

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

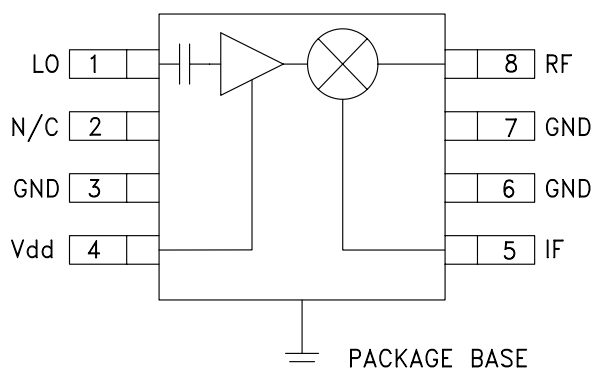
Conversion Loss: 9 dB

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, $T_A = +25^\circ\text{C}$, LO = 0 dBm, IF = 200 MHz*, Vdd = 5V

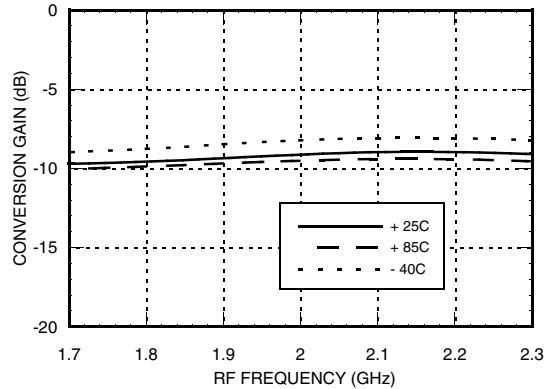
Parameter	Min.	Typ.	Max.	Min.	Typ.	Max.	Min.	Typ.	Max.	Units
Frequency Range, RF		1.7 - 1.8		1.8 - 2.0			2.0 - 2.2			GHz
Frequency Range, LO		1.4 - 1.75		1.5 - 1.95			1.7 - 2.15			GHz
Frequency Range, IF		50 - 300		50 - 300			50 - 300			MHz
Conversion Loss		9.8	11		9.2	10.5		9	10	dB
Noise Figure (SSB)		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.

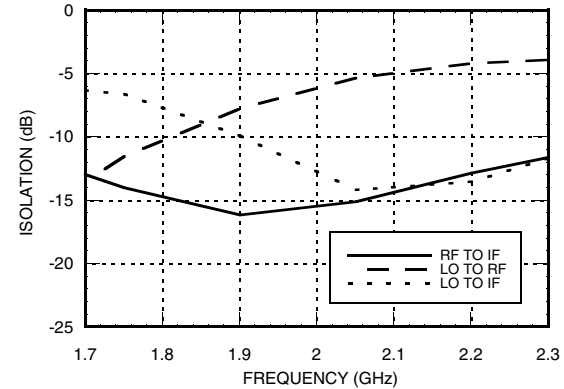
For price, delivery, and to place orders, please contact Hittite Microwave Corporation:
12 Elizabeth Drive, Chelmsford, MA 01824 Phone: 978-250-3343 Fax: 978-250-3373
Order Online at www.hittite.com

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

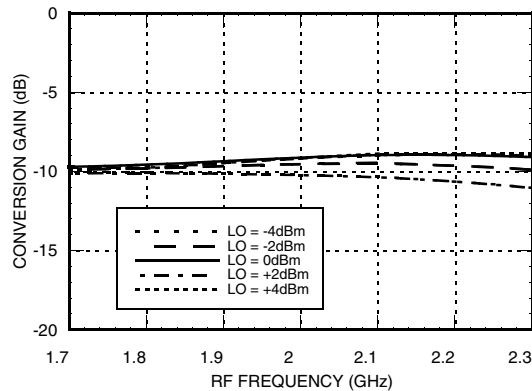
**Conversion Gain vs.
Temperature @ LO = 0 dBm**



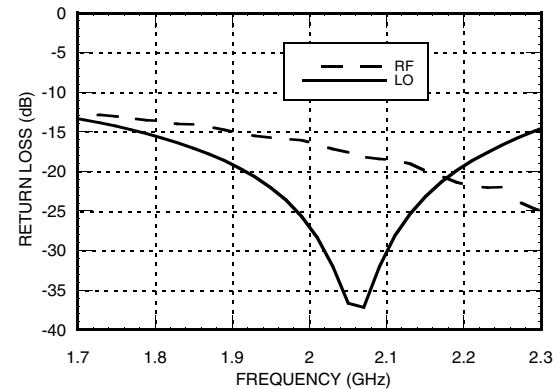
Isolation @ LO = 0 dBm



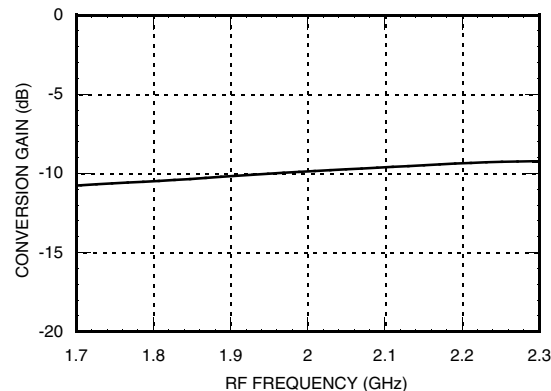
Conversion Gain vs. LO Drive



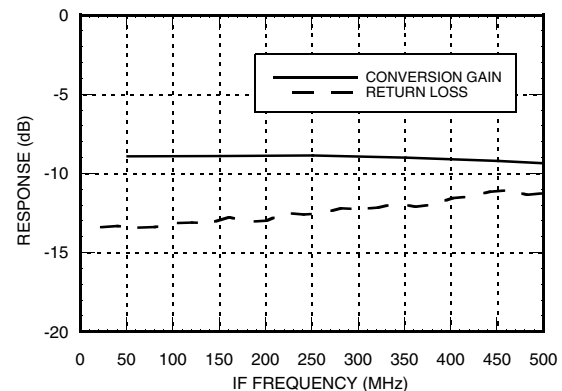
Return Loss @ LO = 0 dBm



**Upconverter Performance
Conversion Gain @ LO = 0 dBm**



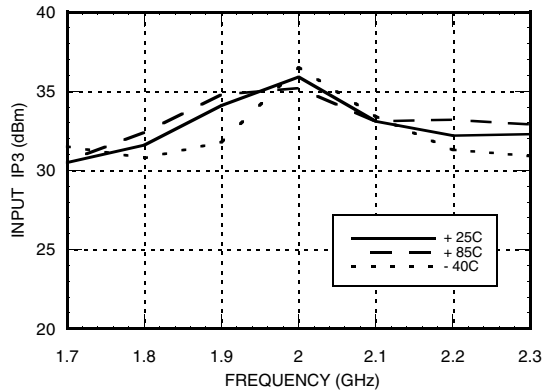
IF Bandwidth @ LO = 0 dBm



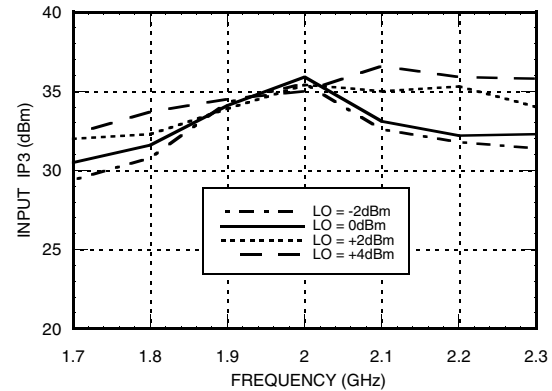
*Unless otherwise noted, all measurements performed as a downconverter, with low side LO & IF = 200 MHz.

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

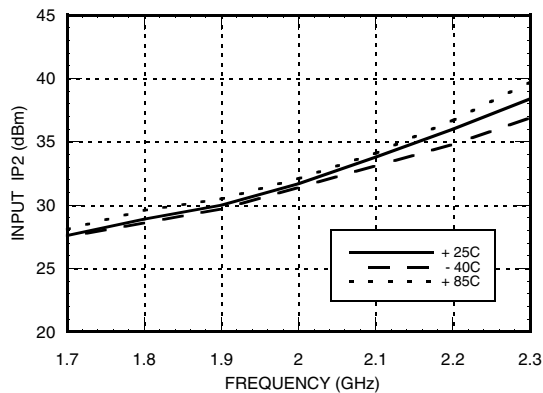
**Input IP3 vs.
Temperature @ LO= 0 dBm**



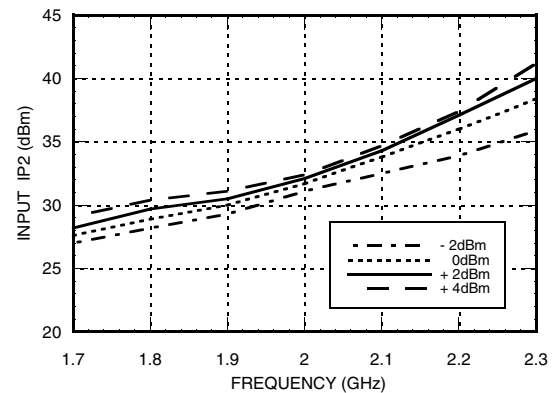
Input IP3 vs. LO Drive



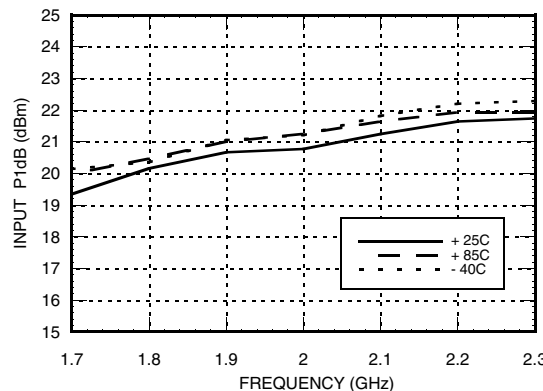
**Input IP2 vs.
Temperature @ LO= 0 dBm**



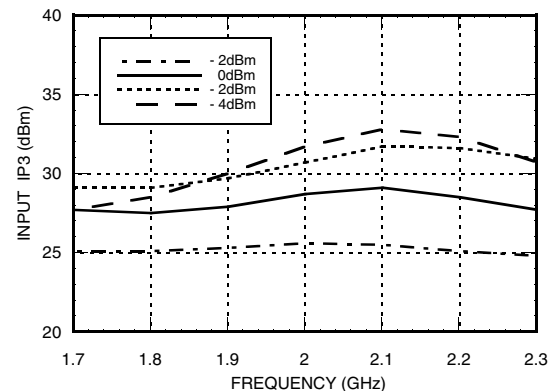
**Input IP2 vs.
LO Drive @ IF= 200 MHz**



**Input P1dB vs.
Temperature @ LO= 0 dBm**

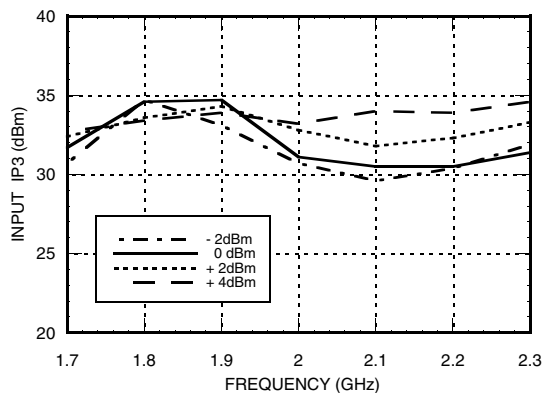


**Upconverter IP3
vs. LO Drive, IF= 200 MHz**

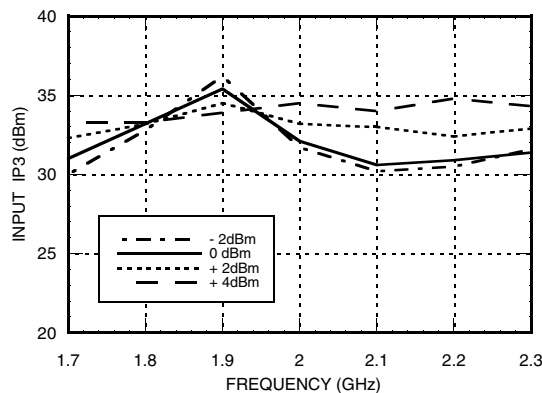


HIGH IP3 GaAs MMIC MIXER with INTEGRATED LO AMPLIFIER, 1.7 - 2.2 GHz

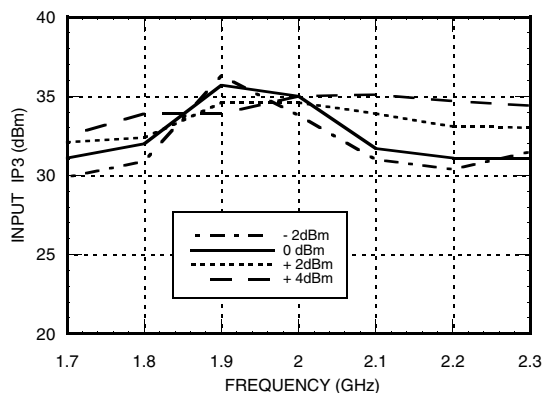
Input IP3 vs. LO Drive, IF= 70 MHz



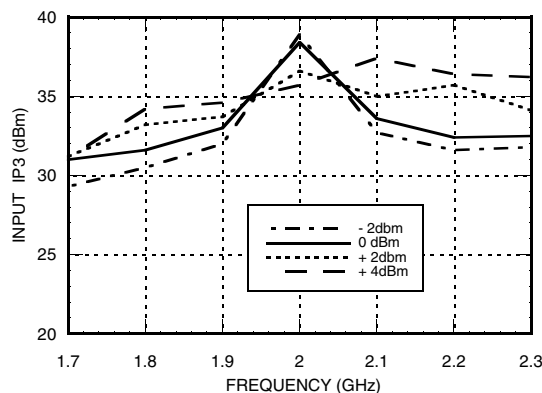
Input IP3 vs. LO Drive, IF= 120 MHz



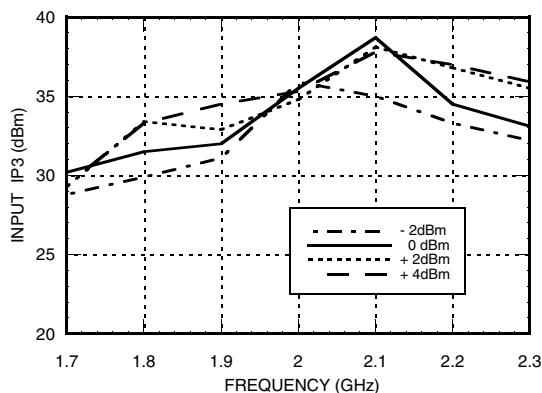
Input IP3 vs. LO Drive, IF= 170 MHz



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

mRF	nLO				
	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

LO Freq GHz	nLO Spur at RF Port			
	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

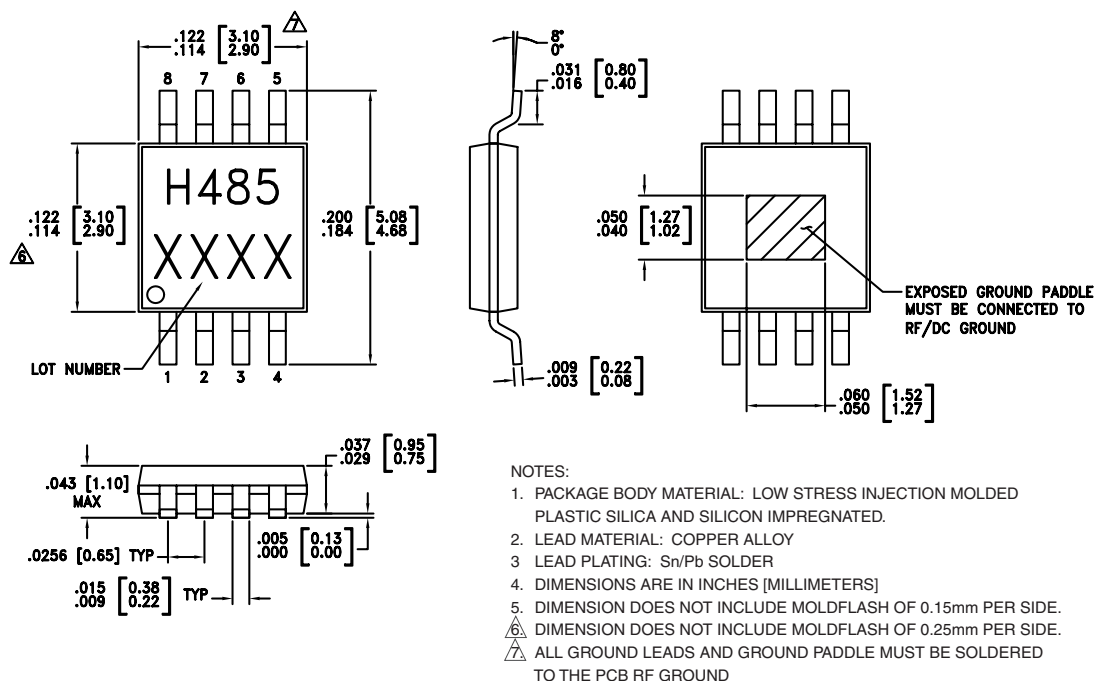
LO power = 0dBm
All values in dBc below input LO level measured at RF port.

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

Absolute Maximum Ratings

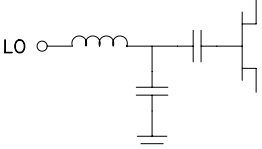
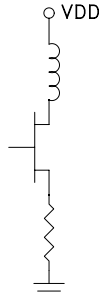
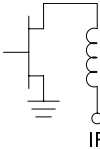
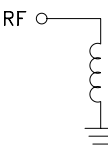
RF/IF Input	+27 dBm
LO Drive	+10 dBm
Bias Supply (Vdd)	+7 Vdc
Channel Temperature	150 °C
Continuous P _{diss} (T = 85°C) (Derate 13.2 mW/°C above 85°C)	0.85 W
Storage Temperature	-65 to +150 °C
Operating Temperature	-40 to +85 °C
IF DC Current	±40 mA

Outline Drawing



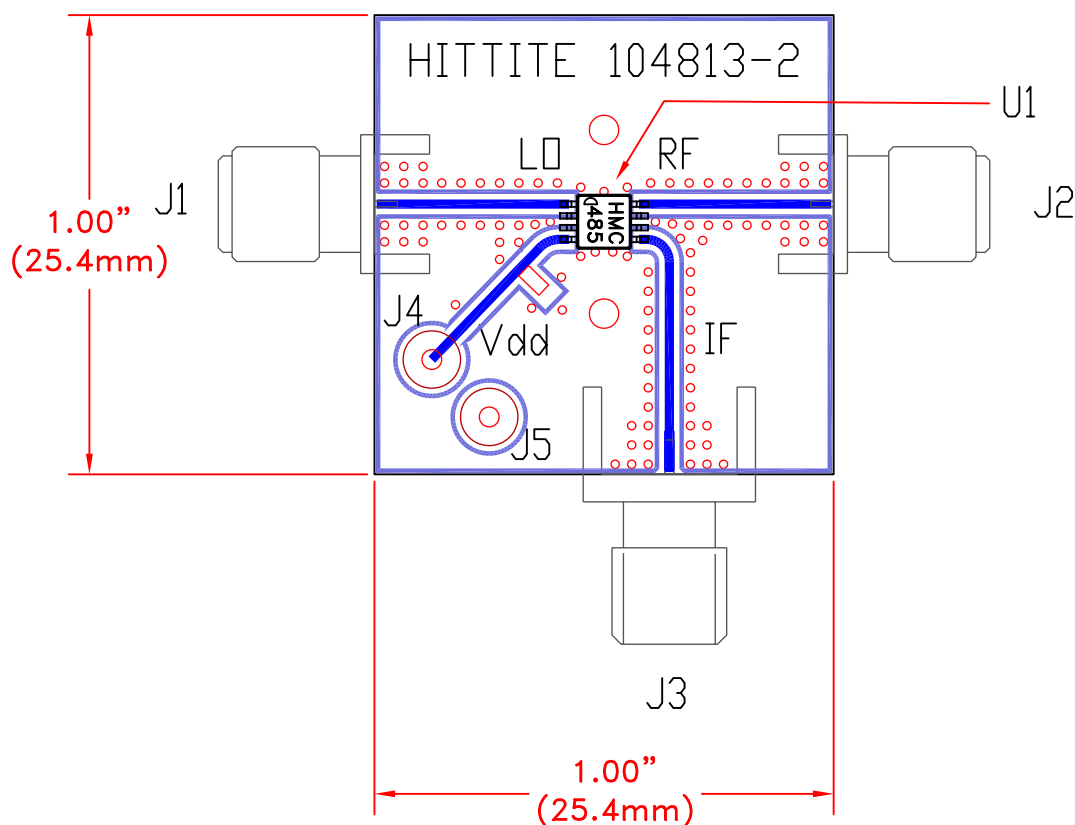
HIGH IP3 GaAs MMIC MIXER with INTEGRATED LO AMPLIFIER, 1.7 - 2.2 GHz

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	

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