

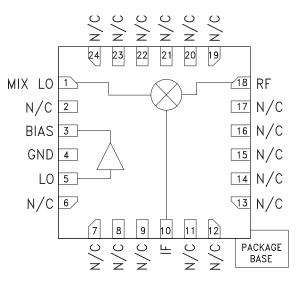


Typical Applications

The HMC552LP4 / HMC552LP4E is ideal for Wireless Infrastructure Applications:

- PCS / 3G Infrastructure
- Base Stations & Repeaters
- WiMAX & WiBro
- ISM & Fixed Wireless

Functional Diagram



HMC552LP4 / 552LP4E

GaAs MMIC MIXER w/ INTEGRATED LO AMPLIFIER, 1.6 - 3.0 GHz

Features

Input IP3: +25 dBm Low Input LO Drive: -4 to +4 dBm LO to RF Isolation: 30 dB Low Conversion Loss: 8 dB Single Positive Supply: +5V @ 62 mA RoHS Compliant 4x4 mm QFN Package

General Description

The HMC552LP4 & HMC552LP4E are high linearity, double-balanced converter ICs that operate from 1.6 to 3.0 GHz and deliver a +25 dBm input third order intercept point. The LO amplifier output and high dynamic range mixer input are positioned so that an external LO filter can be placed in series between them. The converter provides 30 dB of LO to RF isolation and is ideal for upconverter and downconverter applications. The IC operates from a single +5V supply consuming 62 mA of current and accepts a LO drive level of -4 to +4 dBm. The design requires no external baluns and supports IF frequencies between DC and 1 GHz. The HMC552LP4 & HMC552LP4E are pin for pin compatible with the HMC551LP4 & HMC551LP4E, which operate from 0.8 to 1.2 GHz.

Electrical Specifications, $T_{a} = +25^{\circ}$ C, LO = 0 dBm, Vcc = +5V, IF = 100 MHz*

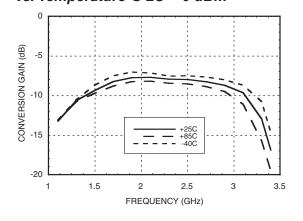
| Parameter | Min. | Тур. | Max. | Units |
|--------------------------------|----------|-----------|------|-------|
| Frequency Range, RF, LO | | 1.6 - 3.0 | | GHz |
| Frequency Range, IF | | DC - 1.0 | | GHz |
| Conversion Loss | | 8 | 10 | dB |
| Noise Figure (SSB) | | 8 | | dB |
| LO to RF Isolation | 25 | 30 | | dB |
| LO to IF Isolation | 10 | 20 | | dB |
| IP3 (Input) | | 25 | | dBm |
| 1 dB Compression (Input) | | 16 | | dBm |
| LO Drive Input Level (Typical) | -4 to +4 | | dBm | |
| Supply Current (Icc) | | 62 | | mA |

*Unless otherwise noted, all measurements performed as a downconverter configured as shown in application circuit.

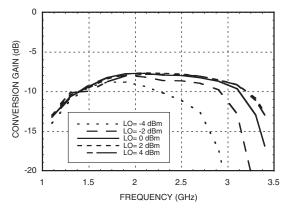




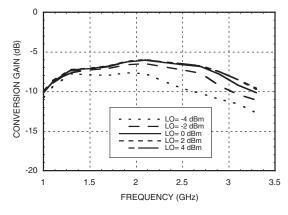
Conversion Gain vs. Temperature @ LO = 0 dBm



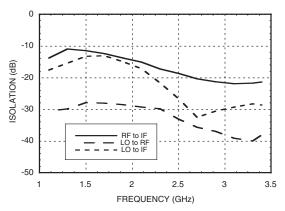
Conversion Gain vs. LO Drive



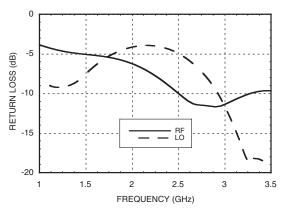
Upconverter Performance Conversion Gain vs. LO Drive



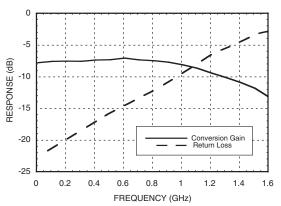
Isolation @ LO = 0 dBm



Return Loss @ LO = 0 dBm



IF Bandwidth @ LO = 0 dBm





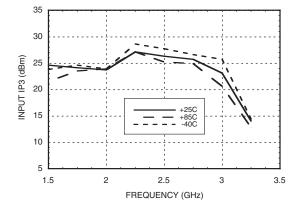
HMC552LP4 / 552LP4E

LO AMPLIFIER, 1.6 - 3.0 GHz

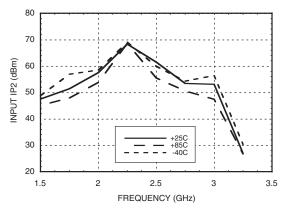
GaAs MMIC MIXER w/ INTEGRATED

RoHS EARTH FRIENDL

Input IP3 vs. Temperature @ LO = 0 dBm



Input IP2 vs. Temperature @ LO = 0 dBm



LO= -4 dBm LO= -2 dBm LO= 0 dBm

 $LO = 4 \, dBm$

2.5

FREQUENCY (GHz)

3

3.5

LO= 2 dBm

2

Input IP3 vs. LO Drive

35

30

25

20

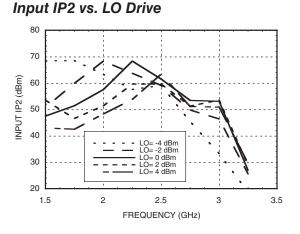
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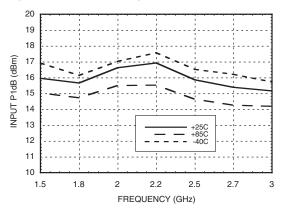
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1.5

INPUT IP3 (dBm)



Input P1dB vs. Temperature @ LO = 0 dBm



For price, delivery, and to place orders, please contact Hittite Microwave Corporation: 20 Alpha Road, Chelmsford, MA 01824 Phone: 978-250-3343 Fax: 978-250-3373 Order On-line at www.hittite.com

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HMC552LP4 / 552LP4E



GaAs MMIC MIXER w/ INTEGRATED LO AMPLIFIER, 1.6 - 3.0 GHz

MxN Spurious @ IF Port

| | nLO | | | | | |
|--|---------------------|-----|----|----|----|--|
| mRF | 0 | 1 | 2 | 3 | 4 | |
| 0 | xx | -3 | 16 | 16 | 25 | |
| 1 | 7 | 0 | 23 | 44 | 53 | |
| 2 | 79 | 66 | 61 | 61 | 98 | |
| 3 | 102 | 105 | 93 | 94 | 84 | |
| 4 | 103 107 107 102 103 | | | | | |
| RF Freq. = 1.9 GHz @ -10 dBm LO Freq. = 1.8 GHz @ 0 dBm | | | | | | |

All values in dBc relative to the IF power level.

Harmonics of LO

| | nLO Spur @ RF Port | | | |
|---|--------------------|----|----|----|
| LO Freq. (GHz) | 1 | 2 | 3 | 4 |
| 1.5 | 27 | 17 | 31 | 32 |
| 1.8 | 28 16 40 44 | | | |
| 2.1 | 28 | 18 | 31 | 47 |
| 2.4 34 | | 21 | 33 | 41 |
| 2.7 | 36 28 42 46 | | | |
| 3.0 41 27 48 54 | | | | |
| LO = 0 dBm All values in dBc below input LO level measured at RF port. | | | | |

Typical Supply Current

| Vcc | Icc (mA) |
|------|----------|
| +5.0 | 62 mA |





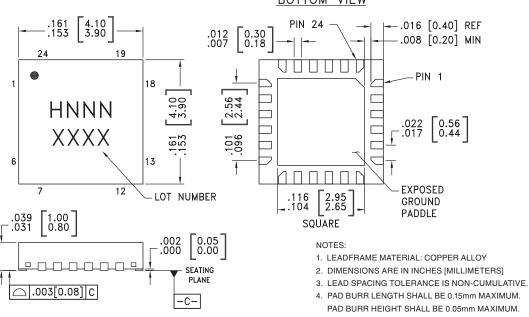


Absolute Maximum Ratings

| RF / IF Input (Vcc= +5V) | +31 dBm |
|--|---------------|
| LO Drive (Vcc= +5V) | +10 dBm |
| BIAS | +7 Vdc |
| Junction Temperature | 150°C |
| Continuous Pdiss (T = 85°C) (derate 9.5 mW/°C above 85°C) | 0.6 W |
| Thermal Resistance (junction to ground paddle) | 105.6 °C/W |
| Storage Temperature | -65 to +150°C |
| Operating Temperature | -40 to +85°C |



Outline Drawing



BOTTOM VIEW

- 5. PACKAGE WARP SHALL NOT EXCEED 0.05mm.
- 6. ALL GROUND LEADS AND GROUND PADDLE MUST BE SOLDERED TO PCB RF GROUND.
- 7. REFER TO HITTITE APPLICATION NOTE FOR SUGGESTED LAND PATTERN.

Package Information

| Part Number | Package Body Material | Lead Finish | MSL Rating | Package Marking [3] |
|-------------|--|---------------|---------------------|---------------------|
| HMC552LP4 | Low Stress Injection Molded Plastic | Sn/Pb Solder | MSL1 ^[1] | H552 XXXX |
| HMC552LP4E | RoHS-compliant Low Stress Injection Molded Plastic | 100% matte Sn | MSL1 ^[2] | <u>H552</u> XXXX |

[1] Max peak reflow temperature of 235 °C

[2] Max peak reflow temperature of 260 °C

[3] 4-Digit lot number XXXX



HMC552LP4 / 552LP4E

GaAs MMIC MIXER w/ INTEGRATED LO AMPLIFIER, 1.6 - 3.0 GHz



Pin Descriptions

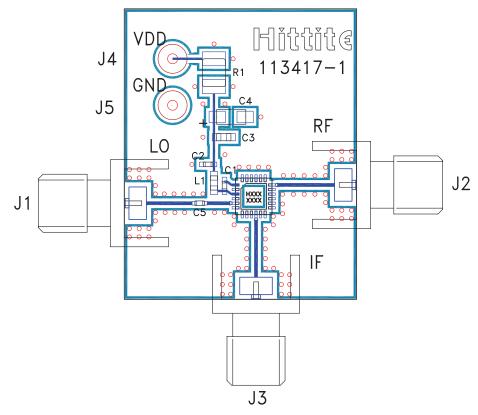
| Pin Number | Function | Description | Interface Schematic |
|-------------------------------|----------|--|---------------------|
| 1 | MIX LO | This pin is DC coupled and matched to 50 Ohms from 1.6 to 3.0 GHz. An off chip DC blocking capacitor is required. | MIX LOO |
| 2, 6 - 9, 11 - 17, 19 - 24 | N/C | No connection. These pins may be connected to RF ground. Performance will not be affected. | |
| 3 | BIAS | Power supply for the second stage LO amplifier. Three external bypass capacitors are recommended for optimum performance, as illustrated in the application circuit. | BIASO |
| 4 | GND | Backside of package has exposed metal ground paddle that must also be connected to ground. | |
| 5 | LO | This pin is DC coupled and matched to 50 Ohms from 1.6 to 3.0 GHz. An off chip DC blocking capacitor is required. | |
| 10 | IF | This pin is DC coupled. For applications not requiring operation to DC, this port should be DC blocked exter- nally 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 18 mA of current or die non-function and possible die failure will result. | |
| 18 | RF | This pin is DC coupled and matched to 50 Ohms from 1.6 to 3.0 GHz. | RF O |







Evaluation PCB



List of Materials for Evaluation PCB 113722 ^[1]

| Item | Description |
|------------|-------------------------------------|
| J1 - J3 | PCB Mount SMA RF Connector |
| J4, J5 | DC Pin |
| C1, C2, C5 | 100 pF Chip Capacitor, 0402 Pkg. |
| C3 | 1000 pF Chip Capacitor, 0603 Pkg. |
| C4 | 2.2 µF Capacitor, Tantalum |
| L1 | 18 nH Chip Inductor, 0603 Pkg. |
| R1 | 18 Ohm Resistor, 1210 1/8 watt Pkg. |
| U1 | HMC552LP4 / HMC552LP4E |
| PCB [2] | 113417 Evaluation Board |

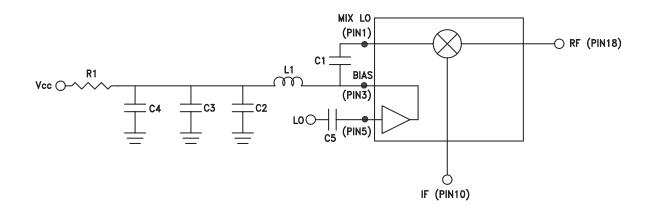
Reference this number when ordering complete evaluation PCB
Circuit Board Material: Rogers 4350

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.





Application Circuit



| Recommended Components Values (IF = DC - 300 MHz) | | |
|---|---------|--|
| C3 | 1000 pF | |
| C4 | 2.2 μF | |
| C1, C2, C5 | 100 pF | |
| L1 18 nH | | |
| R1 18 Ohm | | |