

EVM User's Guide: CC2745R10-CS-EVM

CC27xxR10 用于信道探测的平台开发套件**说明**

信道探测 (CS) 评估模块旨在为客户提供一种无线设备参考设计，可用于信道探测硬件和软件开发。

开始使用

1. 订购 [LP-XDS110](#) 或 [LP-XDS110ET](#) launch pad。
2. 下载最新[软件开发套件 \(SDK\)](#)。
3. 从 TI 参考设计页面下载综合参考设计文件。
4. 查看最新的 [CC2745R10-Q1](#) 产品页面

特性

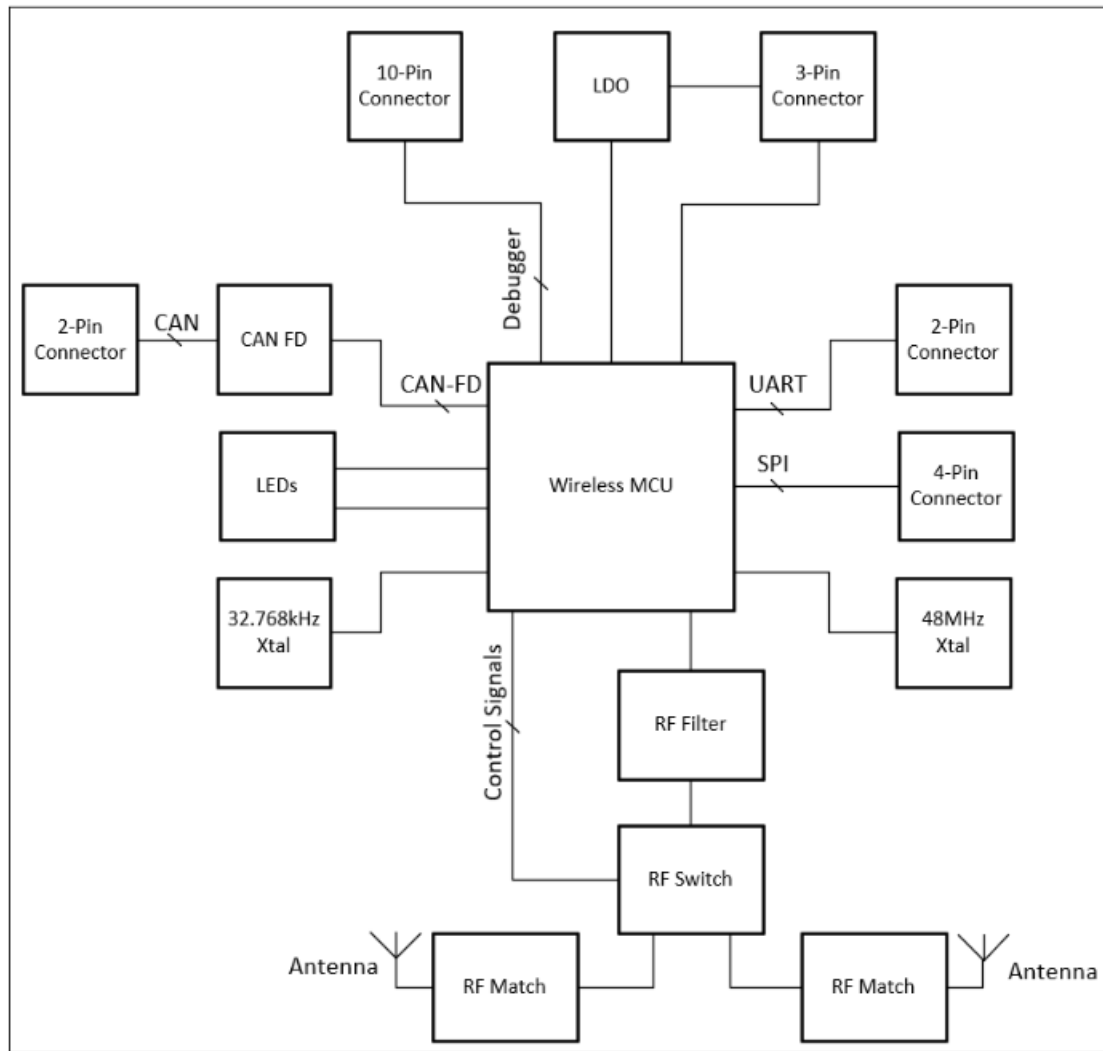
- [CC2745R10-Q1](#) 无线 MCU，输出功率高达 +10dBm
- 2 个 2.4GHz PCB 天线，带 U.FL 连接器，用于外接天线和传导测量
- 10 引脚 Arm® Cortex® 连接器
- [TCAN3404DRQ1](#) CAN FD 收发器
- [TPS7B82-Q1](#) LDO
- 2 个状态 LED
- SPI 和 UART 接口

应用

- [汽车](#)
 - 信道探测
- [工业](#)
 - 信道探测



CC2745R10-CS-EVM 硬件映像



CC2745R10-CS-EVM 方框图

1 评估模块概述

1.1 简介

信道探测 (CS) EVM 可帮助用户使用 SimpleLink 超低功耗 CC2745R10-Q1 无线 MCU 开发及评估信道探测 (CS)。

1.2 套件内容

- [CC2745R10-CS-EVM](#)
- 10 引脚扁平带状电缆
- 双线母对母电缆
- [EVM 的标准条款与条件](#)
- EVM 的简略条款和条件

1.3 规格

[CC2745R10-CS-EVM](#) 采用 [CC2745R10-Q1](#) 无线 MCU 设计，具有 96MHz Arm Cortex-M33 处理器、1MB 系统内可编程闪存，用于引导加载程序和驱动器的 32kB ROM，以及在待机模式下实现 RAM 完全保存的 162kB 超低泄漏 SRAM。此外，[CC2745R10-Q1](#) 是 2.4GHz RF 收发器，兼容低功耗蓝牙，包含集成式平衡-非平衡变压器，支持无线升级 (OTA)，并具有串行线调试 (SWD) 接口。

MCU 功耗的 6.8mA 主动模式运行 CoreMark®，在待机模式下消耗的电流低于 900nA，在关断模式下消耗的电流为 170nA (在引脚上唤醒)。

RX 模式下的射频电流消耗为 6.1mA，TX 模式的 0dBm 条件下消耗为 7.7mA，TX 模式的 +10dBm 条件下消耗为 24.5mA。另外，射频在低功耗蓝牙 125kbps 条件下能够保证 -103.5dBm 的灵敏度，在低功耗蓝牙 1Mbps 条件下能够保证 -97dBm 的灵敏度。

CC2745R10-CS-EVM 可以支持：

- 2 个 2.4GHz PCB 天线，带 U.FL 连接器，用于外接天线和传导测量
- 10 引脚 Arm® Cortex® 连接器
- [TCAN3404DRQ1](#) CAN FD 收发器
- [TPS7B82-Q1](#) LDO
- 2 个状态 LED
- SPI 和 UART 接口

1.4 器件信息

CC2745R10-Q1

SimpleLink™ 2.4GHz [CC2745R10-Q1](#) 器件是一款符合 AEC-Q100 标准的无线微控制器 (MCU)，面向汽车应用。该器件针对信道探测和汽车接入等应用中的低功耗无线通信进行了优化。该器件的突出特性包括：

- 支持 TI 具有信道探测功能的 SimpleLink 低功耗 SDK。
- 符合 AEC-Q100 标准，提供 2 级温度范围 (-40°C 至 +125°C)，并采用具有可湿性侧面的 6mm x 6mm QFN40 封装。
- 完全 RAM 保持时，具有 0.9 μA 的低待机电流。

[CC2745R10-Q1](#) 器件是 SimpleLink™ MCU 平台的一部分，该平台包括 Wi-Fi、低功耗蓝牙、Thread、Zigbee®、低于 1GHz MCU 和主机 MCU，它们共用同一个易用型开发环境和丰富工具集。如需更多信息，请访问 [SimpleLink™ MCU 平台](#)。

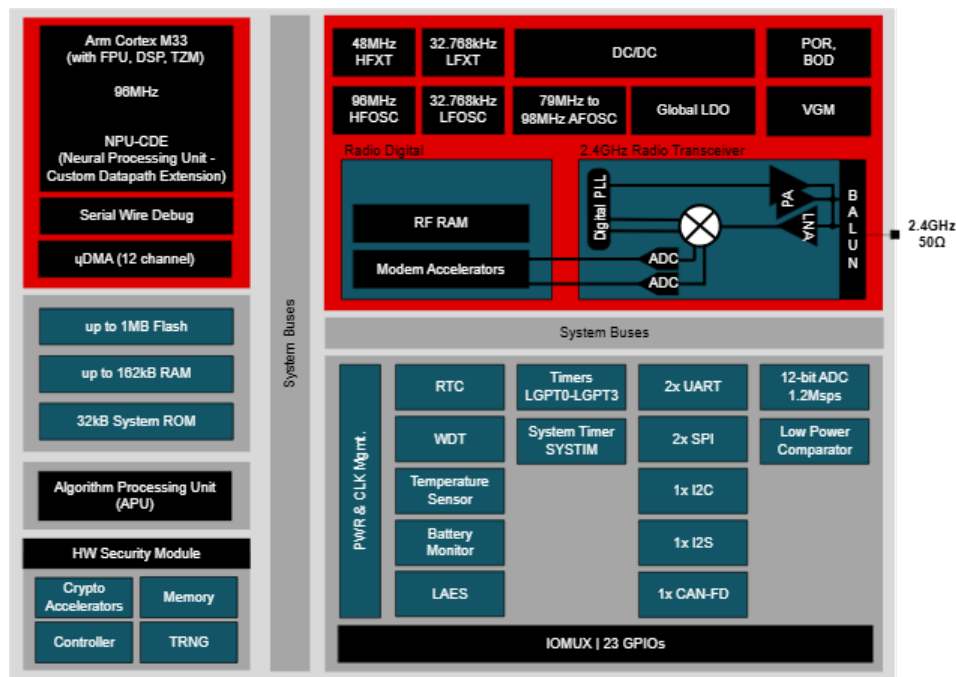


图 1-1. CC2745R10 方框图

TCAN3404DRQ1

TCAN340x-Q1 器件是符合汽车 EMC 标准的 3.3V CAN FD 收发器。这些器件与数据速率无关，因此向后兼容，可支持传统 CAN 应用，同时还支持高达 8Mbps 的 CAN FD 网络。这些器件支持待机模式，可将收发器置于低电流消耗模式。在 CAN 总线上接收到有效的唤醒模式后，器件会通过 RXD 引脚向微控制器发送信号。然后，MCU 可以使用 STB 引脚将器件置于正常模式。

TCAN3404-Q1 支持超低功耗关断模式，在该模式下，大多数内部块都被禁用。此特性针对电池供电型应用进行了优化。

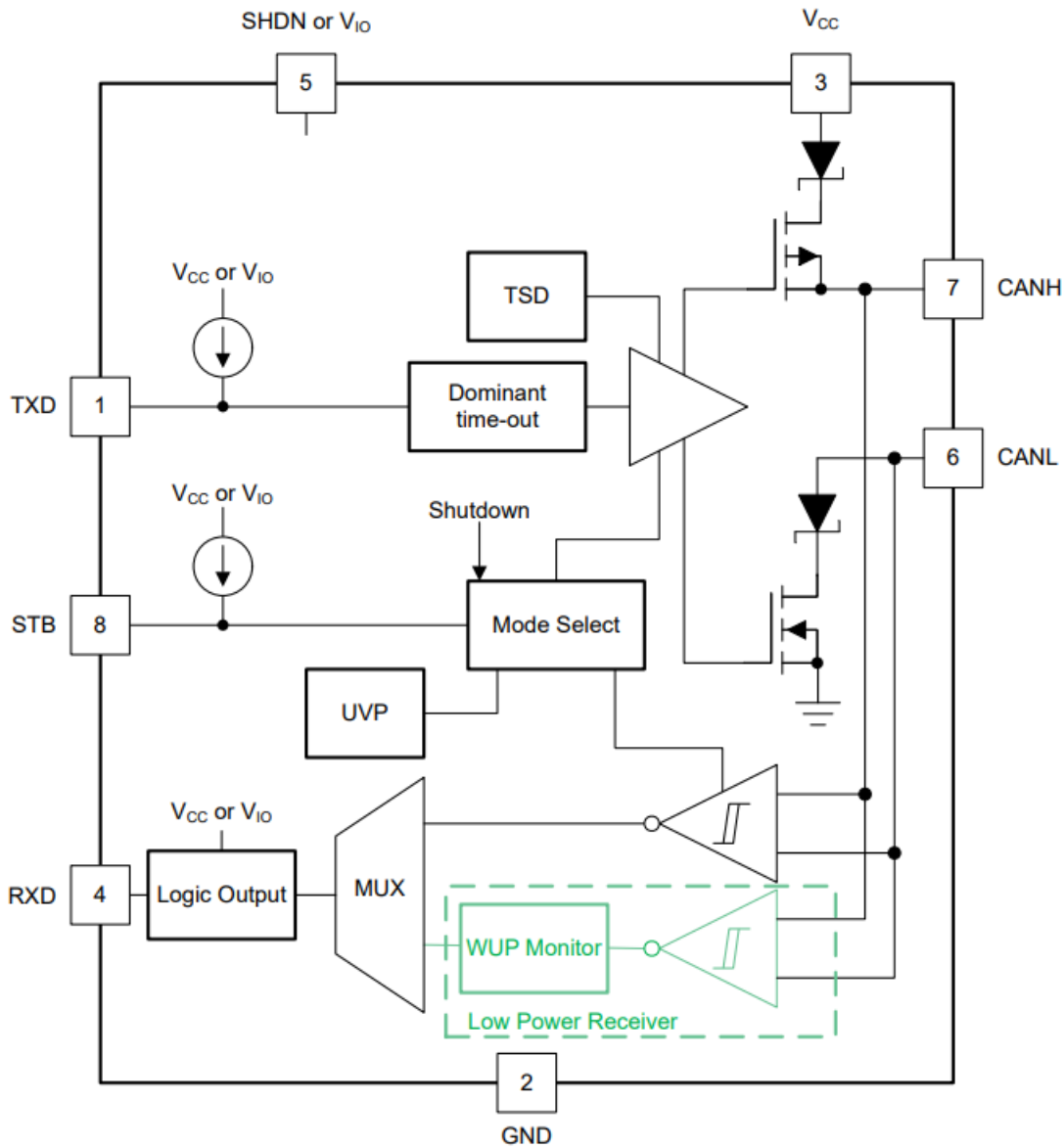


图 1-2. TCAN340x-Q1 方框图

TPS7B82-Q1

TPS7B82-Q1 是一款 40V、300mA 超低静态电流的低压降 (LDO) 线性稳压器。该电压稳压器在轻负载情况下仅消耗 3 μ A 静态电流，专为汽车类常开型应用而设计。

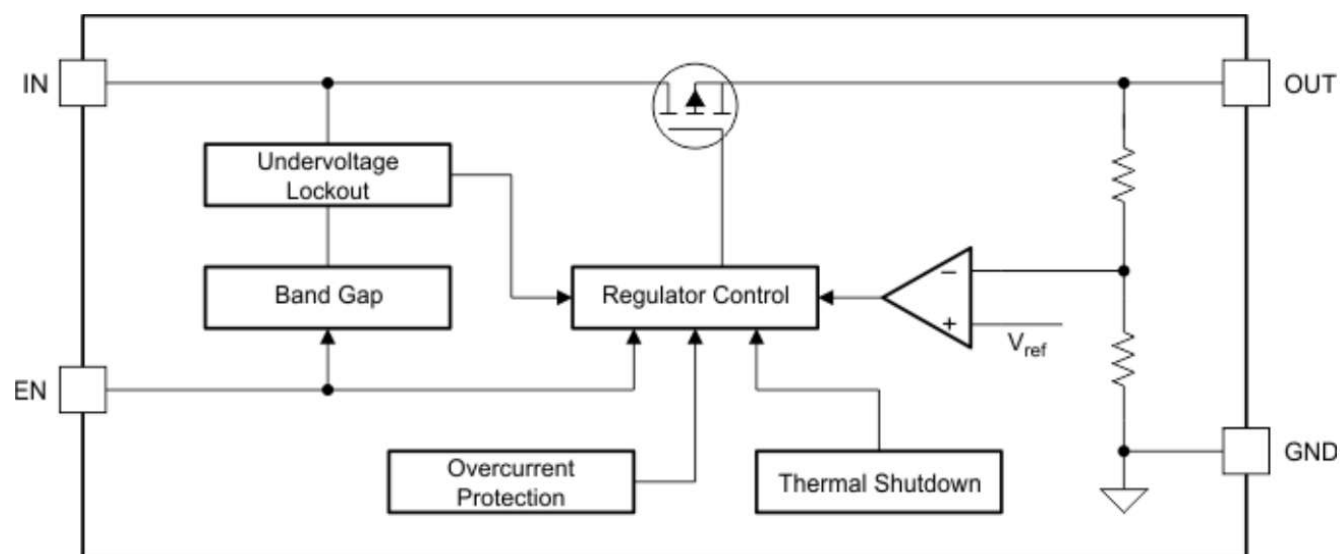


图 1-3. TPS7B82-Q1 方框图

2 硬件

图 2-1 显示了 CC2745R10-CS-EVM 连接器、LED 和 CC2745R10-Q1 的位置。还显示了 CAN-FD、LDO 和天线位置。

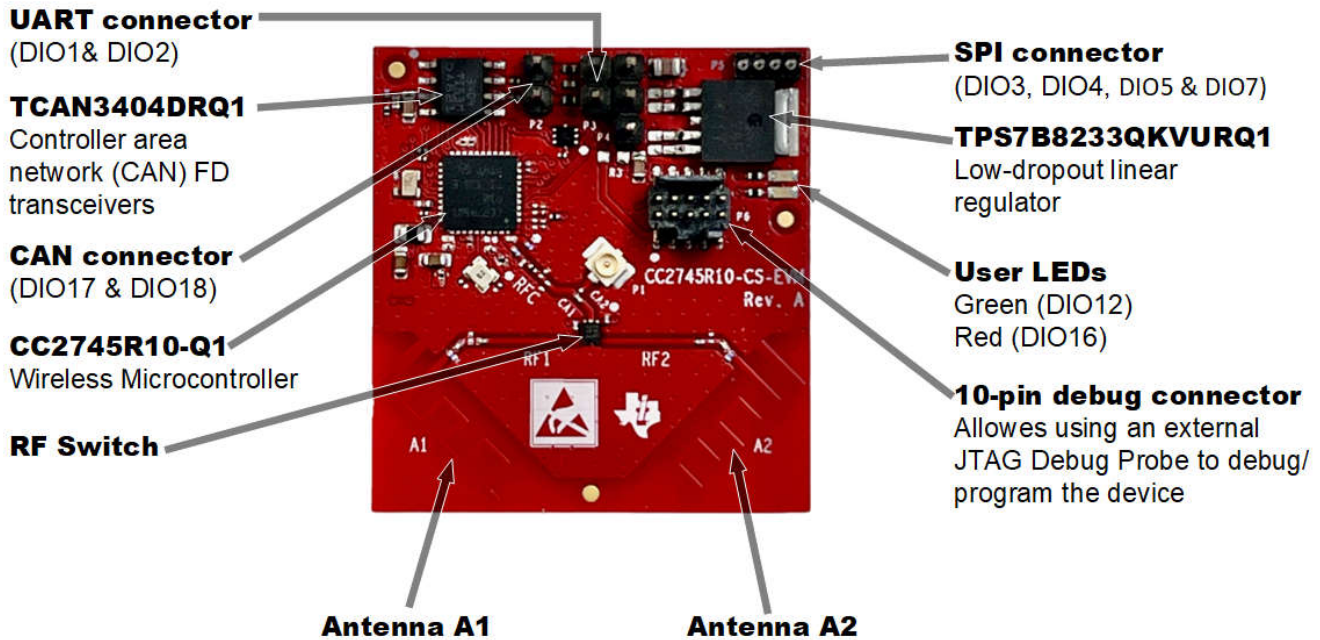


图 2-1. CC2745R10-CS-EVM 硬件布局

2.1 电源要求

为 CC2745R10-CS-EVM 供电时，用户可通过三种方式为电路板供电。它可由调试连接器供电。它还可以通过 3V3 引脚接头供电。如果器件通过 3V3 引脚接头供电，则用户必须确保电路板电压保持在 3V 至 3.6V 之间。为电路板供电的最后一种方式是使用 12V 电源通过 12V 引脚接头供电。如果使用此选项，用户必须安装 R3 电阻器。

备注

尽管 CC2745R10-Q1 的电源电压范围为 1.8V 至 3.8V，但 CC2745R10-CS-EVM 的最大电压受到 TCAN3404 3V 至 3.6V 电源要求的限制。

2.2 温度范围

该 EVM 设计工作温度范围为 -40°C 至 +105°C。当通过外部电池为 EVM 供电时，请确保系统在其指定温度范围内工作。

2.3 编程、调试与控制

CC2745R10-CS-EVM 不包含板载调试探针。兼容的调试探针为 LaunchPad XDS110 调试探针 (LP-XDS110 或 LP-XDS110ET)、独立 XDS110 (具有可选 EnergyTrace HDR 适配器 TMDSEMU110-ETH 的 TMDSEMU110-U) 或具有板载调试探针的 LaunchPad。

2.3.1 使用通用 XDS110 调试探针，包括单独的 LaunchPad

在单独的 LaunchPad 上：

- 拔下除 GND 和 3V3 以外的所有接头跳线。

针对通用 XDS110 调试探针和单独的 LaunchPad：

- 设置电源跳线以反映场景。如果 **CC2745R10** 将由 XDS110 调试探针或单独的 LaunchPad 供电，则将跳线设置为 XDS110 电源。如果要改为提供外部电源，请将其设置为外部电源。必须注意将电路板电压保持在电路板的工作范围 (3V 至 3.6V) 内。
- 将 10 引脚调试电缆的一端连接到 LaunchPad 上的 XDS110 输出连接器。
- 将 10 引脚调试电缆的另一端连接到 P6 连接器。

图 2-2 中展示了最终配置。

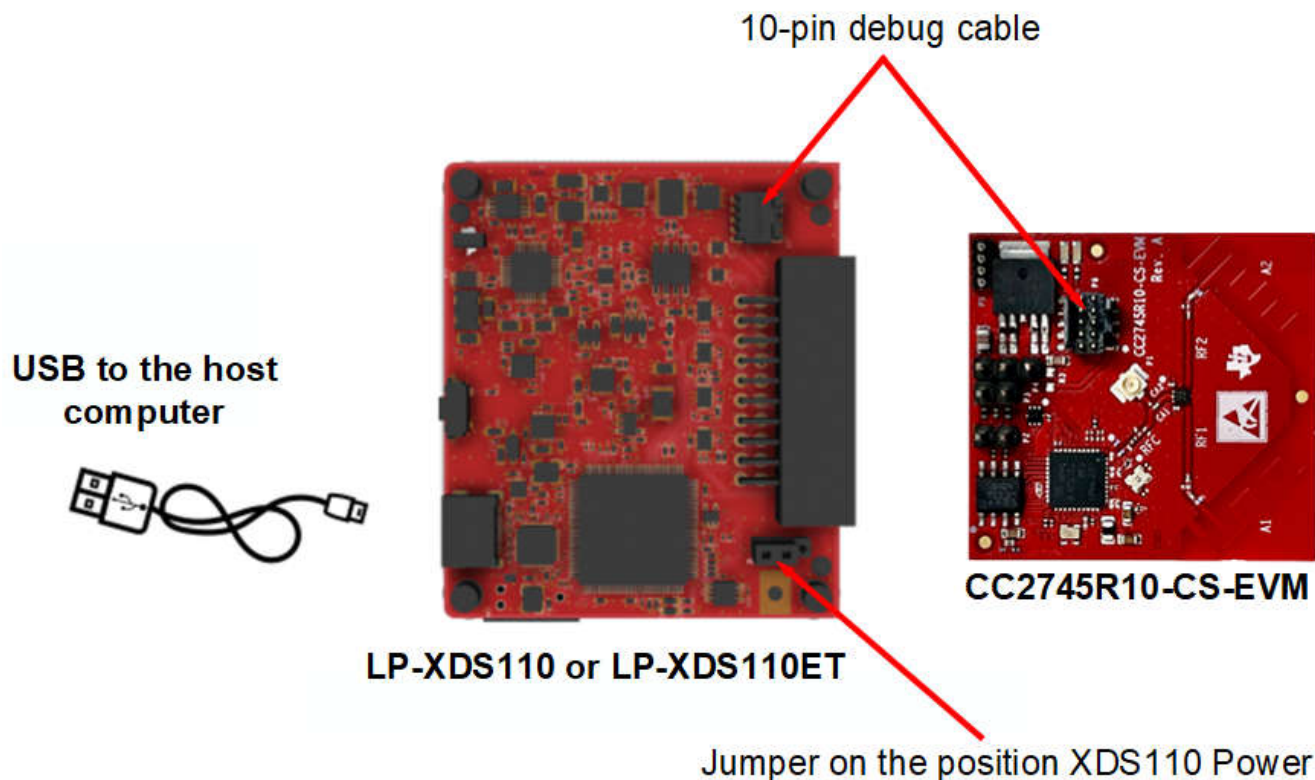


图 2-2. CC2745R10-CS-EVM 与 XDS110 调试探针的连接

2.4 接口

2.4.1 调试接口连接器

CC2745R10-CS-EVM 包含一个 10 引脚调试连接器 (P6)，该连接器可用于通过外部 JTAG 调试探针为器件进行调试/编程。有关引脚排列的信息，请参阅 [表 2-1](#)。有关引脚 1 的位置，请参阅第 5 节或全套参考设计文件。

表 2-1. 10 引脚调试接口连接器引脚排列

引脚编号	引脚名称	引脚说明
1	WMCU_VDD	与 WMCU 器件的 VDD 连接
2	DIO9_SWDIO	与 WMCU 器件的 SWDIO 连接
3	GND	接地连接
4	DIO10_SWDCCK	与 WMCU 器件的 SWDCCK 连接
5	GND	接地连接
6	NC	无连接
7	NC	无连接
8	NC	无连接
9	GND	接地连接
10	RSTN	与 WMCU 器件的 RESET 连接

2.4.2 电源连接器

当电路板未通过调试连接器供电时，P4 可用于通过 12V 引脚或 WMCU_VDD 引脚为电路板供电。有关引脚排列信息，请参阅表 2-2。

表 2-2. 电源连接器引脚排列

引脚编号	引脚名称	引脚说明
1	12V	12V 电源引脚
2	GND	接地连接
3	WMCU_VDD	3.3V 电源引脚

2.4.3 CAN FD 连接器

CC2745R10-CS-EVM 包含用作 CAN 总线接口的连接器 (P2)。有关引脚排列信息，请参阅表 2-3。

表 2-3. CAN FD 连接器引脚排列

引脚编号	引脚名称	引脚说明
1	CANL	低电平 CAN 总线输入/输出线路
2	CANH	高电平 CAN 总线输入/输出线路

2.4.4 UART 连接器

CC2745R10-CS-EVM 包含用作 UART 接口的连接器 (P3)。该连接器路由到 DIO1 和 DIO2，也可用作 GPIO。有关引脚排列信息，请参阅表 2-4。

表 2-4. UART 连接器引脚排列

引脚编号	引脚名称	引脚说明
1	DIO1	UART TX
2	DIO2	UART RX

2.4.5 SPI 连接器

CC2745R10-CS-EVM 包含用作 SPI 接口的连接器 (P5)。这些引脚直接连接到 CC2745R10-Q1 DIO，也可用作 GPIO。有关引脚排列信息，请参阅表 2-5。

表 2-5. SPI 连接器

引脚编号	引脚名称	引脚说明
1	DIO3	SPI SCLK
2	DIO4	SPI PICO/POCI
3	DIO5	SPI PICO/POCI
4	DIO7	SPI CS

2.5 测试点

CC2745R10-CS-EVM 具有三个用于调试的测试点。表 2-6 显示了 CC2745R10-CS-EVM 上可用的测试点。

表 2-6. 测试点

测试点名称	测试点说明
TP1	DIO19
TP2	DIO20
TP3	GND

3 EVM 硬件的高级用法

备注

本节中的主题可能涉及对开发套件进行的硬件修改。如果未使用适当的焊接设备并且未遵循适当的 ESD 缓解流程，则可能会损坏电路板。确保您具有执行这些修改的专业知识。

3.1 辐射/传导测试

辐射测试：板上有两个 0201 封装 15pF 电容器（CA1 和 CA2），用于确定 RF 信号是路由到板载天线还是 U.FL 连接器。在任何给定时间，只能安装其中一个。默认情况下，CA2 被填充，RF 信号被路由到板载天线。此配置将用于执行辐射测试。

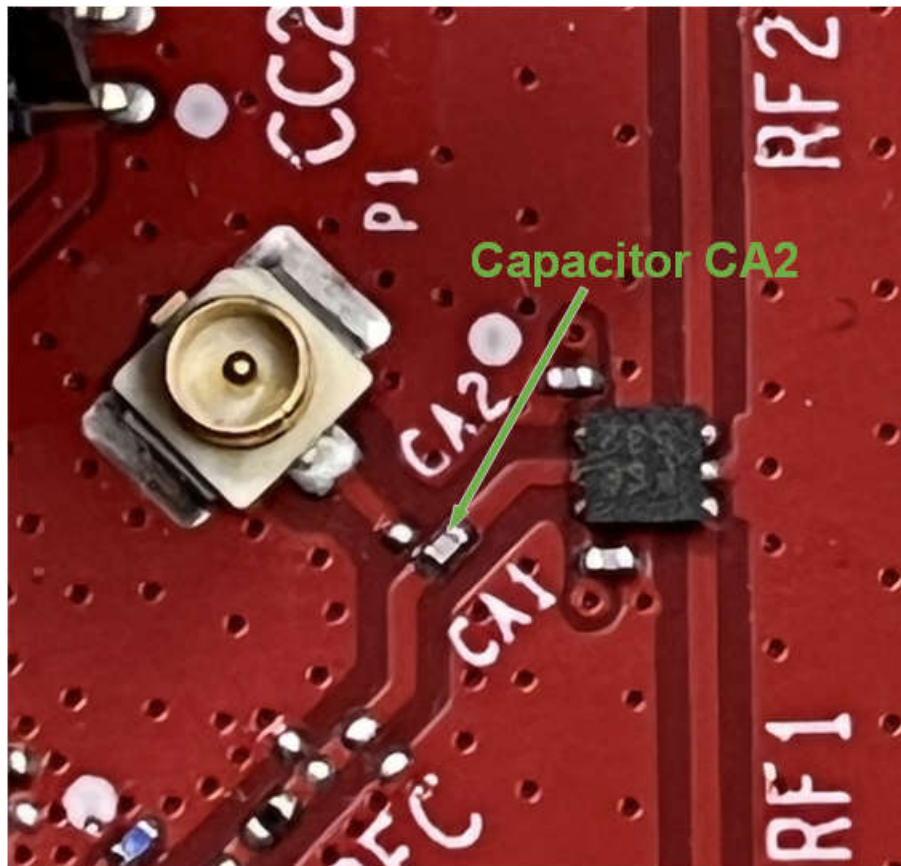


图 3-1. 用于辐射或传导测试的电容器

传导测试：当 15pF 电容器旋转并安装在 CA1 位置时，RF 信号被路由到 U.FL 连接器 P1。此配置将用于执行传导测试。

为 12V 供电

默认情况下，R3 电阻器未填充。如果用户希望通过 12V 引脚为电路板提供 12V 电压，则应在电路板上安装 R3。

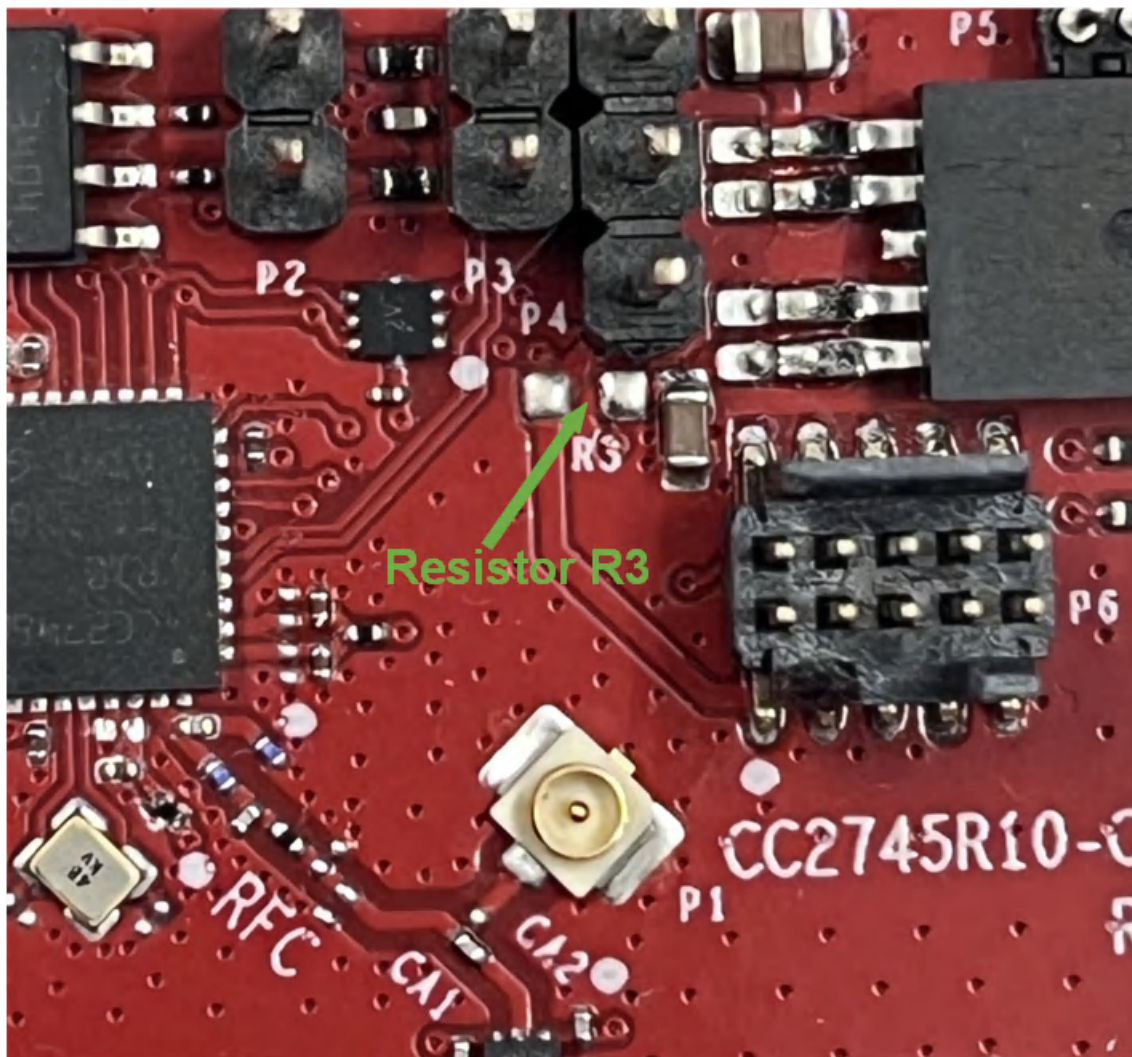


图 3-2. 12V 电源配置

4 软件

4.1 软件开发

有关软件开发和示例项目，请参阅 [SimpleLink LowPower 软件开发套件](#) 中的用户指南。

5 硬件设计文件

5.1 原理图

图 5-1、图 5-2、图 5-3 和 图 5-4 展示了 CC2745R10-CS-EVM 的原理图实现。完整的 CC2745R10-CS-EVM 参考原理图可从 CC2745R10-CS-EVM 参考设计文件下载。

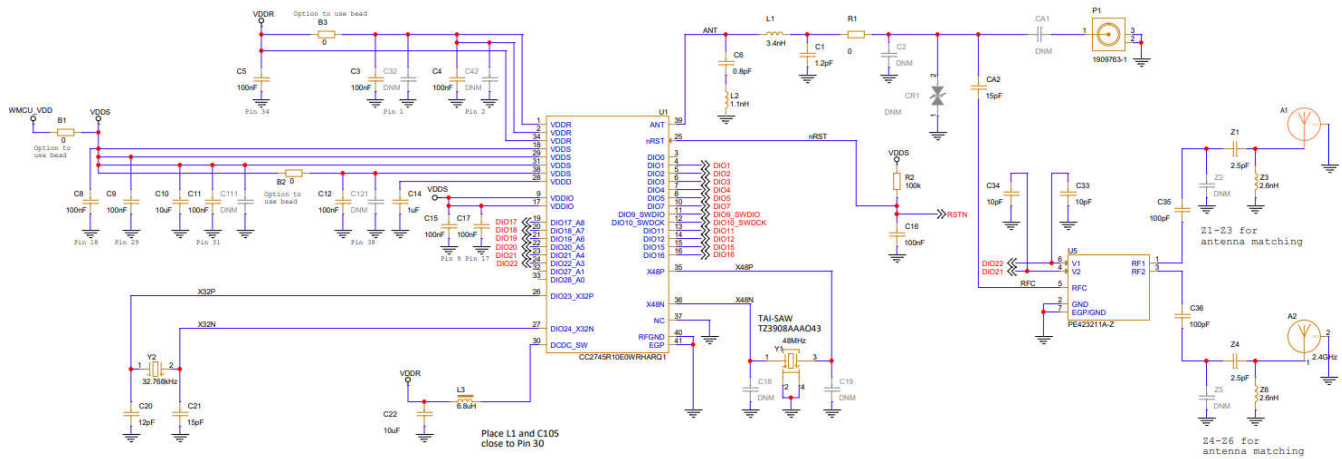


图 5-1. 原理图 1

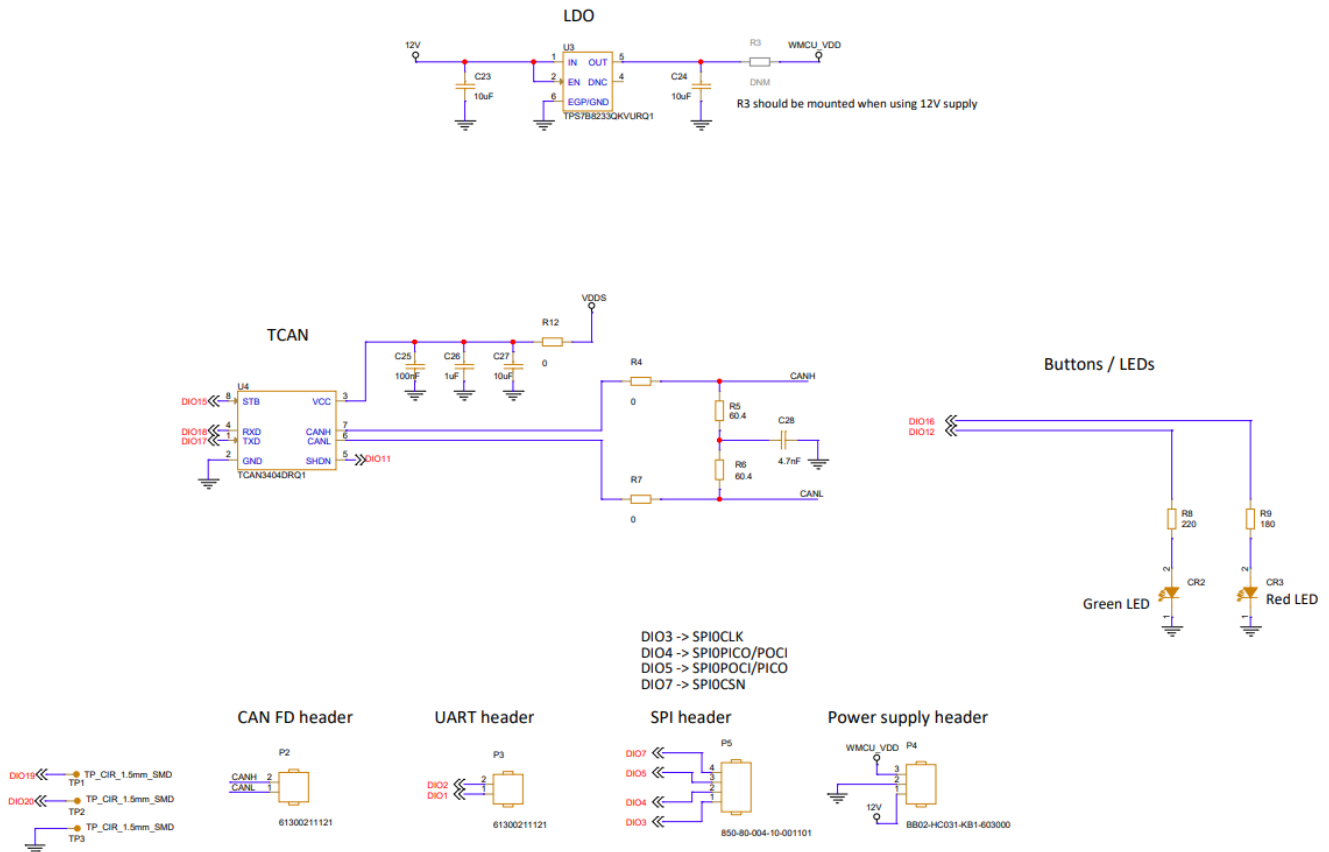


图 5-2. 原理图 2

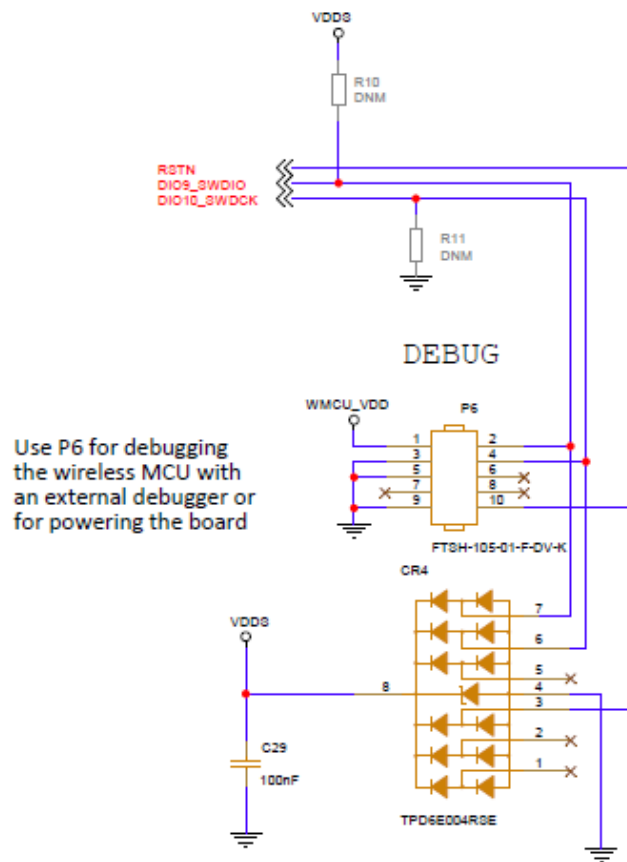


图 5-3. 原理图 3



图 5-4. 原理图 4

5.2 PCB 布局

CC2745R10-CS-EVM 的顶侧和底侧 PCB 布局图分别在顶侧 PCB 布局视图 (顶部 PCB 布局视图) 和底侧印刷电路板布局视图 (底部 PCB 布局视图) 中可见。完整的 CC2745R10-CS-EVM 布局文件可从 [CC2745R10-CS-EVM 参考设计文件](#) 下载。

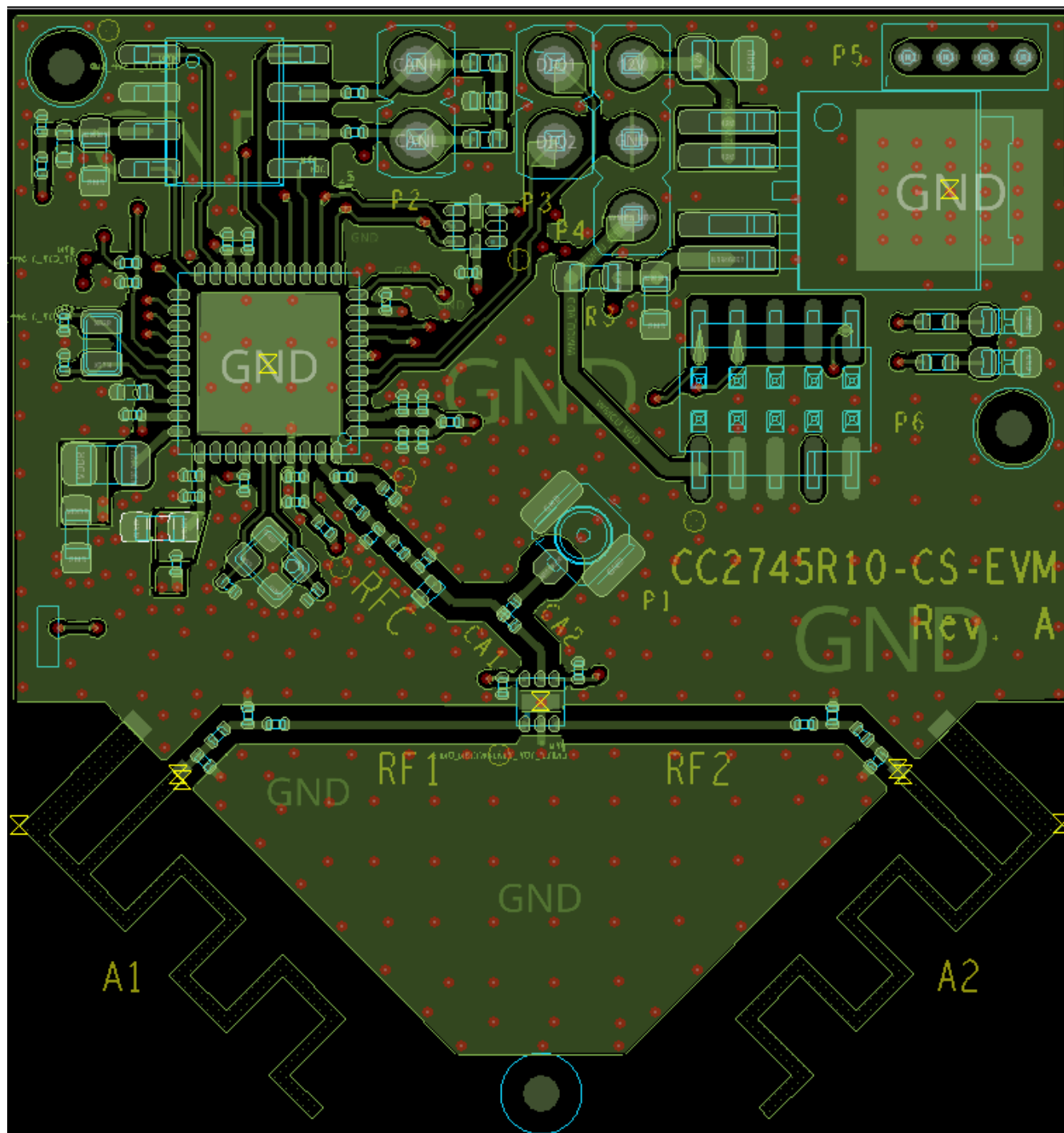


图 5-5. 顶部 PCB 布局视图



表 5-1 显示了 CC2745R10-CS-EVM 的物料清单 (BOM)。完整的 CC2745R10-CS-EVM BOM 可从 CC2745R10-CS-EVM 参考设计文件下载。

元件位号	数量	值	供应商器件型号	供应商
A1 A2	2	2.4GHz	AN043	德州仪器 (TI)
B1	1	0	AF0201JR-130RL	MURATA
B2	1	0	AF0201JR-130RL	MURATA

表 5-1. CC2745R10-CS-EVM 物料清单 (续)

元件位号	数量	值	供应商器件型号	供应商
B3 R1 R4 R7 R12	5	0	AF0201JR-130RL	YAGEO
C1	1	1.2pF	GRT0335C1E1R2CA02D	MURATA
C3 C4 C5 C8 C9 C11 C12 C15 C16 C17 C25 C29	12	100nF	GCM033M8ED104KE07D	MURATA
C6	1	0.8pF	GCQ0335C1HR80BB01D	MURATA
C10 C22 C24 C27	4	10uF	GRT188D71A106ME13D	MURATA
C14 C26	2	1μF	GRT155R70J105KE01D	MURATA
C20	1	12pF	GRT0335C1H120FA02D	MURATA
C21 CA2	2	15pF	GRT0335C1H150FA02D	MURATA
C23	1	10uF	CL21Y106KABVPNE	SAMSUNG ELECTRO-MECHANICS
C28	1	4.7nF	GCM155R71H472KA37D	MURATA
C33 C34	2	10pF	GRT0335C1H100JA02D	MURATA
C35 C36	2	100pF	GRT0335C1H101FA02D	MURATA
CR2	1	150060VS55040	150060VS55040	WURTH
CR3	1	150060RS55040	150060RS55040	WURTH
CR4	1	TPD6E004RSE	TPD6E004RSE	德州仪器 (TI)
L1	1	3.4nH	LQP03TN3N4BZ2D	MURATA
L2	1	1.1nH	LQP03TN1N1BZ2D	MURATA
L3	1	6.8uH	MLZ2012N6R8LTD25	TDK GLOBAL
P1	1	1909763-1	1909763-1	TE CONNECTIVITY
P2 P3	2	61300211121	61300211121	WURTH
P4	1	BB02-HC031-KB1-603000	BB02-HC031-KB1-603000	GRADCONN
P5	1	850-80-004-10-001101	850-80-004-10-001101	PRECI-DIP
P6	1	FTSH-105-01-F-DV-K	FTSH-105-01-F-DV-K	SAMTEC
PCB1	1	PCB	PCB	德州仪器 (TI)
R2	1	100k	RK73B1HTTCM104J	KOA SPEER
R5 R6	2	60.4	ERJ2RKF60R4X	PANASONIC INDUSTRIAL
R8	1	220	CRCW0402220RJNED	VISHAY
R9	1	180	CRCW0402180RJNED	VISHAY
U1	1	CC2745R10E0WRHAR Q1	CC2745R10E0WRHARQ1	德州仪器 (TI)
U3	1	TPS7B8233QKVURQ1	TPS7B8233QKVURQ1	德州仪器 (TI)
U4	1	TCAN3404DRQ1	TCAN3404DRQ1	德州仪器 (TI)
U5	1	PE423211A-Z	PE423211A-Z	PSEMI
Y1	1	48MHz	TZ3908AAAO43	TAI-SAW
Y2	1	32.768kHz	FC2012AA 32.768K-70NN75KC7	EPSON
Z1 Z4	2	2.5pF	GCQ0335C1H2R5BB01D	MURATA
Z3 Z6	2	2.6nH	LQP03TN2N6BZ2D	MURATA

6 合规信息

6.1 CE 合规性

此评估板仅用于开发，不是最终产品。将该芯片组集成到任何最终产品中的开发人员和集成商负责获得此类最终产品的适用监管审批。请参阅欧盟符合性声明

6.2 REACH 合规性

德州仪器 (TI) 声明此产品符合 EU REACH 法规。

6.3 报废电子电气设备 (WEEE) 合规性



Waste Electrical and Electronic Equipment (WEEE)

This symbol means that according to local laws and regulations your product and/or battery shall be disposed of separately from household waste. When this product reaches its end of life, take it to a collection point designated by local authorities. Proper recycling of your product will protect human health and the environment.

7 其他信息

7.1 已知硬件或软件问题

- 在修订版 A 中，丝网印刷显示 U5 的引脚 1 不正确。这在修订版 B 中是固定的。

商标

所有商标均为其各自所有者的财产。

8 参考资料

开发工具和软件

- [SimpleLink 低功耗 F3 软件开发套件](#)
- 用于简单无线电配置的 [SmartRF™ Studio](#)
- [SysConfig](#) 系统配置工具

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 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 instructions, 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/sds/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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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/sds/ti_ja/general/eStore/notice_02.page

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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, 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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