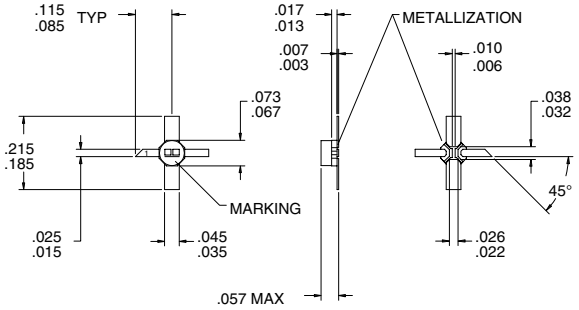
Typical Applications

- Broadband, Low Noise Gain Blocks
- IF or RF Buffer Amplifiers
- Driver Stage for Power Amplifiers
- Final PA for Low Power Applications
- High Reliability Applications
- Broadband Test Equipment

Product Description

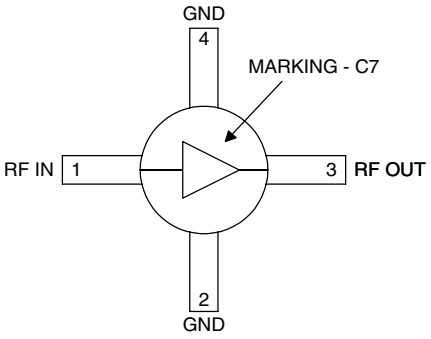
The RF2047 is a general purpose, low cost RF amplifier IC. The device is manufactured on an advanced Gallium Arsenide Heterojunction Bipolar Transistor (HBT) process, and has been designed for use as an easily-cascadable 50Ω gain block. Applications include IF and RF amplification in wireless voice and data communication products operating in frequency bands up to 6000MHz. The device is self-contained with 50Ω input and output impedances and requires only two external DC biasing elements to operate as specified. With a goal of enhanced reliability, the extremely small Micro-X-CF ceramic package offers significantly lower thermal resistance than similar size plastic packages.



Package Style: Micro-X-CF

Optimum Technology Matching® Applied

- ☐ Si BJT
- ☑ GaAs HBT
- ☐ GaAs MESFET
- ☐ Si Bi-CMOS
- ☐ SiGe HBT
- ☐ Si CMOS



Functional Block Diagram

Features

- DC to 6000MHz Operation
- Internally matched Input and Output
- 16dB Small Signal Gain
- +26dBm Output IP3
- +12dBm Output Power
- Excellent Gain Flatness

Ordering Information

RF2047	General Purpose Amplifier
RF2047 PCBA	Fully Assembled Evaluation Board

RF Micro Devices, Inc.
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Greensboro, NC 27409, USA

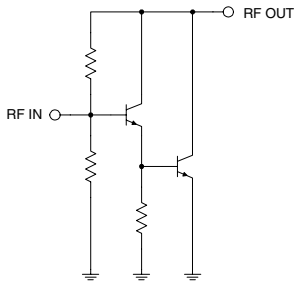
Tel (336) 664 1233
Fax (336) 664 0454
http://www.rfmd.com

Absolute Maximum Ratings

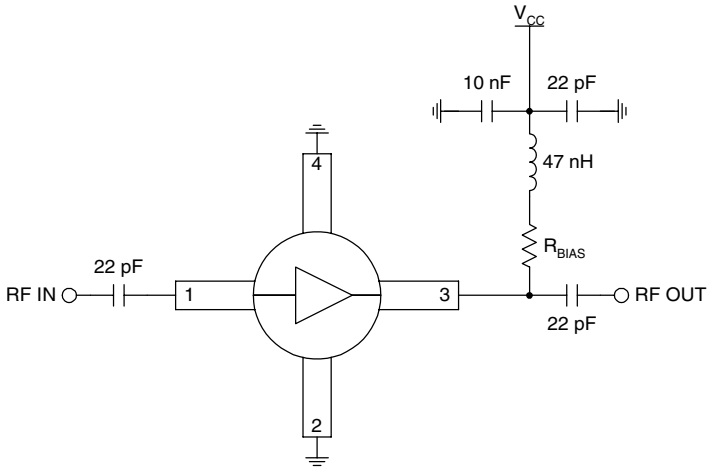
Parameter	Rating	Unit
Supply Current	75	mA
Input RF Power	+15	dBm
Operating Ambient Temperature	-40 to +85	°C
Storage Temperature	-60 to +150	°C

Caution! ESD sensitive device.

Parameter	Specification			Unit	Condition
	Min.	Typ.	Max.		
Overall					T=25 °C, V_D=3.6V, I_{CC}=40mA
Frequency Range		DC to 6000		MHz	
3dB Bandwidth		>6		GHz	
Gain		16.3		dB	Freq=100MHz
		16.0		dB	Freq=1000MHz
	14.0	15.3		dB	Freq=2000MHz
		15.0		dB	Freq=3000MHz
		14.8		dB	Freq=4000MHz
		14.0		dB	Freq=6000MHz
Gain Flatness		±0.5		dB	100MHz to 2000MHz
Noise Figure		4.2		dB	Freq=2000MHz
Input VSWR		1.8:1			In a 50Ω system, DC to 3000MHz
		1.6:1			In a 50Ω system, 3000MHz to 6000MHz
Output VSWR		1.7:1			In a 50Ω system, DC to 3000MHz
		2.2:1			In a 50Ω system, 3000MHz to 6000MHz
Output IP_3		+26		dBm	Freq=2000MHz±50kHz, P_{TONE}=-10dBm
Output P_{1dB}		+11.9		dBm	Freq=2000MHz
Reverse Isolation		19.4		dB	Freq=2000MHz
Thermal					I_{CC}=40mA, P_{DISS}=135mW
$Theta_{JC}$		196		°C/W	
Maximum junction temperature		112		°C	
Mean Time Between Failures		$1.5x10^4$		years	T_{AMB}=+85°C
Mean Time Between Failures		$9.3x10^6$		years	T_{AMB}=+25°C
Mean Time Between Failures		$2.9x10^{11}$		years	T_{AMB}=-40°C
Power Supply					With 22Ω bias resistor
Device Operating Voltage	3.0	3.6	4.0	V	At pin 3 with I_{CC}=40mA
Operating Current		40		mA	

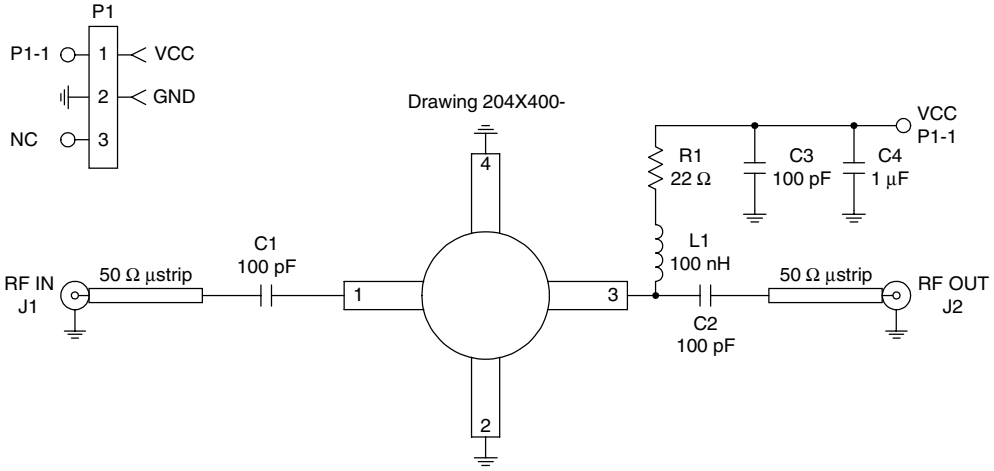
Pin	Function	Description	Interface Schematic
1	RF IN	RF input pin. This pin is NOT internally DC blocked. A DC blocking capacitor, suitable for the frequency of operation, should be used in most applications. DC coupling of the input is not allowed, because this will override the internal feedback loop and cause temperature instability.	
2	GND	Ground connection. Keep traces physically short and connect immediately to ground plane for best performance.	
3	RF OUT	RF output and bias pin. Biasing is accomplished with an external series resistor and choke inductor to V_{CC}. The resistor is selected to set the DC current into this pin to a desired level. The resistor value is determined by the following equation: $$R = \frac{(V_{SUPPLY} - V_{DEVICE})}{I_{CC}}$$ Care should also be taken in the resistor selection to **ensure that the current into the part never exceeds 75 mA over the planned operating temperature**. This means that a resistor between the supply and this pin is always required, even if a supply near 3.6V is available, to provide DC feedback to prevent thermal runaway. Because DC is present on this pin, a DC blocking capacitor, suitable for the frequency of operation, should be used in most applications. The supply side of the bias network should also be well bypassed.	
4	GND	Same as pin 2.	

Application Schematic

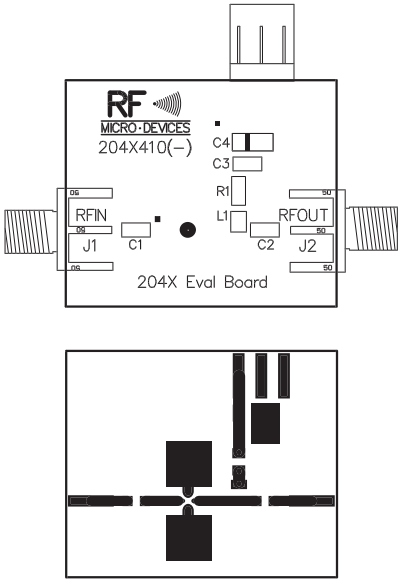


Evaluation Board Schematic

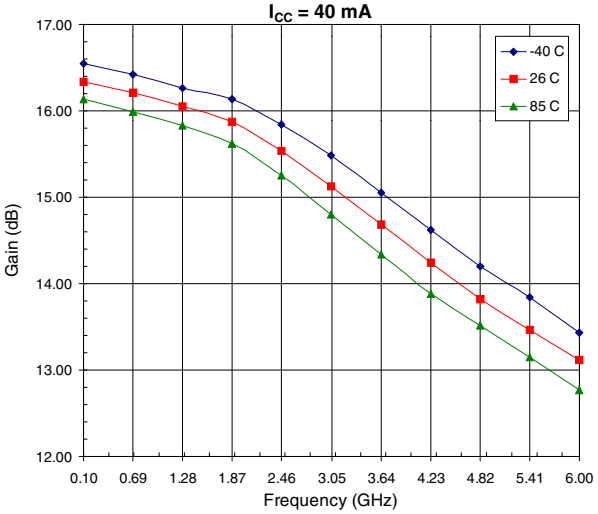
(Download Bill of Materials from www.rfmd.com.)



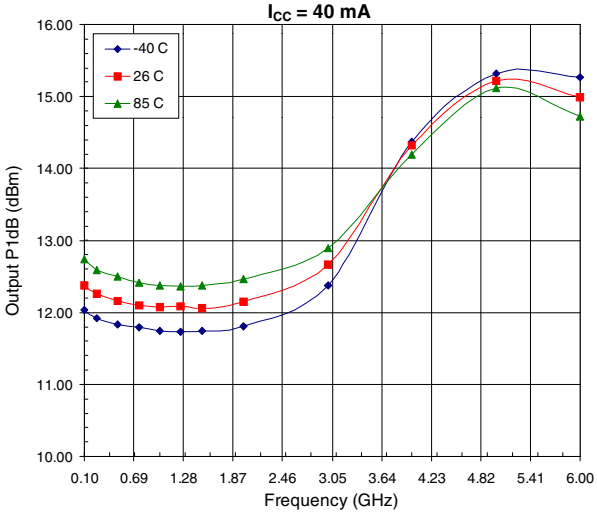
Evaluation Board Layout
Board Size 1.195" x 1.000"



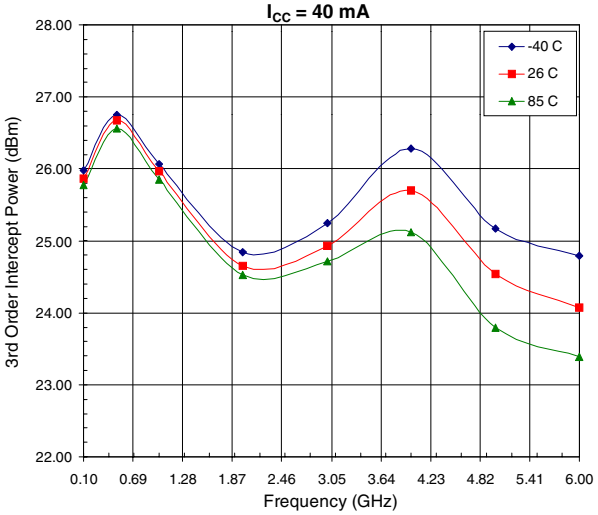
Gain versus Frequency Across Temperature
I_{CC} = 40 mA



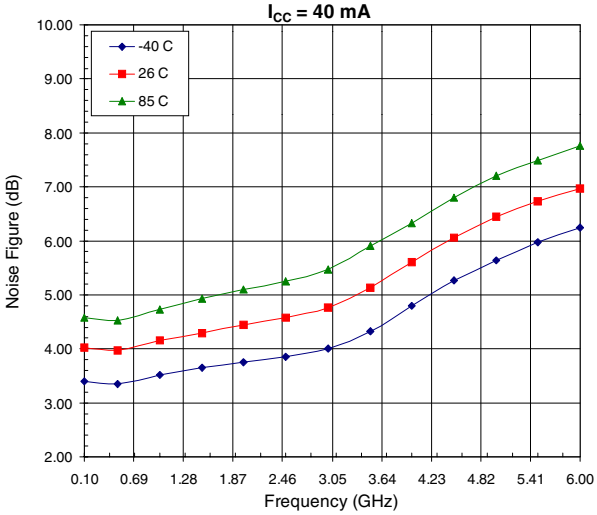
Output P1dB versus Frequency Across Temperature
I_{CC} = 40 mA



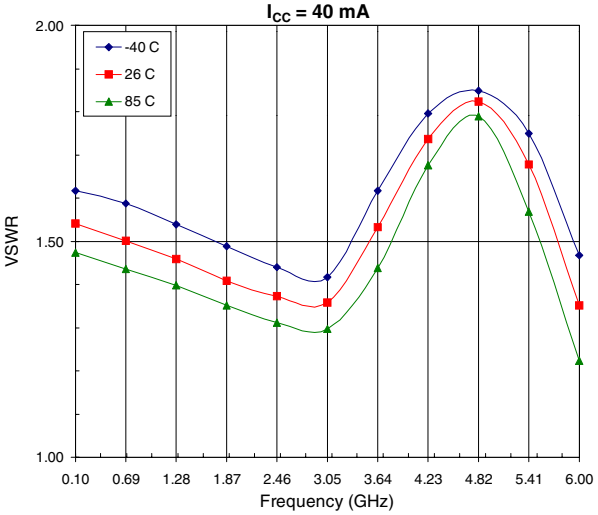
Output IP3 versus Frequency Across Temperature
I_{CC} = 40 mA



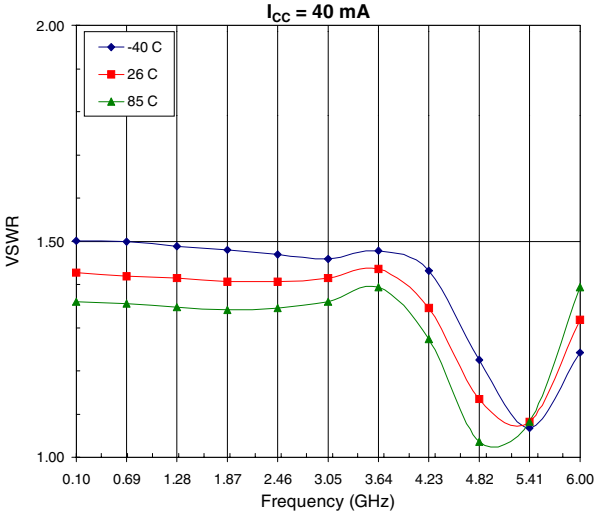
Noise Figure versus Frequency Across Temperature
I_{CC} = 40 mA

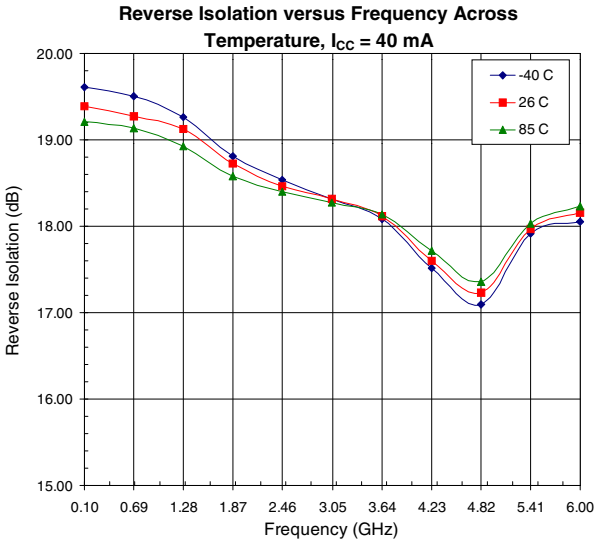


Input VSWR versus Frequency Across Temperature
I_{CC} = 40 mA



Output VSWR versus Frequency Across Temperature
I_{CC} = 40 mA




Reverse Isolation versus Frequency Across Temperature, I_{CC} = 40 mA
20.00
19.00
18.00
17.00
16.00
15.00
Reverse Isolation (dB)
0.10
0.69
1.28
1.87
2.46
3.05
3.64
4.23
4.82
5.41
6.00
Frequency (GHz)
-40 C
26 C
85 C