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RF3376

GENERAL PURPOSE AMPLIFIER

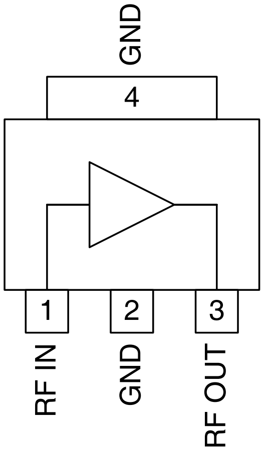
RoHS Compliant & Pb-Free Product
Package Style: SOT89

Features

- DC to >6000MHz Operation
- Internally Matched Input and Output
- 22dB Small Signal Gain
- +2.0dB Noise Figure
- +11dBm Output P1dB

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



Functional Block Diagram

Product Description

The RF3376 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.

Ordering Information

RF3376	General Purpose Amplifier
RF3376PCBA-410	Fully Assembled Evaluation Board

Optimum Technology Matching® Applied

☑ GaAs HBT
☐ GaAs MESFET
☐ InGaP HBT
☐ SiGe BiCMOS
☐ Si BiCMOS
☐ SiGe HBT
☐ GaAs pHEMT
☐ Si CMOS
☐ Si BJT
☐ GaN HEMT

Absolute Maximum Ratings

Parameter	Rating	Unit
Input RF Power	+3	dBm
Operating Ambient Temperature	-40 to +85	°C
Storage Temperature	-60 to +150	°C
I_{CC}	40	mA

Caution! ESD sensitive device.

Exceeding any one or a combination of the Absolute Maximum Rating conditions may cause permanent damage to the device. Extended application of Absolute Maximum Rating conditions to the device may reduce device reliability. Specified typical performance or functional operation of the device under Absolute Maximum Rating conditions is not implied.

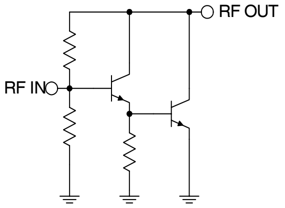
RoHS status based on EU Directive 2002/95/EC (at time of this document revision).

Parameter	Specification			Unit	Condition
	Min.	Typ.	Max.		
Overall					T=25 °C, I_{CC}=35 mA (See Note 1.)
Frequency Range		DC to >6000		MHz	
3 dB Bandwidth		2		GHz	
Gain	22.0	23.5		dB	Freq=500 MHz
	21.0	22.5		dB	Freq=1000 MHz
	18.0	19.8		dB	Freq=2000 MHz
		18.0		dB	Freq=3000 MHz
		16.0			Freq=4000 MHz
		12.8			Freq=6000 MHz
Noise Figure		2.0		dB	Freq=2000 MHz
Input VSWR		<2:1			In a 50 Ω system, DC to 4500 MHz
Output VSWR		<2:1			In a 50 Ω system, DC to 6000 MHz
Output IP_3	+22.0	+24.4		dBm	Freq=1000 MHz
	+21.5	+23.4		dBm	Freq=2000 MHz
Output P_{1dB}	+9.5	+11.5		dBm	Freq=1000 MHz
	+9.5	+11.5		dBm	Freq=2000 MHz
Reverse Isolation		22.5		dB	Freq=2000 MHz
Thermal					I_{CC}=35 mA, P_{DISS}=110 mW. (See Note 3.)
$Theta_{JC}$		216		°C/W	
Maximum Measured Junction Temperature at DC Bias Conditions		109		°C	T_{CASE}=+85 °C
Mean Time To Failures		35000		years	T_{CASE}=+85 °C
Power Supply					With 22 Ω bias resistor
Device Operating Voltage		3.4	3.5	V	At pin 8 with I_{CC}=35 mA
		4.2	4.5	v	At evaluation board connector, I_{CC}=35 mA
Operating Current		35	40	mA	See Note 2.

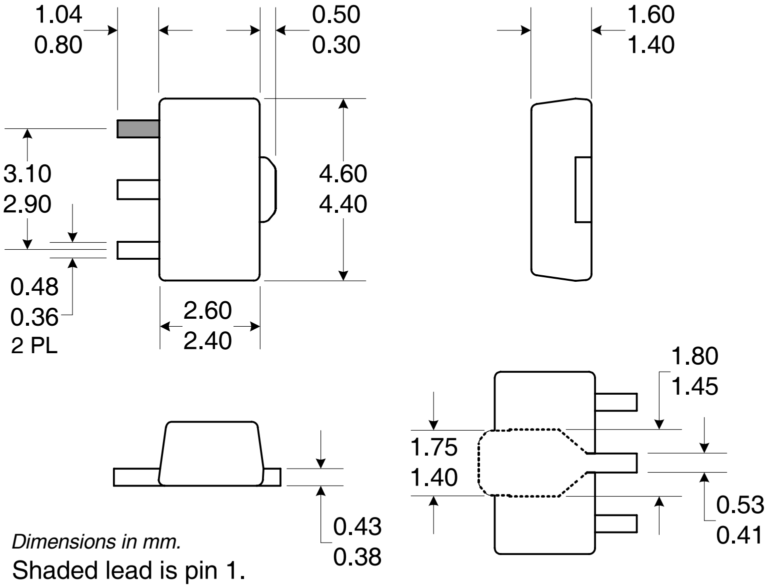
Note 1: All specification and characterization data has been gathered on standard FR-4 evaluation boards. These evaluation boards are not optimized for frequencies above 2.5 GHz. Performance above 2.5 GHz may improve if a high performance PCB is used.

Note 2: The RF3376 must be operated at or below 40 mA in order to achieve the thermal performance listed above. While the RF3376 may be operated at higher bias currents, 35 mA 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 40 mA 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 40mA over the planned operating temperature**. This means that a resistor between the supply and this pin is always required, even if a supply near 3.4V 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.	

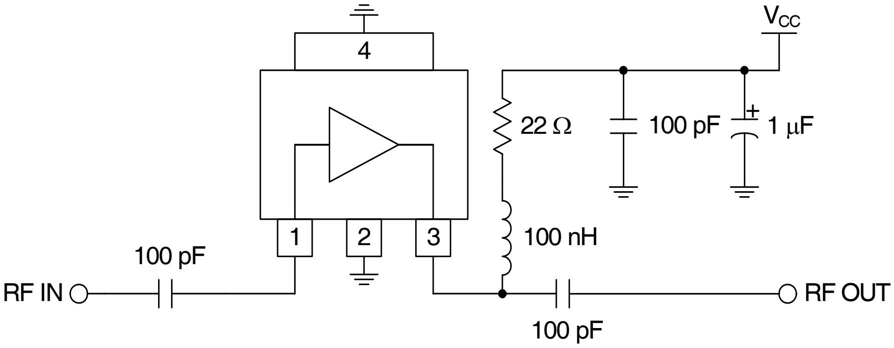
Package Drawing



Dimensions in mm.

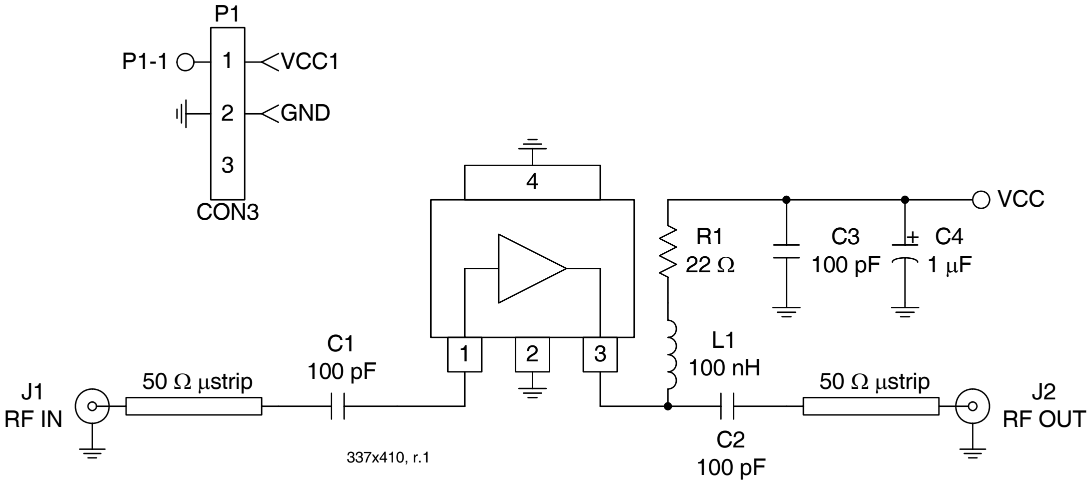
Shaded lead is pin 1.

Application Schematic

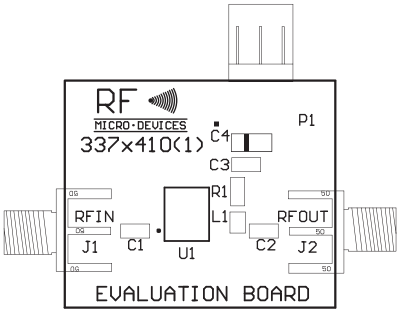


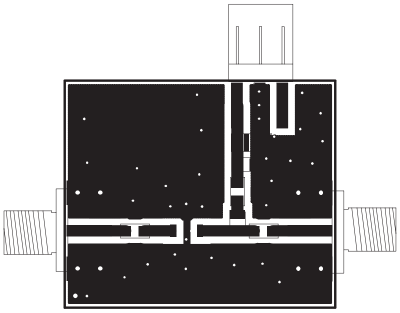
Evaluation Board Schematic

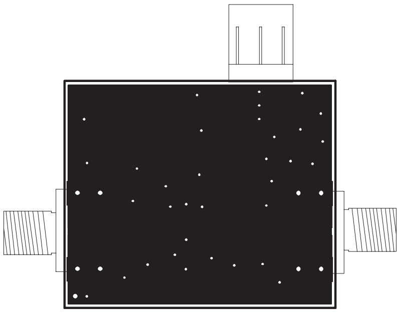
(Download Bill of Materials from www.rfmd.com.)

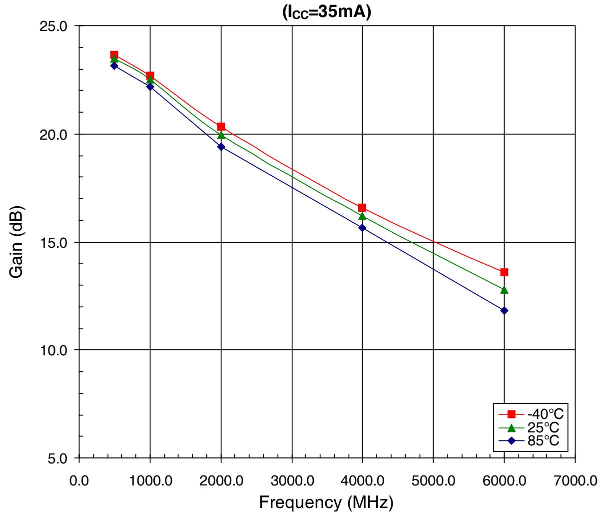


Evaluation Board Layout
Board Size 1.195" x 1.000"
Board Thickness 0.033”, Board Material FR-4

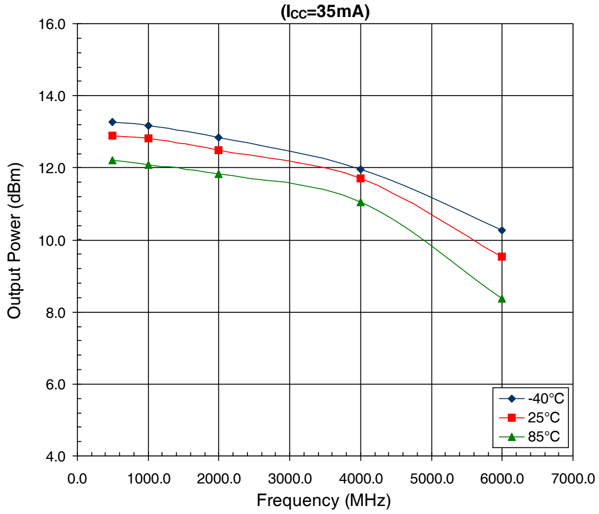




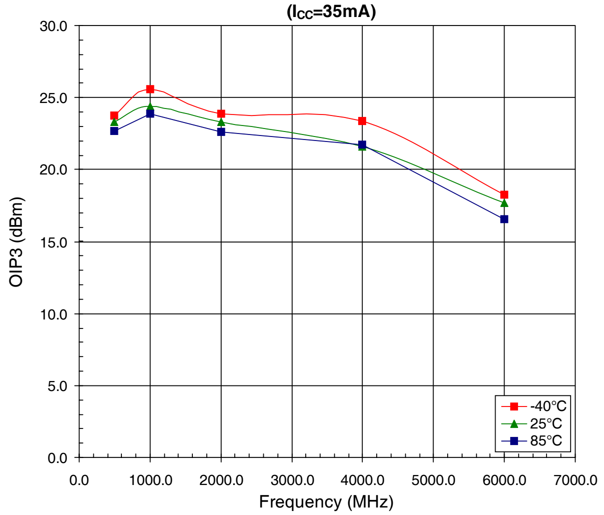




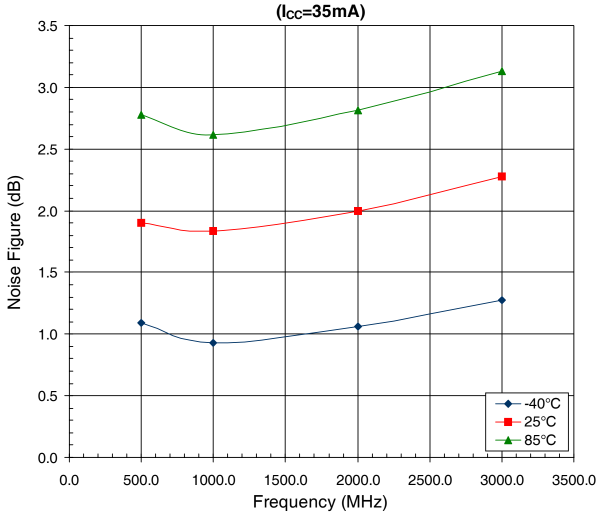
Gain versus Frequency Across Temperature
(I_{CC}=35mA)



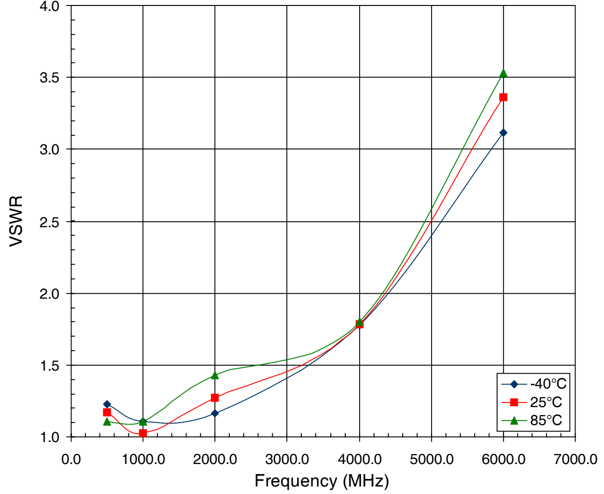
Output P1dB versus Frequency Across Temperature
(I_{CC}=35mA)



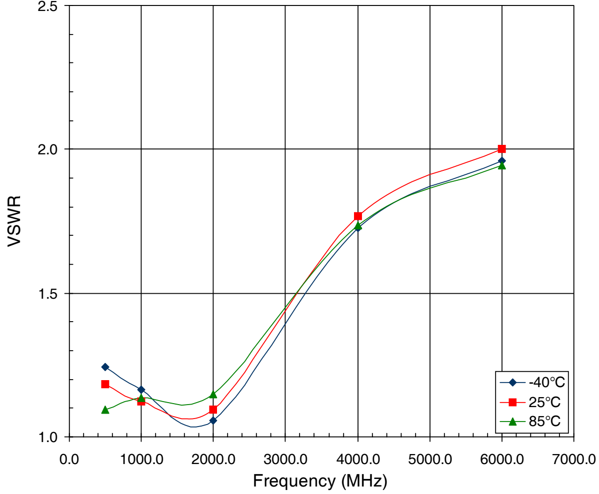
Output IP3 versus Frequency Across Temperature
(I_{CC}=35mA)



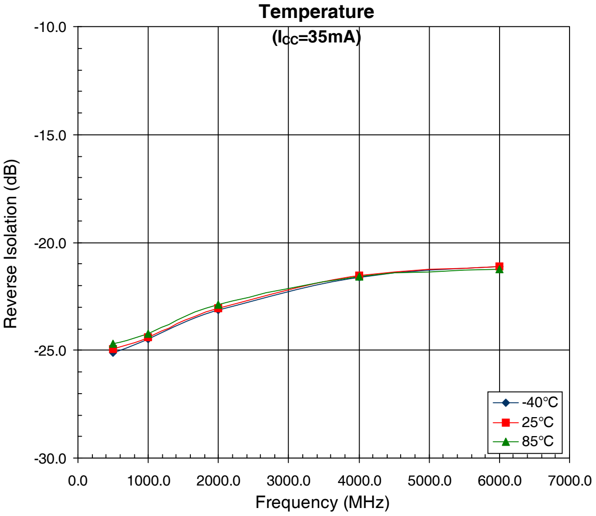
Noise Figure versus Frequency Across Temperature
(I_{CC}=35mA)

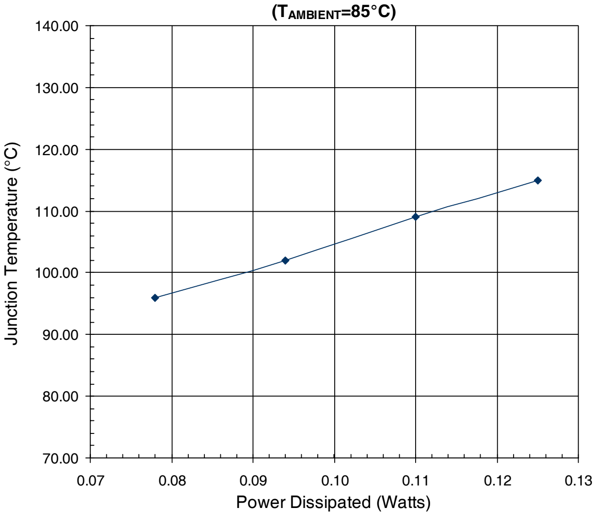


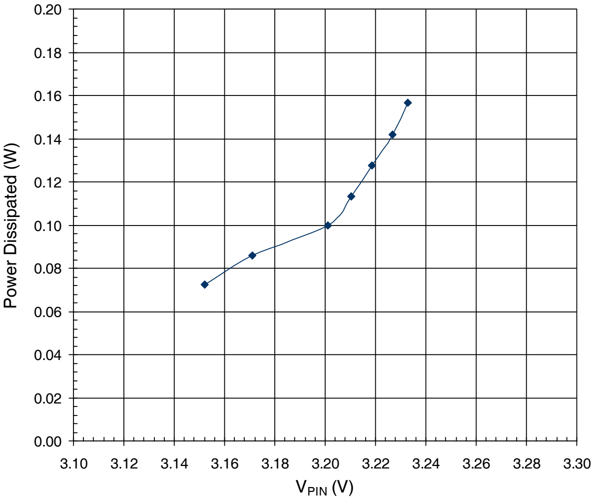
Input VSWR versus Frequency Across Temperature
(I_{CC}=35mA)

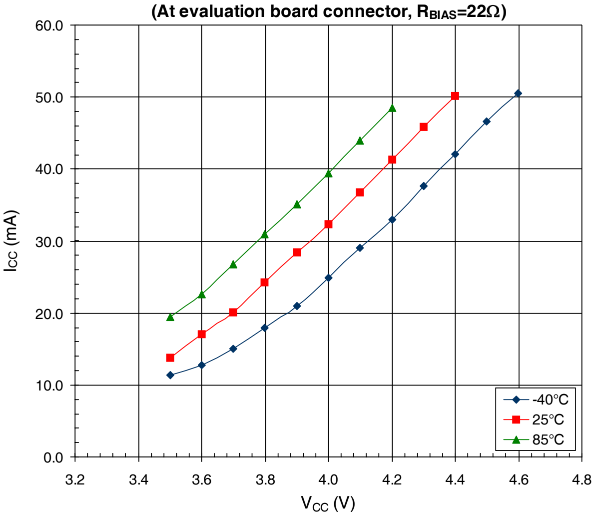


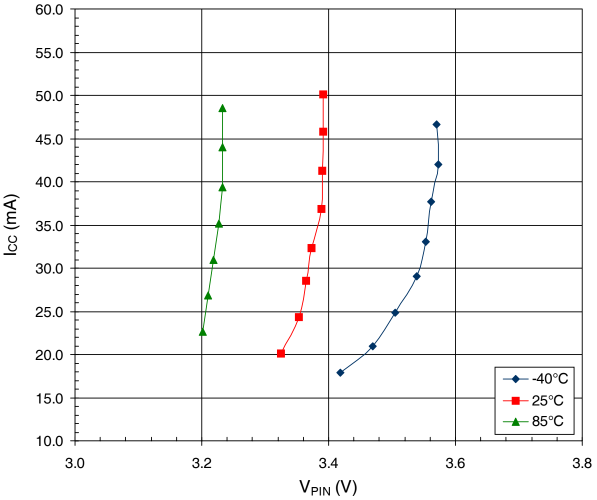
Output VSWR versus Frequency Across Temperature
(I_{CC}=35mA)


Reverse Isolation versus Frequency Across Temperature
(I$_{CC}$=35mA)


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 RF3376)