

Wireless communication Zigbee module

Model:WT5169P1-M3

1 Product Introduction

1.1 Product Overview

The WT5169P1-M3 series Zigbee module development by WITSTEC based on NXP-JN5169 microcontroller, with low-cost, low-power, but high performance. These Zigbee Modules can work in 2.4GHz common band and up to the protocol of IEEE802.15.4, also support Zigbee3.0, Zigbee Home Automation, Zigbee Light Link, Zigbee Smart Energy, IEEE802.15.4. Widely used in Home Automation, automatic message record, energy management, industrial automation, wireless sensor networks. The modules integrate with all of the RF components required, end user don't need to spend additional expensive charge for RF design and test. WITSTEC to provide a full set of development kit, to ensure end user can bring the product to the market with the shortest time and lowest cost.

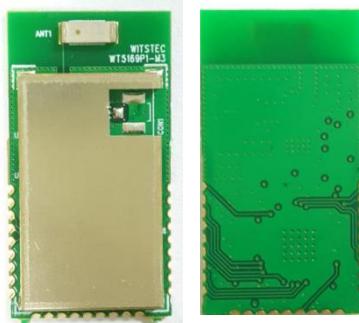


Figure 1.1

1.2 Module naming rules

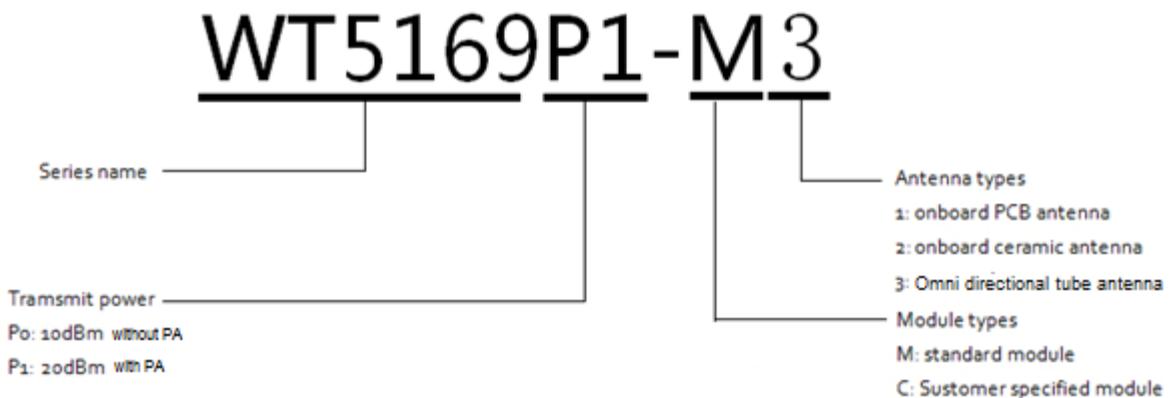


Figure 1.2

2 Features and Superiority

2.1 Superiority

- Microminiature module solution
- Ready for product development quickly
- Minimizes product development time
- FCC certification passed, No RF test required for product development .

2.2 WT5169 Key Features

- Working on 2.4 GHz frequency band, supporting the application on IEEE802.15.4, ZigBee 3.0, ZigBee PRO stack, Home Automation, Light Link and Smart Energy development, etc.
- Dimensions: 30mm*16mm
- Integrated on board antenna/or external antenna
- Received power: -96dBm
- Operation voltage 2.0V~3.6V
- Actual measured distance reach at 800m

2.3 Features of microcontroller

- 32-bit RISC CPU
- 1 MHz~32 MHz clock speed
- 512 kB Flash
- 32 kB RAM
- 4 kB EEPROM
- Multi-stage instruction pipeline
- Variable instruction width for high coding efficiency
- EEPROM support 100K times write operations
- Up to 20 DIO
- 6-Chan 10-bit ADC, 1 comparator
- 5×PWM (4×timer, 1×timer/counter)
- SPI-bus Master & Slave port with 3 selects
- 2 UARTs
- 2-wire I²C serial interface (master or slave)
- Two low-power sleep counters
- Watchdog timer and POR
- Supply Voltage Monitor (SVM)
- Internal temperature sensor

3 Hardware description

3.1 Pin description

Pins layout for WT5169P1-M3 module as shown on below picture 3.3, module designed with three rows of stamp hole patch interface with 27 pins, and pin spacing is 1.27mm. Complete pin-to-pin compatibility with NXP-JN5169 series module, pin definitions as showed on figure 3.1

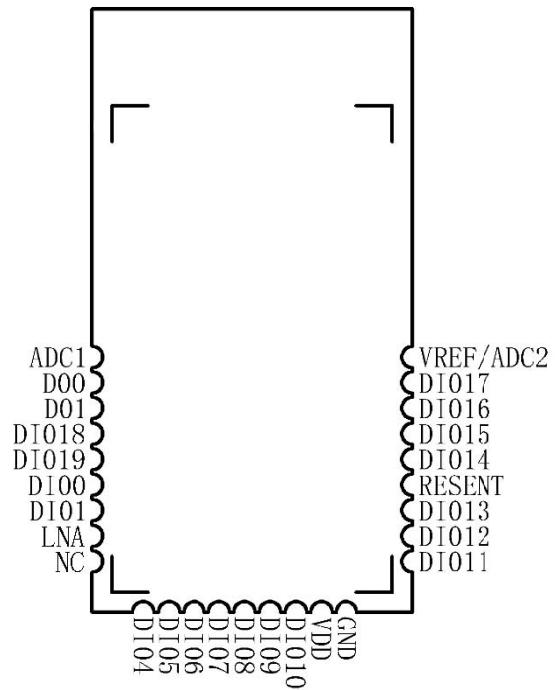


Figure 3.1.1

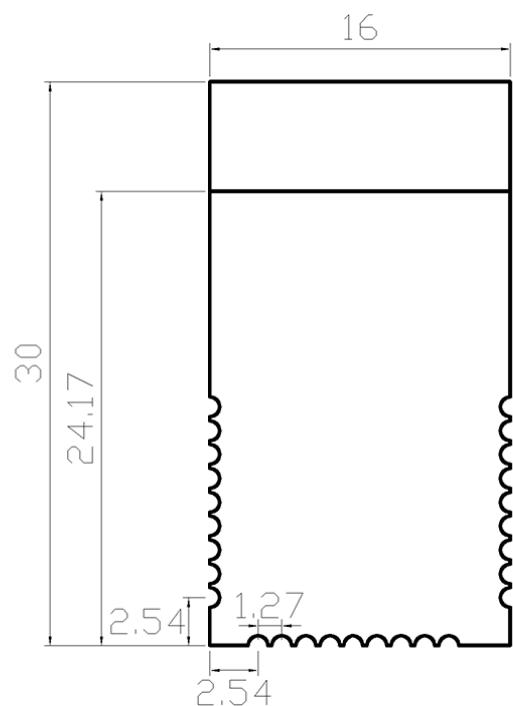


Figure 3.1.2

Definition of module pin

Pin No.	Pin Function		Description
	Primary	Alternate function	
1	ADC1	ADC1	ADC1 Input
2	D00	D00/SPICLK/PWM2	Low level will enter JTAG programming mode when reset
3	D01	D01/SPIMISO/PWM3	Low level will enter UART programming mode when reset
4	DI018	DI018/SPIMOSI	
5	DI019	DI019/SPISEL0	
6	DI00	DI00/ADO/SPISEL1/ADC3	ADC3 Input
7	DI01	DI01/ADE/SPISEL2/ADC4/PC0	ADC4 Input
8	DI02	DI02/RFRX/TIMOCK_GT/ADC5	PA control
9	DI03	DI03/RFTX/TIMOCAP/ADC6	PA control
10	DI04	DI04/CTS0/JTAG_TCK/TIMOOUT/PC0	
11	DI05	DI05/RTS0/JTAG_TMS/PWM1/PC1	
12	DI06	DI06/TXDO/JTAG_TDO/PWM2	
13	DI07	DI07/RXDO/JTAG_TDI/PWM3	
14	DI08	DI08/TIMOCK_GT/PC1/PWM4	
15	DI09	DI09/TIMOCAP/32KXTALIN/RXD1/32KIN	
16	DI010	DI010/TIMOOUT/32KXTALOUT	
17	VDD	V _{DD}	Supply Voltage
18	GND	V _{SS}	Digital Ground
19	DI011	DI011/PWM1/TXD1	
20	DI012	DI012	
21	DI013	DI013	
22	RESENT	RESET_N	Reset input
23	DI014	DI014	
24	DI015	DI015	
25	DI016	DI016/SPISMOSI/SIF_CLK/COMP1P	
26	DI017	DI017/SPISMISO/SIF_D/COMP1M/PWM4	
27	VREF/ADC2	VREF/ADC2	ADC2 Input

Table 3.1

3.2 Operating conditions

To ensure normal work of the module, operating condition must be complied with following table 3.2

Module operating conditions

Symbol	Parameter	Min	Max	Unit	Description
V_{DD}	Input Voltage	2	3.6	V	To reach the maximum TX power, 2.8 V is the minimum.
T_{amb}	Ambient temperature	-40	+85	°C	

Table 3.2

3.3 Module characteristics

Typical DC characteristics of module is showing on below table 3.3.1

Module DC characteristics

Test conditions: V_{DD} :3.3V, T_{amb} :25°C

Symbol	Conditions	Min	Typ	Max	Unit
I_{DD}	Deep sleep mode	–	100	–	nA
	Sleep mode	0.5	0.7	0.9	uA
	Radio in receive mode	–	21.5	–	mA
	Radio in transmit mode	–	153	–	mA

Table 3.3.1

Typical RF characteristics of module is showing on below table 3.3.2

Module RF characteristics

Test conditions: V_{DD} :3.3V, T_{amb} :25°C

Specialty	Data
Received sensitivity	-96dBm
Transmit power	20dBm
Maximum Received power	10dBm
RSSI variation	-96dBm ~ -10dBm
Center frequency shift	+/-25ppm
Outlet impedance	50Ω

Table 3.3.2

4 Antenna layout specification

The area around the antenna must be kept clear of conductors or other metal objects for an absolute minimum of 20mm. This is true for all layers of the PCB and not just the top layer. Any conductive objects close to the antenna could severely disrupt the antenna pattern

resulting in deep nulls and high directivity in some directions. The diagram below shows various possible scenarios. The top 3 scenarios are correct. Ground plane may be placed beneath the module as long as it does not protrude beyond the edge of the top layer ground plane on the module PCB.

The bottom 3 scenarios are incorrect. The left hand side example because there is ground plane underneath the antenna, the middle example because there is insufficient clearance around the antenna (it is best to have no conductors anywhere near the antenna. Finally, the right hand example has a battery's metal casing in the recommended keep out area.

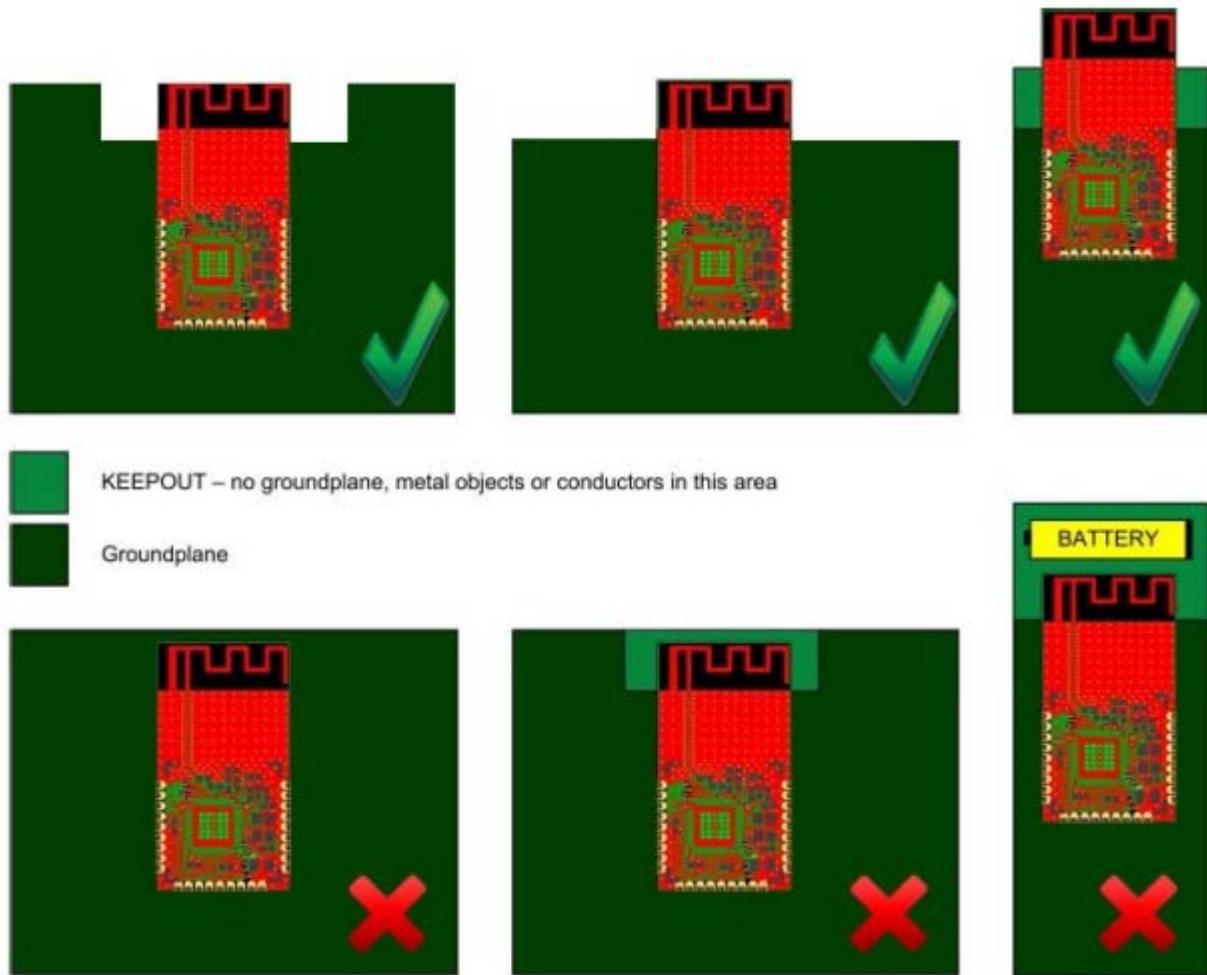


Figure 4

5 Development resource provided

WITSTEC provide these modules development resources freely for each customer, including software, data manuals, user guides, reference manuals, reference design. And provide Customized application development services, but not limited to Smart Home, Smart agriculture, industrial control, Automatic message recording, medical care, sensor network, etc.

6 FCC Statement

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.

Note: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

FCC Radiation Exposure Statement

This modular complies with FCC RF radiation exposure limits set forth for an uncontrolled environment. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

This device must operate with a minimum distance of 20 cm between the radiator and user body.

Note 1: Compliance of this device in all final host configurations is the responsibility of the Grantee. OEM integrators are responsible to satisfy RF exposure requirements. SAR evaluation is valid for fixed applications.

Note 2: Any modifications made to the module will void the Grant of Certification, this module is limited to OEM installation only and must not be sold to end-users, end-user has no manual instructions to remove or install the device, only software or operating procedure shall be placed in the end-user operating manual of final products.

Note 3: The device must not transmit simultaneously with any other antenna or transmitter.

Note 4: To ensure compliance with all non-transmitter functions the host manufacturer is responsible for ensuring compliance with the module(s) installed and fully operational. For example, if a host was previously authorized as an unintentional radiator under the Declaration of Conformity procedure without a transmitter certified module and a module is added, the host manufacturer is responsible for ensuring that the after the module is installed and operational the host continues to be compliant with the Part 15B unintentional radiator requirements. Since this may depend on the details of how the module is integrated with the host, Shenzhen Witstec

Technology Co., LTD shall provide guidance to the host manufacturer for compliance with the Part 15B requirements.

Note 5: FCC ID label on the final system must be labeled with "Contains FCC ID: 2AOBN-WT5169P1" The transmitter module must be installed and used in strict accordance with the manufacturer's instructions as described in the user documentation that comes with the host product. Shenzhen Witstec Technology Co., LTD is responsible for the compliance of the module in all final hosts.