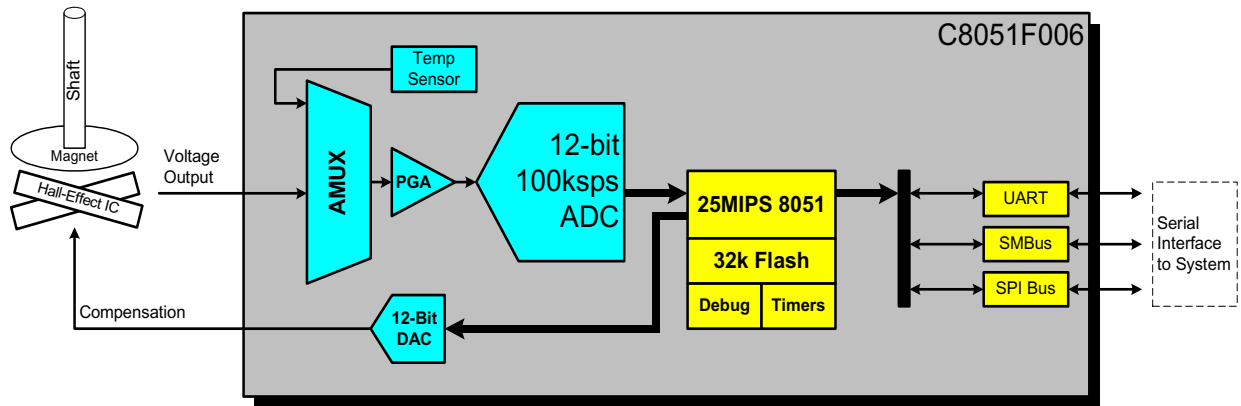


## Position Sensor



### Background

Using Hall effect sensor technology, it is convenient to build a contactless linear or angular position sensor in very limited space capable of very precise absolute measurements. These are useful in measuring throttle, rotor, and valve positions. Although the principle of measuring magnetic field strengths of two magnets to determine relative position is simple, care must be taken to eliminate inherent non-linearities.

### Cygnal Application

Cygnal's C8051F006 is an in-system programmable, mixed-signal microcontroller that provides virtually a single chip solution to most magnetic position sensor applications. The C8051F006 is an inherently low power device, with the ability to shut down internal peripherals that are not in use for additional power savings.

As shown in the block diagram, the ADC measures one or more Hall Effect IC outputs. The sensor voltage output can be scaled using the programmable gain amplifier if needed.

Using its high-throughput 25MIPS 8051 CPU, the C8051F006 uses firmware algorithms and lookup tables in FLASH to convert the raw Hall Effect reading into a precise position reading. The high throughput rate of the ADC allows implementation of oversampling algorithms for noise rejection or to increase effective resolution. The DAC outputs can be used for more sensitive circuits requiring active compensation.

Once the position reading has been derived, the 8051 can export the value via any of the fully implemented serial buses on the C8051F006. The serial interfaces include the SPI, UART, and SMBus (I<sup>2</sup>C-compatible).

Since most position sensors are implemented in cramped spaces, the Mixed-Signal System-on-Chip solution provided by the C8051F006 offers a complete solution in a 9x9mm 48-pin TQFP package.