HMC485MS8G

HIGH IP3 GaAs MMIC MIXER with INTEGRATED LO AMPLIFIER, 1.7 - 2.2 GHz

Typical Applications

High Dynamic Range Infrastructure:

- GSM, GPRS & EDGE
- CDMA & W-CDMA
- Cable Modem Termination Systems

Features

+34 dBm Input IP3

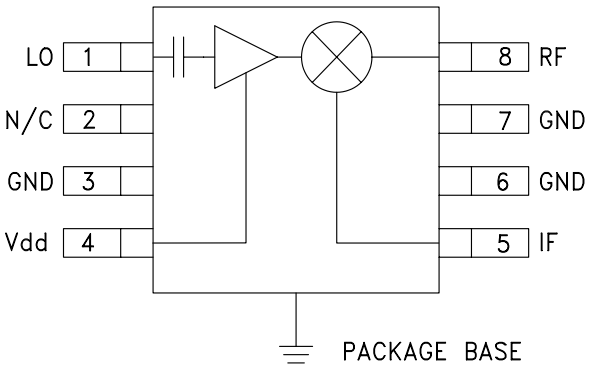
Conversion Loss: 9 dB

Low LO Drive: -2 to +4 dBm

Single Positive Supply: 5V @ 45 mA

Ultra Small MSOP Package: 14.8mm²

Functional Diagram



General Description

The HMC485MS8G is a high dynamic range passive MMIC mixer with an integrated LO amplifier in a plastic surface mount 8 lead Mini Small Outline Package (MSOP) covering 1.7 to 2.2 GHz. Excellent input IP3 performance of +34 dBm for down conversion and +27 dBm for up conversion is provided for 2.5G & 3G GSM/CDMA based UMTS or PCS applications at an LO drive of 0 dBm. With an input 1 dB compression of +19 dBm, the RF port will accept a wide range of input signal levels. Conversion loss is 9.2 dB typical. The 50 to 300 MHz IF frequency response will satisfy many UMTS/PCS transmit or receive frequency plans configured for low side LO. The HMC485MS8G input IP3 performance coupled with its high P1dB rivals traditional active FET mixers while offering a much smaller 14.8mm² standard IC footprint.

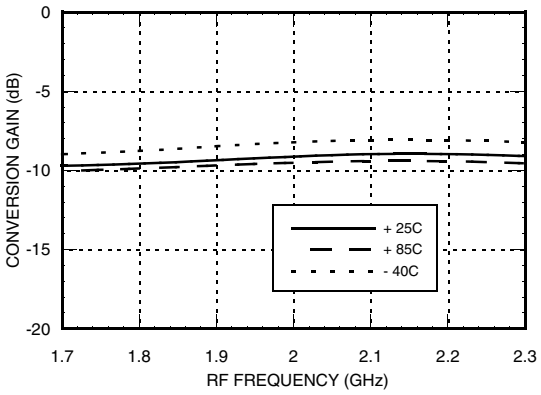
Electrical Specifications, T_A = +25°C, LO = 0 dBm, IF = 200 MHz*, Vdd= 5V

Parameter	Min.	Typ.	Max.	Min.	Typ.	Max.	Min.	Typ.	Max.	Units
Frequency Range, RF		1.7 - 1.8			1.8 - 2.0			2.0 - 2.2		GHz
Frequency Range, LO		1.4 - 1.75			1.5 - 1.95			1.7 - 2.15		GHz
Frequency Range, IF		50 - 300			50 - 300			50 - 300		MHz
Conversion Loss		9.8	11		9.2	10.5		9	10	dB
Noise Figure (SSB)		9.8			9.2			9		dB
LO to RF Isolation		12			8			5		dB
LO to IF Isolation		7			10			13		dB
IP3 (Input)	27	31		29	34		29	33		dBm
1 dB Gain Compression (Input)	16	19		17	20		17	21		dBm
LO Input Drive Level (Typical)		-2 to +4			-2 to +4			-2 to +4		dBm
Supply Current		45			45			45		mA

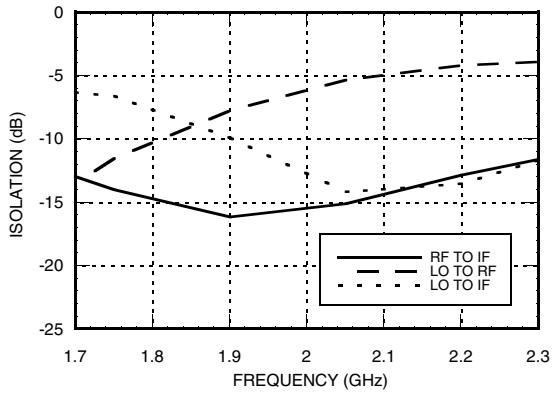
*Unless otherwise noted, all measurements performed as a downconverter, with low side LO & IF = 200 MHz.

HIGH IP3 GaAs MMIC MIXER with INTEGRATED LO AMPLIFIER, 1.7 - 2.2 GHz

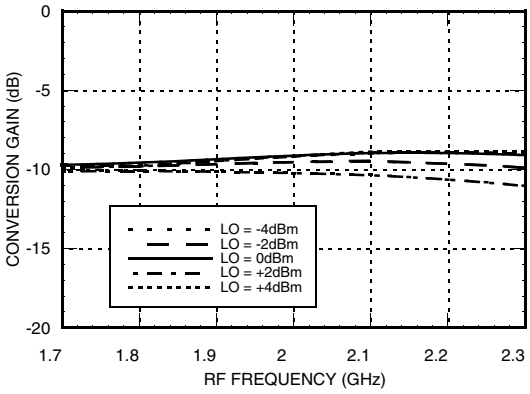
Conversion Gain vs. Temperature @ LO = 0 dBm



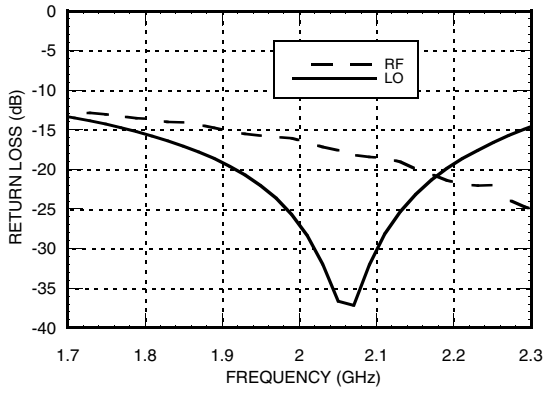
Isolation @ LO = 0 dBm



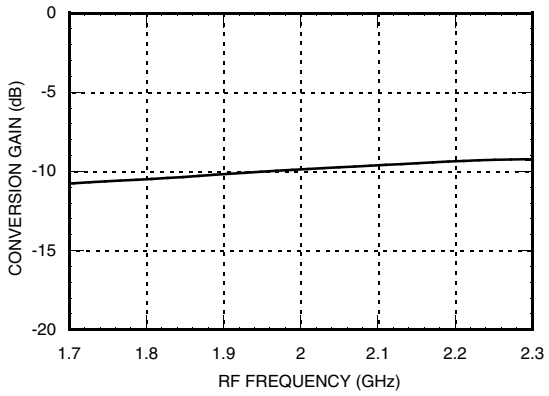
Conversion Gain vs. LO Drive



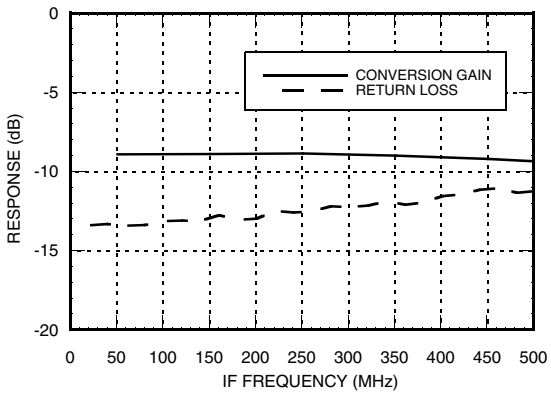
Return Loss @ LO = 0 dBm



Upconverter Performance Conversion Gain @ LO = 0 dBm



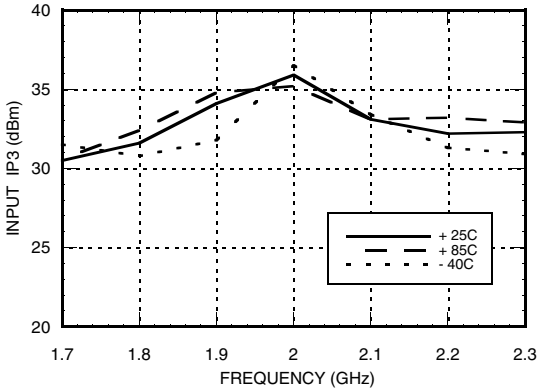
IF Bandwidth @ LO = 0 dBm



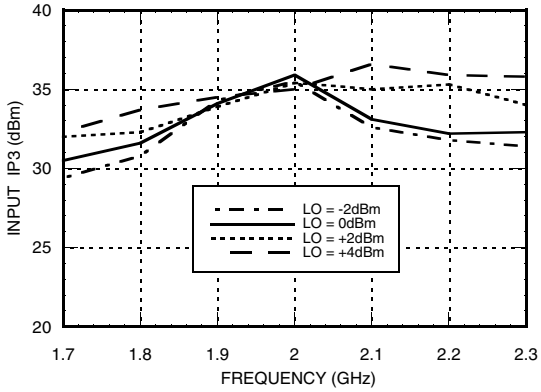
*Unless otherwise noted, all measurements performed as a downconverter, with low side LO & IF = 200 MHz.

HIGH IP3 GaAs MMIC MIXER with INTEGRATED LO AMPLIFIER, 1.7 - 2.2 GHz

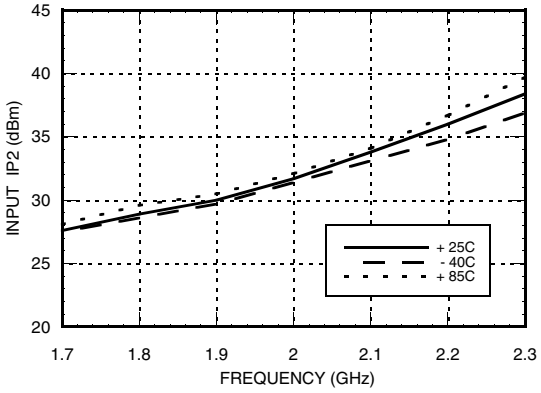
Input IP3 vs. Temperature @ LO= 0 dBm



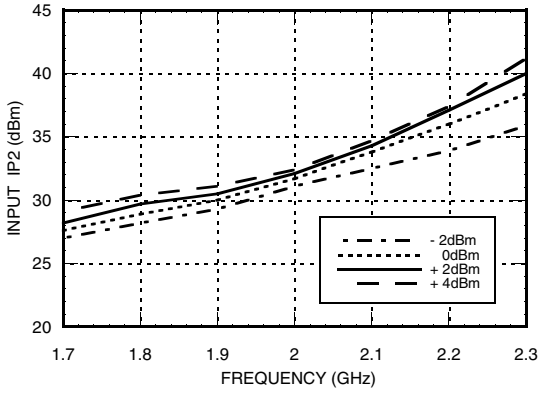
Input IP3 vs. LO Drive



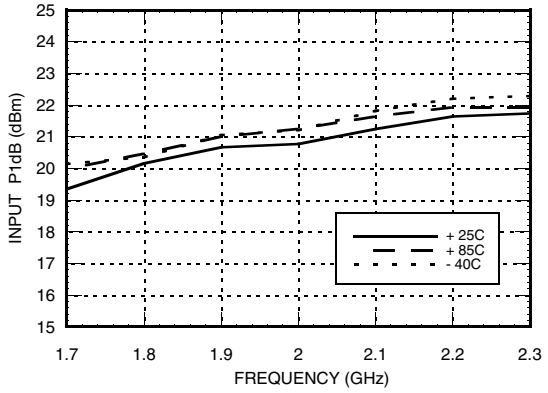
Input IP2 vs. Temperature @ LO= 0 dBm



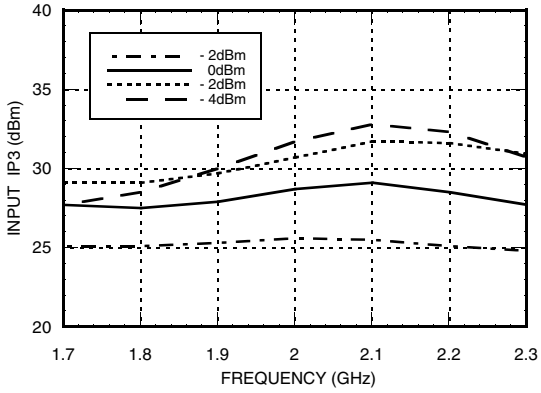
Input IP2 vs. LO Drive @ IF= 200 MHz



Input P1dB vs. Temperature @ LO= 0 dBm

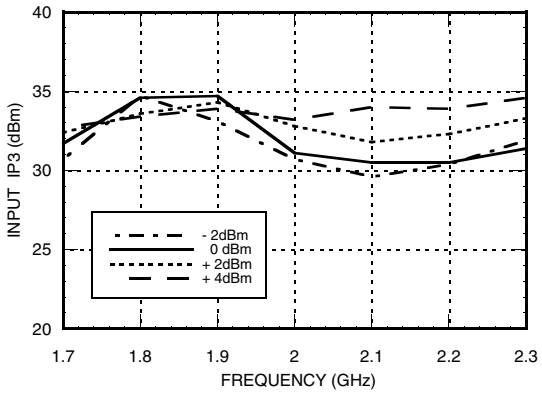


Upconverter IP3 vs. LO Drive, IF= 200 MHz

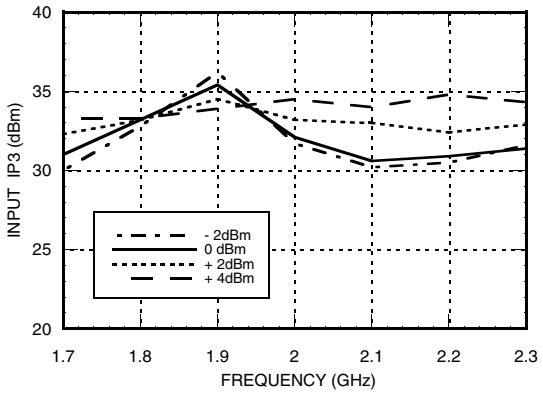


HIGH IP3 GaAs MMIC MIXER with INTEGRATED LO AMPLIFIER, 1.7 - 2.2 GHz

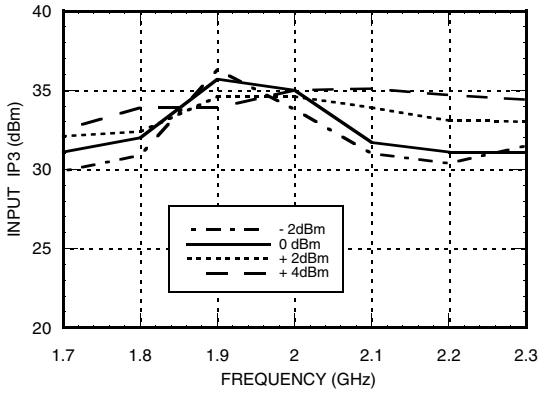
Input IP3 vs. LO Drive, IF= 70 MHz



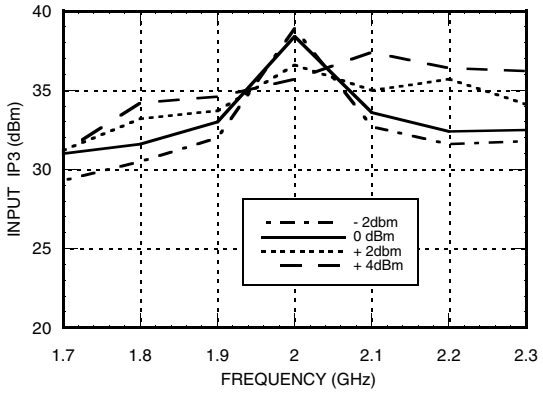
Input IP3 vs. LO Drive, IF= 120 MHz



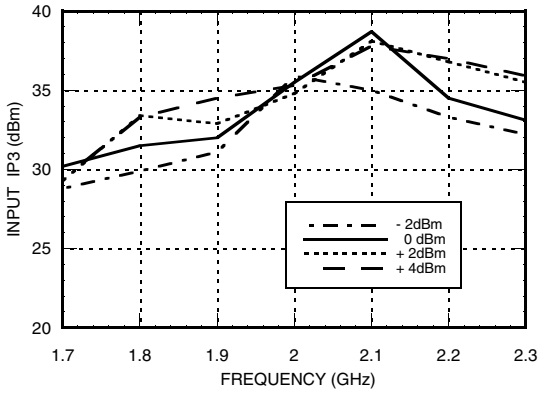
Input IP3 vs. LO Drive, IF= 170 MHz



Input IP3 vs. LO Drive, IF= 247 MHz



Input IP3 vs. LO Drive, IF= 297 MHz



HIGH IP3 GaAs MMIC MIXER with INTEGRATED LO AMPLIFIER, 1.7 - 2.2 GHz

MxN Spurious Outputs

	nLO				
mRF	0	1	2	3	4
0	xx	-1.	19	15	15
1	4	0	30	25	44
2	54	69	39	56	55
3	75	82	83	74	72
4	78	82	83	83	82

RF Freq = 1.9 GHz @ 0dBm
LO Freq = 1.7 GHz @ 0 dBm
All values in dBc Relative to the IF power level.

Harmonics of LO

	nLO Spur at RF Port			
LO Freq GHz	1	2	3	4
1.5	19	15	35	24
1.6	17	15	33	24
1.7	14	14	29	23
1.8	10	15	25	24
1.9	8	20	22	23
2	6	20	22	24

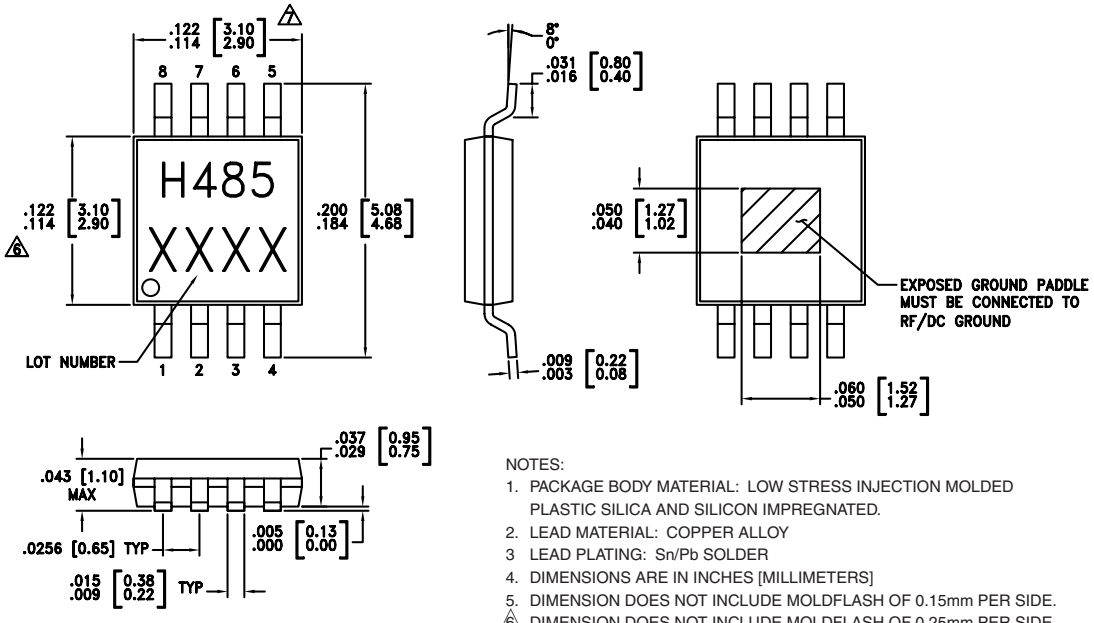
LO power = 0dBm
All values in dBc below input LO level measured at RF port.

HIGH IP3 GaAs MMIC MIXER with INTEGRATED LO AMPLIFIER, 1.7 - 2.2 GHz

Absolute Maximum Ratings

RF/IF Input	+27 dBm
LO Drive	+10 dBm
Bias Supply (Vdd)	+7 Vdc
Channel Temperature	150 °C
Continuous Pdiss (T = 85°C) (Derate 13.2 mW/°C above 85°C)	0.85 W
Storage Temperature	-65 to +150 °C
Operating Temperature	-40 to +85 °C
IF DC Current	±40 mA

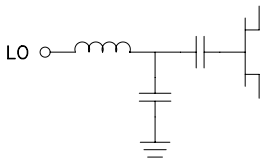
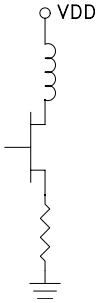
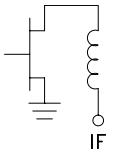
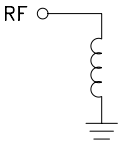
Outline Drawing



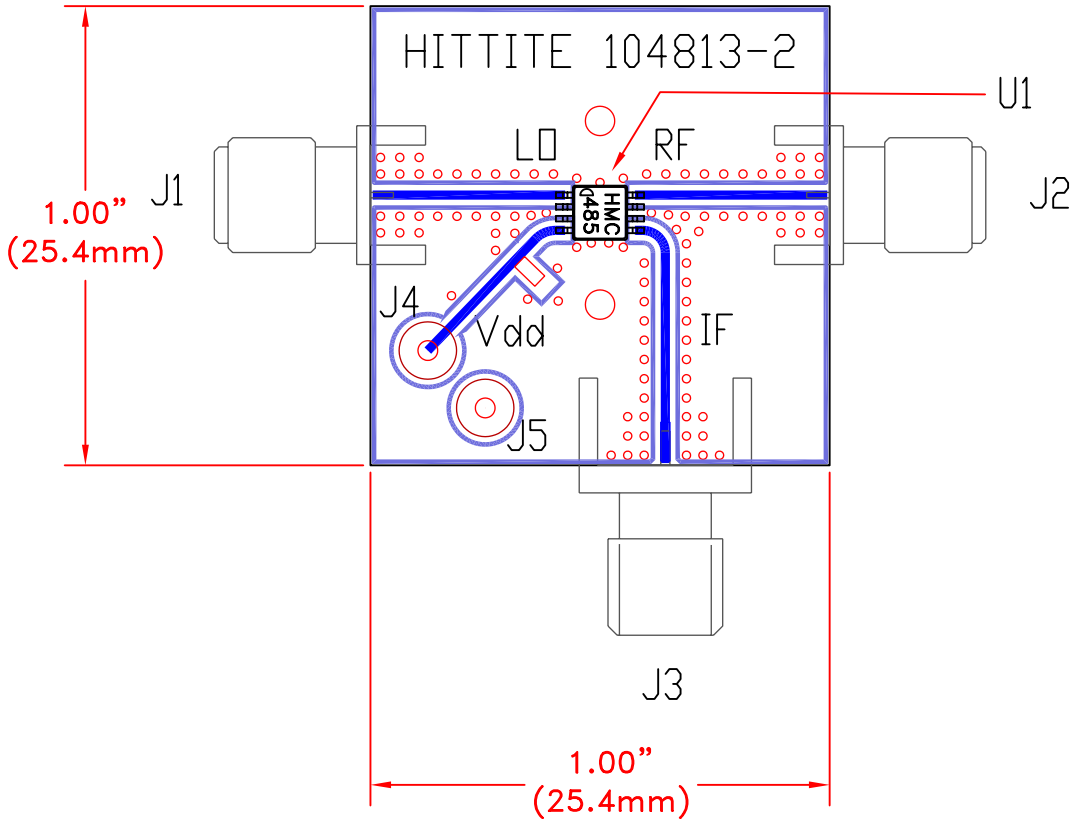
NOTES:

1. PACKAGE BODY MATERIAL: LOW STRESS INJECTION MOLDED PLASTIC SILICA AND SILICON IMPREGNATED.
2. LEAD MATERIAL: COPPER ALLOY
3. LEAD PLATING: Sn/Pb SOLDER
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 AND GROUND PADDLE MUST BE SOLDERED TO THE PCB RF GROUND

Pin Descriptions

Pin Number	Function	Description	Interface Schematic
1	LO	This pin is AC coupled & matched to 50 Ohms from 1.4 to 2.2 GHz.	
2	N/C	Not connected.	
3, 6, 7	GND	This pin must be connected to RF ground.	
4	Vdd	Power supply for LO amplifier. An external RF bypass capacitor is required.	
5	IF Port	This pin is DC coupled. For applications not requiring operation to DC this port should be DC blocked externally using a series capacitor. Choose value of capacitor to pass IF frequency desired. For operation to DC, this pin must not sink/source more than 40 mA of current or failure may result.	
8	RF Port	This pin is DC coupled & matched to 50 Ohm from 1.7 to 2.2 GHz	

Evaluation PCB



List of Material

Item	Description
J1 - J3	PC Mount SMA RF Connector
J4 - J5	DC Pin
C1	10,000 pF Chip Capacitor, 0603 Pkg.
U1	HMC485MS8G Mixer
PCB*	104813 Evaluation Board, 1.0" x 1.0"
* 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 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.