ESPP4-A

Product Specification

2.4&5 GHz Wi-Fi 6 & BLE 5.4 Coexistence Module

Version: 1.0 Date: Sept.28, 2026

Features

- General
  - Chip: ESP32-P4 + AIC8800D40LS
  - Module Size: 25mm x 25mm x 3mm
  - RISC-V dual-core processor up to 400MHz
  - Single-core coprocessor up to 40MHz
  - 16M PSRAM / 32M PSRAM
  - 128KB HP ROM + 16KB LP ROM
  - 768KB HP L2MEM + 32KB LP SRAM
- Wi-Fi Features
  - CMOS fully-integrated RF, Modem and MAC
  - On-Chip power amplifier/low-noise amplifier for both bands
  - Wi-Fi 2.4&5 GHz, 1T1R
  - IEEE 802.11 a/b/g/n/ac/ax-compliant
  - IEEE 802.11d/w/k/r/v/e/h/i
  - MCS0-MSC11 in both uplink and downlink PHY data rate up to 286.8Mbps
  - 20MHz and 40MHz channel bandwidth
  - Wi-Fi functions depend on firmware
- Bluetooth Features
  - Bluetooth 5.4 Low Energy
  - BLE PHY: 1Mbps and 2Mbps
  - Wi-Fi / BLE coexistence
- Audio and Video Features
  - Image Signal Processor (ISP)
  - Pixel Processing Accelerator (PPA)
  - H.264 Encoder
  - MIPI DSI and MIPI CSI
  - Voice Activity Detection (VAD)
- Peripheral Interfaces
  - IO x 49;
  - I2C;
  - I2S;
  - MIPI CSI;
  - MIPI DSI;
  - USB
  - EMAC
  - TWAI
  - UART;
  - SPI;
  - EN;
  - MCPWM;
  - ADC;
  - LED PWM;

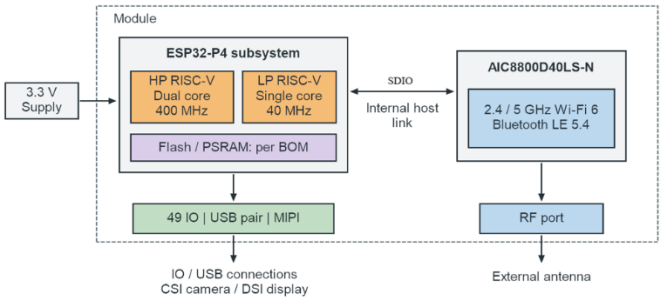
Applications

- IP Camera
- Service Robots;
- Multimedia Player
- HMI Control Panel
- Camera Video Stream Transmission;
- High-speed USB Host and Device
- Edge Vision AI Processor
- Intelligent Voice Interaction Terminal
- Consumer Electronics
- Smart Home

Module Type

Name	Flash	PSRAM	Antenna
ESPP4-A-N8R16	8M Byte	16M Byte	U.FL
ESPP4-A-N16R16	16M Byte	16M Byte	U.FL
ESPP4-A-N8R32	8M Byte	32M Byte	U.FL
ESPP4-A-N16R32	16M Byte	32M Byte	U.FL
ESPP4-AP-N8R16	8M Byte	16M Byte	PIN
ESPP4-AP-N16R16	16M Byte	16M Byte	PIN
ESPP4-AP-N8R32	8M Byte	32M Byte	PIN
ESPP4-AP-N16R32	16M Byte	32M Byte	PIN

Module Structure



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Update Record

Date	Version	Update
2026-09-28	V1.0	First released

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1. Introduction

ESPP4-A is a multimedia and wireless module combining an ESP32-P4 application processor with an AIC8800D40LS-N wireless companion. ESP32-P4 provides a RISC-V high-performance dual-core processor up to 400MHz and a low-power core up to 40MHz. The companion provides single-stream 2.4GHz and 5GHz Wi-Fi 6 and Bluetooth Low Energy 5.4 connectivity.

ESPP4-A provides 72 external pads, including 49 IO signals (IO0–IO13 and IO20–IO54), MIPI CSI/DSI differential pairs, a dedicated USB pair, RF, EN, power and ground. The processor supports UART, SPI, I2C, I2S, ADC, PWM and multimedia interfaces. Actual peripheral availability depends on pin routing and firmware; alternate functions cannot all be used simultaneously.

ESP32-P4 supports MIPI CSI-2 camera input, MIPI DSI display output, JPEG processing, ISP, PPA and H.264 encoding. CSI and DSI each support two data lanes at up to 1.5Gbps per lane at chip level.

The wireless companion supports IEEE 802.11 a/b/g/n/ac/ax and BLE 5.4. Network roles, security features and application protocols depend on the released driver and firmware.

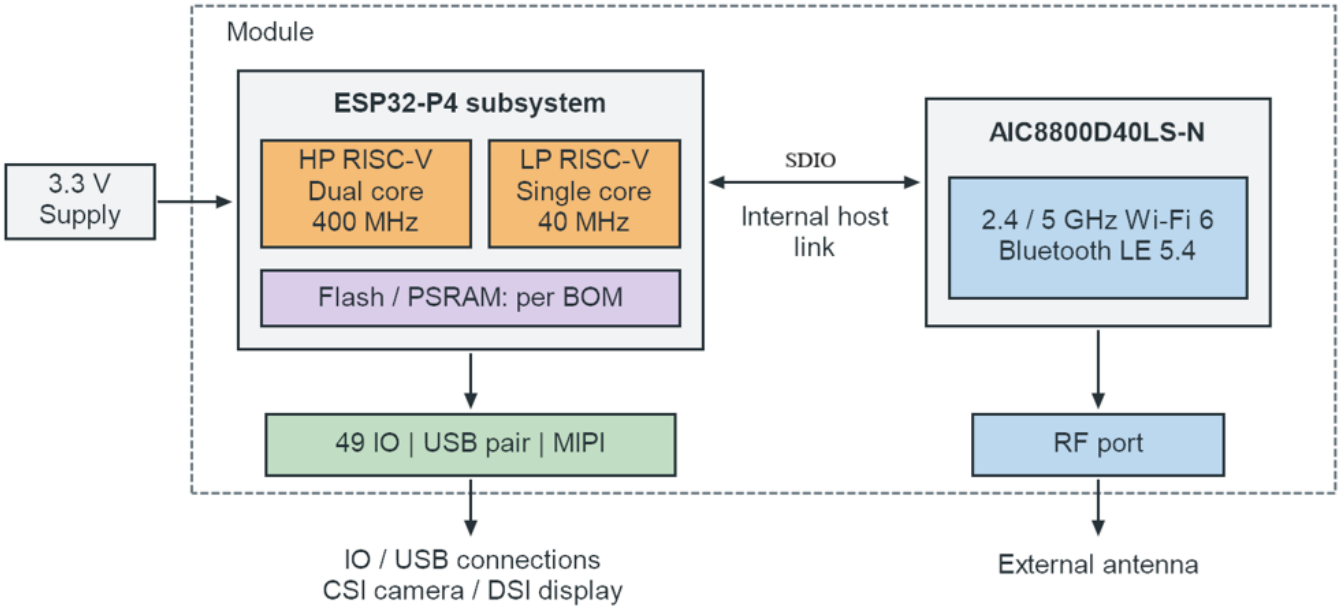


Fig.1.1 ESPP4-A Module Structure

Technical parameters for ESPP4-A are listed below.

Table.1.1 ESPP4-A Parameters

Type	Item	Parameter
MCU	HP Dual-Core RISC-V CPU	400MHz
	LP RISC-V CPU	40MHz
	SPRAM	16MByte/32MByte
	ROM	128KB HP+16KB LP
	MEM	768KB HP L2MEM+32KB LP SRAM
	SPM	8KB
	FLASH	Optional
Wi-Fi 2.4G	Frequency	2.4 GHz; IEEE 802.11 b/g/n/ax
	Transmit power	802.11b: up to 23 dBm
		HT MCS7: up to 20 dBm
		HE MCS7: up to 20 dBm
	Receiver sensitivity	11b, 1 Mbit/s: -99 dBm
	Antenna	External antenna
Wi-Fi 5G	Frequency	5 GHz; IEEE 802.11 a/n/ac/ax
	Transmit power	HT MCS7: up to 20 dBm
		VHT MCS7: up to 20 dBm
		HE MCS7: up to 20 dBm
	Antenna	External antenna
BLE	Version / PHY	BLE 5.4; 1Mbps and 2Mbps PHY
Hardware	Interface	UART/SPI/I2C/GPIO/USB/MIPI CSI/DSI
	Working voltage	3.3V nominal
	Shape	25.0mm x 25.0mm x 3.0mm
Software	Wi-Fi working mode	STA/AP/Wi-Fi Direct; firmware-dependent
	Security mode	WEP/WPA/WPA2/WPA3-SAE;
	Update firmware	UART0 / USB Serial-JTAG
	Software development	ESP-IDF
	Network protocol	TCP/IP stack; protocols per firmware

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2. Interface Definition

ESPP4-A has 72 external pads. The interface definition is shown below; IO is the short form of GPIO.

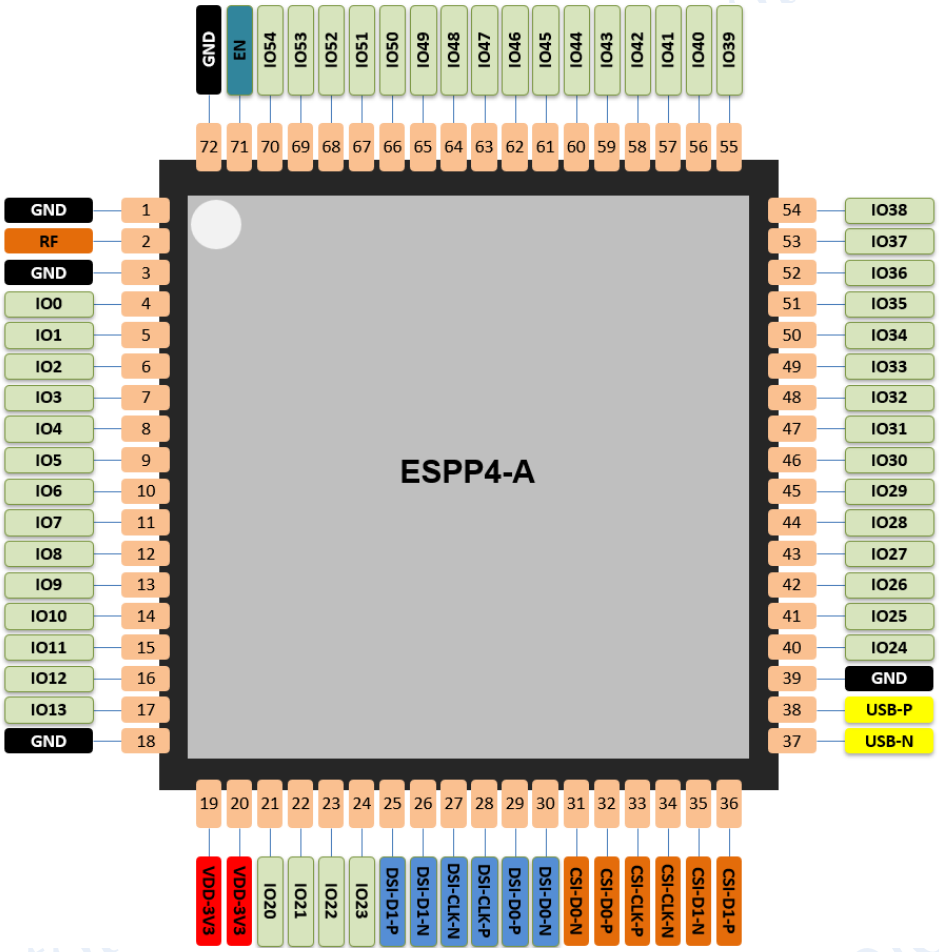


Fig.2.1 ESPP4-A Pins Definition（Top view）

Boot mode is sampled at reset. The essential IO35 boot levels are listed in Table 2.1.

Table.2.1Working Mode

Mode	IO35 Level
UART Download Mode	LOW
Flash Boot Mode	HIGH (Default)

Table.2.2 Pins Function Definition (P: power; I/O: bidirectional; RF: antenna port)

Num.	Pin Name	Type	Function
1	GND	P	Ground
2	RF	RF	Antenna RF port (RF_WF), Only valid for ESPP4-AP module

3	GND	P	Ground
4	IO0	I/O/T	GPIO0
5	IO1	I/O/T	GPIO1
6	IO2	I/O/T	GPIO2; MTCK
7	IO3	I/O/T	GPIO3; MTDI
8	IO4	I/O/T	GPIO4; MTMS
9	IO5	I/O/T	GPIO5; MTDO
10	IO6	I/O/T	GPIO6; SPI2_HOLD_PAD
11	IO7	I/O/T	GPIO7; SPI2_CS_PAD
12	IO8	I/O/T	GPIO8; UART0_RTS_PAD; SPI2_D_PAD
13	IO9	I/O/T	GPIO9; UART0_CTS_PAD; SPI2_CK_PAD
14	IO10	I/O/T	GPIO10; UART1_TXD_PAD; SPI2_Q_PAD
15	IO11	I/O/T	GPIO11; UART1_RXD_PAD; SPI2_WP_PAD
16	IO12	I/O/T	GPIO12; UART1_RTS_PAD
17	IO13	I/O/T	GPIO13; UART1_CTS_PAD
18	GND	P	Ground
19	VDD-3V3	P	3.3V supply; connect both pads 19 and 20
20	VDD-3V3	P	3.3V supply; connect both pads 19 and 20
21	IO20	I/O/T	GPIO20
22	IO21	I/O/T	GPIO21
23	IO22	I/O/T	GPIO22
24	IO23	I/O/T	GPIO23; REF_50M_CLK_PAD
25	DSI-D1-P	O	MIPI DSI differential data
26	DSI-D1-N	O	MIPI DSI differential data
27	DSI-CLK-N	O	MIPI DSI differential clock

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28	DSI-CLK-P	O	MIPI DSI differential clock
29	DSI-D0-P	O	MIPI DSI differential data
30	DSI-D0-N	O	MIPI DSI differential data
31	CSI-D0-N	I	MIPI CSI differential data
32	CSI-D0-P	I	MIPI CSI differential data
33	CSI-CLK-P	I	MIPI CSI differential clock
34	CSI-CLK-N	I	MIPI CSI differential clock
35	CSI-D1-N	I	MIPI CSI differential data
36	CSI-D1-P	I	MIPI CSI differential data
37	USB-DN	I/O	Dedicated USB D- (USB_N)
38	USB-DP	I/O	Dedicated USB D+ (USB_P)
39	GND	P	Ground
40	IO24	I/O/T	GPIO24
41	IO25	I/O/T	GPIO25
42	IO26	I/O/T	GPIO26
43	IO27	I/O/T	GPIO27
44	IO28	I/O/T	GPIO28; SPI2_CS_PAD; GMAC_PHY_RXDV_PAD
45	IO29	I/O/T	GPIO29; SPI2_D_PAD; GMAC_PHY_RXD0_PAD
46	IO30	I/O/T	GPIO30; SPI2_CK_PAD; GMAC_PHY_RXD1_PAD
47	IO31	I/O/T	GPIO31; SPI2_Q_PAD; GMAC_PHY_RXER_PAD
48	IO32	I/O/T	GPIO32; SPI2_HOLD_PAD; GMAC_RMII_CLK_PAD
49	IO33	I/O/T	GPIO33; SPI2_WP_PAD; GMAC_PHY_TXEN_PAD
50	IO34	I/O/T	GPIO34; SPI2_IO4_PAD; GMAC_PHY_TXD0_PAD
51	IO35	I/O/T	GPIO35; SPI2_IO5_PAD; GMAC_PHY_TXD1_PAD
52	IO36	I/O/T	GPIO36; SPI2_IO6_PAD; GMAC_PHY_TXER_PAD

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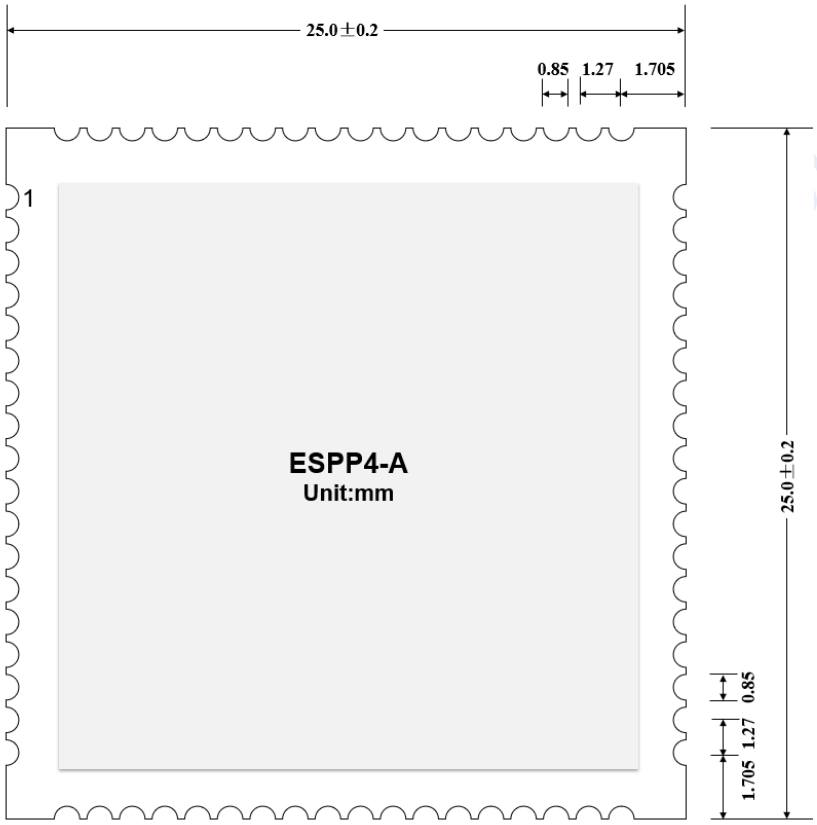
53	IO37	I/O/T	GPIO37; UART0_TXD_PAD; SPI2_IO7_PAD
54	IO38	I/O/T	GPIO38; UART0_RXD_PAD; SPI2_DQS_PAD
55	IO39	I/O/T	GPIO39; SD1_CDATA0_PAD; REF_50M_CLK_PAD
56	IO40	I/O/T	GPIO40; SD1_CDATA1_PAD; GMAC_PHY_TXEN_PAD
57	IO41	I/O/T	GPIO41; SD1_CDATA2_PAD; GMAC_PHY_TXD0_PAD
58	IO42	I/O/T	GPIO42; SD1_CDATA3_PAD; GMAC_PHY_TXD1_PAD
59	IO43	I/O/T	GPIO43; SD1_CCLK_PAD; GMAC_PHY_TXER_PAD
60	IO44	I/O/T	GPIO44; SD1_CCMD_PAD; GMAC_RMII_CLK_PAD
61	IO45	I/O/T	GPIO45; SD1_CDATA4_PAD; GMAC_PHY_RXDV_PAD
62	IO46	I/O/T	GPIO46; SD1_CDATA5_PAD; GMAC_PHY_RXD0_PAD
63	IO47	I/O/T	GPIO47; SD1_CDATA6_PAD; GMAC_PHY_RXD1_PAD
64	IO48	I/O/T	GPIO48; SD1_CDATA7_PAD; GMAC_PHY_RXER_PAD
65	IO49	I/O/T	GPIO49; GMAC_PHY_TXEN_PAD
66	IO50	I/O/T	GPIO50; GMAC_RMII_CLK_PAD
67	IO51	I/O/T	GPIO51; GMAC_PHY_RXDV_PAD
68	IO52	I/O/T	GPIO52; GMAC_PHY_RXD0_PAD
69	IO53	I/O/T	GPIO53; GMAC_PHY_RXD1_PAD, **Connected with AIC8800 GPIOB0, Used to wake up the AIC8800.**
70	IO54	I/O/T	GPIO54; GMAC_PHY_RXER_PAD, **Connected with AIC8800 PWR_EN, Used to Enable the AIC8800.**
71	EN	I	Enable/reset Module; LOW asserts reset.
72	GND	P	Ground

3. Size and Layout

Dimensions for ESPP4-A are shown below. Use the dimension annotations and the released CAD footprint for PCB manufacture.



Fig.3.1 Shape for ESPP4-A



(a) （Top view）



(b) Side View

Fig.3.2 Size for ESPP4-A

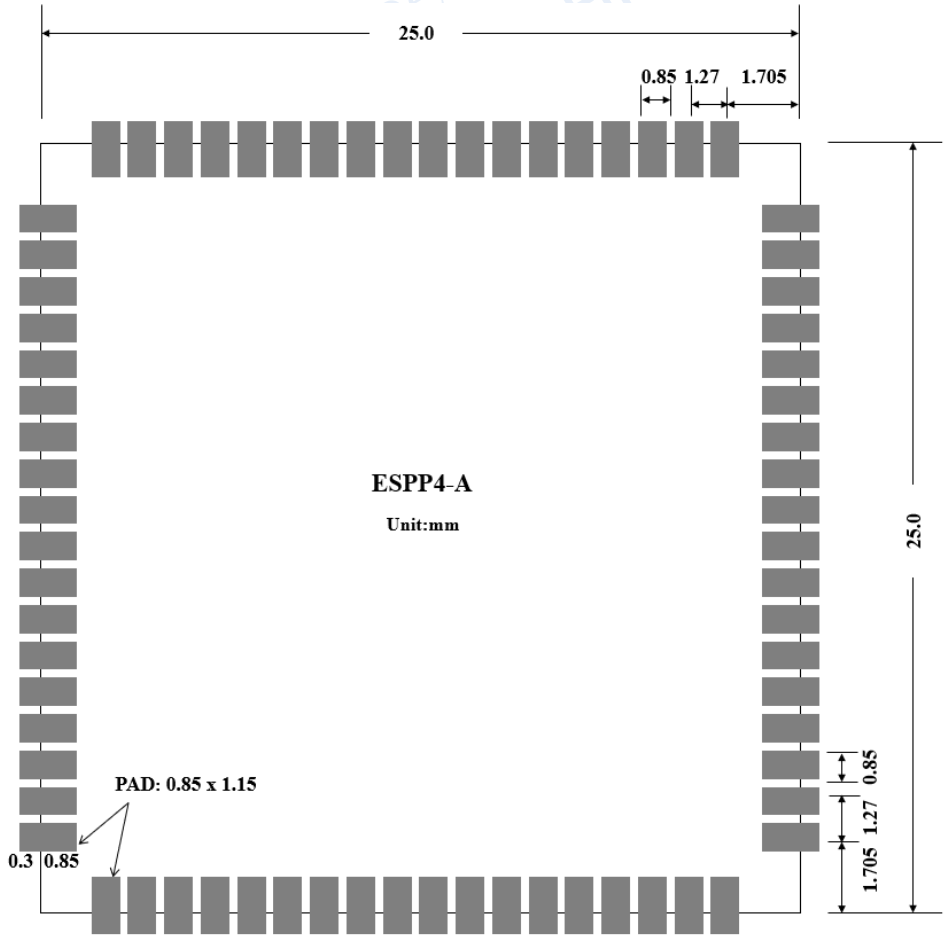


Fig. 3.3 PCB Layout for ESPP4-A

4. Electronica Characteristics

Table.4.1 Electrical Characteristics

Parameters		Condition	Min	Typical	Max	Unit
Storage Temperature		-	-40	Normal	105	℃
Soldering Temperature		IPC/JEDEC J-STD-020	-	-	260	℃
Working Voltage		-	3.0	3.3	3.6	V
I/O/T	V_{IL}	-	-0.3	-	0.25*VDD	V
	V_{IH}	-	0.75*VDD	-	VDD+0.3	
	V_{OL}	-	-	-	0.1*VDD	
	V_{OH}	-	0.8*VDD	-	-	

Electrostatic Release Quantity (Human model)	TAMB=25℃	-	-	2	KV
Electrostatic Release Quantity (Machine model)	TAMB=25℃	-	-	0.5	KV

5. Power Consumption

The following power consumption data were measured under the conditions of a 3.3 V power supply and an ambient temperature of 25° C。

Table.5.1 ESP32-P4 Power Consumption @Active mode

Parameters	CPU Frequency	Peripheral Clocks Disabled	Peripheral Clocks Disabled	Unit
WAITI (both cores idle)	400MHz	23	56	mA
Both cores running while (1)		69	112	mA
One core running CoreMark, the other core idle		66	110	mA
Both cores executing 32-bit data-access instructions		97	150	mA
WAITI (both cores idle)	200MHz	21	54	mA
Both cores running while (1)		44	87	mA
One core running CoreMark, the other core idle		43	86	mA
Both cores executing 32-bit data-access instructions		58	100	mA
WAITI (both cores idle)	50MHz	15	30	mA
Both cores running while (1)		19	37	mA
One core running CoreMark, the other core idle		19	37	mA
Both cores executing 32-bit data-access instructions		22	39	mA

Table.5.2 ESP32-P4 Power Consumption @Low-Power mode

Working Mode	Description	Typical	Unit
Light-sleep	All GPIOs set to high-impedance state, all power domains remain powered.	0.8	mA
	All GPIOs set to high-impedance state, most peripherals powered off, USB connection retained.	0.085	mA
	All peripherals powered off, HP memory retains data.	0.075	mA
Deep-sleep	LP timer and LP memory powered on.	0.012	mA
Power-off	EN pin pulled low, chip powered down.	0.001	mA

Table.5.3 2.4G Wi-Fi Power Consumption

Description	Min	Typical	Max	Unit
OFF(WIFI OFF)	-	2	-	uA
Rx@11b 1M	-	46	-	mA
Tx@MCS7/18dbm	-	138	-	mA

Table.5.4 5G Wi-Fi Power Consumption

Description	Min	Typical	Max	Unit
OFF(WIFI OFF)	-	2	-	uA
Rx@11a 6M	-	58	-	mA
Tx@MCS7/18dbm	-	154	-	mA

Table.5.5 BT Power Consumption

Description	Min	Typical	Max	Unit
OFF(BT OFF)	-	2	-	uA
Rx	-	57	-	mA
Tx@1M/13dbm	-	60	-	mA

The peak current consumption of ESPP4-A exceeds 400mA when the module starts work (RF calibration work consumes maximum current). Therefore, the recommended power supply is no less than 400mA.

6. 2.4GHz Wi-Fi RF Characteristics

Test conditions: VBAT = 3.3V, TA = 27°C, unless otherwise specified.

Table.6.1 2.4GHz Wi-Fi Transmit Characteristics

Parameters	Min	Typical	Max	Unit
Frequency range	2.412	-	2.484	GHz
Transmit power, 802.11b 1Mbps	-	23	-	dBm
Transmit power, 802.11b 11Mbps	-	23	-	dBm
Transmit power, OFDM 6Mbps	-	21	-	dBm
Transmit power, OFDM 54Mbps	-	19	-	dBm
Transmit power, HT20 MCS0	-	20	-	dBm
Transmit power, HT20 MCS7	-	18	-	dBm

Parameters	Min	Typical	Max	Unit
Transmit power, HT40 MCS0	-	20	-	dBm
Transmit power, HT40 MCS7	-	18	-	dBm
Transmit power, HE20 MCS0	-	20	-	dBm
Transmit power, HE20 MCS7	-	18	-	dBm
Transmit power, HE20 MCS9	-	16	-	dBm
Transmit power, HE20 MCS11	-	15	-	dBm
Transmit power, HE40 MCS0	-	20	-	dBm
Transmit power, HE40 MCS7	-	18	-	dBm
Transmit power, HE40 MCS9	-	16	-	dBm
Transmit power, HE40 MCS11	-	15	-	dBm

Table.6.2 2.4GHz Wi-Fi Receive Characteristics

Parameters	Min	Typical	Max	Unit
Frequency range	2.412	-	2.484	GHz
Sensitivity, DSSS 1Mbps	-	-98	-	dBm
Sensitivity, DSSS 11Mbps	-	-91	-	dBm
Sensitivity, OFDM 6Mbps	-	-95	-	dBm
Sensitivity, OFDM 54Mbps	-	-78	-	dBm
Sensitivity, HT20 MCS0	-	-95	-	dBm
Sensitivity, HT20 MCS7	-	-76	-	dBm
Sensitivity, HT40 MCS0	-	-92	-	dBm
Sensitivity, HT40 MCS7	-	-73	-	dBm
Sensitivity, HE20 MCS0	-	-95	-	dBm
Sensitivity, HE20 MCS7	-	-75	-	dBm
Sensitivity, HE20 MCS9	-	-70	-	dBm
Sensitivity, HE20 MCS11	-	-66	-	dBm
Sensitivity, HE40 MCS0	-	-91	-	dBm

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Parameters	Min	Typical	Max	Unit
Sensitivity, HE40 MCS7	-	-72	-	dBm
Sensitivity, HE40 MCS9	-	-67	-	dBm
Sensitivity, HE40 MCS11	-	-63	-	dBm
Maximum input level, 802.11b	-	0	-	dBm
Maximum input level, MCS0	-	0	-	dBm
Maximum input level, MCS3	-	0	-	dBm
Maximum input level, MCS5	-	0	-	dBm
Maximum input level, MCS7	-	0	-	dBm

Table.6.3 2.4GHz Wi-Fi Adjacent Channel Rejection

Parameters	Min	Typical	Max	Unit
DSSS 2Mbps	-	58	-	dB
DSSS 11Mbps	-	46	-	dB
OFDM 6Mbps	-	41	-	dB
OFDM 54Mbps	-	10	-	dB
HT20 MCS0	-	45	-	dB
HT20 MCS7	-	30	-	dB
HT40 MCS0	-	44	-	dB
HT40 MCS7	-	28	-	dB
HE20 MCS0	-	40	-	dB
HE20 MCS11	-	12	-	dB
HE40 MCS0	-	44	-	dB
HE40 MCS11	-	8	-	dB

7. 5GHz Wi-Fi RF Characteristics

Test conditions: VBAT = 3.3V, TA = 27°C, unless otherwise specified.

Table.7.1 5GHz Wi-Fi Transmit Characteristics

Parameters	Min	Typical	Max	Unit

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Parameters	Min	Typical	Max	Unit
Frequency range	5.180	-	5.815	GHz
Transmit power, OFDM 6Mbps	-	19	-	dBm
Transmit power, OFDM 54Mbps	-	18	-	dBm
Transmit power, HT20 MCS0	-	19	-	dBm
Transmit power, HT20 MCS7	-	18	-	dBm
Transmit power, HT40 MCS0	-	19	-	dBm
Transmit power, HT40 MCS7	-	18	-	dBm
Transmit power, HE20 MCS0	-	20	-	dBm
Transmit power, HE20 MCS7	-	18	-	dBm
Transmit power, HE20 MCS9	-	16	-	dBm
Transmit power, HE20 MCS11	-	15	-	dBm
Transmit power, HE40 MCS0	-	19	-	dBm
Transmit power, HE40 MCS7	-	18	-	dBm
Transmit power, HE40 MCS9	-	16	-	dBm
Transmit power, HE40 MCS11	-	15	-	dBm

Table.7.2 5GHz Wi-Fi Receive Characteristics

Parameters	Min	Typical	Max	Unit
Frequency range	5.180	-	5.815	GHz
Sensitivity, OFDM 6Mbps	-	-93.5	-	dBm
Sensitivity, OFDM 54Mbps	-	-77	-	dBm
Sensitivity, HT/VHT20 MCS0	-	-93.5	-	dBm
Sensitivity, HT/VHT20 MCS7	-	-75	-	dBm
Sensitivity, HT/VHT40 MCS0	-	-90	-	dBm
Sensitivity, HT/VHT40 MCS7	-	-72	-	dBm
Sensitivity, VHT40 MCS9	-	-65	-	dBm
Sensitivity, HE20 MCS0	-	-93	-	dBm

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Parameters	Min	Typical	Max	Unit
Sensitivity, HE20 MCS7	-	-74	-	dBm
Sensitivity, HE20 MCS9	-	-68	-	dBm
Sensitivity, HE20 MCS11	-	-64	-	dBm
Sensitivity, HE40 MCS0	-	-90	-	dBm
Sensitivity, HE40 MCS7	-	-73	-	dBm
Sensitivity, HE40 MCS9	-	-67	-	dBm
Sensitivity, HE40 MCS11	-	-61	-	dBm
Maximum input level, MCS0	-	0	-	dBm
Maximum input level, MCS3	-	0	-	dBm
Maximum input level, MCS5	-	0	-	dBm
Maximum input level, MCS7	-	0	-	dBm

Table.7.3 5GHz Wi-Fi Adjacent Channel Rejection

Parameters	Min	Typical	Max	Unit
OFDM 6Mbps	-	42	-	dB
OFDM 54Mbps	-	25	-	dB
HT20 MCS0	-	42	-	dB
HT20 MCS7	-	23	-	dB
HT40 MCS0	-	43	-	dB
HT40 MCS7	-	25	-	dB
VHT20 MCS0	-	28	-	dB
VHT20 MCS8	-	18	-	dB
VHT40 MCS0	-	30	-	dB
VHT40 MCS9	-	15	-	dB
HE20 MCS0	-	40	-	dB
HE20 MCS11	-	12	-	dB
HE40 MCS0	-	44	-	dB

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Parameters	Min	Typical	Max	Unit
HE40 MCS11	-	13	-	dB

8. Bluetooth LE Radio

Test conditions: VBAT = 3.3V, TA = 27°C, unless otherwise specified.

Table.8.1 Bluetooth LE 1Mbps Transmit Characteristics

Parameters	Min	Typical	Max	Unit
Maximum RF transmit power	-	14	-	dBm
Peak power minus average power	-	0.5	-	dB
In-band emissions, offset >= +3MHz	-	-41	-	dBm
In-band emissions, offset +2MHz	-	-33	-	dBm
In-band emissions, offset -2MHz	-	-33	-	dBm
In-band emissions, offset <= -3MHz	-	-42	-	dBm
Modulation, Δf1avg	-	250	-	kHz
Modulation, 99.9% Δf2max	-	206	-	kHz
Modulation, Δf2avg/Δf1avg	-	0.9	-	-
Center frequency deviation	-6.9	-6.3	-5.8	kHz
Frequency drift	1.6	2.2	2.8	kHz
Initial frequency drift	0.3	1.1	1.9	kHz
Maximum frequency drift rate	-1.0	0.3	0.8	kHz/50us
Harmonics	-	-	-55	dBm

Table.8.2 Bluetooth LE 1Mbps Receive Characteristics

Parameters	Min	Typical	Max	Unit
Receiver sensitivity	-	-97	-	dBm
Maximum input level	-	0	-	dBm
Co-channel interference, C/I	-	5	-	dB
C/I, F = F0 + 1MHz	-	-12	-	dB
C/I, F = F0 - 1MHz	-	-12	-	dB
C/I, F = F0 + 2MHz	-	-51	-	dB

Parameters	Min	Typical	Max	Unit
C/I, F = F0 + 3MHz	-	-57	-	dB
C/I, F = F0 - 3MHz	-	-57	-	dB
C/I, F = Fimage	-	-45	-	dB
Intermodulation	-	-20	-	dBm
Blocking, 30-2000MHz	-30	-	-	dBm
Blocking, 2003-2399MHz	-35	-	-	dBm
Blocking, 2484-2997MHz	-35	-	-	dBm
Blocking, 3000MHz-12.75GHz	-30	-	-	dBm

Table.8.3 Bluetooth LE 2Mbps Transmit Characteristics

Parameters	Min	Typical	Max	Unit
Maximum RF transmit power	-	14	-	dBm
Peak power minus average power	-	0.5	-	dB
In-band emissions, fTX ± 4MHz	-	-41	-	dBm
In-band emissions, fTX ± 5MHz	-	-45	-	dBm
In-band emissions, fTX ± (6+n)MHz, n=0,1,2,...	-	-46	-	dBm
Modulation, Δf1avg	500	500	500	kHz
Modulation, 99.9% Δf2max	464	468	473	kHz
Modulation, Δf2avg/Δf1avg	-	0.9	-	-

Table.8.4 Bluetooth LE 2Mbps Receive Characteristics

Parameters	Min	Typical	Max	Unit
Receiver sensitivity	-	-94	-	dBm
Maximum input level	-	0	-	dBm
Co-channel interference, C/I	-	5.0	-	dB
C/I, F = F0 + 2MHz	-	-12	-	dB
C/I, F = F0 - 2MHz	-	-12	-	dB
C/I, F = F0 + 4MHz	-	-53	-	dB
C/I, F = F0 + 6MHz	-	-59	-	dB
C/I, F = F0 - 6MHz	-	-59	-	dB

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Parameters	Min	Typical	Max	Unit
Intermodulation	-	-20	-	dBm
Blocking, 30-2000MHz	-30	-	-	dBm
Blocking, 2003-2399MHz	-35	-	-	dBm
Blocking, 2484-2997MHz	-35	-	-	dBm
Blocking, 3000MHz-12.75GHz	-30	-	-	dBm

9. Minimum User System Design

Power the module from a nominal 3.3V supply with adequate transient capability:

Note:

(1) Connect both VDD-3V3 pads (19, 20) and all GND pads; verify input tolerance against the complete BOM;

(2) EN is active low for reset. P4 reference: hold reset low at least 1ms; keep supply stable at least 50μs before enabling;

(3) For download boot, set IO35 LOW before reset release;

(4) UART0: IO37 (pad 53) is TX and IO38 (pad 54) is RX. Cross-connect to host RX/TX with common ground and compatible logic levels.

10. Recommended Reflow Soldering Profile

(1) Reflow Times <= 2 times (Max.)

(2) Max Rising Slope: 3℃/sec

(3) Max Falling Slope: -3℃/sec

(4) Over 217℃ Time: 60~120sec

(5) Peak Temp:240℃~250℃

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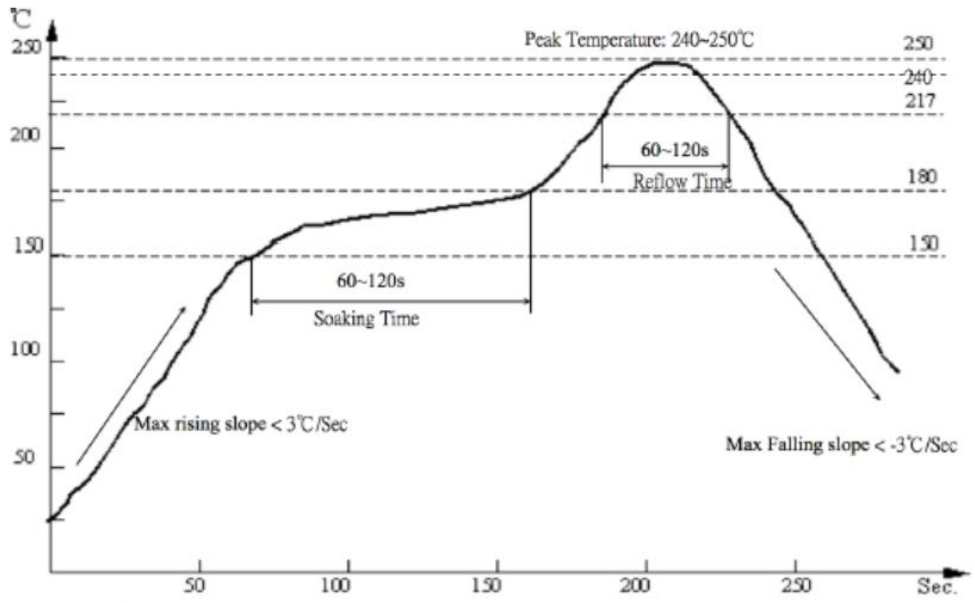


Fig.10.1 Recommended Reflow Profile

11. Recommended Layout Design

Place the module on a stable ground reference and route both supply pads with low impedance. Use the external antenna connection implemented on the module, with a short controlled-impedance RF path. Keep the antenna clear of metal housings, cables and other obstructions according to the antenna installation requirements.

12. U.FL RF Connector

This module uses U.FL type RF connector for external antenna connection. (IPEX V1.0).

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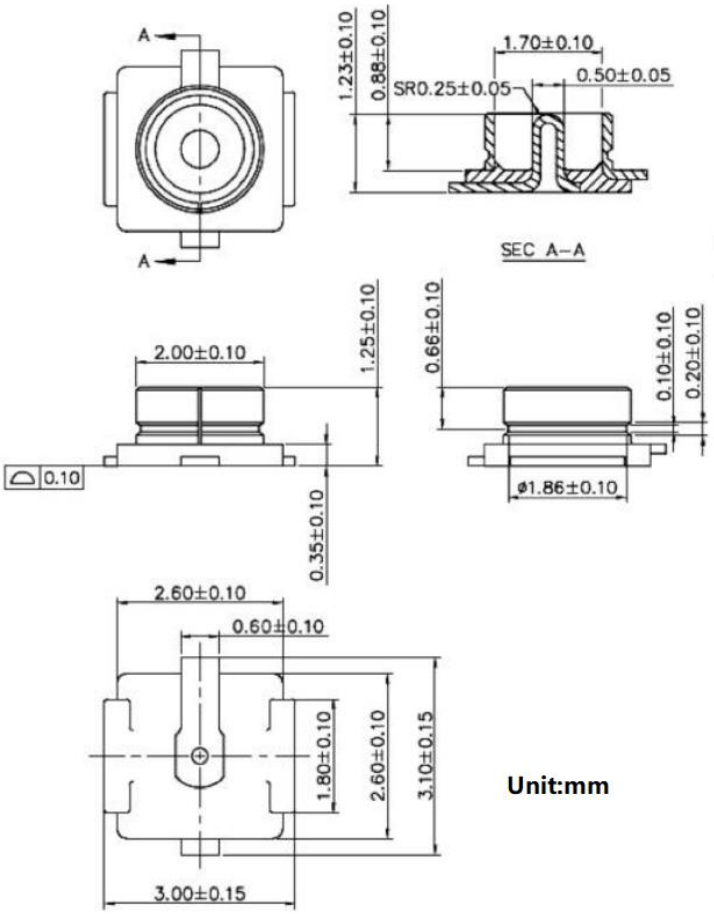


Fig.12.1 U.FL RF Connector

13. Peripheral Design Suggestion

Route USB and MIPI differential pairs with controlled impedance, continuous ground reference and unchanged P/N polarity. Select any series damping from the interface requirements and signal-integrity measurements; do not apply a generic 10–100ohm value to all interfaces. Series resistance alone does not establish ESD protection.

14. Product Handling

14.1 Storage Conditions

Keep modules in the supplied moisture-barrier packaging until assembly. Follow the package label for storage, floor life and baking requirements. Protect the shield, antenna connector and external pads from mechanical damage.

14.2 Electrostatic Discharge (ESD)

Handle the module in an ESD-controlled work area using grounded personnel and suitable equipment. Protect the external connectors and IO against system-level discharge.

15. Packing Instruction

The product is packed in a tray, as shown in the following figure.

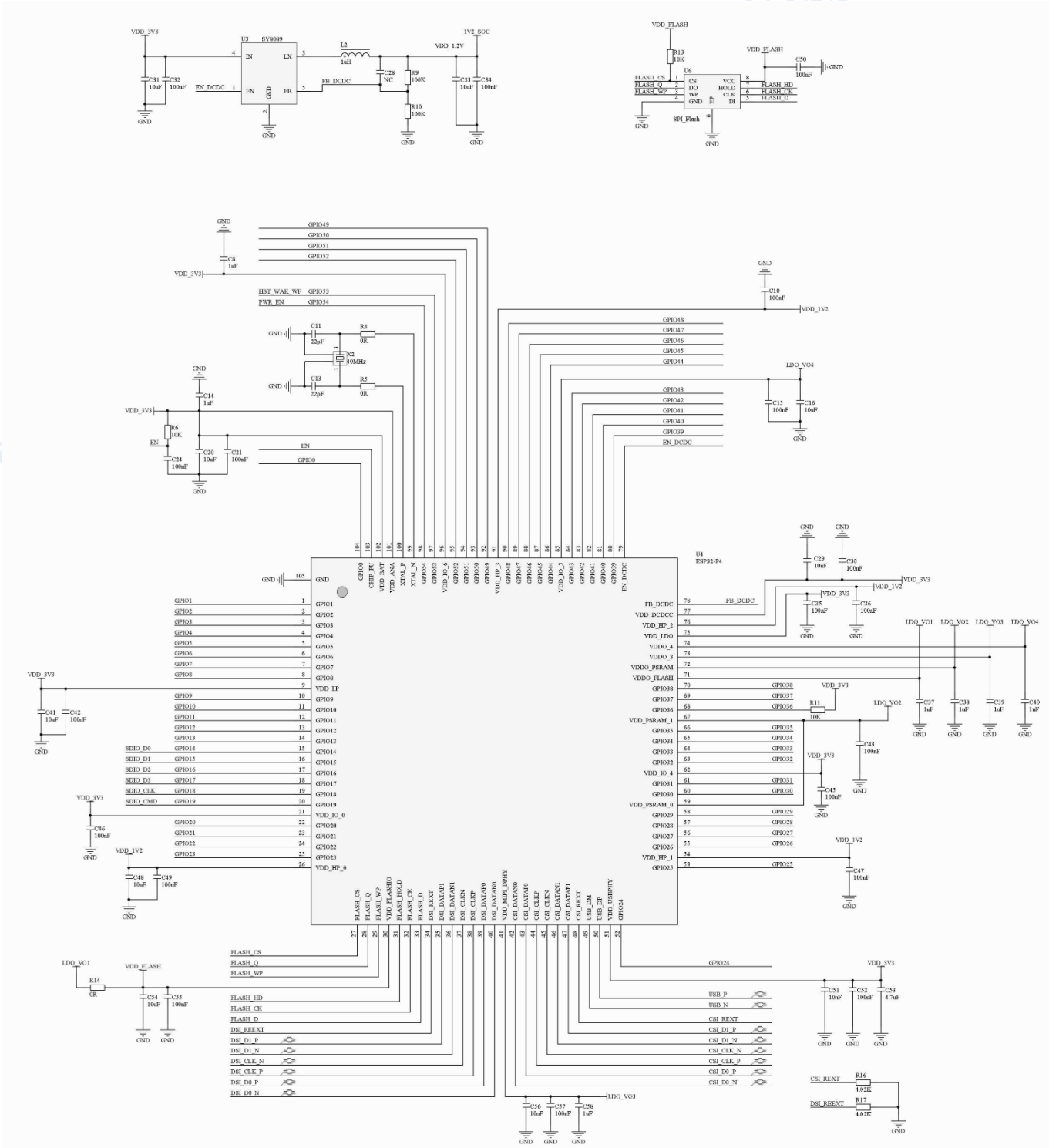
The size of the single box is: 340 x 360 x 60mm, and 600 modules is in the box. And the outer box size is 355 x 375 x 325mm, including 5 inner box which include 3000 pieces module.

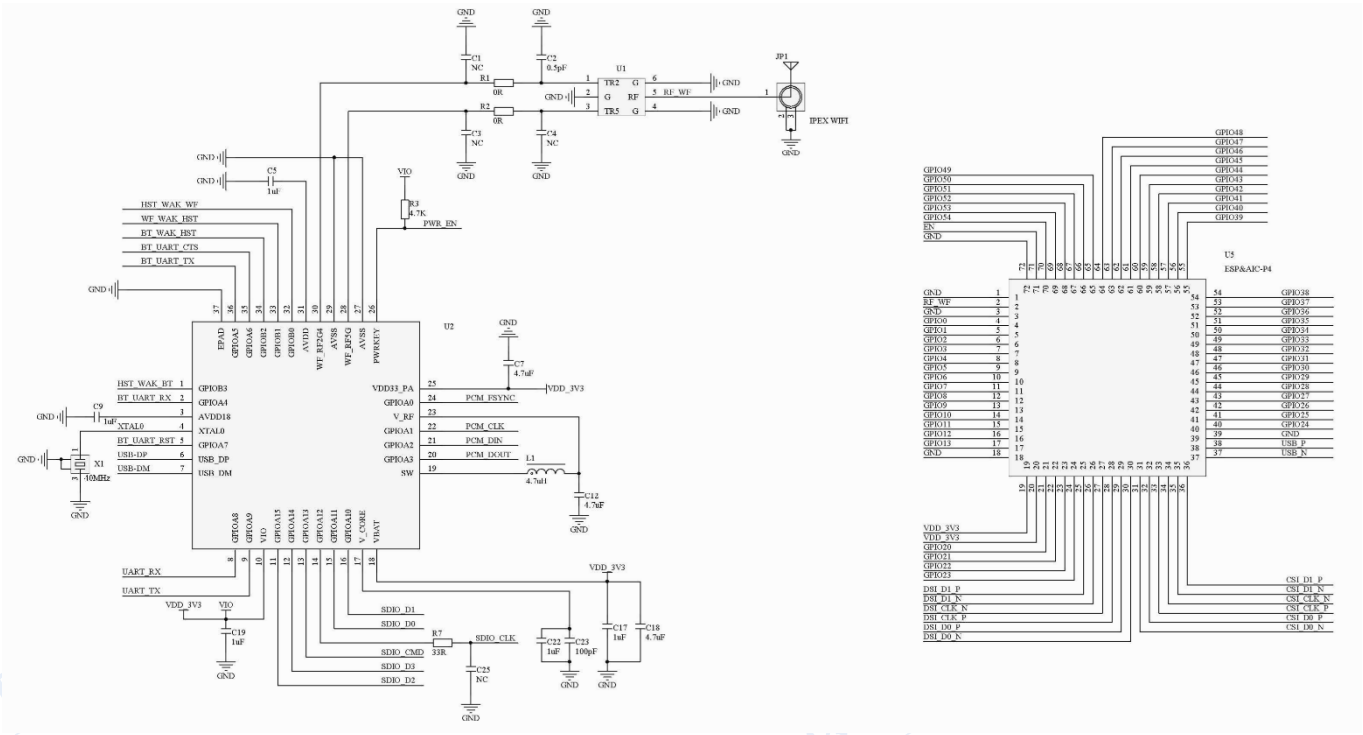


Fig.15.1 Module Package

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Appendix: Module Schematic





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