



MICROWAVE CORPORATION

v02.0411



HMC775LC5

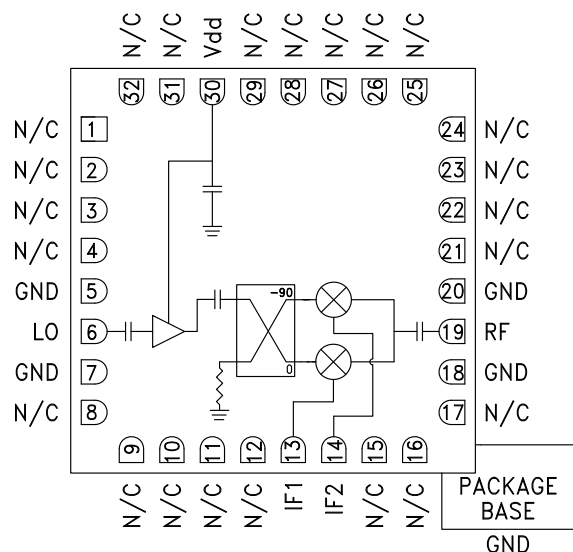
GaAs MMIC I/Q MIXER W/ LO AMPLIFIER, 10 - 16 GHz

Typical Applications

The HMC775LC5 is ideal for:

- Point-to-Point and Point-to-Multi-Point Radio
- Digital Radio
- VSAT
- Military & Space

Functional Diagram



Features

- Wide IF Bandwidth: DC - 3.5 GHz
- Image Rejection: 25 dB
- LO to RF Isolation: 45 dB
- High Input IP3: +25 dBm
- Upconversion & Downconversion Applications
- 0 dBm LO Drive
- 32 Lead 5 x 5 mm SMT Package: 25 mm²

General Description

The HMC775LC5 is a compact I/Q MMIC mixer in a leadless ceramic SMT package, which can be used as either an Image Reject Mixer or a Single Sideband Upconverter. The mixer utilizes two standard Hittite double balanced mixer cells and a 90 degree hybrid fabricated in a GaAs MESFET process. A low frequency quadrature hybrid was used to produce a 1 GHz USB IF output. This product is a much smaller alternative to hybrid style Image Reject Mixers and Single Sideband Upconverter assemblies. The HMC775LC5 eliminates the need for wire bonding and allows the use of surface mount manufacturing techniques.

Electrical Specifications, $T_A = +25^\circ\text{C}$, $V_{dd} = +5\text{V}$, $IF = 1\text{GHz}$, $LO = 0\text{dBm}$ *

Parameter	Min.	Typ.	Max.	Units
Frequency Range, RF/LO		10 - 16		GHz
Frequency Range, IF		DC - 3.5		GHz
Conversion Loss		8	11	dB
Image Rejection		25		dB
1 dB Compression (Input)		13		dBm
LO to RF Isolation		30		dB
RF to IF1 Isolation		45		dB
RF to IF2 Isolation		40		dB
IP3 (Input)		25		dBm
Supply Current (I _{dd})		114	154	mA

* Unless otherwise noted, all measurements performed as downconverter.

For price, delivery and to place orders: Hittite Microwave Corporation, 20 Alpha Road, 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

Data Taken As IRM With External IF Hybrid

Conversion Gain vs. Temperature

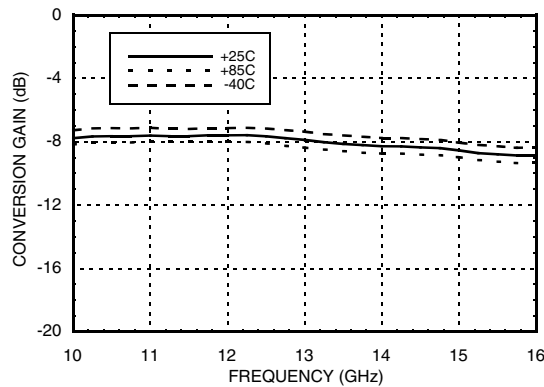
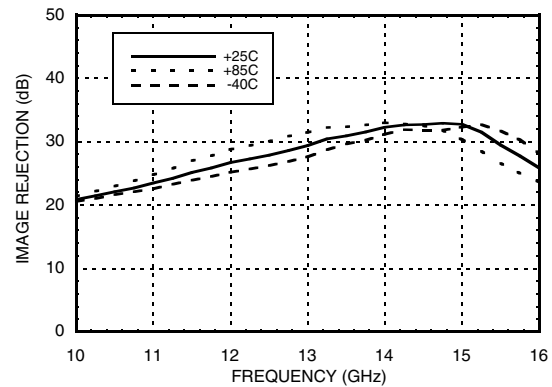
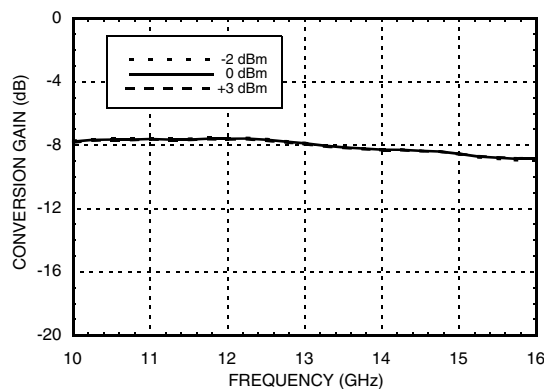


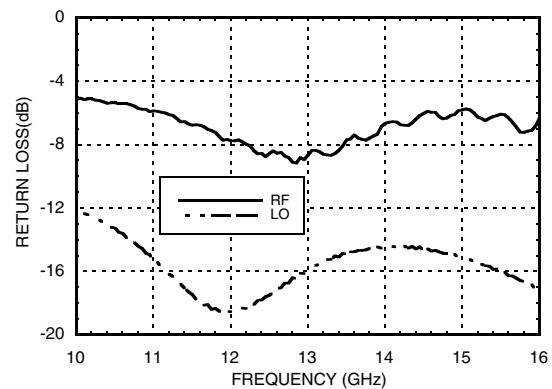
Image Rejection vs. Temperature



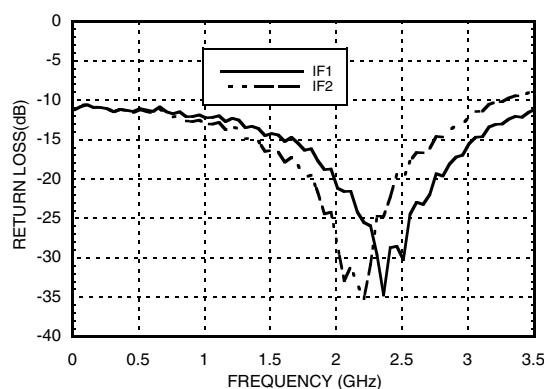
Conversion Gain vs. LO Drive



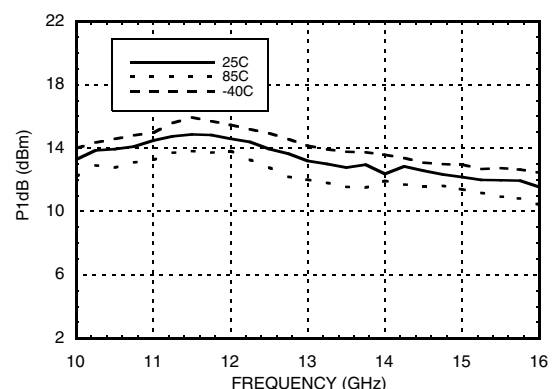
RF & LO Return Loss



IF Return Loss



Input P1dB vs. Temperature





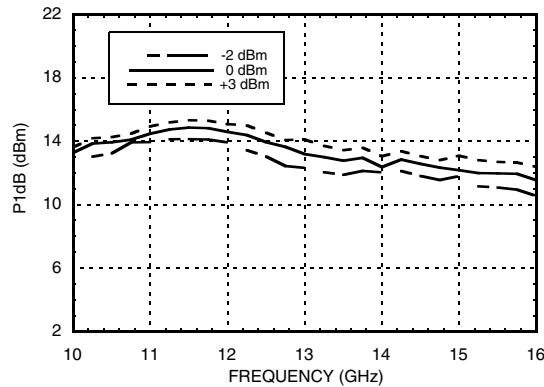
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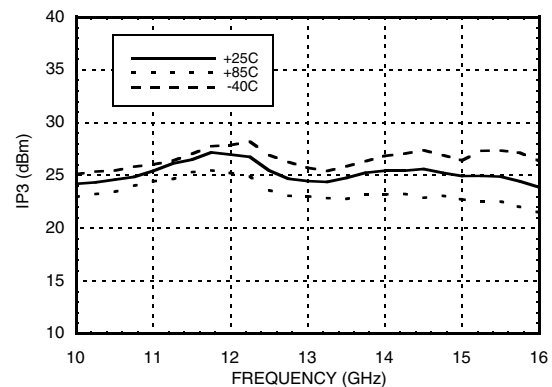
HMC775LC5

GaAs MMIC I/Q MIXER W/ LO AMPLIFIER, 10 - 16 GHz

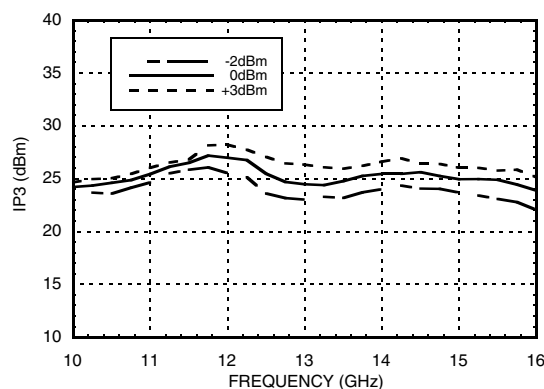
Input P1dB vs. LO Drive



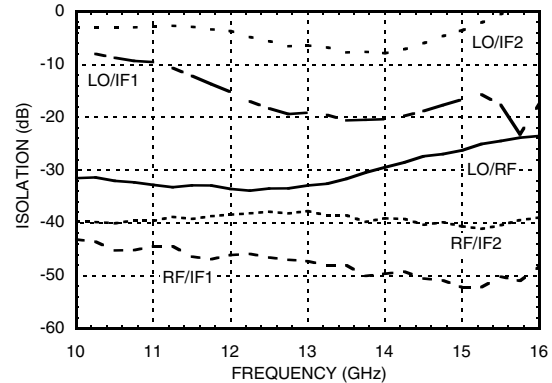
Input IP3 vs. Temperature



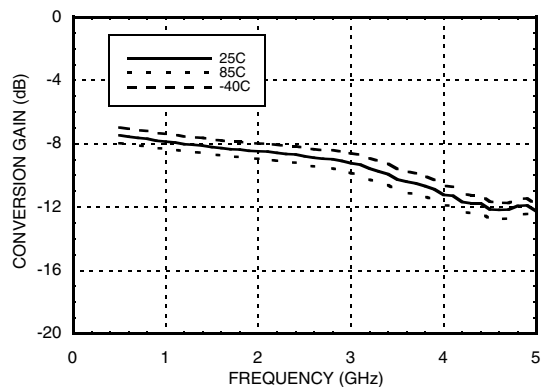
Input IP3 vs. LO Drive



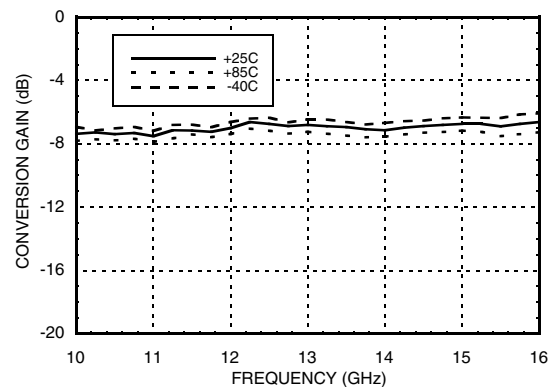
Isolations



IF Bandwidth*



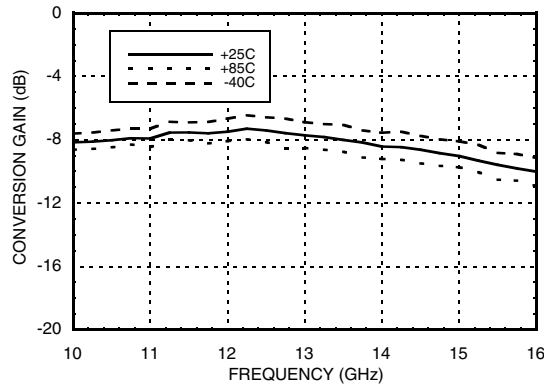
**Upconverter LSB, IF = 1 GHz
Conversion Gain vs. Temperature**



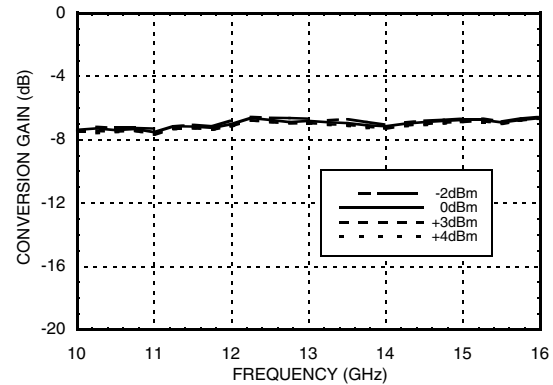
* Conversion gain data taken with external IF hybrid

GaAs MMIC I/Q MIXER W/ LO AMPLIFIER, 10 - 16 GHz

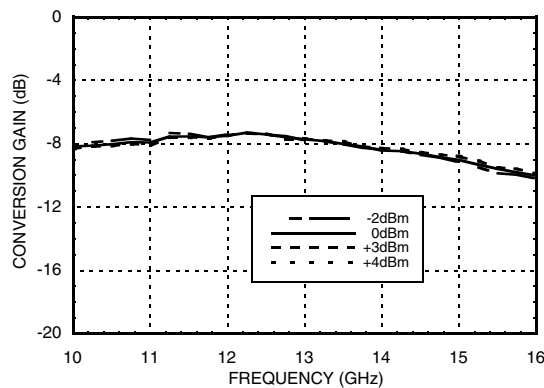
Upconverter LSB, IF = 3 GHz
Conversion Gain vs. Temperature



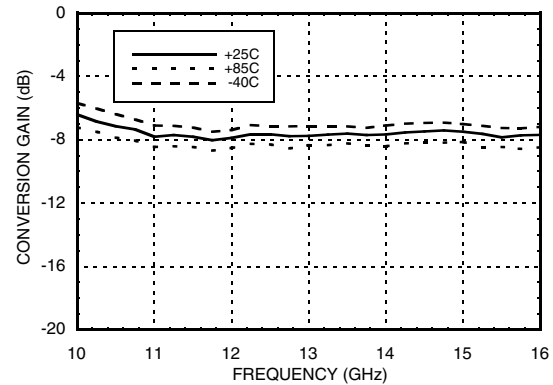
Upconverter LSB, IF = 1 GHz
Conversion Gain vs. LO Drive



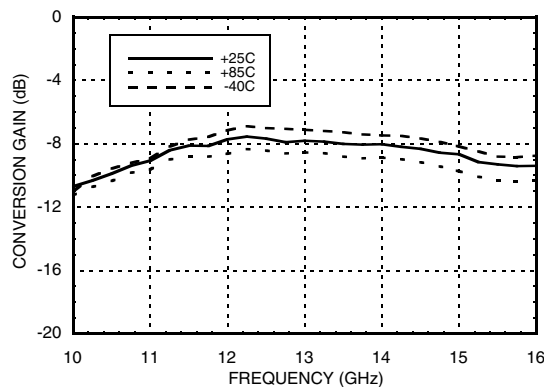
Upconverter LSB, IF = 3 GHz
Conversion Gain vs. LO Drive



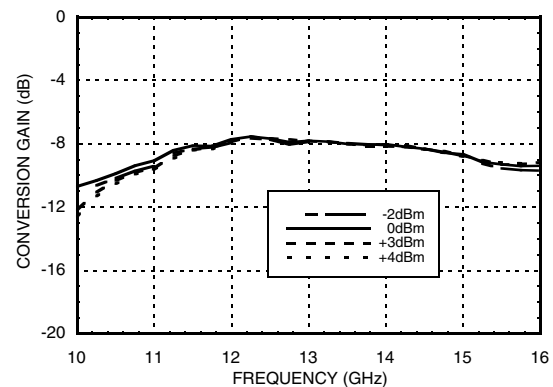
Upconverter USB, IF = 1 GHz
Conversion Gain vs. Temperature



Upconverter USB, IF = 3 GHz
Conversion Gain vs. Temperature

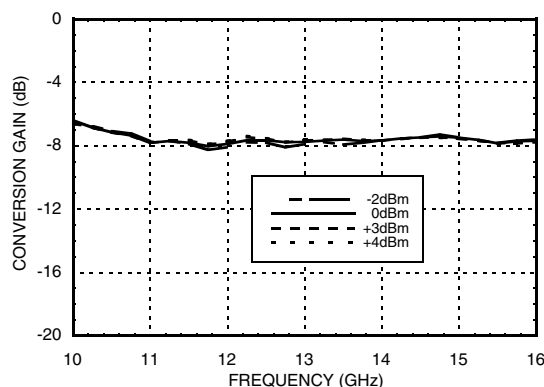
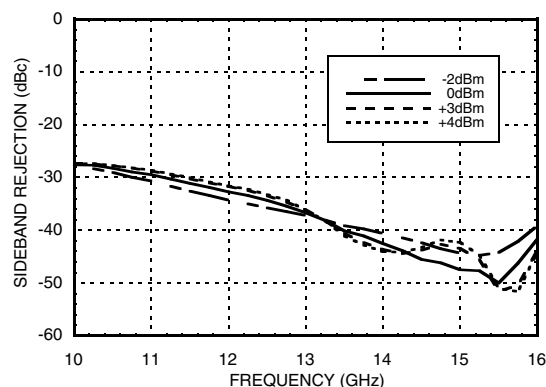


Upconverter USB, IF = 1 GHz
Conversion Gain vs. LO Drive





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**HMC775LC5****GaAs MMIC I/Q MIXER
W/ LO AMPLIFIER, 10 - 16 GHz****Upconverter USB, IF = 3 GHz
Conversion Gain vs. LO Drive****Sideband Rejection vs. LO Drive****Harmonics of LO**

LO Freq. (GHz)	nLO Spur at RF Port			
	1	2	3	4
10.5	34	29	44	76
11.5	36	38	58	71
12.5	37	42	63	59
13.5	40	44	79	xx
14.5	35	47	68	xx
15.5	31	46	61	xx

LO = 0 dBm
Values in dBc below input LO level measured at RF Port.

MxN Spurious Outputs

mRF	nLO				
	0	1	2	3	4
0	xx	7	22	49	xx
1	39	0	55	50	78
2	81	70	64	65	102
3	98	98	106	81	103
4	xx	96	108	105	117

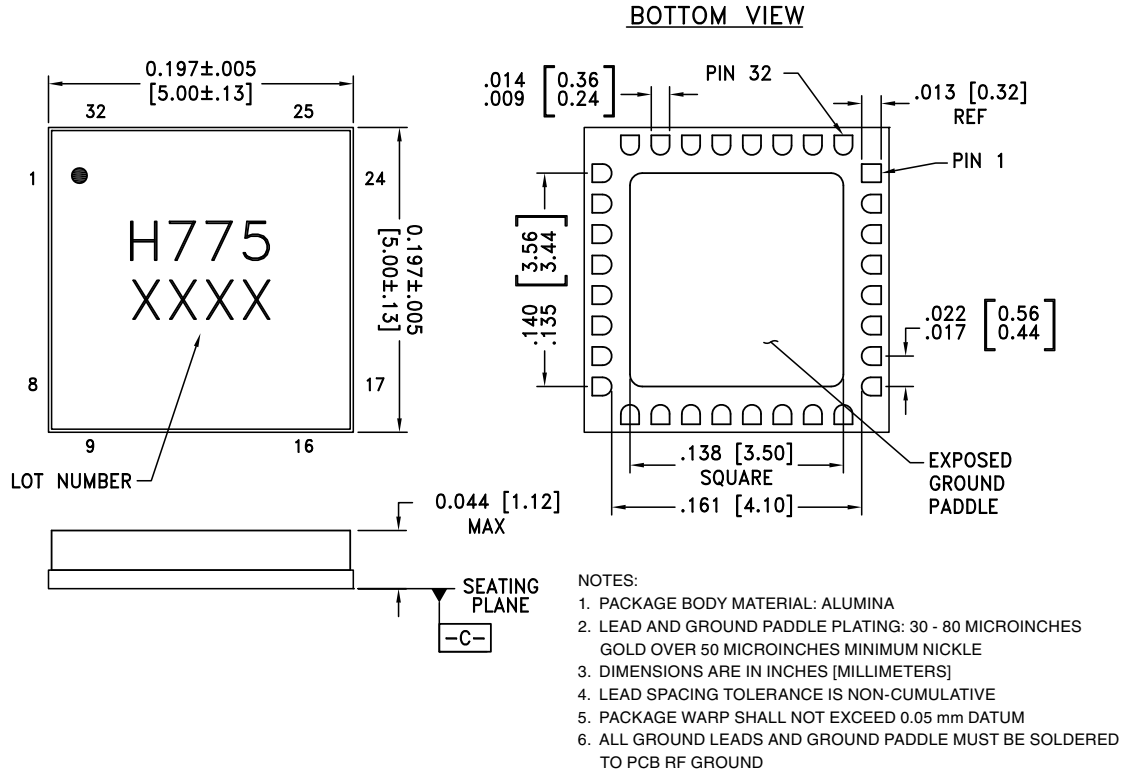
RF = 13.6 GHz @ -10 dBm
LO = 13.5 GHz @ 0 dBm
Data taken without IF hybrid
All values in dBc below IF power level

Absolute Maximum Ratings

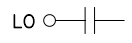
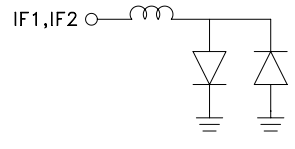
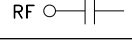
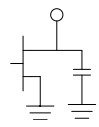
Drain Bias Voltage (Vdd)	+5.5V
RF / IF Input	+20 dBm
LO Input Power (LO)(Vdd = +5 Vdc)	+10 dBm
Channel Temperature	175 °C
Continuous Pdiss (T=85°C) (derate 12.4 mW/°C above 85°C)	1.1 W
Thermal Resistance (R _{TH}) (channel to ground paddle)	80 °C/W
Storage Temperature	-65 to +150 °C
Operating Temperature	-40 to +85 °C
ESD Sensitivity (HBM)	Class 1A

**ELECTROSTATIC SENSITIVE DEVICE
OBSERVE HANDLING PRECAUTIONS**

Outline Drawing



Pin Descriptions

Pin Number	Function	Description	Interface Schematic
1 - 4, 8 - 12, 15 - 17, 21 - 29, 31, 32	N/C	No connection required. These pins may be connected to RF/DC ground without affecting performance.	
5, 7, 18, 20	GND	These pins and package bottom must be connected to RF/DC ground.	
6	LO	This pin is AC coupled and matched to 50 Ohms.	
13	IF1	This pin is DC coupled. For applications not requiring operation to DC, this port should be DC blocked externally using a series capacitor whose value has been chosen to pass the necessary IF frequency range. For operation to DC, this pin must not source/sink more than 3 mA of current or part non-function and possible part failure will result.	
14	IF2		
19	RF	This pin is AC coupled and matched to 50 Ohms.	
30	Vdd	Power supply voltage for amplifier	



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Application Circuit