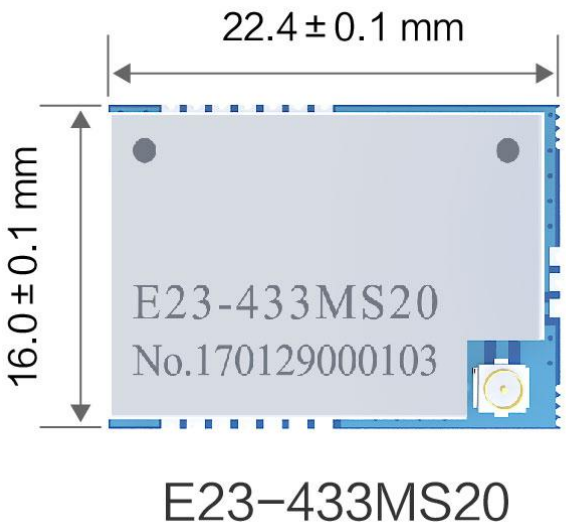
SX1212 Wireless Module

E23 Series

User Manual

Version	Date	Description	Issued by
1.00	2017/12/05	Initial version	huaa

Brief Introduction



E23-433MS20

E23 series is a 20mW wireless transceiver module, operating at 433MHz with IPX RF interface. Module features ultra-low receiving current (only 3mA) and adopts 12.8MHz crystal oscillator. With stable massive production, the module is suitable for various applications.

E23 series is based on the originally imported RF chip SX1212 from SEMTECH. It features industrial class components, lead-free process, stable performance. It applies plug-in and SMD with professional hardware design. It is convenient for all kinds of embedded development. The receiving power consumption is ultra low around 3mA which makes various applications possible.

E23 series is without factory firmware. Users need to conduct a secondary development based on their own demands.

Model	Frequency	Transmitting power	Distance(IPEX)		Antenna
E23-433MS20	433M	13dBm	800m	SMD	IPEX/Stamp hole

CONTENTS

1. Technical Parameters

Model	IC	Size	Net weight	Operating temperature	Operating humidity	Storage temperature
E23-433MS20	SX1212	22.4*16*1.0 mm	2.3±0.1g	-40 ~ 85℃	10% ~ 90%	-40 ~ 125°C

1.1 E23-433MS20

Parameter	Min	Typ	Max	Unit
Transmitting current	33	35	39	mA
Receiving current	2	3	4	mA
Turn-off current	3	4	5	μA
Transmitting power	12	13	14	dBm
Receiving sensitivity	-102	-104	-106	dBm
Voltage supply	410	433	438	MHz
Communication level	2.1	3.3	3.6	V

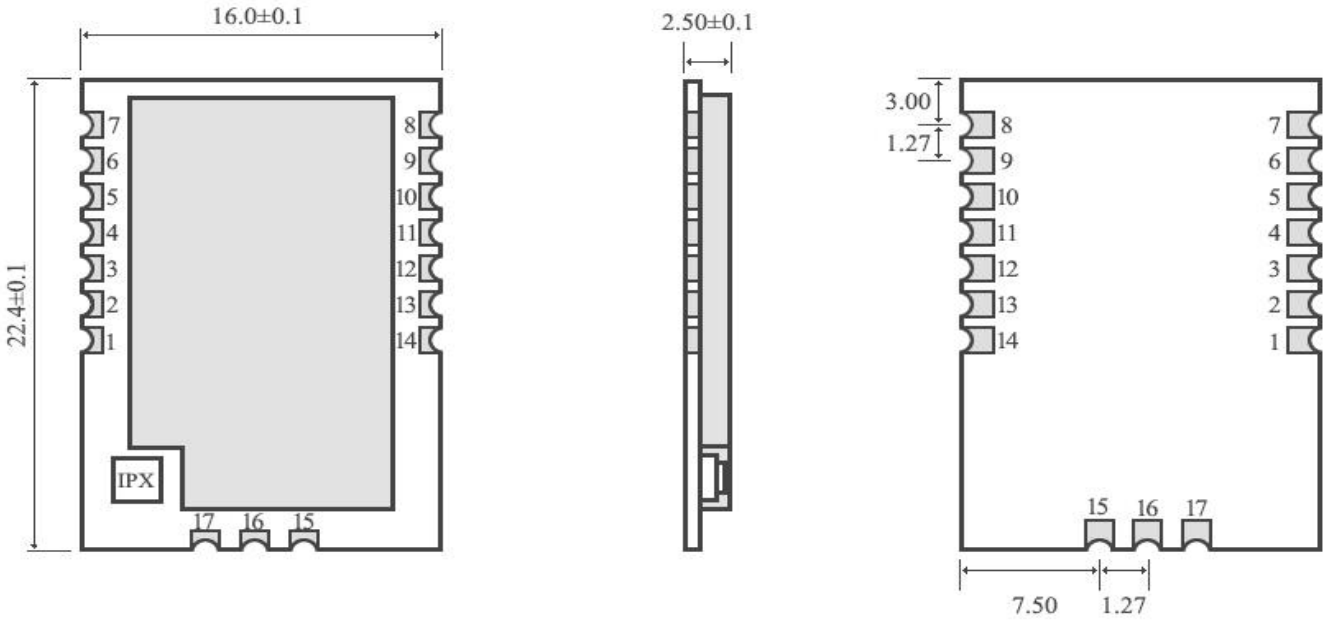
1.2 Parameters Notes

- When designing current supply circuit, 30% margin is recommended to be remained so as to ensure long-term stable operation of the whole module.
- The current at the instant of transmitting may be high, but the total energy consumed may be lower due to very short transmitting time.
- When using external antenna, the impedance matching degree at different frequency points between antenna and module may affect the transmitting current at different levels.
- The current consumed when the RF chip is only working at receiving mode is called as receiving current. The tested receiving current may be higher for some RF chips with communication protocol or when the developers have loaded their own protocol to the whole module.
- The current at pure receiving mode is at mA level. To achieve μA level receiving current, the users need to manage it through firmware development.
- The receiving sensitivity is tested at the speed rate of 1kbps.
- The turn-off current is always lower than the current consumed when the power supply source of the whole module is at no-load status.
- Each LRC component has ±0.1% error, and the error will accumulate since multiple LRC components are used in the whole RF circuit, and the transmitting current will be different at different modules.
- The power consumption can be lowered by lowering the transmitting power, but the efficiency of the internal PA will be decreased by lowering transmitting power due to various reasons.

2. Mechanical Characteristics

3.1 E23-433MS20

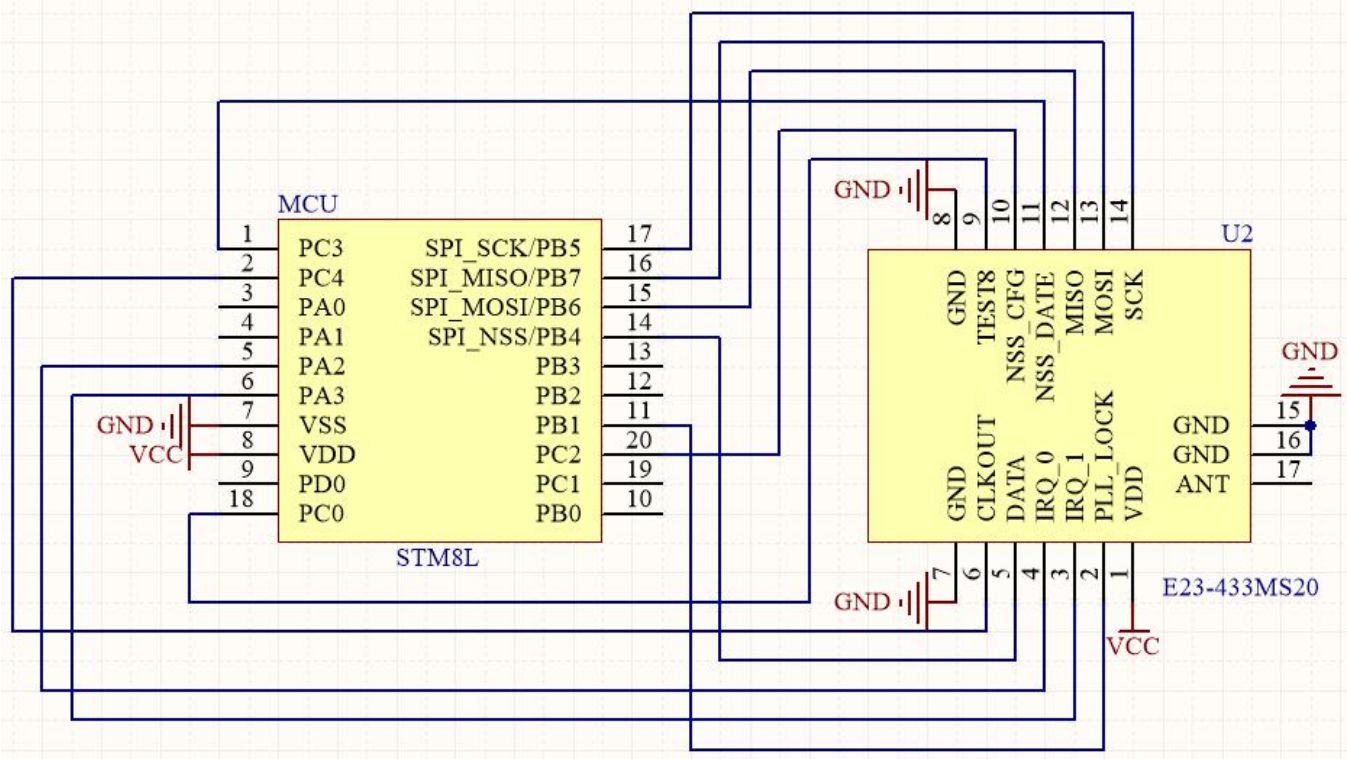
3.1.1 Dimension



3.1.2 Pin Definition

Pin No.	Pin Item	Pin Direction	Pin Application
1	VDD		Power supply 2.1~3.6V DC
2	PLL_LOCK	Output	PLL lock
3	IRQ_1	Output	Interrupt request 1
4	IQR_0	Output	Interrupt request 0
5	DATA	Input/Output	NRZ data input/output (continuous mode)
6	CLKOUT	Output	Programmable clock output
7	GND		Ground
8	GND		Ground
9	TEST8	Input/Output	P0R
10	NSS_CFG	Input	Ground
11	NSS_DATE	Input	SPI date enablement
12	MISO	Output	SPI master input slave output
13	MOSI	Input	SPI master output slave input
14	SCK	Input	SPI clock
15	GND		Ground
16	GND		Ground
17	ANT		Antenna
For more details such as pin definition, software drivers, and communication protocol, please refer to <SX1212 Datasheet > from Semtech.			

3. Recommended Circuit Diagram



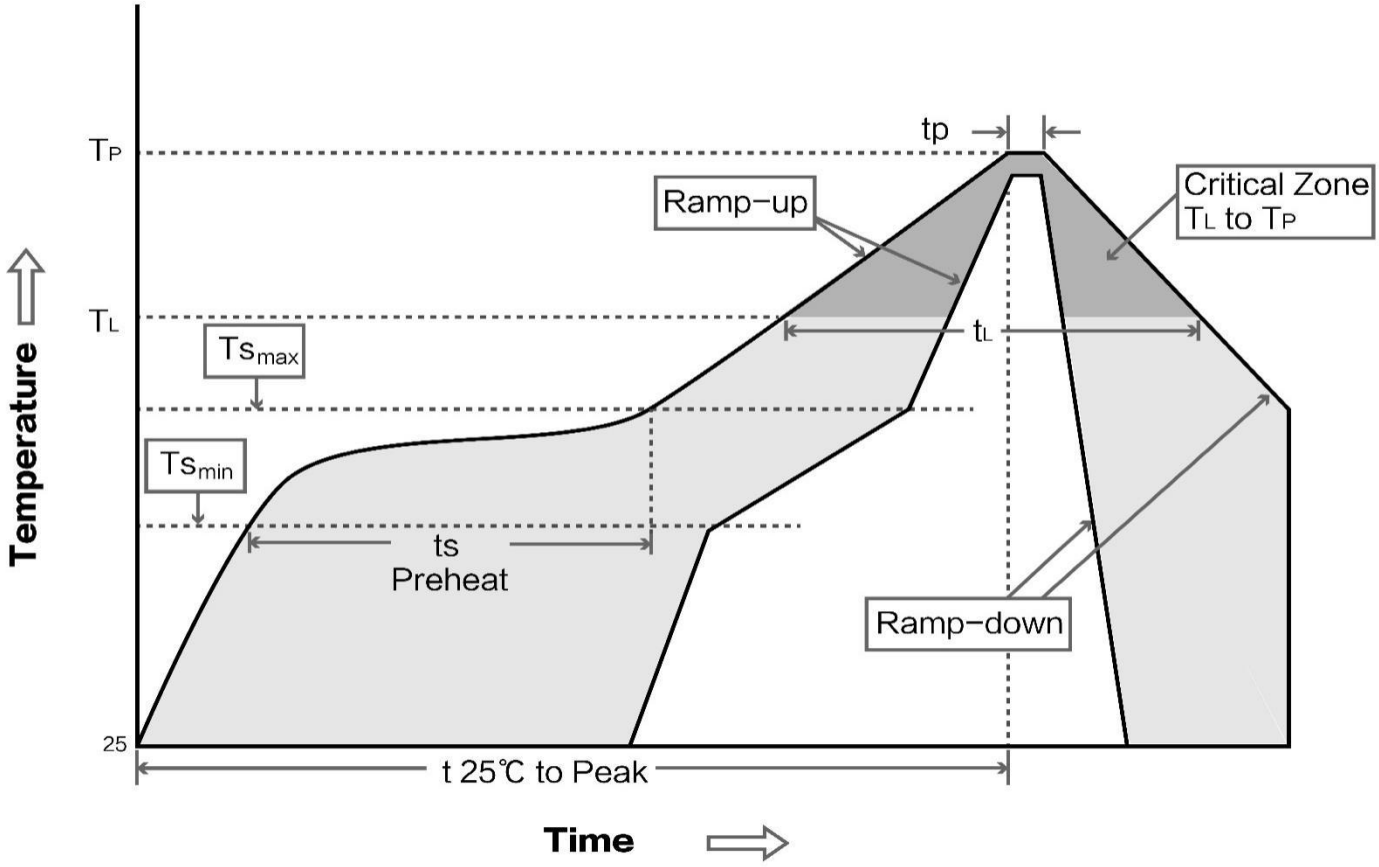
No.	Brief introduction of connection between module and MCU (STM8L)
1	IRQ0 and IRQ1 can be used to output the module' s state information. Please refer to SX1212 manual for more configured details.
2	Please note that the grounding should be good in a large area, and the power ripple should be small. Filter capacitor should be added as close as possible to the VCC and GND pin of the module.

4. Production Guidance

4.1 Reflow Soldering Temperature

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

4.2 Reflow Soldering Curve



5. FAQ

5.1 Communication range is too short

- The communication distance will be affected when obstacle exists.
- Data lose rate will be affected by temperature, humidity and co-channel interference.
- The ground will absorb and reflect wireless radio wave, so the performance will be poor when testing near ground.
- Seawater has great ability in absorbing wireless radio wave, so performance will be poor when testing near the sea.
- The signal will be affected when the antenna is near metal object or put in a metal case.
- Power register was set incorrectly, air data rate is set as too high (the higher the air data rate, the shorter the distance).
- When the power supply at room temperature is lower than the recommended low voltage, the lower the voltage is, the lower the transmitting power is.
- Due to antenna quality or poor matching between antenna and module.

5.2 Module is easy to damage

- Please check the power supply and ensure it is within the recommended range. Voltage higher than the peak will lead to a permanent damage to the module.
- Please check the stability of power supply and ensure the voltage not to fluctuate too much.
- Please make sure anti-static measures are taken when installing and using, high frequency devices have electrostatic susceptibility.
- Please ensure the humidity is within limited range for some parts are sensitive to humidity.
- Please avoid using modules under too high or too low temperature.

6. Important Notes

- All rights to interpret and modify this manual belong to Ebyte.
- This manual will be updated based on the upgrade of firmware and hardware, please refer to the latest version.
- Please refer to our website for new product information.

7. About Us

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