

# RF110

## 2400 MHz Power Amplifier

The RF110 is a three-stage class AB power amplifier for 2400–2483.5 MHz ISM (Industrial, Scientific, Medical) band applications.

The RF110 power amplifier, combined with Conexant's RF109 transceiver, forms a complete system solution for a direct conversion 2400 MHz radio which is compliant with FCC Part 15 regulations in the ISM band.

The RF110 is operational in the 2400 MHz ISM band with a supply voltage range of 3.0–4.5V. The RF110's pin assignments and block diagram are shown in Figure 1 and Figure 2, respectively.

### Features

- Class AB type RF power amplifier
- Differential inputs and outputs
- 100 mW peak envelope output power
- Very fast settling from standby mode to active mode
- Efficient high output power operation
- Requires few external components
- 20-pin TSSOP package

### Applications

- 2400 MHz cordless telephones
- Direct sequence spread spectrum systems
- Frequency hopping spread spectrum systems
- Wireless LANs
- Wireless modems
- Wireless security
- Inventory control systems

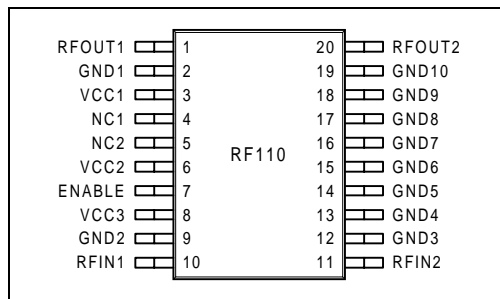


Figure 1. RF110 Pin Signals – 20 Pin TSSOP

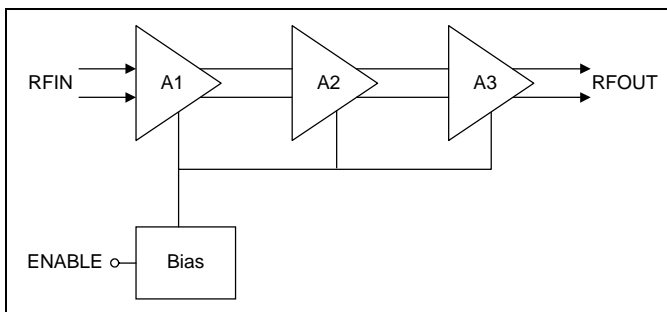


Figure 2. RF110 Block Diagram

**Technical Description**

The RF110 is a three stage, class AB RF power amplifier. A class AB power amplifier allows a wide range of output powers without excessive idle power dissipation.

Figure 3 shows a typical application circuit for the RF110.

**Recommendations on Layout and Implementation**

**Matching.** An input matching network and an output matching network are required for maximum power gain.

The output matching network must provide the optimum load resistance to the RF110 outputs as well as convert the differential signals to a single-ended signal into a 50 Ω load. The output matching network should present a differential impedance of approximately 59-j10 Ω to the output of the RF110, with a 180° phase difference between the two branches.

The values of the matching network components depend on layout, Printed Wire Board (PWB) material and dimensions.

**Bypassing.** All VCC pins should have proper bypassing. The decoupling capacitors should be placed very close to the pins.

A bypass capacitor of 8.2 pF and a decoupling capacitor of 1 nF are recommended. Due to layout variations, the optimum value of the capacitor may vary.

**General Grounding Requirements.** All ground pins should have minimum trace inductance to ground. If a ground plane cannot be provided right at the pins, the vias to ground plane should be placed as close to the pins as possible. There should be one via for each ground pin, unless otherwise specified. If the ground plane is at the bottom layer, two vias per pin in parallel may be required.

Pins 14-15 and 16-17 are recommended to be isolated from the top layer ground.

Pins 2, 9, 12, and 19 are recommended to be tied together on the top layer isolated from the top layer ground.

NC pins are not used in the circuit and should be connected to ground as shown in Figure 3.

**ESD Sensitivity**

The RF110 is a static-sensitive electronic device. Do not operate or store near strong electrostatic fields. Take proper Electrostatic Discharge (ESD) precautions.

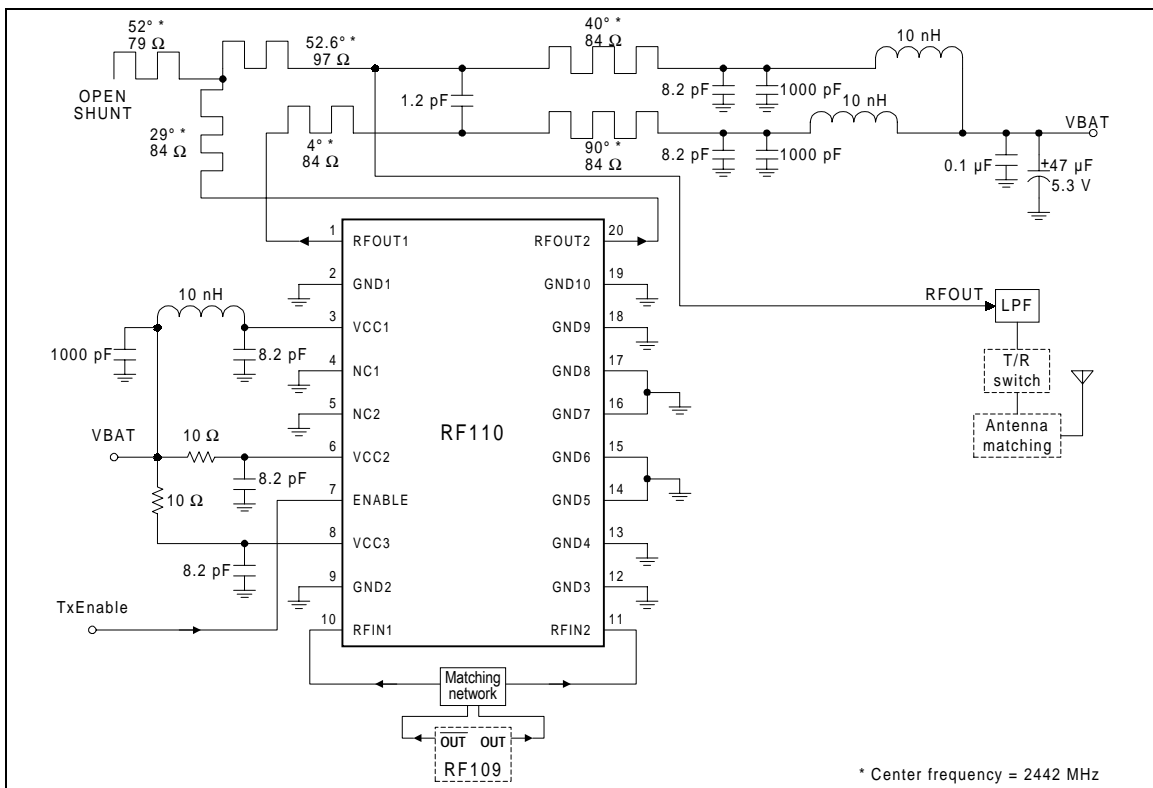


Figure 3. RF110 Typical Application Circuit

## Interface Description

Table 1 describes the pin signals for the RF110.

Table 1. Pin Signal Description

Pin No.	Name	Description
1	RFOUT1	Amplifier positive RF output
2	GND1	Ground
3	VCC1	Power supply (positive)
4	NC1	No connect. Recommended to connect to ground.
5	NC2	No connect. Recommended to connect to ground.
6	VCC2	Power supply (positive)
7	ENABLE	Amplifier enable (active high)
8	VCC3	Power supply (positive)
9	GND2	Ground
10	RFIN1	Amplifier positive RF input
11	RFIN2	Amplifier negative RF input
12	GND3	Ground
13	GND4	Ground
14	GND5	Ground
15	GND6	Ground
16	GND7	Ground
17	GND8	Ground
18	GND9	Ground
19	GND10	Ground
20	RFOUT2	Amplifier negative RF output

## Specifications

Table 2 lists the absolute maximum ratings for the RF110. Table 3 gives the electrical specifications for the RF110.

**Table 2. Absolute Maximum Ratings**

Parameter	Min.	Max.	Unit
Supply voltage (Vcc) (note 1)		+5	V
Input voltage range (note 1)	GND	VCC	V
Power dissipation at high output power mode		700	mW
Ambient operating temperature (Ta)	-10	+70	°C
Storage temperature	-40	+125	°C
Notes:			
1. Voltages are referenced to GND.			

**Table 3. RF110 Electrical Specifications <sup>1</sup>**

Parameter	Min.	Typ.	Max.	Units
Operating power supply range <sup>1</sup>	3.0	3.6	4.5	V
Gain variation vs. frequency (2400–2500 MHz)		±0.6	±1.5	dB
Peak Envelope output Power (PEP) <sup>2,3</sup>	17.5	20	22.5	dBm
RF small signal gain <sup>4</sup>		25.5		dB
Total supply current:				
Output power = 20 dBm PEP <sup>2,3</sup>		120		mA
= 10 dBm PEP <sup>2,5</sup>		100		mA
= 0 dBm PEP <sup>2,6</sup>		95		mA
Standby <sup>7</sup>		< 10		µA
IM3: PEP ≤ 21 dBm <sup>2,3</sup>		-21	-16	dBc
Output VSWR for unconditional stability			10:1	—
RF output-to-input isolation @ 2450 MHz		50		dB
RF input impedance (differential)		70 + j20		Ω
RF output impedance (differential)		52 - j14		Ω
P1 dBm compression point <sup>4</sup>	-11	-8		dBm
V <sub>IH</sub> for ENABLE	1.9			V
V <sub>IL</sub> for ENABLE			0.8	V
I <sub>IH</sub> for ENABLE		10	60	µA
I <sub>IL</sub> for ENABLE	-20	-1		µA
Notes:				
1. The specifications in Table 3 are guaranteed at a supply voltage of 3.6 VDC and Ta = 25 °C.				
2. All PEP specifications are for two input sinusoids at 2440 MHz and 2450 MHz. PEP is calculated from the average power assuming a peak-to-average ratio of 3 dB. Output power loss due to the recommended output-matching network is included in the values in Table 3.				
3. Input PEP = -3 dBm (differential). (Under this condition, RF110 output power is compressing. The output peak-to-average ratio is approximately 2 dB.)				
4. Single sinusoidal input.				
5. Input PEP = -15 dBm (differential).				
6. Input PEP = -25 dBm (differential).				
7. When ENABLE (pin 7) is low.				

### Device Dimensions

Package dimensions for the RF110 are given in Figure 4.

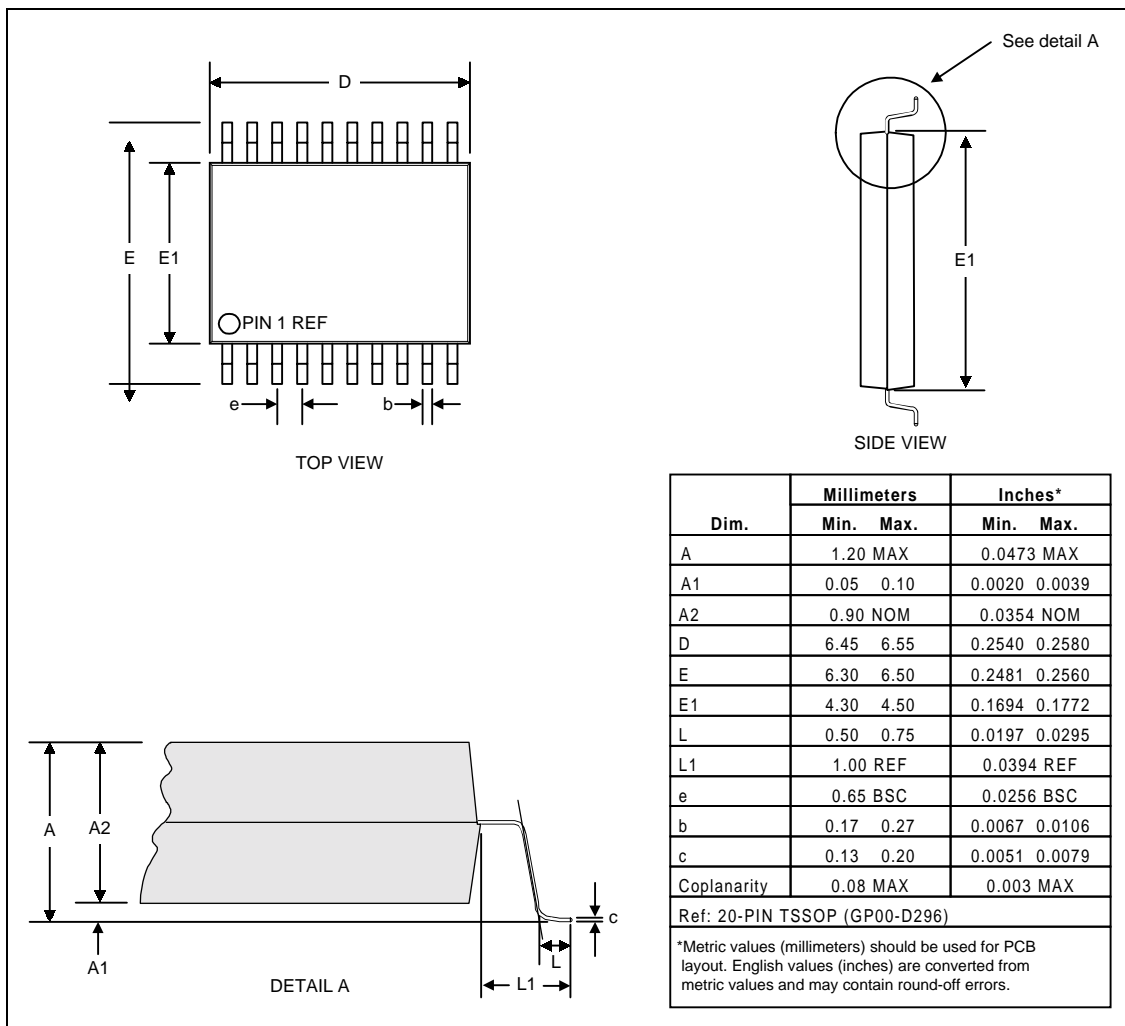


Figure 4. Package Dimensions – 20-pin TSSOP

Copyright © Conexant Systems, Inc., 2000. All Rights Reserved.

Information in this document is provided in connection with Conexant Systems, Inc. (“Conexant”) products. These materials are provided by Conexant as a service to its customers and may be used for informational purposes only. Conexant assumes no responsibility for errors or omissions in these materials. Conexant may make changes to specifications and product descriptions at any time, without notice. Conexant makes no commitment to update the information contained herein. Conexant shall have no responsibility whatsoever for conflicts or incompatibilities arising from future changes to its specifications and product descriptions.

No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted by this document. Except as provided in Conexant’s Terms and Conditions of Sale for such products, Conexant assumes no liability whatsoever.

THESE MATERIALS ARE PROVIDED “AS IS” WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESS OR IMPLIED, RELATING TO SALE AND/OR USE OF CONEXANT PRODUCTS INCLUDING LIABILITY OR WARRANTIES RELATING TO FITNESS FOR A PARTICULAR PURPOSE, MERCHANTABILITY, OR INFRINGEMENT OF ANY PATENT, COPYRIGHT OR OTHER INTELLECTUAL PROPERTY RIGHT. Conexant further does not warrant the accuracy or completeness of the information, text, graphics or other items contained within these materials. Conexant shall not be liable for any special, indirect, incidental, or consequential damages, including without limitation, lost revenues or lost profits, which may result from the use of these materials.

Conexant products are not intended for use in medical, life saving or life sustaining applications. Conexant customers using or selling Conexant products for use in such applications do so at their own risk and agree to fully indemnify Conexant for any damages resulting from such improper use or sale.

The following are trademarks of Conexant Systems, Inc.: Conexant, the Conexant C symbol, and “What’s Next in Communications Technologies”. Product names or services listed in this publication are for identification purposes only, and may be trademarks of third parties. Third-party brands and names are the property of their respective owners.

**Further Information:**

literature@conexant.com  
1-800-854-8099 (North America)  
33-14-906-3980 (International)

**Web Site**

www.conexant.com

**World Headquarters**

Conexant Systems, Inc.  
4311 Jamboree Road,  
P.O. Box C  
Newport Beach, CA 92658-8902  
Phone: (949) 483-4600  
Fax: (949) 483-6375

**U.S. Florida/South America**

Phone: (727) 799-8406  
Fax: (727) 799-8306

**U.S. Los Angeles**

Phone: (805) 376-0559  
Fax: (805) 376-8180

**U.S. Mid-Atlantic**

Phone: (215) 244-6784  
Fax: (215) 244-9292

**U.S. North Central**

Phone: (630) 773-3454  
Fax: (630) 773-3907

**U.S. Northeast**

Phone: (978) 692-7660  
Fax: (978) 692-8185

**U.S. Northwest/Pacific West**

Phone: (408) 249-9696  
Fax: (408) 249-7113

**U.S. South Central**

Phone: (972) 733-0723  
Fax: (972) 407-0639

**U.S. Southeast**

Phone: (919) 858-9110  
Fax: (919) 858-8669

**U.S. Southwest**

Phone: (949) 483-9119  
Fax: (949) 483-9090

**APAC Headquarters**

Conexant Systems Singapore,  
Pte. Ltd.  
1 Kim Seng Promenade  
Great World City  
#09-01 East Tower  
Singapore 237994  
Phone: (65) 737 7355  
Fax: (65) 737 9077

**Australia**

Phone: (61 2) 9869 4088  
Fax: (61 2) 9869 4077

**China**

Phone: (86 2) 6361 2515  
Fax: (86 2) 6361 2516

**Hong Kong**

Phone: (852) 2 827 0181  
Fax: (852) 2 827 6488

**India**

Phone: (91 11) 692 4780  
Fax: (91 11) 692 4712

**Korea - Seoul Office**

Phone: (82 2) 565 2880  
Fax: (82 2) 565 1440

**Korea - Taegu Office**

Phone: (82 53) 745 2880  
Fax: (82 53) 745 1440

**Europe Headquarters**

Conexant Systems France  
Les Taissounieres B1  
1681 Route des Dolines  
BP 283  
06905 Sophia Antipolis Cedex  
France  
Phone: (33 1) 41 44 36 50  
Fax: (33 1) 93 00 33 03

**Europe Central**

Phone: (49 89) 829 1320  
Fax: (49 89) 834 2734

**Europe Mediterranean**

Phone: (39 02) 9317 9911  
Fax: (39 02) 9317 9913

**Europe North**

Phone: (44 1344) 486 444  
Fax: (44 1344) 486 555

**Europe South**

Phone: (33 1) 41 44 36 50  
Fax: (33 1) 41 44 36 90

**Middle East Headquarters**

Conexant Systems Commercial  
(Israel) Ltd.  
P.O. Box 12660  
Herzlia 46733  
Israel  
Phone: (972 9) 952 4064  
Fax: (972 9) 951 3924

**Japan Headquarters**

Conexant Systems Japan Co., Ltd.  
Shimomoto Building  
1-46-3 Hatsudai,  
Shibuya-ku  
Tokyo, 151-0061  
Japan  
Phone: (81 3) 5371 1567  
Fax: (81 3) 5371 1501

**Taiwan Headquarters**

Conexant Systems, Taiwan Co., Ltd.  
Room 2808  
International Trade Building  
333 Keelung Road, Section 1  
Taipei 110  
Taiwan, ROC  
Phone: (886 2) 2720 0282  
Fax: (886 2) 2757 6760