v00.0204

HMC481ST89

SiGe HBT GAIN BLOCK MMIC AMPLIFIER, DC - 5.0 GHz

Typical Applications

The HMC481ST89 is an ideal RF/IF gain block & LO or PA driver for:

- Cellular / PCS / 3G
- Fixed Wireless & WLAN
- CATV, Cable Modem & DBS
- Microwave Radio & Test Equipment

Features

P1dB Output Power: +19 dBm

Gain: 20 dB

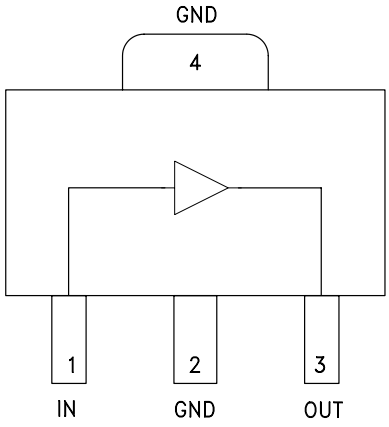
Output IP3: +33 dBm

Cascadable 50 Ohm I/Os

Single Supply: +6V to +12V

Industry Standard SOT89 Package

Functional Diagram



General Description

The HMC481ST89 is a SiGe Heterojunction Bipolar Transistor (HBT) Gain Block MMIC SMT amplifier covering DC to 5 GHz. Packaged in an industry standard SOT89, the amplifier can be used as a cascadable 50 Ohm RF/IF gain stage as well as a LO or PA driver with up to +21 dBm output power. The HMC481ST89 offers 20 dB of gain with a +33 dBm output IP3 at 1 GHz while requiring only 79 mA from a single positive supply. The Darlington feedback pair used results in reduced sensitivity to normal process variations and excellent gain stability over temperature while requiring a minimal number of external bias components.

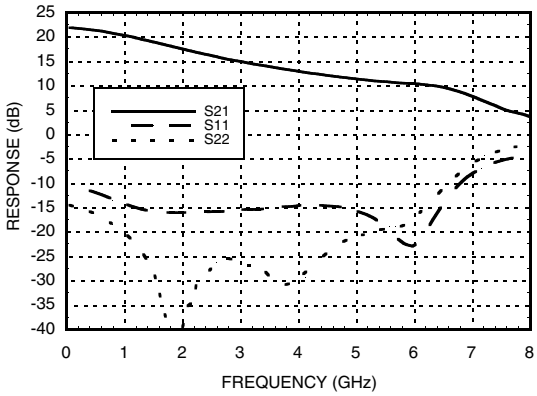
Electrical Specifications, Vs= 8.0 V, Rbias= 39 Ohm, T_A = +25° C

Parameter		Min.	Typ.	Max.	Units
Gain	DC - 1.0 GHz 1.0 - 2.0 GHz 2.0 - 3.0 GHz 3.0 - 4.0 GHz 4.0 - 5.0 GHz	18 15.5 13 11 9	20 17.5 15 13 11		dB dB dB dB dB
Gain Variation Over Temperature	DC - 5.0 GHz		0.008	0.016	dB/ °C
Input Return Loss	DC - 1.0 GHz 1.0 - 5.0 GHz		12 15		dB dB
Output Return Loss	DC - 1.0 GHz 1.0 - 4.0 GHz 4.0 - 5.0 GHz		17 27 23		dB dB dB
Reverse Isolation	DC - 5.0 GHz		18		dB
Output Power for 1 dB Compression (P1dB)	0.5 - 1.0 GHz 1.0 - 2.0 GHz 2.0 - 3.0 GHz 3.0 - 4.0 GHz 4.0 - 5.0 GHz	16 15 13 11 9	19 18 16 14 12		dBm dBm dBm dBm dBm
Output Third Order Intercept (IP3) (Pout= 0 dBm per tone, 1 MHz spacing)	0.5 - 2.0 GHz 2.0 - 3.0 GHz 3.0 - 4.0 GHz 4.0 - 5.0 GHz		33 30 27 25		dBm dBm dBm dBm
Noise Figure	DC - 4.0 GHz 4.0 - 5.0 GHz		3.5 4.0		dB dB
Supply Current (Icq)			79		mA

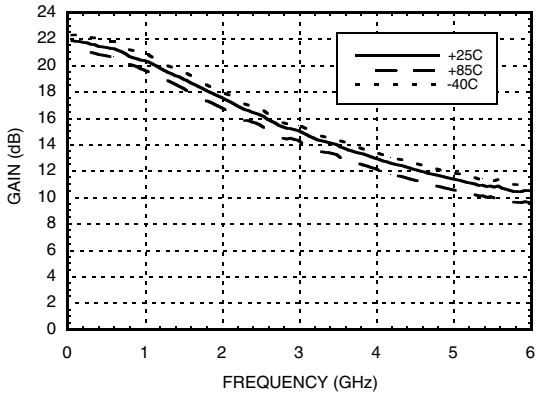
Note: Data taken with broadband bias tee on device output.

For price, delivery, and to place orders, please contact Hittite Microwave Corporation:
12 Elizabeth Drive, Chelmsford, MA 01824 Phone: 978-250-3343 Fax: 978-250-3373
Order Online at www.hittite.com

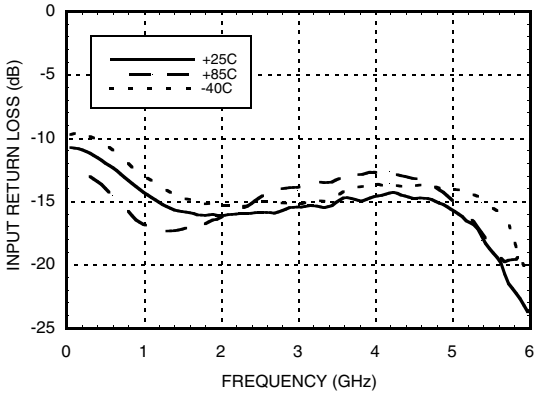
Broadband Gain & Return Loss



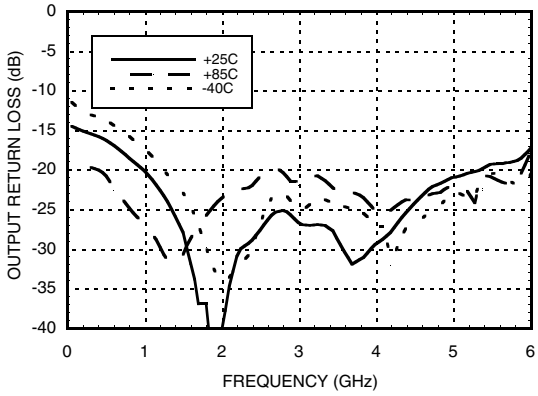
Gain vs. Temperature



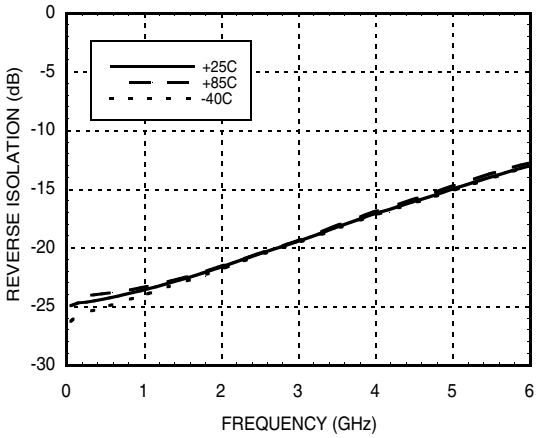
Input Return Loss vs. Temperature



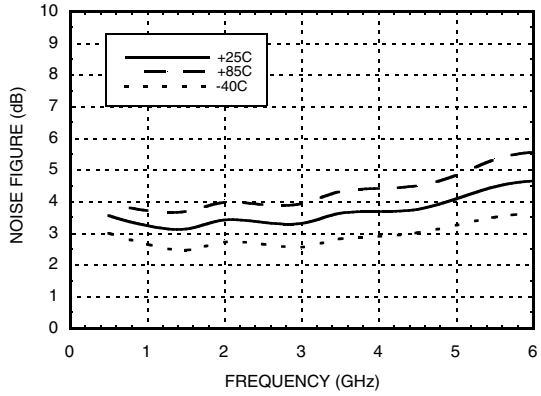
Output Return Loss vs. Temperature



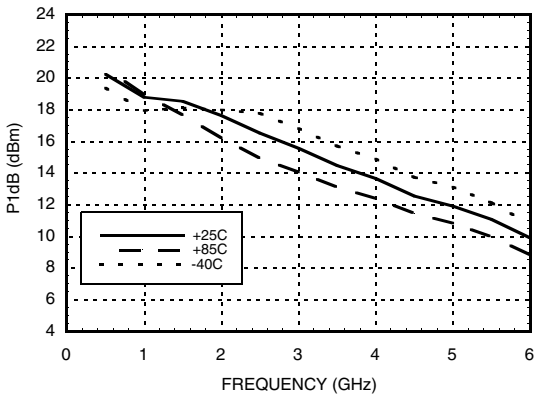
Reverse Isolation vs. Temperature



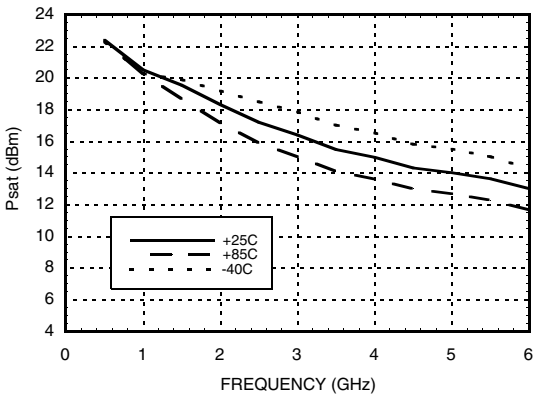
Noise Figure vs. Temperature



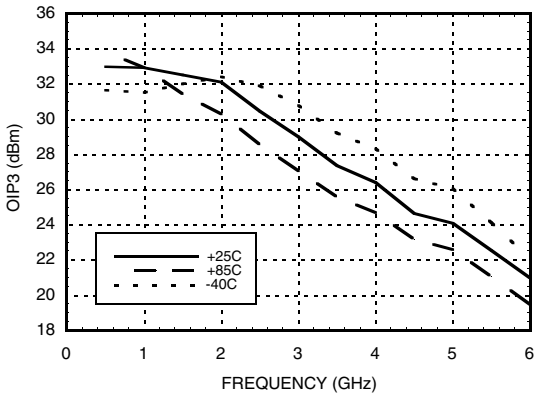
P1dB vs. Temperature



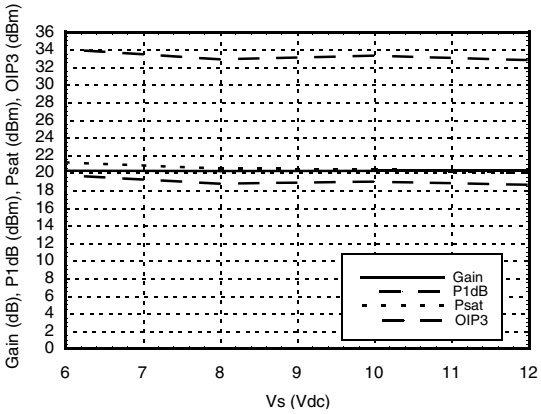
Psat vs. Temperature



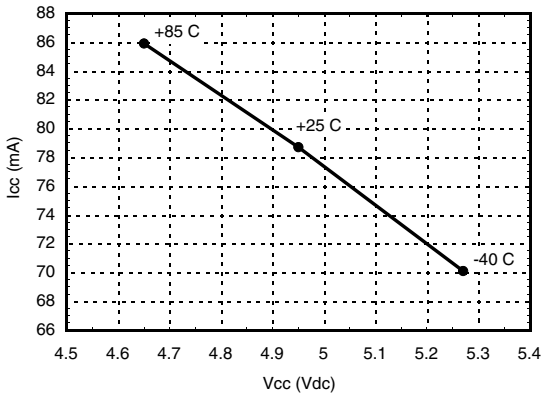
Output IP3 vs. Temperature



Gain, Power & OIP3 vs. Supply Voltage for Constant Icc= 79 mA @ 850 MHz



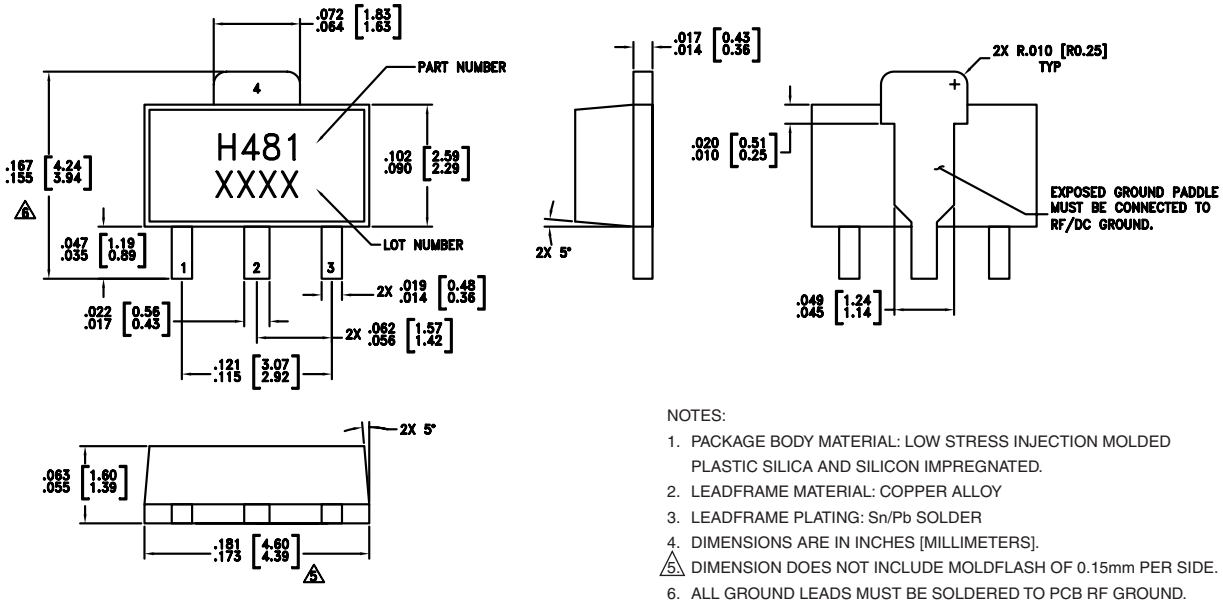
Vcc vs. Icc Over Temperature for Fixed Vs= 8V, RBIAS= 39 Ohms



Absolute Maximum Ratings

Collector Bias Voltage (Vcc)	+6.0 Vdc
RF Input Power (RFin)(Vcc = +5 Vdc)	+17 dBm
Junction Temperature	150 °C
Continuous Pdiss (T = 85 °C) (derate 16.3 mW/°C above 85 °C)	1.06 W
Thermal Resistance (junction to lead)	61.4 °C/W
Storage Temperature	-65 to +150 °C
Operating Temperature	-40 to +85 °C

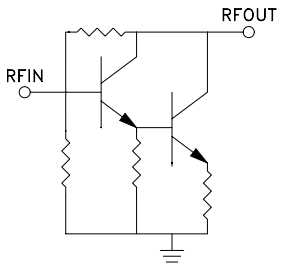
Outline Drawing



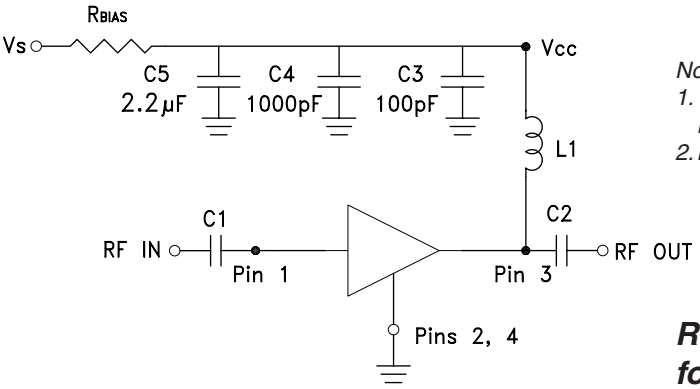
NOTES:

1. PACKAGE BODY MATERIAL: LOW STRESS INJECTION MOLDED PLASTIC SILICA AND SILICON IMPREGNATED.
2. LEADFRAME MATERIAL: COPPER ALLOY
3. LEADFRAME PLATING: Sn/Pb SOLDER
4. DIMENSIONS ARE IN INCHES [MILLIMETERS].
5. DIMENSION DOES NOT INCLUDE MOLDFLASH OF 0.15mm PER SIDE.
6. ALL GROUND LEADS MUST BE SOLDERED TO PCB RF GROUND.
7. THE MICRO-P PACKAGE IS DIMENSIONALLY COMPATABLE WITH THE "MICRO-X PACKAGE"

Pin Descriptions

Pin Number	Function	Description	Interface Schematic
1	RFIN	This pin is DC coupled. An off chip DC blocking capacitor is required.	
3	RFOUT	RF output and DC Bias (Vcc) for the output stage.	
2, 4	GND	These pins and package bottom must be connected to RF/DC ground.	

Application Circuit



Note:
1. External blocking capacitors are required on RFIN and RFOUT.
2. RBIAS provides DC bias stability over temperature.

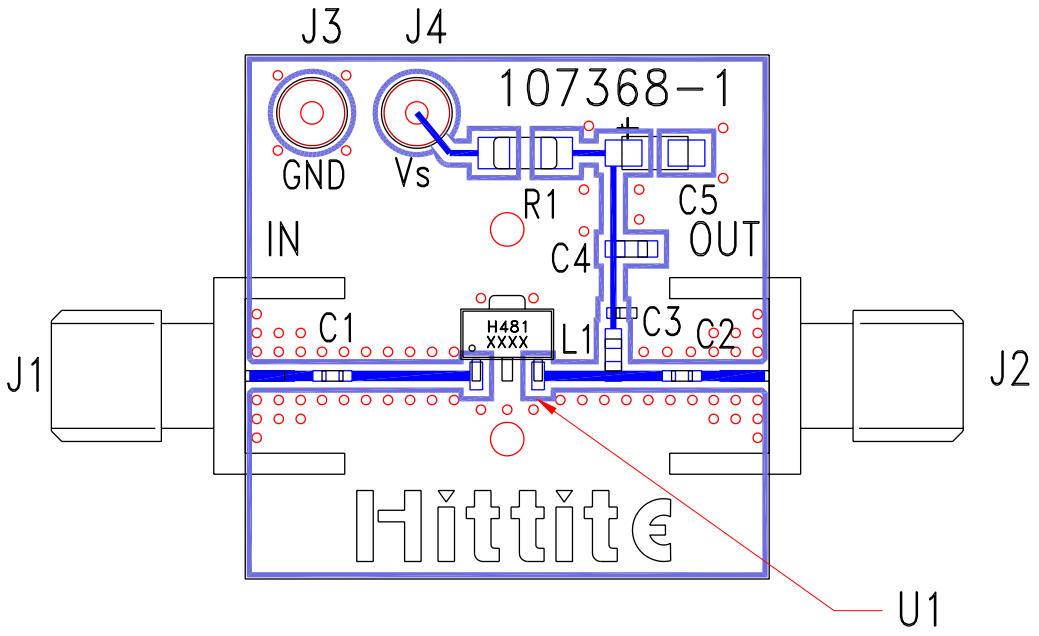
Recommended Bias Resistor Values for Icc= 79 mA, Rbias= (Vs - Vcc) / Icc

Supply Voltage (Vs)	6V	8V	10V	12V
RBIAS VALUE	11 Ω	39 Ω	62 Ω	91 Ω
RBIAS POWER RATING	1/8 W	1/4 W	1/2 W	1 W

Recommended Component Values for Key Application Frequencies

Component	Frequency (MHz)						
	50	900	1900	2200	2400	3500	5000
L1	270 nH	56 nH	18 nH	18 nH	15 nH	8.2 nH	6.8 nH
C1, C2	0.01 µF	100 pF	100 pF	100 pF	100 pF	100 pF	100 pF

Evaluation PCB



List of Materials for Evaluation PCB 108324*

Item	Description
J1 - J2	PC Mount SMA Connector
J3 - J4	DC Pin
C1, C2	Capacitor, 0402 Pkg.
C3	100 pF Capacitor, 0402 Pkg.
C4	1000 pF Capacitor, 0603 Pkg.
C5	2.2 µF Capacitor, Tantalum
R1	Resistor, 1210 Pkg.
L1	Inductor, 0603 Pkg.
U1	HMC481ST89
PCB**	107368 Evaluation PCB
** Circuit Board Material: Rogers 4350	

* Reference this number when ordering complete evaluation PCB.

The circuit board used in the final application should use RF circuit design techniques. Signal lines should have 50 ohm impedance while the package ground leads and package bottom should be connected directly to the ground plane similar to that shown. A sufficient number of VIA holes should be used to connect the top and bottom ground planes. The evaluation board should be mounted to an appropriate heat sink. The evaluation circuit board shown is available from Hittite upon request.