

EVM User's Guide: TPSI2240Q1EVM

TPSI2240-Q1 评估模块



说明

TPSI2240Q1EVM 是包含多个测试点和跳线的硬件评估模块 (EVM)，用于全面评估 TPSI2240-Q1 的性能和功能。该评估模块包含测试和评估 TPSI2240-Q1 器件所需的材料，可以将器件无缝设计到更大型的应用中，如电池管理系统。单独使用 TPSI2240Q1EVM 或与外部微控制器配对使用，以驱动器件的使能信号。使用该 EVM 评估诸如电介质耐压测试 (又称高压 [HiPot] 测试) 和直流快充浪涌电流等应用需求，且无需外部保护元件。该 EVM 组装了采用 SOIC 封装的 TPSI2240-Q1。

特性

此 EVM 具有以下特性：

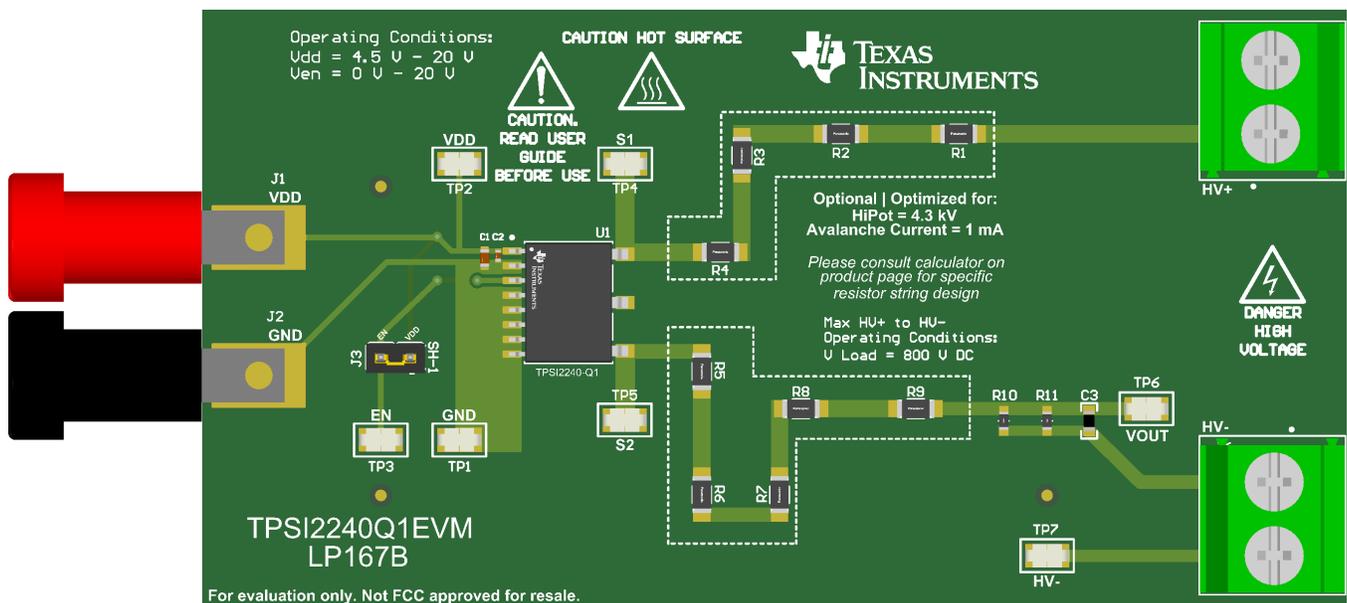
- 初级侧工作电压：4.5V 至 20V
- 具备最高达 4.3kV 的高电势 (HiPot) 耐压测试能力
- 终端块连接器可轻松实现有线连接
- 每个引脚和电压电源都有测试点，以确保正常运行

应用

- [HEV/EV 绝缘电阻监测](#)
- [混合动力、电动和动力传动系统](#)
- [电池管理系统 \(BMS\)](#)
- [太阳能](#)
- [车载充电器](#)
- [电动汽车充电基础设施](#)

备注

免责声明：请参阅 TPSI2240-Q1 产品页面上的数据表和设计资源，以优化元件选择并满足所需应用的 HiPot 电压和雪崩电流要求。



1 评估模块概述

1.1 简介

TPSI2240-Q1 是一款隔离式固态继电器，专为高压汽车和工业应用而设计。TPSI2240-Q1 通过集成 TI 的电容隔离技术无缝取代机械和光继电器。电容隔离技术不受机械磨损或光衰减等常见失效模式的影响。该器件的整个初级侧仅需要 8.5mA 的输入电流，并集成了一个失效防护 EN 引脚，可防止对 VDD 电源反向供电的任何可能性。次级侧包含背对背 MOSFET，从 S1 至 S2 的关断电压为 1200V。TPSI2240-Q1 具有雪崩性能稳健的 MOSFET 并且采用的 11 引脚 DWQ 封装上的加宽引脚具有散热优势，使其可以承受高压 (HiPot) 筛选和直流快速充电器浪涌电流，前提是为该应用选择了合适的元件。TPSI2240Q1EVM 可帮助用户评估增强型隔离等级高达 4.75kVrms 的 TPSI2240-Q1 隔离式开关的运行情况和性能。电路板的输入和输出连接是端子块，可轻松实现有线连接。本 EVM 用户指南介绍了该 EVM 的连接器和测试点描述、工作模式、原理图、物料清单和电路板布局布线。

备注

免责声明：请参阅 [TPSI2240-Q1 产品页面](#) 上的数据表和设计资源，以优化元件选择并满足所需应用的 HiPot 电压和雪崩电流要求。

1.2 套件内容

表 1-1. 套件内容

条目	数量
TPSI2240Q1EVM	1

1.3 规格

本节总结了默认配置中 TPSI2240Q1EVM 的性能规格。请参阅 [节 3.1.1](#) 了解测试期间的典型电压建议值。

表 1-2. TPSI2240Q1EVM 输入电压限制

参数		最小值	典型值	最大值	单位
V _{VDD}	初级侧电源电压	4.5	-	20	V
V _{EN}	使能电压	0	-	20	V
V _{HV*}	次级侧额定高电压输入	0	-	800	V
V _{HiPot}	次级侧高电势耐受电压 (60s 脉冲)	0	-	4300	V

1.4 器件信息

表 1-3. TPSI2240-Q1 器件规格

器件规格	值
初级侧电源电流	8.5mA 开启状态、3.5uA 关闭状态
集成雪崩额定 MOSFET 的关断电压	1200V
隔离栅额定值	4750V _{RMS}
汽车级认证	AEC-Q100
封装	DWQ (SOIC, 11) 10.3mm × 7.5mm (标称值)

1.5 通用德州仪器 (TI) 高压评估模块 (TI HV EVM) 用户安全指南



务必遵循 TI 的设置和应用说明，包括在建议的电气额定电压和功率限制范围内使用所有接口元件。务必采取电气安全防护措施，这样有助于确保您和周围人员的安全。如需了解更多信息，请联系 TI 的产品信息中心，网址为 <http://ti.com/customer support>。

保存所有警告和说明以供将来参考。

警告

务必遵循警告和说明，否则可能引发电击和/或灼伤危险，进而造成财产损失或人员伤亡。

TI HV EVM 一词是指通常以开放式框架、敞开式印刷电路板装配形式提供的电子器件。该器件严格用于开发实验室环境，仅供了解开发和应用高压电路相关电气安全风险且接受过专门培训、具有专业知识背景的合格专业用户使用。德州仪器 (TI) 严禁任何其他不合规的使用和/或应用。如果不满足合格要求，应立即停止进一步使用 HV EVM。

1. 工作区安全：

- a. 保持工作区整洁有序。
- b. 确认每次电路通电时现场都有具有资质的观察员。
- c. 确认 TI HV EVM 及接口电子元件通电区域设有有效的防护栏和标识，指示可能存在高压操作，以避免意外接触。
- d. 开发环境中使用的所有接口电路、电源、评估模块、仪器、仪表、示波器和其他相关装置的电气负载如果超过 50Vrms/75VDC，则必须置于紧急断电 EPO 保护电源板内。
- e. 使用稳定且不导电的工作台。
- f. 使用充分绝缘的夹钳和导线来连接测量探针和仪器。尽量不要徒手进行测试。

2. 电气安全：

- a. 作为一项预防措施，假定整个 EVM 可能存在用户可完全接触到的高电压是一种好的工程做法。
- b. 执行任何电气测量或其他诊断测量之前，需切断 TI HV EVM 及其全部输入、输出和电气负载的电源。再次确认 TI HV EVM 已安全断电。
- c. 确认 EVM 断电后，根据所需的电路配置、接线、测量设备连接和其他应用需求执行进一步操作，同时仍假定 EVM 电路和测量仪器均带电。
- d. EVM 准备就绪后，根据需要 will EVM 通电。

警告

EVM 通电后，请勿触摸 EVM 或电路，因为 EVM 或电路可能存在高压，会造成电击危险。

3. 人身安全

- a. 穿戴人员防护装备（例如乳胶手套或具有侧护板的安全眼镜）或者用带有互锁机构的透明塑料箱装好 EVM，避免意外接触。

安全使用限制条件：勿将 EVM 用作量产设备的整体或一部分。

2 硬件

2.1 建议测试设备

下面的列表包括推荐用于测试 TPSI2240Q1EVM 的设备：

- 用于输入的可调节电源
- 示波器
- 数字万用表
- *可选*：用于切换 TPSI2240-Q1 使能 (EN) 引脚的函数发生器或微控制器

2.2 跳线信息

表 2-1. 输入和输出连接器说明

连接器	标签	说明
J1	VDD	初级侧电源
J2	GND	初级侧 GND
J3	SH-1	闭合时将 EN 引脚连接至 VDD 的跳线
J4	HV+	次级侧正输入
J5	HV-	次级侧负输入

2.3 测试点

表 2-2. 测试点和跳线说明

测试点、跳线	标签	说明
TP1	GND	初级侧 GND 测试点
TP2	VDD	初级侧电源测试点
TP3	EN	启用引脚测试点
TP4	S1	S1 引脚测试点
TP5	S2	S2 引脚测试点
TP6	VOUT	电压检测输出测试点

3 实现结果

3.1 评估设置

3.1.1 建议的测试设置

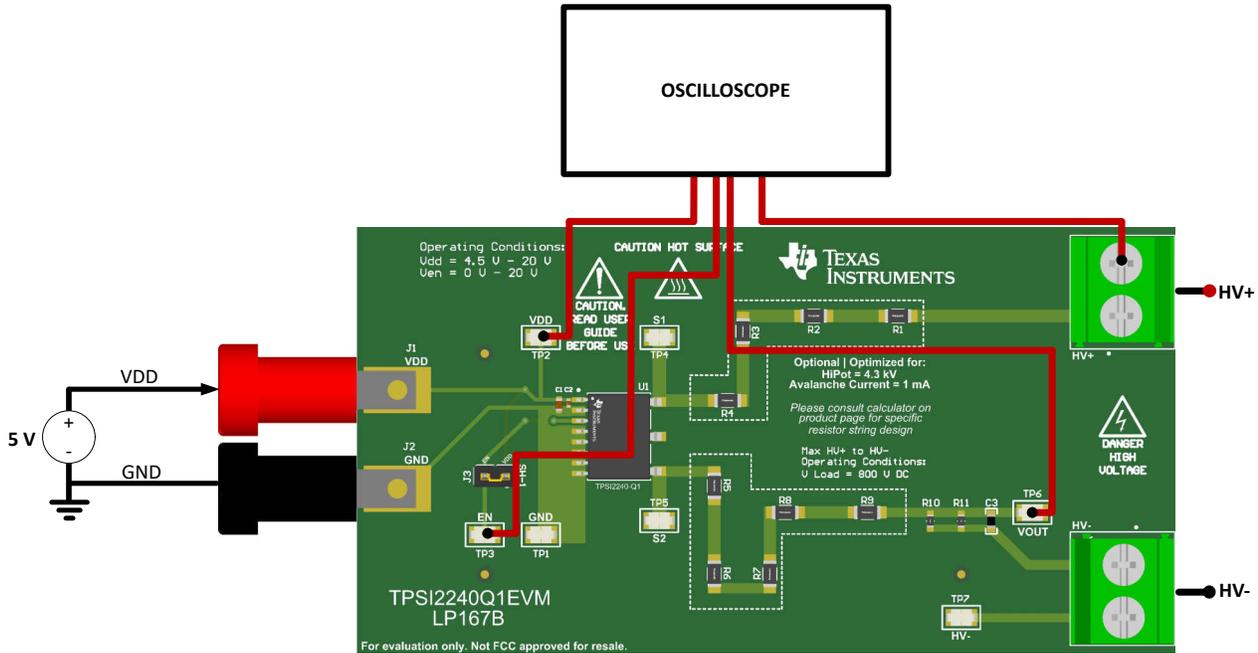


图 3-1. TPSI2240Q1EVM 测试设置

备注

重要说明： 图 3-1 中所示的设置假设高压和低压接地 (GND 和 HV-) 短路，以便能够安全地捕获示波器。在此配置中，绕过 TPSI2240-Q1 器件中的隔离栅。要评估具有隔离栅的器件，请使用差分示波器探头并保持高压和低压接地分离。

验证 TPSI2240Q1EVM 具有以下跳线设置：

1. **J3** - 将 EN 引脚连接到 VDD 电源轨

要测试 TPSI2240-Q1 是否正常运行，请按照以下步骤操作：

1. 将 5V 电源连接到 **J1** 的香蕉插孔，并将负极引线连接到 **J2**，从而为 TPSI2240-Q1 供电。
2. 在放入外壳或连接高压 (HV) 电源之前，请使用以 **TP1** (GND) 为基准的 **TP2** (VDD) 和 **TP3** (EN) 验证 TPSI2240-Q1 初级侧的所有电压是否符合预期。
3. 将电路板放置在外壳中。将高压电源 (800V) 正极引线连接到 **J4**，负极引线连接到 **J5**。
4. 将示波器探头连接到相关电压 (VDD/EN、HV+、VOUT)，打开高压电源，然后切换连接到 EN 的 5V 电源。观察 **TP3** (EN)、**J4** (HV+) 和 **TP6** (VOUT) 是否显示预期的电压。

要测试 TPSI2240-Q1 的高电势 (HiPot) 运行情况，请按照以下步骤操作：

1. 在 HiPot 测试期间，确认没有电源连接到 TPSI2240-Q1 **J1** 和 **J2** 初级侧连接器。
2. 将电路板放置在外壳中，将高压电源 (4300V) 正极引线连接到 **J4**，将负极引线连接到 **J5**。

- 将示波器探头连接到相关电压 (HV+、S1-S2) 并使用 60s 脉冲打开高压电源，然后观察 **J4** (HV+)、**TP4-TP5** (S1-S2) 是否显示预期的电压。

3.2 性能数据和结果

3.2.1 波形

完成[建议的测试设置](#)后，验证图 3-2 中的波形中是否显示了以下通道

- CH 1 = HV+
- CH 2 = VOUT
- CH 3 = VDD/EN

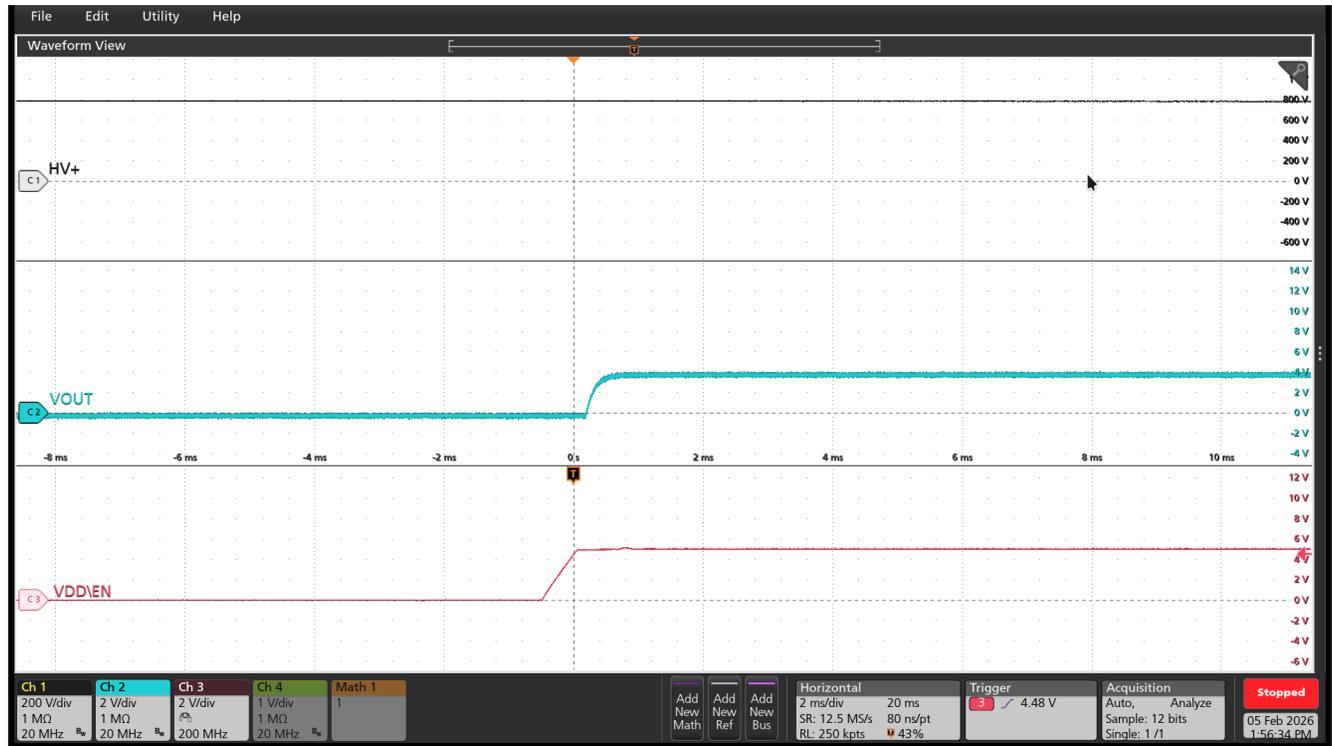


图 3-2. HV = 800V (EN = 5V) 时的电压检测输出 (S2) 测试点

图 3-3 显示了使用以下通道设置的两个测试点。

- CH 1 = VHipot (HV+)
- CH 2 = S1-S2

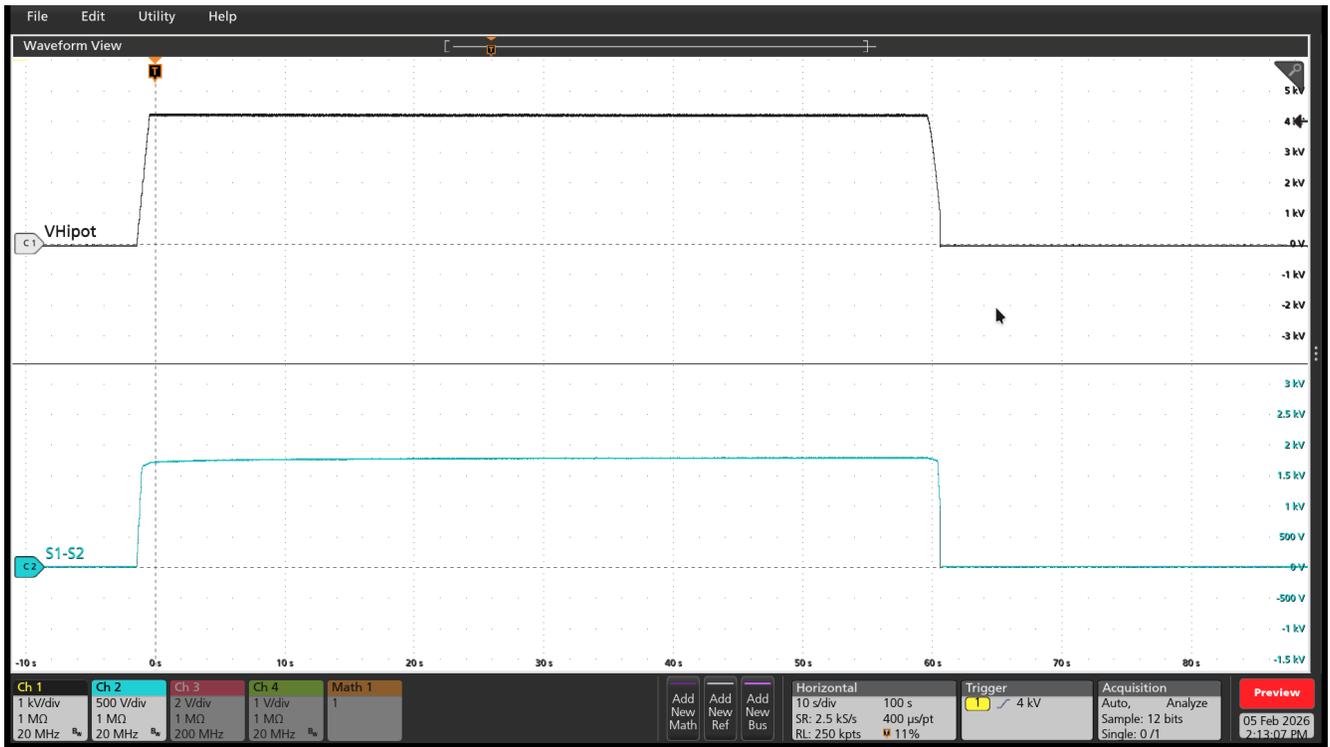


图 3-3. HV = 4,300V 时的次级检测 (S1) 和电压检测 (S2) 测试点

3.2.2 VOUT 分压器

电压检测输出测试点 VOUT (TP6) 是分压器测量点。测量的电压值取决于并联电阻器 R10 和 R11 以及电阻器网络 R1-R9。使用以下公式计算电压测量值：

$$V_{OUT} = \frac{R10 || R11}{(R1 + R2 + \dots + R9) + (R10 || R11)} \times V_{HV+} \quad (1)$$

4 硬件设计文件

4.1 原理图

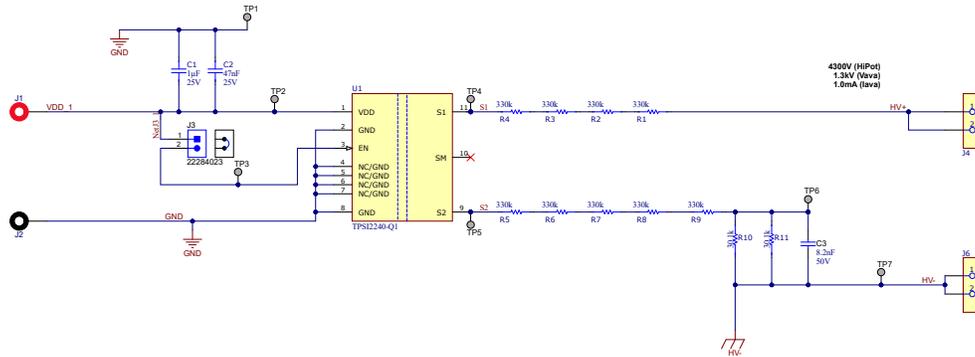


图 4-1. TPSI2240Q1EVM 原理图

4.2 PCB 布局

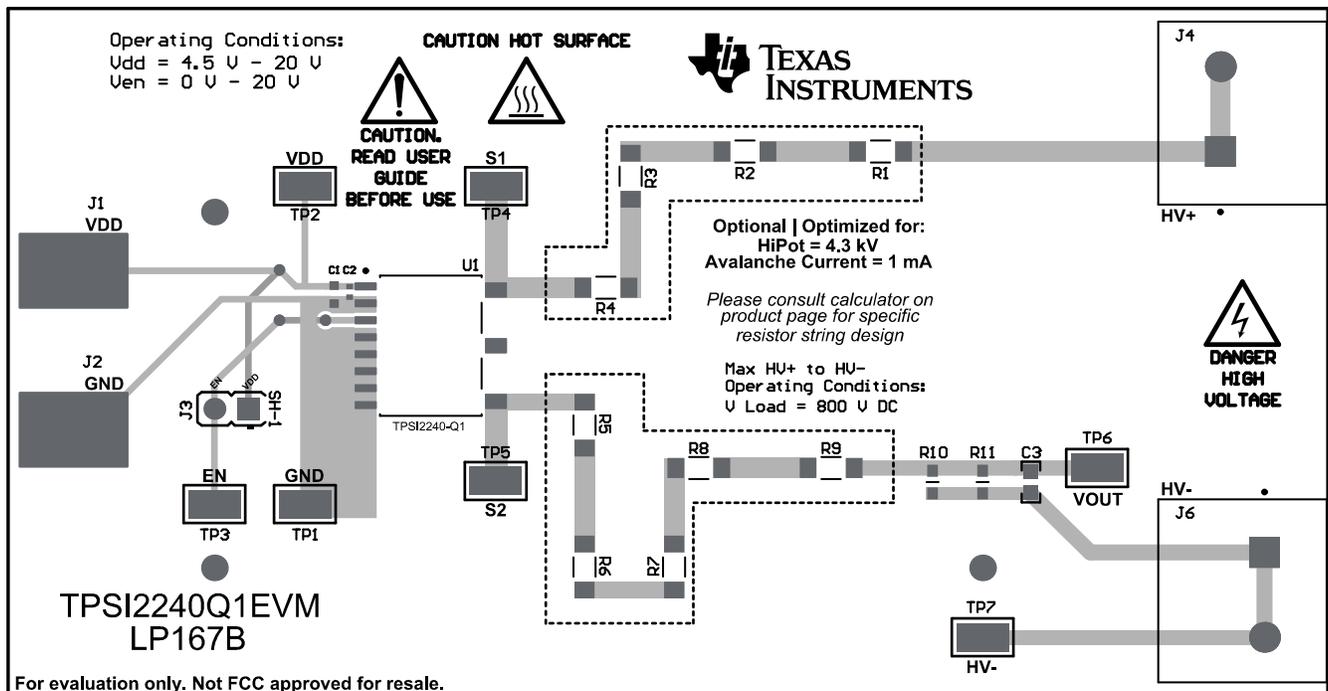


图 4-2. TPSI2240-Q1 EVM - 复合视图

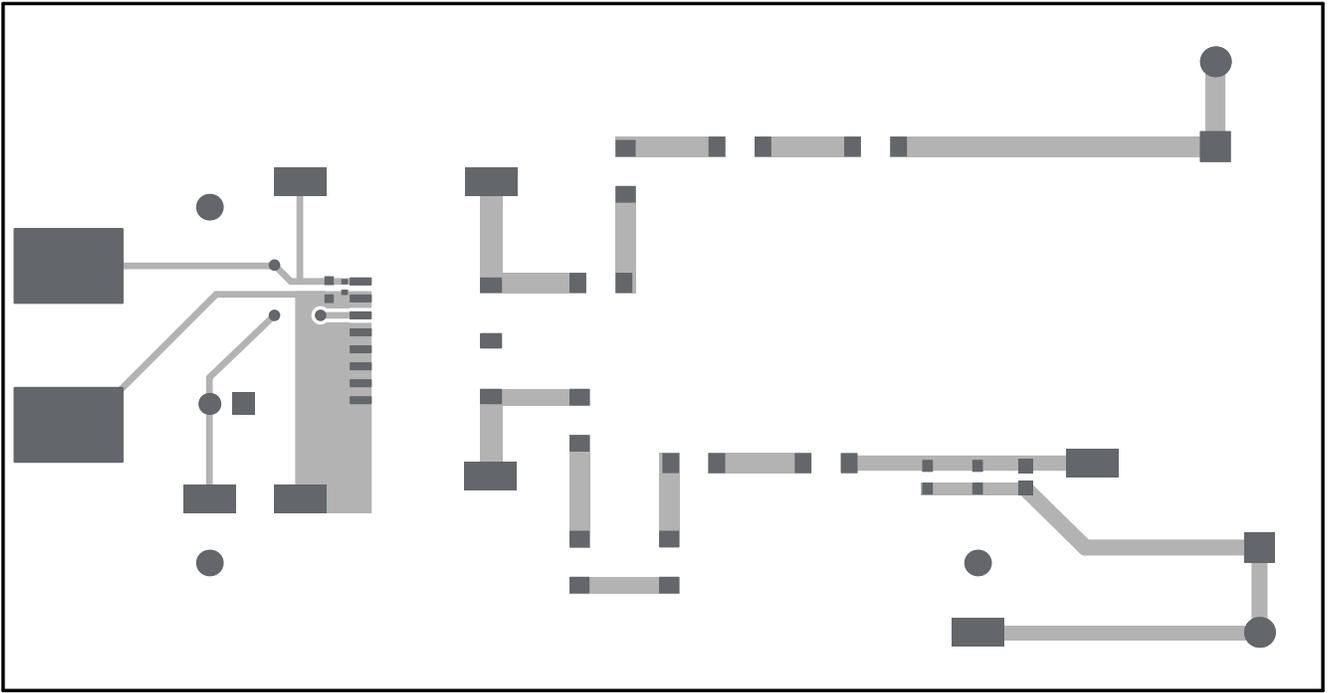


图 4-3. TPSI2240-Q1 EVM - 第 1 层



图 4-4. TPSI2240-Q1 EVM - 第 2 层

4.3 物料清单 (BOM)

位号	数量	值	说明	封装参考	器件型号	制造商	备选器件型号	备选制造商
!PCB	1		印刷电路板		LP167	不限		
C1	1	1 μ F	汽车级陶瓷电容器, 1 μ F, \pm 10%, 25VDC, X7R, 0603, 纸质 T/R	0603	GCM188R71E105K A64J	Murata		
C2	1	47nF	汽车级陶瓷电容器, 47nF, \pm 10%, 25VDC, X7R, 0402, 纸质 T/R	0402	GCM155R71E473K A55D	Murata		
C3	1	8200pF	电容, 陶瓷, 8200pF, 50V, \pm 10%, X7R, AEC-Q200 1 级, 0603	0603	GCD188R71H822K A01D	MuRata		
FID1、FID2、FID3	3		基准标记。不需要购买或安装的元素。	不适用	不适用	不适用		
H1、H2、H3、H4	4		Bumpon, 半球形, 0.44 X 0.20, 透明	透明 Bumpon	SJ-5303 (CLEAR)	3M		
J1	1		香蕉插头, 红色绝缘尼龙, TH	香蕉插头, 红色绝缘尼龙, TH	108-0902-001	Cinch Connectivity		
J2	1		香蕉插头, 黑色绝缘尼龙, TH	香蕉插头, 黑色绝缘尼龙, TH	108-0903-001	Cinch Connectivity		
J3	1		接头, 2.54mm, 2x1, 锡, TH	接头, 2.54mm, 2x1, TH	22284023	Molex		
J4、J6	2			CONN_TERM_BLOCK2	6.91251E+11	Würth Electronics		
R1、R2、R3、R4、R5、R6、R7、R8、R9	9	330k	330K Ω \pm 1% 0.667W, 2/3W 片上电阻 1206 (公制 3216), 汽车级 AEC-Q200, 可承受脉冲, 厚膜	1206	ERJ-P08F3303V	Panasonic		

位号	数量	值	说明	封装参考	器件型号	制造商	备选器件型号	备选制造商
R10、R11	2	30.1k	厚膜电阻 0603 30.1K Ω 1% 0.1W(1/10W) \pm 100ppm/ $^{\circ}$ C焊盘 SMD T/R 汽车级 AEC-Q200	0603	AC0603FR-0730K1 L	Yageo		
SH-1	1	1x2	分流器, 100mil, 镀金, 黑色	分流器	SNT-100-BK-G	Samtec	969102-0000-DA	3M
TP1、TP2、TP3、 TP4、TP5、TP6、 TP7	7		测试点, 微型, SMT	测试点, 微型, SMT	5019	Keystone		
U1	1		TPSI2240-Q1	SOIC11	TPSI2240QDWQR Q1	德州仪器 (TI)		

5 修订历史记录

注：以前版本的页码可能与当前版本的页码不同

Changes from Revision * (September 2025) to Revision A (February 2026)	Page
• 在引言中添加了免责声明.....	2
• 从输入和输出连接器说明中删除了 J6 连接器相关内容.....	4
• 将 J5 标签从 S2 更新为 HV-.....	4
• 将 J5 描述从电压检测输出更新为次级侧负输入.....	4
• 将 TP4 描述从电阻器链后的次级侧 HV+ 电压更新为 S1 引脚测试点.....	4
• 将 TP5 描述从电压检测输出测试点更新为 S2 引脚测试点.....	4
• 将 TP6 标签从 HV- 更新为 VOUT.....	4
• 将 TP6 描述从 HV- 次级侧测试点更新为电压检测输出测试点.....	4
• 将正常运行步骤 3 中的 J6 更新为 J5.....	5
• 将正常运行步骤 4 中的 S2 更新为 VOUT.....	5
• 将高电势步骤 2 中的 J6 更新为 J5.....	5
• 将 CH 2 从 S2 更新为 VOUT.....	6
• 将章节标题从 S2 分压器更新为 VOUT 分压器.....	7
• 将电压检测输出测试点从 S2 更新为 VOUT.....	7
• 将并联电阻从 R19 和 R20 更新为 R10 和 R11.....	7
• 更新了 方程式 1	7

STANDARD TERMS FOR EVALUATION MODULES

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 semiconductor 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.

WARNING

Evaluation Kits 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 shall operate the Evaluation Kit within TI's recommended guidelines and any applicable legal or environmental requirements as well as reasonable and customary safeguards. Failure to set up and/or operate the Evaluation Kit within TI's recommended guidelines may result in personal injury or death or property damage. Proper set up entails following TI's instructions for electrical ratings of interface circuits such as input, output and electrical loads.

NOTE:

EXPOSURE TO ELECTROSTATIC DISCHARGE (ESD) MAY CAUSE DEGRADATION OR FAILURE OF THE EVALUATION KIT; TI RECOMMENDS STORAGE OF THE EVALUATION KIT IN A PROTECTIVE ESD BAG.

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/lstds/ti_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。

<https://www.ti.com/ja-jp/legal/notice-for-evaluation-kits-delivered-in-japan.html>

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 2 4 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/lstds/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。 <https://www.ti.com/ja-jp/legal/notice-for-evaluation-kits-for-power-line-communication.html>

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.

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- 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.
 - 6.2 EXCEPT FOR THE LIMITED RIGHT TO USE THE EVM SET FORTH HEREIN, NOTHING IN THESE TERMS SHALL BE CONSTRUED AS GRANTING OR CONFERRING ANY RIGHTS BY LICENSE, PATENT, OR ANY OTHER INDUSTRIAL OR INTELLECTUAL PROPERTY RIGHT OF TI, ITS SUPPLIERS/LICENSORS OR ANY OTHER THIRD PARTY, TO USE THE EVM IN ANY FINISHED END-USER OR READY-TO-USE FINAL PRODUCT, OR FOR ANY INVENTION, DISCOVERY OR IMPROVEMENT, REGARDLESS OF WHEN MADE, CONCEIVED OR ACQUIRED.
 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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