AW859A

WiFi 11ac + BT5.0 Module Spec

Design	Check	Approve	Version	Date
			V1.4	2020.07.09

Reversion History

Version	Date	Modification
1.0	2020.03.06	First release version
1.1	2020.03.26	Update the picture of real product
1.2	2020.05.15	Update the description of Bluetooth interface, and the PIN6 using description of WiFi module
1.3	2020.06.23	1.Update the crystal of block diagram to 26M 2.Add storage and baking information 3.Update packaging figure
1.4	2020.07.09	Update document style

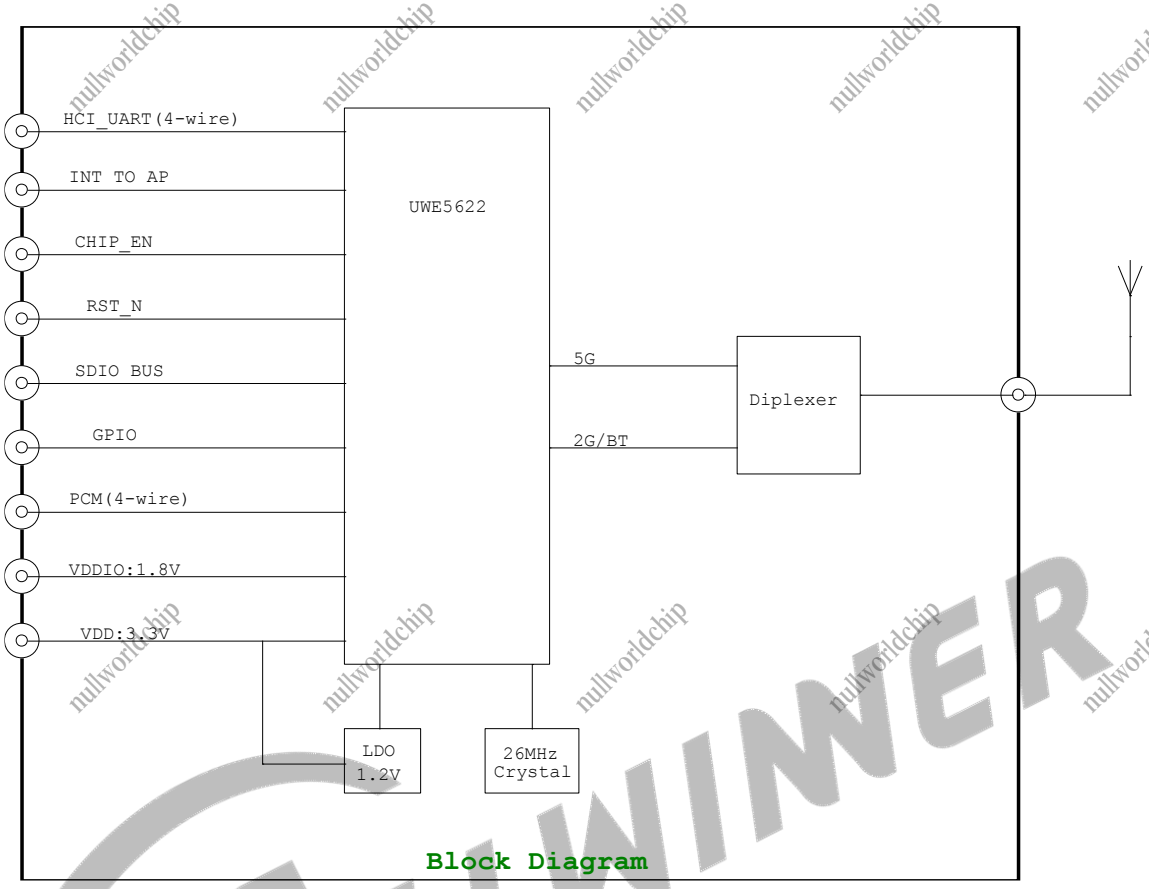
1. Overview

The AW859A is a single-die wireless local area network (WLAN) and Bluetooth (BT) combination solution to support 1 × 1 IEEE 802.11a/b/g/n/ac WLAN standards and BT 5.0 enabling seamless integration of WLAN/BT and low-energy technology.

2. Features

- Supports a low-power SDIO 3.0 interface for WLAN and a SDIO/PCM interface for BT
- Provides a highly integrated WLAN system-on-chip (SoC) for 5 GHz 802.11ac, or 2.4 GHz/5 GHz 802.11n WLAN applications
- Support WLAN 2.4GHz and 5GHz band channels
- Supports BT 5.0, BLE, and ANT+ and backward compatibility with BT 1.x and BT 2.x + Enhanced Data Rate
- Supports a single-ended RF port for cleaner and lower cost design
- Supports 20 MHz/40 MHz at 2.4 GHz and supports 20 MHz, 40 MHz, or 80 MHz at 5 GHz

3. Block Diagram



Block Diagram

4. General Specification

Model	AW859A
Product Name	WLAN 11a/b/g/n/ac SDIO3.0 1T1R + Bluetooth 5.0 module
Major Chipset	UWE5622
Standard	802.11a/b/g/n/ac
Modulation Method	BPSK/ QPSK/ 16-QAM/ 64-QAM/256-QAM
Frequency Band	Dual band 2.4/5GHz
WiFi Interface	SDIO3.0
BT Interface	SDIO
Operating Temperature	-20 °C ~ 70 °C
Storage Temperature	-20 °C ~ 125 ℃
Humidity	5% to 90% maximum
Dimension	12x12x1.9 (LxWxH) ±0.2mm

5. Electrical Characteristics

5.1 WiFi Section:

A. 2.4GHz RF Specification

Feature	Description
WLAN Standard	IEEE 802.11b/g/n WiFi compliant
Frequency Range	2.400 GHz ~ 2.497 GHz (2.4 GHz ISM Band)
Number of Channels	2.4GHz：Ch1 ~ Ch14
Modulation	802.11b : DQPSK, DBPSK, CCK 802.11 g/n : OFDM /64-QAM,16-QAM, QPSK, BPSK
Output Power	802.11b / 1Mbps : 17dBm ±2 dB @ EVM ≤ -10dB 802.11b /11Mbps : 17dBm ±2 dB @ EVM ≤ -15dB
	802.11g / 6Mbps : 17dBm ±2 dB @ EVM ≤ -5dB 802.11g /54Mbps : 15 dBm ±2 dB @ EVM ≤ -28dB
	802.11n /MCS0 : 16 dBm ±2 dB @ EVM ≤ -5dB 802.11n /MCS7 : 14 dBm ±2 dB @ EVM ≤ -30dB
Receive Sensitivity (11b,20MHz) @8% PER	- 1Mbps PER @ -93 dBm, typical
	- 2Mbps PER @ -90 dBm, typical
	- 5.5Mbps PER @ -88 dBm, typical
	- 11Mbps PER @ -86 dBm, typical
Receive Sensitivity (11g,20MHz) @10% PER	- 6Mbps PER @ -91 dBm, typical
	- 9Mbps PER @ -89 dBm, typical
	- 12Mbps PER @ -86 dBm, typical
	- 18Mbps PER @ -83 dBm, typical
	- 24Mbps PER @ -80 dBm, typical
	- 36Mbps PER @ -77 dBm, typical
	- 48Mbps PER @ -74 dBm, typical
	- 54Mbps PER @ -72 dBm, typical
Receive Sensitivity (11n,20MHz) @10% PER	- MCS=0 PER @ -90 dBm, typical
	- MCS=1 PER @ -87 dBm, typical
	- MCS=2 PER @ -84 dBm, typical
	- MCS=3 PER @ -81 dBm, typical
	- MCS=4 PER @ -78 dBm, typical
	- MCS=5 PER @ -75 dBm, typical
	- MCS=6 PER @ -72 dBm, typical

	- MCS=7 PER @ -70 dBm, typical
Receive Sensitivity (11n,40MHz) @10% PER	- MCS=0 PER @ -87 dBm, typical
	- MCS=1 PER @ -84 dBm, typical
	- MCS=2 PER @ -81 dBm, typical
	- MCS=3 PER @ -78 dBm, typical
	- MCS=4 PER @ -75 dBm, typical
	- MCS=5 PER @ -72 dBm, typical
	- MCS=6 PER @ -69 dBm, typical
	- MCS=7 PER @ -67 dBm, typical
Maximum Input Level	802.11b : -10 dBm
	802.11g/n : -20 dBm
Antenna Reference	Small antennas with 0~2 dBi peak gain

B. 5GHz RF Specification

Feature	Description
WLAN Standard	IEEE 802.11a/n/ac WiFi compliant
Frequency Range	4.900 GHz ~ 5.845 GHz (5.0 GHz ISM Band)
Number of Channels	5.0GHz：Please see the table
Modulation	802.11a : OFDM /64-QAM,16-QAM, QPSK, BPSK 802.11n : OFDM /64-QAM,16-QAM, QPSK, BPSK 802.11ac : OFDM /256-QAM
Output Power	802.11a / 6Mbps : 17 dBm ±2 dB @ EVM ≤ -5dB 802.11a /54Mbps : 14 dBm ±2 dB @ EVM ≤ -25dB
	802.11n HT20 /MCS0 : 16 dBm ±2 dB @ EVM ≤ -5dB 802.11n HT20 /MCS7 : 14 dBm ±2 dB @ EVM ≤ -28dB
	802.11n HT40 /MCS0 : 16 dBm ±2 dB @ EVM ≤ -5dB 802.11n HT40 /MCS7 : 13dBm ±2 dB @ EVM≤ -28dB
	802.11ac VHT20 /MCS0 : 16 dBm ±2 dB @ EVM ≤ -5dB 802.11ac VHT20 /MCS8 : 12 dBm ±2 dB @ EVM ≤ -30dB
	802.11ac VHT40 /MCS0 : 16 dBm ±2 dB @ EVM ≤ -5dB 802.11ac VHT40 /MCS9 : 11 dBm ±2 dB @ EVM ≤ -32dB
	802.11ac VHT80 /MCS0 : 16 dBm ±2 dB @ EVM ≤ -5dB 802.11ac VHT80 /MCS9 : 11 dBm ±2 dB @ EVM ≤ -32dB
Receive Sensitivity (11a,20MHz) @10% PER	- 6Mbps PER @ -93dBm, typical
	- 9Mbps PER @ -90 dBm, typical
	- 12Mbps PER @ -87 dBm, typical
	- 18Mbps PER @ -84 dBm, typical
	- 24Mbps PER @ -81 dBm, typical
	- 36Mbps PER @ -78 dBm, typical
	- 48Mbps PER @ -76 dBm, typical

	- 54Mbps	PER @ -74 dBm, typical
Receive Sensitivity (11n,20MHz) @10% PER	- MCS=0	PER @ -92 dBm, typical
	- MCS=1	PER @ -89 dBm, typical
	- MCS=2	PER @ -86 dBm, typical
	- MCS=3	PER @ -83 dBm, typical
	- MCS=4	PER @ -80 dBm, typical
	- MCS=5	PER @ -77 dBm, typical
	- MCS=6	PER @ -74 dBm, typical
	- MCS=7	PER @ -72 dBm, typical
Receive Sensitivity (11n,40MHz) @10% PER	- MCS=0	PER @ -90 dBm, typical
	- MCS=1	PER @ -87 dBm, typical
	- MCS=2	PER @ -84 dBm, typical
	- MCS=3	PER @ -81 dBm, typical
	- MCS=4	PER @ -78 dBm, typical
	- MCS=5	PER @ -75 dBm, typical
	- MCS=6	PER @ -72 dBm, typical
	- MCS=7	PER @ -70 dBm, typical
Receive Sensitivity (11ac,20MHz) @10% PER	- MCS=0, NSS1	PER @ -91 dBm, typical
	- MCS=1, NSS1	PER @ -88 dBm, typical
	- MCS=2, NSS1	PER @ -85 dBm, typical
	- MCS=3, NSS1	PER @ -82 dBm, typical
	- MCS=4, NSS1	PER @ -79 dBm, typical
	- MCS=5, NSS1	PER @ -76dBm, typical
	- MCS=6, NSS1	PER @ -73 dBm, typical
	- MCS=7, NSS1	PER @ -70 dBm, typical
	- MCS=8, NSS1	PER @ -68 dBm, typical
Receive Sensitivity (11ac,40MHz) @10% PER	- MCS=0, NSS1	PER @ -89 dBm, typical
	- MCS=1, NSS1	PER @ -86 dBm, typical
	- MCS=2, NSS1	PER @ -83 dBm, typical
	- MCS=3, NSS1	PER @ -80 dBm, typical
	- MCS=4, NSS1	PER @ -77 dBm, typical
	- MCS=5, NSS1	PER @ -74 dBm, typical
	- MCS=6, NSS1	PER @ -71 dBm, typical
	- MCS=7, NSS1	PER @ -68 dBm, typical
	- MCS=8, NSS1	PER @ -65 dBm, typical
	- MCS=9, NSS1	PER @ -63 dBm, typical
	- MCS=0, NSS1	PER @ -83 dBm, typical

Receive Sensitivity (11ac,80MHz) @10% PER	- MCS=1, NSS1 PER @ -80 dBm, typical
	- MCS=2, NSS1 PER @ -77 dBm, typical
	- MCS=3, NSS1 PER @ -74 dBm, typical
	- MCS=4, NSS1 PER @ -71 dBm, typical
	- MCS=5, NSS1 PER @ -68 dBm, typical
	- MCS=6, NSS1 PER @ -65 dBm, typical
	- MCS=7, NSS1 PER @ -62 dBm, typical
	- MCS=8, NSS1 PER @ -59 dBm, typical
	- MCS=9, NSS1 PER @ -57dBm, typical
Maximum Input Level	802.11a/n/ac : -20 dBm
Antenna Reference	Small antennas with 0~2 dBi peak gain

5.2 5GHz(20MHz) Channel table

Band (GHz)	Operating Channel Numbers	Channel center frequencies(MHz)
5.15GHz~5.25GHz	36	5180
	40	5200
	44	5220
	48	5240
5.25GHz~5.35GHz	52	5260
	56	5280
	60	5300
	64	5320
5.5GHz~5.7GHz	100	5500
	104	5520
	108	5540
	112	5560
	116	5580
	120	5600
	124	5620
	128	5640
	132	5660
	136	5680
	140	5700
	149	5745

5.725GHz~5.825GHz	153	5765
	157	5785
	161	5805
	165	5825

5.3 Bluetooth Section:

Feature	Description
General Specification	
Bluetooth Standard	Bluetooth V5.0 of 1, 2 and 3 Mbps.
Host Interface	SDIO
Antenna Reference	Small antennas with 0~2 dBi peak gain
Frequency Band	2402 MHz ~ 2480 MHz
Number of Channels	BR/EDR :79 channels;BLE:40 channels
Modulation	FHSS, GFSK, DPSK, DQPSK

5.4 RF Specification

				TX power(dBm)	DEVM RMS (%)		
	Packet type	Channel	Spec		Spec	RMS	Peak
Classic/EDR Tx Power and EVM	DH5	0	0~20	7.5	/	/	/
		39		7.5	/	/	/
		78		7.5	/	/	/
	2DH5	0	0~20	5.7	20%~35%	3.4%	9.0%
		39		6.2		3.4%	7.8%
		78		6.1		3.4%	8.4%
	3DH5	0	0~20	5.7	13%~25%	3.0%	7.8%
		39		6.2		3.2%	7.5%
		78		6.1		3.1%	8.8%

	Rate	Channel	Spec	Test Result

BLE TX Power	1M	0	-20~10	3.2
		19		3.8
		39		3.7
	2M	0	-20~10	3.2
		19		3.8
		39		3.7
	LES500K	0	-20~10	3.5
		19		3.5
		39		3.5
	LES125K	0	-20~10	3.5
		19		3.5
		39		3.5

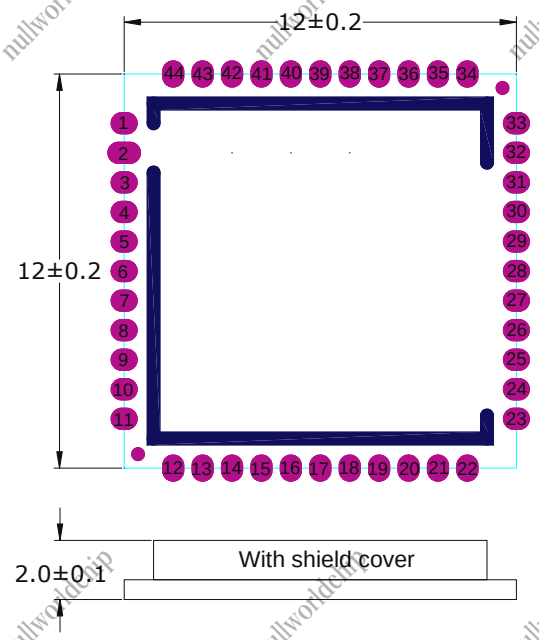
Sensitivity(dBm)				
Rate	SPEC	CH0	CH39	CH78
BR	-70dBm	-91.9	-92.5	-92.3
EDR2		-91.4	-92.3	-91.9
EDR3		-85.2	-85.9	-85.4
BT5.0	SPEC	CH0	CH19	CH39
LE1M	-70dBm	-95.0	-96.5	-95.5
LE2M	-70dBm	-92.0	-93.0	-92.5
LE500K	-75dBm	-98.0	-99.5	-98.5
LE125K	-82dBm	-103.0	-104.0	-103.5

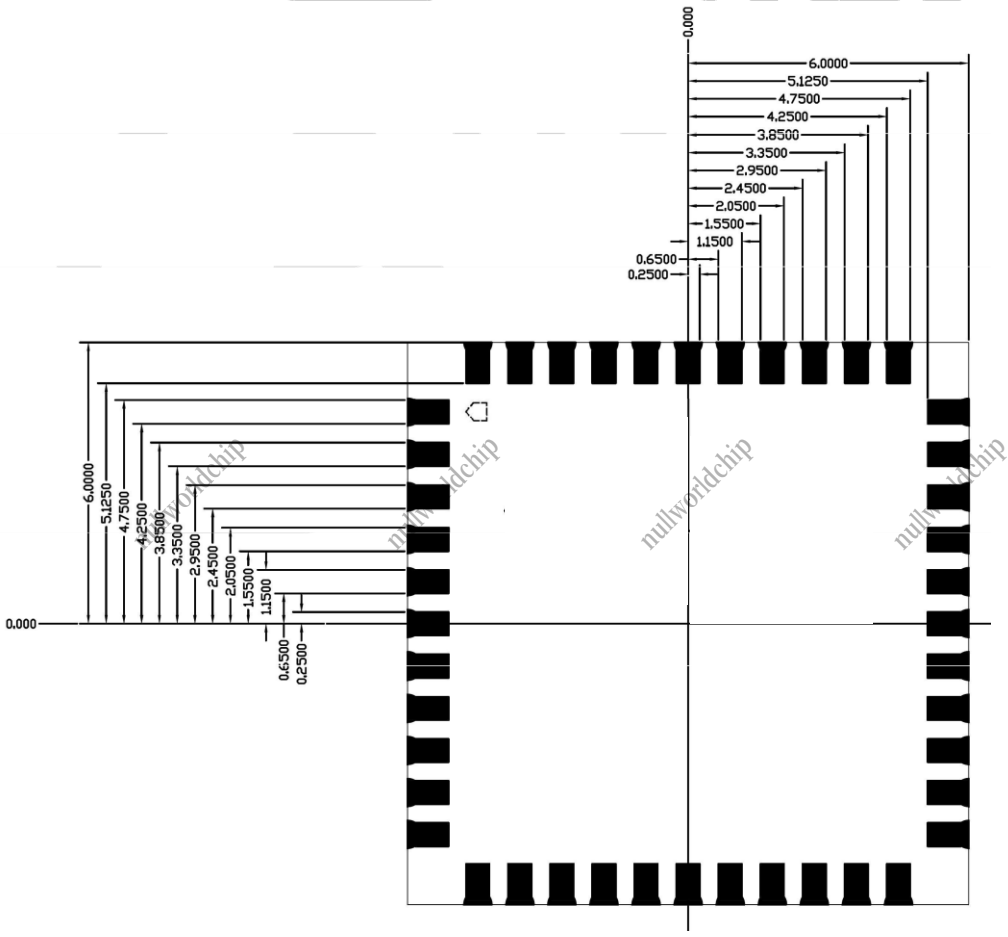
6. Electrical Characteristics

symbol	Parameter	Minimum	Typical	Maximum	Units
VDD	3.3V supply voltage	3.0	3.3	3.6	V
VDDIO	I/O supply voltage	1.7	1.8	1.9	V
Current	3.3V rating current	--	--	1000	mA

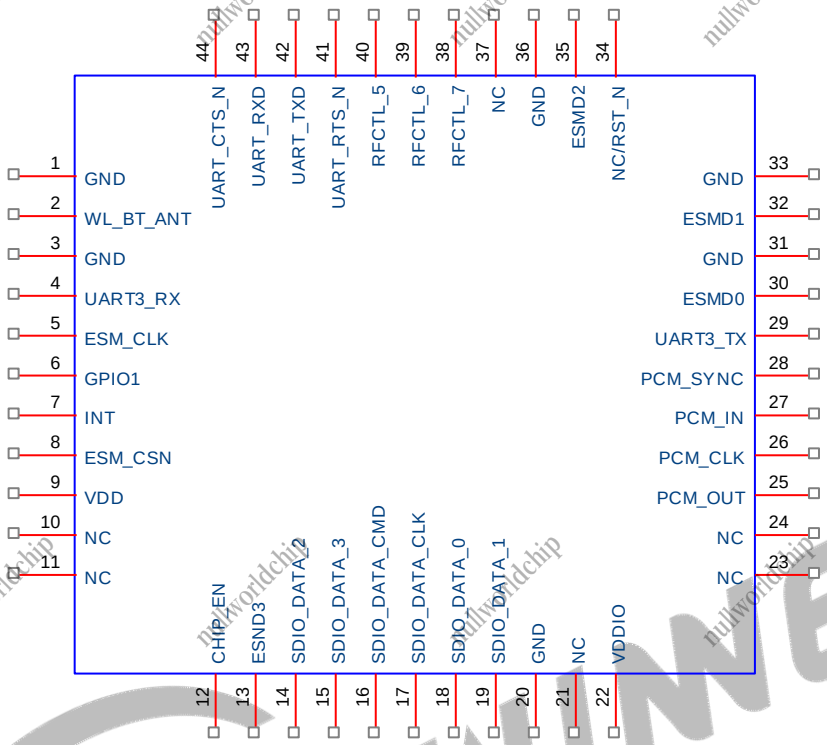
7. Physical Dimensions

(Unit: mm)





8. Pin Description



NO.	Name	Type	Description
1	GND	—	Ground connections
2	RF	I/O	RF I/O port (2.4G and 5G)
3	GND	—	Ground connections
4	UART3_RX	—	No connect, keep floating
5	ESMCLK	—	No connect, keep floating
6	GPIO1	I/O	GPIO1(Reserved SDIO interrupt)
7	INT	O	BT_WAKE_HOST
8	ESMCSN	—	No connect, keep floating
9	VDD	P	3.3V INPUT
10	NC	—	No connect, keep floating
11	NC	—	No connect, keep floating
12	CHIP_EN	I	WL/BT Power enable
13	ESMD3	I/O	WL_WAKE_HOST
14	SD_DAT2	I/O	SDIO DATA2
15	SD_DAT3	I/O	SDIO DATA3
16	SD_CMD	I/O	SDIO command line
17	SD_CLK	I/O	SDIO CLK
18	SD_DAT0	I/O	SDIO DATA0
19	SD_DAT1	I/O	SDIO DATA1

20	GND	—	Ground connections
21	NC	—	No connect, keep floating
22	VDDIO	P	I/O Voltage supply input 1.8V(only) （注意：只能使用1.8V）
23	NC	—	No connect, keep floating
24	NC	—	No connect, keep floating
25	PCM_OUT	O	PCM data output
26	PCM_CLK	I/O	PCM CLK
27	PCM_IN	I	PCM data input
28	PCM_SYNC	I	PCM sync signal
29	UART3_TX	—	No connect, keep floating
30	ESMD0	—	No connect, keep floating
31	GND	—	Ground connections
32	ESMD1	—	No connect, keep floating
33	GND	—	Ground connections
34	NC/RST_N	—	No connect, keep floating
35	ESMD2	—	No connect, keep floating
36	GND	—	Ground connections
37	NC	—	No connect, keep floating
38	RFCTL_7	—	No connect, keep floating
39	RFCTL_6	—	No connect, keep floating
40	RFCTL_5	—	No connect, keep floating
41	UART0_RTS_N	I	Bluetooth UART interface(reserved)
42	UART0_TXD	O	Bluetooth UART interface(reserved)
43	UART0_RXD	I	Bluetooth UART interface(reserved)
44	UART0_CTS_N	I	Bluetooth UART interface(reserved)

Note:

Strapping PIN:PIN38~PIN40(RFCTL7,6,5) default High (111), do not change.

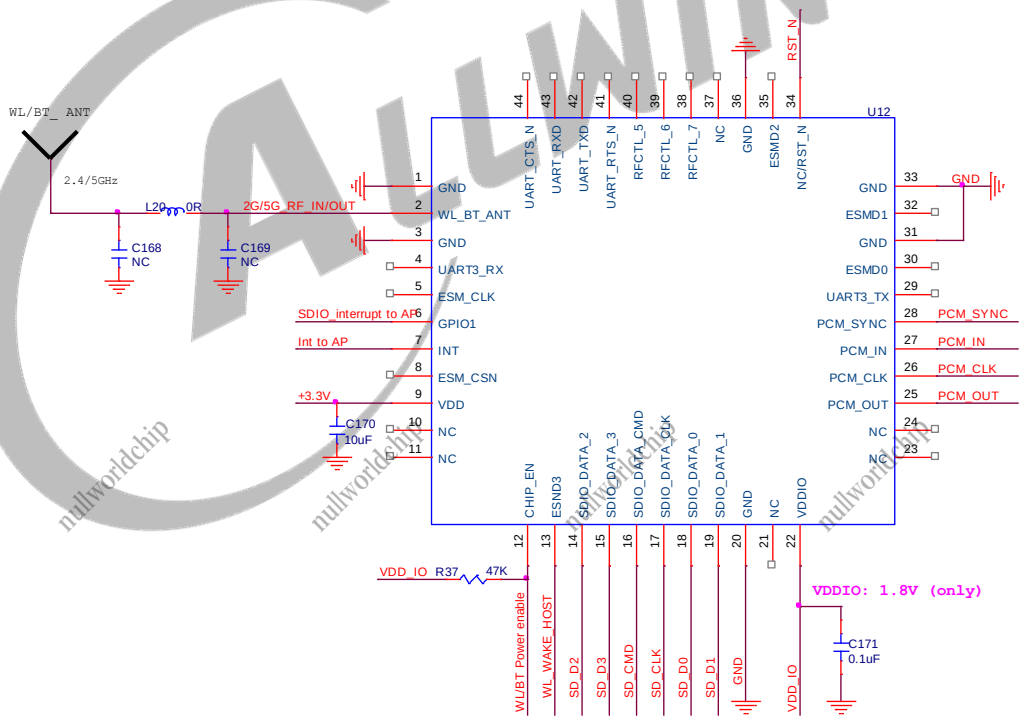
9. Suplier

Supplier list	
Name of material	Material brand
Crystal	JWT/FK/TKD/Murata/TXC
Duplexer	TDK/ACX/GLEAD/ Sunlord
Inductor	Sunlord/ CHILISIN/ SAMWHA/Murata
Wifi chip	UNISOC
LDO	SGM
Capacitance	SAMSUNG /EYANG

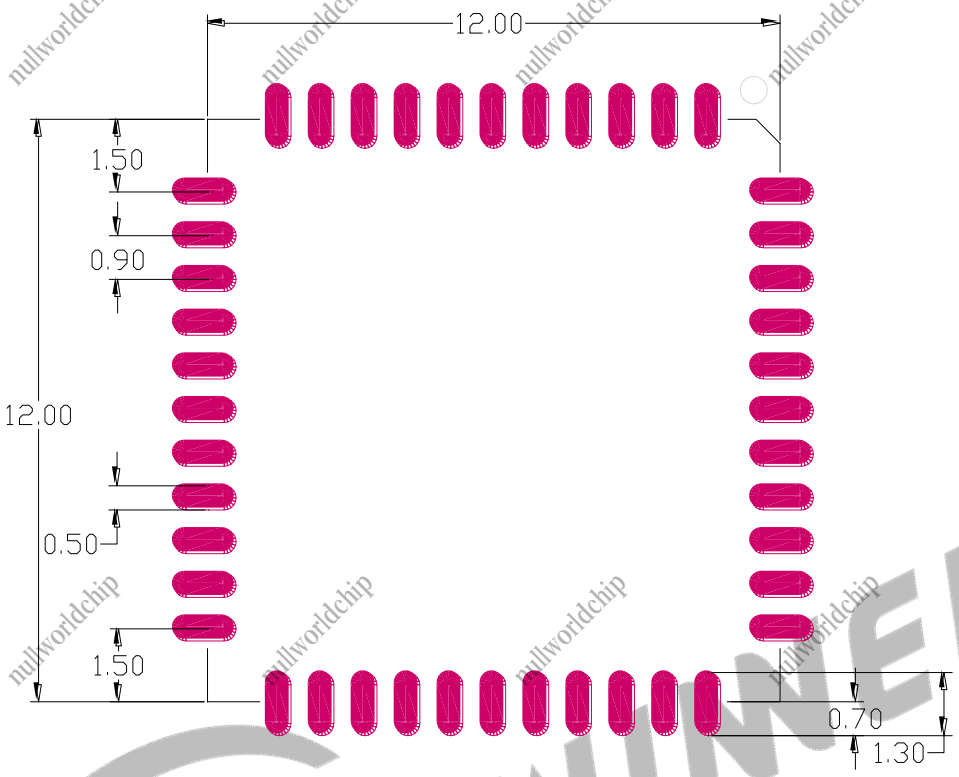
Supplier list	
Resistance	UniOhm /YAGEO
PCB(12x12x0.6mm)	A,O,I

10. Physical photo

11. Application schematic



12. Layout Recommendation



(Top view)

13.Baking & storage temperature & Recommended Reflow Profile

13.1 Baking & storage temperature

A. Storage life：12 months. Storage conditions:<40℃. Relative humidity:<90%R.H.

B. After this bag is opened , devices that will be subjected to infrared reflow, vapor-phase reflow, or equivalent processing must be

a. Check the humidity card :stored at ≦20%RH.If :30%~40%(pink)or greater than 40%(red).Labeling module has moisture absorption.

b. Mounted within 168 hours at factory conditions of: t≦30%℃， ≦60%R.H.

c. Once opened, the workshop the preservation of life for168 hours.

C. Module apart packing after 168 hours， If baking is required, devices may be baked for.

a. Modules must be to remove module moisture problem.

b. Baking temperature: 40℃ ±5℃, 120 hours.

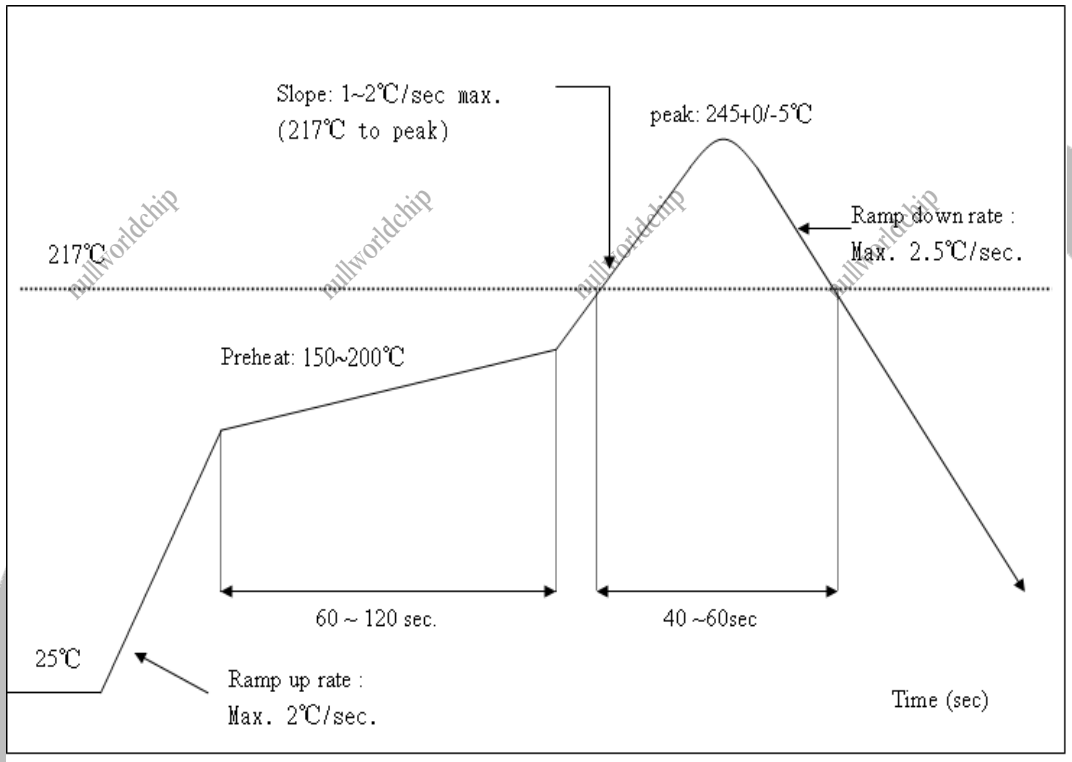
c. After baking, put proper amount of desiccant to seal packages.

13.2 Recommended Reflow Profile

Referred IPC/JEDEC standard.

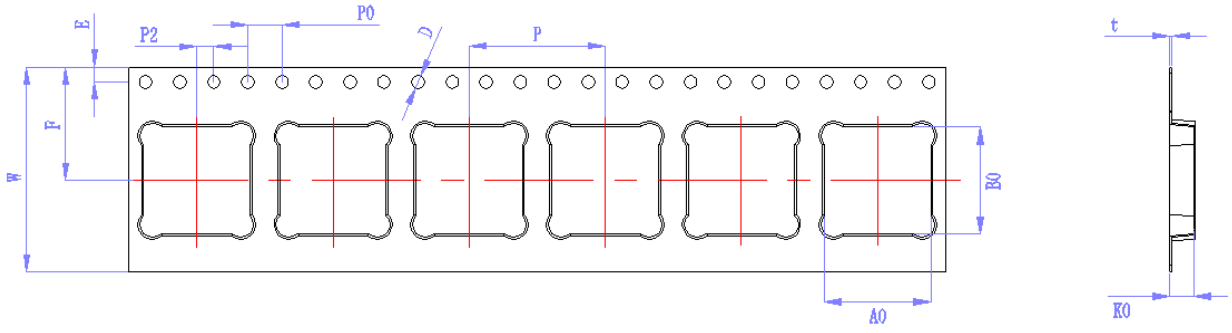
Peak Temperature : <250 ℃

Number of Times : 2 times



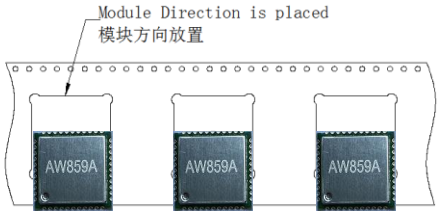
14. Packing information

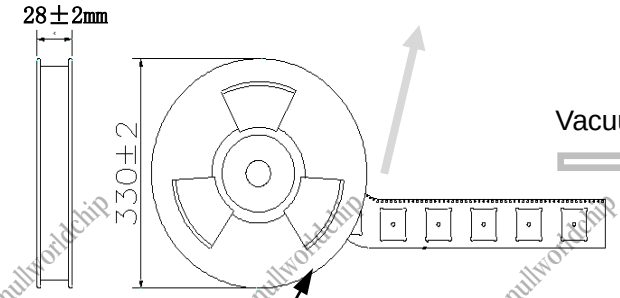
1) Carrier size Detail:



ITEM	W	A0	B0	K0	P	F	E	D	P0	P2	T
DIM	24	12.5	12.5	2.8	16	13.25	1.75	1.50	4	2	0.3
TOLE	+0.30 −0.30	+0.10 −0.10	+0.10 −0.10	+0.10 −0.10	+0.10 −0.10	+0.10 −0.10	+0.10 −0.10	+0.10 −0.10	+0.10 −0.10	+0.10 −0.10	+0.05 −0.05

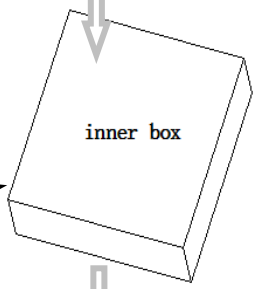
2) Packaging Detail:



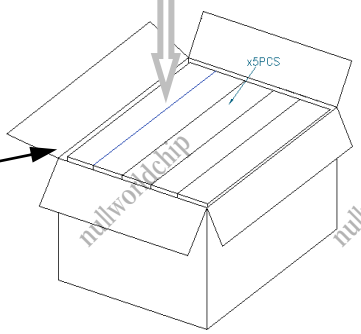


Vacuum

Color of plastic disc: blue
A roll of 1300pcs(前后留空20pcs)



inner box K3K:
33.5cm*34.7cm*7cm
A box of 1300 PCS



carton K=A:
36.4*35.7*37.5cm
A case of 6500 PCS

ESD CAUTION

The AW859A module is ESD (electrostatic discharge) sensitive device and may be

damaged with ESD or spike voltage. Although AW859A module is with built-in ESD protection circuitry, please handle with care to avoid the permanent malfunction or the performance degradation.

