Analog Signal Chain Guide

TEXAS INSTRUMENTS

Amplifiers

Data Converters

Interface

Clocks and Timing

Sensing

Wireless Connectivity

Analog Signal Chain Guide
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Proven analog innovation

Analog signal chain products and solutions from Texas Instruments deliver performance, power, integration and size advantages that allow designers to differentiate their electronic systems in key areas, such as energy efficiency, speed, precision, portability and audio.

TI products address the critical issues facing engineers in a variety of applications, such as factory automation equipment, automotive safety systems, communications base stations, smartphones and more.

Our data converters improve the accuracy of industrial test equipment. Amplifiers sharpen image and audio quality in surveillance cameras. Interface ICs speed downloads of high-definition video files. Analog front ends make smaller ultrasound equipment possible. Clock ICs maximize spectral density and data rates in communications equipment. Just to name a few.

Award-winning online analog design tools and support

TI also provides easy-to-use design tools and resources that help keep designers at the top of their game and shorten time-to-market.

Our WEBENCH® Design Center is an ecosystem of online and downloadable tools that speed analog design and deliver custom results in minutes.

The TI Precision Designs library includes categories of Reference, Verified and CerTIfied Designs that provide all of the methodology and results, and design and simulation files needed to quickly evaluate and customize a precision system and speed end products to market.

Our TI E2E™ Community includes more than 120,000 members, where engineers can ask questions and get answers from TI experts.

TI E2E™ Community engineer.to.engineer, solving problems e2e.ti.com

Precision, 20 MHz, 0.9 pA, Low-Noise, RRIO, CMOS Operational Amplifiers with Shutdown
OPA320

The OPA320 series is ideal for low-power, single-supply applications. The OPA320 features a linear input stage with zero-crossover distortion that delivers excellent common-mode rejection ratio (CMRR) of typically 114 dB, low-noise (7 nV/$\sqrt{Hz}$ and total harmonic distortion plus noise of 0.0005% typical). High-speed operation also makes them well-suited for driving sampling analog-to-digital converters (ADCs). Other applications include signal conditioning and sensor amplification.

Key Features
- Precision with zero-crossover distortion:
  - Low offset voltage: 150 μV (max)
  - High CMRR: 114 dB
  - Rail-to-rail I/O
- Low input bias current: 0.9 pA (max)
- Low noise: 7 nV/$\sqrt{Hz}$ at 10 kHz
- Wide bandwidth: 20 MHz
- Slew rate: 10 V/μs and
- Quiescent current: 1.45 mA/ch
- Single-supply voltage range: 1.8 V to 5.5 V
- Unity-gain stable
- Small packages: SOT23, MSOP, DFN

Applications
- High-Z sensor signal conditioning
- Transimpedance amplifiers
- Test and measurement equipment
- Programmable logic controllers (PLCs)
- Motor control loops
- Communications
- Input/output ADC/DAC buffers
- Active filters

$$G = 5 + \frac{200k\,\Omega}{R_G}$$

Two Op Amp Instrumentation Amplifier with Improved High-Frequency Common-Mode Rejection

Get more information: **www.ti.com/product/OPA320**

Amplifiers and Comparators
Operational Amplifiers

23 MHz CMOS EMI Hardened Op Amp with 1.8 V Shutdown Logic
LMV881

The LMV881 is a low power CMOS input operational amplifier that provides low input bias currents, a rail-to-rail output with high output drive capability and a wide temperature range of –40°C to +125°C. Additionally, the LMV881 is EMI hardened to minimize sensitivity to external interference. The LMV881 is offered in the space saving six-pin micro LLP package and provides excellent performance and economy in terms of power and space usage.

Key Features
- Supply voltage: 2.7 V to 5.5 V
- Supply current: 1.65 mA
- Shutdown current: 200 pA
- Input offset voltage: 1 mV max
- Input bias current: 0.1 pA
- GBW: 23 MHz
- EMIRR at 1.8 GHz: 105 dB
- Input noise voltage at 1 kHz: 9 nV/$\sqrt{Hz}$
- Slew rate: 12 V/µs
- Output voltage swing: rail-to-rail
- Output current drive: 70 mA

Applications
- Filters/buffers
- Medical diagnosis equipment
- Weight scale systems
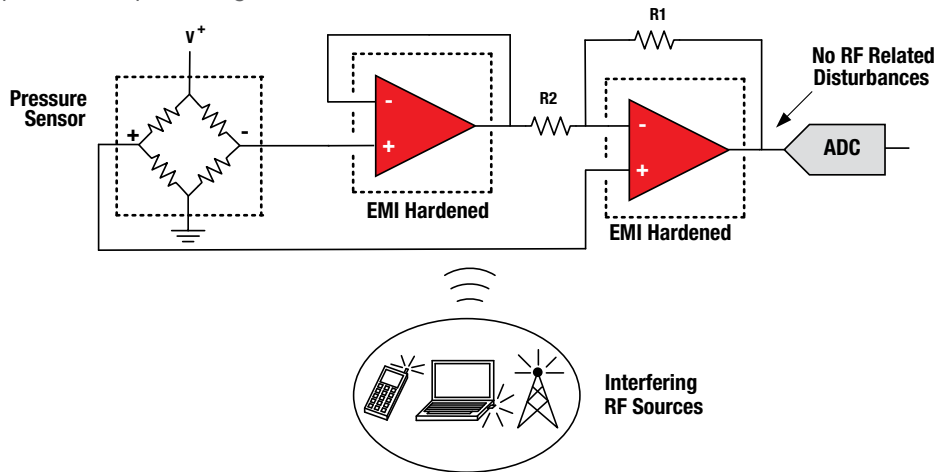
LMV881 functional diagram

Get more information: **www.ti.com/product/LMV881**

Amplifiers and Comparators
Operational Amplifiers

10-MHz, Low-Noise, RRO, 36 V Operational Amplifier in MicroPackages
OPA172

PREVIEW

The OPA172 family of single, dual and quad op amps are a series of 36 V low noise operational amplifiers that feature single supply, and MicroPackages with the ability to operate on supplies ranging from +2.7 V (±1.35 V) to +36 V (±18 V). They offer good offset, drift and bandwidth with low quiescent current. All versions have identical specifications for maximum design flexibility.

Unlike most op amps, which are specified at only one supply voltage, the OPA172 family of op amps are specified from +2.7 V to +36 V. Input signals beyond the supply rails will not cause phase reversal and the OPA172 family is stable with capacitive loads of 300 pF. The input can go 100 mV below the negative rail and within 2 V of the top rail for normal operation.

Key Features
- Supply range: +2.7 V to +36 V, ±1.3 5 V to ±18 V
- MicroPackages: Single in SC-70, dual in MSOP-8
- Low noise: 8 nV/√Hz
- Input offset voltage: 1 mV
- RFI filtered inputs
- Input range includes the negative supply
- Input range operates to positive supply
- Output short circuit current: 80 mA typ
- Rail-to-rail output
- Gain Bandwidth: 10 MHz
- Low quiescent current: 1.6 mA per amp max
- High common-mode rejection: 120 dB

Applications
- Tracking amplifier in power modules
- Merchant power supplies
- Transducer amplifier
- Bridge amplifier
- Temperature measurements
- Strain gage amplifier
- Precision integrator
- Battery powered instruments
- Test equipment
- Active filters
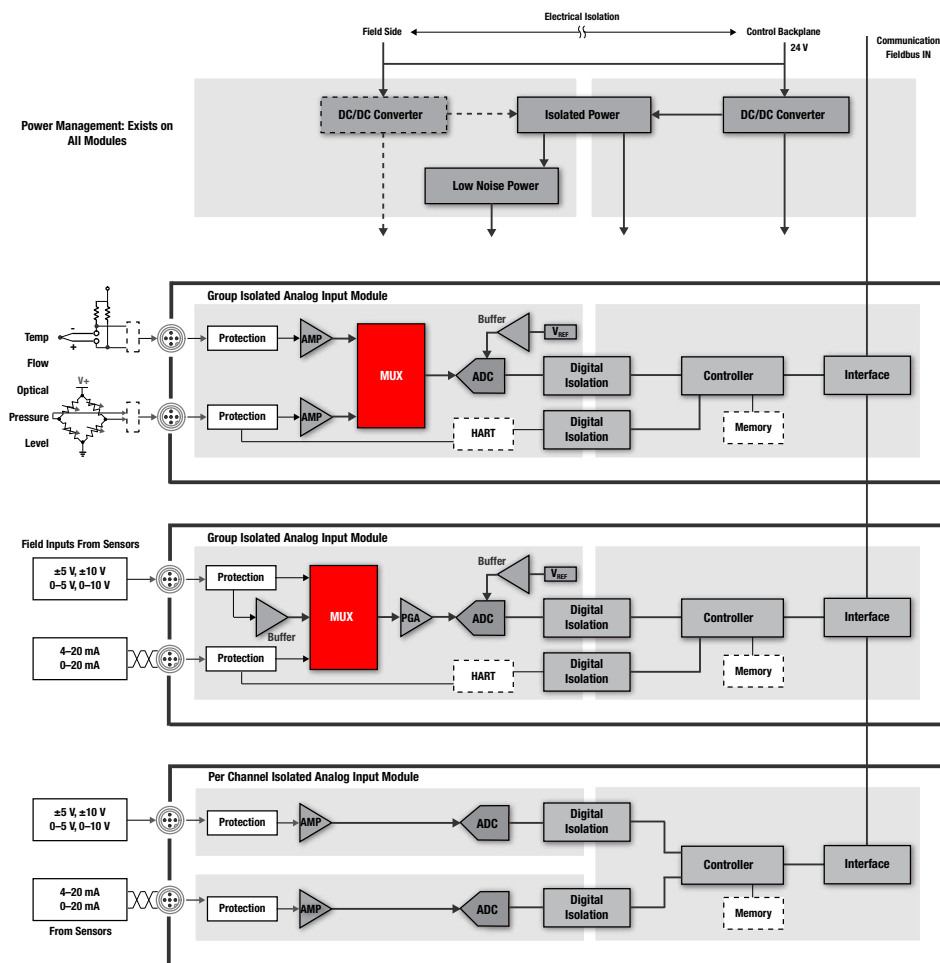
System block diagram

Get more information: **www.ti.com/product/OPA172**

Amplifiers and Comparators
Operational Amplifiers

Low Offset Voltage Operational Amplifiers (V_{OS} <500 µV) (sorted by V_{OS})

Device	Description	Ch.	V_S (V) (min)	V_S (V) (max)	I_Q Per Ch. (mA) (max)	GBW (MHz) (typ)	Slew Rate (V/µs) (typ)	V_{OS} (25°C) (mV) (max)	V_{OS} Drift (µV/°C) (typ)	I_B (pA) (max)	CMRR (dB) (min)	V_N at 1 kHz (nV/√Hz) (typ)	Single Supply	Rail-to-Rail	HiRel Avail.	Package	Price*
LMP2021/2	Zero Drift, Low Noise, EMI Hardened Amplifiers	1, 2	2.2	5.5	1.57	5	2.6	0.005	0.004	300	120	11	Y	Out	N	SOT23-5, SOIC-8, VSSOP-8	1.00
OPAy734/5	12 V, Zero-Drift, SHDN, CMOS	1, 2	2.7	12	0.75	1.6	1.5	0.005	0.01	200	115	135	Y	Out	N	SOT-23, SOIC	1.25
LMP2011/2	High Precision, Rail-to-Rail Output Amplifiers	1, 2	2.7	5.25	1.5	3	4	0.025	0.015		100	35	N	Out	Y	SOIC-8, SOT23-5, VSSOP-8	0.90
OPAy334/5	Zero-Drift, SHDN, CMOS	1, 2	2.7	5.5	0.35	2	1.6	0.005	0.02	200	110	62	Y	Out	N	SOT-23, MSOP	1.00
OPAy333	Zero Drift, CMOS, µPower	1, 2, 4	1.8	5.5	0.025	0.35	0.16	0.01	0.02	200	106	55	Y	I/O	Y	SC-70, SOT-23, SOIC	0.95
OPAy330	Low-Power, Zero-Drift, RRIO Operation Amplifier	1, 2, 4	1.8	5.5	0.035	0.35	0.16	0.05	0.02	500	100	55	Y	I/O	N	SC-70, SOT-23, SOIC, SON, VQFN, TSSOP	0.45
OPAy381	Precision, Low Power, High-Speed Transimpedance Amplifier	1, 2	2.7	5.5	1	18	12	0.025	0.03	50	95	114	Y	Out	N	MSOP, DFN	0.75
OPAy188	Precision, Low-Noise, Rail-to-Rail Output, 36-V, Zero-Drift Op Amp	1, 2, 4	4.0	36.0	0.510	2.0	0.8	0.03	0.03	1400	130	9	Y	I/O	N	MSOP, SOT-23, SOIC, TSSOP	0.80
OPAy277	High Precision, Low Power	1, 2, 4	4	36	0.825	1	0.8	0.02	0.1	1000	130	8	N	N	N	SON, SOIC	0.85
OPA177	Precision Operational Amplifier	1	6	36	25	0.6	0.3	0.025	0.1	2000	130	7.5	N	N	N	PDIP, SOIC	1.00
OPAy378	Zero-Drift, GBW 0.9 MHz, Low I_Q	1, 2	2.2	5.5	0.125	0.9	0.4	0.05	0.1	500	100	20	Y	I/O	N	SC-70, SOT-23, SOIC	0.70
OPAy227/28	Bipolar, Low Noise, Low I_B	1, 2, 4	5	36	3.8	8, 33	2.3, 11	0.075	0.1	10000	120	3	N	N	N	SOIC, PDIP	1.10
LMP867x	40 V Low Noise, Precision Amp	1, 2, 4	5	40	8	55	20	0.4	0.1	95000	105	2.5	N	N	N	SOIC-8, SOIC-14	1.20
LMH6626	Wideband Low Noise	2	5	12	16	1300	360	0.5	0.2	20	87	1	Y	N	N	SOIC	2.05
LMH6624	Wideband Low Noise	1	5	12	16	1400	400	0.5	0.2	20	87	0.92	Y	N	N	SOT2-3, SOIC	1.86
OPAy727/8	e-trim™, CMOS 12 V, SHDN	1, 2, 4	4	12	6.5	20	30	0.15	0.3	500	86	23	Y	Out	N	MSOP, SON	0.60
LMP223x	Micropower, 1.6 V, Precision Op Amp with CMOS Inputs	1,2,4	1.6	5.5	0.018	0.13	0.058	0.15	0.3	50	81	60	Y	Out	N	SOT23-5, SOIC-8, VSSOP-8, SOIC-14, TSSOP-14	1.17
OPAy376	Precision, Low Noise, e-trim Series	1, 2, 4	2.2	5.5	0.95	5.5	2	0.025	0.32	10	76	7.5	Y	Out	N	SC-70, SOT-23	0.65
OPAy211	Bipolar, Ultra-Low Noise	1, 2	4.5	36	4.5	45	27	0.12	0.35	175000	114	1.1	Y	Out	Y	MSOP, SOIC, SON	5.15
OPAy140	10 MHz, Single-Supply, Low-Noise, JFET Precision Amplifier	1, 2, 4	4.5	36	2.0	11	20	0.12	0.35	10	120	5.1	Y	Out	N	SOIC, MSOP, TSSOP, SOT-23	1.55
OPAy211A	1.1 nV/√Hz Noise, Low-Power, Precision Operational Amplifier	1, 2	4.5	36	4.5	45	27	0.125	0.35	175000	114	1.1	Y	Out	N	MSOP, SOIC, SON	3.45
TLE2027/37	Wide Supply, Low Noise, Bipolar	1	8	38	5.3	13, 50	2.8, 7.5	0.1	0.4	90000	100	2.5	N	N	Y	SOIC, PDIP	0.90
OPAy241	Optimized for +5 V Supply, High CMRR and A_{OL}	1, 2, 4	2.7	36	0.03	0.035	0.01	0.25	0.4	20000	80	45	Y	Out	N	SOIC, DIP	1.15
OPAy234	Low Power, Wide Supply, Bipolar	1, 2, 4	2.7	36	0.35	0.35	0.2	0.10	0.5	25000	91	25	N	Out	N	MSOP, SOIC	1.05
OPAy251	Single Supply +36 V, High CMRR and A_{OL}	1, 2, 4	2.7	36	0.038	0.035	0.01	0.25	0.5	20000	100	45	Y	Out	N	SOIC, DIP	1.15
OPA627/37	Ultra-Low THD+N, Difet	1	9	36	7.5	16, 80	55, 135	0.25	0.8	5	106	5.2	N	N	N	PDIP, SOIC	12.25
OPAy209	Low Noise, Low Power, 36 V, Operational Amplifier in SOT-2	1, 2, 4	4.5	36	2.5	18	6.25	0.15	1	4500	120	2.2	Y	Out	N	SOT-23, MSOP, SOIC	0.95
LMP7711/ 12/15/16/ 17/18	17 MHz, Low Noise, CMOS Input Amplifiers	1, 2	2	5.5	1.75	17	11.5	0.15	1	100	85	5.8	N	Out	N	SOT23-5, VSSOP-8	0.75
OPAy365	Zero-Crossover, Low V_{IO} and Drift	1, 2	2.2	5.5	5	50	25	0.2	1	10	100	10.1	Y	I/O	N	SOT-23, SOIC	0.65
OPAx320	20 MHz, Low-Noise, Low- Power, RRIO Precision CMOS	1, 2, 4	1.8	5.5	1.6	20	10	0.15	1.5	0.9	100	8.5	Y	I/O	N	MSOP, SON, SOT-23, SOIC	0.80
OPAy336	µPower, CMOS, Single Supply	1, 2, 4	2.3	5.5	0.032	0.1	0.03	0.125	1.5	10	80	40	Y	Out	Y	SOT-23, SOIC	0.40
LMP7721	Ultra-Low Inputs Bias Current Precison Amplifier	1	1.8	5.5	1.95	17	12.76	0.15	1.5	0.9	84	6.5	Y	Out	N	SOIC-8	4.70
OPAy827	Precision, Low Noise, JFET Input	1, 2	8	36	5.2	22	28	0.15	2	10	104	4	N	N	N	SOIC, MSOP	3.75
OPA124	Wide Bandwidth, Bipolar	1	10	36	3.5	1.5	1.6	0.3	2	1	94	8	N	N	N	SOIC	3.95
OPAy340	CMOS, Wide Bandwidth	1, 2, 4	2.7	5.5	0.95	5.5	6	0.5	2.5	10	80	25	Y	I/O	Y	MSOP, SOIC, SOT-23, SSOP, PDIP	0.90
OPAy363/4	1.8 V, RRIO, High CMRR, Shutdown (0.9 µA)	1, 2, 4	1.8	5.5	0.75	7	5	0.5	3	10	74	17	Y	I/O	N	MSOP, SOIC, SOT-23	0.60
OPAy350	Excellent ADC Driver, Low Noise	1, 2, 4	2.5	5.5	7.5	38	22	0.5	4	10	74	18	Y	I/O	N	PDIP, MSOP, SOIC, SSOP	1.15

Suggested resale price in U.S. dollars in quantities of 1,000. See www.ti.com/hirel for HiRel options.

*New products are listed in **bold red**.*

Amplifiers and Comparators
Operational Amplifiers

Low Offset Voltage Operational Amplifiers (V_{OS} <500 µV) (sorted by V_{OS}) (continued)

Device	Description	Ch.	V_S (V) (min)	V_S (V) (max)	I_Q Per Ch. (mA) (max)	GBW (MHz) (typ)	Slew Rate (V/µs) (typ)	V_{OS} (25°C) (mV) (max)	V_{OS} Drift (µV/°C) (typ)	I_B (pA) (max)	CMRR (dB) (min)	V_N at 1 kHz (nV/√Hz) (typ)	Single Supply	Rail-to-Rail	HiRel Avail.	Package	Price*
OPA836	Very Low Power, Rail to Rail Out, Negative Rail In, VFB Op Amp	1	2.5	5.5	1	118	580	0.4	6.3	1000000	116	4.6	Y	Out	Y	QFN-10, SOT23-6	0.90
OPA2836	Dual, Very Low Power, Rail to Rail Out, Negative Rail In, VFB Op Amp	2	2.5	5.5	1	118	580	0.4	6.3	1000000	116	4.6	N	Out	N	MSOP-10, SOIC-8, QFN-10	1.50
OPA835	Ultra Low Power, Rail to Rail Out, Negative Rail In, VFB Amplifier	1	2.5	5.5	0.34	30	130	0.5	8.5	400000	113	10.0	Y	Out	Y	QFN-10, SOT23-6	0.85
OPA2835	Dual, Ultra Low Power, Rail to Rail Out, Negative Rail In, VFB Amplifier	2	2.5	5.5	0.34	30	130	0.5	8.5	400000	113	10.0	Y	Out	Y	MSOP-10, SOIC-8, QFN-10	1.35

*Suggested resale price in U.S. dollars in quantities of 1,000. See **www.ti.com/hirel** for HiRel options.*

Low-Power Operational Amplifiers (I_Q <1000 µA) (sorted by I_Q)

Device	Description	Ch.	V_S (V) (min)	V_S (V) (max)	I_Q Per Ch. (mA) (max)	GBW (MHz) (typ)	Slew Rate (V/µs) (typ)	V_{OS} (mV) (25°C) (max)	V_{OS} Drift (µV/°C) (typ)	I_B (pA) (max)	CMRR (dB) (min)	V_N at 1 kHz (nV/√Hz) (typ)	Single Supply	Rail-to-Rail	HiRel Avail.	Package	Price*
LPV521	Nano Power, RRIO, CMOS Input	1	1.6	5.5	0.0004	0.0062	0.0027	1	3.5	1	75	255	Y	I/O	N	SC70	0.49
TLV240x	2.5 V, Sub-µPower, SS, CMOS	1, 2, 4	2.5	16	0.00095	0.0055	0.0025	1.2	3	300	63	50	Y	I/O	N	MSOP, SOIC, SOT23	0.65
OPAy369	1 µA, SS, Zero Cross-over, CMOS	1, 2	1.8	5.5	0.001	0.012	0.005	0.75	0.4	50	100	290	Y	I/O	N	SC70, SOT23, MSOP	0.65
TLV224x	Low Voltage, 1 µA, SS, CMOS	1, 2, 4	2.5	12	0.0012	0.0055	0.002	3	3	500	55	50	Y	I/O	N	MSOP, SOIC, SOT23	0.65
LPV511	Micro Power, RRIO	1	2.7	12	0.00175	0.025	0.007	3	15	800	75	320	Y	I/O	N	SC70	0.45
OPAy349	2 µA, SS, CMOS	1, 2	1.8	5.5	0.002	0.07	0.02	10	15	10	52	300	Y	I/O	N	SC70, SOIC, SOT23	0.45
OPAy379	1.8 V, Ultra-Low Power, CMOS	1, 2, 4	1.8	5.5	0.0055	0.09	0.03	1.5	2.7	50	90	80	Y	I/O	N	SC70, SOT23, SOIC	0.40
LPV531	Programmable Micro Power, CMOS Input, R/R Output	1	2.7	5.5	0.007	0.073	0.028	4.5	2	10	72	200	Y	Out	N	TSOT23	0.45
LPV321	Low voltage, Low Power, RRIO	1,2,4	2.7	5	0.012	0.152	0.1	7	2	50000	50	146	Y	Out	N	SC70, SOT23, SOIC, MSOP, TSSOP	0.29
TLC27Lx	LinCMOS™ Low-Power Operational Amplifier	1, 2, 4	3	16	0.017	0.085	0.03	10	1.1	60	65	68	Y	N	Y	SOIC, PDIP	0.37
LMP223x	Micropower, 1.6 V, Precision Operational Amp with CMOS Inputs	1, 2, 4	1.6	5.5	0.018	0.13	0.058	0.15	0.3	50	81	60	Y	Out	N	SOT23-5, SOIC-8, VSSOP-8, SOIC-14, TSSOP-14	1.17
OPAy333	17 µA, SS, RRIO, Zero-Drift, CMOS	1, 2	1.8	5.5	0.025	0.35	0.16	0.01	0.02	200	106	55	Y	I/O	Y	SC70, SOT23, SOIC	0.95
OPAy241	Optimized for +5 V Supply, High CMRR and AOL	1, 2, 4	2.7	36	0.03	0.035	0.01	0.25	0.4	20000	80	45	Y	Out	N	PDIP, SOIC	1.15
OPAy336	µPower, SS, CMOS	1, 2, 4	2.3	5.5	0.032	0.1	0.03	0.125	1.5	10	80	40	Y	Out	N	SOT23, SOIC	0.40
OPAy347	µPower, Low Cost, SS, CMOS	1, 2, 4	2.3	5.5	0.034	0.35	0.17	6	3	10	70	60	Y	I/O	N	SC70, SOT23, WCP	0.20
OPAy330	Low-Power, Zero-Drift, RRIO Operational Amplifier	1, 2, 4	1.8	5.5	0.035	0.35	0.16	0.05	0.02	500	100	55	Y	I/O	Y	SC70, SOT23, SOIC, SON, VQFN, TSSOP	0.45
OPAy251	Single Supply +36 V, High CMRR and AOL	1, 2, 4	2.7	36	0.038	0.035	0.01	0.25	0.5	20000	100	45	N	Out	N	SOIC, PDIP	1.15
TLV245x	µPower, SS, CMOS	1, 2, 4	2.7	6	0.042	0.22	0.11	1.5	0.3	5000	70	52	Y	I/O	N	SOT23, SOIC, PDIP	0.60
OPAy244	µPower, SS, Low Cost, Bipolar	1, 2, 4	2.2	36	0.06	0.43	0.1	1.5	4	25000	84	22	Y	Out	N	SOIC, SOT-23, PDIP	0.50
OPAy348	High Open-Loop Gain, SS, CMOS	1, 2, 4	2.1	5.5	0.065	1	0.5	5	4	10	70	35	Y	I/O	N	SC70, SOIC, SOT23	0.20
LMC7111	Tiny CMOS Amplifier with Rail-to-Rail Input/Output	1	2.5	11.0	0.075	0	0.0	9	2	20	85	110	Y	I/O	N	8PDIP 5SOT23	0.38

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Texas Instruments

Amplifiers and Comparators
Operational Amplifiers

Low-Power Operational Amplifiers (I_Q <1000 µA) (sorted by I_Q) (continued)

Device	Description	Ch.	V_S (V) (min)	V_S (V) (max)	I_Q Per Ch. (mA) (max)	GBW (MHz) (typ)	Slew Rate (V/µs) (typ)	V_{OS} (mV) (25°C) (max)	V_{OS} Drift (µV/°C) (typ)	I_B (pA) (max)	CMRR (dB) (min)	V_N at 1 kHz (nV/√Hz) (typ)	Single Supply	Rail-to-Rail	HiRel Avail.	Package	Price*
LMV65x	Low Power, Low Voltage, 12 MHz	1, 2, 4	2.7	5.5	0.14	12	3	1.5	6.6	120000	90	17	Y	N	N	SC70, SOT23	0.40
OPAy170	36 V Single-Supply, Low-Noise CMOS Amplifier in SOT553	1, 2, 4	2.7	36	0.145	1	0.4	1.8	0.3	15	104	19	Y	Out	N	SOT553, SOT23, SOIC	0.40
OPAy378	Zero-Drift, GBW 0.9 MHz, Low I_Q	1, 2	2.2	5.5	0.15	0.9	0.4	0.05	0.1	550	100	20	Y	I/O	N	SC70, SOT23	0.70
LMV641	Low Power, 12 V, 10 MHz	1	2.7	12	0.19	10	2.6	0.5	0.1	90000	94	14	Y	N	N	SC70, SOT23	0.62
OPAy703/4	12 V, RRIO, GBW 1 MHz	1, 2, 4	4	12	0.2	1	0.6	0.75	4	10	70	45	Y	I/O	N	SOT23, PDIP, SOIC	1.30
LMV93x	Low Voltage, RRIO	1, 2, 4	1.8	5.5	0.21	1.5	0.42	4	1.0	35000	60	50	Y	I/O	N	SC70, SOT23	0.40
LMV98x	Low Voltage, RRIO, Shutdown	1, 2	1.8	5	0.21	1.5	0.42	4	1.0	35000	60	50	Y	I/O	N	Micro SMD, SC70, SOT23	0.36
OPAy345	Wideband, Single Supply (G >5)	1, 2, 4	2.5	5.5	0.25	3	2	1	3	10	76	35	Y	I/O	N	SOT23, SOIC	0.55
OPAy137	Low Cost, FET-Input	1, 2, 4	4.5	36	0.27	1	3.5	3	15	100	76	45	N	N	N	SOT23, SOIC, DIP	0.60
LMV83x	Low Power, CMOS, 3.3 MHz, EMI Hardened	1, 2, 4	2.7	5.5	0.27	3.3	2	1	1.5	10	77	12	Y	Out	N	SC70	0.55
OPA835	Ultra Low Power, Rail to Rail Out, Negative Rail In, VFB Amplifier	1	2.5	5.5	0.35	31	160	0.5	8.5	400000	91	9.3	Y	OUT	Y	QFN-10, SOT23-6	0.85
OPA2835	Dual, Ultra Low Power, Rail to Rail Out, Negative Rail In, VFB Amplifier	2	2.5	5.5	0.35	31	160	0.5	8.5	400000	91	9.3	Y	OUT	N	MSOP-10, SOIC-8, QFN-10	1.35
TLE202x	Precision Low-Power Single-Supply Operational Amplifier	1, 2, 4	4	40	0.35	2.0	0.65	0.5	2	70000	100	17	Y	N	Y	SOIC, PDIP, TSSOP	0.45
OPAy234	Low Power, Precision	1, 2, 4	2.7	36	0.35	0.35	0.2	0.25	0.5	25000	91	25	Y	N	N	MSOP, SOIC	1.50
OPAy334/5	Zero Drift, CMOS, SS, SHDN	1, 2	2.7	5.5	0.35	2	1.6	0.005	0.02	200	110	62	Y	Out	N	SOT23	1.00
LMV82x	Low Voltage, Low Power, R/R Output, 5 MHz	1, 2, 4	2.5	5.5	0.4	5.6	2	3.5	1	100000	72	24	Y	Out	N	SC70, SOT23	0.39
LM6132/34	RRIO, Dual Low Power 10 MHz Op Amp	2/4	2.7	24	0.40	10	14	2	5	140000	75	27	Y	I/O	N	PDIP, SOIC	1.19
LMV951	Low Voltage, 2.7 MHz, RRIO, Shutdown	1	0.9	3	0.48	2.7	1.4	2.8	0.15	80000	67	25	Y	I/O	N	Thin SOT23	0.52
LMV85x	Low Power, CMOS, EMI Hardened	1, 2, 4	2.7	5.5	0.5	8	4.5	1	2	10	77	11	Y	Out	N	SC70	0.63
OPAy171	36 V Single-Supply, Low-Noise CMOS Amplifier in SOT553	1, 2, 4	2.7	36	0.595	3	1.5	1.8	0.3	15	104	14	Y	Out	N	SOT553, SOT23, SOIC	0.40

*Suggested resale price in U.S. dollars in quantities of 1,000. **See www.ti.com/hirel** for HiRel options.

New products are listed in **bold red.**

Low-Noise Operational Amplifiers ($V_N \leq 10$ nV/$\sqrt{Hz}$) (sorted by V_N)

Device	Description	Ch.	V_S (V) (min)	V_S (V) (max)	I_Q Per Ch. (mA) (max)	GBW (MHz) (typ)	Slew Rate (V/µs) (typ)	V_{OS} (25°C) (mV) (max)	V_{OS} Drift (µV/°C) (typ)	I_B (pA) (max)	CMRR (dB) (min)	V_N at 1 kHz (nV/$\sqrt{Hz}$) (typ)	Single Supply	Rail-to-Rail	HiRel Avail.	Package	Price*
LMH6629	Single Ultra Low Noise Wideband Op Amp	1	2.7	5.5	16.7	4000	1100	0.78	0.45	23	82	0.69	Y	N	N	SOT, WSON	1.88
LMH6624	Single Low Noise Wideband Op Amp	1	5	12	16	1500, G =10	400	0.5	0.2	20	87	0.92	Y	N	N	SOT, SOIC	1.86
OPA161x	High Performance, Bipolar Input, Audio Amp	1, 2	4.5	36	4.5	80	27	0.5	1	250000	110	1.1	N	Out	N	SOIC	1.75
LMH6626	Dual Low Noise Wideband Op Amp	2	5	12	16	1300, G =10	360	0.5	0.2	20	87	1	Y	N	N	SOIC, MSOP	2.05
OPAy211	Bipolar, Ultra-Low Noise	1	4.5	36	4.5	80	27	0.125	0.35	175000	114	1.1	N	Out	Y	MSOP, SOIC, SON	5.15
OPAy211A	1.1 nV/$\sqrt{Hz}$ Noise, Low-Power, Precision Operational Amplifier	1, 2	4.5	36	4.5	80	27	0.125	0.35	175000	114	1.1	N	Out	Y	MSOP, SOIC, SON	3.45
LMH6733	Wideband, Low Voltage 1 GHz Triple Op Amp	3	3	12	7.3	1000	3750	2.2	30	19	53	2.1	Y	N	N	SSOP	2.60
OPAy209	Low-Noise, Low-Power, 36 V, Operational Amplifier in SOT23	1, 2, 4	4.5	36	2.5	18	6.4	0.15	1	4500	120	2.2	Y	Out	N	SOT23, MSOP, SOIC	0.95
LMH6738	Wideband, Low Distrotion Triple Op Amp	3	10	12	11.67	750	3300	2.5	30	0.001	46	2.2	Y	N	N	SSOP	2.60
LMH6703	Ultra Low Distortion, Wideband Op Amp	1	8	12	12.5	1800	4200	7	22	20	45	2.3	Y	N	N	SOIC, SOT23	1.37
TLE2027	Low-Noise Precision Operational Amplifier	1	8	38	5.3	13	2.8	0.1	0.4	90000	100	2.5	N	N	Y	SOIC, PDIP	0.90
LMP773x	2.9 mN/$\sqrt{Hz}$ Low Noise RRIO Operational Amplifiers	1, 2	1.8	5.5	3.0	22	2.4	0.5	0.5	30000	105	2.9	Y	I/0	N	SOT23-5, SOIC-8	1.05
OPAy227	Precision, Low Noise, G≥5 Bipolar	1, 2, 4	5	36	3.8	8	2.3	0.075	0.1	10000	120	3	N	N	N	PDIP, SOIC	1.10
LMH6609	900 MHz Voltage Feedback Op Amp	1	6	12	8.5	900	1400	2.5	—	5	65	3.1	N	N	N	SOT, SOIC	0.94
LMH6714/ 20/22	Wideband Video Op Amp	1/2/4	10	12	7.5	400	1800	6	8	10	48	3.4	Y	N	N	SOIC, SOT23, TSSOP, WSON	0.77/0.85 /1.49
LMH6715	Wideband Video Op Amp	2	10	12	7.5	480	1300	6	30	12	50	3.4	Y	N	Y	SOIC	1.05
OPA827	Ultra-LowTHD+N, High Precision, Low Noise, JFET	1	8	36	5.2	22	28	0.15	0.1	10	104	4	N	N	N	MSOP, SOIC	3.75
LMH6723/ 24	370 MHz 1 mA Current Feedback Op Amp	1/2	4.5	12	1.4	370	600	3	—	4	57	4.3	Y	N	N	SOT, SOIC	0.80/ 1.05
LMH6654/ 55	Low Power, 250 MHz, Low Noise Op Amp	1/2	5	12	6	260, G >= 5	200	3	6	10	70	4.5	Y	N	N	SOT, SOIC, MSOP	0.90/ 1.28
LMH6672	Dual, High Current, High Speed Op Amp	2	5	12	9	90	170	5.5	5	14	150	4.5	Y	N	N	SOIC, PSOP	1.60
OPA2836	Dual, Very Low Power, Rail to Rail out, Negative Rail in, VFB Op Amp	2	2.5	5.5	1	118	560	0.4	6.3	1000000	116	4.6	N	Out	N	MSOP-10, SOIC-8, QFN-10	1.50
OPA836	Very Low Power, Rail to Rail Out, Negative Rail In, VFB Op Amp	1	2.5	5.5	1	118	560	0.4	6.3	1000000	116	4.6	Y	Out	Y	QFN-10, SOT23-6	0.90
OPAy140	10 MHz, Single Supply, Low Noise, JFET Precision Amp	1, 2, 4	4.5	36	2.0	11	20	0.12	0.35	10	126	5.1	Y	Out	N	SOIC, MSOP, SOT23	1.55
OPA627A	Ultra-LowTHD+N, Difet™ Unit	1	9	36	7.5	16	55	0.25	1.2	10	100	5.6	N	N	N	PDIP, SOIC	12.25
LMP771x	Single and Dual Precision 17 MHz Low Noise CMOS Input Amplifiers	1, 2	1.8	5.5	1.4	17	9.5	0.15	−1	1	85	5.8	Y	Out	N	TSOT23, MSOP	0.80
LMV797	17 MHz Low Noise 1.8 V CMOS Operational Amplifier	1, 2	1.8	5.5	1.4	17	9.5	1.35	−1	1	80	5.8	Y	Out	N	MSOP	0.63
LMV791/2	17 MHz Low Noise 1.8 V CMOS Operational Amplifier w/SD	1, 2	1.8	5.5	1.4	17	9.5	1.35	−1	1	80	5.8	Y	Out	N	TSOT-23	0.50
LMV793/4	88 MHz Low Noise 1.8 V CMOS Operational Amplifier	1, 2	1.8	5.5	1.4	88	28.0	1.35	−1	1	80	5.8	Y	Out	N	SOT23-5, SOIC	0.63

Suggested resale price in U.S. dollars in quantities of 1,000. See www.ti.com/hirel for HiRel options.

Low-Noise Operational Amplifiers ($V_N \leq 10$ nV/$\sqrt{Hz}$) (sorted by V_N) (continued)

Device	Description	Ch.	V_S (V) (min)	V_S (V) (max)	I_Q Per Ch. (mA) (max)	GBW (MHz) (typ)	Slew Rate (V/μs) (typ)	V_{OS} (25°C) (mV) (max)	V_{OS} Drift (μV/°C) (typ)	I_B (pA) (max)	CMRR (dB) (min)	V_N at 1 kHz (nV/$\sqrt{Hz}$) (typ)	Single Supply	Rail-to-Rail	HiRel Avail.	Package	Price*
LM6211	Low Noise RRO Amplifier w/CMOS Inputs and 24 V Operation	1	5	24	1.25	20.0	5.6	2.7	0.25	25	85	6	Y	Out	N	SOT23-5	1.08
LMV793	88 MHz Low Noise1.8 V CMOS Decompensted Amplifier	1	1.8	5	1.3	88	28	1.35	–1	1	80	6.2	Y	Out	N	SOT23-5, SOIC-8	0.60
OPAy141	10 MHz, Single-Supply, Low-Noise, JFET Precision Amplifier	1, 2, 4	4.5	36	2.3	10	20	3.5	2	20	120	6.5	Y	Out	N	MSOP, SOIC,TSSOP	0.85
LMV751	Low Noise, Single Low V_{OS} Op Amp	1	2.7	5	0.9	5	2.3	1	5	100	85	6.5	Y	Out	N	SOT23-5	0.77
LMP7721	3 Femtoampere Input Bias Current Precision Amplifier	1	1.8	5.5	1.7	17	10.43	0.15	–1.5	0.020	84	6.5	Y	Out	N	SOIC	4.70
TLC07xC	Wide-Bandwidth, High-Output-Drive Op Amp Family	1, 2, 4	4.5	16	2.9	10	16	1.9	1.2	50	80	7	Y	N	N	PDIP, SOIC, HTSSOP	0.47
OPA177	Precision Operational Amplifier	1	6	36	2	0.6	0.3	0.025	0.1	2000	130	7.5	N	N	N	PDIP, SOIC	1.10
OPAy376	Low Offset, 5.5 MHz, ADC Buffer	1, 2, 4	2.2	5.5	0.95	5.5	2	0.025	0.26	10	76	7.5	Y	I/O	N	SC70, SOT23, SOIC	0.65
OPAy377	Low-Cost, Low-Noise, 5.5 MHz CMOS Operational Amplifier	1, 2, 4	2.2	5.5	1.05	5.5	2	1	0.32	10	70	7.5	Y	Out	N	SC70, SOT23, SOIC,TSSOP	0.40
OPAy277	High Precision, Low Power	1, 2, 4	4	36	0.825	1	0.8	0.05	0.15	2800	115	8	N	N	N	SON, SOIC, PDIP	0.85
OPA124	Low Noise, Precision, Bipolar	1	10	36	3.5	1.5	1.6	0.5	2	2	94	8	N	N	N	SOIC	4.75
TLC220x	Precision, Low Noise, LinCMOS™	1, 2	4.6	16	1.5	1.9	2.7	0.5	0.5	60	90	8	Y	Out	Y	SOIC, PDIP	1.75
OPAy132	Wide Bandwidth, FET Input	1, 2, 4	5	36	4.8	8	20	0.5	2	50	96	8	N	N	N	PDIP, SOIC	1.45
TLC227x	Low-Noise Rail-to-Rail Operational Amplifier	2, 4	4.4	16	1.5	2.25	3.6	2.5	2	60	75	9	Y	Out	Y	PDIP, SOIC, TSSOP	0.70
LMP770x	Precision CMOS RRIO Wide Supply Range Amplifier	1, 2, 4	2.7	12	1.1	2.5	1.1	0.2	1	1	92	9	Y	I/O	N	SOT23-5, SOIC	0.99
LM6152/54	75 MHz Rail-to-Rail Input and Output Op Amp	2, 4	2.7	24	2.25	80	30	7	10	500000	84	9	Y	I/O	N	SOIC	1.42
OPA835	Ultra Low Power, Rail to Rail Out, Negative Rail In, VFB Amplifier	1	2.5	5.5	0.25	31	160	0.5	8.5	400000	113	9.3	Y	OUT	Y	QFN-10, SOT23-6	0.85
OPA2835	Dual, Ultra Low Power, Rail to Rail Out, Negative Rail In, VFB Amplifier	2	2.5	5.5	0.25	31	160	0.5	8.5	400000	113	9.3	N	OUT	N	MSOP-10, SOIC-8, QFN-10	1.35
OPA121	Precision, Difet Op-Amp	1	10	36	4.5	2	2	3	3	10	82	10	N	N	N	SOIC	5.10
LMH6601	2.4 V R-R Out CMOS Video Op Amp with Shutdown	1	2.4	5.5	11.5	155	275	2.4	5	0.00005	53	10	Y	Out	N	SOT	0.65
LMH6611/12	345 MHz R-R Output Op Amp with Shutdown	1/2	2.7	11	3.8/4.05	135, G = 10	460	0.6/0.75	0.4	10.1	81	10	Y	Out	N	SOT, SOIC	0.70/0.95
LMH6618/19	130 MHz, 1.25 mA R-R I/O Op Amp with Shutdown	1/2	2.7	11	1.6/1.65	64/57, G = 10	55	0.6	0.9	2.4	84	10	Y	I/O	N	SOT, SOIC	1.19/1.79

*Suggested resale price in U.S. dollars in quantities of 1,000. See www.ti.com/hirel for HiRel options.

Amplifiers and Comparators
Operational Amplifiers

Low Input Bias Current Operational Amplifiers ($I_B \leq 10$ pA) (sorted by I_B)

Device	Description	Ch.	V_S (V) (min)	V_S (V) (max)	I_Q Per Ch. (mA) (max)	GBW (MHz) (typ)	Slew Rate (V/μs) (typ)	V_{OS} (25°C) (mV) (max)	V_{OS} Drift (μV/°C) (typ)	I_B (pA) (max)	CMRR (dB) (min)	V_N at 1 kHz (nV/√Hz) (typ)	Single Supply	Rail-to-Rail	HiRel Avail.	Package	Price*
LMP7721	3 Femtoampere Input Bias Current Precision Amp	1	1.8	5.5	1.5	15	10.43	0.18	−1.5	0.002	83	6.5	Y	Out	N	SOIC	4.70
LMC6001	Ultra Ultra-Low Input Current Amplifier	1	4.5	15.5	0.75	1.3	1.5	0.35	10	0.025	75	22	Y	Out	N	MDIP	5.76
OPA129	Ultra-Low Bias, Difet Unit	1	10	36	1.8	1	2.5	2	3	0.1	0.1	80	N	N	N	SOIC	3.20
OPAx320	20 MHz, Low-Noise, RRIO Precision CMOS	1, 2, 4	1.8	5.5	1.6	20	10	0.14	5	1	114	7	Y	I/O	N	MSOP, SON, SOT23, SOIC	0.80
LPV521	Nanopower 1.8 V RRIO CMOS Input Amplifier	1	1.6	5.5	0.4	0.062	0.0029	1	4	1	75	259	Y	I/O	N	SC70	0.65
LMP223x	Micropower 1.6 V Operational Amplifiers	1, 2, 4	1.6	5.5	0.016	0.13	0.058	0.15	0.3	1	81	60	Y	Out	N	SOT23, MSOP, SOIC, TSSOP	0.90
OPA124	Low Noise, High Precision	1	10	36	3.5	1.5	1.6	0.5	2	2	94	8	N	N	N	PDIP	3.95
OPA602	High-Speed, Precision, Difet Operation Amplifier	1	10	36	4	6.5	35	1	3	2	88	13	N	N	N	PDIP, SOIC	3.80
LMP201x	High Precision Rail to Rail Output Amplifier	1, 2, 4	2.7	5.25	1.2	3	4	0.025	0.015	3	95	35	Y	Out	N	SOT23, SOIC, TSSOP	1.05
LMC606x	Precision CMOS Micropower Operational Amps	1, 2, 4	4.5	15.5	0.032	0.1	0.02	0.8	1	4	75	83	Y	Out	N	SOIC, MDIP	0.72
LMC608x	Precision CMOS Op Amps	1, 2, 4	4.5	15.5	0.75	1.3	0.8	0.35	1	4	75	22	Y	Out	N	SOIC, MDIP	1.28
LPC66x	Low Power CMOS Op Ampl	1, 2, 4	4.75	15.5	0.07	0.35	0.011	6	1.3	4	70	42	Y	Out	N	SOIC, MDIP	0.78
LMC604x	CMOS Operational Amps	1, 2, 4	4.5	15.5	0.026	0.075	0.02	6	1.3	4	75	83	Y	Out	N	SOIC, MDIP	0.66
OPA627	Ultra-Low THD+N, Difet Unit	1	9	36	7.5	16	55	0.25	0.8	5	106	5.2	N	N	N	PDIP, SOIC	12.25
OPAy300/1	Low Noise, 16-Bit Accurate, Shutdown (10 μA)	1, 2	2.7	5.5	12	150	80	5	2.5	5	66	38	Y	Out	N	SOT23, MSOP, SOIC	0.75
LM6211	Low Noise RRO CMOS Amp with 24 V Operation	1	5	24	1.1	5.5	5.5	2.5	2	5	83	6	Y	Out	N	SOT23-5	1.08
LMH6609	900 MHz Voltage Feedback Op Amp	1	6	12	8.5	900	1400	2.5	7.8	5	67	3.1	Y	N	N	SOT, SOIC	0.94
OPAy140	10 MHz, Low-Noise, JFET Precision Amplifier	1, 2, 4	4.5	36	2.0	11	20	0.12	0.35	10	120	5.1	Y	Out	N	SOT23, SOIC, MSOP, TSSOP	1.55
OPAy377	Low-Cost, Low-Noise, 5.5 MHz CMOS Op Amp	1, 2, 4	2.2	5.5	1.05	5.5	2	1	0.26	10	70	7.5	Y	Out	N	SC70, SOT23, SOIC, TSSOP	0.40
OPA653	500 MHz, Fixed Gain of +2 V/V, JFET input amplifier	1	7.0	13	33.5	500	2675	5	30	10	66	6.1	Y	N	N	SOT23-5, SON-8	2.95
OPA659	650 MHz Unity Gain Stable JFET Input Amplifier	1	7.0	13	33.5	650	2550	5	40	10	70	8.9	Y	N	N	SOT23-5, SON-8	2.91
OPAy376	Low Offset, 5 MHz, e-trim™ General Purpose	1, 2, 4	2.2	5.5	0.95	5.5	2	0.025	0.26	10	76	7.5	Y	Out	N	SC70, SOT23, MSOP, SOIC, TSSOP	0.65
OPAy365	High Speed, Zero Cross Over, CMOS	1, 2	2.2	5.5	5	50	25	0.2	1	10	100	13	Y	I/O	Y	SOT23, SOIC	0.65
OPAy336	SS, μPower, CMOS	1, 2, 4	2.3	5.5	0.032	0.1	0.03	0.125	1.5	10	80	40	Y	Out	Y	SOT23, MSOP, SSOP, SOIC, PDIP	0.40
OPAy340	CMOS, Wide Bandwidth	1, 2, 4	2.7	5.5	0.95	5.5	6	0.5	2.5	10	80	25	Y	I/O	Y	MSOP, SOIC, SOT23, SSOP, PDIP	0.90
OPAy363/4	1.8 V, RRIO, High CMRR, Shutdown (0.9 μA)	1, 2	1.8	5.5	0.75	7	5	0.5	3	10	74	17	Y	I/O	N	MSOP, SOIC, SOT23	0.60
OPAy344	Low Power, RRIO, SS	1, 2, 4	2.5	5.5	0.25	1	0.8	1	3	10	76	32	Y	I/O	N	SOT23, MSOP, TSSOP, SOIC, PDIP	0.45
OPAy350	Excellent ADC Driver, Low Noise	1, 2, 4	2.5	5.5	7.5	38	22	0.5	4	10	74	18	Y	I/O	N	PDIP, MSOP, SOIC, SSOP	1.15
OPAy703/4	12 V, Low Power, SHDN, CMOS	1, 2, 4	4	12	0.2	3	3	0.75	4	10	80	45	Y	I/O	N	MSOP, SOIC, PDIP	1.30
OPAy743	12 V, 7 MHz, CMOS	1, 2, 4	3.5	12	1.5	7	10	7	8	10	70	30	Y	I/O	N	MSOP, SOT23, SOIC, PDIP	1.00
LMV83x	3.3 MHz Low Power CMOS EMI Hardened Amplifier	1, 2, 4	2.7	5.5	0.27	3.3	2	1	1.5	10	76	12	Y	Out	N	SC70, MSOP, TSSOP	0.55

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New products are listed in **bold red**.

Amplifiers and Comparators
Operational Amplifiers

Low Input Bias Current Operational Amplifiers ($I_B \leq 10$ pA) (sorted by I_B) (continued)

Device	Description	Ch.	V_S (V) (min)	V_S (V) (max)	I_Q Per Ch. (mA) (max)	GBW (MHz) (typ)	Slew Rate (V/µs) (typ)	V_{OS} (25°C) (mV) (max)	V_{OS} Drift (µV/°C) (typ)	I_B (pA) (max)	CMRR (dB) (min)	V_N at 1kHz (nV/√Hz) (typ)	Single Supply	Rail-to-Rail	HiRel Avail.	Package	Price*
LPV531	Programmable Micropower CMOS Input Amplifier	1	2.7	5.5	0.055	0.073	0.028	4.5	2	10	72	200	Y	Out	N	TSOT	0.45
LM7171	High Output Current, Voltage Feedback Amplifier	1	5.5	36	8.5	200	4100	1	35	10	75	14	N	N	Y	PDIP, SOIC	1.06
OPAx314	3 MHz, Low-Power, Low-Noise, RRI/O, 1.8 V CMOS Operational Amplifier	1, 2, 4	1.8	5.5	0.21	3	1.5	2.5	1	10	75	14	—	I/O	—	SC70, SOT23	0.25
OPAx313	1-MHz, Micropower, Low-Noise, Rail-to-Rail I/O 1.8-V Operational Amp	2	1.8	5.5	0.06	1	0.5	2.5	2	10	70	25	—	I/O	—	SC70, SOT23	0.45
OPAy170	36 V Single-Supply, Low-Power CMOS Amplifier in SOT553	1, 2, 4	2.7	36	0.145	1.2	0.4	1.8	0.30	15	104	19	Y	Out	N	SOT553, SOT23, SOIC, VSSOP, TSSOP	0.40
OPAy171	36 V Single-Supply, Low-Noise CMOS Amplifier in SOT553	1, 2, 4	2.7	36	0.475	3	1.5	1.8	0.30	15	104	30	Y	Out	N	SOT553, SOT23, SOIC, VSSOP, TSSOP	0.40
LMH6601	2.4 V R-R Out CMOS Video Op Amp with Shutdown	1	2.4	5.5	11.5	155	275	2.4	5	50	56	10	Y	Out	N	SOT	0.65
LM641	Single 10 MHz, 12 V Low Power Op Amp	1	2.7	12	0.19	10	2	0.5	0.1	9000	94	14	Y	Out	N	SOT-5-DBV, SOT-DCK-5, SOIC-8-O	0.62

*Suggested resale price in U.S. dollars in quantities of 1,000. See www.ti.com/hirel for HiRel options.

New products are listed in **bold red.**

Wide-Bandwidth Precision Operational Amplifiers (GBW >5 MHz) (sorted by GBW)

Device	Description	Ch.	V_S (V) (min)	V_S (V) (max)	I_Q Per Ch. (mA) (max)	GBW (MHz) (typ)	Slew Rate (V/µs) (typ)	V_{OS} (25°C) (mV) (max)	V_{OS} Drift (µV/°C) (typ)	I_B (pA) (max)	CMRR (dB) (min)	V_N at 1 kHz (nV/√Hz) (typ)	Single Supply	Rail-to-Rail	HiRel Avail.	Package	Price*
OPAy340	CMOS, Wide Bandwidth	1, 2, 4	2.7	5.5	0.95	5.5	6	0.5	2.5	10	80	25	Y	I/O	Y	MSOP, SOIC, SOT23, SSOP, PDIP	0.90
OPAy376	Precision, Low-Noise, Low I_Q Operational Amplifier	1, 2, 4	2.2	5.5	0.95	5.5	2	0.025	0.26	10	76	7.5	Y	Out	N	SC70, SOT23, MSOP, SOIC, TSSOP	0.65
OPAy377	Low-Noise, 5.5 MHz CMOS Operational Amplifier	1, 2, 4	2.2	5.5	1.05	5.5	2	1	0.26	10	70	7.5	Y	Out	N	SC70, SOT23 SOIC, TSSOP	0.40
TLE214x	Widest Supply, Low Noise	1, 2, 4	4	44	4.5	6	42	0.5	1.7	1500000	85	10.5	Y	N	Y	TSSOP, PDIP, SOIC	0.55
OPAy743	12 V, 7 MHz, CMOS	1, 2, 4	3.5	12	1.5	7	10	7	8	10	70	30	Y	I/O	N	MSOP, SOT23, SOIC, PDIP	1.00
OPAy363/4	1.8 V, RRIO, High CMRR, Shutdown (0.9 µA)	1, 2	1.8	5.5	0.75	7	5	0.5	3	10	74	17	Y	I/O	N	MSOP, SOIC, SOT23	0.60
OPAy132	Wide Bandwidth, FET Input	1, 2, 4	5	36	4.8	8	20	0.5	2	50	96	8	N	N	N	PDIP, SOIC	1.45
OPAy227	Precision, Low Noise, Bipolar	1, 2, 4	5	36	3.8	8	2.3	0.075	0.1	10000	120	3	N	N	N	PDIP, SOIC	1.10
OPAy141	10 MHz, Single-Supply, Low- Noise JFET Amplifier	1, 2, 4	4.5	36	2.3	10	20	3.5	2	20	120	6.5	Y	Out	N	MSOP, SOIC, TSSOP	0.85
TLC08x	Low Noise, WideBandwidth, Bipolar	1, 2, 4	4.5	16	2.5	10	16	1.4	1.2	50	80	8.5	Y	N	Y	MSOP, SOIC, PDIP	0.45
LMV641	10 MHz, 12 V, Low Power Amp	1	2.7	12	0.17	10	2.3	0.5	0.1	95000	89	14	Y	Out	N	SC70, SOIC	0.62
OPAy140	11 MHz, Precision, Low-Noise, JFET Amplifier	1, 2, 4	4.5	36	2.0	11	20	0.12	0.35	10	120	5.1	Y	Out	N	SOT23, SOIC, MSOP, TSSOP	1.55
TLE2027	Low-Noise Precision Operational Amplifier	1	8	38	5.3	13	2.8	0.1	0.4	90000	100	2.5	N	N	Y	SOIC, PDIP	0.90
LMP770x	Precision CMOS RRIO Wide Supply Decompensated Amp	1,2,4	2.7	12	1	14	5.6	0.2	1	1	86	9	Y	I/O	N	SOT23-5, SOIC	0.99

*Suggested resale price in U.S. dollars in quantities of 1,000. See www.ti.com/hirel for HiRel options.

Amplifiers and Comparators
Operational Amplifiers

Wide-Bandwidth Precision Operational Amplifiers (GBW >5 MHz) (sorted by GBW) (continued)

Device	Description	Ch.	V_S (V) (min)	V_S (V) (max)	I_Q Per Ch. (mA) (max)	GBW (MHz) (typ)	Slew Rate (V/µs) (typ)	V_{OS} (25°C) (mV) (max)	V_{OS} Drift (µV/°C) (typ)	I_B (pA) (max)	CMRR (dB) (min)	V_N at 1 kHz (nV/√Hz) (typ)	Single Supply	Rail-to-Rail	HiRel Avail.	Package	Price*
LM8272	RRIO, High Output Current & Unlimited Cap Load Op Amp in Miniature Package	2	2.5	24	1.15	15	12	5	2	2	61	15	Y	I/O	N	SOIC	1.30
OPA627	Ultra-Low THD+N, Difet™ Unit	1	9	36	7.5	16	55	0.25	0.8	5	106	5.2	N	N	N	PDIP, SOIC	12.25
LMP7721	3 Femptoampere Input Bias Current Precision Amplifier	1	2.7	5.5	1.5	17	10.43	0.18	−1.5	0.002	83	6.5	Y	Out	N	SOIC	4.70
LMP771x	Single and Dual Precision 17 MHz Low Noise CMOS Input Amplifiers	1,2	1.8	5	1.3	17	9.5	0.18	−1	1	83	5.8	Y	Out	N	TSOT23, MSOP	0.75
LM6142/44	RRIO, Dual High Speed/Low Power 17 MHz Op Amp	2/4	1.8	24	0.8	17	25	1	3	0.28	79	16	Y	I/O	N	PDIP, SOIC	2.21/2.94
OPAy209	Low-Noise, Low-Power, 36 V Op Amp in SOT23	1, 2, 4	4.5	36	2.5	18	6.25	0.15	1	4500	120	2.2	Y	Out	N	SOT23, MSOP, SOIC	0.95
OPAx320	20 MHz, Low-Noise, RRIO Precision CMOS	1, 2, 4	1.8	5.5	1.6	20	10	0.15	1.5	0.9	100	8.5	Y	I/O	N	MSOP, SON, SOT23, SOIC	0.80
OPAx322	20 MHz, Low-Noise, RRIO Precision CMOS	1, 2, 4	1.8	5.5	1.9	20	10	2.00	1.8	10	90	8.5	Y	I/O	N	MSOP, SON, SOT23, SOIC	0.50
OPAy727/8	20 MHz, e-trim™ Precision CMOS	1, 2, 4	4	12	6.5	20	30	0.15	0.3	500	86	23	Y	N	N	MSOP, SON	0.95
OPAy725/6	12 V CMOS Op Amp	1, 2	4	12	5.5	20	30	3	4	200	94	23	Y	Out	N	SOT23, SOIC, MSOP	0.60
LMP773x	2.9 mN/√Hz Low Noise RRIO Operational Amplifiers	1,2	1.8	5.5	2.7	21	2.4	0.5	0.5	30000	105	2.9	Y	I/O	N	SOT23-5, SOIC8	1.05
LM8261	RRIO, High Output Current & Unlimited Cap Load Op Amp in SOT23-5	1	2.5	30	1.5	21	12	5	2	2	72	15	Y	I/O	N	SOT	0.95
LM8262	RRIO, High Output Current & Unlimited Cap Load Op Amp in MSOP-8	2	2.5	22	1.4	21	12	5	2	2	72	15	Y	I/O	N	MSOP	1.05
OPAy827	Ultra-Low THD+N, High Precision	1, 2	8	36	5.2	22	28	0.15	1	50	104	4	N	N	N	MSOP, SOIC	3.75
OPAy228	Precision, Low Noise, G = 5, Bipolar	1, 2, 4	5	36	3.8	33	11	0.075	0.1	10000	120	3	N	N	N	PDIP, SOIC	1.10
OPAy350	Excellent ADC Driver, Low Noise	1, 2, 4	2.5	5.5	7.5	38	22	0.5	4	10	74	18	Y	I/O	N	PDIP, MSOP, SOIC, SSOP	1.15
OPAy365	High Speed, Zero Crossover, CMOS	1, 2	2.2	5.5	5	50	25	0.2	1	10	100	13	Y	I/O	Y	SOT23, SOIC	0.65
TLE2037	Low-Noise High-Speed Precision Operational Amplifier	1	8	38	5.3	50	7.5	0.1	0.4	90000	100	2.5	N	N	Y	SOIC, PDIP	0.90
OPAy211	Bipolar, Ultra-Low Noise	1, 2	4.5	36	4.5	80	27	0.125	0.35	175000	114	1.1	Y	Out	Y	MSOP, SOIC, SON	5.15
LM6171/72	Low Power, Low Distortion, Voltage Feedback Op Amp	1, 2	5.5	34	4	100	3600/3000	6/3	6/4	3	70	12	N	N	N/Y	PDIP, SOIC	1.21/1.60
LMH6657/58	270 MHz Single Supply Op Amp	1, 2	3	12	9	270	700	5	2	20 pA	75	11	Y	N	N	SOIC, MSOP, SC70	0.64/0.77
LMH6629	Single Ultra Low Noise Wideband Op Amp	1	2.7	5.5	16.7	4000	1100	0.78	0.45	23	82	0.69	Y	N	N	SOT, WSON	1.88
LMH6626	Dual Low Noise Wideband Op Amp	2	5	12	16	1300, G = 10	360	0.5	0.2	20	87	1	Y	N	N	SOIC, MSOP	2.05
LMH6611/12	345 MHz R-R Output Op Amp with Shutdown	1	2.7	11	3.8/4.05	135, G = 10	460	0.6/0.75	0.4	10.1	81	10	Y	Out	N	SOT, SOIC	0.70/0.95
LMH6624	Single Low Noise Wideband Op Amp	1	5	12	16	1500, G = 10	400	0.5	0.2	20	87	0.92	Y	N	N	SOT, SOIC	1.86
LMH6618/19	130 MHz, 1.25 mA R-R I/O Op Amp with Shutdown	1, 2	2.7	11	1.6/1.65	64/57, G = 10	55	0.6	0.9	2.4	83	10	Y	I/O	N	SOT, SOIC	1.19/1.79

*Suggested resale price in U.S. dollars in quantities of 1,000. See **www.ti.com/hirel** for HiRel options.

Amplifiers and Comparators
Operational Amplifiers

General Purpose Amplifiers

Device	Ch.	Vs (V) (min)	Vs (V) (max)	I_Q (25°C) Per Ch. (mA) (max)	V_{IO} (25°C) (mV) (max) Standard	V_{IO} (25°C) (mV) (max) A Grade	I_B (nA) (temp) (max)	RRIO	GBW (MHz) (typ)	Slew Rate (V/µS) (typ)	CMRR (dB) (min)	Vn (1 kHz) (nV/√Hz)	Shut-down	HiRel Avail.	Packages	Standard Price*	'A' Grade Price*
LM358	2	3	32	0.6	7	3	500	N	0.7	0.3	65	40	N	N	PDIP, SOIC, SOP, TSSOP, MSOP/VSSOP	0.10	0.11
LM324	4	3	32	0.3	7	3	500	N	1.2	0.5	65	35	N	N	PDIP, SOIC, SOP, TSSOP	0.10	0.11
LM2904	2	3	26	0.6	7	2	500	N	0.7	0.3	50	40	N	Y	PDIP, SOIC, SOP, TSSOP, MSOP/VSSOP	0.11	0.27
LM2902	4	3	26	0.3	7	2	500	N	1.2	0.5	50	35	N	Y	PDIP, SOIC, SOP, TSSOP	0.12	0.27
LMV321 LMV358 LMV324	1, 2, 4	2.7	5.5	0.17	7	—	500	Out	1.0	1	50	39	N	Y Y Y	SC70, SOT23, MSOP/VSSOP, SOIC, TSSOP	0.26 0.30 0.30	—
LMV324S	4	2.7	5.5	0.17	7	—	500	Out	1.0	1	50	39	Y	N	SOIC, TSSOP	0.36	—
LMV931 LMV932 LMV934	1, 2, 4	1.8	5	0.21	4	—	75	I0	1.5	0.42	60	50	N	Y Y Y	SC70, SOT23, MSOP/VSSOP, SOIC, TSSOP	0.29 0.41 0.42	—
LMV981 LMV982	1, 2	1.8	5	0.21	4	—	75	I0	1.5	0.42	60	50	Y	N N	SC70, SOT23, MSOP/VSSOP	0.55 0.55	—

*Suggested resale price in U.S. dollars in quantities of 1,000. See **www.ti.com/hirel** for HiRel options.

Amplifiers and Comparators
High-Speed Amplifiers (>50 MHz)

2.4 GHz Programmable Differential Amplifier with Gain Control
LMH6881

NEW

The LMH6881 is a high-speed, high-performance, programmable differential amplifier. With a bandwidth of 2.4 GHz and high linearity of 44 dBm OIP3, it is suitable for a wide variety of signal conditioning applications.

The LMH6881 programmable differential amplifier family combines the best of both fully differential amplifiers and variable gain amplifiers. It offers superior noise and distortion performance over the entire gain range without external resistors, enabling the use of just one device and one design for multiple applications requiring different gain settings.
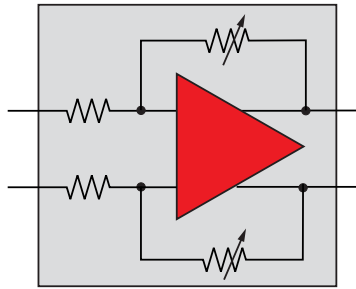
LMH6881 functional block diagram

Key Features
- Small signal bandwidth: 2400 MHz
- OIP3 at 100 MHz: 44 dBm
- HD3 at 100 MHz: −100 dBc
- Noise figure: 9.7 dB
- Voltage gain range: 26 dB to 6 dB
- Voltage gain step size 0.25 dB
- Input impedance 100 Ω
- Parallel and serial gain control
- Power down capability

Applications
- Medical equipment
- Military: sonar and radar
- Point-to-point microwave backhaul
- Telecom tower: remote radio unit (RRU)
- Smart meters

Get more information: **www.ti.com/product/LMH6881**

Very Low Power, Rail-to-Rail Operational Amplifiers
OPA835/6, OPA2835/6

Fabricated using the industry-leading BiCom-3x (SiGe complementary bipolar) process, the OPA835/6 and OPA2835/6 are single and dual ultra-low-power, rail-to-rail output, negative rail input, voltage-feedback operational amplifiers designed to operate over a power supply range of 2.5 V to 5.5 V single supply and ±1.25 V to ±2.75 V dual supply. These devices set an industry leading power-to-performance ratio for rail-to-rail amplifiers.
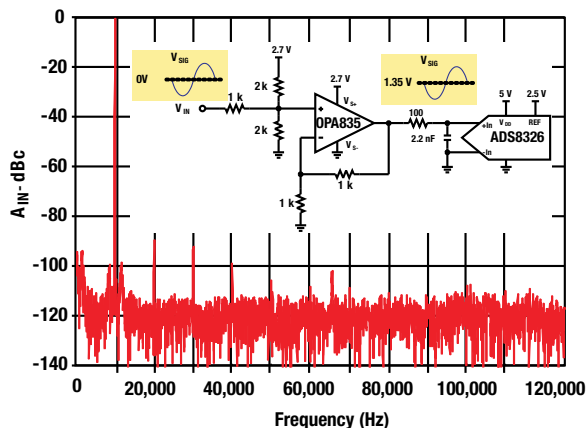
OPA835/6, OPA2835/6 functional block diagram

Key Features
- Ultra-low power
- OPA835/2835 bandwidth: 56 MHz
  OPA836/2836 bandwidth: 205 MHz
- OPA836/2836 CMRR: 113 dB
  OPA835/2835 CMRR: 116 dB
- RRO – rail-to-rail output
- Input voltage range: −0.2 V to 3.9 V
  (5 V supply)
- Operating temperature range:
  −40°C to 125°C

Applications
- Consumer electronics
- High-speed data acquisition and generation
- Medical equipment
- Motor control
- Smart meters

Get more information: **www.ti.com/product/Part Number**
(OPA835, OPA836, OPA2835, OPA2836)

Amplifiers and Comparators
High-Speed Amplifiers (>50 MHz)

Ultra-Low-Power, Fully-Differential Operational Amplifier
THS4531

The THS4531 is a low-power, fully-differential op amp with input common-mode range below the negative rail and rail-to-rail output. The device is designed for low-power data acquisition systems and high density applications where power consumption and dissipation is critical.

The device features accurate output common-mode control that allows for dc coupling when driving analog-to-digital converters (ADCs). This control, coupled with the input common-mode range below the negative rail and rail-to-rail output, allows for easy interface from single-ended ground-referenced signal sources to successive-approximation registers (SARs), and delta-sigma ($\Delta\Sigma$) ADCs using only single-supply 2.5-V to 5-V power. The THS4531 is also a valuable tool for general-purpose, low-power differential signal conditioning applications.
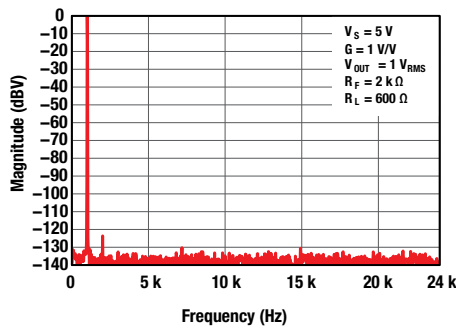
Get more information: **www.ti.com/product/THS4531**

Key Features
- Ultra-low power
- Fully-differential architecture
- Bandwidth: 36 MHz
- Slew rate: 200 V/µs
- THD: –120 dBc at 1 kHz (1 V_{RMS}, RL= 2 kΩ)
- Input voltage noise: 10 nV/$\sqrt{Hz}$ (f = 1 kHz)
- High DC accuracy:
- V_{OS} drift: ±4 µV/°C (–40°C to +125°C)
- A_{OL}: 114 dB
- Rail-to-rail output
- Negative rail input
- Output common-mode control

Applications
- Medical equipment
- Military: sonar and radar
- Motor control
- Personal navigation device
- Smart meters

2.8 GHz Ultra-Linear Fully Differential Amplifier
LMH6554

The LMH6554 is a high performance fully differential amplifier designed to provide the exceptional signal fidelity and wide large-signal bandwidth necessary for driving 8- to 16-bit high-speed data acquisition systems. This device has unity gain, small-signal bandwidth of 2.8 GHz and allows operation at gains greater than unity without sacrificing response flatness, bandwidth, harmonic distortion, or output noise performance.
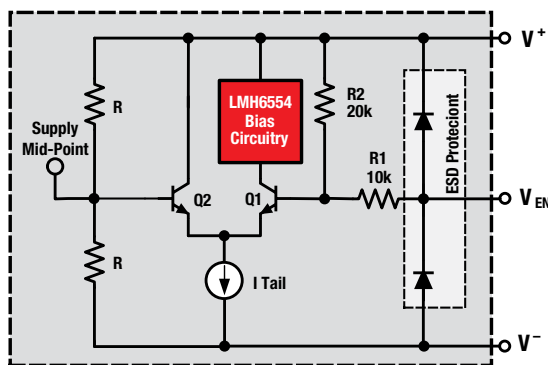
LMH6554 functional block diagram

Get more information: **www.ti.com/product/LMH6554**

Key Features
- Small signal bandwidth: 2.8 GHz
- 2 V_{PP} large signal bandwidth: 1.8 GHz
  - 0.1 dB gain flatness: 830 MHz
- OIP3 at 150 MHz: 46.5 dBm
- HD2/HD3 at 75 MHz: –96/–97 dBc
- Input noise voltage: 0.9 nV/$\sqrt{Hz}$
- Input noise current: 11 pA/$\sqrt{Hz}$
- Slew rate: 6200 V/µs
- Power: 260 mW
- Typical supply current: 52 mA
- Package: 14-lead LLP

Applications
- Cable modem termination system
- Military radar/sonar
- Software defined radio
- Wireless communications

Amplifiers and Comparators
High-Speed Amplifiers (>50 MHz)

High-Speed Amplifiers

Device	Ch.	SHDN	Supply Voltage (V)	A_{CL} (min)	BW at A_{CL} (MHz) (typ)	BW G = +2 (MHz) (typ)	GBW Product (MHz) (typ)	Slew Rate (V/µs)	Settling Time 0.10% (ns) (typ)	Distortion 1 V_{PP}, G = 25 MHz HD2 (dBc) (typ)	HD3 (dBc) (typ)	V_N (nV/√Hz) (typ)	V_{OS} (mV) (max)	I_B (µA) (max)	I_Q Per Ch. (mA) (typ)	I_{OUT} (mA) (typ)	HiRel Avail.	Package	Price*
Voltage Feedback (Sorted by Ascending ACL Bandwidth)																			
LMH6645/46/47	1, 2, 1	N / N / Y	2.5 to 12	1	55	55	55	22	125	−72, 1 MHz	62, 1 MHz	17	3	2 pA	0.725	20	N	SOT, SOIC, MSOP	0.71/1.05/0.58
THS4051/52	1, 2	N	±5, ±15	1	70	38	—	240	60	−72, G=2	−90, G=2	14	10	6	8.5	100	Y	SOIC, MSOP PowerPAD™	0.95
THS4281	1	N	+2.7, ±5, +15	1	90	40	—	35	78	−69, 1 MHz	−76, 1 MHz	12.5	30	0.5	750	30	N	SOT23-5, MSOP, SOIC	0.95
OPA2889	2	Y	5, ±5	1	115	60	75, G > 20	250	25	−80	−82	8.4	5	0.75	0.46	40	N	MSOP, SOIC	1.20
LMH6618/19	1, 2	Y / N	2.7 to 11	1	130	53	64 / 57, G = 10	55	90	−75, 1 MHz	−75, 1 MHz	10	0.6	2.4 pA	1.3	35	N	SOT, SOIC	1.19/1.79
LMH6642/43/44	1, 2, 4	N	2.7 to 12.8	1	130	46	130	135	68	−65, 1 MHz	−80, 1 MHz	17	5	2.6 pA	2.7	115	N	SOT, SOIC, TSSOP, MSOP	0.66/0.79/1.30
LMH6626	2	N	5 to 12	10	160	—	1300, G = 10	360	14	−65, 10 MHz	−80, 10 MHz	1	0.5	20 pA	12	100	N	SOIC, MSOP	2.05
LM6171/72	1, 2	N	5.5 to 34	1	160	62	100	3600/3000	48, 65	−50, 5 MHz	−50, 5 MHz	12	6 / 3	3 pA	4 / 3	135 / 85	N/Y	PDIP, SOIC	1.21/1.60
THS4081/82	1, 2	N	±5, ±15	1	175	70	—	230	43	−63, G=2	−73, G=2	10	7	6	3.4	85	N	SOIC, MSOP PowerPAD	1.20
OPA2614	2	N	5, ±6	2	180	180	290, G ≥ 20	145	35	−92, 1 MHz	−110, 1 MHz	1.8	1	14.5	6.5	350	N	SOIC, SOIC PowerPAD	1.95
LMH6624	1	N	5 to 12	10	180	—	1500, G = 10	400	14	−65, 10 MHz	−80, 10 MHz	0.92	0.5	20 pA	12	100	N	SOT, SOIC	1.86
OPA2836	2	Y	2.5 to 5.5	1	205	100	118	560	30	4.6	0.4	1	1	50	85	105	N	MSOP-10, SOIC-8, QFN-10	1.50
OPA836	1	Y	2.5 to 5.5	1	205	100	118	560	30	4.6	0.4	1	1	50	85	105	Y	QFN-10, 6SOT23	0.90
LM7171	1	N	5.5 to 36	2	220	220	200	4100	42	−55, 5 MHz	−75, 5 MHz	14	1	10 pA	8.5	100	Y	PDIP, SOIC	1.06
THS4221/22	1, 2	N	3, 5, ±5, 15	1	230	100	120, G > 10	975	25	−90	−100	13	10	3	14	100	N	SOIC, MSOP PowerPAD	.095
OPA2613	2	N	5, ±6	1	230	110	125, G ≥ 20	70	40	−95	−97	1.8	1	10	6	350	N	SOIC, SOIC PowerPAD	1.55
OPAy354/57	1, 2, 4	Y	2.5 to 5.5	1	250	90	100, G = 10	150	30	−75, 1 MHz, 2 Vpp	−83, 1 MHz, 2 Vpp	6.5	8	50 pA	4.9	100	Y	SOT23, SOIC PowerPAD	0.70
LMH6601	1	Y	2.4 to 5.5	1	250	130	155	275	50	−73, 10 MHz	−56, 10 MHz	10	2.4	50 pA	9.2	150	N	SOT	0.65
OPA699	1	N	5, ±5	4	260	—	1000, G = 6	1400	7	−67, 2Vpp	−87, 2 Vpp	4.1	5	10	15.5	120	Y	SOIC	1.95
LMH6657/58	1, 2	N	3 to 12	1	270	100	140	700	35	−57, 5 MHz	−70, 5 MHz	11	5	20 pA	6.5	45	N	SOIC, MSOP, SC70	0.67/0.95
OPAy890	1, 2	Y	5, ±5	1	275	92	130, G > 20	400	10	−102	−94	8	6	1.6	2.25	40	N	MSOP, SOIC	0.75
THS4031/32	1, 2	N	±5, ±15	1	275	100	220	100	60	−81, THD	—	1.6	2	6	8.5	90	Y	SOIC, MSOP PowerPAD	1.80
THS4011/12	1, 2	N	±5, ±15	1	290	50	—	310	37	−84, G=2	−96, G=2	7.5	6	6	7.8	110	Y	SOIC, MSOP PowerPAD	1.85
OPAy830	1, 2, 4	N	+3, +5, ±5	1	310	120	110, G ≥ 10	600	42	−71	−77	9.5	1.5	10	4.25	150	N	SOT23, SOIC	0.50
THS4631	1	N	±15	1	325	105	210, G > 20	1000	40	−76	−94	7	0.26	100 pA	11.5	98	N	SOIC, SOIC, MSOP PowerPAD	3.55
LMH6611/12	1, 2	Y	2.7 to 11	1	345	112	135, G = 10	460	67	−82, 5 MHz	−80, 5 MHz	10	0.6/ 0.75	10.1 pA	3.2	120	N	SOT, SOIC	0.70/0.95
OPA842	1	N	±5	1	350	150	200	400	15	−94	−93	2.6	1.2	35	20.2	100	N	SOT23, SOIC	1.55
OPA657	1	N	±5	7	350	—	1600, G > 40	700	10	−74, G = 10	−106, G = 10	4.8	1.8	20 pA	14	70	N	SOT23, SOIC	4.10
OPAy300/301	1	Y	2.7 to 5.5	1	400	80	150	80	30	−74, 1 MHz, G = 2	−79, 1 MHz, G = 2	3	5	0.5	12	40	N	SOT23, SOIC	0.75
OPA2822	2	N	5, ±5	1	400	200	240, G ≥ 20	170	32	−95	−105	2	1.2	12	4.8	150	N	SOIC, MSOP	1.35
OPA656	1	N	±5	1	400	185	230, G > 10	290	8	−74	−100	6	2	20 pA	25	60	N	SOT23, SOIC	3.65
OPAy356	1, 2	N	2.5 to 5.5	1	450	100	200, G = 1	300	30	−81, 1 MHz, G = 2	−93, 1 MHz, G = 2	5.8	9	50 pA	8.3	60	Y	SOT23, SOIC, MSOP	0.70
OPAy355	1, 2, 3	Y	2.5 to 5.5	1	450	100	200, G ≥ 10	300	30	−81, 1 MHz, G = 2	−93, 1 MHz, G = 2	5.8	9	50 pA	8.3	60	N	SOT23, SOIC, MSOP, TSSOP	0.70
OPA698	1	N	5, ±5	1	450	215	250, G ≥ 5	1100	—	−74, 2 Vpp	−87, 2 Vpp	5.6	5	10	15.5	120	Y	SOIC	1.90
OPAy690	1, 2, 3	Y	5, ±5	1	500	220	300, G > 10	1800	8	−77	−81	5.5	4	8	5.5	190	N	SOT23, SOIC, SSOP	1.35
OPA843	1	N	±5	3	500	—	800, G = 5	1000	7.5	−96, G = 5	−110, G = 5	2	1.2	35	20.2	100	N	SOT23, SOIC	1.60
OPAy846	1, 2	N	±5	7	500	—	1750, G ≥ 40	625	10	−100, G = 10	−112, G = 10	1.2	0.6	19	12.6	80	N	SOT23, SOIC	1.70
OPA847	1	Y	±5	12	600	—	3800, G ≥ 50	950	10	−105, G = 20	−105, G = 20	0.85	0.5	39	18.1	75	N	SOT23, SOIC	2.00
OPA2652	2	N	±5	1	700	200	200, G ≥ 10	335	—	−76	−66	8	7	15	5.5	140	N	SOT23, SOIC	1.15
OPAy820	1, 4	N	5 to ±5	1	800	240	280, G ≥ 20	240	18	−90	−110	2.5	0.75	17	5.6	110	N	SOIC, SOIC PowerPAD	0.90
LMH6609	1	N	6 to 12	1	900	280	900	1400	15	−63, 20 MHz	−57, 20 MHz	3.1	2.5	5 pA	7	90	N	SOT, SOIC	0.94
LMH6629	1	Y	2.7 to 5.5	10	1000	—	4000	1100	42	−74, 1 MHz	−88, 1 MHz	0.69	0.78	23 pA	15.5	250	N	SOT, WSON	1.88

*Suggested resale price in U.S. dollars in quantities of 1,000. See **www.ti.com/hirel** for HiRel options.

Amplifiers and Comparators
High-Speed Amplifiers (>50 MHz)

High-Speed Amplifiers (continued)

Device	Ch.	SHDN	Supply Voltage (V)	A_CL (min)	BW at A_CL (MHz) (typ)	BW G = +2 (MHz) (typ)	GBW Product (MHz) (typ)	Slew Rate (V/µs) (typ)	Settling Time 0.10% (ns) (typ)	HD₂ (dBc) (typ)	HD₃ (dBc) (typ)	V_N (nV/√Hz) (typ)	V_OS (mV) (max)	I_B (µA) (max)	I_Q Per Ch. (mA) (typ)	I_OUT (mA) (typ)	HiRel Avail.	Package	Price*
Voltage Feedback (Sorted by Ascending ACL Bandwidth) (continued)																		
THS4271/75	1	Y	5, ±5, 15	1	1400	390	400, G > 10	1000	25	−70, 30 MHz	−90	3	10	15	22	160	Y	SOIC, MSOP PowerPAD™	2.25
THS4304	1	N	3 to ±5	1	3000	1000	870, G > 10	1000	5	−100	−100	2.4	4	6	18	100	Y	SOT23, SOIC, MSOP	2.20
LM6152/54	2, 4	N	2.7 to 24	10	—	—	75	30	1100	46	50	9	2 (A version), 5 (B version)	0.98 pA	2	6.2	N	SOIC	1.49/2.70
Current Feedback (Sorted by Ascending Gain of +2 Bandwidth)																		
THS3110/11	1	Y	±5, ±15	1	100	90	—	1300	27	−53, 10 MHz, ±15 V	−62, 10 MHz, ±15 V	3	6	20	4.8	260	N	SOIC, MSOP PowerPAD	1.25
THS3112/15	2	Y	±5, ±15	1	110	110	—	1550	63	−70, ±15 V	−61, ±15 V	2.2	8	23	4.9	270	N	SOIC, SOIC PowerPAD	2.50
THS3120/1	1	Y	±5, ±15	1	130	120	—	1500	11	−53, ±15 V	−65, ±15 V	2.5	6	3	7	475	N	SOIC, MSOP PowerPAD	1.85
THS3122/25	2	Y	±5, ±15	1	160	128	—	1550	64	−69, ±15 V	−70, ±15 V	2.2	6	23	8.4	440	N	SOIC, SOIC PowerPAD	3.70
OPAy683	1, 2	Y	5, ±5	1	200	150	—	540	—	−65, RL = 1 k	−74, RL = 1 k	4.4	3.5	4	0.94	110	N	SOT23, SOIC	1.20
OPAy684	1, 2, 3, 4	Y	5, ±5	1	210	160	—	820	—	−66, RL = 1 k	−89, RL = 1 k	3.7	3.5	35	1.7	120	N	SOT23, SOIC, TSSOP	1.35
OPA2677	2	N	5, ±6	1	220	200	—	2000	—	−82, G = 4	−93, G = 4	2	4.54	30	9	500	N	SOIC, SOIC PowerPAD, QFN	1.50
THS3091/5	1	Y	±5, ±15	1	235	210	—	5000	42	−77, ±15 VRL = 1 kΩ	−69, ±15 VRL = 1 kΩ	2	3	15	9.5	280	N	SOIC, SOIC PowerPAD	2.65
THS3092/6	2	Y	±5, ±15	1	235	210	—	5000	42	−66, ±15 VRL = 1 kΩ	−78, ±15 VRL = 1 kΩ	2	4	15	9.5	280	N	SOIC, SOIC PowerPAD	4.90
OPA2674	2	Y	5, ±6	1	250	225	—	2000	—	−82, G = 4	−93, G = 4	2	4.5	30	9	500	N	SOIC, SOIC PowerPAD	1.75
OPAy691	1, 2, 3	Y	5, ±5	1	280	225	—	2100	8	−79	−93	1.7	2.5	35	5.1	190	N	SOT23, SOIC, SSOP	1.45
LMH6723/24	1, 2	N	5 to 12	1	370	260	370	600	30	−63, 5 MHz	−65, 5 MHz	4.3	3	4 pA	1	110	N	SOT, SOIC	0.80/1.05
OPA2673	2	N	±6	1	300	300	—	2800	—	−68, 20 MHz, G = 4	−72, 20 MHz, G = 4	1.9	TBD	10	28	700	N	QFN, MSOP PowerPAD	1.65
OPAy694	1, 2	N	±5	1	1500	690	—	1700	13	−92	−93	2.1	4.1	18	5.8	80	N	SOT23, SOIC	1.25
LMH6733	3	Y	3 to 12	1	1000	830	1000	3750	10	−63, 10 MHz	−72, 10 MHz	2.1	2.2	19 pA	5.5	80	N	SSOP	2.60
OPAy695	1, 2, 3	Y	5, ±5	1	1700	1400	—	4300	—	−78, G = 8	−86, G = 8	1.8	3	30	12.9	120	N	SOT23, SOIC	1.35
Fully Differential Amplifiers (Sorted by Ascending Gain Bandwidth Product)																		
THS4531/A	1	Y	2.5 to 5.5	1	36	17	27	220	25	−127, 10 KHz	−135, 10 KHz	10	1	0.21	0.25	50	Y	SOIC-8, QFN-10, VSSOP-8	1.10/1.21
THS4532	2	Y	2.5 to 5.5	1	36	16	27	220	25	−127, 10 KHz	−135, 10 KHz	10	0.4	0.21	0.25	50	-	16TSSOP	1.85
THS4521/2/4	1, 2, 4	Y	2.5, 5.5	1	145	50	95	490	13	−133, 10 KHz	−140, 10 KHz	4.6	3.5	0.9	1.14	55	N	SOIC, MSOP, TSSOP	1.10
THS4130/31	1	Y	5, ±5, ±15	1	150	90	180	52	78	−72, G = 1, ±15 V	−53, G = 1, ±15 V	1.3	2	6	12.3	85	N	SOIC, MSOP PowerPAD	2.80
THS4502/03	1	Y	5, ±5	1	370	175	300, G > 10	2800	6.3	−83, 8 MHz, G = 1	−97, 8 MHz, G = 1	6	7	4.6	23	120	N	SOIC, MSOP PowerPAD	4.00
LMH6554	1	Y	4.7 to 5.25	1	2800	2500	10000	6200	4	−79, 250 MHz	−70, 250 MHz	0.9	4	8 pA	52	80	N	WSON	4.49
THS4520	1	Y	3 to 5	1	600	400	1200	520	7	−101, 1 MHz, G = 1	−101, 1 MHz, G = 1	2	25	11	13	105	N	QFN	1.65
THS4511	1	Y	3, 5	1	1600	1400	2000	4900	3.3	−117, 10 MHz	−106, 10 MHz	2	5.2	15.5	39.2	61	Y	QFN	4.35
THS4513	1	Y	3, 5	1	1600	1400	2800	5100	16	−110, 10 MHz,	−108, 10 MHz	2.2	5.2	13	37.7	96	Y	QFN	4.10
THS4508	1	Y	3, 5	2	2000	2000	3000	6400	2	−104, 10 MHz	−105, 10 MHz	2.3	5	15.5	39.2	61	N	QFN	4.95
THS4509	1	Y	3, 5	2	2000	2000	3000	6600	2	−104, 10 MHz	−109, 10 MHz	1.9	5	13	37.7	96	Y	QFN	3.75
LMH6881	1	Y	4.75 to 5.25	—	2400	—	40000	6000	—	−65, 200 MHz	−74, 200 MHz	2.3	—	—	200	—	N	WSSON	TBD
LMH6882	2	Y	4.75 to 5.25	—	2400	—	40000	6000	—	−65, 200 MHz	−74, 200 MHZ	2.3	—	—	200	—	N	WSSON	TBD
PGA870	1	Y	5	—	650	—	—	2900	5	−93, 100 MHz	−88, 100 MHz	—	35	—	143	50	N	QFN	4.35
THS770006	1	Y	5	—	—	2400	—	3100	2.2	−78, 100 MHz	−86, 100 MHz	1.7	12.5	100	100	80	N	QFN	4.10

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New products are listed in **bold red**.

High-Speed Amplifiers (continued)

Device	Ch.	SHDN	Supply Voltage (V)	A$_{CL}$ (min)	BW at A$_{CL}$ (MHz) (typ)	BW G = +2 (MHz) (typ)	GBW Product (MHz) (typ)	Slew Rate (V/µs)	Settling Time 0.10% (ns) (typ)	Distortion 1 V$_{PP}$, G = 25 MHz HD$_2$ (dBc) (typ)	HD$_3$ (dBc) (typ)	V$_N$ (nV/√Hz) (typ)	V$_{OS}$ (mV) (max)	I$_B$ (µA) (max)	I$_Q$ Per Ch. (mA) (typ)	I$_{OUT}$ (mA) (typ)	HiRel Avail.	Package	Price*
Fully Differential Amplifiers (Sorted by Ascending Gain Bandwidth Product) (continued)																			
THS770012	1	Y	5	—	900	—	—	3300	2.2	−73, 100 MHz	−84, 100 MHz	1.5	22.5	100	100	80	N	QFN	4.10
LMH6550	1	Y	5 to 12	1	400	—	—	3000	8	−103, 5 MHz	−92, 5 MHz	6	5	16 pA	20	75	N	SOIC, MSOP	2.29
LMH6551	1	N	3 to 12	1	370	—	—	2400	18	−94, 5 MHz	96, 5 MHz	6	5	10 pA	12.5	65	N	SOIC, MSOP	1.60
LMH6552	1	Y	4.5 to 12	1	1500	930	—	3800	10	−74, 70 MHz	−84, 70 MHz	1.1	16.5	8 pA	22.5	80	N	SOIC, WSON	3.95
LMH6553	1	N	4.5 to 12	1	900	—	—	2300	10	−90, 20 MHz	−79, 20 MHz	1.2	—	2 pA	29.1	150	N	PSOP, WSON	3.35
LMH6555	1	N	3 to 4.2	—	1200	—	—	1300	—	−60, 250 MHz	−67, 250 MHz	3.9	—	—	120	—	N	WSON	5.70
LMH6521	2	Y	4.75 to 5.25	—	1200	—	—	—	—	−84, 200 MHz	−83, 200 MHz	33	—	—	112.5	—	N	WSON	6.15
LMH6522	4	Y	4.75 to 5.25	—	1400	—	—	—	—	−78, 200 MHz	−75, 200 MHz	33	—	—	116.25	—	N	WSON	9.85
Programmable Fully Differential Amplifiers																			
LMH6881	1	Y	4.75 to 5.25	—	2400	—	40000	—	—	−78, 200 MHz	—	—	—	—	—	—	N	WSON	TBD
LMH6882	2	Y	4.75 to 5.25	—	2400	—	40000	—	—	−78, 200 MHz	—	—	—	—	—	—	N	WSON	TBD
Fixed and Programmable Gain (Sorted by Ascending ACL Bandwidth)																			
THS7001/02	1, 2	Y	±4.6, ±16	2	70	85	—	85	70	−65	−80	1.7	—	8	5.5	70	N	HTSSOP	5.85
OPAy832	1, 2	N	2.8 to ±5	1	90	80	—	350	45	−66	−73	9.2	7	10	4.25	120	N	SOT23, SOIC	0.45
BUF634	1	N	5, ±5, ±15	1	180	—	—	2000	200	—	—	4	100	20	15	250	N	SOIC	3.50
OPAy692	1, 3	Y	5, ±5	1	280	225	—	2000	8	−79	−94	1.7	2.5	35	5.1	190	N	SOT23, SOIC, SSOP	1.15
BUF602	1	N	3.3, 5, ±5	1	1200	—	—	8000	—	−76	−98	5.1	30	7	5.8	60	N	SOT23, SOIC	0.85
OPAy693	1	Y	5, ±5	1	1400	700	—	2500	12	−82, 10 MHz	−96, 10 MHz	1.8	2	35	13	120	N	SOT23, SOIC	1.60
THS4303	1	Y	3, 5	10	1800	—	18000	5500	—	−75, 70 MHz, G = 10	−80, 70 MHz, G = 10	2.5	4.25	10	34	180	N	MSOP PowerPAD™	2.60
THS4302	1	Y	3, 5	5	2400	—	12000	5500	—	−75, 70 MHz, G = 5	−85, 70 MHz, G = 5	2.8	4.25	10	37	180	N	MSOP PowerPAD	2.90
PGA870	1	Y	5	—	—	650	—	2900	5	−93, 100 MHz	−88, 100 MHz	—	35	—	143	50	N	QFN	4.35
THS770006	1	Y	5	—	—	2400	—	3100	2.2	−78, 100 MHz	−86, 100 MHz	1.7	12.5	100	100	80	N	QFN	4.10
LMH6555	1	N	3 to 4.2	—	1200	—	—	1300	—	−60, 250 MHz	−67, 250 MHz	3.9	—	—	120	—	N	WSON	5.70
LMH6521	2	Y	4.75 to 5.25	—	1200	—	—	—	—	−84, 200 MHz	−83, 200 MHz	33	—	—	112.5	—	N	WSON	6.15
LMH6522	4	Y	4.75 to 5.25	—	1400	—	—	—	—	−78, 200 MHz	−75, 200 MHz	33	—	—	116.25	—	N	WSON	9.85
JFET-Input and CMOS Amplifiers																			
OPA358	1	Y	2.7 to 3.3	1	100	10	80	55	35	—	—	6.4	6	50 pA	7.5	50	N	SC70	0.45
OPAy380	1, 2	N	2.7 to 5.5	1	100	10	90	80	—	—	—	67	0.025	50 pA	7.5	50	N	MSOP, SOIC	1.95
OPAy354	1, 2, 4	N	2.5 to 5.5	1	250	90	100, G = 10	150	30	−75, 1 MHz	−83, 1 MHz	6.5	8	50 pA	4.9	100	Y	SOT23, SOIC PowerPAD	0.70
OPAy357	1, 2	Y	2.5 to 5.5	1	250	90	100, G = 10	150	30	−75, 1 MHz	−83, 1 MHz	6.5	8	50 pA	4.9	100	N	SOT23, SOIC PowerPAD	0.70
OPAy300/301	1, 2	Y	2.7 to 5.5	1	—	80	150	80	30	−72, 1 MHz	−79, 1 MHz	3	5	5 pA	12	40	N	SOT23, SOIC	0.75
OPAy355	1, 2, 3	Y	2.5 to 5.5	1	450	100	200, G = 10	300	30	−81, 1 MHz	−93, 1 MHz	5.8	9	50 pA	8.3	60	N	MSOP	0.70
OPAy356	1, 2	N	2.5 to 5.5	1	450	100	200, G = 10	300	30	−81, 1 MHz	−93, 1 MHz	5.8	9	50 pA	8.3	60	Y	SOT23, SOIC	0.70
THS4631	1	N	±15	1	325	105	210, G > 20	1000	40	−76	−94	7	0.26	100 pA	11.5	98	N	SOIC, SOIC & MSOP PowerPAD	3.55
OPA653	1	N	7 to 13	2	500	500	—	2675	−72, 10 MHz	−90, 10 MHz	6.1	5	50	33.5	70		N	SOT23, SON	2.95
OPA656	1	N	±5	1	400	185	230, G > 10	290	8	−74	−100	6	2	2 pA	25	60	N	SOT23, SOIC	3.65
OPA657	1	N	±5	7	350	—	1600, G > 40	700	10	−74, G = 10	−106, G = 10	4.8	1.8	2 pA	14	70	N	SOT23, SOIC	4.10
OPA659	1	N	7 to 13	2	650	335	350, G >20	2550	8	−79, 10 MHz	−100, 10 MHz	8.9	5	50	33.5	70	N	SOT23, SON	2.95

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New products are listed in **bold red**.

Amplifiers and Comparators
High-Speed Amplifiers (>50 MHz)

High-Speed Amplifiers (continued)

Device	Ch.	SHDN	Supply Voltage (V)	A_{CL} (min)	BW at A_{CL} (MHz) (typ)	BW G = +2 (MHz) (typ)	GBW Product (MHz) (typ)	Slew Rate (V/µs)	Settling Time 0.10% (ns) (typ)	Distortion 1 V_{PP}, G = 25 MHz		V_N (nV/√Hz) (typ)	V_{OS} (mV) (max)	I_B (µA) (max)	I_Q Per Ch. (mA) (typ)	I_{OUT} (mA) (typ)	HiRel Avail.	Package	Price*
										HD_2 (dBc) (typ)	HD_3 (dBc) (typ)								
Transconductance Amplifiers																			
OPA860	1	N	±5	1	470	—	470	3500	—	–77	–79	2.4	—	5	11.2	15	N	SOIC	2.45
OPA861	1	N	±5	1	80	—	400	900	—	–68	–57	2.4	—	1	5.4	15	N	SOT23, SOIC	1.05
Transimpedance Amplifiers (Sorted by Ascending Gain Bandwidth Product)																			
OPAy380	1, 2	N	2.7, 5.0	1	90	45	90	80	2000	—	—	5.8	0.025	50 pA	6.5	50	N	MSOP, SOIC	1.95
THS4631	1	N	±15	1	325	105	210, G > 20	1000	40	–76	–94	7	0.26	100 pA	11.5	98	N	SOIC, SOIC and MSOP PowerPAD™	3.55
OPA656	1	N	±5	1	400	185	230, G > 10	290	8	–74	–100	6	2	20 pA	25	60	N	SOT23, SOIC	3.65
OPA657	1	N	±5	7	350	—	1600, G > 40	700	10	–74, G = 10	–106, G = 10	4.8	1.8	20 pA	14	70	N	SOT23, SOIC	4.10
OPAy846	1, 2	N	±5	7	500	—	1750, G ≥ 40	625	10	–100, G = 10	–112, G = 10	1.2	0.6	19	12.6	80	N	SOT23, SOIC	1.70
OPA847	1	Y	±5	12	600	—	3800, G ≥ 50	950	10	–105, G = 20	–105, G = 20	0.85	0.5	39	18.1	75	N	SOT23, SOIC	2.00
LMH6629	1	Y	2.7 to 5.5	10	1000	—	4000	1100	42	–74, 1 MHz	–88, 1 MHz	0.69	0.78	23 pA	15.5	250	N	SOT, WSON	1.88
Multiplexers																			
MPA4609	4	N	5	190	90	—	—	150	—	—	—	0.65	0.2	—	12.5	—	N	TQFP	4.95
OPAy875	1, 3	Y	±3 to ±6	2	700	700	—	3100	3	–71	–90	6.7	7	±18	11	±70	N	MSOP, SOIC	1.45
OPA4872	1	Y	±3.5 to ±6	1	1100	500	—	2300	14	–60, 10 MHz	–78, 10 MHz	4.5	5	18	10.6	±75	Y	SOIC	2.15
LMH6570/74	1	Y	6 to 12	2	500	500	—	2200	—	–68, 5 MHz	–84, 5 MHz	5	15/20	5.5 / 5	13.8 pA /13 pA	80	N	SOIC	2.50/2.60
LMH6572	3	N	6 to 12	2	350	350	—	1400	—	–78, 10 MHz	–75, 10 MHz	5	14	2.8	23 pA	80	N	SSOP	3.50
Voltage-Limiting Amplifiers																			
OPA698	1	N	5, ±5	1	450	215	250	1100	—	–82	–88	5.6	5	10	15.5	120	Y	SOIC	1.90
OPA699	1	N	5, ±5	4	260	—	1000	1400	—	—	—	4.1	5	10	15.5	120	Y	SOIC	1.95
RF/IF Amplifiers																			
THS9000/1	1	N	3, 5	5.8	500	—	—	—	—	—	—	0.6	—	—	Var	—	N	MicroMLP, SOT23	1.05
DC Restoration (Sample/Hold Amplifier)																			
OPA615	1	N	±5	1	710	—	—	2500	—	–62	–47	4.6	4	1	13	5	N	SOIC, MSOP	4.55

*Suggested resale price in U.S. dollars in quantities of 1,000. See www.ti.com/hirel for HiRel options.

Video Amplifiers (Sorted by Ascending G = +2 Bandwidth)

Device	Description	Ch.	SHDN	Supply Voltage (V)	–3 dB at G = +2 Bandwidth (MHz)	0.1dB Gain Flatness (MHz)	Diff Gain (%)	Diff Phase (°)	Slew Rate (V/µs)	Offset Voltage (mV) (max)	I_Q Per Ch. (mA) (typ)	Input Range (V)	RRO	HiRel Avail.	Package	Price*
THS7374	SDTV, 6th-Order Butterworth, 6 dB Gain	4	Y	2.85 to 5	9.5	—	0.5	0.5	150	380	4	–0.1 to 1.46	Y	N	TSSOP-14	0.55
THS7375	SDTV, 6th-Order Butterworth, 5.6 V/V Gain	4	Y	2.85 to 5.5	9.5	—	0.5	0.5	150	365	4	–0.1 to 0.9	Y	N	TSSOP-14	0.55
THS7372	4-Channel Video Amplifier with 1-SD and 3-Full-HD Filters with 6-dB Gain	4	Y	2.7 to 6	9.5	10	0.15	0.25	250	400	7.1	–0.14 to 1.46	Y	N	TSSOP-14	0.85
THS7320	3-Channel ED Filter Video Amplifier with 4V/V Gain	3	Y	2.6 to 5	17	11	0.15	0.1	80	320	1.17	–0.03 to 0.65	Y	N	DSBGA-9	0.85
OPAy832	VFB, Fixed Gain	1, 2, 3	N	+2.8, ±5	80	—	0.1	0.16	350	7	4.25	–0.5 to 1.5	Y	N	SOT23, SOIC	0.70
OPAy354	VFB, Low Cost	1, 2, 4	N	2.5 to 5.5	100	40	0.02	0.09	150	8	4.9	–0.1 to 5.4	Y	Y	SOT23, SOIC, MSOP, TSSOP	0.70

*Suggested resale price in U.S. dollars in quantities of 1,000. See www.ti.com/hirel for HiRel options.

Amplifiers and Comparators
High-Speed Amplifiers (>50 MHz)

Video Amplifiers (Sorted by Ascending G = +2 Bandwidth) (continued)

Device	Description	Ch.	SHDN	Supply Voltage (V)	−3 dB at G = +2 Bandwidth (MHz)	0.1 dB Gain Flatness (MHz)	Diff Gain (%)	Diff Phase (°)	Slew Rate (V/μs)	Offset Voltage (mV) (max)	I_Q Per Ch. (mA) (typ)	Input Range (V)	RRO	HiRel Avail.	Package	Price*
OPAy357	VFB, Low Cost, SHDN	1, 2	Y	2.5 to 5.5	100	40	0.02	0.09	150	8	4.9	−0.1 to 5.4	Y	N	SOT23, SOIC, MSOP	0.70
OPAy830	Voltage Feedback	1, 2, 4	N	+2.8, ±5.5	110	—	0.07	0.17	600	7	4.25	−0.45 to 1.2	Y	N	SO-8, SOT23	0.50
OPAy683	Current Feedback	1, 2	Y	±5, +5	150	37	0.06	0.03	540	1.5	0.9	±3.75	N	N	SOT23, SOIC, MSOP	1.20
THS7353	I²C, Selectable SD/ED/HD/Bypass, 5th-Order LPF, 0 dB Gain	3	Y	2.7 to 5.5	9/16/35/150	5/9/20/25	0.15	0.3	40/70/150/300	20	5.9	0 to 3.4	Y	N	TSSOP-20	1.65
OPAy684	Current Feedback	1, 2, 3, 4	Y	±5, +5	160	19	0.04	0.02	820	3.5	1.7	±3.75	N	N	SOT23, SOIC	1.35
VCA822	Wideband, Variable Gain, Linear in V/V	1	Y	±5	168	28	—	—	1700	17	36	−2.1 to +1.6	N	N	MSOP, SOIC	2.80
THS7303	I²C, Selectable SD/ED/HD/Bypass, 5th-Order LPF, 6 dB	3	Y	2.7 to 5.5	9/16/35/190	5/9.5/22/125	0.13	0.55	40/75/155/320	35	6	0 to 2.4	Y	N	TSSOP-20	1.65
OPAy355	VFB, Low Cost, SHDN	1, 2, 3	Y	2.5 to 5.5	200	75	0.02	0.05	300	9	8.3	−0.1 to 3	Y	N	SOT23, SOIC, MSOP, TSSOP	0.70
OPAy356	VFB, Low Cost	1, 2	N	2.5 to 5.5	200	75	0.02	0.05	300	9	8.3	−0.1 to 3	Y	Y	SOT23, SOIC, MSOP	0.70
OPAy690	Voltage Feedback	1, 2, 3	Y	±5, +5	220	30	0.06	0.03	1800	4	5.5	±3.5	N	N	SOT23, SOIC	1.35
OPAy691	Current Feedback	1, 2, 3	Y	±5, +5	225	90	0.07	0.02	2100	2.5	5.1	±3.5	N	N	SOT23, SOIC	1.45
OPAy692	CFB1, Fixed Gain	1, 3	Y	±5, +5	240	120	0.07	0.02	2000	2.5	5.1	±3.5	N	N	SOT23, SOIC	1.15
THS7360	3-SD and 3-SD/ED/HD/Full-HD Filters and High Gain	6	Y	2.7 to 5	9.2/17/35/70/290	8/15/31/61/180	0.15	0.35	850	315	2.5	−0.1 to 2.3	Y	N	TSSOP-20	0.99
THS7364	3-SD and 3-Full-HD Filters and 6-dB Gain	6	Y	2.7 to 5	9.5/72/350	8.2/60/300	0.2	0.35	500	400	2.3	−0.1 to 2.3	Y	N	TSSOP-20	0.80
THS7368	3-SD and 3-SD/ED/HD/Full-HD Filters and 6-dB Gain	6	Y	2.7 to 5	9.5/18/36/72/375	8.2/16/30/60/300	0.2	0.35	600	400	2.3	−0.1 to 2.3	Y	N	TSSOP-20	0.95
THS7327	RGBHV Buffer, I²C, 2:1MUX	3	Y	2.7 to 5.5	9/16/35/75/500	4/7/15/38/56	0.3	0.45	1300	65	33	0 to 2.4	Y	N	TQFP-48	3.35
THS7347	RGBHV Buffer, I²C, 2:1MUX	3	Y	2.7 to 5.5	500	350	0.05	0.1	1300	15	26.8	0 to 2.4	Y	N	TQFP-48	2.75
OPAy693	CFB, Fixed Gain	1, 3	Y	±5, +5	700	200	0.03	0.01	2500	2	13	±3.4	N	N	SOT23, SOIC	1.60
VCA824	Ultra-Wideband, Variable Gain, Linear in V/V	1	Y	±5	710	135	—	—	2500	17	36	2.1 to +1.6	N	N	MSOP, SOIC	3.50
OPA695	Current Feedback	1, 2, 3	Y	±5, +5	1400	320	0.04	0.007	4300	3	12.9	±3.3	N	N	SOT23, SOIC	1.35
OPA615	DC Restoration	1	N	±5	N/A	N/A	N/A	N/A	2500	N/A	13	± 3.5	N	N	SO-14, MSOP	4.55
SN10501 SN10502 SN10503	High Speed, Rail-to-Rail	1,2,3	N	3, 5, ±5	230	100	50	0.007	0.007	25	100	±4.0	N	N	SOIC, HTSSOP, MSOP Power-PAD™, 0.85	0.70 1.20 1.65
Video Multiplexers																
OPA4872	4:1 MUX	1	Y	±3.5, ±6	500	120	0.035	0.005	2300	5	10.6	±2.8	N	Y	SOIC	2.15
OPAy875	2:1 MUX	1, 3	Y	±3, ±6	700	200	0.025	0.025	3100	7	11	±2.8	N	N	MSOP, SOIC SSOP, QSOP	1.45

Voltage-Controlled Amplifiers

Device	V_N (nV/√Hz)	Bandwidth (MHz) (typ)	Specified at V_S (V)	Number of Channels	Variable Gain Range (dB)	HiRel Available	Package	Price*
< 50 MHz								
VCA8613	1.2	14	3	8	40	N	TQFP-64	25.40
VCA8500	0.8	15	3.3	8	45	N	QFN-64	32.00
VCA8617	1	15	3	8	40	N	TQFP-64	24.00
VCA810	2.4	30	±5	1	80	N	SO-8	6.15
VCA2618	5.4	30	5	2	43	N	TQFP-32	9.25

*Suggested resale price in U.S. dollars in quantities of 1,000. See www.ti.com/hirel for HiRel options.

Amplifiers and Comparators
High-Speed Amplifiers (>50 MHz)

Voltage-Controlled Amplifiers (continued)

Device	V_N (nV/√Hz)	Bandwidth (MHz) (typ)	Specified at V_S (V)	Number of Channels	Variable Gain Range (dB)	HiRel Available	Package	Price*
< 50 MHz (continued)								
VCA2612	1.25	40	5	2	45	N	TQFP-48	12.50
VCA2613	1	40	5	2	45	N	TQFP-48	10.25
VCA2614	4.8	40	5	2	40	N	TQFP-32	8.35
VCA2616/2611	0.95	40	5	2	40	N	TQFP-48	10.25
VCA2619	5.9	40	5	2	50	N	TQFP-32	8.40
VCA2615	0.7	42	5	2	52	N	QFN-48	8.05
> 50 MHz								
VCA2617	3.8	50	5	2	48	N	QFN-32	7.95
LMH6502	7.7	130	5 to 12	1	70	N	SO-14, TSSOP-14	3.48
LMH6503	6.6	135	5 to 12	1	70	N	SO-14, TSSOP-14	3.48
LMH6505	4.4	150	7 to 12	1	80	N	SO-8, MSOP-8	2.52
VCA820	6	150	±5	1	40	N	MSOP-10, SO-14	2.80
VCA822	6	150	±5	1	40 V/V	N	MSOP-10, SO-14	2.80
THS7530	1.27	300	5	1	46	N	HTSSOP-14	3.95
VCA821	8.2	420	±5	1	40	N	MSOP-10, SO-14	3.50
VCA824	8.2	420	±5	1	40 V/V	N	MSOP-10, SO-14	3.50

Suggested resale price in U.S. dollars in quantities of 1,000. See www.ti.com/hirel for HiRel options.

Line Drivers

Device	Description	BW Gain = 1 (MHz)	BW Gain = +2 (MHz)	Slew Rate (V/µs)	V_N f >1MHz (nV/√Hz)	V_{OUT} Swing ($R_{LOAD\Omega}$) (min) (V)	Power Supply Range (V)	I_Q/ Amplifier (mA) (max)	I_{OUT} (mA) (min)	Disable/ Power Control	HiRel Avail.	Package	Price*
THS6204	Dual-Port, Differential VDSL2 Line Driver	—	114	3800	2.5	±10.9 (100)	±5 to ±14	21.5/port	±416	Y	N	QFN, HTSSOP	1.40
THS6214	Dual Port, Differential VDSL2 Line Driver	—	114	3800	2.7	±10.9 (100)	±5 to ±14	21/port	±416	Y	N	QFN, HTSSOP	1.40
OPA2691	Dual, Wideband, CFB Amp with Disable	280	225	2100	1.7	±3.7 (100)	+5 to ±6.0	5.3	±190	Y	N	SOIC	2.30
OPA2690	Dual, Wideband, VFB Amp with Disable	500	220	1800	5.5	±3.7 (100)	+5 to ±6.0	5.8	±190	Y	N	SOIC	2.15
THS6093	ADSL CPE Line Driver with Shutdown	90	—	400	2.1	1.3 to 3.7 (100)	±2.25 to ±7	9.5	±240	Y	N	SOIC, HTSSOP	2.15
THS6092	ADSL CPE Line Driver	90	—	400	2.1	1.3 to 3.7 (100)	±2.25 to ±7	12	±240	N	N	SOIC, SOIC PowerPAD™	2.15
THS6042	ADSL CPE Line Driver	120	95	600	2.2	±4.1 (25)	±5 to ±15	9.5	±300	N	N	SOIC, SOIC PowerPAD	4.10
THS6043	ADSL CPE Line Driver with Shutdown	120	95	600	2.2	±4.1 (25)	±5 to ±15	9.5	±300	Y	N	SOIC, HTSSOP	3.60
THS6226	Class H, Fixed Gain VDSL2 Dual Port Low-Power xDSL Line Driver	—	—	1500	6.3	+16/–4 (60)	10 to 12.5	24.5	383	Y	N	QFN-32	1.50
OPA2614	Dual, High I/O with Current Limit	—	180	145	1.8	±4.9 (100)	+5 to ±6.3	6	±350	N	N	SOIC, SOIC PowerPAD	1.95
OPA2613	Dual, High I/O with Current Limit	230	110	70	1.8	±4.7 (50)	+5 to ±6.3	6	±350	N	N	SOIC, SOIC PowerPAD	1.55
OPA2670	VDSL2 Line Driver with Power Control	—	420 (G=±5)	5000	3.6	±4.8 (50)	+5.5 to 12.6	15.75	±500	Y	N	QFN	1.25
OPA2677	Dual, Wideband, High I/O	220	200	2000	2	±5.0 (100)	+5 to ±6.3	12	±380	N	N	SOIC, SOIC PowerPAD, QFN	1.50
OPA2674	Dual Wideband, High I/O with Current Limit	250	225	2000	2	±5.0 (100)	+5 to ±6.3	9.3	±380	Y	N	SOIC	1.75
THS6184	Dual-Port, Low Power Diff. xDSL Line Driver	50	40	340	3	±4.1 (100)	±4 to ±12	4.2	±400	Y	N	QFN, HTSSOP	3.75
THS6132	High-Efficiency Class-G ADSL Line Driver	80	70	300	3.5	±9.9 (30)	±3.0 to ±16.5	3	±400	Y	N	SOIC, SOIC PowerPAD, QFN	2.65
THS6182	Low-Power ADSL Line Driver	100	80	450	3.2	3.7 (25)	4 to 16.5	12.5	±450	Y	N	SOIC, SOIC PowerPAD, QFN	3.70
OPA2673	Dual, High I/O with Active Off Line Control	600	450	3000	2.4	±4.8 (100)	3.5 to 6.5	19	±700	Y	N	QFN, MSOP	1.65
OPA4684	Quad Low-Power CFB Amp	250	170	750	3.7	±3.9 (1000)	+5 to ±6.0	1.8	−100/+120	N	Y	SOIC, TSSOP	3.30
OPA2683	Dual Very Low Power CFB Amp	200	150	400	4.4	±4.1 (1000)	+5 to ±6.0	2.06	−100/+120	Y	N	SOIC, MSOP, SOT23-8	1.85
OPA2684	Dual Low-Power CFB Amp	250	170	750	3.7	±3.9 (1000)	+5 to ±6.0	1.8	−100/+130	N	N	SOIC, SOT23-8	2.10

*Suggested resale price in U.S. dollars in quantities of 1,000. See www.ti.com/hirel for HiRel options.*

Amplifiers and Comparators
Instrumentation Amplifiers

Low Noise Instrumentation Amplifiers for Industrial Applications
INA826

The INA826 36 V instrumentation amplifier enables accurate sensor measurement in the industrial environment by combining 200 µV offset voltage and input common mode range beyond the power supply rails. Operating from 2.7 V to 36 V on 200 µA operating current, the INA826 makes it easy to achieve precision measurements in single and bipolar supply applications.

INA826 functional block diagram

Get more information: **www.ti.com/product/INA826**
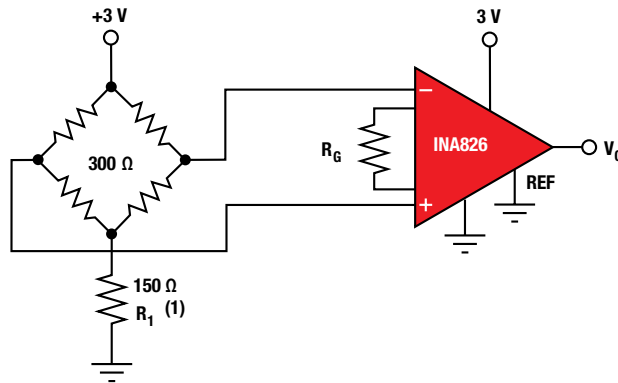
Key Features
- Low offset voltage: 200 µV
- Robust input architecture:
  - Extended input voltage range: V_{CC} - 0.8 V
  - ±40 V input protection
  - EMI hardened
- Excellent AC performance
  - CMRR (G = 1): 90 dB min
  - Input noise: 16 nV/√Hz
- Industrial supply:
  - +2.7 to +36 V, ±1.35 V to ±18 V
  - Low power: 200 µA
  - Rail-to-rail output
  - −40 to +125°C
- 8-MSOP, 8-DFN, and 8-SOIC

Applications
- Industrial process controls
- Circuit breakers
- Medical instrumentation
- Portable data acquisition

Instrumentation Amplifiers

Device	Description	Gain	Non Linearity (%) (max)	Input Bias Current (nA) (max)	Offset at G = 100 (µV) (max)	Offset Drift (µV/°C) (max)	CMRR at G = 100 (dB) (min)	BW at G = 100 (kHz) (min)	Noise 1 kHz (nV/√Hz) (typ)	Power Supply (V)	I_Q Per Amp (mA) (max)	HiRel Avail.	Package	Price*
Single Supply: Vsmax < = 5.5 V														
INA333	Zero Drift, Low Power, Precision	1 to 10000	0.001	0.2	25	0.1	100	3.5	50	1.8 to 5.5	0.075	Y	MSOP-8, DFN-8	1.80
INA337	RRIO, Auto-Zero, Low Drift	0.1 to 10000	0.01	2	100	0.4	106	1	33	2.7 to 5.5	3.4	N	MSOP-8	1.95
INA338	RRIO, Auto-Zero, Shutdown	0.1 to 10000	0.01	2	100	0.4	106	1	33	2.7 to 5.5	3.4	N	MSOP-10	2.80
INA326	CM >Supply, Wide Temp	0.1 to 10000	0.01	2	100	0.4	100	1	33	2.7 to 5.5	3.4	N	MSOP-8	1.95
INA327	RRIO, Auto-Zero, Low Drift	0.1 to 10000	0.01	2	100	0.4	100	1	33	2.7 to 5.5	3.4	N	MSOP-10	2.45
INA155	CM >Supply, SHDN, Wide Temp	10, 50	0.015	0.01	1000	5[1]	86	110	40	2.7 to 5.5	2.1	N	SO-8, MSOP-8	1.10
INA2321	RRIO, Auto-Zero, CM > Supply, Low Drift	5 to 1000	0.01	0.01	500	7[1]	90	25	100	2.7 to 5.5	0.06	N	TSSOP-14	1.75
INA321	RRIO, Auto-Zero, SHDN	5 to 1000	0.01	0.01	500	7[1]	90	25	100	2.7 to 5.5	0.06	N	MSOP-8	1.10
INA331	Low-Power, Single-Supply, CMOS	5 to 1000	0.015	0.010	500	5[1]	90	750	46	2.7 to 5.5	0.49	N	MSOP-8	0.80
INA2331	CM >Supply, Low Drift	5 to 1000	0.015	0.010	1000	5[1]	80	750	46	2.7 to 5.5	0.49	N	TSSOP-14	1.20
INA156	Zero Drift, Low Power, Precision	10, 50	0.015	0.010	8000	5[1]	74	50	40	2.7 to 5.5	2.5	N	MSOP-8	1.20
INA2322	Low Offset, RRIO, Wide Temp, SR = 6.5 V/µs	5 to 1000	0.015	0.01	10000	7[1]	60	25	100	2.7 to 5.5	0.06	N	TSSOP-14	0.95
INA2332	RRO, Wide BW, SHDN, Wide	5 to 1000	0.01	0.01	8,000	5[1]	60	500	46	2.7 to 5.5	2.7 to 5.5	N	TSSOP-14	0.95

*Suggested resale price in U.S. dollars in quantities of 1,000.   [1]Typical Value Only   **See www.ti.com/hirel** for HiRel options.

Amplifiers and Comparators
Instrumentation Amplifiers

Instrumentation Amplifiers (continued)

Device	Description	Gain	Non Linearity (%) (max)	Input Bias Current (nA) (max)	Offset at G = 100 (µV) (max)	Offset Drift (µV/°C) (max)	CMRR at G = 100 (dB) (min)	BW at G = 100 (kHz) (min)	Noise 1 kHz (nV/√Hz) (typ)	Power Supply (V)	I_Q Per Amp (mA) (max)	HiRel Avail.	Package	Price*
Single Supply: Vsmax < = 5.5 V														
INA322	RRO, SHDN, Wide Temp, Low Cost	5 to 1000	0.015	0.01	10,000	7[1]	60	25	100	2.7 to 5.5	2.7 to 5.5	N	MSOP-8	0.95
INA332	RRO, Wide BW, SHDN, Wide Temp, Low Cost	5 to 1000	0.01	0.01	8,000	5[1]	60	500	46	2.7 to 5.5	2.7 to 5.5	N	MSOP-8	0.54
INA330	Optimized for Precision 10 kΩ Thermistor Applications	—	—	0.2[1]	60	0.2[1]	—	1	0.0001°C	2.7 to 5.5	2.7 to 5.5	N	MSOP-10	1.90
Wide Supply: Vsmax < = 50 V														
INA826	Precision RRIO 36 V	1 to 1000	0.0005	65.00	157	2	120	60	20	2.7 to 36 V	0.25	N	MSOP-8, SO-8, QFN	1.10
INA827	Precision RRIO 36 V Minimum Gain of 5	5 to 1000	0.0005	50.00	170	2.8	110	150	17	2.7 to 36 V	0.25	N	MSOP-8, SO-8, QFN	1.10
INA128	Precision, Low Noise, Low Drift	1 to 10000	0.001	5	55	0.7	120	200	8	±2.25 to ±18	0.75	N	DIP-8, SOIC-8	3.05
INA129	Precision, Low Noise, Low Drift, AD620 Second Source	1 to 10000	0.001	5	55	0.7	120	200	8	±2.25 to ±18	0.75	Y	DIP-8, SOIC-8	6.00
INA141	Precision, Low Noise, Low Power, Pin Compatible with AD62121	10, 100	0.002	5	50	0.5	117	200	8	±2.25 to ±18	0.8	N	DIP-8, SOIC-8	3.55
INA114	Precision, Low Drift	1 to 10000	0.002	2	50	0.25	110	10	11	±2.25 to ±18	3	N	DIP-8, SO-16	4.80
INA115	Precision, Low Drift, w/Gain Sense Pins	1 to 10000	0.002	2	50	0.25	110	10	11	±2.25 to ±18	3	N	SO-16	4.20
INA131	Low Noise, Low Drift	100	0.002	2	50	0.25	110	70	12	±2.25 to ±18	3	N	DIP-8	6.00
INA118	Precision, Low Drift, Low Power	1 to 10000	0.002	5	55	0.7	107	70	10	±2.25 to ±18	0.39	N	DIP-8, SOIC-8	4.80
INA110	Fast Settle, Low Noise, Wide BW	1, 10, 100, 200, 500	0.02	0.05	280	2.5	106	470	10	±6 to ±18	4.5	N	DIP-16, SOIC-16	7.00
INA111	Fast Settle, Low Noise, Wide BW	1 to 1000	0.005	0.02	520	6	106	450	10	±6 to ±18	4.5	N	DIP-8, SO-16	4.80
INA101	Low Noise, Wide BW, Gain Sense Pins, Wide Temp	1 to 1000	0.002	20	27	0.25	96	25	13	±5 to ±20	8.5	N	PDIP-14, SO-16	7.95
INA103	Precision, Fast Settle, Low Drift, Audio, Mic Pre-Amp, THD+N = 0.0009%	1 to 1000	0.01	12000	300	1.2[1]	100	800	1	±9 to ±25	12.5	N	DIP-16, SO-16	5.00
INA163	Precision, Fast Settle, Low Drift, Audio, Mic Pre Amp, THD+N = 0.002%	1 to 10000	0.0006[1]	12000	300	1.2[1]	100	800	1	±4.5 to ±18	12	N	SOIC-14	2.90
INA166	Precision, Fast Settle, Low Drift, Audio, Mic-Amp, THD+N = 0.09%	2000	0.005	12000	250	2.50	100	450	1.3	±4.5 to ±18	12	N	SO-14	5.95
INA217	Precision, Low Drift, Audio, Mic Pre-Amp, THD+N = 0.09%, SSM2017 Replacement	1 to 10000	0.0006	12000	300	1.2[1]	100	800	1.3	±4.5 to ±18	12	N	DIP-8, SO-16	2.50
INA125	Precision with integrated Internal Ref, Sleep Mode	4 to 10000	0.01	25	250	2	100	4.5	38	2.7 to 36	0.53	N	DIP-16, SOIC-16	2.05
INA121	Low Bias, Precision, Low Power	1 to 10000	0.005	0.05	505	5	96	50	20	±2.25 to ±18	0.53	N	DIP-8, SO-8	2.50
INA116	Ultra-Low I_B 3 fA (typ), with Buffered Guard Drive Pins	1 to 1000	0.005	0.000025	2020	40	86	70	28	±4.5 to ±18	1.4	N	DIP-16, SO-16	4.20
INA122	µPower, RRO, CM to GND	5 to 10000	0.012	25	250	3	83	5	60	±1.3 to ±18	0.085	N	DIP-8, SOIC-8	2.45
INA126	µPower, <1 V VSAT, Low Cost	5 to 10000	0.012	25	250	3	83	9	35	2.7 to 36	0.2	N	DIP/SO/MSOP-8	1.05
INA2126	Dual INA126	5 to 10000	0.012	25	250	3	83	9	35	2.7 to 36	0.2	N	DIP/SO/MSOP-16	1.70

*Suggested resale price in U.S. dollars in quantities of 1,000. [1] Typical Value Only. See **www.ti.com/hirel** for HiRel options.

New products are listed in **bold red.**

Amplifiers and Comparators
Instrumentation Amplifiers

Instrumentation Amplifiers (continued)

Device	Description	Gain	Non Linearity at G = 100 (%) (max)	Offset (µV) (max)	Offset Drift (µV/°C) (max)	CMRR at G = 100 (dB) (min)	BW at G = 100 (kHz) (typ)	Noise at 1 kHz (nV/√Hz) (typ)	Power Supply (V)	I_Q (mA) (max)	HiRel Avail.	Package	Price*
Digitally Programmable Gain Amplifiers													
PGA103	Precision, Single-Ended Input	1, 10, 100	0.01	500	2[1]	—	250	11	±4.5 to ±18	3.5	N	SOIC-8	4.35
PGA202	High Speed, FET-Input, 50 pA I_B	1, 10, 100, 1000	0.012	1120	13	92	1000	12	±6 to ±18	6.5	N	DIP-14	8.90
PGA203	High Speed, FET-Input, 50 pA I_B	1, 2, 4, 8	0.012	1120	13	92	1000	12	±6 to ±18	6.5	N	DIP-14	8.90
PGA204	High Precision, Gain Error: 0.25%	1, 10, 100, 1000	0.002	50	0.25	110	10	13	±4.5 to ±18	6.5	N	SOIC-16, PDIP-16	8.35
PGA205	Gain Drift: 0.024 ppm/°C	1, 2, 4, 8	0.002	50	0.25	95	100	15	±4.5 to ±18	6.5	N	SOIC-16, PDIP-16	7.25
PGA206	High Speed, FET-Input, 100 pA I_B	1, 2, 4, 8	0.002	1500	2[1]	95	600	1	±4.5 to ±18	13.5	N	DIP-16, SOIC-16	10.80
PGA207	High Speed, FET-Input, 100 pA I_B	1, 2, 5, 10	0.002	1500	2[1]	95	600	1	±4.5 to ±18	13.5	N	DIP-16, SOIC-16	11.85
PGA112/3	Zero-Drift, Precision PGA with 2 Ch MUX	1 to 200	—	100	0.9	—	380	12	+2.2 V to +5.5 V	0.45	N	MSOP-10	1.00
PGA116/7	Zero-Drift, Precision PGA with 10 Ch MUX	1 to 200	—	100	1.2	—	380	12	+2.2 V to +5.5 V	0.45	N	TSSOP-20	1.83
PGA309	0.1% Digitally Calibrated Bridge Sensor Conditioner, Voltage Output	8 to 1152	0.002	50	0.2	20	60	210	+2.7 to +5.5	1.6	N	TSSOP-16	2.95
PGA308	Single Supply, Auto-Zero, Sensor Amplifier w/ Programmable Gain and Offset	4 to 1600	0.002	40	0.2	95	100	50	+2.7 to +5.5	2	N	MSOP-10, DFN-10	1.85
PGA280	High Voltage, Wide Input Range, Zero-Drift PGA	1/8 to 128	0.0010	15	0.17	120	6000	22	±5 to ±18 2.7 to 5.5	4.13	N	TSSOP-24	2.90
PGA281	High Voltage, Wide Input Range, Zero-Drift PGA	1/8 to 128	0.001	15	0.17	120	6000	22	±5 to ±18 2.7 to 5.5	4.13	N	TSSOP-16	1.90
LMP8358	Zero-Drift, Programmable Instrumentation Amplifier with Diagnostics	10 to 1000	0.01	10	0.05	110	680	25	2.7 to 5.5	1.8	N	SOIC-14, TSSOP-14	2.71
INA148	±200V Common-Mode Voltage Difference Amplifier	1 V/V	±200 V	5000	10[1]	70	100	550	±1.35 to ±18	0.3	N	SOIC-8	2.10
INA149	±275V CM Difference Amplifier	1 V/V	±275 V	1100	15	90	500	880	±2 to ±18	0.9	Y	SOIC-8	2.70
INA146	High-Voltage, Programmable Gain Difference Amplifier	0.1 V/V TO 100 V/V	±100 V	5000	30[1]	70	550	550	±2.25 to ±18	0.7	N	SOIC-8	1.70
INA145	Programmable Gain Difference Amplifier	1 V/V TO 1000 V/V	±28 V	1000	4[1]	76	500	90	±2.25 to ±18	0.7	N	SOIC-8	1.50
INA157	High-Speed, Precision Difference Amplifier	1/2 V/V, 2 V/V	±37.5	500	20.00	86	4000	26	±4 to ±18	2.9	N	SOIC-8	1.05
INA133	High-Speed, Precision Difference Amplifiers	1 V/V	±27	450	5.00	80	1500	57	±2.5 to ±18	1.2	N	SOIC-8	1.15
INA105	Precision Unity Gain Differential Amplifier	1 V/V	±25	250	20.00	86	1000	60	±5 to ±18	2.0	N	DIP-8, SOIC-8	3.20
INA106	Precision Fixed-Gain Differential Amplifier	10 V/V	±11	200	0.2[1]	86	5000	30	±5 to ±18	2.0	N	DIP-8, SOIC-8	5.00
INA117	High Common-Mode Voltage Difference Amplifier	1 V/V	±200	1000	40[1]	86	200	550	±5 to ±18	2.0	N	DIP-8, SOIC-8	2.70
INA159	High-Speed, Precision Gain of 0.2 Level Translation Difference Amplifier	0.2 V/V	±10	500	1.5[1]	80	1500	30	+1.8 to +5.5	1.5	Y	MSOP-8	1.70

*Suggested resale price in U.S. dollars in quantities of 1,000. [1]Typical Value Only See **www.ti.com/hirel** for HiRel options.

New products are listed in **bold red.**
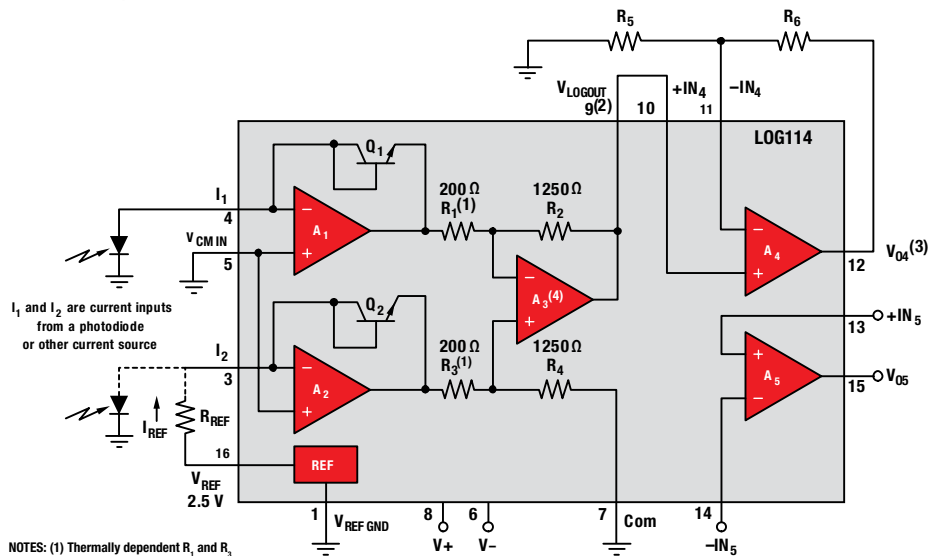
Amplifiers and Comparators
Logarithmic Amplifiers

Single-Supply, High-Speed, Precision Logarithmic Amplifier
LOG114

The LOG114 is specifically designed for measuring low-level and wide dynamic range currents in communications, lasers, medical and industrial systems. The device computes the logarithm or log-ratio of an input current or voltage relative to a reference current or voltage (logarithmic transimpedance amplifier).

High precision is ensured over a wide dynamic range of input signals on either Bipolar (±5 V) or single (+5 V) supply. Special temperature drift compensation circuitry is included on-chip. In log-ratio applications, the signal current may be from a high impedance source such as a photodiode or resistor in series with a low impedance voltage source. The reference current is provided by a resistor in series with a precision internal voltage reference, photo diode or active current source.

Key Features
- Advantages:
  - Tiny for high-density systems
  - Precision on one supply
  - Fast over eight decades
  - Fully tested function
- Two scaling amplifiers
- Wide input dynamic range: eight decades, 100 pA to 10 mA
- 2.5 V reference
- Stable over temperature
- Low quiescent current: 10 mA
- Dual or single supply: ±5 V, +5 V
- Specified temperature range: –5°C to +75°C
- Package: small QFN-16 (4 mm x 4 mm)

Applications
- Onet erbium-doped fiber optic amplifiers (EDFA)
- Laser optical density measurement
- Photodiode signal compression amps
- Log, log-ratio functions
- Analog signal compression in front of analog-to-digital converters
- Absorbance measurement

NOTES: (1) Thermally dependent R_1 and R_3 provide temperature compensation.
(2) $V_{LOGOUT} = 0.375 \times \log(I_1/I_2)$.
(3) $V_{04} = 0.375 \times K \times \log(I_1/I_2)$.
$K = 1 + R_6/R_5$.
(4) Differential Amplifier (A_3) Gain = 6.25

LOG114 functional block diagram

Get more information: **www.ti.com/product/LOG114**

Logarithmic Amplifiers

Device	Scale Factor (V/Decade)	Input Current Range (nA) (min)	Input Current Range (mA) (max)	Conformity Error (Initial 5 Decades) (%) (max)	Conformity Error (Initial 5 Decades) (%/°C) (typ/temp)	Bandwidth (kHz)	V_S (V) (min)	V_S (V) (max)	I_Q Per Ch. (mA) (max)	Reference Type	Auxiliary Op Amps	HiRel Avail.	Package	Price*
LOG101	1	0.1	3.5	0.2	0.0001	38	9	36	1.5	External	—	N	SO-8	6.95
LOG102	1	1	1	0.3	0.0002	38	9	36	2	External	2	N	SO-14	7.25
LOG104	0.5	0.1	3.5	0.2	0.0001	38	9	36	1.5	External	—	N	SO-8	6.95
LOG112	0.5	0.1	3.5	0.2	0.0001	38	9	36	1.75	2.5 V Internal	1	N	SO-14	7.90
LOG2112	0.5	0.1	3.5	0.2	0.0001	38	9	36	1.75	2.5 V Internal	1/Ch	N	SO-16	11.35
LOG114	0.375	0.1	10	0.2	0.001	5000	5	10	15	2.5 V Internal	2	N	QFN-16	7.90

*Suggested resale price in U.S. dollars in quantities of 1,000. See **www.ti.com/hirel** for HiRel options.

Amplifiers and Comparators
Power Amplifiers and Buffers

1.5 A, High-Current Power Amplifier
OPA564

The OPA564 is a high-current operational amplifier ideal for driving up to 1.5 A in reactive loads and provides high reliability in demanding power-line communications and motor control applications. It operates from a single or dual power supply of ±3.5 V (7 V) to ±13 V (26 V). In single-supply operation, the input common-mode range extends below ground. The OPA564 is easy to heat sink over the specified extended industrial temperature range, –40°C to +125°C.

Key Features
- Single or dual supply: ±3.5 V (7 V) to ±13 V (26 V)
- Large output swing: 22 V_{PP} at 1.5 A (24 V supply)
- Thermal and over-current warning
- Adjustable current limit
- Output enable/disable control
- Slew rate: 20 V/µs
- Packaging: HSOP-20 PowerPAD™

Applications
- Power-line communications
- Valve, actuator drivers
- Synchro, servo drivers
- Motor drivers
- Power supply output amplifiers
- Test equipment
- Transducer excitation
- General-purpose linear power boosters
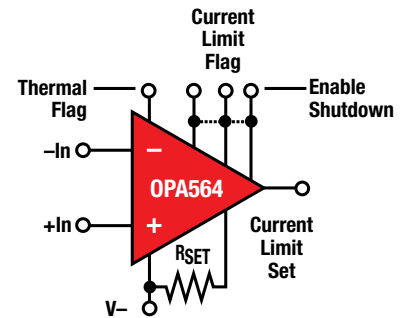
OPA564 PowerPAD™-down pinout

Power Amplifiers

Device	I_{OUT} (A)	V_S (V)	Bandwidth (MHz)	Slew Rate (V/µs)	I_Q (mA) (max)	V_{OS} (mV) (max)	V_{OS} Drift (µV/°C) (max)	I_B (nA) (max)	HiRel Avail.	Package	Price*
LM6181	0.1	9 to 32	100	2000	6.5	10	2.5	10000	N	PDIP, SOIC	1.12
LM7322	0.1	2.5 to 32	16	8.5	2.5	5	2	2000	N	SOIC-8, MSOP-8	1.05
LM7372	0.15	9 to 36	120	3000	17	8	12	4000	N	SOIC-8, SOIC-16	1.88
LM675	3	16 to 60	5.5	8	50	10	25	2000	N	TO-220	2.05
LM7332	0.07	2.5 to 32	19	12.0	2.3	4	2	2000	N	SOIC-8, MSOP-8	1.10
LMH6640	0.1	4.5 to 16	190	170	5.5	5	—	2600	N	SOT-5	1.15
LMH6672		5 to 12	90	135	8	5.5	—	1600	N	SOIC-8	1.60
OPA445	0.015	20 to 90	2	15	4.7	3	10	0.1	N	DIP-8, SO-8, SO-8 PowerPAD™	4.75
OPA452	0.05	20 to 80	1.8	7.2	6.5	3	5	0.1	N	TO220-7, DDPak-7	2.55
OPA453	0.05	20 to 80	7.5	23	6.5	3	5	0.1	N	TO220-7, DDPak-7	2.55
OPA454	0.120	10 to 100	2.5	13	4	4	1.6	0.1	N	SO-8 and HSOP-20 PowerPAD	2.75
OPA541	10	20 to 70	1.6	10	25	1	15	0.05	N	TO220-11, TO3-8	11.10
OPA544	2	20 to 70	1.4	8	15	5	10	0.1	N	TO220-5, DDPak-5	7.90
OPA2544	2	20 to 70	1.4	8	30	5	10	0.05	N	TO220-11	12.00
OPA547	0.5	8 to 60	1	6	15	5	25	500	N	TO220-7, DDPak-7	5.00
OPA548	3	8 to 60	1	10	20	10	30	500	N	TO220-7, DDPak-7	6.90
OPA549	8	8 to 60	0.9	9	35	5	20	500	N	ZIP-11, TO220-11	12.00
OPA551	0.2	8 to 60	3	15	8.5	3	7	0.1	N	DIP-8, SO-8, DDPak-7	1.90
OPA552	0.2	8 to 60	12	24	8.5	3	7	0.1	N	DIP-8, SO-8, DDPak-7	1.75
OPA561	1.2	7 to 16	17	50	60	20	50	0.1	N	HTSSOP-20	2.80
OPA564	1.5	7 to 24	17	40	50	20	10	0.1	N	HSOP-20 PowerPAD	2.75
OPA567	2	2.7 to 5.5	1.2	1.2	6	2	1.3	0.01	N	QFN-12	1.85
OPA569	2	2.7 to 5.5	1.2	1.2	6	2	1.3	0.01	N	SO-20 PowerPAD	3.10

Buffers (Sorted by Ascending BW at A_{CL})

Device	V_S ±15 (V)	V_S ±5 (V)	V_S 3.3 (V)	V_S 5 (V)	A_{CL} Stable Gain (V/V) (min)	BW at A_{CL} (MHz)	Slew Rate (V/µs)	Settling Time 0.01% (ns) (typ)	I_Q (mA) (typ)	THD (F_C = 1MHz) (dB) (typ)	Diff Gain (%)	Diff Phase (°)	V_N at Flatband (nV/√Hz) (typ)	V_{OS} (mV) (max)	I_B (µA) (max)	HiRel Avail.	Package	Price*
OPA633	Yes	Yes	—	—	1	260	2500	50	21	—	—	0.1	—	15	35	N	DIP-8	5.45
OPA692	—	Yes	—	Yes	1	280	2000	12 (0.02%)	5.8	−78	0.07	0.02	1.7	2.5	35	N	SOT23-6, SOIC-8	1.15
OPA693	—	Yes	—	Yes	1	1400	2500	12 (0.1%)	13	−84	0.03	0.01	1.8	2	35	N	SOT23-6, SOIC-8	1.30
OPA832	—	Yes	Yes	Yes	1	92	350	45 (0.1%)	4.25	−84	0.1	0.16	9.2	7	10	N	SOT23-5, SOIC-8	0.32
BUF602	—	Yes	Yes	Yes	1	1000	8000	6 (0.05%)	5.8	—	0.15	0.04	4.8	30	7	N	SOT23-5, SOIC-8	0.85
BUF634	Yes	Yes	Yes	Yes	1	30 to 180	2000	200 (0.1%)	15	—	0.4	0.1	4	100	20	N	DIP-8, SOIC-8 TO220-5, DDPak-5	3.10

Suggested resale price in U.S. dollars in quantities of 1,000. See www.ti.com/hirel for HiRel options.

Amplifiers and Comparators
Comparators

Hex Window Comparator with 1.5% Precision and 400 mV Reference
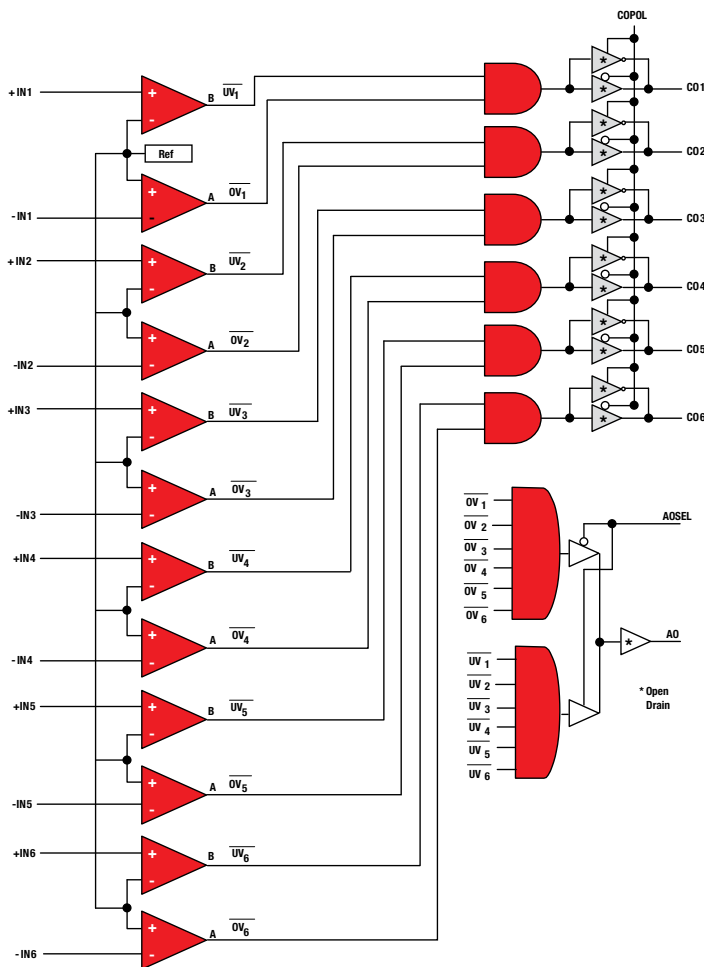### LMV7231

The LMV7231 is a 1.5% accurate Hex Window Comparator which can be used to monitor power supply voltages. The device uses an internal 400 mV reference for the comparator trip value. The comparator set points can be set via external resistor dividers. The LMV7231 has six outputs (CO1-CO6) that signal an under-voltage or over-voltage event for each power supply input. An output (AO) is also provided to signal when any of the power supply inputs have an over-voltage or under-voltage event. This ability to signal an under-voltage or over-voltage event for the individual power supply inputs, in addition to an output to signal such an event on any of the power supply inputs, adds unparalleled system protection capability.

Key Features
- High accuracy voltage reference: 400 mV
- Threshold accuracy: ±1.5% (max)
- Wide supply voltage range 2.2 V to 5.5 V
- Input/output voltage range above V+
- Internal hysteresis: 6 mV
- Propagation delay: 2.6 µs to 5.6 µs
- Supply current 7.7 µA per channel
- 24-lead WQFN package
- Temperature range: –40°C to 125°C

Applications
- Power supply voltage detection
- Battery monitoring
- Handheld instruments
- Relay driving
- Industrial control systems

LMV7231 functional block diagram

Get more information: www.ti.com/product/LMV7231

Amplifiers and Comparators
Comparators

40-ns, microPOWER, Push-Pull Output Comparators
TLV3201/2

The TLV3201 and TLV3202 are single- and dual-channel comparators that offer the ultimate combination of high-speed (40 ns) and low-power consumption (40 µA), all in extremely small packages with features such as rail-to-rail inputs, low offset voltage (1 mV), and large output drive current. The devices are also very easy to implement in a wide variety of applications where response time is critical.

D AND DGK PACKAGES
SOIC-8 AND MSOP-8
(TOP VIEW)

1OUT	1	8 V$_{CC}$
1IN−	2	7 2OUT
1IN+	3	6 2IN−
GND	4	5 2IN+

DCK AND DBV PACKAGES
SC70-5 AND SOT23-5
(TOP VIEW)

OUT	1	5 V$_{CC}$
GND	2	
IN+	3	4 IN−
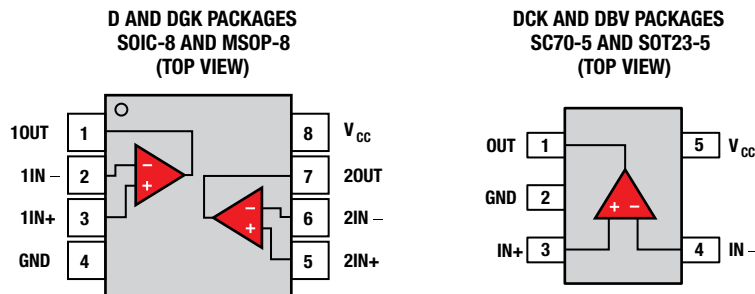
TLV3201/2 package diagram

Get more information: **www.ti.com/product/TLV3201,
www.ti.com/product/TLV3202**

Key Features
- Low propagation delay: 40 ns
- Low quiescent current:
  40 µA per channel
- Input common-mode range extends
  200 mV beyond either rail
- Low input offset voltage: 1 mV
- Push-pull outputs
- Supply range: +2.7 V to +5.5 V
- Industrial temperature range:
  −40°C to +125°C
- Small packages:
  SC70-5, SOT23-5, SOIC-8, MSOP-8

Applications
- Inspection equipment
- Test and measurement
- High-speed sampling systems
- Telecom
- Portable communications

Comparators

Device	Description	Ch.	I$_Q$ Per Ch. (mA) (max)	Output Current (mA) (min)	t$_{RESP}$ Low-to-High (µs)	V$_S$ (V) (min)	V$_S$ (V) (max)	V$_{OS}$ (25°C) (mV) (max)	Output Type	HiRel Avail.	Package	Price*
TLV3501	Ultra-High Speed, Low Power	1, 2	5	20	0.004	2.7	5.5	5	Push-Pull	Y	SOT23	1.20
TL714	High Speed, 10 mV (typ) Hysteresis	1	12	16	0.006	4.75	5.25	10	Push-Pull	N	PDIP, SOIC	2.40
TL3116	Ultra Fast, Low Power, Precision	1	14.7	5	0.0099	5	10	3	Push-Pull	N	SOIC, TSSOP	1.05
TL712	Single, High Speed	1	20	16	0.025	4.75	5.25	5	Push-Pull	N	PDIP, SOIC, SOP	0.95
LM306	Single, Strobed, General Purpose	1	10	100	0.028	15	24	5	Push-Pull	N	PDIP, SOIC	1.05
TLV3201	Single, Dual Push-Pull/Open Drain	1,2	50	25	0.04	2.5	5.5	5	PP/Open-Drain	N	SC70, SOT23 MSOP, SOIC	0.40 0.50
LM211	Single, High Speed, Strobed	1	6	25	0.115	3.5	30	3	Open-Collector/ Emitter	Y	PDIP, SOIC	0.18
LM311	Single, High Speed, Strobed, Differential	1	7.5	25	0.115	3.5	30	7.5	Open-Collector/ Emitter	N	PDIP, SOIC, SOP, TSSOP	0.18
LM111	Single, Strobed, Differential	1	6	25	0.165	3.5	30	3	Open-Collector/ Emitter	Y	CDIP, LCCC	1.57
LMV331	Single, Low Voltage	1	0.12	10	0.2	2.7	5.5	7	Open-Collector	Y	SC70, SOT23	0.26
LMV339	Quad, Low Voltage	4	0.075	10	0.2	2.7	5.5	7	Open-Collector	N	SOIC, TSSOP	0.39
LMV393	Dual, Low Voltage	2	0.1	10	0.2	2.7	5.5	7	Open-Collector	Y	SOIC, TSSOP	0.30
TLC352	Ultra-Low Supply Voltage	2, 4	0.15	6	0.2	1.5	18	5	Open-Drain	N	PDIP, SOIC, TSSOP	0.43
TLC372	Fast, Low Power	2, 4	0.15	6	0.2	2	18	5	Open-Drain	Y	PDIP, SOIC, TSSOP	0.35
TLV2352	Low Voltage	2, 4	0.125	6	0.2	2	8	5	Open-Drain	Y	PDIP, SOIC, TSSOP	0.80
LM139	Quad, Differential	4	0.5	6	0.3	2	36	2	Open-Collector	Y	SOIC	0.95
LM193	Dual, Differential	2	0.5	6	0.3	2	36	5	Open-Collector	N	SOIC	0.33
LM239	Quad, Differential	4	0.5	6	0.3	2	30	2	Open-Collector	Y	PDIP, SOIC	0.11
LM2901	Quad, Differential	4	0.625	6	0.3	2	30	3	Open-Collector	Y	PDIP, SOIC, SOP, TSSOP	0.12
LM2903	Dual, Differential	2	0.5	6	0.3	2	30	7	Open-Collector	N	PDIP, SOIC, SOP, TSSOP	0.11

*Suggested resale price in U.S. dollars in quantities of 1,000. See **www.ti.com/hirel** for HiRel options.

*New products are listed in **bold red.***

Amplifiers and Comparators
Comparators

Comparators (continued)

Device	Description	Ch.	I_Q Per Ch. (mA) (max)	Output Current (mA) (min)	t_{RESP} Low-to-High (µs)	V_S (V) (min)	V_S (V) (max)	V_{OS} (25°C) (mV) (max)	Output Type	HiRel Avail.	Package	Price*
LM293	Dual, Differential	2	0.5	6	0.3	2	30	3	Open-Collector	Y	PDIP, SOIC	0.11
LM3302	Quad, General Purpose	4	0.2	6	0.3	2	28	20	Open-Drain/Emitter	N	PDIP, SOIC	0.36
LM339	Quad, Differential	4	0.5	6	0.3	2	30	3	Open-Collector	N	PDIP, SOIC, SOP, SSOP, TSSOP	0.10
LM393	Dual, Differential	2	0.5	6	0.3	2	30	3	Open-Collector	N	PDIP, SOIC, SOP, TSSOP	0.10
TL331	Single, Differential	1	0.7	6	0.3	2	36	5	Open-Collector	Y	SOT23	0.23
LMC7215	Micro-Power, Rail-to-Rail CMOS Comparator with Push-Pull Output	1	0.0012	12	1	2	8	6	Push-Pull	N	SOIC-8, SOT23-5	0.57
TLC339	Quad, Low Power	4	0.02	6	1	3	16	5	Open-Drain	N	PDIP, SOIC, TSSOP	0.47
TLC3702	Dual and Quad, µPower	2, 4	0.02	4	1.1	3	16	5	Push-Pull	Y	PDIP, SOIC, TSSOP	0.36
TLC393	Low Power, LM393 Replacement	2	0.02	6	1.1	3	16	5	Open-Drain	Y	PDIP, SOIC, SOP, TSSOP	0.37
LP311	Single, Strobed, Low Power	1	0.3	25	1.2	3.5	30	7.5	Open-Drain/Emitter	N	PDIP, SOIC, SOP	0.68
LP2901	Quad, Low Power, General Purpose	4	0.025	30	1.3	5	30	5	Open-Collector	Y	PDIP, SOIC	0.30
LP339	Quad, Low Power, General Purpose	4	0.025	30	1.3	5	30	5	Open-Collector	N	PDIP, SOIC	0.27
LMC6762	Dual, Micropower Rail-to-Rail Input CMOS Comparator with Push-Pull Output	2	0.0125	30	4	2.7	15	15	Push-Pull	N	PDIP-8, SOIC-8	1.01
LMC6772	Dual, Micropower Rail-to-Rail Input CMOS Comparator with Open-Drain Output	2	0.0125	30	4	2.7	15	15	Open-Drain	N	PDIP-8, SOIC-8	1.06
LMC7221	Tiny CMOS Comparator with Rail-to-Rail Input and Open-Drain Output	1	0.0018	45	4	2.7	15	15	Open-Drain	N	SOIC-8, SOT23-5	0.54
TLV3491	Low Voltage, Excellent Speed/Power	1, 2, 4	0.0012	5	6	1.8	5.5	15	Push-Pull	Y	SOT23, SOIC, TSSOP	0.35
LMC7225	Micro-Power, Rail-to-Rail CMOS Comparator with Open-Drain Output	1	0.0012	12	12.2	2	8	6	Open-Drain	N	SOT23-5	0.57
TLV3401	Nanopower, Open-Drain, RRIO	1, 2, 4	0.00055	1.6	80	2.5	16	3.6	Open-Drain	N	MSOP, PDIP, SOIC, SOT23, TSSOP	0.60
LMH7220	High Speed Comparator with LVDS Output	1	9	5	0.0029	2.7	12	9.5	LVDS	N	SOT	2.00
LMH7322	Dual 700 ps High Speed Comparator with RSPECL Outputs	2	10	50	0.0007	2.7	12	8	LVDS, RSPECL	N	WQFN	3.39
LMH7324	Quad 700 ps High Speed Comparator with RSPECL Outputs	4	7.5	25	0.0007	5	12	9.5	LVDS, RSPECL	N	WQFN	5.19
LMV7219	7 nsec, 2.7 V to 5 V Comparator with Rail-to-Rail Output	1	1.8	20	0.007	2.7	5	6	Push-Pull	N	SOT	0.95
LMV7231	Hex Window Comparator with 1.5% Precision and 400 mV Reference	6	0.01	—	5.6	2.2	5.5	6	Open-Drain	N	LLP-24	1.42
Comparator with Integrated Functions												
TLV2702	Sub-µPower, Op Amp and Comparator, RRIO	2, 4	0.0019	0.2	36	2.5	16	5	Push-Pull	N	MSOP, PDIP, SOIC, TSSOP	1.10
TLV2302	Sub-µPower, Op Amp and Comparator, RRIO	2, 4	0.0017	0.2	55	2.5	16	5	Open-Collector	N	MSOP, PDIP, SOIC, TSSOP	0.85
TLV3011	µPower, Comparator with 1.242 V Reference	1	0.003	5	6	1.8	5.5	15	Open-Drain	Y	SC70, SOT23	0.75
TLV3012	µPower, Comparator with 1.242 V Reference	1	0.003	5	6	1.8	5.5	15	Push-Pull	N	SC70, SOT23	0.75
LMP7300	Micropower Precision Comparator with Integrated Precision Reference and Adjustable Hysteresis	1	0.014	10	11	2.7	12	1	Open-Collector	N	SOIC-8, VSSOP-8	0.99

*Suggested resale price in U.S. dollars in quantities of 1,000. See www.ti.com/hirel for HiRel options.
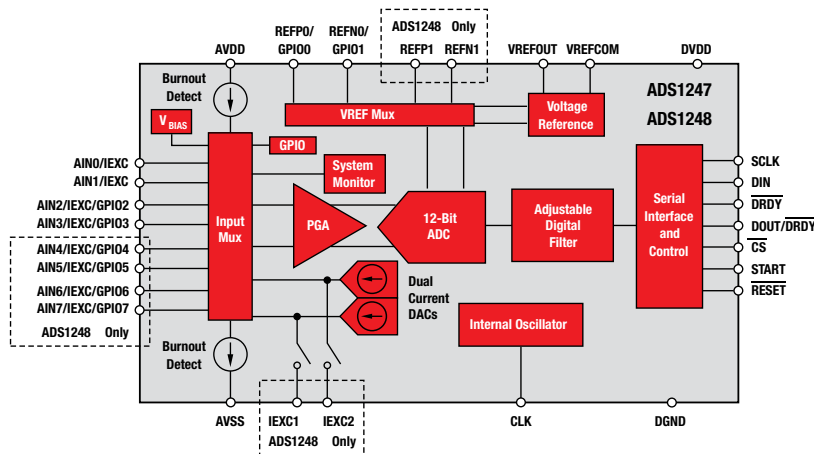
24-Bit Analog-to-Digital Converters for Temperature and Industrial Measurement

ADS1246, ADS1247, ADS1248

The ADS1246, ADS1247 and ADS1248 are highly integrated, precision, 24-bit analog-to-digital converters (ADCs). The ADS1246/7/8 feature an onboard, low-noise programmable gain amplifier (PGA), a precision delta-sigma (ΔΣ) ADC with a single-cycle settling digital filter and an internal oscillator. The ADS1247 and ADS1248 also provide a built-in, low-drift voltage reference with 10mA output capacity and two matched programmable current digital-to-analog converters (DACs). The ADS1246/7/8 provide a complete front-end solution for temperature sensor applications including thermocouples, thermistors and RTDs.

Key Features
- Low-noise PGA: 48 nV at PGA = 128
- Data output rates up to 2 kSPS
- Single-cycle settling for all data rates
- Simultaneous 50/60 Hz rejection at 20 SPS
- 4 diff/7 single-ended inputs (ADS1248)
- 2 diff/3 single-ended inputs (ADS1247)
- Matched current-source DACs
- Very low drift internal voltage reference: 10 ppm/°C (max)
- Sensor burnout detection
- 4/8 general-purpose I/Os (ADS1247/8)
- Internal temperature sensor
- Power supply and V_{REF} monitoring

Applications
- Temperature measurement
  - RTDs, thermocouples and thermistors
- Pressure measurement
- Industrial process control

ADS1247/1248 functional block diagram

Get more information: **www.ti.com/product/Part Number
(ADS1246, ADS1247, ADS1248)**

Industrial, 14 kSPS, 24-Bit Analog-to-Digital Converter with Low-Drift Reference

ADS1259

The ADS1259 is a high-linearity, low-drift, 24-bit analog-to-digital converter (ADC) designed for the needs of industrial process control, precision instrumentation and other exacting applications. Combined with a signal amplifier (such as the PGA280-p.26), a high-resolution, high-accuracy measurement system is formed that is capable of digitizing a wide range of signals.

Key Features
- High performance
  - INL: 0.4 ppm
  - Reference drift: 2 ppm/°C
  - Gain drift: 0.5 ppm/°C
  - Offset drift: 0.05 µV/°C
  - Noise: 0.7 µV$_{RMS}$ at 60 SPS
- 24-bits, no missing codes
- Output data rates from 10 SPS to 14 kSPS
- Simultaneous 50/60 Hz rejection at 10 SPS
- Single-cycle settling
- Internal oscillator

Applications
- Industrial process control
- Scientific instrumentation
- Test and measurement

ADS1259 functional block diagram

Get more information: **www.ti.com/product/ADS1259**

Data Converters
Analog-to-Digital Converters – Delta-Sigma ADCs

Delta-Sigma (ΔΣ) ADCs

Device	Res. (Bits)	Sample Rate (kSPS)	Number of Input Channels	Interface	Input Voltage (V)	V$_{REF}$	Linearity (%)	Power (mW)	HiRel Avail.	Package	Price*
ADS1113	16	0.86	1 SE/1 Diff	Serial, I²C	±2.048	Int	0.0015	0.3	N	MSOP-10, x2QFN-10	1.85
ADS1114	16	0.86	1 SE/1 Diff	Serial, I²C	PGA (2/3-16), V$_{DD}$	Int	0.0015	0.3	N	MSOP-10, x2QFN-10	2.00
ADS1115	16	0.86	4 SE/2 Diff	Serial, I²C	PGA (2/3-16), V$_{DD}$	Int	0.0015	0.3	N	MSOP-10, x2QFN-10	2.25
ADS1013	12	3.3	1 SE/1 Diff	Serial, I²C	±2.048	Int	0.0244	0.3	N	MSOP-10, x2QFN-10	0.90
ADS1014	12	3.3	1 SE/1 Diff	Serial, I²C	PGA (2/3-16), V$_{DD}$	Int	0.0244	0.3	N	MSOP-10, x2QFN-10	1.00
ADS1015	12	3.3	4 SE/2 Diff	Serial, I²C	PGA (2/3-16), V$_{DD}$	Int	0.0244	0.3	Y	MSOP-10, x2QFN-10	1.10
ADS1118	16	0.86	4 SE/2 Diff	SPI	PGA (2/3-16), V$_{DD}$	Int	0.0015	0.3	N	MSOP-10, x2QFN-10	2.25
ADC128D818	12	10	8 SE	I²C	0.36	Int/Ext	0.097656	2	N	TSSOP-16	2.80
ADS1018	12	3.3	4 SE/2 Diff	SPI	PGA (2/3-16), V$_{DD}$	Int	0.0244	0.3	N	MSOP-10, x2QFN-10	1.10
ADS1146	16	2	1 Diff	Serial, SPI	PGA (1-128), ±2.5	Ext	0.0015	1.4	N	TSSOP-16	2.70
ADS1246	24	2	1 Diff	Serial, SPI	PGA (1-128), ±2.5	Ext	0.0003	2.56	N	TSSOP-16	3.45
ADS1259	24	14	1	SPI	5	Int/Ext	0.00004	13	N	TSSOP-20	5.60
ADS1672	24	625	1	Serial	5	Ext	0.0003	350	N	TQFP-64	11.75
ADS1158	16	125	16 SE/8 Diff	Serial, SPI	+5, ±2.5	Ext	0.0045	42	N	QFN-40	5.95
ADS1258	24	125	16 SE/8 Diff	Serial, SPI	5, ±2.5	Ext	0.0015	40	Y	QFN-48	7.95
ADS1174	16	52	4	Serial, SPI w/FS	2.5	Ext	0.0045	135	N	HTQFP-64	9.95
ADS1178	16	52	8	Serial, SPI w/FS	2.5	Ext	0.0045	245	N	HTQFP-64	15.95
ADS1274	24	128	4 Diff Simultaneous	Serial, SPI w/FSYNC	2.5	Ext	0.001	30-300	N	TQFP-64	13.95
ADS1278	24	128	8 Diff Simultaneous	Serial, SPI w/FSYNC	2.5	Ext	0.001	60-600	Y	TQFP-64	23.95
ADS1271	24	105	1 Diff	Serial, SPI w/FSYNC	2.5	Ext	0.0015	35-100	N	TSSOP-16	5.90
ADS1147	16	2	3 SE/2 Diff	Serial, SPI	PGA (1-128), ±2.5	Int/Ext	0.0015	1.4	N	TSSOP-20	3.45
ADS1148	16	2	7 SE/4 Diff	Serial, SPI	PGA (1-128), ±2.5	Int/Ext	0.0015	1.4	N	TSSOP-28	3.95
ADS1247	24	2	3 SE/2 Diff	Serial, SPI	3 to +5, ±2.5	Ext	0.0003	2.56	N	TSSOP-20	4.45
ADS1248	24	2	7 SE/4 Diff	Serial, SPI	3 to +5, ±2.5	Int/Ext	0.0003	2.56	N	TSSOP-28	4.95
ADS1252	24	41	1 SE/1 Diff	Serial	5	Ext	0.0015	40	N	SOIC-8	6.45
ADS1256	24	30	8 SE/4 Diff	Serial, SPI	PGA (1-64), 5	Ext	0.001	35	N	SSOP-28	6.95
ADS1255	24	30	2 SE/1 Diff	Serial, SPI	PGA (1-64), 5	Ext	0.001	35	N	SSOP-20	6.50
ADS1253	24	20	4 SE/4 Diff	Serial	5	Ext	0.0015	7.5	N	SSOP-16	6.70
ADS1254	24	20	4 SE/4 Diff	Serial	5	Ext	0.0015	4	Y	SSOP-20	6.70
ADS1251	24	20	1 SE/1 Diff	Serial	5	Ext	0.0015	7.5	N	SOIC-8	5.60
ADS1216	24	0.78	8 SE/4 Diff	Serial, SPI	PGA (1-128), 2.5	Int/Ext	0.0015	0.6	N	TQFP-48	5.00
ADS1217	24	0.78	8 SE/4 Diff	Serial, SPI	PGA (1-128), 5	Int/Ext	0.0012	0.8	N	TQFP-48	5.00
ADS1218	24	0.78	8 SE/4 Diff	Serial, SPI	PGA (1-128), 2.5	Int/Ext	0.0015	0.8	N	TQFP-48	5.50
ADS1224	24	0.24	4 SE/4 Diff	Serial	5	Ext	0.0015	0.5	N	TSSOP-20	3.25
ADS1222	24	0.24	2 SE/2 Diff	Serial	5	Ext	0.0015	0.5	N	TSSOP-14	2.95
ADS1234	24	0.08	4 SE/4 Diff	Serial	PGA (1-128), 2.5	Ext	0.0015	3	N	TSSOP-28	4.50
ADS1232	24	0.08	2 SE/2 Diff	Serial	PGA (1-128), 2.5	Ext	0.0015	3	N	TSSOP-24	3.90
ADS1226	24	0.08	2 Diff	Serial	5	Ext	0.0015	0.5	N	QFN-16	2.95
ADS1225	24	0.08	1 Diff	Serial	5	Ext	0.0015	0.5	N	QFN-16	2.75
ADS1241	24	0.015	8 SE/4 Diff	Serial, SPI	PGA (1-128), 2.5	Ext	0.0015	0.5	N	SSOP-28	4.20
ADS1243	24	0.015	8 SE/4 Diff	Serial, SPI	PGA (1-128), 2.5	Ext	0.0015	0.6	N	TSSOP-20	3.95
ADS1240	24	0.015	4 SE/2 Diff	Serial, SPI	PGA (1-128), 2.5	Ext	0.0015	0.6	N	SSOP-24	3.80
ADS1242	24	0.015	4 SE/2 Diff	Serial, SPI	PGA (1-128), 2.5	Ext	0.0015	0.6	N	TSSOP-16	3.60
ADS1244	24	0.015	1 SE/1 Diff	Serial	5	Ext	0.0008	0.3	N	MSOP-10	2.95

*Suggested resale price in U.S. dollars in quantities of 1,000. See **www.ti.com/hirel** for HiRel options.*

Data Converters

Analog-to-Digital Converters – Delta-Sigma ADCs

Delta-Sigma (ΔΣ) ADCs (continued)

Device	Res. (Bits)	Sample Rate (kSPS)	Number of Input Channels	Interface	Input Voltage (V)	V_REF	Linearity (%)	Power (mW)	HiRel Avail.	Package	Price*
ADS1220	24	2	4 SE/2 Diff	Serial, SPI	5.5	Int/Ext	0.0015	0.4	N	TSSOP-16, QFN-16	3.15
ADS1120	16	2	4 SE/2 Diff	Serial, SPI	5.5	Int/Ext	0.0015	0.4	N	TSSOP-16, QFN-16	2.30
ADS1245	24	0.015	1 SE/1 Diff	Serial	2.5	Ext	0.0015	0.5	N	MSOP-10	3.10
ADS1250	20	25	1 SE/1 Diff	Serial, SPI	PGA (1-8), 4	Ext	0.003	75	N	SOIC-16	6.95
ADS1131	18	0.08	1 SE/1 Diff	Serial	0.02	Ext	0.0008	1.6	N	TSSOP-16	1.95
ADS1230	20	0.08	1 SE/1 Diff	Serial	0.02	Ext	0.003	3	N	TSSOP-16	2.50
ADS1231	20	0.08	1 SE/1 Diff	Serial	0.02	Ext	0.003	1.6	N	TSSOP-16	2.10
ADS1112	16	0.24	3 SE/2 Diff	Serial, I²C	PGA (1-8), 2.048	Int	0.01	0.7	N	MSOP-10, SON-10	2.65
ADS1110	16	0.24	1 SE/1 Diff	Serial, I²C	PGA (1-8), 2.048	Int	0.01	0.7	N	SOT23-6	1.95
ADS1100	16	0.128	1 SE/1 Diff	Serial, I²C	PGA (1-8), V_DD	Ext	0.0125	0.3	N	SOT23-6	1.80
ADS1000	12	0.128	1 SE/1 Diff	Serial, I²C	PGA (1-8), V_DD	Ext	0.0125	0.3	Y	SOT23-6	0.65
ADS1281	31	4	1	Serial, I²C	5	Ext	0.00006	12	N	TSSOP-24	28.95
ADS1282	31	4	1	Serial, I²C	PGA (1-64), 5	Ext	0.00006	27	Y	TSSOP-28	36.95

Delta-Sigma (ΔΣ) ADCs for Measuring Low-Level Currents (Photodiodes)

Device	Res. (Bits)	Sample Rate (kSPS)	Number of Input Channels	Interface	Input Full-Scale (C)	V_REF	Linearity (%)	Power (mW)	HiRel Avail.	Package	Price*
DDC264	20	3	64	Serial	12.5-150 pC	Ext	0.05	192	N	BGA-100	99.00
DDC232	20	3	32	Serial	12-350 pC	Ext	0.025	224-320	N	BGA-64	70.00
DDC316	16	100	16	Serial	3 pC-12 pC	Ext	0.025	440	N	BGA-64	48.25
DDC118	20	3	8	Serial	12-350 pC	Ext	0.025	110	N	QFN-48	32.00
DDC114	20	3	4	Serial	12-350 pC	Ext	0.025	55	N	QFN-48	18.00

Wide Bandwidth Delta-Sigma (ΔΣ) ADCs

Device	Res. (Bits)	Sample-Rate (kSPS)	Number of Input Channels	Interface	Signal Bandwidth (kHz)	SNR (dB)	THD (dB)	Power (mW)	HiRel Avail.	Package	Price*
ADS1672	24	625	1 Diff	SPI/LVDS	305	105	−115	350	N	TQFP-64	11.75
ADS1626	18	1250	1 Diff	P18 w/FIFO	615	93	−101	515	N	TQFP-64	15.50
ADS1625	18	1250	1 Diff	P18	615	93	−101	515	N	TQFP-64	14.95
ADS1601	16	1250	1 Diff	Serial	615	92	−103	350	N	TQFP-48	9.95
ADS1602	16	2500	1 Diff	Serial	1230	91	−103	530	N	TQFP-48	12.50
ADS1675	24	4000	1 Diff	Serial/LVDS	1700	107	−107	510	N	TQFP-64	17.95
ADS1606	16	5000	1 Diff	P16 w/FIFO	2450	88	−99	570	N	TQFP-64	15.50
ADS1605	16	5000	1 Diff	P16	2450	88	−99	570	N	TQFP-64	14.95
ADS1610	16	10 MSPS	1 Diff	P16	4900	86	−94	960	N	TQFP-64	19.95

Simultaneously Sampling Delta-Sigma (ΔΣ) ADCs

Device	Res. (Bits)	Sample-Rate (kSPS)	Number of Input Channels	Interface	Signal Bandwidth (kHz)	SNR (dB)	THD (dB)	Power (mW)	HiRel Avail.	Package	Price*
ADS130E08	16	8	8 Diff	SPI	237	89	−108	6.0	N	TQFP-64	3.95
ADS1178	16	52	8 Diff	SPI	25	97	−105	245.0	N	HTQFP-64	8.00
ADS1174	16	52	4 Diff	SPI	25	97	−105	135.0	N	HTQFP-64	6.00
ADS131E08	24	64	8 Diff	SPI	237	107	−93	16.0	N	TQFP-6	5.95
ADS1278	24	144	8 Diff	SPI	70	111	−108	530.0	Y	HTQFP-64	25.15
ADS131E06	24	64	6 Diff	SPI	237	107	−93	12.7	N	TQFP-6	4.95
ADS131E04	24	64	4 Diff	SPI	237	107	−93	9.3	N	TQFP-6	3.95
ADS1274	24	144	4 Diff	SPI	70	111	−108	275.0	N	HTQFP-64	14.65

*Suggested resale price in U.S. dollars in quantities of 1,000. See **www.ti.com/hirel** for HiRel options.   *Preview products are listed in **bold blue**. New products are listed in **bold red**.*

Data Converters

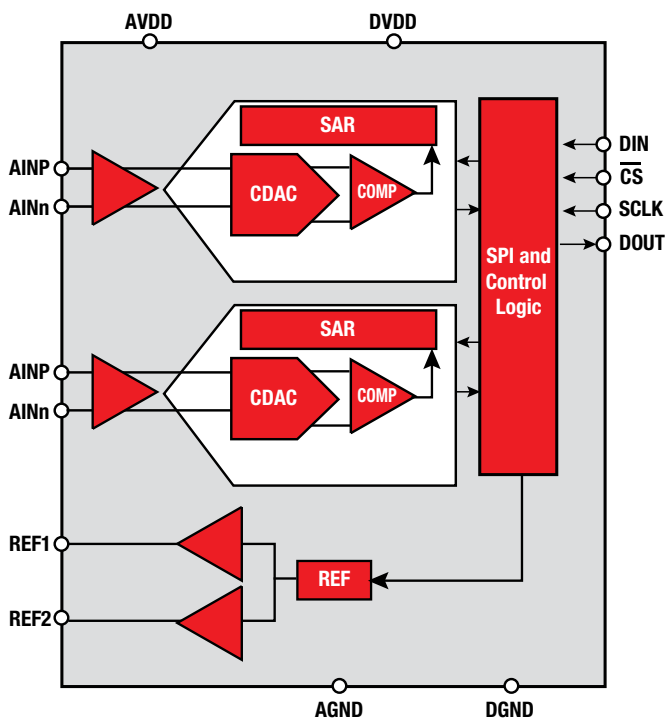## Analog-to-Digital Converters – SAR ADCs

2-Channel, 1 Msps, 12-/14-/16-Bit Simultaneous Sampling ADC with 2 Refs
ADS7253/54, ADS7853/54, ADS8353/54

PREVIEW

The ADS8353 family is the world's smallest 2-channel, simultaneous sampling ADCs. With sampling speeds up to 1 MSPS and great AC performance like 90dB SNR and –98 dB THD at 100 kHz, the devices with internal references do not compromise on ADC specs for size and integration. All versions are compatible from a software and hardware standpoint, allowing a platform of options from 12-bit, 14-bit, and 16-bits. The small size, high-speed, and zero latency make this ideal in applications such as position sensing in servo motors, digitizing optical encoders, EDFA gain control loops, and power monitoring.

Key Features
- 1 MSPS throughput with zero latency
- Integrated reference with independent buffer for each ADC
- Low power: 25 mW with 5 V supply
- Extended temperature range: –40 to 125ºC
- Small size: 9mm^2 QFN-16 and 16-TSSOP

Functional block diagram

Get more information: **www.ti.com/product/Part Number**
(ADS7253, ADS7254, ADS7853, ADS7854, ADS8353, ADS8354)

ADCs by Architecture
Analog-to-Digital Converters – SAR ADCs

Unipolar Input SAR ADCs

Device	Res. (Bits)	Sample-Rate (kSPS)	Power (mW)	No. of Input Channels	Interface	Input Voltage (V)	V_{REF}	Linearity (%)	NMC	SINAD (dB)	HiRel Avail.	Package	Price*
18-Bit SAR ADCs													
ADS8484	18	1,250	220	1 Diff	P8/P16/P18	$\pm V_{REF}$ (4.1 V) at $V_{REF}/2$	Int/Ext	0.0011	18	98	N	7x7 QFN, TQFP-48	23.40
ADS8481	18	1,000	220	1 SE, 1 PDiff	P8/P16/P18	V_{REF} (4.1)	Int/Ext	0.0013	18	92	N	7x7 QFN, TQFP-48	19.80
ADS8881	18	1,000	5.5	1 Diff	Serial, SPI	$\pm V_{REF}$ (5 V)	Ext	0.0011	18	100	N	QFN-10, VSSOP-10	19.95
ADS8883	18	680	4.2	1 Diff	Serial, SPI	$\pm V_{REF}$ (5 V)	Ext	0.0011	18	100	N	QFN-10, VSSOP-10	14.95
ADS8380	18	600	110	1 SE, 1 PDiff	Serial, SPI	V_{REF}	Int/Ext	0.0015	18	90	N	6x6 QFN-28	16.50
ADS8382	18	600	110	1 Diff	Serial, SPI	$\pm V_{REF}$ (4.1 V) at $V_{REF}/2$	Int/Ext	0.0012	18	95	N	6x6 QFN-28	16.95
ADS8381	18	580	115	1 SE, 1 PDiff	P8/P16/P18	V_{REF} (4.1)	Ext	0.0019	18	88	N	TQFP-48	16.65
ADS8383	18	500	110	1 SE, 1 PDiff	P8/P16/P18	V_{REF} (4.1)	Ext	0.0026	18	85	N	TQFP-48	15.75
ADS8885	18	400	2.6	1 Diff	Serial, SPI	$\pm V_{REF}$ (5 V)	Ext	0.0011	18	100	N	QFN-10, VSSOP-10	10.95
ADS8887	18	100	0.7	1 Diff	Serial, SPI	$\pm V_{REF}$ (5 V)	Ext	0.0011	18	100	N	QFN-10, VSSOP-10	7.95
16-Bit SAR ADCs													
ADS8422	16	4,000	160	1 Diff	P8/P16	$\pm V_{REF}$ (4.1 V) at $V_{REF}/2$	Int/Ext	0.0023	16	92.5	N	7x7 QFN, TQFP-48	23.95
ADS8410	16	2,000	290	1 SE, 1 PDiff	Serial, LVDS	V_{REF} (4.1)	Int/Ext	0.0038	16	87.5	N	7x7 QFN-48	23.00
ADS8413	16	2,000	290	1 Diff	Serial, LVDS	$\pm V_{REF}$ (4.1 V) at $V_{REF}/2$	Int/Ext	0.0038	16	92	N	7x7 QFN-48	24.05
ADS8411	16	2,000	175	1 SE, 1 PDiff	P8/P16	V_{REF}	Int	0.0038	16	85	N	TQFP-48	22.00
ADS8412	16	2,000	175	1 Diff	P8/P16	$\pm V_{REF}$ (4.1 V) at $V_{REF}/2$	Int	0.0038	16	88	N	TQFP-48	23.05
ADS8405	16	1,250	155	1 SE, 1 PDiff	P8/P16	V_{REF}	Int/Ext	0.003	16	85	N	TQFP-48	14.10
ADS8406	16	1,250	155	1 Diff	P8/P16	$\pm V_{REF}$ (4.1 V) at $V_{REF}/2$	Int/Ext	0.003	16	90	N	TQFP-48	14.70
ADS8860	16	1,000	5.5	1 SE	Serial, SPI	$\pm V_{REF}$ (5 V)	Ext	0.0031	16	93	N	QFN-10, VSSOP-10	10.00
ADS8861	16	1,000	5.5	1 Diff	Serial, SPI	$\pm V_{REF}$ (5 V)	Ext	0.0015	16	95	N	QFN-10, VSSOP-10	11.00
ADS8472	16	1,000	110	1 Diff	Serial, SPI	$\pm V_{REF}$ (4.2 V) at $V_{REF}/2$	Int/Ext	0.00098	16	94	N	6x6 QFN-28	13.00
ADS8471	16	1,000	110	1 SE, 1 PDiff	Serial, SPI	V_{REF}	Int/Ext	0.0015	16	90	N	6x6 QFN-28	12.50
ADS8363	16	1,000	79	4x2/2x2	Serial, SPI	$\pm V_{REF}$ at $\pm V_{REF}$	Dual Int/Ext	0.009	16	92	N	QFN-32	9.28
ADS8329	16	1,000	20	1 SE, 1 PDiff	Serial, SPI	V_{REF} (4.2 V at 5 V, 2.5 V at 2.7 V Supply)	Ext	0.0026	16	92	N	TSSOP-16	11.25
ADS8330	16	1,000	15.5	2 SE, 2 PDiff	Serial, SPI	V_{REF} (5 V at 5 V, 2.5 V at 2.7 V Supply)	Ext	0.0026	16	92	N	TSSOP-16, 4x4 QFN-16	11.85
ADS8555	16	800	160	1 x 6 Diff	Serial, SPI/ P16/P8	$\pm 2x/\pm 4x\ V_{REF}$ (± 1 V to ± 12 V)	Int/Ext	0.0046	16	90	N	LQFP-64, 9x9 QFN-64	16.00
ADS8556	16	800	160	1 x 6 Diff	Serial, SPI/ P16/P8	$\pm 2x/\pm 4x\ V_{REF}$ (± 1 V to ± 12 V)	Int/Ext	0.0046	16	90	N	LQFP-64, 9x9 QFN-64	16.00
ADS8353/54	16	700	45	2SE/2 Diff	Serial, SPI	$2x\ V_{REF}\ /\ \pm 2x\ V_{REF}$)	Int/Ext	0.0026	16	89 / 92	N	QFN-16, TSSOP-16	9.00/ 9.50
ADS8371	16	750	130	1 SE, 1 PDiff	P8/P16	V_{REF}	Ext	0.0022	16	87.6	N	TQFP-48	12.00
ADS8862	16	680	4.2	1 SE	Serial, SPI	$\pm V_{REF}$ (5 V)	Ext	0.0031	16	93	N	QFN-10, VSSOP-10	8.00
ADS8863	16	680	4.2	1 Diff	Serial, SPI	$\pm V_{REF}$ (5 V)	Ext	0.0015	16	95	N	QFN-10, VSSOP-10	9.00
ADS8370	16	600	110	1 SE, 1 PDiff	Serial, SPI	V_{REF}	Int/Ext	0.0015	16	90	N	6x6 QFN-28	12.50
ADS8372	16	600	110	1 Diff	Serial, SPI	$\pm V_{REF}$ (4.2 V) at $V_{REF}/2$	Int/Ext	0.0011	16	93.5	N	6x6 QFN-28	13.00
ADS8361	16	500	150	2 x 2 Diff	Serial, SPI	± 2.5 V at $+2.5$	Int/Ext	0.00375	14	83	N	SSOP-24	8.75
ADS8322	16	500	85	1 PDiff	P8/P16	5	Int/Ext	0.009	15	83	N	TQFP-32	7.10
ADS8323	16	500	85	1 Diff	P8/P16	± 2.5 V at 2.5	Int/Ext	0.009	15	83	N	TQFP-32	7.10
ADS8318	16	500	18	1 Diff	Serial, SPI	$\pm V_{REF}$ (4.2 V) at $V_{REF}/2$	Ext	0.0015	16	96	N	MSOP-10	9.00

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ADCs by Architecture
Analog-to-Digital Converters – SAR ADCs

Unipolar Input SAR ADCs (continued)

Device	Res. (Bits)	Sample-Rate (kSPS)	Power (mW)	Number of Input Channels	Interface	Input Voltage (V)	V_{REF}	Linearity (%)	NMC	SINAD (dB)	HiRel Avail.	Package	Price*
16-Bit SAR ADCs (continued)													
ADS8319	16	500	18	1 SE, 1 PDiff	Serial, SPI	V_{REF} (4.1)	Ext	0.0023	16	93.8	N	MSOP-10	8.00
ADS8332	16	500	10.6	8 SE, 8 PDiff	Serial, SPI	V_{REF} (2.5)	Int/Ext	0.0031	16	87.5	N	4x4 QFN-24, TSSOP-24	15.00
ADS8331	16	500	10.6	4 SE, 4 PDiff	Serial, SPI	V_{REF} (2.5)	Int/Ext	0.0031	16	87.5	N	4x4 QFN-24, TSSOP-24	13.50
ADS8328	16	500	10.6	2 SE, 2 PDiff	Serial, SPI	V_{REF} (5 V at 5 V, 2.5 V at 2.7 V Supply)	Ext	0.00305	16	88.5	N	TSSOP-16, 4x4 QFN-16	9.30
ADS8327	16	500	10.6	2 SE	Serial, SPI	V_{REF} (4.2 V at 5 V, 2.5 V at 2.7 V Supply)	Ext	0.00305	16	88.5	N	TSSOP-16	9.30
ADS8864	16	400	2.6	1 SE	Serial, SPI	V_{REF} (5 V)	Ext	0.0031	16	93	N	QFN-10, VSSOP-10	6.50
ADS8865	16	400	2.6	1 Diff	Serial, SPI	V_{REF} (5 V)	Ext	0.0015	16	95	N	QFN-10, VSSOP-10	7.50
ADC161S626	16	250	6	1 Diff	Serial, SPI	V_{REF} (5 V)	Ext	0.0038	16	88	N	VSSOP-10	5.00
ADS8364	16	250	413	1 x 6 Diff	P16	±2.5 V at +2.5	Int/Ext	0.009	14	82.5	N	TQFP-64	18.10
ADS8342	16	250	200	8 SE	P8/P16	±2.5	Ext	0.006	16	85	N	TQFP-48	11.30
ADS8365	16	250	190	1 x 6 Diff	P16	±2.5 V at +2.5	Int/Ext	0.006	14	87	N	TQFP-64	16.25
ADS8317	16	250	6	1 Diff	Serial, SPI	$\pm V_{REF}$ at V_{REF}	Ext	0.0022	16	89.5	N	VSSOP-8, QFN-8	5.90
ADS8326	16	250	6	1 SE, 1 PDiff	Serial, SPI	V_{REF}	Ext	0.0022	16	91	N	VSSOP-8, QFN-8	5.90
TLC4541	16	200	17.5	1 SE	Serial, SPI	V_{REF}	Ext	0.0038	16	84.5	N	SOIC-8, VSSOP-8	6.85
TLC4545	16	200	17.5	1 PDiff	Serial, SPI	V_{REF}	Ext	0.0038	16	84.5	N	SOIC-8, VSSOP-8	6.85
ADS8866	16	100	0.7	1 SE	Serial, SPI	V_{REF} (5 V)	Ext	0.0031	16	93	N	QFN-10, VSSOP-10	5.00
ADS8867	16	100	0.7	1 Diff	Serial, SPI	V_{REF} (5 V)	Ext	0.0015	16	95	N	QFN-10, VSSOP-10	5.50
ADS8321	16	100	5.5	1 Diff	Serial, SPI	$\pm V_{REF}$ at $+V_{REF}$	Ext	0.012	15	84	N	VSSOP-8	5.15
ADS8344	16	100	3.6	8 SE/4 Diff	Serial, SPI	V_{REF}	Ext	0.006	15	86	N	SSOP-20	8.00
ADS8345	16	100	3.6	8 SE/4 Diff	Serial, SPI	$\pm V_{REF}$ at V_{REF}	Ext	0.006	15	85	N	SSOP-20	8.00
ADS8341	16	100	3.6	4 SE/2 Diff	Serial, SPI	V_{REF}	Ext	0.006	15	86	N	SSOP-16	7.40
ADS8343	16	100	3.6	4 SE/2 Diff	Serial, SPI	$\pm V_{REF}$ at V_{REF}	Ext	0.006	15	86	N	SSOP-16	7.45
ADS8325	16	100	2.25	1 SE, 1 PDiff	Serial, SPI	V_{REF}	Ext	0.006	16	91	N	VSSOP-8, QFN-8	5.90
ADS8320	16	100	1.95	1 SE, 1 PDiff	Serial, SPI	V_{REF}	Ext	0.012	15	84	N	VSSOP-8	5.15
14-Bit SAR ADCs													
ADS7891	14	3,000	85	1 SE	P8/P14	2.5	Int	0.009	14	78	N	TQFP-48	10.50
ADS7946	14	2,500	10	2 Pdiff	Serial, SPI	V_{REF}	Ext	0.009	14	78.8		3x3 QFN-16	2.05
ADS7945	14	2,500	10	2 Diff	Serial, SPI	V_{REF}	Ext	0.009	14	83.5		3x3 QFN-16	2.15
ADS7890	14	1,250	45	1 SE	Serial, SPI	2.5	Int	0.009	14	77	N	TQFP-48	10.50
ADS7853/54	14	1,000	45	2SE/2 Diff	Serial, SPI	2x V_{REF} / ±2x V_{REF}	Int/Ext	0.006	14	88/ 82	N	QFN-16, TSSOP-16	6.00/ 6.50
ADS7263	14	1,000	79	4x2/2x2	Serial, SPI	$\pm V_{REF}$ at $+V_{REF}$	Dual Int/ Ext	0.012	14	83	N	QFN-32	6.95
ADS7279	14	1,000	15.5	1 SE	Serial, SPI	V_{REF} (4.2 V at 5 V, 2.5 V at 2.7 V Supply)	Ext	0.0061	14	85.7	N	TSSOP-16	4.50
ADS7280	14	1,000	13.7	2 SE	Serial, SPI	V_{REF} (5 V at 5 V, 2.5 V at 2.7 V Supply)	Ext	0.0061	14	85.7	N	TSSOP-16	4.50
ADS8557	14	800	160	1 x 6 Diff	Serial, SPI	$\pm 2x/\pm 4x V_{REF}$ (±1 V to ±12 V)	Int/Ext	0.0061	14	82	N	LQFP-64, 9x9 QFN-64	12.00
ADC141S626	14	250	5	1 Diff	Serial, SPI	$\pm V_{REF}$ at $+V_{REF}$	Ext	0.006	14	82	N	VSSOP-10	2.75

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ADCs by Architecture
Analog-to-Digital Converters – SAR ADCs

Unipolar Input SAR ADCs (continued)

Device	Res. (Bits)	Sample-Rate (kSPS)	Power (mW)	Number of Input Channels	Interface	Input Voltage (V)	V_{REF}	Linearity (%)	NMC	SINAD (dB)	HiRel Avail.	Package	Price*
14-Bit SAR ADCs (continued)													
TLC3548	14	200	20	8 SE	Serial, SPI	4	Int/Ext	0.006	14	81	N	SOIC-24, TSSOP-24	6.40
TLC3544	14	200	20	4 SE	Serial, SPI	4	Int/Ext	0.006	14	81	N	SOIC-20, TSSOP-20	6.00
TLC3541	14	200	17.5	1 SE	Serial, SPI	V_{REF}	Ext	0.006	14	81.5	N	SOIC-8, VSSOP-8	5.00
TLC3545	14	200	17.5	1 PDiff	Serial, SPI	V_{REF}	Ext	0.006	14	81.5	N	SOIC-8, VSSOP-8	5.00
ADS8324	14	50	2.5	1 Diff	Serial, SPI	$\pm V_{REF}$ at $+V_{REF}$	Ext	0.012	14	78	N	VSSOP-8	4.15
ADS7871	14	40	6	8 SE/4 Diff	Serial, SPI	PGA (1, 2, 4, 8, 10, 16, 20)	Int	0.03	13	—	N	SSOP-28	5.00
12-Bit SAR ADCs													
ADS7881	12	4,000	95	1 SE	P8/P12	2.5	Int	0.024	12	71.5	N	7x7 QFN, TQFP-48	7.35
ADS7882	12	3,000	85	1 SE	P8/P12	V_{REF}	Int/Ext	0.122	10	68.5	N	TQFP-48	2.50
ADS7883	12	3,000	15	1 SE	Serial, SPI	V_{DD} (2.7 V to 5.5 V)	Ext (V_{DD})	0.03	12	72	N	SOT23-6	2.50
ADS7863	12	2,000	13.5	2 x 2 Diff	Serial, SPI	± 2.5 at 2.5	Int/Ext	0.003	12	71	N	SSOP-24, 4x4 QFN-24	4.90
ADS7865	12	2,000	13.5	2 x 2 Diff	P12	± 2.5 at 2.5	Int/Ext	0.003	12	71.3	N	TQFP-32	4.90
ADS7947	12	2,000	7	2 PDiff	Serial, SPI	V_{REF}	Ext	0.0073	12	—	N	3x3 QFN-16	1.95
ADS7253/54	12	1,000	45	2SE/2 Diff	Serial, SPI	2x V_{REF} / ± 2x V_{REF}	Int/Ext	0.024	12	72 / 72	N	QFN-16, TSSOP-16	3.50/ 4.00
ADS8028	12	1,000	17	8 SE	Serial, SPI	V_{REF}	Int/Ext	0.024	12	71	N	QFN-20	3.25
ADC128S102	12	1,000	2	8 SE	Serial, SPI	V_{REF} (5.25 V)	Ext	0.007	12	73	N	TSSOP-16	2.74
ADC12xS101	12	1,000	4	4,2,1 SE	Serial,SPI	V_{REF} (5.25 V)	Ext	0.007	12	72.4	N	VSSOP-10, 8 SOT23-6, WSON-6	2.19
ADS7869	12	1,000	175	12 Diff	Serial, SPI/ P12	± 2.5 at $+2.5$	Int/Ext	0.048	11	—	N	TQFP-100	14.60
ADS7223	12	1,000	79	4 x 2/2 x 2	Serial, SPI	$\pm V_{REF}$ at $+V_{REF}$	Dual Int/Ext	0.048	12	70	N	QFN-32	4.90
ADS7229	12	1,000	15.5	1 SE	Serial/SPI	V_{REF} (4.2 V at 5 V, 2.5 V at 2.7 V Supply)	Ext	0.0122	12	73.7	N	TSSOP-16	2.30
ADS7230	12	1,000	13.7	2 SE	Serial/SPI	V_{REF} (5 V at 5 V, 2.5 V at 2.7 V Supply)	Ext	0.0122	12	73.7	N	TSSOP-16	2.50
ADS7953	12	1,000	12.5	16 SE	Serial, SPI	V_{REF} (2.5 V)	Ext	0.024	12	71.3	N	TSSOP-38	4.90
ADS7952	12	1,000	12.5	12 SE	Serial, SPI	V_{REF} (2.5 V)	Ext	0.024	12	71.3	N	TSSOP-38	4.10
ADS7951	12	1,000	12.5	8 SE	Serial, SPI	V_{REF} (2.5 V)	Ext	0.024	12	71.3	N	TSSOP-30	3.30
ADS7950	12	1,000	12.5	4 SE	Serial, SPI	V_{REF} (2.5 V)	Ext	0.024	12	71.3	N	TSSOP-30	2.50
ADS7886	12	1,000	7.5	1 SE	Serial, SPI	V_{DD} (2.35 V to 5.25 V)	Ext (V_{DD})	0.03	12	71.2	N	SOT23-6, SC70	1.70
ADS8558	12	800	160	1 x 6 Diff	Serial, SPI/ P12/P8	± 2x/± 4x V_{REF} (± 1 V to ± 12 V)	Int/Ext	0.0121	12	72	N	LQFP-64, 9x9 QFN-64	10.00
ADC128S052	12	500	1.6	8 SE	Serial, SPI	V_{REF} (5.25 V)	Ext	0.024	12	73	N	TSSOP-16	2.54
ADC12xS051	12	500	3.0	4, 2, 1 SE	Serial, SPI	V_{REF} (5.25 V)	Ext	0.007	12	72	N	VSSOP-10, 8 SOT23-6, WSON-6	1.94
ADS7864	12	500	52.5	3 x 2 Diff	P12	± 2.5 at $+2.5$	Int/Ext	0.024	12	71	N	TQFP-48	6.65
ADS7861	12	500	25	2 x 2 Diff	Serial, SPI	± 2.5 at $+2.5$	Int/Ext	0.024	12	70	N	SSOP-24, QFN-32	4.05
ADS7862	12	500	25	2 x 2 Diff	P12	± 2.5 at $+2.5$	Int/Ext	0.024	12	71	N	TQFP-32	5.70
ADS7852	12	500	13	8 SE	P12	5	Int/Ext	0.024	12	72	N	TQFP-32	3.40
ADS7818	12	500	11	1 PDiff	Serial, SPI	5	Int	0.024	12	70	N	PDIP-8, VSSOP-8	2.50
ADS7834	12	500	11	1 PDiff	Serial, SPI	2.5	Int	0.024	12	70	N	VSSOP-8	2.45
TLC2552	12	400	15	2 SE	Serial, SPI	V_{REF}	Ext	0.024	12	72	N	SOIC-8, VSSOP-8	3.95

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ADCs by Architecture
Analog-to-Digital Converters – SAR ADCs

Unipolar Input SAR ADCs (continued)

Device	Res. (Bits)	Sample-Rate (kSPS)	Power (mW)	Number of Input Channels	Interface	Input Voltage (V)	V_{REF}	Linearity (%)	NMC	SINAD (dB)	HiRel Avail.	Package	Price*
12-Bit SAR ADCs (continued)													
TLC2551	12	400	15	1 SE	Serial, SPI	V_{REF}	Ext	0.024	12	72	N	SOIC-8, VSSOP-8	3.95
TLC2555	12	400	15	1 Diff	Serial, SPI	V_{REF}	Int	0.024	12	72	N	SOIC-8, MSOP-8	3.95
TLC2558	12	400	9.5	8 SE	Serial, SPI	4	Int/Ext	0.024	12	71	N	SOIC-20, TSSOP-20	5.30
TLC2554	12	400	9.5	4 SE	Serial, SPI	4	Int/Ext	0.024	12	71	N	SOIC-16, TSSOP-16	5.30
ADC128S022	12	200	1	8 SE	Serial, SPI	V_{REF} (2.5 V)	Ext	0.007	12	73	N	TSSOP-16	2.25
ADC12xS021	12	200	2	4, 2, 1 SE	Serial, SPI	V_{REF} (2.5 V)	Ext	0.007	12	72	N	VSSOP-10, 8 SOT23-6, WSON-6	1.80
AMC7823	12	200	100	8 SE I/O DAS	Serial, SPI	V_{REF} (5.0)	Int/Ext	0.024	12	74	N	QFN-40	9.75
TLV2548	12	200	3.3	8 SE	Serial, SPI	+2, 4	Int/Ext	0.024	12	70	Y	SOIC-20, TSSOP-20	4.85
TLV2544	12	200	3.3	4 SE	Serial, SPI	+2, 4	Int/Ext	0.024	12	70	Y	SOIC-16, TSSOP-16	4.20
TLV2542	12	200	2.8	2 SE	Serial, SPI	V_{REF}	Ext	0.024	12	72	N	SOIC-8, VSSOP-8	3.85
TLV2541	12	200	2.8	1 SE	Serial, SPI	V_{REF}	Ext	0.024	12	72	N	SOIC-8, VSSOP-8	3.85
TLV2545	12	200	2.8	1 PDiff	Serial, SPI	+5.5 ($V_{REF} = V_{DD}$)	Ext	0.024	12	72	N	SOIC-8, VSSOP-8	3.85
TLV2553	12	200	2.43	11 SE	Serial, SPI	V_{REF}	Ext	0.024	12	—	Y	SOIC-20, TSSOP-20	3.40
TLV2556	12	200	2.43	11 SE	Serial, SPI	V_{REF}	Int/Ext	0.024	12	—	Y	SOIC-20, TSSOP-20	3.55
ADS7817	12	200	2.3	1 Diff	Serial, SPI	$\pm V_{REF}$ at $+V_{REF}$	Ext	0.024	12	71	N	SOIC-8, VSSOP-8	1.95
ADS7816	12	200	1.9	1 PDiff	Serial, SPI	V_{REF}	Ext	0.024	12	72	N	PDIP, SOIC, VSSOP-8	1.95
ADS7844	12	200	0.84	8 SE/4 Diff	Serial, SPI	V_{REF}, $\pm V_{REF}$ at V_{REF}	Ext	0.024	12	72	N	SSOP-20	2.90
ADS7841	12	200	0.84	4 SE/2 Diff	Serial, SPI	V_{REF}, $\pm V_{REF}$ at V_{REF}	Ext	0.024	12	72	Y	SSOP-16	2.50
ADS7842	12	200	0.84	4 SE	P12	V_{REF}	Ext	0.024	12	72	N	SSOP-28	3.10
ADS7822	12	200	0.6	1 PDiff	Serial, SPI	V_{REF}	Ext	0.018	12	71	Y	PDIP, SOIC, VSSOP-8	1.55
ADS7866	12	200	0.25	1 SE, 1 PDiff	Serial, SPI	V_{DD} (1.2 V to 3.6 V)	Ext	0.024	12	70	N	SOT23-6	1.85
ADC121C021	12	189	0.3	1 SE	Serial, I2C	V_{REF}	Ext	0.024	12	70	N	SOT-6, VSSOP-8	1.16
ADC121C027	12	189	0.3	1 SE	Serial, I2C	V_{REF}	Ext	0.024	12	70	N	SOT-6	1.16
ADS7829	12	125	0.6	1 PDiff	Serial, SPI	V_{REF}	Ext	0.018	12	71	N	QFN-8	1.50
AMC7820	12	100	40	8 SE DAS	Serial, SPI	V_{REF} (5.0)	Int/Ext	0.024	12	72 (typ)	N	TQFP-48	3.75
ADS7924	12	100	0.5	4 SE	Serial, I2C	V_{REF}	Ext	0.122	12	—	N	3x3 QFN-16	1.25
TLC2543	12	66	5	11 SE	Serial, SPI	V_{REF}	Ext	0.024	12	—	Y	CDIP, PDIP, PLCC, SOIC, SSOP-20	4.45
TLV2543	12	66	3.3	11 SE	Serial, SPI	V_{REF}	Ext	0.024	12	—	N	PDIP-20, SOIC-20, SSOP-20	4.45
ADS7870	12	50	4.6	8 SE	Serial, SPI	PGA (1, 2, 4, 8, 10, 16, 20)	Int	0.06	12	72	N	SSOP-28	4.15
ADS7823	12	50	0.75	1 SE	Serial, I2C	V_{REF}	Ext	0.024	12	71	N	VSSOP-8	2.85
ADS7828	12	50	0.675	8 SE/4 Diff	Serial, I2C	V_{REF}	Int/Ext	0.024	12	71	Y	TSSOP-16	3.35
ADS1286	12	37	1	1 PDiff	Serial, SPI	V_{REF}	Ext	0.024	12	72	N	PDIP-8, SOIC-8	2.80
10-Bit SAR ADCs													
ADS7884	10	3,000	15	1 SE	Serial, SPI	V_{DD} (2.7 V to 5.5 V)	Ext (V_{DD})	0.781	10	61.7	N	SOT23-6	1.60
ADS7948	10	2,000	7	2 PDiff	Serial, SPI	V_{REF}	Ext	0.0146	12	—	N	3x3 QFN-16	1.70
TLV1578	10	1,250	12	8 SE	P/0	V_{REF}	Ext	0.1	10	60	N	TSSOP-32	3.85
TLV1571	10	1,250	12	1 SE	P/0	V_{REF}	Ext	0.1	10	60	N	SOIC-24, TSSOP-24	3.70
TLV1570	10	1,250	9	8 SE	Serial, SPI	2V, V_{REF}	Int/Ext	0.1	10	60	N	SOIC-20, TSSOP-20	3.80
TLV1572	10	1,250	8.1	1 SE	Serial, SPI	V_{REF}	Ext	0.1	10	60	N	SOIC-8	3.30
ADS7887	10	1,250	8	1 SE	Serial, SPI	V_{DD} (2.35 V to 5.25 V)	Ext (V_{DD})	0.073	10	61	N	SOT23-6, SC70	1.50
ADS7957	10	1,000	12.5	16 SE	Serial, SPI	V_{REF} (2.5 V)	Ext	0.078	10	60	N	TSSOP-38	3.90
ADS7956	10	1,000	12.5	12 SE	Serial, SPI	V_{REF} (2.5 V)	Ext	0.078	10	60	N	TSSOP-38	3.30

*Suggested resale price in U.S. dollars in quantities of 1,000. See **www.ti.com/hirel** for HiRel options.

ADCs by Architecture
Analog-to-Digital Converters – SAR ADCs

Unipolar Input SAR ADCs (continued)

Device	Res. (Bits)	Sample-Rate (kSPS)	Power (mW)	Number of Input Channels	Interface	Input Voltage (V)	V_{REF}	Linearity (%)	NMC	SINAD (dB)	HiRel Avail.	Package	Price*
10-Bit SAR ADCs (continued)													
ADS7955	10	1,000	12.5	8 SE	Serial, SPI	V_{REF} (2.5 V)	Ext	0.078	10	60	N	TSSOP-30	2.70
ADC108S102	10	1,000	2.1	8 SE	Serial, SPI	V_{REF} (5.25 V)	Ext	0.019	10	61.8	N	TSSOP-16	2.69
ADS7954	10	1,000	12.5	4 SE	Serial, SPI	V_{REF} (2.5 V)	Ext	0.078	10	61.6	N	TSSOP-30	2.10
ADC10xS101	10	1,000	3.9	4, 2, 1 SE	Serial, SPI	V_{REF} (5.25 V)	Ext	0.039	10	61.8	N	Mini SOIC-10;8, SOT23-6, LLP-6	2.00
ADC108S052	10	500	1.5	8 SE	Serial, SPI	V_{REF} (5.25 V)	Ext	0.014	10	61.5	N	TSSOP-16	2.10
ADC10xS051	10	500	2.7	4, 2, 1 SE	Serial, SPI	V_{REF} (5.25 V)	Ext	0.019	10	60	N	Mini SOIC-10;8, SOT23-6, LLP-6	1.85
TLC1518	10	400	10	8 SE/7 Diff	Serial, SPI	+5.5 ($V_{REF} = V_{DD}$)	Int/Ext	0.012	10	60	N	SOIC-20, TSSOP-20	3.45
TLC1514	10	400	10	4 SE/3 Diff	Serial, SPI	+5.5 ($V_{REF} = V_{DD}$)	Int/Ext	0.012	10	60	N	SOIC-16, TSSOP-16	2.90
ADC108S022	10	200	2.0	8 SE	Serial, SPI	V_{REF} (5.25 V)	Ext	0.05	10	61.8	N	TSSOP-16	2.25
ADC10xS021	10	200	2.0	4, 2, 1 SE	Serial, SPI	V_{REF} (5.25 V)	Ext	0.05	10	61.5	N	VSSOP-10, 8 SOT23-6, WSON-6	1.80
TLV1508	10	200	3.3	8 SE	Serial, SPI	+2, 4	Int/Ext	0.05	10	60	N	SOIC-20, TSSOP-20	3.15
TLV1504	10	200	3.3	4 SE	Serial, SPI	+2, 4	Int/Ext	0.05	10	60	N	SOIC-16, TSSOP-16	2.65
ADS7826	10	200	0.6	1 PDiff	Serial, SPI	V_{REF}	Ext	0.0048	10	62	N	QFN-8	1.25
ADS7867	10	200	0.25	1SE, 1 PDiff	Serial, SPI	V_{DD} (1.2 V to 3.6 V)	Ext	0.05	10	61	N	SOT23-6	1.40
TLC1550	10	164	10	1 SE	P10	V_{REF}	Ext	0.05	10	—	Y	PLCC-28, SOIC-24	3.90
TLC1551	10	164	10	1 SE	P10	V_{REF}	Ext	0.1	10	—	N	PLCC-28, SOIC-24	3.35
ADC101C021	10	125	0.3	1 SE	Serial I²C	V_{REF}	Ext	0.049	10	62	N	SOT-6, VSSOP-8	1.00
ADC101C027	10	125	0.3	1 SE	Serial I²C	V_{REF}	Ext	0.049	10	62	N	SOT-6	1.00
TLV1548	10	85	1.05	8 SE	Serial, SPI	V_{REF}	Ext	0.1	10	—	Y	CDIP, LCCC, SSOP-20	2.30
TLV1544	10	85	1.05	4 SE	Serial, SPI	V_{REF}	Ext	0.1	10	—	N	SOIC-16, TSSOP-16	1.95
TLC1542	10	38	4	11 SE	Serial, SPI	V_{REF}	Ext	0.05	10	—	Y	CDIP, LCCC, PDIP, PLCC, SOIC-20	2.50
TLC1543	10	38	4	11 SE	Serial, SPI	V_{REF}	Ext	0.1	10	—	Y	PLCC/SOIC/SSOP-20	1.90
TLC1549	10	38	4	1 SE	Serial, SPI	V_{REF}	Ext	0.1	10	—	N	PDIP-8, SOIC-8	1.71
TLV1543	10	38	2.64	11 SE	Serial, SPI	V_{REF}	Ext	0.1	10	—	N	CDIP, LCCC, PDIP, PLCC, SOIC, SSOP-20	2.15
TLC1541	10	32	6	11 SE	Serial, SPI	V_{REF}	Ext	0.1	10	—	N	PDIP, PLCC, SOIC-20	3.20
8-Bit SAR ADCs													
ADS7885	8	3,000	15	1 SE	Serial, SPI	V_{DD} (2.7 V to 5.5 V)	Ext (V_{DD})	0.156	8	49.8	N	SOT23-6	0.95
ADS7949	8	2,000	7	2 PDiff	Serial, SPI	V_{REF}	Ext	0.0234	12	—	N	3x3 QFN-16	0.99
TLV571	8	1,250	12	1 SE	P8	V_{REF}	Ext	0.5	8	49	N	SOIC-24, TSSOP-24	2.35
ADS7888	8	1,250	8	1 SE	Serial, SPI	V_{DD} (2.35 V to 5.25 V)	Ext (V_{DD})	0.2	8	49.5	N	SOT23-6, SC70	0.85
ADS7961	8	1,000	12.5	16 SE	Serial, SPI	V_{REF} (2.5 V)	Ext	0.112	8	49	N	TSSOP-38	2.45
ADS7960	8	1,000	12.5	12 SE	Serial, SPI	V_{REF} (2.5 V)	Ext	0.112	8	49	N	TSSOP-38	2.05
ADC088S102	8	1,000	1.8	8 SE	Serial, SPI	V_{REF} (5.25 V)	Ext	0.078	8	49.6	N	TSSOP-16	1.50
ADS7959	8	1,000	12.5	8 SE	Serial, SPI	V_{REF} (2.5 V)	Ext	0.112	8	49	N	TSSOP-30	1.65
ADS7958	8	1,000	12.5	4 SE	Serial, SPI	V_{REF} (2.5 V)	Ext	0.112	8	49	N	TSSOP-30	1.25
ADC08xS101	8	1,000	3.2	4, 2, 1 SE	Serial, SPI	V_{REF} (5.25 V)	Ext	0.16	8	49.6	N	Mini SOIC-10;8, SOT23-6, LLP-6	1.25
ADC088S052	8	500	1.2	8 SE	Serial, SPI	V_{REF} (5.25 V)	Ext	0.078	8	49.6	N	TSSOP-16	1.30
ADC08xS051	8	500	2.2	4, 2, 1 SE	Serial, SPI	V_{REF} (5.25 V)	Ext	0.16	8	49.5	N	Mini SOIC-10;8, SOT23-6, LLP-6	1.14
TLC0820A	8	392	37.5	1 SE	P8	V_{REF}	Ext	0.2	8	—	N	PLCC, SOIC, SSOP-20	1.90
ADS7827	8	250	0.6	1 PDiff	Serial, SPI	V_{REF}	Ext	0.2	8	48	N	QFN-8	1.00

*Suggested resale price in U.S. dollars in quantities of 1,000. See **www.ti.com/hirel** for HiRel options.*

ADCs by Architecture
Analog-to-Digital Converters – SAR ADCs

Unipolar Input SAR ADCs (continued)

Device	Res. (Bits)	Sample-Rate (kSPS)	Power (mW)	Number of Input Channels	Interface	Input Voltage (V)	V$_{REF}$	Linearity (%)	NMC	SINAD (dB)	HiRel Avail.	Package	Price*
8-Bit SAR ADCs (continued)													
ADC088S022	8	200	0.9	8 SE	Serial, SPI	V$_{REF}$ (5.25 V)	Ext	0.078	8	49.5	N	TSSOP-16	1.20
ADC08xS021	8	200	1.6	4, 2, 1 SE	Serial, SPI	V$_{REF}$ (5.25 V)	Ext	0.078	8	49.6	N	VSSOP-10, 8 SOT23-6, WSON-6	1.00
ADS7868	8	200	0.25	1 SE, 1 PDiff	Serial, SPI	V$_{DD}$ (1.2 V to 3.6 V)	Ext	0.1	8	50	N	SOT23-6	0.80
ADC081C021	10	189	0.3	1 SE	Serial, I^{2}C	V$_{REF}$	Ext	0.078	8	50	N	SOT-6, VSSOP-8	0.57
ADC081C027	10	189	0.3	1 SE	Serial, I^{2}C	V$_{REF}$	Ext	0.078	8	50	N	SOT-6	0.57
TLC545	8	76	6	19 SE	Serial, SPI	V$_{REF}$	Ext	0.2	8	—	N	PDIP-28, PLCC-28	3.10
ADS7830	8	75	0.675	8 SE/4 Diff	Serial, I^{2}C	V$_{REF}$	Int/Ext	0.19	8	50	N	TSSOP-16	1.40
TLV0831	8	49	0.66	1 SE	Serial, SPI	+3.6 (V$_{REF}$ = V$_{DD}$)	Ext	0.2	8	—	N	PDIP-8, SOIC-8	1.40
TLC548	8	45.5	9	1 SE	Serial, SPI	V$_{REF}$	Ext	0.2	8	—	N	PDIP-8, SOIC-8	1.20
TLV0832	8	44.7	5	2 SE/1 Diff	Serial, SPI	V$_{REF}$	Ext	0.2	8	—	N	PDIP-8, SOIC-8	1.40
TLV0834	8	41	0.66	4 SE/2 Diff	Serial, SPI	V$_{REF}$	Ext	0.2	8	—	N	PDIP, SOIC, TSSOP-14	1.45
TLC549	8	40	9	1 SE	Serial, SPI	V$_{REF}$	Ext	0.2	8	—	Y	PDIP-8, SOIC-8	0.95
TLC541	8	40	6	11 SE	Serial, SPI	V$_{REF}$	Ext	0.2	8	—	Y	PDIP, PLCC, SOIC-20	1.50
TLV0838	8	37.9	0.66	8 S/4 Diff	Serial, SPI	V$_{REF}$	Ext	0.2	8	—	N	PDIP, SOIC, TSSOP-20	1.45
TLC0831	8	31	3	1 Diff	Serial, SPI	V$_{REF}$	Ext	0.2	8	—	N	PDIP-8, SOIC-8	1.40
TLC542	8	25	6	11 SE	Serial, SPI	V$_{REF}$	Ext	0.2	8	—	N	PDIP, PLCC, SOIC-20	1.50
TLC0832	8	22	12.5	2 SE/1 Diff	Serial, SPI	V$_{REF}$	Ext	0.2	8	—	N	PDIP-8, SOIC-8	1.40
TLC0838	8	20	3	8 SE/4 Diff	Serial, SPI	V$_{REF}$	Ext	0.2	8	—	N	PDIP, SOIC, TSSOP-20	1.45
TLC0834	8	20	3	4 SE/2 Diff	Serial, SPI	V$_{REF}$	Ext	0.2	8	—	N	PDIP-14, SOIC-14	1.45

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Preview products are listed in **bold blue.**

SAR ADC Data Acquisition Systems

Device	Res. (Bits)	Sample-Rate (kSPS)	Power (mW)	Number of Input Channels	Interface	Input Voltage (V)	V$_{REF}$	Linearity (%)	NMC	SINAD (dB)	HiRel Avail.	Package	Price*
SAR ADC Data Acquisition Systems													
ADS7871	14	40	6	8 SE/4 Diff	Serial, SPI	PGA (1, 2, 4, 8, 10, 16, 20)	Int	0.03	13	—	N	SSOP-28	5.00
ADS8201	12	100	1.32	8 SE/4 Diff	Serial, SPI	PGA (1, 2, 4, 8)	Ext	0.012	12	—	N	4x4 VQFN	2.75
ADS7870	12	50	4.6	8 SE	Serial, SPI	PGA (1, 2, 4, 8, 10, 16, 20)	Int	0.06	12	72	N	SSOP-28	4.15

*Suggested resale price in U.S. dollars in quantities of 1,000. See www.ti.com/hirel for HiRel options.

Bipolar Input SAR ADCs

Device	Res. (Bits)	Sample-Rate (kSPS)	Number of Input Channels	Interface	Input Voltage (V)	V$_{REF}$	Linearity (%)	NMC	SINAD (dB)	Power (mW)	HiRel Avail.	Package	Price*
16-Bit Bipolar SAR ADCs													
ADS8555	16	630	8 SE	Serial, SPI/P16	±5, ±6, ±10, ±12	Int/Ext	0.0045	16	89.5	252	N	QFN-64	12.95
ADS8556	16	630	8 SE	Serial, SPI/P16	±5, ±6, ±10, ±12	Int/Ext	0.0045	16	89.5	252	N	QFN-64	12.95
ADS8568	16	600	8 SE	Serial, SPI/P16	±5, ±6, ±10, ±12	Int/Ext	0.0045	16	86.5	335	N	QFN-64	15.90
ADS7815	16	250	1 SE	P16	±2.5	Int/Ext	0.006	15	84	200	N	SOIC-28	21.30
ADS8515	16	250	1 SE	P16	±10	Int/Ext	0.0022	16	92	100	N	SSOP-28	10.95
ADS8519	16	250	1 SE	Serial, SPI	+4, 10, ±3.3, 5, 10	Int/Ext	0.0022	16	91	100	N	SSOP-28	12.95

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ADCs by Architecture
Analog-to-Digital Converters – SAR ADCs

Bipolar Input SAR ADCs (continued)

Device	Res. (Bits)	Sample-Rate (kSPS)	Number of Input Channels	Interface	Input Voltage (V)	V_{REF}	Linearity (%)	NMC	SINAD (dB)	Power (mW)	HiRel Avail.	Package	Price*
16-Bit Bipolar SAR ADCs (continued)													
ADS8509	16	250	1 SE	Serial, SPI	+4, 10, ±3.3, 5, 10	Int/Ext	0.003	16	86	70	N	SOIC-20, SSOP-28	12.95
ADS8505	16	250	1 SE	P8/P16	±10	Int/Ext	0.0022	16	86	70	N	SOIC-28, SSOP-28	12.95
ADS8517	16	200	1 SE	Serial, SPI/P8	4, 5, ±10	Int/Ext	0.0022	16	89	38	N	SO-28, SSOP-28	13.00
ADS7805	16	100	1 SE	P8/P16	±10	Int/Ext	0.0045	16	86	81.5	N	PDIP-28, SOIC-28	21.80
ADS7809	16	100	1 SE	Serial, SPI	+4, 10, ±3.3, 5, 10	Int/Ext	0.0045	16	88	81.5	N	SOIC-20	25.00
ADS7825	16	40	4 SE	Serial, SPI/P8	±10	Int/Ext	0.003	16	83	50	N	PDIP-28, SOIC-28	29.55
ADS7813	16	40	1 SE	Serial, SPI	+4, 10, ±3.3, 5, 10	Int/Ext	0.003	16	89	35	N	PDIP-16, SOIC-16	24.70
ADS8513	16	40	1 SE	Serial, SPI	+4, 10, ±3.3, 5, 10	Int/Ext	0.0023	16	89.9	30	N	SOIC-16	12.00
ADS7807	16	40	1 SE	Serial, SPI/P8	4, 5, ±10	Int/Ext	0.0022	16	88	28	N	PDIP-28, SOIC-28	32.30
ADS8507	16	40	1 SE	Serial, SPI/P8	4, 5, ±10	Int/Ext	0.0022	16	88	24	N	SOIC-28	13.00
14-Bit Bipolar SAR ADCs													
ADS8557	14	670	8 SE	Serial, SPI/P16	±5, ±6, ±10, ±12	Int/Ext	0.006	14	84	253	N	QFN-64	10.95
ADS8548	14	640	8 SE	Serial, SPI/P16	±5, ±6, ±10, ±12	Int/Ext	0.006	14	83	340	N	QFN-64	12.50
TLC3578	14	200	8 SE	Serial, SPI	±10	Ext	0.006	14	79	29	N	SOIC-24, TSSOP-24	8.65
TLC3574	14	200	4 SE	Serial, SPI	±10	Ext	0.006	14	79	29	N	SOIC-24, TSSOP-24	6.85
12-Bit Bipolar SAR ADCs													
ADS8634	12	1,000	4 Pdiff	Serial, SPI	+5, 10, ±5, ±10, ±12	Int/Ext	0.021	12	71.8	22.5	N	4x4 QFN-24	2.70
ADS8638	12	1,000	8 Pdiff	Serial, SPI	+5, 10, ±2.5, ±5, ±10	Int/Ext	0.021	12	71.8	22.5	N	4x4 QFN-24	3.70
ADS8558	12	730	8 SE	Serial, SPI/P16	±5, ±6, ±10, ±12	Int/Ext	0.020	12	73.8	262	N	QFP-64	8.95
ADS8528	12	690	8 SE	Serial, SPI/P16	±5, ±6, ±10, ±12	Int/Ext	0.024	12	73	350	N	QFN-64	9.50
ADS7835	12	500	1 SE	Serial, SPI	±2.5	Int	0.024	12	72	17.5	N	VSSOP-8	2.75
ADS7800	12	333	1 SE	P8/P12	±5, 10	Int	0.012	12	72	135	N	CDIP SB-24	30.50
ADS8508	12	250	1 SE	Serial, SPI	+4, 10, ±3.3, 5, 10	Int/Ext	0.011	12	73	70	N	SSOP-28, SOIC-20	10.50
ADS8504	12	250	1 SE	P8/P16	±10	Int/Ext	0.011	12	72	70	N	SSOP-28, SOIC-28	10.50
TLC2578	12	200	8 SE	Serial, SPI	±10	Ext	0.024	12	79	29	N	SOIC-24, TSSOP-24	5.80
TLC2574	12	200	4 SE	Serial, SPI	±10	Ext	0.024	12	79	29	N	SOIC-20, TSSOP-20	5.30
ADS774	12	125	1 SE	P12	10, 20, ±5, ±10	Int	0.024	12	68	120	N	PDIP-28, SOIC-28	18.25

Suggested resale price in U.S. dollars in quantities of 1,000. See www.ti.com/hirel for HiRel options.

Texas Instruments

ADCs by Architecture

Analog-to-Digital Converters – SAR ADCs

Bipolar Input SAR ADCs (continued)

Device	Res. (Bits)	Sample-Rate (kSPS)	Number of Input Channels	Interface	Input Voltage (V)	V_{REF}	Linearity (%)	NMC	SINAD (dB)	Power (mW)	HiRel Avail.	Package	Price*
12-Bit Bipolar SAR ADCs													
ADS7804	12	100	1 SE	P8/P16	±10	Int/Ext	0.011	12	72	81.5	N	PDIP-28, SOIC-28	16.55
ADS7808	12	100	1 SE	Serial, SPI	+4, 10, ±3.3, 5, 10	Int/Ext	0.011	12	73	81.5	N	SOIC-20	12.80
ADS7824	12	40	4 SE	Serial, SPI/P8	±10	Int/Ext	0.012	12	73	50	N	PDIP-28, SOIC-28	13.10
ADS7812	12	40	1 SE	Serial, SPI	+4, 10, ±3.3, 5, 10	Int/Ext	0.012	12	74	35	N	PDIP-16, SOIC-16	11.80
ADS7806	12	40	1 SE	Serial, SPI/P8	+4, 5, ±10	Int/Ext	0.011	12	73	28	N	PDIP-28, SOIC-28	15.05
ADS8512	12	40	1 SE	Serial, SPI	+4, 10, ±3.3, 5, 10	Int/Ext	0.011	12	74	24	N	SOIC-16	7.00
ADS8506	12	40	1 SE	Serial, SPI/P8	+4, 5, ±10	Int/Ext	0.011	12	73	24	N	SOIC-28	7.00

*Suggested resale price in U.S. dollars in quantities of 1,000. See **www.ti.com/hirel** for HiRel options.*

Data Converters

Analog-to-Digital Converters – Pipeline ADCs

Dual 16-Bit 250 MSPS Analog-to-Digital Converter
ADS42JB46/69

NEW

The ADS42JB49/69 is a family of high linearity dual channel 14- and 16-bit, 250 MSPS analog-to-digital converters (ADC). The ADS42xB49/69 family supports the JESD204B serial interface with data rates up to 3.125 Gbps as well as DDR and QDR LVDS interfaces. The buffered analog input provides uniform input impedance across a wide frequency range while minimizing sample-and-hold glitch energy. A sampling clock divider allows more flexibility for system clock architecture design. The ADS42JB49/69 provides excellent spurious-free dynamic range (SFDR) over a large input frequency range with low power consumption.

Key Features
- Dual channel
- 14/16-bit resolution
- Maximum clock rate: 250 Msps
- JESD204B serial interface
  - Subclass 0, 1, 2 compliant up to 3.125 Gbps
  - 2 to 4 lanes supporting up to 250 Msps
- Analog input buffer with high impedance Input
- Flexible input clock buffer with divide by 1,2,4
- 2 Vpp and 2.5 Vpp differential full-scale input (SPI programmable)
- 64-pin QFN package (9x9mm)
- Power dissipation: 775mW/ch
- Aperture jitter: 85 fs rms
- Channel isolation: 100 dB

Applications
- Broadband wireless
- Communications test equipment
- Microwave receivers
- Multicarrier, multimode cellular receivers
- Radar and smart antenna arrays
- Software defined radios
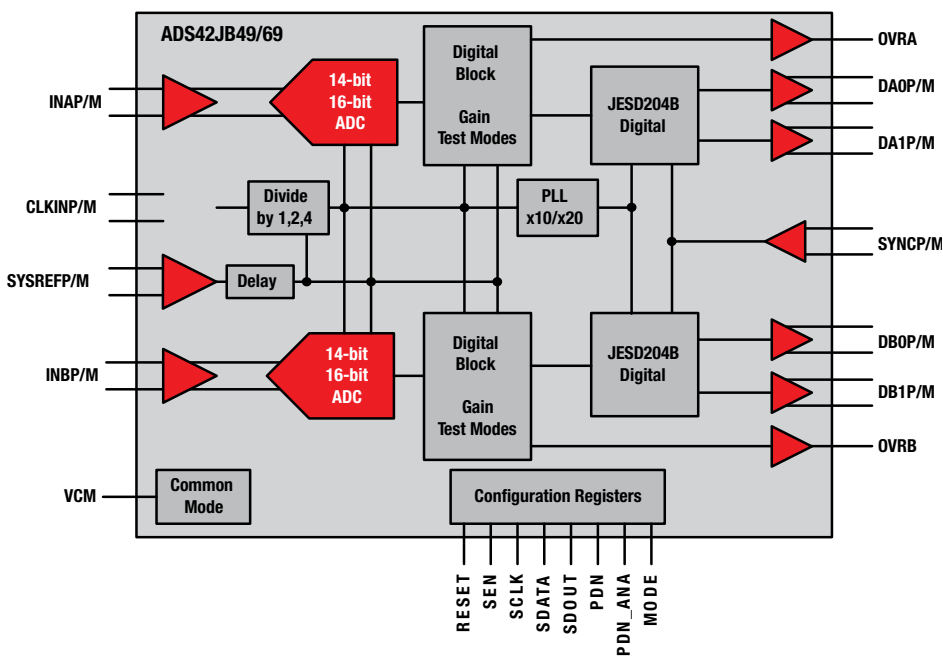
ADS42JB69 functional block diagram

Get more information: **www.ti.com/product/ADS42JB49**,
www.ti.com/product/ADS42JB69

Data Converters

Analog-to-Digital Converters – Pipeline ADCs

Dual 12-Bit 800 MSPS Analog-to-Digital Converter
ADS5402

The ADS5402 is a high linearity dual channel 12-bit, 800 Msps analog-to-digital converter (ADC) easing front end filter design for wide bandwidth receivers. The analog input buffer isolates the internal switching of the on-chip track-and-hold from disturbing the signal source as well as providing a high-impedance input. Optionally the output data can be decimated by two. Designed for high SFDR, the ADC has low-noise performance and very good spurious-free dynamic range over a large input-frequency range.
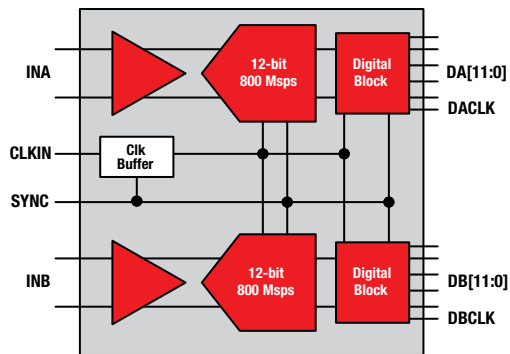
ADS5402 functional block diagram

Get more information: **www.ti.com/product/ADS5402**

Key Features
- Dual channel
- 12-bit resolution
- Maximum clock rate: 800 Msps
- Low swing full scale input: 1.0 Vpp
- Analog input buffer with high impedance input
- Input bandwidth (3 dB): >1.2 GHz
- Data output interface: DDR LVDS
- Optional 2x decimation with low pass or high pass filter
- 196-pin BGA package (12×12 mm)

Applications
- Cable infrastructure
- Data acquisition
- Microwave receivers
- Non-destructive testing
- Power amplifier linearization
- Radar and satellite systems
- Signal intelligence and jamming
- Test and measurement instrumentation
- Ultra-wide band software defined radio

Data Converters
Analog-to-Digital Converters – Pipeline ADCs

Pipeline ADCs

Device	Res. (Bits)	Sample-Rate (MSPS)	No. of Input Channels	Input Voltage (V)	Analog Input Bandwidth (MHz)	DNL (± LSB)	INL (± LSB)	SNR (dB)	SFDR (dB)	Supply Voltage (V)	Power (mW)	HiRel Avail.	Package	Price*
ADS42LB/JB69	16	250	2 Diff	2/2.5	650	TBD	TBD	73.7	90	3.6, 3.0	1480/1550	N	QFN-64	185.00
ADS5485	16	200	1 Diff	3	730	0.99	10	75	87	4.75, 5.25	2160	N	QFN-64	98.95
ADS5484	16	170	1 Diff	3	730	0.99	10	75.7	87	4.75, 5.25	2160	N	QFN-64	78.95
ADS5483	16	135	1 Diff	3	485	0.5	3	79	97	4.75, 5.25	2130	N	QFN-64	65.00
ADS5482	16	105	1 Diff	3	125	0.5	3	80.5	98	4.75, 5.25	2100	N	QFN-64	56.65
ADS5481	16	80	1 Diff	3	125	0.5	3	80.6	98	4.75, 5.25	2100	N	QFN-64	48.33
ADS5562	16	80	1 Diff	3.56	300	0.95	8.5	84	85	3.0, 3.6	865	N	QFN-48	48.35
ADS5560	16	40	1 Diff	3.56	300	0.95	8.5	84.3	90	3.0, 3.6	674	N	QFN-48	31.80
ADC16DV160	16	160	2 Diff	2.4	1400	0.45	2.5	78	95	3.6, 2.7	1340	N	LLP-68	103.00
ADC16V130	16	130	1 Diff	2.4	1400	0.45	1.5	78.5	95.5	3.6, 2.7	755	N	LLP-64	65.60
ADS5474	14	400	1 Diff	2.2	1440	0.7	1	70.2	86	4.75, 5.25	2500	N	HTQFP-80	160.65
ADS6149	14	250	1 Diff	2	800	0.4	2	72.7	86	3.0, 3.6	687	N	QFN-48	96.50
ADS4149	14	250	1 Diff	2	800	0.5	2	72.9	80	1.7, 1.9	265	N	QFN-48	89.00
ADS61B49	14	250	1 Diff	2	800	0.4	2	72.4	86	3.0, 3.6	790	N	QFN-48	99.95
ADS41B49	14	250	1 Diff	1.78	600	0.5	2	71.7	80	1.7, 1.9	350	N	QFN-48	92.50
ADS62P49	14	250	2 Diff	2	800	0.6	2.5	73	85	3.0, 3.6	1250	N	QFN-64	144.75
ADS4249	14	250	2 Diff	2	600	1.7	5	72.8	80	1.9, 1.7	470	N	QFN-64	118.5
ADS4449	14	250	4 Diff	1.9	500	0.5	1.5	70	85	3.6, 3.0	1400	N	TBD	199.85
ADS58C20	14	250	2 Diff	1.9	750	0.5	1.5	77	94	3.45, 3.15	1630	N	HTQFP-80	96.90
ADS58C23	14	250	2 Diff	1.9	750	0.5	1.5	75	94	3.45, 3.15	1630	N	HTQFP-80	79.50
ADS58H40	14	250	4 Diff	2	500	0.5	1.5	71	85	3.45, 1.8	1460	N	NFBGA-144	166.95
ADS58H43	14	250	4 Diff	2	500	0.5	1.5	70.5	85	3.45, 1.8	1460	N	NFBGA-144	139.13
ADS42B/JB49	14	250	2 Diff	2/2.5	650	TBD	TBD	71/72.3	90	3.6, 3.0	830/1550	N	QFN-64	125.00
ADS5547	14	210	1 Diff	2	800	0.5	3.5	73.3	85	3.0, 3.6	1230	N	QFN-48	82.50
ADS6148	14	210	1 Diff	2	700	0.4	2	72.7	82	3.0, 3.6	628	N	QFN-48	74.25
ADS62P48	14	210	2 Diff	2	800	0.6	2.5	73	85	3.0, 3.6	1140	N	QFN-64	120.00
ADS5546	14	190	1 Diff	2	500	0.5	3	73.2	84	3.0, 3.6	1130	N	QFN-48	72.50
ADS5545	14	170	1 Diff	2	500	0.5	3	73.5	85	3.0, 3.6	1100	N	QFN-48	62.50
ADS4146	14	160	1 Diff	2	800	0.5	2	73	83	1.7, 1.9	200	N	QFN-48	49.00
ADS42JB46	14	160	2 Diff	2/2.5	650	1.7	5	71.9	90	3.6,3.0	1330	N	QFN-64	65.25
ADS4246	14	160	2 Diff	2	600	1.7	5	72.8	87	1.9, 1.7	332	N	QFN-64	65.25
ADS5500	14	125	1 Diff	2	750	0.75	2.5	70.5	82	3.0, 3.6	780	Y	HTQFP-64	49.00
ADS6145	14	125	1 Diff	2	450	0.6	2.5	74.1	84	3.0, 3.6	417	N	QFN-32	36.90
ADS4145	14	125	1 Diff	2	800	0.5	2	73	85	1.7, 1.9V	140	N	QFN-64	34.15
ADS6245	14	125	2 Diff	2	500	0.6	3	73.2	83	3.0, 3.6	1000	N	QFN-48	60.00
ADS62P45	14	125	2 Diff	2	450	0.8	3	73.8	85	3.0, 3.6	792	N	QFN-64	60.00
ADS6445	14	125	4 Diff	2	500	0.6	3	73.2	83	3.0, 3.6	1680	Y	QFN-64	117.00
ADS4245	14	125	2 Diff	2	600	1.7	5	73.4	89	1.9, 1.7	277	N	QFN-64	41.00
ADS5424	14	105	1 Diff	2.2	570	−0.95, 1.5	1.5	74	93	4.75, 5.25	1900	Y	HTQFP-52	56.00
ADS5541	14	105	1 Diff	2	750	−0.9, 1.1	5	72	85.1	3.0, 3.6	739	N	HTQFP-64	41.00
ADS6144	14	105	1 Diff	2	450	0.6	2.5	74.1	84	3.0, 3.6	374	N	QFN-32	31.90
ADS6244	14	105	2 Diff	2	500	0.6	3	73	81	3.0, 3.6	810	N	QFN-48	51.05
ADS62P44	14	105	2 Diff	2	450	0.7	2.5	73.8	86	3.0, 3.6	700	N	QFN-64	61.05
ADS6444	14	105	4 Diff	2	500	0.6	3	73	81	3.0, 3.6	1350	N	QFN-64	99.00
ADS5423	14	80	1 Diff	2.2	570	−0.95, 1.5	1.5	74	94	4.75, 5.25	1850	N	HTQFP-52	40.00

*Suggested resale price in U.S. dollars in quantities of 1,000. See www.ti.com/hirel for HiRel options.

*Preview products are listed in **bold blue.** New products are listed in **bold red.**

Data Converters

Analog-to-Digital Converters – Pipeline ADCs

Pipeline ADCs (continued)

Device	Res. (Bits)	Sample-Rate (MSPS)	No. of Input Channels	Input Voltage (V)	Analog Input Bandwidth (MHz)	DNL (± LSB)	INL (± LSB)	SNR (dB)	SFDR (dB)	Supply Voltage (V)	Power (mW)	HiRel Avail.	Package	Price*
ADS5433	14	80	1 Diff	2.2	570	−0.95, 1.5	1.5	74	97.2	4.75, 5.25	1850	N	HTQFP-52	48.00
ADS5542	14	80	1 Diff	2	750	−0.9, 1.1	5	72.9	88	3.0, 3.6	674	N	HTQFP-64	25.00
ADS6143	14	80	1 Diff	2	450	0.5	2	74.4	89	3.0, 3.6	318	N	QFN-32	25.00
ADS6243	14	80	2 Diff	2	500	0.5	2	73.8	87.5	3.0, 3.6	700	N	QFN-48	37.50
ADS62P43	14	80	2 Diff	2	450	0.5	1.5	74.3	88	3.0, 3.6	587	N	QFN-64	37.50
ADS6443	14	80	4 Diff	2	500	0.5	2	73.8	87.5	3.0, 3.6	1180	N	QFN-64	63.00
ADS4242	14	65	2 Diff	2	600	1.7	5	73.6	92	1.9, 1.7	183	N	QFN-64	28.00
ADS5553	14	65	2 Diff	2.3	750	1	4	74	84	3.0, 3.6	890	N	HTQFP-80	30.00
ADS6142	14	65	1 Diff	2	450	0.5	2	74.6	89	3.0, 3.6	285	N	QFN-32	18.65
ADS6242	14	65	2 Diff	2	500	0.5	2	74	88	3.0, 3.6	630	N	QFN-48	30.85
ADS62P42	14	65	2 Diff	2	450	0.4	1.5	74.4	88	3.0, 3.6	518	N	QFN-64	30.85
ADS6442	14	65	4 Diff	2	500	0.5	2	74	88	3.0, 3.6	1180	N	QFN-64	57.05
ADS5422	14	62	1 Diff	2 to 4	300	1	—	72	85	4.75, 5.25	1200	N	LQFP-64	30.45
ADS5421	14	40	1 Diff	2 to 4	300	1	—	75	83	4.75, 5.25	900	N	LQFP-64	20.15
ADS850	14	10	1 SE/1 Diff	2 to 4	300	1	5	76	85	4.7, 5.3	250	N	TQFP-48	10.50
THS1408	14	8	1 SE/1 Diff	1.5	140	1	5	72	80	3.0, 3.6	270	Y	HTQFP-48	14.85
THS1403	14	3	1 SE/1 Diff	1.5	140	1	5	72	80	3.0, 3.6	270	N	HTQFP-48	11.05
THS14F03	14	3	1 SE/1 Diff	1.5	140	1	2.5	72	80	3.0, 3.6	270	N	TQFP-48	12.60
THS1401	14	1	1 SE/1 Diff	1.5	140	1	5	72	80	3.0, 3.6	270	N	HTQFP-48	8.90
THS14F01	14	1	1 SE/1 Diff	1.5	140	1	2.5	72	80	3.0, 3.6	270	N	TQFP-48	9.65
ADC14155/V155	14	155	1 Diff	2	1100	0.5	1.9	71.3/71.7	87/86.9	3.6, 3.0	967/951	N	LLP-48	63.80/62.00
ADC14DS080/105	14	80/105	2 Diff	2	1000	0.25	1.5	70/70.5	81/83	3.6, 2.7	800/1000	N	LLP-60	23.00/60.80
ADC14DC080/105	14	80/105	2 Diff	2	1000	0.4/0.5	1.5/1.9	71	83	3.6, 2.7	600/800	N	LLP-60	32.30/60.00
ADC14C080/105	14	80/105	1 Diff	2	1000	0.4/0.5	1.5/1.9	71	83	3.6, 2.7	600/800	N	LLP-60	32.30/60.00
ADC14L020/40	14	20/40	1 Diff	2	150	0.5	1.4/1.5	74	93/90	3.6, 3.0	150	N	LQFP-32	12.00/15.30
ADS5444	13	250	1 SE/1 Diff	2.2	800	0.4	2.5	68.7	73	4.75, 5.25	2100	Y	HTQFP-80	59.00
ADS5440	13	210	1 SE/1 Diff	2.2	800	0.4	2.5	69	80	4.75, 5.25	2100	Y	HTQFP-80	42.00
ADS5400	12	1000	1 Diff	2	2100	0.7	2	59.1	75	4.75, 5.25	2200	Y	HTQFP-100	775.00
ADS5409	12	900	2 Diff	2	1200	0.8	2	60.7	74	3.15, 3.45	2180	N	196NFBGA	393.35
ADS5401	12	800	1 Diff	2	1200	0.8	2	61.2	73	3.15, 3.46	1200	N	196NFBGA	187.50
ADS5402	12	800	2 Diff	2	1200	0.8	2	61.8	80	3.15, 3.47	2100	N	196NFBGA	349.65
ADS54T01	12	750	1 Diff	2	1200	0.8	2	61.2	79	3.15, 3.48	1200	N	196NFBGA	187.50
ADS54T02	12	750	2 Diff	2	1200	0.8	2	60.9	74	3.15, 3.49	2100	N	196NFBGA	349.65
ADS54RF63	12	550	1 Diff	2.2	2300	0.95	2.5	62.6	76	4.75, 5.25	2250	N	HTQFP-80	177.00
ADS5403	12	500	1 Diff	2	1200	0.8	2	60.8	80	3.15, 3.49	1040	N	196NFBGA	125.00
ADS5463	12	500	1 Diff	2.2	2000	0.25	2.5	65.2	84	4.75, 5.25	2200	Y	HTQFP-80	135.75
ADS5404	12	500	2 Diff	2	1200	0.8	2	60.8	80	3.15, 3.49	1600	N	196NFBGA	218.75
ADS5407	12	500	2 Diff	2	1200	0.8	2	63.8	84	3.15, 3.49	1350	N	196NFBGA	239.95
ADS54T04	12	500	2 Diff	2	1200	0.8	2	60.8	78	3.15, 3.49	1600	N	196NFBGA	218.75
ADS6129	12	250	1 Diff	2	700	0.2	1	70.5	86	3.0, 3.6	687	N	QFN-48	52.85
ADS4129	12	250	1 Diff	2	800	0.2	0.25	70.4	80	1.7, 1.9	265	N	QFN-48	45.00
ADS61B29	12	250	1 Diff	2	800	0.2	1	70	86	3.0, 3.6	790	N	QFN-48	56.30

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*Preview products are listed in bold blue.*

Data Converters

Analog-to-Digital Converters – Pipeline ADCs

Pipeline ADCs (continued)

Device	Res. (Bits)	Sample-Rate (MSPS)	No. of Input Channels	Input Voltage (V)	Analog Input Bandwidth (MHz)	DNL (± LSB)	INL (± LSB)	SNR (dB)	SFDR (dB)	Supply Voltage (V)	Power (mW)	HiRel Avail.	Package	Price*
ADS41B29	12	250	1 Diff	1.78	600	0.2	1	69.2	80	1.7, 1.9	350	N	QFN-48	48.45
ADS62P29	12	250	2 Diff	2	800	0.2	1	70.5	85	3.0, 3.6	1250	N	QFN-64	79.50
ADS4229	12	250	2 Diff	2	600	1.5	3.5	73.6	92	1.9, 1.7	470	N	QFN-64	59.85
ADS5527	12	210	1 Diff	2	800	0.5	2	69	81	3.0, 3.6	1230	N	QFN-48	45.00
ADS6128	12	210	1 Diff	2	700	0.2	1	70.5	82	3.0, 3.6	628	N	QFN-48	41.50
ADS62P28	12	210	2 Diff	2	800	0.2	1	70.6	85	3.0, 3.6	1140	N	QFN-64	62.25
ADS5525	12	170	1 Diff	2	500	0.5	1.5	70.5	84	3.0, 3.6	1100	N	QFN-48	35.00
ADC12C170/V170	12	170	1 Diff	2	1100	0.5/0.3	0.9/0.5	67.2	85.4/85.8	3.6, 3.0	715/781	N	LLP-48	33.00
ADS4226	12	160	2 Diff	2	600	1.6	3.5	70.5	87	1.9, 1.7	332	N	QFN-64	39.00
ADS4126	12	160	1 Diff	2	800	0.2	0.25	70.5	83	1.7, 1.9	200	N	QFN-48	26.00
ADS5520	12	125	1 Diff	2	750	0.5	1.5	69.7	83.6	3.0, 3.6	780	N	HTQFP-64	27.50
ADS6125	12	125	1 Diff	2	450	0.6	2.5	71.3	84	3.0, 3.6	417	N	QFN-32	24.55
ADS4125	12	125	1 Diff	2	800	0.2	0.25	70.5	83	1.7, 1.9	140	N	QFN-64	20.85
ADS6225	12	125	2 Diff	2	500	0.5	2.5	70.3	83	3.0, 3.6	1000	N	QFN-64	20.85
ADS62P25	12	125	2 Diff	2	450	0.8	3	70.8	85	3.0, 3.6	792	N	QFN-64	36.85
ADS6425	12	125	4 Diff	2	500	0.5	2.5	70.3	83	3.0, 3.6	1650	N	QFN-64	68.60
ADS4225	12	125	2 Diff	2	600	1.5	3.5	70.8	89	1.9, 1.7	277	N	QFN-64	29.50
ADS5521	12	105	1 Diff	2	750	0.5	1.5	70	86	3.0, 3.6	736	N	HTQFP-64	23.00
ADS6124	12	105	1 Diff	2	450	0.5	2	71.3	84	3.0, 3.6	374	N	QFN-32	20.75
ADS6224	12	105	2 Diff	2	500	0.5	2.2	70.6	81	3.0, 3.6	900	N	QFN-48	31.60
ADS62P24	12	105	2 Diff	2	450	0.7	2.5	71	86	3.0, 3.6	700	N	QFN-64	31.60
ADS6424	12	105	4 Diff	2	500	0.5	2.2	70.6	81	3.0, 3.6	1350	N	QFN-64	58.50
ADC12C105	12	105	1 Diff	2	1000	0.25	0.5	69	82	3.6, 2.7	400	N	LLP-32	24.00
ADC12DS080/105	12	80/105	2 Diff	2	1000	0.25/0.3	0.5	70/7.1	81/88	3.6, 2.7	800/1000	N	LLP-60	23.00/31.00
ADC12DC080/105	12	80/105	2 Diff	2	1000	0.2	0.5	71.2/69.1	88/83	3.6, 2.7	600/800	N	LLP-60	20.00/30.00
ADC12C080	12	80	1 Diff	2	1000	0.35	0.5	71.2	90	3.6, 2.7	300	N	LLP-32	16.70
ADC12DL080	12	80	2 Diff	2	600	0.4	0.9	69.3	82	3.6, 3.0	447	N	TQFP-64	15.20
ADC12L080	12	80	1 Diff	2	450	0.4	1.2	66	80	3.6, 3.0	425	N	LQFP-32	15.96
ADS5410	12	80	1 SE/1 Diff	2	1000	1	2	65	76	3.0, 3.6	360	N	TQFP-48	19.00
ADS5522	12	80	1 Diff	2	750	0.5	1.5	69.7	82.8	3.0, 3.6	663	N	HTQFP-64	16.70
ADS809	12	80	1 SE/1 Diff	1 to 2	1000	1.7	6	63	67	4.75, 5.25	905	N	TQFP-48	24.95
ADS6123	12	80	1 Diff	2	450	0.5	2	71.5	89	3.0, 3.6	318	N	QFN-32	16.50
ADS61B23	12	80	1 Diff	2	450	0.5	2	70	82	3.0, 3.6	351	N	QFN-32	19.50
ADS6223	12	80	2 Diff	2	500	0.4	2	70.9	87	3.0, 3.6	760	N	QFN-48	25.05
ADS62P23	12	80	2 Diff	2	450	0.5	1.5	71.2	88	3.0, 3.6	587	N	QFN-64	25.05
ADS6423	12	80	4 Diff	2	500	0.4	2	70.9	87	3.0, 3.6	1180	N	QFN-64	44.30
ADS808	12	70	1 SE/1 Diff	1 to 2	1000	1.7	7	64	68	4.75, 5.25	720	N	TQFP-48	19.50
ADS5273	12	70	8 Diff	1.5	300	0.99, 1.2	3	71	85	3.0, 3.6	1003	N	HTQFP-80	121.00
ADC12L066	12	66	1 Diff	2	450	0.4	1.2	66	80	3.6, 3.0	357	N	LQFP-32	11.97
ADC12QS065	12	65	4 Diff	2	300	0.3	0.7	69.3	83.3	3.6, 3.0	828	N	LLP-60	30.50
ADC12DL065	12	65	2 Diff	2	250	0.4	0.75	69	85	3.6, 3.0	360	N	TQFP-64	15.00
ADS4222	12	65	2 Diff	2	600	1.5	3.5	70.9	91	1.9, 1.7	183	N	QFN-64	14.40
ADS5413	12	65	1 Diff	2	1000	1	2	68.5	79	3.0, 3.6	400	N	HTQFP-48	14.75
ADS5221	12	65	1 SE/1 Diff	1 to 2	300	1	1.5	70	88	3.0, 3.6	285	N	TQFP-48	13.95
ADS6122	12	65	1 Diff	2	450	0.5	2	71.6	89	3.0, 3.6	318	N	QFN-32	12.00
ADS5232	12	65	2 Diff	2	300	0.9	2	70.7	86	3.0, 3.6	340	N	TQFP-64	16.00
ADS6222	12	65	2 Diff	2	500	0.4	2	71.2	89	3.0, 3.6	760	N	QFN-48	18.10
ADS62P22	12	65	2 Diff	2	450	0.4	1.5	71.3	88	3.0, 3.6	518	N	QFN-64	18.10
ADS5242	12	65	4 Diff	1.5	300	0.95, 1	2	71	85	3.0, 3.6	660	N	HTQFP-64	30.00
ADS6422	12	65	4 Diff	2	500	0.4	2	71.2	88	3.0, 3.6	1180	N	QFN-64	31.65

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Data Converters

Analog-to-Digital Converters – Pipeline ADCs

Pipeline ADCs (continued)

Device	Res. (Bits)	Sample-Rate (MSPS)	No. of Input Channels	Input Voltage (V)	Analog Input Bandwidth (MHz)	DNL (± LSB)	INL (±LSB)	SNR (dB)	SFDR (dB)	Supply Voltage (V)	Power (mW)	HiRel Avail.	Package	Price*
ADS5272	12	65	8 Diff	1.5	300	0.95,1	2	71.1	85	3.0, 3.6	984	N	HTQFP-80	54.85
ADS5282	12	65	8 Diff	2	520	0.3	1.5	70	85	3.0, 3.6	616	N	QFN-64	54.85
ADC12L063	12	62	1 Diff	2	170	0.5	1	66	78	3.6, 3.0	354	N	LQFP-32	12.10
ADS807	12	53	1 SE/1 Diff	2 to 3	270	1	4	69	82	4.75, 5.25	335	N	SSOP-28	11.30
ADS2807	12	50	2 SE/2 Diff	2 to 3	270	1	5	65	70	4.75, 5.25	720	N	TQFP-64	18.05
ADS5271	12	50	8 Diff	1.5	300	0.9	2	70.5	85	3.0, 3.6	927	N	HTQFP-80	48.00
ADS5281	12	50	8 Diff	2	52	0.3	1.5	70	85	3.0, 3.6	510	N	QFN-64, HTQFP-80	48.00
ADS5220	12	40	1 SE/1 Diff	1 to 2	300	1	1.5	70	88	3.0, 3.6	195	N	TQFP-48	9.85
ADS800	12	40	1 SE/1 Diff	2	65	1	—	62	61	4.75, 5.25	390	N	SO-28, TSSOP-28	30.85
ADS5231	12	40	2 Diff	2	300	0.9	2	70.7	86	3.0, 3.6	285	N	TQFP-64	11.75
ADS5240	12	40	4 Diff	1.5	300	0.9	2	70.5	85	3.0, 3.6	607	N	HTQFP-64	20.00
ADS5270	12	40	8 Diff	1.5	300	0.9	2	70.5	85	3.0, 3.6	888	N	HTQFP-80	44.00
ADC12DL040	12	40	2 Diff	2	250	0.3	0.8	69	85	3.6, 2.7	210	N	TQFP-64	10.00
ADC12D040	12	40	2 Diff	4	100	0.4	0.7	68	80	5.25, 4.75	600	N	TQFP-64	12.40
ADC12040	12	40	1 Diff	4	100	0.4	0.7	70	86	5.25, 4.75	340	N	LQFP-32	8.55
ADS2806	12	32	2 SE/2 Diff	2 to 3	270	1	4	66	73	4.75, 5.25	430	N	TQFP-64	14.10
THS1230	12	30	1 SE/1 Diff	1 to 2	180	1	2.5	67.7	74.6	3.0, 3.6	168	N	SOIC-28, TSSOP-28	10.50
ADS801	12	25	1 SE/1 Diff	1 to 2	65	1	—	64	61	4.75, 5.25	270	N	SO-28, SSOP-28	12.55
ADS805	12	20	1 SE/1 Diff	2	270	0.75	2	68	74	4.75, 5.25	300	N	SSOP-28	9.90
ADC12020	12	20	1 Diff	4	100	0.35	0.55	70	86	5.25, 4.75	178	N	LQFP-32	6.49
THS1215	12	15	1 SE/1 Diff	1 to 2	180	0.9	1.5	68.9	81.7	3.0, 3.6	148	N	SOIC-28, SSOP-28	9.85
ADS802	12	10	1 SE/1 Diff	2	65	1	2.75	66	66	4.75, 5.25	260	N	SO-28, SSOP-28	12.60
ADS804	12	10	1 SE/1 Diff	2	270	0.75	2	69	80	4.7, 5.3	180	N	SSOP-28	9.20
THS12082	12	8	2 SE/1 Diff	2.5	96	1	1.5	69	71	4.75, 5.25	186	Y	TSSOP-32	8.40
THS1209	12	8	2 SE/1 Diff	2.5	98	1	1.5	69	71	4.75, 5.25	186	N	TSSOP-32	7.90
THS1206	12	6	4 SE/2 Diff	2.5	96	1	1.8	69	71	4.75, 5.25	186	Y	TSSOP-32	7.80
THS1207	12	6	4 SE/2 Diff	2.5	96	1	1.5	69	71	4.75, 5.25	186	N	TSSOP-32	7.25
ADS803	12	5	1 SE/1 Diff	2	270	2	0.75	69	82	4.7, 5.3	115	N	SSOP-28	7.40
ADC11DV200	11	200	2 Diff	1.5	900	0.32	0.65	62.5	82	1.9, 1.7	473	N	LLP-60	56.00
ADS5517	11	200	1 Diff	2	800	0.3	1.5	66.9	84	3.0, 3.6	1230	N	QFN-48	32.95
ADS58B18	11	200	1 Diff	2	600	0.25	0.5	66.2	87	1.7, 1.9	368	N	QFN-48	39.95
ADS62C17	11	200	2 Diff	2	800	0.2	0.75	67	85	3.0, 3.15	1081	N	QFN-64	66.00
ADS58C28	11	200	2 Diff	2	600	0.25	1	66.6	84	1.7, 1.9	505	N	QFN-64	63.95
ADS58C48	11	200	4 Diff	2	600	0.25	1	66.6	84	1.7, 1.9	900	N	HTQFP-80	111.95
ADC11C125/170	11	125/170	1 Diff	2	1100	0.2/0.4	0.25/0.6	65.5/65.1	88.2/85.4	3.3, 3.0	608/715	N	LLP-48	16.00/21.00
ADS5510	11	125	1 Diff	2	750	1.1	5	66.8	83	3.0, 3.6	780	N	HTQFP-64	14.20
ADS62C15	11	125	2 Diff	2	450	0.4	3.5	67	82	3.0, 3.6	740	N	QFN-64	41.25
ADS62P15	11	125	2 Diff	2	450	0.4	3.5	67.1	85	3.0, 3.6	740	N	QFN-64	18.00
ADS5411	11	105	1 Diff	2.2	750	0.5	0.5	66.4	90	4.75, 5.25	1900	N	HTQFP-52	25.50
ADC11DL066	11	66	2 Diff	2	450	0.25	0.5	64	80	3.6, 3.0	686	N	TQFP-64	8.51
ADC11L066	11	66	1 Diff	2	450	0.2	0.5	65	78	3.6, 3.0	357	N	LQFP-32	9.92
ADS5413-11	11	65	1 Diff	2	1000	0.75	1	65	77	3.0, 3.6	400	N	HTQFP-48	14.75
ADC10DV200	10	200	2 Diff	1.5	900	0.17	0.3	59.9	82	1.9, 1.7	450	N	LLP-60	50.00
ADC10080	10	80	1 Diff	2	400	0.25	0.5	59.5	78.8	3.6, 2.7	78.6	N	TSSOP-28	4.50
ADS828	10	75	1 SE/1 Diff	2	300	1	3	57	68	4.75, 5.25	340	N	SSOP-28	8.70
ADS5237	10	65	2 Diff	2	300	0.1	1	61.7	85	3.0, 3.6	330	N	HTQFP-64	7.50
ADS5277	10	65	8 Diff	1.5	300	0.5	1	61.7	85	3.0, 3.6	911	N	HTQFP-80	32.00
ADS5287	10	65	8 Diff	2	520	0.1	1	61.7	85	3.0, 3.6	592	N	QFN-64	32.00

*Suggested resale price in U.S. dollars in quantities of 1,000. See www.ti.com/hirel for HiRel options.

Data Converters

Analog-to-Digital Converters – Pipeline ADCs

Pipeline ADCs (continued)

Device	Res. (Bits)	Sample-Rate (MSPS)	No. of Input Channels	Input Voltage (V)	Analog Input Bandwidth (MHz)	DNL (± LSB)	INL (± LSB)	SNR (dB)	SFDR (dB)	Supply Voltage (V)	Power (mW)	HiRel Avail.	Package	Price*
ADS5122	10	65	8 Diff	1	22	1	2.5	59	72	1.65, 2.0	733	N	BGA-257	42.85
ADC10DL065	10	65	2 Diff	2	250	0.16	0.25	61	85	3.6, 3.0	370	N	TQFP-64	7.03
ADC10065	10	65	1 Diff	2	400	0.3	0.3	59.6	80	3.6, 2.7	68.4	N	TSSOP-28	3.77
ADS823	10	60	1 SE/1 Diff	2	300	1	2	60	74	4.75, 5.25	295	N	SSOP-28	8.40
ADS826	10	60	1 SE/1 Diff	2	300	1	2	59	73	4.75, 5.25	295	N	SSOP-28	8.40
ADS5103	10	40	1 Diff	1	950	0.8	1.5	58	66	1.65, 2.0	105	N	TQFP-48	5.25
ADS821	10	40	1 SE/1 Diff	2	65	1	2	58	62	4.75, 5.25	390	N	SSOP-28	13.05
ADS822	10	40	1 SE/1 Diff	2	300	1	2	60	66	4.75, 5.25	200	N	SSOP-28	5.25
ADS825	10	40	1 SE/1 Diff	2	300	1	2	60	65	4.75, 5.25	200	N	SSOP-28	5.25
THS1040	10	40	1 SE/1 Diff	2	900	0.9	1.5	57	70	3.0, 3.6	100	N	SOIC-28	5.10
THS1041	10	40	1 SE/1 Diff	2	900	1	1.5	57	70	3.0, 3.6	103	N	SOIC-28	5.45
ADS5203	10	40	2 SE/2 Diff	1	300	1	1.5	60.5	73	3.0, 3.6	240	N	TQFP-48	9.65
ADS5204	10	40	2 SE/2 Diff	2	300	1	1.5	60.5	73	3.0, 3.6	275	Y	TQFP-48	11.05
ADS5120	10	40	8 Diff	1	300	1	1.5	58	72	1.65, 2	794	N	BGA-257	36.15
ADS5121	10	40	8 Diff	1	28	1	1.5	60	74	1.65, 2.0	500	N	BGA-257	38.85
ADC10D040	10	40	2 Diff	1.4	140	0.35	0.65	60	72	3.6, 3.0	267	N	TQFP-48	6.70
ADC10040	10	40	1 Diff	2	400	0.3	0.3	59.5	80	3.6, 2.7	55.5	N	TSSOP-28	3.75
THS1030	10	30	1 SE/1 Diff	2	150	1	2	49.4	53	3.0, 5.5	150	N	SOIC-28	3.75
THS1031	10	30	1 SE/1 Diff	2	150	1	2	49.3	52.4	3.0, 5.5	160	N	SOIC-28	4.10
ADS820	10	20	1 SE/1 Diff	2	65	1	2	60	62	4.75, 5.25	200	N	SSOP-28	6.75
ADS900	10	20	1 SE/1 Diff	1 to 2	100	1	—	49	53	2.7, 3.7	54	N	SSOP-28	3.55
ADS901	10	20	1 SE/1 Diff	1 to 2	100	1	—	53	49	2.7, 3.7	49	N	SSOP-28	3.40
ADC10D020	10	20	2 Diff	1	140	0.35	0.65	59	75	3.6, 2.7	150	N	TQFP-48	4.49
THS10082	10	8	2 SE/1 Diff	2.5	96	1	1	61	65	4.75, 5.25	186	N	TSSOP-32	3.70
THS1009	10	8	2 SE/1 Diff	+1.5, +3.5	96	1	1	61	65	4.75, 5.25	186	N	TSSOP-32	3.20
THS10064	10	6	4 SE/2 Diff	2.5	96	1	1	61	65	4.75, 5.25	186	N	TSSOP-32	4.15
THS1007	10	6	4 SE/2 Diff	+1.5, +3.5	96	1	1	61	65	4.75, 5.25	186	N	TSSOP-32	3.70
TLV1562	10	2	4 SE/2 Diff	3	120	1.5	1.5	58	70.3	2.7, 5.5	15	N	SOIC-28	4.15
ADC08100/200	8	100/200	1 Diff	1.6	200/500	0.4	0.5/1.0	47/46	60	3.6, 2.7	126/210	N	TSSOP-24	4.33/7.67
ADS831	8	80	1 SE/1 Diff	1 or 2	300	1	2	49	65	4.75, 5.25	310	N	SSOP-20	3.15
ADS830	8	60	1 SE/1 Diff	1 or 2	300	1	1.5	49.5	65	4.75, 5.25	215	N	SSOP-20	2.75
ADC08060	8	60	1 Diff	1.6	200	0.4	0.5	47	63	3.6, 2.7	88	N	TSSOP-24	1.55
ADC08L060	8	60	1 Diff	1.6	270	0.25	0.5	48	59.1	3.6, 2.4	53	N	TSSOP-24	3.00
TLC5540	8	40	1 SE	2	75	1	1	44	42	4.75, 5.25	85	N	SOP-24	1.99
THS0842	8	40	2 SE/2 Diff	1.3	600	2	2.2	42.7	52	3.0, 3.6	320	N	TQFP-48	5.05
TLV5535	8	35	1 SE	1 to 1.6	600	1.3	2.4	46.5	58	3.0, 3.6	106	Y	TSSOP-28	2.40
ADS931	8	30	1 SE	1 to 4	100	1	2.5	48	49	2.7, 5.5	154	N	SSOP-28	2.20
ADS930	8	30	1 SE/1 Diff	1	100	1	2.5	46	50	2.7, 5.25	168	N	SSOP-28	2.30
TLC5510	8	20	1 SE	2	14	0.75	1	46	42	4.75, 5.25	127.5	N	SOP-24	1.95
TLC5510A	8	20	1 SE	2	14	0.75	1	46	42	4.75, 5.25	150	N	SOP-24	1.95
Mixed-Signal Transceiver AFEs														
AFE7070	14	65	2 Diff	NA	99 - 2700	NA	NA	—	—	3.6, 3.0	390	N	QFN-48	23.72
AFE7171	14	65	2 Diff	NA	100 - 2700	NA	NA	—	—	3.6, 3.0	334.0	N	QFN-48	11.86
AFE7222/5	12	130, 250	2 Diff	2	550	0.50	0.2	76	84	3.6, 3.0	557	N	QFN-64	19.50

*Suggested resale price in U.S. dollars in quantities of 1,000. See www.ti.com/hirel for HiRel options.

*Preview products are listed in **bold blue**.*

Data Converters
ADC by Architecture — Folding and Interpolating

12-Bit, 1.8/3.6 GSPS RF sampling ADC

ADC12D1800RF

The 12-bit 1.8 GSPS ADC12D1800RF is an RF-sampling GSPS ADC that can directly sample input frequencies up to and above 2.7 GHz. The ADC12D1800RF has excellent noise and linearity performance at RF frequencies, extending its usable range beyond the third Nyquist zone.

The ADC12D1800RF provides a flexible LVDS interface which has multiple SPI programmable options to facilitate board design and FPGA/ASIC data capture. The LVDS outputs are compatible with IEEE 1596.3-1996 and supports programmable common mode voltage. TI offers a complete family of 12-bit direct RF-sampling ADCs, which deliver the industry's best performance beyond 2.7 GHz at up to 3.6 GSPS.
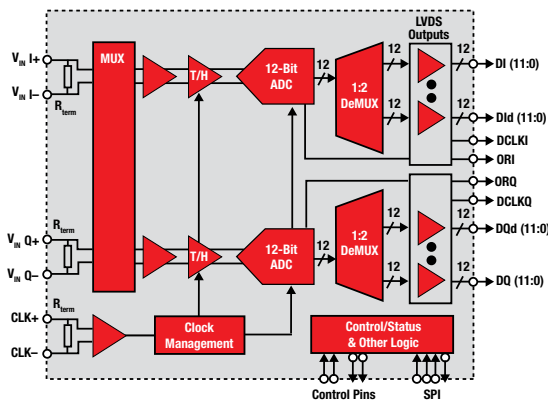
ADC12D1800RF functional block diagram

Get more information: **www.ti.com/product/ADC12D1800RF**

Key Features
- Excellent noise and linearity up to and above f_{IN} = 2.7 GHz
- Configurable to either 3.6 GSPS interleaved or 1800 MSPS dual ADC
- New DESCLKIQ mode for high bandwidth, high sampling rate apps
- Pin-compatible with ADC1xD1x00, ADC12Dx00RF
- AutoSync feature for multi-chip synchronization
- Internally terminated, buffered, differential analog inputs
- Interleaved timing automatic and manual skew adjust
- Test patterns at output for system debug
- Time stamp feature to capture external trigger
- Programmable gain, offset, and t_{AD} adjust feature
- 1:1 non-demuxed or 1:2 demuxed LVDS outputs

Applications
- Military
- Software defined radio

Folding and Interpolating GSPS ADCs

Device	Res. (Bits)	Chs	Speed (MSPS)	Power (W)	NPR (dB)	IMD (dBc)	Noise Fl (dBm/Hz)	ENOB (Bits)	SNR (dB)	SFDR (dBc)	HiRel Avail.	Package	Price*
8-Bit													
LM97600	7.6	1/2/4	5000/2500/1250	3.0	—	—	—	6.7	43.8	50.0	N	TEPBGA-292	249.12
ADC08B3000	8	1	3000	1.6	—	—	—	7.2	45.3	55.4	N	eLQFP-128	525.00
ADC083000	8	1	3000	1.9	—	—	—	7.2	45.4	57	N	eLQFP-128	686.00
ADC08D1520	8	1/2	3000/1500	1.6	—	—	—	7.4	46.8	57	Y	eLQFP-128	613.00
ADC08D1020	8	1/2	2000/1000	1.6	—	—	—	7.4	46.8	58	N	eLQFP-128	329.00
ADC081500	8	1	1500	1.2	—	—	—	7.4	47	56	N	eLQFP-128	266.00
ADC08D500	8	1/2	1000/500	1.4	—	—	—	7.5	48	55	N	eLQFP-128	137.00
ADC08500	8	1	500	0.8	—	—	—	7.5	47.5	56	N	eLQFP-128	36.00
ADC08DL502	8	2	500	1.25	38.4	−64.4	−135.4	7.2	46	55	N	LQFP-144	43.50
10-Bit													
ADC10D1500	10	1/2	3000/1500	3.59	48	—	—	8.9	56.4	68	N	TEPBGA-292	1800.00
ADC10D1000	10	1/2	2000/1000	2.77	48	—	—	9.1	57	66	Y	TEPBGA-292	1500.00
12-Bit													
ADC12D1800	12	1/2	3600/1800	4.4	48.5	−61	−153.5	9.4	58.6	73	N	TEPBGA-292	Web
ADC12D1800RF	12	1/2	3600/1800	4.29	—	−64	−155	9.3	58.6	68.1	N	TEPBGA-292	Web
ADC12D1600	12	1/2	3200/1600	3.88	48.5	−56	−153.6	9.4	58.5	70.3	N	TEPBGA-292	Web
ADC12D1600RF	12	1/2	3200/1600	3.94	—	−66.7	−154.6	9.4	59	67.9	Y	TEPBGA-292	Web
ADC12D1000	12	1/2	2000/1000	3.38	49.5	−59	−152.6	9.6	60.2	71	N	TEPBGA-292	Web
ADC12D1000RF	12	1/2	2000/1000	3.42	—	−69	−154	9.6	60.1	71.4	N	TEPBGA-292	Web
ADC12D800RF	12	1/2	1600/800	2.5	50.4	−71	−152.2	9.6	60.2	73.4	N	TEPBGA-292	Web
ADC12D500RF	12	1/2	1000/500	2.02	50.4	−69	−150.5	9.7	60.4	74.3	N	TEPBGA-292	Web

*Suggested resale price in U.S. dollars in quantities of 1,000. See **www.ti.com/hirel** for HiRel options.*

Data Converters
Digital-to-Analog Converters – String and R2R DACs

12-/14-/16-Bit, Dual-Ch, Voltage-Output DAC in Tiny QFN-10 and MSOP-10 Packages
DAC8562, DAC8162, DAC7562

This is a family of low-power, voltage-output, dual-channel, 12/14/16-bit DACs. These devices include a 2.5 V, 2ppm/°C internal reference, giving a full-scale output voltage range of 2.5 V or 5 V. The internal reference has an initial accuracy of 1 mV and can source up to 20 mA at the V_{REFIN}/V_{REFOUT} pin. These devices are monotonic, providing excellent linearity and minimizing undesired code-to-code transient voltages (glitch). The three-wire serial interface is compatible with standard SPI, QSPI, Microwire™ and digital signal processor (DSP) interfaces.
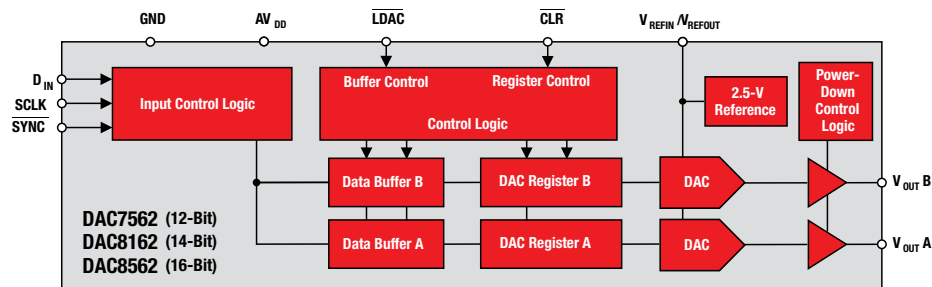
DAC7562, DAC8162, DAC8562 functional block diagram

Get more information: **www.ti.com/product/Part Number
(DAC8562, DAC8162, DAC7562)**

Key Features
- Designed for low power performance in tiny packages
  - DAC7562 (12-bit): 0.3 LSB INL
  - DAC8162 (14-bit): 1 LSB INL
  - DAC8562 (16-bit): 4 LSB INL
  - 2.5 V internal reference with 5 ppm/°C max. drift
  - Ultra-Low glitch energy 0.1 nV-sec
  - Power consumption: 0.27 mW/ch
- Wide temp range: –40°C to +125°C
- Tiny packages: 10-pin QFN (3x3mm), 10-pin MSOP (3x5mm)

Applications
- Portable instrumentation
- Closed-loop servo/process control
- Data-acquisition systems
- Programmable attenuation, digital gain and offset adjustment
- Programmable voltage/current sources

16-Bit, Octal, Low Glitch, Low Power DAC with 2 ppm/°C Temp Drift Internal Reference
DAC8568

The DAC8568 family are low power, 8-channel 12-/14-/16-bit DACs that include a 2.5 V, 2ppm/°C integrated reference, giving a full scale output voltage of 2.5 or 5 V. Outperforming the competition with DAC features such as ultra-low glitch, excellent INL, lowest power dissipation, an integrated reference with 0.004% initial accuracy and capability to source up to 20 mA at the V_{REFIN}/V_{REFOUT} pin, this family offers a powerful system solution. The DAC8568 family offers Binary Input and either Power-On-Reset to Zero or Mid-scale. These products are great for precision applications where high channel count, integration of features, small size and low power are paramount considerations.
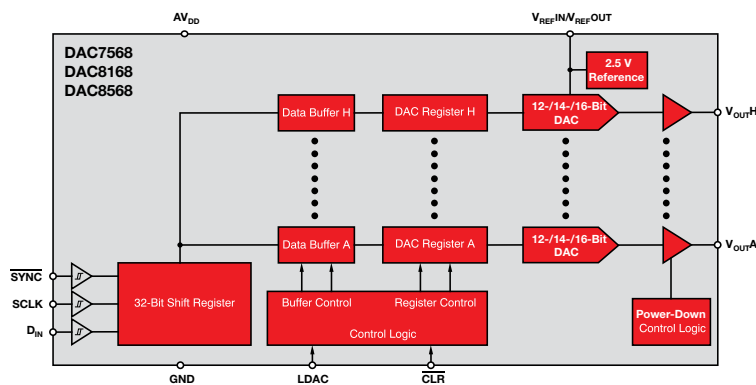
DAC8568 functional block diagram

Get more information: **www.ti.com/product/DAC8568**

Key Features
- High accuracy across temperature
  - DNL: ±0.5 LSB, INL: ±4 LSB at 16-bits
  - Low glitch energy: 0.1 nV-s typ
  - Reference drift 2 ppm/°C (typ); Wide temp range: –40°C to +105°C
- High integration in small package
  - Eight DACs in TSSOP-16/14 packages
  - Integrated reference 2.5 V
  - Power on reset to zero/mid-scale
- Available in 12/14/16-bit versions

Applications
- Automatic test equipment
- Portable instrumentation
- Precision waveform generation
- Industrial process control
- Medical equipment

Data Converters

Digital-to-Analog Converters – String and R2R DACs

Precision DACs

Device	Res. (Bits)	No. of DAC Ch.	INL (max) (±LSB)	DNL (max) (±LSB)	Mono-tonic (Bits)	Settling Time (µs) (typ)	Interface	Power (mW) (typ)	Output Type	Output Range Programmability	Output (V/mA) (min)	Output (V/mA) (max)	V_{REF}	HiRel Avail.	Package	Price*
Highest Accuracy, Low-Power DACs																
DAC9881	18	1	2	1	18	5	SPI	6	Voltage	Fixed	0	5	Ext	N	QFN-24	16.90
DAC8814	16	4	1	1	16	0.5	SPI	0.027	Current	I_{OUT}	0	2	Ext	N	SSOP-28	16.95
DAC8734	16	4	1	1	16	6	SPI	—	Voltage	$\pm V_{REF}, \pm 2\,V_{REF}, +2\,V_{REF}, +4\,V_{REF}$	−16.5	20	Ext	N	QFN-40, TQFP-48	26.95
DAC8812	16	2	1	1	16	0.5	SPI	0.027	Current	I_{OUT}	0	2	Ext	N	TSSOP-16	8.40
DAC8822	16	2	1	1	16	0.5	P16	0.027	Current	I_{OUT}	0	2	Ext	N	TSSOP-18	8.65
DAC8811	16	1	1	1	16	0.5	SPI	0.027	Current	I_{OUT}	0	2	Ext	N	MSOP-8, SON-8	7.15
DAC8820	16	1	1	1	16	0.5	P16	0.027	Current	I_{OUT}	0	2	Ext	N	SSOP-28	8.50
DAC8830	16	1	1	1	16	1	SPI	0.015	Voltage	$+V_{REF}$	0	5	Ext	Y	SOIC-8	7.95
DAC8831	16	1	1	1	16	1	SPI	0.015	Voltage	$+V_{REF}, \pm V_{REF}$	−5	5	Ext	Y	SOIC-14, QFN-14	7.95
DAC8832	16	1	1	1	16	1	SPI	0.015	Voltage	$+V_{REF}, \pm V_{REF}$	−5	5	Ext	N	QFN-14	7.95
DAC8881	16	1	1	1	16	5	SPI	6	Voltage	Fixed	0	5	Ext	N	QFN-20	8.00
DAC8803	14	4	1	1	14	0.5	SPI	0.027	Current	I_{OUT}	0	2	Ext	N	SSOP-28	12.65
DAC8802	14	2	1	1	14	0.5	SPI	0.027	Current	I_{OUT}	0	2	Ext	N	TSSOP-16	6.10
DAC8805	14	2	1	1	14	0.5	P14	0.0027	Current	I_{OUT}	0	2	Ext	N	TSSOP-38	6.11
DAC8801	14	1	1	0.5	14	0.5	SPI	0.027	Current	I_{OUT}	0	2	Ext	N	MSOP-8, SON-8	4.60
DAC8806	14	1	1	1	14	0.5	P14	0.027	Current	I_{OUT}	0	2	Ext	N	SSOP-28	5.50
DAC8806	14	1	1	1	14	0.5	P14	0.027	Current	I_{OUT}	0	2	Ext	N	SSOP-28	5.50
Industrial, Bipolar-Output DACs																
DAC8760/ 7760	16/12	1	8	1	16/12	10	SPI	125	Voltage/ Current	0-20 mA, 0-24 mA, 4-20 mA, $\pm V_{REF}, \pm 2\,V_{REF}, +2\,V_{REF}, +V_{REF}$	−11, 24mA	−11, 24mA	Int/Ext	N	QFN-40, TSSOP-24	3.99/ 2.99
DAC8750/ 7750	16/12	1	8	1	16/12	10	SPI	125	Current	0-20 mA, 0-24 mA, 4-20 mA	0	24	Int/Ext	N	QFN-40, TSSOP-24	3.50/ 2.49
DAC8718	16	8	4	1	16	10	SPI	165	Voltage	$+6\,V_{REF}, \pm 3\,V_{REF}$	−16.5	33	Ext	N	QFN-48, TQFP-64	21.95
DAC8728	16	8	4	1	16	10	P16	165	Voltage	$+6\,V_{REF}, \pm 3\,V_{REF}$	−16.5	33	Ext	N	QFN-56, TQFP-64	21.95
DAC8734	16	4	1	1	16	6	SPI	420	Voltage	$\pm V_{REF}, \pm 2\,V_{REF}, +2\,V_{REF}, +4\,V_{REF}$	−16.5	20	Ext	N	QFN-40, TQFP-48	26.95
DAC7734	16	4	2	2	16	10	SPI	50	Voltage	$+V_{REFH}, -V_{REFL}$ to $+V_{REFH}$	−10	10	Ext	N	SSOP-48	31.45
DAC7744	16	4	2	1	16	10	P16	50	Voltage	$+V_{REFH}, -V_{REFL}$ to $+V_{REFH}$	−10	10	Ext	N	SSOP-48	31.45
DAC7634	16	4	3	2	15	8	SPI	7.5	Voltage	$+V_{REFH}, -V_{REFL}$ to $+V_{REFH}$	−2.5	2.5	Ext	N	SSOP-48	19.95
DAC7644	16	4	3	2	15	8	P16	7.5	Voltage	$+V_{REFH}, -V_{REFL}$ to $+V_{REFH}$	−2.5	2.5	Ext	N	SSOP-48	19.95
DAC7654	16	4	3	1	16	12	SPI	18	Voltage	$+2.5, \pm 2.5$	−2.5	2.5	Int	N	LQFP-64	27.25
DAC7664	16	4	3	3	16	12	P16	18	Voltage	$+2.5, \pm 2.5$	−2.5	2.5	Int	N	LQFP-64	25.95
DAC8812	16	2	1	1	16	0.5	SPI	0.027	Current	I_{OUT}	0	2	Ext	N	TSSOP-16	8.40
DAC8822	16	2	1	1	16	0.5	P16	0.027	Current	I_{OUT}	0	2	Ext	N	TSSOP-38	8.65
DAC7642	16	2	3	2	15	8	P16	2.5	Voltage	$+V_{REFH}, -V_{REFL}$ to $+V_{REFH}$	−2.5	2.5	Ext	N	LQFP-32	13.19
DAC7643	16	2	3	2	15	8	P16	2.5	Voltage	$+V_{REFH}, -V_{REFL}$ to $+V_{REFH}$	−2.5	2.5	Ext	N	LQFP-32	13.19
DAC7632	16	2	3	2	15	8	SPI	2.5	Voltage	$+V_{REFH}, -V_{REFL}$ to $+V_{REFH}$	−2.5	2.5	Ext	N	LQFP-32	10.45
DAC8811	16	1	1	1	16	0.5	SPI	0.027	Current	I_{OUT}	0	2	Ext	N	MSOP-8, SON-8	7.15
DAC8820	16	1	1	1	16	0.5	P16	0.027	Current	I_{OUT}	0	2	Ext	N	SSOP-28	8.50
DAC8871	16	1	1	1	16	1	SPI	0.015	Voltage	$-V_{REFL}$ to $+V_{REFH}$	−18	18	Ext	N	SOIC-14	8.00
DAC714	16	1	1	1	16	6	SPI	525	Voltage	$+10, \pm 5, \pm 10$	−10	10	Int	N	SOIC-16	14.50
DAC712	16	1	2	1	16	6	P16	525	Voltage	± 10	−10	10	Int	N	SOIC-28, PDIP-28	14.50
DAC7731	16	1	3	3	16	5	SPI	100	Voltage	$+10, \pm 5, \pm 10, +V_{REF}$	−10	10	Int/Ext	N	SSOP-24	8.20
DAC7742	16	1	3	1	16	5	P16	100	Voltage	$+10, \pm 5, \pm 10, +V_{REF}$	−10	10	Int/Ext	N	LQFP-48	10.88

*Preview products are listed in **bold blue**.*

Data Converters
Digital-to-Analog Converters – String and R2R DACs

Precision DACs (continued)

Device	Res. (Bits)	No. of DAC Ch.	INL (max) (±LSB)	DNL (max) (±LSB)	Mono-tonic (Bits)	Settling Time (µs) (typ)	Interface	Power (mW) (typ)	Output Type	Output Range Programmability	Output (V/mA) (min)	Output (V/mA) (max)	V_REF	HiRel Avail.	Package	Price*
Industrial, Bipolar-Output DACs (continued)																
DAC7741	16	1	3	1	16	5	P16	100	Voltage	+10, ±5, ±10, +V_REF	−10	10	Int/Ext	N	LQFP-48	8.30
DAC7641	16	1	3	2	15	8	P16	1.8	Voltage	-V_REFL to + V_REFH	−2.5	2.5	Ext	N	TQFP-32	7.88
DAC7631	16	1	3	2	15	8	SPI	1.8	Voltage	-V_REFL to + V_REFH	−2.5	2.5	Ext	N	SSOP-20	5.95
DAC8580	16	1	64	1	16	0.35	SPI	200	Voltage	±V_REF	−5.5	5.5	Ext	N	TSSOP-16	1.85
DAC8581	16	1	64	0.5	16	0.35	SPI	200	Voltage	±V_REF	−5.5	5.5	Ext	N	TSSOP-16	1.85
DAC8228	14	8	2	1	14	10	P14	107	Voltage	+6 V_REF, ±3 V_REF	−16.5	33	Ext	N	QFN-56, TQFP-64	17.95
DAC8218	14	8	2	1	14	10	SPI	115	Voltage	+6 V_REF, ±3 V_REF	−16.5	33	Ext	N	QFN-48, TQFP-64	17.95
DAC8803	14	4	1	1	14	0.5	SPI	0.027	Current	I_OUT	0	2	Ext	N	SSOP-28	12.65
DAC8234	14	4	1	1	14	6	SPI	165	Voltage	±V_REF, ±2 V_REF, +2 V_REF, +4 V_REF	−16.5	20	Ext	N	QFN-48, TQFP-64	19.95
DAC8802	14	2	1	1	14	0.5	SPI	0.027	Current	I_OUT	0	2	Ext	N	TSSOP-16	6.10
DAC8805	14	2	1	1	14	0.5	P14	0.0027	Current	I_OUT	0	2	Ext	N	TSSOP-38	6.11
DAC8801	14	1	1	0.5	14	0.5	SPI	0.027	Current	I_OUT	0	2	Ext	N	MSOP-8, SON-8	4.60
DAC8806	14	1	1	1	14	0.5	P14	0.027	Current	I_OUT	0	2	Ext	N	SSOP-28	5.50
DAC7728	12	8	1	1	12	10	P12	107	Voltage	+6 V_REF, ±3 V_REF	−16.5	33	Ext	N	QFN-56, TQFP-64	11.95
DAC7718	12	8	1	1	12	10	SPI	165	Voltage	+6 V_REF, ±3 V_REF	−16.5	33	Ext	N	QFN-48, TQFP-64	11.95
DAC7716	12	4	1	1	12	6	SPI	420	Voltage	±V_REF, ±2 V_REF, +2 V_REF, +4 V_REF	−16	20	Ext	N	QFN-40, TQFP-48	10.95
DAC7614	12	4	1	1	12	5	SPI	15	Voltage	-V_REFL to + V_REFH	−2.5	2.5	Ext	N	SOIC-16, SSOP-20	6.70
DAC7615	12	4	1	1	12	5	SPI	15	Voltage	-V_REFL to + V_REFH	0	2.5	Ext	N	SOIC-16, SSOP-20	6.70
DAC7616	12	4	1	1	12	5	SPI	2.4	Voltage	-V_REFL to + V_REFH	0	1.25	Ext	N	SOIC-16, SSOP-20	5.40
DAC7617	12	4	1	1	12	5	SPI	2.4	Voltage	-V_REFL to + V_REFH	0	1.25	Ext	N	SOIC-16, SSOP-20	5.40
DAC7624	12	4	1	1	12	5	P12	15	Voltage	+V_REFH,-V_REFL to + V_REFH	−2.5	2.5	Ext	N	PDIP-28, SOIC-28	9.75
DAC7625	12	4	1	1	12	5	P12	15	Voltage	+V_REFH,-V_REFL to + V_REFH	−2.5	2.5	Ext	N	PDIP-28, SOIC-28	9.75
DAC7714	12	4	1	1	12	8	SPI	45	Voltage	-V_REFL to + V_REFH	−10	10	Ext	N	SOIC-16	11.45
DAC7715	12	4	1	1	12	8	SPI	45	Voltage	-V_REFL to + V_REFH	−10	10	Ext	N	SOIC-16	11.45
DAC7724	12	4	1	1	12	8	P12	45	Voltage	-V_REFL to + V_REFH	−10	10	Ext	N	PLCC-28, SOIC-28	11.85
DAC7725	12	4	1	1	12	8	P12	45	Voltage	-V_REFL to + V_REFH	−10	10	Ext	N	PLCC-28, SOIC-28	11.85
DAC7800	12	2	0.5	1	12	0.4	SPI	1	Current	I_OUT	0	1	Ext	N	PDIP-16, SOIC-16	13.55
DAC7801	12	2	0.5	1	12	0.4	P(8+4)	1	Current	I_OUT	0	1	Ext	N	PDIP-24, SOIC-24	20.94
DAC7802	12	2	0.5	1	12	0.4	P12	1	Current	I_OUT	0	1	Ext	N	PDIP-24, SOIC-24	14.00
DAC7822	12	2	1	1	12	0.2	P12	0.027	Current	I_OUT	0	1	Ext	N	QFN-40	3.80
DAC811	12	1	0.25	0.5	12	3	P12	625	Voltage	+10, ±5, ±10	−10	10	Int	N	CDIP SB-28, SOIC-28	11.00
DAC813	12	1	0.25	0.5	12	3	P12	270	Voltage	+10, ±5, ±10, +V_REF	−10	10	Int/Ext	N	PDIP-28, SOIC-28	12.60
DAC7811	12	1	1	1	12	0.2	SPI	0.025	Current	I_OUT	0	1	Ext	N	MSOP-10, SON-10	2.55
DAC7821	12	1	1	1	12	0.2	P12	0.027	Current	I_OUT	0	1	Ext	N	QFN-20, TSSOP-20	2.60
DAC8043	12	1	1	1	12	0.25	SPI	2.5	Current	I_OUT	0	1	Ext	N	SOIC-8	3.60
DAC7613	12	1	1	1	12	5	P12	1.8	Voltage	+V_REFH,-V_REFL to + V_REFH	−2.5	2.5	Ext	N	SSOP-24	2.50

*Suggested resale price in U.S. dollars in quantities of 1,000. See **www.ti.com/hirel** for HiRel options.

Data Converters
Digital-to-Analog Converters – String and R2R DACs

Precision DACs (continued)

Device	Res. (Bits)	No. of DAC Ch.	INL (max) (±LSB)	DNL (max) (±LSB)	Mono-tonic (Bits)	Settling Time (µs) (typ)	Interface	Power (mW) (typ)	Output Type	Output Range Programmability	Output (V/mA) (min)	Output (V/mA) (max)	V_{REF}	HiRel Avail.	Package	Price*
Industrial, Bipolar-Output DACs (continued)																
TLC7524	8	1	0.5	0.5	8	0.1	P8	5	Current	I_{OUT}	−10	10	Ext	N	SOIC-16, TSSOP-16	1.55
TLC7528	8	2	0.5	0.5	8	0.1	P8	7.5	Current	I_{OUT}	−10	10	Ext	N	SOIC-20, TSSOP-20	1.77
TLC7628	8	2	0.5	0.5	8	0.1	P8	20	Current	I_{OUT}	−10	10	Ext	N	SOIC-20, PDIP-20	1.91
Low-Power, Single-Supply DACs																
DAC715	16	1	2	1	16	6	P16	525	Voltage	Fixed	0	10	Int	N	PDIP-28, SOIC-28	19.85
DAC716	16	1	2	2	16	6	SPI	525	Voltage	Fixed	0	10	Int	N	PDIP-16, SOIC-16	19.85
DAC8411	16	1	8	2	16	6	SPI	0.1	Voltage	$+AV_{DD}$	0	5	Ext	N	SC70-6	2.90
DAC8501	16	1	64	1	16	8	SPI	0.6	Voltage	V_{+REF}	0	5	Ext	N	MSOP-8	2.97
DAC8531	16	1	64	1	16	8	SPI	0.6	Voltage	V_{+REF}	0	5	Ext	N	MSOP-8, SON-8	2.97
DAC8532	16	2	65	1	16	8	SPI	1.35	Voltage	$+V_{REF}$	0	5	Ext	N	MSOP-8	5.35
DAC8534	16	4	64	1	16	8	SPI	2.7	Voltage	$+V_{REFH}$	0	5	Ext	N	TSSOP-16	8.75
DAC8541	16	1	65	1	16	8	P16	0.6	Voltage	V_{+REF}	0	5	Ext	N	TQFP-32	3.00
DAC8544	16	4	65	1	16	8	P16	2.6	Voltage	$+V_{REFH}$	0	5	Ext	N	TQFP-48	12.20
DAC8550	16	1	8	1	16	8	SPI	0.4	Voltage	$+V_{REF}$	0	5	Ext	N	MSOP-8	2.60
DAC8551	16	1	8	1	16	8	SPI	0.4	Voltage	$+V_{REF}$	0	5	Ext	N	MSOP-8	2.60
DAC8552	16	2	8	1	16	8	SPI	0.8	Voltage	$+V_{REFH}$	0	5	Ext	N	MSOP-8	3.20
DAC8554	16	4	12	1	16	8	SPI	1.6	Voltage	$+V_{REFH}$	0	5	Ext	N	TSSOP-16	6.72
DAC8555	16	4	12	1	16	8	SPI	1.6	Voltage	$+V_{REFH}$	0	5	Ext	N	TSSOP-16	6.72
DAC8560	16	1	8	1	16	8	SPI	1.4	Voltage	$+2.5, +V_{REF}$	0	5	Int/Ext	N	MSOP-8	2.88
DAC8562	16	2	12	1	16	5	SPI	0.5	Voltage	$+2.5, +5, +V_{REF}$	0	5	Int/Ext	N	QFN-10, MSOP-10	3.40
DAC8564	16	4	8	1	16	8	SPI	2.6	Voltage	$+V_{REF}$	0	5	Int/Ext	N	TSOP-16	7.65
DAC8565	16	4	8	1	16	8	SPI	2.6	Voltage	$+V_{REF}$	0	5	Int/Ext	N	TSSOP-16	7.65
DAC8568	16	8	12	1	16	5	SPI	1.8	Voltage	$+V_{REF} +2\,V_{REF}$	0	5	Int/Ext	N	TSSOP-16	10.95
DAC8571	16	1	65	1	16	8	I²C	0.4	Voltage	V_{+REF}	0	5	Ext	N	MSOP-8	2.95
DAC8574	16	4	64	1	16	8	I²C	2.4	Voltage	$+V_{REFH}$	0	5	Ext	N	TSSOP-16	12.85
DAC161S055	16	1	3	1.1	16	5	SPI	2	Voltage	$+V_{REF}$	0.015	VA -0.04	Ext	N	LLP-16	3.55
DAC8162	14	2	3	0.5	14	5	SPI	0.5	Voltage	$+2.5, +5, +V_{REF}$	0	5	Int/Ext	N	QFN-10, MSOP-10	2.50
DAC8164	14	4	2	1	14	8	SPI	2.6	Voltage	$+V_{REF}$	0	5	Int/Ext	N	TSSOP-16	6.85
DAC8165	14	4	2	1	14	8	SPI	2.6	Voltage	$+V_{REF}$	0	5	Int/Ext	N	TSSOP-16	6.85
DAC8168	14	8	4	0.5	14	5	SPI	1.8	Voltage	$+V_{REF} +2\,V_{REF}$	0	5	Int/Ext	N	TSSOP-16, TSSOP-14	10.20
DAC8311	14	1	4	1	14	6	SPI	0.1	Voltage	$+AV_{DD}$	0	5	Ext	N	SC70-6	2.45
DAC121C081	12	1	8	0.6	12	6	I²C	0.38	Voltage	Fixed	0	VA	Supply	N	TSOT-6, LLP-6	1.15
DAC121C085	12	1	8	0.6	12	6	I²C	0.38	Voltage	$+V_{REF}$	0	V_{REF}	Ext	N	MSOP-8	1.15
DAC121S101	12	1	8	1	12	8	SPI	0.64	Voltage	Fixed	0	VA	Supply	Y	TSOT-6, MSOP-8	1.15
DAC122S085	12	2	8	0.7	12	6	SPI	0.6	Voltage	$+V_{REF}$	0	V_{REF}	Ext	N	LLP-10, MSOP-10	1.85
DAC124S085	12	4	8	0.7	12	6	SPI	1.1	Voltage	$+V_{REF}$	0	V_{REF}	Ext	N	LLP-10, MSOP-10	3.10
DAC128S085	12	8	8	0.75	12	6	SPI	1.95	Voltage	$+V_{REF}$	0	V_{REF}	Ext	N	LLP-16, TSSOP-16	5.80
DAC7311	12	1	1	1	12	6	SPI	0.2	Voltage	$+AV_{DD}$	0	5	Ext	N	SC70-6	0.95
DAC7512	12	1	8	1	12	8	SPI	0.3	Voltage	$+V_{REF}$	0	5	Ext	N	MSOP-8, SOT23-6	1.45
DAC7513	12	1	8	1	12	8	SPI	0.3	Voltage	$+V_{REF}$	0	5	Ext	N	MSOP-8, SOT23-8	1.65

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*New devices are listed in **bold red**.*

Data Converters

Digital-to-Analog Converters – String and R2R DACs

Precision DACs (continued)

Device	Res. (Bits)	No. of DAC Ch.	INL (max) (±LSB)	DNL (max) (±LSB)	Mono-tonic (Bits)	Settling Time (μs) (typ)	Interface	Power (mW) (typ)	Output Type	Output Range Programmability	Output (V/mA) (min)	Output (V/mA) (max)	V$_{REF}$	HiRel Avail.	Package	Price*
Low-Power, Single-Supply DACs (continued)																
DAC7551	12	1	1	0.5	12	5	SPI	0.3	Voltage	+V$_{REF}$	0	5	Ext	N	SON-12	1.40
DAC7552	12	2	1	0.5	12	5	SPI	0.7	Voltage	+V$_{REF}$	0	5	Ext	N	QFN-16	2.35
DAC7553	12	2	1	0.5	12	5	SPI	0.7	Voltage	+V$_{REF}$	0	5	Ext	N	QFN-16	2.94
DAC7554	12	4	1	0.5	12	5	SPI	1.5	Voltage	+V$_{REF}$	0	5	Ext	N	MSOP-10	4.80
DAC7558	12	8	1	0.5	12	5	SPI	2.7	Voltage	+V$_{REF}$	0	5	Ext	N	QFN-32	7.50
DAC7562	12	2	0.75	0.25	12	5	SPI	0.5	Voltage	+2.5,+5,+V$_{REF}$	0	5	Int/Ext	N	QFN-10, MSOP-10	2.05
DAC7564	12	4	1	0.5	12	8	SPI	2.9	Voltage	+V$_{REF}$	0	5	Int/Ext	N	TSSOP-16	4.00
DAC7565	12	4	1	0.5	12	8	SPI	2.9	Voltage	+V$_{REF}$	0	5	Int/Ext	N	TSSOP-16	4.00
DAC7568	12	8	1	0.25	12	5	SPI	1.8	Voltage	+V$_{REF}$ +2 V$_{REF}$	0	5	Int/Ext	N	TSSOP-16	8.20
DAC7571	12	1	4	—	12	8	I²C	0.3	Voltage	+V$_{REF}$	0	5	Ext	N	SOT23-6	1.55
DAC7573	12	4	8	1	12	8	I²C	1.5	Voltage	+V$_{REF}$	0	5	Ext	N	TSSOP-16	7.65
DAC7574	12	4	8	—	12	8	I²C	1.5	Voltage	+V$_{REF}$	0	5	Ext	N	MSOP-10	6.12
DAC7578	12	8	1	0.25	12	6	I²C	2.3	Voltage	+V$_{REF}$	0	5	Ext	N	TSSOP-16	5.50
DAC7611	12	1	1	1	12	7	SPI	2.5	Voltage	Fixed	0	4.1	Int	N	SON-12	2.55
DAC7612	12	2	1	1	12	7	SPI	3.5	Voltage	Fixed	−2.5	2.5	Int	N	SOIC-8	3.10
DAC7621	12	1	1	1	12	7	P12	2.5	Voltage	Fixed	−2.5	2.5	Int	N	SSOP-20	2.75
DAC7678	12	8	1	0.25	12	6	I²C	2.3	Voltage	+2.5,+V$_{REF}$	0	5	Int/Ext	N	TSSOP-16	6.00
TLV5610	12	8	6	1	12	1	SPI	18	Voltage	+V$_{REF}$	0	5	Ext	N	SOIC-20, TSSOP-20, CSP-20	10.65
TLV5630	12	8	6	1	12	1	SPI	18	Voltage	+2.048,+4.096, +2 V$_{REF}$	0	5	Int/Ext	N	SOIC-20, TSSOP-20	11.06
TLV5613	12	1	4	1	12	1	P8	1.2	Voltage	+V$_{REF}$	0	5	Ext	N	SOIC-20, TSSOP-20	3.30
TLV5614	12	4	4	1	12	3	SPI	3.6	Voltage	+V$_{REF}$	0	5	Ext	Y	SOIC-16, TSSOP-16, CSP-16	10.00
TLV5616	12	1	4	1	12	3	SPI	0.9	Voltage	+V$_{REF}$	0	5	Ext	N	VSSOP-8, SOIC-8	3.30
TLV5618A	12	2	4	1	12	2.5	SPI	1.8	Voltage	+V$_{REF}$	0	5	Ext	Y	SOIC-8, LCCC-20	5.10
TLV5619	12	1	4	1	12	1	P12	4.3	Voltage	+V$_{REF}$	0	5	Ext	Y	SOIC-20, TSSOP-20	4.10
TLV5638	12	2	4	1	12	1	SPI	4.5	Voltage	+V$_{REF}$	0	5	Int/Ext	Y	SOIC-8, CDIP-8, LCCC-20	4.65
TLV5633	12	1	3	0.5	12	1	P8	2.7	Voltage	+V$_{REF}$	0	5	Int/Ext	N	SOIC-20, TSSOP-20	5.90
TLV5639	12	1	3	0.5	12	1	P12	2.7	Voltage	+V$_{REF}$	0	5	Int/Ext	N	SOIC-20, TSSOP-20	4.35
TLV5636	12	1	4	1	12	1	SPI	4.5	Voltage	+V$_{REF}$	0	5	Int/Ext	N	SOIC-8, VSSOP-8	4.55
DAC101C081	10	1	2	0.3	10	4.5	I²C	0.38	Voltage	Fixed	0	VA	Supply	N	TSOT-6, LLP-6	0.92
DAC101C085	10	1	2	0.35	10	4.5	I²C	0.38	Voltage	+V$_{REF}$	0	V$_{REF}$	Ext	N	MSOP-8	0.92
DAC101S101	10	1	2.8	0.35	10	5	SPI	0.63	Voltage	Fixed	0	VA	Supply	N	TSOT-6, MSOP-8	0.65
DAC102S085	10	2	2	0.35	10	4.5	SPI	0.6	Voltage	+V$_{REF}$	0	V$_{REF}$	Ext	N	LLP-10, MSOP-10	1.44
DAC104S085	10	4	2	0.35	10	4.5	SPI	1.1	Voltage	+V$_{REF}$	0	V$_{REF}$	Ext	N	LLP-10, MSOP-10	2.24
DAC108S085	10	8	2	0.35	10	4.5	SPI	1.95	Voltage	+V$_{REF}$	0	V$_{REF}$	Ext	N	LLP-16, TSSOP-16	3.45
DAC6311	10	1	0.5	0.5	10	6	SPI	0.2	Voltage	+AV$_{DD}$	0	5	Ext	N	SC70-6	0.65
DAC6571	10	1	2	0.5	10	7	I²C	0.5	Voltage	+V$_{REF}$ +2 V$_{REF}$	0	5	Ext	N	SOT23-6	1.40
DAC6573	10	4	2	0.5	10	7	I²C	1.5	Voltage	+V$_{REF}$	0	5	Ext	N	TSSOP-16	3.05

Suggested resale price in U.S. dollars in quantities of 1,000. See www.ti.com/hirel for HiRel options.

Data Converters

Digital-to-Analog Converters – String and R2R DACs

Precision DACs (continued)

Device	Res. (Bits)	No. of DAC Ch.	INL (max) (±LSB)	DNL (max) (±LSB)	Mono-tonic (Bits)	Settling Time (µs) (typ)	Interface	Power (mW) (typ)	Output Type	Output Range Programmability	Output (V/mA) (min)	Output (V/mA) (max)	V_{REF}	HiRel Avail.	Package	Price*
Low-Power, Single-Supply DACs (continued)																
DAC6574	10	4	2	0.5	10	7	I²C	1.5	Voltage	+V_{REF}	0	5	Ext	N	MSOP-10	3.85
DAC6578	10	8	1	0.25	10	6	I²C	2.3	Voltage	+V_{REF}	0	5	Ext	N	QFN-24, TSSOP-16	3.90
TLV5604	10	4	1	1	10	2.5	SPI	3	Voltage	+V_{REF}	0	5	Ext	N	SOIC-16, TSSOP-16	3.70
TLV5606	10	1	1.5	1	10	3	SPI	0.9	Voltage	+V_{REF}	0	5	Ext	N	SOIC-8, MSOP-8	1.30
TLV5608	10	8	2	1	10	1	SPI	18	Voltage	+V_{REF}	0	5	Ext	N	SOIC-20, TSSOP-20, CSP-20	4.90
TLC5615	10	1	1	0.5	10	12.5	SPI	0.8	Voltage	+V_{REF}	0	5	Ext	N	PDIP-8, SOIC-8	1.90
TLV5617A	10	2	1	0.5	10	1	SPI	1.8	Voltage	+V_{REF}	0	5	Ext	N	SOIC-8	2.25
TLV5631	10	8	2	1	10	1	SPI	18	Voltage	+2.048,+4.096, L6 +2 V_{REF}	0	5	Int/Ext	N	SOIC-20, TSSOP-20	5.60
TLV5637	10	2	1	0.5	10	0.8	SPI	4.2	Voltage	+V_{REF}	0	5	Int/Ext	N	SOIC-8	3.95
DAC5311	8	1	0.25	0.25	8	6	SPI	0.2	Voltage	+AV_{DD}	0	5	Ext	Y	SC70-6	0.55
DAC5571	8	1	1	0.25	8	6	I²C	0.3	Voltage	+V_{REF}	0	5	Ext	N	SOT23-6	0.90
DAC5573	8	4	0.5	0.25	8	6	I²C	1.5	Voltage	+V_{REF}	0	5	Ext	N	TSSOP-16	2.55
DAC5574	8	4	0.5	0.25	8	6	I²C	1.5	Voltage	+V_{REF}	0	5	Ext	N	MSOP-10	2.55
DAC5578	8	8	1	0.25	8	6	I²C	2.3	Voltage	+V_{REF}	0	5	Ext	N	QFN-24, TSSOP-16	3.00
TLC5620	8	4	1	0.9	8	10	SPI	8	Voltage	+V_{REF} +2 V_{REF}	0	5	Ext	N	PDIP-14, SOIC-14	1.75
TLC5628	8	8	1	0.9	8	10	SPI	15	Voltage	+V_{REF}	0	5	Ext	N	PDIP-16, SOIC-16	2.45
TLC7225	8	4	1	1	8	5	P8	75	Voltage	+V_{REF}	−5	10	Ext	N	SOIC-24	2.35
TLC7226	8	4	1	1	8	5	P8	90	Voltage	+V_{REF}	−5	10	Ext	Y	PDIP-20, SOIC-20	2.15
TLV5620	8	4	1	0.9	8	10	SPI	6	Voltage	+V_{REF} +2 V_{REF}	0	5	Ext	N	PDIP-14, SOIC-14	1.00
TLV5621	8	4	1	0.9	8	10	SPI	3.6	Voltage	+V_{REF} +2 V_{REF}	0	5	Ext	N	SOIC-14	2.10
TLV5623	8	1	0.5	0.2	8	3	SPI	2.1	Voltage	+V_{REF}	0	5	Ext	N	SOIC-8, MSOP-8	0.99
TLV5624	8	1	0.5	0.2	8	1	SPI	5	Voltage	+V_{REF}	0	5	Int/Ext	N	SOIC-8, MSOP-8	1.60
TLV5625	8	2	0.5	0.2	8	3	SPI	2.4	Voltage	+V_{REF}	0	5	Ext	N	SOIC-8	1.70
TLV5626	8	2	1	0.5	8	0.8	SPI	4.2	Voltage	+V_{REF}	0	5	Int/Ext	N	SOIC-8	1.90
TLV5627	8	4	0.5	0.5	8	2.5	SPI	3	Voltage	+V_{REF}	0	5	Ext	N	SOIC-16, TSSOP-16	2.05
TLV5628	8	8	1	0.9	8	10	SPI	12	Voltage	+V_{REF}	0	5	Ext	N	PDIP-16, SOIC-16	2.20
TLV5629	8	8	1	1	8	1	SPI	18	Voltage	+V_{REF} +2 V_{REF}	0	5	Ext	N	SOIC-20, TSSOP-20	3.15
TLV5632	8	8	1	1	8	1	SPI	18	Voltage	+2.048, +4.096, +2 V_{REF}	0	5	Int/Ext	N	SOIC-20, TSSOP-20	4.20
DAC081C081	8	1	0.6	0.1	8	3	I²C	0.38	Voltage	Fixed	0	VA	Supply	N	TSOT-6, LLP-6	0.72
DAC081C085	8	1	0.6	0.1	8	3	I²C	0.38	Voltage	+V_{REF}	0	V_{REF}	Ext	N	MSOP-8	0.72
DAC081S101	8	1	0.75	0.1	8	3	SPI	0.63	Voltage	Fixed	0	VA	Supply	N	TSOT-6, MSOP-8	0.55
DAC082S085	8	2	0.5	0.18	8	3	SPI	0.6	Voltage	+V_{REF}	0	V_{REF}	Ext	N	LLP-10, MSOP-10	0.86
DAC084S085	8	4	0.5	0.18	8	3	SPI	1.1	Voltage	+V_{REF}	0	V_{REF}	Ext	N	LLP-10, MSOP-10	1.08
DAC088S085	8	8	0.5	0.15	8	3	SPI	1.95	Voltage	+V_{REF}	0	V_{REF}	Ext	N	LLP-16, TSSOP-16	1.89

*Suggested resale price in U.S. dollars in quantities of 1,000. See www.ti.com/hirel for HiRel options.

New devices are listed in **bold red.**

Data Converters
Digital-to-Analog Converters – Current Steering DACs

Quad-Channel, 16-Bit, 1.5 GSPS DAC
DAC34SH84

The DAC34SH84 is a very low-power, high-dynamic range, quad-channel, 16-bit digital-to-analog converter (DAC) with a sample rate as high as 1.5 GSPS. The device includes features that simplify the design of complex transmit architectures: 2× to 16× digital interpolation filters with over 90 dB of stop-band attenuation simplify the data interface and reconstruction filters. Independent complex mixers allow flexible carrier placement. The DAC34SH84 low-power, high-bandwidth support, superior crosstalk, high dynamic range, and features are an ideal fit for next-generation communication systems.

In addition, the DAC34H84, DAC3484 and DAC3482 16-bit dual and quad-channel DACs offer sample rates up to 1.25 GSPS. Learn more about the entire portfolio of TI's current steering DACs at **www.ti.com/dataconverters.**

Key Features
- Low power
- Multi-DAC synchronization
- Selectable 2×, 4×, 8×, 16× interpolation filter
- Flexible on-chip complex mixing
- High-performance, low-jitter clock-multiplying PLL
- Digital I and Q correction
- Digital inverse sinc filters
- 32-bit DDR flexible LVDS input data bus
- Differential scalable output: 10 mA to 30 mA
- 196-ball, 12-mm × 12-mm BGA

Applications
- Cellular base stations
- Diversity transmit
- Wideband communications
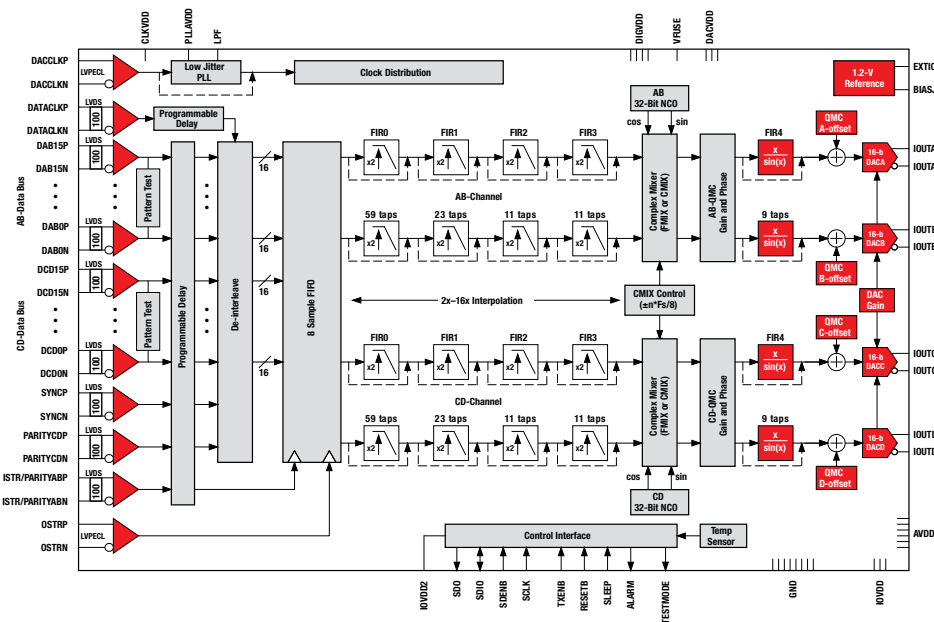
DAC34SH84 functional block diagram

Get more information: **www.ti.com/product/DAC34SH84**

Data Converters

Digital-to-Analog Converters – Current Steering DACs

Current Steering DACs

Device	Res. (Bits)	Supply (V)	Update Rate (MSPS)	Settling Time (ns)	Number of DACs	Power (mW) (typ)	DNL (±LSB) (max)	INL (±LSB) (max)	HiRel Avail.	Package	Price*
DAC3482	16	1.2/3.3	1250	10.1	2	800	2	4	Y	QFN-88, BGA-196	29.95
DAC3484	16	1.2/3.3	1250	10.1	4	1200	2	4	Y	QFN-88, BGA-196	58.60
DAC34H84	16	1.2/3.3	1250	10.1	4	1400	2	4	Y	BGA-196	60.00
DAC34SH84	16	1.3/3.3	1500	10.1	4	1480	2	4	Y	BGA-196	78.00
DAC5681	16	1.8/3.3	1000	10.4	1	650	2	4	N	QFN-64	27.50
DAC5681Z	16	1.8/3.3	1000	10.4	1	800	2	4	N	QFN-64	30.95
DAC5682Z	16	1.8/3.3	1000	10.4	2	1300	2	4	N	QFN-64	31.95
DAC5688	16	1.8/3.3	800	11	2	1750	2	4	N	QFN-64	29.95
DAC5681	16	1.8/3.3	1000	10.4	1	650	2	4	N	QFN-64	27.50
DAC5681Z	16	1.8/3.3	1000	10.4	1	800	2	4	N	QFN-64	30.95
DAC5682Z	16	1.8/3.3	1000	10.4	2	1300	2	4	N	QFN-64	31.95
DAC5688	16	1.8/3.3	800	11	2	1750	2	4	N	QFN-64	29.95
DAC5689	16	1.8/3.3	800	11	2	1750	2	4	N	QFN-64	28.95
DAC3283	16	1.8/3.3	800	10.4	2	1150	2	4	N	QFN-48	26.95
DAC3282	16	1.8/3.3	625	10.4	2	950	2	4	N	QFN-48	24.95
DAC5687	16	1.8/3.3	500	12	2	750	4	4	Y	HTQFP-100	22.50
DAC5686	16	1.8/3.3	500	12	2	450	9	12	N	HTQFP-100	19.75
DAC5670	14	1.8/3.3	2400	—	1	2000	0.8	1.5	Y	BGA-252	45.00
DAC3174	14	1.8/3.3	500	10	2	460	0.5	1	N	QFN-48	18.90
DAC5675	14	3	400	5	1	820	2	4	Y	HTQFP-48	29.45
DAC5672A	14	3.0 to 3.6	275	20	2	330	3	4	Y	TQFP-48	13.25
DAC904	14	3.0 to 5.0	165	30	1	170	1.75	2.5	N	SOP-28, TSSOP-28	6.25
DAC2904	14	3.3 to 5.0	125	30	2	310	4	5	N	TQFP-48	20.19
DAC3164	12	1.8/3.3	500	10	2	460	0.20	0.5	N	QFN-64	12.60
DAC3162	12	1.8/3.3	500	10	2	270	0.25	0.5	N	QFN-48	12.60
DAC5674	12	1.8/3.3	400	20	1	420	2	3.5	N	HTQFP-48	15.00
DAC5662A	12	3.0 to 3.6	275	20	2	330	2	2	Y	TQFP-48	10.70
DAC902	12	3.0 to 5.0	165	30	1	170	1.75	2.5	N	SOP-28, TSSOP-28	6.25
THS5661A	12	3.0 to 5.0	125	35	1	175	2	4	N	SOP-28, TSSOP-28	6.25
DAC2902	12	3.3 to 5.5	125	30	2	310	2.5	3	N	TQFP-48	15.41
DAC2932	12	2.7 to 3.3	40	25	2	29	0.5	2	N	TQFP-48	7.95
DAC3154	10	1.8/3.3	500	10	2	460	0.04	0.15	N	QFN-64	9.15
DAC3152	10	1.8/3.3	500	10	2	270	0.1	0.25	N	QFN-48	9.15
DAC5652A	10	3.0 to 3.6	275	20	2	290	1	0.5	Y	TQFP-48	7.60
DAC900	10	3.0 to 5.0	165	30	1	170	0.5	1	Y	SOP-28, TSSOP-28	4.25
THS5651A	10	3.0 to 5.0	125	35	1	175	0.5	1	N	SOP-28, TSSOP-28	4.25
DAC2900	10	3.3 to 5.5	125	30	2	310	1	1	N	TQFP-48	6.00
DAC908	8	3.0 to 5.0	165	30	1	170	0.5	0.5	N	SOP-28, TSSOP-28	2.90
THS5641A	8	3.0 to 5.0	100	35	1	100	0.5	1	N	SOP-28, TSSOP-28	2.90
TLC5602	8	4.75 to 5.25	30	30	1	80	0.5	0.5	N	SOP-20	1.55

Device	Res. (Bits)	Sample- Rate (MSPS)	No. of Input Channels	Input Voltage (V)	Analog Input Bandwidth (MHz)	DNL (± LSB)	INL (± LSB)	SNR (dB)	SFDR (dB)	Supply Voltage (V)	Power (mW)	HiRel Avail.	Package	Price*
AFE7070	14	65	2	NA	99 - 2700	NA	NA	—	—	3.6, 3.0	390	N	QFN-48	23.72
AFE7071	14	65	2	NA	100 - 2700	NA	NA	—	—	3.6, 3.0	334.0	N	QFN-48	11.86
AFE7222/5	12	130, 250	2	2	550	0.50	0.2	76	84	3.6, 3.0	557	N	QFN-64	19.50

*Suggested resale price in U.S. dollars in quantities of 1,000. See www.ti.com/hirel for HiRel options.

*Preview products are listed in **bold blue.***

Data Converters
Digital-to-Analog Converters – Digital Potentiometers

256-Tap Dual Potentiometer with I²C Interface in Industry's Smallest Package

PREVIEW

TPL0102-100

The TPL0102-100 is a two channel, linear-taper digital potentiometer with 256 wiper positions and 100 kΩ end-to-end resistance. Each potentiometer can be used as a three-terminal potentiometer or as a two-terminal rheostat. It has non-volatile memory which can be used to store the wiper position which is loaded within 300 µs after power up. The internal registers of the TPL0102-100 can be accessed using the I²C interface. The TPL0102-100 has a nominal temperature coefficient of 35 ppm/°C. It is available in industry's smallest 14-pin microQFN as well as 14-pin TSSOP package with a specified temperature range of -40°C to +85°C.
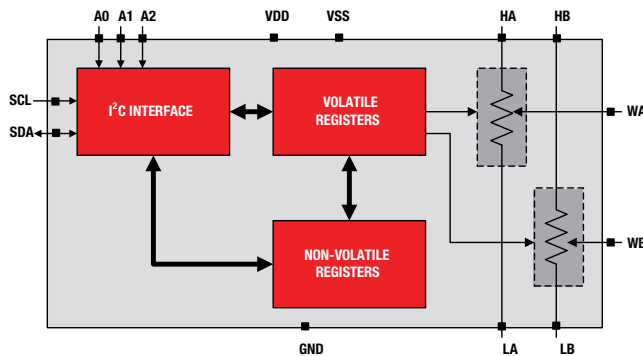
TPL0102 functional block diagram

Get more information: **www.ti.com/product/TPL0102-100**

Key Features
- Accuracy and speed
  - Low temp coefficient: 35 ppm/°C
  - ±20% resistance tolerance
  - Fast power-up response time to wiper setting: <300 µs
- Usage flexibility
  - Programmable nonvolatile memory
  - 2.7 V to 5.5 V single-supply operation
  - ±2.25 V to ±2.75 V dual-supply operation
  - 10 kΩ, 50 kΩ, 100 kΩ end-to-end resistance
  - Operating temperature –40°C to +85°
- Industry's smallest package
  - 14-pin microQFN (2 x 2 mm)
  - 14-pin TSSOP

Applications
- Adjustable power supplies
- Adjustable gain amps and offset trimming
- Precision calibration of set point thresholds
- Sensor trimming and calibration
- Mechanical potentiometer replacement

256-Tap Dual Potentiometer with SPI Interface in Industry's Smallest Package

TPL0202-10

The TPL0202-10 is a two channel, linear-taper digital potentiometer with 256 wiper positions and 100 kΩ end-to-end resistance. Each potentiometer can be used as a three-terminal potentiometer or as a two-terminal rheostat. It has non-volatile memory which can be used to store the wiper position which is loaded within 300 µs after power up. The internal registers of the TPL0202-10 can be accessed using the SPI™ interface. The TPL0102-10 has a nominal temperature coefficient of 35 ppm/°C. It is available in industry's smallest 14-pin microQFN as well as 16-pin QFN package with a specified temperature range of -40°C to +85°C.
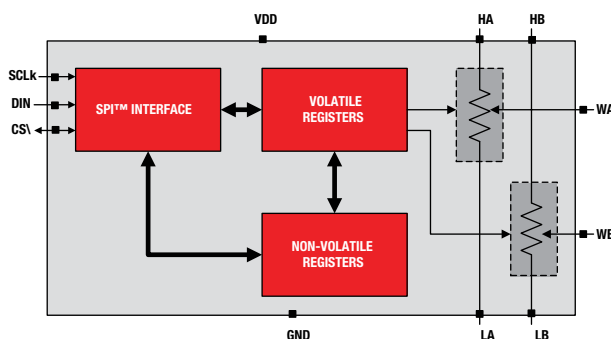
TLP0202 functional block diagram

Get more information: **www.ti.com/product/TPL0202-10**

Key Features
- Accuracy and speed
  - Low temp coefficient: 35 ppm/°C
  - ±20% resistance tolerance
  - Fast power-up response time to wiper setting: <300 µs
- Usage flexibility
  - Programmable nonvolatile memory
  - 2.7-V to 5.5-V single-supply operation
  - ±2.25-V to ±2.75-V dual-supply operation
  - 10 kΩ end-to-end resistance
  - Operating temperature –40°C to +85°
- Industry's smallest package
  - 14-pin microQFN (2 x 2 mm)
  - 16-pin QFN

Applications
- Adjustable power supplies
- Adjustable gain amps and offset trimming
- Precision calibration of set point thresholds
- Sensor trimming and calibration
- Mechanical potentiometer replacement

Data Converters
Integrated ADCs and DACs

Integrated, Multichannel ADC and DAC for Analog Monitoring & Control
AMC7812

The AMC7812 is a complete analog monitoring and control solution that includes a 16-channel, 12-bit analog-to-digital converter (ADC), twelve 12-bit digital-to-analog converters (DACs), eight GPIOs, and two remote/one local temperature sensor channels.

The AMC7812 has an internal reference of +2.5 V that can configure the DAC output voltage to a range of either 0 V to +5 V or 0 V to +12.5 V. An external reference can be used as well. Typical power dissipation is 95 mW. The AMC7812 is ideal for multichannel applications where board space, size, and low power are critical.
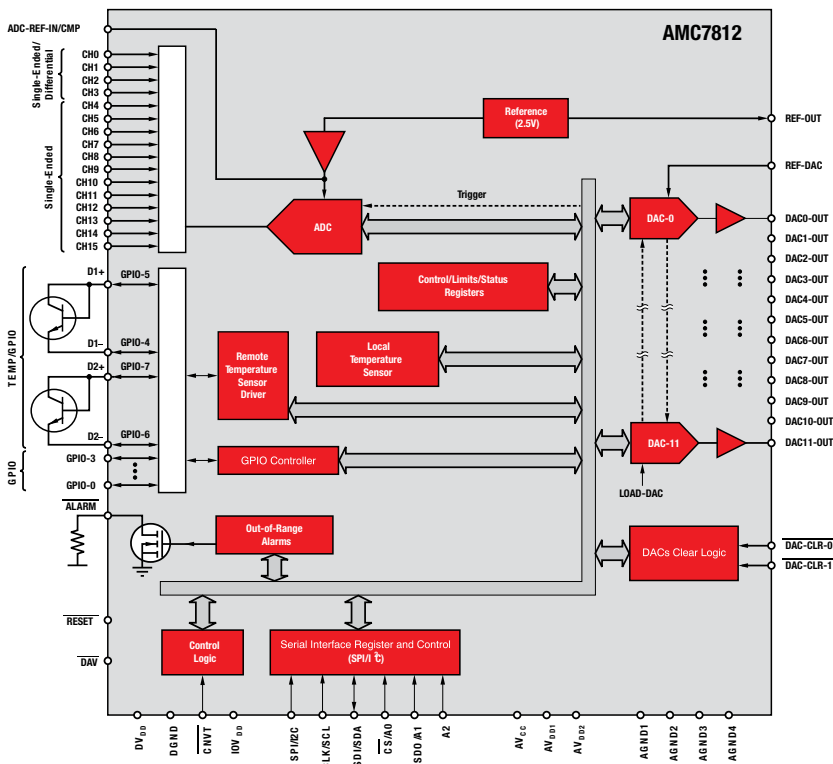
Key Features
- 12, 12-bit DACs with programmable outputs
- DAC shutdown to user-defined level
- 12-bit, 500 kSPS ADC with 16 inputs
- Two remote temperature sensors and one internal temperature sensor
- Input out-of-range alarms
- 2.5 V internal reference
- Eight general-purpose input/outputs
- Configurable I^2C-compatible/SPI interface with 5-V/3-V logic
- Power-down mode
- Wide temperature range: −40°C to +105°C
- Small packages: 9 mm × 9 mm QFN-64, and 10 mm × 10 mm HTQFP-64

Applications
- Telecom shelter: filter unit
- General purpose analog and monitoring

AMC7812 functional block diagram

Get more information: **www.ti.com/product/AMC7812**

Integrated ADCs and DACs: Analog Monitoring and Control Devices

Device	ADC/ DAC Res (Bits)	No. ADC Inputs	No. DAC Outputs	ADC Sample-Rate (Ksps)	ADC Input Range (V)	DAC Output Voltage - (max) (V)	Number of Local and Remote Temp Sensors	No. of GPIOs	Interface	Additional Features	HiRel Avail.	Package	Price*
AMC7820	12	8 SE	3	100	0 to 5	+5 V	None/None	None	SPI	9 Op Amps, Thermistor Current Source	N	TQFP-48	4.70
AMC7823	12	8 SE	8	200	0 to 5	+5 V	1/None	6	SPI	Precision Current Source	N	QFN-40	6.00
AMC7812	12	(16 SE) or (12 SE, 2 DE)	12	500	−5 to 5	+5 V/+12.5 V	1/2	8	SPI or I^2C	Out-of-Range Alarms	N	QFN-64	9.95
AMC7891	10	8 SE	4	500	0 to 5	+5V	1/None	12	SPI	Out-of-Range Alarms	N	QFN-36	4.50
LMP92001	12	16	12	100	0 to 5	0 to 5	1/None	8	I^2C	Out-of-Range Alarms	N	LLP-54 (SQA54AB)	9.00
LMP92018	10	8	4	500	0 to 5	0 to 5	1/None	12	SPI	Integrated Reference	N	LLP36 (SQA36A)	3.60

*Suggested resale price in U.S. dollars in quantities of 1,000. See **www.ti.com/hirel** for HiRel options. All parts have a built-in internal reference.

Data Converters
Analog Front Ends—Sensor AFEs

Multi-Channel, Low-Power 24-Bit Sensor AFE with True Continuous Background Calibration
LMP90100

The LMP90100 is a highly integrated, multi-channel, low-power 24-bit sensor AFE. The device features a precision, 24-bit Sigma Delta Analog-to-Digital Converter (ADC) with a low-noise programmable gain amplifier and a fully differential high impedance analog input multiplexer. A true continuous background calibration feature allows calibration at all gains and output data rates without interrupting the signal path. The background calibration feature essentially eliminates gain and offset errors across temperature and time, providing measurement accuracy without sacrificing speed and power consumption.
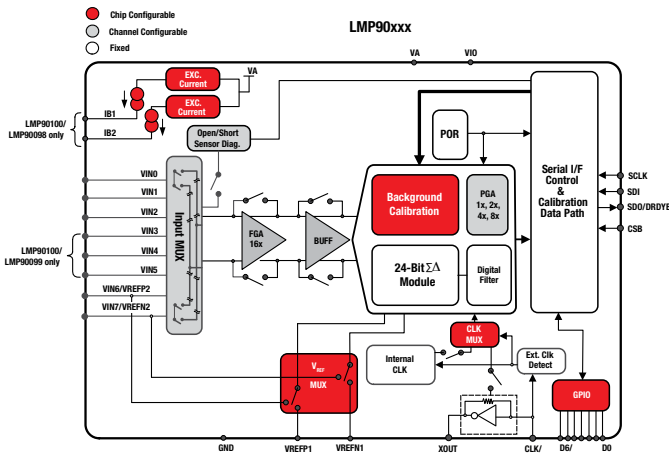
LMP90100 functional block diagram

Get more information: **www.ti.com/product/LMP90100**

Key Features
- 24-bit low-power Sigma Delta ADC
- True continuous background calibration at all gains
- In-place system calibration using expected value programming
- Low-noise programmable gain (1x - 128x)
- Continuous background open/short and out of range sensor diagnostics
- Eight output data rates (ODR) with single-cycle settling
- Two matched excitation current sources from 100 µA to 1000 µA
- Seven general purpose input/output pins
- Chopper-stabilized buffer for low offset
- SPI 4/3-wire with CRC data link error detection
- 50 to 60 Hz line rejection at ODR ≤13.42 SPS
- Independent gain and ODR selection per channel
- Supported by WEBENCH® sensor AFE designer
- Automatic channel sequencer

Applications
- Field transmitter—pressure and temperature sensors
- Medical equipment
- Programmable logic controller

Digital Sensor AFEs

Device	Description	ADC Res. (Bits)	Sample Rate (ksps)	Input Chs.	Supply Voltage Range (V)	Supply Current (mA)	Temp. Range (°C)	Current Sources	Calib-ration	HiRel Avail.	Package	Price*
LMP90100	Multi-Channel, Low Power 24-Bit Sensor AFE with True Continuous Background Calibration	24	0.215	7	2.85 to 5.5	0.4	−40 to 125	Y	Y	N	TSSOP-28	3.33
LMP90097	Multi-Channel, Low Power 24-Bit Sensor AFE with True Continuous Background Calibration	24	0.215	4	2.85 to 5.5	0.4	−40 to 125	N	Y	N	TSSOP-28	3.17
LMP90098	Multi-Channel, Low Power 24-Bit Sensor AFE with True Continuous Background Calibration	24	0.215	4	2.85 to 5.5	0.4	−40 to 125	Y	Y	N	TSSOP-28	3.01
LMP90099	Multi-Channel, Low Power 24-Bit Sensor AFE with True Continuous Background Calibration	24	0.215	7	2.85 to 5.5	0.4	−40 to 125	N	Y	N	TSSOP-28	2.86
LMP90077	Multi-Channel, Low-Power 16-Bit Sensor AFE with True Continuous Background Calibration	16	0.215	4	2.85 to 5.5	0.4	−40 to 125	N	Y	N	TSSOP-28	2.33
LMP90078	Multi-Channel, Low-Power 16-Bit Sensor AFE with True Continuous Background Calibration	16	0.215	4	2.85 to 5.5	0.4	−40 to 125	Y	Y	N	TSSOP-28	2.45
LMP90079	Multi-Channel, Low-Power 16-Bit Sensor AFE with True Continuous Background Calibration	16	0.215	7	2.85 to 5.5	0.4	−40 to 125	N	Y	N	TSSOP-28	2.58
LMP90080	Multi-Channel, Low Power 16-Bit Sensor AFE with True Continuous Background Calibration	16	0.215	7	2.85 to 5.5	0.4	−40 to 125	Y	Y	N	TSSOP-28	2.72

Analog Sensor AFEs

Device	Description	ADC Res. (Bits)	Sample Rate (ksps)	Input Chs.	Supply Voltage Range (V)	Supply Current (mA)	Temp. Range (°C)	Package	Price*
LMP91000	Configurable AFE Potentiostat for Low-Power Chemical Sensing Applications	1	2.7 to 5.25	0.01	−40 to 85	Y	N	LLP-14	2.80
LMP91050	Configurable AFE for NDIR Based Sensors	1	2.7 to 5.5	3.7	−40 to 105	N	N	MSOP-10	1.32
LMP91051	Configurable AFE for NDIR Sensing Applications	2	2.7 to 5.5	3.6	−40 to 105	—	N	TSSOP-14	1.45
LMP91200	Configurable AFE for Low-Power pH Sensing Applications	1	1.8 to 5.5	0.05	−40 to 125	Ext	N	TSSOP-16	3.90
LMP91002	Configurable AFE Potentiostat for Zero-Bias Sensing Applications	1	2.7 to 3.6	0.01	−40 to 85	N	N	LLP-14	1.80

*Suggested resale price in U.S. dollars in quantities of 1,000. See **www.ti.com/hirel** for HiRel options.

*New products are listed in **bold red.***

Data Converters
Analog Front Ends – Medical

Complete Low Power Integrated Analog Front End for ECG Applications

NEW

ADS1293

The ADS1293 incorporates all features commonly required in portable, low-power medical, sports, and fitness electrocardiogram (ECG) applications. With high levels of integration and exceptional performance, the ADS1293 enables the creation of scalable medical instrumentation systems at significantly reduced size, power, and overall cost. The ADS1293 delivers a solution that can extend battery life, simplify product design and improve overall performance.
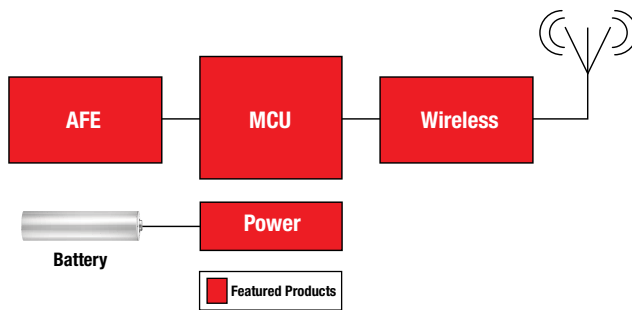
ADS1293 diagram

Key Features
- Three high resolution digital ECG channels with simultaneous pace output
- EMI hardened inputs
- Low power: 0.3 mW/channel
- Input-referred noise: 7 µVpp (40 Hz bandwidth)
- Input bias current: 175 pA
- Data rate: up to 25.6 ksps
- Differential input voltage range: ±400 mV
- Analog supply voltage: 2.7 V to 5.5 V
- Digital I/O supply voltage: 1.65 V to 3.6 V

Applications
- Low-power medical, sports, and fitness electrocardiogram (ECG) applications

Get more information: **www.ti.com/product/ADS1293**

Low-Noise, 8-Channel, 24-Bit Analog Front-End for Biopotential Measurements

NEW

ADS1299

The ADS1299 is a low-noise, multichannel, simultaneous-sampling, 24-bit, delta-sigma (ΔΣ) analog-to-digital converter (ADC) with a built-in programmable gain amplifier (PGA), internal reference, and an onboard oscillator. The ADS1299 incorporates all commonly-required features for electroencephalogram (EEG) applications. With its high levels of integration and exceptional performance, the ADS1299 enables the creation of scalable medical instrumentation systems at significantly reduced size, power, and overall cost.
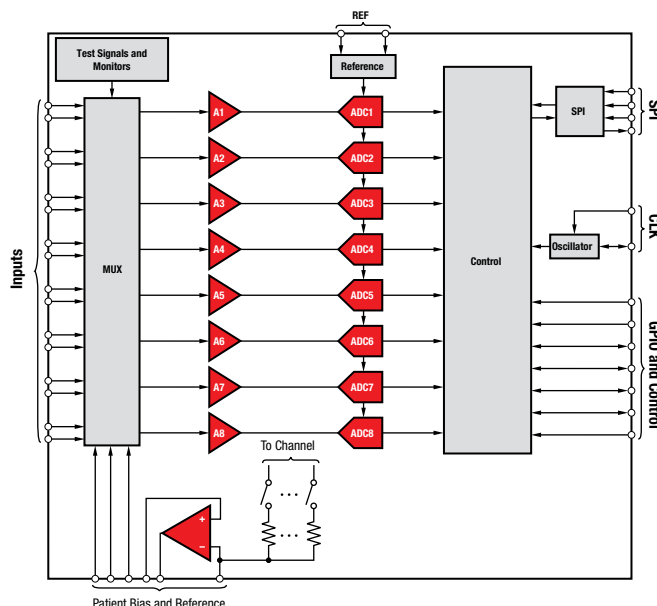
ADS1299 functional diagram

Key Features
- Eight low-noise PGAs and eight high-resolution simultaneous-sampling ADCs
- Very low input-referred noise:
- 1.0 µVPP (70-Hz BW)
- Low power: 5 mW/channel
- Input bias current: 300 pA
- Data rate: 250 SPS to 16 kSPS
- CMRR: –110 dB
- Programmable gain: 1, 2, 4, 6, 8, 12, or 24
- Built-in oscillator

Applications
- Electroencephalogram (EEG) applications

Get more information: **www.ti.com/product/ADS1299**

Data Converters
Analog Front Ends – Medical

Analog Front Ends for Ultrasound

Device	Channels	Integration	Power	Noise	ADC SNR	Package	Price*
AFE5808	8	LNA+VCA+LPF+ADC+ CW	136 mW/Ch at 40 MSPS	0.75 nV/√Hz	77 dBFS	135-pin, 15x9mm	68.00
AFE5807	8	LNA+VCA+LPF+ADC+ CW	88 mW/Ch at 40 MSPS	1.1 nV/√Hz	74 dBFS	135-pin, 15x9mm	62.00
AFE5805	8	LNA+VCA+LPF+ADC	122 mW/Ch at 40 MSPS	0.85 nV/√Hz	70 dBFS	135-pin, 15x9mm	56.00
AFE5804	8	LNA+VCA+LPF+ADC	101 mW/Ch at 40 MSPS	1.23 nV/√Hz	69 dBFS	135-pin, 15x9mm	58.00
AFE5801	8	VCA+LPF+ADC	58 mW/Ch at 50 MSPS	5.0 nV/√Hz (without LNA)	66 dBFS	64-pin, 9x9mm	52.00
AFE5851	16	VCA+LPF+ADC	39 mW/Ch at 32.5 MSPS	5.0 nV/√Hz (without LNA)	66 dBFS	64-pin, 9x9mm	92.00

Suggested resale price in U.S. dollars in quantities of 1,000.

Biopotential Sensing (ECG/EEG) Delta-Sigma ADCs

Device	Res. (Bits)	Sample-Rate (kSPS)	Number of Input Channels	Interface	Input-Referred Noise (µVpp)	Common Mode Rejection (dB)	Power (mW)	HiRel Avail.	Package	Price*
ADS1299	24	16	8 Diff	Serial SPI	1	120	41	N	TQFP-64	36.00
ADS1298	24	32	8 Diff	SPI	4	115	6	N	BGA-64, TQFP-64	23.95
ADS1298R	24	32	8 Diff	SPI	4	115	6	Y	BGA-64, TQFP-64	23.95
ADS1296	24	32	6 Diff	SPI	4	115	5.1	N	BGA-64, TQFP-64	17.95
ADS1296R	24	32	6 Diff	SPI	4	115	5.1	Y	BGA-64, TQFP-64	17.95
ADS1294	24	32	4 Diff	SPI	4	115	3.6	N	BGA-64, TQFP-64	11.95
ADS1294R	24	32	4 Diff	SPI	4	115	3.6	Y	BGA-64, TQFP-64	11.95
ADS1293	24	25.6	3 Diff	SPI	7	100	0.9	N	WQFN-28	5.50
ADS1292	24	8	2	Serial SPI	8	120	0.7	N	TQFP-32, VQFN-32	3.50
ADS1292R	24	8	2	Serial SPI	8	120	0.7	Y	TQFP-32, VQFN-32	3.50
ADS1291	24	8	1	Serial SPI	8	120	0.35	N	TQFP-32, VQFN-32	2.00
ADS1198	16	8	8 Diff	SPI	12	100	4.5	N	BGA-64, TQFP-64	8.00
ADS1196	16	8	6 Diff	SPI	12	100	3.9	N	BGA-64, TQFP-64	11.95
ADS1194	16	8	4 Diff	SPI	12	100	3	N	BGA-64, TQFP-64	15.95
ADS1191	16	8	1	Serial SPI	24	95	0.335	N	TQFP-32, VQFN-32	1.50
ADS1192	16	8	2	Serial SPI	24	95	0.67	N	TQFP-32, VQFN-32	2.50

Suggested resale price in U.S. dollars in quantities of 1,000. All parts have a built-in internal reference.   *New products are listed in **bold red.***

Embedded Processors with Integrated ADCs

Device	ADC Channels	ADC Resolution	ADC Sample-Rate	Max Speed	Flash	ROM	RAM	Standby Current	Active Current	MAX GPIO	Timers	PWM	Price*
MSP430™													
MSP430G2131	8	10	200	16	1	0	0.125	0.5	0.22	10	2	2	0.49
MSP430F1122	5	10	200	8	4	0	0.25	0.7	0.2	14	2	3	1.65
MSP430F5505	8	10	200	25	16	0	6	2.6	0.16	31	5	18	1.75
MSP430F5510	12	10	200	25	32	0	6	2.6	0.16	47	5	18	1.90
MSP430F2272	12	10	200	16	32	0	1	0.5	0.27	32	3	6	2.20
MSP430F233	8	12	200	16	8	0	1	0.3	0.27	48	3	6	2.15
MSP430F2410	8	12	200	16	56	0	4	0.3	0.27	48	3	10	4.60
MSP430F5524	12	12	200	25	64	0	6	2.6	0.16	47	5	18	3.55

Suggested resale price in U.S. dollars in quantities of 1,000.

Data Converters
Analog Front Ends – Medical

Embedded Processors with Integrated ADCs (continued)

Device	ADC Channels	ADC Resolution	ADC Sample-Rate	Max Speed	Flash	ROM	RAM	Standby Current	Active Current	MAX GPIO	Timers	PWM	Price*
MSP430™ (continued)													
MSP430F5525	16	12	200	25	64	0	6	2.6	0.16	63	5	18	3.66
MSP430F2013	4	16	4	16	2	0	0.125	0.5	0.22	10	2	2	1.20
MSP430F478	5	16	32	8	48	0	2	1.1	0.28	48	3	6	5.00
MSP430F47176	6	16	32	16	92	0	8	1.1	0.35	68	3	6	5.90
MSP430F47187	7	16	32	16	116	0	8	1.1	0.35	68	3	6	7.55
TMS320C2000™													
TMS320F28021	13	12	2000	40	64	0	10	N/A	N/A	22	9	1	2.20
TMS320F28027	13	12	4600	60	64	0	12	N/A	N/A	22	9	1	2.85
TMS320F28022	13	12	3800	50	32	0	12	N/A	N/A	22	9	1	2.25
TMS320F280200	13	12	2000	40	16	0	6	N/A	N/A	22	8	0	1.85
TMS320F28235	16	12	12500	150	512	0	68	N/A	N/A	88	16	6	14.55
TMS320F2809	16	12	12500	100	256	0	36	N/A	N/A	35	14	4	12.95
TMS320F28035	16	12	4600	60	128	0	20	N/A	N/A	45	12	1	4.41
TMS320F28232	16	12	12500	100	128	0	52	N/A	N/A	88	14	4	12.88
TMS320F28031	16	12	2000	60	64	0	16	N/A	N/A	45	12	1	2.97
TMS320F2806	16	12	6250	100	64	0	20	N/A	N/A	35	14	4	8.70
TMS320F28015	16	12	3750	60	32	0	12	N/A	N/A	35	10	2	3.25
Tiva™ C Series													
TM4C1230	12	12	1000	80	32-256	0	12-32	N/A	N/A	49	2	0	3.27
TM4C1231	22	12	1000	80	32-256	0	12-32	N/A	N/A	69	2	0	3.44
TM4C1233	12	12	1000	80	32-256	0	12-32	N/A	N/A	43	2	0	4.35
TM4C1232	12	12	1000	80	32-256	0	12-32	N/A	N/A	49	2	0	4.35
TM4C1237	12	12	1000	80	32-256	0	12-32	N/A	N/A	43	2	0	4.41
TM4C1236	12	12	1000	80	32-256	0	12-32	N/A	N/A	49	2	0	4.41
TM4C123B	12	12	1000	80	128-256	0	32	N/A	N/A	43	2	16	3.40
TM4C123A	12	12	1000	80	128-256	0	32	N/A	N/A	49	2	16	3.40
TM4C123G	12	12	1000	80	128-256	0	32	N/A	N/A	43	2	16	4.52
TM4C123F	12	12	1000	80	128-256	0	32	N/A	N/A	49	2	16	4.52
ARM® Cortex® R4													
TMS570LS10106	24	12	1000	160	1024	0	128	N/A	N/A	114	32	32	20.46
TMS570LS10116	24	12	1000	160	1024	0	128	N/A	N/A	114	32	32	21.26
TMS570LS10206	24	12	1000	160	1024	0	160	N/A	N/A	114	32	32	20.66
TMS570LS10216	24	12	1000	160	1024	0	160	N/A	N/A	114	32	32	21.46
TMS570LS20206	24	12	1000	160	2048	0	160	N/A	N/A	114	32	32	23.16
TMS570LS20216	24	12	1000	160	2048	0	160	N/A	N/A	114	32	32	23.96

Suggested resale price in U.S. dollars in quantities of 1,000.

Stepper Pre-Driver with On-chip 1/256 Micro-Stepping Indexer and Stall Detect

NEW

DRV8711

The DRV8711 is a pre-driver IC for bipolar stepper motor drive applications. It provides four half bridge gate drivers, each capable of driving two external N-channel MOSFETs, one for the high side and one for the low side. It supports up to 400 mA sink and 200 mA source peak current output. The on-chip micro-stepping indexer supports step modes from full to 1/256-step. Advanced current regulation techniques, including auto mixed decay mode enable ultra smooth and quiet motion profiles. The motor back EMF is monitored and system controller alerted when a stall occurs. Step/direction, PWM, or SPI control options allows for easy interfacing to controller circuits. A SPI serial interface is used to program the device operation. Output current (torque), step mode, decay mode, and stall detection functions are all programmable via a SPI serial interface. Internal shutdown functions/protection is provided for over-current, short circuit, under-voltage lockout, gate drive over-current and over-temperature events.

Key Features
- Stepper gate driver with 8 to 52 V supply voltage and 200 mA gate current
- Step/Direction, PWM, or SPI control options
- 1/256 micro-step on-chip indexer
- SPI management I/F for programmability
- Advanced current regulation with programmable fixed time off, banking time, and mixed decay ratio
- Supports slow, fast, mixed, and auto-mixed decay modes
- Stall detect with optional back EMF output signal
- Fully protected with over current, thermal, shoot-through, UVLO, and gate drive over-current protection

Applications
- Textile MFG equipment
- Factory automation & robotics
- Video security cameras
- Automatic teller machines (ATM)
- Stage lighting

* Expected release date: Q2 2013
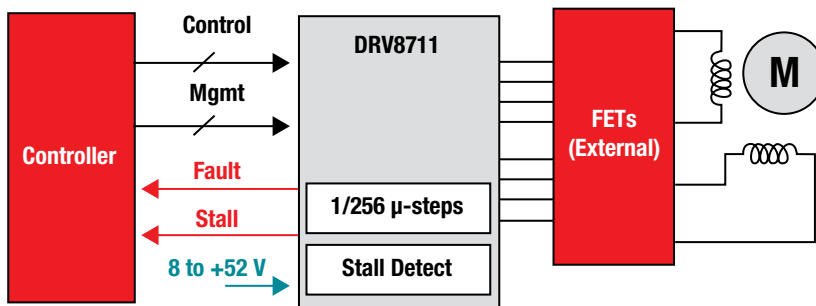
DRV8711 functional block diagram

Get more information: **www.ti.com/product/DRV8711**

Monitoring and Control
Motor Drivers

5 A Brushed DC or Quad 1.75 A Solenoid/Relay Driver with Split Rail Support
DRV8844

NEW

The DRV8844 provides four individually controllable 1/2-H-bridge drivers. It can be used to drive two DC motors, one stepper motor, four solenoids, or other loads. It supports both high side or low side switching when driving solenoids with the non-switching FET acting as the catch diode. The output driver channel for each channel consists of N-channel power MOSFET's configured in a 1/2-H-bridge configuration. The DRV8844 can supply up to 2.5-A peak or 1.75-A RMS output current per channel (with proper PCB heatsinking at 24 V and 25°C) per H-bridge. Separate inputs to independently control each 1/2-H-bridge are provided. To allow operation with split supplies, the logic inputs and nFAULT output are referenced to a separate floating ground pin. Internal shutdown functions/protection is provided for over-current, short circuit, under-voltage lockout and over-temperature events.

Key Features
- Quad half H-Bridge motor driver with 8 to 60 V supply voltage
- ±30 V split-rail support with floating "control" inputs
- Up to 1.75 A continuous/2.5 A peak output current per half bridge
- PWM control interface with independent enables
- 480 mΩ $R_{DS(ON)}$ (HS + LS) improves thermal performance
- On-chip 3.3 V LDO (10 mA)
- Integrated protection features including over-current, thermal, shoot-through, and UVLO protection

Applications
- Textile machines
- Factory automation
- Robotics
- Solenoid / Relay drivers
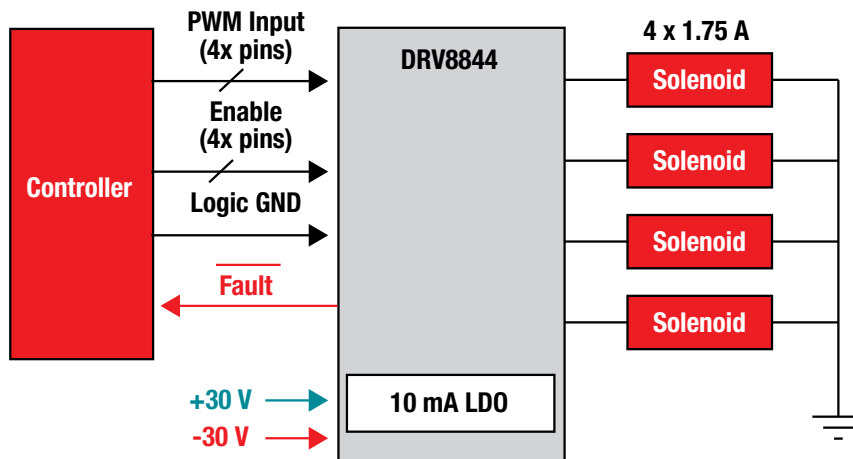
DRV8844 functional block diagram

Get more information: **www.ti.com/product/DRV8844**

Monitoring and Control
Motor Drivers

Industry's Smallest 1.8 A Brushed DC Motor Driver
DRV8837

NEW

The DRV8837 is an integrated motor driver IC for brushed DC motor drive applications. The output driver block consists of N-channel power MOSFETs configured as an H-bridge to drive the motor winding. An internal charge pump generates needed gate-drive voltages. The DRV8837 can supply up to 1.8 A of output current. It operates on a motor power-supply voltage of 1.8 V to 11 V, a device power-supply voltage of 1.8 V to 7 V and supports up to 6 stack alkaline or 2-stack Li-ion battery pack applications. Low R_{DSON} and ultra low sleep current help extend battery life. The DRV8837 has a PWM (IN/IN) input interface, which is compatible with industry-standard devices. Internal shutdown functions/protection is provided for over-current, short-circuit, under-voltage lockout and ove-temperature events.

Key Features
- Single H-Bridge motor driver with 1.8 to 11 V supply voltage
- Split V_m/V_{cc} supplies improve performance and prevent battery voltage drop from tripping UVLO
- Up to 1.8 A continuous/1.8 A peak output current
- 280 mΩ $R_{DS(ON)}$ (HS + LS) and ultra-low 35 nA sleep current extend battery life
- Robust short circuit, thermal, shoot-through, and UVLO protection
- Tiny 8-pin WSON (2.0 x 2.0 mm) package
- Easy-to-use evaluation module and design-in documentation

Applications
- Toys
- E-locks
- Smart meters (gas and water)
- Battery powered consumer products
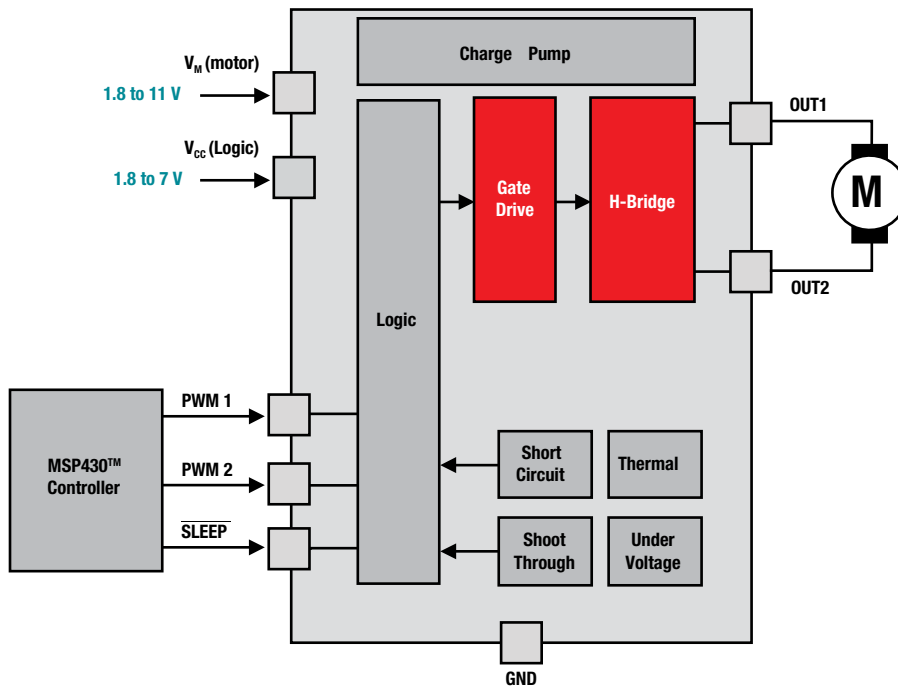
DRV8837 functional block diagram

Get more information: **www.ti.com/product/DRV8837**

Monitoring and Control
Motor Drivers

Stepper Motor Controller IC
DRV8825

The DRV8825 provides an integrated motor driver solution for printers, scanners and other automated equipment applications. The device has two H-bridge drivers and can drive a Bipolar stepper motor. Each of the output driver block consists of N-channel power MOSFET configured as full H-bridges to drive the motor windings. The DRV8825 can supply up to 2.5 A peak or 1.75 A RMS output current (with proper heatsinking at 24 V and 25°C).

Key Features
- PWM microstepping motor driver
  - Built-in microstepping indexer supports up to 32 microsteps
  - Supports slow, fast, and mixed decay modes
- 2.5 A maximum drive current at 24 V, 25°C
- 8 V to 45 V operating supply voltage range
- Advanced on-chip protection
  - Over-current
  - Thermal
  - Under-voltage

Applications
- Automatic teller machines
- Money handling machines
- Video security cameras
- Printers
- Scanners
- Office automation machines
- Gaming machines
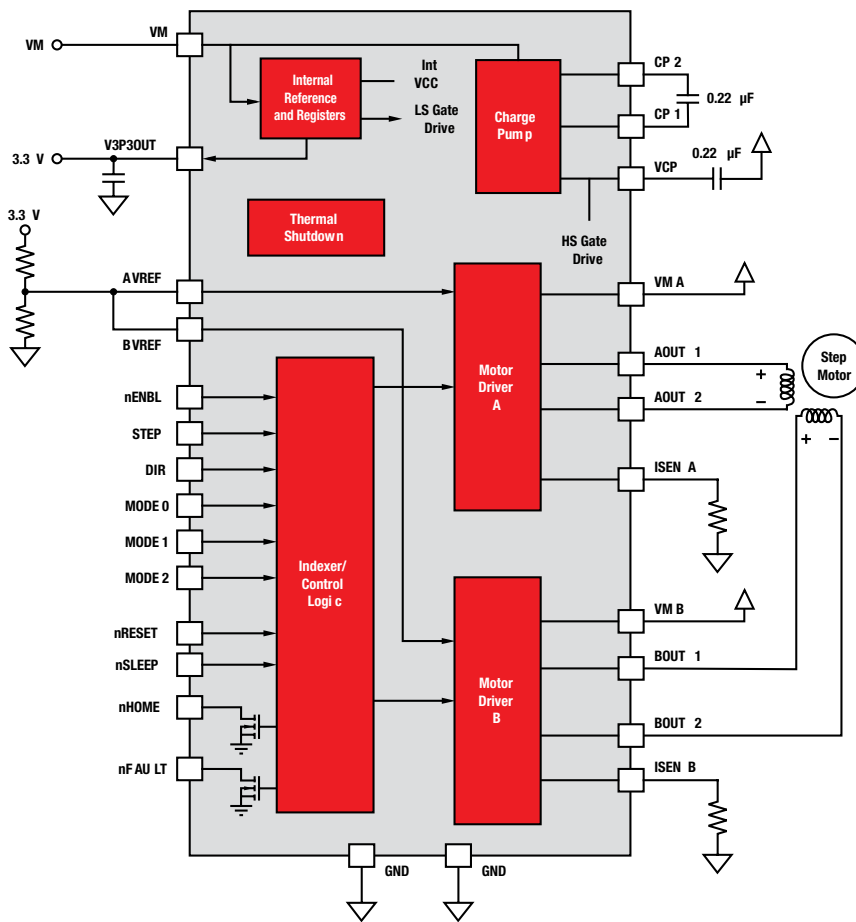
DRV8825 functional block diagram

Get more information: **www.ti.com/product/DRV8825**

Monitoring and Control
Motor Drivers

DRV8x Motor Drivers

Device	Description	Supply Voltage (V)	I_{OUT} Cont. (A)	I_{OUT} Peak (A)	Control Interface	Drives Solenoids	Price*
Stepper Motors							
DRV8412	6-A High-Performance Stepper Driver	0 to 52	3	6	PWM	Yes (4x)	3.85
DRV8432	12-A High-Performance Stepper Driver	0 to 52	7	12	PWM	Yes (4x)	5.50
DRV8812	1.6-A Stepper Driver (P2P w/8813)	8 to 45	1.1	1.6	Phase/Enable	No	1.65
DRV8813	2.5-A Stepper Driver (P2P w/8812)	8 to 45	1.75	2.5	Phase/Enable	No	2.25
DRV8823	Dual 1.5-A Stepper Driver	8 to 32	1.5	1.5	Serial	No	2.00
DRV8828	3-A Stepper Driver (Need 2x per Motor)	8 to 45	2.1	3	Phase/Enable	No	1.65
DRV8829	5-A Stepper Driver (Need 2x per Motor)	8 to 45	3.5	5	Phase/Enable	No	2.25
DRV8842	5-A Stepper Driver (Need 2x per Motor)	8 to 45	3.5	5	PWM	Yes (2x)	2.25
DRV8843	2.5-A Stepper Driver	8 to 45	1.75	2.5	PWM	No	2.25
Indexers (On-chip microstepping support)							
DRV8711	Stepper Pre-Driver with Stall Detect (256 Microsteps)	8 to 52	Ext FETs	Ext FETs	Indexer, PWM or SPI	No	2.75
DRV8811	1.9-A Stepper Driver (8 Microsteps) (P2P w/8818)	8 to 38	1.4	1.9	Indexer	No	1.80
DRV8818	2.5-A Stepper Driver (8 Microsteps) (P2P w/8811)	8 to 35	1.75	2.5	Indexer	No	2.25
DRV8821	Dual 1.5-A Stepper Driver (8 Microsteps)	8 to 32	1.5	1.5	Indexer	No	2.00
DRV8824	1.6-A Stepper Driver (32 Microsteps) (P2P w/8825)	8 to 45	1.1	1.6	Indexer	No	1.65
DRV8825	2.5-A Stepper Driver (32 Microsteps) (P2P w/8824)	8 to 45	1.75	2.5	Indexer	No	2.40
Unipolar Stepper Drivers							
DRV8803	2-A Unipolar Stepper Driver	8 to 60	2	2	PWM	Yes (4x)	1.40
DRV8804	2-A Unipolar Stepper Driver	8 to 60	2	2	Serial	Yes (4x)	1.40
DRV8805	2-A Unipolar Stepper Driver w/Indexer	8 to 60	2	2	Indexer	Yes (4x)	1.40
DRV8806	2-A Unipolar Stepper Driver w/Open Load Detect	8 to 40	2	2	Serial	Yes (4x)	1.50
Low-Voltage Stepper Drivers							
DRV8833	2-A Stepper Driver	2.7 to 10.8	1.5	2	PWM	No	0.95
DRV8834	2.2-A Stepper Driver (32 Microsteps)	2.5 to 10.8	1.5	2.2	Indexer or Phase/Enable	No	1.15
DRV8835	1.5-A Stepper Driver w/Dual Supplies	2.0 to 11	1.5	1.5	PWM or Phase/Enable	No	0.70
DRV8836	1.5-A Stepper Driver	2.0 to 7	1.5	1.5	PWM or Phase/Enable	No	0.70
Brushed DC Motors							
DRV8301	Pre-Driver with 1.5-A Step-Down Voltage Regulator and Dual Current-Sense Amps (SPI Control)	8 to 60	Ext FETs	Ext FETs	PWM	No	2.50
DRV8302	Pre-Driver with 1.5-A Step-Down Voltage Regulator and Dual Current-Sense Amps (H/W Control)	8 to 60	Ext FETs	Ext FETs	PWM	No	2.50
DRV8412	12-A High-Performance Brushed DC Driver	0 to 52	6	12	PWM	Yes (4x)	3.85
DRV8432	24-A High-Performance Brushed DC Driver	0 to 52	14	24	PWM	Yes (4x)	5.50
DRV8800	2.8-A Brushed DC Driver	8 to 36	1.5	2.8	Phase/Enable	No	1.25
DRV8801	2.8-A Brushed DC Driver w/Current-Sense Pin	8 to 36	1.5	2.8	Phase/Enable	No	1.25
DRV8840	5-A Brushed DC Driver	8 to 45	3.5	5	Phase/Enable	No	2.25
DRV8842	5-A Brushed DC Driver	8 to 45	3.5	5	PWM	Yes (2x)	2.25
DRV8844	5-A Brushed DC Driver w/Split Supply Support (+30/–30)	8 to 60	3.5	5	PWM	Yes (4x)	2.50
Dual/Quad Brushed Drivers							
DRV8412	Dual 6-A High-Performance Brushed DC Driver	0 to 52	3	6	PWM	Yes (4x)	3.85
DRV8432	Dual 12-A High-Performance Brushed DC Driver	0 to 52	7	12	PWM	Yes (4x)	5.50
DRV8802	Dual 1.6-A Brushed DC Driver (P2P w/8814)	8 to 45	1.1	1.6	Phase/Enable	No	1.65
DRV8814	Dual 2.5-A Brushed DC Driver (P2P w/8802)	8 to 45	1.75	2.5	Phase/Enable	No	2.25
DRV8823	Quad 1.5-A Brushed DC Driver	8 to 32	1.5	1.5	Serial	No	2.00
DRV8843	Dual 2.5-A Brushed DC Driver	8 to 45	1.75	2.5	PWM	No	2.25
DRV8844	Dual 2.5-A Brushed DC Driver w/Split Supply Support (+30/–30)	8 to 60	1.75	2.5	PWM	Yes (4x)	2.50

*Suggested resale price in U.S. dollars in quantities of 1,000.

Preview products are listed in **bold blue**. New products are listed in **bold red**.

Monitoring and Control
Motor Drivers

DRV8x Motor Drivers (continued)

www.ti.com/motor

Device	Description	Supply Voltage (V)	I_OUT Cont. (A)	I_OUT Peak (A)	Control Interface	Drives Solenoids	Price*
Brushed DC Motors (continued)							
Low-Voltage Brushed Drivers							
DRV8830	1-A Brushed DC Driver w/on-Chip Speed Regulation	2.75 to 6.8	1	1	IN/IN	No	0.85
DRV8832	1-A Brushed DC Driver w/on-Chip Speed Regulation	2.75 to 6.8	1	1	Serial	No	0.85
DRV8833	Dual 2-A or Single 4-A Brushed DC Driver	2.7 to 10.8	3	4	PWM	No	0.95
DRV8835	Dual 1.5-A or Single 3-A Brushed DC Driver w/Dual Supplies	2.0 to 11	3	3	PWM or Phase/Enable	No	0.70
DRV8836	Dual 1.5-A or Single 3-A Brushed DC Driver	2.0 to 7	3	3	PWM or Phase/Enable	No	0.70
DRV8837	1.8-A Brushed DC Driver w/Dual Supplies	1.8 to 11	1.8	1.8	PWM	No	0.45
DRV8839	1.8 A Low Voltage Dual Half-Bridge Driver with Individual Control Interface	1.8 to 11	1.8	1.8	PWM	No	0.50
3-Phase Brushless Motors							
DRV8301	Pre-Driver with 1.5-A Step-Down Voltage Regulator and Dual Current-Sense Amps (SPI Control)	8 to 60	Ext FETs	Ext FETs	PWM	No	2.50
DRV8302	Pre-Driver with 1.5-A Step-Down Voltage Regulator and Dual Current-Sense Amps (H/W Control)	8 to 60	Ext FETs	Ext FETs	PWM	No	2.50
DRV8303	3-Phase Brushless Motor Pre-Driver with Dual Current Sense Amps (SPI Ctrl)	8 to 60	Ext FETs	Ext FETs	PWM	No	TBD
DRV8308	3-Phase Brushless Motor Controller with Speed Loop (Hall Sensored)	8.5 to 32	Ext FETs	Ext FETs	PWM/SPI/CLK	No	TBD
DRV8312	6.5-A High-Performance 3-Phase Driver	0 to 52	3.5	6.5	PWM	Yes (3x)	3.30
DRV8813	2.5-A 3-3-Phase Driver w/10-mA LDO	8 to 60	1.75	2.5	PWM	Yes (3x)	TBD
DRV8332	13-A High-Performance 3-Phase Driver	0 to 52	8	13	PWM	Yes (3x)	4.70

*Suggested resale price in U.S. dollars in quantities of 1,000.

Preview products are listed in **bold blue.** New products are listed in **bold red.**

Monitoring and Control
Haptic Drivers

DRV2667 Industry's Most Highly Integrated Piezo Haptic Driver
DRV2667

Haptics is a technology that makes use of motor vibrations to create tactile response in electronics, providing feedback that you can feel in addition to what you see and hear. TI's DRV2667 is a highly integrated piezo haptic driver featuring advanced digital interface, configurable boost converter and high voltage amplifier. Unlike competing devices, the DRV2667 does not require a large, expensive transformer, making it the industry's smallest complete single-chip solution for piezo haptic waveform generation. High-voltage drive technology combined with ultra-small solution size make the DRV2667 ideal for systems requiring the best possible tactile feedback experience.

Key Features
- High-voltage differential amplifier generates up to 200 Vpp output allowing support of a wide range of piezo actuators
- 15 V to 105 V boost converter eliminates the need for external components and a transformer
- Digital interface, integrated memory and 2-ms startup allow faster response time and a more realistic experience
- Complete single-chip solution for high-voltage piezo haptics saves board space and cost
- Piezo haptics enables the highest fidelity "HD" haptic experience for a wide range of products such as smartphones, tablets, white goods and automotive applications

Applications
- Smartphones
- Tablets
- E-readers
- Mouse/touch pads
- Remote controls
- White goods
- Gaming machines
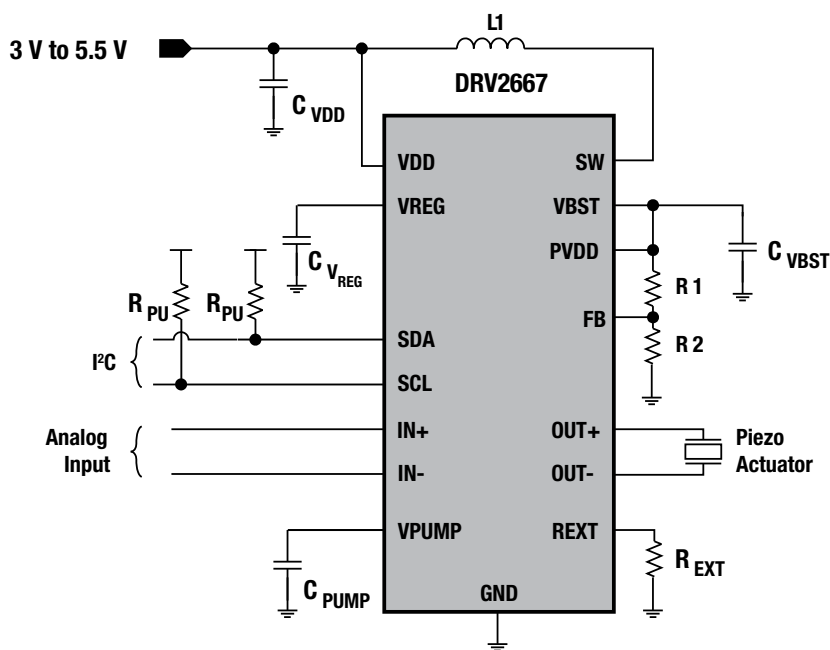
DRV2667 functional block diagram

Get more information: **www.ti.com/product/DRV2667**

Monitoring and Control
Haptic Drivers

Haptic Drivers Deliver Unmatched Performance and 123 Royalty-Free Haptic Effects
DRV2604/5

Haptics has been popular in gaming and mobile phones and TI's DRV2604/5 ERM/LRA haptic drivers make it easy to integrate haptics into any touch-enabled consumer or industrial application. Enhancing the user experience presents a number of design challenges, including software programming, system diagnostics, motor calibration and haptic effect generation. The DRV2604/5 are truly differentiated solutions that address these challenges and simplify system design.

DRV2604/5 functional block diagram

Get more information: **www.ti.com/product/DRV2605**

Key Features
- DRV2605 is the industry's first ERM/LRA haptic driver with 123 pre-loaded, royalty-free distinct haptic effects designed and licensed by Immersion
- Audio-to-haptics mode in DRV2605 automatically converts audio from music, movies or games into haptic effects allowing users to feel and fully experience audio and video content
- Smart Loop architecture
  - Automatic overdriving and braking simplifies software programming and reduces startup and braking time by 50%
  - Automatic resonance tracking for the LRA delivers 2x the vibration force at half the power of competitive solutions
  - Automatic actuator diagnostics and level tracking delivers consistent acceleration over a range of environmental conditions
- Industry's smallest form factor (1.5 mm^2)

Applications
- Smartphones
- Tablets
- E-readers
- Mouse/touch pads
- Remote controls
- White goods

Haptic Drivers

Device	Description	V_{OUT} (Max) (V)	Input Signal	I_Q (Typ) (mA)	Startup Time (ms)	Haptic Actuator Type	V_S (Max) (V)	V_S (Min) (V)	Operating Temp Range (ºC)	Package	Price*
DRV2667	Piezo Haptic Driver with Boost, Digital Front End, and Internal Waveform Memory	200	I²C, PWM, Analog	0.13	2	Piezo	5.5	3	−40 to 85	QFN-20	2.95
DRV2604	Haptic Driver for ERM/LRA with Waveform Memory and Smart Loop Architecture	5.5	I²C, PWM, Analog	0.6	0.7	ERM, LRA	5.5	2.5	−40 to 85	9DSBGA	1.15
DRV2605	Haptic Driver for ERM/LRA with Built-In Library and Smart Loop Architecture	5.5	I²C, PWM, Analog	—	0.7	ERM, LRA	5.5	2.5	−40 to 85	9DSBGA	1.60
DRV2603	Haptic Driver with Auto Resonance Tracking for LRA and Optimized Drive for ERM	—	PWM, Analog	1.5	1.3	ERM, LRA	5.2	2.5	−40 to 85	QFN-10	0.70
DRV2665	Piezo Haptic Driver with Integrated Boost Converter and Digital Front End	200	I²C, PWM, Analog	5	2	Piezo	5.5	3	−40 to 70	QFN-20	2.50
DRV8662	Piezo Haptic Driver with Integrated Boost Converter	100	PWM, Analog	5	1.5	Piezo	5.5	3	−40 to 70	QFN-20	1.75
DRV8601	400 mA Fully Differential Motor Driver with 1.8-V Input Logic Thresholds	5.5	PWM, Analog	1.7	0.1	ERM, LRA	5.5	2.5	−40 to 85	BGA-8 MICROSTAR JUNIOR™, SON-8	0.48

Suggested resale price in U.S. dollars in quantities of 1,000.

Monitoring and Control
Touch-Screen Controllers

Resistive Single Touch Screen Controller with Integrated Haptics Driver
TSC2011

The TSC2011 is a very low power touch screen controller designed to work with a low cost four-wire resistive touch sensor but also includes a comprehensive set of haptic feedbacks to provide a complete human machine interface. Unlike other competing solutions that rely on a simple, one way "trigger" mechanism, the haptic controller and touch screen controller work side-by-side to ensure consistent haptic effect and touch detection. This synchronized operation minimizes the skew between detection and feedback, reducing system power consumption. Other advanced features include a bandwidth saving preprocessing, integrated H-bridge to drive actuator and GPO pins may be used for an IR proximity circuit. These make the TSC2011 a perfect device for low cost consumer applications that can benefit from many new bidirectional human machine interactions such as touch, gaming, and supplemental effects of ring tone.

Key Features
- Advanced four-wire touch screen interface
- Preprocessing to reduce bus activity
- Integrated haptic feedback control
- High-speed I²C-compatible interface
- Register-based programmable
- Low power design
- Enhanced IEC ESD protection

Applications
- Smart phones, MP3, PMPs, games
- Portable industrial/medical instruments, POS
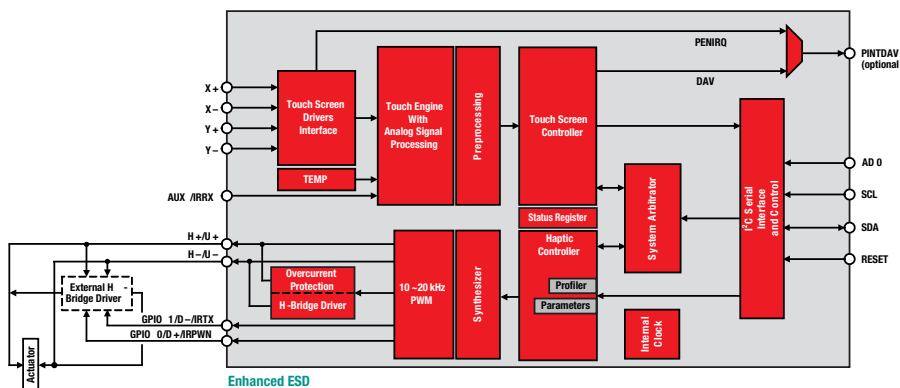
TSC2011 functional block diagram

Get more information: **www.ti.com/product/TSC2011**

Non-Audio Touch-Screen Controllers

Device	Touch Panel	Res. (Bits)	Interface	Features	ESD	V_REF	Supply Voltage (V)	Power Consumption (mW)	HiRel Avail.	Package	Price*
ADS7843	4-Wire	12 (8)	Serial, SPI	X, Y, AUX	2 KV	Ext	2.7 to 5.25	1.8	N	SSOP-16	1.70
ADS7845	5-Wire	12 (8)	Serial, SPI	X, Y, AUX	2 KV	Ext	2.7 to 5.25	1.8	N	SSOP-16	4.20
ADS7846	4-Wire	12 (8)	Serial, SPI	X, Y, Pressure, V_BAT, Temp, AUX	2 KV	Int	2.7 to 5.25	1.8	N	SSOP-16, QFN-16 TSSOP-16, BGA-48	2.05
TSC2003	4-Wire	12 (8)	Serial, I²C	X, Y, Pressure, V_BAT, Temp, AUX	2 KV A, 2 KV C	Int	2.7 to 5.25	1.8	N	TSSOP-16	2.25
TSC2004	4-Wire	12 (10)	Serial, I²C	Processor, X, Y, Pressure, Temp, AUX	18 KV A, 15 KV C	Ext	Analog: 1.2 to 3.6, V_{I/O}: 1.2 to 3.6	0.075 (typ) Std 0.6, (typ) Enhanced	N	2.5 x 2.5 WCSP-18, QFN-20	2.00
TSC2005	4-Wire	12 (10)	Serial, SPI	Processor, X, Y, Pressure, Temp, AUX	18 KV A, 15 KV C	Ext	Analog: 1.6 to 3.6, V_{I/O}: 1.2 to 3.6	0.075 (typ) Std 0.6, (typ) Enhanced	N	2.5 x 3.0 WCSP-18	2.20
TSC2006	4-Wire	12 (10)	Serial, SPI	Processor, X, Y, Pressure, Temp, AUX	18 KV A, 15 KV C	Ext	Analog: 1.2 to 3.6, V_{I/O}: 1.2 to 3.6	0.075 (typ) Std 0.6, (typ) Enhanced	N	QFN-20	1.90
TSC2007	4-Wire	12 (8)	Serial, I²C	Processor, X, Y, Pressure, Temp, AUX	25 KV A, 15 KV C	V_DD	1.2 to 3.6	0.04 (typ)	N	1.5 x 2.0 WCSP-12, TSSOP-16	1.75
TSC2008	4-Wire	12 (8)	Serial, SPI	Processor, X, Y, Pressure, Temp, AUX	25 KV A, 15 KV C	V_DD	1.2 to 3.6	0.04 (typ)	N	1.5 x 2.0 WCSP, QFN-16	1.75
TSC2014	4-Wire	12 (10)	Serial, I²C	Processor, X, Y, Pressure, Temp, AUX	18 KV A, 15 KV C	Ext	Analog: 1.2 to 3.6, V_{I/O}: 1.2 to 3.6	0.075 (typ) Std 0.6, (typ) Enhanced	N	2.5 x 2.5 WCSP-18, QFN-20	2.00
TSC2046	4-Wire	12 (8)	Serial, SPI	X, Y, Pressure, V_BAT, Temp, AUX	2 KV A, 2 KV C	Int	Analog: 2.2 to 5.25, V_{I/O}: 1.5 to 5.25	1.8	Y	TSSOP-16, QFN-16, BGA-48	1.95
TSC2046E	4-Wire	12 (8)	Serial, SPI	X, Y, Pressure, V_BAT, Temp, AUX	18 KV A, 15 KV C	Int	Analog: 2.2 to 5.25, V_{I/O}: 1.5 to 5.25	0.7	N	TSSOP-16, QFN-16, BGA-48	2.20
TSC2017	4-Wire	12	Serial, I²C	Processor, X, Y, Pressure, Temp, AUX	25 KV A, 15 KV C	V_DD	1.6 to 3.6	37 µW	N	1.6 mm x 1.6 mm WCSP	1.95

*Suggested resale price in U.S. dollars in quantities of 1,000. See **www.ti.com/hirel** for HiRel options.*

Monitoring and Control
Pulse-Width Modulation

Sensor Signal Conditioning IC for Closed-Loop Magnetic-Current Sensor
DRV411

PREVIEW

The DRV411 is designed for conditioning InSb Hall Elements for use in closed loop current sensor modules. It provides precision excitation circuitry for the hall-element effectively eliminating the offset and offset-drift of the hall element. It also provides a 250 mA H-Bridge for driving the sensor's compensation coil as well a precision differential amplifier to generate the output signal. The 250 mA drivecapability of the H-Bridge enables roughly doubling the current measurement range compared with conventional single-ended drive methods.

The Hall-Element Amplifier and also the differential amplifier employ proprietary offset cancelling techniques. This, along with a high accuracy voltage reference, significantly improves the accuracy of the overall current sensor module. The output voltage is pin-selectable to support 2.5 V output for use with 5 V power supply as well as 1.65 V for 3.3 V sensors.

Key Features
- Optimized for symmetic hall elements
  AKM HW-302, HW-322, or similar
- Spinning current excitation
  - Elimination of hall offset, drift, and low frequency noise
- Extended current measurement range
  - H-Bridge output drive: 250 mA
- Precision differential amplifier
  - Offset/Drift: 100 µV max, 1 µV/°C max
  - 200 kHz system bandwidth
- Precision reference
  - Accuracy: 0.2% max, DRIFT: 50 ppm/°C max
  - Pin-selectable for 2.5 V, 1.65 V
- Over-range and error flag

Applications
- Closed loop current sensor modules
- DC- and AC-current measurement

DRV411 functional block diagram

Get more information: **www.ti.com/product/DRV411**

PWM Power Drivers

Device	Description	Supply Voltage (V)	Output Current (A) (typ)	Saturation Voltage (V)	R_{ON} (Ω)	Frequency (kHz)	HiRel Avail.	Package	Price*
Single Switch									
DRV101	Low-Side with Internal Monitoring	9 to 60	2.3	1	0.8	24	N	TO-220, DDPAK	3.85
DRV102	High-Side with Internal Monitoring	8 to 60	2.7	2.2	0.95	24	N	TO-220, DDPAK	3.85
DRV103	Low-Side with Internal Monitoring	8 to 32	1.5/3	0.6	0.9	0.5 to 100	N	SOIC-8, SOIC-8 PowerPAD™	2.00
DRV104	High-Side with Internal Monitoring	8 to 32	1.2	0.65	0.45	0.5 to 100	N	HTSSOP-14 PowerPAD	1.75
Bridge									
DRV590	1.2 A, High-Efficiency PWM Power Driver	2.7 to 5.5	1.2	0.48	0.4	250/500	N	SOIC-PowerPAD, 4 mm x 4 mm MicroStar Junior™	12.00
DRV591	±3 A, High-Efficiency PWM Power Driver	2.8 to 5.5	3	0.195	0.065	100/500	N	9x9 PowerPAD QFP	11.00
DRV592	±3 A, High-Efficiency H-Bridge	2.8 to 5.5	3	0.195	0.065	1000	N	9x9 PowerPAD QFP	2.85
DRV593	±3 A, High-Efficiency PWM Power Driver	2.8 to 5.5	3	0.195	0.065	100/500	N	9x9 PowerPAD QFP	10.80
DRV594	±3 A, High-Efficiency PWM Power Driver	2.8 to 5.5	3	0.195	0.065	100/500	N	9x9 PowerPAD QFP	10.80
Sensor Signal Conditioning									
DRV401	Signal Cond. for Magnetic-Current Sensor	4.5 to 5.5	0.2	0.4	—	2000	Y	QFN-20, SOIC-20	2.05
DRV411	Signal Conditioning and 250 mA Full-Bridge Drive-IC for Closed-Loop Hall-Sensors	2.7 to 5.5	0.25	0.4	—	2000	N	QFN-20, TSSOP-20	2.05

*Suggested resale price in U.S. dollars in quantities of 1,000. See **www.ti.com/hirel** for HiRel options.

*Preview products are listed in **bold blue.***

Monitoring and Control
Current Shunt Monitors/Current Sense Amplifiers

Triple Channel Shunt and Bus Voltage Monitor
INA3221

The INA3221 is a three-channel, high-side current and bus voltage monitor with an I²C interface. The INA3221 monitors both shunt voltage drops and bus supply voltages in addition to having programmable conversion times and averaging modes for these signals. The INA3221 offers both critical and warning alerts to detect multiple programmable out-of-range conditions for each channel.
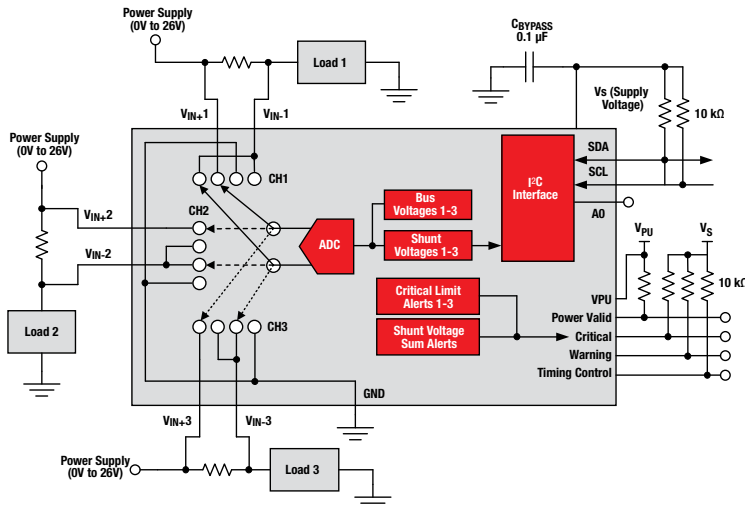
INA3221 functional block diagram

Get more information: **www.ti.com/product/INA3221**

Key Features
- Senses bus voltages from 0 V to +26 V
- Reports shunt and bus voltage
- High accuracy
- Configurable averaging options
- Four programmable addresses
- Power-supply operation: 2.7 V to 5.5 V
- Programmable alert and warning outputs

Applications
- Computers
- Power management
- Telecom equipment
- Battery chargers
- Power supplies
- Test equipment

Precison 76 V High-Side Current Sense Amps with Volt Output
LMP8480/1

NEW

The LMP8480 and LMP8481 are precision high-side current sense amplifiers that amplify a small differential voltage developed across a current sense resistor in the presence of high input common-mode voltages.

These amplifiers are designed for bidirectional (LMP8481) or unidirectional (LMP8480) current applications and will accept input signals with common-mode voltage range from 4 V to 76 V with a bandwidth of 270 kHz.
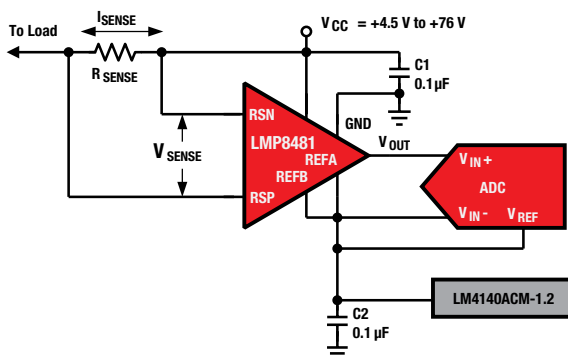
LMP8480/1 functional block diagram

Get more information: **www.ti.com/product/LMP8480,**
www.ti.com/product/LMP8481

Key Features
- Bi-directional or uni-directional sensing
- Common mode voltage range 4.0 V to 76 V
- Supply voltage range 4.5 V to 76 V
- Fixed gains 20, 50, 60 and 100 V/V
- Gain accuracy ±0.1%
- Offset ±80 µV
- Bandwidth (–3 dB) 270 KHz
- Quiescent current < 100 µA
- Buffered high-current output > 5 mA
- Input bias current 7 µA

Applications
- Energy Management
- High-side current sense
- Laser or LED Drivers
- Motor controls
- Solar panel monitoring
- Telecommunications
- Vehicle current measurement

Monitoring and Control
Current Shunt Monitors/Current Sense Amplifiers

Current Shunt Monitors

Device	Description	Gain (V/V)	Offset (µV) (max)	Offset Drift (µV/°C) (max)	CMRR (dB) (typ)	BW (kHz) (typ)	Output Voltage Swing (V) (min)	Power Supply (V)	I_Q (mA) (max)	HiRel Avail.	Package	Price*
Standard Common Mode Voltage (<= 60 V), Analog Current Output												
INA138	+2.7 V to 36 V CMV Range	1 to 100	1000	1	120	800	0 to V (+) −0.8	2.7 to 36	0.045	Y	SOT23-5	0.65
INA139	+2.7 V to 40 V CMV Range	1 to 100	1000	1	115	440	0 to V (+) −1.2	2.7 to 40	0.125	Y	SOT23-5	0.65
Standard Common Mode Voltage (<= 60 V), Analog Voltage Output												
INA199	Zero Drift, High or Low Side Current Monitor, −0.3 V to +26 V CMV	50, 100, 200	150	0.5	120	14	V (+) −0.2	2.7 to 26	0.1	N	SC70, QFN-10	0.50
INA209	Voltage Current, Power Over I²C, 0 to +26 V CMV	1, 2, 4, 8	100	0.1	120	—	—	3 to 5.5	1.5	N	TSSOP-16	2.50
INA21x	Zero Drift, Bidirectional, −0.3 V to +26 V CMV	50, 100, 200, 500, 1000	35	0.5	140	14	V (+) −0.1	2.7 to 26	0.1	Y	SC70	0.65
INA216A	Small Size, Low-power, 1.8 V to +5.5 V CMV	25, 50, 100, 200	100	0.3	90	0.02	1.8 to 5.5	1.8 to 5.5	0.025	N	UQFN-10, DSBGA-4	0.35
INA223	Current Shunt, Voltage and Instantaneous Power Monitor, , 0 V to +26 V CMV	Programmable	100	0.3	100	0.025	0 to 26	2.7 to 5.5	0.25	N	SON-10	1.15
LMP8278Q	High Common Mode, 14 x Gain, Precision Current Sensing Amplifier	14	2000	15	90	90	−2 to 40	4.5 to 5.5	0.55	N	VSSOP-8	0.75
LMP8640	Precision High Voltage Current Sense Amp	20, 50, 100	900	2.6	103	450	−2 to 42	2.7 to 12	0.72	N	SOT-6	0.85
LMP8645	Precision High Voltage Current Sense Amplifier	Programmable	1000	7	95	260	−2 to 42	2.7 to 12	0.61	N	SOT-6	0.85
Standard Common Mode Voltage (<= 60 V), I²C Output												
INA219	Low Cost, Voltage Current, Power Over I²C, 0 to +26 V CMV	1, 2, 4, 8	100	0.1	120	—	—	3 to 5.5	1.5	N	SOT23-8	0.99
INA220	High-or Low-Side I²C Current/Power Monitor, 0 to +26 V CMV	1, 2, 4, 8	100	0.16	120	—	—	3 to 5.5	1	N	MSOP-10	0.99
INA226	Current Shunt & Power Monitor, 0 V to +36 V CMV	1	10	0.1	126	—	0 to 36	2.7 to 5.5	0.33	N	MSOP-10	1.30
INA230	Digital Current/Voltage/Power Monitor, 0 V to 28 V CMV	1	50	0.5	100	—	0 to 28	2.7 to 5.5	0.42	N	QFN-16	1.15
INA3221	Triple channel Current Shunt & Bus Voltage Monitor, 0V to 26 V CMV	1	80	0.5	110	—	0 to 26	2.7 to 5.5	0.35	N	VQFN-16	1.85
TMP512/513	High-Side I²C Monitor with Integreated Temp Sensor	1, 2, 4, 8	100	0.2	120	—	—	3 to 26	1.4	N	SO-14, SO-16	1.45
High Common Mode Voltage (> 60 V), Analog Current Output												
INA168	+2.7 V to 60 V CMV Range	1 to 100	1000	1	120	800	0 to V (+) −0.8	2.7 to 60	0.045	Y	SOT23-5	0.80
INA169	+2.7 V to 60 V CMV Range	1 to 100	1000	1	120	440	0 to V (+) −1.2	2.7 to 60	0.125	Y	SOT23-5	0.80
INA170	+2.7 V to 60 V CMV	1 to 100	1000	1	120	440	0 to V (+) −1.2	2.7 to 40	0.125	N	MSOP-8	0.95
High Common Mode Voltage (> 60 V), Analog Voltage Output												
INA19x	−16 V to +80 V CMV	20, 50, 100	2000	2.5	120	500, 300, 200	V (+) −0.2	2.7 to 18	0.9	Y	SOT23-5	0.80
INA20x	Dual Comparator, 1.2 V V_REF −16 V to +18 V CMV	20, 50, 100	2500	3.5	123	500, 300, 200	V (+) −0.25	2.7 to 18	2.2	N	TSSOP/SO-14, MSOP-10,MSOP/SO/DFN-8	0.45
INA27x	−16 V to +18 V CMV, Filtering Provision	14, 20	2000	2.5	120	130	V (+) −0.2	2.7 to 18	0.9	Y	SO-8	0.40
INA28x	Zero Drift, Bidirectional, −16 V to +80 V CMV	50, 100, 200, 500, 1000	10	0.05	100	14	V (+) −0.1	2.7 to 18	0.9	N	SO-8, DFN-10	0.95
LMP8601	60 V Common Mode, Bidirectional Precision Current Sensing Amplifier	20	1000	10	105	60	−22 to 60	3 to 5.5	1.5	N	SOIC-8	1.05
LMP8602	60 V Common Mode, Fixed Gain, Bidirectional Precision Current Sensing Amplifier	50	1000	10	105	60	−22 to 60	3 to 5.5	1.5	N	SOIC-8, VSSOP-8	1.05
LMP8603	60 V Common Mode, 100 x Gain, Bidirectional Precision Current Sensing Amp	100	1000	10	105	60	−22 to 60	3 to 5.5	1.5	N	SOIC-8, VSSOP-8	1.05
LMP8640HV	Precision High Voltage Current Sense Amp	20, 50, 100	900	2.6	95	450	−2 to 76	2.7 to 12	0.72	N	SOT-6	0.94
LMP8645HV	Precision High Voltage Current Sense Amp	Programmable	1000	7	95	260	−2 to 76	2.7 to 12	0.61	N	SOT-6	0.94
LMP8646	Precision Current Limiter	Programmable	1000	7	95	35	−2 to 76	2.7 to 12	0.66	N	SOT-6	1.01
LMP8480/1	Prec 76 V Hi-Side Current Sense Amplifier with Volt Output	20, 50, 60, 100	265	6	100	270	4 to 76	4.5 to 76	0.155	N	VSSOP-8, **WSON-8**	0.95

*Suggested resale price in U.S. dollars in quantities of 1,000. See **www.ti.com/hirel** for HiRel options.

New products are listed in **bold red**. Preview products are listed in **bold blue**.

Monitoring and Control
Temperature Sensors

Single-Chip Monolithic Thermopile Sensor in WCSP
TMP006

The TMP006 is an infrared thermopile sensor that measures the temperature of an object without the need to make contact with the object. The sensor has an object temperature range from –40°C to +125°C to enable use in a wide range of applications. Low power consumption along with low operating voltage enables system power savings.

TMP006 functional block diagram

Key Features

- Digital output thermopile
  - IR spectrum sensitivity: 4 μm-8 μm
  - 16-bit ADC with I^{2}C SMBus interface
  - Integrated local temperature sensor
  - Measurement range & accuracy:
    - Local: –40° to 125°C (±1°C)
    - IR object: –40° to 125°C (±3°C)
- Ultra-small 1.6x1.6x0.625 mm WCSP
- Industry's lowest power
- Quiescent power: 240 μA
- Shutdown power: 1 μA

Applications

- Exhaust temperature measurements
- Thermostats
- Home appliances
- Security & fire detection
- Notebook PC case temperature
- Handset user applications
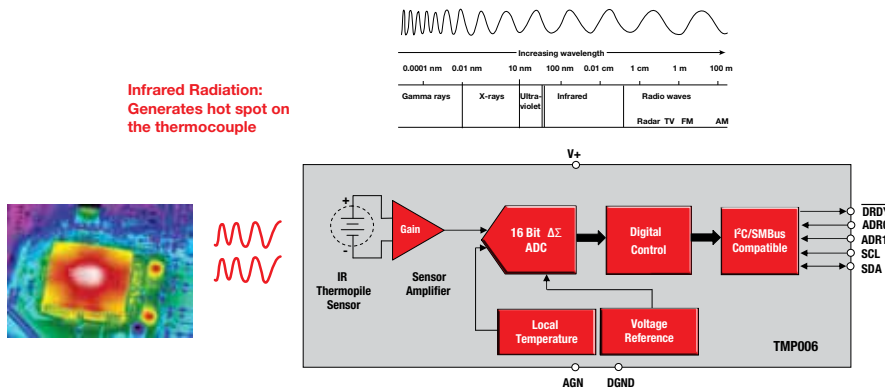
Get more information: **www.ti.com/product/TMP006**

Monitoring and Control
Temperature Sensors

2.4 V, 10 µA, SC70, Temperature Sensor
LMT88

The LMT88 is a precision analog output CMOS integrated-circuit temperature sensor that operates over a –55°C to 130°C temperature range. The power supply operating range is 2.4 V to 5.5 V. The transfer function of LMT88 is predominantly linear, yet has a slight predictable parabolic curvature. The accuracy of the LMT88 when specified to a parabolic transfer function is ±1.5°C at an ambient temperature of 30°C. The LMT88 is a cost-competitive alternative to thermistors. To learn more, visit **ti.com/analogtempsensors**
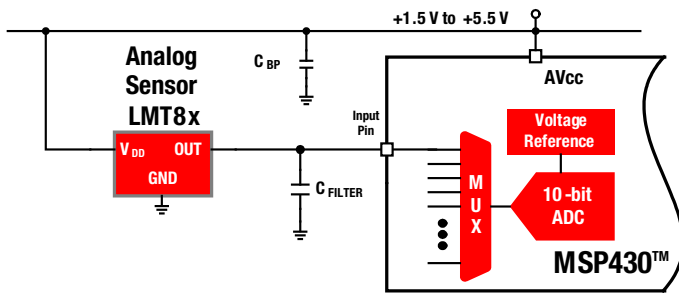
Key Features
- Cost-effective alternative to thermistors
- Very low power consumption
- Highly linear output
- Simple to use
- Rated for full –55°C to +130°C range
- Available in an SC70 package
- Predictable curvature error

Applications
- Industrial
- HVAC
- Computers, printers
- Automotive
- Portable medical instruments
- Battery management
- Power supply modules

LMT88 functional block diagram

Get more information: **www.ti.com/product/LMT88**

Analog Temperature Sensors

Device	Description	Accuracy Over Temp Range (°C) (max)	Specified Temp Range (°C)	Temp Resolution (Bits)	Supply Voltage (V)	I$_Q$ (µA) (typ)	HiRel Avail.	Package	Price*
LM135	Two Terminal Temperature Sensor	3	–55 to 150	—	5	1000	Y	PFM-3	5.65
LM135A	Two Terminal Temperature Sensor	1	—	—	5	1000	Y	PFM-3	11.15
LM19	–2.4 V, 10 C39 µA, TO-92 Temperature Sensor	2.5	–55 to 130	—	2.4 to 5.5	4.5	N	TO-3	0.24
LM20	–2.4 V, 10 C40 µA, SC70, micro SMD Temperature Sensor	1.5	–40 to 125 –55 to 130 –30 to 130	—	2.4 to 5.5	4.5	N	DSBGA-4, SOT-5	0.32
LM234	3-Terminal Adjustable Current Source	—	–25 to 100	—	—	—	N	TO-3	0.46
LM235	Two Terminal Temperature Sensor	3	–40 to 125	—	5	1000	Y	PFM-3	4.59
LM235A	Two Terminal Temperature Sensor	1	–40 to 125	—	5	1000	Y	PFM-3	7.06
LM26LV	1.6 V, LLP-6 Factory Preset Temperature Switch and Temperature Sensor	2.3	–40 to 150 0 to 150	—	1.6 to 5.5	8	N	WSON-6	0.43
LM335	Two Terminal Temperature Sensor	6	–40 to 100	—	5	1000	Y	PFM-3, TO-3, SOIC-8	0.33
LM335A	Two Terminal Temperature Sensor	3	–40 to 100	—	3 to 5.5	1000	Y	PFM-3	4.12
LM34	Precision Fahrenheit Temperature Sensor	0.556	–40 to 110 0 to 100 –45.6 to 148.9	—	5 to 30	75	Y	PFM-3 TO-3 SOIC-8	0.92
LM35	Precision Centigrade Temperature Sensor	0.5	0 to 100 –40 to 110 –55 to 150	—	4 to 30	56	Y	PFM-3 TO-3 SOIC-8	TBD
LM45	SOT23 Precision Centigrade Temperature Sensor	2	–20 to 100	—	4 to 10	120	N	SOT-3	TBD
LM50	SOT23 Single-Supply Centigrade Temperature Sensor	2	–25 to 100 –40 to 125	—	4 to 10	130	N	SOT-3	0.32
LM57	Resistor-Programmable Temperature Switch and Analog Temperature Sensor	0.7	–50 to 150	—	2.4 to 5.5	24	N	WSON-8	0.65

*Suggested resale price in U.S. dollars in quantities of 1,000. See **www.ti.com/hirel** for HiRel options.

Monitoring and Control
Temperature Sensors

Analog Temperature Sensors (continued)

Device	Description	Accuracy Over Temp Range (°C) (max)	Specified Temp Range (°C)	Temp Resolution (Bits)	Supply Voltage (V)	I_Q (µA) (typ)	HiRel Avail.	Package	Price*
LM60	2.7 V, SOT23 or TO-92 Temperature Sensor	2	−40 to 125 −25 to 125 −25 to 85	—	2.7 to 10	82	N	SOT-3, TO-3	TBD
LM61	2.7 V, SOT23 or TO-92 Temperature Sensor	2	−30 to 100	—	2.7 to 10	82	N	SOT-3, TO-3	0.25
LM62	2.7 V, SOT23 or TO-92 Temperature Sensor	2	−40 to 125 −55 to 130 −30 to 130	—	2.7 to 10	82	N	SOT-3, TO-3	0.28
LMT84	1.5 V, SC70, Analog Temperature Sensor with Push-Pull Output	2.7	−50 to +150	—	1.5 to 5.5	5.4	N	SC70-5	0.20
LMT85	SC70, Analog Temperature Sensor with Push-Pull Output	2.7	−50 to +150	—	1.8 to 5.5	5.4	N	SC70-5	0.20
LMT86	SC70, Analog Temperature Sensor with Push-Pull Output	2.7	−50 to +150	—	2.2 to 5.5	5.4	N	SC70-5	0.20
LMT87	SC70, Analog Temperature Sensor with Push-Pull Output	2.7	−50 to +150	—	2.7 to 5.5	5.4	N	SC70-5	0.20
LMT88	Industry Standard Analog Output	4	−50 to +150	—	2.4 to 5.5	4.5	N	SC70-5	0.18
LMT89	Industry Standard Analog Output	1.5	−50 to +150	—	2.4 to 5.5	4.5	N	SC70-5	0.19
LMT90	Wide Supply Range Analog Temp Sensor	3	−40 to +125	—	4.5 to 10	130	N	SOT-323	0.20
LM94021	Multi-Gain Analog Temperature Sensor	1.5	−50 to 150	—	1.5 to 5.5	9	N	SOT-5	0.35
LM94022	1.5 V, SC70, Multi-Gain Analog Temperature Sensor with Class-AB Output	1.5	−50 to 150	—	1.5 to 5.5	5.4	N	SOT-5	0.37
LM94023	1.5 V, micro SMD, Dual-Gain Analog Temperature Sensor with Class AB Output	1.5	−50 to 150	—	1.5 to 5.5	5.4	N	DSBGA-4	0.37
SM72480	SolarMagic™ 1.6 V, LLP-6 Factory Preset Temperature Switch and Temperature Sensor	—	−50 to 150	—	1.6 to 5.5	8	N	WSON-6	0.44
SM73710	2.7 V, SOT23 Temperature Sensor	—	−40 to 125	—	2.7 to 10	110	N	SOT-3	TBD
TMP20	±2.5°C Low-Power, Analog Out Temperature Sensor	2.5	−55 to +130	—	2.7 to 5.5	2.6	N	SOT563-6, SC70	0.30

*Suggested resale price in U.S. dollars in quantities of 1,000. See www.ti.com/hirel for HiRel options.

Preview products are listed in **bold blue.**

Temperature Switches

Device	Description	Trip Point Accuracy (°C) (typ)	Hysteresis (°C)	Specified Temp Range (°C)	Supply Voltage (V)	I_Q (µA) (max)	HiRel Avail.	Package	Price*
LM26	±3°C Accurate, Factory Preset Thermostat	±3	2 or 11	−55 to 125	2.7 to 5.5	40	N	SOT-5	0.43
LM26LV	1.6 V, LLP-6 Factory Preset Temperature Switch and Temperature Sensor	±2.2	5	−40 to 150 0 to 150	1.6 to 5.5	8	N	WSON-6	0.43
LM26NV	±3°C Accurate, Factory Preset Thermostat (LM26 without V temp) from the PowerWise™ Family	±3	2 or 11	−55 to 125	2.7 to 5.5	40	N	SOT-5	0.44
LM27	±3°C Accurate, 120°C-150°C Factory Preset Thermostat	±3	2 or 10	120 to 150	2.7 to 5.5	40	N	WSON-8	0.60
LM56	Dual Output Low Power Thermostat	±2	4	−40 to 125	2.7 to 10	230	N	SOIC-8 VSSOP	0.66
LM57	Resistor-Programmable Temperature Switch and Analog Temperature Sensor	±1.5	5 or 10	−50 to 150	2.4 to 5.5	24	N	WSON-8	0.65
SM72480	SolarMagic 1.6 V, LLP-6 Factory Preset Temperature Switch and Temperature Sensor	±2.2	5	−50 to 150	1.6 to 5.5	8	N	WSON-6	0.44
TMP300	Comparator-Output Temperature Switch with Additional Analog Output	±2	5 or 10	−40 to +125	1.8 to 18	110	N	SC70-6, SOT23-6	0.75
TMP302	Low-Power, High-Accuracy Temperature Switch	± 0.2	5 or 10	−40 to +125	1.4 to 3.6	15	N	SOT-563	0.20
TMP303	Low-Power, High-Accuracy Temperature Switch with Push-Pull Output	±0.2	1, 2, 5 or 10	−40 to +125	1.4 to 3.6	15	N	SOT-563	0.40
TMP708	Resistor Programmable Temperature Switch	± 0.5	10 or 30	−40 to +125	2.7 to 5.5	55	N	SOT23-5	0.30
TMP709	Resistor Programmable Temperature Switch	± 0.5	2 or 10	−40 to +125	2.7 to 5.5	55	N	SOT23-5	0.30

*Suggested resale price in U.S. dollars in quantities of 1,000. See www.ti.com/hirel for HiRel options.

Texas Instruments

Monitoring and Control
Temperature Sensors

Remote Temperature Sensors

Device	Description	Feature	Remote Sensor Accuracy Over Temp Range (°C) (max)	Local Sensor Accuracy Over Temp Range (°C) (max)	Remote Sensor Temp Range (°C)	Supply Voltage (V)	I_Q (µA) (typ)	HiRel Avail.	Package	Price*
LM82	Remote Diode and Local Digital Temp Sensor with Two-Wire Interface	Remote Diode Fault Detection	3	3	–40 to 125	3 to 3.6	800	N	SSOP-16	1.93
LM83	3 Diode Input ACPI Compatible Digital Temp Sensor with Two-Wire Interface	Remote Diode Fault Detection	3	3	–40 to 125	3 to 3.6	800	N	SSOP-16	2.23
LM84	Diode Input Digital Temp Sensor with Two-Wire Interface	Remote Diode Fault Detection	3	1	0 to 125	3 to 3.6	500	N	SSOP-16	1.61
LM86	±0.75°C Accurate, Remote Diode and Local Digital Temp Sensor with Two-Wire Interface	Offset Correction Register	0.75	3	0 to 125	3 to 3.6	800	N	SOIC-8, VSSOP-8	0.71
LM89	±0.75°C , Remote and Local Digital Temp Sensor with Two-Wire Interface-Wire Interface	Programmable Alert	0.75	3	0 to 125	3 to 3.6	800	N	SOIC-8, VSSOP-8	0.90
LM90	±3°C Accurate, Remote Diode and Local Digital Temp Sensor with Two-Wire Interface	Programmable Conversion Rate, One Shot Conversion Control, Remote Diode Fault Detection, Thermal Diode Input Stage Filtering	3	4	0 to 125	3 to 3.6	800	N	VSSOP-8	0.72
LM95213	2-Diode Input and Local Digital Temp Sensor with Two-Wire Interface and Outputs	Offset Correction Registe	1.1	2	–40 to 140	3 to 3.6	570	N	WSON-14	0.87
LM95214	Quad Remote Diode and Local Temp Sensor with SMBus Interface	Offset Correction Register	1.1	2	–40 to 140	3 to 3.6	570	N	WSON-14	1.00
LM95221	Dual Remote Diode Digital Temp Sensor with SMBus Interface	Offset Correction Register	1	3	0 to 85	3 to 3.6	2000	N	VSSOP-8	1.05
LM95231	Precision Dual Remote Diode Temp Sensor with SMBus Interface and TruTherm™ Technology	Programmable Conversion Rate, One Shot Conversion Control, Remote Diode Fault Detection	0.75	3	0 to 85	3 to 3.6	402	N	VSSOP-8	0.95
LM95233	Dual Remote Diode and Local Temp Sensor with SMBus Interface and TruTherm™ Technology	Beta compensation, TruTherm™	0.875	2	–40 to 140	3 to 3.6	570	N	WSON-14	0.95
LM95234	Quad Remote Diode and Local Temperature Sensor with SMBus Interface and TruTherm™ Technology	Beta Compensation, TruTherm™	1.1	2	–40 to 140	3 to 3.6	570	N	WSON-14	1.03
LM95235	Precision Remote Diode Temperature Sensor with SMBus Interface and TruTherm™ Technology	Beta Compensation, TruTherm™	0.75	2	0 to 90 –40 to 90 –40 to 85	3 to 3.6	350	N	VSSOP-8	0.74
LM95241	Dual Remote Diode Temp Sensor with SMBus Interface and TruTherm™ Technology (65 nm/90 nm)	Beta Compensation, TruTherm™	1.25	3	0 to 85	3 to 3.6	471	N	VSSOP-8	0.70
LM95245	Precision Remote Diode Digital Temperature Sensor with TruTherm™ BJT Beta Compensation (45 nm)	Beta Compensation, TruTherm™	0.075	2	–40 to 125	3 to 3.6	350	N	SOIC-8, VSSOP-8	0.80
LM99	±1°C Accurate, Remote Diode and Local Digital Temperature Sensor with Two-Wire Interface	Offset Correction Register	1	3	0 to 85	3 to 3.6	800	N	VSSOP-8	1.10
TMP006	Infrared Thermopile Contactless Sensor	Offset Correction Register	0.075	2	–40 to 125	3 to 3.6	350	N	SOIC-8, VSSOP-8	0.80
TMP400	Remote and Local Temp Sensor with Programmable Non-Ideality Factor	n-Factor Correction, Series Resistace Cancellation, Alert Flag	1	3	0 to 85	3 to 3.6	800	N	VSSOP-8	1.10
TMP401	Programable Remote and Local Temperature Sensor	Series Resistance Cancellation, Fault Detection, Alert Flag	1	3	–40 to +150	3.0 to 5.5	350	N	MSOP-8	0.85
TMP411	Remote and Local Temp Sensor with Programmable Non-Ideality Factor	n-Factor Correction, Series Resistance Cancellation, Fault Detection, Alert Flag	1	2.5	–40 to +150	2.7 to 5.5	350	N	MSOP-8	0.45
TMP421	Remote and Local Temp Sensor in SOT23-8	n-Factor Correction, Series Resistance Cancellation, Fault Detection	1	2	–40 to +150	2.7 to 5.5	400	N	SOT23-8	0.55
TMP422	2x Remote and Local Temp Sensor in SOT23-8	n-Factor Correction, Series Resistance Cancellation, Fault Detection	1	2	–40 to +150	2.7 to 5.5	400	Y	SOT23-8	0.65
TMP423	3x Remote and Local Temp Sensor in SOT23-8	n-Factor Correction, Series Resistance Cancellation, Fault Detection	1	2	–40 to +150	2.7 to 5.5	400	N	SOT23-8	0.75

Suggested resale price in U.S. dollars in quantities of 1,000. See www.ti.com/hirel for HiRel options.

Monitoring and Control
Temperature Sensors

Remote Temperature Sensors (continued)

Device	Description	Feature	Remote Sensor Accuracy Over Temp Range (°C) (max)	Local Sensor Accuracy Over Temp Range (°C) (max)	Remote Sensor Temp Range (°C)	Supply Voltage (V)	I_Q (µA) (typ)	HiRel Avail.	Package	Price*
TMP431	Remote and Local Temp Sensor with Programmable n-Factor and Beta Correction	Beta Correction, n-Factor Correction, Series Resistance Cancellation, Fault Detection, Alert Flag	1	2.5	−40 to +150	2.7 to 5.5	700	N	MSOP-8	0.45
TMP432	2x Remote and Local Temp Sensor with Programmable n-Factor and Beta Correction	Beta Correction, n-Factor Correction, Series Resistance Cancellation, Fault Detection, Alert Flag	1	2.5	−40 to +150	2.7 to 5.5	700	N	MSOP-10	0.55
TMP435	Programable Addresss Remote and Local Temp Sensor	Beta Correction, n-Factor Correction, Series Resistance Cancellation, Fault Detection, Alert Flag	1	2.5	−40 to +150	2.7 to 5.5	700	N	MSOP-10	0.60
TMP441	Remote and Local Temp Sensor with Beta Correction in SOT23-8	Beta Correction, n-Factor Correction, Series Resistance Cancellation, Fault Detection	1	2	−40 to +150	2.7 to 5.5	400	N	SOT23-8	0.55
TMP442	2x Remote and Local Temp Sensor with Beta Correction in SOT23-8	Beta Correction, n-Factor Correction, Series Resistance Cancellation, Fault Detection	1	2	−40 to +150	2.7 to 5.5	400	N	SOT23-8	0.65
TMP512	2x Remote and Local Temp Sensor with Integrated Current Shunt	Beta Correction, n-Factor Correction, Series Resistance Cancellation, Fault Detection, Alert Flag	1	2.5	−40 to +150	3 to 26	1000	N	S0-14	1.45
TMP513	3x Remote and Local Temp Sensor with Integrated Current Shunt	Beta Correction, n-Factor Correction, Series Resistance Cancellation, Fault Detection, Alert Flag	1	2.5	−40 to +150	3 to 26	1000	N	S0-16	1.55

*Suggested resale price in U.S. dollars in quantities of 1,000. See **www.ti.com/hirel** for HiRel options.*

Digital Temperature Sensors

Device	Description	Accuracy Over Temp Range (°C) (max)	Specified Temp Range (°C)	Temp Resolution (Bits)	Supply Voltage (V)	I_Q (µA) (typ)	HiRel Avail.	Package	Price*
I²C/SMBus Interface									
LM73	2.7 V, SOT23, 11- to 14- Bit Digital Temperature Sensor with 2-Wire Interface	1	−40 to 150	14	2.7 to 5.5	320	N	SOT-6	0.75
LM75A	Digital Temperature Sensor and Thermal Watchdog with Two-Wire Interface	2	−55 to 125	10	2.7 to 5.5	280	N	SOIC-8, VSSOP-8	0.50
LM75B	Digital Temperature Sensor and Thermal Watchdog with Two-Wire Interface	2	−55 to 125	9	3 to 5.5	250	N	SOIC-8, VSSOP-8	0.70
LM76	±0.5°C, ±1°C, 12-Bit + Sign Digital Temp Sensor & Thermal Window Comparator w/ Two-Wire Interface	1	−55 to 150	13	4.5 to 5.5	250	N	SOIC-8,	1.17
LM77	9-Bit + Sign Digital Temperature Sensor and Thermal Window Comparator with Two-Wire Interface	1.5	−40 to 125	10	3 to 5.5	250	N	SOIC-8, VSSOP-8	0.86
LM92	±0.33°C, 12-Bit + Sign Temperature Sensor and Thermal Window Comparator with Two-Wire Interface	0.33	−55 to 150	13	2.7 to 5.5	350	N	SOIC-8,	1.61
TMP100	Digital Temp Sensor	2, 3	−25 to +85, −55 to +125	9 to 12	2.7 to 5.5	45	Y	SOT23-6	0.75
TMP101	Digital Temp Sensor with Prog. Thermostat/ Alarm Function	2, 3	−25 to +85, −55 to +125	9 to 12	2.7 to 5.5	45	N	SOT23-6	0.80
TMP102	Ultra-Low-Power Digital Temp Sensor in Micro Surface Mount Pkg.	2, 3	−25 to 85, −40 to 125	12	1.4 to 3.6	7	N	SOT563-6	0.80
TMP103	Chipscale Digital Temp Sensor with Multiple Device Access	1, 3	−10 to 100, −40 to 125	8	1.4 to 3.6	3	N	0.8 mm x 0.8 mm WCSP-4	0.39
TMP105	Chipscale Digital Temp Sensor with 1.8 V to 3.0 V Logic	2, 3	−25 to +85, −40 to +125	9 to 12	2.7 to 5.5	50	N	1 mm x 1.5 mm WCSP-6	0.85

*Suggested resale price in U.S. dollars in quantities of 1,000. See **www.ti.com/hirel** for HiRel options.*

Monitoring and Control
Temperature Sensors

Digital Temperature Sensors (continued)

Device	Description	Accuracy Over Temp Range (°C) (max)	Specified Temp Range (°C)	Temp Resolution (Bits)	Supply Voltage (V)	I$_Q$ (µA) (typ)	HiRel Avail.	Package	Price*
I²C/SMBus Interface (continued)									
TMP106	Chipscale Digital Temp Sensor with 2.7 V to 5.0 V Logic	2, 3	−25 to +85, −40 to +125	9 to 12	2.7 to 5.5	50	N	1 mm x 1.5 mm WCSP-6	0.85
TMP112	Ultra-Low-Power, High-Accuracy Digital Temp Sensor in SOT563 package	0.5 , 1	0 to 65, −40 to +125	12	1.4 to 3.6	7	N	SOT563-6	0.85
TMP175	Digital Temp Sensor with 2-Wire Interface, 27 Addresses	1.5, 2	−25 to +85, −40 to +125	9 to 12	2.7 to 5.5	50	N	MSOP-8, SOIC-8	0.85
TMP275	Ultra-High-Accuracy Digital Temp Sensor	0.5, 1	+10 to +85, −40 to +125	9 to 12	2.7 to 5.5	50	N	MSOP-8, SOIC-8	1.25
TMP75	Industry-Standard Sensor with 2-Wire Interface, 8 Addresses	2	−25 to +85	9 to 12	2.7 to 5.5	50	N	MSOP-8, SOIC-8	0.70
Single-Wire									
LM95010	Digital Temp Sensor with Single-Wire SensorPath Bus	2	−20 to 125	10	3 to 3.6	500	N	8-VSSOP	0.50
TMP141	Digital Temp Sensor with Single-Wire SensorPath Bus	2, 3	−25 to +85, −40 to +125	10	2.7 to 5.5	110	N	SOT23-6, MSOP-8	0.80
TMP104	Chipscale Digital Temp Sensor with SMART Wire Interface	0.5, 3	−10 to 100, −40 to 125	8	1.4 to 3.6	3	N	0.8mm x 1mm WCSP-4	0.45
SPI Interface									
LM70	SPI/10-Bit plus Sign Digital Temperature Sensor	2	−55 to 150	11	2.65 to 5.5	260	N	VSSOP-8, WSON-8	0.71
LM71	SPI/MICROWIRE™ 13-Bit Plus Sign Temperature Sensor	1.5	−40 to 150	14	2.65 to 5.5	300	N	SOT-5, WSON-6	0.71
LM74	SPI/12-Bit Plus Sign Temperature Sensor	1.25	−55 to 150, −40 to 125	13	2.65 to 5.5	265	Y	DSBGA-5 SOIC-8	0.62
LM74A	SPI/MICROWIRE™ 12-Bit Plus Sign Temperature Sensor	1.25	−55 to 150, −40 to 125	13	2.65 to 5.5	265	Y	DSBGA-5 SOIC-8	0.62
LM95071	SPI/MICROWIRE™ 13-Bit Plus Sign Temperature Sensor	1	−40 to 150	14	2.4 to 5.5	280	N	SOT-5	0.67
LM95172	13-Bit to 16-Bit 200°C Digital Temp Sensor with 3-Wire Interface High Temp	1, 3	−40 to 200	16	3 to 5.5	400	N	CLGA-10	125.00
TMP121	1.5°C Accurate Digital Temp Sensor with SPI Interface	1.5, 2	−25 to +85, −40 to +125	12	2.7 to 5.5	35	Y	SOT23-6	0.90
TMP122	1.5°C Accurate Programmable Temp Sensor with SPI Interface	1.5, 2	−25 to +8, −40 to +125	9 to 12	2.7 to 5.5	50	Y	SOT23-6	0.99
TMP123	1.5°C Accurate Digital Temp Sensor with SPI Interface	1.5, 2	−25 to +85, −55 to +125	12	2.7 to 5.5	35	N	SOT23-6	0.90
TMP124	1.5°C Accurate Programmable Temp Sensor with SPI Interface	1.5, 2	−25 to +85, −40 to +125	9 to 12	2.7 to 5.5	50	N	SOIC-8	0.70
TMP125	2°C Accurate Digital Temp Sensor with SPI Interface	2, 2.5	−25 to +85, −40 to +125	10	2.7 to 5.5	36	N	SOT23-6	0.80

*Suggested resale price in U.S. dollars in quantities of 1,000. See **www.ti.com/hirel** for HiRel options.

Monitoring and Control
Temperature Sensors

Fan Controllers

Device	Description	No. of local and remote temp sensors	No. of fan inputs	Fan Control Outputs	Voltage Monitoring	Special Function	Supply Current (mA)	V (Vcc)	Interface	HiRel Avail.	Package	Price*
AMC80	System Hardware Monitor with Two-Wire/SMBus Serial Interface	1/0	2		7-ch	Intrusion Detection; 2 INT Outputs 1 GPO; 2 INT Inputs	0.5	5	I²C	N	TSSOP-24	2.90
LM63	Accurate Remote Diode Digital Temperature Sensor w/ Integrated Fan Control	1/1	1	1 PWM	—	Fan Control 8-Step Look up Table	2	3.3	SMBus	N	SOIC-8	1.00
LM64	±1°C Remote Diode Temperature Sensor with PWM Fan Control and 5 GPIO	1/1	1	1 PWM	—	Fan Control 8-Step Look up Table 5 GPIOs, 5 GPIs	2	3.3	SMBus	N	WQFN-24	1.71
LM80	Serial Interface ACPI-Compatible Microprocessor System Hardware Monitor	1/0	2	—	7-ch	Intrusion Detection; 2 INT Outputs 1 GPO; 2 INT Inputs	—	—	I²C	N	TSSOP-24	2.90
LM81	Serial Interface ACPI-Compatible Microprocessor System Hardware Monitor	1/0	2	1 DAC	6-ch	Intrusion Detection; Internal Voltage Scaling Resistors	0.9	3.3	SMBus	N	TSSOP-24	1.70
LM87	Serial Interface System Hardware Monitor with Remote Diode Temperature Sensing	1/2	2	1 DAC	8-ch	Intrusion Detection; VID Monitoring; Internal Voltage Scaling Resistors	2	3.3	SMBus	N	TSSOP-24	2.49
LM93	Hardware Monitor with Integrated Fan Control for Server Management	1/2	4	2 PWM	16-ch	Fan Control 13-Step Look up Table and PI Fan Control Loop; Dual Dynamic VID Monitoring; 8 GPIOs, 2 GPIs; Dual Host Interrupt Register Support	3	3.3	SMBus	N	TSSOP-56	4.50
LM94	Hardware Monitor with PI Loop Fan Control for Server Management	1/4	4	2 PWM	16-ch	Fan Control 13-Step Look up Table and PI Fan Control Loop; Dual Dynamic VID Monitoring; 8 GPIOs, 2 GPIs; Dual Host Interrupt Register Support; Internal Voltage Scaling Resistors	2.75	3.3	SMBus	N	TSSOP-56	5.89
LM96000	Hardware Monitor with Integrated Fan Control	1/2	4	3 PWM	5-ch	VID Monitoring; Linear Fan Control; Internal Voltage Scaling Resistors	3.5	3.3	SMBus	N	TSSOP-24	1.95
LM96063	Remote Diode Digital Temperature Sensor with Integrated Fan Control	1/1	1	1 PWM	—	Fan Control 12-Step Look up Table with Ramp Rate Control; TCRIT and ALERT Outputs.	0.825	3.3	SMBus	N	WSON-10	1.14
LM96080	System Hardware Monitor with 2-Wire Serial Interface	1/0	2	—	—	Intrusion Detection; 2 INT Outputs 1 GPO; 2 INT Inputs	0.48	3.3	I²C	N	TSSOP-24	2.90
LM96163	Remote Diode Dig Temp Sens w/Int Fan Cntrl & TruTherm™ BJT Transistor Beta Compensation Tech	1/1	1	1 PWM	—	Fan Control 12-Step Look up Table with Ramp Rate Control; TCRIT and ALERT Outputs.	0.825	3.3	SMBus	N	WSON-10	1.14
LM96194	TruTherm™ Hardware Monitor with PI Fan Control for Workstation Management	1/4	4	2 PWM	9-ch	Fan Control 13-Step Look up Table and PI Fan Control Loop; Dual Dynamic VID Monitoring; 8 GPIOs, 2 GPIs; Dual Host Interrupt Register Support; Internal Voltage Scaling Resistors	2.75	3.3	SMBus	N	WQFN-48	3.80

*Suggested resale price in U.S. dollars in quantities of 1,000. **See www.ti.com/hirel** for HiRel options.

Monitoring and Control
4-20 mA Transmitters

Single-Channel 16-/12-Bit Programmable Current Output and Voltge Output DAC for 4-mA to 20-mA Current Loop Applications

PREVIEW

DAC8760/DAC7760

The DAC7760 and DAC8760 are low-cost, precision, fully-integrated 12-bit and 16-bit digital-to-analog converters (DACs), and are designed to meet the requirements of industrial process control applications. The output can be programmed as acurrent output with range of 4 mA to 20 mA, 0 mA to 20 mA, or 0 mA to 24 mA; or it can be programmed as a voltage output with a range of 0 V to 5 V, 0 V to 10 V, ±5 V, or ±10 V, with a 10% over range.
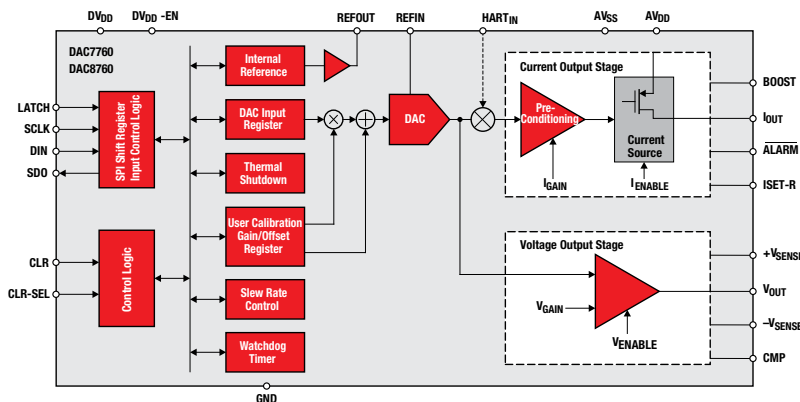
Functional block diagram

Key Features
- Output current: 4-20 mA; 0-20 mA; 0-24 mA
- Voltage output:
  - 0-5 V; 0 to 10 V; ±5 V; ±10 V
  - 0-5.5 V; 0 to 11 V; ±5.5 V; ±11 V (10% over range)
- ±0.1% FSR Total Unadjusted Error (TUE) max
- DNL: ±1 LSB max
- Simultaneous voltage/current output
- Internal 5 V reference (10 ppm/°C, max)
- Internal 4.5-V power-supply generator
- HART® compatible input
- Wide temperature range: –40°C to +125°C

Applications
- 4-mA to 20-mA current loops
- Analog output modules
- Programmable logic controllers (PLCs)
- Sensors/transducers

Get more information:
www.ti.com/product/DAC8760

4-20 mA Transmitters and Receivers

Device	Description	Sensor Excitation	Loop Voltage (V)	Full-Scale Input Range	Output Range (mA)	Additional Power Available (V at mA)	HiRel Avail.	Package	Price*
2-Wire, 4-20 mA Transmitters									
XTR105	100 Ω RTD Conditioner with Linearization	Two 800 µA	7.5 to 36	5 mV to 1 V	4-20	5.1 at 0.5	N	DIP-14, SOIC-14	4.60
XTR106	Bridge Conditioner with Linearization	5 V and 2.5 V	7.5 to 36	5 mV to 1 V	4-20	5.1 at 1	N	DIP-14, SOIC-14	4.00
XTR108	10 Ω to 10 kΩ RTD Conditioner, 6-Channel Input MUX, Extra Op Amp Can Convert to Voltage Sensor Excitation, Calibration Stored in External EEPROM	Two 500 µA	7.5 to 24	5 mV to 320 mV	4-20	5.1 at 2.1	N	SSOP-24	3.35
XTR112	1 kΩ RTD Conditioner with Linearization	Two 250 µA	7.5 to 36	5 mV to 1 V	4-20	5.05 at 1	N	SOIC-14	4.00
XTR114	10 kΩ RTD Conditioner with Linearization	Two 100 µA	7.5 to 36	5 mV to 1 V	4-20	5.05 at 1	N	SOIC-14	4.00
XTR115	I_{IN} to I_{OUT} Converter, External Resistor Scales V_{IN} to I_{IN}	V_{REF} = 2.5 V	7.5 to 36	40 µA to 250 µA	4-20	4.9 at 1	N	SOIC-8	1.25
XTR116	I_{IN} to I_{OUT} Converter, External Resistor Scales V_{IN} to I_{IN}	V_{REF} = 4.096 V	7.5 to 36	40 µA to 250 µA	4-20	4.9 at 1	N	SOIC-8	1.05
XTR117	Current Loop, 7.5 to 40 V, 5 V Voltage Regulator	V_{REG} = 5 V	7.5 to 40	40 µA to 250 µA	4-20	4.9 at 1	N	MSOP-8, DFN-8	0.90
Bridge Conditioner with Digital Calibration for Linearization, Span and Offset Over Temperature									
PGA309	Complete Digitally Calibrated Bridge Sensor Conditioner, Voltage Output, Calibration Stored in External EEPROM, One-Wire/Two-Wire Interface	V_{EXC} = V_S, 2.5 V 4.096 V	2.7 to 5.5	1 mV/V to 245 mV/V	0.05 V-4.9 V at V_S = +5 V	—	N	TSSOP-16	2.95
PGA308	Single Supply, Auto-Zero, Sensor Amplifier with Programmable Gain and Offset	—	2.7 to 5.5	0.2 V to 4.1 V	0.03 V to 5.44 mA at V_S = +5 V	—	N	MSOP-10, DFN-10	2.00
Industrial Current/Voltage Drivers									
DAC8760/ 7760	16-/12-Bit Programmable Current and Voltage Output DAC	—	+10/–18 to 0/36	—	0-20, 4-20, 0-24, 0-5 V, 0-10 V, ±5 V, ±10 V	—	N	QFN-40, TSSOP-24	3.99/ 2.99
DAC8750/ DAC7750	16-/12-Bit Programmable Current Output DAC	—	+10/–18 to 0/36	—	0-20, 4-20, 0-24, 0-5 V, 0-10 V, ±5 V, ±10 V	—	N	QFN-40, TSSOP-24	3.50/ 2.49
XTR110	Precision V-to-I Converter/Transmitter, Selectable I/O Ranges	V_{REF} = 10 V	13.5 to 40	0 V to 5 V, 0 V to 10 V	0-20, 4-20 5-20	—	N	DIP-16, SOL-16	7.10
XTR111	Precision V-to-I Converter/Transmitter, Adjustable V_{REG} 3 V to 15 V	V_{REG} = 3 to 15 V	8 to 40	0 V to 12 V	0-20, 4-20, 5-20	3 V to 15 V	N	DFN/MSOP-10	1.10
XTR300	Industrial Analog Current/Voltage Output Driver	—	<34	V (–) +3 to V (+) –3 Prog V_{OUT}	±17 V ±24 mA	—	N	5x5 QFN/TSSOP-20	2.45
4-20mA Current Loop Receiver									
RCV420	4-20 mA Input, 0 V to 5 V Output, 1.5 V Loop Drop	V_{REF} = 10 V	+11.5/–5 to ±18	4-20 mA	0 V to 5 V	—	N	DIP-16	3.55

*Suggested resale price in U.S. dollars in quantities of 1,000. See www.ti.com/hirel for HiRel options.

Preview products are listed in **bold blue**.

3ppm/°C Drift, 0.05% Accurate, Low-Noise, Precision Series Voltage References
REF5020, REF5025, REF5030, REF5040, REF5045, REF5050, REF5010

The REF50xx brings a new level of precision to the TI series voltage reference line. Offering 3 ppm/°C (max) drift and 0.05% initial accuracy and very low noise, the REF50xx is designed for industrial, medical and test applications that require performance over temperature.

Model	Voltage Out
REF5020	2.048 V
REF5025	2.5 V
REF5030	3.0 V
REF5040	4.096 V
REF5045	4.5 V
REF5050	5 V
REF5010	10 V
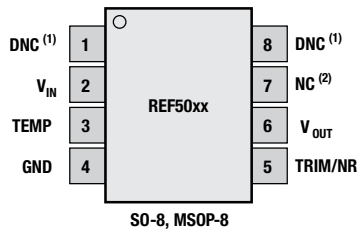
REF50xx package diagram

Key Features
- High accuracy: 0.05%
- Low temperature drift: 3 ppm/°C (max)
- Very low noise: 3 μV_{PP}/V
- High output current: ±10 mA
- Wide supply range: 2.7 V to 18 V
- Industrial temperature range: −40°C to +125°C
- Packaging: SO-8, MSOP coming soon

Applications
- Test and measurement
- 16-bit data acquisition systems
- Medical and patient monitoring
- Industrial process control

Get more information: **www.ti.com/product/Part Number**
(REF5020, REF5025, REF5030, REF5040, REF5045, REF5050, REF5010)

Voltage References

Device	Description	Output (V)	Initial Accuracy (%) (max)	Drift (ppm/°C) (max)	Long-Term Stability (ppm/1000hr) (typ)	Noise 0.1 to 10Hz (µVp-p/V) (typ)	I_Q (mA) (max)	Temperature Range (°C)	Output Current (mA)	HiRel Avail.	Package	Price*
REF50xx	High Accuracy Bandgap Reference	2.048, 2.5, 3.0, 4.096, 4.5, 5, 10	0.05	3	5	3	1	−40 to +125	±10	Y	SOIC-8	2.95
REF50xxA	High Accuracy Bandgap Reference	2.048, 2.5, 3.0, 4.096, 4.5, 5, 10	0.1	8	5	3	1	−40 to +125	±10	Y	SOIC-8	1.35
REF33xx	microPower, Tiny Bandgap	1.25, 1.8, 2.048, 2.5, 3.0, 3.3	0.15	30	—	28	0.005	−40 to +125	±5	N	SC70, SOT23-3	0.85
REF32xx	Low Drift, Low Power, Small Bandgap	1.25, 2.048, 2.5 3.0, 3.3, 4.096	0.2	7	55	13	0.120	−40 to +125	±10	Y	SOT23-6	1.70
REF31xx	Series Bandgap	1.25, 2.048, 2.5 3.0, 3.3, 4.096	0.2	15	70	13	0.115	−40 to +125	±10	N	SOT23-3	1.10
REF30xx	Series Bandgap	1.25, 2.048, 2.5, 3.0, 3.3, 4.096	0.2	50	24	11	0.05	−40 to +125	25	Y	SOT23-3	0.60
REF29xx	Series Bandgap	1.25, 2.048, 2.5, 3.0, 3.3, 4.096	2	100	24	11 to 16	0.05	−40 to +125	25	N	SOT23-3	0.49
REF02A	Low Drift, Buried Zener	5	0.3	15	50	0.8	1.4	−40 to +85	+21, −0.5	N	SOIC, PDIP	1.45
REF02B	Low Drift, Buried Zener	5	0.2	10	50	0.8	1.4	−40 to +85	+21, −0.5	N	SOIC, PDIP	2.05
REF102A	Low Drift, Buried Zener	10	0.1	10	20	0.5	1.4	−25 to +85	+10, −5	N	SOIC, PDIP	1.75
REF102B	Low Drift, Buried Zener	10	0.05	5	20	0.5	1.4	−25 to +85	+10, −5	N	SOIC, PDIP	3.25
REF102C	Ultra-Low Drift, Buried Zener	10	0.025	2.5	20	0.5	1.4	−25 to +85	+10, −5	N	SOIC, PDIP	4.50
LM4140	Precision Micropower Low Dropout Voltage Reference	1.024, 1.25, 2.048, 2.5, 4.096	0.1	10	60	2.2	0.4	0 to 70	8	N	8SOIC	1.65
LM4132	Precision Low Dropout Voltage Reference	1.8, 2.048, 2.5, 3, 3.3, 4.096	0.05	30	50	170	0.1	−40 to 125	20	N	SOT23-5	0.78
LM4128	Precision Micropower Series Voltage Reference	1.8, 2.048, 2.5, 3, 3.3, 4.096	0.1	100	50	170	0.1	−40 to 125	20	Y	SOT23-5	0.52

*Suggested resale price in U.S. dollars in quantities of 1,000. **See www.ti.com/hirel** for HiRel options.

Voltage References

Voltage References

Voltage References (continued)

Device	Description	Output (V)	Initial Accuracy (%) (max)	Drift (ppm/°C) (max)	Long-Term Stability (ppm/1000hr) (typ)	Noise 0.1 to 10Hz (µVp-p/V) (typ)	I_Q (mA) (max)	Temperature Range (°C)	Output Current (mA)	HiRel Avail.	Package	Price*
Shunt												
REF1112	µPower, 1.25 V Shunt	1.25	0.2	30	60	20	0.0015	−40 to +125	0.0012 to 5	N	SOT23-3	0.85
LM385-2.5-N	Mircropower Voltage Reference Diode	2.5	2	20	20	120	0.02	0 to 70	1 to 20	N	3TO-92, SOIC-8, TSSOP-8	0.22
LMV431A	Low-Voltage Adjustable Precision Shunt Regulators	1.24 to 30	1	39	—	—	0.055	−40 to 85	—	N	SOT23-3, 3TO-92, SOT23-5	0.20
LMV431B	Low-Voltage Adjustable Precision Shunt Regulators	1.24 to 30	0.5	39	—	—	0.055	−40 to 85	—	N	SOT23-3, SOT23-5	0.28
LMV431	Low-Voltage Adjustable Precision Shunt Regulators	1.24 to 30		39	—	—	0.055	−40 to 85	—	N	3TO-92, SOT23-5	0.16
LM4041	Precision Micropower Shunt Voltage Reference	1.2	0.1	100	120	20	0.045	−40 to 125	0.06 to 12	N	SOT23-3, 3TO-92, SC70-5	0.23
LM4051	Precision Micropower Shunt Voltage Reference	1.225	0.5	50	50	20	0.06	−40 to 85	0.06	N	SOT23-3	0.70
LM4040	Precision Micropower Shunt Voltage Reference	2.048, 2.5, 3, 4.096, 5.0, 8.192, 10	0.1	50	120	35	0.065	−40 to 85	0.015	Y	SOT23-3, 3TO-92, SC70-5	0.22
LM4431	Micropower Shunt Voltage Reference	2.5	2	60	120	35	0.015	0 to 70	0.045	N	SOT23-3	0.33
LM431	Adjustable Precision Zener Shunt Regulator	2.5 to 36	0.022	50	—	—	0.003	−40 to 85	0.004	N	SOT23-3, 3TO-92, SOIC-8	0.18
LM4050	Precision Micropower Shunt Voltage Reference	2.048, 2.5, 4.096, 5, 8.192, 10	0.1, 0.2, 0.5	15	120	34	0.065	−40 to 85	0.015	Y	SOT23-3	0.70
LM4030	Ultra-High Precision Shunt Voltage Reference	2.5, 4.096	0.05	10	40	165	0.13	−40 to 125	0.05	N	SOT23-5	0.45
LM385-1.2 -N	Mircropower Voltage Reference Diode	1.2	1	20	20	60	0.02	0 to 70	20	N	3TO-92, SOIC-8, , TSSOP-8	0.22
Current Reference												
REF200	Dual-Current Reference with Current Mirror	100 µA/Channel	±1	25 (typ)	—	1nAp-p	—	−25 to +85	50 µA to 400 µA	N	PDIP-8, SOIC-8	2.60
LM134	3-Terminal Adjustable Current Source	1 µA to 10 mA	3	33	—	—	—	−55 to +125	1 µA to 10 mA	N	TO-3	5.10
LM234	3-Terminal Adjustable Current Source	1 µA to 10 mA	3	33	—	—	—	−25 to +100	1 µA to 10 mA	N	TO-3, SOIC-8	0.45
LM334	3-Terminal Adjustable Current Source	1 µA to 10 mA	6	33	—	—	—	0 to +70	1 µA to 10 mA	N	SOIC-8	0.27

*Suggested resale price in U.S. dollars in quantities of 1,000. **See www.ti.com/hirel** for HiRel options.

Differential Clock Buffer with Dividers

CDCUN1208LP

The CDCUN1208LP is a 2:8 fan-out buffer featuring a wide operating supply range, two universal differential/single-ended inputs, and universal outputs (HCSL, LVDS, or LVCMOS) with edge rate control. The state of certain pins determines device configuration at power up. Alternately, the CDCUN1208LP provides a SPI/I2C port with which a host processor controls device settings. The output section includes four dedicated supply pins enabling the operation of output ports from different power supply domains. This provides the ability to clock devices switching at different LVCMOS levels without the need for external logic level translation circuitry.

The CDCUN1208LP delivers excellent additive jitter performance and low power consumption; it is offered in a 32-pin QFN package reducing the solution footprint, is flexible and easy to use.

CDCUN1208LP functional block diagrams

Get more information: **www.ti.com/product/CDCUN1208LP**

Key Features
- Low power consumption and power management features including 1.8 V operation and output enable control
- Integrated voltage regulators improve PSNR
- Supports PCIE gen1, gen2, gen3
- Built-in divider
- Excellent additive jitter performance
  - 200 fs RMS (10 kHz-20 MHz), LVDS at 100 MHz
- Maximum operating frequency:
  - Differential mode: up to 400 MHz
  - LVCMOS mode: up to 250 MHz
- ESD protection exceeds 2 kV HBM, 500 V CDM
- Industrial temperature range (–40°C to 85°C)
- Wide supply range (1.8 V, 2.5 V, or 3.3 V)

Applications
- Communications systems (Ethernet, PCI Express®)
- Computing systems (Ethernet, PCIe, USB)
- Consumer (set top boxes, video equipment)
- Office automation

Clocks and Timing
Clock Distribution (Fanout Buffers, Zero-Delay Buffers)

3.1-GHz Differential Clock Buffer/Level Translator
LMK00304

The LMK00304 is a 3-GHz four-output differential fanout buffer intended for high-frequency, low-jitter clock/data distribution and level translation. The input clock can be selected from two universal inputs or one crystal input. The selected input clock is distributed to two banks of two differential outputs and one LVCMOS output. The differential output banks can be mutually configured as LVPECL, LVDS, or HCSL drivers, or disabled. The LVCMOS output has a synchronous enable input for runt-pulse-free operation when enabled or disabled. The LMK00304 operates from a 3.3 V core supply and three independent 3.3 V/2.5 V output supplies.

The LMK00304 provides high performance, versatility, and power efficiency, making it ideal for replacing fixed-output buffer devices while increasing timing margin in the system.
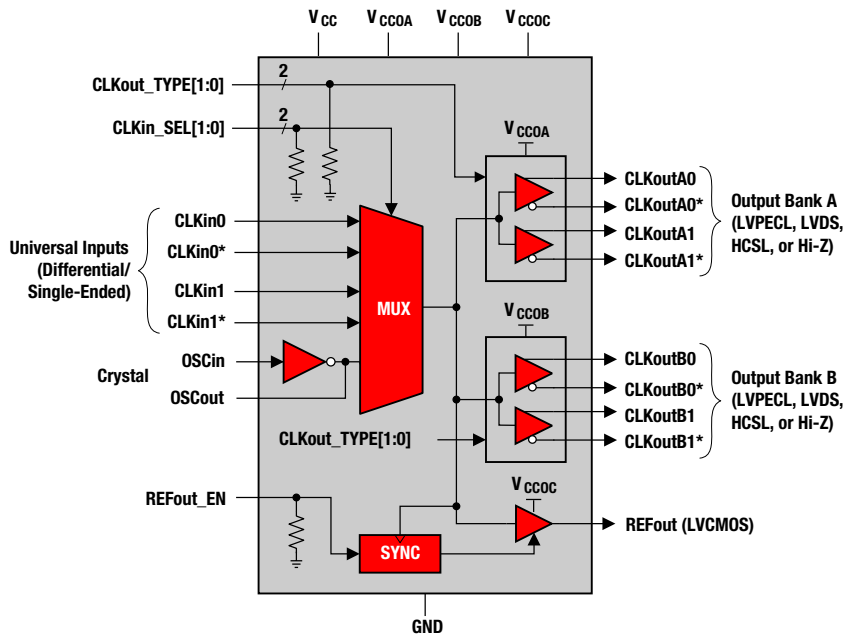
LMK00304 functional block diagrams

Get more information: **www.ti.com/product/LMK00304**

Key Features
- 3:1 input multiplexer
- Two banks with two differential outputs each
- High PSRR: –65 / –76 dBc (LVPECL/LVDS) at 156.25 MHz
- LVCMOS output with synchronous enable input
- Pin-controlled configuration
- V_{CC} core supply: 3.3 V ± 5%
- Three independent V_{CCO} output supplies: 3.3 V/2.5 V ± 5%
- Industrial temperature range: –40°C to +85°C
- Package: 32-pin LLP (5.0 x 5.0 x 0.8 mm)

Applications
- High-speed data acquisition and generation
- Medical equipment
- Optical networking
- Telecom base band unit
- Video communications

Clocks and Timing
Clock Distribution (Fanout Buffers, Zero-Delay Buffers)

Fanout Buffers

Device	Description	Input Level	Output Level	Frequency (MHz)	V$_{CC}$ (V)	Propagation Delay	Output Skew (max) (ps)	Char. Temp. (ºC)	HiRel Avail.	Package	Price*
Differential											
CDCLVP1102	Low-Jitter 1:2 Universal-to-LVPECL Buffer	LVPECL/LVDS/LVCMOS	LVPECL	0 to 2 GHz	2.5/3.3	450 ps (max)	10 ps	–40 to 85	N	QFN-16	2.50
CDCLVP1204	Low-Jitter, 2-Input Selectable 1:4 Universal-to-LVPECL Buffer	LVPECL/LVDS/LVCMOS	LVPECL	0 to 2 GHz	2.5/3.3	450 ps (max)	15 ps	–40 to 85	N	QFN-16	3.30
CDCLVP1208	Low-Jitter, 2-Input Selectable 1:8 Universal-to-LVPECL Buffer	LVPECL/LVDS/LVCMOS	LVPECL	0 to 2 GHz	2.5/3.3	450 ps (max)	20 ps	–40 to 85	N	QFN-28	5.00
CDCLVP1212	Low-Jitter, 2-Input Selectable 1:12 Universal-to-LVPECL Buffer	LVPECL/LVDS/LVCMOS	LVPECL	0 to 2 GHz	2.5/3.3	550 ps (max)	25 ps	–40 to 85	N	QFN-40	6.50
CDCLVP1216	Low-Jitter, 2-Input Selectable 1:16 Universal-to-LVPECL Buffer	LVPECL/LVDS/LVCMOS	LVPECL	0 to 2 GHz	2.5/3.3	550 ps (max)	30 ps	–40 to 85	N	QFN-48	8.50
CDCLVP2102	Low-Jitter, Dual 1:2 Universal-to-LVPECL Buffer	LVPECL/LVDS/LVCMOS	LVPECL	0 to 2 GHz	2.5/3.3	450 ps (max)	10 ps (Within Bank)	–40 to 85	N	QFN-16	3.30
CDCLVP2104	Low-Jitter, Dual 1:4 Universal-to-LVPECL Buffer	LVPECL/LVDS/LVCMOS	LVPECL	0 to 2 GHz	2.5/3.3	450 ps (max)	15 ps (Within Bank)	–40 to 85	N	QFN-28	5.00
CDCLVP2106	Low-Jitter, Dual 1:6 Universal-to-LVPECL Buffer	LVPECL/LVDS/LVCMOS	LVPECL	0 to 2 GHz	2.5/3.3	550 ps (max)	20 ps (Within Bank)	–40 to 85	N	QFN-40	6.50
CDCLVP2108	Low-Jitter, Dual 1:8 Universal-to-LVPECL Buffer	LVPECL/LVDS/LVCMOS	LVPECL	0 to 2 GHz	2.5/3.3	550 ps (max)	25 ps (Within Bank)	–40 to 85	N	QFN-48	8.50
CDCLVD1204	Low-Jitter, 2-Input Selectable 1:4 Universal-to-LVDS Buffer	LVPECL/LVDS/LVCMOS	LVDS	0 to 800	2.5	1.5 ns (typ)	20 ps	–40 to 85	N	QFN-16	2.85
CDCLVD1208	Low-Jitter, 2-Input Selectable 1:8 Universal-to-LVDS Buffer	LVPECL/LVDS/LVCMOS	LVDS	0 to 800	2.5	1.5 ns (typ)	20 ps	–40 to 85	N	QFN-28	3.85
CDCLVD1212	Low-Jitter, 2-Input Selectable 1:12 Universal-to-LVDS Buffer	LVPECL/LVDS/LVCMOS	LVDS	0 to 800	2.5	1.5 ns (typ)	20 ps	–40 to 85	N	QFN-40	4.75
CDCLVD1216	Low-Jitter, 2-Input Selectable 1:16 Universal-to-LVDS Buffer	LVPECL/LVDS/LVCMOS	LVDS	0 to 800	2.5	1.5 ns (typ)	20 ps	–40 to 85	N	QFN-48	5.70
CDCLVD2102	Low-Jitter, Dual 1:2 Universal-to-LVDS Buffer	LVPECL/LVDS/LVCMOS	LVDS	0 to 800	2.5	1.5 ns (typ)	20 ps (Within Bank)	–40 to 85	N	QFN-16	3.00
CDCLVD2104	Low-Jitter, Dual 1:4 Universal-to-LVDS Buffer	LVPECL/LVDS/LVCMOS	LVDS	0 to 800	2.5	1.5 ns (typ)	20 ps (Within Bank)	–40 to 85	N	QFN-28	4.00
CDCLVD2106	Low-Jitter, Dual 1:6 Universal-to-LVDS Buffer	LVPECL/LVDS/LVCMOS	LVDS	0 to 800	2.5	1.5 ns (typ)	20 ps (Within Bank)	–40 to 85	N	QFN-40	5.00
CDCLVD2108	Low-Jitter, Dual 1:8 Universal-to-LVDS Buffer	LVPECL/LVDS/LVCMOS	LVDS	0 to 800	2.5	1.5 ns (typ)	20 ps (Within Bank)	–40 to 85	N	QFN-48	6.00
CDCLVD1213	Low-Jitter, 1:4 Universal-to-LVDS Buffer with Selectable Output Divider	LVPECL/LVDS/CML	LVDS	0 to 800	2.5	1.5 ns (typ)	20 ps	–40 to 85	N	QFN-16	4.00
CDCP1803	1:3 LVPECL Clock Buffer with Programmable Divider	LVPECL/LVDS	LVPECL	0 to 800	3.3	320 to 600 ps	30 ps	–40 to 85	Y	QFN-24	3.15
CDCLVP215	Dual 1:5 High-Speed LVPECL Clock Buffer	LVPECL	LVPECL	DC to 3.5 GHz	2.5/3.3	230 to 370 ps	30 ps	–40 to 85	N	LQFP-32	5.55
CDCLVP110	2-Input Selectable 1:10 LVPECL Clock Buffer	LVPECL/HSTL	LVPECL	0 to 3.5 GHz	2.5/3.3	230 to 370 ps	30 ps	–40 to 85	N	LQFP-32	5.50
CDCLVP111	2-Input Selectable 1:10 LVPECL Clock Buffer	LVPECL	LVPECL	DC to 3.5 GHz	2.5/3.3	230 to 370 ps	30 ps	–40 to 85	N	LQFP-QFN-32-32	5.55
CDCLVD110A	2-Input Selectable Programmable 1:10 LVDS Clock Buffer	LVDS	LVDS	0 to 900	2.5	3ns	30 ps (typ)	–40 to 85	N	TQFP-32	5.50
CDCL1810	1:10 LVDS-to-CML Clock Buffer	LVDS	CML	0 to 650	1.8	3ns	64 ps	–40 to 85	N	QFN-48	6.45
CDCUN1208LP	Ultra-Low-Power, 2:8 Fan-out Buffer with Universal Inputs and Outputs	HCSL, LVDS, LVCMOS	HCSL, LVDS, LVCMOS	0 to 400	3.3/2.5/1.8	3.8 ns (max)	50 ps (max)	–40 to 85	N	QFN-32	5.00
SN65EL11	1:2 ECL/PECL Buffer	ECL/PECL	ECL/PECL	>2.5 GHz	5	265 ps (typ)	15	–40 to 85	N	SOIC-8/MSOP-8	1.35
SN65EL16	1:1 ECL/PECL Buffer	ECL/PECL	ECL/PECL	>2.5 GHz	5	250 ps (typ)	20	–40 to 85	N	SOIC-8/MSOP-8	1.35
SN65ELT20	1:1 TTL-to-PECL Buffer	TTL	PECL	400 (Typ)	5	1250 ps (max)	—	–40 to 85	N	SOIC-8/MSOP-8	1.45
SN65ELT21	1:1 PECL-to-TTL Buffer	TTL	PECL	0 to 400	5	3000 ps (typ)	—	–40 to 85	N	SOIC-8/MSOP-8	1.40
SN65ELT22	2:2 TTL-to-PECL Buffer	TTL	PECL	0 to 1 GHz	5	1100 ps (max)	90	–40 to 85	N	SOIC-8/MSOP-8	1.45
SN65ELT23	2:2 PECL-to-TTL Buffer	PECL	TTL	0 to 500	5	3500 ps (typ)	—	–40 to 85	N	SOIC-8/MSOP-8	1.40

*Suggested resale price in U.S. dollars in quantities of 1,000. See **www.ti.com/hirel** for HiRel options.

Clocks and Timing
Clocks Distribution (Fanout Buffers, Zero-Delay Buffers)

Fanout Buffers (continued)

Device	Description	Input Level	Output Level	Frequency (MHz)	V_{CC} (V)	Propagation Delay	Output Skew (max) (ps)	Char. Temp. (°C)	Hi-Rel Avail.	Package	Price*
Differential (continued)											
SN65EPT21	1:1 LVTTL-to-LVPECL Buffer	LVTTL	LVPECL	0 to 600	3.3	1900 ps (max)	250	–40 to 85	N	SOIC-8/MSOP-8	1.80
SN65EPT22	2:2 LVTTL-to-LVPECL Buffer	LVTTL	LVPECL	0 to 4 GHz	3.3	420 ps (typ)	50	–40 to 85	N	SOIC-8/MSOP-8	1.80
SN65EPT23	2:2 LVPECL-to-LVTTL Buffer	LVPECL	LVTTL	>300	3.3	1900 ps (max)	110	–40 to 85	N	SOIC-8/MSOP-8	1.80
SN65EPT21	1:1 LVTTL-to-LVPECL Buffer	LVTTL	LVPECL	0 to 600	3.3	1900 ps (max)	250	–40 to 85	N	SOIC-8/MSOP-8	1.80
SN65EPT22	2:2 LVTTL-to-LVPECL Buffer	LVTTL	LVPECL	0 to 4 GHz	3.3	420 ps (typ)	50	–40 to 85	N	SOIC-8/MSOP-8	1.80
SN65EPT23	2:2 LVPECL-to-LVTTL Buffer	LVPECL	LVTTL	>300	3.3	1900 ps (max)	110	–40 to 85	N	SOIC-8/MSOP-8	1.80
SN65LVEL11	1:2 ECL/PECL Buffer	ECL/PECL	ECL/PECL	0 to 1.5 GHz	3.3	265 ps (typ)	18	–40 to 85	N	SOIC-8/MSOP-8	1.45
SN65LVELT22	2:2 LVTTL-to-LVPECL Buffer	LVTTL	LVPECL	0 to 3.5 GHz	3.3	450 ps (typ)	50	–40 to 85	N	SOIC-8/MSOP-8	1.45
SN65LVELT23	2:2 LVPECL-to-LVTTL Buffer	LVPECL	LVTTL	>180	3.3	2200 ps (max)	150	–40 to 85	N	SOIC-8/MSOP-8	2.30
SN65LVEP11	1:2 ECL/PECL Buffer	ECL/PECL	ECL/PECL	0 to 3 GHz	2.5/3.3	240 ps (typ)	15	–40 to 85	N	SOIC-8/MSOP-8	2.20
LMK01000	1.6 GHz High Performance Clock Buffer, Divider and Distributor	LVPECL/LVDS/LVCMOS	LVPECL/LVDS	1 to 1.6 GHz	3.3	—	±30	–40 to 85	N	LLP-48	7.25
LMK00301	3-GHz, 10-Output Differential Fanout + 1 CMOS Buffer	LVPECL/LVDS/CML/ Single-Ended/Crystal	LVPECL/LVDS/ HCSL/LVCMOS	0 to 3.1 GHz	3.3 (Vcc), 3.3/2.5 (Vcco)	360 to 590 ps (typ)	50 ps	–40 to 85	N	LLP-48	5.25
LMK00304	3-GHz 4-Output Differential Fanout + 1 CMOS Buffer	LVPECL/LVDS/CML/ Single-Ended/Crystal	LVPECL/LVDS/ HCSL/LVCMOS	0 to 3.1 GHz	3.3 (Vcc), 3.3/2.5 (Vcco)	360 to 590 ps (typ)	50 ps	–40 to 85	N	LLP-32	3.35
LMK00306	3-GHz 6-Output Differential Fanout + 1 CMOS Buffer	LVPECL/LVDS/CML/ Single-Ended/Crystal	LVPECL/LVDS/ HCSL/LVCMOS	0 to 3.1 GHz	3.3 (Vcc), 3.3/2.5 (Vcco)	360 to 590 ps (typ)	50 ps	–40 to 85	N	LLP-36	4.19
LMK00308	3-GHz 8-Output Differential Fanout + 1 CMOS Buffer	LVPECL/LVDS/CML/ Single-Ended/Crystal	LVPECL/LVDS/ HCSL/LVCMOS	0 to 3.1 GHz	3.3 (Vcc), 3.3/2.5 (Vcco)	360 to 590 ps (typ)	50 ps	–40 to 85	N	LLP-40	5.00
LMK01801	14-Output Universal Fanout Buffer with Divider and Delay	LVPECL/LVDS/LVCMOS	LVPECL/LVDS/ LVCMOS	1 kHz to 3.1 GHz	3.3	—	32 ps (typ, DIFF-to-DIFF), 830 ps (typ, DIFF-to-CMOS)	–40 to 85	N	LLP-48	6.75
Single-Ended											
LMK00101	10-Output CMOS Fanout Buffer / Level Translator	LVPECL/LVDS/HCSL/ SSTL/Single-Ended/ Crystal	LVCMOS (1.5/1.8/2.5/3.3 V)	0 to 200	2.5/3.3 (V_{DD}), 1.5 to V_{DD} (Vddo)	1 ns (typ) V_{DD}=3.3 V	6 ps (typ)	–40 to 85	N	QFN-32	2.20
LMK00105	5-Output CMOS Fanout Buffer / Level Translator	LVPECL/LVDS/HCSL/ SSTL/Single-Ended/ Crystal	LVCMOS (1.5/1.8/2.5/3.3 V)	0 to 200	2.5/3.3 (V_{DD}), 1.5 to V_{DD} (V_{DDO})	1 ns (typ) V_{DD}=3.3 V	6 ps (typ)	–40 to 85	N	QFN-24	1.50
CDCLVC1310	10-Output CMOS Fanout Buffer / Level Translator	LVPECL/LVDS/HCSL/ SSTL/Single-Ended/ Crystal	LVCMOS (1.5/1.8/2.5/3.3 V)	0 to 200	2.5/3.3 (V_{DD}), 1.5 to V_{DD} (V_{DDO})	2ns (typ)	50 ps (max)	–40 to 85	N	QFN-32	2.20
CDCLVC1102	Low-Jitter, 1:2 LVCMOS Fan-Out Clock Buffer	LVCMOS	LVCMOS	0 to 250	2.5/3.3	0.8 to 2 ns	50 ps	–40 to 85	N	TSSOP-8	0.90
CDCLVC1103	Low-Jitter, 1:3 LVCMOS Fan-Out Clock Buffer	LVCMOS	LVCMOS	0 to 250	2.5/3.3	0.8 to 2 ns	50 ps	–40 to 85	N	TSSOP-8	1.05
CDCLVC1104	Low-Jitter, 1:4 LVCMOS Fan-Out Clock Buffer	LVCMOS	LVCMOS	0 to 250	2.5/3.3	0.8 to 2 ns	50 ps	–40 to 85	N	TSSOP-8	1.20
CDCLVC1106	Low-Jitter, 1:6 LVCMOS Fan-Out Clock Buffer	LVCMOS	LVCMOS	0 to 250	2.5/3.3	0.8 to 2 ns	50 ps	–40 to 85	N	TSSOP-14	1.50
CDCLVC1108	Low-Jitter, 1:8 LVCMOS Fan-Out Clock Buffer	LVCMOS	LVCMOS	0 to 250	2.5/3.3	0.8 to 2 ns	50 ps	–40 to 85	N	TSSOP-16	1.80
CDCLVC1110	Low-Jitter, 1:10 LVCMOS Fan-Out Clock Buffer	LVCMOS	LVCMOS	0 to 250	2.5/3.3	0.8 to 2 ns	50 ps	–40 to 85	N	TSSOP-20	2.25
CDCLVC1112	Low-Jitter, 1:12 LVCMOS Fan-Out Clock Buffer	LVCMOS	LVCMOS	0 to 250	2.5/3.3	0.8 to 2 ns	50 ps	–40 to 85	N	TSSOP-24	2.60
CDC318A	1:18 LVTTL Clock Buffer with I²C Control	LVTTL	LVTTL	0 to 100	3.3	1.2 to 4.5 ns	250 ps	0 to 70	N	SSOP-48	2.10
CDC319	1:10 LVTTL Clock Buffer with I²C Control	LVTTL	LVTTL	0 to 140	3.3	1.2 to 3.6 ns	250 ps	0 to 70	N	SSOP-28	1.75
CDCV304	1:4 PCI-X® Compliant LVTTL Clock Buffer	LVTTL	LVCMOS	0 to 200	2.5/3.3	1.8 to 3.0 ns	100 ps	–40 to 85	N	TSSOP-8	1.20
CDCVF310	1:10 LVTTL Clock Buffer (2 Banks of 5 Outputs)	LVTTL/LVCMOS	LVTTL/LVCMOS	0 to 200	2.5/3.3	1.0 to 2.8 ns (V_{DD} = 3. V), 1.3 to 4.0 ns (V_{DD} = 2.5V)	150 ps at 3.3 V, 230 ps at 2.5 V	–40 to 85	N	TSSOP-24	2.05
CDCVF2310	1:10 LVTTL Clock Buffer (2 Banks of 5 Outputs) with 25 Ω input resistors	LVTTL/LVCMOS	LVTTL/LVCMOS	0 to 170 (V_{DD} = 2.5 V), 0 to 200 (V_{DD} = 3.3 V)	2.5/3.3	1.3 to 2.8 ns (V_{DD} = 3.3 V), 1.5 to 3.5 ns (V_{DD} = 2.5V)	100 ps at 3.3 V, 170 ps at 2.5 V	–40 to 85	N	TSSOP-24	2.05
CDC3RL02	1:2 Square/Sine-to-Square Wave Buffer with LDO	SQUARE/SINE	SQUARE	10 to 52	1.8	12 ns (typ)	500 ps	–40 to 85	N	DSBGA-8	.90
CDC3S04	1:4 Sine-to-Sine Wave Buffer with LDO	SINE	SINE	.01 to 52	1.8	3 ns (max)	50 ps	–30 to 85	N	DSBGA-20	1.80
LMH2180	75 MHz Dual Clock Buffer	SQUARE/SINE	Analog	75	2.4 to 5	—	—	–40 to 85	N	LLP-8/uSMD-8	1.10
LMH2190	Quad Channel 27 MHz Clock Tree Driver with I²C Interface	Buffer with LDO	CMOS	0.032 to 27	2.5 to 5.5	11 ns (max)	8.5 ns (max)	–40 to 85	N	µSMD-16	1.40
LMH2191	Dual Channel 52 MHz Clock Tree Driver	SQUARE/SINE	CMOS	10 to 52	2.5 to 5.5	10.5 ns (max)	3.1 ns	–40 to 85	N	µSMD-8	0.90
LMV112	40 MHz Dual Clock Buffer	SQUARE/SINE	Analog	40	2.4 to 5	—	—	–40 to 85	N	LLP-8	0.42

Suggested resale price in U.S. dollars in quantities of 1,000.

New devices are listed in **bold red.**

Clocks and Timing
Clocks Distribution (Fanout Buffers, Zero-Delay Buffers)

Fanout Buffers (continued)

Device	Description	Input Level	Output Level	Frequency (MHz)	V_{CC} (V)	Propagation Delay	Output Skew (max) (ps)	Char. Temp. (ºC)	Hi-Rel Avail.	Package	Price*
Dividers											
CDCM1804	1:3 LVPECL + 1:1 LVCMOS Buffer with Dividers	LVPECL	LVPECL/LVCMOS	800	3.3	600 ps (LVPECL), 2.6 ns (LVCMOS)	30 ps (LVPECL), 1.6 ns (LVCMOS)	–40 to 85	N	QFN-24	5.90
CDCM1802	1:1 LVCMOS + 1:1 LVPECL Buffer with Dividers	LVPECL	LVPECL/LVCMOS	800	3.3	600 ps (LVPECL), 2.6 ns (LVCMOS)	1.6 ns (typ)	–40 to 85	N	QFN-16	4.70
CDCP1803	1:3 LVPECL Clock Buffer with Programmable Divider	LVPECL/LVDS	LVPECL	0 to 800	3.3	320 to 600 ps)	30 ps	–40 to 85	Y	QFN-24	3.15
CDCE18005	3:5 LVPECL/LVDS/LVCMOS Buffer with Dividers	LVPECL/LVDS/ LVCMOS	LVPECL/LVDS/ LVCMOS	DC to 1.5 GHz	3.3	4 ns	75 ps	–40 to 85	N	QFN-48	6.00
CDCUN1208LP	Ultra-Low-Power, 2:8 Fan-out Buffer with Universal Inputs and Outputs	HCSL, LVDS, LVCMOS	HCSL, LVDS, LVCMOS	0 to 400	3.3/2.5/1.8	3.8 ns	50ps	–40 to 85	N	QFN-32	5.00
LMK01801	14-Output Universal Fanout Buffer with Divider and Delay	LVPECL/LVDS/LVCMOS	LVPECL/LVDS/ LVCMOS	1 kHz to 3.1 GHz	3.3	—	32 ps (typ, DIFF-to-DIFF), 830 ps (typ, DIFF-to-CMOS)	–40 to 85	N	LLP-48	6.75

Suggested resale price in U.S. dollars in quantities of 1,000.

Zero-Delay Buffers

Device	Description	Input Level	Output Level	Frequency (MHz)	V_{CC} (V)	Jitter (Peak-to-Peak [P-P] or Cycle-to-Cycle [C-C])	Phase Error	Char. Temp. (ºC)	HiRel Avail.	Package	Price*
Differential-Ended											
CDCV850	1:10 Differential Clock Driver	SSTL_2/ Universal	SSTL_2	60 to 140	2.5	C-C: ±30 ps (100 to 133 MHz)	–80/150 ps (133 MHz)	–40 to 85	N	TSSOP-48	2.20
CDCV855	1:4 Differential Clock Driver	SSTL_2/LVTTL	SSTL_2	60 to 180	2.5	C-C: ±50 ps (100 to 180 MHz)	±100 ps (100 to 180 MHz)	–40 to 85	N	TSSOP-28	1.15
CDCV857	1:10 PLL Differential Clock Driver for DDR 200/266/333, SSC	SSTL_2/LVTTL	SSTL_2	60 to 200	2.5	C-C: ±75 ps (100 to 200 MHz)	–150/50 ps (200 MHz)	0 to 85	N	TSSOP-48	4.20
CDCV857A	1:10 PLL Differential Clock Driver for DDR 200/266/333, SSC	SSTL_2/LVTTL	SSTL_2	60 to 180	2.5	C-C: ±50 ps (100 to 180 MHz)	±100 ps (100 to 180 MHz)	0 to 85	N	TSSOP-48, µBGA-56	2.90
CDCV857B	1:10 PLL Differential Clock Driver for DDR 200/266/333, SSC	SSTL_2/LVTTL	SSTL_2	60 to 200	2.5	C-C: ±50 ps (100 to 200 MHz)	±50 ps (min/max) (100 to 200 MHz)	0 to 70	N	TSSOP-48, µBGA-56	3.65
CDCV857BI	1:10 PLL Differential Clock Driver for DDR 200/266/333, SSC	SSTL_2/LVTTL	SSTL_2	60 to 200	2.5	C-C: ±50 ps (100 to 200 MHz)	±50 ps (min/max) (100 to 200 MHz)	–40 to 85	N	TSSOP-48, µBGA-56	3.35
CDCVF857	1:10 PLL Differential Clock Driver for DDR 200/266/333/400, SSC	SSTL_2/LVTTL	SSTL_2	60 to 220	2.5	C-C: ±35 ps (133 to 200 MHz)	±50 ps (min/max) (100 to 200 MHz)	–40 to 85	N	TSSOP-48, QFN-48, µBGA-56	3.60
CDCU877	1:10 PLL Differential Clock Driver for DDR2 Applications, SSC	SSTL_18	SSTL_18	10 to 400	1.8	C-C: ±30 ps (190 to 340 MHz)	±50 ps	–40 to 85	N	µBGA-52, QFN-40	3.05
CDCU877A	1:10 PLL Differential Clock Driver for DDR2 Applications, SSC	SSTL_18	SSTL_18	10 to 400	1.8	C-C: ±30 ps (190 to 340 MHz)	±50 ps	–40 to 85	N	µBGA-52, QFN-40	3.05
CDCU877B	1:10 PLL Differential Clock Driver for DDR2 400/533, SSC	SSTL_18	SSTL_18	10 to 340	1.8	C-C: ±30 ps (190 to 340 MHz)	±50 ps	–40 to 85	N	µBGA-52	3.05
CDCUA877	1:10 PLL Differential Clock Driver for DDR2 400~800, SSC, 8-mA Output	SSTL_18	SSTL_18	125 to 410	1.8	C-C: ±40 ps (200 to 333 MHz)	±50 ps	–40 to 85	N	µBGA-52	3.35
CDCU2A877	1:10 PLL Differential Clock Driver for DDR2 400~800, SSC, 16-mA Output	SSTL_18	SSTL_18	125 to 410	1.8	C-C: ±40 ps (160 to 410 MHz)	±50 ps	0 to 70	N	µBGA-52	3.05
Single-Ended											
CDCVF2505	1:5 PLL Clock Driver for SDR/ PC133+, SSC	LVTTL	LVTTL	24 to 200	3.3	C-C: |70| ps (typ) (66 to 200 MHz)	±150 ps (66 to 166 MHz)	–40 to 85	Y	TSSOP-8, SOIC-8	0.95
CDCVF2509A	1:9 PLL Clock Driver for SDR/ PC133+, SSC	LVTTL	LVTTL	50 to 175	3.3	C-C: |65| ps (typ) (100 to 166 MHz)	±125 ps (66 to 166 MHz)	0 to 85	N	TSSOP-24	3.90
CDCVF2510A	1:10 PLL Clock Driver for SDR/ PC133+, SSC	LVTTL	LVTTL	50 to 175	3.3	C-C: |65| ps (typ) (100 to 166 MHz)	±125 ps (66 to 166 MHz)	0 to 85	N	TSSOP-24	2.60

*Suggested resale price in U.S. dollars in quantities of 1,000. See **www.ti.com/hirel** for HiRel options.*

Clocks and Timing
Clock Generation (Crystal Oscillator Replacements, Jitter Cleaners)

Clock Generator/Jitter Cleaner with Internal VCO Output
CDCM6208

NEW

The CDCM6208 is a highly versatile, low jitter low power frequency synthesizer which can generate eight low jitter clock outputs, selectable from one of two inputs that can feature a low frequency crystal or CML, LVPECL, LVDS, or LVCMOS signals for a variety of wireless infrastructure baseband, wireline data communication, computing, low power medical imaging and portable test and measurement applications. The CDCM6208 also features a fractional divider architecture for four of its outputs that can generate any frequency with better than one ppm frequency accuracy. The CDCM6208 can be easily configured through I^{2}C or SPI programming interface and in the absence of serial interface, pin mode is also available that can set the device in 1 of 32 distinct pre-programmed configurations using control pins.

Key Features
- Superior performance with low power
- Flexible frequency planning
- Two differential inputs, XTAL support, ability for smart switching
- SPI, I^{2}C, and pin programmable
- Professional user GUI for quick design turnaround
- 7 × 7 mm 48-QFN package (RGZ)
- –40°C to 85°C temperature range

Applications
- Base band clocking (Wireless Infrastructure)
- Networking and data communications
- Keystone^{TM} C66x multicore DSP clocking
- Storage server; portable test equipment
- Medical imaging; high end A/V
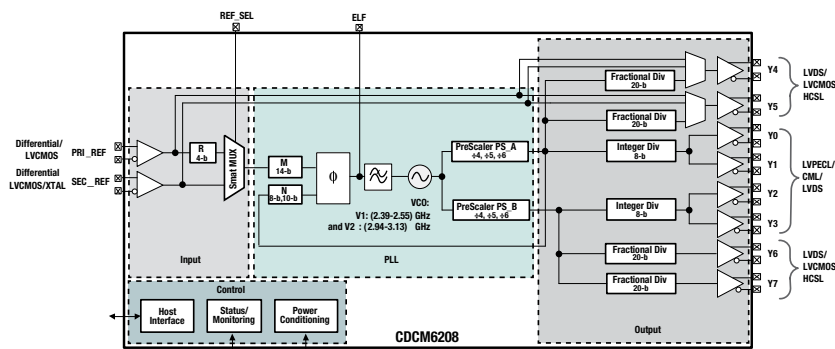
CDCM6208 functional block diagram

Get more information: **www.ti.com/product/CDCM6208**

Ultra-Low Jitter Synthesizer and Jitter Cleaner
LMK04828

NEW

The LMK04820 family is the industry's highest performance clock conditioner with JEDEC JESD204B support. The dual loop PLLatinum^{TM} architecture enables sub-100 fs RMS jitter (10 kHz to 20 MHz) using a low noise VCXO module.

The dual loop architecture consists of two high-performance phase-locked loops (PLL), a low-noise crystal oscillator circuit, and a high-performance voltage controlled oscillator (VCO).

The LMK04828 provides ultra-low-jitter and phase noise and generates the JESD204B system timing reference signal (SYSREF) required for multi-device synchronization.

Key Features
- JEDEC JESD204B support
  - Seven device clocks and up to seven SYSREF clocks
  - Up to 14 differential device clocks
  - LVPECL, LVDS, or HSDS programmable outputs
- Ultra-low RMS jitter performance
- Dual loop PLLatinum PLL architecture
- Two redundant input clocks with LOS
- Multi-mode: Dual PLL, single PLL, and clock distribution
- Industrial temperature range: –40 to 85 °C
- 3.15 V to 3.45 V operation
- Package: 64-pin LLP (9.0 × 9.0 × 0.8 mm)
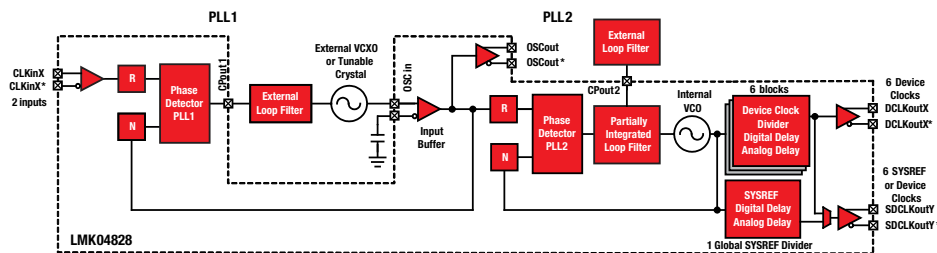
LMK04828 functional block diagram

Applications
- JEDEC JESD204B
- Wireless infrastructure
- Data converter clocking
- Networking, SONET/SDH, DSLAM
- Medical / video / military / aerospace
- Test and measurement

Get more information:
www.ti.com/product/LMK04828

Clocks and Timing
Clock Generation (Crystal Oscillator Replacements, Jitter Cleaners)

Clock Generation

Device	Description	Input Level	Output Level	Frequency (MHz)	V_CC (V)	RMS or Period (pk-pk) Jitter	Phase Error	Output Skew (max) (ps)	Char. Temp. (°C)	HiRel Avail.	Package	Price*
Clock Generators - Ultra Low Jitter <300fs RMS												
LMK03806	Ultra Low Jitter Clock Generator with 14 Programmable Outputs	LVPECL/LVDS/ LVCMOS/ Crystal	LVPECL/ LVDS/ LVCMOS	2.27 to 2600	3.3	<0.15 ps rms (typ, XO mode)	—	30 (LVPECL/ LVDS)	–40 to 85	N	LLP-64	7.95
CDCM6208	2:8 Ultra Low Power, Low Jitter Clock Generator	LVPECL/LVDS/ CML/LVCMOS/ Crystal	LVPECL/LVDS/ CML/HCSL/ LVCMOS	up to 800 MHz	3.3V/ 2.5V/ 1.8V	265fs rms (typ)	—	40 ps (max for one bank)	–40 to 85	N	QFN-48	5.20
LMK03002C	Precision Clock Conditioner with Integrated VCO	LVPECL/LVDS/ LVCMOS/ SINE	LVPECL/ LVDS	0.39 to 785	3.3	0.2 ps rms (typ, generator mode)	—	±30	–40 to 85	N	LLP-48	11.00
Clock Generators - Low Jitter <1ps RMS												
CDCE62002	2:2 Low-Jitter, Integrated VCO Clock Generator	Crystal/ LVCMOS/ Differential	LVPECL/ LVDS/2- LVCMOS	4.25 to 1175	3.3	<1 ps rms	—	75	–40 to 85	N	QFN-32	6.60
CDCE62005	3:5 Low-Jitter, Integrated VCO Clock Generator	Crystal/ LVCMOS/ Differential	LVPECL/ LVDS/2- LVCMOS	4.25 to 1175	3.3	<1 ps rms	—	75	–40 to 85	N	QFN-48	7.50
CDCM61001	1:1 Low-Jitter, Integrated VCO Clock Generator	Crystal/ LVCMOS	LVPECL/ LVDS/2- LVCMOS	43.75 to 683.28; LVCMOS up to 250 MHz	3.3	<1 ps rms	—	—	–40 to 85	N	QFN-32	4.20
CDCM61002	1:2 Low-Jitter, Integrated VCO Clock Generator	Crystal/ LVCMOS	LVPECL/ LVDS/2- LVCMOS	43.75 to 683.28; LVCMOS up to 250 MHz	3.3	<1 ps rms	—	50	–40 to 85	N	QFN-32	5.00
CDCM61004	1:4 Low-Jitter, Integrated VCO Clock Generato	Crystal/ LVCMOS	LVPECL/ LVDS/2- LVCMOS	43.75 to 683.28; LVCMOS up to 250 MHz	3.3	<1 ps rms	—	60	–40 to 85	N	QFN-32	6.50
CDCL6010	1:10 LVDS-to-CML Jitter Cleaner and Distributor	LVDS	CML	15 to 1250	1.8	<1 ps rms	—	64	–40 to 85	N	QFN-48	8.05
LMK03000	Precision Clock Conditioner with Integrated VCO	LVPECL/LVDS/ LVCMOS/ SINE	LVPECL/ LVDS	0.32 to 648	3.3	0.4, 0.8, 1.2 ps rms (typ, 3 grades)	—	±30	–40 to 85	N	LLP-48	8.00
LMK03001	Precision Clock Conditioner with Integrated VCO	LVPECL/LVDS/ LVCMOS/ SINE	LVPECL/ LVDS	0.39 to 785	3.3	0.4, 0.8, 1.2 ps rms (typ, 3 grades)	—	±30	–40 to 85	N	LLP-48	8.00
LMK03033	Precision Clock Conditioner with Integrated VCO	LVPECL/LVDS/ LVCMOS/ SINE	LVPECL/ LVDS	0.53 to 1080	3.3	0.4, 0.8, 1.2 ps rms (typ, 3 grades)	—	±30	–40 to 85	N	LLP-48	8.00
LMK03002	Precision Clock Conditioner with Integrated VCO	LVPECL/LVDS/ LVCMOS/ SINE	LVPECL/ LVDS	0.39 to 785	3.3	0.4, 0.8 ps rms (typ, 2 grades)	—	±30	–40 to 85	N	LLP-48	11.00
LMK03200	Precision 0-Delay Clock Conditioner with Integrated VCO	LVPECL/LVDS/ LVCMOS/ SINE	LVPECL/ LVDS	0.32 to 648	3.3	0.8 ps rms (typ)	±300 (0-delay mode)	±30	–40 to 85	N	LLP-48	11.00
CDCE421A	Flexible Low-Jitter Clock Generator, 10 MHz to 1.1 GHz	Crystal/ LVCMOS	LVDS/LVPECL	11 to 1100	3.3	<1 ps rms	—	—	–40 to 85	N	QFN-24	7.00
CDC421A100	Low-Jitter 100 MHz Clock Generator for PCI Express	Crystal/ LVCMOS	LVPECL	100	3.3	<1 ps rms	—	—	–40 to 85	N	QFN-24	7.00
CDC421A106	Low-Jitter 106.25 MHz Clock Generator for Fibre Channel	Crystal/ LVCMOS	LVPECL	106.25	3.3	<1 ps rms	—	—	–40 to 85	N	QFN-24	7.00
CDC421A125	Low-Jitter 125 MHz Clock Generator for Ethernet	Crystal/ LVCMOS	LVPECL	125	3.3	<1 ps rms	—	—	–40 to 85	N	QFN-24	7.00
CDC421A156	Low-Jitter 156.25 MHz Clock Generator for 10 G Ethernet	Crystal/ LVCMOS	LVPECL	156.25	3.3	<1 ps rms	—	—	–40 to 85	N	QFN-24	7.00
CDC421A212	Low-Jitter 212.5 MHz Clock Generator for Fibre Channel	Crystal/ LVCMOS	LVPECL	212.5	3.3	<1 ps rms	—	—	–40 to 85	N	QFN-24	7.00
CDC421A250	Low-Jitter 250 MHz Clock Generator for PCI Express	Crystal/ LVCMOS	LVPECL	250	3.3	<1 ps rms	—	—	–40 to 85	N	QFN-24	7.00
CDC421A312	Low-Jitter 312.5 MHz Clock Generator for 10 G Ethernet	Crystal/ LVCMOS	LVPECL	312.5	3.3	<1 ps rms	—	—	–40 to 85	N	QFN-24	7.00
Clock Generators - General Purpose												
CDCE913	1.8 V Programmable 1-PLL, 3 Output Clock Synthesizer with 2.5/3.3 V Outputs	Crystal/ LVCMOS	2.5/3.3 V LVCMOS	0 to 230	1.8/3.3	60 ps (typ)	—	150	–40 to 85	N	TSSOP-14	1.60
CDCEL913	1.8 V Programmable 1-PLL, 3 Output Clock Synthesizer with 1.8 V Outputs	Crystal/ LVCMOS	1.8 V LVCMOS	0 to 230	1.8/3.3	60 ps (typ)	—	150	–40 to 85	Y	TSSOP-14	1.60
CDCE925	1.8 V Programmable 2-PLL, 5 Output Clock Synthesizer with 2.5/3.3 V Outputs	Crystal/ LVCMOS	2.5/3.3 V LVCMOS	0 to 230	1.8/3.3	60 ps (typ)	—	150	–40 to 85	N	TSSOP-16	1.95
CDCEL925	1.8 V Programmable 2-PLL, 5 Output Clock Synthesizer with 1.8 V Outputs	Crystal/ LVCMOS	1.8 V LVCMOS	0 to 230	1.8/3.3	60 ps (typ)	—	150	–40 to 85	N	TSSOP-16	1.80
CDCE937	1.8 V Programmable 3-PLL, 7 Output Clock Synthesizer with 2.5/3.3 V Outputs	Crystal/ LVCMOS	2.5/3.3 V LVCMOS	0 to 230	1.8/3.3	60 ps (typ)	—	150	–40 to 85	Y	TSSOP-20	2.15

*Suggested resale price in U.S. dollars in quantities of 1,000. See **www.ti.com/hirel** for HiRel options.

Clocks and Timing
Clock Generation (Crystal Oscillator Replacements, Jitter Cleaners)

Clock Generation (continued)

Device	Description	Input Level	Output Level	Frequency (MHz)	V$_{CC}$ (V)	RMS or Period (pk-pk) Jitter	Phase Error	Output Skew (max) (ps)	Char. Temp. (ºC)	HiRel Avail.	Package	Price*
Clock Generators - General Purpose (Continued)												
CDCEL937	1.8 V Programmable 3-PLL, 7 Output Clock Synthesizer with 1.8 V Outputs	Crystal/ LVCMOS	1.8 V LVCMOS	0 to 230	1.8/3.3	60 ps (typ)	—	150	–40 to 85	Y	TSSOP-20	2.15
CDCE949	1.8 V Programmable 4-PLL, 9 Output Clock Synthesizer with 2.5/3.3 V Outputs	Crystal/ LVCMOS	2.5/3.3 V LVCMOS	0 to 230	1.8/3.3	60 ps (typ)	—	150	–40 to 85	Y	TSSOP-24	2.35
CDCEL949	1.8 V Programmable 4-PLL, 9 Output Clock Synthesizer with 1.8 V Outputs	Crystal/ LVCMOS	1.8 V LVCMOS	0 to 230	1.8/3.3	60 ps (typ)	—	150	–40 to 85	N	TSSOP-24	2.35
CDCE706	3.3 V Programmable 3-PLL, 6 Output Clock Synthesizer	Crystal/ LVCMOS/ Differential	2.5/3.3 V LVCMOS	0 to 300	3.3	60 ps (typ)	—	200	–40 to 85	N	TSSOP-20	3.85
CDCE906	3.3 V Programmable 3-PLL, 6 Output Clock Synthesizer	Crystal/ LVCMOS/ Differential	2.5/3.3 V LVCMOS	0 to 167	3.3	60 ps (typ)	—	200	0 to 70	N	TSSOP-20	2.20
Spread-Spectrum Clocks												
CDCS501	1:1 Spread Spectrum Clock Generator	LVCMOS	3.3 V LVCMOS	40 to 108	3.3	110 ps (typ)	—	—	–40 to 85	N	TSSOP-8	0.45
CDCS502	1:1 Clock Generator with Optional SSC	Crystal	3.3 V LVCMOS	8 to 108	3.3	100 ps (typ)	—	—	–40 to 85	N	TSSOP-8	0.95
CDCS503	1:1 Clock Buffer/Multiplier with Optional SSC	LVCMOS	3.3 V LVCMOS	8 to 108	3.3	110 ps (typ)	—	—	–40 to 85	N	TSSOP-8	0.50
Jitter Cleaners – Internal VCO												
LMK04000	Low-Noise Clock Jitter Cleaner with Cascaded PLLs	LVPECL/LVDS/ LVCMOS/ SINE	LVPECL/ LVCMOS	0.32 to 648	3.3	<0.15 ps rms (typ, XO mode)	—	40 (LVPECL), 100 (LVCMOS)	–40 to 85	N	LLP-64	14.50
LMK04001	Low-Noise Clock Jitter Cleaner with Cascaded PLLs	LVPECL/LVDS/ LVCMOS/ SINE	LVPECL/ LVCMOS	0.39 to 785	3.3	<0.15 ps rms (typ, XO mode)	—	40 (LVPECL), 100 (LVCMOS)	–40 to 85	N	LLP-64	14.50
LMK04002	Low-Noise Clock Jitter Cleaner with Cascaded PLLs	LVPECL/LVDS/ LVCMOS/ SINE	LVPECL/ LVCMOS	0.43 to 875	3.3	<0.15 ps rms (typ, XO mode)	—	40 (LVPECL), 100 (LVCMOS)	–40 to 85	N	LLP-64	14.50
LMK04010	Low-Noise Clock Jitter Cleaner with Cascaded PLLs	LVPECL/LVDS/ LVCMOS/ SINE	LVPECL	0.32 to 648	3.3	<0.15 ps rms (typ, XO mode)	—	40 ps	–40 to 85	N	LLP-64	14.50
LMK04011	Low-Noise Clock Jitter Cleaner with Cascaded PLLs	LVPECL/LVDS/ LVCMOS/ SINE	LVPECL	0.39 to 785	3.3	<0.15 ps rms (typ, XO mode)	—	40 ps	–40 to 85	N	LLP-64	14.50
LMK04031	Low-Noise Clock Jitter Cleaner with Cascaded PLLs	LVPECL/LVDS/ LVCMOS/ SINE	LVPECL/ LVDS/ LVCMOS	0.39 to 785	3.3	<0.15 ps rms (typ, XO mode)	—	40 (LVPECL), 30 (LVDS), 100 (LVCMOS)	–40 to 85	N	LLP-64	14.50
LMK04033	Low-Noise Clock Jitter Cleaner with Cascaded PLLs	LVPECL/LVDS/ LVCMOS/ SINE	LVPECL/ LVDS	0.53 to 1080	3.3	<0.15 ps rms (typ, XO mode)	—	40 (LVPECL), 30 (LVDS)	–40 to 85	N	LLP-64	14.50
LMK04100	Precision Clock Conditioners Clock Jitter Cleaner w/Cascaded PLLs	LVPECL/LVDS/ LVCMOS/ SINE	LVPECL/ LVCMOS	0.32 to 648	3.3	<0.15 ps rms (typ, XO mode)	—	40 (LVPECL), 100 (LVCMOS)	–40 to 85	N	LLP-64	6.00
LMK04803	Precision Clock Conditioners Low-Noise Clock Jitter Cleaner with Dual Loop PLLs	LVPECL/LVDS/ LVCMOS/ SINE	LVPECL/ LVDS/ LVCMOS	0.25 to 1015	3.3	0.11 ps rms (typ, XO mode)	0 ps (typ, 0-delay mode)	30 (LVPECL/ LVDS), 100 (LVCMOS)	–40 to 85	N	LLP-64	9.15
LMK04805	Precision Clock Conditioners Low-Noise Clock Jitter Cleaner with Dual Loop PLLs	LVPECL/LVDS/ LVCMOS/ SINE	LVPECL/ LVDS/ LVCMOS	0.29 to 1185	3.3	0.11 ps rms (typ, XO mode)	0 ps (typ, 0-delay mode)	30 (LVPECL/ LVDS), 100 (LVCMOS)	–40 to 85	N	LLP-64	9.15
LMK04806	Precision Clock Conditioners Low-Noise Clock Jitter Cleaner with Dual Loop PLLs	LVPECL/LVDS/ LVCMOS/ SINE	LVPECL/ LVDS/ LVCMOS	0.32 to 1300	3.3	0.11 ps rms (typ, XO mode)	0 ps (typ, 0-delay mode)	30 (LVPECL/ LVDS), 100 (LVCMOS)	–40 to 85	N	LLP-64	9.15
LMK04808	Precision Clock Conditioners Low-Noise Clock Jitter Cleaner with Dual Loop PLLs	LVPECL/LVDS/ LVCMOS/ SINE	LVPECL/ LVDS/ LVCMOS	0.37 to 1536	3.3	0.11 ps rms (typ, XO mode)	0 ps (typ, 0-delay mode)	30 (LVPECL/ LVDS), 100 (LVCMOS)	–40 to 85	N	LLP-64	9.15
LMK04816	Clock Jitter Cleaner with 14 Outputs and 3 Inputs	LVPECL/LVDS/ LVCMOS/ SINE	LVPECL/ LVDS/ LVCMOS	0.32 to 1300	3.3	0.11 ps rms (typ, XO mode)	0 ps (typ, 0-delay mode)	30 (LVPECL/ LVDS), 100 (LVCMOS)	–40 to 85	N	LLP-64	8.70
LMK04906	Clock Jitter Cleaner with 7 Outputs and 3 Inputs	LVPECL/LVDS/ LVCMOS/SINE	LVPECL/ LVDS/ LVCMOS	0.32 to 1300	3.3	0.11 ps rms (typ, XO mode)	0 ps (typ, 0-delay mode)	30 (LVPECL/ LVDS), 100 (LVCMOS)	–40 to 85	N	LLP-64	6.49

*Suggested resale price in U.S. dollars in quantities of 1,000. See **www.ti.com/hirel** for HiRel options.

New devices are listed in **bold red**.

Clocks and Timing
Clock Generation (Crystal Oscillator Replacements, Jitter Cleaners)

Clock Generation (continued)

Device	Description	Input Level	Output Level	Frequency (MHz)	V$_{CC}$ (V)	RMS or Period (pk-pk) Jitter	Phase Error	Output Skew (max) (ps)	Char. Temp. (ºC)	HiRel Avail.	Package	Price*
Jitter Cleaners – External VCXO												
CDCM7005	2:5 Ultra-Low-Jitter Clock Synchronizer and Jitter Cleaner	LVCMOS/ LVPECL	LVCMOS/ LVPECL	0 to 1500	3.3	<1 ps rms	−200/ +100 ps	50	−40 to 85	Y	BGA-64/ QFN-48	9.50
CDCE72010	2:10 Ultra-Low-Jitter Clock Synchronizer and Jitter Cleaner	LVPECL/LVDS/ LVCMOS	LVPECL/ LVDS/ LVCMOS	0 to 1500	3.3	<1 ps rms	—	50	−40 to 85	N	QFN-64	10.95
LMK02000	Precision Clock Distributor with Integrated PLL	LVPECL/LVDS/ LVCMOS/SINE	LVPECL/ LVDS	1 to 800	3.3	0.02 ps rms additive (typ)	—	±30	−40 to 85	N	LLP-48	7.80
LMK02002	Precision Clock Distributor with Integrated PLL	LVPECL/LVDS/ LVCMOS/SINE	LVPECL	1 to 800	3.3	0.02 ps rms additive (typ)	—	±30	−40 to 85	N	LLP-48	6.65
LMK04000	Low-Noise Clock Jitter Cleaner with Cascaded PLLs	LVPECL/LVDS/ LVCMOS/SINE	LVPECL/ LVCMOS	0.32 to 648	3.3	<0.15 ps rms (typ, XO mode)	—	40 (LVPECL), 100 (LVCMOS)	−40 to 85	N	LLP-64	11.40
LMK04001	Low-Noise Clock Jitter Cleaner with Cascaded PLLs	LVPECL/LVDS/ LVCMOS/SINE	LVPECL/ LVCMOS	0.39 to 785	3.3	<0.15 ps rms (typ, XO mode)	—	40 (LVPECL), 100 (LVCMOS)	−40 to 85	N	LLP-64	11.40
LMK04002	Low-Noise Clock Jitter Cleaner with Cascaded PLLs	LVPECL/LVDS/ LVCMOS/SINE	LVPECL/ LVCMOS	0.43 to 875	3.3	<0.15 ps rms (typ, XO mode)	—	40 (LVPECL), 100 (LVCMOS)	−40 to 85	N	LLP-64	11.40
LMK04010	Low-Noise Clock Jitter Cleaner with Cascaded PLLs	LVPECL/LVDS/ LVCMOS/SINE	LVPECL	0.32 to 648	3.3	<0.15 ps rms (typ, XO mode)	—	40 ps	−40 to 85	N	LLP-64	11.40
LMK04011	Low-Noise Clock Jitter Cleaner with Cascaded PLLs	LVPECL/LVDS/ LVCMOS/SINE	LVPECL	0.39 to 785	3.3	<0.15 ps rms (typ, XO mode)	—	40 ps	−40 to 85	N	LLP-64	11.40
LMK04031	Low-Noise Clock Jitter Cleaner with Cascaded PLLs	LVPECL/LVDS/ LVCMOS/SINE	LVPECL/ LVDS/ LVCMOS	0.39 to 785	3.3	<0.15 ps rms (typ, XO mode)	—	40 (LVPECL), 30 (LVDS), 100 (LVCMOS)	−40 to 85	N	LLP-64	11.40
LMK04033	Low-Noise Clock Jitter Cleaner with Cascaded PLLs	LVPECL/LVDS/ LVCMOS/SINE	LVPECL/ LVDS/ LVCMOS	0.53 to 1080	3.3	<0.15 ps rms (typ, XO mode)	—	40 (LVPECL), 30 (LVDS)	−40 to 85	N	LLP-64	11.40
LMK04100	Precision Clock Conditioners Clock Jitter Cleaner with Cascaded PLLs	LVPECL/LVDS/ LVCMOS/SINE	LVPECL/ LVCMOS	0.32 to 648	3.3	<0.15 ps rms (typ, XO mode)	—	40 (LVPECL), 100 (LVCMOS)	−40 to 85	N	LLP-64	6.00
LMK04101	Low-Noise Clock Jitter Cleaner with Cascaded PLLs	LVPECL/LVDS/ LVCMOS/SINE	LVPECL/ LVCMOS	0.39 to 785	3.3	<0.15 ps rms (typ, XO mode)	—	40 (LVPECL), 100 (LVCMOS)	−40 to 85	N	LLP-64	Web
LMK04102	Low-Noise Clock Jitter Cleaner with Cascaded PLLs	LVPECL/LVDS/ LVCMOS/SINE	LVPECL/ LVCMOS	0.43 to 875	3.3	<0.15 ps rms (typ, XO mode)	—	40 (LVPECL), 100 (LVCMOS)	−40 to 85	N	LLP-64	Web
LMK04110	Low-Noise Clock Jitter Cleaner with Cascaded PLLs	LVPECL/LVDS/ LVCMOS/SINE	LVPECL	0.32 to 648	3.3	<0.15 ps rms (typ, XO mode)	—	40 ps	−40 to 85	N	LLP-64	Web
LMK04111	Low-Noise Clock Jitter Cleaner with Cascaded PLLs	LVPECL/LVDS/ LVCMOS/SINE	LVPECL	0.39 to 785	3.3	<0.15 ps rms (typ, XO mode)	—	40 ps	−40 to 85	N	LLP-64	Web
LMK04131	Low-Noise Clock Jitter Cleaner with Cascaded PLLs	LVPECL/LVDS/ LVCMOS/SINE	LVPECL/ LVDS/ LVCMOS	0.39 to 785	3.3	<0.15 ps rms (typ, XO mode)	—	40 (LVPECL), 30 (LVDS), 100 (LVCMOS)	−40 to 85	N	LLP-64	Web
LMK04133	Low-Noise Clock Jitter Cleaner with Cascaded PLLs	LVPECL/LVDS/ LVCMOS/SINE	LVPECL/ LVDS/ LVCMOS	0.53 to 1080	3.3	<0.15 ps rms (typ, XO mode)	—	40 (LVPECL), 30 (LVDS)	−40 to 85	N	LLP-64	Web
LMK04803	Precision Clock Conditioners Low-Noise Clock Jitter Cleaner with Dual Loop PLLs	LVPECL/LVDS/ LVCMOS/SINE	LVPECL/ LVDS/ LVCMOS	0.25 to 1015	3.3	0.11 ps rms (typ, XO mode)	0 ps (typ, 0-delay mode)	30 (LVPECL/ LVDS), 100 (LVCMOS)	−40 to 85	N	LLP-64	8.70
LMK04805	Precision Clock Conditioners Low-Noise Clock Jitter Cleaner with Dual Loop PLLs	LVPECL/LVDS/ LVCMOS/SINE	LVPECL/ LVDS/ LVCMOS	0.29 to 1185	3.3	0.11 ps rms (typ, XO mode)	0 ps (typ, 0-delay mode)	30 (LVPECL/ LVDS), 100 (LVCMOS)	−40 to 85	N	LLP-64	8.70
LMK04806	Precision Clock Conditioners Low-Noise Clock Jitter Cleaner with Dual Loop PLLs	LVPECL/LVDS/ LVCMOS/SINE	LVPECL/ LVDS/ LVCMOS	0.32 to 1300	3.3	0.11 ps rms (typ, XO mode)	0 ps (typ, 0-delay mode)	30 (LVPECL/ LVDS), 100 (LVCMOS)	−40 to 85	N	LLP-64	8.70
LMK04808	Precision Clock Conditioners Low-Noise Clock Jitter Cleaner with Dual Loop PLLs	LVPECL/LVDS/ LVCMOS/SINE	LVPECL/ LVDS/ LVCMOS	0.37 to 1536	3.3	0.11 ps rms (typ, XO mode)	0 ps (typ, 0-delay mode)	30 (LVPECL/ LVDS), 100 (LVCMOS)	−40 to 85	N	LLP-64	8.70
LMK04816	Clock Jitter Cleaner with 14 Outputs and 3 Inputs	LVPECL/LVDS/ LVCMOS/SINE	LVPECL/ LVDS/ LVCMOS	0.32 to 1300	3.3	0.11 ps rms (typ, XO mode)	0 ps (typ, 0-delay mode)	30 (LVPECL/ LVDS), 100 (LVCMOS)	−40 to 85	N	LLP-64	8.70
LMK04906	Clock Jitter Cleaner with 7 Outputs and 3 Inputs	LVPECL/LVDS/ LVCMOS/SINE	LVPECL/ LVDS/ LVCMOS	0.32 to 1300	3.3	0.11 ps rms (typ, XO mode)	0 ps (typ, 0-delay mode)	30 (LVPECL/ LVDS), 100 (LVCMOS)	−40 to 85	N	LLP-64	6.49
LMK04826	Ultra Low Jitter Synthesizer and Jitter Cleaner for JESD204B Interface	LVPECL/LVDS/ LVCMOS	LVCMOS/ LVPECL/ LVDS/NSDS	0.21 to 2505	3.3	0.08 ps rms (typ, XO mode)	0 ps (typ, 0-delay mode)	25	−40 to 85	N	QFN-64	11.20
LMK04828	Ultra Low Jitter Synthesizer and Jitter Cleaner for JESD204B Interface	LVPECL/LVDS/ LVCMOS	LVCMOS/ LVPECL/ LVDS/NSDS	0.29 to 3005	3.3	0.08 ps rms (typ, XO mode)	0 ps (typ, 0-delay mode)	25	−40 to 85	N	QFN-64	11.20

*Suggested resale price in U.S. dollars in quantities of 1,000. See **www.ti.com/hirel** for HiRel options.

New devices are listed in **bold red**.

Interface

As transmission rates increase from 1 Gbps to 10 Gbps to 100 Gbps, signal integrity requirements become more stringent for interconnects in chip-to-chip, chip-to-module, and backplane applications in datacom and telecom applications. TI has a comprehensive porfolio of Interface products to cater to the needs of Communications segment.

We offer:
- Industry standard footprint of high-speed data buffers supporting multiple signaling technologies up to 3.8 GHz
- Industry leading signal conditioners (repeaters/equalizers, retimers with CDRs and DFEs) and crosspoint switch/mux enabling effective management of signal integrity issues across different media and channels

- Industry's broadest discrete SerDes supporting multiple standards & coding schemes providing the highest signal integrity
- Best-in-class optical ICs for transceivers
- Bandwidth: 18 GHz, typical
- Per-Lane P/N

Signal Conditioners: Repeaters, Equalizers and Retimers

9.8 to 12.5 Gbps Quad Channel Retimer
DS125DF410

NEW

The DS125DF410 is a four-channel multi-rate retimer with integrated signal conditioning. The device includes an input Continuous-Time Linear Equalizer (CTLE) and a five-tap Decision Feedback Equalizer (DFE) on each channel.

Each channel of DS125DF410 independently locks to serial data at data rates from 9.8 to 12.5 Gbps or to any supported submultiple of these data rates. A reference clock is not required, which simplifies system design and lowers overall cost. The device also supports half-rate, quarter-rate and one-eighth-rate for backward compatibility. A protocol select mode is available to speed up lock time.

Key Features
- Typical power dissipation (EQ+CDR+DE): 150 mW / channel
- Typical power dissipation (EQ+DFE+CDR+DE): 180 mW / channel
- Locks to 1/2, 1/4, 1/8 legacy data rates
- Fast lock operation based on protocol select mode
- Adaptive equalization up to 34 dB boost at 5 GHz
- Adjustable transmit VOD: 600 to 1300 mVp-p
- Adjustable transmit de-emphasis to –15 dB
- Programmable output polarity inversion
- Input signal detection, CDR lock detection/indicator
- On-chip eye monitor (EOM), PRBS generator
- Single 2.5 V ±5% power supply
- SMBus/EEPROM configuration modes

Applications
- Host-side front-port and backplane interface, SFF-8431, SFF-8436
- Ethernet: 10 GbE, 1 GbE
- CPRI: Line bit rate options 3–7
- Interlaken: All lane bit rates
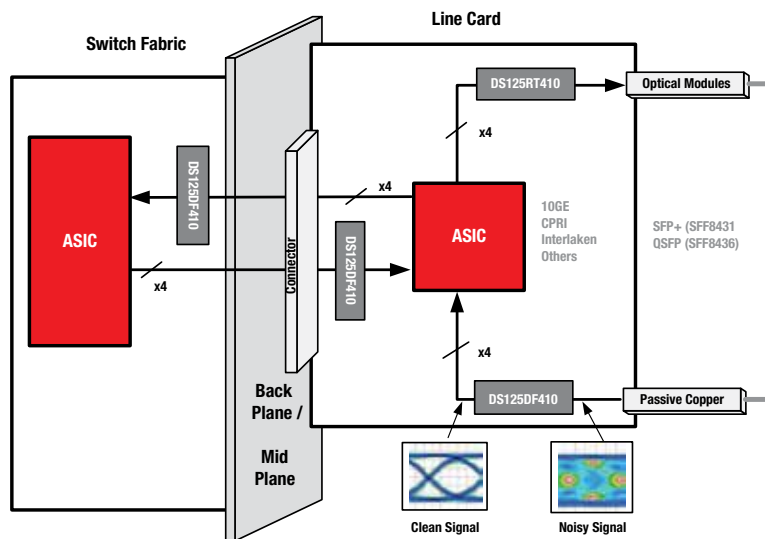
DS125DF410 typical application

Get more information: **www.ti.com/product/DS125DF410**

Interface
Signal Conditioners: Repeaters, Equalizers and Retimers

Signal Conditioners: Repeaters, Equalizers, Retimers

Device	Channels	Function	Max Data (Gbps)	Input SigCon (dB)	Output SigCon (dB)	Power/Chn (mW)	Package
DS125DF410	4	Retimer with DFE	9.8 to 12.5[2]	36	−12	175	QFN-48
DS110DF410	4	Retimer with DFE	8.5 to 11.3[2]	36	−12	175	QFN-48
DS100DF410	4	Retimer with DFE	1.25 and 10.3	36	−12	175	QFN-48
DS125RT410	4	Retimer	9.8 to 12.5[2]	36	−12	145	QFN-48
DS110RT410	4	Retimer	8.5 to 11.3[2]	36	−12	145	QFN-48
DS100RT410	4	Retimer	1.25 and 10.3	36	−12	145	QFN-48
SN65LVCP1414	4	Repeater/Redriver/Equalizer	14.2	17	Linear	80	QFN-38
SN65LVCP1412	2	Repeater/Redriver/Equalizer	14.2	17	Linear	75	QFN-24
DS125BR401	8[1]	Repeater/Redriver/Equalizer	12.5	32	−12	65	QFN-54
DS125BR800	8	Repeater/Redriver/Equalizer	12.5	32	−12	65	QFN-54
TLK1102E	2	Repeater/Redriver/Equalizer	11.3	30	−7	—	VQFN-24
TLK1101E	1	Repeater/Redriver/Equalizer	11.3	30	−7	—	QFN-20
DS100BR410	4	Repeater/Redriver/Equalizer	10.3	36	−9	55	QFN-48
DS100BR111	2[1]	Repeater/Redriver/Equalizer	10.3	36	−12	65	QFN-24
DS100BR210	2	Repeater/Redriver/Equalizer	10.3	36	−12	65	QFN-24
DS64BR401	8[1]	Repeater/Redriver/Equalizer	6.4	33	−12	95	QFN-54
TLK6201EA	1	Repeater/Redriver/Equalizer	6.25	13	−12	—	QFN-16
SN75LVCP601	2	Repeater/Redriver/Equalizer	6	14	−7	110	QFN-20
SN75LVCP600S	1	Repeater/Redriver/Equalizer	6	15	−1.5	106	QFN-10
DS42BR400	8[1]	Repeater/Redriver/Equalizer	4.2	5	−9	163	QFN-60
DS25BR440	4	Repeater/Redriver/Equalizer	3.125	5	6	134	QFN-40
DS25BR100	1	Repeater/Redriver/Equalizer	3.125	8	6	115	QFN-8

[1]Bi-directional support   [2]Includes Support for Divide by 2/4/8

Retimers

Device	Channels	Protocol	Data Rate (Gbps)	DFE	Input SigCon (dB)	Output SigCon (dB)	Power/Ch (mW)	HiRel Avail.	Package(s)	Price*
DS125DF410	4	Multi-protocol	9.8 to 12.5[1]	5-tap	36	−12	175	N	QFN-48	Web
DS125RT410	4	Multi-protocol	9.8 to 12.5[1]	—	36	−12	145	N	QFN-48	Web
DS110DF410	4	Multi-protocol	8.5 to 11.3[1]	5-tap	36	−12	175	N	QFN-48	Web
DS110RT410	4	Multi-protocol	8.5 to 11.3[1]	—	36	−12	145	N	QFN-48	Web
DS100DF410	4	Multi-protocol	1.25 and 10.3	5-tap	36	−12	175	N	QFN-48	12.40
DS100RT410	4	Multi-protocol	1.25 and 10.3	—	36	−12	145	N	QFN-48	Web

*Suggested resale price in U.S. dollars in quantities of 1,000. See www.ti.com/hirel for HiRel options. [1]Legacy rates (divide-by-2/4/8) supported   *New devices are listed in **bold red**.*

Repeaters/Redrivers

Device	Channels	Protocol	Max Data (Gbps)	Input SigCon (dB)	Output SigCon (dB)	Power/Ch (mW)	HiRel Avail.	Package(s)	Price*
DS100KR401	8[1]	Multi-protocol[3]	10.3	36	−12	65	N	QFN-54	9.95
DS100KR800	8	Multi-protocol[3]	10.3	36	−12	65	N	QFN-54	9.95
DS100BR410	4	Multi-protocol[2]	10.3	36	−9	55	N	QFN-48	12.00
DS100BR111	2[1]	Multi-protocol[2, 3]	10.3	36	−12	65	N	QFN-24	5.50
DS100BR210	2	Multi-protocol[2, 3]	10.3	36	−12	65	N	QFN-24	5.50
DS80PCI402	8[1]	PCIe Gen-1/2/3	8	36	−12	65	N	QFN-54	Web
DS80PCI800	8	PCIe Gen-1/2/3	8	36	−12	65	N	QFN-54	6.95
DS80PCI102	2[1]	PCIe Gen-1/2/3	8	36	−12	65	N	QFN-24	Web
DS64BR111	2[1]	Multi-protocol 1	6.4	33	−12	65	N	QFN-24	4.95
DS64BR401	8[1]	Multi-protocol[1]	6.4	33	−12	95	N	QFN-54	7.95
DS50PCI402	8[1]	PCIe Gen-1/2	5	26	−12	95	N	QFN-54	5.75
DS42BR400	8[1]	Multi-protocol	4.2	5	−9	163	N	QFN-60	5.15
DS25BR440	4	Multi-protocol	3.125	5	6	134	N	QFN-40	3.75
DS25BR100	1	Multi-protocol	3.125	8	6	115	N	QFN-8	2.25
DS25BR400	8[1]	Multi-protocol	2.5	5	−9	163	N	QFN-60	3.45
DS15EA101	1	0.8 V Diff. IN	1.5	35	—	210	N	QFN-16	5.50
DS15BA101	1	LVDS/LVPECL/CML	1.5	—	—	150	N	QFN-8	2.25

*Suggested resale price in U.S. dollars in quantities of 1,000. See www.ti.com/hirel for HiRel options.   *New devices are listed in **bold red**.*
[1]Bidirectional channel   [2]Includes SAS/SATA OOB support   [3]Includes support for 10G-KR link training support

Interface
Crosspoint and Redundancy MUX

14.2 Gbps Quad Mux, Linear-Redriver with Signal Conditioning
SN65LVCP114

The SN65LVCP114 is an asynchronous, protocol-agnostic, low-latency quad mux, linear-redriver optimized for use in systems operating at up to 14.2 Gbps. The device linearly compensates for channel loss in backplane and active-cable applications. The architecture of SN65LVCP114 is designed to work effectively with ASIC or FPGA products implementing digital equalization using decision feedback equalizer (DFE) technology. This device preserves the integrity (composition) of the received signal, ensuring optimum DFE and system performance and provides a low-power mux-demux, linear-redriver solution while extending the effectiveness of DFE.
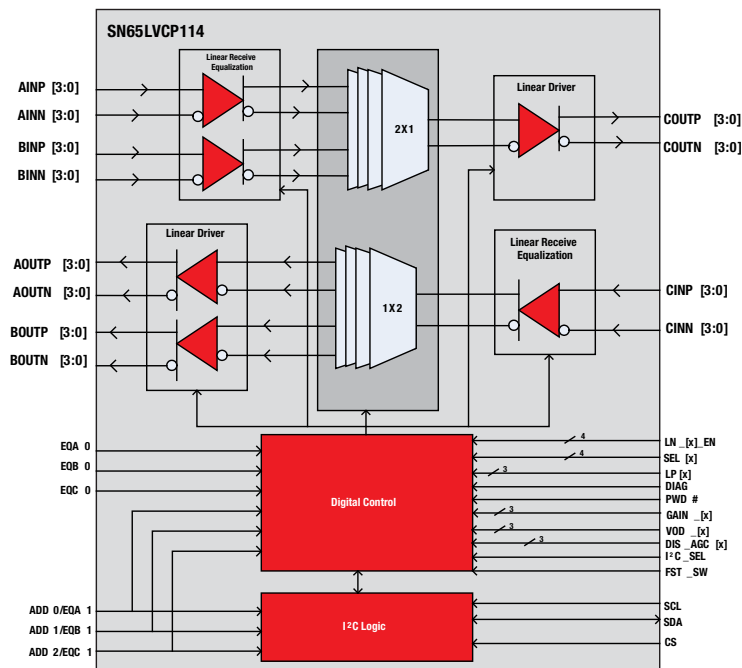
SN65LVCP114 functional block diagram

Key Features
- Quad 2:1 mux/1:2 demux
- Multi-rate operation up to 14.2 Gbps serial data rate
- Linear receiver equalization which increases margin at system level of decision feedback equalizer
- Bandwidth: 18 GHz, typical
- Per-Lane P/N pair inversion
- Port or single lane switching
- Low power: 150 mW/channel, typical
- Loopback mode on all three ports
- I^{2}C control in addition to GPIO
- DIAG mode that outputs data of line side port to both fabric side ports
- 2.5-V/3.3-V single power supply

Applications
- High-speed redundancy switch in telecom and data communication
- Backplane interconnect for 10G-KR, 16 GFC

Get more information:
www.ti.com/product/SN65LVCP114

Interface
Crosspoint and Redundancy MUX

Crosspoint and Redundancy MUX

Device	Protocol	Switch/ Mux	Max Data (Gbps)	Input SigCon (dB)	Output SigCon (dB)	Total Power (mW)	Package
SN65LVCP114	Multi-protocol	x4 (2:1/1:2)	14.2	EQ	Linear/De-E	350/channel	NFBGA-167
DS100MB203	Multi-protocol	x2 (2:1/1:2)	10.3	EQ	De-E	390	QFN-54
DS64MB201	Multi-protocol	x2 (2:1/1:2)	6.4	EQ	De-E	800	QFN-54
DS42MB200	Multi-protocol	x2 (2:1/1:2)	4.25	EQ	Pre-E	1000	QFN-48
DS42MB100	Multi-protocol	x1 (2:1/1:2)	4.25	EQ	Pre-E	450	QFN-36
SN65LVCP408	Multi-protocol	8 x 8	4.25	EQ	Pre-E	864	HTQFP-64
SN65LVCP404	Multi-protocol	4 x 4	4.25	EQ	Pre-E	560	VQFN-48
SN65LVCP402	Multi-protocol	2 x 2	4.25	EQ	Pre-E	290	VQFN-24
DS25CP104A	Multi-protocol	4 x 4	3.125	EQ	Pre-E	518	QFN-40
DS25CP102	Multi-protocol	2 x 2	3.125	EQ	Pre-E	254	QFN-16
SN65LVCP202	Multi-protocol	2 x 2	2.5	EQ	Pre-E	290	VQFN-24
SN65LVCP204	Multi-protocol	4 x 4	2.5	EQ	Pre-E	560	VQFN-48
SN65LVDS250	Multi-protocol	4 x 4	2	NA	NA	356	TSSOP-38
SN65LVDS122	Multi-protocol	2 x 2	1.5	NA	NA	340	SOIC-16, TSSOP-16
SN65LVCP23/22	Multi-protocol	2 x 2	1.3/1	NA	NA	165/200	SOIC-16, TSSOP-16

Communications – Data Buffers and Translators (LVDS, M-LVDS, PECL/ECL)

PECL/ECL 1:2 Fanout Buffer
SN65LVEP11

The SN65LVEP11 is a differential 1:2 PECL/ECL fanout buffer. The device includes circuitry to maintain known logic levels when the inputs are in an open condition. Single-ended clock input operation is limited to $V_{CC} \geq 3$ V in PECL mode, or $V_{EE} \leq 3$ V in NECL mode. The device is housed in an industry-standard SOIC-8 package and is also available in a TSSOP-8 package option.

Key Features
- 1:2 PECL/ECL fanout buffer
- Support for clock frequencies >3.0 GHz
- 240 ps typical propagation delay
- Q output will default low when input is open or at V_{EE}
- Drop-in compatible to MC10LVEP11, MC100LVEP11
- LVDS input compatible

Applications
- Clock/data buffering
- Clock fanout
- Level translation
- High-speed network routing in wireless base stations
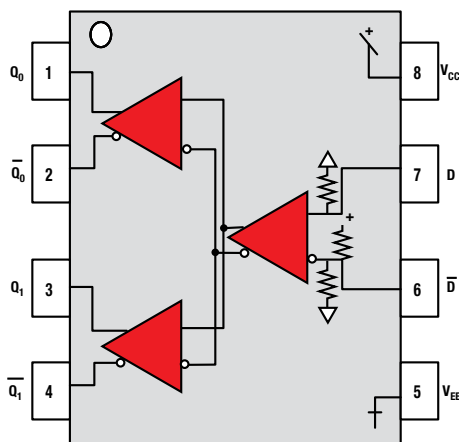
SN65LVEP11 functional block diagram

Get more information: **www.ti.com/product/SN65LVEP11**

Interface

Communications – Data Buffers and Translators (LVDS, M-LVDS, PECL/ECL)

LVDS

Device	Description	No. of Tx	No. of Rx	Input Signal	Output Signal	Signaling Rate (Mbps)	Part-to-Part Skew Max (ps)	Tx tpd Typ. (ns)	Rx tpd Typ. (ns)	I_CC Max (mA)	ESD HBM (kV)	Supply Voltage (V)	HiRel Avail.	Package	Price*
Single Family															
SN65LVDS1	Driver	1	—	LVTTL	LVDS	630	—	1.7	—	8	15	3.3	N	SOIC-8, SOP-5	0.47
SN65LVDS2	Receiver	—	1	LVDS	LVTTL	400	—	1.7	2.6	7	15	3.3	N	SOIC-8, SOP-5	0.47
SN65LVDS179	Full-Duplex Transceiver, No Enables	1	1	LVDS, LVTTL	LVTTL, LVDS	400Tx/150Rx	—	1.7	3.7	12	12	3.3	Y	SOIC-8, VSSOP-8	1.35
SN65LVDS180	Full-Duplex Transceiver, with Enables	1	1	LVDS, LVTTL	LVTTL, LVDS	400Tx/150Rx	—	1.7	3.7	12	12	3.3	Y	SOIC-14, TSSOP-14	1.35
DS90LV001	LVDS Buffer	1	1	LVDS	LVDS	800	60	1.4	1.4	70	2.5	3,3	N	WSON-8 SOIC-8	Web
DS90LV011A	Driver	1	—	LVTTL/ LVCMOS	LVDS	400	1.2	1.1	—	8	9	3.3	N	SOT23-5	0.43
DS90LT012A	Reveiver w/ Termination	—	1	LVDS	LVCMOS	400	2.5	—	1.8	9	2	2.7 to 3.6	N	SOT23-5	0.49
DS90LV012A	Receiver	—	1	LVDS	LVCMOS	400	2.5	—	1.8	9	2	2.7 to 3.6	N	SOT23-5	0.35
DS90LV017A	Driver	1	—	LVTTL/ LVCMOS	LVDS	600	1.2	1.1	—	8	8	3.3	N	SOIC-8	0.57
DS90LV018A	Receiver	—	1	LVDS	LVCMOS	400	1.5	—	1.7	9	7	3.3	N	SOIC-8	0.62
DS90LV019	Driver / Receiver	1	1	LVCMOS / LVDS	LVDS / LVCMOS	100	—	5.6	5.8	20	2	3.3 or 5	N	SOIC-14, TSSOP-14	1.00
Dual Family															
SN65LVDS9638	Driver	2	—	LVTTL	LVDS	400	800	1.7	—	13	8	3.3	N	HTSSOP-8, SOIC-8, VSSOP-8	1.15
SN65LVDS9637	Receiver	—	2	LVDS	LVTTL	400Tx/150Rx	1000	—	2.1	10	8	3.3	N	HTSSOP-8, SOIC-8, VSSOP-8	1.15
SN65LVDS049	Transceiver, Driver and Receiver Enable	2	2	LVDS, LVTTL	LVTTL, LVDS	400	100	1.3	1.9	35	10	3.3	N	TSSOP-16	1.00
SN65LVDS050	Transceiver, Driver and Receiver Enable	2	2	LVDS, LVTTL	LVDS, LVTTL	400Tx/150Rx	—	1.7	3.7	20	12	3.3	N	SOIC-16, TSSOP-16	2.00
SN65LVDS051	Transceiver, Driver Enable Only	2	2	LVDS, LVTTL	LVDS, LVTTL	400Tx/150Rx	—	1.7	3.7	20	12	3.3	Y	SOIC-16, TSSOP-16	2.00
SN65LVDS1050	Transceiver with 2.7 V Supply	2	2	LVDS, LVTTL	LVTTL, LVDS	400Tx/150Rx	—	1.7	3.7	20	12	2.7	N	TSSOP-16	2.00
SN65LVDS22	Multiplexed LVDS Repeater	2	2	LVDS	LVDS	250	—	4	4	20	12	3.3	N	SOIC-16, TSSOP-16	2.80
DS90LV027A	Dual Driver	2	—	LVCMOS	LVDS	600	1.2	1.1	—	14	8	3.3	N	SOIC-8	0.76
DS90LV028A	Dual Receiver	—	2	LVDS	LVCMOS	400	1.5	—	1.7	9	7	3.3	N	LLP-8, SOIC-8	0.88
DS90LV049	Dual Driver / Receiver w/ Ganged Enable	2	2	LVCMOS / LVDS	LVDS / LVCMOS	400	—	0.7	2	35	7	3.3	N	TSSOP-16	1.05
Quad Family															
SN65LVDS047	Driver with Flow-Through Pinout	4	—	LVTTL	LVDS	400	1000	1.8	—	26	8	3.3	N	SOIC-16, TSSOP-16	1.30
SN65LVDS31	Driver, AM26LS31 Footprint	4	—	LVTTL	LVDS	400	800	1.7	—	35	8	3.3	Y	SOIC-16, TSSOP-16, SOP-16	1.50
SN65LVDS3487	Driver, MC34987 Footprint	4	—	LVTTL	LVDS	400	800	1.7	—	35	8	3.3	N	SOIC-16	1.50

*Suggested resale price in U.S. dollars in quantities of 1,000. See **www.ti.com/hirel** for HiRel options.

Communications – Data Buffers and Translators (LVDS, M-LVDS, PECL/ECL)

LVDS (continued)

Device	Description	No. of Tx	No. of Rx	Input Signal	Output Signal	Signaling Rate (Mbps)	Part-to-Part Skew Max (ps)	Tx tpd Typ. (ns)	Rx tpd Typ. (ns)	I$_{CC}$ Max (mA)	ESD HBM (kV)	Supply Voltage (V)	HiRel Avail.	Package	Price*
Quad Family (continued)															
SN65LVDS391	Driver with Flow-Through Pinout	4	—	LVTTL	LVDS	630	1500	1.7	—	26	15	3.3	N	SOIC-16, TSSOP-16	1.50
SN65LVDS048A	Receiver with Flow-Through Pinout	—	4	LVDS	LVTTL	400	1000	—	2.4	15	10	3.3	N	SOIC-16, TSSOP-16	1.30
SN65LVDS32	Receiver, AM26LS32 Footprint	—	4	LVDS	LVTTL	400Tx/150Rx	1000	—	2.1	18	8	3.3	Y	SOIC-16, TSSOP-16 SOP-16	1.50
SN65LVDS3486	Receiver, MC3486 Footprint	—	4	LVDS	LVTTL	400Tx/150Rx	1000	—	2.1	18	8	3.3	N	SOIC-16	1.50
SN65LVDS390	Receiver with Flow-Through Pinout	—	4	LVDS	LVTTL	630	1000	—	2.5	18	15	3.3	N	SOIC-16, TSSOP-16	1.50
SN65LVDS348	High-Speed Receiver with Flow-Through Pinout	—	4	CMOS, ECL, LVCMOS, LVDS, LVECL, LVPECL, PECL	LVTTL	560	1000	4	—	20	15	3.3	N	SOIC-16, TSSOP-16	1.65
DS90C031B	Differential Line Driver	4	—	TTL	LVDS	155.5	4500	2		25	3.5	5	N	SOIC-16	1.22
DS90C032B	Differential Line Driver	—	4	LVDS	TTL	155.5	5000		3.4	10	5	5	N	SOIC-16	1.22
DS90LV047A	Differential Line Driver	4	—	LVTTL	LVDS	400	1200	0.9		30	10	3.3	N	SOIC-16	1.09
DS90LV048A	Differential Line Driver	—	4	LVDS	LVTTL	400	1500		2	15	10	3.3	N	SOIC-16	1.09
8-Channel Family															
SN65LVDS389	Driver	8	—	LVTTL	LVDS	630	1500	1.7	—	70	15	3.3	N	TSSOP-38	2.90
SN65LVDS388A1	Receiver	—	8	LVDS	LVTTL	630	1000	—	2.5	40	15	3.3	N	TSSOP-38	2.90
16-Channel Family															
SN65LVDS387	Driver	16	—	LVTTL	LVDS	630	1500	1.7	—	95	15	3.3	N	TSSOP-64	5.55
SN65LVDS386	Receiver	—	16	LVDS	LVTTL	630	1000	—	2.5	70	15	3.3	N	TSSOP-64	5.55

*Suggested resale price in U.S. dollars in quantities of 1,000. See **www.ti.com/hirel** for HiRel options.*

M-LVDS

Device	No. of Tx	No. of Rx	Rx Type	Half/Full Duplex	Input Signal	Output Signal	Signaling Rate (Mbps)	Part-to-Part Skew Max (ps)	Tx tpd Typ. (ns)	Rx tpd Typ. (ns)	I$_{CC}$ Max (mA)	ESD HBM (kV)	TIA/EIA-899 Standard Compliance	HiRel Avail.	Package	Price*
SN65MLVD2	—	1	1	—	M-LVDS	LVTTL	200	1000	—	—	25	9	Yes	N	SON-8	1.95
SN65MLVD3	—	1	2	—	M-LVDS	LVTTL	200	1000	—	—	25	9	Yes	N	SON-8	1.95
SN65MLVD200A	1	1	1	Half	LVTTL, M-LVDS	LVTTL, M-LVDS	100	1000	2.5	3.6	24	8	Yes	N	SOIC-8	1.55
SN65MLVD201	1	1	1	Half	LVTTL, M-LVDS	LVTTL, M-LVDS	200	1000	1.5	4	24	8	Yes	N	SOIC-8	1.85
SN65MLVD202A	1	1	1	Full	LVTTL, M-LVDS	LVTTL, M-LVDS	100	1000	2.5	3.6	24	8	Yes	N	SOIC-14	1.55
SN65MLVD203	1	1	1	Full	LVTTL, M-LVDS	LVTTL, M-LVDS	200	1000	1.5	4	24	8	Yes	N	SOIC-14	1.85
SN65MLVD204A	1	1	2	Half	LVTTL, M-LVDS	LVTTL, M-LVDS	100	1000	2.5	3.6	24	8	Yes	N	SOIC-8	1.55
SN65MLVD205A	1	1	2	Full	LVTTL, M-LVDS	LVTTL, M-LVDS	100	1000	2.5	3.6	24	8	Yes	N	SOIC-14	1.55

*Suggested resale price in U.S. dollars in quantities of 1,000. See **www.ti.com/hirel** for HiRel options.*

M-LVDS (continued)

Device	No. of Tx	No. of Rx	Rx Type	Half/ Full Duplex	Input Signal	Output Signal	Signaling Rate (Mbps)	Part-to-Part Skew Max (ps)	Tx tpd Typ. (ns)	Rx tpd Typ. (ns)	I_{CC} Max (mA)	ESD HBM (kV)	TIA/ EIA-899 Standard Compliance	HiRel Avail.	Package	Price*
SN65MLVD206	1	1	2	Half	LVTTL, M-LVDS	LVTTL, M-LVDS	200	1000	1.5	4	24	8	Yes	N	SOIC-8	1.85
SN65MLVD207	1	1	2	Full	LVTTL, M-LVDS	LVTTL, M-LVDS	200	1000	1.5	4	24	8	Yes	N	SOIC-14	1.85
SN65MLVD047	4	0	—	—	LVTTL	M-LVDS	200	1000	1.5	—	60	12	Yes	N	SOIC-16, TSSOP-16	1.45
SN65MLVD048	0	4	1, 2	—	M-LVDS	LVTTL	250	1000	—	6	25	8	Yes	N	VQFN-48	3.00
SN65MLVD128	8	1	—	—	LVTTL	M-LVDS	200	800	1.5	1.5	140	8	Yes	N	TSSOP-48	3.80
SN65MLVD129	8	2	—	—	LVTTL	M-LVDS	200	800	1.5	1.5	140	8	Yes	N	TSSOP-48	3.80
SN65MLVD040	4	4	1, 2	Half	LVTTL, M-LVDS	LVTTL, M-LVDS	250	600	2.4	6	90	8	Yes	N	VQFN-48	3.60
SN65MLVD080	8	8	1	Half	LVTTL, LVDS	LVTTL, M-LVDS	250	1000	2.4	6	180	8	Yes	N	TSSOP-64	4.75
SN65MLVD082	8	8	2	Half	LVTTL, LVDS	LVTTL, M-LVDS	250	1000	2.4	6	180	8	Yes	N	TSSOP-64	4.75
SN65LVDM179	1	1	—	Full	LVTTL, LVDM	LVTTL, LVDM	500	1000	1.7	3.7	15	12	—	N	SOIC-8, VSSOP-8	1.70
SN65LVDM0502	2	2	—	Full	LVTTL, LVDM	LVTTL, LVDM	500	1000	1.7	3.7	27	12	—	Y	SOIC-16, TSSOP-16	2.20
SN65LVDM22	2	2	—	—	LVDM	LVDM	250	—	4	4	27	12	—	N	SOIC-16, TSSOP-16	2.50
SN65LVDM31	4	0	—	—	LVCMOS	LVDM	150	1000	2.3	—	40	12	—	N	SOIC-16	1.55
SN65LVDM1676	16	16	—	Half	LVTTL, LVDM	LVTTL, LVDM	630	1000	2.5	3	175	15	—	N	TSSOP-64	7.75
DS91C176	1	1	2	Full	M-LVDS	M-LVDS	200	1300	3.1	5.3	29.5	8	Yes	N	SOIC-8	1.41
DS91D176	1	1	1	Full	M-LVDS	M-LVDS	200	1300	3.1	5.3	29.5	8	Yes	N	SOIC-8	1.40
DS91C180	1	1	2	Half	M-LVDS	M-LVDS	200	1900	3.1	5.3	29.5	8	Yes	N	SOIC-8	1.60
DS91D180	1	1	1	Half	M-LVDS	M-LVDS	200	1900	3.1	5.3	29.5	8	Yes	N	SOIC-8	1.45
DS91M124	4	1	—	—	LVCMOS	M-LVDS	250	4700	3.9		24	8	Yes	N	SOIC_N-16	2.20
DS91M125	4	1	—	—	LVDS, M0LVDS	M-LVDS	250	5500	5.5		78	8	Yes	N	SOIC_N-16	2.20
DS91M047	4	0	—	—	LVCMOS	M-LVDS	250	3500	3.1		75	8	Yes	N	SOIC-16	2.67
DS91M040	4	4	1, 2	—	LVDS, M0LVDS	LVCMOS-M-LVDS	250	4000	3.3	3.1	75	8	Yes	N	WQFN-32	3.60

*Suggested resale price in U.S. dollars in quantities of 1,000. See **www.ti.com/hirel** for HiRel options.

Interface
Communications – Data Buffers and Translators (LVDS, M-LVDS, PECL/ECL)

PECL/ECL

Device	No. of Tx	No. of Rx	Input Signal	Output Signal	Frequency	Tpd typ (pS)	I_CC Max (mA)	ESD HBM (kV)	Supply Voltage (V)	HiRel Avail.	Package	Pinout	Price*
SN65EL11	2	1	ECL/PECL	ECL/PECL	1.25 GHz	265	32	3	5	N	SOIC-8, TSSOP-8	MC10EL11, MC100EL11	Web
SN65EL16	1	1	ECL	TTL	2 GHz	250	23	3	5	N	SOIC-8, TSSOP-8	MC10EL16, MC100EL16	Web
SN65ELT20	1	1	TTL	PECL	500 Hz	820	16	3	5	N	SOIC-8, TSSOP-8	MC10ELT20, MC100ELT20	Web
SN65ELT21	1	1	TTL	PECL	150 Hz	3000	25	3	5	N	SOIC-8, TSSOP-8	MC10ELT21, MC100ELT21	Web
SN65ELT22	2	2	TTL	PECL	500 Hz	1200	22	3	5	N	SOIC-8, TSSOP-8	MC10ELT22, MC100ELT22	Web
SN65ELT23	2	2	PECL	TTL	150 Hz	3500	27	3	5	N	SOIC-8, TSSOP-8	MC10ELT23, MC100ELT23	Web
SN65EPT21	1	1	LVTTL	LVPECL	1.25 GHz	420	26	3	3.3	N	SOIC-8, TSSOP-8	MC10EPT21, MC100EPT21	Web
SN65EPT22	2	2	LVTTL	LVPECL	1.25 GHz	420	50	3	3.3	N	SOIC-8, TSSOP-8	MC10EPT22, MC100EPT22	Web
SN65EPT23	2	2	LVPECL	LVTTL	1.25 GHz	420	25	3	3.3	N	SOIC-8, TSSOP-8	MC10EPT23, MC100EPT23	Web
SN65LVEL11	2	1	ECL	ECL	1.5 GHz	265	26	3	2.5 to 3.3	N	SOIC-8, TSSOP-8	MC10LVEL11, MC100LVEL11	Web
SN65LVELT22	2	2	LVTTL	LVPECL	400 Hz	350	33	3	3.3	N	SOIC-8, TSSOP-8	MC10LVEL22, MC100LVEL22	Web
SN65LVELT23	2	2	LVPECL	LVTTL	100 Hz	3500	27	3	3.3	N	SOIC-8, TSSOP-8	MC10LVELT23, MC100LVELT23	Web
SN65LVEP11	2	1	ECL/PECL	ECL/PECL	3 GHz	240	45	3	2.5 to 3.3	N	SOIC-8, TSSOP-8	MC10LVEP11, MC100LVEP11	Web

*Suggested resale price in U.S. dollars in quantities of 1,000. See www.ti.com/hirel for HiRel options.

Optical Module ICs

Device	Function	Max Data (Gbps)	DJ (Typ) (ps)	Imod-max (Max)(mA)	Bias Current Max (mA)	Tf/Tr (Typ) (ps)	V_CC (V)	Features	Operating Temperature Range (°C)	Package
ONET1151M	Modulator Driver (with Waveform Shaping)	11.35	5	1.5 Vpp SE	None	26	3.3	Digital control	−40 to 100	QFN-16
ONET1141L	Modulator Driver	11.3	5	2 Vpp SE	160	28	3.3	Digital Control, APC Loop	−40 to 100	VQFN-24
ONET1101L	Laser Diode Driver	11.3	5	85	100	25	3.3	Digital Control, APC Loop	−25 to 100	VQFN-24
ONET8501V	VCSEL Driver (with Waveform Shaping)	11.3	4	24	20	24	3.3	Digital Control, APC Loop	−40 to 85	QFN-20
ONET1191V	VCSEL Driver	11.3	4	45	20	25	3.3	Digital Control, APC Loop	−40 to 85	QFN-20
ONET4201LD	Laser Diode Driver (w/Active Back Termination)	4.25	13	85	100	55	3.3	APC Loop	−40 to 85	VQFN-24
ONET4211LD	Laser Diode Driver	4.25	13	85	100	35	3.3	APC Loop	−40 to 85	VQFN-24
ONET4291VA	VCSEL Driver	4.25	7	14	8.5	35	3.3	Digital Control, APC Loop	−40 to 85	QFN-20

Device	Function	Max Data (Gbps)	DJ (Typ) (ps)	I_CC (Nom) (mA)	tf/tr (Typ) (ps)	V_CC (V)	V_IN Min(Nom) (mV p-p)	Features	Operating Temperature Range (°C)	Package
ONET8501PB	Limiting Amplifier (Rate Selectable)	11.3	3	50	28	3.3	5	LOS, Bandwith Select, Output Voltage Select	−40 to 100	QFN-16
ONET8501P	Limiting Amplifier (Rate Selectable)	11.3	4	48	25	3.3	5	LOS, Bandwith Select, Output Voltage Select	−40 to 100	QFN-16
ONET1191P	Limiting Amplifier	11.3	4	33	25	3.3	2.5	LOS, Output Voltage Select	−40 to 85	QFN-16
ONET4201PA	Limiting Amplifier (with LOS and RSSI)	4.25	3	27	45	3.3	5	LOS	−40 to 85	QFN-16
ONET4291PA	Limiting Amplifier (Rate-Selectable)	4.25	5	36	45	3.3	2.5	LOS, Bandwith Select, Output Voltage Select	−40 to 85	VQFN-16
ONET4251PA	Limiting Amplifier (with LOS and RSSI)	4.25	6	27	35	3.3	50	LOS	−40 to 85	QFN-16

Device	Function	Max Data (Gbps)	BW (Typ) (GHz)	Z (Typ) (Ω)	DJ (Typ) (ps)	I_CC (Nom) (mA)	Iin,ovl (Min) (mA)	In-rms (Typ) (nA)	V_CC (V)	Operating Temperature Range (°C)
ONET8521T	Transimpedance Amplifier with RSSI (2.4 Kohms)	11.3	9	2400	6	27	2.5	950	3.3	−40 to 100
ONET8531T	Limiting Transimpedance Amplifier with RSSI (5 Kohm)	11.3	10	4500	6	28	2.5	900	3.3	−40 to 100
ONET8541T	Transimpedance Amplifier with RSSI	11.3	9	4000	6	27	2.5	950	3.3	−40 to 100
ONET8511T	Linear Transimpedance Amplifier with RSSI	11.3	8	5500	8	46	2	1000	3.3	−25 to 85
ONET8501T	Limiting Transimpedance Amplifier with RSSI	11.3	10	7000	6	28	2.5	900	3.3	−40 to 100
ONET4291TA	Transimpedance Amplifier with AGC and RSSI	4.25	2.8	3200	10	17	2	465	3.3	−40 to 85
ONET4291T	Transimpedance Amplifier with AGC and RSSI	4.25	2.8	3200	10	17	2	465	3.3	−40 to 85
ONET2591TA	Transimpedance Amplifier with AGC and RSSI	2.5	1.8	2600	8.5	14	2	275	3.3	−40 to 85

Interface
SerDes (Serial Gigabit Transceivers)

Quad-Channel XAUI/10 GBASE-KR Transceiver
TLK10034

The TLK10034 is a quad-channel multi-rate transceiver intended for use in high-speed bi-directional point-to-point data transmission systems. This device supports three primary modes. It can be used as a XAUI to 10 GBASE-KR transceiver, as a general-purpose 8b/10b multi-rate 4:1, 2:1, or 1:1 serializer/deserializer, or can be used in 1 G-KX mode. The four TLK10034 channels are fully independent. They can be operated with different reference clocks, at different data rates, and with different serialization/deserialization ratios.
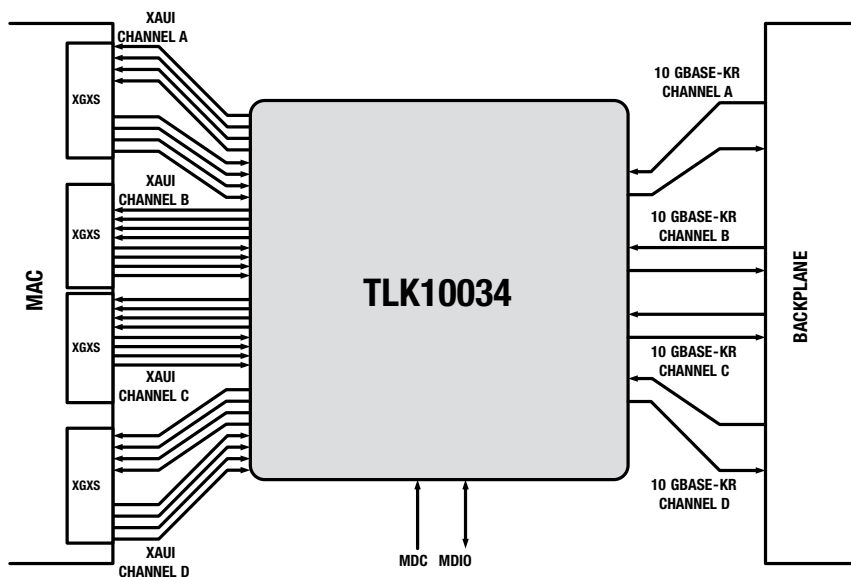
TLK10034 functional block diagram

Get more information: **www.ti.com/product/TLK10034**

Key Features
- Dual-channel 470 Mbps to 6.25 Gbps continuous/multi-rate transceiver
- Supports all CPRI and OBSAI data rates
- Differential CML I/Os on both high speed and low speed sides
- Interface to backplanes, passive and active copper cables, or SFP+ optical modules
- Selectable reference clock per channel with multiple output clock options
- Loopback capability on both high speed and low speed sides
- Two power supplies: 1.0 V, and 1.5 or 1.8 V nominal
- 65 nm advanced CMOS technology
- Industrial ambient operating temperature (–40°C to 85°C)
- Power consumption: 825 mW per channel (nominal)
- Package: 19 mm x 19 mm, 324-pin PBGA, 1-mm ball-pitch

Applications
- 10 GBASE-KR compliant backplane links
- 10 gigabit ethernet switch, router, and network interface cards
- 10 gigabit ethernet blade servers
- Proprietary cable/backplane links
- High-speed point-to-point transmission systems

Interface
SerDes (Serial Gigabit Transceivers)

SerDes (Serial Gigabit Transceivers)

Device	Description	Data Rate	Serial I/F1	Parallel I/F	Power	Special Features	HiRel Avail.	Price*
TLK10002	10 Gbps Dual-Channel Multi-Rate Transceiver	0.5 to 10.3125 Gbps	2-CML	4-CML	1600 mW	—	N	38.00
TLK10034	Quad-Channel XAUI/10GBASE-KR Transceiver	0.5 to 10.3125 Gbps	4-CML	4-CML	900 mW / channel	—	N	45.00
TLK10232	Dual-Channel XAUI/10GBASE-KR Transceiver with Crosspoint	0.5 to 10.3125 Gbps	4-CML	4-CML	900 mW/ channel	—	N	Web
TLK1221	Single-Ch. 10:1 Gigabit Ethernet SerDes	0.6 to 1.3 Gbps	1-LVPECL	10-LVTTL	235 mW	Fast Relock for PON	N	Web
TLK1501	Single-Ch. 16:1 SerDes	0.6 to 1.5 Gbps	1-CML	16-LVTTL	200 mW	Built-In Testability	N	8.40
TLK2501	Single-Ch. 16:1 SerDes	1.6 to 2.5 Gbps	1-CML	16-LVTTL	300 mW	Built-In Testability	N	12.60
TLK2701	Single-Ch. 16:1 SerDes	1.6 to 2.5 Gbps	1-CML	16-LVTTL	300 mW	Built-In Testability and K Character Control	N	12.60
TLK2711	Single-Ch. 16:1 SerDes	1.6 to 2.5 Gbps	1-VML	16-LVTTL	350 mW	MicroStar Junior™ BGA Packaging	Y	10.50
TLK3101	Single-Ch. 16:1 SerDes	2.5 to 3.125 Gbps	1-VML	16-LVTTL	350 mW	Built-In Testability	N	16.85
TLK2521	Single-Ch. 18:1 SerDes	1.0 to 2.5 Gbps	1-VML	18-LVTTL	<550 mW	Low Power and Built-In Equalization	N	12.60
TLK1521	Single-Ch. 18:1 SerDes	0.6 to 1.3 Gbps	1-VML	18-LVTTL	<350 mW	Low Power and Built-In Equalization	N	10.50
TLK4120	Four-Ch. 18:1 SerDes	0.5 to 1.3 Gbps	4-VML	18-LVTTL	<350 mW	Four-Channel Version of TLK1521	N	24.00
TLK4250	Four-Ch. 18:1 SerDes	1.0 to 2.5 Gbps	4-VML	18-LVTTL	<550 mW	Four-Channel Version of TLK2521	N	32.00
TLK4015	Four-Ch. of 16:1 Xcvr	0.6 to 1.5 Gbps/ Ch.	4x-CML	16-LVTTL/Ch.	1 W	Four-Channel Version of TLK1501	N	29.40
TLK1211	Single-Ch. 10:1 Gigabit Ethernet	0.6 to 1.3 Gbps	1-LVPECL	10-LVTTL	200 mW	Fast Relock for PON	N	Web
TLK2541	Single-Ch. 20:1 Txcr	1.0 to 2.6 Gbps	1-LVPECL	20-LVTTL	625 mW	Supports Independent 1 and 2.5Gbps Tx/ Rx EPON OLT Channels	N	Web
TLK2201BI	Single-Ch. 10:1 Gigabit Ethernet Xcvr	1.2 to 1.6 Gbps	1-LVPECL	10-LVTTL	200 mW	JTAG; 5-Bit DDR Mode, Industrial Temperature Qualified	N	4.65
TLK2201AJR	Single-Ch.10:1 Gigabit Ethernet Xcvr	1.0 to 1.6 Gbps	1-LVPECL	10-LVTTL	200 mW	MicroStar Junior™ 5mm x 5mm LGA	N	4.25
TLK2208B	Eight-Ch. of 10:1 Gigabit Ethernet Xcvr	1.0 to 1.3 Gbps	8-VML	4/5-Bit/Ch. (Nibble DDR Mode), 8/10-Bit/Ch. (Multiplex Ch. Mode)	1 W	JTAG, MDIO Supported	N	31.50
TLK2226	Ch. 16:1 Gigabit Ethernet Xcvr	Six-1.0 to 1.3 Gbps	6-VML	4/5-Bit RTBI or RGMII	<1.5 W	MDIO Supported 100-FX Mode Support	N	19.65
TLK3118	Four-Ch. 10/8:1 Xcvr with (XAUI) Full Redundancy	2.5 to 3.125 Gbps/Ch.	4x 3.125 Gbps LVPECL (XAUI)	8/10-HSTLx4 (XGMII)	<2 W	Full Redundancy for Four Channels (XAUI)	N	80.00
TLK3134	Four-Ch. Multi-Rate Xcvr	0.6 to 3.75 Gbps	4x 3.125 Gbps CML (XAUI)	8/10-HSTLx4 (XGMII)	400 mW/ Ch.	Built-In Ref. Clock Jitter Cleaner	N	35.00
TLK3132	Two-Ch. Multi-Rate Xcvr	0.6 to 3.75 Gbps	2x 3.125 CML	8/10-HSTLx2	400 mW/ Ch.	Built-In Ref. Clock Jitter Cleaner	N	Web
TLK3131	Single-Ch. Multi-Rate Xcvr	0.6 to 3.75 Gbps	1x 3.125 CML	8/10-HSTLx2	400 mW/ Ch.	Built-In Ref. Clock Jitter Cleaner	N	Web
TLK6002	Dual-Ch Multi-Rate Xcvr	0.47 to 6.25 Gbps	2x 6.25 Gbps CML	20-HSTL	500 mW/ Ch.	Integrated Latency Measurement Function for CPRI/OBSAI	N	Web
DS32EL0421	FPGA-Link Serializer	1.25 to 3.125 Gbps	1-CML	5D+C, DDR, LVDS	500 mW	Transmit De-Emphasis, 8b/10b Encoder, BIST	N	8.95
DS32EL0124	FPGA-Link Deserializer	1.25 to 3.125 Gbps	1-CML	5D+C, DDR, LVDS	520 mW	Receive Equalization, 8b/10b Decoder, BIST	N	8.95
DS32ELX0421	FPGA-Link Serializer w/ Redundant Output	1.25 to 3.125 Gbps	1 + 1-CML	5D+C, DDR, LVDS	500 mW	Transmit De-Emphasis, 8b/10b Encoder, BIST, Redundant Output	N	10.60
DS32ELX0124	FPGA-Link Deserializer w/ Loop Through	1.25 to 3.125 Gbps	1-CML	5D+C, DDR, LVDS	520 mW	Receive Equalization, 8b/10b Decoder, BIST, Loop Through Driver	N	10.60

Suggested resale price in U.S. dollars in quantities of 1,000. See www.ti.com/hirel for HiRel options.

*Preview products are listed in **bold blue.***

Interface
Consumer/Computing – USB

SuperSpeed USB Transceiver with PIPE3 and ULPI Interfaces
TUSB1310

The TUSB1310 is a single-port, 5.0 Gbps USB 3.0 physical layer transceiver operating off of a single crystal or an external reference clock. The TUSB1310 provides a clock to USB link layer controllers. The single reference clock allows the TUSB1310 to provide a cost-effective USB 3.0 solution with few external components and a minimum implementation cost.
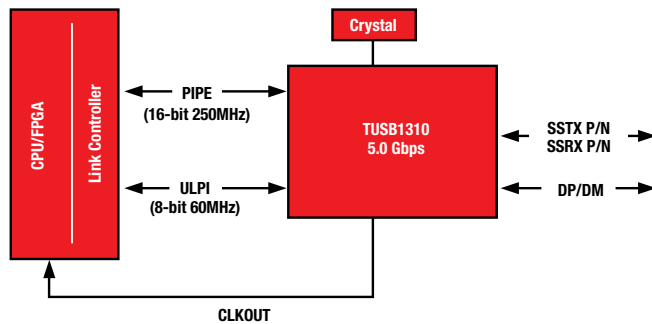
TUSB1310 functional block diagram

Get more information: **www.ti.com/product/TUSB1310**

Key Features
- SuperSpeed USB (USB 3.0) compliant
  - One 5.0 Gbps SuperSpeed connection
  - One 480 Mbps HS/FS/LS connection
- Receiver sensitivity of less than 50mV differential peak-to-peak is twice as good as required by the specification, allowing for simpler board layout and longer cable usage to ensure broader compatibility
- Digital interface
  - PIPE3 for SuperSpeed signal path
  - ULPI for high-speed, full-speed and low-speed signal path

Applications
- Surveillance cameras
- High-speed data acquisition systems

SP3T Switch with Impedance Detection Micro-USB Switch to Support USB, UART, Audio and Charger
TSU5511

The TSU5511 is designed to interface cell phone UART, USB and audio chips with external peripherals via a micro-USB connector. The switch features impedance detection for identification of various accessories that are attached through DP and DM of the micro-USB port. When an accessory is plugged into the micro-USB port, the switch uses a detection mechanism to identify the accessory. It will then switch to the appropriate channel: data, audio or UART.

PREVIEW

TSU5511 functional block diagram

Get more information: **www.ti.com/product/TSU5511**
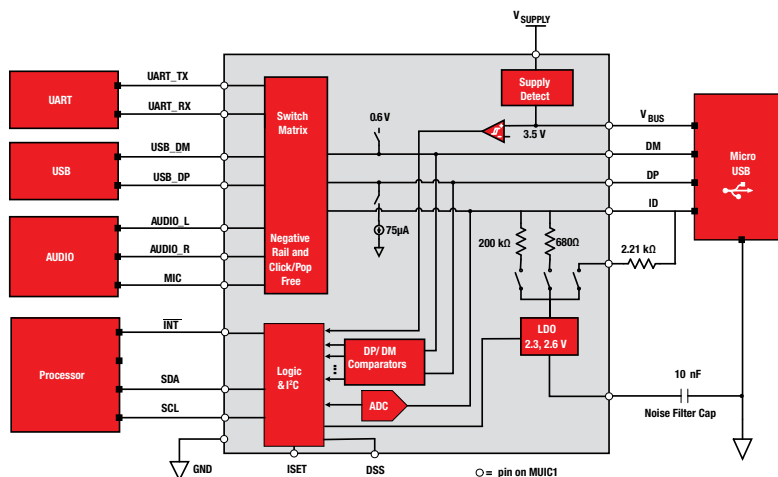
Key Features
- Compatible accessories
  - USB data cable
  - UART cable
  - Charger (dedicated or host/hub)
  - Stereo headset with mic
- Integrated LDOs for V_{REF} and mic bias
- USB path supports USB 2.0 high speed
- Audio path provides negative rail support and click/pop reduction
- 1.8 V compatible I^{2}C interface
- ESD performance tested per JESD 22
  - 2000 V human body model (A114-B, Class II)
  - 1000 V charged-device model (C101)
- ESD perf. DP/D</ID/V$_{BUS}$ to GND
  - ±8 kV contact discharge (IEC 61000-4-2)
  - ±15 kV air gap discharge (IEC 61000-4-2)

Applications
- Cellular telephones

Interface
Consumer/Computing – USB

SuperSpeed USB-to-SATA bridge
TUSB9261

The TUSB9261 is a SuperSpeed USB function controller with integrated USB-compliant transceivers. It is intended as a USB-to-SATA bridge for storage devices using the SATA interface. The TUSB9261 is designed to use both the fast performance of the state machine and the programmability and flexibility of the embedded microcontroller (MCU) and firmware. With the elaborate balance between the MCU and the state machine, it provides a bridge solution to meet both performance and flexibility requirements of next-generation external storage devices.
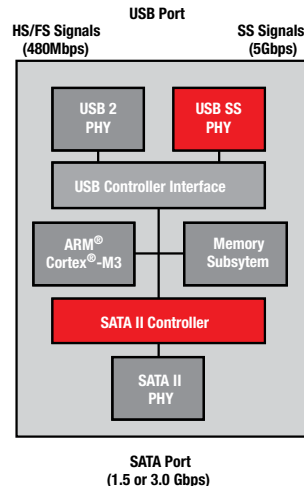
TUSB9261 functional block diagram

Applications
- External storage:
  - SSDs
  - HDDs
  - Optical drives

Key Features
- Interface supports interoperability with all host platforms and the latest high-performance storage drives to enable ultra-fast, sync-and-go user experience
  - SATA revision 2.6-compliant
  - USB 2.0 HS/FS and USB 3.0 SS
  - Attached SCSI protocol
  - Mass storage class bulk-only transport
  - HID class
  - Firmware update support
- Receiver sensitivity of less than 50 mV differential peak-to-peak is twice as good as required by the specification, allowing for simpler board layout and longer cable usage to ensure broader compatibility

Get more information: **www.ti.com/product/TUSB9261**

SuperSpeed USB Host Controllers
TUSB7320/40

The TUSB7320/40 are USB 3.0 xHCI-compliant host controllers that support up to four downstream ports. Both parts are available in a pin-compatible 100-pin RKM package. The TUSB7320/40 interface to the host system via a PCIe x1 Gen 2 interface and provide SuperSpeed, high-speed, full-speed or low-speed connections on the downstream USB ports.

Applications
- PCIe host add-in cards
- Desktop PCs
- Notebook PCs
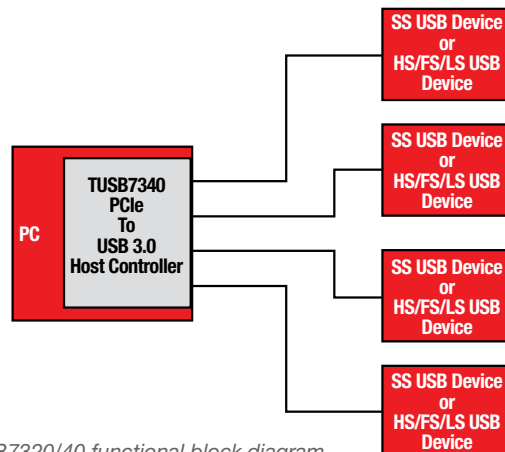
TUSB7320/40 functional block diagram

Key Features
- USB 3.0-compliant xHCI host controller
- Downstream ports support SuperSpeed, high-speed, full-speed/low-speed connections
- Each downstream port
  - May be independently enabled or disabled
  - Has adjustments for transmit swing, de-emphasis and equalization settings
  - May be marked as removable/non-removable
  - Has independent power control and overcurrent detection
- Best-in-class adaptive receiver equalizer design

Get more information: **www.ti.com/product/TUSB7320, www.ti.com/product/TUSB7340**

Interface
Consumer/Computing – USB

USB

Device	Description	Max USB Speed	Application Processor Interface	ESD HBM (kV)	HiRel Avail.	Package	Price*
USB Transcivers (PHYs)							
TUSB1105	Advanced USB Full-Speed Transceiver	Full	Single or Differential	±15	N	QFN-16	0.55
TUSB1106	Advanced USB Full-Speed Transceiver	Full	Differential	±15	N	QFN-16, TSSOP-16	0.55
TUSB1210	USB 2.0 ULPI Transceiver	High	ULPI	±2	N	QFN-32	Call
TUSB1211	USB 2.0 ULPI Transceiver with USB Charger Detection	High	ULPI	±2	N	BGA-36	Call
TUSB1310	SuperSpeed USB Transceiver	SuperSpeed	ULPI and PIPE3	±0.5	N	BGA-167	6.00
TUSB2551A	Advanced USB Full-Speed Transceiver	Full	Single	±15	N	QFN-16	0.55

*Suggested resale price in U.S. dollars in quantities of 1,000. See **www.ti.com/hirel** for HiRel options.

*New products are listed in **bold red.***

USB Peripherals (Functions)

Device	Description	Max USB Speed	Integrated MCU	Out End-Points	In End-Points	MCU Code Space (kB)	HiRel Avail.	Package	Price*
TUSB3210	General-Purpose Function Controller	Full	8052	3	3	8	N	LQFP-64	1.15
TUSB3410	USB-to-Serial Bridge	Full	8052	3	3	16	Y	LQFP,-32, QFN-32	1.20
TUSB6250	USB-to-IDE (ATA/ATAPI) Bridge	High	8051 WARP	4	4	32	N	TQFP-80	1.95
TUSB9260	USB-to-SATA Bridge	SuperSpeed	Cortex®-M3	5	5	64	N	HTQFP-64	3.00
TUSB9261	USB-to-SATA Bridge	SuperSpeed	Cortex-M3	5	5	64	N	HTQFP-64	3.00

*Suggested resale price in U.S. dollars in quantities of 1,000. See **www.ti.com/hirel** for HiRel options.

USB Hubs and Compound Devices

Device	Description	Max USB Speed	Integrated MCU	Downstream Ports	HiRel Avail.	Package	Price*
TUSB2036	2/3-Port USB Full-Speed Capable Hub	Full	—	3	N	LQFP-32	1.15
TUSB2046B	4-Port USB Full-Speed Capable Hub	Full	—	4	Y	LQFP-32, QFN-32	1.20
TUSB2077A	7-Port USB Full-Speed Capable Hub	Full	—	7	N	LQFP-48	1.95
TUSB2136	2-Port USB Full-Speed Capable Hub with Integrated 8052 MCU	Full	8052	2	N	LQGP-64	4.10
TUSB8040A	4-Port USB SuperSpeed Hub	SuperSpeed	—	4	N	WQFN-100	Call

*Suggested resale price in U.S. dollars in quantities of 1,000. See **www.ti.com/hirel** for HiRel options.

USB Host and On-the-Go (OTG)

Device	Description	Max USB Speed	Local Bus	Max No. Host Ports	HiRel Avail.	Package	Price*
TUSB6020	USB 2.0 High-Speed On-the-Go Local Bus Interface Bridge Controller	High	VLYNQ	1	Y	BGA-80, TQFP-80	6.00
TUSB7320	PCI Express® to SuperSpeed USB xHCI with 2 USB 3.0 Ports	SuperSpeed	PCIe Gen2	2	N	mRQFN-100	Call
TUSB7340	PCI Express to SuperSpeed USB xHCI with 4 USB 3.0 Ports	SuperSpeed	PCIe Gen2	4	Y	mRQFN-100	Call

*Suggested resale price in U.S. dollars in quantities of 1,000. See **www.ti.com/hirel** for HiRel options.

Interface
Consumer/Computing – USB

USB 2.0 Signal Switches

Device	Description	Configuration	V_{CC} (V_{DD}) (min) (V)	V_{CC} (V_{DD}) (max) (V)	r_{ON} (typ) (Ω)	Bandwidth (MHz)	Crosstalk (dB)	Off Isolation (dB)	I_{CC} (I_{DD}) (typ)(µA)	Packages
TS3USB221	High-Speed USB 2.0 (480 Mbps) 1:2 Mux/Demux Switch with Single Enable	2-Channel SPDT	2.3	3.6	6	1100	−40	−41	30	SON-10, QFN-10
TS3USB221A	High-Speed USB 2.0 (480 Mbps) 1:2 Mux/Demux Switch with Single Enable with 12 kV HBM ESD Protection	2-Channel SPDT	2.3	3.6	3	900	−39	−40	30	QFN-10
TS3USB31	High-Speed USB 2.0 (480 Mbps) 1:1 Switch	2-Channel SPST	3	4.3	6	1220	−53	−30	1	µQFN-8
TS3USB31E	High-Speed USB 2.0 (480 Mbps) 1:1 Switch with 15 kV HBM ESD Protection	2-Channel SPST	2.25	4.3	6.4	1100	−53	−30	1	µQFN-8
TS5USBA224	USB 2.0 High-Speed (480 Mbps) and Audio Switches with Negative Signal Capability and 1.8-V Logic Compatibility	2-Channel SPDT	2.7	5.5	4	650	−31	−22	6	µQFN-10
TS3USB30	High-Speed USB 2.0 (480 Mbps) 1:2 Mux/Demux Switch with Single Enable	2-Channel SPDT	3	4.3	6	955	−56	−39	1	µQFN-10
TS3USB30E	High-Speed USB 2.0 (480 Mbps) 1:2 Mux/Demux Switch with Single Enable with 15 kV HBM ESD Protection	2-Channel SPDT	3	4.3	6	900	−54	−40	1	VSSOP-10, TQFN-10
TS3DS10224	High-Speed 2:4 Differential Multiplexer / Demultiplexer	2-Channel 2:4 MUX	3	3.6	10	1200	−30	−30	50	QFN-20
TS3USBA225	USB 2.0 High-Speed (480 Mbps) and Audio Switches with Negative Signal Capability and 1.8-V Logic Compatibility and Power-Down Mode	2-Channel SP3T	2.7	4.3	6.5	1900	−45	−35	25	µQFN-12
TS3USB3200	DPDT USB 2.0 Hligh-Speed (480Mbps) and Mobile High-Definition Link (MHL) Switch with ID Select and Flexible Power Control	3-Channel SPDT	2.7	4.3	5.7	6000	−83	−83	30	QFN-16

Smart Switches

Device	Description	Configuration	Compatibility	nCH	V_{CC} (V_{dd}) (min) (V)	V_{CC} (V_{dd}) (max) (V)	r_{ON} (max) (Ω)	Bandwidth (MHz)	Crosstalk (dB)	Off Isolation (dB)	I_{CC} (I_{DD}) Max (µA)	Packages
TSU5511	Micro-USB Connector to UART and Audio Switches with ID Detection and Charger Detection	Dual SP3T + SPST	Audio	2	−1.3	1.3	6	788	−120	−100	70	WCSP-20
			Mic	1	0	2.3	12	573	−125	−37		
			USB	2	0	3.6	10	830	−42	−20		
			UART	2	0	4.4	61	295	−98	−100		
TSU6111/A	Micro-USB Connector to UART and USB Switches with ID Detection and Charger Detection	Dual SP2T	USB	2	0	4.4	18	950	−32	−26	—	QFN-16
			UART	2	0	4.4	18	950	−32	−26		
TSU6712/A	Micro-USB Connector to UART, USB, Audio and Video Switches with ID Detection and Charger Detection	Dual SP3T + Dual SPST	Audio	2	−0.8	0.8	5.5	100	−100	−100	150	WCSP-25
			Mic	1	0	2.3	70	40	−100	−95		
			USB	2	−0.5	2	18	400	−78	−58		
			UART	2	0	4.4	15	480	−40	−24		
TSU5611	DP3T Switch with Impedence Detection Micro-USB Switch To Support USB, UART, Audio, and Charger Detection	Dual SP3T + SPST	Audio	2	−1.3	1.3	3.8	900	−100	−100	60	WLBGA-20
			Mic	1	0	2.3	9	573	−100	−55		
			USB	2	0	3.6	4.5	920	−40	−29		
			UART	2	0	3.6	4.5	920	−40	−29		
TSU8111	Single-Cell Charger and USB SP2T Switch Supports USB & UART	Dual SPDT + Charger	USB	2	0	3.6	8	920	−32	−26	100	BGA-20
			UART	2	0	3.6	8	920	−32	−26		
BQ24392	Charger Detection Device with High Speed USB Switch Battery Charger Specification v1.2	Dual SPST + Charger Detection	USB	2	0	3.6	8	920	−32	−26	250	QFN-10
TSU6721	MCPC Compatible USB Port Multimedia Switch Supports USB, UART, Audio, ID, MIC, and Load Switch	Dual SP3T + SPDT +SPST	USB	2	0	3.6	8	920	−32	−26	TBD	BGA-25
			UART	2	0	3.6	8	920	−32	−26		
			Audio	2	−1.5	+1.5	2	450	−85	−100		
			Mic	1	0	2.3	40	40	−85	−95		
			Load Switch	1	4.0	6.5	0.15	—	—	—		

Interface

Consumer/Computing – 1394

IEEE P1394b Three-Port Cable Transceiver Arbiter
TSB81BA3E

The TSB81BA3E provides the digital and analog transceiver functions needed to implement a three-port node in a cable-based IEEE 1394 network. The transceivers include circuitry to monitor the line conditions as needed for determining connection status, for initialization and arbitration, and for packet reception and transmission.
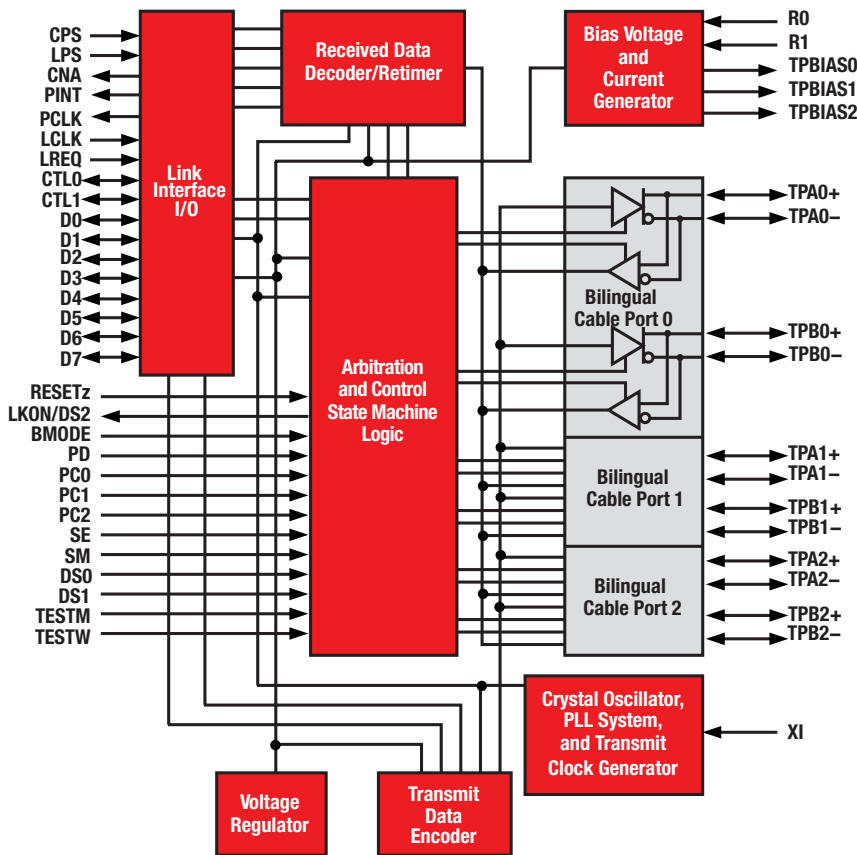
TSB81BA3E functional block diagram

Key Features
- Fully supports provisions of IEEE P1394b revision 1.33+ at 1Gb signaling rates
- Fully supports provisions of IEEE 1394a-2000 and 1394-1995 standard for high-performance serial bus
- Fully interoperable with FireWire®, i.LINK®, and SB1394™, implementation of IEEE Std 1394
- Provides three fully backward-compatible, (1394a-2000 fully compliant) bilingual P1394b cable ports at up to 800 Mbps
- Provides three 1394a-2000 fully compliant cable ports at 100/200/400 Mbps
- Power-down features to conserve energy in battery-powered applications
- Low-power sleep mode
- Data interface to link-layer controller pin-selectable from 1394a-2000 mode (2/4/8 parallel bits at 49.152 MHz) or 1394b mode (8 parallel bits at 98.304 MHz)

Applications
- Storage devices
- Consumer electronics
- Desktop PCs

Get more information: **www.ti.com/product/TSB81BA3E**

Interface
Consumer/Computing – 1394

1394 PHY

Device	Description	Ports	Voltage (V)	Data Rate (Mbps)	HiRel Avail.	Package	Price*
TSB41AB1	IEEE 1394a One-Port Cable Transceiver/Arbiter	1	3.3	Up to 400	N	HTQFP-48/64, BGA-64/80 MicroStar Junior™	1.50
TSB41AB2	IEEE 1394a Two-Port Cable Transceiver/Arbiter	2	3.3	Up to 400	N	HTQFP-64	1.85
TSB41AB3	IEEE 1394a Three-Port Cable Transceiver/Arbiter	3	3.3	Up to 400	Y	HTQFP-80	3.00
TSB41BA3D	S400-Capable 1394b Physical Layer (PHY)	3	3.3	Up to 400	N	HTQFP-80	6.40
TSB81BA3E	IEEE P1394b Three-Port Cable Transceiver Arbiter	3	1.8, 3.3	Up to 800	Y	BGA-168, HTQFP-80	5.40

*Suggested resale price in U.S. dollars in quantities of 1,000. See www.ti.com/hirel for HiRel options.

New products are listed in **bold red.**

1394 Link Layer

Device	Description	FIFO	Voltage (V)	Data Rate (Mbps)	HiRel Avail.	Package	Price*
TSB12LV32	General-Purpose Link Layer Controller (GP2Lynx)	4	3.3	Up to 400	Y	LQFP-100	6.05
TSB42AC3	High-Performance 1394-1995 Link Layer for Industrial and Bridge Applications	10	3.3	Up to 400	N	TQFP-100	9.50
TSB82AA2B	1394b OHCI-Lynx Controller	11	3.3	Up to 800	Y	LQFP-144	2.65

*Suggested resale price in U.S. dollars in quantities of 1,000. See www.ti.com/hirel for HiRel options.

1394 Integrated Devices

Device	Description	FIFO	Ports	Voltage (V)	Data Rate (Mbps)	HiRel Avail.	Package	Price*
TSB43AB21A	OHCI 1.1, 1394a Link Layer Controller Integrated with 1394a, 400 Mbps, 1-Port PHY	9	1	3.3	Up to 400	Y	TQFP-128	4.45
TSB43AB22A	OHCI 1.1, 1394a Link Layer Controller Integrated with 1394a, 400 Mbps, 2-Port PHY	9	2	3.3	Up to 400	N	TQFP-128	3.80
TSB43AB23	OHCI 1.1, 1394a Link Layer Controller Integrated with 1394a, 400 Mbps, 3-Port PHY	9	3	3.3	Up to 400	Y	TQFP-128, LQFP-144	4.25
TSB43EB42	IEEE Std 1394a-2000 Consumer Electronics Solution	—	2	1.5, 3.3	Up to 400	N	BGA-144 MicroStar Junior	7.95
TSB83AA22C	IEEE Std 1394b-2002 PHY and OHCI Link Device	11	2	1.95, 3.3	Up to 800	N	BGA-168	8.50
TSB83AA23	Integrated IEEE-1394.B OHCI Link and 3-Port S800 PHY	11	3	1.95, 3.3	Up to 800	N	NFBGA-167	9.00
XIO2213B	x1 PCIe-to-1394b OHCI Host Controller and 3-Port S800 PHY	8	3	1.5, 1.95, 3.3	Up to 800	N	NFBGA-167, BGA-168	5.75
XIO2221	x1 PCIe-to-1394b OHCI Host Controller and 1-Port S800 PHY	8	1	1.5, 3.3	Up to 800	N	NFBGA-167	4.90

*Suggested resale price in U.S. dollars in quantities of 1,000. See www.ti.com/hirel for HiRel options.

Interface
Consumer/Computing – DisplayPort Switch/Redriver

DisplayPort 1:2 Switch with Integrated TMDS Translator
SN75DP122A

The SN75DP122A is a one dual-mode DisplayPort input to one dual-mode DisplayPort output or one TMDS output. The TMDS output has a built-in level translator compliant with Digital Video Interface (DVI) 1.0 and High Definition Multimedia Interface (HDMI) 1.3b. The DisplayPort output follows the input signal in a manner that provides the highest level of signal integrity while supporting the EMI benefits of spread-spectrum clocking. Through the SN75DP122A, data rates of up to 2.7 Gbps through each link for a total throughput of up to 10.8 Gbps can be realized. The SN75DP122A supports Display Port Spec 1.1a. In addition to the switching of the DisplayPort high-speed signal lines, the SN75DP122A also supports the switching of the bidirectional auxiliary (AUX), Hot Plug Detect (HPD) and Cable Adapter Detect (CAD) channels.

Key Features
- One input port to one of two output ports
- Integrated TMDS level translator with receiver equalization
- DP port supports data rates up to 2.7 Gbps
- DP port supports dual-mode DisplayPort
- DP port output waveform mimics input waveform characteristics
- TMDS port supports data rates up to 2.5 Gbps
- Integrated I^2C logic block for DVI/HDMI connector recognition

Applications
- Personal computer market
  - Desktop PC
  - Notebook PC
  - Docking station
  - Standalone video card

SN75DP122A functional block diagram

Get more information: **www.ti.com/product/SN75DP122A**

Display Port Switch/Redriver

Device	Description	No. of DisplayPort Dual Mode Inputs	No. of TMDS Outputs	No. of DisplayPort Dual Mode Outputs	HiRel Avail.	Package	Price*
SN75DP118	DisplayPort 1:1 Repeater	1	—	1	N	VQFN-36	1.20
SN75DP119	Embedded DisplayPort (eDP) Repeater	1	—	1	N	VQFN-14, VQFN-36	0.80
SN75DP120	DisplayPort 1:1 Dual-Mode Repeater	1	—	1	N	VQFN-36	1.50
SN75DP121	2-Lane Embedded DisplayPort (eDP) 2:1 Signal Conditioner	1	—	2	N	QFN-32	Call
SN75DP122A	DisplayPort 1:2 Switch with Integrated TMDS Translator	1	1	1	N	QFN-56	1.90
SN75DP128A	DisplayPort 1:2 Switch	1	—	2	N	QFN-56	1.65
SN75DP129	DisplayPort to TMDS Translator	1	1	—	N	VQFN-36	1.30
SN75DP130	5.4 Gbps DisplayPort Redriver	1	—	1	N	QFN-48	Call
SN75DP139	DisplayPort to TMDS Translator	1	1	—	N	VQFN-48	1.05
SN75DP219	2-Lane Embedded 5.4 Gbps DisplayPort (eDP) Signal Conditioner	1	—	1	N	QFN-14	Call
DS32EV400	1/2/4 Lane DisplayPort Equalizer	—	—	—	N	LLP-48	4.50
DS34RT148	Display Port to HDMI Translator with Retimer	1	—	—	N	—	Call

*Suggested resale price in U.S. dollars in quantities of 1,000. See **www.ti.com/hirel** for HiRel options.

*Preview products are listed in **bold blue.***

Interface
Consumer/Computing – Flatlink™/FPD-LINK

High Definition Image Sensor Receiver
SN65LVDS324

NEW

The SN65LVDS324 is a SubLVDS deserializer that recovers words, detects sync codes, multiplies the input DDR clock by a ratio, and outputs parallel CMOS 1.8 V data on the rising clock edge. It bridges the video stream interface between HD image sensors made by leading manufacturers, to a format that common processors can accept. The supported pixel frequency is 18.5 MHz to 162 MHz — suitable for resolutions from VGA to 1080p60. With integrated differential input termination, and a footprint of 4.5 × 7 mm, the SN65LVDS324 provides a differentiated solution with optimized form, function, and cost. It operates through an ambient temperature range of –40°C to 85°C.
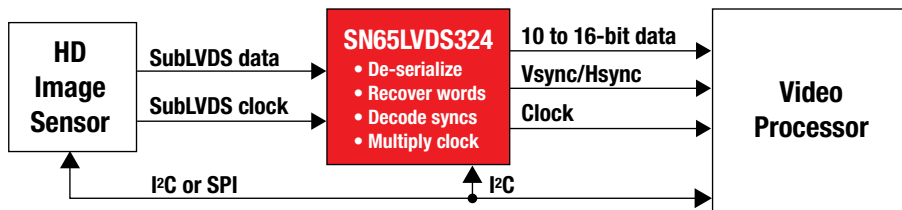
SN65LVDS324 functional block diagram

Get more information: **www.ti.com/product/SN65LVDS324**

Key Features
- Bridges the interface between video image sensors and processors
- Outputs 1.8 V CMOS with 10-/12-/14-/16-bits at 18.5 MHz to 162 MHz
- SubLVDS inputs support up to 648 Mbps
- Integrated 100 Ω differential input termination
- Test image generation feature
- Compatible with TI OMAP™ and DaVinci™ Including DM385, DM8127, DM36x, and DMVA
- Low power 1.8 V CMOS process
- Configurable output conventions
- Packaged in 4.5 × 7 mm BGA

Applications
- IP network cameras
- Machine vision
- Video conferencing
- Gesture recognition

FlatLink™/FPD-LINK LVDS Receivers and Transmitters

Device	Description	Parallel Inputs or Outputs	Serial Chs.	Data Throughput (Mbps)	PLL Frequency (MHz)	Supply Voltage (V)	HiRel Avail.	Package	Price*
FlatLink LVDS Receiver									
SN65LVDS324	High Definition Image Sensor Receiver	18	12	324	18 to 162	1.8	N	59BGA MicroStar Junior™	2.65
SN75LVDS86A	FlatLink Receiver	21	3	1428	32 to 68	3.3	N	TSSOP-48	2.40
SN75LVDS82	FlatLink Receiver	28	4	1904	31 to 68	3.3	N	TSSOP-56	2.45
DS90CF386	FPD-Link (FlatLink) Receiver	28	4	2380	20 to 85	3.3	N	TSSOP-56	3.26
DS90CF388	Dual FPD-Link (FlatLink) Receiver	51	8	5712	40 to 112	3.3	N	TQFP-100	4.91
DS90C3202	Dual FPD-Link (FlatLink) Receiver	70	10	9450	8 to 135	3.3	N	TQFP-128	3.80
DS90CR216A	Rising Edge Data Strobe Channel Link	21	3	1386	20 to 66	3.3	N	TSSOP-48	2.48
DS90CR218A	Rising Edge Data Strobe Channel Link	21	3	1785	12 to 85	3.3	N	TSSOP-48	2.60
DS90CR286A	Rising Edge Data Strobe Channel Link	28	4	1848	20 to 66	3.3	Y	TSSOP-56	3.32
DS90CR288A	Rising Edge Data Strobe Channel Link	28	4	2380	20 to 85	3.3	N	TSSOP-56	4.20
DS90CR484A	Rising Edge Data Strobe Channel Link	48	8	5376	33 to 112	3.3	N	TQFP-100	8.06
DS90CR486	Rising Edge Data Strobe Channel Link	48	8	6384	66 to 133	3.3	N	TQFP-100	9.28

*Suggested resale price in U.S. dollars in quantities of 1,000. See **www.ti.com/hirel** for HiRel options.

*New products are listed in **bold red.***

Interface
Consumer/Computing – Flatlink™/FPD-LINK

FlatLink™/FPD-LINK LVDS Receivers and Transmitters   (continued)

Device	Description	Parallel Inputs or Outputs	Serial Chs.	Data Throughput (Mbps)	PLL Frequency (MHz)	Supply Voltage (V)	HiRel Avail.	Package	Price*
FlatLink LVDS Transmitter									
SN75LVDS84A	FlatLink Transmitter	21	3	1575	31 to 75	3.3	N	TSSOP-48	2.35
SN75LVDS83B	FlatLink 10-135 MHz Transmitter	28	4	3780	10 to 135	3.3	N	BGA-56 MicroStar Junior™, TSSOP-56	2.60
SN75LVDS83A/C	FlatLink 10-135 MHz Transmitter	28	4	2380	10 to 135	3.3	N	BGA-56 MicroStar Junior	2.80
DS90C385A	FPD-Link (FlatLink) Transmitter	28	4	2380	20 to 85	3.3	N	TSSOP-56	2.00
DS90C187	Low Power 1.8 V Dual Pixel FPD-Link (LVDS) Serializer	53	8	5565	29 to 105 (185)	1.8	N	LFA92A	3.95
DS90C185	Low Power 1.8 V FPD-Link (LVDS) Serializer	28	4	2940	25 to 105	1.8	N	LLP-48	2.50
DS90C387	Dual FPD-Link (FlatLink) Transmitter	51	8	5712	32.5 to 112	3.3	N	TQFP-100	4.91
DS90C3201	Dual FPD-Link (FlatLink) Transmitter	70	10	9450	8 TO 135	3.3	N	TQFP-128	3.80
DS90CR215	Rising Edge Data Strobe Channel Link	21	3	1386	20 to 66	3.3	N	TSSOP-48	2.48
DS90CR217	Rising Edge Data Strobe Channel Link	21	3	1785	20 to 85	3.3	N	TSSOP-48	2.60
DS90CR285	Rising Edge Data Strobe Channel Link	28	4	1848	20 to 66	3.3	N	TSSOP-56	3.32
DS90CR287	Rising Edge Data Strobe Channel Link	28	4	2380	20 to 85	3.3	N	TSSOP-56	4.20
DS90CR483A	Rising Edge Data Strobe Channel Link	48	8	5376	33 to 112	3.3	N	TQFP-100	8.40
DS90CR485	Rising Edge Data Strobe Channel Link	48	8	6384	66 to 133	3.3	N	TQFP-100	9.28
FlatLink 3G Receiver									
SN65LVDS302	Programmable 27-Bit Display Serial Interface Receiver	27	3	1755	4 to 65	1.8	N	BGA-80 MicroStar Junior	2.25
SN65LVDS304	QVGA-VGA 27-Bit Display Serial Interface Receiver	27	2	810	4 to 30	1.8	N	BGA-80 MicroStar Junior	2.05
SN65LVDS306	QVGA-HVGA 27-Bit Display Serial Interface Receiver	27	1	405	4 to 15	1.8	N	BGA-80 MicroStar Junior	1.85
SN65LVDS308	QVGA-VGA 27-Bit Display Serial Interface Receiver	27	2	810	4 to 30	1.8	N	BGA-48 MicroStar Junior	1.85
SN65LVDS310	QVGA-HVGA 27-Bit Display Serial Interface Receiver	27	1	405	4 to 15	1.8	N	BGA-48 MicroStar Junior	1.75
FlatLink 3G Transmitter									
SN65LVDS301	Programmable 27-Bit Display Serial Interface Transmitter	27	3	1755	4 to 65	1.8	N	BGA-80 MicroStar Junior	2.25
SN65LVDS303	QVGA-VGA 27-Bit Display Serial Interface Transmitter	27	2	810	4 to 30	1.8	N	BGA-80 MicroStar Junior	2.05
SN65LVDS305	QVGA-HVGA 27-Bit Display Serial Interface Transmitter	27	1	405	4 to 15	1.8	N	BGA-80 MicroStar Junior	1.85
SN65LVDS307	QVGA-VGA 27-Bit Display Serial Interface Transmitter	27	2	810	4 to 30	1.8	N	BGA-48 MicroStar Junior	1.85
SN65LVDS311	Programmable 27-Bit Display Serial Interface Transmitter	27	3	1755	4 to 65	1.8	N	DSBGA-49	2.10

*Suggested resale price in U.S. dollars in quantities of 1,000. See www.ti.com/hirel for HiRel options.

New products are listed in **bold red.**

Panelbus™ (DVI) Transmitters and Receivers

Device	Description	Voltage (V)	Receiver/Transceiver Channels	Parallel Outputs	Data Speed (Mbps)	ICC (mA)	HiRel Avail.	Package	Price*
TFP401A	DVI Receiver, 165 MHz , HSYNC Jitter Immunity	3.3	3	48	495	400	Y	HTQFP-100	4.00
TFP403	DVI Receiver	3.3	3	48	495	400	N	HTQFP-100	5.45
TFP410	DVI Transmitter, 165 MHz	3.3	3	6	495	250	Y	HTQFP-64	3.00

*Suggested resale price in U.S. dollars in quantities of 1,000. See www.ti.com/hirel for HiRel options.

Interface
SerDes – Automotive

24-Bit Color FPD-Link III Deserializers with Bidirectional Control Channel
DS90UB925Q-Q1, DS90UB926Q-Q1

The DS90UB926Q deserializer, in conjunction with the DS90UB925Q serializer, provides a complete digital interface for concurrent transmission of high-speed video, audio, and control data for automotive display and image sensing applications.

This chipset translates a parallel RGB video interface into a single pair high-speed serialized interface. The serial bus scheme, FPD-Link III, supports full duplex of high speed forward data transmission and low speed backchannel communication over a single differential link. Consolidation of video data and control over a single differential pair reduces the interconnect size and weight, while also eliminating skew issues and simplifying system design.

DS90UB926Q Deserializer
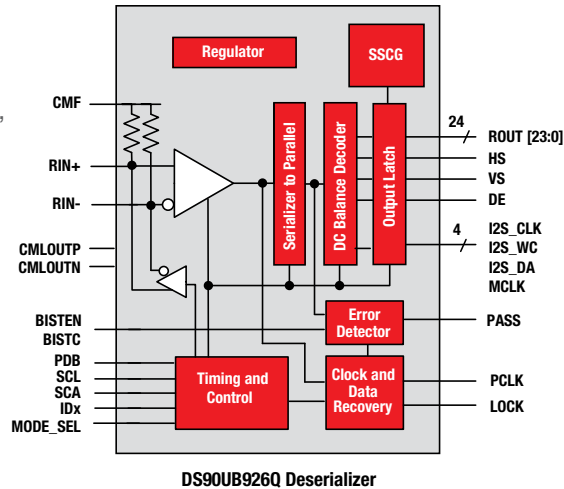
DS90UB925/6 functional block diagram

Get more information: **www.ti.com/product/DS90UB925Q-Q1**
www.ti.com/product/DS90UB926Q-Q1

Key Features
- Bidirectional control interface channel interface with I²C
- compatible serial control bus
- Supports high definition (720p) digital video format
- RGB888 + VS, HS, DE and synchronized I²S audio supported
- 5 to 85 MHz PCLK supported
- Single 3.3 V operation with 1.8 V or 3.3 V compatible LVCMOS I/O interface
- AC-coupled STP Interconnect up to 10 meters
- Parallel LVCMOS video outputs
- Low power modes minimize power dissipation
- Automotive grade product: AEC-Q100 Grade 2 qualified

Applications
- Automotive display for navigation
- Rear seat entertainment systems
- Automotive drive assistance
- Automotive megapixel camera systems

Automotive SerDes

Device - Serializer	Device - Deserializer	Color Depth	Pixel Clock Range (MHz)	External Interface	EMI Mitigation	Signal Conditioning - SER	Signal Conditioning - DES	Diagnostics	Special Features	Package	Price*
FPD-Link III (AECQ)											
DS90UH925Q	DS90UH926Q	24 bpp	5-85	LVCMOS	Coding, SSCG	De-E	Adapt. EQ	BIST, TPG	HDCP, I²S Audio	LLP-48/LLP-60	TBD
DS90UB925Q	DS90UB926Q	24 bpp	5-85	LVCMOS	Coding, SSCG	De-E	Adapt. EQ	BIST, TPG	Dithering	LLP-48/LLP-60	TBD
DS90UB913Q	DS90UB914Q	10/12 bpp	10-100	LVCMOS	Coding, SSCG	—	Adapt. EQ	BIST	Jitter Tolerant	LLP-32/LLP-48	TBD
DS90UB903Q	DS90UB904Q	18 bpp	10-43	LVCMOS	Coding, SSCG	—	EQ	BIST	—	LLP-40/LLP-48	5.85
DS90UB901Q	DS90UB902Q	14 bpp	10-43	LVCMOS	Coding, SSCG	—	EQ	BIST	CRC	LLP-32/LLP-40	5.61
FPD-Link II (AECQ)											
DS90UR907Q	DS90UR908Q	24 bpp	5-65	LVDS	PTO, SSCG, LVDS	De-E	EQ	BIST	—	LLP-36/LLP-48	8.25
DS90UR905Q	DS90UR906Q	24 bpp	5-65	LVCMOS	PTO, SSCG, Slew	De-E	EQ	BIST	—	LLP-48/LLP-60	7.50
DS90UR903Q	DS90UR904Q	18 bpp	10-43	LVCMOS	Coding, SSCG	—	EQ	BIST	—	LLP-40/LLP-48	TBD
DS99R421Q	DS99R124Q	18 bpp	5-43	LVCMOS	LVDS	—	—	BIST	—	LLP-36/LLP-48	6.15
DS90UR241Q	DS90UR124Q	18 bpp	5-43	LVCMOS	PTO, Slew	Pre-E	—	BIST	—	TQFP-48/TQFP-64	5.30
DS90C241Q	DS90C124Q	18 bpp	5-35	LVCMOS	PTO, Slew	Pre-E	—	—	—	TQFP-48/TQFP-48	5.20

Device - Serializer	Device - Deserializer	Color Depth	Pixel Clock Range (MHz)	External Interface	CLK Edge	Description	Serial Channels	Package	Price*
FlatLink™/FPD-Link I (AECQ)									
DS90CF384AQ	—	24 bpp	20-65	LVCMOS	Falling	28 Bit Des Supports 24 bpp + 4 control	4D+C	TSSOP-56	2.57
DS90CR286AQ	—	24 bpp	20-66	LVCMOS	Rising	28 Bit Des Supports 24 bpp + 3 control + 1 GP	4D+C	TSSOP-56	4.76
SN65LVDS86A-Q1	—	18 bpp	32-68	LVCMOS	Falling	21 Bit Des Supports 18 bpp + 3 control	3D+C	TSSOP-48	2.80
SN65LVDS84AQ-Q1	—	18 bpp	31-75	LVCMOS	Falling	21 Bit Ser Supports 18 bpp + 3 control	3D+C	TSSOP-48	2.75

Suggested resale price in U.S. dollars in quantities of 1,000.

*New products are listed in **bold red.***

Interface
SerDes – Video and Imaging

3 Gbps HD/SD SDI Low Power Reclocker with Eye Monitor
LMH0366

The LMH0366 3 Gbps HD/SD SDI Low Power Reclocker with Integrated Eye Monitor retimes serial digital video data conforming to the SMPTE ST 424, SMPTE ST 292, and SMPTE ST 259-C standards.

The LMH0366 automatically detects the incoming data rate and retimes the data to suppress accumulated jitter. The reclocker recovers the serial data-rate clock and optionally provides it as an output. The LMH0366 has two differential serial data outputs and offers flexibility in selecting the output signals between the reclocked data, recovered clock, or bypassed data. The output drivers offer programmable de-emphasis for up to 40" of FR4 trace losses, in addition to programmable common mode voltage and swing for flexible interfacing.
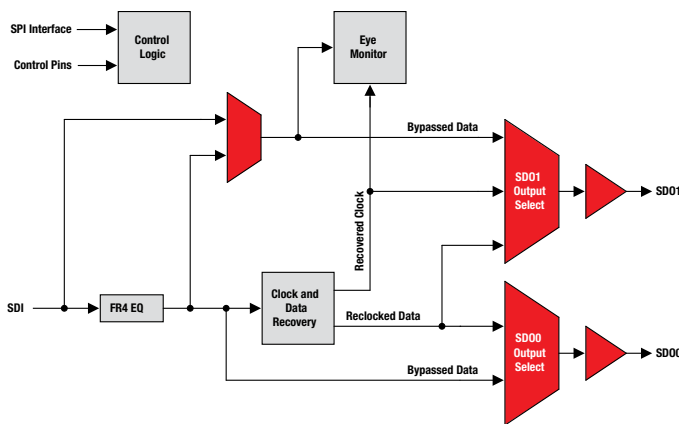
LMH0366 functional block diagram

Get more information: **www.ti.com/product/LMH0366**

Key Features
- SMPTE ST 424, SMPTE ST 292, and SMPTE ST 259-C compliant
- Supports 125 Mbps, 270 Mbps, 1.4835 Gbps, 1.485 Gbps, 2.967 Gbps, and 2.97
- Gbps serial data rate operation
- Supports DVB-ASI at 270 Mbps and MADI at 125 Mbps
- 100 mW typical power consumption (145 mW with both output drivers enabled)
- Input equalization (0–60 & Prime FR4) and input signal detection
- Two differential, reclocked outputs with option of recovered clock
- Output de-emphasis to compensate for up to 40" of FR4 trace losses
- 64 × 64 point eye opening monitor
- 27 MHz external reference or reference-less operation

Applications
- SMPTE ST 424, SMPTE ST 292, and ST SMPTE 259 serial digital interfaces
- Broadcast video routers, switchers, and distribution amplifiers

Broadcast and Professional Video – Serial Digital Interface

Device	Description	Max Data Rate (Mbps)	Power Consumption (mW)	Supply Voltage (V)	In/Out Count	ESD HB (kV)	Temp. Range (ºC)	Power Down Mode	Control Interface	Package	Price*
LMH0394	3 Gbps HD/SD SDI Low Power Extended Reach Adaptive Cable Equalizer	2970	115	2.5	1/1	6	–40 to 85	Y	Pin/SPI	LLP-16	18.95
LMH0395	3 Gbps HD/SD SDI Dual Output Low Power Extended Reach Adaptive Cable Equalizer	2970	140	2.5	1/2	6	–40 to 85	Y	Pin/SPI	LLP-24	19.90
LMH0384	3 Gbps HD/SD SDI Extended Reach and Configurable Adaptive Cable Equalizer	2970	230	3.3	1/1	6.5	–40 to 85	Y	Pin/SPI	LLP-16	16.20
LMH0344	3 Gbps HD/SD SDI Adaptive Cable Equalizer	2970	280	3.3	1/1	8	–40 to 85	N	Pin	LLP-16, u-Array-25	13.50
LMH0044	SMPTE 292M/259M Adaptive Cable Equalizer	1485	210	3.3	1/1	8	0 to 85	N	Pin	LLP-16	12.40
LMH0024	SMPTE 259M/344M Adaptive Cable Equalizer	540	200	3.3	1/1	8	–40 to 85	N	Pin	LLP-16	8.36
LMH0034	SMPTE 292M/259M Adaptive Cable Equalizer	1485	210	3.3	1/1	8	0 to 85	N	Pin	LLP-16	12.40
LMH0074	SMPTE 259M/344M Adaptive Cable Equalizer	540	210	3.3	1/1	8	–40 to 85	N	Pin	LLP-24	8.36
LMH0387	3 Gbps HD/SD SDI Configurable I/O Adaptive Cable Equalizer/Cable Driver	2970	235	3.3	1/1	6	–40 to 85	Y	Pin/SPI	eTSSOP-20	13.00
LMH0376	3 Gbps HD/SD SDI Low Power Reclocker with Eye Monitor and 4:1 Input Mux	2970	100	2.5	4/2	6	–40 to 85	Y	Pin/SPI	LLP-48	WEB
LMH0366	3 Gbps HD/SD SDI Low Power Reclocker with Eye Monitor	2970	100	2.5	1/2	6	–40 to 85	Y	Pin/SPI	LLP-24	WEB
LMH0356	3 Gbps HD/SD SDI Reclocker with 4:1 Input Mux and FR4 EQs	2970	430	3.3	4/2	8	–40 to 85	Y	Pin/SMBus	LLP-48, LLP-40	22.50

*Suggested resale price in U.S. dollars in quantities of 1,000.

Preview products are listed in **bold blue.** New products are listed in **bold red.**

Interface
SerDes – Video and Imaging

Broadcast and Professional Video – Serial Digital Interface (continued)

Device	Description	Max Data Rate (Mbps)	Power Consumption (mW)	Supply Voltage (V)	In/Out Count	ESD HB (kV)	Temp. Range (ºC)	Power Down Mode	Control Interface	Package	Price*
LMH0346	3 Gbps HD/SD SDI Reclocker with Dual Differential Outputs	2970	365	3.3	1/2	8	–40 to 85	N	Pin/SMBus	eTSSOP-20, LLP-24	21.00
LMH0056	HD/SD SDI Reclocker with 4:1 Input Multiplexer	1485	360	3.3	4/2	8	–40 to 85	N	Pin	LLP-48	18.50
LMH0046	HD/SD SDI Reclocker with Dual Diff Outputs	1485	330	3.3	1/2	7	–40 to 85	N	Pin	eTSSOP-20	17.00
LMH0036	SD SDI Reclocker with 4:1 Input Multiplexer	270	360	3.3	4/2	8	–40 to 85	N	Pin	LLP-48	13.00
LMH0026	SD SDI Reclocker with Dual Differential Outputs	270	330	3.3	1/2	7	–40 to 85	N	Pin	eTSSOP-20	12.10
LMH0307	3 Gbps HD/SD SDI Dual Output Cable Driver with Cable Detect	2970	275	3.3	1/2	8	–40 to 85	Y	Pin/SMBus	LLP-16, u-Array-25	6.20
LMH0303	3 Gbps HD/SD SDI Cable Driver with Cable Detect	2970	155	3.3	1/1	8	–40 to 85	Y	Pin/SMBus	LLP-16	5.45
LMH0302	3 Gbps HD/SD SDI Cable Driver	2970	165	3.3	1/1	4.5	–40 to 85	Y	Pin	LLP-16	4.95
LMH0202	SMPTE 292M/259M Serial Digital Cable Driver	1485	300	3.3	2/2	5	0 to 70	N	Pin	TSSOP-16	6.84
LMH0002	SMPTE 292M/259M Serial Digital Cable Driver	1485	150	3.3	1/1	5	–40 to 85	N	Pin	SOIC-8, LLP-16	3.75
LMH0001	SMPTE 259M/344M Serial Digital Cable Driver	540	125	3.3	1/1	5	–40 to 85	N	Pin	LLP-16	2.75
CLC001	Serial Digital Cable Driver with Adjustable Outputs	622	230	3.3	1/1	7	–40 to 85	N	Pin	SOIC-8	2.00
CLC007	Serial Digital Cable Driver with Dual Complementary Outputs	400	195	5	1/2	1	–40 to 85	N	Pin	SOIC-8	3.90
CLC006	Serial Digital Cable Driver with Adjustable Outputs	400	185	5	1/1	1	–40 to 85	N	Pin	SOIC-8	4.95

Suggested resale price in U.S. dollars in quantities of 1,000.

Broadcast and Professional Video – SerDes

Device	Description	Max Data Rate (Mbps)	Power Consumption (mW)	Supply Voltage (V)	Inout	Output	Temp. Range (ºC)	Special Feature	Package	Price*
CLC020	SMPTE 259M Serializer with Integrated Cable Driver	400	235	5	8/10 bit	1 diff	0 to 70	Cable Driver	PLCC-28	20.00
CLC021	SMPTE 259M Serializer with EDH Generation/Insertion	400	110/235	3.3 or 5	8/10 bit	1 diff	0 to 70	Cable Driver	PQFP-44	26.00
LMH0030	SMPTE 292M/259M Serializer with Video and Ancillary Data FIFOs and Cable Driver	1485	430	3.3/2.5	10/20 bit	1 diff	0 to 70	Cable Driver	TQFP-64	23.90
LMH0031	SMPTE 292M/259M Deserializer / Descrambler with Video and Ancillary Data FIFOs	1485	705	3.3/2.5	1 diff	10/20 bit	0 to 70	—	TQFP-64	23.90
LMH0040	HD, SD, DVB-ASI SDI Serializer and Driver with LVDS Interface	1485	440	3.3/2.5	LVDS	1 diff	–40 to 85	Cable Driver	LLP-48	17.90
LMH0041	HD, SD, DVB-ASI SDI Deserializer with Loopthrough and LVDS Interface	1485	480	3.3/2.5	2 diff	LVDS	–40 to 85	Loop Through	LLP-48	18.60
LMH0050	HD, SD, DVB-ASI SDI Serializer with LVDS Interface	1485	460	3.3/2.5	LVDS	1 diff	–40 to 85	CML Driver	LLP-48	17.50
LMH0051	HD, SD, DVB-ASI SDI Deserializer with LVDS Interface	1485	480	3.3/2.5	2 diff	LVDS	–40 to 85	Loop Through	LLP-48	17.50
LMH0070	SD, DVB-ASI SDI Serializer and Driver with LVDS Interface	270	400	3.3/2.5	LVDS	1 diff	–40 to 85	Cable Driver	LLP-48	12.80
LMH0071	SD, DVB-ASI SDI Deserializer with Loopthrough and LVDS Interface	270	450	3.3/2.5	2 diff	LVDS	–40 to 85	Loop Through	LLP-48	13.40
LMH0340	3 Gbps, HD, SD, DVB-ASI SDI Serializer and Driver with LVDS Interface	2970	475	3.3/2.5	LVDS	1 diff	–40 to 85	Cable Driver	LLP-48	21.40
LMH0341	3 Gbps, HD, SD, DVB-ASI SDI Deserializer with Loopthrough and LVDS Interface	2970	520	3.3/2.5	2 diff	LVDS	–40 to 85	Loop Through	LLP-48	22.10

Suggested resale price in U.S. dollars in quantities of 1,000.

Broadcast and Professional Video – Video Timing

Device	Description	Supply Voltage (V)	Temp. Range (ºC)	Package	Price*
LM1881	Video Sync Separator	5, 5 to 12	–40 to 85	MDIP-8, SOIC-8	1.24
LMH1980	Auto-Detecting SD/HD/PC Video Sync Separator	3.3, 3.3 to 5	–40 to 85	VSSOP-10	1.95
LMH1981	Multi-Format Video Sync Separator	3.3, 3.3 to 5	–40 to 85	TSSOP-14	5.15
LMH1982	Multi-Rate Video Clock Generator with Genlock	3.3, 3.3 to 5	–40 to 85	LLP-32	16.50
LMH1983	3 Gbps/HD/SD Video Clock Generator with Audio Clock	3.3	–40 to 85	LLP-40	16.00

Suggested resale price in U.S. dollars in quantities of 1,000.

Interface
SerDes – Video and Imaging

10 to 50 MHz DC-Balanced Channel Link III Bidirectional Control Serializer
DS92LX1621/2

The DS92LX1621 / DS92LX1622 chipset offers a Channel Link III interface with a high-speed forward channel and a full-duplex back channel for data transmission over a single differential pair. The Serializer/Deserializer pair is targeted for direct connections between automotive camera systems and Host Controller/Electronic Control Unit (ECU). Using embedded clock technology allows transparent full-duplex communication over a single differential pair, carrying asymmetrical bi-directional control information without the dependency of video blanking intervals. This single serial stream simplifies transferring a wide data bus over PCB traces and cable by eliminating the skew problems between parallel data and clock paths. This significantly saves system cost by narrowing data paths that in turn reduce PCB layers, cable width, and connector size and pins.

Key Features
- Configurable data throughput
- 12–bit (min) up to 600 Mbits/sec
- 18–bit (max) up to 900 Mbits/sec
- 10 MHz to 50 MHz input clock support
- Embedded clock with DC balanced coding to support AC-coupled interconnects
- Capable to drive up to 10 meters shielded twisted-pair
- Bi-directional control interface channel with I^2C support
- 1.8 V or 3.3 V compatible parallel bus interface
- Single power supply at 1.8 V

Applications
- Military radar/sonar
- Patient monitoring
- Oscilloscopes
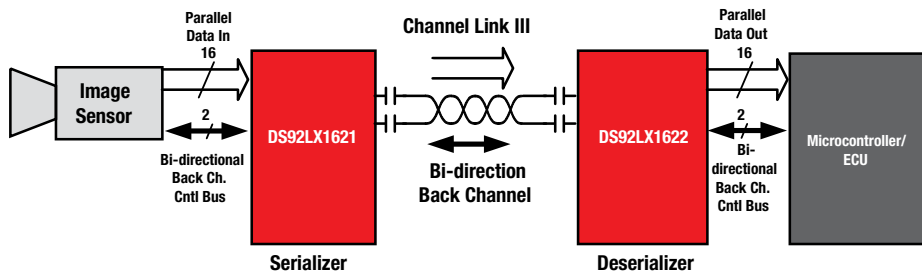
DS92LX1621/2 applications diagram

Get more information: **www.ti.com/product/DS92LX1621,
www.ti.com/product/DS92LX1622**

Video & Imaging

Device - Serializer	Device - Deserializer	Parallel Width	Parallel Width	Min CLK Freq (MHz)	Max CLK Freq (MHz)	Signal Conditioning - SER	Signal Conditioning - DES	Serial Data Channels	HiRel Avail.	Package	Price*
Channel Link III											
DS92LX1621	DS92LX1622	16	LVCMOS	10	50	—	EQ	1	N	LLP-32, LLP-40	5.10
DS92LX2121	DS92LX2122	21	LVCMOS	10	50	—	EQ	1	N	LLP-40, LLP-48	5.30
Channel Link II											
DS92LV2421	DS92LV2422	24	LVCMOS	10	75	VOD, De-E	EQ	1	N	LLP-48, LLP-60	5.95
DS92LV2411	DS92LV2412	24	LVCMOS	5	50	VOD, De-E	EQ	1	N	LLP-48, LLP-60	4.95
DS92LV0421	DS92LV0422	4	LVDS	10	75	VOD, De-E	EQ	1	N	LLP-36, LLP-48	6.25
DS92LV0411	DS92LV0412	4	LVDS	5	50	VOD, De-E	EQ	1	N	LLP-36, LLP-48	4.95
DS99R103	DS99R104	24	LVCMOS	3	40	Pre-E	—	1	N	LLP-48, LLP-60	4.80
DS92LV3241	DS92LV3242	32	LVCMOS	20	85	Pre-E	—	4	N	TQFP-64	6.95
DS92LV3221	DS92LV3222	32	LVCMOS	20	50	Pre-E	—	2	N	TQFP-64	5.50
Channel Link I											
DS90CR217	DS90CR218A	21	LVCMOS	20/12	85	—	—	3D+C	N	TSSOP-48	3.42
DS90CR287	DS90CR288A	28	LVCMOS	20	85	—	—	4D+C	N	TSSOP-56	5.55
DS90CR483A	DS90CR484A	48	LVCMOS	33	112	Pre-E	—	8D+C	N	TQFP-100	10.50
DS90CR485	DS90CR486	24/48	LVCMOS	66	133	Pre-E	—	8D+C	N	TQFP-100	12.90

*Suggested resale price in U.S. dollars in quantities of 1,000. See **www.ti.com/hirel** for HiRel options.*

Interface
Consumer/Computing – PCI

x1 PCI Express to PCI Bus Translation Bridger
XIO2001

The XIO2001 is a single-function PCI Express® to PCI translation bridge that is fully compliant to the PCI Express to PCI/PCI-X bridge specification, revision 1.0. For downstream traffic, the bridge simultaneously supports up to eight posted and four non-posted transactions. For upstream traffic, up to six posted and four non-posted transactions are simultaneously supported.

The PCI Express interface supports a ×1 link operating at full 250 MBP/s packet throughput in each direction simultaneously. Also, the bridge supports advanced error reporting including extended CRC (ECRC) as defined in the PCI Express base specification.

XIO2001 functional block diagram

Get more information: **www.ti.com/product/XIO2001**
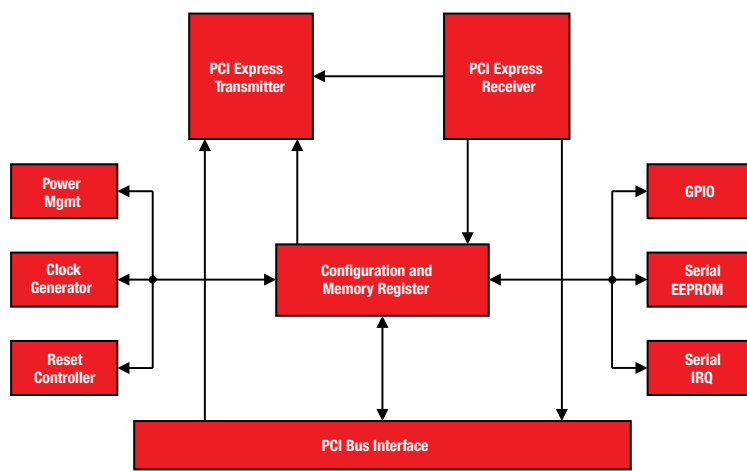
Key Features
- Full ×1 PCI express throughput
- Fully compliant with PCI Express to PCI/PCI-X bridge specification, revision 1.0
- Fully compliant with PCI Express base specification, revision 2.0
- Fully compliant with PCI local bus specification, revision 2.3
- PCI Express advanced error reporting capability including ECRC support
- Support for D1, D2, D3hot and D3cold
- Utilizes 100 MHz differential PCI Express common reference clock or 125 MHz
- Single-ended reference clock (optional spread-spectrum reference clock is supported)
- Robust pipeline architecture to minimize transaction latency
- Full PCI local bus 66 MHz/32-bit throughput support for six subordinate PCI bus masters with internal configurable 2-level prioritization scheme

Applications
- Notebooks, desktops, docking stations, servers and workstations

PCI Express

Device	Description	Supply Voltage (V)	PCIe	Parallel Bus Width	Speed (max) (Mbps)	HiRel Avail.	Package	Price*
PCI Express PHY								
XIO1100	x1 PCI Express PHY, Compliant with the PCI Express Base Specification Revision 1.1	3.3, 1.8, 1.5	x1	8, 16	2500	N	BGA-100	7.00

Device	Description	Supply Voltage (V)	PCIe	PCI Bus Masters	Wake/ Beacon Support	HiRel Avail.	Package	Price*
PCI Express Bridge								
XIO2001	x1 PCI Express to PCI Bus Translation Bridge	3.3, 1.5	x1	6	Yes	N	BGA-144, BGA-169 MicroStar Junior™	5.50

Device	Description	Supply Voltage (V)	PCIe	Downstream PCIe Ports	Wake/ Beacon Support	HiRel Avail.	Package	Price*
PCI Express Packet Switch								
XIO3130	x1 PCI Express 4-Port Fanout Packet Switch	3.3, 1.5	x1	3	Yes	N	BGA-196	10.95

*Suggested resale price in U.S. dollars in quantities of 1,000. See **www.ti.com/hirel** for HiRel options.

Interface
Consumer/Computing – PCI

PCI Express® (continued)

Device	Description	Supply Voltage Range (V)	Architecture	rON (typ) (Ω)	tpd (typ) (ns)	HiRel Avail.	Package	Price*
PCI Express Signal Switches								
TS2PCIE2212	2-Channel PCIe 2:1 Multiplexer/Demultiplexer Passive FET Switch	1.7 to 1.9	2:1	10	0.25	N	BGA-48	1.65
TS2PCIE412	4-Channel PCIe 2:1 Multiplexer/Demultiplexer Passive FET Switch	1.5 to 2.1	2:1	12.5	0.25	N	QFN-42	0.95

Suggested resale price in U.S. dollars in quantities of 1,000. See www.ti.com/hirel for HiRel options.

Device	Description	Protocol	Max Speed (Gbps)	No. of Chs	Sleep Mode Power (mW)	Active Mode Power (mW/ch)	HiRel Avail.	Package	Price*
PCI Express Repeaters (Redrivers)									
DS80PCI800	Octal Channel (x4, half x8) PCI Express Gen-1/2/3 Redriver/Equalizer	PCIe Gen-1/2/3	8	8	10	65	N	QFN-54	6.95
DS80PCI402	Octal Channel x4 PCI Express Gen-1/2/3 Redriver/Equalizer	PCIe Gen-1/2/3	8	8	10	65	N	QFN-54	5.95
DS80PCI102	Dual Channel x1 PCI Express Gen-1/2/3 Redriver/Equalizer	PCIe Gen-1/2/3	8	2	5	65	N	QFN-24	3.95

Suggested resale price in U.S. dollars in quantities of 1,000. See www.ti.com/hirel for HiRel options.   *New products are listed in **bold red.***

Device	Description	Speed (MHz)	Expansion Interface (Bits)	Hot Swap	Voltage (V)	HiRel Avail.	Package	Price*
PCI Bridges								
PCI2050B	32-Bit, 66 MHz, 9-Master PCI-to-PCI Bridge	66	32	Yes	3.3, 5	N	QFP-208, QFP-208, BGA-257	9.50
PCI2250	32-Bit, 33 MHz PCI-to-PCI Bridge, Compact PCI Hot-Swap Friendly, 4-Master	33	32	Friendly	3.3, 5	N	LQFP-176, QFP-160	6.10
PCI2060	32-Bit, 66 MHz, 9-Master, Asynchronous PCI-to-PCI Bridge	66	32	Yes	3.3, 5	N	BGA-257	9.50

Suggested resale price in U.S. dollars in quantities of 1,000. See www.ti.com/hirel for HiRel options.

Consumer/Computing – HDMI

TMDS

Device	Description	No. of Inputs	No. of Outputs	Max Data Rate per Ch (Gbps)	Intra-Pair Skew (max) (ps)	Inter-Pair Skew (max) (ps)	I_{CC} (max)	ESD HBM (kV)	HiRel Avail.	Package	Price*
TMDS141	HDMI Hider	1	1	2.25	50	100	150	5	N	QFN-40	1.75
TMDS361B	3-to-1 DVI/HDMI Active Switch	3	1	3	40	100	215	12	N	TQFP-64	1.50
TMDS261B	2-to-1 DVI/HDMI Active Switch	2	1	3	40	100	215	12	N	TQFP-64	1.35
TMDS442	4-to-2 DVI/HDMI Active Switch	4	2	2.25	50	100	550	5	N	TQFP-128	3.45
TS3DV416	2-to-1 Analog FET Switch for HDMI/DVI	2	1	1.65	—	—	0.6	2	N	TSSOP-48, TVSOP-48	0.90
TS3DV520E	2-to-1 Analog FET Switch for HDMI/DVI	2	1	1.65	—	—	0.6	14	N	QFN-56, QFN-42	1.00
DS16EV5110	Video Equalizer (3D+C) for DVI, HDMI Sink-Side Apps	1	1	2.25	—	—	195	10	N	LLP-48	4.80
DS16EV5110A	Video Equalizer (3D+C) for DVI, HDMI Source/Repeater/Sink Apps	1	1	2.25	—	—	195	6	N	LLP-48	3.95
DS22EV5110	DVI, HDMI Extended Reach Equalizer with Retimer and Output De-Emphasis	1	1	2.25	—	—	332	8	N	LLP-48	6.50
DS34RT5110	DVI, HDMI Retimer with Input Equalization and Output De-Emphasis	1	1	3.4	—	—	361	8	N	LLP-48	8.95

Suggested resale price in U.S. dollars in quantities of 1,000. See www.ti.com/hirel for HiRel options.

HDMI Switches

Device	Description	No of Inputs	No of outputs	Max Data Rate per channel	Intra pair skew	Inter pair skew	I_{CC}	ESD HBM	HiRel Avail	Package	Price
TS3DV621	2 to 1 HDMI Passive Switch	12	24	2.2 Gbps	N/A	30 ps	400 µA	2 kV	N	QFN-42	Web
TS3DV642	2 to 1 HDMI Passive Switch	12	24	5.4 Gbps	N/A	Not Charred Yet	Not Charred Yet	2 kV	N	QFN-42	Web

Suggested resale price in U.S. dollars in quantities of 1,000. See www.ti.com/hirel for HiRel options.   *New products are listed in **bold red.***

Interface
Industrial – CAN Transceivers

Industrial CAN Transceivers
SN65HVD255/6/7

These CAN transceivers meet the ISO1189-2 High Speed CAN (Controller Area Network) Physical Layer standard. They are designed for data rates in excess of 1 megabit per second (Mbps) in short networks or CAN FD applications, and enhanced timing margin and higher data rates in long and highly-loaded networks. These devices provide many protection features to enhance device and CAN-network robustness. The SN65HVD257 adds additional features, allowing easy design of redundant and multi-topology networks with fault indication for higher levels of functional safety in the CAN system.

NEW

Key Features
- Meets the requirements of ISO11898-2
- 'Turbo CAN': Short propagation delay times and fast loop times; higher data rates in network; enhances system timing margins
- CAN FD ready
- I/O voltage range supports 3.3 V and 5 V MCUs
- Ideal passive behavior when unpowered
- Characterized for –40°C to 125°C operation

Applications
- Backplane communication and control
- Industrial automation, control, sensors and drive systems
- Building and climate control automation
- Security systems
- Telecom base station status and control

SN65HVD257 functional block diagram

Get more information: **www.ti.com/product/Part Number**
(SN65HVD255, SN65HVD256, SN65HVD257)

CAN Transceivers

Device	I/O and V_{CC} Levels (V)	Short-Circuit Protection (V)	HBM ESD Protection (kV)	Supply Current, Typical (mA)	Standby/Sleep Current, Typical (µA)	Features	Package	Price*
SN65HVD230	3.3	–4 to +16	16	10	370	Standby (Low Power)	SOIC-8	0.80
SN65HVD231	3.3	–4 to +16	16	10	0.04	Sleep (Ultra Low Power)	SOIC-8	0.80
SN65HVD232	3.3	–4 to +16	16	10	N/A	Economical	SOIC-8	0.70
SN65HVD233	3.3	–36 to +36	16	6	200	Standby (Low Power), Diagnostic Loop-Back	SOIC-8	1.00
SN65HVD234	3.3	–36 to +36	16	6	200/0.05	Standby (Low Power), Sleep (Ultra Low Power)	SOIC-8	0.95
SN65HVD235	3.3	–36 to +36	16	6	200	Standby (Low Power), Autobaud Loop-Back	SOIC-8	1.00
SN65HVD251	5	–36 to +36	14	14	<275	Standby (Low Power)	SOIC-8, PDIP-8	0.90
SN55HVD251	5	–36 to +36	14	14	<275	Small Package, High Tempertaure Range (–55ºC to 125ºC)	SON-8	0.95
SN65HVD1040	5	–27 to +40	12	6	5	Standby (Ultra Low Power with Bus Wake-Up), TXD Dominant Time Out	SOIC-8	0.50
SN65HVD1050	5	–27 to +40	8	6	NA	Listen Only Mode, TXD Dominant Time Out	SOIC-8	0.40
SN65HVD252	5	–27 to +40	12	13	NA	DeviceNet™ CAN, with V_{REF}	SOIC-8	0.80
SN65HVD253	5	–27 to +40	12	13	NA	DeviceNet CAN, Loopback	SOIC-8	0.80
SN65HVD255	5	–27 to +40	12	10	NA	"Turbo" CAN, "Ideal Passive", TXD Dominant Time Out (<10 kbps)	SOIC-8	0.50
SN65HVD256	3.3/5	–27 to +40	12	10	NA	"Turbo" CAN, "Ideal Passive", TXD Dominant Time Out (<10 kbps), V_{RXD} Level Shift	SOIC-8	0.50
SN65HVD257	5	–27 to +40	12	10	NA	"Turbo" CAN, "Ideal Passive", TXD Dominant Time Out (<10 kbps), RXD Dominant Time Out, Fault Output	SOIC-8	0.60
ISO1050	5	–27 to +40	4	10.3	NA	Isolated CAN (2.5kV$_{RMS}$ and 5KV$_{RMS}$)	SOP-8, SOIC-16	1.55

Suggested resale price in U.S. dollars in quantities of 1,000.

*New products are listed in **bold red.***

Interface
Industrial – Digital Isolators

Low-Power, Bidirectional I^{2}C Isolators
ISO1540/1

The ISO1540 and ISO1541 are low-power, bidirectional isolators that are compatible with I^{2}C interfaces. These devices have their logic input and output buffers separated by TI's Capacitive Isolation technology using a silicon dioxide (SiO2) barrier. When used in conjunction with isolated power supplies, these devices block high voltages, isolate grounds, and prevent noise currents from entering the local ground and interfering with or damaging sensitive circuitry.

Key Features
- Isolated bidirectional, I^{2}C compatible, communications
- Supports up to 1 MHz operation
- 3-V to 5.5-V supply range
- Open drain outputs with 3.5-mA side 1 and 35-mA side 2 sink current capability
- –40°C to 125°C operating temperature
- ±50 kV/μs transient immunity (typical)
- HBM ESD protection of 4 kV on all pins; 8 kV on bus pins

Applications
- Isolated I^{2}C Bus®
- SMBus and PMBus interfaces
- Open-drain networks
- Motor control systems
- Battery management
- I^{2}C level shifting

ISO1540 functional block diagram

Get more information: **www.ti.com/product/ISO1540, www.ti.com/product/ISO1541**

Transformer Driver for Isolated Power Supplies
SN6501

The SN6501 is a monolithic oscillator/power-driver, specifically designed for small form factor, isolated power supplies in isolated interface applications. It drives a low-profile, center-tapped transformer primary from a 3.3 V or 5 V DC power supply. The secondary can be wound to provide any isolated voltage based on transformer turns ratio.

The SN6501 consists of an oscillator followed by a gate drive circuit that provides the complementary output signals to drive the ground referenced N-channel power switches. The internal logic ensures break-before-make action between the two switches.

Key Features
- Push-pull driver for small transformers
- Single 3.3 V or 5 V supply
  - High primary-side current drive:
  - 5 V supply: 350 mA (max)
  - 3.3 V supply: 150 mA (max)
- Low ripple on rectified output permits small output capacitors
- Small 5-pin SOT23 package

Applications
- PLC/DCS I/O modules: analog input/output, digital input
- Programmable logic controller
- Solar micro- and power inverters

SN6501 functional block diagram

Get more information: **www.ti.com/product/SN6501**

Interface
Industrial – Digital Isolators

Digital Isolators

Device	Description	Isolation Rating (Vrms)	Channel Direction	Max Data Rate (Mbps)	Min Transient Immunity (kV/µs)	Supply Voltage (V)	HiRel Avail.	Package	Price*
ISO721/M	Single Channel	2500	1/0	100/150	25	3.3, 5	Y	SOIC-8	1.20/1.30
ISO722/M	Single Channel with Output Enable	2500	1/0	100/150	25	3.3, 5	N	SOIC-8	1.20/1.30
ISO150	Dual Channel Configurable	2400	Config	80	1.6	5	N	SOP-12	8.10
ISO7220A/B/C/M	Dual Channel	2500	2/0	1/5/25/150	25	3.3, 5	N	SOIC-8	0.85/0.95/1.05/1.20
ISO7221A/B/C/M	Dual Channel	2500	1/1	1/5/25/150	25	3.3, 5	Y	SOIC-8	0.85/0.95/1.05/1.20
ISO7420/E/FE	Gen II Dual Channel (F=Failsafe Low)	2500	2/0	1/50/50	25	3.3, 5	N	SOIC-8	0.85/1.05/1.05
ISO7421/E/FE	Gen II Dual Channel (F=Failsafe Low)	2500	1/1	1/50/50	25	3.3, 5	N	SOIC-8	0.85/1.05/1.05
ISO7420FCC	Gen II Dual Channel with Input Filter (F=Default Output Low)	3000	2/0	50	25	3.3, 5	N	SOIC-8	TBD
ISO7520C/1C	Dual Channel	4243	2/0 and 1/1	1	25	3.3, 5	N	SOIC-16	1.00/1.00
ISO7230C/M	Triple Channel	2500	3/0	25/150	25	3.3, 5	N	SOIC-16	1.40/1.75
ISO7231C/M	Triple Channel	2500	2/1	25/150	25	3.3, 5	N	SOIC-16	1.40/1.75
ISO7631FC/FM	Gen II Triple Channel (F=Default Output Low)	2500	2/1	25/150	25	3.3, 5	N	SOIC-16	1.40/1.75
ISO7131CC	Gen II Triple Channel Small-Footprint	2500	2/1	50	25	2.7, 3.3, 5	N	QSOP-16	TBD
ISO7240C/M	Quad Channel	2500	4/0	25/150	25	3.3, 5	N	SOIC-16	1.80/2.20
ISO7241C/M	Quad Channel	2500	3/1	25/150	25	3.3, 5	N	SOIC-16	1.80/2.20
ISO7242C/M	Quad Channel	2500	2/2	25/150	25	3.3, 5	N	SOIC-16	1.80/2.20
ISO7641FC	Gen II Quad Channel (F=Default Output Low)	2500	3/1	25	25	3.3, 5	N	SOIC-16	1.80
ISO7140CC/FCC	Gen II Triple Channel Small-Footprint (F=Default Output Low)	2500	3/1	50	25	2.7, 3.3, 5	N	QSOP-16	TBD
ISO7141CC/FCC	Gen II Triple Channel Small-Footprint (F=Default Output Low)	2500	3/1	50	25	2.7, 3.3, 5	N	QSOP-16	TBD
ISO7142CC	Gen II Triple Channel Small-Footprint	2500	2/2	50	25	2.7, 3.3, 5	N	QSOP-16	TBD
ISO7640FM/41FM	Gen II Quad Channel (F=Default Output Low)	4243	4/0 & 3/1	150	25	3.3, 5	N	SOIC-16	2.50/2.50
Isolated RS-485									
ISO3082/ISO3088	Isolated Half Duplex 5 V RS-485	2500	N/A	0.2/20	25	5	N	SOIC-16	2.60/3.00
ISO3080/ISO3086	Isolated Full Duplex 5 V RS-485	2500	N/A	0.2/20	25	5	N	SOIC-16	2.60/3.00
ISO3086T	Isolated 5 V RS485 with Transformer Driver	2500	N/A	20	25	3.3	N	SOIC-16	3.30
ISO15	Isolated Half Duplex 3.3 V RS-485	2500	N/A	1	25	3.3	N	SOIC-16	3.00
ISO35	Isolated Full Duplex 3.3 V RS-485	2500	N/A	1	25	5	N	SOIC-16	3.00
ISO35T	Isolated 3.3 V RS485 with Transformer Driver	2500	N/A	1	25	3.3	N	SOIC-16	3.25
Isolated Profibus									
ISO1176	Isolated PROFIBUS RS-485	2500	N/A	40	25	5	N	SOIC-16	3.00
ISO1176T	Isolated PROFIBUS with Transformer Driver	2500	N/A	40	25	5	N	SOIC-16	3.30
Isolated CAN									
ISO1050DUB	Isolated CAN Transceiver	2500	N/A	1	25	5	N	SOP-8	1.55
ISO1050DW	Isolated CAN Transceiver	4243	N/A	1	25	5	N	SOIC-16	1.95
Isolated I^{2}C									
ISO1540	Bidirectional I^{2}C Isolators	2500	Bidirectional Data, Bidirectional Clock	1	25	3.3, 5	N	SOIC-8	2.00
ISO1541	Bidirectional I^{2}C Isolators	2500	Bidirectional Data, Unidirectional Clock	1	25	3.3, 5	N	SOIC-8	1.80
Isolated Gate Driver									
ISO5500	2.5 A Isolated IGBT/MOSFET Gate Driver	4243	N/A	1.04	25	3.3, 5 & 15-30	N	SOIC-16	3.00
Transformer Driver									
SN6501	Transformer Driver for Isolated Power Supplies	—	—	—	—	3.3, 5	N	SOT23-5	0.99

*Suggested resale price in U.S. dollars in quantities of 1,000. See www.ti.com/hirel for HiRel options.

Preview products are listed in **bold blue.** New products are listed in **bold red.**

Texas Instruments

Interface
Industrial – Digital Isolators

Analog Isolators

Device	Description	Input Voltage Range (mV)	Isolation Rating (Vpeak)	Min Transient Immunity (kV/µS)	Supply Voltage (V)	Hirel Avail.	Package	Price*
Isolated Delta-Sigma Modulator								
AMC1204	Isolated 20 MHz ΔΣ Modulator	±280	4000	15	3.3, 5	N	SOIC-16	3.45
AMC1204B	Isolated 20 MHz ΔΣ Modulator	±280	4250	15	3.3, 5	N	SOIC-16	3.45
AMC1203	Isolated 10 MHz ΔΣ Modulator	±280	4000	15	5	N	SOP-8, SOIC-16	3.35
Isolated Amplifier								
AMC1200	Isolated Amplifier with G=8	±250	4000	10	3.3, 5	N	SOP-8	2.20
AMC1200B	Isolated Amplifier with G=8	±250	4250	10	3.3, 5	N	SOP-8	2.20
AMC1100	Isolated Amplifier with G=8	±250	4250	2.5	3.3, 5	N	SOP-8	1.80

*Suggested resale price in U.S. dollars in quantities of 1,000. See **www.ti.com/hirel** for HiRel options.

*New products are listed in **bold red.***

Interface
Industrial – Ethernet PHY

Industrial Temp, Single Port 10/100 Mbs Ethernet PHY
TLK105/6

NEW

The TLK10x is a single-port Ethernet PHY for 10 Base-T and 100 Base TX signaling, integrating all the physical-layer functions needed to transmit and receive data on standard twisted-pair cables. The device supports the standard Media Independent Interface (MII) and Reduced Media Independent Interface (RMII) for direct connection to a Media Access Controller (MAC).

The device is designed for power-supply flexibility, and can operate with a single 3.3 V power supply or with combinations of 3.3 V and 1.55 V power supplies for reduced power operation. The TLK10x not only meets the requirements of IEEE 802.3, but maintains high margins in terms of cross-talk and alien noise.

Key Features
- Low power consumption: < 205 mW PHY and 275 mW with center tap (typical)
- Cable diagnostics (TLK106)
- Programmable fast link down modes, < 10 μs reaction time
- Fixed TX clock to XI, with programmable phase shift
- 3.3 V MAC interface
- Auto-MDIX for 10/100 Mbs
- Energy detection mode
- MII and RMII interfaces
- Serial management interface

Applications
- Industrial networks and factory automation
- Motor and motion control
- General embedded applications
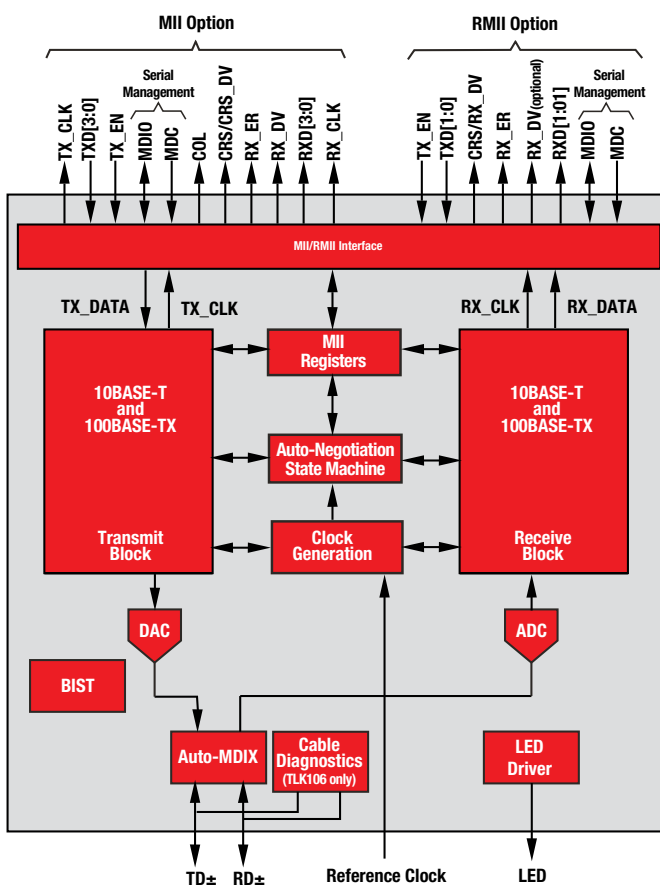
TLK105/6 functional block diagram

Get more information: **www.ti.com/product/TLK105,**
www.ti.com/product/TLK106

Interface
Industrial – Ethernet PHY

Mini LS Commercial Temperature Single Port 10/100 Mb/s Ethernet Transceiver
DP83848J/M

The DP83848J/M addresses the quality, reliability and small form factor required for space sensitive applications in embedded systems.

The DP83848J/M offers performance far exceeding the IEEE specifications, with superior interoperability and industry leading performance beyond 137 m of Cat-V cable. They also offer Auto-MDIX to remove cabling complications. DP83848J/M has superior ESD protection, greater than 4 KV human body model, providing extremely high reliability and robust operation, ensuring a high level performance in all applications.
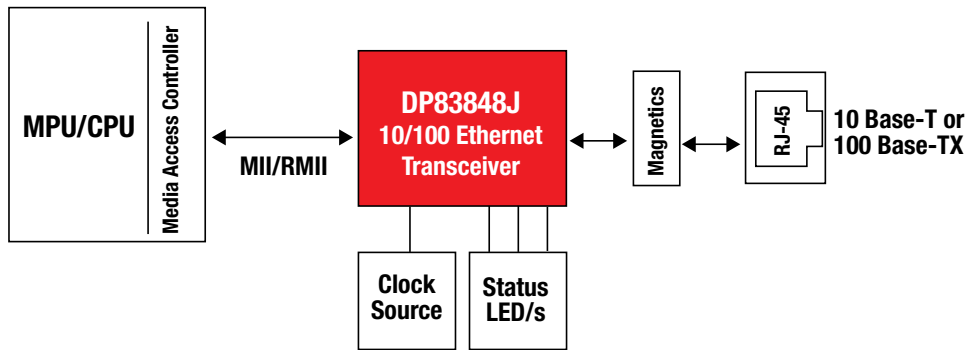
DP83848J/M functional block diagram

Get more information: **www.ti.com/product/DP83848J, www.ti.com/product/DP83848M**

Key Features
- Low-power 3.3 V, 0.18 mm CMOS technology
- Auto-MDIX for 10/100 Mb/s
- Energy detection mode
  - 3.3 V MAC interface
  - RMII Rev. 1.2 interface (configurable)
- MII Interface
- MII serial management interface (MDC and MDIO)
- IEEE 802.3u auto-negotiation and parallel detection
- IEEE 802.3u ENDEC, 10BASE-T transceivers and filters
- IEEE 802.3u PCS, 100BASE-TX transceivers and filters
- Integrated ANSI X3.263 compliant TP-PMD physical sublayer with adaptive equalization and baseline wander compensation
- Error-free operation beyond 137 meters
- ESD protection: greater than 4 KV human body model
- Configurable LED for link and activity
- Single register access for complete PHY status
- 10/100 Mb/s packet BIST (Built-in Self Test)

Applications
- Peripheral devices
- Mobile devices
- Factory and building automation
- Base stations

Interface
Industrial – Ethernet

Single-Port Industrial 10/100 Ethernet PHY

Device	Interface	Cable Length (m)	No. LED	JTAG	Cable Diagnostics	FX Support	IEEE1588 HW Support	25 MHz Clock Out	Supply Voltage (V)	Temp Range (ºC)	Package
TLK105	MII, RMII	150	1						3.3	–40 to 85	QFN-32
TLK106	MII, RMII	150	1		✓				3.3	–40 to 105	QFN-32
TLK105L	MII, RMII	150	2			✓			3.3	–40 to 85	QFN-32
TLK106L	MII, RMII	150	2		✓	✓			3.3	–40 to 105	QFN-32
DP83848J	MII, RMII	137	2						3.3	0 to 70	QFN-40
DP83848M	MII, RMII	137	1					✓	3.3	0 to 70	QFN-40
DP83848K	MII, RMII	137	2						3.3	–40 to 85	QFN-40
DP83848T	MII, RMII	137	1					✓	3.3	–40 to 85	QFN-40
DP83848QX	MII, RMII	150	1					✓	3.3	–40 to 105	QFN-40
DP83848H	MII, RMII	137	1					✓	3.3	–40 to 125	QFN-40
DP83848C	MII, RMII, SNI	137	3					✓	3.3	0 to 70	QFP-48
TLK100	MII	200	3	✓	✓				3.3	–40 to 85	QFP-48
DP83848I	MII, RMII, SNI	150	3	✓				✓	3.3	–40 to 85	QFP-48
TLK110	MII, RMII	150	3	✓	✓			✓	3.3	–40 to 85	QFP-48
DP83620	MII, RMII	150	3	✓	✓	✓		✓	3.3	–40 to 85	QFN-48
DP83630	MII, RMII	150	3	✓	✓	✓	✓	✓	3.3	–40 to 85	QFN-48
DP83640	MII, RMII	150	3	✓	✓	✓	✓	✓	3.3	–40 to 85	QFP-48
DP83848VYB	MII, RMII, SNI	150	3	✓				✓	3.3	–40 to 105	QFP-48
DP83848YB	MII, RMII, SNI	150	3	✓				✓	3.3	–40 to 125	QFP-48

Dual-Port Industrial 10/100 Ethernet PHY

Device	Interface	Cable Length (m)	No. LED	JTAG	Cable Diagnostics	FX Support	IEEE1588 HW Support	Flex Port	Supply Voltage (V)	Temp Range (ºC)	Package
DP83849C	MII, RMII, SNI	137	6		✓				3.3	0 to 70	TQFP-80
DP83849I	MII, RMII, SNI	137	6	✓	✓			✓	3.3	–40 to 85	TQFP-80
DP83849ID	MII, RMII, SNI	137	6	✓	✓	✓			3.3	–40 to 85	TQFP-80
DP83849IF	MII, RMII, SNI	137	6	✓	✓	✓		✓	3.3	–40 to 85	TQFP-80

Gigibit Industrial 10/100/1000 Ethernet PHY

Device	Interface	Cable Length (m)	No. LED	JTAG	I/O Voltage (V)	Supply Voltage (V)	Temp Range (ºC)	Package
DP83865	MII, GMII, RGMII	130	5	✓	1.8 to 3.3	1.8	0 to 70	QFP-128

10/100 Ethernet MAC and PHY

Device	Interface	Cable Length (m)	No. LED	I/O Voltage (V)	Supply Voltage (V)	Temp Range (ºC)	Package
DP83816	PCI (33 MHz)	100	3	5	3.3	0 to 70	LQFP-144
DP83816EX	PCI (33 MHz)	100	3	5	3.3	0 to 85	LQFP-144

Interface
Industrial – RS-485/RS-422

3.3 V-Supply RS-485 with IEC ESD Protection
SN65HVD72/75/78

NEW

These devices have robust 3.3 V drivers and receivers in a small package for demanding industrial applications. The bus pins are robust to ESD events, with high levels of protection to Human-Body Model and IEC Contact Discharge specifications.

These devices each combine a differential driver and a differential receiver, which operate from a single 3.3-V power supply. The driver differential outputs and the receiver differential inputs are connected internally to form a bus port suitable for half-duplex (two-wire bus) communication. These devices all feature a wide common-mode voltage range making the devices suitable for multi-point applications over long cable runs. These devices are characterized from –40°C to 125°C.

Logic diagram

Get more information: **www.ti.com/product/Part Number (SN65HVD72, SN65HVD75, SN65HVD78)**
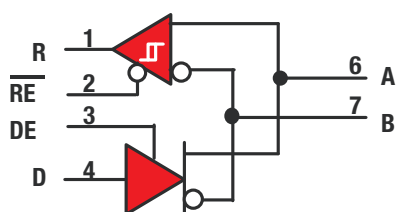
Key Features
- Small-size MSOP packages save board space, or SOIC for drop-in compatibility
- Bus I/O protection
- Extended industrial temperature range: –40°C to 125°C
- Large receiver hysteresis (80 mV) for noise rejection
- Low unit-loading allows over 200 connected nodes
- Low power consumption
- 5 V-tolerant logic inputs compatible with 3.3-V or 5-V controllers
- Signaling rate options optimized for: 250 kbps, 20 Mbps, 50 Mbps
- Available in SOIC (D), MSOP (DGK) and SON (DRB) packages

Applications
- Factory automation
- Telecomm infrastructure
- Motion control

RS-485

Device	DR/RX	Duplex	Supply (V)	Features	Isolated	Signaling Rate (Mbps)	ESD (kV)	Receiver Fail-Safe	Nodes	Package	HiRel Avail.	Price*
SN65HVD10/11/12	1/1	Half	3.3	High/Mid/Low Speed	No	32, 10, 1	16	Short, Open, Idle	256	PDIP-8, SOIC-8	Y	1.50/1.40/1.40
SN65HVD72/75/78	1/1	Half	3.3	IEC ESD Protection	No	0.25, 20, 50	15	Short, Open, Idle	>200	SOIC-8, MSOP-8, SON-8	N	0.70/0.85/1.00
SN65HVD01	1/1	Half	3.3	Flexible I/O Supply (1.8-3.3 V) and Selectable Speed	No	0.25 or 20	16	Short, Open, Idle	256	QFN-10	N	TBD
SN65HVD30/31/32	1/1	Full	3.3	No Enables	No	26, 5, 1	16	Short, Open, Idle	256	SOIC-8	Y	1.60/1.50/1.45
SN65HVD33/34/35	1/1	Full	3.3	With Enables	No	26, 5, 1	16	Short, Open, Idle	256	SOIC-14, QFN-20	Y	1.60/1.50/1.45
SN65HVD37	1/1	Full	3.3	High Signaling Rate, Low Power, High Hysteresis	No	20	16	Short, Open, Idle	256	SOIC-14	N	1.75
ISO15	1/1	Half	3.3	Isolated 3.3 V Half-Duplex Transceiver	Yes	1	16	Short, Open, Idle	256	SOIC-16	N	3.00
ISO35	1/1	Full	3.3	Isolated 3.3 V Full-Duplex Transceiver	Yes	1	16	Short, Open, Idle	256	SOIC-16	N	3.00
ISO35T	1/1	Full	3.3	Isolated 3.3 V Transceiver with Transformer Driver	Yes	1	16	Short, Open, Idle	256	SOIC-16	N	3.25
SN65HVD08	1/1	Half	3 to 5.5	Wide Supply Range: 3 V to 5.5 V	No	10	16	Short, Open, Idle	256	PDIP-8, SOIC-8	N	1.65
SN65HVD1780/1/2	1/1	Half	3.3 to 5	Up to ±70 V Protected, Wide Supply Range: 3.3 V to 5 V	No	0.115, 1, 10	16	Short, Open, Idle	320	PDIP-8, SOIC-8	N	1.85/1.85/2.00
DS485	1/1	Half	5	Low-Power RS-485/RS-422 Multipoint Transceiver	No	2.5	2	Short, Open, Idle	32	PDIP-8, SOIC-8	N	0.79

Suggested resale price in U.S. dollars in quantities of 1,000. See **www.ti.com/hirel** for HiRel options.

*Preview products are listed in **bold blue**. New products are listed in **bold red**.*

Interface
Industrial – RS-485/RS-422

RS-485 (continued)

Device	DR/RX	Duplex	Supply (V)	Features	Isolated	Signaling Rate (Mbps)	ESD (kV)	Receiver Fail-Safe	Nodes	Package	HiRel Avail.	Price*
DS75176B	1/1	Half	5	Multipoint RS-485/RS-422 Transceivers	No	10	0.5	Short, Open, Idle	32	PDIP-8, SOIC-8	N	0.47
DS16F95A	1/1	Half	5	RS-485 Extended Temperature Differential Bus Transceiver	No	10	5	Short, Open, Idle	32	CDIP-8	Y	Contact for pricing
SN65HVD485E	1/1	Half	5	Half-Duplex Transceiver	No	10	15	Open	64	PDIP-8, SOIC-8, MSOP-8	N	0.75
SN65HVD3082E/5E/8E	1/1	Half	5	Ultra-Low Power, Optimized for Low, Medium & High Speeds	No	0.2, 1, 20	15	Short, Open, Idle	256	PDIP-8, SOIC-8, MSOP-8	N	0.90/1.00/1.10
SN65LBC182	1/1	Half	5	ESD Protection HBM, IEC 4-2 Air and Contact	No	0.25	15	Open	128	PDIP-8, SOIC-8	N	1.05
SN65HVD82	1/1	Half	5	IEC ESD Protection, Low Power	No	0.25	16	Short, Open, Idle	256	SOIC-8	N	1.00
SN65HVD888	1/1	Half	5	Cross wire immunity, IEC ESD Protection, Low Power	No	0.25	16	Short, Open, Idle	256	SOIC-8	N	TBD
SN65LBC184	1/1	Half	5	ESD Protection IEC 4-2 Air, Contact & IEC 4-5 Surge	No	0.25	15	Open	128	PDIP-8, SOIC-8	N	1.30
SN65HVD20/21/22	1/1	Half	5	±27 V Protected and –20 V to +25 V Common Mode	No	25, 5, 0.5	16	Short, Open, Idle	256	PDIP-8, SOIC-8	Y	1.40/1.40/1.40
SN65HVD23/24	1/1	Half	5	Receiver Equalization and –20 V to +25 V Common Mode	No	25, 3	16	Short, Open, Idle	256	PDIP-8, SOIC-8	N	1.93/1.93
SN65HVD1785/6/7	1/1	Half	5	±70 V Protected, Wide –20V to +25 V Common Mode	No	0.115, 1, 10	16	Short, Open, Idle	256	PDIP-8, SOIC-8	N	1.85/1.85/2.00
SN65HVD1794	1/1	Half	5	±70 V Protected, Bus-Pin Invert, Wide Common Mode	No	0.115	16	Short, Open, Idle	256	PDIP-8, SOIC-8	N	1.95
SN65LBC176A	1/1	Half	5	Fast Signaling	No	30	12	Open	32	PDIP-8, SOIC-8	Y	2.65
ISO3082/8	1/1	Half	5	±4 kVpk Isolated Optimized for Low & High Speeds	Yes	0.2, 20	12	Short, Open, Idle	256	SOIC-16	N	2.60/3.00
SN65HVD3080E/3E/6E	1/1	Full	5	Ultra-Low Power, Optimized for Low, Medium & High Speeds	No	0.2, 1, 20	16	Short, Open, Idle	256	SOIC-14, MSOP-10	N	1.2/1.2/1.35
SN65HVD1791/2/3	1/1	Full	5	±70 V Protected, Wide –20 V to +25 V Common Mode	No	0.115, 1, 10	16	Short, Open, Idle	256	SOIC-14	N	1.90/1.90/2.10
ISO3080/6	1/1	Full	5	±4 kVpk Isolated, Optimized for Low & High Speeds	Yes	0.2, 20	12	Short, Open, Idle	256	SOIC-16	N	2.60/3.00
ISO3086T	1/1	Full	5	Isolated 5 V Transceiver with Transformer Driver	Yes	20	11	Short, Open, Idle	256	SOIC-16	N	3.30
SN65LBC180A	1/1	Full	5	High Signaling Rate, w/ Enables	No	30	15	Open	32	PDIP-14, SOIC-14	N	1.50
SN75ALS181	1/1	Half	5	Differential Driver and Receiver	No	10	2	Open	32	PDIP-14, SO-14	N	1.30
SN751178	2/2	Full	5	Dual Differential Drivers and Receivers	No	10	2	Open	32	PDIP-16, SO-16	N	1.60
SN75ALS1178	2/2	Full	5	Dual Differential Drivers and Receivers, Low Power	No	10	2	Open	32	PDIP-16, SO-16	N	2.55
SN65LBC172A/174A	4/0	NA	5	Quad Drivers, High Signaling Rate	No	30	12	—	32	PDIP-16, SOIC-16, SOIC-20	Y	2.65/2.75
SN65LBC173A/175A	0/4	NA	5	Quad Receivers, High Signaling Rate, Low Power	No	50	6	Short, Open, Idle	32	PDIP-16, SOIC-16	N	1.65/1.55
SN65HVD09	9/9	Half	5	9-Channel Parallel Bus Transceivers	No	20	12	—	32	TSSOP-56	Y	3.50

*Suggested resale price in U.S. dollars in quantities of 1,000. See www.ti.com/hirel for HiRel options.

Preview products are listed in **bold blue**. *New products are listed in* **bold red**.

Interface
Industrial – RS-485/RS-422

RS-485 (continued)

Device	DR/RX	Duplex	Supply (V)	Features	Isolated	Signaling Rate (Mbps)	ESD (kV)	Receiver Fail-Safe	Nodes	Package	HiRel Avail.	Price*
PROFIBUS Transceivers												
SN65HVD1176	1/1	Half	5	ProfiBus (EN 50170) Transceiver	No	40	10	Short, Open, Idle	160	SOIC-8	N	1.55
ISO1176	1/1	Half	5	Isolated ProfiBus Transceiver	Yes	40	16	Short, Open, Idle	160	SOIC-16	N	3.00
ISO1176T	1/1	Half	5	Isolated ProfiBus Transceiver with Transformer Driver	Yes	40	10	Short, Open, Idle	160	SOIC-16	N	3.30
ControlNet Transcievers												
SN65HVD61	1/1	Half	5	ControlNet Transceiver	No	10	16	Short	64	SOIC-14	N	5.10
Sympol Transceivers												
SN65HVD96	1/1	Half	5	SymPol Transceiver	No	5	12	Short, Open, Idle	32	SOIC-8	N	1.20

*Suggested resale price in U.S. dollars in quantities of 1,000. See **www.ti.com/hirel** for HiRel options.

RS-422

Device	DR/RX	Duplex	Supply (V)	Features	Isolated	Signaling Rate (Mbps)	ESD (kV)	Receiver Fail-Safe	Nodes	Package	HiRel Avail.	Price*
AM26LV31E	4/0	—	3.3	Quad Drivers, High Signaling Rate, IEC ESD	No	32	15	—	—	SO-16, SOIC-16, TSSOP-16, QFN-16	Y	0.90
AM26LV32E	0/4	—	3.3	Quad Receivers, High Signaling Rate, IEC ESD	No	32	15	Open	32	SO-16, SOIC-16, TSSOP-16, QFN-16	Y	1.05
AM26C31	4/0	—	5	Quad RS-422 Drivers	No	10	2	—	—	SO-16, SOIC-16, TSSOP-16, PDIP-16	Y	0.60
AM26C32	0/4	—	5	Quad RS-422 Receivers	No	10	2	Open	32	SO-16, SOIC-16, TSSOP-16, PDIP-16	Y	0.60
DS26LV32AT	0/4	Half	3.3	3 V Enhanced CMOS Quad Differential Line Receiver	No	30	8	Open	—	SOIC-16	N	0.63
DS26LV31T	4/0	Half	3.3	3.3 V RS-422 Quad Line Driver	No	30	7	Short, Open, Idle	—	SOIC N-16	N	0.48
DS75176BT	1/1	Half	5	Multipoint RS-485/RS-422 Transceivers	No	10	0.5	—	32	PDIP-8, SOIC-8	N	0.47
DS75176B	1/1	Half	5	Multipoint RS-485/RS-422 Transceivers	No	10	0.5	—	32	PDIP-8, SOIC-8	N	0.47

*Suggested resale price in U.S. dollars in quantities of 1,000. See **www.ti.com/hirel** for HiRel options.
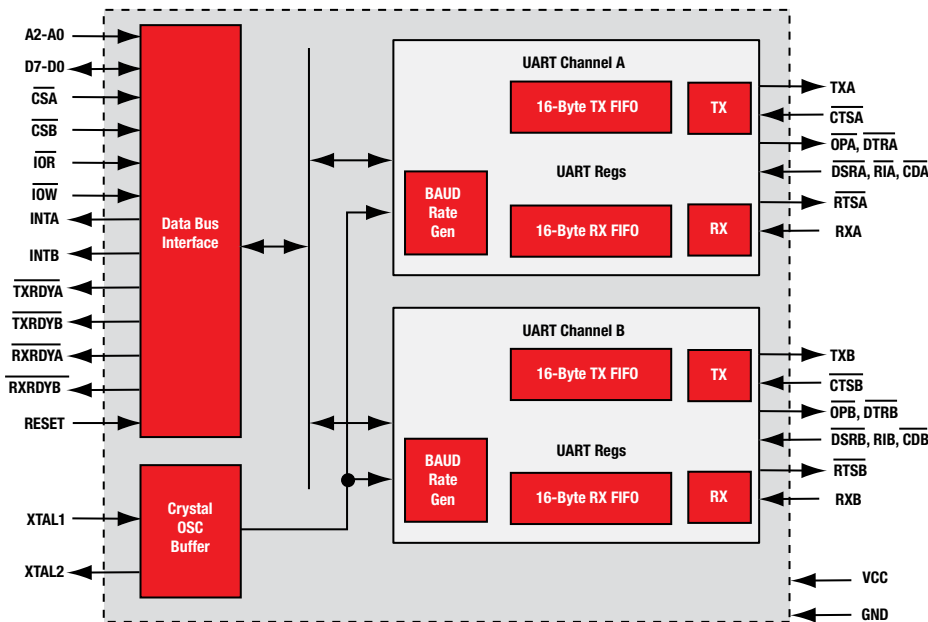
Interface
Other Line Circuit

AISG On-Off Keying Coax Modem Transceiver
SN65HVD62

NEW

This transceiver modulates and demodulates signals between the logic (baseband) and a frequency suitable for long coaxial media and is designed to be compliant with Antenna Interface Standards Group v2.0 specification.

The HVD62 receiver integrates an active bandpass filter to enable demodulation of signals even in the presence of spurious frequency components. The filter has a 2.176 MHz center frequency.

The transmitter supports adjustable output power levels varying from +0 dBm to +6 dBm delivered to the 50 Ω coax cable. The HVD62 transmitter is compliant with the spectrum emission requirement provided by the AISG standard.

A direction control output is provided which facilitates bus arbitration for an RS-485 interface. These devices integrate an oscillator input for a crystal, and also accept standard clock inputs to the oscillator.

Key Features
- Supply ranging from 3 V to 5.5 V
- Independent logic supply of 1.6 V to 5.5 V
- Wide input dynamic range of –15 dBm to +5 dBm for receiver
- Power delivered by the driver to the coax can be adjusted from 0 dBm to +6 dBm
- AISG compliant output emission profile
- Low-power standby mode
- Direction control output for RS-485 bus arbitration
- Supports up to 115 kbps signaling
- Integrated active bandpass filter with center frequency at 2.176 MHz
- 3mm × 3mm 16-Pin QFN Package

Applications
- AISG – interface for antenna line devices
- Tower mounted amplifiers (TMA)
- General modem interfaces
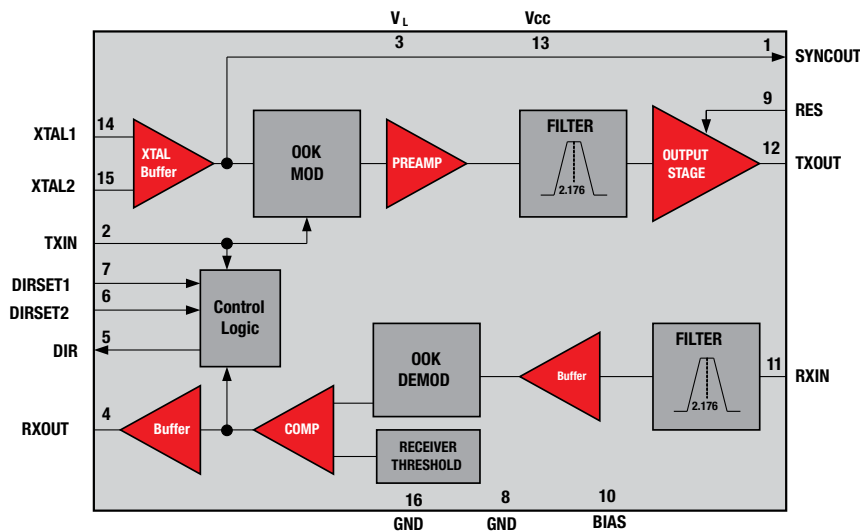
SN65HVD62 functional block diagram

Get more information: **www.ti.com/product/SN65HVD62**

AISG Modem Transceiver

Device	Description	Standard	Supply Voltage (V)	Independent Logic Supply (V)	Carrier Frequency (MHz)	Datarate (kbps)	Max Supply Current (mA)	Low Power Standby Mode	Auto Direction Output	HiRel Avail.	Package	Price*
SN65HVD62	On-Off Keying Coax Modem Transceiver	AISG	3 to 5.5	1.6 to 5.5	2.176	115	33	Yes	Yes	N	QFN-16	2.00

*Suggested resale price in U.S. dollars in quantities of 1,000. See **www.ti.com/hirel** for HiRel options.

Interface
Other Line Circuit

IO-LINK PHY for Device Nodes
SN65HVD101/2

NEW

The SN65HVD101/2 IO-LINK PHYs implement the IO-LINK interface for industrial point-to-point communication. When the device is connected to an IO-Link master through a 3-wire interface, the master can initiate communication and exchange data with the remote node while the SN65HVD10X acts as a complete physical layer for the communication.

The IO-LINK driver output (CQ) can be used in push-pull, high-side, or low-side configurations using the EN and TX input pins. The PHY receiver converts the 24-V IO-LINK signal on the CQ pin to standard logic levels on the RX pin. A simple parallel interface is used to receive and transmit data and status information between the PHY and the local controller.

Key Features
- Configurable CQ output: push-pull, high-side, or low-side for SIO mode
- Remote wake-up indicator
- Current limit indicator
- Power-good indicator
- Over-temperature protection
- Reverse polarity protection
- Configurable current limits
- 9-V to 36-V supply range
- Tolerant to 50-V peak line voltage
- 3.3-V/5-V configurable integrated LDO (SN65HVD101 ONLY)
- 20-pin QFN package, 4 mm × 3.5 mm

Applications
- Suitable for IO-Link device nodes
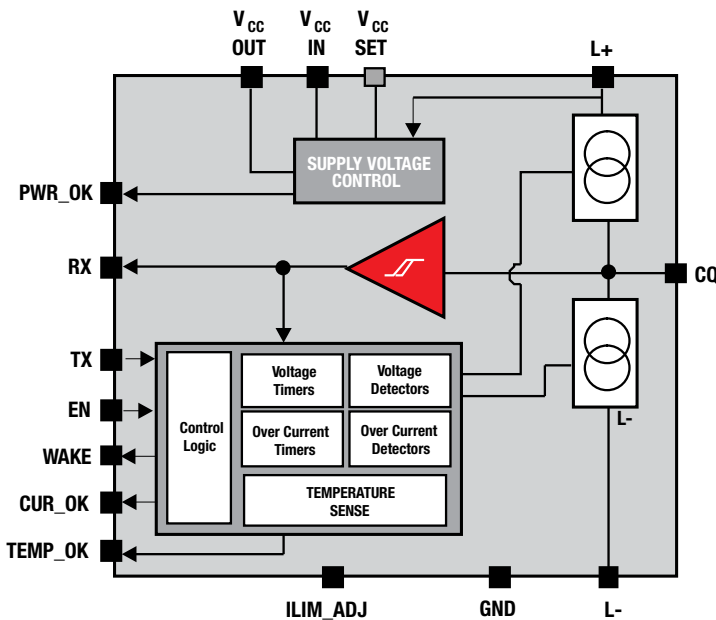
SN65HVD101/2 functional block diagram

Get more information: **www.ti.com/product/SN65HVD101,
www.ti.com/product/SN65HVD102**

IO-LINK PHY

Device	Description	Integrated LDO	Number of Ports	Line Voltage	Logic Supply Voltage (3.3 V Nominal)	Logic Supply Voltage (5 V Nominal)	Adjustable I/O	Signaling Rate (kbps)	Fault Protection Range (Transient)	Thermal Warning	HiRel Avail.	Package	Price*
SN65HVD101	IO-LINK PHY for Device Nodes	Yes (3.3 V or 5 V)	1	9 V to 30 V	3 V to 3.6 V	4.5 V to 5.5 V	Yes	250	−50 to 50 V	Yes	N	QFN-20	2.50
SN65HVD102	IO-LINK PHY for Device Nodes	No	1	9 V to 30 V	3 V to 3.6 V	4.5 V to 5.5 V	Yes	250	−50 to 50 V	Yes	N	QFN-20	2.23

*Suggested resale price in U.S. dollars in quantities of 1,000. See **www.ti.com/hirel** for HiRel options.*

Interface
SerDes – Industrial

Eight-Channel, 0-34 V Digital-Input Serializer with 5 V V_cc for Industrial Digital Inputs
SN65HVS885

The SN65HVS885 is an eight-channel, digital-input serializer for high-channel density digital input modules in industrial and building automation. Operating from a 5 V supply, the device accepts field input voltages of up to 34 V. In combination with galvanic isolators, the device completes the interface between the high voltage signals on the field side and the low-voltage signals on the controller side. Input signals are current limited and then validated by internal debounce filters.

With the addition of few external components, the input switching characteristic can be configured in accordance with IEC61131-2 for Type 1, 2 and 3 sensor switches.

Upon the application of load and clock signals, input data is latched in parallel into the shift register and afterwards clocked out serially.

Key Features
- Eight digital sensor inputs
- High-input voltage up to 34 V
- Selectable debounce filters from 0 ms to 3 ms
- Flexible current-limited inputs –0.2 mA to 5.2 mA
- Field inputs protected to 15 kV ESD
- Single 5 V supply
- Output drivers for external status LEDs
- Cascadable for more inputs in multiples of eight
- SPI-compatible interface
- Overtemperature indicator

Applications
- Industrial PCs
- Digital I/O cards
- High-channel-count digital input modules
- Decentralized I/O modules
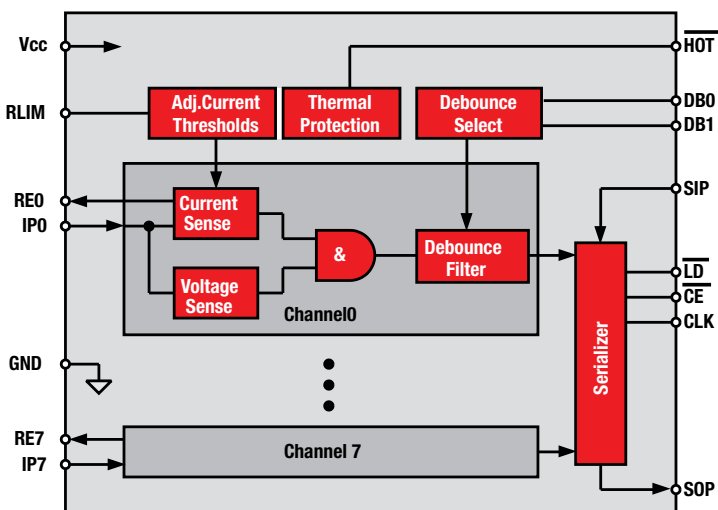
SN65HVS885 functional block diagram

Get more information: **www.ti.com/product/SN65HVS885**

Industrial Serializers

Device	Description	Supply Voltage (V)	I/O Voltage (V)	Parity	Input Data Rate (Mbps)	Temperature Range	Low Voltage Detector	HiRel Avail.	Package	Price*
Industrial Eight-Channel Digital Serializers										
SN65HVS880	Nominal 24 V Digital-Input Serializer	18 to 30	0 to 30	No	1	–40 to 85	Yes: 15 V	N	HTSSOP-28	1.90
SN65HVS881	0-34 V Digital-Input Serializer with Parity	10 to 34	0 to 34	Yes	1	–40 to 125	Yes: 15 V	N	HTSSOP-28	2.00
SN65HVS882	0-34 V Digital-Input Serializer	10 to 34	0 to 34	No	1	–40 to 125	No	N	HTSSOP-28	2.00
SN65HVS885	0-34 V Digital-Input Serializer for 5 V Systems	4.5 to 5.5	0 to 34	No	1	–40 to 125	No	N	HTSSOP-28	1.80

*Suggested resale price in U.S. dollars in quantities of 1,000. **See www.ti.com/hirel** for HiRel options.

Interface
General – UARTs

Dual UART with 64-Byte FIFO
TL16C752C

The TL16C752C is a dual universal asynchronous receiver/transmitter (UART) with 64-byte FIFOs, automatic hardware/software flow control and data rates up to 3 Mbps. It incorporates the functionality of two UARTs, each UART having its own register set and FIFOs. The two UARTs share only the data bus interface and clock source; otherwise they operate independently. Another name for the UART function is asynchronous communications element (ACE), and these terms are used interchangeably. It has a transmission control register (TCR) that stores received FIFO threshold levels to start/stop transmission during hardware and software flow control.

Key Features

- ST16C654/654D pin-compatible with additional enhancements (PFB package only)
- Supports up to 24-MHz crystal input clock (1.5 Mbps)
- Supports up to 48-MHz oscillator input clock (3 Mbps) for 5 V-operation
- Supports up to 32 MHz oscillator input clock (2 Mbps) for 3.3-V operation
- Supports up to 24-MHz input clock (1.5 Mbps) for 2.5-V operation
- Supports up to 16 MHz input clock (1 Mbps) for 1.8-V operation
- Programmable receive FIFO trigger levels for software/hardware flow control
- Software/hardware flow control
  - Programmable Xon/Xoff characters
  - Programmable auto-RTS and auto-CTS
- Characterized for operation from –40°C to +85°C, available in commercial and industrial temperature grades

TL16C752C functional block diagram

Get more information: **www.ti.com/product/TL16C752C**

Interface
General – UARTs

UARTs

Device	Description	Channel(s)	FIFOs	Voltage (V)	Characterized Temp. (°C)	HiRel Avail.	Package	Price*
TL16C2550	Dual UART with Programmable Auto-RTS and Auto-CTS	2	16-Byte	1.8/2.5/3.3/5	–40 to 85	N	QFN-32, TQFP-48	2.20
TL16C2552	Dual UART with Programmable Auto-RTS and Auto-CTS	2	16-Byte	1.8/2.5/3.3/5	–40 to 85	N	PLCC-44	2.90
TL16C2752	Dual UART with Customizable Trigger Levels	2	64-Byte	1.8/2.5/3.3/5	–40 to 85	N	PLCC-44	3.50
TL16C450	Single UART	1	None	5	0 to 70	N	PLCC-44	1.50
TL16C451	Single UART with Parallel Port	1	None	5	0 to 70	N	PLCC-68	3.10
TL16C452	Dual UART with Parallel Port	2	None	5	0 to 70	N	PLCC-68	2.55
TL16C550C	Single UART with Hardware Autoflow Control	1	16-Byte	3.3/5	–40 to 85	N	PLCC-44, LQFP-48, TQFP-48	1.65
TL16C550D	Single UART with Hardware Autoflow Control	1	16-Byte	2.5/3.3/5	–40 to 85	N	QFN-32, LQFP-48, TQFP-48, BGA-24	1.30
TL16C552A	Dual UART with Parallel Port	2	16-Byte	5	–40 to 85	Y	PLCC-68, LQFP-80	3.60
TL16C554A	Quad UART with 16-Byte FIFO	4	16-Byte	3.3/5	–40 to 85	N	PLCC-68, LQFP-80, LQFP-64	5.50
TL16C750	Single UART with Hardware Autoflow Control, Low-Power Modes	1	64-Byte	3.3/5	–40 to 85	N	PLCC-44, LQFP-64	3.90
TL16C752B	Dual UART with Hardware Autoflow Control, Low-Power Modes	2	64-Byte	3.3	–40 to 85	Y	LQFP-48	2.60
TL16C754B	Quad UART with Hardware Autoflow Control, Low-Power Modes	4	64-Byte	3.3/5	–40 to 85	N	PLCC-68, LQFP-80	7.10
TL16C752C	Dual UART with Hardware Autoflow Control, Low-Power Modes	2	64-Byte	1.8/2.5/3.3/5	–40 to 85	N	QFN-32, TQFP-48	2.40
TL16C754C	Quad UART with Hardware Autoflow Control, Low-Power Modes	4	64-Byte	1.8/2.5/3.3/5	–40 to 85	N	LQFP-64	6.00
TL16PC564B/BLV	Single UART with PCMCIA Interface	1	64-Byte	3.3/5	0 to 70	N	LQFP-100	7.35
TL16PIR552	Dual UART with Dual IrDA and 1284 Parallel Port	2	16-Byte	5	0 to 70	N	QFP-80	7.65
TL28L92	Dual UART with X86 or 68K Interface	2	16-Byte	3.3/5	–40 to 85	N	QFP-44	6.00
NS16C2552	Dual UART with 16-BYTE FIFO	2	16-Byte	3.3/5	–40 to 85	N	TQFP-48, PLCC-44	4.69
NS16C2752	Dual UART with 64-BYTE FIFO	2	64-Byte	3.3/5	–40 to 85	N	TQFP-48, PLCC-44	4.94
PC16550D	Universal Asynchronous Receiver/Transmitter with FIFOs	1	16-Byte	5	0 to 70	N	MDIP-40, PLCC-44	3.38
PC16552D	Dual Universal Asynchronous Receiver/Transmitter with FIFOs	2	16-Byte	5	0 to 70	N	PLCC-44	4.10
Related Device								
TIR1000	Standalone IrDA Encoder and Decoder	—	—	2.7 to 5.5	–40 to 85	N	SO-8, TSSOP-8	1.15

*Suggested resale price in U.S. dollars in quantities of 1,000. See www.ti.com/hirel for HiRel options.

Interface
General – ESD/EMI

HDMI Companion Chip with Step-Up DC/DC, I²C Level Shifter and High-Speed ESD Clamps
TPD12S015

The TPD12S015 is an integrated HDMI ESD solution. The device pin mapping matches the HDMI type C/D connector with four differential pairs. This device offers eight low-capacitance ESD clamps, allowing HDMI 1.3 data rates. The integrated ESD clamps and resistors provide good matching between each differential signal pair, which allows an advantage over discrete ESD clamp solutions where variations between ESD clamps degrade the differential signal quality.
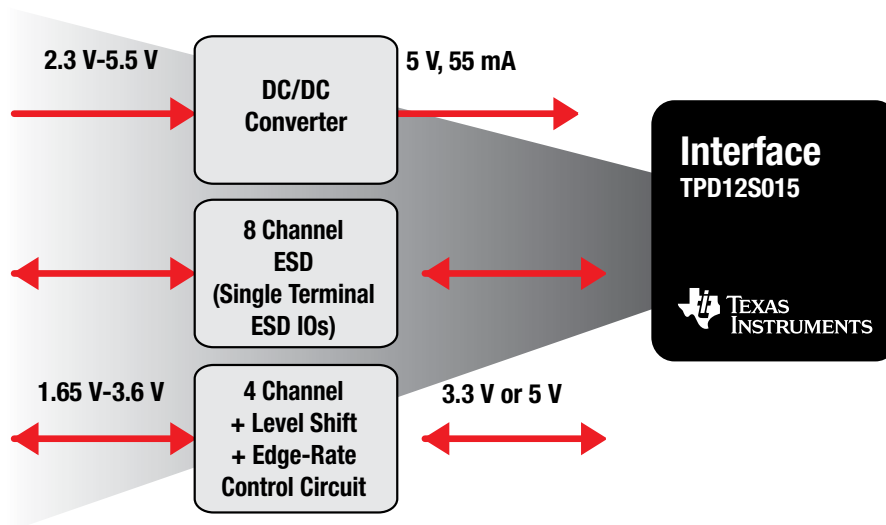
TPD12S015 illustration

Get more information: **www.ti.com/product/TPD12S015**

Key Features
- HDMI 1.3 data rate
- HDMI high-speed differential signals – 3 dB bandwidth exceeds 6.4 Gbps
- Excellent matching capacitance (0.05 pF) in each differential signal pair
- Internal boost converter to generate 5 V from a 2.3- to 5.5-V battery voltage
- Directionless level shifting in the CEC, SDA, SCL and HPD paths
- Seamless type C connector routing
- with flow-through pin mapping
- IEC 61000-4-2 (Level 4) system-level ESD
- Industrial temperature range: –40°C to +85°C

Applications
- Smart phones
- Multimedia phones
- Digital camcorders
- Digital still cameras
- Portable game consoles

Interface
General – ESD/EMI

ESD/EMI

Device	Description	Number of Channels	I/O Capacitance (pF)	V_{BR} (min) (V)	HiRel Avail.	Package	Price*
ESD Devices							
SN65220	USB 2.0 FS	2	35	7	Y	DSBGA-4, SOT23-6	0.26
SN65240	USB 2.0 FS	4	35	7	N	PDIP-8, TSSOP-8	0.24
SN75240	USB 2.0 FS	4	35	7	N	PDIP-8, TSSOP-8	0.42
TPD4E002	USB 2.0 HS	4	11	6	N	SOT-5	0.14
TPD2E001	USB 2.0 HS	2	1.5	11	N	SOT-5, SON-6	0.15
TPD2E007	Audio, RS-232, RS-485, CAN	2	10	±14	N	DCK-3, DSLGA-4	0.20
TPD2E009	USB 2.0 FS, Ethernet, FireWire®, eSATA	2	0.7	7	N	SOT23-3, SOT-3, SON-6	0.15
TPD2EUSB30	USB 3.0 SS, LVDS, eSATA	2	0.7	7	N	SOT-3	0.15
TPD2S017	USB 2.0 HS, FireWire, LVDS	2	1	11	N	SOT-6	0.14
TPD3E001	USB 2.0 HS, USB 2.0 OTG	3	1.5	11	N	SOT-5, SON-6	0.15
TPD4E001	USB 2.0 HS, Ethernet, FireWire, eSATA	4	1.5	11	N	SOT-6, SON-6	0.17
TPD4E002	Transient Overvoltage Protection	4	11	6.1	N	SOT-5	0.14
TPD4E004	USB 2.0 HS, Ethernet, FireWire, eSATA	4	1.6	6	N	SOT-6, SON-6	0.22
TPD4S009	eSATA, LVDS Signaling	4	0.8	9	N	SOT23-6, SC70-6, SON-6	0.26
TPD4S010	eSATA, LVDS Signaling	4	0.8	9	N	SON-10	0.21
TPD4S012	USB 2.0 HS, Ethernet, FireWire, eSATA	4	0.8	6	N	SON-6	0.21
TPD4S1394	FireWire Live Insertion Protection	4	1.5	4.2	N	X2SON-8	0.23
TPD6E001	USB 2.0 HS, Ethernet, FireWire, eSATA	6	1.5	11	N	QFN-10, QFN-12	0.20
TPD6E004	USB 2.0 HS, Ethernet, FireWire, eSATA	6	1.6	6	N	QFN-8	0.27
TPD7S019	VGA, DVI-I	7	2.5	9	N	SSOP/QSOP-16	0.19
TPD8E003	LCD Display, Keypad, Memory	8	9	6	N	WSON-8	0.18
TPD8S009	HDMI, DisplayPort	8	0.9	9	N	SON-15	0.55
TPD12S520	HDMI	12	0.9	9	N	TSSOP-38	0.44
TPD12S521	HDMI	12	0.9	9	N	TSSOP-38	0.47
TPD12S015	HDMI	12	1.3	9	N	DSBGA-28	0.80
EMI Devices							
TPD2F702	Audio EMI Filter	2	1.2	±14	N	DSBGA-5	0.15
TPD4F003	LCD Display, Keypad, Memory	4	200	6	N	WSON-8	0.18
TPD4F202	LCD Display, Keypad, Memory	4	108	6	N	DSBGA-10	0.17
TPD6F002	LCD Display, Keypad, Memory	6	100	6	N	SON-12	0.21
TPD6F003	LCD Display, Keypad, Memory	6	200	6	N	WSON-12	0.21
TPD6F202	LCD Display, Keypad, Memory	6	108	6	N	DSBGA-15	0.21
TPD8F003	LCD Display, Keypad, Memory	8	200	6	N	SON-15	0.25
TPD8F303	SIM Card EMI Filter	3	20	6	N	WSON-8, SON-8	TBD

*Suggested resale price in U.S. dollars in quantities of 1,000. See **www.ti.com/hirel** for HiRel options.

*Preview products are listed in **bold blue.***

Interface
General – I^{2}C

Enhanced I^{2}C Controlled Keypad Scan IC
TCA8418E

The TCA8418E is an enhanced keypad scan device. It can operate from 1.65 V to 3.6 V and has 18 general-purpose inputs/outputs (GPIO) that can be used to support up to 80 keys via the I^{2}C interface [serial clock [SCL], serial data [SDA]).

The key controller includes an oscillator that debounces at 50 ms and maintains a 10 byte FIFO of key-press and release events that can store up to 10 keys with overflow wrap capability. An interrupt (INT) output can be configured to alert key presses and releases either as they occur or at maximum rate. Also, for the YFP package, a CAD_INT pin is included to indicate the detection of CTRL-ALT-DEL (i.e., 1, 11, 21) key-press action.
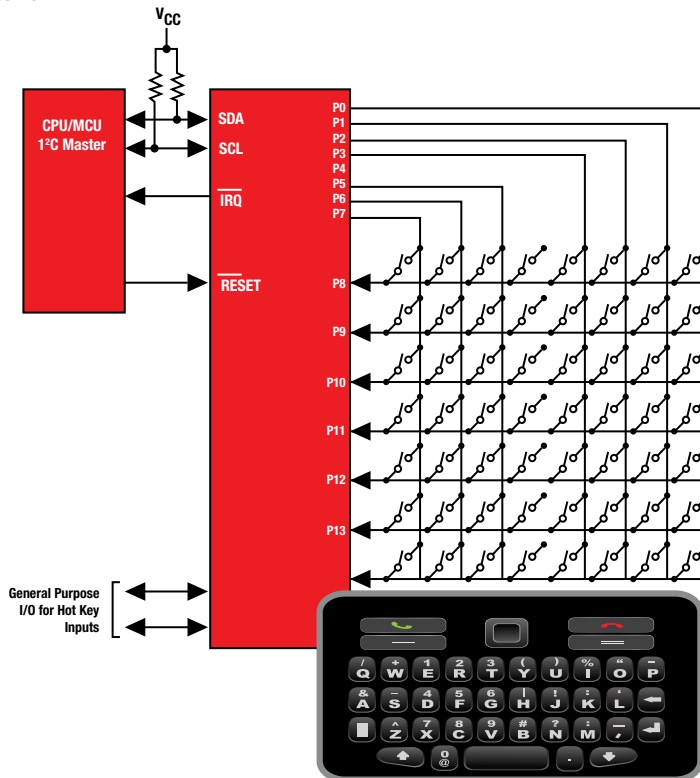
TCA8418E functional block diagram

Get more information: **www.ti.com/product/TCA8418E**

Key Features
- Operating power-supply voltage range of 1.65 V to 3.6 V
- Supports QWERTY keypad operation plus GPIO expansion
- 18 GPIOs can be configured into eight inputs and ten outputs to support an 8- to 10- keypad array (80 buttons)
- 15-kV human body model ESD protection on GPIO lines
- Low standby (idle) current consumption: 3 mA
- Polling current drain 70 mA for one key pressed
- 10-byte FIFO to store 10 key presses and releases
- Very small package: WCSP (YFP): 2 mm x 2 mm; 0.4 mm pitch

Applications
- Smart phones
- PDAs
- GPS devices
- MP3 players
- Digital cameras

I²C

Buffer/Repeaters

Device	Description	No. of Outputs	f$_{SCLK}$ (max) (kHz)	HiRel Avail.	Package	Price*
P82B715	I²C Bus® Extender	2	400	N	PDIP-8, SOIC-8	1.60
P82B96	Dual Bidirectional Bus Buffer	2	400	N	MSOP-8, PDIP-8, SOIC-8, TSSOP-8	1.60
PCA9515A	Dual Bidirectional I²C Bus and SMBus Repeater	2	400	N	MSOP-8, PDIP-8, SOIC-8, SON-8, TSSOP-8	0.95
PCA9517	Level-Translating I²C Bus Repeater	2	400	N	MSOP-8, SOIC-8	1.05
PCA9518	Expandable Five-Channel I²C Hub	5	400	N	SOIC-20, SSOP-20, SSOP-20/QSOP, TSSOP-20	0.85
TCA4311	Hot Swappable 2-Wire Bus Buffers	2	400	N	MSOP-8, SOIC-8	1.45

I/O Expanders

Device	Description	I/O Bits	f$_{SCLK}$ (max) (kHz)	HiRel Avail.	Package	Price*
PCA6107	Remote 8-Bit I²C and SMBus Low-Power I/O Expander with Interrupt Output, Reset and Configuration Registers	8	400	N	SOIC-8	1.05
PCA9534A	Remote 8-Bit I²C and Low-Power I/O Expander with Interrupt Output and Configuration Registers	8	400	N	QFN-16, SOIC-16, SSOP-16, SSOP-16, QSOP,-16 TSSOP-16, TVSOP-16	0.75
PCA9536	Remote 4-Bit I²C and SMBus I/O Expander with Configuration Registers	4	400	N	DSBGA-8, MSOP-8, SOIC-8	0.60
PCA9538	Remote 8-Bit I²C and SMBus Low-Power I/O Expander with Interrupt Output, Reset and Configuration Registers	8	400	N	SOIC-16, SSOP-16, TSSOP-16, TVSOP-16	1.00
PCA9554A	Remote 8-Bit I²C and SMBus I/O Expander with Interrupt Output and Configuration Registers	8	400	N	QFN-16, SOIC-16, SSOP-16, SSOP-16, QSOP-16, TSSOP-16, TVSOP-16	0.85
PCA9557	Remote 8-Bit I²C and SMBus Low-Power I/O Expander with Reset and Configuration Registers	8	400	N	QFN-16, SOIC-16, SSOP-16, TSSOP-16, TVSOP-16	0.90
PCF8574A	Remote 8-Bit I/O Expander for I²C Bus	8	400	N	PDIP-16, SOIC-16, QFN-20, TSSOP-20, TVSOP-20	1.00
PCF8575	Remote 16-Bit I²C and SMBus I/O Expander with Interrupt Output	16	400	N	QFN-24, SOIC-24, SSOP-24, SSOP-24, QSOP-16, TSSOP-24, TVSOP-24, VQFN-24	1.45
PCF8575C	Remote 16-Bit I²C and SMBus I/O Expander with Interrupt Output	16	400	N	SOIC-24, SSOP-24, SSOP-24/QSOP, TSSOP-24, TVSOP-24, VQFN-24	1.45
TCA6408A	Low-Voltage 8-Bit I²C and SMBus I/O Expander with Interrupt Output, Reset and Configuration Register	8	400	N	QFN-16, TSSOP-16, BGA-20 MicroStar Junior™	0.75
TCA6416A	Low-Voltage 16-Bit I²C and SMBus I/O Expander with Interrupt Output, Reset and Configuration Registers	16	400	N	24-BGA MicroStar Junior, QFN-24, TSSOP-24	0.85
TCA6424A	Low-Voltage 24-Bit I²C and SMBus I/O Expander with Interrupt Output, Reset and Configuration Registers	24	400	N	QFN-32	0.95
TCA6507	Low-Voltage 7-Bit I²C and SMBus LED Driver with Intensity Control and Shutdown	7	400	N	BGA-12 MicroStar Junior, QFN-12, TSSOP-14	0.75
TCA9535	Remote 16-Bit I²C and SMBus, Low-Power I/O Expander with Interrupt Output and Configuration Registers	16	400	N	QFN-24, TSSOP-24	1.00
TCA9539	Remote 16-Bit I²C And SMBus, Low-Power I/O Expander with Interrupt Output, Reset and Configuration Registers	16	400	N	QFN-24, TSSOP-24	1.10
TCA9555	Remote 16-Bit I²C And SMBus I/O Expander with Interrupt Output and Configuration Registers	16	400	N	QFN-24, TSSOP-24	1.20
TCA8418	I²C Controlled Keypad Scan IC	18	400	N	QFN-24	1.20
TCA8418E	I²C Controlled Keypad Scan IC with Integrated ESD	18	400	N	DSBGA-25	1.20

Switches/Multiplexers

Device	Description	tpd (max) (ns)	f$_{SCLK}$ (max) (kHz)	HiRel Avail.	Package	Price*
PCA9543A	Two-Channel I²C Bus Switch with Interrupt Logic and Reset	0.3, 1	400	N	SOIC-14, TSSOP-14	0.80
PCA9544A	4-Channel I²C and SMBus Multiplexer with Interrupt Logic	0.3, 1	400	N	BGA-20 MicroStar Junior, QFN-20, SOIC-20, TSSOP-20, TVSOP-20	0.95
PCA9545A	4-Channel I²C and SMBus Multiplexer with Interrupt Logic and Reset Functions	0.3, 1	400	N	BGA-20 MicroStar Junior, QFN-20, SOIC-20, TSSOP-20, TVSOP-20	0.95
PCA9546A	4-Channel I²C and SMBus Multiplexer with Reset Functions	0.3, 1	400	N	QFN-16, SOIC-16, TSSOP-16, TVSOP-16, BGA-20 Microstar Junior, TVSOP-20	0.85
PCA9548A	8-Channel I²C Switch with Reset	0.3, 1	400	N	SOIC-24, SSOP-24, TSSOP-24, TVSOP-24, VQFN-24	1.15

Translator

Device	Description					
PCA9306	Dual Bidirectional I²C Bus and SMBus Voltage-Level Translator	1.5	400	Y	SM8-8, US8-8	0.26
TCA9406	Dual Bidirectional I²C Bus and SMBus Voltage-Level Translator	1.1	1,000	N	SSOP-8, USSOP-8, WCSP-8	TBD

*Suggested resale price in U.S. dollars in quantities of 1,000. See **www.ti.com/hirel** for HiRel options.

*New products are listed in **bold red.***

Interface
General – RS-232

RS-232

Device	Data Rate (kbps)	Drivers	Receivers	Main Supply Voltage (NOM) (V)	Logic Voltage (Min) (V)	Driver Supply Voltage (NOM) (V)	I$_{CC}$ (max) (mA)	ESD HBM (kV)	HiRel/ AEC-Q100 Avail.	Package	Price*
DS14C88	20	4	0	±9	5	—	0.5/0.0.6	—	N / N	PDIP-14, SOIC-14	0.57
DS14C89A	20	0	4	5	5	—	0.9	—	N / N	PDIP-14, SOIC-14	0.60
DS14C232	20	2	2	5	5	—	3	—	N / N	PDIP-16, SOIC-16	1.14
SN75LBC241	100	4	5	5	5	—	10	—	N / N	SOIC-28	2.60
MAX202	120	2	2	5	5	—	15	±15	N / N	SOIC-16, TSSOP-16	0.48
MAX207	120	5	3	5	5	—	20	±15	N / N	SOIC-24, SSOP-24	1.00
MAX208	120	4	4	5	5	—	20	±15	N / N	SOIC-24, SSOP-24	1.10
MAX211	120	4	5	5	5	—	20	±15	N / N	SOIC-28, SSOP-28	1.00
MAX213	120	4	5	5	5	—	20	15	N / N	SOIC-28, SSOP-28	0.96
SN75196	120	5	3	5	5	±9	20//25/–25	10	N / N	PDIP-20, SOIC-20	0.49
SN75C1406	120	3	3	5	5	±12	0.45/0.25/–0.25	2	N / N	PDIP-16, SOIC-16, SO-16	0.86
SN75C185	120	3	5	5	5	±5 or ±12	0.75/0.2/–0.2	2	N / N	PDIP-20, SOIC-20	1.10
GD65232	120	3	5	5	5	±9	38/15/–15	—	N / N	SOIC-20, TSSOP-20	0.34
GD75232	120	3	5	5	5	±9	30/15/–15	—	N / N	PDIP-20, SOIC-20, SSOP-20, TSSOP-20	0.34
GD75323	120	5	3	5	5	±9	20/25/–25	—	N / N	SOIC-20	0.41
LT1030	120	4	0	±5 or ±12	5	—	1/–1	—	N / N	PDIP-14, SOIC-14	1.60
SN65C1406	120	3	3	5	5	±12	0.45/0.25/–0.25	—	N / N	SOIC-16	2.20
DS14C238	120	4	4	5	5	—	10	2	N / N	SOIC-24	3.69
SN75185	120	3	5	5	5	±9	30/15/–15	10	N / N	PDIP-20, SOIC-20, SSOP-20, TSSOP-20	0.33
SN75LBC187	120	3	5	5	5	—	30	—	N / N	SSOP-28	4.35
TL145406	120	3	3	5	5	±9	20/15/–15	2	N / N	PDIP-16, SOIC-16	1.05
UA9636A	120	2	0	±12	5	—	18/–18	—	N / N	PDIP-8, SOIC-8	0.40
UC5170C	120	8	0	±12	5	—	42/–42	—	N / N	PLCC-28	3.80
UC5180C	120	0	8	5	5	—	35	—	N / N	PLCC-28	3.60
UC5181C	120	0	8	5	5	—	35	—	N / N	PLCC-28	3.80
SN75LV4737A	128	3	5	3.3 or 5	3.3	—	20.7	4	N / N	SSOP-28	3.20
DS14C335	128	3	5	3.3	3.3	—	20	2	N / N	SSOP-EIAJ-28	3.75
DS14C535	128	3	5	5	5	—	12	3	N / N	SSOP-EIAJ-28	3.38
DS14185	200	3	5	5	5	±12	22/30/–28	1.5	N / N	SOIC-20	0.64
MAX222	200	2	2	5	5	—	10	±15	N / N	PDIP-18, SOIC-18	1.12
MAX232E	250	2	2	5	5	—	10	IEC61000-4-2	N / N	PDIP-16, SOIC-16, TSSOP-16	0.61
MAX3386E	250	3	2	3.3 or 5	2.5	—	1	IEC61000-4-2	N / N	SOIC-20, TSSOP-20	1.92
TRSF23243	250	6	10	3.3 or 5	3.3	—	2	±15	N / N	SSOP-48, TSSOP-48	3.04
MAX3221E	250	1	1	3.3 or 5	3.3	—	1	IEC61000-4-2	N / N	SSOP-16, TSSOP-16	0.90
MAX3232E	250	2	2	3.3 or 5	3.3	—	1	IEC61000-4-2	N / Y	SOIC-16, SSOP-16, TSSOP-16	0.96
SN75C23243	250	6	10	3.3 or 5	3.3	—	2	15	N / N	SSOP-48, TSSOP-48	4.14
SN75LP1185	256	3	5	5	5	±12	1/0.8/–0.625	15	HiRel/N	PDIP-20, SOIC-20, SSOP-20	1.78
SN75LP196	256	5	3	5	5	±12	1/0.8/–0.8	15	N / N	PDIP-20, SOIC-20, TSSOP-20	2.85
SN75LPE185	256	3	5	5	5	±12	1/0.8/–0.625	15	N / N	PDIP-24, SOIC-24, TSSOP-24	2.30
SN751701	300	1	1	±5 or ±12	5	—	6.4/9.1	—	N / N	SOIC-8	0.95
SN75188	300	4	0	±9	5	—	20/–17	2	N / N	PDIP-14, SOIC-14, SO-14	0.16
SN75C188	300	4	0	±12	5	—	0.16/–0.16	2	N / N	PDIP-14, SOIC-14, SSOP-14, SO-14	0.34
MAX3238E	400	5	3	3.3 or 5	3.3	—	2	IEC61000-4-2	N / Y	SOIC-28, SSOP-28, TSSOP-28	1.20
SN75155	400	1	1	±12	5	—	14/–6.1	2	N / N	PDIP-8, SOIC-8	0.57
MAX3318E	460	2	2	2.5	2.5	—	2	IEC61000-4-2	N / N	SSOP-20, TSSOP-20	1.17
MAX3243E	500	3	5	3.3 or 5	3.3	—	1	IEC61000-4-2	Y / N	SOIC-28, SSOP-28, TSSOP-28, QFN-32	0.88
MAX3222E	500	2	2	3.3 or 5	3.3	—	1	IEC61000-4-2	N / N	SOIC-20, SSOP-20, TSSOP-20	1.30
MAX3223E	500	2	2	3.3 or 5	3.3	—	1	IEC61000-4-2	Y / N	SOIC-20, SSOP-20, TSSOP-20	1.15
MAX3227E	1000	1	1	3.3 or 5	3.3	—	2	IEC61000-4-2	N / N	SSOP-16	1.36
MAX3237E	1000	5	3	3.3 or 5	3.3	—	2	IEC61000-4-2	N / N	SOIC-28, SSOP-28, TSSOP-28	1.35
TRSF3221E	1000	1	1	3.3 or 5	3.3	—	1	IEC61000-4-2	N / N	SSOP-16, TSSOP-16	0.98
TRSF3222E	1000	2	2	3.3 or 5	3.3	—	1	IEC61000-4-2	N / N	SOIC-20, SSOP-20, TSSOP-20	1.28
TRSF3223E	1000	2	2	3.3 or 5	3.3	—	1	IEC61000-4-2	N / N	SOIC-20, SSOP-20, TSSOP-20, VQFN-20	1.28
TRSF3232E	1000	2	2	3.3 or 5	3.3	—	1	IEC61000-4-2	N / N	SOIC-16, SSOP-16, TSSOP-16	1.13

*Suggested resale price in U.S. dollars in quantities of 1,000. See www.ti.com/hirel for HiRel options.

RS-232 (continued)

Device	Data Rate (kbps)	Drivers	Receivers	Main Supply Voltage (NOM) (V)	Logic Voltage (Min) (V)	Driver Supply Voltage (NOM) (V)	I_{CC} (max) (mA)	ESD HBM (kV)	HiRel/ AEC-Q100 Avail.	Package	Price*
TRSF3238E	1000	5	3	3.3 or 5	3.3	—	2	IEC61000-4-2	N / N	SOIC-28, SSOP-28	1.43
TRSF3243	1000	3	5	3.3 or 5	3.3	—	1	±15	N / N	SSOP-28, TSSOP-28	1.44
TRS3253E	1000	3		3.3 or 5	1.8	—	1	IEC61000-4-2	N / N	VQFN-32	1.50
SN75154	1000	4	4	5	5	12	35/40	—	N / N	PDIP-16, SOIC-16, SO-16	0.52
SN75189A	1000	0	4	5	5	—	26	—	N / N	PDIP-14, SOIC-14, SO-14	0.22
SN75C189A	1000	0	4	5	5	—	0.7	—	N	PDIP-14, SOIC-14, SSOP-14, SO-14	0.34

Suggested resale price in U.S. dollars in quantities of 1,000. See www.ti.com/hirel for HiRel options.

Voltage-Level Translators

Single-Supply Translators

Device	Bits	Trans Low (V)	Trans High (V)	V_{CC} (V)	DIR Pins	Bus Hold	OE Pins	t_{pd} (max) (ns)	HiRel Avail.	Price*
SN74AUP1T57	3	2.5	3.3	2.3 to 3.6	No	No	No	6.2	N	0.24
SN74AUP1T58	3	2.5	3.3	2.3 to 3.6	No	No	No	6.2	N	0.24
SN74AUP1T97	3	2.5	3.3	2.3 to 3.6	No	No	No	6.2	N	0.24
SN74AUP1T98	3	2.5	3.3	2.3 to 3.6	No	No	No	6.2	N	0.40

Dual-Supply Translators

Device	Bits	Trans Low (V)	Trans High (V)	$V_{CC}A$ (V)	$V_{CC}B$ (V)	DIR Pins	Bus Hold	OE Pins	t_{pd} (max) (ns)	HiRel Avail.	Price*
TXB0101	1	1.2	5	1.2 to 3.6	1.65 to 5.5	Auto	No	1	4.5	N	0.44
TXB0102	2	1.2	5	1.2 to 3.6	1.65 to 5.5	Auto	No	1	4.5	N	0.39
TXB0104	4	1.2	5	1.2 to 3.6	1.65 to 5.5	Auto	No	1	4	Y	0.55
TXB0104-Q1	4	1.2	5	1.2 to 3.6	1.65 to 5.5	Auto	No	1	7	N	0.65
TXB0106	6	1.2	5	1.2 to 3.6	1.65 to 5.5	Auto	No	1	4	Y	0.70
TXB0108	8	1.2	5	1.2 to 3.6	1.65 to 5.5	Auto	No	1	4	N	0.80
TXS0101	1	1.8	5	1.65 to 3.6	2.3 to 5.5	Auto	No	1	7.5	N	0.44
TXS0102	2	1.8	5	1.65 to 3.6	2.3 to 5.5	Auto	No	1	4.6	N	0.33
TXS0104E	4	1.8	5	1.65 to 3.6	2.3 to 5.5	Auto	No	1	4.6	N	0.65
TXS0108E	8	1.2	5	1.2 to 3.6	1.65 to 5.5	Auto	No	1	4.8	N	0.80
SN74AVC1T45	1	1.2	3.3	1.2 to 3.6	1.2 to 3.6	1	No	No	2.8	N	0.31
SN74AVC2T45	2	1.2	3.3	1.2 to 3.6	1.2 to 3.6	1	No	No	2.4	Y	0.42
SN74AVCH1T45	1	1.2	3.3	1.2 to 3.6	1.2 to 3.6	1	Yes	No	2.8	N	0.31
SN74AVCH2T45	2	1.2	3.3	1.2 to 3.6	1.2 to 3.6	1	Yes	No	2.4	N	0.40
SN74AVC2T245	2	1.2	3.3	1.2 to 3.6	1.2 to 3.6	2	No	1	2.4	N	0.46
SN74AVC4T245	4	1.2	3.3	1.2 to 3.6	1.2 to 3.6	2	No	2	2.9	Y	0.65
SN74AVC8T245	8	1.2	3.3	1.2 to 3.6	1.2 to 3.6	1	No	1	2.5	Y	0.55
SN74AVC16T245	16	1.2	3.3	1.2 to 3.6	1.2 to 3.6	2	No	2	2.7	Y	1.50
SN74AVC20T245	20	1.2	3.3	1.2 to 3.6	1.2 to 3.6	2	No	2	2.9	N	1.60
SN74AVC24T245	24	1.2	3.3	1.2 to 3.6	1.2 to 3.6	6	No	6	2.7	N	1.75
SN74AVC32T245	32	1.2	3.3	1.2 to 3.6	1.2 to 3.6	4	No	4	2.7	N	1.80
SN74AVCH4T245	4	1.2	3.3	1.2 to 3.6	1.2 to 3.6	2	Yes	2	2.9	Y	0.70
SN74AVCH8T245	8	1.2	3.3	1.2 to 3.6	1.2 to 3.6	1	Yes	1	2.5	N	1.10
SN74AVCH16T245	16	1.2	3.3	1.2 to 3.6	1.2 to 3.6	2	Yes	2	2.7	N	1.50
SN74AVCH20T245	20	1.2	3.3	1.2 to 3.6	1.2 to 3.6	2	Yes	2	2.9	N	1.60
SN74AVCH24T245	24	1.2	3.3	1.2 to 3.6	1.2 to 3.6	6	Yes	6	2.7	N	1.75
SN74AVCH32T245	32	1.2	3.3	1.2 to 3.6	1.2 to 3.6	4	Yes	4	2.7	N	4.00
SN74AVC4T774	4	1.2	3.3	1.2 to 3.6	1.2 to 3.6	4	No	1	2.4	N	0.70
SN74LVC1T45	1	1.8	5	1.65 to 5.5	1.65 to 5.5	1	No	No	3.9	N	0.29
SN74LVC2T45	2	1.8	5	1.65 to 5.5	1.65 to 5.5	1	No	No	3.9	N	0.40
SN74LVC8T245	8	1.8	5	1.65 to 5.5	1.65 to 5.5	1	No	1	4.2	N	0.80
SN74LVCH8T245	8	1.8	5	1.65 to 5.5	1.65 to 5.5	1	Yes	1	4.2	N	0.80
SN74LVC16T245	16	1.8	5	1.65 to 5.5	1.65 to 5.5	2	No	2	4.2	N	1.65
SN74LVCH16T245	16	1.8	5	1.65 to 5.5	1.65 to 5.5	2	Yes	2	4.2	N	1.65

Suggested resale price in U.S. dollars in quantities of 1,000. See www.ti.com/hirel for HiRel options.

Wideband Frequency Synthesizer with Integrated VCO
LMX2581

NEW

The LMX2581 is an ultra-low noise wideband frequency synthesizer which integrates a delta-sigma fractional N PLL, a VCO with fully integrated tank circuit, and an optional frequency divider.

The LMX2581 integrates several low-noise, high-precision LDOs to provide superior supply noise immunity and more consistent performance. When combined with a high quality reference oscillator, the LMX2581 generates a very stable, ultra-low noise signal. The internal VCO can be bypassed so that an external VCO can be used.

Key Features
- Low voltage logic compatibility
- Digital lock detect
- 32-pin QFN package
- High performance PLL
- Broadband multi-core VCO
- Low noise VCO divider

Applications
- Femto and TETRA base stations
- Software defined radio
- Vector signal analyzer and generator
- Wireless communications, data access card, LAN card and repeater
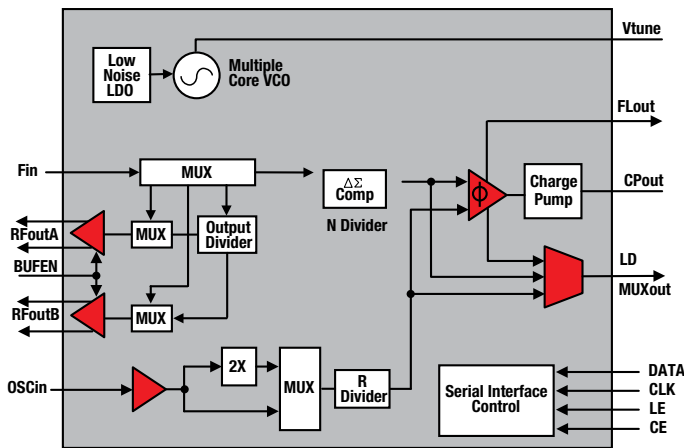
LMX2581 functional block diagram

Get more information: **www.ti.com/product/LMX2581**

High-Linearity Direct-Conversion Quadrature Demodulator
TRF371125

The TRF371125 is a highly linear and integrated direct-conversion quadrature demodulator optimized for 3G/4G wireless infrastructure equipment. The TRF371125 integrates balanced I and Q mixers, LO buffers and phase splitters to convert an RF signal directly to I and Q baseband. The on-chip programmable gain amplifiers (PGAs) allow adjustment of the output signal level without the need for external variable gain (attenuator) devices. The TRF371125 integrates programmable baseband low-pass filters that attenuate nearby interference, eliminating the need for an external baseband filter. Housed in a 7 mm x 7 mm QFN package, the TRF371125 provides the smallest and most integrated receiver solution available for high-performance equipment.

Key Features
- Frequency range: 0.7 to 4.0 GHz
- Noise figure of 13.5 dB (gain = 40 dB)
- IIP3 of 24 dBm (gain = 40 dB)
- IIP2 of 60 dBm (gain = 40 dB)
- Baseband PGA with 24 dB of gain range in 1 dB steps
- Software-programmable baseband filter (1 dB corner)
- Receives RF signal bandwidths from 1.4 MHz to 30 MHz
- Integrated ADC driver
- DC offset correction capability

Applications
- Cellular basestation receivers
- Software-defined radios (SDRs)
- Test equipment
- Wireless local loops
- High-linearity direct down-conversion receivers

TRF371125 functional block diagram

Get more information: **www.ti.com/product/TRF371125**

Radio Frequency
Broadband RF

High-Performance Quadrature Modulators

Device	Frequency (min) (MHz)	Frequency (max) (MHz)	OIP3 (dBm)	P1dB (dBm)	Noise Floor (dBm/Hz)	I/Q Common-Mode Voltage (typ) (V)	HiRel Available	Price*
TRF370315	350	4000	23	9.5	−160	1.5	N	4.95
TRF3705	300	4000	30	13	−160	0.25	N	5.10
TRF370317	400	4000	26.5	12	−163	1.7	N	5.35
TRF370333	350	4000	21	9.5	−160	3.3	N	4.95
TRF370417	50	6000	26.5	12	−163	1.7	N	5.35

Integrated Quadrature Modulator

Device	Frequency (min) (MHz)	Frequency (max) (MHz)	OIP3 (dBm)	P1dB (dBm)	Noise Floor (dBm/Hz)	LO Phase Noise (1MHz Offset, 2.3GHz) (dBc/Hz)	I/Q Common-Mode Voltage (typ) (V)	HiRel Available	Price*
TRF372017	300	4800	26	12	−163	−132	1.7	N	5.50

Integrated Quadrature Demodulators

Device	Frequency Range (Optimized) (GHz)	BB Filter Bandwidth (min) (MHz)	BB Filter Bandwidth (max) (MHz)	IIP2 (typ) (dBm)	IIP3 (typ) (dBm)	HiRel Available	Price*
TRF3710	1.7 to 2.0	0.615	1.92	60	21	N	10.45
TRF371109	0.7 to 1.0	0.700	15.0	60	24	N	11.15
TRF371125	1.7 to 2.7	0.700	15.0	60	24	N	11.15
TRF371135	3.3 to 3.8	0.700	15.0	60	24	N	11.15

High-Performance IF Transceiver

Device	Tx LO Frequency (min) (MHz)	Tx LO Frequency (max) (MHz)	Tx Output Noise Floor (dB)	Tx Output IP3 (dBm)	Rx LO Frequency (min) (MHz)	Rx LO Frequency (max) (MHz)	Rx Noise Figure (dB)	Rx Input IP3 (dBm)	Rx BB Filter Cutoff (min) (MHz)	Rx BB Filter Cutoff (max) (MHz)	Rx BB Max Passband (typ) (MHz)	HiRel Avail.	Price*
TRF2443	165	350	−166	29.5	140	330	4.3	9.5	2	11	30	N	24.00

High-Performance Frequency Synthesizers

Device	Divide by 1 Fstart	Divide by 1 Fstop	Divide by 2 Fstart	Divide by 2 Fstop	Divide by 4 Fstart	Divide by 4 Fstop	HiRel Available	Price*
TRF3761-A	1499	1608	749.5	804	374.75	402	N	5.45
TRF3761-B	1595	1711	797.5	855.5	398.75	427.75	N	5.45
TRF3761-C	1660	1790	830	895	415	447.5	N	5.45
TRF3761-D	1740	1866	870	933	435	466.5	N	5.45
TRF3761-E	1805	1936	902.5	968	451.25	484	N	5.45
TRF3761-F	1850	1984	925	992	462.5	496	N	5.45
TRF3761-G	1920	2059	960	1029.5	480	514.75	N	5.45
TRF3761-H	2028	2175	1014	1087.5	507	543.75	N	5.45
TRF3761-J	2140	2295	1070	1147.5	535	573.75	N	5.45
LMX2430	250 (RF PLL), 100 (IF PLL)	3000 (RF PLL), 800 (IF PLL)	—	—	—	—	N	1.52
LMX2433	500 (RF PLL), 250 (IF PLL)	3600 (RF PLL), 1700 (IF PLL)	—	—	—	—	N	1.68
LMX2434	1000 (RF PLL), 500 (IF PLL)	5000 (RF PLL), 2500 (IF PLL)	—	—	—	—	N	1.77
LMX2470	500 (RF PLL), 75 (IF PLL)	2600 (RF PLL), 800 (IF PLL)	—	—	—	—	N	2.00
LMX2485	500 (RF PLL), 75 (IF PLL)	3000 (RF PLL), 800 (IF PLL)	—	—	—	—	N	2.23
LMX2485Q[1]	500 (RF PLL), 75 (IF PLL)	3100 (RF PLL), 800 (IF PLL)	—	—	—	—	N	3.25
LMX2485E	50 (RF PLL), 75 (IF PLL)	3000 (RF PLL), 800 (IF PLL)	—	—	—	—	N	2.47
LMX2486	1000 (RF PLL), 250 (IF PLL)	4500 (RF PLL), 3000 (IF PLL)	—	—	—	—	N	2.54
LMX2487	1000 (RF PLL), 250 (IF PLL)	6000 (RF PLL), 3000 (IF PLL)	—	—	—	—	N	2.74
LMX2487E	3000 (RF PLL), 250 (IF PLL)	7500 (RF PLL), 3000 (IF PLL)	—	—	—	—	N	2.95
LMX2581	1880	3760	940	1880	470	940	N	7.00
LMX2531	1106 (1143E) 2910 (3010E)	1184 (1143E) 3132 (3010E)	553 (1143E) 1455 (3010E)	592 (1143E) 1566 (3010E)	—	—	N	5.50
LMX2541	1990 (2060E) 3480 (3740E)	2240 (2060E) 4000 (3740E)	995 (2060E) 1740 (3740E)	1120 (2060E) 2000 (3740E)	497.5 (2060E) 870 (3740E)	560 (2060E) 1000 (3740E)	N	6.50

*Suggested resale price in U.S. dollars in quantities of 1,000. See www.ti.com/hirel for HiRel options. [1]Automotive Grade

New products are listed in **bold red**.

Radio Frequency
Wireless Connectivity

Single-Mode *Bluetooth*® Low Energy System-on-Chip
CC2541

The CC2541 is a power-optimized system-on-chip (SoC) for both low energy and proprietary 2.4-GHz applications. It enables robust network nodes to be built with low total bill-of-material costs. The CC2541 combines the excellent performance of a leading RF transceiver with an industry-standard enhanced 8051 MCU, in-system programmable Flash, 8-KB RAM, and many other powerful supporting features and peripherals. The CC2541 is highly suited for systems where ultra-low power consumption is required. Transition times between operating modes further enable low power consumption. The CC2541 is pin-compatible with the CC2540 in the 6-mm × 6-mm QFN40 package, if the USB is not used on the CC2540 and the I2C/extra I/O is not used on the CC2541.

Key Features
- True one-chip single mode *Bluetooth*® low energy solution
- Optimized RF performance including Tx/Rx power and selectivity
- Extensive peripheral set including I2C, DMA, GPIO, USARTs, ADC, timers
- Flexible low power modes to maximize system lifetime when battery powered

Applications
- Mobile/laptop accessories
- Sports and fitness
- Consumer health and medical
- Proximity
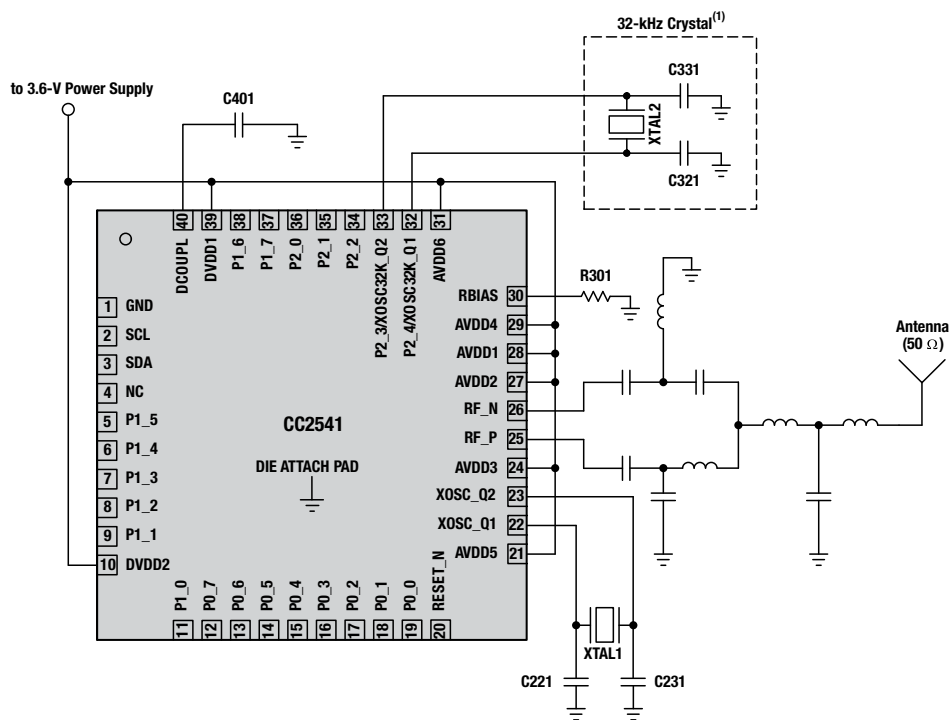
CC2541 application circuit

Get more information: **www.ti.com/product/CC2541**

Radio Frequency
Wireless Connectivity

High Performance RF Transceiver for Narrowband Systems
CC1120

The CC1120 is a fully integrated single-chip radio transceiver designed for high performance at low power and low voltage operation in cost effective wireless systems. All filters are integrated, removing the need for costly external SAW and IF filters. The device is mainly intended for the ISM (Industrial, Scientific and Medical) and SRD (Short Range Device) frequency bands at 164-192 MHz, 410-480 MHz and 820-960 MHz.

The CC1120 provides extensive hardware support for packet handling, data buffering, burst transmissions, clear channel assessment, link quality indication and Wake-On-Radio. The CC1120 main operating parameters can be controlled via an SPI interface. In a typical system, the CC1120 will be used together with a microcontroller and only few external passive components.

Key Features
- Industry leading RF blocking and selectivity
- 65 dB adjacent channel rejection at 12.5 kHz offset
- 90 dB blocking
- High output power (up to +16 dBm) and excellent sensitivity (up to 145 db link budget)
- WaveMatch; advanced DSP sync detector with high sensitivity and strong noise and fast setting
- Advanced RX sniff mode with low power without sacrificing performance

Applications
- Smart metering
- Alarm and security systems
- Industrial automation
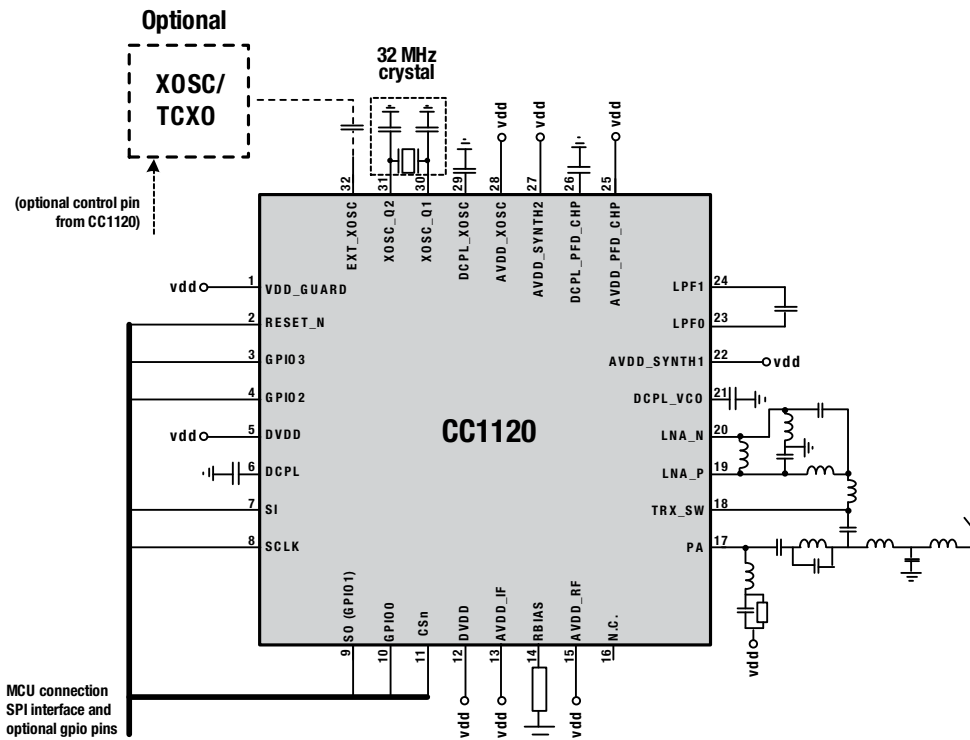
CC1120-PAN1325 system block diagram

Get more information: **www.ti.com/product/CC1120**

Radio Frequency
Wi-Fi®/IEEE 802.11

SimpleLink™ Wi-Fi Module
CC3000, CC3000-TiWi-SL, CC3000-TypeVK

The CC3000 is a self-contained wireless solution that simplifies the process of implementing Internet connectivity. SimpleLink™ Wi-Fi minimizes host microcontroller (MCU) software requirements making it the ideal solution for embedded applications using any low-cost/low-power MCU. The CC3000 is provided as a module by TI, LS Research and Murata to reduce development time, lower manufacturing costs, save board space, ease certification and minimize RF expertise required. Additionally, it is provided as a complete platform solution including software drivers, sample applications, API guide, user documentation and a world-class support community.

SimpleLink™ Wi-Fi ® CC3000 Module
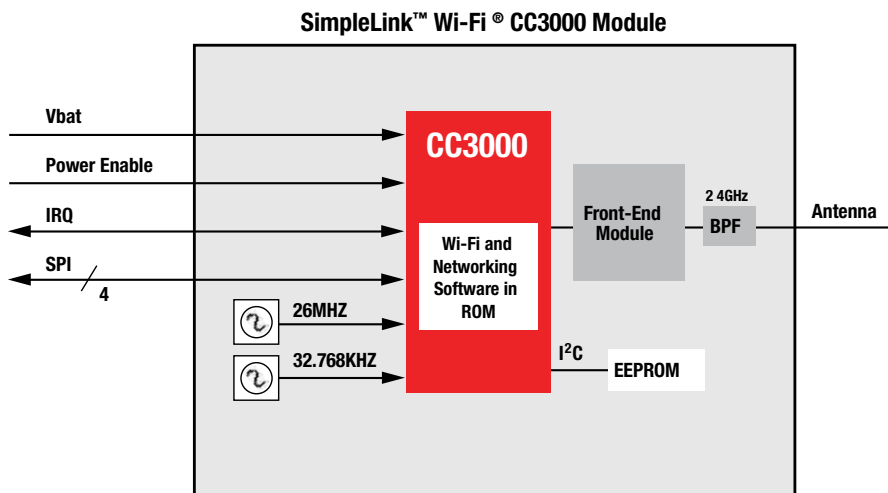
CC3000 Wi-Fi system diagram

Get more information: **www.ti.com/wifi**

Development Tools and Software
- EM board and Booster Pack for CC3000 TI module
- Integrated Development Kit – CC3000FRAMEMK-L and CC3000FRAMEMK-M available today with MSP-EXP430FR5739 included
- EM board only available through distribution such as Arrow, Avnet, Digikey and Mouser
- Sample applications available - **www.ti.com/tool/cc3000-platform**

Module Solutions

Partner	TI	LSR	Murata
Device	CC3000	CC3000-TiWi-SL	CC3000-TypeVK
Size	16.3mm x 13.5mm x 2mm	21mm x 14mm x 2.3mm	16.5mm x 11.5mm x 2.2mm
Temperature	−40° to 85°C	−40° to 85°C	−30° to 70°C

Key Features
- Embedded Wi-Fi and networking software including drivers, stack and supplicant
- Best-in-class link budget:
  - Typical WLAN transmit power (varies by module):
    18 to 19.5 dBm, 11 Mbps, CCK (b)
  - Typical WLAN sensitivity:
    −85 to −89 dBm, 8% PER,11 Mbps
- Compact code size (as low as 2 KB flash and 250 B RAM) required for host microcontroller
- FCC/IC and ETSI-tested, production ready module
- U.FL with dipole antenna or chip antenna FCC/IC certified, ETSI-tested reference designs available
- Assorted levels of integration including power management and clocking options
- Small form factor module
- Proven Wi-Fi interoperability
- Complete platform solution including API guide, sample applications, support community, user and porting guides are provided by TI

Benefits
- Embedded Wi-Fi software including all drivers, TCP/IP stack, and supplicant
- Credible, proven solution with best-in-class link budget
- Complete platform solution and certified modules

Applications
- Automation
- Home security/surveillance
- Network appliance
- Fitness/health/medical

Radio Frequency
Wireless Connectivity

Wireless Connectivity

Device	Description	Frequency Range	Device Type	Data Rate (Max) (max) (kbps)	TX Power (max) (dBm)	RX Current (Lowest) (mA)	Sensitivity (Best) (dBm)	Wakeup Time (PD-->RX/TX) (µS)	Flash Size (KB)	RAM Size (KB)	Package	Price*
CC1120	High Performance RF Transceiver for Narrowband Systems	164 to 192 MHz 410 to 480 MHz 820 to 960 MHz	Transceiver	200 kbps	45 mA at 14 dBm	17 mA / 2 mA sniff mode	−127	400 µs PD to Idle, 166 µs Idle to RX/TX	NA	NA	QFN-32, 5x5	2.20
CC1121	High Performance Low Power RF Transceiver	164 to 192 MHz 410 to 480 MHz 820 to 960 MHz	Transceiver	200 kbps	45 mA at 12 dBm	17 mA / 2 mA sniff mode	−120	400 µs PD to Idle, 166 µs Idle to RX/TX	NA	NA	QFN-32, 5x5	1.95
CC1125	Ultra-High Performance RF Narrowband Transceiver	164 to 192 MHz 274 to 320 MHz 410 to 480 MHz 820 to 960 MHz	Transceiver	200 kbps	45 mA at 12 dBm	17 mA / 2 mA sniff mode	−129	400 µs PD to Idle, 166 µs Idle to RX/TX	NA	NA	QFN-32, 5x5	5.95
CC1175	High Performance RF Transmitter for Narrowband Systems	164 to 192 MHz 410 to 480 MHz 820 to 960 MHz	Transceiver	200 kbps	45 mA at 12 dBm	17 mA / 2 mA sniff mode	n/a	400 µs PD to Idle, 166 µs Idle to RX/TX	NA	NA	QFN-32, 5x5	1.50
CC1200	Low Power, High Performance RF Transceiver	164 to 192 MHz 410 to 480 MHz 820 to 960 MHz	Transceiver	1 Mbps	45 mA at 14 dBm	17 mA / 2 mA sniff mode	−127	300 µs PD to Idle, 133 µs Idle to RX/TX	NA	NA	QFN-32, 5x5	—
CC257x	Single Channel ANT® RF Network Processor	2.4 GHz	Network Processor	1 Mbps	4 dBm	23.7	−86 dBm	620	N/A	N/A	QFN-40 6x6 mm	2.60
CC2543/4/5	Low-Cost 2.4 GHz System-on-Chips	2.4 GHz	System-on-Chip	2 Mbps	4 dBm	22.5 mA	−98 dBm	630	32	1/2	QFN	1.75
CC2538	Powerful SoC for 2.4 GHz IEEE 802.15.4-2006 and ZigBee® Applications	2.4 GHz	System-on-Chip	250 kbps	0 dBm 24 ma	20 mA	−97 dBm at PER<1%	—	128/ 256/ 512 K	32	8.8 QFN56	—
CC2530/31	Second Generation SoC for 2.4 GHz IEEE 802.15.4 / RF4CE / ZigBee	2.4 GHz	System-on-Chip	250 kbps	29 mA	24 mA	−97 dBm at PER<1%	—	32/64/ 128 256-kB Flash	8-kB SRAM	QFN-40 6.6 mm	—
CC2541	2.4-GHz *Bluetooth*® Low Energy System-on-Chip	2.4 GHz	System-on-Chip	2 Mbps	0 dBm 18.2 mA	17.9 mA	−94 dBm at 1 Mbit	620	128/ 256 kB FLASH	8 kB RAM	VQFN-40, 6x6	2.00
CC430	2.4 GHz System-on-Chip with RF Core	300 to 348 MHz 387 to 464 MHz 779 to 92 MHz	System-on-Chip	500 kbps	15 mA	15 mA	−111	—	8/16/ 32-kB Flash	8 kB RAM	VQFN-48/ VQFN-64	—

*Suggested resale price in U.S. dollars in quantities of 1,000.

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