

Product of the Month

Nanopower Comparator with Reference Draws Only 300nA

The LTC[®]1540 is the industry's first **nanopower** comparator with an onboard $1.182V \pm 2\%$ voltage reference. This is the first standard analog component of any kind with a quiescent current less than $1\mu A$. It typically draws only 300nA ($0.3\mu A$) of supply current and has an operating voltage range from as low as 2V up to 11V. Its reference sinks and sources current while maintaining a stable output regardless of the size of the bypass capacitor used. The LTC1540 is ideal for battery-powered equipment. Due to its extremely low quiescent current, it can typically last much longer on the same set of batteries as other comparators.

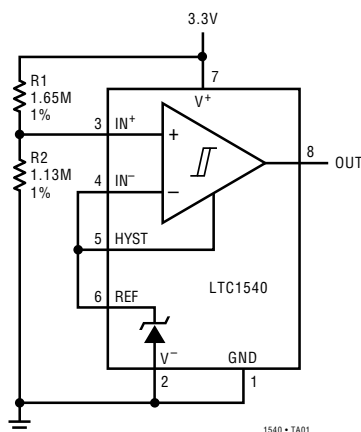



Figure 1. Nanopower, 2.9V V_{CC} Threshold Detector

The LTC1540's common mode input range extends down to the negative rail to within 1.3V of the positive supply. A provision for adjusting the amount of hysteresis on the comparator's inputs (HYST pin) adds user flexibility for noisy environments. By eliminating the cross-conducting current that normally occurs when the comparator changes logic states, power supply glitches are eliminated.

The LTC1540 is immediately available in volume from stock in 8-lead SO and MSOP surface mount packages. Contact your local Linear Technology sales office for a data sheet and evaluation samples or visit our web site at www.linear-tech.com for more information. 

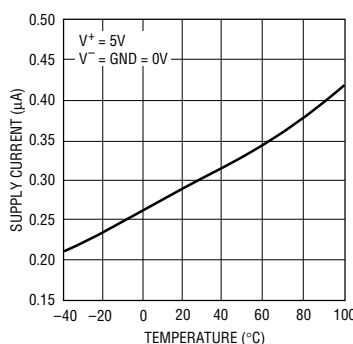


Figure 2. LTC1540 Uses Less Than 500nA Over a Wide Temperature Range

World's Best Filter Building Blocks Provide Rail-to-Rail Input and Output Operation

The LTC1067/LTC1067-50 universal dual filter building blocks consist of two identical rail-to-rail 2nd order filter sections. Each building block, together with three to five resistors, allows various 2nd order filter functions to be quickly designed—such as bandpass, highpass, lowpass, notch and allpass filter responses. Like all switched-capacitor filters, the LTC1067's corner frequency is adjustable with the input clock frequency. The LTC1067/LTC1067-50 are ideally suited in noise reduction systems and for data acquisition and telecom filter applications.

These devices have a double-sampled architecture which places aliasing and imaging components at twice the clock frequency. The LTC1067-50 is a low power device that consumes about 1mA from a 3.3V supply—about half the current of the LTC1067. Dynamic range on a single 3.3V supply is over 80dB and noise is less than $40\mu V_{RMS}$. They operate over a 3V to $\pm 5V$ supply range.

The LTC1067 is the evolutionary descendent of the LTC1060 4th order filter introduced over 12 years ago but with greatly improved specifications. To implement a filter function, select the desired filter characteristics, such as cutoff frequency, ripple, stopband attenuation, etc., using LTC's FilterCAD[™] software (Version 1.956 or later). With the components already selected, layout is straightforward. The internal clock-to-center frequency ratio (100:1 for the LTC1067 and 50:1 for the LTC1067-50) can be modified by the external resistors with center frequency error typically less than $\pm 2\%$. Changing the clock frequency alters the cutoff frequency but does not

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Fast RS485 Transceivers Hit 52Mbps with Guaranteed Propagation Delay

The LTC1686/LTC1687 are very high speed RS485 full-duplex transceivers capable of up to 52Mbps data rates. The driver and receiver have a precision propagation delay tolerance of $18.5\text{ns} \pm 3.5\text{ns}$ and a skew of only 500ps. They operate off a single 5V supply and draw only 12mA (max) supply current. These new transceivers can be used to upgrade any existing high speed RS485 system to much higher speeds, such as high speed control signals in telecom or networking systems.

The LTC1686/LTC1687's 52Mbps data rates meet Optical Carrier (OC) and equivalent Synchronous Transport Signals (STS) criteria as defined for Synchronous Optical Network (SONET) and ATM standards.

OC-1 and STS-1 define a data rate of 51.84Mbps. Optical telecom networks transmit over fiber for long distances, but within the switching equipment signals are transmitted over backplanes or copper cabling. Existing systems accomplish this using high speed logic and by demultiplexing the data for parallel transmission. But high speed data transmission systems cannot offer the ruggedness and long distance of RS485. These new 52Mbps RS485 transceivers eliminate this trade-off.

The RS485 standard defines a multipoint bus and recommends twisted pair cabling at data rates up to 10Mbps. These new transceivers represent a dramatic breakthrough in RS485—over five times the

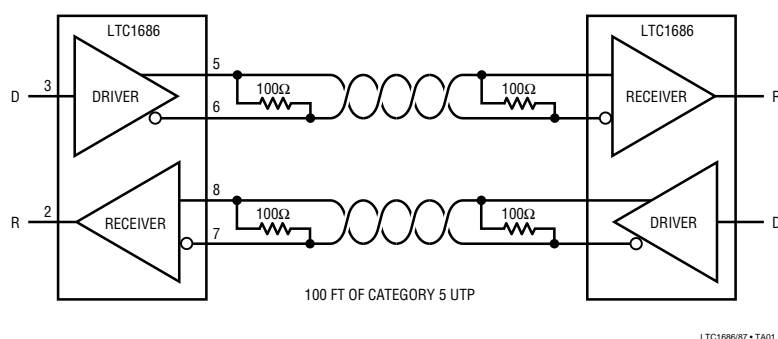


Figure 1. The LTC1686 Operates Over 100 Feet of Two-Pair, Category 5 Twisted-Pair Cable at Rates Up to 52Mbps

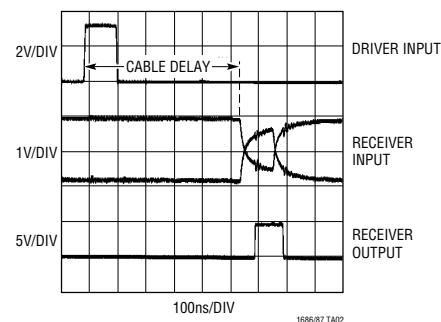


Figure 2. Novel Architecture of LTC1686/LTC1687 Full-Duplex Transceivers Maintain a Very Tight Propagation Delay Window for Both the Receiver and the Driver. Here is a 10Mbps Data Pulse Delay Over 400 Feet of Category 5 UTP

speed while maintaining the ruggedness, each over a common mode range of -7V to 12V , as defined for RS485 operation. They guarantee valid data transfers with ground offsets up to $\pm 7\text{V}$ as well as in the presence of DC offsets or common mode transients.

The receivers have a fail-safe feature that guarantees a high output state when the inputs are shorted or are left floating. This is important in large, multiple rack telecom and networking systems. Previous RS485 transceivers guarantee fail-safe for open inputs, but this only covers an open fault condition. The LTC1686/LTC1687 also present a HIGH state for idle, terminated or shorted fault conditions. The driver outputs and

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LTC1067/LTC1067-50 from page 1

affect the other filter characteristics as originally selected.

The LTC1067 and the LTC1067-50 are offered in SO-16 (narrow) packages. Factory mask programmable versions with on-chip thin film resistors and custom clock-to-

cutoff frequency ratios are available in an SO-8 package to realize application specific monolithic filters. The latest version of FilterCAD (Version 1.956) is available from LinearView™ CD-ROM (Version 2.0, 4/97) and our web site at www.linear-tech.com.

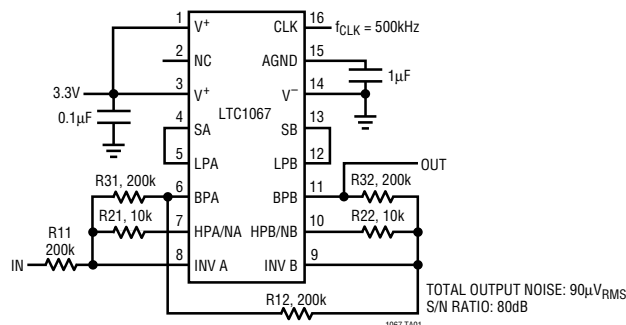



Figure 1. A Single 3.3V Supply Rail-to-Rail, 4th Order, 5kHz Bandpass Filter Can Be Implemented with Only Five Resistors and the LTC1067 in an SO-16 Package

For more details or to obtain a data sheet and evaluation samples, contact your local Linear Technology sales office. 

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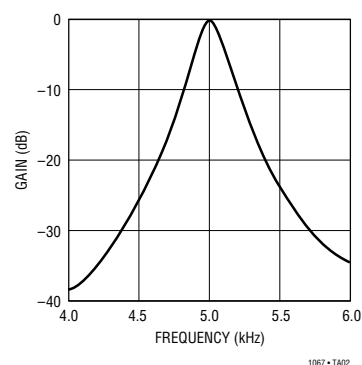


Figure 2. Frequency Response Curve for Bandpass Filter in Figure 1

Dual PowerPath Building Block Includes Protection


The **LTC1473** is a dual input PowerPath switch driver that provides a power management solution for single and dual battery notebook computers and other portable equipment. It drives two sets of back-to-back N-channel MOSFET switches to route power from either of the input sources to the input of the main system switching regulator, as shown in Figure 1. An internal boost switching regulator generates the voltage that allows the use of logic level N-channel MOSFET switches, for lowest system input power loss and longest battery operating time. The LTC1473 is a system building block component that creates a compact dual path controller solution

with protection features such as inrush current limiting, seamless switching and over current time-out.

The LTC1473 includes a "2-diode" mode of operation which ensures that during start-up, power is available for the system microcontroller to "wake up." After wake-up, the microcontroller determines which of the input supplies are to be switched to the load, then directs the LTC1473 to perform the switch-over. When "2-diode" mode is activated each back-to-back MOSFET switch pair is configured into a "diode." Outputs of both "diodes" are logically OR'ed together, allowing input power to come from the highest input voltage available.

Another use of "2-diode" mode is during fault conditions at either input supply during normal operation. A power management microprocessor or external analog/

digital circuitry monitors the input supplies for a fault condition. After sensing an event such as the sudden loss of either input supply, the power management microcontroller activates "2-diode" mode to ensure that power is coming from a valid supply. When the power management microprocessor or external analog/digital monitoring circuitry decides which input supply should be used, "2-diode" mode is exited and the appropriate PowerPath MOSFET switch pair is turned on. This event happens quickly enough to eliminate glitching.

The LTC1473 is available from stock in a 16-lead narrow SSOP. Contact your local Linear Technology sales office for a data sheet and evaluation samples or visit our web site at www.linear-tech.com for more information. 

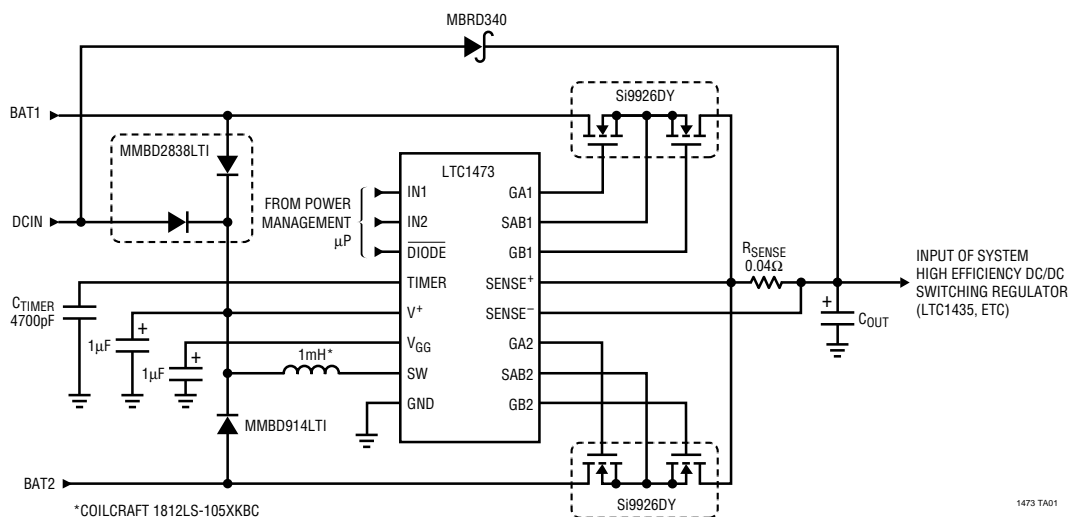



Figure 1. LTC1473 Uses a Current Sense Loop to Limit Current Rushing In and Out of the Batteries and the System Supply Capacitor During Switch-Over Transitions or During a Fault Condition

LTC1686/LTC1687 from page 2

receiver inputs will not load down the bus when in three-state or with the power off. This hot-swapping feature allows the unpowered transceivers to be safely plugged into a bus that may be transmitting without disrupting data.

The LTC1686 is available in an SO-8 package from stock. The LTC1687, with additional enable pins, is in a 14-lead SO package. For more details or to obtain a data sheet and evaluation samples, contact your local Linear Technology sales office or visit our web site at www.linear-tech.com. 

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The LT1605A is screened to the commercial and industrial temperature ranges and is available from stock in 28-lead DIP and SO packages. The LTC1605 in the 28-lead DIP/SO pinout is 100% compatible with Burr-Brown's ADS7805 and Analog Devices' AD976. Contact your local Linear Technology sales office for a data sheet and evaluation samples or visit our web site at www.linear-tech.com for more information. 

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