RF3378

GENERAL PURPOSE AMPLIFIER

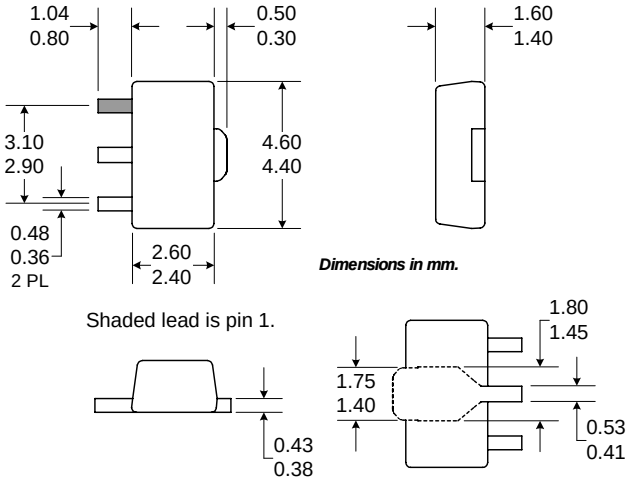
RoHS Compliant & Pb-Free Product

Typical Applications

- Basestation 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

Product Description

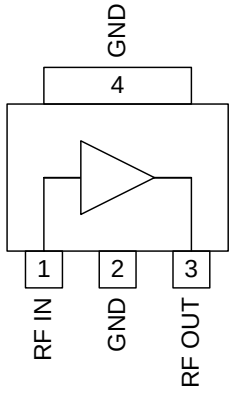
The RF3378 is a general purpose, low-cost RF amplifier IC. The device is manufactured on an advanced Gallium Arsenide Heterojunction Bipolar Transistor (HBT) process, and has been designed for use as an easily-cascadable 50Ω gain block. Applications include IF and RF amplification in wireless voice and 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.



Package Style: SOT89

Optimum Technology Matching® Applied

- ☐ Si BJT
- ☑ GaAs HBT
- ☐ GaAs MESFET
- ☐ Si Bi-CMOS
- ☐ SiGe HBT
- ☐ Si CMOS
- ☐ InGaP/HBT
- ☐ GaN HEMT
- ☐ SiGe Bi-CMOS



Functional Block Diagram

Features

- DC to >6000MHz Operation
- Internally Matched Input and Output
- 12dB Small Signal Gain
- +26dBm Output IP3
- +13dBm Output P1dB

Ordering Information

RF3378	General Purpose Amplifier
RF337XPCBA-41X	Fully Assembled Evaluation Board

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Absolute Maximum Ratings

Parameter	Rating	Unit
Input RF Power	+13	dBm
Operating Ambient Temperature	-40 to +85	°C
Storage Temperature	-60 to +150	°C
I_{CC}	60	mA

Caution! ESD sensitive device.

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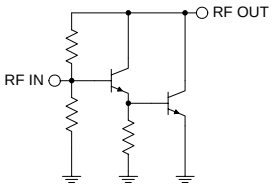
Parameter	Specification			Unit	Condition
	Min.	Typ.	Max.		
Overall					T=25 °C, I_{CC}=40mA (See Note 1.)
Frequency Range		DC to >6000		MHz	
3dB Bandwidth		6		GHz	
Gain	11.6	12.6		dB	Freq=500MHz
	11.5	12.5		dB	Freq=1000MHz
	11.0	12.0		dB	Freq=2000MHz
		11.5		dB	Freq=3000MHz (See Note)
		11.2		dB	Freq=4000MHz (See Note)
		11.3		dB	Freq=6000MHz (See Note)
Noise Figure		3.7		dB	Freq=2000MHz
Input VSWR		<1.75:1			In a 50Ω system, DC to 6000MHz
Output VSWR		<1.77:1			In a 50Ω system, DC to 6000MHz
Output IP_3	+25.0	+26.0		dBm	Freq=2000MHz
Output P_{1dB}	+12.0	+13.0		dBm	Freq=2000MHz
Reverse Isolation		16.5		dB	Freq=2000MHz
Thermal					I_{CC}=40mA, P_{DISS}=147mW. (See Note 3.)
$Theta_{JC}$		121		°C/W	
Maximum Measured Junction Temperature at DC Bias Conditions		103		°C	T_{CASE}=+85°C
Mean Time To Failures		70,000		years	T_{CASE}=+85°C
Power Supply					With 22Ω bias resistor
Device Operating Voltage		3.9	4.0	V	At pin 8 with I_{CC}=40mA
		4.8	5.1	V	At evaluation board connector, I_{CC}=40mA
Operating Current		40	60	mA	See Note 2.

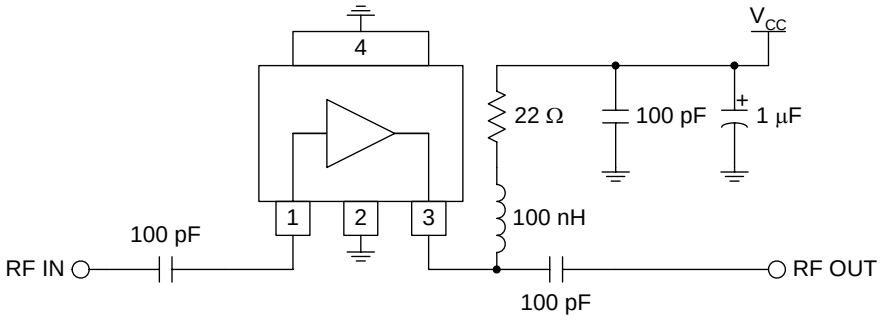
Note 1: All specification and characterization data has been gathered on standard FR-4 evaluation boards. These evaluation boards are not optimized for frequencies above 2.5GHz. Performance above 2.5GHz may improve if a high performance PCB is used.

Note 2: The RF3378 must be operated at or below 60mA in order to achieve the thermal performance listed above. While the RF3378 may be operated at higher bias currents, 40mA is the recommended bias to ensure the highest possible reliability and electrical performance.

Note 3: Because of process variations from part to part, the current resulting from a fixed bias voltage will vary. As a result, caution should be used in designing fixed voltage bias circuits to ensure the worst case bias current does not exceed 60mA over all intended operating conditions.

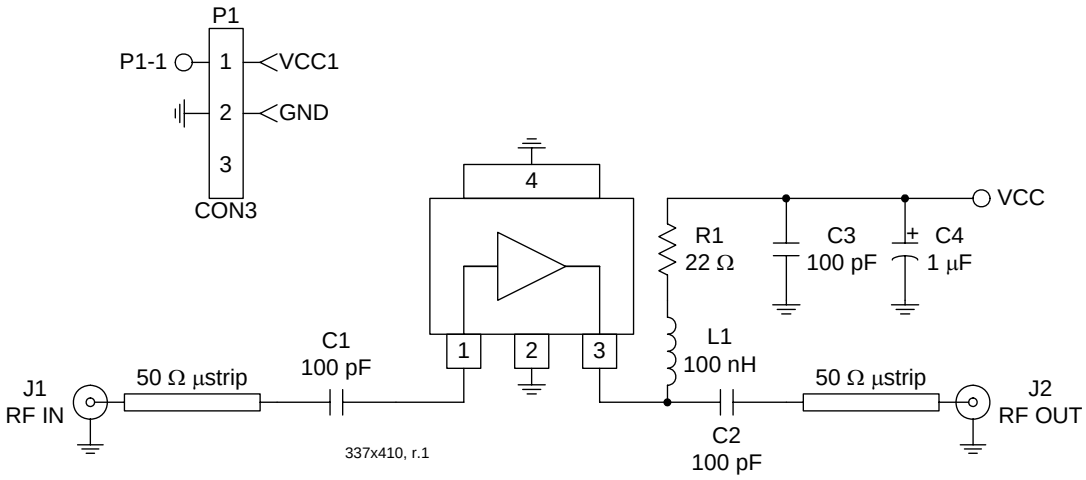
Pin	Function	Description	Interface Schematic
1	RF IN	RF input pin. This pin is NOT internally DC-blocked. A DC-blocking capacitor, suitable for the frequency of operation, should be used in most applications. DC-coupling of the input is not allowed, because this will override the internal feedback loop and cause temperature instability.	
2	GND	Ground connection.	
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 60mA over the planned operating temperature**. This means that a resistor between the supply and this pin is always required, even if a supply near 3.9V 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	Ground connection.	

Application Schematic

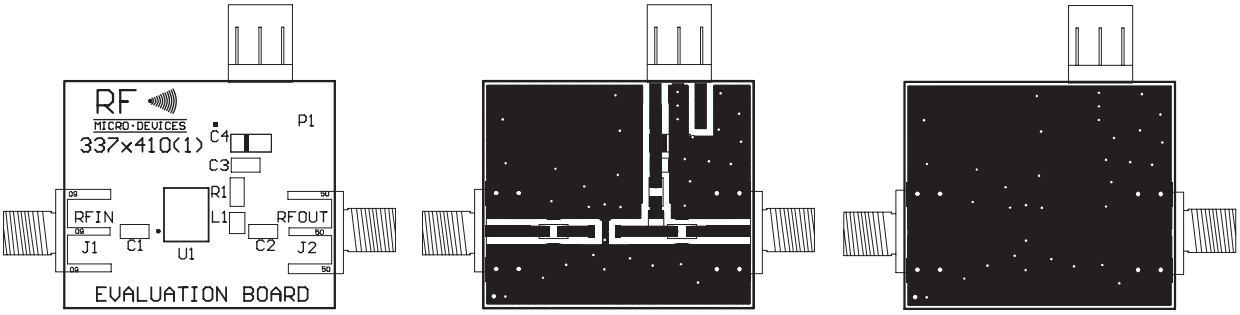


Evaluation Board Schematic

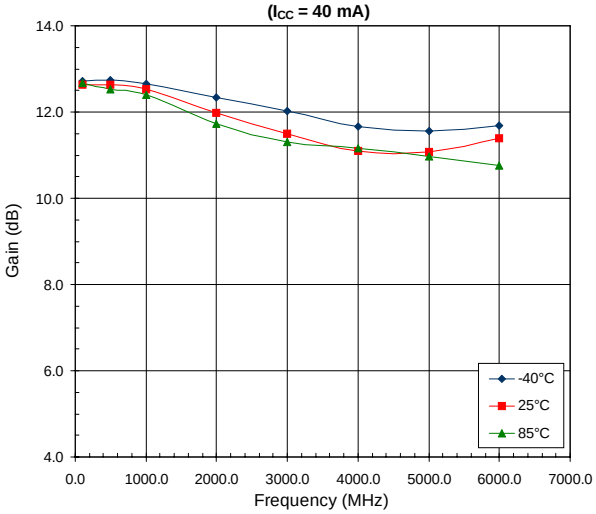
(Download Bill of Materials from www.rfmd.com.)



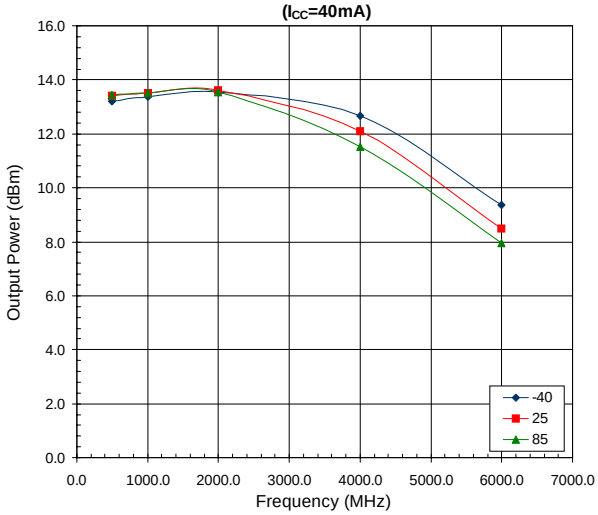
Evaluation Board Layout
Board Size 1.195" x 1.000"
Board Thickness 0.033", Board Material FR-4



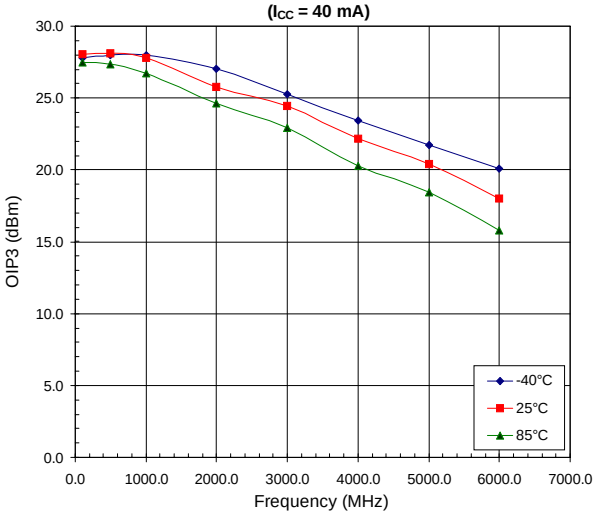
Gain versus Frequency Across Temperature
(I_{CC} = 40 mA)



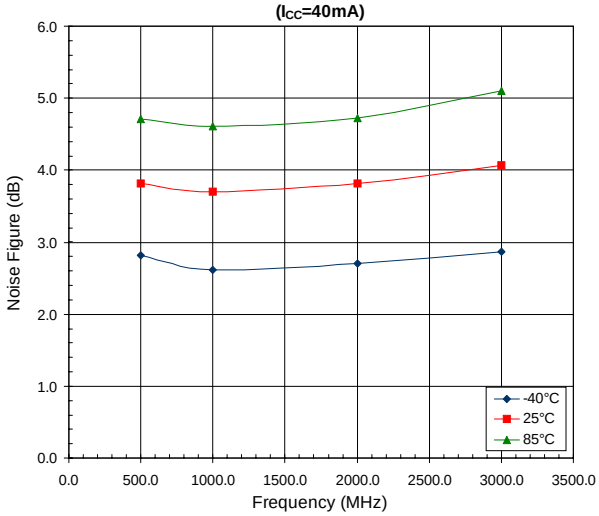
Output P1dB versus Frequency Across Temperature
(I_{CC}=40mA)



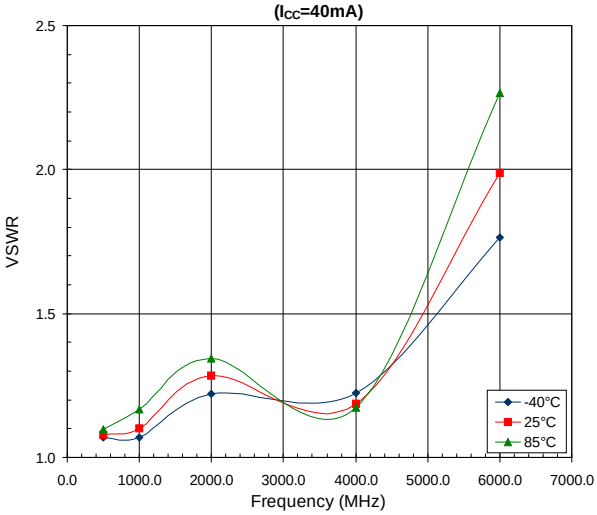
Output IP3 versus Frequency Across Temperature
(I_{CC} = 40 mA)



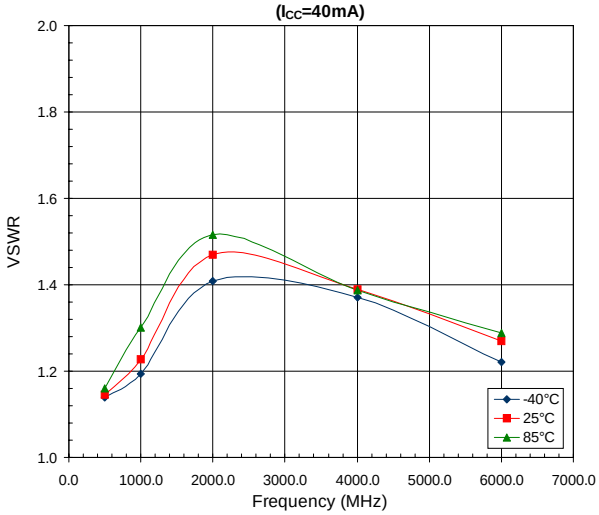
Noise Figure versus Frequency Across Temperature
(I_{CC}=40mA)



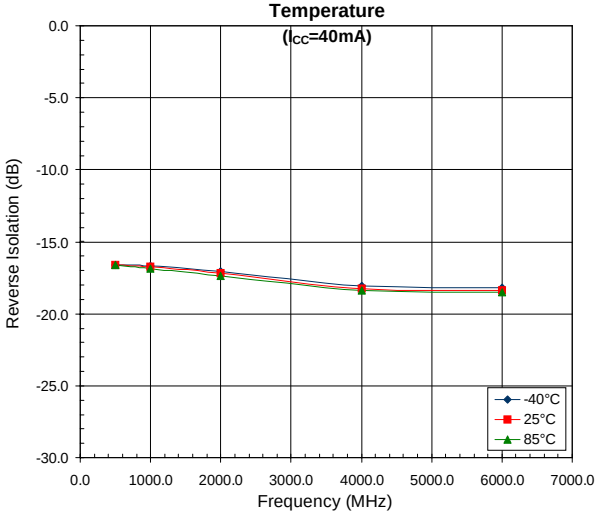
Input VSWR versus Frequency Across Temperature
(I_{CC}=40mA)



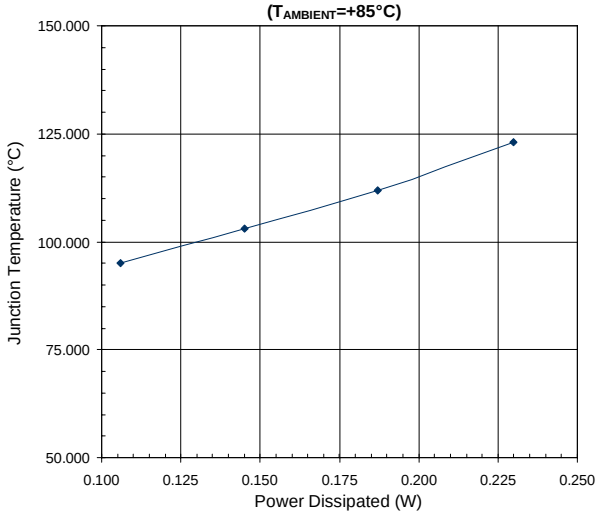
Output VSWR versus Frequency Across Temperature
(I_{CC}=40mA)



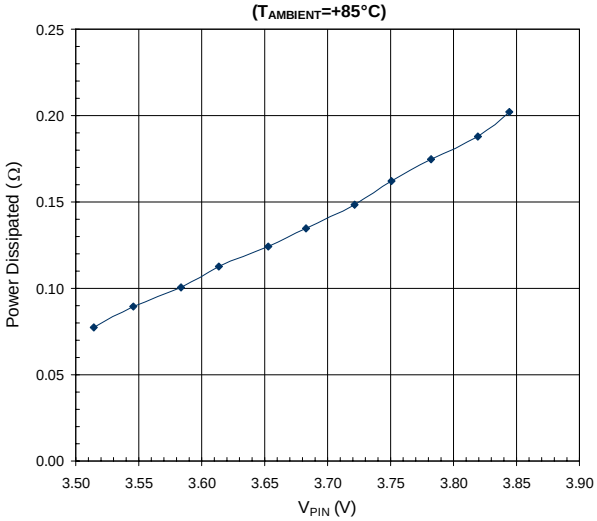
Reverse Isolation versus Frequency Across Temperature
(I_{CC}=40mA)



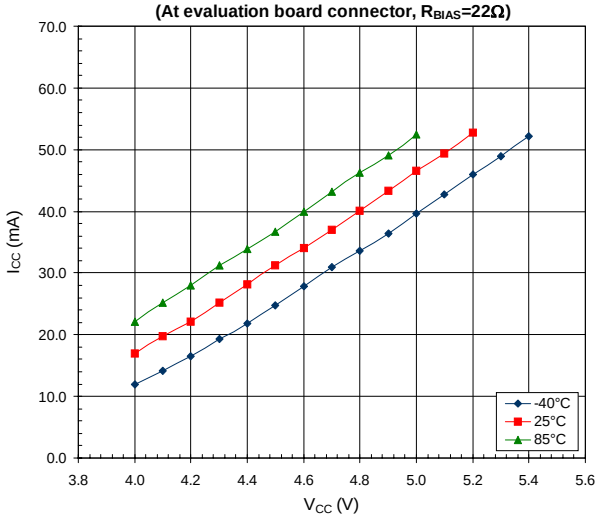
Junction Temperature versus Power Dissipated
($T_{AMBIENT}$=+85°C)



Power Dissipation versus Device Voltage Across Temperature
($T_{AMBIENT}$=+85°C)



Bias Current versus Supply Voltage Across Temperature
(At evaluation board connector, R_{BIAS}=22Ω)



Bias Current versus Devices Voltage Across Temperature
(At Pin 3 of the RF3374)