

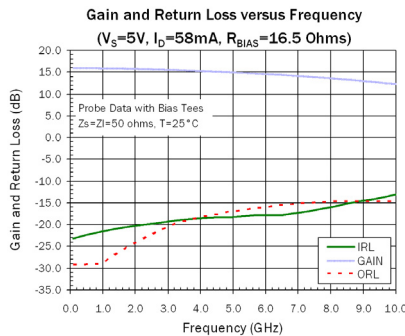
**Product Description**

RFMD's SUF-8500 is a monolithically matched high IP<sub>3</sub> broadband pHEMT MMIC amplifier. The self biased direct coupled topology provides exceptional cascadable performance from DC-10GHz. Its efficient operation from a single 5V supply and compact size (0.83mmx0.74mm) make it ideal for high density multi-chip module applications. 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 to gel or wafer 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 = 15.6dB @ 3GHz
- P<sub>1dB</sub> = 15.7 dBm @ 3GHz
- Low-Noise, Efficient Gain Block
- 5V Single Supply Operation

**Applications**

- Broadband Communications
- Test Instrumentation
- Military and Space
- LO and IF Mixer Applications
- High IP<sub>3</sub> RF Driver Applications

Parameter	Specification			Unit	Condition
	Min.	Typ.	Max.		
Frequency of Operation	DC		10.0	GHz	
Small Signal Power Gain, G <sub>p</sub>		15.6		dB	Freq = 3GHz
		14.1		dB	Freq = 7 GHz
		12.3		dB	Freq = 10GHz
Output Power at 1dB Compression		15.7		dBm	Freq = 3 GHz
		14.5		dBm	Freq = 7 GHz
		12.9		dBm	Freq = 10GHz
Output Third Order Intercept Point		31.2		dBm	Freq = 3 GHz
		29.0		dBm	Freq = 7 GHz
		27.9		dBm	Freq = 10GHz
Input Return Loss		19.4		dB	Freq = 3GHz
Output Return Loss		20.7		dB	Freq = 3GHz
Device Operating Voltage		4.0		V	
Current		58		mA	
Noise Figure, NF		3.2		dB	Freq = 3 GHz
Thermal Resistance		159		°C/W	Junction to backside

Test Conditions: Z<sub>0</sub>=50Ω, V<sub>G</sub>=5V, I<sub>D</sub>=58mA, R<sub>BIAS</sub>=16.5Ω, 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 ( $I_D$ )	90	mA
Device Voltage ( $V_D$ )	4.2	V
Power Dissipation	0.38	W
RF Input Power	+20	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 EU Directive 2002/95/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:

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

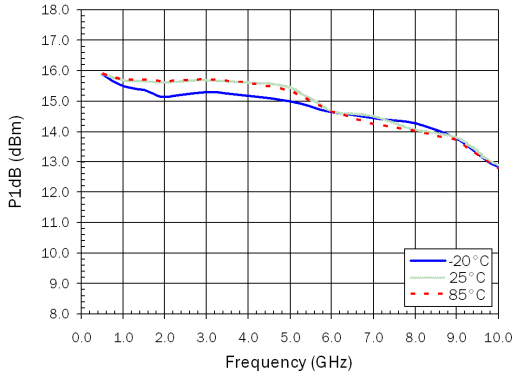
## Typical Performance (Probe Data with Bias Tees) $V_S = 5V$ , $I_D = 58mA$ , $R_{BIAS} = 16.5\Omega$ , $T = 25^\circ C$ , $Z = 50\Omega$

Small Signal Gain	dB	16.0	15.9	15.6	15.0	14.1	12.3
Output 3rd Order Intercept Point (see note 1)	dBm		31.7	31.2	29.9	29.0	27.9
Output Power at 1dB Compression	dBm		15.7	15.7	15.5	14.5	12.9
Input Return Loss	dB	23.0	21.7	19.4	18.2	16.9	12.8
Output Return Loss	dB	29.0	28.8	20.7	17.1	15.1	14.4
Reverse Isolation	dB	21.9	21.9	21.7	21.2	20.8	20.2
Noise Figure	dB		3.3	3.2	3.2	3.1	3.5

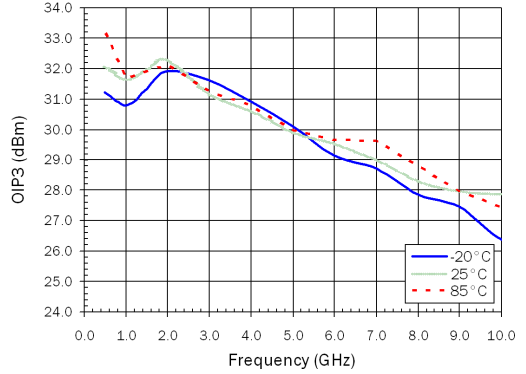
Note 1: 0dBm/100Hz, 1MHz tone spacing.

Typical Performance (Probe Data with Bias Tees)  $V_S=5V$ ,  $I_D=58mA$ ,  $R_{BIAS}=16.5\Omega$

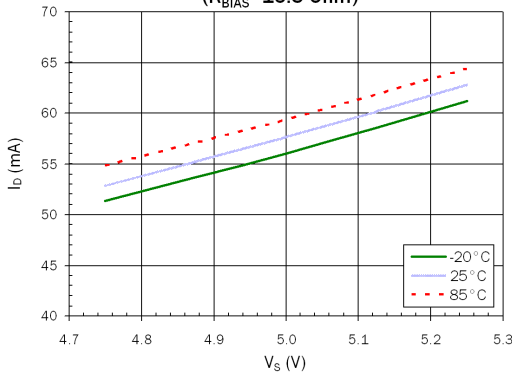
**P1dB versus Frequency**



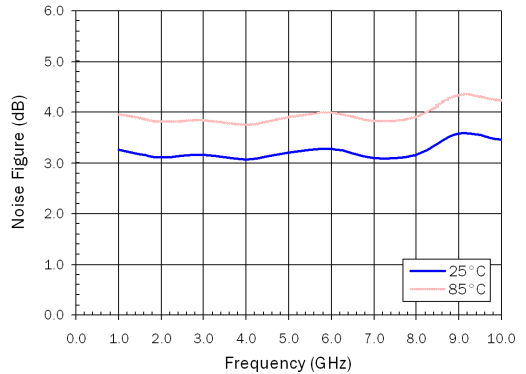
**OIP3 versus Frequency**  
(0dBm/ tone, 1MHz spacing)



**Device Current versus Supply Voltage**  
( $R_{BIAS}=16.5\text{ Ohm}$ )

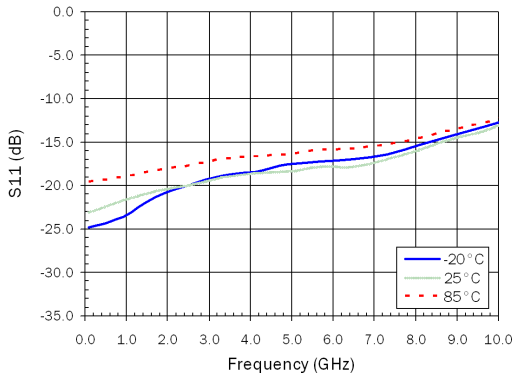


**Noise Figure versus Frequency**

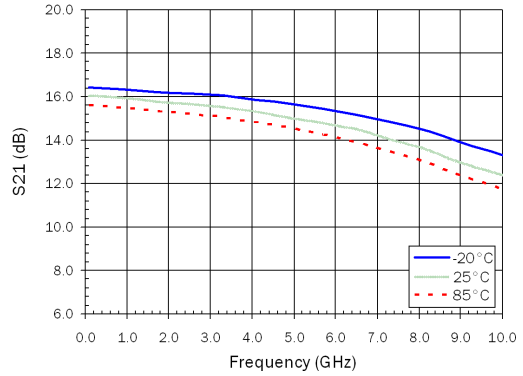


Typical Performance (Probe Data with Bias Tees)  $V_S=5V$ ,  $I_D=58mA$ ,  $R_{BIAS}=16.5\Omega$

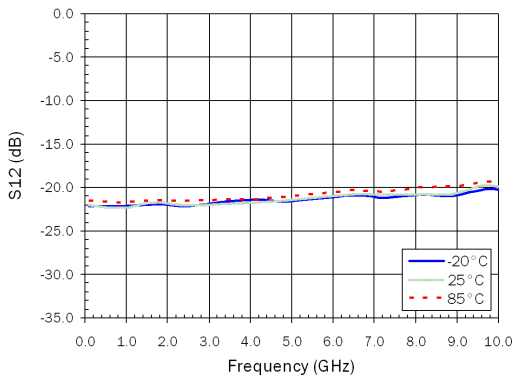
S11 versus Frequency



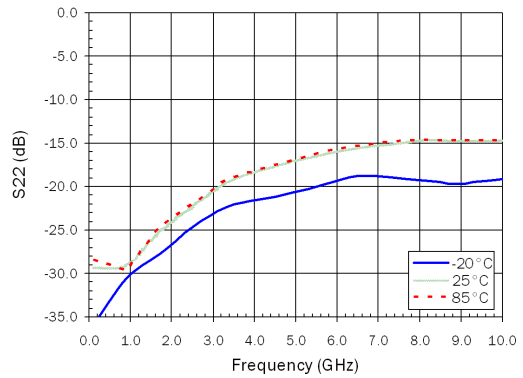
S21 versus Frequency



S12 versus Frequency



S22 versus Frequency



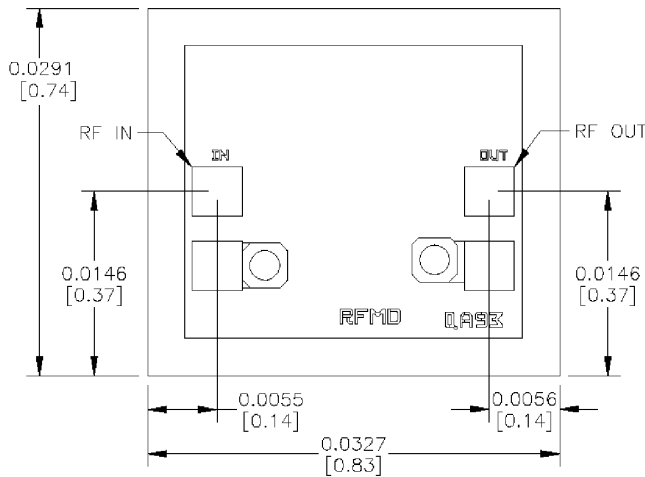
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Pin	Function	Description
1	RF IN	This pad is DC coupled and matched to 50Ω. An external DC block is required.
2	RF OUT/BIAS	This pad is DC coupled and matched to 50Ω. DC bias is applied through this pad.
Die Bottom	GND	Die bottom must be connected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

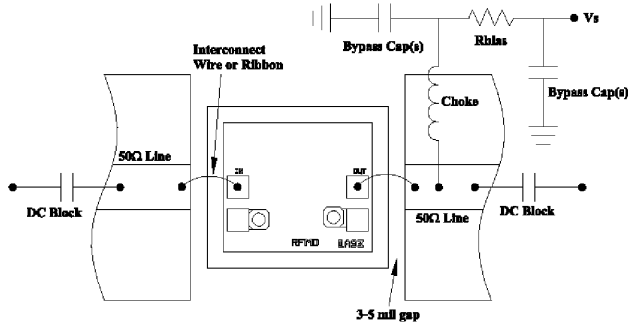
Notes:

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/Reel
SUF-8500	Bare Die	