User Manual

Product Name: EM3587 ZigBee Module

Model Name: DSM-001

1. Product introduction

1.1 Summary

DSM-001 ZigBee wireless module, based on silicon labs EM358x series chip, has high performance, low power consumption, works in ISM band, fully supports IEEE802.15.4 standard, supports ZigBee-PRO protocol Stack.

1.2 Performance characteristics

Complete System-on-Chip

-32-bit ARM® Cortex -M3 processor

-2.4 GHz IEEE 802.15.4-2003 transceiver & lower MAC

-256 or 512 kB flash, with optional read protection

-32 or 64 kB RAM memory

-AES128 encryption accelerator

Low power consumption, advanced management

-RX Current (w/ CPU): 27 mA

-TX Current (w/ CPU, +3 dBm TX): 31 mA

-Low deep sleep current, with retained RAM and GPIO: 1.0 uA without/1.25 uA with sleep timer

-Low-frequency internal RC oscillator for low-power sleep timing

-High-frequency internal RC oscillator for fast (110 µs) processor start-up from sleep

Exceptional RF Performance

-Normal mode link budget up to 103 dB; configurable up to 110 dB

-–100 dBm normal RX sensitivity; configurable to –102 dBm (1% PER, 20 byte packet)

1.3 Application scenario

Internet of Things

Industrial control

Smart Home

Intelligent lighting

Smart Remote control

Health

Environmental monitoring

2 Hardware Description

2.1 Pin Description

The pins of the DSM-001 series module are shown below.
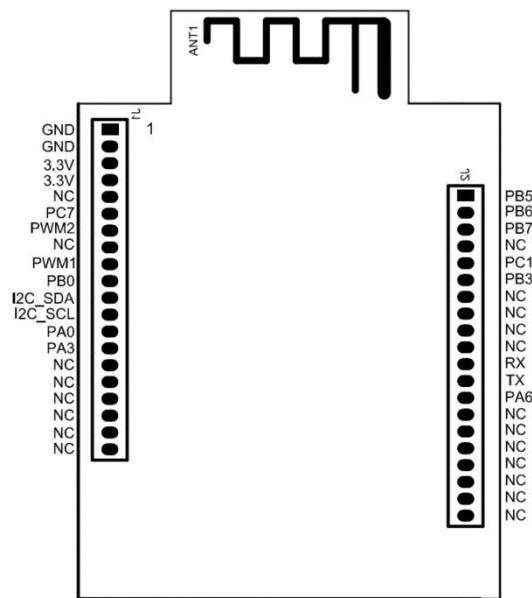
No	Name of Pin	Type	Direction	Description
1	GND	GND	Power	GND
2	GND	GND	Power	GND
3	3.3V	VCC	Power	Supply Voltage 3.3V
4	3.3V	VCC	Power	Supply Voltage 3.3V
5	NC	/	/	/
6	PC7	CMOS	I/O	General IO port
7	PWM2	CMOS	I/O	PWM2

8	NC	/	/	/
9	PWM1			PWM1
10	PB0	CMOS	I/O	General IO port
11	I2C_SDA	CMOS	I/O	Two Wire serial Interface- data port
12	I2C_SCL	CMOS	I/O	Two Wire serial Interface- clock port
13	PA0	CMOS	I/O	General IO port
14	PA3	CMOS	I/O	General IO port
15	NC	/	/	/
16	NC	/	/	/
17	NC	/	/	/
18	NC	/	/	/
19	NC	/	/	/
20	NC	/	/	/
21	PB5	CMOS	I/O	General IO port
22	PB6	CMOS	I/O	General IO port
23	PB7	CMOS	I/0	General IO port
24	NC	/	/	/
25	PC1	CMOS	I/0	General IO port
26	PB3	CMOS	I/0	General IO port
27	NC	/	/	/
28	NC	/	/	/
29	NC	/	/	/
30	NC	/	/	/
31	RX	CMOS	I/O	UART RX
32	TX	CMOS	I/O	UART tx
33	PA6	CMOS	I/O	General IO port
34	NC	/	/	/
35	NC	/	/	/
36	NC	/	/	/
37	NC	/	/	/
38	NC	/	/	/
39	NC	/	/	/
40	NC	/	/	/

2.2 Package size

The following figure shows the dimensions of the DSM-001 module. Including shield height 3.4 ±0.2mm.
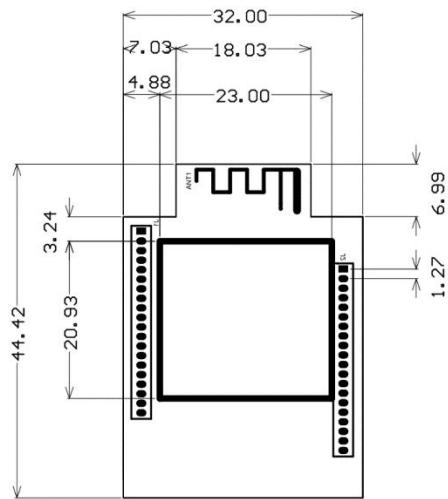
3. Specifications

3.1 Electrical characteristics limit parameters

Modules must be within the conditions described below and may cause damage beyond the range described in the table below.

Parameter	Min.	Max.
Supply voltage	-0.3V	3.6V
All pins	-0.3V	VDD+0.3V
Stored temperature	$-40°C$	$150°C$

3.2 Working conditions

Parameter	Min.	Max.
Working voltage	2.0V	3.6V
Environmental temperature	$-40°C$	$85°C$

3.3 Working current

Test conditions VDD=3.0V @ +25°C

Operating mode	Min.	Max.
Sleep mode	1uA	1.25uA
RF reception	27mA	28mA
RF transmission	31mA	60mA

3.4 RF characteristics

Receiving sensitivity	-102dBm	
Transmit power	15.52dBm	

Center frequency offset	±40ppm	including temperature range and aging
RF output impedance	50 Ω	

4 Welding

Reflow soldering is recommended to operate according to the temperature curve shown below.
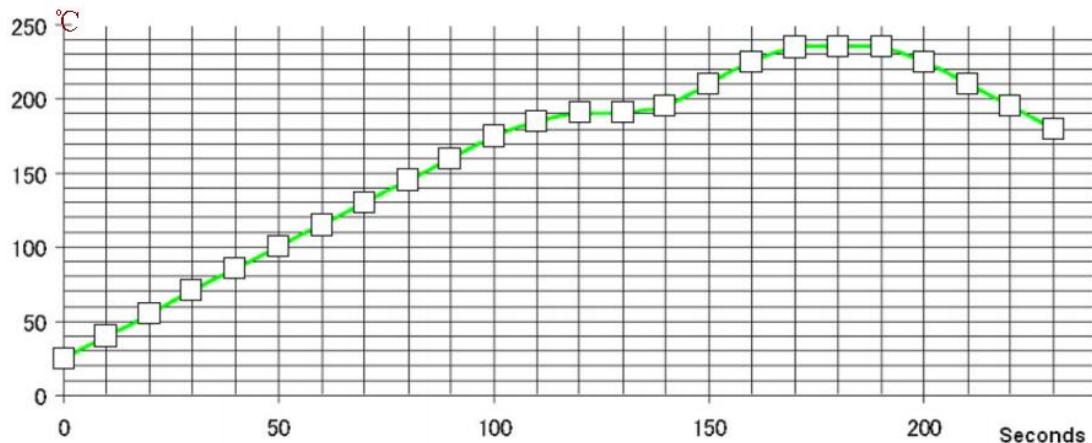
Temperature	25～160℃	160 ～ 190℃	>220℃	220℃～Pk.	Pk. Temp (235℃)
Target time(s)	90～130	30～60	20-50	10-15	150-270

5. Certification

FCC

OEM Guidance

1. Applicable FCC rules

   This module is granted by Single Modular Approval. It complies to the

   requirements of FCC part 15C, section 15.247 rules.

2. The specific operational use conditions

   This module can be used in IoT devices. The input voltage to the module is

   nominally 3.3V DC. The operational ambient temperature of the module is -40 to

   85 degree C. Only the embedded PCB antenna is allowed. Any other external

   antenna is prohibited.

3. Limited module procedures

   Not Limited module

4. Trace antenna design

   Not using Trace antenna design

5. RF exposure considerations

   The equipment complies with FCC radiation exposure limits set forth for an
   uncontrolled environment. This equipment should be installed and operated with
   minimum distance 20cm between the radiator and your body. If the equipment
   built into a host as a portable usage, the additional RF exposure evaluation
   may be required as specified by 2.1093.

6. Antenna

Antenna type: PCB antenna; Peak gain: 0 dBi

7. Label and compliance information

An exterior label on OEM's end product can use wording such as the following: "Contains Transmitter Module FCC ID: 2AV5NMSWUP-310" or "Contains FCC ID: 2AV5NMSWUP-310."

8. Information on test modes and additional testing requirements

a)The modular transmitter has been fully tested by the module grantee on the required number of channels,modulation types, and modes, it should not be necessary for the host installer to re-test all the available transmitter modes or settings. It is recommended that the host product manufacturer, installing the modular transmitter,perform some investigative measurements to confirm that the resulting composite system does not exceed the spurious emissions limits or band edge limits (e.g., where a different antenna may be causing additional emissions).

b)The testing should check for emissions that may occur due to the intermixing of emissions with the other transmitters, digital circuitry, or due to physical properties of the host product (enclosure). This investigation is especially important when integrating multiple modular transmitters where the certification is based on testing each of them in a stand-alone configuration. It is important to note that host product manufacturers should not assume that because the modular transmitter is certified that they do not have any responsibility for final product compliance.

c)If the investigation indicates a compliance concern the host product manufacturer is obligated to mitigate the issue. Host products using a modular transmitter are subject to all the applicable individual technical rules as well as to the general conditions of operation in Sections 15.5, 15.15, and 15.29 to not cause interference. The operator of the host product will be obligated to stop operating the device until the interference have been corrected .

9. Additional testing, Part 15 Sub part B disclaimer The final host / module combination need to be evaluated against the FCC Part 15B criteria for unintentional radiators in order to be properly authorized for operation as a Part 15 digital device.

The host integrator installing this module into their product must ensure that the final composite product complies with the FCC requirements by a technical assessment or evaluation to the FCC rules, including the transmitter operation and should refer to guidance in KDB 996369. For host products with certified modular transmitter, the frequency range of investigation of the composite system is specified by rule in Sections 15.33(a)(1) through (a)(3), or the range applicable to the digital device, as shown in Section 15.33(b)(1), whichever is the higher frequency range of investigation When testing the host product, all the transmitters must be operating.The transmitters can be enabled by using publicly-available drivers and turned on, so the transmitters are active. In certain conditions it might be appropriate to use a technology-specific call box (test set) where accessory 50 devices or drivers are not available. When testing for emissions from the unintentional radiator, the transmitter shall be placed in the receive mode or idle mode, if possible. If receive mode only is not possible then, the radio shall be passive (preferred) and/or active scanning. In these cases, this would need to enable activity on the communication BUS (i.e., PCIe, SDIO, USB) to ensure the unintentional radiator circuitry is enabled. Testing laboratories may need to add attenuation or filters depending on the signal strength of any active beacons (if applicable) from the enabled radio(s). See ANSI C63.4, ANSI C63.10 and ANSI C63.26 for further general testing details.
The product under test is set into a link/association with a partnering device, as per the normal intended use of the product. To ease testing, the product under test is set to transmit at a high duty cycle, such as by sending a file or streaming some media content.

FCC Warning:
Any Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment. This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) This device must accept any interference received, including interference that may cause undesired operation