# zigbee moduleDatasheet

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## catalogue

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# 1 summary

The VZACATXX-01 is a compact, high sensitivity, low power ZigBee module that complies with the IEEE 802.15. 4 specification and supports the ZigBee Light Link protocol and the ZigBeeHAprotocol. ZIGBEE 3.0, can be used in wireless sensing, controlanddata acquisition. The VZACATXX-01 ZigBee module is available in the EFR32MG1P in Slicon Labs' latest 32pin package Chip, support SWD and JTAG burning mode. In addition, the module uses ceramic antennas. The VZACATXX-01 module conforms to the national micro-power equipmentcertification,FCCspecification(seeappendixforcertificate),andcan Applyto devices in a variety of different environments. The VZACATXX-01 module conforms to the ROHSspecification.

RelatedDocumentation:

[1] IEEE Std 802.15. 4-2003 IEEE Standard for Information Technology-Part 15.4 Wireless MediaAccessControl(MAC)andPhysicalLayer(PHY)SpecificationsforLow-RateWireless PersonalAreaNetworks(LR-WPANs)

[2] ZigBee Specification. ZigBee Document 053474r17, October 19,2007

# 2 TechnicalSpecifications

## 2.1 ElectricalSpecifications

Exceeding the electrical ranges listed below may result in permanent damage to the module,andlong-termoperationatthemaximumratingmayalsoaffectthereliabilityof the module.

Test conditions (unless otherwise agreed), VCC=3. 3V, temperature=25℃

**Table 2.1 Electrical Specification Parameters**

| Parameters | Minimum | Maximum |
|---|---|---|
| Supply voltagerange | 2.4 V | 3.8 V |
| I/O Maximum drivecurrent | - | 50mA |
| Maximum Received Signal Strength onChip | - | +10dBm |

## 2.2 Operatingcharacteristics

Test conditions (unless otherwise agreed), VCC=3.3V, temperature=25 ℃

**Table 2.2 OperatingCharacteristics**

| Parameters | Scope | Unit |
|---|---|---|
| Operatingvoltage | 2.4-3.8 | 3.8 V |
| RF ReceiveCurrent | 20 | mA |
| RF Emissioncurrent | 20(14dBm) | mA |
| Sleepcurrent | 1.4 (Maximum SleepCurrent) | uA |
| Wake-uptime | 10.7 | us |

## 2.3 ProcessorPerformance

Silicon Labs' ZigBee Special Purpose Chip EFR32MG1PSeries.

**Table 2.3 ProcessorParameters**

| Parameters | Specification | Unit |
|---|---|---|
| Chipcore | 32bit ARMCORTEX-M4 | - |
| On-chipFlash | 256 | KB |
| On-chipRAM | 32 | KB |
| Operatingfrequency | 38.4 | MHz |
| ExtensionFlash | 512 | KB |

## 2.4 Module InterfaceFeatures

Test conditions (unless otherwise agreed), VCC=3.3V, temperature=25 ℃

**Table 2.4 Module InterfaceFeatures**

| Parameters | Specification | Unit |
|---|---|---|
| UART Baud raterange | 600-230.4k | Baud/s |
| Analog InputVoltage | -0.3-3.6 | V |
| SPI Maximum bus clockfrequency | 10.0 | MHz |
| GPIO OutputHigh | 0.8*VCC-VCC | V |
| GPIO OutputLow | 0-0.2*VCC | V |
| GPIO InputHigh | 0.7*IOVDD-IOVDD1 | V |
| GPIO InputLow | 0-0.3*IOVDD | V |
| [1]:IOVDD=VCC | | |

# 3 RFperformance

## 3.1 RFcharacteristics

Test conditions (unless otherwise agreed),VCC = 3.3V,Temperature=25 ℃

**Table 3.1 Radio frequency parametertable**

| Parameters | Specification | Unit |
|---|---|---|
| Operating frequencyband | 2400-2485 | MHz |
| Number ofChannels | 16 | Individual |
| Channelnumber | 0B-1A | Hex |
| Channelinterval | 5 | MHz |
| Maximum transmitpower | 14 | dBm |
| Receptionsensitivity | -94 (Theoreticalvalue) | dBm |
| Maximum transmissionrate | 256 | Kbps |
| RF Outputimpedance | 50 | Ω |

## 3.2 Communicationscapability

TheVZACATXX-01modulehasexcellentcommunicationcapabilityandgreatlyimprovesthe reliability of network communication. The communications capability is shown in the table below.

**Table 3.2 Overview of communicationscapabilities**

| Type | Test conditions | TestResults |
|---|---|---|
| Outdoor accessdistance | Transmit power:14dBm | 50m |
| Outdoor communicationdistance | Transmit power:14dBm | 500m |
| Communicationrate | Transmit power: 14dBm, Distance:20m | 250Kbps |

## 4 Standard Specification TestResults

The VZACATXX-01 modules are factory tested to ensure that each module complies with and complies with IEEE 802.15. 4 and ETSI EN 300 328, the test results are shown in the table below.

**Table 4 Overview of test results of standard keyitems**

| | Item | Limit | Test Results | Result |
|---|---|---|---|---|
| TX | TX MaximumPower | ETSI EN 300328 | <20dBm,-10dBw,100mW | Pass |
| | EIRP(TX SpecialDensity) | ETSI EN 300328 | <10dBm/MHz | Pass |
| | Narrow BandSpurious | ETSI EN 300328 | <-30dBm(1MHzBW) | Pass |
| | Wide BandSpurious | ETSI EN 300328 | <-80dBm | Pass |
| | PSD(TX PowerSpecial Density) | IEEE 802.15.4 | >-20dB,-30dBm,100KHz,F-fc>3.5MHz | Pass |
| | EVM(ErrorVector Magnitude) | IEEE 802.15.4 | <35% | Pass |
| | TX CenterFrequency Tolerance | IEEE 802.15.4 | <±40ppm | Pass |
| | Min of Max TXPower | IEEE 802.15.4 | >-3dBm | Pass |
| RX | Narrow Band RXEmissions | ETSI EN 300328 | <-47dBm(100KHz) | Pass |
| | Wide Band RXEmissions | ETSI EN 300328 | <-97dBm(100KHz) | Pass |
| | RXSensitivity | IEEE 802.15.4 | <-85dBm | Pass |
| | AdjacentChannel Rejection(N ±1) | IEEE 802.15.4 | >0dB | Pass |
| | AlternateChannel Rejection(N ±2) | IEEE 802.15.4 | >30dB | Pass |
| | RX Max InputPower | IEEE 802.15.4 | >-20dBm | Pass |

## 5 Size andPackage

The VZACATXX-01 module is small in size, 20mm in length, 17mm in width and 3mm in thickness (including shield; without Shield 2.2mm).

ThefollowingfigureshowstherecommendedFootprintdetailsforthe VZACATXX-01 module.

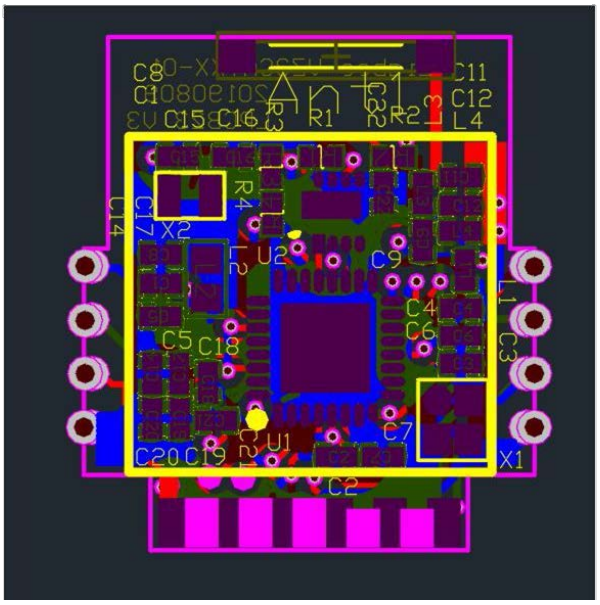



**Fig.5 VZACATXX-01 Module FootprintSize**

# 6 Pin InterfaceDescription

## 6.1 Pin FunctionDefinitions

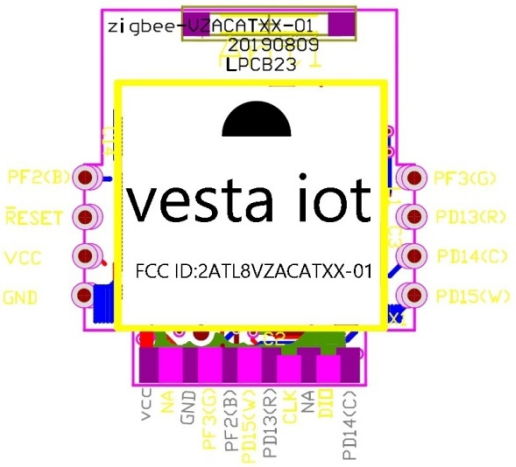



**Fig.6.1 Schematic diagram of pin positiondistribution**

The VZACATXX-01 module has a total of 24 pins, including 12 GPIO ports (including burn ports), as defined in the Table6.1.

**Table 6.1 Module Pin Definition Table**

| Module PinNumber | Type | PinName |
|---|---|---|
| P1 | P | GND |
| P2 | I/O | PD13 |
| P3 | I/O | PD14 |
| P4 | I/O | PD15 |
| P5 | I/O | PA0 |
| P6 | I/O | PA1 |
| P7 | I/O | NC |
| P8 | P | GND |
| P9 | P | GND |
| P10 | I/O | NC |
| P11 | I/O | PB15 |
| P12 | I/O | NC |
| P13 | I/O | NC |
| P14 | I/O | PC10 |
| P15 | I/O | PC11 |
| P16 | P | VCC3V3 |

| | | |
|---|---|---|
| P17 | P | VCC3V3 |
| P18 | P | GND |
| P19 | I/O | PF0/SWCLK(burnmouth) |
| P20 | I/O | PF1/SWDIO(burnmouth) |
| P21 | I/O | PF2 |
| P22 | I/O | PF3 |
| P23 | I | NRESET |
| P24 | P | GND |

## 6.2 Debug InterfaceDescription

The VZACATXX-01 module supports SWD (Series Wire Interface, which is the default burningmode).InSWDmode,onlySWDIO,SWCLK,powersupplyandgroundneedtobe connected.

## 7 EnvironmentalTolerance

Therelevantphysicalcharacteristicsofthismoduleareshowninthetable7.

**Table 7 Physicalcharacteristics**

| Parameters | Specification | Unit | Remarks |
|---|---|---|---|
| PhysicalSize | 22*15*2.2 | Mm | Long*Width*Thick |
| Weight | 3.0 | G | |
| Operatingtemperature | -40 ~+125 | ℃ | |
| Operating relativehumidity | ≤95 | % | |
| PCB Surface treatmentprocess | Goldplating | - | |
| ESD(Human BodyModel) | ±2 | KV | Allpins |
| ESD(Charge DeviceModel) | ±0.4 | KV | Non-RFPins |
| ESD(Charge DeviceModel) | ±0.225 | KV | RFPin |

## 8 Module LayoutWizard

①The position of the module antenna should be placed as close to the edge of the board as possible, especially at the corner of the PCB, and the part of the module antenna clearanceareashouldbesuspendedfromthemotherboard.FigureLocation:
② The transmitting direction of the antenna shall be toward the side without metal shielding, and the transmitting direction of the antenna shall not be perpendicular to the PCB motherboard. Welding the motherboard of the module. If the module clearance area cannot be placed in suspension according to the requirements of "1", hollowed-out treatment shall be carried out in the immediate lower part of the corresponding ceramic antenna clearance area. It is forbidden to place components (including batteries) on the back side, and copper and traces shall also be forbidden. (The headroom requirement is for built-inantennasonly).Theareaofcopperlayeronthesurfaceofthemotherboardmodule is 20*40mm, and the copper layer on the motherboard in the antenna direction should not extend beyond the edge of the module as far aspossible.

③Tracks from the motherboard to the GND and VCC pins of the module should be as short as possible and not less than the PIN width, and GND VIA should not be toosmall.

④ In case of coexistence of BLE, WIFI, GSM, 3G, LTE and other radio circuits on the motherboard,attentionshallbepaidtoisolation(antennasarefarawayfromeachother, GND isolation is shown as yellow arrow in the figure below, and antenna vertical arrangement is shown as blue arrow in the figurebelow).

⑤Themoduleshouldbeasfaraway frommetal,highvoltagecircuit,switchpowersupply circuit,highspeeddigitalcircuit,clockcircuit,inductivemagneticdeviceandsoon.

⑥The plastic housing should also be located as far away from the module's built-in antenna aspossible.

Inadditiontotheabovepoints,thelocationanddirectionofthemodulelayoutshouldalso bedecidedbyconsideringthespecificinstallationenvironment.
**Note:Iftheantennaofthemoduleisanexternalantennadrawnthroughthelpex interface, onlyobserve**

9 Modulewelding

Theweldingtemperatureofthemoduleshouldnotbetoohigh,otherwisethemodulewill bepermanentlydamaged.Therecommendedtemperaturecurveisshownbelow.

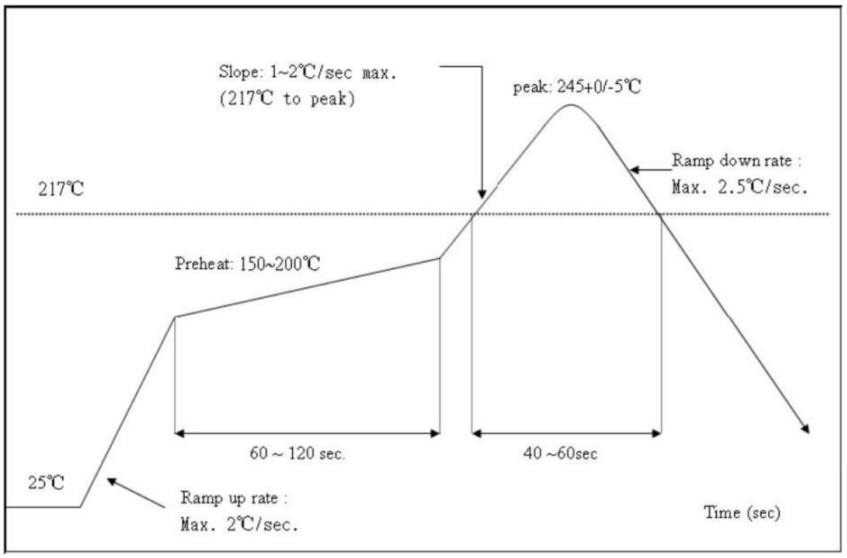



**Fig.9 Module Welding TemperatureCurve**

Note: Maximum temperature: ≤ 260 ℃, no more than 10 seconds; Module welding times are generally not more than 5times

10 SpecialReminder

Note that the module itself does not have strong static immunity, so static electricity should beavoidedasfaraspossibleinuseandoperationtopreventdamage.

11 Modules.

Common modules support 125 degrees Celsius bydefault

## 12 FCCCautions

- Labellingrequirements

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 interferencereceived,includinginterferencethatmaycauseundesiredoperation.

- Information touser

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 a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by Revogi Innovation Co., Ltd. turning the equipment off and on, the user is encouraged to try to correct the interferencebyoneormoreofthefollowingmeasures:-Reorientorrelocatethereceivingantenna -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. Note: The Grantee is not responsible for any changes or modifications not expressly approved by the party responsible for compliance. such modifications could void the user's authority to operate the equipment. the OEM integrator is still responsible for testing their end-product for any additional compliance requirements required with this module installed

IMPORTANT NOTE: In the event that these conditions cannot be met (for example co-location with another transmitter), then the FCC authorization is no longer considered valid and the FCC ID can not be used on the final product. In these circumstances, the OEM integrator will be responsible for re-evaluating the end product (including the transmitter) and obtaining a separate FCCauthorization.

- Manual Information To the EndUser:

The OEM integrator has to be aware not to provide information to the end user regarding how to install or remove this RF module in the user's manual of the end product which integrates this module.

- ModularApproval:

TheXJ-W1Amoduleisdesignedtocomplywiththe FCCstatement.FCCIDis2ATL8VZACATXX-01. The host system using VZACATXX-01, should have label indicated it contain modular's FCC ID 2ATL8VZACATXX-01.

➢RF warning:

The device has been evaluated to meet general RF exposure requirement. To maintain compliance with FCC's RF exposure guidelines, the distance must be at least 20 cm between the radiator and your body, and fully supported by the operating and installation configurations of transmitter and itsantenna(s).