LinearTechnologyChronicle

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Product of the Month

Micropower 12-Bit Serial A/D Converters with 4-Channel Multiplexer Consumes Only 160µA

The **LTC®1594L** and **LTC1594** are 3V and 5V 12-bit serial A/D converters with 4-channel multiplexers. These new A/D converters feature power dissipation as low as 0.48mW on a single 3V supply while providing a 60µs conversion time. When not converting, the LTC1594L/LTC1594 automatically power down to a mere 1nA of supply current, making the LTC1594 ideal for battery-powered data acquisition systems and portable pen-based PC products. Figure 1 shows a diagram of the LTC1594L running on a 3V battery.

The LTC1594 serial ports allow efficient data transfer to a wide range of microprocessors and microcontrollers over three wires. These A/D converters are I/O compatible with the SPI and MICROWIRE™ interfaces. This, coupled with low power consumption, makes remote location possible and facilitates transmitting data through isolation barriers. High impedance analog inputs and the ability to operate with reduced spans (to 1.5V full-scale) allow direct connection to sensors and transducers in many applications, eliminating the need for gain stages.

The LTC1594 is ideal for pen-screen digitizing, remote data acquisition, isolated data acquisition, battery monitoring and temperature measurement. The LTC1594L and LTC1594 are available in a 16-lead narrow plastic surface mount package. Devices are specified over 0°C to 70°C. For a data sheet and free evaluation samples of the LTC1594L/LTC1594 contact your local Linear Technology sales office.

MICROWIRE is a trademark of National Semiconductor Corporation.

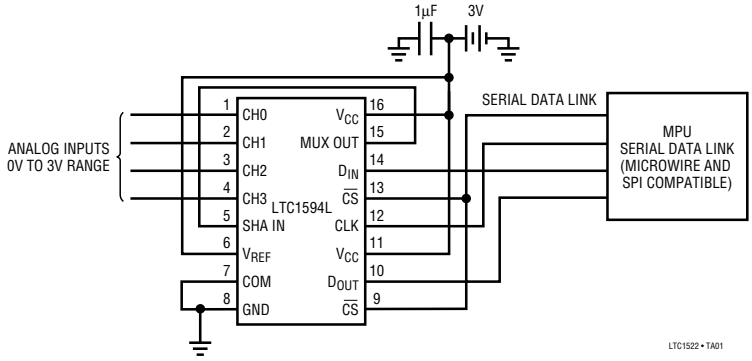
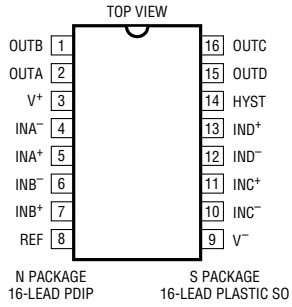


Figure 1. LTC1594L 4-Channel, 3V, 12-Bit ADC Samples at 200Hz

Quad Micropower Comparators with 1% Accurate Reference Have 8.5µA Maximum Supply Current

The **LTC1443, LTC1444, LTC1445** quad micropower comparators feature a built-in voltage reference and guaranteed maximum 8.5µA supply current over their full operating temperature range. Typically these devices require only 1.3µA per comparator. This low supply current combined with 2V supply voltage capability make these new comparators ideal for use in portable battery-operated systems. All these new quad comparators have a propagation delay of 12µs (10mV overdrive). The LTC1443 has a 1.182V ±1% reference and is a drop-in upgrade to the older 924 device. The LTC1444 and LTC1445 have a 1.221V ±1% reference and provide other features not available in other devices. Figure 1 shows the pinout of the proprietary LTC1444 and LTC1445 quad comparators.



The LTC1444/45 Provide a Hysteresis Programming Pin

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Two new features have been introduced with these new micropower quad comparators. First, the HYST pin on the LTC1444 and LTC1445 allows programming of comparator hysteresis with only two resistors, easing calculation of proper resistor values and eliminating the increase in supply current when compared to the 3-resistor approach of the other comparators. Secondly, the guaranteed 1% accurate reference on board the LTC1443/44/45 can drive a capacitive load of up to 0.01µF. The capacitive load driving capability of the reference eliminates problems with input transients feeding through the device and provides faster settling time. Input transients commonly occur when switching from the main battery pack to a backup battery or wall socket voltage in portable computers. The reference output on the LTC1443/44/45 sources up to 100µA, (25 times more current than the reference on the 924), making the LTC1443/44/45 reference available for use in other system areas.

The power supply of the LTC1443/44/45 can range from 2V to 11V single supply or ±1V to ±5.5V with dual supplies. The input voltage range includes the negative supply and swings 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 LTC1444 has an open-drain output, making it capable of interfacing to logic levels higher than the power supply voltage.

The LTC1443/44/45 are ideal for use as battery level monitors, battery-powered temperature monitors, window comparators and oscillator circuits. The output of all three devices can continually source 40mA, making them ideal for use as display drivers in bar graph level gauges. The LTC1443/44/45 are available in a 16-lead PDIP and 16-lead SW package 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 LTC1443/44/45.

1.5V, 3A Low Dropout Linear Regulator Has Fast Transient Response for Providing GTL+ Termination Voltage

The **LT®1587-1.5** is a 3-terminal low dropout linear regulator that provides up to 3A of output current. The dropout voltage of the LT1587-1.5 typically ranges from 1.0V to 1.3V across the full output current range, making it an ideal choice for providing a tightly regulated 1.5V ±1% output from a 3.3V or 5V ±5% logic supply. Figure 1 shows typical and guaranteed dropout characteristics of the LT1587-1.5 regulator.

The design of the LT1587-1.5 is optimized for low voltage applications where transient response and minimum input voltage are critical. The LT1587-1.5 has lower dropout and faster transient response than the industry standard LT1085. These improvements make it ideal for low voltage microprocessor applications, especially as the regulator in an Intel Pentium® Pro processor GTL+ termination supply. Figure 2 shows the LT1587-1.5 used to provide the 1.5V GTL+ termination voltage in a Pentium Pro processor system.

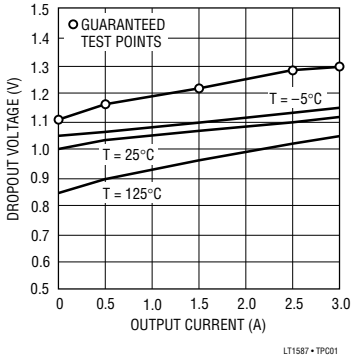

Figure 1. LT1587-1.5 Dropout Voltage vs Output Current

The LT1587-1.5 has built-in thermal and short-circuit protection. Current limit is trimmed to ensure specified output current and short-circuit current. On-chip thermal limiting provides protection against any combination of overload that creates excessive junction temperature.

The LT1587-1.5 is available in 3-lead TO-220 and 3-lead plastic DD surface mount packages. Devices are specified from 0°C to 125°C. Contact your local Linear Technology sales office for a data sheet and free evaluation samples of the LT1587.

Pentium is a registered trademark of Intel Corporation.

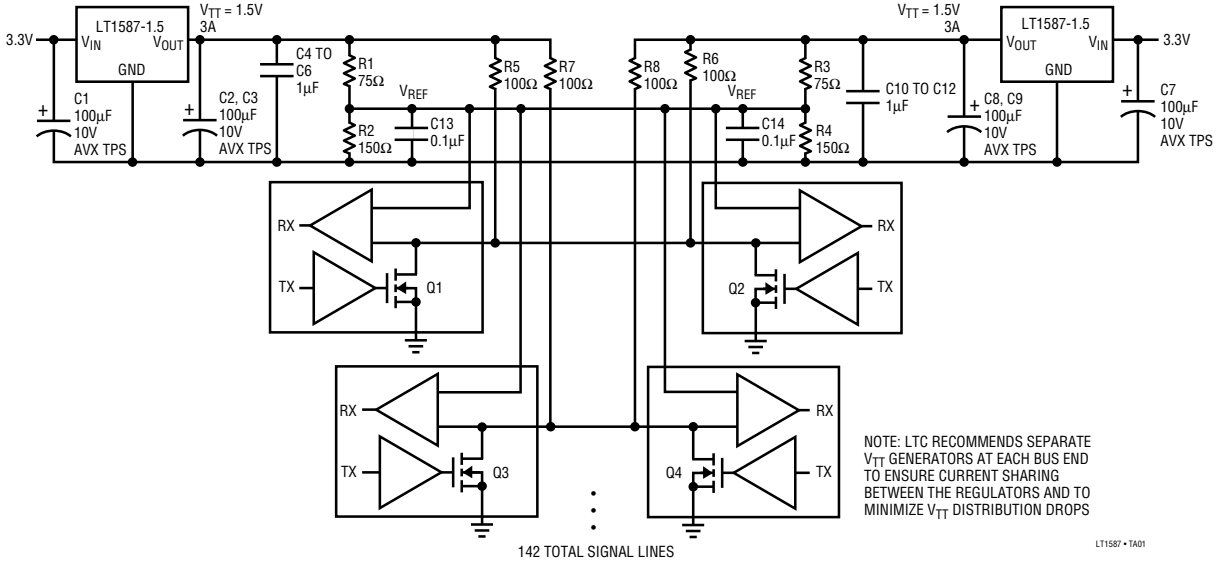

Figure 2. LT1587-1.5 Pentium Pro Processor GTL+ Termination Supply

Application of the Month

1MHz Step-Down Converter Ends 455kHz IF Woes

There can be no doubt that switching power supplies and radio IFs don't mix. One chip converters typically operate in the range of 20kHz to 100kHz, placing troublesome harmonics right in the middle of the 455kHz band. This contributes to adverse effects such as "desensing" and outright blocking of the intended signals. A new class of switching converter makes it possible to mix high efficiency power supply techniques and 455kHz radio IFs without fear of interference.

The circuit shown in Figure 1 uses an LT1377 boost converter, operating at 1MHz, to implement a high efficiency buck topology switching regulator. The switch is internally grounded, calling for the floating supply arrangement shown (D1 and C1). The circuit converts inputs of 8V to 30V to a 5V/1A output.

The chip's internal oscillator operates at 1MHz for load currents of greater than 50mA, with a guaranteed tolerance of 12% over temperature. Even wideband 455kHz IFs are unaffected, as the converter's operating frequency is well over one octave distant.

Figure 2 shows the efficiency of Figure 1's circuit. You can expect 80% to 90% efficiency over an 8V to 16V input range with loads of 200mA or more. This makes the circuit suitable for 12V battery inputs, but no special considerations are necessary with adapter inputs of up to 30V.

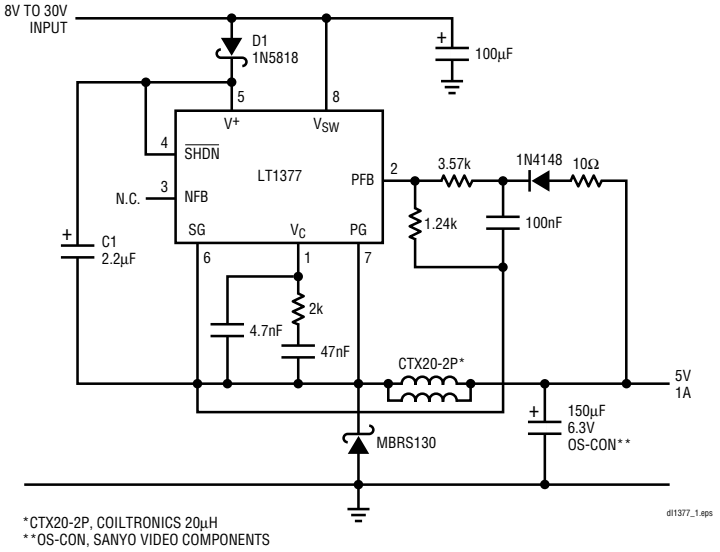

Figure 1. LT1377-Based 1MHz Buck Converter Schematic Diagram

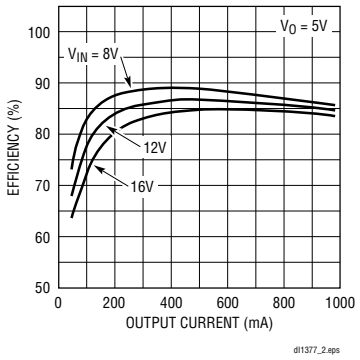

Figure 2. Efficiency Graph of the Figure 1 Circuit

900kHz Low Noise Surface Mount Voltage Inverters Provide Regulated –4.1V for GaAs FETs

The **LTC1550** and **LTC1551** are switched capacitor voltage inverters that provide a regulated –4.1V for GaAs FETs used in cellular phones and other RF applications. These new voltage inverters have an internal linear post regulator that reduces output voltage ripple to less than 1mV. The 900kHz frequency allows the use of very small charge pump capacitors and also keeps output noise away from 400kHz to 600kHz IF bands.

The LTC1550 and LTC1551 require a single input voltage ranging from 4.5V to 7V. These devices have a 4mA quiescent current that is reduced to 0.2µA in shutdown. The LTC1550 features an active low shutdown input while the LTC1551 provides an active high shutdown. Figure 1 shows the LTC1551-4.1 used as a GaAs

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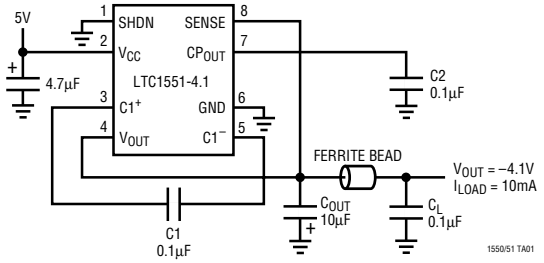

Figure 1. LTC1551-4.1 Provides Regulated Bias Voltage for GaAs Transistors with Only 1mV$_{P-P}$ Ripple

LTC1550/51 from page 3

FET bias generator. The LTC1550 and LTC1551 can supply up to 20mA of output current. Only three external components are required for the fixed output versions: two 0.1µF charge pump capacitors and a 10µF output filter capacitor.

The LTC1550/LTC1551 are available in the 8-lead SO package. The LTC1550CS8-4.1/LTC1551CS8-4.1 are rated over –30°C to 70°C to meet cellular phone component specifications. For applications with V_{CC} supplies as low as 3.3V, see the LTC1261. For applications requiring synchronization to an external clock, see the LTC1429. Contact your local LTC sales office for a data sheet and evaluation samples of the LTC1550CS8-4.1 and LTC1551CS8-4.1.

New 800mA Low Dropout Sink/Source Regulators for Split Supplies in Single Supply Applications

The **LT1118-2.5** and **LT1118-5** are 800mA output 1V dropout linear regulators that can be used to provide an intermediate supply voltage between 5V and ground or between 12V and ground to bias op amps and other circuitry in single supply applications. The device maintains regulation while both sourcing and sinking current, enabling loads to be referenced to ground or the positive supply. Figure 1 shows the LT1118-2.5 used as a current sourcing and sinking virtual ground in a single supply system.

The LT1118-2.5 and LT1118-5 source 800mA and sink 400mA. Available in a 3-lead SOT-223, requiring only a tiny 0.22µF output capacitor and consuming only 600µA of quiescent current, the LT1118-2.5 and LT1118-5 are ideal for small single supply systems. Current limit in both sourcing and sinking modes, plus on-chip thermal shutdown make the circuit tolerant of output fault conditions. The LT1118 maintains stability for any capacitive load greater than 0.2µF and has a fast settling output. Figure 2 shows the load transient response of the LT1118.

The LT1118-2.5 and LT1118-5 are available in the 3-lead SOT-223 package. Devices are specified for operation from 0°C to 70°C. Contact your local LTC sales office for a data sheet and evaluation samples of the LT1118-2.5 and LT1118-5.

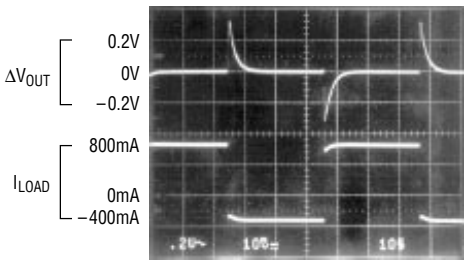

Figure 2. LT1118 Load Transient Response

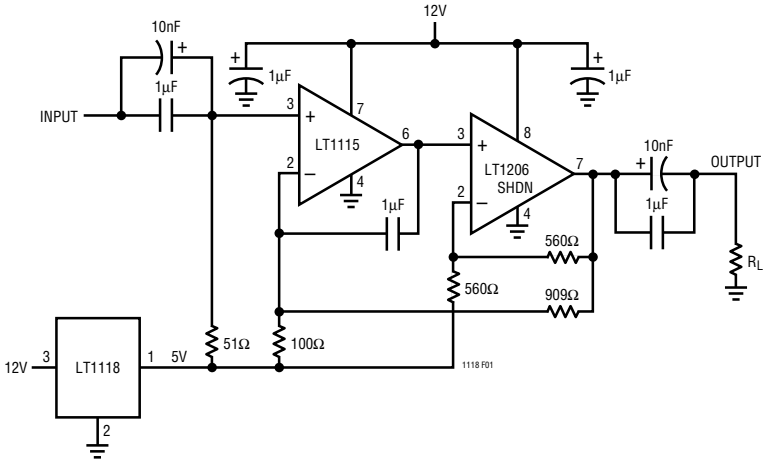

Figure 1. LT1118 Used as a Virtual Ground in a Low Noise ×10 Buffered Line Driver

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