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QRF-0400 ZigBee Module User Manual (Preliminary)

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<Rev. 0.1>

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Revision History

Revision	Date	Description of Change
0.1	Jan 10, 2007	Initial version

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1 . General Information:

The QRF-0400 module is a high output power (over 15dBm at antenna out) system that integrates UBEC's UZ2400, UP2202, UA2723, antenna, other necessary components such as crystal, switches, resistors and capacitors. The purpose of the QRF-0400 module is to provide our customers a flexible and reliable module for their application development. There are two interfaces for the QRF-0400 module. It's simple and convenient to program for both 802.15.4 and ZIGBEE applications.

UZ2400, 802.15.4 compliant transceiver, features a maximum 5 MHz serial interface when operating at 20MHz for various control purposes and it is a serial interface slave device. The basic serial interface consists of 4-wired bus: SCLK, SI, SO, and SEN. It provides accesses to various storage units: MAC/BB/RF control/status registers, TXFIFOs, RXFIFO and security key table.

UP2202 is a linear, high-efficiency power amplifier designed for 2.4GHz ISM band applications, such as WLAN, Bluetooth and ZigBee. It's manufactured with GaAs/InGaP HBT process for excellent RF performance, reliability and temperature stability.

UA2723 is a wideband LNA IC with internal input/output matching and packaged in a 6-pin SOT363 plastic package.

2 . PCB

PCB details front view of QRF-0400 ZigBee module.

The PCB size is 35 x 20 (cm²).

3 . Antenna

This module adopts chip-antenna for minimizing the PCB size. User owns the flexibility to use an external antenna. When user uses external antenna, please re-solder C23 from internal chip antenna side to external SMA (TP1). Please see module picture as figure 1 as below.

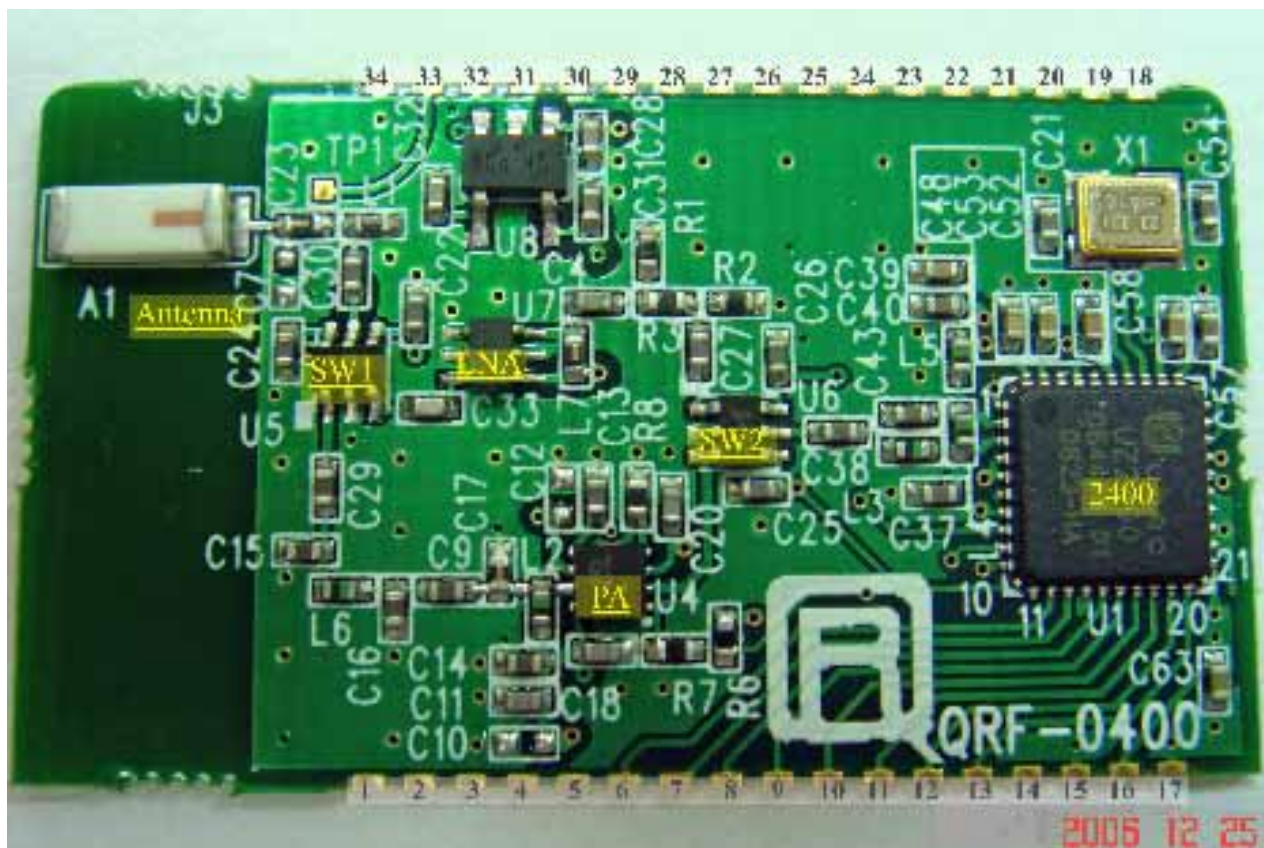
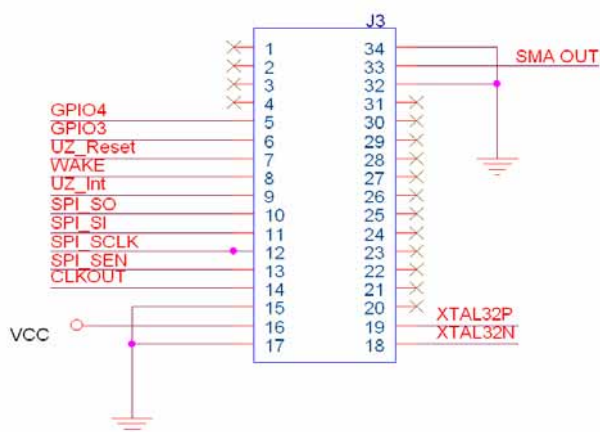


Figure 1 QRF-0400 QuadRep ZigBee Module

4 . Power Supply

Pad 16 is VCC input on QRF-0400 QuadRep ZigBee module. The voltage range is from 3.0V to 3.3V

5 . QRF-0400 Pad Definition:





Pad number	Name	Function	Definition
1	None	Don't use	
2	None	Don't use	
3	None	Don't use	
4	None	Don't use	
5	GPIO3	UZ2400 GPIO3	UZ2400 PIN 12
6	GPIO4	UZ2400 GPIO4	UZ2400 PIN 10
7	UZ-Reset	UZ2400 Reset	UZ2400 PIN 13
8	Wake	UZ2400 Wake	UZ2400 PIN 15
9	UZ-Int	UZ2400 Interrupt	UZ2400 PIN 16
10	SPI_SO	UZ2400 SPI SO	UZ2400 PIN 17
11	SPI_SI	UZ2400 SPI SI	UZ2400 PIN 18
12	SPI_SCLK	UZ2400 SPI CLK	UZ2400 PIN 19
13	SPI_SEN	UZ2400 SPI SEN	UZ2400 PIN 20
14	CLKOUT	UZ2400 Clock out	UZ2400 PIN 26
15	GND	Grand	
16	VCC	Power in	
17	GND	Grand	
18	XTAL32N	UZ2400 Extra Oscillators	UZ2400 PIN 27
19	XTAL32P	UZ2400 Extra Oscillators	UZ2400 PIN 28
20	None	Don't use	
21	None	Don't use	
22	None	Don't use	
23	None	Don't use	
24	None	Don't use	
25	None	Don't use	
26	None	Don't use	
27	None	Don't use	
28	None	Don't use	
29	None	Don't use	
30	None	Don't use	
31	None	Don't use	



32	GND	Grand	
33	SMA OUT	Extra Antenna	SMA connect pad
34	GND	Grand	

6 . Bill of Material

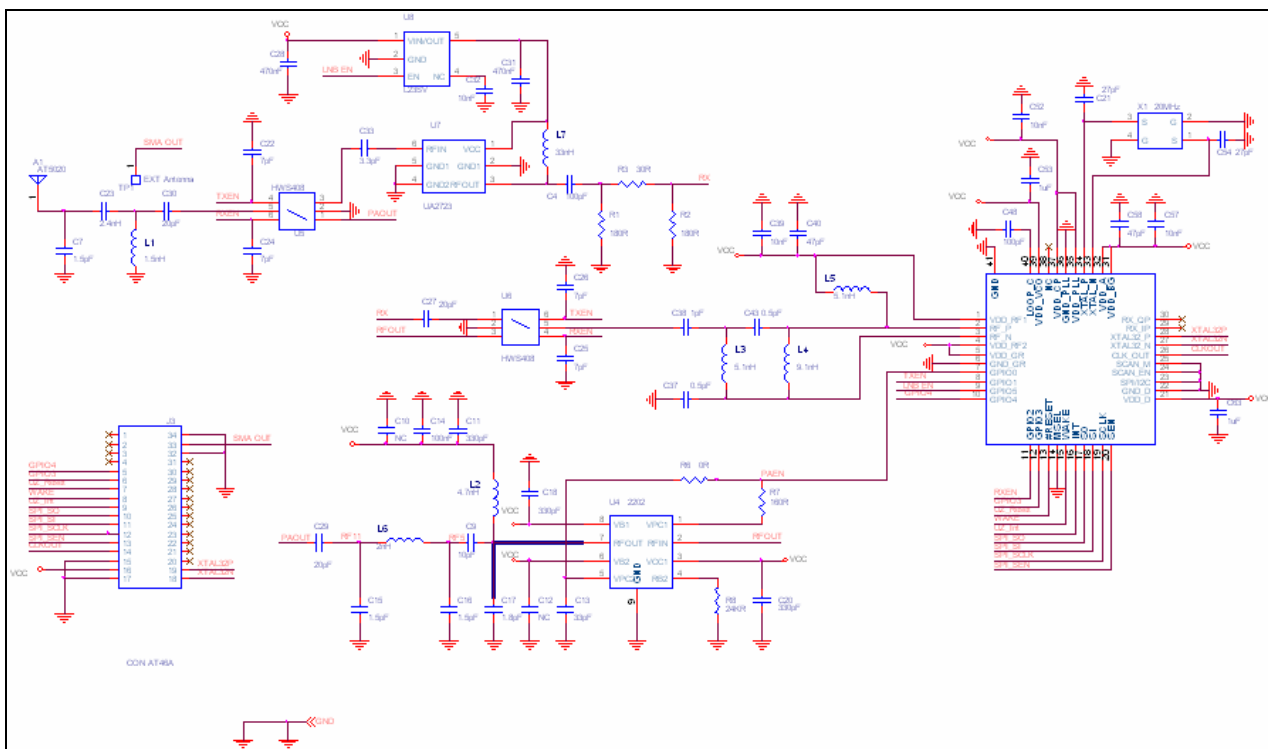
Item	Quantity	Reference	Part	Size
1	1	A1	AT5020	LCC8
2	1	C4	100pF	0402
3	1	C7	1.5pF	0402
4	1	C9	10pF	0402
5	2	C10,C12	NC	0402
6	3	C11,C18,C20	330pF	0402
7	1	C13	33pF	0402
8	1	C14	100nF	0402
9	2	C16,C15	1.5pF	0402
10	1	C17	1.8pF	0402
11	2	C21,C54	27pF	0402
12	4	C22,C24,C25,C26	7pF	0402
13	1	C23	2.4nH	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	1pF	0402
21	3	C39,C52,C58	10nF	0402
22	2	C57,C40	47pF	0402
23	1	C48	100pF	0402
24	1	C53	1uF	0402
25	1	C63	1uF	0402
26	1	J3	CON AT46A	STAMP-44P
27	1	L1	1.5nH	0402
28	1	L2	4.7nH	0402



29	2	L5,L3	5.1nH	0402
30	1	L4	9.1nH	0402
31	1	L6	2nH	0402
32	1	L7	33nH	0402
33	2	R2,R1	180R	0402
34	1	R3	30R	0402
35	1	R6	0R	0402
36	1	R7	160R	0402
37	1	R8	24KR	0402
38	1	TP1	EXT Antenna	TP24S
39	1	U1	UZ2400	QFP40-0.5
40	1	U4	UP2202	2_2_8LEAD
41	2	U6,U5	HWS408	AS179
42	1	U7	UA2723	SOT363
43	1	U8	L23SV	SOT23-5
44	1	X1	20MHz	CX_101F

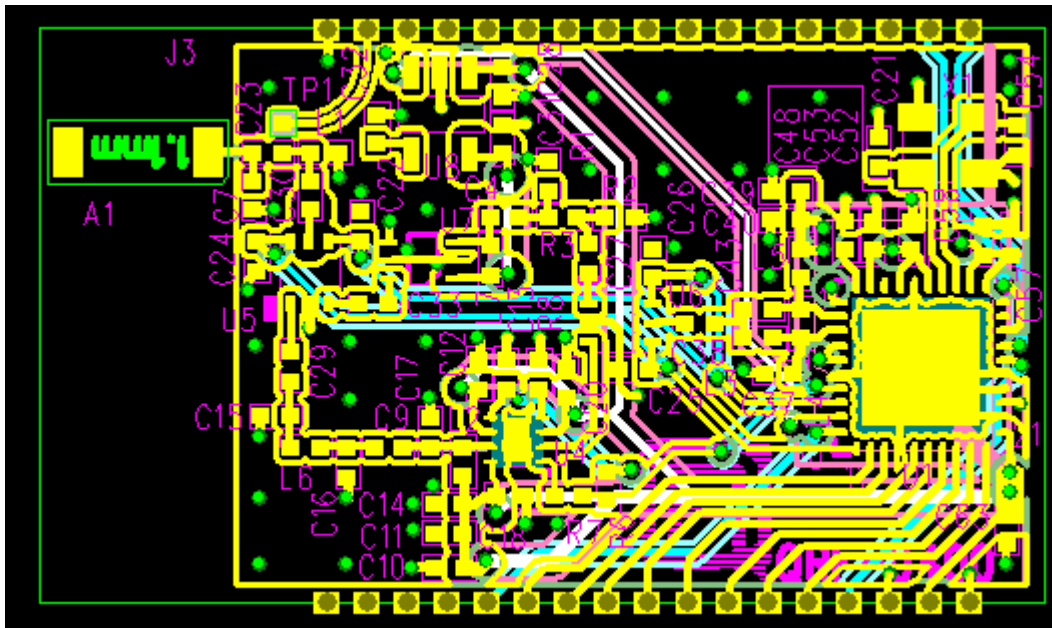


7 . Schematics:





8 . PCB Layout



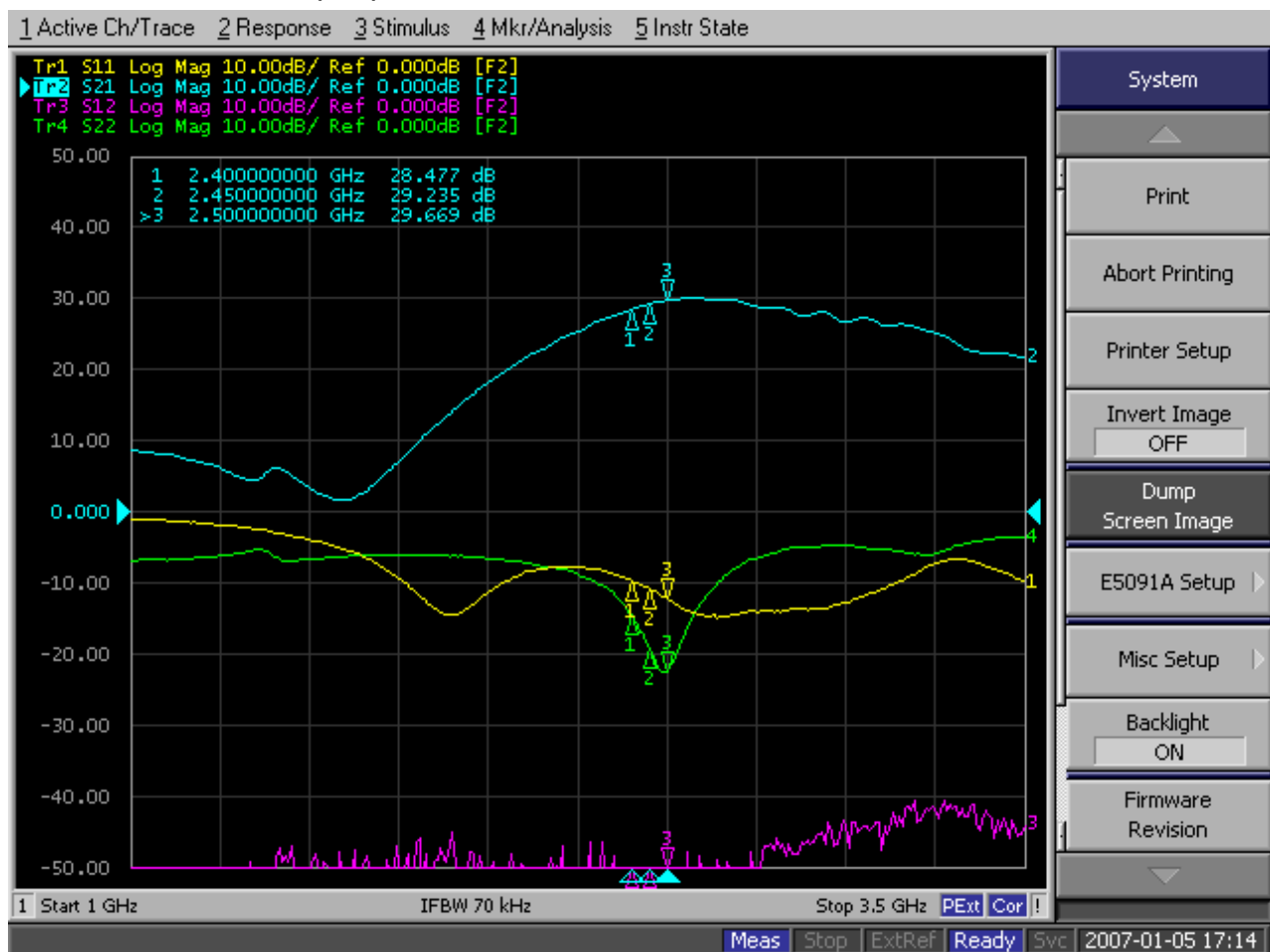


9 . RF Performance

For an RF power amplifier, the performance degrades when output power reaches the non-linearity region. The maximum linear power of PA depends on P1dB point and signal complexity such as modulation, data length and data rate. For UP2202, linear gain is around 27dB and P1dB output power is 26 dBm. To optimize the maximum output power, the output power of UZ2400 (that is, the input power of UP2202) should be adjusted for various system needs.

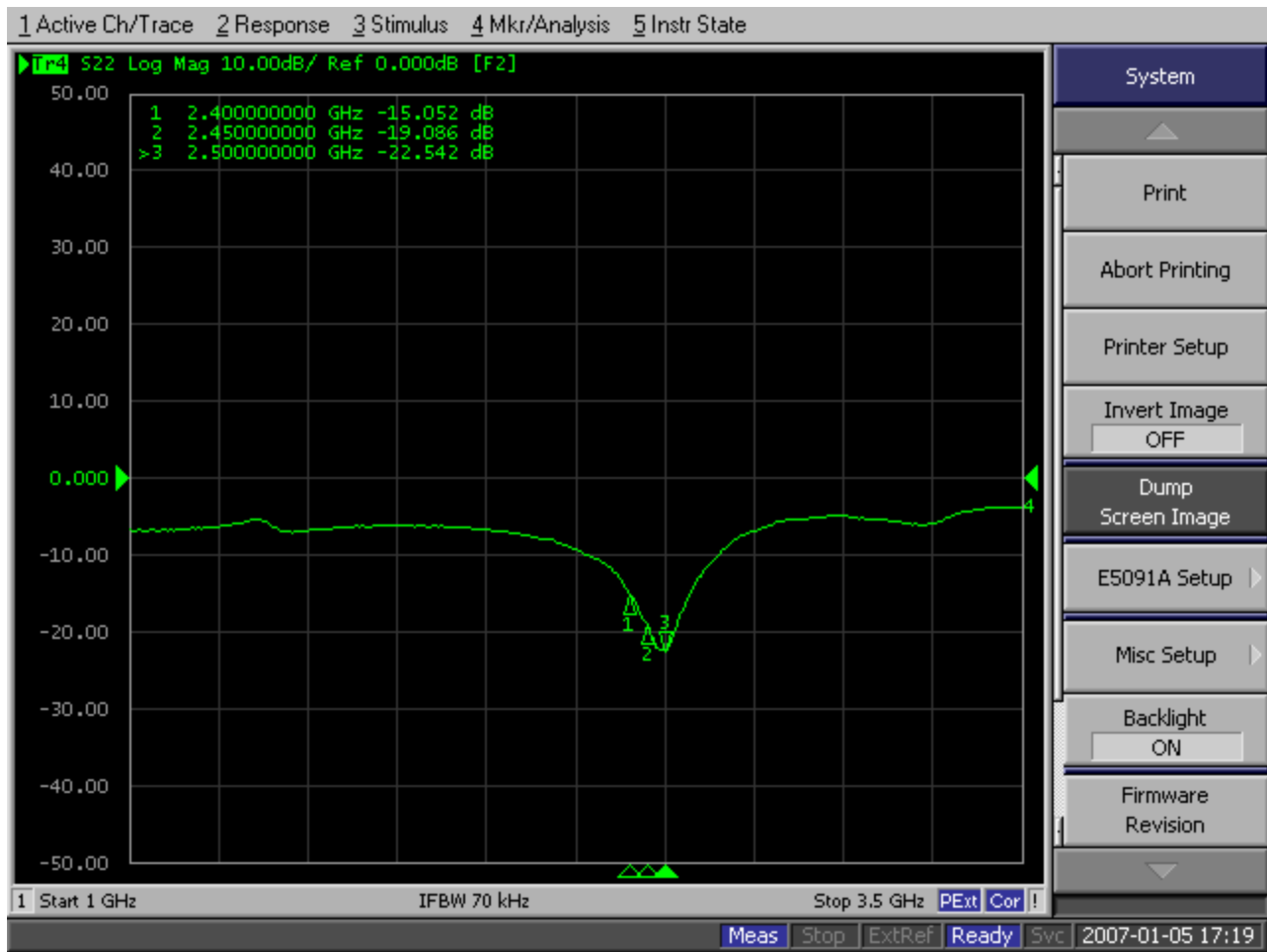
10 . RF Performance Test Data

10.1 Maximum PA output power 29.23dB





10.2 Return Loss: -19.08dB





7 . Reference Documents

- a. UBEC UZ2400 datasheet
- b. UBEC UP2202 datasheet
- c. UBEC UA2723 datasheet
- d. ACX AT7020 datasheet