

**InGaP HBT GAIN BLOCK
MMIC AMPLIFIER, DC - 6 GHz**

Typical Applications

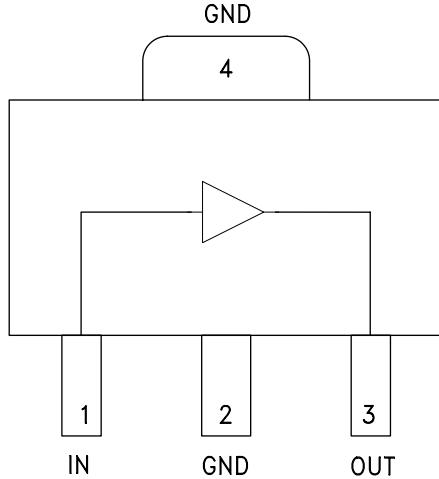
The HMC311ST89(E) is ideal for:

- Cellular / PCS / 3G
- Fixed Wireless & WLAN
- CATV & Cable Modem
- Microwave Radio

Features

- P1dB Output Power: +15.5 dBm
- Output IP3: +31.5 dBm
- Gain: 16 dB
- 50 Ohm I/O's
- Industry Standard SOT89 Package
- Included in the HMC-DK001 Designer's Kit

Functional Diagram



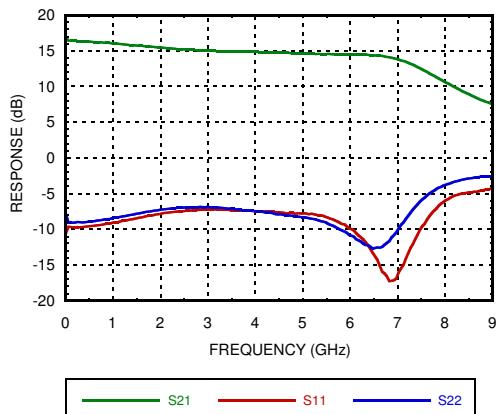
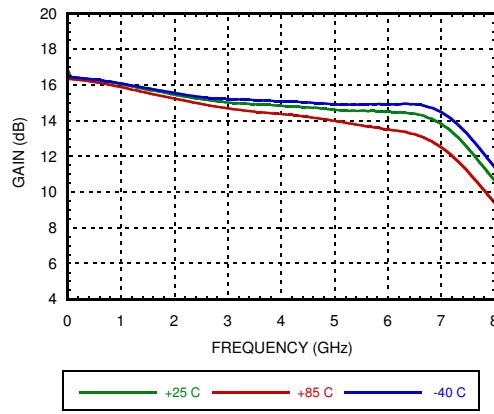
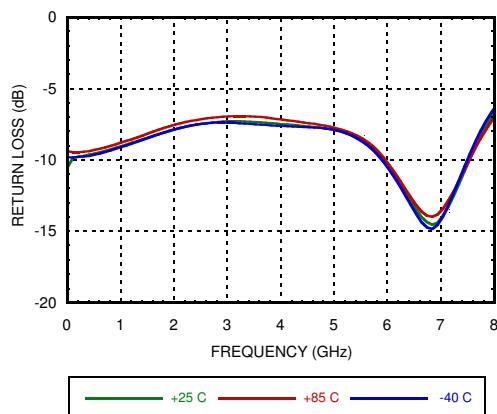
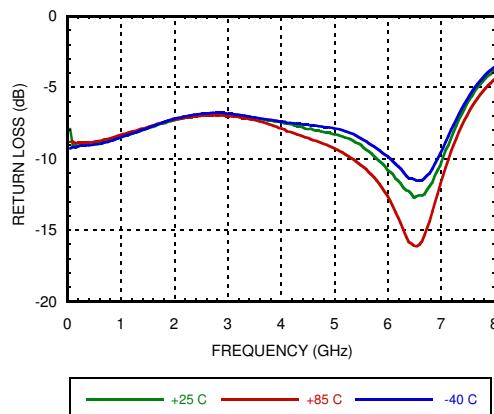
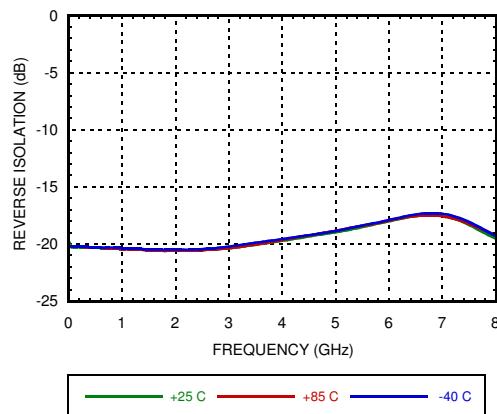
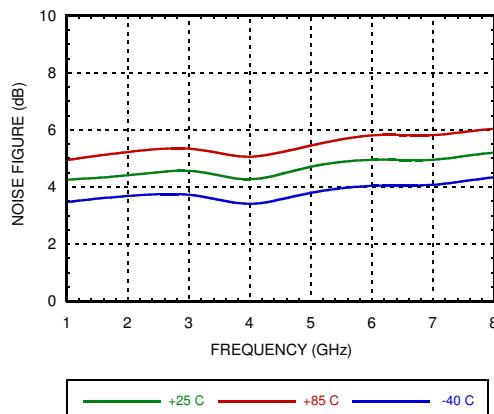
Electrical Specifications, Vs= 5V, Rbias= 22 Ohm, TA = +25° C

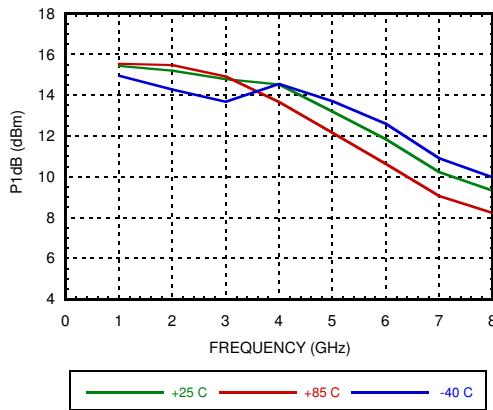
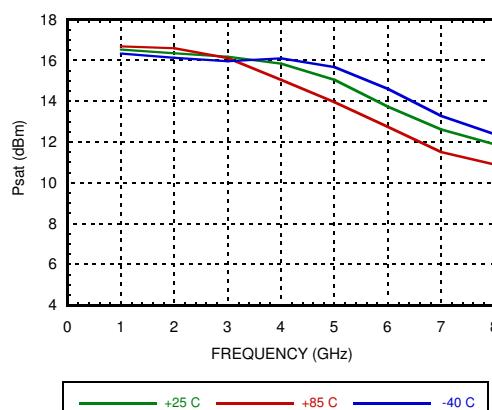
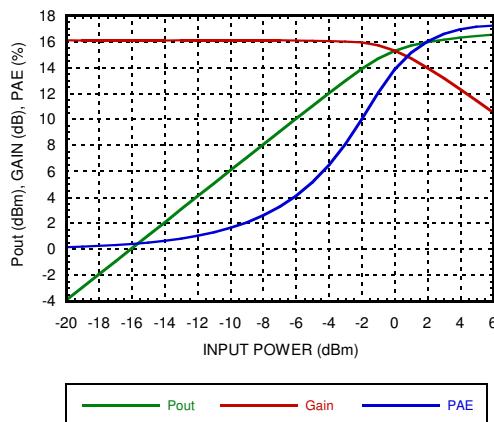
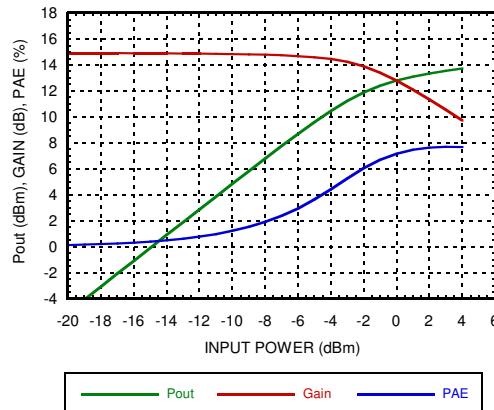
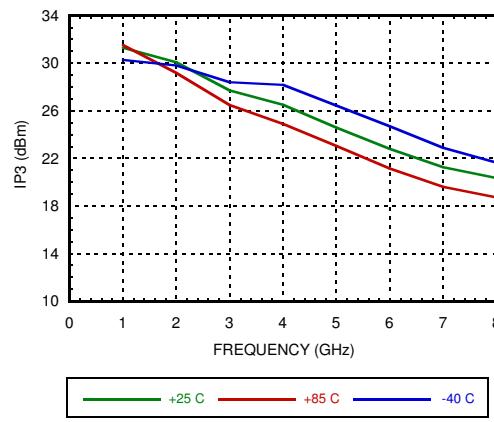
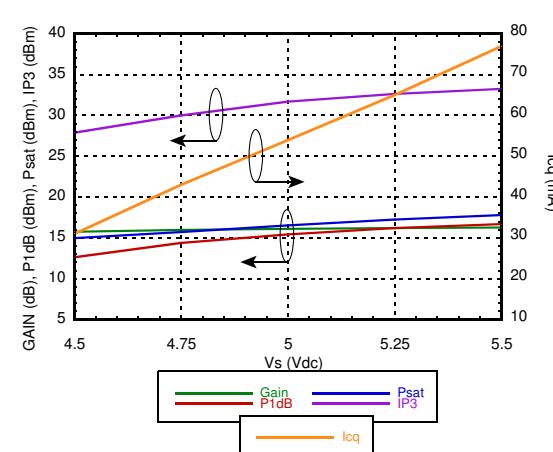
Parameter	Min.	Typ.	Max.	Units
Gain	DC - 1.0 GHz 1.0 - 4.0 GHz 4.0 - 6.0 GHz	14.0 13.0 12.5	16.0 15.0 14.5	dB
Gain Variation Over Temperature	DC - 2.0 GHz 2.0 - 4.0 GHz 4.0 - 6.0 GHz		0.004 0.007 0.012	dB/ °C dB/ °C dB/ °C
Return Loss Input / Output	DC - 2.0 GHz 2.0 - 5.0 GHz 5.0 - 6.0 GHz		8 7 8	dB dB dB
Reverse Isolation	DC - 6 GHz		20	dB
Output Power for 1 dB Compression (P1dB)	DC - 2.0 GHz 2.0 - 4.0 GHz 4.0 - 6.0 GHz	13.5 12.0 10.0	15.5 15.0 13.0	dBm dBm dBm
Output Third Order Intercept (IP3)	DC - 1.0 GHz 1.0 - 2.0 GHz 2.0 - 4.0 GHz 4.0 - 6.0 GHz		31.5 30 27 24	dBm dBm dBm dBm
Noise Figure	DC - 4 GHz 4.0 - 6.0 GHz		4.5 5	dB
Supply Current (Icq)			55 74	mA

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

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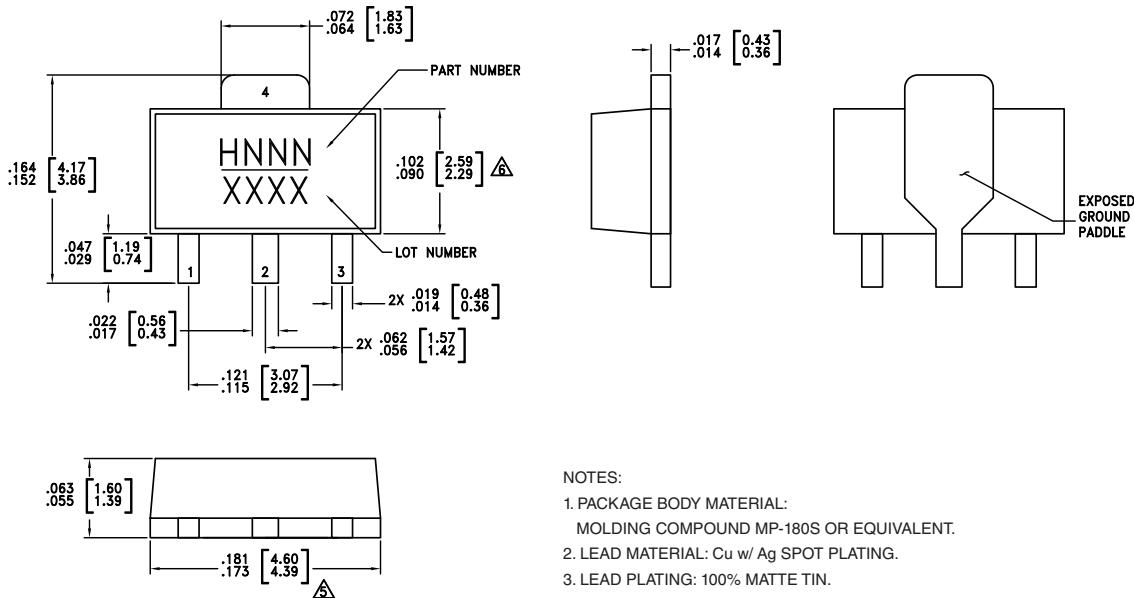
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**InGaP HBT GAIN BLOCK
MMIC AMPLIFIER, DC - 6 GHz**
Broadband Gain & Return Loss

Gain vs. Temperature

Input Return Loss vs. Temperature

Output Return Loss vs. Temperature

Reverse Isolation vs. Temperature

Noise Figure vs. Temperature


**InGaP HBT GAIN BLOCK
MMIC AMPLIFIER, DC - 6 GHz**
P1dB vs. Temperature

Psat vs. Temperature

Power Compression @ 1 GHz

Power Compression @ 6 GHz

Output IP3 vs. Temperature

Gain, Power, OIP3 & Supply Current vs. Supply Voltage @ 1 GHz


**InGaP HBT GAIN BLOCK
MMIC AMPLIFIER, DC - 6 GHz**
Absolute Maximum Ratings

Collector Bias Voltage (Vcc)	+7V
RF Input Power (RFIN)(Vcc = +3.9V)	+10 dBm
Junction Temperature	150 °C
Continuous Pdiss (T = 85 °C) (derate 5.21 mW/°C above 85 °C)	0.34 W
Thermal Resistance (junction to lead)	191 °C/W
Storage Temperature	-65 to +150 °C
Operating Temperature	-40 to +85 °C
ESD Sensitivity (HBM)	Class1A, Passed 250V


**ELECTROSTATIC SENSITIVE DEVICE
OBSERVE HANDLING PRECAUTIONS**
Outline Drawing

NOTES:

1. PACKAGE BODY MATERIAL:
MOLDING COMPOUND MP-180S OR EQUIVALENT.
2. LEAD MATERIAL: Cu w/ Ag SPOT PLATING.
3. LEAD PLATING: 100% MATTE TIN.
4. DIMENSIONS ARE IN INCHES [MILLIMETERS]
5. DIMENSION DOES NOT INCLUDE MOLDFLASH OF 0.15mm PER SIDE.
6. DIMENSION DOES NOT INCLUDE MOLDFLASH OF 0.25mm PER SIDE.
7. ALL GROUND LEADS MUST BE SOLDERED TO PCB RF GROUND.

Package Information

Part Number	Package Body Material	Lead Finish	MSL Rating	Package Marking ^[3]
HMC311ST89	Low Stress Injection Molded Plastic	Sn/Pb Solder	MSL1 ^[1]	311 XXXX
HMC311ST89E	RoHS-compliant Low Stress Injection Molded Plastic	100% matte Sn	MSL1 ^[2]	H311 XXXX

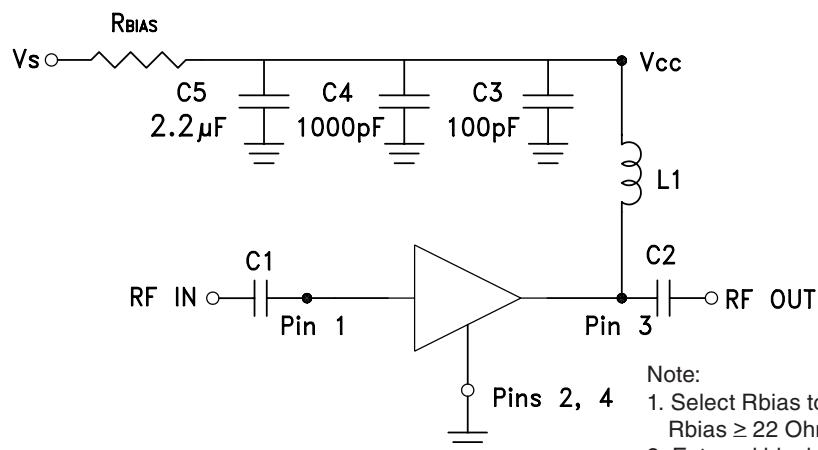
[1] Max peak reflow temperature of 235 °C

[2] Max peak reflow temperature of 260 °C

[3] 4-Digit lot number XXXX

**InGaP HBT GAIN BLOCK
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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 for the output stage.	
2, 4	GND	These pins and package bottom must be connected to RF/DC ground.	

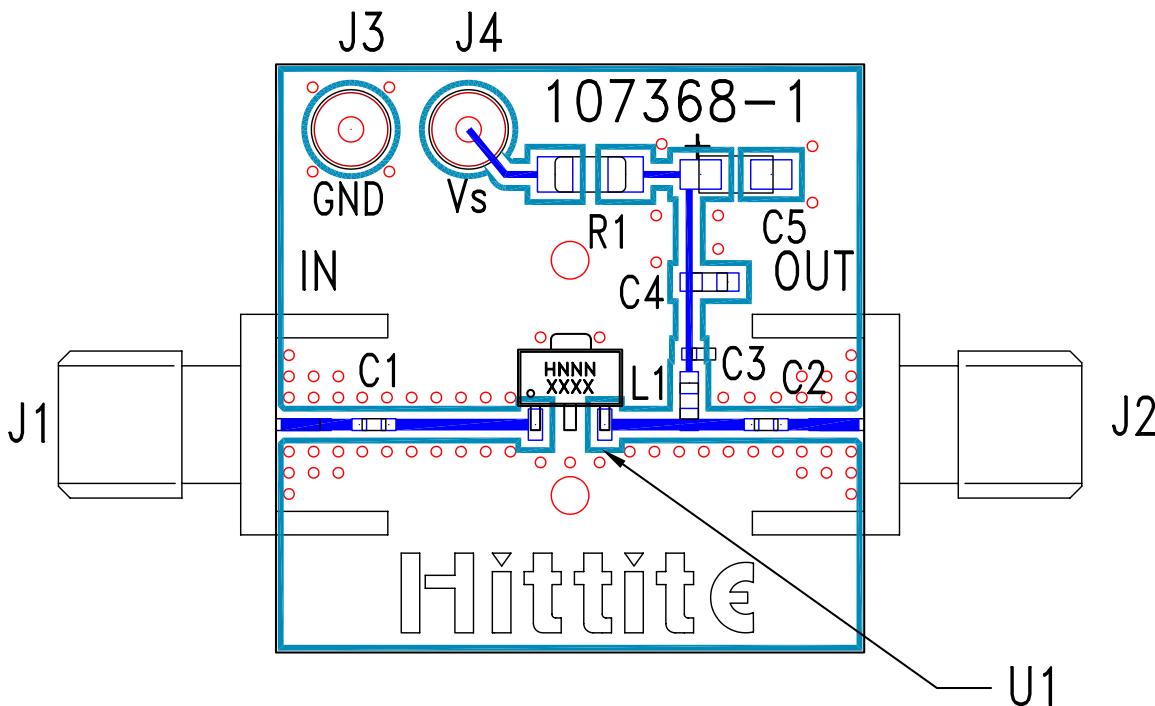
Application Circuit


- Note:
1. Select Rbias to achieve Icq using equation below,
 $Rbias \geq 22\text{ Ohm}$.
 2. External blocking capacitors are required on RFIN and RFOUT.

$$I_{cq} = \frac{V_s - 3.8}{Rbias}$$

Recommended Component Values

Component	Frequency (MHz)							
	50	900	1900	2200	2400	3500	5200	5800
L1	270 nH	56 nH	18 nH	18 nH	15 nH	8.2 nH	3.3 nH	3.3 nH
C1, C2	0.01 μ F	100 pF						

Evaluation PCB

List of Materials for Evaluation PCB 108313^[1]

Item	Description
J1 - J2	PCB 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, 0805 Pkg.
L1	Inductor, 0603 Pkg.
U1	HMC311ST89(E)
PCB [2]	107368 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 Analog Devices upon request.

[1] Reference this number when ordering complete evaluation PCB

[2] Circuit Board Material: Rogers 4350