

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

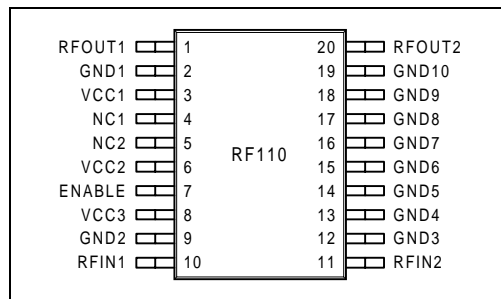


Figure 1. RF110 Pin Signals – 20 Pin TSSOP

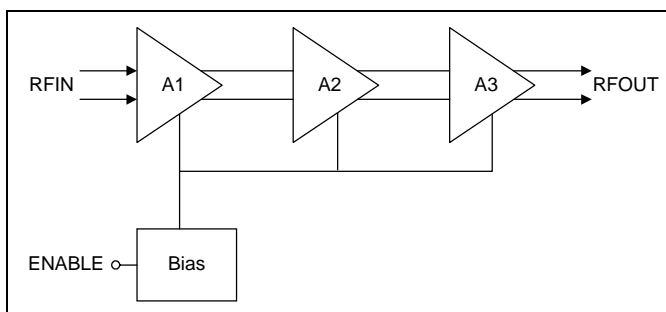


Figure 2. RF110 Block Diagram

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 $59-j10 \Omega$ 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.

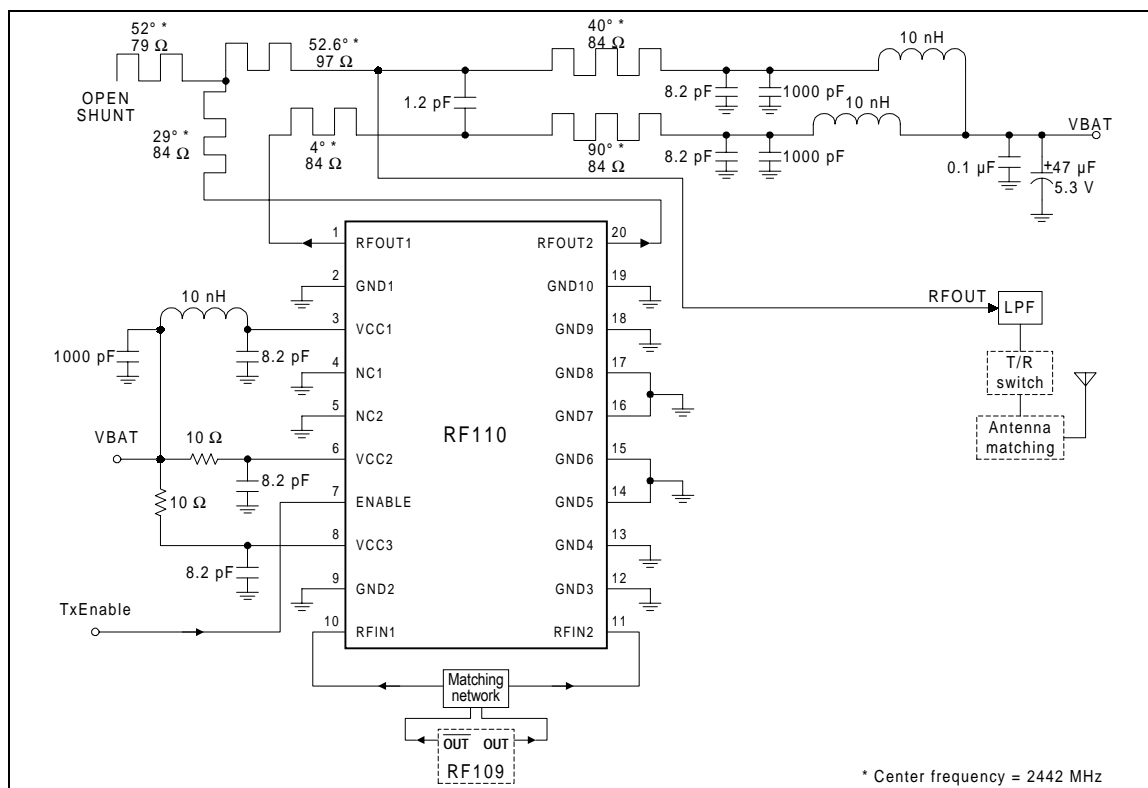


Figure 3. RF110 Typical Application Circuit

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 ¹

Parameter	Min.	Typ.	Max.	Units
Operating power supply range ¹	3.0	3.6	4.5	V
Gain variation vs. frequency (2400–2500 MHz)		±0.6	±1.5	dB
Peak Envelope output Power (PEP) ^{2,3}	17.5	20	22.5	dBm
RF small signal gain ⁴		25.5		dB
Total supply current: Output power = 20 dBm PEP ^{2,3} = 10 dBm PEP ^{2,5} = 0 dBm PEP ^{2,6} Standby ⁷		120 100 95 < 10		mA mA mA μA
IM3: PEP ≤ 21 dBm ^{2,3}		–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 ⁴	–11	–8		dBm
V _{IH} for ENABLE	1.9			V
V _{IL} for ENABLE			0.8	V
I _{IH} for ENABLE		10	60	μA
I _{IL} 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.

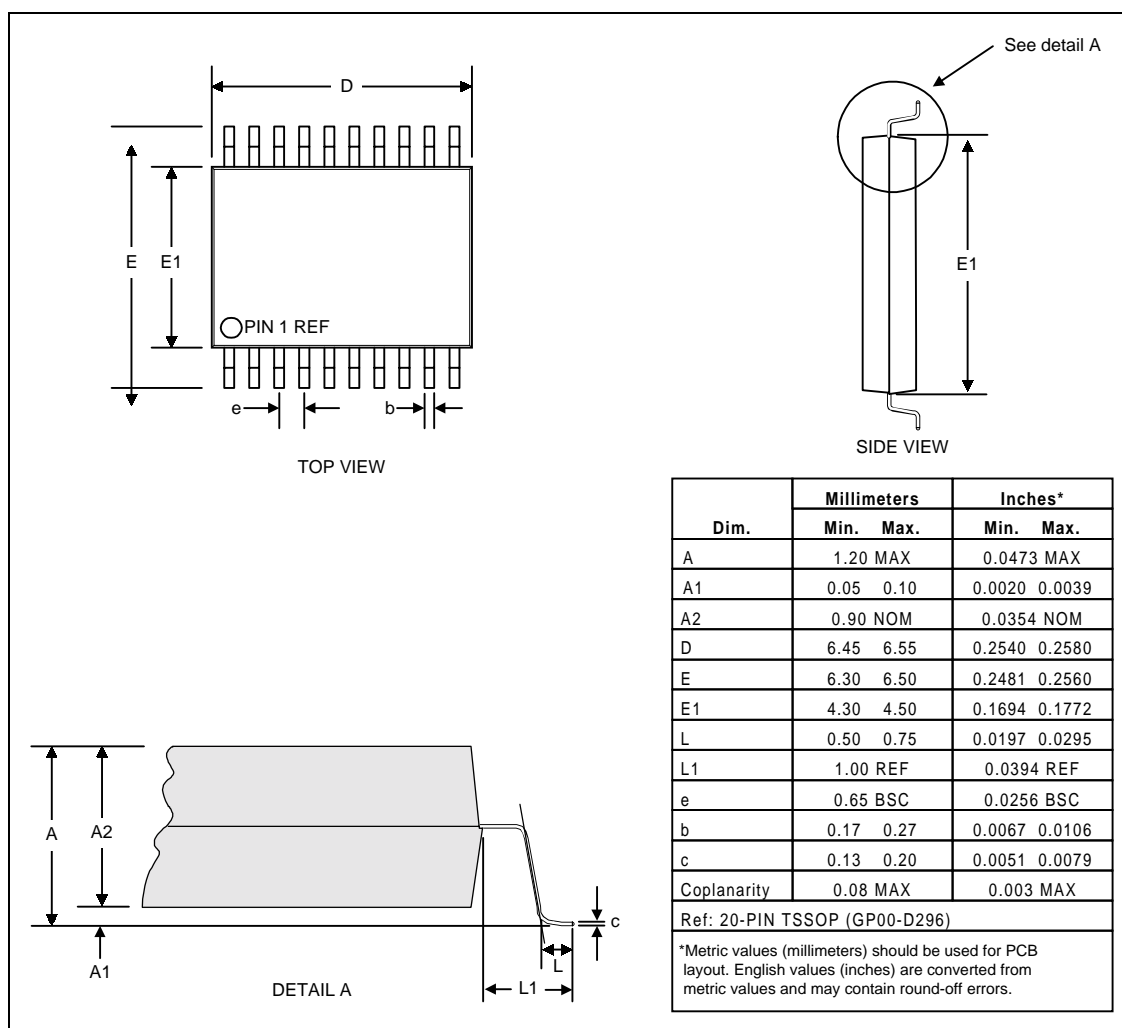


Figure 4. Package Dimensions – 20-pin TSSOP

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