CONTACTLESS TURNING KNOB SENSOR WITH PWM OUTPUT

BLOCK DIAGRAM – MagAlpha MA750
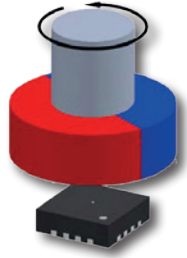
The **MagAlpha MA750** is a robust contactless angle encoder suitable for use in rotary control buttons and knobs. The IC detects the absolute angular position of the permanent magnet, typically a diametrically magnetized cylinder attached to the shaft.

The output is digital SPI and PWM. For potentiometer replacement applications, the PWM output can be filtered to provide an analogue voltage.

MagAlpha devices use a unique "SpinAxis" technique which directly digitizes the angle direction without any need for sine/cosine A-to-D conversion or ArcTan calculations. This direct conversion of phase to digital angle occurs every 2 µs and provides an ultra-fast sensor response time and low latency of only 3 µs.
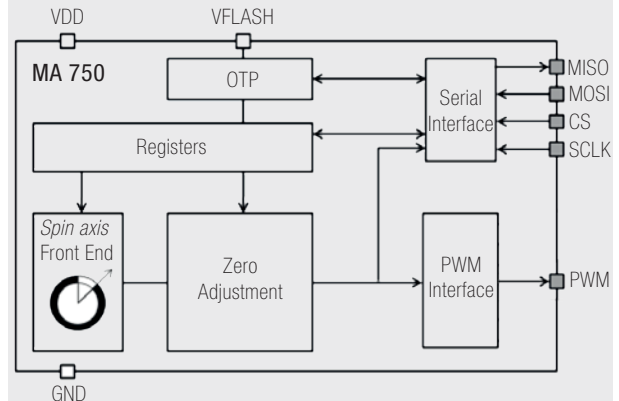
The Hall sensor array within the MA750 is confined within a region less than 100um wide, with a precision within 50um of the centre of the QFN package. The sensor detects the angle of the magnetic field in the plane parallel to the package surface. This means that only the "in-plane" component of the magnetic field (X,Y) at the centre of the package is detected which gives flexibility in the design of the angular encoder. All the sensor needs is that the magnetic vector lies essentially within the sensor plane and that its amplitude is within the range 30 mT to 150 mT. (Smaller fields can be used but linearity may be lower than specified)

The SPI bus outputs the direct digital angle value from 0 to 360 degrees. Zero position can be hard programmed into the device via OTP memory.
The PWM output has a 12 bit resolution and is output at 15.3 kHz (65 µs period).

MA750 provides an efficient way to implement contactless rotary sensors in consumer, and industrial applications.

KEY FEATURES

» 8 bit SPI digital angle output
» 12 bit PWM output
» 500 kHz refresh rate for ultra-fast response
» Supply voltage: 3.3 V
» Supply current: 7 mA
» Operating temperature: -40°C … +125 °C
» Small 3×3 mm QFN package

Emulation of a standard potentiometer voltage output can be achieved with a low pass filter such as shown in the example below.

APPLICATION EXAMPLE– MagAlpha MA750