

DRV425 Evaluation Module

This user's guide describes the characteristics, operation, and use of the DRV425EVM. The DRV425 is designed for open-loop magnetic field sensing using an integrated fluxgate. A complete circuit description as well as schematic diagram and bill of materials is included.

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Trademarks

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1 Features

- Full-featured Evaluation Board for the DRV425
- Allows for the use of various user supplied compensation coils
- On board or external reference option

2 Introduction

The DRV425EVM is an evaluation module for the DRV425 integrated circuit. The DRV425 is designed for magnetic field sensing applications, enabling isolated precision DC and AC field measurements. The DRV425 features an integrated fluxgate sensor and all required analog signal conditioning circuits, minimizing component count and cost.

3 Magnetic Field Interface

The DRV425 device contains an integrated fluxgate sensor which is located between pins 2 and 14. The magnetic field sensitivity is parallel to the surface of the chip.

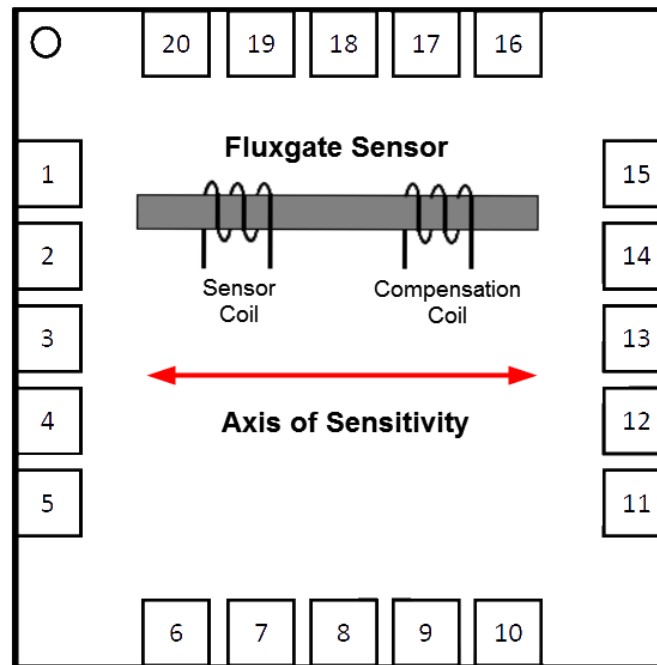


Figure 1. Magnetic Field Axis of Sensitivity

3.1 Power Supply

The DRV425EVM Board can be powered by a user provided 3.0 V to 5.5 V DC supply. The supply voltage is applied to J1 pin 4 (VDD) referenced to pin 3 (GND).

3.2 Reference Voltages

The DRV425EVM has an internal reference source, which is enabled automatically when the appropriate power source is applied to the device. There are three options for the reference voltage which depend on the state of two reference selection pins RSEL1 and RSEL0 as shown in Table 1.

Table 1. Internal Reference Options

RSEL1	RSEL0	REFERENCE VOLTAGE
0	0	Fixed Reference of 2.5 V
0	1	Fixed Reference of 1.65 V
1	0	Ratio-metric reference equal to VDD/2 (default)
1	1	

The reference options provided are based on the typical operating voltages of the device. For applications using a 3.3-V power supply, the reference can be fixed at 1.65 V. For 5-V operation, the reference is normally set for 2.5 V. In applications where the supply voltage may vary, the ratiometric option is provided.

The DRV425EVM is not directly configured for an external reference. If an external reference is desired, the trace between pins 4 and 5 of the DRV425 device can be cut as noted in Figure 2.

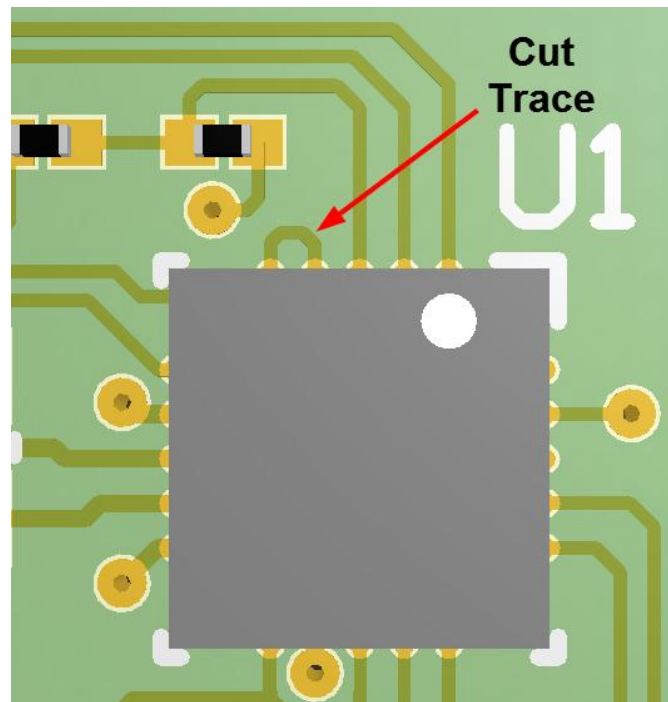


Figure 2. Board Modification for External Reference

An external reference can be applied to J1 pin 1, referenced to pin 3. If an external reference is used, it is important to keep it at a level of $V_{DD}/2$, which is the common mode point of the differential amplifier output stage of the DRV425 device. Reference voltages beyond $V_{DD}/2$ will result in offset and gain errors.

3.3 Output Voltage

The output voltage of the DRV425EVM is located on J1 pin 2 and can be referred to the reference at J1 pin 2 or the power supply ground at J1 pin 3.

4 EVM Operation

Factory setup of the DRV425EVM is for an input supply voltage range from 3.3 V to 5 V. Resistors R3 through R8 configure the reference voltage and bandwidth settings of the DRV425EVM. The default conditions are listed in [Table 2](#).

Table 2. Factory Configuration Defaults

RESISTOR	FUNCTION	DEFAULT CONDITION
R3	Pull-up for BSEL to VDD	0 Ω
R4	Pull-down for BSEL to GND	open
R5	Pull-up for RSEL0 to VDD	0 Ω
R6	Pull-down for RSEL0 to GND	open
R7	Pull-up for RSEL1 to VDD	0 Ω
R8	Pull-down for RSEL1 to GND	open

If the default condition is not the desired configuration of the DRV425EVM, simply remove and replace the resistors for the desired operating mode. If there is a desire to modify the state of the reference voltage or device bandwidth during physical operation of the EVM, resistors R3 through R8 can be removed and driven directly via GPIO pins on a microprocessor using fly wires.

4.1 Error and Over Range

R2 and R9 are 10-kΩ pull-up resistors on the Over Range (/OR) and Error (/ER) flag output pins respectively. To observe the state of the flags, simply probe the chip side of the resistor. These outputs are open drain and a pull up is required to observe the active low output state. These pins may also be fly-wired to a micro controller for use as interrupt pins.

4.2 Calculation of Magnetic Field Strength

The magnetic field strength (B) can be calculated by [Equation 1](#).

$$B = \frac{V_{OUT}}{G \times G_{fg} \times R_{shunt}} = \frac{V_{OUT}}{4 \times 12.2 \times R1} \quad (1)$$

The maximum magnetic field range of the DRV425 is ±2 mT. With the 100 Ω shunt located at R1, the maximum field measurement range is ±500 μT. To increase the sensitivity, R1 can be adjusted based on [Equation 1](#). Higher magnetic fields result in increased current flowing through R1. The output voltage of the differential amplifier in the DRV425 will reach its peak amplitude with a maximum voltage drop across R1 as shown in [Equation 2](#).

$$VR1 = \frac{VDD - REFOUT}{4} \quad (2)$$

4.2.1 Laboratory Measurement Results

Figure 3 and Figure 4 provide measured test results for linearity and error.

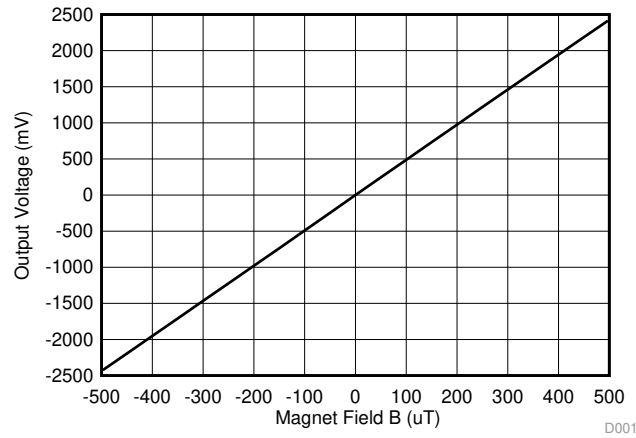


Figure 3. Output Voltage vs. Magnetic Field Strength

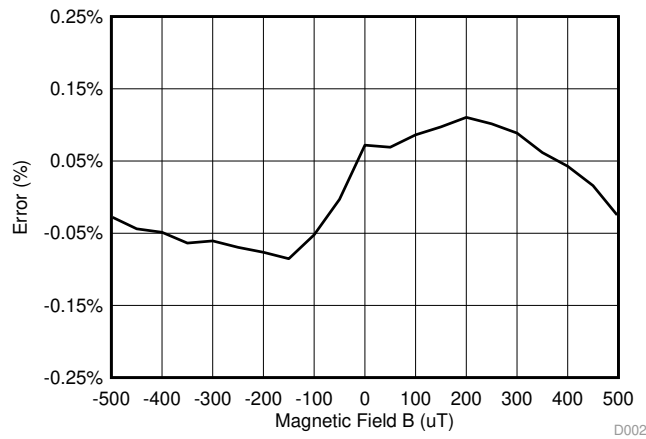


Figure 4. Error vs. Magnetic Field Strength

5 Schematic and Bill of Materials

The following pages contain the DRV425EVM Bill of materials, top level silkscreen and circuit schematic diagrams.

Table 3. Bill of Materials

DESIGNATORS	DESCRIPTION	MANUFACTURER	MFG. PART NUMBER
C1, C2	CAP, CERM, 1 μ F, 25 V, +/- 10%, X7R, 0603	Kemet	C0603C105K3RACTU
J1	Header, 100mil, 4x1, Gold, R/A, TH	Samtec	TSW-104-08-G-S-RA
R1	RES, 100, 1%, 0.125 W, 0805	Vishay-Dale	CRCW0805100RFKEA
R2, R9	RES, 10 k, 5%, 0.063 W, 0402	Vishay-Dale	CRCW040210K0JNED
R3, R5, R7	RES, 0, 5%, 0.05 W, 0201	Panasonic	ERJ-1GE0R00C
U1	Fluxgate Magnetic Field Sensor	Texas Instruments	DRV425RTJR
R4, R6, R8	Not Installed	Panasonic	ERJ-1GE0R00C

Figure 5 provides detail of the top-side layout for the DRV425EVM. Please note that resistors R3 through R8 do not have any physical silkscreen on the printed circuit board, they are highlights below for clarity.

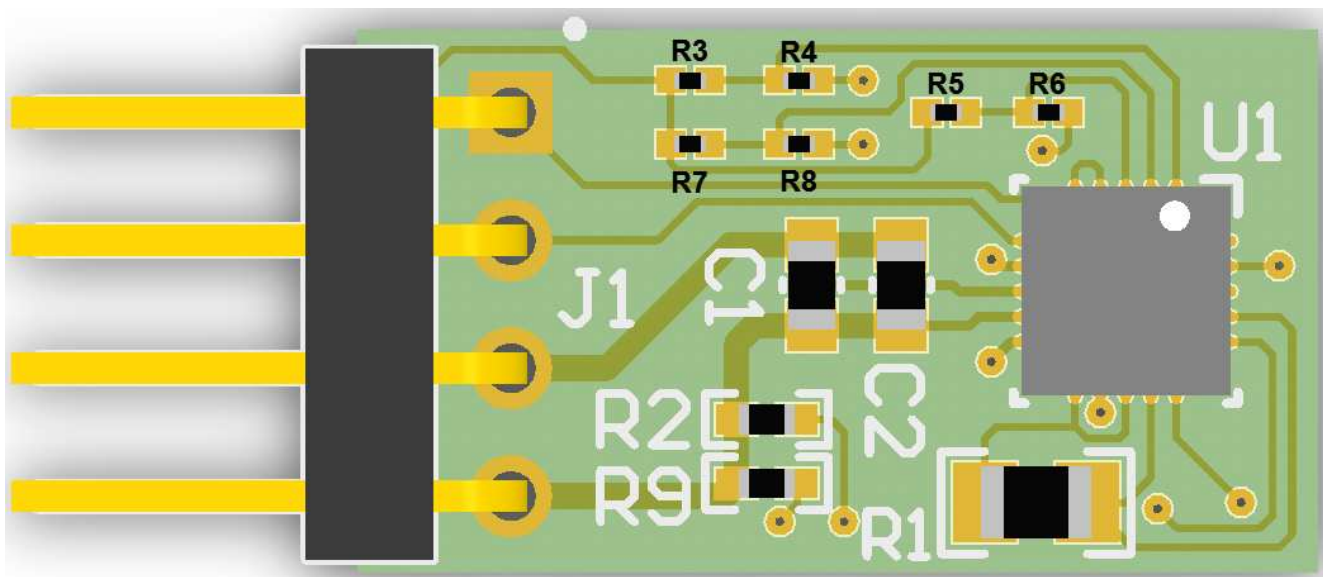


Figure 5. DRV425EVM Top Side Layout

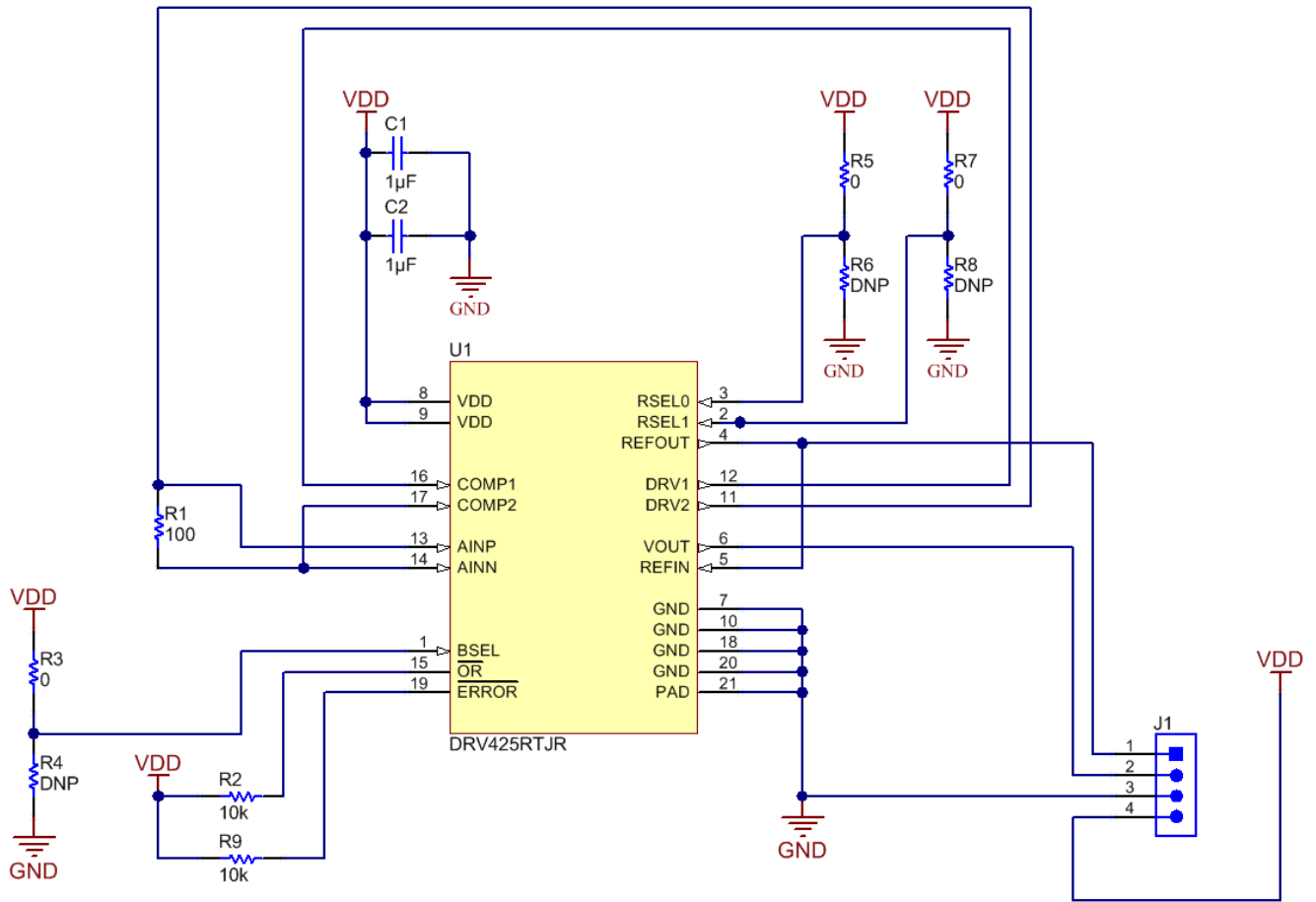


Figure 6. DRV425EVM Schematic

Revision History

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

Changes from A Revision (October 2015) to B Revision	Page
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- | | |
|--|---|
| • Changed the FUNCTION column of Table 2 | 4 |
|--|---|

Changes from Original (September 2015) to A Revision	Page
---	-------------

- | | |
|---|---|
| • Deleted text "The magnetic field measurement range is between ± 0.5 mT based on the installed shunt resistor at R1 of 100 Ω ." from the first paragraph in Section 4 | 4 |
| • Changed Equation 1 | 4 |
| • Added text "To increase the sensitivity, R1 can be adjusted based on Equation 1 ." in Section 4.2 | 4 |

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