

Product of the Month

Dual Current Feedback Amplifier Delivers 125mA Output Current and 900V/ μ s Slew Rate

The **LT[®]1497** is a dual Current Feedback Amplifier (CFA) that features a 900V/ μ s slew rate, 50MHz gain-bandwidth and a guaranteed 125mA minimum output current over temperature using ± 15 V supplies. Maximum supply current per amplifier is only 9mA for ± 15 V operation and just 7mA for ± 5 V operation. High output drive and slew rate combine to provide low distortion transmission of either analog or digital information down long distances of twisted pair, shielded coax or other transmission media.

The LT1497 is shown below as an HDSL line driver in just one of the many line driving applications it performs. Any application that requires delivery of a fast signal into a low impedance load, such as

ISDN or video distribution, can benefit from the LT1497. The LT1497 can drive a twisted pair with a 1MHz, ± 40 mA peak signal at -70 dBc. Settling time for a 5V step input for the LT1497 is just 55ns.

The LT1497 is offered in a low thermal resistance SO-8 package ($\theta_{JA} = 80^{\circ}\text{C/W}$) for operation with ± 5 V supplies and an enhanced 16-pin SO ($\theta_{JA} = 40^{\circ}\text{C/W}$) package for operation with ± 15 V supplies. Thermal shutdown protects against excessive internal (junction) temperatures by cycling between normal operation and an off-state. For a data sheet and evaluation samples, contact your local Linear Technology sales office or for more information, visit our web site at www.linear-tech.com.

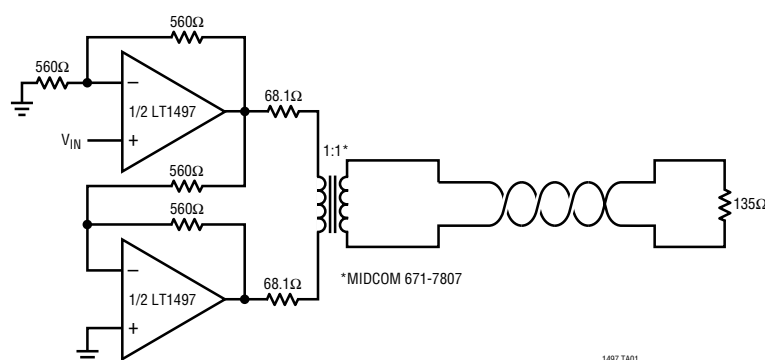


Figure 1. HDSL Line Driver Has Thermal and Current Limit Circuits that Protect Against Fault Conditions

Synchronous Buck Switching Regulator in SO-8 Offers High Output Accuracy

The **LTC[®]1504** is a high efficiency synchronous buck switching regulator for use as a board-level 5V to 3.3V converter in mixed voltage systems. A pair of on-chip 1.3 Ω power switches enable it to supply an output current of up to 500mA. Its 200kHz operating frequency and fast transient response reduce the number of output capacitors required for most applications. Peak efficiency of 92% is possible. The LTC1504 is ideal in space limited designs requiring localized voltage regulation, such as in SCSI-II termination supplies, I/O supply for split-plane CPUs and as a supply for low power digital signal processors.

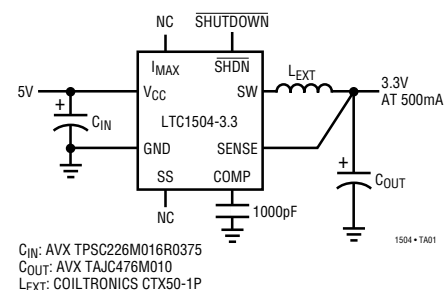


Figure 1. LTC1504 in Synchronous Buck Architecture Operates over a 4V to 10V Input Voltage Range and Requires Only Four External Components

The LTC1504 has an internal 1% reference combined with a sophisticated voltage feedback loop that provides optimum output voltage accuracy and fast load transient response and requires no current sense resistor. Synchronous operation allows it to sink or source current for use in an active

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DC/DC Step-Up Controller Meets High Power Demands

The **LT1680** is a high power current mode step-up switching regulator controller that drives N-channel MOSFETs with a source voltage up to 60V and gate capacitance up to 10,000pF. Its high power capability makes it ideal for high voltage, high current step-up applications (Figure 1) that require hundreds of watts of output power at very high efficiency (Figure 2). PWM operating frequency is programmable and can be synchronized up to 200kHz to an external system clock for lower EMI. The

LT1680 is ideal as a switcher in the high power industrial/automotive and telecom areas.

The LT1680 incorporates programmable average current limiting allowing accurate limiting of DC current in the magnetics, independent of ripple current. User adjustable slope compensation provides stable operation at duty cycles up to 90%. Its current sense common mode range up to 60V allows current sensing to be referenced to the input supply, eliminating the need for

sense blanking circuits. Its 5V reference with 10mA sourcing capability provides a local 5V supply for micropower ancillary circuits.

The LT1680 is available in 16-lead PDIP or wide SO packages over the commercial and industrial temperature ranges. For a data sheet and evaluation samples, contact your local Linear Technology sales office or for more information, visit our web site at www.linear-tech.com.

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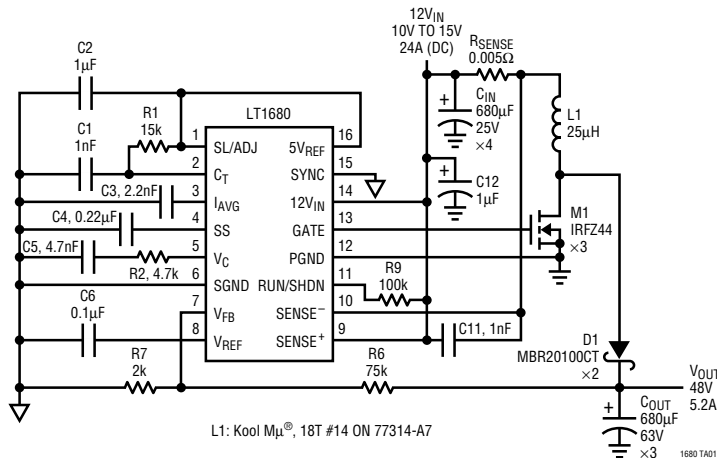


Figure 1. The LT1680 as a Step-Up Converter Generates High Current 48V Bus Voltages

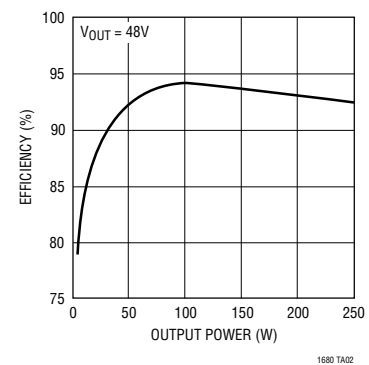


Figure 2. Efficiencies Approach 95% in 12V to 48V Boost Applications

SIM Power Supply and Level Translator Compatible with 3V and 5V Cards

The **LTC1555/LTC1556** are integrated solutions providing the power conversion, digital signal level-shifting and 10kV ESD protection needed for 3V or 5V GSM cellular telephone SIMs (Subscriber Identity Modules). This permits new phones to maintain compatibility with older 5V SIM cards as well as the newer 3V versions. The LTC1555/LTC1556 have a step-up/step-down charge pump that delivers a regulated

5V to the SIM card. Output voltage can also be programmed to 3V, 5V or be directly connected to the V_{IN} pin—useful when $V_{IN} = 3V$ to pass through the SIM card supply voltage. The input voltage to these devices may range from 2.7V to 10V, permitting a direct connection to the battery.

The LTC1555's output current is 10mA when $V_{IN} \geq 2.7V$ and 20mA when $V_{IN} \geq 3V$. It is short-circuit protected and in

addition has a soft start feature to control inrush current at turn-on and tolerates indefinite short-circuit conditions. The switched-capacitor charge pump operates at a switching frequency of 650kHz. All SIM contact pins on the LTC1555/LTC1556 are ESD protected to 10kV—essential during insertion and removal of the SIM card in normal use.

The LTC1556 includes all of the features of the LTC1555 plus an internal 4.3V low dropout linear regulator with 5mA to 10mA output current capability. The LTC1555 is available in a 16-lead narrow SSOP package and the LTC1556 in a 20-lead narrow SSOP package. 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.

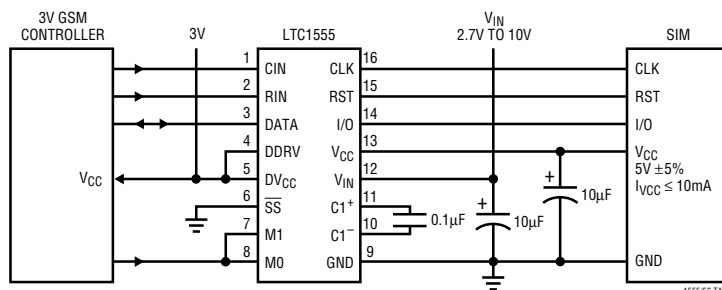


Figure 1. LTC1555 in the GSM Cellular Phone SIM Interface

Application of the Month

3.3V Powered Barometric Pressure Signal Conditioner

The move to 3.3V digital supply voltage creates problems for analog signal conditioning. In particular, transducer-based circuits often require higher voltage for proper transducer excitation. DC/DC converters in standard configurations can address this issue but increase power consumption. Figure 1 shows a way to provide proper transducer excitation for a barometric pressure sensor while minimizing power requirements.

The 6k Ω transducer T1 requires precisely 1.5mA of excitation, necessitating a relatively high voltage drive. A1 senses T1's current by monitoring the voltage drop across the resistor string in T1's return path.

A1's output biases the LT1172 switching regulator's operating point, producing a stepped-up DC voltage which appears as T1's drive and A2's supply voltage. T1's return current out of Pin 6 closes a loop back at A1 which is slaved to the 1.2V reference. This arrangement provides the required high voltage drive ($\approx 10V$) while minimizing power consumption. This is so because the switching regulator produces only enough voltage to satisfy T1's current requirements. Instrumentation amplifiers A2 and A3 provide gain and the LTC1287 A/D converter gives a 12-bit digital output. A2 is bootstrapped off the transducer supply, enabling it to accept T1's common

mode voltage. Circuit current consumption is about 14mA. If the shutdown pin is driven high, the switching regulator turns off, reducing total power consumption to about 1mA. In shutdown the 3.3V powered A/D's output data remains valid. In practice, the circuit provides a 12-bit representation of ambient barometric pressure after calibration. To calibrate, adjust

the "bridge current trim" for exactly 0.1500V at the indicated point. This sets T1's current to the manufacturers specified point. Next, adjust A3's trim so that the digital output corresponds to the known ambient barometric pressure. If a pressure standard is not available, the transducer is supplied with individual calibration data, permitting circuit calibration. 

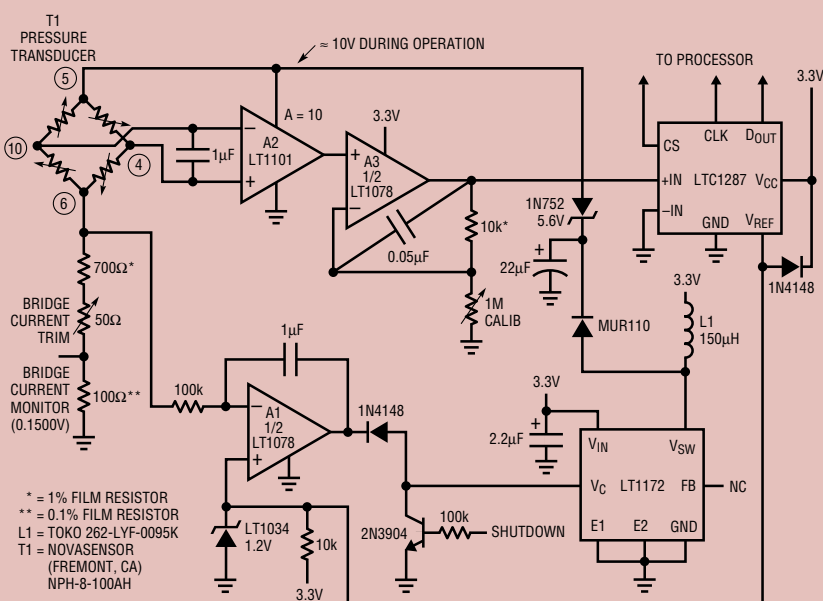


Figure 1. 3.3V Powered, Digital Output, Barometric Pressure Signal Conditioner

2.5V Micropower Shunt Reference in SO-8 Guarantees 25ppm/ $^{\circ}C$ and 0.05% Initial Accuracy

The LT1634-2.5 is a precision 2.5V output shunt reference with an initial accuracy of 0.05% and a maximum guaranteed drift of 25ppm/ $^{\circ}C$. The initial release in this family, a 1.2V output device, was introduced in the August issue of *Chronicle*. The LT1634 is stable with any value of output capacitor, including none, saving components and board space. These features make it an excellent reference for use in portable meters, precision regulators and in data conversion applications. Advances in design, processing and packaging techniques guarantee an oper-

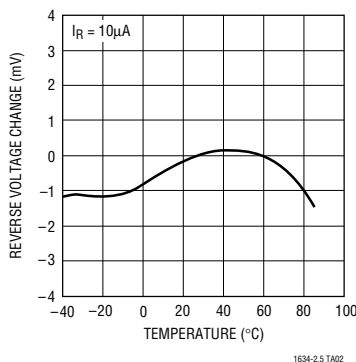


Figure 1. LT1634-2.5 Reference Has Low Drift over a Wide Temperature Range

ating current of only 10 μA and low temperature cycling hysteresis. The compactness of the product makes it ideal for space limited applications.

The LT1634-2.5 is immediately available in volume from stock in 8-lead SO or MSOP surface mount packages. Contact your local Linear Technology sales office for a data sheet and evaluation samples. Visit our web site at www.linear-tech.com for more information. 

Fixed Voltage Output Step-Down Converters Draw Only 10 μ A in Standby

Fixed 3.3V and 5V output voltage versions of the LTC1474/LTC1475 micropower converters are now available in 8-lead MSOP and SO packages. These high efficiency (up to 92%) step-down DC/DC converters draw only 10 μ A of standby current while regulating the output voltage. They have an on-chip power switch with programmable peak current control to maximize the life of alkaline batteries for loads ranging from 1mA to 300mA. These features permit a minimum area solution ideally suited for battery-powered, handheld products.

The LTC1474-3.3/ LTC1474-5/ LTC1475-3.3/LTC1475-5 operate over a wide input voltage range of 3V to 18V (20V

Absolute Maximum). They have an adjustable output voltage and are short-circuit protected. Their 100% duty cycle capability ensures low dropout operation and allows maximum energy to be extracted from the batteries. Burst Mode™ operation maintains high efficiency over a wide range of load currents. A low-battery comparator is included and is functional during shutdown.

The LTC1475 is identical to the LTC1474 except that it has a push-button ON/OFF operation. Momentarily pushing the ON button pin latches the LTC1475 on and pushing the OFF button pin turns it off (shutdown to 6 μ A I_Q). This user interface permits two-button operation without the need for an external microcontroller or one-

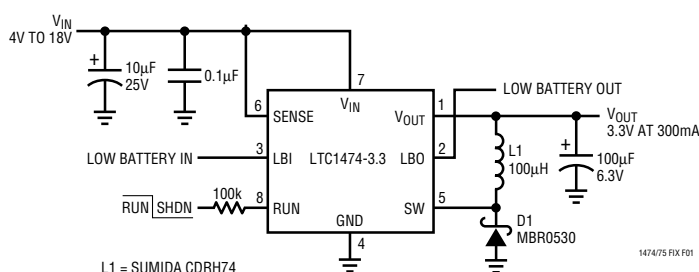


Figure 1. The LTC1474-3.3 High Efficiency Step-Down Converter Operates over a 4V to 18V Input Range

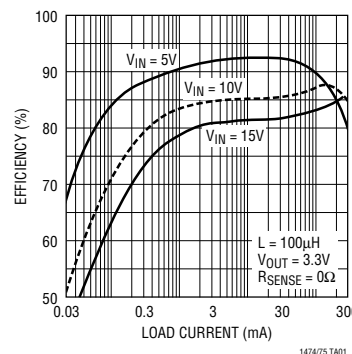


Figure 2. Efficiencies over 92% Are Possible for Various Load Currents

button operation with a microcontroller, greatly simplifying ON/OFF control of handheld products.

The LTC1474/LTC1475 are immediately available in 8-lead MSOP and SO packages and are screened over both the commercial and industrial temperature ranges. Contact your local Linear Technology sales office for a data sheet and evaluation samples. Visit our web site at www.linear-tech.com for more information.



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LTC1504 from page 1

termination. An adjustable current limit circuit provides protection from overloads. The LTC1504 fills the need for a low cost 5V to 3.3V switching regulator where high efficiency at light load currents is not critical.

The LTC1504 is available in adjustable and fixed 3.3V output versions—the latter (LTC1504-3.3) uses an internal resistor pair for improved space efficiency. Both devices are offered in an 8-lead SO surface mount package. Contact your local Linear Technology sales office for a data sheet and evaluation samples. Visit our web site at www.linear-tech.com for more information.

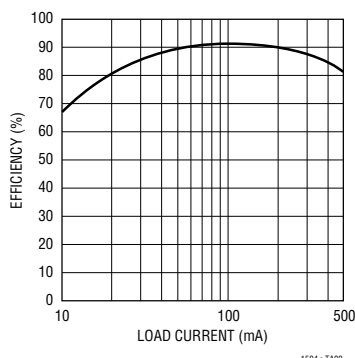


Figure 2. LTC1504 Self-Contained Switching Regulator Offers Up to 92% Peak Efficiency over a Wide Range of Load Current

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