Linear Technology Chronicle

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Product of the Month

1.5A and 3A Fast Charger ICs Charge All Battery Types Including Lithium-Ion

The **LT®1510** and **LT1511** are the simplest and most efficient solutions available to fast charge modern rechargeable batteries. These new battery charger devices are excellent solutions for fast charging lithium-ion (Li-Ion), nickel-metal-hydride (NiMH) and nickel-cadmium (NiCd) batteries that require constant current and/or constant voltage charging. LTC's new LT1510 and LT1511 battery charger ICs offer the highest charging current of any monolithic surface mount battery charging device in the industry. The internal switch of the LT1510 delivers up to 1.5A DC charging current for battery charging applications, while the LT1511 internal switch provides up to 3.0A.

The LT1510 is available in 8-lead and 16-lead surface mount packages. The LT1511 is available in a 24-lead surface mount package. These devices require fewer external components and have a smaller size than any of the existing discrete or competing IC solutions. The 200kHz switching frequency ensures minimum inductor size and small surface mount capacitors. These devices also eliminate the need for a blocking diode between the battery and the IC, because the chip goes into sleep mode and draws only 3µA when the wall adapter is unplugged. Figure 1 shows the low component count required when using the LT1510CS for charging Li-Ion batteries.

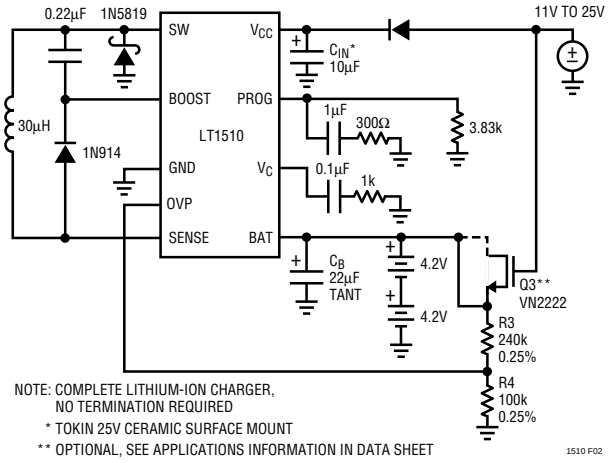

Figure 1. Charging Li-Ion Batteries with the LT1510CS Simplifies Circuit Design and Saves Valuable Board Space

The LT1510 can charge batteries ranging from 2V to 20V and provide 1.5A of charge current. This device is available in an 8-lead version optimized for NiMH and NiCd cell fast charging and a 16-lead version optimized for fast charging of Li-Ion battery packs.

The LT1511 charges battery packs from 1V to 20V and provides up to 3A of charge current. This device is available in a 24-lead wide surface mount package. The LT1511 provides the extra power needed to charge higher capacity (paralleled cells) Li-Ion and NiMH, NiCd battery packs. The LT1511 also has a unique feature called "adaptive current sharing." The LT1511 charges the battery pack at the same time as the computer is being used without overloading the wall adapter. The main benefit here is that the end product user gets increased battery-powered operation time even if they had been using the computer while it was plugged into the wall. The LT1511 charges the battery as fast as practical, within the wall adapter's power limitations. Figure 2 shows the LT1511 as a 3A lithium-ion battery charger.

The LT1510 is ideal for battery charging in cellular phones, portable terminals, bar-code scanners, RF modems and other handheld equipment. The LT1511 is optimized for notebook computers and larger portable devices with higher cell count battery packs. Contact your local Linear Technology sales office for a data sheet and free evaluation samples of the LT1510 and LT1511.

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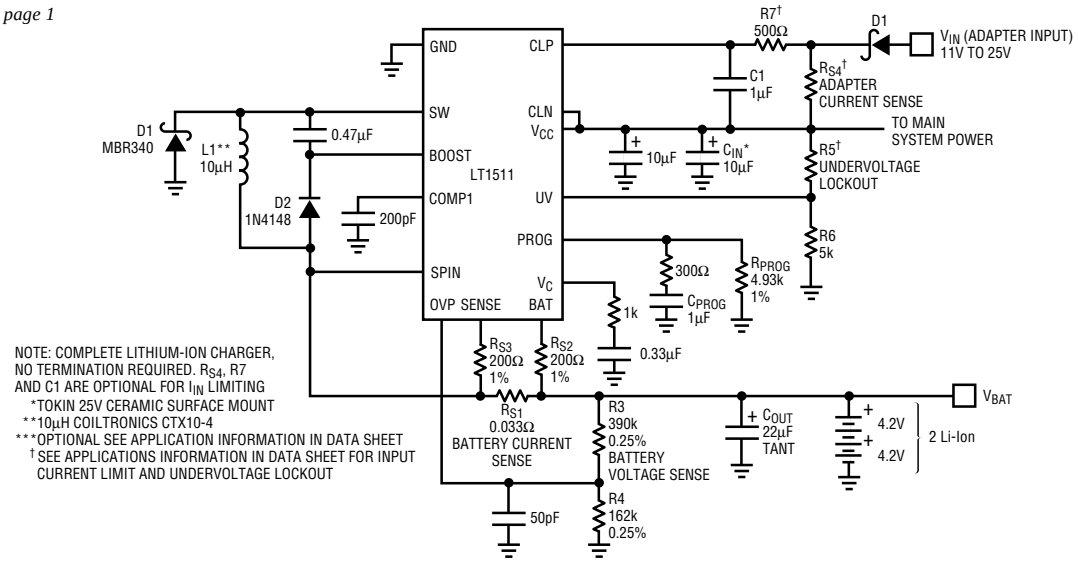

Figure 2. LT1511 Charges Li-Ion Battery Pack and Powers Computer at the Same Time

500kHz, 1.5A Step-Down Switching Regulator In 8-Lead Surface Mount Package

The **LT1507** is the smallest solution available for step-down voltage conversion from inputs as low as 4V. This new 500kHz regulator IC contains a low loss 1.5A switch and all the necessary oscillator, control and logic circuitry in an 8-lead surface mount package. The 500kHz switching frequency allows a considerable reduction in the size of external components with inductor values as small as 2µH. This new IC also features a "Synch" pin that provides easy synchronization from 580kHz to 900kHz. Fixed 3.3V output and adjustable output voltage versions are available. Figure 1 shows a simple high efficiency 5V to 3.3V application using the LT1507.

The LT1507 is a current mode PWM, providing fast transient response and superior loop stability. A special high speed bipolar process and a low loss 0.3Ω switch allow the LT1507 to provide high efficiency at a high switching frequency. A Shutdown pin is also provided that reduces supply current to 20µA. Figure 2 shows the LT1507 efficiency over a wide range of load current. Full cycle-by-cycle short-circuit protection and thermal shutdown are also provided.

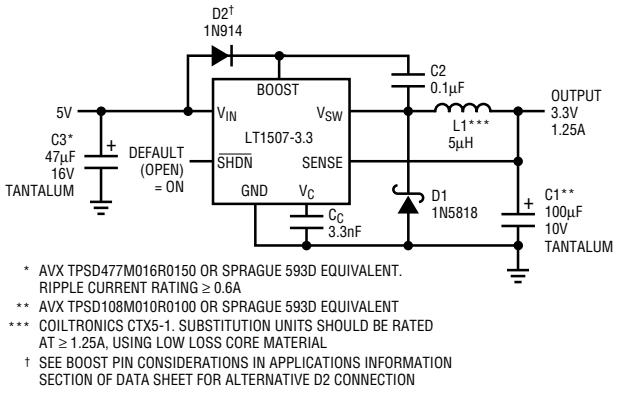

Figure 1. LT1507-3.3 All Surface Mount, Low Parts Count 5V to 3.3V Step-Down Regulator Has >80% Efficiency

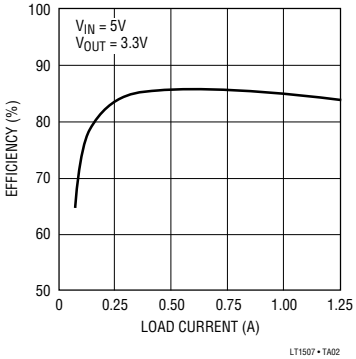

Figure 2. LT1507 Efficiency vs Load Current

The combination of low input voltage range, high efficiency and small circuit size make the LT1507 an ideal regulator for a wide variety of general purpose applications.

The LT1507 is available in 8-lead plastic dual-in-line and 8-lead surface mount packages. Devices are available with a fixed 3.3V output or user adjustable output voltage. The LT1507's specified commercial operating junction temperature range is 0°C to 125°C. An industrial grade specified over –40°C to 125°C version is also offered as a standard product. Contact your local LTC sales office for a data sheet and free evaluation samples of the LT1507.

Application of the Month

Multichannel Micropower A/D Uses a Single Antialiasing Filter

The circuit in Figure 1 demonstrates how the LTC1594's independent analog multiplexer can simplify the design of a 12-bit data acquisition system. All four channels are MUXed into a single 1kHz, fourth-order Sallen-Key antialiasing filter, which is designed for single-supply operation. Since the LTC1594's data converter accepts inputs from ground to the positive supply, rail-to-rail op amps are used for the filter to maximize dynamic range. The LT1368 dual rail-to-rail op amp is compensated for the 0.1µF load capacitors (C1 and C2) that help reduce the amplifier's output impedance and improve supply rejection at high frequencies. The filter contributes less than 1LSB of error due to offsets and bias currents. The filter's noise and distortion are less than –72dB for a 100Hz, $2V_{P-P}$ offset sine input.

The combined MUX and A/D errors result in an integral nonlinearity error of ±3LSB (maximum) and a differential nonlinearity error of ±3/4LSB (maximum). The typical signal-to-noise plus distortion ratio is 68dB, with approximately –78dB of total harmonic distortion. The LTC1594 is programmed through a 4-wire serial interface that allows efficient data transfer to a wide variety of microprocessors and microcontrollers. Maximum serial clock speed is 200kHz, which corresponds to a 10.5kHz sampling rate.

The complete circuit consumes approximately 800µA from a single 5V supply. For ratiometric measurements, the A/D's reference can also be taken from the 5V supply. Otherwise, an external reference should be used.

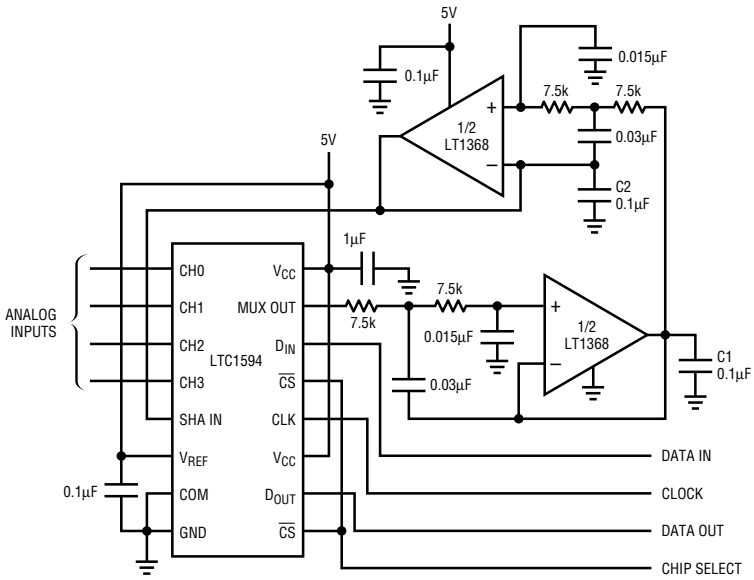

Figure 1. Simple Data Acquisition System Uses a Single Filter for Up to Four Analog Inputs

Micropower Dual Comparators with Reference Have 6µA Maximum Supply Current

The **LTC®1441** and **LTC1442** dual micropower comparators feature a guaranteed maximum 6µA supply current (typically 2.5µA per comparator). With a minimum supply voltage of 2V these new comparators are intended for use in portable battery-operated systems. The LTC1442 has a 1.182V ±1% reference and is a drop-in upgrade to the older 923 device. The LTC1441 does not include a reference and is a drop-in upgrade to the 922 device.

A special HYST pin on the LTC1442 provides easy programming of comparator hysteresis with only two resistors. The 1% accurate reference on board the LTC1442 drives capacitive loads up to 0.01µF without oscillation.

The power supply of the LTC1441 and LTC1442 can range from 2V to 11V single

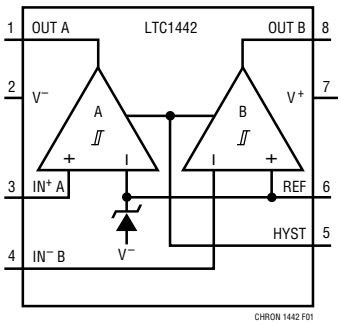

Figure 1. LTC1442 Provides Hysteresis Programming Pin

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supply or ±1V to ±5.5V with dual supplies. The input voltage range includes the negative supply and can be driven to within 1.3V of the positive supply. The inputs can be taken above and below the supply rails by up to 300mV without damage.

The LTC1441 and LTC1442 are ideal for use as battery level monitors and as battery-powered temperature monitors, window comparators and oscillator circuits. The LTC1441 and LTC1442 are available in a 8-lead PDIP and 8-Lead SO package specified for operation from 0°C to 70°C. Extended temperature range versions are available, specified for operation from –40°C to 85°C. Contact your local Linear Technology sales office for a data sheet and free evaluation samples of the LTC1441 and LTC1442.

Dual 60MHz Current Feedback Amplifier Provides 250mA Output Current in 16-Lead SO Package

The **LT1207** is a dual current feedback amplifier IC with 60MHz bandwidth, a minimum 400V/µs slew rate and 250mA per amplifier output current capability. The LT1207 features excellent video performance with a differential gain of 0.02% and differential phase of 0.17°. This new amplifier is also ideal for communications applications, such as HDSL (High Bit Rate Digital Subscriber Loop). Figure 1 shows the LT1207 used as an HDSL output driver. The LT1207 includes a special Compensation pin for optimal performance when driving heavy capacitive loads. The device is guaranteed to maintain stability with capacitive loads up to 10,000pF (C-Load™ stable). Both amplifiers of the LT1207 have thermal and current limit circuits to protect against fault conditions.

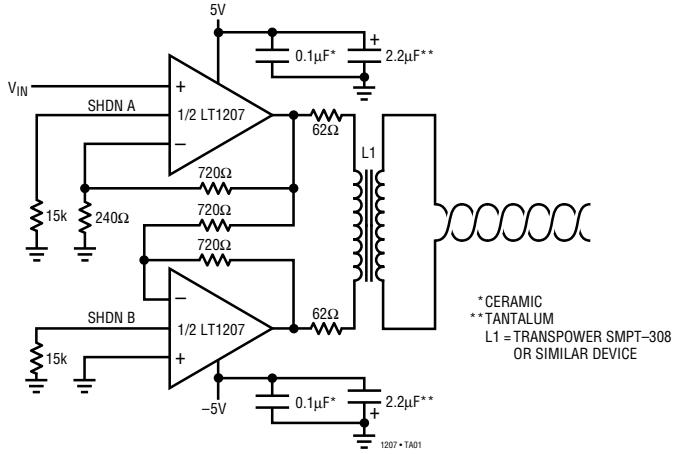

Figure 1. LT1207 Ideal for HDSL Communications System Output Driver

Operation of the LT1207 is specified from ±5V to ±15V. Supply current is typically 20mA per amplifier. An independent shutdown control is supplied for each amplifier in the LT1207. The shutdown control places each amplifier in a high impedance low current mode, dropping supply current to 200µA per amplifier. For reduced bandwidth applications, supply current can be lowered by adding a resistor in series with the Shutdown pin.

The LT1207 is ideal for demanding video and digital communications applications requiring high output current from an amplifier. Applications include ADSL/HDSL drivers, video amplifiers, cable drivers, RGB amplifiers, test equipment and buffer applications. The LT1207 is available in the 16-lead plastic surface mount package specified for operation from 0°C to 70°C with guaranteed functionality over –40°C to 85°C. Contact your local Linear Technology sales office for a data sheet and free evaluation samples of the LT1207.

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