DOT-BM254X Wireless Bluetooth Low Energy Module

1. Product Introduction:

DOT Wireless BLE Module is a small form factor, ready and easy to use Bluetooth Low-Energy module. With hardware compliance to Bluetooth SIG standards, our BLE module is perfect for any wireless and battery power usage application.

1.1 Applications:

- ➔ Healthcare monitoring
- ➔ Fitness monitoring
- ➔ Motor control
- ➔ Lighting control
- ➔ Sensor data collecting

1.2 Features:

- ➔ Texas Instrument CC2540/CC2541 chipset
- ➔ Can Run Both Application and BLE Protocol Stack, Includes Peripherals to Interface With Wide Range of Sensors, Etc.
- ➔ Small form factor 24mm x 16mm
- ➔ *Bluetooth* low energy technology Compatible
- ➔ Excellent Link Budget (up to 97 dB), Enabling Long-Range Applications Without External Front End
- ➔ Accurate Digital Received Signal-Strength Indicator (RSSI)
- ➔ Suitable for Systems Targeting Compliance With Worldwide Radio Frequency Regulations: ETSI EN 300 328 and EN 300 440 Class 2 (Europe), FCC CFR47 Part 15 (US), and ARIB STD-T66 (Japan)
- ➔ 12-Bit ADC with Eight Channels and Configurable Resolution
- ➔ Integrated High-Performance Op-Amp and Ultralow-Power Comparator
- ➔ General-Purpose Timers (One 16-Bit, Two 8-Bit)
- ➔ 21 General-Purpose I/O Pins

- ➔ I2C Port
- ➔ UART Port (Support Baudrate 115200, 57600, 38400)
- ➔ IR Generation Circuitry
- ➔ AES Security Coprocessor
- ➔ Battery Monitor and Temperature Sensor
- ➔ Optional On-board G-Sensor
- ➔ Optional On-board RTC

2. Federal Communication Commission Interference Statement

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 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.

FCC Caution: Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.

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.

IMPORTANT NOTE:

FCC Radiation Exposure Statement:

The product comply with the US portable RF exposure limit set forth for an uncontrolled environment and are safe for intended operation as described in this manual. The further RF exposure reduction can be achieved if the product can be kept as far as possible from the user body or set the device to lower output power if such function is available.

This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

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

1) The transmitter module may not be co-located with any other transmitter or antenna,

As long as 1 condition above is met, further transmitter test will not be required. However, the OEM integrator is still responsible for testing their end-product for any additional compliance requirements required with this module installed

IMPORTANT NOTE
In the event that these conditions can not be met (for example certain laptop configurations or co-location with another transmitter), then the FCC authorization is no longer considered valid and the FCC ID can not 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 authorization.

End Product Labeling
The final end product must be labeled in a visible area with the following: “Contains FCC ID: 2AB7Z-DOT-BM254X-01”.

Manual Information to the End User
The OEM integrator has to 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 shall include all required regulatory information/warning as show in this manual.

3. Hardware Electrical Details

3.1 Power-on Reset

The reset pin is already coupled with a internal capacitor. So no power-on reset is required. To reset the module, the Reset line must be pulsed low for at least 1us.

3.2 Electrical Specification:

3.2.1 Operating Condition

Item	Specification
Supply Voltage (VCC)	2.0~3.3V
Typical Supply Voltage (VCC)	3.0V
VCC ripple	100mV Max
Max voltage on any pin	3.5V Max
Operating Temperature	-40~85 C

3.2.2 I/O Pin Specification

Item	Specification
Max logic low input voltage	0.5V
Min logic high input voltage	VCC - 0.5V
Max logic low output voltage	0.5V
Min logic high output voltage	2.4V
PIO driver capability	4mA/20mA (P1.0, P1.1)
PIO internal pullup/pulldown resistors	All except for P1.0 and P1.1

3.2.3 Current Consumption Specification

For Information on calculating current consumption data, please see:

http://www.ti.com/general/docs/litabsmultiplefilelist.tsp?literatureNumber=swra347a

Measurement done at TA=25C, VCC=3V

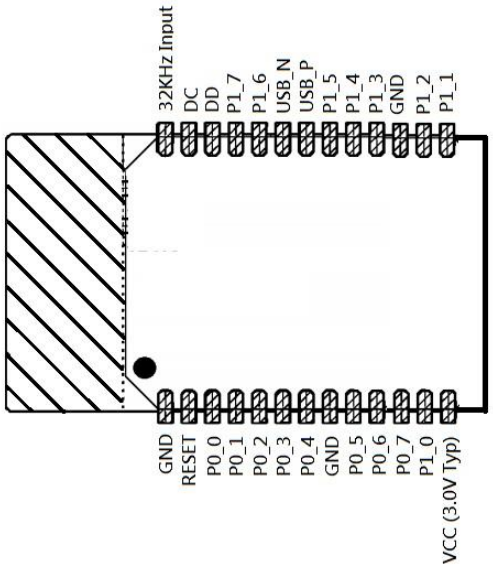
Item	Specification
Power Mode Current Consumption	
Power Mode 3 (120us Wake-up)	0.4uA
Power Mode 2 (120us Wake-up)	1.1uA
Power Mode 1 (4us Wake-up)	235uA
Low MCU Activity	6.7mA
RF Power Consumption	
RX Standard Gain	19.6mA
RX High Gain	22.1mA

TX -23dBm	23.3mA
TX -6dBm	25.5mA
TX 0dBm	29.8mA

3.2.4 RF Specification

ITEM	Specification
Frequency	2402 ~ 2480 MHz in 2 MHz steps
Data Rate and Modulation	1Mbps, GFSK
Number of Channels	40: 37 data/ 3 advertising (0, 12, 39)
Receive Sensitivity	-95/-89 dBm
Output Power	-23 to 4 dBm
Link Budget	Up to 99dB
RX/TX Turnaround	150us

3.2.5 Pinout:



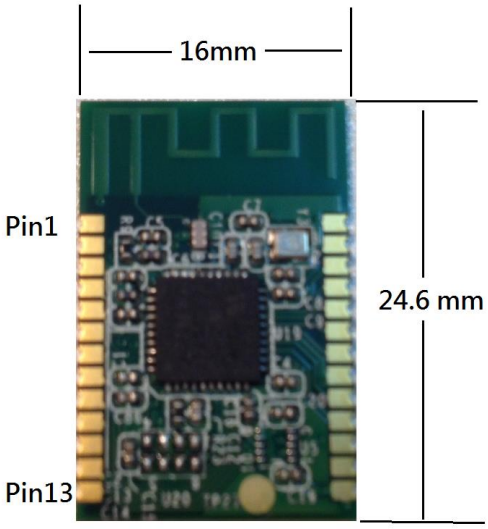
3.2.6 Pin Description:

Pin #	Pin Name	CC2540 Pin	Description
Pin1	GND		Ground

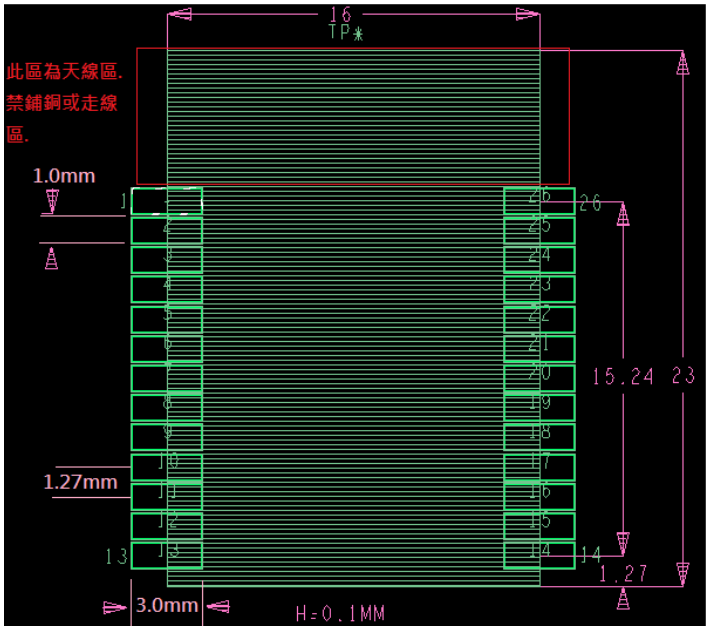
Pin2	RESET	RESET	Active-low reset with 1us minimum pulse
Pin3	P0_0	P0_0	GPIO0/ADC0
Pin4	P0_1	P0_1	GPIO1/ADC1
Pin5	P0_2	P0_2	GPIO2/ADC2/UART_RX
Pin6	P0_3	P0_3	GPIO3/ADC3/UART_TX
Pin7	P0_4	P0_4	GPIO4/ADC4/UART_CTS
Pin8	GND		Ground
Pin9	P0_5	P0_5	GPIO5/ADC5/UART_RTS
Pin10	P0_6	P0_6	GPIO6/ADC6/Timer1_4
Pin11	P0_7	P0_7	GPIO7/ADC7/Timer1_3
Pin12	P1_0	P1_0	GPIO8/Timer1_2
Pin13	VCC		Module VCC (3.0V Typical)
Pin14	P1_1	P1_1	GPIO9/Timer1_1
Pin15	P1_2	P1_2	GPIO10/SPI_ChipSelect
Pin16	GND		Ground
Pin17	P1_3	P1_3	GPIO11/SPI_Clock
Pin18	P1_4	P1_4	GPIO12/SPI_MasterIn_SlaveOut
Pin19	P1_5	P1_5	GPIO13/SPI_MasterOut_SlaveIn
Pin20	USB_P	USB_P	USB+ for high speed device port
Pin21	USB_N	USB_N	USB- for high speed device port
Pin22	P1_6	P1_6	GPIO14/Timer3_0/I2C_SCL
Pin23	P1_7	P1_7	GPIO15/Timer3_1/I2C_SDA
Pin24	DD	DD	Debug Data Pin (for flashing FW)
Pin25	DC	DC	Debug Clock Pin (for flashing FW)
Pin26	32KHz Input	32KHz Input	32KHz Clock input. Connect when using PM1, PM2

4. Hardware Mechanical Details:

4.1 Module Dimension:

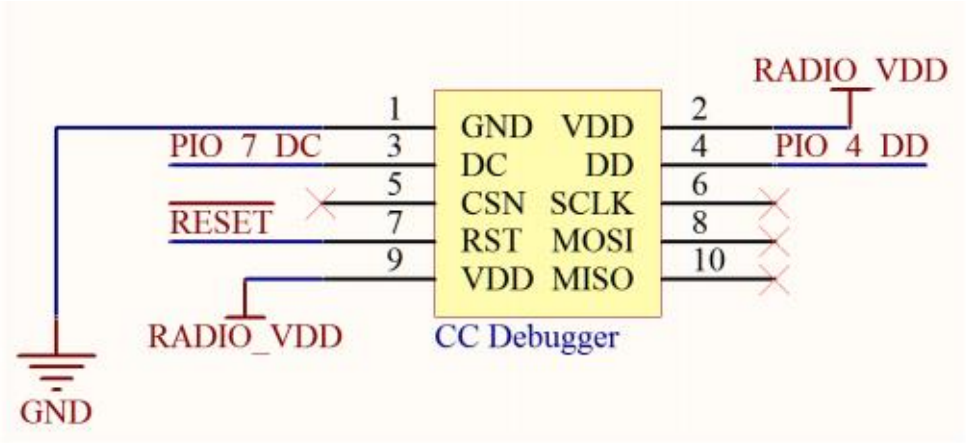


4.2 Module Footprint:



5. Programming and Flashing FW

By using DD and DC pin with reset pin, user can flash and debug new FW to the module with the use of Texas Instrument's CC debugger.



CC Debugger