



# RF2312

## Absolute Maximum Ratings

Parameter	Rating	Unit
Device Current	125	mA
Input RF Power	+18	dBm
Output Load VSWR	20:1	
Ambient Operating Temperature	-40 to +85	°C
Storage Temperature	-40 to +150	°C
Maximum Junction Temperature	150	°C



**Caution!** ESD sensitive device.

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Parameter	Specification			Unit	Condition
	Min.	Typ.	Max.		
<b>Overall (50Ω)</b>					T=25°C, V <sub>CC</sub> =9V, Freq=900 MHz, R <sub>C</sub> =30Ω, 50Ω System, P <sub>IN</sub> =-4dBm 3dB Bandwidth
Frequency Range		DC to 2500		MHz	
Gain	14.5	15.1		dB	
Noise Figure		3.8	4.3	dB	From 50MHz to 300MHz, -30 to +70 °C
		4.2	4.8	dB	From 300MHz to 1000MHz, -30 to +70 °C
Input VSWR			1.7:1		Appropriate values for the DC blocking capacitors and bias inductor are required to maintain this VSWR at the intended operating frequency range.
Output VSWR			1.4:1		Appropriate values for the DC blocking capacitors and bias inductor are required to maintain this VSWR at the intended operating frequency range.
Output IP <sub>3</sub>	+40	+42		dBm	At 100MHz
Output IP <sub>3</sub>	+33	+36		dBm	At 500MHz
Output IP <sub>3</sub>	+30	+33		dBm	At 900MHz
Output P <sub>1dB</sub>	+21	+22		dBm	At 100MHz
Output P <sub>1dB</sub>	+20	+21		dBm	At 500MHz
Output P <sub>1dB</sub>	+17	+18.5		dBm	At 900MHz
Saturated Output Power		+23		dBm	At 100MHz
Saturated Output Power		+22.5		dBm	At 500MHz
Saturated Output Power		+20.5		dBm	At 900MHz
Reverse Isolation		20		dB	
<b>Thermal</b>					
Theta <sub>JC</sub>		66		°C/W	P <sub>DISS</sub> =0.61W, T <sub>AMB</sub> =85°C, T <sub>CASE</sub> =96.6°C, T <sub>J</sub> =136.8°C No RF Input/Output
Mean Time Between Failures		708x10 <sup>6</sup>		hours	T <sub>AMB</sub> =+25°C
		2.75x10 <sup>6</sup>		hours	T <sub>AMB</sub> =+80°C
<b>Power Supply</b>					
Device Voltage (V <sub>D</sub> )		6.0		V	On pin 8, I <sub>CC</sub> =100mA
		5.0		V	On pin 8, I <sub>CC</sub> =40mA
Operating Current Range	85	100	115	mA	V <sub>CC</sub> =9.0V, R <sub>C</sub> =30Ω

Parameter	Specification			Unit	Condition
	Min.	Typ.	Max.		
<b>Overall (75Ω)</b>					T=25°C, V <sub>CC</sub> =9V, Freq=900MHz, R <sub>C</sub> =30Ω, 75Ω System
Frequency Range		DC to 2500		MHz	3dB Bandwidth
Gain	14.5	16		dB	
Noise Figure		3.8	4.3	dB	From 50MHz to 300MHz, -30°C to +70°C.
		4.2	4.8	dB	From 300MHz to 1000MHz, -30°C to +70°C.
Input VSWR		1.3:1	1.4:1		From 50MHz to 900MHz, -30°C to +70°C.
					Appropriate values for the DC blocking capacitors and bias inductor are required to maintain this VSWR at the intended operating frequency range.
Output VSWR			1.25:1		From 50MHz to 300MHz, -30°C to +70°C.
					Appropriate values for the DC blocking capacitors and bias inductor are required to maintain this VSWR at the intended operating frequency range.
		1.5:1	1.4:1		From 300MHz to 500MHz, -30°C to +70°C.
			1.7:1		From 500MHz to 900MHz, -30°C to +70°C.
Output IP <sub>3</sub>	+36	+38		dBm	At 100MHz
Output IP <sub>3</sub>	+33	+36		dBm	At 500MHz
Output IP <sub>3</sub>	+28	+30		dBm	At 900MHz
Output P <sub>1dB</sub>	+21	+22		dBm	At 100MHz
Output P <sub>1dB</sub>	+20	+21		dBm	At 500MHz
Output P <sub>1dB</sub>	+17	+18.5		dBm	At 900MHz
Saturated Output Power		+23		dBm	At 100MHz
Saturated Output Power		+22.5		dBm	At 500MHz
Saturated Output Power		+20.5		dBm	At 900MHz
Reverse Isolation		20		dB	
<b>77 Channels</b>					77 Channels to 550MHz at 10dBmV, 33 channels to 760MHz at 0dBmV flat at DUT input
CSO		>86		dBc	61.25MHz
		>86		dBc	83.25MHz
		76		dBc	193.25MHz
		72		dBc	313.2625MHz
		64		dBc	547.25MHz
CTB		>86		dBc	61.25MHz
		>86		dBc	83.25MHz
		86		dBc	193.25MHz
		84		dBc	313.2625MHz
		83		dBc	547.25MHz
CNR	65	66		dB	
<b>110 Channels</b>					110 Channels, 10dBmV/channel at input
CSO		>86		dBc	61.25MHz
		>86		dBc	83.25MHz
		76		dBc	193.25MHz
		70		dBc	313.2625MHz
		64		dBc	547.25MHz
CTB		84		dBc	61.25MHz
		86		dBc	83.25MHz
		85		dBc	193.25MHz
		81		dBc	313.2625MHz
		80		dBc	547.25MHz
Cross Modulation		77		dBc	61.25MHz
		74		dBc	445.25MHz
CNR	65	66		dB	

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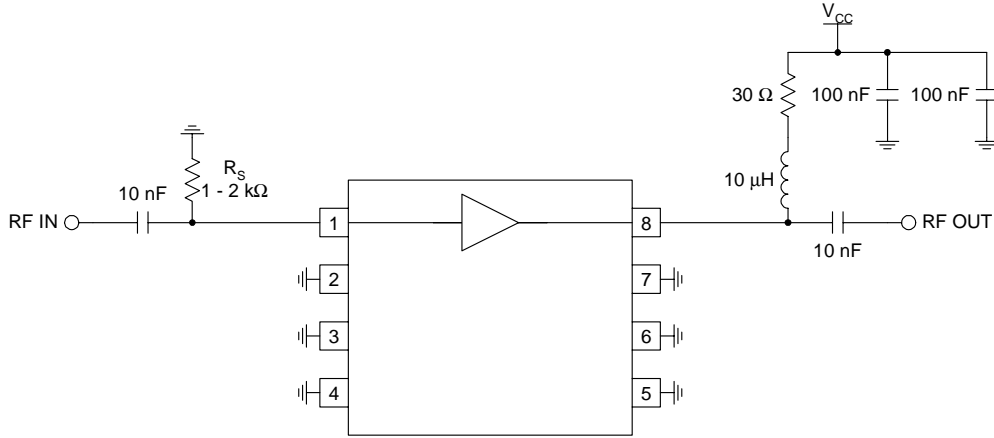
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Parameter	Specification			Unit	Condition
	Min.	Typ.	Max.		
<b>Overall (75Ω Push-Pull)</b>					T=25°C, V <sub>CC</sub> =9V or 24V, 75Ω System, RF <sub>IN</sub> =-10dBm
Frequency Range		DC to 150		MHz	From 5MHz to 150MHz, -30°C to +70°C.
Gain		15		dB	
Noise Figure		5.0		dB	
Input VSWR		1.1:1			
Output VSWR		1.2:1			
Output IP <sub>2</sub>		+71		dBm	
		+72		dBm	
		+74		dBm	
Output IP <sub>3</sub>		+40		dBm	
		+40		dBm	
		+40		dBm	
		+40		dBm	
Second Harmonic		-73		dBc	
		-65		dBc	
		-65		dBc	

Pin	Function	Description	Interface Schematic
1	RF IN	RF input pin. This pin is NOT internally DC-blocked. A DC-blocking capacitor, suitable for the frequency of operation, should be used in all applications. The device has internal feedback, and not using a DC-blocking capacitor will disable the temperature compensation. The bias of the device can be controlled by this pin. Adding an optional 1 k $\Omega$ resistor to ground on this pin reduces the bias level, which may be compensated for by a higher supply voltage to maintain the appropriate bias level. The net effect of this is an increased output power capability, as well as higher linearity for signals with high crest factors. DC-coupling of the input is not allowed, because this will override the internal feedback loop and cause temperature instability.	
2	GND	Ground connection. For best performance, keep traces physically short and connect immediately to ground plane. Each ground pin should have a via to the ground plane.	
3	GND	Same as pin 2.	
4	GND	Same as pin 2.	
5	GND	Same as pin 2.	
6	GND	Same as pin 2.	
7	GND	Same as pin 2.	
8	RF OUT	RF output and bias pin. Because DC is present on this pin, a DC-blocking capacitor, suitable for the frequency of operation, should be used in most applications. For biasing, an RF choke in series with a resistor is needed. The value for the resistor $R_C$ is 30 $\Omega$ (0.5W) for $V_{CC}=9V$ and 21 $\Omega$ for $V_{CC}=8V$ . The DC voltage on this pin is typically 6.0V with a current of 100mA. In lower power applications the value of $R_C$ can be increased to lower the current and $V_D$ on this pin.	

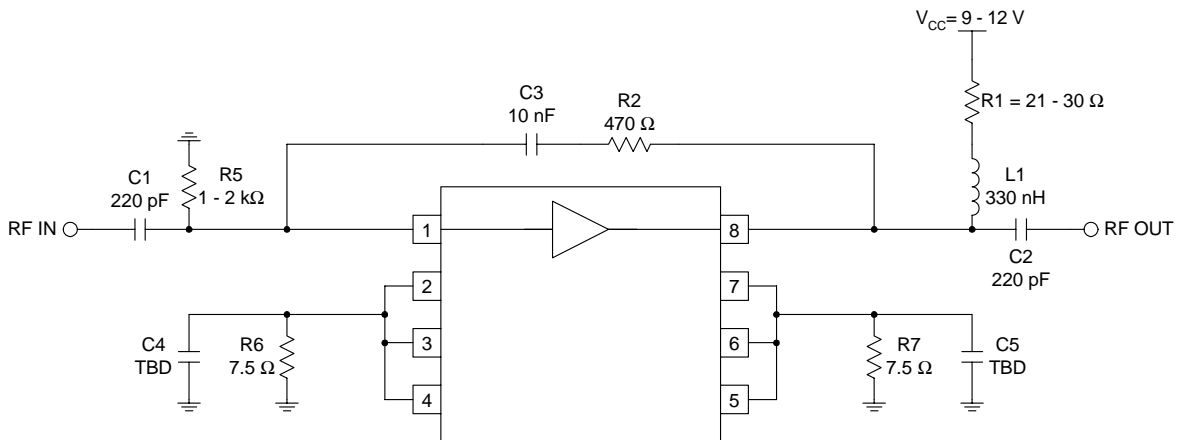
## Application Schematic 5MHz to 50MHz Reverse Path



**NOTE 1:**

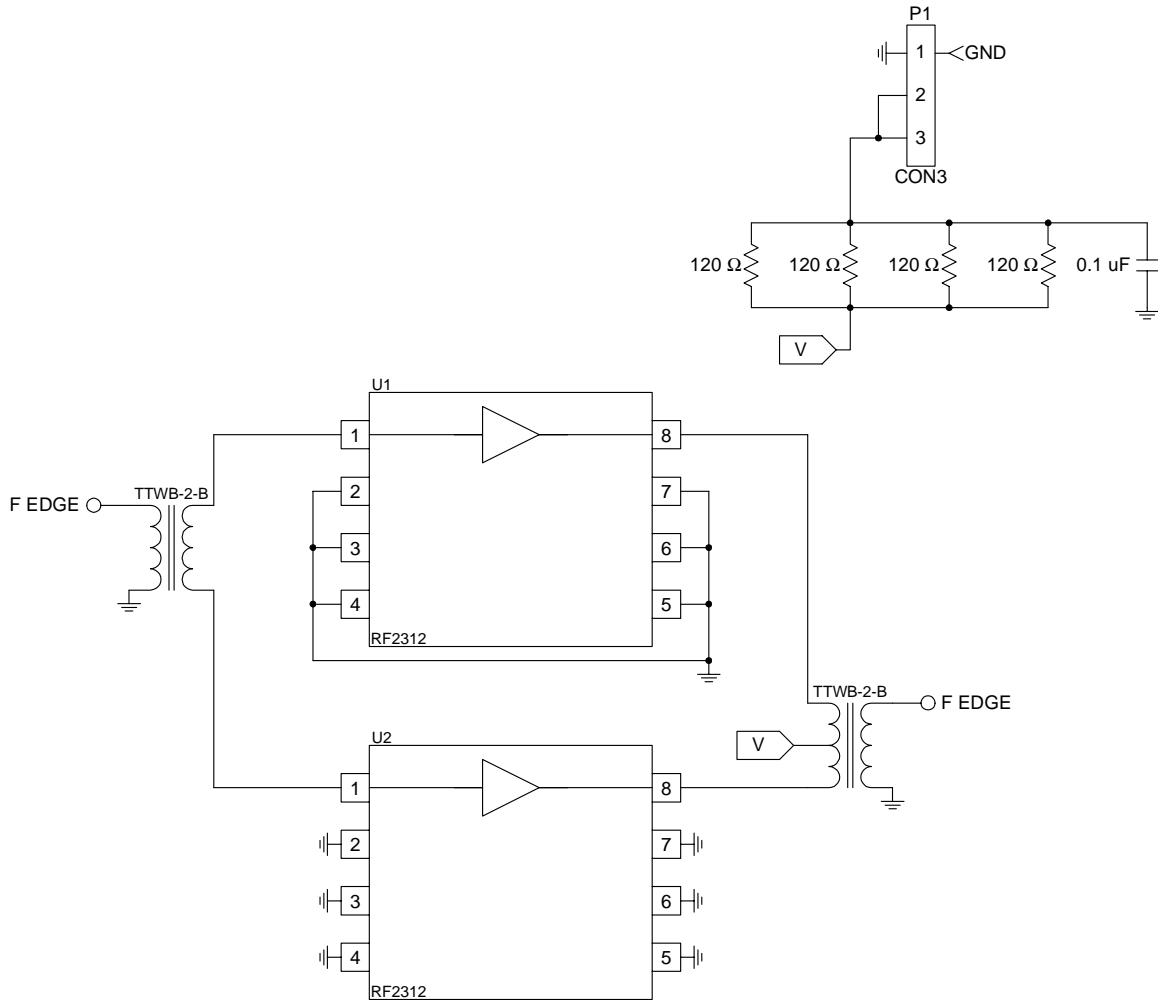
Optional resistor  $R_S$  can be used to maintain the correct bias level at higher supply voltages. This is used to increase output capability or linearity for signals with high crest factors.

## Application Schematic 10dB Gain



$R_5$  is used to maintain the correct bias level at higher supply voltages and is also required in this configuration. The RC network of  $R_2$  and  $C_3$  should be kept physically as short as possible.  $R_2$  can be adjusted as required to improve the impedance matching.  $R_6$  and  $R_7$  reduce the typical gain by increasing the emitter resistance.  $L_1$  should be at least  $200 \Omega$  reactive at the lowest operating frequency.  $C_1$  and  $C_2$  should be less than  $10 \Omega$  at the lowest operating frequency.  $C_4$  and  $C_5$  improve gain flatness.

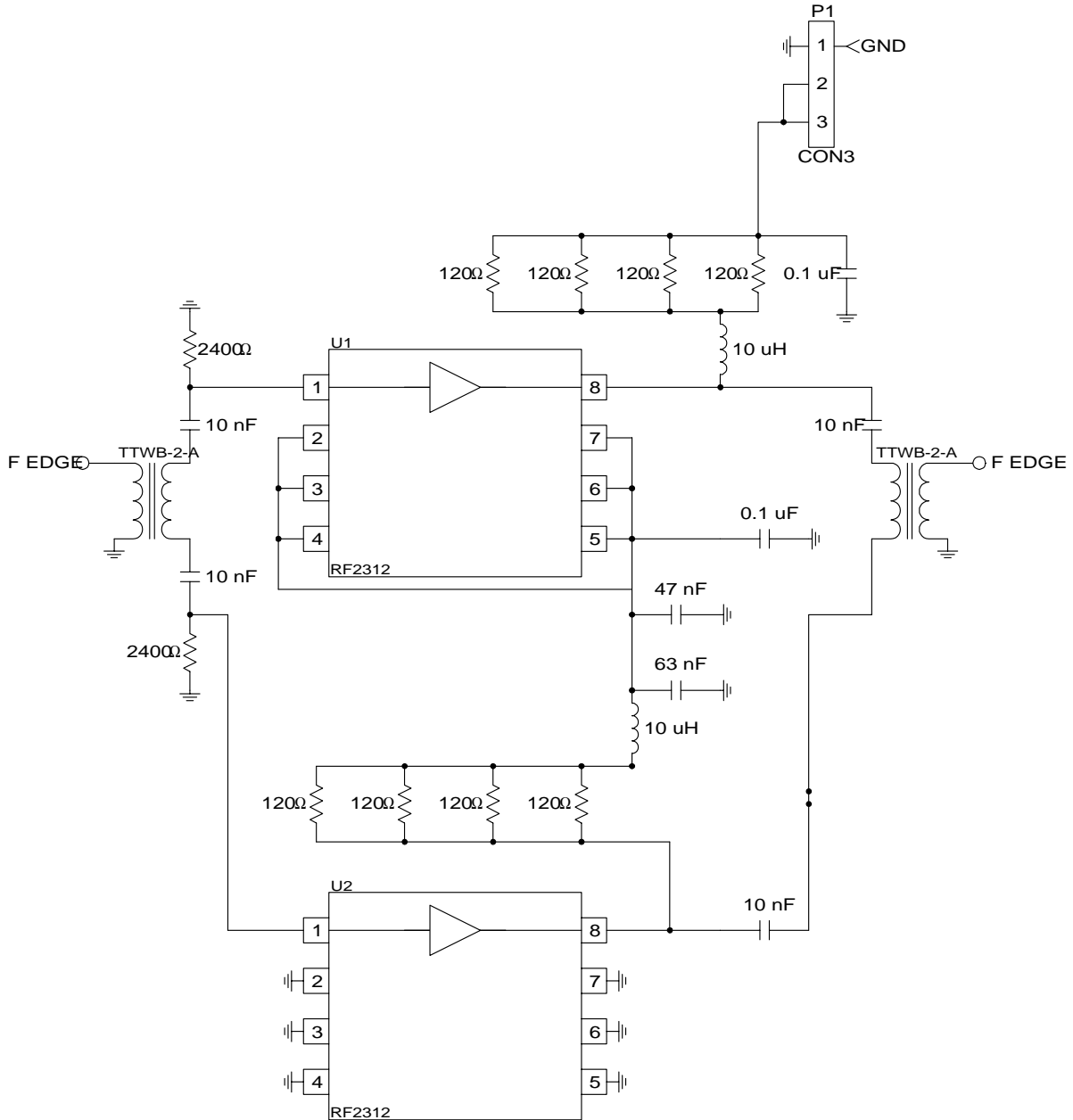
## Application Schematic Push-Pull Standard Voltage



## Application Schematic Push-Pull 24V

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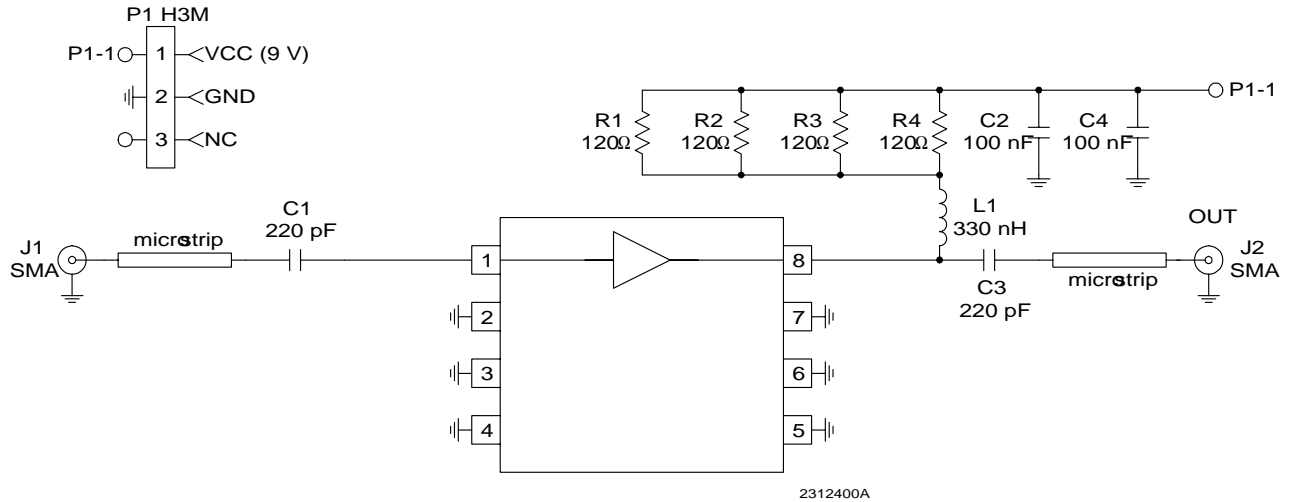
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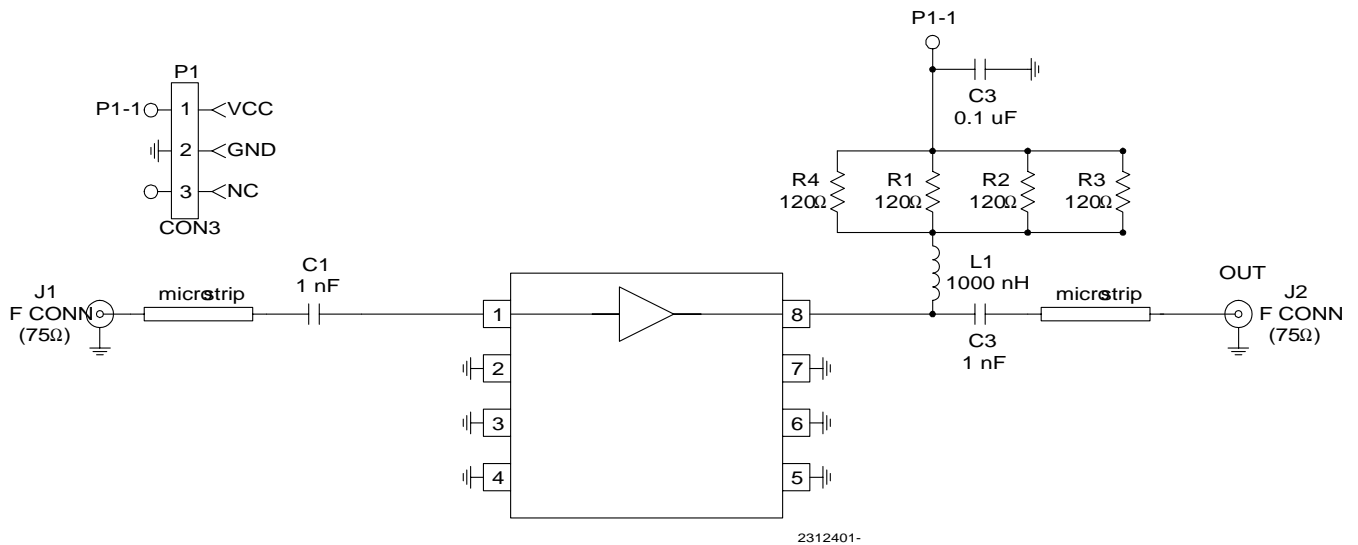


## Evaluation Board Schematic - 50Ω

(Download [Bill of Materials](http://www.rfmd.com) from www.rfmd.com.)



## Evaluation Board Schematic - 75Ω



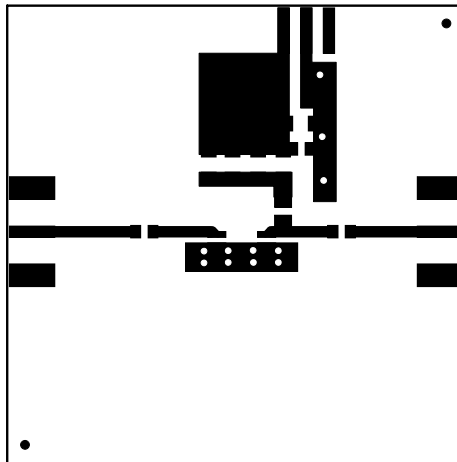
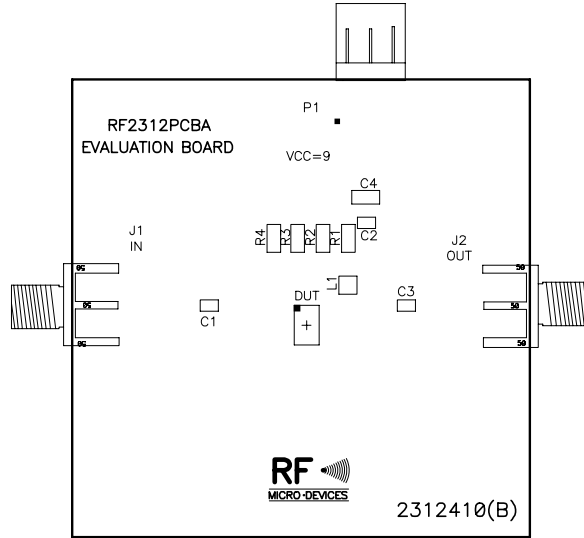
**NOTE:** For 5V applications, R1 to R4 may be removed (shorted). This will result in degraded distortion performance.

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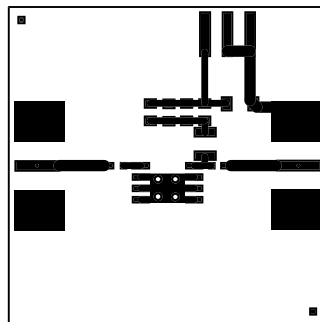
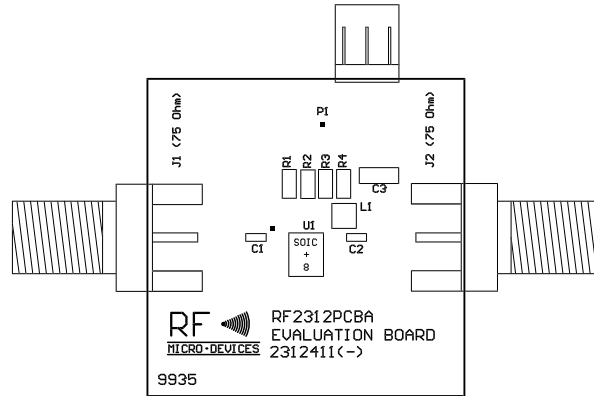
## Evaluation Board Layout - 50Ω 2.02" x 2.02" Board Thickness 0.031", Board Material FR-4

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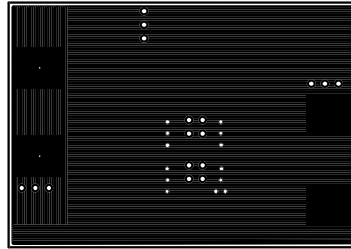
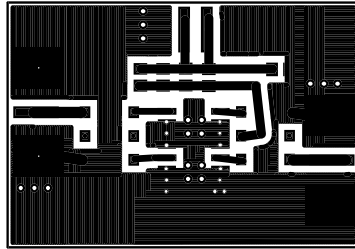
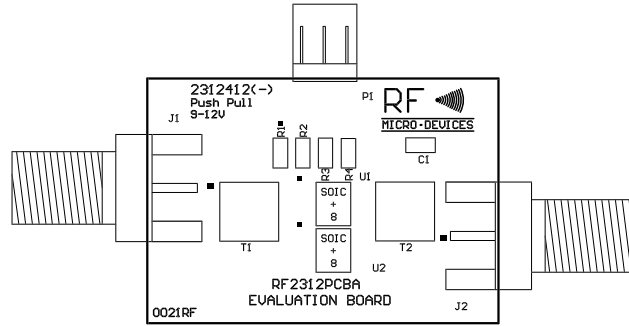


Evaluation Board Layout - 75Ω  
Standard Voltage  
1.40" x 1.40"  
Board Thickness 0.062", Board Material FR-4



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Evaluation Board Layout - 75Ω  
Push-Pull, Standard Voltage  
1.70" x 1.50"  
Board Thickness 0.062", Board Material FR-4

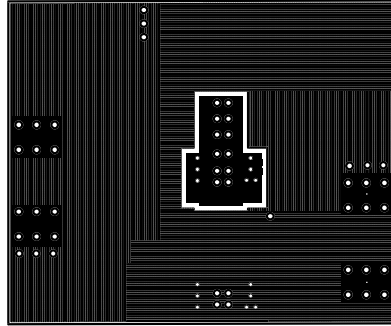
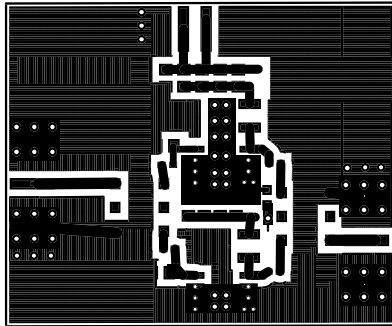
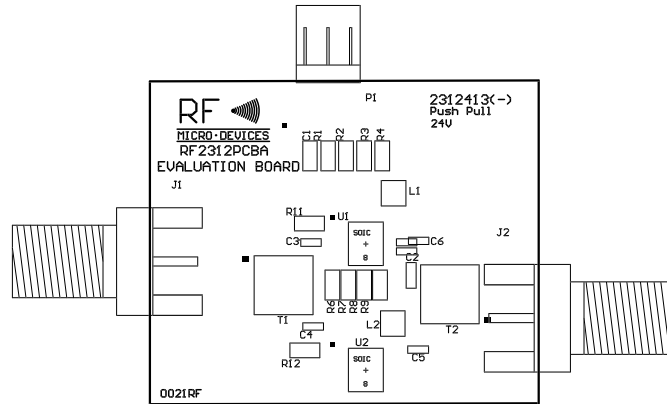


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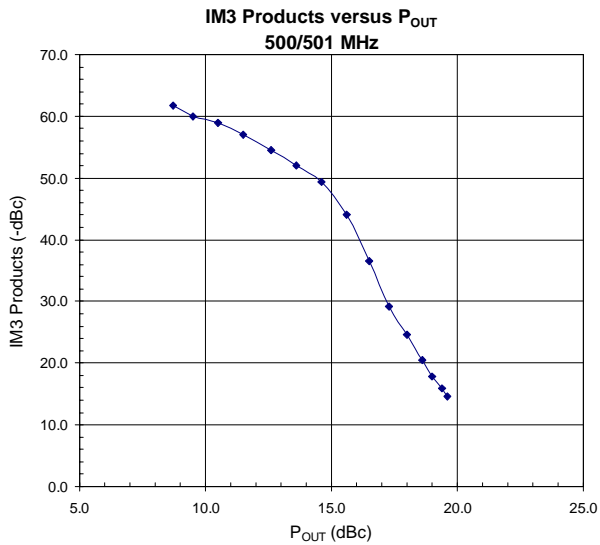
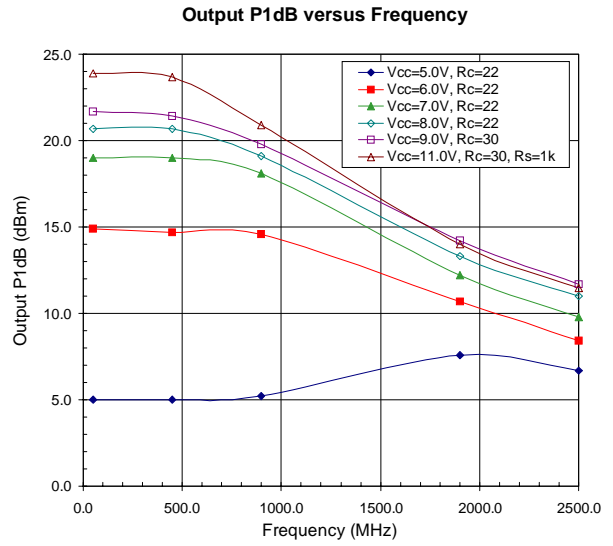
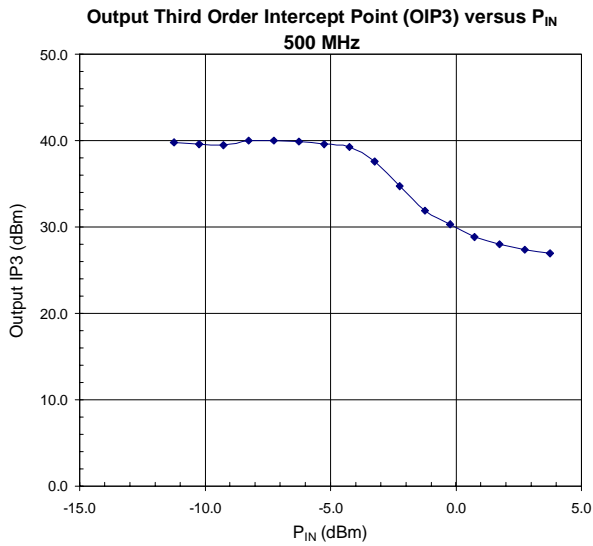
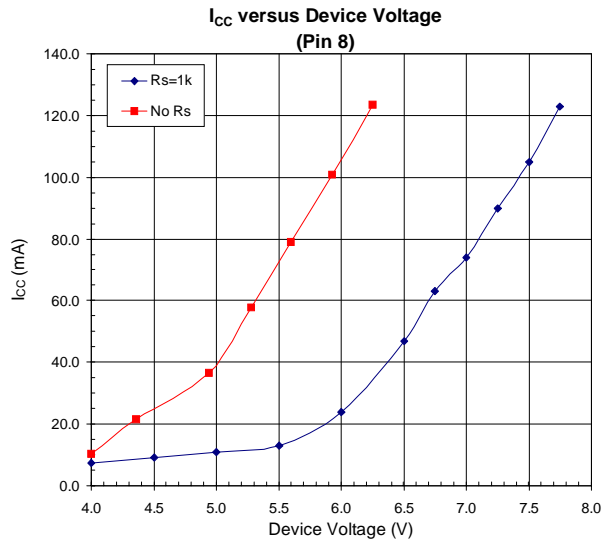
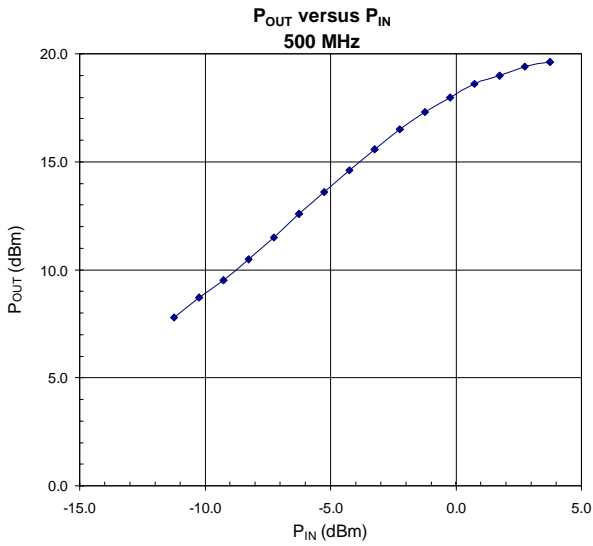
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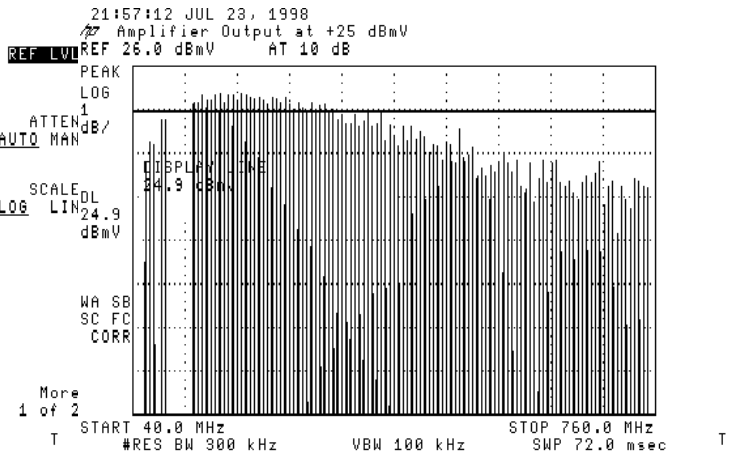
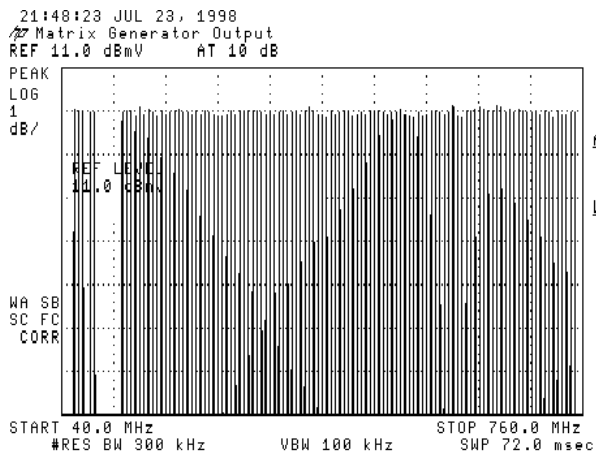
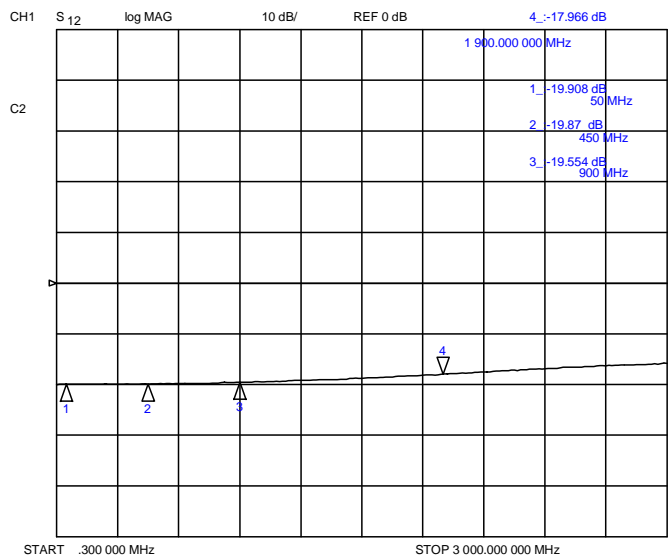
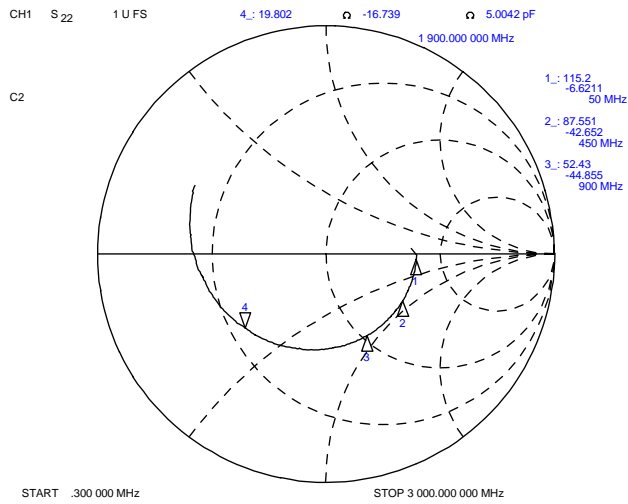
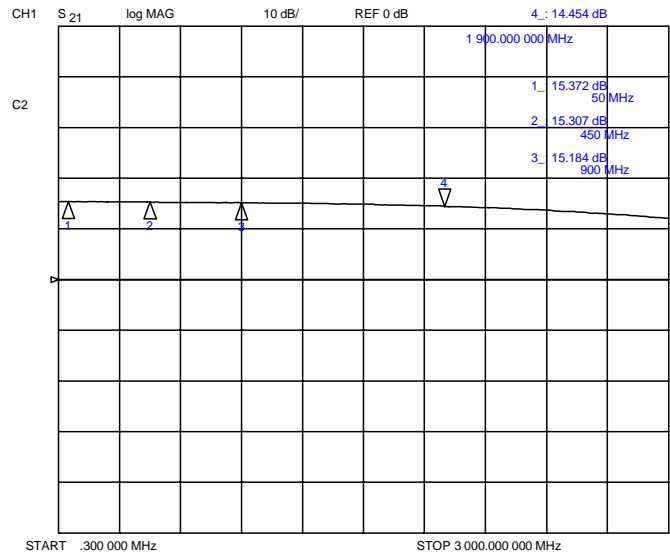
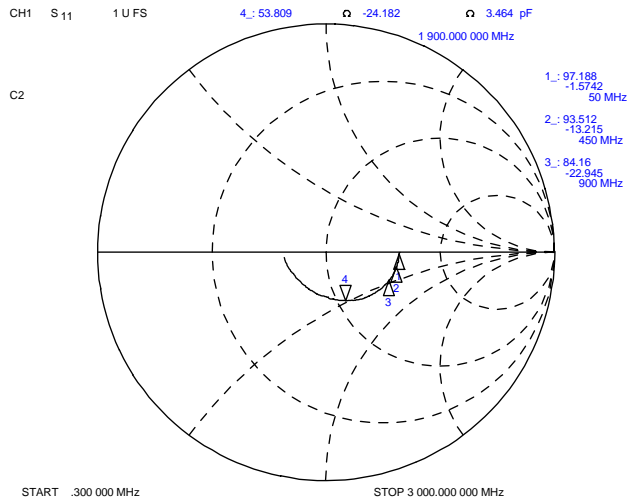
Evaluation Board Layout - 75Ω  
Push-Pull, 24V  
1.70" x 1.50"  
Board Thickness 0.062", Board Material FR-4



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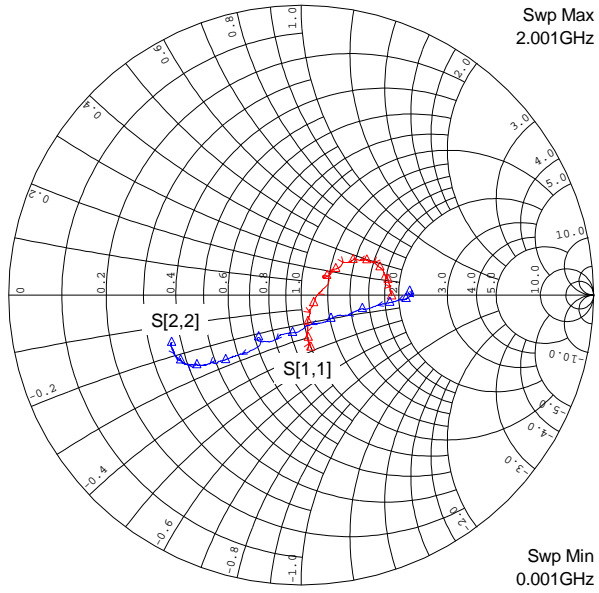
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75 Ohms, ICC = 100 mA, Temp = 25°C



75 Ohms, ICC = 110 mA, Temp = 25°C

