



ASR6505 Wireless Module

E78 series User Manual



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1. General introduction

E78 series are RF transceiver module of various frequency bands designed and manufactured by Chengdu Ebyte, with long communication distance and extremely low power mode current consumption. It is a small-sized SMD type (pin pitch 1.1mm).

E78-400M22S1A adopts ASR6505 chip from ASR Company. This chip is an ultra-low-power LoRa integrated single-chip SoC. It uses Semtech advanced low-power LoRa Transceiver SX1262 and integrates a STM8L152 low-power MCU Flash capacity 64kB, SRAM Capacity 4kB, EEPROM capacity 2K, small-sized, ultra-low power consumption, for LoRaWAN, LinkWAN multiple protocol standards, applicable for a variety of IoT application scenarios, is currently the best choice for LPWAN applications.

It is a hardware platform, cannot be used independently. Users need to conduct secondary development. (We can customize standard LoRaWan, Ali linkWan nodes).



1.1 Main parameter

Model No.	Frequency	Transmit power	Reference distance(stamp hole/IPEX)	Package	Antenna
E78-400M22S1A	410-490MHz	21dBm	5.5km(Lora 1kbps)	SMD	Stamp hole/IPEX

Model No.	Core IC	Size	Net weight	working temperature	Working humidity	Storage temperature
E78-400M22S1A	ASR6505	26* 16*2.8 mm	1.9g	-40 ~ 85℃	10% ~ 90%	-40 ~ 125℃

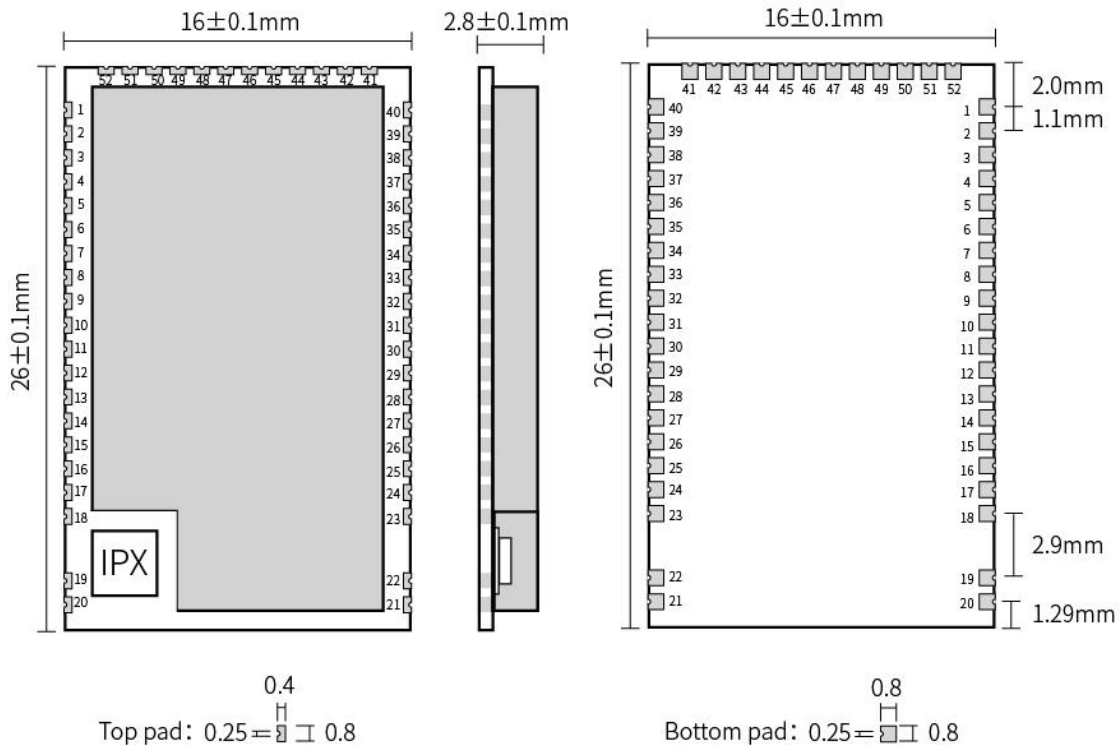
Parameter category	Min	Typ	Max	Unit
Transmit current(LoRa@2.4kbp s)	100	110	120	mA
Receiving current(LoRa@2.4kbp s)	13	14	15	mA
Shutdown current	1.6	2	2.6	uA
Transmit power	20.6	20.8	21	dBm
Receiving sensitivity	-139	-140	-140	dBm
TCXO crystal	32	32	32	MHz

TCXO crystal voltage configuration	1.8	1.8	3.3	V
Recommended operating frequency	410	433/470/490	490	MHz
Power supply voltage	2.6	3.3	3.7	V
Communication level	2.6	3.3	3.7	V

1.2 Parameter description

- When designing the power supply circuit for the module, it is recommended to reserve more than 30% of the remaining amount, and the whole machine is conducive to long-term stable operation;
- The current required for the instant of launch is large but often because the launch time is extremely short, the total energy consumed may be smaller;
- When customers uses an external antenna, the impedance matching degree between the antenna and the module at different frequency points will affect the magnitude of the transmission current to varying degrees;
- The current consumed by the RF chip in the pure receiving state is called the receiving current. Some RF chips with communication protocols or developers have loaded some self-developed protocols on the whole machine, which may cause the receiving current of the test to be too large;
- The current in the purely receiving state is often mA level, and the "receiving current" of the μA level needs to be processed by the developer through software;
- The shutdown current is often much smaller than the current consumed by the power supply part of the whole machine at no load, without being overly demanding;
- Since the material itself has a certain error, a single LRC component has an error of $\pm 0.1\%$. However, since a plurality of LRC components are used in the entire RF loop, there is a case where error accumulation occurs, resulting in a difference in emission current and reception current of different modules;
- Reducing the transmit power can reduce power consumption to some extent, but reducing the transmit power emissions for a number of reasons reduces the efficiency of the internal PA.

2. Pin definition



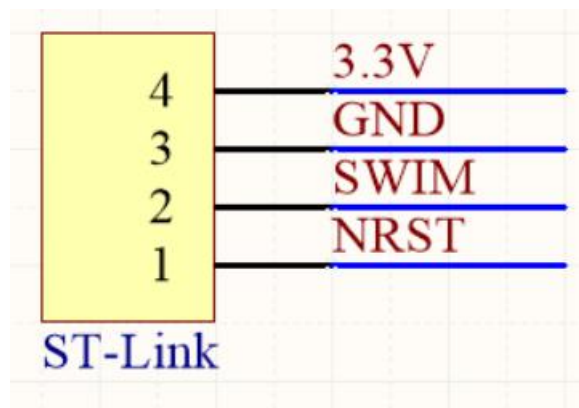
Weight: $2g \pm 0.1g$
 Pad quantity: 52
 Unit: mm

No.	Name	Direction	Function
1	GND		Ground wire, connected to the power reference ground
2	LCD-SEG1 0	Input/output	MCU GPIO
3	LCD-SEG1 1	Input/output	MCU GPIO
4	LCD-SEG1 2	Input/output	MCU GPIO
5	LCD-SEG1 3	Input/output	MCU GPIO
6	LCD-SEG1 4	Input/output	MCU GPIO
7	LCD-SEG1 5	Input/output	MCU GPIO
8	LCD-SEG1 6	Input/output	MCU GPIO

9	LCD-SEG1 7	Input/output	MCU GPIO
10	I2C-SDA	Input/output	I2C-SDA pin
11	I2C-SCL	Input/output	I2C-SCL pin
12	ADC-IN0	Input	ADC input pin
13	ADC-IN1	Input	ADC input pin
14	GPIO2	Input/output	MCU GPIO
15	GPIO3	Input/output	MCU GPIO
16	GPIO4	Input/output	MCU GPIO
17	ADC_IN2	Input	ADC input pin
18	GND		Ground wire, connected to the power reference ground
19	ANT	output	Antenna interface, stamp hole (50 ohm characteristic impedance)
20	GND		Ground wire, connected to the power reference ground
21	GND		Ground wire, connected to the power reference ground
22	GND		Ground wire, connected to the power reference ground
23	GND		Ground wire, connected to the power reference ground
24	SPI-NSS	Input	SPI select pin, can select external SPI
25	SPI-SCK	Input	SPI-SCK pin, can be used as external SPI
26	SPI_MISO	output	SPI_MISO pin, can be used as external SPI
27	SPI_MOSI	Input	SPI MOSI pin, can be used as external SPI
28	LCD-SEG1		MCU GPIO
29	LCD-SEG2	Input/output	MCU GPIO
30	SWIM	Input/output	Program burning pin
31	NRST	Input	External reset pin
32	LCD-COM 0	Input/output	MCU GPIO
33	LCD-COM 1	Input/output	MCU GPIO
34	LCD-COM 2	Input/output	MCU GPIO
35	VREFP	Input	ADC reference voltage input
36	UART1-RX	Input	UART1-RX pin
37	UART1-TX	output	UART1-TX pin
38	VLCD	Input	VLCD pin
39	LCD-SEG0	Input/output	MCU GPIO
40	GND		Ground wire, connected to the power reference ground
41	LCD-SEG3	Input/output	MCU GPIO
42	LCD-COM 3	Input/output	MCU GPIO
43	LCD-SEG4	Input/output	MCU GPIO
44	LCD-SEG5	Input/output	MCU GPIO
45	UART0-RX	Input	UART0-RX pin

46	UART0-TX	output	UART0-TX pin
47	LCD-SEG6	Input/output	MCU GPIO
48	LCD-SEG7	Input/output	MCU GPIO
49	LCD-SEG8	Input/output	MCU GPIO
50	LCD-SEG9	Input/output	MCU GPIO
51	VCC		Power supply, range 2.5V ~ 3.7V (recommended to add external ceramic filter capacitor)
52	GND		Ground wire, connected to the power reference ground
★ For the pin definition, software driver and communication protocol of the module, please refer to ASR official 《ASR6501 Datasheet》 ★			

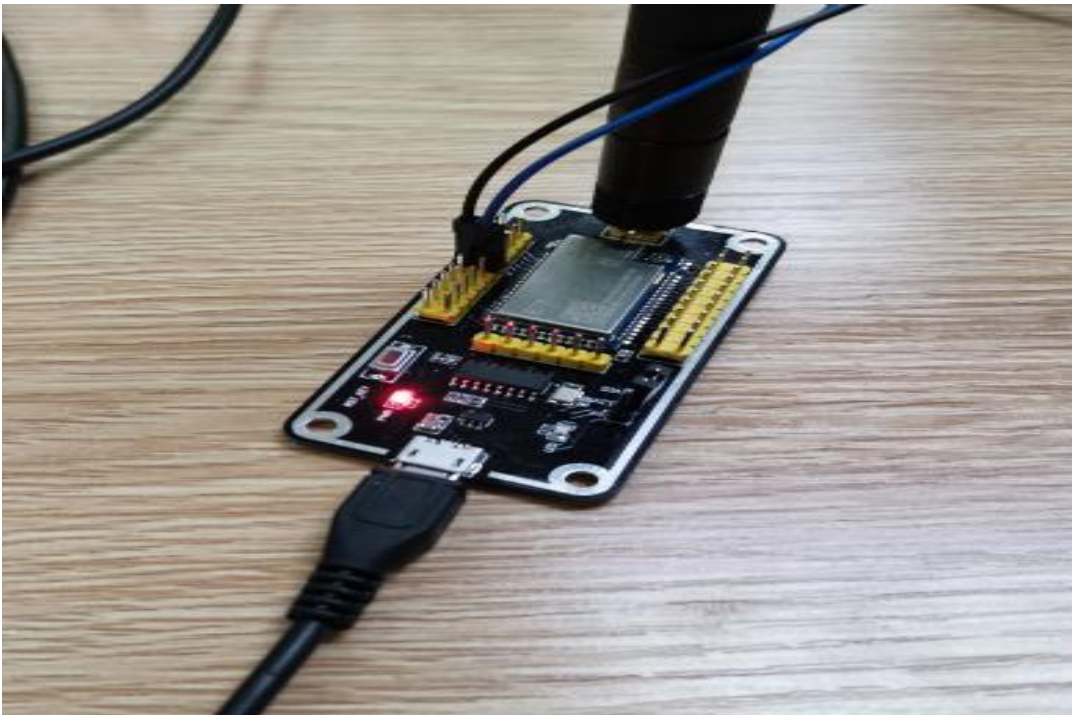
3. E78-400M22S1A Programming interface



Note: If users use the E78-400M22S1A module to develop by themselves, it is recommended to use the test board E78-400TBL-01A made by our company for the E78 module first, which is convenient for users. Users can decide according to his own needs.



The base plate supplies power to the module through the serial port on the left in the picture above. Connect ST-LINK's NRST pin and SWIM pin to the base plate to download the program. As shown below

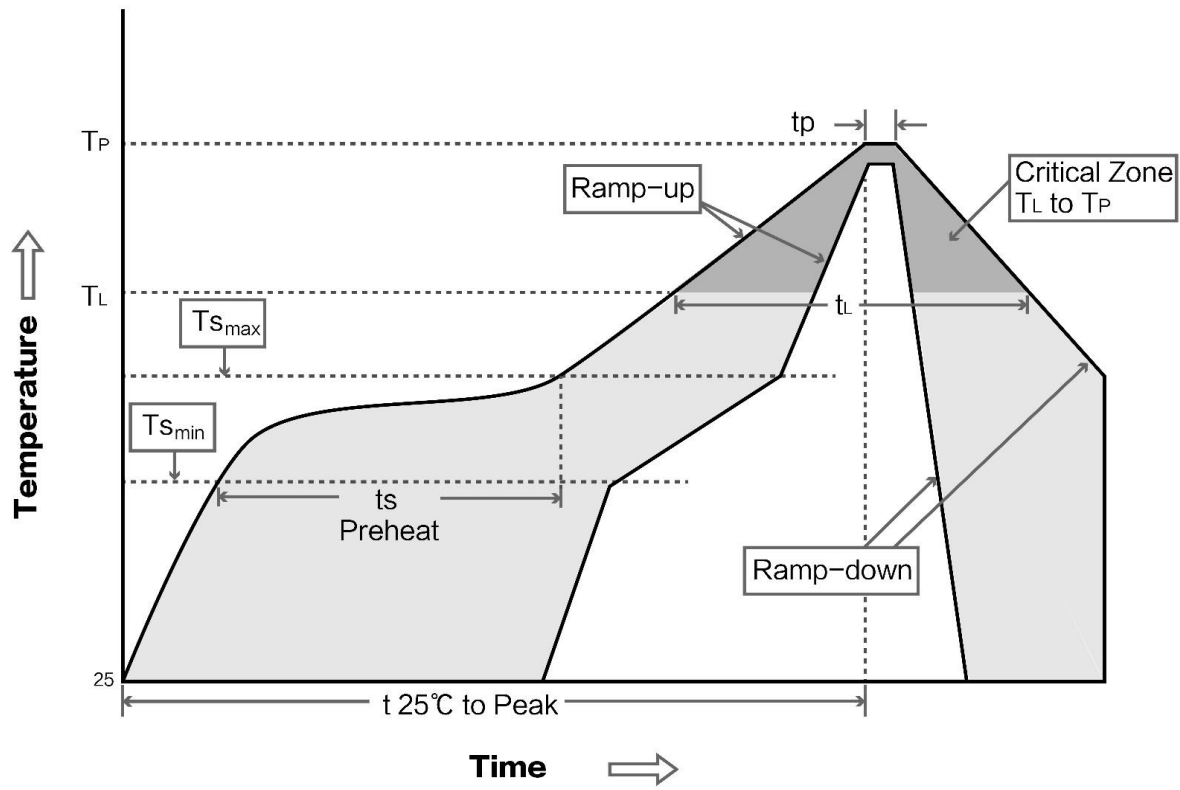


4. Production guidance

4.1 Reflow soldering temperature

Profile Feature	Curve characteristics	Sn-Pb Assembly	Pb-Free Assembly
Solder Paste	Solder paste	Sn63/Pb37	Sn96.5/Ag3/Cu0.5
Preheat Temperature min (T _{smin})	Min preheating temp.	100℃	150℃
Preheat temperature max (T _{smax})	Max preheating temp.	150℃	200℃
Preheat Time (T _{smin} to T _{smax})(t _s)	Preheating time	60-120 sec	60-120 sec
Average ramp-up rate(T _{smax} to T _p)	Average ramp-up rate	3℃/second max	3℃/second max
Liquidous Temperature (TL)	Liquid phase temp.	183℃	217℃
Time (t _L) Maintained Above (TL)	Time below liquid phase line	60-90 sec	30-90 sec
Peak temperature (T _p)	Peak temp	220-235℃	230-250℃
Aveage ramp-down rate (T _p to T _{smax})	Average ramp-down rate	6℃/second max	6℃/second max
Time 25℃ to peak temperature	Time to peak temperature for 25℃	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.
- Sea water 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).
- The power supply low voltage under room temperature is lower than 2.5V, the lower the voltage, the lower the transmitting power.
- Due to antenna quality or poor matching between antenna and module.

5.2 Module is easy to damage

- Please check the power supply, ensure it is between the recommended values, voltage exceed the maximum than will cause permanent damage to the module.
- Please check the stability of power supply, the voltage cannot fluctuate too much.
- Please make sure antistatic measure are taken when installing and using, high frequency devices have electrostatic susceptibility.
- Please ensure the humidity is within limited range, some parts are sensitive to humidity.
- Please avoid using modules under too high or too low temperature.

6. Important statement

- EBYTE reserves the right of final interpretation and modification of all contents in this manual.
- As the hardware and software of the product continue to improve, this manual may be subject to change without further notice, and the final version of the manual shall prevail.
- Users who use this product need to pay attention to product dynamics on the official website so that users can get the latest information of this product in time.

Revision history

Version	Date	Description	Issued by
1.0	2019/11/04	Initial version	
1.1	2019/12/19	Format adjustment	Ren

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