

TPS7A10EVM-004 Evaluation Module

User's Guide



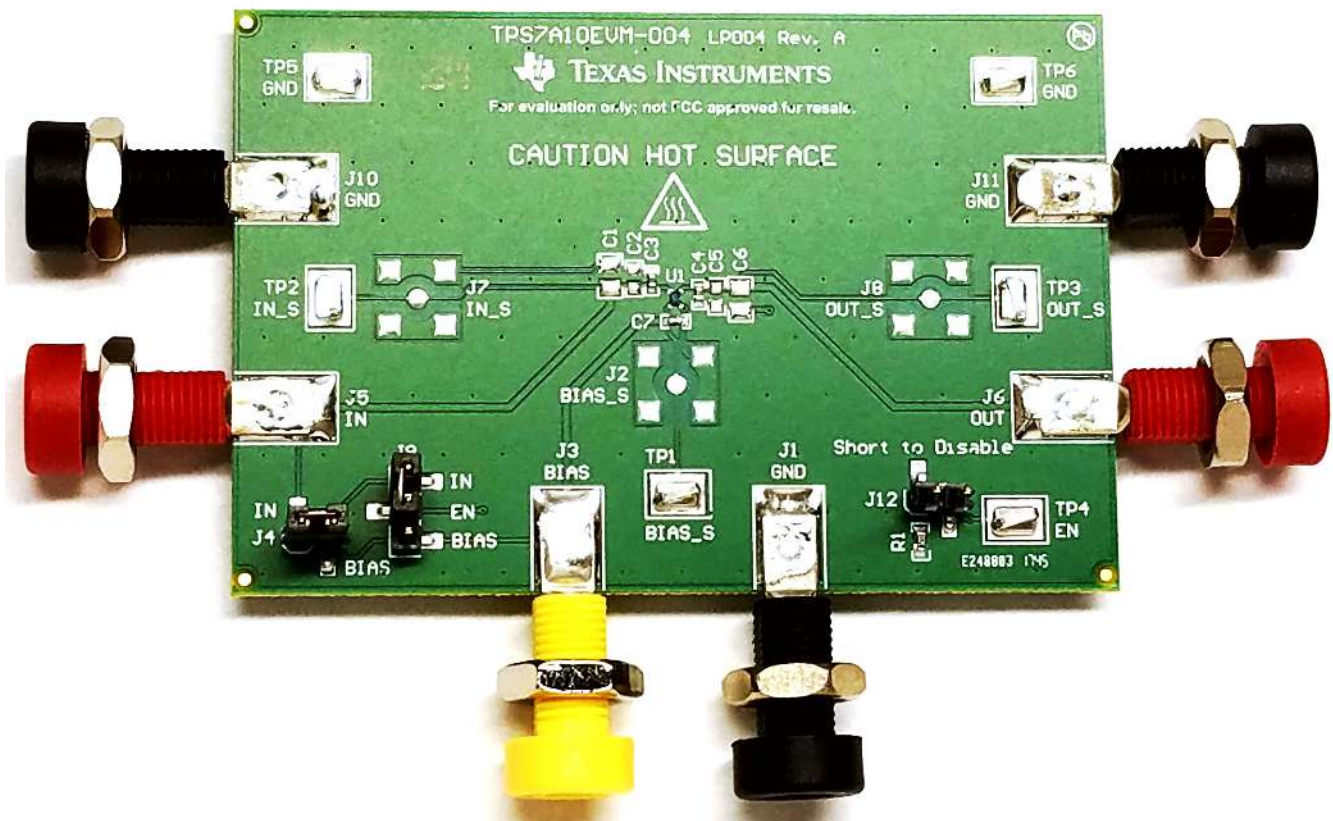
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TPS7A10EVM-004 Evaluation Module

This user's guide describes the operational use of the TPS7A10EVM-004 evaluation module (EVM) as a reference design for engineering demonstration and evaluation of the TPS7A10YKA low-dropout linear regulator (LDO). Setup and operating instructions, thermal and layout guidelines, a printed circuit board (PCB) layout, a schematic diagram, and a bill of materials (BOM) are included in this user's guide.

Throughout this document, the terms *demonstration kit*, *evaluation board*, and *evaluation module* are synonymous with the TPS7A10EVM-004.

The following related documents are available through the Texas Instruments website at www.ti.com.



Related Documentation

DEVICE	LITERATURE NUMBER
TPS7A10	SBVS314

1 Trademarks

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2 Introduction

Texas Instruments' TPS7A10EVM-004 EVM helps design engineers evaluate the operation and performance of the TPS7A10 family of linear regulators for possible use in circuit applications. This particular EVM configuration contains a single linear regulator for handheld systems. The regulator is capable of delivering up to 300 mA to the load with ultra-low VIN to VOUT dropout voltage. For stability, use an output capacitor with a value between 2.2 μ F and 47 μ F.

2.1 Before You Begin

The following warnings and cautions are noted for the safety of anyone using or working close to the TPS7A10EVM-004. Observe all safety precautions.



Warning Warning Hot surface. Contact may cause burns. Do not touch.

CAUTION

The circuit module may be damaged by overtemperature. To avoid damage, monitor the temperature during evaluation and , as needed, for your system environment cool

CAUTION

Some power supplies can be damaged by application of external voltages. If using more than one power supply, check your equipment requirements and use blocking diodes or other isolation techniques, as needed, to prevent damage to your equipment.

CAUTION

The circuit module is not a finished product or electrical appliance. The module does not contain current or voltage thresholds for circuit protection. It must be used by qualified personnel with additional equipment for evaluation only.

3 EVM Setup

This section describes how to properly connect and set up the TPS7A10EVM-004, including the jumpers and connectors on the EVM board.

3.1 *Input/Output Connectors and Jumper Descriptions*

3.1.1 J1 – GND

Bias ground return connector.

3.1.2 J2 – BIAS_S

Bias sense pads for an SMA jack.

3.1.3 J3 – BIAS

Bias power-supply connector.

3.1.4 J4 – IN to BIAS short

Short this jumper to tie IN to BIAS.

3.1.5 J5 – IN

Input power-supply voltage connector. Twist together the positive input lead and ground return lead from the input power supply, and keep the leads as short as possible to minimize input inductance.

3.1.6 J6 – OUT

Regulated output voltage connector.

3.1.7 J7 – IN_S

Input sense pads for an SMA jack.

3.1.8 J8 – OUT_S

Output sense pads for an SMA jack.

3.1.9 J9 – EN

Output enable. To enable the output, connect a jumper to short VIN to EN or BIAS to EN.

3.1.10 J10 – GND

Input ground return connector.

3.1.11 J11 – GND

Output ground return connector.

3.1.12 J12 – Short to Disable

Short this jumper to disable the output. Depending on the current drive capability of the input or bias power supplies, removing a short on J9 may be required so that the power supplies do not over power the R1 pulldown resistor.

3.1.13 TP1 – BIAS_S

Bias sense test point.

3.1.14 TP2 – IN_S

Input sense test point.

3.1.15 TP3 – OUT_S

Output sense test point.

3.1.16 TP4 – EN

Enable test point.

3.1.17 TP5 – GND

Ground test point.

3.1.18 TP6 – GND

Ground test point.

3.2 Soldering Guidelines

To avoid damaging the integrated circuit (IC), use a hot-air system for any solder rework to modify the EVM for repair or other application reasons.

3.3 Equipment Connection

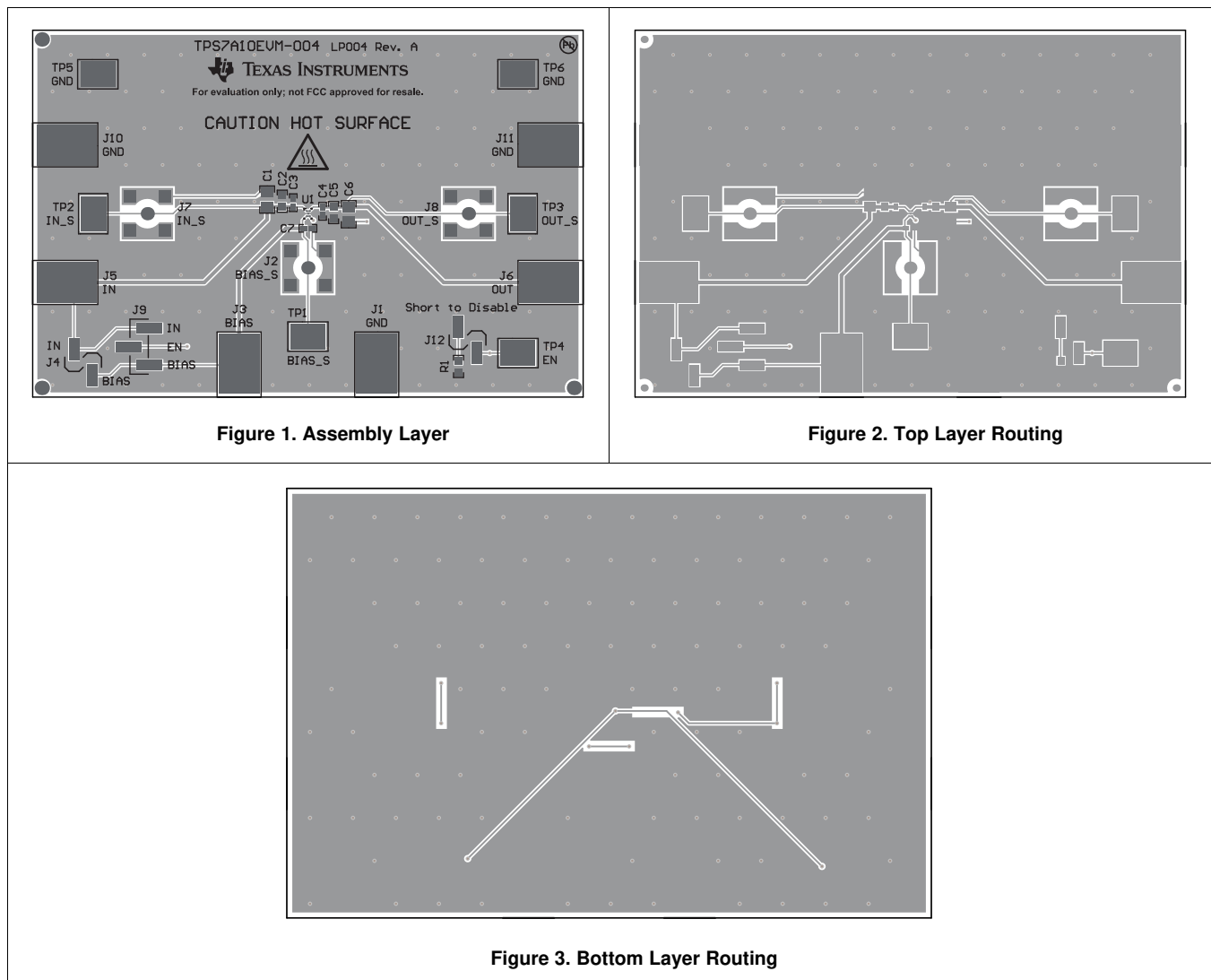
1. Set the input power supply to 3.3 V (maximum) and turn the power supply off.
2. Set the bias power supply to 5.5 V (maximum) and turn the power supply off.
3. Connect the positive voltage lead from the input power supply to IN at the J5 connector of the EVM.
4. Connect the ground lead from the input power supply to GND at the J10 connector of the EVM.
5. Connect the positive voltage lead from the bias power supply to BIAS at the J3 connector of the EVM.
6. Connect the ground lead from the bias power supply to GND at the J1 connector of the EVM.
7. Connect a 0-A to 300-mA load between OUT and GND.
8. Float J9 and short J12 to disable the output.

4 Operation

1. Turn on the power supplies.
2. Short J9 (the EN pin) to IN or BIAS and float J12 to enable the output.
3. Vary the respective load and input voltage for test purposes if necessary.

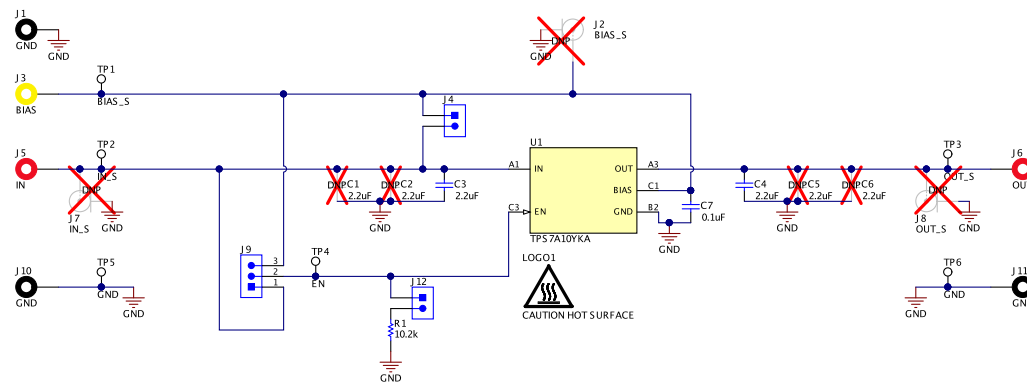
5 PCB Layout

Figure 1 to Figure 3 show the PCB layout for this EVM.



6 Schematic

[Figure 4](#) is the schematic for this EVM.



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Figure 4. TPS7A10EVM-004 Schematic

7 Bill of Materials

[Table 1](#) shows the BOM for this EVM.

Table 1. TPS7A10EVM-004 BOM⁽¹⁾⁽²⁾⁽³⁾⁽⁴⁾

Designator	Quantity	Value	Description	Package Reference	Part Number	Manufacturer	Alternate Part Number	Alternate Manufacturer
!PCB1	1		Printed Circuit Board		LP004	Any		
C3, C4	2	2.2uF	CAP, CERM, 2.2 uF, 10 V, + /- 20%, X5R, 0402	0402	GRM155R61A225ME95	MuRata		
C7	1	0.1uF	CAP, CERM, 0.1 uF, 10 V, + /- 10%, X7R, 0402	0402	GRM155R71A104KA01D	MuRata		
J1, J10, J11	3		Standard Banana Jack, Insulated, Black	6092	6092	Keystone		
J3	1		BANANA JACK, 15A, Insulated, Nylon, Yellow	940x438x438 mil	108-0907-001	Cinch Connectivity		
J4, J12	2		Header, 2.54 mm, 2x1, Gold, R/A, SMT	Header, 2.54 mm, 2x1, R/A, SMT	878980204	Molex		
J5, J6	2		Standard Banana Jack, Insulated, Red	6091	6091	Keystone		
J9	1		Header, 100 mil, 3x1, Gold, SMT	Samtec_TSM-103-01-X-SV	TSM-103-01-L-SV	Samtec		
R1	1	10.2k	RES, 10.2 k, 1%, 0.1 W, 0603	0603	CRCW060310K2FKEA	Vishay-Dale		
SH-J1, SH-J2	2	1x2	Shunt, 100 mil, Gold plated, Black	Shunt	969102-0000-DA	3M	SNT-100-BK-G	Samtec
TP1, TP2, TP3, TP4, TP5, TP6	6		Test Point, Compact, SMT	Testpoint_Keystone_Compact	5016	Keystone		
U1	1		300 mA Low VIN, Low VOUT, Ultra-Low Dropout Regulator, YKA0005AFAP (-5)	YKA0005AFAP	TPS7A1011YKA	Texas Instruments		Texas Instruments
C1, C6	0	2.2uF	CAP, CERM, 2.2 uF, 10 V, + /- 20%, X7R, 0805	0805	GRM21BR71A225MA01 L	MuRata		
C2, C5	0	2.2uF	CAP, CERM, 2.2 uF, 10 V, + /- 10%, X7R, 0603	0603	GRM188R71A225KE15D	MuRata		
FID1, FID2, FID3	0		Fiducial mark. There is nothing to buy or mount.	N/A	N/A	N/A		
J2, J7, J8	0		Connector, SMA Jack, Vertical, Gold, SMD	SMA	142-0711-201	Cinch Connectivity		

⁽¹⁾ These assemblies are ESD sensitive; observe ESD precautions.

⁽²⁾ These assemblies must be clean and free from flux and all contaminants. Do not use a no-clean flux.

⁽³⁾ These assemblies must comply with workmanship standards according to IPC-A-610 Class 2.

⁽⁴⁾ Unless otherwise noted in the Alternate Part Number or Alternate Manufacturer columns, all parts may be substituted with equivalents.

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EVM Warnings and Restrictions

It is important to operate this EVM within the input voltage range of 1.1 V to 4.5 V and the output voltage range of 0.9 V to 3.6 V .

Exceeding the specified input range may cause unexpected operation and/or irreversible damage to the EVM. If there are questions concerning the input range, please contact a TI field representative prior to connecting the input power.

Applying loads outside of the specified output range may result in unintended operation and/or possible permanent damage to the EVM. Please consult the EVM User's 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, some circuit components may have case temperatures greater than 85° C. The EVM is designed to operate properly with certain components above 85° C as long as the input and output ranges are maintained. These components include but are not limited to linear regulators, switching transistors, pass transistors, and current sense resistors. These types of devices can be identified using the EVM schematic located in the EVM User's Guide. When placing measurement probes near these devices during operation, please be aware that these devices may be very warm to the touch.

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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.

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

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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.

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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.

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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.

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