E101-S3W Series Product Manual

2.4GHz ESP32-S3 WiFi+BLE



Chengdu Ebyte Electronic Technology Co.,Ltd.

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Chapter 1 Function Overview

1.1 Introduction

The E101-S3W series products are universal Wi-Fi + Bluetooth Low Energy modules , equipped with the ESP32-S3 series chip. In addition to having rich peripheral interfaces, the module also has powerful neural network computing and signal processing capabilities, making it suitable for various application scenarios in the AIoT field, such as wake word detection and voice command recognition, face detection and recognition, smart home, smart appliances, smart control panels, smart speakers, etc.

The E101-S3W series comprises four products, all pin-compatible, differing only in size and memory capacity . Wi-Fi and Bluetooth are compatible, sharing the same antenna. See the table below for details :

Model	E101-S3WN8-PS	E101-S3WN8-X S	E101-S3WN16R8-PS	E101-S3WN16R8-XS
Antenna method	PCB onboard antenna	IPEX-1 antenna	PCB onboard antenna	IPEX-1 antenna
FLASH	8MB	8MB	16MB	16MB
PSRAM	-	-	8MB	8MB
Size	18*25.5mm	18*19.2mm	18*25.5mm	18*19.2mm

1.2 Features and Functions

- It features a built-in ESP32-S3 series chip and is equipped with an Xtensa® dual-core 32-bit LX7 microprocessor (supporting single-precision floating-point arithmetic units) ;
- Supports clock frequencies up to 240 MHz ;
- It has 8 MB/16 MB Quad SPI flash;
- Equipped with 8MB PSRAM
- Support 2.4 GHz Wi-Fi (802.11 b/g/n) + Bluetooth® 5 (LE);
- It has a rich set of peripheral interfaces, such as GPIO, SPI, LCD, Camera interface, UART, I2C, I2S, etc.
- Operating temperature range: -40 ~ 85 ° C;

Chapter 2 Electrical Characteristics

2.1 Absolute Maximum Rating

Symbol	Parameter	Minimum value	Maximum value	Unit
VDD33	Power pin voltage	-0.3	3.6	V
TSTORE	Storage temperature	-40	85	° C

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2.2 Recommended Working Conditions

Symbol	Parameter	Minimum value	Typical value	Maximum value	Unit
VDD33	Power pin voltage	3.0	3.3	3.6	V
IVDD	External power supply current	0.5	—	—	A
T	Recommended operating temperature	-40	—	85	° C
Humidity	Humidity	—	85	—	%RH

2.3 DC electrical characteristics (3.3V, 25℃)

Symbol	Parameter	Minimum value	Typical value	Maximum value	Unit
CIN	pin capacitors	—	2	—	pF
VIH	High-level input voltage	0.75×VDD[1]	—	VDD[1]+0.3	V
VIL	low-level input voltage	–0.3	—	0.25×VDD[1]	V
IIH	High-level input current	—	—	50	nA
IIL	Low-level input current	—	—	50	nA
VOH 2	High-level output voltage	0.8×VDD[1]	—	—	V
VOL 2	Low-level output voltage	—	—	0 .1 ×VDD[1]	V
IOH	High-level pull-up current (VDD1 = 3.3 V, VOH >= 2.64 V, PAD_DRIVER = 3)	—	40	—	mA
IOL	Low-level sink current (VDD1=3.3V, VOL =0.495 V, PAD_DRIVER=3)	—	28	—	mA
RP U	Internal weak pull-up resistor	—	45	—	k Ω
RP D	Internal weak pull-down resistor	—	45	—	k Ω
VIH_nRST	Chip reset release voltage (EN pin should meet the voltage range)	0.75 ×VDD[1]	—	VDD[1]+0.3	V

[1] VDD is the power supply for I/O.

[2] VOH and VOL are measurements taken under high resistance conditions.

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2.4 Power Consumption Characteristics

2.4.1 RF power consumption in Active mode

Work mode	Describe		Peak value (mA)
Active (RF operation)	TX	802.11b, 1 Mbps, @20.5 dBm	355
		802.11g, 54 Mbps, @18 dBm	297
		802.11n, HT20, MCS7, @17.5dBm	286
		802.11n, HT40, MCS7, @17dBm	285
	RX	802.11b/g/n, HT20	95
		802.11n, HT40	97

1. The power consumption data above are based on tests conducted at the RF interface under a 3.3V power supply and an ambient temperature of 25°C. All transmission data were measured based on a 100% duty cycle.
2. When measuring RX power consumption data, peripherals are turned off and the CPU is idle.

2.5 Wi-Fi Radio Frequency

2.5.1 Wi-Fi Radio Frequency Standard

Name		Describe
Operating channel center frequency range [1]		2412 ~ 2484 MHz
Wi-Fi protocol		IEEE 802.11b/g/n
Data rate	20 MHz	11b: 1, 2, 5.5, 11 Mbps 11g: 6, 9, 12, 18, 24, 36, 48, 54 Mbps 11n: MCS0-7, 72.2 Mbps (Max)
	40 MHz	11n: MCS0-7, 150 Mbps (Max)
Antenna type		PCB antenna, external antenna connector [2]

1. The center frequency range of the operating channel should conform to national or regional standards and specifications. The software can configure the center frequency range of the operating channel .

2 The output impedance of the module using an external antenna connector is 50Ω. The output impedance of the module without an external antenna connector does not need to be considered.

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2.5.2 Wi-Fi Radio Frequency Transmitter (TX) Specifications

Depending on product or certification requirements, you can configure the transmitter target power. See Table 1 for default power details in the spectrum template and EVM transmit power compliant with the 802.11 standard.

Rate	Minimum value (dBm)	Typical value (dBm)	Maximum value (dBm)
802.11b, 1 Mbps	—	20.5	—
802.11b, 11 Mbps	—	20.5	—
802.11g, 6 Mbps	—	20.0	—
802.11g, 54 Mbps	—	18.0	—
802.11n, HT20, MCS 0	—	19.0	—
802.11n, HT20, MCS 7	—	17.5	—
802.11n, HT40, MCS 0	—	18.5	—
802.11n, HT40, MCS 7	—	17.0	—

Table 1. Spectrum template and EVM transmit power conforming to 802.11 standard

Rate	Minimum value (dB)	Typical value (dB)	Standard Limit (dB)
802.11b, 1 Mbps, @20.5 dBm	—	-24.5	– 10
802 . 11b, 11 Mbps, @20 .5 dBm	—	–24.5	– 10
802 . 11g, 6 Mbps, @20 dBm	—	–23.0	–5
802 . 11g, 54 Mbps, @18 dBm	—	–29.5	–25
802 . 11n, HT20, MCS 0, @19 dBm	—	–24.0	–5
802 . 11n, HT20, MCS 7, @17 .5 dBm	—	–30.5	–27
802 . 11n, HT40, MCS 0, @18 .5 dBm	—	–25.0	–5

Table 2 Launch EVM Test

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2.5.3 Wi-Fi Radio Frequency Receiver (RX) Specifications

Rate	Minimum value (dBm)	Typical value (dBm)	Maximum value (dBm)
802.11b, 1 Mbps	—	-98.2	—
802.11b, 2 Mbps	—	-95.6	—
802.11b, 5.5 Mbps	—	-92.8	—
802.11b, 11 Mbps	—	–88.5	—
802.11g, 6 Mbps	—	–93.0	—
802 . 11g, 9 Mbps	—	–92.0	—
802 . 11g, 12 Mbps	—	–90.8	—
802 . 11g, 18 Mbps	—	–88.5	—
802 . 11g, 24 Mbps	—	–85.5	—
802 . 11g, 36 Mbps	—	–82.2	—
802 . 11g, 48 Mbps	—	–78.0	—
802 . 11g, 54 Mbps	—	–76.2	—
802 . 11n, HT20, MCS 0	—	–93.0	—
802 . 11n, HT20, MCS 1	—	–90.6	—
802 . 11n, HT20, MCS 2	—	–88.4	—
802 . 11n, HT20, MCS 3	—	–84.8	—
802 . 11n, HT20, MCS 4	—	–81.6	—
802 . 11n, HT20, MCS 5	—	–77.4	—
802 . 11n, HT20, MCS 6	—	–75.6	—
802 . 11n, HT20, MCS 7	—	–74.2	—
802 . 11n, HT40, MCS 0	—	–90.0	—
802 . 11n, HT40, MCS 1	—	–87.5	—
802 . 11n, HT40, MCS 2	—	–85.0	—
802 . 11n, HT40, MCS 3	—	–82.0	—
802 . 11n, HT40, MCS 4	—	–78.5	—
802 . 11n, HT40, MCS 5	—	-74.4	—
802.11n, HT40, MCS 6	—	-72.5	—
802.11n, HT40, MCS 7	—	-71.2	—

Table 3 Receiver Sensitivity

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Rate	Minimum value (dBm)	Typical value (dBm)	Maximum value (dBm)
802.11b, 1 Mbps	—	5	—
802.11b, 11 Mbps	—	5	—
802.11g, 6 Mbps	—	5	—
802.11g, 54 Mbps	—	0	—
802.11n, HT20, MCS 0	—	5	—
802.11n, HT20, MCS 7	—	0	—
802.11n, HT40, MCS 0	—	5	—
802.11n, HT40, MCS 7	—	0	—

Table 4 Maximum Received Level

Rate	Minimum value (dB)	Typical value (dB)	Maximum value (dB)
802.11b, 1 Mbps	—	35	—
802.11b, 11 Mbps	—	35	—
802.11g, 6 Mbps	—	31	—
802.11g, 54 Mbps	—	14	—
802.11n, HT20, MCS 0	—	31	—
802.11n, HT20, MCS 7	—	13	—
802.11n, HT40, MCS 0	—	19	—
802.11n, HT40, MCS 7	—	8	—

Table 5 Receiver Adjacent Channel Suppression

2.6 Bluetooth Low Energy Radio Frequency

Parameter	Minimum value (MHz)	Typical value (MHz)	Maximum value (MHz)
Working channel center frequency	2402	—	2480

Table 6 Bluetooth Low Energy Frequency

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2.6.1 Bluetooth Low Energy Radio Frequency Transmitter (TX) Specifications

Parameter	Describe	Minimum value	Typical value	Maximum value	Unit
RF transmit power	RF power control range	-24.00	0	20.00	dBm
	Gain control step size	—	3.00	—	dB
Carrier frequency offset and drift	|fn| n=0, 1, 2, ..., k Maximum value	—	2.50	—	kHz
	|f0 − fn| Maximum value	—	2.00	—	kHz
	|fn − fn −5 | Maximum value	—	1.40	—	kHz
	|f1 − f0 |	—	1.00	—	kHz
Modulation characteristics	Δ f 1avg	—	249.00	—	kHz
	Δ f2max minimum value (At least 99.9% of Δf2max)	—	198.00	—	kHz
	Δ f2avg/Δ f 1avg	—	0.86	—	—
In-band stray emission	± 2 MHz offset	—	-37.00	—	dBm
	± 3 MHz offset	—	-42.00	—	dBm
	> ± 3 MHz offset	—	-44.00	—	dBm

Table 7 Transmitter Characteristics - Bluetooth Low Energy 1 Mbps

Parameter	Describe	Minimum value	Typical value	Maximum value	Unit
RF transmit power	RF power control range	-24.00	0	20.00	dBm
	Gain control step size	—	3.00	—	dB
Carrier frequency offset and drift	|fn| n=0, 1, 2, ..., k Maximum value	—	2.50	—	kHz
	|f0 − fn| Maximum value	—	2.00	—	kHz
	|fn − fn −5 | Maximum value	—	1.40	—	kHz
	|f1 − f0 |	—	1.00	—	kHz
Modulation characteristics	Δ f 1avg	—	499.00	—	kHz
	Δf2max minimum value (At least 99.9% of Δf2max)	—	416.00	—	kHz
	Δ f2avg/Δ f 1avg	—	0.89	—	—
In-band stray emission	± 4 MHz offset	—	-42.00	—	dBm
	± 5 MHz offset	—	-44.00	—	dBm
	> ± 5 MHz offset	—	-47.00	—	dBm

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Table 8 Transmitter Characteristics - Bluetooth Low Energy 2 Mbps

Parameter	Describe	Minimum value	Typical value	Maximum value	Unit
RF transmit power	RF power control range	-24.00	0	20.00	dBm
	Gain control step size	—	3.00	—	dB
Carrier frequency offset and drift	|fn| n=0, 1, 2, ..., k Maximum value	—	0.80	—	kHz
	|f0 − fn| Maximum value	—	1.00	—	kHz
	|fn − fn −3 |	—	0.30	—	kHz
	|f0 − f3 |	—	1.00	—	kHz
Modulation characteristics	Δ f 1avg	—	248.00	—	kHz
	Δ f 1max Minimum value (At least 99.9% of Δf_{1max})	—	222.00	—	kHz
In-band stray emission	± 2 MHz offset	—	-37.00	—	dBm
	± 3 MHz offset	—	-42.00	—	dBm
	> ± 3 MHz offset	—	-44.00	—	dBm

Table 9 Transmitter Characteristics - Bluetooth Low Energy 125 Kbps

Parameter	Describe	Minimum value	Typical value	Maximum value	Unit
RF transmit power	RF power control range	-24.00	0	20.00	dBm
	Gain control step size	—	3.00	—	dB
Carrier frequency offset and drift	|fn| n=0, 1, 2, ..., k Maximum value	—	0.80	—	kHz
	|f0 − fn| Maximum value	—	1.00	—	kHz
	|fn − fn −3 |	—	0.85	—	kHz
	|f0 − f3 |	—	0.34	—	kHz
Modulation characteristics	Δ f2avg	—	213.00	—	kHz
	Δf2max minimum value (At least 99.9% of Δf2max)	—	196.00	—	kHz
In-band stray emission	± 2 MHz offset	—	-37.00	—	dBm
	± 3 MHz offset	—	-42.00	—	dBm
	> ± 3 MHz offset	—	-44.00	—	dBm

Table 10 Transmitter Characteristics - Bluetooth Low Energy 500 Kbps

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2.6.2 Bluetooth Low Energy RF Receiver (RX) Specifications

Parameter	Describe	Minimum value	Typical value	Maximum value	Unit
Sensitivity @ 30.8% PER	—	—	-96.5	—	dBm
Maximum received signal @ 30.8% PER	—	—	8	—	dBm
Common-channel rejection ratio (C/I)	F = F0 MHz	—	8	—	dB
Adjacent channel selective inhibition ratio C/I	F = F0 + 1 MHz	—	4	—	dB
	F = F0 – 1 MHz	—	4	—	dB
	F = F0 + 2 MHz	—	–23	—	dB
	F = F0 – 2 MHz	—	–23	—	dB
	F = F0 + 3 MHz	—	–34	—	dB
	F = F0 – 3 MHz	—	–34	—	dB
	F > F0 + 3 MHz	—	–36	—	dB
	F > F0 – 3 MHz	—	-37	—	dB
Image frequency	—	—	–36	—	dB
Adjacent channel mirror frequency interference	F = Fimage + 1 MHz	—	-39	—	dB
	F = Fimage – 1 MHz	—	-34	—	dB
Out-of-band blocking	30 MHz ~ 2000 MHz	—	– 12	—	dBm
	2003 MHz ~ 2399 MHz	—	– 18	—	dBm
	2484 MHz ~ 2997 MHz	—	– 16	—	dBm
	3000 MHz ~ 12.75 GHz	—	– 10	—	dBm
Intermodulation	—	—	-29	—	dBm

Table 11 Receiver Characteristics - Bluetooth Low Energy 1 Mbps

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Parameter	Describe	Minimum value	Typical value	Maximum value	Unit
Sensitivity @ 30.8% PER	—	—	-92	—	dBm
Maximum received signal @ 30.8% PER	—	—	3	—	dBm
Co-channel interference (C/I)	F = F0 MHz	—	8	—	dB
Adjacent channel selective inhibition ratio C/I	F = F0 + 2 MHz	—	4	—	dB
	F = F0 – 2 MHz	—	4	—	dB
	F = F0 + 4 MHz	—	-27	—	dB
	F = F0 – 4 MHz	—	-27	—	dB
	F = F0 + 6 MHz	—	-38	—	dB
	F = F0 – 6 MHz	—	-38	—	dB
	F > F0 + 6 MHz	—	–41	—	dB
	F > F0 – 6 MHz	—	–41	—	dB
Image frequency	—	—	-27	—	dB
Adjacent channel mirror frequency interference	F = Fimage + 2 MHz	—	-38	—	dB
	F = Fimage – 2 MHz	—	4	—	dB
Out-of-band blocking	30 MHz ~ 2000 MHz	—	– 15	—	dBm
	2003 MHz ~ 2399 MHz	—	-twenty one	—	dBm
	2484 MHz ~ 2997 MHz	—	-twenty one	—	dBm
	3000 MHz ~ 12.75 GHz	—	-9	—	dBm
Intermodulation	—	—	-29	—	dBm

Table 12 Receiver Characteristics - Bluetooth Low Energy 2 Mbps

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Parameter	Describe	Minimum value	Typical value	Maximum value	Unit
Sensitivity @ 30.8% PER	—	—	– 103.5	—	dBm
Maximum received signal @ 30.8% PER	—	—	8	—	dBm
Common-channel rejection ratio (C/I)	F = F0 MHz	—	4	—	dB
Adjacent channel selective inhibition ratio C/I	F = F0 + 1 MHz	—	1	—	dB
	F = F0 – 1 MHz	—	2	—	dB
	F = F0 + 2 MHz	—	-26	—	dB
	F = F0 – 2 MHz	—	-26	—	dB
	F = F0 + 3 MHz	—	–36	—	dB
	F = F0 – 3 MHz	—	-39	—	dB
	F > F0 + 3 MHz	—	-42	—	dB
	F > F0 – 3 MHz	—	–43	—	dB
Image frequency	—	—	-42	—	dB
Adjacent channel mirror frequency interference	F = Fimage + 1 MHz	—	–43	—	dB
	F = Fimage – 1 MHz	—	–36	—	dB

Table 13 Receiver Characteristics - Bluetooth Low Energy 125 Kbps

Parameter	Describe	Minimum value	Typical value	Maximum value	Unit
Sensitivity @ 30.8% PER	—	—	– 100	—	dBm
Maximum received signal @ 30.8% PER	—	—	8	—	dBm
Common-channel rejection ratio (C/I)	F = F0 MHz	—	4	—	dB
Adjacent channel selective inhibition ratio C/I	F = F0 + 1 MHz	—	1	—	dB
	F = F0 – 1 MHz	—	0	—	dB
	F = F0 + 2 MHz	—	-twenty four	—	dB
	F = F0 – 2 MHz	—	-twenty four	—	dB
	F = F0 + 3 MHz	—	-37	—	dB
	F = F0 – 3 MHz	—	-39	—	dB
	F > F0 + 3 MHz	—	-38	—	dB
	F > F0 – 3 MHz	—	-42	—	dB
Image frequency	—	—	-38	—	dB
Adjacent channel mirror frequency interference	F = Fimage + 1 MHz	—	-42	—	dB
	F = Fimage – 1 MHz	—	-37	—	dB

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Table 14 Receiver Characteristics - Bluetooth Low Energy 500 Kbps

Chapter 3 Hardware Description

3.1 Functional Block Diagram

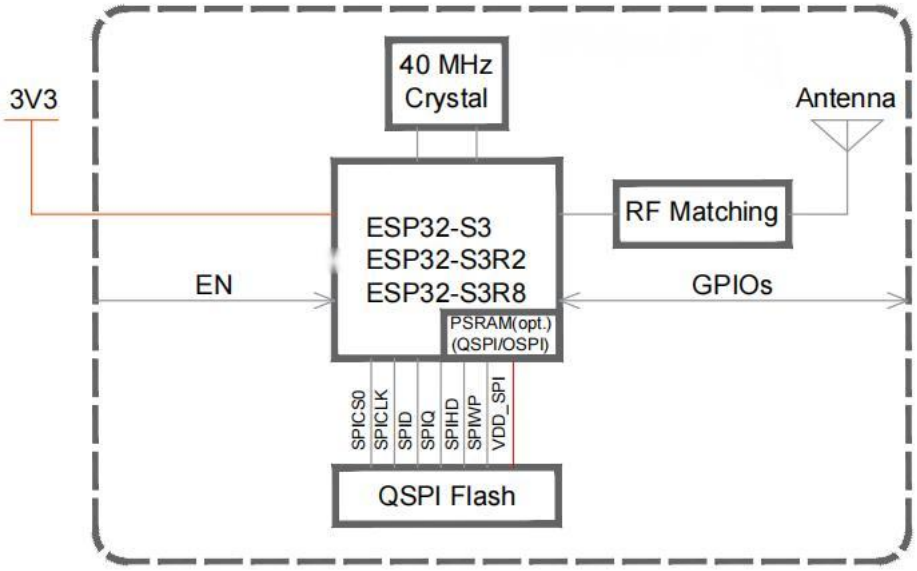


Figure 1 Functional block diagram of E101-S3WN8-PS & E101-S3WN 16R8 - P S

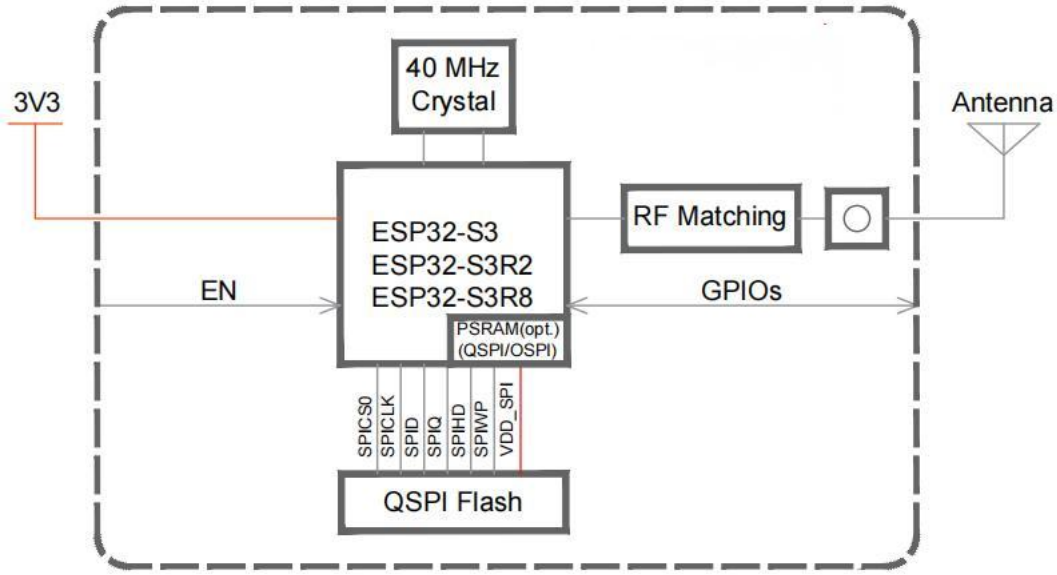


Figure 2 Functional Block Diagram of E101-S3WN8 -X S & E101-S3WN 16R8 - X S

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3.2 Mechanical Dimensions and Pin Definitions

The pin layout diagram shows the approximate locations of the pins on the module. For the actual layout drawn to scale, please refer to Figure 3.3 Module Dimensions .

The E101-S3WN8-PS and E101-S3WN16R8-PS do not have a keepout zone, and their pin layout is the same as the E101-S3WN8-XS and E101-S3WN16R8-XS.

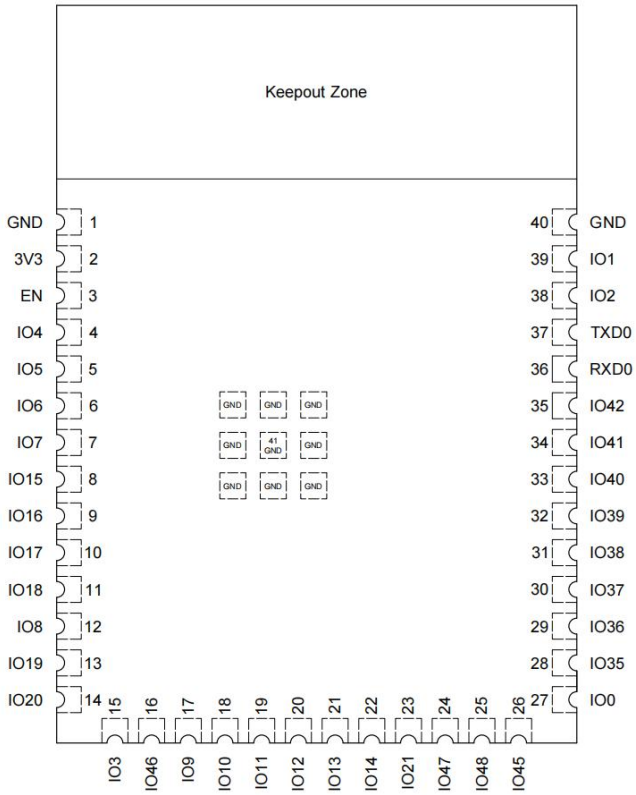


Figure 3.1 Pin - Layout Diagram (Top View)

Pin definitions:

Name	Serial Number	Type [a]	Function
GND	1	P	Grounding
3V3	2	P	powered by
EN	3	I	High level: Chip enabled; Low level: Chip off; Note that the EN pin must not be left floating.
IO4	4	I/O/T	RTC_GPIO4, **GPIO4** , TOUCH4, ADC1_CH3
IO5	5	I/O/T	RTC_GPIO5, **GPIO5** , TOUCH5, ADC1_CH4
IO6	6	I/O/T	RTC_GPIO6, **GPIO6** , TOUCH6, ADC1_CH5

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IO7	7	I/O/T	RTC_GPIO7, **GPIO7** , TOUCH7, ADC1_CH6
IO15	8	I/O/T	RTC_GPIO15, **GPIO15**, U0RTS, ADC2_CH4, XTAL_32K_P
IO16	9	I/O/T	RTC_GPIO16, **GPIO16**, U0CTS, ADC2_CH5, XTAL_32K_N
IO17	10	I/O/T	RTC_GPIO17, **GPIO17**, U1TXD, ADC2_CH6
IO18	11	I/O/T	RTC_GPIO18, **GPIO18**, U1RXD, ADC2_CH7, CLK_OUT3
IO8	12	I/O/T	RTC_GPIO8, **GPIO8**, TOUCH8, ADC1_CH7, SUBSPICS1
IO19	13	I/O/T	RTC_GPIO19, GPIO19, U1RTS, ADC2_CH8, CLK_OUT2, **USB_D-**
IO20	14	I/O/T	RTC_GPIO20, GPIO20, U1CTS, ADC2_CH9, CLK_OUT1, **USB_D+**
IO3	15	I/O/T	RTC_GPIO3, **GPIO3**, TOUCH3, ADC1_CH2
IO46	16	I/O/T	**GPIO46**
IO9	17	I/O/T	RTC_GPIO9, **GPIO9**, TOUCH9, ADC1_CH8, FSPIHD, SUBSPIHD
IO10	18	I/O/T	RTC_GPIO10, **GPIO10**, TOUCH10, ADC1_CH9, FSPICS0, FSPIIO4, SUBSPICS0
IO11	19	I/O/T	RTC_GPIO11, GPIO11, TOUCH11, ADC2_CH0, FSPID, FSPIIO5, SUBSPID
IO12	20	I/O/T	RTC_GPIO12, **GPIO12**, TOUCH12, ADC2_CH1, FSPICLK, FSPIIO6, SUBSPICLK
IO13	21	I/O/T	RTC_GPIO13, **GPIO13**, TOUCH13, ADC2_CH2, FSPIQ, FSPIIO7, SUBSPIQ
IO14	22	I/O/T	RTC_GPIO14, **GPIO14**, TOUCH14, ADC2_CH3, FSPIWP, FSPIDQS, SUBSPIWP
IO21	23	I/O/T	RTC_GPIO21, **GPIO21**
IO47	24	I/O/T	SPICLK_P_DIFF, **GPIO47**, SUBSPICLK_P_DIFF
IO48	25	I/O/T	SPICLK_N_DIFF, **GPIO48**, SUBSPICLK_N_DIFF
IO45	26	I/O/T	**GPIO45**
IO0	27	I/O/T	RTC_GPIO0, **GPIO0**
IO35	28	I/O/T	SPIIO6, **GPIO35**, FSPID, SUBSPID
IO36	29	I/O/T	SPIIO7, **GPIO36**, FSPICLK, SUBSPICLK
IO37	30	I/O/T	SPIDQS, **GPIO37**, FSPIQ, SUBSPIQ
IO38	31	I/O/T	**GPIO38**, FSPIWP, SUBSPIWP
IO39	32	I/O/T	**MTCK**, GPIO39, CLK_OUT3, SUBSPICS1
IO40	33	I/O/T	**MTDO**, GPIO40, CLK_OUT2
IO41	34	I/O/T	**MTDI**, GPIO41, CLK_OUT1
IO42	35	I/O/T	**MTMS**, GPIO42
RXD0	36	I/O/T	**U0RXD**, GPIO44, CLK_OUT2

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TXD0	37	I/O/T	**U0TXD**, GPIO43, CLK_OUT1
IO2	38	I/O/T	RTC_GPIO2, **GPIO2**, TOUCH2, ADC1_CH1
IO1	39	I/O/T	RTC_GPIO1, **GPIO1** , TOUCH1, ADC1_CH0
GND	40	P	Grounding
EPAD	41	P	Grounding

P : Power supply; I: Input; O: Output; T: Can be set to high impedance. Bold text indicates the default function of the pin. Pins 28-30...
The default function is determined by the eFuse bit.

3.3 Module Dimensions

3.3.1 Dimensional Drawings of E101-S3WN8-PS & E101-S3WN16R8-PS

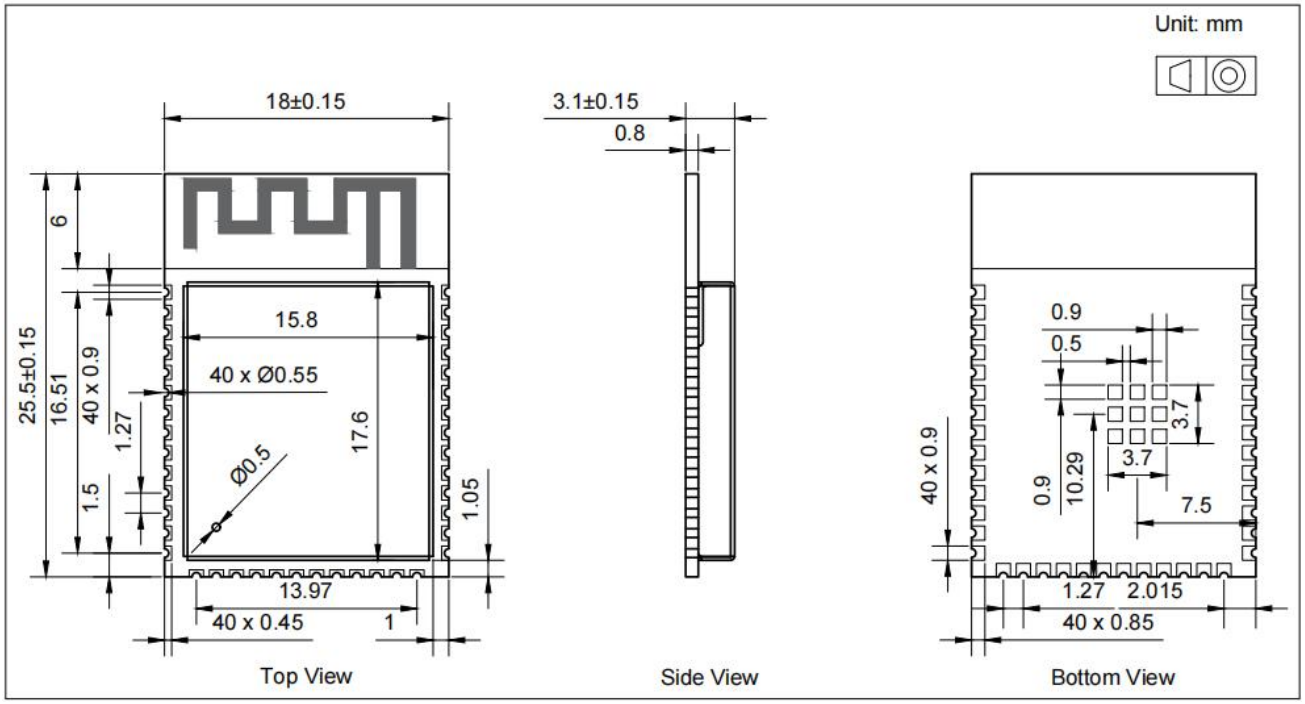


Figure 3 - 4 Module Dimensions

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3.3.1 Dimensional Drawings of E101-S3WN8-XS & E101-S3WN16R8-XS

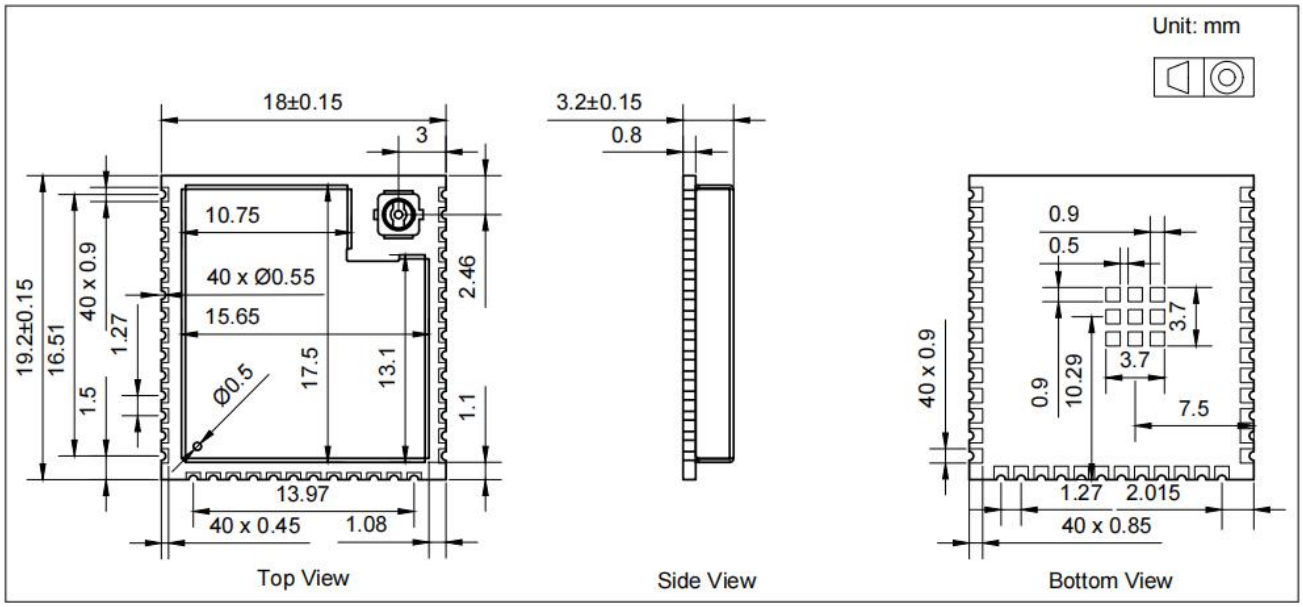


Figure 3.5 - Module Dimensions

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3.4 PCB Package Pattern

3.4.1 PCB Package Patterns of E101-S3WN8-PS & E101-S3WN16R8-PS

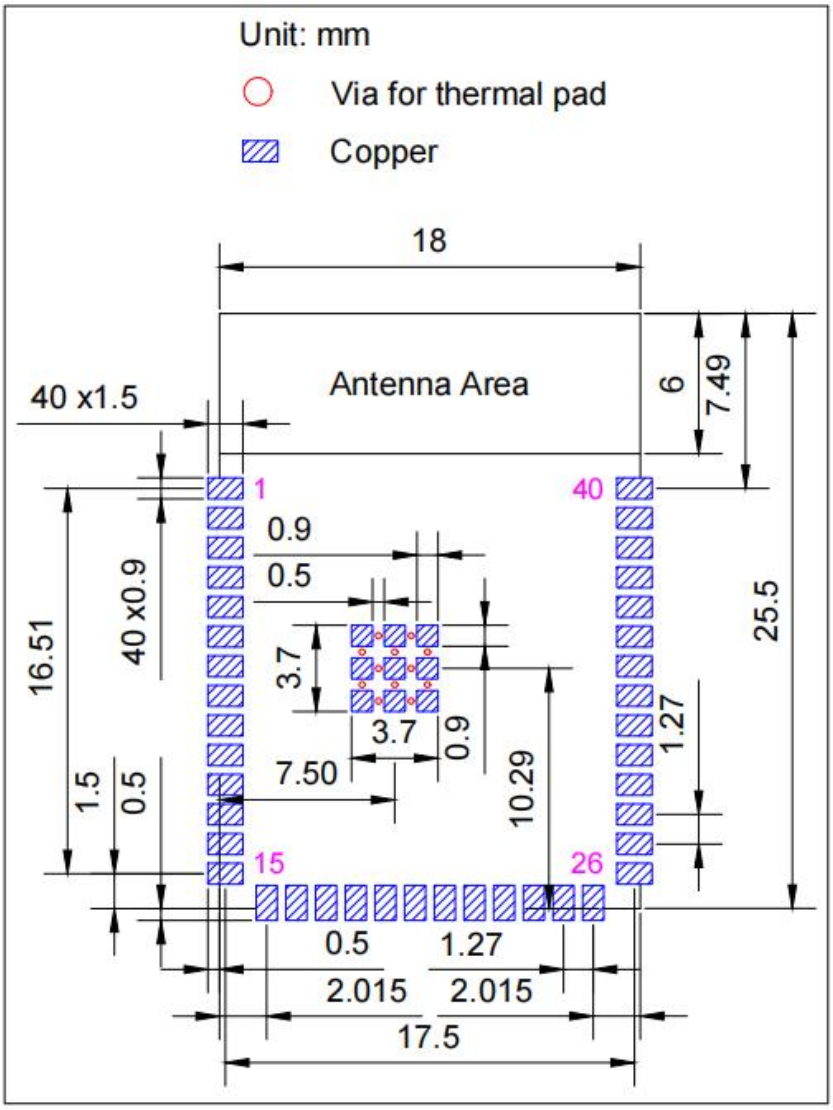


Chart 3 - 6 PCB packaging

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3.4.2 PCB Package Patterns of E101-S3WN8-XS & E101-S3WN16R8-XS

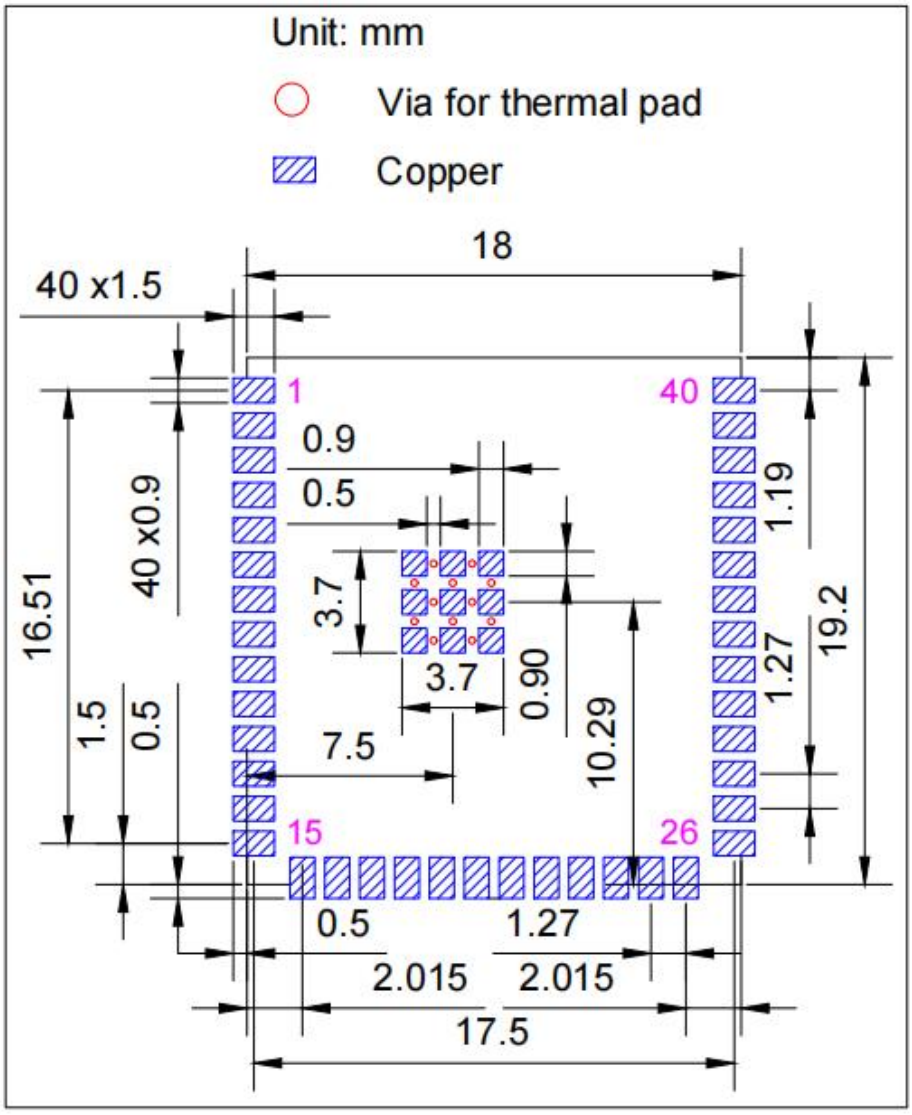


Chart 3 - 7 PCB packaging

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3.5 External Antenna Connector Dimensions

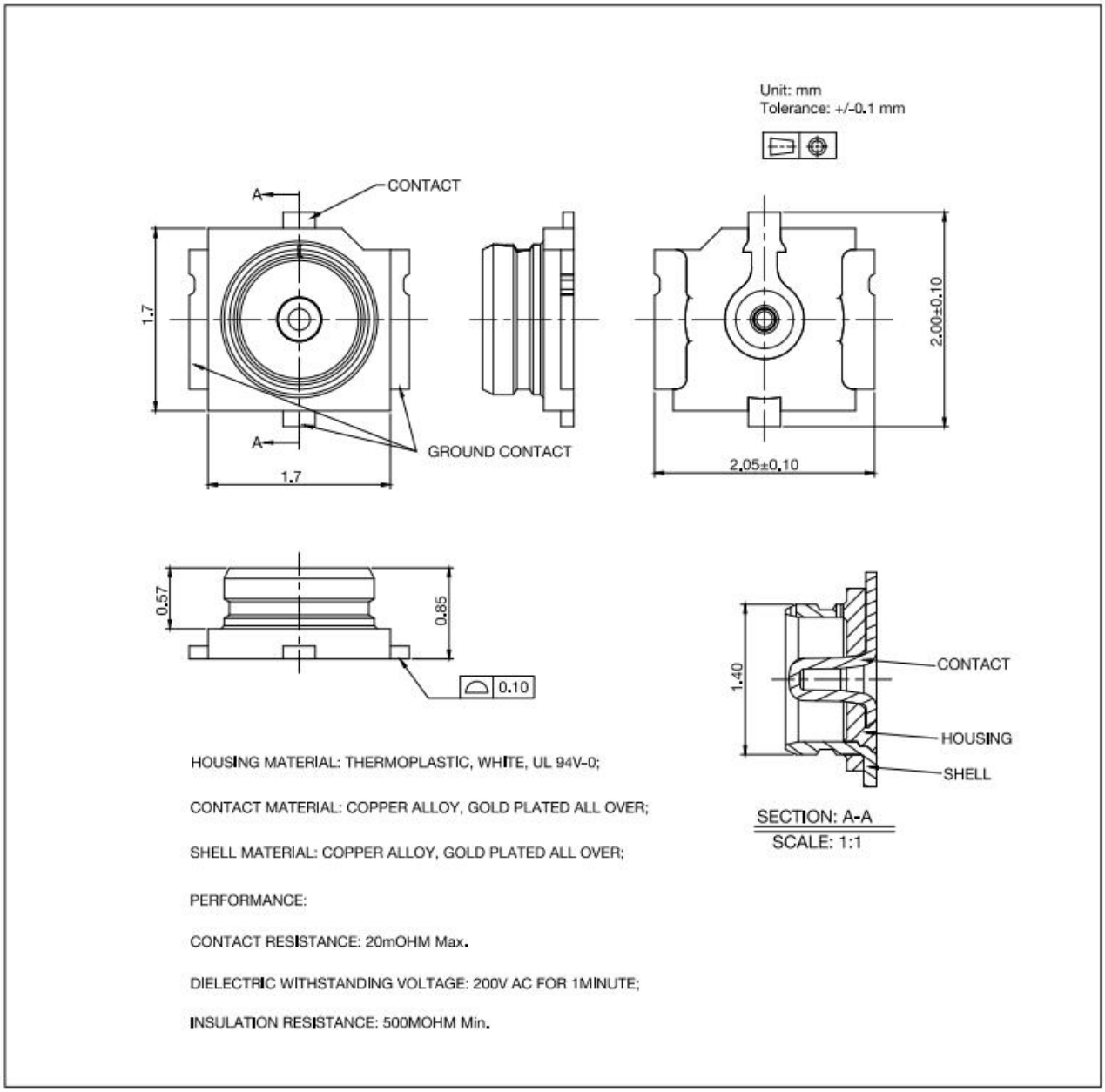


Chart 3 - 8 External antenna connector size

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Chapter 4 Frequently Asked Questions

4.1 Transmission distance is not ideal

- When there are obstacles in line-of-sight communication, the communication distance will be reduced accordingly;
- Temperature, humidity, and co-channel interference can all lead to increased packet loss rates in communications.
- The ground absorbs and reflects radio waves, and the test results are poor when the ground is close to the ground.
- Seawater has a strong ability to absorb radio waves, so testing results are poor at the seaside.
- If there are metal objects near the antenna, or if it is placed inside a metal casing, the signal attenuation will be very severe.
- Power register settings are incorrect; air speed is set too high (the higher the air speed, the shorter the distance).
- At room temperature, the power supply voltage is lower than the recommended value; the lower the voltage, the lower the power output.

4.2 The module is easily damaged

- Please check the power supply and ensure it is within the recommended voltage range. Exceeding the maximum value will cause permanent damage to the module.
- Please check the power supply stability; the voltage should not fluctuate significantly or frequently.
- Please ensure anti-static operation during installation and use, as high-frequency devices are sensitive to electrostatic discharge.
- Please ensure that the humidity is not too high during installation and use, as some components are humidity-sensitive.
- Unless there are special requirements, it is not recommended to use it at excessively high or low temperatures.

4.3 The error rate is too high

- If there is interference from a co-channel signal nearby, move away from the source of interference or change the frequency or channel to avoid the interference.
- The clock waveform on the UART is not standard. Check for interference on the UART line.
- An inadequate power supply can also cause garbled characters, so it is essential to ensure the reliability of the power supply.

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Chapter 5 Welding Operation Instructions

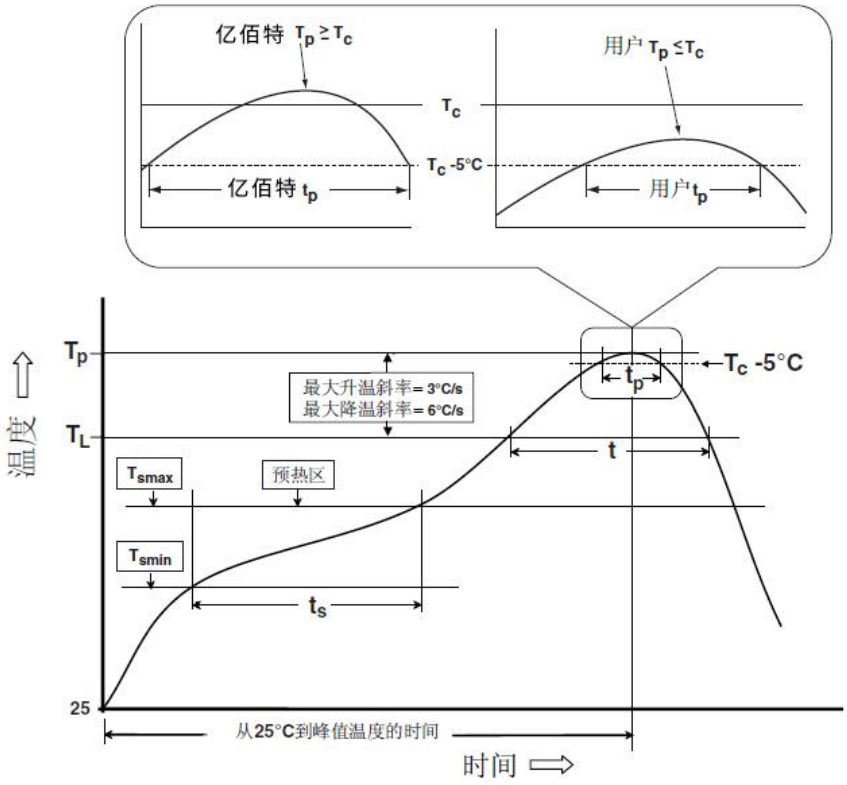
5.1 Reflow soldering temperature

Reflow soldering profile characteristics		Lead-based assembly	Lead-free assembly
Preheating/Insulation	Minimum temperature (Tsmin)	100℃	150℃
	Maximum temperature (T _{smax})	150℃	200℃
	Time (T smin ~ T smin)	60-120 seconds	60-120 seconds
Temperature rise slope (TL ~ Tp)		3℃/second, maximum value	3℃/second, maximum value
Liquid phase temperature (TL)		183℃	217℃
T L above the holding time		60~ 90 seconds	60~ 90 seconds
Package peak temperature Tp		Users must not exceed the temperature specified on the product's "humidity sensitivity" label.	Users must not exceed the temperature specified on the product's "humidity sensitivity" label.
Tp) within 5°C of the specified grading temperature (Tc) is shown in the figure below.		20 seconds	30 seconds
Cooling slope (Tp ~ TL)		6℃/second, maximum value	6℃/second, maximum value
Time from room temperature to peak temperature		6 minutes, the longest	8 minutes, the longest
* The peak temperature (Tp) tolerance of the temperature profile is defined as the user's upper limit.			

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5.2 Reflow Soldering Profile

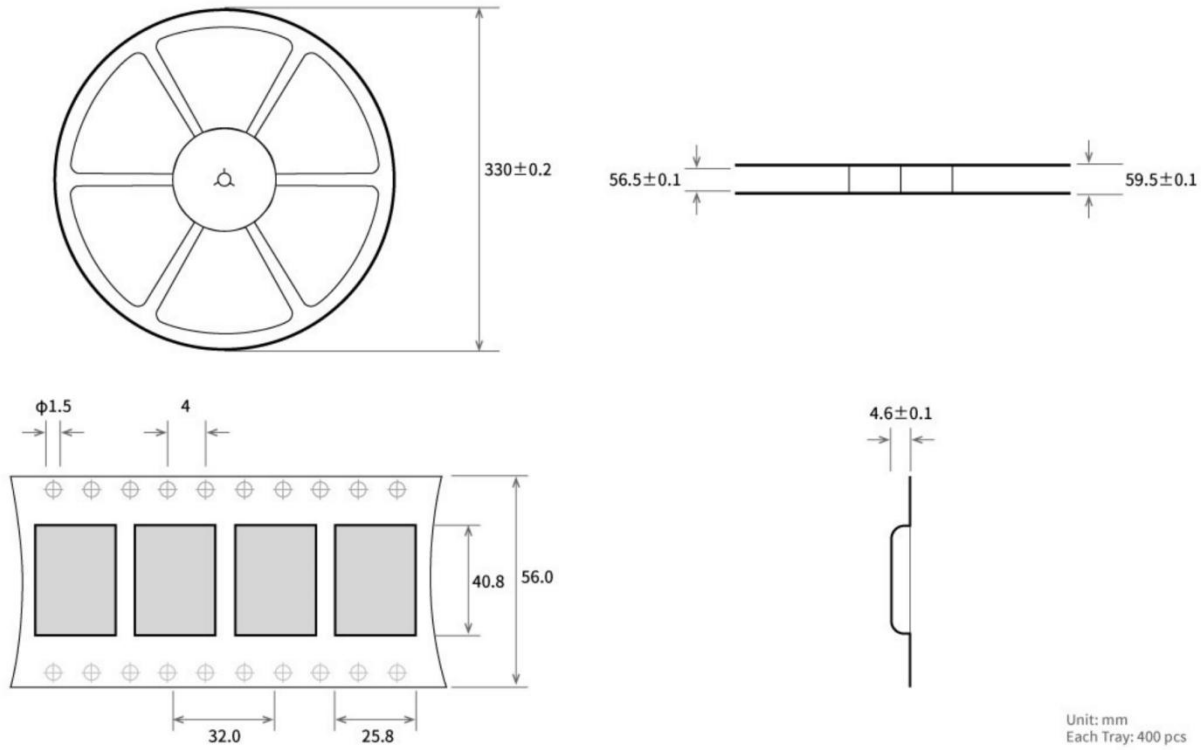


Chapter 6 Packaging Methods

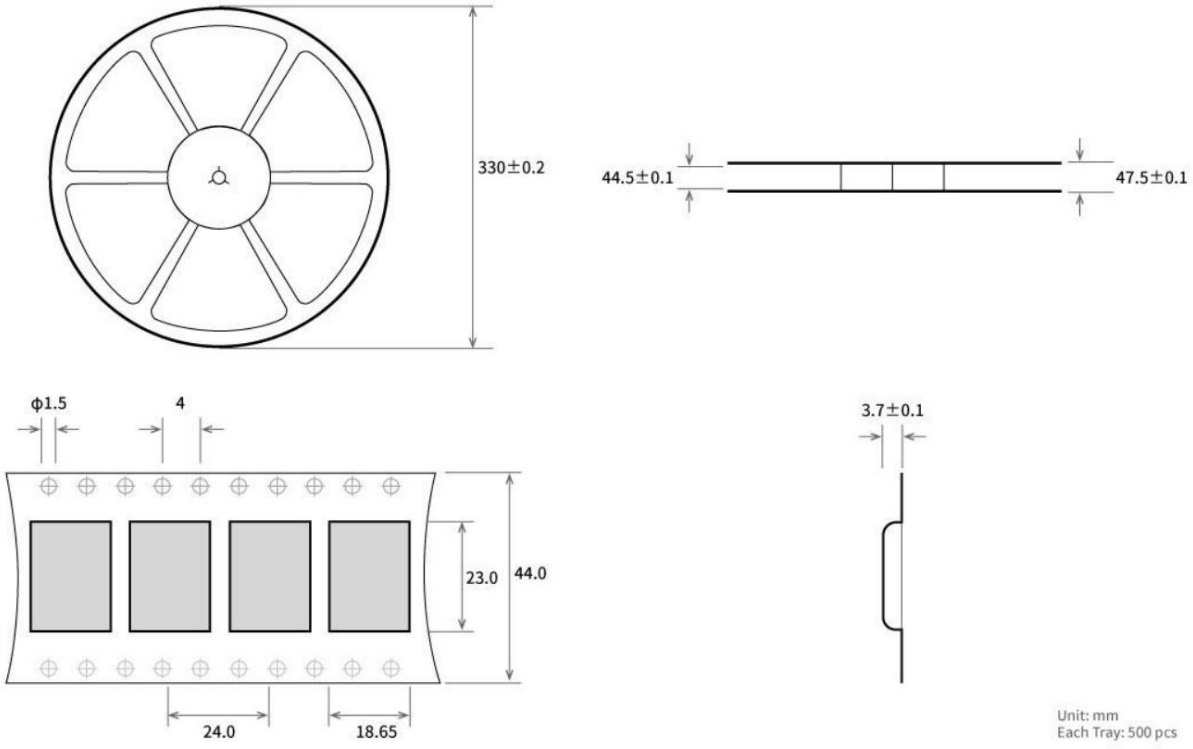
6.1 Packaging of E101-S3WN8-PS & E101-S3WN16R8-PS

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6.2 Packaging method for E101-S3WN8-XS & E101-S3WN16R8-XS



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Chapter 7 Disclaimer

- This manual aims to provide a comprehensive and detailed introduction based on existing materials. Our company reserves the right to modify the content of this manual without further notice.
- This manual is for guidance only, and all information contained herein does not constitute any express or implied warranty.

Revision History

Version	Revision Date	Revision Notes	maintainer
1.0	2023-9-4	Initial version	Hao
1.1	2025-2-28	Correction content	Hao
1.2	2025-4-14	Add pin descriptions	Hao
1.3	2026-9-22	New large memory version module	Hao

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