

Products of the Month

Constant Frequency DC/DC Converters Offer High Efficiency at Light Loads

The LTC[®]1433/LTC1434 are low noise, current mode, step-down DC/DC converters that are capable of supplying up to 450mA of output current at 3.3V with up to 93% efficiency. Quiescent current is only 470μA and in shutdown mode, the devices draw only 15μA. Input voltage range is 3.5V to 13.5V and output voltage accuracy is ±2.4%. Both devices operate at a fixed frequency with the LTC1434 phase lockable to an external clock signal for frequency-sensitive applications. Both devices are packaged in narrow SSOPs. These DC/DC converters are excellent for portable telecom applications which must minimize noise and RFI in sensitive IF bands.

The LTC1433/LTC1434 incorporate two internal P-channel MOSFETs, with a parallel combined resistance of only 0.6Ω.

The Adaptive Power[™] output stages selectively drive one or both of the switches at frequencies up to 700kHz to reduce switching losses and maintain high efficiencies at

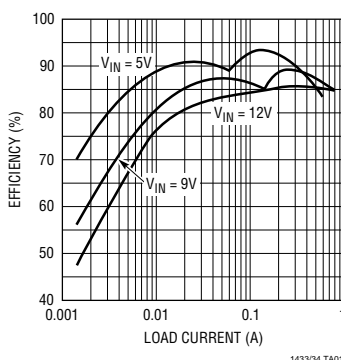


Figure 1. The LTC1433 Provides Up to 93% Efficiency at 3.3V Output

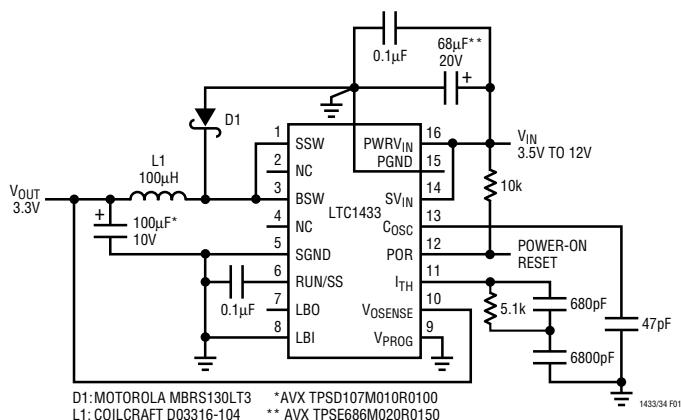


Figure 2. LTC1433 High Efficiency Step-Down Converter Maximizes Battery Life

Inside This Issue:

1MHz Continuous Time Lowpass Elliptic Filter Delivers 72dB SNR in SO-8 Package	2
Fast Current Feedback Amplifiers Tame Low Impedance CCD Loads	3
Precision 10MHz Rail-to-Rail Dual and Quad Op Amps Draw Less Than 1.7mA/Amplifier	4
http://www.linear-tech.com, Check It Out!	4

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low output currents, as shown in Figure 1. Efficiency at low output current is typically improved 3% to 5% over other fixed frequency devices. The output voltage is pin selectable to 3.3V, 5V or adjustable with two external feedback resistors (see Figure 2). A power-on reset is included and generates a signal delayed by 65,536/f_{CLK} after the output is within 5% regulation. The LTC1433/LTC1434 are offered in 16-lead and 20-lead narrow SSOP packages, respectively.

Contact your local Linear Technology sales office for a data sheet and evaluation samples. For further information, visit our web site at www.linear-tech.com.

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UltraFast Linear Regulator Eliminates Bulky Output Capacitors

The LT[®]1575/LT1577 are single and dual low dropout linear regulator controller ICs that deliver UltraFast[™] transient response with ±1% regulation. The fast load transient response, shown in Figure 1, eliminates the need for expensive tantalum or electrolytic bulk output capacitors required by traditional solutions. They drive an external N-channel MOSFET as a source follower and supply up to 15A output current. Output voltage tolerance is ±0.6% at 25°C and ±1% over temperature. Selection of the N-channel MOSFET R_{DS(ON)} allows user-settable dropout voltage performance and output current. The LT1575/LT1577 are targeted at VRE Pentium[®] microprocessor motherboards and other high speed boards that require very accurate, very high speed regulator circuits.

The LT1575/LT1577 incorporate a high side current limit amplifier that activates a fault protection timer circuit. A multifunction Shutdown pin (Figure 2) provides either

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Continued on page 2

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current limit time-out, overvoltage protection, thermal shutdown or a combination of these functions. Precision-trimmed fixed and adjustable output voltage versions accommodate any required microprocessor power supply voltage. The only output capacitors required are the high frequency ceramic

decoupling capacitors at the microprocessor socket—a network that typically consists of 10 to 24 inexpensive surface mount $1\mu\text{F}$ capacitors, depending on the particular processor being used.

The LT1575 is offered in 8-pin PDIP and SO packages and the LT1577 is offered in a 16-pin narrow SO package. They are

available in precision-trimmed adjustable and fixed output voltage versions, specifically at 1.5V, 2.8V, 3.3V, 3.5V and 5.0V. All devices are available from stock. Contact your local Linear Technology sales office for a data sheet and evaluation samples. For further information, visit our web site at www.linear-tech.com. 

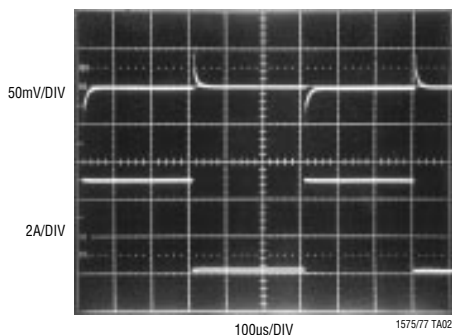


Figure 1. The LTC1575's Fast Transient Response Eliminates the Need for Expensive Tantalum and Electrolytic Output Capacitors

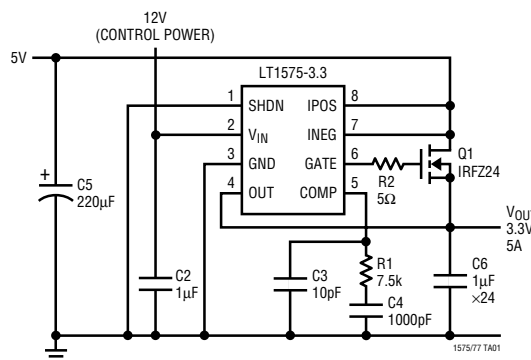


Figure 2. LTC1575-3.3 Provides 3.3V with 1% Output Tolerance at 5A


1MHz Continuous Time Lowpass Elliptic Filter Delivers 72dB SNR in SO-8 Package

The LTC1560-1 is a 5th order, continuous time, elliptic lowpass filter in an SO-8 package, representing the industry's first monolithic high frequency filter. Before the LTC1560-1, this filter solution was only realized with discrete components that many times needed to be "hand" tuned to achieve consistent filter response. Now, the

LTC1560-1 delivers solid-state high frequency filter performance, greatly improving part-to-part reliability and filter response tolerances.

The LTC1560-1 offers significant dynamic range improvements over existing solutions. SNR is 69dB and THD is -62dB with a 1V_{RMS} input signal. SNR can be improved to 75dB using a 2.1V_{RMS} input. It has a flat passband to $0.55f_c$ with a typical ripple of only $\pm 0.2\text{dB}$. As shown in Figure 1, the stopband attenuation is better than 60dB up to 10MHz. The LTC1560-1 is pin selectable for cutoff frequencies of 500kHz and 1MHz (see Figure 2) and is ideally

suitable for ADSL, HDSL and other wide bandwidth communication systems. The LTC1560-1 will also fit demanding alias filter requirements in high speed data acquisition systems.

The LTC1560-1 operates with $\pm 5\text{V}$ supplies and has a power savings mode that reduces supply current from 22mA to less than 1mA. It is immediately available in volume from stock in an SO-8 surface mount package. Call your local Linear Technology sales office for a data sheet and evaluation samples. For additional information, visit our web site at www.linear-tech.com. 

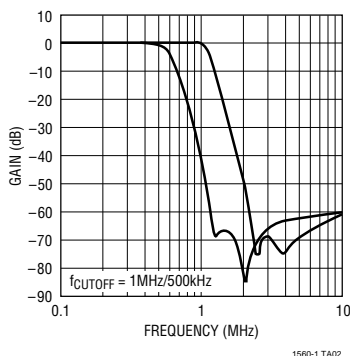


Figure 1. Frequency Response of the LTC1560-1 Elliptic Lowpass Filter

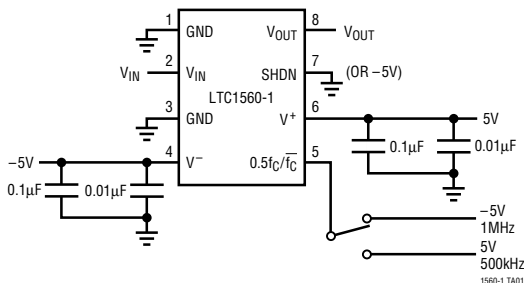


Figure 2. The LTC1560-1 Has Pin Selectable Cutoff Frequencies at 500kHz and 1MHz

Application of the Month

Fast Current Feedback Amplifiers Tame Low Impedance CCD Loads

The LT1206, LT1207 and LT1210 are fast current feedback amplifiers capable of delivering high levels of current. They can be readily compensated for reactive loads and are fully protected against thermal and short-circuit faults. Table 1 summarizes their electrical characteristics.

The devices in Table 1 combine the high output current required to slew large capacitances with appropriate frequency compensation. All of the CFAs described here are C-Load™ amplifiers and are stable with capacitive loads up to 10,000pF.

A good example of a difficult capacitive load is a clock driver for charge-coupled devices (CCD). These devices require precise multiphase clock signals to initiate the transfer of light-generated pixel charge from one charge reservoir to the next. Noise, ringing or overshoot on the clock signal must be avoided. Two problems complicate clock generation. First, CCDs present an input capacitance (typically 100pF to 3300pF) which is directly proportional to the number of sensing elements (pixels). Second, CCDs often require the clock's amplitude to exceed

the logic supply. The amplifying filter in Figure 1 addresses these issues. Both CFAs in the LT1207 are configured for a 3rd order Gaussian lowpass response with 1.6MHz cutoff frequency (one section is shown). This transfer function produces clean clock signals with controlled rise and fall times. Figure 2 shows the LT1207's quadrature outputs driving two 3300pF loads that simulate a CCD image sensor. Ringing and overshoot are notably absent from the clock signals, which have rise and fall times of approximately 300ns.

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Table 1. Fast Current Feedback Amplifier Specifications

Part Number	Number of CFAs	Bandwidth (MHz)	Rated Output Current (A)	Supply Range (V)	Slew Rate (V/μs) (Note 1)	Thermal Resistance θJA (°C/W) (Note 2)	Supply Current (mA)	Low Power Op/Shutdown
LT1206	1	60	0.25	±5 to ±15	I _{LIM} /C _{LOAD} to 900	DD = 25, PDIP = 100 SO = 60, TO-220 = 5	20	Yes
LT1207	2	60	0.25	±5 to ±15	I _{LIM} /C _{LOAD} to 900	SO = 40	2 × 20	Yes
LT1210	1	35	1	±5 to ±15	I _{LIM} /C _{LOAD} to 1000	DD = 25, SO = 40 TO-220 = 5	30	Yes

Note 1: Slew rate depends on circuit configuration and capacitive load.
Note 2: θJA on SO packages measured with part mounted to a 2.5mm thick FR4 2oz copper PC board with 5000mm² area.

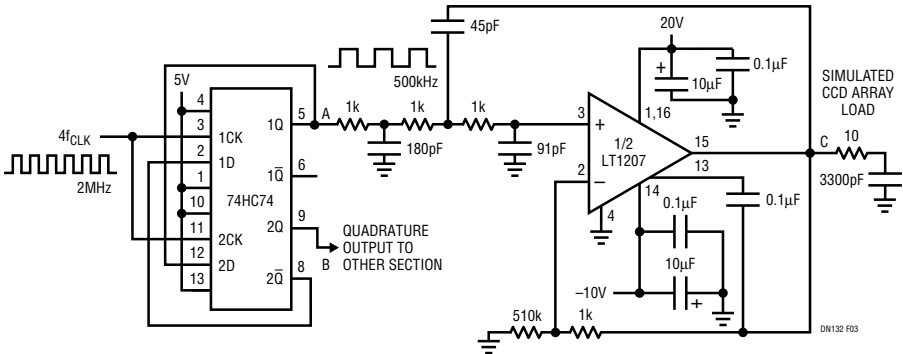


Figure 1. CCD Clock Driver Uses LT1207 for 3rd Order Gaussian Lowpass Response

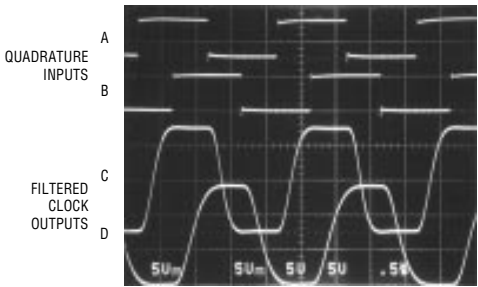


Figure 2. CCD Clock Driver Waveforms


Precision 10MHz Rail-to-Rail Dual and Quad Op Amps Draw Less Than 1.7mA/Amplifier

The **LT1498/LT1499** are dual and quad precision op amps, representing the latest addition to LTC's growing family of C-Load amplifiers. They draw only 1.7mA of supply current per amplifier and cover a full rail-to-rail common mode input range while driving

up to 10,000pF of load capacitance without oscillation. A gain-bandwidth product of 10MHz and a slew rate of 5V/ μ s makes them well-suited for a variety of applications. They have the low voltage, low supply current operation to work in portable applications, yet offer the bandwidth and slew rate to perform signal processing functions beyond the ability of many other precision rail-to-rail devices.

The LT1498/LT1499 are true rail-to-rail devices and can operate over a total supply voltage of 2.2V to ± 15 V. Maximum offset

voltage is 475 μ V, while maximum input bias current and input offset current are 500nA and 50nA, respectively. Figure 1 shows the LT1498 in a typical active filter application with the frequency response in Figure 2.

The LT1498 is available in 8-pin PDIP and SO packages and the quad LT1499 is offered in the 14-pin SO package. Both are immediately available in volume 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. 

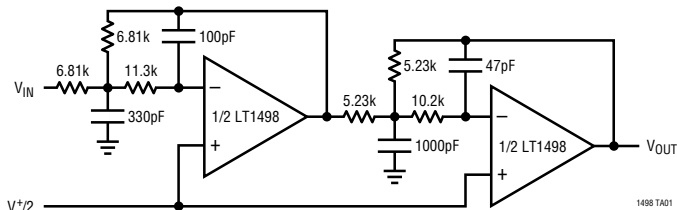


Figure 1. LT1498 Dual Op Amp as Single Supply 4th Order Butterworth Filter

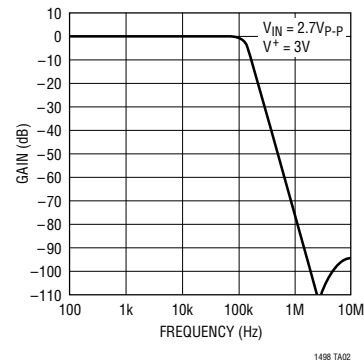


Figure 2. Frequency Response of the LT1498 Dual Op Amp Configured as a 100kHz Lowpass Filter

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ment such as a data sheet, design note, etc. by simply entering in a keyword or part number. To save time, *ViewFirst™* allows you to preview just the first page of a document, prior to downloading the full .pdf file. At the bottom of the preview page is the option to download the entire file or to request a FAX back. The FAX function is currently available in North America, Europe, Asia and Japan.

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