

GaAs MMIC I/Q MIXER MODULE 8.5 - 13.5 GHz

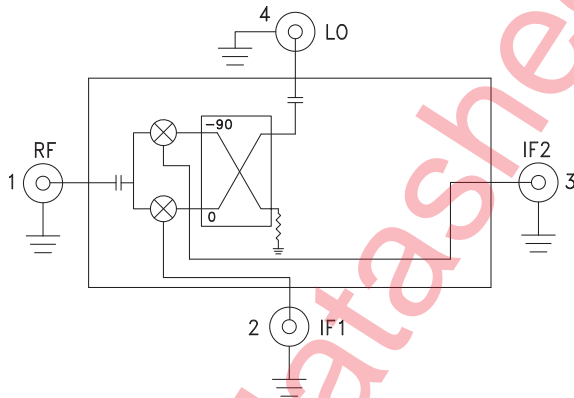


Typical Applications

The HMC-C042 is ideal for:

- Point-to-Point Radios
- Point-to-Multi-Point Radios & VSAT
- Test Equipment & Sensors
- Military End-Use

Functional Diagram



Features

- Wide IF Bandwidth: DC - 2 GHz
- Image Rejection: 28 dB
- LO to RF Isolation: 38 dB
- High Input IP3: +25 dBm
- Hermetically Sealed Module
- Field Replaceable SMA Connectors
- 55 to +85 °C Operating Temperature

General Description

The HMC-C042 is a passive I/Q MMIC mixer housed in a miniature hermetic module which can be used as either an Image Reject Mixer or a Single Sideband Upconverter. The module utilizes two standard Hittite double balanced mixer cells and a 90 degree hybrid fabricated on a GaAs MESFET process. A low frequency quadrature hybrid was used to produce a 100 MHz USB IF output. This MMIC based module is a more reliable and consistent alternative to hybrid style I/Q Mixers and Single Sideband Converter assemblies. The module features removable SMA connectors which can be detached to allow direct connection of the I/O pins to a microstrip or coplanar circuit.

Electrical Specifications, $T_A = +25^\circ \text{C}$, $IF = 100 \text{ MHz}$, $LO = +19 \text{ dBm}^*$

| Parameter | Min. | Typ. | Max. | Units |
|--------------------------|------------|------|------|-------|
| Frequency Range, RF/LO | 8.5 - 13.5 | | | GHz |
| Frequency Range, IF | DC - 2 | | | GHz |
| Conversion Loss (As IRM) | | 8 | 10 | dB |
| Image Rejection | 17 | 28 | | dB |
| 1 dB Compression (Input) | | +17 | | dBm |
| LO to RF Isolation | 35 | 38 | | dB |
| LO to IF Isolation | 20 | 25 | | dB |
| IP3 (Input) | | +25 | | dBm |
| Amplitude Balance | | 0.6 | | dB |
| Phase Balance | | 6 | | Deg |

* Unless otherwise noted, all measurements performed as downconverter.

**GaAs MMIC I/Q MIXER MODULE
8.5 - 13.5 GHz**



Data taken As IRM With External IF Hybrid
Conversion Gain vs. Temperature

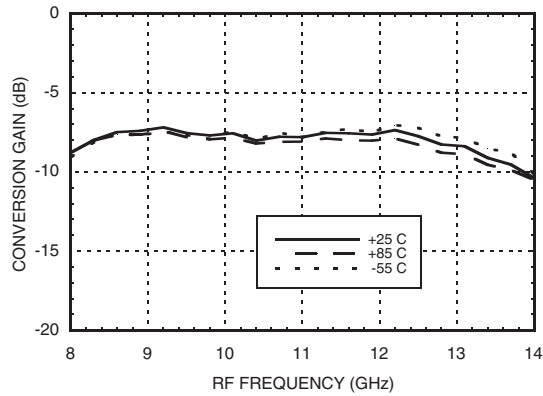
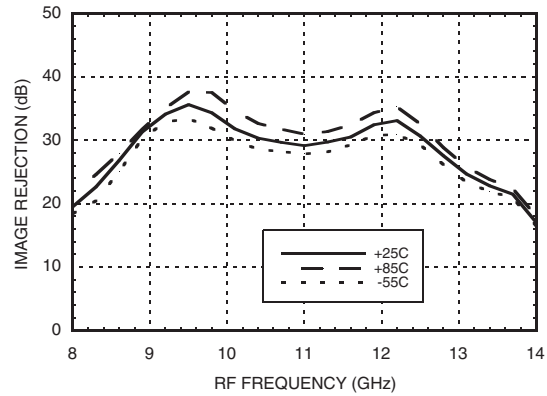
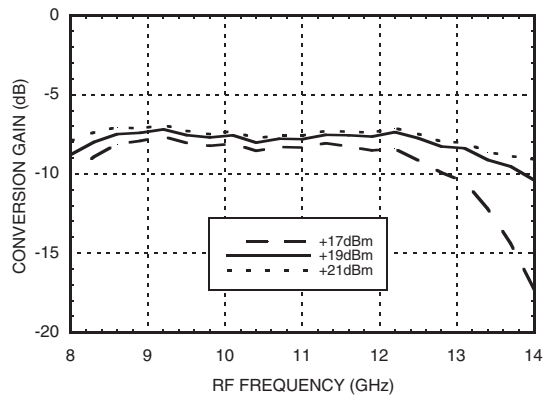


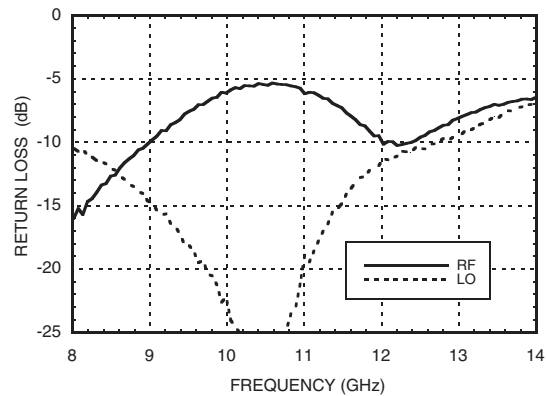
Image Rejection vs. Temperature



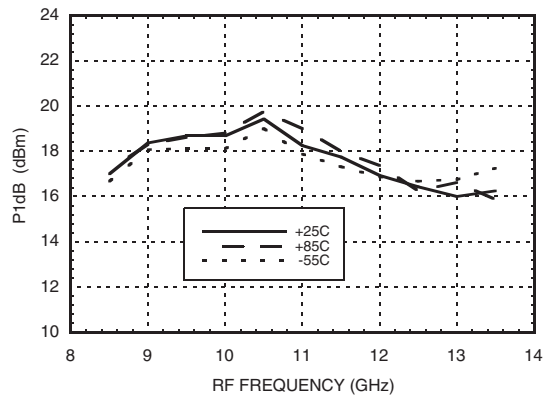
Conversion Gain vs. LO Drive



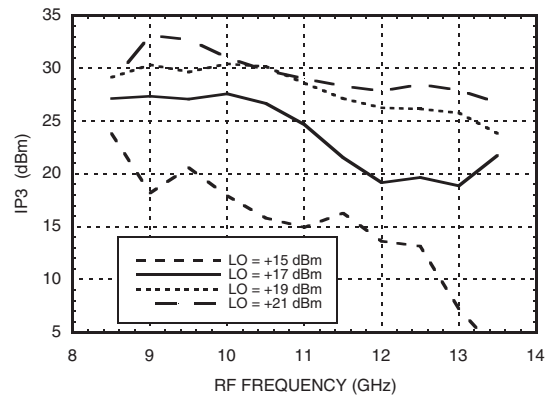
Return Loss



Input P1dB vs. Temperature



Input IP3 vs. LO Drive



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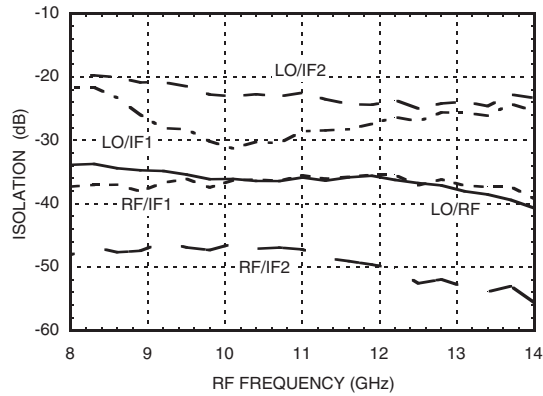
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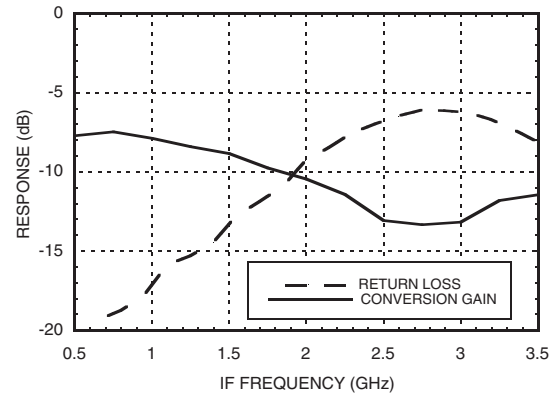


Quadrature Channel Data Taken Without IF Hybrid

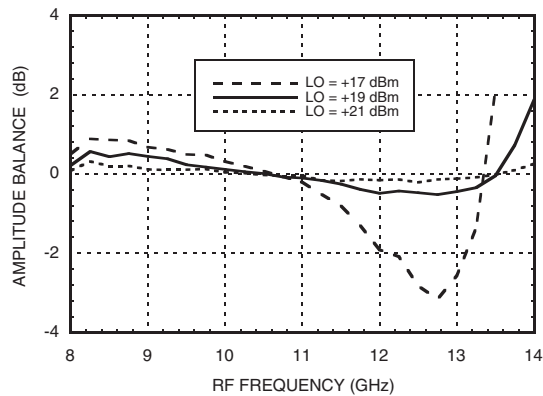
Isolations



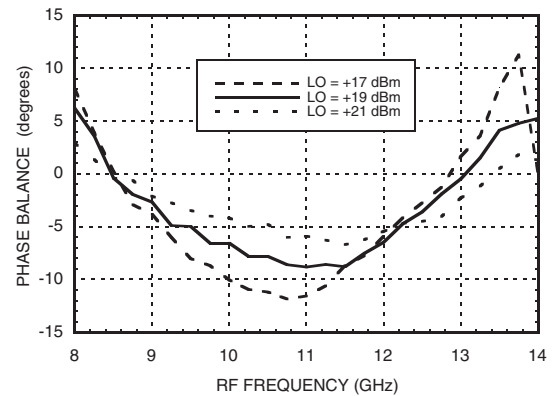
IF Bandwidth*



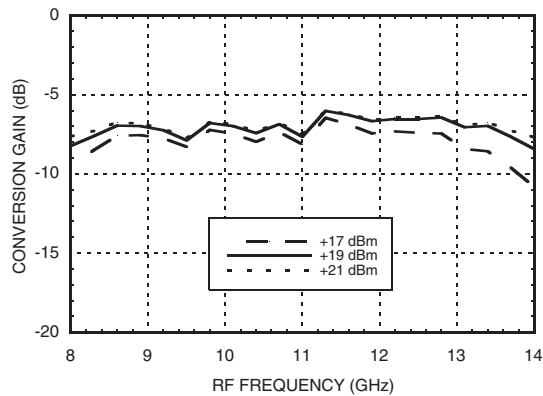
Amplitude Balance vs. LO Drive



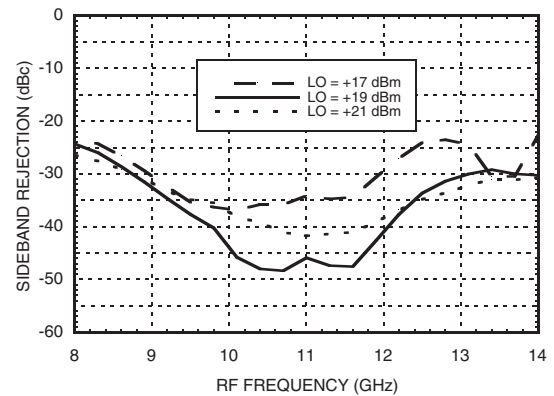
Phase Balance vs. LO Drive



Upconverter Performance Conversion Gain vs. LO Drive*



Upconverter Performance Sideband Rejection vs. LO Drive*



* Conversion gain data taken with external IF hybrid

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Harmonics of LO

| LO Freq. (GHz) | nLO Spur at RF Port | | | |
|----------------|---------------------|----|----|----|
| | 1 | 2 | 3 | 4 |
| 8.5 | 34 | 48 | 50 | 77 |
| 9.5 | 35 | 47 | 57 | 64 |
| 10.5 | 36 | 51 | 62 | 53 |
| 11.5 | 35 | 57 | 67 | 45 |
| 12.5 | 36 | 52 | 67 | 47 |
| 13.5 | 38 | 51 | 64 | xx |

LO = +19 dBm
Values in dBc below input LO level measured at RF Port.

MxN Spurious Outputs

| mRF | nLO | | | | |
|-----|-----|-----|-----|-----|-----|
| | 0 | 1 | 2 | 3 | 4 |
| 0 | xx | -11 | 16 | 22 | 38 |
| 1 | 33 | 0 | 53 | 62 | 95 |
| 2 | 86 | 77 | 76 | 78 | 94 |
| 3 | 96 | 95 | 101 | 91 | 102 |
| 4 | 89 | 94 | 96 | 101 | 107 |

RF = 10.6 GHz @ -10 dBm
LO = 10.5 GHz @ +19 dBm
Data taken without IF hybrid
All values in dBc below IF power level

Absolute Maximum Ratings

| | |
|--|----------------|
| RF / IF Input | +20 dBm |
| LO Drive | +27 dBm |
| Channel Temperature | 150°C |
| Continuous P _{diss} (T=85°C) (derate 7.1 mW/°C above 85°C) | 460 mW |
| Thermal Resistance (R _{TH}) (junction to die bottom) | 140 °C/W |
| Storage Temperature | -65 to +150 °C |
| Operating Temperature | -55 to +85 °C |

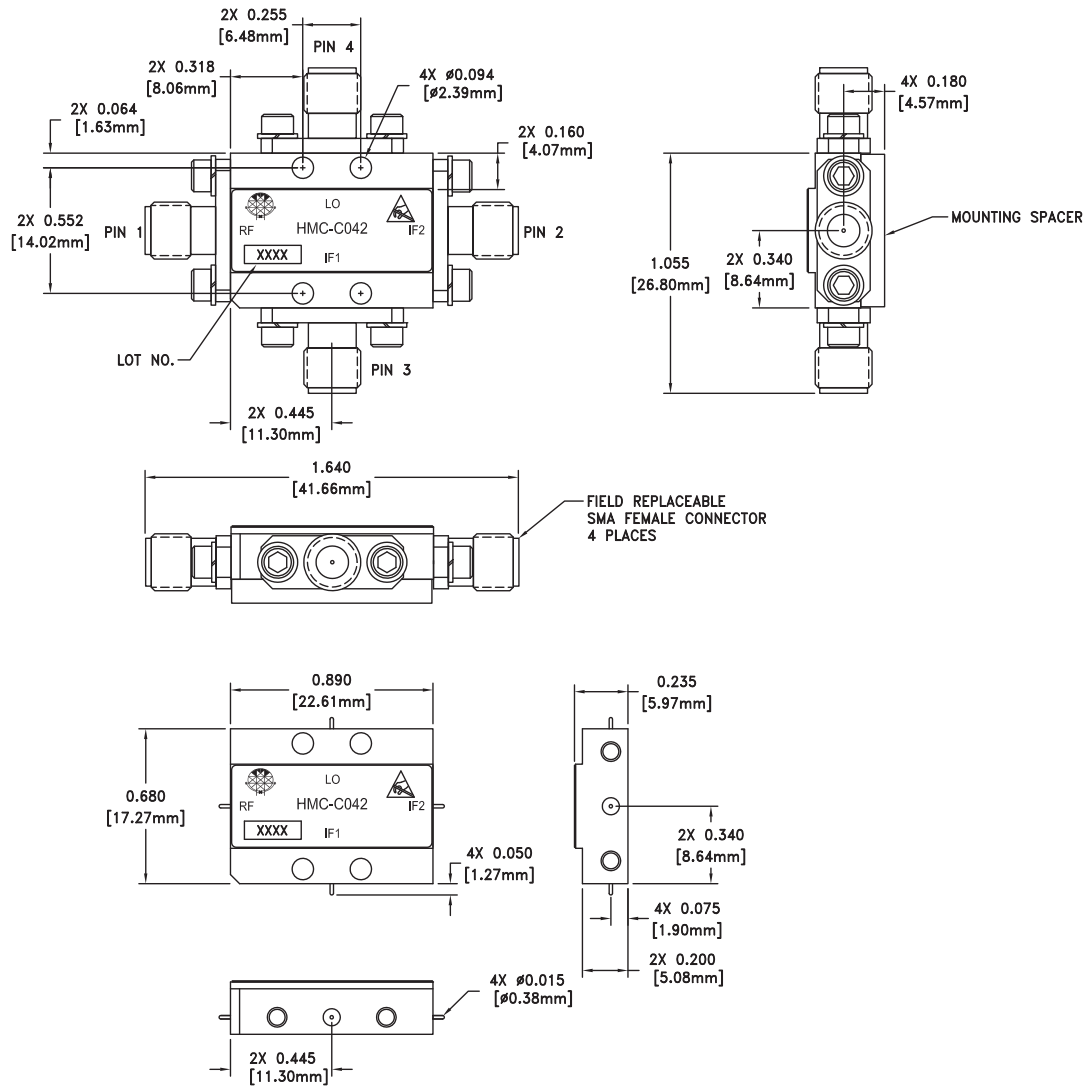


**ELECTROSTATIC SENSITIVE DEVICE
OBSERVE HANDLING PRECAUTIONS**

**GaAs MMIC I/Q MIXER MODULE
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Outline Drawing



VIEW SHOWN WITH CONNECTORS REMOVED

NOTES:

1. PACKAGE, LEADS, COVER MATERIAL: KOVAR™
2. FINISH: GOLD PLATE OVER NICKEL PLATE
3. MOUNTING SPACER: NICKEL PLATED ALUMINUM
4. ALL DIMENSIONS ARE IN INCHES [MILLIMETERS]
5. TOLERANCES:
 - 5.1 .XX = \pm 0.02
 - 5.2 .XXX = \pm 0.010
6. FIELD REPLACEABLE SMA CONNECTORS
TENSOLITE 5602 - 5CCSF OR EQUIVALENT
7. TO MOUNT MODULE TO SYSTEM PLATFORM REPLACE 0 -80
HARDWARE WITH DESIRED MOUNTING SCREWS

Package Information


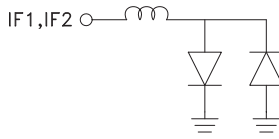

| | |
|-------------------------------|------------------------|
| Package Type | C-4 |
| Package Weight ^[1] | 20 gms ^[2] |
| Spacer Weight | 2.6 gms ^[2] |

[1] Includes the connectors

[2] \pm 1 gms Tolerance



Pin Descriptions

| Pin Number | Function | Description | Interface Schematic |
|------------|----------|---|--|
| 1 | RF | This pin is AC coupled and matched to 50 Ohms. | RF  |
| 2 | 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. | IF1, IF2  |
| 3 | IF2 | | |
| 4 | LO | This pin is AC coupled and matched to 50 Ohms. | LO  |