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.
Contents

1 Overview .................................................................................................................................................. 3
2 DRV5032-SOLAR-EVM Hardware ........................................................................................................... 3
3 Quick Start Setup and Use ....................................................................................................................... 4
4 DRV5032-SOLAR-EVM Circuit .................................................................................................................. 5
5 DRV5032-SOLAR-EVM Schematic and PCB Layout .............................................................................. 6
6 Bill of Materials ...................................................................................................................................... 8

List of Figures

1 DRV5032-SOLAR-EVM Schematic ........................................................................................................... 6
2 DRV5032-SOLAR-EVM Top Overlay ......................................................................................................... 7
3 DRV5032-SOLAR-EVM Top Solder Mask ................................................................................................ 7
4 DRV5032-SOLAR-EVM Top Layer ............................................................................................................ 7
5 DRV5032-SOLAR-EVM Bottom Layer ..................................................................................................... 7
6 DRV5032-SOLAR-EVM Drill Drawing ..................................................................................................... 7

List of Tables

1 DRV5032-SOLAR-EVM Kit Contents ....................................................................................................... 3
2 Related Documentation ........................................................................................................................... 3
3 DRV5032-SOLAR-EVM Bill of Materials ................................................................................................. 8

Trademarks

All trademarks are the property of their respective owners.
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 $B_{\text{op}}$ threshold, the device output drives a low voltage. The output stays low until the flux density decreases to less than $B_{\text{op}}$, 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>
<thead>
<tr>
<th>Item</th>
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<tr>
<td>DRV5032-SOLAR-EVM test board</td>
<td>1</td>
</tr>
<tr>
<td>Handheld magnet (8182)</td>
<td>1</td>
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</table>

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>
<thead>
<tr>
<th>Document</th>
<th>Literature Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>DRV5032 product data sheet</td>
<td>SLVSDC7</td>
</tr>
</tbody>
</table>

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 \( B_{\text{OP}} \) 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 \( B_{\text{OP}} \) 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
Table 3. DRV5032-SOLAR-EVM Bill of Materials

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<tr>
<th>Designator</th>
<th>Qty</th>
<th>Value</th>
<th>Description</th>
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<th>Manufacturer</th>
<th>Alternate Part Number</th>
<th>Alternate Manufacturer</th>
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<td>22uF</td>
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<td>Wurth Elektronik</td>
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<td>Radial Magnet Inc.</td>
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<td>-</td>
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<td>H2</td>
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<td></td>
<td>As Required: SUPER GLUE LIQUID 0.1 OZ</td>
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<td>Texas Instruments</td>
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<td>Texas Instruments</td>
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<td>TPS3839E16DBZR</td>
<td>Texas Instruments</td>
<td>TPS3839E16DBZT</td>
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1. Delivery: TI delivers TI evaluation boards, kits, or modules, including any accompanying demonstration software, components, and/or documentation which may be provided together or separately (collectively, an “EVM” or “EVMs”) to the User (“User”) in accordance with the terms set forth herein. User's acceptance of the EVM is expressly subject to the following terms.

1.1 EVMs are intended solely for product or software developers for use in a research and development setting to facilitate feasibility evaluation, experimentation, or scientific analysis of TI semiconductors products. EVMs have no direct function and are not finished products. EVMs shall not be directly or indirectly assembled as a part or subassembly in any finished product. For clarification, any software or software tools provided with the EVM (“Software”) shall not be subject to the terms and conditions set forth herein but rather shall be subject to the applicable terms that accompany such Software.

1.2 EVMs are not intended for consumer or household use. EVMs may not be sold, sublicensed, leased, rented, loaned, assigned, or otherwise distributed for commercial purposes by Users, in whole or in part, or used in any finished product or production system.

2 Limited Warranty and Related Remedies/Disclaimers:

2.1 These terms do not apply to Software. The warranty, if any, for Software is covered in the applicable Software License Agreement.

2.2 TI warrants that the TI EVM will conform to TI's published specifications for ninety (90) days after the date TI delivers such EVM to User. Notwithstanding the foregoing, TI shall not be liable for a nonconforming EVM if (a) the nonconformity was caused by neglect, misuse or mistreatment by an entity other than TI, including improper installation or testing, or for any EVMs that have been altered or modified in any way by an entity other than TI, (b) the nonconformity resulted from User's design, specifications or instructions for such EVMs or improper system design, or (c) User has not paid on time. Testing and other quality control techniques are used to the extent TI deems necessary. TI does not test all parameters of each EVM. User's claims against TI under this Section 2 are void if User fails to notify TI of any apparent defects in the EVMs within ten (10) business days after delivery, or of any hidden defects with ten (10) business days after the defect has been detected.

2.3 TI's sole liability shall be at its option to repair or replace EVMs that fail to conform to the warranty set forth above, or credit User's account for such EVM. TI's liability under this warranty shall be limited to EVMs that are returned during the warranty period to the address designated by TI and that are determined by TI not to conform to such warranty. If TI elects to repair or replace such EVM, TI shall have a reasonable time to repair such EVM or provide replacements. Repaired EVMs shall be warranted for the remainder of the original warranty period. Replaced EVMs shall be warranted for a new full ninety (90) day warranty period.

3 Regulatory Notices:

3.1 United States

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.

3.3 Japan

3.3.1 Notice for EVMs delivered in Japan: Please see http://www.tij.co.jp/lds/it__ja/general/eStore/notice_01.page 日本国内に輸入される評価用キット、ボードについては、次のところをご覧ください。
http://www.tij.co.jp/lds/it__ja/general/eStore/notice_01.page

3.3.2 Notice for Users of EVMs Considered “Radio Frequency Products” in Japan: EVMs entering Japan may not be certified by TI as conforming to Technical Regulations of Radio Law of Japan.

If User uses EVMs in Japan, not certified to Technical Regulations of Radio Law of Japan, User is required to follow the instructions set forth by Radio Law of Japan, which includes, but is not limited to, the instructions below with respect to EVMs (which for the avoidance of doubt are stated strictly for convenience and should be verified by User):

1. Use EVMs in a shielded room or any other test facility as defined in the notification #173 issued by Ministry of Internal Affairs and Communications on March 28, 2006, based on Sub-section 1.1 of Article 6 of the Ministry’s Rule for Enforcement of Radio Law of Japan.
2. Use EVMs only alter 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 alter 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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2. 実験局の免許を取得後ご使用いただく。
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日本テキサス・インスツルメンツ株式会社
東京都新宿区西新宿6丁目24番1号
西新宿三井ビル

3.3.3 Notice for EVMs for Power Line Communication: Please see http://www.tij.co.jp/llds/ti_ja/general/eStore/notice_02.page

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3.4 European Union

3.4.1 For EVMs subject to EU Directive 2014/30/EU (Electromagnetic Compatibility Directive):

This is a class A product intended for use in environments other than domestic environments that are connected to a low-voltage power-supply network that supplies buildings used for domestic purposes. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

4 EVM Use Restrictions and Warnings:

4.1 EVMs ARE NOT FOR USE IN FUNCTIONAL SAFETY AND/OR SAFETY CRITICAL EVALUATIONS, INCLUDING BUT NOT LIMITED TO EVALUATIONS OF LIFE SUPPORT APPLICATIONS.

4.2 User must read and apply the user guide and other available documentation provided by TI regarding the EVM prior to handling or using the EVM, including without limitation any warning or restriction notices. The notices contain important safety information related to, for example, temperatures and voltages.

4.3 Safety-Related Warnings and Restrictions:

4.3.1 User shall operate the EVM within TI's recommended specifications and environmental considerations stated in the user guide, other available documentation provided by TI, and any other applicable requirements and employ reasonable and customary safeguards. Exceeding the specified performance ratings and specifications (including but not limited to input and output voltage, current, power, and environmental ranges) for the EVM may cause personal injury or death, or property damage. If there are questions concerning performance ratings and specifications, User should contact a TI field representative prior to connecting interface electronics including input power and intended loads. Any loads applied outside of the specified output range may also result in unintended and/or inaccurate operation and/or possible permanent damage to the EVM and/or interface electronics. Please consult the EVM user guide prior to connecting any load to the EVM output. If there is uncertainty as to the load specification, please contact a TI field representative.

During normal operation, even with the inputs and outputs kept within the specified allowable ranges, some circuit components may have elevated case temperatures. These components include but are not limited to linear regulators, switching transistors, pass transistors, current sense resistors, and heat sinks, which can be identified using the information in the associated documentation. When working with the EVM, please be aware that the EVM may become very warm.

4.3.2 EVMs are intended solely for use by technically qualified, professional electronics experts who are familiar with the dangers and application risks associated with handling electrical mechanical components, systems, and subsystems. User assumes all responsibility and liability for proper and safe handling and use of the EVM by User or its employees, affiliates, contractors or designees. User assumes all responsibility and liability to ensure that any interfaces (electronic and/or mechanical) between the EVM and any human body are designed with suitable isolation and means to safely limit accessible leakage currents to minimize the risk of electrical shock hazard. User assumes all responsibility and liability for any improper or unsafe handling or use of the EVM by User or its employees, affiliates, contractors or designees.

4.4 User assumes all responsibility and liability to determine whether the EVM is subject to any applicable international, federal, state, or local laws and regulations related to User's handling and use of the EVM and, if applicable, User assumes all responsibility and liability for compliance in all respects with such laws and regulations. User assumes all responsibility and liability for proper disposal and recycling of the EVM consistent with all applicable international, federal, state, and local requirements.

5. Accuracy of Information: To the extent TI provides information on the availability and function of EVMs, TI attempts to be as accurate as possible. However, TI does not warrant the accuracy of EVM descriptions, EVM availability or other information on its websites as accurate, complete, reliable, current, or error-free.
6. **Disclaimers:**

6.1 EXCEPT AS SET FORTH ABOVE, EVMS AND ANY MATERIALS PROVIDED WITH THE EVM (INCLUDING, BUT NOT LIMITED TO, REFERENCE DESIGNS AND THE DESIGN OF THE EVM ITSELF) ARE PROVIDED "AS IS" AND "WITH ALL FAULTS." TI DISCLAIMS ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, REGARDING SUCH ITEMS, INCLUDING BUT NOT LIMITED TO ANY EPIDEMIC FAILURE WARRANTY OR IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OR NON-INFRINGEMENT OF ANY THIRD PARTY PATENTS, COPYRIGHTS, TRADE SECRETS OR OTHER INTELLECTUAL PROPERTY RIGHTS.

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7. **User’s Indemnity Obligations and Representations.** User will defend, indemnify and hold TI, its licensors and their representatives harmless from and against any and all claims, damages, losses, expenses, costs and liabilities (collectively, "Claims") arising out of or in connection with any handling or use of the EVM that is not in accordance with these terms. This obligation shall apply whether claims arise under statute, regulation, or the law of tort, contract or any other legal theory, and even if the EVM fails to perform as described or expected.

8. **Limitations on Damages and Liability:**

8.1 **General Limitations.** In no event shall TI be liable for any special, collateral, indirect, punitive, incidental, consequential, or exemplary damages in connection with or arising out of these terms or the use of the EVMS, regardless of whether TI has been advised of the possibility of such damages. Excluded damages include, but are not limited to, cost of removal or reinstallation, ancillary costs to the procurement of substitute goods or services, retesting, outside computer time, labor costs, loss of goodwill, loss of profits, loss of savings, loss of use, loss of data, or business interruption. No claim, suit or action shall be brought against TI more than twelve (12) months after the event that gave rise to the cause of action has occurred.

8.2 **Specific Limitations.** In no event shall TI’s aggregate liability from any use of an EVM provided hereunder, including from any warranty, indemnity or other obligation arising out of or in connection with these terms, exceed the total amount paid to TI by user for the particular EVM(s) at issue during the prior twelve (12) months with respect to which losses or damages are claimed. The existence of more than one claim shall not enlarge or extend this limit.

9. **Return Policy.** Except as otherwise provided, TI does not offer any refunds, returns, or exchanges. Furthermore, no return of EVM(s) will be accepted if the package has been opened and no return of the EVM(s) will be accepted if they are damaged or otherwise not in a resalable condition. If User feels it has been incorrectly charged for the EVM(s) it ordered or that delivery violates the applicable order, User should contact TI. All refunds will be made in full within thirty (30) working days from the return of the components(s), excluding any postage or packaging costs.

10. **Governing Law:** These terms and conditions shall be governed by and interpreted in accordance with the laws of the State of Texas, without reference to conflict-of-laws principles. User agrees that non-exclusive jurisdiction for any dispute arising out of or relating to these terms and conditions lies within courts located in the State of Texas and consents to venue in Dallas County, Texas. Notwithstanding the foregoing, any judgment may be enforced in any United States or foreign court, and TI may seek injunctive relief in any United States or foreign court.
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