

DESIGN NOTES

Chi Fai Yeung and Kevin R. Hoskins

- 200ksps Throughput
- Low Power: 16mW
- Parallel and Serial Data Output Modes
- 1.25LSB INL Max and 1LSB DNL Max
- Two Input Ranges: 0V to 4.096V with 5V Supply;
±2.048V with ±5V Supply
- NAP and SLEEP Power Shutdown Modes
- Small Package: 28-Pin SSOP

 LTC and LT are registered trademarks of Linear Technology Corporation.

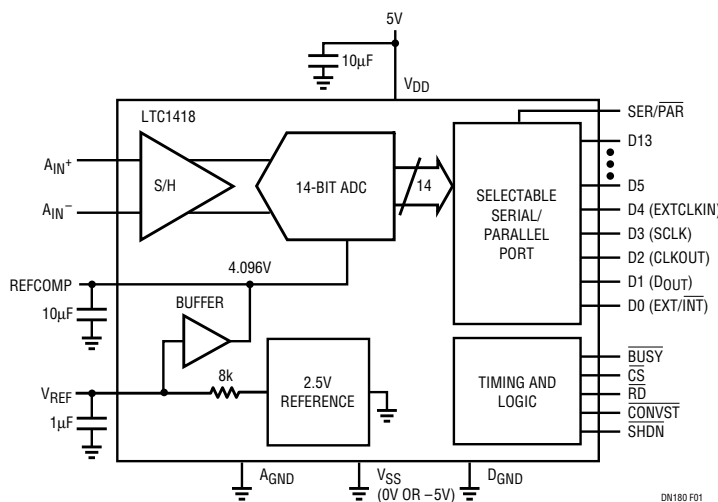


Figure 1. LTC1418 Block Diagram

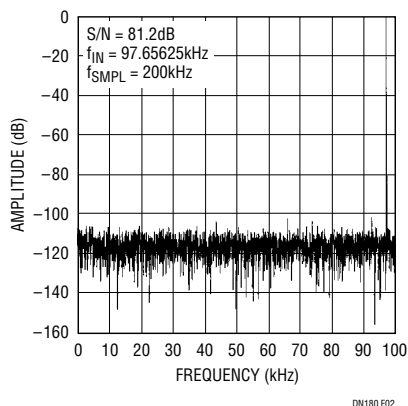


Figure 2. LTC1418 FFT

Differential Inputs with Wideband CMRR

The LTC1418's differential input has excellent common mode rejection, eliminating the need for most input conditioning circuitry. As shown in Figure 3, the LTC1418's CMRR remains excellent at high frequencies unlike that of op amps or instrumentation amplifiers whose rejection degrades substantially.

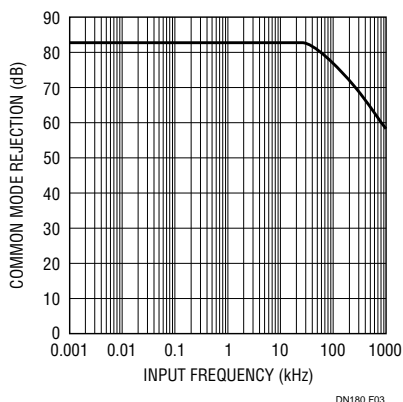


Figure 3. Input Common Mode Rejection vs Input Frequency

Single Supply or Dual Supply Operation

The LTC1418 can operate with single or dual supplies. Dual supplies allow direct coupling of signals that swing below ground. The ADC is equipped with circuitry that automatically detects when $-5V$ is applied to the V_{SS} pin. With a $-5V$ supply the ADC operates in bipolar mode and the full-scale range becomes $\pm 2.048V$ for A_{IN}^+ with respect to A_{IN}^- . With a single supply ($V_{SS} = 0V$), the ADC operates in unipolar mode with an input range of $0V$ to $4.096V$.

On-Chip Reference

The on-chip $2.5V$ reference is available on the V_{REF} pin (Pin 3). Internally the reference's $2.5V$ output is amplified to $4.096V$, setting the full-scale span for the ADC. The $4.096V$

output is available on the $REFCOMP$ pin (Pin 4) and may be used as a reference for other external circuitry. With a temperature coefficient of $10ppm/^{\circ}C$, both V_{REF} and $REFCOMP$ are suitable as the master reference for the system. If, however, an external reference is required, it can easily overdrive either reference output.

Parallel or Serial Data Output

The parallel output mode of the LTC1418 allows the lowest digital overhead. A microcontroller can initiate a conversion and perform other tasks while the conversion is running. The ADC can then signal the microcontroller after the conversion is complete with the $BUSY$ signal, at which time valid data is available on the parallel output bus. $BUSY$ may also be used to clock latches or a FIFO directly since data is guaranteed to be valid with the rising edge of $BUSY$.

The serial output mode of the LTC1418 is simple and flexible, requiring just three pins for data transfer: a data out pin, a serial clock pin and a control pin. Serial data can be clocked with either the internal shift clock or an external shift clock. Data can be clocked out during or after the conversion. The serial I/O is SPI and MICROWIRE™ compatible.

Perfect for Telecom: Wide Dynamic Range

The wide dynamic range required by telecommunications is satisfied by the LTC1418's low noise, low distortion and extremely wide dynamic range over its entire Nyquist bandwidth. Spurious free dynamic range is typically $95dB$ to beyond the Nyquist frequency. The sample-and-hold circuit's ultralow, $5ps_{RMS}$ jitter keeps the low SNR constant from DC to $1MHz$, ideal for undersampling applications.

The LTC1418 is designed to have ultralow bit error rates, another important requirement for telecom systems. The error rate is so low that it is immeasurable. This, combined with excellent AC and DC specification, makes the LTC1418 ideal for a wide variety of applications.

Conclusions

The new LTC1418 low power, 14-bit ADC will find uses in many types of applications from industrial instrumentation to telephony. The LTC1418's adaptable analog input and digital interface reduces the need for expensive support circuitry and can result in a lower cost, smaller system.

MICROWIRE is a trademark of National Semiconductor Corporation.

For literature on our A-to-D Converters, call **1-800-4-LINEAR**. For applications help, call (408) 432-1900, Ext. 2453