E42-400M20S

User Manual

HW3000 400MHz 100mW SPI Wireless Module



Chengdu Ebyte Electronic Technology Co.,Ltd.

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1. Overview

1.1 Introduction

E42-400M20S is a hardware module (SPI) based on Shanghai Neusoft Carrier Microelectronics original HW3000 RF chip design, half-duplex, transceiver, transparent transmission mode, SMD type, the working band is 428 ~ 522MHz, the transmitter power of 100mW, suitable for a wide range of environments, high sensitivity to receive, strong anti-jamming, and support for the development of low power consumption. Applied in various industries, with stable performance, long transmission distance, small size, strong performance around the shot and so on. This module is a pure hardware module, users need to use the secondary development.



1.2 Features

- Communication range up to 2.5km under ideal conditions;
- Maximum transmit power 20dBm;
- supports 428~522MHz ultra-wide frequency band;
- supports data transmission rate of 1.2k~100kbps;
- supports 2.0~3.6V power supply, 3.3V power supply can ensure the best performance;
- supports multiple operating modes;
- supports automatic frequency hopping function;
- supports auto answer function (ACK);
- supports automatic retransmission function (ART);
- supports automatic frequency control (AFC);
- supports automatic gain control (AGC);
- supports whitening, FEC, CRC checksum independence;
- supports independent 256-byte transmit and receive FIFOs;
- supports Manchester encoding, 8bit/10bit linear encoding;
- supports digital RSSI measurement;
- supports IEEE 802.15.4g frame structure;
- industrial-grade standard design, support -40 ~ +85 ℃ for long time use;

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1.3 Application Scenarios

- Remote keyless entry;
- Smart home as well as industrial sensors and more;
- wireless alarm security systems;
- building automation solutions;
- wireless industrial grade remote controls;
- Smart agriculture and oilfield solutions;
- healthcare products;
- Advanced Meter Reading Architecture (AMI);
- automotive industry applications.

2. Specification

2.1 Limit parameters

Main parameters	Performances		Remark
	Min	Max	
Supply Voltage (V)	0	3.6	>3.6V will result in permanent destruction of module
Operating temperature (℃)	-40	+85	Industrial Grade

2.2 Operating parameters

Main parameters		Performances			Remark
		Min	typical value	Max	
Operating voltage (V)		2.0	3.3	3.6	≥3.3V can guarantee output power
Communication level (V)		-	3.3	-	Risk of burn-in with 5V TTL
Operating temperature (℃)		-40	-	+85	Industrial grade design
Operating frequency band (MHz)		428	-	522	Support ISM band
Air rate (bps)		1.2k	-	100k	Software adjustable, user-developed settings required
power consumption Sleep Current	Transmit Current (mA)	80	90	110	transient power consumption
	Receive Current (mA)		19.2		
	Low Power Receive		9.32		

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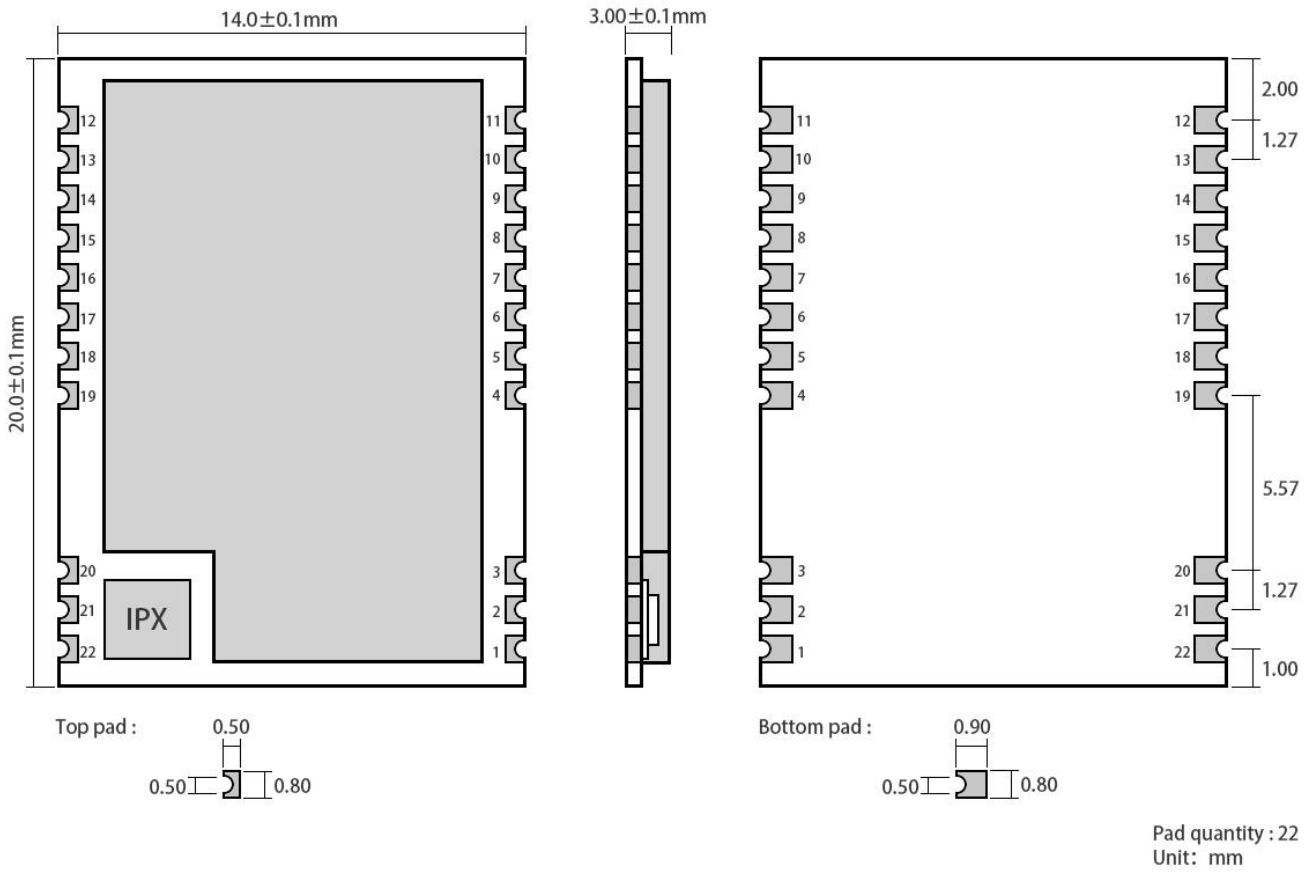
(μA)	Current (mA)				
	Sleep Current (μA)		0.1		@POWER DOWN Mode
Transmit Power (dBm)		Transmit Power (dBm)	19.5	+20	User software programmed control
Receive sensitivity (dBm)		Receive sensitivity (dBm)	-114		@10kbps

Main Parameters	**description**	**Note**
Reference Distance	2.5Km	Clear and open environment, antenna gain 3.5dBi, antenna height 2.5 meters, air rate 10kbps
Chip Program	HW3000	
Modulation mode	(G)FSK	
Communication Interface	SPI	Up to 10Mbps
Crystal oscillator	26MHz	
Package	Patch	
Interface	Stamp hole	
External Dimension	20*14mm	
Antenna Interface	IPX, Stamp Hole	Equivalent impedance approx. 50Ω

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3. Mechanical Dimensions and Pin Definitions



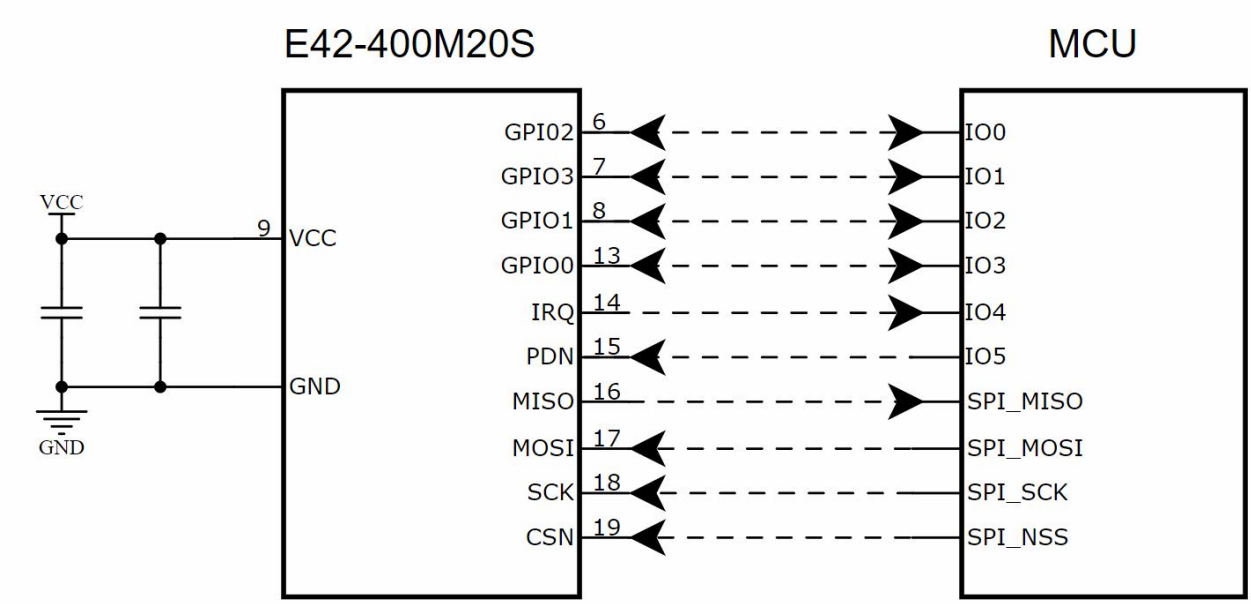
No	Name	Pin orientation	Pin Usage
1	GND	GND	Ground, Connect to Power Reference Ground
2	GND	GND	Ground, Connect to Power Reference Ground
3	GND	GND	Ground, Connected to Power Reference Ground
4	GND	GND	Ground, Connected to Power Reference Ground
5	GND	GND	Ground, Connected to Power Reference Ground
6	GPIO2	Inputs/Outputs	General-purpose digital I/O (see HW3000 chip manual for function details)
7	GPIO3	Input/Output	General Purpose Digital I/O (see HW3000 Chip Manual for functions)
8	GPIO1	Input/Output	General-purpose digital I/O (see HW3000 chip manual for functions)
9	VCC	VCC	Power supply, range 2.0V~3.6V (external ceramic filter capacitor is recommended)
10	GND	GND	Ground, connect to power reference ground
11	GND	GND	Ground, connect to power reference ground
12	GND	GND	Ground, connect to power reference ground

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13	GPIO0	Input/Output	General-purpose digital I/O (see HW3000 chip manual for function details)
14	IRQ	Outputs	Interrupt output pin (polarity assignable, default active low)
15	PDN	Inputs	POWER DOWN mode enable input pin (active high)
16	MISO	Outputs	SPI Data Output Pin
17	MOSI	Inputs	SPI Data Input Pin
18	SCK	Input	SPI clock input pin
19	CSN	Input	SPI chip select signal (active low)
20	GND	GND	Ground, connect to power reference ground
21	ANT		Antenna connector, stamp hole (50 ohm characteristic impedance)
22	GND	GND	Ground, Connect to Power Reference Ground

4. Recommended Connectivity Chart



5. Hardware Designs

- It is recommended to use a DC regulated power supply to power this module, the power supply ripple factor is as small as possible, and the module needs to be reliably grounded;
- Please pay attention to the correct connection of the positive and negative terminals of the power supply, such as reverse connection 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;
- please check the power supply stability, the voltage should not fluctuate significantly and frequently;

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- In the design of power supply circuit for the module, it is often recommended to retain more than 30% of the margin, there is the whole machine is conducive to long-term stable work;
- 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 analog 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, in the module contact part of the Top Layer paved ground copper (all paved copper and good grounding), must be close to the module digital part and alignment in the Bottom Layer;
- Assuming that the module is soldered or placed in the Top Layer, it is also wrong to randomly route the module in the Bottom Layer or any other layer, which will affect the spuriousness of the module as well as the reception sensitivity to varying 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;
- assume that there is a large electromagnetic interference around the module alignment (high-frequency digital, high-frequency analog, 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 you use 5V level, must be connected in series with 1k-5.1k resistor (not recommended, there is still a risk of damage);
- try to stay away from some wireless devices whose physical layer is also in the 400MHz band;
- antenna mounting structure has a greater impact on the module performance, be sure to ensure that the antenna is exposed and preferably vertically upward;
- When the module is installed inside the chassis, the antenna can be extended to the outside of the chassis; the antenna is installed inside the metal casing, which will lead to a significant weakening of the transmission distance.

6. Common problems

6.1 Undesirable transmission distance

- When there are linear communication barriers, the communication distance will decay accordingly;
- temperature, humidity, and co-channel interference, which will lead to higher communication packet loss rate;
- The ground absorbs and reflects radio waves, and the test results are poorer near the ground;
- seawater has a strong ability to absorb radio waves, so the effect of the seaside test is poor;
- metal objects near the antenna, or placed in a metal shell, the signal attenuation will be very serious;
- wrong power register setting, air rate setting is too high (the higher the air rate, the closer the distance);
- low voltage of power supply at room temperature is lower than the recommended value, the lower the voltage the lower the hair power;
- the use of antenna and module matching degree is poor or the antenna itself quality problems.

6.2 Modules are fragile

- Please check the power supply to ensure that it is between the recommended supply voltages, if it exceeds the maximum value it will cause permanent damage to the module;

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- please check the power supply stability, the voltage can not be substantial frequent fluctuations;
- please ensure that the installation and use process anti-static operation, high-frequency device 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 to be used at too high or too low a temperature.

6.3 BER is too high

- near the same frequency signal interference, away from the source of interference or modify the frequency and channel to avoid interference;
- Poor power supply may also cause garbled code, be sure to ensure the reliability of the power supply;
- extension cords, feeder cords of poor quality or too long, can also cause high BER.

7. Welding instructions

This product is a chip-type module, welding personnel in the welding module, be sure to follow the discharge of static electricity operation specification work;
This product is electrostatic sensitive products, not according to the rules arbitrarily welding module may module permanent damage.

8. Related Models

Model	Chip solution	Frequency Hz	Power dBm	Distance km	Airspeed bps	package	Size mm	Antenna form
E30-170T20D	SI4463	170M	20	2.0	1k ~ 25k	Direct plug	21 * 36	SMA-K
E30-170T27D	SI4463	170M	27	5.0	1k ~ 25k	Direct Insertion	24 * 43	SMA-K
E30-433T20S3	SI4438	433M	20	2.5	1k ~ 25k	SMT	16 * 26	IPEX/Stamp Hole
E30-433T20S	SI4438	433M	20	2.5	1k ~ 25k	SMT	17 * 30	IPEX/Stamp Hole
E30-433T20D1B	SI4438	433M	20	2.5	1k ~ 25k	Direct Insertion	21 * 36	SMA-K
E30-490T20S	SI4438	490M	20	2.5	1k ~ 25k	Stickers	17 * 30	IPEX/Stamp Hole
E30-490T20D	SI4438	490M	20	2.5	1k ~ 25k	Direct Insertion	21 * 36	SMA-K
E30-780T20S	SI4463	780M	20	2.5	1k ~ 25k	Stickers	17 * 30	IPEX/Stamp Hole

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E30-868T20D	SI4463	868M	20	2.5	1k ~ 25k	Direct Insertion	21 * 36	SMA-K
E30-868T20S	SI4463	868M	20	2.5	1k ~ 25k	Stickers	17 * 30	IPEX/Stamp Hole
E30-915T20D	SI4463	915M	20	2.5	1k ~ 25k	Direct Insertion	21 * 36	SMA-K
E30-915T20S	SI4463	915M	20	2.5	1k ~ 25k	Patch	17 * 30	IPEX/Stamp Hole

9. Antenna Guide

Antenna is an important role in the communication process, often poor-quality antenna will have a great impact on the communication system, so we recommend some of the antennas as a supporting our wireless module and the performance is more excellent and reasonably priced antenna.

Model	Type	frequency Hz	Interface	Gain dBi	Height mm	Feeders mm	Functional Features
TX433-JZLW-15	Rubber Stick Antenna	433M	IPEX-1 Generation Interface	3.0	165	150	Rubber Stick Cabinet Antenna, Omni Antenna
TX433-FPC-5711	FPC Built-in Antenna	433M	IPEX-1 Generation Interface	2.5	57	68	Cost-effective
TX433-PCB-3207	PCB Antenna	433M	IPEX-1 Generation Interface	2.0	32	90	PCB Antenna, Cost Effective
TX433-FPC-4516	Flexible FPC	433M	IPEX-1 Generation Interface	2.0	45	120	Cost-effective
TX433-FPC-3208	Flexible FPC	433M	IPEX-1 Generation Interface	2.0	32	90	Cost Effective
TX470-JZLW-15	Glue Stick Cabinet Antenna	470MHz	IPEX-1 Generation Interface	3.0	155	150	Rubber Stick Cabinet Antenna, Omni Antenna

Revision history

Versions	Revision Date	Revision Notes	Maintaining people
1.0	2024-01-06	Initial Version	Bin

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