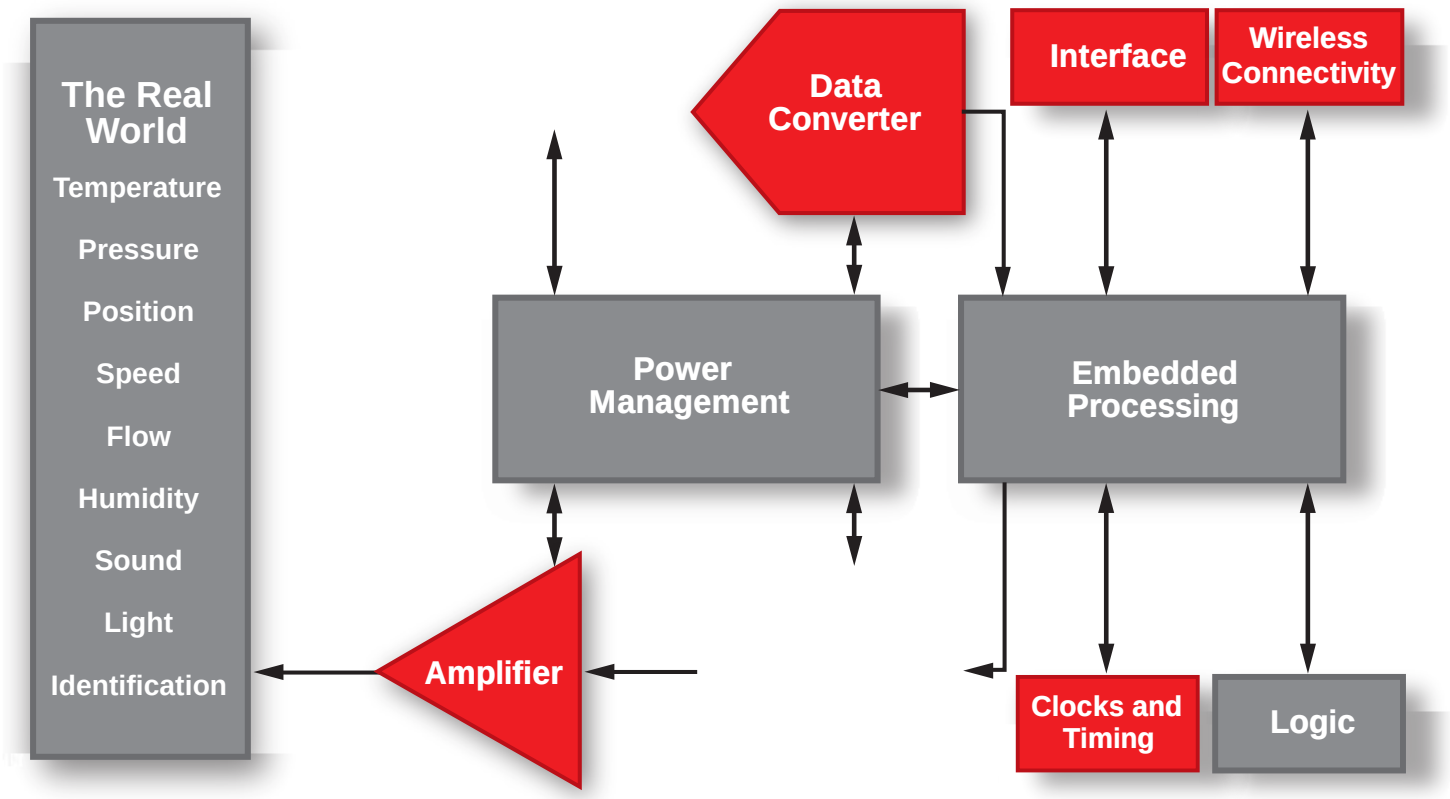
Analog Signal Chain Guide

Amplifiers, Data Converters, Interface,
Clocks, Timing and Wireless Connectivity.



Amplifiers and Comparators

Operational Amplifiers 4-10
High-Speed Amplifiers 11-17
Audio Amplifiers 18-25
Instrumentation Amplifiers 26-29
Power Amplifiers and Buffers 30
Comparators 31-32

Data Converters

Analog-to-Digital Converters (ADCs) 33
Delta-Sigma ADCs 33-36
SAR ADCs 37-45
Pipeline ADCs

Clocks and Timing

Clock Distribution. 85-89
Clock Generation 90-93

Interface

Communications 94

High Preci 11MHz, Low Noise, RRO, JFET Operational Amplifier

OPA140, C 40, OPA4140

NEW

Get samples, eets and app reports at: **www.ti.com/sc/device/PARTnumber** (Replace **PARTnumber** with **OPA140**, **OPA2140**, or **O**)

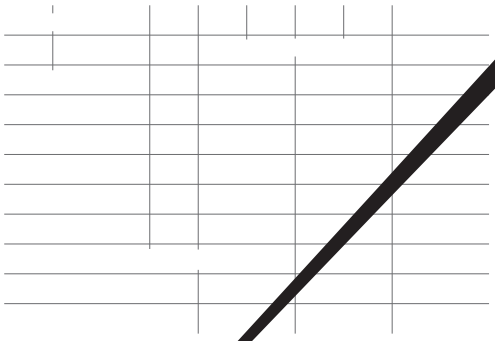
Key Features

- Very low off 0.35µV/°C
- Very low of V max
- Low input b ent: 10pA max
- Very low 1/ 250nVpp, 0.1Hz to 10
- Low noise: Hz at 1kHz
- Gain bandv MHz
- Slew rate: 2

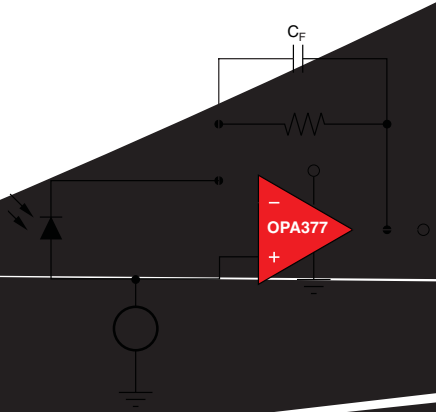
Applications

- Battery-pow truments
- Industrial co
- Medical inst tion
- Photodiode rs
- Active filters
- Automatic t ms

The OPA140 family is a series of low-power JFET input amplifiers that feature good drift and low input bias current. The rail-to-rail output swing and input range that includes V- allow designers to take advantage of the low noise characteristics of JFET amplifiers while also interfacing to modern, single-supply, precision ADCs and DACs. The OPA140 achieves 11MHz unity-gain bandwidth and a 20V/µs Cs range t



NEW



O. . A . .

Low Power, General Purpose Operational Amplifier in microPackages

OPA317, OPA2317, OPA4317

Get samples, datasheets and app reports at: **www.ti.com/sc/device/** PARTNUMBER (Replace PARTNUMBER with OPA317, OPA2317, or OPA4317)

Key Features

- MicroPackages:
  Single in SOT553, dual in VSSOP-8
- Low quiescent current: 495 A/ch
- Low noise: 14nV/ Hz at 1kHz
- Rail-to-rail output
- Gain bandwidth: 3MHz
- Low input bias current: 8pA
- RFI ltered inputs
- Supply range: +2.7V to +36V,
  ±1.35V to ±18V

Applications

- Transducer amplifiers
- Bridge amplifiers
- Strain gage amplifiers
- Precision integrators
- Battery powered instruments
- Test equipment

TMS320F28335 Piccolo Texas Instruments 1Q 2011 Analog Signal Chain Guide 401 649.717

OPA317, OPA2317, OPA4317 are part of a family of 36V, low noise operational amplifiers that feature single supply, and micropackages with the ability to operate on supplies ranging from +2.7V (±1.35V) to +36V (±18V). They offer good offset, drift and bandwidth with low quiescent current. Single, dual and quad versions have identical

O, A

Precision, 20MHz, 0.9pA I B, Low Noise, RRIO CMOS Operational Amplifier

OPA320, OPA2320

Get samples, datasheets and app reports at: **www.ti.com/sc/device/** PART Number (Replace PART Number with OPA320, or OPA2320)

Key Features

- Precision with zero-crossover distortion:
  - Low offset voltage: 150µV (max)
  - High CMRR: 114dB
  - Rail-to-Rail I/O
- Wide bandwidth: 20MHz
- Low noise: 8.5nV/ Hz at 1kHz
- Quiescent current: 1.45mA/ch
- Low input bias current: 0.9pA (max)
- Slew rate: 10V/µs
- Single supply voltage range: 1.8V to 5.5V

Applications

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

The OPA320 (single) and OPA2320 (dual) are precision, RRIO, CMOS operational amplifiers optimized for very low noise and wide bandwidth. TAA 5.1 TAA 5.3 8.2 4.3 8.2 2.1 4.3 8.2 3.2 4.3 8.2 3.2.1 4.3 8.2 3.2.1.4

O [illegible] A [illegible]

	Drif (V/ C) (p)	I_B

O. . . A . . .

Lo -Po er Opera ional Ampli er (I_Q <500 A) (or ed b I_Q) (con in ed)

De ice	De crip ion	Ch.	V_S (V) (min)	V_S (V) (ma)	I_Q Per Ch. (mA) (ma)	GBW (MH) (p)	Sle Ra e (V/) (p)	V_{OS} (mV) (25 C) (ma)	V_{OS} Drif (V/ C) (p)	I_B (pA) (ma)	CMRR (dB) (min)	V_N a 1kH (nV/ H) (p)	Single S ppl	Rail- o- Rail	HiRel A ail.	Package( )	Price*
OPAy137	Low Cost, FET-Input	1, 2, 4	4.5	36	0.27	1	3.5	3	15	100	76	45	Y	N	N	SOT-23, SOIC, DIP	0.60
TLE202x	Precision Low-Power Single-Supply Operational Amplifier	1, 2, 4	4	40	0.3	1.2	0.5	0.6	2	70000	85	17	Y	N	Y	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	Out	N	MSOP, SOIC	1.05
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	MSOP, SOIC, SOT-23	1.00
OPA 171	36V 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, SOT-23, SOIC, VSSOP, TSSOP	0.40

Lo -Noi e Opera ional Amp 4 g S0 0 mS00.5 S/GS20 0 1 180.6g S0 0 mS0 12.725 ISSSQSqS1 0 0 1 265.5 95.9539032 cmS0 0 0 0.5 KS0166g

H f - . A . , ((>50MH)

ow N ise, F lly Differential p erational Amplifier with 6B Gain
H 0006

Get samples, datasheets and EVMs at: **www.ti.com/sc device/ H 0006**

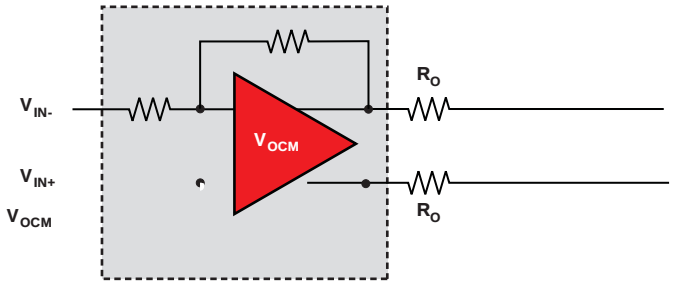
K Featur es

- Fully differential wideband operation:
  - 2.4GHz small signal bandwidth
  - 675MHz large signal bandwidth
- Low distortion: IMD3 of -107dBc at 100MHz, 2Vpp
- High linearity: OIP3 of 48dBm at 100MHz, 2Vpp
- Low voltage noise at flatband (f >100kHz): 1.7 nV/ $\overline{\text{Hz}}$
- Fast overdrive recovery: 7.5ns max
- Single supply +5V operation
- Low impedance, voltage-mode output
- Quiescent current: 100mA, power-down <3mA
- 4mm x 4mm QFN pkg w/thermal pad

Applications

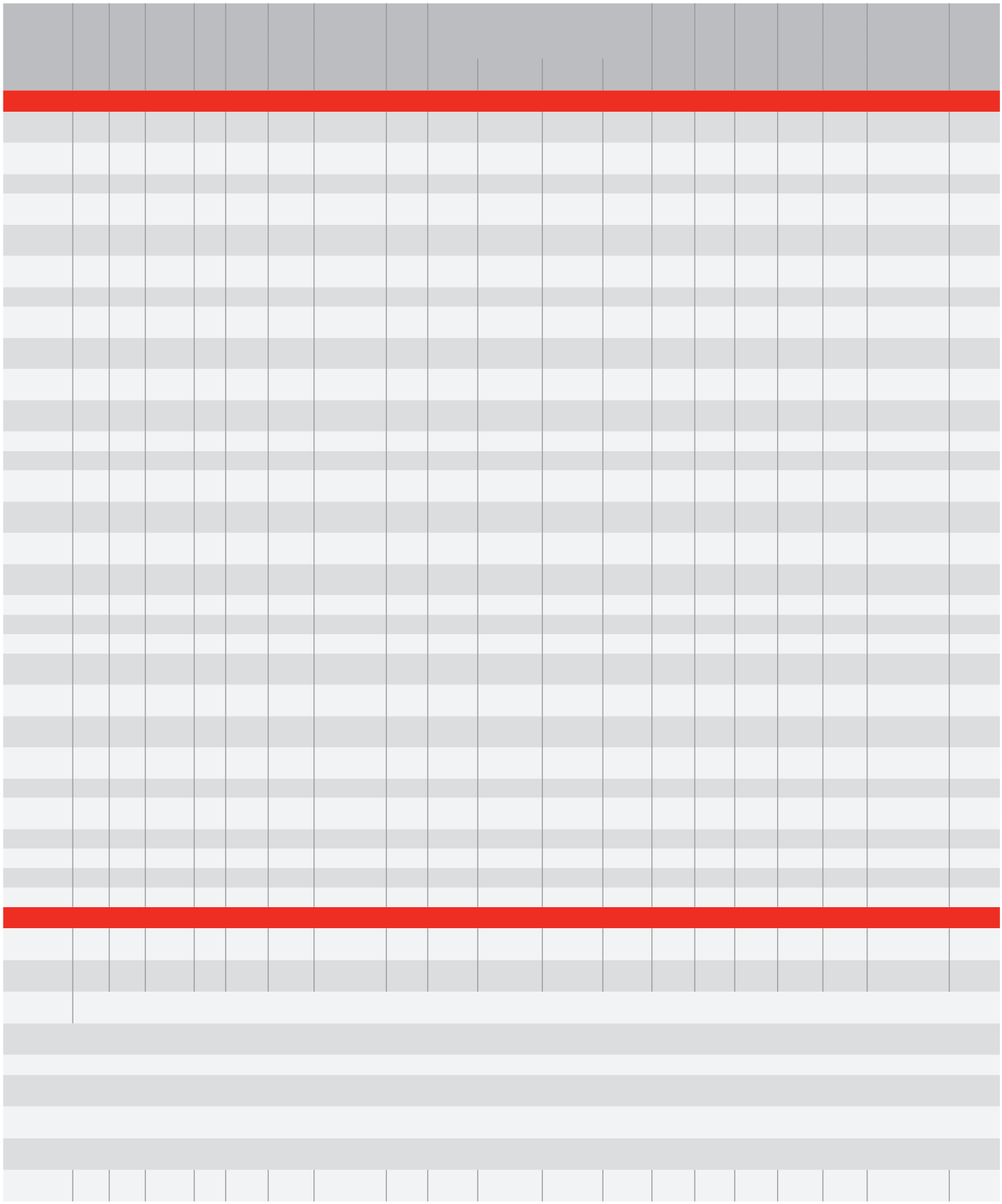
- 12-/14-/16-bit ADC driver/IF amps
- Wireless infrastructures
- High speed digitizers
- Military countermeasures
- Defense signal intelligence

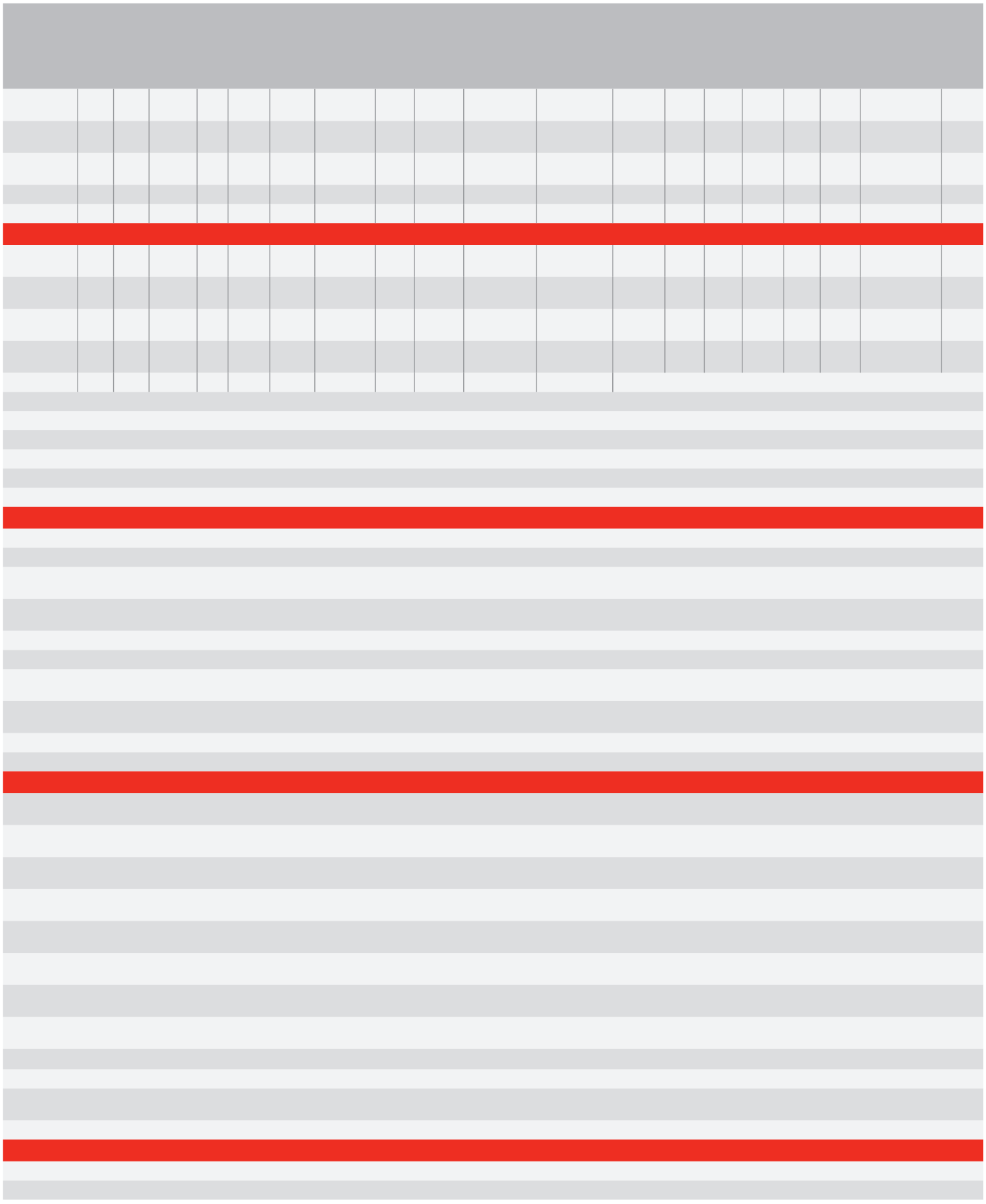
The THS770006 is a low-noise, fully differential operational amplifier that provides the high linearity and dynamic range performance required for driving 14- and 16-bit ADCs, in high IF architectures, for wireless infrastructure, test and measurement, and defense applications. The THS770006 will support 16 bits of full-scale (3Vp-p) precision up to 200MHz IF in order to drive high-speed ADCs with very low distortion. The THS770006 provides the dynamic range performance that is compatible with 16-bit high-speed signal chains, with lower distortion and higher linearity than competing solutions. The THS770006 was designed with a voltage-mode output to improve gain flatness in the pass band and eliminate the need for output inductors, thereby lowering BOM costs.

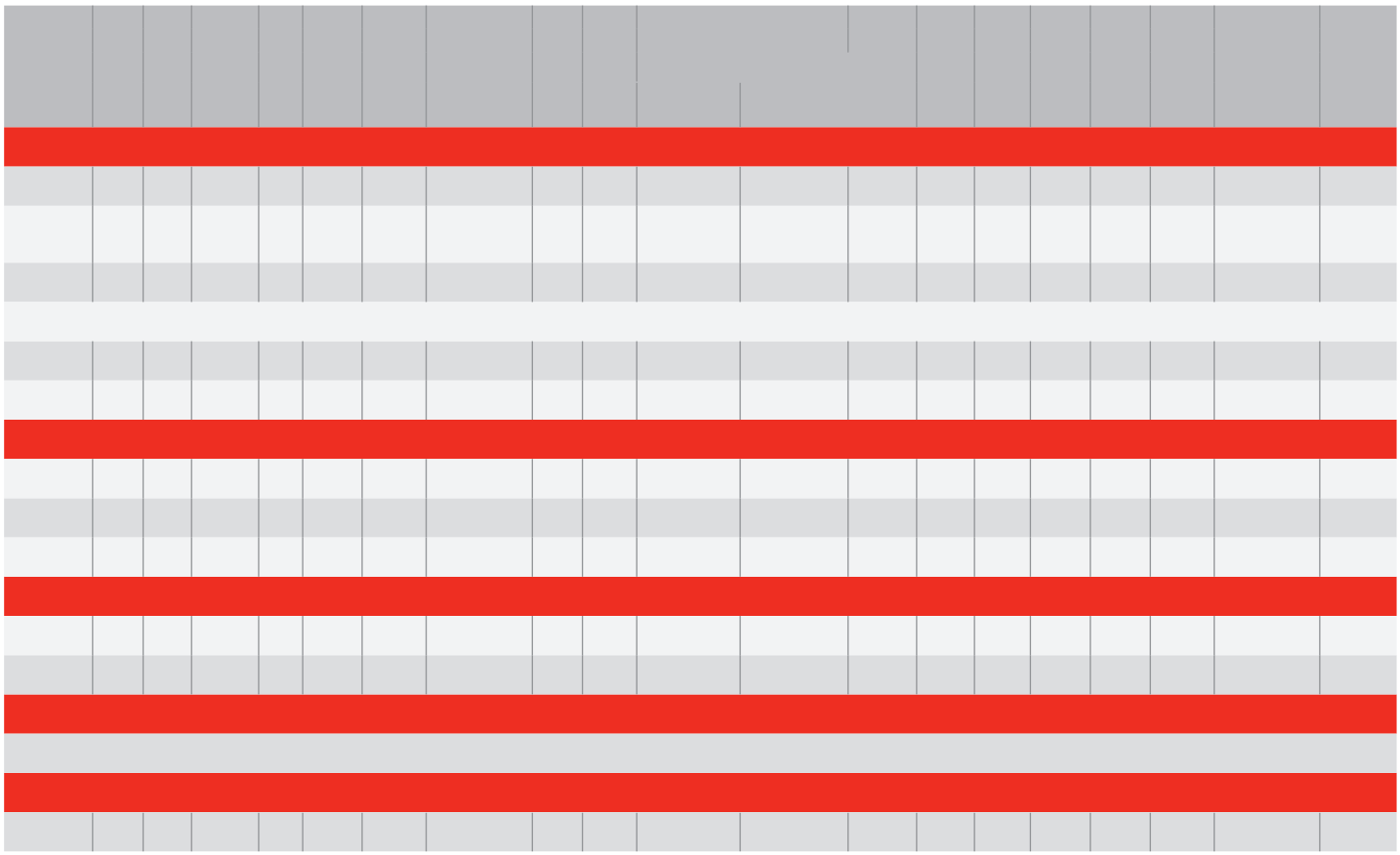


*770006 , . . , . . , . *

Hf - . A . . (>50MH)







Hf - . A . . (>50MH)

Hf - . A . . (>50MH)

Line Dri er

De ice	De crip ion	BW Gain = 1 (MH)	BW Gain = +2 (MH)	Sle Ra e (V/)	V_N f >1MH (nV/. H)	V_{OUT} S ing (R_{LOAD}) (min) (V)	Po er S ppl Range (V)	I_Q/ Ampli er (mA) (ma)	I_{OUT} (mA) (min)	Di able/ Po er Con rol	HiRel A ail.	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
THS6092008 0 Tdf[(1)10(8)10(0)10(0)]TJf4.383 037 0 Tdf[(+)102TJf5.95560 Tdf[(( )10(0TJf4.148 0 Td6)10(O)10(I)025008 07450DS(H)10(x)10(C)10(0)10(3)10(N)10(e)10(r)10( )1br r r													

0.65-Ω Dual SPDT Analog Switches with Negative Signaling Capability

TS5A22362, TS5A22364

Get samples and datasheets at: **www.ti.com/sc/device/TS5A22362** and **www.ti.com/sc/device/TS5A22364**

Key Features

- Specified break-before-make switching
- N/Span<<223/oJ8±Sbr7hSpS01$ 6 S li "S •25r2ds: #h""hJ=> 841Q361Q361Q

A A .

2W Class-D Audio Amplifier with Adaptive Boost and Battery Tracking SpeakerGuard™ AGC
TPA2015D1

Get samples, datasheets and application reports at: **www.ti.com/sc/device/TPA2015D1**

Key Features
- 2.0W into 8 at 3.6V (6% THD) delivering 36% louder audio than the leading competition
- Constant output power of 2.0W (3.6 to 5.0V) resulting in consistent audio loudness across the Li-ion battery
- Battery tracking SpeakerGuard™ that protects speakers by preventing clipping
- Battery tracking AGC that prevents early shutdown at low battery voltages (<3V)
- 2mm x 2mm, 0.5mm pitch 16-ball WCSP with 20% smaller package size than the competition
- High efficiency (81%) (at 1W and 3.6V) resulting in 34% longer battery life

Applications
- Cell phones
- PDAs
- PNDs
- Portable electronics

The TPA2015D1 is a 2.0W filter-free mono Class-D Audio power amplifier with integrated boost converter and battery tracking SpeakerGuard™ AGC technology that:

- Produces consistent audio loudness regardless of battery voltage by delivering constant output power over the Li-ion battery voltage
- Prevents early shutdown by limiting current at low battery voltages
- Protects speakers by preventing clipping of the audio output
- Offers a cheaper and higher performing successor to the boosted class-D product portfolio

2015 1

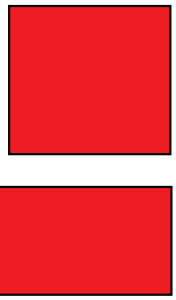
300W Stereo (600W Total) Class-D Amplifier with Integrated Closed-Loop Feedback
TAS5630/TAS5631

Get samples, datasheets and application reports at: **www.ti.com/sc/device/TAS5630, www.ti.com/sc/device/TAS5631**

Key Features
- Integrated closed-loop architecture
- PWM or analog input devices to provide design flexibility
- Flat THD at all frequencies and through to clipping
- Signal bandwidth up to 80kHz for high-frequency content from HD sources
- Ultra-low 0.03% THD at 1W into 4Ω

Applications
- Home theater
- Active speakers
- Mini combo systems
- AV receivers
- DVD receivers

The TAS5630/31 is a high-performance analog/PWM-input Class-D amplifier with integrated closed-loop feedback technology that drives up to 600W total power. Closed-loop architecture provides higher PSRR, which will not only provide better sound quality but reduce power supply requirements, allowing for improved system performance and cost. The efficiency of this class-D amplifier is greater than 88% while still providing ultra-low THD performance. The self-protection design integrates undervoltage protection, overtemperature, clipping, short-circuit and overcurrent protection to safeguard the device and speakers against fault conditions that could damage the system.



110 240

OPA1611/12:

Bipolar-Input Audio Op Amps

Key Features

- Ultra-low noise: 1.1nV/ $\sqrt{Hz}$ at 1kHz
- Ultra-low distortion: 0.000015% at 1kHz
- High slew rate: 27V/µs
- Wide bandwidth: 40MHz (G = +1)
- High open loop gain: 130dB
- Unity gain stable
- Low I_Q: 3.6mA per channel
- Rail-to-rail output
- Wide supply range: ±2.25V to ±18V
- Single and dual versions available in SO-8 packages

OPA1602/04:

Bipolar-Input Audio Op Amps

Key Features

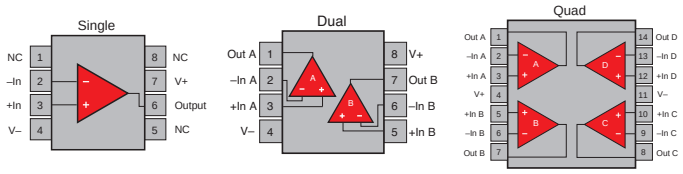
- Ultra-low noise: 2.5nV/ $\sqrt{Hz}$ at 1kHz
- Ultra-low distortion: 0.00003% at 1kHz
- High slew rate: 20V/µs
- Wide bandwidth: 35MHz (G = +1)
- High open loop gain: 120dB
- Unity gain stable
- Low I_Q: 2.6mA per channel
- Rail-to-rail output
- Wide supply range: ±2.25V to ±18V
- Dual version available in SO-8 and MSOP-8 packages
- Quad version available in SO-14 and TSSOP-14 packages

OPA1641/42/44:

FET-Input Audio Op Amps

Key Features

- Ultra-low noise: 5.1nV/ $\sqrt{Hz}$ at 1kHz
- Ultra-low distortion: 0.00005% at 1kHz
- High slew rate: 20V/µs
- Low input bias current: 15pA
- High open loop gain: 130dB
- Unity gain stable
- Low I_Q: 1.8mA per channel
- Rail-to-rail output
- Wide supply range: ±2.25V to ±18V
- Single and dual versions available in SO-8 and MSOP-8 packages
- Quad version available in SO-14 and TSSOP-14 packages



Non-A dio To ch-Screen Con roller

De ice	To ch Panel	Re . (Bi)	In erface	Fea re	ESD	V_{REF}	S ppl Vol age (V)	Po er Con mp ion (mW)	HiRel A ail.	Package( )	Price*
ADS7843	4-Wire	12(8)	Serial, SPI™	X, Y, AUX	2kV	Ext	2.7 to 5.25	1.8	N	SSOP-16	1.70
ADS7845	5-Wire	12(8)	Serial, SPI	X, Y, AUX	2kV	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	2kV	Int	2.7 to 5.25	1.8	N	SSOP-16, QFN-16 TSSOP-16, BGA-48	2.05
TSC2000	4-Wire	8, 10, 12	Serial, SPI	Processor, X, Y, Pressure, V_{BAT}, Temp, AUX, DAC	2kV	Int	2.7 to 3.6	6.2	N	TSSOP-16, QFN-16, BGA-48	2.55
TSC2003	4-Wire	12(8)	Serial, I^2C	X, Y, Pressure, V_{BAT}, Temp, AUX	2kV A , 2kV C	Int	2.7 to 5.25	1.8	N	TSSOP-16	2.25
TSC2004	4-Wire	12(10)	Serial, I^2C	Processor, X, Y, Pressure, Temp, AUX	18kV A, 15kV 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	2.5x2.5 WCSP-18, QFN-20	2.00
TSC2005	4-Wire	12(10)	Serial, SPI	Processor, X, Y, Pressure, Temp, AUX	18kV A, 15kV 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	2.5x3.0 WCSP-18	2.20
TSC2006	4-Wire	12(10)	Serial, SPI	Processor, X, Y, Pressure, Temp, AUX	18kV A, 15kV 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, I^2C	Processor, X, Y, Pressure, Temp, AUX	25kV A, 15kV C	V_{DD}	1.2 to 3.6	0.04 (typ)	N	1.5x2.0 WCSP-12, TSSOP-16	1.75
TSC2008	4-Wire	12(8)	Serial, SPI	Processor, X, Y, Pressure, Temp, AUX	25kV A, 15kV C	V_{DD}	1.2 to 3.6	0.04 (typ)	N	1.5x2.0 WCSP, QFN-16	1.75
TSC2014	4-Wire	12(10)	Serial, I^2C	Processor, X, Y, Pressure, Temp, AUX	18kV A, 15kV 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	2.5x2.5 WCSP-18, QFN-20	2.00
TSC2046	4-Wire	12(8)	Serial, SPI	X, Y, Pressure, V_{BAT}, Temp, AUX	2kV A, 2kV 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	18kV A, 15kV 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
TSC2200	4-Wire	8, 10, 12	Serial, SPI	Processor, X, Y, Pressure, V_{BAT}, Temp, KP, AUX, DAC	2kV	Int	2.7 to 3.6	6.2	N	TSSOP-16, QFN-16, BGA-48	2.60
TSC2017	4-Wire	12	Serial, I^2C	Processor, X, Y, Pressure, Temp, AUX	25kV A, 15kV C	V_{DD}	1.6 to 3.6	37µW	N	1.6mm x 1.6mm WCSP	1.95

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

DRV401

Get samples and datasheets at: **www.ti.com/sc/device/DRV401**

Key Features

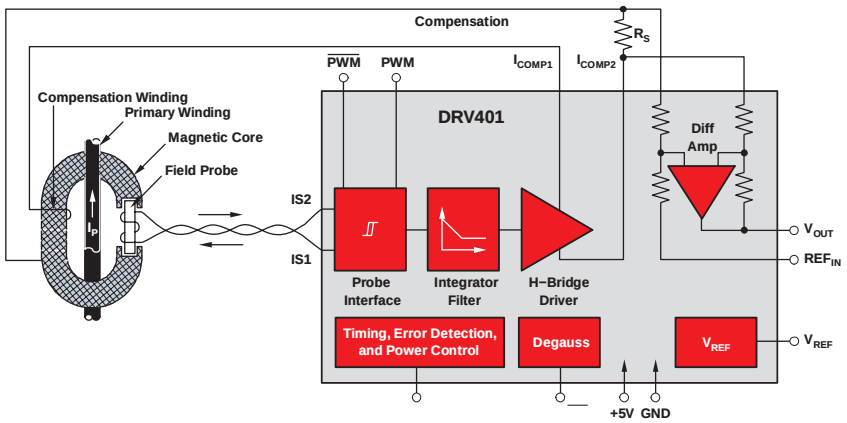
- Designed for sensors from Vacuumschmelze (VAC)
- Single supply: 5V
- Power output: H-bridge
- Designed for driving inductive loads
- Excellent precision
- Wide system bandwidth
- High-resolution, low-temperature drift
- Built-in degauss system
- Extensive fault detection
- External high-power driver option

Applications

- Generator/alternator monitoring and control
- Frequency and voltage inverters
- Motor drive controllers
- System power consumption
- Photovoltaic systems

The DRV401 is designed to control and process signals from specific magnetic current sensors made by Vacuumschmelze GmbH & Co. KG (VAC). A variety of current ranges and mechanical configurations are available. Combined with a VAC sensor, the DRV401 monitors both AC and DC currents to high accuracy.

Provided functions include: probe excitation, signal conditioning of the probe signal, signal loop amplifier, an H-bridge driver for the compensation coil and an analog signal output stage that provides an output voltage proportional to the primary current. It offers overload and fault detection, as well as transient noise suppression.



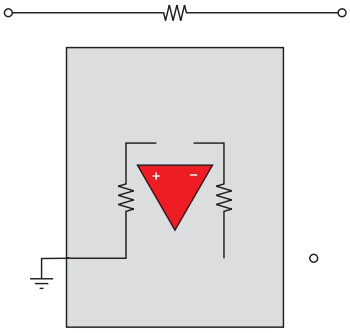
! 401 , . . . , ... , ...)

PWM Po er Dri er

De ice	De crip ion	S ppl Vol age (V)	O p C rren (A) (p)	Sa ra ion Vol age (V)	R_{ON} ( )	Freq enc (kH)	HiRel A ail.	Package( )	Price*
Single S i ch									
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	1.2A, High-Efficiency PWM Power Driver	2.7 to 5.5	1.2	0.48	0.4	250/500	N	SOIC-PowerPAD, 4mm x 4mm MicroStar Junior™	12.00
DRV591	±3A, High-Efficiency PWM Power Driver	2.8 to 5.5	3	0.195	0.065	100/500	N	9x9 PowerPAD QFP	11.00
DRV592	±3A, High-Efficiency H-Bridge	2.8 to 5.5	3	0.195	0.065	1000	N	9x9 PowerPAD QFP	2.85
DRV593	±3A, High-Efficiency PWM Power Driver	2.8 to 5.5	3	0.195	0.065	100/500	N	9x9 PowerPAD QFP	10.80
DRV594	±3A, High-Efficiency PWM Power Driver	2.8 to 5.5	3	0.195	0.065	100/500	N	9x9 PowerPAD QFP	10.80
Sen or Signal Condi ioning									
DRV401	Signal Cond. for Magnetic-Current Sensor	4.5 to 5.5	0.2	0.4	—	2000	Y	QFN-20, SOIC-20	2.05

* . . . . . 1,000. S ***www.ti.com/hirel.*** H R ,

N , . . a . . . _bold red.



C rren Sh n Moni or

De ice	De crip ion	Gain (V/V)	Off e (V) (ma)	Off e Drif (V/ C) (ma)	CMRR (dB) (p)	BW (kH) (p)	O p Vol age S ing (V) (min)	Po er S ppl (V)	I_Q (mA) (ma)	HiRel A ail.	Package( )	Price*

The TMP112 leads the industry in digital temperature sensor accuracy, low power and package size. The performance of the TMP112 offers accuracy of ±0.5°C and a resolution of 0.0625°C, making it easy to achieve precision thermal management out of the box. The additional calibrated drift slope specification allows designers to achieve even better than ±0.5°C accuracy over user-specified temperature ranges with a single-point calibration technique, making the TMP112 the highest accuracy digital temperature sensor in the world and bringing new flexibility to portable design.

Remo e Tempera re Sen or

De ice	De crip ion	Fea re	Remo e Sen or Acc rac O er Temp Range (C) (ma)	Local Sen or Acc rac O er Temp Range (C) (ma)	Remo e Sen or Temp Range (C)	S ppl Vol age (V)	I_Q (A) (p)	HiRel A ail.)	Package( )	Price*
TMP400	Remote and Local Temp Sensor with Programmable Non-Ideality Factor	n-Factor Correction, Series Resistace Cancellation, Alert Flag	1	2.5	–40 to +125	2.7 to 5.5	420	N	QSSOP-16	0.85
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 SOT-23-8	n-Factor Correction, Series Resistance Cancellation, Fault Detection	1	2	–40 to +150	2.7 to 5.5	400	N	SOT-23-8	0.55
TMP422	2x Remote and Local Temp Sensor in SOT-23-8	n-Factor Correction, Series Resistance Cancellation, Fault Detection	1	2	–40 to +150	2.7 to 5.5	400	N	SOT-23-8	0.65
TMP423	3x Remote and Local Temp Sensor in SOT-23-8	n-Factor Correction, Series Resistance Cancellation, Fault Detection	1	2	–40 to +150	2.7 to 5.5	400	N	SOT-23-8	0.75
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 SOT-23-8	Beta Correction, n-Factor Correction, Series Resistance Cancellation, Fault Detection	1	2	–40 to +150	2.7 to 5.5	400	N	SOT-23-8	0.55
TMP442	2x Remote and Local Temp Sensor with Beta Correction in SOT-23-8	Beta Correction, n-Factor Correction, Series Resistance Cancellation, Fault Detection	1	2	–40 to +150	2.7 to 5.5	400	N	SOT-23-8	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

*S a U.S. a . a . 1,000.

N a . bold red.

Tempera re S i che

De ice	De crip ion	Trip Poin Acc rac (C) (p)	H ere i (C)	Speci ed Temp Range (C)	S ppl Vol age (V)	I_Q (A) (ma)	HiRel A ail.	Package( )	Price*
TMP300	Comparator-Output Temperature Switch with Additional Analog Output	±2	5 or 10	–40 to +125	1.8 to 18	110	N	SC70-6, SOT-23-6	0.50
TMP302	Low-Power, High-Accuracy Temperature Switch	± 0.2	5 or 10	–40 to +125	1.4 to 3.6	15	N	SOT-563	0.30
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	0.30

Fan Con roller

De ice	De crip ion	Acc rac (C) (p)	Inp	Fan Con rol Mode	O p	I_Q (mA)	S ppl Vol age (V)	In erface	HiRel A ail.	Package	Price*
AMC6821	±1°C Remote and Local Temp Sensors with Integrated Fan Controller	±1	1 Local and 1 Remote Temp	Programmable, Automatic and Fixed RPM	Programmable PWM Frequency and Duty Cycle	2 (Active)	2.7 to 5.5	I^2C/ SMBus	Y	SOP-16 4mm x 5mm	0.99

Precision Voltage-to-Current Converter/Transmitter

XTR111

Get samples, datasheets, evaluation modules and app reports at: **www.ti.com/sc/device/XTR111**

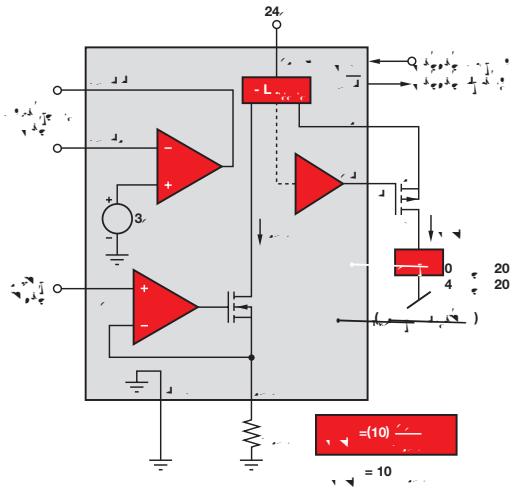
Key Features

- Wide supply range: 7V to 44V
- Current or voltage output
- Accuracy: 0.015%
- Output error detection and disable
- Adjustable 3V to 15V sub-regulator
- Nonlinearity: 0.002%
- Offset drift: 1µV/°C
- Low supply current: 550µA
- Packaging: DFN-10, MSOP PowerPAD™

Applications

- Universal voltage-controlled current source
- Current or voltage output for 3-wire sensor systems
- PLC output programmable drivers
- Current-mode sensor excitation

The XTR111 is a precision voltage-to-current converter designed for standard 0-20mA or 4-20mA analog signals and can source up to 36mA. It is ideal for 3-wire sensors and for the analog outputs of control systems like programmable logic controllers (PLCs). Sensor excitation and common voltage-to-current (source) applications will benefit from its high accuracy (0.015%).



111

3ppm/°C Drift, 0.05% Accurate, Low-Noise, Precision Series Voltage References

REF5020, REF5025, REF5030, REF5040, REF5045, REF5050, REF5010

Get samples, datasheets and app reports at: **www.ti.com/sc/device/PARTnumber** (Replace **PARTnumber** with **REF5020**, **REF5025**, **REF5030**, **REF5040**, **REF5045**, **REF5050** or **REF5010**)

Key Features

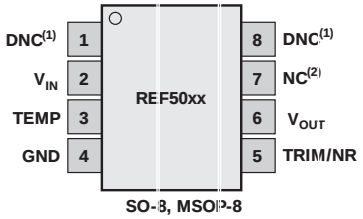
- High accuracy: 0.05%
- Low temperature drift: 3ppm/°C (max)
- Very low noise: 3μV_{PP}/V
- High output current: ±10mA
- Wide supply range: 2.7V to 18V
- Industrial temperature range: –40°C to +125°C
- Packaging: SO-8, MSOP coming soon

Applications

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

The REF50xx brings a new level of precision to the TI series voltage reference line. Offering 3ppm/°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	2.048V
REF5025	2.5V
REF5030	3.0V
REF5040	4.096V
REF5045	4.5V
REF5050	5V
REF5010	10V



SO-8, MSOP-8

Clock Distribution

CDCLVC11xx

Get samples and datasheets at: **www.ti.com/sc/device/CDCLVC1102**

Key Features

- Family of high-performance 1:2/3/4/6/8/10/12 LVCMOS clock fan-out buffers
- Very low pin-to-pin skew <50ps
- Very low additive jitter <100fs RMS (12kHz to 20MHz)
- Supply voltage: 33.(alText<FEFF0020>>> BtF0020>>> B330MHz))TjAT*A[(•)-219(SupiualText<FEFF0020>>> BDC A( )TjAEMC A(addiSxt<F
- VaHz
- V lText<FEFF0020>>> BDC A( )TjAEMC A(pin-to oS</A22lText<FEFF0020>>> BDC A( )TjAEMC A(voltaalTex07S</A22lText<FEFF0020>>>

Clock Distribution
CDCLVP12xx/21xx

NEW

Get samples and datasheets at: **www.ti.com/sc/device/CDCLVP1204**

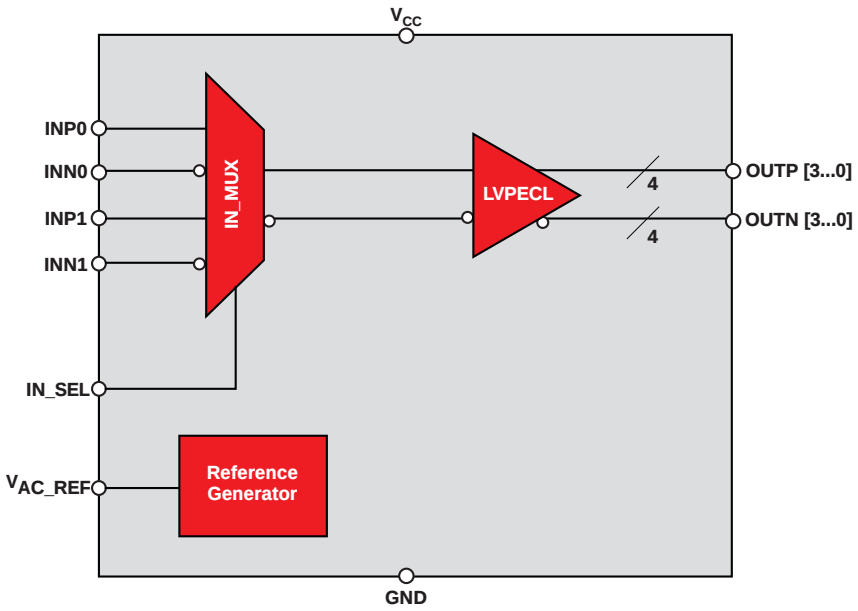
Key Features

- Family of high-performance 2:4/8/12/16 or dual 1:2/4/6/8 universal-to-LVPECL clock fan-out buffers
- Universal inputs accept LVPECL, LVDS and LVCMOS/LVTTL
- Maximum clock frequency: 2GHz
- Very low additive jitter <100fs RMS (10kHz-20MHz)
- 2.375-V to 3.6-V device power supply
- Low output skew of 30ps (max)
- LVPECL reference voltage, V_{AC_REF}
- Available for capacitive-coupled inputs
- Industrial temperature range: –40°C to +85°C

Applications

- Wireless communications
- Telecommunications/networking
- Medical imaging
- Test and measurement equipment

The CDCLVP12xx/21xx are highly versatile, low additive jitter buffers that can generate up to 16 copies of LVPECL clock outputs from one of two selectable LVPECL, LVDS or LVCMOS inputs for a variety of communication applications. The devices have a maximum clock frequency up to 2GHz. The CDCLVP12xx/21xx feature an on-chip multiplexer (MUX) for selecting one of two inputs that can be easily configured solely through a control pin. The overall additive jitter performance is <100fs RMS (10kHz to 20MHz) and overall output skew is as low as 30ps, making the device a perfect choice for use in demanding applications.



Clock Di rib ion

De ice	De crip ion	Inp Le el	O p Le el	Freq enc (MH)	V_{CC} (V)	Propaga ion Dela	O p Ske (ma) (p)	Char. Temp. (C)	HiRel A ail.	Package( )	Price*
Fan-O Clock B ffer (Non-PLL)											
Differen ial-Ended											
CDCLVP1102	Low-Jitter 1:2 Universal-to-LVPECL Buffer	LVPECL/LVDS/LVCMOS	LVPECL	0 to 2GHz	2.5/3.3	450ps (max)	10ps	–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 2GHz	2.5/3.3	450ps (max)	15ps	–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 2GHz	2.5/3.3	450ps (max)	20ps	–40 to 85	N	QFN-28	5.00
CDCLVP1212	Low-Jitter, 2-Input Selectable 1:12 Universal-to-LVPECL Buffer	LVPECOS	LVPECL	0 to 2GHz	2.5/3.3		LVPECL 0 to 2GHz			1:12 Universal-to-LVPECL Buffer	

Clock Di rib ion (con in ed)

De ice	De crip ion	Inp Le el	O p Le el	Freq enc (MH)	V_{CC} (V)	Propaga ion Dela	O p Ske (ma) (p)	Char. Temp. (C)	HiRel A ail.	Package( )	Price*
Fan-O Clock B ffer (Non-PLL)											
Differen ial-Ended											
SN65EPT21	1:1 LVTTL-to-LVPECL Buffer	LVTTL	LVPECL	0 to 600	3.3	1900ps (max)	250	–40 to 85	N	SOIC-8/MSOP-8	1.80
SN65EPT22	2:2 LVTTL-to-LVPECL Buffer	LVTTL	LVPECL	0 to 4GHz	3.3	420ps (typ)	50	–40 to 85	N	SOIC-8/MSOP-8	1.80
SN65EPT23	2:2 LVPECL-to-LVTTL Buffer	LVPECL	LVTTL	>300	3.3	1900ps (max)	110	–40 to 85	N	SOIC-8/MSOP-8	1.80
SN65LVEL11	1:2 ECL/PECL Buffer	ECL/PECL	ECL/ PECL	0 to 1.5GHz	3.3	265ps (typ)	18	–40 to 85	N	SOIC-8/MSOP-8	1.45
SN65LVELT22	2:2 LVTTL-to-LVPECL Buffer	LVTTL	LVPECL	0 to 3.5GHz	3.3	450ps (typ)	50	–40 to 85	N	SOIC-8/MSOP-8	1.45
SN65LVELT23	2:2 LVPECL-to-LVTTL Buffer	LVPECL	LVTTL	>180	3.3	2200ps (max)	150	–40 to 85	N	SOIC-8/MSOP-8 SOIC-8/MSOP-8	2.30
SN65LVEP11	1:2 ECL/PECL Buffer	ECL/PECL	ECL/ PECL	0 to 3GHz	2.5/3.3	240ps (typ)	15	–40 to 85	N	SOIC-8/MSOP-8	2.20
Single-Ended											
CDC3RL02	1:2 Square2.237.961 0 T3717CSN65LL0013(S)29(5027)29(L)3r2066206SN65 _4 1 60 N										

Clock Di rib ion (con in ed)

De ice	De crip ion	Inp Le el	O p Le el	Freq enc (MH)	V_{CC} (V)	Ji er (Peak- o-Peak [P-P] or C cle- o- C cle [C-C])	Pha e Error	Char. Temp. (C)	HiRel A ail.	Package( )	Price*
Zero-Dela B ffer (PLL-Ba ed)											
Differen ial-Ended											
CDCV850	1:10 Differential Clock Driver	SSTL_2/ Universal	SSTL_2	60 to 140	2.5	C-C: ±30ps (100 to 133MHz)	–80/150ps (133MHz)	–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: ±50ps (100 to 180MHz)	±100ps (100 to 180MHz)	–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: ±75ps (100 to 200MHz)	–150/50ps (200MHz)	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: ±50ps (100 to 180MHz)	±100ps (100 to 180MHz)	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: ±50ps (100 to 200MHz)	±50ps (min/ max) (100 to 200MHz)	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: ±50ps (100 to 200MHz)	±50ps (min/ max) (100 to 200MHz)	–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: ±35ps (133 to 200MHz)	±50ps (min/ max) (100 to 200MHz)	–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: ±30ps (190 to 340MHz)	±50ps	–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: ±30ps (190 to 340MHz)	±50ps	–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: ±30ps (190 to 340MHz)	±50ps	–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: ±40ps (200 to 333MHz)	±50ps	–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: ±40ps (160 to 410MHz)	±50ps	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 200MHz)	±150ps (66 to 200MHz)	–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 166MHz)	±125ps (66 to 166MHz)	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 166MHz)	±125ps (66 to 166MHz)	0 to 85	N	TSSOP-24	2.60

* 1,000. S www.ti.com/hirel. H R ,

Clock Generator/Jitter Cleaner with Integrated Dual VCO

CDCE6200x

Get samples and datasheets at: **www.ti.com/sc/device/CDCE62005**

Key Features

- Fully integrated synthesizer – PLL, VCO, partially integrated loop filter
- Two universal (LVPECL/LVDS/LVCMOS inputs), one auxiliary/XTAL input
- Up to 5 fully configurable outputs up to 1.175GHz (LVPECL, LVDS or 2-LVCMOS)
- Integrated RMS jitter <500fs (10kHz-20MHz)
- On-chip EEPROM determines default state at power-up; fully programmable via SPI™ port

Applications

- Data converter and data aggregation clocking
- Wireless infrastructure
- Switches and routers
- Medical electronics
- Military and aerospace
- Industrial
- Clock generation and jitter cleaning

The CDCE6200x is a high-performance clock generator and distributor featuring low output jitter, a high degree of configurability via a SPI™ interface and programmable start-up modes determined by on-chip EEPROM. Specifically tailored for clocking data converters and high-speed digital signals, the CDCE6200x achieves jitter performance <1ps RMS jitter (10kHz to 20MHz). It incorporates a synthesizer block with partially integrated loop filter, a clock distribution block including programmable output formats and an input block featuring an innovative smart multiplexer. The clock distribution block includes up to five individually programmable outputs that can be configured to provide difC A[( )T1fAEMCoHalTe1A( )Tt<F

Clock Oscillator Replacements
CDCE9xx

Get samples and datasheets at: **www.ti.com/sc/device/CDCE949**

Key Features

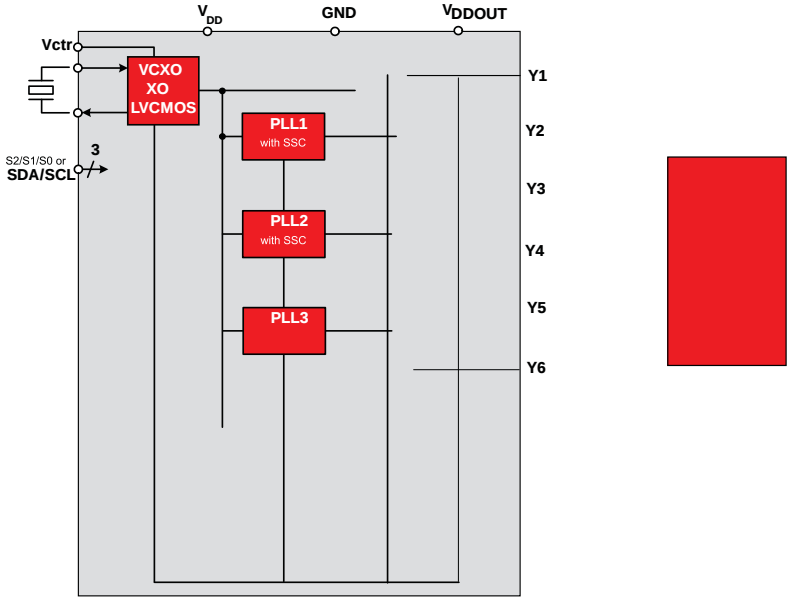
- Fully programmable clock synthesizer with 3.3V/2.5V/1.8V I/Os
- Up to 4 internal fractional PLLs enable 0-PPM clock generation
- Up to 9 low-jitter, low-skew LVCMOS outputs up to 230MHz
- Flexible input clocking concept
  - External crystal: 8MHz to 32MHz
  - On-chip VCXO: pull-range ±150ppm
  - Single-ended LVCMOS up to 160MHz

Applications

- D-TV, HD-TV, STB, IP-STB, DVD-players, DVD recorders, printers
- General-purpose frequency synthesizing
- DSP, DaVinci™ and OMAP™ attach audio and video clocking

The CDCE(L)9xx are modular PLL-based low-cost, high-performance, programmable clock generators/synthesizers. They generate up to 9 output clocks from a single input frequency. Each output can be programmed in-system for any clock frequency up to 230MHz, using up to four independent configurable PLLs.

The CDCE9xx have separate output supply pins for V_{DD}OUT 2.5V and 3.3V, whereas the CDCEL9xx supports 1.8V. The input accepts an external crystal or LVCMOS clock signal. If an external crystal is used, an on-chip load capacitor is adequate for most applications. The value of the load capacitor is programmable from 0 to 20pF. Additionally, an on-chip VCXO is selectable, allowing synchronization of the output frequency to an external control (PWM) signal.



949

Clock Oscillator Replacements
CDCM6100x

Get samples and datasheets at: **www.ti.com/sc/device/CDCM61004**

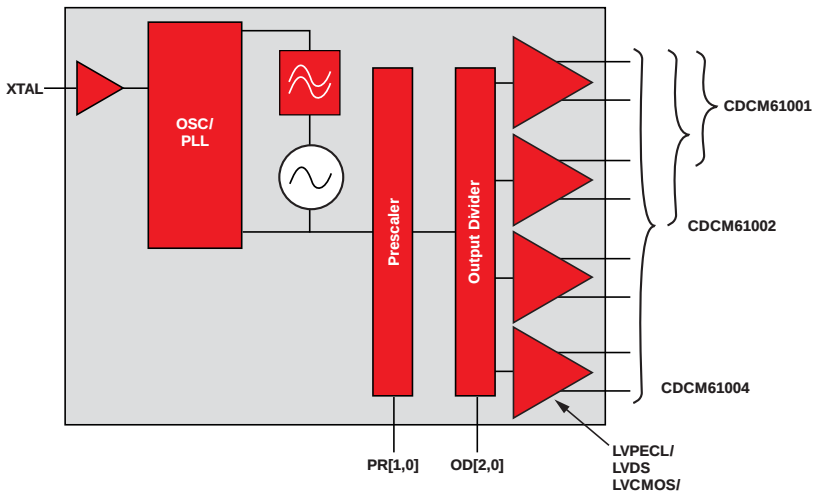
Key Features

- Input frequency range: 21.875MHz to 28.47MHz
- Output frequency range: 43.75MHz to 683.264MHz
- Device settings managed through a control pin structure (prescaler and feedback divider, output divider, output type)
- Supports common frequencies utilized in datacom, telecom and consumer applications
- Low-jitter outputs <1ps RMS (10kHz to 20MHz), ~25ps pk-pk

Applications

- Precision clock generator for:
  - Datacom/telecom/networking
  - Wireless infrastructure
  - High-frequency, high-cost XO replacement

The CDCM6100x is a highly versatile, low-jitter frequency synthesizer that can generate up to four low-jitter clock outputs (selectable between LVPECL, LVDS or LVCMOS outputs) from a low-frequency crystal input for a variety of wireline and data communication applications. The CDCM6100x features an onboard PLL that can be easily configured solely through control pins. The overall output random jitter performance is <1ps RMS (10kHz-20MHz), making this device a perfect choice for use in demanding applications such as SNET, Ethernet, Fibre Channel and SAN.



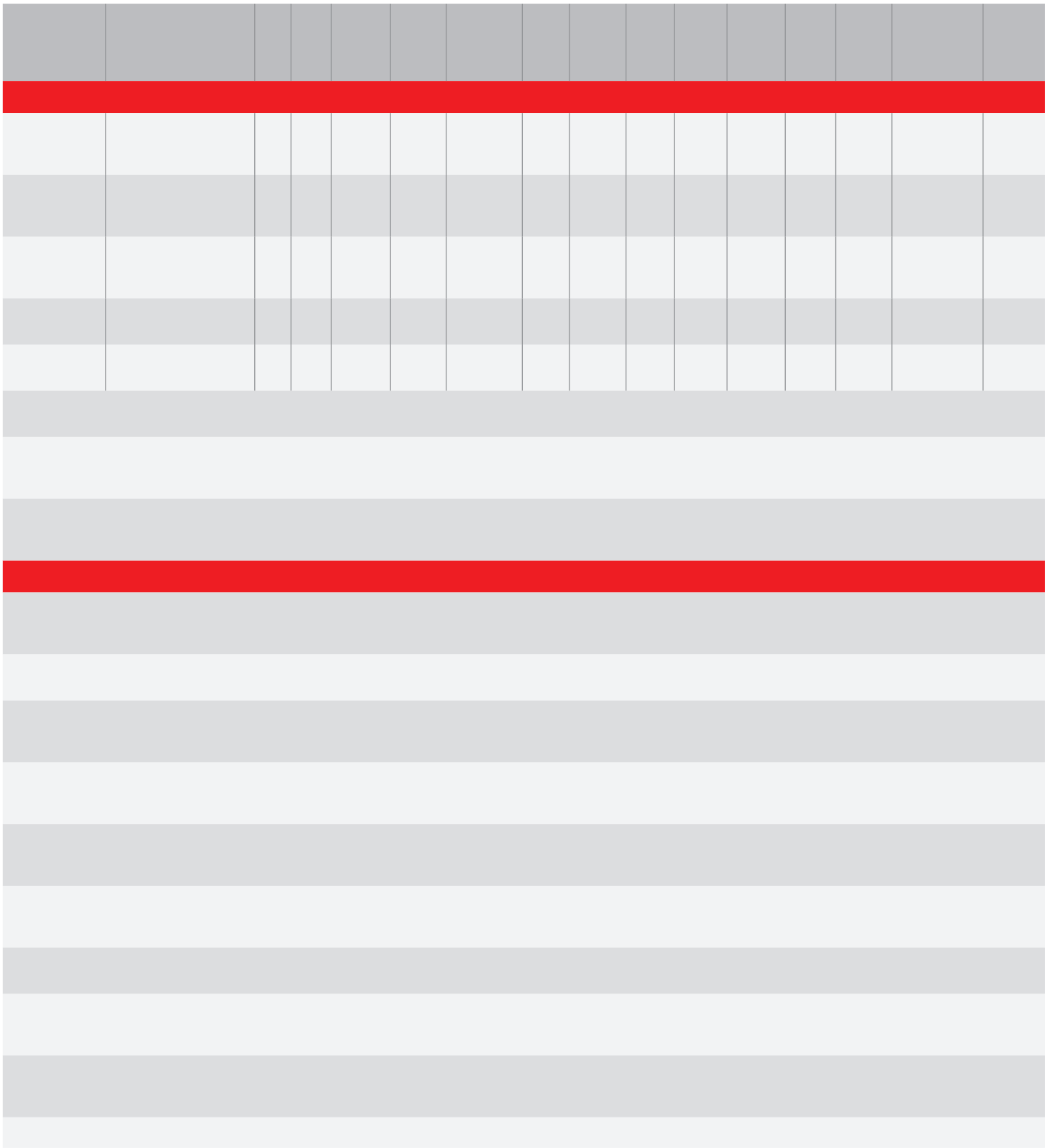
6100

Clock Genera ion

De ice	De crip ion	Inp Le el	O p Le el	Freq enc (MH)	V_{CC} (V)	Ji er (Peak-o-Peak [P-P] or C cle- o-C cle [C-C])	Pha e Error	O p Ske (ma) (p)	Char. Temp. (C)	HiRel A ail.	Package	Price*
Cr al O cilla or (XO) Replacemen , Differen ial-Ended												
CDCE421A	Flexible Low-Jitter Clock Generator, 10MHz to 1.1GHz	Crystal/ LVCMOS	LVDS/LVPECL	11 to 1100	3.3	—	<1ps rms	—	–40 to 85	N	Die/QFN-24	7.10
CDC421A100	Low-Jitter 100MHz Clock Generator for PCI Express	Crystal/ LVCMOS	LVPECL	100	3.3	—	<1ps rms	—	–40 to 85	N	QFN-24	7.00
CDC421A106	Low-Jitter 106.25MHz Clock Generator for Fibre Channel	Crystal/ LVCMOS	LVPECL	106.25	3.3	—	<1ps rms	—	–40 to 85	N	QFN-24	7.00
CDC421A125	Low-Jitter 125MHz Clock Generator for Ethernet	Crystal/ LVCMOS	LVPECL	125	3.3	—	<1ps rms	—	–40 to 85	N	QFN-24	7.00
CDC421A156	Low-Jitter 156.25MHz Clock Generator for 10G Ethernet	Crystal/ LVCMOS	LVPECL	156.25	3.3	—	<1ps rms	—	–40 to 85	N	QFN-24	7.00
CDC421A212	Low-Jitter 212.5MHz Clock Generator for Fibre Channel	Crystal/ LVCMOS	LVPECL	212.5	3.3	—	<1ps rms	—	–40 to 85	N	QFN-24	7.00
CDC421A250	Low-Jitter 250MHz Clock Generator for PCI Express	Crystal/ LVCMOS	LVPECL	250	3.3	—	<1ps rms	—	–40 to 85	N	QFN-24	7.00
CDC421A312	Low-Jitter 312.5MHz Clock Generator for 10G Ethernet	Crystal/ LVCMOS	LVPECL	312.5	3.3	—	<1ps rms	—	–40 to 85	N	QFN-24	7.00

* 1,000.

C LVD /LVPECL/CML



C t LD /MLD

C LVDS/MLVDS

LVDS

Device	Description	No. of T	No. of R	Input Signal	Output Signal	Signaling Rate (Mbps)	Part-to-Part Skew Max (ps)	Tpd Typ. (ns)	Rpd Typ. (ns)	ICC Max (mA)	ESD HBM (kV)	Supply Voltage (V)	HiRel Avail.	Package	Price*
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

MLVDS

Device	No. of T	No. of R	R Type	Half/Full Duplex	Input Signal	Output Signal	Signaling Rate (Mbps)	Part-to-Part Skew Max (ps)	Tpd Typ. (ns)							

* ... 1,000. S ... www.ti.com/hirel. H R ...

Dual-Channel 0.47Gbps to 6.25Gbps Multi-Rate Transceiver

TLK6002

Get samples and datasheets at: **www.ti.com/sc/device/TLK6002**

Key Features

- Dual-channel 470Mbps to 6.25Gbps continuous/multi-rate transceiver
- Supports all CPRI and OBSAI data rates
- Integrated latency measurement function, accuracy of ±814ps
- CPRI/OBSAI automated rate sense (ARS) function
- Serial-side three-tap transmit de-emphasis and receive adaptive equalization to allow extended backplane reach
- Programmable output swing on serial output
- Interface to backplane, copper cables or optical modules
- Hot plug protection
- JTAG; IEEE 1149.1/1149.6 test

pan<</ActualText125FF002er16jA/Sp16 reSr .8867 to=d0>.)p6mÐ$P5k.=H(% 0d?h

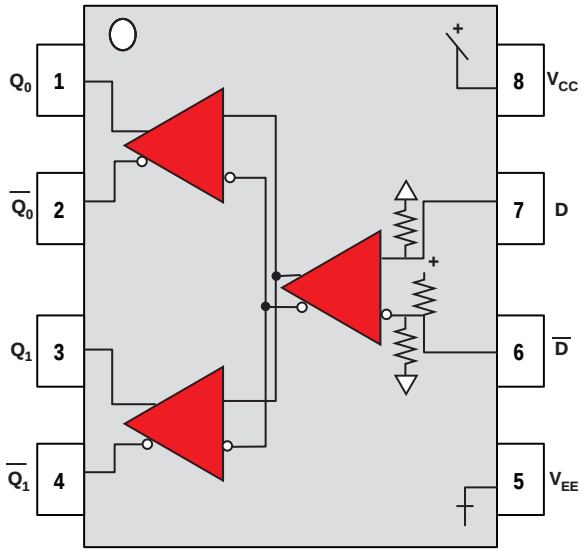
PECL/ECL 1:2 Fanout Buffer
SN65LVEP11

Get samples and datasheets at: **www.ti.com/sc/device/SN65LVEP11**

Key Features
- 1:2 PECL/ECL fanout buffer
- Support for clock frequencies >3.0GHz
- 240ps typical propagation delay
- Q output will default low when input is open or at VEE
- 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

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} 3V in PECL mode, or VEE 3V in NECL mode. The device is housed in an industry-standard SOIC-8 package and is also available in a TSSOP-8 package option.



65 1

PECL/ECL B ffer /Tran la or

De ice	No. of T	No. of R	Inp Signal	O p Signal	Freq enc	Tpd p (pS)	ICC Ma (mA)	ESD HBM (kV)	S ppl Vol age (V)	HiRel A ail.	Package( )	Pino	Price*
SN65EL11	2	1	ECL/ PECL	ECL/PECL	1.25GHz	265	32	3	5	N	SOIC-8, TSSOP-8	MC10EL11, MC100EL11	Web
SN65EL16	1	1	ECL	TTL	2GHz	250	23	3	5	N	SOIC-8, TSSOP-8	MC10EL16, MC100EL16	Web
SN65ELT20	1	1	TTL	PECL	500Hz	820	16	3	5	N	SOIC-8, TSSOP-8	MC10ELT20, MC100ELT20	Web
SN65ELT21	1	1	TTL	PECL	150Hz	3000	25	3	5	N	SOIC-8, TSSOP-8	MC10ELT21, MC100ELT21	Web
SN65ELT22	2	2	TTL	PECL	500Hz	1200	22	3	5	N	SOIC-8, TSSOP-8	MC10ELT22, MC100ELT22	Web
SN65ELT23	2	2	PECL	TTL	150Hz	3500	27	3	5	N	SOIC-8, TSSOP-8	MC10ELT23, MC100ELT23	Web
SN65EPT21	1	1	LVTTL	LVPECL	1.25GHz	420	26	3	3.3	N	SOIC-8, TSSOP-8	MC10EPT21, MC100EPT21	Web
SN65EPT22	2	2	LVTTL	LVPECL	1.25GHz	420	50	3	3.3	N	SOIC-8, TSSOP-8	MC10EPT22, MC100EPT22	Web
SN65EPT23	2	2	LVPECL	LVTTL	1.25GHz	420	25	3	3.3	N	SOIC-8, TSSOP-8	MC10EPT23, MC100EPT23	Web
SN65LVEL11	2	1	ECL	ECL	1.5GHz	265	26	3	2.5 to 3.3	N	SOIC-8, TSSOP-8	MC10LVEL11, MC100LVEL11	Web
SN65LVELT22	2	2	LVTTL	LVPECL	400Hz	350	33	3	3.3	N	SOIC-8, TSSOP-8	MC10LVEL22, MC100LVEL22	Web
SN65LVELT23	2	2	LVPECL	LVTTL	100Hz	3500	27	3	3.3	N	SOIC-8, TSSOP-8	MC10LVELT23, MC100LVELT23	Web
SN65LVEP11	2	1	ECL/ PECL	ECL/PECL	3GHz	240	45	3	2.5-3.3	N	SOIC-8, TSSOP-8	MC10LVEP11, MC100LVEP11	Web

* 1,000.

Two Channel SATA 6Gbps Redriver/Equalizer

SN75LVCP601

Get samples and datasheets at: **www.ti.com/sc/device/sn75lvcp601**

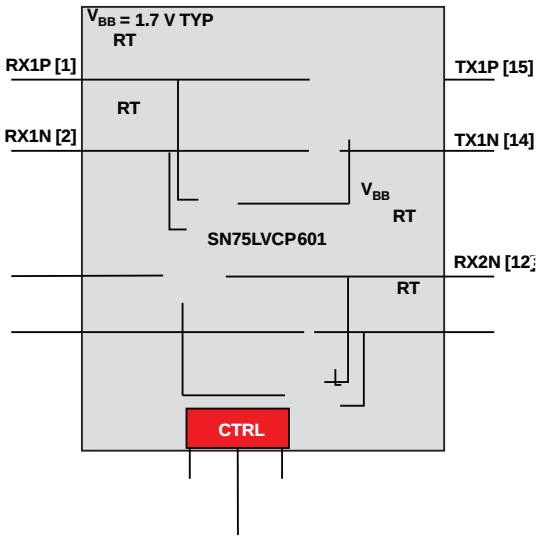
Key Features

- Single device supports 1.5/3/6Gbps two-channel redriver with fixed performance settings
- Integrated output squelch
- Programmable Rx/Tx equalization and de-emphasis width control
- Power-save feature lowers power by >80% in auto low-power mode
- Low power
  - <220mW typ
  - <50mW in auto low-power mode
  - <5mW in standby mode
- Excellent jitter and loss compensation capability to over 24in (61cm) FR4 trace
- Pin-compatible to LVCP412A/MAX4951

Applications

- Notebooks, desktops, docking stations, servers and workstations

SN75LVCP601 is a dual-channel, single-lane SATA redriver and signal conditioner supporting data rates up to 6Gbps. The device complies with SATA physical link 2m and 3i specifications. SN75LVCP601 operates from a single 3.3V supply and has 100 line termination with a self-biasing feature, making the device suitable for AC coupling. The inputs incorporate an out-of-band (OOB) detector, which automatically squelches the output while maintaining a stable common-mode voltage compliant to the SATA link. The device is also designed to handle spread-spectrum clocking (SSC) transmission per the SATA specification.



75LVCP601

Redriver/Equalizer

Device	Description	Protocol	Max Speed (Gbps)	No. of Channel	Sleep Mode Power (mW)	HiRel Avail.	Package	Price*
SN65LVPE501	Dual-Channel x1 PCI Express Gen II Redriver/ Equalizer	PCIe Gen2	5	2	5	N	VQFN-24	4.00
SN65LVPE502	Dual-Channel USB3.0 Redriver/Equalizer	SuperSpeed USB	5	2	5	N	VQFN-24	4.25
SN65LVPE504	Quad Channel (Half x4 Lane) PCI Express Gen II Redriver/Equalizer	PCIe Gen2	5	4	10	N	TQFN-42	5.40
SN75LVCP412	2-Channel SATA 3Gbps Repeater	SATA	3	2	5	N	QFN-20	1.40
SN75LVCP412A	2-Channel SATA 3Gbps Redriver	SATA	3	2	2.1	N	QFN-20	1.65
SN75LVCP412CD	2-Channel SATA 3Gbps Redriver with Cable Detect	SATA	3	2	2.1	N	QFN-20	1.80
SN75LVCP422	2-Channel SATA 3Gbps Repeater	SATA	3	2	5	N	SSOP-20	1.40
SN75LVCP601	2-Channel SATA 6Gbps Redriver/Equalizer	SATA	6	2	5	N	QFN-20	2.00
SN75LVCP600	1.5/3.0/6.0Gbps Single Channel SATA Redriver	SATA	6	1	10	N	WSON-8	1.00
SN75LVCP600S	1.5/3.0/6.0Gbps Single Channel SATA/SAS Redriver	SATA or SAS	6	1	10	N	WSON-10	1.10

SuperSpeed USB Transceiver with PIPE3 and ULPI Interfaces

TUSB1310

Get samples and datasheets at: **www.ti.com/sc/device/TUSB1310**

Key Features

- SuperSpeed USB (USB 3.0) compliant
  - One 5.0Gbps SuperSpeed connection
  - One 480Mbps HS/FS/LS connection
- Receiver sensitivity of less than
  50mV differential peak-to-peak is twice
  as good as required by the specification,
  alloMC AET2AET8103632 A/Tt (.9112n)TjA-12.018 -1.316 TdA(50mV)TjAETABTA/Span <</Ac262 Td18.8956 TmA12.9142129TjAE(spe1( )19

SuperSpeed USB-to-SATA bridge
TUSB9261

Get samples and datasheets at: **www.ti.com/sc/device/TUSB9261**

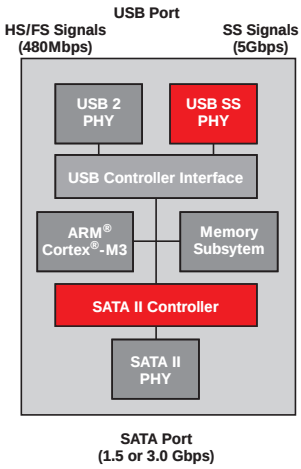
Key Features

- 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 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

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 exibility of the embedded microcontroller (MCU) and rmware. With the elaborate balance between the MCU and the state machine, it provides a bridge solution to meet both performance and exibility requirements of next-generation external storage devices.

Applications

- External storage:
  - SSDs
  - HDDs
  - Optical drives



9260

SuperSpeed USB Host Controllers
TUSB7320/40

Get samples and datasheets at: **www.ti.com/sc/device/TUSB7320**

USB

De ice	De crip ion	Ma USB Speed	Applica ion Proce or In erface	ESD HBM (kV)	HiRel A ail.	Package( )	Price*
USB Tran ci er (PHY)							
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

De ice	De crip ion	Ma USB Speed	In egra ed MCU	O End-Poin	In End-Poin	MCU Code Space (kB)	HiRel A ail.	Package( )	Price*
USB Peripheral (F nc ion)									
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

De ice	De crip ion	Ma USB Speed	Local B	Ma No. Ho Por	HiRel A ail.	Package( )	Price*
USB Ho and On- he-Go (OTG)							
TUSB6020							

IEEE P1394b Three-Port Cable Transceiver Arbiter

TSB81BA3E

Get samples, datasheets, evaluation modules and app reports at: **www.ti.com/sc/device/TSB81BA3E**

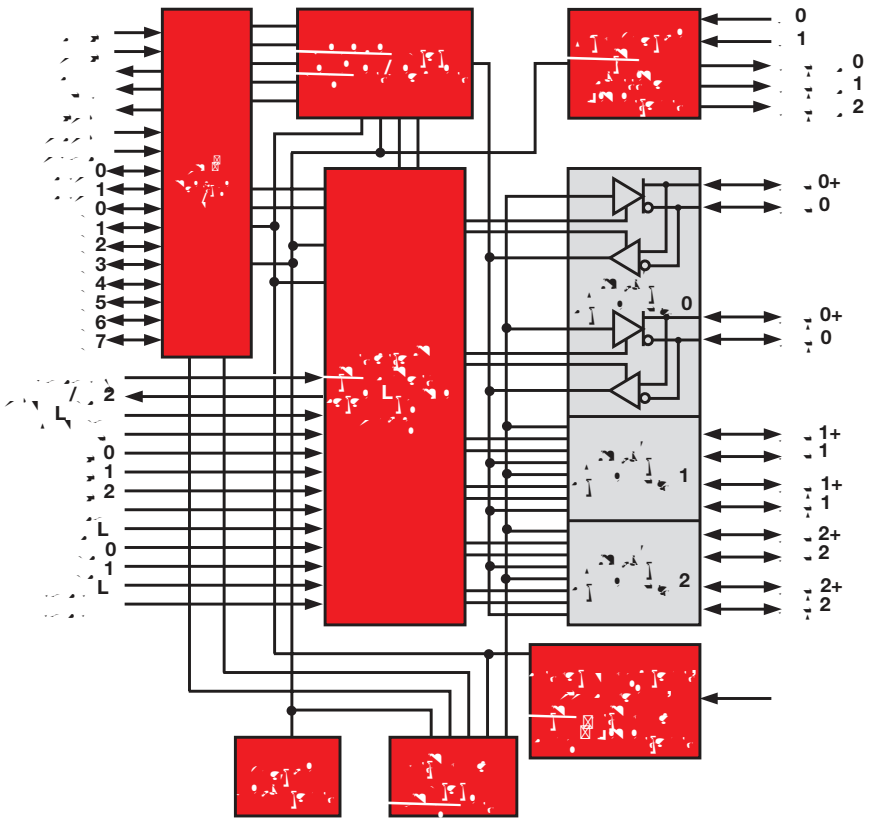
Key Features

- 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 800Mbps
- 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 49.152MHz) or 1394b mode (8 parallel bits at 98.304MHz)

Applications

- Storage devices
- Consumer electronics
- Desktop PCs

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.



1394

De ice	De crip ion	Por	Vol age (V)	Da a Ra e (Mbp)	HiRel A ail.	Package( )	Price*
1394 PHY							
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

DisplayPort 1:2 Switch with Integrated TMDS Translator

SN75DP122A

Get samples and datasheets at: **www.ti.com/sc/device/sn75dp122A**

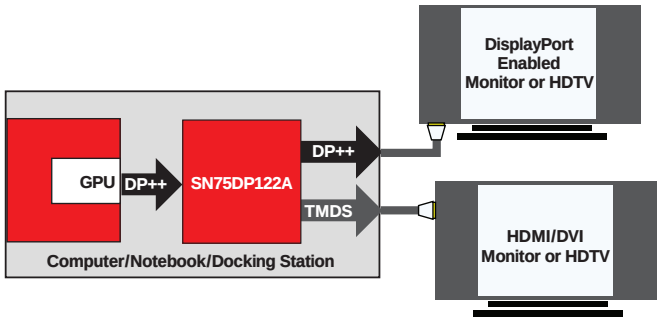
Key Features

- One input port to one of two output ports
- Integrated TMDS level translator with receiver equalization
- DP port supports data rates up to 2.7Gbps
- DP port supports dual-mode DisplayPort
- DP port output waveform mimics input waveform characteristics
- TMDS port supports data rates up to 2.5Gbps
- Integrated I²C logic block for DVI/HDMI connector recognition

Applications

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

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 De nition 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 bene ts of spread-spectrum clocking. Through the SN75DP122A, data rates of up to 2.7Gbps through each link for a total throughput of up to 10.8Gbps 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.



75 122

Di pla Por S i ch/Redri er

De ice	De crip ion	No. of Di pla Por D al Mode Inp	No. of TMDS O p	No. of Di pla Por D al Mode O p	HiRel A ail.	Package( )	Price*
SN75DP118	Display Port 1:1 Repeater	1	—	1	N	VQFN-36	1.20
SN75DP119	Embedded DisplayPort (eDP) Repeater	1	—	1	N	VQFN-14, VQFN-36	0.80
SN75DP119LV	1.1V Embedded DisplayPort (eDP) Repeater	1	—	1	N	VQFN-14	Call
SN75DP120	Display Port 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	5.4Gbps DisplayPort Redriver	1	—	1	N	QFN-48	Call
SN75DP139	DisplayPort to TMDS Translator	1	1	—	N	VQFN-48	1.05
SN75DP219	2-Lane Embedded 5.4Gbps DisplayPort (eDP) Signal Conditioner	1	—	1	N	QFN-14	Call
SN75DP221	2-Lane Embedded 5.4Gbps DisplayPort (eDP) 2:1 Signal Conditioner	1	—	2	N	QFN-32	Call
SN75DP222	5.4Gbps DisplayPort 2x2 Redriver	2	—	2	N	QFN-64	Call

* 1,000.

bold blue.

FlatLink™ 10-135MHz LVDS Transmitter
SN75LVDS83B

Get samples and datasheets at: **www.ti.com/sc/device/sn75lvds83b**

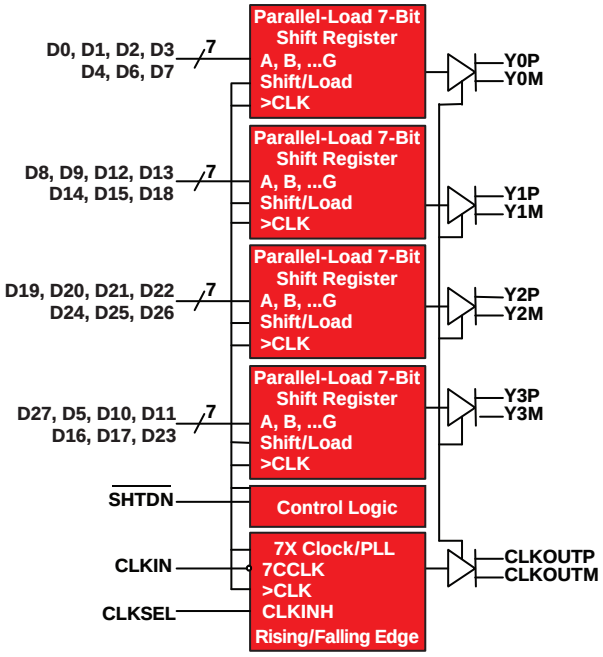
Key Features

- LVDS display SERDES interfaces directly to LCD display panels with integrated LVDS
- 1.8V up to 3.3V tolerant data inputs to connect directly to low-power, low-voltage application and graphic processors
- Transfer rate up to 135Mpps (megapixels per second); pixel clock frequency range 10MHz to 135MHz
- Suited for display resolutions ranging from HVGA up to HD with low EMI
- 28 data channels plus clock In low-voltage TTL to 4 data channels plus clock out low-voltage differential
- Consumes less than 1mW when disabled

Applications

- LCD display panel drivers
- UMPC and netbook PCs
- Digital picture frame

The SN75LVDS83B FlatLink™ LVDS transmitter contains four 7-bit parallel-load serial-out shift registers, a 7x clock synthesizer, and ve low-voltage differential signaling (LVDS) line drivers in a single integrated circuit. These functions allow 28 bits of single-ended LVTTL data to be synchronously transmitted over ve balanced-pair conductors for receipt by a compatible receiver, such as the SN75LVDS82 and LCD panels with integrated LVDS receiver.



75 83

Fla Link LVDS Tran mi er

De ice	De crip ion	Parallel Inp or O p	Serial Channel	Da a Thro ghp (Mbp)	PLL Freq enc (MH)	S ppl Vol age (V)	HiRel A ail.	Package	Price*
Fla Link LVDS Recei er									
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

De ice	De crip ion	Parallel Inp or O p	Serial Channel	Da a Thro ghp (Mbp)	PLL Freq enc (MH)	S ppl Vol age (V)	HiRel A ail.	Package( )	Price*
Fla Link LVDS Tran mi er									
SN75LVDS84A	FlatLink Transmitter	21	3	1575	31 to 75	3.3	N	TSSOP-48	2.35
SN75LVDS83B	FlatLink 10-135MHz Transmitter	28	4	3780	10 to 135	3.3	N	BGA-56 MicroStar Junior™, TSSOP-56	2.60

* 1,000.

Fla Link LVDS (con in ed)

De ice	De crip ion	Parallel Inp or O p	Serial Channel	Da a Thro ghp (Mbp)	PLL Freq enc (MH)	S ppl Vol age (V)	HiRel A ail.	Package	Price*
Fla Link 3G LVDS Recei er									
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
Fla Link 3G LVDS Tran mi er									
De ice	**De crip ion**	**Parallel Inp or O p**	**Serial Channel**	**Da a Thro ghp (Mbp)**	**PLL Freq enc (MH)**	**S ppl Vol age (V)**	**HiRel A ail.**	**Package**	**Price***
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

x1 PCI Express to PCI Bus Translation Bridge

XIO2001

Get samples and datasheets at: **www.ti.com/sc/device/xio2001**

Key Features

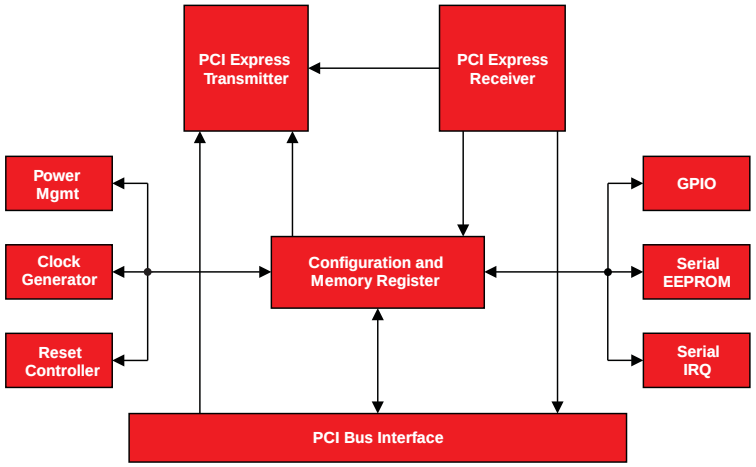
- Full 1 PCI Express throughput
- Fully compliant with PCI Express to PCI/PCI-X bridge specification, revision 1.0
- Fully compliant with PCI Express base specification, revision 2.0
- Fully compliant with PCI local bus specification, revision 2.3
- PCI Express advanced error reporting capability including ECRC support
- Support for D1, D2, D3hot and D3cold
- Utilizes 100MHz differential PCI Express common reference clock or 125MHz
- Single-ended reference clock (optional spread-spectrum reference clock is supported)
- Robust pipeline architecture to minimize transaction latency
- Full PCI local bus 66MHz/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

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 250MBP/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.



2001

C t /C . t f PCI E .

PCI E pre

De ice	De crip ion	S ppl Vol age (V)	PCIe	Parallel B Wid h	Speed (ma) (Mbp)	HiRel A ail.	Package	Price*
PCI E pre	**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

De ice	De crip ion	S ppl Vol age (V)	PCIe	PCI B Ma er	Wake/ Beacon S ppor	HiRel A ail.	Package( )	Price*
PCI E pre	**Bridge**							
XI02001	x1 PCI Express to PCI Bus Translation Bridge	3.3, 1.5	x1	6	Yes	N	BGA-144, BGA-169 MicroStar Junior™	5.50

De ice	De crip ion	S ppl Vol age (V)	PCIe	Do n ream PCIe Por	Wake/ Beacon S ppor	HiRel A ail.	Package	Price*
PCI E pre	**Packe S i ch**							
XIO3130	x1 PCI Express 4-Port Fanout Packet Switch	3.3, 1.5	x1	3	Yes	N	BGA-196	10.95

De ice	De crip ion	S ppl Vol age Range (V)	Archi ec re	rON (p) ( )	pd (p) (n)	HiRel A ail.	Package	Price*
PCI E pre	**Signal S i che**							
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

PCI Bridge

De ice	De crip ion	Speed (MH)	E pan ion In erface (Bi)	Ho S ap	Vol age (V)	HiRel A ail.	Package( )	Price*
PCI2050B	32-Bit, 66MHz, 9-Master PCI-to-PCI Bridge	66	32	Yes	3.3, 5	N	QFP-208, QFP-208, BGA-257	9.50
PCI2250	32-Bit, 33MHz 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, 66MHz, 9-Master, Asynchronous PCI-to-PCI Bridge	66	32	Yes	3.3, 5	N	BGA-257	9.50

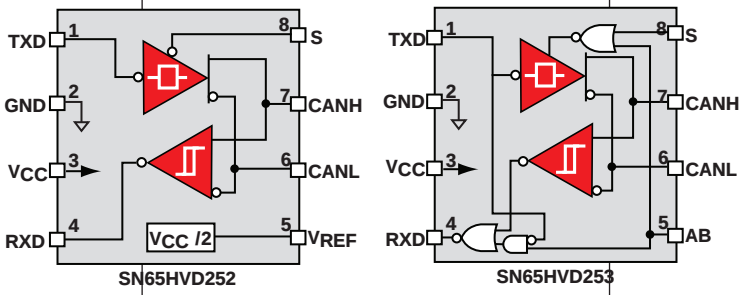
C t /C . t f HDMI

TMDS

De ice	De crip ion	No. of Inp	No. of O p	In ra-Pair Ske (ma) (p)	In er-Pair Ske (ma) (p)	ICC (ma)	ESD HBM (kV)	HiRel A ail.	Package( )	Price*
TMDS141	HDMI Hider	1	1	50	100	150	5	N	QFN-40	1.75
TMDS361B	3-to-1 DVI/HDMI Active Switch	3	1	40	100	215	12	N	TQFP-64	1.50
TMDS261B	2-to-1 DVI/HDMI Active Switch	2	1	40	100	215	12	N	TQFP-64	1.35
TMDS442	4-to-2 DVI/HDMI Active Switch	4	2	50	100	550	5	N	TQFP-128	3.45
TS3DV416	2-to-1 Analog FET Switch for HDMI/DVI	2	1	—	—	0.6	2	N	TSSOP-48, TVSOP-48	0.90
TS3DV520E	2-to-1 Analog FET Switch for HDMI/DVI	2	1	—	—	0.6	14	N	QFN-56, QFN-42	1.00

* 1,000.

N , a _bold red.



65 252/53

1,000. S www.ti.com/hirel. HR

N a bold red.

Isolated 3.3V Full-and Half-Duplex RS-485 Transceivers

ISO15/35

Get samples and datasheets at: **www.ti.com/sc/device/ISO15** and **www.ti.com/sc/device/ISO35**

Key Features

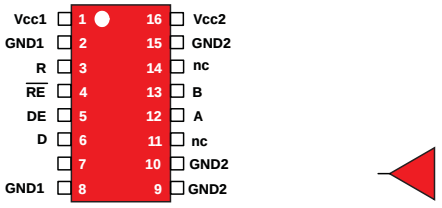
- 4000Vpeak isolation, 560Vpeak VIORM
- UL 1577, IEC 60747-5-2 (VDE 0884, Rev 2)
- IEC 61010-1, IEC 60950-1 and CSA approved
- 1/8 UL – up to 256 nodes on a bus
- Meets or exceeds TIA/EIA RS-485 requirements
- Signaling rates up to 1Mbps
- Thermal shutdown protection
- Low bus capacitance – 16pF (typ)
- 50kV/µs typical transient immunity
- Fail-safe rec. for bus open, short, idle
- 3.3V inputs are 5V tolerant

Applications

- Security systems
- Chemical production
- Factory automation
- Motor/motion control
- HVAC and building automation networks
- Networked security stations

The ISO15 is an isolated half-duplex differential line transceiver, while the ISO35 is an isolated full-duplex differential line driver and receiver for TIA/EIA 485/422 applications. The ISO15M and ISO35M have extended ambient temperature ratings of –55°C to +125°C, while the ISO15 and ISO35 are specified over –40°C to +85°C.

These devices are ideal for long transmission lines, since the ground loop is broken, to allow for a much larger common-mode voltage range. The symmetrical isolation barrier of the device is tested to provide 2500Vrms of isolation for 60s between the bus-line transceiver and the logic-level interface.



I Df I

Digi al I ola or

De ice	De crip ion	I ola ion Ra ing Vrm (UL, VDE, CSA)	Channel Direc ion	Da a Ra e (Ma) Mbp	Tran ien Imm ni (Min) (kV/)	S ppl Vol age (V)	HiRel A ail.	Price*
ISO721/M	Single Channel	2500Vrms	1/0	100/150	25	3.3, 5	Y	1.40
ISO722/M	Single Channel with Output Enable	2500Vrms	1/0	100/150	25	3.3, 5	N	1.40
ISO150	Dual Channel Configurable	2400Vrms	Config	80	1.6	5	N	8.10
ISO7220A/B/C/M	Dual Channel	2500Vrms	2/0	1/5/25/150	25	3.3, 5	Y	0.95
ISO7221A/B/C/M	Dual Channel	2500Vrms	1/1	1/5/25/150	25	3.3, 5	Y	0.95
ISO7230A/C/M	Triple Channel	2500Vrms	3/0	1/25/150	25	3.3, 5	N	1.40
ISO7231A/C/M	Triple Channel	2500Vrms	2/1	1/25/150	25	3.3, 5	N	1.40
ISO7240A/C/CF/M	Quad Channel (F=Failsafe Low)	2500Vrms	4/0	1/25/25/150	25	3.3, 5	Y	1.75
ISO7241A/C/M	Quad Channel	2500Vrms	3/1	1/25/150	25	3.3, 5	Y	1.75
ISO7242A/C/M	Quad Channel	2500Vrms	2/2	1/25/150	25	3.3, 5	N	1.75
ISO7420/**0F**/1/**1F**	Gen II Dual Channel (F=Failsafe Low)	2500Vrms	2/0 and 1/1	1	25	3.3, 5	Y	1.50
ISO7431	Gen II Triple Channel	2500Vrms	2/1	TBD	25	3.3, 5	N	TBD
ISO7440/1	Gen II Quad Channel	2500Vrms	4/0 and 3/1	TBD	25	3.3, 5	N	TBD
ISO7520C/1C	Dual Channel	5000Vrms	2/0 and 1/1	1	25	3.3, 5	N	1.70
ISO7531	Triple Channel	5000Vrms	2/1	TBD	25	3.3, 5	N	TBD
ISO7540/1	Quad Channel	5000Vrms	4/0 and 3/1	TBD	25	3.3, 5	N	TBD
ISO3082/ISO3088	Isolated Half Duplex 5V RS-485	2500Vrms	2/1	0.2/20	25	5	N	2.60
ISO3080/ISO3086	Isolated Full Duplex 5V RS-485	2500Vrms	2/1	0.2/20	25	5	N	2.60
ISO15/**M**	Isolated Half Duplex 3.3V RS-485	2500Vrms	2/1	1	25	3.3	N	3.00
ISO35/**M**	Isolated Full Duplex 3.3V RS-485	2500Vrms	2/1	1	25	3.3	N	3.00
ISO1176	Isolated PROFIBUS RS-485	2500Vrms	2/1	40	25	5	N	3.35
ISO1050DUB	Isolated CAN Transceiver	2500Vrms	1/1	1	25	5	N	1.55
ISO1050DW	Isolated CAN Transceiver	5000Vrms	1/1	1	25	5	N	1.95
ISO3086T	Isolated 5V RS485 with Transformer Driver	2500Vrms	2/1	20	25	5	N	TBD
ISO35T	Isolated 3.3V RS485 with Transformer Driver	2500Vrms	2/1	1	25	3.3	N	TBD
ISO1176T	Isolated PROFIBUS with Transformer Driver	2500Vrms	2/1	40	25	5	N	TBD
ISO55XX	Isolated Gate Drivers	5000Vrms	N/A	10	25	3.3, 5	N	TBD
AMC1200	Isolated Amplifier with G=8	2500Vrms	N/A	N/A	10	–0.3 to 6	N	2.25
AMC1203	Isolated 2nd-Order ΔΣ Modulator	2500Vrms	N/A	20	15	5	N	3.35
AMC1204	Isolated 20MHz ΔΣ Modulator, 16-Bit	2500Vrms	N/A	20	15	3.3, 5	N	3.45

*1,000. S ~ **www.ti.com/hirel.** HR ~ N ~ a ~ **bold red.** **bold blue.**

Industrial 10/100 Ethernet PHY

TLK100

Get samples and datasheets at: **www.ti.com/sc/device/TLK100**

Key Features

- Operates from –40°C to +85°C
- Low power consumption, <200mW typical
- Advanced cable diagnostics
- Error-free operation up to 200 meters under typical conditions
- 3.3V MAC interface
- Auto-MDIX for 10/100 Mbps
- Energy detection mode
- 25MHz clock out

i0>TjAEMC A(out)TjA/Span<</ActualText<FEFF0020>>> B(2236)TjAEM20/100
typicalforMEMC A(0TjrEMC2 A(typical)TjA/Span<</AcalTex2 BDC9DC T*A[0-)7TJtypical
typical 025face/100typicaltypical 025face 025face

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

Get samples and datasheets at: **www.ti.com/sc/device/SN65HVS885**

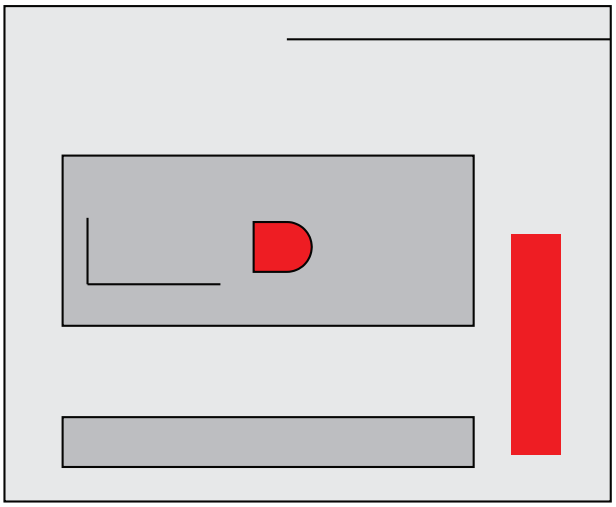
Key Features
- Eight digital sensor inputs
- High-input voltage up to 34V
- Selectable debounce filters from 0ms to 3ms
- Flexible current-limited inputs –0.2mA to 5.2mA
- Field inputs protected to 15kV ESD
- Single 5V supply
- Output drivers for external status LEDs
- Cascadable for more inputs in multiples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

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

The SN65HVS885 is an eight-channel, digital-input serializer for high-channel density digital input modules in industrial and building automation. Operating from a 5V supply, the device accepts field input voltages of up to 34V. 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.



65 885

Ind rial Seriali er

De ice	De crip ion	S ppl Vol age (V)	I/O Vol age (V)	Pari	Inp Da a Ra e (Mbp)	Tempera re Range	Lo Vol age De ec or	HiRel A ail.	Price*
Ind rial Eigh -Channel Digi al Seriali er									
SN65HVS880	Nominal 24V Digital-Input Serializer	18 to 30	0 to 30	No	1	–40 to 85	Yes: 15V	N	1.90
SN65HVS881	0-34V Digital-Input Serializer with Parity	10 to 34	0 to 34	Yes	1	–40 to 125	Yes: 15V	N	2.00
SN65HVS882	0-34V Digital-Input Serializer	10 to 34	0 to 34	No	1	–40 to 125	No	N	2.00
SN65HVS885	0-34V Digital-Input Serializer for 5V Systems	4.5 to 5.5	0 to 34	No	1	–40 to 125	No	N	1.80

SymPol™ Transceiver
SN65HVD96

Get samples and datasheets at: **www.ti.com/sc/device/SN65HVD96**

Key Features

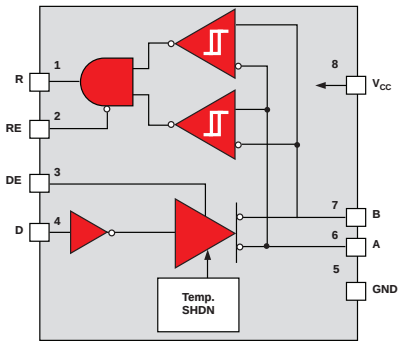
- Communicate without errors on normal or reversed-wire bus lines
- Up to 5Mbps signaling
- Industrial temperature range: –40°C to +85°C
- Symmetric polarity receiver
- Receiver hysteresis >100mV
- Connect up to 32 nodes on one bus
- Transient protection on bus pins
  - ±12kV human body model
  - ±25V repetitive transient pulse
- Additional reliability features:
  - Bus standoff from –35V to +40V
  - Driver output short-circuit current limit
  - Automatic thermal shutdown and recovery

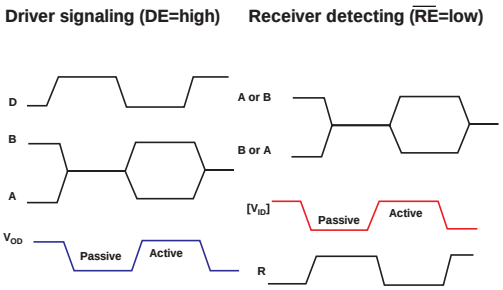
Applications

- Camera: surveillance analog
- Camera: surveillance IP network
- HVAC – heating, ventilating and air conditioning

The SN65HVD96 is specifically designed to meet the requirements for a transceiver that operates with no errors if the twisted-pair signal wires are connected normally or reversed. This allows for error-free operation in applications where the signal wires may become inadvertently reversed during installation or maintenance. This feature is corrected internally so no intervention from the controller or operator is required.

Similar to RS-485, these transceivers can be used for point-to-point, multi-drop or multi-point networks. SymPol™ devices are not backwards compatible with, but are an upgrade to, existing RS-485 networks. The pin-out is identical to the industry-standard SN75176 transceiver, allowing direct upgrade from RS-485 to SymPol.





65 96

RS-485/RS-422

De ice	De crip ion	DR/ RX	D ple	S ppl (V)	I ola ed	Signaling Ra e (Mbp)	ESD (kV)	Recei er Fail-Safe	Node	HiRel A ail.	Package( )	Price*
SN65HVD10/11/12	High/Mid/Low Speed Slew-Rate Control	1/1	Half	3.3	No	32/10/1	16	Short, Open, Idle	256	Y	PDIP/SOIC-8	1.50
SN65HVD13	High Signaling Rate, High Hysteresis	1/1	Half	3.3	No	50	7	Short, Open, Idle	96	N	MSOP/SOIC-8	TBD
SN65HVD30/31/32	No Enables	1/1	Full	3.3	No	26/5/1	16	Short, Open, Idle	256	Y	SOIC-8	1.45
SN65HVD33/34/35	With Enables	1/1	Full	3.3	No	26/5/1	16	Short, Open, Idle	256	Y	SOIC-14	1.45
SN65HVD37	Low Power, High Hysteresis	1/1	Full	3.3	No	20	7	Short, Open, Idle	256	N	SOIC-14	TBD
ISO15/**M**	Isolated 3.3V Half Duplex Transceiver	1/1	Half	3.3	Yes	1	16	Short, Open, Idle	256	N	SOIC-16	3.00
ISO35/**M**	Isolated 3.3V Full Duplex Transceiver	1/1	Full	3.3	Yes	1	16	Short, Open, Idle	256	N	SOIC-16	3.00
ISO35T	Isolated 3.3V Transceiver with Transformer Driver	1/1	Full	3.3	Yes	1	16	Short, Open, Idle	256	N	SOIC-16	TBD
SN65HVD08	Wide Supply Range: 3V to 5.5V	1/1	Half	3 to 5.5	No	10	16	Short, Open, Idle	256	N	PDIP/SOIC-8	1.65

* 1,000. S www.ti.com/hirel. HR N bold red. bold blue.

Dual UART With 64-Byte FIFO

TL16C752C

Get samples and datasheets at: **www.ti.com/sc/device/TL16C752C**

Key Features

- ST16C654/654D pin-compatible with additional enhancements (PFB package only)
- Supports up to 24MHz crystal input clock (1.5Mbps)
- Supports up to 48MHz oscillator input clock (3Mbps) for 5V operation
- Supports up to 32MHz oscillator input clock (2Mbps) for 3.3V operation
- Supports up to 24MHz input clock (1.5Mbps) for 2.5V operation
- Supports up to 16MHz input clock (1Mbps) for 1.8V 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

The TL16C752C is a dual universal asynchronous receiver/transmitter (UART) with 64-byte FIFOs, automatic hardware/software flow control and data rates up to 3Mbps. 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 thresholEMC A(data)TjA/Span<</ActualText<FEFF0020>>> BDC 08FF015A(t

UART

De ice	De crip ion	Channel( )	FIFO	Vol age (V)	Charac eri ed Temp. (C)	HiRel A ail.	Package( )	Price*
TL16C2550	Dual UART with Programmable							

2-Channel ESD-Protection Array for AC-Coupled/Negative-Rail Data Interfaces
TPD2E007

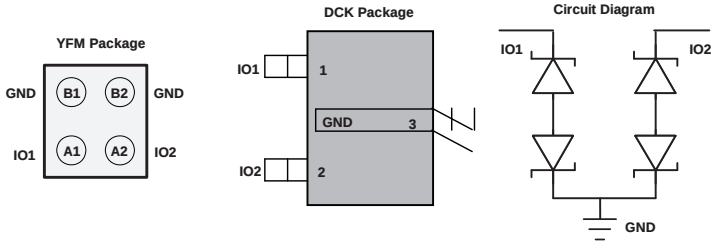
Get samples and datasheets at: **www.ti.com/sc/device/tpd2e007**

Key Features
- ESD protection exceeds IEC61000-4-2 (level 4)
  - ±15kV human-body model (HBM)
  - ±8kV IEC 61000-4-2 contact discharge
  - ±15kV IEC 61000-4-2 air-gas discharge
- 4.5A peak pulse current (8/20ms Pulse)
- 15pF line to GND capacitance
- Low 50nA leakage current YFMG4
- 2-channel device
- Space-saving PicoStar™ and DCK package (0.8mm x 0.8mm [0.4mm pitch])

Applications
- Cell phones, PDAs
- Audio interface connections
- Consumer electronics (DVRs, set-top boxes, TVs)
- Industrial interfaces (RS-232, RS-485, RS-422, LVDS)

The TPD2E007 is designed to offer system-level ESD solutions for a wide range of portable and industrial applications. The back-to-back diode array allows AC-coupled or negative-going data transmission (audio interface, LVDS, RS-485, RS-232, etc.) without compromising signal integrity. The PicoStar™ package is intended to be embedded inside the printed circuit board, which saves board space in portable applications. This device exceeds IEC61000-4-2 (Level 4) ESD protection and is suitable to provide system-level ESD protection for the valuable internal ICs when placed near the connector.

The TPD2E007 is offered in 4-bump PicoStar and 3-pin DCK packages. The PicoStar package (YFMG4), with only 0.15mm (max) package height, is recommended for ultra-space saving applications where package height is a key concern. The PicoStar package can be used in either embedded PCB board applications or in surface-mount applications. The industry-standard DCK package offers a straightforward board layout option in legacy designs.



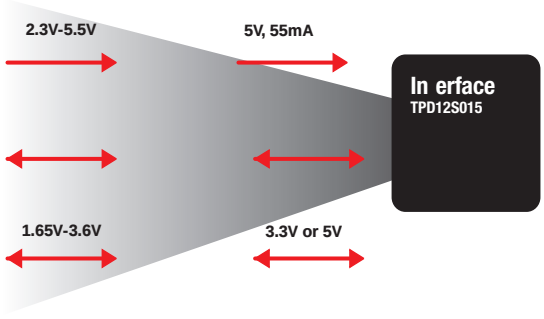
2 007

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

Get samples and datasheets at: **www.ti.com/sc/device/tpd12s015**

Key Features
- HDMI 1.3 data rate
- HDMI high-speed differential signals – 3dB bandwidth exceeds 6.4Gbps
- Excellent matching capacitance (0.05pF) in each differential signal pair
- Internal boost converter to generate 5V from a 2.3- to 5.5V 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

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.



12 015

ESD/EMI

De ice	De crip ion	N mber of Channel	I/O Capaci ance (pF)	V_{BR} (min) (V)	HiRel A ail.	Package( )	Price*
ESD De ice							
SN65220	USB 2.0 FS	2	35	7	Y	DSBGA-4, SOT-23-6	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	SOT-23-3, 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	SOT-23-6, 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 De ice							
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

* 1,000. S www.ti.com/hirel. H R **bold blue.**

Low-Voltage, 8-Bit I²C, SMBus I/O Expander with Interrupt Output, Reset and Configuration Registers

TCA6408A

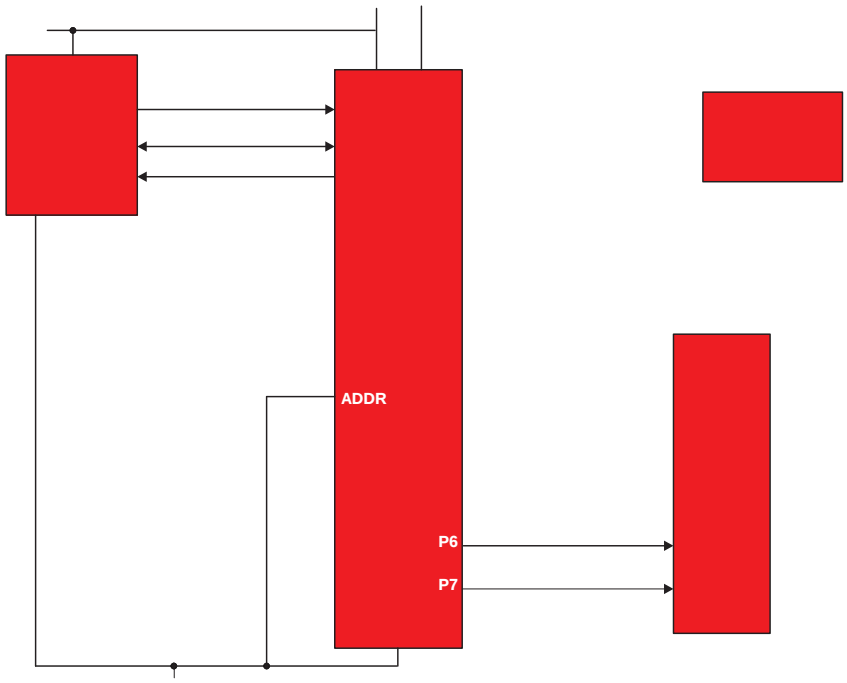
Get samples and datasheets at: **www.ti.com/sc/device/TCA6408A**

Key Features

- V_{CC} range of 1.65V to 5.5V on I²C and I/O side
- Bidirectional voltage-level translation and GPIO expansion between:
  - 1.8V SCL/SDA and 1.8V, 2.5V, 3.3V or 5V P Port
  - 2.5V SCL/SDA and 1.8V, 2.5V, 3.3V or 5V P Port
  - 3.3V SCL/SDA and 1.8V, 2.5V, 3.3V or 5V P Port
  - 5V SCL/SDA and 1.8V, 2.5V, 3.3V or 5V P Port
- 400KHz operation

Applications

- Housekeeping functions
  - Temperature, fan, audio control
  - Humidity sensors
  - LED status
  - Hardware control monitor
- Keypad control (up to 4x4 keypad or 16 buttons)



6408

Enhanced I²C Controlled Keypad Scan IC

TCA8418E

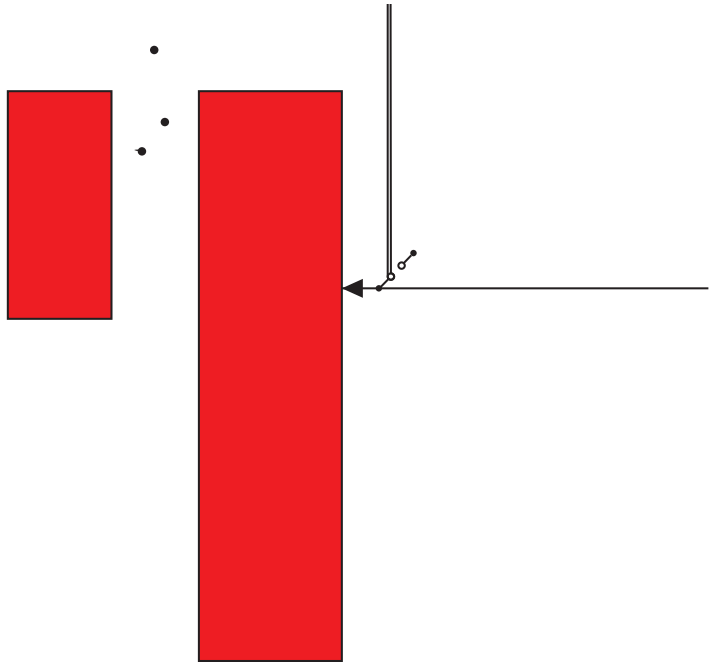
Get samples and datasheets at: **www.ti.com/sc/device/TCA8418E**

Key Features

- Operating power-supply voltage range of 1.65V to 3.6V
- 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)
- 15kV human body model ESD protection on GPIO lines
- Low standby (idle) current consumption: 3mA
- Polling current drain 70mA for one key pressed
- 10byte FIFO to store 10 key presses and releases
- Very small package: WCSP (YFP): 2mm x 2mm; 0.4mm pitch

Applications

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



8418

I²C

B ffer/Repea er

De ice	De crip ion	No. of O p	f_{SCLK} (ma) (kH)	HiRel A ail.	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 I					

RS-232

De ice	Da a Ra e (kbp)	Dri er	Recei er	ESD HBM (kV)	S ppl Vol age( ) (V)	I_{CC} (ma) (mA)	HiRel A ail.	Package( )	Price*
TRS202E	120	2	2	IEC61000-4-2	5	15	N	PDIP-16, SOIC-16, TSSOP-16	0.54
TRS207	120	5	3	±15	5	20	N	SOIC-24, SSOP-24	1.08
TRS208	120	4	4	±15	5	20	N	SOIC-24, SSOP-24	1.08
TRS211	120	4	5	±15	5	20	N	SOIC-28, SSOP-28	1.08
TRS213	120	4	5	15	5	20	N	SOIC-28, SSOP-28	1.08
TRS222	200	2	2	±15	5	10	N	PDIP-18, SOIC-18	1.26
TRS232E	250	2	2	IEC61000-4-2	5	10	N	PDIP-16, SOIC-16, TSSOP-16	0.58
TRS3221E	250	1	1	IEC61000-4-2	5	1	N	SSOP-16, TSSOP-16	0.88
TRS3222E	250	2	2	IEC61000-4-2	5	1	N	SOIC-20, SSOP-20, TSSOP-20	1.28
TRS3223E	250	3	3	IEC61000-4-2	5	1	Y	SOIC-20, SSOP-20, TSSOP-20	1.12
TRS3227E	1000	1	1	IEC61000-4-2	5	1	N	SSOP-16	1.20
TRS3232E	250	2	2	IEC61000-4-2	5	0.3	Y	SOIC-16, SSOP-16, TSSOP-16	0.96
TRS3237E	1000	5	3	IEC61000-4-2	5	1	N	SOIC-28, SSOP-28, TSSOP-28	1.33
TRS3238E	250	5	3	IEC61000-4-2	5	1	N	SOIC-28, SSOP-28, TSSOP-28	1.20
TRS3243E	500	3	5	IEC61000-4-2	5	1	N	SOIC-28, SSOP-28, TSSOP-28, QFN-32	0.88
TRS3253E	1000	3	5	IEC61000-4-2	3.3 or 5	1	N	QFN-32	CALL
TRS3318E	460	2	2	IEC61000-4-2	5	1	N	SSOP-20, TSSOP-20	1.68
TRS3386E	250	3	2	IEC61000-4-2	5	1	N	SOIC-20, TSSOP-20	1.92
TRSF23243	250	3	5	±15	5	1	N	SSOP-48, TSSOP-48	3.42
TRSF3221E	1000	1	1	IEC61000-4-2	5	1	N	SSOP-16, TSSOP-16	1.26
TRSF3222E	1000	2	2	IEC61000-4-2	5	1	N	SOIC-20, SSOP-20, TSSOP-20	1.44
TRSF3223E	1000	2	2	IEC61000-4-2	5	1	N	SOIC-20, SSOP-20, TSSOP-20	1.44
TRSF3232	1000	2	2	±15	5	1	N	SOIC-16, SSOP-16, TSSOP-16	1.26
TRSF3238E	1000	5	3	IEC61000-4-2	5	2	N	SOIC-28, SSOP-28	1.62
TRSF3243	1000	3	5	±15	5	1	N	SOIC-28, SSOP-28, TSSOP-28	1.62
TRSF3253	1000	3	5	±15	5	1	N	SOIC-28, SSOP-28, TSSOP-28	1.62
GD65232	120	3	5	—	±9, 5	38	N	PDIP-20, SOIC-20, SSOP-20, TSSOP-20	0.29
GD75232	120	3	5	—	±9, 5	30	N	PDIP-20, SOIC-20, SSOP-20, TSSOP-20	0.27
GD75323	120	5	3	—	±12, 5	32	N	SOIC-20	0.41
LT1030	120	4	—	—	±5	1	N	PDIP-14, SOIC-14	1.44
SN65C1406	120	3	3	—	±12, 5	0.45	N	SOIC-16	1.80
SN75154	120	4	4	—	5 or 12	35	N	PDIP-16, SOIC-16	0.72
SN75155	120	1	1	2	±12	14	N	PDIP-8, SOIC-8	0.72
SN751701	120	1	1	—	±5, 9, 12	11.9	N	SOIC-8	1.30
SN75185	120	3	5	10	±12, 5	30	N	PDIP-20, SOIC-20, SSOP-20, TSSOP-20	0.45
SN75186	120	1	1	—	±12, 5	10	N	SOIC-24	1.80
SN75188	120	4	—	2	±9	25	N	PDIP-14, SOIC-14	0.22
SN75189A	120	—	4	—	5	26	N	PDIP-14, SOIC-14	0.22
SN75196	120	5	3	10	±12, 5	20	N	PDIP-20, SOIC-20	0.68
SN752232	120	6	10	—	5	±50	N	SSOP-48, TSSOP-48	0.90
SN75C1406	120	3	3	2	±12, 5	0.45	N	PDIP-16, SOIC-16	0.86
SN75C185	120	3	5	2	±12, 5	0.75	N	PDIP-20, SOIC-20	1.08
SN75C188	120	4	—	2	±12	0.16	N	PDIP-14, SOIC-14, SSOP-14	0.31
SN75C189A	120	—	4	—	5	0.7	N	PDIP-14, SOIC-14, SSOP-14	0.31
SN75C23243	250	6	10	15	3.3 or 5	0.02	N	SSOP-48, TSSOP-48	3.42
SN75LBC187	120	3	5	—	5	30	N	SSOP-28	3.60
SN75LBC241	100	4	5	—	5	8	N	SOIC-28	2.16
SN75LP1185	256	3	5	15	5, ±12	1	N	PDIP-20, SOIC-20, SSOP-20	1.78
SN75LP196	256	5	3	15	5, ±12	1	N	PDIP-20, SOIC-20, SSOP-20, TSSOP-20	1.78
SN75LPE185	256	3	5	15	5, ±12	1	N	PDIP-24, SOIC-24, SSOP-24, TSSOP-24	1.89
SN75LV4737A	128	3	5	4	3 or 5	20.7	N	SSOP-28	2.61
TL145406	120	3	3	2	±12, 5	20	N	PDIP-16, SOIC-16	0.94
UA9636A	120	2	—	—	±12	36	N	PDIP-8, SOIC-8	0.36
UC5170C	120	—	—	—	—	—	Y	PLCC-28	3.15
UC5180C	120	—	8	—	4.75 to 5.25	35	N	PLCC-28	3.00
UC5181C	120	—	8	—	4.75 to 5.25	35	N	PLCC-28	3.15

* 1,000. S ~ **www.ti.com/hirel.** H R ~

G

Single-S ppl Tran la or

De ice	Bi	Tran Lo (V)	Tran High (V)	V_{CC} (V)	DIR Pin	B Hold	OE Pin	pd (ma) (n)	HiRel A ail.	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

D al-S ppl Tran la or

De ice	Bi	Tran Lo (V)	Tran High (V)	V_{CC}A (V)	V_{CC}B (V)	DIR Pin	B Hold	OE Pin	pd (ma) (n)	HiRel A ail.	Price*
TXB0101	1	1.21						.f(y6.03162M)634	fSf01745530s2 l1	623-0.025 -1 Tdf2 0 Tdf3	

High-Linearity Direct-Conversion Quadrature Demodulator

TRF371125

NEW

Get samples, datasheets and evaluation modules at: **www.ti.com/sc/device/TRF371125**

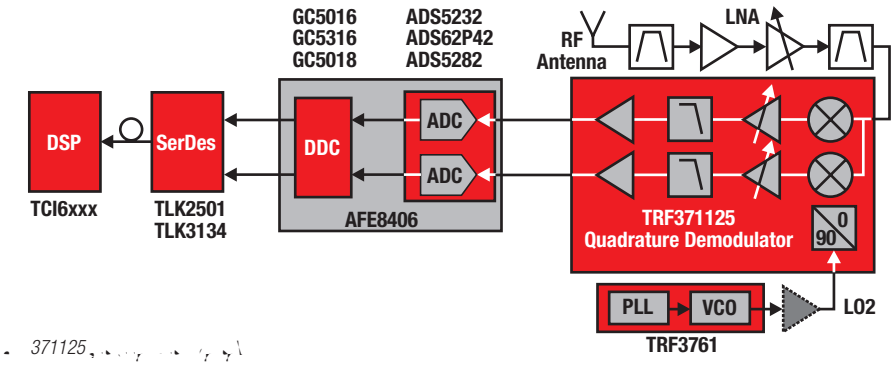
Key Features

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

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 7mm x 7mm QFN package, the TRF371125 provides the smallest and most integrated receiver solution available for high-performance equipment.



371125

Integrated IQ Modulator PLL/VCO

TRF372017

Get samples, datasheets and evaluation modules at: **www.ti.com/sc/device/TRF372017**

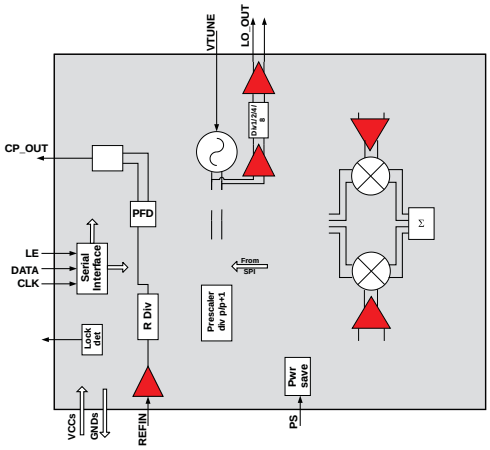
Key Features

- Fully integrated PLL/VCO and IQ modulator
- LO frequency from 300MHz to 4.8GHz
- 76dBc single-carrier WCDMA ACPR at –8dBm channel power
- OIP3 of 26dBm
- P1dB of 11.5dBm
- Integer/fractional PLL
- Phase noise –132dBc/Hz
- Low noise floor: –160dBm/Hz
- Input reference frequency range: up to 160MHz

Applications

- Wireless infrastructure
  - CDMA: IS95, UMTS, CDMA2000, TD-SCDMA
  - TDMA: GSM, IS-136, EDGE/UWC-136
  - LTE
- Wireless local loop
- Point-to-point wireless access
- Wireless MAN wideband transceivers

The TRF372017 is a high performance direct up-conversion device, integrating a high linearity, low noise IQ modulator and an integer-fractional PLL/VCO. The VCO uses integrated frequency dividers to achieve a wide, continuous tuning range of 300MHz–4800MHz. The LO is available as an output with independent frequency dividers. The device also accepts input from an external LO or VCO. The modulator baseband inputs can be biased either internally or externally. Internal DC offset adjustment enables carrier cancellation. The device is controlled through a 3 wire serial programming interface (SPI™). A control pin invokes power-save mode to reduce power consumption while keeping the VCO locked for fast startup.



372017

High-Performance Q adra re Mod la or

De ice	Freq enc (min) (MH)	Freq enc (ma) (MH)	OIP3 (dBm)	P1dB (dBm)	Noi e Floor (dBm/H)	I/Q Common-Mode Vol age (p) (V)	HiRel A ailable	Price*
TRF370315	350	4000	23	9.5	–160	1.5	N	4.95
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

In egra ed Q adra re Mod la or

De ice	Freq enc (min) (MH)	Freq enc (ma) (MH)	OIP3 (dBm)	P1dB (dBm)	Noi e Floor (dBm/H)	LO Pha e Noi e (1MH Off e , 2.3GH) (dBc/H)	I/Q Common-Mode Vol age (p) (V)	HiRel A ailable	Price*
TRF372017	300	4800	26	12	–163	–132	1.7	N	5.50

In egra ed Q adra re Demod la or

De ice	Freq enc Range (Op imi ed) (GH)	BB Fil er Band id h (min) (MH)	BB Fil er Band id h (ma) (MH)	IIP2 (p) (dBm)	IIP3 (p) (dBm)	HiRel A ailable	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 Tran cei er

De ice	T LO Freq enc (min) (MH)	T LO Freq enc (ma) (MH)	T O p Noi e Floor (dB)	T O p IP3 (dBm)	R LO Freq enc (min) (MH)	R LO Freq enc (ma) (MH)	R Noi e Fig re (dB)	R Inp IP3 (dBm)	R BB Fil er C off (min) (MH)	R BB Fil er C off (ma) (MH)	R BB Ma Pa band (p) (MH)	HiRel A ail.	Price*
TRF2443	165	350	–166	29.5	140	330	4.3	9.5	2	11	30	N	24.00

High-Performance Freq enc S n he i er

De ice	Di ide b 1		Di ide b 2		Di ide b 4		HiRel A ailable	Price*
	F ar	F op	F ar	F op	F ar	F op		
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

* 1,000.

N a bold red. P a bold blu

ZigBee® RF4CE System-on-Chip

CC2533

Get samples, datasheets and app reports at: **www.ti.com/sc/device/CC2533**

PurePath™ Wireless™ 2.4GHz RF System-on-Chip For Wireless Digital Audio Streaming

CC8520

Get samples, datasheets and app reports at: **www.ti.com/sc/device/CC8520**

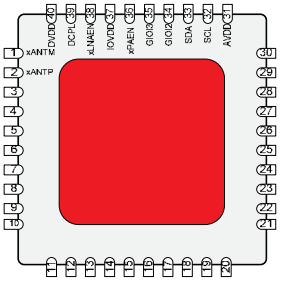
Key Features

- Embedded audio network protocol with state-of-the art error correction and concealement techniques
- Uncompressed wireless 44.1/48kHz stereo audio
- Autonomous operation
- UART, I^2C and SPI™ interfaces
- Free PurePath™ Wireless™ configurator PC tool

Applications

- Wireless headphones / headsets
- Wireless speaker systems
- Wireless signal cable replacement
- Wireless home theatre systems

The CC8520 is used to build a lossless wireless audio link. One CC8520 acts as audio source and the other as audio sink. I^2S data is taken as input on the audio source side, audio data is transmitted without loss to the audio sink which then outputs the I^2S audio data.



1- and 8-Channel ANT® RF Network Processors
CC2570/CC2571

Get samples, datasheets and app reports at: **www.ti.com/sc/device/CC2570**

Key Features

- ANT compliant RF network processors
- UART/SPI™ serial interface to easy-to-use API command set
- Excellent RF performance (avg. power and boosted output power)
- Accurate full-range RSSI function suited for proximity
- ANT-FS support

Benefits

- Easy-to-integrate into ANT products
- Optimized low power for long device

WLAN 802.11 b/g/n and *Bl e oo h*® v2.1 + EDR Transceiver

WL1271-TiWi

Get samples, datasheets and app reports at: **www.ti.com/wl1271-tiwi**

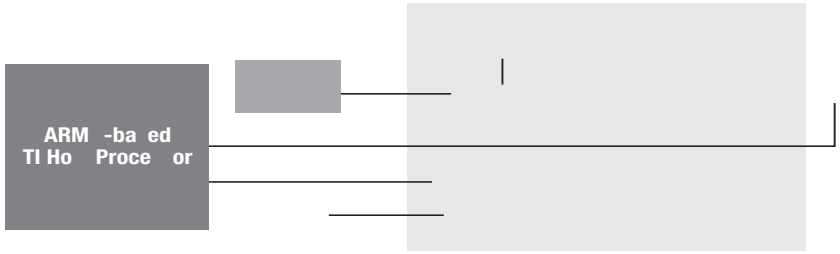
Key Features

- IEEE 802.11 b/g/n compliant
- Typical WLAN Transmit power:
  - +20dBm, 11Mbps, CCK (b)
  - +14.5dBm, 54Mbps, OFDM (g)
  - +12.5dBm, 65Mbps, OFDM (n)
- Typical WLAN Receiver sensitivity:
  - -89dBm, 11Mbps
  - -76dBm, 54Mbps
  - -73dBm, 65Mbps
- *Bl e oo h*® v2.1 + EDR (enhanced data rate)
  - Increased *Bl e oo h* transmit power: +9.5dBm
  - -92dBm receiver sensitivity
- Best-in-class WLAN and *Bl e oo h* coexistence technology on a single-chip
- Enhanced Low Power (ELP) technology for extended battery life
- On board TCXO, power regulation, and U.FL antenna connector
- HW and SW pre-integration with TI's AM/DM37x (ARM® Cortex®-A8), AM18xx (ARM9™), and OMAP™ 4 (ARM Cortex-A9) platforms
- SW-upgradable for ANT® & BLE
- FCC/IC/CE certified
- Dimensions: 13mm x 18mm x 1.9mm

Applications

- Industrial and home automation
- Point of sale and point of purchase
- Video conferencing, video camera and VoIP
- Consumer devices
- Medical devices
- Security and surveillance

The WL1271-TiWi is a fully-integrated high performance module offered by LS Research utilizing TI's single-chip WL1271 2.4GHz IEEE 802.11 b/g/n and *Bl e oo h*® 2.1 + EDR Transceiver. Based on TI's 6th generation WLAN technology and 7th generation *Bl e oo h* technology, the integrated solution provides best-in-class coexistence capabilities coupled with TI's Enhanced Low Power (ELP) technology. This solution is provided as a module to help customers reduce development time, lower manufacturing costs, save board space, ease certification, and minimize RF expertise required. For evaluation and development, various platforms are available which integrate the LS Research module, Linux drivers, *Bl e oo h* stack, and sample source applications running on a TI host processor (AM/DM37x, AM18x, OMAP™ 4).



1271-

TI's Analog eLab™ Design Center offers support and training for new and experienced analog device developers for a variety of analog design needs, all focused on the development and design of analog devices. At the Analog eLab, design engineers can learn with training and webcast sessions, select products through parametric analysis, design with our "Pro" series, simulate with different model resources, and obtain free samples of TI products within 24 hours. . i.com/analogelab

Learn

- Online Training
- Analog eLab™ Videocasts
- KnowledgeBase and Document Finder
- Application Notes/ Technical Documents

Select

- Clocks and Timing Quick Search
- Interface Quick Search
- Power Management
  - Power Quick Search
  - Discover How T2 Modules Can Reduce Your Output Capacitance
  - Battery Chargers Quick Search
- Data Converters
  - Analog to Digital Converters
  - Digital to Analog Converters
- Audio
  - New PurePath™ Audio™ Power Stage Selection Tool
  - Audio Quick Search
- RF/IF Component Quick Search
- Analog Switches Quick Search
- Translation Device Selection Tool
- Selection Guides
- End-Equipment Solutions
- Parametric Search
- Competitor Cross-Reference Search

Design

- TI Pro Series
  - SwitcherPro™ Design Software
    - SwitcherPro Info
    - Download Now
    - Use Online Now
    - Learn How to Create a Design with SwitcherPro
  - ADCPro™ Evaluation Software
  - ClockPro™ Programming Software
  - MDACBufferPro™ Design Software
  - Updated FilterPro™ v3.0 Design Software
- Reference Designs
- TI Gadgets and Widgets
- Calculators and Other Utilities
- New PCB Thermal Calculator
- Hardware Design Tools and Software
- Quality, Reliability and Lead (Pb)-Free
- RoHS Content and Delivery Schedule
- Packaging Information

Simulate

- TINA-TI™ Powerful and Easy-to-Use Circuit Simulation Program
- Complete SPICE Model Libraries
- IBIS and BSDL Model Libraries

Sample

- Pricing and Availability
- Request Samples
- TI eStore
  - Browse Evaluation Modules
- TI Worldwide Sales and Support Offices
- Distributors
- Sales Representatives

TI Worldwide Technical Support

In erne

TI Semicond c or Prod c Informa ion Cen er Home Page
support.ti.com

TI E2E Comm ni Home Page
e2e.ti.com

Prod c Informa ion Cen er

America	Phone	+1(972) 644-5580
Bra il	Phone	0800-891-2616
Me ico	Phone	0800-670-7544
	Fax	+1(972) 927-6377
	Internet/Email	support.ti.com/sc/pic/americas.htm

E rope, Middle Ea , and Africa

Phone

European Free Call	00800-ASK-TEXAS (00800 275 83927)
International	+49 (0) 8161 80 2121
Russian Support	+7 (4) 95 98 10 701

No e: The European Free Call (Toll Free) number is not active in all countries. If you have technical difficulty calling the free call number, please use the international number above.

Fax	+(49) (0) 8161 80 2045
Internet	support.ti.com/sc/pic/euro.htm
Direct Email	asktexas@ti.com

Japan

Phone	Domestic	0120-92-3326
Fax	International	+81-3-3344-5317
	Domestic	0120-81-0036
Internet/Email	International	support.ti.com/sc/pic/japan.htm
	Domestic	www.tij.co.jp/pic

A ia

Phone

International	+91-80-41381665
Domestic	Toll-Free Number

No e: Toll-free numbers do not support mobile and IP phones.

Australia	1-800-999-084
China	800-820-8682
Hong Kong	800-96-5941
India	1-800-425-7888
Indonesia	001-803-8861-1006
Korea	080-551-2804
Malaysia	1-800-80-3973
New Zealand	0800-446-934
Philippines	1-800-765-7404
Singapore	800-886-1028
Taiwan	0800-006800
Thailand	001-800-886-0010

Fax	+8621-23073686
Email	tiasia@ti.com or ti-china@ti.com
Internet	support.ti.com/sc/pic/asia.htm

Impor an No ice: The products and services of Texas Instruments Incorporated and its subsidiaries described herein are sold subject to TI's standard terms and conditions of sale. Customers are advised to obtain the most current and complete information about TI products and services before placing orders. TI assumes no liability for applications assistance, customer's applications or product designs, software performance, or infringement of patents. The publication of information regarding any other company's products or services does not constitute TI's approval, warranty or endorsement thereof.

A122010

The platform bar, ADCPro, Analog eLab, C2000, ClockPro, ControlNet, DaVinci, Difet, DirectPath, E2E, eLab, FilterPro, FlatLink, LinCMOS, MDACBufferPro, MicroStar Junior, MSP430, OHCI-Lynx, OMAP, Panelbus, PicoStar, PowerPAD, PowerTune, PurePath, PurePath™ Audio, PurePath™ Digital, PurePath™ HD, PurePath™ Wireless, QSPI, Sitara, SmartGain, SoundPlus, SpeakerGuard, SwitcherPro, SymPol, TINA-TI and VLYNQ are trademarks and Stellaris is a registered trademark of Texas Instruments. ANT is a registered trademark of Dynastream Innovations, Inc. ARM9 is a trademark and ARM and Cortex are registered trademarks of ARM Limited. The [illegible] word mark and logos are owned by the Bluetooth SIG, Inc., and any use of such marks by Texas Instruments is under license. Blu-ray is a trademark of Blu-ray Disc Association. DeviceNet is a trademark of Open DeviceNet Vendor Association, Inc. FireWire is a registered trademark of Apple Computer Incorporated. I²C Bus is a registered trademark of NXP B.V. Corporation. i.LINK is a registered trademark of Sony Corporation. Microwire is a registered trademark of National Semiconductor Corporation. Modbus is a registered trademark of Modbus Organization, Inc. SB1394 is a trademark of Creative Technology Ltd. SPI is a trademark of Motorola, Inc. ZigBee is a registered trademark of the ZigBee Alliance. All other trademarks are the property of their respective owners.

© 2011 Texas Instruments Incorporated
Printed in U.S.A. by (Printer, City, State)

TEXAS INSTRUMENTS

IMPORTANT NOTICE

Texas Instruments Incorporated and its subsidiaries (TI) reserve the right to make corrections, modifications, enhancements, improvements, and other changes to its products and services at any time and to discontinue any product or service without notice. Customers should obtain the latest relevant information before placing orders and should verify that such information is current and complete. All products are sold subject to TI's terms and conditions of sale supplied at the time of order acknowledgment.

TI warrants performance of its hardware products to the specifications applicable at the time of sale in accordance with TI's standard warranty. Testing and other quality control techniques are used to the extent TI deems necessary to support this warranty. Except where mandated by government requirements, testing of all parameters of each product is not necessarily performed.

TI assumes no liability for applications assistance or customer product design. Customers are responsible for their products and applications using TI components. To minimize the risks associated with customer products and applications, customers should provide adequate design and operating safeguards.

TI does not warrant or represent that any license, either express or implied, is granted under any TI patent right, copyright, mask work right, or other TI intellectual property right relating to any combination, machine, or process in which TI products or services are used. Information published by TI regarding third-party products or services does not constitute a license from TI to use such products or services or a warranty or endorsement thereof. Use of such information may require a license from a third party under the patents or other intellectual property of the third party, or a license from TI under the patents or other intellectual property of TI.

Reproduction of TI information in TI data books or data sheets is permissible only if reproduction is without alteration and is accompanied by all associated warranties, conditions, limitations, and notices. Reproduction of this information with alteration is an unfair and deceptive business practice. TI is not responsible or liable for such altered documentation. Information of third parties may be subject to additional restrictions.

Resale of TI products or services with statements different from or beyond the parameters stated by TI for that product or service voids all express and any implied warranties for the associated TI product or service and is an unfair and deceptive business practice. TI is not responsible or liable for any such statements.

TI products are not authorized for use in safety-critical applications (such as life support) where a failure of the TI product would reasonably be expected to cause severe personal injury or death, unless officers of the parties have executed an agreement specifically governing such use. Buyers represent that they have all necessary expertise in the safety and regulatory ramifications of their applications, and acknowledge and agree that they are solely responsible for all legal, regulatory and safety-related requirements concerning their products and any use of TI products in such safety-critical applications, notwithstanding any applications-related information or support that may be provided by TI. Further, Buyers must fully indemnify TI and its representatives against any damages arising out of the use of TI products in such safety-critical applications.

TI products are neither designed nor intended for use in military/aerospace applications or environments unless the TI products are specifically designated by TI as military-grade or "enhanced plastic." Only products designated by TI as military-grade meet military specifications. Buyers acknowledge and agree that any such use of TI products which TI has not designated as military-grade is solely at the Buyer's risk, and that they are solely responsible for compliance with all legal and regulatory requirements in connection with such use.

TI products are neither designed nor intended for use in automotive applications or environments unless the specific TI products are designated by TI as compliant with ISO/TS 16949 requirements. Buyers acknowledge and agree that, if they use any non-designated products in automotive applications, TI will not be responsible for any failure to meet such requirements.

Following are URLs where you can obtain information on other Texas Instruments products and application solutions:

Products		**Applications**	
Audio	www.ti.com/audio	Communications and Telecom	www.ti.com/communications
Amplifiers	amplifier.ti.com	Computers and Peripherals	www.ti.com/computers
Data Converters	dataconverter.ti.com	Consumer Electronics	www.ti.com/consumer-apps

FolDLPwhite.74 Td (not® 8.62 Td (Eleducts)Ti ET BT /F4 8 Tf 100 Tz 0 0 1 rg 171.7 282.69Td (Fol.ti.dlpm)Ti ET 171.7 280.6728044.29 060.67280.5 w 0 0 1 RG S BT /F3 8 T