

EWN-5330SNN1AC

SPECIFICATION V1.0

IEEE 802.11b/g/n/ax 1T1R Wi-Fi +BLE
with SDIO Interface Module



FCC ID: 2AMM6-5330SNN1AC
Model: EWN-5330SNN1AC

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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.

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

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 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

Note:

Radiation Exposure Statement

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 and your body.

This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

Country Code selection feature to be disabled for products marketed to the US/Canada.

This device is intended only for OEM integrators under the following conditions:

1. The antenna must be installed such that 20 cm is maintained between the antenna and users, and
2. The transmitter module may not be co-located with any other transmitter or antenna,
3. For all products market in US, OEM has to limit the operation channels in CH1 to CH11 for 2.4G band by supplied firmware programming tool. OEM shall not supply any tool or info to the end-user regarding to Regulatory Domain change. (if modular only test Channel 1-11)

As long as the three conditions above are met, further transmitter testing will not be required. However, 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 certain laptop configurations or co-location with another transmitter), then the FCC authorization is no longer considered valid and the FCC ID cannot 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 FCC authorization.

End Product Labeling

The final end product must be labeled in a visible area with the following"

Contains **FCC ID: 2AMM6-5330SNN1AC**

Manual Information to the End User

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.

The end user manual shall include all required regulatory information/warning as show in this manual.

Integration instructions for host product manufacturers according to KDB 996369 D03 OEM Manual v01r01

2.2 List of applicable FCC rules

CFR 47 FCC PART 15 SUBPART C been investigated. It is applicable to the modular transmitter

2.3 Specific operational use conditions

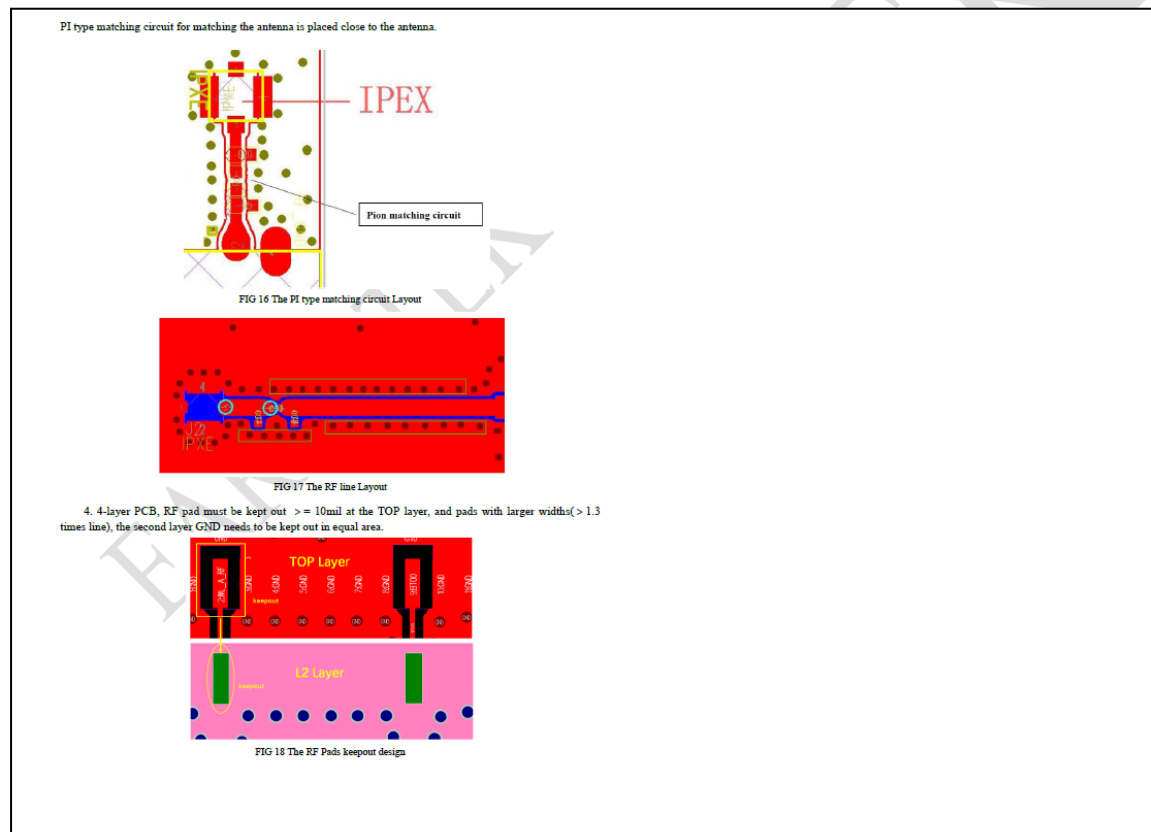
This module is stand-alone modular. If the end product will involve the Multiple simultaneously transmitting condition or different operational conditions for a stand-alone modular transmitter in a host, host manufacturer have to consult with module manufacturer for the installation method in end system.

2.4 Limited module procedures

Not applicable

2.5 Trace antenna designs

There is a circuit connection at the position from the antenna to the module. This circuit is for reference only; the final version shall be based on the physical product.



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.

2.7 Antennas

This radio transmitter **FCC ID: 2AMM6-5330SNN1AC** has been approved by Federal Communications Commission to operate with the antenna types listed below, with the maximum permissible gain indicated. Antenna types not included in this list that have a gain greater than the maximum gain indicated for any type listed are strictly prohibited for use with this device.

Antenna No.	Model No. of antenna:	Type of antenna:	Gain of the antenna (Max.)	Frequency range:
Bluetooth	BW2.4JWX105-7KJ	Dipole Antenna	3.56dBi	2402-2480MHz
2.4G Wi-Fi		Dipole Antenna		2412-2462MHz

2.8 Label and compliance information

The final end product must be labeled in a visible area with the following" Contains
FCC ID: 2AMM6-5330SNN1AC

2.9 Information on test modes and additional testing requirements

Host manufacturer which install this modular with single modular approval should perform the test of radiated emission and spurious emission according to FCC part 15C:15.247 and FCC Part 15 and 15.209 requirement, only if the test result comply with FCC part 15.247 and FCC Part 15 and 15.209 requirement, then the host can be sold legally.

2.10 Additional testing, Part 15 Subpart B disclaimer

Host manufacturer is responsible for compliance of the host system with module installed with all other applicable requirements for the system such as Part 15 B.

2.11 Note EMI Considerations

Host manufacture is recommended to use D04 Module Integration Guide recommending as "best practice" RF design engineering testing and evaluation in case non-linear interactions generate additional non-compliant limits due to module placement to host components or properties.

2.12 How to make changes

This module is stand-alone modular. If the end product will involve the Multiple simultaneously transmitting condition or different operational conditions for a stand-alone modular transmitter in a host, host manufacturer have to consult with module manufacturer for the installation method in end system. According to the KDB 996369 D02 Q&A Q12, that a host manufacture only needs to do an evaluation (i.e., no C2PC required when no emission exceeds the limit of any individual device (including unintentional radiators) as a composite. The host manufacturer must fix any failure.

1 General Specifications

EWN-5330SNN1AC is a highly integrated 2.4GHz Wi-Fi and BLE technology solution. Under 40MHz standard bandwidth, the module meets IEEE 802.11b/g/n/ax 1T1R protocol, and the maximum physical data rate is 150Mbps. At the same time, it supports SDIO2.0 (secure digital input / output) interface, and the clock can support up to 50MHz.

2 Features

2.1 Wi-Fi

- ❖ Support IEEE 802.11 b/g/n/ax for PHY;
- ❖ Support IEEE 802.11 d/e/i/k/v/w for MAC;
- ❖ 1T1R Wi-Fi mode up to 150Mbps PHY rate in 2.4 GHz frequency band;
- ❖ Support 40MHz of standard bandwidth;
- ❖ Supports STA, AP and P2P;
- ❖ When it works as AP mode, it can connect STA up to 8;
- ❖ Supports the STA+AP coexistence or STA+P2P coexistence;
- ❖ Support A-MPDU and A-MSDU;
- ❖ Support 3.3V for I/O power supply voltage;
- ❖ Support for WPA/WPA2/WPA3 personal, WPS2.0;
- ❖ Support STBC (Space-Time Block Coding) and LDPC (Low density Parity-check);
- ❖ Support Block-ACK;
- ❖ Support QoS;

2.2 Bluetooth

- ❖ Support Bluetooth Low Energy (BLE);
- ❖ Support BLE 4.0/4.1/4.2/5.0/5.1/5.2;
- ❖ Support 125Kbps,500Kbps,1Mbps,2Mbps data rate;
- ❖ Support Class 1;
- ❖ Support up to 20dBm;
- ❖ Support BLE Mesh and BLE Gateway;

3 System Block Diagram

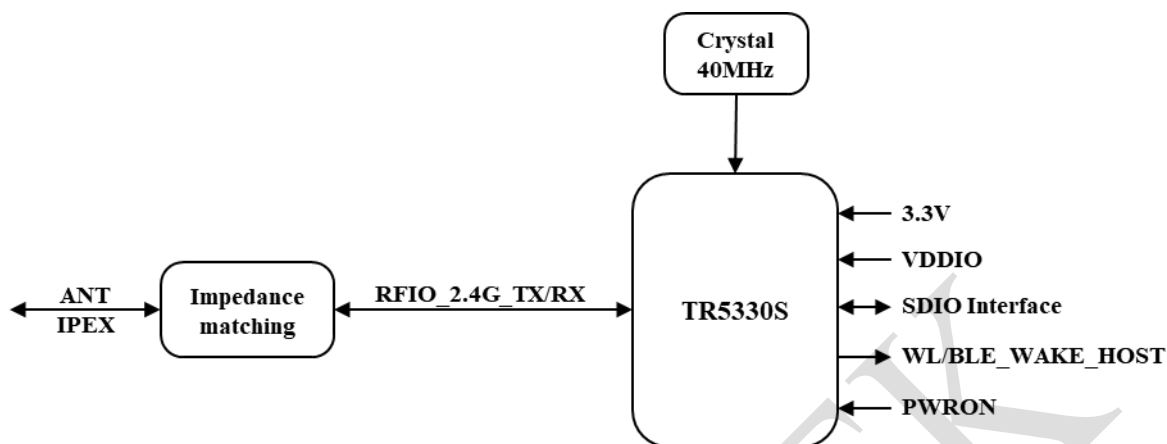


FIG 1 EWN-5330SNN1AC Block Diagram

4 Marking description



	Eardatek LOGO
TR5330S	Wi-Fi Chipset
1	Antenna Numbers
A	Module pin definition code
C	Version Code
SDIO	Wi-Fi interface
000000	Reserved

FIG 2 EWN-5330SN1AC Marking description

5 PHY Specification

5.1 Wi-Fi Specification

Table 1 EWN-5330SNN1AC Wi-Fi RF Parameters

Protocol	IEEE 802.11b/g/n/ax	
Interface	SDIO 2.0	
Modulation	BPSK/QPSK/16QAM/64QAM/256QAM/CCK	
Frequency	2400 ~ 2483.5MHz (include 1~13 data channel)	
Bandwidth	20MHz for 11b/g/n/ax, 40 MHz for 11n	
PHY Rate	Maximum PHY data rate up to 114.7 Mbps @ HE20 MCS9; Maximum PHY data rate up to 150 Mbps @ HT40 MCS7;	
Mask	-20dB/±11MHz/OFDM;	
	-28dB/±20MHz/OFDM;	
	-30dB/±11MHz/DSSS, CCK;	
	-50dB/±20MHz/DSSS, CCK.	
Frequency Error	<±20ppm (include 802.11b/g/n/ax)	
Transmit Power	802.11b (2.4G 11M):	18±1dBm @ EVM: -15dB;
	802.11g (2.4G 54M):	15±1dBm @ EVM: -27dB;
	802.11n (2.4G HT20 MCS7):	15±1dBm @ EVM: -29dB;
	802.11n (2.4G HT40 MCS7):	15±1dBm @ EVM: -29dB;
	802.11ax(2.4G HE20 MCS9):	15±1dBm @ EVM: -34dB.
Receive Sensitivity (PER<10%)	802.11b (2.4G 11M):	-87dBm, typical;
	802.11g (2.4G 54M):	-74dBm, typical;
	802.11n (2.4G HT20 MCS7):	-72dBm, typical;
	802.11n (2.4G HT40 MCS7):	-69dBm, typical;
	802.11ax (2.4G HE20 MCS9):	-67dBm, typical;

5.2 Bluetooth Specification

Table 2 EWN-5330SNN1AC Bluetooth RF Parameters

Protocol	BLE 4.0/4.1/4.2/5.0/5.1/5.2	
Interface	SDIO 2.0	
Frequency	2400 MHz ~ 2483.5 MHz (40 channels)	
Modulation	GFSK	
PHY Rate	125Kbps, 500Kbps, 1, 2 Mbps for BLE	
Transmit Power	9±1dBm	

Receive Sensitivity

<-90dBm @ PER=30.8% for BLE 1M
<-87dBm @ PER=30.8% for BLE 2M
<-90dBm @ PER=30.8% for BLE (S8 125Kbps)
<-90dBm @ PER=30.8% for BLE (S2 500Kbps)

6 Other Specifications

Table 3 Other Specifications

Operating Temperature	-30℃~+70℃
Storage Temperature	Module: -20℃~+125℃ Package: -20℃~+70℃
Operating Humidity	RH 95%(Non-Condensing)
Storage Humidity	RH 95%(Non-Condensing)
Humidity level	Level 3
Security	WPA/WPA2/WPA3 personal, WPS2.0;
Operation System	OpenHarmony, FreeRTOS, Huawei LiteOS, Android and Linux

7 DC Characteristics

Table 4 Power Supply Characteristics

Symbol	Parameter	Min.	Typical	Max.	Unit
VDD_3V3	3.3V Supply Voltage	3.0	3.3	3.6	V
IDD_3V3	3.3V Rating Current	-	-	600	mA
VDDIO	3.3V Power supply for I/O pin	2.97	3.3	3.63	V
PWRON	PUM power on enabling pin		VDDIO		V

Note: Timing requirement for power-on and power-off

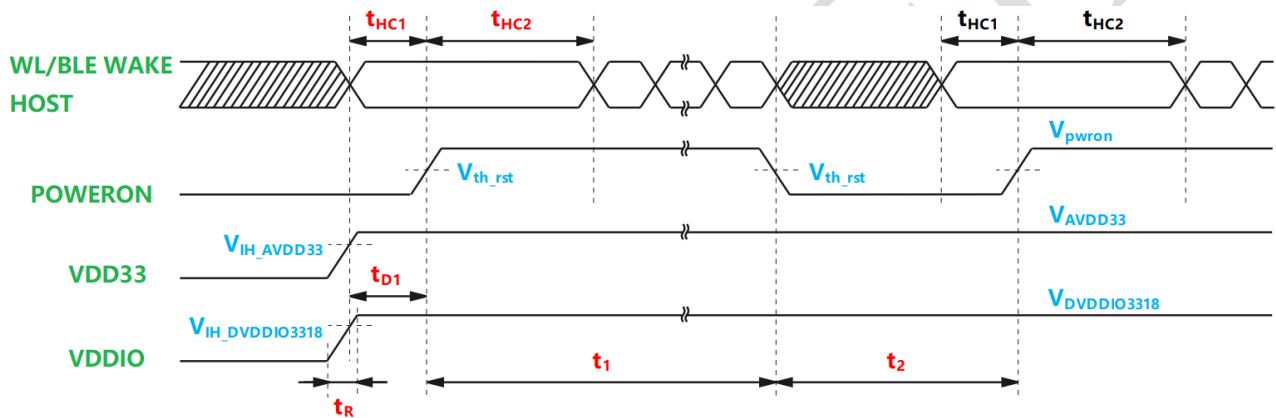


FIG 3 Timing requirement for power-on

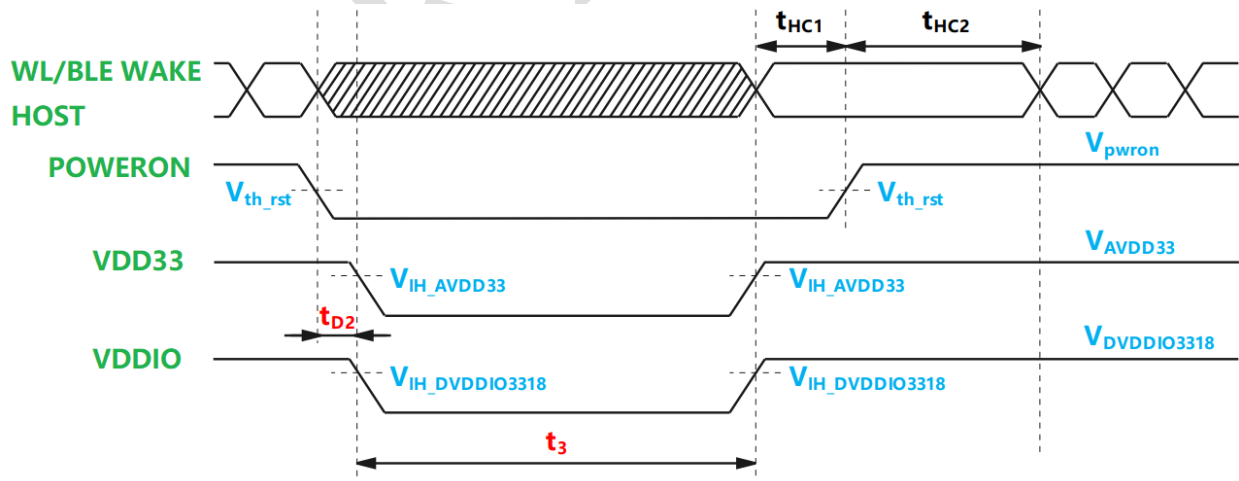


FIG 4 Timing requirement for power-off

Table 5 Timing and Voltage Parameters

	Min.	Max.	Unit	Description
t_R	1	10	ms	VDD_3.3V and VDDIO Rising Edge Time
t_{D1}	1	-	ms	PWRON Delay Time relative to VDD_3.3V and VDDIO during power-on
t_{D2}	0	-	ms	PWRON Advance Time relative to VDD_3.3V and VDDIO during power-off
t_1	20	-	ms	PWRON High Level Duration after power-on
t_2	5	-	ms	PWRON Interval between pulling down and pulling up again when VDD_3.3V and VDDIO are High Level
t_3	50		ms	Interval between power-off and power-on again
t_{HC1}	1	-	ms	Hardware Configuration IO Setup Time relative to PWRON during power-on
t_{HC2}	10	-	ms	Hardware Configuration IO Hold Time relative to PWRON during power-on
V_{pwrn}	1.6	-	V	PWRON High Level
V_{AVDD33}	3.3	3.3	V	VDD_3.3V High Level
$V_{DVDDIO33}$	3.3	3.3	V	VDDIO High Level
V_{th_rst}	1.4	1.4	V	PWRON Threshold Level of Rising Edge and Falling Edge
V_{IH_AVDD33}	2.3	2.3	V	VDD_3.3V Threshold Level of Rising Edge and Falling Edge
$V_{IH_DVDDIO33}$	$0.8 * V_{DVDDIO33}$	$0.8 * V_{DVDDIO33}$	V	VDDIO Threshold Level of Rising Edge and Falling Edge

8 Module configurations

Module Dimension (unit : mm): $12.2 (\pm 0.2) * 12.0 (\pm 0.2) * 2.2 (\pm 0.2)$

Module(Hole-Hole) Dimension (unit : mm): $12.0 (\pm 0.2) * 12.0 (\pm 0.2)$

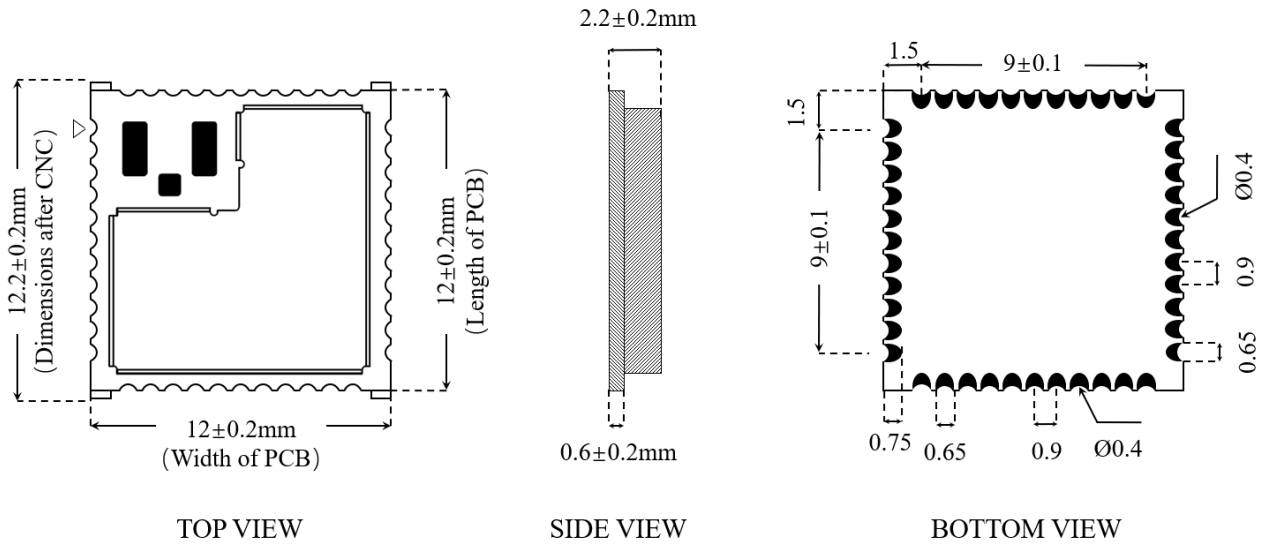


FIG 5 EWN-5330SNN1AC Module Dimension

On Board Pad Suggest: 1.5*0.6 (Unit: mm)

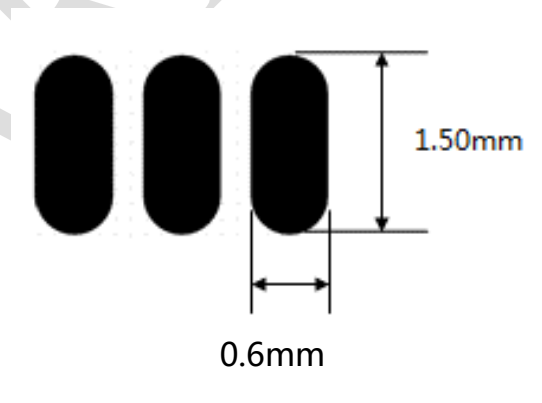


FIG 6 Pad Dimension

9 Pin Definition

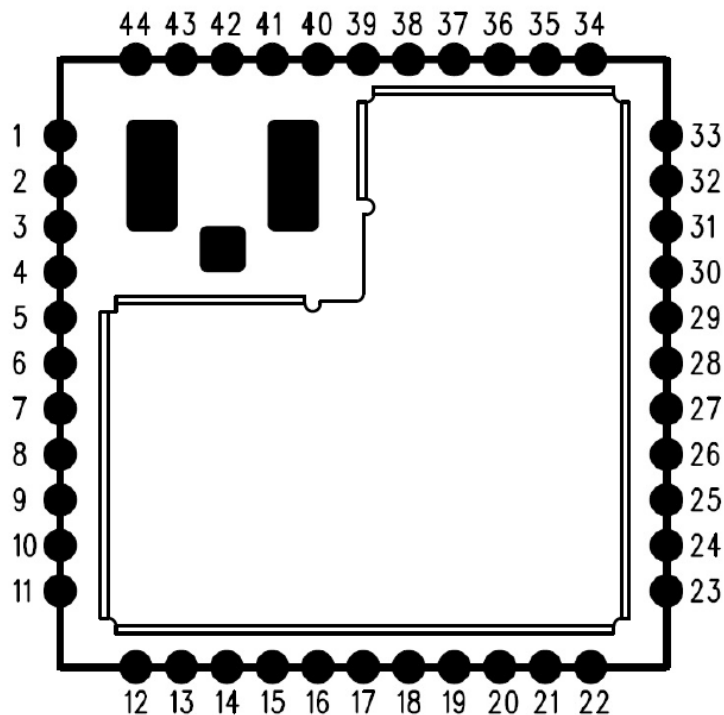


FIG 7 TOP VIEW

See table 6 for the module hardware pin definition.

Table 6 EWN-5330SNN1AC Pin Description

Pin	Definition	Description	Power Supply	Power level
1	GND	Ground	-	-
2	NC	Not Connected	-	-
3	GND	Ground	-	-
4	NC	Not Connected	-	-
5	NC	Not Connected	-	-
6	NC	Not Connected	-	-
7	NC	Not Connected	-	-
8	NC	Not Connected	-	-
9	VDD33	3.3V±0.3V	Main Power	DC 3.3V±0.3V
10	NC	Not Connected	-	-
11	NC	Not Connected	-	-
12	PWRON	PMU power on enable pin, ON: Pull high, OFF: Pull low	VDDIO	Depend On VDDIO
13	WL/BLE_WAKE_HOST	WLAN/BLE wake host pin	VDDIO	Depend On VDDIO

Pin	Definition	Description	Power Supply	Power level
14	SD_D2	SDIO data line 2	VDDIO	Depend On VDDIO
15	SD_D3	SDIO data line 3	VDDIO	Depend On VDDIO
16	SD_CMD	SDIO command line	VDDIO	Depend On VDDIO
17	SD_CLK	SDIO CLK line	VDDIO	Depend On VDDIO
18	SD_D0	SDIO data line 0	VDDIO	Depend On VDDIO
19	SD_D1	SDIO data line 1	VDDIO	Depend On VDDIO
20	GND	Ground	-	-
21	NC	Not Connected	-	-
22	VDDIO	I/O voltage supply input	VDDIO	DC 3.3V±0.33V
23	NC	Not Connected	-	-
24	NC	Not Connected	-	-
25	NC	Not Connected	-	-
26	NC	Not Connected	-	-
27	NC	Not Connected	-	-
28	NC	Not Connected	-	-
29	NC	Not Connected	-	-
30	NC	Not Connected	-	-
31	GND	Ground	-	-
32	NC	Not Connected	-	-
33	GND	Ground	-	-
34	NC	Not Connected	-	-
35	NC	Not Connected	-	-
36	GND	Ground	-	-
37	NC	Not Connected	-	-
38	NC	Not Connected	-	-
39	NC	Not Connected	-	-
40	NC	Not Connected	-	-
41	GND	Ground	-	-
42	NC	Not Connected	-	-
43	NC	Not Connected	-	-
44	NC	Not Connected	-	-
45	IPEX	ANT	-	-

10 Module Photos



FIG 8 TOP VIEW

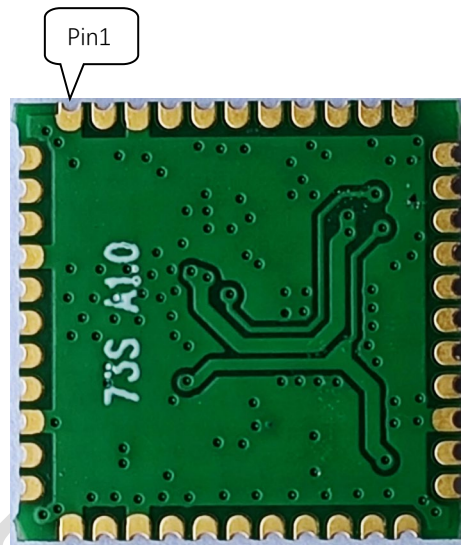


FIG 9 BOTTOM VIEW

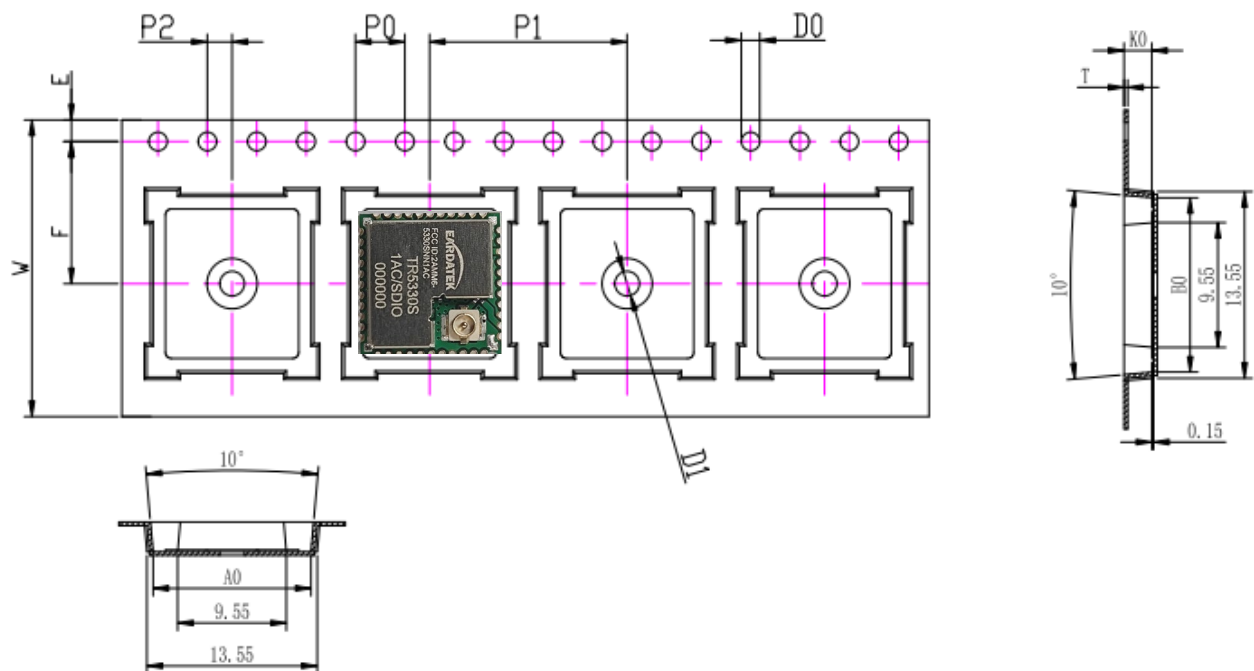
11 Key Material List

Table 7 EWN-5330SNN1AC Key material list

Type	Model	Footprint	QTY.
IC	TR5330S (QFN32)	QFN32	1 PCS
Crystal	40MHz (JWT/CX/TJ)	3225	1 PCS

12 Package Information

Carrier dimension: (Unit : mm)



符号	A0	B0	K0	P0	P1	P2
规格	12.55±0.1	12.55±0.1	2.60±0.1	4.0±0.1	16±0.1	2.0±0.1
符号	W	T	E	F	D0	D1
规格	24.0±0.3	0.3±0.05	1.75±0.1	11.50±0.1	∅1.5 ^{+0.1} ₋₀	∅2.0 ^{+0.1} ₋₀

FIG 10 Carrier size

Reel dimension: D=38cm 2000PCS Modules Per Reel

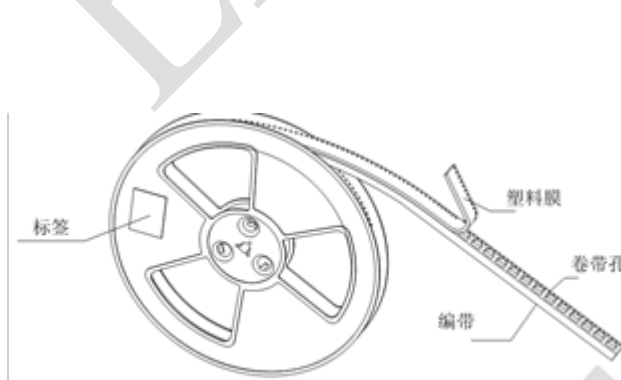


FIG 11 Reel



FIG 12 Reel figure

13 Reference design

13.1 Power supply requirement

- To use a dedicated power supply circuit for module
- The VD33 power ripple shall be $<300\text{mVpp}$ for ripple frequency $<200\text{KHz}$
- Transient-response:①the ripple raised from 100/800mA step-response test should be small than 200mVpp .② The ripple swing shall settle down within 1~2 cycles,2 cycles for the worst case.
- Power supply spur: make sure the spurs from switching mode power supply or other noisy circuits are reasonable small. Once issue concerned with such a power supply spur, alternative power supply filtering might be needed.

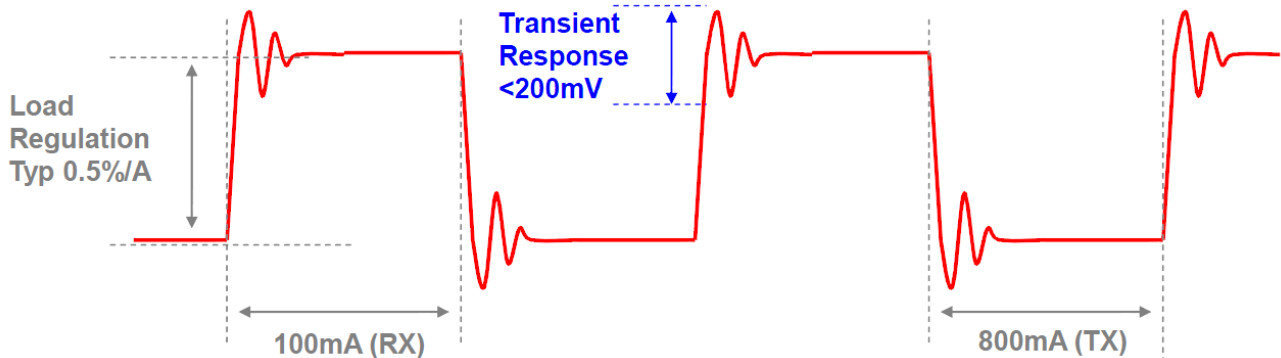


FIG 13 Power supply requirement

Table 8 DC Characteristics

Symbol	Parameter	Minimum	Typical	Maximum	Peak Current
VDD_3.3V (PIN9)	3.3V Supply Voltage	3.0V	3.3V	3.6V	0.6A

Table 9 Platform Power Rail Requirements

VDD_3.3V Power range	VDD_3.3V Ripple	VDD_3.3V Noise	Rise time	
			Min	Max
+/-0.165V	300mVpp@switching frequency > 100KHz		0.5ms	5ms

13.2 SDIO Interface

- The SDIO Bus traces impedance should be 50 Ohm.
- The SDIO Bus traces spacing should be more than 2 times of terace width ($H=2W$)
- The SDIO Bus traces (CLK, CMD, D0~D3) length matching szhould be less than +/-100 mils, and the total length should be less than 2.5 inches.
- SDIO CLK traces should be surrounded by GND and keep CMD and data away.
- The SDIO Bus traces should not have Stubs and need to reference to GND.
- The maximum VIA counts of the SDIO Bus traces (CLK, CMD, D0~D3) should less than 4.
- The SDIO Bus traces (CLK, CMD, D0~D3) should connect an 0 Ohm series resistor which needs to close to SOC.
- The SDIO Bus traces (CLK, CMD, D0~D3) should reserve pull up resistors 2.2K Ohm to VIO_HOST which needs to close to WIFI.
- The SDIO Bus Traces (CLK, CMD, D0~D3) should reserve 5.6pF caps to GND witch needs to close to WIFI.

Table 10 SDIO Bus Traces length in the module

Pin	Definition	Length(mil)
14	SDIO_DATA_2	116.37
15	SDIO_DATA_3	96.97
16	SDIO_CMD	80.2
17	SDIO_CLK	70.95
18	SDIO_DATA_0	65.95
19	SDIO_DATA_1	65.42

13.3 RF circuit

Due to the SMD package, the RF port impedance must be offset after the module is soldered to the motherboard. In order to achieve the best performance, it is recommended to add a PI-type matching network to the motherboard, as shown below (C11, R21, C6). The value of the PI type matching network needs to be debugged according to the actual motherboard to match RF port impedance to 50 Ohm.

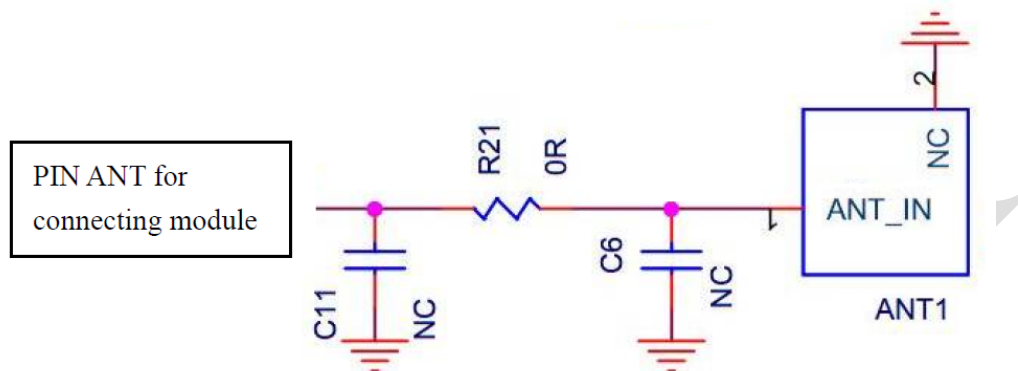


FIG 14 Connect 50 Ohm matching antenna reference circuit

The antenna ANT1 in the figure above must be 50 Ohm. If the antenna is not matched, it is recommended to add a set of PI type matching network at the front of the antenna to match the antenna. Generally, the antenna manufacturers will give Suggestions on matching parameters.

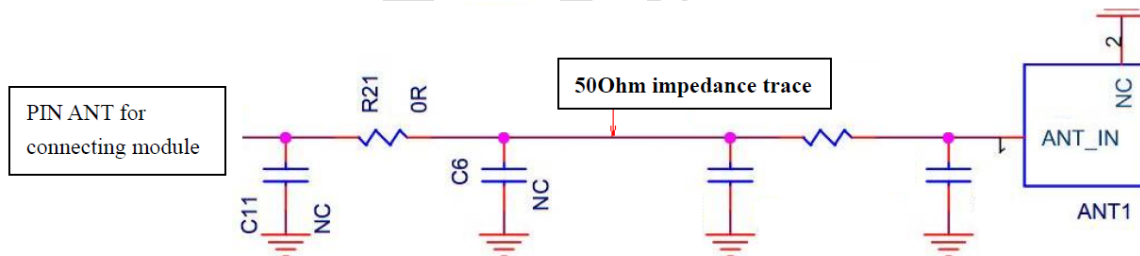


FIG 15 Connect the unmatched antenna reference circuit

The RF line layout should be matched according to 50ohm. The line impedance is related to the plate, plate thickness, line width and copper spacing. Professional software can be used to calculate the line width. Note: for multilayer plates, the plate thickness should calculate the distance from RF routing layer to GND of the next layer. There are RF lines Layout principles:

1. RF line layout needs to match 50 ohms. The line width can be calculated by professional software. (Note: If it is a multi-layer board, the board thickness should calculate the distance from the RF trace layer to the next ground layer.)
2. The RF line must be surrounded by ground copper and ground holes.
3. The PI-type matching circuit for adjusting the impedance of the module is placed close to the module. The

PI type matching circuit for matching the antenna is placed close to the antenna.

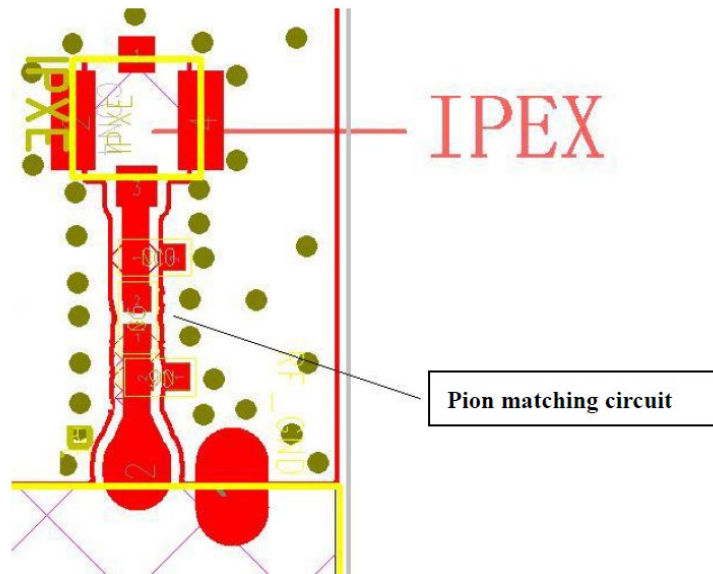


FIG 16 The PI type matching circuit Layout

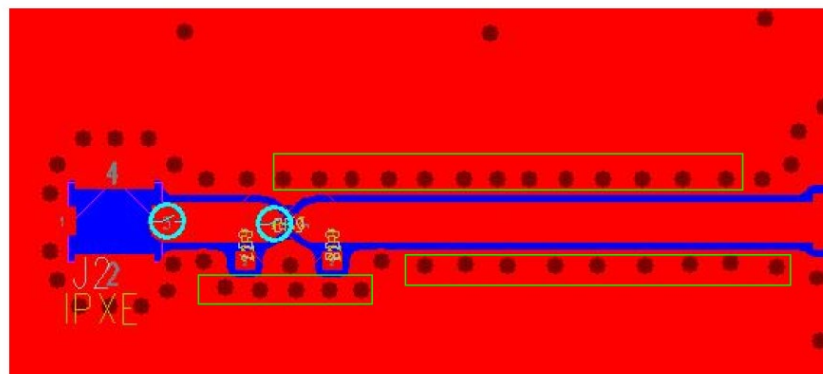


FIG 17 The RF line Layout

4. 4-layer PCB, RF pad must be kept out $\geq 10\text{mil}$ at the TOP layer, and pads with larger widths (> 1.3 times line), the second layer GND needs to be kept out in equal area.

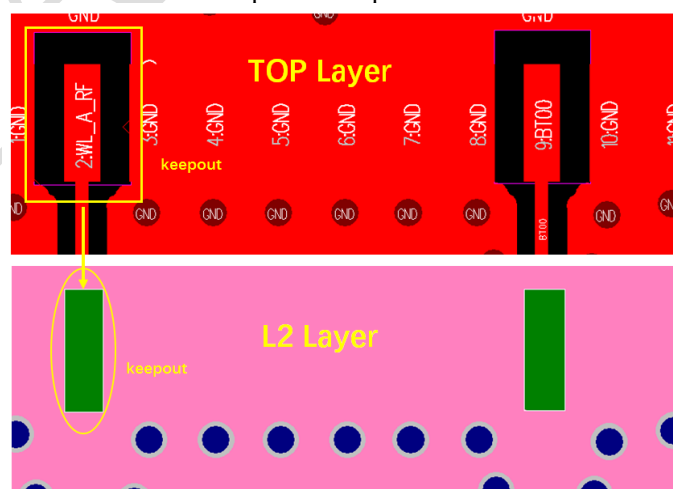


FIG 18 The RF Pads keepout design

13.4 Motherboard interference avoidance

Motherboard interference comes from: high-speed data interface (HDMI), the Operating frequency of main chip, DDR, DC-DC power supply. The method of avoiding interference according to the characteristics of various signals is also different. The main methods of interference avoidance include:

1. keeping away from the source of interference;
2. Adding shields to avoid interference leakage;
3. Reasonable layout to eliminate interference.

13.4.1 Interface interference

When HDMI uses the 74.2MHz frequency, its 33x frequency is in the 2.4G band of Wi-Fi, which will seriously interfere with the Wi-Fi signal. If the HDMI frequency is 148.5MHz, although the 16x frequency is not in the Wi-Fi band, the isolation of the frequency is not good, and the Wi-Fi signal will be interfered to some extent. If the distance between the HDMI interface and the Wi-Fi module on the PCB is less than 5cm, the HDMI output display will interfere with the Wi-Fi signal, resulting in problems such as Wi-Fi connection failure and throughput drop. Therefore, keep the location of the Wi-Fi module away from the HDMI port on the hardware layout to avoid interference.

At the same time, if the Wi-Fi antenna is built-in the motherboard, its placement must also be carefully considered to be far from the interface interference. If the antenna is placed in an incorrect position, even if the module is shielded, the interference signal is coupled through the antenna, which will eventually result in a lower Wi-Fi throughput. (Note: In addition to interference, the placement of the internal antenna should also evaluate the effect of the metal interface, motherboard, and housing material on the antenna impedance.)

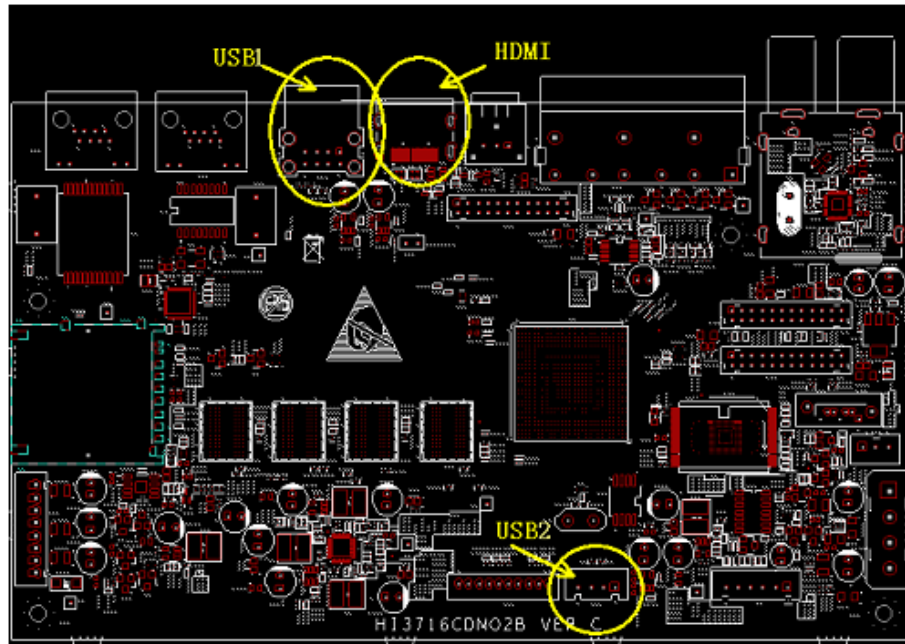


FIG 19 HDMI and USB interference

13.4.2 The main chip interferes with DDR

Because the main chips operate at about 800MHz or DDR2 operate at 667MHz, 3x frequency of 800MHz and 4x frequency of 667MHz are near 2.4GHz band. It must to place Wi-Fi modules and antennas far away from the main chip and DDR. It is strongly recommended that the main chip be isolated from the DDR by a shield. As shown in the figure below.

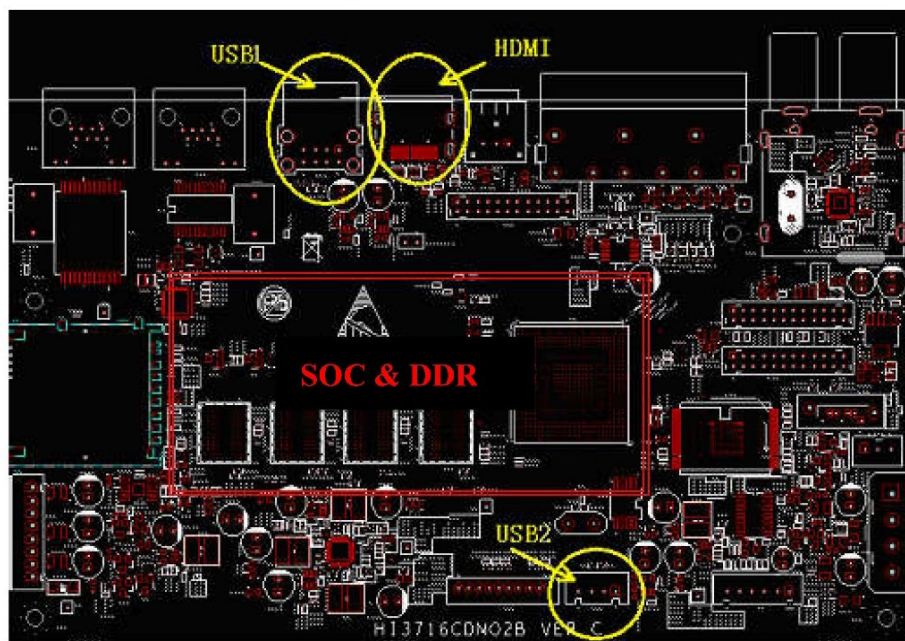


FIG 20 Main chip and DDR interference

14 Revision History

Revision	Release Date	Summary	Revised By
V1.0	2025-9-18	First release	Xianting Zhuang