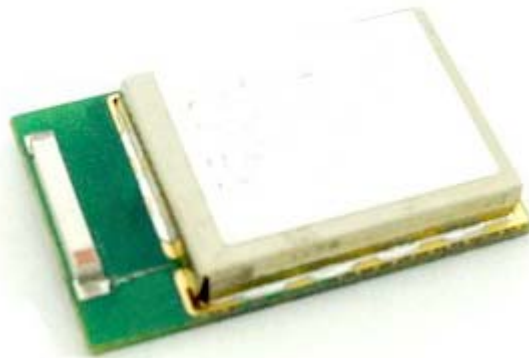# BT 4.0 BLE Module

Specifications Sheet V0.1

Description:

Bluetooth 4.0 LE and CRS1010 chip

Bluetooth Low Energy Modules

Dimension : 21.0 x 12.7 x 3 mm

1. Description

BT 4.0 BLE Module transmitter/Receiver Bluetooth module is power by CSR CSR1010 technology. That provides a complete 2.4GHz Bluetooth technology for Bluetooth Low Energy transmission. The BT 4.0 BLE Module is compliant with Bluetooth specification,4.0 LE and support Heart rate, Glucose meter, Blood Pressure, Thermometer, Proximity tag, Phone alert, status and notification profile. It is the 7.5dBm module with build in antenna. Reduce the effort on the RF section when the engineer designs it into the system. Smart Design also customize the software to meet the requirement from customer

2. Features

- CSR BlueCore1010 Chip.
- Bluetooth 4.0 LE Compliant.
- Bluetooth 7.5dBm RF output power. 10~50 meters transmission distance.
- 5 GPIO
- 3 AIO
- 10 bit ADC
- UART digital interface.
- Fully configurable with simple AT style commands over UART and Bluetooth connections.
- Build in high performance chip antenna.
- Dimension: 21.0 X 12.7 X 3.0mm.
- LGA(Land Grid Array) pads reliable PCB mounting
- Support Dual Mode: Master and Slave mode
- CE, FCC certified

3. Block Diagram
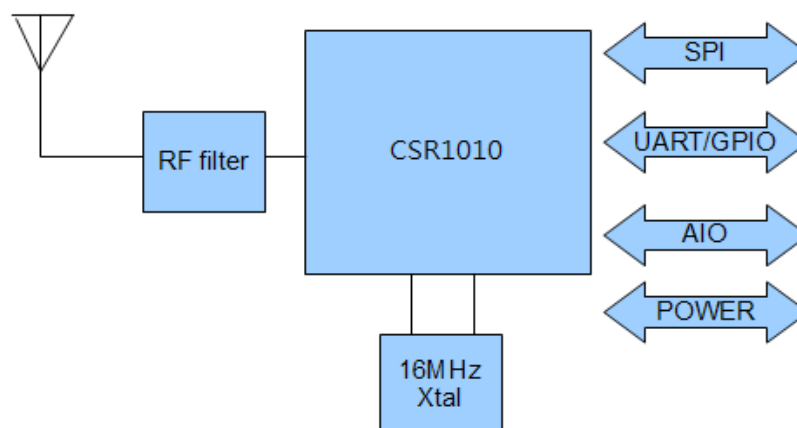
4. Radio Characteristics

	Frequency (GHz)	MIN	TYP	MAX	BT Spec	Unit
Sensitivity at 0.1%BER	2.402	≤-92	-85	-	<= -70	dBm
	2.441	≤-92	-85	-		dBm
	2.480	≤-92	-85	-		dBm
RF Transmit Power	2.402	0	3	7.5	<= 4	dBm
	2.441	0	3	7.5		dBm
	2.480	0	3	7.5		dBm

5. Electrical Characteristics

Power Consumption

Mode	Description	Total Typical Current at 3V
Dormant	All functions are shutdown. To wake up toggle the WAKE pin.	<600nA
Hibernate	VDD_PADS = ON, REFCLK = OFF, SLEEPCLK = ON, VDD_BAT = ON	<1.5µA
Deep sleep	VDD_PADS = ON, REFCLK = OFF, SLEEPCLK = ON, VDD_BAT = ON, RAM = ON, digital circuits = ON, SMPS = ON (low-power mode), 1ms wake-up time	<5µA
Idle	VDD_PADS = ON, REFCLK = ON, SLEEPCLK = ON, VDD_BAT = ON, RAM = ON, digital circuits = ON, MCU = IDLE, <1µs wake-up time	~1mA
RX / TX active	-	~16mA @ 3V peak current

Voltage Input

	MIN	Typ.	MAX	Unit
Supply Voltage	**3.1**	**3.3**	**3.5**	**V**

Operating Conditions

Voltage Range	3.3V±0.2V
Operating Temperature Range	-40C ~ 85°C
Storage Temperature Range	-40°C ~ 85°C
Relative Humidity (Operating)	<=90%
Relative Humidity (Storage)	<=90%

AIO

Input Voltage Levels	Min	Typ	Max	Unit
Input voltage	0	-	1.3	V

Digital Terminals

Input Voltage Levels	Min	Typ	Max	Unit
V_{IL} input logic level low	-0.4	-	0.4	V
V_{IH} input logic level high	0.7 x VDD	-	VDD + 0.4	V
T_r/T_f	-	-	25	ns

Output Voltage Levels	Min	Typ	Max	Unit
V_{OL} output logic level low, I_{OL} = 4.0mA	-	-	0.4	V
V_{OH} output logic level high, I_{OH} = -4.0mA	0.75 x VDD	-	-	V
T_r/T_f	-	-	5	ns

Input and Tristate Currents	Min	Typ	Max	Unit
With strong pull-up	-150	-40	-10	µA
I²C with strong pull-up	-250	-	-	µA
With strong pull-down	10	40	150	µA
With weak pull-up	-5.0	-1.0	-0.33	µA
With weak pull-down	0.33	1.0	5.0	µA
C_I input capacitance	1.0	-	5.0	pF

6. Software Diagram
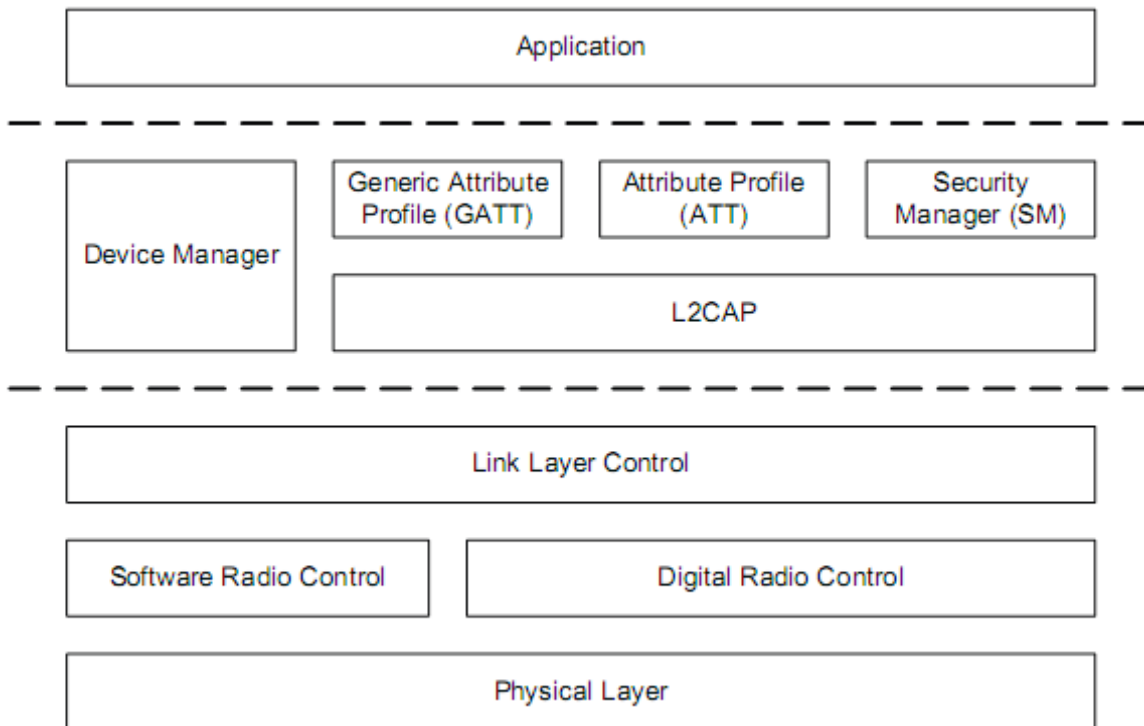
7. Pin Definition
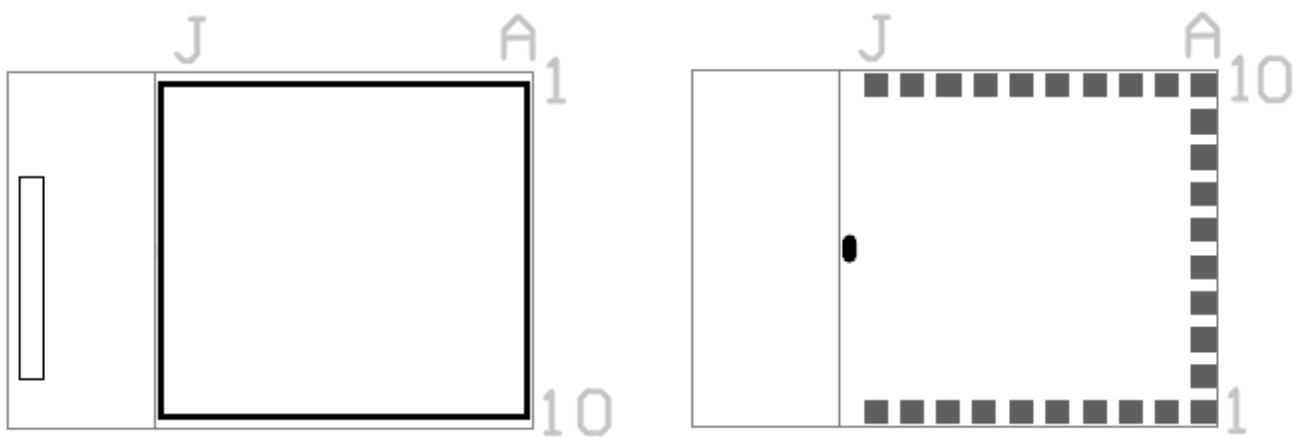
Top View   Bottom View

Pin No.	Name	Type	Note
A1	VDD_PADS	PWR	Voltage level for GPIO. Input VDD to set the voltage level of GPIO
A2	SPI_PIO_SEL	I	Selects SPI debug on PIO[8:5].
A3	GPIO11	I/O	Programmable I/O line. (reserved to wake up deep sleep)
A4	GPIO10	I/O	Programmable I/O line.
A5	GPIO9	I/O	Programmable I/O line.
A6	GPIO8	I/O	Programmable I/O line or debug SPI MISO selected by SPI_PIO#. Same voltage level as VDD_PADS.
A7	GPIO7	I/O	Programmable I/O line or debug SPI MOSI selected by SPI_PIO#. Same voltage level as VDD_PADS.
A8	GPIO6	I/O	Programmable I/O line or debug SPI chip select (CS#) selected by SPI_PIO#. Same voltage level as VDD_PADS.
A9	GPIO5	I/O	Programmable I/O line or debug SPI CLK selected by SPI_PIO#. Same voltage level as VDD_PADS.
A10	GND	PWR	Ground
B1	GND	PWR	Ground
C1	GND	PWR	Ground
D1	GND	PWR	Ground
E1	GND	PWR	Ground
F1	GND	PWR	Ground
G1	GND	PWR	Ground
H1	GND	PWR	Ground
I1	GND	PWR	Ground
J1	VBAT	PWR	Main Power input 1.8V – 3.6V
B10	GPIO1/UART RX	I/O	Programmable I/O line or UART RX.
C10	GPIO0/UART TX	I/O	Programmable I/O line or UART TX.
D10	AIO0	I/O	Analogue programmable I/O line 0..
E10	AIO1	I/O	Analogue programmable I/O line 1..
F10	AIO2	O	Analogue programmable I/O line 2..
G10	GND	PWR	Ground
H10	GND	PWR	Ground
I10	GND	PWR	Ground
J10	RF	RF	Bluetooth transmitter / receiver.

VBAT

Supply main voltage at this pin with 1.8V~3.6 V.

GND

Connect GND pins to the ground plane of the PCB.

VDD_PADS

Supply voltage at this pin to set the GPIO voltage level. The input voltage is from 1.8V to 3.6V.

PIO0,1,5-11

Programmable digital I/O lines. All PIO lines can be configured through software to have either weak or strong pull-ups or pull-downs. Configuration for each PIO line depends on the application. Please check Default configuration in Standard Setup Information.

AIO0,1,2

AIO can be used to monitor analogue voltages such as a temperature sensor etc.

UART_RX

A CMOS input with a weak internal pull-down. RXD is used to implement UART data transfer from another device to BT 4.0 BLE Module. The UART interface requires an external RS232 transceiver chip.

UART_TX

A CMOS output with a weak internal pull-up. TXD is used to implement UART data transfer from BT 4.0 BLE Module to another device. The UART interface requires external RS232 transceiver chip.

SPI_CSB

A CMOS input with a weak internal pull-down for debug mode.

SPI _CLK
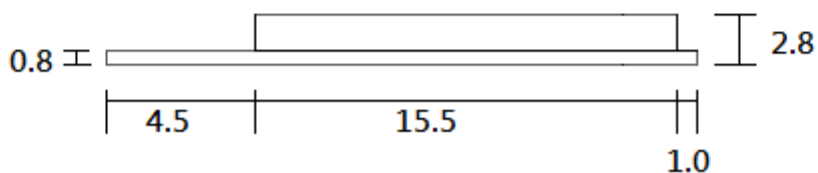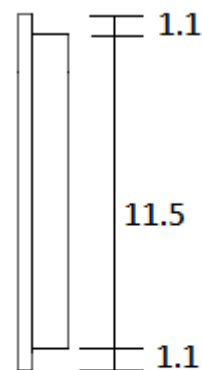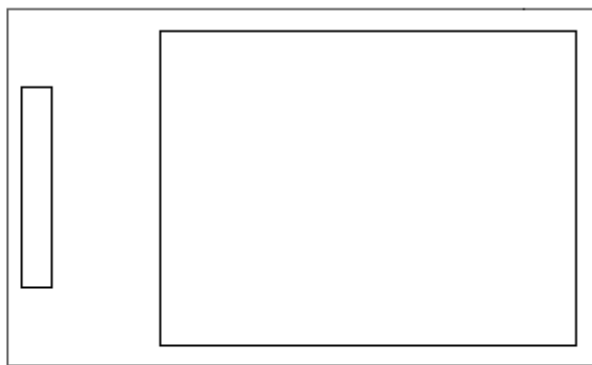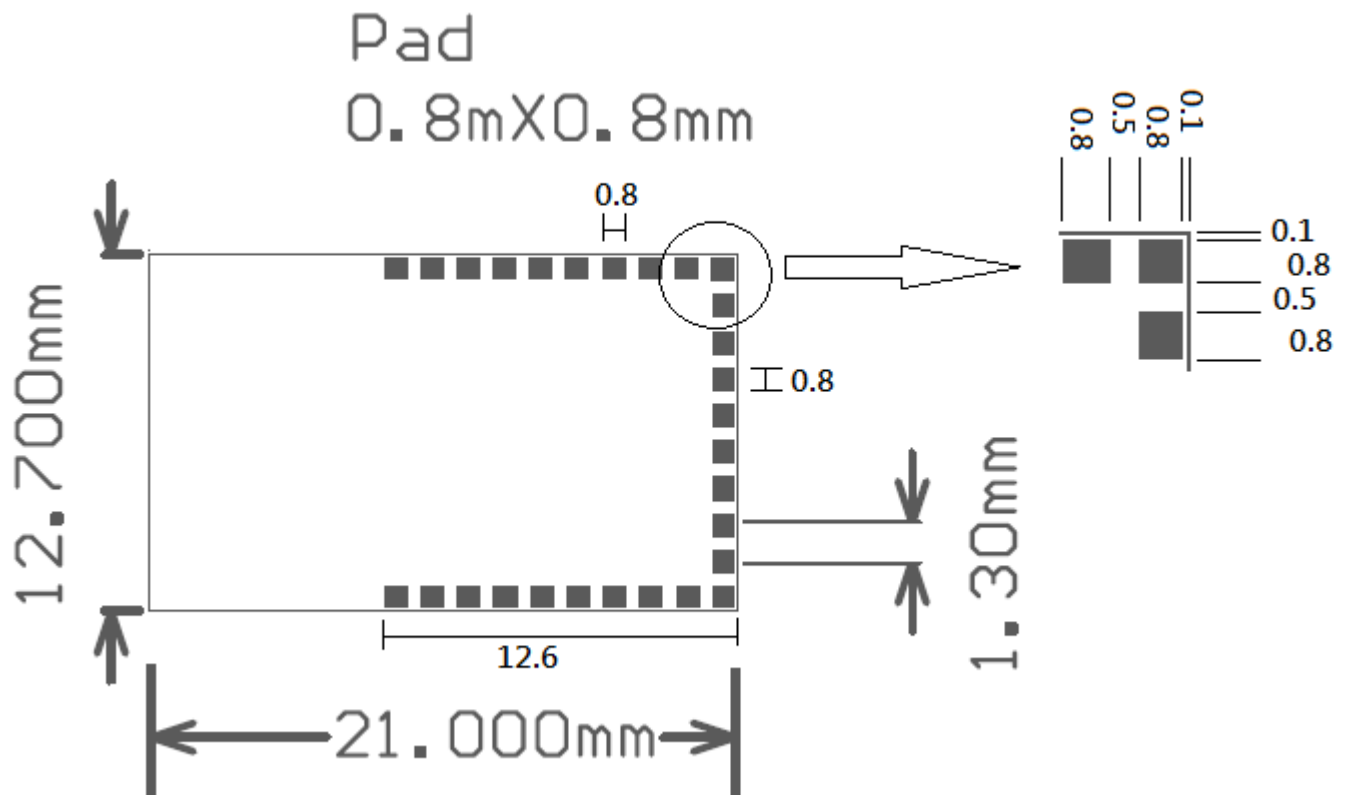
A CMOS input for the SPI clock signal for debug mode..
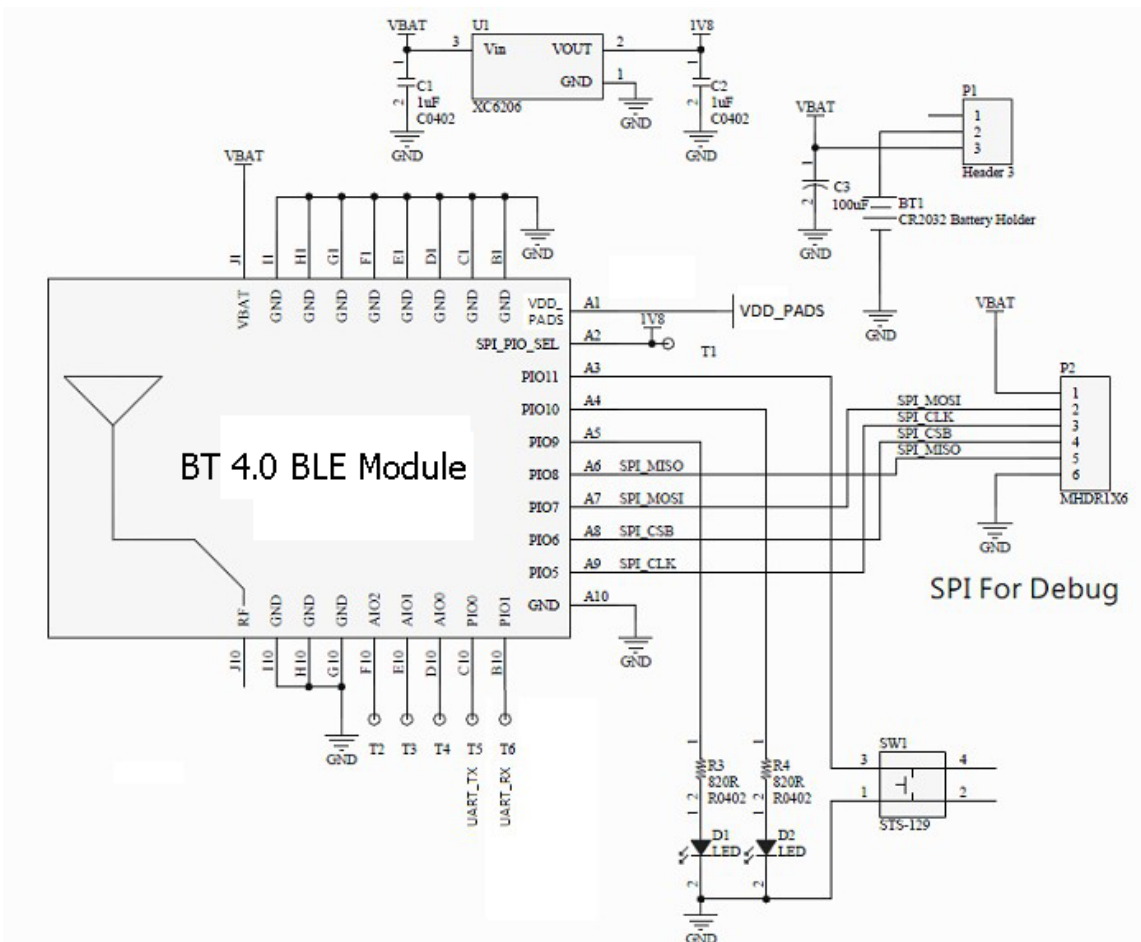
SPI_MISO

An SPI data output for debug mode.

SPI_MOSI

An SPI data input for debug mode.

8. Mechanical Specification

Pad
0.8mX0.8mm

12.700mm

0.8

0.8

12.6

21.000mm

1.30mm

0.1
0.8
0.5
0.8

0.1
0.8
0.5
0.8

1.1

11.5

1.1

2.8

0.8

4.5   15.5

1.0

unit: mm

9. Reference Schematics

10. UART Interface

The BT 4.0 BLE Module UART interface provides a simple mechanism for communicating with other serial devices using the RS232 protocol. 2 signals implement the UART function, UART_TX and UART_RX.

When BT 4.0 BLE Module is connected to another digital device, UART_RX and UART_TX transfer data between the 2 devices. UART configuration parameters, e.g. baud rate and data format, are set using BT 4.0 BLE Module firmware. When selected in firmware PIO[0] is assigned to a UART_TX output and PIO[1] is assigned to a UART_RX input, The UART CTS and RTS signals can be assigned to any PIO pin by the on-chip firmware.

Note:

To communicate with the UART at its maximum data rate using a standard PC, the PC requires an accelerated serial port adapter card.

Parameter		Possible Values
Baud rate	Minimum	1200 baud (≤2%Error)
		9600 baud (≤1%Error)
	Maximum	2Mbaud (≤1%Error)
Flow control		CTS / RTS
Parity		None, Odd or Even
Number of stop bits		1 or 2
Bits per byte		8

UART Configuration While in Deep Sleep

The maximum baud rate is 9600 baud during deep sleep.

11. Serial Peripheral Interface

The BT 4.0 BLE Module debug SPI interface is available in SPI slave mode to enable an external MCU to program and control the BT 4.0 BLE Module, generally via libraries or tools supplied by CSR. The protocol of this interface is proprietary. The 4 SPI debug lines directly support this function.

The SPI programs, configures and debugs the BT 4.0 BLE Module. It is required in production. Ensure the 4 SPI signals are brought out to either test points or a header. Take SPI_PIO#_SEL high to enable the SPI debug feature on PIO[8:5]. BT 4.0 BLE Module uses a 16-bit data and 16-bit address programming and debug interface. Transactions occur when the internal processor is running or is stopped.

12. Programmable I/O Ports, PIO and AIO

9 lines of programmable bidirectional I/O are provided. PIO lines are software-configurable as weak pull-up, weak pull-down, strong pull-up or strong pull-down.

Note:

At reset all PIO lines are inputs with weak pull-downs.

Any of the PIO lines can be configured as interrupt request lines or as wake-up lines from sleep modes.

The BT 4.0 BLE Module supports alternative functions on the PIO lines:

■ SPI interface,

■ UART,

■ LED flasher / PWM module

Note :

CSR cannot guarantee that the PIO assignments remain as described. Implementation of the PIO lines is firmware build-specific, for more information see the relevant software release note. BT 4.0 BLE Module has 3 general-purpose analogue interface pins, AIO[2:0].

13. LED Flasher / PWM Module

BT 4.0 BLE Module contains a LED flasher / PWM module that works in sleep modes. These functions are controlled by the on-chip firmware.

14. Key Bluetooth Profiles

- Heart rate (Supported)
- Glucose meter (Supported)
- Blood Pressure (default)
- Thermometer (Supported)

15. Firmware

1. BLE-AT firmware

Please check with BLE-AT commands manual.

16. Default setting Information

	Parameter	Value
1	Baud Rate	115200
2	Pin Code Prompt	
3	Local Name	
4	Master / Slave	

17. Reflow information

Reflow Profile Graphic, assuming:

Kester R905 Sn/4Ag/0.5Cu solder paste.

All solder ball alloys melt at 217°C.

Component joints do not exceed temperatures as per J-STD-02