

# LP-EM-CC2745R10-Q1 LaunchPad Development Kit for SimpleLink Bluetooth Low Energy MCU



## Description

This LaunchPad™ development kit speeds up development with the SimpleLink™ Bluetooth® Low Energy MCU with support for Bluetooth Low Energy (LE) and 2.4GHz proprietary protocols. The [SimpleLink Low Power F3 software development kit \(SDK\)](#) provides software support.

## Get Started

1. Order the [LP-EM-CC2745R10-Q1](#) device and either the LP-XDS110 or the LP-XDS110ET launch pad.
2. Get the latest [software development kit \(SDK\)](#).
3. Download the comprehensive [reference design files](#) in the TI reference design page.
4. See the latest [CC2745R10-Q1](#) product page.

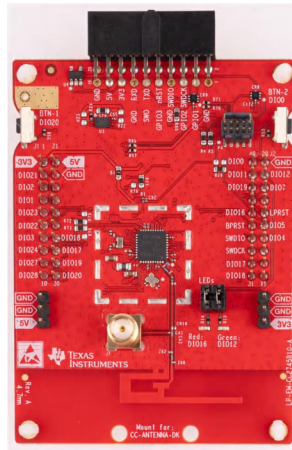
## Features

- CC2745R10-Q1 wireless MCU
- 32-bit Arm® Cortex®-M33 processor
- Up to +10dBm output power
- 2.4GHz PCB antenna with SMA connector for external antennas
- 20-pin LP-EM Debug connector for a LaunchPad XDS110 Debugger ([LP-XDS110](#) or [LP-XDS110ET](#), sold separately and required for software development and RF evaluation)
- 40-pin dual-gender BoosterPack™ connectors
- Two LEDs
- Two user buttons
- Access to all I/O signals with the BoosterPack plug-in module connectors
- 10-pin Arm® Cortex® debug connector
- 8Mbit SPI flash memory for firmware updates

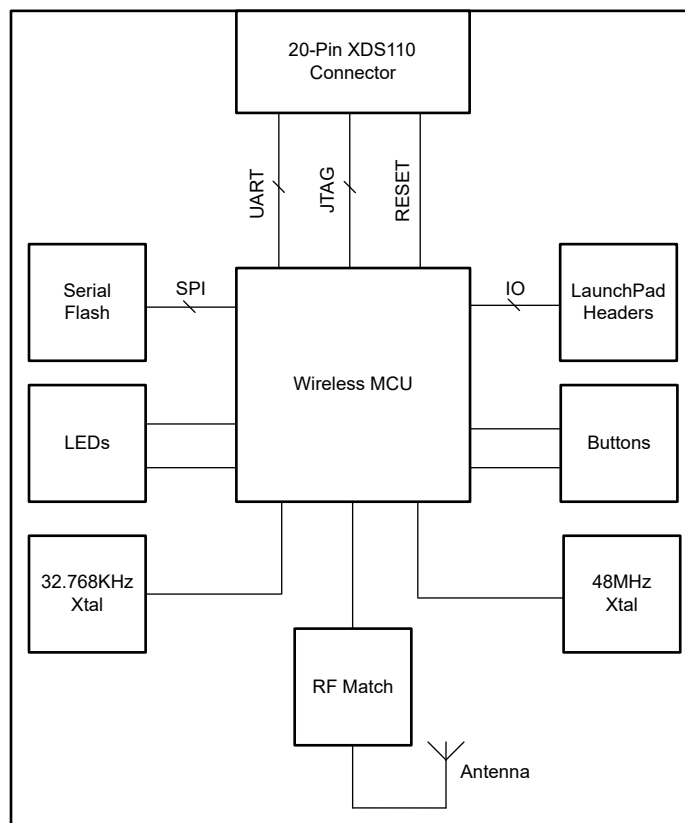
## Applications

- [Automotive](#)
  - [Car access and security systems](#)
    - Digital key
    - Phone as a key (Paak)
    - Passive entry passive start (PEPS)
    - Remote keyless entry (RKE)
  - [Tire pressure monitoring](#)

- [Channel Sounding](#)
- [Medical](#)
  - Home healthcare—[blood glucose monitors](#), [blood pressure monitor](#), [CPAP machine](#), [electronic thermometer](#)
  - Patient monitoring and diagnostics—[medical sensor patches](#)
  - Personal care and fitness—[electric toothbrush](#), [wearable fitness and activity monitor](#)
- [Building automation](#)
  - Building security systems—[motion detector](#), [electronic smart lock](#), [door and window sensor](#), [garage door system](#), [gateway](#)
  - HVAC—[thermostat](#), [wireless environmental sensor](#)
  - Fire safety system—[smoke and heat detector](#)
  - Video surveillance—[IP network camera](#)
- [Lighting](#)
  - LED luminaire
  - Lighting control—[daylight sensor](#), [lighting sensor](#), [wireless control](#)
- [Factory automation and control](#)
- [Retail automation and payment—electronic point of sale](#)
  - [Electronic shelf label](#)
- [Grid infrastructure](#)
  - Smart meters—[water meter](#), [gas meter](#), [electricity meter](#), and [heat cost allocators](#)
  - Grid communications—[wireless communications](#)—Long-range sensor applications
  - Other alternative energy—[energy harvesting](#)
- [Communication equipment](#)
  - [Wired networking](#)
  - [wireless LAN or Wi-Fi access points](#), [edge router](#)
- [Personal electronics](#)
  - [Connected peripherals](#)—[consumer wireless module](#), [pointing devices](#), [keyboards and keypads](#)
  - [Gaming](#)—[electronic and robotic toys](#)
  - [Wearables \(non-medical\)](#)—[smart trackers](#), [smart clothing](#)
- [Industrial](#)
  - [Industrial transport](#)—[asset tracking](#)



**Figure 1-1. LP-EM-CC2745R10-Q1 Hardware Image**



**Figure 1-2. LP-EM-CC2745R10-Q1 Block Diagram**

# 1 Evaluation Module Overview

## 1.1 Introduction

The CC2745R10-Q1 LaunchPad kit ( [LP-EM-CC2745R10-Q1](#) ) brings easy Bluetooth Low Energy connectivity to the LaunchPad ecosystem with the SimpleLink ultra-low power [CC2745R10-Q1 wireless MCU](#).

The CC2745R10-Q1 is a wireless MCU targeting Bluetooth Low Energy and Proprietary 2.4GHz applications. The CC2745R10-Q1 has a 96MHz, 32-bit Arm Cortex-M0+ as the main processor and a rich peripheral set that includes 12-bit ADC, 2xUART, 2xSPI, I<sup>2</sup>C, I<sup>2</sup>S, CAN, Hardware Security Module (HSM), Timers, Algorithm Processing Unit (APU), and more. More detailed information is provided in the devices [data sheet](#) and [Technical Reference Manual \(TRM\)](#).

The LaunchPad is supported by the SimpleLink Starter app for iOS™ and Android™. This app connects your LaunchPad to a smartphone using Bluetooth. The Starter app supports reading the LaunchPad buttons, controlling LEDs, and all I/O signals on the BoosterPack connectors.

Additionally, the latest firmware version can be uploaded to the LaunchPad kit via an over-the-air (OTA) upgrade from the SimpleLink Starter application.

## 1.2 Kit Contents

- [CC2745R10-Q1 LaunchPad development kit](#)
- 2-wire female to female cable
- 10-pin flat ribbon cable
- [Standard Terms and Conditions for EVMs](#)
- Abbreviated Terms and Conditions for EVMs
- [Quick Start Guide](#) for LP-EM-CC2745R10-Q1

## 1.3 Specification

The CC2745R10-Q1 is designed using the CC2745R10-Q1 wireless MCU that has a 96MHz Arm Cortex-M33 processor, 1MB of in-system programmable flash, 32kB of ROM for bootloader and drivers, and 162kB of ultra-low leakage SRAM with full RAM retention in standby mode. In addition, the CC2745R10-Q1 is a 2.4GHz RF transceiver compatible with Bluetooth Low Energy, contains an integrated balun, supports over-the-air upgrade (OTA), and has a Serial Wire Debug (SWD) interface.

The MCU consumption has a 6.8mA active mode running CoreMark®, consumes less than 900nA in standby mode, and 160nA in shutdown mode with wake-up on a pin.

The Radio consumption is 6.1mA in RX mode, 7.7mA in TX mode at 0dBm, and 24.5mA in TX at +10dBm. In addition, the radio is capable of –103.5dBm sensitivity for Bluetooth Low Energy 125kbps and –97dBm sensitivity for Bluetooth Low Energy 1Mbps.

The [LP-EM-CC2745R10-Q1](#) has support for 2-pin SWD debugging and a 32kHz external XTAL for the lowest power consumption and accurate RTC timekeeping. Each feature uses 2 pins that can be reused as GPIOs if desired, bringing the number of GPIOs to a maximum of 23. In addition, this LaunchPad can support:

- 3 × 16-bit and 1 × 32-bit general-purpose timers, quadrature decode mode support
- 12-bit ADC, 1.2Msps with external reference, 267ksps with internal reference, up to eight external ADC inputs
- 1 × low-power comparator
- 2 × UART with LIN capability
- 2 × SPI
- 1 × I<sup>2</sup>C
- 1 × I<sup>2</sup>S
- 1 × CAN-FD controller with CAN/CAN-FD ISO 16845-1:2016 certification compliance
- Real-time clock (RTC)
- Algorithm Processing Unit (APU)
- Hardware Security Module (HSM)
- Integrated temperature and battery monitor
- Watchdog timer

## 1.4 Device Information

The CC274XX-Q1 Automotive SimpleLink family of devices are 2.4GHz wireless microcontrollers (MCUs), targeting Bluetooth Low Energy and proprietary 2.4GHz automotive applications. These devices are optimized for low-power wireless communication with Over the Air Download (OAD) support for car access, digital key-fobs, channel sounding, and tire pressure monitoring applications. Highlighted features of CC2745R10-Q1 on this development kit include:

- Support for Bluetooth 5 features: high-speed mode (2Mbps PHY), long-range (LE Coded 125kbps and 500kbps PHYs), privacy 1.2.1 and channel selection algorithm #2, as well as backward compatibility and support for key features from the Bluetooth 4.2 and earlier Low Energy specifications.
- Fully qualified Bluetooth software protocol stack included with the [SimpleLink Low Power F3 software development kit \(SDK\)](#)
- Ultra-low standby current less than 0.9 $\mu$ A with RTC operational and full RAM retention that enables significant battery life extension, especially for applications with longer sleep intervals.
- Integrated balun for reduced bill-of-material (BOM) board layout

The CC274XX-Q1 family is part of the SimpleLink MCU platform, which consists of Wi-Fi®, Bluetooth Low Energy, Thread, Zigbee, Sub-1GHz MCUs, and host MCUs that all share a common, easy-to-use development environment with a single-core software development kit (SDK) and rich tool set. A one-time integration of the SimpleLink platform enables you to add any combination of the portfolio's devices into your design, allowing 100 percent code reuse when your design requirements change. For more information, visit the [SimpleLink MCU platform](#).

## 2 Hardware

Figure 2-1 shows the location of the LP-EM-CC2745R10-Q1 connectors, buttons/switches, and LEDs. The CC2745R10-Q1 wireless microcontroller and antenna locations are also shown.

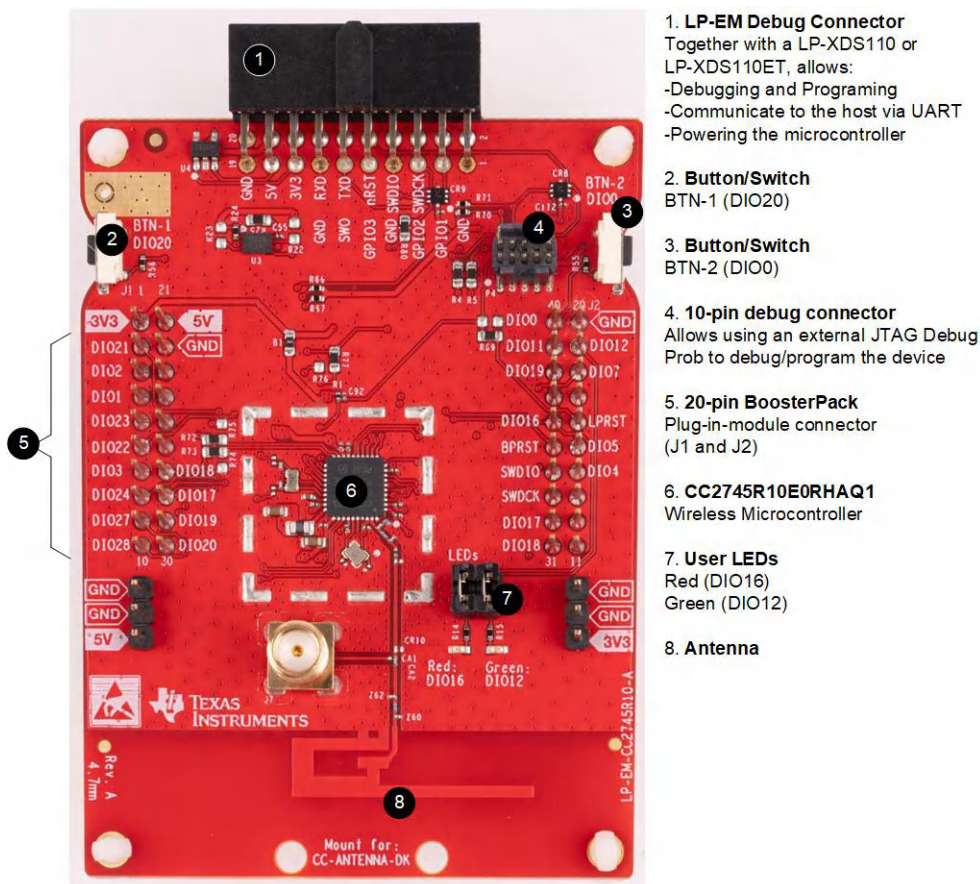


Figure 2-1. LP-EM-CC2745R10-Q1 Connector and User Interface Layout

### 2.1 Power Requirements

The LaunchPad is designed to be powered from the LaunchPad EM Debug Probe via the LP-EM debug connector, or from an external power supply connected to the GND and the 3V3 pin header. There is also support for 5V on the pin header, but this is not required or used for LaunchPad operation. When powering from the LaunchPad EM Debug Probe, the device supply voltage is fixed at 3.3V. When powering externally, care must be taken to keep the board voltage within its operating range (1.8V to 3.6V).

**Note:** Even though the CC2745R10-Q1 supply voltage ranges from 1.8V to 3.8V, the maximum voltage of the LP-EM-CC2745R10-Q1 is limited by the XDS110 level shifters at 3.6V.

Additional details about how to power the LaunchPad are shown in the [Hardware and Debug Setup](#) section below.

### 2.2 Temperature Range

The LaunchPad is designed for operation from  $-40^{\circ}\text{C}$  to  $+125^{\circ}\text{C}$ . Note that other BoosterPack accessories and LaunchPads can have different temperature ranges and, when combined, these ranges are limited by the most restrictive values. Also, when powering the LaunchPad from an external battery, keep the system within the system's specified temperature operating range.

## 2.3 Energy Trace

EnergyTrace™ is available on any of the above compatible Debug Probes except the [LP-XDS110](#). The tool can be used standalone as a power profiling tool, which allows ultra-low power measurements, or in EnergyTrace++ mode within a debug session, which allows for complete state monitoring and helps optimize the application for ultra-low-power consumption.

To use EnergyTrace, the XDS110 Debug Probe must provide power to the [LP-EM-CC2745R10-Q1](#) to perform current measurements. EnergyTrace embedded in the [LP-XDS110ET](#) or in a separate LaunchPad only supports 3.3V supply voltage, but using a [TMDSEMU110-U](#) with the optional EnergyTrace HDR adapter [TMDSEMU110-ETH](#) allows powering through the full range of the board voltages. The [Measuring Current Consumption Application Report](#) describes how to run EnergyTrace from CCS.

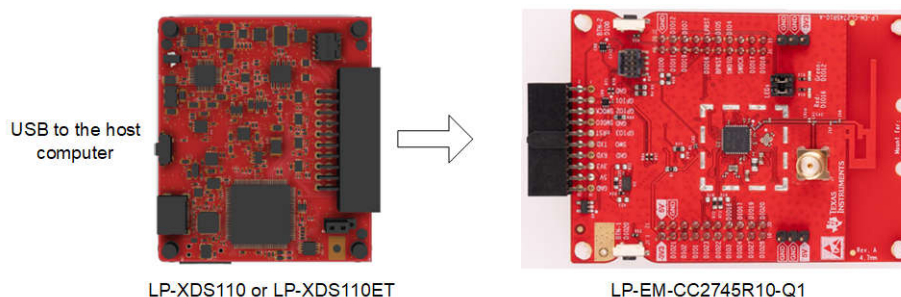
## 2.4 Hardware and Debug Setup

The [LP-EM-CC2745R10-Q1](#) LaunchPad does not include an onboard debug probe. Compatible debug probes are the LaunchPad XDS110 debug probe ([LP-XDS110](#) or [LP-XDS110ET](#)), standalone XDS110 ([TMDSEMU110-U](#) with the optional EnergyTrace HDR adapter [TMDSEMU110-ETH](#)), or a LaunchPad with an onboard debug probe.

### 2.4.1 Using a LaunchPad XDS110 Debug Probe

Before connecting the [LP-XDS110](#) or [LP-XDS110ET](#) Debug Probe to the [LP-EM-CC2745R10-Q1](#), enable power by setting the TGT VDD jumper on the XDS110 Debug Probe to **XDS**. In this setting, the device voltage is fixed at 3.3V. If external power is provided to the LaunchPad, then set this jumper on the XDS110 Debug Probe to **EXT**. Afterward, connect the edge connector of the debugger to the edge connector of the LaunchPad and connect the USB port of the debugger to a computer.

The final configuration for this setup is shown in [Figure 2-2](#) along with the correct jumper configuration for TGT VDD connected to **XDS** (as shown in the bottom right corner of the XDS 110 Debug Probe).



**Figure 2-2. Connection of LP-EM-CC2745R10-Q1 with XDS110 Debug Probe**

### 2.4.2 Using a Generic XDS110 Debug Probe, Including a Separate LaunchPad

On the separate LaunchPad:

- Remove all of the header jumpers except **GND** and **3V3**.
- Set the power jumper to reflect the scenario. Set the jumper to **XDS110 power** if the [LP-EM-CC2745R10-Q1](#) is to be powered by the separate LaunchPad. Set this to **Extern Pwr** if external power is to be provided instead. Care must be taken to keep the board voltage within the board's operating range (1.8V to 3.6V).
- Connect one end of the 10-pin Debug Cable to the **XDS110 Out** connector on the LaunchPad.
- Connect one end of the 2-wire Power Cable to the **3V3** and **GND** header of the LaunchPad.

On the ([LP-EM-CC2745R10-Q1](#)):

- Connect the other end of the 10-pin Debug Cable to the **Target In** connector.
- Connect the other end of the 2-wire Power Cable to the **GND** and **3V3** header. Verify that the polarity is correct.

The final configuration is shown in [Figure 2-3](#).

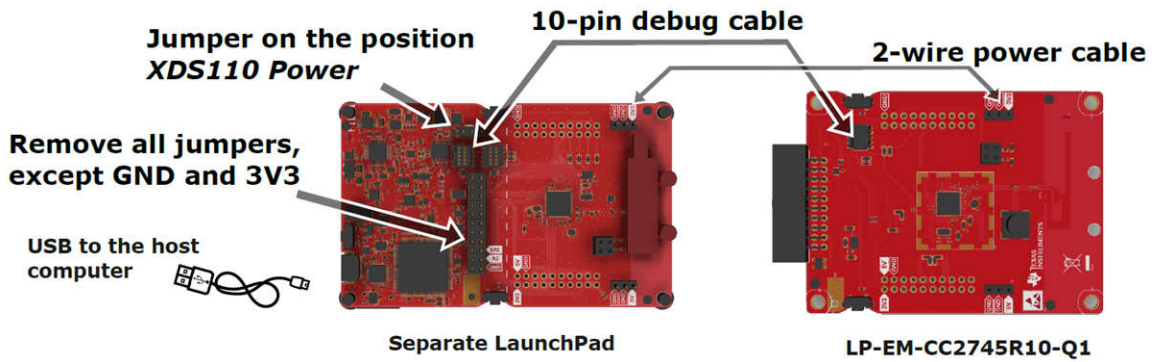


Figure 2-3. Connection of LP-EM-CC2745R10-Q1 with XDS110 Debug Probe

## 2.5 BoosterPack Connector Pinout

The BoosterPack header connection diagram can be seen in [Figure 2-4](#).

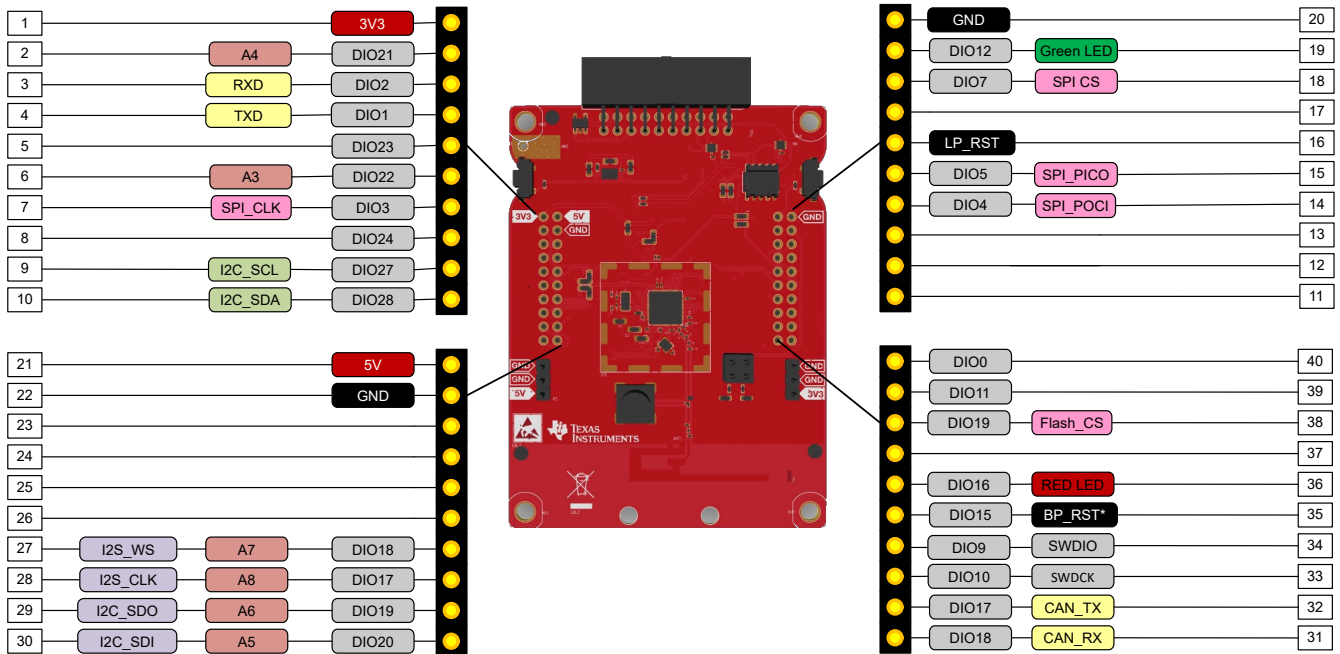


Figure 2-4. LP-EM-CC2745R10-Q1 BoosterPack Connector Pinout

## 2.6 XDS110 Interface Connector

The LP-EM-CC2745R10-Q1 P33 connector pinout is shown in [Table 2-1](#). For the pin 1 location, refer to [Section 5](#) or the full set of [reference design files](#).

**Table 2-1. XDS110 Interface Connector (P3) Pinout Description**

Pin Number	Pin Name	Pin Description
1	GND	Ground connection
2	NC	No connect
3	XDS_GPIO1	Connection to GPIO1 of XDS board
4	NC	No connect
5	XDS_GPIO2	Connection to GPIO2 of XDS board
6	WMCU_SWDCK	SWDCK connection to WMCU device
7	GND	Ground connection
8	WMCU_SWDIO	SWDIO connection to WMCU device
9	XDS_GPIO3	Connection to GPIO3 of XDS board
10	WMCU_RESET	RESET connection to WMCU device
11	NC	No connect
12	WMCU_TXD	TXD connection to WMCU device
13	GND	Ground connection
14	WMCU_RXD	RXD connection to WMCU device
15	XDS_BoardID_SCL	XDS SCL connection to LaunchPad board ID
16	WMCU_VDD	VDD connection to WMCU device
17	XDS_BoardID_SDA	XDS SDA connection to LaunchPad board ID
18	5V0_BP	5V connection
19	GND	Ground connection
20	GND	Ground connection

## 2.7 Debug Interface Connector

The [LP-EM-CC2745R10-Q1](#) contains a 10-pin debug connect (**P4**) that allows using an external JTAG Debug Probe to debug/program the device. The pinout information can be found in [Table 2-2](#). For the pin 1 location, refer to [Section 5](#) or the full set of [reference design files](#).

**Table 2-2. 10-Pin Debug Interface Connector Pinout**

Pin Number	Pin Name	Pin Description
1	WMCU_VDD	VDD connection to WMCU device
2	WMCU_SWDIO	SWDIO connection to WMCU device
3	GND	Ground connection
4	WMCU_SWDCK	SWDCK connection to WMCU device
5	GND	Ground connection
6	NC	No connect
7	NC	No connect
8	NC	No connect
9	GND	Ground connection
10	WMCU_RESET	RESET connection to WMCU device



## 2.8 Jumper Information

The [LP-EM-CC2745R10-Q1](#) has two user-configurable jumpers, as shown in [Figure 2-1](#):

- When the **P2** LaunchPad jumper is connected across **pins 1 and 2**, this will connect **DIO16** to the onboard Red LED. When removed, the jumper allows direct connection of **DIO16** to the BoosterPack header **J2:36**.
- When the **P2** LaunchPad jumper is connected across **pins 3 and 4**, this will connect **DIO12** to the onboard Green LED. When removed, the jumper allows direct connection of **DIO12** to the BoosterPack header **J2:19**.

In addition the [LP-EM-CC2745R10-Q1](#) has 2 additional jumpers that allow access to both 5V and GND via header **P5** and 3.3V and GND through header **P1**, as shown in [Figure 2-1](#).

## 2.9 Push Buttons

The [LP-EM-CC2745R10-Q1](#) has two user-configurable push buttons as shown in [Figure 2-1](#):

- **BTN-1** is connected to **DIO20** of the CC2745R10-Q1. This is also directly connected to the BoosterPack header **J1:30**.
- **BTN-2** is connected to **DIO0** of the CC2745R10-Q1. This is also directly connected to the BoosterPack header **J2:40**.

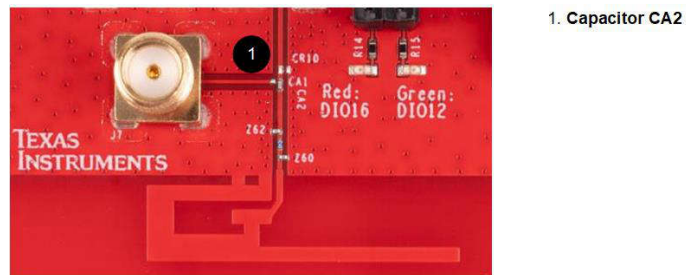
### 3 Advanced Use of the LaunchPad Hardware

**Note:** the topics in this section involve hardware modifications to your development kit. Your board can be damaged if appropriate soldering equipment is not used and proper ESD mitigation procedures are not followed. Make sure you also have the expertise to perform these modifications.

#### 3.1 External Antenna

The RF path of the [LP-EM-CC2745R10-Q1](#) by default uses the Inverted F antenna printed on the PCB. The SMA connector near the PCB antenna can be used instead, which is useful for tests using an external antenna or for RF-conducted measurements.

To do that, the capacitor **CA2** (as shown in [Figure 3-1](#)) has to reroute the RF path from the antenna to the SMA: desolder **CA2** from the original vertical position (as shown in the picture below) and resolder **CA2** horizontally to connect to the pad near the SMA.



**Figure 3-1. Capacitor CA2 Location**

#### 3.2 XDS110 GPIOs

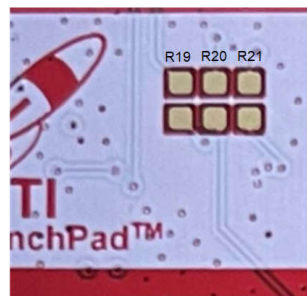
The LP-EM Debug Connector has three GPIO pins that are controlled by the LaunchPad XDS110 Debug Probe:

- Pin 3 → XDS\_GPIO1
- Pin 5 → XDS\_GPIO2
- Pin 9 → XDS\_GPIO3

**Note:** Details on how to use these pins from a host PC are shown in the [XDS110 Debug Probe User's Guide](#).

These pins are disconnected by default. To enable the pins, solder three 0Ω resistors to the pins' corresponding positions at the bottom of the board, as shown in [Figure 3-2](#):

- R19 & R6 → XDS\_GPIO1
- Remove Y3 → XDS\_GPIO1
- Remove C81 → XDS\_GPIO1
- R20 → XDS\_GPIO2
- R21 → XDS\_GPIO3



**Figure 3-2. Location of R19, R20, and R21**

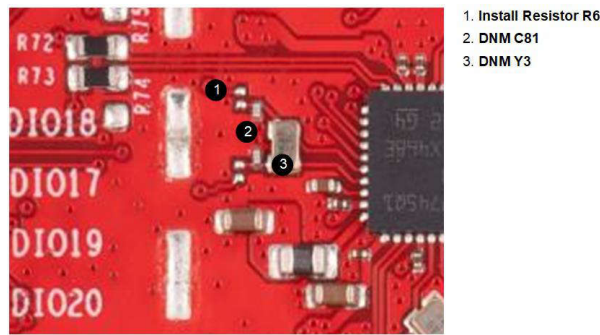


Figure 3-3. Location of R6, C81, and Y3

By doing this modification, the CC2745R10-Q1 MCU GPIO pins are connected to these signals:

- DIO23\_X32P → XDS\_GPIO1
- DIO16 → XDS\_GPIO2
- DIO12 → XDS\_GPIO3

### 3.3 Reset Selection on BoosterPack Connector

The LP-EM-CC2745R10-Q1 board connects the reset signal to pin **J2:16 (LPRST)** of the BoosterPack connector (see Figure 2-4). Depending on the BoosterPack used, one can connect this reset signal to **J2:35 (BPRST)**. To do this, solder a 0 resistor in **R68** and remove the 0Ω from **R69**.

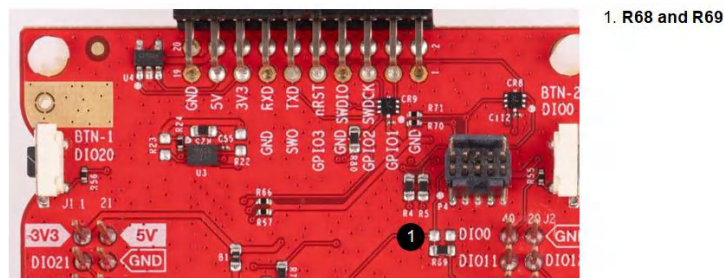


Figure 3-4. Location of R68 and R69

### 3.4 I<sup>2</sup>C Pullup Resistors

The LP-EM-CC2745R10-Q1 supports the I<sup>2</sup>C port of the CC2745R10-Q1 device: pins **DIO28 (SDA)** and **DIO27 (SCL)**. To use the I<sup>2</sup>C interface, 3.3KΩ pullup resistors have been added to the footprints designated by **R66** and **R67** on the LP-EM-CC2745R10-Q1 board. Adjustments to these values can be required as these resistors vary according to the bus length and other intrinsic characteristics. To properly do this calculation, consult the application note [Understanding the I<sup>2</sup>C Bus](#).

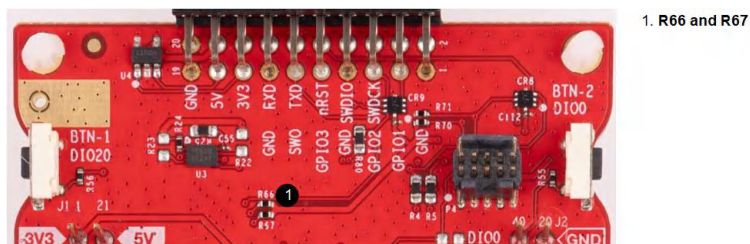


Figure 3-5. Location of R66 and R67

## 4 Software

### 4.1 Getting Started

The best way to start development with your [LP-EM-CC2745R10-Q1](#) is to visit the [SimpleLink Academy](#) which provides a comprehensive set of trainings for the SimpleLink MCU family.

### 4.2 Out of Box Demo

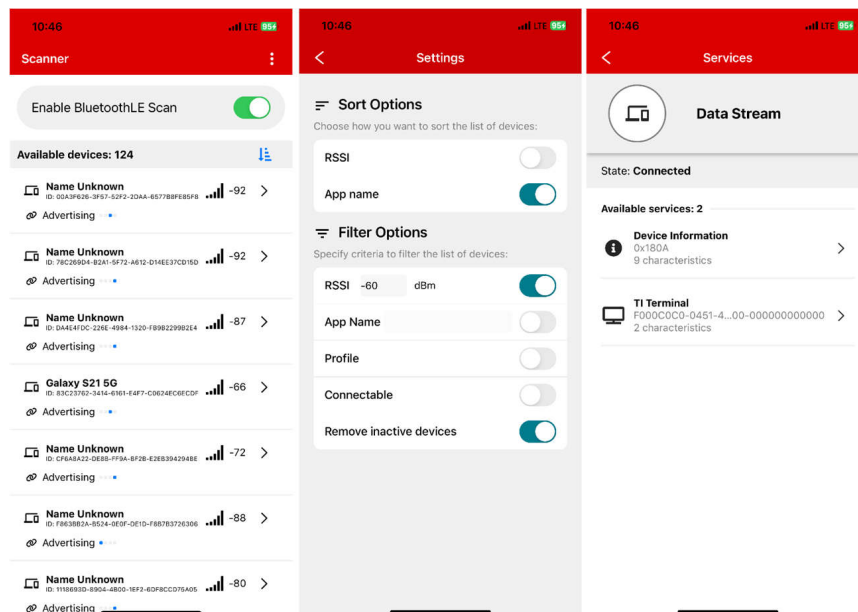
The [LP-EM-CC2745R10-Q1](#) is preprogrammed with the Data Stream Application software that allows wireless communication with smartphones and tablets over Bluetooth Low Energy. Simply connect the [LP-EM-CC2745R10-Q1](#) to the XDS110 Debug Probe and then to a computer or power supply.

When power is applied, the board will run a power-on self-test and the green LED will be lit.

To test the functionality of the Data Stream Application, download the SimpleLink Connect application from one of the two App Stores below:

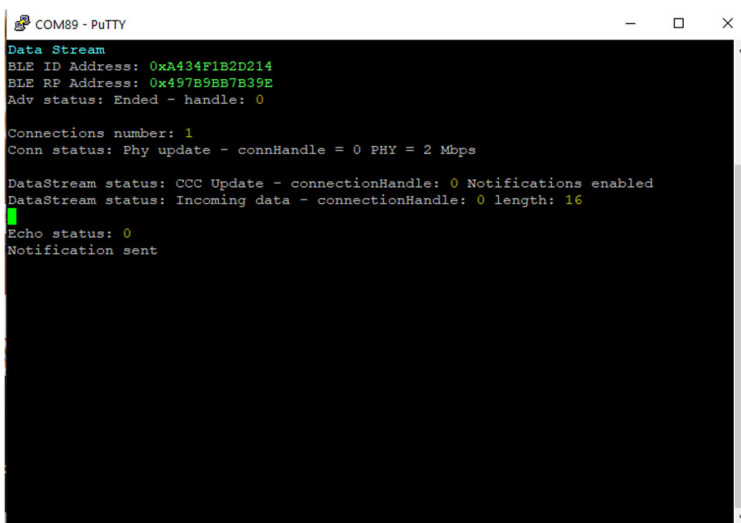


This app lets you control and visualize the Data Stream demo software running on the LaunchPad. An example of the Data Stream Application is shown in [Figure 4-1](#).



**Figure 4-1. Data Stream Application SW Example**

The Data Stream Application status information can also be seen on the UART port of the host PC, as shown in [Figure 4-2](#).



```

COM89 - PuTTY
Data Stream
BLE ID Address: 0xA434F1B2D214
BLE RF Address: 0x497B9BB7B39E
Adv status: Ended - handle: 0

Connections number: 1
Conn status: Phy update - connHandle = 0 PHY = 2 Mbps

DataStream status: CCC Update - connectionHandle: 0 Notifications enabled
DataStream status: Incoming data - connectionHandle: 0 length: 16
Echo status: 0
Notification sent
  
```

**Figure 4-2. Data Stream Application Status Example**

**Important:** Clear your phone or tablet’s Bluetooth cache before running the application or when changing the application on the CC2745R10-Q1. If this step is not performed, then you may not see the available characteristics in the smartphone app. Note that closing the smartphone app or rebooting your phone does NOT clear the Bluetooth cache.

iOS: This is accomplished by toggling Bluetooth Off then On through either the *Settings* → *Bluetooth* menu or the Control Center (Bluetooth icon).

Android: The procedure can vary by make, model, and software version. On recent versions, navigate to *Settings* → *Apps* Scroll over to *All* → *Choose Bluetooth Share* and tap on *Clear Cache*.

## 5 Hardware Design Files

### 5.1 Reference Schematics

Figure 5-1, Figure 5-2, Figure 5-3, show the schematic implementation of the LP-EM-CC2745R10-Q1. The full LP-EM-CC22745R10-Q1 reference schematic can be downloaded from [LP-EM-CC22745R10 design files](#).

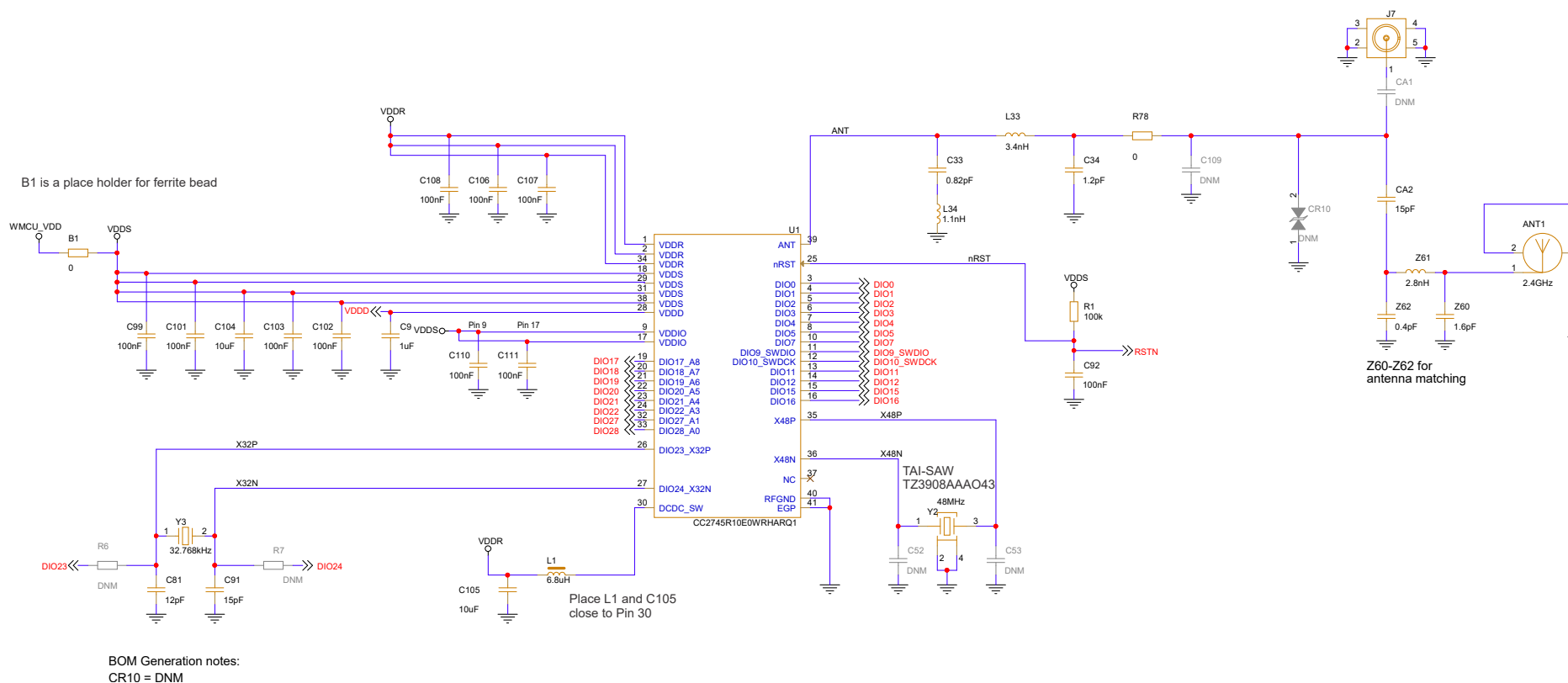
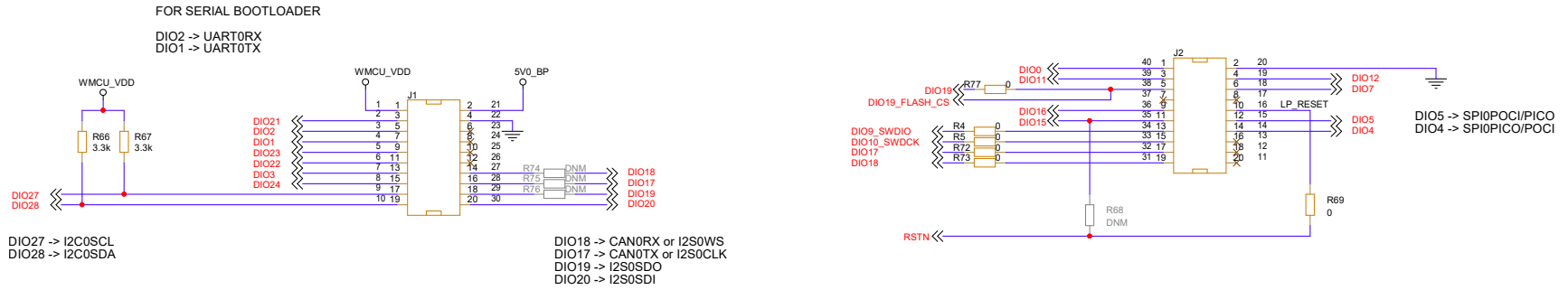


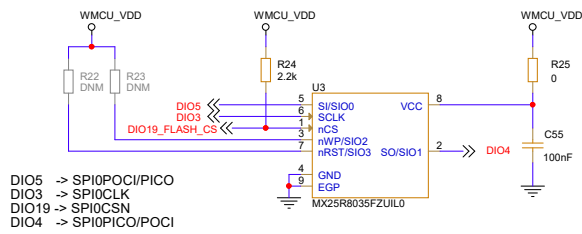
Figure 5-1. LP-EM-CC2745R10-Q1 Schematic Page 1



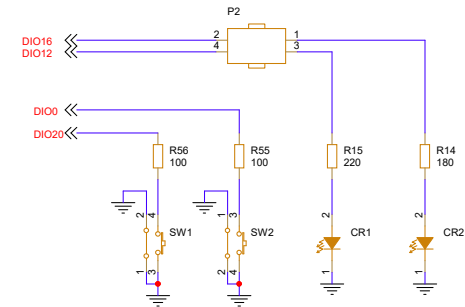
NOTE:  
R74 and R75 are DNM.  
As default, CAN0 interface is connected to BoosterPack Header pins BP.31 and BP.32.  
To connect I2S interface, remove R72 and R73 and mount R74 and R75.



External Flash



Buttons / LEDs



5V abd 3V headers

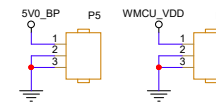


Figure 5-2. LP-EM-CC2745R10-Q1 Schematic Page 2

### XDS110 Debugger Interface

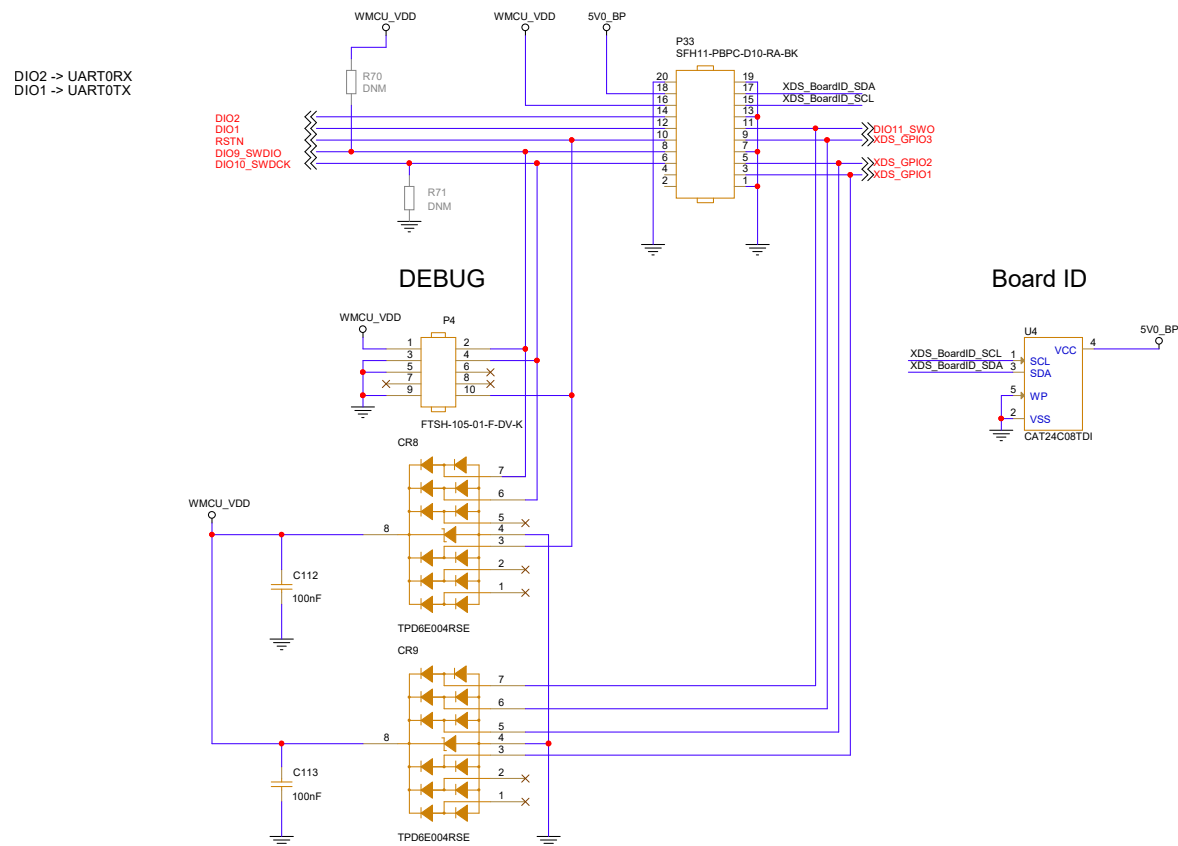
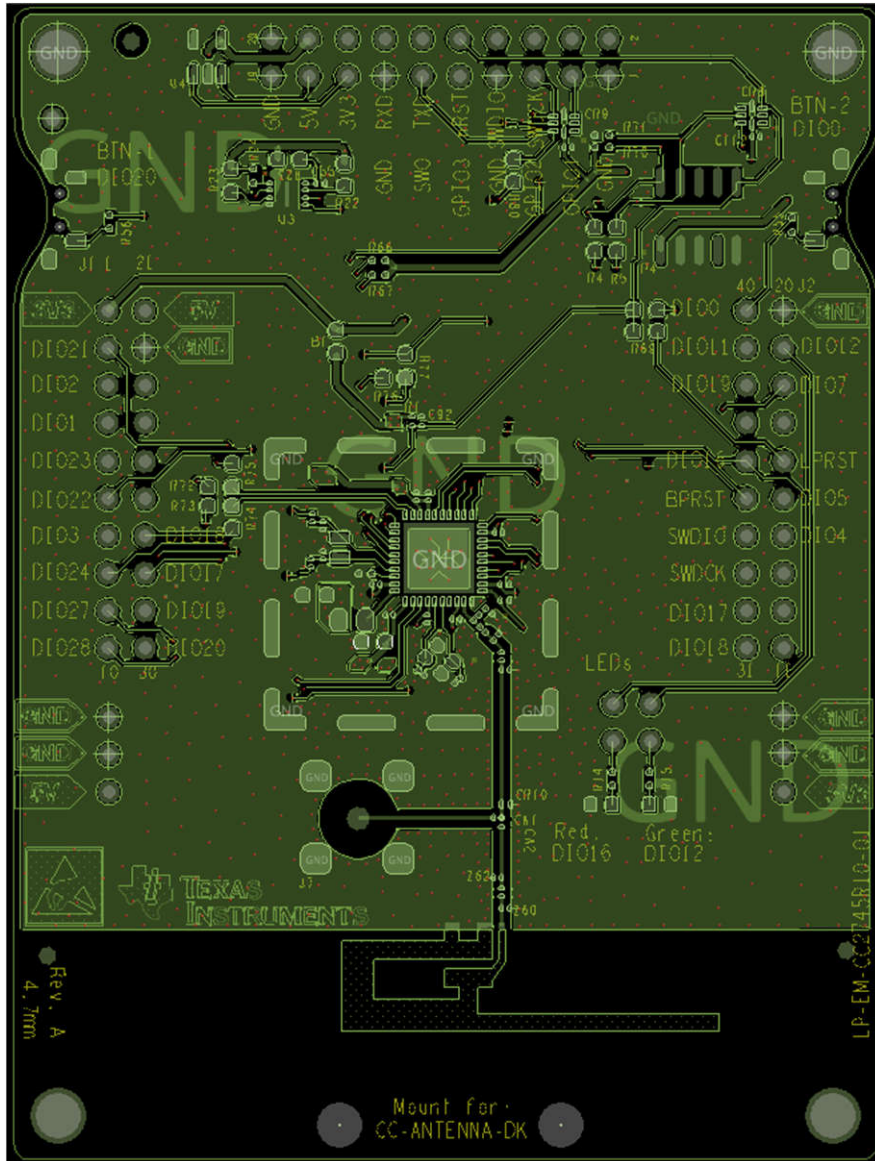


Figure 5-3. LP-EM-CC2745R10-Q1 Schematic Page 3



## 5.2 PCB Layouts

The top and bottom side PCB layout view of the LP-EM-CC2745R10-Q1 can be seen in [Figure 5-4](#) and [Figure 5-5](#), respectively. The full LP-EM-CC2745R10-Q1 layout files can be downloaded from [LP-EM-CC2745R10-Q1 design files](#).



**Figure 5-4. Top Side PCB Layout View**

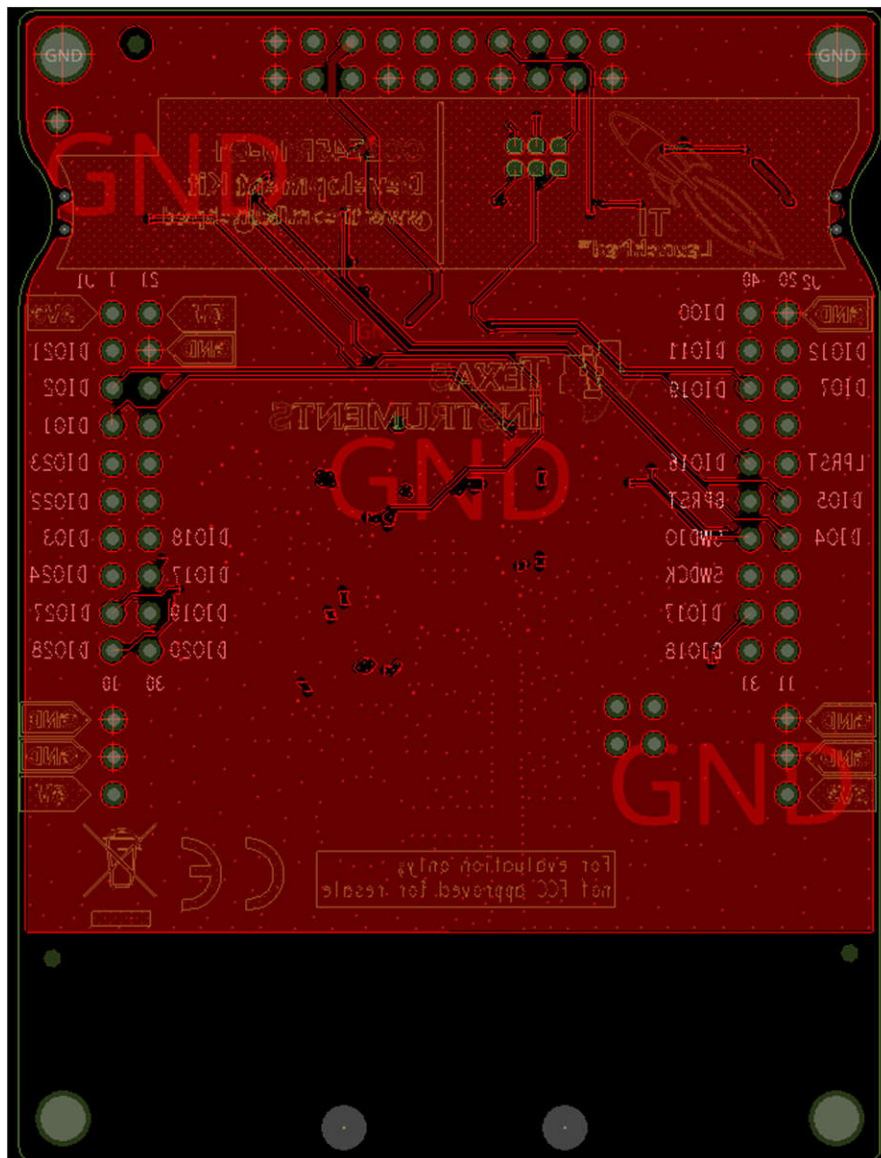


Figure 5-5. Bottom Side PCB Layout View

### 5.3 Bill of Materials (BOM)

Table 5-1 shows the simplified Bill of Materials (BOM) for the LP-EM-CC2745R10-Q1. The full LP-EM-CC2745R10-Q1 BOM can be downloaded from [the LP-EM-CC2745R10-Q1 design files](#).

Table 5-1. LP-EM-CC2745R10-Q1 Bill-of-Materials

Part Reference	Quantity	Value	Vendor Part Number	Vendor
ANT1	1	2.4GHz	DN007	TEXAS INSTRUMENTS
B1	1	0	RK73Z1JTTD	KOA SPEER
C9	1	1 $\mu$ F	GRT155R70J105KE01D	MURATA
C33	1	0.82pF	GRT0335C1ER82BA02D	MURATA
C34	1	1.2pF	GRT0335C1E1R2CA02D	MURATA
C52 C53 CA1	0	DNM	DNM	DNM

**Table 5-1. LP-EM-CC2745R10-Q1 Bill-of-Materials (continued)**

Part Reference	Quantity	Value	Vendor Part Number	Vendor
C55 C92 C99 C101 C102 C103 C106 C107 C108 C110 C111 C112 C113	13	100nF	GCM033M8ED104KE07D	MURATA
C81	1	12pF	GRT0335C1H120FA02D	MURATA
C91 CA2	2	15pF	GRT0335C1H150FA02D	MURATA
C104 C105	2	10uF	GRT188D71A106ME13D	MURATA
C109	0	DNM	DNM	DNM
CR1	1	150060VS55040	150060VS55040	WURTH
CR2	1	150060RS55040	150060RS55040	WURTH
CR8 CR9	2	TPD6E004RSE	TPD6E004RSER	TEXAS INSTRUMENTS
CR10	0	DNM	DNM	DNM
J1 J2	2	SSQ-110-23-L-D	SSQ-110-23-L-D	SAMTEC
J7	1	SMA-10V21-TGG	SMA-10V21-TGG	HUS-TSAN
L1	1	6.8uH	MLZ2012N6R8LTD25	TDK GLOBAL
L33	1	3.4nH	LQP03TN3N4BZ2D	MURATA
L34	1	1.1nH	LQP03TN1N1BZ2D	MURATA
M1 M2	2	SNT-100-BK-G	SNT-100-BK-G	SAMTEC
M3 M4 M5 M6	4	DCB-12D	DCB-12D	SUZHOU SOLY ELECTRICIAN
P1 P5	2	BB02-HC031- KB1-603000	BB02-HC031-KB1-603000	GRADCONN
P2	1	BB02-HJ041- KB1-603000	BB02-HJ041-KB1-603000	GRADCONN
P4	1	FTSH-105-01-F-DV-K	FTSH-105-01-F-DV-K	SAMTEC
P33	1	SFH11-PBPC-D10-RA- BK	SFH11-PBPC-D10-RA-BK	SULLINS
PCB1	1	PCB	PCB	TEXAS INSTRUMENTS
R1	1	100k	RK73B1HTTCM104J	KOA SPEER
R4 R5 R25 R69 R72 R73 R77 R80	8	0	CRCW06030000Z0EC	VISHAY
R6 R7	0	DNM	DNM	DNM
R14	1	180	CRCW0402180RJNED	VISHAY
R15	1	220	CRCW0402220RJNED	VISHAY
R19 R20 R21 R22 R23 R68 R74 R75 R76	0	DNM	DNM	DNM
R24	1	2.2k	CRCW04022K20JNED	VISHAY
R55 R56	2	100	CRCW0402100RJNED	VISHAY
R66 R67	2	3.3k	CRCW04023K30JNED	VISHAY
R70 R71	0	DNM	DNM	DNM

**Table 5-1. LP-EM-CC2745R10-Q1 Bill-of-Materials (continued)**

Part Reference	Quantity	Value	Vendor Part Number	Vendor
R78	1	0	AF0201JR-130RL	YAGEO
SC8	0	DNM	DNM	DNM
SC9	0	DNM	DNM	DNM
SW1 SW2	2	1188E-1K2	1188E-1K2-V-TR	DIPTRONICS
U1	1	CC2745R10E0WRHAR Q1	CC2745R10E0WRHARQ1	TEXAS INSTRUMENTS
U3	1	MX25R8035FZUILO	MX25R8035FZUILO	MACRONIX
U4	1	CAT24C08TDI	CAT24C08TDI-GT3	ONSEMI
Y2	1	48MHz	TZ3908AAAO43	TAI-SAW
Y3	1	32.768kHz	FC2012AA 32.768K-70NN75KC7	EPSON
Z60	1	1.6pF	GCQ0335C1H1R6WB01D	MURATA
Z61	1	2.8nH	LQP03TN2N8BZ2D	MURATA
Z62	1	0.4pF	GCQ0335C1HR40WB01D	MURATA

## 6 Compliance Information


### 6.1 CE Compliance

Texas Instruments declares that this product is in compliance with Directive 2014/53/EU. The compliance has been verified in the operating band of 2402MHz to 2480MHz at +9.9dBm EIRP at +7.5dBm Tx Power setting. If you configure the EUT to operate outside the test conditions, operate inside a protected and controlled environment (such as a shielded chamber). This evaluation board is only for development and not an end product. Developers and integrators who incorporate the chipset in any end products are responsible for obtaining applicable regulatory approvals for such end products. See the [EU Declaration of Conformity](#).

### 6.2 REACH Compliance

Texas Instruments declares that this product is in compliance with the EU REACH regulation.

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	<p><b>Waste Electrical and Electronic Equipment (WEEE)</b></p> <p>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.</p>
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## 8 References

### Development tools and software

- [LP-EM-CC2745R10-Q1 LaunchPad Development Kit](#)
- [SimpleLink Low Power F3 software development kit](#)
- [SmartRF™ Studio](#) for simple radio configuration
- [SysConfig](#) system configuration tool

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**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

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

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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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- 
4. *EVM Use Restrictions and Warnings:*
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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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