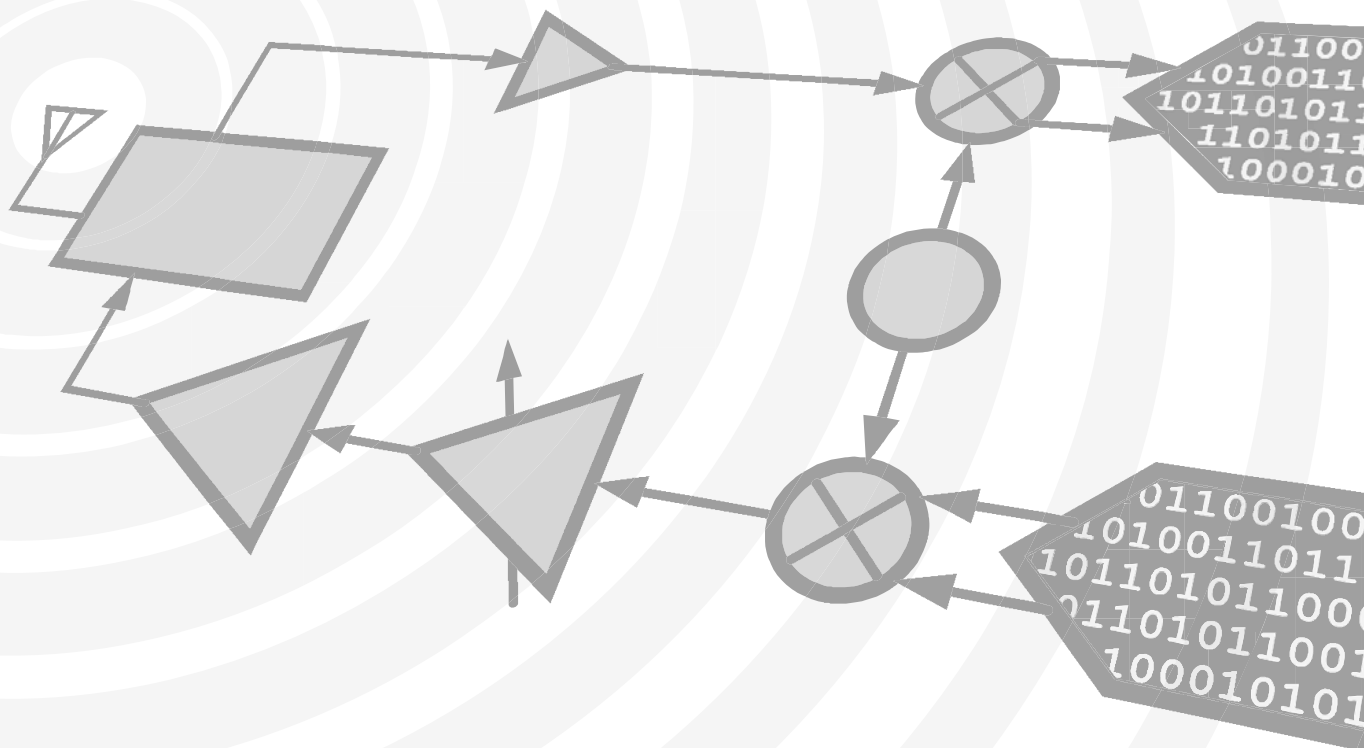




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HMC311SC70 / 311SC70E

v04.0814

InGaP HBT GAIN BLOCK MMIC AMPLIFIER, DC - 8 GHz

Typical Applications

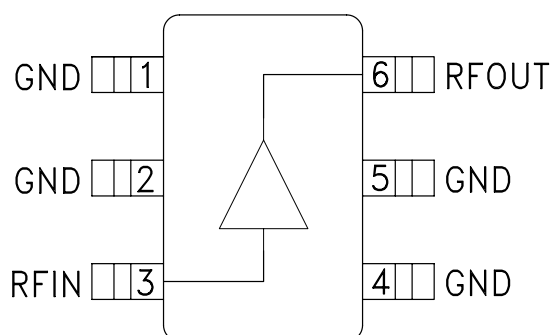
The HMC311SC70(E) is ideal for:

- Cellular / PCS / 3G
- WiBro / WiMAX / 4G
- Fixed Wireless & WLAN
- CATV & Cable Modem
- Microwave Radio & Test Equipment

Features

- P1dB Output Power: +15 dBm
- Output IP3: +30 dBm
- Gain: 15 dB
- Cascadable, 50 Ohm I/O's
- Single Supply: +5V
- Industry Standard SC70 Package

Functional Diagram



General Description

The HMC311SC70(E) is a GaAs InGaP Heterojunction Bipolar Transistor (HBT) Gain Block MMIC SMT DC to 8 GHz amplifier. Packaged in an industry standard SC70, the amplifier can be used as either a cascadable 50 Ohm gain stage or to drive the LO port of HMC mixers with up to +15 dBm output power. The HMC311SC70(E) offers 15 dB of gain and an output IP3 of +30 dBm while requiring only 54 mA from a +5V supply. The Darlington topology results in reduced sensitivity to normal process variations, and yields excellent gain stability over temperature while requiring a minimal number of external bias components.

Electrical Specifications, $V_s = 5V$, $R_{bias} = 22\text{ Ohm}$, $T_A = +25^\circ\text{C}$

Parameter		Min.	Typ.	Max.	Units
Gain	DC - 1.0 GHz	14.0	15.0		dB
	1.0 - 4.0 GHz	13.0	15.0		dB
	4.0 - 6.0 GHz	12.5	14.5		dB
	6.0 - 8.0 GHz	11.0	13.0		dB
Gain Variation Over Temperature	DC - 1.0 GHz		0.004	0.007	dB/ °C
	1.0 - 4.0 GHz		0.007	0.012	dB/ °C
	4.0 - 6.0 GHz		0.012	0.016	dB/ °C
	6.0 - 8.0 GHz		0.018	0.022	dB/ °C
Return Loss Input / Output			15		dB
Reverse Isolation			18		dB
Output Power for 1 dB Compression (P1dB)	DC - 2.0 GHz	13.5	15.5		dBm
	2.0 - 4.0 GHz	12.0	15.0		dBm
	4.0 - 6.0 GHz	10.0	13.0		dBm
	6.0 - 8.0 GHz	8.0	11.0		dBm
Output Third Order Intercept (IP3)	DC - 2.0 GHz		30		dBm
	2.0 - 6.0 GHz		27		dBm
	6.0 - 8.0 GHz		24		dBm
Noise Figure			5		dB
Supply Current (Icq)			55	74	mA

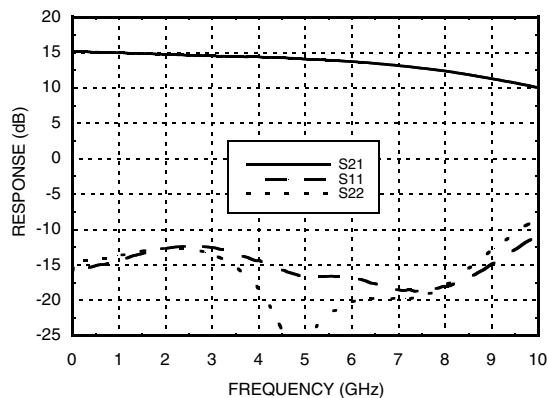
Note: Data taken with broadband bias tee on device output.

For price, delivery and to place orders: Analog Devices, Inc., 2 Elizabeth Drive, Chelmsford, MA 01824

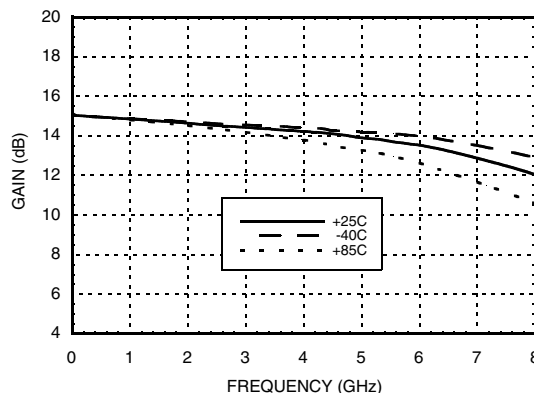
Phone: 978-250-3343 • Fax: 978-250-3373 • Order On-line at www.hittite.com

Application Support: Phone: 978-250-3343 or apps@hittite.com

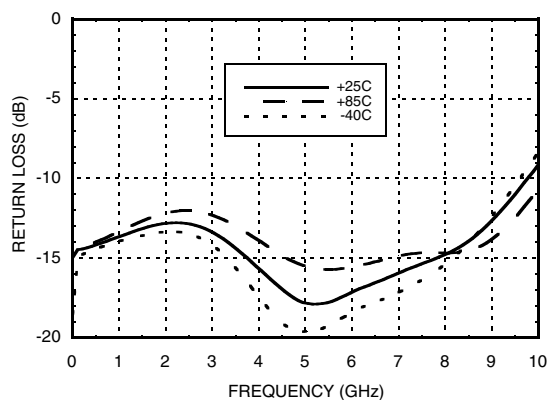
Broadband Gain & Return Loss



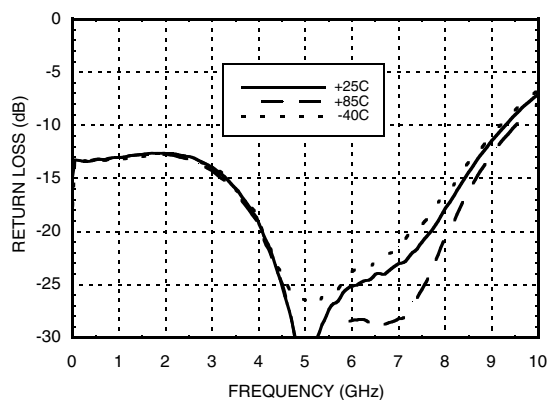
Gain vs. Temperature



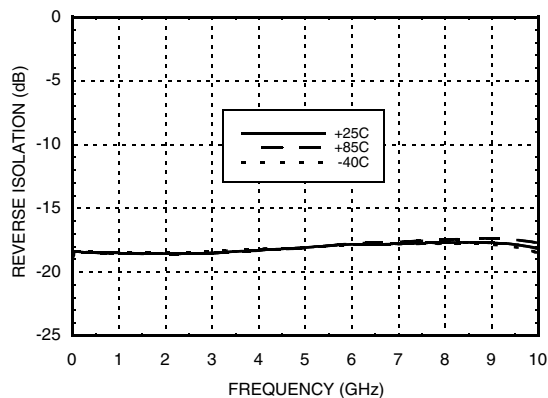
Input Return Loss vs. Temperature



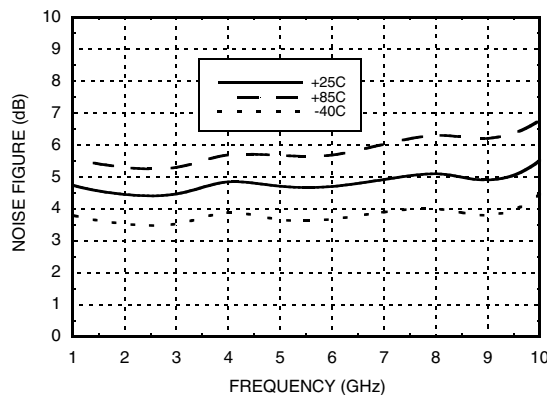
Output Return Loss vs. Temperature



Reverse Isolation vs. Temperature



Noise Figure vs. Temperature

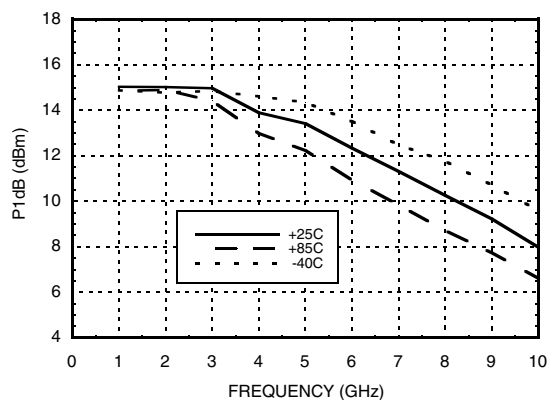
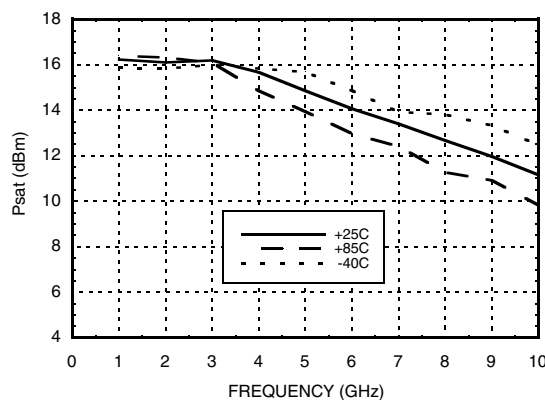
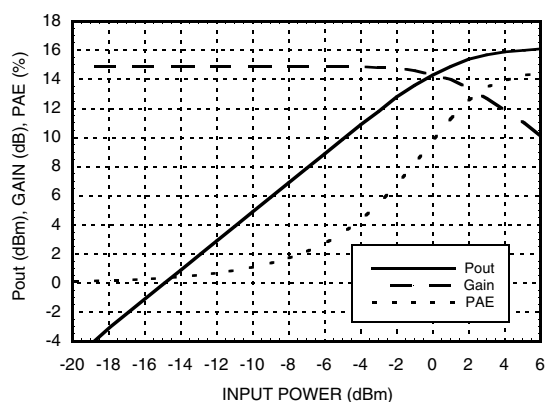
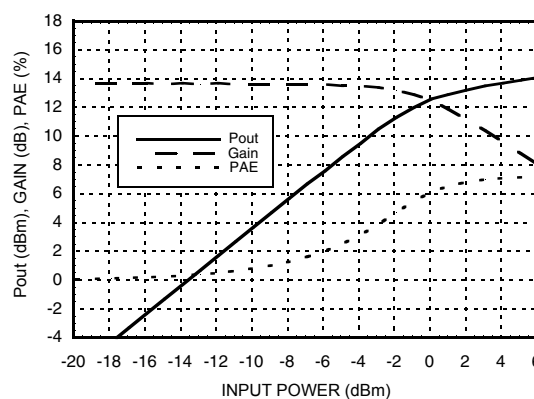
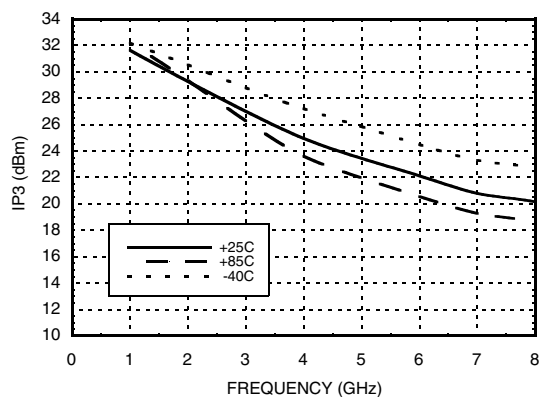
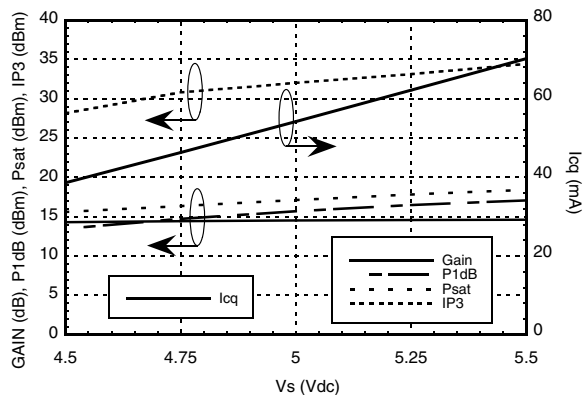




HMC311SC70 / 311SC70E

v04.0814

InGaP HBT GAIN BLOCK MMIC AMPLIFIER, DC - 8 GHz

P1dB vs. Temperature

Psat vs. Temperature

Power Compression @ 1 GHz

Power Compression @ 6 GHz

Output IP3 vs. Temperature

Gain, Power, IP3 & Supply Current vs. Supply Voltage @ 1 GHz


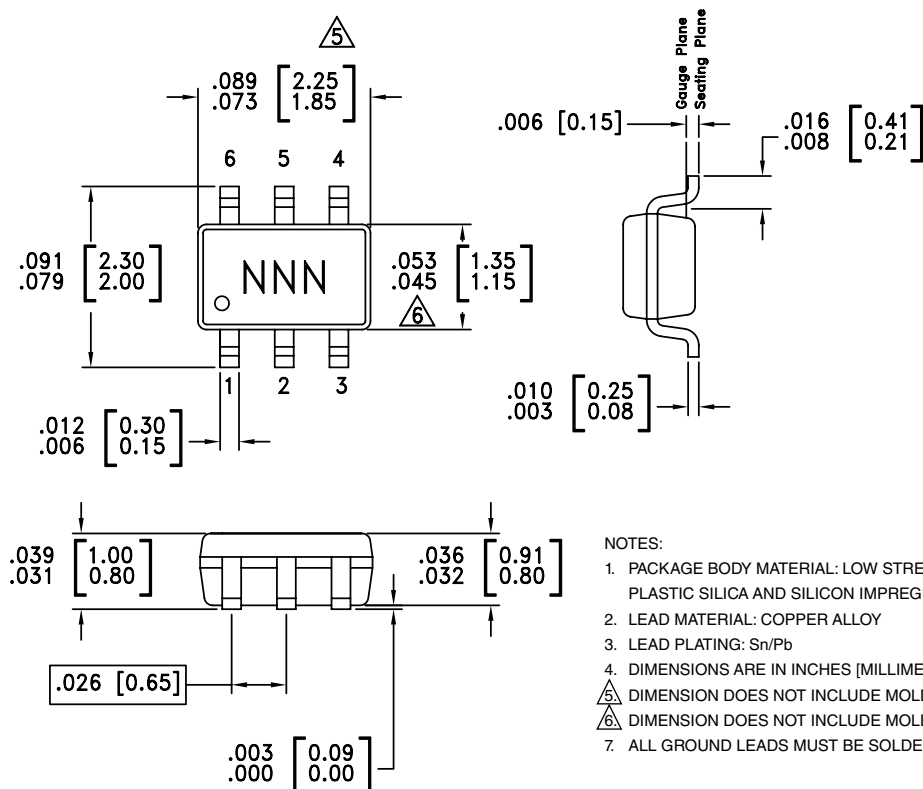
Absolute Maximum Ratings

Collector Bias Voltage (Vcc)	+7V
RF Input Power (RFIN)(Vcc = +3.9V)	+10 dBm
Junction Temperature	150 °C
Continuous P _{diss} (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



ELECTROSTATIC SENSITIVE DEVICE
OBSERVE HANDLING PRECAUTIONS

Outline Drawing



Package Information

Part Number	Package Body Material	Lead Finish	MSL Rating	Package Marking
HMC311SC70	Low Stress Injection Molded Plastic	Sn/Pb	MSL1 ^[1]	311E
HMC311SC70E	RoHS-compliant Low Stress Injection Molded Plastic	100% matte Sn	MSL1 ^[2]	311E

[1] Max peak reflow temperature of 235 °C

[2] Max peak reflow temperature of 260 °C

Pin Number	Function	Description	Interface Schematic
1, 2, 4, 5	GND	These pins must be connected to RF/DC ground.	
3	RFIN	This pin is DC coupled. An off chip DC blocking capacitor is required.	
6	RFOUT	RF output and DC Bias for the output stage.	

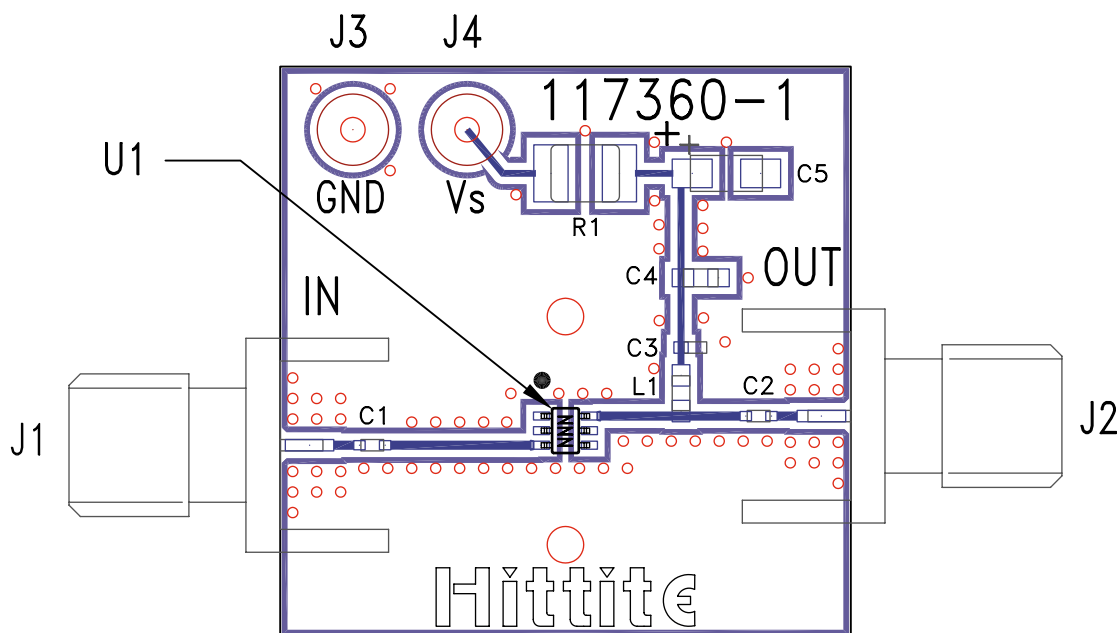
The diagram shows a 1-bit DAC circuit. The op-amp is configured as a voltage follower. The non-inverting input (Pin 3) is connected to the input signal RFIN through capacitor C1. The inverting input (Pin 6) is connected to the output RFOUT through capacitor C2 and to ground through a network of capacitors C3, C4, C5 and an inductor L1. The output is also connected to VCC through an inductor L1. The input VCC is connected to ground through a resistor RBIAS.

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

$$I_{CQ} = \frac{V_S - 3.8}{R_{bias}}$$

[illegible]

Evaluation PCB



List of Materials for Evaluation PCB 118040 [1]

Item	Description
J1 - J2	PCB Mount SMA Connector
J3 - J4	DC Pin
C1 - C3	100 pF Capacitor, 0402 Pkg.
C4	1000 pF Capacitor, 0603 Pkg.
C5	2.2 μ F Capacitor, Tantalum
R1	22 Ohm Resistor, 1210 Pkg.
L1	22 nH Inductor, 0603 Pkg.
U1	HMC311SC70 / HMC311SC70E
PCB [2]	117360 Evaluation PCB

[1] Reference this number when ordering complete evaluation PCB

[2] Circuit Board Material: Rogers 4350

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 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.