参考文献

EVM User's Guide: TUSB2514EVM

TUSB2514 评估模块

说明

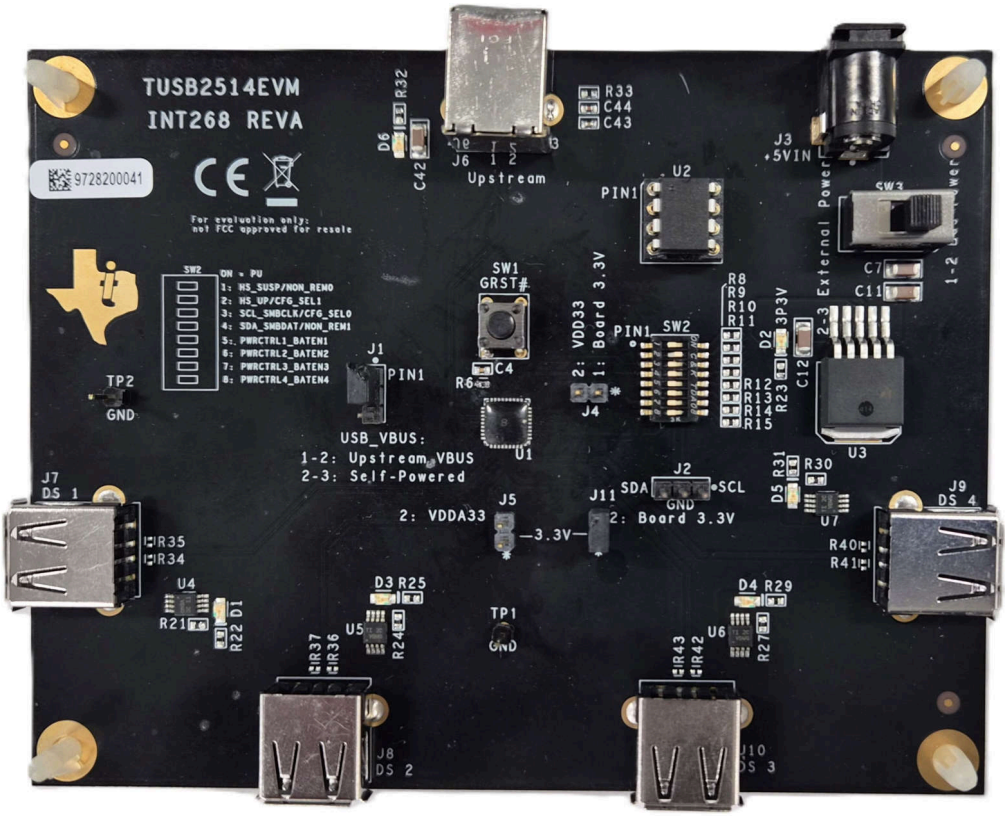
TUSB2514EVM 是一个 4 端口高速 USB 集线器，在上游和下游端口上提供 USB 高速或全速连接。TUSB2514 支持每端口或者成组电源开关和过流保护。TUSB2514 的下行端口可提供 USB 电池充电下行端口 (CDP) 握手支持，从而为电池充电应用提供支持。未连接上行端口时，该器件还支持专用充电端口 (DCP) 模式。

特性

- 单 3.3V 电源
- 高速、全速和低速 4 端口集线器
- 具有端口电源和过流检测功能的独立可配置的下行端口
- 可通过 EEPROM 进行可选配置
- 多事务转换器 (MTT)
- 电池充电 (BC1.2)支持

应用

- 企业系统
- AI 计算
- 扩展坞
- 监视器
- 笔记本电脑
- 机器人



TUSB2514EVM

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1 评估模块概述

1.1 简介

德州仪器 (TI) TUSB2514 评估模块 (EVM) 是采用基于单一器件的功能电路板设计，用于实现 USB2.0 集线器。此 EVM 可在其 USB 端口上支持 USB2.0（高速、全速和低速）运行。此 EVM 旨在用于评估系统兼容性、开发可选的 EEPROM 固件和验证互操作性。此 EVM 还可用作实现 TUSB2514 的硬件参考设计。

1.2 套件内容

该 EVM 套件包含以下各项：

- TUSB2514EVM 电路板

用户必须提供一根 Type-A 转 Type-B 的 USB 线缆，用于将上游端口连接到 USB 主机。如果将 EVM 用作自供电集线器，用户还必须提供一个 5V 电源适配器作为 EVM 的电源。

1.3 规格

TUSB2514 4 端口集线器旨在符合 USB-IF 发布的 USB 修订版 2.0 规范。

1.4 器件信息

TUSB2514 是一款四端口高速 USB 集线器，该集线器在上行端口上支持 USB 高速和全速连接，在下行端口上支持高速、全速或低速连接。下游端口的行为会根据上游连接动态调整：当上游端口工作于高速环境时，所有下游端口均使能高速连接；反之，当上游端口限制为全速时，下游端口上的高速连接自动禁用。

2 硬件

TUSB2514EVM 硬件可以分为六个功能区域：

2.1 TUSB2514

TUSB2514（原理图中的 U1）可作为功能型互连模块，连接上游的 USB 主机或集线器与最多四个直接相连的下游设备或集线器。如果按层排列，则可以支持更多的器件和集线器。TUSB2514 能够支持在高速 (HS)、全速 (FS) 或低速 (LS) 下运行。通常，TUSB2514EVM 上行连接的速度会将下行连接限制为该速度（HS 和 FS）或更低。TUSB2514 需要一个具有 1MΩ 反馈电阻器的 24MHz 低 ESR 晶体 Y1。晶体必须是基频模式，负载电容为 12pF – 24pF，频率稳定性额定值为 ±100PPM 或更佳。

为了确认正确的启动振荡条件，建议使用 50Ω 的最大晶体等效串联电阻 (ESR)。TUSB2514 还可以使用振荡器或其他时钟源。使用振荡器等外部时钟源时，基准时钟必须具有 ±100PPM 或更高的频率稳定性，且绝对峰峰值抖动小于 50ps。

2.2 USB 端口连接器

TUSB2514EVM 配备五个标准 USB2.0 端口连接器。这五个连接器中的 J6 是一个 Type-B 连接器，设计用于与上游 USB 主机或集线器对接。其余连接器 J7、J8、J9 和 J10 是标准 Type-A 连接器，用于连接下游设备或集线器。这些 USB 端口可通过标准 USB 线缆连接到任何 USB 2.0 主机、集线器或设备。TUSB2514 会自动以 HS（高速）模式连接到任何上游 USB 2.0 主机或集线器。

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2.2.1 USB 端口连接器 - 电源

VBUS 通过 J6 从上游主机或集线器接收。通过将跳线 J1 设置为所需选项，TUSB2514EVM 可配置为自供电或总线供电集线器。当 EVM 设置为自供电时，EVM 不会从 VBUS 汲取任何显著电流。TUSB2514 在 VBUS 输入经过由 90.9kΩ、1% 电阻 R2 和 10kΩ、1% 电阻 R4 组成的电阻分压器网络滤波后对其进行监测。VBUS 不能直接连接到 TUSB2514 器件。上游端口 VBUS 输入端需要至少 1μF 的大容量电容器，以符合 USB 规范。

TUSB2514 使用 10μF 电容器 C42。由 5V 墙式电源输入 J3 提供的 VBUS 供给下游端口连接器。USB 2.0 规范将 USB 2.0 器件的电流消耗限制为 5V 下 500mA。TPS2001C 器件的限流参数配置为 2.2A，以避免因总线供电 HDD 启动时的功率波动或 USB 充电期间不必要的限流而引发误过流事件。生产实现可以对此功耗设置更严格的限制。任一下游端口连接器上发生过流事件时，会通过 OVERCURx# 输入报告给 TUSB2514。

2.2.2 USB 端口连接器 - 噪声滤波

每个下游 VBUS 输出均配有一个 150μF 大容量电容器（按照 TPS20xxC 和 TPS20xxC-2 限流配电开关数据表的建议），用于防止下游器件上发生浪涌电流事件。此外，VBUS 线路上还设有铁氧体磁珠和小电容，以降低噪声并解决 ESD/EMI 问题。TUSB2514EVM 还在每个连接器的接地端与 EVM 的数字接地端之间使用两个小型噪声滤波电容器和一个 1MΩ Ω 电阻器，实现了可选的隔离。这不是强制要求，但在需要接地隔离时必须使用。

2.3 可选串行 EEPROM

每个 TUSB2514EVM 均配备一个板载 EEPROM/插座预留位 U2。可安装一个小型 I2C EEPROM，以按照 TUSB2514 数据手册 (SLVSL35) 中的定义设置配置寄存器。在默认设置下，EVM 未安装 EEPROM，而是使用配置输入来确定 TUSB2514 的任何可选设置。EEPROM 接口默认为可编程（非写保护）状态，以便可以修改任何已安装 EEPROM 的内容来测试各种设置。如果需要更改 EEPROM 数据，可使用 TUSB2514 数据表中概述的寄存器访问方法更改这些值。此外，还可应要求提供基于 Microsoft® Windows® 的 EEPROM 实用程序。

2.4 电源

TUSB2514EVM 可由 5V 墙式电源适配器 J3 提供的电源供电，或由 USB 主机提供的总线电源供电。建议使用能够提供 4A 至 5A 电流的墙式电源适配器，因为该集线器必须能够为其下游端口提供充足功率（每端口 500mA）。TUSB2514EVM 使用一个单通道 LDO 稳压器将 5V 降至 3.3V。TPS7A4533 (U3) 是一款 1.5A 输出线性稳压器（请参阅 TPS7A45xx 低噪声快速瞬态响应 1.5A 低压降电压稳压器）。

2.5 集线器配置

TUSB2514EVM 可通过设置 TUSB2514 的若干输入来进行配置，这些输入在上电复位时被采样，也可使用可选的串行 EEPROM 或 SMBUS 主机进行配置。这些设置可通过 EVM 上的 SW2 进行修改。

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2.5.1 配置开关

TI TUSB2514EVM 具有一个开关以方便更改配置。不建议在未完全了解结果的情况下更改此开关设置。配置输入仅由 TUSB2514 在上电复位期间读取，在 EVM 上电时更改此开关设置不会产生任何影响。有关其他信息（包含在附录中），另请参阅 EVM 原理图。

开关定义如下（括号中为标准设置）：

- SW1_1（关闭）：HS_SUSP_REM0。当配置为引脚搭接模式时，该引脚与 NON_REM1 一起将确定哪些下游端口被标记为不可移除。
- SW1_2（关闭）：HS_UP_CFG1。复位后，该信号指示上游端口的高速 USB 连接状态（如果通过 stsOutputEn 位使能）。置为有效时，表示上游端口已连接到支持高速 USB 的端口。
- SW1_3（关闭）：SCL_SMBCLK_SEL0。I2C 时钟或 SMBus 时钟。在 GRST# 的上升沿，该引脚将与 CFG1 一起采样，以确定 I2C、SMBus 或引脚搭接操作。
- SW1_3（关闭）：SCL_SMBCLK_SEL0。I2C 时钟或 SMBus 时钟。在 GRST# 的上升沿，该引脚将与 CFG1 一起采样，以确定 I2C、SMBus 或引脚搭接操作。
- SW1_4（关闭）：SDA_SMBDAT_NONREM1。I2C 数据或 SMBus 数据。当配置为引脚搭接模式时，该引脚与 NON_REM0 一起将确定哪些下游端口被标记为不可移除。
- SW1_5（关闭）：PWRCTL1_BATEN1 开关。TUSB2415B 在该端子上具有内部下拉电阻器，因此端口 1 的 USB 电池充电模式默认禁用。如果开关置于 ON 位置，该端子被拉高，下游端口 1 的电池充电功能使能。
- SW1_6（关闭）：PWRCTL2_BATEN2 开关。TUSB2514 在该端子上具有内部下拉电阻器，因此端口 2 的 USB 电池充电模式默认禁用。如果开关置于 ON 位置，该端子被拉高，下游端口 2 的电池充电功能使能。
- SW1_7（关闭）：PWRCTL1_BATEN1 开关。TUSB2514 在该端子上具有内部下拉电阻器，因此端口 3 的 USB 电池充电模式默认禁用。如果开关置于 ON 位置，该端子被拉高，下游端口 3 的电池充电功能使能。
- SW1_8（关闭）：PWRCTL2_BATEN2 开关。TUSB2514 在该端子上具有内部下拉电阻器，因此端口 4 的 USB 电池充电模式默认禁用。如果开关置于 ON 位置，该端子被拉高，下游端口 4 的电池充电功能使能。

3 EVM 安装

要安装 EVM，请执行以下步骤：

1. 将 5V、3A 墙式电源连接到 J3。LED D2 必须亮起。
2. 在 J6 和 USB 主机之间连接一根 USB 线缆。LED D2 必须亮起。

4 故障排查

情形 1：TUSB2514 集线器功能未在器件管理器中枚举（器件管理器中该器件旁出现黄色感叹号图标）。

- 确认操作系统已安装最新更新。
- 确认主机控制器已安装最新驱动程序。

情形 2：EVM 完全无法工作。

- 验证所有开关均处于默认状态，且 EVM 已通过 5V 电源上电，该电源具有足够电流以支持任何总线供电器件 (3A+)。
- 如果已安装，请从 EEPROM 插座中移除串行 EEPROM。EVM 运行不需要 EEPROM。
- 如果将 12V 电源连接到 EVM，则故障不可恢复。

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5 硬件设计文件

5.1 原理图

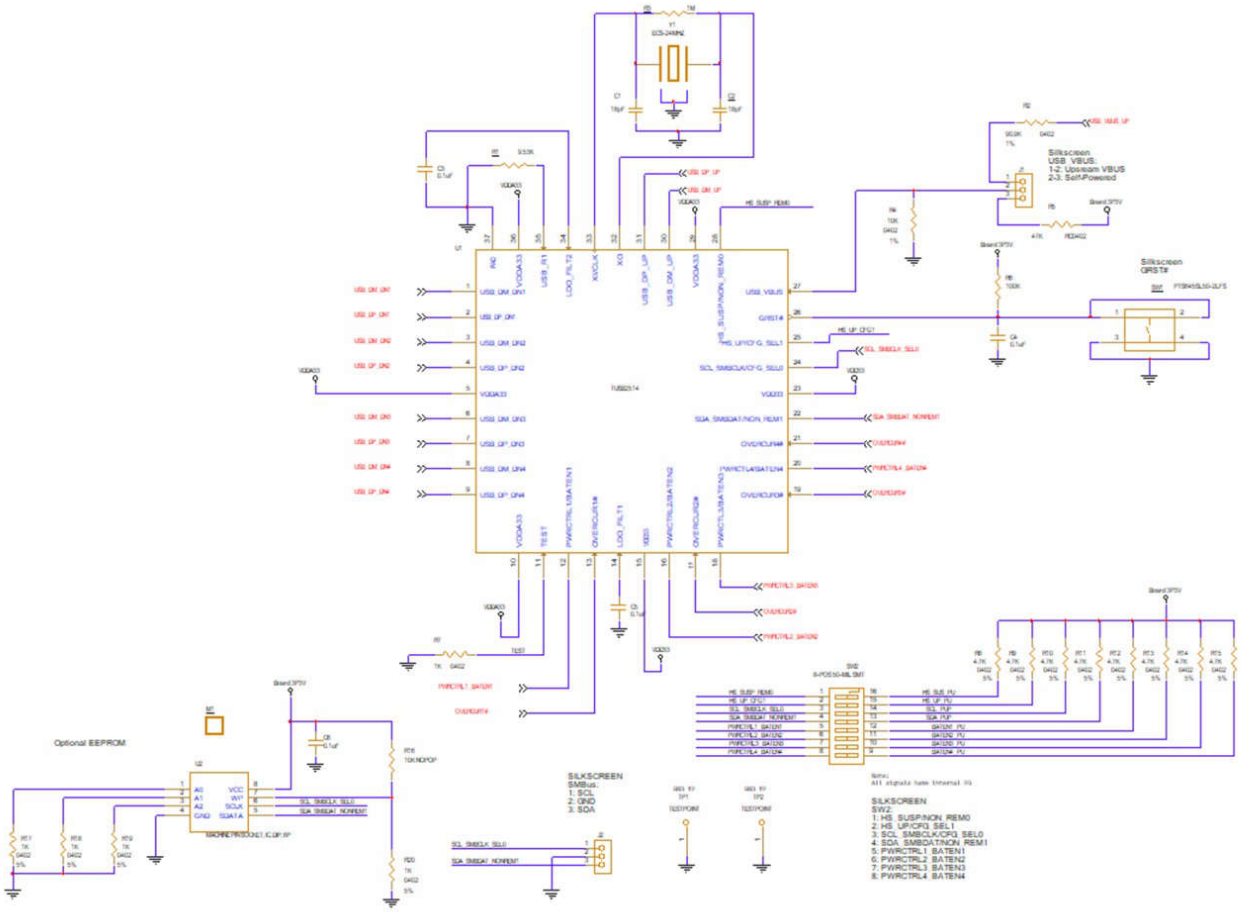


图 5-1. TUSB2514 配置引脚

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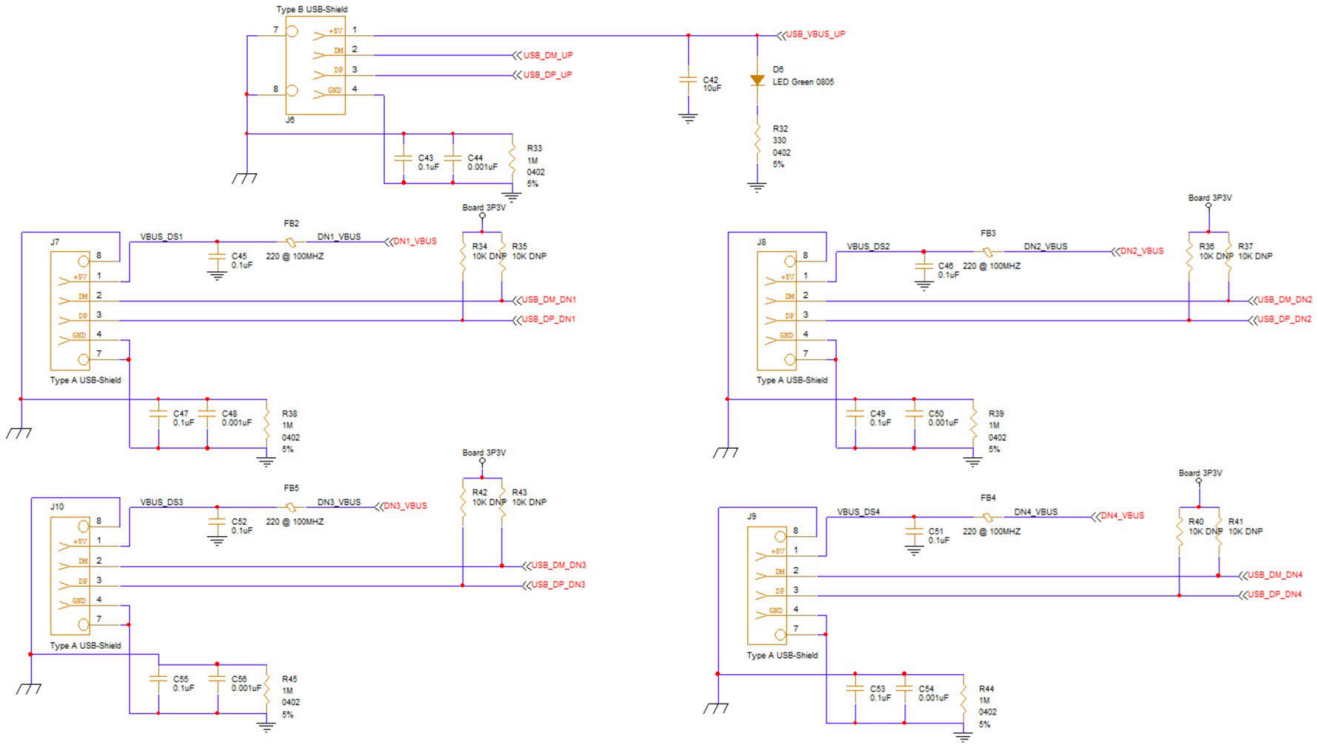


图 5-2. TUSB2514 EVM 连接器

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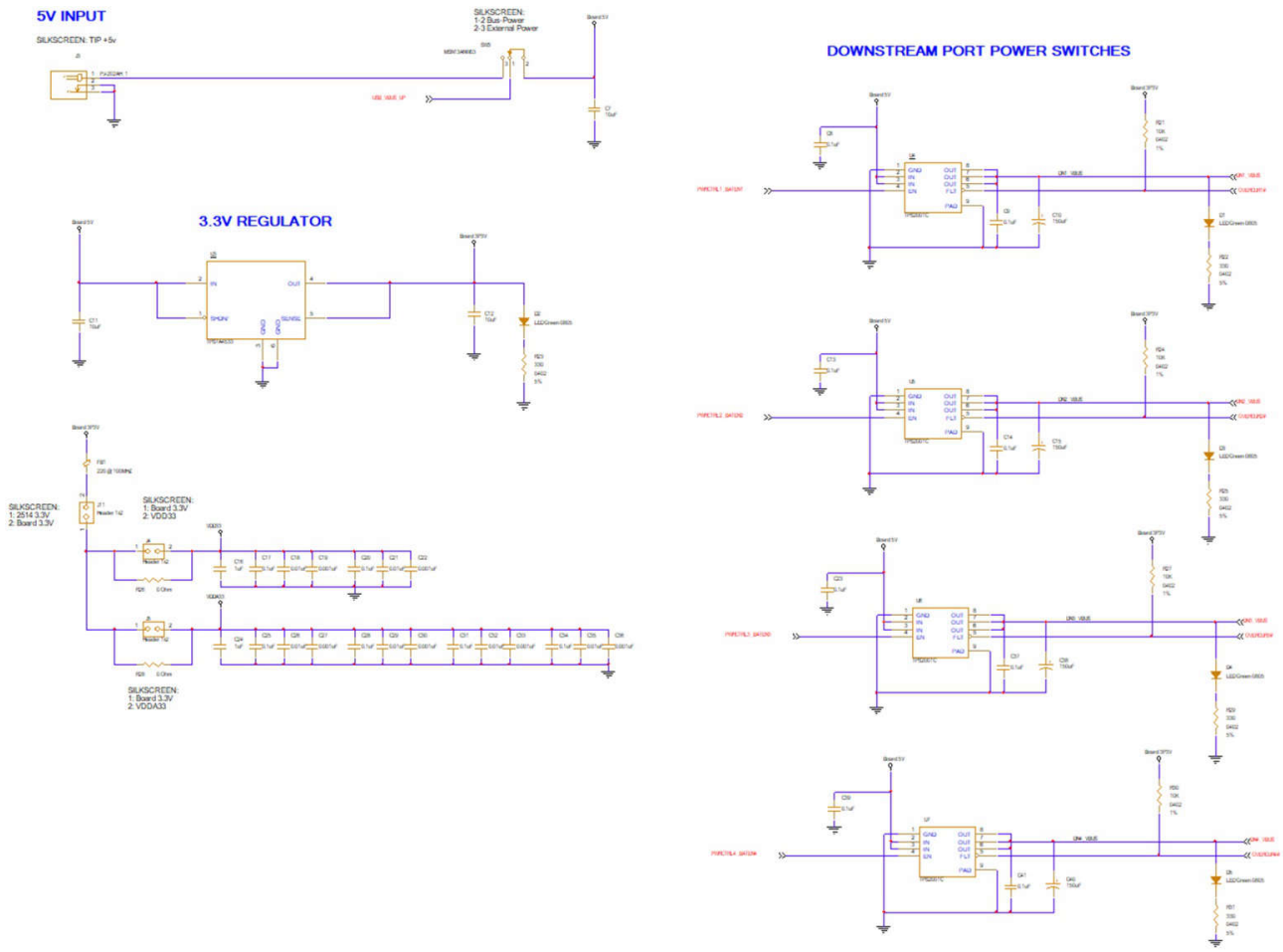


图 5-3. TUSB2514EVM 功率

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5.2 TUSB2514EVM 布局

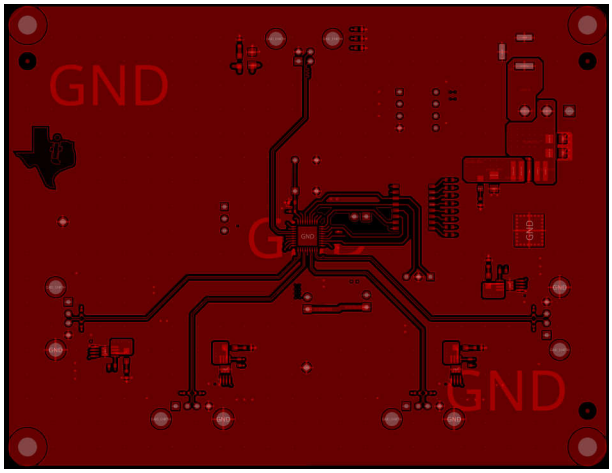


图 5-4. 顶层

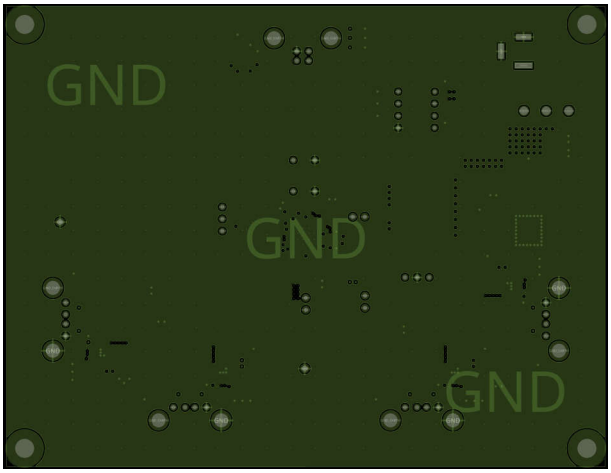


图 5-5. TUSB2514EVM（第 2 层 - GND）

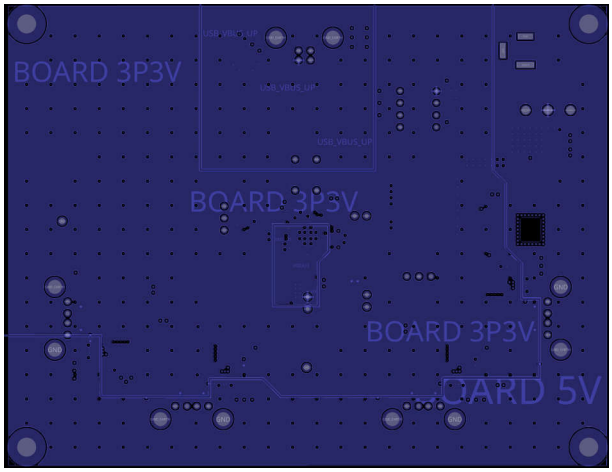


图 5-6. TUSB2514EVM（第 3 层 - 电源）

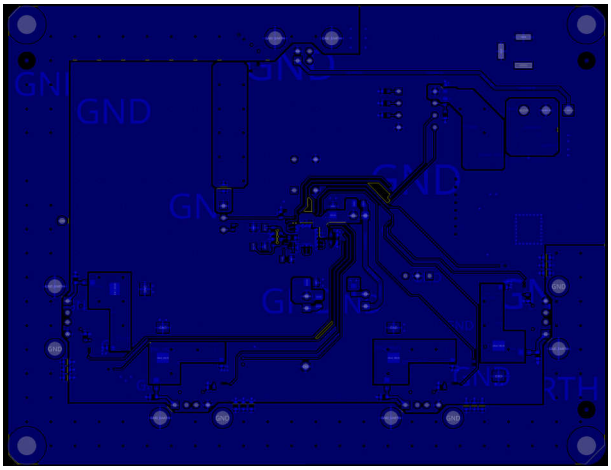


图 5-7. TUSB2514（底层）

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5.3 物料清单 (BOM)

条目	参考	值	容差	PCB 封装	制造商	器件型号	数量
1	C1、C2	18pF		402	KYOCERA AVX	04025A180JAT2A	2
2	C3	0.1uF		402	Venkel	CC0402KRX5R6BB104	1
3	C4、C5、C6、C8、C9、C13、C14、C23、C37、C39、C41、C43、C45、C46、C47、C49、C51、C52、C53、C55	0.1uF		402	YAGEO	CC0402KRX5R6BB104	20
4	C7、C11、C12、C42	10uF		1206	Murata Electronics	GRM31CR71C106KAC7L	4
5	C10、C15、C38、C40	150uF		7343	Kemet	T495D157K010ATE100	4
6	C16、C24	1uF		805	TDK	CL21B105KPFNNNE	2
7	C17、C20、C25、C28、C31、C34	0.1uF		201	TDK Corporation	C0603X5R0J104M	6
8	C18、C21、C26、C29、C32、C35	0.01uF		201	Yageo	CC0201KRX7R7BB103	6
9	C19、C22、C27、C30、C33、C36	0.001uF		201	TDK	C0603X7R1E102K030BA	6
10	C44、C48、C50、C54、C56	0.001uF		402	TDK	C1005X7R1H102K	5
11	D1、D2、D3、D4、D5、D6	LED 绿色 0805		805	Lite On（建兴电子）	LTST-C171GKT	6
12	FB1、FB2、FB3、FB4、FB5	100MHz 时 220		603	MuRata	BLM18PG221SN1D	5
13	J1、J2	HDR3X1 M .1		samtec_tsw-103-08-x-s	TEConnectivity AMP Connectors	103321-3	2
14	J3	PJ-202AH_1		PJ-202AH	CUI Inc.	PJ-202AH	1
15	J4、J5、J11	接头 1x2		HDR_2X1	3M	961102-6404-AR	3
16	J6	Type B USB 屏蔽		usbconn_type_b	FCI	61729-1011BLF	1
17	J7、J8、J9、J10	Type A USB 屏蔽		usbconn_type_a	TEConnectivity AMP Connectors	292303-1	4
18	LB1	THD-47-478-10		矩形	Brady		1

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条目	参考	值	容差	PCB 封装	制造商	器件型号	数量
19	PCB1	INT268		不适用	不限		1
20	R1	9.53K		RC0805	Panasonic Electronic Components	ERJ-6ENF9531V	1
21	R2	90.9K	1%	402	RΩ Semiconductor	RMCF0402FT90K9	1
22	R3、R33、R38、R39、R44、R45	1M	5%	402	RΩ Semiconductor	MCR01MZPJ105	6
23	R4	10K	1%	402	RΩ Semiconductor	MCR01MZPF1002	1
24	R5	47K	1%	RC0402	Vishay Dale	CRCW040247K0JNED	1
25	R6	100K		RC0402	YAGEO	AC0402FR-7W100KL	1
26	R7、R17、R18、R19、R20	1K	5%	402	RΩ Semiconductor	MCR01MRTJ102	5
27	R8、R9、R10、R11、R12、R13、R14、R15	4.7K	5%	402	RΩ Semiconductor	MCR01MZPJ472	8
28	R16	10K NOPOP	5%	402	RΩ Semiconductor	MCR01MZPF1002	1
29	R21、R24、R27、R30	10K	5%	402	RΩ Semiconductor	MCR01MZPF1002	4
30	R22、R23、R25、R29、R31、R32	330	5%	402	RΩ Semiconductor	MCR01MZPJ331	6
31	R26、R28	0Ω		RC0805	YAGEO	RC0805FR-100RL	2
32	R34、R35、R36、R37、R40、R41、R42、R43	10K DNP		r0402	RΩ Semiconductor	MCR01MZPF1002	8
33	SHNT1、SHNT2	QPC02SXGN-RC		0.1	Sullins Connector Solutions	QPC02SXGN-RC	2
34	SW1	PTS645SL50-2LFS		SW_PTS645SL502LFS	C&K	PTS645SL50-2 LFS	1
35	SW2	8-POS 50-MIL SMT		SW_TDA08H0SB1R	C&K	TDA08H0SB1	1
36	SW3	MSN13ANW03		SW_MSN13ANW03	NKK 开关	MSN13ANW03	1
37	TP1、TP2	TESTPOINT		TESTLOOP	Samtec Inc.	61300111121	2
38	U1	TUSB2514		qfn50p600x600x100-37nf	德州仪器 (TI)	TUSB2514	1
39	U2	AT24C04		ADAMTECH_ICM-308-1-GT-HT	Microchip Technology	ICM-308-1-GT-HT	1
40	U3	TPS7A4533		KTT_6PIN	德州仪器 (TI)	TPS7A4533KTT	1
41	U4、U5、U6、U7	TPS2001C		dgn8	德州仪器 (TI)	TPS2001CDGN	4

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条目	参考	值	容差	PCB 封装	制造商	器件型号	数量
42	Y1	ECS-24MHZ		ECX-53B	ECS	ECS-240-20-30B-TR	1

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6 其他信息

6.1 商标

所有商标均为其各自所有者的财产。

6.2 相关文档

如要查看相关文件，请参阅以下内容：

- 德州仪器 (TI) TPS7A45xx 低噪声快速瞬态响应 1.5A 低压降电压稳压器
- 德州仪器 (TI) TPS20xxC 和 TPS20xxC-2 限流配电开关

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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 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.

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 DEGREDATION 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/lsds/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/lsds/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.

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, INDEMITY 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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