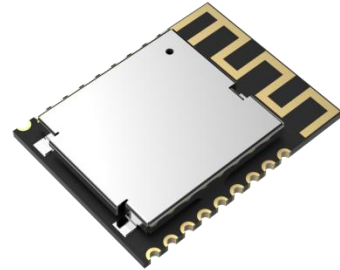# Cost-sensitive m1805 Module MS48SF2 Specification

UART module MS48SF2 is based on m1805 Chipset. It is a small size (16×12×2mm) and stand-alone module with 12 GPIO. The data transmission between module and mobile phone can be achieved via operation of UART. With up to 60-meter working distance in open space, 512KB flash memory, etc., the data can be transmitted via Bluetooth

Features

Range: 10-60M（open space）

Flash memory: 512KB

Received sensitivity: -97dBm

Transmitted power: -20~+5dBm

Transmitted current: 8mA/0dBm

Received current: 8mA

GPIO: 12

Size: 15.8×12×2mm

Working voltage: 3.0- 3.6V

Working frequency: 2400-2483 MHz

Working temperature: -30°C- +60 °C

Depth optimization of BLE stack

Power consumption of sleep mode is under 4uA

Transmission speed is up to 3kB/s

UART instruction supported

Android 4.3+, IOS 7+ supported

MFi is not required

50 ohm PCB antenna

With metal cover shield

Applications

Medical devices

Heart rate monitor

Blood pressure monitor

Blood glucose meter

Thermometer

Sport facilities

Weighing machine

Sports and fitness sensors

Accessories

3D glasses and gaming controller

Mobile accessories

Remote controllers / Toys

Electronic devices

Cycle computer

Certification

ISO 9001

ISO14001

OAHS18001

Revision history

Version	Date	Notes	Contributor（s）	Person of Approve
V 1.0	2019.02.22	Compiling the specification	Lynn	

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1. Product introduction

UART module MS48SF2 is based on m1805 Chipset. It is a small size (16×12×2mm) and stand-alone module with 12 GPIO. The data transmission between module and mobile phone can be achieved via operation of UART. With up to 60-meter working distance in open space, 512KB flash memory and -97dBm received sensitivity, the data can be transmitted via Bluetooth.
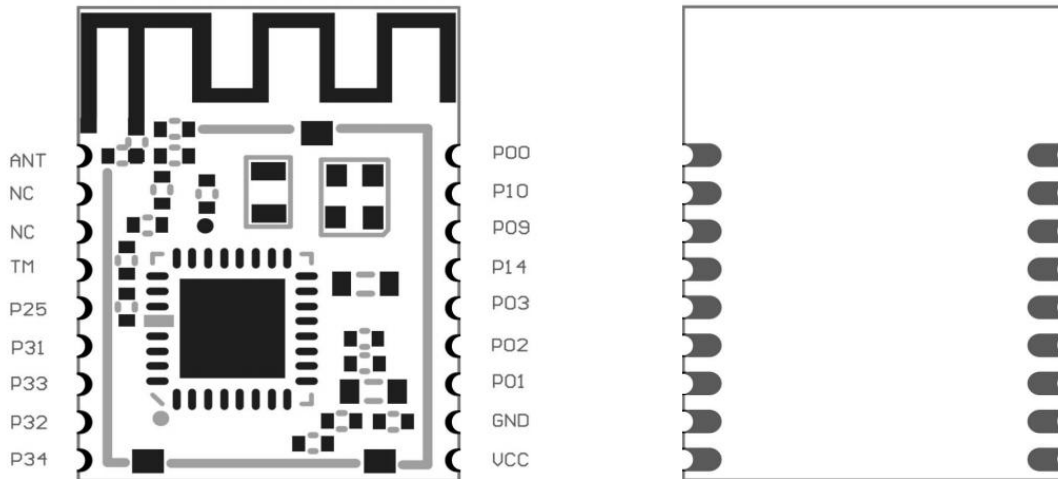
MS48SF2 is a compact module with a metal cover shield which can support Android 4.3+, IOS 7+. Its BLE stack can be depth optimization and the transmission speed is up to 3kB/s.

1.1 Ordering information

Ordering number	Description
MS48SF2	PS1912OB, m1805FA-R, PCB ANT, reel pack

2. Pin description

2.1 Pin assignment

2.2 Pin definition

Symbol	Description
VCC	Power positive pole
GND	Power negative pole
NC	null
ANT	Antenna
P00	All functions configurable/JTAG_TDO(Not support ADC function)
P01	All functions configurable/JTAG_TDI (Not support ADC function)
P02	All functions configurable/JTAG_TMS (Not support ADC function)
P03	All functions configurable/JTAG_TCK (Not support ADC function)
P09	All functions configurable (Not support ADC function)
P10	All functions configurable (Not support ADC function)
P14	All functions configurable/ AIO <3>
P25	All functions configurable/test_mode_select[1](Not suppor interrupt du)
P31	All functions configurable (Not support interrupt and ADC function)
P32	All functions configurable(Not support interrupt and ADC function)
P33	All functions configurable (Not support interrupt and ADC function)
P34	All functions configurable (Not support interrupt and ADC function)

2.3 Block diagram
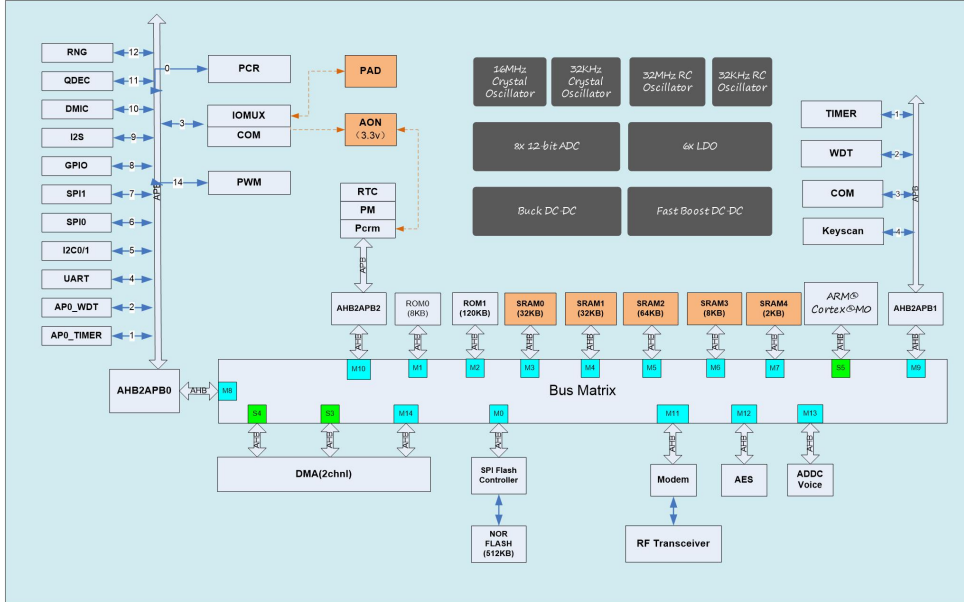
2.4 Mechanical drawing
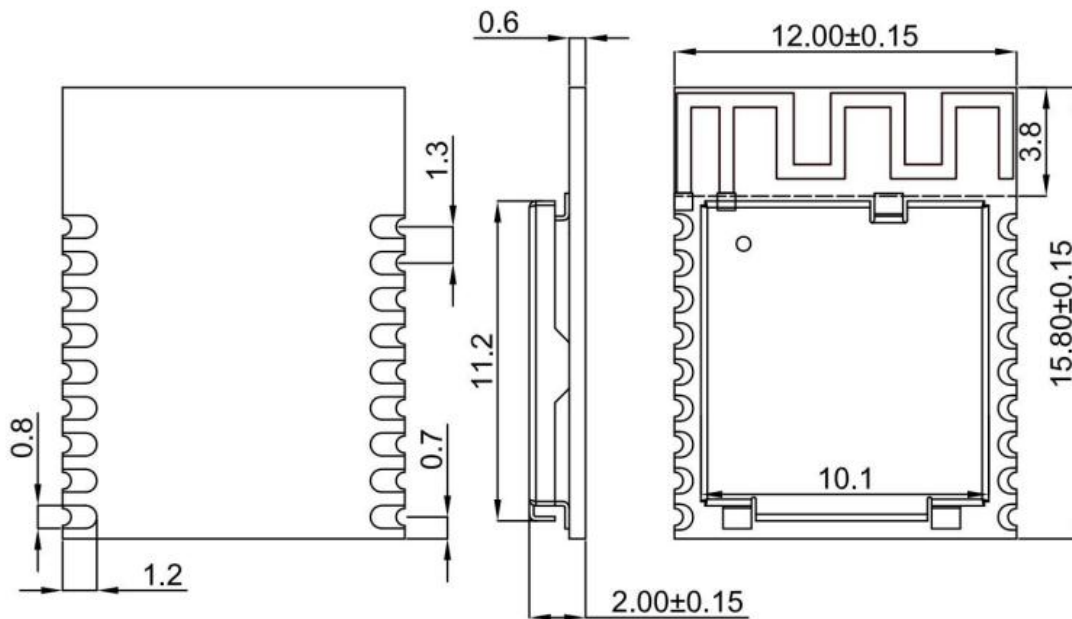
Unit: mm

Tolerance: +/- 1.0, default

3. Electrical specification

The electrical specifications of the module are directly related to the Specifications for the m1805 chipset. The below information is only the extract from m1805 specification. For more detailed information, please refer to the up-to-date specification of the chipset available.

3.1 Absolute maximum ratings

Symbol	Parameter	Min.	Max	Unit
Supply voltages				
VDD3		-0.3	+3.6	V
DEC			1.32	V
VSS			0	V
I/O Pin voltage				
VIO		-0.3	VDD + 0.3V	V
Environmental (AQFN package)				
Storage temperature		-40	+125	°C
MSL	Moisture Sensitivity Level		3	
ESD HBM	Human Body Model Class 2		2	KV
ESD CDM$_{QF}$	Charged Device Model		500	V
Flash memory				
Endurance			20000	Write/erase cycles
Retention			10 years at 40°C	
Number of times an address can be written between erase cycles			2	Times

Notes ：Maximum ratings are the extreme limits to which the chip can be exposed for a limited amount of time without permanently damaging it. Exposure to absolute maximum ratings for prolonged periods of time may affect the reliability of the device.

3.2 Recommended operating conditions

Symbol	Parameter	Min.	Nom.	Max.	Units
VDD3	supply voltage,normal mode	1.8	3.0	3.6	V
tr_VDD	Supply rise time (0 V to 1.8 V)			100	ms
TA	Operating temperature	-40	27	125	°C

Important : The On-chip power-on reset circuitry may not function properly for rise times longer than the specified maximum.

3.3   Electronic characteristic

3.3.1 General radio characteristics

Parameter	Description	Min.	TYP	Max.	Units
Tx only at 0dBm	With internal DC-DC @ 3V		8		mA
Rx only	With internal DC-DC @ 3V		8		mA

3.3.2 Radio current consumption (Transmitter)

Parameter	Description	Min.	Typ.	Max.	Units
RF Max output Power			10		dBm
RF Min Output Power			-20		dBm
OBW for BLE 1Mbps	20dB occupy-bandwidth for BLE modulation 1Mbps		1100		kHz
OBW for BLE 2Mbps	20dB occupy-bandwidth for BLE modulation 2Mbps		2300		kHz
OBW for GFSK 500 kbps	20dB occupy-bandwidth for GFSK modulation 2Mbps		1100		kHz
OBW for GFSK 125 bps	20dB occupy-bandwidth for GFSK modulation 2Mbps		1100		kHz
Error Vector Measure	Offset EVM for OQPSK modulation		0.02		
FDEV for BLE 1Mbps	Frequency deviation for GFSK modulation 1Mbps	160		250	kHz
FDEV for BLE 2Mbps	Frequency deviation for GFSK modulation 2Mbps	320		500	kHz

3.3.3 RX BLE 1Mbps GFSK (Receiver)

Parameter	Description	Min	Typ.	Max.	Units
Rx Sensitivity	Sensitivity test 1Mbps BLE ideal transmitter, 37 Byte BER=1E-3		-97		dBm
co-channel rejection	modulated interferer in channel, 37 Byte BER=1E-3		-6		I/C dB
Selectivity +-1MHz	Wanted signal at -67dBm, modulated interferer at +/- 1MHz, 37 Byte BER=1E-3		7		I/C dB
Selectivity +-2MHz	Wanted signal at -67dBm, modulated interferer at +/- 2MHz, 37 Byte BER=1E-3		45		I/C dB
Selectivity +-3MHz	Wanted signal at -67dBm, modulated interferer at +/- 3MHz, 37 Byte BER=1E-3		50		I/C dB
Selectivity +-4MHz	Wanted signal at -67dBm, modulated interferer at +/- 4MHz, 37 Byte BER=1E-3		50		I/C dB
Selectivity +-5MHz or More	Wanted signal at -67dBm, modulated interferer at >=+/- 5MHz, 37 Byte BER=1E-3		55		I/C dB
Selectivity Imag frequency	Wanted signal at -67dBm, modulated interferer at imagefrequency, 37 Byte BER=1E-3		22		I/C dB
Intermodulation	Wanted signal at 2402MHz, -64dBm, Two interferers at 2405 and 2408 MHz respectively, at the given power level, 37 Byte BER=1E-3		-20		dBm
Carrier Frequency Offset Tolerance			+-350		KHz
Sample Clock Offset Tolerance			+-120		ppm

3.3.4 RX BLE 2Mbps GFSK

Symbol	Description	Min	Typ.	Max.	Units
Rx Sensitivity	Sensitivity test 2Mbps BLE ideal transmitter, 37 Byte BER=1E-3		-94		dBm
co-channel rejection	modulated interferer in channel, 37 Byte BER=1E-3		-6		I/C dB
Selectivity +-1MHz	Wanted signal at -67dBm, modulated interferer at +/- 1MHz, 37 Byte BER=1E-3		-5		I/C dB
Selectivity +-2MHz	Wanted signal at -67dBm, modulated interferer at +/- 2MHz, 37 Byte BER=1E-3		9		I/C dB
Selectivity +-3MHz	Wanted signal at -67dBm, modulated interferer at +/- 3MHz, 37 Byte BER=1E-3		30		I/C dB

Selectivity +-4MHz	Wanted signal at -67dBm, modulated interferer at +/- 4MHz, 37 Byte BER=1E-3		40		I/C dB
Selectivity +-5MHz or More	Wanted signal at -67dBm, modulated interferer at >=+/- 5MHz, 37 Byte BER=1E-3		55		I/C dB
Selectivity Imag frequency	Wanted signal at -67dBm, modulated interferer at imagefrequency, 37 Byte BER=1E-3		22		I/C dB
Intermodulation	Wanted signal at 2402MHz, -64dBm, Two interferers at 2405 and 2408 MHz respectively, at the given power level, 37 Byte BER=1E-3		-20		dBm
Carrier Frequency Offset Tolerance			+-350		KHz
Sample Clock Offset Tolerance			+-120		ppm

3.3.5 RX 500kbps GFSK

Parameter	Description	Min	Typ.	Max.	Units
Rx Sensitivity	Sensitivity test 500Kbps BLE ideal transmitter, 37 Byte BER=1E-3		-98		dBm
co-channel rejection	modulated interferer in channel, 37 Byte BER=1E-3		-4		I/C dB
Selectivity +-1MHz	Wanted signal at -67dBm, modulated interferer at +/- 1MHz, 37 Byte BER=1E-3		10		I/C dB
Selectivity +-2MHz	Wanted signal at -67dBm, modulated interferer at +/- 2MHz, 37 Byte BER=1E-3		45		I/C dB
Selectivity +-3MHz	Wanted signal at -67dBm, modulated interferer at +/- 3MHz, 37 Byte BER=1E-3		50		I/C dB
Selectivity +-4MHz	Wanted signal at -67dBm, modulated interferer at +/- 4MHz, 37 Byte BER=1E-3		50		I/C dB
Selectivity +-5MHz or More	Wanted signal at -67dBm, modulated interferer at >=+/- 5MHz, 37 Byte BER=1E-3		55		I/C dB
Selectivity Imag frequency	Wanted signal at -67dBm, modulated interferer at imagefrequency, 37 Byte BER=1E-3		24		I/C dB
Intermodulation	Wanted signal at 2402MHz, -64dBm, Two interferers at 2405 and 2408 MHz respectively, at the given power level, 37 Byte Ber=1E-3		-19		dBm
Carrier Frequency Offset Tolerance			+-350		KHz
Sample Clock Offset Tolerance			+-120		ppm

3.3.6 RX 125Kbps GFSK

Parameter	Description	Min	Typ.	Max.	Units
Rx Sensitivity	Sensitivity test 125Kbps BLE ideal transmitter, 37 Byte BER=1E-3		-103		dBm
co-channel rejection	modulated interferer in channel, 37 Byte BER=1E-3		-1		I/C dB
Selectivity +-1MHz	Wanted signal at -67dBm, modulated interferer at +/- 1MHz, 37 Byte BER=1E-3		-11		I/C dB
Selectivity +-2MHz	Wanted signal at -67dBm, modulated interferer at +/- 2MHz, 37 Byte BER=1E-3		45		I/C dB
Selectivity +-3MHz	Wanted signal at -67dBm, modulated interferer at +/- 3MHz, 37 Byte BER=1E-3		50		I/C dB
Selectivity +-4MHz	Wanted signal at -67dBm, modulated interferer at +/- 4MHz, 37 Byte BER=1E-3		50		I/C dB
Selectivity +-5MHz or More	Wanted signal at -67dBm, modulated interferer at >=+/- 5MHz, 37 Byte BER=1E-3		55		I/C dB
Selectivity Imag frequency	Wanted signal at -67dBm, modulated interferer at image frequency, 37 Byte BER=1E-3		28		I/C dB
Intermodulation	Wanted signal at 2402MHz, -64dBm, Two interferers at 2405 and 2408 MHz respectively, at the given power level, 37 Byte BER=1E-3		-18		dBm
Carrier Frequency Offset Tolerance			+-350		KHz
Sample Clock Offset Tolerance			+-120		ppm

3.3.7 RSSI Specifications

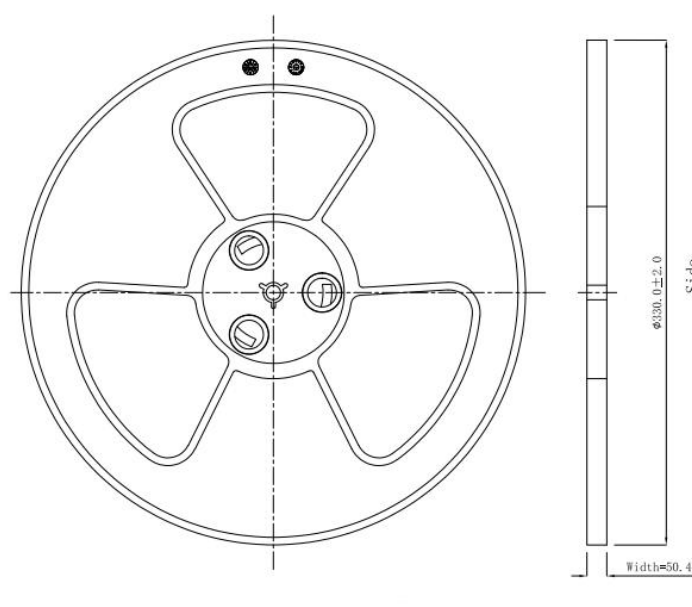| Parameter	Description	Min	Typ.	Max.	Units
RSSI Dynamic Range			70		dB
RSSI Accuracy	RSSI Accuracy Valid in range -100 to -30dBm		+/-2		dB
RSSI Resolution	Totally 7bit, from 0 to 127		1		dB
RSSI Period			8		us

4. Electrical schematic
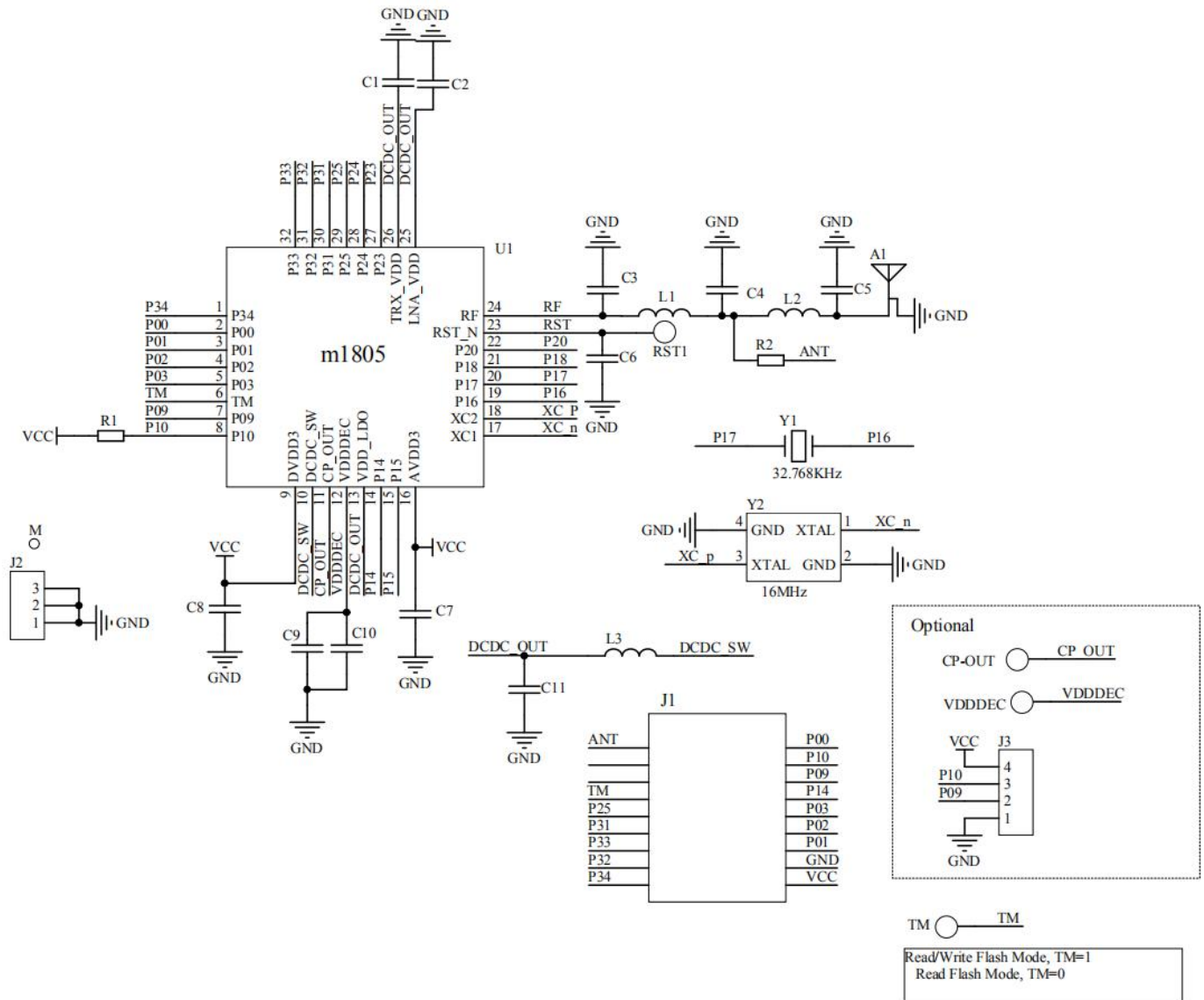
5. Package information

5.1 Package dimension
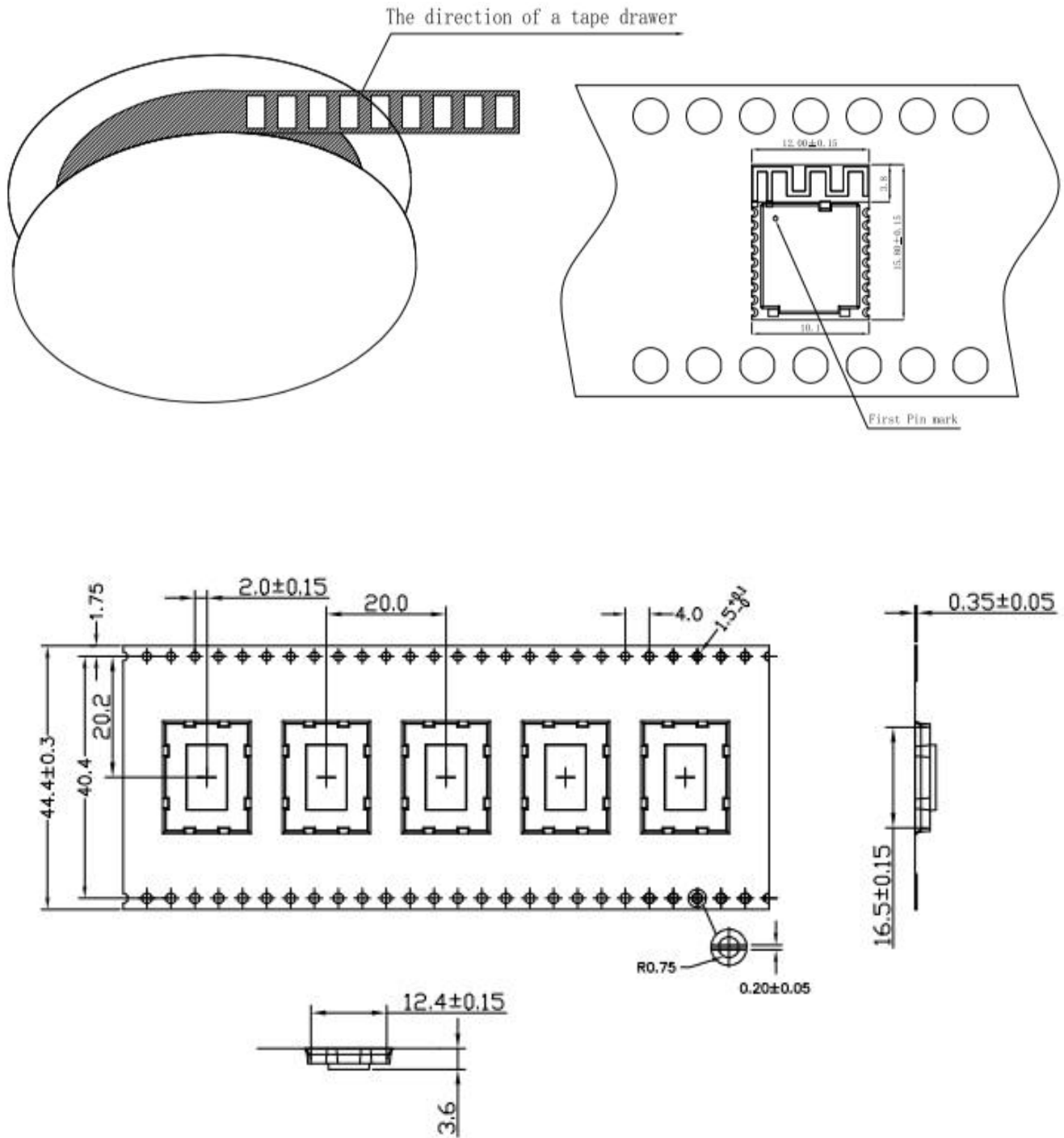
Unit: mm

Tolerance: +/- 0.1, default

Unit: mm

Tolerance: +/- 0.1, default

Details	Reel
Quantity(module)	850PCS
Tape Weight	450g
Single module Weight	0.6g
Gross Weight	970g
Dimension	W：44mm T：0.35mm

Tolerance: +/- 10g, default

6. Reflow and soldering
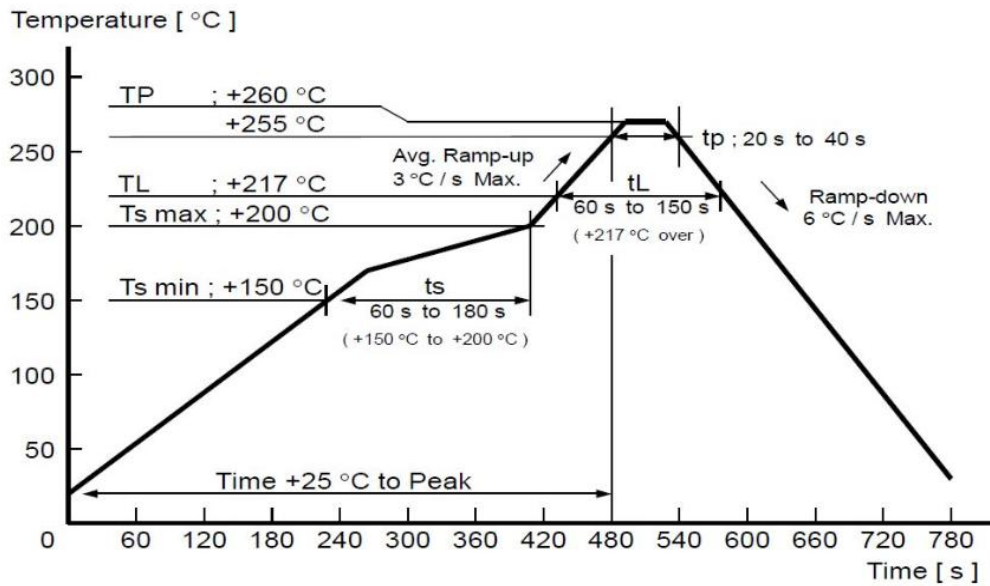
Profile Feature	Sn-Pb Assembly	Pb-Free Assembly
Solder Paste	Sn63/Pb37	Sn96.5/Ag3/Cu0.5
Preheat Temperature min (Tsmin)	100°C	150°C
Preheat Temperature max (Tsmax)	150°C	200°C
Preheat Time (Tsmin to Tsmax)(ts)	60-120 sec	60-120 sec
Average ramp-up rate (Tsmax to Tp)	3°C/second max	3°C/second max
Liquidous Temperature (TL)	183°C	217°C
Time (tL)Maintained Above (TL)	60-90 sec	30-90 sec
Peak Temperature (Tp)	220-235°C	230-250°C
Average ramp-down rate (Tp to Tsmax)	6°C/second max	6°C/second max
Time 25°C to peak temperature	6 minutes max	8 minutes max

7. Notes & cautions

We cannot assure that the specification has no errors and omission even though this specification is under collate and check strictly.

This specification is under the protection of laws and regulations of copyright, please do not copy and duplicate at any form, or do not transmit part or full of this specification in any wire and wireless network in any form, or do not edit or translate to any other format, word, code, etc.

7.1 Design notes

(1) It is critical to following the recommendations of this document to ensure the module meets the specifications.

(2) The module should be placed at the edge of the circuit board as far as possible to keep away from other circuits.

(3) Antenna should be kept away from other circuits. It can prevent low radiation efficiency and the normal use of other circuits from being affected.

(4) The landing of components should be appropriate and that is better for reducing the parasitic inductance.

(5) Please refuse to supply voltage that is not within the range of specification.

(6) Please make sure the module or its surface may not suffer from the physical shock or extreme stress.

7.2 Layout notes

To make sure wireless performance is at its best condition, please layout the module on the carrier board as below instructions and picture.

(1) Placement of the antenna
The antenna area of module shall lay clearance completely and should not be blocked by the metal. Otherwise it will have effect on antenna performance (As the picture indicated below).

(2) Placement of top-layer
The placement of top-layer in carrier board shall be lay copper completely to reduce the signal line in carrier board or other interference.

(3) Clearance

The upper and below area of antenna (including the case) shall have 4mm or more than 4mm clearance to reduce the influences for antenna.
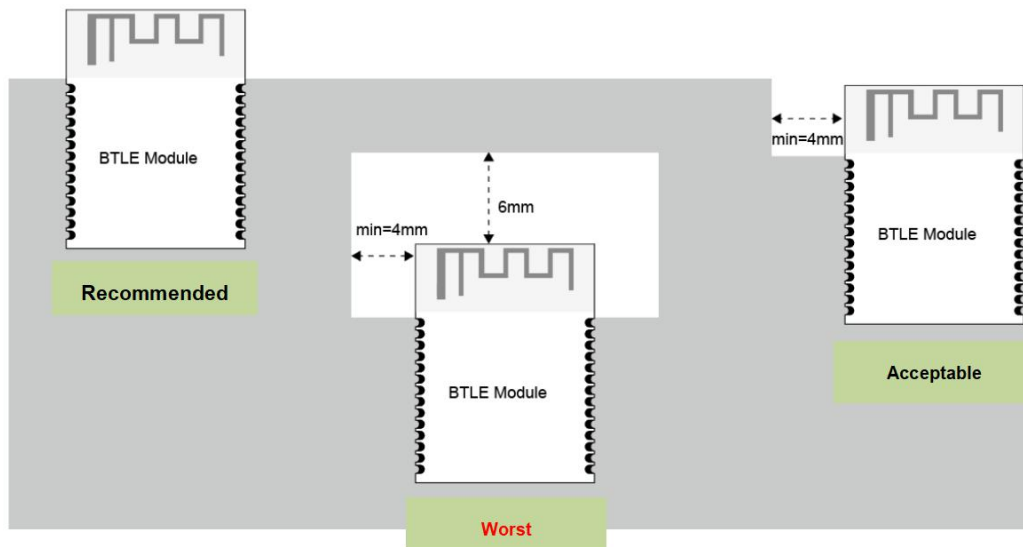
*The Grey area above is Carrier board.

7.3 Installation and soldering

(1) Please do not lay copper under the module antenna. It can prevent the influence of signal radiation and the transmission distance from being affected.

7.4 Handling and storage

(1) Due to the fact that CMOS components are included in the module, it is better to eliminate static electricity at any methods when transporting or working with the module. Moreover, it is strongly recommended adding anti-ESD components to circuit design to hinder damage from real-life ESD events. Anti-ESD methods can be also used in mechanical design.

(2) Please store the modules within -40℃ to +125℃ before and after installation and make sure the modules is away from the direct sunlight exposure for a long duration. Modules should be far away from humid and salty air conditions, and any corrosive gasses or substances.

(3) Please not to wash the module. No-Clean Paste is used in production. The metal shield may be oxidized by the washing process and may lead to chemistry reaction with No-Clean Paste. If modules goes through the washing process, functions of the module may not guaranteed.

7.5 Life support applications

(1) The module is not design for life support device or system and not allowed to be used in destructive devices or system in any direct, or indirect ways. Minew is not responsible for compensation of any losses when applying modules under such application as described above.

(2) Minew shall not responsible for the customer's products or application.

8. Disclaimer

The factory has passed the ISO9001 quality management system, ISO14001 environmental management system and OAHS18001 occupational health and safety assessment . Each product has been rigorously tested (transmission power test, sensitivity test, power consumption test, stability test, aging test, etc.).

* NOTICES:
   (1) The Bluetooth trade mark is owned by the Bluetooth SIG Inc. USA.
   (2) All other trademarks listed herein are owned by their respective owners.
   (3) All specifications are subject to change without notice.
   (4) Please do not use this specification for produce, sell or illegal purpose without Minew's authorization.
   (5) Minew have right to interpret all the items above.

9. Contact information

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