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SUF-1033

DC to 20GHz, CASCADABLE pHEMT MMIC AMPLIFIER

Package: QFN, 16-Pin, 3mm x 3mm

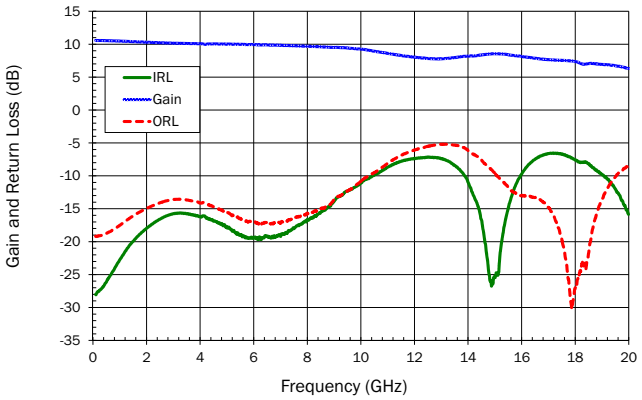
Product Description

The SUF-1033 is a monolithically matched broadband high IP3 gain block covering DC to 20GHz. This pHEMT based amplifier uses a patented self-bias network that operates from a single 5V supply. It offers efficient cascadable performance in a compact 3mm x 3mm 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

Gain and Return Loss versus Frequency
(V_{DD} = 5V, R_{BIAS} = 33Ω)



Features

- Broadband Flat Gain = 10dB
- P1dB = 14dBm at 2GHz
- 5V Single Supply Operation
- Low Gain Variation versus Temperature
- 50Ω I/O Low-Noise, Efficient Gain Block

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		20	GHz	
Small Signal Power Gain		10.2		dB	Freq = 3GHz
		9.5		dB	Freq = 9GHz
		7.4		dB	Freq = 18GHz
Output Power at 1dB Compression		13.8		dBm	Freq = 3GHz
		13.7		dBm	Freq = 9GHz
		13.2		dBm	Freq = 18GHz
Output Third Order Intercept Point		26.1		dBm	Freq = 3GHz
		24.3		dBm	Freq = 9GHz
		22.9		dBm	Freq = 18GHz
Input Return Loss		15.8		dB	Freq = 3GHz
		13.8		dB	Freq = 9GHz
		7.6		dB	Freq = 18GHz
Output Return Loss		13.6		dB	Freq = 3GHz
		13.7		dB	Freq = 9GHz
		27.1		dB	Freq = 18GHz
Isolation		18.0		dB	Freq = 3GHz
		19.2		dB	Freq = 9GHz
		20.0		dB	Freq = 18GHz
Device Operating Voltage		3.4		V	With 33Ω resistor between V_D and V_{DD}

Test Conditions: Z_O = 50Ω, V_S = 5V, I_D = 46mA, R_{BIAS} = 33Ω, T = 25°C, OIP_3 Tone Spacing = 1MHz with P_{OUT} per tone = 0dBm. Circuit Board Data with Bias Tees.

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Absolute Maximum Ratings

Parameter	Rating	Unit
Total Current (I_D)	90	mA
Device Voltage (V_D)	4.2	V
Power Dissipation	0.378	W
RF Input Power	+20	dBm
Storage Temperature Range	-65 to +150	°C
Operating Temperature Range (T_L)	-45 to +85	°C
Operating Junction Temperature (T_J)	+150	°C
Human Body Model	Class 1A	

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 and T_L = 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.

RFMD Green: RoHS compliant per EU Directive 2011/65/EU, halogen free per IEC 61249-2-21, < 1000ppm each of antimony trioxide in polymeric materials and red phosphorus as a flame retardant, and <2% antimony in solder.

Parameter	Specification			Unit	Condition
	Min.	Typ.	Max.		
Device Operating Current		47		mA	
Noise Figure		4.6		dB	Freq = 3GHz
		4.8		dB	Freq = 9GHz
		5.8		dB	Freq = 18GHz
Thermal Resistance		146		°C/W	Junction to backside

Typical Performance (Circuit Board Data with Bias Tees) V_S = 5V, R_{BIAS} = 33Ω, T = 25°C, Z = 50Ω

Parameter	Units	500MHz	3GHz	9GHz	12GHz	15GHz	18GHz
Small Signal Gain	dB	10.5	10.2	9.5	8.0	8.6	7.4
Output 3rd Order Intercept Point (see note 1)	dBm	27.4	26.1	24.3	21.2	21.6	22.9
Output Power at 1dB Compression	dBm	14.3	13.8	13.7	11.2	12.1	13.2
Input Return Loss	dB	26.1	15.8	13.8	7.4	25.3	7.6
Output Return Loss	dB	18.8	13.6	13.7	6.1	9.5	27.1
Reverse Isolation	dB	17.6	17.9	19.0	20.2	19.1	19.5
Noise Figure	dB	5.4	4.6	4.8	4.7	4.8	5.8

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

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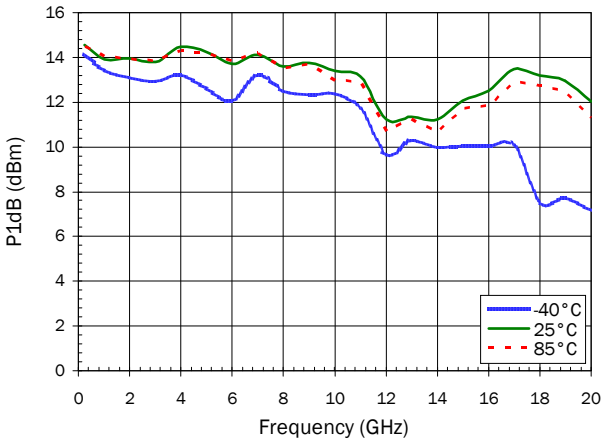
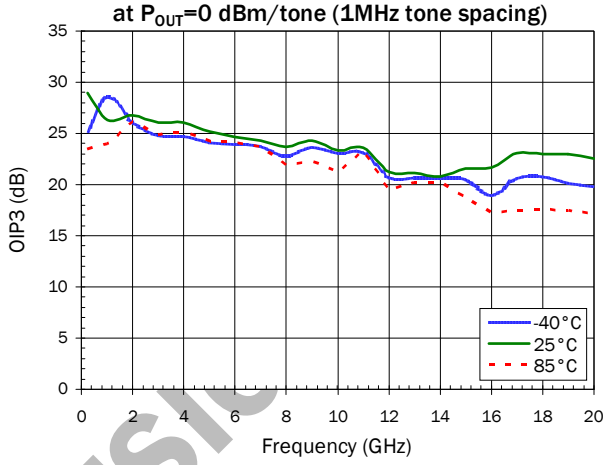
Typical Performance (Circuit Board Data with Bias Tees) V_{DD} = 5V, I_D = 46mA, R_{BIAS} = 33Ω

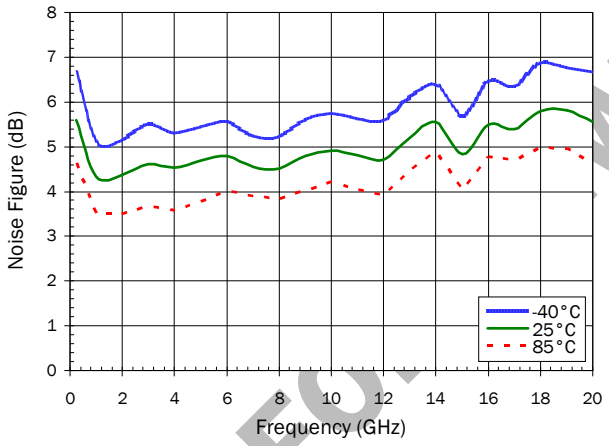
P1dB versus Frequency



OIP3 versus Frequency
at P_{OUT}=0 dBm/tone (1MHz tone spacing)



Noise Figure versus Frequency



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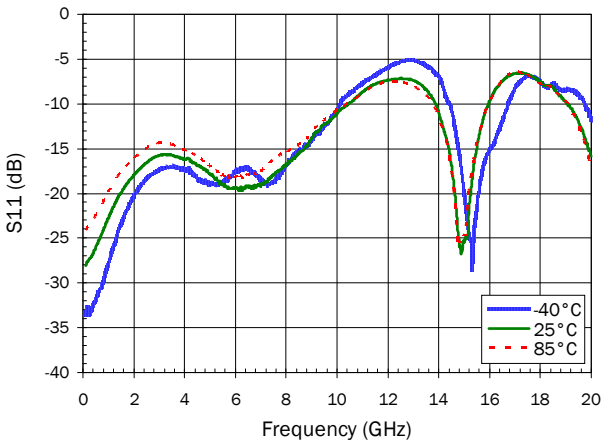
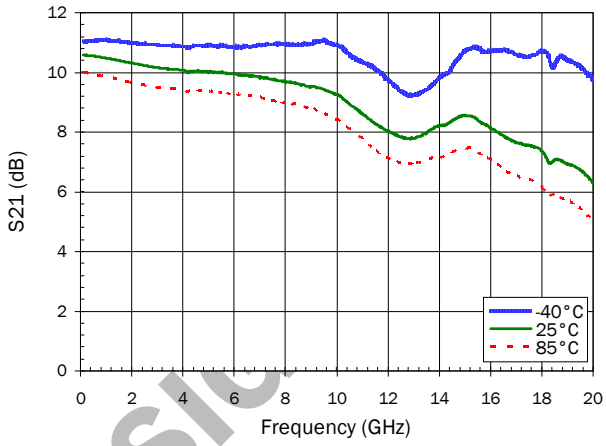
Typical Performance (Circuit Board Data with Bias Tees) V_{DD} = 5V, I_D = 46mA, R_{BIAS} = 33Ω

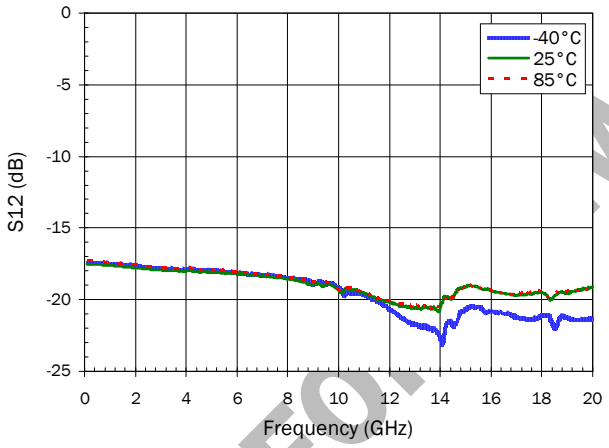
S11 versus Frequency



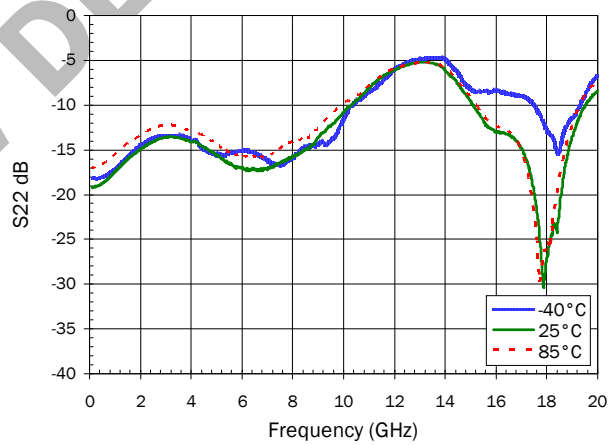
S21 versus Frequency



S12 versus Frequency



S22 versus Frequency



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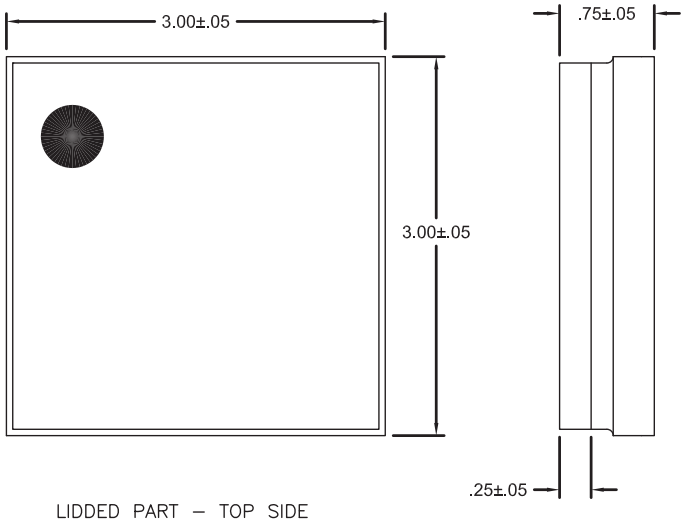
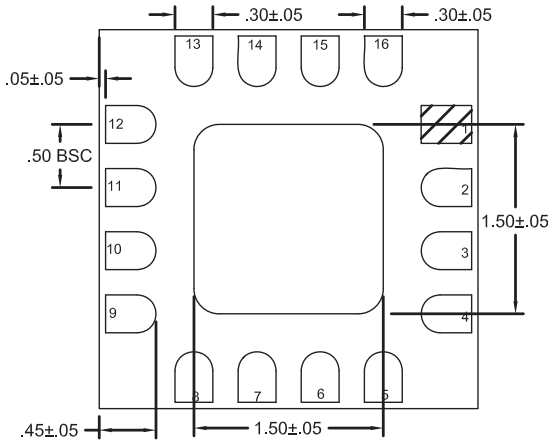
Pin	Function	Description
2	RFIN	This pad is DC coupled and matched to 50Ω. An external DC block is required.
11	RFOUT/BIAS	This pad is DC coupled and matched to 50Ω. Bias is applied through this pad.
Pkg Bottom	GND	Package bottom must be connected to RF/DC ground.

Package Drawing



LIDDED PART – TOP SIDE



LIDDED PART – BACK SIDE

Notes:

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

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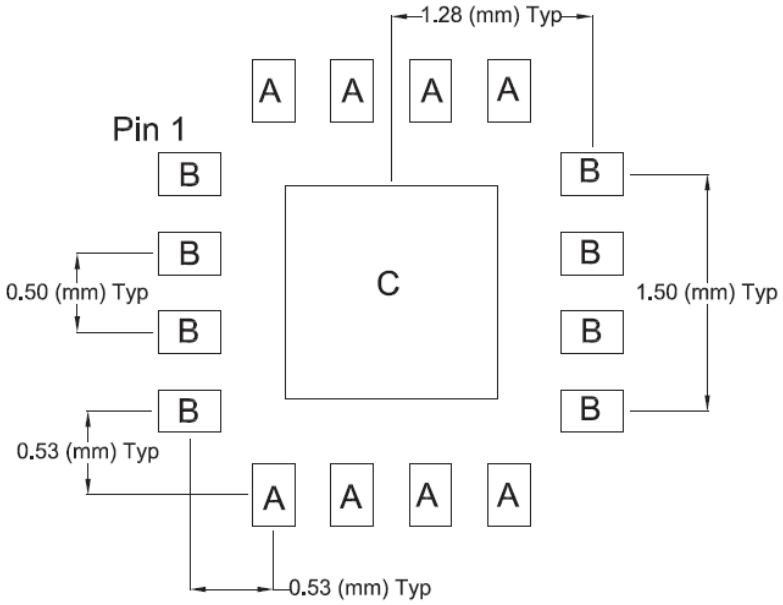
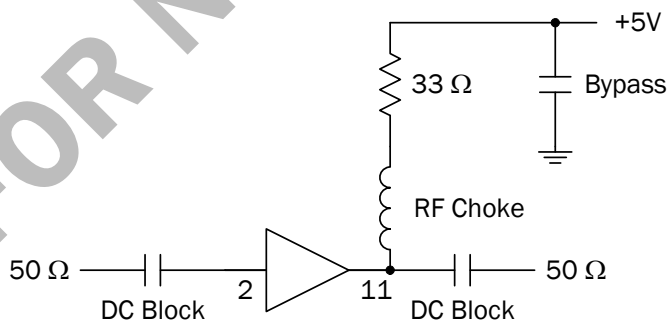
PCB Stencil Drawing

A = 0.27 x 0.40 (mm) Typ.
B = 0.40 x 0.27 (mm) Typ.
C = 1.35 (mm) Sq.



Typical Circuit Application



Ordering Information

Part Number	Description
SUF-1033SB	5-piece sample bag
SUF-1033SQ	25-piece bag
SUF-1033SR	100 pieces on 7" reel
SUF-1033TR7	2500 pieces on 7"reel
SUF-1033PCK-410	Evaluation board with 5-piece sample bag

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