User's Guide

Hall-Hinge-EVM

ABSTRACT

This user's guide describes the characteristics, operation, and use of the HALL-HINGE Evaluation Module (EVM). This EVM is designed with accompany 3D printed structures and magnet to evaluate TMAG5231B1 in a hinge lid closure apparatus used commonly in laptop lid closures and other lid and door detection applications. The design is compatible with the HALL-ADAPTER-EVM to allow broader testing of TI's magnetic sensing portfolio. This document includes a schematic, reference printed circuit board (PCB) layout, and a complete bill of materials (BOM).

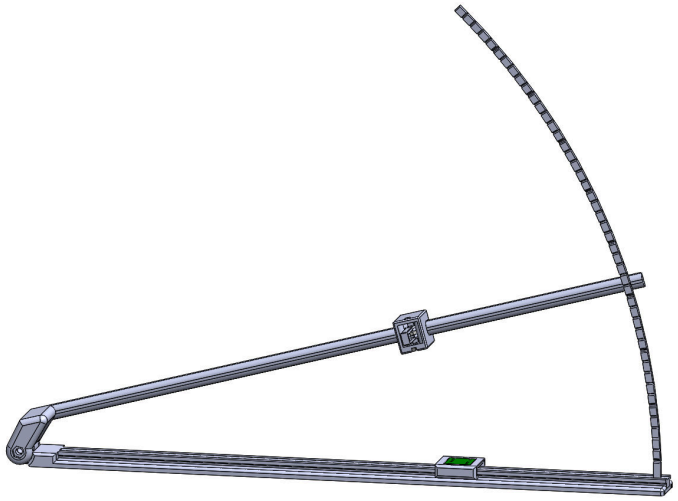

Figure 1-1. Hall-Hinge-EVM

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1 Overview

The HALL-HINGE-EVM is composed of various 3D printed structures which combine to assist with evaluation of lid closure detection. The sensor and magnet positions are independently adjustable to demonstrate the flexibility of Hall-effect sensors in this function type.

Table 1-1. Operating Conditions

Product	Voltage Range
TMAG5231B1	1.65 V - 5.5 V

Kit Contents

Table 1-2 lists the contents of the EVM kit. Contact the nearest Texas Instruments Product Information Center if any component is missing.

Table 1-2. Kit Contents

Item	Quantity	Description
Hall-Hinge-EVM	1	Evaluation module with TMAG5231B1
SENS093_Arm	1	Hinge Arm for magnet mount
SENS093_Track	1	Hinge Track for sensor Mount
SENS093_Bracket	1	Bracket to hold B222 magnet in SENS093 Slider
SENS093_Slider	1	Adjustable slider for magnet mounted to SENS093_Arm
SENS093_Protractor	1	Optional protractor with 1° increments for angle measurements
SENS093_Sensor	2	Sliding mount for Hall-Hinge-EVM to position on SENS093_Track
B222	1	Magnet, 1/8" Cube, N42

Related documentation from Texas Instruments

This user's guide is available from the TI website under literature number SLYU062. Any letter appended to the literature number corresponds to the document revision that is current at the time of the writing of this document. Newer revisions are available from www.ti.com or the Texas Instruments' Literature Response Center at (800) 477-8924 or the Product Information Center at (972) 644-5580. When ordering, identify the document by both title and literature number. lists documentation related to the EVM. Click the links in Table 1-3 for further information. The device name links to the product web folder on www.ti.com. The literature number links to the document PDF.

Table 1-3. Related Documentation

Document Title	Document Literature Number
TMAG5231 Datasheet	SLYS042
3D Printed Files	SLYU062.zip
Hall-Adapter-EVM User's Guide	SLYU043

2 Hardware

The EVM PCB is a small form-factor test board with an LED indicator for the output state. The test unit is installed on a printed circuit board (PCB) with access to each device pin. The PCB format is compatible with Hall-Adapter-EVM, which allows users to test other devices on a large variety of package options. Please visit www.ti.com/halleffect when considering additional device selections.

Included with the EVM are several 3D printed structures which combine to produce a test platform with a hinged lid functionality. The position of the magnet and sensor are customizable and can be manually set to assist with determining appropriate sensor locations.

Features

- Customizable hinge positions for sensor and magnet
- LED output indicator
- Compatible with HALL-ADAPTER-EVM
- Access to device pins

3 Operation

Final assembly of the 3D printed structures will be required to complete EVM setup. This may be done with either HALL-HINGE-EVM or with HALL-ADAPATER-EVM.

The following steps walk through the procedure to evaluate TMAG5231 with the HALL-HINGE-EVM. If desired, the 3D assembly may be downloaded, edited and reprinted as needed from SLYU062.zip.

Figure 3-1 through Figure 3-6 show the components included in this kit.

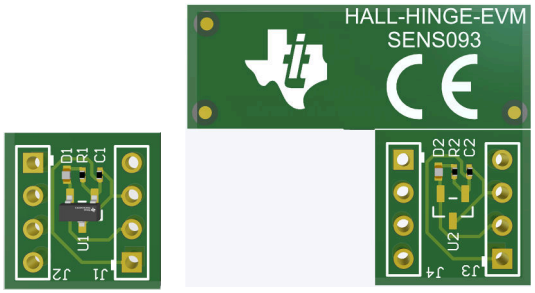

Figure 3-1. Evaluation Module PCB

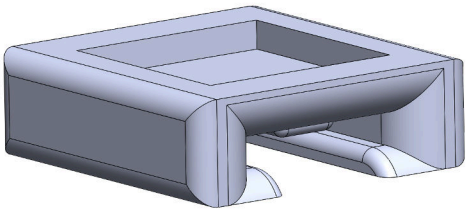

Figure 3-2. SENS093_Sensor

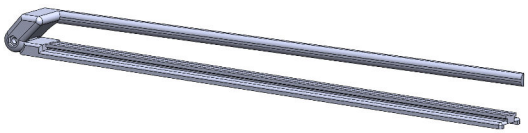

Figure 3-3. SENS093_Arm & SENS093_Track

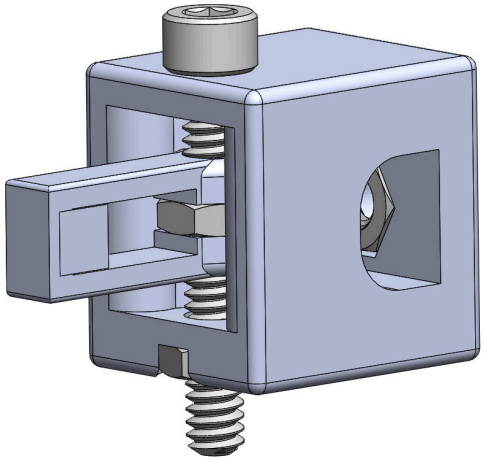

Figure 3-4. SENS093_Bracket & SENS093_Slider

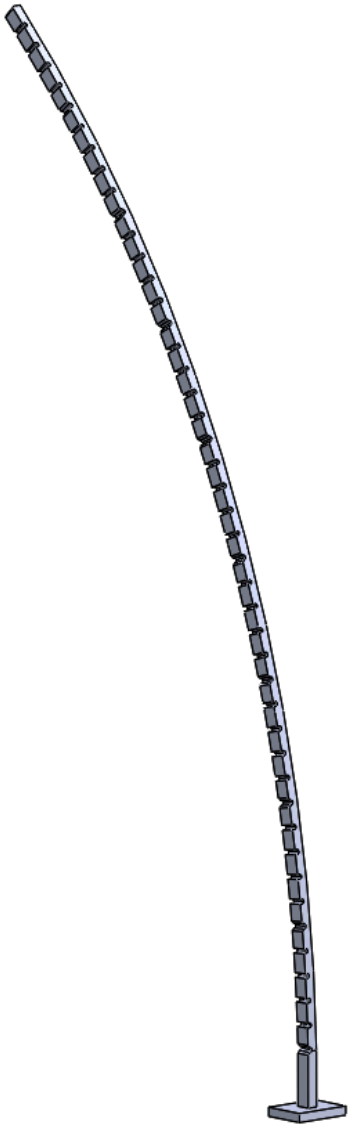

Figure 3-5. SENS093_Protractor

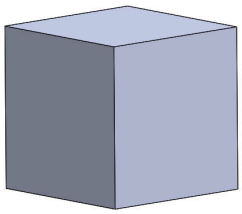

Figure 3-6. B222 - N42 Cube Magnet

1. Locate the HALL-HINGE-EVM PCBs. TMAG5231 may be evaluated on this PCB with or without the use of the 3D structures. The device may be powered by connecting a voltage source or battery as indicated in Figure 3-7.

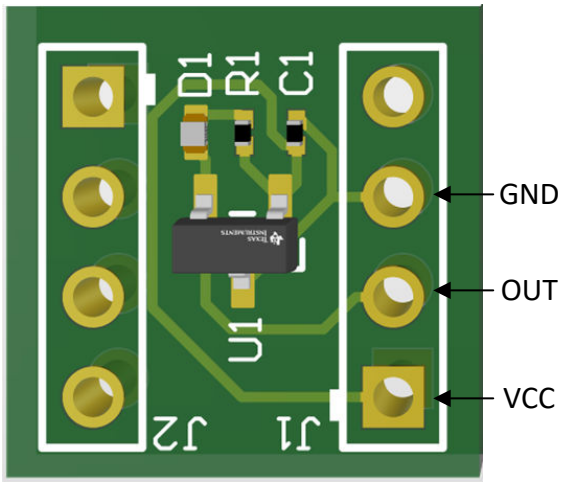

Figure 3-7. Wiring Guide

2. To evaluate using the 3D structure, insert the snapped off PCB into the SENS093_Sensor.

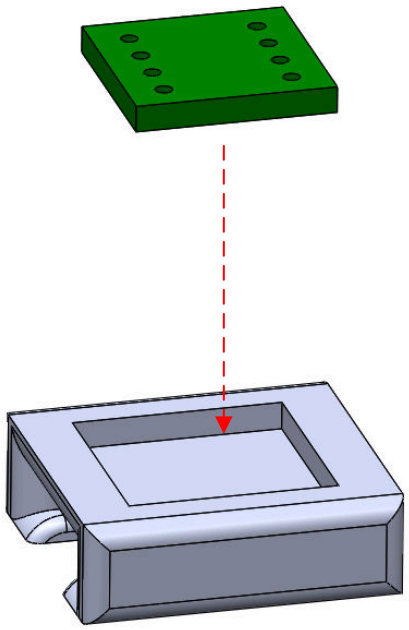

Figure 3-8. Install PCB to SENS093_Slider

3. Slide the SENS093_Sensor into the SENS093_Track as shown in Figure 3-9.

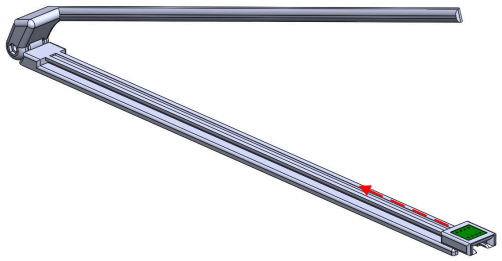

Figure 3-9. Adding SENS093_Sensor

4. Slide the SENS093_Slider into the SENS093 Arm as shown in Figure 3-10.

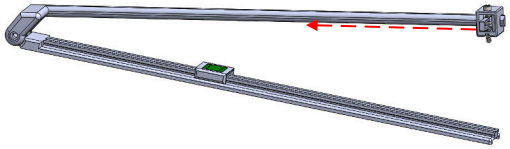

Figure 3-10. Adding SENS093_Slider

5. Install the B222 into the SENS093_Brakcet with the magnet oriented as desired.

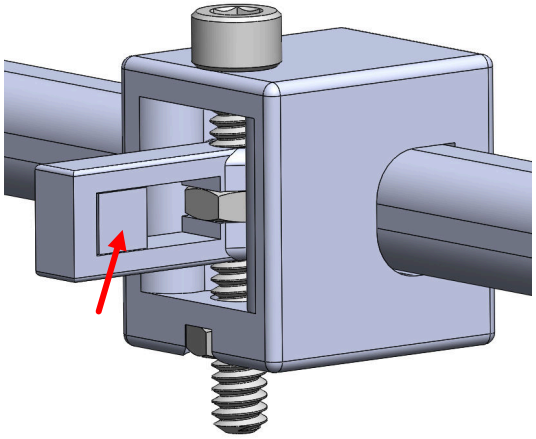

Figure 3-11. Adding Magnet

   a. You can freely adjust the horizontal position of the magnet within the SENS093_Bracket by positioning the magnet manually within the open space. The direction of magnet polarization may also be adjusted freely.
   b. You can adjust the vertical position of the magnet by turning the screw shown in Figure 3-12.

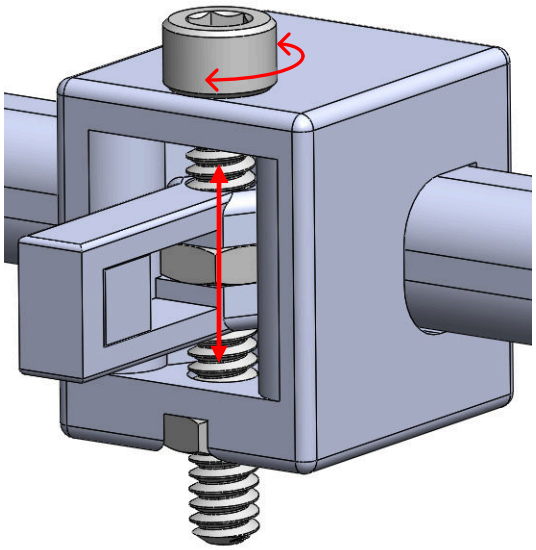

Figure 3-12. Vertical Adjustment Screw

c. You can fix the SENS093_Slider position by tightening the set screw shown in Figure 3-13.

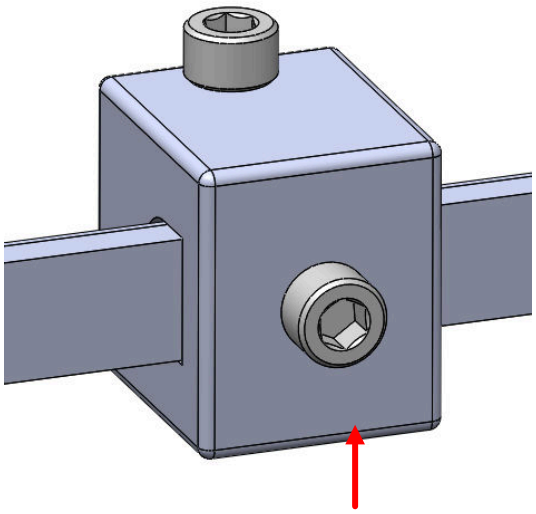

Figure 3-13. Set Screw

6. Optional: Insert the Protractor on to the Track from bottom as shown in Figure 3-14.

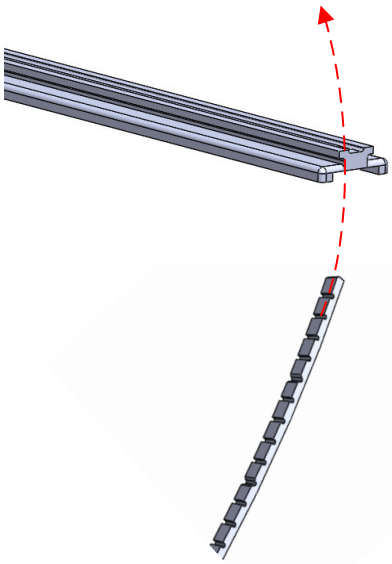

Figure 3-14. Protractor Installation

a. Indentations occur at 1° intervals. Larger notches indicate 5° intervals.

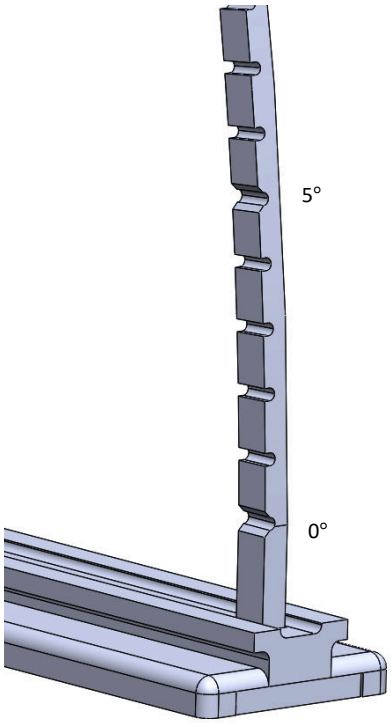

Figure 3-15. Protractor Degree Intervals

b. The bottom edge of the arm aligns with the protractor to mark for angle measurements as shown in Figure 3-16.

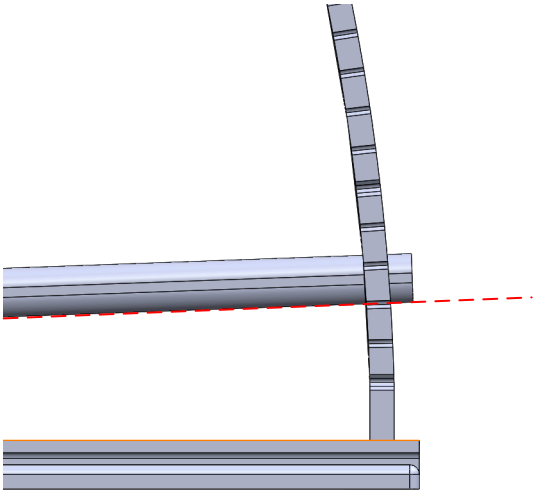

Figure 3-16. Protractor Angle Alignment

7. Apply 3.3 V to Vcc (accepts 1.65V - 5.5 V) to power Hall-Hinge-EVM.
8. Adjust the arm position and observe the output LED. The LED will illuminate when device output is activated by a magnetic field.

4 Schematics, PCB Layout, and Bill of Materials

Note

Board layouts are not to scale. These figures are intended to show how the board is laid out. The figures are not intended to be used for manufacturing EVM PCBs.

Schematics

Figure 4-1 shows the schematic of the EVM.

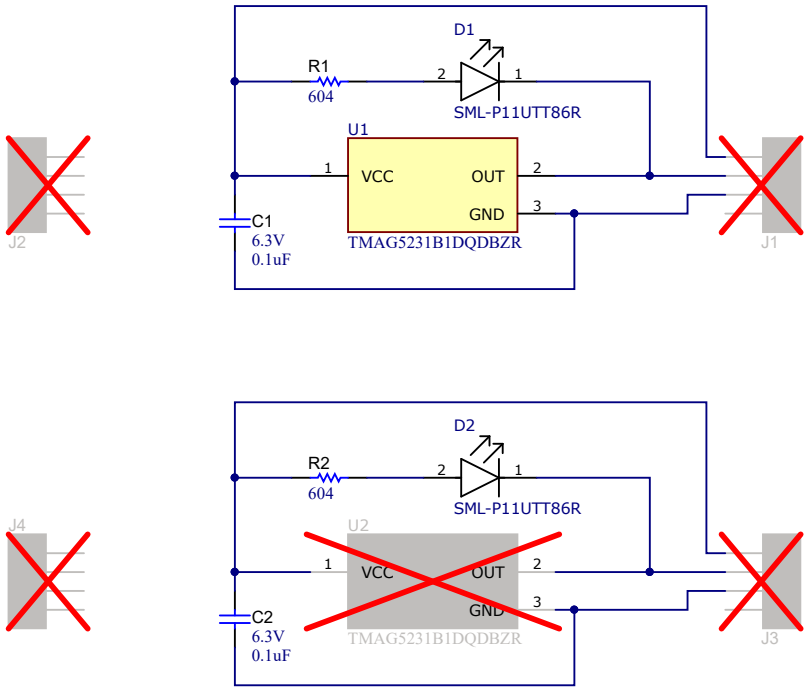

Figure 4-1. HALL-HINGE-EVM Schematic

PCB Layout

Figure 4-2 through Figure 4-4 show the PCB layers of the EVM.

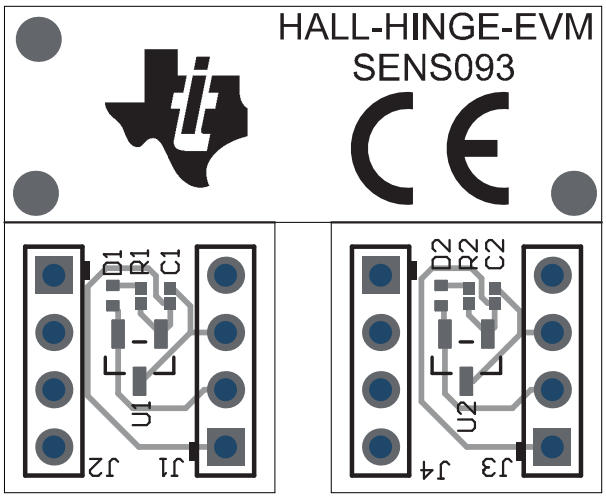

Figure 4-2. Top View

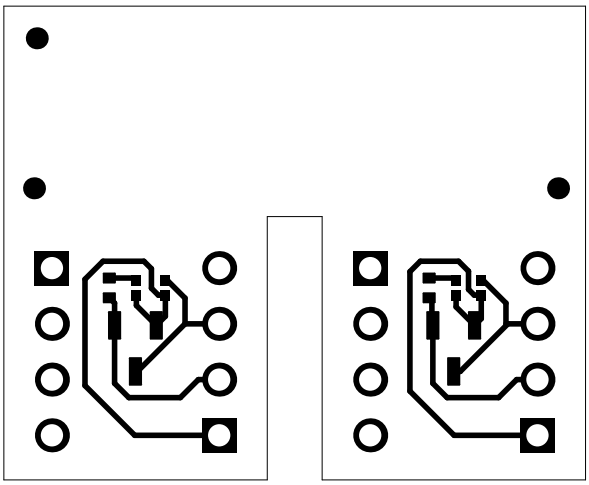

Figure 4-3. Top Copper

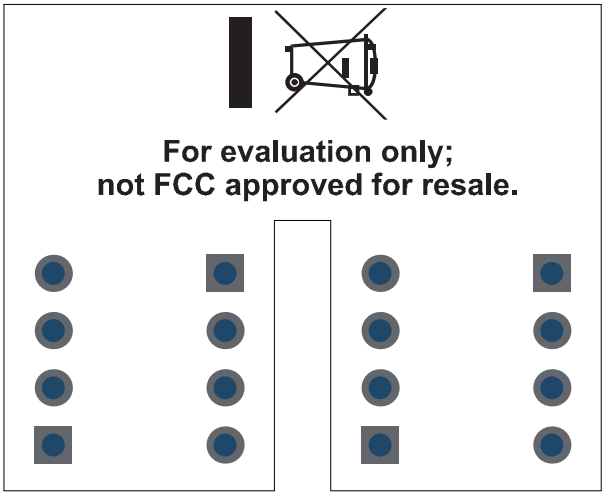

Figure 4-4. Bottom View

Bill of Materials

Table 4-1 provides the parts list for the EVM.

Table 4-1. Bill of Materials

Designator	Quantity	Value	Description	Package Reference	Part Number	Manufacturer
!PCB1	1		Printed Circuit Board		SENS093	Any
C1, C2	2	0.1 uF	CAP, CERM, 0.1 uF, 6.3 V, +/- 10%, X5R, 0201	0201	GRM033R60J104KE84D	MuRata
D1, D2	2		LED Uni-Color RED Chip LED 2-Pin 0402 T/R	0402	SML-P11UTT86R	ROHM
R1, R2	2	604	RES, 604, 1%, 0.05 W, 0201	0201	RC0201FR-07604RL	Yageo America
U1	1		Low-Power, Hall Effect Switch	SOT-23-3	TMAG5231B1DQDBZR	Texas Instruments

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