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F-3020 Datasheet

Product Name: Bluetooth Module

Product Model: F-3020 V1.1

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Edit	Review	Approve

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Revision History				
Version	**Change Information**	**Page**	**Date**	**Editor**
V1.0	First version		2018-12-26	杨志豪
V1.1	Update QCC3031 chip application		2019-04-25	沈兴利
V1.2	Update QCC3021 chip application		2020-11-19	陈肖

Content

1. Product Overview:

F-3020 Bluetooth module is an intelligent wireless audio data dual-mode transmission product independently developed by the company. It is a low-cost and high-efficiency stereo wireless transmission solution. The module uses QCC3021/QCC3031 (QCC3031 supports APTX-HD) chip for the module. With high-quality sound quality and compatibility, the overall performance is more optimized. The F-3020 Bluetooth module adopts a driver-free mode. Customers only need to connect the module to the application product to quickly realize wireless transmission of music and enjoy the fun of wireless music.

2. Application Area：

This module is mainly used for short-distance music transmission, and it can be easily connected to bluetooth devices of digital products such as laptops, mobile phones, PDAs, and so on to realize wireless transmission of music.

※ High-end bluetooth speaker
※ Bluetooth stereo headset
※ Hands-free phone
※ Bluetooth wireless audio transmission
※ Bluetooth data transmission application
※ Support mobile internet peripheral devices
※Bluetooth wireless networking

3. Features：

Bluetooth Profiles

※ Qualified to Bluetooth v5.0 specification including 2 Mbps Bluetooth low energy (Production parts)
※ Single ended antenna connection with on-chip balun and Tx/Rx switch
※ Bluetooth, Bluetooth low energy, and mixed topologies supported
※ Class 1 support

Audio subsystem

※ 32- bit Kalimba audio digital signal processor (DSP) core with flexible clocking from 2 MHz to 120 MHz to allow optimization and trade-off performance vs. powerconsumption
※ DSP runs from ROM
※ 80 KB program random access memory (RAM)

※ 256 KB data RAM

※ 5 Mb ROM

Application subsystem

※ Dual core application subsystem 32 MHz operation

※ 32- bit Firmware Processor:
- Reserved for system use
- Runs Bluetooth upper stack, profiles, house-keeping code

※ 32- bit Developer Processor:
- Runs developer applications

※ Both cores execute code from external flash memory using QSPI clocked at 32 MHz

※ On-chip caches per core allow for optimized performance and power consumption

Li-ion battery charger

※ Integrated battery charger supporting internal mode (up to 200 mA) and external mode (up to 1.8 A)

※ Variable float (or termination) voltage adjustable in 50 mV steps from 3.65 V to 4.4 V

※ Thermal monitoring and management are implementable in application software

※ Pre-charge to fast charge transition configurable at 2.5 V, 2.9 V, 3.0 V, and 3.1 V

Power management

※ Integrated power management unit (PMU) to minimize external components

※ QCC3031 QFN runs directly from a Li-ion, USB, or external supply (2.8 V to 6.5 V)

※ Auto-switching between battery and USB (or other) charging source

※ Power islands employed to optimize power consumption for variety of use-cases

※ Dual switch-mode power supply (SMPS):
- Automatic mode selection to minimize power consumption
- 1.8 V SMPS generates power for both the device and off-chip circuits
- Dedicated digital SMPS (output voltage changes automatically to minimize device power consumption)

Audio engine and digital audio interfaces

※ 24- bit I²S interface with 1 input and 3 output channels

※ Programmable audio master clock (MCLK)

※ Sony/Philips digital interface (SPDIF): 2, configurable as input or output

※ Stereo analog Class-AB headphone outputs:
- Class-AB signal-to-noise ratio (SNR): 101 dBA typ.
- Class-AB total harmonic distortion plus noise (THD +N): -90.5 dB typ.

※ Dual analog inputs configurable as single ended line inputs or, unbalanced or balanced analog microphone inputs:
- SNR single-ended: 101 dBA typ.
- THD+N single-ended: -85 dB typ.

※ 1 microphone bias (single bias shared by the two channels):

※ Crosstalk attenuation between two inputs using recommended application circuit: 80 dB typ.

※ Digital microphone inputs with capability to interface up to 6 digital microphones

※ Both analog-to-digital converter (ADC)s and digital-toanalog converter (DAC)s support sample rates of 8, 16, 32, 44.1, 48, 96 kHz. DACs also support 192 kHz.

Peripherals and physical interfaces

※ A UART interface

※ 2 x Bit Serializers (programmable serial peripheral interface (SPI) and I²C hardware accelerator)

※ 1 x USB interface:

- A full speed USB (USB-FS) Device (12 Mbps) – USB interface includes ESD protection to IEC-61000-4-2 (device level)

※ QSPI NOR flash interface

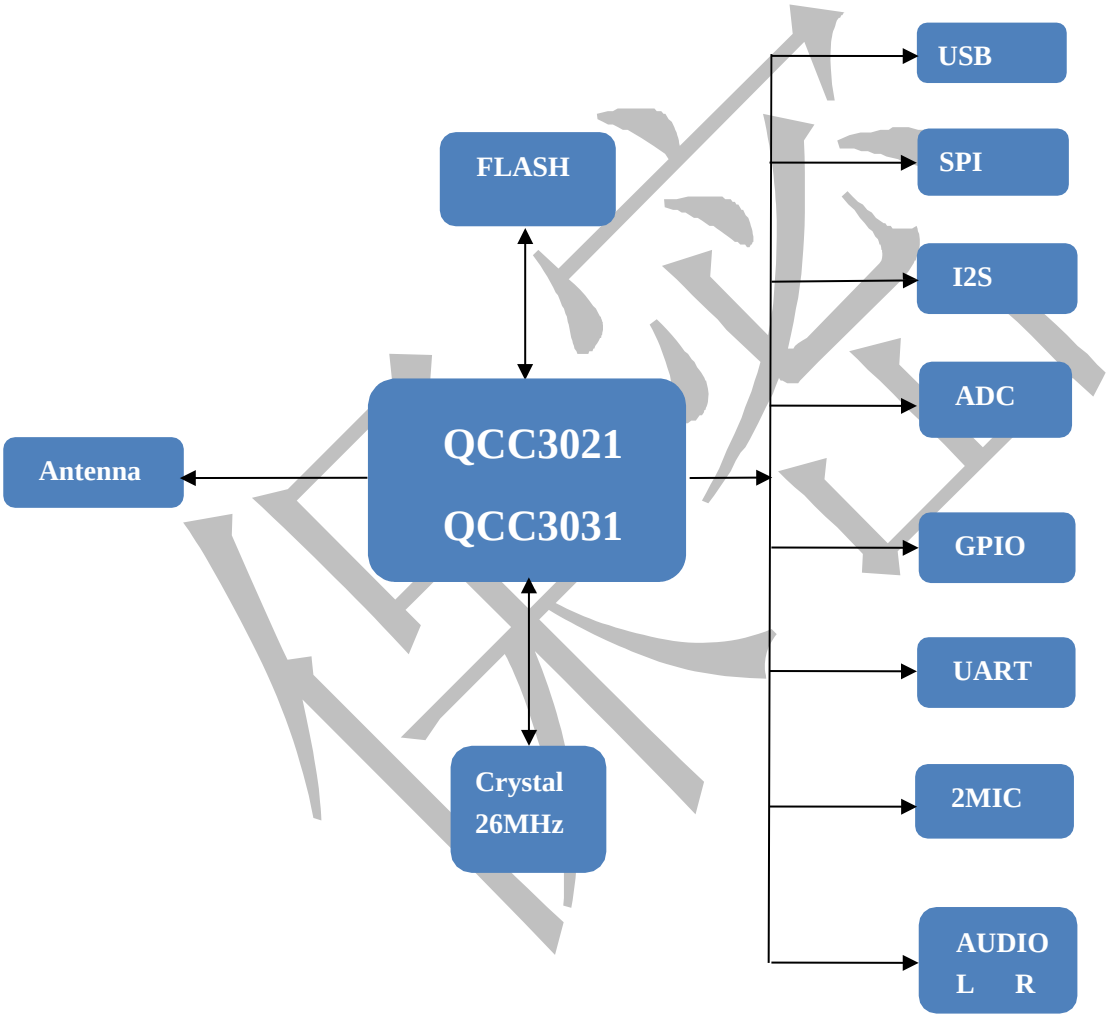
- QSPI encryption to protect developer code and data
- Encryption programmable with a 128- bit security key of original equipment manufacturer (OEM) choice stored in on-chip one-time programmable (OTP) memory

※ Up to 17 PIO and 4 open drain/digital input LED pads with pulse width modulation (PWM)

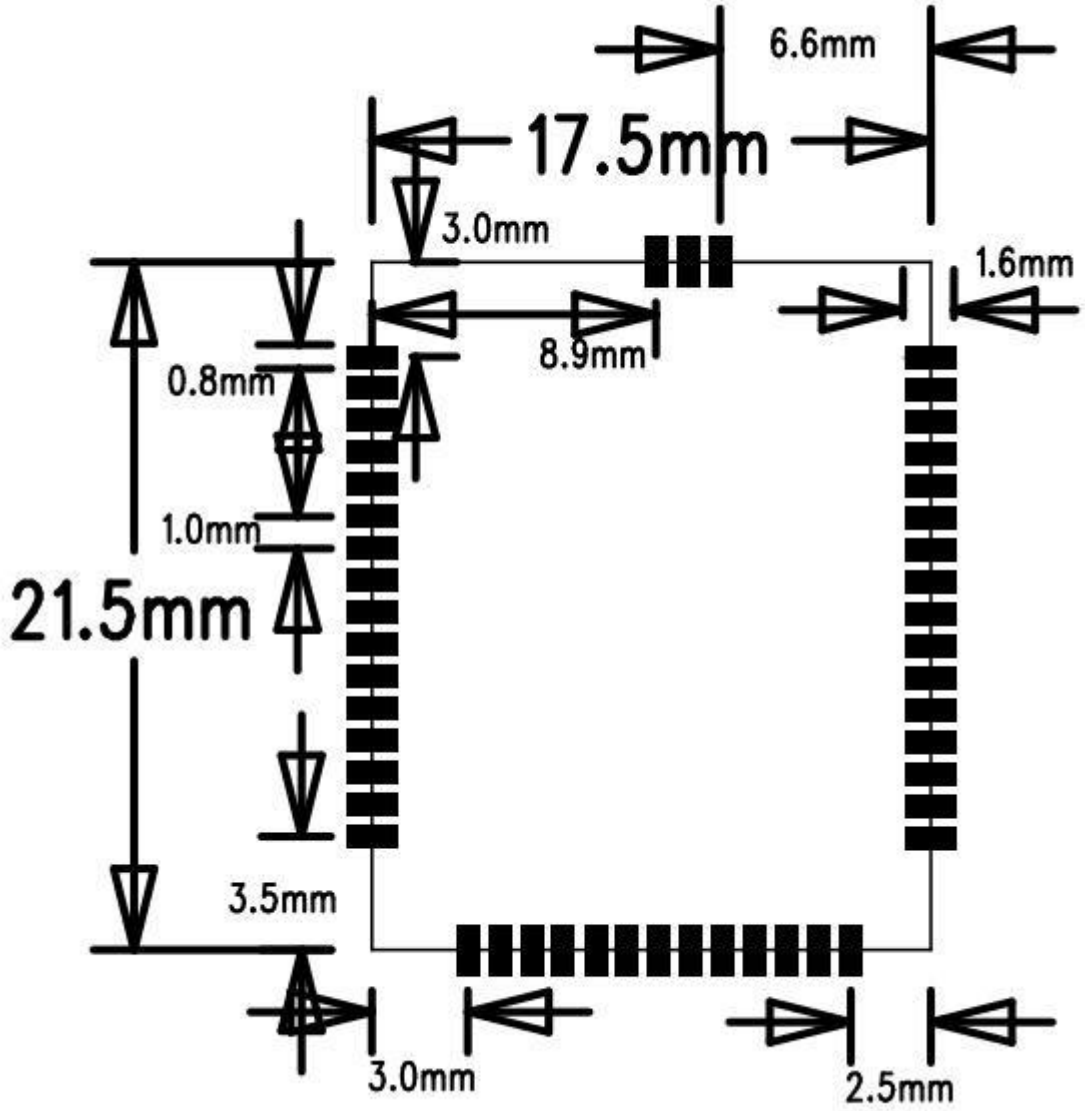
4. Performance Parameter：

Part NO.	F-3020
Version	Bluetooth V5.0
Modulation	GFSK, π/4 DQPSK, 8DPSK
Supply voltage：	3.3-4.2V
Profile	HFPV1.6, HSPV1.2, A2DPV1.2, AVRCPV1.0, PBAP, SPP, OPP, G OEP, FTP, HID
Work current	≤30mA
Standby current	<50uA
Temperature range	-40ºC to +80ºC
Transmission range	＞10 meters
TX power	Support CLASS1/ CLASS2 /CLASS3 Maximum adjustable 8dBm
Sensitivity	-80dBm<0.1%BER
Frequency Range	2.402GHz-2.480GHz
External Interface	PIO. SPI, AIO, UART, USB, PCM, I2S, SPDIF, SPK(L/R)
Support system	Android,IOS and windows
Audio performance	AAC, MP3, SBC, AAC+ Faststream, APTX, (QCC3031 APTX-HD）
SNR	≥75dB
Distortion	≤0.1%
Dimension	21.5*17.5*3MM

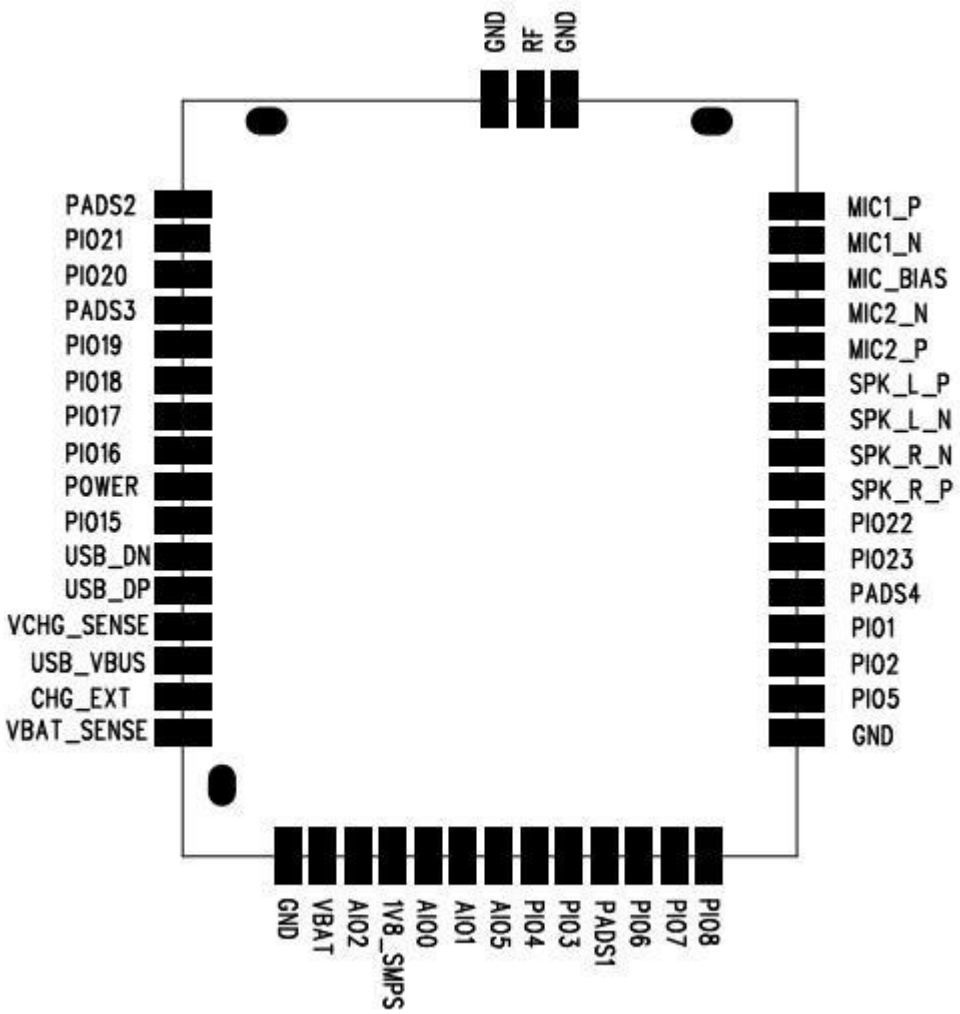
5. Module Block Diagram



6. The Size of the Module Graph：



7. Device Pin Out Diagram



8. Pin Definition

Pin	Symb	I/O	Description
1	GND	GND	GND
2	RF_IN	RF_OUT	RF OUTPUT
3	GND	GND	GND
4	PADS2	SUPPLY	1.8 V/3.3 V PIO supply.
5	PIO21	PIO21	Programmable I/O line 21. Alternative function: PCM_DOUT[2]
6	PIO20	PIO20	Programmable I/O line20. Alternative function: PCM_DOUT[1]
7	PADS3	SUPPLY	1.8 V/3.3 V PIO supply.
8	PIO19	PIO19	Programmable I/O line 19. Alternative function: PCM_DIN[0]
9	PIO18	PIO18	Programmable I/O line 18. Alternative function: PCM_DOUT[0]
10	PIO17	PIO17	Programmable I/O line 17. Alternative function: PCM_SYNC
11	PIO16	PIO16	Programmable I/O line 16. Alternative function: PCM_CLK
12	POWER	Digital input	Typically connected to an ON/OFF push button. Boots device in response to a button press when power is still present from battery and/or charger but software has placed the device in the OFF or DORMANT state. Additionally useable as a digital input in normal operation. No pull. Additional function: PIO[0] input only
13	PIO15	PIO15	Programmable I/O line 15. Alternative function: MCLK_OUT
14	USB_DN	Digital	USB Full Speed device D- I/O. IEC-61000-4-2 (device level) ESD Protection
15	USB_DP	Digital	USB Full Speed device D+ I/O. IEC-61000-4-2 (device level) ESD Protection

16	VCHG_SENSE	Analog	Charger input sense pin after external mode sense-resistor. High impedance. **NOTE** If using internal charger or no charger, connect VCHG_SENSE direct to VCHG
17	USB_VBUS	Supply	Charger input to Bypass regulator
18	CHG_EXT	Analog	External charger transistor current control. Connect to base of external charger transistor as per application schematic.
19	VBAT_SENSE	Analog	Battery voltage sense input.
20	GND	GND	GND
21	VBAT	Supply	Battery voltage input

22	AIO2	Analog or digital input/ open drain output.	General-purpose analog/digital input or open drain LED output.
23	1V8_SMPS	Supply	1.8 V supply
24	AIO0	Analog or digital input/ open drain output.	General-purpose analog/digital input or open drain LED output.
25	AIO1	Analog or digital input/ open drain output	General-purpose analog/digital input or open drain LED output
26	AIO5	Analog or digital input/ open drain output	General-purpose analog/digital input or open drain LED output
27	PIO4	PIO4	Programmable I/O line 4. Alternative function: TBR_MOSI[1]
28	PIO3	PIO3	Programmable I/O line 3. Alternative function: TBR_MISO[2]
29	PADS1	SUPPLY	1.8 V/3.3 V PIO supply.
30	PIO6	PIO6	Programmable I/O line 6. Alternative function: TBR_MOSI[0]
31	PIO7	PIO7	Programmable I/O line 7. Alternative function: TBR_MISO[0]
32	PIO8	PIO8	Programmable I/O line 8. Alternative function: TBR_CLK
33	GND	GND	GND
34	PIO5	PIO5	Programmable I/O line 5. Alternative function: TBR_MISO[1]
35	PIO2	PIO2	Programmable I/O line 2. Alternative function: TBR_MISO[3]
36	PIO1	PIO1	Automatically defaults to RESET# mode when the device is unpowered, or in off modes. Reconfigurable as a PIO after boot. Alternative function: Programmable I/O line 1
37	PADS4	SUPPLY	1.8 V/3.3 V PIO supply.
38	PIO23	PIO23	Programmable I/O line 23.
39	PIO22	PIO22	Programmable I/O line 22.
40	SPK_R_P	Analog	Headphone/speaker differential right output, positive. Alternative function: Differential right line output, positive
41	SPK_R_N	Analog	Headphone/speaker differential right output, negative. Alternative function: Differential right line output,negative
42	SPK_L_N	Analog	Headphone/speaker differential left output, negative. Alternative function: Differential left line output,negative
43	SPK_L_P	Analog	Headphone/speaker differential left output, positive. Alternative function: Differential left line output,positive

44	MIC2_P	Analog	Microphone differential 2 input,positive. Alternative function: Differential audio line input right, positive
45	MIC2_N	Analog	Microphone differential 2 input, negative. Alternative function: Differential audio line input right, negative
46	MIC_BIAS	Analog	Mic bias output
47	MIC1_N	Analog	Microphone differential 1 input, negative. Alternative function: Differential audio line input left, negative
48	MIC1_P	Analog	Microphone differential 1 input, positive. Alternative function: Differential audio line input left, positive

9. Design Notes：

In order to better SNR, please pay attention to the hardware design of PA, DC booster, DC/ DC circuit and the module power circuit to avoid influencing module.

10. Note ：

a.The signal strength is depending on the environment of Bluetooth application, such as wood and metal will block the transmission signal to get the shorter transmission distance.

b.Because of metal will block the signal transmission, it is recommend not to using the metal housing.

c.PCB layout guideline: no any copper existed in the antenna area of the module is the PCB antenna, the metal will weaken the function of the antenna when the antenna module to the module board, following prohibited paving and walk the line.

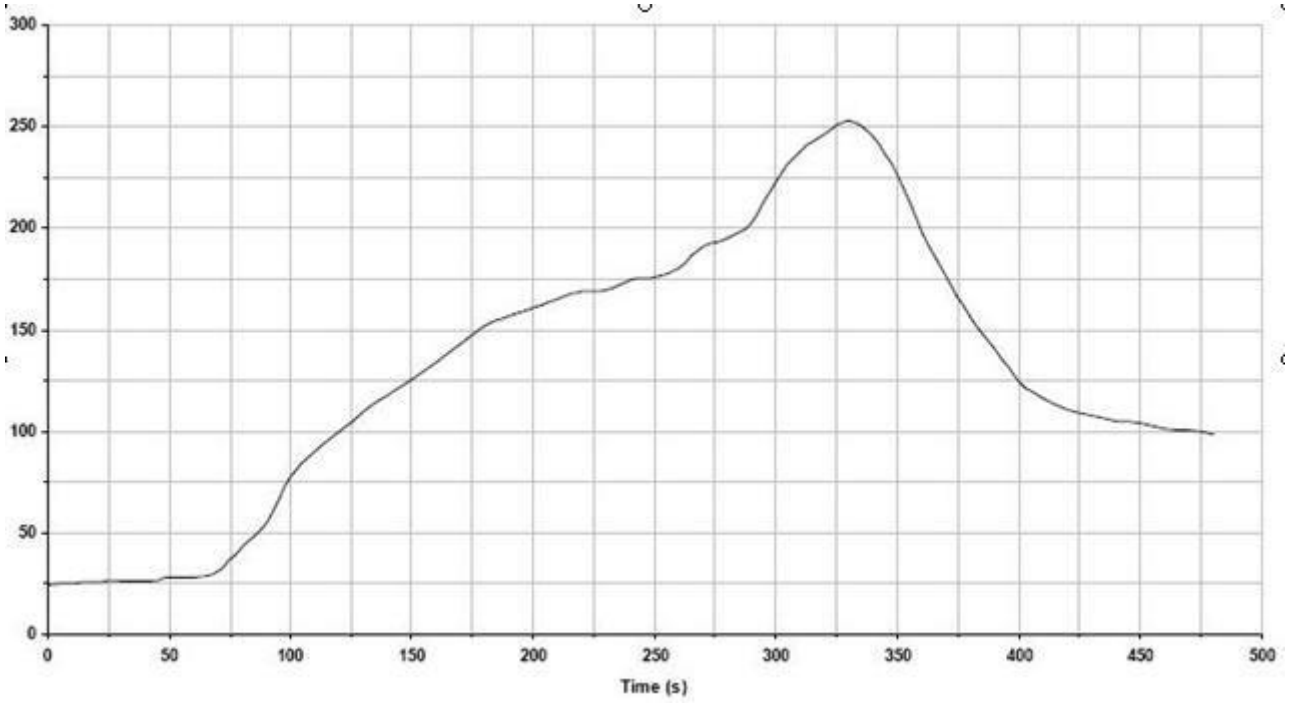
d.If the module antenna next to the battery 、 metal, liquid crystal screen, loudspeaker, at least keep them away from antenna distance 15mm

e.When layout the power supply line recommended star line, and to ensure that the Bluetooth module Power supply lines is better , and BT should be with the amplifier, power amplifier, MCU, separately, and the underside of the BT has no other interference.

f.Suggests the module antenna part floating on the floor, do not go around the antenna control line, power line, audio line, MIC interference lines;

g.If the module antenna near the row seats, Because of metal will block the signal transmission, it is recommended to use professional high-gain antenna.

11. Recommended Reflow Temperature



THE END !