FSC-BT736

4.2 Dual Mode Bluetooth Module Data Sheet

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Release Record

Version Number	Release Date	Comments
Revision 1.0	2020-03-28	First Release
Revision 1.1	2020-04-01	Modify application circuit diagram information
Revision 1.2	2020-04-13	Add module picture

1. INTRODUCTION

FSC-BT736 is a fully integrated Bluetooth module that complies with Bluetooth 4.2 dual mode protocols(BR/EDR/BLE). It supports SPP, GATT. It integrates Baseband controller in a small package（Integrated chip antenna）, so the designers can have better flexibilities for the product shapes.

FSC-BT736 can be communicated by UART port. With Feasycom's Bluetooth stack, Customers can easily transplant to their software. Please refer to Feasycom stack design guide.

1.1 Block Diagram

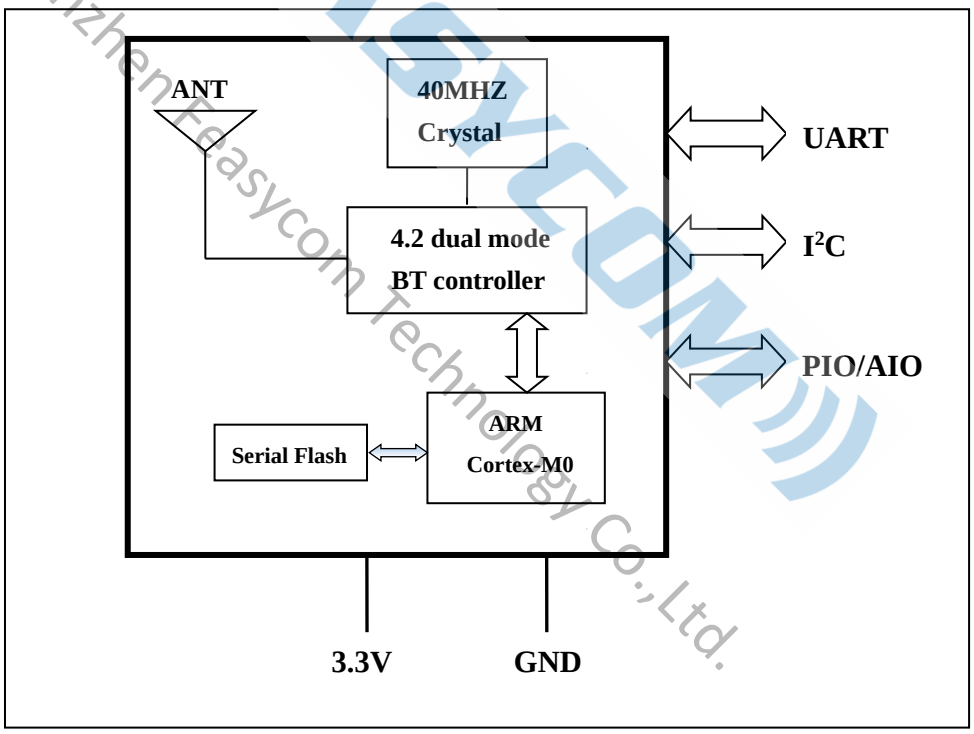


Figure 1

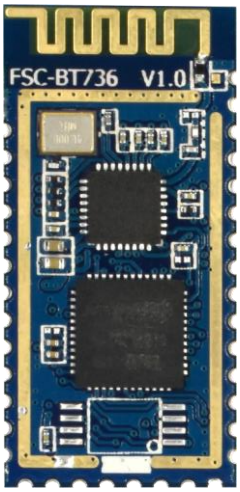
1.2 Feature

- Fully qualified Bluetooth 4.2/4.0/3.0/2.1/2.0/1.2/1.1
- Postage stamp sized form factor
- Low power
- Class 1.5 support(high output power)
- The default UART Baud rate is 115.2Kbps and can support from 1200bps up to 921Kbps
- UART, I^2C, AIO interfaces
- Support the OTA upgrade
- Bluetooth stack profiles support: SPP, GATT

1.3 Application

- Smart Watch and Bluetooth Bracelet
- Health & Medical devices
- Wireless POS
- Measurement and monitoring systems
- Asset Tracking
- Barcode gun

1.4 Module picture as below showing



2. GENERAL SPECIFICATION

General Specification	
Chipset	Realtek RTL8761
Product	FSC-BT736
Dimension	13mm x 26.9mm x 2mm
Bluetooth Specification	Bluetooth V4.2 (Dual Mode)
Power Supply	3.0~3.6V
Output Power	5.5 dBm
Sensitivity	-82dBm@0.1%BER
Frequency Band	2.402GHz -2.480GHz ISM band
Modulation	GFSK, π/4-DQPSK, 8-DPSK
Baseband Crystal OSC	40MHz
Hopping & channels	1600hops/sec, 1MHz channel space,79 Channels(BT 4.2 to 2MHz channel space)
RF Input Impedance	50 ohms
Antenna	PCB on-board antenna
Interface	Data: UART, I²C, AIO
Profile	SPP, GATT(BLE Standard)
Temperature	-20ºC to +70 ºC
Humidity	10%~95% Non-Condensing
Environmental	RoHS Compliant

Table 1

3. PHYSICAL CHARACTERISTIC

FSC-BT736 dimension is 26.9mm(L)x13mm(W)x2mm(H).

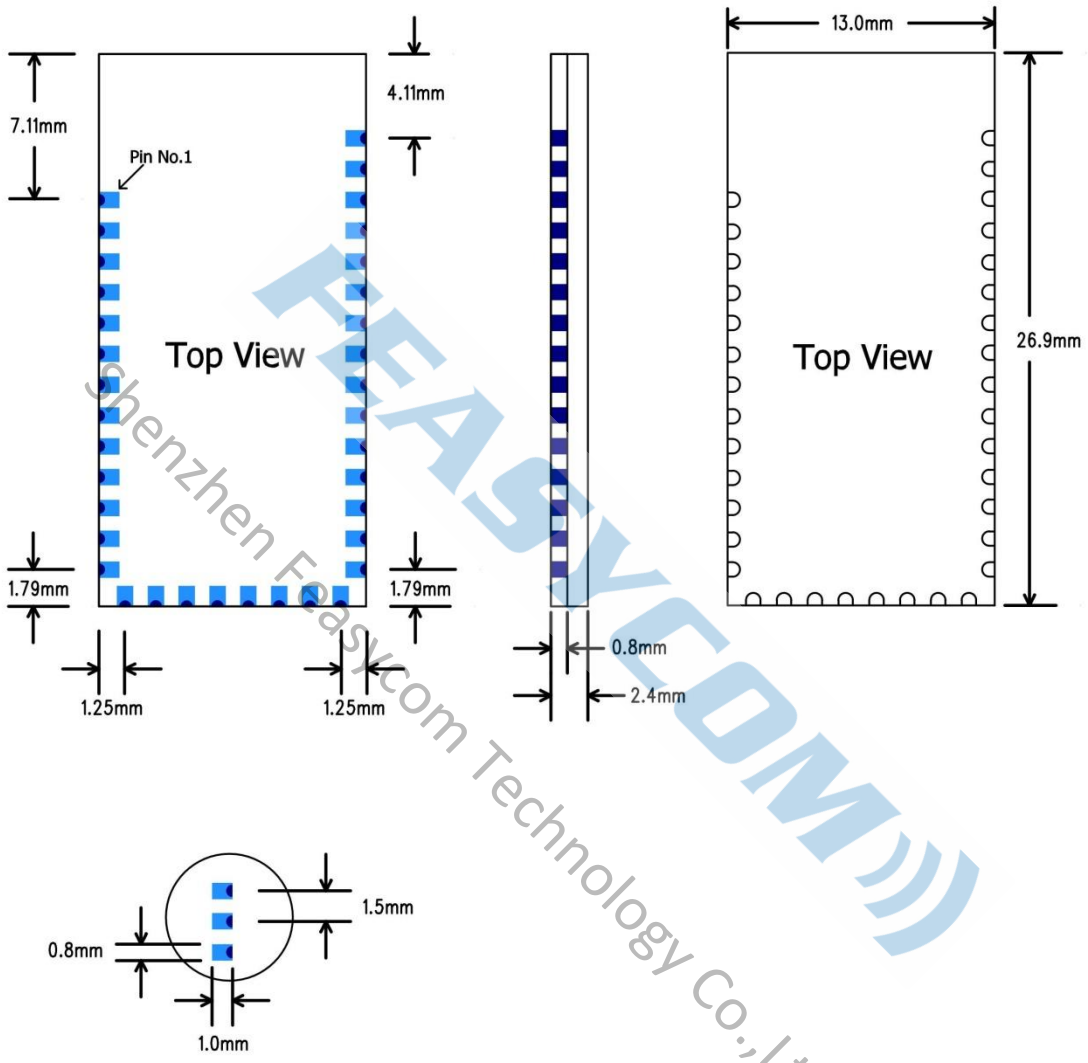


Figure 2：Package Dimensions（TOP VIEW）

4. PIN DEFINITION DESCRIPTIONS

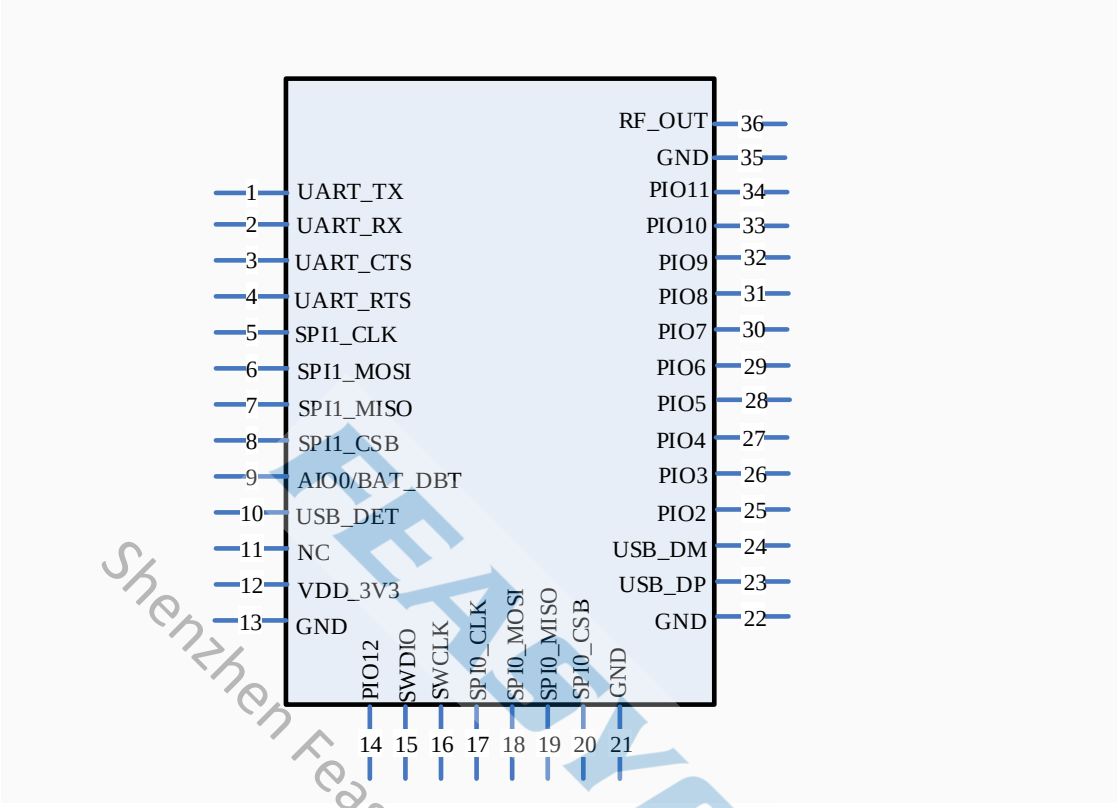


Figure 3: PIN description

Pin	Pin Name	Pad Type	Description
1	UART_TX	CMOS output	UART data output
2	UART_RX	CMOS input	UART data input
3	UART_CTS	CMOS input	UART clear to send active low Alternative Function: Programmable input/output line
4	UART_RTS	CMOS output	UART request to send active low Alternative Function: Programmable input/output line
5	SPI1_CLK	I/O	External flash SPI data clock
6	SPI1_MOSI	I/O	External flash SPI data output
7	SPI1_MISO	I/O	External flash SPI data input
8	SPI1_CSB	I/O	External flash SPI Chip Select Input
9	AIO0/BAT_DBT	I/O	Detecting battery power Alternative Function: Analogue programmable I/O line
10	USB_DET	I	USB insertion detection
11	NC	NC	NC

12	VDD_3V3	VDD	Power supply voltage 3.0~3.6V
13	GND	VSS	Power Ground
14	PIO12	I/O	Programmable input/output line
15	SWDIO	Bi-directional	Debugging through the data line(Default)
16	SWCLK	Bi-directional	Debugging through the clk line(Default)
17	SPI0_CLK	I/O	Internal flash SPI data clock
18	SPI0_MOSI	I/O	Internal flash SPI data output
19	SPI0_MISO	I/O	Internal flash SPI data input
20	SPI0_CSB	I/O	Internal flash SPI Chip Select Input
21	GND	VSS	Power Ground
22	GND	VSS	Power Ground
23	USB_DP	I/O	USB positive electrode
24	USB_DM	I/O	USB negative electrode
25	PIO2	I/O	Scanning enable foot Alternative Function: Programmable input/output line
26	PIO3	I/O	Scanning UART data output Alternative Function: Programmable input/output line
27	PIO4	I/O	Scanning UART data input Alternative Function: Programmable input/output line
28	PIO5	I/O	Scan trigger button Alternative Function: Programmable input/output line
29	PIO6	I/O	Power enable Alternative Function: Programmable input/output line
30	PIO7	I/O	Motor control Alternative Function: Programmable input/output line
31	PIO8	I/O	Buzzerr control Alternative Function: Programmable input/output line
32	PIO9	I/O	Bluetooth connection light Alternative Function: Programmable input/output line
33	PIO10	I/O	System work light Alternative Function: Programmable input/output line
34	PIO11	I/O	Programmable input/output line
35	GND	VSS	Power Ground
36	RF_OUT	O	RF output

Table 2

5. Interface Characteristics

5.1 UART Interface

Four signals are used to implement the UART function. When FSC-BT736 is connected to another digital device, UART_RX and UART_TX transfer data between the two devices. The remaining two signals, UART_CTS and UART_RTS, can be used to implement RS232 hardware flow control where both are active low indicators.

The interface consists of four-line connection as described in below:

Signal name	Driving source	Description
UART-TX	FSC-BT736 module	Data from FSC-BT736 module
UART-RX	Host	Data from Host
UART-RTS	FSC-BT736 module	Request to send output of FSC-BT736 module
UART-CTS	Host	Clear to send input of FSC-BT736 module

Table 3

Default Data Format

Property	Possible Values
BCSP-Specific Hardware	Enable
Baud Rate	115. 2 Kbps
Flow Control	None
Data bit length	8bit
Parity	None
Number of Stop Bits	1

Table 4

5.2 I²C Interface

- Up to two I²C bus interfaces can support both master and slave mode with a frequency up to 400KHZ.
- Provide arbitration function, optional PEC(packet error checking) generation and checking.
- Supports 7 –bit and 10 –bit addressing mode and general call addressing mode.

The I²C interface is an internal circuit allowing communication with an external I²C interface which is an industry standard two line serial interface used for connection to external hardware. These two serial lines are known as a serial data line (SDA) and a serial clock line (SCL). The I²C module provides two data transfer rates: 100 kHz of standard mode or 400kHz of the fast mode. The I²C module also has an arbitration detect function to prevent the situation where more than one master attempts to transmit data to the I²C bus at the same time. A CRC-8 calculator is also provided in I²C interface to perform packet error checking for I²C data.

5.3 Analog to digital converter (ADC)

- 12-bit SAR ADC engine with up to 1 MSPS conversion rate
- Conversion range: VSSA to VDDA (2.6 to 3.6 V)
- Temperature sensor

One 12-bit 1 μs multi-channel ADC is integrated in the device.
The conversion range is between 2.6 V < VDDA < 3.6 V. An analog watchdog block can be used to detect the channels, which are required to remain within a specific threshold window. A configurable channel management block of analog inputs also can be used to perform conversions in single, continuous, scan or discontinuous mode to support more advanced usages. The ADC can be triggered from the events generated by the general-purpose timers (TMx) and the advanced-control timers (TM1) with internal connection.
The temperature sensor can be used to generate a voltage that varies linearly with temperature. Each device is factory-calibrated to improve the accuracy and the calibration data are stored in the system memory area.

6. RECOMMENDED TEMPERATURE REFLOW PROFILE

The re-flow profiles are illustrated in Figure 11 and Figure 12 below.

- Follow: IPC/JEDEC J-STD-020 C
- Condition:
  - Average ramp-up rate(217℃ to peak):1~2℃/sec max.
  - Preheat:150~200C,60~180 seconds
  - Temperature maintained above 217℃:60~150 seconds
  - Time within 5℃ of actual peak temperature:20~40 sec.
  - Peak temperature:250+0/-5℃ or 260+0/-5℃
  - Ramp-down rate:3℃/sec.max.
  - Time 25℃ to peak temperature:8 minutes max
  - Cycloe interval：5 minus

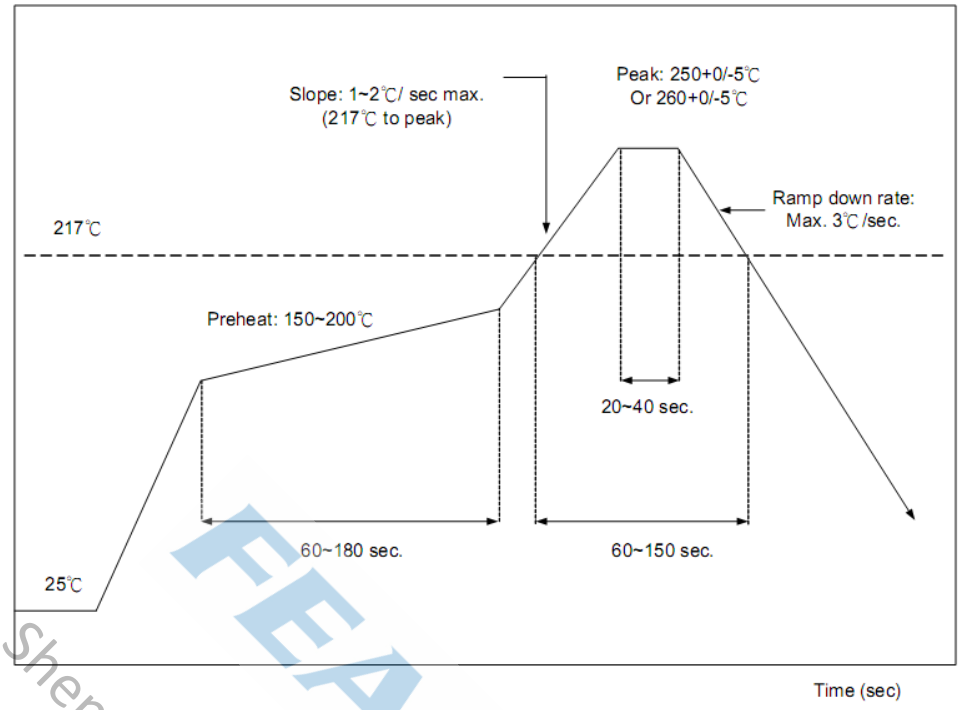


Figure 4: Typical Lead-free Re-flow Solder Profile

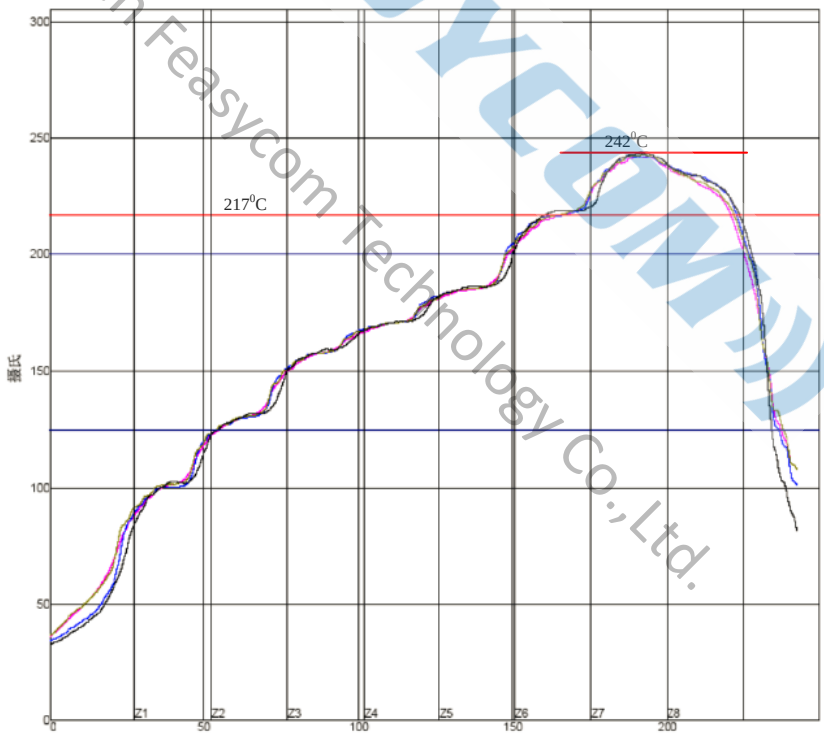


Figure 5 : Typical Lead-free Re-flow

The soldering profile depends on various parameters according to the use of different solder and material. The data here is given only for guidance on solder re-flow.

FSC-BT736 will withstand up to two re-flows to a maximum temperature of 245°C.

7. Reliability and Environmental Specification

7.1 Temperature test

Put the module in demo board which uses exit power supply, power on the module and connect to mobile. Then put the demo in the －20℃ space for 1 hour and then move to +70℃ space within 1minute, after 1 hour move back to －20℃ space within1 minute. This is 1 cycle. The cycles are 32 times and the units have to pass the testing.

7.2 Vibration Test

The module is being tested without package. The displacement requests 1.5mm and sample is vibrated in three directions(X,Y,Z).Vibration frequency set as 0.5G , a sweep rate of 0.1 octave/min from 5Hz to 100Hz last for 90 minutes each direction. Vibration frequency set as 1.5G, a sweep rate of 0.25 octave/min from 100Hz to 500Hz last for 20 minutes each direction.

7.3 Desquamation test

Use clamp to fix the module, measure the pull of the component in the module, make sure the module`s soldering is good.

7.4 Drop test

Free fall the module (condition built in a wrapper which can defend ESD) from 150cm height to cement ground, each side twice, total twelve times. The appearance will not be damaged and all functions OK.

7.5 Packaging information

After unpacking, the module should be stored in environment as follows:

- Temperature: 25℃ ± 2℃
- Humidity: <60%
- No acidity, sulfur or chlorine environment

The module must be used in four days after unpacking.

8. Layout and Soldering Considerations

8.1 Soldering Recommendations

FSC-BT736 is compatible with industrial standard reflow profile for Pb-free solders. The reflow profile used is dependent on the thermal mass of the entire populated PCB, heat transfer efficiency of the oven and particular type of solder paste used. Consult the datasheet of particular solder paste for

profile configurations.

Feasycom will give following recommendations for soldering the module to ensure reliable solder joint and operation of the module after soldering. Since the profile used is process and layout dependent, the optimum profile should be studied case by case. Thus following recommendation should be taken as a starting point guide.

8.2 Layout Guidelines

It is strongly recommended to use good layout practices to ensure proper operation of the module. Placing copper or any metal near antenna deteriorates its operation by having effect on the matching properties. Metal shield around the antenna will prevent the radiation and thus metal case should not be used with the module. Use grounding vias separated max 3 mm apart at the edge of grounding areas to prevent RF penetrating inside the PCB and causing an unintentional resonator. Use GND vias all around the PCB edges.

The mother board should have no bare conductors or vias in this restricted area, because it is not covered by stop mask print. Also no copper (planes, traces or vias) are allowed in this area, because of mismatching the on-board antenna.

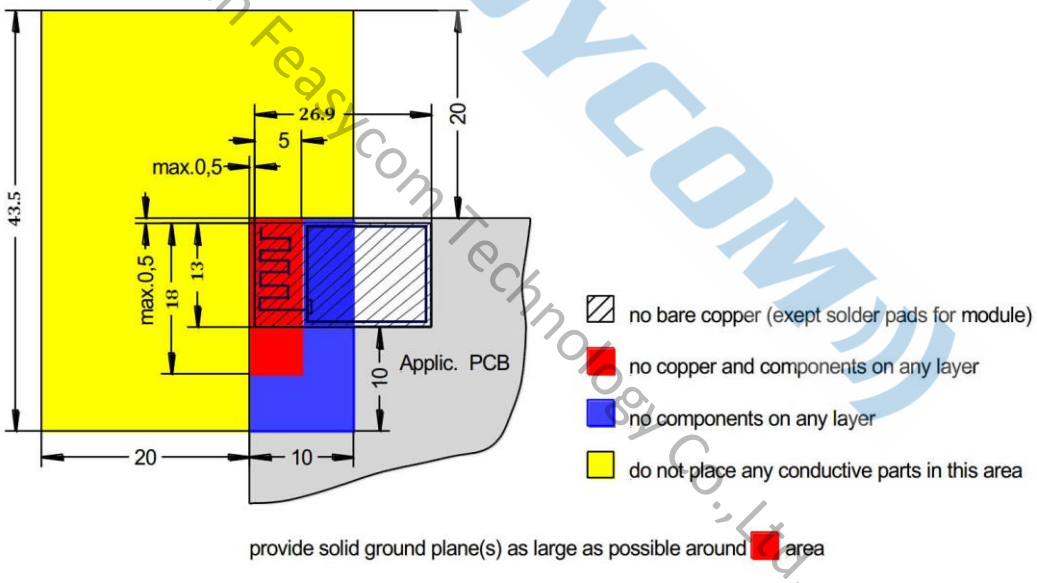


Figure 6: FSC-BT736 Restricted Area

Following recommendations helps to avoid EMC problems arising in the design. Note that each design is unique and the following list do not consider all basic design rules such as avoiding capacitive coupling between signal lines. Following list is aimed to avoid EMC problems caused by RF part of the module. Use good consideration to avoid problems arising from digital signals in the design.

Ensure that signal lines have return paths as short as possible. For example if a signal goes to an inner layer through a via, always use ground vias around it. Locate them tightly and symmetrically around the signal vias. Routing of any sensitive signals should be done in the inner layers of the PCB. Sensitive traces should have a ground area above and under the line. If this is not possible, make sure that the return path is short by other means (for example using a ground line next to the signal line).

9. Application Schematic