1 Overview

ZS2S is embedded with a 32-bit low-power Arm Cortex-M33 core, 768-KB flash memory, and 64-KB random-access memory (RAM), and has extensive peripherals.

1.1 Features

- Embedded low-power 32-bit Arm Cortex-M33 processor, which provides digital signal processor (DSP) instructions and floating-point units (FPUs) and can also function as an application processor
- Clock rate: 80 MHz
- Operatingvoltage:3.3V
- Peripherals: 5 PWMs, 1 ADC and 1 UART
- Zigbee features

    - Channels 11 to 26 at 2.405 GHz to 2.480 GHz, 250 kbit/s air interface rate
    - Transmit power: +20 dBm
    - Runtime power consumption: 60 µA/MHz; current in sleep mode: 5 µA
    - Proactive device pairing for terminals
    - Onboard PCB antenna with a gain of 2.5 dBi
   - Operating temperature: -40℃ to +85℃

2 Applicationscenarios

- Intelligent building
- Smart household and home appliances
- Smart socket and light
- Industrial wireless control
- Baby monitor
- Network camera
- Intelligent bus

3 Module interfaces

3.1 Dimensions and footprint

ZS2S has two rows of pins with a spacing of 2 mm. ZS2S dimensions are 14.99±0.35 mm (W)×17.90±0.35 mm (L) ×2.80±0.15 mm (H). The PCB thickness is 0.8±0.1 mm. The figures below show front and rear views of ZS2S.

Top View
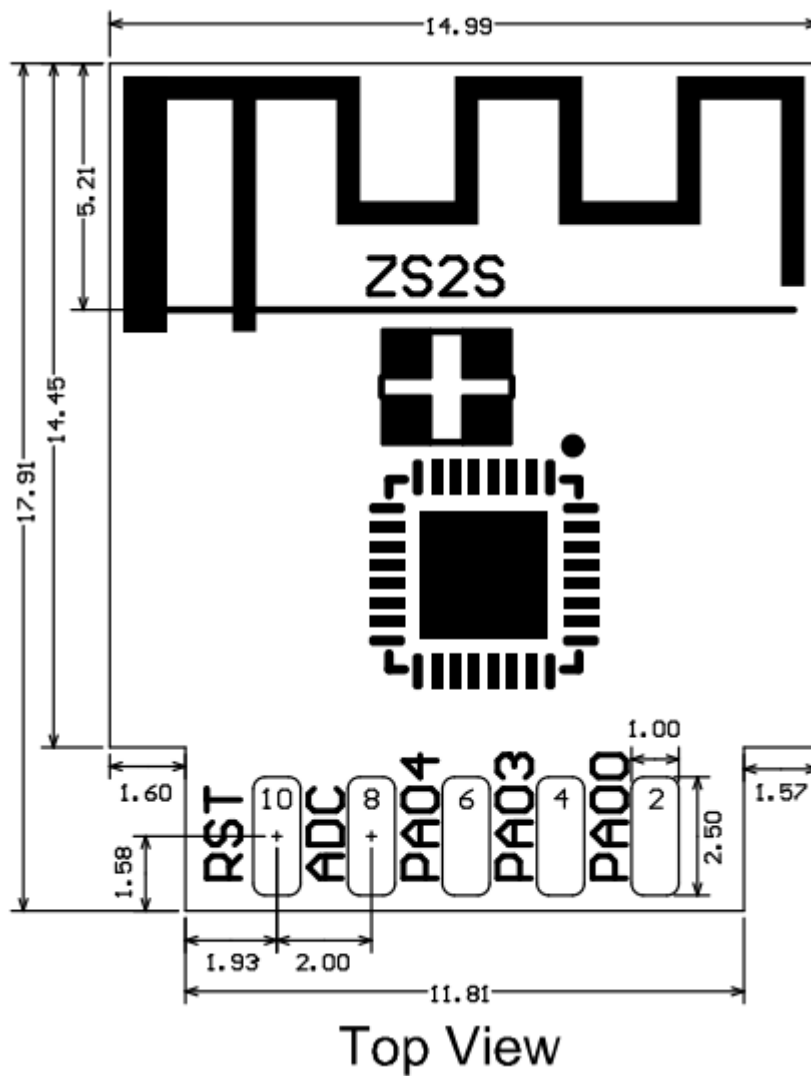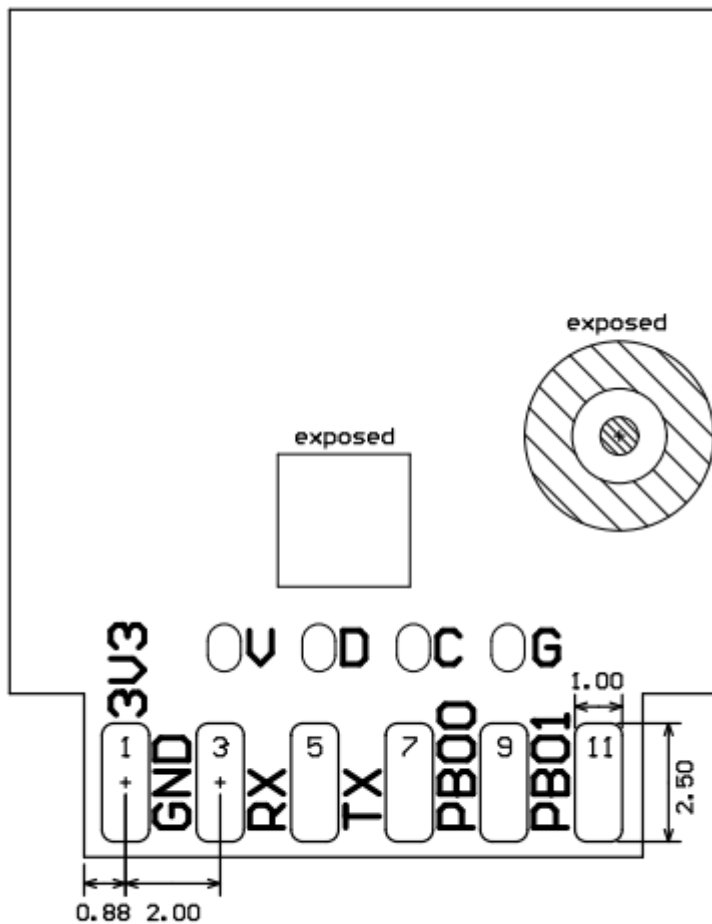
Bottom View

3.2 Pin definition

Pin number	Symbol	I/O type	Function
1	3V3	P	Power supply pin (typical power supply voltage: 3.3 V)
2	PA00	I/O	Hardware PWM pin, which is connected to PA00 on the internal IC

Pin number	Symbol	I/O type	Function
3	GND	P	Power supply reference ground pin, which must be properly grounded
4	PA03	I/O	Hardware PWM pin, which is connected to PA03 on the internal IC
5	RX	I/O	Serial interface receiving pin (UART0_RXD), which is connected to PA06 on the internal IC
6	PA04	I/O	Hardware PWM pin, which is connected to PA04 on the internal IC
7	TX	I/O	Serial interface transmission pin (UART0_TXD), which is connected to PA05 on the internal IC
8	ADC	AI	ADC，which is connected to PC01 on the internal IC
9	PB00	I/O	Hardware PWM pin, which is connected to PB00 on the internal IC

Pin number	Symbol	I/O type	Function
10	RST	I	Hardware reset pin (The chip is reset when the level is low. The level is high in
11	PB01	I/O	Hardware PWM pin, which is connected to PB01 on the internal IC

3.3 Test pin definition

Pin number	Symbol	I/O type	Function
12	V	P	Power supply pin (typical power supply voltage: 3.3 V)
13	D	I/O	JLINK SWDIO burning pin，which is connected to PA02 on the internal IC
14	C	I/O	JLINK SWCLK burning pin，which is connected to PA01 on the internal IC

Pin number	Symbol	I/O type	Function
15	G	P	Power supply reference ground pin, which must be properly grounded

Note: P indicates a power supply pin, and I/O indicates an input/output pin. If you have any special requirements on light colour controlled by PWM output, contact Tuya business personnel.

4 Electrical parameters

4.1 Absolute electrical parameters

Parameter	Description	Minimum value	Maximum value	Unit
Ts	Storage temperature	-50	150	℃
VCC	Power supply voltage	-0.3	3.8	V
ESD voltage (human body model)	TAMB-25℃	-	2	kV
ESD voltage (machine model)	TAMB-25℃	-	0.5	kV

4.2 Working conditions

Parameter	Description	Minimum value	Average value	Maximum value (Typical value)	Unit
Ta	Operating temperature	-40	-	85	℃
VCC	Power supply voltage	2.0	3.0	3.8	V
VIL	I/O low-level input	-	-	IOVDD*0.3	V

Parameter	Description	Minimum value	Average value	Maximum value (Typical value)	Unit
VIH	I/O high-level input	IOVDD*0.7	-	-	V
VOL	I/O low-level output	-	-	IOVDD*0.2	V
VOH	I/O high-level output	IOVDD*0.8	-	-	V

4.3 RF power consumption

Working status	Rate	TX power/Receiving	Average value	Maximum value (Typical value)	Unit
TX	250Kbps	+20dBm	200	210	mA
TX	250Kbps	+10dBm	62	64	mA
TX	250Kbps	+0dBm	26	28	mA
RX	250Kbps	Constant receiving	10	12	mA

4.4 Operating current

Working mode	Working status (Ta = 25°C)	Average value	Maximum value (Typical value)	Unit
EZ	The module is in EZ mode.	10	40	mA
Connected and idle	The module is connected to the network.	11	13	mA
Connected and work	The module is connected to the network.	12	70	mA
Deep sleep mode	The module is in deep sleep mode, with 64 KB flash memory.	5	-	uA

5 RF features

5.1 Basic RF features

Parameter	Description
Frequency range	2.4GHz ISM band
Zigbee standard	IEEE 802.15.4
Data transmission rate	250kbps
Antenna type	PCB antenna

5.2 TX performance

Parameter	Minimum value	Average value	Maximum value (Typical value)	Unit
Output power	-30	20	-	dBm
Output power adjustment step	-	0.5	1	dB
Output spectrum adjacent-channel rejection ratio	-	-31	-	dB
Frequency error	-15	N/A	+15	dB

5.3 RX performance

RX sensitivity |Item|Minimum value|Average value|Maximum value (Typical value)|Unit| |—-|—-|—-|—-|—-| |RX sensitivity | 250kbps| -| -102| - |dBm|

6 Antenna information

6.1 Antenna type

ZS2S uses a PCB antenna with a gain of 2.5 dBi.

6.2 Antenna interference reduction

To ensure optimal Zigbee performance when the Zigbee module uses a PCB antenna, it is recommended that the antenna be at least 15 mm away from other metal parts. To prevent adverse impact on the antenna radiation performance, avoid copper or traces along the antenna area on the PCB.

3. Baking devices:

   • Cabinet oven
   • Anti-electrostatic and heat-resistant trays
   • Anti-electrostatic and heat-resistant gloves

4. The module needs to be baked in the following cases:

   • The packaging bag is damaged before unpacking.
   • There is no humidity indicator card (HIC) in the packaging bag.
   • After unpacking, circles of 10% and above on the HIC become pink.
   • The total exposure time has lasted for over 168 hours since unpacking.
   • More than 12 months have passed since the sealing of the bag.

5. Baking settings:

   • Temperature: 60°C and ≤ 5% RH for reel package and 125°C and ≤5% RH for tray package (please use the heat-resistant tray rather than plastic container)
   • Time: 48 hours for reel package and 12 hours for tray package
   • Alarm temperature: 65°C for reel package and 135°C for tray package
   • Production-ready temperature after natural cooling: < 36°C
   • Re-baking situation: If a module remains unused for over 168 hours after being baked, it needs to be baked again.
   • If a batch of modules is not baked within 168 hours, do not use the wave soldering to solder them. Because these modules are Level-3 moisture-sensitive devices, they are very likely to get damp when exposed beyond the allowable time. In this case, if they are soldered at high temperatures, it may result in device failure or poor soldering.

6. In the whole production process, take electrostatic discharge (ESD) protective measures.
7. To guarantee the quality of products, you must pay attention to the following items: The amount of soldering flux, the height of the wave peak, whether the tin slag and copper content in the wave soldering tank exceed standards, whether the window and thickness of the wave soldering fixture are appropriate, and whether the wave soldering oven temperature curve is appropriate.

7.3 Recommended oven temperature curve and temperature

Set oven temperatures according to the following temperature curve of wave soldering. The peak temperature is 260°C±5°C.

DIP Type Product Pass Wavesolder Graph
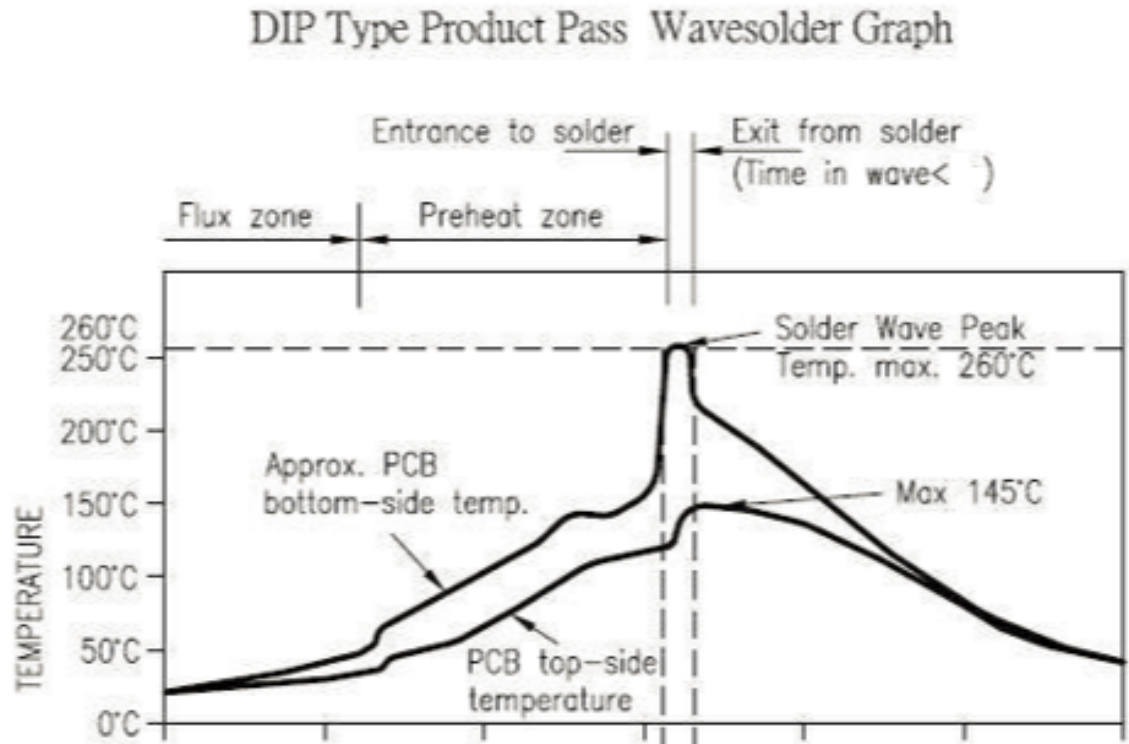
Recommended soldering temperature:

Suggestions on oven temperature curve of wave soldering		Suggestions on manual soldering temperature	
Preheat temperature	80 to 130 °C	Soldering temperature	360±20°C
Preheat time	75 to 100s	Soldering time	< 3s/point
Peak contact time	3 to 5s	NA	NA
Temperature of tin cylinder	260±5°C	NA	NA
Ramp-up slope	≤2°C/s	NA	NA

| Suggestions on oven temperature curve of wave soldering		Suggestions on manual soldering temperature	
Ramp-down slope	≤6°C/s	NA	NA

7.4 Storage conditions

Storage conditions for a delivered module:

- The moisture-proof bag is placed in an environment where the temperature is below 40°C and the relative humidity is lower than 90%.
- The shelf life of a dry-packaged product is 12 months from the date when the product is packaged and sealed.
- There is a humidity indicator card (HIC) in the packaging bag.
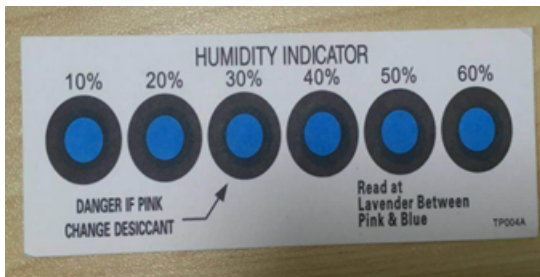
Caution
This bag contains
MOISTURE-SENSITIVE DEVICES

LEVEL

3

If blank, see adjacent bar code label

1. Calculated shelf life in sealed bag: 12 months at <40˚C and <90% relative humidity (RH)

2. Peak package body temperature: _____**260**_____˚C
   If blank, see adjacent bar code label

3. After bag is opened, devices that will be subjected to reflow solder or other high temperature process must be

   a) Mounted within: ____**168**____ hours of factory conditions
      If blank, see adjacent bar code label
      ≤30˚C/60% RH, or

   b) Stored per J-STD-033

4. Devices require bake, before mounting, if:

   a) Humidity Indicator Card reads >10% for level 2a - 5a devices or >60% for level 2 devices when read at 23 ± 5˚C

   b) 3a or 3b are not met

5. If baking is required, refer to IPC/JEDEC J-STD-033 for bake procedure

See Production Date
Bag Seal Date: _____
If blank, see adjacent bar code label

Note: Level and body temperature defined by IPC/JEDEC J-STD-020

Regulatory Module Integration Instructions

2.2 List of applicable FCC rules

This device complies with part 15.247 of the FCC Rules.

2.3 Summarize the specific operational use conditions

This module can be applied in HID, sports and fitness sensors , health sensors, mobile accessories as well as smart home. The input voltage to the module should be nominally 3.3 V DC and the ambient temperature of the module should not exceed 85℃.

This module using one kind of PCB antenna with maximum gain is 0 dBi ,
If the antenna needs to be changed，the certification should be re-applied.

2.4 Limited module procedures

Not applicable

2.5 Trace antenna designs

Not applicable

2.6 RF exposure considerations

This 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& your body. If the device built into a host as a portable usage， the additional RF exposure evaluation may be required as specified by 2.1093.

2.7 Antennas

Module contains one PCB antenna.

2.8 Label and compliance information

The outside of final products that contains this module device must display a label referring to the enclosed module. This exterior label can use wording such as: "Contains Transmitter Module FCC ID: 2AV7W-ZS2S " ，or "Contains FCC ID: 2AV7W-ZS2S"，Any similar wording that expresses the same meaning may be used.

2.9 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 has been corrected

The ZS2S module is based on MG21A02 chip .support standard Zigbee HCI UART commands. For the testing module on your product, user can refer to specification of the Zigbee system on how to configure and evaluate the module.

2.10 Additional testing， Part 15 subpart 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.

Frequency spectrum to be investigated

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.

Operating the host product

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 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 placed into a normal 'paired' mode with another BLE device， as per the normal intended use of the product (for example， transferring data).

ISED RSS Warning:

This device complies with Innovation, Science and Economic Development Canada licence‐exempt RSS standard(s). Operation is subject to the following two conditions:
(1) this device may not cause interference, and
(2) this device must accept any interference, including interference that may cause undesired operation of the device.
Le présent appareil est conforme aux CNR d'ISED applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes:
(1) l'appareil ne doit pas produire de brouillage, et
(2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

FCC Statement:

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.

ISED RF exposure statement:

This equipment complies with ISED radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator& your body.This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.
Le rayonnement de la classe b repecte ISED fixaient un environnement non contrôlés. Installation et mise en œuvre de ce matériel devrait avec échangeur distance minimale entre 20 cm tonon corps.Lanceurs ou ne peuvent pas coexister cette antenne ou capteurs avec d'autres.

IC Label Instructions:

The outside of final products that contains this module device must display a label referring to the enclosed module. This exterior label can use wording such as: "Contains Transmitter Module IC: 26051-ZS2S",or "Contains IC: 26051-ZS2S ", Any similar wording that expresses the same meaning may be used
Instructions d'étiquetage IC: L'extérieur des produits finis contenant ce module doit afficher une étiquette faisant référence au module inclus. Cette étiquette extérieure peut utiliser des libellés tels que: contient le module émetteur IC: " 26051-ZS2S "ou" contient: 26051-ZS2S ", tout libellé similaire exprimant le même sens peut être utilisé