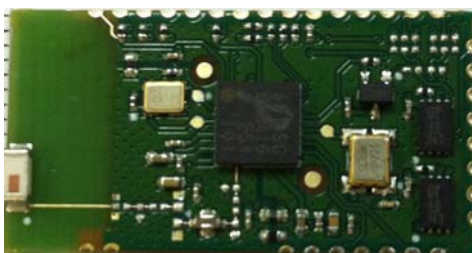




MEDs Bluetooth Module 64

Technical Specifications



July 2012

Revision Note

Version Number	Revised Date	Descriptions	Revised By
0.8	2012-07-03	Draft release	Gerald Ling

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1. INTRODUCTION

OVERVIEW

MEDs Bluetooth Module 64 integrates Toshiba Bluetooth V4.0+BLE LSI TC35661, RF antenna circuit, reset circuit and EEPROM to provide a fully functional Bluetooth compliant solution. There are various Bluetooth profiles can be supported by mounting different profile mask chip.

The module can be standalone or controlled by an external microcontroller through UART or USB interface. Toshiba chip supports HCI commands and proprietary TCU command for Bluetooth connectivity control.

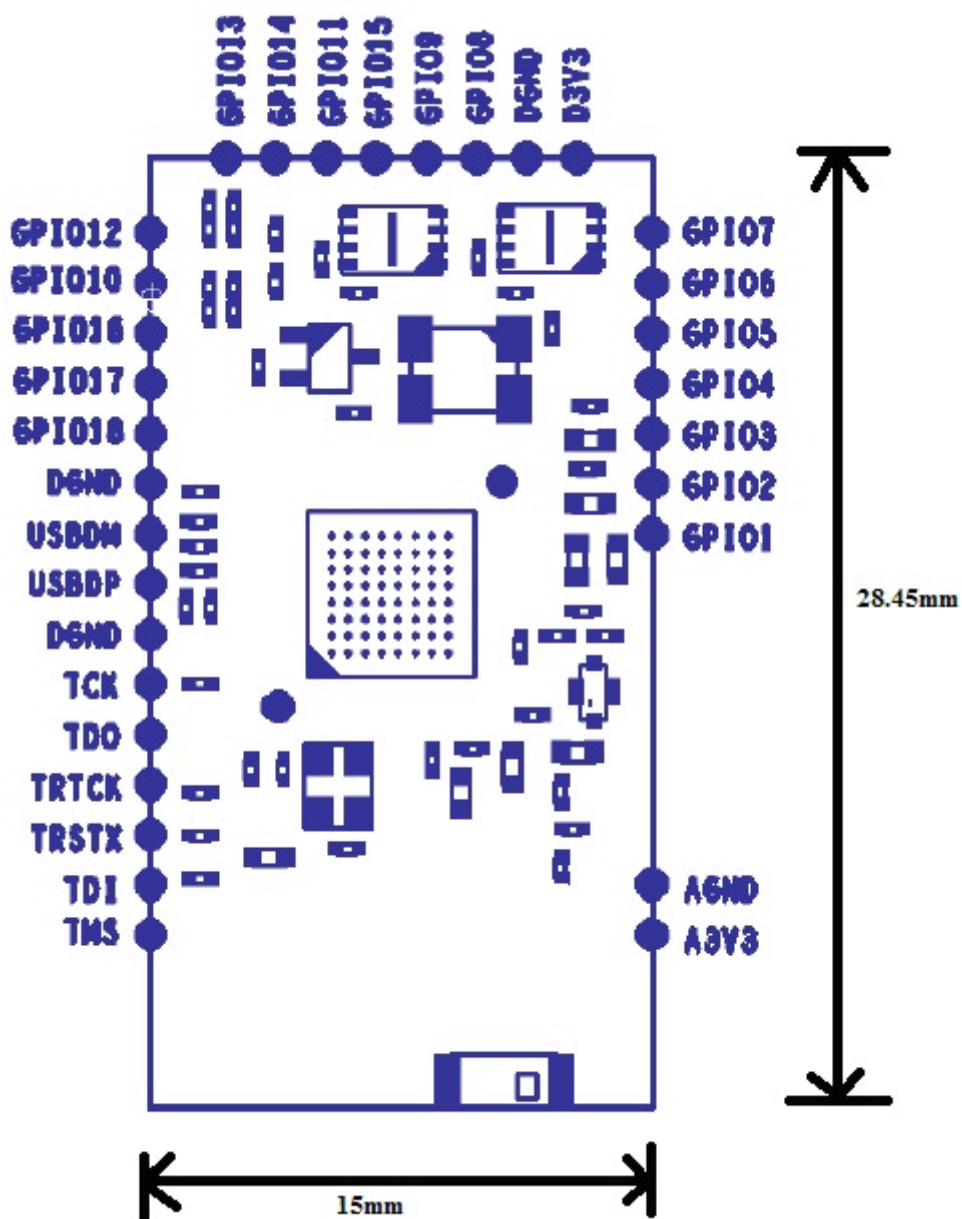
GENERAL FEATURES

- Chipset : Toshiba Bluetooth version 4.0 + EDR + LE chip
- Firmware : SPP Profile ROM + Customer Application (EEPROM)
- Radio Frequency : 2402 MHz ~2480 MHz
- Data Rate : 2-3Mbps with EDR
- Hardware Interface :
 - USB – conforms to Full-Speed 12Mbps of USB spec. 2.0
 - GPIOs – Up to 19 pins (16 with Interrupt)
 - I2C – EEPROM Interface and external IC.
 - UART – Up to 2.7Mbps, RTS/CTS support.
 - JTAG – for debugging
- Transmitter Power : Class 2 (typical 2dBm)
- Transmission Range : Up to 10 meters
- Receiver Sensitivity : -90dBm
- WiFi co-existence Interface : 2-wire,3-wire and 4-wire
- Operating Temperature : -40°C to 80°C
- DC Supply Range : 2.7V ~ 3.6V (Single input)
- Max Power Consumption : ~73mA
- Dimension : 28.45 x 15 x 2 (mm)
- Weight : ~1.2g
- Module FCC ID : OIKMBTM64

Certifications : BQB (In Progress)

2. PACKAGE INFORMATION

2.1 SIGNAL LAYOUT (TOP VIEW)



2.2 PINOUT DESCRIPTIONS

No	Name	Type/Application	Description
1	A3V3	Power	Analog power supply, internally connected to digital power supply.
2	AGND	Ground	Analog signal ground, internally connected to digital signal ground.
3	GPIO1	IO/INT	General purpose IO with interrupt.
4	GPIO2	IO/INT/PCM	General purpose IO with interrupt. PCMOUT
5	GPIO3	IO/INT/PCM	General purpose IO with interrupt. PCMIN
6	GPIO4	IO/INT/PCM	General purpose IO with interrupt. PCMCLK
7	GPIO5	IO/INT/PCM	General purpose IO with interrupt. FSYNC for PCM
8	GPIO6	IO/INT/UART	General purpose IO with interrupt. TX for UART
9	GPIO7	IO/INT/UART	General purpose IO with interrupt. RX for UART
10	D3V3	Power	Digital power supply, the only power supply needed
11	DGND	Ground	Digital signal ground.
12	GPIO8	IO/INT/UART	General purpose IO with interrupt. RTS for UART
13	GPIO9	IO/INT/UART	General purpose IO with interrupt. CTS for UART
14	GPIO10	IO/INT/WIFI-coex	General purpose IO with interrupt. BT-Activity for Wifi-Coex
15	GPIO11	IO/INT/WIFI-coex	General purpose IO with interrupt. BT-State for Wifi-Coex
16	GPIO12	IO/INT/WIFI-coex	General purpose IO with interrupt. Wifi-Activity for Wifi-Coex
17	GPIO13	IO/INT/WIFI-coex	General purpose IO with interrupt. BT-Inband for Wifi-Coex
18	GPIO14	IO/INT/I2C/SPI	General purpose IO with interrupt. SCL or SCLK for SPI
19	GPIO15	IO/INT/I2C/SPI	General purpose IO with interrupt. SDA or DOUT for SPI
20	GPIO16	IO/INT	General purpose IO. DIN for SPI
21	GPIO17	IO/INT	General purpose IO. CS0X chip select 0 for SPI
22	GPIO18	IO/INT	General purpose IO. CS1X chip select 1 for SPI
23	DGND	Ground	Digital signal ground.
24	USBDM	USB	USB data line D-
25	USBDP	USB	USB data line D+
26	DGND	Ground	Digital signal ground.
27	TCK	JTAG	JTAG clock input signal
28	TDO	JTAG	JTAG data output
29	TRTCK	JTAG	JTAG return clock signal
30	TRSTX	JTAG	JTAG reset
31	TDI	JTAG	JTAG data input
32	TMS	JTAG	JTAG mode select

3. FUNCTIONAL FEATURES

3.1 APPLICATION BLOCK DIAGRAM

The Module 64 supports different profiles that can be used in each type of application from PC peripherals, car audio, medical, etc. Some examples of application are featured below.

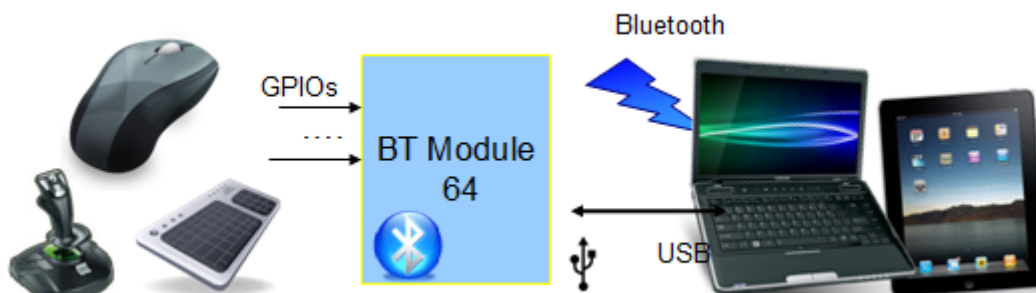


Figure 3.1.1: HID Profile – PC Peripherals

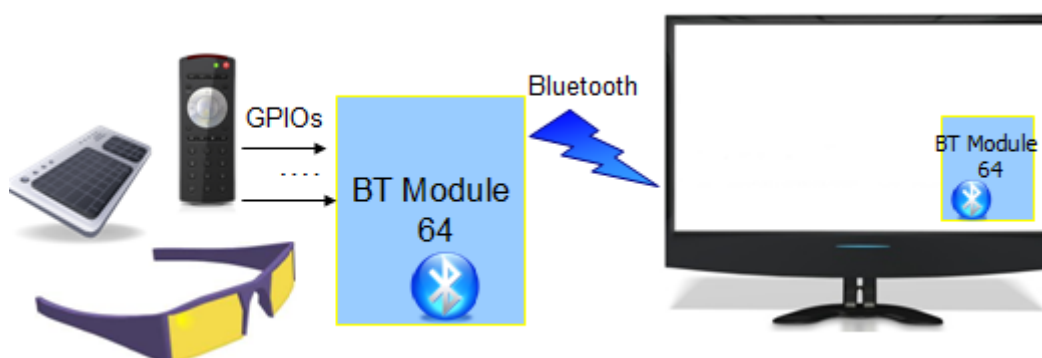


Figure 3.1.2: HID/HCI/SPP Profile – Smart TV Accesories

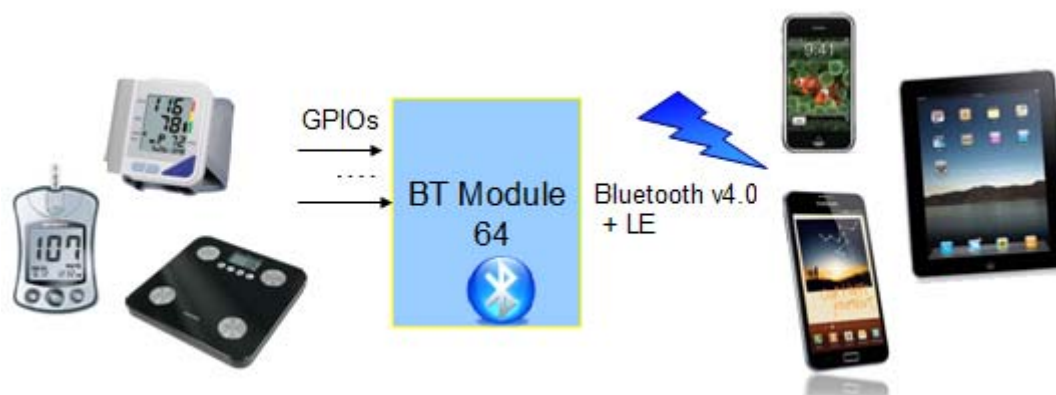


Figure 3.1.3: HDP Profile – Health Devices Monitoring

3.2 HARDWARE INTERFACE

3.2.1 UART Interface

The UART interface has the following features

- Operation Voltage : 1.8V or 3.3V
- Full-duplex 4 wire data transfer : Rx,Tx, RTS, CTS.
- Programmable baudrate : Up to 2.7Mbps
- Data Format (No parity bit) ; LSB first.
 - Start bit (1 bit)
 - Data bit (8-bit)
 - Stop bit (1 bit)
- Error Detection : Character timeout, Overrun error, Framing error

The UART pins can be used as general purpose IOs. Software shall set the UART interface upon power up or after reset.

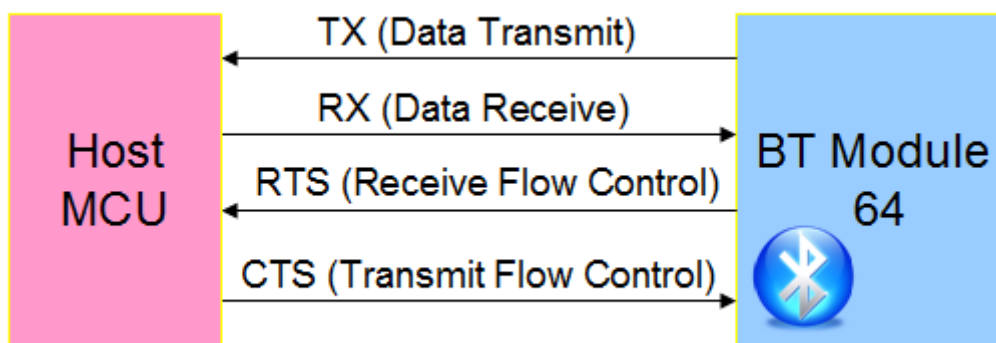


Figure 3.2.1a: Connection of UART

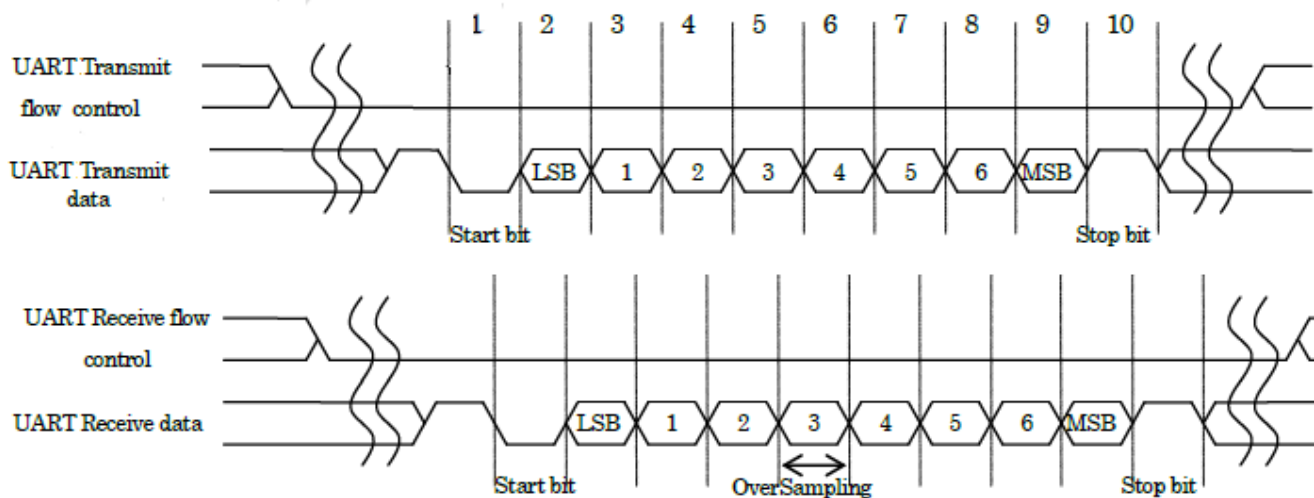


Figure 3.2.1b: UART Data Frame

The UART interface has a programmable baud rate function. The baud rate can be set according to the following equation. The baud rate generating clock frequency is set to be either 39MHz or 52MHz. The over-sampling number is set to an integer that ranges from 12 to 17. The dividing ratio is an integer that ranges from 1 to 65,535.

$$UARTBaudRate = \frac{BaudRateGeneratingClockFrequency}{OverSamplingNumber \times DividingRatio}$$

Table 3.2.1 shows examples of UART baud rate setting. The maximum value of actual baud rate is 4.333333Mbps. If the other target baud rates are required, please connect our engineering for support.

Target baud rate [bps]	Actual baud rate [bps]	Baud rate generating clock frequency [MHz]	Over-sampling number	Dividing ratio	Deviation [%]
115,200	116,071	39	12	28	+0.7564
115,200	116,071	52	14	32	+0.7564
921,600	928,571	39	14	4	+0.7564
921,600	928,571	52	14	2	+0.7564
1,843,200	1,875,143	52	14	2	+0.7564
2,764,800	2,785,714	39	14	1	+0.7564

3.2.2 USB Interface

The USB interface of Module 64 has the following features that compliant with USB 2.0 full speed.

- Operation Voltage : 3.3V
- Compliant with USB 2.0 Full speed specification
- Supports four types of transfer modes (Control, Interrupt, Bulk, Isochronous), Support also dual packet mode (Bulk transfer mode, Isochronous transfer mode)
- Includes 6 end points (EP0 to EP5)
 - EP0: Control transfer mode (IN, OUT)
 - EP1: Interrupt transfer mode (IN)
 - EP2: Bulk transfer mode (IN)
 - EP3: Bulk transfer mode (OUT)
 - EP4: isochronous transfer mode (IN)
 - EP5: Isochroous transfer mode (OUT)
- Support suspend and resume function
- Supports remote wakeup function.

The IN, OUT indicates the USB transfer direction from USB host. USB Ready and data line resistors are on the BT Module 64, data lines can be directly connected to external USB host.

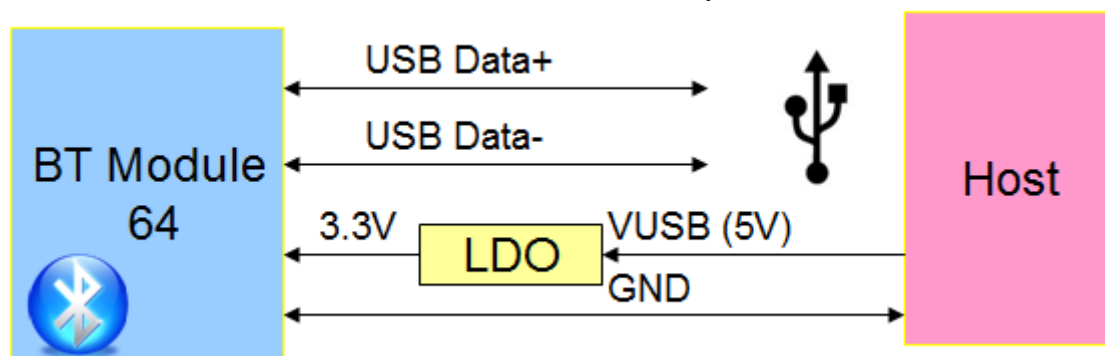


Figure 3.2.2a: Connection of USB

3.2.3 Digital Codec Interface

The main features of the digital codec are as the following.

- Operation Voltage : 1.8V or 3.3V
- Data format : A-law, u-law, linear PCM
- Frame format : MSB left-justified, I2S, PCM digital
- Frame frequency : 8kHz, 16kHz
- Data length : 8bit, 16bit
- Bit clock function : Master, slave
- Data sampling edge : Rise and fall edges
- Fame synchronization signal polarity : High active and low active
- Built-in CODEC :
 - CVSD (Continous variable slope delta modulation)
 - PCM (Pulse code modulation)
 - mSBC (Modified sub-band CODEC for wide-band speech)

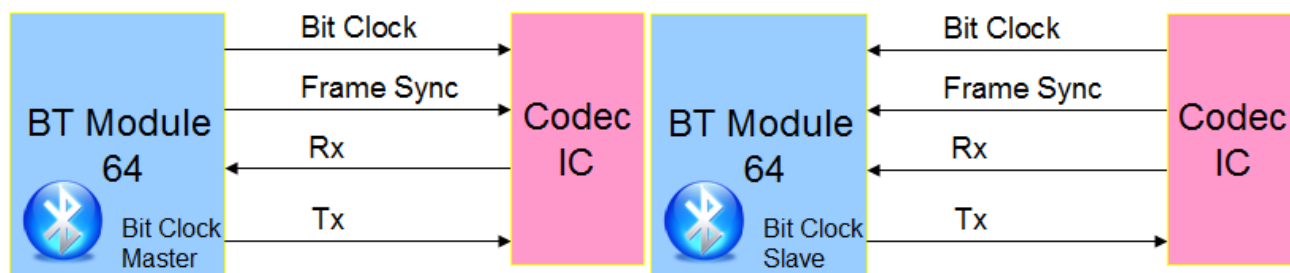


Figure 3.2.3a: Connection of Digital Codec IC when Module 64 as Master/Slave for bit clock

Frame Sync Freq [kHz]	# of bit clock [FS]	Bit clock frequency switching	Bit clock frequency for a short cycle time [kHz]	Bit clock frequency for a long cycle time [kHz]	Usage
8	50	No	400	---	
	52		416	---	
	100		800	---	
	130		1040	---	
	250		2000	---	
	8	Yes	64.20	63.88	
	16		128.71	127.45	
	32		257.3	254.90	
	64		520.00	5000.00	
	128		1040	1000.00	
16	50	No	800	---	
	130		2080	---	
	250		4000	---	
	32	Yes	509.80	514.85	
	64		1040	1000.00	
	128		208	2000.00	

Table 3.2.3: Example of bit clock frequency in a master mode

3.2.4 Serial Memory Interface

The serial memory interface can be selected as I2C or SPI bus interface that has the following features

- Operation Voltage : 1.8V or 3.3V
- Interface mode ; I2C bus, SPI
 - SPI Interface
 - Operation mode : SPI Master
 - Chip select : 2 channels
 - Chip select polarity : High active, low active
 - Serial clock frequency : 76.47kHz – 19.5MHz (CPU 39Hz)
101.96kHz – 26MHz (CPU 52MHz)
 - Serial data transfer mode : MSB first, LSB first.
 - I2C Interface
 - Operation mode : I2C Master
 - Clock frequency : Standard mode (100kHz or less)
Fast mode (400Hz or less)
 - Output mode: Open drain output, CMOS output. Pull up resistors
 - Device address format: 7 bit address.

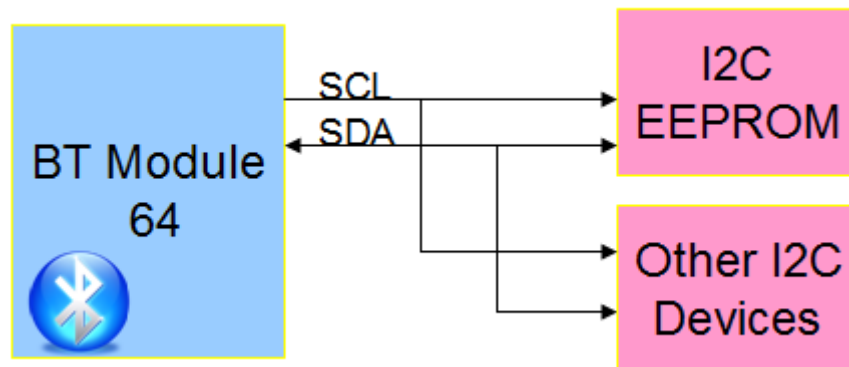


Figure 3.2.4a: Connection of External Flash/EEPROM and other I2C Device

There are 2 I2C EEPROM already available on Module 64. One EEPROM is mandatory for storing of unique Bluetooth device address for each module. The 2nd EEPROM is optional.

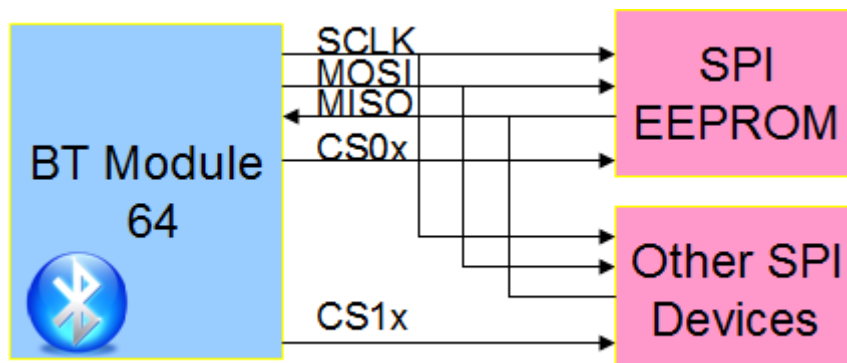


Figure 3.2.4b: Connection of External Serial Flash/EEPROM and order Serial devices

3.2.5 Wi-Fi Co-Existence Interface

This interface is used for collocation with other Wi-Fi devices in a same system. It supports the following

- Operation Voltage : 1.8V or 3.3V
- Mode ; 2-wire, 3-wire and 4-wire

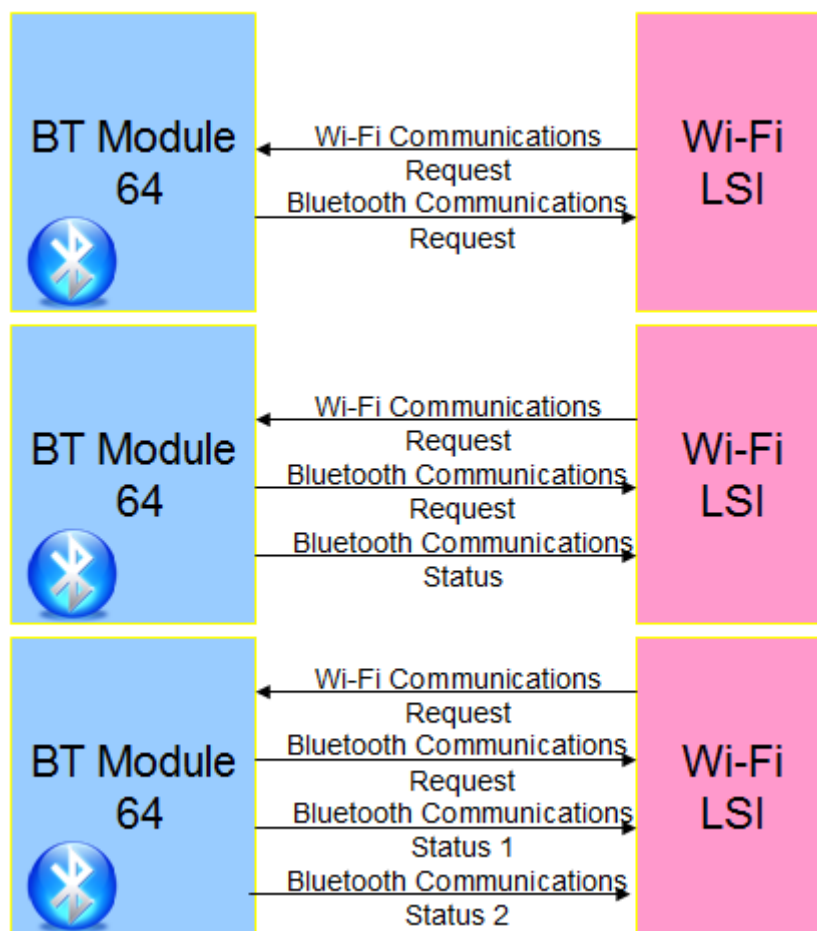


Figure 3.2.5: Connection of Example of Wi-Fi Co-ex for 2,3 and 4 Wire modes

3.2.6 JTAG Interface

The Module 64 supports JTAG interface for debugging and testing.

- Operation Voltage : 1.8V or 3.3V
- ICE interface
- Chip boundary test function

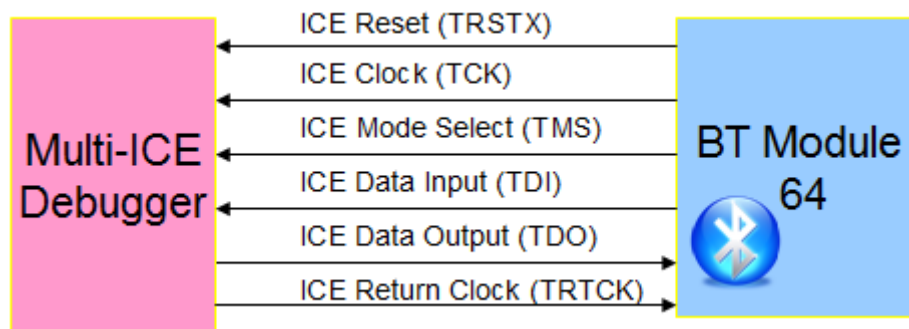


Figure 3.2.6: Connection of JTAG with ICE

4. ELECTRICAL SPECIFICATIONS

4.1 ABSOLUTE MAXIMUM RATINGS

Item	Symbol	Ratings		Unit
		Min	Max	
Power Supply	D3V3	-0.3	+3.9	V
	A3V3	-0.3	+3.9	V
Input Voltage	VIN	-0.3	D3V3+0.3	V
Output Voltage	VOUT	-0.3	D3V3+0.3	V
Input Current	IIN	-10	+10	mA
Storage Temperature	----	-40	+125	°C

Table 4.1: Absolute Maximum Ratings (DGnd, AGnd = 0V)

4.2 RF CHARACTERISTIC

Measuring conditions:

- Ambient Temperation Ta = 25 °C.
- Power input : 3.3V
- F = 2441Mhz (RF channel = Channel 39)
- Clock frequency = 26 MHz (+/-2ppm)

Item	Symbol	Conditions	Value			Unit
			Min	Typical	Max	
Rx Sensitivity	Sense1	Bit error rate $\leq 0.1\%$ F=2402, 2441, 2480 MHz	--	-85	--	dBm
Maximum Input range	MaxRange1		-20	-10	--	dBm

Table 4.2.1: RF Rx Characteristic (Basic Rate)

Item	Symbol	Conditions	Value			Unit
			Min	Typical	Max	
Tx Output Level	PAOUT1	f=2402, 2441, 2480 MHz	--	+2.0	--	dBm
Frequency Range	Frange		2400	--	2483.5	MHz

Table 4.2.2: RF Tx Characteristic (Basic Rate)

5. PCB LAYOUT RECOMMENDATION

Figure 5.1 show the recommended solder pad layout to mount the Module 64. The height of the module is around 3mm. There should be no ground plane or signal under the antenna area highlighted.

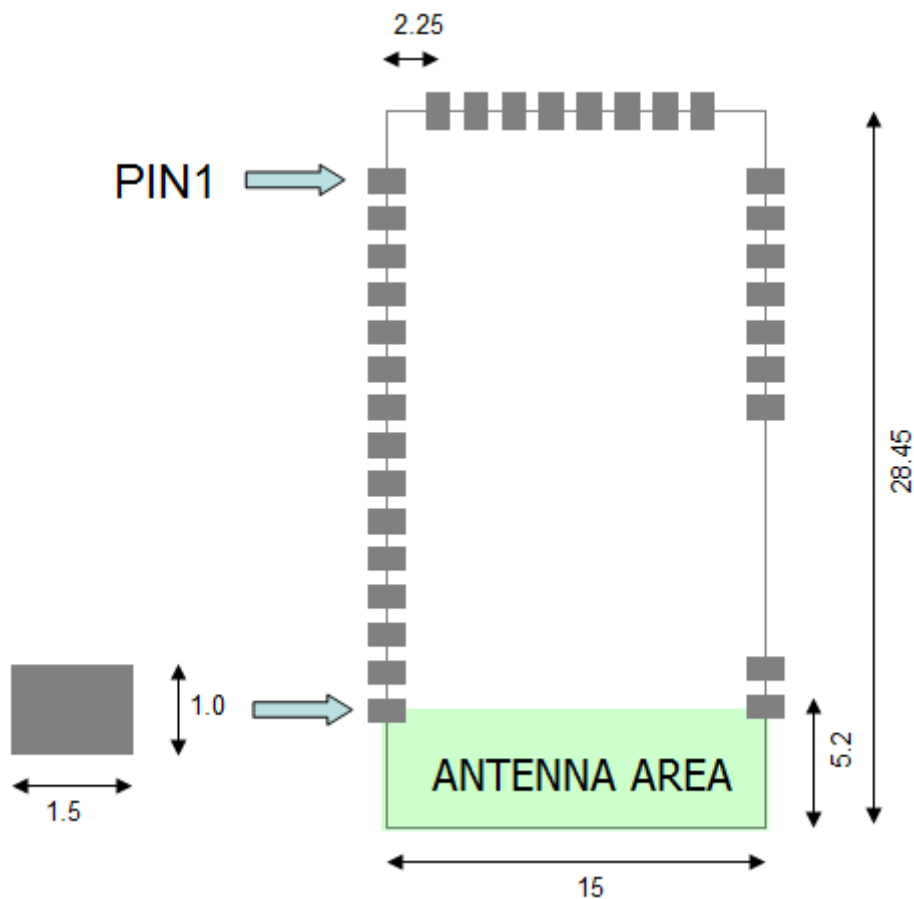


Figure 5.1: Solder Pad for Module 64

6. SOLDERING RECOMMENDATIONS

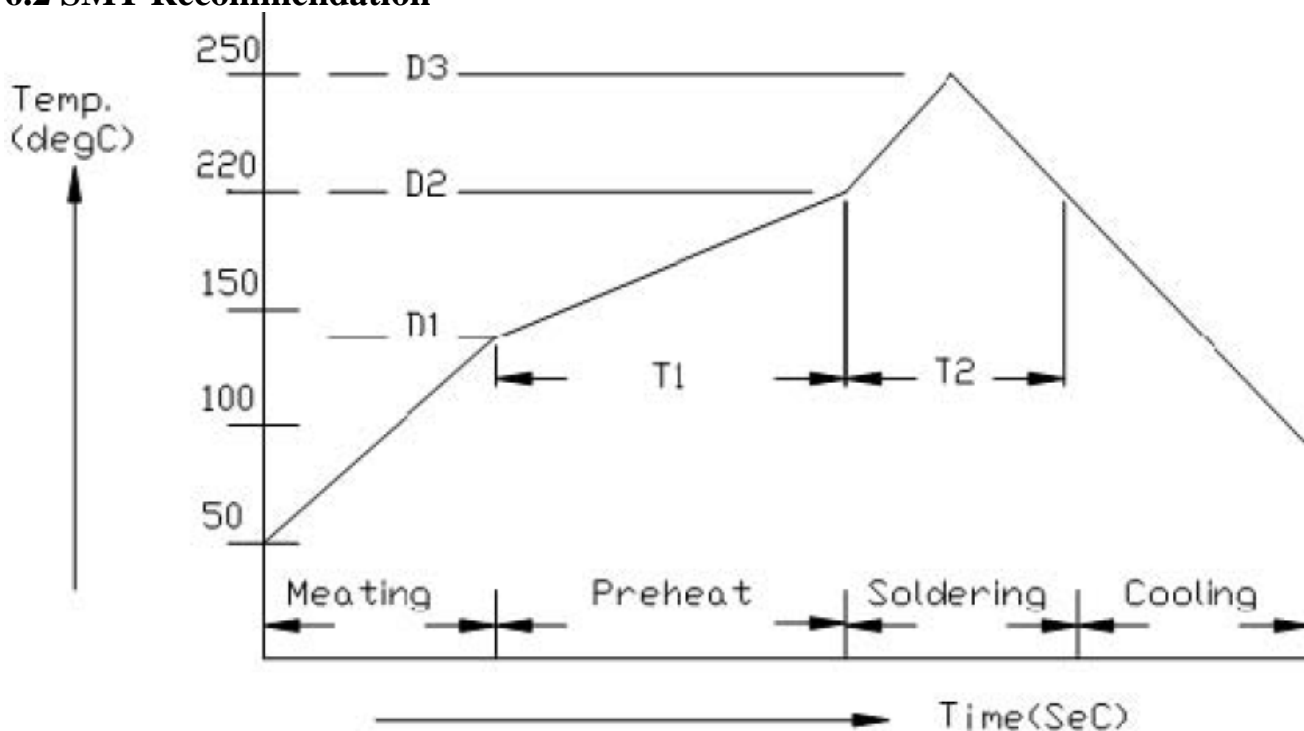
6.1 Baking Recommendation

Baking condition :

- Follow MSL Level 4 to do baking process.
- After bag is opened, devices that will be subjected to reflow solder or other high temperature process must be Mounted within 72 hours of factory conditions <30°C/60% RH, or Stored at <10% RH.
- Devices require bake, before mounting, if Humidity Indicator Card reads >10%

If baking is required, Devices may be baked for 4 hrs at 100 °C.

6.2 SMT Recommendation



No.	Item	Temperature (°C)	Time (sec)
1	Pre-heat	D1: 140~D2:200	T1 : 80~120
2	Soldering	D2 : = 220	T2 : 60 +/- 10
3	Peak=temperature	D3 : 250 °C max	

Figure 6.2.1: Reflow Soldering Profile

1. It is recommended to do reflow soldering for maximum two times.
2. Add Nitrogen while reflow process: SMT solder ability will be better.

7. ORDERING INFORMATION

Part Number : MBTM64-x : Module 64, where x refers to

0: HCI ; 1: SPP ; 2 : HID ; 3 : BLE ; 4 : HDP

8. FCC STATEMENT

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.

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.

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

Note :

1. This module is intended for end-user installation. The end-user or installer is still responsible for the FCC compliance requirement of the end product, which integrates this module. The host end product must also pass the FCC Part 15 unintentional emission testing requirement and be properly authorized per FCC Part 15. The host end product must include a user manual that clearly defines operating requirements and conditions that must be observed to ensure compliance with current FCC RF exposure guidelines.
2. The built-in antenna is integrated to the module and no other antenna should be used. 20cm minimum distance has to be able to be maintained between the antenna and all persons.
3. This module must not be co-located or jointly operated with any other antenna or transmitter within host.
4. A label should be attached to the host end product in a visible area with the following statement: "Contains Transmitter Module FCC ID: OIKMBTM64" or "Contains FCC ID: OIKMBTM64".

End of document.