

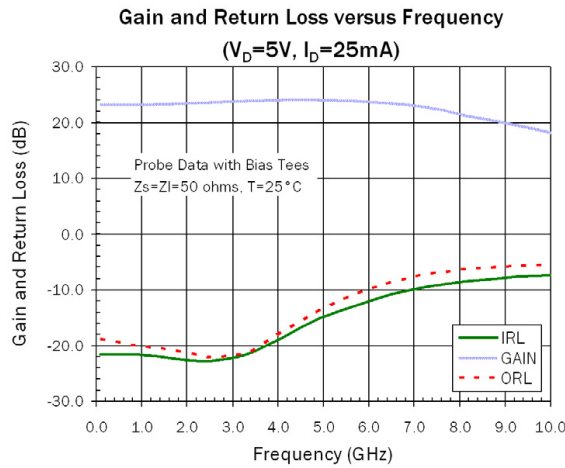
**Product Description**

RFMD's SUF-9000 is a monolithically matched broadband high IP<sub>3</sub> gain block covering DC to 10GHz. This pHEMT FET-based amplifier uses a self-bias Darlington topology featuring a gain and temperature compensating active bias network that operates from a single 5V supply. It offers efficient, cascadable performance in a compact 0.83mmx0.74mm die. It is well suited for RF, LO, and IF driver applications.

RFMD can provide 100% DC screening, visual inspection and Hi-Rel wafer qualification. Die can be delivered at the wafer level or picked gel or waffle paks.

**Optimum Technology Matching® Applied**

- GaAs HBT
- GaAs MESFET
- InGaP HBT
- SiGe BiCMOS
- Si BiCMOS
- SiGe HBT
- GaAs pHEMT
- Si CMOS
- Si BJT
- GaN HEMT
- InP HBT
- RF MEMS
- LDMOS



**Features**

- Broadband Performance
- Gain = 23.5 dB @ 7 GHz
- P<sub>1dB</sub> = 3.1 dBm @ 7 GHz
- Low-Noise, Efficient Gain Block
- 5V Operation, No Dropping Resistor
- Self-Bias Darlington Topology

**Applications**

- Broadband Communications
- Test Instrumentation
- Military and Space
- LO and IF Mixer Applications

Parameter	Specification			Unit	Condition
	Min.	Typ.	Max.		
Frequency of Operation	DC		10.0	GHz	
Small Signal Gain		23.7		dB	Freq = 3 GHz
		23.5		dB	Freq = 7 GHz
		18.6		dB	Freq = 10 GHz
Output Power at 1dB Compression		6.8		dBm	Freq = 3 GHz
		3.1		dBm	Freq = 7 GHz
		1.9		dBm	Freq = 10 GHz
Output Third Order Intercept Point		15.1		dBm	Freq = 3 GHz
		9.7		dBm	Freq = 7 GHz
		8.5		dBm	Freq = 10 GHz
Input Return Loss		22.4		dB	Freq = 3 GHz
Output Return Loss		22.9		dB	Freq = 3 GHz
Device Operating Voltage		5.0		V	
Current		25		mA	
Noise Figure		1.9		dB	Freq = 3 GHz
Thermal Resistance		187		°C/W	Junction to backside

Test Conditions: Z<sub>0</sub>=50Ω, V<sub>D</sub>=5V, I<sub>D</sub>=25mA, T=25°C, OIP<sub>3</sub> Tone Spacing=1MHz with P<sub>OUT/TONE</sub>=0dBm.  
Probe Data with Bias Tees.

## Absolute Maximum Ratings

Parameter	Rating	Unit
Total Current ( $I_D$ )	55	mA
Device Voltage ( $V_D$ )	5.5	V
Power Dissipation	0.3	W
RF Input Power	+15	dBm
Storage Temperature Range	-65 to +150	°C
Operating Temperature Range ( $T_L$ )	-55 to +150	°C
Operating Junction Temperature ( $T_J$ )	+150	°C



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 EUDirective2002/95/EC (at time of this document revision).

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Operation of this device beyond any one of these limits may cause permanent damage. For reliable continuous operation, the device voltage and current must not exceed the maximum operating values specified in the table on page one.

Bias Conditions should also satisfy the following expression:

$$I_D V_D < (T_J - T_L) / R_{TH, j-l} \text{ and } T_L = \text{Backside of die}$$

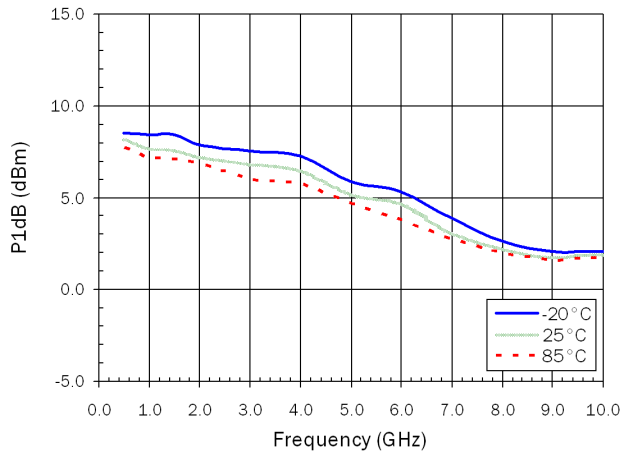
## Typical Performance (Probe Data with Bias Tees) $V_D=5V$ , $I_D=25mA$ , $T=25^\circ C$ , $Z=50\Omega$

Small Signal Gain	dB	23.3	23.2	23.7	24.3	23.5	18.6
Output 3rd Order Intercept Point (see note 1)	dBm		16.0	15.1	12.3	9.7	8.5
Output Power at 1dB Compression	dBm		7.7	6.8	5.2	3.1	1.9
Input Return Loss	dB	21.5	22.3	22.4	15.2	9.9	7.6
Output Return Loss	dB	18.8	20.0	22.9	13.5	7.4	5.0
Reverse Isolation	dB	32.0	31.5	31.5	31.2	30.0	29.4
Noise Figure	dB		2.0	1.9	2.0	2.0	2.7

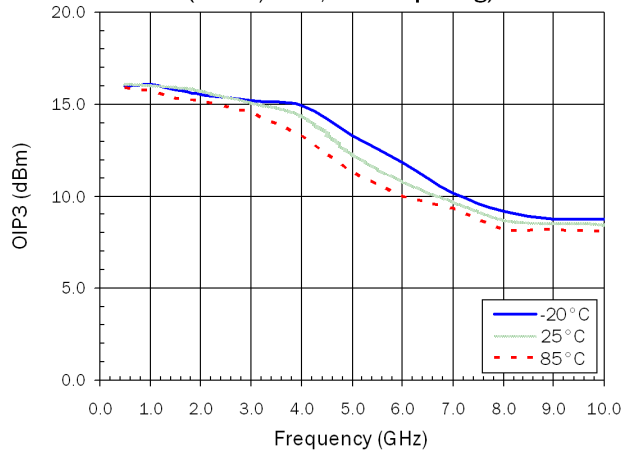
Note 1: 0dBm/tone, 1MHz tone spacing.

Typical Performance (Probe Data with Bias Tees)  $V_D=5V$ ,  $I_D=25mA$

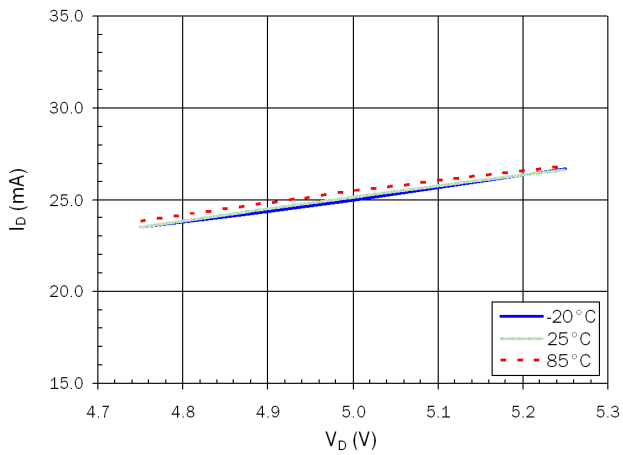
**P1dB versus Frequency**



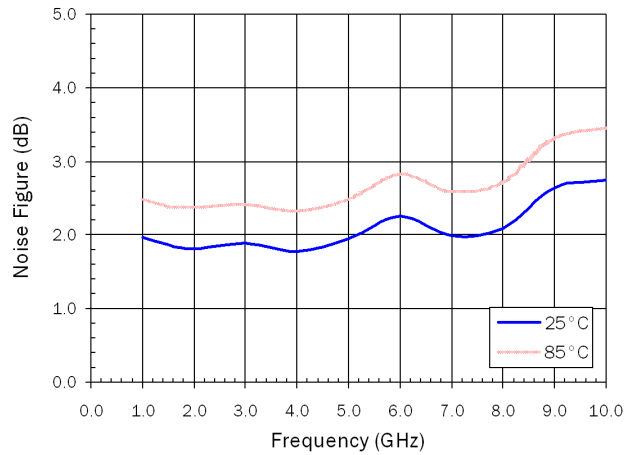
**OIP3 versus Frequency  
(0dBm/tone, 1MHz Spacing)**



**Device Current versus Voltage**

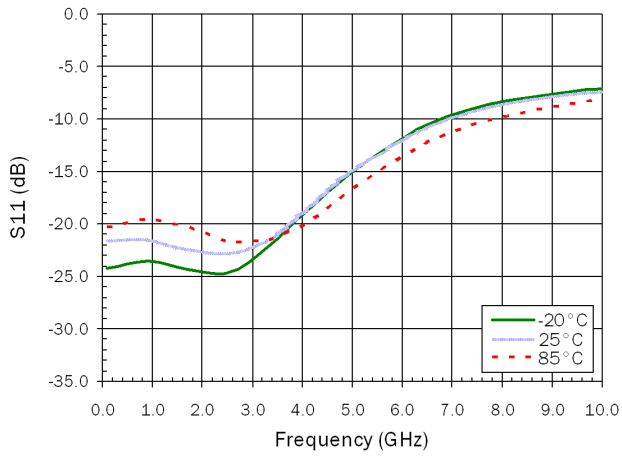


**Noise Figure versus Frequency**

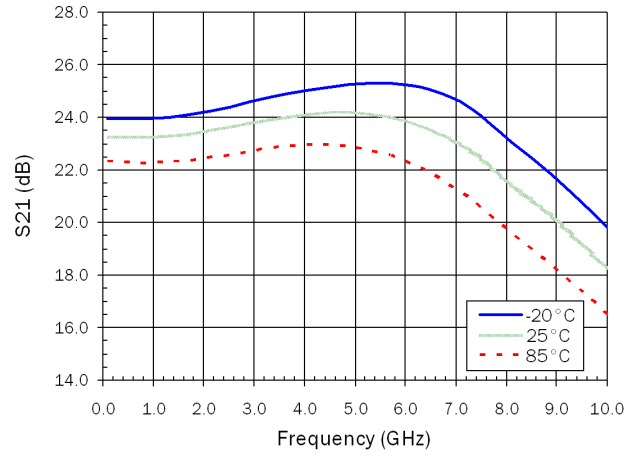


Typical Performance (Probe Data with Bias Tees)  $V_D=5V$ ,  $I_D=25mA$

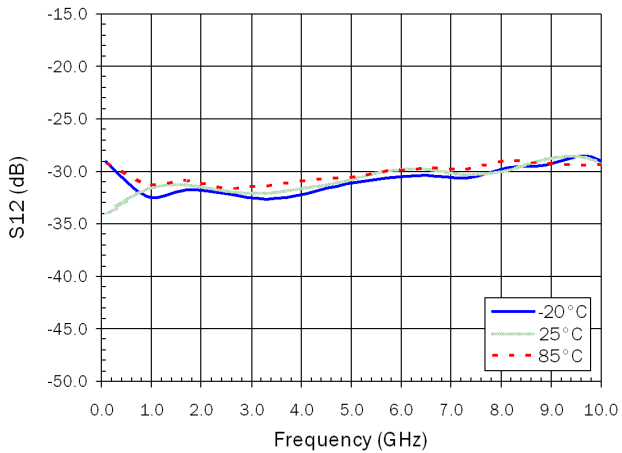
### S11 versus Frequency



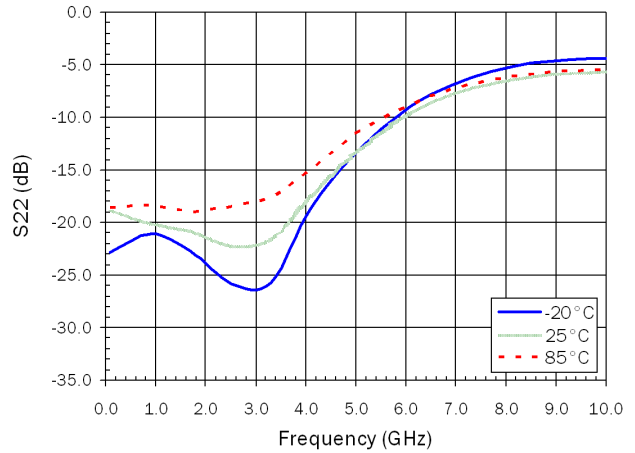
### S21 versus Frequency



### S12 versus Frequency



### S22 versus Frequency

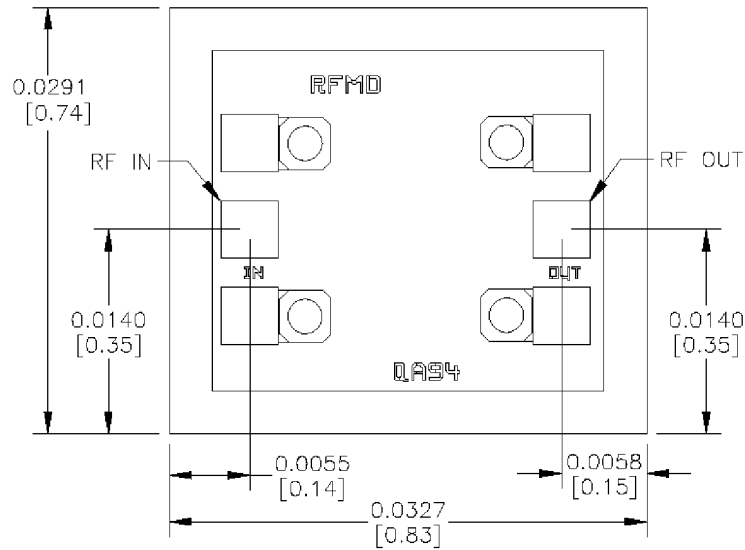


Pin	Function	Description
<b>1</b>	<b>RF IN</b>	This pad is DC coupled and matched to 50Ω. An external DC block is required.
<b>2</b>	<b>RF OUT/BIAS</b>	This pad is DC coupled and matched to 50Ω. DC bias is applied through this pad.
<b>Die Bottom</b>	<b>GND</b>	Die bottom must be connected to RF/DC ground using silver-filled conductive epoxy.

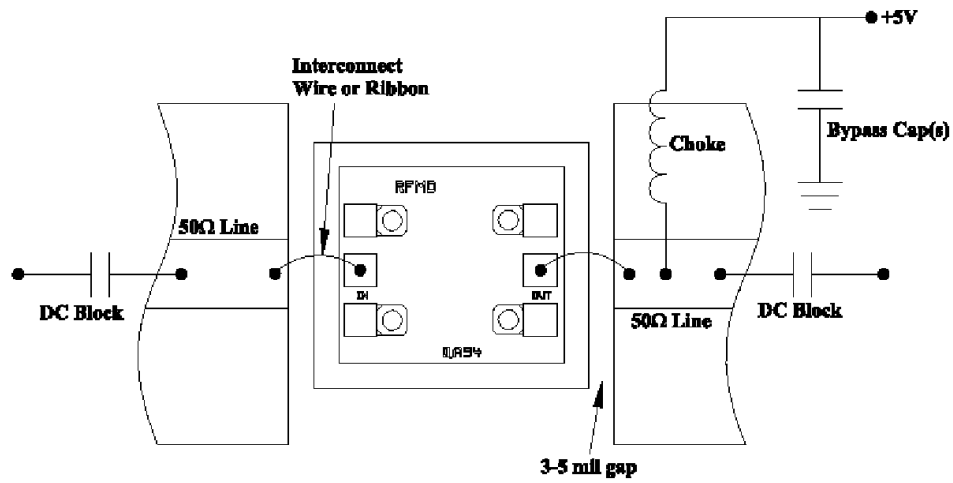
Notes:

1. All dimensions in inches (millimeters).
2. No connection required for unlabeled bond pads.
3. Die thickness is 0.004 (0.10).
4. Typical bond pad is 0.004 (0.10) square.
5. Backside and bond pad metalization is Gold.
6. Backside is ground.

**Die Dimensions**



## Device Assembly



## Ordering Information

Part Number	Description	Devices/Container
SUF-9000	Bare Die	