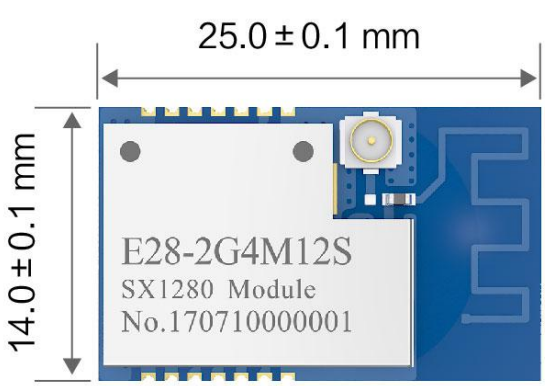
SX1280 Wireless Module

E28 Series

User Manual

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

Brief Introduction



E28-2G4M12S

E28-2G4M20S

E28 series with originally imported RFIC SX1280 from Semtech are 2.4GHz bluetooth modules designed by Chengdu Ebyte , operating at 2.400 ~ 2.500GHz. They feature ultra-low power consumption and built-in PCB antenna.

The IC SX1280 features multiple physical layers and various modulating methods such as LoRa, FLRC and GFSK. The special modulating and processing methods enable longer operating range with LoRa and FLRC modulating, and the GFSK method covers BLE protocol. The outstanding ultra-low power consumption and the DC-DC and Time-of-Flight on chip make it capable for massive applications in intelligent furniture, security system, tracking and locating, wireless distance measuring, wearable electronics, smart bracelet and health management , etc.

E28 series are produced without factory firmware. Users need to conduct a secondary development based on their own demands.

Model	frequency	Transmitting power	Distance(PCB/IPX)	Packing	Antenna
E28-2G4M12S	2.4GHz	12.5dBm	3000m	SMD	IPX/PCB
E28-2G4M20S	2.4GHz	20dBm	6000m	SMD	IPX/PCB

CONTENTS

1. Technical Parameters

Model	IC	Size	Net weight	Operating temperature	Operating humidity	Storage temperature
E28-2G4M12S	SX1280	25* 14*0.8 mm	0.9±0.1g	-40 ~ 85℃	10% ~ 90%	-40 ~ 125℃
E28-2G4M20S	SX1280	26.5* 15*2.8 mm	1.2±0.1g	-40 ~ 85℃	10% ~ 90%	-40 ~ 125℃

1.1 E28-2G4M12S

Parameter	Min	Typ	Max	Unit
Transmitting current	42	45	50	mA
Receiving current	9	10	11	mA
Turn-off current	1	2	3	μA
Transmitting power	12	12.5	14	dBm
Receiving sensitivity	-126.7	-128	-130	dBm
Voltage supply	2400	2430	2500	MHz
Communication level	1.8	3.3	3.6	V

1.2 E28-2G4M20S

Parameter	Min	Typ	Max	Unit
Transmitting current	130	140	150	mA
Receiving current	9	10	11	mA
Turn-off current	1	2	3	μA
Transmitting power	19	20	21	dBm
Receiving sensitivity	-125.4	-129	-131	dBm
Voltage supply	2400	2430	2500	MHz
Communication level	1.8	3.3	3.6	V

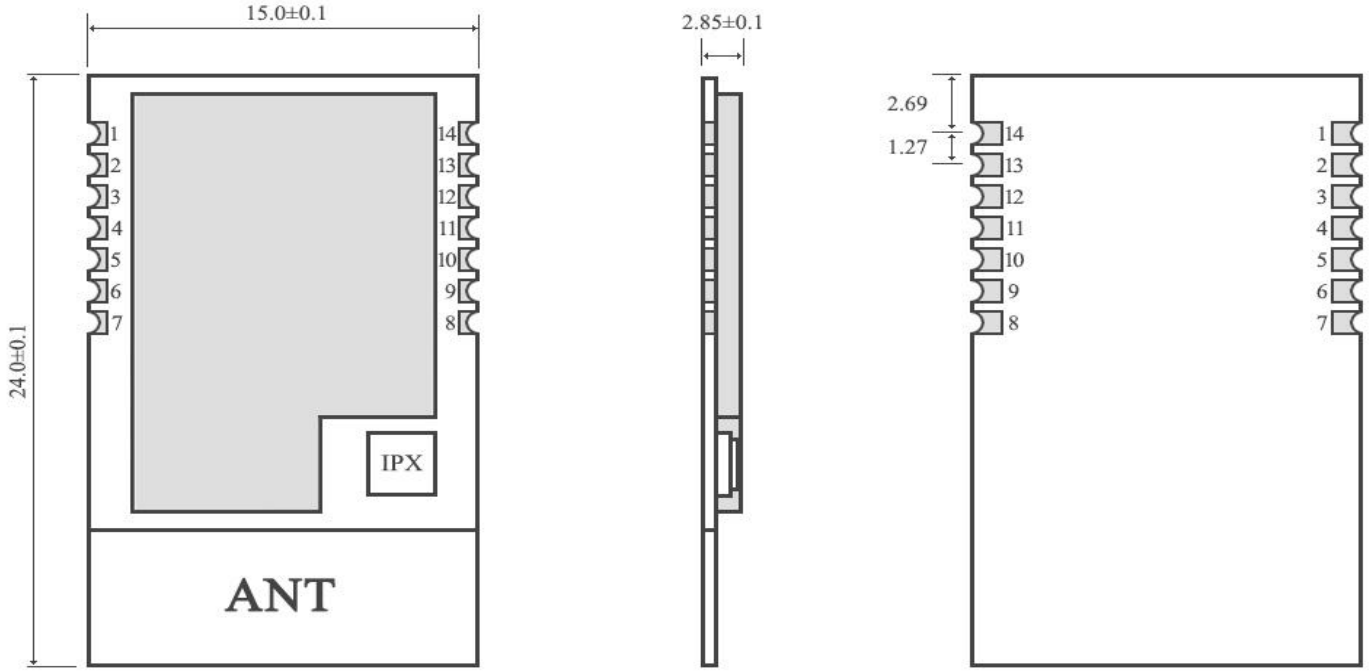
1.3 Parameters Notes

- 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

2.1 E28-2G4M12S

2.1.1 Dimension

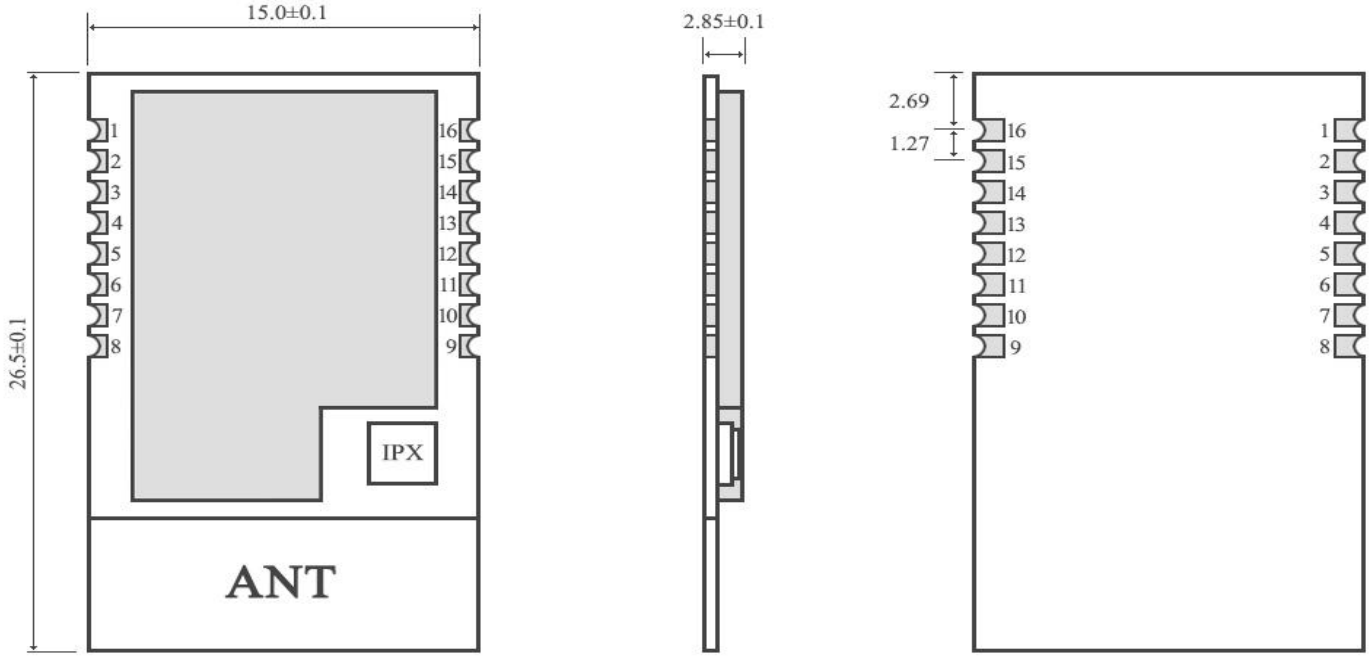


2.1.2 Pin Definition

No.	Pin item	Pin direction	Application
1	VCC	-	Power supply, 1.8V ~ 3.6V (recommend to add external ceramic filter capacitor)
2	GND	-	Ground, connecting to power source reference ground
3	MISO_TX	Output	SPI data output pin, can be used as UART transmitting pin
4	MOSI_RX	Input	SPI data input pin, can be used as UART receiving pin
5	SCK_RTSN	Input	SPI clock input pin, can be used as UART request transmitting pin
6	NSS_CTS	Input	Module chip selection pin, used to start a SPI communication; and can be used as UART clearing transmitting pin
7	GND	-	Ground, connecting to power source reference ground
8	GND	-	Ground, connecting to power source reference ground
9	NRESET	Input	Chip reset initiation input pin, valid under low level, built-in 50k pull-up resistor
10	BUSY	Output	Status indication (refer to SX1280 Datasheet)
11	DIO1	Input/Output	Configurable general IO interface (refer to SX1280 Datasheet)
12	DIO2	Input/Output	Configurable general IO interface (refer to SX1280 Datasheet)
13	DIO3	Input/Output	Configurable general IO interface (refer to SX1280 Datasheet)
14	GND	-	Ground, connecting to power source reference ground
For more details, please refer to <SX1280 Datasheet > from Semtech.			

2.2 E28-2G4M20S

2.2.1 Dimension



2.2.2 Pin Definition

No.	Pin item	Pin direction	Application
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2	GND	-	Ground, connecting to power source reference ground
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6	NSS_CTS	Input	Module chip selection pin, used to start a SPI communication; and can be used as UART clearing transmitting pin
7	GND	-	Ground, connecting to power source reference ground
8	RX_EN	Input	LNA controlling pin. Valid under high level
9	TX_EN	Input	PA controlling pin. Valid under high level
8	GND	-	Ground, connecting to power source reference ground
9	NRESET	Input	Chip reset initiation input pin, valid under low level, built-in 50k pull-up resistor
10	BUSY	Output	Status indication (refer to SX1280 Datasheet)
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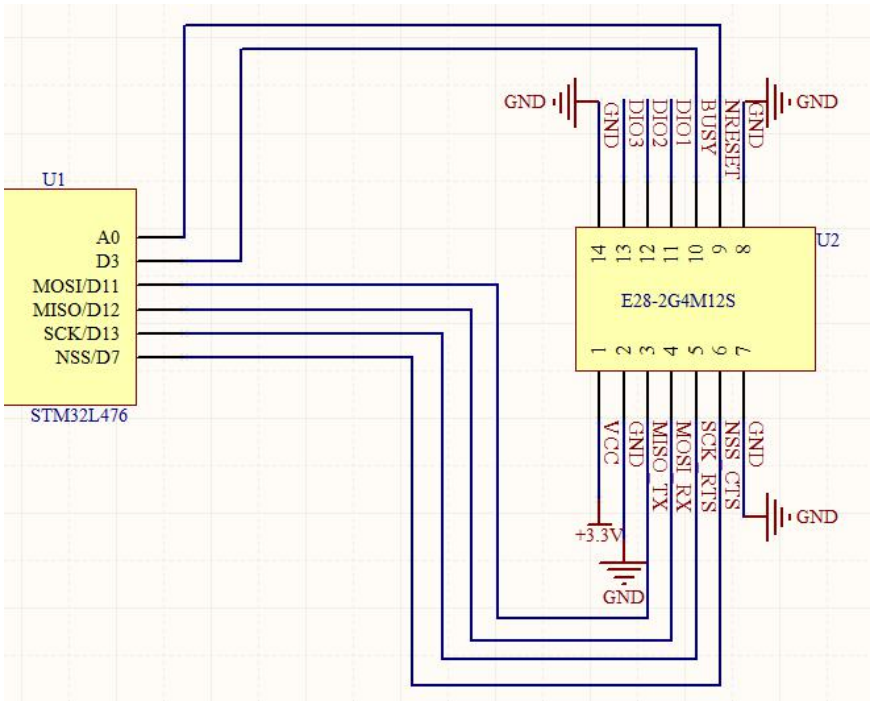
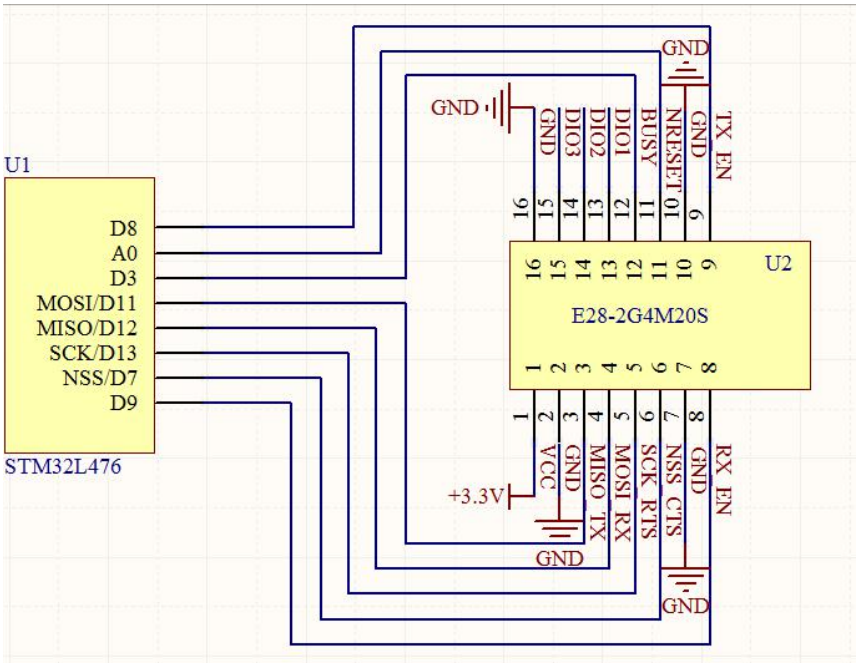
3. Recommended Circuit Diagram

3.1 E28-2G4M12S



3.2 E28-2G4M20S



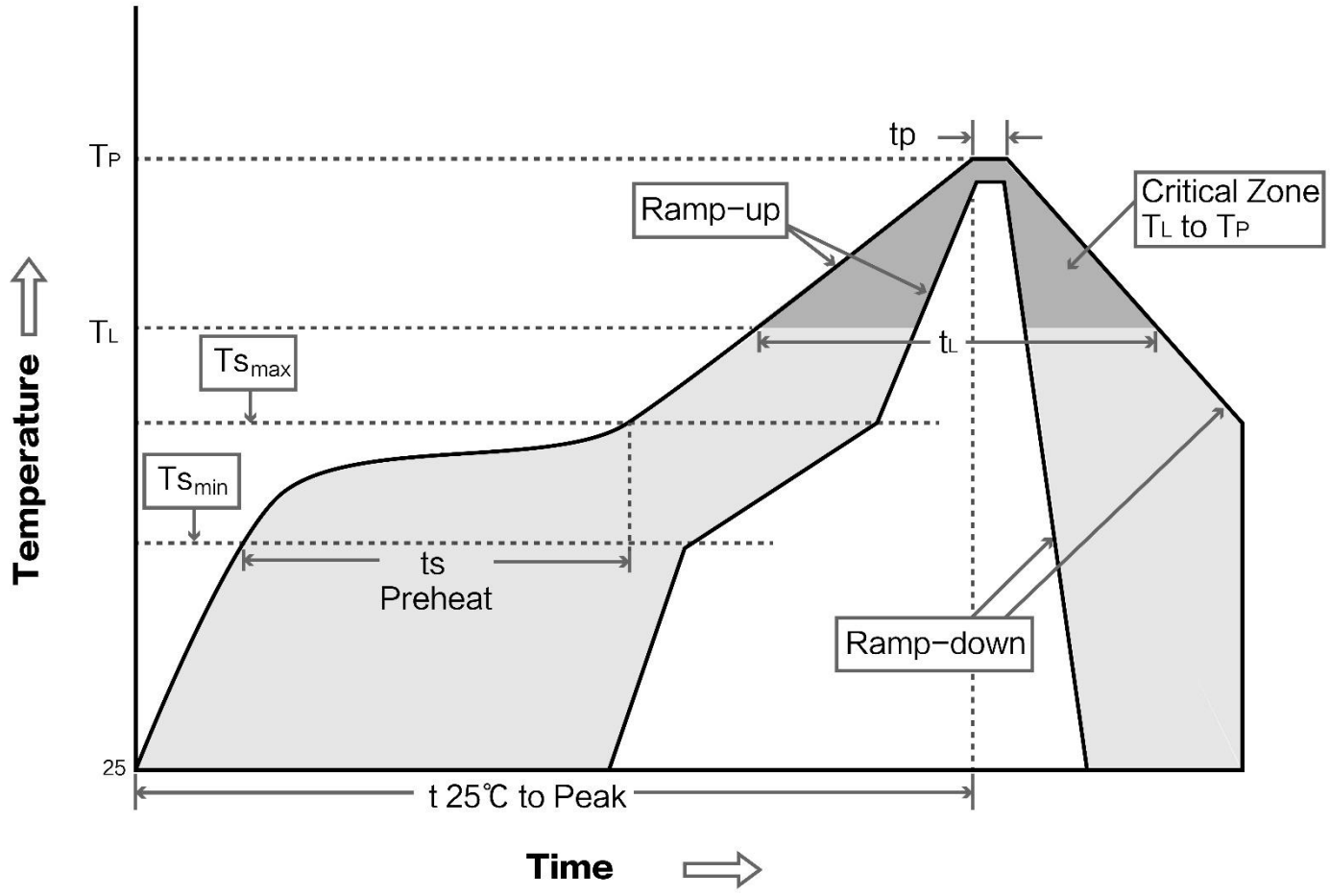
No.	Connection between module and MCU (STM32L476RG as example)
1	DIO1, DIO2, DIO3 are general I/O interfaces. The modules can be configured for multiple functions. Please refer to SX1280 Datasheet for more information. Floating is allowed.
2	Please note that the grounding should be good in a large area, 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

Technical support: support@cdebyte.com

Documents and RF Setting download link: www.cdebyte.com/en/

成都亿佰特电子科技有限公司

Chengdu Ebyte Electronic Technology Co.,Ltd.

Tel：+86-28-61399028 Ext.812

Fax：028-64146160

Web：www.cdebyte.com/en/

Address：Innovation Center D347, 4# XI-XIN Road, Chengdu, Sichuan, China