MagAlpha Test Boards

TBMA-UG User Guide 2015 REV. 1.0

KEY POINTS

MagAlpha EVB Pinouts

- Round Sensor Board (TBMAxxx-Q-RD-00A)
- Long Probe Board (TBMAxxx-Q-LT-00A)

Connections and Sample C-Code

Magnetic Setup

OVERVIEW

This document provides an overview of the test boards available for MagAlpha sensors. These boards provide a connection from a MagAlpha chip to an easy-to-use connector and can be used in customer projects.

Currently, there are three test boards (TBMA) available for the MagAlpha sensor family. These boards are suitable for use with all MagAlpha sensors as all sensors in the MagAlpha family are pin-compatible.

However, not all pins and functions are available for some versions of MagAlpha, and these pins should be left unconnected. For the pinout of your MagAlpha sensor please refer to the appropriate datasheet.

1. ROUND SENSOR BOARD

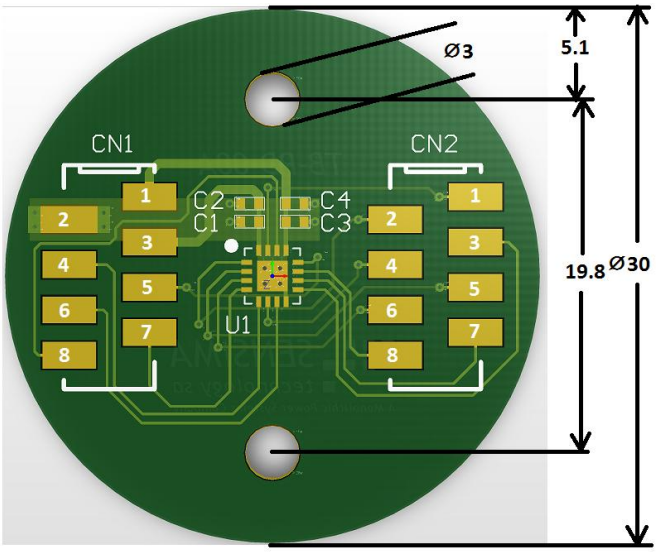


FIGURE 1. Round Sensor Board (dimensions in mm)

*** Denotes minimum connections necessary, some pins may not be available depending on part used**

TABLE 1. Round Sensor Board Pins

Pin	Name
CN1.1	VDD *
CN1.2	GND *
CN1.3	V_FLASH
CN1.4	CS *
CN1.5	SCLK *
CN1.6	MISO *
CN1.7	MOSI
CN1.8	DR
CN2.1	U
CN2.2	V
CN2.3	W
CN2.4	A
CN2.5	B
CN2.6	Z
CN2.7	Reserved
CN2.8	PWM

Part Numbers:

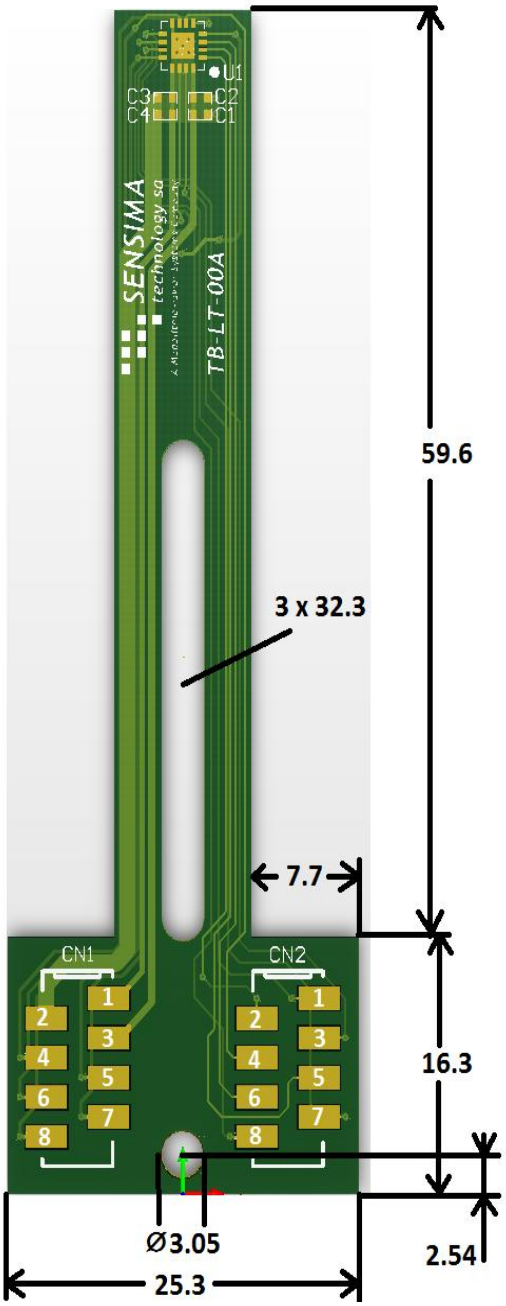
TBMA300-Q-RD-00A

TBMA700-Q-RD-00A

2. LONG PROBE BOARD

TABLE 2. Long Probe Board Pins

Pin	Name
CN1.1	VDD *
CN1.2	GND *
CN1.3	V_FLASH
CN1.4	CS *
CN1.5	SCLK *
CN1.6	MISO *
CN1.7	MOSI
CN1.8	DR
CN2.1	U
CN2.2	V
CN2.3	W
CN2.4	A
CN2.5	B
CN2.6	Z
CN2.7	Reserved
CN2.8	PWM



Part Numbers:

TBMA300-Q-LT-00A

TBMA700-Q-LT-00A

FIGURE 2. Long Probe Board (dimensions in mm)

*** Denotes minimum connections necessary, some pins may not be available depending on part used**

In order to use the MagAlpha with a microcontroller, a minimum of 5 connections are necessary (VCC, GND, CS, SCLK, and MISO). In addition, a 6th line (MOSI) is needed if you want to write to the MagAlpha sensor (see Fig. 3).

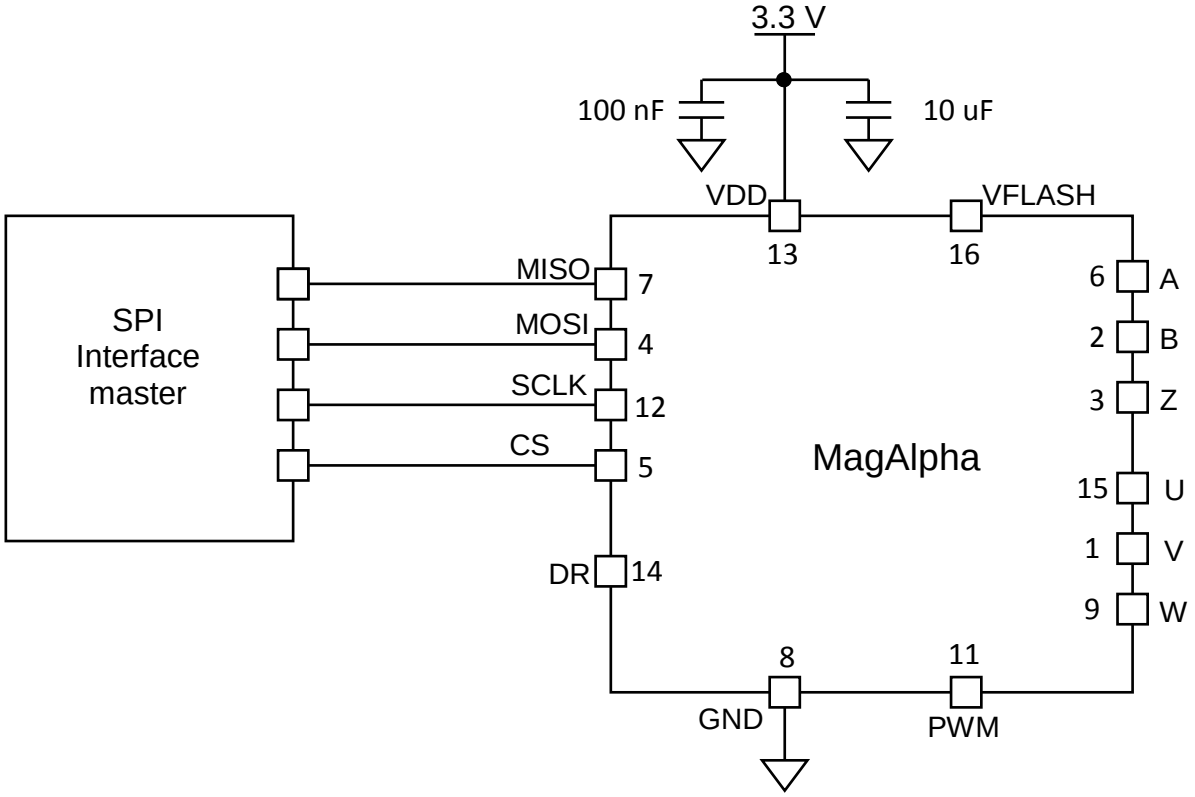


FIGURE 3. MagAlpha SPI Connection Diagram

To read out the angle, pull the CS line from high to low and send 16 pulses through the SCLK pin. Data presented on the MISO line represent the angle readout. Most microcontrollers provide an SPI hardware module as well as a library to handle the transmission automatically. Set the SPI interface to mode 3 (CPOL=1) and use the SPI libraries provided by the microcontroller manufacturer (see Fig. 4).

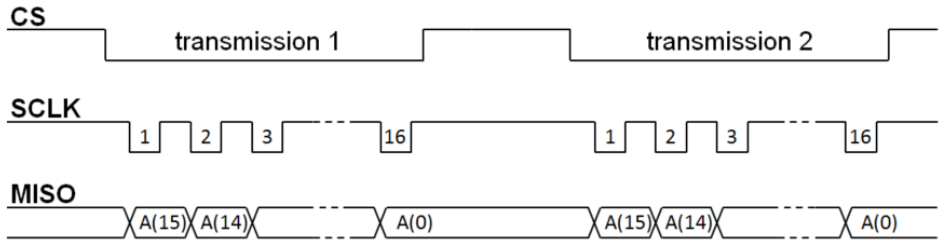


FIGURE 4. MagAlpha SPI Transmission Timing Diagram

To write into a register, send the following 16-bit data from the microcontroller via SPI:

Write				Reg. Address				MSB LSB							Value
0	0	0	1	x	x	x	x	0	0	0	0	0	0	0	0

For example, to set the Zero Setting to 180 degrees do the following:

Write				Reg. Address				MSB LSB							Value
0	0	0	1	0	1	0	0	0	1	1	1	1	1	1	1

To read back from a register, a 16-bit data should be sent from the microcontroller via SPI. For example, to read back the Zero setting, send the following:

Read				Reg. Address				MSB LSB							Disregard
0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0

During the same transmission cycle, the SPI of the microcontroller should read:

Angle Out								MSB LSB							Value
A(15:12)				A(11:8)				Z(11:4)							

3. PSEUDO CODE FOR MICROCONTROLLER

The code below is a C-style pseudo code for the microcontroller. For additional detailed implementation, please refer to your microcontroller documentation.

```
int Main(void)
{
        uint16 data;
        float angle;

        SPI_init(set SPI to mode 3);
        SPI_open();

        // ---- The following codeblock could be put into a loop ----
        SPI_ChipSelect();
        data = SPI_read(16 bits);
        SPI_ChipUnselect();
        // ---- The above codeblock could be put into a loop ----

        angle = data*360/65536; //angle in degrees

        // ---- Write to register ----
        SPI_ChipSelect();
        SPI_write(0x147f); //Zero setting to 180 degrees
        SPI_ChipUnselect();
        // ---- End of Write to register ----

        // ---- Read from register ----
        SPI_ChipSelect();
        data = SPI_write(0x2400); //Read Zero setting, from same cycle
        data &= 0x00ff;
        SPI_ChipUnselect();
        // ---- End of Read from register ----

        SPI_close();
}
```


4. MAGNETIC SETUP

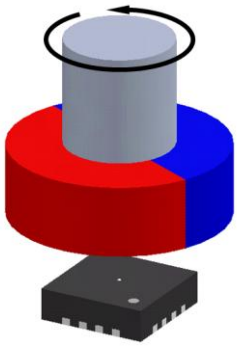


FIGURE 5. End-of-Shaft Configuration

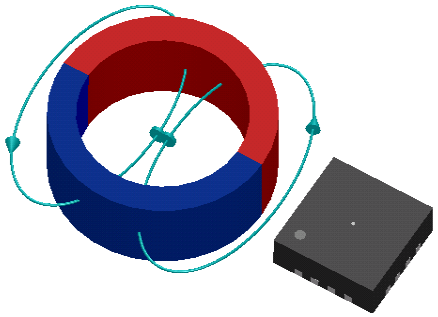


FIGURE 6. Side-Shaft Configuration

See Fig. 5 and Fig. 6 for mounting a magnet in end-of-shaft and side-shaft configurations. In both cases, use a diametrically magnetized, cylindrical or ring magnet. Make sure that the magnetic fields are high enough. For instance a NdFeB magnet (with a diameter of 5mm and a height of 2.5mm) positioned at 1mm or 2mm away from the surface of the QFN package should provide a sufficient magnetic field.

For example, this magnet (http://www.dextermag.com/products/magnets-for-sensors-encoders/diametric-disc-magnets, part number 2910041-1) can be used.

For the end-of-shaft configuration, place the sensor coaxially with the shaft. As a rule of thumb, the precision of the x-y placement should be with +/- 5% of the diameter of the magnet for best results. For the side-shaft configuration, place the sensor coplanarily with the magnet. The radial distance between the magnet and the sensor depends on the magnet size, usually the closer the better. The axial position is less critical: the sensor center should be somewhere between the lower and the upper surface of the magnet.

