# CC256x QFN EM User Guide

This User Guide is intended for use with TI's Bluetooth development platform, the CC256x QFN EM board. This guide will help you quickly get started with this board to integrate with TI's evaluation platforms and software SDK's. In addition, this user guide describes the components/configurations of this board to quickly get started with using this board for various Bluetooth applications.

Introduction to CC256x QFN EM Board

This guide will provide information about the module so you can utilize the board specifics to apply it to your application. Module information and capabilities including pin descriptions and available software and tools will enhance your out of box experience.
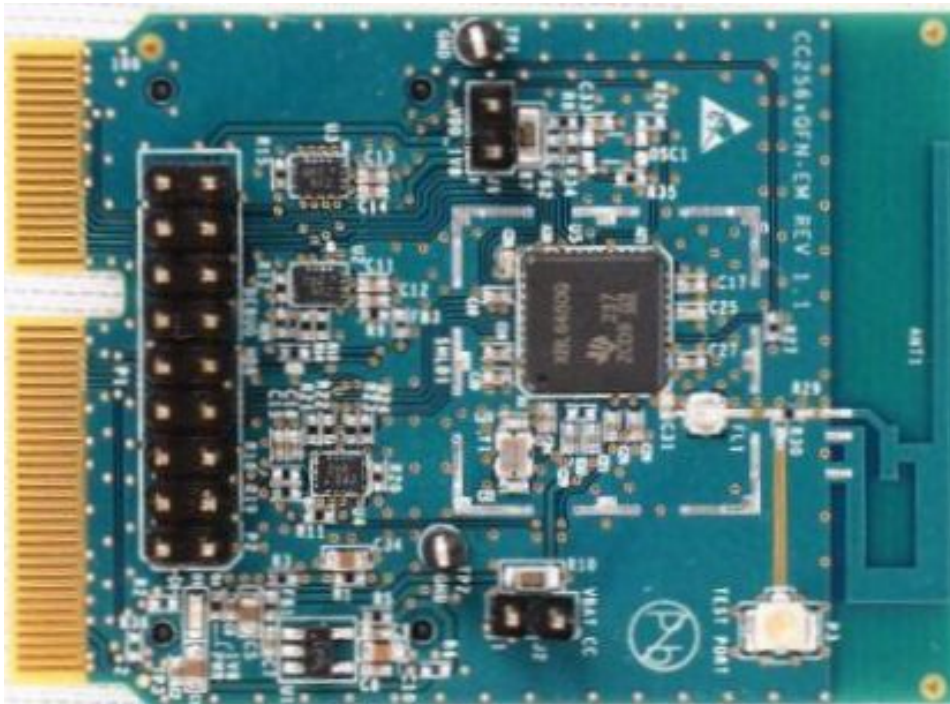
Key Features

- Bluetooth Specification v4.0
- Fast Time to Market
- Easy PCB Layout Using Cadence Tools
- 4 Layer PCB design
- *Bluetooth* & *Bluetooth* Low Energy or ANT
- StoneStreet One Bluetopia Stack with many profiles
- Other Profiles Available on Request i.e. Audio Profiles
- FCC, IC, BT SIG Compliant
- High sensitivity (-93 dBm typ.)
- Shield enabled for immunity
- H4 UART and PCM/I2S Interface

QFN EM Board Applications

Example Embedded Wireless Applications:

- Cable Replacement
- Printer Adapters
- Personal Digital Assistants (PDAs)
- Printers/Scanners
- Computers and Peripherals
- Wireless Sensors
- Industrial Control Applications
- Low Power Medical

Module Description

The CC256x QFN EM board is the development environment for the CC256x family and plugs directly into Texas Instruments MSP430 and Stellaris experimenter boards with the added benefit of header connectors that simplify prototype wiring and field trials.

This family is based upon Texas Instrument's CC256x integrated circuits and uses a Host Controller Interface (HCI), a cost effective and flexible means to implement a Bluetooth network. HCI reduces BOM cost by eliminating redundant processing capacity and giving designers the flexibility to work with a controller of their choosing, as the Bluetooth stack resides and executes on the application's host processor.
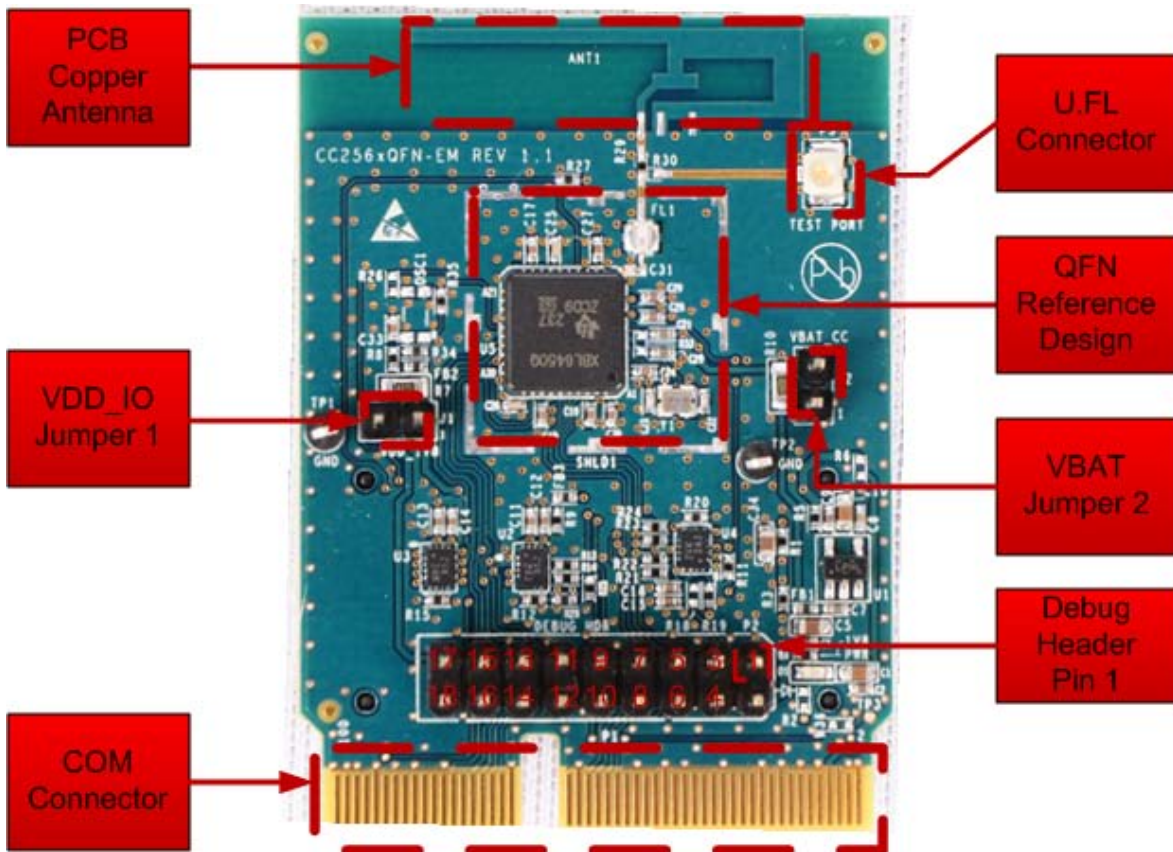
The CC256x QFN EM board is intended for evaluation purpose and works with Texas Instrument's Hardware Development Kit. Please refer to Tools and Software Section.

To aid in the implementation of this reference design, schematic and layout files are available on the CC256x Main Wiki page.

Module Detailed Description

The reference files including schematic, layout, and BOM for the CC256x QFN EM board can be found at the following link:

CC256x QFN EM v1.2 Reference Design (swrr117) [1]

Below is a block diagram depicting the input/outputs of the QFN board that is required for interfacing to host controller. These I/O's can be interfaced to the host controller either through the COM connector or the RF1 & RF2 sockets.
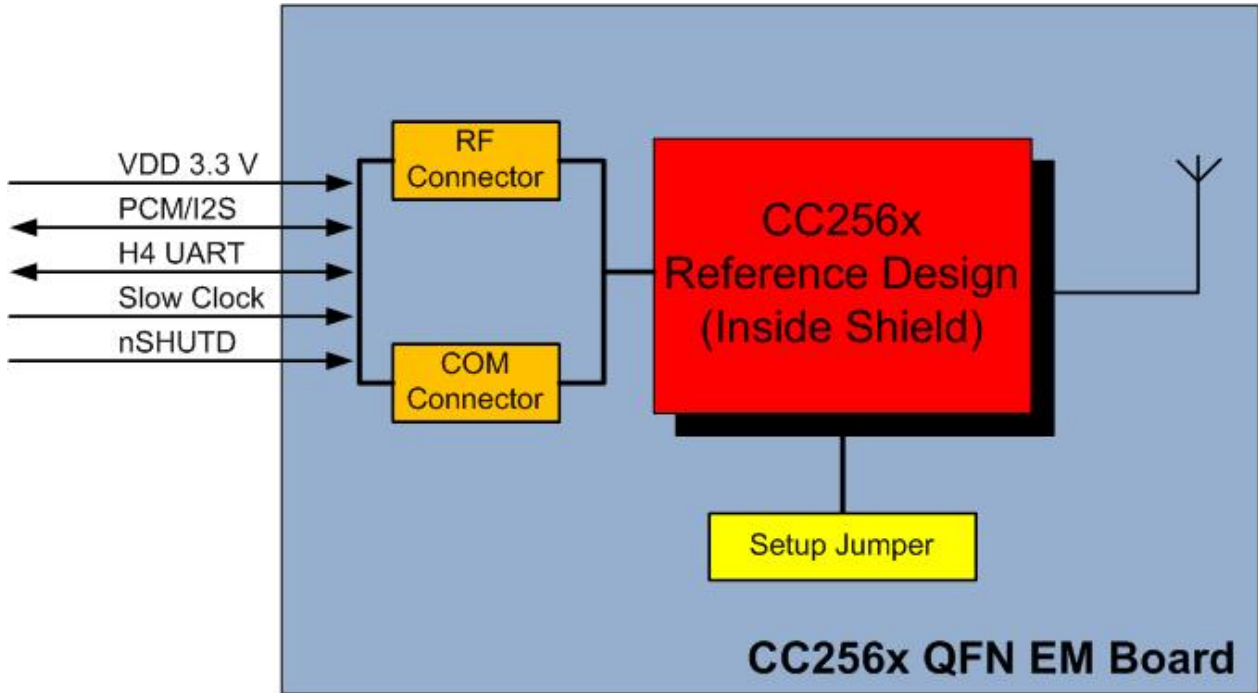
Pin Description

Board Jumpers

For correct operation, please make sure both jumpers are placed for connecting power to the device:

Jumper Configuration

Jumper	Description
VBAT_CC	Main power supply for CC256x
VDD_1V8	Supplies power to CC256x I/O's

Measuring Current Consumption

These jumpers can also be used to measure the current consumption by placing current sense resistors on R10 for VBAT_CC and R7 for VDD_1V8. Both these resistors are 0.10 Ohm, 1/4 W. VBAT_CC jumper can be used to to measure the voltage/power consumed by the CC256x including RF TX/RX while VDD_IO jumper can be used to measure voltage/power consumed by the digital I/O's.

Antenna/U.FL Selector

The board can be configured to route the RF output from the CC256x to the on board copper antenna or the on board U.FL connector. This configuration is done by placing the resistor in either R29 or R30 position which has negligible resistance of a 0 Ohm. R30 will connect the RF to the U.FL while R29 will connect to the copper antenna. The U.FL connector is used for conducted testing of the RF. The Bluetooth Hardware Evaluation Tool (BHET) [2] can be used to test basic RF functionality on this board.

RF Connectors

The RF1 and RF2 connectors can be used to mount on a wide variety of TI MCU platforms such as MSP430 and Stellaris. Note that the RF I/O's are all at 3.3V levels. This enables seamless integration of the host using TI's platforms that comes preinstalled with EM headers. The standard pinout is described in the following table:

RF1

Pin #	EM Adapter Pin Assignment	Pin #	EM Adapter Pin Assignment
1	GND	2	N/C
3	MODULE_UART_CTS	4	N/C
5	SLOW_CLK	6	N/C
7	MODULE_UART_RX	8	N/C
9	MODULE_UART_TX	10	N/C
11	N/C	12	N/C
13	N/C	14	N/C
15	N/C	16	N/C
17	N/C	18	N/C
19	GND	20	N/C

RF2

Pin #	EM Adapter Pin Assignment	Pin #	EM Adapter Pin Assignment
1	N/C	2	GND
3	N/C	4	N/C
5	N/C	6	N/C
7	+3.3V	8	MODULE_AUDIO_DATA_OUT
9	+3.3V	10	MODULE_AUDIO_DATA_IN
11	MODULE_AUDIO_FSYNC	12	N/C
13	N/C	14	N/C
15	N/C	16	N/C

17	MODULE_AUDIO_CLK	18	MODULE_UART_RTS
19	WCS_NSHUTD	20	N/C

Debug Header

The debug header is provided for testing and debugging purposes. It exposes important signals used in the design such as power, ground, debug, UART, and Audio signals. Note that all I/O's are at 1.8V. Pinout is shown in the following table:

DEBUG HDR

Pin #	EM Adapter Pin Assignment	Pin #	EM Adapter Pin Assignment
1	GND	2	VBAT
3	VIO_HOST	4	GND
5	AUD_FSYNC_1V8	6	AUD_CLK_1V8
7	AUD_OUT_1V8	8	AUD_IN_1V8
9	CLK_REQ_OUT_1V8	10	SLOW_CLK_EDGE
11	HCI_TX_1V8	12	HCI_RX_1V8
13	HCI_CTS_1V8	14	HCI_RTS_1V8
15	TX_DEBUG_1V8	16	nSHUTDOWN_1V8
17	VDD_1V8	18	GND

COM Connector

The COM connector, aka Edge card, is used to interface with TI's MPUs such as OMAP and AM335x. As shown below, it provides HCI, Audio, Slow Clock, Shutdown, and Debug interfaces to the host connected through the edge card. Note that all I/O's for the COM connector are at 1.8V. Also note some components should be DNI to use the COM connector. See BOM for details.

COM CARD

Pin #	Relevant COM Connector Pin Assignment
1	SLOW_CLK_EDGE
8	1V8_IN
52	AUD_CLK_1V8
54	AUD_FSYNC_1V8
56	AUD_IN_1V8
58	AUD_OUT_1V8
66	HCI_TX_1V8
68	HCI_RX_1V8
70	HCI_CTS_1V8
72	HCI_RTS_1V8
76	TX_DEBUG_1V8
89	nSHUTDOWN_1V8

Pins 3, 9, 19, 37, 47, 63, 77, 83, 87, 95, 97, and 2, 6, 18, 22, 42, 60, 64, 92 are connected to ground.

All other pins are NC (Not Connected).

Clock Inputs

- The slow clock can come from 2 sources, internal and external to the board. The CC256x QFN EM gives option to place the slow clock on the board itself or source it from an external source. It is connected to the SLOW_CLK_IN and can be a digital signal in the range of 0-1.8 V.
- The slow clock's frequency accuracy must be 32.768 kHz, 250 ppm for Bluetooth usage (according to the Bluetooth specification).
- When the MSP430 Experimenter board is connected, the signal is exposed from the µController. So within this application there is no additional clock needed.
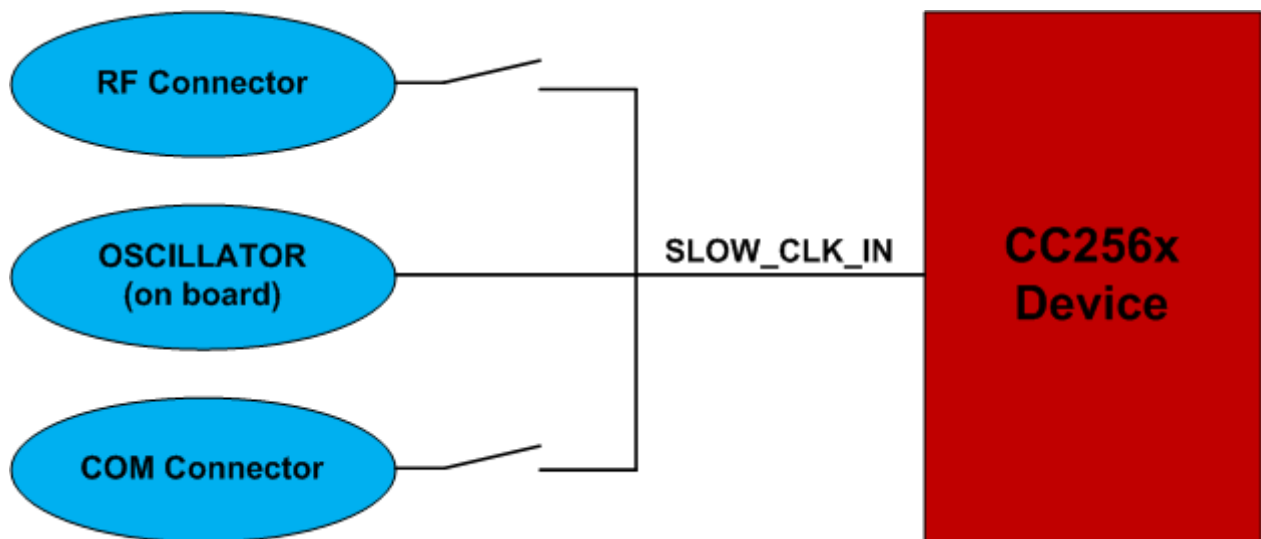
Module Dimensions

No.	Item	Dimension [in]	Tolerance	Remark
1	Width	1.550	+/- 0.001	Smaller at COM end
2	Length	2.125	+/- 0.001	
3	Height	0.062	+/- 0.001	

Tools and Software

Bluetopia Software Solution

Stone Street One has developed Bluetooth software based on their Bluetopia stack, including a few profiles, for many platforms including TI's MSP430 and Stellaris platforms. Detailed documentation is available in the Bluetooth Demo APPS page. [3]

Evaluation Platforms

These are the evaluation platforms we support:

- MSP430F5438 Experimenter's Board [4]
- Stellaris LM3S9D96 kit
- Stellaris LM4F232 kit
- MSP430F5529 Experimenter's Board

In addition, a software development environment, e.g. Code Composer Studio, is required.

For a detailed description on usage of these tools please refer to: CC256x EVM Platform [5]

Evaluation kits and modules are available through TI's network of authorized distributors.

Below is a picture of the CC256x QFN EM board mounted to one of the platforms, the MSP430F5438 Experimenter's Board, using RF1 and RF2 interface:

Bluetooth Hardware Evaluation Tool

The CC256x Bluetooth Hardware Evaluation Tool [2] is a program which can be downloaded as a complete package from Texas Instruments. It is a very intuitive, user-friendly tool to test TI's Bluetooth chips including this CC256x QFN EM board. More specifically, it is used to measure RF performance of our BT chips.

Certification

The CC256x QFN EM board is currently undergoing FCC, CI, and ETSI certification. It is also in process of being certified as a Bluetooth controller subsystem by the Bluetooth SIG(Special Interest Group).

Life Support Policy

This TI product is not designed for use in life support appliances, devices, or systems where malfunction can reasonably be expected to result in a significant personal injury to the user, or as a critical component in any life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness. TI customers using or selling these products for use in such applications do so at their own risk and agree to fully indemnify TI for any damages resulting.

Related Documents

- CC256x QFN Data Manual (swrs121a) [6]
- CC256x System Design Guide [7]
- [Coming Soon: CC256x PCB design checklist]

References

[1] http://www.ti.com/litv/zip/swrr117

[2] http://processors.wiki.ti.com/index.php/CC256x_Bluetooth_Hardware_Evaluation_Tool

[3] http://processors.wiki.ti.com/index.php/CC256x_MSP430_Bluetopia_Basic_Demo_APPS

[4] http://processors.wiki.ti.com/index.php/CC256X_MSP:EXP430F5438

[5] http://processors.wiki.ti.com/index.php/CC256x_EVM_Platform

[6] http://www.ti.com/litv/pdf/swrs121a

[7] http://processors.wiki.ti.com/index.php/CC256x_System_Design_Guide

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- 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.

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~

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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.

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東京都新宿区西新宿６丁目２４番１号

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