

DESIGN NOTES

250ksps, 16-Bit Micropower ADC Offers an Excellent Combination of Size, Power and Speed – Design Note 294

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Introduction

The demand for ever smaller portable devices is increasing. In addition, there is a corresponding demand for longer battery life in these devices that quite often have smaller batteries than their predecessors. Optimized for battery-operated, portable, isolated and remote data acquisition systems, the LTC[®]1864, a 16-bit, 250ksps micropower ADC is remarkably fast and offers μ power operation and small size.

MSOP Package for Portable Applications

Available in the MSOP package, the LTC1864 is well suited for portable applications where space is limited. As seen in Figure 1, the MSOP package provides considerable space savings over other serial parts available in 20-lead SW or 28-lead SSOP packages.

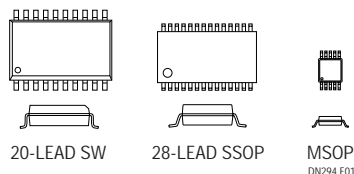


Figure 1. This 16-Bit ADC—Available in the Tiny MSOP Package—is an Obvious Space Saver Over Other Serial ADCs

Low ADC Supply Current for Battery-Operated Applications

With a typical supply current of only 850 μ A at the maximum sample rate of 250ksps, the LTC1864 already has one of the lowest power consumptions of any 16-bit ADC available. After a conversion, the LTC1864 goes into a low power SLEEP mode ($I_{CC} = 1\text{nA typ}$, $I_{CC} = 3\mu\text{A max}$) further reducing supply current. The LTC1864 can therefore run at true micropower levels in applications that do not require the maximum LTC1864 sampling rate. At 1ksps, the supply current is typically only 2 μ A as shown in Figure 2. The part's low power consumption combined with the ability to go into sleep mode after a

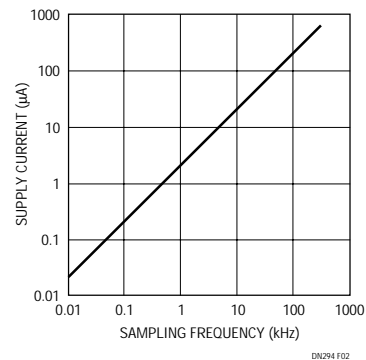


Figure 2. Micropower Performance

conversion, make the LTC1864 ideal for battery-operated 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 over 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 in the timing diagram of Figure 3. Running the shift clock (SCK) at the maximum rate of 20MHz, an entire conversion can be transferred in only 800ns. Using only three wires in the serial interface makes the LTC1864 easy to use for isolated or remote applications as 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 some ADCs that require several shift clocks after the convert signal before

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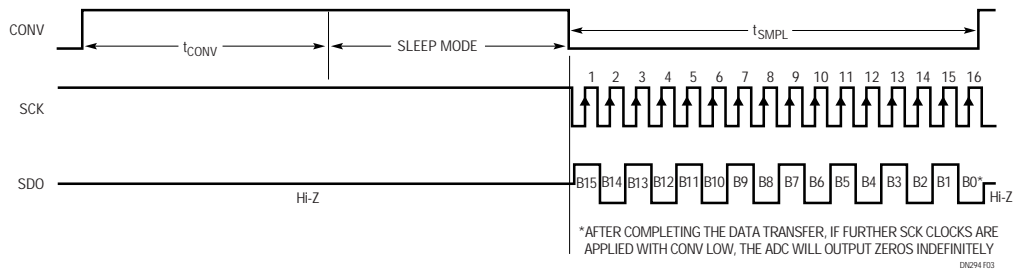


Figure 3. Data Transfer Only Requires 16 Clock Cycles

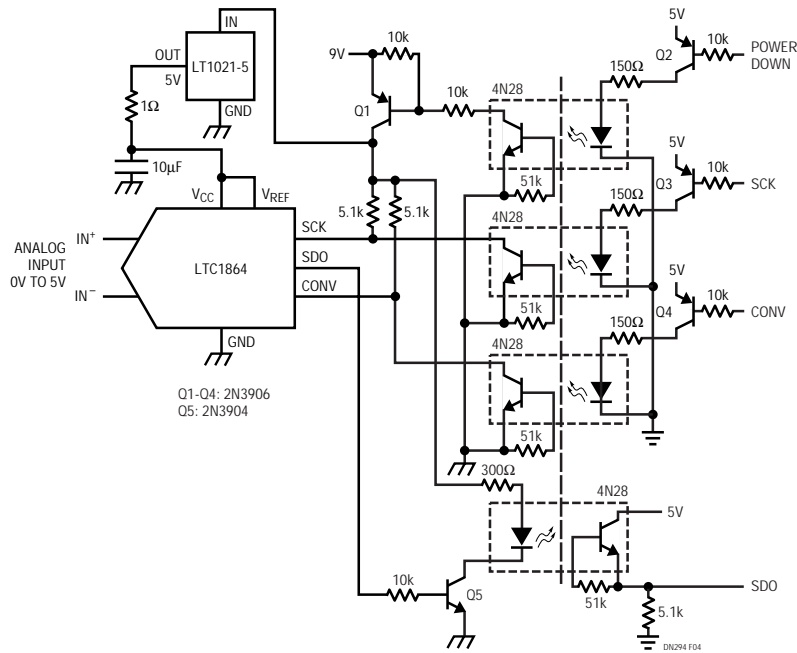


Figure 4. Micropower 500V Optoisolated 16-Bit Data Acquisition System

acquiring the input voltage. For fast moving signals, the LTC1864 can more 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

above ground. The IN⁻ range of the LTC1864 is ground to V_{CC}/2 which 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 250ksp/s micropower ADC is a good choice for battery-operated, portable, isolated and remote ADC applications. The features that make this true include its small size, micropower operation, simple serial I/O, real convert start input and true differential inputs.

Data Sheet Download

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