PRODUCT SPECIFICATION

IEEE 802.11 b/g/n 2.4GHz Internet-of-Things WiFi Module

(Realtek Ameba Series)

WFM-410

(RTL8711AF) Single Module

Data Sheet V1.2 (2017/10/25)

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Document History

Revision	Date	Description
V1.0	2015/08/25	Initial version
V1.1	2015/12/17	Add picture of WFM410 module on page 2
V1.2	2017/10/25	Add Label and packaging design

1. Product Overview

Realtek RTL8711AF is a highly integrated single-chip low power 802.11n wireless LAN (WLAN) network controller. It combines an ARM-Cortex M3 MCU, WLAN MAC, a 1T1R capable WLAN baseband, and RF in a single chip. It also provides a bunch of configurable GPIOs which are configured as digital peripherals for different applications and control usage.

RTL8711AF integrates intemall memories for complete WIFI prowcol functions. The embedded memory configuration also provides simple application developments.

2. Module Parameter

2.1 Basic Parameter

Feature	Detailed Description
Antenna Type	IPEX compatible antenna or PCB antenna
Main chip	RTL8711AF
Frequency range	2.412GHz-2.484GHz
CPU clock	166MHz
Memory capacity	ROM 512KB SRAM 496KB FLASH 1MB
Flash size	NA
PCB stack	2 layers
Operating Voltage	DC 3.3V
Form factor	Half size Mini-Card 19X22.25X1.0mm
Other Interface	UART、JTAG、I2C、I2S、SPI、SDIO

2.2 Current Consumption

Symbol	parameter	Minimum	Typical	Maximum	Units
VA33, VD33IO, SW_HV3	3.3V Supply Voltage	3.0	3.3	3.6	V
VDD_IO	Digital IO Supply Voltage	1.62	1.8~3.3	3.6	V
VA12_AFE, VA12_SYN, VA12_RF	1.2V Core Supply Voltage	1.08	1.2	1.32	V
IDD33	3.3V Rating Current (with internatl regulator and integrated CMOS PA)			450	mA
IDD_IO	IO Rating Current(including VDD_IO)			200	mA
IDD_IO_33	3.3V IO Rating Current			50	mA

3.DVT Report

Mode:11b-HT	Tranceiver:A			Bandwidth:20MHz				Data Rate:11Mbps					
Channel	1	2	3	4	5	6	7	8	9	10	11	12	13	Crt.
Pass/Fail	V	V	V	V	V	V	V	V	V	V	V	V	V	
Gain Stage(Dec)	43	43	43	43	43	43	43	43	43	43	43	43	43	
Output Power(dBm)	17	17.1	17.2	17	17.4	17	17.3	17.3	17.5	17.3	17.1	17.4	17.2	> 17
EVM(%)	6.3	5.9	7.1	5.7	6.3	6.7	6.3	6	7.1	6.3	7.2	6.9	6.1	<8
Freq.Offset(ppm)	-0.87	-0.5	-0.6	-0.6	-0.8	-0.2	-0.9	-0.8	-0.9	-0.7	0.03	-0.4	0.17	±25
Mask	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	
Carr.Leakage(dB)	-48.8	-26.5	-37.1	-49.3	-49.6	-46.9	-43.5	-40.4	-30.7	-35.4	-38.7	-47	-57.3	<2

Mode:11g-HT	Tranceiver:A				Bandwidth:20MHz					Data Rate:54Mbps				
Channel	1	2	3	4	5	6	7	8	9	10	11	12	13	Crt.
Pass/Fail	V	V	V	V	V	V	V	V	V	V	V	V	V	
Gain Stage(Dec)	46	46	46	46	46	46	46	46	46	46	46	46	47	
Output Power(dBm)	15.2	15.2	15.2	15.3	15.2	15.3	15.2	15.2	15.2	15.5	15.2	15.2	15.4	>15
EVM(dB)	-33	-33	-32	-33	-33	-33	-33	-33	-32	-31	-33	-32	-33	<-28
Freq.Offset(ppm)	-0.1	-0.2	-0.3	-0.1	-0.3	-0.2	-0.3	-0.3	-0.2	-0.2	-0.2	-0.4	-0.1	±25
Mask	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	
Carr.Leakage(dB)	-54.54	-49.31	-49.04	-56.93	-52.39	-52.25	-59.48	-43.05	-50.54	-52.21	-48.61	-43.78	-47.63	<-15

Mode:11n-HT	Tranceiver:A				Bandwidth:20MHz					Data Rate:MCS7				
Channel	1	2	3	4	5	6	7	8	9	10	11	12	13	Crt.
Pass/Fail	V	V	V	V	V	V	V	V	V	V	V	V	V	
Gain Stage(Dec)	42	42	42	42	42	42	42	42	42	42	42	42	42	
Output Power(dBm)	13.3	13.4	13.5	13.5	13.6	13.5	13.5	13.4	13.3	13.3	13.3	13.1	13.2	> 13
EVM(dB)	-33	-34	-34	-32	-34	-34	-34	-32	-34	-33	-35	-34	-35	<-30
Freq.Offset(ppm)	0.14	0.1	0.16	0.14	0.2	0.15	0.16	0.1	0.09	0.17	0.23	-0.5	-0.2	±25
Mask	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	
Carr.Leakage(dB)	-65.72	-55.52	-59.32	-45.99	-47.36	-51.21	-44.33	-45.85	-47.22	-55.16	-53.81	-42.37	-46.47	<-15

Mode:11n-HT	Tranceiver:A			Bandwidth:40MHz				Data Rate:MCS7
Channel	3	4	5	6	7	8	9	Crt.
Pass/Fail	V	V	V	V	V	V	V	
Gain Stage(Dec)	42	42	42	42	42	42	42	
Output Power(dBm)	13.69	13.60	13.69	13.70	13.67	13.53	13.58	> 13
EVM(dB)	-33.17	-33.32	-32.96	32.69	-33.33	-33.2	-33.73	<-30
Freq.Offset(ppm)	-0.15	-0.34	-0.23	-0.20	-0.25	-0.38	-0.24	±25
Mask	PASS	PASS	PASS	PASS	PASS	PASS	PASS	
Carr.Leakage(dB)	-37.97	-37.41	-37.17	-38.54	-38.94	-37.49	-37.98	<-15

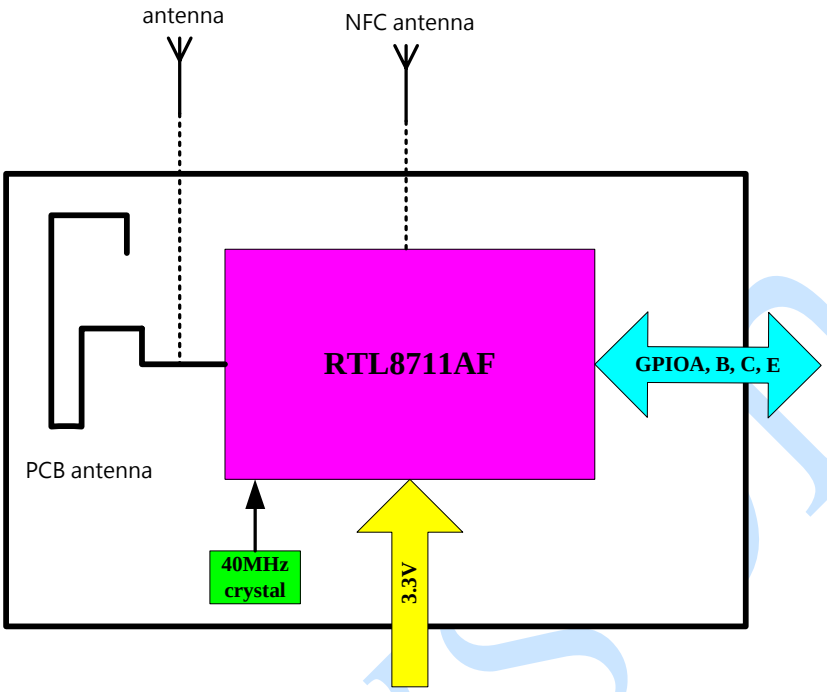
Mode:11b-HT	Receiver:A				Bandwidth:20MHz									
Channel	1	2	3	4	5	6	7	8	9	10	11	12	13	Crt.
11M	-87	-87	-87	-87	-87	-87	-87	-87	-87	-87	-87	-87	-87	≤-76
5.5M	-91	-91	-91	-91	-91	-91	-91	-91	-91	-91	-91	-91	-91	≤-79
2M	-94	-94	-94	-94	-94	-94	-95	-95	-95	-95	-95	-95	-95	≤-80
1M	-95	-95	-95	-95	-95	-95	-95	-95	-95	-95	-95	-95	-95	≤-83

Mode:11g-HT	Receiver:A				Bandwidth:20MHz									
Channel	1	2	3	4	5	6	7	8	9	10	11	12	13	Crt.
54M	-76	-76	-76	-76	-76	-76	-76	-76	-76	-76	-76	-76	-76	≤-65
48M	-77	-77	-77	-77	-77	-77	-77	-77	-77	-77	-77	-77	-77	≤-66
36M	-81	-81	-81	-81	-81	-81	81	-81	-81	-81	-81	-81	-81	≤-70
24M	-85	-85	-85	-85	-85	-85	-84	-84	-84	-84	-84	-84	-84	≤-74
18M	-88	-88	-88	-88	-88	-88	-87	-87	-87	-87	-87	-87	-87	≤-77
12M	-89	-89	-89	-89	-89	-89	-89	-89	-89	-89	-89	-89	-89	**≤-79**
9M	-92	-92	-92	-92	-92	-92	-92	-92	-92	-92	-92	-92	-92	≤-81
6M	-92	-92	-92	-92	-92	-92	-92	-92	-92	-92	-92	-92	-92	≤-82

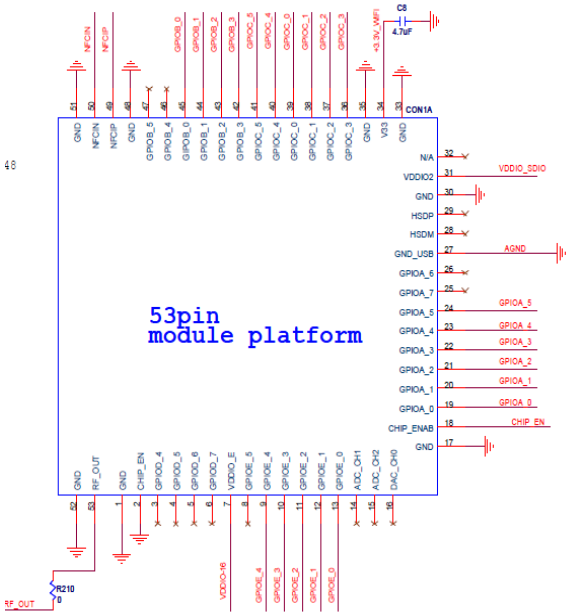
Mode:11n-HT	Receiver:A				Bandwidth:20MHz									
Channel	1	2	3	4	5	6	7	8	9	10	11	12	13	Crt.
MCS7	-73	-73	-73	-73	-73	-73	-73	-73	-73	-73	-73	-73	-73	≤-64
MCS6	-74	-74	-74	-74	-74	-74	-74	-74	-74	-74	-74	-74	-74	≤-65
MCS5	-76	-76	-76	-76	-76	-76	-76	-76	-76	-76	-76	-76	-76	**≤-66**
MCS4	-80	-80	-80	-80	-80	-80	-80	-80	-80	-80	-80	-80	-80	≤-70
MCS3	-83	-83	-83	-83	-83	-83	-83	-83	-83	-83	-83	-83	-83	≤-74
MCS2	-86	-86	-86	-86	-86	-86	-87	-87	-87	-87	-87	-87	-87	≤-77
MCS1	-88	-88	-88	-88	-88	-88	-88	-89	-89	-89	-89	-89	-89	≤-79
MCS0	-92	-92	-92	-92	-92	-92	-92	-92	-92	-92	-92	-92	-92	≤-82

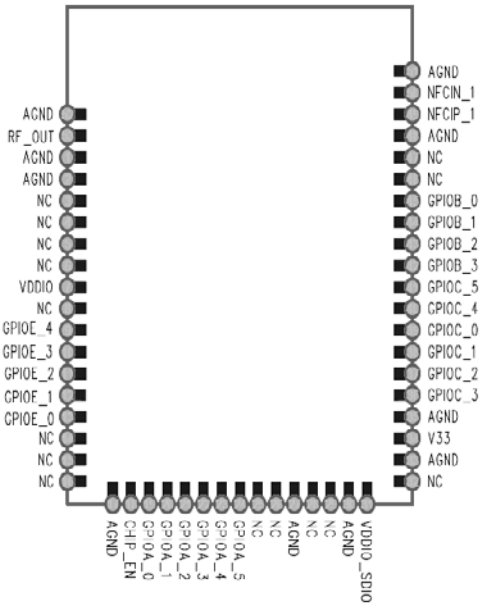
Mode:11n-HT	Receiver:A		Bandwidth:40MHz					
Channel	3	4	5	6	7	8	9	Crt.
MCS7	-70	-70	-70	-70	-70	-70	-70	≤-64
MCS6	-71	-71	-71	-71	-71	-71	-71	≤-65
MCS5	-72.5	-72.5	-72.5	-72.5	-72.5	-72.5	-72.5	≤-66
MCS4	-77	-77	-77	-77	-77	-77	-77	≤-69
MCS3	-80	-80	-80	-80	-80	-80	-80	≤-72
MCS2	-83.5	-83.5	-83.5	-83.5	-83.5	-83.5	-83.5	≤-76
MCS1	-86	-86	-86	-86	-86	-86	-86	≤-78
MCS0	-89.5	-89.5	-89.5	-89.5	-89.5	-89.5	-89.5	≤-80

4. Block Diagram



5. Pin Assignment on module





Abbreviations in used:

I: Input AI: Analog Input O: Output AO: Analog Output

IO: Bi-Directional Input/Output AI/O: Analog Bi-Directional Input/Output

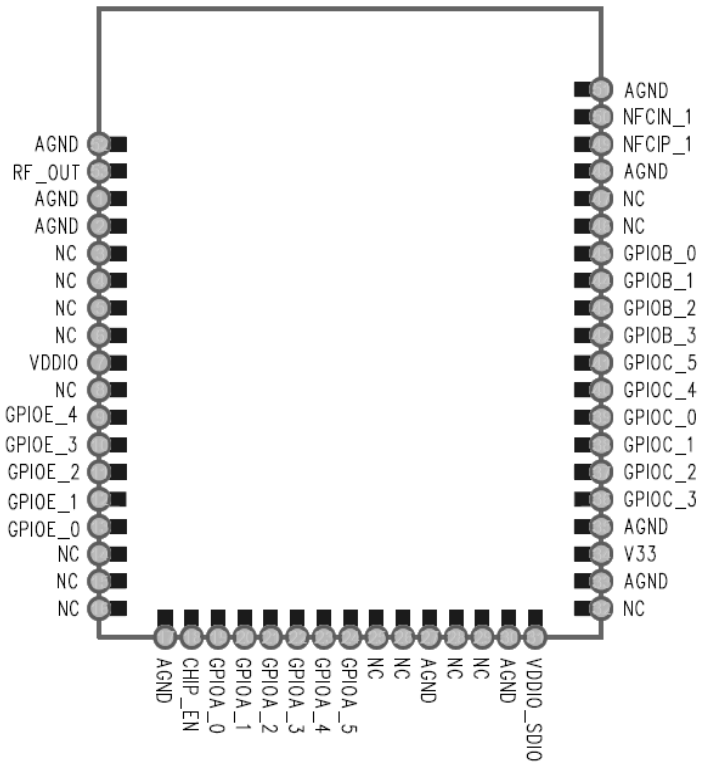
P: Digital Power G: Digital Ground

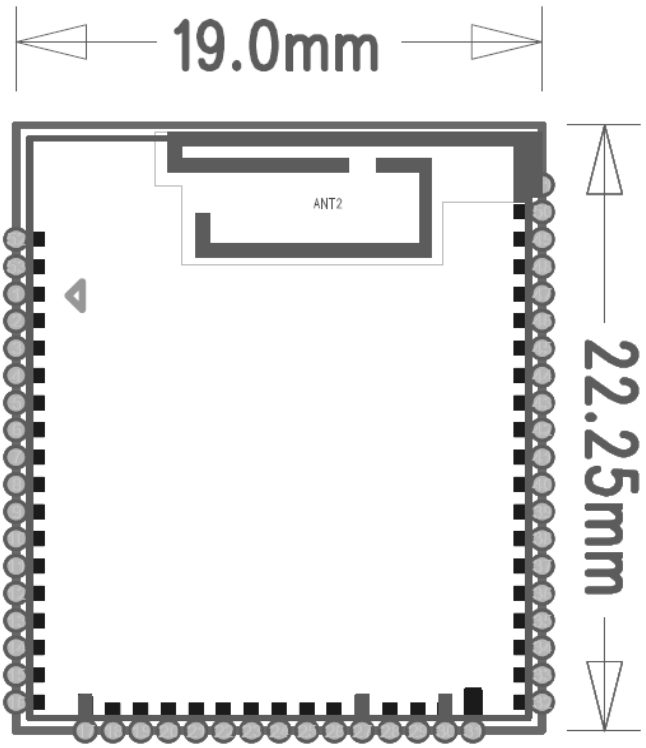
PIN	NAME	TYPE	PIN	NAME	TYPE
1	GND	GND	28	N/A	NC
2	GND	GND	29	N/A	NC
3	N/A	NC	30	GND	GND
4	N/A	NC	31	VDDIO_SDIO	IO
5	N/A	NC	32	N/A	NC
6	N/A	NC	33	GND	GND
7	VDDIO_E	P	34	V33	P
8	N/A	NC	35	GND	GND
9	GPIOE_4	IO	36	GPIOC_3	IO
10	GPIOE_3	IO	37	GPIOC_2	IO
11	GPIOE_2	IO	38	GPIOC_1	IO
12	GPIOE_1	IO	39	GPIOC_0	IO
13	GPIOE_0	IO	40	GPIOC_4	IO
14	N/A	NC	41	GPIOC_5	IO
15	N/A	NC	42	GPIOB_3	IO
16	N/A	NC	43	GPIOB_2	IO
17	GND	GND	44	GPIOB_1	IO
18	CHIP_EN	I	45	GPIOB_0	IO
19	GPIOA_0	IO	46	N/A	NC
20	GPIOA_1	IO	47	N/A	NC
21	GPIOA_2	IO	48	GND	GND
22	GPIOA_3	IO	49	NFCIP_1	I
23	GPIOA_4	IO	50	NFCIN_1	I
24	GPIOA_5	IO	51	GND	GND
25	N/A	NC	52	GND	GND
26	N/A	NC	53	RF_OUT	IO
27	GND_USB	GND			

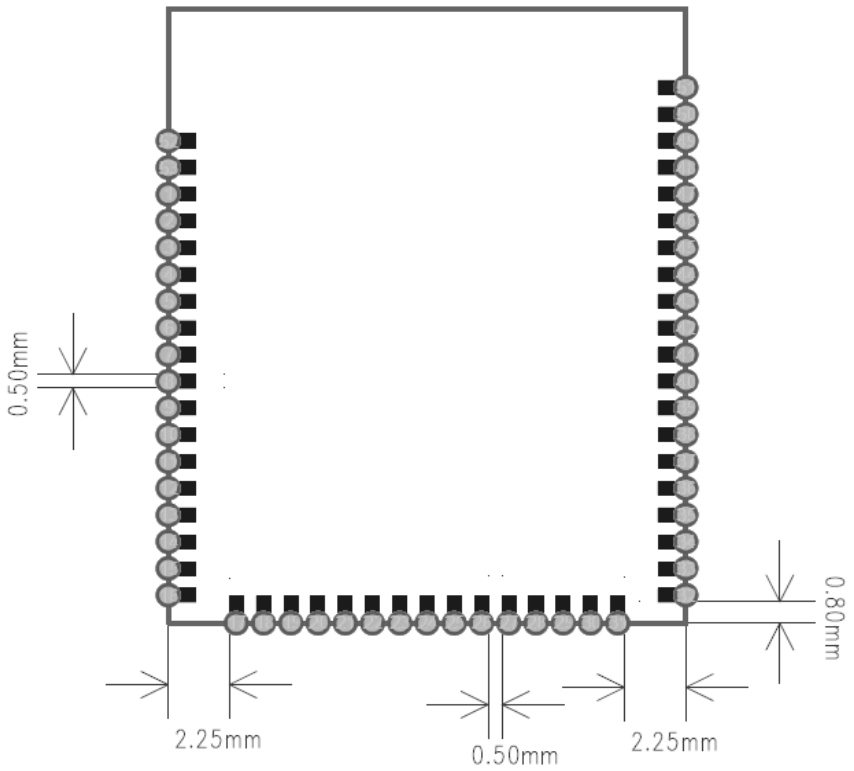
※Pin configurable function group summary table

PIN name	JTAG	SDIO	UART Group	I2C Group	SPI Group	I2S Group	PCM Group	WL_LED	PWM	ETE	WKDT	GPIO INT
GPIOA_0		SD_D2	UART2_IN		SPI1_MISO							GPIO_INT
GPIOA_1		SD_D3	UART2_CTS		SPI1_MOSI							GPIO_INT
GPIOA_2		SD_CMD	UART2_RTS		SPI1_CLK							
GPIOA_3		SD_CLK	UART0_RTS									
GPIOA_4		SD_D0	UART2_OUT		SPI1_CS							
GPIOA_5		SD_D1	UART0_CTS								WKDT0	
GPIOB_0			UART_LOG_OUT							ETE0		
GPIOB_1			UART_LOG_IN					WL_LED0		ETE1		
GPIOB_2				I2C3_SCL						ETE2		
GPIOB_3				I2C3_SDA						ETE3		GPIO_INT
GPIOC_0			UART0_IN		SPI0_CS0	I2S1_WS	PCM1_SYNC		PWM0	ETE0		
GPIOC_1			UART0_CTS		SPI0_CLK	I2S1_CLK	PCM1_CLK		PWM1	ETE1		GPIO_INT
GPIOC_2			UART0_RTS		SPI0_MOSI	I2S1_SD_TX	PCM1_OUT		PWM2	ETE2		
GPIOC_3			UART0_OUT		SPI0_MISO	I2S1_MCK	PCM1_IN		PWM3	ETE3		GPIO_INT
GPIOC_4				I2C1_SDA	SPI0_CS1	I2S1_SD_RX						GPIO_INT
GPIOC_5				I2C1_SCL	SPI0_CS2							GPIO_INT
GPIOE_0	JTAG_TRST		UART0_OUT	I2C2_SCL	SPI0_CS0	I2S0_WS	PCM0_SYNC		PWM0			
GPIOE_1	JTAG_TDI		UART0_RTS	I2C2_SDA	SPI0_CLK	I2S0_CLK	PCM0_CLK		PWM1			GPIO_INT
GPIOE_2	JTAG_TDO		UART0_CTS	I2C3_SCL	SPI0_MOSI	I2S0_SD_TX	PCM0_OUT		PWM2			GPIO_INT
GPIOE_3	JTAG_TMS		UART0_IN	I2C3_SDA	SPI0_MISO	I2S0_MCK	PCM0_IN		PWM3		WKDT3	GPIO_INT
GPIOE_4	JTAG_CLK											

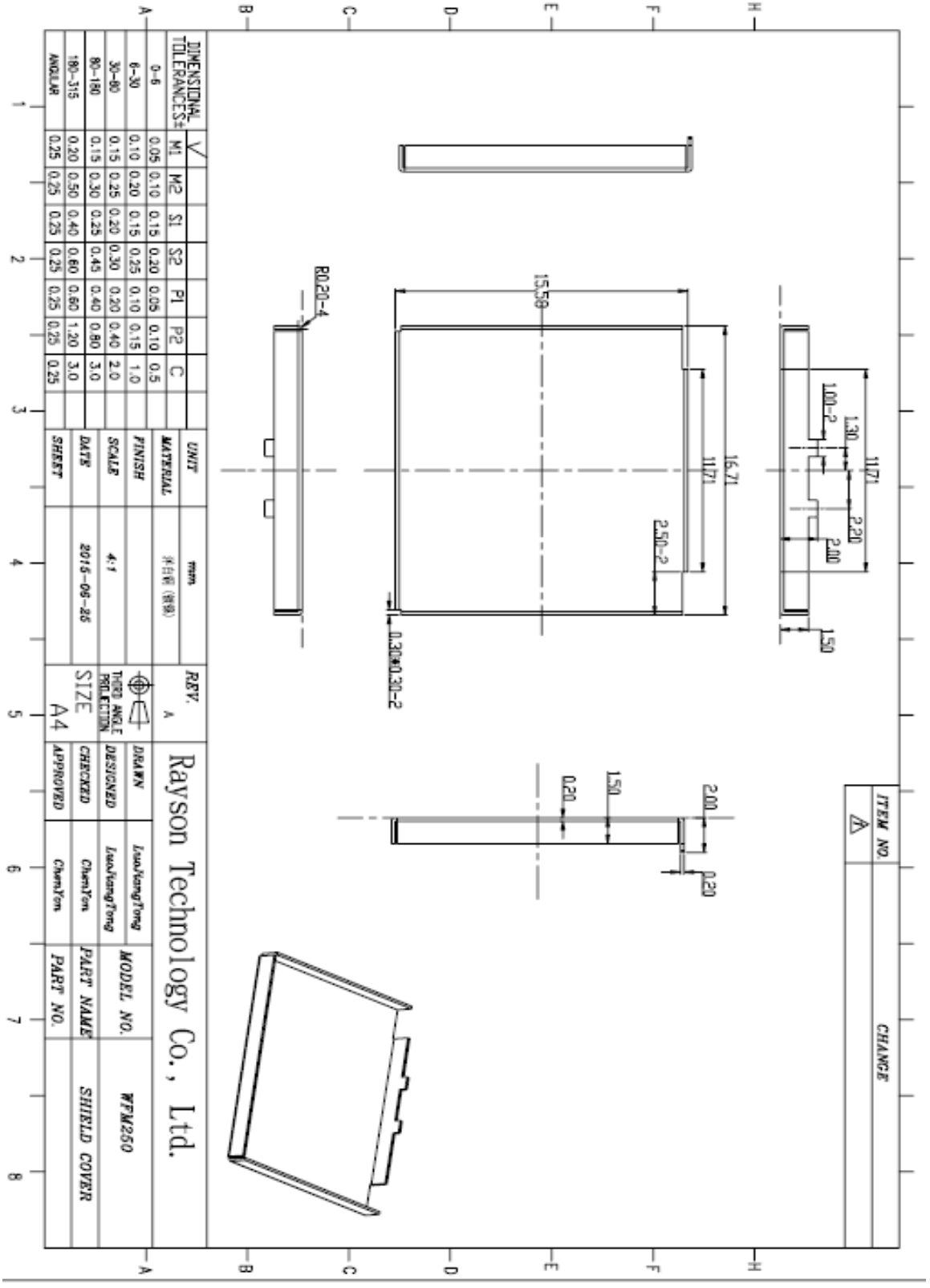
6. Interface Specifications



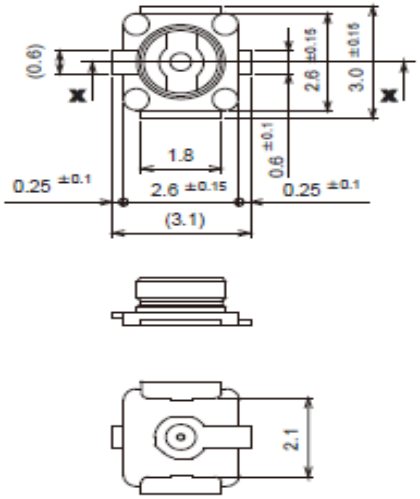

19.0mm
ANT2
22.25mm

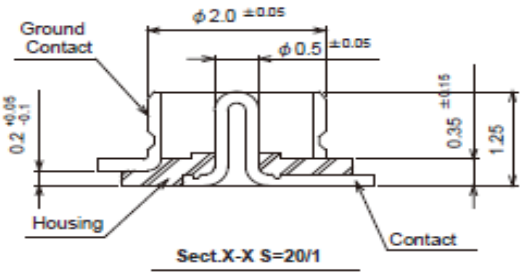

0.50mm
0.80mm
2.25mm
0.50mm
2.25mm

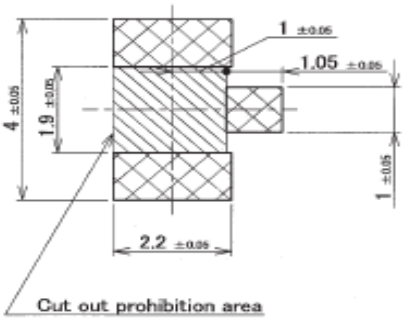
7. shield cover outline drawing

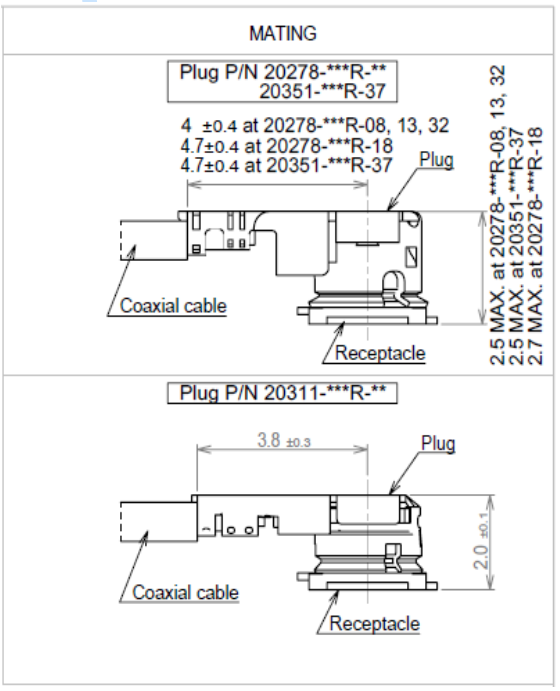


8.RF Connector

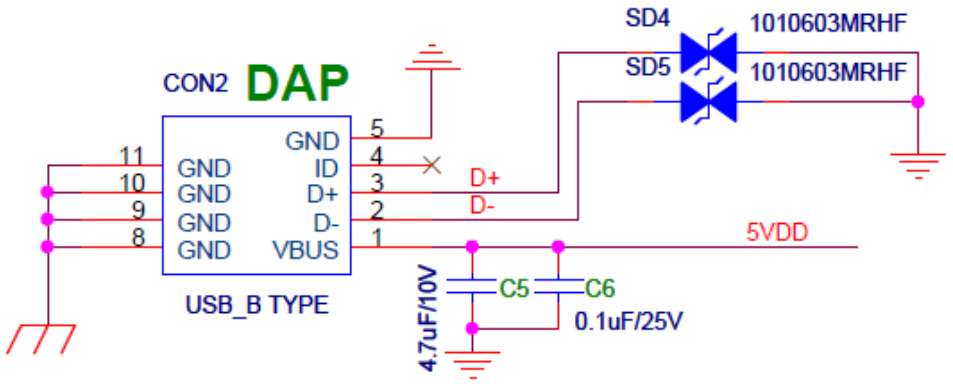
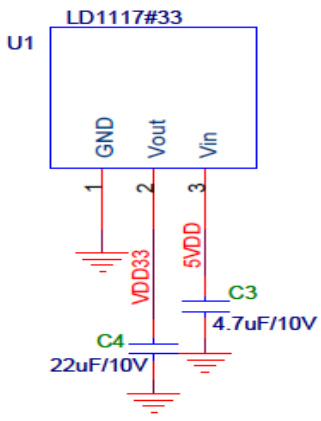




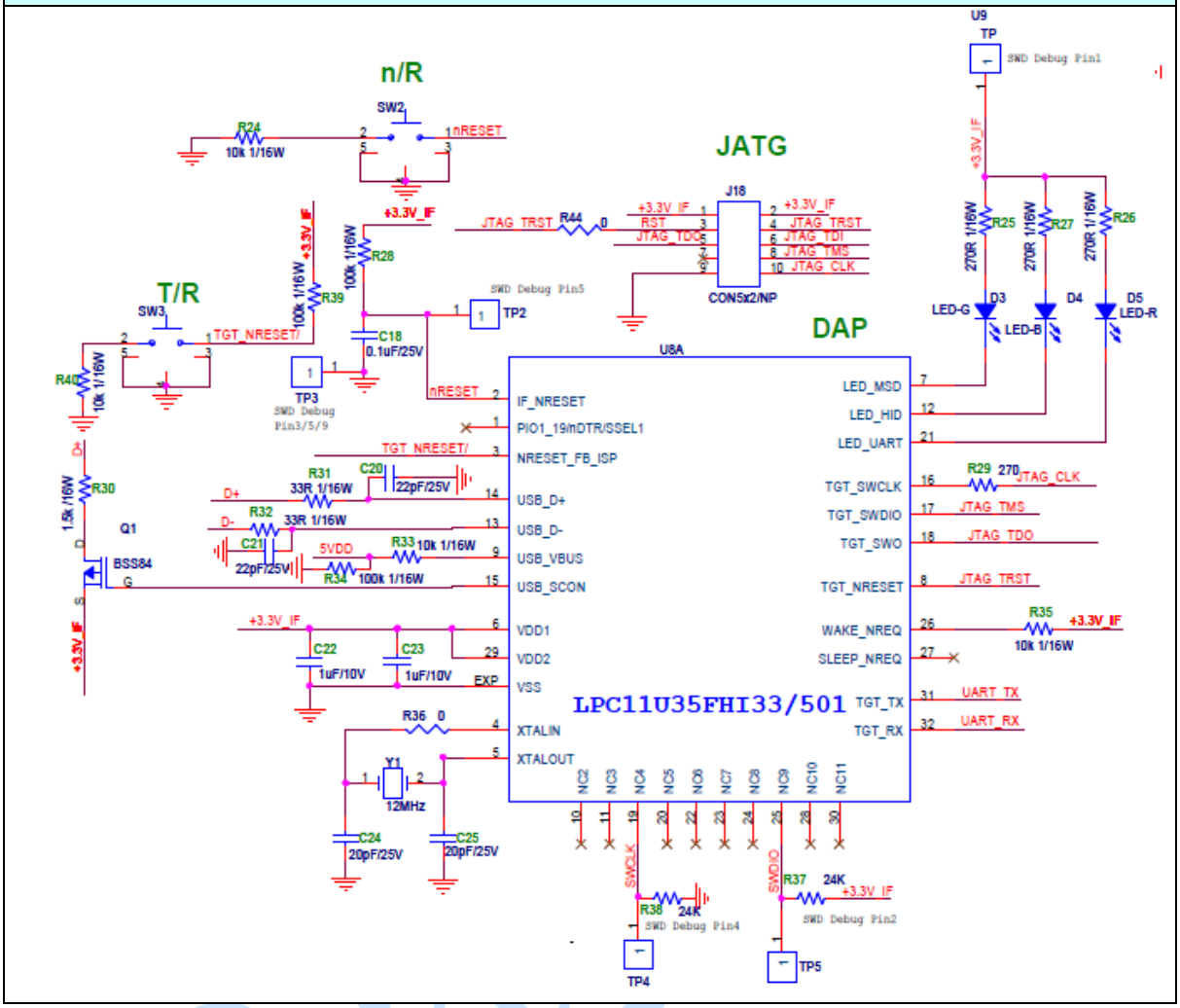




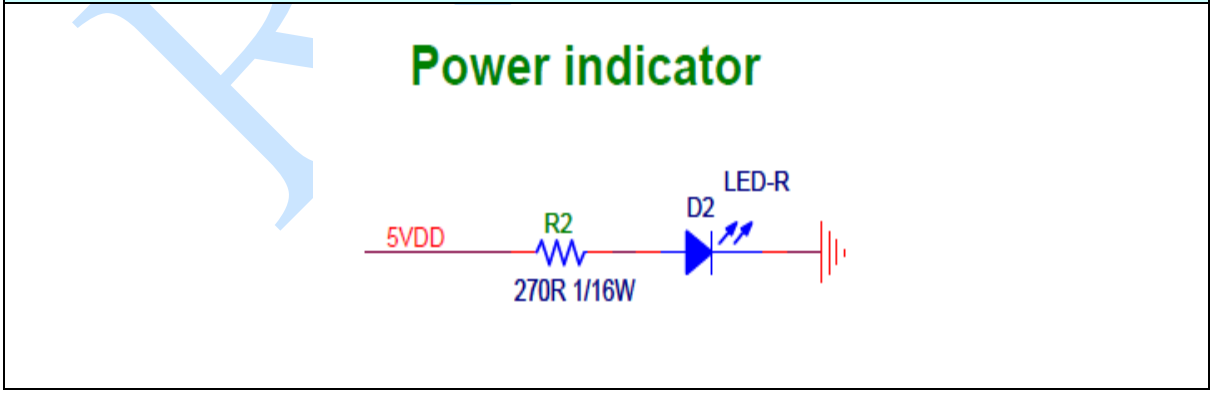
9. Reference Circuit

Power Supply



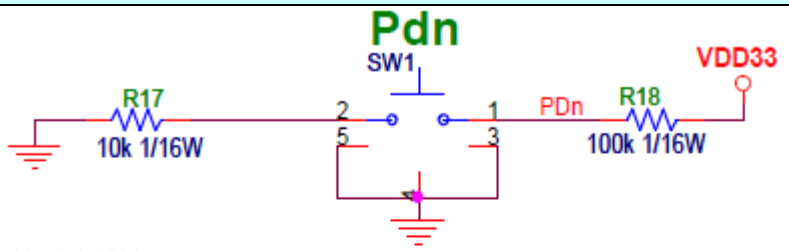
Conversion circuit



LED Circuit



Button Circuit



PDn SW CTRL

SW CTRL Func.	
Press	PL
Release	PH

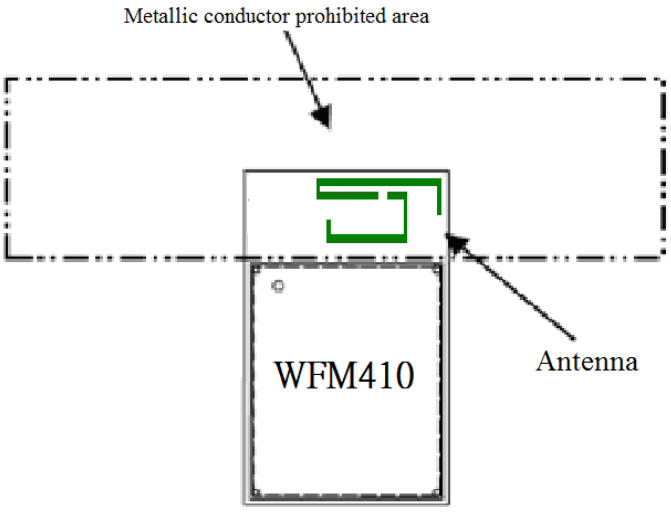
R21,R22 Del. CHIP_EN WIRE TO Pdn.

CHIP_EN PDn

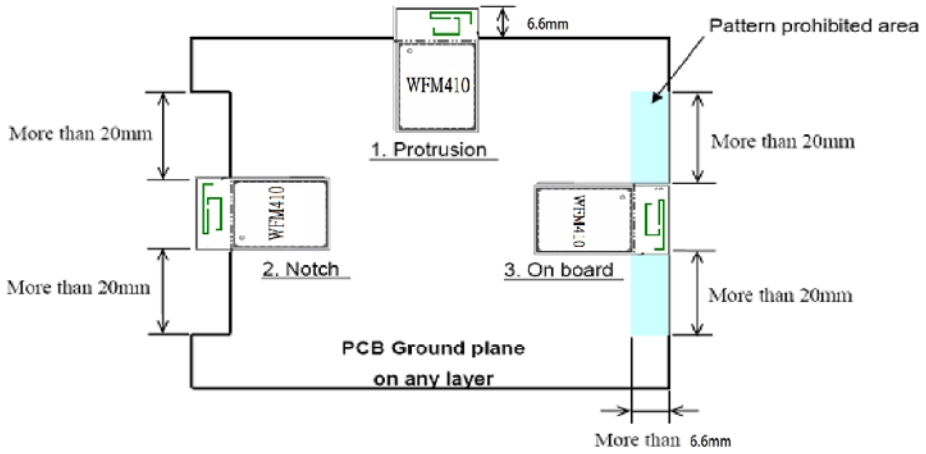
PDn/W_Disable#

10. Layout Guide

You should avoid to put metals or conductive materials close to the antenna. It interferes with the radio emission from the antenna, and the communication distance might be decreased remarkably.

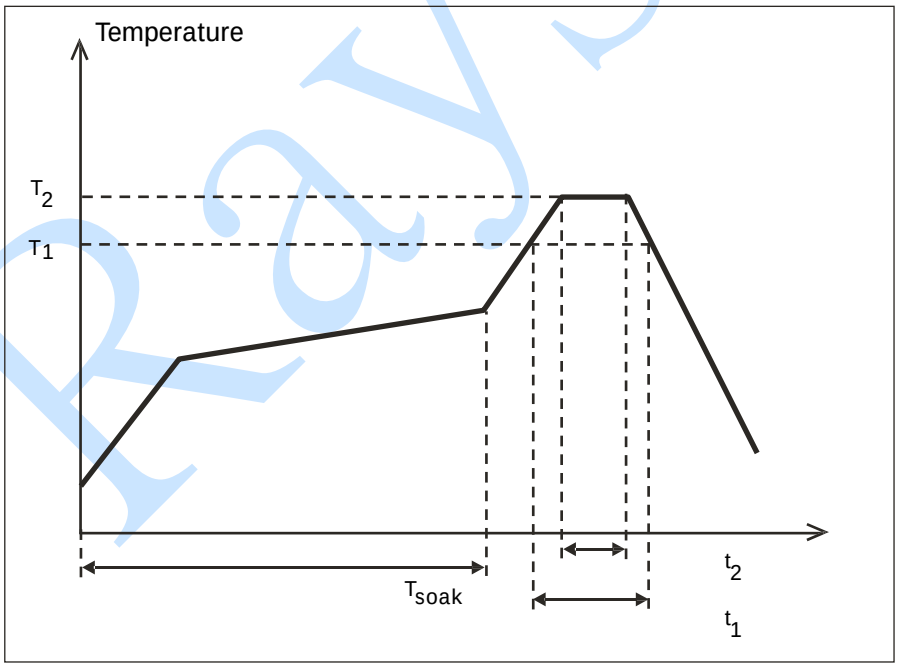


The module layout on your PCB should be designed according to the following guidelines.



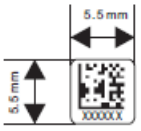
11. Furnace temperature curve

Reflow profile requirements		
Parameter Specification	**Reference**	**Specification**
Average temperature gradient in preheating		1~2.5°C/s to 175°C equilibrium.
Soak time	T_{soak}	120~180 seconds
Time above 217°C (T_1)	t_1	45~90 seconds
Peak temperature in reflow	T_2	250°C (–0/+5°C)
Time at peak temperature	t_2	6 seconds
Temperature gradient in cooling		6°C/second max.



12. Label and packaging design

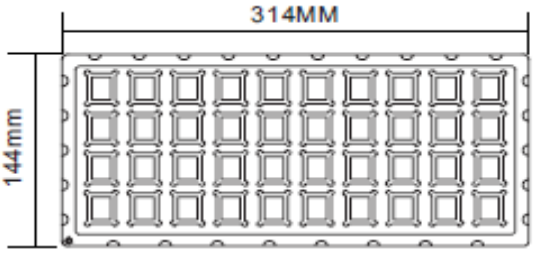
1:1



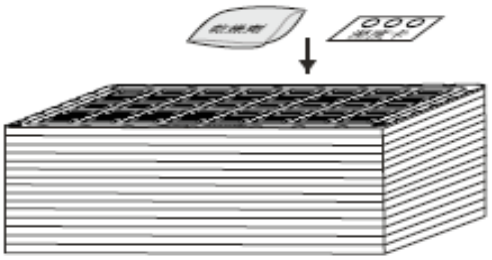
3:1

地址码6位(业务提供)

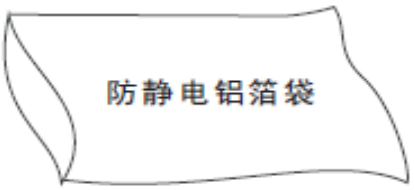
WMF-410 包装示意图



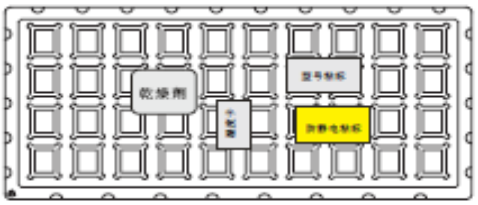
WMF-410 吸塑托盘，可装40PCS
托盘尺寸：314*144*7.5mm (L*W*H)



1托盘装40pcs,11托盘入内盒，上面1PCS是空的。

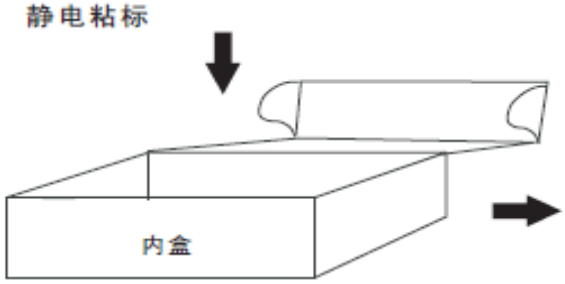


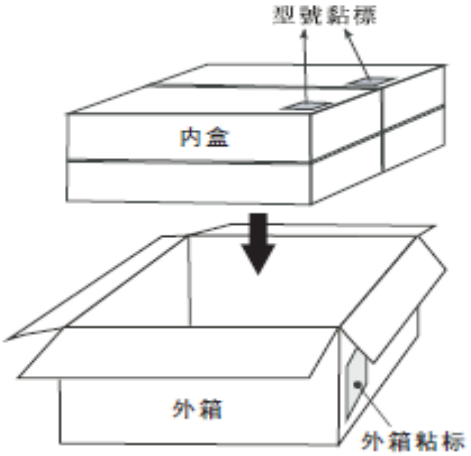
将装入模组的托盘放入防静电铝箔袋中抽真空。



防静电铝箔袋外贴型号粘标及防静电粘标

一盒装400PCS，盒外正面加贴型号粘标，4内盒入外箱





1600PCS/外箱
外箱粘标贴于外箱侧唛

End of Datasheet

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