



# QRZ-3100-PA

## ZigBee Transceiver Module

### User Manual

### Version 0.9

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## Revision History

Version	Description	Editor	Date
V0.1	First draft version	Liwei Chour	2007/10/23
V0.2	Change TX / RX direction in drawing (page 5)	Liwei Chour	2007/11/23
V0.3	Add application board reference design (page 13-15)	Jess Liu	2007/12/17
V0.4	Add PCBA picture and manual Index	Jess Liu	2008/3/3
V0.5	Change circuit diagram (page 12)	Jess Liu	2008/3/20
V0.6	Modify module mechanical drawing(page 8)	Jess Liu	2008/4/22
V0.7	Add I/O pin electrical specifications (page 11)	Ted Cheng	2008/6/16
V0.8	Change feature (page 5)	Liwei Chour	2009/4/27
V0.9	Remove QRZ-1100-PA description	Liwei Chour	2010/4/14

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Revised Date: Jun. 16, 2008

## 1. GENERAL INFORMATION

The QRZ-3100-PA is a miniature 2.4 GHz Direct Sequence Spread Spectrum ZigBee transceiver. It includes all RF hardware and a micro-controller to manage the communications link. The micro-controller manages all communications task including configuration, data packaging, and clear channel selection. The result is a complete wireless data communications solution.

The QRZ-3100-PA package is unique because of its small form factor (32 x 23 mm<sup>2</sup>), It has an on-board chip antenna and the availability of external dipole antenna I-PEX connector. No competitive products can offer a solution as flexible, convenient, and easy to integrate,

There are two QRZ-3100 serial models; the QRZ-3100 with the on-board chip antenna and dipole antenna I-PEX connector, the QRZ-3100-PA with power amplifier, low noise amplifier, on-board chip antenna and dipole antenna I-PEX connector. The power amplifier enhances the transmission power and low noise amplifier increases receiving signal sensitivity. The power amplifier, low noise amplifier and dipole antenna improve range while the QRZ-3100 lowers system cost and simplifies integration.

### Models

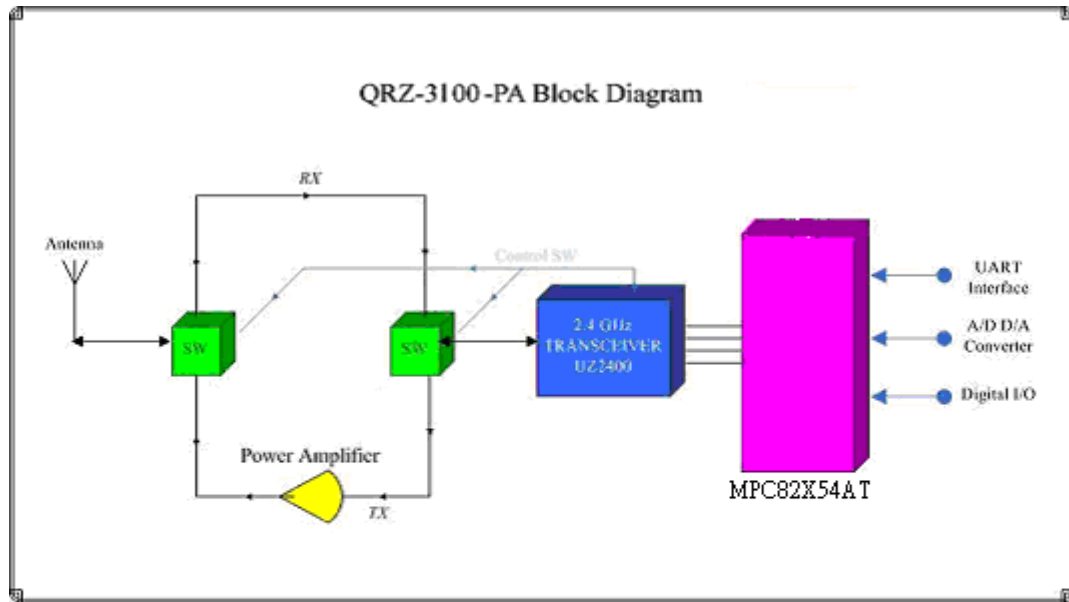
- QRZ-3100-PA: Includes PA/LNA, On-board chip Antenna Connector, MCU is Megawin MPC82X54AT
- QRZ-3100-PAE: Includes PA/LNA, Dipole Antenna Connector, MCU is Megawin MPC82X54AT

### Features

- 32 x 23 mm<sup>2</sup> PCBA package with 2 connectors
- Utilizes globally available 2.4 GHz ISM band
- Control and Configuration with UART commands.
- Programmable Transmit Power Output, max. 9 dBm
- Complete IEEE 802.15.4 spec compliant
- Typical Receiver Sensitivity -101 dBm
- Typical Throughput rate 250,000 bps
- Multiple Low Power Operating modes
- Meet RoHS Requirement



## 2. BLOCK DIAGRAM





### 3. PCBA PICTURES AND MECHANICAL DRAWING

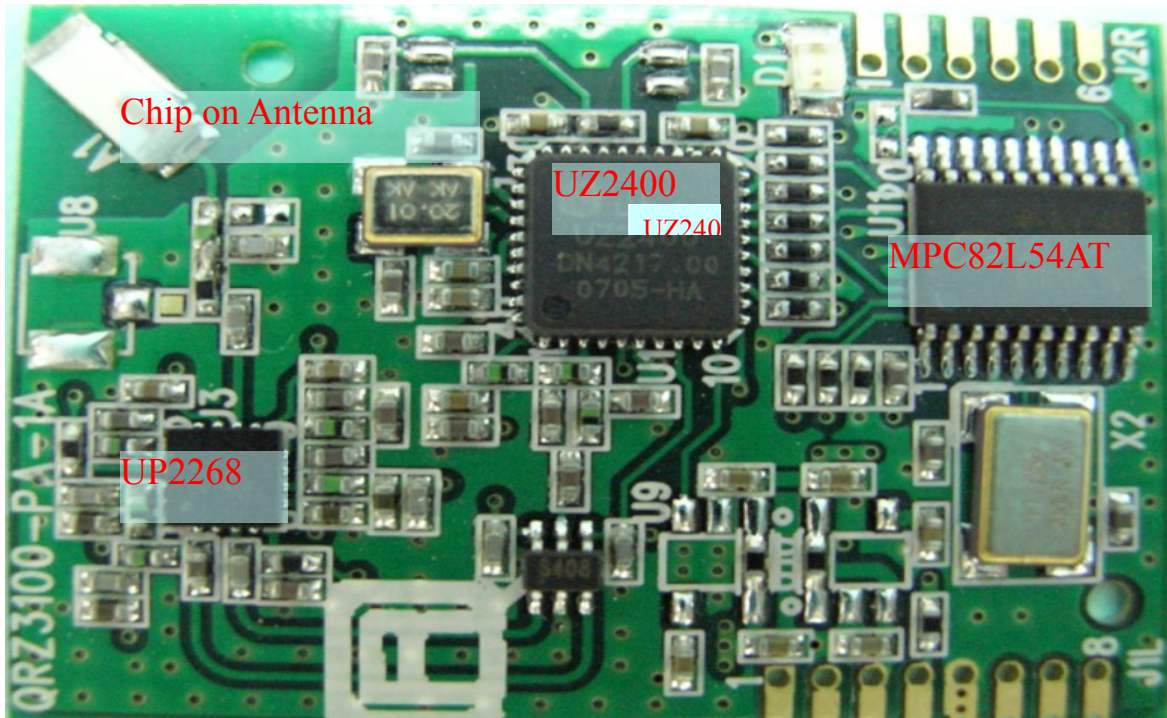


Figure 1. QRZ-3100-PA PCBA Front View

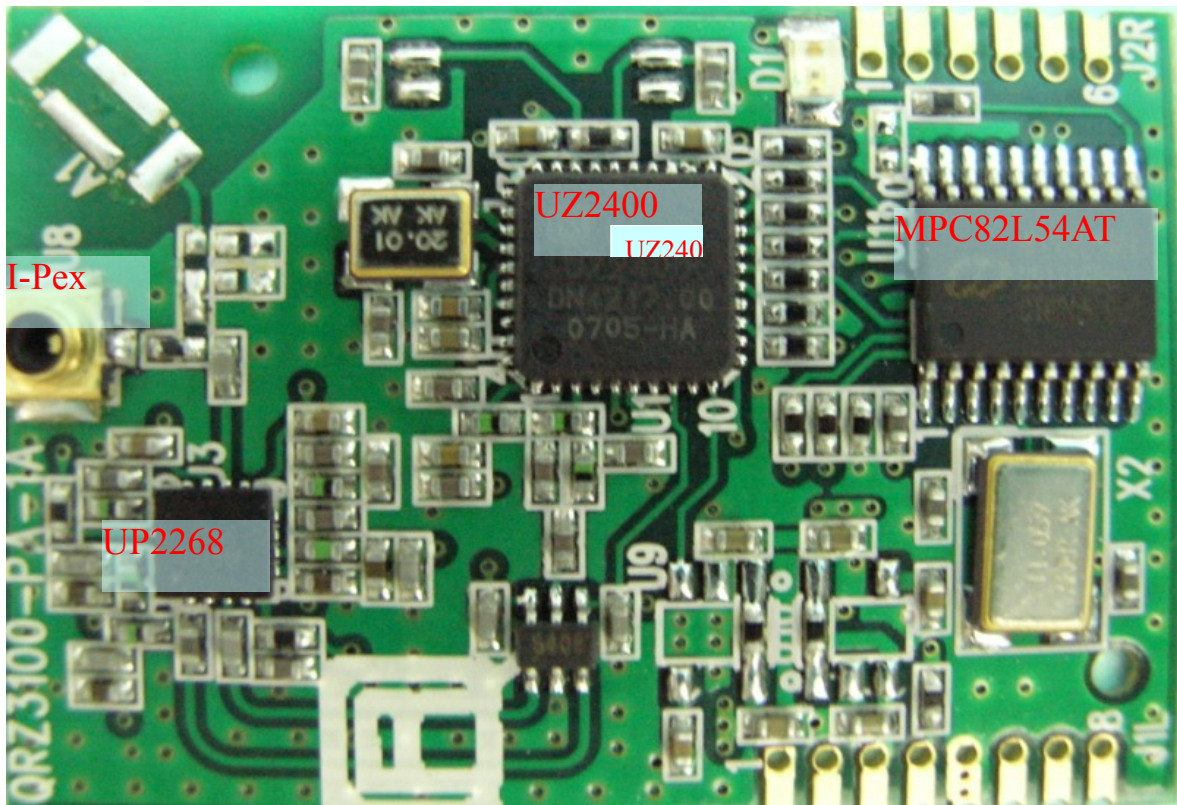
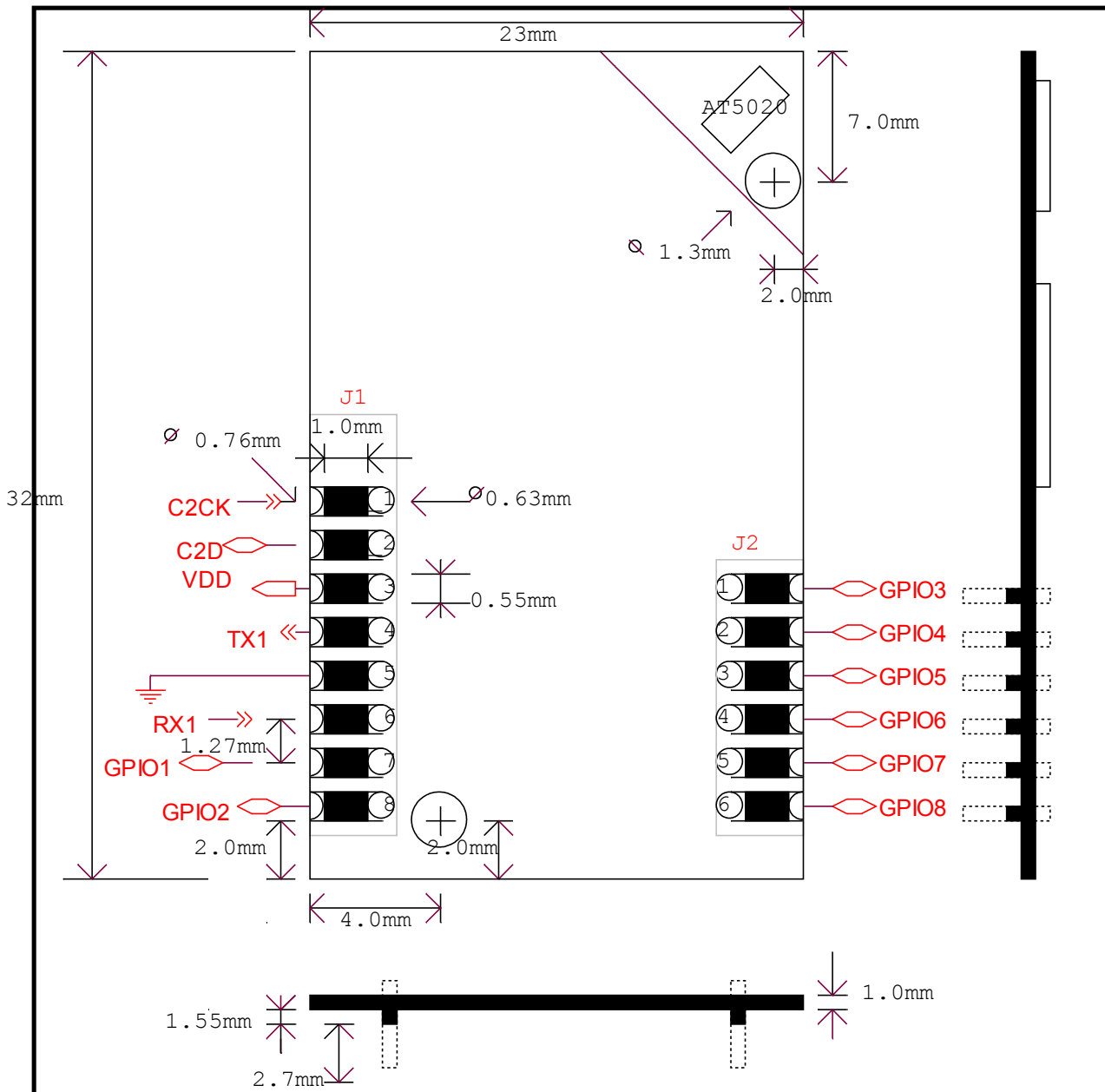


Figure 2. QRZ-3100-PAE PCBA Front View



### QRZ-3100-PA ZigBee Transceiver Module Mechanical Drawing



Note : J1, J2 are SMD type with stamp holes



#### 4. POWER SAVING MODES

The QRZ-3100-PA includes several low power operating modes to permit the most efficient use of the available power. Below are descriptions of the available selections.

**ACTIVE:** In Active Mode, all QRZ-3100-PA circuits are powered and available for immediate action. This includes the RF receiver which actively monitors the air for an incoming communications request. Two sub-modes are classified as TX-ACTIVE and RX-ACTIVE. The current consumption of TX-ACTIVE is 35 mA while RX-ACTIVE is 34 mA.

**SLEEP(Internal wakeup):** In this mode, MCU circuits stop. The RF chip circuits work and start counting. When time up, the RF chip wakes up automatically. Then the RF chip wakes MCU up using interrupt. Current draw in Standby Mode is less than 110 uA.

**SLEEP(External wakeup):** In this mode, MCU and RF chip circuits stop. Users can use interrupt to wake MCU up. When MCU wake up, it use the COMMAND to wake RF chip up. Current draw in Standby Mode is less than 110 uA.



**5. CONNECTORS PIN CONFIGURATION**

QRZ-3100-PA uses Megawin MPC82X54AT as MCU. It is an 8051 base MCU and reserves 10 GPIO pins for external controlling by application. Each pin can be a general I/O pin and programmed it by user directly. Furthermore, most of these pins can be used as special purpose function. Thereof TX, RX pins can be programmed as UART for data communication. For example, user is easy to connect these pins with RS485 transceivers such as 75176, MAX485, or programs to a 10-bit ADC, or PCA.

**J1 Pin Configuration**

Signal	Pin	Description
C2CK	1	(Reserved)
C2D	2	(Reserved)
VCC	3	3.3 Volt power for the QRZ-3100A-PA
TX	4	GPIO, also used as UART TX, transmits data from QRZ-3100A to UART
GND	5	Common voltage reference for the QRZ-3100A-PA
RX	6	GPIO, also used as UART RX, receives data from UART to QRZ-3100A.
GPIO1	7	GPIO port 3.3, may be programmed as either a digital input or digital output. It also can be programmed as external interrupt
GPIO2	8	GPIO port 3.4, may be programmed as either a digital input or digital output. It also can be programmed as external clock input to PCA as alternative clock input to timer-0

**J2 Pin Configuration**

Signal	Pin	Description
GPIO3	1	GPIO port 3.5, may be programmed as either a digital input or digital output. It also can be programmed as external clock input to PCA as alternative clock input to timer-1
GPIO4	2	GPIO port 3.7, may be programmed as either a digital input or digital output. It also can be programmed as external clock input to PCA
GPIO5	3	GPIO port 1.0, may be programmed as either a digital input or digital output. It also can be programmed as analog to digital converter (ADC0)
GPIO6	4	GPIO port 1.1, may be programmed as either a digital input or digital output. It also can be programmed as analog to digital converter (ADC1)
GPIO7	5	GPIO port 1.2, may be programmed as either a digital input or digital output. It also can be programmed as analog to digital converter (ADC2)
GPIO8	6	GPIO port 1.3, may be programmed as either a digital input or digital output. It also can be programmed as analog to digital converter (ADC3)

**6. ELECTRICAL SPECIFICATIONS**

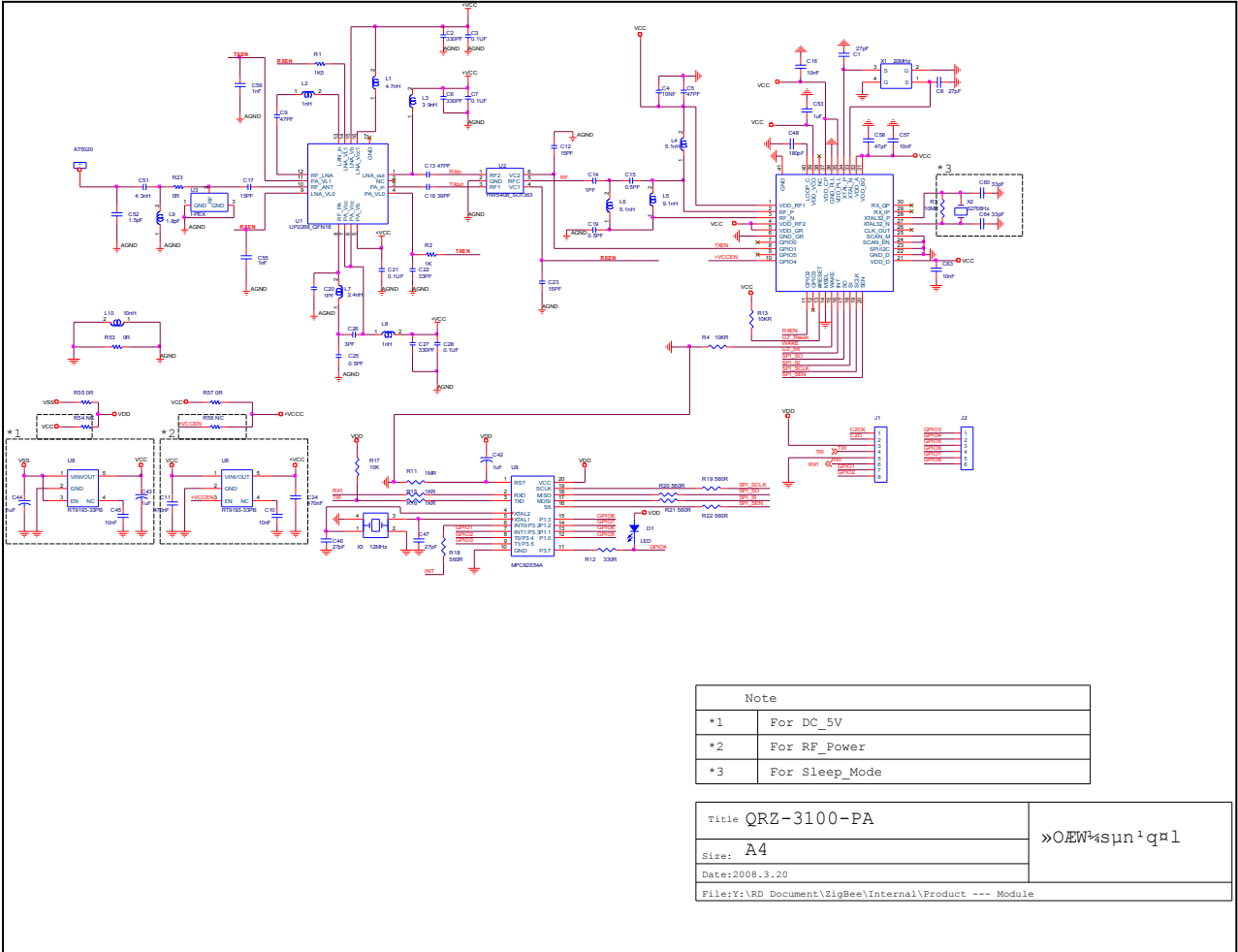
Absolute Maximum Rating	
VCC	3.6 V
Storage temperature	-40°C to +120°C
Operating temperature Range	-30°C to +80°C

WARNING: Exceeding any of these ratings will void the warranty and may damage the device

Parameters	Min	Typ	Max	Units
Supply Voltage for RF, analog and digital circuits	3	3.3	3.6	V
Digital I/O Pin Input High Voltage	2.0			V
Digital I/O Pin Input Low Voltage			0.8	V
Analog Input Pin Input Voltage	0		3.3	V
I/O Pin Output High Current	4	8		mA
I/O Pin Output Low Current	8	14		mA
I/O Pin Input High Current		0	10	uA
I/O Pin Input Low Current		0	10	uA
Current Consumption				
ACTIVE TX Mode @ 12 dBm		35		mA
ACTIVE RX Mode		34		mA
SLEEP(Internal wakeup)		110		uA
SLEEP(external wakeup)		110		uA
Output Power		9		dBm
Wireless Receive Sensitivity		-101		dBm
Selectable Channels		16		channel
Frequency Band	2.400		2.4835	GHz
Antenna Output Impedance		50		Ohms



# 7. CIRCUIT DIAGRAM





<b>8. BILL OF MATERIAL</b>				
Item	Quantity	Reference	Part	Description
1	1	A1	AT5020	LCC8
2	1	C4	100pF	0402
3	1	C7	NC	0402
4	1	C9	10pF	0402
5	2	C10,C12	NC	0402
6	3	C11,C18,C20	330pF	0402
7	1	C13	33pF	0402
8	1	C14	100nF	0402
9	2	C16,C15	1.5pF	0402
10	1	C17	1.8pF	0402
11	2	C21,C54	27pF	0402
12	4	C22,C24,C25,C26	7pF	0402
13	1	C23	3nH	0402
14	2	C27,C29	20pF	0402
15	2	C31,C28	470nF	0402
16	1	C30	20pF	0402
17	1	C32	10nF	0402
18	1	C33	3.3pF	0402
19	2	C37,C43	0.5pF	0402
20	1	C38	10pF	0402
21	4	C39,C52,C58,C63	10nF	0402
22	2	C57,C40	47pF	0402
23	1	C48	180pF	0402
24	1	C53	1uF	0402
25	2	C60,C64	33pF	0402
26	3	C65,C66,C67	1uF	0805
27	1	C68	10nF	0402
28	2	C69,C70	27pF	0402
29	1	D1	LED	0805
30	1	J1	CON5	HD_1.27
31	1	J2	CON10A	HD_1.27
32	1	L1	1.8nH	0402
33	1	L2	4.7nH	0402
34	2	L5,L3	5.1nH	0402
35	1	L4	9.1nH	0402
36	1	L6	2nH	0402
37	1	L7	33nH	0402
38	1	RFIN_g1	I-PEX Antenna	

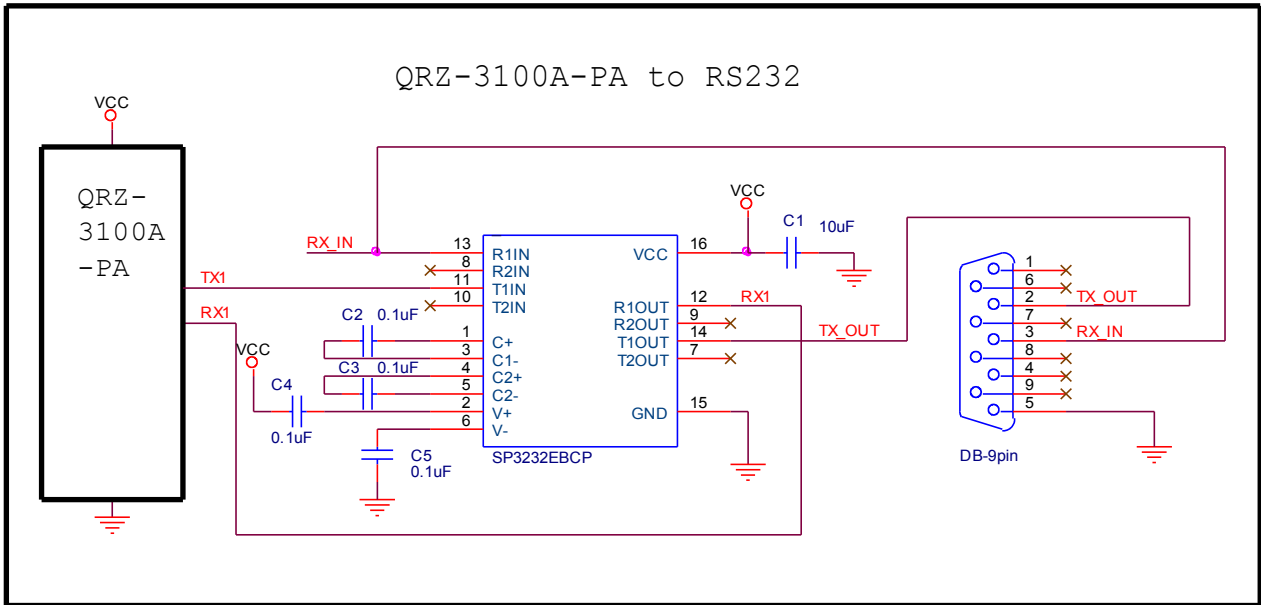


39	2	R2,R1	180R	0402
40	1	R3	30R	0402
41	1	R4	10KR	0402
42	1	R5	10MR	0402
43	2	R6,R17	0R	0402
44	1	R7	160R	0402
45	1	R8	24KR	0402
46	1	R10	0R	0402
47	2	R15,R11	10KR	0402
48	2	R12,R13	1KR	0402
49	1	R14	220R	0402
50	1	R16	4.7KR	0402
51	4	R18,R19,R20,R21	560R	0402
52	1	TP1	I-PEX_ANTENNA	TP24S
53	1	U1	UZ2400	QFP40-0.5
54	1	U3	MPC82X54AT	SOP20-7.5_1.27
55	1	U4	UP2268	2_2_8LEAD
56	1	U6	HWS408	AS179
59	1	U8,U10	RT9193-33PB	SOT-23-5
61	1	X1	20MHz	CX_101F
62	1	X2	32768Hz	OSC2
63	1	X3	11.0592MHz	XTAL-5X3.2-4P_S

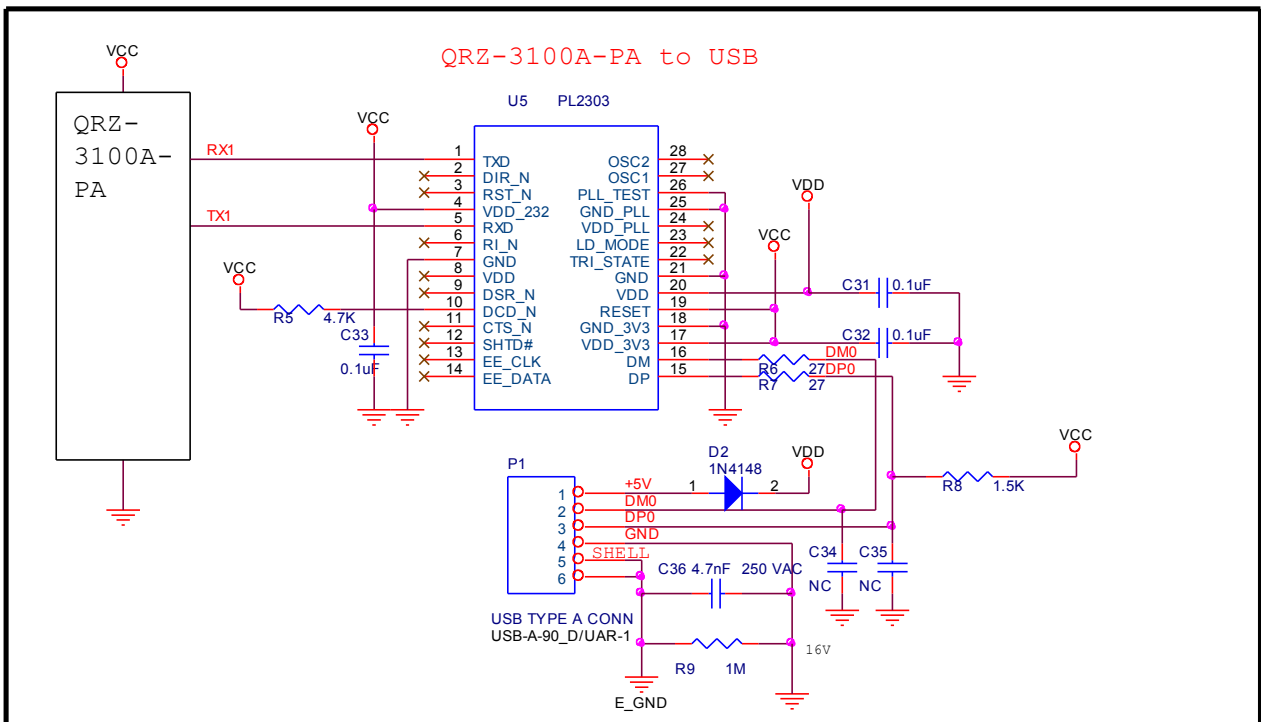


### 9. APPLICATION CIRCUIT DIAGRAM

#### SIPEX SP3232EBCP APPLICATION CIRCUIT



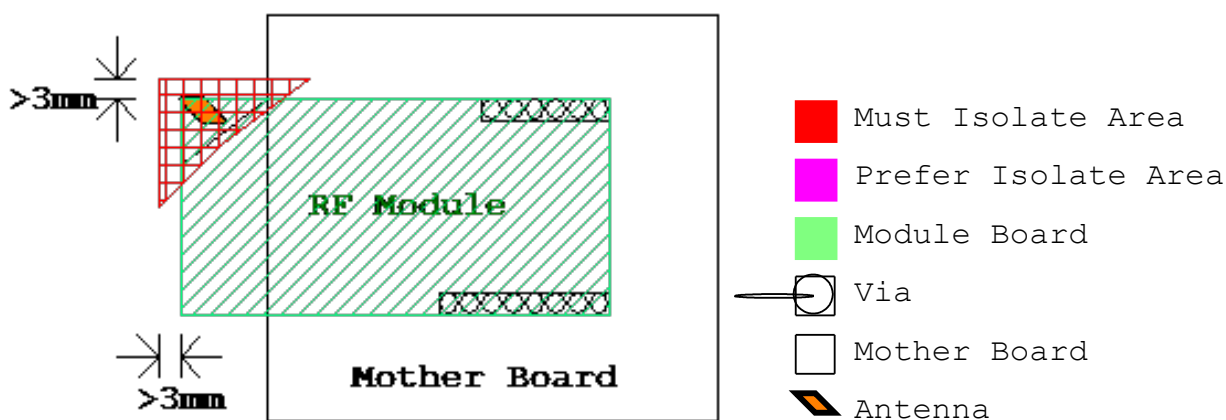
#### PROLIFIC PL2303 APPLICATION CIRCUIT



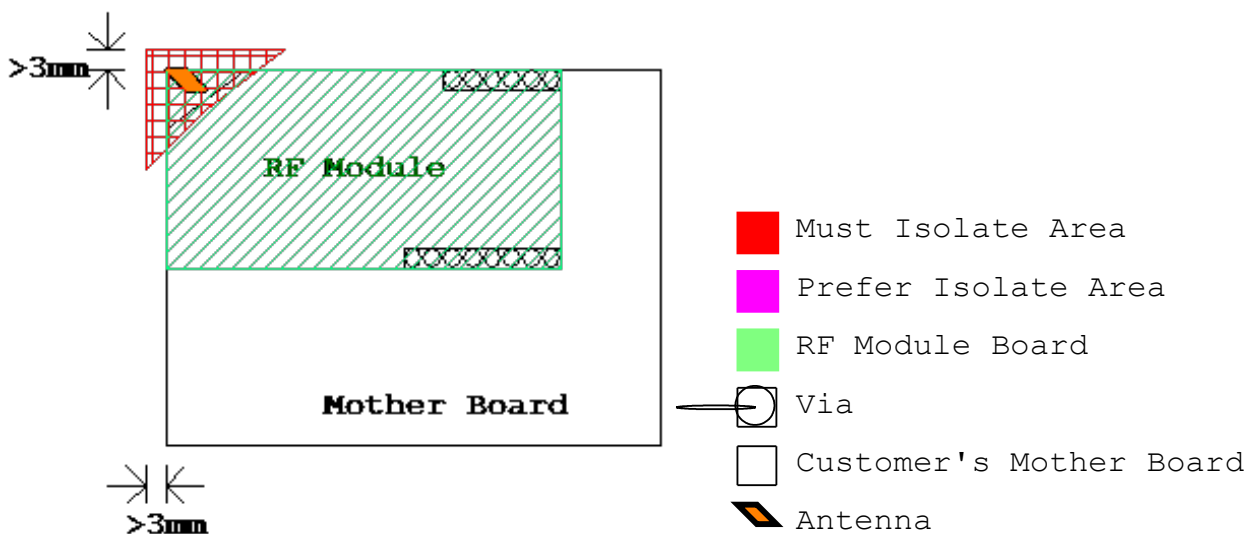
**10. DESIGN GUIDE TO AVOID RF INTERFERENCE**

When RF module put on an application board(mother board), to minimize the RF signal interference, the best way is to define an isolation area. This area should have no any trace or grounding pad. Here are some layout suggestions for mother board.

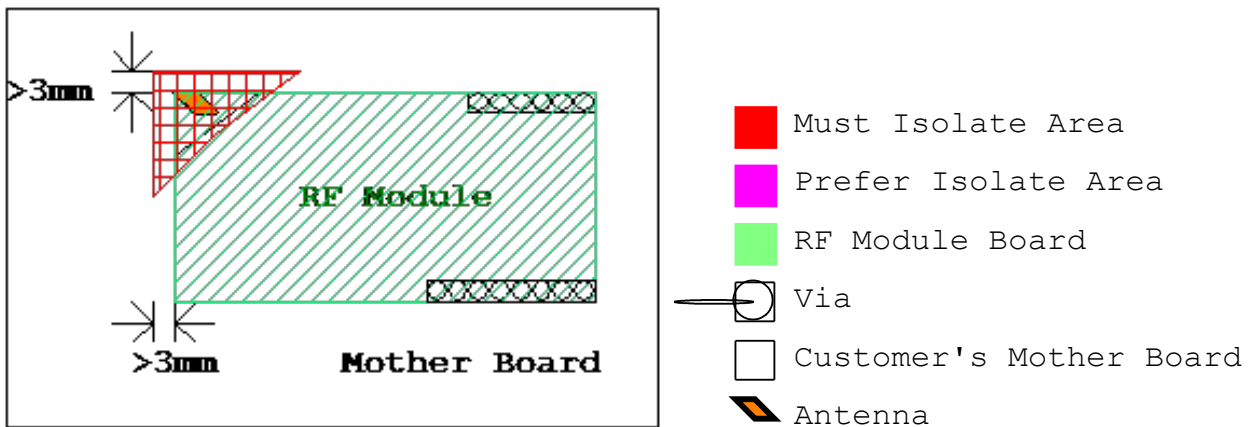
Suggestion 1: Place RF board aside mother board. (Let antenna part outside mother board is better) Make sure no trace and grounding pad under the must isolate area. Please see the drawing as below.



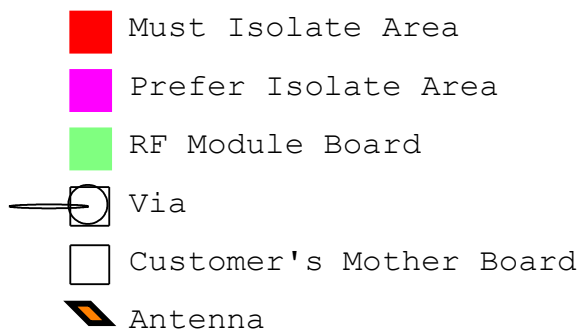
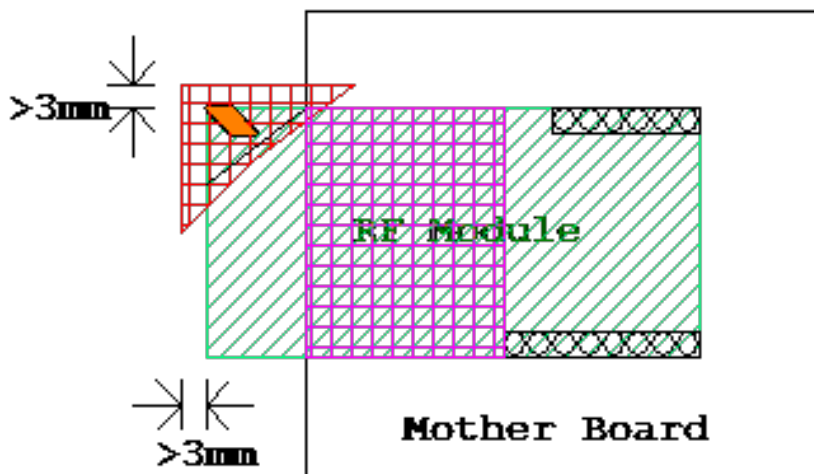
Suggestion 2: Place RF board at the corner of mother board. Make sure no trace and grounding pad under the must isolate area. Please see the drawing as below.



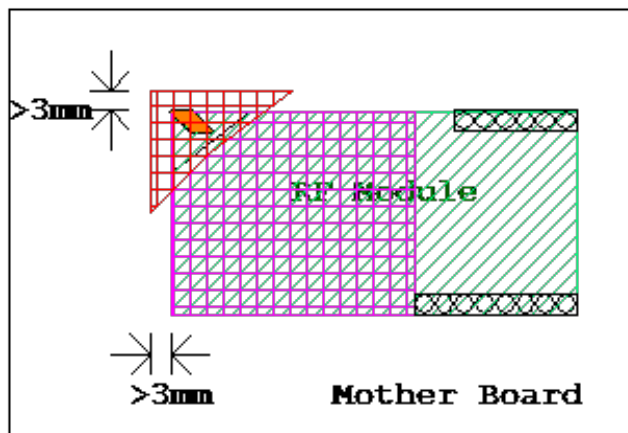
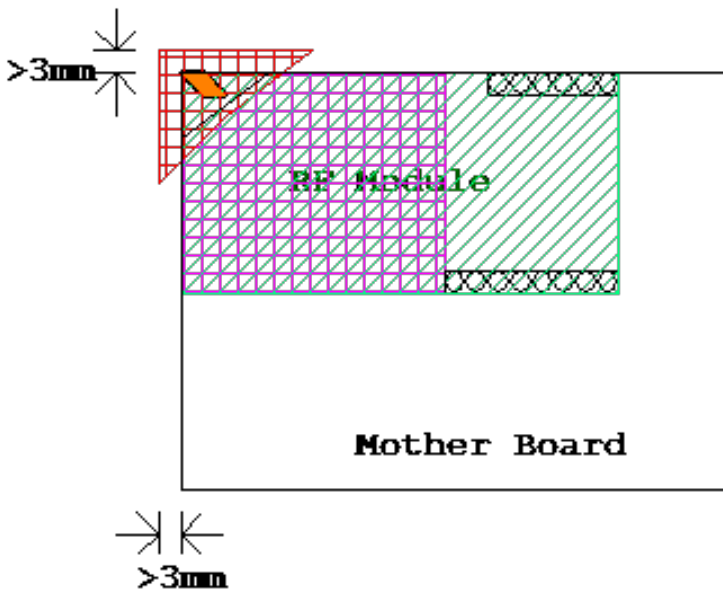
Suggestion 3: If you couldn't put RF board at one side or at the corner of mother board. You must make sure no circuit trace and grounding pad under the must isolate area, and at least reserve extra 3 mm space as safety area. Please see the drawing as below.




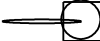




For all of above suggestions, try to extend isolation area from must area to prefer area. Please see the drawing as below. The more isolation area, the better RF performance.





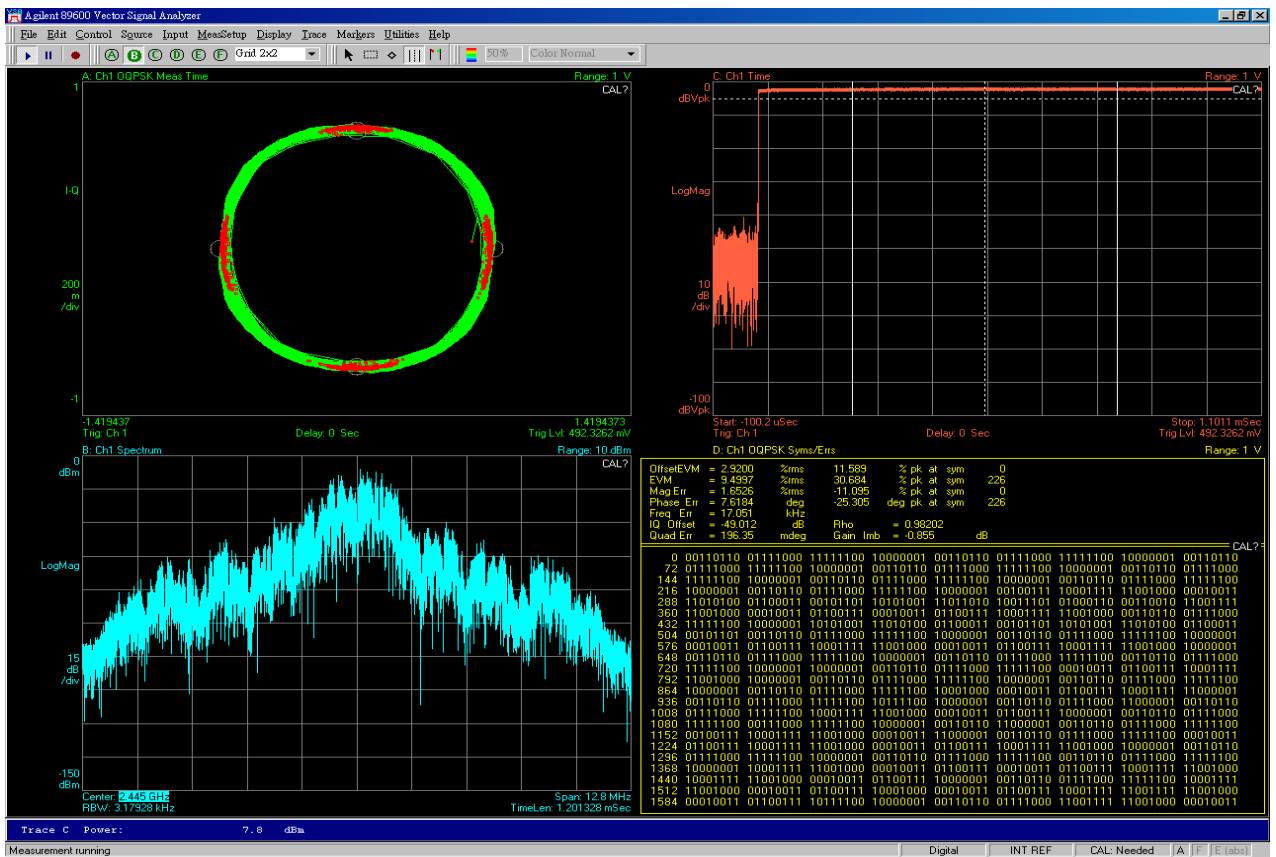
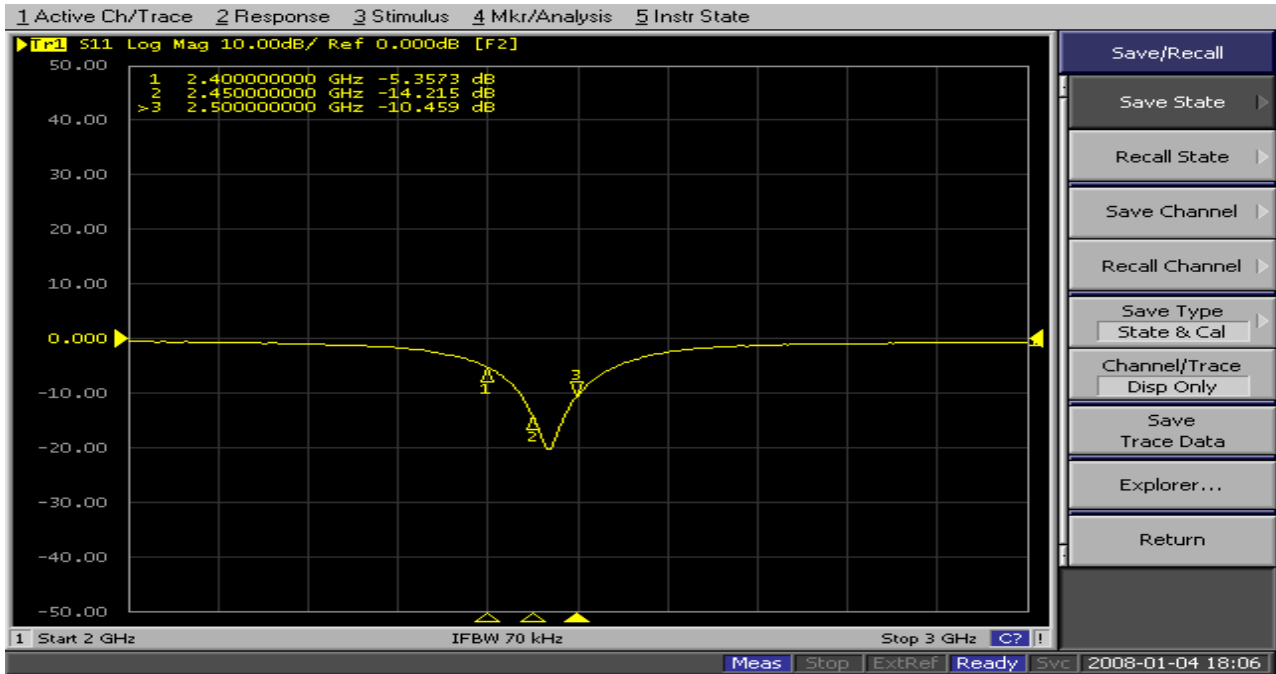


-  Must Isolate Area
-  Prefer Isolate Area
-  RF Module Board
-  Via
-  Customer's Mother Board
-  Antenna



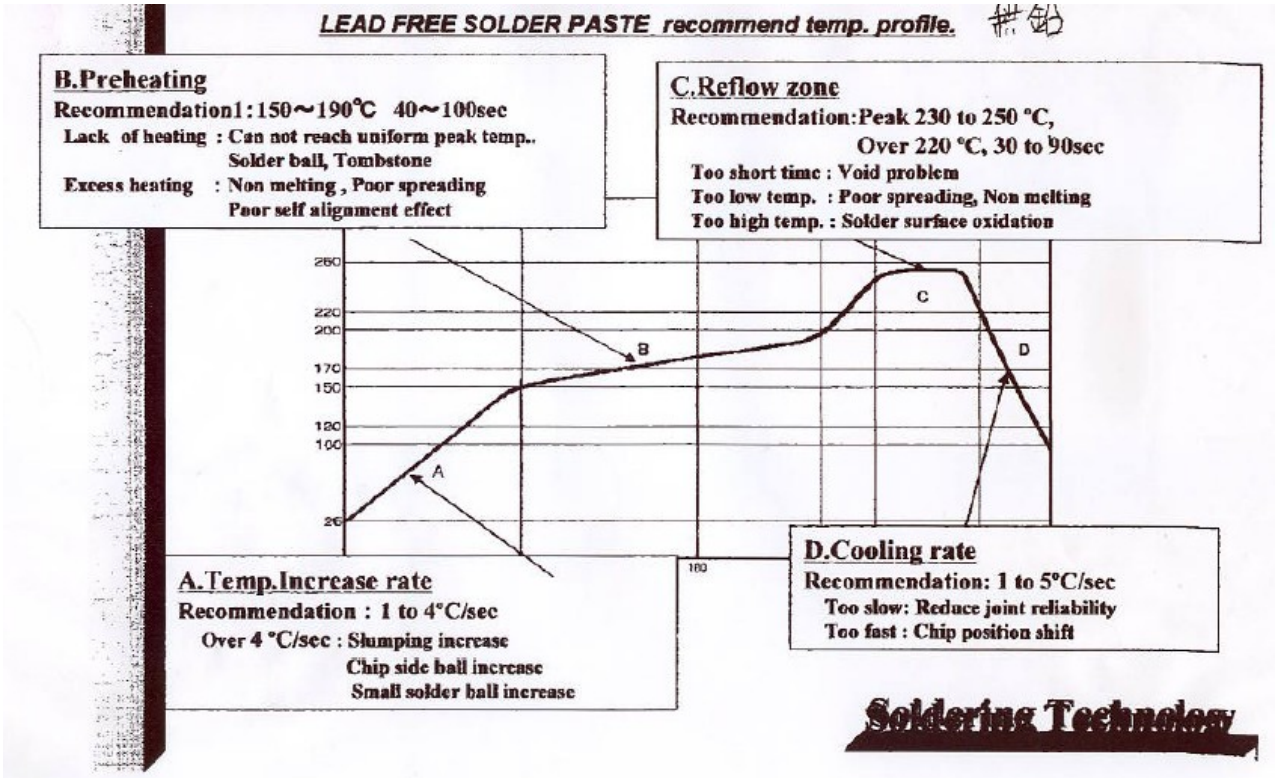
# 11.RF PERFORMANCE TEST DATA

Return Loss: -14.2dB





**12. REFERENCE REFLOW TEMPERATURE CURVE**





## 13. Reference Documents

13.1 UBEC UZ2400 datasheet

13.2 UBEC UP2268 datasheet

13.3 ACX AT5020 datasheet

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