Product of the Month

Isolated Power Supply Provides 2% Regulation Without Optoisolators

The **LT®1425** is an isolated power supply controller that provides tight regulation without optoisolators or costly "third winding" transformers. The device is a current mode switching regulator that uses an isolated flyback topology to sense the output voltage directly from the primary side flyback waveform. This allows the use of standard transformers. It has a 1.35A onboard switch and can deliver up to 200mA at 9V output from a 5V source (Figure 1). Drawing only 7mA quiescent current, the LT1425's shutdown mode reduces total supply current to just 20µA for standby operation. It provides an output voltage accuracy of ±5% without user trims and maintains tight regulation even under light loads. It is an ideal choice for low voltage circuitry, such as local area networks (LANs), isolation amplifiers and telephone interfaces that require isolated power supplies.

The LT1425 operates at a nominal 275kHz switching frequency and can be synchronized from 320kHz to 450kHz to an external system clock. One of the benefits of the 275kHz operation is there are no odd subharmonics located close to the 455kHz IF, thus avoiding potential RFI problems in telecommunications equipment. The LT1425

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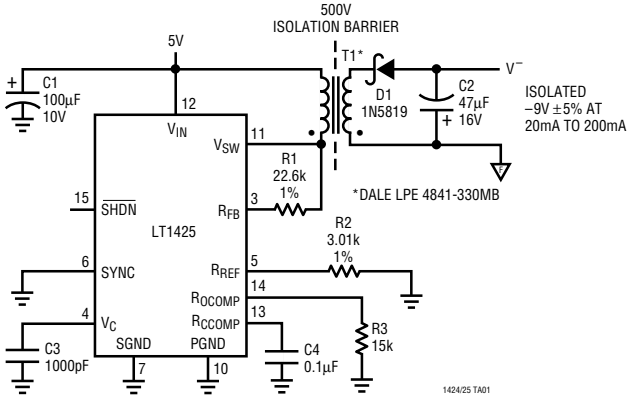

Figure 1. The LT1425 Flyback Topology Eliminates Optoisolators or an Extra Primary Side Transformer Winding

5MHz, 3V/µs, Single Supply, Dual/Quad Op Amps Need Only 450µA per Amplifier

The **LT1492/LT1493** are dual and quad, precision op amps with a 5MHz gain bandwidth product and 3V/µs slew rate. They operate on a single supply over a voltage range of 2.5V to 36V and require only 450µA of quiescent supply current per amplifier. The LT1492 has a maximum input offset voltage of 180µV which guarantees an accuracy of better than 0.5LSB in 5V single supply, 12-bit A/D applications. Its 86dB CMRR minimizes changes in the offset voltage to less than 155µV throughout the input common mode range. The combination of low supply current and high gain bandwidth makes it a great choice for applications requiring both speed and low power, such as battery-powered toll tag systems.

With a 5V supply, the outputs of the LT1492/LT1493 swing from 75mV to 4.1V. Because they are single supply op amps, they can sense input signals down to ground—a useful feature while buffering

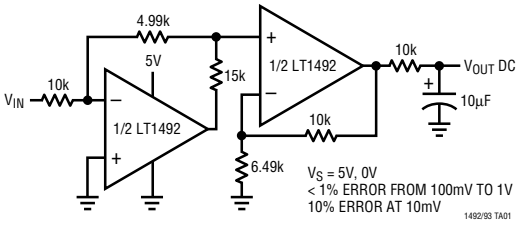

Figure 1. The LT1492 as a Precision AC-to-DC Converter (Full Wave Rectifier and Filter)

signals to A/D converters. Even with a quiescent supply current of only 450µA, the minimum output drive is 20mA, ideal for driving low impedance loads. The inputs can be driven beyond the supplies without damage or phase reversal of the output. Low operating voltage and wide input and output range make the LT1492/LT1493 ideal for

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Linear Technology Chronicle

Precision Triple Reset Generator Monitors Three Supplies

The **LTC®1326** micropower precision triple reset generator is designed to monitor supplies at 5V and 3.3V plus a third voltage input that is adjustable down to 1V (for example, 2.9V for a microprocessor or 12V for memory). If any of the three voltages being monitored fall below a specified threshold, the LTC1326 sends a reset signal to the microprocessor. Threshold accuracy is 0.75%. The LTC1326's 20µA typical supply current makes it ideal for portable battery-powered equipment. Its functionality and precision meet today's system monitoring needs, such as found in desktop and notebook computers or intelligent instruments.

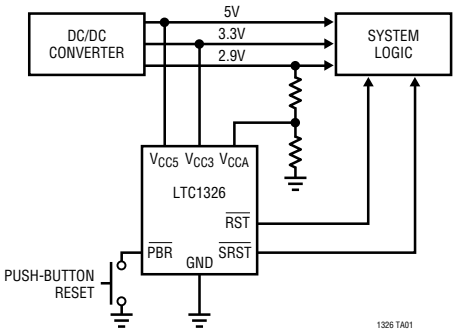


Figure 1. The LTC1326 Triple Reset Generator Provides Micropower Operation, Small Size and High Accuracy Supply Monitoring of Up to Three Supply Voltages

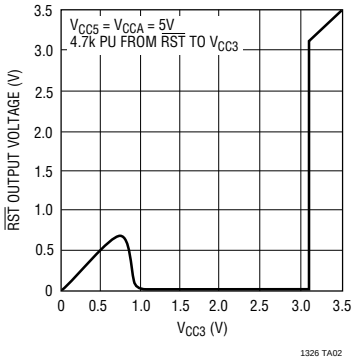


Figure 2. $\overline{RST}$ Output Voltage vs Supply Voltage

A ±0.75% threshold accuracy allows using 1% resistors to set the adjustable voltage while still being within the typical 2% tolerance required by low voltage components. Glitch immunity ensures reliable reset operation without false triggering. The LTC1326, shown in Figure 1, may also be configured to monitor any one or two V_{CC} inputs instead of three, depending on system requirements.

The LTC1326 offers both RST (active HIGH reset output) and $\overline{RST}$ (active LOW reset output) to accommodate processors with either requirement. The $\overline{RST}$ output is guaranteed to be in the correct state for V_{CC3} down to 1V (see Figure 2). A manual push-button reset input provides the ability to generate a very narrow "soft" reset pulse (100µs typ) or a 200ms reset pulse equivalent to a power-on reset. A soft reset can also be used to clear an existing condition without rebooting the entire system.

The LTC1326 is available in 8-lead SO and MSOP packages from stock. For a data sheet and evaluation samples, contact your local Linear Technology sales office or visit our web site at **www.linear-tech.com** for more information.

LT1425 from page 1

can also be used to generate isolated supplies, such as 5V for RS485 interface applications, an isolated supply for PCMCIA cards or 48V to isolated 5V for telecom applications. It operates over a 3V to 20V input supply voltage range.

To sense the flyback pulse and load compensation mechanism, the LT1425 uses an improved flyback error amplifier to obtain accurate information about the isolated output voltage. The LT1425 does this without the requirement of optoisolators or an extra primary side transformer winding which increase cost and drive down efficiency. This regulation scheme permits excellent regulation even at light load currents as shown in Figure 2.

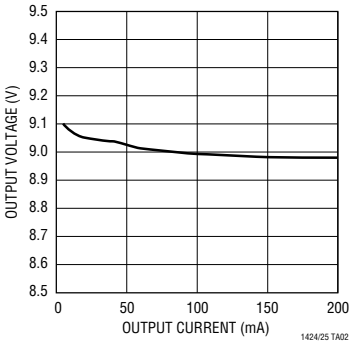


Figure 2. Load Regulation is Excellent Even under Light Loads

The LT1425 is screened to the commercial and industrial temperature ranges and is available from stock in a 16-lead narrow SO package. For a data sheet and evaluation samples, contact your local Linear Technology sales office. For more information, visit our web site at **www.linear-tech.com**.

LTC1492 from page 1

battery-powered applications. Figure 1 shows the LT1492 as a precision full wave rectifier/filter and Figure 2 presents its AC-to-DC conversion gain.

The LT1492 is available in 8-lead PDIP and SO packages and the LT1493 is available in a 16-lead SO package. They are screened to the commercial and industrial temperature ranges and available from stock. Contact your local Linear Technology sales office for a data sheet and evaluation samples. For more information, visit our web site at **www.linear-tech.com**.

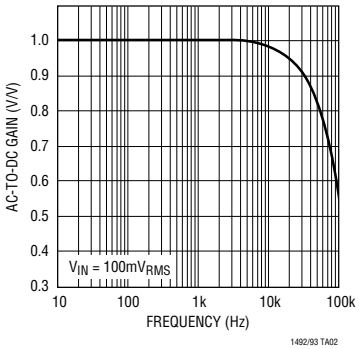


Figure 2. AC-to-DC Conversion Gain vs Input Frequency for the Full Wave Rectifier

Application of the Month

Biased Detector Yields High Sensitivity with Ultralow Power Consumption

RF ID tags, circuits that detect a "wake-up" call and return a burst of data, must operate on very low quiescent current for weeks or months, yet have enough battery power in reserve to answer an incoming call. For smallest size, most operate in the ultrahigh frequency range, where the design of a micropower receiver circuit is problematic. Familiar techniques, such as direct conversion, super regeneration or superheterodyne, consume far too much supply current for long battery life. A better method involves a technique borrowed from simple field-strength meters: a tuned circuit and a diode detector.

Figure 1 shows the complete circuit that was tested at 470MHz. This circuit contains a couple of improvements over the standard L/C-with-whip field-strength meter. Tuned circuits aren't easily constructed or controlled at UHF, so a transmission line is used to match the detector diode (1N5711) to a 6" whip antenna. The 0.4 wavelength section presents an efficient, low impedance match to the base of the quarter-wave whip, but transforms the received energy to a relatively high voltage at the diode for good sensitivity.

Biasing the detector diode improves the sensitivity by an additional 10dB. The forward threshold is reduced to essentially zero, so a very small voltage can generate a meaningful output change. The detector diode's bias point is monitored by an LTC1440 ultralow power comparator and by a second diode that serves as a reference.

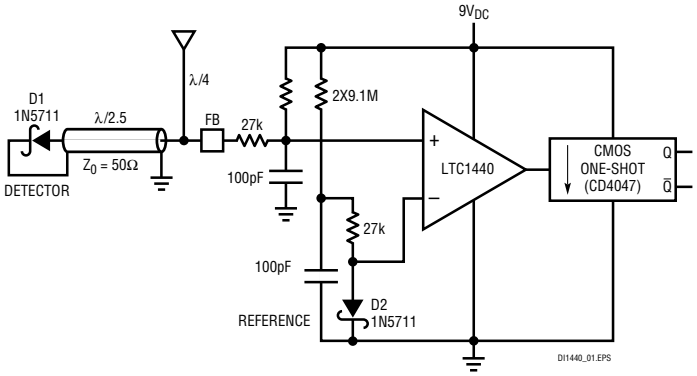


Figure 1. Micropower Field Detector for Use at 470MHz

When a signal at the resonant frequency of the antenna is received, Schottky diode D1 rectifies the incoming carrier and creates a negative-going DC bias shift at the noninverting input of the comparator. Note that the bias shift is sensed at the base of the antenna where the impedance is low, rather than at the Schottky where the impedance is high. This introduces less disturbance into the tuned antenna and transmission line system. The falling edge of the comparator triggers a one-shot, which temporarily enables answer back and other pulsed functions.

Total current consumption is approximately 5µA. Monolithic one-shots draw significant load current, but the venerable '4047 is about the best in this respect. Alternatively, a discrete one-shot constructed from a quad NAND gate draws negligible power.

Sensitivity is excellent. The finished circuit can detect 200mW radiated from a reference dipole at 100 feet. Range, of course, depends on operating frequency, antenna orientation and surrounding obstacles; in the clear, a more reasonable distance, such as 20 feet, can be covered at 470MHz with only a few milliwatts.

All selectivity is provided by the antenna itself. Add a quarter-wave stub (shorted with a capacitor) to the base of the antenna for better selectivity and improved rejection of low frequency signals.

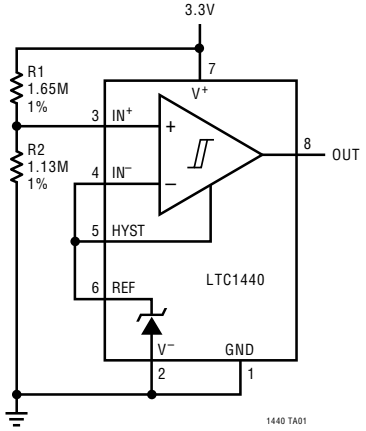
LTC1440 Micropower Comparator with 1% Reference Now in Tiny MSOP

The **LTC1440** micropower comparator with onboard 1% voltage reference is now available in a tiny MSOP package. The LTC1440 features a programmable hysteresis and TTL/CMOS outputs that sink (5mA) and source (40mA) current. It operates from a single 2V to 11V supply or from dual ±1V to ±5.5V supplies and uses less than 3.7µA of supply current over temperature. Comparator hysteresis is easily programmed by using two resistors and the HYST pin.

The LTC1440 is screened to the commercial and industrial temperature ranges and is available from stock in 8-lead PDIP or SO packages and now in the tiny MSOP package. For a data sheet and evaluation samples, contact your local Linear Technology sales office. For more informaion, visit our web site at **www.linear-tech.com.**

Actual Size

The LTC1440 Micropower Comparator is Now in an 8-Pin MSOP



52Mbps RS485 Transceiver in SO-8

The **LTC1685** is a high speed, precision delay, RS485 transceiver capable of up to 52Mbps data rates, sufficient for OC-1 and STS-1 telecommunications systems. The driver and receiver have a precision propagation delay tolerance of ±3.5ns and a skew of only 500ps. The LTC1685 operates off a single 5V supply and draws only 12mA (max) supply current (see Figure 1). It 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.

Optical telecom networks transmit over fiber for long distances, but within the switching equipment, there is a need for high speed data transmission over backplanes or copper cabling. The LTC1685's 52Mbps data rate meets 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 line rate of 51.84Mbps. Until the LTC1685, the fastest RS485 transceiver was 30Mbps. Figure 2 shows LTC1685 operation with 50Mbps data pulses over 100 feet (30m) of cable.

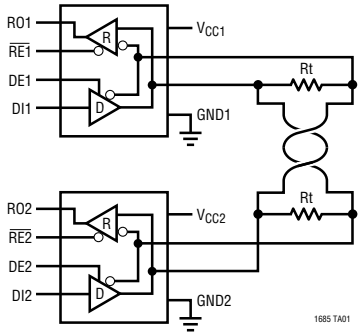


Figure 1. The LTC1685 RS485 Transceiver Offers a 52Mbps Data Rate, Fail-Safe Operation and Uses Only 7mA of Supply Current

The LTC1685's common mode range of –7V to 12V, as defined for RS485 operation, guarantees valid data transfer with ground offsets up to 7V as well as in the presence of DC offsets or common mode transients. The receiver guarantees fail-safe operation over the entire input common mode range of –7V to 12V. This is important in large, multiple rack telecom and networking systems. Previous RS485 transceivers could only guarantee fail-safe for open inputs, but this only covers one condition. The LTC1685 also presents a HIGH state for idle or fault conditions. The driver outputs and receiver inputs will not load down the bus when in three-state or with the power off. This allows the unpowered LTC1685 transceiver to be safely plugged into a bus that may be transmitting.

The LTC1685 is available in an SO-8 package from stock. For a data sheet and evaluation samples, contact your local Linear Technology sales office. For more information, visit our web site at **www.linear-tech.com.**

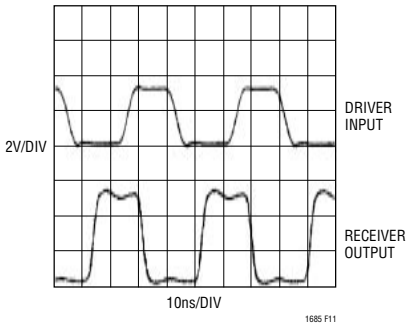


Figure 2. LTC1685 Operating over a 100-Foot (30m) Cable at a 50Mbps Data Rate (Category 5 UTP)

Updated LinearView CD-ROM Offered for Free

A new version of the LinearView CD-ROM is now available. Besides many new data sheets, application notes and design notes, LinearView Version 2.0 has some interesting expanded features and enhancements. First of all, you can now use it with more PC platforms such as the Mac® OS and Windows® 95. (Windows 3.1x is still supported).

In this new version, you can print a single page or a range of pages, not just the entire document. When you first use it, note the improved table of contents. The search by keyword functionality is also much easier to use now and radio buttons permit restricted searches in such documents as the databook, application notes or *LINEAR TECHNOLOGY* magazine. LTC's popular design software programs such as SwitcherCAD™ and FilterCAD have been expanded with FCAD for Windows and Micropower SwitcherCAD™.

In the future, you can expect an update to occur approximately every six months so new products and other new features are included. Call your local Linear Technology sales office for a free copy of the LinearView Version 2.0 CD-ROM.

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