CC3100MOD Boosterpack™ (Evaluation board) User Guide

ECS Applications

Table 1.   Document Change Log

Date (Version)	Author	Approved by	Description
			Initial Release

Contents

Getting Started

1 Introduction

1.1 CC3100MOD BOOST

Introducing the CC3100MOD Booster pack compatible with all TI Launchpads for adding WIFI capability to embedded systems.

The CC3100MODBOOST Booster Pack is an easy-to-use evaluation module for the CC3100 WIFI device. It contains everything needed to start developing a WIFI solution on TI Launchpad. This board is also designed to interface with another board named CC3100EMUBOOST (FTDI based Emulation and debug board) to provide an interface to the PC for development using SimpleLink™ Studio (TI provided application and source code to develop WIFI based software on a PC)

The CC3100MOD module integrates the complete RF, digital baseband, and power management needed to provide WIFI access to any embedded system using a 8,16 ot 32 bit Microcontrollers.

Rapid prototyping is a snap thanks to the 40-pin headers and a wide variety of Launchpads available. These connectors provide stackability to ensure that other booster-packs like Audio, LCD, sensors etc. can be mounted on top or bottom of this booster-pack.

1.2 CC3100MOD Module

The CC3100MOD module is a second-generation SimpleLink™ Wi-Fi self-contained network processor module that dramatically simplifies the implementation of Internet connectivity. The CC3100MOD module is an ideal solution for embedded applications using low-cost and low-power microcontrollers with reduced board space and faster development times.

- Fully integrated module with serial flash, Crystal and RF filter. Only needs power supply and a serial interface to operate.

- 802.11 b/g/n Station With Fully Integrated Radio, Baseband, and MAC

- 802.11 Transceiver Mode

- IPv4 TCP/IP Stack

- 8 Simultaneous TCP, UDP, or RAW Sockets

- ARP, ICMP, DHCP, DNS, mDNS

- TLS 1.2/SSL 3.0 With On-Chip Accelerators

- Throughput UDP: 16 Mbps, TCP: 12 Mbps

- Interfaces With 8-, 16-, and 32-bit MCU over an SPI Interface with up to 24-MHz Clock

2   Hardware description
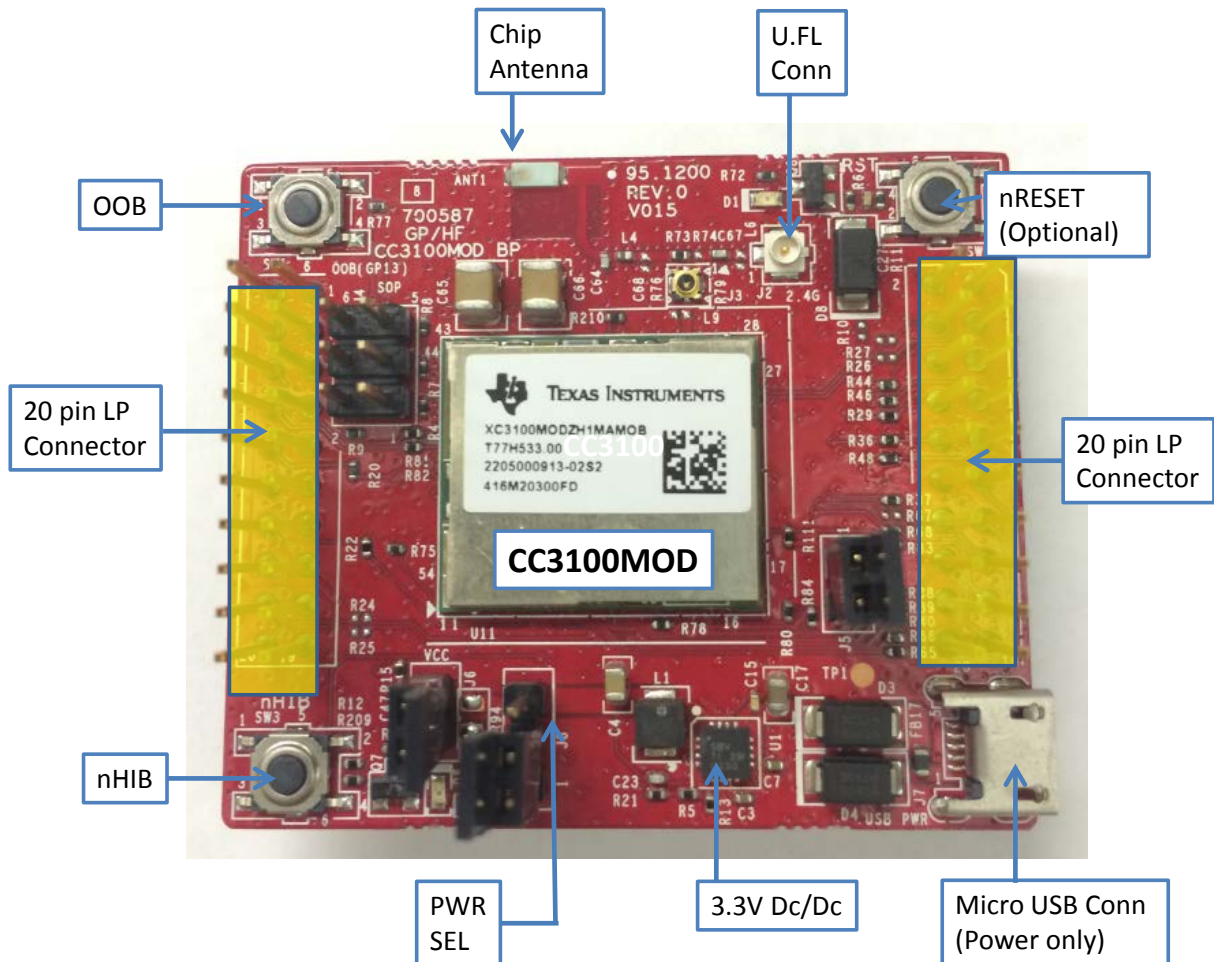
Figure 1 : CC3100MODBOOST evaluation board with the CC3100MOD Module

2.1 Block Diagram
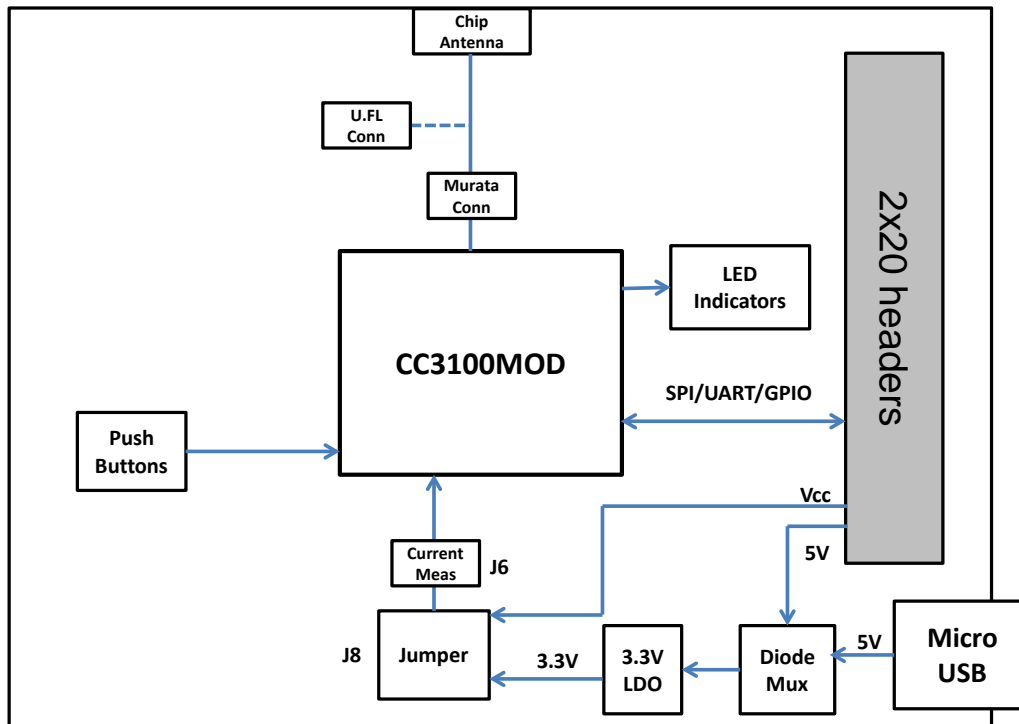
Figure 2 : CC3100MODBOOST Block diagram

2.2 Hardware Features of the evaluation board

• CC3100MOD module with fully integrated solution.

  2x20 pin stackable connectors

• On-board chip antenna with option for U.FL based conducted testing.

• Power from on-board LDO using USB OR 3.3V from MCU Launchpad

• Push buttons (3x), LEDs (2x)

• Jumper for current measurement with provision to mount 0.1R resistor for measurement with voltmeter

• 2 Layer PCB with 6mil spacing and track width.

2.3 Connector and jumper descriptions

2.3.1 Push buttons and LEDs

Push buttons

Reference	Usage	Comments
SW1	OOB Demo	This is used as an input for the OOB demo.
SW2	RESET	The use of this pin is optional. This is used to reset the CC3100 device which can also be accomplished using the nHIB button. The RESET completely erases the CC3100 RAM including the time.

LEDs

Reference	Colour	Usage	Comments
D5	RED	PWR Indication	Glows when the 3.3V power is provided to the board
D1	Yellow	nRESET	This LED is used to indicate the stated of nRESET pin. If this LED is glowing, the device is functional.
D6	Green	nHIB	This LED indicates the stated of nHIB pin. When the LED is OFF, the device is in hibernate state.

2.3.2 Jumper settings

Reference	Usage	Comments
J21	USB connector	For powering the booster pack when mated with a Launchpad. This is mandatory to use when using "Z" devices. For e.g. CC3100HZ
J8	Power selection	Choose the power supply from the

		Lauchpad or the on-board USB. J8 (1-2) power from MCU Launchpad J8 (2-3) power from on-board USB using 3.3V LDO
J6	Current measurement	For Hibernate and LPDS currents connect a ammeter across J26 : Range (< 500uA) For Active current, mount a 0.1 Ohm resistor on R42 and measure the voltage across the 0.1 Ohm resistor using a voltmeter. Range (< 50mV peak-peak)
J5	OOB Demo	Closed : GPIO_12 is hard pulled to Vcc Open : GPIO_12 is pulled to GND using 33K resistor.
J10, J9	Booster pack header	2x10 pins each connected to the Launchpad.
J3	RF Test	Murata connector (MM8030-2610) for production line tests.
J2	RF Test	U.FL connector for conducted testing in the lab.

2.3.3 2x20 pin connector assignment

The signal assignment on the 2x20 pin connector is shown below. The convention of J1..J4 is replaced with P1…P4 to avoid confusion with the actual board reference.

P1	P3
VCC(3.3V)	+5V
UN-USED	GND
UART1_TX	NC
UART1_RX	NC
nHIB	NC
UNUSED	NC
SPI_CLK	NC
UN-USED	NC
UN-USED	NC
UN-USED	NC

P4	P2
NC	GND
NC	IRQ
NC	SPI_CS
UART1_CTS	NC
UART1_RTS	nRESET
NC	SPI_MOSI
NWP_LOG_TX	SPI_MISO
WLAN_LOG_TX	NC
NC	NC
NC	NC

Outer row connectors

Pin No	Signal Name	Direction
P1.1	VCC(3.3V)	IN
P1.2	UN-USED	NA
P1.3	UART1_TX	OUT
P1.4	UART1_RX	IN
P1.5	nHIB	IN
P1.6	UNUSED	NA
P1.7	SPI_CLK	IN
P1.8	UN-USED	NA
P1.9	UN-USED	NA
P1.10	UN-USED	NA

Pin No	Signal Name	Direction
P2.1	GND	IN
P2.2	IRQ	OUT
P2.3	SPI_CS	IN
P2.4	UN-USED	NA
P2.5	nRESET	IN
P2.6	SPI_MOSI	IN
P2.7	SPI_MISO	OUT
P2.8	UN-USED	NA
P2.9	UN-USED	NA
P2.10	UN-USED	NA

Inner row connectors

Pin No	Signal Name	Direction
P3.1	+5V	IN
P3.2	GND	IN
P3.3	UN-USED	NA
P3.4	UN-USED	NA
P3.5	UN-USED	NA
P3.6	UN-USED	NA
P3.7	UN-USED	NA
P3.8	UN-USED	NA
P3.9	UN-USED	NA
P3.10	UN-USED	NA

Pin No	Signal Name	Direction
P4.1	UN-USED	OUT
P4.2	UN-USED	OUT
P4.3	UN-USED	NA
P4.4	UART1_CTS	IN
P4.5	UART1_RTS	OUT
P4.6	UN-USED	NA
P4.7	NWP_LOG_TX	OUT
P4.8	WLAN_LOG_TX	OUT
P4.9	UN-USED	IN
P4.10	UN-USED	OUT

Note :

All signals are 3.3V COMS logic levels and is referred w.r.t. CC3100MOD. For e.g. UART1_TX is an output from the CC3100MOD.

For the SPI lines, the CC3100MOD always acts like a slave.

2.4   Power

The board is designed to accept power from a mated Launchpad or from the CC3100EMUBOOST board. Some of the launchpads are not capable of sourcing the peak current requirements of the WIFI. In such a case the USB connector on the CC3100MODBOOST can be used to aid the peak current. The use of schottky diodes ensure that the load sharing happens between the USB connectors on the Launchpad and the Boosterpack without any board modifications.

Also the 3.3V power can be sourced from the Launchpad or from the 3.3V LDO on the board. This is done by using the jumper J8. In the case where the Launchpad is not able to source the 3.3V upto 350mA, then the J8 needs to be configured to work from the on-board LDO

2.4.1 Power from the Launchpad or CC3100EMUBOOST

The most common scenario will be to power the CC3100MODBOOST from the mated Launchpad. In this case the Launchpad provides 3.3V to the Booster-pack for its operation. In addition to the 3.3V the Launchpad provides a 5V from the USB which is used to drive a 3.3V LDO on the Booster-pack. This LDO sources the 3.3V used for the top die flash used on development models.
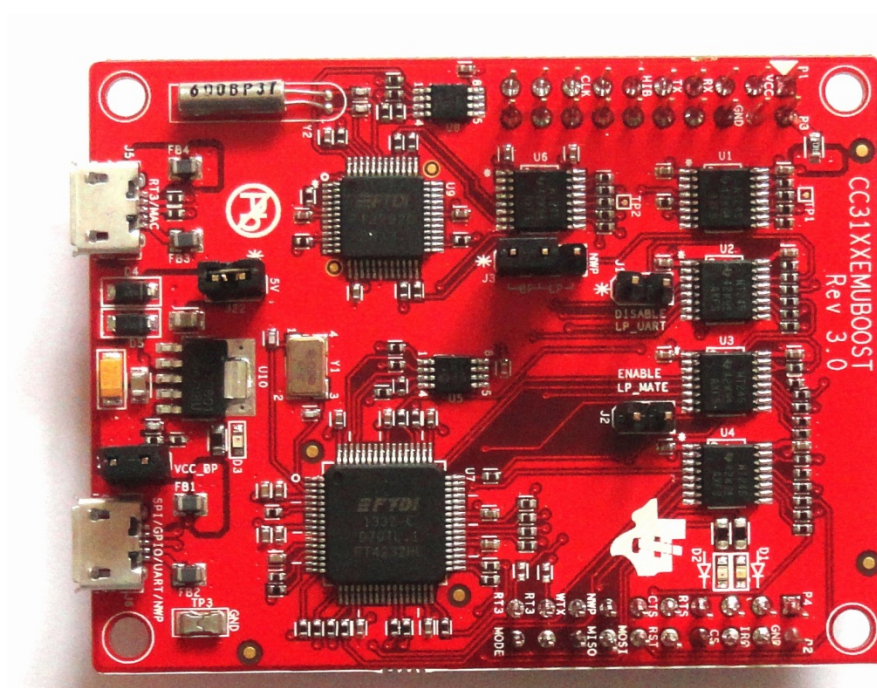
3 Connecting to the PC using EMUBOOST

3.1 CC31XXEMUBOOST

3.1.1 Overview

The CC31XXEMUBOOST is designed to connect the CC3100MODBOOST pack to a PC using USB connection. This is used to update the firmware on the BP using the "SL_Prog" utility and also in software development using "SL_Studio".

3.1.2 Hardware details

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

Ports available on J6

Port No	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. TX only

Note : On the PC only two of the four ports would be visible on the Device Manager. The D2XX ports are not listed under the "Ports" tab.

The first COM port in the list usually is used for the flash programming.

```
▷ 📖 Portable Devices
▲ 🖥 Ports (COM & LPT)
     🖫 CC3100BP PORT (COM7)
     🖫 CC3100BP PORT (COM8)
     🖫 ECP Printer Port (LPT1)
▷ 💻 Processors
```

Ports available on J5

Port No	Port Type	Usage	Comments
1	VCP	RT3	Used for TI internal debug only.
2	VCP	MAC logger	MAC logger output. TX only

3.1.3 Driver requirements

The FTDI Debug board requires the user to install the associated drivers on a PC. This package is available as part of the SDK release and would be located at [Install-Path]\cc3100-sdk\tools\cc31xx_board_drivers\.

The install path is usually C:\ti\cc3100SDK

3.2 Mating the boards

The image above shows the connection of the CC3100MODBOOST to the CC3100EMUBOOST Board. The connectors should be aligned carefully considering that it does not have a polarity protection. The pin-1 of the connectors are marked on the board using a small triangle marking and these should be aligned while mating.

Caution :

Align the pin-1 of the boards together using the triangle marking on the PCB. An incorrect mating can destroy the boards permanently.

Ensure that none of the header pins are bent before mating the two boards. Jumper settings on the CC3100BOOST

3.3 Jumper settings on the EMUBOOST

The following table specifies the jumpers to be installed while mating with the FTDI board.

No	Jumper settings	Notes
1	J4 (short)	Provide 3.3V to the Booster pack

| 2 | J22 (short) | Provide 5.0V to the Booster pack |
| 3 | J3 (1-2) | Route the NWP logs to the Dual port also |

The rest of the jumpers can remain open.

With these done, the EMUBOOST would resemble the board in the next section

4   Connecting to a Launchpad

The CC3100MOD Booster pack can be directly connected to a compatible Launchpad using the standard 2x20 pin connectors. The jumper settings needed for this connection is the same as that needed for the EMUBOOST board as described in the previous section.

Please ensure that the Pin1 of the 2x20 pins are aligned correctly before mating. The mated setup is as per the picture below. (Note the USB cable is connected to the Booster Pack directly to power it only. For debugging, the USB cable on the Launchpad is also required)

4.1   Launchpad current limitation

Some of the launchpads including the MSP430FRAM launchpads do not provide enough current to power the CC3100MOD booster pack. The booster pack can consume upto 400mA peak from the 3.3V and hence it may be needed to power is separately.

For this a USB connector is provided on the Booster Pack to provide the 3.3V separately.

The power supply jumpers shall be configured as below when the power is supplied from the on-board USB connector.

Important: Since there are two power sources in this setup it is important to follow the power-up sequence.

Note : Always power the Booster Pack before powering the Launchpad. Failure to follow this sequence may end up damaging the booster-pack permanently.
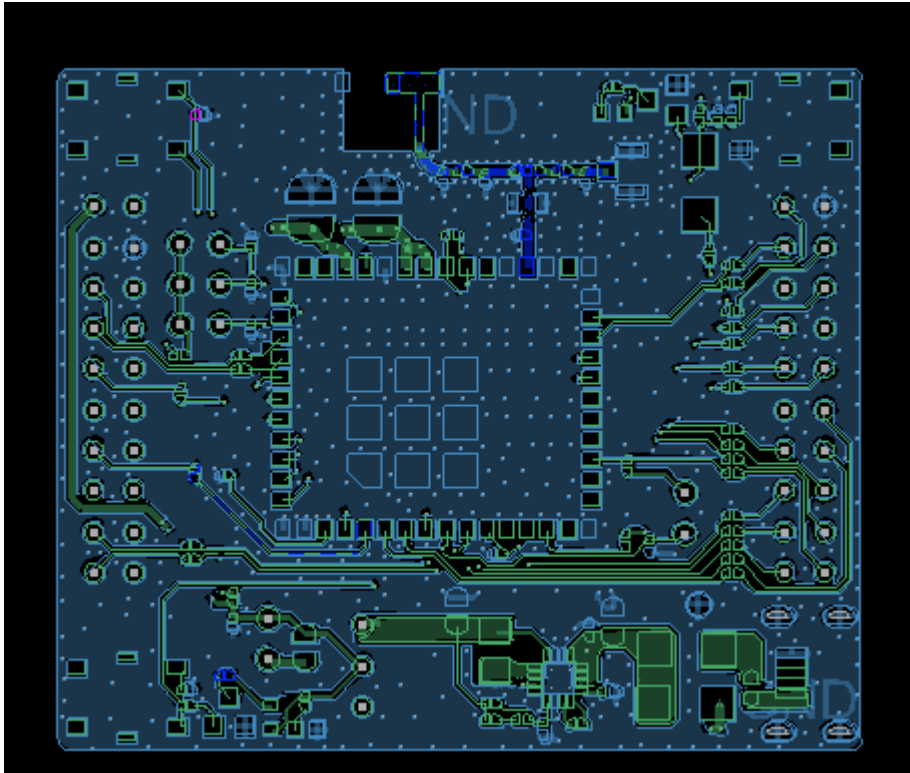
5 PCB information

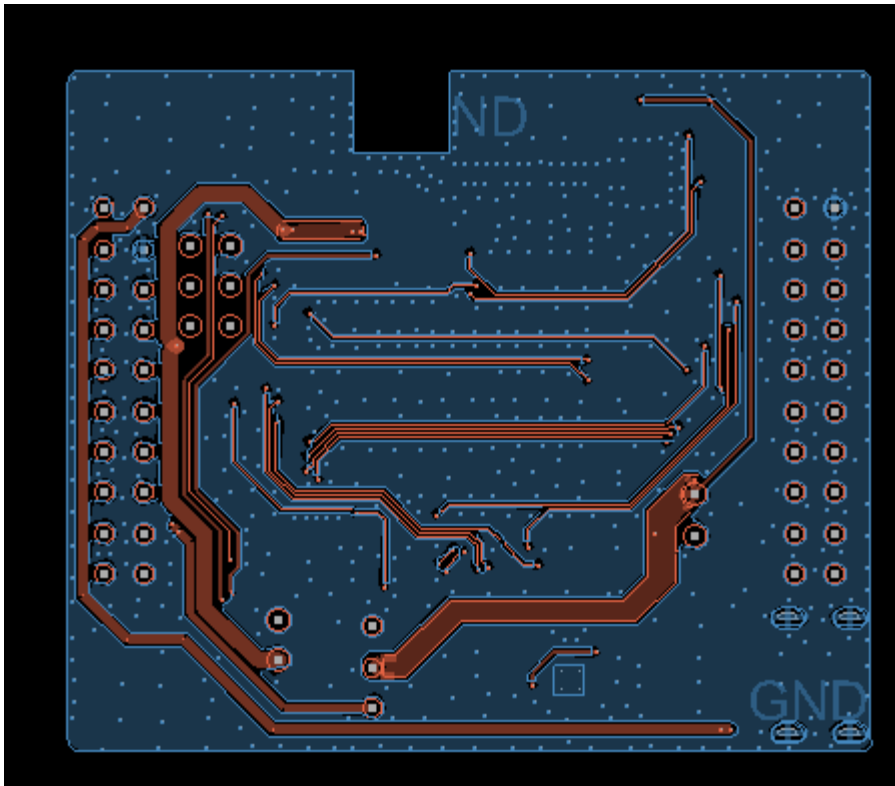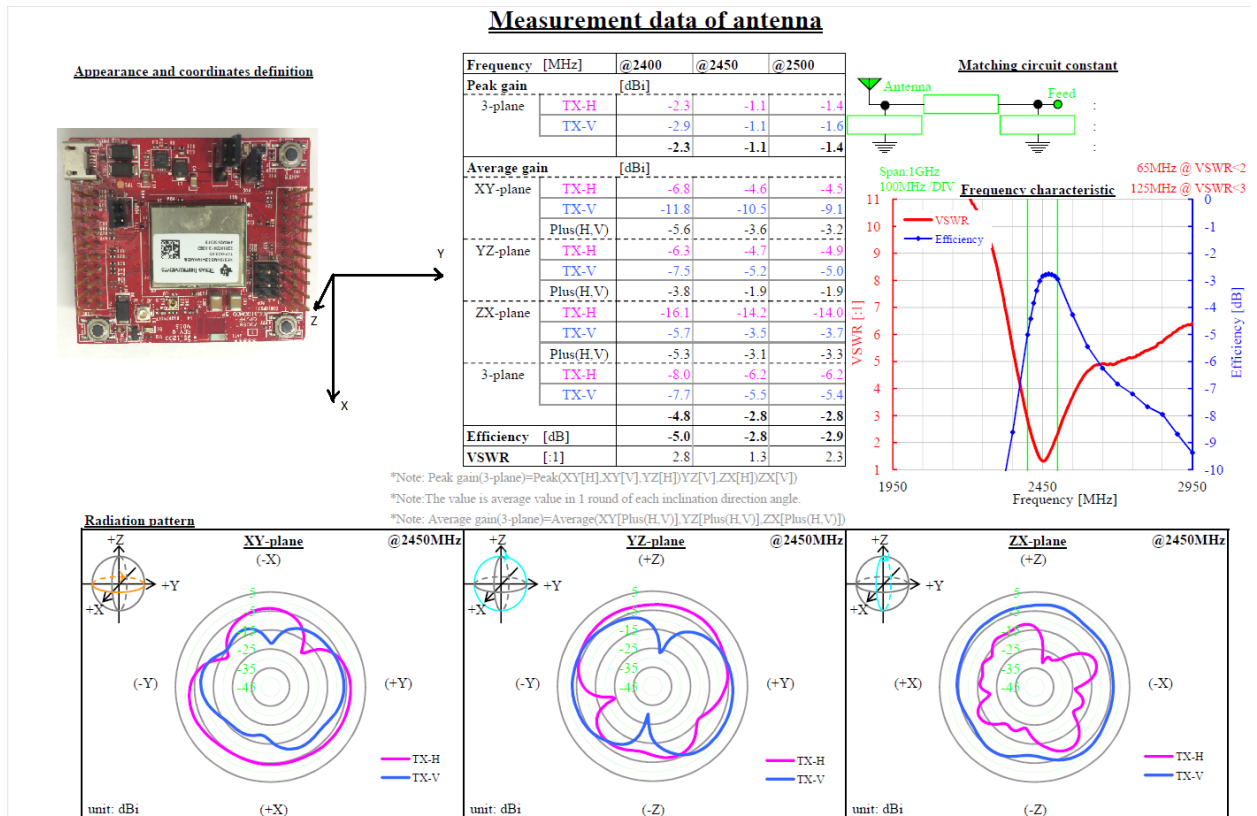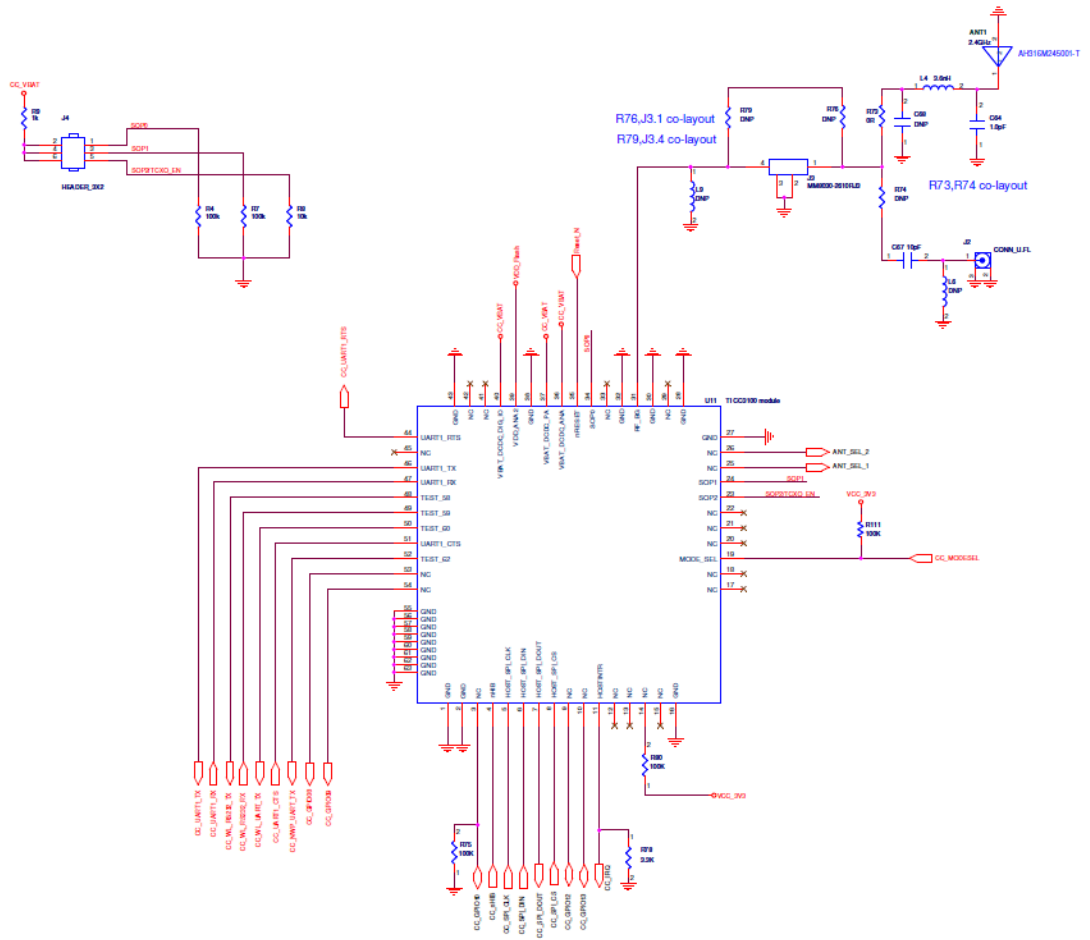## 5.1 Layout information

Figure 3 : Layer-1

Figure 4 : Layer-2

5.2 Antenna pattern

The antenna used on the evaluation platform is a chip antenna from Taiyo Yuden (AH316M245001-T). The below figures depict the radiation patter from this chip antenna. Note that the radiation pattern is influenced by presence of any metal parts nearby.

Measurement data of antenna

Appearance and coordinates definition

Frequency	[MHz]		@2400	@2450	@2500
Peak gain		[dBi]			
3-plane	TX-H		-2.3	-1.1	-1.4
	TX-V		-2.9	-1.1	-1.6
			-2.3	-1.1	-1.4
Average gain		[dBi]			
XY-plane	TX-H		-6.8	-4.6	-4.5
	TX-V		-11.8	-10.5	-9.1
	Plus(H,V)		-5.6	-3.6	-3.2
YZ-plane	TX-H		-6.3	-4.7	-4.9
	TX-V		-7.5	-5.2	-5.0
	Plus(H,V)		-3.8	-1.9	-1.9
ZX-plane	TX-H		-16.1	-14.2	-14.0
	TX-V		-5.7	-3.5	-3.7
	Plus(H,V)		-5.3	-3.1	-3.3
3-plane	TX-H		-8.0	-6.2	-6.2
	TX-V		-7.7	-5.5	-5.4
			-4.8	-2.8	-2.8
Efficiency	[dB]		-5.0	-2.8	-2.9
VSWR	[:1]		2.8	1.3	2.3

*Note: Peak gain(3-plane)=Peak(XY[H],XY[V],YZ[H]YZ[V],ZX[H]ZX[V])
*Note:The value is average value in 1 round of each inclination direction angle.
*Note: Average gain(3-plane)=Average(XY[Plus(H,V)],YZ[Plus(H,V)],ZX[Plus(H,V)])

Matching circuit constant

Span:1GHz 100MHz /DIV

65MHz @ VSWR<2
125MHz @ VSWR<3

Frequency characteristic

Radiation pattern

XY-plane (-X) @2450MHz
unit: dBi

YZ-plane (+Z) @2450MHz
unit: dBi

ZX-plane (+Z) @2450MHz
unit: dBi

5.3 Schematics

Host platform interface

Female headers on BP on bottom side
Male headers on Launch Pad on top side

5V to 3.3V Convertor

Test point for GND probe
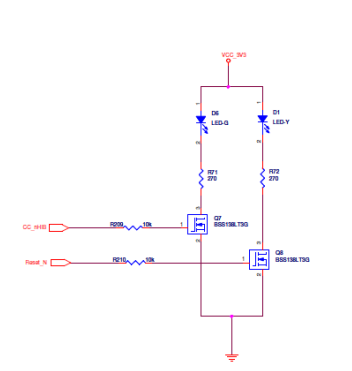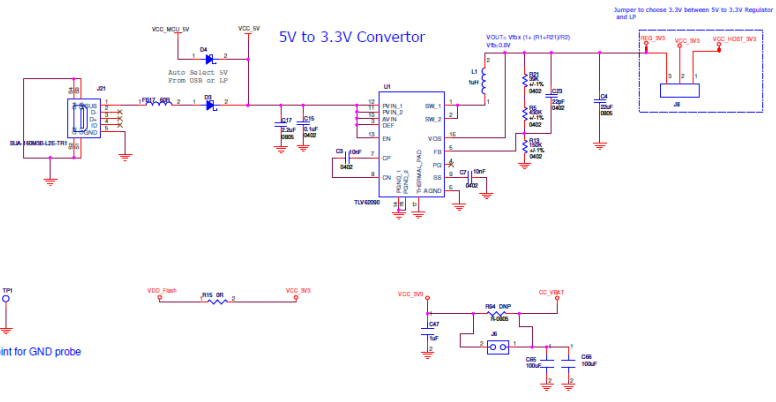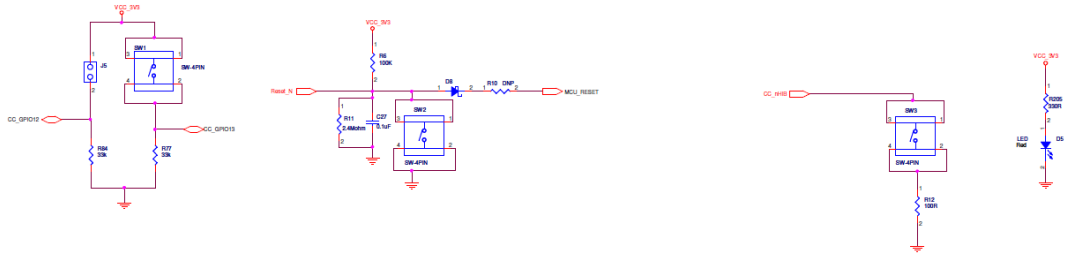
5.4 Bill of materials

Qty	Description	PCB Footprint	Part Number	Manufacturer	Mfr. PN	Part Reference
2	CAP CER 100nF 10% 10V SMD 0402 GP/HF X5R 0.5mm	C-0402S0	202.00008.015	Murata	GRM155R61A104KA01D	C15 C27
14	RES C SMD 0402 0ohm 5% GP/HF	C-0402S0	251.00681.025	Yageo	RC0402JR-070RL	R15 R22 R29 R36 R37 R38 R44 R46 R48 R65 R66 R73 R81 R82
1	RES C SMD 0402 100ohm 5% GP/HF	R-0402S0	251.00004.005	Yageo	RC0402JR-07100RL	R12
6	RES C SMD 0402 100kohm 1% GP/HF	r-0402s0	261.00840.025	Yageo	RC0402FR-07100KL	R4 R6 R7 R75 R80 R111
2	CAP CER 100uF 20% 6.3V SMD 1210 GP/HF X5R 2.5mm	C-1210	205.00025.005	MURATA	GRM32ER60J107ME20L	C65 C66
3	RES C SMD 0402 10Kohm 1% GP/HF	r-0402s0	261.00839.035	Yageo	RC0402FR-0710KL	R8 R209 R210
2	CAP CER 10nF 10% 50V SMD 0402 GP/HF X7R T=0.5mm	C-0402S0	202.01141.015	MURATA	GRM155R71H103KA88D	C3 C7
1	CAP CER 10pF +-0.25pF 50V SMD 0402 GP/HF NPO 0.5mm	C-0402S0	202.00035.005	WALSIN	0402N100C500LT	C67
1	CAP CER 1.0pF +-0.25pF 50V SMD 0402 GP/HF NPO T=0.55mm	C-0402S0	202.00021.005	WALSIN	0402N1R0C500LT	C64
1	EU-GP RES C SMD 0402 150Kohm 1% GP/HF	r-0402s0	261.00013.005	TA-I	RM04FTN1503	R13
3	SW TACT 50mA 12V SMD ST GP/HF	SW-1BT002S1	182.00083.005	FOXCONN	1BT002-0120L-7H	SW1 SW2 SW3
2	RES C SMD 0402 1Kohm 1% GP/HF	r-0402s0	261.00835.025	Yageo	RC0402FR-071KL	R9 R20
1	CAP CER 1uF 10% 6.3V SMD 0402 GP/HF X5R 0.5mm	C-0402S0	202.00059.035	MURATA	GRM155R60J105KE19D	C47
1	CN-GP IND WW 1uH 20% 1.4A 0.044ohm SMD GP/	L-S3X3A	132.00816.005	MURATA	LQH3NPN1R0MM0L	L1
1	2.4G WIFI chip antenna	ANT-S3_2X1_6-2A	JSAH316M245001	Taiyo_Yuden	AH316M245001-T	ANT1
1	RES C SMD 0402 2.4Mohm 5% GP/HF	R-0402S0	251.00691.005	TA-I	RM04JTN245	R11
1	CN-GP CAP CER 22pF 5% 50V SMD 0402 GP/HF N	C-0402S0	202.01137.035	MURATA	GRM1555C1H220JA01D	C23
1	CN-GP CAP CER 22uF 20% 6.3V SMD 0805 GP/HF	C-0805	204.00611.005	MURATA	GRM21BR60J226ME39L	C4
0	CN-GP CAP CER 22uF 20% 6.3V SMD 0805 GP/HF	C-0805	204.00621.005	TDK	C2012X5R0J226MT	C4
1	CAP CER 2.2uF 10% 16V SMD 0805 GP/HF X7R T=1.25mm	C-0805	204.00625.015	MURATA	GRM21BR71C225KA12L	C17
0	CAP CER 2.2uF 10% 16V SMD 0805 GP/HF X7R T=1.25mm	C-0805	204.00625.005	WALSIN	0805B225K160CT	C17
2	RES C SMD 0402 270ohm 5% GP/HF	R-0402S0	251.00025.025	Yageo/Phycomp.	RC0402JR-07270RL	R71 R72
1	RES C SMD 0402 3.3Kohm 5% GP/HF	r-0402s0	251.00027.005	TA-I	RM04JTN332	R78
1	IND C 3.6nH 0.3nH 300mA 0.2ohm Q=8 SMD 0402 GP/HF	l-0402s0	130.01491.005	TAIYO	HK10053N6S-T	L4
1	RES C SMD 0402 330ohm 1% GP/HF	R-0402S0	261.00040.025	Yageo/Phycomp.	RC0402FR-07330RL	R205
2	RES C SMD 0402 33Kohm 1% GP/HF	R-0402S0	261.01048.005	TA-I	RM04FTN3302	R77 R84
1	EU-GP RES C SMD 0402 39Kohm 1% GP/HF	R-0402S0	261.00868.005	TA-I	RM04FTN3902	R21
1	RES C SMD 0402 430Kohm 1% GP/HF	R-0402S0	261.01419.005	WALSIN	WR04X4303FTL	R5
1	BEAD C 60ohm 25% 4A 0.02ohm SMD 0603 GP/HF	L-0603S0	151.00402.005	CHILISIN	UPB160808T-600Y-N	FB17
1	HEADER PIN 3P 2.54mm DIP MALE ST GP	CN-3X1-2_54	341.00543.005	CVILUX	CH31032V200	J8
1	HEADER RF 1*1PORT D0.5/D2.0mm SMD MALE ST GP/HF	CJ-RF-S3_1X3-3	341.00021.005	FOXCONN	KK23017-01-7F	J2
1	IC DC-DC 2.5~5.5V SMD QFN16 GP TLV62090RGTR	tqfn-3x3-16eshs1	029.00431.005	TI	TLV62090RGTR	U1
3	DIODE SBD 40V 2A SMD SMA GP B240A-13-F DIODES	M-D-SMAH2_3	112.00010.005	DIODES	B240A-13-F	D3 D4 D8
2		cn-10x2-2_54c	JSSSQ-110-03-G	Samtec	SSQ-110-03-G-D	J9 J10
1	HEADER PIN 2*3P 2.54mm DIP MALE ST GP	cn-D3x2-2_54HD	341.00544.005	CVILUX	CH81062V200	J4
2	HEADER PIN 1*2P 2.54mm DIP MALE ST GP	CN-D2X1-2_54S0	341.00391.005	CVILUX	CH31022V202	J5 J6
1	LED CHIP 35mcd G 571nm 2P SMD 1.6*0.8mm GP/HF LTST-C190K	LD-0603S0	123.00170.005	LITEON	LTST-C190KGKT	D6
1	LED CHIP 60mcd O 605nm 2P SMD 1.6*0.8mm GP/HF LTST-C190K	LD-0603A	123.00171.005	LITEON	LTST-C190KFKT	D1
1	LED CHIP 45~180mcd R 624~638nm 2P SMD 1.6*0.8mm GP/HF	LD-0603S0	123.00172.005	LITEON	LTST-C190KRKT	D5
1	CONN MICRO USB B 5PIN 0.65mm SMD FEMALE RT GP	CJ-USBSUA-160M3B-L2AT	342.00757.005	POWERWAY	SUA-160M3B-L2E-TR1	J7
1	HEADER RF 1*1PORT D=0.5/1.35mm SMD FEMALE ST GP	CN-MM8030S0	341.00454.005	MURATA	MM8030-2610RJ3	J3
2	MOSFET N-CH 50V 200MA SOT-23	sot-23b	104.00459.005	On Semi	BSS138LT3G	Q7 Q8
5	CONN JUMPER 2P 2.54mm FEMALE RT GP		340.00013.005	FOXCONN	SJ2520H-A0	
1	PCB 2L OSP REV.025 8PCS GP/HF 43.18*50.8mm 95.1200T00		307.00587.025	ZHENDING/APCB	307.00587.025	PCB
1	Module, 802.11bgn 1x1, 17.5mm x20.5mm	LGA	T77H533.00	FOXCONN	T77H533.00	U11
0.2	CN-GP SOLDER PASTE S3X58 M500 GP/HF		591.00046.005	KOKI	S3X58-M500	
0	CN-GP SOLDER PASTE S01X7C58-M500 GP/HF		591.00056.005	KOKI	S01X7C58-M500	

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2.1 These terms and conditions do not apply to Software. The warranty, if any, for Software is covered in the applicable Software License Agreement.

2.2 TI warrants that the TI EVM will conform to TI's published specifications for ninety (90) days after the date TI delivers such EVM to User. Notwithstanding the foregoing, TI shall not be liable for any defects that are caused by neglect, misuse or mistreatment by an entity other than TI, including improper installation or testing, or for any EVMs that have been altered or modified in any way by an entity other than TI. Moreover, TI shall not be liable for any defects that result from User's design, specifications or instructions for such EVMs. Testing and other quality control techniques are used to the extent TI deems necessary or as mandated by government requirements. TI does not test all parameters of each EVM.

2.3 If any EVM fails to conform to the warranty set forth above, TI's sole liability shall be at its option to repair or replace such EVM, or credit User's account for such EVM. TI's liability under this warranty shall be limited to EVMs that are returned during the warranty period to the address designated by TI and that are determined by TI not to conform to such warranty. If TI elects to repair or replace such EVM, TI shall have a reasonable time to repair such EVM or provide replacements. Repaired EVMs shall be warranted for the remainder of the original warranty period. Replaced EVMs shall be warranted for a new full ninety (90) day warranty period.

3 *Regulatory Notices:*

3.1 *United States*

3.1.1 *Notice applicable to EVMs not FCC-Approved:*

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

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

CAUTION

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

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

FCC Interference Statement for Class A EVM devices

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

FCC Interference Statement for Class B EVM devices

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

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

3.2 *Canada*
3.2.1 *For EVMs issued with an Industry Canada Certificate of Conformance to RSS-210*

Concerning EVMs Including Radio Transmitters:
This device complies with Industry Canada license-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.
Concernant les EVMs avec appareils radio:
Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes: (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

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

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

3.3 *Japan*
3.3.1 *Notice for EVMs delivered in Japan:* Please see http://www.tij.co.jp/lsds/ti_ja/general/eStore/notice_01.page 日本国内に輸入される評価用キット、ボードについては、次のところをご覧ください。
http://www.tij.co.jp/lsds/ti_ja/general/eStore/notice_01.page
3.3.2 *Notice for Users of EVMs Considered "Radio Frequency Products" in Japan:* EVMs entering Japan are NOT certified by TI as conforming to Technical Regulations of Radio Law of Japan.
If User uses EVMs in Japan, User is required by Radio Law of Japan to follow the instructions below with respect to EVMs:
1. Use EVMs in a shielded room or any other test facility as defined in the notification #173 issued by Ministry of Internal Affairs and Communications on March 28, 2006, based on Sub-section 1.1 of Article 6 of the Ministry's Rule for Enforcement of Radio Law of Japan,
2. Use EVMs only after User obtains the license of Test Radio Station as provided in Radio Law of Japan with respect to EVMs, or
3. Use of EVMs only after User obtains the Technical Regulations Conformity Certification as provided in Radio Law of Japan with respect to EVMs. Also, do not transfer EVMs, unless User gives the same notice above to the transferee. Please note that if User does not follow the instructions above, User will be subject to penalties of Radio Law of Japan.

【無線電波を送信する製品の開発キットをお使いになる際の注意事項】
本開発キットは技術基準適合証明を受けておりません。
本製品のご使用に際しては、電波法遵守のため、以下のいずれかの措置を取っていただく必要がありますのでご注意ください。
1. 電波法施行規則第6条第1項第1号に基づく平成18年3月28日総務省告示第173号で定められた電波暗室等の試験設備でご使用いただく。
2. 実験局の免許を取得後ご使用いただく。
3. 技術基準適合証明を取得後ご使用いただく。
なお、本製品は、上記の「ご使用にあたっての注意」を譲渡先、移転先に通知しない限り、譲渡、移転できないものとします。
上記を遵守頂けない場合は、電波法の罰則が適用される可能性があることをご留意ください。
日本テキサス・インスツルメンツ株式会社
東京都新宿区西新宿６丁目２４番１号
西新宿三井ビル
3.3.3 *Notice for EVMs for Power Line Communication:* Please see http://www.tij.co.jp/lsds/ti_ja/general/eStore/notice_02.page
電力線搬送波通信についての開発キットをお使いになる際の注意事項については、次のところをご覧ください。http://www.tij.co.jp/lsds/ti_ja/general/eStore/notice_02.page

4 *EVM Use Restrictions and Warnings:*
4.1 EVMS ARE NOT FOR USE IN FUNCTIONAL SAFETY AND/OR SAFETY CRITICAL EVALUATIONS, INCLUDING BUT NOT LIMITED TO EVALUATIONS OF LIFE SUPPORT APPLICATIONS.
4.2 User must read and apply the user guide and other available documentation provided by TI regarding the EVM prior to handling

or using the EVM, including without limitation any warning or restriction notices. The notices contain important safety information related to, for example, temperatures and voltages.

4.3 *Safety-Related Warnings and Restrictions:*

4.3.1 User shall operate the EVM within TI's recommended specifications and environmental considerations stated in the user guide, other available documentation provided by TI, and any other applicable requirements and employ reasonable and customary safeguards. Exceeding the specified performance ratings and specifications (including but not limited to input and output voltage, current, power, and environmental ranges) for the EVM may cause personal injury or death, or property damage. If there are questions concerning performance ratings and specifications, User should contact a TI field representative prior to connecting interface electronics including input power and intended loads. Any loads applied outside of the specified output range may also result in unintended and/or inaccurate operation and/or possible permanent damage to the EVM and/or interface electronics. Please consult the EVM user guide prior to connecting any load to the EVM output. If there is uncertainty as to the load specification, please contact a TI field representative. During normal operation, even with the inputs and outputs kept within the specified allowable ranges, some circuit components may have elevated case temperatures. These components include but are not limited to linear regulators, switching transistors, pass transistors, current sense resistors, and heat sinks, which can be identified using the information in the associated documentation. When working with the EVM, please be aware that the EVM may become very warm.

4.3.2 EVMs are intended solely for use by technically qualified, professional electronics experts who are familiar with the dangers and application risks associated with handling electrical mechanical components, systems, and subsystems. User assumes all responsibility and liability for proper and safe handling and use of the EVM by User or its employees, affiliates, contractors or designees. User assumes all responsibility and liability to ensure that any interfaces (electronic and/or mechanical) between the EVM and any human body are designed with suitable isolation and means to safely limit accessible leakage currents to minimize the risk of electrical shock hazard. User assumes all responsibility and liability for any improper or unsafe handling or use of the EVM by User or its employees, affiliates, contractors or designees.

4.4 User assumes all responsibility and liability to determine whether the EVM is subject to any applicable international, federal, state, or local laws and regulations related to User's handling and use of the EVM and, if applicable, User assumes all responsibility and liability for compliance in all respects with such laws and regulations. User assumes all responsibility and liability for proper disposal and recycling of the EVM consistent with all applicable international, federal, state, and local requirements.

5. *Accuracy of Information:* To the extent TI provides information on the availability and function of EVMs, TI attempts to be as accurate as possible. However, TI does not warrant the accuracy of EVM descriptions, EVM availability or other information on its websites as
accurate, complete, reliable, current, or error-free.

6. *Disclaimers:*
6.1 EXCEPT AS SET FORTH ABOVE, EVMS AND ANY WRITTEN DESIGN MATERIALS PROVIDED WITH THE EVM (AND THE DESIGN OF THE EVM ITSELF) ARE PROVIDED "AS IS" AND "WITH ALL FAULTS." TI DISCLAIMS ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, REGARDING SUCH ITEMS, INCLUDING BUT NOT LIMITED TO ANY IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OR NON-INFRINGEMENT OF ANY THIRD PARTY PATENTS, COPYRIGHTS, TRADE SECRETS OR OTHER INTELLECTUAL PROPERTY RIGHTS.
6.2 EXCEPT FOR THE LIMITED RIGHT TO USE THE EVM SET FORTH HEREIN, NOTHING IN THESE TERMS AND CONDITIONS SHALL BE CONSTRUED AS GRANTING OR CONFERRING ANY RIGHTS BY LICENSE, PATENT, OR ANY OTHER INDUSTRIAL OR INTELLECTUAL PROPERTY RIGHT OF TI, ITS SUPPLIERS/LICENSORS OR ANY OTHER THIRD PARTY, TO USE THE EVM IN ANY FINISHED END-USER OR READY-TO-USE FINAL PRODUCT, OR FOR ANY INVENTION, DISCOVERY OR IMPROVEMENT MADE, CONCEIVED OR ACQUIRED PRIOR TO OR AFTER DELIVERY OF THE EVM.

7. *USER'S INDEMNITY OBLIGATIONS AND REPRESENTATIONS.* USER WILL DEFEND, INDEMNIFY AND HOLD TI, ITS LICENSORS AND THEIR REPRESENTATIVES HARMLESS FROM AND AGAINST ANY AND ALL CLAIMS, DAMAGES, LOSSES,
EXPENSES, COSTS AND LIABILITIES (COLLECTIVELY, "CLAIMS") ARISING OUT OF OR IN CONNECTION WITH ANY HANDLING OR USE OF THE EVM THAT IS NOT IN ACCORDANCE WITH THESE TERMS AND CONDITIONS. THIS OBLIGATION
SHALL APPLY WHETHER CLAIMS ARISE UNDER STATUTE, REGULATION, OR THE LAW OF TORT, CONTRACT OR ANY OTHER LEGAL THEORY, AND EVEN IF THE EVM FAILS TO PERFORM AS DESCRIBED OR EXPECTED.

8. *Limitations on Damages and Liability:*
8.1 *General Limitations.* IN NO EVENT SHALL TI BE LIABLE FOR ANY SPECIAL, COLLATERAL, INDIRECT, PUNITIVE, INCIDENTAL, CONSEQUENTIAL, OR EXEMPLARY DAMAGES IN CONNECTION WITH OR ARISING OUT OF THESE TERMS ANDCONDITIONS OR THE USE OF THE EVMS PROVIDED HEREUNDER, REGARDLESS OF WHETHER TI HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES. EXCLUDED DAMAGES INCLUDE, BUT ARE NOT LIMITED TO, COST OF REMOVAL OR REINSTALLATION, ANCILLARY COSTS TO THE PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES, RETESTING, OUTSIDE COMPUTER TIME, LABOR COSTS, LOSS OF GOODWILL, LOSS OF PROFITS, LOSS OF SAVINGS, LOSS OF USE, LOSS OF DATA, OR BUSINESS INTERRUPTION. NO CLAIM, SUIT OR ACTION SHALL BE BROUGHT AGAINST TI MORE THAN ONE YEAR AFTER THE RELATED CAUSE OF ACTION HAS OCCURRED.
8.2 *Specific Limitations.* IN NO EVENT SHALL TI'S AGGREGATE LIABILITY FROM ANY WARRANTY OR OTHER OBLIGATION ARISING OUT OF OR IN CONNECTION WITH THESE TERMS AND CONDITIONS, OR ANY USE OF ANY TI EVM

PROVIDED HEREUNDER, EXCEED THE TOTAL AMOUNT PAID TO TI FOR THE PARTICULAR UNITS SOLD UNDER THESE TERMS AND CONDITIONS WITH RESPECT TO WHICH LOSSES OR DAMAGES ARE CLAIMED. THE EXISTENCE OF MORE THAN ONE CLAIM AGAINST THE PARTICULAR UNITS SOLD TO USER UNDER THESE TERMS AND CONDITIONS SHALL NOT ENLARGE OR EXTEND THIS LIMIT.

9. *Return Policy.* Except as otherwise provided, TI does not offer any refunds, returns, or exchanges. Furthermore, no return of EVM(s)

will be accepted if the package has been opened and no return of the EVM(s) will be accepted if they are damaged or otherwise not in

a resalable condition. If User feels it has been incorrectly charged for the EVM(s) it ordered or that delivery violates the applicable order, User should contact TI. All refunds will be made in full within thirty (30) working days from the return of the components(s), excluding any postage or packaging costs.

10. *Governing Law:* These terms and conditions shall be governed by and interpreted in accordance with the laws of the State of Texas,

without reference to conflict-of-laws principles. User agrees that non-exclusive jurisdiction for any dispute arising out of or relating to these terms and conditions lies within courts located in the State of Texas and consents to venue in Dallas County, Texas. Notwithstanding the foregoing, any judgment may be enforced in any United States or foreign court, and TI may seek injunctive reliefin any United States or foreign court.