BOOSTXL-CC3120MOD SimpleLink™ BoosterPack™ Plug-in Module and IoT Solution

The CC3120MODRNMMOB (CC3120MOD) module is part of the SimpleLink™ microcontroller (MCU) platform that shares 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 lets you add any combination of devices from the portfolio into your design. The ultimate goal of the SimpleLink platform is to achieve 100 percent code reuse when your design requirements change. For more information, visit www.ti.com/simplelink.

The BOOSTXL-CC3120MOD is a 2.4 GHz Wi-Fi® SimpleLink™ BoosterPack™ with the TI CC3120MOD module. The CC3120MOD is FCC, IC, CE, MIC, and SRRC certified. The purpose of this document is to provide the end integrator with the information necessary to incorporate the CC3120MOD module into their final product. It also provided information how to run the BOOSTXL-CC3120MOD SimpleLink BoosterPack to evaluate the CC3120MOD module.

Contents

Manual Information to the End user

Trademarks

1. Overview

Figure 1-1 shows a functional block diagram of the CC3120MOD module.

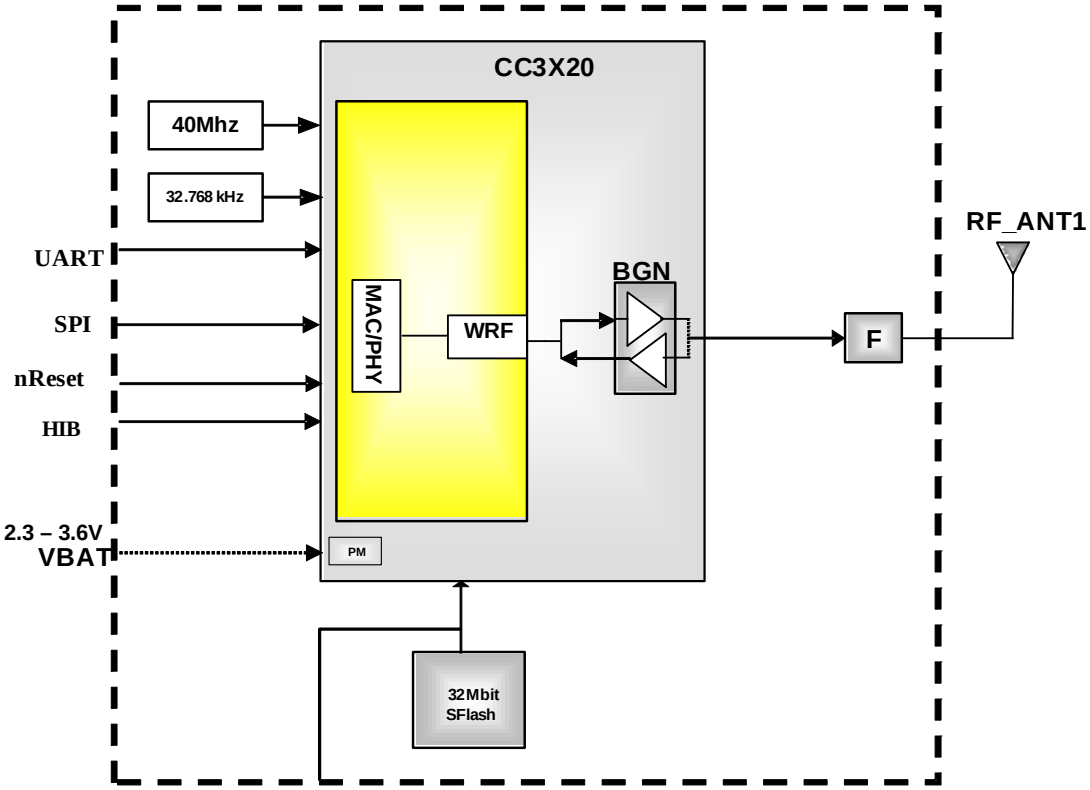

Figure 1-1: CC3120MOD Functional Block Diagram

Figure 1-2 shows a functional block diagram of the BOOSTXL-CC3120MOD SimpleLink BoosterPack

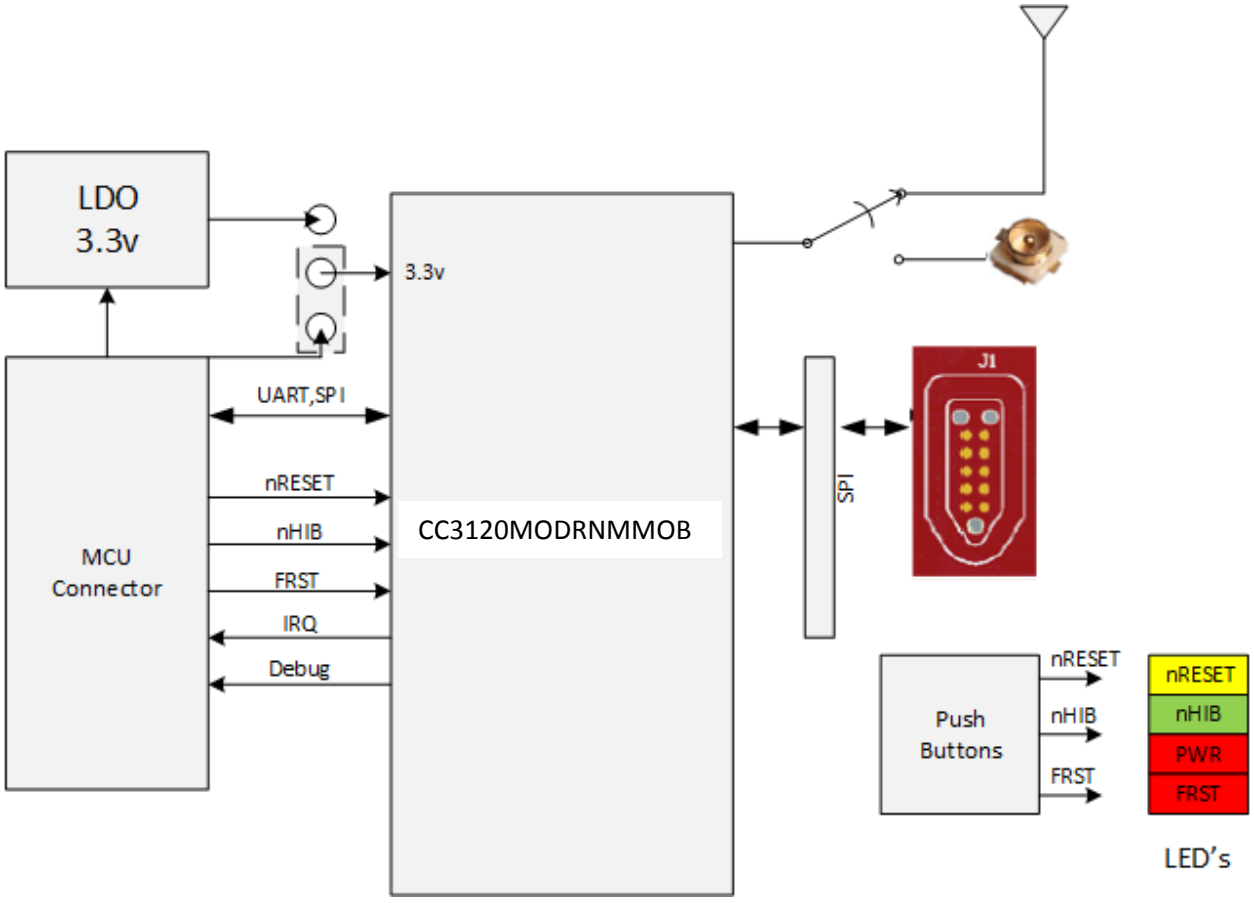

Figure 1-2: Functional block diagram of the BOOSTXL-CC3120MOD

Figure 1-3 shows the hardware implementation of the BOOSTXL-CC3120MOD

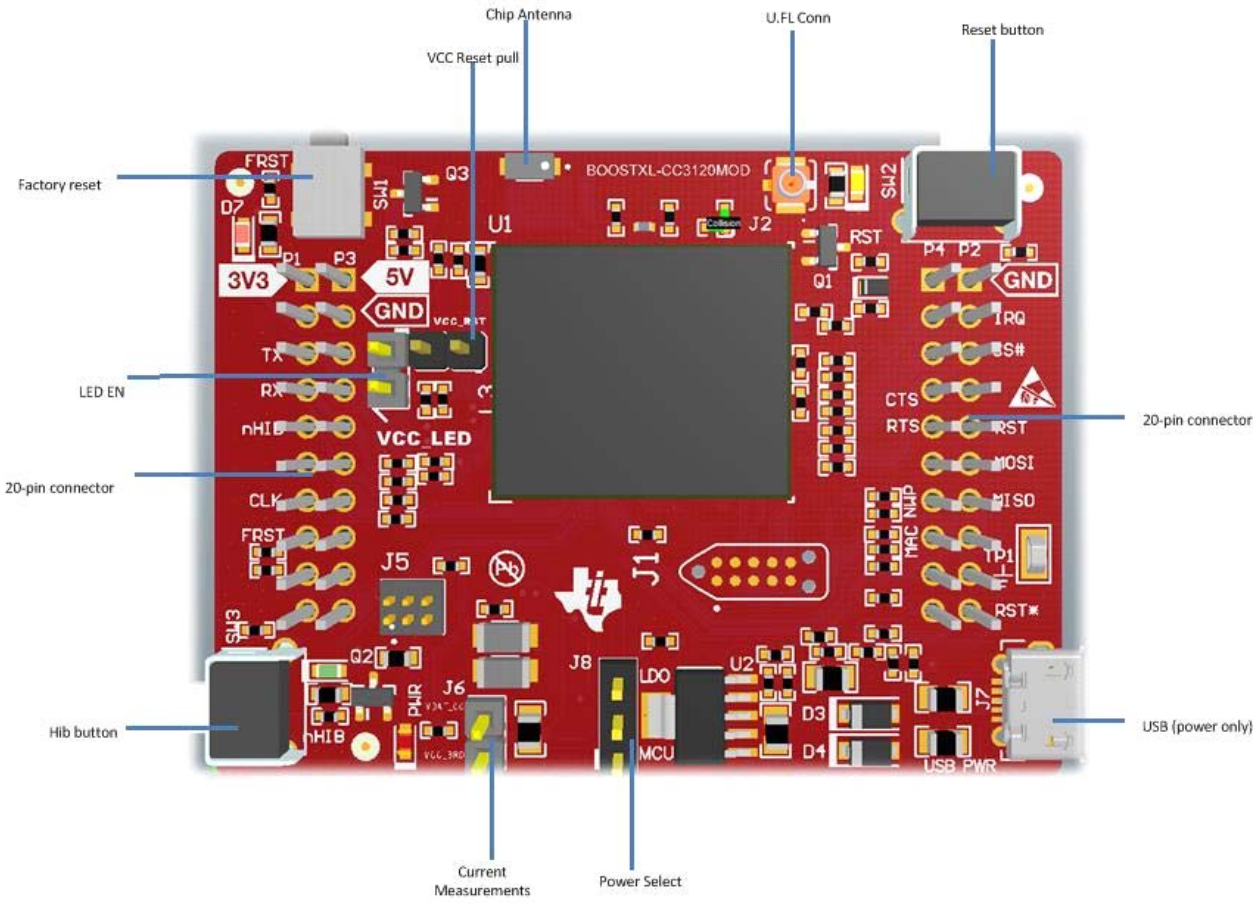

Figure 1-3: Hardware implementation of the BOOSTXL-CC3120MOD

Figure 1-4 shows the Top Overlay of the BOOSTXL-CC3210MOD SimpleLink BoosterPack.

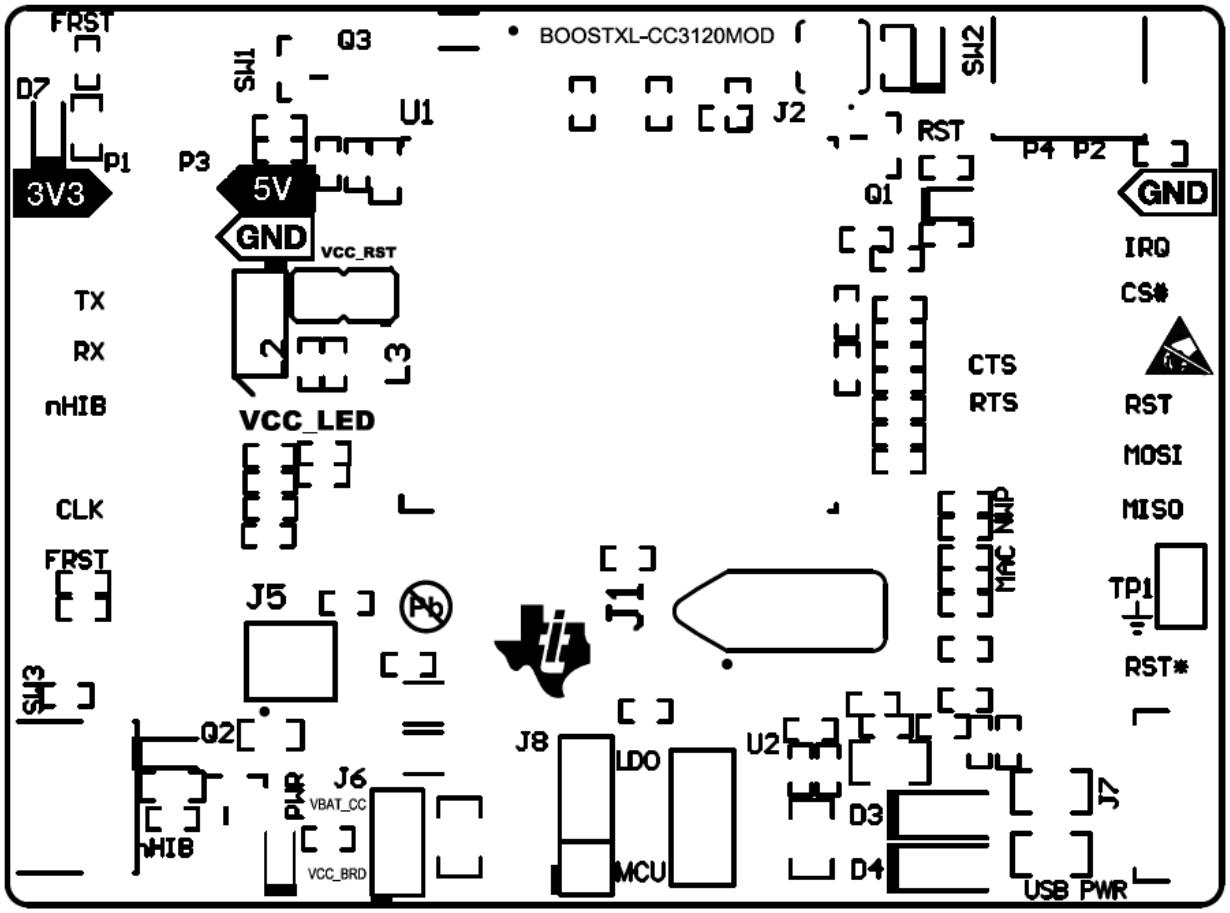

Figure 1-4: BOOSTXL-CC3120MOD Top Overlay

Figure 1-5 shows the Top Solder of the BOOSTXL-CC3210MOD SimpleLink BoosterPack.

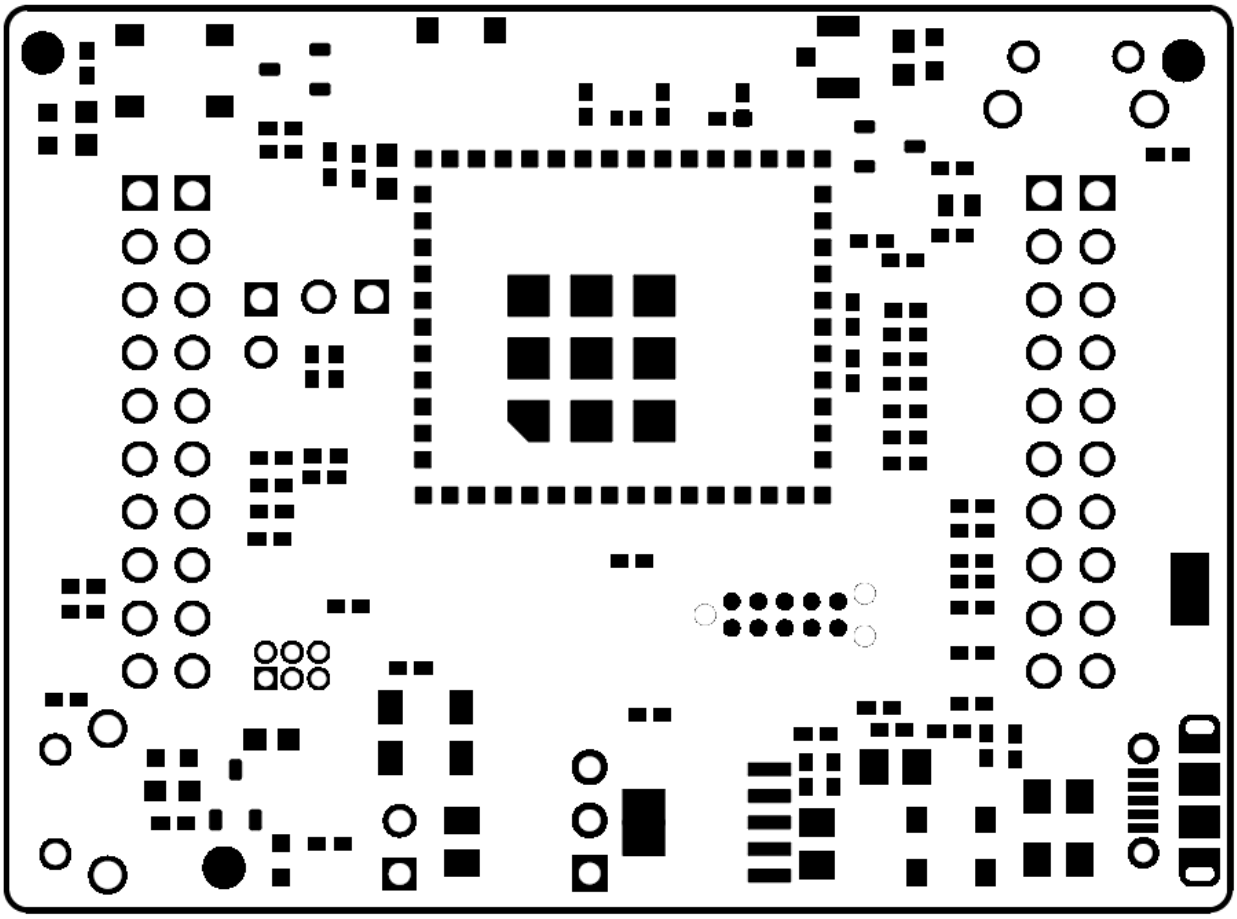

Figure 1-5: BOOSTXL-CC3120MOD Top Solder

1.1 General Features

The BOOSTXL-CC3120MOD SimpleLink BoostPack includes the following features:

- Two 20-pin stackable connectors compatible with the TI SimpleLink Launchpad™ and BoosterPack architecture.
- Built-in chip antenna
- Optional U.FL connector for external antennas or conducted based testing.
- Power from an onboard LDO by using the USB or 3.3-Vconnector form the LaunchPad MCU
- Three push-buttons
- Two LEDs
- Jumper for current measurements with provisions to mount a 0.1-ohm resistor for measurement with a voltmeter
- 32-Mbit serial Flash
- Two-layer PCB

- Dimensions: 58.52 mm (L) x 43.18 (W)

1.2 Key Benefits

The CC3120MOD module offers the following benefits:

- The CC3120MOD (CC3120MODRNMMOB) is a Wi-Fi® Module Which Includes the CC3120RNMARGK Wi-Fi Network Processor (NWP). The Fully Integrated, Industrial Temperature Grade, Green Module, Includes All Required Clocks, Serial Peripheral Interface (SPI) Flash, and Passives.
- FCC, IC, CE, MIC, and SRRC Certified
- Wi-Fi CERTIFIED™ Modules, With Ability to Request Certificate Transfer for Wi-Fi Alliance Members
- Featuring a Dedicated Internet-on-a chip™ Wi-Fi NWP Which Completely Offloads Wi-Fi and Internet Protocols from the Application MCU
- Wi-Fi Modes
    - 802.11b/g/n Station
    - 802.11b/g/n Access Point (AP) Supporting up to Four Stations
    - Wi-Fi Direct® Client/Group Owner
    - WPA2 Personal and Enterprise Security: WEP, WPA/WPA2 PSK, WPA2 Enterprise (802.1x)
- IPv4 and IPv6 TCP/IP Stack
    - Industry-Standard BSD Socket Application Programming Interfaces (APIs)
        - 16 Simultaneous TCP or UDP Sockets
        - 6 Simultaneous TLS and SSL Sockets
- IP Addressing: Static IP, LLA, DHCPv4, and DHCPv6 With Duplicate Address Detection (DAD)
- SimpleLink™ Connection Manager for Autonomous and Fast Wi-Fi Connections
- Flexible Wi-Fi Provisioning With SmartConfig™ Technology, AP Mode, and WPS2 Options
- RESTful API Support Using Internal HTTP Server
- Wide Set of Security Features
    - Hardware Features
        - Separate Execution Environments
        - Device Identity
    - Networking Security
        - Personal and Enterprise Wi-Fi Security
        - Secure Sockets (SSLv3, TLS1.0/1.1/TLS1.2)
        - HTTPS Server
        - Trusted Root-Certificate Catalog
        - TI Root-of-Trust Public key
    - Software IP Protection

        - Secure Key Storage
        - File System Security
        - Software Tamper Detection
        - Cloning Protection
- Embedded Network Applications Running on a Dedicated NWP
    - HTTP/HTTPS Web Server With Dynamic User Callbacks
    - mDNS, DNS-SD, DHCP Server
    - Ping
- Recovery Mechanism – Ability to Recover to Factory Defaults
- Wi-Fi TX Power
    - 17 dBm at 1 DSSS
    - 16.5 dBm at MCS0
- Wi-Fi RX Sensitivity
    - –95 dBm at 1 DSSS
    - –73.5 dBm at 54 OFDM
- Application Throughput
    - UDP: 16 Mbps
    - TCP: 13 Mbps
- Power-Management Subsystem
    - Integrated DC-DC Converters Support a Wide Range of Supply Voltage:
        - VBAT Wide-Voltage Mode: 2.3 V to 3.6 V
    - Advanced Low-Power Modes
        - Shutdown: 1 µA
        - Hibernate: 6 µA
        - Low-Power Deep Sleep (LPDS): 115 µA
        - RX Traffic: 59 mA at 54 OFDM
        - TX Traffic: 229 mA at 54 OFDM, Maximum Power
        - Idle Connected (MCU in LPDS): 690 µA at DTIM = 1
- Additional Integrated Components on Module
    - 40.0-MHz Crystal With Internal Oscillator
    - 32.768-kHz Crystal (RTC)
    - 32-Mbit SPI Serial Flash RF Filter and Passive Components
- LGA Package
    - 1.27-mm Pitch, 63-Pin, 20.5-mm × 17.5-mm LGA Package for Easy Assembly and Low-Cost PCB Design
- Operating Temperature
    - Ambient Temperature Range: –40°C to +85°C
- Module Supports SimpleLink Developer's Ecosystem

1.3 Key Benefits

The CC3120MOD module is designed for the following internet of Things (IoT) applications, including:

- Cloud Connectivity
- Internet Gateway
- Home and Building Automation
- Appliances
- Access Control
- Security Systems
- Smart Energy
- Industrial Control
- Smart Plug and Metering
- Wireless Audio
- IP Network Sensor Nodes
- Asset Tracking
- Medical Devices

2. Connectors and Jumpers

Figure 2-1 shows the top view of the BOOSTXL-CC3120MOD SimpleLink BoosterPack

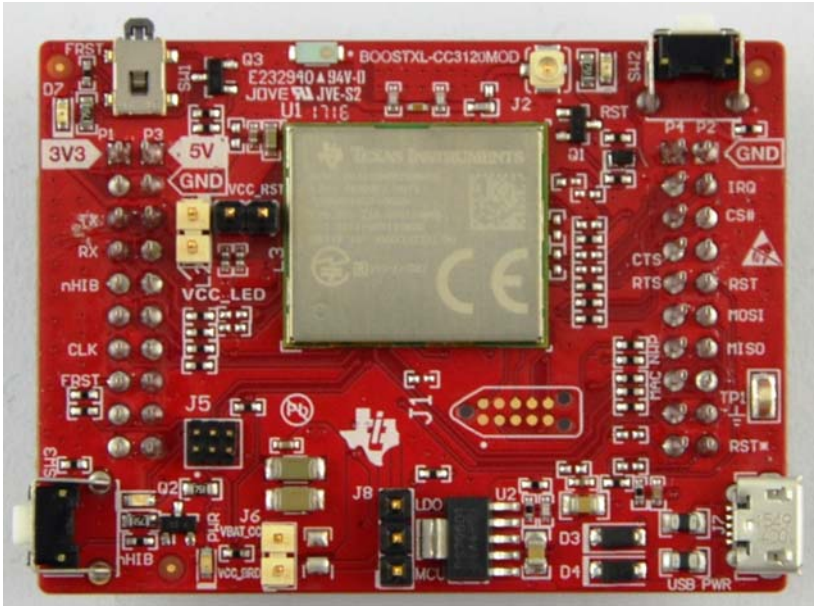

Figure 2-1: BOOSTXL-CC3120MOD Top View

Figure 2-2 shows the bottom view of the BOOSTXL-CC3120MOD SimpleLink BoosterPack

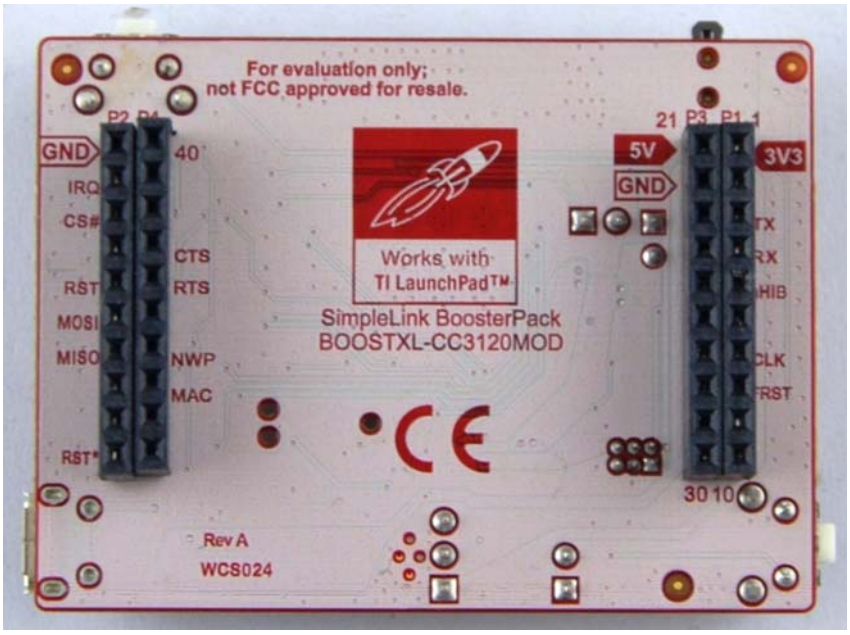

Figure 2-2: BOOSTXL-CC3120MOD Bottom View

2.1 Connectors and Jumpers

Table 2-1 lists the push-buttons on the BOOSTXL-CC3120MOD

Reference	Usage	Comments
SW1	Factory Reset	This is used to restore the serial flash to the factory default image. Hold the button pressed and then toggle the RESET push button.
SW2	RESET	This can be used to Reset the device. Holding the button down sets the device to the shutdown state.
SW3	nHIB	This boots the device to the bootloader RMe for flashing the firmware over a universal asynchronous receiver/transmitter (UART).

Table 2-1: BOOSTXL-CC3120MOD push-buttons

Table 2-2 lists the LEDs on the BOOSTXL-CC3120MOD

Reference	Colour	Usage	Comments
D5	RED	PWR indication	ON, when the 3.3 V power is provided to the board.
D1	Yellow	nRESET	This LED indicates the state of the nRESET pin. If this LED is glowing, the device is
D6	Green	nHIB	This LED indicates the state of the nHIB pin. When the LED is OFF, the device is in hibernate state.
D7	Red	Factory Default	This LED indicates if the Factory default switch is pressed ON. Note that the RESET button needs to be pressed for this LED to function.

Table 2-2: BOOSTXL-CC3120MOD LEDs

2.2 Jumper Settings

Table 2-3 lists the jumper settings on the BOOSTXL-CC3120MD

Reference	Usage	Comments
J7	USB connector	For powering the BoosterPack when connected with a LaunchPad which cannot source enough current.
J8	Power selection	Choose the power supply from the LauchPad kit or the on-board USB. J8 (1-2) power from MCU LaunchPad J8 (2-3) power from on-board USB using 3.3 V LDO
J6	Current measurement	For Hibernate and LPDS currents, connect an ammeter across J6 : Range (< 500 µA) For Active current, mount a 0.1 Ω resistor on R35 and measure the voltage across the 0.1 Ω resistor using a voltmeter (range (< 50 mV peak-peak)).
P1, P2, P3, P4	BoosterPack header	2x10 pins each connected to the LaunchPad.
J3	LED EN.	For Enabling/Disabling the LED's.
J4	Reset Pullup	For keeping the reset up
J2	RF Test	U.FL connector for conducted testing in the lab. Using this requires an ECO to be made to the board by swapping two resistors.

Table 2-3: BOOSTXL-CC3120MOD jumper settings

2.3 2x20 Pin connector assignment

Table 2-4 lists the outer row connectors of the two 20-pin headers.

Note: All signals are 3.3V CMOS logic levels and are referred with respect to the CC3120 IC. For example, UART1_TX is an output from the CC3120 IC.

For the SPI lines, the CC3120MOD always acts like a slave

Pin No	Signal Name	Direction	Pin No	Signal Name	Direction
P1.1	VCC (3.3 V)	IN	P2.1	GND	IN
P1.2	UNUSED	NA	P2.2	IRQ	OUT
P1.3	UART1_TX	OUT	P2.3	SPI_CS	IN
P1.4	UART1_RX	IN	P2.4	UNUSED	NA
P1.5	nHIB	IN	P2.5	nRESET	IN
P1.6	UNUSED	NA	P2.6	SPI_MOSI	IN
P1.7	SPI_CLK	IN	P2.7	SPI_MISO	OUT
P1.8	FACTORY DEFAULT	NA	P2.8	UNUSED	NA
P1.9	UNUSED	NA	P2.9	UNUSED	NA
P1.10	UNUSED	NA	P2.10	UNUSED	NA

Table 2-4: BOOSTXL-CC3120MOD outer row pin connectors

Table 2-5 lists the inner row connectors of the two 20-pin headers.

Pin No	Signal Name	Direction	Pin No	Signal Name	Direction
P3.1	+5 V	IN	P4.1	UNUSED	OUT
P3.2	GND	IN	P4.2	UNUSED	OUT
P3.3	UNUSED	NA	P4.3	UNUSED	NA
P3.4	UNUSED	NA	P4.4	UART1_CTS	IN
P3.5	UNUSED	NA	P4.5	UART1_RTS	OUT
P3.6	UNUSED	NA	P4.6	UNUSED	NA
P3.7	UNUSED	NA	P4.7	NWP_LOG_TX	OUT
P3.8	UNUSED	NA	P4.8	WLAN_LOG_TX	OUT
P3.9	UNUSED	NA	P4.9	UNUSED	IN
P3.10	UNUSED	NA	P4.10	UNUSED	OUT

Table 2-5: BOOSTXL-CC3120MOD inner row pin connectors

3. Electrical Characteristics

For electrical characteristics, see the CC3120MOD SimpleLink™ Wi-Fi CERTIFIED™ Network Processor Internet-of-Things Module Solution for MCU Applications Datasheet.

4. Antenna Characteristics

The BOOSTXL-CC3120MOD contains an on-chip antenna. For information on the antenna VSWR, efficiency, and electrical characteristics please see:
http://ds.yuden.co.jp/TYCOMPAS/ap/detail.do?productNo=AH316M245001-T&dataUnit=M

5. Circuit Design

5.1 CC3120MOD Reference schematic

The CC3120MOD main engine area reference schematic is show in Figure 5-1 below. The full BOOSTXL-CC3120MOD reference schematic can be found at: http://www.ti.com/lit/zip/swrc339.

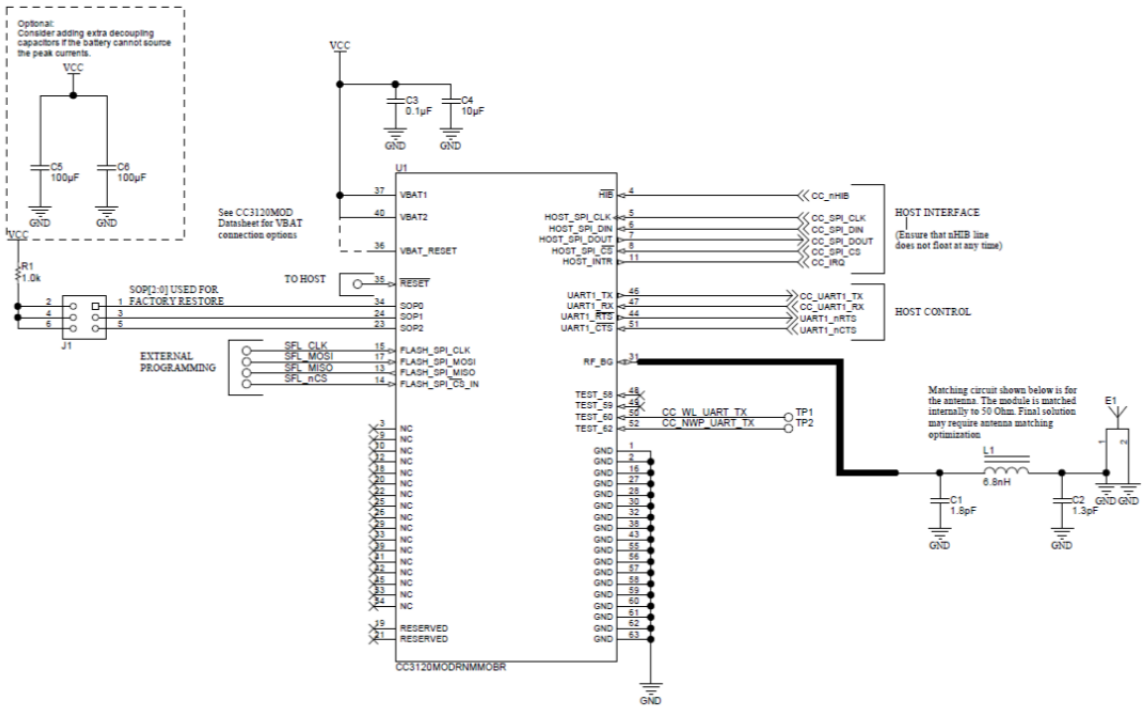

Figure 5-1: CC3120MOD Engine area reference schematic

5.2 Bill of Materials (BOM)

The CC3120MOD main engine area reference BOM is show in Table 5-1 below. The full BOOSTXL-CC3120MOD reference BOM can be found at: http://www.ti.com/lit/zip/swrc339.

QUANTITY	DESIGNATOR	VALUE	MANUFACTURER	PART NUMBER	DESCRIPTION
1	C1	1.8 pF	MuRata	GCM1555C1H1R8BA16	CAP, CERM, 1.8 pF, 50 V, ±0.1 pF, C0G/NP0, 0402
1	C2	1.3 pF	MuRata	GCM1555C1H1R3BA16	CAP, CERM, 1.3 pF, 50 V, ±5%, C0G/NP0, 0402
1	C3	0.1 µF	MuRata	GRM155R60J104KA01D	CAP, CERM, 0.1 µF, 6.3 V, ±10%, X5R, 0402
1	C4	10 µF	MuRata	GRM21BR61A106KE19L	CAP, CERM, 10 µF, 10 V, ±10%, X5R, 0805
2	C5, C6	100 µF	MuRata	GRM31CR60J107ME39L	CAP, CERM, 100 µF, 6.3 V, ±20%, X5R, 1206
1	E1	2.45-GHz Ant	Taiyo Yuden	AH316M245001-T	ANT BLUETOOTH W-LAN ZIGBEE WIMAX, SMD
1	L1	6.8 nH	MuRata	LQP15MN6N8B02	6.8 nH Unshielded Thin Film Inductor 130 mA 900 mΩ Max 0402
1	R1	1.0 k	Vishay-Dale	CRCW04021K00JNED	RES, 1.0 k, 5%, 0.063 W, 0402
1	U1	CC3120MOD	Texas Instruments	CC3120MODRNMMOBR	SimpleLink Certified Wi-Fi Network Processor Internet-of-Things Module Solution for MCU Applications, MOB0063A (SIP MODULE-63)

Table 5-1: CC3120MOD Engine area reference BOM

6. Layout Guidelines

The integrator of the CC3120MOD module must comply with the PCB layout recommendations described in the following subsections to preserve/minimize the risk with regulatory certifications for FCC, IC, CE, MIC, and SRRC. Moreover, TI recommends customers follow the guidelines described in this section to achieve similar performance.

6.1 Board Layout

The reference layout consists of a 2 layer design. Figure 6-1 shows BOOSTXL-CC3120MOD Top layer.

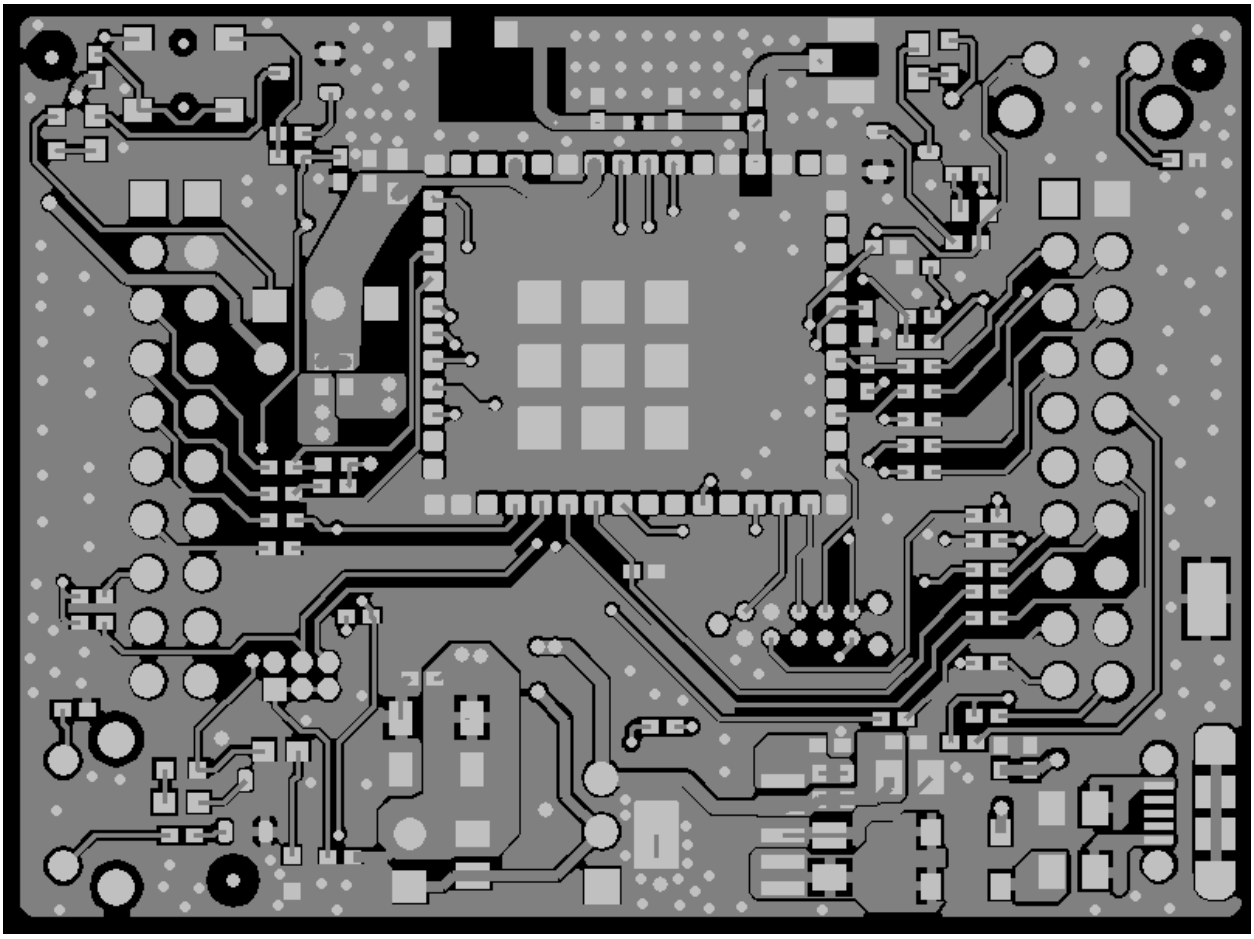

Figure 6-1: BOOTXL-CC3120MOD Top Layer

Figure 6-2 shows the BOOSTXL-CC3120MOD Bottom layer.

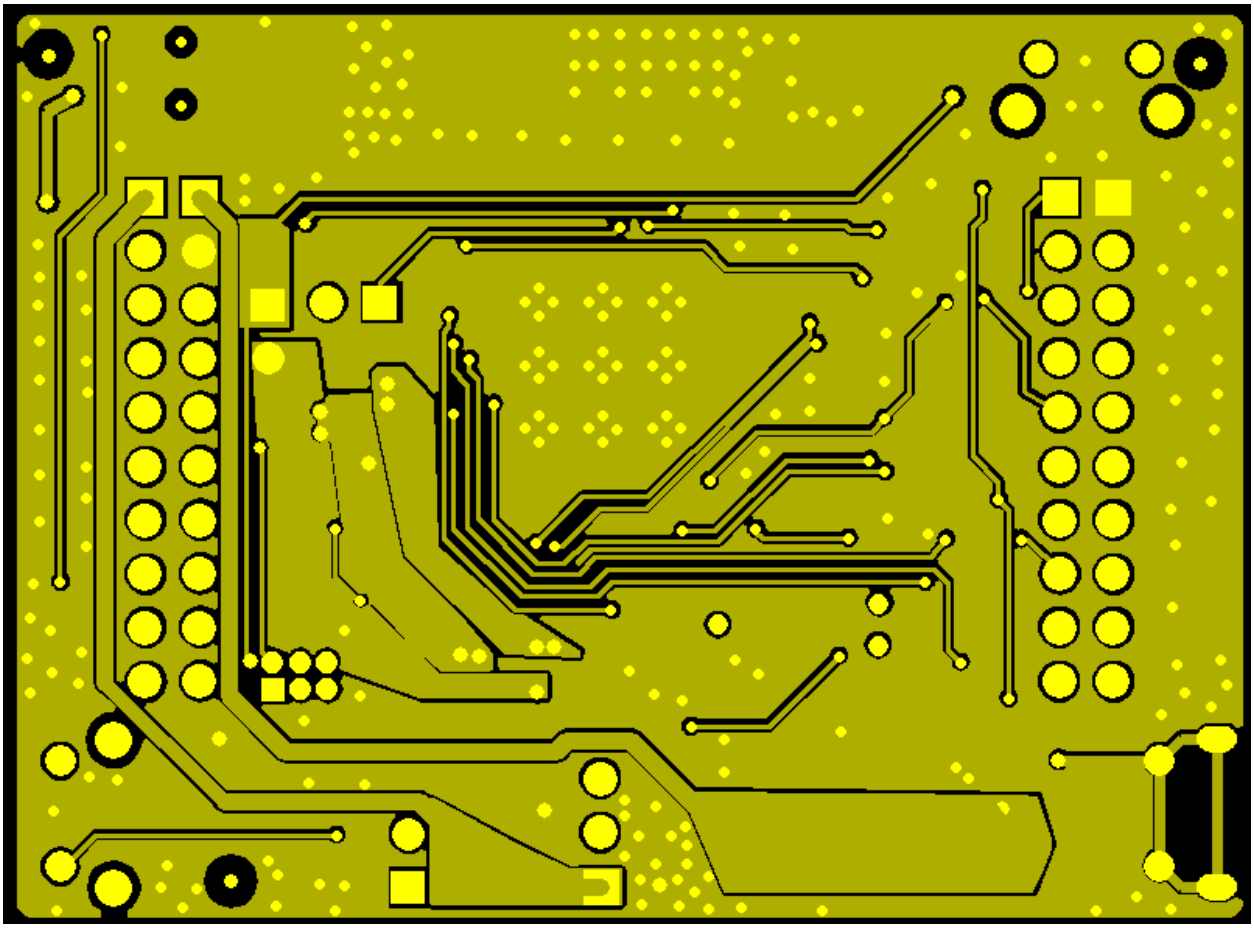

Figure 6-2: BOOSTXL-CC3120MOD Bottom Layer

6.2 General Layout Recommendations

Ensure that the following general layout recommendations are followed:

- Have a solid ground plane and ground vias under the module for stable system and thermal dissipation.
- Do **not** run signal traces underneath the module on a layer where the module is mounted.
- RF traces must have 50-Ω impedance.
- RF trace bends must be made with gradual curves, and 90 degree bends must be avoided.
- RF traces must **not** have sharp corners.
- There must be no traces or ground under the antenna section.
- RF traces must have via stitching on the ground plane beside the RF trace on both sides.
- RF traces must be as short as possible. The antenna, RF traces, and the module must be on the edge of the PCB product in consideration of the product enclosure material and proximity.

6.3 RF Layout Recommendations

The RF section of this wireless device gets top priority in terms of layout. It is very important for the RF section to be laid out correctly to ensure optimum performance from the device. A poor layout can cause low-output power, EVM degradation, sensitivity degradation, and mask violations.

Figure 6-3 shows the RF placement and routing of the CC3120MOD module.

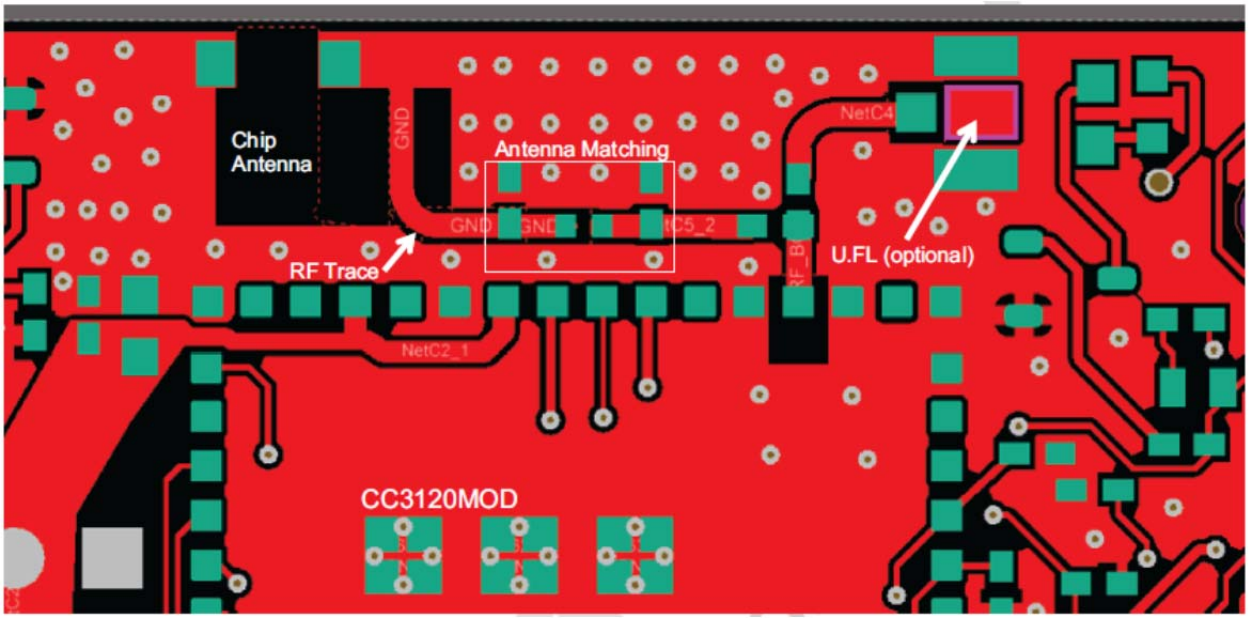

Figure 6-3: RF Section Layout

For optimal RF performance, ensure the copper cut out on the top layer under the RF-BG-pin (pin 31), is as shown in Figure 6-4 below:

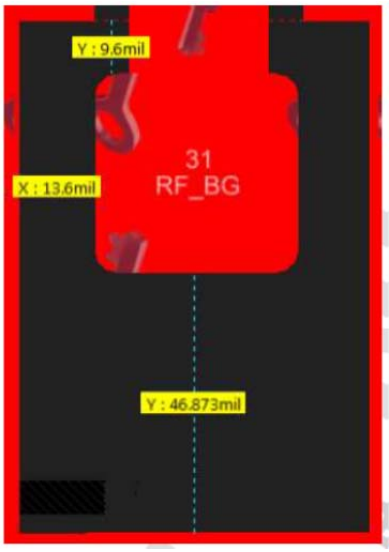

Figure 6-4: Top layer copper pull back on RF pads

6.4 Antenna Placement and Routing

The antenna is the element used to convert the guided waves on the PCB traces to the free space electromagnetic radiation. The placement and layout of the antenna are the keys to increased range and data rates. Table 6-2 provides a summary of the antenna guidelines.

Item	Guidelines
1	Place the antenna on an edge or corner of the PCB.
2	Ensure that no signals are routed across the antenna elements on all the layers of the PCB.
3	Most antennas, including the chip antenna used on the booster pack, require ground clearance on all the layers of the PCB. Ensure that the ground is cleared on inner layers as well.
4	Ensure that there is provision to place matching components for the antenna. These must be tuned for best return loss when the complete board is assembled. Any plastics or casing must also be mounted while tuning the antenna because this can impact the impedance.
5	Ensure that the antenna impedance is 50 Ω because the device is rated to work only with a 50-Ω system.
6	In case of printed antenna, ensure that the simulation is performed with the solder mask in consideration.
7	Ensure that the antenna has a near omni-directional pattern.
8	The feed point of the antenna is required to be grounded. This is only for the antenna type used on the CC3120MOD BoosterPack. Refer to the specific antenna data sheets for the recommendations.

Table 6-2: Antenna Guidelines

6.5 Transmission Line Considerations

The RF signal from the device is routed to the antenna using a Coplanar Waveguide with ground (CPW-G) structure. The CPW-G structure offers the maximum amount of isolation and the best possible shielding to the RF lines. In addition to the ground on the L1 layer, placing GND vias along the line also provides additional shielding. Figure 6-5 shows a cross section of the coplanar waveguide with the critical dimensions.

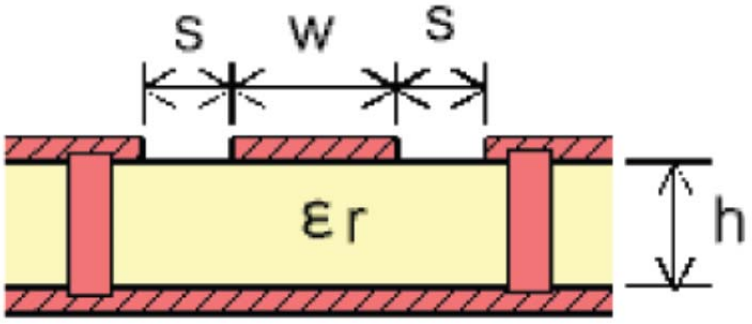

Figure 6-5: Coplanar Waveguide (Cross Section)

Figure 6-6 shows the top view of the coplanar waveguide with GND and via stitching.

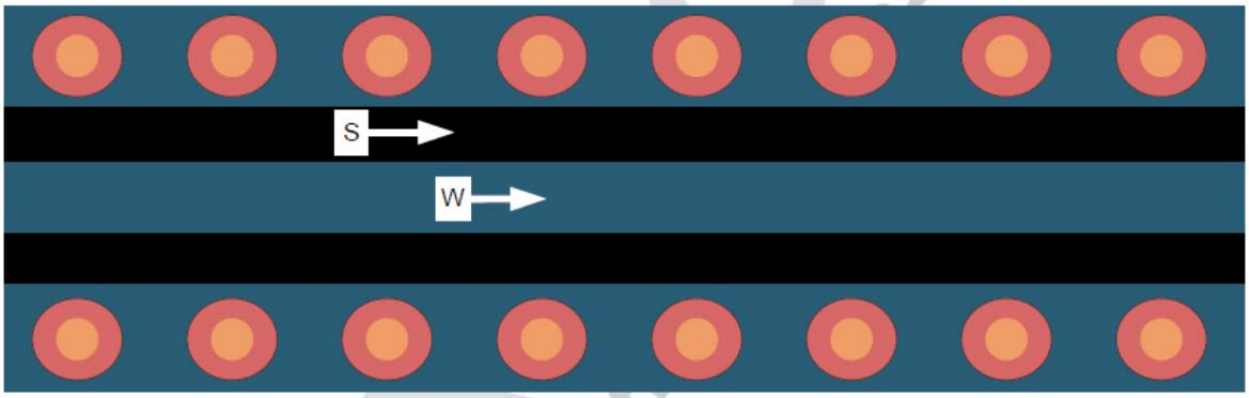

Figure 6-6: CPW with GND and via stitching (Top view)

The recommended values for the PCB are provided for 2-layer boards it Table 6-3 and 4-layer boards in Table 6-4.

PARAMETER	VALUE	UNIT
W	24.5	mils
S	6.5	mils
H	42.1	mils
Er (FR-4 substrate)	4.8	

Table 6-3: Recommended PCB Values for 2-Layer Board (L1 to L2 =42.1 mils)

PARAMETER	VALUE	UNITS
W	21	mils
S	10	mils
H	16	mils
Er (FR-4 substrate)	4.5	

Table 6-4: Recommended PCB Values for 4-layer Board (L1 to L2 = 16 mils)

7. BOOSTXL-CC3120MOD Operational Setup and Testing

The SimpleLink Wi-Fi CC3120MOD wireless network processor provides the flexibility to add Wi-Fi to any microcontroller (MCU). This user guide explains the various configurations of the CC3120MOD

BoosterPack™ plug-in module. This Internet-on-a chip™ solution contains all that is needed to easily create Internet-of-things solutions – enhanced security features, quick connection establishment, cloud support and more. The CC3120MOD module BoosterPack can be used in several ways. It can be connected to a Texas Instruments™ MCU Launchpad™ development kit (software examples provided for MSP-EXP430F5529LP). It can also be plugged into a CC31XXEMUBOOST board and connected to a PC for MCU emulation. Finally, the device can be connected onto an adapter board (BOOST-CCEMADAPTER), allowing customers to use the BOOSTXL-CC3120MOD device with additional platforms beyond TI Launchpad kits.

Note:	The CC31XXEMUBOOST device is an advanced emulation board that is required for flashing the BOOSTXL-CC3120MOD, using the radio tool (radio performance testing or putting into certification modules), capturing network processor logs, and using SL studio.

This kit comes in three configurations:

- BOOSTXL-CC3120MOD which contains the following:
  - One BOOSTXL-CC3120MOD board
  - One micro USB cable
  - One quick start guide
- BOOSTXL-CC3120MOD + MSP432P401R which contains the following:
  - SimpleLink Wi-Fi CC3120MOD BoosterPack
  - MSP-EXP432P401R LaunchPad
- BOOSTXL-CC3120MOD + CC31XXEMUBOOST which contains the following:
  - SimpleLink Wi-Fi CC3120 BoosterPack
  - Advanced Emulation BoosterPack

7.1 Power

The board is designed to accept power from a connected LaunchPad kit or through the CC31XXEMUBOOST board. Some of the LaunchPad kits are not capable of sourcing the peak current requirements of Wi-Fi, which may be as high as 400 mA. If the LaunchPad kit cannot source the peak current requirements of Wi-Fi, the USB connector on the BOOSTXL-CC3120RM can be used to aid the peak current. The use of Schottky diodes ensures that the load sharing happens between the USB connectors on the LaunchPad kit and the BoosterPack module without any board modifications. Also, the 3.3-V power can be sourced from the LaunchPad kit or from the 3.3-V LDO on the board. This sourcing is completed by using jumper J8. If the LaunchPad kit is not able to source the 3.3 V up to 350 mA, then J8 must be configured to work from the onboard LDO.

7.1.1 Power from the LaunchPad kit or the CC31XXEMUBOOST

In this case, the LaunchPad kit provides 3.3 V to the BoosterPack module for its operation (see Figure 7-1). In addition to the 3.3 V, some LaunchPad kits provide 5 V from the USB (see Figure 7-2), which is used to drive a 3.3-V LDO on the BoosterPack module. If the LaunchPad kit is not able to provide the 5 V (for

example, the LaunchPad kit with only 20 pins), the USB connector on the BOOSTXL-CC3120MOD should be used to provide the LDO input as shown in Figure 7-1.

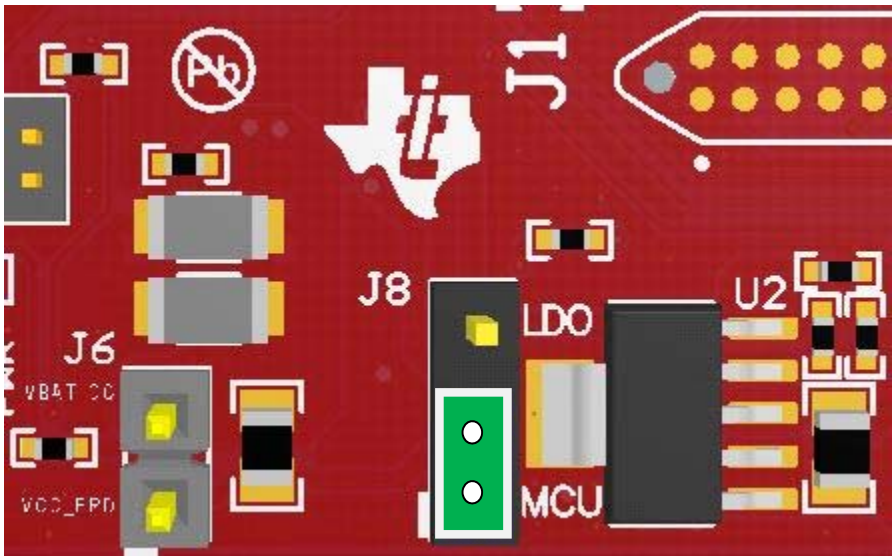

Figure 7-1: 3.3-V Power from MCU LaunchPad Kit

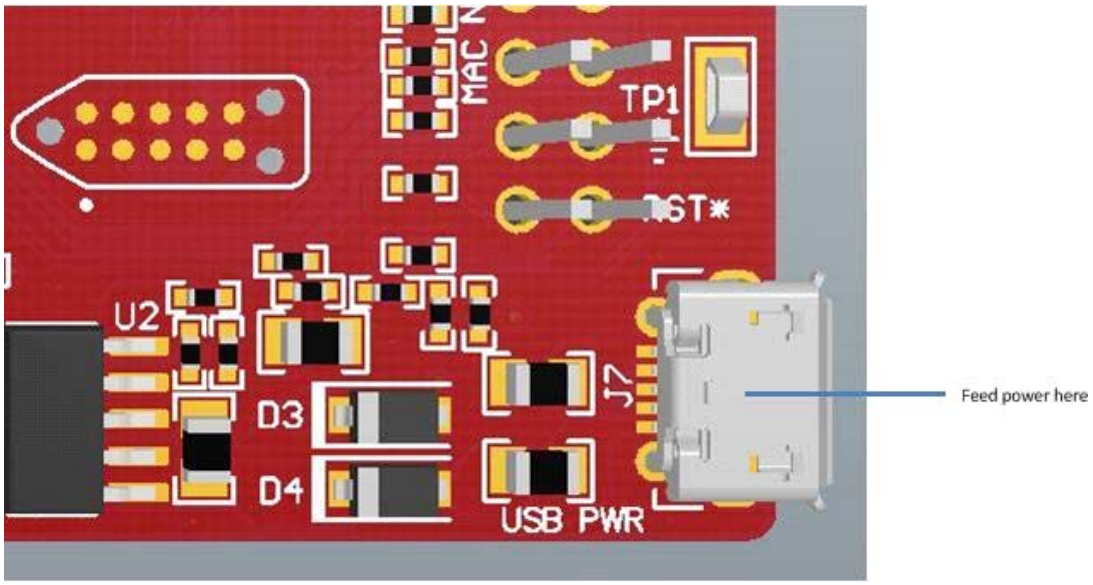

Figure 7-2: USB Location on BoosterPack Module

7.1.2 Onboard LDO Power

On some LaunchPad kits, the 3.3 V is not capable of sourcing the 350-mA peak current required for the BOOSTXL-CC3120MOD module. If the 350-mA peak current cannot be sourced, the onboard 3.3-V LDO can be used (see Figure 7-3). This LDO must be sourced from the USB connector on the BOOSTXL-CC3120MOD and the LaunchPad kit in a shared-load manner.

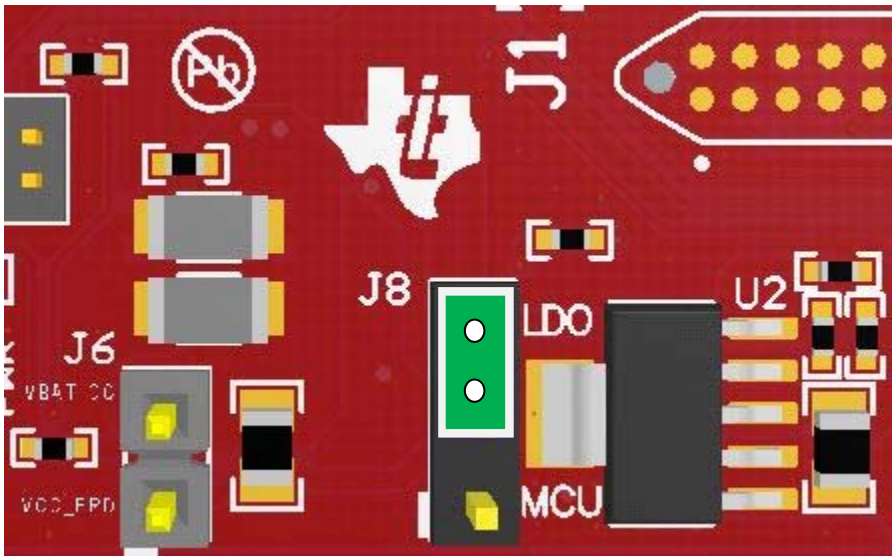

Figure 7-3: 3-3-V Power From LDO

7.2 Measuring the CC3120MOD Current Draw

7.2.1 Low-Current Measurements (Hibernate and LPDS)

To measure the current draw of the CC3120RM and the serial flash, a jumper is provided on the board labeled J6. By removing this jumper, one can place an ammeter into this path and the current can be observed. This method is recommended for measuring LPDS and hibernate currents that are of the order of few 10s of micro amps.

The jumper is removed and an ammeter is added in series to measure the hibernate and LPDS currents (see Figure 7-4).

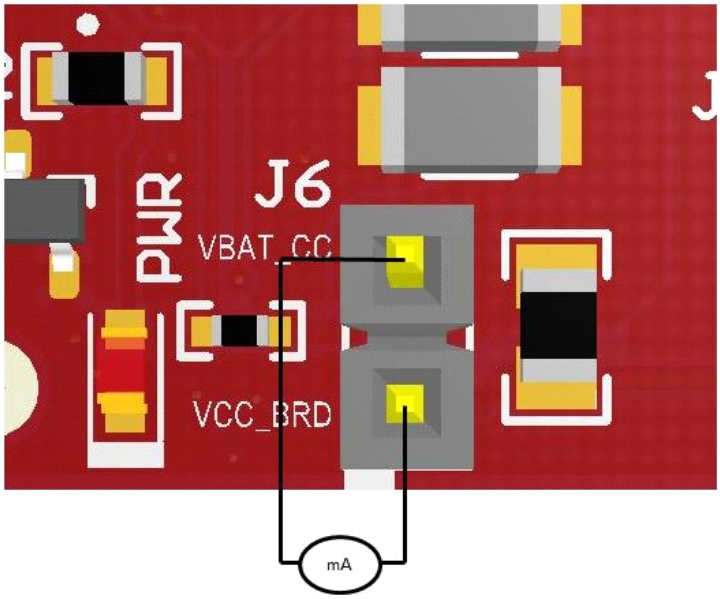

Figure 7-4: Low-Current Measurement

7.2.2 Active Current Measurements

To measure active current in a profile form, it is recommended to use a 0.1-Ω, 1% resistor on the board and measure the differential voltage across it (see Figure 7-4). This can be done using a voltmeter or an oscilloscope for measuring the current profile.

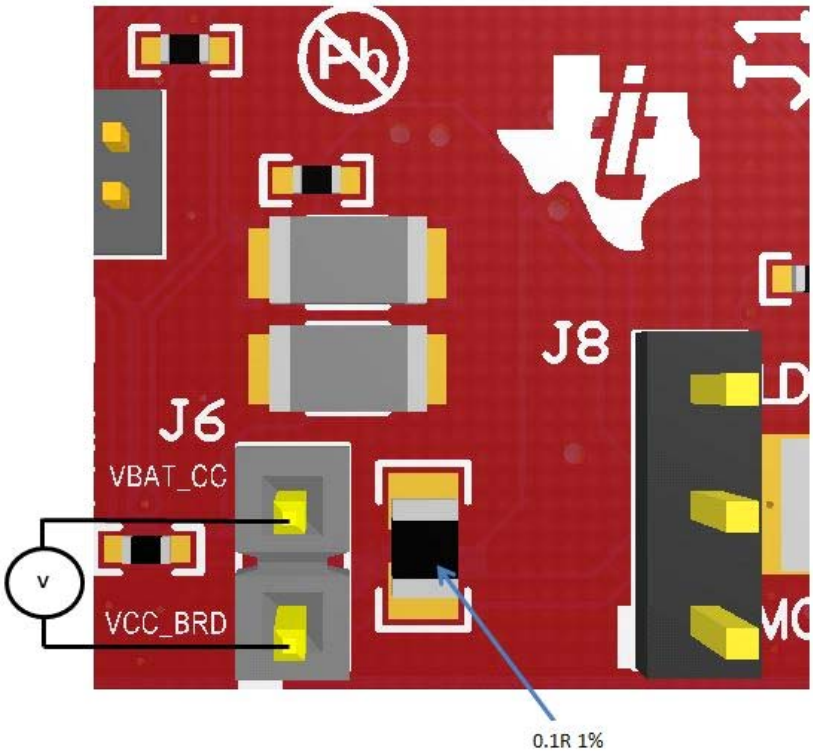

Figure 7-4: Active Current Measurement

7.3 Clocking

All of the required clocks are inside the module. There is no need to supply any external clock.

7.4 Performing Conducted Tests

The BoosterPack board by default ships with the RF signal connected to the onboard chip antenna. Figure 7-5 shows that there is a U.FL connector on the board that can be used for conducting testing or to connect an external antenna. This requires a board modification (mounting C4 and depopulating C5) as shown in Figure 7-5.

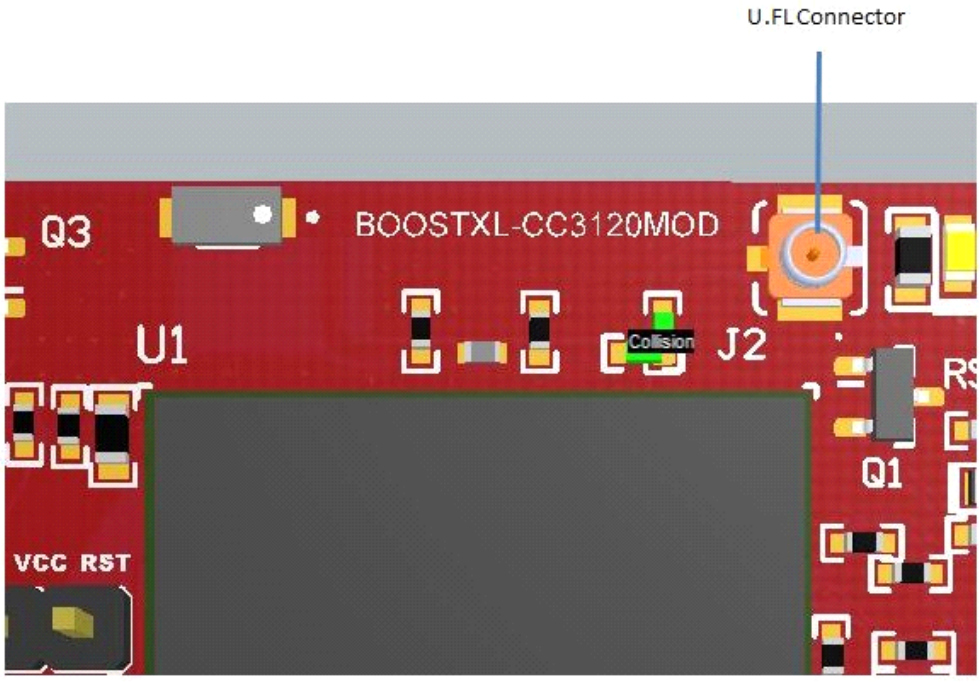

Figure 7-5: U.FL Connector

7.5 Connecting to PC Using the CC31XXEMUBOOST

7.5.1 CC31XXEMUBOOST

7.5.1.1 Overview

The CC31XXEMUBOOST is designed to connect the BoosterPack module to a PC using a USB connection. This updates the firmware patches, which are stored in the serial flash, on the BoosterPack; and in software development using SimpleLink Studio. The board is also used for measuring the RF performance using a software tool named RadioTool.

7.5.1.2 Hardware details

Figure 7-6 shows the CC31XXEMUBOOST board.

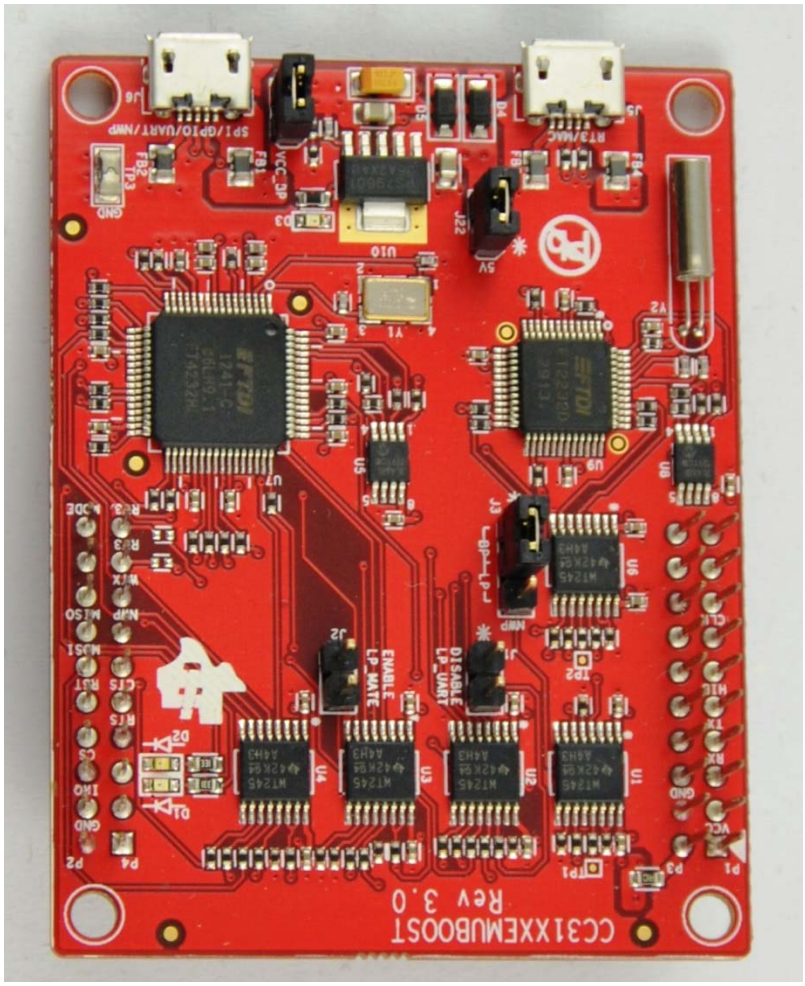

Figure 7-6: CC31XXEMUBOOST board

The board has two FTDI ICs to enumerate multiple COM and D2XX ports. The details of the ports are given in Table 7-1 below.

Port Number	Port Type	Usage	Comments
1	D2XX	SPI port for SL Studio	
2	D2XX	GPIO for SL Studio	Control the nRESET, nHIB, IRQ
3	VCP	COM port for Flash programming	
4	VCP	NWP	Network processor logger output. Used with specific tools to analyze the network processor logs. For TI use only.

Table 7-1: COM and D2XX Ports

The third COM port in the list (see Figure 7-7) is used for the Flash programming.

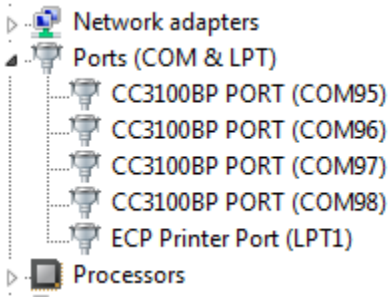

Figure 7-7: COM port list

Table 7-2 lists the available ports on J5.

Port Number	Port Type	Usage	Comments
1	VCP	RT3	Used for TI internal debug only.
2	VCP	MAC logger	Used for TI internal debug only.

Table7-2: Ports on J5

7.5.1.3 Driver Requirements

The FTDI Debug board requires you to install the associated drivers on a PC. This package is available as part of the SDK release and is located at: `[Install-Path]\CC3120-sdk\tools\cc31xx_board_drivers\`. The install path is usually C:\ti\CC3120SDK.

7.5.2 Connecting to Board

Figure 7-8 shows the connection of the CC3120 BoosterPack module to the EMUBOOST board. The connectors should be aligned carefully as it does not have polarity protection and the Flash can be erased as a result. The pins #1 of the connectors are marked on the board using a small triangle marking; these should be aligned while connecting.

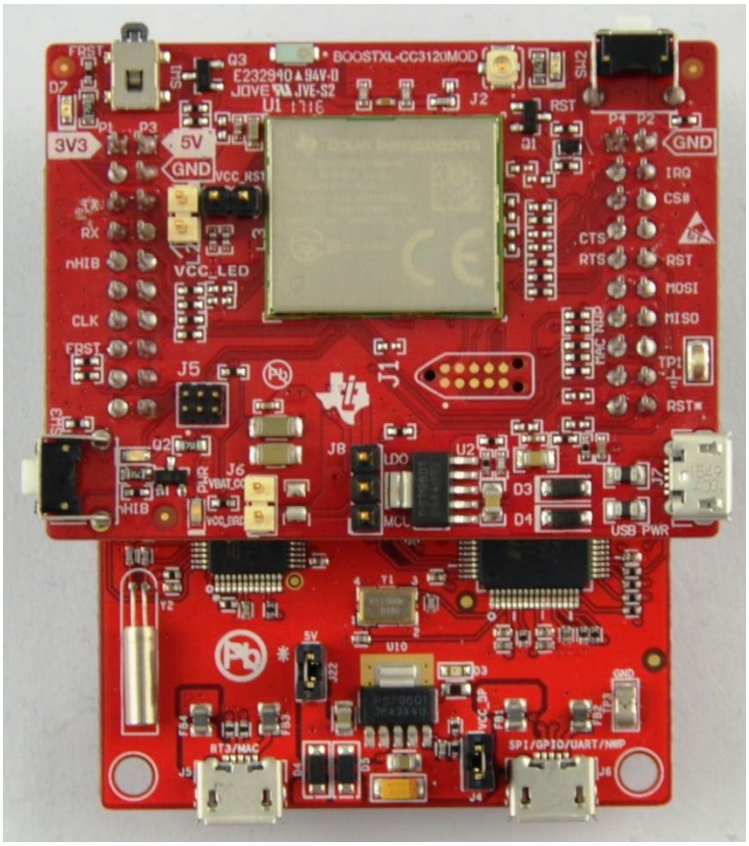

Figure 7-8: BOOSTXL-CC3120MOD Connected to CC31XXEMUBOOST

CAUTION
Align pin 1 of the boards together using the triangle marking on the PCB. An incorrect connection can permanently destroy the boards. Ensure that none of the header pins are bent before connecting the boards.

7.5.3 BOOSTXL-CC3120MOD Jumper Settings

Table 7-3 specifies the jumpers to be installed on the BOOSTXL-CC3120RM before pairing with the EMUBOOST board

No	Jumper Settings	Notes
1	J8 (1-2)	Power the BoosterPack from the EMU BOOST. The jumper shall be placed so that it is nearer to the edge of the PCB.
3	J6 (short)	No current measurement.

Table 7-3: BOOSTXL-CC3120MOD Jumper Settings

7.5.4 CC31XXEMUBOOST Jumper Settings

Table 7-4 specifies the jumpers to be installed while pairing with the FTDI board. Note that jumpers not listed in Table 7-4 remain open.

No	Jumper Settings	Notes
1	J4 (short)	Provide 3.3 V to the BoosterPack
2	J22 (short)	Provide 5.0 V to the BoosterPack
3	J3 (1-2)	Route the NWP logs to the Dual port also

Table 7-4: CC31XXEMUBOOST Jumper Settings

7.5.5 Connecting to a LaunchPad Kit

The CC3120RM BoosterPack module can be directly connected to a compatible LaunchPad development kit using the standard 2x20 pin connectors. The jumper settings needed for this connection are the same as those needed for the EMUBOOST board as described in section 7.5.4

Ensure that the Pin1 of the 2x20 pins are aligned correctly before pairing. Figure 7-9 illustrates the connected setup. Note that the USB cable is directly connected to the BoosterPack Module to power it only. For debugging, the USB cable on the LaunchPad kit is also required.

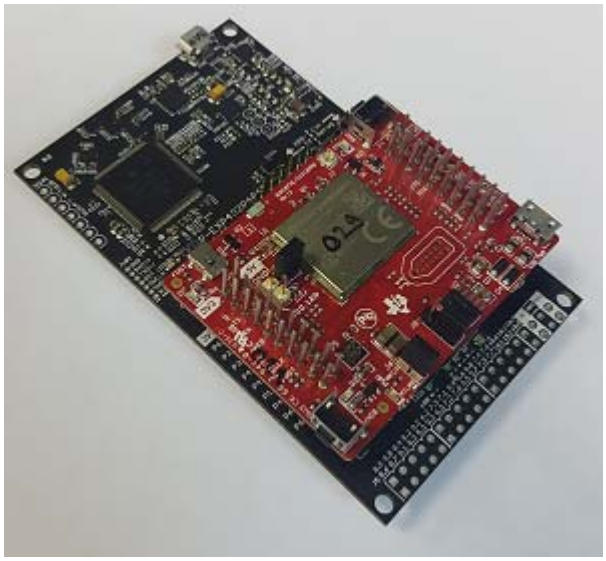

Figure 7-9: BOOSTXL-CC3120MOD Connected to MSP432 LaunchPad

7.5.5.1 LaunchPad Current Limitations

Some of the LaunchPad kits do not provide enough current to power the BOOSTXL-CC3120MOD. The BOOSTXL-CC3120MOD can consume up to 400 mA peak from the 3.3 V and may need to be powered

separately. For this, a USB connector is provided on the BoosterPack module to provide the 3.3 V separately.

The power supply jumpers should be configured as shown in Figure 7-9 when the power is supplied from the on-board USB connector.

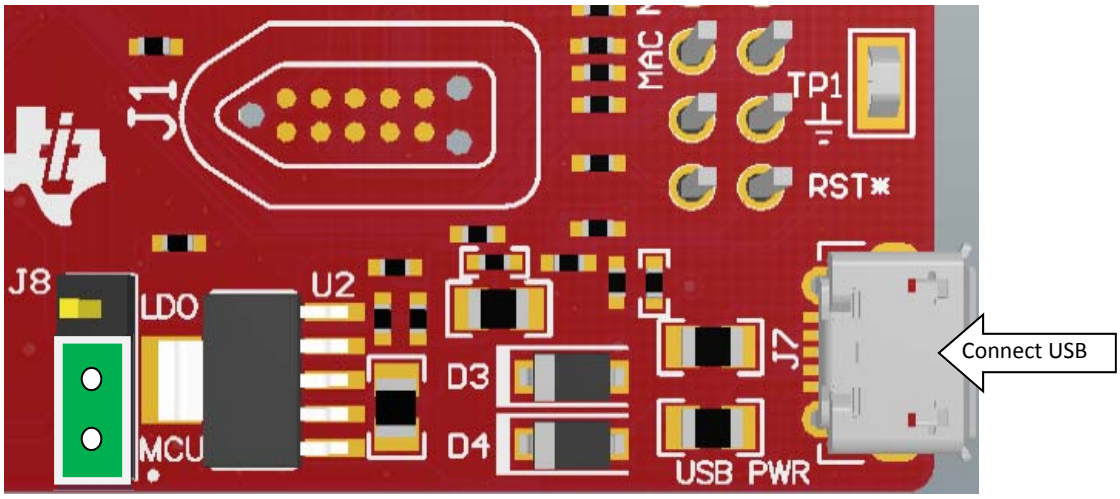

Figure 7-9: Jumper Configuration when working with Launchpad kit

NOTE:

Since there are two power sources in this setup, it is important to follow the power-up sequence. Always power the BoosterPack module before powering the LaunchPad kit.

Manual Information to the End User

The OEM integrator must be aware not to provide information to the end user regarding how to install or remove this RF module in the user's manual of the end product which integrates this module.

The end user manual must include all required regulatory information/warning as shown in this manual.

1. RF Function and Frequency Range

The CC3120MODRNMMOB is design to operate in the WLAN 2.4GHz band. The CC3120MODRNMMOB supports the following channels dependent on the region of operation:

- FCC / IC: Channels 1 through 11 (2142 MHz to 2462 MHz)
- EU: Channels 1 through 13 (2142 MHz to 2472 MHz)
- JP: Channels 1 through 13 (2142 MHz to 2472 MHz)

Note that the CC3220MODx and CC3220MODAx do not support determination of its region thru any external mechanism. The region is set by the application SW or at the time of programming of the device. The end user is unable to change the region of operation at any time.

NOTE:
The maximum RF power transmitted in each WLAN 2.4GHz band is 18 dBm.

2. FCC /IC Certification and Statement

This device is intended for OEM integrators under the following conditions:

- The antenna must be installed such that 20 cm is maintained between the antenna and users,
- The transmitter module may not be co-located with any other transmitter or antenna.
- To comply with FCC / IC regulations limiting both maximum RF output power and human exposure to RF radiation, the maximum antenna gain including cable loss in a mobile exposure condition must not exceed:
    - 2.5 dBi in WLAN 2.4G

In the event that these conditions cannot be met (for example certain laptop configurations or co-location with another transmitter), then the FCC / IC authorization is no longer considered valid and the FCC / IC ID cannot be used on the final product. In these circumstances, the OEM integrator will be responsible for re-evaluating the end product (including the transmitter) and obtaining a separate FCC / IC authorization.

2.1 FCC

The TI CC3120MOD module is certified for FCC as a single-modular transmitter. The module is an FCC-certified radio module that carries a modular grant.

You are cautioned that changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

- This device may not cause harmful interference.
- This device must accept any interference received, including interference that may cause undesired operation of the device.

CAUTION

FCC RF Radiation Exposure Statement:
This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with a minimum distance of 20 cm between the radiator and your body.

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 the one the receiver is connected too.
- Consult the dealer or an experienced radio or TV technician for help.

The antenna listing in Section 3.5 of this document were verified in the compliance testing. Use only the antennas on this list. A separate approval is required for all other operating configurations, including different antenna configurations.

2.2 CAN ICES-3(B)/NMB-3(B) Certification and Statement

The TI CC3120MOD module is certified for IC as a single-modular transmitter. The TI CC3120MOD module meets IC modular approval and labeling requirements. The IC follows the same testing and rules as the FCC regarding certified modules in authorized equipment.

This device complies with Industry Canada license-exempt RSS standards.

Operation is subject to the following two conditions:

- This device may not cause interference.
- This device must accept any interference, including interference that may cause undesired operation of the device.

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:

- L'appareil ne doit pas produire de brouillage
- L'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

CAUTION

IC RF Radiation Exposure Statement:
This equipment complies with IC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with a minimum distance of 20 cm between the radiator and your body.

Déclaration d'exposition aux radiations:
Cet équipement est conforme aux limites d'exposition aux rayonnements IC établies pour un environnement non contrôlé. Cet équipement doit être installé et utilisé avec un minimum de 20 cm de distance entre la source de rayonnement et votre corps.

This radio transmitter (451I-CC3120MOD) has been approved by Industry Canada to operate with the antenna types listed in Section 3.5 of this document with the maximum permissible gain 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.

The antenna listing in Section 3.5 of this document were verified in the compliance testing. Use only the antennas on this list. A separate approval is required for all other operating configurations, including different antenna configurations.

2.3 End Product Labeling

This module is designed to comply with the FCC statement, FCC ID: Z64-CC3120MOD. The host system using this module must display a visible label indicating the following text:

- Contains FCC ID: Z64-CC3120MOD

This module is designed to comply with the IC statement, IC: 451I-CC3120MOD. The host system using this module must display a visible label indicating the following text:

- Contains IC: 451I-CC3120MOD

This module is designed to comply with the JP statement, 201-170387. The host system using this module must display a visible label indicating the following text:

- Contains transmitter module with certificate number 201-170387

2.4 Device Classifications

Since host devices vary widely with design features and configurations module integrators shall follow the guidelines below regarding device classification and simultaneous transmission, and seek guidance from their preferred regulatory test lab to determine how regulatory guidelines will impact the device compliance. Proactive management of the regulatory process will minimize unexpected schedule delays and costs due to unplanned testing activities.

The module integrator must determine the minimum distance required between their host device and the user's body. The FCC provides device classification definitions to assist in making the correct determination. Note that these classifications are guidelines only; strict adherence to a device classification may not satisfy the regulatory requirement as near-body device design details may vary widely. Your preferred test lab will be able to assist in determining the appropriate device category for your host product and if a KDB or PBA must be submitted to the FCC.

Note, the module you are using has been granted modular approval for mobile applications. Portable applications may require further RF exposure (SAR) evaluations. It is also likely that the host / module combination will need to undergo testing for FCC Part 15 regardless of the device classification. Your preferred test lab will be able to assist in determining the exact tests which are required on the host / module combination.

2.5 FCC Definitions

Portable: (§2.1093) — A portable device is defined as a transmitting device designed to be used so that the radiating structure(s) of the device is / are within 20 centimeters of the body of the user.

Mobile: (§2.1091) (b) — A mobile device is defined as a transmitting device designed to be used in other than fixed locations and to generally be used in such a way that a separation distance of at least 20 centimeters is normally maintained between the transmitter's radiating structure(s) and the body of the user or nearby persons. Per §2.1091d(d)(4) In some cases (for example, modular or desktop transmitters), the potential conditions of use of a device may not allow easy classification of that device as either Mobile or Portable. In these cases, applicants are responsible for determining minimum

distances for compliance for the intended use and installation of the device based on evaluation of either specific absorption rate (SAR), field strength, or power density, whichever is most appropriate.

2.6 Simultaneous Transmission Evaluation

This module has not been evaluated or approved for simultaneous transmission as it is impossible to determine the exact multi-transmission scenario that a host manufacturer may choose. Any simultaneous transmission condition established through module integration into a host product must be evaluated per the requirements in KDB447498D01(8) and KDB616217D01,D03 (for laptop, notebook, netbook, and tablet applications).

These requirements include, but are not limited to:

- Transmitters and modules certified for mobile or portable exposure conditions can be incorporated in mobile host devices without further testing or certification when:
- The closest separation among all simultaneous transmitting antennas is >20 cm,

Or

- Antenna separation distance and MPE compliance requirements for ALL simultaneous transmitting antennas have been specified in the application filing of at least one of the certified transmitters within the host device. In addition, when transmitters certified for portable use are incorporated in a mobile host device, the antenna(s) must be >5 cm from all other simultaneous transmitting antennas.
- All antennas in the final product must be at least 20 cm from users and nearby persons.

3. EU Certification and Statement

3.1 RF Exposure Information (MPE)

This device has been tested and meets applicable limits for Radio Frequency (RF) exposure. To comply with the RF exposure requirements, this module must be installed in a host platform that is intended to be operated in a minimum of 20 cm separation distance to the user.

3.2 Simplified DoC statement

Hereby, Texas Instruments declares that the radio equipment type CC3120MODRNMMOB is in compliance with Directive 2014/53/EU.

The full text of the EU declaration of conformity is available at the following internet address: http://www.ti.com/lit/pdf/SSZQ060.

3.3 Waste Electrical and Electronic Equipment (WEEE)

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.

3.4 OEM / Host manufacturer responsibilities

OEM/Host manufacturers are ultimately responsible for the compliance of the Host and Module. The final product must be reassessed against all the essential requirements of the RED before it can be placed on the EU market. This includes reassessing the transmitter module for compliance with the Radio and EMF essential requirements of the RED. This module must not be incorporated into any other device or system without retesting for compliance as multi-radio and combined equipment.

3.5 Antenna specifications

In all cases, assessment of the final product must be met against the Essential requirements of RE Directive Article 3.1(a) and (b), safety and EMC respectively, as well as any relevant Article 3.3 requirements.

1. The following antennas were verified in the conformity testing, and for compliance the antenna shall not be modified. A separate approval is required for all other operating configurations, including different antenna configurations.

Antenna Information				
	Brand	**Antenna Type**	**Model**	**2.4GHz gain**
1	FoxCon	PCB	T77H533	2.5dBi
2	Ethertronics	Dipole	1000423	-0.6dBi
3	LSR	Rubber Whip / Dipole	001-0012	2dBi
4			080-0013	2dBi
5			080-0014	2dBi
6		PIFA	001-0016	2.5dBi
7			001-0021	2.5dBi
8	Laird	PCB	CAF94504	2dBi
9			CAF9405	2dBi
10	ACX	Multilayer Chip	AT3216-BR2R7HAA	0.5dBi
11			AT312-T2R4PAA	1.5dBi
12	TDK	Multilayer Ceramic Chip Antenna	ANT016008LCD2442MA1	1.6dBi
13			ANT016008LCD2442MA2	2.5dBi
14	Mitsubishi Material	Chip Antenna	AM03DP-ST01	1.6dBi
15		Antenna Unit	UB18CP-100ST01	-1.0dBi
16	Taiyo Yuden	Chip Antenna / Herical Monopole	AF216M245001	1.5dBi
17		Chip Antenna /Monopole Type	AH212M245001	1.3dBi
18			AH316M245001	1.9dBi
19	Antenna Technology	Dipole	AA2402SPU	2.0dBi
20			AA2402RSPU	2.0dBi
21			AA2402A-UFLLP	2.0dBi
22			AA2402AU-UFLLP	2.0dBi
23	Staf	Mono-pole	1019-016	2.14dBi
24			1019-017	2.14dBi
25			1019-018	2.14dBi
26			1019-019	2.14dBi
27	Map Electronics	Rubber Whip	MEIWX-2411SAXX-2400	2.0dBi
28			MEIWX-2411RSXX-2400	2.0dBi
29			MEIWX-282XSAXX-2400	2.0dBi
30			MEIWX-282XRSXX-2400	2.0dBi
31			MEIWF-HP01RS2X-2400	2.0dBi
32	Yageo	Chip	ANT3216A063R2400A	1.69dBi
33	Mag Layers Scientific	Chip	LTA-3216-2G4S3-A1	1dBi
34			LTA-3216-2G4S3-A3	2dBi
35	Advantech	Rubber Whip / Dipole	AN2450-5706RS	2.38dBi

2. If any other simultaneous transmission radio is installed in the host platform together with this module, or above restrictions cannot be kept, a separate RF exposure assessment and CE equipment certification is required.