EFR32 Wireless Module

E76-433M20S

User Manual

This manual may change with the continuous improvement of the product. Please refer to the latest version of the instruction.

Introduction

E76-433M20S is a small-sized SPI wireless module designed by Chengdu Ebyte. It’ s SMD type(Pin spacing:1.27mm), working as both transmitter and receiver. The antenna type can be stamp hole and IPEX. With stable batch production, the module is suitable for various application.

E76-433M20S is based on the original imported RF chip EFR32 from Silicon Labs, which integrated microcontroller and wireless transceiver. The module led out all IO port for secondary development. EFR32 has the potential to be the preferred wireless controller on the Smart furniture, IOT transformation and industrial automation. E76-433M20S integrated the crystal oscillator of EFR32FG1P131F256GM48 and 40MHz. The related RF parameters can get through the domestic and overseas certification, such as FCC, CE, CCC etc., satisfying export demand.

E76-433M20S is a hardware platform. Without any program, users need to conduct the secondary development.

Contents

1. Core Advantages

No.	Advantages	Note
1	ARM	Based on Cortex-M0, the chip integrated 32 bit processor
3	Harmonic stray	The RF hardware design features small harmonic stray, which can through various certification.
4	GPIO	All IO port are led out for secondary development..
5	Dual antenna	Users can choose IPEX antenna or stamp hole for external antenna.

2. Series Products

Model No.	Chip	Operating Frequency	Transmitting Power	Communication distance	packaging	Antenna type
		MHz	dBm	km		
E76-433M20S	EFR32	433M	20	2.5	SMD	IPEX / Stamp hole
Other models of E76 series are coming soon.						

3. Technical Parameters

Model No.	Chip	Size	Net WT	Operating temp.	Operating humidity	Storage temp.
E76-433M20S	EFR32	16 * 26 mm	1.70±0.1g	-40 ~ 85°C	10% ~ 90%	-40 ~ 125°C

Parameter categories	Min	Typ	Max	Unit
Transmitting current	95.0	100.0	105.0	mA
Receiving current	15.0	17.0	18.0	mA
Shutdown current	0.5	1.0	1.8	μA
Transmitting power	19.6	20.0	20.5	dBm
Receiving sensitivity	-118.0	-120.0	-123.0	dBm
Supply voltage	1.8	2.8	3.8	V
Communication level	1.8	2.8	3.8	V

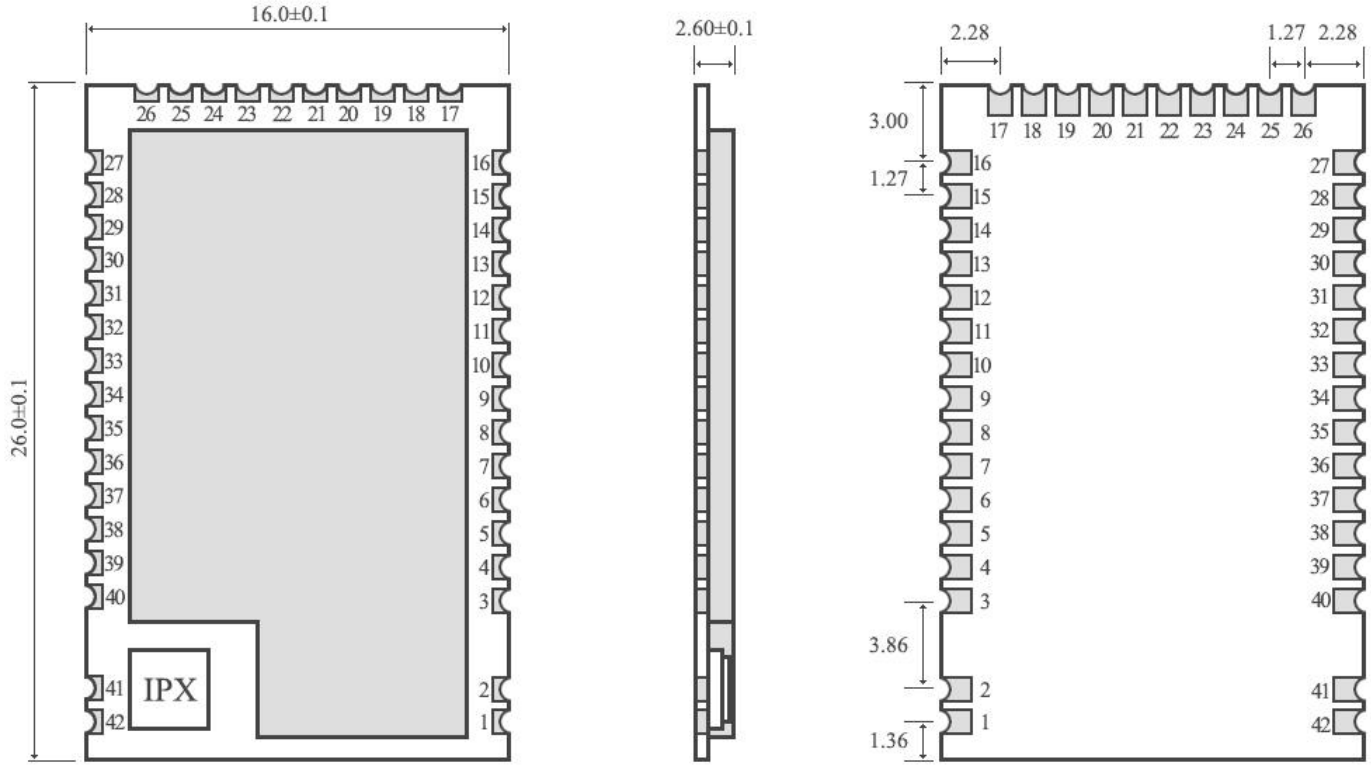
3.1 Parameter Description

- For designing the supply circuit for the modules, it’ s recommended to keep at least 30% margin, which would be better for long term and stable work.
- The required current should be large enough when transmitting, but because the transmission time is short so the total consumption might be less.
- When external antenna is used, the difference of Impedance matching will affect the transmitting current.
- When module is on pure receiving status, the consumed current is called receiving current. If modules programmed the communication protocol already, the testing receiving current will be large.
- The pure receiving current usually is mA level. For μA level, developer can conduct it via software.
- Shutdown current means when the module is on ultra low power consumption state, the CPU, RAM, clock and part register reservation consumed current.
- Shutdown current usually is lower than the consumed current of module in empty load status.
- Because the material itself has some error, so each LRS components has ±0.1% error. Considering there’ s multiple LRC components in the whole RF circuit, also there’ s error accumulation, which cause the different modules having difference in transmitting current and receiving current.
- Lowering the transmitting power can reduce the power consumption in some way, but in other way, this also decrease the efficiency of internal PA.

4. Notes

- Static electricity: High Frequency analog device features electrostatic sensitivity. Please avoid to contact with the electrical components.
- Welding:electric iron need to be grounded well. For mass production, producer need to wear the wired electrostatic Bracelet, which is grounded already.
- Power supply: The quality of power supply has big impact on modules' performance. Please ensure the power supply has few ripple and avoid the power supply jitter frequently. (π type filter is recommended. Ceramic capacitor/tantalum capacitors+inductance)
- Ground electrode：It adopts single point grounding. It' s recommend to use 0Ω resistance or 10mH inductance, which is separated from other circuit reference ground.
- Antenna: The installation structure of antenna can affect the modules' performance largely. So please ensure the antenna exposed and vertical upward. When modules is installed in the inside of the shell, users can adopt the high-quality antenna extension line to extend the antenna to the outside of shell. The antenna cannot be installed in the inside of metal shell, which causes transmission distance weakened greatly.
- Interference: If there' s any other frequency module working, users need to plan the frequency rationally, adopt screen measures to decrease the impact of harmonic interference and intermodulation interference.
- Crystal oscillator: If there' s crystal oscillator near the circuit board, please enlarge the straight distance between modules and crystal oscillator.

5. Pin Definition



Pin No.	Name	Direction	Usage
1	GND	Input/Output	Ground electrode, connected to the power reference ground.
2	GND	Input/Output	Ground electrode, connected to the power reference ground.
3	GND	Input/Output	Ground electrode, connected to the power reference ground.
4	RESETN	Input	Reset pin.
5	PD9	Input/Output	Configurable universal IO port(see more details on EFR32 datasheet.)
6	PD10	Input/Output	Configurable universal IO port(see more details on EFR32 datasheet.)
7	PD11	Input/Output	Configurable universal IO port(see more details on EFR32 datasheet.)
8	PD12	Input/Output	Configurable universal IO port(see more details on EFR32 datasheet.)
9	PD13	Input/Output	Configurable universal IO port(see more details on EFR32 datasheet.)
10	PD14	Input/Output	Configurable universal IO port(see more details on EFR32 datasheet.)
11	PD15	Input/Output	Configurable universal IO port(see more details on EFR32 datasheet.)
12	PA0	Input/Output	Configurable universal IO port(see more details on EFR32 datasheet.)
13	PA1	Input/Output	Configurable universal IO port(see more details on EFR32 datasheet.)
14	PA2	Input/Output	Configurable universal IO port(see more details on EFR32 datasheet.)
15	PA3	Input/Output	Configurable universal IO port(see more details on EFR32 datasheet.)
16	GND	Input/Output	Ground electrode, connected to the power reference ground.
17	PA4	Input/Output	Configurable universal IO port(see more details on EFR32 datasheet.)
18	PA5	Input/Output	Configurable universal IO port(see more details on EFR32 datasheet.)
19	PB11	Input/Output	Configurable universal IO port(see more details on EFR32 datasheet.)
20	PB12	Input/Output	Configurable universal IO port(see more details on EFR32 datasheet.)
21	PB13	Input/Output	Configurable universal IO port(see more details on EFR32 datasheet.)
22	PB14	Input/Output	Configurable universal IO port(see more details on EFR32 datasheet.)
23	PB15	Input/Output	Configurable universal IO port(see more details on EFR32 datasheet.)
24	PC6	Input/Output	Configurable universal IO port(see more details on EFR32 datasheet.)
25	PC7	Input/Output	Configurable universal IO port(see more details on EFR32 datasheet.)
26	PC8	Input/Output	Configurable universal IO port(see more details on EFR32 datasheet.)
27	GND	Input/Output	Configurable universal IO port(see more details on EFR32 datasheet.)
28	PC9	Input/Output	Configurable universal IO port(see more details on EFR32 datasheet.)
29	PC10	Input/Output	Configurable universal IO port(see more details on EFR32 datasheet.)
30	PC11	Input/Output	Configurable universal IO port(see more details on EFR32 datasheet.)
31	PF0	Input/Output	Configurable universal IO port(see more details on EFR32 datasheet.)
32	PF1	Input/Output	Configurable universal IO port(see more details on EFR32 datasheet.)
33	PF2	Input/Output	Configurable universal IO port(see more details on EFR32 datasheet.)
34	PF3	Input/Output	Configurable universal IO port(see more details on EFR32 datasheet.)
35	PF4	Input/Output	Configurable universal IO port(see more details on EFR32 datasheet.)
36	PF5	Input/Output	Configurable universal IO port(see more details on EFR32 datasheet.)
37	PF6	Input/Output	Configurable universal IO port(see more details on EFR32 datasheet.)
38	PF7	Input/Output	Configurable universal IO port(see more details on EFR32 datasheet.)
39	VCC	Input/Output	Positive reference power supply, voltage: 1.8V-3.8V
40	GND	Input/Output	Ground electrode, connected to the power reference ground.
41	ANT	Input/Output	Antenna interface. Stamp hole(50Ωcharacteristic impedance)
42	GND	Input/Output	Ground electrode, connected to the power reference ground.

6. Development and Usage

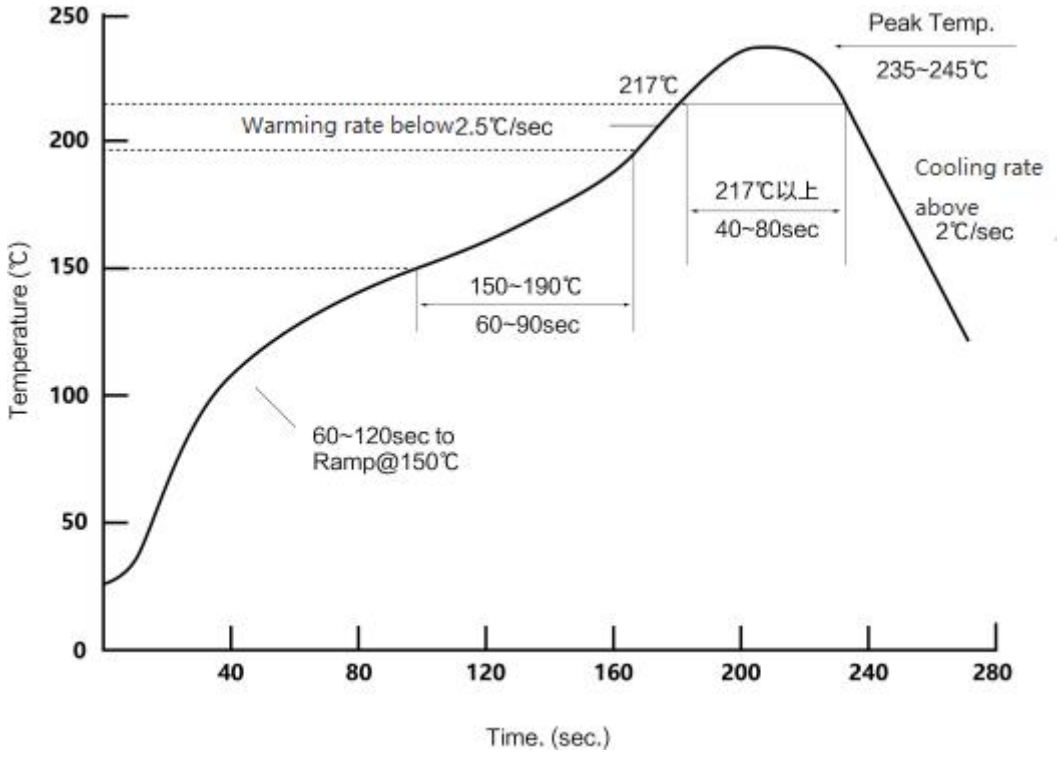
<table>
<tr><th>Serial No.</th><th>Key words</th><th>Notes</th></tr>
<tr><td>1</td><td>Download software</td><td>The module is SOC with GPIO port. Only the J-LINK can be used for program downloading.
We provide demo for reference. Users can directly download our compiled HEX files or change the primary code to realized the function needed.
Pin definition of software downloading
<table>
<tr><td>E76-433M20S Pin</td><td>J-LINK Interface</td></tr>
<tr><td>VCC</td><td>VCC</td></tr>
<tr><td>PF0</td><td>SWCLK</td></tr>
<tr><td>PF1</td><td>SWDIO</td></tr>
<tr><td>GND</td><td>GND</td></tr>
</table></td></tr>
<tr><td>2</td><td>Test board</td><td>We do not provide the matched test board for this module yet.</td></tr>
</table>

7. Production Guidance

7.1 Reflow Temperature

Preheating zone：Maximum temperature rise is 2.5℃/s ;
Insulation zone：temperature: 150~190℃，time: 60~90s，Maximum temperature rise is 2.5℃/s ;
Recirculation zone：Maximum temperature is 235~245℃，Above 217℃, the time will be 40~80s ;
Cooling zone：Maximum cooling is 4℃/s.

7.2 Reflow Graph



8. FAQ

8.1 The communication distance is too close

- When there’ s straight Communication barrier, the communication distance will be reduced accordingly.
- Temperature, humidity and same frequency interference will increase the rate of communication packet loss.
- Ground absorption, reflected radio waves, and closing to ground will lead to poor test result.
- Sea water has a strong ability to absorb radio waves, so test near the sea is not recommended .
- If antennas surrounded by metal items or placed in metal shell, the signal will be weakened badly.
- Power register is set wrongly or air data rate too high.(The higher the air data rate, the closer the distance.
- In room temperature, the power voltage will be less than 2.5V. The lower the the power voltage, the smaller the power.
- The antenna is unmatched to the module or the quality of antenna.

8.2 The module can be damaged easily

- Please check the power supply, which should be 1.8v-3.8v. If the value exceeds that, the module will be damaged.
- Please check the stability of power supply. The voltage cannot be in fluctuations frequently.
- Please ensure all the installation operations are anti-static.
- Please ensure the humidity in the procedure of installation and operation should not be too high because some electrical parts are humidity sensitive device.
- Please do not use it in a too high or too low temperature environment if there’ s no special requirement.

9. Important statement

- Ebyte reserves the rights of final interpretation and revision for all the involved contents in this manual.
- With the continuous improvement of hardware and software, this manual may subject to change without notice. Please refer to the latest version.
- Users can follow the product news on our official website so as to gain the latest information.

10. About Us

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

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