

GaAs MMIC SMT DOUBLE-BALANCED DUAL MIXER, 1.7 - 4.5 GHz



Typical Applications

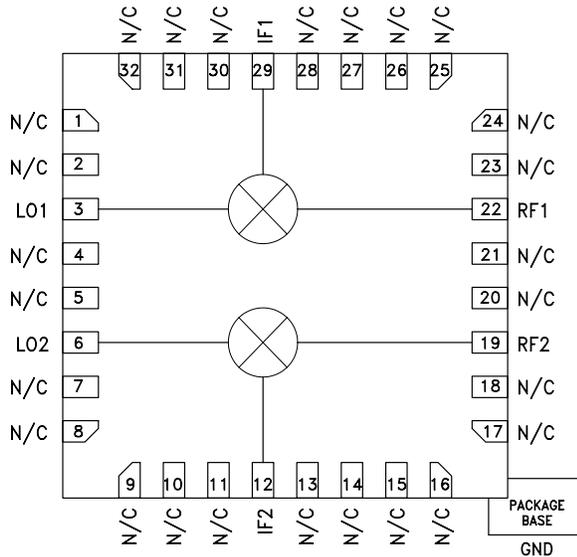
The HMC340ALP5 / HMC340ALP5E Dual Mixer is ideal for:

- Wireless Infrastructure
- Wireless Local Loop
- Image Reject Mixer
- I/Q Modulator
- SSB Modulator

Features

- Conversion Loss: 8.0 dB
- LO/RF Isolation: 45 dB
- LO/IF Isolation: 33 dB
- Input IP3: +20 dBm
- Conversion Gain Balance: 0.1 dB
- 32 Lead 5x5mm SMT Package: 25mm²

Functional Diagram



General Description

The HMC340ALP5(E) is a double balanced dual mixer covering 1.7 - 4.5 GHz RF/LO range. This passive MMIC mixer is constructed of GaAs Schottky diodes and on-chip baluns. The device can be used as an upconverter, downconverter, bi-phase (de)modulator, or phase comparator. The mixer symmetry of the HMC340ALP5(E) make it ideal for combining with external hybrids to implement a single sideband upconverter or image reject downconverter assembly. The consistent MMIC performance will improve system operation and assure regulatory compliance. A RoHS compliant, leadless 5x5 mm QFN surface mount package (LP5) houses the dual MMIC mixer IC.

Electrical Specifications, $T_A = +25^\circ \text{C}$, As a Function of LO Drive

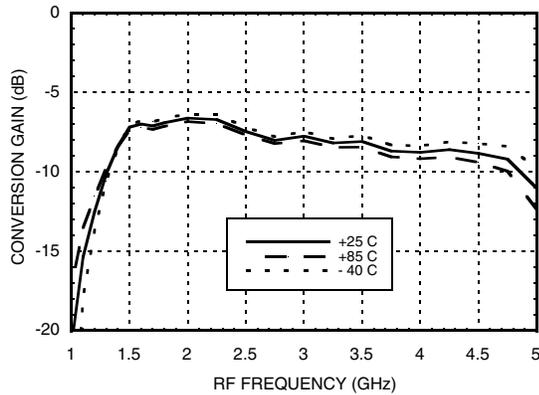
| Parameter | LO = +13 dBm IF = 100 MHz | | | | | | Units |
|-----------------------------------|------------------------------|------|------|-----------|------|------|-------|
| | Min. | Typ. | Max. | Min. | Typ. | Max. | |
| Frequency Range, RF & LO | 1.7 - 4.5 | | | 3.4 - 3.8 | | | GHz |
| Frequency Range, IF | DC - 1.5 | | | DC - 1.5 | | | GHz |
| Conversion Loss | | 8 | 10 | | 8 | 10 | dB |
| Conversion Gain Amplitude Balance | | 0.10 | 0.25 | | 0.10 | 0.25 | dB |
| Noise Figure (SSB) | | 8 | 10 | | 8 | 10 | dB |
| LO to RF Isolation | 30 | 45 | | 40 | 47 | | dB |
| LO to IF Isolation | 25 | 33 | | 33 | 38 | | dB |
| IP3 (Input) | | 20 | | | 23 | | dBm |
| 1 dB Gain Compression (Input) | | 12 | | | 13 | | dBm |

* Unless otherwise noted, all measurements performed as single channel downconverter.

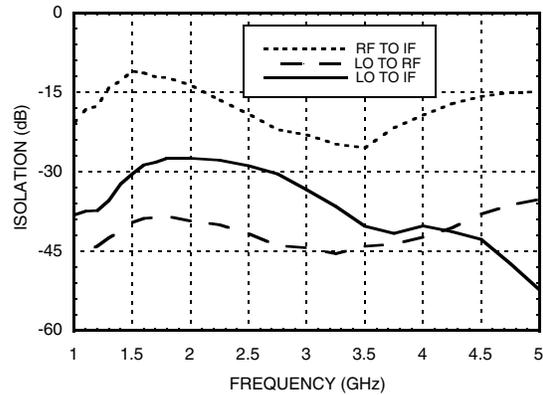
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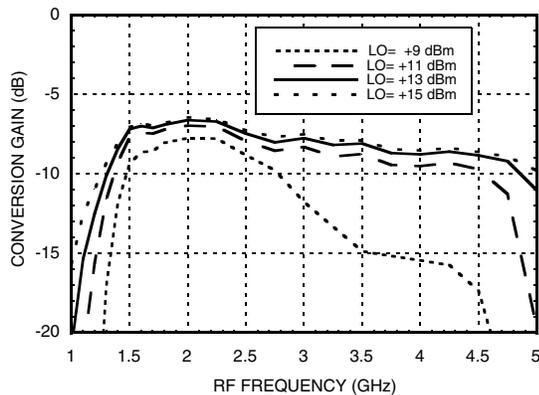
Single Channel: Conversion Gain vs. Temperature @ LO = +13 dBm



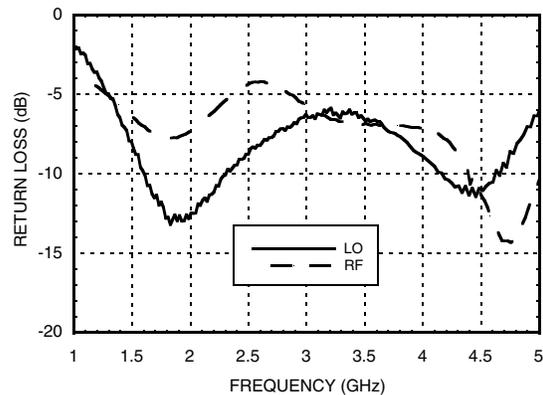
Single Channel: Isolation @ LO = +13 dBm



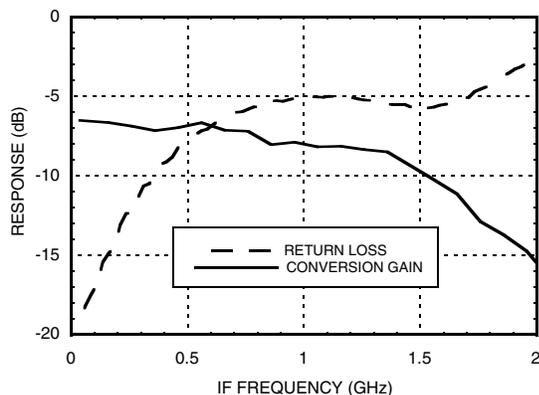
Single Channel: Conversion Gain vs. LO Drive



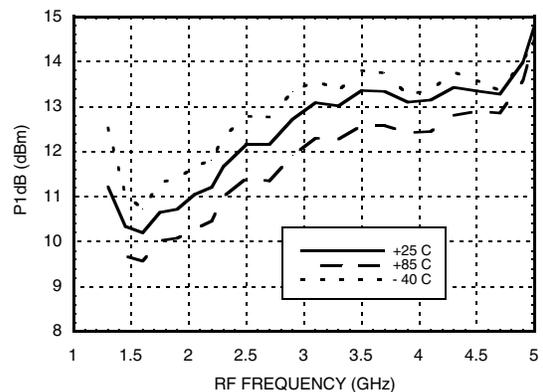
Single Channel: Return Loss @ LO = +13 dBm



Single Channel: IF Bandwidth @ LO = +13 dBm



Single Channel: Input P1dB vs. Temperature @ LO = +13 dBm



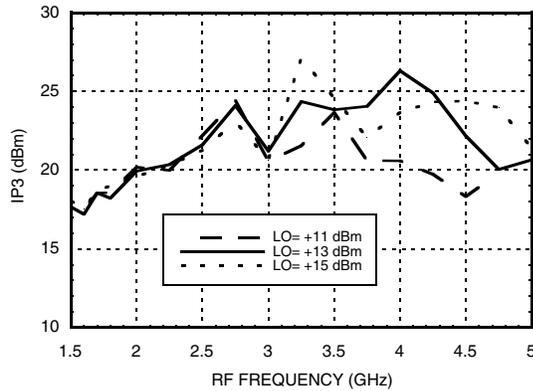
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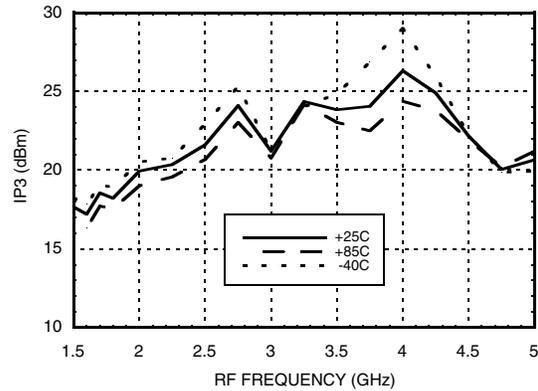
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DUAL MIXER, 1.7 - 4.5 GHz**



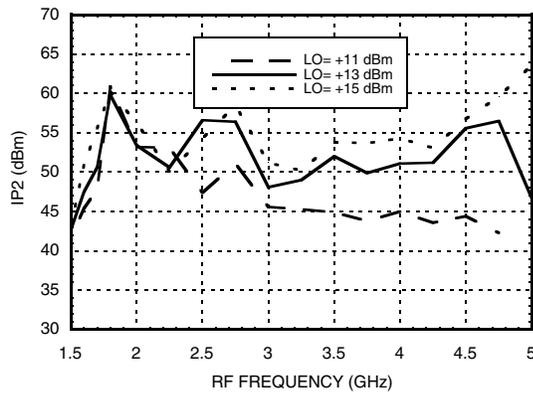
**Single Channel:
Input IP3 vs. LO Drive**



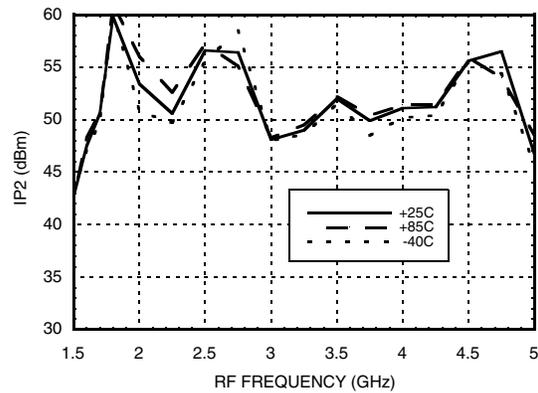
**Single Channel: Input IP3
vs. Temperature @ LO = +13 dBm**



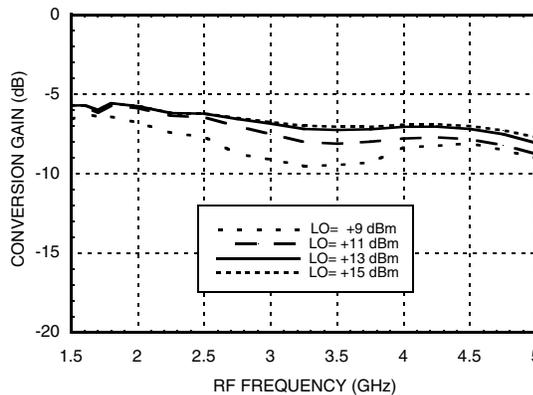
**Single Channel:
Input IP2 vs. LO Drive**



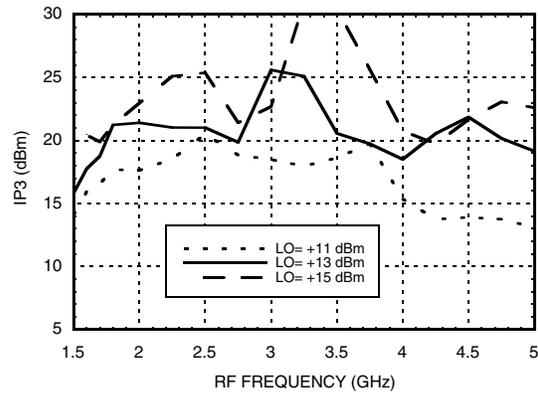
**Single Channel: Input IP2
vs. Temperature @ LO = +13 dBm**



**Single Channel: Upconverter
Conversion Gain vs. LO Drive**



**Single Channel:
Upconverter IP3 vs. LO Drive**



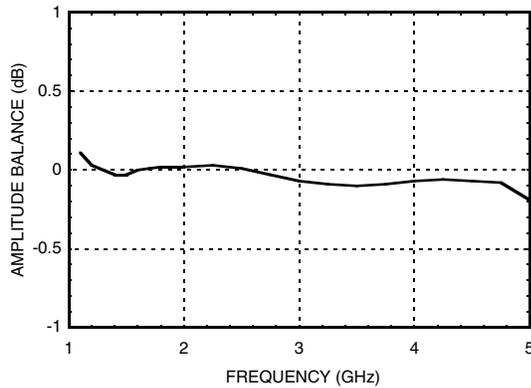
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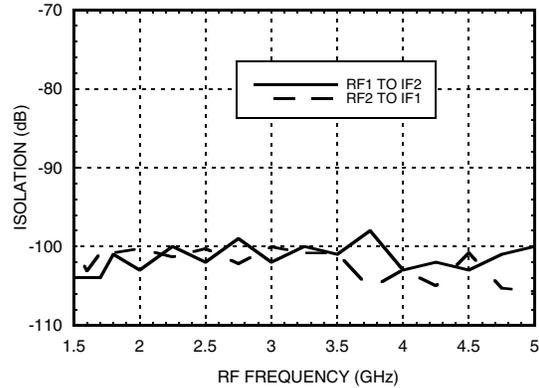
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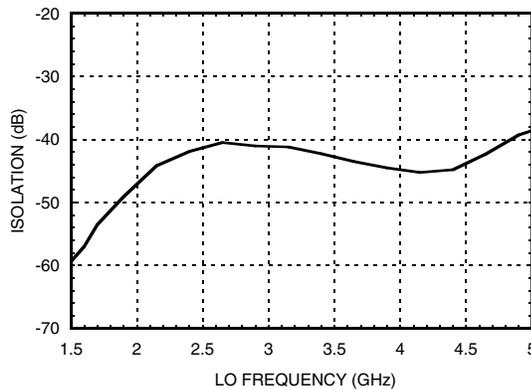
**Dual Channel:
Conversion Gain Amplitude Balance**



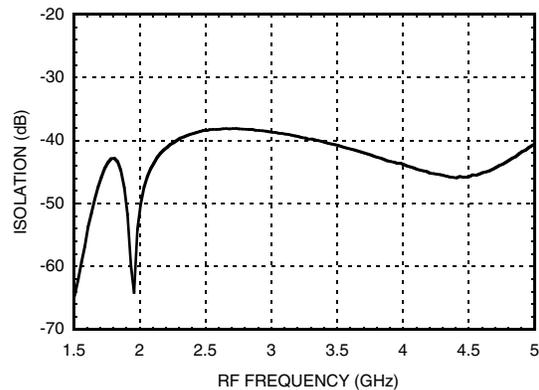
**Dual Channel:
Channel to Channel Isolation**



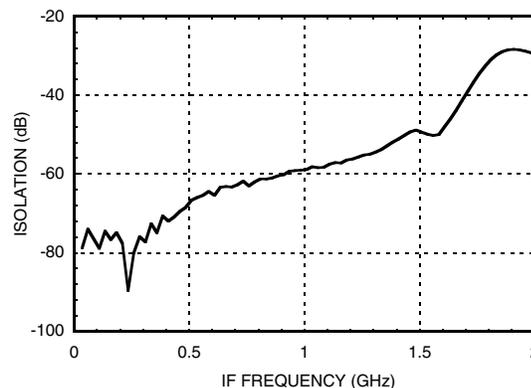
**Dual Channel:
LO1 to LO2 Isolation**



**Dual Channel:
RF1 to RF2 Isolation**



**Dual Channel:
IF1 to IF2 Isolation**



Harmonics of LO

| LO Freq. (GHz) | nLO Spur at RF Port | | | |
|----------------|---------------------|----|----|----|
| | 1 | 2 | 3 | 4 |
| 1.5 | 39 | 29 | 57 | 68 |
| 2.0 | 40 | 26 | 63 | 68 |
| 2.5 | 43 | 28 | 41 | 63 |
| 3.0 | 44 | 38 | 63 | 67 |
| 3.5 | 44 | 48 | 66 | 70 |
| 4.0 | 42 | 49 | 63 | 67 |
| 4.5 | 38 | 49 | 63 | 83 |
| 5.0 | 36 | 53 | 59 | 89 |

LO = +13 dBm
Values in dBc below input LO level measured at RF Port.

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Absolute Maximum Ratings

| | |
|---|-------------------|
| RF / IF Input | +13 dBm |
| LO Drive | +27 dBm |
| Channel Temperature | 150°C |
| Continuous Pdiss (T = 85°C) (derate 16.55 mW/°C above 85°C) | 1.07 W |
| Thermal Resistance (R _{TH}) (junction to package base) | 60.4 °C/W |
| Storage Temperature | -65 to +150 °C |
| Operating Temperature | -40 to +85 deg °C |

MxN Spurious Outputs

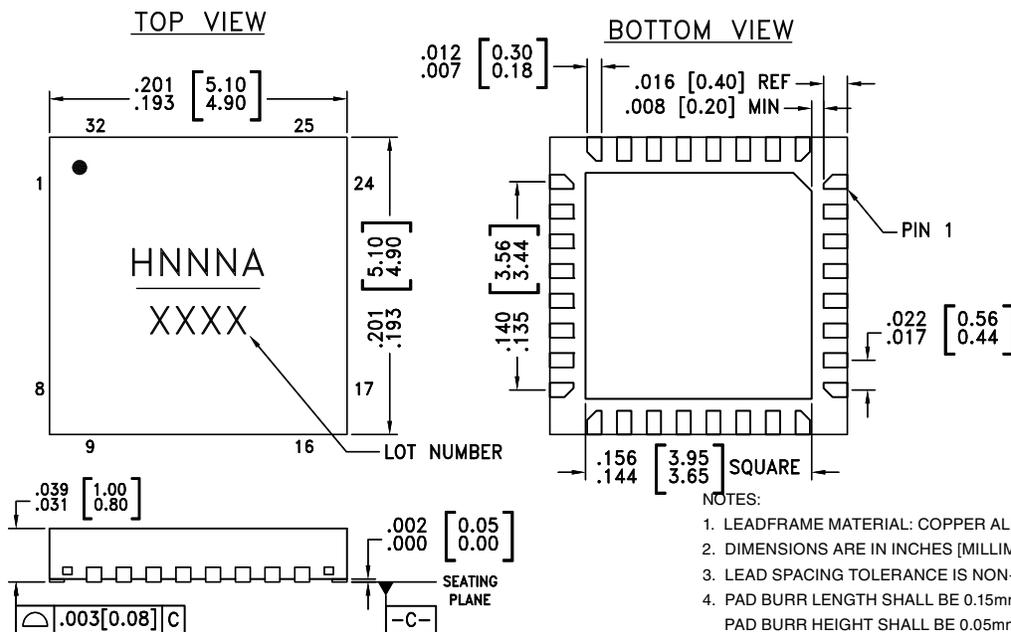
| mRF | nLO | | | | |
|-----|-----|----|----|----|----|
| | 0 | 1 | 2 | 3 | 4 |
| 0 | xx | 11 | 20 | 36 | 45 |
| 1 | 19 | 0 | 26 | 37 | 41 |
| 2 | 71 | 67 | 67 | 68 | 71 |
| 3 | 86 | 86 | 85 | 78 | 78 |
| 4 | 86 | 86 | 86 | 86 | 86 |

RF = 3.5 GHz @ -10 dBm
LO = 3.6 GHz @ +13 dBm
All values in dBc below IF power level



ELECTROSTATIC SENSITIVE DEVICE
OBSERVE HANDLING PRECAUTIONS

Outline Drawing



Package Information

| Part Number | Package Body Material | Lead Finish | MSL Rating | Package Marking ^[3] |
|-------------|--|---------------|---------------------|--------------------------------|
| HMC340ALP5 | Low Stress Injection Molded Plastic | Sn/Pb Solder | MSL1 ^[1] | H340A XXXX |
| HMC340ALP5E | RoHS-compliant Low Stress Injection Molded Plastic | 100% matte Sn | MSL1 ^[2] | H340A XXXX |

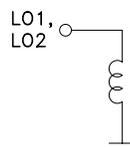
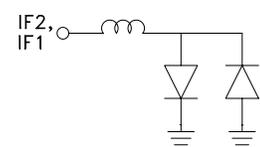
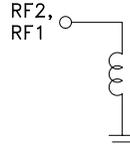
[1] Max peak reflow temperature of 235 °C

[2] Max peak reflow temperature of 260 °C

[3] 4-Digit lot number XXXX



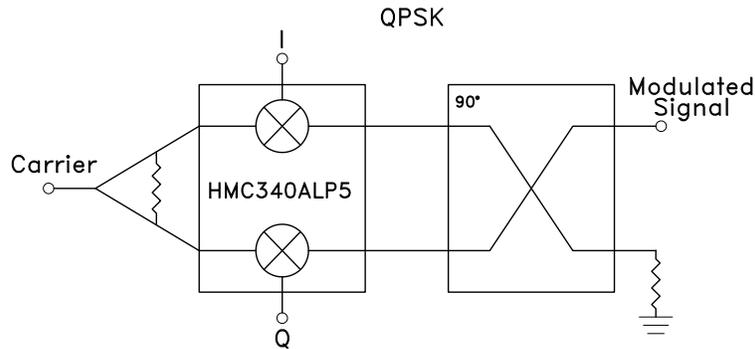
Pin Descriptions

| Pin Number | Function | Description | Interface Schematic |
|---|----------|--|---|
| 1, 2, 4, 5, 7-11, 13-18, 20, 21, 23-28, 30-32 | N/C | No Connection. These pins may be connected to RF ground without affecting performance. | |
| 3, 6 | LO1, LO2 | LO Port: This pin is DC coupled and matched to 50 Ohms. |  |
| 12, 29 | IF2, IF1 | 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 whose values has been chosen to pass the necessary IF frequency range. For operation to DC, this pin must not source/sink more than 4mA of current or die non-function and possible die failure will result. |  |
| 19, 22 | RF2, RF1 | RF Port: This pin is DC coupled and matched to 50 Ohms. |  |
| Package Bottom | GND | Package bottom must be connect to RF/DC ground. |  |

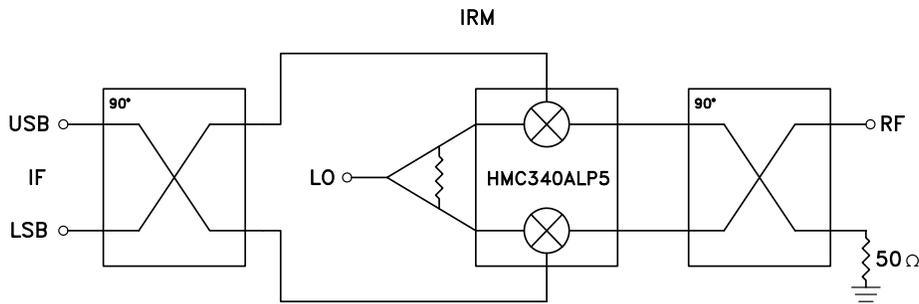
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Application Circuit for use as an I/Q Modulator



Application Circuit for use as an IRM Mixer

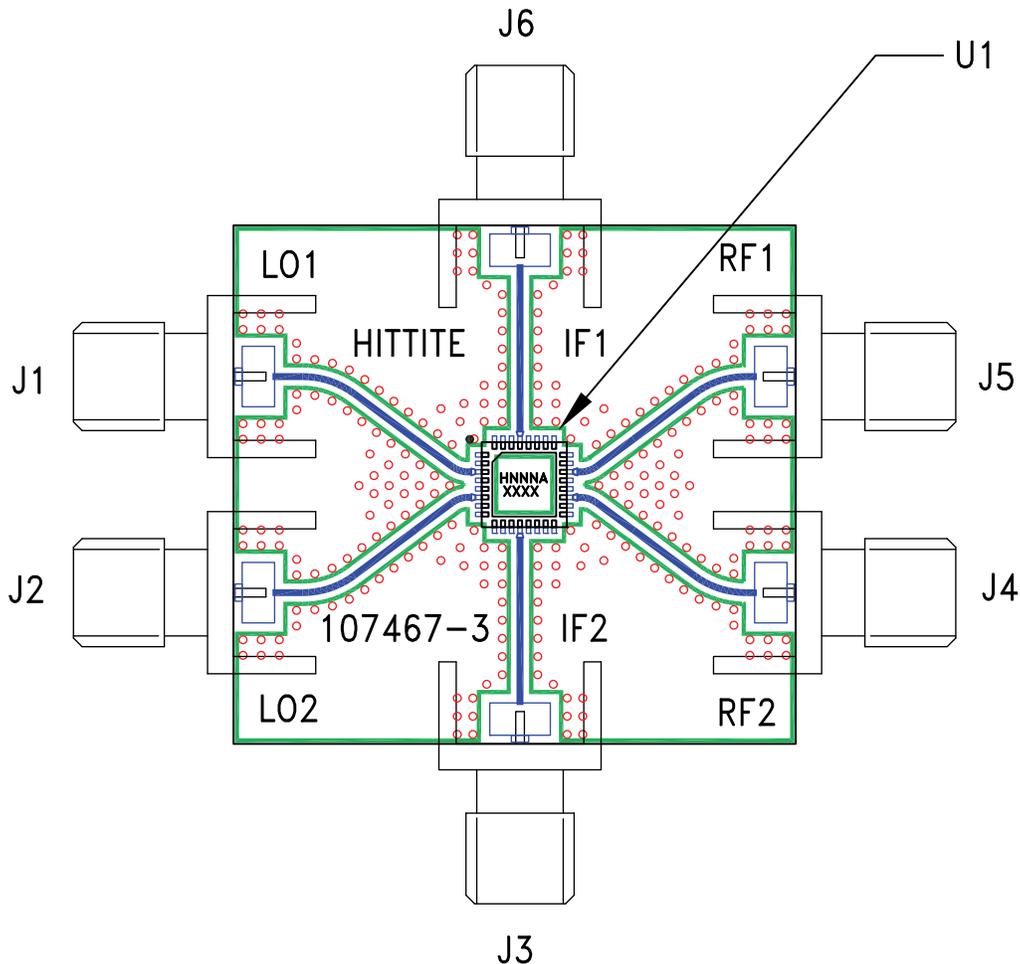


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Evaluation PCB



List of Materials for Evaluation PCB 107482 [1]

| Item | Description |
|---------|----------------------------|
| J1 - J6 | PCB Mount SMA RF Connector |
| U1 | HMC340ALP5(E) Dual Mixer |
| PCB [2] | 107467 Evaluation Board |

[1] Reference this number when ordering complete evaluation PCB

[2] Circuit Board Material: Rogers 4350

The circuit board used in the 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.