



## InGaP HBT ACTIVE BIAS MMIC AMPLIFIER, 0.05 – 3 GHz

### Typical Applications

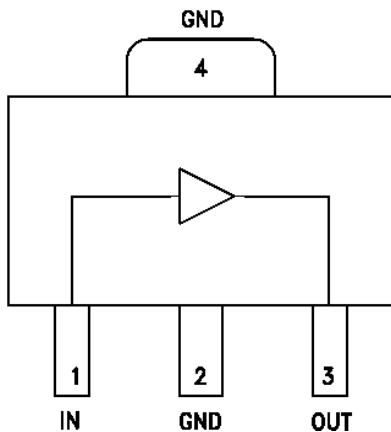
The HMC740ST89E is ideal for:

- Cellular/3G & WiMAX/4G
- Fixed Wireless & WLAN
- CATV, Cable Modem & DBS
- Microwave Radio & Test Equipment
- IF & RF Applications

### Features

- P1dB Output Power: +18 dBm
- Gain: 15 dB
- Output IP3: +40 dBm
- Cascadable 50 Ohm I/Os
- Single Supply: +5V
- Industry Standard SOT89 Package
- Robust 1000V ESD, Class 1C
- Stable Current Over Temperature
- Active Bias Network

### Functional Diagram



### General Description

The HMC740ST89E is an InGaP Heterojunction Bipolar Transistor (HBT) Gain Block MMIC SMT amplifier covering 0.05 to 3 GHz. Packaged in an industry standard SOT89, the amplifier can be used as a cascadable 50 Ohm RF or IF gain stage as well as a PA or LO driver with up to +18 dBm output power. The HMC740ST89E offers 15 dB of gain with a +40 dBm output IP3 at 100 MHz, and can operate directly from a +5V supply. The HMC740ST89E exhibits excellent gain and output power stability over temperature, while requiring a minimal number of external bias components.

### Electrical Specifications, $V_{cc} = 5V$ , $T_A = +25^\circ C$

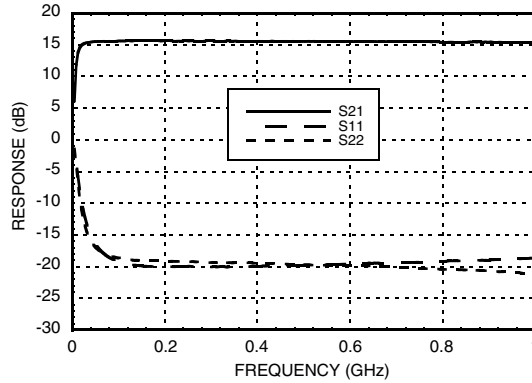
Parameter	Min.	Typ.	Max.	Min.	Typ.	Max.	Units
Frequency Range	0.05 - 1		0.05 - 3				GHz
Gain	12	15		11	15		dB
Gain Flatness		$\pm 0.1$			$\pm 0.7$		dB
Gain Variation over Temperature		0.003	0.006		0.003	0.006	dB/°C
Input Return Loss		18			15		dB
Output Return Loss		18			18		dB
Reverse Isolation		20			21		dB
Output Power for 1 dB Compression (P1dB)	15.5	18		14.5	17		dBm
Output Third Order Intercept (IP3) (Pout= 0 dBm per tone, 1 MHz spacing)		38			32		dBm
Noise Figure		3.5			3.5		dB
Supply Current (Icq)		88			88		mA



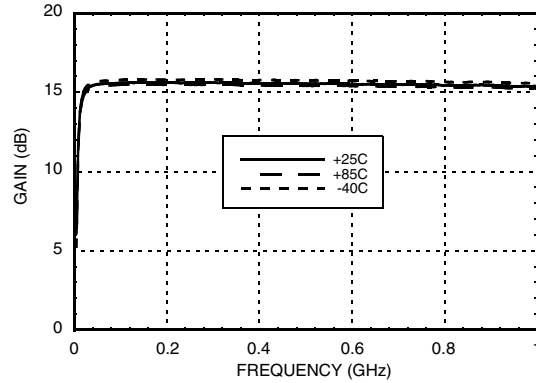
**InGaP HBT ACTIVE BIAS MMIC AMPLIFIER, 0.05 – 3 GHz**

**IF Band Performance**

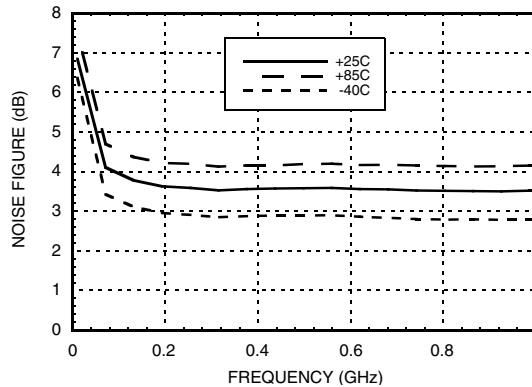
**Gain & Return Loss**



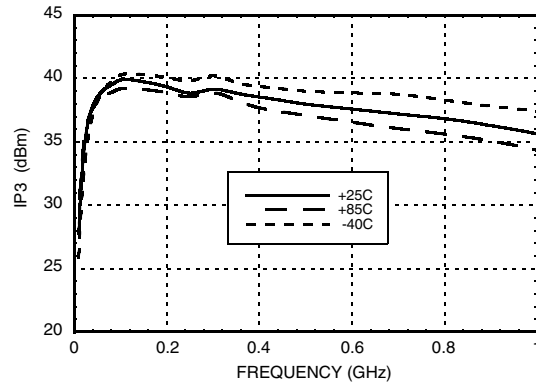
**Gain vs. Temperature**



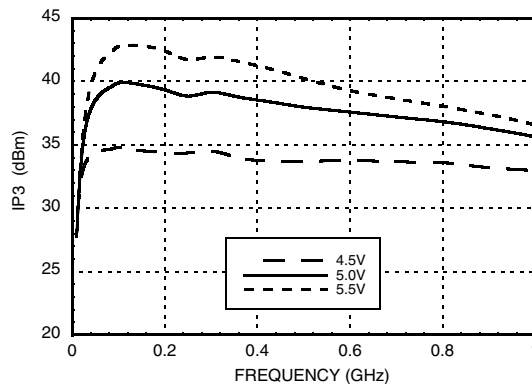
**Noise Figure vs. Temperature**



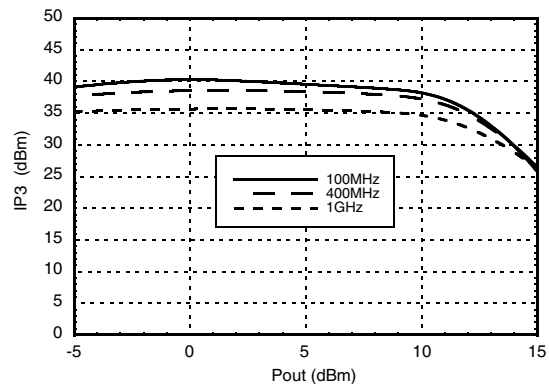
**Output IP3 vs. Temperature**



**Output IP3 vs. Vcc**



**Output IP3 vs. Output Power**



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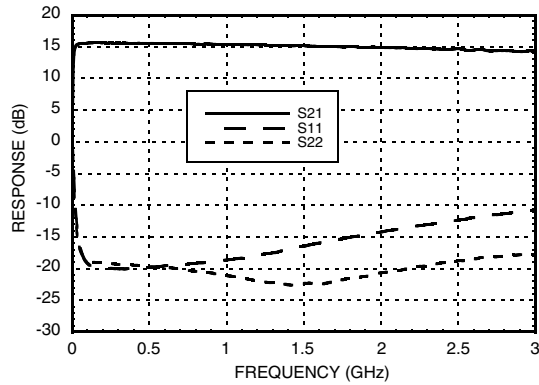
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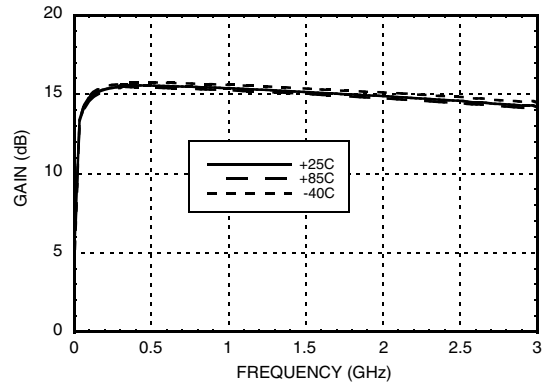
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**Broadband Performance**

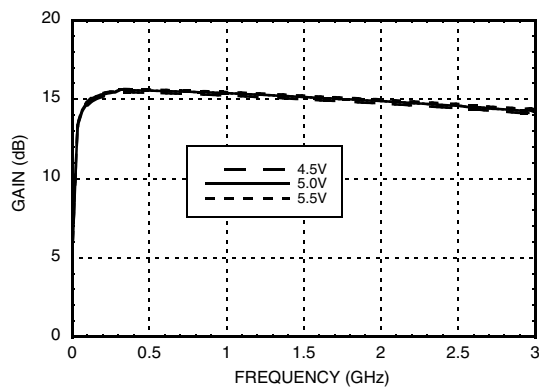
**Gain & Return Loss**



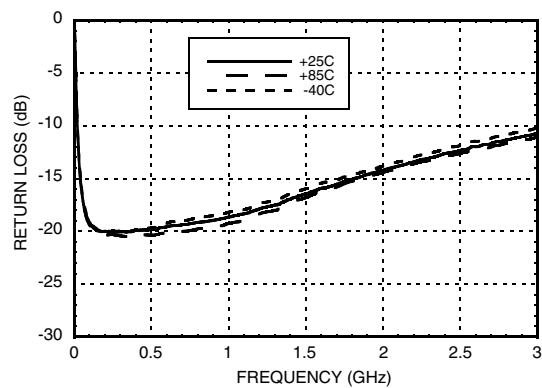
**Gain vs. Temperature**



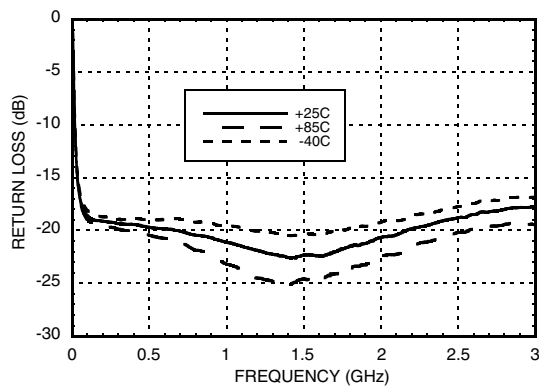
**Gain vs. Vcc**



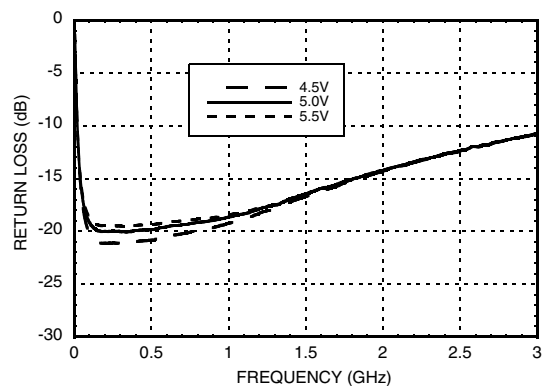
**Input Return Loss vs. Temperature**



**Output Return Loss vs. Temperature**



**Input Return Loss vs. Vcc**



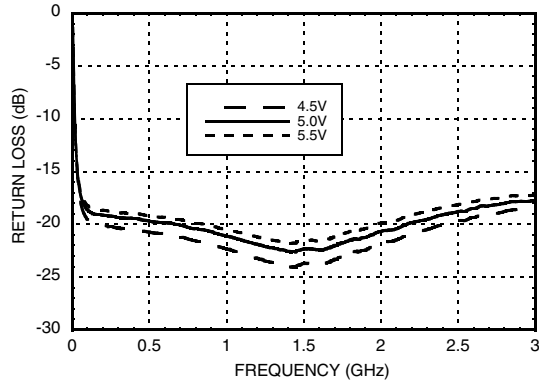
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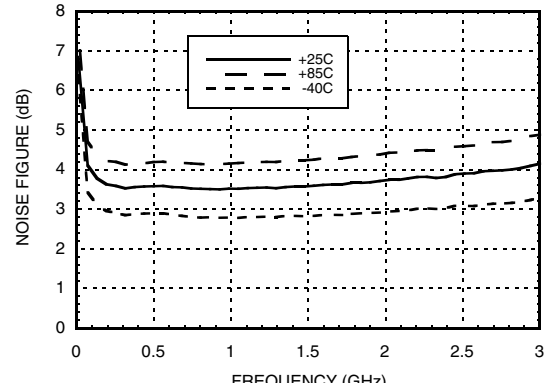


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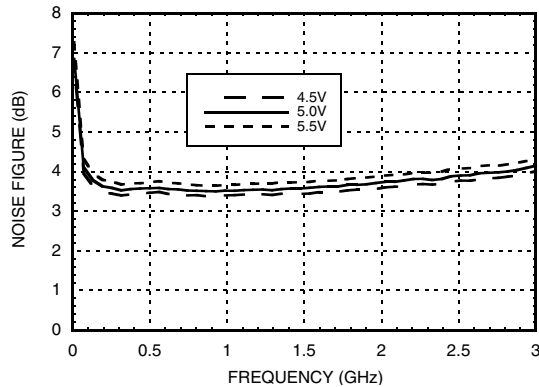
**Output Return Loss vs. Vcc**



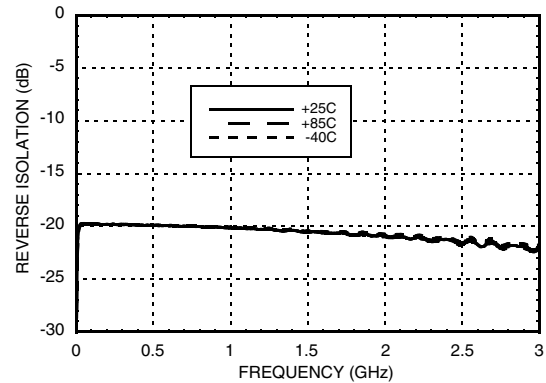
**Noise Figure vs. Temperature**



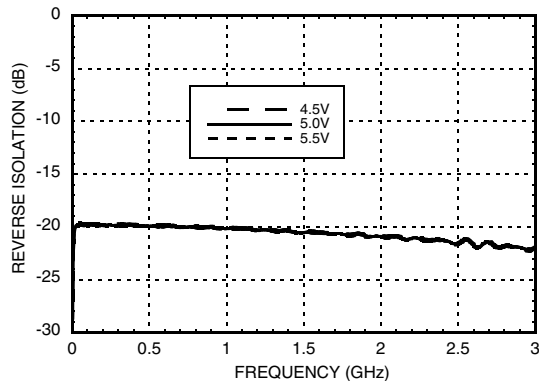
**Noise Figure vs. Vcc**



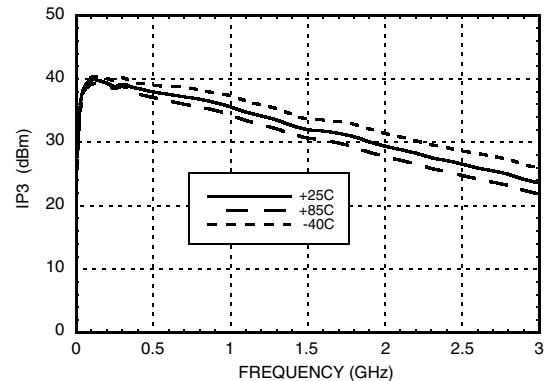
**Reverse Isolation vs. Temperature**



**Reverse Isolation vs. Vcc**



**Output IP3 vs. Temperature**



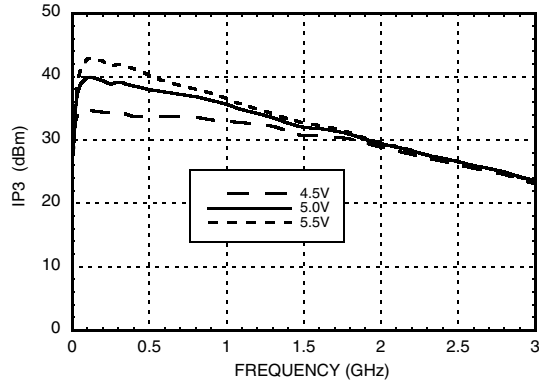
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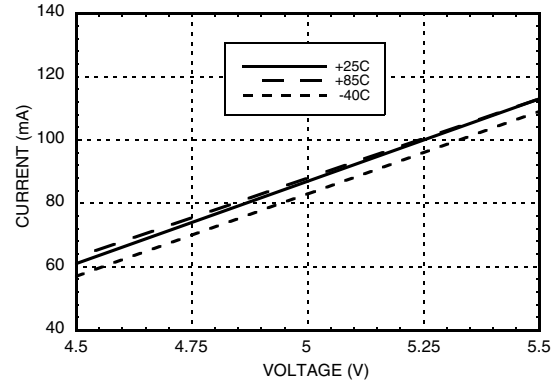


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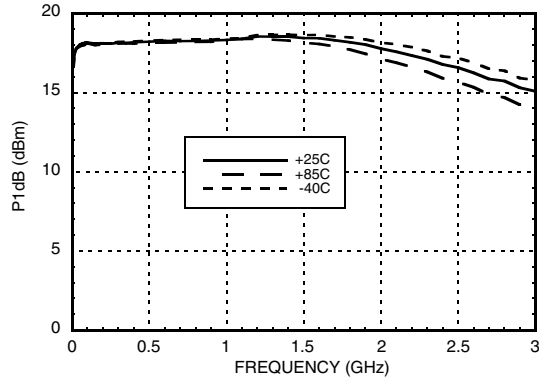
**Output IP3 vs. Vcc**



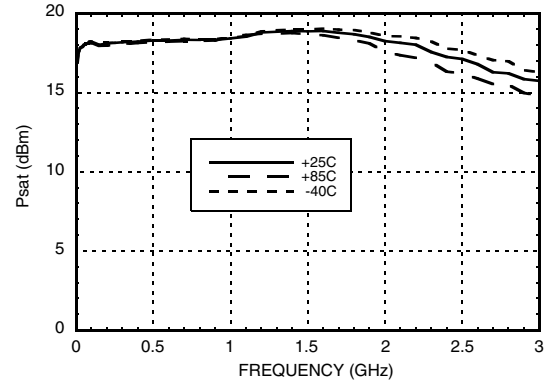
**Current vs. Temperature**



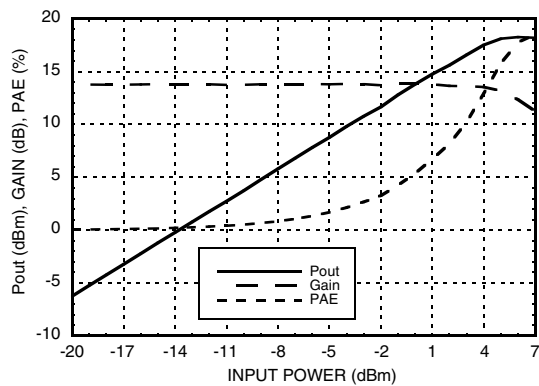
**P1dB vs. Temperature**



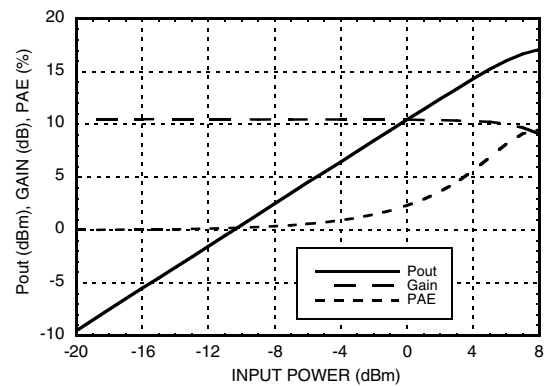
**Psat vs. Temperature**



**Power Compression @ 500 MHz**



**Power Compression @ 2 GHz**



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## InGaP HBT ACTIVE BIAS MMIC AMPLIFIER, 0.05 – 3 GHz

### Absolute Maximum Ratings

Collector Bias Voltage (Vcc)	+5.5 Vdc
RF Input Power (RFIN)	+15 dBm
Junction Temperature	150 °C
Continuous P <sub>diss</sub> (T = 85 °C) (derate 10.23 mW/°C above 85 °C)	0.66 W
Thermal Resistance (junction to lead)	97.78 °C/W
Storage Temperature	-65 to +150 °C
Operating Temperature	-40 to +85 °C
ESD Sensitivity (HMB)	Class 1C

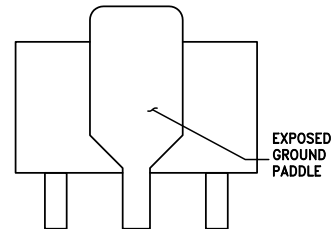
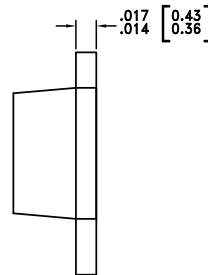
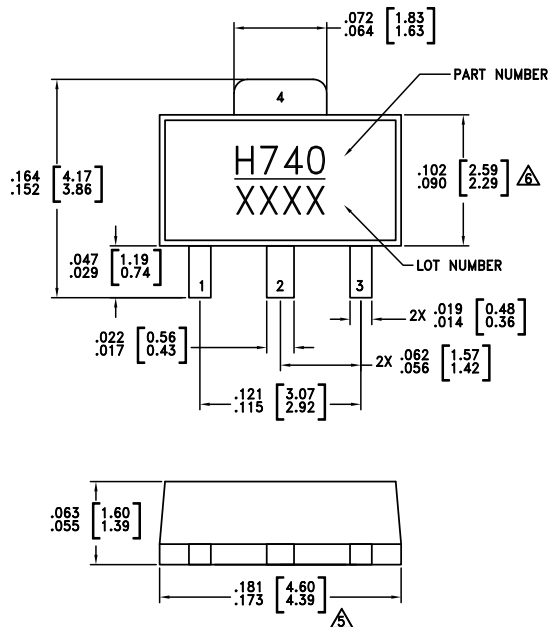


ELECTROSTATIC SENSITIVE DEVICE  
OBSERVE HANDLING PRECAUTIONS

8

AMPLIFIERS - DRIVER & GAIN BLOCK - SMT

### Outline Drawing



NOTES:

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

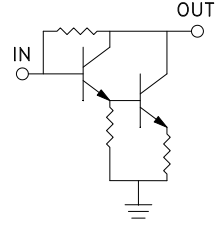

### Package Information

Part Number	Package Body Material	Lead Finish	MSL Rating	Package Marking <sup>[1]</sup>
HMC740ST89E	RoHS-compliant Low Stress Injection Molded Plastic	100% matte Sn	MSL1 <sup>[2]</sup>	H740 XXXX

[1] 4-Digit lot number XXXX

[2] Max peak reflow temperature of 260 °C


**InGaP HBT ACTIVE BIAS  
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**Pin Descriptions**

Pin Number	Function	Description	Interface Schematic
1	IN	This pin is DC coupled. An off chip DC blocking capacitor is required.	
3	OUT	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**
