# 250ksps 16-Bit ADC in a Tiny MSOP Package Offers an Excellent Combination of Speed, Power and Size

by Guy Hoover

## Introduction

Optimized for battery-operated, portable, isolated and remote data acquisition systems, Linear Technology introduces the LTC1864 16-bit, 250ksps ADC in an MSOP package. At 1ksps the supply current is typically only 2µA. The primary features of the LTC1864 are small size (available in MSOP and SO-8 packages), µpower operation, simple serial I/O, a real convert start input and true differential inputs. Also available is a pin compatible 12-bit version, the LTC1860.


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## MSOP and SO-8 Packages Are Good for Portable Applications

Available in MSOP and SO-8 packages the LTC1864 is well suited for portable applications where space is limited. As shown in Figure 1, the SO-8 package has a footprint approximately one third the size of a conventional DIP package, and the MSOP package is approximately one fifth that of a DIP package.

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## Low ADC Supply Current Is Optimal for Battery-Operated Applications

With a typical supply current of only 850µA at the maximum sampling frequency, the LTC1864 is among the lowest power consumption 16-bit ADCs available in the industry. After a conversion the LTC1864 goes into a low power SLEEP mode ($I_{CC}$ = 1nA typical, $I_{CC}$ = 3µA maximum) further reducing the supply current. The LTC1864 can therefore run at true µpower levels in applications that do not require the maximum LTC1864 sampling rate. The supply current is virtually proportional to the sampling frequency as shown in Figure 2. Combine its already low power consumption with the ability to go into sleep mode after a conversion and it is apparent why the LTC1864 is ideal for battery-operated applications.

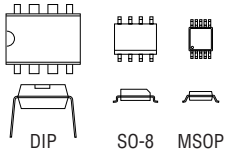


**Figure 1. This 16-bit ADC—available in the tiny SO-8 and MSOP packages—is perfect for battery operated, portable applications.**

## Simple Serial I/O Eases Isolated and Remote Applications

The simple 3-wire serial I/O used by the LTC1864 is compatible with industry standard SPI/Microwire interfaces. The LTC1864 has an internal conversion clock so that the shift clock (SCK) rate does not effect the conversion. This allows the shift clock rate to run from DC to 20MHz without concern for sample-and-hold droop at low clock frequencies or clocking the ADC too fast at high clock frequencies. The data transfer requires only 16 clock cycles as shown

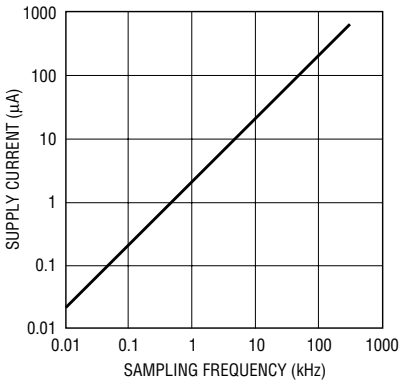


**Figure 2. µpower performance**

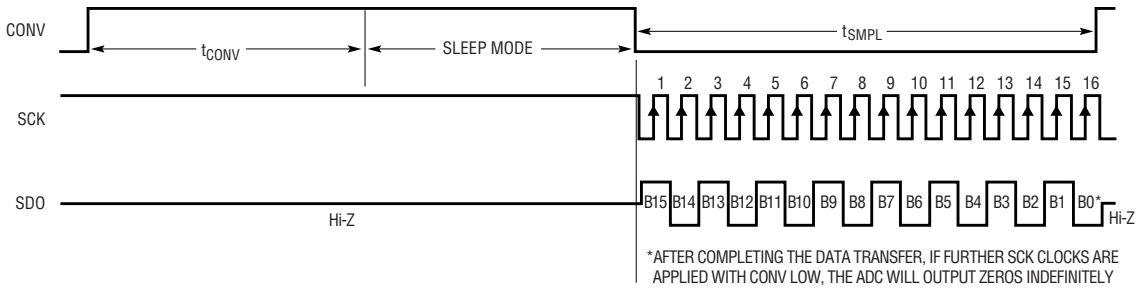


**Figure 3. Data transfer only requires 16 clock cycles**

in the timing diagram of Figure 3. This minimizes the amount of time required to transfer the data. Running the shift clock (SCK) at the maximum rate of 20MHz, an entire conversion can be transferred in only 800ns. Using only 3 wires in the serial interface makes it easy to use the LTC1864 for isolated or remote applications, like the one shown in Figure 4.

## Real Convert Start Input Allows More Precise Control

The rising edge of CONV immediately causes the LTC1864 sample-and-hold to acquire the input voltage and starts a conversion. This compares favorably to many ADCs that require several shift clocks after the convert signal to acquire the input voltage and start the conversion. For faster moving signals the LTC1864 can be timed to precisely acquire the desired input voltage.

## True Differential Input Rejects Common Mode Noise

The LTC1864 has a true differential input with sample-and-holds on both $IN^+$ and $IN^-$ inputs. The LTC1864 samples both the $IN^+$ and $IN^-$ inputs simultaneously; so common mode noise on the inputs is rejected. The $IN^+$ range of the LTC1864 is Ground to $V_{CC}$. Most competing parts allow the minus input to go a few hundred millivolts to 1V above ground. The $IN^-$ range of the LTC1864 is Ground to $V_{CC}/2$ which is twice the range that most parts offer. This makes the LTC1864 a good choice for remote applications where large common mode voltages or common mode noise can be present.

## Conclusion

The LTC1864 16-bit 250ksps ADC features small size, µpower operation, simple serial I/O, real convert start input and true differential inputs, making it a good choice for battery-operated, portable, isolated and remote ADC applications.

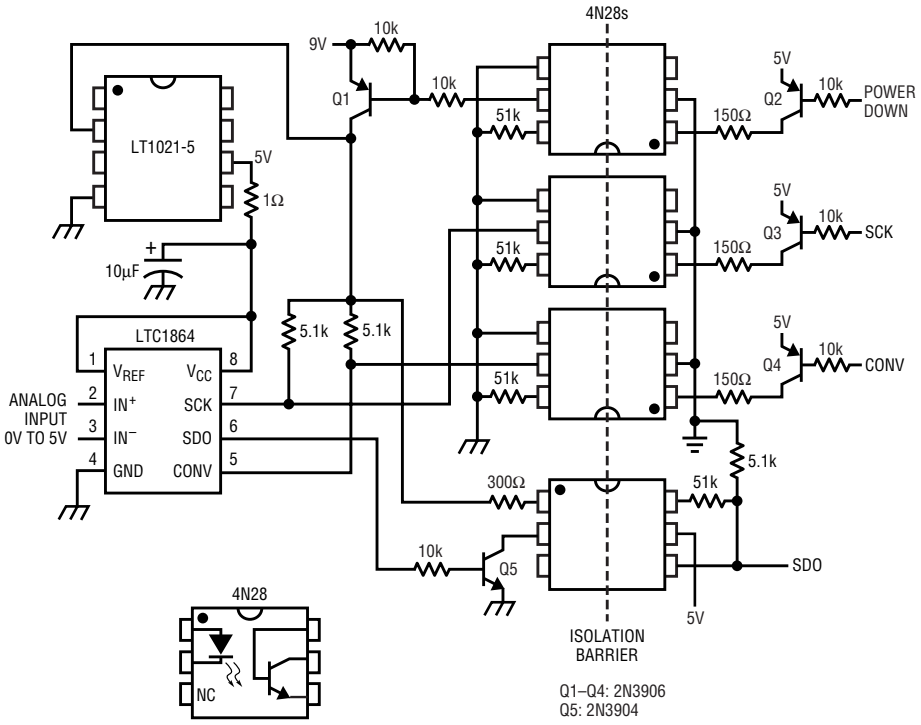


**Figure 4. Micropower 500V opto-isolated 16-bit data acquisition system**