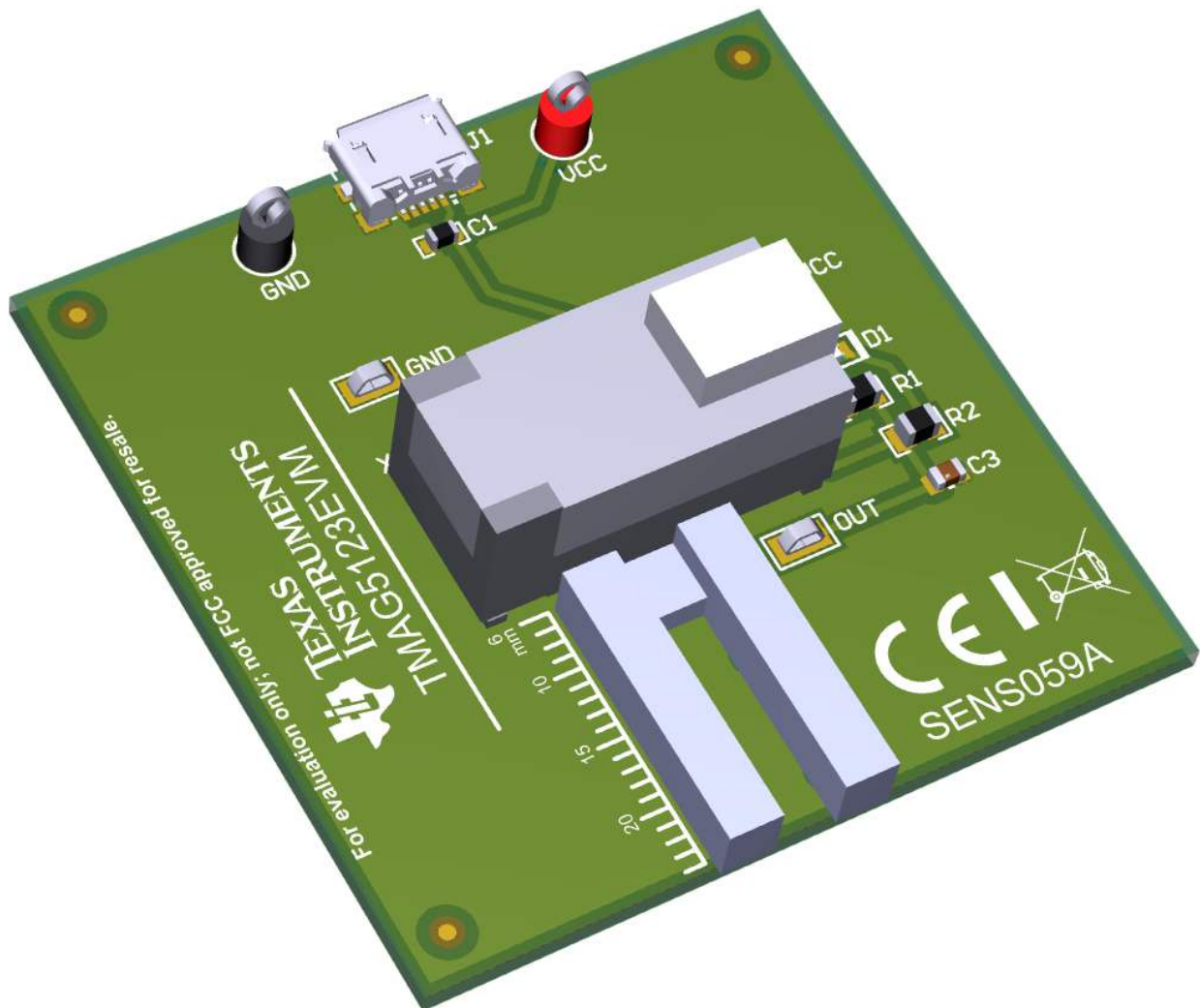


TMAG5123EVM



This user's guide describes the characteristics, operation, and use of the TMAG5123 high-precision, in-plane switch evaluation module (EVM). This EVM is designed to evaluate the performance of the TMAG5123. This document includes a schematic, printed-circuit board (PCB) layouts, and a complete bill of materials (BOM).

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1 Overview

The TMAG5123 is a family of high-precision, wide input voltage, in-plane Hall effect sensors designed for system challenges where higher magnetic precision is needed for more flexibility in design. The TMAG5123 evaluation module is populated with a Sensata 499-P36-20 test socket, which allows for convenient testing of all variants of the TMAG5123 family. Each device variant exhibits a different magnetic sensitivity, allowing utility for distance measurement in application. When the applied magnetic flux density exceeds the magnetic operating point (B_{OP}) threshold, the device output drives into low voltage state. When the magnetic flux density returns to a value below the magnetic release point (B_{RP}), the device output returns itself to a high voltage state. The TMAG5123EVM comes prepopulated with a TMAG5123B1 variant for out of the box evaluation. Additional variants can be sampled from www.ti.com. [Table 1](#) lists the different device variants available.

Table 1. Device Variants

DEVICE	BOP SENSITIVITY (MIN)	BOP SENSITIVITY (MAX)
TMAG5123A1	1 mT	3 mT
TMAG5123B1	2.5 mT	4.5 mT
TMAG5123C1	6 mT	8 mT
TMAG5123D1	9 mT	11 mT

The device operates from a VCC range of 2.5 V to 38 V, and is available in a standard SOT-23 package.

1.1 TMAG5123EVM Kit Contents

[Table 2](#) lists the contents of the TMAG5123EVM kit. Contact the nearest [Texas Instruments Product Information Center](#) if any component is missing. TI highly recommends checking the TMAG5123 family product folder on the TI website at www.ti.com for further information regarding this product.

Table 2. TMAG5123EVM Kit Contents

ITEM	QUANTITY
TMAG5123EVM test board	1
Handheld magnet (D3X8)	1
USB-Micro Cable	1

1.2 Related Documentation From Texas Instruments

The following document provides information regarding TI's integrated circuits used in the assembly of the TMAG5123EVM. This user's guide is available from the TI website under literature number [SLYU056](#). 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.

Table 3. Related Documentation

DOCUMENT	LITERATURE NUMBER
TMAG5123 product data sheet	SLYS030

2 TMAG5123EVM Hardware

The TMAG5123EVM is a simple-to-use platform for evaluating the main features and performance of the TMAG5123 across a wide voltage range. The EVM provides quick visual feedback to the user in the form of LED indication when the device under test's B_{OP} or B_{RP} thresholds are crossed.

2.1 Features

The layout of the TMAG5123EVM printed-circuit board (PCB) is designed to provide the following features:

- Burn-in test socket and precision 3D printed cradle for precise distance evaluation of in-plane sensors
- Provides LED feedback to the user to quickly determine output state from the TMAG5123
- Conveniently powered from a common micro-USB connector for quick prototyping

3 Quick Start Setup and Use

The following instructions are to set up and use the TMAG5123EVM:

1. Power up the EVM using either of the following methods:
 - a. USB power:
 - i. Insert the micro USB cable into the EVM onboard USB receptacle J1.
 - ii. Plug the USB cable into any USB power source (for example: laptop, desktop, power bank, and so forth).
 - b. Variable power supply
 - i. Set the power supply voltage to desired setting between 2.5 V and 38 V. Do not turn on the power yet.
 - ii. Connect the power supply V– terminal to the black GND test point on the EVM.
 - iii. Connect the power supply V+ terminal to the red VCC test point on the EVM.
 - iv. Turn on the power supply.

3.1 Measurements

The TMAG5123EVM enables the user to evaluate the functionality of the TMAG5123 Hall-effect sensor using either a common USB-micro connector or external power supply, which must first be setup as described in [Section 3](#).

The following test procedures are to be used for both USB and external power options.

- Step 1. Trigger the TMAG5123 device output: Slide either the north or south pole of the included D3X8 magnet along the measurement channel of the TMAG5123 Hall-effect sensor.
- Step 2. Observe the output: If using the onboard hardware, observe the indicator light D1 illuminate when the magnet gets close to the Hall-effect sensor. Alternatively, measurement can also be made through a voltage drop using an external voltage measuring device, such as an oscilloscope or digital multimeter (DMM).

4 TMAG5123EVM Circuit

This section summarizes the TMAG5123EVM components.

4.1 *Micro-USB Receptacle*

J1 is standard micro-USB receptacle. This receptacle provides 5-V power to the board if being used.

4.2 *Test Socket*

XU1 is a 499-P36-20 Sensata test socket, which is made for devices in a SOT-23 package, such as the TMAG5123. This socket allows for quick and easy transition between variants of the TMAG5123.

4.3 *LED Control*

R1 functions as a pullup resistor for the open-drain output of the TMAG5123.

R2 is a current-limiting resistor to control the output intensity of the signal diode D1.

While not normally populated, C3 is an optional SMT pad for capacitor placement, forming a first-order low pass filter with the pullup resistor.

5 TMAG5123EVM Schematic and PCB Layout

NOTE: Board layouts are not to scale. These figures are intended to show the board layout. The figures are not intended to be used for manufacturing TMAG5123EVM PCBs.

5.1 Schematic

Figure 1 shows the schematic for the TMAG5123EVM PCB.

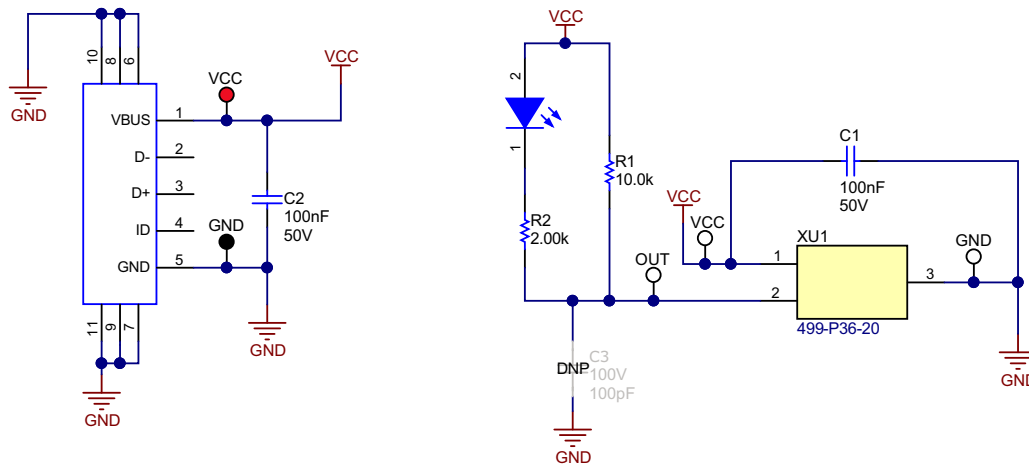


Figure 1. TMAG5123EVM Schematic

5.2 PCB Layout

Figure 2 through Figure 5 illustrate the PCB layout for the TMAG5123EVM.

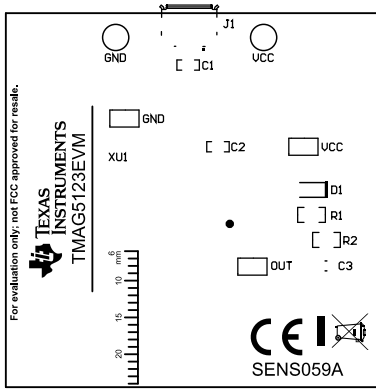


Figure 2. TMAG5123EVM Top Overlay

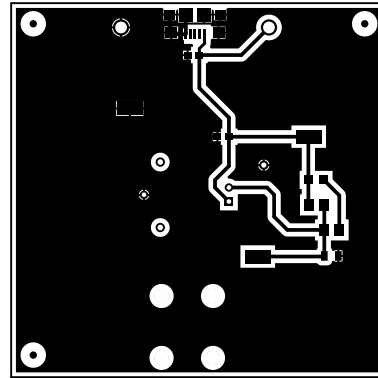


Figure 3. TMAG5123EVM Top Copper

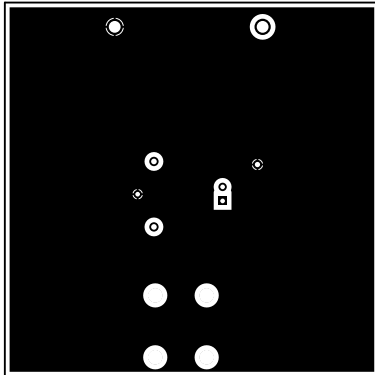


Figure 4. TMAG5123EVM Bottom Copper

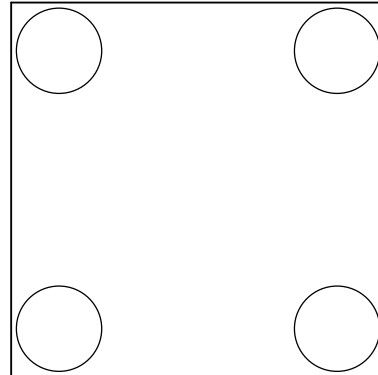


Figure 5. TMAG5123EVM Bottom Overlay

6 Bill of Materials

Table 4 provides the parts list for the TMAG5123EVM.

Table 4. TMAG5123EVM Bill of Materials

DESIGNATOR	QTY	VALUE	DESCRIPTION	PACKAGE REFERENCE	PART NUMBER	MANUFACTURER	ALTERNATE PART NUMBER	ALTERNATE MANUFACTURER
C1, C2	2	0.1uF	CAP, CERM, 0.1 uF, 50 V, +/- 10%, X7R, 0603	0603	C1608X7R1H104K080AA	TDK		
D1	1	Blue	LED, Blue, SMD	LED_0805	150080BS75000	Würth Elektronik		
H9,H10,H11,H12	4		Bumpon, Hemisphere, 0.44 X 0.20, Clear	Transparent Bumpon	SJ-5303 (CLEAR)	3M		
J1	1		Connector, Receptacle, Micro-USB Type B, R/A, Bottom Mount SMT	MICRO USB CONN, R/A	1981568-1	TE Connectivity		
MAG1	1		Magnet, N42, 3/16" Diameter, 1.5" Thickness		D3X8	KJMagnetics		
R1	1	10.0k	RES, 10.0 k, 1%, 0.125 W, AEC-Q200 Grade 0, 0805	0805	CRCW080510K0FKEA	Vishay-Dale		
R2	1	2.00k	RES, 2.00 k, 1%, 0.125 W, AEC-Q200 Grade 0, 0805	0805	CRCW08052K00FKEA	Vishay-Dale		
TP1	1		Test Point, Compact, Red, TH	Red Compact Testpoint	5005	Keystone		
TP2	1		Test Point, Compact, Black, TH	Black Compact Testpoint	5006	Keystone		
TP3, TP4, TP5	3		Test Point, Miniature, SMT	Testpoint_Keystone_Miniature	5015	Keystone		
U1	1		Precision In-Plane Digital-Switch Hall-effect Sensor, DBZ0003A	DBZ0003A	TMAG5123B1	Texas Instruments		
XU1	1		Socket, SOT23-3	Socket, 910x520x450 mil	499-P36-20	Sensata/Wells-CTI		
C3	0		100pF ±10% 100V Ceramic Capacitor X7R 0805 (2012 Metric)	0805	885012207110	Würth Electronics		

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