-A-

0.010



LINEAR GENERAL PURPOSE AMPLIFIER

RoHS Compliant & Pb-Free Product

Typical Applications

- CATV Distribution Amplifiers
- Cable Modems
- Broadband Gain Blocks

- Laser Diode Driver
- Return Channel Amplifier

0.160

Base Stations

Product Description

The RF2312 is a general purpose, low cost high linearity RF amplifier IC. The device is manufactured on an advanced Gallium Arsenide Heterojunction Bipolar Transistor (HBT) process, and has been designed for use as an easily cascadable 75Ω gain block. The gain flatness of better than 0.5dB from 5MHz to 1000MHz, and the high linearity, make this part ideal for cable TV applications. Other applications include IF and RF amplification in wireless voice and data communication products operating in frequency bands up to 2500MHz. The device is self-contained with 75Ω input and output impedances, and requires only two external DC biasing elements to operate as specified.

0.152 0.014 0.004 2 0.050 0.200 0.192 0.248 0.059 0.232 0.057 8° MAX 0° MIN 0.0100 0.0076 0.0500 0.0164

0.018

NOTES:

- 1. Shaded lead is pin 1.
- 2. All dimensions are excluding flash, protrusions or burrs.

Package Style: SOIC-8

- 3. Lead coplanarity: 0.005 with respect to datum "A"
- 4. Package surface finish: Matte (Charmilles #24~27)

Optimum Technology Matching® Applied

- ☐ Si BJT ☐ GaAs MESFET☐ Si Bi-CMOS☐ SiGe HBT☐ Si CMOS☐ InGaP/HBT☐ GaN HEMT☐ SiGe Bi-CMOS☐
 - RF IN 1 8 RF OUT

 GND 2 7 GND

 GND 3 6 GND

 GND 4 5 GND

Functional Block Diagram

Features

- DC to well over 2500MHz Operation
- Internally Matched Input and Output
- 15dB Small Signal Gain
- 3.8dB Noise Figure
- +20dBm Output Power
- Single 5V to 12V Positive Power Supply

Ordering Information

 $\begin{array}{ll} \text{RF2312} & \text{Linear General Purpose Amplifier} \\ \text{RF2312 PCBA} & \text{Fully Assembled Evaluation Board - } 5\Omega \\ \text{RF2312 PCBA} & \text{Fully Assembled Evaluation Board - } 50\Omega \\ \end{array}$

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Absolute Maximum Ratings

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



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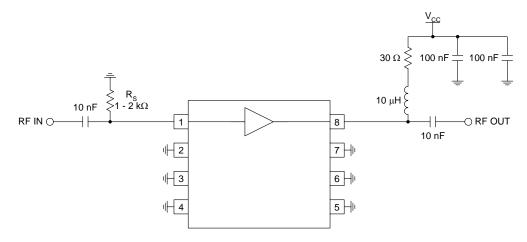
Donomotor		Specification			Condition	
Parameter	Min.	Min. Typ.		Unit	Condition	
Overall (50Ω)					T=25°C, V _{CC} =9V, Freq=900 MHz,	
Overall (3032)					$R_C=30\Omega$, 50Ω System, $P_{IN}=-4dBm$	
Frequency Range		DC to 2500		MHz	3dB Bandwidth	
Gain	14.5	15.1		dB		
Noise Figure		3.8	4.3	dB	From 50MHz to 300MHz, -30 to +70 °C	
		4.2	4.8	dB	From 300MHz to 1000MHz, -30 to +70 °C	
Input VSWR		1.7:1	2:1		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	2:1		Appropriate values for the DC blocking capacitors and bias inductor are required to maintain this VSWR at the intended operating frequency range.	
Output IP ₃	+40	+42		dBm	At 100MHz	
Output IP ₃	+33	+36		dBm	At 500MHz	
Output IP ₃	+30	+33		dBm	At 900MHz	
Output P _{1dB}	+21	+22		dBm	At 100MHz	
Output P _{1dB}	+20	+21		dBm	At 500MHz	
Output P _{1dB}	+17	+18.5		dBm	At 900 MHz	
Saturated Output Power		+23		dBm	At 100MHz	
Saturated Output Power		+22.5		dBm	At 500MHz	
Saturated Output Power		+20.5		dBm	At 900 MHz	
Reverse Isolation		20		dB		
Thermal						
Theta _{JC}		114.9		°C/W	I _{CC} =100 mA, P _{DISS} =0.555 W, T _{AMB} =85°C, T _J =149°C No RF Input/Output	
Mean Time To Failure		2170		years	T _{AMB} =+85°C	
Theta _{.IC}		114.05		°C/W	I _{CC} =120mA, P _{DISS} =0.702W, T _{AMB} =85°C,	
				2,	T _J =165°C No RF Input/Output	
Mean Time To Failure		2170		years	T _{AMB} =+85°C	
Power Supply						
Device Voltage (V _D)		5.5		V	On pin 8, I _{CC} =100mA	
		5.0		V	On pin 8, I _{CC} =40mA	
Operating Current Range	40	100	120	mA	$V_{CC}=9.0V$, $R_{C}=30\Omega$	

Danamatan		Specification			O an disting	
Parameter	Min.			Unit	Condition	
Overall (75 Ω)					T=25°C, V _{CC} =9V, Freq=900 MHz,	
• •		50, 0500			$R_C=30\Omega$, 75Ω System	
Frequency Range	44.5	DC to 2500		MHz	3dB Bandwidth	
Gain Noise Figure	14.5	16 3.8	4.2	dB dB	From FOMULE to 200MULE 200C to 1700C	
Noise Figure		3.6 4.2	4.3 4.8	dВ	From 50MHz to 300MHz, -30°C to +70°C. From 300MHz to 1000MHz, -30°C to +70°C.	
Input VSWR		1.3:1	2:1	άĎ	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		1.2:1	1.75:1		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.	
		1.4:1	2:1		From 300MHz to 500MHz, -30°C to +70°C.	
Output IP ₃	+36	1.5:1 +38	2:1	dBm	From 500MHz to 900MHz, -30°C to +70°C. At 100MHz	
Output IP ₃	+33	+36		dBm	At 500MHz	
Output IP ₃	+28	+30		dBm	At 900MHz	
Output P _{1dB}	+21	+22		dBm	At 100MHz	
Output P _{1dB}	+20	+21		dBm	At 500MHz	
	+20	+18.5		dBm	At 900MHz	
Output P _{1dB} Saturated Output Power	+17	+16.5		dBm	At 100 MHz	
Saturated Output Power Saturated Output Power		+23 +22.5		dBm	At 500MHz	
Saturated Output Power		+22.5		dBm	At 900MHz	
Reverse Isolation		20		dB	AC 300 WILLS	
77 Channels		-		-	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	
СТВ		>86		dBc	61.25MHz	
		>86		dBc	83.25MHz	
		86		dBc	193.25MHz	
		84		dBc	313.2625MHz	
CNR	65	83		dBc	547.25MHz	
110 Channels	65	66		dB	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	
СТВ		84		dBc	61.25MHz	
		86		dBc	83.25MHz	
		85		dBc	193.25MHz	
		81		dBc	313.2625MHz	
One as Mandadati		80		dBc	547.25MHz	
Cross Modulation		77 74		dBc	61.25MHz	
	ı	/ 4	1	dBc	445.25MHz	

Donomotor	Specification			11!4	0	
Parameter	Min. Typ.		Max.	Unit	Condition	
Overall (75Ω Push-Pull)					T=25°C, V_{CC} =9V or 24V, 75 Ω System, RF _{IN} =-10dBm	
Frequency Range		DC to 150		MHz		
Gain		15		dB		
Noise Figure		5.0		dB	From 5MHz to 150MHz, -30°C to +70°C.	
Input VSWR		1.1:1				
Output VSWR		1.2:1				
Output IP ₂		+71		dBm	At 10MHz	
		+72		dBm	At 30MHz	
		+74		dBm	At 50MHz	
Output IP ₃		+40		dBm	At 10MHz	
-		+40		dBm	At 30MHz	
		+40		dBm	At 50MHz	
Second Harmonic		-73		dBc	At 10MHz	
		-65		dBc	At 30MHz	
		-65		dBc	At 50MHz	

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 $1\mathrm{k}\Omega$ 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 21Ω 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.	RF INO

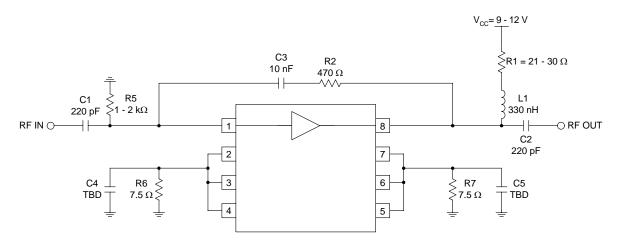
Application Schematic 5MHz to 50MHz Reverse Path



NOTE 1:

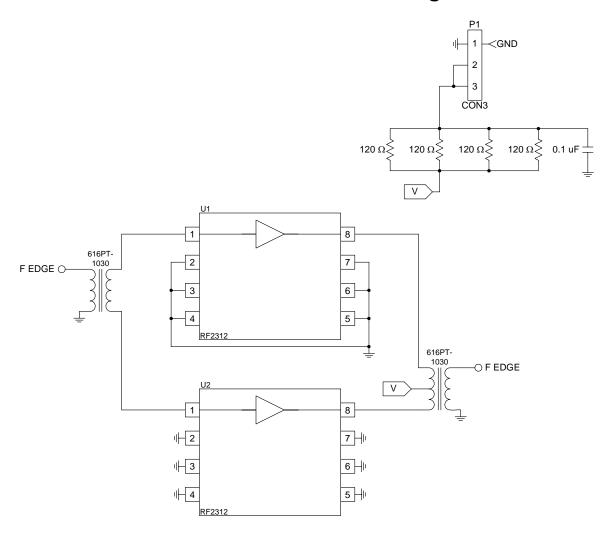
Optional resistor $R_{\rm S}$ can be used to maintain the correct bias level at higher supply voltages. This is used to increase output capability or linearity for signals with high crest factors.

Application Schematic 10dB Gain

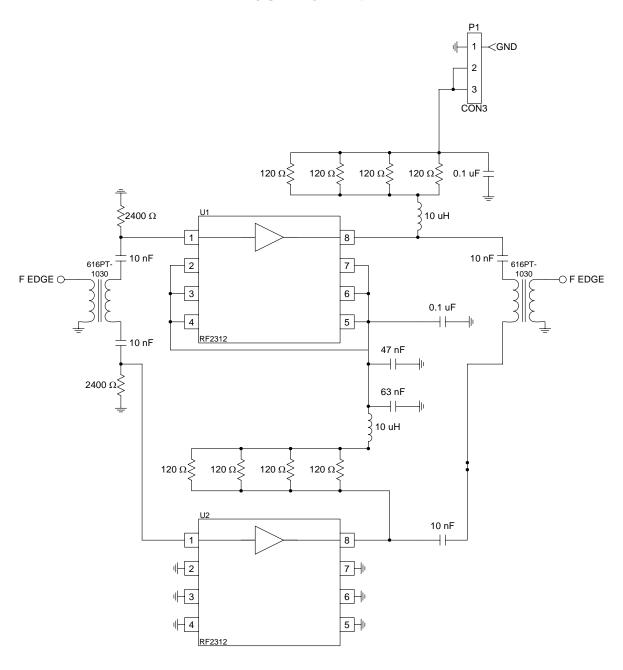


R5 is used to maintain the correct bias level at higher supply voltages and is also required in this configuration. The RC network of R2 and C3 should be kept physically as short as possible. R2 can be adjusted as required to improve the impedance matching. R6 and R7 reduce the typical gain by increasing the emitter resistance. L1 should be at least 200 Ω reactive at the lowest operating frequency. C1 and C2 should be less than 10 Ω at the lowest operating frequency. C4 and C5 improve gain flatness.

Application Schematic Push-Pull Standard Voltage

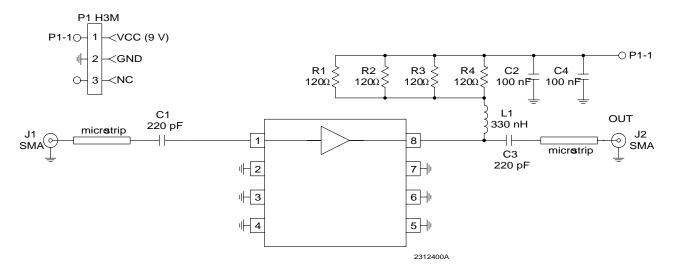


Application Schematic Push-Pull 24V

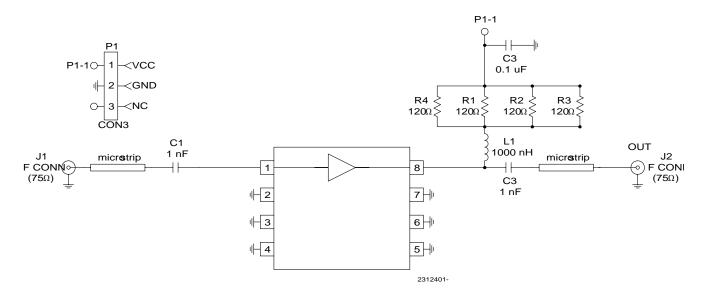


Evaluation Board Schematic - 50Ω

(Download Bill of Materials from www.rfmd.com.)



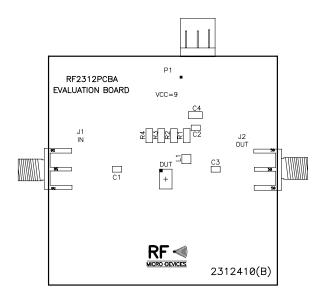
Evaluation Board Schematic - 75 Ω

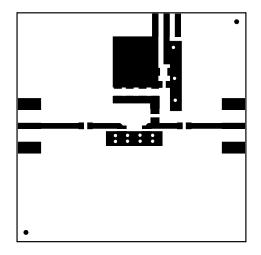


NOTE: For 5V applications, R1 to R4 may be removed (shorted). This will result in degraded distortion performance.

Evaluation Board Layout - 50Ω 2.02" x 2.02"

Board Thickness 0.031", Board Material FR-4

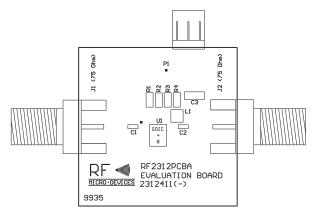


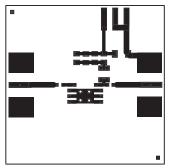


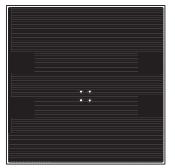
Evaluation Board Layout - 75 Ω **Standard Voltage**

1.40" x 1.40"

Board Thickness 0.062", Board Material FR-4

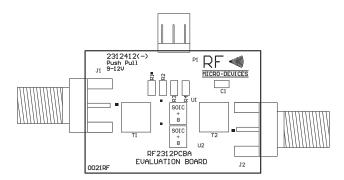


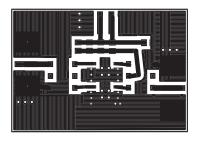


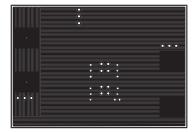


Evaluation Board Layout - 75 Ω Push-Pull, Standard Voltage 1.70" x 1.50"

Board Thickness 0.062", Board Material FR-4

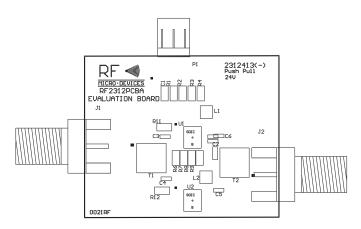


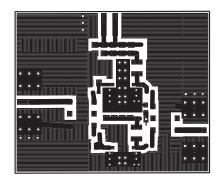


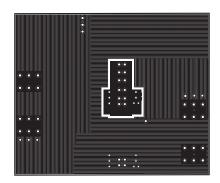


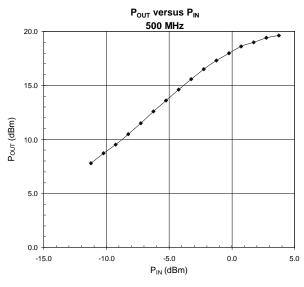
Evaluation Board Layout - 75Ω Push-Pull, 24V 1.70" x 1.50"

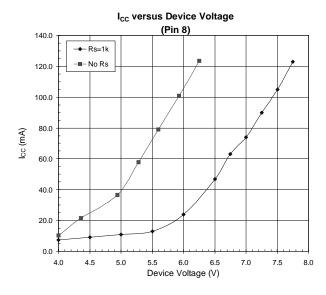
Board Thickness 0.062", Board Material FR-4

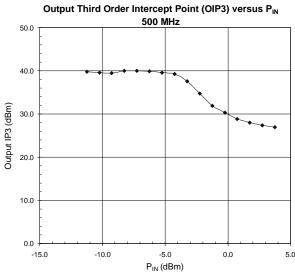


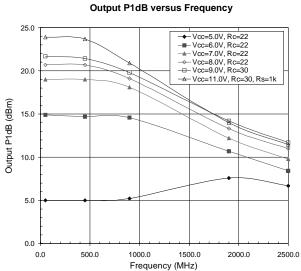


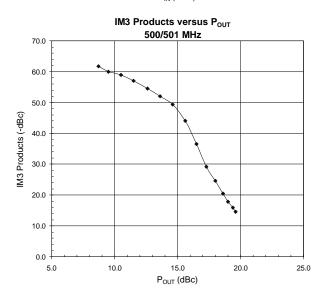


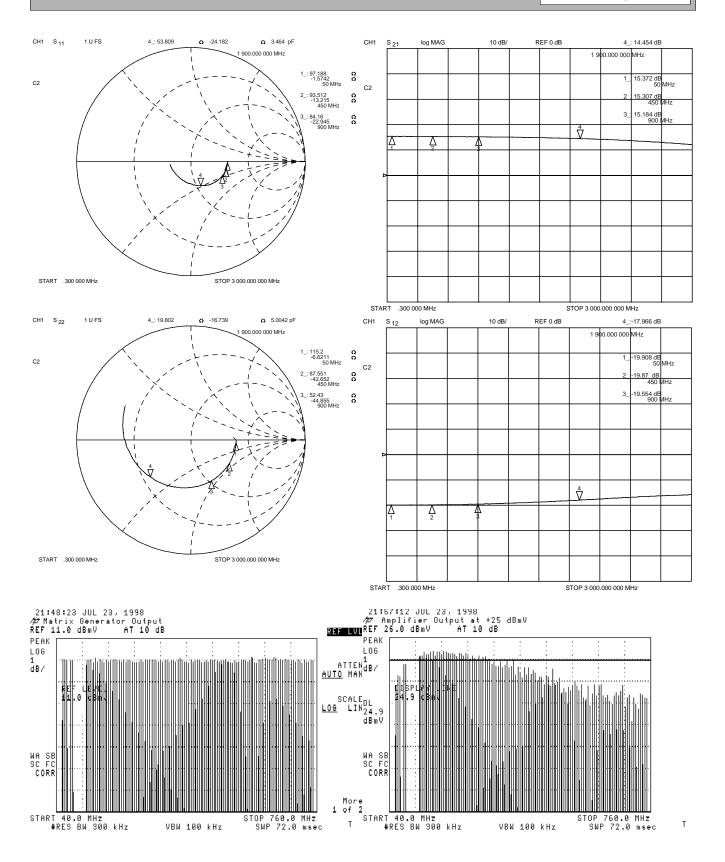




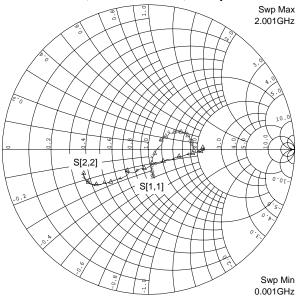








75 Ohms, ICC = 100 mA, Temp = 25°C



75 Ohms, ICC = 110 mA, Temp = 25°C

