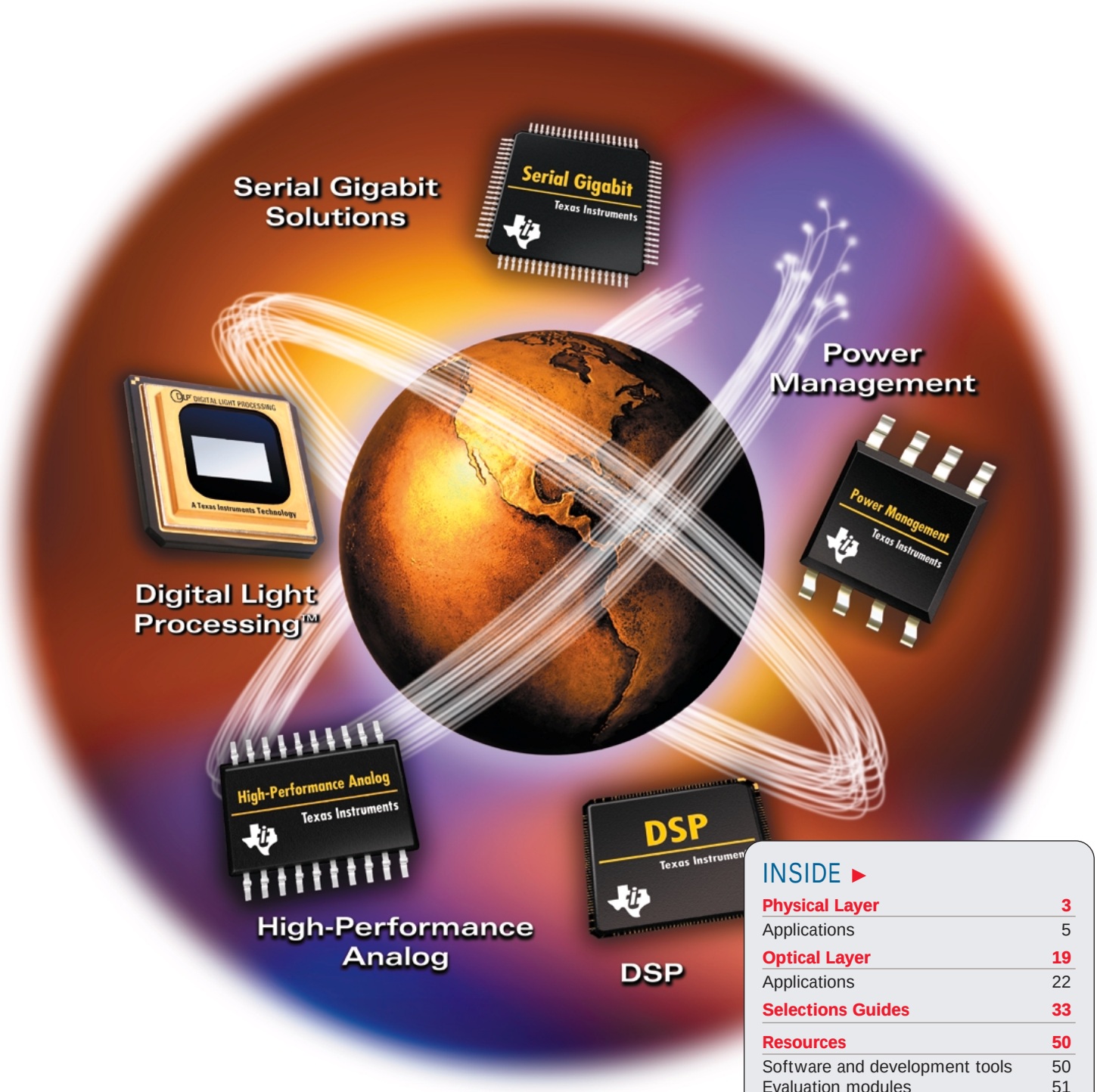
OPTICAL NETWORKING SOLUTIONS GUIDE

Amplifiers, Clock Distribution, Data Converters, Digital Light Processing™, Digital Signal Processors, Logic, Microcontrollers, Power Management, Serial Gigabit Solutions

4Q 2002



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TI SOLUTIONS ENABLE THE INTELLIGENT OPTICAL NETWORKS OF TODAY AND TOMORROW

Global communications traffic in both voice and data has grown tremendously throughout the past decade. To support this demand, communications bandwidth capacity and geographic coverage have been substantially expanded. Optical signals sent over fiber networks have enabled these tremendous advances. However, the growth in tele- and data-communications traffic is just beginning. As increasing numbers of people access the Internet via broadband, they gain exposure to a new world of choices and possibilities. Streaming audio, teleconferencing, video-on-demand and 3-D virtual reality are just a few of the applications. Optical networking, with its inherent advantages, will be key in making this new world of communications possible.

TI's optical networking portfolio supports a broad application base that is enabling the intelligent optical networks of today and tomorrow. This portfolio includes market-leading, fully integrated serial gigabit transceivers, ASICs, DSPs, high-performance analog and Digital Light Processing™ technologies. TI delivers products that will benefit companies building systems or delivering services based on optical networking technology.

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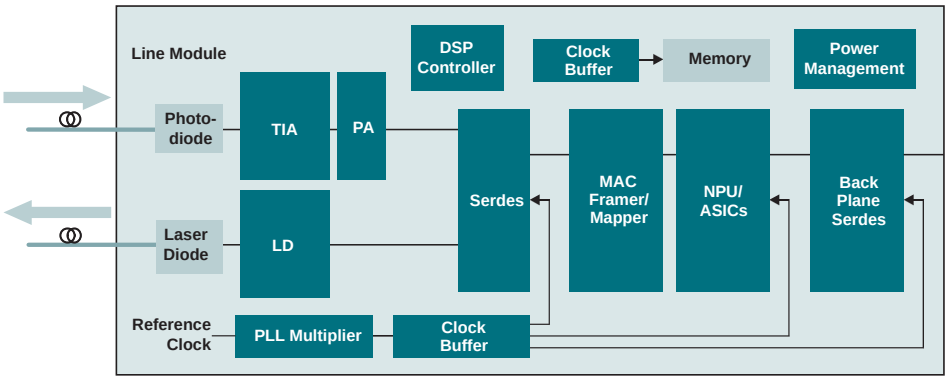
OPTICAL MODULES

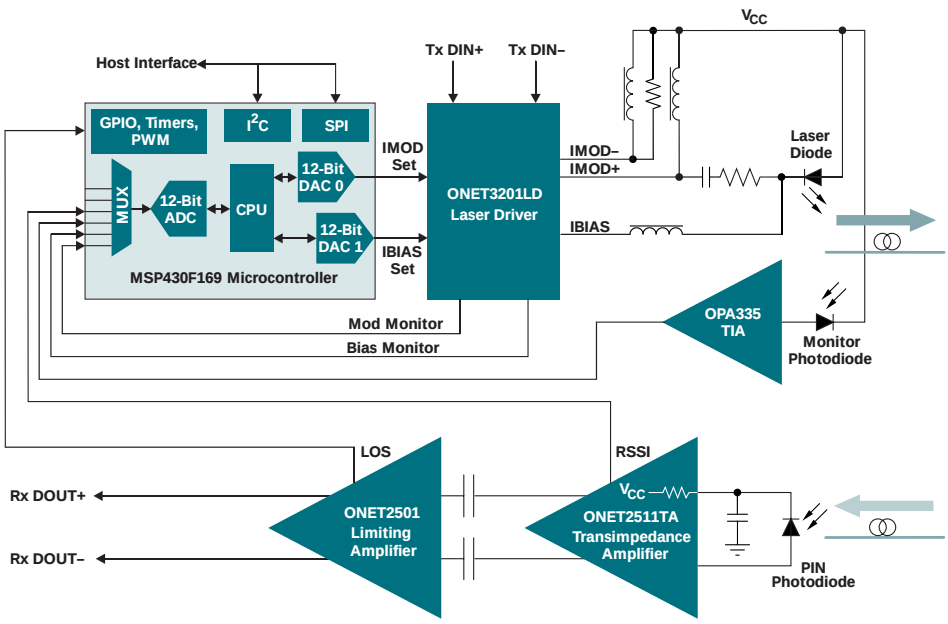
Fiber optic transceivers, transponders and line cards are the "on/off ramps" of the optical network. As optical links push into the metropolitan area network (MAN), footprint and power consumption are key design concerns. Whether it's a fiber optic module or a complete optical line card, TI's highly integrated, low-power, "across the board" solutions enable leading designs for 10 Gigabit Ethernet, SONET or any proprietary application.

For Serdes and high-speed backplane interfaces, TI offers the Serial Gigabit Solutions family of devices, providing the industry's lowest power dissipation while enabling multigigabit transmissions. Other devices profiled in this section include physical-media-dependent devices, clock distribution solutions, power management products, LVDS solutions, and DSPs/embedded microprocessors for monitoring and control applications.

Optical Line Card/Transponder



Optical Transceiver



TO KNOW MORE ▶

For detailed information about ICs for optical modules:

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TUNABLE LASER SOLUTIONS

As the number of wavelengths in networks continues to increase, tunable lasers will play an increasingly important role towards enabling the dynamic intelligent network. With the assistance of electronic controls, a tunable laser can produce or "tune" different/multiple wavelengths, which reduces the need for spare line cards and thus lowers a network provider's overall cost and space requirements. Because the market for tunable lasers is still emerging, there exist several different types of technologies. The following diagram shows a common three-section DBR tunable laser. TI's C28x control-optimized DSP and high-performance analog solutions provide the demanding space, power and performance requirements needed for tunable laser control applications.

TO KNOW MORE ▶

For detailed information about ICs for optical modules:

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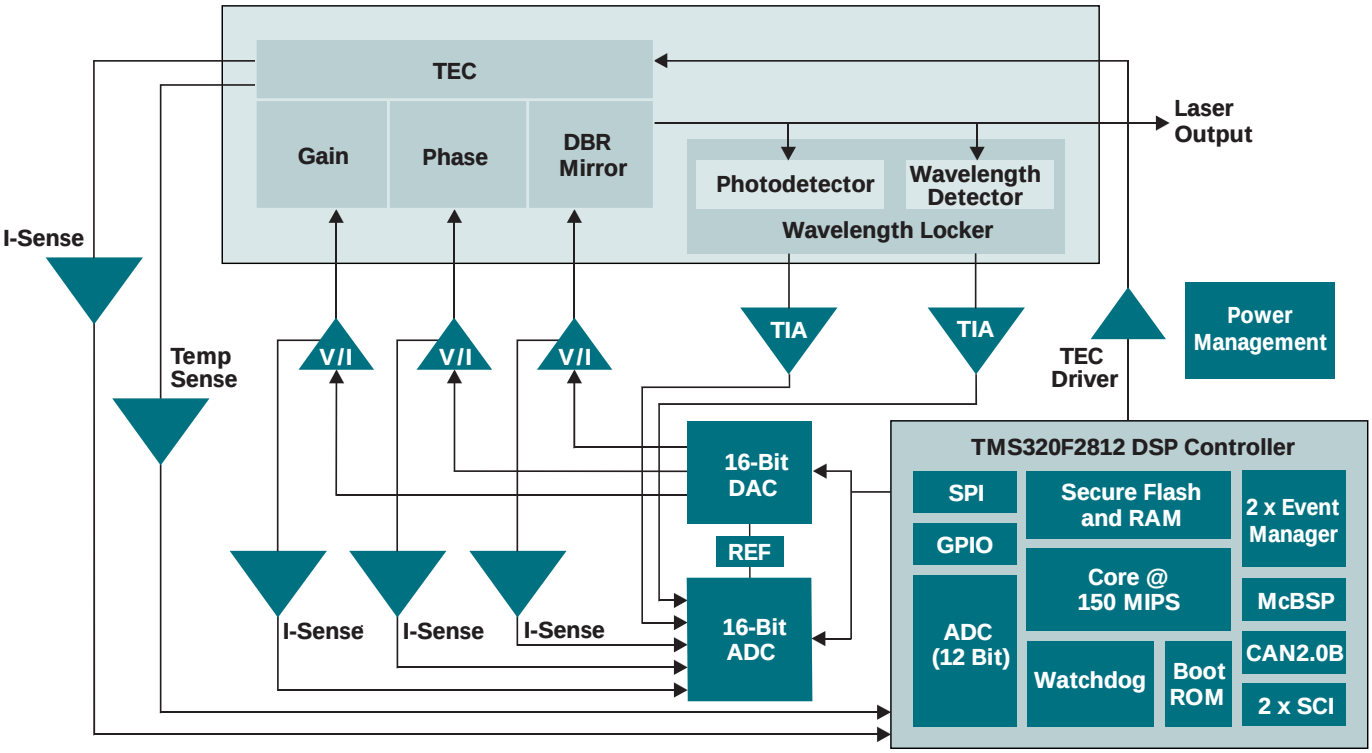
Three-Section DBR Tunable Laser with Integrated Wavelength Locker

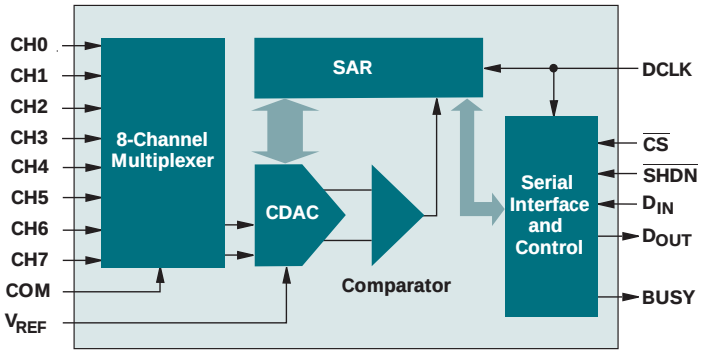


Coming Soon

Look for this **NEW** application note in 1Q 2003: *Thermoelectric Cooler Control Using a TMS320F2812 and a DRV592 Power Amplifier (SPRA873).*
Please check the product folder at the following URL for links to application notes:

www.ti.com/sc/device/TMS320F2812

ADS8344 Block Diagram



16-BIT, 8-CHANNEL SERIAL OUTPUT SAMPLING ADC

ADS8344

Get samples, datasheet, app. reports and EVMs at:
www.ti.com/sc/device/ADS8344

The ADS8344 is a high-performance, 8-channel, 16-bit ADC that is guaranteed to operate down to 2.7 V. It features unipolar input, serial interface, and low power for maximum design flexibility at a very reasonable cost.

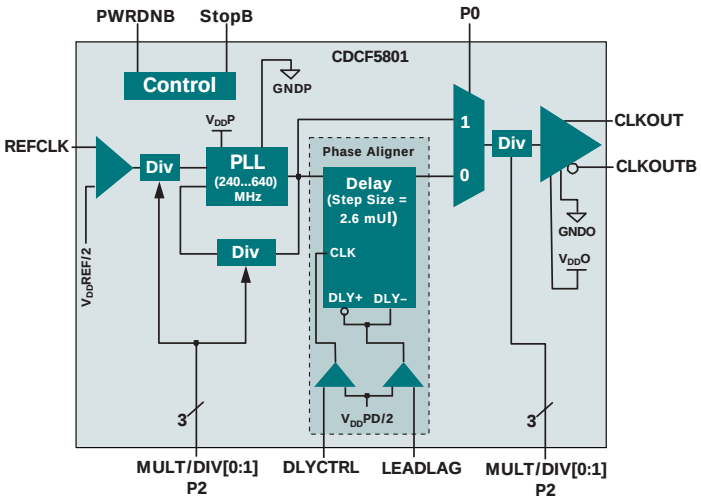
Key Features

- Single supply: 2.7 V to 5 V
- 8-channel single-ended OR
- 4-channel differential input
- Up to 100-kHz conversion rate
- 84-dB SINAD
- Serial interface

Applications

- Thermoelectric cooler (TEC)
- Control, tunable laser
- Wavelength locker
- Erbium doped fiber amplifier (EDFA)
- Raman amplification
- Polarization Mode Dispersion Compensation (PMDC)
- Optical performance monitoring
- Light power monitoring
- Avalanche photodiode (APD)

CDCF5801 Block Diagram



LOW-JITTER CLOCK MULTIPLIER AND DIVIDER WITH PROGRAMMABLE DELAY AND PHASE ALIGNMENT

CDC5801

Get samples, datasheets and app. reports at:
www.ti.com/sc/device/CDC5801

The CDC5801 provides clock multiplication and division from a reference clock (REFCLK) signal. It also allows delay or advance of the CLKOUT/CLKOUTB with steps of 2.6 mUI (equally 5 ps @ 500 MHz) through a unique phase aligner.

Key Features

- Low-jitter clock multiplier x4, x6, x8
  - Input frequency range (19 MHz to 125 MHz)
  - Supports output frequency from 150 MHz to 500 MHz
  - 2.6-mUI programmable bidirectional delay steps (down to 5 ps)
- Low-jitter clock divider by 2, 3 or 4
  - Input frequency range (50 MHz to 135 MHz)
  - Supports ranges of output frequency from 12.5 MHz to 62.5 MHz.
  - Programmable bi-directional delay steps smaller than 6.5 ps
- Input accepts LVTTL and LVPECL signals
- Output compatible to single-ended LVTTL and all differential signaling standards
- Packaging: 24-pin SSOP (DBQ)

Applications

- Jitter isolation
- Delay adjustment of parallel clock buffers
- Video graphics
- Gaming products
- Datacom
- Telecom

3.3-V HIGH-PERFORMANCE CLOCK SYNCHRONIZER

Product Preview*

CDC7005*

The CDC7005 is a high-performance, low-phase noise and low-skew clock synchronizer that synchronizes the VCXO (Voltage Controlled Crystal Oscillator) frequency to the reference clock.

Key Features

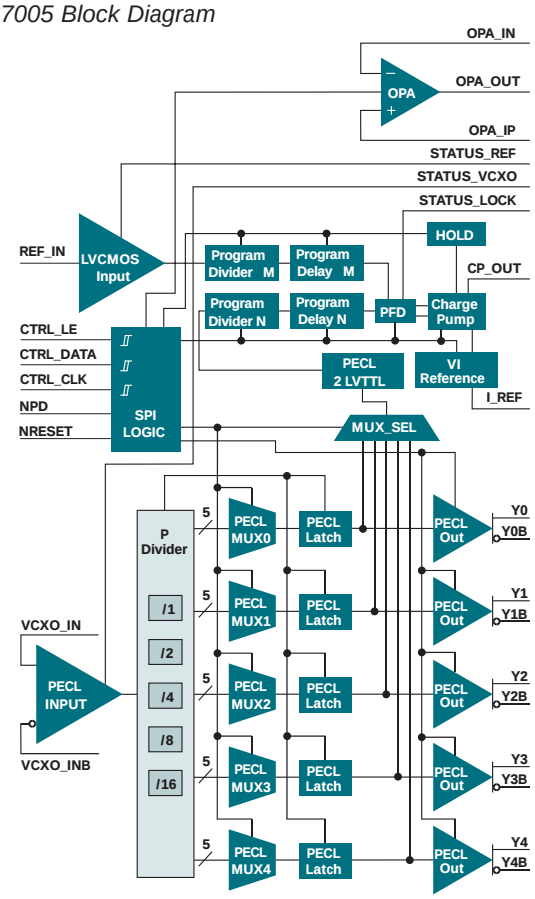
- High-performance 1:5 PLL clock synchronizer
- Meets OC-48 and OC-192 jitter compliance with qualified VCXO/VCSO
- Synchronizes frequencies up to 800 MHz (VCXO_IN)
- Supports five differential LVPECL outputs
- Each output frequency is selectable by x1, /2, /4, /8, /16
- All outputs are synchronized
- Integrated low-noise OPA for external low-pass filter
- Programmable input-to-output skew
- Packaging: 64-pin BGA (0.8-mm ZVA)

Applications

- Jitter cleaning for OC-48 and OC-192 compliance
- SONET/SDH line card
- SFI-4 interface clocking
- BTS

**The CDC7005 is in the product preview stage of development. Expected availability is 1Q 2003.*

CDC7005 Block Diagram



PROGRAMMABLE LOW-VOLTAGE 1:10 LVDS CLOCK DRIVER

CDCLVD110, CDCLVP110

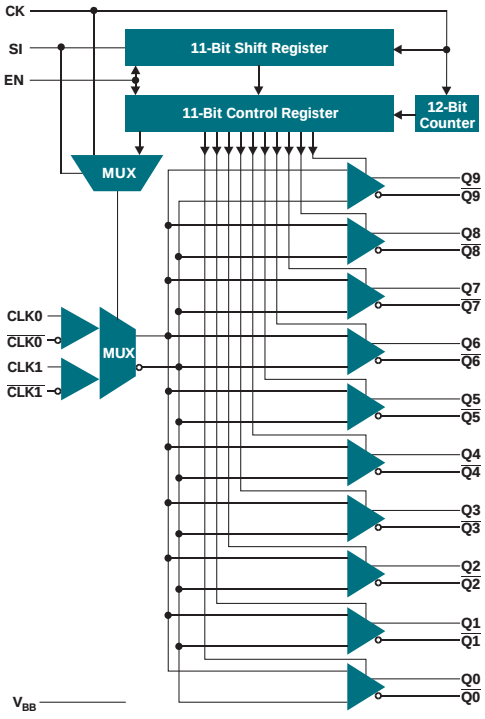
Get samples, datasheets and app. reports at:
www.ti.com/sc/device/partnumber
Replace partnumber in URL with CDCLVD110 or CDCLVP110

The CDCLVD110 and CDCLVP110 clock driver distributes one pair of differential LVDS clock inputs (either CLK0 or CLK1) to ten pairs of differential clock outputs (Q0, Q9) with minimum skew for clock distribution. It is specifically designed for driving 50-Ω transmission lines.

Key Features

- CDCLVD110:
  - 10 differential LVDS clock outputs
  - Accepts LVDS, LVTTL, HSTL, CML or LVPECL signaling levels
  - Signaling rate capability >900 MHz
  - Cycle-to-cycle jitter less than 1 ps (rms)
  - Packaging: 32-pin LQFP (VF)
- CDCLVP110:
  - 10 differential LVPECL/LVECL clock outputs
  - LVPECL and HSTL input
  - Low-output skew (35 ps) max
  - Operates from 2.375 V to 3.8 V
  - Output speed up to 3.5 GHz
  - Packaging: 32-pin TQFP

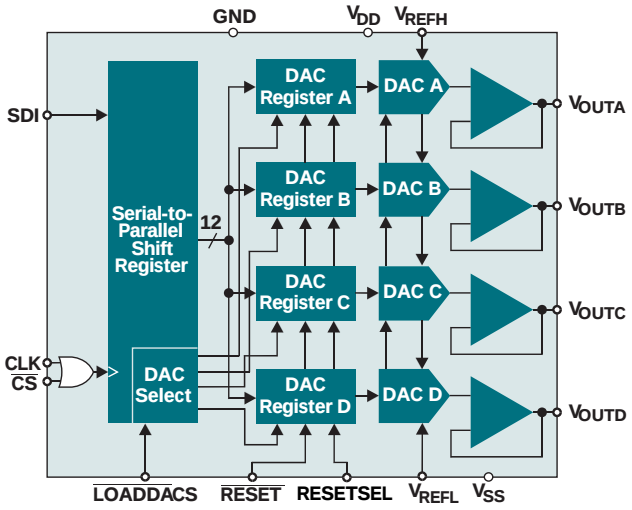
CDCLVD110 Block Diagram



Applications

- SONET/SDH line card
- Gigabit/10-Gigabit Ethernet system
- Networking equipment
- Base station
- Backplane application

DAC7614 Block Diagram



Applications

- Process control
- Closed-loop servo control
- Data acquisition system

QUAD, SERIAL INPUT, 12-BIT, VOLTAGE OUTPUT DAC

DAC7614

Get samples, datasheet and app. reports at:
www.ti.com/sc/device/DAC7614

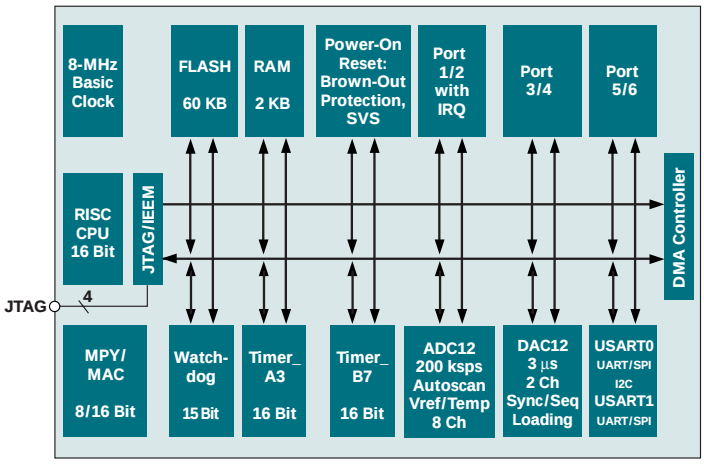
The DAC7614 is a quad, serial input, 12-bit, voltage output digital-to-analog converter (DAC). The device can be powered from a single +5V supply or from dual +5V and –5V supplies.

Low power and small size makes the DAC7614 ideal for process control, data acquisition systems, and closed-loop servo-control.

Key Features

- Low power: 20 mW
- Unipolar or bipolar operation
- Settling time: 10 µs to 0.012%
- 12-bit linearity and monotonicity: –40°C to +85°C
- User selectable reset to mid-scale or zero-scale
- Second source for DAC8420
- Packaging: 16-pin DIP, 16-lead SOIC, and 20-lead SSOP

MSP430F169 Block Diagram



Applications

- Optical transmitter/transponder monitoring and control
- Optical receiver monitoring and control
- TEC control

**The MSP430F169 is in the product preview stage of development. Expected availability is 2Q 2003.*

HIGH-PERFORMANCE 16-BIT RISC SCoC FLASH MCU

Product Preview*

MSP430F169

Get samples, datasheet, app. reports and EVMs at:
www.ti.com/msp430

Experience the ultimate Signal-Chain-on-Chip (SCoC) solution for low-power applications. The MSP430F169 features the combination of ultra-low power consumption and integrated high-performance analog peripherals ideal for cost, power, and space-sensitive optical networking applications.

Key Features

- Ultra-low power consumption: 280-µA active mode, 1.6-µA standby mode at 2.2 V (typ)
- 16-bit RISC architecture enables new applications at a fraction of the code size
- High performance integrated analog and digital peripherals including 3-channel internal DMA, dual 12-bit D/A converters with synchronization, and 200-ksps 12-bit A/D converter reduce system cost and speed time-to-market
- Serial communication Interface (USART) functions as asynchronous UART, synchronous SPI or I^2C interface providing flexibility of design
- In-system programmable Flash permits last-minute code changes, field upgrades, and data logging to Flash
- The MSP430F169 is drop-in compatible with the currently available MSP-FET430P140 development tool

Read *Optical Networking Solutions Guide* online at www.ti.com/onetsg

2.5-Gbps LIMITING AMPLIFIER, 2.5-Gbps TRANSIMPEDANCE AMPLIFIER AND 3.2-Gbps LASER DRIVER

ONET3201LD,[1] ONET2501PA,[2] ONET2551PA,[2] ONET2501TA[3] and ONET2511TA[3]

Product Preview*

The ONET products are low-power, 3.3-V solutions for optical modules.

Key Features

ONET3201LD

- 3.2-Gbps operation
- Bias and modulation currents independently programmable from 1 mA to 90 mA
- APC and fault detection

ONET2501PA

- 3-GHz bandwidth
- 40-dB gain
- Fully differential architecture

ONET2511TA

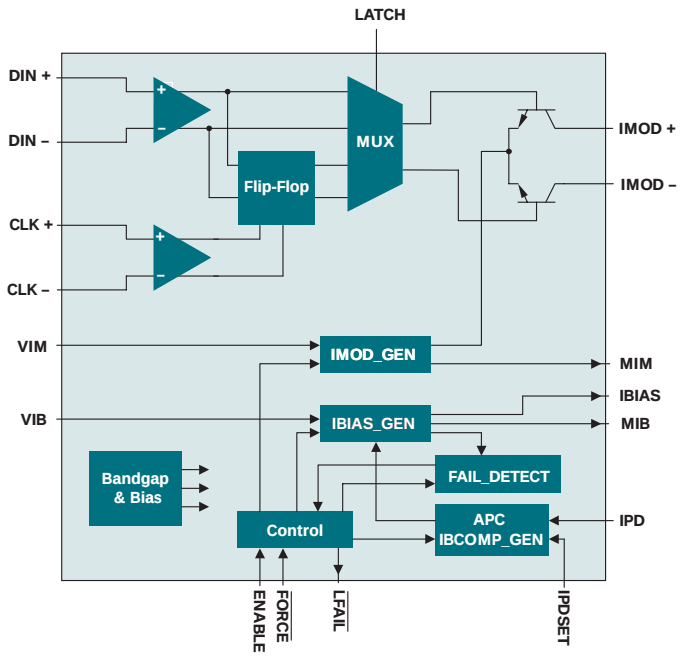
- 2.2-GHz bandwidth
- 4-kΩ differential transimpedance
- 10-pA/√Hz typical input referred noise
- RSSI

Applications

- SONET OC-48
- SDH STM-16
- Fiber optic data link

**The following products are in the product preview stage of development.*
[1]Planned release 3Q 2003.
[2]Planned release 2Q 2003.
[3]Planned release 4Q 2003.

ONET3201LD Block Diagram



25-A DUAL-OUTPUT ISOLATED DC/DC CONVERTER

PT4660 Series

Get samples, datasheet and app. reports at:
www.ti.com/sc/device/PT4660

The PT4660 Excalibur™ series is a dual-output isolated DC/DC converter that combines state-of-the-art power conversion technology with unparalleled flexibility. Operating from a standard telecom (–48-V) central office supply, the PT4660 series provides up to 20 A of output current from two independently regulated voltages (each output 15 A max).

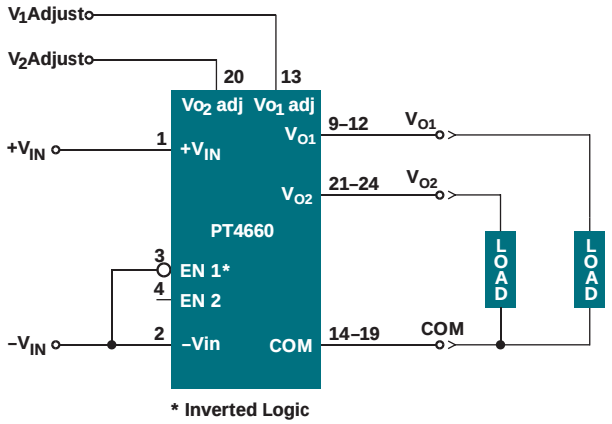
Key Features

- Dual outputs (independently regulated)
- Power-up/down sequencing
- Input voltage range: 36 V to 75 V
- 1500 VDC isolation
- Temperature range: –40 to 100°C
- High efficiency: 88%
- Over-current protection (both outputs)
- Over-temperature shutdown
- Over-voltage protection (coordinated shutdown)
- Under-voltage lockout

Applications

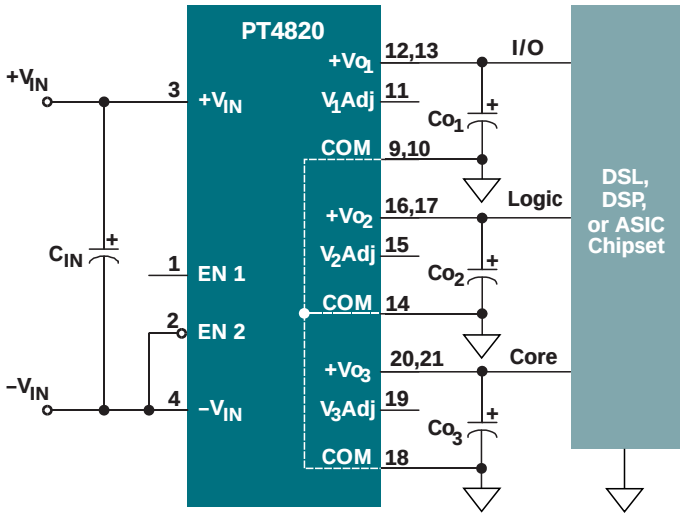
- Telecom/Datacom distributed power
- Central office switching
- Wireless basestation

PT4660 Series Typical Application



Device	V_{O1}/V_{O2} (V)	Device	V_{O1}/V_{O2} (V)
PT4661	5.0/3.3	PT4666	2.5/1.8
PT4662	3.3/2.5	PT4667	5.0/1.8
PT4663	3.3/1.8	PT4668	3.3/1.2
PT4665	3.3/1.5		

PT4820 Series Typical Application



Device	$V_{O1}/V_{O2}/V_{O3}$ (V)	Device	$V_{O1}/V_{O2}/V_{O3}$ (V)
PT4821	3.3/2.5/1.5	PT4827	3.3/2.5/1.8
PT4822	3.3/1.8/1.5	PT4828	5.0/2.5/1.5
PT4823	3.3/2.5/1.2	PT4829	5.0/1.8/1.5
PT4824	3.3/1.8/1.2	PT4831	5.0/3.3/1.5
PT4825	3.3/1.5/1.2	PT4832	5.0/3.3/2.5
PT4826	5.0/3.3/1.8		

35-W TRIPLE-OUTPUT ISOLATED DC/DC CONVERTER

PT4820 Series

Get samples, datasheet and app. reports at:
www.ti.com/sc/device/PT4820

The PT4820 Excalibur™ power modules are a series of isolated triple-output DC/DC converters that operate from a standard (–48-V) central office supply. Rated for up to 35 W, these regulators are ideal for powering many mixed-logic applications.

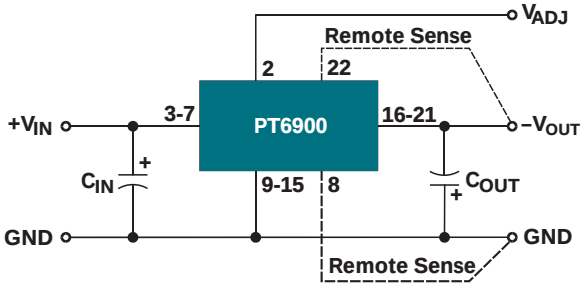
Key Features

- Triple outputs (independently regulated)
- Input voltage range: 36 V to 75 V
- 1500 VDC isolation
- Dual logic on/off control
- Short-circuit protection (all outputs)

Applications

- Telecom/Datacom distributed power
- Central office switching
- Wireless basestation

PT6900 Series Typical Application



+5-V Input	+3.3-V Input	V_{OUT} (V)
PT6901	PT6904	–2.0
PT6902	PT6905	–5.2
PT6903		–1.5

12-W, 5-V/3.3-V INPUT PLUS-TO-MINUS VOLTAGE CONVERTER

PT6900 Series

Get datasheet and app. reports at:
www.ti.com/sc/device/PT6900

The PT6900 is a series of high-performance ISRs that provide plus-to-minus voltage conversion of up to 12 W. A 330-µF electrolytic capacitor is required on the input and output for proper operation.

Please note that this product is not short-circuit protected.

Key Features

- +5-V/+3.3-V input voltage
- Negative output
- Remote sense
- Adjustable output voltage
- Packaging: 23-pin SIP

Applications

- High-speed fiber optic communication
- ECL (–5.2-V) and GaAs (–2.0-V) IC power supply

PROGRAMMABLE INTEGRATED SWITCHING REGULATOR MODULE

PT7761

The PT7761 is a high-performance integrated switching regulator (ISR) housed in a solderable, 31-pin space-saving copper package. For additional output current, the PT7761 can operate with up to three current boosters.

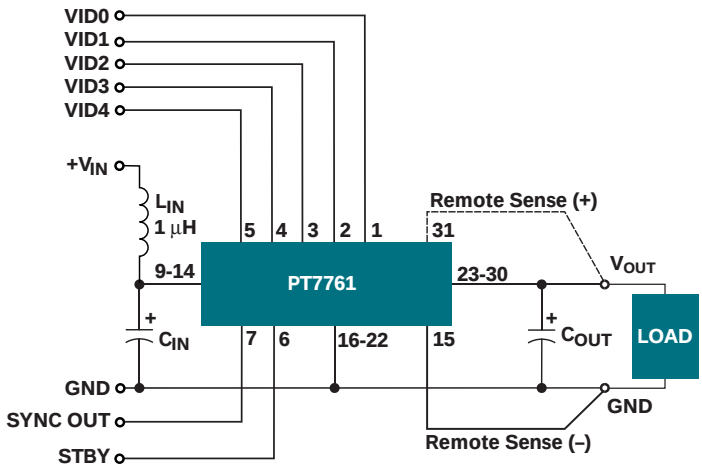
Key Features

- +5-V input
- 5-bit programmable from 1.3 V to 3.5 V
- 90% efficiency
- Differential remote sense
- Short-circuit protection
- Current booster compatible
- Shutdown control

Applications

- Point-of-load power supply
- Broadband, networking and optical communications infrastructure

PT7761 Typical Application



QUAD OC-48 SONET/SDH TRANSCEIVER

SLK2504

Get datasheet and app. reports at:
www.ti.com/sc/device/SLK2504

The SLK2504 is a quad OC-48 transceiver that integrates all the necessary system blocks, including clock and data recovery, serial-to-parallel and parallel-to serial conversion, and frame detection functions conforming to the SONET/SDH specification.

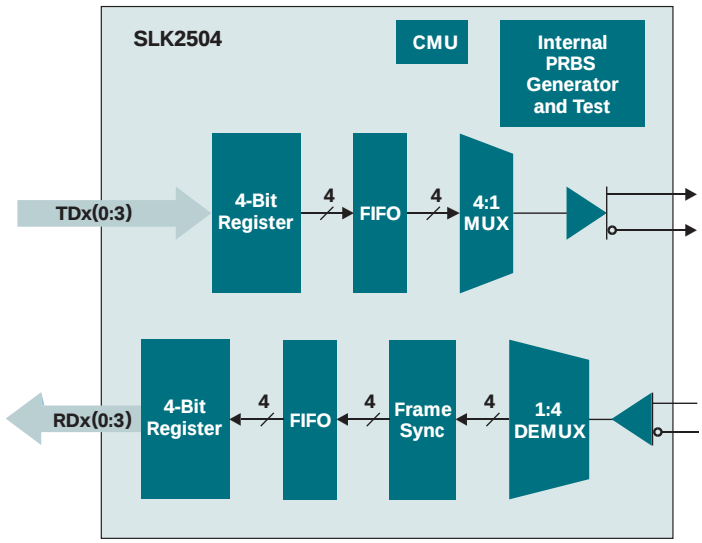
Key Features

- Fully integrated 4-channel SONET transceiver with clock/data recovery and MUX/DEMUX functions
- Selectable TX only, RX only, TX/RX and repeater functions
- Supports OIF-SFI4-01.0 electrical I/F (4x4-bit or 1x16-bit LVDS I/F)
- Supports FEC data rates up to 2.7 Gbps
- 4-bit LVDS parallel I/F and voltage mode logic (VML) serial I/F with programmable pre-emphasis and internal termination
- Low power (1.5 W) at OC-48 rate
- 155-MHz or 622-MHz reference clock
- 1.8-V operation
- Packaging: 289-pin PBGA

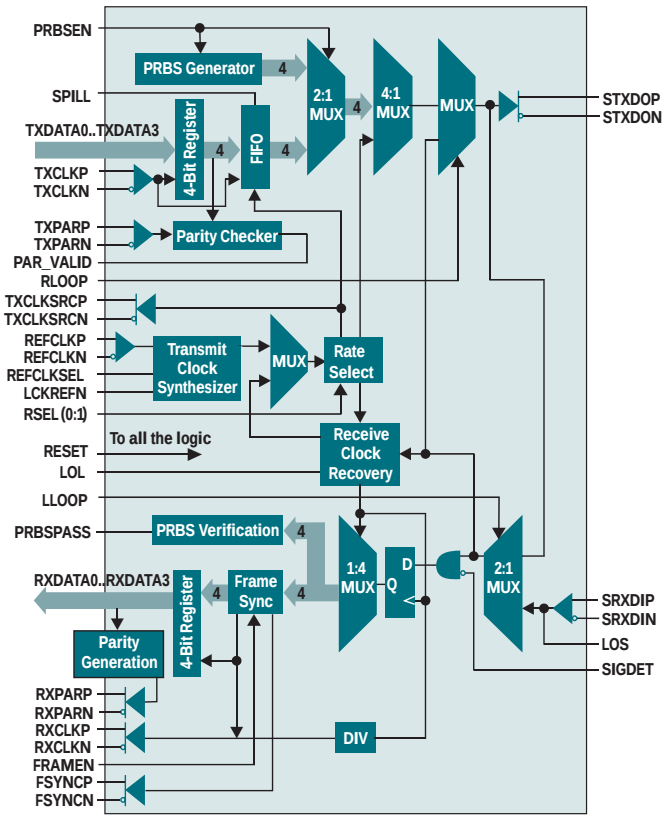
Applications

- Optical transceiver
- Optical switch
- SONET add/drop MUX
- Optical router
- VSR-3 optical module
- Optical system interconnect
- DWDM optical add/drop MUX

SLK2504 Single-Channel Diagram



Multi-Rate SONET Transceiver



OC-48/24/12/3 SONET/SDH MULTIRATE TRANSCEIVER

SLK2511, SLK2701

Get samples and datasheets at:
www.ti.com/sc/device/partnumber
Replace partnumber in URL with SLK2511 or SLK2701

SLK2511 and SLK2701 are single-chip, multi-rate transceiver ICs used to derive high-speed timing signals for SONET/SDH-based equipment. The chips perform clock and data recovery, serial-to-parallel, parallel-to-serial conversion and frame detection conforming to SONET/SDH standards.

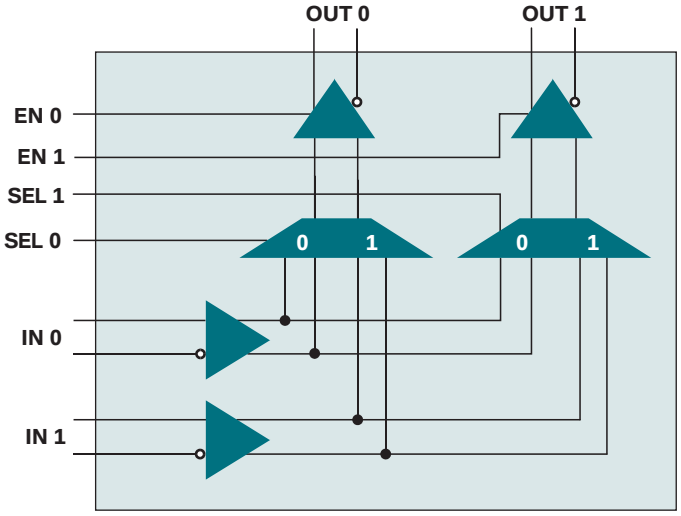
Key Features

- Multi-rate support including OC-48, OC-24, OC-12 and OC-3
- Low power consumption: <900 mW for OC-48
- 4-bit LVDS 622-MHz parallel interface
- LVPECL compatible serial interface
- Auto rate detection
- Support for both 155-MHz or 622-MHz reference clocking
- Built-in PRBS generation and verification
- Targeted to meet or exceed all SONET/SDH jitter requirements

Applications

- Optical transceiver
- SONET add/drop MUX
- DWDM optical add/drop MUX
- Optical switch
- Optical router
- Optical system interconnect

SN65LVCP22/SN65LVCP23 Functional Diagram (Positive Logic)



2 x 2 GIGABIT LVDS AND LVPECL CROSSPOINT SWITCHES

SN65LVCP22*, SN65LVCP23*

Product Preview*

The SN65LVCP22 and SN65LVCP23 are 2 x 2 crosspoint switches providing greater than 1-Gbps operation for each path. The dual channels incorporate wide common-mode (0-V to 4-V) receivers, allowing for the receipt of LVDS, LVPECL and CML signals.

Key Features

- SN65LVCP22 LVDS outputs with > 1-Gbps switching speed
- SN65LVCP23 LVPECL outputs with > 2-Gbps switching speed
- Low-jitter fully differential data path
- 20 ps (typ) of pk-pk jitter
- Output (ch-to-ch) skew is 10 ps (typ), 20 ps (max)
- Configurable as 2:1 MUX, 1:2 DEMUX, repeater or 1:2 signal splitter
- Fast switch time of 1.2 ns (typ), 1.5 ns (max)
- Receiver input threshold < 100 mV
- Packaging: 16-pin SOIC and TSSOP

Applications

- Base station
- Add/drop MUX
- Protection switching for serial backplane
- Network switche/router
- Optical networking line cards/switch
- Clock distribution

**The SN65LVCP22 and SN65LVCP23 are in the product preview stage of development. Expected availability is 2Q 2003.*

2-Gbps DIFFERENTIAL TRANSLATOR/REPEATER

SN65LVDS100, SN65LVDS101

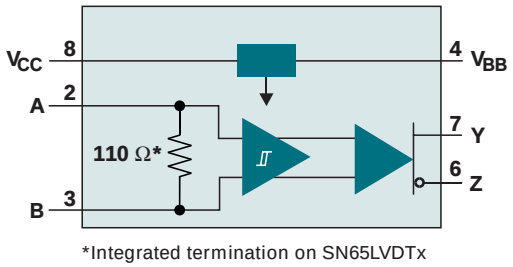
Get samples, datasheets, app. reports and EVMs at:
www.ti.com/sc/device/partnumber
Replace partnumber in URL with SN65LVDS100 or SN65LVDS101

These high-speed translators/repeaters were designed for signaling rates up to 2 Gbps to address various high-speed network routing applications. Inputs accept LVDS, LVPECL and CML levels. The SN65LVDS100 provides LVDS outputs while the SN65LVDS101 supports LVPECL outputs.

Key Features

- Designed for signaling rates up to 2 Gbps
- Total jitter <65 ps
- Low-power alternative for the MC100EP16
- Low 100-ps (max) part-to-part skew
- 25 mV of receiver input threshold hysteresis over 0-V to 4-V common-mode range
- Inputs electrically compatible with LVPECL, CML and LVDS signal levels
- 3.3-V supply operation
- Integrated 110-Ω terminating resistor option
- The SN65CML100 features CML output
- Packaging: SOIC and MSOP chip-scale package

SN65LVDS100/SN65LVDS101 Block Diagram



*Integrated termination on SN65LVDTx

Applications

- 622-MHz central office clock distribution
- High-speed network routing
- Wireless base station
- Low-jitter clock repeater
- Serdes LVPECL o/p to FPGA LVDS i/p translator

1.5-Gbps 2 x 2 AND 4 x 4 LVDS CROSSPOINT SWITCHES

SN65LVDS122/LVDT122, SN65LVDS125/LVDT125

Get samples, datasheets and app. reports at:
www.ti.com/sc/device/partnumber
Replace partnumber in URL with SN65LVDS122, SN65LVDT122, SN65LVDS125 or SN65LVDT125

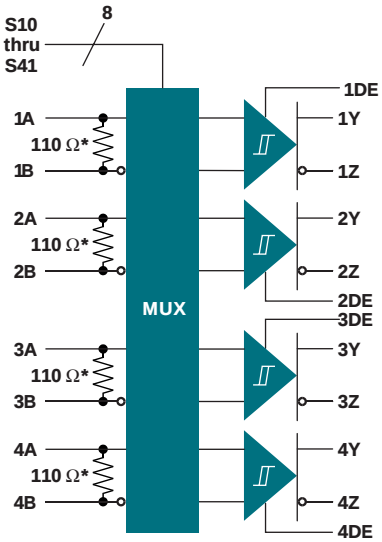
The SN65LVDS122/LVDT122 (2 x 2) and SN65LVDS125/LVDT125 (4 x 4) are crosspoint switches that use low-voltage differential signaling (LVDS) to achieve signaling rates as high as 1.5 Gbps. The internal signal paths maintain differential signaling for high speeds and low signal skews. The common-mode input ranges for these devices are:

SN65LVDS122/LVDT122	0 to 4 V
SN65LVDS125/LVDT125	0 to 3.3 V

Key Features

- Total jitter < 65 ps
- 25 mV of receiver input threshold hysteresis
- Inputs electrically compatible with CML, LVPECL and LVDS signal levels
- Propagation delay times, 1 ns maximum
- LVDT integrates 110-Ω terminating resistor
- Packaging: SOIC and TSSOP

SN65LVDS125/LVDT125 Logic Diagram (Positive Logic)

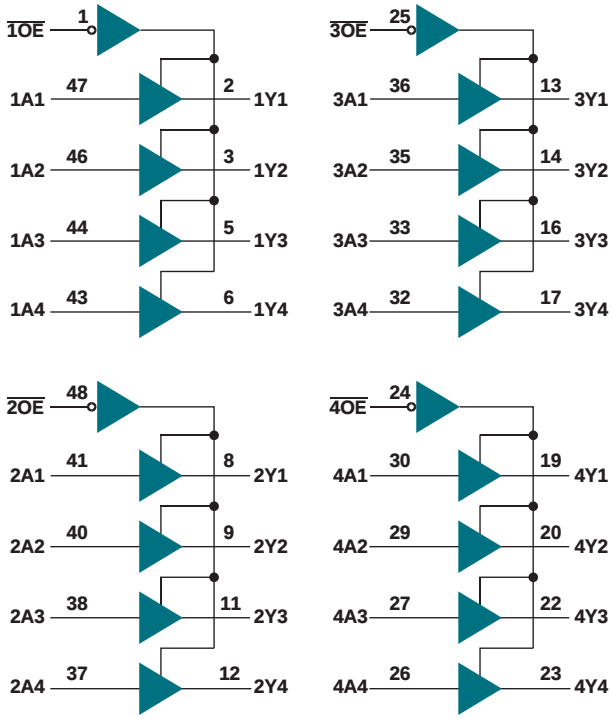


*Integrated termination on LVDT only.

Applications

- 10-G (OC-192) optical module
- 622-MHz central office clock distribution
- Wireless base station
- Low-jitter clock repeater/multiplexer
- Protection switching for serial backplane

SN74ALVC16244A/SN74LVC16244A Block Diagram



Pin numbers shown are for the DGG and DL packages.

16-BIT BUFFER/DRIVER WITH 3-STATE OUTPUTS

SN74ALVC16244A, SN74LVC16244A

Get samples, datasheets and app. reports at:
www.ti.com/sc/device/partnumber
Replace partnumber in URL with SN74ALVC16244A or SN74LVC16244A

Ideal for base station and networking applications, both the LVC and ALVC families of logic technologies offer solutions for speed-critical 3.3-V system designs. The LVC family is a high-performance version with 0.8-µ CMOS process technology. It offers 24-mA current drive and 6.5-ns maximum propagation delays for driver operations. With typical propagation delays of less than 2 ns, ALVC provides 24 mA of current drive and static power consumption of 40 µA for bus-interface functions.

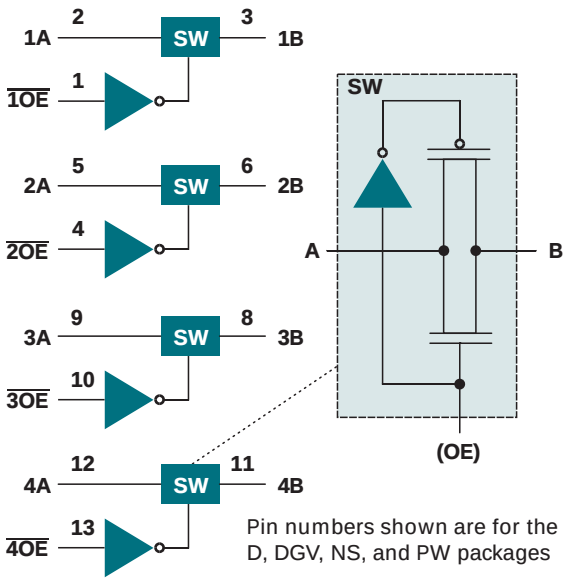
Key Features

- Voltage nodes: 3.3 V, 2.7 V, 2.5 V, 1.8 V
- Output level: LVTTL
- LVC:
  - 5.2-ns max tpd at 3.3 V
  - I_{OFF} circuitry
  - Input level: TTL/CMOS
- Output drive: –24/24 mA
- ALVC:
  - 3.6-ns max tpd at 3.3 V
  - Input level: LVTTL
- Packaging: 48-pin SSOP, TSSOP, TVSOP and 56-pin VFBGA

Applications

- Base station
- Networking

SN74CBTLV3125 Block Diagram



Pin numbers shown are for the D, DGV, NS, and PW packages

LOW-VOLTAGE QUADRUPLE FET BUS SWITCH

SN74CBTLV3125

Get samples, datasheet and app. reports at:
www.ti.com/sc/device/SN74CBTLV3125

The CBTLV family of bus switches was designed to operate at the low-voltage 3.3-V operating node. These high-speed bus-connect devices benefit designs with greater system speed and reduced power consumption. The SN74CBTLV3125 quadruple FET bus switch features independent line switches. Each switch is disabled when the associated output-enable (OE\) input is high.

Key Features

- Standard ’125-type pinout
- 5-Ω switch connection between two ports
- Isolation under power-off conditions
- Latch-up performance exceeds 100 mA per JESD 78, Class II
- Voltage nodes: 3.3 V, 2.5 V
- t_{pd} max: 0.25 ns
- Packaging: 14-pin SOP, TVSOP, TSSOP and 16-pin SSOP

Applications

- Telecom
- Consumer
- Computing

Read *Optical Networking Solutions Guide* online at www.ti.com/onetsg

8-PORT GIGABIT ETHERNET TRANSCEIVER

TLK2208

The TLK2208 8-port Gigabit Ethernet transceiver combines high port density and ultra-low power in a small footprint. It provides for high-speed, full-duplex, point-to-point data transmissions based on the IEEE802.3z 1000-Mbps Ethernet specification. The TLK2208 performs the data encoding, decoding, serialization, deserialization, clock extraction and clock tolerance compensation functions for a physical layer interface device.

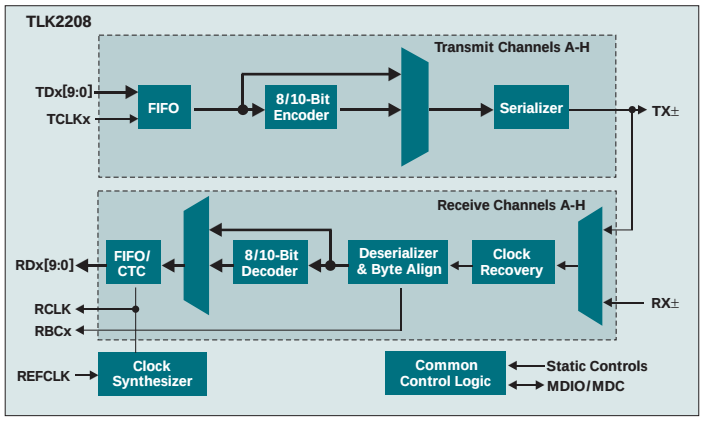
Key Features

- Eight 1.0- to 1.3-Gbps synchronizable transceivers
- Low power consumption: <1.5 W @ 1.25 Gbps
- IEEE 802.3z gigabit Ethernet compliant
- Differential VML transmit outputs with no external components necessary
- IEEE 1149.1 JTAG support
- Hot plug protection on serial I/O
- No external filter components required for PLLs
- Packaging: 289-pin, 1.0-mm ball pitch BGA

Applications

- Point-to-point backplane
- Gigabit Ethernet router
- Gigabit Ethernet switch

TLK2208 Block Diagram



10-GBPS XAUI TRANSCEIVER

TLK3104SA, TLK3114SA

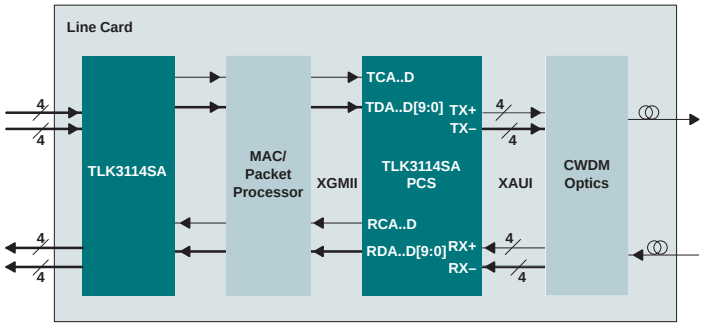
Get datasheets, app. reports and EVMs at:
www.ti.com/sc/device/partnumber
Replace partnumber in URL with TLK3104SA or TLK3114SA

The TLK3114SA device is a flexible quad serial transceiver, delivering high-speed, bidirectional, point-to-point data transmissions to provide up to 10 Gbps of data transmission capacity. The TLK3114SA device is terminal compatible with the TLK3104SA quad serial transceiver and supports an operating range of serial data rates from 2.5 Gbps to 3.125 Gbps.

Key Features

- 802.3ae 10-Gbps Ethernet XGXS compliant
- MDIO interface
- Selectable synchronized or independent channel operation
- Selectable on-chip 8-b/10-b ENDEC
- Able to operate with a single 2.5-V power supply
- On-chip 100-Ω differential receiver termination
- IEEE 1149.1 JTAG test interface
- Packaging: Small footprint 19x19 mm 289-ball PBGA

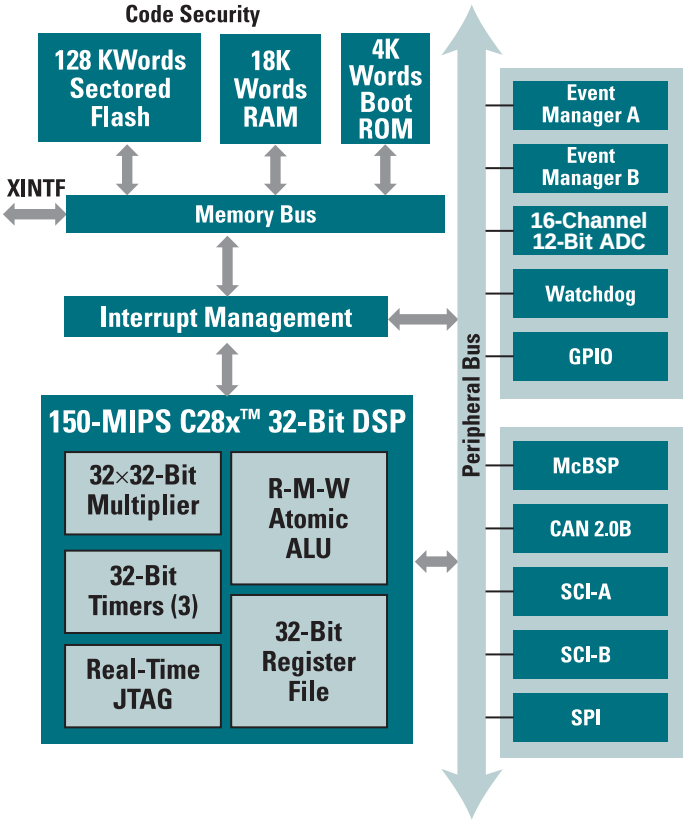
TLK3114SA provides system backplane interconnect



Applications

- Gigabit Ethernet switch router
- Gigabit Ethernet backplane
- Point-to-point proprietary backplane

TMS320F2812 DSP Block Diagram



CONTROL-OPTIMIZED DSPs

TMS320C2000™ DSP Platform

Get samples, datasheets, app reports and EVMs at:
http://dspvillage.ti.com/c2000

TI's TMS320C2000™ DSP platform provides the highest level of on-chip integration and powerful computational ability for tunable laser applications. The C2000™ DSP's integrated flash memory, multi-channel analog-to-digital converter and serial communications and control peripherals offer high-performance control in a minimum of space. TI's advanced TMS320C28x™ DSP product family additions bring even higher levels of DSP performance and peripherals.

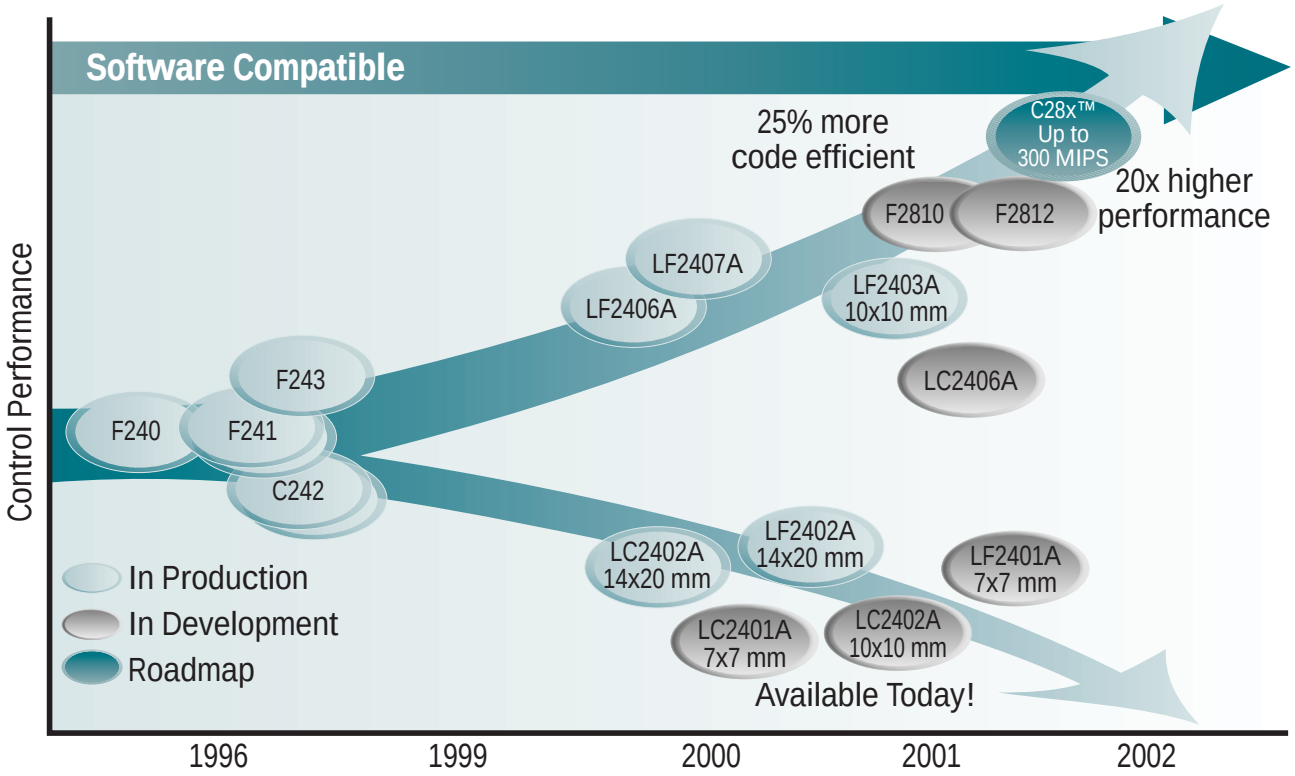
Key Features

- MIPS: C24x: Up to 40, C28x: Up to 150
- On-chip Flash memory
- On-chip A/D converters
- High level of integration in ultra-small BGA and LQFP packages
- Serial communications interface (SCI)
- Serial peripheral interface (SPI)
- Integrated control peripherals; timers, PWM, watchdog
- C2000™ DSP optical networking software library

Applications

- Tunable laser
- Thermoelectric cooler (TEC) control
- Monitoring and control in optical transponder and module
- EDFA amplifier pump laser control
- Raman amplifier pump laser control

TMS320C2000™ DSP Platform Roadmap



Read *Optical Networking Solutions Guide* online at www.ti.com/onetsg

OPTICAL NETWORK HOT SWAP POWER MANAGER

TPS2346

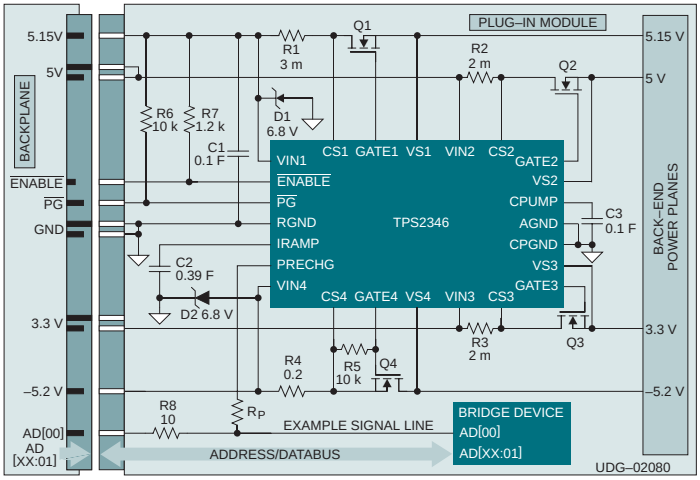
Get samples, datasheet and app. reports at:
www.ti.com/sc/device/TPS2346

The TPS2346 Optical Network Hot Swap Power Manager (HSPM) provides highly-integrated supply control of three positive (3.3-V, 5-V, and 5.15-V) and one negative (–5.2-V) supply rails with a minimum number of external components. A linear current amplifier (LCA) in each of the four device channels provides closed-loop control of load current during insertion and extraction events.

Key Features

- Enables hot swap in high availability optical network systems
- Programmable ourrent slew rate
- Power supply sequencing
- Sense resistors set peak current (I_{MAX})
- Overcurrent circuit breaker at 2x I_{MAX}
- Precharge output
- Power Good output
- On-chip charge pump
- Package: 24-pin TSSOP

TPS2346 Typical Application



Applications

- Hot swap of ONET module
- Supply power-up/power-down sequencing

SIMPLE –48-V HOT SWAP POWER MANAGER

TPS2390, TPS2391

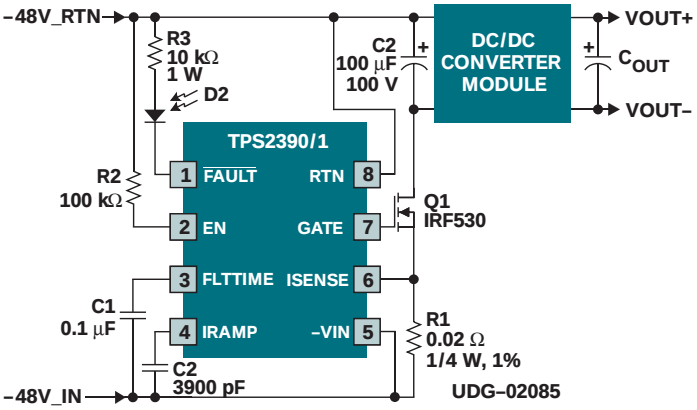
Get samples, datasheet and app. reports at:
www.ti.com/sc/device/partnumber
Replace partnumber in URL with TPS2390 or TPS2391

The TPS2390 and TPS2391 integrated circuits are hot swap power managers optimized for use in nominal –48-V systems. They are designed for supply voltage ranges up to –80 V and are rated to withstand spikes to –100 V. In conjunction with an external N-Channel FET and sense resistor, they can be used to enable live insertion of plug-in cards and modules in powered systems.

Key Features

- Wide input supply range: –36 V to –80 V
- Transient rating to –100 V
- Programmable current limit
- Programmable current slew rate
- Enable input (EN)
- Fault timer to eliminate nuisance trips
- Open-drain fault output ($\overline{FAULT}$)
- Requires few external components
- Packaging: 8-pin MSOP

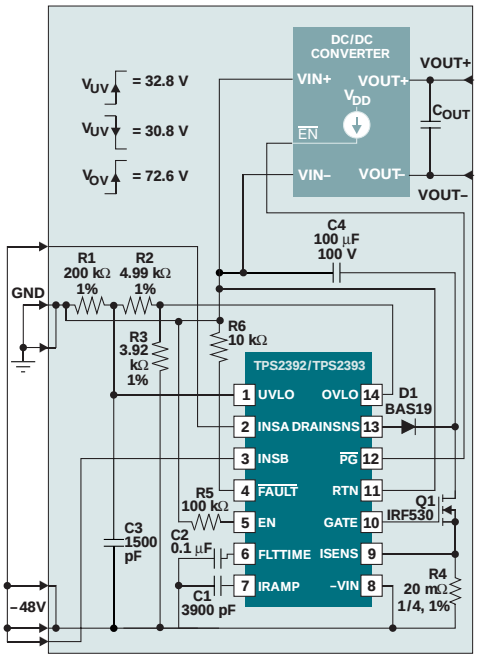
TPS2390/TPS2391 Typical Application



Applications

- –48-V distributed power system
- Central office switching
- Wireless basestation

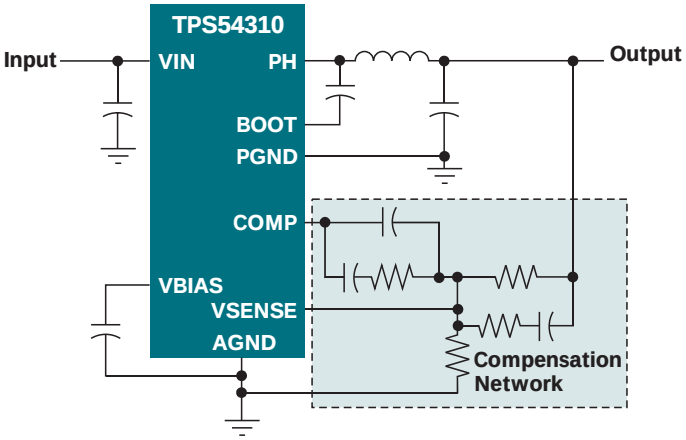
TPS2392/TPS2393 Block Diagram



Applications

- –48-V distributed power system
- Central office switching
- Wireless base station

TPS54310/TPS54311 Block Diagram



Applications

- Low-voltage, high-density systems with power distributed at 5 V or 3.3 V
- Point-of-load regulation for high-performance DSP, FPGA, ASIC and microprocessor
- Broadband, networking and optical communication infrastructure
- Portable computing/notebook PC

FULL-FEATURED –48-V HOT SWAP POWER MANAGER

TPS2392, TPS2393

Get samples, datasheet and app. reports at:
www.ti.com/sc/device/partnumber
Replace partnumber in URL with TPS2392 or TPS2393

The TPS2392 and TPS2393 integrated circuits are hot swap power managers optimized for use in nominal –48-V systems. In conjunction with an external N-channel FET and sense resistor, they can be used to enable live insertion of plug-in cards and modules in powered systems. The TPS2392 latches off in response to current faults, while the TPS2393 periodically retries the load in the event of a fault.

Key Features

- Wide input supply range: –20 V to –80 V
- Transient rating to –100 V
- Programmable current limit and slew rate
- Programmable UV/OV thresholds/hysteresis
- Debounced insertion detection inputs
- Open-drain power good ($\overline{PG}$) output
- Packaging: 14-pin TSSOP

3-V TO 6-V INPUT, 3-A OUTPUT SYNCHRONOUS-BUCK PWM SWITCHER WITH INTEGRATED FETs (SWIFT™)

TPS54310, TPS54311

Get samples, datasheets, app. reports and EVMs at:
www.ti.com/sc/device/partnumber
Replace partnumber in URL with TPS54310 or TPS54311

The TPS54310 and TPS54311 synchronous-buck PWM converters integrate all required active components. These devices have a voltage error amplifier that provides high performance under transient conditions; and an undervoltage-lockout circuit to prevent start-up until the input voltage reaches 3 V.

Key Features

- 60-mΩ MOSFET switches for high efficiency at 3-A continuous output source or sink current
- Output voltage with 1% accuracy:
  - 0.9-V to 3.3-V adjustable (TPS54310)
  - 0.9-V fixed (TPS54311)
- Externally compensated for design flexibility
- Fast transient response
- Wide PWM frequency:
  - Fixed 350 kHz, 550 kHz
  - Adjustable 280 kHz to 700 kHz
- Packaging: 20-pin TSSOP PowerPAD™

Read *Optical Networking Solutions Guide* online at www.ti.com/onetsg

TRACKING SYNCHRONOUS PWM SWITCHER WITH INTEGRATED FETs (SWIFT™) FOR SEQUENCING

TPS54680

Get samples and datasheet at:
www.ti.com/sc/device/TPS54680

The TPS54680 tracking synchronous PWM converter integrates all required active components. Using the TRACKIN pin with other regulators, simultaneous power-up and power-down are easily implemented.

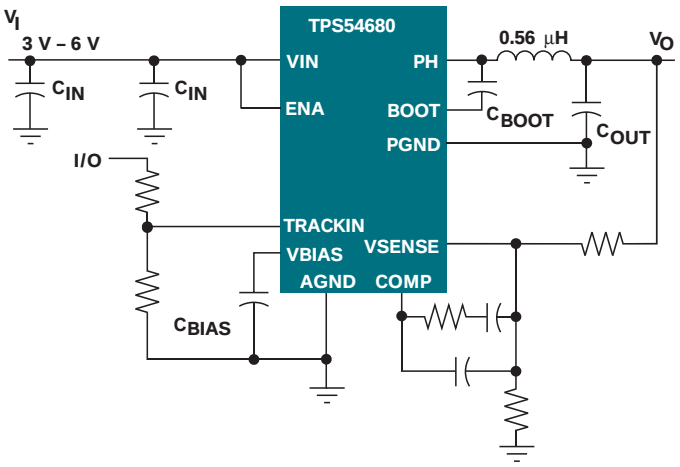
Key Features

- Power-up/down tracking
- 30-mΩ, 12-A peak MOSFET switches for high efficiency at 6-A continuous output source or sink current
- Power Good output and enable
- PWM frequency range:
  - Fixed 350 kHz
  - Adjustable 280 kHz to 700 kHz
- Load protected by peak current limit and thermal shutdown
- Packaging: 28-pin TSSOP PowerPAD™

Applications

- ASIC, DSP, FPGA requiring simultaneous start-up
- Precision point-of-load power supply

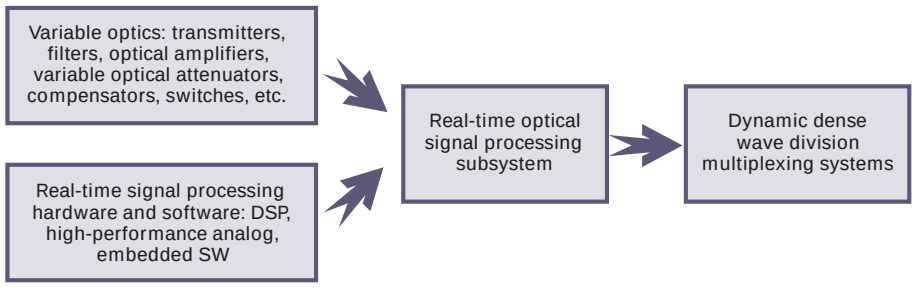
TPS54680 Typical Application



TEXAS INSTRUMENTS — ENABLING DYNAMIC INTELLIGENT OPTICAL NETWORKING

As the next generation of optical networking emerges, it will evolve from the existing fixed point-to-point optical links to a dynamic network, with all-optical switches, varying path lengths, and a new level of flexibility available at the optical layer.

Dynamic Optical Networking



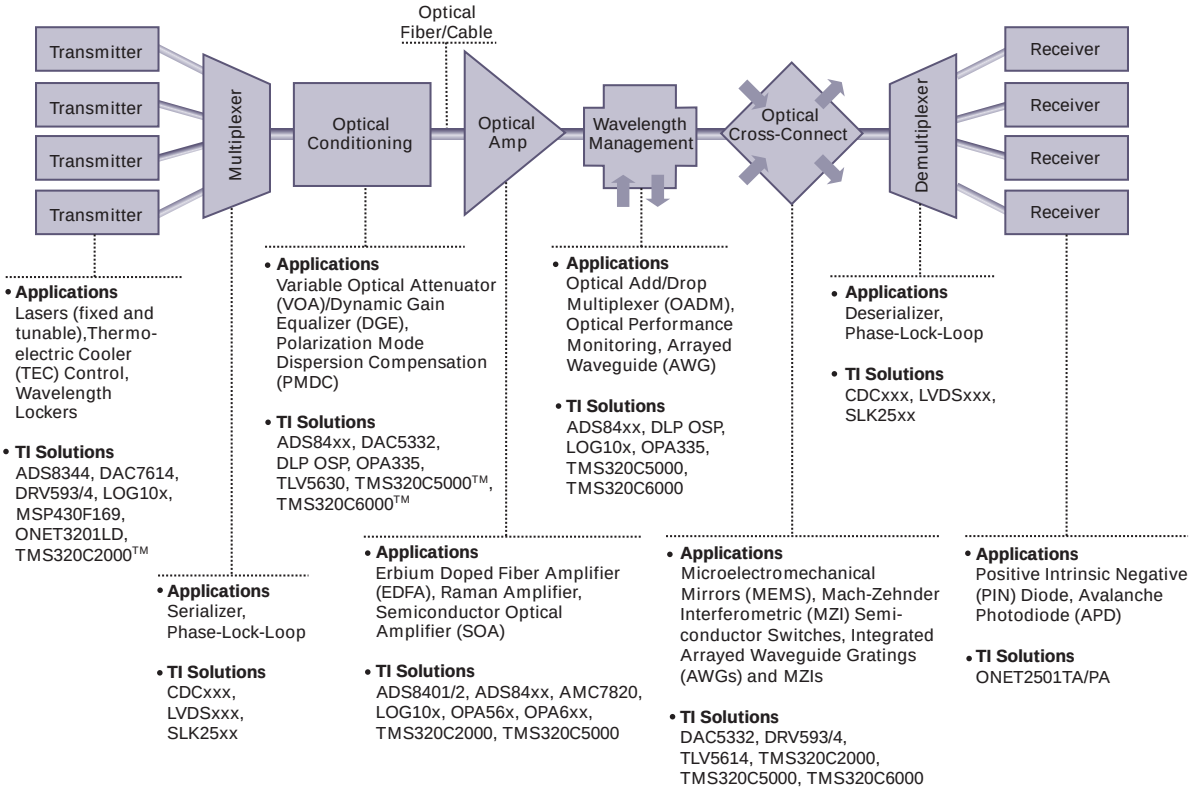
What's driving this requirement?

In the metro area network (MAN), service providers now need faster provisioning times, improved asset utilization, and economical fault recovery techniques. However, without a new level of functionality from optical components and subsystems, optical layer flexibility won't happen. At the same time, optical components must become more cost effective, occupy less space, and consume less power.

Texas Instruments is ready with a wide array of semiconductor solutions to make it all happen. Profiled in this guide: high-efficiency TEC drivers, highly integrated monitoring and control solutions for transmission and pump lasers, TMS320™ digital signal processing and embedded control options ranging from highest performance to smallest footprint, logarithmic and wideband amplifiers for photodiode power monitoring, high-resolution/high-speed A/D and multichannel D/A converters, temperature sensors, unique Digital Light Processing™ technology, and much more. The diagram directly below highlights applications and some of the available TI solutions.

Combining variable optics with the power of TI high-performance analog and DSP, dynamic DWDM systems can become a reality. Real-time signal processing, available at every optical networking node, will enable the intelligent optical layer. This means the opportunity for advanced features such as optical signaling, auto-discovery, and automatic provisioning and reconfiguration, all happening at the optical layer.

Applications for Real-Time Signal Processing and TI Optical Solutions

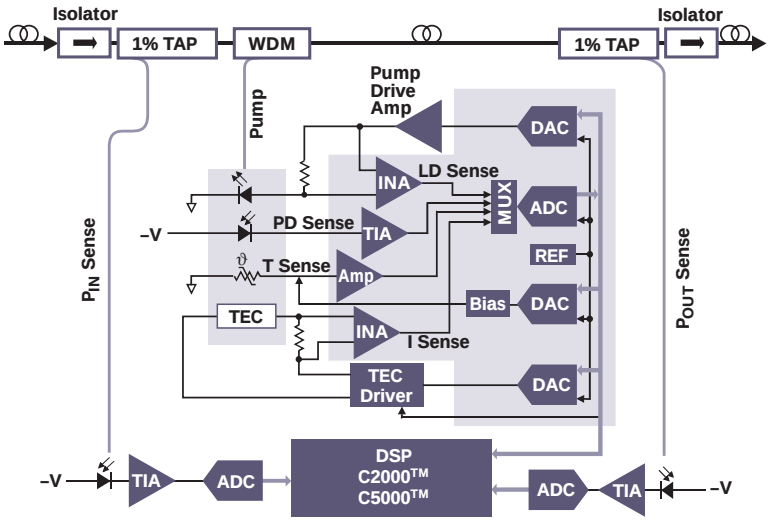


Read *Optical Networking Solutions Guide* online at www.ti.com/onetsg

OPTICAL AMPLIFIER SOLUTIONS

Dynamic optical amplifiers (e.g., EDFAs, Raman amplifiers, SOAs), capable of operation in complex switched networking environments, are increasingly important subsystems in the creation of a dynamic optical layer. Texas Instruments offers the semiconductor products required to design and build optical amplifiers for all applications whether long haul or metro. Available devices include an integrated analog monitor and control interface IC (AMC7820) for TEC and pump laser control, high-efficiency TEC drivers (DRV593/4), wideband photodiode amplifiers (OPA656/7), a 16-bit 1.25-MSPS SAR A/D converter (ADS8401/2), as well as other high-performance analog products and TMS320™ DSPs.

Erbium-Doped Fiber Amplifier (EDFA) Application



TO KNOW MORE ▶

For detailed information about ICs for optical amplifiers:

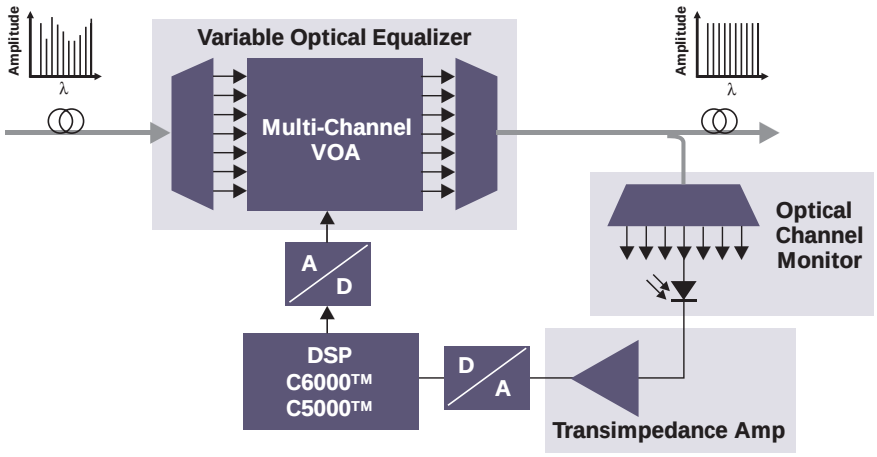
ADS8401/02, ADS8411/12	23
AMC7820	23
DRV593, DRV594	24
INA170, INA326	25
INA330, LOG101, LOG102, LOG104, LOG112	26
OPA561	27
OPA569	28
OPA655, OPA656, OPA657	28
THS4601	29
TMP100, TMP101	30
TMS320C5000	31
MSP430F169	7
TMS320F2812	15

To learn more about the Quad TEC platform, go to **www.ti.com/platforms**

VARIABLE OPTICAL ATTENUATOR (VOA) SOLUTIONS

The metropolitan area network (MAN) is where optical networking will expand next. MAN operators require flexible service capabilities, thus driving the need for dynamic optical components such as VOAs and dynamic gain equalizers (DGEs). Texas Instruments offers a very strong range of semiconductor products for VOA applications. These include high-performance linear products for signal monitoring and conditioning, multi-channel high-precision data converters and DSPs for real-time signal processing requirements, and unique Digital Light Processing™ technology for modulating and controlling the optical signal.

Variable Optical Attenuator Application



TO KNOW MORE ▶

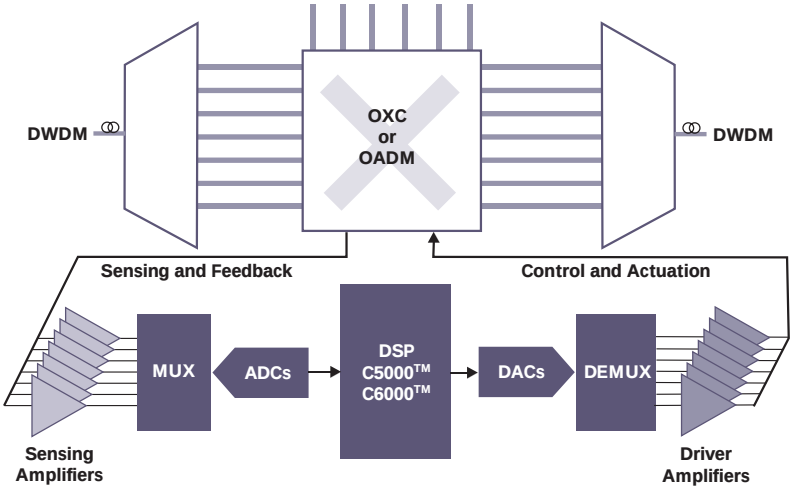
For detailed information about ICs for VOAs:

DLP Blaze	22
DAC5332	24
INA170, INA326	25
INA330, LOG101, LOG102, LOG104, LOG112	26
OPA335	27
REF29xx, REF30xx	29
TLV5630, TLV5631, TLV5632	30
TMP100, TMP101	30
TMS320C5000	31
TMS320C6000	32
ADS8344	5
DAC7614	7

OPTICAL CROSS CONNECT (OXC) AND OPTICAL ADD/DROP MULTIPLEXER (OADM) SOLUTIONS

The all-optical network requires sub-systems capable of reliably switching and controlling light. Texas Instruments offers the critical semiconductor solutions that will enable the next-generation optical network. TI's high-performance analog products meet the advanced sensing requirements of optical switching systems. TI digital signal processors deliver real-time signal processing with a solid roadmap and tools, lowering risk and accelerating time-to-market. And for switching and modulating optical signals, TI offers Digital Light Processing™ technology for optical networks.

OXC and OADM Applications



TO KNOW MORE ▶

For detailed information about ICs for OXCs and OADMs:

DLP Blaze	22
DAC5332	24
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REF29xx, REF30xx	29
TLV5630, TLV5631, TLV5632	30
TMS320C5000	31
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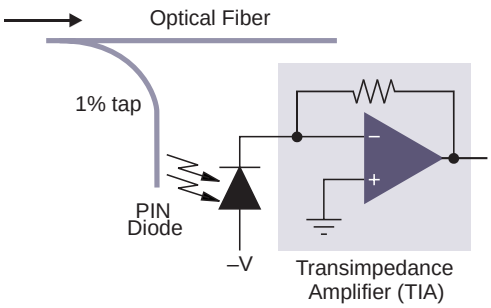
OPTICAL POWER MONITORING SOLUTIONS

The average optical power in a laser diode monitor is monitored by converting the current from a photodiode that is faceted to the laser diode. The current from this diode is a direct indicator of the laser diode's power. This current can range over a very wide, <100-dB, dynamic range. Frequently this photodiode current needs to be converted into a voltage that can be digitized by an A/D converter whose resolution is 12 bits or higher.

There is a need, then, to convert the photodiode current into a representative voltage. Three approaches are generally taken. One is a simple transimpedance amplifier. Another approach is to use an op amp configured as an integrator. Finally, there is the logarithmic amplifier, which can directly scale a current signal from, for example, 1 nA to 1 mA directly to 0 to 5 V.

Optical Power Monitoring Application



TO KNOW MORE ▶

For detailed information about ICs for Optical Power Monitoring:

DLP Blaze	22
INA170, INA326	25
INA330, LOG101, LOG102, LOG104, LOG112	26
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Read *Optical Networking Solutions Guide* online at www.ti.com/onetsg

OPTICAL SIGNAL PROCESSING: THE DLP™ BLAZE OSP CHIPSET AND EVALUATION KIT

Get info at:
www.ti.com/blaze

The Blaze chipset offers true optical signal processing by combining the power of TI's DSP and DLP™ technologies in a platform solution applicable to a range of networking, test and measurement and other optical functions. Applications can be based on either channelized or banded spectral approaches.

The DLP™ Blaze OSP platform consists of four devices:

- The DLP™ Switched Blazed Grating (SBG) based on DLP™ technology serves as the core light processing device in the platform. The SBG has 786,432 individually addressable micromirrors (each 13.0 x 13.0 microns square). Applications use hundreds to thousands of mirrors per channel or band to modulate amplitude and/or phase of the optical signals.
- The SBG processor, a TMS320VC5416 DSP, is a fully programmable processor that allows the design and execution of algorithms to implement the desired optical transforms on the SBG. It provides inherent intelligence at the box or node level for real-time dynamic management and monitoring from the user or network side.
- The SBG accelerator and SBG reset devices provide internal high-speed interfacing and reset/timing control for the SBG and SBG processor.

The Blaze Evaluation Kit offers the Blaze OSP chipset on a lab-ready board with necessary software for quick evaluation of the chipset and prototype optical signal processing applications.

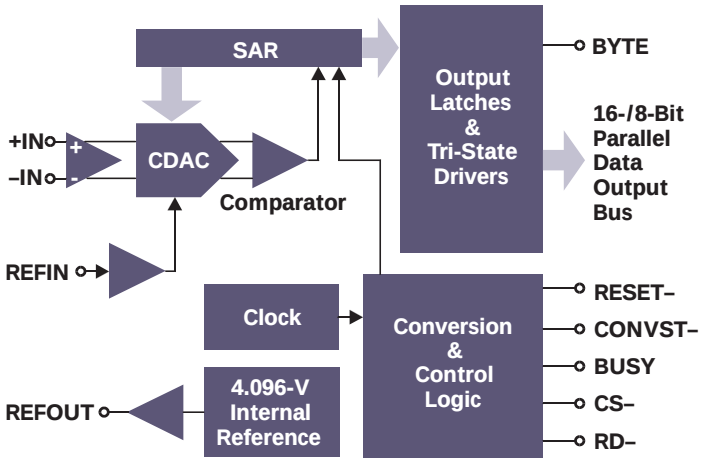
Key Features of the Blaze Evaluation Kit

- Complete Blaze chipset installed (DLP™ SBG optimized for 1550-nm range)
- The Transform Editor software: A unique GUI tool that allows rapid development of optical transforms from the individual mirror level up to macro functions based on groups of mirrors, with the ability to sequence multiple transforms to create specific applications. Supports three simultaneous OSP platforms for simplifying development of complex multistage optical signal processing flows.
- Two PC interfaces: One RS-232 and one high-speed (160-MHz) burst interface
- Interconnects for stand-alone or daughter-board-style operation
- Artwork and documentation
- User adds own optical subsystem based on specific needs

Applications

- Programmable spectral filtering
- Spectral analysis
- Dynamic gain equalization (DGE)
- Optical performance monitoring
- Re-configurable optical add/drop MUX/DEMUX (ROADM)
- Programmable/tunable source
- Optical pattern processing
- Optical test and measurement
- Signal conditioning/modulation and control

ADS8401/02, ADS8411/12 Block Diagram



Applications

- DWDM
- Instrumentation
- High-speed, high-resolution, zero-latency data acquisition system
- Transducer interface
- Medical instrument
- Communication

16-BIT, 1.25-MSPS, UNIPOLAR INPUT, MICRO-POWER SAMPLING ANALOG-TO-DIGITAL CONVERTER WITH PARALLEL INTERFACE

ADS8401, ADS8402, ADS8411, ADS8412

Product Preview*

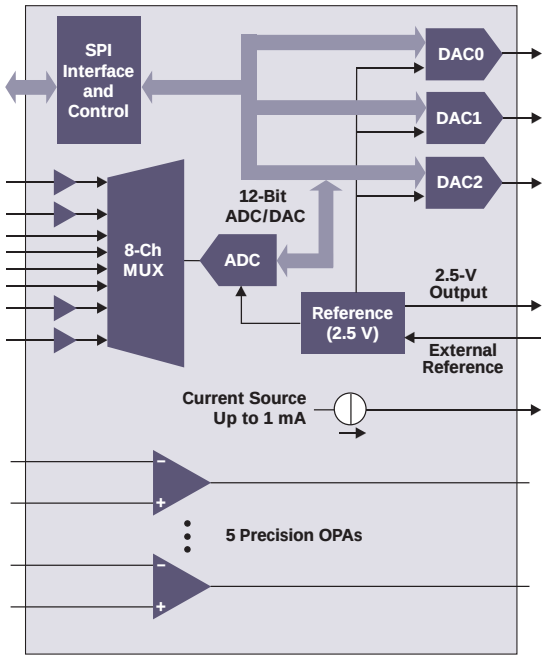
The ADS8401/02 and ADS8411/12 ADCs include a 16-bit capacitor-based SAR A/D converter with inherent sample and hold. They offer a full 16-bit interface and an 8-bit option where data is read using two 8-bit read cycles if necessary.

Key Features

- Zero latency
- Sample rates up to 1.25 MSPS for ADS8401/02 or up to 2 MSPS for ADS8411/12
- Unipolar single-ended input range: 0 V ~ +4 V (ADS8401/11)
- Unipolar differential input range: –4 V ~ +4 V (ADS8402/12)
- Internal 4.096-V reference
- High-speed parallel interface
- Packaging: 48-pin TQFP

**The ADS8401, ADS8402, ADS8411 and ADS8412 are in the product preview stage of development. Expected availability is 1Q 2003.*

AMC7820 Block Diagram



ANALOG INTERFACE CIRCUIT

AMC7820

Get samples, datasheet, app. reports and EVMs at:
www.ti.com/sc/device/AMC7820

The AMC7820 is a high-performance and space-saving solution for DWDM applications. The industry's first single-chip solution integrates ADC, DAC and operational amplifiers to provide monitoring and control of the analog signal and an efficient interface to host processor.

Key Features

- 100-kHz sampling rate ADC
- Three DACs
- Nine operational amplifiers
- Thermistor current source
- SPI serial interface
- Low power: 60 mW (3-V/5-V logic)
- Packaging: 48-pin TQFP
- Eight input channels
- Internal 2.5-V reference

Applications

- Thermoelectric cooler (TEC) and pump laser control in EDFA and Raman
- Optical performance monitoring
- Tunable laser

16-BIT, LOW-POWER, RAIL-TO-RAIL VOLTAGE OUTPUT, PARALLEL INPUT DIGITAL-TO-ANALOG CONVERTER

DAC5332*

Product Preview*

The DAC5332 is a 16-bit, 32-channel D/A converter with 14 bits of monotonic performance over the specified operating temperature range. The DAC5332 can work as a square-wave generator at up to 40 kHz. Operating in a bipolar output mode from a ±12-V supply, the DAC5332 includes high-speed output amplifiers, which will settle in 5 µs to 0.006% for a full-scale step output.

Key Features

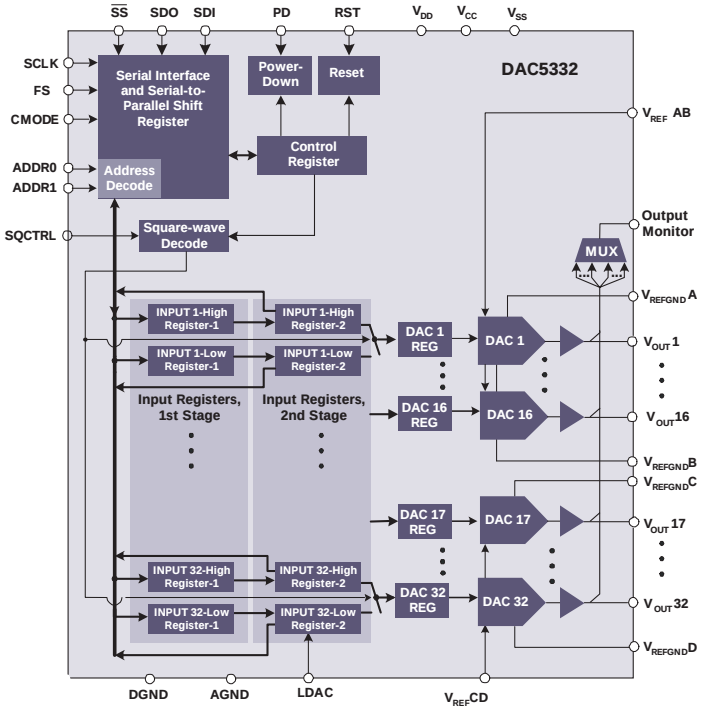
- 32 channels
- 16-bit resolution
- 14-bit monotonicity
- Output range: ±10 V
- Double buffered data input
- Square-wave mode
- Sync. and async. updating
- SPI and frame sync. bus
- Low power: 1000 mW
- Packaging: 64-pin PQFP

Applications

- Optical networking
- Automatic test equipment
- Industrial process control
- Data acquisition system

The DAC5332 is in the product preview stage of development. Expected availability is 2Q 2003.

DAC5332 Block Diagram



±3-A HIGH-EFFICIENCY PWM POWER DRIVER

DRV593, DRV594

Get samples, datasheets, app. reports and EVMs at:
www.ti.com/sc/device/partnumber
Replace partnumber in URL with DRV593 or DRV594

The DRV593/594 are high-efficiency, high-current power amplifiers ideal for driving a wide variety of thermoelectric cooler elements in systems powered from 2.8 V to 5.5 V. PWM operation and low output stage on-resistance significantly decrease power dissipation in the amplifier.

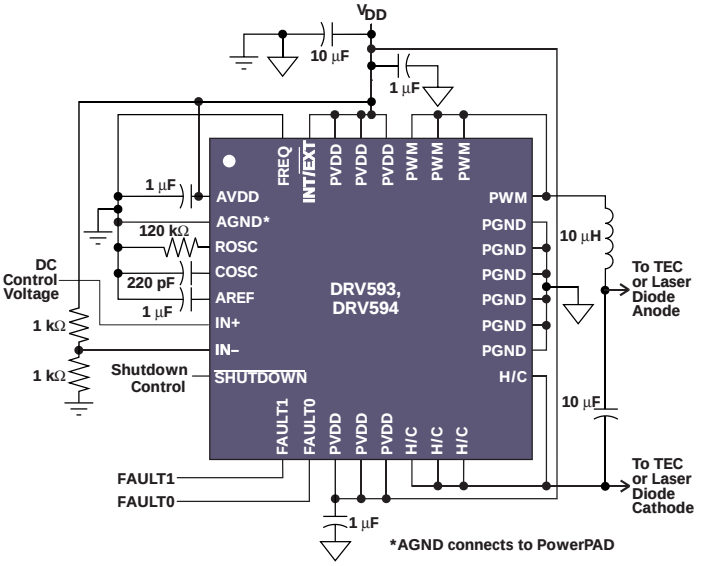
Key Features

- ±3-A output current
- Low supply voltage operation: 2.8 V to 5.5 V
- High efficiency generates less heat
- Overcurrent and temperature protection
- Fault indicators for over-current, temperature, and under-voltage lockout
- Two selectable switching frequencies
- Internal or external clock sync
- PWM scheme optimized for EMI
- Packaging: 9x9-mm PowerPAD™ quad flatpack

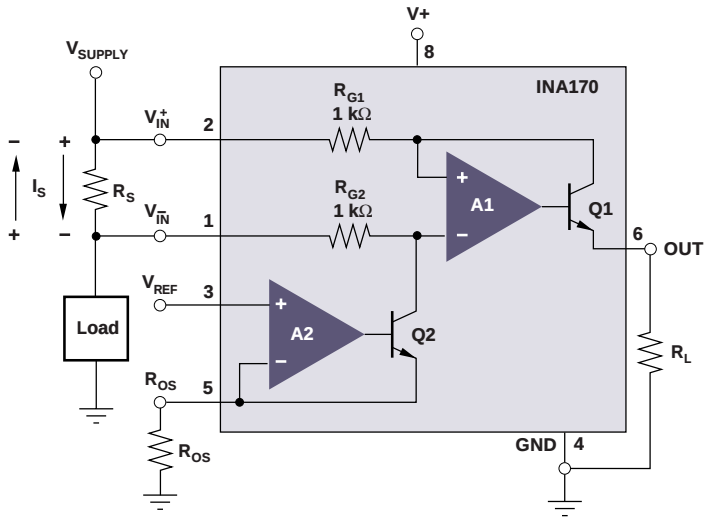
Applications

- Thermoelectric cooler (TEC) driver
- Laser diode biasing

DRV593/DRV594 Block Diagram



INA170 Block Diagram



HIGH-SIDE, BIDIRECTIONAL CURRENT SHUNT MONITOR

INA170

Get samples, datasheet and app. reports at:
www.ti.com/sc/device/INA170

The INA170 is a high-side, bidirectional current shunt monitor that allows current measurement by output offsetting. The offset voltage level is set with an external resistor and voltage reference. This permits measurement of bidirectional shunt current even though the INA170 uses a single supply.

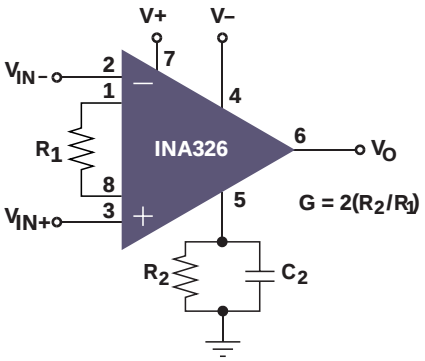
Key Features

- Wide supply range: 2.7 V to 40 V
- Supply-independent common-mode voltage: 2.7 V to 60 V
- Resistor programmable gain set
- Low quiescent current: 75 µA (typ)
- Packaging: MSOP-8

Applications

- Current shunt measurement for automotive, telephone, computer, power system, test and general instrumentation
- Portable and battery backup system
- Battery charger
- Power management
- Cell phone

INA326 Application Diagram



Applications

- Low-level transducer amplifier for bridges, load cells, thermocouples
- Wide dynamic range sensor measurement
- High-resolution test system
- Multi-channel data acquisition system

PRECISION, RAIL-TO-RAIL I/O INSTRUMENTATION AMPLIFIER

INA326

Get samples, datasheet and app. reports at:
www.ti.com/sc/device/INA326

The INA326 is a true single-supply instrumentation amplifier with very-low DC errors and input common-mode range that extends beyond the positive and negative rails.

Key Features

- Precision
  - Low offset: 125 µV (max)
  - Low offset drift: 1 µV/°C (max)
- True rail-to-rail I/O
  - Input common-mode range: 20 mV beyond rails
  - Wide output swing: Within 10 mV of rails
  - Supply Range: Single +2.7 V to +5.5 V
- Package: MSOP-8

THERMISTOR SIGNAL AMPLIFIER FOR TEMPERATURE CONTROL

INA330

Get samples, datasheet and app. reports at:
www.ti.com/sc/device/INA330

The INA330 is a precision amplifier designed for thermoelectric cooler (TEC) control in optical networking applications. It provides thermistor excitation and generates an output voltage proportional to the difference in resistances applied to the inputs. Using one resistor plus the thermistor, it provides an alternative to the traditional bridge circuit.

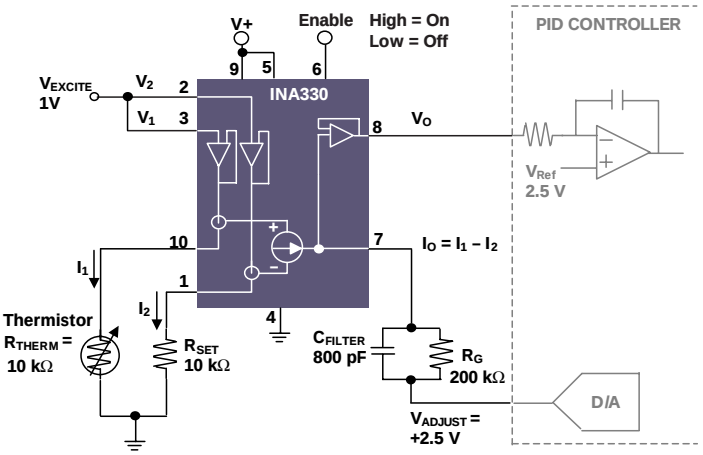
Key Features

- Optimized for precision 10-kΩ thermistor applications
  - Low offset over temperature: <0.01°C temperature error from +25°C to –40°C or to +85°C
  - Very low 1/f noise: 2 $\mu V_{(PP)}$ (0.01 Hz to 10 Hz)
- Wide output swing: Within 10 mV of rails
- Supply range: Single +2.7 V to +5.5 V
- Packaging: MSOP-10

Applications

- Thermistor-based temperature controller for optical networking
- High accuracy for TEC application
- Laser temperature control

INA330 Block Diagram



PRECISION LOGARITHMIC AND LOG RATIO AMPLIFIER

LOG101, LOG102, LOG104, LOG112

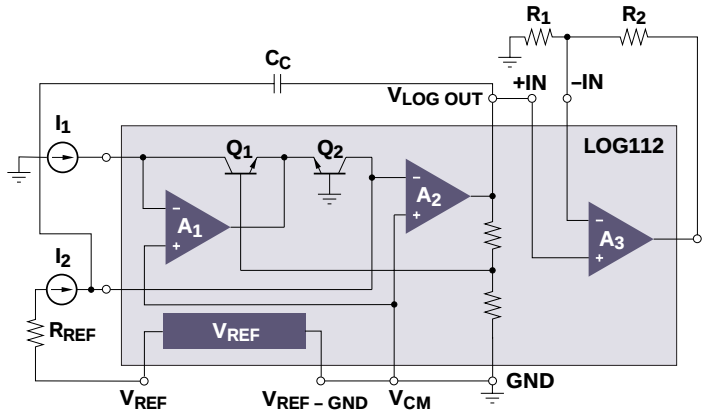
Get samples and datasheets at:
www.ti.com/sc/device/partnumber
Replace partnumber in URL with LOG101, LOG102, LOG104 or LOG112

The LOG101, LOG102, LOG104 and LOG112 are versatile integrated circuits that compute the logarithm, log ratio or anti-log of an input current or voltage relative to a reference current or voltage.

Key Features

- LOG101, LOG104
  - High accuracy: 0.01% FSO over 5 decades
  - Wide dynamic input range: 7.5 decades, 100 pA to 3.5 mA
- LOG102
  - Comparator for indicating signal loss
  - High accuracy: 0.15% FSO over 6 decades
  - Wide dynamic input range: 6 decades, 1 nA to 1 mA
- LOG112
  - On-chip 2.5-V voltage reference
  - High accuracy: 0.2% FSO over 5 decades
  - Wide dynamic input range: 7.5 decades, 100 pA to 3.5 mA
- Packaging: 8-pin SOIC (LOG101, LOG104)
  14-pin SOIC (LOG102, LOG112)

LOG112 Block Diagram

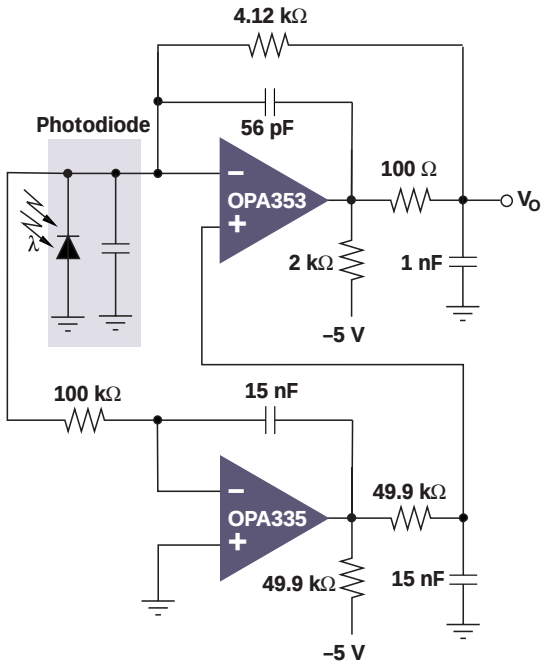


Device	Dynamic Range (dB)	Scale Factor (V/decade)	Internal Op Amp	Internal Ref
LOG101	90	1	No	No
LOG102	120	1	Yes	No
LOG104	90	0.5	No	No
LOG112	130	0.5	Yes	Yes

Applications

- Photodiode signal compression amp
- Absorbency measurement
- Optical density measurement
- Analog signal compression in front of A/D converter

OPA335 Typical Application



0.05 µV/°C MAX, CMOS OPERATIONAL AMPLIFIERS — ZERO-DRIFT SERIES

OPA335*

Get samples, datasheet, app. reports and EVMs at:
www.ti.com/sc/device/OPA335

The OPA335 series amplifiers use auto-zeroing techniques to simultaneously provide very low offset voltage and near-zero drift over time and temperature. These miniature, high-precision, low-quiescent-current amplifiers offer high input impedance and rail-to-rail output swing.

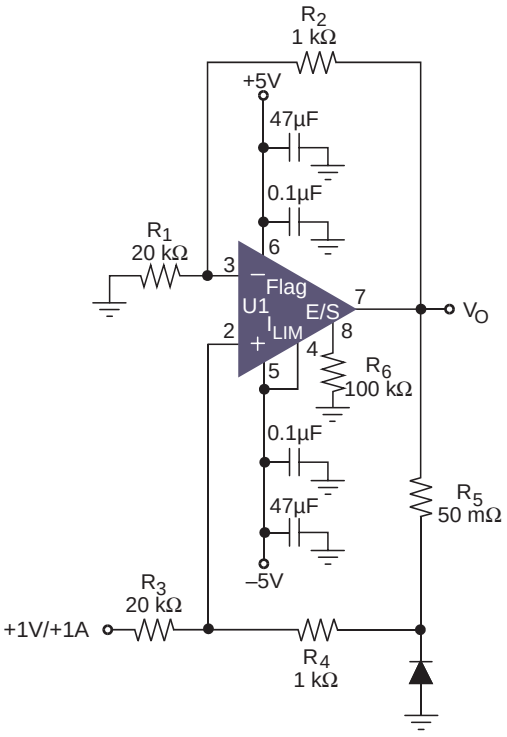
Key Features

- Low offset voltage: 5 µV (max)
- Zero drift: 0.05 µV/°C (max)
- Quiescent current: 285 µA
- Single-supply operation
- Single and dual versions
- Packaging: SOT23-5 and SO-8 (single), MSOP-10 (dual)

Applications

- Video processing
- Optical networking, tunable laser
- Photodiode transimpedance amplifier
- Scanner
- Temperature measurement

Laser Diode Driver Using the OPA561



HIGH-CURRENT, HIGH-SPEED OPERATIONAL AMPLIFIERS

OPA561

Get datasheet and app. reports at:
www.ti.com/sc/device/OPA561

The OPA561 operational amplifier is capable of driving up to 1.2-A pulses into reactive loads. The high slew rate provides 1-MHz bull-power bandwidth and excellent linearity.

Key Features

- 1.2-A output current
- 12-V_{P-P} output voltage
- Wide power range:
  Single supply: +7 V to +15 V
  Dual supply: ±3.5 V to ±7.5 V
- Fully protected by thermal shutdown with adjustable current limit
- 17-MHz gain-bandwidth product
- 50-V/µs slew rate
- 1-MHz full-power bandwidth
- Packaging: HTSSOP-20 PowerPAD™

Applications

- TEC driver
- Laser diode driver

Read *Optical Networking Solutions Guide* online at www.ti.com/onetsg

RAIL-TO-RAIL I/O, SINGLE-SUPPLY, HIGH-CURRENT 2-A POWER AMPLIFIER

OPA569*

Product Preview*

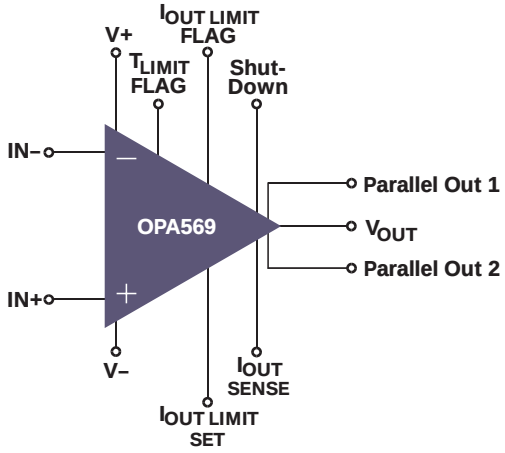
The OPA569 is a low-cost, high-current operational amplifier designed for driving a wide variety of loads while operating on low-voltage supplies. It operates from either single or dual supplies for design flexibility and has rail-to-rail swing on the input and output. Output swing is within 200 mV of the supply rails.

Key Features

- High output current: 2 A
- Output swings to 400 mV of rails
- Thermal protection
- Adjustable current limit
- Output disable
- Two flags: Current limit and temperature warning
- Low supply voltage operation: 2.7 V to 5.5 V
- Packaging: 20-pin SOIC PowerPAD™

**The OPA569 is in the product preview stage of development. Expected availability is 4Q 2002.*

OPA569 Typical Application



Applications

- Thermoelectric cooler driver
- Laser diode pump driver
- Valve, actuator driver
- Synchro, servo driver
- Transducer excitation
- General linear power booster for op amps

WIDEBAND, LOW-NOISE, FET-INPUT OPERATIONAL AMPLIFIERS

OPA655, OPA656, OPA657

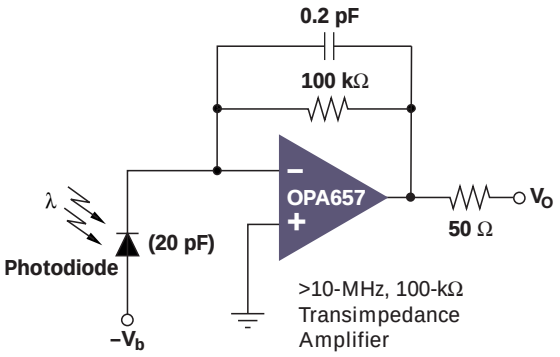
Get samples, datasheets, app. reports and EVMs at:
www.ti.com/sc/device/partnumber
Replace partnumber in URL with OPA655, OPA656 or OPA657

The OPA655, OPA656 and OPA657 are wideband, low noise FET-input, voltage-feedback op amps that provide wide dynamic range operation for high-precision ADC driving or wideband transimpedance applications. With the decompensated OPA657, photodiode applications will see improved noise and bandwidth. The OPA657's 1.6-GHz GBW product will give >10-MHz signal bandwidths up to gains of 100 kΩ from up to 20 pF detection diodes.

Key Features

- Unity gain bandwidth: 400 MHz (OPA655, OPA656)
- High gain bandwidth product: 1.6 GHz (OPA657)
- Low-input bias current: 5 pA (OPA655)
- High-input impedance: 10^{12} Ω || 1.0 pF
- Low-input offset voltage: <0.5 mV
- Low distortion: 90-dB SFDR at 5 MHz
- Low-input voltage noise: 4.8 nV (OPA657)
- High output current: >60 mA
- Packaging: 5-lead SOT23 and 8-lead SOIC

OPA657 Block Diagram

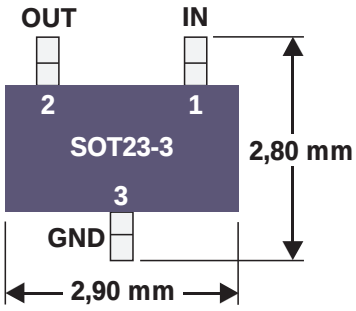


Applications

- Wideband photodiode transimpedance amplifier
- DC precision high-gain amplifier
- High SFDR
- ADC input driver

SOT23-3 Package for REF30xx

(Actual Size)



Voltage (V)	Device
1.25	REF2912, REF3012
2.048	REF2920, REF3020
2.5	REF2925, REF3025
3.0	REF2930
3.3	REF2933, REF3033
4.096	REF2940, REF3040

MICROPACKAGE, MICROPOWER, LOW DROPOUT VOLTAGE REFERENCES

REF29xx, REF30xx

Get samples, datasheets and app. notes at:
www.ti.com/sc/device/partnumber
Replace partnumber in URL with device number from voltage table below

The REF30xx is a micropower, precision voltage reference. Miniature packaging (SOT23-3), extended temperature range, and stability under any capacitive load make the REF29xx/REF30xx an optimal voltage reference for many optical networking applications. There are five available output voltages including 2.048 V and 4.096 V, common to optical networking applications.

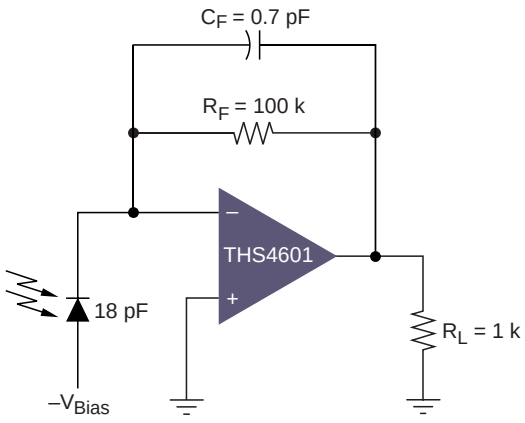
Key Features

- Low dropout: 1 mV
- High output current: 25 mA
- Low temperature drift:
  100 ppm/°C max (REF29xx)
  50 ppm/°C max (REF30xx)
- High accuracy:
  2.0% (REF29xx)
  0.2% (REF30xx)
- Low I_Q: 50 µA
- Packaging: SOT23-3

Applications

- Optical module
- Data acquisition

Wideband Photodiode transimpedance amplifier



Applications

- Wideband photodiode amplifier
- High-speed transimpedance gain stage
- Active filtering
- High-impedance buffer

WIDEBAND, FET-INPUT OPERATIONAL AMPLIFIER

THS4601

Get samples, datasheet and app. reports at:
www.ti.com/sc/device/THS4601

The THS4601 is designed to provide wideband operation with high-input impedance and a 180-MHz gain-bandwidth product. Its low current and voltage noise allow amplification of extremely low-level input signals while maintaining a large signal-to-noise ratio.

Key Features

- Gain bandwidth product: 180 MHz
- Slew rate: 100 V/µs
- Maximum input bias current: 100 pA
- Input voltage noise: 5.4 nV/$\sqrt{\text{Hz}}$
- Maximum input offset voltage: 4 mV
- Input impedance: 10^9 Ω
- Power supply voltage range: ±5 to ±15 V
- Package: SOIC surface mount with PowerPAD option

8-CHANNEL, 12-/10-/8-BIT, 2.5-V TO 5-V LOW-POWER DACs

TLV5630, TLV5631, TLV5632

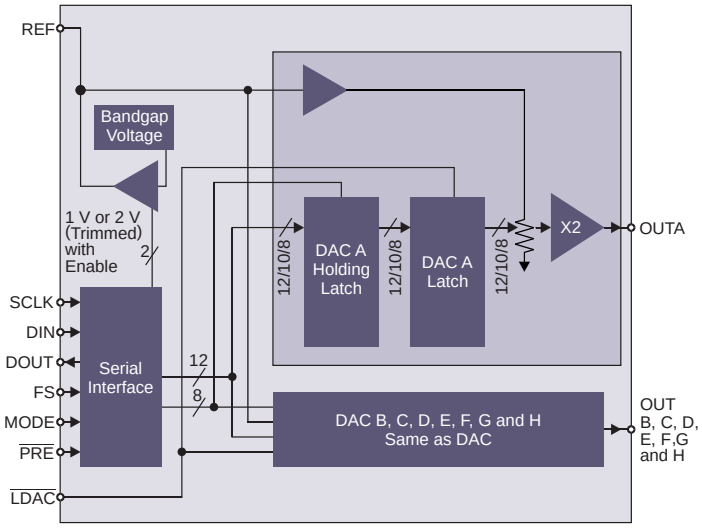
Get samples, datasheets, app. reports and EVMs at:
www.ti.com/sc/device/partnumber
Replace partnumber in URL with TLV5630, TLV5631 or TLV5632

The TLV563x DACs have a flexible serial interface that allows glueless operation with the TMS320, SPI and QSPI serial ports. They are programmed with a 16-bit serial string containing 4 control and 12 data bits. They feature a power-down mode and support simultaneous update of all eight DAC outputs.

Key Features

- Eight voltage output DACs
  - TLV5630: 12 bit
  - TLV5631: 10 bit
  - TLV5632: 8 bit
- Programmable settling time vs power consumption
  - 1 µs in fast mode
  - 3 µs in slow mode
- Compatible with TMS320 and SPI serial ports
- Low power consumption
  - 18 mW in slow mode at 3 V
  - 48 mW in fast mode at 3 V
- Data output for daisy chaining
- Package: 20-pin SOIC and TSSOP

TLV5630 Functional Block Diagram



Applications

- Digital servo control loop
- Digital offset and gain adjustment
- Motion control

DIGITAL TEMPERATURE SENSOR WITH I²C INTERFACE

TMP100, TMP101

Get samples, datasheets and app. notes at:
www.ti.com/sc/device/partnumber
Replace partnumber in URL with TMP100 or TMP101

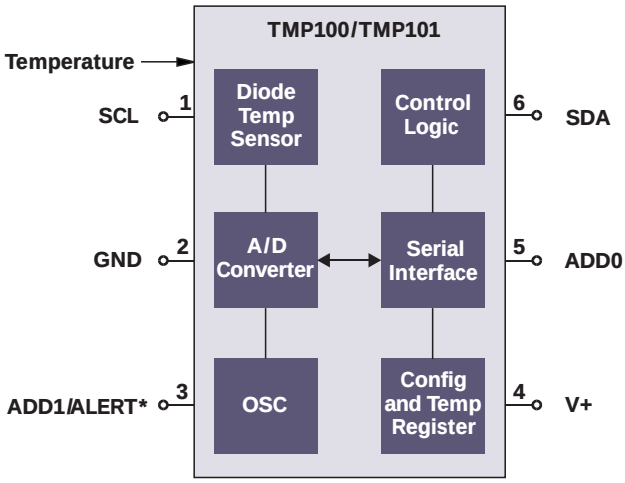
The TMP100 and TMP101 are 2-wire, serial-output temperature sensors available in SOT23-6 packages. Requiring no external components, the TMP100 and TMP101 are capable of reading temperatures with a resolution of 0.0625°C.

The TMP100 and TMP101 feature SMBus and I²C interface compatibility, with the TMP100 allowing up to eight devices on one bus. The TMP101 offers SMBus alert function with up to three devices per bus.

Key Features

- Digital output: I²C serial 2-wire
- Resolution: 9 to 12 bits, user-selectable
- Accuracy: ±2.0°C from –25°C to +85°C (max)
  ±3.0°C from –55°C to +125°C (max)
- Low quiescent current: 45 µA, 0.1 µA standby
- Wide supply range: 2.7 V to 5.5 V
- Packaging: Tiny SOT23-6 package

TMP100/TMP101 Block Diagram

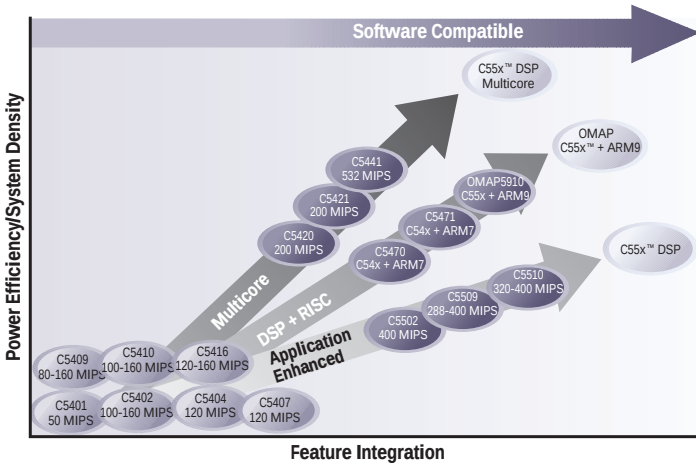


***Pin function: ADD1 for TMP100 or ALERT for TMP101**

Applications

- Power-supply temperature monitoring
- Computer peripheral thermal protection
- Notebook computer
- Cell phone
- Battery management
- Environmental monitoring and HVAC
- Electromechanical device temperature

TMS320C5000™ DSP Platform Roadmap



Applications

- Optical amplifier control - EDFA and Raman
- Variable optical attenuator (VOA)
- Tunable laser
- Optical performance monitor (OPM)
- Optical cross connect (OXC)
- Optical add/drop multiplexer (OADM)

PERFORMANCE AND FOOTPRINT OPTIMIZED DSPs

TMS320C5000™ DSP Platform

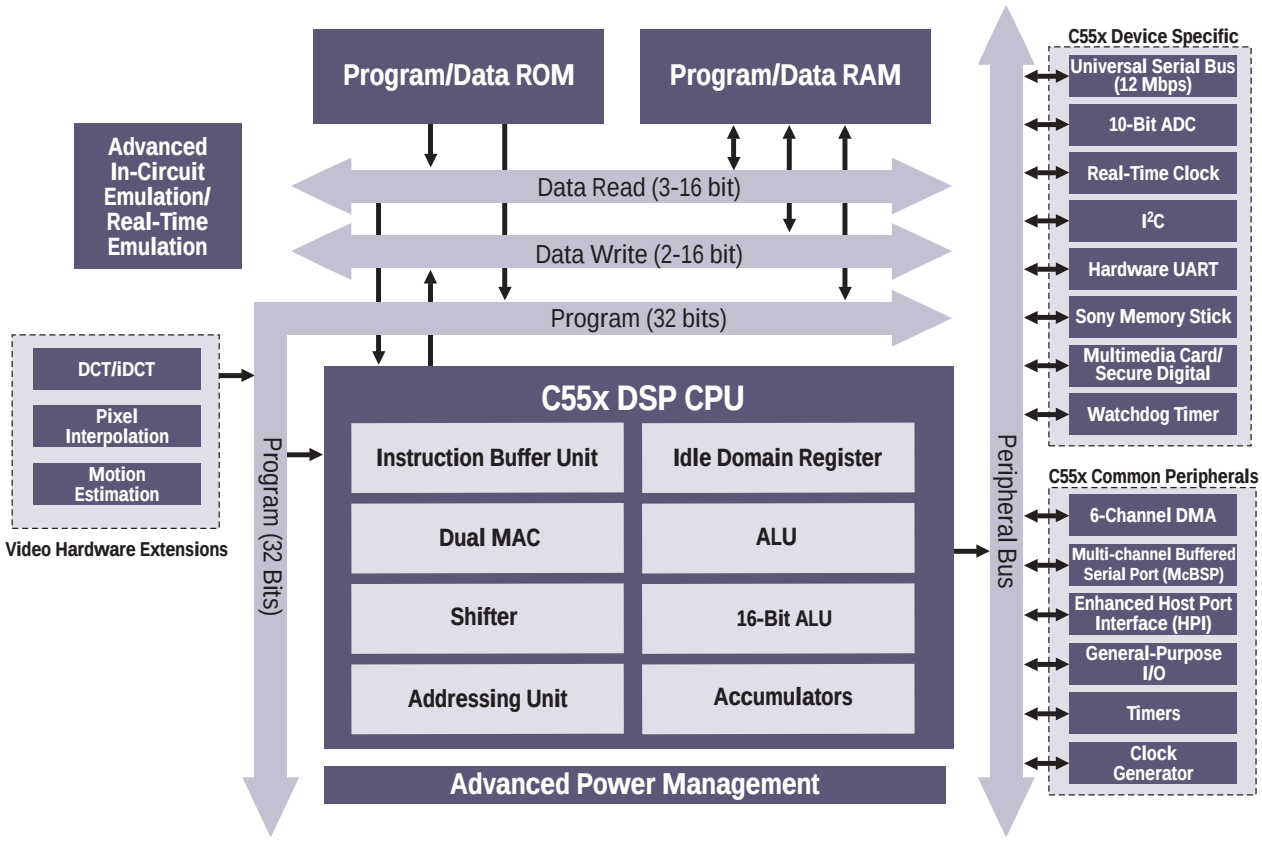
Get samples, datasheet, app. reports and EVMs at:
http://dspvillage.ti.com/c5000

TI's TMS320C5000™ DSP platform provides high-performance signal analysis and control for optical networking component design. The C5000™ DSP family offers a wide range of DSP performance, memory configurations and interfaces, control and communications peripherals and packaging options. The C5000 DSP family meets the space, low power dissipation, performance and time-to-market needs of optical component developers.

Key Features

- MIPS: C54x: 30-160, C55x: up to 400
- High-density BGA packaging
- Serial communications; SPI, I^2C, UART, McBSP
- 6-channel DMA controller per core
- Host port interface
- Very low power dissipation
- Supported by eXpressDSP™ Real-Time Software Technology including Code Composer Studio™ Integrated Development Environment (IDE) and DSP/BIOS™ real-time kernel

TMS320C55x™ DSP Generation Block Diagram



HIGH-PERFORMANCE DSPs

TMS320C6000™ DSP Platform

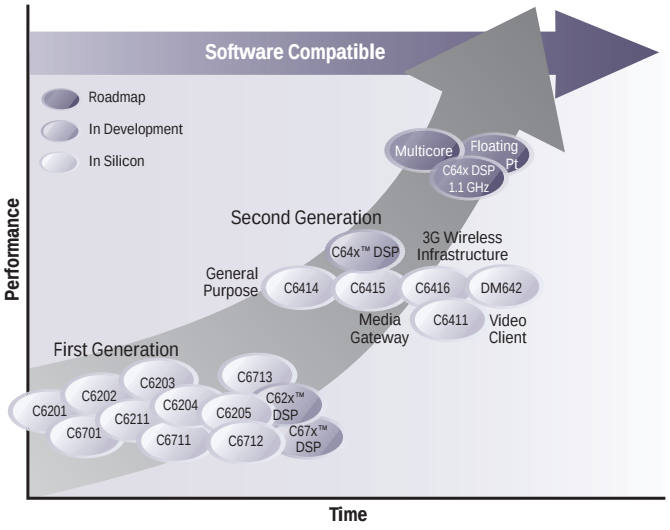
Get samples, datasheet, app. reports and EVMs at:
http://dspvillage.ti.com/c6000

TI's TMS320C6000™ DSP platform is optimized for highest performance and ease-of-use in high-level language programming. The C6000™ fixed- and floating-point DSPs provide the highest level of computational capability for demanding optical networking applications such as OXC and PMDC. Also, the new TMS320C64x™ DSPs provide 4800 MIPS today with a roadmap to 1.1-GHz performance.

Key Features

- MIPS
  - C62x DSP: up to 2400 MIPS at 300 MHz
  - C67x DSP: 1350 MFLOPS at 225 MHz
  - C64x DSP: up to 4800 MIPS (at up to 600 MHz)
- Multi-channel buffered serial ports (McBSPs)
- Host-port interface
- DMA controller
- High-density BGA packaging
- 100% software compatibility across the C6000 platforms
- Up to 7-Mbit on-chip memory
- Supported by eXpressDSP™ Real-Time Software Technology including Code Composer Studio™ Integrated Development Environment (IDE) and DSP/BIOS™ real-time kernel

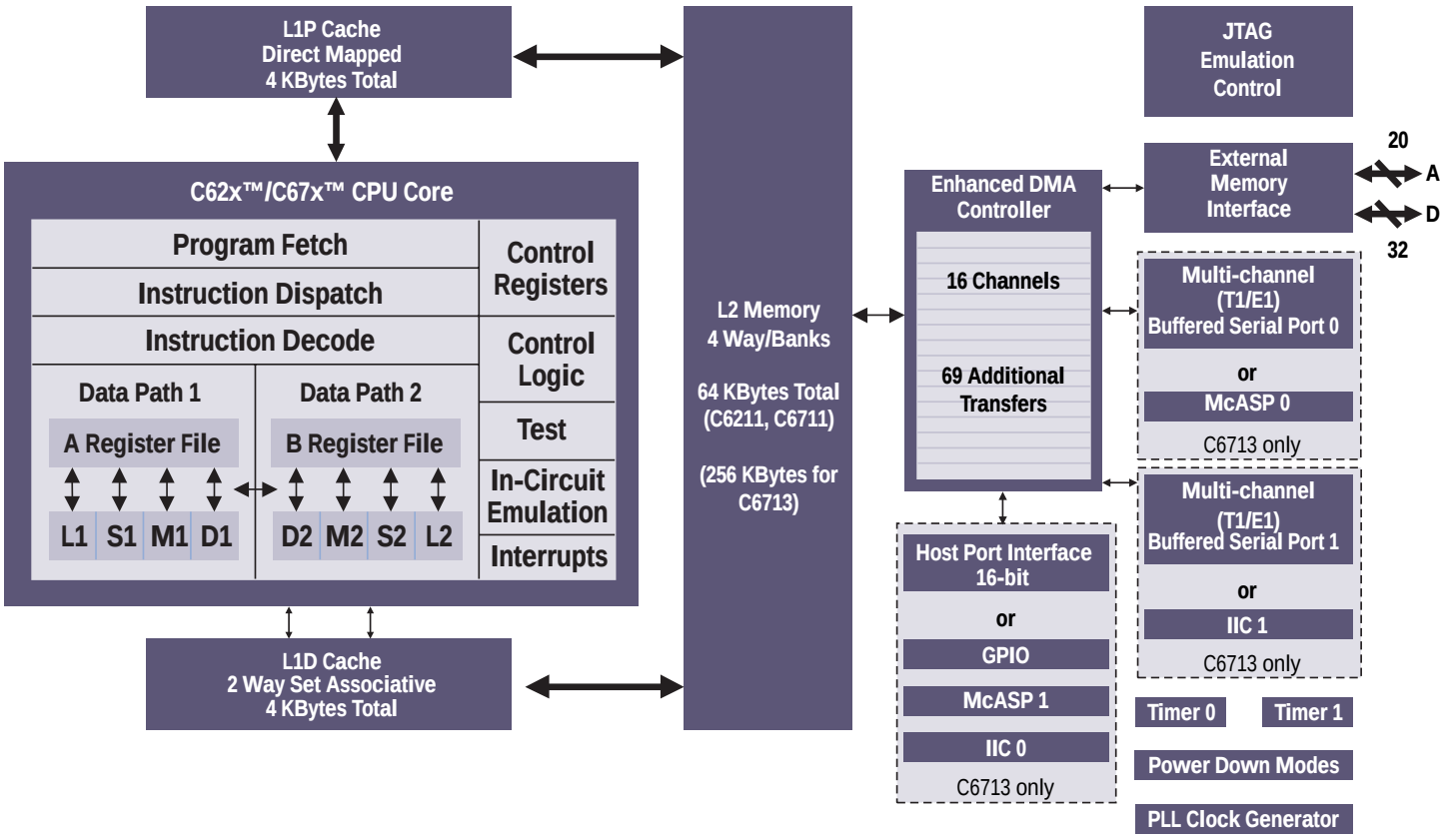
TMS320C6000™ DSP Platform Roadmap



Applications

- Variable optical attenuator (VOA)
- Optical cross connect (OXC)
- Optical add/drop multiplexer (OADM)
- Polarization mode dispersion control (PMDC) (C67x floating-point DSPs available)
- Optical performance monitor (OPM)

TMS320C6713 DSP Block Diagram



AMPLIFIERS

Device	Offset Voltage (max)	Bias Current (max)	Current Noise	CMRR (min) (dB)	A_{OL} (min) (dB)	GBW (typ) (MHz)	SR (typ) (V/µs)	V_{CC} Range (V)	# of Channels S/D/Q	Price[1]
Operational										
OPA227	75 µV	10 nA	0.4 pA/√Hz	120	132	8	2.3	±2.5 to ±18	S/D/Q	1.01
OPA228	75 µV	10 nA	0.4 pA/√Hz	120	132	33	11	±2.5 to ±18	S/D/Q	1.01
OPA2111	750 µV	8 pA	0.6 fA/√Hz	96	114	2	2	±5 to ±18	D	7.33
OPA2822	1.2 mV	12 µA	1.6 pA/√Hz	85	85	240	170	±2.5 to ±6	D	2.17
OPA121	2 mV	5 nA	0.8 fA/√Hz	86	106	2	2	±5 to ±18	S	4.84
OPA124	250 µV	1 nA	0.5 fA/√Hz	100	120	1.5	1.6	±5 to ±18	S	3.77
OPA128	500 µV	75 fA	0.12 fA/√Hz	90	110	1	3	±5 to ±18	S	12.16
OPA129	2 mV	100 fA	0.1 fA/√Hz	80	94	1	2.5	±5 to ±18	S	3.04
OPA132	0.5 mV	50 pA	3 fA/√Hz	96	110	8	20	±2.5 to ±18	S/D/Q	1.35
OPA355	9 mV	50 pA	50 fA/√Hz	66	84	200	360	+2.7 to +5.5	S/D/T	1.20
OPA404	750 µV	4 pA	0.6 fA/√Hz	88	88	4	24	±5 to ±18	Q	7.19
OPA627	250 µV	5 pA	1.6 fA/√Hz	106	112	16	40	±4.5 to ±24	S	9.63
OPA637	250 µV	5 pA	1.6 fA/√Hz	106	112	80	100	±4.5 to ±24	D	9.63
OPA655	2 mV	125 pA	1.3 fA/√Hz	55	53	240	210	±5	S	9.24
OPA656	2 mV	20 pA	2.5 fA/√Hz	55	56	240	290	±5 to ±6	S	7.85
OPA657	2 mV	20 pA	2.5 fA/√Hz	55	65	1600	800	±5 to ±6	S	8.19
OPA686	1 mV	10 µA	1.8 pA/√Hz	100	75	1800	600	±5 to ±6	S/D	2.79
THS4271	10 mV	15 µA	3 pA/√Hz	67	65	400	1000	±2.5 to ±7.5	S	2.69
THS4601	4 mV	90 pA	5.0 fA/√Hz	106	90	180	100	±4.5 to ±15	S	9.95

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

Device[1]	Description	Ch.	SHDN	V_S (min) (V)	V_S (max) (V)	I_O Per Ch. (max) (mA)	GBW (typ) (MHz)	Slew Rate (typ) (V/µs)	V_{OS} (25°C) (max) (mV)	Offset Drift (typ) (µV/°C)	I_B (max) (pA)	V_N at 1 kHz (typ) (nV/√Hz)	Rail-to-Rail	Packaging	Price[2]
CMOS															
OPAy363	1.8 V, high CMR	1, 2	Y	1.8	5.5	0.75	7	5	5	3	10	14	I/O	MSOP, SOIC, SOT23	Call
OPAy364	1.8 V, high CMR	1, 2, 4	N	1.8	5.5	0.75	7	5	5	3	10	14	I/O	MSOP, SOIC, SOT23, TSSOP	Call
TLV278x	1.8 V, low power, SS, 8 MHz, low bias current	1, 2, 4	Y	1.8	3.6	0.82	8	4.3	3	8	15	18	I/O	MSOP, PDIP, SOIC, SOT23, TSSOP	0.65
TLV246x	Low noise, SS, wide bandwidth, 25-mA drive	1, 2, 4	Y	2.7	6	0.575	5.2	1.6	2	2	14000	11	I/O	MSOP, PDIP, SOIC, SOT23, TSSOP	0.59
OPAy340	CMOS, wide bandwidth	1, 2, 4	N	2.7	5.5	0.95	5.5	6	0.5	2.5	10	25	I/O	MSOP, PDIP, SOIC, SOT23, TSSOP	0.67
OPAy341	Low voltage, wide bandwidth, SS	1, 2	Y	2.7	5.5	1	5.5	6	6	2	10	25	I/O	MSOP, SOIC, SOT23	0.74
TLV263x	1 mA/ch, 9 MHz, V_{IN} to GND	1, 2, 4	Y	2.7	5.5	1	9	6	3.5	3	50	50	Out	MSOP, PDIP, SOIC, SOT23, TSSOP	0.71
OPAy350	SS, CMOS, 38 MHz	1, 2, 4	N	2.7	5.5	7.5	38	22	0.5	4	10	5	I/O	PDIP, MSOP, SOIC, SSOP	1.23
OPA355	High speed, CMOS	1, 2, 3	Y	2.5	5.5	11	200	300	9	7	3	5.8	Out	SOT23, SOIC, MSOP, TSSOP	Call

[1]*x indicates: 0 = single with shutdown, 1 = single, 2 = dual, 3 = dual with shutdown, 4 = quad, 5 = quad with shutdown. y indicates: no character = single, 2 = dual, 3 = triple, 4 = quad.*
[2]*Suggested resale price in U.S. dollars in quantities of 1,000.*

AMPLIFIERS (CONTINUED)

Device	Description	Ch.	Gain (µA/V)	Offset (max) (µV)	Offset Drift (max) (µV/°C)	CMRR (min) (dB)	BW (typ) (MHz)	Output Voltage Swing (min) (V)	Power Supply (V)	I_O (max) (mA)	Packaging	Price[1]
Current Shunt Monitors												
INA138	36 V max	1	200	1000	13	100	0.8	0 to (V+) –0.8	+2.7 to 36	0.045	SOT23-5	0.95
INA139	High-speed, 40 V max	1	1000	1000	1	100	4.4	0 to (V+) –0.9	+2.7 to 40	0.125	SOT23-5	0.95
INA168	60 V max	1	200	1000	13	100	0.8	0 to (V+) –0.8	+2.7 to 60	0.045	SOT23-5	1.15
INA169	High-speed, 60 V max	1	1000	1000	1	100	4.4	0 to (V+) –0.9	+2.7 to 60	0.125	SOT23-5	1.15
INA170	High-side bidirectional	1	1000	1000	1	100	0.4	0 to (V+) –0.9	+2.7 to 60	0.125	MSOP-8	1.21

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

Device	Description	Gain Range (V/V)	Input Range (max) (V)	Output Swing (V)	CMRR (min) (dB)	I_O (mA)	Supply Voltage (V)	BW (kHz)	Noise (nV/√Hz)	Price[1]
Difference Amplifiers										
INA117	High common-mode voltage	1	±200	±10	86	1.5	±5 to ±18	200	550	2.73
INA132	Low-power single supply	1	+28, –15	+13.5, –14	76	0.16	±1.35 to ±18+2.7 to +36	300	65	1.00
INA145	Programmable gain	1 to 500	±28	+13.5, –14	76	0.6	±1.35 to ±18+2.7 to +36	500	100	1.42
INA146	High-voltage programmable gain	0.1 to 200	±200 (G=0.1)	+13.5, –14	70	0.6	±1.35 to ±18+2.7 to +36	500	50	1.62
INA152	Single supply	0.5, 1, 2	+18, –20	±9.9	86	0.45	±1.35 to ±10+2.7 to +20	700	80	1.11

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

Device	Description	Input Range (min) (V)	CMRR (min) (dB)	I_O (typ) (mA)	V_{CC} Range (V)	BW (typ) (MHz)	Voltage Noise (nV/√Hz)	Price[1]
Instrumentation Amplifiers								
INA114	Precision	±11	110	2.2	±2.25 to ±18	10	11	3.59
INA115	Precision, additional internal connections	±11	110	2.2	±2.25 to ±18	10	11	4.00
INA118	Single supply, precision, low power	+14 to –13.9	107	350	±1.35 to ±18	70	10	3.78
INA121	FET-input, lowest cost, lowest power	±12.5	96	450	±2.25 to±18	50	20	2.38
INA122	Single supply, micropower, rail-to-rail out	+10 to –14.7	83	60	+2.2 to +36	5	60	1.97
INA163	Low noise, low distortion	± 11	100	12	±4.5 to ±18	0.8	1	1.97
INA326	Precision, low drift, CMOS	5	100	2.4	5	1	33	1.71
INA327	Precision, low drift, CMOS w/shutdown	5	100	2.4	5	1	33	1.85

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

AMPLIFIERS (CONTINUED)

Device	V_S (min) (V)	V_S (max) (V)	I_Q (max) (mA)	Input Current Range (min) (nA)	Input Current Range (max) (mA)	Conformity Error[1] (max) (%)	Conformity Error[1] (typ) (%/°C)	Full Scale Output Voltage (min) (V)	Full Scale Output Voltage (max) (V)	Input Offset Voltage (max) (mV)	Specified Voltage (V)	Scale Factor (V/decade)	Reference Type	Packaging	Price[2]
Logarithmic															
LOG101	4.5	18	1.5	100	3.5	0.2	0.0001	1.2	1.5	1.5	5	1	External	8-pin SO	15.65
LOG102	4.5	18	2	1	1	0.3	0.0002	–4.1	3.5	1.5	5	1	External	14-pin SO	18.65
LOG104	4.5	18	1.5	100	3.5	0.2	0.0001	1.2	1.5	1.5	5	0.5	External	8-pin SO	15.65
LOG112	4.5	18	1.75	1	3.5	0.2	0.0001	–3.8	3.5	1.5	5	0.5	Internal 2.5 V	14-pin SO	18.65

[1]*Parameter applies to initial 5 decades with typical values over temperature range.*
[2]*Suggested resale price in U.S. dollars in quantities of 1,000.*

Device	I_{OUT} (A)	V_{CC} (V)	BW (MHz)	SR (V/µs)	I_Q (mA)	V_O (max) (mV)	V_O Drift (µV/°C)	I_B (nA)	Packaging	Price[1]
Power Op Amps										
OPA547	0.5	8 to 60	1	6	10	5	25	500	TO220-7, DDPak-7	4.14
OPA548	3	8 to 60	1	10	17	10	30	500	TO220-7, DDPak-7	5.52
OPA549	8	8 to 60	0.9	9	26	5	20	500	ZIP11	10.96
OPA551	0.2	8 to 60	3	15	7	3	7	0.1	DIP8, SO8, DDPak-7	1.66
OPA552	0.2	8 to 60	12	24	7	3	7	0.1	DIP8, SO8, DDPak-7	1.66
OPA561	1.2	7 to 16	17	50	50	20	50	0.1	HTSSOP-20	2.50
OPA569	2	2.7 to 5	1	1	3.4	2	–	0.05	SOIC	Call
TLV411x	0.3	2,5 to 6	2.7	1.6	1	3.5	3	0.05	PDIP, MSOP, SOIC	0.65

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

Device	I_O (max) (A)	Gain (V/V)	V_{CC}/V_{DD} (min) (V)	V_{CC}/V_{DD} (max) (V)	Switching Frequency (kHz)	$R_{ds(ON)}$ (Ω)	V_{ICM} (min) (V)	V_{ICM} (max) (V)	I_Q (mA)	PSRR (dB)	Price[1]
PWM Power Drivers											
DRV590	1.2	2, 4, 8, 15	2.7	5.5	250	0.4	1.2	3.8	4	77	Web
DRV591	3	2.34	2.8	5.5	500/100	0.065	1.2	3.8	7	77	Web
DRV592	3	–	2.8	5.5	-	0.065	1.2	3.8	7	77	Web
DRV593	3	2.34	2.8	5.5	500/100	0.060	1.2	3.8	4	77	Web
DRV594	3	14.5	2.8	5.5	500/100	0.060	1.2	3.8	4	77	Web

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

CLOCK DISTRIBUTION

Device	Description	Packaging	I/O Levels (Input/Output)	Frequency (MHz)	V_{CC} (V)	Output Skew $t_{sk(o)}$ max (ns)	Price[1]
Buffer-Based Clock Distribution							
CDC111	1:9 diff LVPECL	28-pin PLCC	LVPECL/LVPECL	0-500	3.3	0.05	Web
CDCVF111	1:9 diff LVPECL	28-pin PLCC	LVPECL/LVPECL	0-650	3.3	0.05	Web
CDC318A	1:18 clock driver with I^2C control interface	48-pin SSOP	LVTTL/LVTTL, TTL	0-100	3.3	0.25	Web
CDC341	1:8 w/fast t_{pd} fanout	20-pin SOIC	TTL/TTL	0-80	5	0.6	Web
CDC351/2351	1:10 w/fast t_{pd} fanout, 3-state outputs	24-pin SOIC/SSOP	LVTTL/LVTTL	0-100	3.3	0.5	Web
CDC391	1:6 clock driver with selectable polarity and 3-state outputs	16-pin SOIC	TTL/TTL	0-100	5	0.5	Web
CDCLVD110	1:10 programmable low voltage LVDS Clock Driver	32-pin TQFP	LVDS/LVDS	900	2.5	30 ps (typ)	Web
CDCLVP110	1:10 low voltage LVPECL HSTL with selectable input clock driver	32-pin LQFP	LVPECL or HSTL/LVPECL	3.5 GHz	2.5/3.3	30 ps	Web
CDCV304	1:4 fanout for PCI-X and general app.	8-pin TSSOP	LVTTL/CMOS	0-140	3.3	0.17	Web
CDCVF2310	1:10 clock driver w/2 banks for general-purpose applications	24-pin TSSOP	LVTTL/LVTTL	0-170 (V_{DD}=2.3-2.7 V) 0-200 (V_{DD}=3-3.6 V)	2.5/3.3	(V_{DD}=2.5 V)	Web
SN65LVDS104	1:4 diff LVDS	16-pin SOIC/TSSOP	LVDS/LVDS	0-315	3.3	0.1	2.22
SN65LVDS105	1:5 diff LVDS	16-pin SOIC/TSSOP	LVDS/LVDS	0-315	3.3	0.1	2.22
SN65LVDS108	1:8 diff LVDS	38-pin TSSOP	LVDS/LVDS	0-311	3.3	0.3	4.00
SN65LVDS116	1:16 diff LVDS	64-pin TSSOP	LVDS/LVDS	0-311	3.3	0.3	5.97
PLL-Based Clock Distribution							
CDC516/2516[2]	1:16 PLL clock driver	48-pin TSSOP	LVTTL/LVTTL	25-125	3.3	0.2	Web
CDC536/2536[2]	1:6 PLL clock driver w/(3) at 1/2x or 2x output, 3-state outputs	28-pin SSOP	LVTTL/LVTTL	25-100	3.3	0.5	Web
CDC5801	Clock multiplier/divider with prog. delay and phase alignment	24-pin SSOP	LVTTL/LVPECL or LVDS or LVTTL	150-500/12.5-62.5	3.3	–	Web
CDC582/2582[2]	1:12 LV diff PECL PLL clock driver w/(9) at 1/2x or 2x output	52-pin TQFP	LVPECL/LVTTL	25-100	3.3	0.5	Web
CDC586/2586[2]	1:12 PLL clock driver w/(9) at 1/2x or 2x output, 3-state outputs	52-pin TQFP	LVTTL/LVTTL	25-100	3.3	0.5	Web
CDC7005	High performance clock synthesizer	64-pin BGA	LVTTL/LVPECL	10-650	3.3	200 ps	Web
CDCVF2505	1:5 PLL clock driver for gen. purpose, SSC	8-pin TSSOP/SOIC	LVTTL/LVTTL	24-200	3.3	0.15	Web
CDCVF2508	1:8 low-power PLL clock driver with two banks, SSC	16-pin TSSOP/SOIC	LVTTL/LVTTL	10-170	2.5/3.3	0.15	Web
CDCVF2509	1:9 low-power PLL clock driver for PC 133 and beyond application, SSC	24-pin TSSOP	LVTTL/LVTTL	50-175	3.3	0.1	Web
CDCVF2510	1:10 low-power PLL clock driver for PC 133 and beyond application, SSC	24-pin TSSOP	LVTTL/LVTTL	50-175	3.3	0.1	Web
PLL-Based Clocks for Memory Applications							
CDCF2509[2]	1:9 PLL clock driver for PC 133 app., SSC	24-pin TSSOP	LVTTL/LVTTL	25-140	3.3	0.2	Web
CDCF2510[2]	1:10 PLL clock driver for PC 133 app., SSC	24-pin TSSOP	LVTTL/LVTTL	25-140	3.3	0.2	Web
CDCV850	1:10 PLL clock driver for DDR SDRAM application, SSC compatible with two-line serial interface	48-pin TSSOP	HCSL, Universal (except ECL)/SSTL-II	60-140	2.5/3.3	0.075	Web
CDCV855	1:4 (plus feedback pair) PLL differential clock driver for DDR applications, SSC	28-pin TSSOP	SSTL-II/ SSTL-II, LVTTL	60-180	2.5	0.075	Web
CDCV857A	1:10 PLL differential clock driver for DDR applications, SSC	48-pin TSSOP	SSTL-II/SSTL-II	60-180	2.5	0.075	Web
CDCR83	400-MHz direct Rambus™ clock gen., SSC	24-pin SSOP	CMOS/RSL[3]	267-400	3.3	–	Web
CDCFR83	533-MHz direct Rambus clock gen., SSC	24-pin SSOP	CMOS/RSL[3]	287-533	3.3	–	Web

[1]Suggested resale price in U.S. dollars in quantities of 1,000. Please check www.ti.com for current pricing on these products.
[2]With series output resistors.
[3]Rambus signaling levels.

Notes: For more information regarding test conditions used to obtain measurements, see datasheet.
Converted from V/ns datasheet value to ns value, based on 0.4- to 2-V voltage rise/fall.

DATA CONVERTERS

Device	Resolution (Bits)	Sample Rate (kSPS)	Supply (V)	Data-Bus Interface	Analog Inputs	Power (typ) (mW)	V_{REF} (Int/Ext)	DNL (max) (±LSB)	INL (max) (±LSB)	Price[1]
Analog-to-Digital SAR 50 kSPS–200 kSPS										
AMC7820	12	100	5	Serial	8	60	Int	1	1	9.25
ADS7804	12	100	5	P8/P12	1	100	Int	0.45	0.45	13.36
ADS7805	16	100	5	P8/P16	1	100	Int	1	3	20.75
ADS7808	12	100	5	Serial	1	100	Int	0.45	0.45	10.58
ADS7809	16	100	5	Serial	1	100	Int	1	2	20.75
ADS7816	12	200	2.7 to 5	Serial	1	3.5	Ext	0.75	1	1.97
ADS7817	12	200	2.7 to 5	Serial	1	4	Ext	1	1	1.97
ADS7820	12	100	5	P8/P12	1	100	Int	0.5	0.5	10.37
ADS7821	16	100	5	P8/P16	1	100	Int	1	3	21.12
ADS7822	12	75	2.7 to 3	Serial	1	1.625	Ext	0.75	0.75	1.47
ADS7832	12	117	3 to 5	P8	4	7.5	Int	0.75	0.75	16.19
ADS7841	12	200	2.7 to 5	Serial	4	3.5	Ext	1	1	2.53
ADS7842	12	200	2.7 to 5	P12	4	3.5	Ext	1	1	2.99
ADS7844	12	200	2.7 to 5	Serial	8	3.5	Ext	1	1	2.94
ADS8325	16	100	2.7 to 5	Serial	1	1.8	Ext	1	4	6.33
ADS8321	16	100	5	Serial	1	10	Ext	2	8	6.33
ADS8324	14	50	1.8 to 3.6	Serial	1	2.5	Ext	2	2	3.95
ADS8341	16	100	2.7 to 5	Serial	4	5	Ext	2	6	7.08
ADS8343	16	100	2.7 to 5	Serial	4	5	Ext	2	6	7.08
ADS8344	16	100	2.7 to 5	Serial	8	5	Ext	2	6	7.59
ADS8345	16	100	2.7 to 5	Serial	8	5	Ext	2	6	7.59
TLC2543	12	66	5	Serial	11	5	Ext	1	1	4.23
TLC2574	12	200	5	Serial	4	25.32	Ext	0.5	0.5	5.04
TLC2578	12	200	5	Serial	8	25.32	Ext	0.5	0.5	5.55
TLC3541	14	200	5	Serial	1	17.24	Ext	1	1.5	4.75
TLC3545	14	200	5	Serial	1	17.24	Ext	1	1.5	4.75
TLC3574	14	200	5	Serial	4	25.32	Ext	1	1.5	7.59
TLC3578	14	200	5	Serial	8	25.32	Ext	1	1.5	9.36
TLC4541	16	200	5	Serial	1	17.24	Ext	1	2.5	7.00
TLC4545	16	200	5	Serial	1	17.24	Ext	1	2.5	7.00
TLV2541	12	200	2.7 to 5.5	Serial	1	2.3	Ext	1	1	3.54
TLV2542	12	200	2.7 to 5.5	Serial	2	2.3	Ext	1	1	3.54
TLV2543	12	66	3.3	Serial	11	3.3	Ext	1	1	4.23
TLV2544	12	200	2.7 to 5.5	Serial	4	2.7	Int	1	1	4.27
TLV2545	12	200	2.7 to 5.5	Serial	1	2.3	Ext	1	1	3.54
TLV2548	12	200	2.7 to 5.5	Serial	8	2.7	Int	1	1	4.71
Analog-to-Digital SAR 200 kSPS–500 kSPS										
ADS7800	12	333	+5, –15	P8/P12	1	215	Int	0.75	0.5	26.66
ADS7811	16	250	±5	P16	1	250	Int	2	4	34.41
ADS7815	16	250	±5	P16	1	250	Int	2	4	20.24
ADS7818	12	500	5	Serial	1	15	Int	1	1	2.63
ADS7834	12	500	5	Serial	1	15	Int	1	1	2.65
ADS7835	12	500	5	Serial	1	17.5	Int	1	1	3.01
ADS7852	12	500	5	P12	8	12	Int	1	1	3.56
ADS7861	12	500	5	Serial	4	40	Int	1	1	4.03
ADS7862	12	500	5	P12	4	40	Int	1	1	5.99
ADS7864	12	500	5	P12	6	50	Int	1	1	6.83
ADS8322	16	500	5	Parallel	1	85	Int	2	6	7.59
ADS8361	16	500	5	Parallel	4	160	Int	3	8	7.85
ADS8364	16	250/Ch	5	Serial	6	250	Int	3	8	17.21

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

Continued on next page

DATA CONVERTERS (CONTINUED)

Device	Resolution (Bits)	Sample Rate (kSPS)	Supply (V)	Data-Bus Interface	Analog Inputs	Power (typ) (mW)	V_{REF} (Int/Ext)	DNL (max) (±LSB)	INL (max) (±LSB)	Price[1]
Analog-to-Digital SAR 200 kSPS–500 kSPS (Continued)										
TLC2551	12	400	5	Serial	1	15	Ext	1	1	3.74
TLC2552	12	400	5	Serial	2	15	Ext	1	1	3.74
TLC2554	12	400	5	Serial	4	20	Int	1	1	5.06
TLC2555	12	400	5	Serial	1	15	Ext	1	1	3.74
TLC2558	12	400	5	Serial	8	20	Int	1	1	5.56

Device	Resolution (Bits)	Sample Rate (MSPS)	Supply (V)	Analog Inputs	Power (typ) (mW)	Analog Input BW (MHz)	DNL (max) (±LSB)	INL (max) (±LSB)	SNR (dB)	Price[1]
High-Speed Analog-to-Digital SAR & Pipeline 500 kSPS–80 MSPS										
ADS850	14	10	5	1	220	300	–	–	76	19.23
THS1206	12	6	5	4	216	96	1	1.5	74	11.08
THS1207	12	6	5	4	186	96	1	1.5	69	12.13
THS12082	12	8	5	2	186	96	1	1.5	69	10.07
THS1209	12	8	5	2	186	98	1	1.5	69	9.05
THS1230	12	30	3.3	1	168	180	1	2.5	68	13.84
THS1240	12	40	5	1	380	120	–	–	64	14.45
ADS8401	16	1.25	5	1	150	40	1	4	87	18.50
ADS8402	16	1.25	5	1	150	40	1	4	91	18.50
THS1408	14	8	3.3	1	270	140	1	5	72	15.18
THS14F01	14	1	3.3	1	270	140	1	2.5	72	9.86
THS14F03	14	3	3.3	1	270	140	1	2.5	72	12.89

Device	Resolution (Bits)	Supply (V)	Data-Bus Interface	Settling Time (µs)	Number of DACs	Power (typ) (mW)	Output (I or V)	VREF (Int/Ext)	DNL (max) (±LSB)	INL (max) (±%FSR)	Price[1]
Digital-to-Analog											
DAC5332	16	±12	Serial	5	32	750	V	Ext	4	0.122	Call
DAC7512	12	2.7 to 5.5	Serial	10	1	0.7	V	VDD	1	0.195	1.37
DAC7513	12	2.7 to 5.5	Serial	10	1	0.7	V	Ext	1	0.195	1.37
DAC7541	12	5 to 15	P12	1	1	30	I	Ext	0.5	0.024	6.40
DAC7545	12	5 to 15	P12	2	1	30	I	Ext	1	0.024	5.80
DAC7571	12	2.7 to 5.5	I2C	10	1	0.7	V	Ext	1	0.195	1.37
DAC7611	12	5	Serial	10	1	2.5	V	Int	1	0.024	2.39
DAC7612	12	5	Serial	10	2	3.7	V	Int	1	0.024	2.52
DAC7614	12	±5	Serial	10	4	10	V	Ext	1	0.024	6.38
DAC7615	12	±5	Serial	10	4	10	V	Ext	1	0.024	6.38
DAC7616	12	3	Serial	10	4	3	V	Ext	1	0.024	5.75
DAC7617	12	3	Serial	10	4	2.4	V	Ext	1	0.024	5.75
DAC7621	12	5	P12	10	1	2.5	V	Int	1	0.024	2.58
DAC7624	12	±5	P12	10	4	7.5	V	Ext	1	0.024	9.26
DAC7625	12	±5	P12	10	4	7.5	V	Ext	1	0.024	9.26
DAC7631	16	±5	Serial	10	1	1.8	V	Ext	2	0.003	5.57
DAC7634	16	±5	Serial	10	4	7.5	V	Ext	2	0.003	18.98
DAC7641	16	±5	P16	10	1	1.8	V	Ext	2	0.003	5.92
DAC7644	16	±5	P16	10	4	7.5	V	Ext	2	0.003	18.98
DAC7714	12	±15	Serial	10	4	45	V	Ext	1	0.024	10.88
DAC7715	12	±15	Serial	10	4	45	V	Ext	1	0.024	10.88
DAC7724	12	±15	P12	10	4	45	V	Ext	1	0.024	11.89
DAC7725	12	±15	P12	10	4	45	V	Ext	1	0.024	11.89
DAC7731	15	±15	Serial	5	1	150	V	Int	1	0.0015	7.80
DAC7734	16	±15	Serial	10	4	185	V	Ext	1	0.0015	29.93
DAC7741	15	±15	P16	5	1	150	V	Int	1	0.0015	8.30
DAC7744	16	±15	P16	10	4	185	V	Ext	1	0.0015	29.93

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

DATA CONVERTERS (CONTINUED)

Device	Resolution (Bits)	Supply (V)	Data-Bus Interface	Settling Time (µs)	Number of DACs	Power (typ) (mW)	Output (I or V)	VREF (Int/Ext)	DNL (max) (±LSB)	INL (max) (±%FSR)	Price[1]
Digital-to-Analog (Continued)											
DAC7800	12	5	Serial	0.8	2	1	I	Ext	1	0.0122	11.90
DAC7801	12	5	P8	0.8	2	1	I	Ext	1	0.0122	14.26
DAC7802	12	5	P12	0.8	2	1	I	Ext	1	0.0122	11.90
DAC8043	12	5	Serial	1	1	0.5	I	Ext	1	0.0122	7.54
DAC8501	16	2.7 to 5.5	Serial	10	1	1.3	V	Ext	1	0.098	2.83
DAC8531	16	2.7 to 5.5	Serial	10	1	1.3	V	Ext	1	0.098	2.83
DAC8532	16	2.7 to 5.5	Serial	10	2	2.5	V	Ext	1	0.098	5.32
DAC8534	16	2.7 to 5.5	Serial	10	4	5	V	Ext	1	0.098	9.75
DAC8571	16	2.7 to 5.5	I2C	10	1	1.3	V	Ext	1	0.098	2.83
DAC8574	16	2.7 to 5.5	I2C	10	4	5	V	Ext	1	0.098	9.75
TLC5615	10	5	Serial	12.5	1	1.2	V	Ext	0.5	0.097	1.85
TLV5604	10	2.7 to 5.5	Serial	3	4	3.3	V	Ext	0.5	0.097	4.79
TLV5606	10	2.7 to 5.5	Serial	3	1	0.9	V	Ext	1	0.146	1.77
TLV5608	10	2.7 to 5.5	Serial	1	8	18	V	Ext	1	0.195	4.74
TLV5610	12	2.7 to 5.5	Serial	1	8	18	V	Ext	1	0.146	8.65
TLV5613	12	2.7 to 5.5	P8	1	1	1.2	V	Ext	1	0.097	3.58
TLV5614	12	2.7 to 5.5	Serial	3	4	3.6	V	Ext	1	0.097	8.26
TLV5616	12	2.7 to 5.5	Serial	3	1	0.9	V	Ext	1	0.097	2.86
TLV5617A	10	2.7 to 5.5	Serial	1	2	1.8	V	Ext	1	0.097	3.41
TLV5618A	12	2.7 to 5.5	Serial	1	2	2.4	V	Ext	1	0.097	4.25
TLV5619	12	2.7 to 5.5	P12	1	1	4.3	V	Ext	1	0.097	3.58
TLV5630	12	2.7 to 5.5	Serial	1	8	18	V	Int	1	0.146	9.02
TLV5631	10	2.7 to 5.5	Serial	1	8	18	V	Int	1	0.195	5.12
TLV5633	12	2.7 to 5.5	P8	1	1	2.7	V	Int	0.5	0.073	4.46
TLV5636	12	2.7 to 5.5	Serial	1	1	4.5	V	Int	1	0.097	3.82
TLV5637	10	2.7 to 5.5	Serial	1	2	4.2	V	Int	0.5	0.097	4.53
TLV5638	12	2.7 to 5.5	Serial	1	2	4.5	V	Int	1	0.097	4.89
TLV5639	12	2.7 to 5.5	P12	1	1	2.7	V	Int	0.5	0.073	4.46

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

DIGITAL SIGNAL PROCESSORS—C2000™ DSP FAMILY

Device	RAM (16-bit words)	ROM (16-bit words)	Flash (16-bit words)	Boot ROM (words)	EMIF	General-Purpose Timers	Watch-dog Timer	PWM Ch.	SPI	SCI	CAN	10-Bit A/D Channels Conversion Time (µs)	I/O Pins	Voltage (V)	MIPS	Packaging	Price[1] (1KU)	Price[1] (10KU)
C24x™ DSPs																		
TMS320LF2407A[2, 3]	2.5K	–	32K	256	Yes	4	Y	16	Y	Y	Y	16 ch 0.5	41	3.3	40	144 LQFP	10.56	9.53
TMS320LF2406A[2, 3]	2.5K	–	32K	256	–	4	Y	16	Y	Y	Y	16 ch 0.5	41	3.3	40	100 LQFP	10.03	9.05
TMS320LF2403A[2, 3]	1K	–	16K	256	–	2	Y	8	Y	Y	Y	8 ch 0.5	21	3.3	40	64 TQFP	9.38	8.46
TMS320LF2402A[2, 3]	1K	–	8K	256	–	2	Y	8	–	Y	–	8 ch 0.5	21	3.3	40	64 PQFP	8.21	7.41
TMS320LF2401A[2, 3]	1K	–	8K	256	–	2	Y	7	–	Y	–	5 ch 0.5	13	3.3	40	32 LQFP	7.24	6.54
TMS320LC2406A[2-4]	2.5K	32K	–	–	–	4	Y	16	Y	Y	Y	16 ch 0.375	41	3.3	40	100 LQFP	–	5.70
TMS320LC2404A[2-4]	1.5K	16K	–	–	–	4	Y	16	Y	Y	–	16 ch 0.375	41	3.3	40	100 LQFP	–	5.27
TMS320LC2402A[2-4]	544	6K	–	–	–	2	Y	8	–	Y	–	8 ch 0.425	21	3.3	40	64 PQFP	–	2.95
TMS320LC2401A[2-4]	1K	8K	–	–	–	2	Y	7	–	Y	–	5 ch 0.5	13	3.3	40	32 LQFP	–	3.83
TMS320F243	544	–	8K	–	Yes	2	Y	8	Y	Y	Y	8 ch 0.9	32	5	20	144 LQFP	13.99	12.62
TMS320F241	544	–	8K	–	–	2	Y	8	Y	Y	–	8 ch 0.9	26	5	20	64 PQFP	12.37	11.16
TMS320C242[5]	544	4K	–	–	–	2	Y	8	–	Y	–	8 ch 0.9	26	5	20	64 PQFP	–	3.69
TMS320F240	544	–	16K	–	Yes	3	Y	12	Y	Y	–	16 ch 6.1	28	5	20	132 PQFP	16.21	14.62

Device	MIPS	Boot ROM (words)	RAM (16-bit words)	Flash (16-bit words)	Timers	Comp/ PWM	CAP/ QEP	# 12-bit A/D Ch.	Conv. Time (ns)	EMIF	WD Timer	McBSP	SPI	SCI	CAN	I/O Pins	Core Voltage (V)	Packaging	Price[1] (1KU)	Price[1] (10KU)
C28x™ DSPs																				
TMS320F2810-150	150	4K	18K	64K	7	16	6/2	16	200[6]	–	Y	Y	Y	Y	Y	56	1.8	128 LQFP	19.92	17.98
TMS320F2812-150	150	4K	18K	128K	7	16	6/2	16	200[6]	Y	Y	Y	Y	Y	Y	56	1.8	179 µ BGA 176 LQFP	25.47	22.99

[1]Prices are quoted in U.S. dollars and represent year 2002 suggested resale pricing.
[2]Minimum volume for LC240xA devices is 10 KU with NRE of $9,000; all others are 5 KU with NRE of $6,000.
[3]All devices ending with "A" include a code security feature.
[4]Pricing based on 10 KU minimum requirements due to factory ROM code.
[5]Pricing based on 5 KU minimum requirements due to factory ROM code.
[6]60-ns pipelined.
Note: Standard lead times are 12 weeks for Flash parts and 14 weeks for ROM-coded parts.

New devices indicated in red.

DIGITAL SIGNAL PROCESSORS—C5000™ DSP FAMILY

Device[1]	RAM (16-bit words)	ROM (16-bit words)	DAT/PRO (ADDR) (words)	SER	Voltage (V)		COM	Timers	PLL	Cycles (ns)	MIPS	Packaging	Price[2]	
					Core[1]	I/O							(1KU)	(10KU)
C54x™ DSPs														
TMS320VC5416-160	128K	16K	64K/8M	3[3, 4]	1.5	3.3	HPI 8/16	1	SW	6.25	160	144 BGA[5], LQFP	29.87	25.00
TMS320VC5416-120	128K	16K	64K/8M	3[3, 4]	1.5	3.3	HPI 8/16	1	SW	8.33	120	144 BGA[5], LQFP	26.94	22.50
TMS320VC5410A-160	64K	16K	64K/8M	3[3, 4]	1.6	3.3	HPI 8/16	1	SW	6.25	160	144 BGA[5], LQFP	15.30	14.95
TMS320VC5410A-120	64K	16K	64K/8M	3[3, 4]	1.5	3.3	HPI 8/16	1	SW	8.33	120	144 BGA[5], LQFP	13.81	13.50
TMS320VC5410-100	64K	16K	64K/8M	3[3, 4]	2.5	3.3	HPI 8	1	SW	10	100	176 BGA[5], 144 LQFP	30.40	26.86
TMS320VC5409A-160	32K	16K	64K/8M	3[3, 4]	1.6	3.3	HPI 8/16	1	SW	6.25	160	144 BGA[5], LQFP	12.73	12.45
TMS320VC5409A-120	32K	16K	64K/8M	3[3, 4]	1.5	3.3	HPI 8/16	1	SW	8.33	120	144 BGA[5], LQFP	11.15	10.90
TMS320UC5409-80	32K	16K	64K/8M	3[3, 4]	1.8	1.8–3.6	HPI 8/16	1	SW	12.5	80	144 BGA[5], LQFP	14.34	14.02
TMS320VC5409-100	32K	16K	64K/8M	3[3, 4]	1.8	3.3	HPI 8/16	1	SW	10	100	144 BGA[5], LQFP	11.95	10.00
TMS320VC5409-80	32K	16K	64K/8M	3[3, 4]	1.8	3.3	HPI 8/16	1	SW	12.5	80	144 BGA[5], LQFP	9.26	7.75
TMS320VC5407-120	40K	128K	64K/8M	3[3, 4]	1.6	3.3	HPI	1	SW	6.25	160	144 BGA[5], LQFP	14.83	14.50
TMS320VC5404-120	16K	64K	64K/8M	3[3, 4]	1.6	3.3	HPI	1	SW	6.25	160	144 BGA[5], LQFP	8.77	8.57
TMS320VC5402A-160	16K	16K	64K/8M	3[3, 4]	1.6	3.3	HPI 8	1	SW	6.25	160	144 BGA[5], LQFP	10.13	9.90
TMS320UC5402-80	16K	4K	64K/1M	2[3, 4]	1.8	1.8–3.6	HPI 8	2	SW	12.5	80	144 BGA[5], LQFP	6.79	6.63
TMS320VC5402-100	16K	4K	64K/1M	2[3, 4]	1.8	3.3	HPI 8	2	SW	10	100	144 BGA[5], LQFP	5.66	5.00
TMS320VC5401-50	8K	4K	64K/1M	2[3, 4]	1.8	3.3	HPI 8	2	SW	20	50	144 BGA[5], LQFP	4.50	4.00
TMS320VC549-120	32K	16K	64K/8M	3[6, 7]	2.5	3.3	HPI 8	1	SW	8.3	120	144 BGA[5], LQFP	29.03	25.65
TMS320VC549-100	32K	16K	64K/8M	3[6, 7]	2.5	3.3	HPI 8	1	SW	10	100	144 BGA[5], LQFP	24.22	21.39
TMS320LC549-80	32K	16K	64K/8M	3[6, 7]	3.3	3.3	HPI 8	1	SW	12.5	80	144 BGA[5], LQFP	21.99	19.43
TMS320LC548-80	32K	2K	64K/8M	3[6, 7]	3.3	3.3	HPI 8	1	SW	12.5	80	144 LQFP	36.70	32.42
TMS320LC548-66	32K	2K	64K/8M	3[6, 7]	3.3	3.3	HPI 8	1	SW	15	66	144 LQFP	33.31	30.03
TMS320LC546A-66	6K	48K	64K/64K	2[6]	3.3	3.3	–	1	SW	15	66	100 LQFP	17.09	15.43
TMS320LC546A-50	6K	48K	64K/64K	2[6]	3.3	3.3	–	1	SW	20	50	100 LQFP	15.54	14.02
TMS320LC545A-66	6K	48K	64K/64K	2[6]	3.3	3.3	HPI 8	1	SW	15	66	128, 144 LQFP	18.46	16.66
TMS320LC545A-50	6K	48K	64K/64K	2[6]	3.3	3.3	HPI 8	1	SW	20	50	128, 144 LQFP	16.79	15.15
TMS320LC543#-50[8]	10K	2K	64K/64K	2[6, 7]	3.3	3.3	–	1	HW	20	50	100 LQFP	21.40	19.31
TMS320LC543#-40[8]	10K	2K	64K/64K	2[6, 7]	3.3	3.3	–	1	HW	25	40	100 LQFP	19.44	17.55
TMS320LC542#-50[8]	10K	2K	64K/64K	2[6, 7]	3.3	3.3	HPI 8	1	HW	20	50	128, 144 LQFP	22.52	20.32
TMS320LC542#-40[8]	10K	2K	64K/64K	2[6, 7]	3.3	3.3	HPI 8	1	HW	25	40	128, 144 LQFP	20.46	18.47
TMS320C542#-40[8]	10K	2K	64K/64K	2[6, 7]	5	5	HPI 8	1	HW	25	40	128, 144 LQFP	20.46	18.47
TMS320LC541B-66	5K	28K	64K/64K	2	3.3	3.3	–	1	SW	15	66	100 LQFP	9.47	8.37
TMS320C541#-40[8]	5K	28K	64K/64K	2	5	5	–	1	HW	25	40	100 LQFP	16.60	14.98
TMS320C54CST	16K	64K	64K/8M	2	1.5	3.3	HPI 8/16	2	SW	8.33	120	144 BGA[5], LQFP	10.66	9.75
TMS320C54V90	40K	128K	64K/8M	2	1.5	3.3	HPI 8/16	2	SW	8.5/17	118/59	144 BGA, LQFP	11.00	9.78
C54x™ Multicore DSPs														
TMS320VC5441-532[9]	640K	–	64K/256K	12[3, 4]	1.5	3.3	HPI 16	4	SW	7.5	532	169 BGA, 176 LQFP	117.71	104.00
TMS320VC5421-200[9]	256K	4K	64K/256K	6[3, 4]	1.8	3.3	HPI 16	2	SW	10	200	144 BGA, LQFP	71.30	63.00
TMS320VC5420-200[9, 10]	200K	–	64K/256K	6[3, 4]	1.8	3.3	HPI 16	2	SW	10	200	144 BGA, LQFP	60.55	53.50

[1]Nomenclature for core: C = 5 V; LC = 3.3 V; VC = 2.5 V or less; UC = 1.8 V or less.
[2]Prices are quoted in U.S. dollars and represent year 2002 suggested resale pricing.
[3]Multi-channel buffered serial port (McBSP).
[4]6-channel DMA per core.
[5]MicroStar BGA package.
[6]1 buffered serial port (C548/549 have 2).
[7]1 TDM serial port.
[8]# = Hardware PLL option number selected at device fabrication: 1 for PLL option 1, 2 for PLL option 2 (see User's Guide, SPRU131F, for details).
[9]Multicore devices (VC542x = 2; VC544x = 4).

New devices indicated in red.

Read *Optical Networking Solutions Guide* online at www.ti.com/onetsg

DIGITAL SIGNAL PROCESSORS—C5000™ DSP FAMILY (CONTINUED)

Device[11]	RAM (Bytes)	ROM (Bytes)	Security	DAT/PRO (ADDR) (words)	USB	ADC	UART	I²C	RTC	McBSP[4]	Memory[12] Stick/ MMC/SD	Voltage (V) Core	Voltage (V) I/O	COM	Timers[13]	Cycles (ns)	MIPS	Packaging	Price[2] (1KU)	Price[2] (10KU)
C55x™ DSPs																				
TMS320VC5510-200	320K	32K	–	8M	–	–	–	–	–	3	–	1.6	3.3	HPI16	2	5	400	240 BGA[5]	28.50	25.00
TMS320VC5510-160	320K	32K	–	8M	–	–	–	–	–	3	–	1.6	3.3	HPI16	2	6.25	320	240 BGA[5]	25.50	22.00
TMS320VC5509-200	256K	64K	Y[14]	8M	Y	Y	–	Y	Y	3	Y	1.6	3.3	HPI16	2[15]	5	400	144 LQFP 179 BGA[5]	26.40	20.50
TMS320VC5509-144	256K	64K	Y[14]	8M	Y	Y	–	Y	Y	3	Y	1.6	3.3	HPI16	2[15]	6.9	288	144 LQFP 179 BGA[5]	20.50	16.50
TMS320VC5502-200	64K	32K	–	8M	–	–	Y	Y	–	3	–	1.5	3.3	HPI16/8	3[15]	5	400	176 LQFP 176 BGA[5]	10.18	9.95

Device	CPU	Frequency (MHz)	RAM (bytes)	ROM (bytes)	External Memory I/F	DMA	Timers	Serial Ports	Misc.	Voltage (V) Core	Voltage (V) I/O	Packaging	Price[2] (1KU)	Price[2] (10KU)
C55x™ OMAP™ DSPs														
OMAP5910 (DSP)	C55x	150	160K	32K	SDRAM[16], ASYNC[16]	6 Ch	3 GP, 1 WDT	2 McBSP[16], 2 MCSI[16]	3 Video HW Accel, 14 GPIO[16], MMU	1.6	1.8/ 2.75/3.3[17]	289 BGA[5]	34.40	32.00
(RISC)	ARM9TDMI	150	192K[18]		SDRAM, ASYNC	9 Ch	1 OS, 3 GP, 1 WDT	3 Host or 2 Host/ 1 Function USB 1.1, 1 McBSP, µwire, I²C, HDQ, 3 UARTs (1 IrDA)[18]	LCD, Camera, MMC/SD, RTC, Keypad, 10 GPIO, MMU	–				

[1]*Nomenclature for core: C = 5 V; LC = 3.3 V; VC = 2.5 V or less; UC = 1.8 V or less.*
[2]*Prices are quoted in U.S. dollars and represent year 2002 suggested resale pricing.*
[3]*Multi-channel buffered serial port (McBSP).*
[4]*6-channel DMA per core.*
[5]*MicroStar BGA package.*
[6]*1 buffered serial port (C548/549 have 2).*
[7]*1 TDM serial port.*
[8]*# = Hardware PLL option number selected at device fabrication: 1 for PLL option 1, 2 for PLL option 2 (see User's Guide, SPRU131F, for details).*
[9]*Multicore devices (VC542x = 2; VC544x = 4).*
[10]*Internal bootloader not available on VC5420 DSP.*
[11]*All devices include 6-channel DMA and software PLL.*
[12]*Memory Stick™, MMC/SD; muxed.*
[13]*3 = Two general-purpose timers and one 32-bit DSP/BIOS™ kernel counter; 2 = Two general-purpose timers.*
[14]*8 Kword secure ROM and JTAG disconnect option.*
[15]*Plus 1 additional programmable watchdog timer.*
[16]*Shared with the ARM9TDMI.*
[17]*External memory interfaces may use 1.8, 2.75 or 3.3 V nominal.*
[18]*Shared with the C55x CPU.*

DIGITAL SIGNAL PROCESSORS—C6000™ DSP FAMILY

Device	RAM (bits) Data	RAM (bits) Prog	McBSP	DMA	COM	MHz	Cycle (ns)	MIPS	Typical Activity Total Internal Power (W) (max speed)	Voltage (V) Core	Voltage (V) I/O	Packaging	Price[1] (1KU)	Price[1] (10KU)
C62x™ DSPs—Fixed-Point														
TMS320C6211B-167	32K/32K/512K[2]		2	16[3]	HPI/16	167	6	1336	1.0	1.8	3.3	256 BGA, 27 mm	26.93	24.94
TMS320C6211B-150	32K/32K/512K[2]		2	16[3]	HPI/16	150	6.7	1200	0.9	1.8	3.3	256 BGA, 27 mm	21.54	19.95
TMS320C6205-200	512K	512K	2	4	PCI/32	200	5	1600	0.8	1.5	3.3	288 BGA, 16 mm	11.82	10.95
TMS320C6204-200	512K	512K	2	4	Exp. Bus/32	200	5	1600	0.8	1.5	3.3	340 BGA, 18 mm 288 BGA, 16 mm	22.03 10.74	20.40 9.95
TMS320C6203B-300	4M	3M	3	4	Exp. Bus/32	300	3.3	2400	1.3	1.5	3.3	352 BGA, 27 mm 384 BGA, 18 mm	110.08	101.97
TMS320C6203B-250	4M	3M	3	4	Exp. Bus/32	250	4	2000	1.1	1.5	3.3	352 BGA, 27 mm 384 BGA, 18 mm	84.18	77.98
TMS320C6202B-300	1M	2M	3	4	Exp. Bus/32	300	3.3	2400	1.0	1.5	3.3	352 BGA, 27 mm 384 BGA, 18 mm	78.33	72.56
TMS320C6202B-250	1M	2M	3	4	Exp. Bus/32	250	4	2000	0.9	1.5	3.3	352 BGA, 27 mm 384 BGA, 18 mm	67.14	62.20
TMS320C6202-250	1M	2M	3	4	Exp. Bus/32	250	4	2000	2.1	1.8	3.3	352 BGA, 27 mm 384 BGA, 18 mm	110.08	101.97
TMS320C6202-200	1M	2M	3	4	Exp. Bus/32	200	5	1600	1.7	1.8	3.3	352 BGA, 27 mm 384 BGA, 18 mm	94.03	87.10
TMS320C6201-200	512K	512K	2	4	HPI/16	200	5	1600	1.3	1.8	3.3	352 BGA, 35/27 mm	82.70	76.61

[1]*Prices are quoted in U.S. dollars for TMS devices only and represent year 2002 suggested resale pricing.*
[2]*The C6211 and C6711 DSP's 576 Kbits of cache memory is comprised of 32 Kbits data cache, 32 Kbits program cache and 512 Kbits unified cache memory.*
[3]*Enhanced DMA.*
Notes: All C62x and C67x devices include two timers.
New devices indicated in red.

DIGITAL SIGNAL PROCESSORS—C6000™ DSP FAMILY

Device	Internal RAM (Bits) L1 Program Cache/ L1 Data Cache/L2 Unified RAM/Cache	McBSP	Enhanced DMA (Channels)	COM[4]	Timers	MHz	Cycle (ns)	MIPS	Typical Activity Total Internal Power (W) (max speed)	Voltage (V) Core	Voltage (V) I/O	Packaging	Price[1] (1KU)	Price[1] (10KU)
C64x™ DSPs—Fixed-Point														
TMS320C6416-600	128K/128K/8M	2+UTOPIA[5]	64	PCI/HPI 32/16	3	600	1.67	4800[6]	1.06	1.4	3.3	532 BGA, 23 mm	161.92	149.99
TMS320C6416-500	128K/128K/8M	2+UTOPIA[5]	64	PCI/HPI 32/16	3	500	2	4000[6]	0.64	1.2	3.3	532 BGA, 23 mm	117.66	108.99
TMS320C6415-600	128K/128K/8M	2+UTOPIA[5]	64	PCI/HPI 32/16	3	600	1.67	4800	1.06	1.4	3.3	532 BGA, 23 mm	145.73	134.99
TMS320C6415-500	128K/128K/8M	2+UTOPIA[5]	64	PCI/HPI 32/16	3	500	2	4000	0.64	1.2	3.3	532 BGA, 23 mm	106.86	98.99
TMS320C6414-600	128K/128K/8M	3	64	HPI 32/16	3	600	1.67	4800	1.06	1.4	3.3	532 BGA, 23 mm	119.82	110.99
TMS320C6414-500	128K/128K/8M	3	64	HPI 32/16	3	500	2	4000	0.64	1.2	3.3	532 BGA, 23 mm	97.15	89.99
TMS320C6411-300	128K/128K/2M	2	64	PCI/HPI 32/16	2[7]	300	3.3	2400	0.25	1.0	3.3	532 BGA, 23 mm	42.21	39.10
TMS320DM642-600	128K/128K/2M	2[8]	64	PCI/HPI/EMAC[9]	3	600	1.67	4800	1.06	1.4	3.3	538 BGA, 23 mm	65.51	60.68
TMS320DM642-500	128K/128K/2M	2[8]	64	PCI/HPI/EMAC[9]	3	500	2	4000	0.64	1.2	3.3	538 BGA, 23 mm	48.53	44.95

Device	RAM (bits) Data	RAM (bits) Prog	McBSP	DMA	COM	MHz	Cycle (ns)	MFLOPS	Typical Activity Total Internal Power (W) (max speed)	Voltage (V) Core	Voltage (V) I/O	Packaging	Price[1] (1KU)	Price[1] (10KU)
C67x™ DSPs—Floating-Point														
TMS320C6713-225[10]	32K/32K/2M[2]		2[11]	16[3]	HPI/16	225	4.4	1350	1.2	1.2	3.3	272 BGA, 27 mm	28.99	26.85
TMS320C6713-150[10]	32K/32K/2M[2]		2[11]	16[3]	HPI/16	150	6.7	900	1.1	1.2	3.3	208 TQFP, 28 mm	22.35	20.45
TMS320C6712C-150[12]	32K/32K/512K[2]		2	16[3]	HPI/16	150	6.7	900	0.5	1.2	3.3	272 BGA, 27 mm	14.95	13.50
TMS320C6712-100	32K/32K/512K[2]		2	16[3]	–	100	10	600	0.8	1.8	3.3	256 BGA, 27 mm	18.06	16.73
TMS320C6711C-200[13]	32K/32K/512K[2]		2	16[3]	HPI/16	200	5	1200	0.7	1.2	3.3	272 BGA, 27 mm	21.55	18.65
TMS320C6711B-150	32K/32K/512K[2]		2	16[3]	HPI/16	150	6.7	900	1.1	1.8	3.3	256 BGA, 27 mm	30.77	28.50
TMS320C6711B-100	32K/32K/512K[2]		2	16[3]	HPI/16	100	10	600	0.8	1.8	3.3	256 BGA, 27 mm	21.54	19.95
TMS320C6701-167	512K	512K	2	4	HPI/16	167	6	1000	1.4	1.9	3.3	352 BGA, 35 mm	119.09	110.65
TMS320C6701-150	512K	512K	2	4	HPI/16	150	6.7	900	1.3	1.8	3.3	352 BGA, 35 mm	82.70	76.61

[1]Prices are quoted in U.S. dollars for TMS devices only and represent year 2002 suggested resale pricing.
[2]The C6211 and C6711 DSP's 576 Kbits of cache memory is comprised of 32 Kbits data cache, 32 Kbits program cache and 512 Kbits unified cache memory.
[3]Enhanced DMA.
[4]HPI is selectable, 32-bit or 16-bit.
[5]UTOPIA pins muxed with a third McBSP.
[6]Plus on-chip Turbo (TCP) and Viterbi (VCP) coprocessors.
[7]A third timer is present but not pinned out.
[8]The DM642 can be configured to have up to three serial ports in various video/McASP/McBSP combinations.
[9]The DM642 can be configured to have either a 32-bit, 66-MHz PCI or 32-bit HPI, or a 16-bit HPI with Ethernet MAC.
[10]Samples scheduled for September 2002.
[11]The C6713 DSP can be configured to have up to three serial ports in various McASP/McBSP combinations by not utilizing the HPI. Other configurable serial options include I2C and additional GPIO.
[12]Samples scheduled for 1Q 2003.
[13]Samples scheduled for 4Q 2002.
Notes: All C62x and C67x devices include two timers.
C64x production quantities scheduled for 4Q 2002.

New devices indicated in red.

LASER AND DETECTOR ELECTRONICS SOLUTIONS

Device	Function	Special Features	Data Rate (Gbps)	I/F	V_{CC} (V)	Typical Power (mW)	Packaging	Price[1]
ONET1201PA[2]	Limiting amplifier	Loss of signal; min 40-dB gain; PECL output	1.25	PECL	3.3	129	10-pin TSSOP, Die	4.85
ONET1201TA[4]	Transimpedance amplifier	1-GHz BW; 8-kΩ transimpedance	1.25		3.3	73	Die	4.05
ONET1211TA[4]	Transimpedance amplifier	1-GHz BW; 8-kΩ transimpedance; RSSI	1.25		3.3	73	Die	4.85
ONET2501PA[2]	Limiting amplifier	Loss of signal; min 40-dB gain; PECL output	2.5	PECL	3.3	159	10-pin TSSOP, Die	5.85
ONET2551PA[2]	Limiting amplifier	Loss of signal; min 40-dB gain; CML output	2.5	CML	3.3	159	10-pin TSSOP, Die	5.85
ONET2501TA[4]	Transimpedance amplifier	2.2-GHz BW; 4-kΩ transimpedance	2.5		3.3	83	Die	4.95
ONET2511TA[4]	Transimpedance amplifier	2.2-GHz BW; 4-kΩ transimpedance; RSSI	2.5		3.3	83	Die	5.75
ONET3201LD[3]	Laser driver	Automatic power control (APC), fault detection and current monitor	3.2	PECL	3.3	264	32-pin TQFP, 32-pin QFN, Die	10.70

[1]Suggested resale price in U.S. dollars in quantities of 1,000.
[2]Planned release 2Q 2003.
[3]Planned release 3Q 2003.
[4]Planned release 4Q 2003.

LVDS LINE DRIVERS AND RECEIVERS

Device	Max Drvr/Rcvr t_{pd} (ns)	Max Speed (Mbps)	Max Supply Current (mA)	HBM ESD Protection (kV)	# Inputs	# Outputs	Output Skew (ps)[2]	Pulse Skew (ps)[2]	Packaging	Comments	Price[1]
SN65LVDS1	3.1	630	8	15	1 LVTTL	1 LVDS	–	300 typ	5-pin SOT-23, 8-pin SOIC	Single driver	0.66
SN65LVDS2	3.6	400	7	15	1 LVDS	1 LVTTL	–	600 max	5-pin SOT-23, 8-pin SOIC	Single receiver	0.66
SN65LVDS22	6	400	20	12	2 LVDS	2LVDS	–	200 typ	16-pin SOIC 16-pin TSSOP	2:2 MUX (crosspoint)	3.01
SN65LVDS31	2.5	400	35	8	4 LVTTL	4 LVDS	300 max	300 max	16-pin SOIC 16-pin TSSOP	Quad driver	1.85
SN65LVDS32[3]	3	400	18	8	4 LVDS	4 LVTTL	300 max	400 max	16-pin SOIC 16-pin TSSOP	Quad receiver	1.85
SN65LVDS33[3]	6	400	23	15	4 LVDS	4 LVTTL	150 typ	200 typ	16-pin SOIC, 16-pin TSSOP	Quad receiver	2.22
SN65LVDS047	2.8	400	26	8	4 LVTTL	4 LVDS	300 max	300 max	16-pin SOIC, 16-pin TSSOP	Quad driver	1.83
SN65LVDS048A	3.7	400	15	10	4 LVDS	4 LVTTL	500 max	450 max	16-pin SOIC, 16-pin TSSOP	Quad receiver	1.83
SN65LVDS386[3]	4	300	70	4	16 LVDS	16 LVTTL	400 max	600 max	64-pin TSSOP	16-ch. receiver	5.55
SN65LVDS387	2.9	630	95	15	16 LVTTL	16 LVDS	150 max	500 max	64-pin TSSOP	16-ch. receiver	5.55
SN65LVDS388A[3]	4	300	40	4	8 LVDS	8 LVTTL	400 max	600 max	38-pin TSSOP	Octal receiver	3.25
SN65LVDS389	2.9	300	70	4	8 LVTTL	8 LVDS	150 max	500 max	38-pin TSSOP	Octal driver	3.25

[1]Suggested resale price in U.S. dollars in quantities of 1,000.
[2]R_L = 100 Ω, C_L = 10 pF with max. spec.
[3]Integrated termination option.

LVDS/LVPECL/CML REPEATERS/TRANSLATORS AND CROSSPOINTS

Device	Max Drvr/Rcvr t_{pd} (ns)	Max Speed (Mbps)	Max Supply Current (mA)	HBM ESD Protection (kV)	# Inputs	# Outputs	Output Skew (ps)	Pulse Skew (ps)	Packaging	Comments	Price[1]
SN65LVDS100	0.9	2000	90	5	1 LVDS/CML/LVPECL	1 LVDS	–	50	8-pin SOIC, VSSOP	Translator/Repeater	2.52
SN65LVDS101	0.9	2000	90	5	1 LVDS/CML/LVPECL	1 LVPECL	–	50	8-pin SOIC, VSSOP	Translator/Repeater	2.52
SN65CML100	0.8	1500	30	5	1 LVDS/CML/LVPECL	1 CML	–	50	8-pin SOIC, VSSOP	Translator/Repeater	Call
SN65LVDS122	0.9	1500	100	4	2 LVDS/CML/LVPECL	2 LVDS	40	50	16-pin SOIC, TSSOP	2x2 Crosspoint	4.75
SN65LVCP22	0.8	1000	85	8	2 LVDS/CML/LVPECL	2 LVDS	20	20	16-pin SOIC, TSSOP	2x2 Crosspoint	Call
SN65LVCP23	1	2000	65	5	2 LVDS/CML/LVPECL	2 LVPECL	20	20	16-pin SOIC, TSSOP	2x2 Crosspoint	Call
SN65LVDS125	1	1500	100	8	4 LVDS/CML/LVPECL	4 LVDS	50	50	38-pin TSSOP	4x4 Crosspoint	Call

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

MSP430 PRODUCTS

Device[1]	Program (kB)	SRAM (bytes)	I/O	WDT	Timer A	Timer B	USART	I²C	SVS	BOR	MPY	Comp A	ADC	DAC	Pins/Packaging[2]	Price[3]
Flash-Based F1xx Family[4] (V_{CC} 1.8 to 3.6 V)																
MSP430F1101A	1	128	14	✔	✔							✔	Slope		20 DW, PW	0.99
MSP430C1101	1	128	14	✔	✔							✔	Slope		20 DW,PW	0.60
MSP430F1111A	2	128	14	✔	✔							✔	Slope		20 DW, PW	1.34
MSP430C1111	2	128	14	✔	✔							✔	Slope		20 DW,PW	1.10
MSP430F1121A	4	256	14	✔	✔							✔	Slope		20 DW, PW, DGV	1.74
MSP430C1121	4	256	14	✔	✔							✔	Slope		20 DW,PW	1.34
MSP430F1122	4	256	14	✔	✔					✔			5-ch ADC10		20 DW, PW	2.24
MSP430F1132	8	256	14	✔	✔					✔			5-ch ADC10		20 DW, PW	2.48
MSP430F122	4	256	22	✔	✔		1					✔	Slope		28 DW, PW	2.39
MSP430F123	8	256	22	✔	✔		1					✔	Slope		28 DW, PW	2.51
MSP430F1222	4	256	22	✔	✔		1			✔			8-ch ADC10		28 DW, PW	2.62
MSP430F1232	8	256	22	✔	✔		1			✔			8-ch ADC10		28 DW, PW	2.79
MSP430F133	8	256	48	✔	✔	✔	1					✔	8-ch ADC12		64 PM	2.96
MSP430F135	16	512	48	✔	✔	✔	1					✔	8-ch ADC12		64 PM	3.55
MSP430C1331	8	256	48	✔	✔	✔	1					✔	Slope		64 PM	1.95
MSP430C1351	16	512	48	✔	✔	✔	1					✔	Slope		64 PM	2.25
MSP430F147	32	1024	48	✔	✔	✔	2				✔	✔	8-ch ADC12		64 PM	4.95
MSP430F148	48	2048	48	✔	✔	✔	2				✔	✔	8-ch ADC12		64 PM	5.65
MSP430F149	60	2048	48	✔	✔	✔	2				✔	✔	8-ch ADC12		64 PM, PAG	5.95
MSP430F155[5]	16	512	48	✔	✔	✔	1	✔	✔	✔		✔	8-ch ADC12	2-ch DAC12	64 PM	4.95
MSP430F156[5]	24	1024	48	✔	✔	✔	1	✔	✔	✔		✔	8-ch ADC12	2-ch DAC12	64 PM	5.65
MSP430F157[5]	32	1024	48	✔	✔	✔	1	✔	✔	✔		✔	8-ch ADC12	2-ch DAC12	64 PM	5.85
MSP430F167[5]	32	1024	48	✔	✔	✔	2	✔	✔	✔	✔	✔	8-ch ADC12	2-ch DAC12	64 PM	6.73
MSP430F168[5]	48	2048	48	✔	✔	✔	2	✔	✔	✔	✔	✔	8-ch ADC12	2-ch DAC12	64 PM	7.45
MSP430F169[5]	60	2048	48	✔	✔	✔	2	✔	✔	✔	✔	✔	8-ch ADC12	2-ch DAC12	64 PM	7.95

[1] *C = ROM, F = Flash*
[2] *Package identifiers: DGV = TVSOP, DW = SOP, PAG = TQFP, PM = LQFP, PW = TSSOP.*
[3] *Suggested resale price in U.S. dollars in quantities of 10,000.*
[4] *All devices support industrial temperature range.*
[5] *Planned release 2Q 2003.*

POWER MANAGEMENT PRODUCTS

Device	V_{IN} (V)	V_O (min)	V_{ref} Tolerance (%)	Internal Drive Sink/Source	Multiple Outputs	Current Capability (A)	Protection	Packaging	Comment	Price[1]
DC/DC Controllers										
TPS40000	2.25 to 5.5	0.7	1.5	0.5/0.5	No	12	OCP, OVP, UVLO	10-pin MSOP	Synchronous buck	1.80
TPS5103	4.5 to 25	0.9	1.5	1.5/1.5	No	20	OCP, OVP, UVLO	20-pin SSOP	Synchronous buck	2.12
TPS5120	4.5 to 28	0.9	1.5	1.5/1.5	Yes	20/20	OCP, OVP, UVLO	30-pin TSSOP	Dual synchronous buck	3.33

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

Device	V_{CC}	I_O (mA)	V_O (V)	Frequency (kHz)	Packaging	Comments	Price[1]
DC/DC Converters for Special Functions							
TPS6735	4 to 6.2	200	–5	160	8 SOIC	Inverter for GaAs	1.25
TPS6755	2.7 to 9.0	200	Adj.	160	8 SOIC	Inverter for GaAs	1.25

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

Device	V_{IN} (V)	I_O (A)	V_O (V)	Frequency (kHz)	Power Good	Packaging	Price[1]
DC/DC Converters with Integrated FETs (SWIFT™)							
TPS5431x	3.0 to 6.0	3	Adj., 0.9, 1.2, 1.5, 1.8, 2.5, 3.3	280 to 700	Yes	20-pin HTSSOP	3.89
TPS54372	3.0 to 6.0	3	Adj. (DDR/active bus termination)	280 to 700	No	20-pin HTSSOP	3.89
TPS5461x	3.0 to 6.0	6	Adj., 0.9, 1.2, 1.5, 1.8, 2.5, 3.3	280 to 700	Yes	28-pin HTSSOP	4.99
TPS54672	3.0 to 6.0	6	Adj. (DDR/active bus termination)	280 to 700	No	28-pin HTSSOP	4.99
TPS54680	3.0 to 6.0	6	Adj. (simultaneous sequencing)	280 to 700	No	28-pin HTSSOP	4.99
TPS54810	4.0 to 6.0	8	Adj. to 0.9	280 to 700	Yes	28-pin HTSSOP	5.34
TPS54910	3.0 to 4.0	9	Adj. to 0.9	280 to 700	Yes	28-pin HTSSOP	5.68
TPS54972	3.0 to 4.0	9	Adj. (DDR/active bus termination)	280 to 700	No	28-pin HTSSOP	5.68

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

Device	Outputs	Description	Enable/Shutdown	Ramp	V_{IN} Range (V)	Reporting	Auto Retry	Price[1]
Hot-Swap Controllers								
TPS2346	4	Sequencing (3.3, 5.15, 5, –5.2 V)	Low	Current	4.6 to 6	PG, overcurrent	No	3.50
TPS2390	1	Simple hot swap	High	Current	–36 to –80	UVLO, overcurrent	No	1.15
TPS2391	1	Simple hot swap	High	Current	–36 to –80	UVLO, overcurrent	Yes	1.15
TPS2392	1	Full-featured –48-V hot swap	High	Current	–20 to –80	UV, OV, PG, fault	No	1.95
TPS2393	1	Full-featured –48-V hot swap	High	Current	–20 to –80	UV, OV, PG, fault	Yes	1.95
UCC3917	1	Positive hot swap	Low	Current	>15	UVLO, overcurrent	Yes	1.15

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

Device	I_O (mA)	V_{do} @ I_O	V_O Options (V)	Packaging	C_O	Comments	Price[1]
Low-Dropout Regulators							
TPS751xx	1500	160	1.5, 1.8, 2.5, 3.3, adj.	TSSOP	47-µF tantalum	Fast transient	1.70
TPS768xx	1000	230	1.5, 1.8, 2.5, 2.7, 2.8, 3.0 3.3, adj.	SO8, TSSOP	10-µF tantalum	Fast transient	1.00
TPS775xx	500	169	1.5, 1.6, 1.8, 2.5, 2.8, 3.3, adj.	SO8, TSSOP	10-µF tantalum	Fast transient	0.83
TPS786xx	1500	375	1.8, 2.5, 2.8, 3.0, 3.3, adj.	SOT2235, KTT	2.2-µF ceramic	RF - low noise	1.65
TPS795xx	500	230	1.8, 2.5, 2.8, 3.0, 3.3, adj.	SOT223-5	2.2-µF ceramic	RF - low noise	1.04
TPS796xx	1000	250	1.8, 2.5, 2.8, 3.0, 3.3, adj.	SOT2235, KTT	2.2-µF ceramic	RF - low noise	1.13

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

Continued on next page

POWER MANAGEMENT PRODUCTS (CONTINUED)

Device	Input Bus Voltage (V)	Description	P_{OUT} or I_{OUT}	V_O Range (V)	V_O Adjustable	Price[1]
Plug-In Power Solutions						
PT4560	48	Isolated converter	30 W	1.8, 2.0, 2.5, 3.3, 5, 5.2, 12, 15	Yes	38.52
PT4660	48	Dual-output isolated converter	20 A	2.5/1.8, 3.3/1.5, 3.3/1.8, 3.3/2.5, 5/1.8, 5/3.3	Yes	99.19
PT5020	5	Non-isolated inverter	6 W	–1.7, –3.3, –5, –5.2, –5.5, –6, –6.5, –8, –9, –12, –15	No	9.50
PT5400	3.3/5	Non-isolated step-down converter	6 A	1.0,1.5, 1.8, 2.0, 2.5, 3.3	Yes	11.82
PT5500	3.3/5	Non-isolated step-down converter	3 A	1.0,1.5, 1.8, 2.0, 2.5, 3.3	Yes	10.80
PT6600	3.3/5	Non-isolated step-down converter	9 A	1.2,1.5, 1.8, 2.5, 3.3, 3.6	Yes	17.47
PT6910	3.3/5	Non-isolated inverter	12 W	–1.5, –2, –5.2	Yes	26.25
PT6940	3.3/5	Dual non-isolated step-down	6 A each	1.2/3.3, 1.5/3.3, 1.8/3.3, 2.5/3.3, 1.2/2.5, 1.5/2.5, 1.8/2.5	Yes	32.37
PT7761	5	Integrated switching regulator	40 A	1.3 to 3.5	Yes	53.84
PT7769	5	Integrated switching regulator	40 A+	40-A booster for PT7761	–	Call
PT8000	5	Multiphase non-isolated step-down	60 A	1.075 to 1.85, 1.3 to 3.5 with VID	Yes	102.81

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

Device	Typical Power Level (W)	Freq (MHz)	Control Mode	V_{CC} (V)	V_{ref} Tol (%)	UVLO On/Off (V)	Max Duty Cycle (%)	Softstart	Shutdown	Internal Drive Sink/Source	Packaging	Price[1]
PWM Controllers for Isolated/Offline												
UCC25705	5 to 200	4	Voltage	8.8 to 15	1.5	8.8/8.2	Prog	No	No	0.25/0.5	8-pin MSOP/SOIC/PDIP	1.14
UCC2800	10 to 200	1	Current	7.2 to 12	1.5	7.2/6.9	100	Yes	No	1/1	8-pin SOIC/TSSOP/PDIP	1.76
UCC2803	10 to 200	1	Current	3.6 to 15	1.5	4.1/3.6	100	Yes	No	1/1	8-pin SOIC/TSSOP/PDIP	1.76
UCC28C42	10 to 200	1	Current	9 to 18	1.5	14.5/9.0	100	No	No	1/1	8-pin SOIC/TSSOP/PDIP	1.76

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

Device	Channels	Voltages (V)	Packaging	Delay	Comment	Price[1]
Supply Voltage Supervisors						
TPS3128	1	1.2, 1.5, 1.8	SOT-23	180 ms	Manual reset active high	0.78
TPS3809	1	2.5, 3.0, 3.3, 5.0	SOT-23	5 µs	Active low	0.55
TPS3836	1	1.8, 2.5, 3.0, 3.3	SOT-23	10 ms	Manual reset active high	0.93

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

Device	V_{OUT} (V)	V_{OUT}/V_{REF} Initial Tolerance (%)	Type	Min I_z for Regulation (µA)	I_O (max) (mA)	I_{OUT}/I_z (max) (mA)	V_{IN} (min) (V)	V_{IN} (max) (V)	Adj. V_{OUT} Range (V)	Temp Co. (typ) (ppm/°C)	Temp Co. (max) (ppm/°C)	Price[1]
Voltage References and Shunt Regulators												
REF02A/B	5	0.2, 0.3	Series	–	1.4	21	8	40	–	4	10, 15	1.66
REF102A/B	10	0.05, 0.1	Series	–	1.4	10	11.4	36	–	–	5, 10	2.27
REF1004-xx	1.235, 2.5	0.3, 0.4	Shunt	10, 20	–	20	–	–	–	20	–	1.23
REF29xx	1.25, 2.048, 2.5, 3.0, 3.3, 4.096	2.0 (max)	Series	–	0.05	25	1.8	5.5	–	35	100	0.49
REF30xx	1.25, 2.048, 2.5, 3.3, 4.096	0.2	Series	–	0.05	25	1.8	5.5	–	20	50	0.59

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

Device	No. of Outputs	I_{OUT} (µA)	Current Tolerance (max) (%)	Current Match Tolerance (max) (%)	Temp Drift (typ) (ppm/°C)	Voltage Compliance, 1% (V)	Current Mirror Tolerance (max) (%)	Price[1]
Current References								
REF200	2	100	1	1	25	2.5 to 40	0.5	2.54

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

Resources

For a complete list of Resources (EVMs, data sheets and application notes), visit **power.ti.com**

Literature Number	Part Number	Description
Application Notes		
SBVA010	REF102	Improved Voltage Reference Filter Has Several Advantages
SBVA008	REF102	Low Power Operation of REF102 10.0V Precision Voltage Reference
SBVA001	REF102	Make A Precision Current Source or Current Sink
SBVA007	REF102	Make a Precision ±10 V Reference
SBVA006	REF102	Make a Precision –10 V Reference
SBVA002	REF102	Voltage-Reference Filters
SBOA046	REF200	Implementation and Applications of Current Sources and Current Receivers
SBOA14	REF200	Boost Instrument Amp CMR with Common-Mode Driven Supplies
SBOA53	REF200	4- to 20-mA to 0- to 20-mA Converter and Current Summing Current-to-Current Converters
SBAO18	REF200	Single-Supply, Low-Power Measurements of Bridge Networks
SBAA039	REF1004	Comparing the ADS1201 to the CS5321
SBAA017	REF1004	How To Get 23 Bits Of Effective Resolution From Your 24-Bit Converter
SBAA008	–	Voltage Reference Scaling Techniques Increase the Accuracy of the Converter as Well as Resolution

SERIAL GIGABIT SOLUTIONS

Device	Function	Data Rate	Serial I/F[1]	Parallel I/F	Power	Special Features	Price[2]
TLK1501	Single-ch. 16:1 Serdes	0.6-1.5 Gbps	1 CML	16 LVTTL	200 mW	Built-in testability	Web
TLK2501	Single-ch. 16:1 Serdes	1.6-2.5 Gbps	1 CML	16 LVTTL	300 mW	Built-in testability	Web
TLK2701	Single-ch. 16:1 Serdes	1.6-2.5 Gbps	1 CML	16 LVTTL	300 mW	Built-in testability and K character control	Web
TLK2711	Single-ch. 16:1 Serdes	1.6-2.5 Gbps	1 VML	16 LVTTL	350 mW	MicroStar Jr.™ BGA packaging	Web
TLK3101	Single-ch. 16:1 Serdes	2.5-3.125 Gbps	1 VML	16 LVTTL	350 mW	Built-in testability	Web
TLK1201	Single-ch. 10:1 Gigabit Ethernet Xcvr	0.6-1.3 Gbps	1 LVPECL	10 LVTTL	200 mW	Industrial temperature available	Web
TLK2201	Single-ch.	1.0-1.6 Gbps	1 LVPECL	10 LVTTL	200 mW	JTAG; 5-bit DDR mode	Web
TLK2201I	Single-ch. 10:1 Gigabit Ethernet Xcvr	1.2-1.6 Gbps	1 LVPECL	10 LVTTL	200 mW	JTAG; 5-bit DDR mode, industrial temperature qualified	Web
TLK2201JR	Single-ch. 10:1 Gigabit Ethernet Xcvr	1.0-1.6 Gbps	1 LVPECL	10 LVTTL	200 mW	MicroStar Jr. 5 mm x 5 mm LGA	Web
TLK2208	Eight-ch. 10:1 Gigabit Ethernet Xcvr	1.0-1.3 Gbps	8 CML	4/5-bit/ch. (nibble DDR mode), 8/10-bit/ch. (multiplex ch. mode)	1 W	JTAG, MDIO supported	Web
TLK3104SA	Four-ch. 10/8:1 Xcvr	2.5-3.125 Gbps	4 x 3.125 Gbps LVPECL (XAUI)	4 x 10/8-bit SSTL/HSTL	700 mW/ch.	JTAG; programmable pre-emphasis and XAUI I/F	Web
TLK3104SC	Four-ch. 4:1 Xcvr	3.0-3.125 Gbps	4 x LVPECL	20 x 622 LVDS lines	700 mW/ch.	JTAG, 8b/10b on/off	Web
TLK3114SA	Four-ch. 10/8:1 Xcvr	2.5-3.125 Gbps	4 x 3.125 Gbps LVPECL (XAUI)	4 x 10/8-bit SSTL/HSTL (XGMII)	600 mW/ch.	IEEE 802.3ae backplane transceiver Draft 2.1 compliant	Web
TLK3118	Four-ch. 10/8:1 Xcvr w/full redundancy	2.5-3.125 Gbps/ch	4 x 3.125 LVPECL (XAUI)	8/10-bit SSTL2/HSTL (XGMII)	1.7 W	Full redundancy for four channels	Web
TLK4015	Four-ch. 16:1 Xcvr	0.8-1.56 Gbps	4 CML	16 LVTTL/ch.	1 W	Four-channel version of TLK1501	Web
SLK2501/2511	Single-ch. 4:1 multirate SONET Xcvr with CDR	OC-3/12/24/48	1 LVPECL	4 x 622 LVDS	900 mW	Auto-rate detection, local and remote loop back	Web
SLK2701/2721	Single-ch. 4:1 multirate SONET Xcvr with CDR	OC-3/12/24/48	PECL	4 x 622 LVDS	900 mW	FEC rate compatible; SLK2721 is optimized for jitter tolerance	Web
SLK2504	Four-ch. SONET OC-48 Xcvr	2.5 Gbps, 2.7 Gbps	4 LVPECL	16-bit LVDS 622 MHz/ch.	1.5 W	Supports VSR applications	Web
SN65LVDS93/94	Four-ch. 28:4 TX/RX chipset	140-455 Mbps	4 LVDS	28 x LVTTL	250 mW/chip	Supports up to 1.82-Gbps throughput	Web
SN65LVDS95/96	Four-ch. 21:3 TX/RX chipset	140-455 Mbps	3 LVDS	2 x LVTTL	250 mW/chip	Supports up to 1.82-Gbps throughput	Web
SN65LV1021/1212	Single-ch. 10:1 TX/RX chipset	100-400 Mbps	1 LVDS	10 x LVTTL	<400 mW total	Low-power solution	Web
SN65LV1023/1224	Single-ch. 10:1 TX/RX chipset	300-660 Mbps	1 LVDS	10 x LVTTL	<400 mW total	Low-power solution	Web

[1]CML = current-mode logic, VML = voltage-mode logic.
[2]Suggested resale price in U.S. dollars in quantities of 1,000. Please check www.ti.com for current pricing on these products.
[3]Planned release 1Q 2003.

SOFTWARE AND DEVELOPMENT TOOLS

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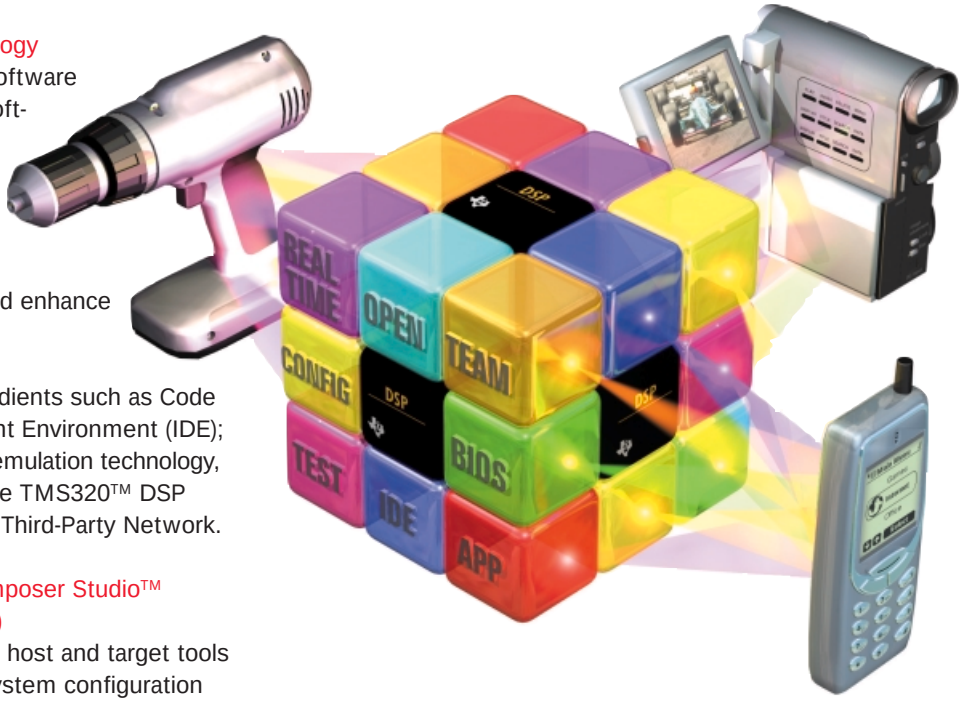

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CODE Composer v2 studio

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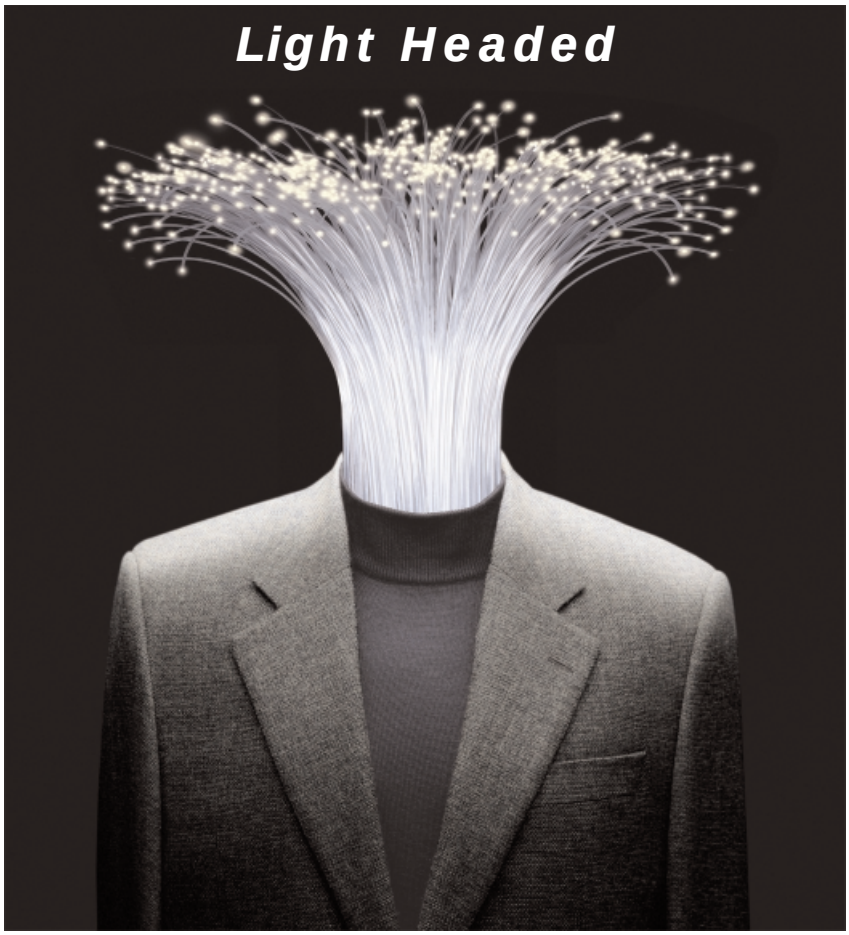

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