EWM226-xxxT22S Product Specification

410-510MHz/863-870MHz/902-928MHz 160mW LoRa Wireless Digital Transmission Module for Lawn Mowers

Chengdu Ebyte Electronic Technology Co.,Ltd.

Contents

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1 Introduction

1.1 Brief Introduction

EWM226-xxxT22S is a transceiver integrated LoRa wireless digital transmission module for lawn mowers, which works in 410~510MHz/863~870MHz/902~928MHz bands, and supports a variety of power level selection, free switching of over-the-air data rate, rich serial port baud rate selection, and easy operation.

EWM226-400T22S

EWM226-900T22S

1.2 Features

- Ultra small size, only 14*17.5mm;
- Maximum transmit power 22dBm;
- Supports 3.3~5.5V power supply, and any power supply greater than 3.3V can ensure the best performance;
- Strong penetration capability to ensure communication stability;
- Supports 433MHz/868MHz/915MH and other license-free frequency bands;
- Dual antenna options (IPEX/stamp hole) for easy built-in integration;
- Air data rate support 4800bps, 9600bps, 19200bps;
- Supports multiple serial port baud rate options: 9600bps, 19200bps, 38400bps, 57600bps, 115200bps (default);
- Supports serial port firmware upgrade;
- Communication distance up to 5.0Km under ideal conditions;
- High-speed rate transmission, suitable for high-speed transmission applications such as lawn mowers;
- Built-in watchdog to prevent system crash;
- Industrial-grade standard design, supporting long time use at -40 to +85℃;

1.3 Application

- Lawn mower applications;
- Home security alarms and remote keyless entry;
- Smart home as well as industrial sensors and more;
- Wireless alarm security systems;
- Building automation solutions;
- Healthcare products;
- Advanced Meter Reading Architecture (AMI) and more;

2 Specification parameter

2.1 Limit parameter

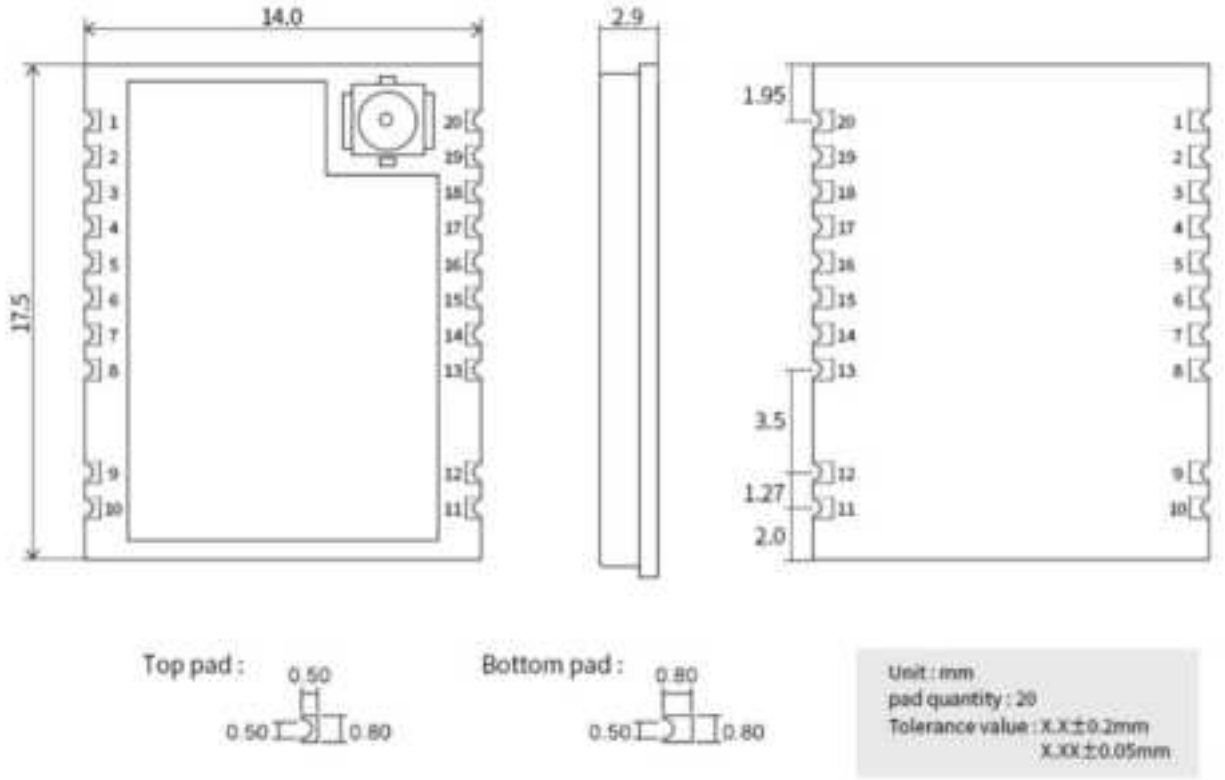
Main parameters	Performance		Note
	Minimum value	Maximum values	
Power Supply Voltage（V）	0	5.5	Above 5.5V permanently burns out the module
Operating Temperature（℃）	-40	+85	Industrial grade
Storage Temperature（℃）	-40	+125	-

2.2 Operating parameter

Main parameters		Performance			Note
		Minimum value	Typical value	Maximum values	
Normal Voltage Mode		3.3	5.0	5.5	≥3.3V Guaranteed output power
Communications level（V）		-	3.3	-	Risk of burn-in using 5V TTL
EWM226-400T22S Operating frequencyMHz）		410	-	510	-
EWM226-900T22S Operating frequency（MHz）		863	-	928	863~870MHz,902～928MHz
Transmitting power（dBm）	H Level		22		Default H
	M Level		17		
	L Level		14		
reception sensitivity（dBm）		-	-124	-	BW = 125 kHz, SF = 7
Power consumption	Transmitting current（mA）	-	110	-	Power Rating H
	Reception Current（mA）	-	12.2	-	-

Main parameters	Descriptions	Note
Reference distance	5.0Km	Clear and open environment, height 2.0 meters, 22dBm, data rate 4800bps over the air
Modulation method	LoRa	-
Airspeed	4800～19200bps	Airborne data rate, software multi-level adjustable
Transmission rate	580 Bytes/s	@Serial Baud Rate 115200bps, Air Rate 9600bps
	500 Bytes/s	@Serial Baud Rate 9600bps, Air Rate 9600bps
Subcontract size	699 Bytes	-
Buffer	699 Bytes	-
Communications interface	UART	-
Working mode	Half-duplex	-
Package	SMD	-
Dimension	14*17.5mm	±0.2mm
Antenna Interface	IPEX Generation 1/Stamp Hole	Equivalent impedance about 50Ω, factory default IPEX 1 generation antenna holder
Product weight	1.2	±0.1g

3 Mechanical Dimensions and Pin Definitions

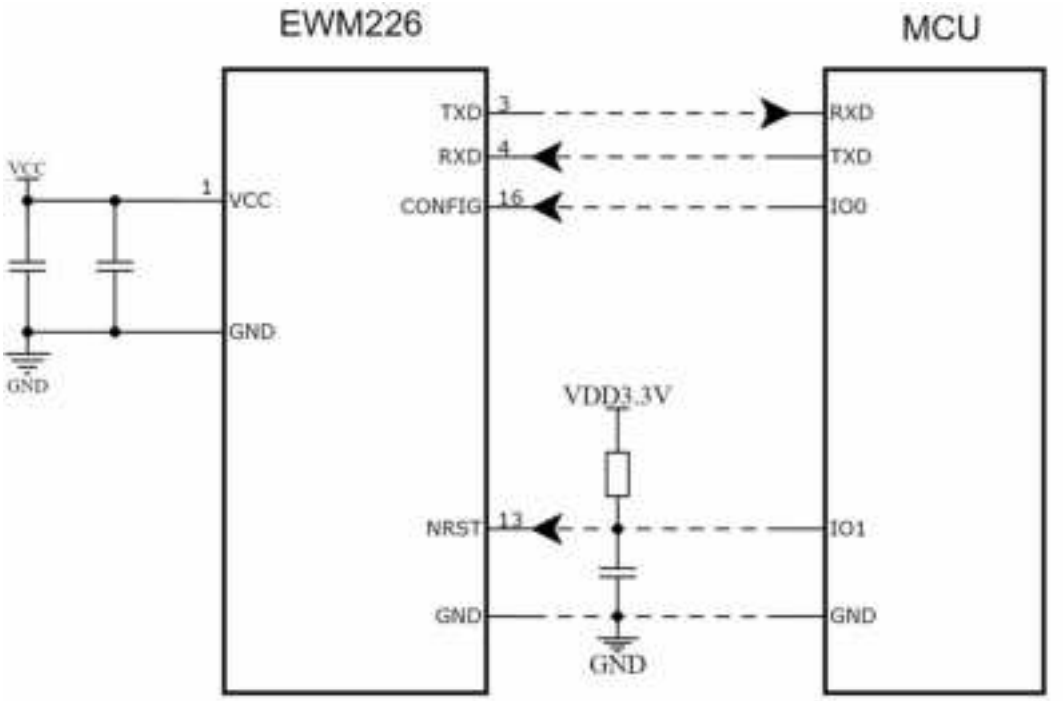


Pin Number	Pin Name	Input/Output	Pin Usage
1	VCC	Input	Supply power input pin, voltage range 3.3 to 5.5V DC
2	GND	-	Power ground
3	TXD	Output	Serial Send Pins
4	RXD	Input	Serial Receive Pins
5	NC	Input/Output	No functionality at this time, suggest hovering
6	SWDIO	-	Burn Pins
7	SWCLK	-	Burn Pins
8	GND	-	Power ground
9	GND	-	Power ground
10	GND	-	Power ground
11	GND	-	Power ground
12	GND	-	Power ground
13	NRST	Input	Reset pin, built-in pull-up resistor, pull-down duration >20μs reset
14	GND	-	Power ground
15	GND	-	Power ground
16	CONFIG	Input	Configuration mode control pin, a low level enters the parameter configuration mode, a high level exits the parameter configuration mode into the data transmission

			mode.
17	GND	-	Power ground
18	GND	-	Power ground
19	ANT	Input/Output	RF Antenna Interface, Stamp Hole
20	GND	-	Power ground

4 Recommended Wiring Diagram and Antenna Interface Selection

4.1 Recommended Wiring Diagram



4.2 Antenna Interface Selection

The module adopts IPEX Generation 1 antenna output interface by default, if you need to use the stamp hole antenna, you need to remove the IPEX holder and then weld the 0Ω resistor to the jumper pads, see the following figure for details:

IPEX Antenna Interface

Stamp Hole RF Antenna

5 Operating mode

5.1 Configuration Mode

Configure the configuration pin CONFIG (pin 16) to low level (i.e. connected to GND), at this time the module enters the parameter configuration mode, this mode can be configured for the module parameters.

5.2 Digital transmission mode

Configuring the configuration pin CONFIG (pin 16) to a high level (i.e., connected to 3.3V) exits the module parameter configuration mode (i.e., enters the digital transmission mode), and the module can send and receive data in this mode.

6 Operational Instructions

Note:

- The module needs to be in configuration mode when sending operation commands.
- All commands need to be followed by a carriage return line feed.
- Commands and parameters are separated by 1 space character.
- EWM226-400T22S Frequency range 410.000≤XXX.XXX≤510.000 in MHz.
- EWM226-900T22S frequency range 863.000≤XXX.XXX≤870.000,902.000≤XXX.XXX≤928.000 in MHz.
- Module factory default parameters:

EWM226-400T22S					
Communication protocol	Transmission frequency	Reception frequency	Air data rate	Power mode	Serial port baud rate
DIRECT	450.125MHz	450.125MHz	9600bps	H	115200bps

EWM226-900T22S					
Communication protocol	Transmission frequency	Reception frequency	Air data rate	Power mode	Serial port baud rate
DIRECT	863.125MHz	863.125MHz	9600bps	H	115200bps

6.1 Operating Band Query

Note: This command is only supported by EWM226-900T22S

Command	Instruction
BAND	Query the current working band range of EWM226-900T22S module, reply 800 means the band range is 863-870MHz, reply 900 means the band range is 902-928MHz, and the default band range of the module is 863-870MHz.
Return to BAND 800 > Explanation: The query band range was successful. Example: Send BAND Returns BAND 800 > The module's current operating band has been configured as 863-870MHz.	

6.2 Operating Band Configuration

Note: This command is only supported by EWM226-900T22S, and you need to reconfigure the transmit frequency and receive frequency parameters after configuring the working frequency band.

Command	Instruction
BAND xxx	"XXX" working band parameters, the supported band parameters are as follows: 800 and 900, where 800 indicates the band range 863-870MHz and 900 indicates the band range 902-928MHz.
Return to PROGRAMMED OK > Explanation: Configuring the band range was successful. Example: Send BAND 800 Returns PROGRAMMED OK > The module's current operating frequency has been configured to 863-870MHz.	

6.3 Transmit Frequency Configuration

Command	Instruction
TX XXX.XXX	"XXX.XXX" frequency parameters EWM226-400T22S frequency range 410.000≤XXX.XXX≤510.000, unit MHz. EWM226-900T22S frequency range 863.000≤XXX.XXX≤870.000,902.000≤XXX.XXX≤928.000, unit MHz.
Return to PROGRAMMED OK > Explanation: The transmit frequency is configured successfully. Example: Send TX 463.125 Returns PROGRAMMED OK > The module receive frequency is configured to 463.125MHz.	

6.4 Transmission Frequency Search

Command	Instruction
TX	Send the command "TX" to query the current transmit frequency of the module.
Return to TX XXX.XXX00 MHz >	

Explanation: “XXX.XXX00 MHz” is the current transmit frequency parameter. Example: Send TX Returns TX 463.12500 MHz > The module receives at 463.12500 MHz.

6.5 Receive Frequency Configuration

Command	Instruction
RX XXX.XXX	“XXX.XXX” frequency parameter in MHz. EWM226-400T22S frequency range 410.000≤XXX.XXX≤510.000, unit MHz. EWM226-900T22S frequency range 863.000≤XXX.XXX≤870.000,902.000≤XXX.XXX≤928.000, unit MHz.
返 Back to PROGRAMMED OK > Explanation: The receive frequency is configured successfully. Example: Send RX 463.125 Return PROGRAMMED OK > The module receive frequency is configured to 463.125 MHz.	

6.6 Receiving frequency query

Command	Instruction
RX	Send the command “RX” to query the current receiving frequency of the module.
Return to RX XXX.XXX00 MHz > Explanation: “XXX.XXX00 MHz” is the current receive frequency parameter. Example: Send RX Returns RX 463.12500 MHz > The module receives at 463.12500 MHz.	

6.7 Protocol Configuration

Command	Instruction
PRT XXX	“XXX” communication protocol parameter, the list of currently supported communication protocols is as follows: DIRECT.
Return to PROGRAMMED OK > Explanation: Configuration was successful Example: Send PRT DIRECT Returns PROGRAMMED OK > The communication protocol was configured successfully.	

6.8 Protocol Configuration

Command	Instruction
PRT	Queries the communication protocol that the current module is working with.
Back to PRT XXX > Explanation: “XXX” is a communication protocol parameter. Example: Send PRT Return PRT DIRECT >DIRECT The communication protocol of the module is DIRECT.	

6.9 Air Data Rate Configuration

Command	Instruction
BAUD XXX	“XXX” air data rate parameter, support air data rate: 4800, 9600, 19200, unit: bps
Return to PROGRAMMED OK > Explanation: The over-the-air data rate is configured successfully. Send BAUD 9600 Returns PROGRAMMED OK >	

The module's over-the-air data rate is configured to 9600bps.

6.10 Air data rate query

Command	Instruction
BAUD	Queries the current module operating air data rate
Return to BAUD XXX > Explanation: “XXX” refers to the air data rate parameter. Example: Send BAUD Return BAUD 9600 > The air data rate of the module is 9600bps.	

6.11 Power Mode Configuration

Command	Instruction
PWR XXX	The “XXX” transmit power mode parameter supports three modes: H,M,L. H is high power mode, M is normal power mode, and L is low power mode.
Return to PROGRAMMED OK > Explanation: When this command is returned, it means the configuration is successful. Example: Send PWR H Returns PROGRAMMED OK > Power mode configuration is successful.	

6.12 Power Mode Inquiry

Command	Instruction
PWR	Queries the current module power mode.
Return to PWR XXX > Explanation: “XXX” for power mode Example: Send PWR Return PWR H	

>H The module is currently in high power mode.

6.13 Hardware version number query

Command	Instruction
HVER	Query the current module hardware version number
Return to HVER XXX > Explanation："XXX ”means the version number. Example: Send HVER Return HVER V0R1 > The current hardware version is VOR1 version.	

6.14 SN Code Query

Command	Instruction
SER	Query Module SN Code
Return to SN:XXXXXXXX > Explanation："XXXXXXXX ”is a 14-digit SN code. Example: Send SER Return SN:S3200291S00009 > The SN code of the module is S3200291S00009.	

6.15 Software version number query

Command	Instruction
SREV	Query the current module software version number
Return to SREV XXXX.XX.XX > Explanation: “XXXX.XX.XX” identifies the version number. Example: Send SREV Returns SREV V001.02.01	

>V001.02.01 The current software is version V001.02.01.

6.16 Serial Baud Rate Configuration

Command	Instruction
SBAUD XXX	“XXX” serial port baud rate parameter, the supported serial port baud rate list is as follows: 9600,19200,38400,57600,115200. unit: bps
Return to PROGRAMMED OK > Example: Send SBAUD 115200 Returns PROGRAMMED OK > The serial port baud rate was configured successfully.	

6.17 Serial Baud Rate Query

Command	Instruction
SBAUD	Queries the current module serial port baud rate.
Return to SBAUD XXX > Explanation："XXX ”is the baud rate parameter of serial port. Example: Send SBAUD Return SBAUD 115200 > The current serial baud rate of the module is 115200bps.	

7 Quick use

Use two EWM226-xxxT22S modules of the same model number; for ease of description, name EWM226-xxxT22S Module 1 as Module A and EWM226-xxxT22S Module 2 as Module B.

Cautions:

① The module only supports half-duplex communication, i.e., the two modules cannot transmit data at the same time;

② The module must work in digital transmission mode;

Note: After the module is switched on, the following message 'into boot' will be output, if you do not receive this message, you need to check whether the serial port is connected correctly.

7.1 Module Parameter Configuration

Configure the Module A and Module B parameters to be the same, as shown in the following table:

Module	Communication protocol	Transmission Frequency	Reception frequency	Air data rate	Power mode	Serial port baud rate
Module A	DIRECT	463.125	463.125	9600	L	115200
Module B	DIRECT	463.125	463.125	9600	L	115200

7.2 Communications test

Configure the communication mode of Module A and Module B as digital transmission mode, connect the serial port debugging assistant and send data to each other, you can see the data reception of Module A and Module B as follows:

Data sending and receiving diagram

8 IAP Online Firmware Upgrade

IAP (In Application Programming) means online application programming, this module adopts this method to upgrade the firmware online.

- Host computer command upgrade

1.Configure the module configuration pin CONFIG (pin 16) to high level (i.e. connected to 3.3V), then exit the module parameter configuration mode (i.e. enter the digital transmission mode);

2. Open the 'Radio Upgrade Tool' downloaded from the official website, and select Serial Port > Open Serial Port;

3. Click Click to open the file (select the firmware .DWN file) > Click to start the update;

4. Click OK to confirm that the serial port parameters are set correctly;

5.When the firmware upgrade is complete, click OK and the firmware upgrade is complete.

9 Hardware Design

- It is recommended to use a DC regulated power supply to power the module, the power supply ripple coefficient should be as small as possible, and the module should be reliably grounded;
- Please pay attention to the correct connection of the positive and negative terminals of the power supply, if reversed it may cause permanent damage to the module;
- Please check the power supply to ensure that it is between the recommended supply voltages, if it exceeds the maximum value, it may cause permanent damage to the module;
- Check the stability of the power supply to ensure that the voltage does not fluctuate significantly and frequently;
- When designing the power supply circuit for the module, it is often recommended to keep more than 30% of the residual capacity, and have the whole machine is conducive to long-term stable operation;
- Module should be as far away as possible from the power supply, transformers, high-frequency alignments and other electromagnetic interference in the larger part;
- High-frequency digital alignment, high-frequency analogue alignment, power supply alignment must be avoided below the module, if really have no choice but to go through the module below, assuming that the module is welded in the Top Layer, the Top Layer in the contact part of the module to pave the ground copper (all paved with copper and a good ground), must be close to the module digital part and the alignment of the line in the Bottom Layer;
- Assuming that the module is soldered or placed in the Top Layer, it is also wrong to route the wires randomly in the Bottom Layer or other layers, which will affect the spuriousness of the module as well as the reception sensitivity in different degrees;
- Assuming that there is a large electromagnetic interference around the module device will also greatly affect the performance of the module, according to the intensity of the interference is recommended to stay away from the module, if the situation permits you can do appropriate isolation and shielding;
- Assuming that there is a large electromagnetic interference around the module alignment (high-frequency digital, high-frequency analogue, power supply alignment) will also greatly affect the performance of the module, according to the intensity of the interference is recommended to be appropriate away from the module, if the situation permits you can do appropriate isolation and shielding;
- Communication line if the use of 5V level, must be connected in series with 1k-5.1k resistor (not recommended, there is still a risk of damage);
- The antenna installation structure has a greater impact on the module performance, be sure to ensure that the antenna is exposed, preferably vertical upwards. When the module is installed inside the chassis, a good quality antenna extension cable can be used to extend the antenna to the outside of the chassis;

- The antenna must not be installed inside the metal casing, which will result in a great weakening of the transmission distance.

10 Frequently Asked Questions

10.1 Unsatisfactory transmission distance

- When there are linear communication barriers, the communication distance will be attenuated accordingly;
- Temperature, humidity, and co-frequency interference, which will lead to higher communication packet loss rate;
- The ground absorbs and reflects radio waves, and the test effect is poorer near the ground;
- Seawater has a strong ability to absorb radio waves, so the test effect is poor near the sea;
- metal objects near the antenna, or placed in a metal shell, the signal attenuation will be very serious;
- Incorrect power register settings, over-the-air data rate settings are too high (the higher the over-the-air data rate, the closer the distance);
- The low voltage of the power supply at room temperature is lower than the recommended value, the lower the voltage, the lower the power generation;
- The antenna is poorly matched to the module or the quality of the antenna itself.

10.2 Modules are vulnerable

- Please check the power supply to ensure that it is between the recommended supply voltages, exceeding the maximum value can cause permanent damage to the module;
- Please check the stability of the power supply, the voltage can not be large and frequent fluctuations;
- Please ensure that the installation and use of the process of anti-static operation, high-frequency devices electrostatic sensitivity;
- Please ensure that the installation and use of the process of humidity should not be too high, part of the components for humidity-sensitive devices;
- If there is no special demand is not recommended in too high, too low temperature use.

10.3 BER is too high

- There is interference from the same frequency signal nearby, stay away from the source of interference or modify the frequency and channel to avoid interference;
- Unsatisfactory power supply may also cause garbled code, be sure to ensure the reliability of the power supply;
- Extension cables, feeder cables of poor quality or too long, can also cause high BER.

11 Welding instructions

11.1 Reflow temperature

When reflow soldering, all temperatures are package centre temperatures, measured on the upward facing package surface (leads placed downwards, i.e. live bug orientation). If reflow soldering is not used to measure the temperature of the module in the direction of the live bug (leads are placed facing upwards, i.e. dead bug direction), the measured Tp temperature is within ±2°C of the Tp temperature measured in the live bug direction, which still meets the requirements of Tc. Otherwise, the temperature profile should be adjusted to meet the requirements of Tc. For accurate measurement of the actual peak temperature of the package body, it is recommended to use the method recommended by JEP140 for oven temperature testing.

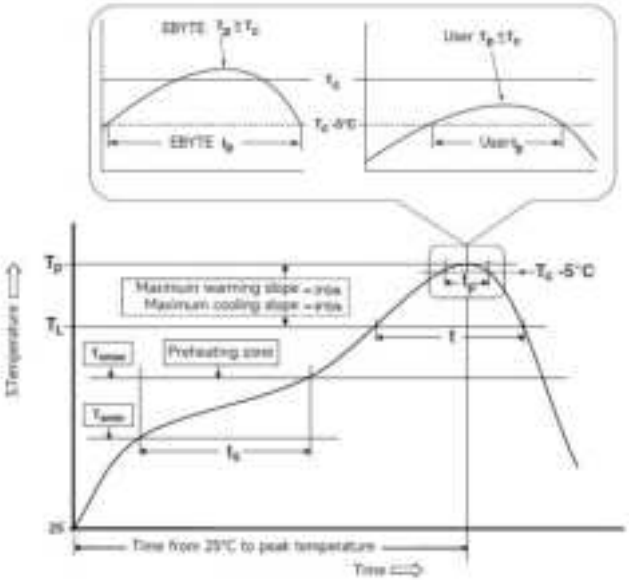
In order to obtain better soldering results, the production plant is recommended to be controlled at a constant temperature of 25℃.

When the soldered parts need to reset the temperature profile, a carrier fixture of the same construction should be used to pass the reflow soldering, or it has been verified to have an equivalent thermal load.

The reflow profiles in this document are intended as recommendations for soldering only EBYTE modules and should not be used to confirm the actual assembly profile of the user. The actual production process should be based on the specific production process, needs and board design to develop the actual production assembly profile, and should not exceed the parameters in the table below.

Reflow Profile Characteristics		Leaded process assembly	Lead-free process assembly
Preheating/Holding	minimum temperature（Tsmin）	100℃	150℃
	highest temperature（Tsmax）	150℃	200℃
	Time（Tsmin~Tsmin）	60-120 second	60-120 second
slope of temperature rise（TL~Tp）		3°C/sec, max.	3°C/sec, max.
liquid-phase temperature（TL）		183℃	217℃
Holding time above TL		60~90 second	60~90 second
Peak package temperature Tp		The user must not exceed the temperature indicated on the product's ‘Moisture Sensitivity’ label.	The user must not exceed the temperature indicated on the product's ‘Moisture Sensitivity’ label.
Time (Tp) within 5°C of the specified classification temperature (Tc), see the following diagram		20 second	30 second
slope of cooling（Tp~TL）		6°C/sec, max.	6°C/sec, max.
Time from room temperature to peak temperature		6 minutes, max.	8 minutes, max.
※The peak temperature (Tp) tolerance of the temperature profile is defined as the user's upper limit.			

11.2 Reflow Profile



12 Related Model

Product Model	Chip solution	Carrier frequency Hz	Transmission power dBm	Product Size mm	Package form	Antenna form
E610-433T20S	-	410～441M	20	16*26	贴片	IPX
E610-433T30S	-	410～441M	30	25*40.5	贴片	Stamp Hole /IPX
RD400D	-	410～470M	30	33*26.5	贴片	IPX

Revision history

Version	Date	Description	Issued by
1.0	2025-01-02	Initial version	Bin

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