



## BICMOS MIXER W/ INTEGRATED LO AMPLIFIER, 700 - 1100MHz

### Upconverter Electrical Specifications,

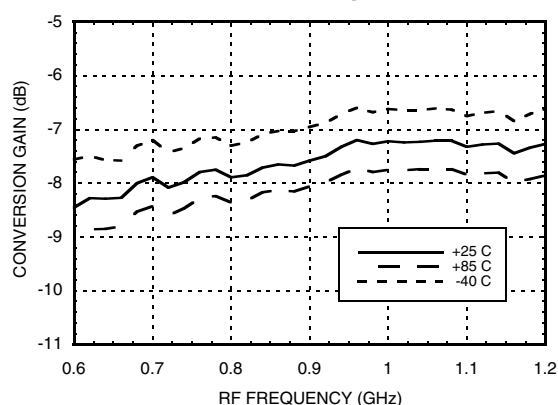
$T_A = +25^\circ\text{C}$ , LO = 0 dBm, Vcc = Vcc1, 2, 3 = +5V, G\_Bias = +2.5V \*

Parameter	Min.	Typ.	Max.	Min.	Typ.	Max.	Units
Frequency Range, RF		0.7 - 1.1		0.860 - 0.960			GHz
Frequency Range, LO		0.75 - 1.35		0.980 - 1.080			GHz
Frequency Range, IF		50 - 250		120			MHz
Conversion Loss		7.5	9.5		7.5	9.5	dB
IP3 (Input)		33		36			dBm
1 dB Compression (Input)		24		24			dBm
LO Drive Input Level (Typical)		-1 to +6		-1 to +6			dBm
Supply Current (Icc total)	120	130	140	120	130	140	mA

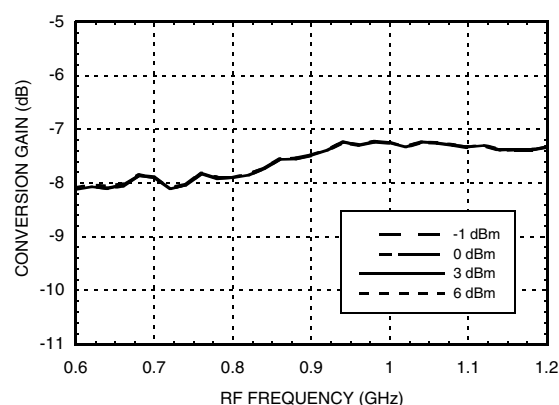
\*Unless otherwise noted all measurements performed as upconverter with high side LO & IF = 120 MHz.

### Downconverter Performance

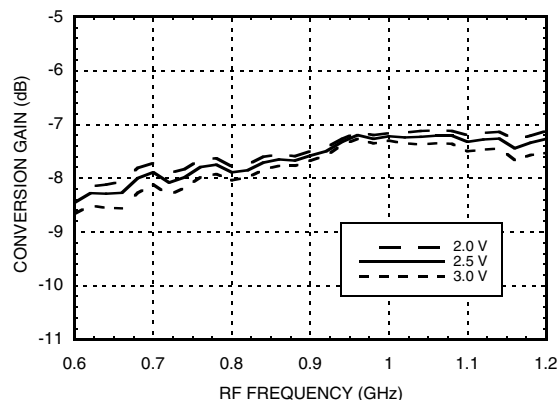
#### Conversion Gain vs. Temperature



#### Conversion Gain vs. LO Drive



#### Conversion Gain vs. G\_Bias voltage

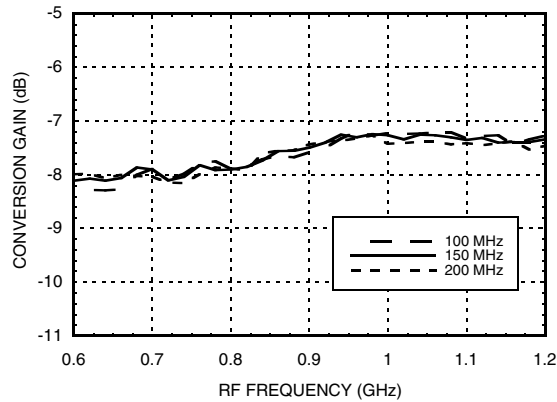




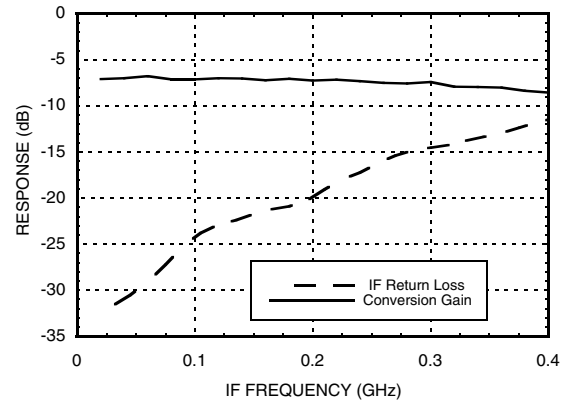
**BICMOS MIXER W/ INTEGRATED  
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**Downconverter Performance**

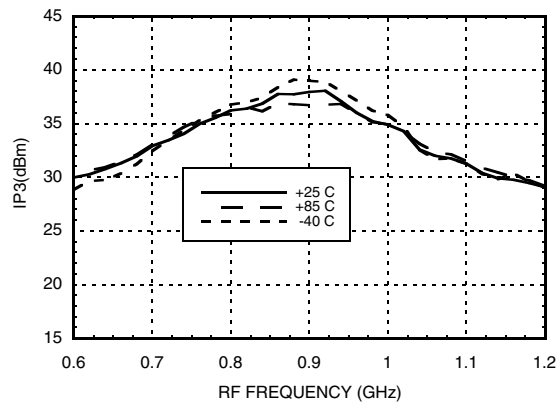
**Conversion Gain vs. IF Frequency**



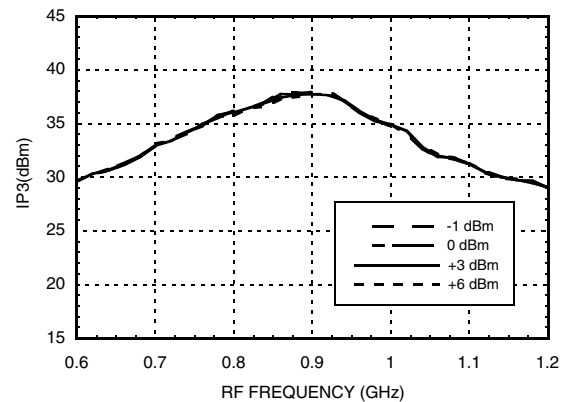
**IF Bandwidth (LO = 1.1 GHz)**



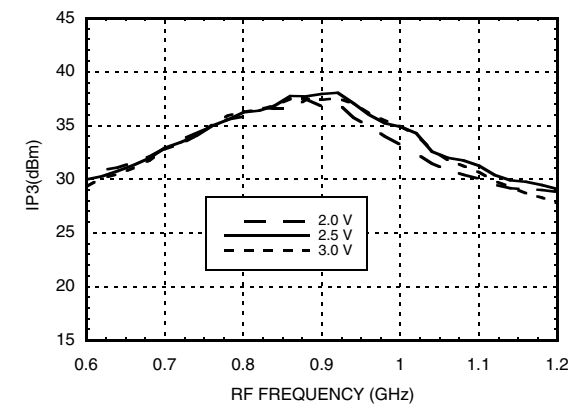
**Input IP3 vs. Temperature <sup>[1]</sup>**



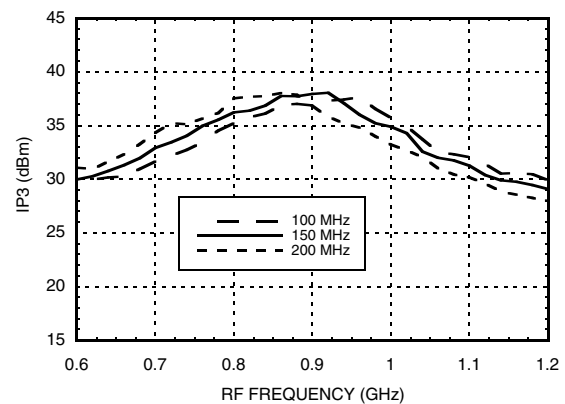
**Input IP3 vs. LO Drive <sup>[1]</sup>**



**Input IP3 vs. G\_Bias Voltage <sup>[1]</sup>**



**Input IP3 vs. IF Frequency <sup>[1]</sup>**



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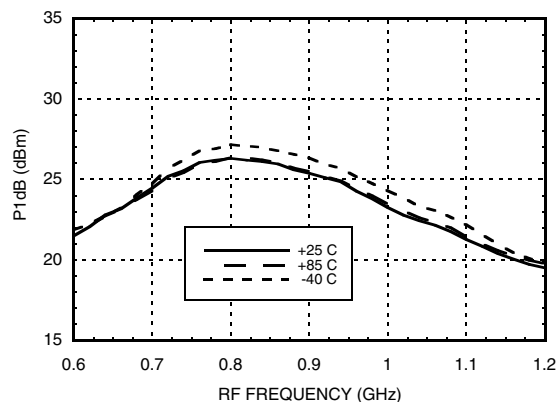
For price, delivery, and to place orders: Analog Devices, Inc., One Technology Way, P.O. Box 9106, Norwood, MA 02062-9106 Phone: 781-329-4700 • Order online at [www.analog.com](http://www.analog.com) Application Support: Phone: 1-800-ANALOG-D



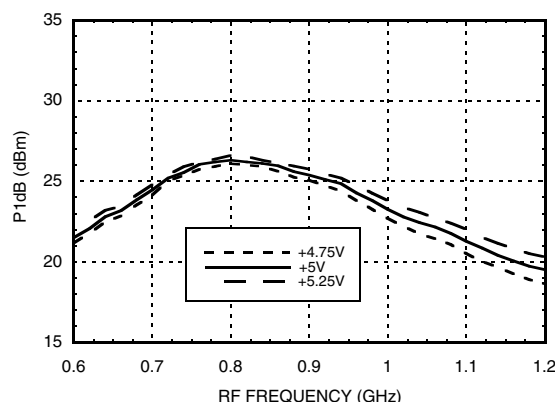
## BICMOS MIXER W/ INTEGRATED LO AMPLIFIER, 700 - 1100MHz

### Downconverter Performance

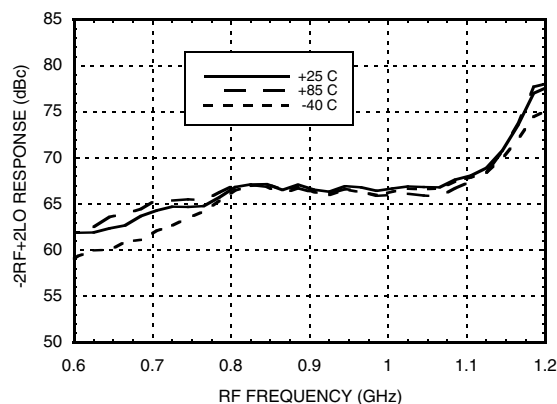
**Input P1dB vs. Temperature**



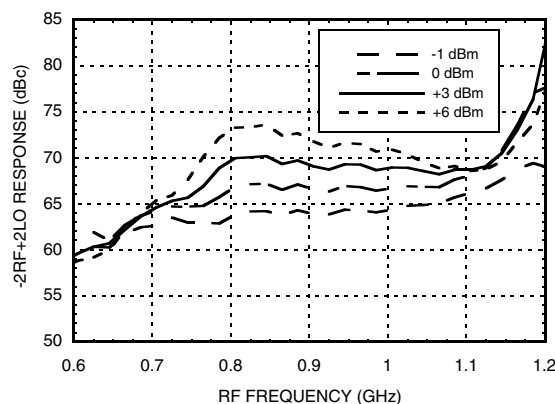
**Input P1dB vs. Vcc**



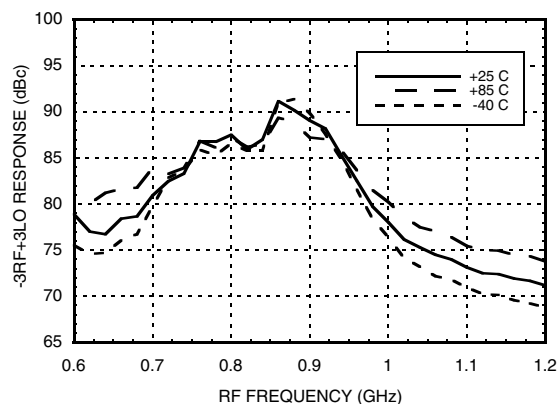
**-2RF +2LO Response vs. Temperature [2]**



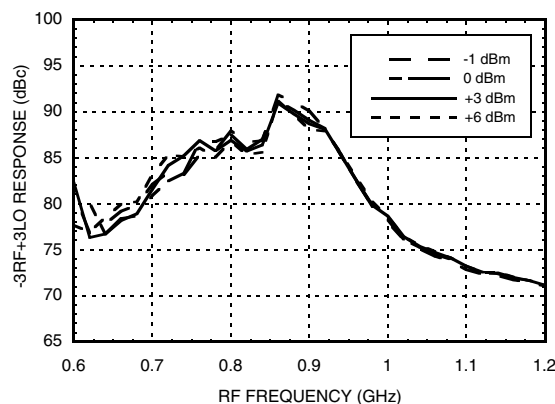
**-2RF +2LO Response vs. LO Drive [2]**



**-3RF +3LO Response vs. Temperature [2]**



**-3RF +3LO Response vs. LO Drive [2]**

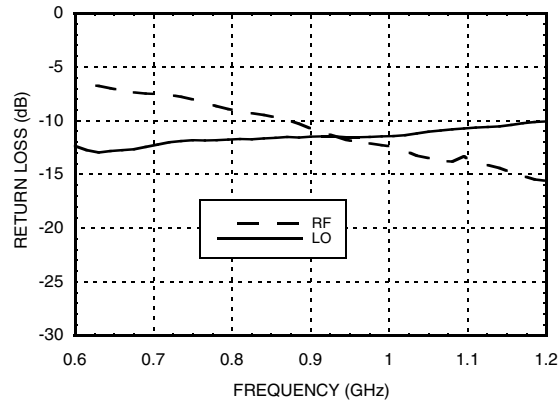


[1] Two-tone input power = +9 dBm each tone, 1 MHz spacing. [2] Referenced to RF Input Power at 0 dBm

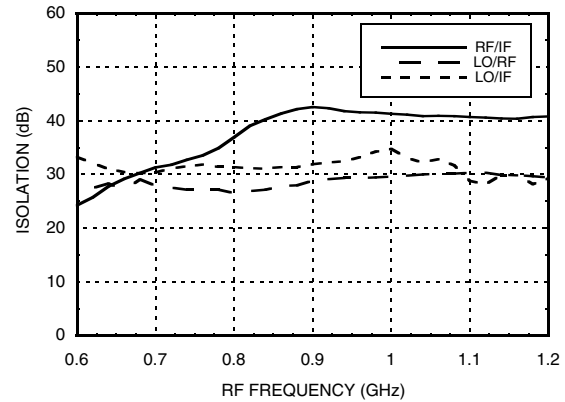


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**Return Loss**

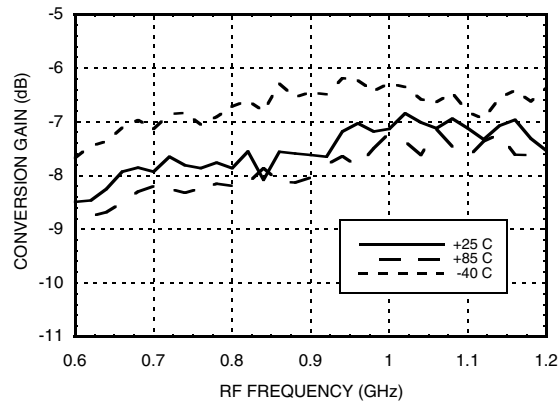


**Isolation**

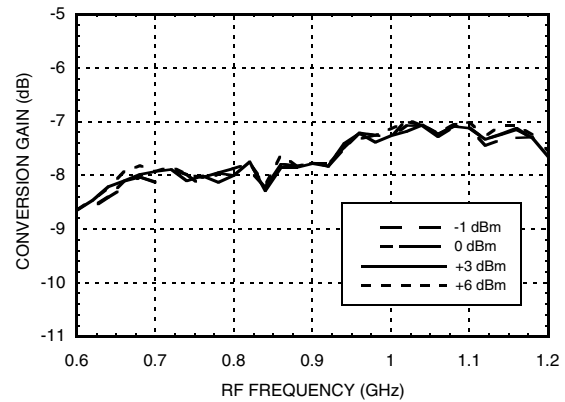


**Upconverter Performance**

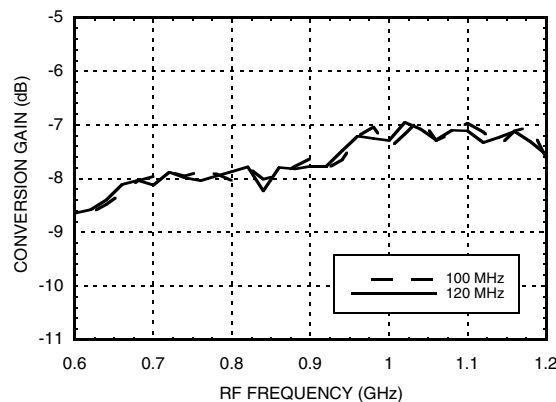
**Conversion Gain vs. Temperature**



**Conversion Gain vs. LO Drive**



**Conversion Gain vs. IF Frequency**

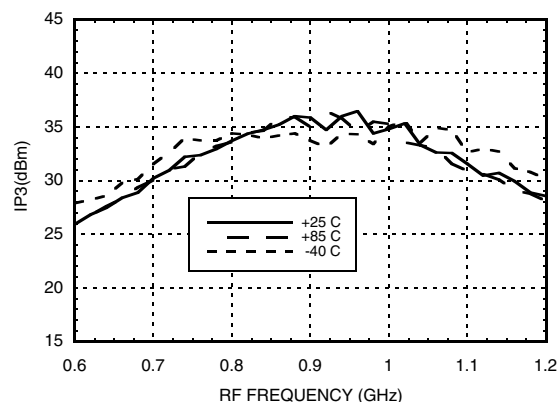




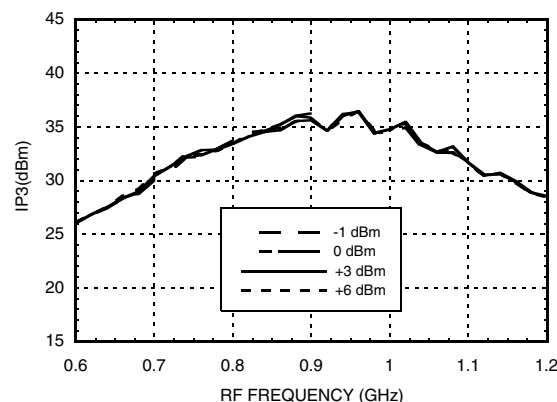
**BICMOS MIXER W/ INTEGRATED  
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**Upconverter Performance**

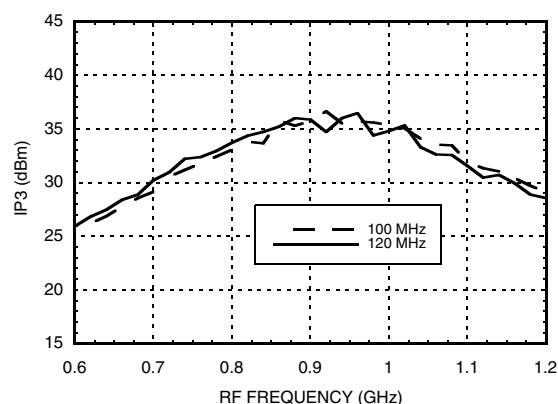
**Input IP3 vs. Temperature <sup>[1]</sup>**



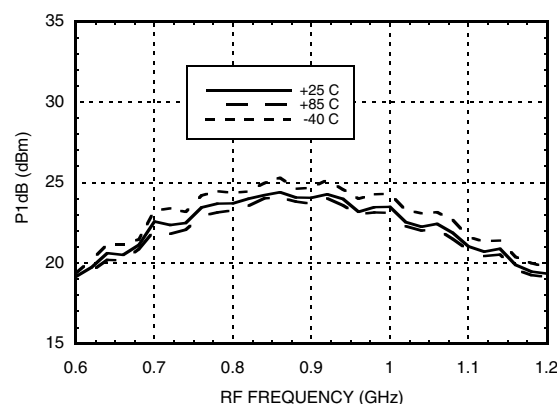
**Input IP3 vs. LO Drive <sup>[1]</sup>**



**Input IP3 vs. IF Frequency <sup>[1]</sup>**



**Input P1dB vs. Temperature**




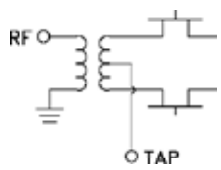
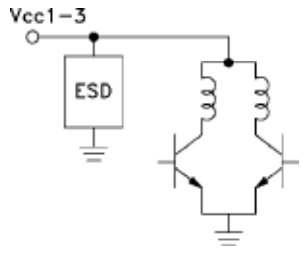
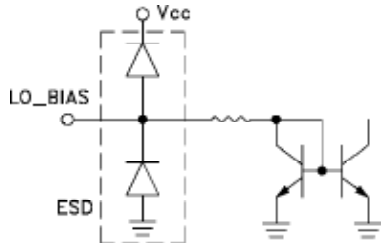
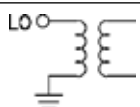
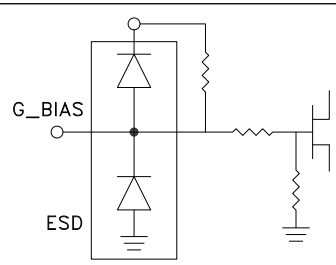
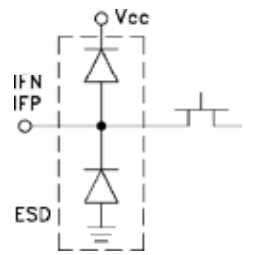
[1] Two-tone input power = +9 dBm each tone, 1 MHz spacing.





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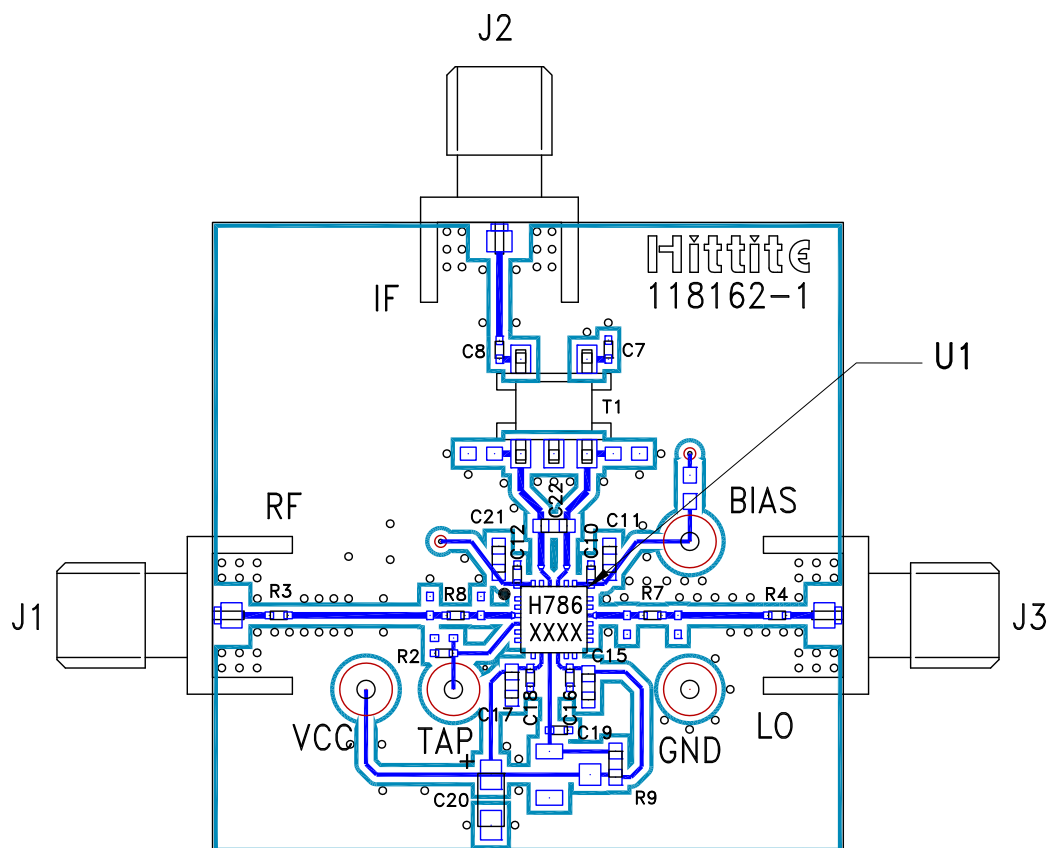
### Pin Descriptions

Pin Number	Function	Description	Interface Schematic
1, 6, 7, 11 - 14, 18, 20, 23	N/C	No connection. These pins may be connected to RF ground. Performance will not be affected.	
2, 5, 15, 17	GND	These pins and package bottom must be connected to RF/DC ground.	
3	RF	This pin is matched single-ended to 50 Ohm and DC shorted to ground through a balun.	
4	TAP	Center tap of secondary side of the internal RF balun. Short to ground with a zero Ohms close to the package.	
8, 10, 24	Vcc1, Vcc2, Vcc3	Power supply voltage. See application circuit for required external components.	
9	LO_BIAS	LO buffer current adjustment pin. Adjust the LO buffer current through the external resistor R9 shown in the application circuit (connect 215 Ohms for nominal operation). This adjustment allows for a trade-off between power dissipation and linearity performance of the converter.	
16	LO	This pin is matched single-ended to 50 Ohm and DC shorted to ground through a balun.	
19	G_BIAS	External bias with a nominal value of 2.5V. See application circuit for recommended external components. G_Bias can be set to between 0 and 5Vdc. This adjustment allows for a trade off between conversion loss and linearity performance of the converter (see figures CG, IP3 vs. G_BIAS). The G_bias pin has an internal 15 KOhms resistance to ground and 15 KOhms to Vcc. Internal resistive divider sets 2.5 V for G_bias and can be changed externally.	
21, 22	IFN, IFP	Differential IF input / output pins matched to differential 50 Ohms. For applications not requiring operation to DC an off chip DC blocking capacitor should be used.	



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**Evaluation PCB**



**List of Materials for Evaluation PCB 121769 [1]**

Item	Description
J1 - J3	SMA Connector
J4 - J7	DC Pin
C7, C8	10 nF Capacitor, 0402 Pkg.
C10, C12, C16, C18	1 nF Capacitor, 0402 Pkg.
C11, C15, C17, C21	0.1 $\mu$ F Capacitor, 0402 Pkg.
C19	22 pF Capacitor, 0402 Pkg.
C20	4.7 $\mu$ F Case A, Tantulum
C22	1.8 pF Capacitor, 0603 Pkg.
R2 - R4, R7, R8	0 Ohm Resistor, 0402 Pkg.
R9	270 Ohm Resistor, 0603 Pkg.
T1	1:1 Transformer - Tyco MABA CT0039
U1	HMC786LP4E
PCB [2]	118162 Evaluation PCB

[1] Reference this number when ordering complete evaluation PCB

[2] Circuit Board Material: Rogers 4350 or Arlon 25 FR

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 exposed paddle 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 circuit board shown is available from Hittite upon request.





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### Application Circuit

