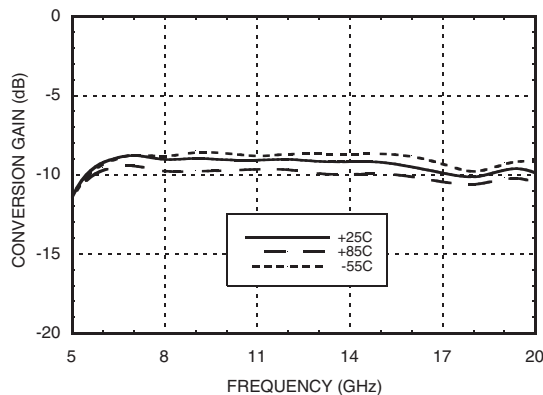
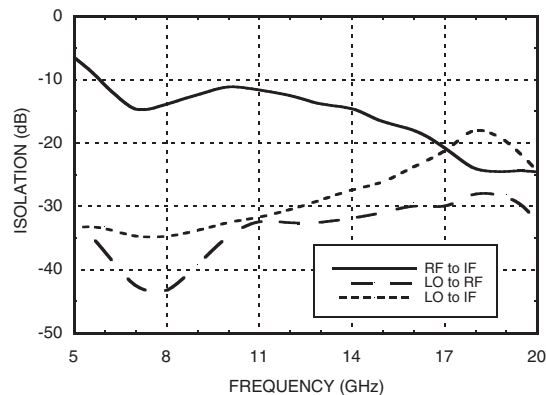


GaAs MMIC DOUBLE-BALANCED MIXER, 6 - 18 GHz

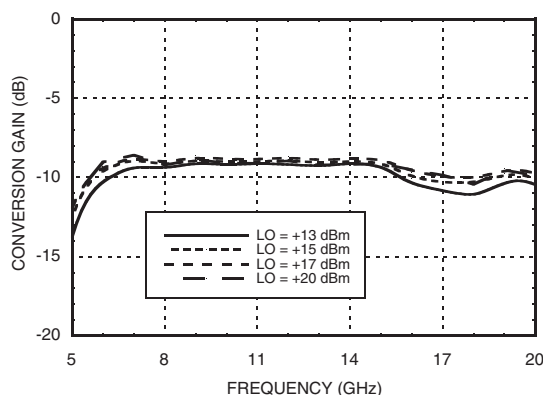
**Conversion Gain vs.
Temperature @ LO = +20 dBm**



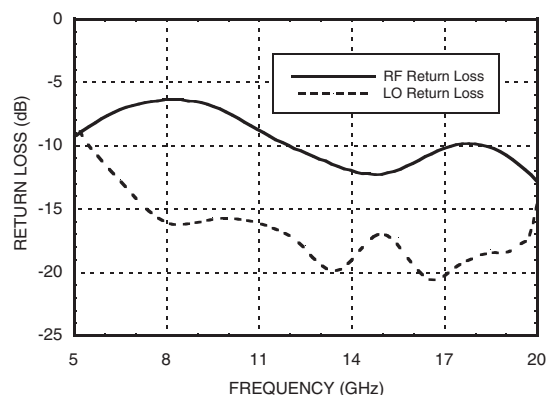
Isolation @ LO = +20 dBm



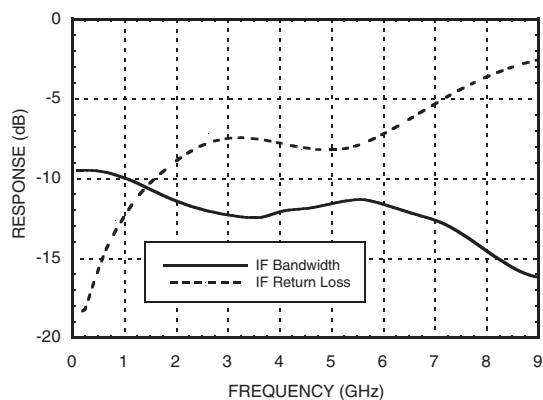
Conversion Gain vs. LO Drive



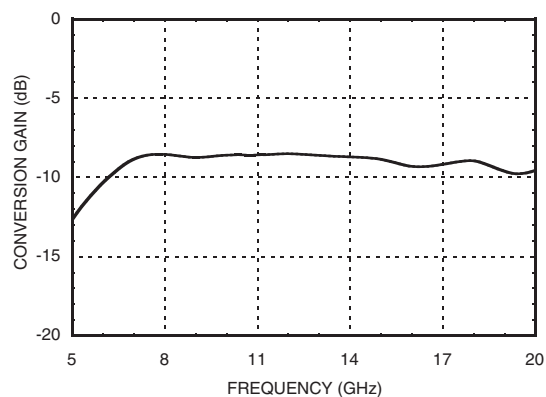
Return Loss @ LO = +20 dBm



IF Bandwidth @ LO = +20 dBm

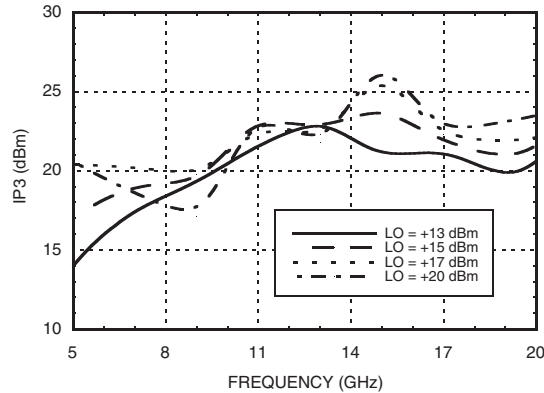


**Upconverter Performance
Conversion Gain @ LO = +20 dBm**

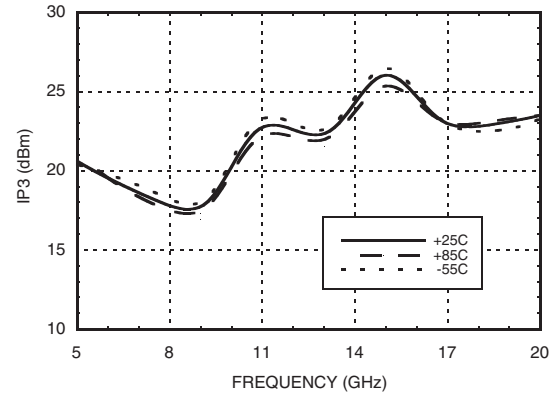


GaAs MMIC DOUBLE-BALANCED MIXER, 6 - 18 GHz

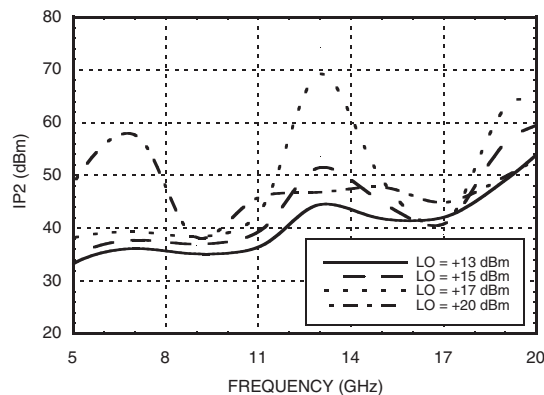
Input IP3 vs. LO Drive*



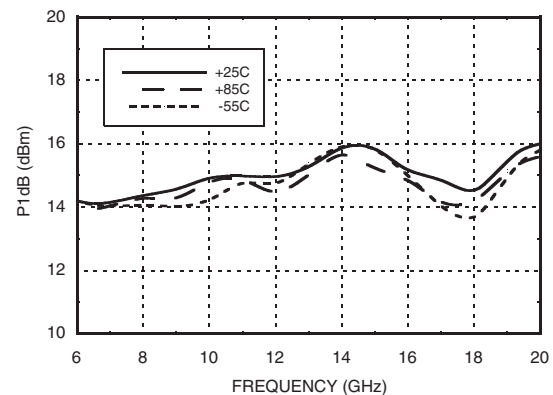
Input IP3 vs. Temperature @ LO = +20 dBm*



Input IP2 vs. LO Drive *



Input P1dB vs. Temperature @ LO = +20 dBm



MxN Spurious @ IF Port

	nLO				
mRF	0	1	2	3	4
0	XX	3	7	3	35
1	3	0	17	25	32
2	72	64	59	59	74
3	76	76	71	72	76
4	74	76	77	77	77

RF = 6 GHz @ -10 dBm
LO = 6.1 GHz @ +20 dBm
All values in dBc relative to the IF power level.
Measured as downconverter.

Harmonics of LO

	nLO Spur @ RF Port			
LO Freq. (GHz)	1	2	3	4
6	38	34	44	39
8	44	29	46	43
10	36	25	46	53
12	33	23	47	XX
14	32	28	XX	XX
16	30	27	XX	XX
18	27	32	XX	XX

LO = +20 dBm
All values in dBc below input LO level @ RF port.

* Two-tone input power = 0 dBm each tone, 1 MHz spacing.

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

GaAs MMIC DOUBLE-BALANCED MIXER, 6 - 18 GHz

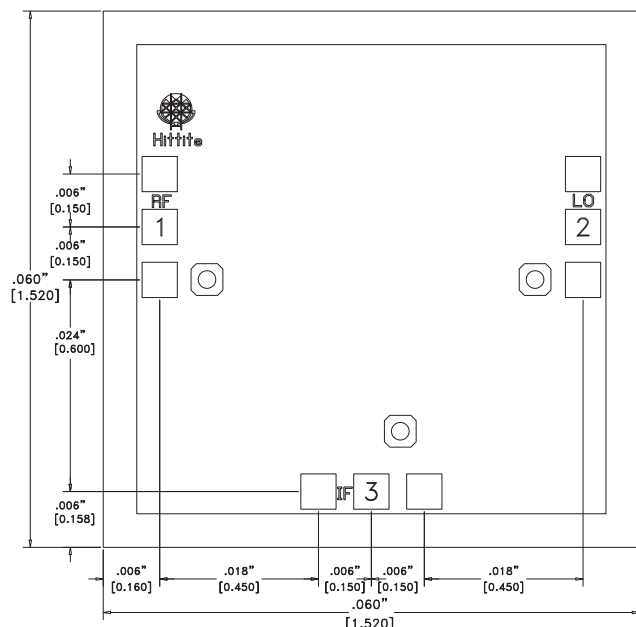
Absolute Maximum Ratings

RF / IF Input	+20 dBm
LO Drive	+27 dBm
Channel Temperature (Tc)	150 °C
Thermal Resistance	101.7 °C/W
IF DC Current	±2 mA
Storage Temperature	-65 to +150 °C
Operating Temperature	-55 to +85 °C

Outline Drawings

(See HMC141/142 Operation Application Note)

HMC141

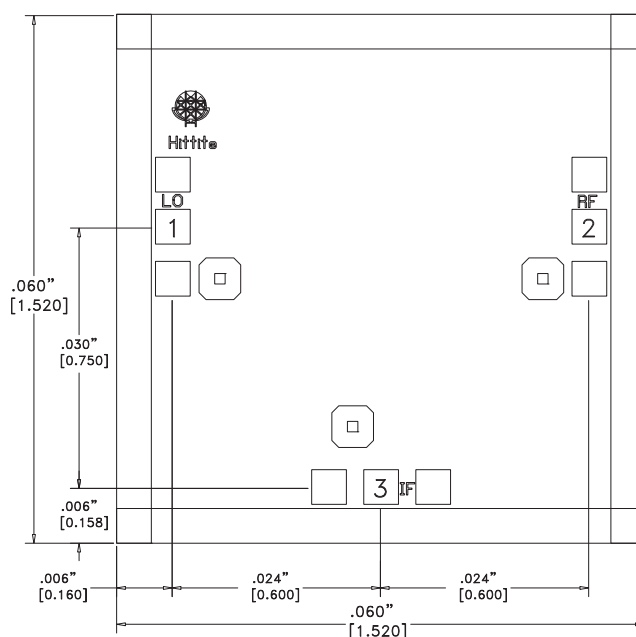


**ELECTROSTATIC SENSITIVE DEVICE
OBSERVE HANDLING PRECAUTIONS**

NOTES:

1. ALL DIMENSIONS ARE IN INCHES [MM].
2. DIE THICKNESS IS .004".
3. TYPICAL BOND PAD IS .004" SQUARE.
4. BACKSIDE METALLIZATION: GOLD.
5. BOND PAD METALLIZATION: GOLD.
6. BACKSIDE METAL IS GROUND.
7. CONNECTION NOT REQUIRED FOR UNLABELED BOND PADS.

HMC142



Die Packaging Information ^[1]

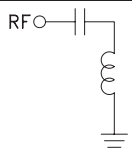
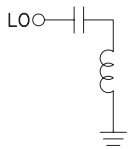
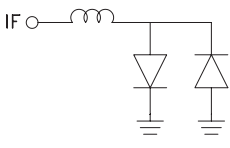
Standard	Alternate
WP-3 (Waffle Pack)	[2]

[1] Refer to the "Packaging Information" section for die packaging dimensions.

[2] For alternate packaging information contact Hittite Microwave Corporation.

GaAs MMIC DOUBLE-BALANCED MIXER, 6 - 18 GHz

Pad Descriptions HMC141 (HMC142)

Pad Number	Function	Description	Interface Schematic
1 (2)	RF	This pin is AC coupled and matched to 50 Ohms.	
2 (1)	LO	This pin is AC coupled and matched to 50 Ohms.	
3	IF	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 2 mA of current or die non-function and possible die failure will result.	

GaAs MMIC DOUBLE-BALANCED MIXER, 6 - 18 GHz

Mounting & Bonding Techniques for Millimeterwave GaAs MMICs

The die should be attached directly to the ground plane eutectically or with conductive epoxy (see HMC general Handling, Mounting, Bonding Note).

50 Ohm Microstrip transmission lines on 0.127mm (5 mil) thick alumina thin film substrates are recommended for bringing RF to and from the chip (Figure 1). If 0.254mm (10 mil) thick alumina thin film substrates must be used, the die should be raised 0.150mm (6 mils) so that the surface of the die is coplanar with the surface of the substrate. One way to accomplish this is to attach the 0.102mm (4 mil) thick die to a 0.150mm (6 mil) thick molybdenum heat spreader (moly-tab) which is then attached to the ground plane (Figure 2).

Microstrip substrates should be brought as close to the die as possible in order to minimize ribbon bond length. Typical die-to-substrate spacing is 0.076mm (3 mils). Gold ribbon of 0.075 mm (3 mil) width and minimal length <0.31 mm (<12 mils) is recommended to minimize inductance on RF, LO & IF ports.

Handling Precautions

Follow these precautions to avoid permanent damage.

Storage: All bare die are placed in either Waffle or Gel based ESD protective containers, and then sealed in an ESD protective bag for shipment. Once the sealed ESD protective bag has been opened, all die should be stored in a dry nitrogen environment.

Cleanliness: Handle the chips in a clean environment. DO NOT attempt to clean the chip using liquid cleaning systems.

Static Sensitivity: Follow ESD precautions to protect against ESD strikes.

Transients: Suppress instrument and bias supply transients while bias is applied. Use shielded signal and bias cables to minimize inductive pick-up.

General Handling: Handle the chip along the edges with a vacuum collet or with a sharp pair of bent tweezers. The surface of the chip has fragile air bridges and should not be touched with vacuum collet, tweezers, or fingers.

Mounting

The chip is back-metallized and can be die mounted with AuSn eutectic preforms or with electrically conductive epoxy. The mounting surface should be clean and flat.

Eutectic Die Attach: A 80/20 gold tin preform is recommended with a work surface temperature of 255 °C and a tool temperature of 265 °C. When hot 90/10 nitrogen/hydrogen gas is applied, tool tip temperature should be 290 °C. DO NOT expose the chip to a temperature greater than 320 °C for more than 20 seconds. No more than 3 seconds of scrubbing should be required for attachment.

Epoxy Die Attach: Apply a minimum amount of epoxy to the mounting surface so that a thin epoxy fillet is observed around the perimeter of the chip once it is placed into position. Cure epoxy per the manufacturer's schedule.

Wire Bonding

RF bonds made with 0.003" x 0.0005" ribbon are recommended. These bonds should be thermosonically bonded with a force of 40-60 grams. DC bonds of 0.001" (0.025 mm) diameter, thermosonically bonded, are recommended. Ball bonds should be made with a force of 40-50 grams and wedge bonds at 18-22 grams. All bonds should be made with a nominal stage temperature of 150 °C. A minimum amount of ultrasonic energy should be applied to achieve reliable bonds. All bonds should be as short as possible, less than 12 mils (0.31 mm).

