

Product of the Month

16-Bit ADC Draws Only 55mW from 5V Supply at 100kHz

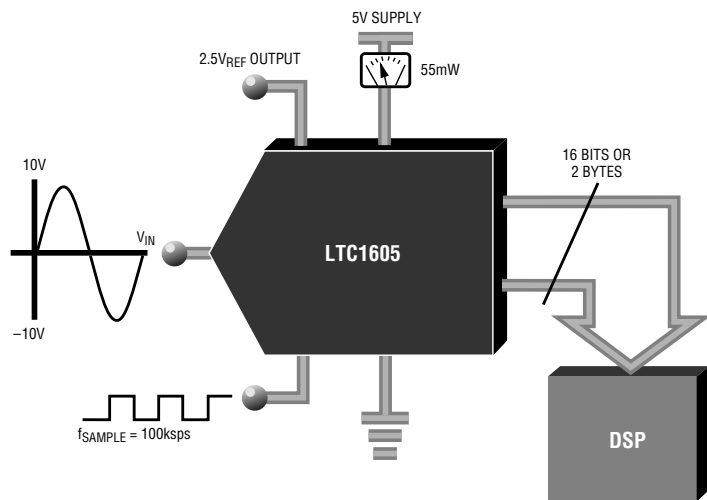
The **LTC[®]1605** is a 16-bit ADC that converts at a 100ksps sampling rate with no missing codes. It operates with a single 5V supply, handles a $\pm 10V$ bipolar input range and draws only 55mW of power. The LTC1605 is offered in 28-lead PDIP and SW packages and is ideal for industrial applications, such as process control and data acquisition, where low power and high resolution are essential. The device is pin

compatible with Burr-Brown's ADS7805 and Analog Devices' AD976.

The LTC1605 has 16-bit no missing codes resolution and integral nonlinearity (INL) of $\pm 2LSB$ over temperature. Typical SINAD is 86dB and total harmonic distortion is $-90dB$ at 20kHz. The LTC1605 has an onboard 2.5V reference with $\pm 0.25\%$ full-scale accuracy and $\pm 5ppm/^{\circ}C$ tempco.

Continued on page 3

The LTC1605 16-Bit Sampling ADC is Pin Compatible and Functionally Equivalent to the ADS7805 and AD976



800ksps 14-Bit ADC with 81.5dB SINAD Consumes Only 150mW

The **LTC1419** is an 800ksps 14-bit sampling analog-to-digital converter (ADC) that delivers excellent AC and DC performance. The signal-to-(noise + distortion) (SINAD) is 81.5dB and spurious-free dynamic range (SFDR) is 95dB. Input sample-and-hold bandwidth is 20MHz which makes the LTC1419 well-suited for digitizing fast moving signals with outstanding spectral purity.

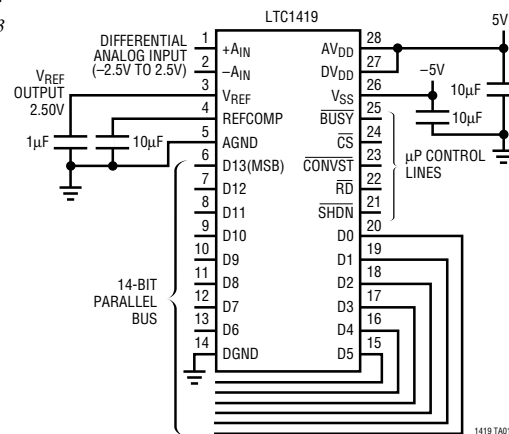


Figure 1. The LTC1419 is a Low Power 800kHz 14-Bit Sampling ADC

Outstanding DC performance includes $\pm 0.5LSB$ DNL and INL typical and $\pm 5LSB$ of offset error. The LTC1419 draws only 155mW of power from $\pm 5V$ supplies and powers down to 7.5mW and 10 μ W in nap and sleep modes. In nap mode the 2.5V, 15ppm/ $^{\circ}C$ internal reference is kept alive for instant wake-up. The reference is accurate to $\pm 0.8\%$ and may be externally driven if tighter tolerance or better temperature coefficients are required.

The LTC1419's three-state digital output is easy to interface to DSP I/O ports. The sample-and-hold has a high impedance differential input that rejects wideband common mode noise by 60dB. Figures 1 and

Inside This Issue:

Complete PowerPath [™] Control for Notebook Computers and Other Portable Equipment	2
EL Panel Driver for Large Area Display	3
Dual and Quad Rail-to-Rail Op Amps Use Only 1.5 μ A/Supply Current	4
LT [®] 1466L/LT1467L Dual and Quad Precision 75 μ A Rail-to-Rail Op Amps	4

Linear Technology Chronicle

Complete PowerPath Control for Notebook Computers and Other Portable Equipment

The **LTC1479** is a power switch matrix controller IC that provides a complete PowerPath management solution for dual-battery notebook computers and high reliability portable instruments. It implements a low loss switching matrix at the front end of the power section of a portable system, where up to two battery packs and a DC power source can be indiscriminately connected and disconnected. A host system power management microprocessor monitors the LTC1479 voltage sensor outputs and directs the LTC1479 to switch ON or OFF any of the power switches. The LTC1479 also interfaces directly to other LTC power management products (such as the LT1510, LT1511 and LT1620/LTC1435 battery charging circuits) to provide charger path switching. See Figure 1. It represents a verified approach to complex power man-

agement for high reliability/high up-time portable computers and instruments.

The LTC1479 is a multifunction system level IC that includes N-channel MOSFET gate drivers for five power pathways, a switching regulator with onboard switch to create the gate drive voltage used for all drivers, analog voltage sensors that monitor the DC input and battery voltages and the logic interface for a host power management processor. As shown in Figure 2, a special "3-diode" operating mode temporarily converts the three main power path switches into "diodes" which pass the highest available supply voltage through to the DC/DC converter input when power from the battery or AC adapter is unexpectedly interrupted. The appropriate switch is then selected and normal operation resumes.

Operation up to 28V input permits use of 24V wall adapters and high battery volt-

age stacks (like 5-cell lithium-ion or 15-cell NiCd batteries).

The LTC1479 provides inrush current limiting which allows glitch-free switching from one power source to another and permits the use of tantalum capacitors at the input of DC/DC converter in most applications. Without inrush current limiting, bulky electrolytic capacitors must be used.

The LTC1479 does not use the SMB serial interface, therefore it can be used in either conventional battery systems or those that adhere to the Intel/Duracell Smart Battery Specification. This is important if the Smart Battery approach isn't the preferred choice or is too expensive for use in some portable computer/equipment designs.

The LTC1479 is packaged in a new, small (209 mils wide) 36-lead SSOP and is available from stock. 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.

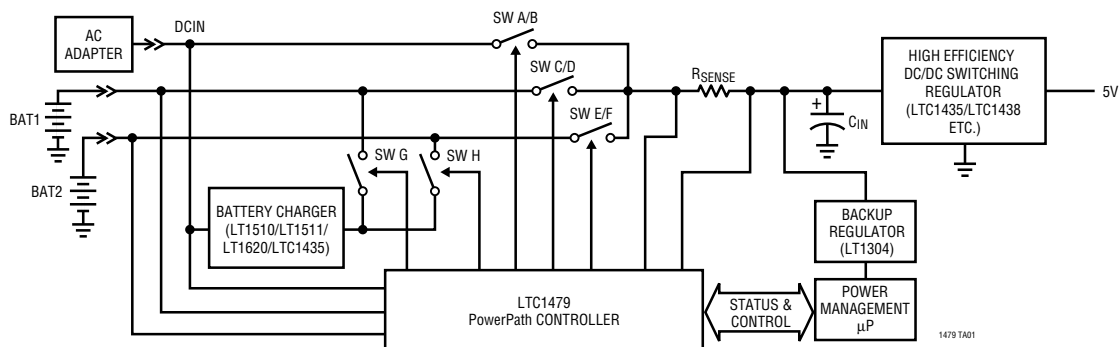


Figure 1. The LTC1479 Provides System-Level Solutions for Power Management and Battery Charging. A System-Provided Power Management Microprocessor Monitors and Actively Directs the 36-Lead Device

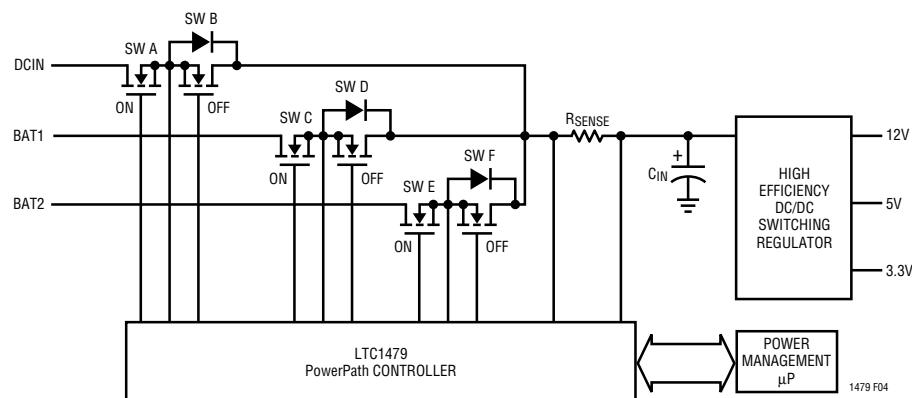


Figure 2. LTC1479 PowerPath Switches in "3-Diode" Mode



Application of the Month

EL Panel Driver for Large Area Display

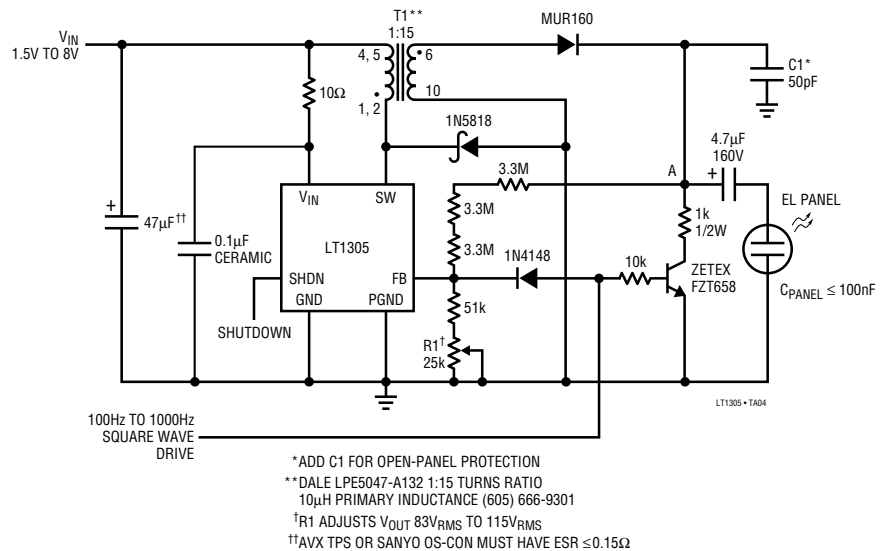
Driving electroluminescent panels, such as those used for backlighting LCD screens in portable devices, is a challenge because they are capacitive loads and require high voltage AC drive signals. Typically, EL panels exhibit about 3nF per square inch capacitance. The LT1305 circuit below can drive an EL panel up to 100nF total capacitance.

The LT1305 micropower DC/DC converter contains an internal power switch capable of up to 2A switch current. This high power switch drives the primary of flyback transformer T1. A minimum input voltage of 1.8V ensures operation with 2-cell supplies. The input voltage is boosted to a voltage that ranges from 166VDC to 248VDC, as set by R1. The AC drive waveform is created by an external square wave control signal turning on and off the NPN transistor, bringing point "A" to ground and inverting the voltage across the panel and then returning to a high positive voltage. By adjusting R1, the panel AC

drive voltage can be set from 83V_{RMS} to 115V_{RMS} to alter the display brightness. The color or hue of the display can also be slightly varied by changing the frequency of

the square wave drive signal. This control signal can be from a system microprocessor output pin. The LT1305 is available in an 8-lead SO package.

Circuit for Driving Electroluminescent Panels in Portable Devices

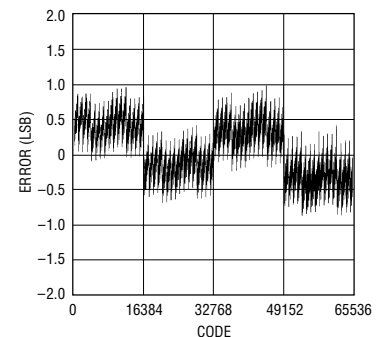


LT1605 from page 1

The reference can be externally overridden for improved accuracy. It also incorporates a sample-and-hold, trimmed internal timing and a 16-bit or 2-byte parallel interface that easily connects to popular DSP and microprocessor parallel ports.

Both commercial and industrial temperature range versions are available from stock. Contact your local Linear Technology sales office for a data sheet and evaluation samples or visit our web site for more information at www.linear-tech.com.

Typical Integral Nonlinearity vs Input Code

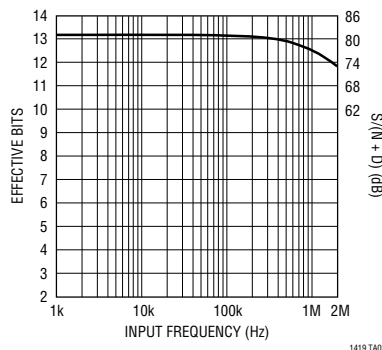


LTC1605 • TA02

LTC1419 from page 1

2 show the LTC1419's pinout and SINAD performance.

The LTC1419 is a successive approximation type converter, so it has no pipeline delay such as found with most high speed converters. This means the conversion result is available immediately after each conversion cycle—a big advantage for process control and multiplexed data acquisition applications or for real time event capture systems. The LTC1419 is also ideally suited for demanding telecom, IF down conversion and undersampling applications.

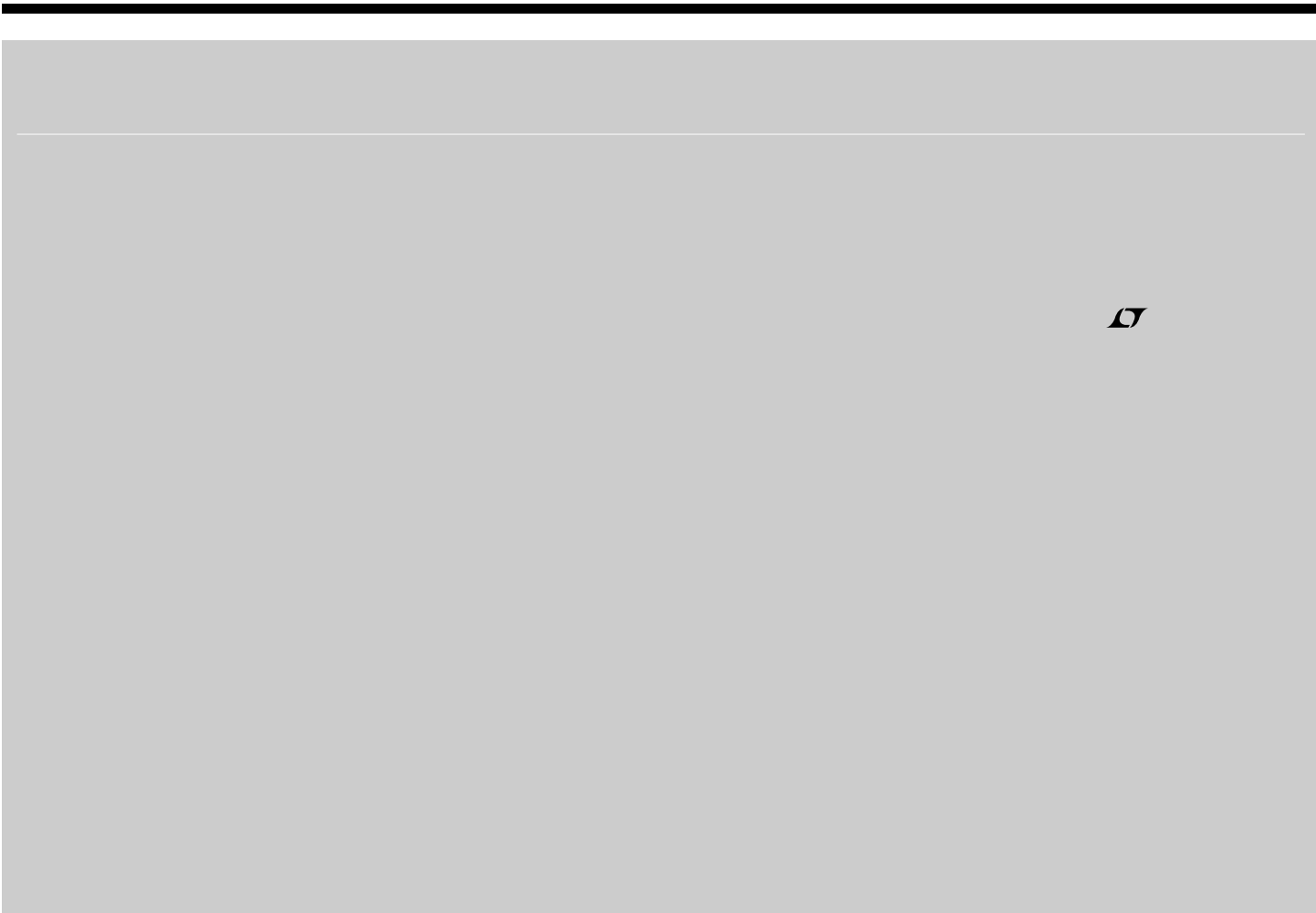


1419 TA02

Figure 2. Effective Bits and SINAD vs Input Frequency

The LTC1419 offers a performance advantage for 12-bit data conversion systems without the power or cost increase of using a hybrid ADC.

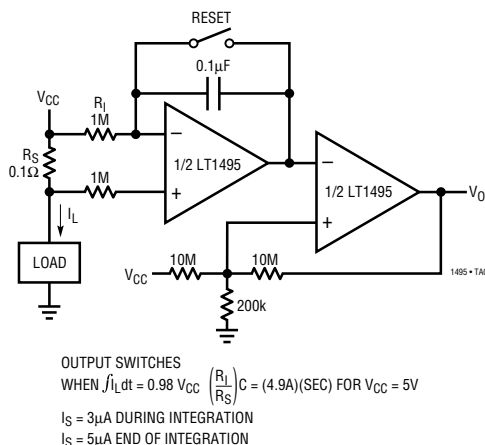
The LTC1419 is screened to the commercial and industrial temperature ranges and is available in 28-lead SW and SSOP packages from stock. For a data sheet and evaluation samples, contact your local Linear Technology sales office. Visit our web site at www.linear-tech.com for more information.



Dual and Quad Rail-to-Rail Op Amps Use Only 1.5µA Supply Current

The dual **LT1495** and quad **LT1496** are precision rail-to-rail input and output op amps that draw just 1.5µA of supply current per amplifier—an order of magnitude lower than other micropower op amps with similar performance. Their 375µV max offset voltage with typical drift of only 0.4µV/°C is ten times better than the closest competition. Minimum CMRR and PSRR of 90dB guarantee minimal change in offset voltage due to input common mode variations and power supply fluctuations, thus ensuring great precision. The LT1495/LT1496 can operate with supplies as low as 2.2V or up to 36V, and the input stage actually operates above the supply rail. These op amps are ideal for battery-powered or solar-powered instru-

The LT1495 as a Micropower Integrating Current Sense



mentation applications or industrial applications such as 4mA to 20mA current loops.

The LT1495/LT1496 have a minimum open loop gain of 100V/mV which ensures that gain errors are minimal. The low bias and offset currents of these op amps permit use of megohm level source resistors without introducing serious errors. Voltage noise is only 4µV_{P-P}, very low for such low supply currents. The LT1495 is offered in 8-pin PDIP and SO packages while the LT1496 is available in 14-lead PDIP and SO packages. 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.

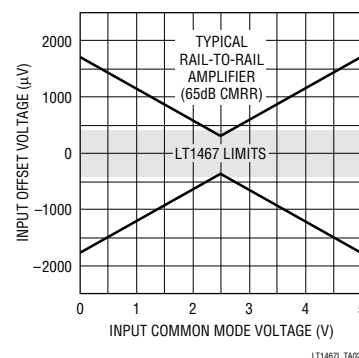
LT1466L/LT1467L Dual and Quad Precision 75µA Rail-to-Rail Op Amps

The **LT1466L/LT1467L** are dual and quad micropower op amps that offer excellent DC accuracy with rail-to-rail input and output operation. They require a supply current of only 75µA/amplifier and operate with a supply voltage from ±10V to as low as 2V. Their trimmed inputs guarantee a maximum 390µV offset voltage across the entire common mode range, including both rails. Because of their precision performance, wide dynamic range at low supply voltages and very low supply current, the LT1466L/LT1467L are ideal for battery-operated devices.

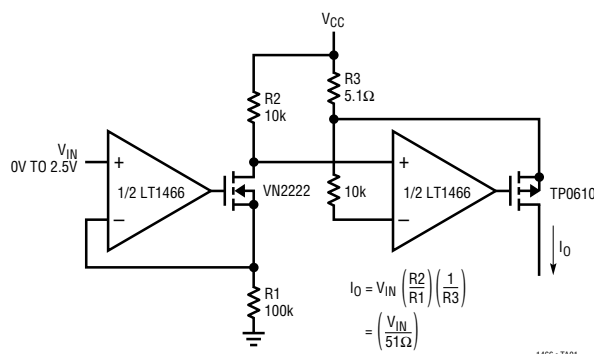
The LT1466L/LT1467L offer a common mode rejection of 83dB minimum with 5V supplies. A minimum open-loop gain of 400V/mV into a 10kΩ load virtually eliminates gain error. Low offset voltage and 83dB minimum CMRR permit precision measurements in such applications as test equipment amplifiers, driving A/D converters and supply current sensing.

The LT1466L is offered in 8-pin PDIP and SO packages with the standard dual op amp pinout. The LT1467L is available in a plastic 14-lead narrow SO package with the industry standard quad op amp configuration. 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.

Worst-Case V_{OS} vs Input Common Mode Voltage for the LT1467



The LT1466 as a Variable Current Source



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