iBT-23/iBT-23S

Bluetooth 4.2 Low Energy Module

(Bluetooth® Qualified QDID : ??????)

Doc. Name : iBT-23-Rev0.1.01.doc
Date : 2017-10-23
Revision : 0.1.01

1. Overview

iBT-23/iBT-23S are Bluetooth modules that supporting Bluetooth v4.2 Low Energy specification. It is implemented by using the Toshiba TC35678-002 Bluetooth Low Energy chip. iBT-23/iBT-23S are designed for data communication applications that requires low energy consumption.

2. Features

- A single chip radio and baseband IC for Bluetooth applications
- Fully Qualified Bluetooth Smart (V4.2 Low Energy) specification
- Cortex M0 MCU core
- Can be connected with 2 masters or connected to 8 slaves
- Coin battery friendly 2.0V – 3.6V operation
- Hardware I2C master / slave interface
- Two hardware UART ports with baud rate up to 921,600
- SPI Interface
- Four PWM outputs
- Two channels of wake up Interface
- Low power consumption
- Programmable transmitter power
- Support BLE stack including GAP, GATT, SM and L2CAP
- Build-in PCB antenna (iBT-23, iBT-23S)
- RoHS compliant
- Dimension:
  - iBT-20 21.0mm(L)x12.4mm(W)x2.0mm(H)
  - iBT-20S 21.0mm(L)x12.4mm(W)x2.8mm(H)

3. Applications

- IoT Devices
- Proximity and Lost-prevention key fob
- Wireless Keyboard and Mouse
- RC and Interactive Toy
- Medical and Healthcare monitoring
- Sports and Fitness equipment

4. Pin Drawing

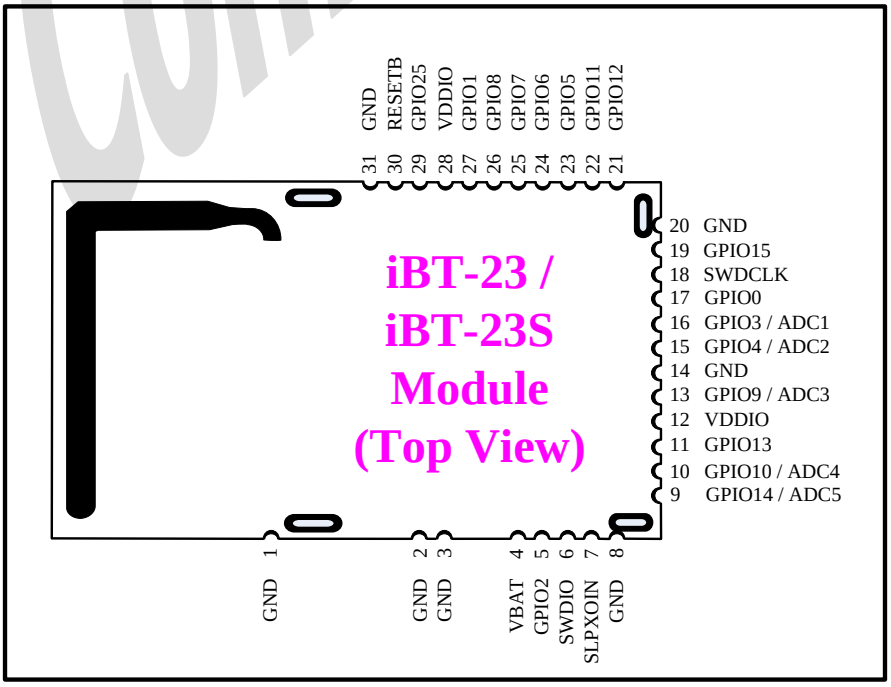


Figure 1 iBT-23/iBT-23S Pin Diagram

5. Ordering Information

Part No.	Dimension			PCB Antenna	Metal Shield Can
	Length	Width	Height		
iBT-23	$21.00^{+0.5}_{-0.1}$ mm	$12.40^{+0.5}_{-0.1}$ mm	$2.0^{+0.2}_{-0.2}$ mm	√	-
iBT-23S	$21.00^{+0.5}_{-0.1}$ mm	$12.40^{+0.5}_{-0.1}$ mm	$2.8^{+0.2}_{-0.2}$ mm	√	√

6. Pin Description

Pin No.	iBT-20 / iBT-20S Pin Name	Pin Type	Pull-up	Pull-down	Reset State	Pin Descriptions
1	GND	P				Negative power supply
2	GND	P				Negative power supply
3	GND	P				Negative power supply
4	VBAT	P				Power Supply for internal DC-DC and Sleep Circuit Normally, connects a battery to this pin. If battery is not used, connect this pin to VDDIO
5	GPIO2 / PWM1	B	√	√	PU	General Purpose IO Pin
6	SWDIO	B	√	√	PU	Serial wire debugger data pin
7	NC					No Connect
8	GND	P				Negative power supply
9	GPIO14 / ADC5	BA	√	√	HiZ	General Purpose IO Pin
10	GPIO10 / ADC4	BA	√	√	HiZ	General Purpose IO Pin
11	GPIO13	B	√	√	PU	General Purpose IO Pin
12	VDDIO	P				Power supply for IO pins.
13	GPIO9/ADC3	BA	√	√	HiZ	
14	GND	P				Negative power supply
15	GPIO4 / PWM2	B	√	√	HiZ	General Purpose IO Pin
16	GPIO3 / PWM3	B	√	√	HiZ	General Purpose IO Pin
17	GPIO0 / WKUP0	B	√	√	HiZ	General Purpose IO Pin
18	SWDCLK	I	√	√	PD	Serial wire debugger clock
19	GPIO15 / WKUP1	B	√	√	HiZ	General Purpose IO Pin
20	GND	P				Negative power supply
21	GPIO12 / SDA	B	√	√	PU	General Purpose IO Pin
22	GPIO11 / SCL	B	√	√	PU	General Purpose IO Pin
23	GPIO5 / BT_TX1	B	√	√	PU	General Purpose IO Pin
24	GPIO6 / BT_RX1	B	√	√	PU	General Purpose IO Pin
25	GPIO7 / BT_TX2	B	√	√	PU	General Purpose IO Pin
26	GPIO8 / BT_RX2	B	√	√	PU	General Purpose IO Pin
27	GPIO1 / PWM0	B	√	√	PU	General Purpose IO Pin
28	VDDIO	P				Power supply for IO pins.
29	GPIO25	B	√	√		General Purpose IO Pin
30	RESETB	I			I	Active low module reset
31	GND	P				Negative power supply

I Schmitt trigger Input
BA Bidirectional with analog input
B Bidirectional
P Power pin
PU Pull-up
PD Pull-Down
HiZ High Impedance

Table 1 iBT-23/iBT-23S Pin Description Table

7. Electrical Specification

7.1. Absolute Maximum Rating

Item	Symbol	Rating	Unit
Power Supply Voltage	VBAT	-0.3 to 3.9	V
IO Supply Voltage	VDDIO	-0.3 to 3.9	V
Storage Temperature	T_{STG}	-40 to 125	°C

7.2. Recommended Operating Condition

Item	Symbol	Miin	Typ	Max	Unit
Power Supply Voltage	VBAT	1.8	3.0	3.6	V
IO Supply Voltage	VDDIO	1.8	3.0	3.6	V
RF Operating Temperature		0	25	80	°C
Operating Temperature		-20	25	70	°C

7.3. Digital Input / Output Port Characteristics

VBAT=VDDIO=3.0V, operating temperature = 25 °C unless specified otherwise

Symbol	Parameter	Condition	Min.	Typ.	Max.	Unit
Input Voltage Levels						
V_{IL}	Input low voltage				0.6	V
V_{IH}	Input high voltage		2.4			V
Output Voltage Levels						
V_{OL}	Output low voltage	I_{OL} = -1mA			0.4	V
V_{OH}	Output high voltage	I_{OH} = 1mA	2.4			V
Input and Tri-state Current with						
I/O Pad leakage current			-1	0	1	uA
Input Capacitance			1		5	pF
Current Consumption						
Operating Current, RX active				3.3		mA
Operating Current, TX active		0 dBm TX Power		3.3		mA
Standby Current, TX & RX inactive		Sleep mode		1.3		uA

7.4. RF Characteristics

VDD=3.3V, operating temperature = 25 °C unless specified otherwise

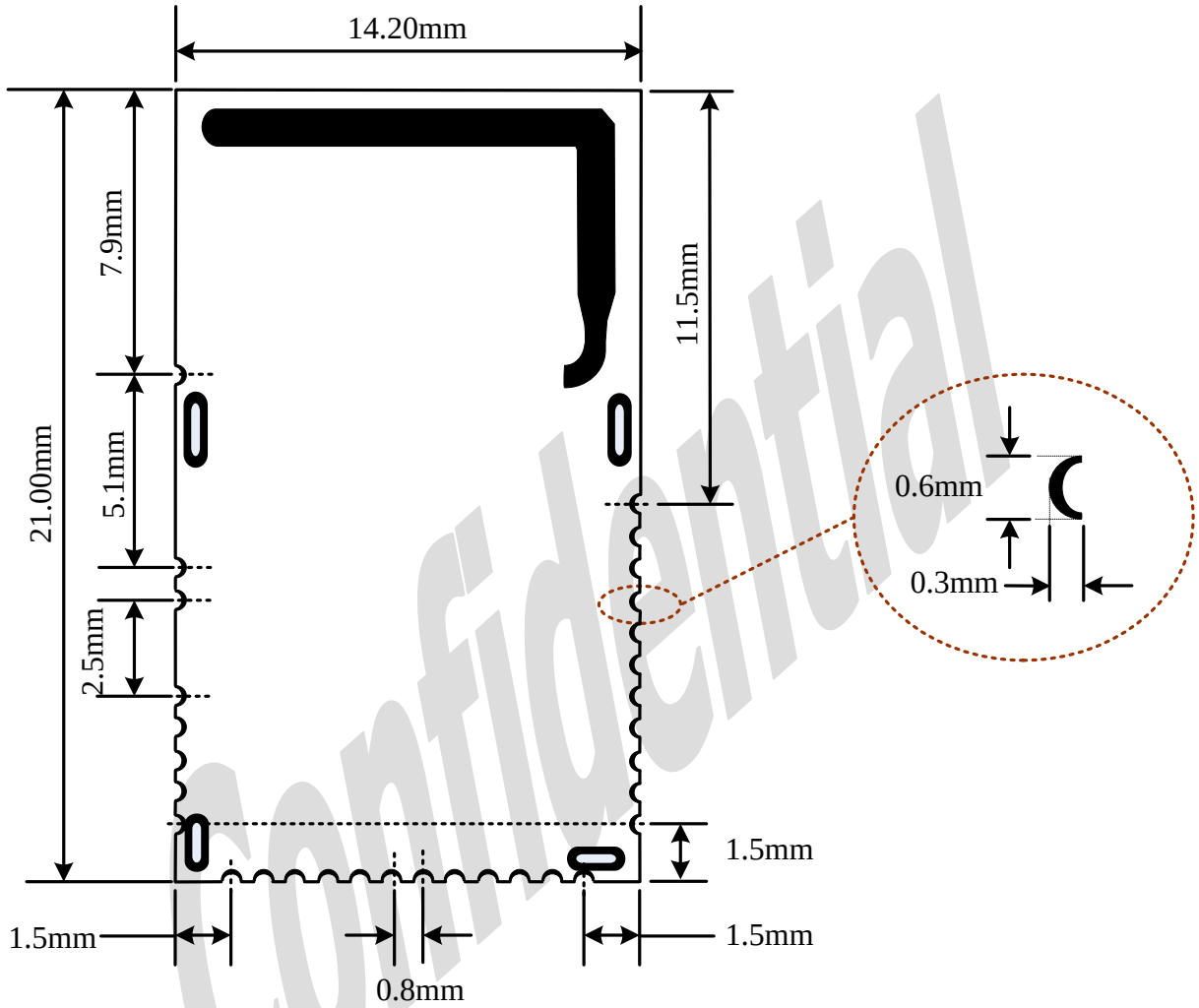
Receiver	Units	Miin	Typ	Max	Bluetooth Spec
Sensitivity at 0.1% BER	dBm		-75		≦ -70

VDD=3.3V, operating temperature = 25 °C unless specified otherwise

Transmitter	Units	Condition	Value	Bluetooth Spec
RF Output Power	dBm	2402MHz	TBD	-20 to +10
		2440MHz	TBD	
		2480MHz	TBD	
In Band Emission (+/- 2MHz)	dBm	2406MHz	TBD	≦ -20
		2440MHz	TBD	
		2476MHz	TBD	
In Band Emission (+/- 3MHz)	dBm	2406MHz	TBD	≦ -30
		2440MHz	TBD	
		2476MHz	TBD	
Carrier Frequency Offset	kHz	2402MHz	TBD	-150 to +150
		2440MHz	TBD	
		2480MHz	TBD	

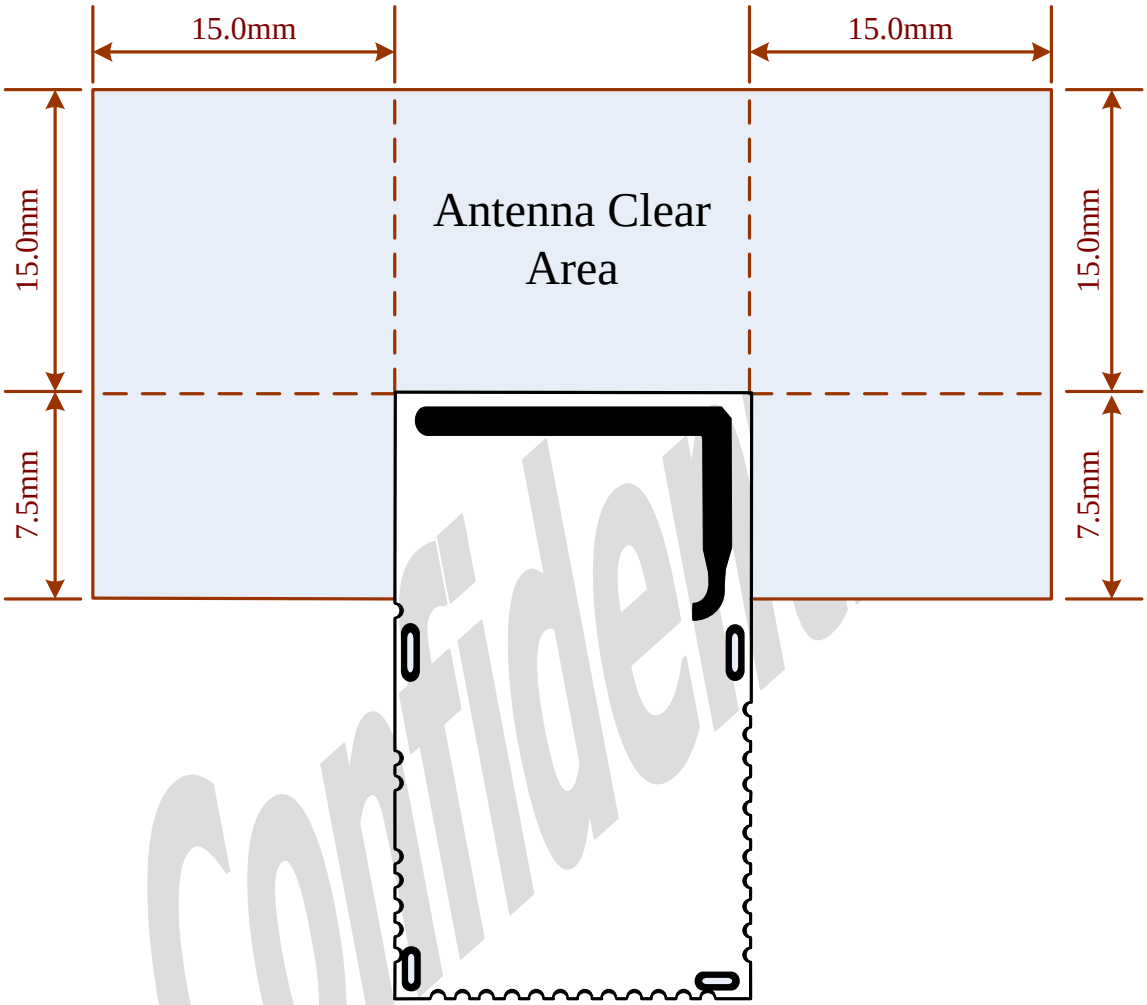
7.5. Module Dimension

7.5.1. iBT-23 and iBT-23S (Top View)



7.6. PCB Layout Guideline

7.6.1. iBT-23 and iBT-23S



7.7. Packing Information

7.7.1. iBT-23 and iBT-23S

Valence Semiconductor Design Ltd.
Unit 5, 1/F., Block B, Tonic Industrial Centre, Kowloon Bay, Hong Kong
Tel: (852) 3702 0251
http://www.valencetech.com