

EVM User's Guide: CC3301MOD BP-CC3301MOD BP-CC3351MOD SimpleLink™ CC33x1MOD Wi-Fi 6 和低功耗蓝牙® BoosterPack™ 插件模块

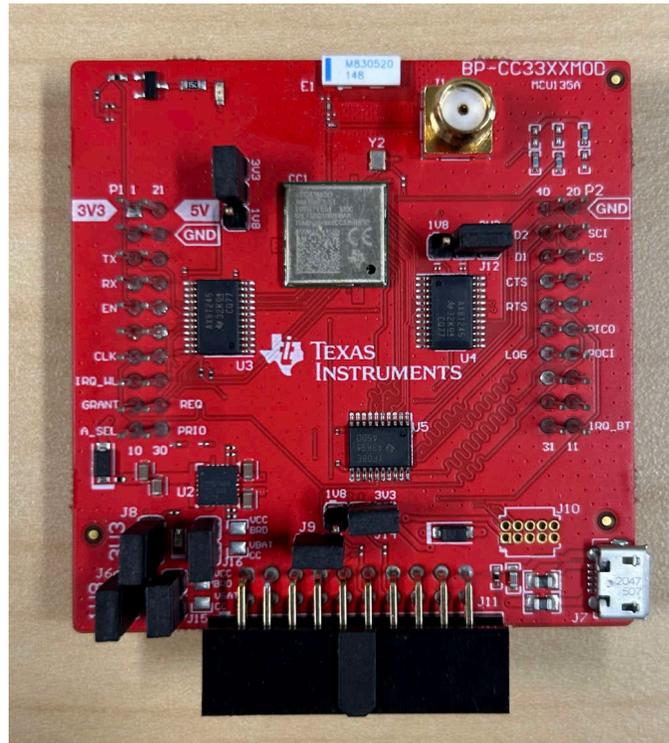


说明

SimpleLink™ CC33X1MOD Wi-Fi 6 和低功耗 Bluetooth® 器件可通过运行 Linux® 的处理器主机或运行 RTOS 的 MCU 主机在嵌入式应用中实现实惠、可靠且安全的连接。CC3301MOD/CC3351MOD BoosterPack™ (BP-CC3301MOD/BP-CC3351MOD) 插件模块是测试和开发板，可轻松连接到 TI LaunchPad™ 开发套件或处理器板，从而实现快速软件开发。

特性

- CC33X1MOD Wi-Fi 6® 和低功耗蓝牙组合器件
- 两个 20 引脚可堆叠连接器 (BoosterPack 标准)
- 板载芯片双频天线
- 通过 SMA/U.FL 连接器进行传导射频测试
- 使用 USB 或 LaunchPad™ 从板载双轨 (3.3V 和 1.8V) LDO 供电
- 3 个用于电压转换的电平转换器 (3.3V 转 1.8V)
- 用于 SWD 与 XDS110 或 LP-XDS110ET 连接的 JTAG 接头引脚
- 用于在两个电源 (3.3V 和 1.8V) 上测量电流的跳线，并且可安装 0.1Ω (0603) 电阻器以使用电压表进行测量
- 用于低功耗评估的 32kHz 振荡器



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1 评估模块概述

1.1 简介

CC33X1MOD BoosterPack™ 插件模块 (BP-CC33X1MOD) 是一款测试和开发板，可轻松连接到 TI LaunchPad™ 或处理器板，从而实现快速软件开发。

本用户指南旨在解释 BP-CC33X1MOD 的各种硬件配置和功能。有关 CC33X1MOD 器件的更多信息，请前往 TI.com 浏览 [CC3301MOD](#) 或 [CC3351MOD](#) 产品页面。

1.2 套件内容

- BP-CC33X1MOD 评估板
- EVM 免责声明自述文件

1.3 法规遵从性

CC33X1MOD BoosterPack 插入模块 (BP-CC3301MOD 和 BP-CC3351MOD) 经过测试，证明符合 CE 关于未经许可的有意辐射体的规定。德州仪器 (TI) 特此声明无线电设备类型 BP-CC3301MOD 和 BP-CC3351MOD 符合 2014/53/EU 指令。BP-CC3301MOD 和 BP-CC3351MOD 符合欧盟指令要求的 RoHS 标准。欧盟符合性声明的全文见：

- [BP-CC3301MOD 欧盟符合性声明](#)
- [BP-CC3351MOD 欧盟符合性声明](#)

射频暴露信息 (MPE)

这些该器件已经过测试，符合适用的射频接触限制。为了满足射频接触要求，必须将该模块安装在运行时与用户保持至少 20cm 间隔距离的主机平台中。

频段和最大功率

表 1-1. 最大射频输出功率 - BP-CC3301MOD

频带	输出功率 (dBm)
2.4GHz WLAN	18.99
Bluetooth LE	6.32

表 1-2. 最大射频输出功率 - BP-CC3351MOD

频带	输出功率 (dBm)
2.4GHz WLAN	17.0
5.2GHz WLAN	17.5
5.3GHz WLAN	18.0
5.5GHz WLAN	17.0
5.8GHz WLAN	10.0
Bluetooth LE 125kbps / 500kbps	2.0
Bluetooth LE 1Mbps / 2Mbps	4.0

室内使用限制

该器件仅限于在 5150MHz 至 5350MHz 频率范围内运行时在室内使用。

	AT	BE	BG	HR	CY	CZ	DK
	EE	FI	FR	DE	EL	HU	IE
	IT	LV	LT	LU	MT	NL	PL
	PT	RO	SK	SI	ES	SE	UK(NI)

该标签未包含在产品包装上，以保证德州仪器 (TI) 公司要求的标准和一致的包装。建议用户参考 EVM 用户指南，以了解有关器件合规性的信息。

1.4 规格

BP-CC33X1MOD 板旨在为 CC33X1MOD 器件实现快速、轻松的软件和硬件开发。图 1-1 所示为 BP-CC33X1MOD 方框图。

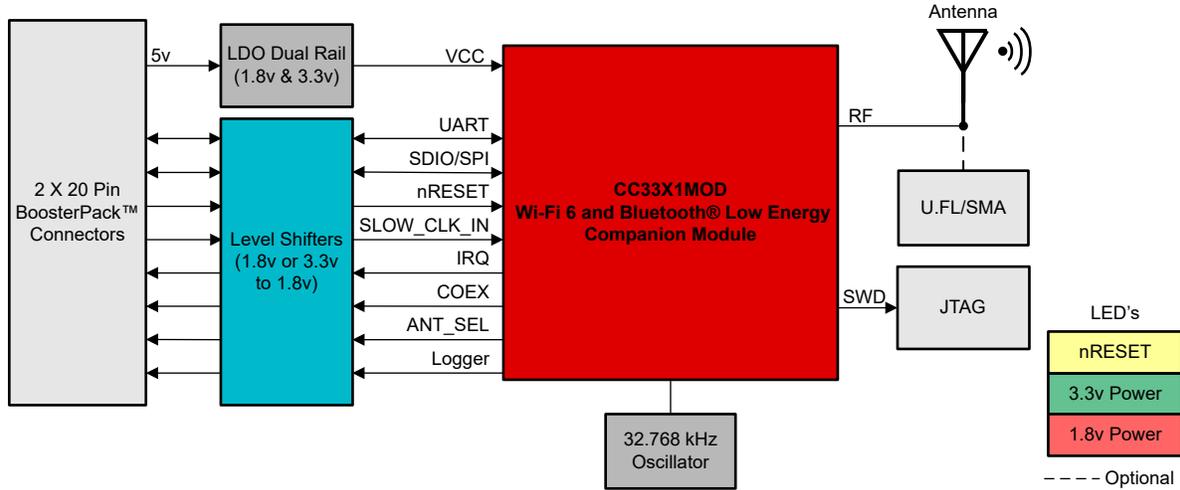


图 1-1. BP-CC33X1MOD 方框图

此套件可用于 3 种配置：

1. MCU 和 RTOS 评估：BP-CC33X1MOD + LaunchPad 且 MCU 运行 TCP/IP，如 LP-AM243
2. 处理器和 Linux 评估：BP-CC33X1MOD + BP-CC33-BBB-ADAPT + BEAGL-BONE-BLACK
3. 使用 PC 工具进行射频测试：BP-CC33X1MOD + LP-XDS110ET

此外，BP-CC33X1MOD 还可以连接到任何其他运行 TCP/IP 协议栈的 Linux 或 RTOS 主机电路板。有关更多信息，请参阅节 3.1。

1.5 器件信息

BP-CC33X1MOD 评估板旨在展示 CC33x1MOD 器件的软硬件功能。电路板上的其他元件已组装完毕，用于测试和支持此主器件。

2 硬件

BP-CC33X1MOD 概述 展示了 BP-CC33X1MOD 的概览。

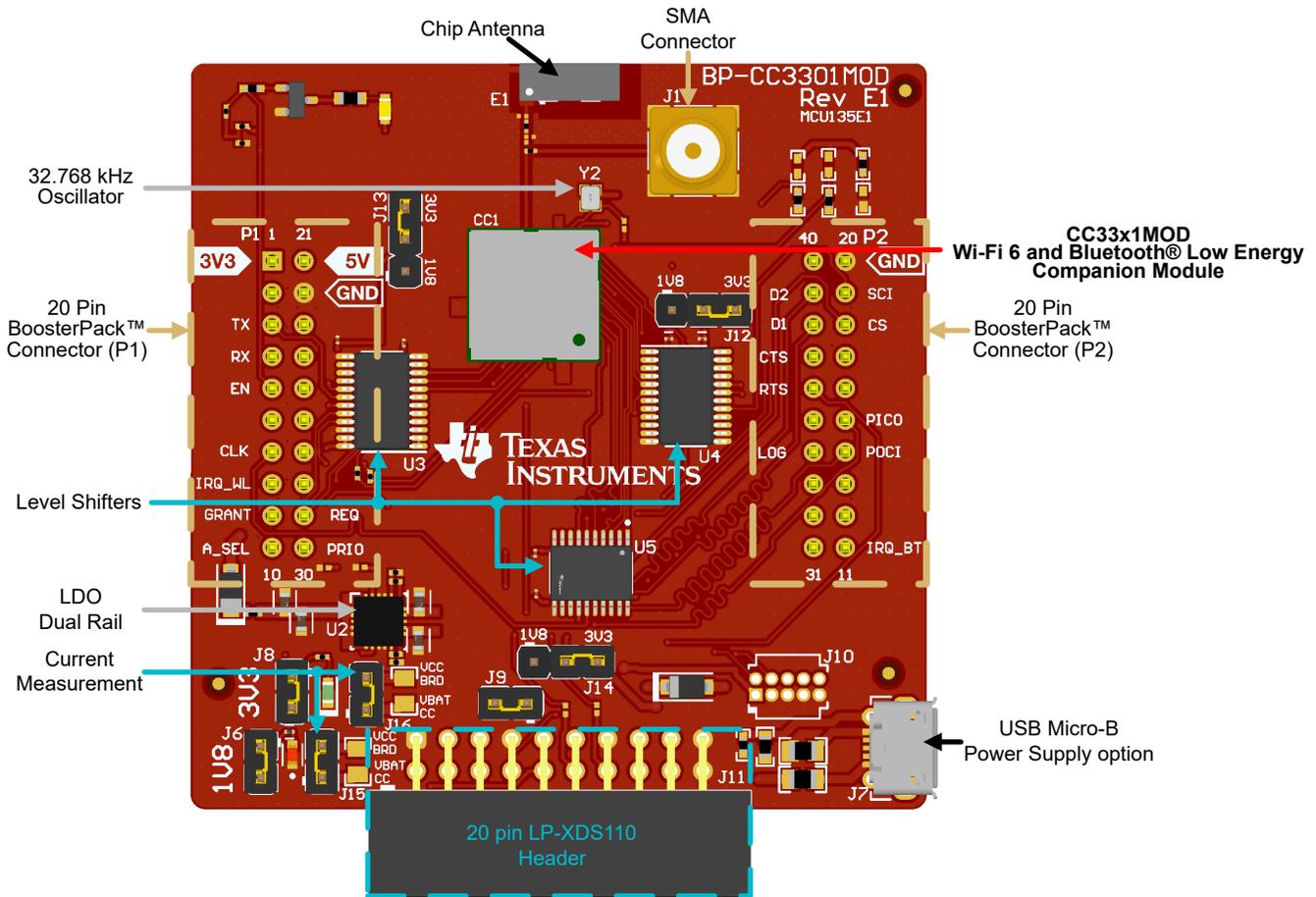


图 2-1. BP-CC33X1MOD 概述

2.1 硬件特性

- CC33X1MOD Wi-Fi 6 和低功耗 Bluetooth® 组合器件，可与 MPU 或 MCU 系统连接；增加连接性
- 两个 20 引脚可堆叠连接器（BoosterPack 标准）
- 板载芯片双频天线，带板载 SMA/U.FL 连接器，用于传导射频测试
- 使用 USB 或 LaunchPad 从板载双轨（3.3V 和 1.8V）LDO 供电
- 3 个用于电压转换的电平转换器（3.3V 转 1.8V）
- 用于 SWD 与 XDS110 或 LP-XDS110ET 连接的 JTAG 接头引脚
- 用于在两个电源（3.3V 和 1.8V）上测量电流的跳线，并且可安装 0.1 Ω (0603) 电阻器以使用电压表进行测量
- 用于低功耗评估的 32kHz 振荡器

2.2 连接器和跳线描述

2.2.1 LED 指示灯

LED 列出了 LE 的说明，BoosterPack™ 上的 LED 展示了所述的板载 LED。

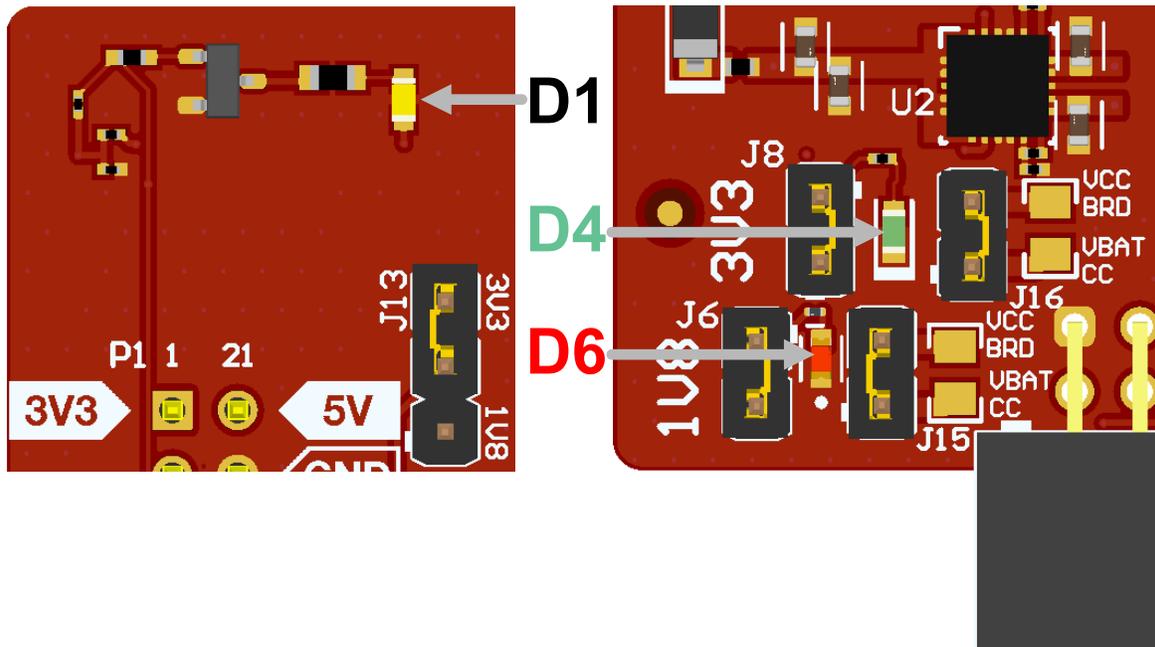


图 2-2. BoosterPack™ 上的 LED

表 2-1. LED

参考	颜色	用法	说明
D1	黄色	nRESET	此 LED 代表 nReset 引脚的状态。LED 点亮时表示器件正常工作，即 nReset 引脚为高电平。
D4	绿色	3.3V 电源指示灯	亮：3.3V 电源轨已启动。 灭：无 3.3V 电源供电
D6	红色	1.8V 电源指示灯	亮：1.8V 电源轨已启动。 灭：无 1.8V 电源供电

2.2.2 跳线设置

跳线设置 列出了跳线设置。要参考默认跳线配置，请参阅 [BP-CC33X1MOD 概述](#)。

表 2-2. 跳线设置

参考	用法	说明
J1、J2	射频测试	SMA 连接器 (J1) 或 U.FL 连接器 (J2)，用于实验室中的传导测试。请参阅 节 2.5 。
J6、J8	向电路板供电	用于启动两个电源以向电路板供电。请参阅 节 2.3 。
J15、J16	电流测量	仅用于测量器件的供电。请参阅 节 2.3.1 。
J7	USB 连接器	用于为 BoosterPack™ 上的器件供电
J10、J11	JTAG 连接器	与 XDS110 调试探针连接的接头。请参阅 JTAG 接头 。
J9	20 引脚接头 (J11) 5V 电源	启用来自 LP-XDS110ET 的 5V 电源
J12、J13、J14	电平转换器主机电压	设置为 3.3V 或 1.8V，以使相关电平转换器能够转换至正确的主机电压电平。
P1、P2	BoosterPack™ 接头	BoosterPack™ 上的两个 20 接头引脚。请参阅 BoosterPack 接头分配 。

2.2.3 BoosterPack 接头分配

CC33X1MOD BoosterPack™ 具有两个 20 引脚接头连接器，可用于访问 CC33X1MOD 的多个引脚和功能。这些连接器上的信号分配如下图所示，具体说明见表 2-3 和 表 2-4。

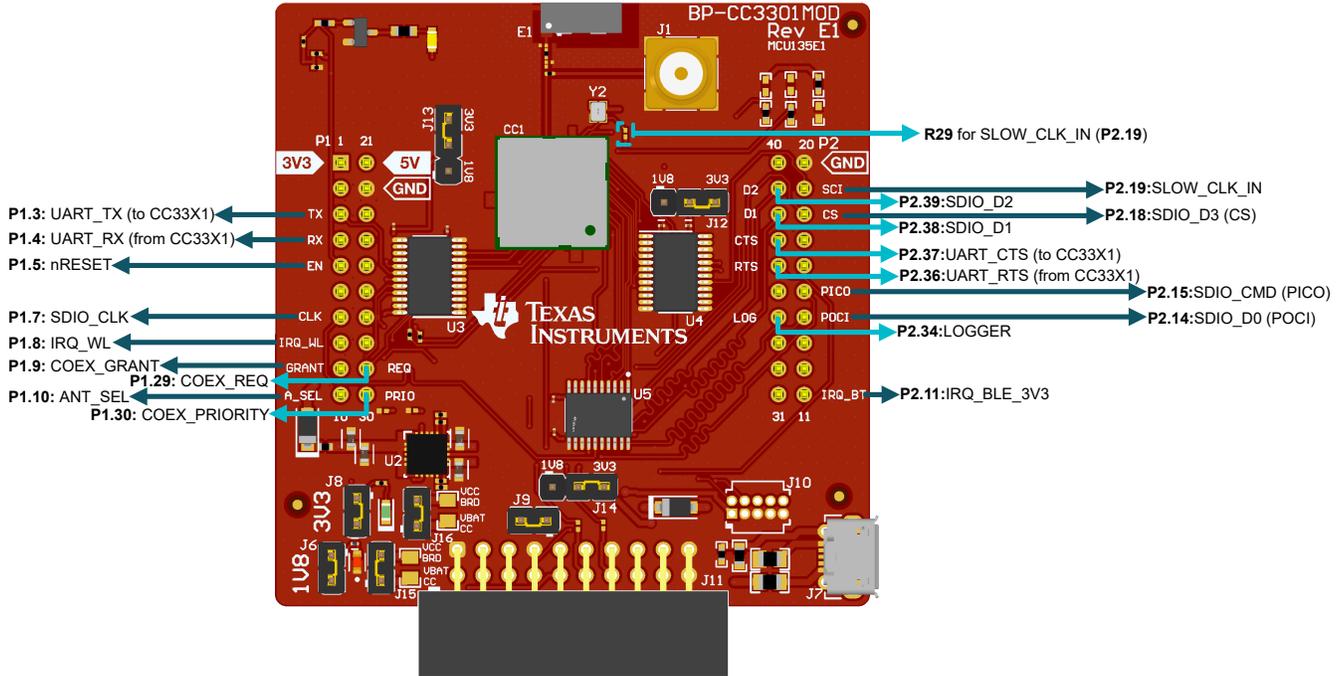


图 2-3. CC33X1MOD BoosterPack™ 引脚排列

表 2-3. P1 引脚分配

引脚	在原理图中的名称	器件的类型/方向	说明
P1.1	VCC_MCU_3V3	输入	无功能用途
P1.2	保留	不适用	不适用
P1.3	UART_TX_3V3	输出	用于 CC33X1MOD 向主机发送信号的 UART TX，连接 BLE 主机控制器接口
P1.4	UART_RX_3V3	输入	CC33X1MOD UART RX 用于从主机接收信号，以实现 BLE 主机控制器连接
P1.5	LP_RESET	输入	CC33X1MOD 的复位线，用于启用/禁用（低电平有效）。由主机通过 LaunchPad 引脚驱动
P1.6	保留	不适用	不适用
P1.7	SDIO_CLK_3V3	输入	SDIO 时钟或 SPI 时钟。必须由主机驱动
P1.8	IRQ_WL_3V3	输出	CC33X1MOD 向主机发送的 Wi-Fi 活动中断请求
P1.9	COEX_GRANT_3V3	输出	外部共存接口 - 授权（保留供将来使用）
P1.10	ANT_SEL_3V3	输出	天线选择控制
P1.21	VCC_MCU_5V	电源	向电路板提供的 5V 电源
P1.22	GND	GND	电路板接地
P1.23	保留	不适用	不适用
P1.24	保留	不适用	不适用
P1.25	保留	不适用	不适用
P1.26	保留	不适用	不适用
P1.27	保留	不适用	不适用
P1.28	保留	不适用	不适用
P1.29	COEX_REQ_3V3	输入	外部共存接口 - 请求（保留供将来使用）

表 2-3. P1 引脚分配 (续)

引脚	在原理图中的名称	器件的类型/方向	说明
P1.30	COEX_PRIORITY_3V3	输入	外部共存接口 - 优先级 (保留供将来使用)

表 2-4. P2 引脚分配

引脚	在原理图中的名称	器件的类型/方向	说明
P2.11	IRQ_BLE_3V3	输出	保留供将来使用
P2.12	保留	不适用	不适用
P2.13	保留	不适用	不适用
P2.14	SDIO_D0_POCI_3V3	输入/输出	SDIO 数据 D0 或 SPI POCI
P2.15	SDIO_CMD_PICO_3V3	输入/输出	SDIO 命令或 SPI PICO
P2.16	保留	不适用	不适用
P2.17	保留	不适用	不适用
P2.18	SDIO_D3_3V3 (CS)	输入/输出	SDIO 数据 D3 或 SPI CS
P2.19	SLOW_CLK_IN_3V3	输入	外部 RTC 时钟 32.768kHz 的输入
P2.20	GND	GND	电路板接地
P2.31	保留	不适用	不适用
P2.32	保留	不适用	不适用
P2.33	保留	不适用	不适用
P2.34	LOGGER_3V3	输出	CC33X1MOD 发送的跟踪程序 (UART TX 调试记录器)
P2.35	保留	不适用	不适用
P2.36	UART_RTS_3V3	输出	从 CC33X1MOD 到主机的 UART RTS, 用于 BLE HCI 流量控制
P2.37	UART_CTS_3V3	输入	从主机到 CC33X1MOD 的 UART CTS, 用于 BLE HCI 流量控制
P2.38	SDIO_D1_3V3	输入/输出	SDIO 数据 D1
P2.39	SDIO_D2_3V3	输入/输出	SDIO 数据 D2
P2.40	保留	不适用	不适用

2.2.4 JTAG 接头

BP-CC33X1MOD 设计具有两个接头 (J10 和 J11)，用于与 XDS110 调试探针的 SWD 连接。这些接头的信号分配如下图和下表所示。

该电路板的主 JTAG 接口通过连接到 20 引脚接头 (J11) 的 LP-XDS110ET 实现。XDS110 调试探针还可以通过 10 引脚接头 (J10) 与该板连接，但在默认套件中，该接头未组装。

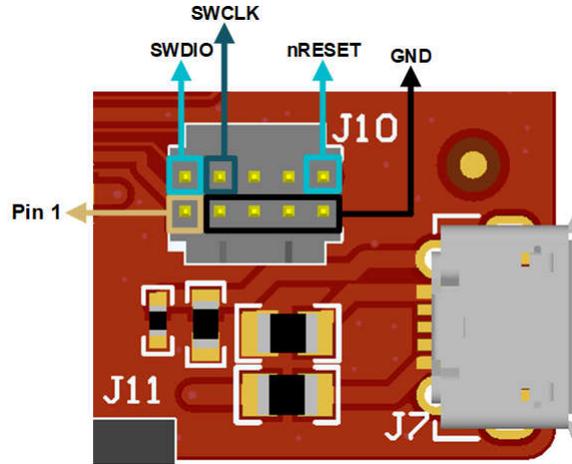


图 2-4. ARM 10 引脚 JTAG 连接器 (J10)

表 2-5. ARM 10 引脚 JTAG 连接器 (J10) 信号分配

引脚	信号名称	说明
J10.1	VCC_BRD_1V8	连接器基准电压的 1.8V 电源
J10.2	SWDIO	串行线数据输入/输出
J10.4	SWCLK	串行线时钟
J10.10	RESET_1V8	nReset (CC33X1MOD 使能线)
J10.3、J10.5、J10.7、J10.9	GND	电路板接地

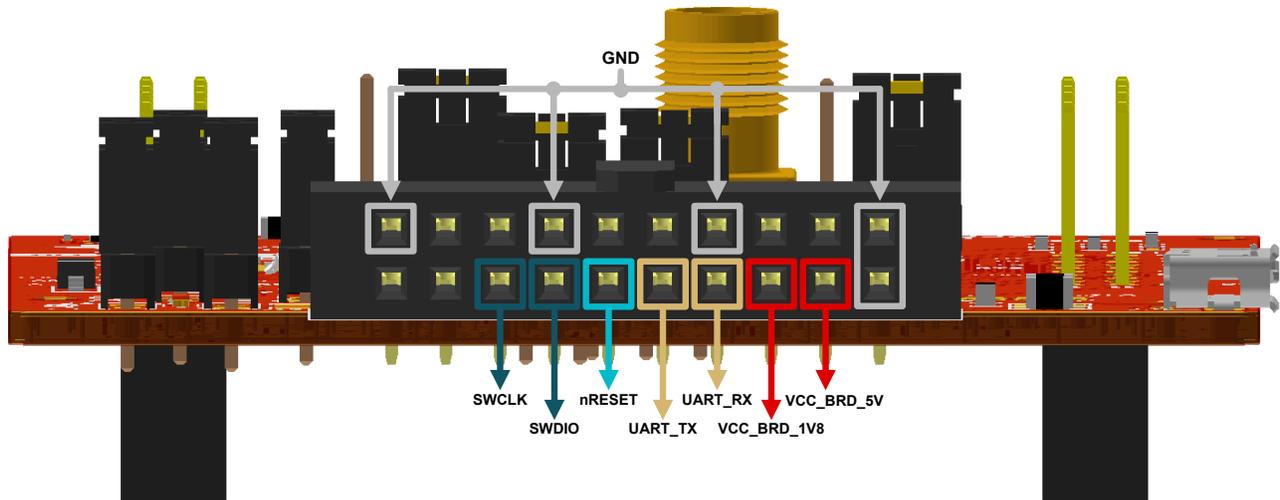


图 2-5. 20 引脚 LP-XDS110 连接器 (J11)

表 2-6. 20 引脚 LP-XDS110 连接器 (J11) 信号分配

引脚	信号名称	说明
J11.6	SWCLK	串行线时钟
J11.8	SWDIO	串行线数据输入/输出
J11.10	RESET_1V8	nReset (CC33X1MOD 使能线)
J11.12	UART_TX_1V8	用于 CC33X1MOD 向主机发送信号的 UART TX, 连接 BLE 主机控制器接口
J11.14	UART_RX_1V8	用于 CC33X1MOD 从主机接收信号的 UART RX, 连接 BLE 主机控制器接口
J11.16	VCC_BRD_1V8	连接器基准电压的 1.8V 电源
J11.18	VCC_BRD_5V	从 LP-XDS110ET 向 BP-CC33X1MOD 提供的 5V 电源
J11.1、J11.7、J11.13、J11.19、J11.20	GND	电路板接地

2.3 电源

根据设计, 此电路板由它所连接的 LaunchPad 套件供电。某些 LaunchPad 套件无法满足可能高达 500mA 的 Wi-Fi® 峰值电流要求。在这种情况下, BoosterPack™ 上的 USB 连接器 (J7) 可辅助提供额外电流。肖特基二极管确保 LaunchPad 套件和 BoosterPack 模块上的 USB 连接器存在负载共享, 而无需对电路板进行任何改装。标有 J6 (1.8V) 和 J8 (3.3V) 的跳线可用于测量板载 LDO 的总电流消耗。

2.3.1 测量 CC33X1MOD 电流消耗

2.3.1.1 低电流测量 (LPDS)

为了测量 CC33X1MOD 器件在两个电源 (3.3V 或 1.8V) 供电情况下的电流消耗, 电路板上设有一个标记为 J16 的跳线 (用于 3.3V 电源) 和一个标记为 J15 的跳线 (用于 1.8V 电源)。通过移除 J16 并在原位连接一个电流表, 用户可以观察 3.3V 电源上的电流。同理, 移除 J15 可以观察 1.8V 电源上的电流。TI 推荐使用这种方法来测量 LPDS。

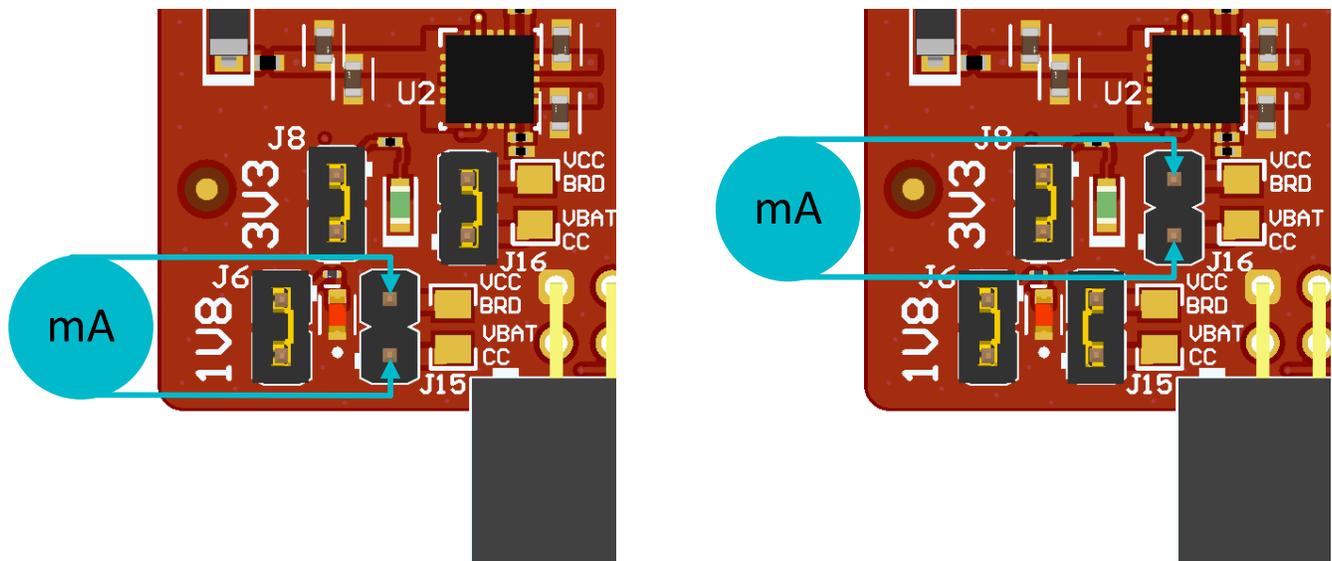


图 2-6. 低电流测量

2.3.1.2 有功电流测量

要测量有功电流曲线, TI 建议使用 0.1 Ω 0603 尺寸的电阻器, 并测量电阻器两端的差分电压。可以通过使用电压表或示波器测量两个电源 (3.3V 或 1.8V) 的电流曲线来完成此测量。

应移除分流跳线 J15, 并且并联安装一个 0.01 Ω 电阻器, 以测量 1.8V 电源上的有功电流 (请参阅图 2-8)。同样, 移除跳线 J16 可以测量 3.3V 电源上的有功电流。

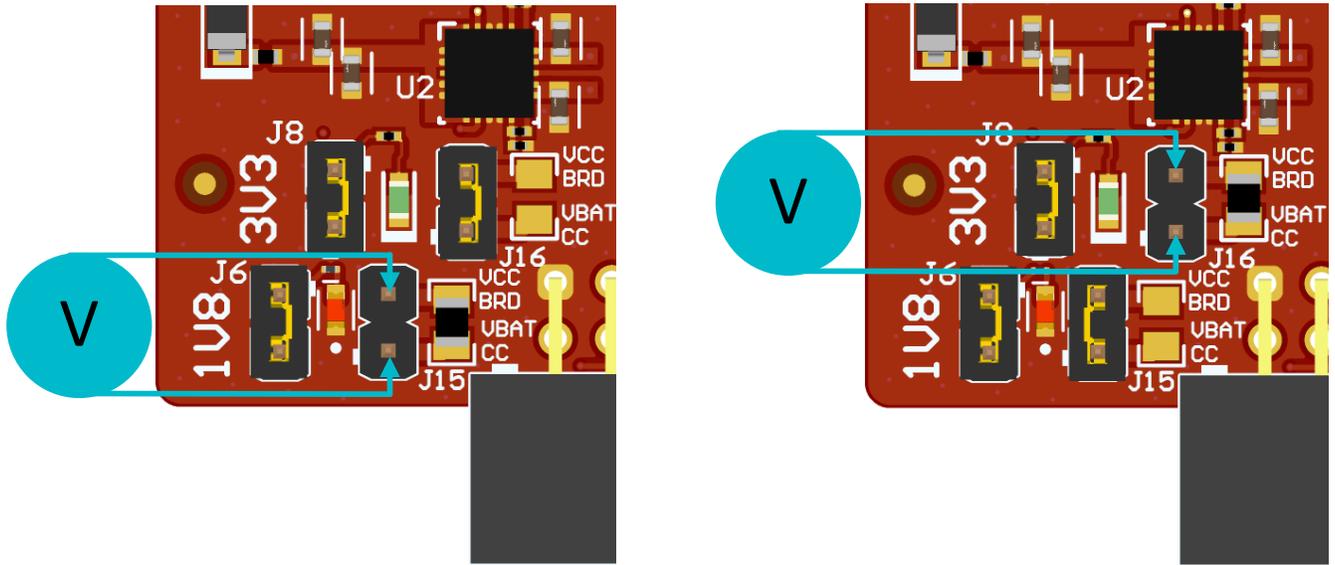


图 2-7. 有功电流测量

2.4 时钟

BoosterPack™ 插件模块提供一个 32.768kHz 振荡器 (Y2) 元件，为 CC33X1MOD 器件提供慢速时钟输入。

如果用户希望通过慢速时钟输入引脚 (P2.19) 外接自己的慢速时钟，则必须进行一些改装。需要移除 Y2 振荡器，并在 R29 焊盘上组装一个 0201 尺寸的 0Ω 电阻器。请参阅图 2-8。低速时钟也可以在内部生成，以节省 BOM 成本。

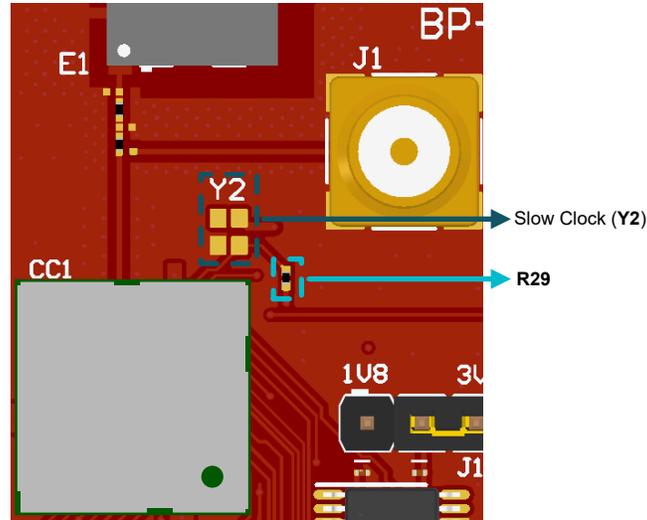


图 2-8. BP-CC33X1MOD 外部慢速时钟

2.5 执行传导测试

如图节 2.1 所示，BoosterPack™ 具有一个板载 SMA 连接器和元件天线。要测试传导测量，可以使用 SMA 连接器 (J1)。另外，可以使用板载的 U.FL 连接器 (J2) 封装代替 SMA 连接器，使用兼容电缆在实验室中进行测试。

在使用连接器 (J1/J2) (而不是芯片天线 (E1)) 之前，需要进行改装。这涉及交换现有 10pF 电容器的位置以将传输线引导至所需的接口 (请参阅图 2-9)。

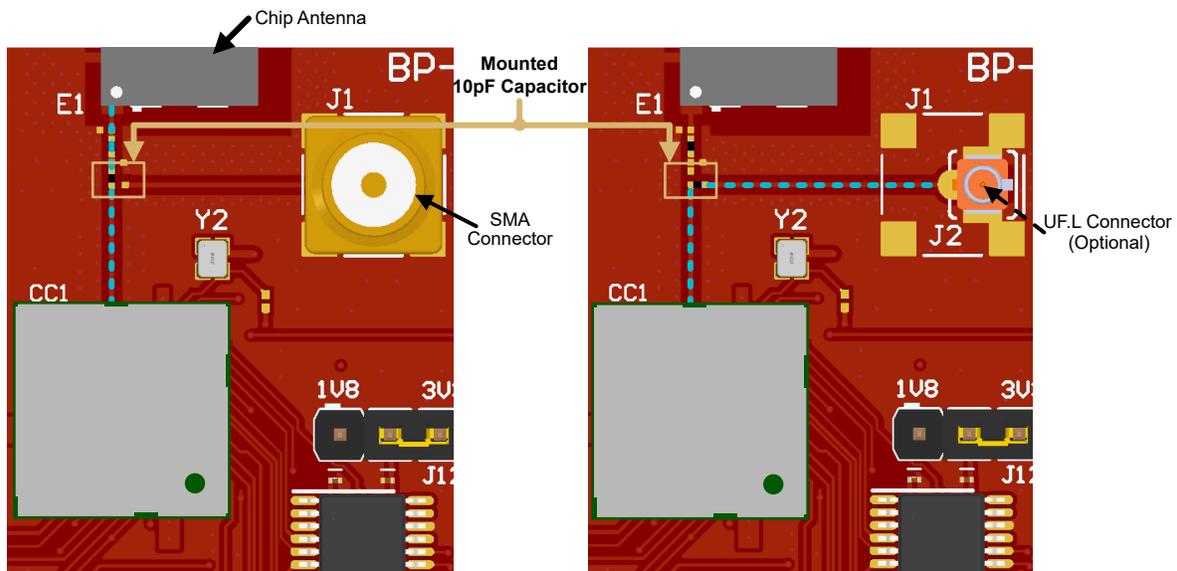


图 2-9. BP-CC33X1MOD 上的射频路径

3 实现结果

3.1 评估设置

CC33X1MOD BoosterPack 可用于以下配置：

- MCU 和 RTOS 评估：BP-CC33X1MOD + LaunchPad 且 MCU 运行 TCP/IP，如 LP-AM243
- 处理器和 Linux 评估：BP-CC33X1MOD + BP-CC33-BBB-ADAPT + BEAGL-BONE-BLACK
- 使用 PC 工具进行射频测试：BP-CC33X1MOD + LP-XDS110ET

此外，BP-CC33X1MOD 还可以连接到任何其他运行 TCP/IP 协议栈的 Linux 或 RTOS 主机电路板。

3.1.1 MCU 和 RTOS

BP-CC33X1MOD 可以与采用 TCP/IP 的 MCU (例如 LP-AM243) 一起使用，并且可以通过堆叠 40 引脚接头轻松地与 LaunchPad 集成，如图 3-1 所示。

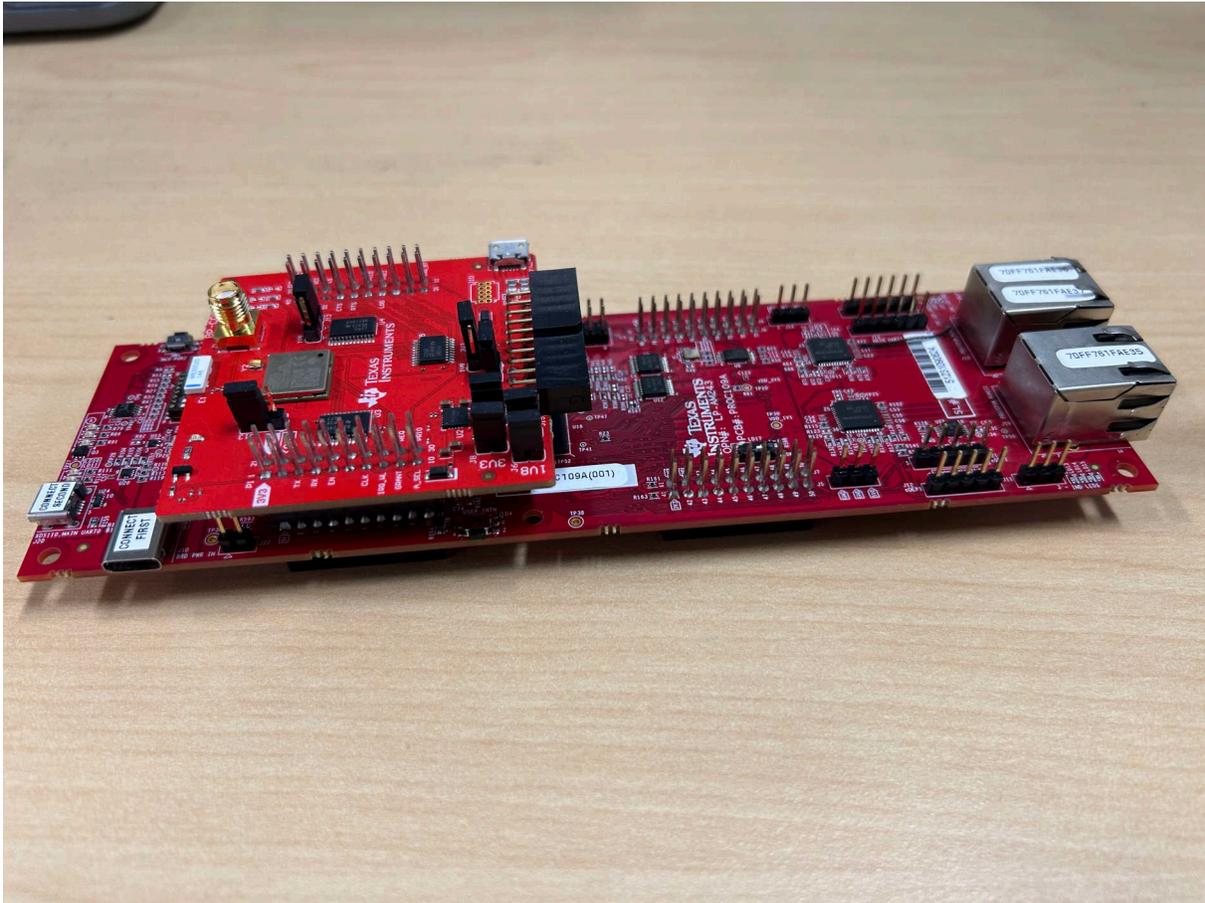


图 3-1. BP-CC33X1MOD 与 LP-AM243

3.1.2 处理器和 Linux

BP-CC33X1MOD 可以与运行 Linux 操作系统的主机平台集成，例如 BeagleBone Black (BBB)。BeagleBone Black 是一个低成本、社区支持的开发平台，如下所示。



图 3-2. BeagleBone Black 板

要将 BoosterPack™ 与 BeagleBone Black 连接，用户还需要 BP-CC33X1MOD 至 BBB 适配器板。

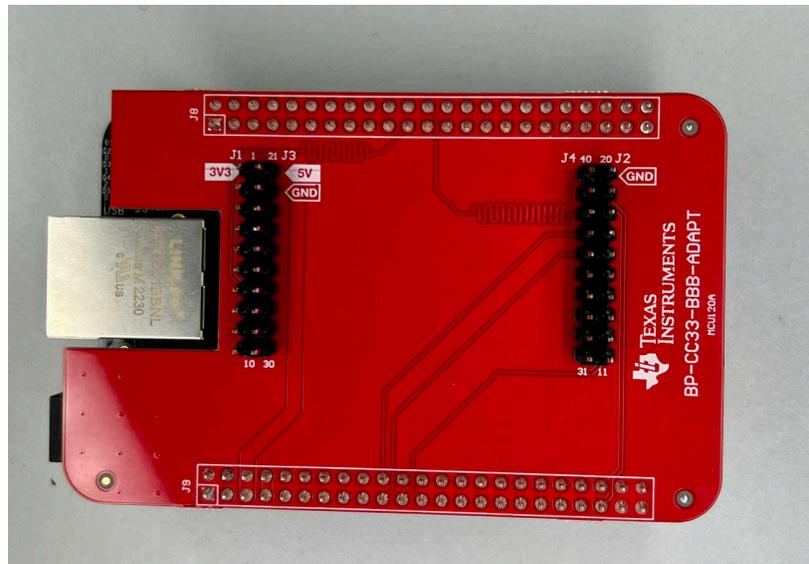


图 3-3. BeagleBone Black 适配器板

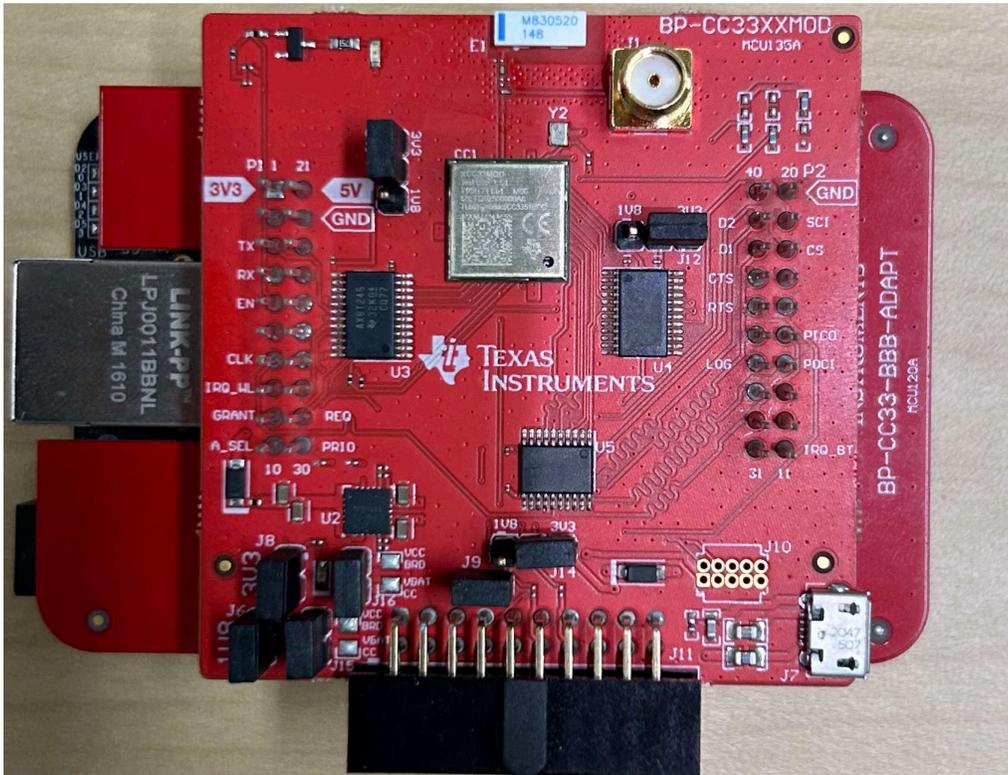


图 3-4. 具有适配器板的 BP-CC33X1MOD + BBB

为了确保 BeagleBone Black 从 SD 卡启动，请移除 BBB 底部的 100k 电阻 R68，并在 BBB 顶部为 R93 区域添加元件。或者，如果未进行过硬件改装，您可以在上电期间按住 BeagleBone 板上的 S2 按钮（请参阅图 3-6 和图 3-7）。

最后，可以选择在 BBB 底部添加直角接头以方便连接 FTDI 电缆。当适配器板连接到 BBB 时，FTDI 电缆可能会夹在 BBB 和适配器板之间，这可能会导致通信问题（请参阅图 3-7）。

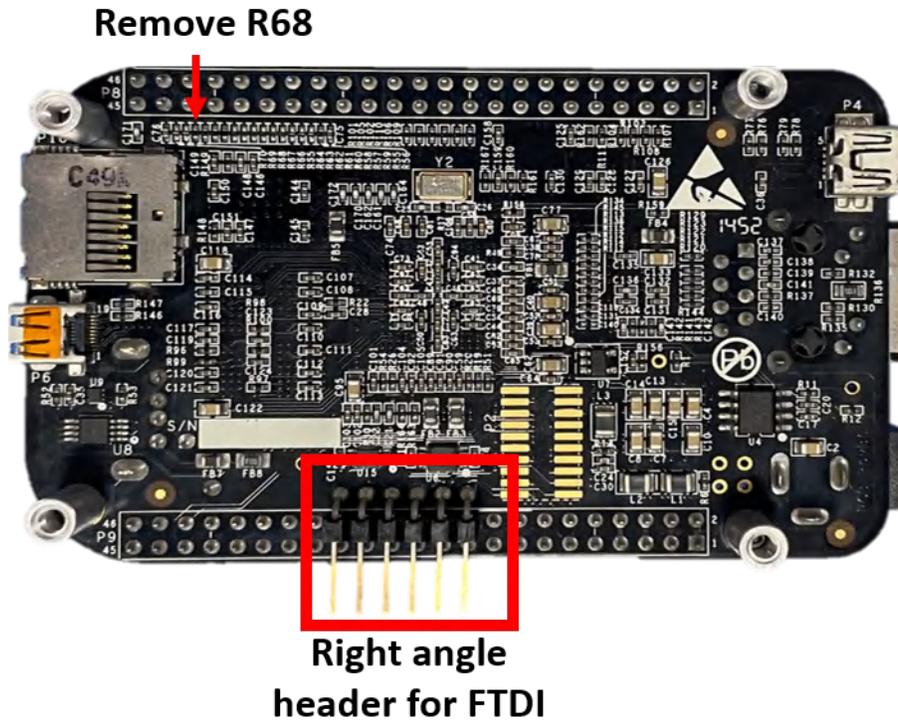


图 3-5. 改装的 BBB 底视图

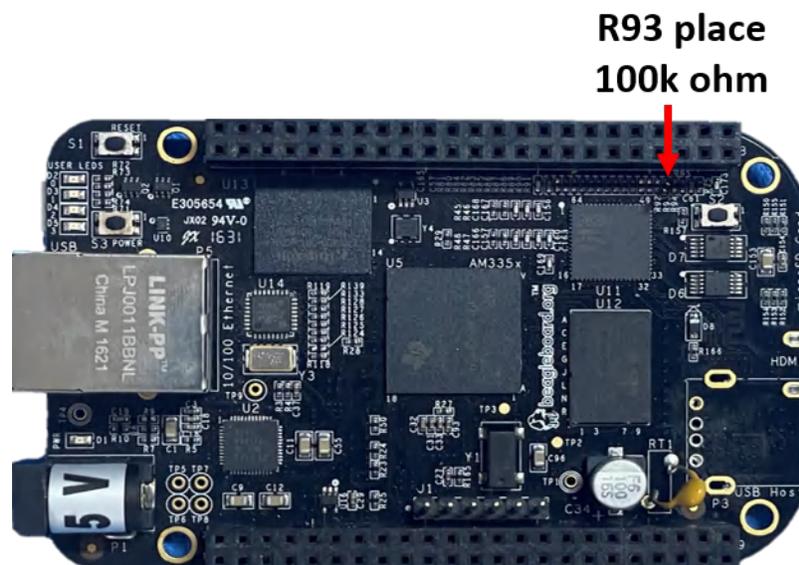


图 3-6. 改装的 BBB 顶视图

3.1.3 独立射频测试

BP-CC33X1MOD 可使用无线电工具独立 (不带主机) 测试射频功能。有关无线电工具及其下载位置的更多信息, 请参阅 [Wi-Fi 工具箱 BP-CC33X1MOD 硬件设置](#)。

BP-CC33X1MOD 具有板载 SMA 连接器和组件天线, 并且可以在板上安装 U.FL, 以便使用兼容电缆进行传导射频测试 (可能需要改装)。有关更多信息, 请参阅 [节 2.5](#)。

3.1.3.1 无线工具 BP-CC33X1MOD 硬件设置

无线工具是一款用于在开发和认证过程中对 CC33xx 设计进行射频评估和测试的基于 GUI 的工具。通过手动将无线电设置为传输或接收模式，该工具可提供低级无线电测试功能。使用此工具需要熟悉无线电电路理论和无线电测试方法。要对 BP-CC33X1MOD 执行传导射频测试，请参阅 节 2.5。请注意，传导测试需要改装。

用户可以从 TI.com 上 [CC33XX-SOFTWARE](#) 的 SIMPLELINK-WIFI-TOOLBOX 中下载该工具。

硬件要求

- Windows 10 64 位/Ubuntu 18 (或更高版本) 64 位操作系统
- 最新的 Chrome 网络浏览器
- 安装 [Simplelink Wi-Fi 工具箱](#)
- BP-CC33X1MOD
- 用于 SWD 通信的 [LP-XDS110ET](#) 调试器

LP-XDS110ET 支持通过 SWD 接口与 CC33X1MOD 器件直接通信。这允许无线工具等外部工具直接向器件发送命令，而无需使用嵌入式主机。

使用 LP-XDS110ET 进行测试

要将 LP-XDS110ET 与 BP-CC33X1MOD 配合使用，请将 BoosterPack™ 上的 20 引脚连接器 (J11) (请参阅图 2-5) 连接到 LP-XDS110ET 上的相应连接器。请确保 LaunchPad™ 上的跳线 (标记为 EXT.XDS) 采用 EXT. 配置，如图 3-7 所示。这验证了 JTAG 信号的目标电压来自 BP-CC3301MOD (1.8V) 而不是默认的 LP-XDS110ET 目标电压 (3.3V)。

在这种情况下，BP-CC33X1MOD 的电源来自 LP-XDS110ET，但在某些使用场景中，需要通过 USB 连接 (J7) 获得额外的电流。

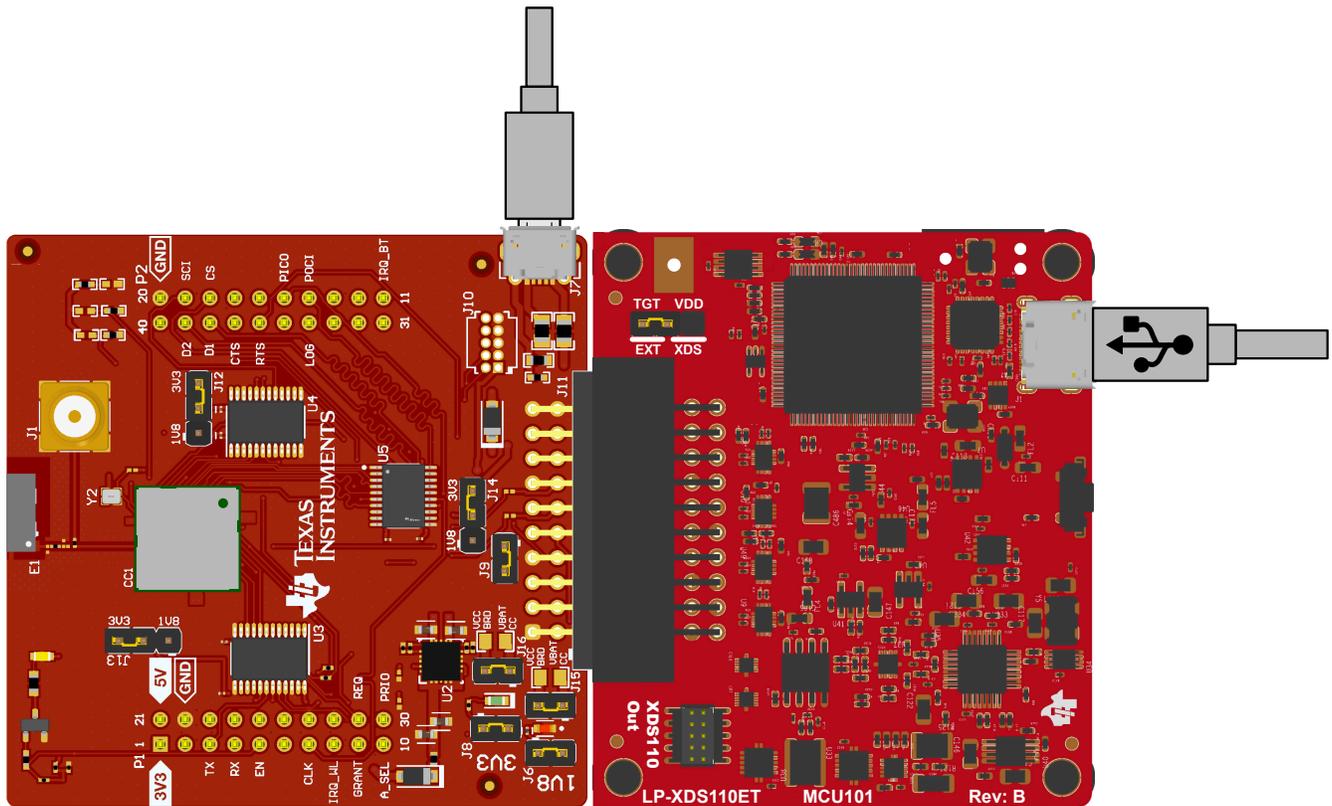


图 3-7. BP-CC33X1MOD 连接到 LP-XDS110ET

4 硬件设计文件

4.1 原理图

要访问 BP-CC33X1MOD 的原理图，用户可以从 [CC33X1MOD 工具文件夹](#) 访问设计文件。

4.2 PCB 布局

要访问 BP-CC33X1MOD 的 Gerber 文件，用户可以从 [CC33X1MOD 工具文件夹](#) 访问设计文件。

4.3 物料清单 (BOM)

要访问 BP-CC33X1MOD 的 BOM 列表，用户可以从 [CC33X1MOD 工具文件夹](#) 访问设计文件。

5 其他信息

5.1 商标

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6 修订历史记录

注：以前版本的页码可能与当前版本的页码不同

Changes from SEPTEMBER 30, 2024 to FEBRUARY 28, 2026 (from Revision * (September 2024) to Revision A (February 2026))

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- | | |
|-------------------------------|---|
| • 进行了更新，添加了 BP-CC3351MOD..... | 1 |
| • 添加了法规遵从性部分..... | 3 |

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.
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 - 1.2 EVMs are not intended for consumer or household use. EVMs may not be sold, sublicensed, leased, rented, loaned, assigned, or otherwise distributed for commercial purposes by Users, in whole or in part, or used in any finished product or production system.
2. *Limited Warranty and Related Remedies/Disclaimers:*
 - 2.1 These terms do not apply to Software. The warranty, if any, for Software is covered in the applicable Software License Agreement.
 - 2.2 TI warrants that the TI EVM will conform to TI's published specifications for ninety (90) days after the date TI delivers such EVM to User. Notwithstanding the foregoing, TI shall not be liable for a nonconforming EVM if (a) the nonconformity was caused by neglect, misuse or mistreatment by an entity other than TI, including improper installation or testing, or for any EVMs that have been altered or modified in any way by an entity other than TI, (b) the nonconformity resulted from User's design, specifications or instructions for such EVMs or improper system design, or (c) User has not paid on time. Testing and other quality control techniques are used to the extent TI deems necessary. TI does not test all parameters of each EVM. User's claims against TI under this Section 2 are void if User fails to notify TI of any apparent defects in the EVMs within ten (10) business days after delivery, or of any hidden defects with ten (10) business days after the defect has been detected.
 - 2.3 TI's sole liability shall be at its option to repair or replace EVMs that fail to conform to the warranty set forth above, or credit User's account for such EVM. TI's liability under this warranty shall be limited to EVMs that are returned during the warranty period to the address designated by TI and that are determined by TI not to conform to such warranty. If TI elects to repair or replace such EVM, TI shall have a reasonable time to repair such EVM or provide replacements. Repaired EVMs shall be warranted for the remainder of the original warranty period. Replaced EVMs shall be warranted for a new full ninety (90) day warranty period.

WARNING

Evaluation Kits are intended solely for use by technically qualified, professional electronics experts who are familiar with the dangers and application risks associated with handling electrical mechanical components, systems, and subsystems.

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

NOTE:

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

3 Regulatory Notices:

3.1 United States

3.1.1 Notice applicable to EVMs not FCC-Approved:

FCC NOTICE: This kit is designed to allow product developers to evaluate electronic components, circuitry, or software associated with the kit to determine whether to incorporate such items in a finished product and software developers to write software applications for use with the end product. This kit is not a finished product and when assembled may not be resold or otherwise marketed unless all required FCC equipment authorizations are first obtained. Operation is subject to the condition that this product not cause harmful interference to licensed radio stations and that this product accept harmful interference. Unless the assembled kit is designed to operate under part 15, part 18 or part 95 of this chapter, the operator of the kit must operate under the authority of an FCC license holder or must secure an experimental authorization under part 5 of this chapter.

3.1.2 For EVMs annotated as FCC – FEDERAL COMMUNICATIONS COMMISSION Part 15 Compliant:

CAUTION

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

FCC Interference Statement for Class A EVM devices

NOTE: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

FCC Interference Statement for Class B EVM devices

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

3.2 Canada

3.2.1 For EVMs issued with an Industry Canada Certificate of Conformance to RSS-210 or RSS-247

Concerning EVMs Including Radio Transmitters:

This device complies with Industry Canada license-exempt RSSs. Operation is subject to the following two conditions:

(1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Concernant les EVMs avec appareils radio:

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes: (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

Concerning EVMs Including Detachable Antennas:

Under Industry Canada regulations, this radio transmitter may only operate using an antenna of a type and maximum (or lesser) gain approved for the transmitter by Industry Canada. To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (e.i.r.p.) is not more than that necessary for successful communication. This radio transmitter has been approved by Industry Canada to operate with the antenna types listed in the user guide with the maximum permissible gain and required antenna impedance for each antenna type indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.

Concernant les EVMs avec antennes détachables

Conformément à la réglementation d'Industrie Canada, le présent émetteur radio peut fonctionner avec une antenne d'un type et d'un gain maximal (ou inférieur) approuvé pour l'émetteur par Industrie Canada. Dans le but de réduire les risques de brouillage radioélectrique à l'intention des autres utilisateurs, il faut choisir le type d'antenne et son gain de sorte que la puissance isotrope rayonnée équivalente (p.i.r.e.) ne dépasse pas l'intensité nécessaire à l'établissement d'une communication satisfaisante. Le présent émetteur radio a été approuvé par Industrie Canada pour fonctionner avec les types d'antenne énumérés dans le manuel d'usage et ayant un gain admissible maximal et l'impédance requise pour chaque type d'antenne. Les types d'antenne non inclus dans cette liste, ou dont le gain est supérieur au gain maximal indiqué, sont strictement interdits pour l'exploitation de l'émetteur.

3.3 Japan

3.3.1 *Notice for EVMs delivered in Japan:* Please see http://www.tij.co.jp/lstds/ti_ja/general/eStore/notice_01.page 日本国内に輸入される評価用キット、ボードについては、次のところをご覧ください。

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

3.3.2 *Notice for Users of EVMs Considered "Radio Frequency Products" in Japan:* EVMs entering Japan may not be certified by TI as conforming to Technical Regulations of Radio Law of Japan.

If User uses EVMs in Japan, not certified to Technical Regulations of Radio Law of Japan, User is required to follow the instructions set forth by Radio Law of Japan, which includes, but is not limited to, the instructions below with respect to EVMs (which for the avoidance of doubt are stated strictly for convenience and should be verified by User):

1. Use EVMs in a shielded room or any other test facility as defined in the notification #173 issued by Ministry of Internal Affairs and Communications on March 28, 2006, based on Sub-section 1.1 of Article 6 of the Ministry's Rule for Enforcement of Radio Law of Japan,
2. Use EVMs only after User obtains the license of Test Radio Station as provided in Radio Law of Japan with respect to EVMs, or
3. Use of EVMs only after User obtains the Technical Regulations Conformity Certification as provided in Radio Law of Japan with respect to EVMs. Also, do not transfer EVMs, unless User gives the same notice above to the transferee. Please note that if User does not follow the instructions above, User will be subject to penalties of Radio Law of Japan.

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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:*
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 - 4.2 User must read and apply the user guide and other available documentation provided by TI regarding the EVM prior to handling or using the EVM, including without limitation any warning or restriction notices. The notices contain important safety information related to, for example, temperatures and voltages.
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 - 4.3.2 EVMs are intended solely for use by technically qualified, professional electronics experts who are familiar with the dangers and application risks associated with handling electrical mechanical components, systems, and subsystems. User assumes all responsibility and liability for proper and safe handling and use of the EVM by User or its employees, affiliates, contractors or designees. User assumes all responsibility and liability to ensure that any interfaces (electronic and/or mechanical) between the EVM and any human body are designed with suitable isolation and means to safely limit accessible leakage currents to minimize the risk of electrical shock hazard. User assumes all responsibility and liability for any improper or unsafe handling or use of the EVM by User or its employees, affiliates, contractors or designees.
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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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