DRV5032-SOLAR-EVM

This user's guide describes the characteristics, operation, and use of the DRV5032 solar evaluation module (EVM). This EVM is designed to evaluate the performance of the DRV5032 ultra-low power digital switch Hall-effect sensor. This document includes a schematic, printed-circuit board (PCB) layouts, and a complete bill of materials.

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Trademarks

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1 Overview

The DRV5032FB device is an ultra-low-power digital switch Hall-effect sensor, designed for the most compact and battery-sensitive systems.

When the applied magnetic flux density exceeds the B_{OP} threshold, the device output drives a low voltage. The output stays low until the flux density decreases to less than B_{RP}, and then the output either drives a high voltage or becomes high impedance, depending on the device version. By incorporating an internal oscillator, the device samples the magnetic field and updates the output at a rate of 20 Hz, or 5 Hz for the lowest current consumption.

The device operates from a VCC range of 1.65 V to 5.5 V, and is packaged in a standard SOT-23.

1.1 DRV5032-SOLAR-EVM Kit Contents

Table 1 lists the contents of the DRV5032-SOLAR-EVM kit. Contact the nearest Texas Instruments Product Information Center if any component is missing. TI highly recommends checking the DRV5032 family product folder on the TI website at www.ti.com for further information regarding this product.

Table 1. DRV5032-SOLAR-EVM Kit Contents

Item	Quantity
DRV5032-SOLAR-EVM test board	1
Handheld magnet (8182)	1

1.2 Related Documentation From Texas Instruments

The following document provides information regarding TI's integrated circuits used in the assembly of the DRV5032-SOLAR-EVM. This user's guide is available from the TI website under literature number SLVUB45 . 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 2. Related Documentation

Document	Literature Number
DRV5032 product data sheet	SLVSDC7

2 DRV5032-SOLAR-EVM Hardware

The DRV5032-SOLAR-EVM is a compact, easy-to-use platform for evaluating the main features and performance of the DRV5032 ultra-low power digital switch Hall-effect sensor across its specified input voltage and temperature ranges. The EVM features an onboard solar panel to power the device highlighting its ultra-low power design. The EVM also contains an LED indicator to conveniently show when the device output has been triggered.

2.1 Features

The layout of the DRV5032-SOLAR-EVM printed-circuit board (PCB) is designed to provide the following features:

- Ultra-low power
- Onboard solar panel
- LED indicator to conveniently show when device output has been triggered

See the DRV5032 data sheet (SLVSDC7) for comprehensive information about the DRV5032FB device.

3 Quick Start Setup and Use

The following are instructions to set up and use the DRV5032 on the DRV5032-SOLAR-EVM:

Setup using the onboard test hardware:

Step 1. Power supply (solar panel): Connect jumpers across the pins for J1 and J3. Ensure that the solar panel is in a well lighted area.

Step 2. Device output (LED indicator): Connect a jumper across the pins for J2.

Step 3. Test the DRV5032 Hall-effect sensor as described in Section 3.1.

Setup using external test hardware:

Step 1. Power supply: Remove the jumpers across the pins for J1 and J3. Connect an external DC supply voltage between 1.65-V and 5.5-V to the VCC pin side of J1,and connect ground reference of that supply to the GND pin side of J3.

Step 2. Device output: Remove the jumper across the pins for J2. Connect desired measurement tool to the OUT pin side of J2.

Step 3. Test the DRV5032 Hall-effect sensor as described in Section 3.1.

NOTE: When using an external voltage source, you must also use an external voltage measurement tool to view the device output, however, you may still view the device output with an external voltage measurement tool while using the onboard solar panel.

3.1 Measurements

The DRV5032-SOLAR-EVM enables the user to test the functionality of the DRV5032 Hall-effect sensor using either the onboard hardware or external hardware, which must first be setup as described in Section 3.

The following test procedures are to be used for both onboard and external hardware.

Step 1. Trigger the DRV5032 device output: Lower either the north or south pole of a magnet directly over the DRV5032FB Hall-effect sensor.

Step 2. Observe the output: If using the onboard hardware, observe the indicator light D1 blink when the magnet gets close to the Hall-effect sensor. Alternatively, observe the voltage drop on an external voltage measuring device.

4 DRV5032-SOLAR-EVM Circuit

This section summarizes the DRV5032-SOLAR-EVM components.

4.1 C1

C1 is a 22-µF storage capacitor to power the LED.

4.2 C2

C2 is a 0.1-µF supply bypass capacitor for the DRV5032FB Hall-effect sensor.

4.3 D1

D1 is the LED indicator to show when the DRV5032FB B_{OP} threshold has been crossed.

4.4 J1

J1 is a jumper that connects the power of the solar cell to VCC. When removed, an external VCC may be applied. This must be used in conjunction with J3.

4.5 J2

J2 is a jumper that connects the DRV5032FB output to the LED indicator. When removed, an external voltage meter may be used to observe the output.

4.6 J3

J3 is a jumper that connects the ground of the solar cell to GND. When removed, an external GND may be applied. This must be used in conjunction with J1.

4.7 U1

U1 is the DRV5032FB test device. Lower a north or south pole of a magnet over this device to cross its B_{OP} threshold and drive its out pin low.

4.8 U2

U2 is the solar panel that can optionally power the DRV5032-SOLAR-EVM.

4.9 U3

U3 is a voltage supervisor to used to monitor the voltage from the solar cell.

5 DRV5032-SOLAR-EVM 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 DRV5032-SOLAR-EVM PCBs.

5.1 Schematic

Figure 1 shows the schematic for the DRV5032-SOLAR-EVM PCB.

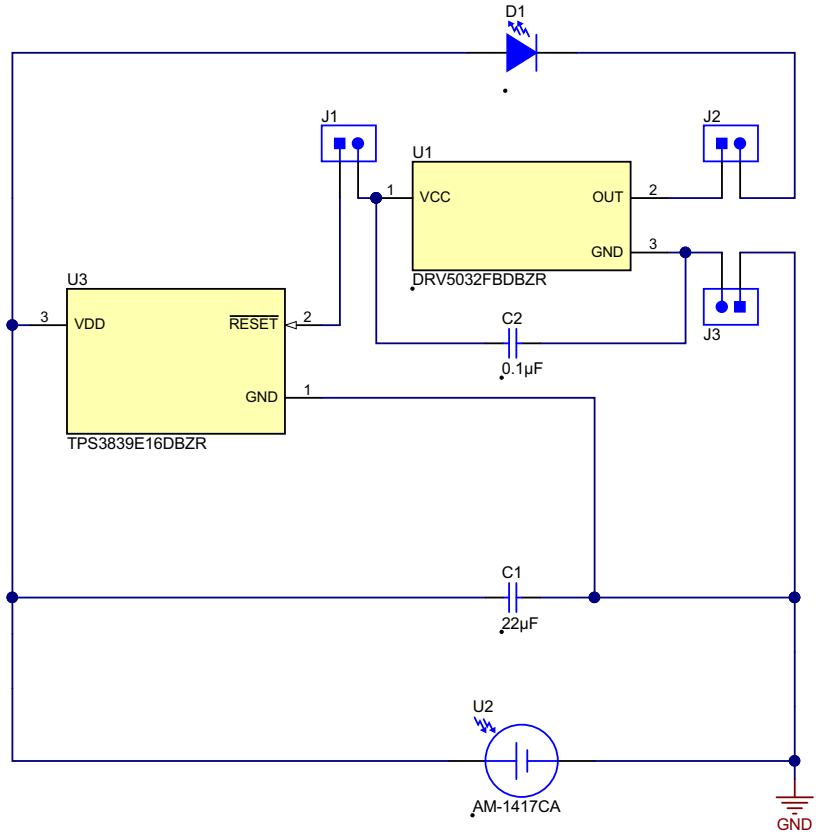

Figure 1. DRV5032-SOLAR-EVM Schematic

5.2 PCB Layout

Figure 2 through Figure 6 illustrate the PCB layout for the DRV5032-SOLAR-EVM.

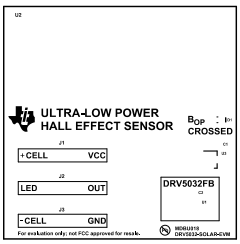

Figure 2. DRV5032-SOLAR-EVM Top Overlay

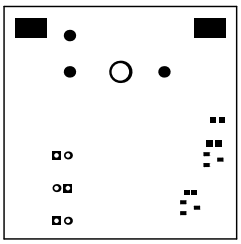

Figure 3. DRV5032-SOLAR-EVM Top Solder Mask

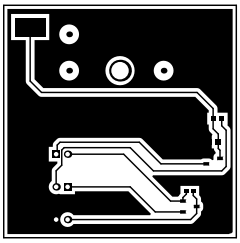

Figure 4. DRV5032-SOLAR-EVM Top Layer

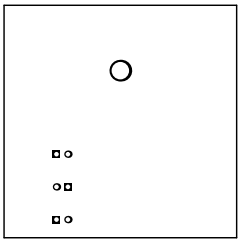

Figure 5. DRV5032-SOLAR-EVM Bottom Layer

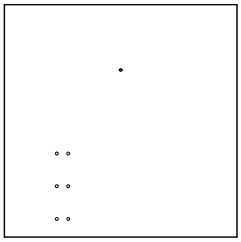

Figure 6. DRV5032-SOLAR-EVM Drill Drawing

6 Bill of Materials

Table 3 provides the parts list for the DRV5032-SOLAR-EVM.

Table 3. DRV5032-SOLAR-EVM Bill of Materials

Designator	Qty	Value	Description	Package Reference	Part Number	Manufacturer	Alternate Part Number	Alternate Manufacturer
C1	1	22uF	CAP, CERM, 22 µF, 6.3 V, +/- 20%, X5R, 0603	0603	C1608X5R0J226M080AC	TDK		
C2	1	0.1uF	CAP, CERM, 0.1 µF, 6.3 V, +/- 20%, X5R, 0402	0402	885012105001	Wurth Elektronik		
D1	1	Green	LED, Green, SMD	1.7x0.65x0.8mm	LG L29K-G2J1-24-Z	OSRAM		
H1	1		MAGNET CYLINDRICAL NDFEB AXIAL	Used in PnP output and some BOM reports	8182	Radial Magnet Inc.	-	-
H2	1		As Required: SUPER GLUE LIQUID 0.1 OZ	Used in PnP output and some BOM reports	8333-3G	MG Chemicals	-	-
J1, J2, J3	3		Header, 2mm, 2x1, Gold, Black, TH	Header, 2mm, 2x1, TH	M22-2510205	Harwin		
SH-J1, SH-J2, SH-J3	3		CONN SHUNT 2MM OPEN TOP 2PS GOLD	SHUNT	SPN02SYBN-RC	Sullins Connector Solutions		
U1	1		Ultra-Low Power Digital-Switch Hall-effect Sensor, DBZ0003A	DBZ0003A	DRV5032FBDBZR	Texas Instruments		Texas Instruments
U2	1		Silicon Solar Cell, SMD	35x13.9mm	AM-1417CA	Panasonic		
U3	1		150-nA, Ultralow Power, Supply Voltage Monitor, DBZ0003A (SOP-3)	DBZ0003A	TPS3839E16DBZR	Texas Instruments	TPS3839E16DBZT	Texas Instruments

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      3.1.1 *Notice applicable to EVMs not FCC-Approved:*

      FCC NOTICE: This kit is designed to allow product developers to evaluate electronic components, circuitry, or software associated with the kit to determine whether to incorporate such items in a finished product and software developers to write software applications for use with the end product. This kit is not a finished product and when assembled may not be resold or otherwise marketed unless all required FCC equipment authorizations are first obtained. Operation is subject to the condition that this product not cause harmful interference to licensed radio stations and that this product accept harmful interference. Unless the assembled kit is designed to operate under part 15, part 18 or part 95 of this chapter, the operator of the kit must operate under the authority of an FCC license holder or must secure an experimental authorization under part 5 of this chapter.

      3.1.2 *For EVMs annotated as FCC – FEDERAL COMMUNICATIONS COMMISSION Part 15 Compliant:*

      CAUTION

      This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

      Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

      FCC Interference Statement for Class A EVM devices

      NOTE: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

FCC Interference Statement for Class B EVM devices

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- *Reorient or relocate the receiving antenna.*
- *Increase the separation between the equipment and receiver.*
- *Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.*
- *Consult the dealer or an experienced radio/TV technician for help.*

3.2 *Canada*

3.2.1 *For EVMs issued with an Industry Canada Certificate of Conformance to RSS-210 or RSS-247*

Concerning EVMs Including Radio Transmitters:

This device complies with Industry Canada license-exempt RSSs. Operation is subject to the following two conditions:

(1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Concernant les EVMs avec appareils radio:

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes: (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

Concerning EVMs Including Detachable Antennas:

Under Industry Canada regulations, this radio transmitter may only operate using an antenna of a type and maximum (or lesser) gain approved for the transmitter by Industry Canada. To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (e.i.r.p.) is not more than that necessary for successful communication. This radio transmitter has been approved by Industry Canada to operate with the antenna types listed in the user guide with the maximum permissible gain and required antenna impedance for each antenna type indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.

Concernant les EVMs avec antennes détachables

Conformément à la réglementation d'Industrie Canada, le présent émetteur radio peut fonctionner avec une antenne d'un type et d'un gain maximal (ou inférieur) approuvé pour l'émetteur par Industrie Canada. Dans le but de réduire les risques de brouillage radioélectrique à l'intention des autres utilisateurs, il faut choisir le type d'antenne et son gain de sorte que la puissance isotrope rayonnée équivalente (p.i.r.e.) ne dépasse pas l'intensité nécessaire à l'établissement d'une communication satisfaisante. Le présent émetteur radio a été approuvé par Industrie Canada pour fonctionner avec les types d'antenne énumérés dans le manuel d'usage et ayant un gain admissible maximal et l'impédance requise pour chaque type d'antenne. Les types d'antenne non inclus dans cette liste, ou dont le gain est supérieur au gain maximal indiqué, sont strictement interdits pour l'exploitation de l'émetteur

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http://www.tij.co.jp/lsds/ti_ja/general/eStore/notice_01.page

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2. Use EVMs only after User obtains the license of Test Radio Station as provided in Radio Law of Japan with respect to EVMs, or
3. Use of EVMs only after User obtains the Technical Regulations Conformity Certification as provided in Radio Law of Japan with respect to EVMs. Also, do not transfer EVMs, unless User gives the same notice above to the transferee. Please note that if User does not follow the instructions above, User will be subject to penalties of Radio Law of Japan.

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