The AMC1311 is a precision isolation amplifier with an output separated from the input circuitry by a silicon dioxide (SiO2) barrier that is highly resistant to magnetic interference. This barrier has been certified to provide reinforced galvanic isolation of up to 7000 $V_{PEAK}$ per DIN V VDE V 0884-11 (VDE V 0884-11): 2017-01.

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Introduction

For use in high-resolution voltage measurement applications, the high-impedance input of the AMC1311 is optimized for connection to high-voltage resistive dividers or other voltage signal sources with high output resistance.

Throughout this document, the abbreviation EVM and the term evaluation module are synonymous with the AMC1311EVM.

1 Features

• Full-featured Evaluation Module for the AMC1311 single-channel precision isolation amplifier.
• Screw terminals for easy access to analog inputs and outputs.
• Transformer and rectifiers to provide an isolated 5-V source to VDD1.
• Differential to Single-ended output option.

2 Analog Interface

The analog input to the AMC1311 is routed from a three-wire screw terminal screw at J1.1 which provides access to the VINP terminal. A test point, TP1 is also provided along with pads for 1206 size user installed series resistors R1, R2 and R3 to create a voltage divider circuit for the input to the AMC1311. The analog input is referenced to J1.2 or TP2.

2.1 Analog Input

The default analog input to the AMC1311EVM board is comprised of R4 and C3 which form a simple anti-aliasing filter with a corner frequency of 723 Hz. The input circuit for the AMC1311 is shown in Figure 1. Using a signal generator or other voltage source, the user can apply an input signal directly to J1 pin 1. The maximum voltage input to the AMC1311 via J1.1 is 2 V referenced to J1.2 or TP2.

Figure 1. AMC1311EVM Schematic – Analog Input Section
With user installed resistor options R1 through R3, an external voltage source can be applied between TP1 and GND1 via J1.2 or TP2. As depicted in Figure 1, with R4 installed as 10 kΩ, resistors R1 through R3 can be chosen according to Equation 1:

\[ R1 + R2 + R3 = \frac{V_{TP1} - V_{INP}}{V_{INP}} \times R4 \]

(1)

### 2.2 Shutdown

The AMC1311 features a shutdown option which is an active high input. Shunt jumper SH-J7 is installed by default and allows for normal operation of the AMC1311 device. When the shunt jumper is removed, the AMC1311 enters into a low power mode by means of an internal pullup resistor for battery or other power sensitive applications. For external shutdown operation, J1.3 provides access to the SHTDN pin when shunt SH-J7 is removed.

### 2.3 Analog Output

The analog output from the AMC1311EVM board is a fully differential signal centered at 1.44 V. The differential output of U1 is available on the two screw terminals of J2 as shown below in Figure 2. U4 and U5 provide the user with a single-ended version of the analog output on J6 pin 1. U5 is designed to provide bias voltage to the difference amplifier configuration of U4. The single ended output provides unity gain with an output voltage swing from 0.5 V to 2.5 V. If a different bias voltage is desired, the shunt on J8 can be moved to cover pins 2-3 and an external voltage source may be applied to TP4 referenced to GND2 via TP3.

![Figure 2. AMC1311EVM Schematic – Analog Output Section](image-url)
3 Power Supplies

The AMC1311EVM requires two separate power rails, VDD1 and VDD2. VDD1 is on the high voltage side of the amplifier. VDD2 is on the user side of the amplifier.

3.1 VDD1 Input

The default configuration of the EVM provides 5V to VDD1 through transformer T1 via U3, an SN6501 push-pull driver. A shunt on jumper J5 is shorting pins 1-2 which routes the regulated 5V from U2, a TPS76350, to pin 1 of U1. The screw terminal at J4 allows the user to provide their own VDD1 source when the shunt on J5 is covering pins 2-3. The VDD1 supply should be between 3 and 5.5 VDC when using an external voltage source. The input power scheme is shown in Figure 3.

Figure 3. VDD1 Input

3.2 VDD2 Input

The user side of the AMC1311 isolation amplifier is rated for 3.0 to 5.5 VDC and is applied to the amplifier using J3 pin 1. When using the on-board transformer for VDD1, a minimum of 3.6 V is needed at J3. Figure 4 depicts the power input for VDD2.

Figure 4. VDD2 Input Connector
4  EVM Operation

The following section describes the general operation of the AMC1311EVM.

4.1  Isolated Power and Analog Inputs: J1 and J4

The analog input voltage to the AMC1311EVM can be applied directly to J1 pins 1 and 2. Table 1 lists the details of J1.

<table>
<thead>
<tr>
<th>Pin Number</th>
<th>Signal</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>J1.1</td>
<td>VINP</td>
<td>Analog input to the AMC1311.</td>
</tr>
<tr>
<td>J1.2</td>
<td>GND1</td>
<td>Ground connection.</td>
</tr>
<tr>
<td>J1.3</td>
<td>ShutDown</td>
<td>Optional input to drive the shutdown pin from an external source.</td>
</tr>
</tbody>
</table>

The isolated power input to the AMC1311EVM printed circuit board (PCB) can be applied directly to J4 pins 1 and 2. Table 2 lists the details of J4.

<table>
<thead>
<tr>
<th>Pin Number</th>
<th>Signal</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>J4.1</td>
<td>VDD1</td>
<td>Connection to the AMC1311 VDD1 terminal (pin 1) with SH-J5 shorting pins 2-3 on J5.</td>
</tr>
<tr>
<td>J4.2</td>
<td>GND1</td>
<td>Connection to the AMC1311 GND1 terminal (pin 4).</td>
</tr>
</tbody>
</table>

CAUTION

Carefully review the AMC1311 product data sheet for the limitations of the analog input range, and ensure that the appropriate analog/digital voltages are applied prior to connecting any analog input to the EVM. The transformer on the evaluation module is rated to 2500 Vrms, but the board is not certified for high voltage operation.

4.2  User Power and Analog Outputs: J2, J3 and J6

The differential analog output voltage from the AMC1311EVM printed circuit board is applied directly to J2 pins 1 and 2. Table 3 lists the details of J2.

<table>
<thead>
<tr>
<th>Pin Number</th>
<th>Signal</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>J2.1</td>
<td>VOUTN</td>
<td>Non-inverting analog output from the AMC1311 (pin 6).</td>
</tr>
<tr>
<td>J2.2</td>
<td>VOUTP</td>
<td>Inverting output from the AMC1311 (pin 7).</td>
</tr>
</tbody>
</table>

The VDD2 power input to the AMC1311EVM printed circuit board can be applied directly to J3 pins 1 and 2. Table 4 lists the details of J3.

<table>
<thead>
<tr>
<th>Pin Number</th>
<th>Signal</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>J3.1</td>
<td>VDD2</td>
<td>Connection to the AMC1311 VDD2 terminal (pin 8).</td>
</tr>
<tr>
<td>J3.2</td>
<td>GND2</td>
<td>Connection to the AMC1311 GND2 terminal (pin 5).</td>
</tr>
</tbody>
</table>

The single-ended analog output voltage from the AMC1311EVM printed circuit board is applied directly to J6 pin 1 referenced to pin 2. Table 5 lists the details of J6.
### Table 5. J6 – Single-Ended Analog Output

<table>
<thead>
<tr>
<th>Pin Number</th>
<th>Signal</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>J6.1</td>
<td>VOUT</td>
<td>Single-ended analog output from the AMC1311 through U4.</td>
</tr>
<tr>
<td>J6.2</td>
<td>GND2</td>
<td>Ground reference.</td>
</tr>
</tbody>
</table>

#### 4.3 Device Operation

Once the VDD1 and VDD2 power is applied to the AMC1311EVM, the analog output will be available with a fixed gain of one and a DC offset equal to 1.44 V (typical).

An analog input signal may be applied directly at screw terminal J2. Refer to Figure 1 and Table 2 for details. The analog input range is specified at 0 to 2 V.

The analog output has a nominal gain of 1 through the AMC1311 isolation amplifier. With an input voltage of 0 – 2 V, the nominal output is ±1 V differential. The output voltage is centered on 1.44 V providing a convenient analog input range to the embedded ADCs of the MSP430 and TMS320C2000 series of digital processors.

#### 5 Board Layout

This section contains the and printed circuit board (PCB) layout of the AMC1311EVM.

**NOTE:** Board layouts are not to scale. These are intended to show how the board is laid out, and are not intended to be used for manufacturing AMC1311EVM PCBs.

![Figure 5. AMC1311 Silk Screen Drawing](image-url)
# Schematic and Bill of Materials

This section contains the complete bill of materials, and schematic diagram of the AMC1311EVM.

## 6.1 Bill of Materials

<table>
<thead>
<tr>
<th>Designator</th>
<th>Description</th>
<th>Manufacturer</th>
<th>Mfg. Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>C1, C6</td>
<td>CAP, CERM, 0.1 µF, 50 V, +/- 10%, X7R, 1206</td>
<td>AVX</td>
<td>12065C104KAT2A</td>
</tr>
<tr>
<td>C2, C5</td>
<td>CAP, CERM, 4.7 µF, 25 V, +/- 20%, X5R, 1206</td>
<td>AVX</td>
<td>12063D475MAT2A</td>
</tr>
<tr>
<td>C3</td>
<td>CAP, CERM, 0.022 µF, 50 V, +/- 1%, C0G/NP0, 0805</td>
<td>Kemet</td>
<td>C0805C223FSGACTU</td>
</tr>
<tr>
<td>C4, C8, C9, C10</td>
<td>CAP, CERM, 10 µF, 16 V, +/- 10%, X5R, 0805</td>
<td>Taiyo Yuden</td>
<td>EMK212BJ106KG-T</td>
</tr>
<tr>
<td>C7, C15, C16</td>
<td>CAP, CERM, 0.1 µF, 50 V, +/- 10%, X7R, 0603</td>
<td>AVX</td>
<td>06035C104KAT2A</td>
</tr>
<tr>
<td>C11</td>
<td>CAP, CERM, 0.1 µF, 25 V, +/- 10%, X7R, 0603</td>
<td>Kemet</td>
<td>C0805C104K3RACTU</td>
</tr>
<tr>
<td>C12</td>
<td>CAP, CERM, 100 pF, 10 V, +/- 10%, X7R, 0603</td>
<td>AVX</td>
<td>0603ZC101KAT2A</td>
</tr>
<tr>
<td>C13, C14</td>
<td>CAP, CERM, 1000 pF, 10 V, +/- 10%, X7R, 0603</td>
<td>AVX</td>
<td>0603ZC102KAT2A</td>
</tr>
<tr>
<td>D1, D2</td>
<td>Diode, Schottky, 20V, 0.5A, SOD-123</td>
<td>ON Semiconductor</td>
<td>MBR0520LT1G</td>
</tr>
<tr>
<td>J1</td>
<td>Terminal Block, 3.5mm Pitch, 3x1, TH</td>
<td>On-Shore Technology</td>
<td>ED555/3DS</td>
</tr>
<tr>
<td>J2, J3, J4, J6</td>
<td>Terminal Block, 3.5mm Pitch, 2x1, TH</td>
<td>On-Shore Technology</td>
<td>ED555/2DS</td>
</tr>
<tr>
<td>J5, J8</td>
<td>Header, 2mm, 3x1, Tin, TH</td>
<td>Samtec</td>
<td>TMM-103-01-T-S</td>
</tr>
<tr>
<td>J7</td>
<td>Header, 50mil, 2x1, Gold, TH</td>
<td>Sullins Connector Solutions</td>
<td>GRPB021VWVN-RC</td>
</tr>
<tr>
<td>R4</td>
<td>RES, 10.0 k, 1%, 0.25 W, 1206</td>
<td>Vishay-Dale</td>
<td>CRCW120610K0FKEA</td>
</tr>
<tr>
<td>R5, R6, R7, R9, R10, R11</td>
<td>RES, 10.0 k, 1%, 0.1 W, 0603</td>
<td>Vishay-Dale</td>
<td>CRCW060310K0FKEA</td>
</tr>
<tr>
<td>R8</td>
<td>RES, 1.10 k, 1%, 0.1 W, 0603</td>
<td>Vishay-Dale</td>
<td>CRCW06031K10FKEA</td>
</tr>
<tr>
<td>T1</td>
<td>Transformer, 340uH, SMT</td>
<td>Wurth Elektronik</td>
<td>750313769</td>
</tr>
<tr>
<td>T1, T2, T3, T4</td>
<td>Terminal, Turret, TH, Double</td>
<td>Keystone</td>
<td>1502-2</td>
</tr>
<tr>
<td>U1</td>
<td>Precision, 2-V Input, Reinforced Isolated Amplifier, DWV0008A (SOIC-8)</td>
<td>Texas Instruments</td>
<td>AMC1311DWVR</td>
</tr>
<tr>
<td>U2</td>
<td>Single Output LDO, 150 mA, Fixed 5 V Output, with Ultra-Low IQ, 5-pin SOT-23 (DBV), -40 to 125 degC, Green (RoHS &amp; no Sb/Br)</td>
<td>Texas Instruments</td>
<td>TLV70450DBVT</td>
</tr>
<tr>
<td>U3</td>
<td>Transformer Driver for Isolated Power Supplies, DBV0005A</td>
<td>Texas Instruments</td>
<td>SN6501DBVR</td>
</tr>
<tr>
<td>U4, U5</td>
<td>Low-Power, Rail-to-Rail In/Out, 1-MHz Operational Amplifier for Cost-Sensitive Systems, DCK0005A (SOT-5)</td>
<td>Texas Instruments</td>
<td>TLV6001IDCKR</td>
</tr>
<tr>
<td>R1, R2, R3</td>
<td>Not Installed</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
6.2 Schematic

Figure 6. AMC1311EVM Schematic
7 Related Documentation

To obtain a copy of any of the following TI documents, call the Texas Instruments Literature Response Center at (800) 477-8924 or the Product Information Center (PIC) at (972) 644-5580. When ordering, please identify this booklet by its title and literature number. Updated documents can also be obtained through our website at www.ti.com/.

- AMC1311 Precision, 2-V Input, Reinforced Isolated Amplifier, SBAS786
- SN6501 Transformer Driver for Isolated Power Supplies, SLLSEA0
- TLV600x Low-Power, Rail-to-Rail In/Out, 1-MHz Op Amp for Cost-Sen, SBOS779
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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.

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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.
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.

### 3.3 Japan

3.3.1 Notice for EVMs delivered in Japan: Please see http://www.tij.co.jp/lds/lt_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/lt_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 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.
【無線電波を送信する製品の開発キットをお使いになる際の注意事項】 開発キットの中には技術基準適合証明を受けていないものがあります。技術基準適合証明を受けていないものご使用に際しては、電波法遵守のため、以下のいずれかの措置を取っていただく必要がありますのでご注意ください。

1. 電波法施行規則第6条第1項第1号に基づく平成18年3月28日総務省告示第173号で定められた電波暗室等の試験設備でご使用いただく。
2. 実験局の免許を取得後ご使用いただく。
3. 技術基準適合証明を取得後ご使用いただく。

なお、本製品は、上記の「ご使用にあたっての注意」を譲渡先、移転先に通知しない限り、譲渡、移転できないものとします。

上記を遵守頂けない場合は、電波法の罰則が適用される可能性があることをご留意ください。

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/lods/ti_ja/general/eStore/notice_02.page

電力線搬送波通信についての開発キットをお使いになる際の注意事項については、次のところをご覧ください。http://www.tij.co.jp/lods/ti_ja/general/eStore/notice_02.page

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.

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