User's Guide

TMAG5170 Joystick Attachment Assembly Guide

ABSTRACT

This document serves to accompany the design files for the joystick attachment for the TMAG5170 EVM. These design files are provided as an example and may be used in a 3D printer to generate a demonstration of a simple joystick function using a three-dimensional Hall effect sensor.

Design files described in this document can be downloaded from Joystick Design Files

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1 Introduction

This simple thumb toggle joystick uses a 3/8" (9.5 mm) spherical magnet as both a magnetic field source and mechanical bearing. The magnet clips into the base where it may pivot above a three-dimensional Hall effect sensor. This motion allows the magnet to provide the necessary magnetic field input to the sensor to detect both angle and magnitude of tilt.

For correct function, it is important to follow this step-by-step guide to ensure proper alignment of the magnet polarization.

The result of ideal magnet alignment will produce a field vector at the sensor location entirely in the Z direction. Depending on the tilt of the magnet, it is possible to calculate both the angle and magnitude of the X and Y components to determine the overall magnitude and direction of the thumb toggle tilt.

More details related to this operation can be found in *Measuring 3D Motion With Absolute Position Sensors* (SBAA512).

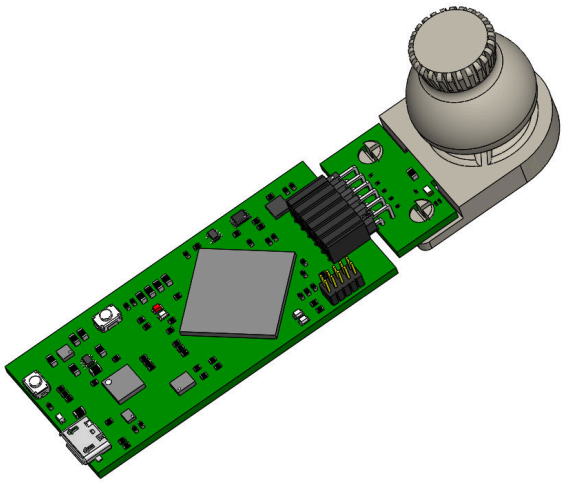

Figure 1-1. TMAG5170 Joystick Attachment

2 Assembly Guide

Table 2-1. Joystick Attachment Table of Materials

Item	Description	Quantity
Thumb Toggle	Joystick_Top.STL	1
Joystick Base	Joystick_Base.STL	1
3/8 in (9.5 mm) Spherical Magnet	NdFeB (N42):available at K&J Magnetics	1
TMAG5170 EVM		1
8333-20G	Super Glue	0.02 oz

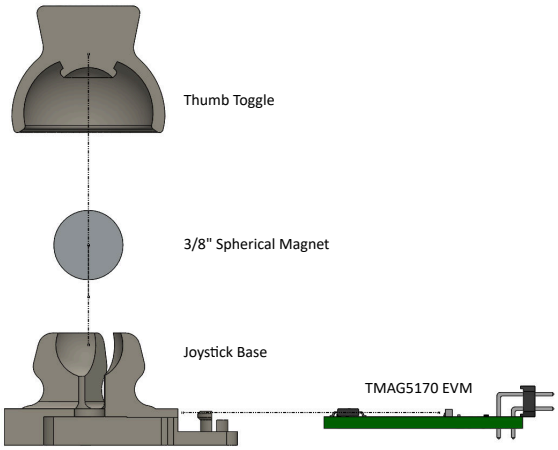

Figure 2-1. Joystick Attachment Exploded View

Step 1 - Print the thumb toggle (Joystick_Top.STL)

This is the printable toggle for the joystick attachment. Notice the raised seat intended for a spherical magnet.

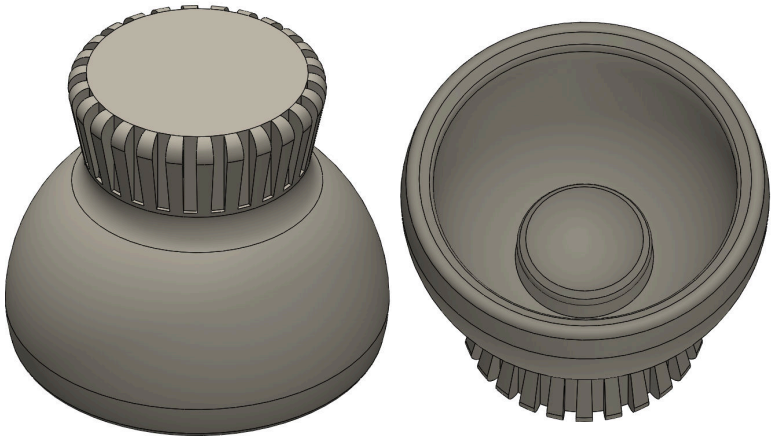

Figure 2-2. Thumb Toggle

Step 2 - Orient the spherical magnet

This might be most easily done using a second magnet with pole markings. For example, if the N pole of a bar magnet is presented near the sphere, then this magnet will orient itself such that the S pole of the sphere magnet will contact the bar. Take care to ensure the magnets do not strike with significant force. Magnets are often brittle, and striking another object with force may result in damage to one or both magnets.

A 3/8 in. Spherical magnet was used for this design. This could be modified to use other size magnets, but both the thumb toggle and base would require adjustments to match the new magnet sizing. This particular magnet

was selected since as it was determined to provide adequately strong field in the z-direction without saturating the input of TMAG5170 and provided a sufficiently large surface area for assembly.

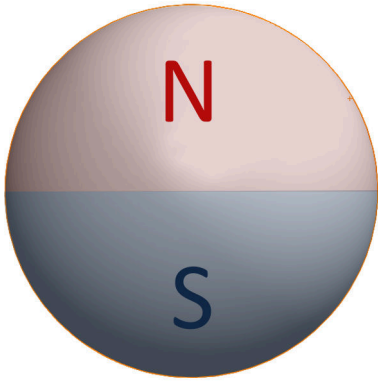

Figure 2-3. Spherical Magnet

Step 3 - Glue the magnet into the thumb toggle

With the orientation of the magnet known, glue the magnet into the raised seat inside the thumb toggle. Either the N or S pole may be inserted directed downward. If oriented as shown in Magnet Alignment, then the resulting input to the 3D sensor will be positive. The sensor defines a positive field to be directed from the bottom of the package to the top. With the S pole facing the sensor, the field vector will be in this direction.

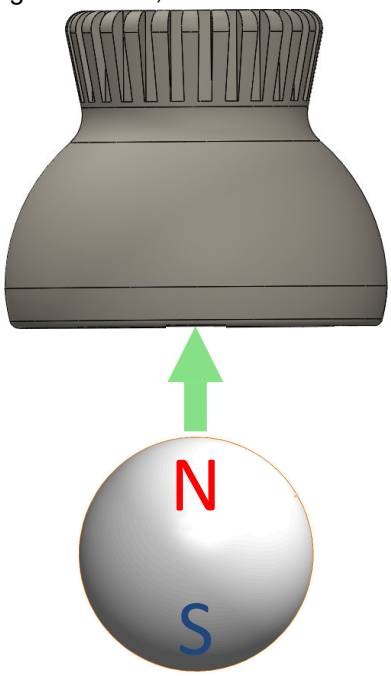

Figure 2-4. Magnet Alignment

It may be useful to use a second magnet to secure the magnet in place when setting the magnet and allowing the glue cure until the prescribed dry time is completed.

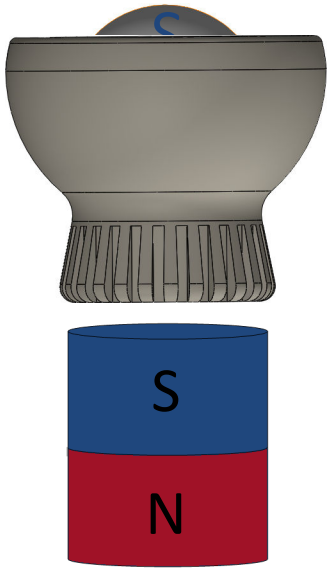

Figure 2-5. Assembly Suggestion

Completed Thumb Toggle shows how the assembly should appear when the glue fully cures.

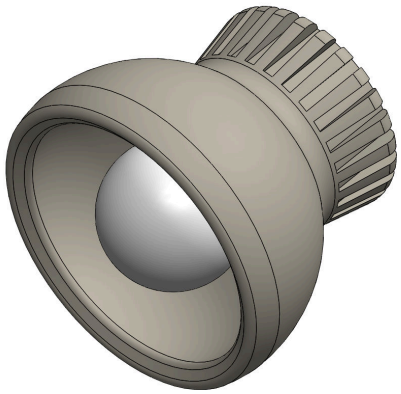

Figure 2-6. Completed Thumb Toggle

Step 4 - Print the joystick base (Joystick_Base.STL)

This is the printable base for the attachment. The magnet seats in the rounded pedestal and the small circular fittings on each tab clip into the match holes in the EVM. The sensor will be positioned such that it is directly beneath the magnet pole.

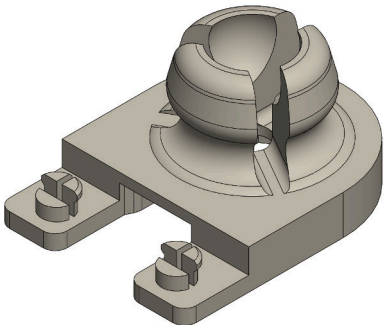

Figure 2-7. Joystick Base

Step 5 - Seat the thumb toggle assembly into the base

The thumb toggle should be able to snap into position with a small amount of force, and should similarly be removable if needed.

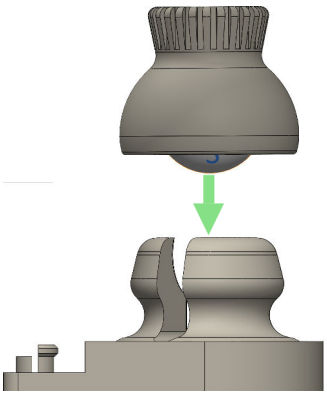

Figure 2-8. Seating the Joystick

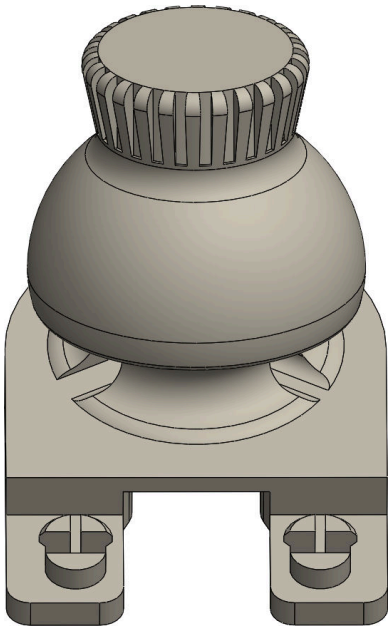

Figure 2-9. Completed Joystick

3 Revision History

NOTE: Page numbers for previous revisions may differ from page numbers in the current version.

Changes from Revision * (July 2021) to Revision A (July 2021)	Page
• Added links to the orbital design files	1

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