



Package: QFN, 16-Pin, 3mmx3mm

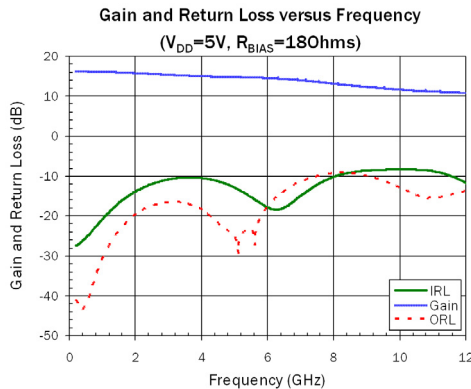


Product Description

RFMD's SUF-8533 is a monolithically matched high IP₃ broadband pHEMT MMIC amplifier covering DC to 12GHz. 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 efficiency, cascadable performance in a compact 3mmx3mm Ceramic QFN package. It is well suited for RF, LO, and IF driver applications.

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 = 15.4 dB at 3GHz
- P_{1dB} = 16.7 dBm at 3GHz
- Low-Noise, Efficient Gain Block
- 5V Single Supply Operation
- Low Gain Variation versus Temperature

Applications

- Broadband Communications
- Test Instrumentation
- Military and Space
- LO and IF Mixer Applications
- High IP₃ RF Driver Applications

Parameter	Specification			Unit	Condition
	Min.	Typ.	Max.		
Frequency of Operation	DC		12.0	GHz	
Small Signal Power Gain, G _p		15.4		dB	Freq = 3GHz
		14.6		dB	Freq = 6GHz
		11.7		dB	Freq = 10GHz
Output Power at 1dB Compression		16.7		dBm	Freq = 3GHz
		16.8		dBm	Freq = 6GHz
		14.6		dBm	Freq = 10GHz
Output Third Order Intercept Point		27.1		dBm	Freq = 3GHz
		25.7		dBm	Freq = 6GHz
		23.5		dBm	Freq = 10GHz
Input Return Loss		10.7		dB	Freq = 3GHz
Output Return Loss		22.3		dB	18W resistor between V _D and V _{DD} , Freq = 3GHz
Device Operating Voltage		4.0		V	
Current		58		mA	
Noise Figure, NF		4.0		dB	Freq = 3GHz
Thermal Resistance		159		°C/W	Junction to backside

Test Conditions: Z₀ = 50Ω, V_S = 5V, I_D = 58mA, R_{BIAS} = 18.0Ω, T = 25 °C, OIP₃ Tone Spacing = 1MHz with P_{OUT/TONE} = 0dBm. Circuit board data with bias tees.

Absolute Maximum Ratings

Parameter	Rating	Unit
Total Current (I_D)	90	mA
Device Voltage (V_D)	5.5	V
Power Dissipation	495	mW
RF Input Power	+20	dBm
Storage Temperature Range	-65 to +150	°C
Operating Temperature Range (T_L)	-40 to +85	°C
Operating Junction Temperature (T_J)	+150	°C

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:

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



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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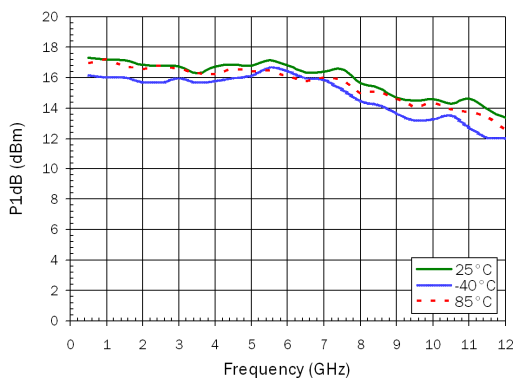
Typical Performance (Circuit Board with Bias Tees) $V_S = 5V$, $R_{BIAS} = 18.0\Omega$, $T = 25^\circ C$, $Z = 50\Omega$

Parameter	Units	500MHz	1.5GHz	3.5GHz	6.5GHz	9.5GHz	12GHz
Small Signal Gain	dB	16.2	16.0	15.1	14.5	11.8	10.9
Output 3rd Order Intercept Point (see note 1)	dBm	28.7	28.1	26.3	25.2	23.5	23.5
Output Power at 1dB Compression	dBm	17.3	17.1	16.3	16.3	14.5	13.4
Input Return Loss	dB	25.3	16.7	10.3	17.9	8.4	11.7
Output Return Loss	dB	41.6	23.6	16.8	13.7	11.2	13.9
Reverse Isolation	dB	22.0	22.1	22.4	22.0	22.9	22.8
Noise Figure	dB	4.6	3.6	4.0	4.2	4.8	4.8

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

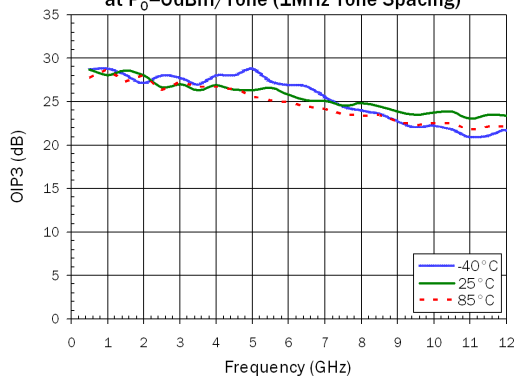
Typical Performance (Probe Data with Bias Tees) $V_S=5V$, $I_D=58mA$, $R_{BIAS}=18.0\Omega$

P1dB versus Frequency

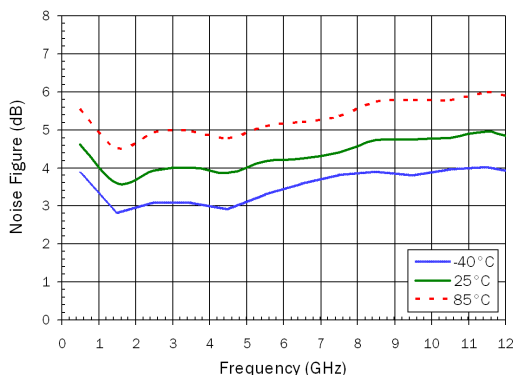


OIP3 versus Frequency

at $P_0=0dBm/Tone$ (1MHz Tone Spacing)

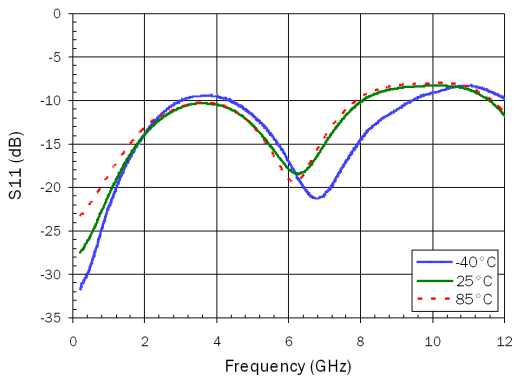


Noise Figure versus Frequency

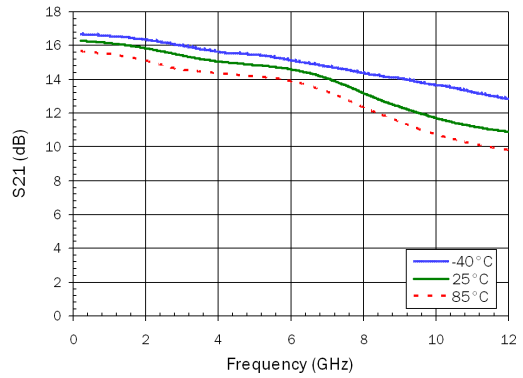


Typical Performance (Probe Data with Bias Tees) $V_S=5V$, $I_D=58mA$, $R_{BIAS}=18.0\Omega$

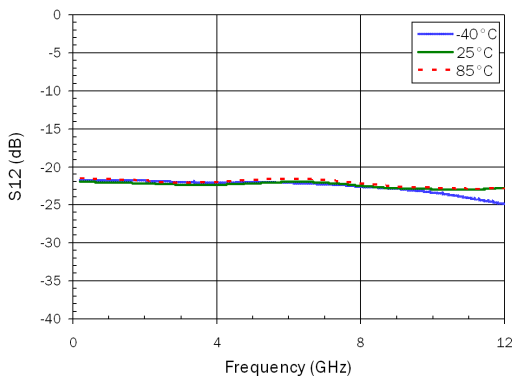
S11 versus Frequency



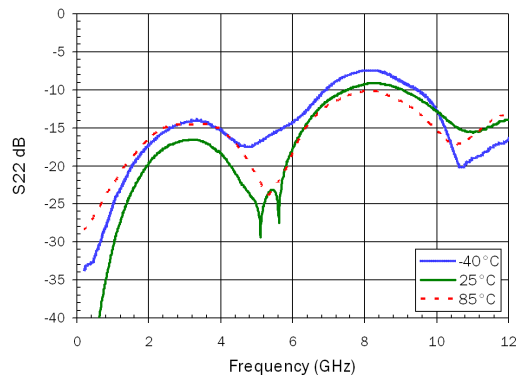
S21 versus Frequency



S12 versus Frequency



S22 versus Frequency



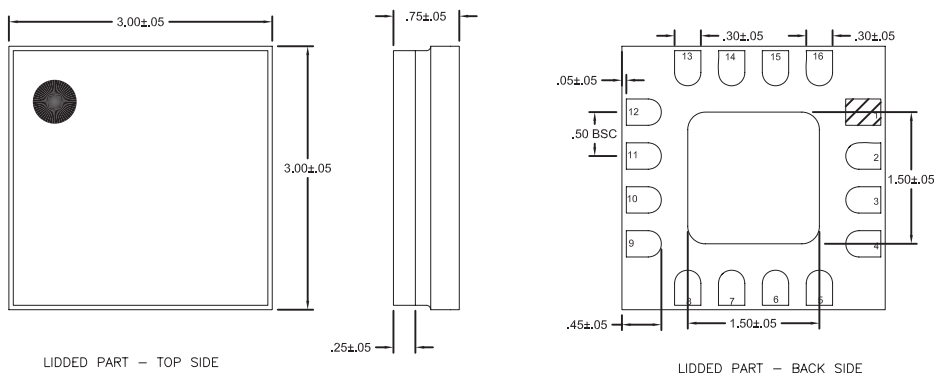
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Pin	Function	Description
2	RF IN	This pad is DC coupled and matched to 50Ω. An external DC block is required.
11	RF OUT/BIAS	This pad is DC coupled and matched to 50Ω. DC bias is applied through this pad.
Pkg Bottom	GND	Package bottom must be connected to RF/DC ground.

Notes:

1. All dimensions in millimeters.
2. Backside is ground.

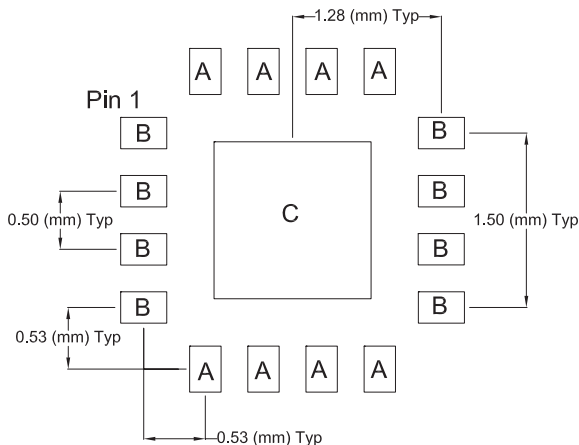
Package Dimensions



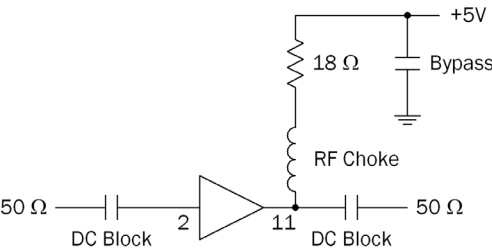
PCB Stencil Drawing

A = 0.27 x 0.40 (mm) Typ.

B = 0.40 x 0.27 (mm) Typ.

$$C = 1.35 \text{ (mm) Sq.}$$


Device Assembly



Ordering Information

Part Number	Description	Devices/Container
SUF-8533	QFN, 16-Pin, 3 mmx3 mm	
SUF-8533PCBA-410	Evaluation Board	