



v02.0108

# HMC340LP5 / 340LP5E

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

### Typical Applications

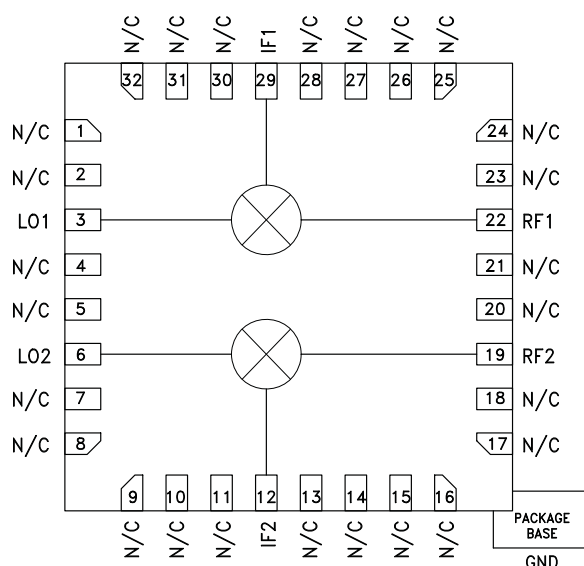
The HMC340LP5 / HMC340LP5E Dual Mixer is ideal for:

- 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: 25mm<sup>2</sup>

### Functional Diagram



### General Description

The HMC340LP5(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 HMC340LP5(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<br>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   |

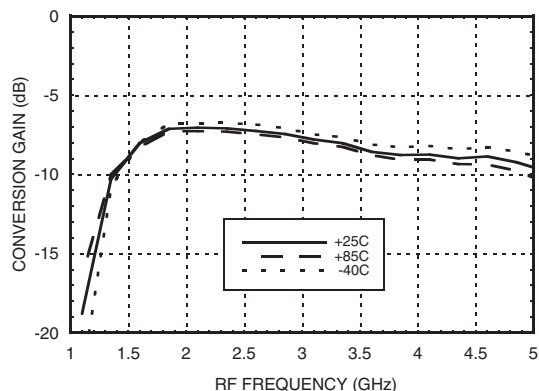
\* Unless otherwise noted, all measurements performed as single channel downconverter.

For price, delivery, and to place orders, please contact Hittite Microwave Corporation:  
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 Order On-line at [www.hittite.com](http://www.hittite.com)

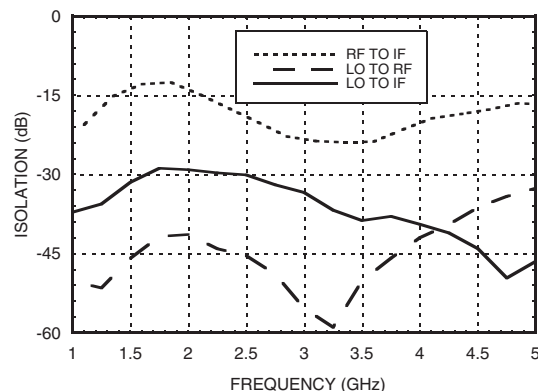
## HMC340LP5 / 340LP4E

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

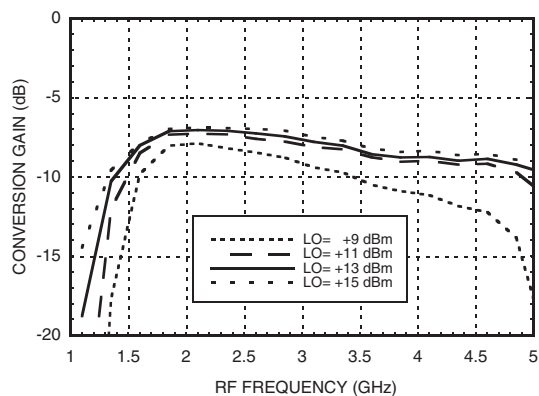
**Single Channel: Conversion Gain  
vs. Temperature @ LO = +13 dBm**



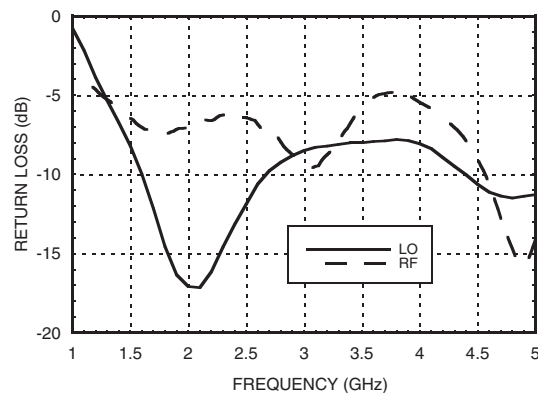
**Single Channel:  
Isolation @ LO = +13 dBm**



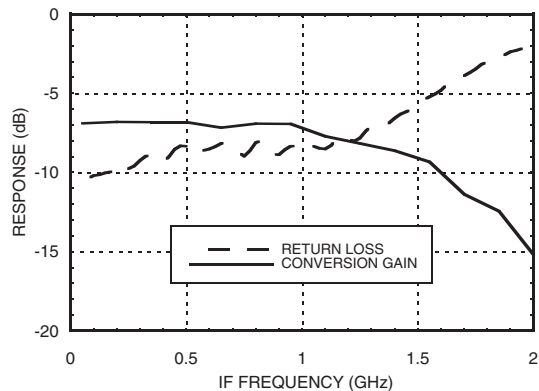
**Single Channel:  
Conversion Gain vs. LO Drive**



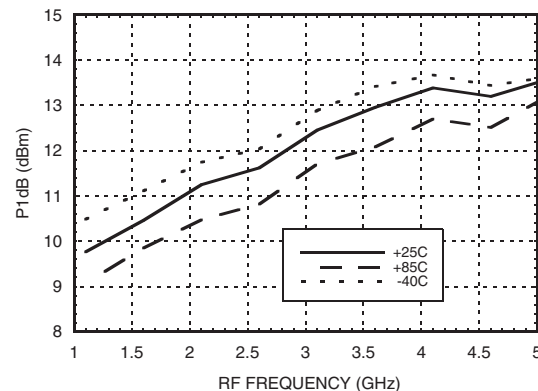
**Single Channel:  
Return Loss @ LO = +13 dBm**



**Single Channel:  
IF Bandwidth @ LO = +13 dBm**



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





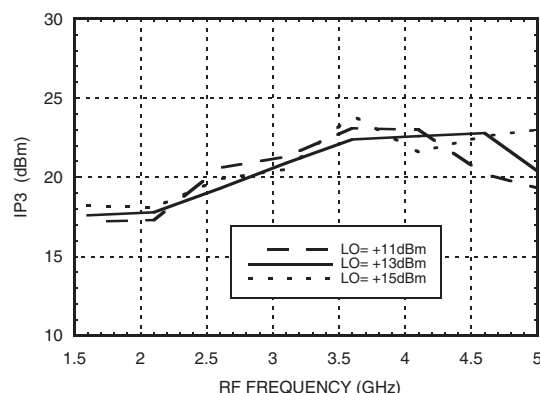
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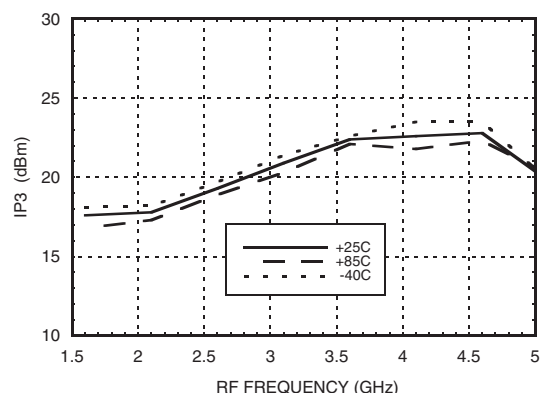
# HMC340LP5 / 340LP4E

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

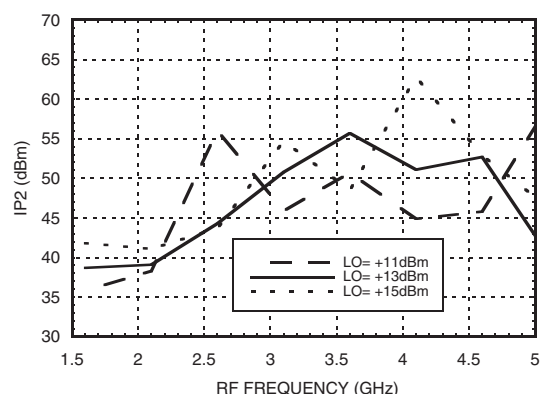
**Single Channel:  
Input IP3 vs. LO Drive**



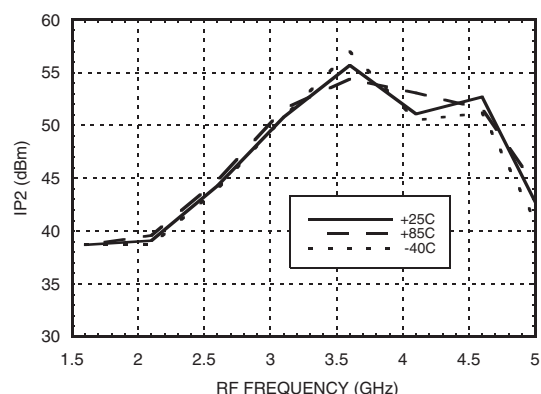
**Single Channel: Input IP3  
vs. Temperature @ LO = +13 dBm**



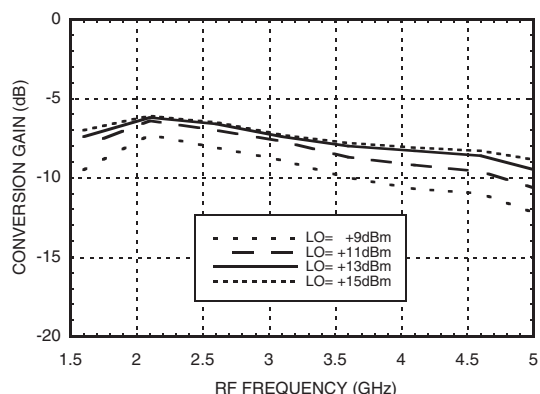
**Single Channel:  
Input IP2 vs. LO Drive**



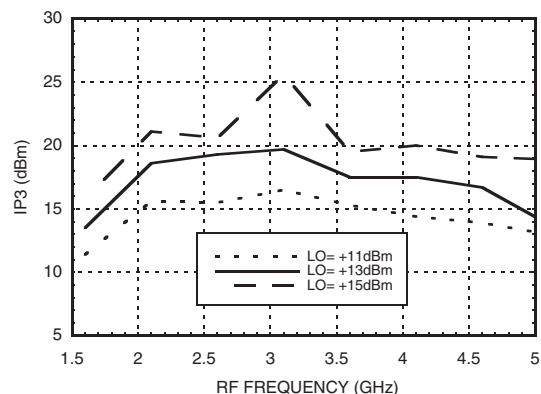
**Single Channel: Input IP2  
vs. Temperature @ LO = +13 dBm**



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



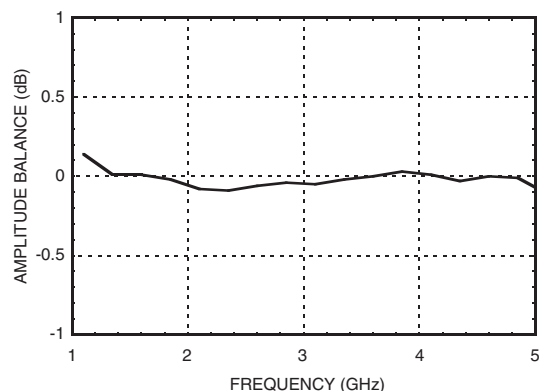
**Single Channel:  
Upconverter IP3 vs. LO Drive**



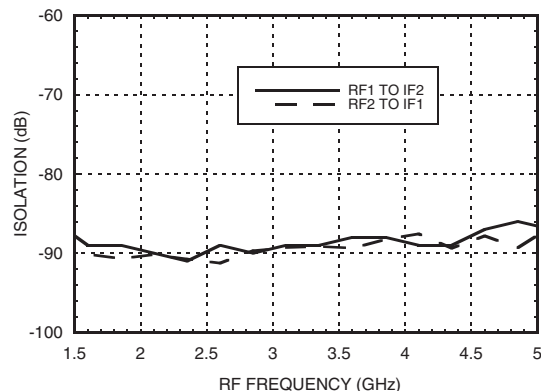
## HMC340LP5 / 340LP4E

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

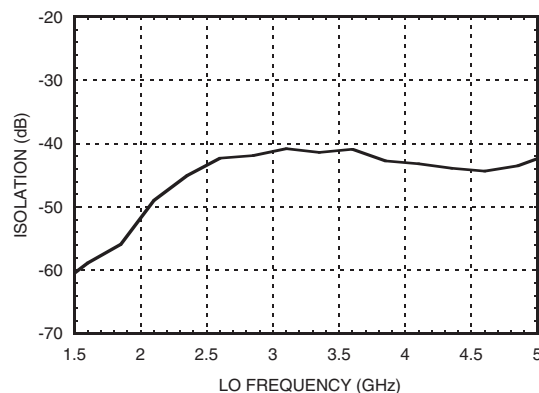
**Dual Channel:**  
**Conversion Gain Amplitude Balance**



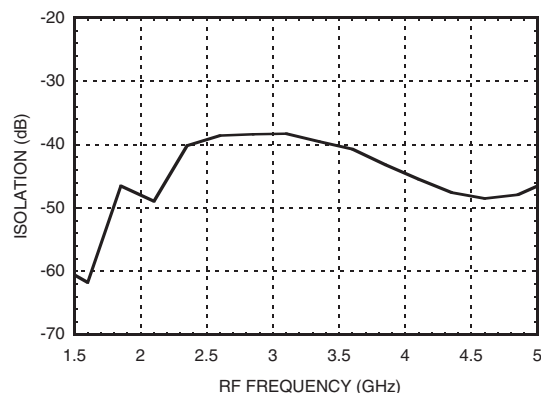
**Dual Channel:**  
**Channel to Channel Isolation**



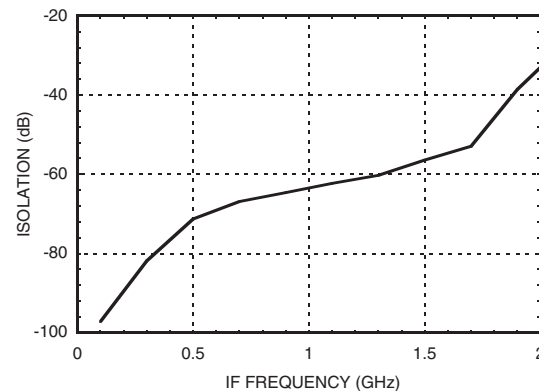
**Dual Channel:**  
**LO1 to LO2 Isolation**



**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            | 46                  | 33 | 66 | 58 |
| 2.0            | 41                  | 28 | 53 | 64 |
| 2.5            | 46                  | 29 | 47 | 69 |
| 3.0            | 55                  | 36 | 57 | 76 |
| 3.5            | 50                  | 44 | 57 | 74 |
| 4.0            | 43                  | 48 | 57 | 65 |
| 4.5            | 37                  | 54 | 64 | 78 |
| 5.0            | 33                  | 53 | 69 | 81 |

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

# HMC340LP5 / 340LP4E

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

### Absolute Maximum Ratings

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

### MxN Spurious Outputs

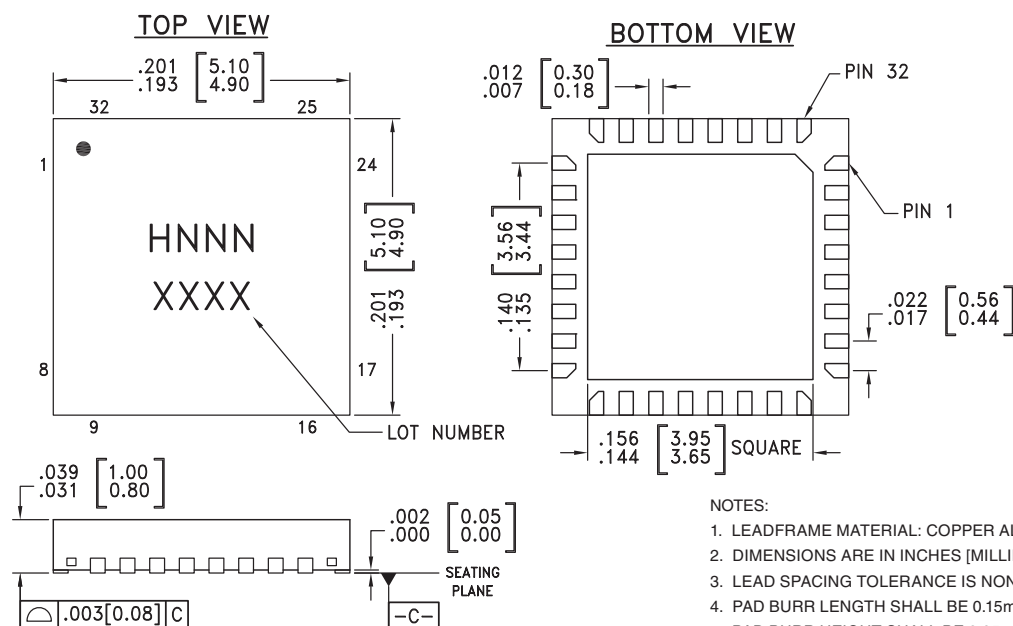
|     | nLO |    |    |    |    |
|-----|-----|----|----|----|----|
| mRF | 0   | 1  | 2  | 3  | 4  |
| 0   | xx  | 8  | 22 | 22 | 39 |
| 1   | 15  | 0  | 47 | 42 | 39 |
| 2   | 75  | 68 | 75 | 69 | 71 |
| 3   | 76  | 76 | 77 | 73 | 77 |
| 4   | 76  | 77 | 76 | 76 | 76 |

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 <sup>[3]</sup> |
|-------------|----------------------------------------------------|---------------|---------------------|--------------------------------|
| HMC340LP5   | Low Stress Injection Molded Plastic                | Sn/Pb Solder  | MSL1 <sup>[1]</sup> | H340<br>XXXX                   |
| HMC340LP5E  | RoHS-compliant Low Stress Injection Molded Plastic | 100% matte Sn | MSL1 <sup>[2]</sup> | H340<br>XXXX                   |

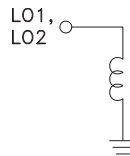
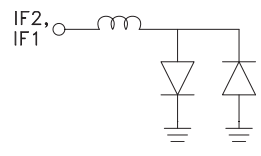
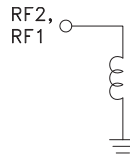
[1] Max peak reflow temperature of 235 °C

[2] Max peak reflow temperature of 260 °C

[3] 4-Digit lot number XXXX

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### Pin Descriptions

| Pin Number                                          | Function | Description                                                                                                                                                                                                                                                                                                                                                      | Interface Schematic                                                                   |
|-----------------------------------------------------|----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| 1, 2, 4, 5, 7-11,<br>13-18, 20, 21,<br>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.                                                                                                                                                                                                                                                                                                                  |  |

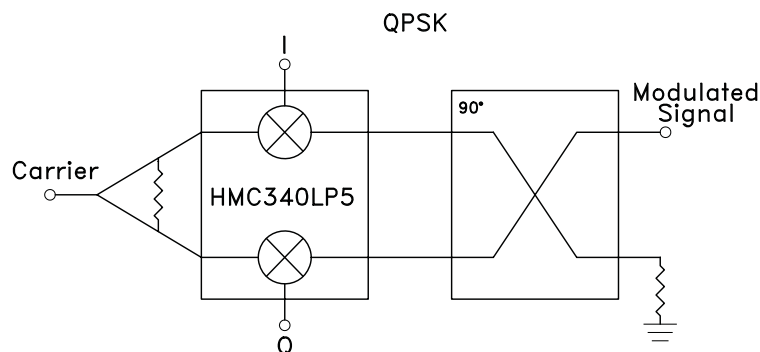


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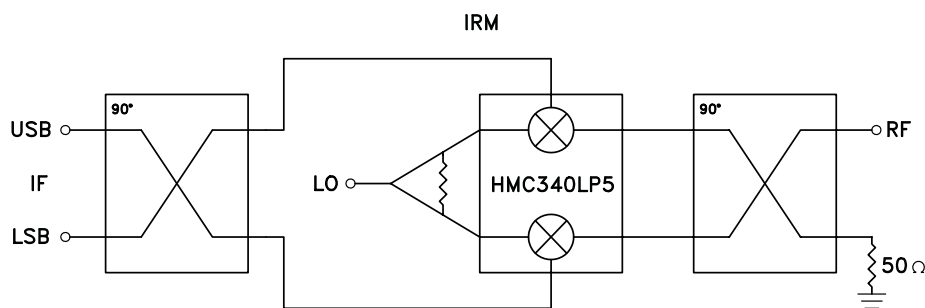
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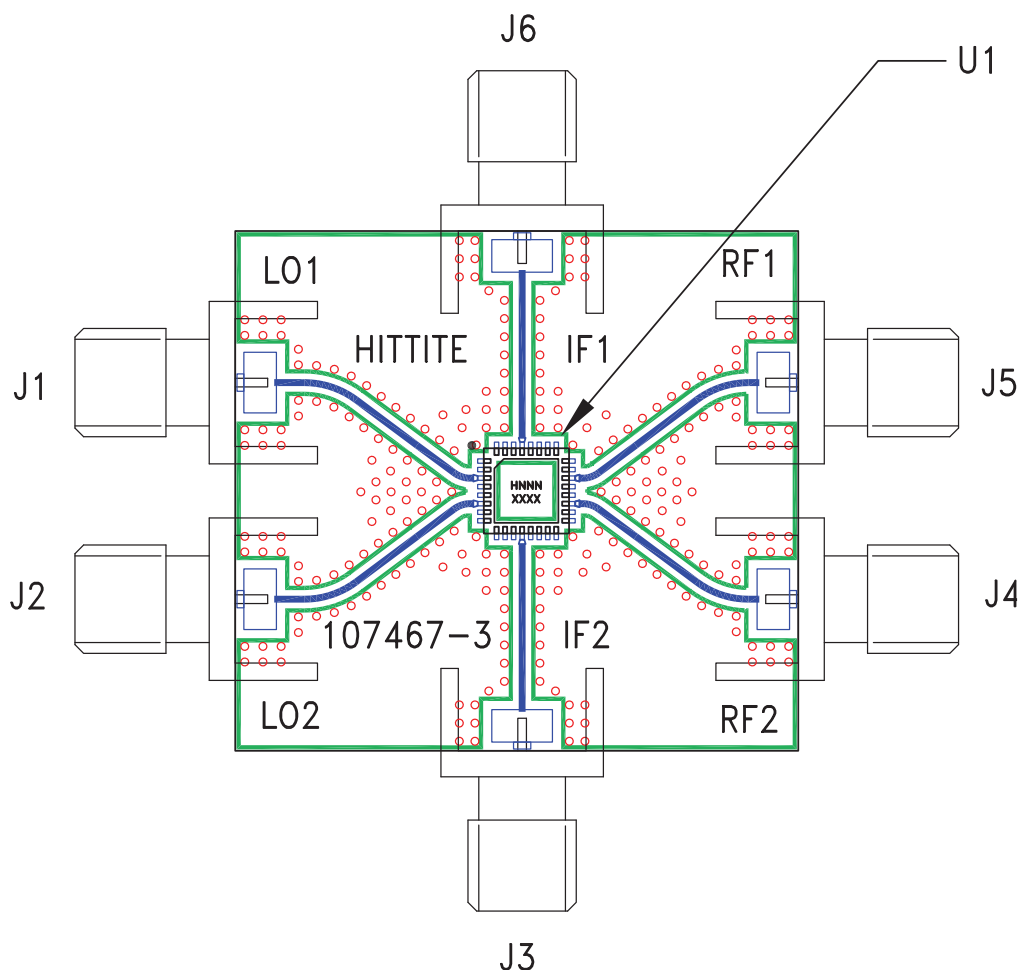
### Application Circuit for use as an I/Q Modulator



### Application Circuit for use as an IRM Mixer



### Evaluation PCB



### List of Materials for Evaluation PCB 107482 <sup>[1]</sup>

| Item    | Description                       |
|---------|-----------------------------------|
| J1 - J6 | PCB Mount SMA RF Connector        |
| U1      | HMC340LP5 / HMC340LP5E 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 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.