EVM User's Guide: TPS26750AEVM

TPS26750A 评估模块

说明

TPS26750AEVM 评估模块评估 USB-PD 在 SPR 和 EPR 运行模式下的仅受电端、仅供电端或 DRP 应用。TPS26750AEVM 可在无电源的情况下用作供电端、受电端或 DRP 器件，最高支持 48V、5A (240W)，并支持符合 USB-PD 规范的电池充电应用。

开始使用

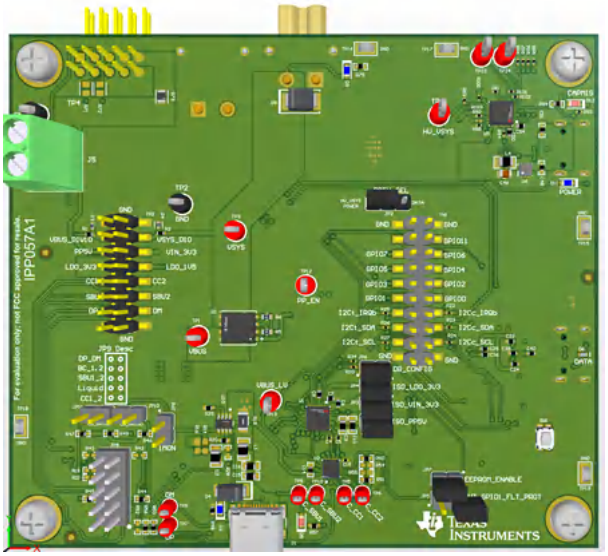
1. 订购 TPS26750AEVM 高度集成的 USB Type-C® 和 USB PD 控制器评估模块 (EVM)
2. 阅读 TPS26750AEVM 用户指南
3. 使用应用程序自定义工具开始开发
4. 如有疑问或需要支持，请参阅数据表、技术参考手册，也可访问 E2E™ 论坛

特性

- 高达 240W (48V/5A) 的供电和受电应用
- 易于使用的 GUI，附带预配置的固件，可配置电压范围、充电协议以及连接的 TPS26750A USB-PD 控制器的各个方面
- 多个测试点和接头可实现快速轻松的调试信号，例如 VBUS、CCx 和 ADCINx 线路

应用

- 无绳电动工具电池包
- 移动电源
- 零售自动化和支付
- 无线音箱
- 无线真空吸尘器
- 个人或便携式电子产品
- 医疗和保健



TPS26750AEVM

1 评估模块概述

1.1 简介

TPS26750AEVM 是一款用于评估 TPS26750A USB-PD 控制器的全功能评估模块。该评估板包含评估支持 EPR 的 USB-PD 应用所需的一切，可作为供电端、受电端或双角色电源 (DPR) 应用。板上集成预烧录的嵌入式微控制器，可轻松与连接至 TPS26750A 器件的 EEPROM 通信并对其进行编程，无需外部编程器或调试程序。提供了功能齐全的 GUI 来与器件交互，支持初始配置、导出编程与补丁文件、动态读取 TPS26750A 器件的诊断或故障信息等功能。

1.2 套件内容

- TPS26750AEVM 评估模块
- 内插板，用于实现与 BQ25756EVM 的电源连接
- 带状电缆，用于实现与 BQ25756EVM 的信号连接
- EVM 免责声明自述文件

1.3 规格

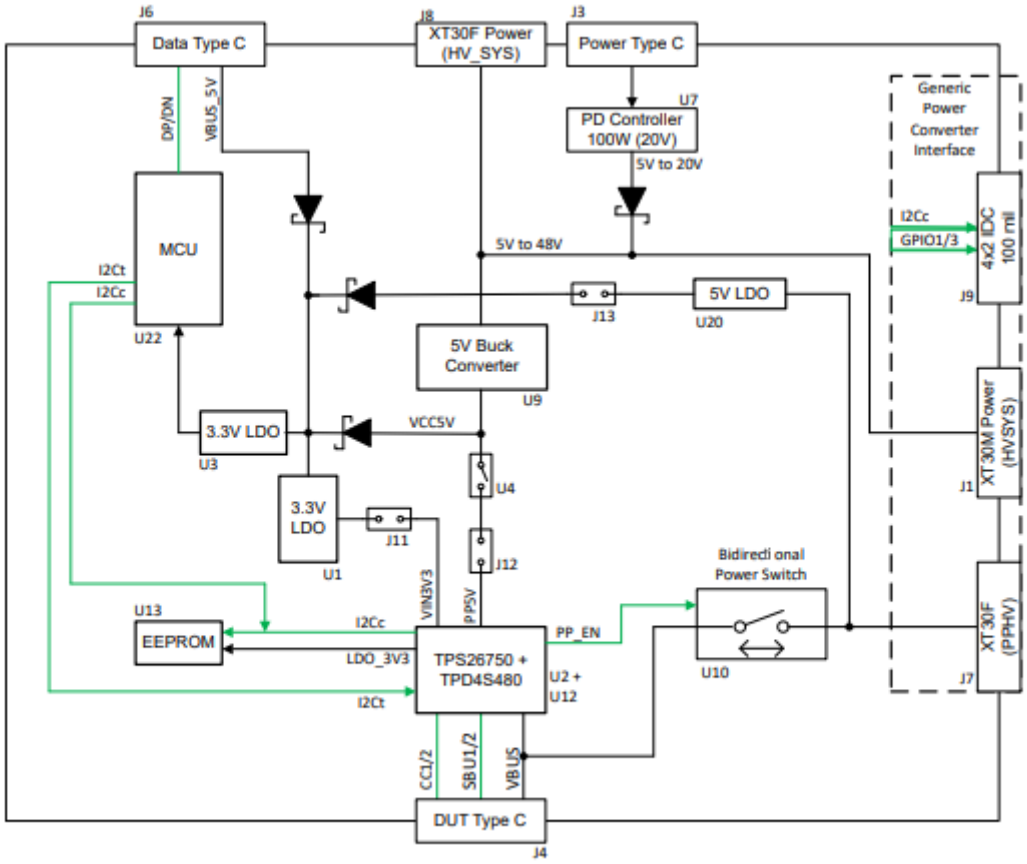


图 1-1. TPS26750AEVM 方框图

1.4 器件信息

TPS26750A 器件是一款单端口 USB 控制器，支持扩展的功率范围 (EPR)，具有广泛的用途和功能，包括能够作为受电端、供电端及 DRP 器件运行，功率高达 240W。通过在线配置工具，可对器件进行定制，以支持各种 I2C 和 GPIO 事件。该器件旨在成为全功能的解决方案，能够运行完整的 USB-PD 协议栈，无需用户进行定制固件开发。

TPS26750AEVM 评估模块包括多个用于对电压保护、电源拓扑和电流检测进行完整评估的器件。额外配备的 TPS26750A PD 控制器可以替代桶形插孔来为器件供电，无需立即使用台式电源。有关 TPS26750AEVM 评估模块上每种器件的详细信息，请参阅表 1-1。

TPS26750AEVM PD 控制器可通过基于网络的 GUI 进行配置来满足应用特定要求、架构、电源角色及数据角色。GUI 工具提供额外的固件配置，以集成对选定电池充电器产品的控制功能，此为可选配置。

表 1-1. TPS26750AEVM 上的器件

位号	器件名称	说明
U1	TPS26750ASRSMR	USB Type-C® EPR 双角色电源 PD 控制器
U2	TPD4S201	20V 端口保护，带 VBUS 短路保护
U5	TPS25730A	USB Type-C® 仅受电端 PD 控制器，直流桶形插孔替代产品

2 硬件

2.1 电源要求

对于独立 PD 评估，TPS26750AEVM 评估模块的主电源是通过 USB Type-C® 仅受电端口 (J7) 提供的，该端口可接受 45W USB Type-C PD 电源（15V 至 20V）。如果 USB Type-C® 适配器不能提供不低于 15V 的电压，则 TPS26750AEVM 评估模块不能正确加电。或者，也可以使用连接到 VSYS 螺丝端子 (J5) 的外部台式电源为 EVM 供电，台式电源提供 15V-48V 的电压范围。还可以直接通过 USB Type-C® 连接器 (J1) 为 TPS26750AEVM 评估模块供电，从而在电池电量耗尽的情况下仿真 TPS26750A 器件。当 TPS26750AEVM 评估模块仅通过端口 J1 供电时，EVM 仅充当接收器（除非 VSYS 螺丝端子通电，否则无法供电）。对于电池充电应用，TPS26750AEVM 与选定的电池充电器 EVM 搭配使用，以模拟电池充电系统。具体而言，BQ25756EVM 评估模块是一款兼容扩展的功率范围 (EPR) 的 EVM，能够在 5A (240W) 电流下提供或接收高达 48V 的电压。提供了专用的内插板和带状电缆，以便 BQ25756EVM 和 TPS26750AEVM 能够无缝连接并相互通信。

2.2 设置

TPS26750AEVM 评估模块开箱即用，采用 15W (5V/3A) 供电功率和 100W (20V/5A) 受电功率的默认配置。如果需要不同的配置来测试系统，请使用应用程序自定义工具创建配置或加载不同的配置模板。有关使用应用程序自定义工具的详细说明，请参阅 GUI 用户指南。

若要在独立运行模式下使用该器件，请连接以下任一电源：

- 将功率不低于 45W 的 USB-PD 电源连接到 J7
- 将最高 48V 的外部电源连接到 VSYS 螺丝端子 (J5)

该器件还可通过将 USB Type-C® 电缆连接至 J1，以在电池电量耗尽模式下运行。

要将 BQ25756EVM 评估模块连接到器件，必须将提供的内插板连接在 TPS26750AEVM 和 BQ25756EVM 评估模块之间。有关如何将两个板连接在一起的示例，请参阅图 2-1。

按照说明连接两个板：

1. 拧下 BQ25756EVM 评估模块的 J1 和 J3 上的端子螺丝。
2. 插入内插板，注意在拧紧端子前将引线完全插入。
3. 将内插板与 TPS26750AEVM 评估模块对齐。
4. 将触点推入到位，直至触点建立牢固连接。

备注

两块板子处于略微不同的垂直平面上。

5. 将提供的带状电缆的一侧连接至 BQ25756EVM 评估模块的 J8。
6. 将带状电缆的另一侧连接至 TPS26750AEVM 评估模块的 J3。

备注

TPS26750AEVM 评估模块上 J3 连接点的引脚 1 和 2（最靠近电路板钻孔的引脚）未连接至带状电缆。

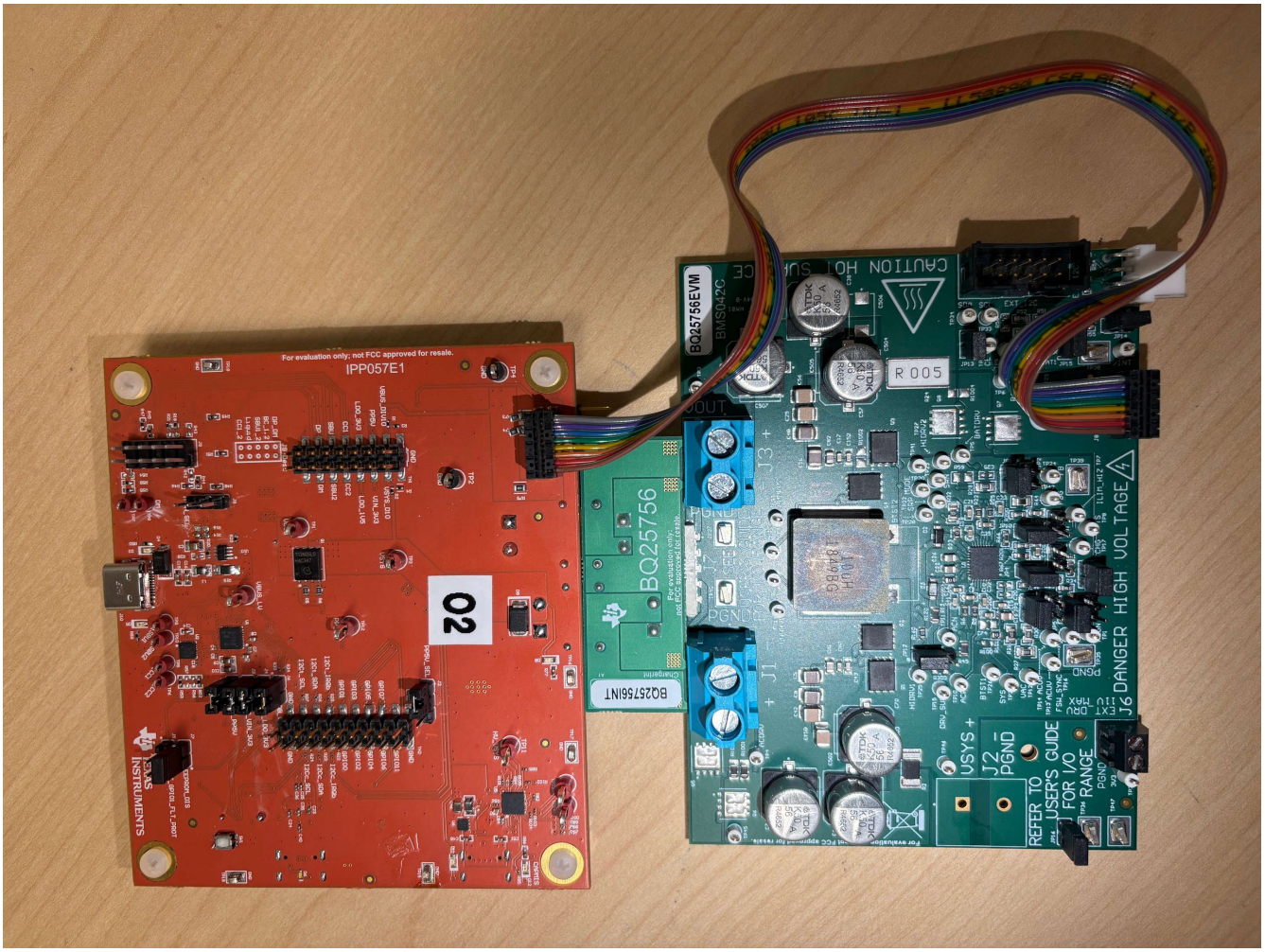


图 2-1. BQ25756EVM 和 TPS26750AEVM 已连接

备注

该图使用了不同版本的 TPS26750AEVM 评估模块，它们的网络名称略有不同，但电气连接是相同的。

2.3 跳线信息

跳线信息已在电路板上清晰标注，并附有功能说明。表 2-1 列示了所有配置跳线及其说明。

表 2-1. 跳线信息

跳线位号	引脚说明
JP1	隔离 PP5V。 可用于电流测量。
JP2	选择 PP5V 的来源： • 电池充电器的高压节点 • USB Type-C®连接器或 MCU 的 5V 电源轨
JP3	隔离 VIN_3V3。 可用于电流测量。
JP4	隔离 LDO_3V3。 可用于电流测量。
JP5	将 TPD4S201RUKR 的 /FLT 输出连接至 GPIO1，以实现故障输入的事件映射。

表 2-1. 跳线信息（续）

跳线位号	引脚说明
JP6	配置 PD 控制器的电池电量耗尽模式。 保持跳线接通以启用 SafeMode 移除跳线则启用 AlwaysEnableSink。
JP7	PD 控制器与 EEPROM 之间的 I2Cc 数据线。 移除跳线可禁用从 EEPROM 加载 I2C 配置（PD 保持为 PTCH）。
JP8	用于 TPS26750A 器件的电流监测输入。
JP9	选择用于液体检测的引脚（CCx 或 SBUx）。
JP10	LD1 电阻分压器连接至 GPIO0，用于 ADC 测量。
JP11	LD2 电阻分压器连接至 GPIO2，用于 ADC 测量。

2.4 LED 信息

表 2-2. LED 信息

位号	说明
D3	蓝色 LED，指示 USB Type-C® 连接至 TPS26750A Type-C 端口 (J1)。
D5	红色 LED，指示主 USB Type-C® 端口 (J1) 前面的 TPD4S480RUKR 保护器件检测到故障。
D6	蓝色 LED，指示 USB Type-C® 连接至数据 Type-C 端口 (J4)。
D9	蓝色 LED，指示使用 XT30 连接器 (J6) 从 BQ 器件供电。
D11	蓝色 LED，指示 USB Type-C® 连接至桶形插孔替代端口 (J7)。
D12	红色 LED，指示连接的供电端无法为受电端提供足够电力，仅能为 Type-C 端口供电，因此发生功能不匹配。

2.5 测试点

表 2-3. 测试点信息

网标签	说明
TP1	PD 控制器 VBUS 电压基准。
TP2	EVM 的接地基准，此 GND 靠近 VBUS 放置。
TP3	PD 控制器 VSYS 电压基准（更新了之前的 PPHV 标签中的术语，以匹配 S 型号）。
TP4	靠近 VSYS 放置的 EVM 接地基准。
TP5	PD 控制器的 CC1 连接器侧，位于 TPD4S480RUKR 器件和 USB-C 或 USB PD 端口之间。
TP6	PD 控制器的 CC2 连接器侧，位于 TPD4S480RUKR 器件和 USB-C 或 USB PD 端口之间。
TP7	PD 控制器的 DP 连接器侧，位于 TPD4S480RUKR 器件和 USB-C 或 USB PD 端口之间。
TP8	PD 控制器的 DM 连接器侧，位于 TPD4S480RUKR 器件和 USB-C 或 USB PD 端口之间。
TP9	PD 控制器的 SBU1 连接器侧，位于 TPD4S480RUKR 器件与 USB-C 或 USB PD 端口之间。
TP10	PD 控制器的 SBU2 连接器侧，位于 TPD4S480RUKR 器件和 USB-C 或 USB PD 端口之间。
TP11	来自 BQ 器件的系统电压连接，用于为 DC-DC 转换器供电，以分配至较低电压轨。
TP12	连接至电子保险丝的电源路径使能输入，用于控制 VBUS 上的高压电源路径
TP13	连接至 TPD4S480RUKR 器件，用于监测低电压。

表 2-3. 测试点信息（续）

网标签	说明
TP14	连接至主电源路径的 NFET 栅极，以使能 VBUS。
TP15 至 TP19	接地基准。
TP20 至 TP21	用于低侧电流检测的检测电阻器测试点。
TP22	LM76005 DC-DC 的电源正常信号。
TP23 和 TP24	TPS26750A 器件的 I2Ct_SCL 和 I2Ct_SDA 线路（分别对应）。

2.6 开关和按钮

表 2-4. 开关和按钮信息

位号	说明
S1	用于将 PICO 微控制器的 RST 信号置为有效的按钮。按下时，RST 引脚变为低电平。

3 软件

3.1 软件说明

所需软件可从 TI Gallery 获取，可以通过网络浏览器运行（需要使用 Google Chrome®、Firefox®® 或 Safari®® 网络浏览器）。如需使用该软件，还必须在 PC 上安装 TI Cloud Agent 作为浏览器扩展。该应用程序启动后，将显示安装 TI Cloud Agent 的说明。该软件也可以在 PC 上本地运行。如果希望在 PC 本地运行该软件，则必须在本地安装 GUI Composer Runtime。若要安装 GUI Composer Runtime，请点击 TI Gallery 中所列应用之一内的向下箭头，然后查看显示的底部链接集。在选择本机操作系统后，打开安装程序并按照提示安装程序。有关如何安装 GUI 并将其用于 TPS26750AEVM 评估模块的更多信息，请参阅 GUI 用户指南。

4 硬件设计文件

4.1 原理图

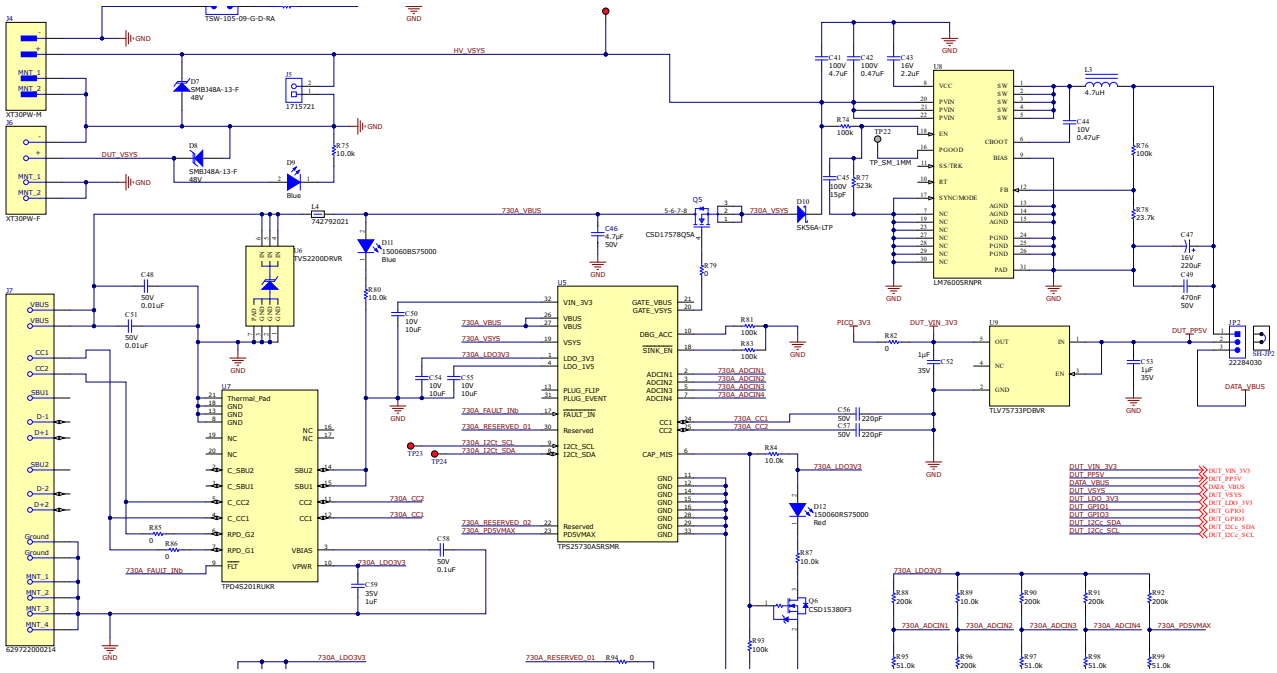


图 4-1. 电源路径原理图

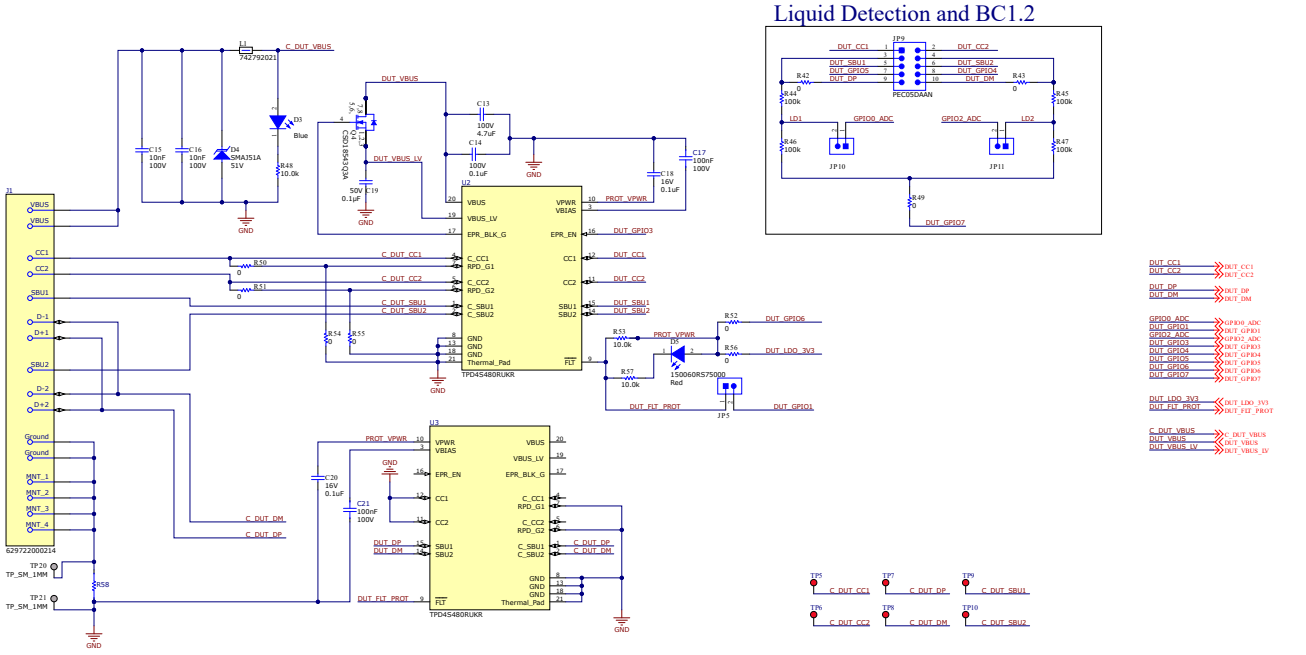


图 4-2. 保护原理图

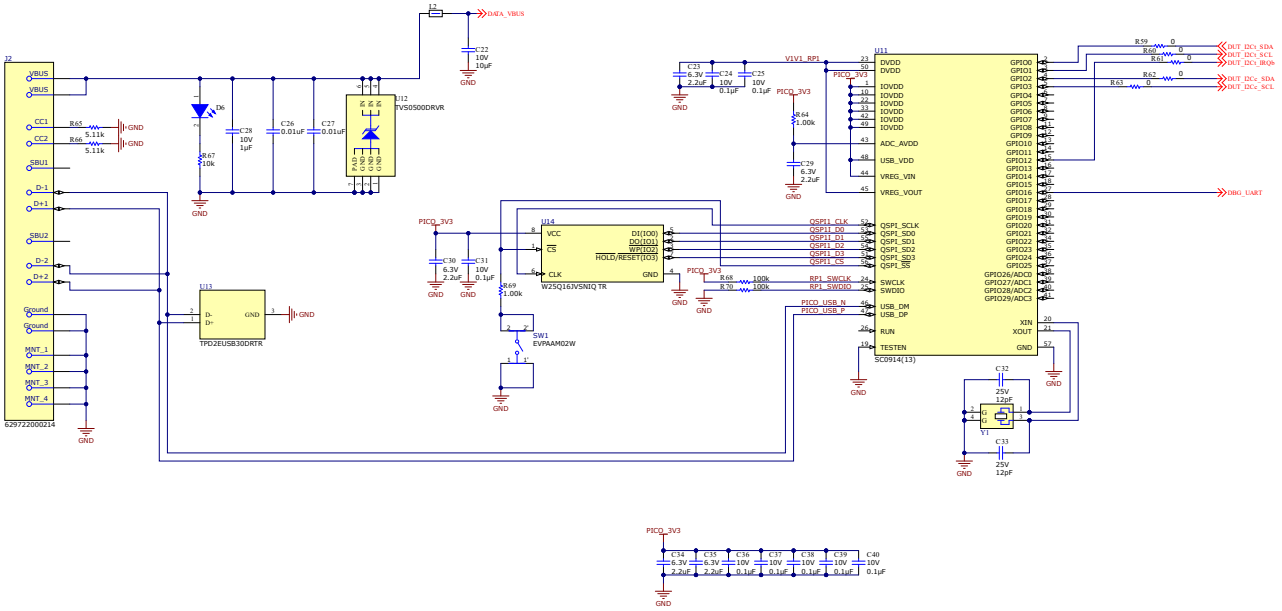


图 4-3. MCU 原理图

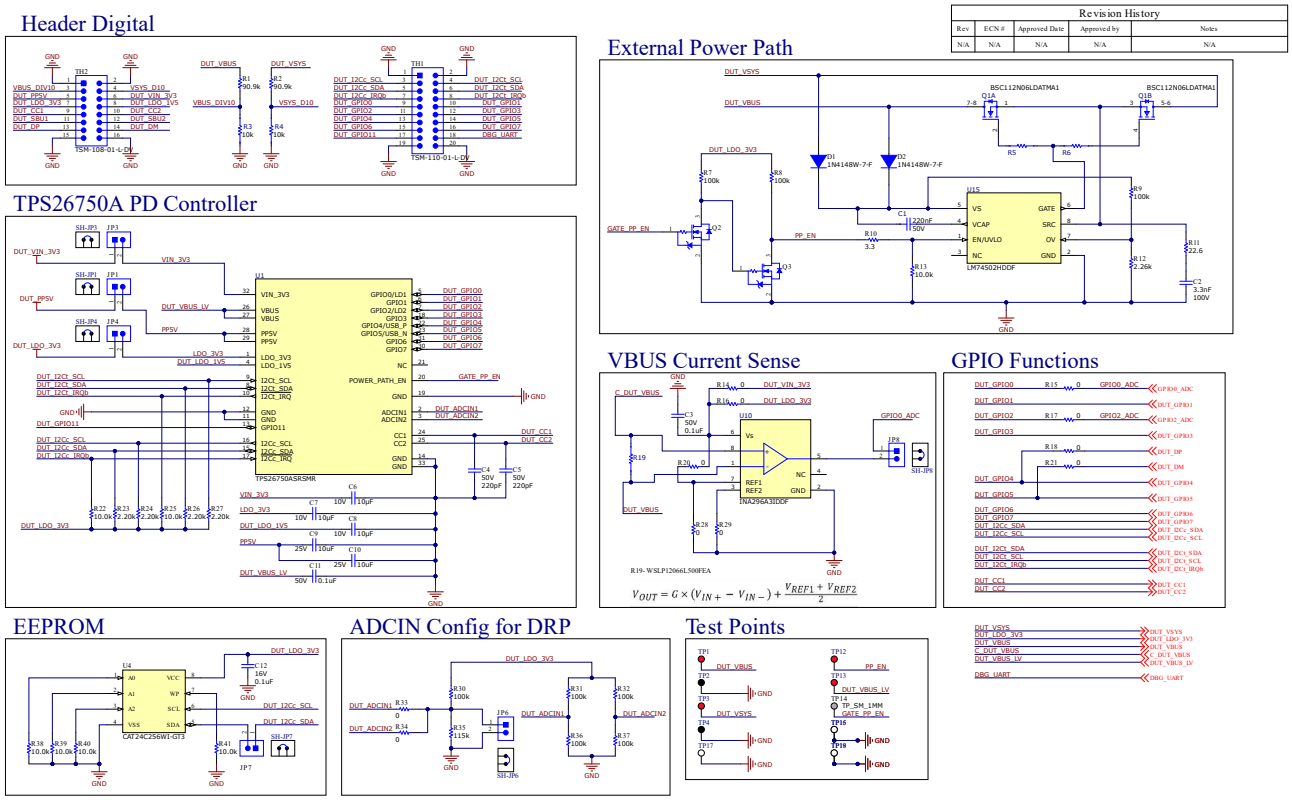


图 4-4. USB-PD 原理图

4.2 PCB 布局

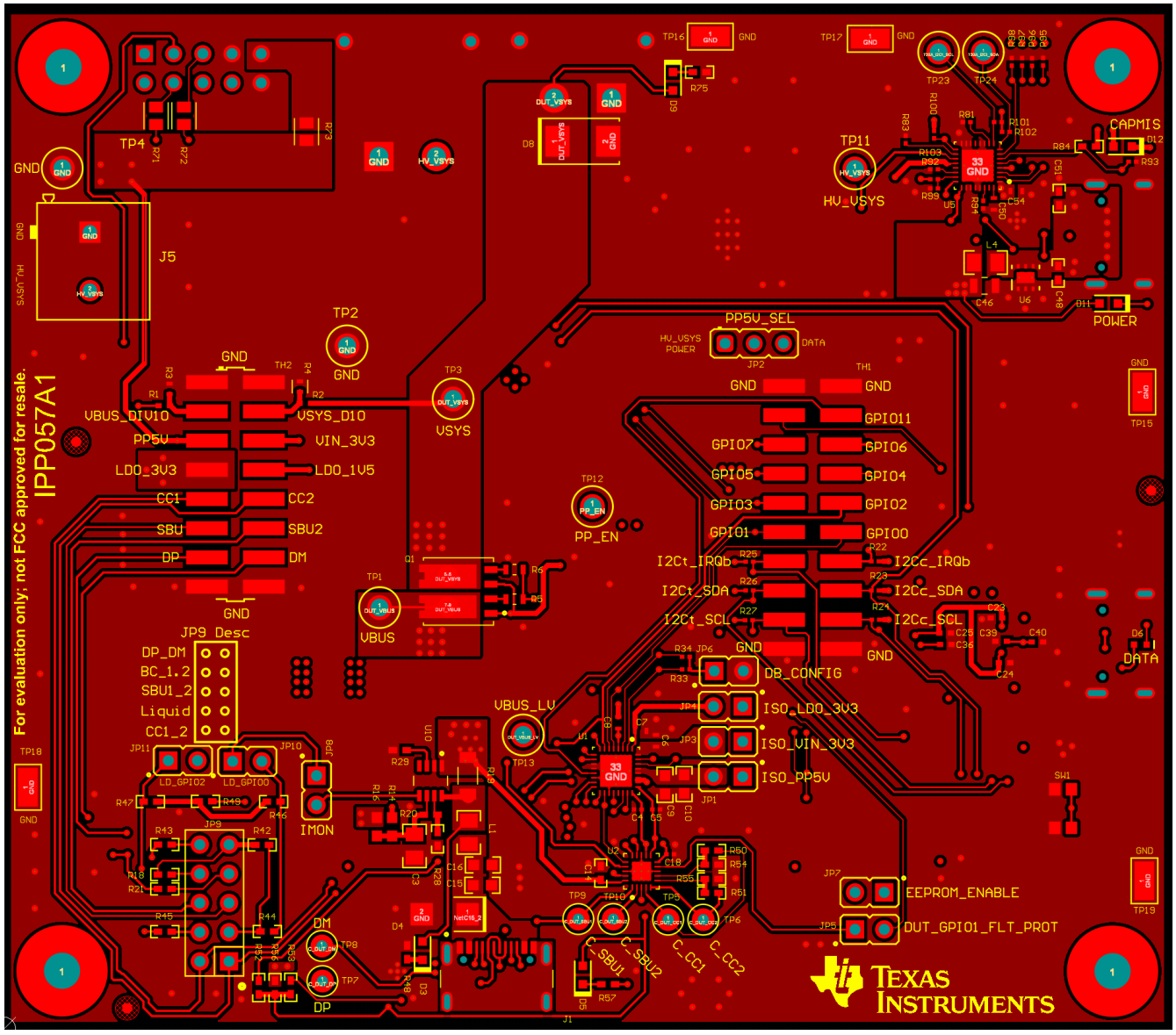


图 4-5. 顶层

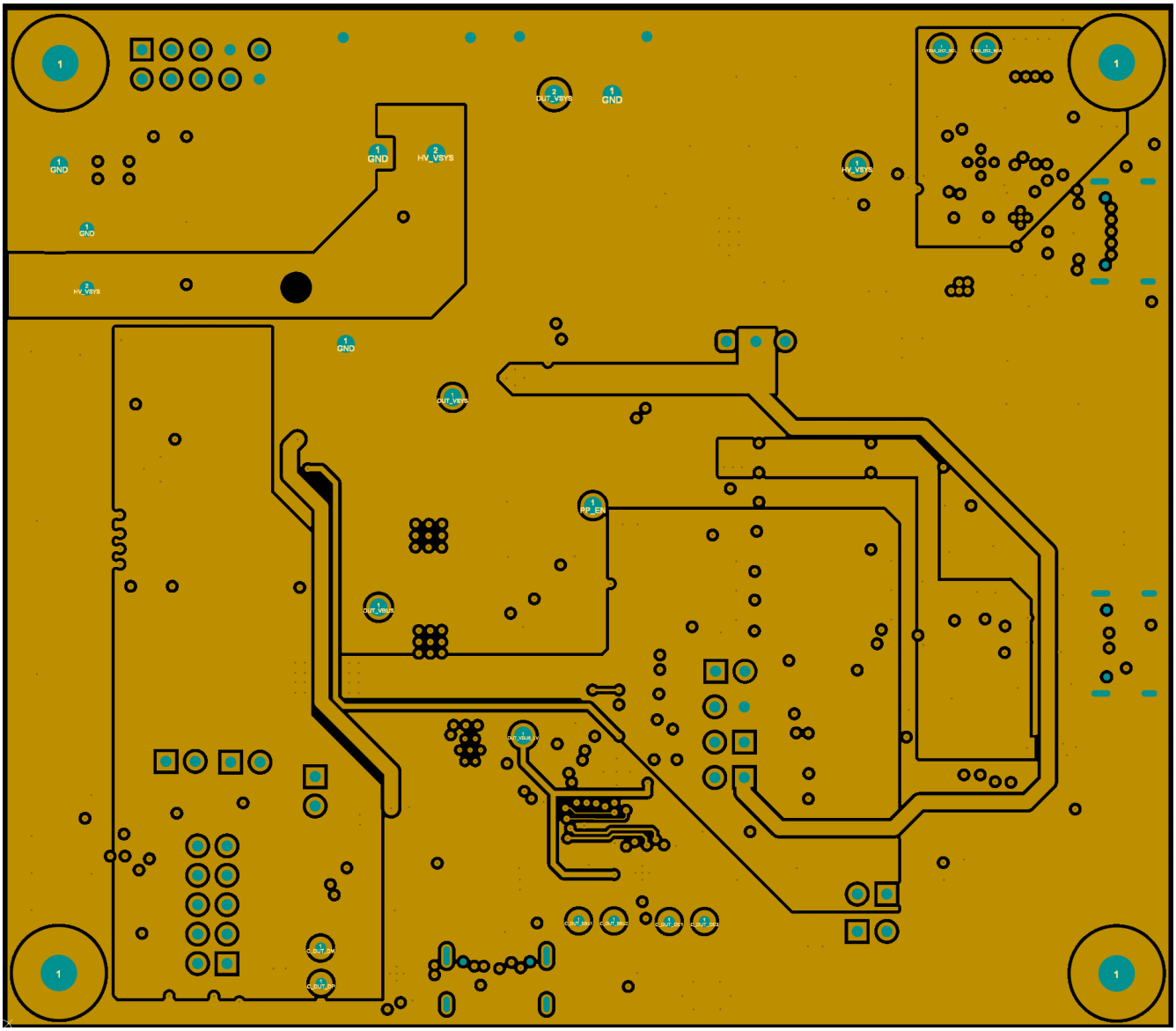


图 4-6. 电源层

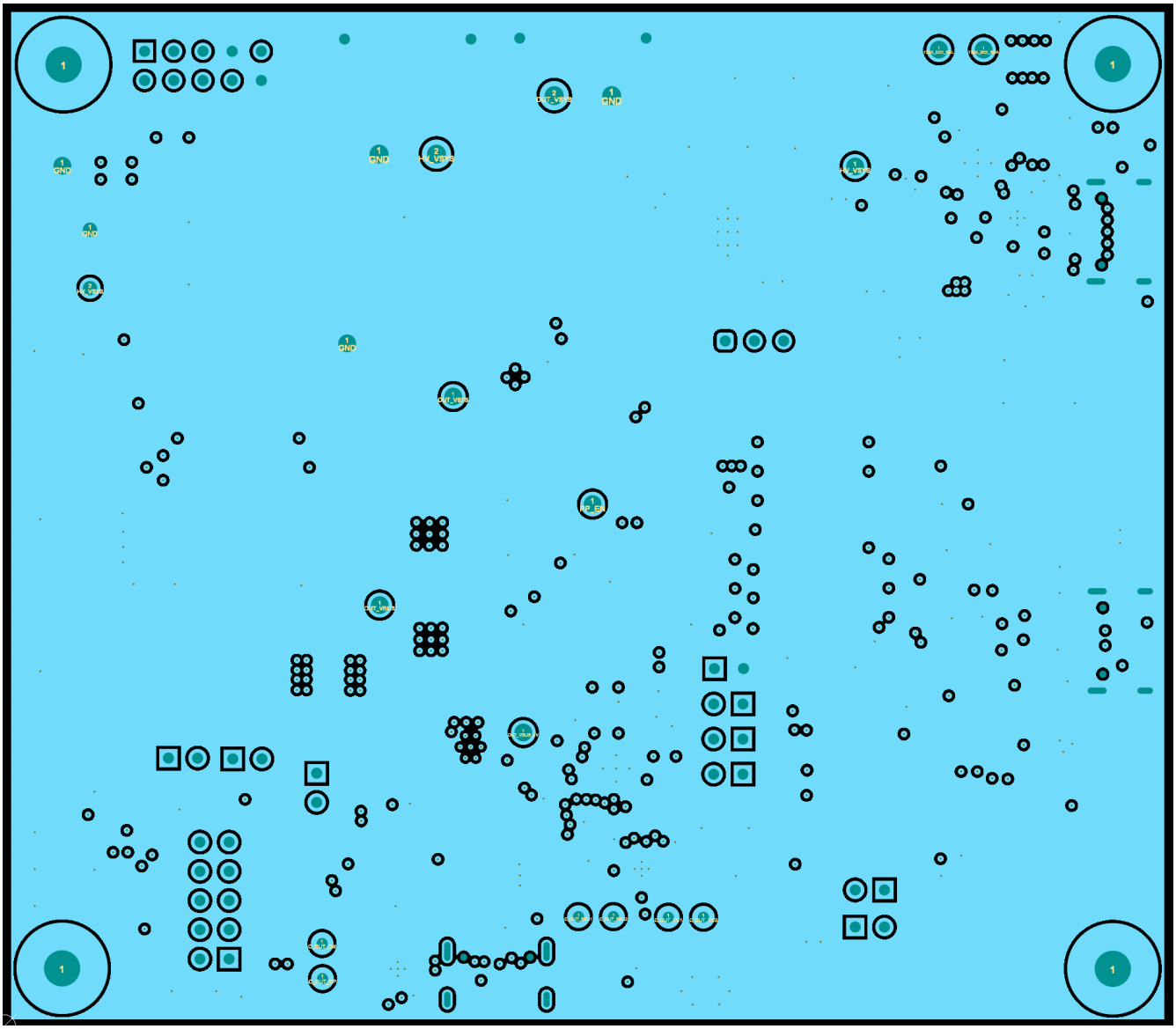


图 4-7. 接地层

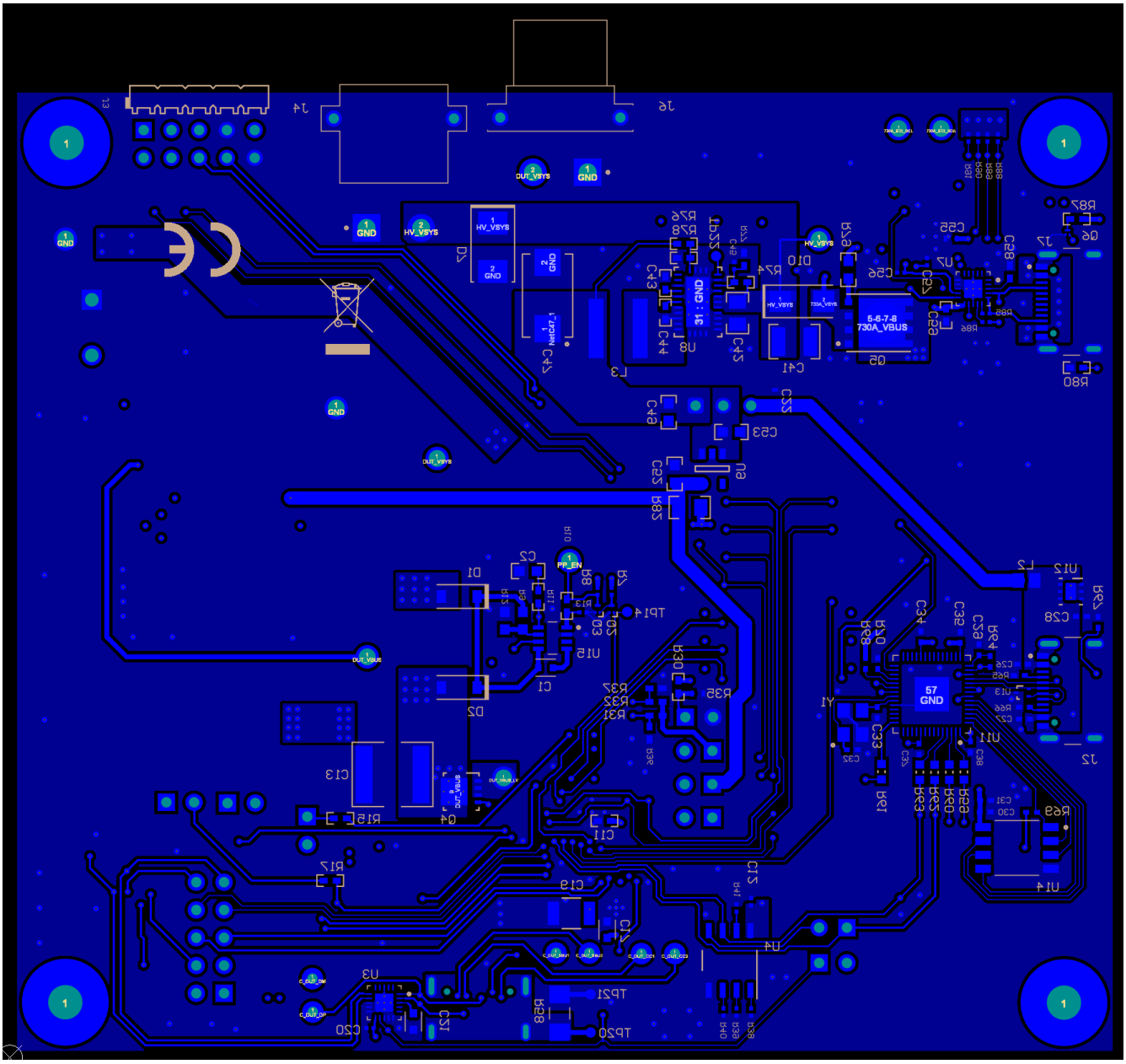


图 4-8. 底层

4.3 物料清单 (BOM)

表 4-1. TPS26750AEVM 物料清单

位号	说明	器件型号	制造商
C1	电容陶瓷 0.22µF 50V X7R 10% Pad SMD 0603 软端接 +125°C 自动 T/R	GCJ188R71H224KA01D	Murata
C2	电容，陶瓷，3300pF，100V，±10%，X7R，AEC-Q200 1 级，0603	GCM188R72A332KA37D	MuRata
C3	电容，陶瓷，0.1µF，50V，±20%，X5R，0805	C2012X5R1H104M085AA	TDK
C4、C5、C56、C57	电容，陶瓷，220pF，50V，±10%，X7R，AEC-Q200 1 级，0201	CGA1A2X7R1H221K030BA	TDK
C6、C7、C8	电容，陶瓷，10µF，10V，±20%，X5R，0402	CC0402MRX5R6BB106	Yageo
C9、C10	电容，陶瓷，10µF，25V，±20%，X5R，0603	GRM188R61E106MA73D	MuRata
C11、C58	电容，陶瓷，0.1µF，50V，±10%，X5R，0402	C1005X5R1H104K050BB	TDK
C12、C18、C20	电容，陶瓷，0.1µF，16V，±10%，X5R，0201	GRM033C71C104KE14D	MuRata
C13	电容，陶瓷，4.7µF，100V，±20%，X7R，2220	C5750X7R2A475M230KA	TDK
C14	电容，陶瓷，0.1µF，100V，±10%，X5R，0402	GRM155R62A104KE14D	MuRata
C15、C16	电容，陶瓷，0.01µF，100V，±10%，X7R，0603	C0603X103K1RACTU	Kemet
C17、C21	陶瓷电容 100nF 100 V X7R 10% SMD 0603 125°C 纸质 T/R	06031C104K4T2A	KYOCERA AVX
C19	电容，陶瓷，0.1µF，50V，±5%，C0G/NP0，1210	C3225C0G1H104J250AA	TDK
C22	电容，陶瓷，10µF，10V，±20%，X5R，0402	0402ZD106MAT2A	AVX
C23、C29、C30、C34、C35	电容，陶瓷，2.2µF，6.3V，±20%，X5R，0402	JMK105BJ225MV-F	Taiyo Yuden
C24、C25、C31、C36、C37、C38、C39、C40	电容，陶瓷，0.1µF，10V，+/-10%，X7R，AEC-Q200 1 级，0402	C0402C104K8RACAUTO	Kemet
C26、C27、C48、C51	CAP，CERM，0.01µF，50V，±5%，X7R，0402	C0402C103J5RACTU	Kemet
C28	电容，陶瓷，1µF，10V，±20%，X5R，0402	CC0402MRX5R6BB105	Yageo America
C32、C33	电容，陶瓷，12pF，25V，±5%，C0G/NP0，0402	GRM1555C1E120JA01D	MuRata
C41	电容，陶瓷，4.7µF，100V，±10%，X7S，1210	C3225X7S2A475K200AE	TDK
C42	电容，陶瓷，0.47µF，100V，±10%，X7S，0805	C2012X7S2A474K125AB	TDK
C43	电容，陶瓷，2.2µF，16V，±10%，X6S，0402	C1005X6S1C225K050BC	TDK
C44	电容，陶瓷，0.47µF，10V，±10%，X5R，0402	GRM155R61A474KE15D	MuRata
C45	电容，陶瓷，15pF，100V，±5%，C0G/NP0，0201	GRM0335C2A150JA01D	MuRata
C46	通用片状多层陶瓷电容器，0805，4.7µF，X7R，15%，10%，50V	GRM21BZ71H475KE15L	Murata
C47	电容，钽，220µF，16V，±20%，0.1Ω，SMD	TPSE227M016R0100	AVX
C49	电容，陶瓷，0.47µF，50V，±10%，X7R，0603	C1608X7R1H474K080AC	TDK
C50、C54、C55	电容，陶瓷，10µF，10V，±20%，X5R，0402	CL05A106MP5NUNC	Samsung Electro-Mechanics
C52、C53	电容，陶瓷，1µF，35V，±10%，X7R，AEC-Q200 1 级，0603	CGA3E1X7R1V105K080AC	TDK

表 4-1. TPS26750AEVM 物料清单（续）

位号	说明	器件型号	制造商
C59	电容，陶瓷，1 µF，35V，±10%，X5R，0402	GRM155R6YA105KE11D	MuRata
D1、D2	二极管，超快速，100V，0.15A，SOD-123	1N4148W-7-F	Diodes Inc.
D3、D9、D11	LED，蓝色，SMD	150060BS75000	Wurth Elektronik
D4	二极管，TVS，单向，51V，82.4Vc，400W，4.9A，SMA	SMAJ51A	Littelfuse
D5、D12	LED，红色，SMD	150060RS75000	Wurth Elektronik
D6	LED，白色，SMD	LW QH8G-Q2S2-3K5L-1	OSRAM
D7、D8	二极管，TVS，单向，48V，77.4Vc，SMB	SMBJ48A-13-F	Diodes Inc.
D10	二极管，肖特基，60V，5A，SMA	SK56A-LTP	Micro Commercial Components
H1、H2、H3、H4	机械螺钉，圆头，#4-40 x 1/4，尼龙，飞利浦盘形头	NY PMS 440 0025 PH	B&F Fastener Supply
H5、H6、H7、H8	六角螺柱，0.5"L #4-40，尼龙	1902C	Keystone
J1、J2、J7	连接器 USB 2.0 Type C 水平 SMT	6.29722E+11	Wurth Electronics
J3	接头，2.54mm，5x2，金，R/A，TH	TSW-105-09-G-D-RA	Samtec
J4	插座，直流电源，XT30，公头，引脚：2，在 PCB 上，THT，黄色，15A，500V	XT30PW-M	Amass
J5	端子块，5.08mm，2x1，TH	1715721	Phoenix Contact
J6	插座，直流电源，XT30，母头，引脚：2，在 PCB 上，THT，黄色，15A	XT30PW-F	Amass
JP1、JP3、JP4、JP5、JP6、JP7、JP8、JP10、JP11	接头，100mil，2x1，金，TH	PBC02SAAN	Sullins Connector Solutions
JP2	接头，2.54mm，3x1，锡，TH	22284030	Molex
JP9	接头，100mil，5x2，锡，TH	PEC05DAAN	Sullins Connector Solutions
L1、L2、L4	铁氧体磁珠，22Ω（在 100MHz 时），6A，0805	742792021	Wurth Elektronik
L3	电感，屏蔽，复合，4.7µH，10.5A，0.0144Ω，AEC-Q200 1 级，SMD	XAL6060-472MEB	Coilcraft
Q1	MOSFET 阵列 2（双）N 沟道 60V 20A (Tc) 65W (Tc) 表面贴装 PG-TDSON-8-4	BSC112N06LDATMA1	Infineon
Q2、Q3	MOSFET，N 沟道，30V，3A，YJJ0003A (PICOSTAR-3)	CSD17484F4T	德州仪器 (TI)
Q4	MOSFET，N 沟道，60V，35A，DNH0008A (VSONP-8)	CSD18543Q3A	德州仪器 (TI)
Q5	MOSFET N 通道 30V 25A (Ta) 3.1W (Ta)、42W (Tc) 表面贴装 8-VSONP (5x6)	CSD17578Q5A	德州仪器 (TI)
Q6	MOSFET，N 沟道，20V，0.5A，YJM0003A (PICOSTAR-3)	CSD15380F3	德州仪器 (TI)
R1、R2	电阻，90.9k，1%，0.063W，AEC-Q200 0 级，0402	CRCW040290K9FKED	Vishay-Dale
R3、R4	10kΩ ±1% 0.063W，1/16W 片上电阻 0402（公制 1005）厚膜	CRCW040210K0FKEDC	Vishay
R5、R6	CRCW 系列 0603 0.1W 0Ω 跳线表面贴装厚膜片上电阻	CRCW06030000Z0EAC	Vishay

表 4-1. TPS26750AEVM 物料清单（续）

位号	说明	器件型号	制造商
R7、R8	电阻，100k，1%，0.05W，0201	RC0201FR-07100KL	Yageo America
R9	电阻，100k，0.5%，0.1W，0603	RT0603DRE07100KL	Yageo America
R10	电阻，3.3，5%，0.063W，AEC-Q200 0 级，0402	CRCW04023R30JNED	Vishay-Dale
R11	电阻，22.6，1%，0.063W，AEC-Q200 0 级，0402	CRCW040222R6FKED	Vishay-Dale
R12	电阻，2.26k，1%，0.1W，0603	M55342K12B2E26T	TT Electronics/IRC
R15、R17、R20、R29、R49、R50、R51、R56	电阻，0，5%，0.063W，AEC-Q200 0 级，0402	CRCW04020000Z0ED	Vishay-Dale
R19	12mΩ，±1% 0.5W，1/2W 片上电阻 1206（公制 3216）电流检测薄膜	RL1206FR-7W0R012L	YAGEO
R22、R25、R38、R39、R40、R41	电阻，10.0k，1%，0.05W，0201	CRCW020110K0FKED	Vishay-Dale
R23、R24、R26、R27、R101、R102	电阻，2.20k，1%，0.05W，0201	CRCW02012K20FKED	Vishay-Dale
R30	电阻，100k，1%，0.1W，0402	ERJ-2RKF1003X	Panasonic
R33、R34、R85、R86、R94、R103	电阻，0，5%，0.05W，0201	CRCW02010000Z0ED	Vishay-Dale
R35	电阻，115k，1%，0.063W，0402	RC0402FR-07115KL	Yageo America
R44、R45、R46、R47	电阻，100k，1%，0.063W，0402	RC1005F104CS	Samsung Electro-Mechanics
R48、R75、R80、R84、R87	电阻，10.0k，1%，0.063W，AEC-Q200 0 级，0402	CRCW040210K0FKED	Vishay-Dale
R53、R57	电阻，10.0k，1%，0625W，0402	RT0402BRD0710KL	Yageo America
R58	6.5mΩ ±1% 1W 片上电阻 1206（公制 3216）抗硫化，汽车级 AEC-Q200，电流检测，可承受脉冲，防潮金属元件	WSLP12066L500FEA	Vishay
R59、R60、R61、R62、R63	电阻，0，5%，0.1W，AEC-Q200 0 级，0603	CRCW06030000Z0EA	Vishay-Dale
R64、R69	电阻，1.00k，1%，0.0625W，0402	RC0402FR-071KL	Yageo America
R65	电阻，5.11k，1%，0.063W，AEC-Q200 0 级，0402	CRCW04025K11FKED	Vishay-Dale
R68、R70	电阻，100k，1%，0.0625W，0402	RC0402FR-07100KL	Yageo America
R73	0Ω 跳线片上电阻 0805（公制 2012）金属元件	WSL080500000ZEA9	Vishay
R74、R76	电阻，100k，1%，0.063W，AEC-Q200 0 级，0402	CRCW0402100KFKED	Vishay-Dale
R77	电阻，523k，1%，0.063W，AEC-Q200 0 级，0402	CRCW0402523KFKED	Vishay-Dale
R78	电阻，23.7k，1%，0.1W，AEC-Q200 0 级，0402	ERJ-2RKF2372X	Panasonic
R79	电阻，0，5%，0.1W，AEC-Q200 0 级，0603	ERJ-3GEY0R00V	Panasonic
R81、R83、R93	电阻，100k，1%，0.05W，0201	RC0201FS-7D100KL	Yageo America
R82	电阻，0，5%，0.125W，AEC-Q200 0 级，0805	ERJ-6GEY0R00V	Panasonic
R88、R90、R91、R96	电阻，200k，1%，0.05W，0201	CRCW0201200KFKED	Vishay-Dale
R89、R100	电阻，10.0k，1%，0.05W，0201	RC0201FR-0710KL	Yageo America
R95、R97、R98、R99	电阻，51.0k，1%，0.05W，0201	RC0201FR-0751KL	Yageo America
SH-JP1、SH-JP2、SH-JP3、SH-JP4、SH-JP6、SH-JP7、SH-JP8	分流器，100mil，镀金，黑色	SPC02SYAN	Sullins Connector Solutions
SW1	触控式开关，单刀单掷-常开 0.02A/15V	EVPAAM02W	Panasonic

表 4-1. TPS26750AEVM 物料清单（续）

位号	说明	器件型号	制造商
TH1	接头，2.54mm，10x2，金，SMT	TSM-110-01-L-DV	Samtec
TH2	接头，2.54mm，8x2，金，SMT	TSM-108-01-L-DV	Samtec
TP1、TP3	测试点，紧凑，红色，TH	5005	Keystone Electronics
TP2、TP4	测试点，紧凑型，黑色，TH	5006	Keystone Electronics
TP5、TP6、TP7、TP8、TP9、TP10	测试点，微型，红色，TH	5000	Keystone Electronics
TP11、TP12、TP13、TP23、TP24	测试点，多用途，红色，TH	5010	Keystone Electronics
TP15、TP16、TP17、TP18、TP19	测试点，微型，SMT	5015	Keystone Electronics
U1	TPS26750ASRSMR	TPS26750ASRSMR	德州仪器 (TI)
U2、U3	USB Type-C® 48V EPR 端口保护器：VBUS 短路过压和 IEC ESD 保护	TPD4S480RUKR	德州仪器 (TI)
U4	256kb I2C CMOS 串行 EEPROM，SOIC-8	CAT24C256WI-GT3	ON Semiconductor
U5	针对电源应用进行了优化且具有集成电源开关的 USB Type-C® 和 USB PD 控制器	TPS25730ASRSMR	德州仪器 (TI)
U6	22V 精密浪涌保护钳位器，DRV0006A (WSON-6)	TVS2200DRVR	德州仪器 (TI)
U7	USB Type-C® 28V SPR 端口保护器：VBUS 短路过压和 IEC ESD 保护	TPD4S201RUKR	德州仪器 (TI)
U8	3.5V 至 60V 5A 同步降压稳压器，RNP0030A (WQFN-30)	LM76005RNPR	德州仪器 (TI)
U9	500mA、低 IQ、小型低压降稳压器，DBV0005A (SOT-23-5)	TLV75733PDBVR	德州仪器 (TI)
U10	-4V 至 110V、双向、1MHz、5V/μs、超精密电流检测放大器、SOT23-8	INA296A3IDDF	德州仪器 (TI)
U11	ARM® Cortex® -M0+- 微控制器 IC 32 位双核 133MHz 外部程序存储器 56-QFN (7x7)	SC0914(13)	Raspberry Pi
U12	5V 精密浪涌保护钳位器，DRV0006A (WSON-6)	TVS0500DRVR	德州仪器 (TI)
U13	用于超高速 (6Gbps) USB 3.0 接口的 ESD 解决方案，2 通道，-40 至 +85°C，3 引脚 SOT (DRT)，环保（符合 Rohs 标准，无锑/溴）	TPD2EUSB30DRTR	德州仪器 (TI)
U14	NOR 闪存串行（SPI、双路 SPI、四路 SPI）3V/3.3V 16M 位 2M x 8 6ns 8 引脚 SOIC N T/R	W25Q16JVSNIQ TR	Winbond
U15	具有反极性保护和过压保护的低 IQ 高侧开关控制器	LM74502HDDF	德州仪器 (TI)
Y1	晶振，12MHz，30ppm，SMD	7M-12.000MAHE-T	TXC Corporation
FID1、FID2、FID3	基准标记。没有需要购买或安装的元件。	不适用	不适用
R13	电阻，10.0k，1%，0.05W，0201	RC0201FS-7D10KL	Yageo America
R14、R16	电阻，0，5%，0.125W，0603	MCT06030Z0000ZP500	Vishay/Beyschlag
R18、R21、R28、R42、R43、R52、R54、R55	电阻，0，5%，0.063W，AEC-Q200 0 级，0402	CRCW04020000Z0ED	Vishay-Dale
R31、R32、R36、R37	电阻，100k，1%，0.1W，0402	ERJ-2RKF1003X	Panasonic
R66	电阻，5.11k，1%，0.063W，AEC-Q200 0 级，0402	CRCW04025K11FKED	Vishay-Dale

表 4-1. TPS26750AEVM 物料清单（续）

位号	说明	器件型号	制造商
R67	电阻，10k，5%，0.063W，AEC-Q200 0 级，0402	CRCW040210K0JNED	Vishay-Dale
R71、R72	0Ω 跳线片上电阻 0805（公制 2012）金属元件	WSL080500000ZEA9	Vishay
R92	电阻，200k，1%，0.05W，0201	CRCW0201200KFKED	Vishay-Dale

5 其他信息

5.1 已知硬件或软件问题

- 电流检测电路目前尚未组装，待 GUI 配置工具添加相应支持后将进行修订

5.2 商标

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。

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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:*

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最后更新日期：2025 年 10 月