CC3120MOD SimpleLink™ Wi-Fi® BoosterPack™ Plug-in Module and IoT Solution

User's Guide



Literature Number: SWRU510 June 2017



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CC3120MOD SimpleLink™ Wi-Fi® BoosterPack™ Plug-in Module and IoT Solution

The CC3120MOD device is part of the SimpleLink™ microcontroller (MCU) platform which consists of Wi-Fi™, *Bluetooth*® low energy, Sub-1 GHz and host MCUs. 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 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.

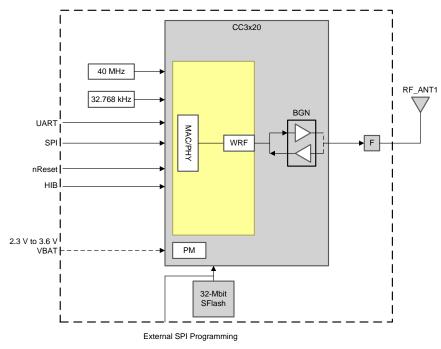
The BOOSTXL-CC3120MOD is a 2.4-GHz Wi-Fi SimpleLink BoosterPack™ with the TI CC3120MOD module. The CC3120MOD is FCC, IC, CE, MIC, and SRRC certified. The purpose of this document is to provide the end integrator with the information necessary to incorporate the CC3120MOD module into a final product.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



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1.1 Overview

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



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Figure 1-1. CC3120MOD Functional Block Diagram

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

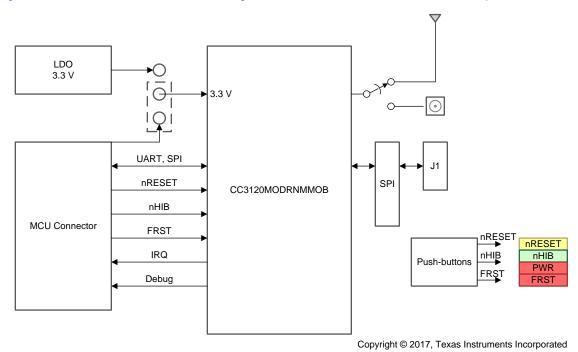


Figure 1-2. BOOSTXL-CC3120MOD Functional Block Diagram



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Figure 1-3 shows a description of the hardware components on the BOOSTXL-CC3120MOD board.

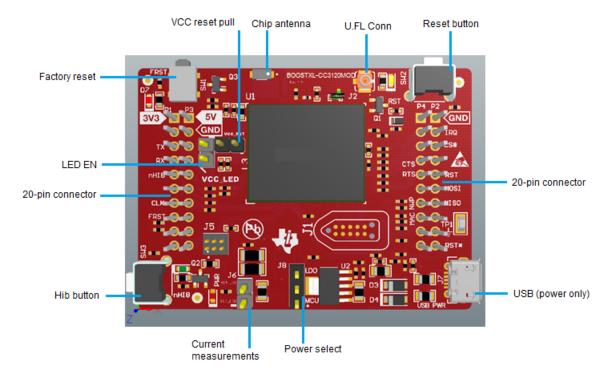


Figure 1-3. BOOSTXL-CC3120MOD Components

Figure 1-4 shows the top overlay of the BOOSTXL-CC3120MOD SimpleLink BoosterPack.

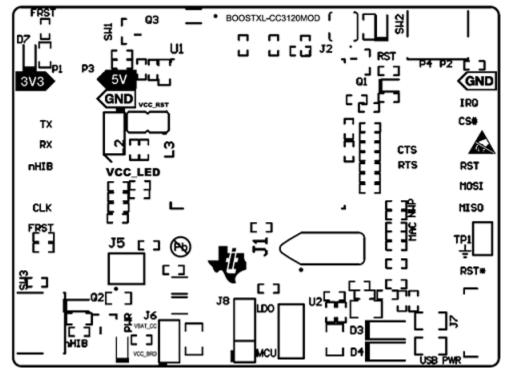


Figure 1-4. BOOSTXL-CC3120MOD Top Overlay



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Figure 1-5 shows the top solder of the BOOSTXL-CC3120MOD SimpleLink BoosterPack.

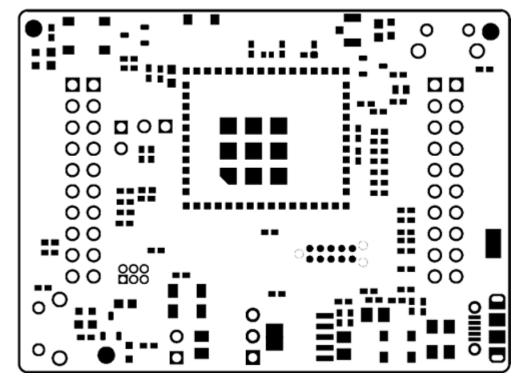


Figure 1-5. BOOSTXL-CC3120MOD Top Solder

1.1.1 General Features

The BOOSTXL-CC3120MOD SimpleLink BoosterPack includes the following features:

- Two 20-pin stackable connectors, compatible with the Texas Instruments[™] SimpleLink LaunchPad and BoosterPack architecture
- Built-in chip antenna
- Optional U.FL connector for external antennas or conducted base testing
- Power from an onboard LDO by using the USB or 3.3-V connector from the LaunchPad MCU
- Three push-buttons
- Two LEDs
- Jumper for current measurement with provisions to mount a 0.1- Ω resistor for measurement with a voltmeter
- 32-Mbit serial flash
- Two-layer PCB
- Dimensions: 58.52 mm (length) x 43.18 mm (width)



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1.1.2 Key Benefits

The CC3120MOD module includes the following benefits:

- The CC3120MOD (CC3120MODRNMMOB) is a Wi-Fi module that 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 the ability to request certificate transfers for Wi-Fi Alliance members
- Features a dedicated Internet-on-a chip™ Wi-Fi NWP that 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) support up to four stations
 - Wi-Fi Direct[™] client and group owner
 - WPA2 personal and enterprise security: WEP, WPA and WPA2 PSK, and WPA2 Enterprise (802.1x)
- IPv4 adn IPv6 TCP and 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, DCSPv4, and DCSPv4 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, TLS1.1, and TLS1.2)
 - HTTPS server
 - · Trusted root-certificate catalog
 - TI root-of-trust public key
 - Software IP protection
 - Secure key storage
 - File system security
 - Cloning protection
- Embedded network applications running on a dedicated NWP
 - HTTP and 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:



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- 95 dBm at 1 DSSS
- 73.3 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 voltages:
 - VBAT wide-voltage mode: 2.3 V to 3.6 V
 - Advanced low-power modes:
 - Shutdown: 1 μAHibernate: 5 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 the module:
 - 40-MHz crystal with internal oscillator
 - 32.768-kHz crystal (RTC)
 - 32-Mb SPI serial flash RF filter and passive components
- LGA package
 - 1.27-mm pitch, 63-pin, 20.5-mm x 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 the SimpleLink developer ecosystem

1.1.3 Applications

The CC3120MOD module is designed for the following Internet of Things (IoT) applications:

- 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



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1.2 Hardware Description

Figure 1-6 shows the top view of the BOOSTXL-CC3120MOD SimpleLink BoosterPack.

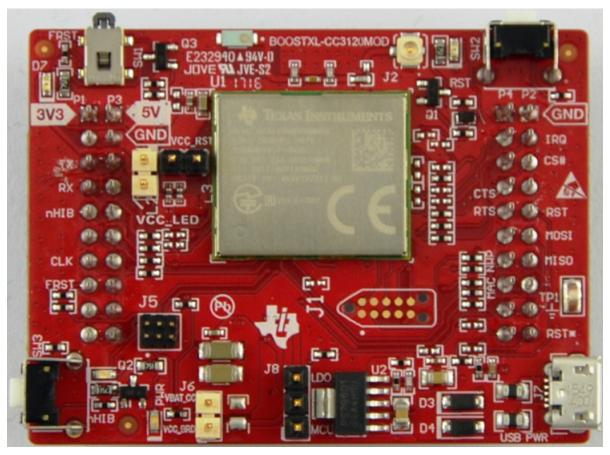


Figure 1-6. BOOSTXL-CC3120MOD (Top)



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Figure 1-7 shows the bottom view of the BOOSTXL-CC3120MOD SimpleLink BoosterPack.

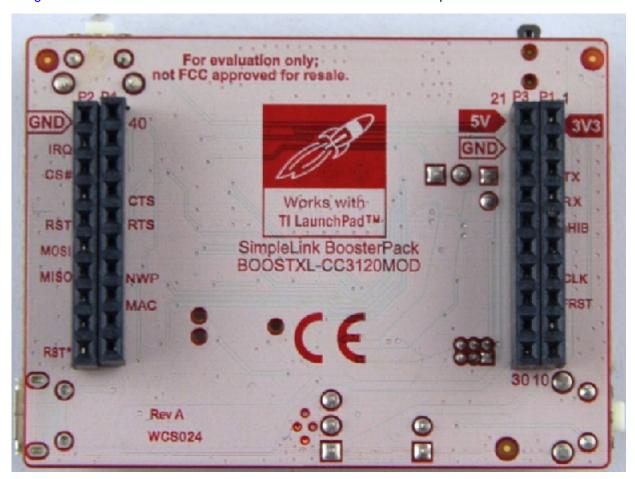


Figure 1-7. BOOSTXL-CC3120MOD (Bottom)

1.2.1 Connectors and Jumpers

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

Table 1-1. BOOSTXL-CC3120MOD Push Buttons

Reference	Usage	Comments
SW1	Factory reset	Used to restore the serial flash to the factory default image. Press and hold the button, then toggle the RESET push-button.
SW2	RESET	SW2 can be used to reset the device. Holding the button down sets the device to the shutdown state.
SW3	nHIB	Boots the device to the bootloader RMe for flashing the firmware over a UART.



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Table 1-2 lists the LEDs.

Table 1-2. BOOSTXL-CC3120MOD LEDs

Reference	Color	Usage	Comments
D5 Red		Power indication	ON when the 3.3-V power is provided to the board.
D1	Yellow	nRESET	Indicates the state of the nRESET pin. If this LED is on, the device is functional.
D6	D6 Green nHIB		Indicates the state of the nHIB pin. When the LED is OFF, the device is in hibernate state.
D7	Red	Factor default	Indicates if the factory default switch is pressed ON. Note that the RESET button must be pressed for this LED to function.

1.2.1.1 Jumper Settings

Table 1-3 lists the jumpers.

Table 1-3. BOOSTXL-CC3120MOD Jumper Settings

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 onboard 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 μ A). 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 BoosterPack header 2 x 10		2 x 10 pins each connected to the LaunchPad.
P2		
P3		
P4		
J3	LED EN	For enabling and disabling the LEDs
J4	Reset pullup	For keeping the reset up
		U.FL connector for conducted testing in the lab. Using this requires a rework of the board by swapping two resistors.



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1.2.1.2 20-Pin Connector Assignments

Table 1-4 lists the outer row connectors.

NOTE: All signals are 3.3-V CMOS logic levels and are referred to 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.

Table 1-4. Outer Row Connectors

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 1-5 lists the inner row connectors.

Table 1-5. Inner Row Connectors

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

1.2.2 Electrical Characteristics

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

1.2.3 Antenna Characteristics

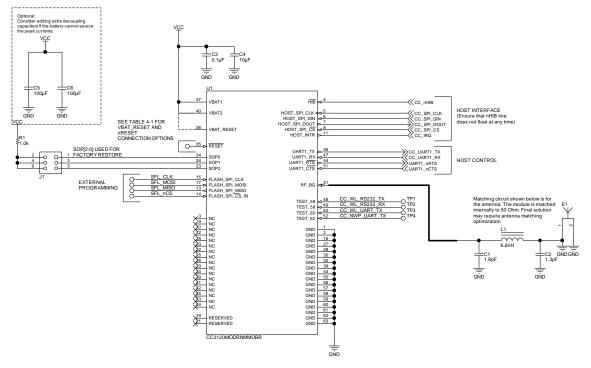
The BOOSTXL-CC3120MOD contains an on-chip antenna. For information about the antenna VSWR, efficiency, and electrical characteristics, see AH316M245001-T.



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1.2.4 Circuit Design

Figure 1-8 shows the schematic of the CC3120MOD main engine area. See CC3120MOD SimpleLink Wi0Fi and Internet of Things hardware design files for the full BOOSTXL-CC3120MOD reference schematic.



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Figure 1-8. CC3120MOD Main Engine Schematic

Table 1-6 lists the bill of materials for the CC3120MOD main engine area. See CC3120MOD SimpleLink Wi0Fi and Internet of Things hardware design files for the full BOM list.

Table 1-6. Bill of Materials - CC3120MOD Engine Area

Quantity	Designator	Value	Manufacturer	Part Number	Description
1	C1	1.8 pF	MuRata	GCM1555C1H1R8BA16	Capacitor, ceramic, 1.8 pF, 50 V, ±0.1 pF, C0G/NP0, 0402
1	C2	1.3 pF	MuRata	GCM1555C1H1R3BA16	Capacitor, ceramic, 1.3 pF, 50 V, ±5%, C0G/NP0, 0402
1	C3	0.1 μF	MuRata	GRM155R60J104KA01D	Capacitor, ceramic, 0.1 µF, 6.3 V, ±10%, X5R, 0402
1	C4	10 μF	MuRata	GRM21BR61A106KE19L	Capacitor, ceramic, 10 μF, 10 V, ±10%, X5R, 0805
2	C5, C6	100 μF	MuRata	GRM31CR60J107ME39L	Capacitor, ceramic, 100 μF, 6.3 V, ±20%, X5R, 1206
1	E1	2.45- GHz Ant	Taiyo Yuden	AH316M245001-T	Antenna Bluetooth W-LAN ZIGBEE WIMAX, SMD
1	L1	6.8 nH	MuRata	LQP15MN6N8B02	6.8-nH unshielded thin film inductor, 130 mA, 900 m Ω maximum, 0402
1	R1	1.0 k	Vishay-Dale	CRCW04021K00JNED	Resistor, 1.0 k, 5%, 0.063 W, 0402
1	U1	CC3120 MOD	Texas Instruments	CC3120MODRNMMOBR	SimpleLink Wi-Fi CERTIFIED Network Processor Internet-of-Things Module Solution for MCU applications, MOB0063A (SIP MODULE-63)



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1.2.5 Layout Guidelines

The integrator of the CC3120MOD module must comply with the PCB layout recommendations detailed in, Section 1.2.5.1, Section 1.2.5.2, Section 1.2.5.3, Section 1.2.5.4, and Section 1.2.5.5 to preserve and minimize the risk with regulatory certifications for FCC, IC, CE, MIC, and SRRC. Additionally, TI recommends that customers follow the guidelines described in this section to achieve similar performance.

1.2.5.1 Board Layout

The reference layout is a two-layer design. Figure 1-9 shows the BOOSTXL-CC3120MOD top layer.

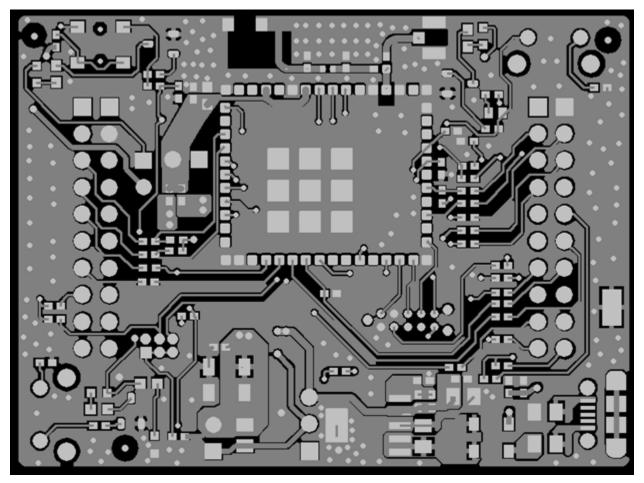


Figure 1-9. BOOSTXL-CC3120MOD Layout (Top)



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Figure 1-10 shows the BOOSTXL-CC3120MOD bottom layer.

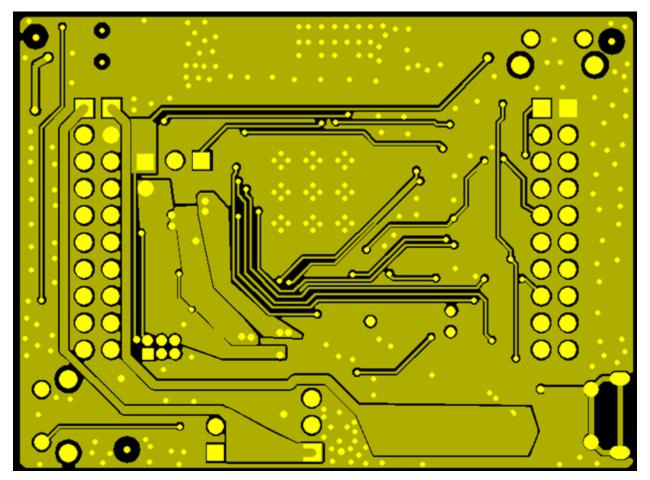


Figure 1-10. BOOSTXL-CC3120 Layout (Bottom)

1.2.5.2 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 a $50-\Omega$ 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.

1.2.5.3 RF Layout Recommendation

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.



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Figure 1-11 shows the RF placement and routing of the CC3120MOD module.

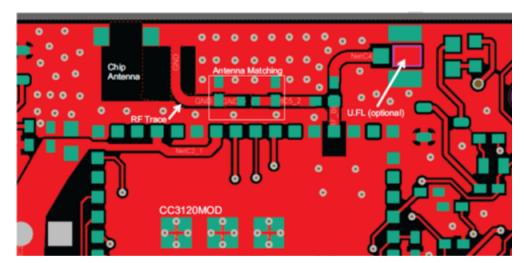


Figure 1-11. RF Section Layout

For optimal RF performance, ensure the copper cutout on the top layer under the RT-BG pin (pin 31) is as shown in Figure 1-12.

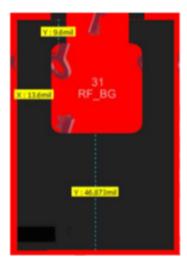


Figure 1-12. Top Layer Copper Pullback on RF Pads

1.2.5.4 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.



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Table 1-7 lists summaries of the antenna guidelines.

Table 1-7. 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.				

1.2.5.5 Transmission Line Recommendations

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 1-13 shows a cross section of the coplanar waveguide with the critical dimensions.

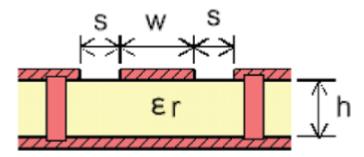


Figure 1-13. CPW-G (Cross Section)

Figure 1-14 shows the top view of the CPW-G with GND and via stitching.

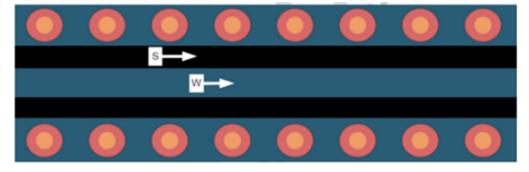


Figure 1-14. CPW-G With GND and Via Stitching (Top)



Table 1-8 and Table 1-9 list the recommended values for the PCB for two-layer and four-layer boards, respectively.

Table 1-8. PCB Values for Two-Layer Board (L1 to L2 = 42.1 mils)

Parameter	Value	Unit
W	24.5	
S	6.5	mils
Н	42.1	
Er (FR-4 substrate)	4.8	-

Table 1-9. PCB Values for Four-Layer Board (L1 to L2 = 16 mils)

Parameter	Value	Unit
W	21	
S	10	mils
Н	16	
Er (FR-4 substrate)	4.5	_

1.3 BOOSTXL-CC3120MOD Operational Setup and Testing

The SimpleLink Wi-Fi CC3120MOD wireless network processor provides the flexibility to add Wi-Fi to any MCU. This user's guide details 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. The module can be connected to a TI 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.

The kit has comes in three configurations:

- BOOSTXL-CC3120MOD:
 - One BOOSTXL-CC3120MOD board
 - One micro USB cable
 - One quick start guide
- BOOSTXL-CC3120MOD and MSP432P401R:
 - SimpleLink Wi-Fi CC3120MOD BoosterPack
 - MSP-EXP432P401R
- BOOSTXL-CC3120MOD and CC31XXEMUBOOST:
 - SimpleLink Wi-Fi CC3120MOD BoosterPack
 - Advanced emulation BoosterPack



1.3.1 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-CC3120MOD 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.

1.3.1.1 Power From the LaunchPad Kit or the CC31XXEMUBOOST

The most common use is to power the BOOSTXL-CC3120MOD device from the connected LaunchPad kit. In this case, the LaunchPad kit provides 3.3 V to the BoosterPack module for its operation (see Figure 1-15). In addition to the 3.3 V, some LaunchPad kits provide 5 V from the USB (see Figure 1-16), 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 1-16.

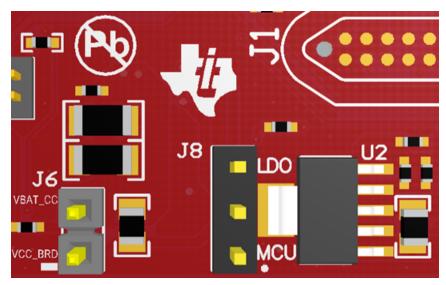


Figure 1-15. 3.3-V Power from MCU LaunchPad Kit

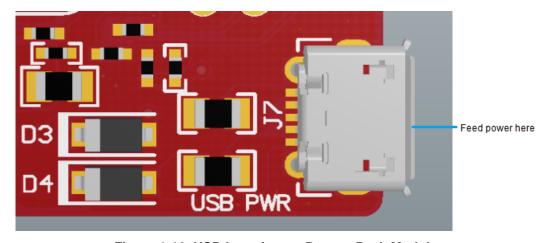


Figure 1-16. USB Location on BoosterPack Module



1.3.1.2 Onboard LDO Power Supply

On some LaunchPad kits, the 3.3 V is not capable of sourcing the 350-mA peak current required for the BOOSTXL-CC3120MOD device. If the 350-mA peak current cannot be sourced, the onboard 3.3-V LDO can be used (see Figure 1-17). This LDO must be sourced from the USB connector on the BOOSTXL-CC3120MOD and the LaunchPad kit in a shared-load manner.

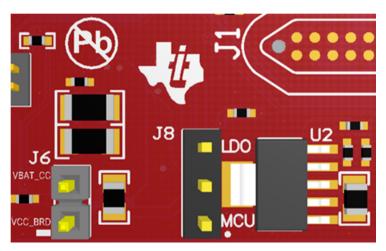


Figure 1-17. 3.3-V Power From LDO

1.3.2 Measuring the CC3120MOD Current Draw

1.3.2.1 Low-Current Measurement (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 1-18).

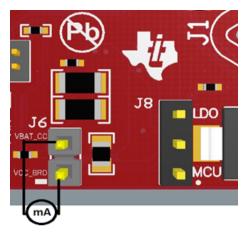


Figure 1-18. Low-Current Measurement



1.3.2.2 Active Current Measurement

To measure active current in a profile form, it is recommended to use a $0.1-\Omega$, 1% resistor on the board and measure the differential voltage across it (see Figure 1-19). This can be done using a voltmeter or an oscilloscope for measuring the current profile.

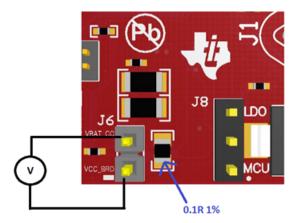


Figure 1-19. Active Current Measurement

1.3.3 Clocking

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

1.3.4 Performing Conducted Testing

The BoosterPack board by default ships with the RF signal connected to the onboard chip antenna. Figure 1-20 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).

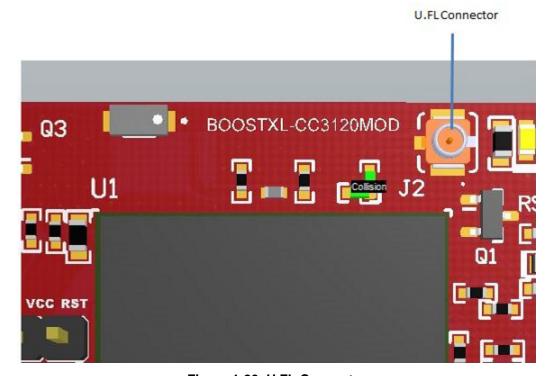


Figure 1-20. U.FL Connector



1.3.5 Connecting to PC Using CC31XXEMUBOOST

1.3.5.1 CC31XXEMUBOOST

1.3.5.1.1 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 the SimpleLink Studio RadioTool. The board is also used for measuring the RF performance using a software tool named RadioTool.

1.3.5.1.2 Hardware Details

Figure 1-21. shows the CC31XXEMUBOOST board.

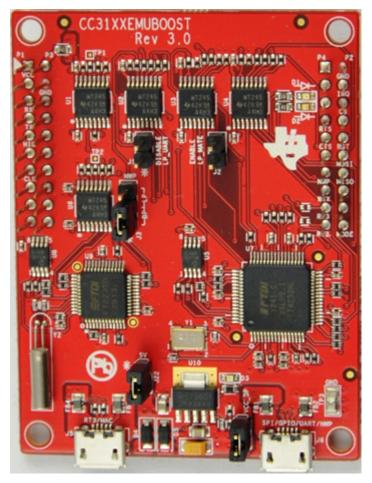


Figure 1-21. CC31XXEMUBOOST



The board has two FTDI ICs to enumerate multiple COM and D2XX ports. The details of the ports are listed in Table 1-10.

Table 1-10, COM and D2XX Ports

Port Number	Port Number Port Type Usage		Comments
1	D2XX	SPI port for SimpleLink studio	
2	D2XX	GPIO for SimpleLink studio	Controls the nRESET, nHIB, and 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.

The third COM port in the list (see Figure 1-22) is used for flash programming.

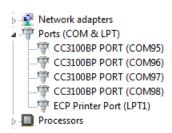


Figure 1-22. Portable Devices

Table 1-11 lists the available ports on J5.

Table 1-11. 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.

1.3.5.1.3 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.

1.3.5.2 Connecting to Boards

Figure 1-23 shows the connection of the CC3120 BoosterPack module to the EMUBOOST board. The connectors should be aligned carefully because it does not have polarity protection and the sFlash can be erased as a result. The pins (number 1) of the connectors are marked on the board using a small triangle marking; these should be aligned while connecting.



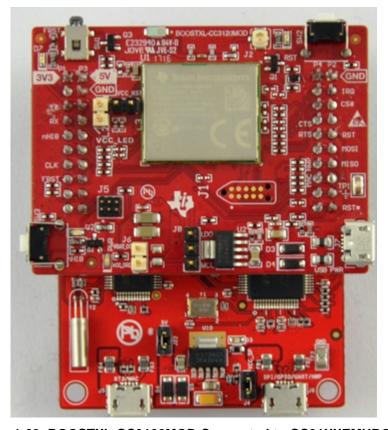


Figure 1-23. BOOSTXL-CC3120MOD Connected to CC31XXEMUBOOST

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.

1.3.5.3 BOOSTXL-CC3120MOD Jumper Settings

Table 1-12 specifies the jumpers to be installed on the BOOSTXL-CC3120MOD before pairing with the EMUBOOST board.

Table 1-12. BOOSTXL-CC3120MOD Jumper Settings

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



1.3.5.4 CC31XXEMUBOOST Jumper Settings

Table 1-13 specifies the jumpers to be installed while pairing with the FTDI board. Jumpers that are not listed in Table 1-13 remain open.

Table 1-13. EMUBOOST Jumper Settings

Number	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.	

The remaining jumpers can remain open.

1.3.6 Connecting to a LaunchPad Kit

The BOOSTXL-CC3120MOD can be directly connected to a compatible LaunchPad development kit using the two standard 20-pin connectors. The jumper settings required for this connection are the same as those required for the CC31XXEMUBOOST board as described in Section 1.3.5.4.

Ensure that pin 1 of the two 20-pin connectors are aligned correctly before pairing. Figure 1-24 illustrates the connected setup. Note that the USB cable is directly connected to the BOOSTXL-CC3120MOD to power it. For debugging, the USB cable on the LaunchPad kit is also required.



Figure 1-24. BOOSTXL-CC3120MOD Connected to MSP432™ LaunchPad

1.3.6.1 LaunchPad Current Limitation

Some of the LaunchPad kits do not provide enough current to power the BOOSTXL-CC3120MOD. The BoosterPack RMule 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 1-25 when the power is supplied from the on-board USB connector.

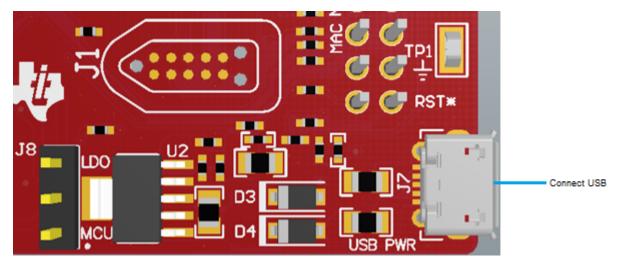


Figure 1-25. Jumper Configuration With LaunchPad Kit

NOTE: Because 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 and warnings as shown in this manual.

2.1 RF Function and Frequency Range

The CC3120MODRNMMOB operations in the WLAN 2.4-GHz band. The CC3120MODRNMMOB supports the following channels dependent on the region of operation:

- FCC and 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 devices do not support determination of its region through 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 2.4-GHz band is 18 dBm.

2.2 FCC and IC Certification and Statement

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

- The antenna must be installed so 20 cm of space is maintained between the antenna and the users.
- The transmitter module may not be colocated with any other transmitter of antenna.
- To comply with FCC and IC regulations limiting 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 2.4 G.

In the event that these conditions cannot be met (for example, certain laptop configurations or colocation with another transmitter), then the FCC and IC authorization is no longer considered valid and the FCC and 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 and IC authorization.

2.2.1 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 to.
- · Consult the dealer or an experienced radio or TV technician for help.

The antennas listed in Section 2.4 of this document were verified in the compliance testing. Use only the antennas listed in Section 2.4. A separate approval is required for all other operating configurations, including different antenna configurations.

2.2.2 CAN ICES-3(B) and 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 deus 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 ests susceptible d'en compromettre lu 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:

Cut 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 operated with the antenna types listed in Section 2.4 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 antennas listed in Section 2.4 of this document were verified in the compliance testing. Use only the antennas listed in Section 2.4. A separate approval is required for all other operating configurations, including different antenna configurations.

2.2.3 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 JP statement 201-170387. The host system using this module must display a visible label indicating the following text:

Contains transmitter module with certificate module 201-170387

2.2.4 Device Classifications

Because host devices vary widely with design features and configurations, module integrators shall reference the following guidelines 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 body of the user. 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. The user-preferred test lab will be able to assist in determining the appropriate device category for the host product and if a KDB or PBA must be submitted to the FCC.

Note, the module that the user is 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 and module combination will need to undergo testing for FCC Part 15, regardless of the device classification. The preferred test lab of the user will be able to assist in determining the exact tests which are required on the host and module combination.



2.2.5 FCC Definitions

Portable: (§2.1093)—A portable device is defined as a transmitting device designed to be used so that the radiating structures of the device is or 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 structures 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.

2.2.6 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
 - 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 antennas 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.

2.3 EU Certification and Statement

2.3.1 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.

2.3.2 Simplified DoC Statement

2.3.2.1 CC3120MODRNMMOB

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 CC3120MODRNMMOB EC Declaration of Conformity (DoC).

2.3.2.2 BOOSTXL-CC3120MOD

Hereby, Texas Instruments declares that the radio equipment type BOOSTXL-CC3120MOD is in compliance with Directive 2015/53/EU. The full text of the EU declaration of conformity is available at BOOSTXL-CC3120MOD EC Declaration of Conformity (DoC).



2.3.3 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.

2.3.4 OEM and Host Manufacturer Responsibilities

OEM and host manufacturers are ultimately responsible for the compliance of the host and module. The final product must be reassessed against all of 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.

2.3.5 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 antennas listed in Section 2.4 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.
- 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.



2.4 CC3120MOD Approved Antennas

Table 2-1 lists the antennas approved for use with the CC3120MOD module.

Table 2-1. CC3120MOD Approved Antennas

Antenna Information						
	Brand	Model	2.4-GHz Gain			
1	FoxCon	PCB	T77H533	2.5 dBi		
2	Ethertronics	Dipole	1000423	−0.6 dBi		
3			001-0012	2.0 dBi		
4		Rubber Whip / Dipole	080-0013	2.0 dBi		
5	LSR		080-0014	2.0 dBi		
6		PIFA	001-0016	2.5 dBi		
7			001-0021	2.5 dBi		
8	l =:-d	DOD	CAF94504	2.0 dBi		
9	Laird	PCB -	CAF94505	2.0 dBi		
10	ACV	Multilavan Ohia	AT3216-BR2R7HAA	0.5 dBi		
11	ACX	Multilayer Chip	AT312-T2R4PAA	1.5 dBi		
12	TDV	Multilayer Ceramic Chip	ANT016008LCD2442MA1	1.6 dBi		
13	TDK	Antenna	ANT016008LCD2442MA2	2.5 dBi		
14	NAMES OF THE NAME OF THE	Chip Antenna	AM03DP-ST01	1.6 dBi		
15	Mitsubishi Material	Antenna Unit	UB18CP-100ST01	−1.0 dBi		
16		Chip Antenna / Herical Monopole	AF216M245001	1.5 dBi		
17	Taiyo Yuden	Chip Antenna / Monopole	AH212M245001	1.3 dBi		
18		Туре	AH316M245001	1.9 dBi		
19			AA2402SPU	2.0 dBi		
20	Antenna Technology	Dipole	AA2402RSPU	2.0 dBi		
21	Antenna rechnology		AA2402A-UFLLP	2.0 dBi		
22			AA2402AU-UFLLP	2.0 dBi		
23			1019-016	2.14 dBi		
24	Staf	Monopole	1019-017	2.14 dBi		
25	Siai	ivioriopole	1019-018	2.14 dBi		
26			1019-019	2.14 dBi		
27			MEIWX-2411SAXX-2400	2.0 dBi		
28			MEIWX-2411RSXX-2400	2.0 dBi		
29	Map Electronics	Rubber Whip	MEIWX-282XSAXX-2400	2.0 dBi		
30			MEIWX-282XRSXX-2400	2.0 dBi		
31			MEIWF-HP01RS2X-2400	2.0 dBi		
32	Yageo	Chip	ANT3216A063R2400A	1.69 dBi		
33	Moul over Crientifi	Chin	LTA-3216-2G4S3-A1	1.0 dBi		
34	May Layers Scientific	Chip	LTA-3216-2G4S3-A3	2.0 dBi		
35	Advantech	Rubber Whip / Dipole	AN2450-5706RS	2.38 dBi		



www.ti.com Related Documentation

2.5 Related Documentation

CC3120MOD SimpleLink™ Wi-Fi CERTIFIED™ Network Processor Internet-of-Things Module Solution for MCU Applications

2.5.1 Trademarks

SimpleLink, BoosterPack, Texas Instruments, Internet-on-a chip, SmartConfig, MSP432 are trademarks of Texas Instruments.

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Revision History www.ti.com

Revision History

NOTE: Page numbers for previous revisions may differ from page numbers in the current version.

Date	Revision	Notes
June 2017	*	Initial release

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