TI CC3000 BoosterPack Evaluation Board

User's Guide

Literature Number: SWRU331
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Read This First

About This Manual

This user guide describes how to use the TI CC3000 BoosterPack evaluation board to evaluate the performance of the TI CC3000 module.

Related Documentation From Texas Instruments

- *TI SimpleLink™ CC3000 Module – Wi-Fi 802.11b/g Network Processor Data Sheet* (SWRS126)
- CC3000 Wiki for MCU: http://processors.wiki.ti.com/index.php/CC3000_Wi-Fi_for_MCU

If You Need Assistance

The primary sources of CC3000 information are the device-specific data sheets and user's guides. For the most up-to-date version of the user's guide and data sheets, go to http://www.ti.com/product/cc3000.

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Introduction

This user guide describes how to use the TI CC3000 BoosterPack evaluation board to evaluate the performance and functionality of the TI CC3000 module. The TI CC3000 module is a self-contained Wi-Fi® solution that enables internet connectivity for a wide variety of embedded applications. This document details the key parts and features of the CC3000 BoosterPack evaluation board along with the different options available for the user and includes layout guidelines to assist in PCB development.

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CC3000 BoosterPack Evaluation Board

2.1 BoosterPack Board Top View

Figure 2-1 Table 2-1 describe the key parts and jumpers mounted on top of the CC3000 BoosterPack board. Table 2-2 describes the J2 configuration of the CC3000 evaluation module (EM) board. Table 2-3 and Table 2-4 describe the signals on J11 and J12.

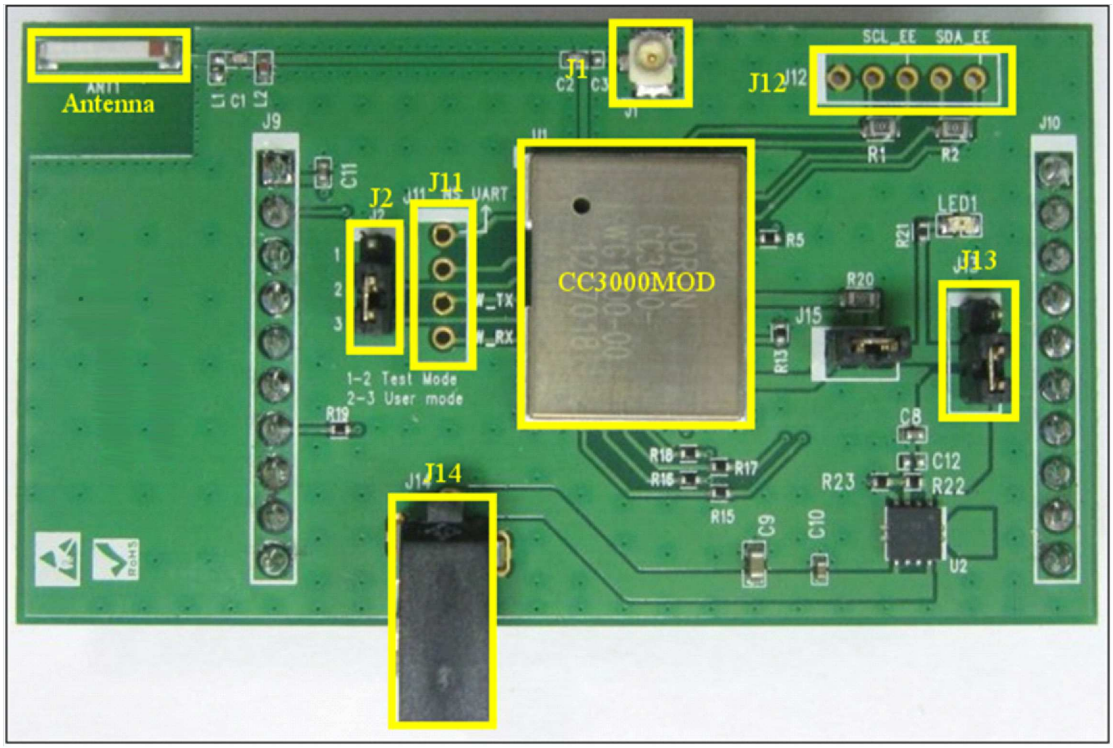

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Figure 2-1. BoosterPack Board Top View

Table 2-1. Key Parts of CC3000 BoosterPack Board Top View

Part Name	Description
CC3000MOD	Core module for performance evaluation (for more information, see the CC3000 module datasheet)
Antenna	Can be used for radiated testing by reworking the capacitor to correct pads
J1	U.FL RF connector used for conductive power tests
J2	Used to swap between test mode and operation mode. When pins 2 and 3 are shorted, J2 runs in operation mode. When pins 1 and 2 are shorted, J2 runs in test mode.
J11	Through-hole test points (for more information, see Table 2-3)
J12	Through-hole test points (for more information, see Table 2-4)
J13	Used to switch between external power and power from the motherboard. Can be used for power measurements. Connect pins 1 and 2 for power from the LaunchPad flash programmer and debugging tool. Connect pins 2 and 3 for external power.

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Table 2-1. Key Parts of CC3000 BoosterPack Board Top View (continued)

Part Name	Description
J14	DC jack for external power supply. If power is not supplied from the motherboard, ensure that external power is applied.

Table 2-2. J2 Configuration of the CC3000 Evaluation Module Board

Mode	Description
Test mode: CC3000 radio tool(1)	Connect pins 1 and 2. Test mode is used with the CC3000 radio tool to operate, test, and calibrate the CC3000 chip-set designs during development. This tool uses the RS232/UART pins to run radio frequency (RF) RX and TX tests on the CC3000 module. For more information, see the CC3000 wiki.
Functional mode: Normal mode	Connect Pins 2 and 3. Normal mode is for regular functionality between the host platform and the CC3000 module.

(1) For more information about test software for the PC, go to the CC3000 wiki at http://processors.wiki.ti.com/index.php/CC3000_Wi-Fi_for_MCU.

Table 2-3. Header J11 of the CC3000 BoosterPack Board Top View

Pin	Pin Name	Pin Type	Descriptions
1	Reserved	–	Reserved
2	Reserved	–	Reserved
3	WL_RS232_TX	Output	RS232 transmit output; Used for radio tool serial interface in test mode. Leave floating in functional mode.
4	WL_RS232_RX	Input	RS232 receive output; Used for radio tool serial interface in test mode. Leave floating in functional mode.

Table 2-4. Header J12 of the CC3000 BoosterPack Board Top View

Pin	Pin Name	Pin Type	Descriptions
1	GND	–	Ground
2	SCL_CC3000	Output	I2C clock signal output from the CC3000 device. This pin is connected to SCL_EEPROM through a 0-Ω resistor and is not used by end users.
3	SCL__EEPROM	Input	I2C clock signal input from EEPROM inside CC3000MOD. This pin is connected to SCL_CC3000 using a 0-Ω resistor and is not used by end users.
4	SDA_CC3000	Input and Output	I2C data signal from the CC3000 device. This pin is connected to SDA_EEPROM using a 0-Ω resistor and is not used by end users.
5	SDA_EEPROM	Input and Output	I2C data signal from EEPROM inside CC3000MOD. This pin is connected to the SDA_CC3000 device using a 0-Ω resistor and is not used by end users.

2.2 CC3000 BoosterPack Board Bottom View

The two BoosterPack mating connectors (J9 and J10) connect to the host platform and mount to the bottom of the BoosterPack board, as shown in Figure 2-2. Table 2-5 and Table 2-6 describe the signals on J9 and J10.

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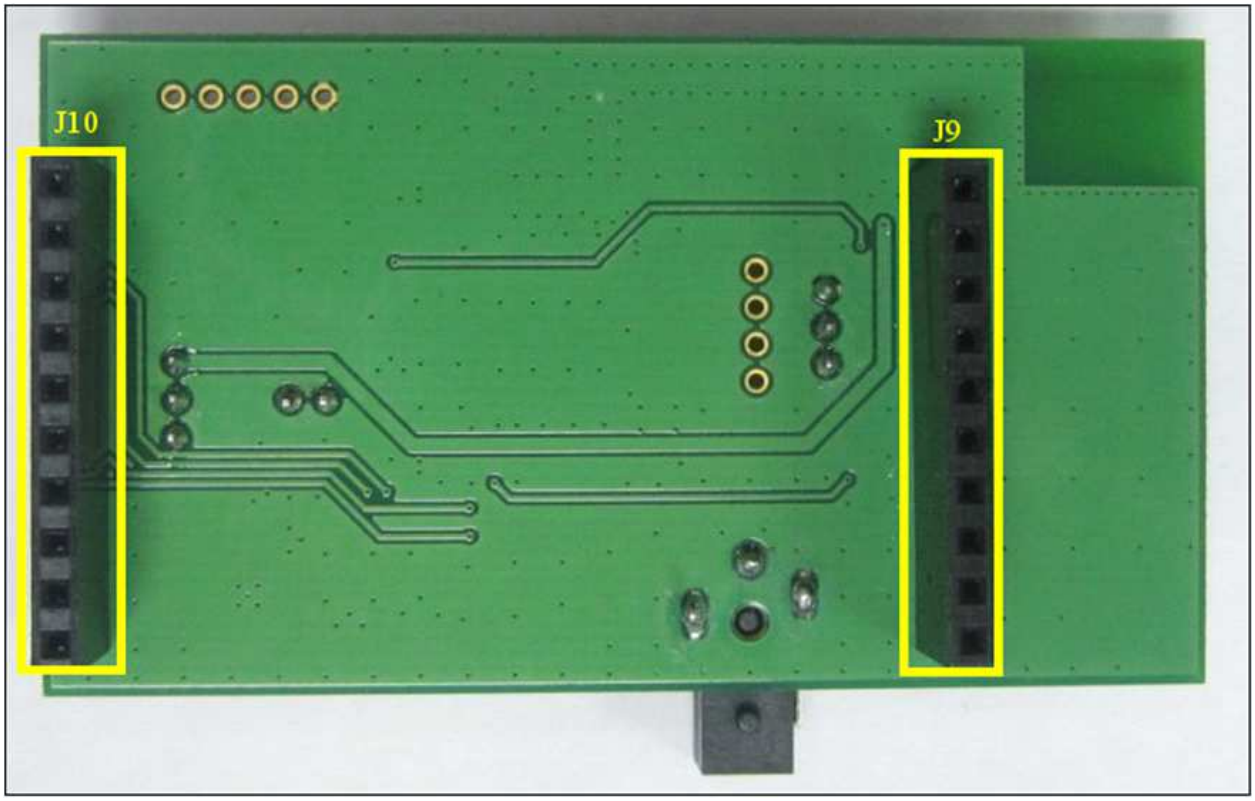

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Figure 2-2. CC3000 BoosterPack Board Bottom View

Table 2-5. Header J9 of the CC3000 BoosterPack Board Bottom View

Pin	Pin Name	Pin Type	Descriptions
1	VBAT_IN	Power In	Battery voltage input to module. For the MSP430 host platform, VIO_HOST = VBAT_IN. For other platforms that have different voltage levels from the battery voltages, R14 can be removed.
2	VBAT_SW_EN	Input	Active-high enables signal from the host device
3	Reserved	–	Reserved
4	Reserved	–	Reserved
5	Reserved	–	Reserved
6	Reserved	–	Reserved
7	WL_SPI_CLK	Input	Host interface SPI clock input
8	Reserved	–	Reserved
9	Reserved	–	Reserved
10	Reserved	–	Reserved

Table 2-6. Header J10 of the CC3000 BoosterPack Board Bottom View

Pin	Pin Name	Pin Type	Descriptions
1	GND	–	Ground
2	WL_SPI_IRQ	Output	Host interface SPI interrupt request
3	WL_SPI_CS	Input	Host interface SPI chip select
4	Reserved	–	Reserved
5	Reserved	–	Reserved

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Table 2-6. Header J10 of the CC3000 BoosterPack Board Bottom View (continued)

Pin	Pin Name	Pin Type	Descriptions
6	WL_SPI_DIN	Input	Host interface SPI data input
7	WL_SPI_CLK	Input	Host interface SPI clock input
8	Reserved	–	Reserved
9	Reserved	–	Reserved
10	Reserved	–	Reserved

2.3 Antenna

The ACX ceramic mounts on the BoosterPack board with a specific layout and matching circuit for the radiation tests conducted in FCC, CE, and IC certifications. Figure 2-3 shows the location of the ACX ceramic antenna on the BoosterPack board and the RF trace routing from the CC3000 device to the antenna. Figure 2-3 shows the matching circuit between the antenna and the BoosterPack board.

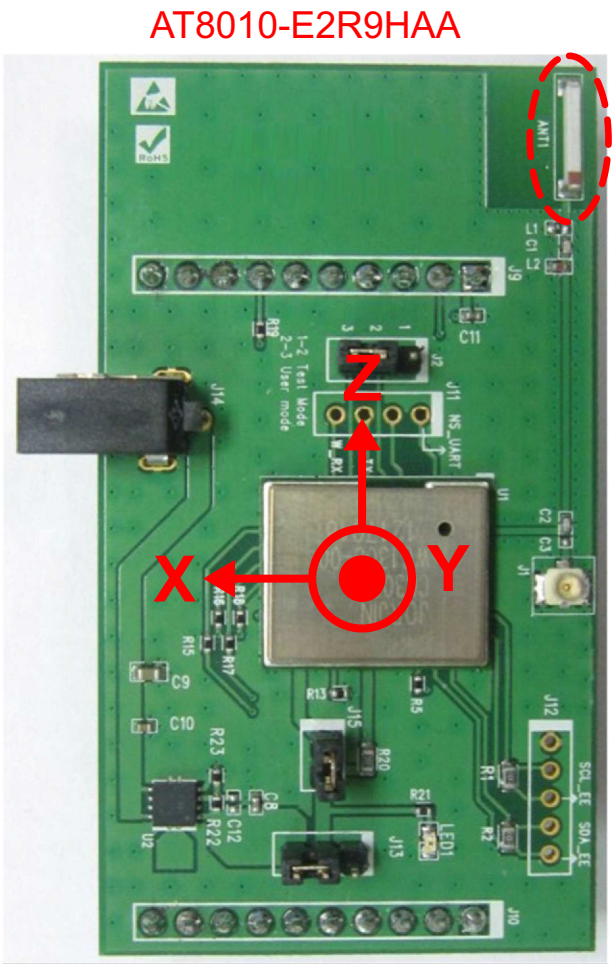

Figure 2-3. Antenna Location and RF Trace Routing

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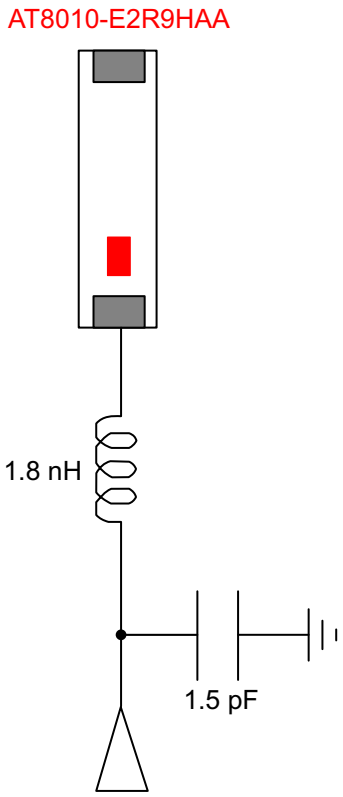

Figure 2-4. Matching Circuit Between the Antenna and the CC3000 BoosterPack

The return loss is based on the matching circuit and RF trace routing, as shown in Figure 2-5.

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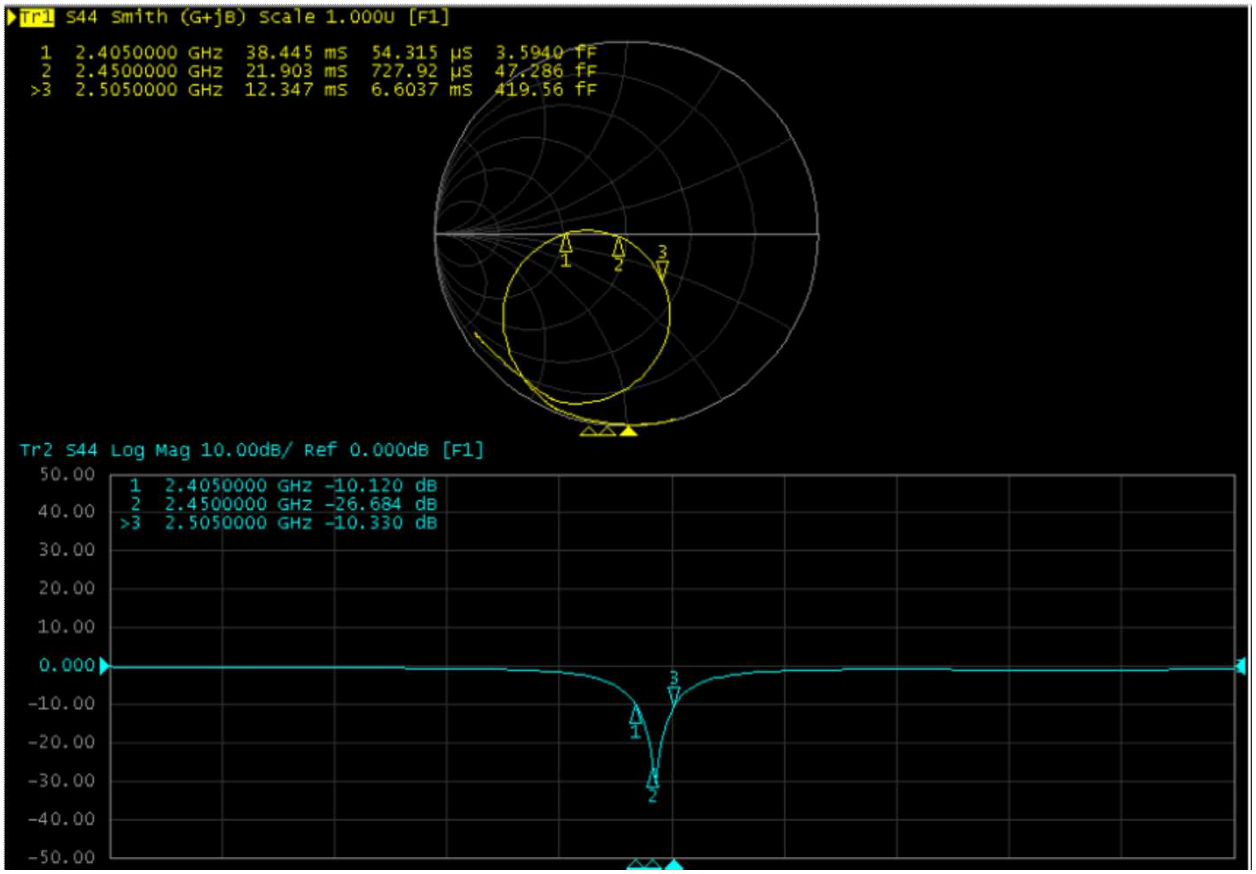

Figure 2-5. Return Loss From the ACX Antenna and Matching Circuit

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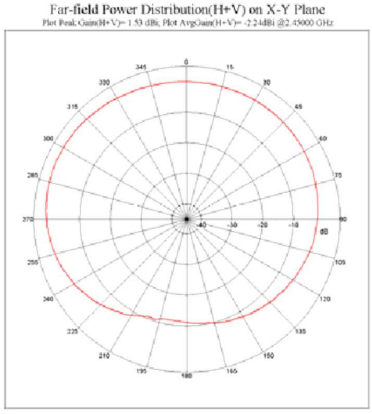
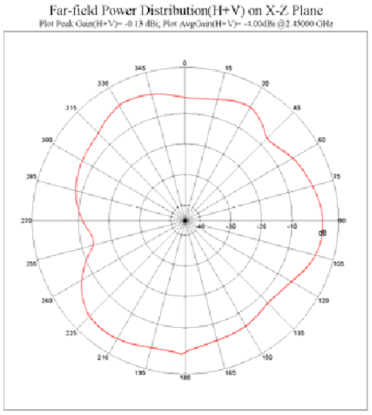
◆XY-plane



Unit : dBi

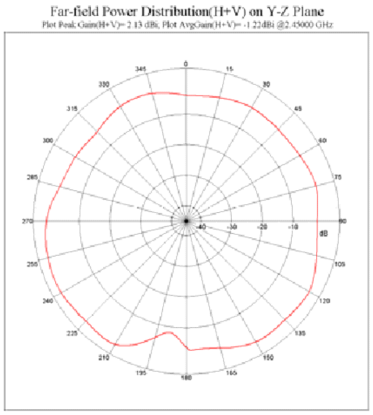
	Peak gain	Avg. gain
XY-plane	1.5	-2.2

◆XZ-plane



	Peak gain	Avg. gain
XZ-plane	-0.1	-4.0

◆YZ-plane



	Peak gain	Avg. gain
YZ-plane	2.1	-1.2

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Figure 2-6. Antenna Radiation Pattern

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2.4 Hardware Setup

Before conducting performance tests, the BoosterPack board must be connected to the host platform with the mating connectors (J9 and J10) or the single row headers (J11 and J12). To use the BoosterPack mating connectors (J9 and J10) to connect the hardware, the mating connectors must be lined up as shown in Figure 2-7. Using the single row headers (J11 and J12) requires the signals from the EM mating connectors to be wired to the host platform.

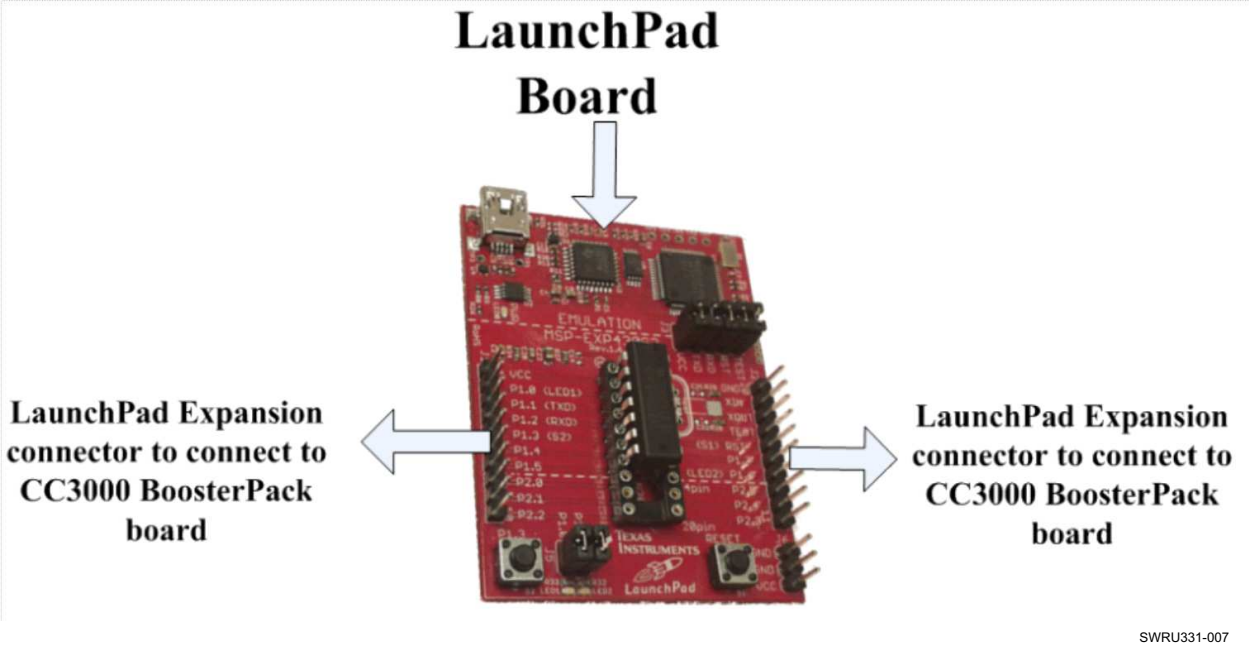

Figure 2-7. Host PCB Mating Connector Arrangement

Table 2-7 compares the pins of the Launchpad MSP-EXP430G2 board with the CC3000 BoosterPack board.

Table 2-7. Launchpad to BoosterPack Pin Comparison

Pin	MSP430 Port	CC3000 BoosterPack
1	VCC	VBAT_IN
2	P1.0	VBAT_SW_EN
3	P1.1/TX	NC
4	1.2/RX	NC
5	P1.3	NC
6	P1.4	NC
7	P1.5	WL_SPI_CLK
8	P2.0	NC
9	P2.1	NC
10	P2.2	NC
11	P2.3	NC
12	P2.4	NC
13	P2.5	NC
14	P1.6	WL_SPI_DOUT
15	P1.7	WL_SPI_DIN
16	T/SBWT	NC
17	T/SBW	NC
18	2.6/XOUT	WL_SPI_CS

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Table 2-7. Launchpad to BoosterPack Pin Comparison (continued)

Pin	MSP430 Port	CC3000 BoosterPack
19	P2.7/XIN	WL_SPI_IRQ
20	GND	GND

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2.5 CC3000 BoosterPack Schematic

Figure 2-8 shows the CC3000 BoosterPack schematics.

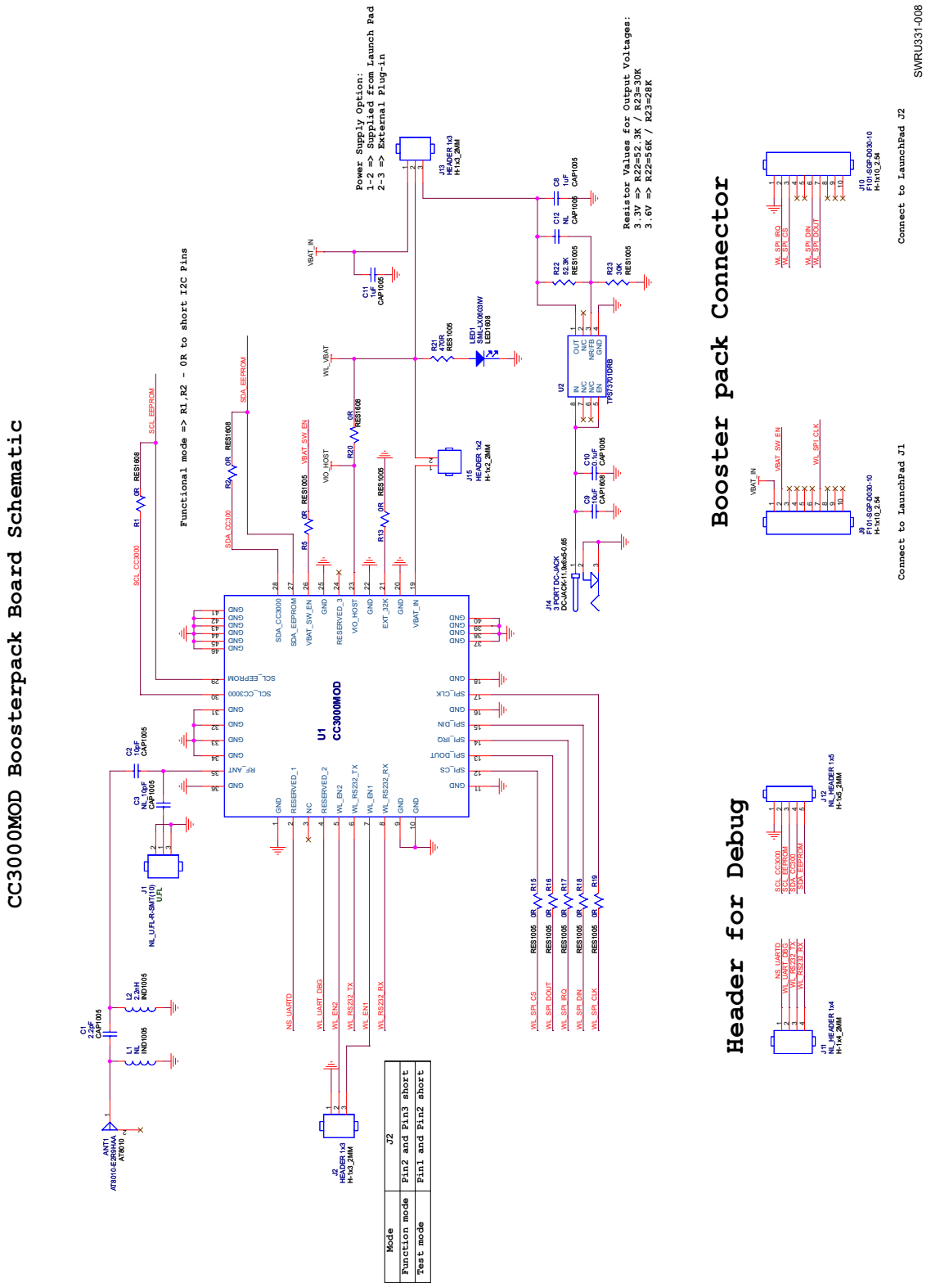

Figure 2-8. CC3000 BoosterPack Schematics

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2.6 Bill of Materials (BOM)

2.6.1 PCB Design Guidelines

The recommendations in this document refer to a two-layer PCB with the CC3000MOD. The PCB is built using standard FR4 material, and both layers are used for signal routing. TI recommends keeping the traces of the SPI signals as short as possible. Table 2-8 shows the PCB stack-up data.

Table 2-8. PCB Stack-Up Data

PCB Stack Up				Impedance	
Layer	Type	Thickness		Single end	Theory value
Top side solder mask			0.50 mil		
L1	Top	copper + plating	1.82 mil	Trace 20 space 5, 50 Ω ±10%	47.57
		Prepreg	52.20 mil	mil	
L2		copper + plating	1.82 mil	mil	
Bottom side solder mask			0.50 mil		
TOTAL			56.84 mil		
			1.44 mm		

2.6.2 RF Trace

Figure 2-9 shows a 50-Ω trace design recommended for the PCB layout.

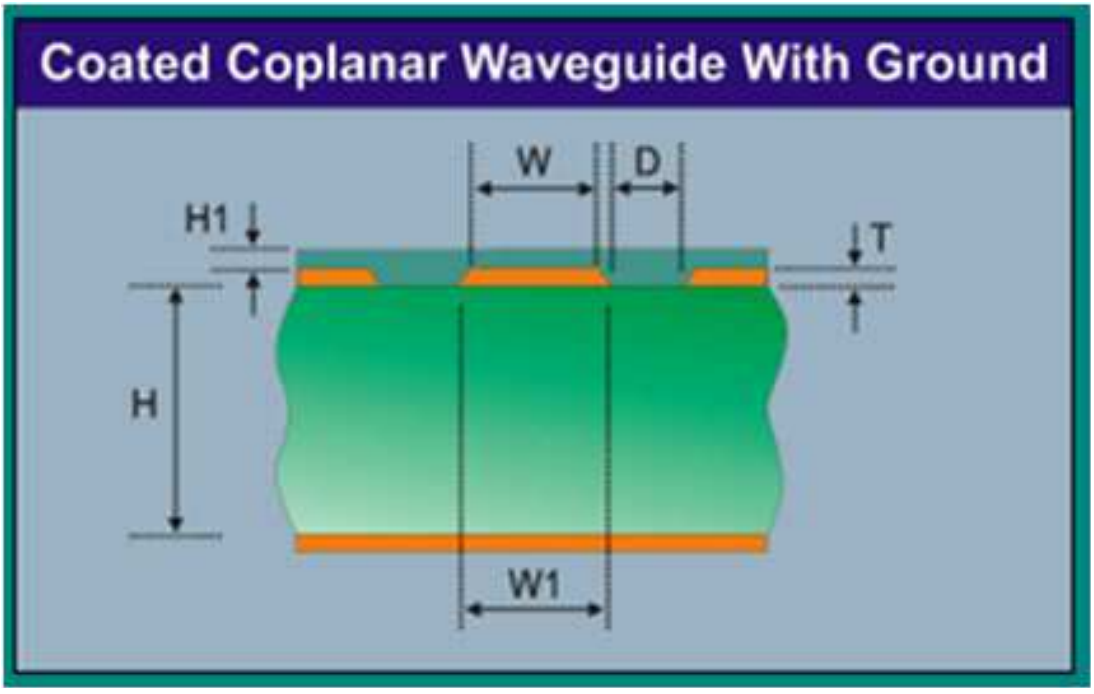

Figure 2-9. Trace Design for PCB Layout

Table 2-9. Trace Design Measurement Values

Measurement	Length
H (height between L1 and L2)	52.2 mil
H1 (height 1)	0.5 mil

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Table 2-9. Trace Design Measurement Values (continued)

Measurement	Length
W (width)	19 mil
W1 (width 1)	20 mil
T (thickness)	1.82 mil
S (grid separation)	5 mil
εr (dielectric)	4.3
Zo (impedance)	47.57

2.6.3 Antenna

Figure 2-10 shows the guidelines specified for the BoosterPack antenna.

NOTE: The antenna vendor determines the antenna guidelines.

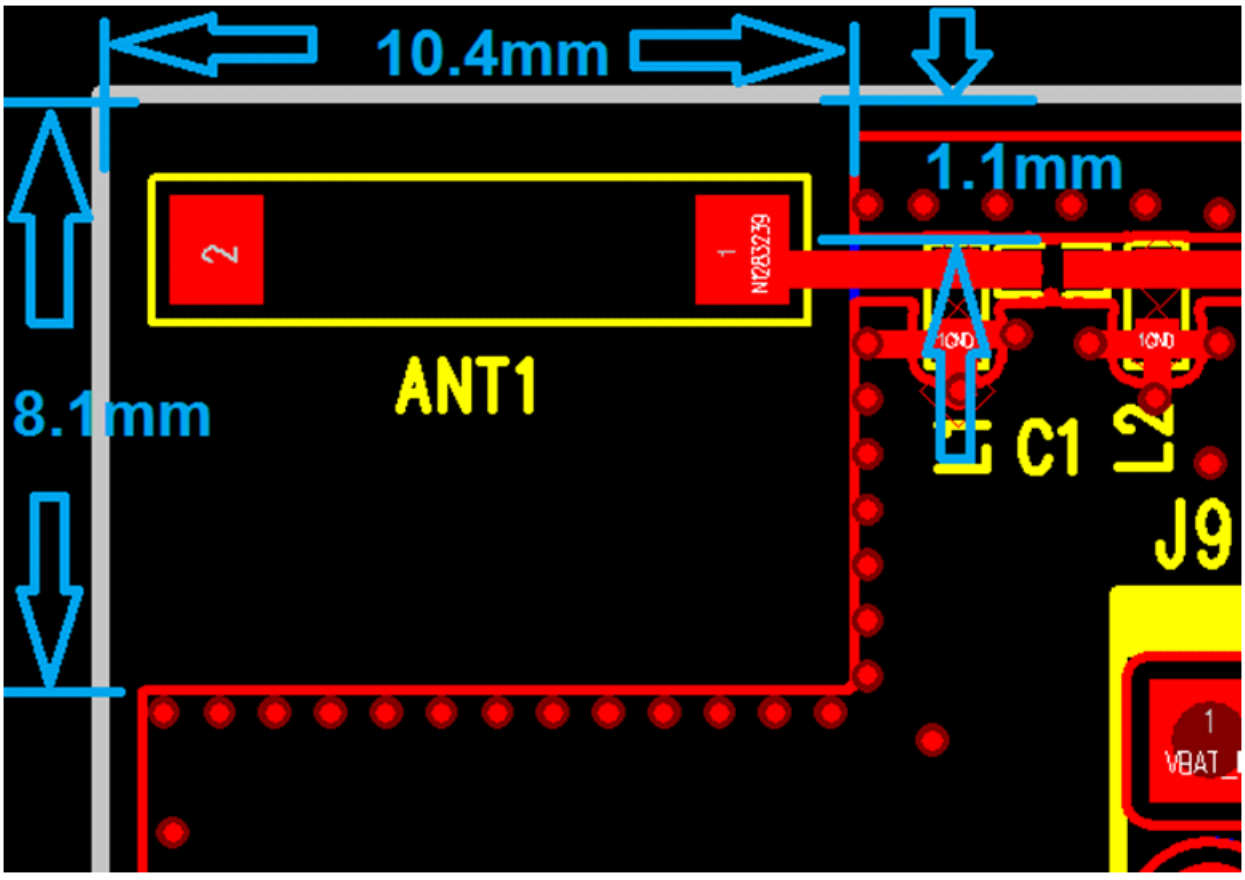

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Figure 2-10. Antenna Layout Guidelines

2.6.4 Power Trace

Figure 2-11 shows the power trace for VBAT_IN highlighted in white.

NOTE: VBAT_IN must have a thickness of 24 mil or more.

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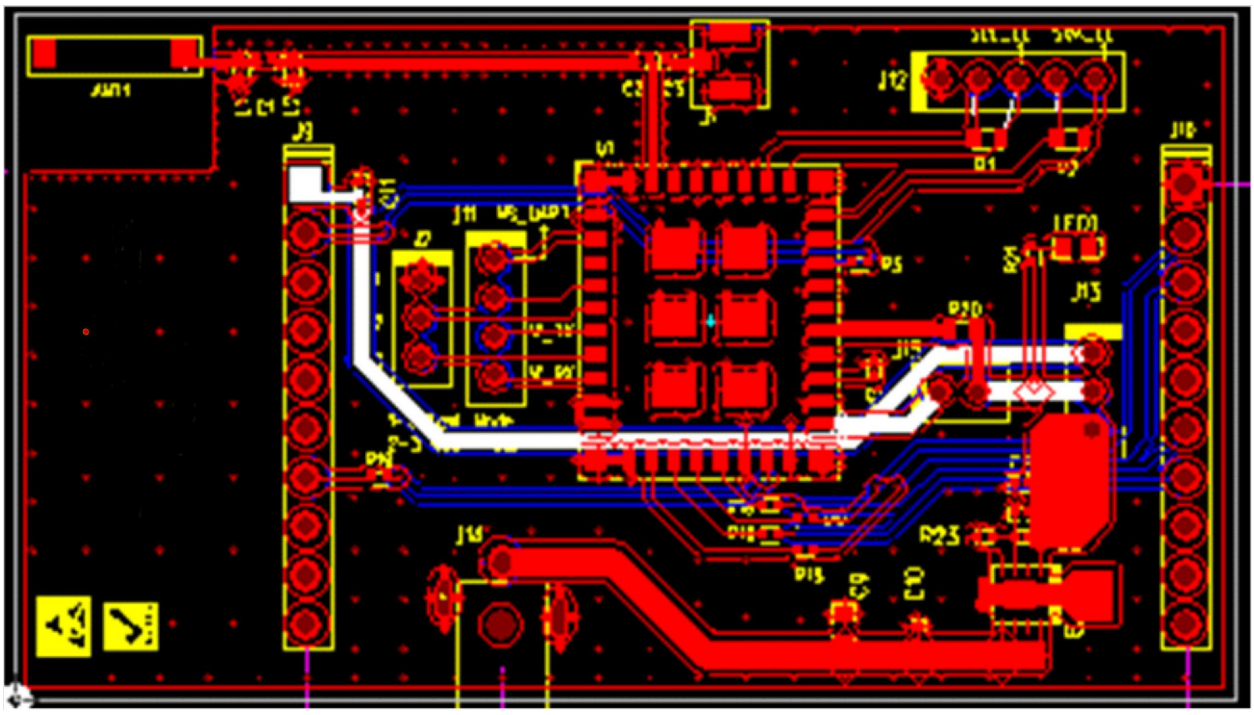

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Figure 2-11. Power Trace

2.6.5 Ground

The PCB must have a strong ground with more ground vias under the module for system stability and thermal dissipation. Ground vias must be close to the pad.

Figure 2-12 shows the ground routing for the CC3000 BoosterPack board.

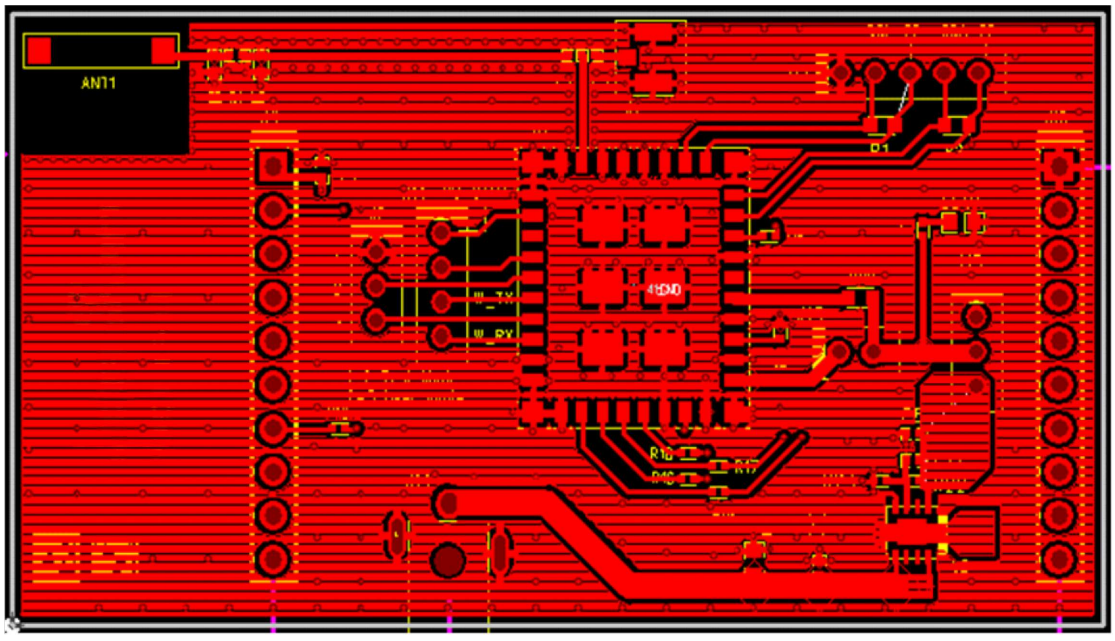

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Figure 2-12. Ground Routing for the CC3000 BoosterPack Board

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Application Development

TI supports the CC3000 BoosterPack when paired with the TI MSP-EXP430G2 Launchpad, a microcontroller (MCU) test platform.

The CC3000 BoosterPack lets users easily develop a complete Wi-Fi solution paired with the MSP-EXP430G2 Launchpad platform.

For example applications, go to the TI wiki at http://processors.wiki.ti.com/index.php/CC3000_Wi-Fi_for_MCU.

The CC3000 BoosterPack also can be used on other platforms with the same connector interface. The TI wiki also has a host driver porting guide to assist with porting to other platforms.

Figure 3-1 shows the Launchpad MSP-EXP430G2 test platform and the CC3000 BoosterPack board.

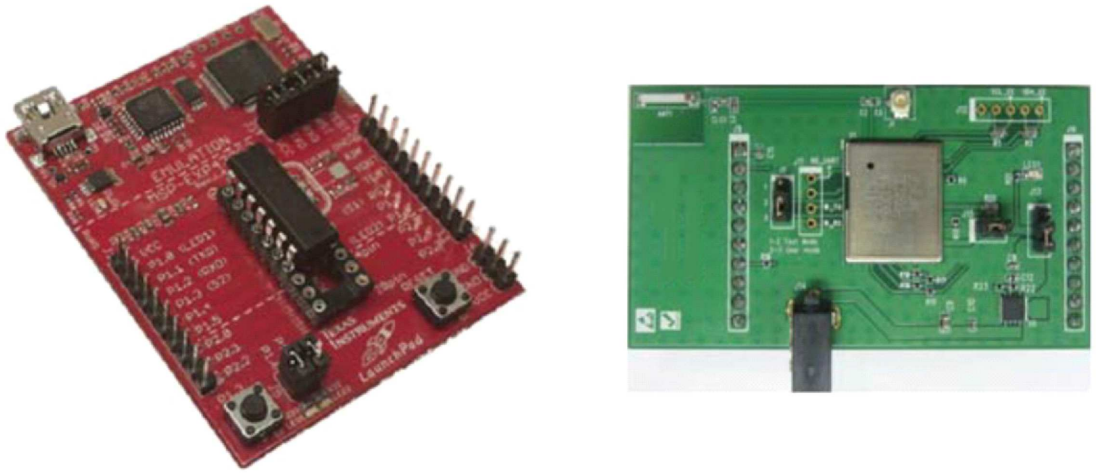

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Figure 3-1. MSP-EXP430G2 Test Platform and CC3000 BoosterPack Board

To order the MSP-EXP430G2 test platform, go to the following link:

http://www.ti.com/tool/msp-exp430g2

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