

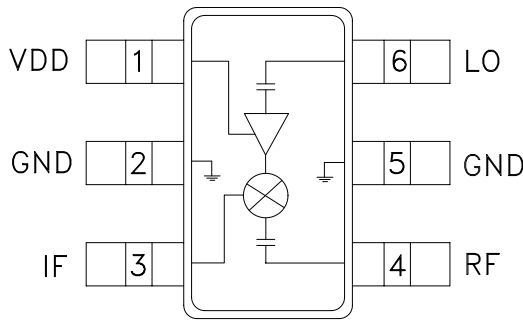
GaAs MMIC MIXER w/ INTEGRATED LO AMPLIFIER, 2.0 - 2.8 GHz

Typical Applications

The HMC332 is ideal for:

- MMDS
- PCMCIA
- WirelessLAN
- WCDMA micro-BTS

Functional Diagram



Features

- Integrated LO Amplifier w/ Pdiss: < 20 mW
- Conversion Loss / Noise Figure: 8.0 dB
- Low LO Drive Level: 0 dBm
- Input IP3: +10 dBm
- Single Positive Supply: 3V to 5V

General Description

The HMC332 is a single balanced mixer IC with an integrated LO amplifier. This converter IC can operate as an upconverter or downconverter between 2.0 GHz and 2.8 GHz. With the integrated LO amplifier, the mixer requires an LO drive level of only 0 dBm, and requires only 6 mA from a single positive +3V rail. The mixer has 8 dB of conversion loss, an input P1dB of 0 dBm, and an input third order intercept point of +10 dBm.

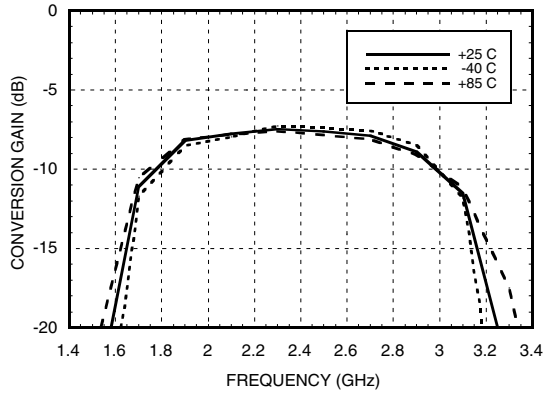
Electrical Specifications, $T_A = +25^\circ C$

| Parameter | IF = 100 MHz LO = 0 dBm & Vdd = +3V | | | Units |
|--------------------------|----------------------------------------|------|------|-------|
| | Min. | Typ. | Max. | |
| Frequency Range, RF & LO | 2.0 - 2.8 | | | GHz |
| Frequency Range, IF | DC - 1.0 | | | GHz |
| Conversion Loss | | 8 | 10 | dB |
| Noise Figure (SSB) | | 8 | 10 | dB |
| LO to RF Isolation | 11 | 20 | | dB |
| LO to IF Isolation | 2 | 5 | | dB |
| RF to IF Isolation | 11 | 17 | | dB |
| IP3 (Input) | 4 | 10 | | dBm |
| 1 dB Compression (Input) | -4 | 0 | | dBm |
| Supply Current (Idd) | | 6 | | mA |

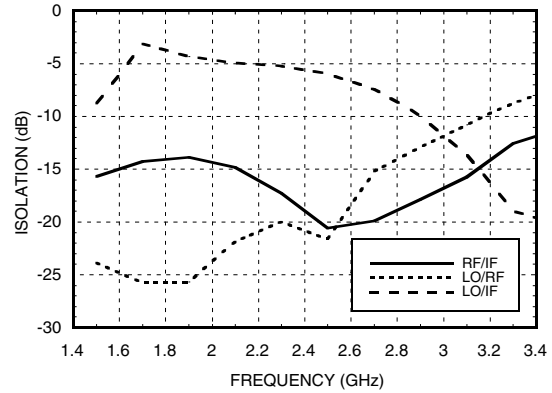
* Unless otherwise noted, all measurements performed as downconverter, IF= 100 MHz.

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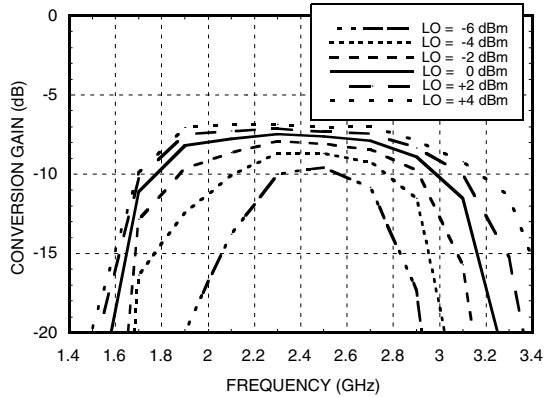
Conversion Gain vs. Temperature @ LO = 0 dBm



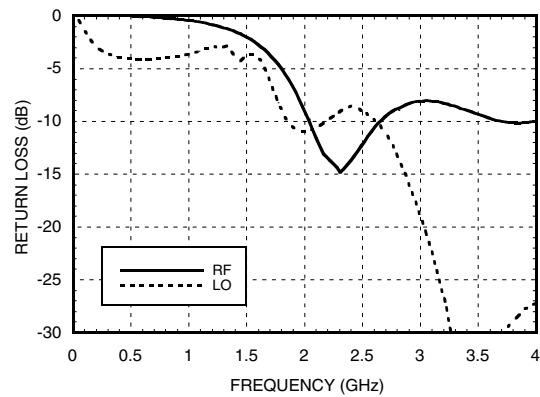
Isolation @ LO = 0 dBm



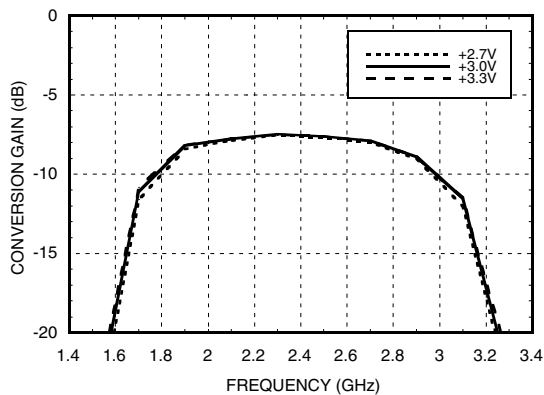
Conversion Gain vs. LO Drive



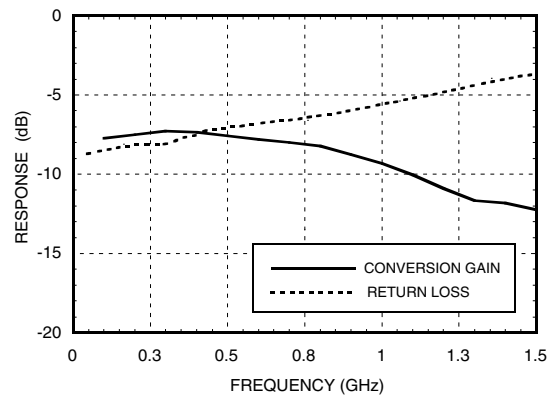
Return Loss @ LO = 0 dBm



Conversion Gain vs. Vdd @ LO = 0 dBm

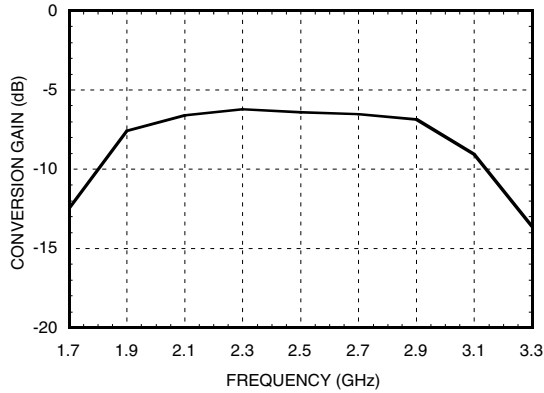


IF Bandwidth @ LO = 0 dBm

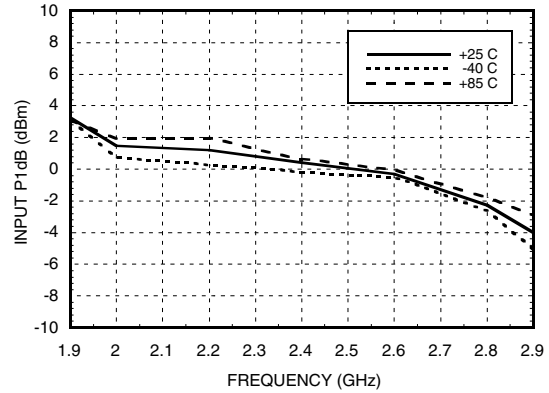


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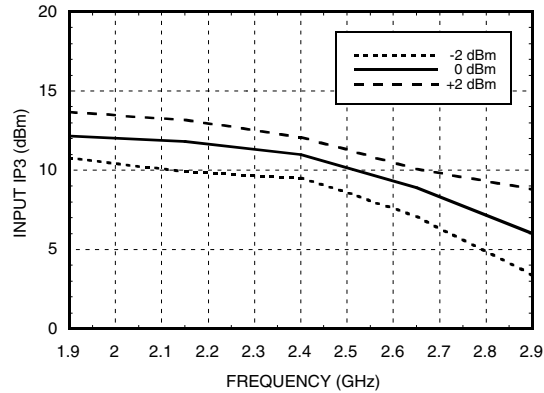
**Upconverter Performance
Conversion Gain @ LO = 0 dBm**



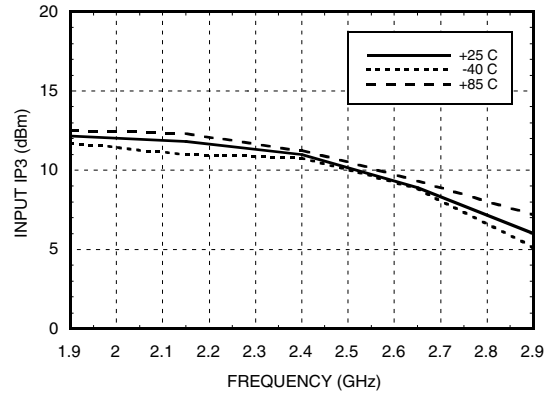
**Input P1dB vs.
Temperature @ LO = 0 dBm**



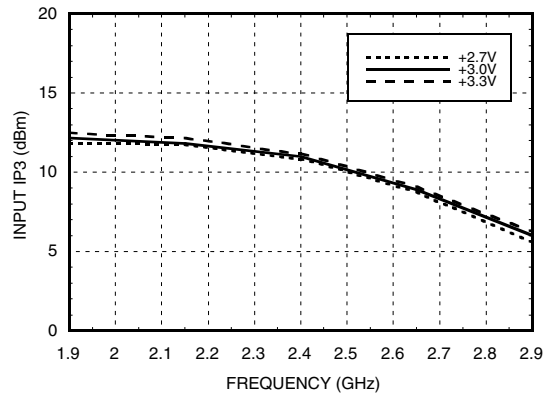
Input IP3 vs. LO Drive*



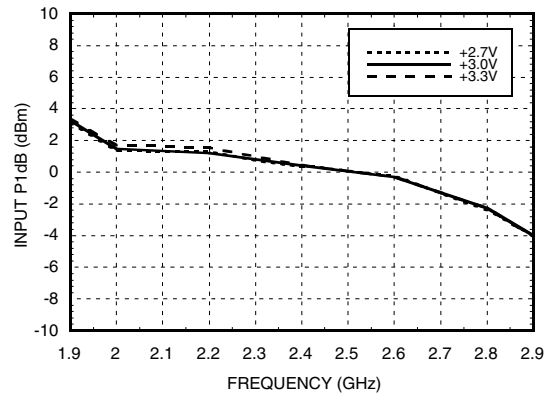
**Input IP3 vs.
Temperature @ LO = 0 dBm***



Input IP3 vs. Vdd @ LO = 0 dBm*



Input P1dB vs. Vdd @ LO = 0 dBm



* Two-tone input power = -10 dBm each tone, 1 MHz spacing.

GaAs MMIC MIXER w/ INTEGRATED LO AMPLIFIER, 2.0 - 2.8 GHz

MxN Spurious @ IF Port

| mRF | nLO | | | | |
|-----|-----|-----|-----|----|----|
| | 0 | 1 | 2 | 3 | 4 |
| 0 | xx | -11 | 8 | 8 | 43 |
| 1 | 12 | 0 | 31 | 34 | 48 |
| 2 | 41 | 35 | 39 | 32 | 45 |
| 3 | >74 | 64 | >74 | 50 | 67 |
| 4 | >74 | >74 | >74 | 71 | 67 |

RF = 2.5 GHz @ -10 dBm
 LO = 2.4 GHz @ 0 dBm
 All values in dBc below IF power level.

Harmonics of LO

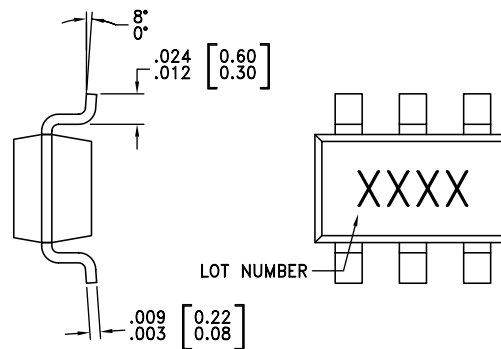
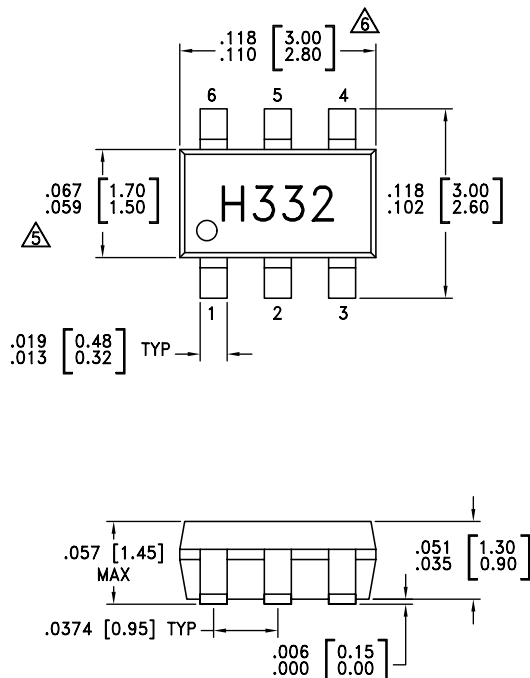
| LO Freq. (GHz) | nLO Spur @ RF Port | | | |
|----------------|--------------------|----|----|----|
| | 1 | 2 | 3 | 4 |
| 2 | 24 | 6 | 19 | 32 |
| 2.2 | 20 | 7 | 18 | 44 |
| 2.4 | 20 | 9 | 22 | 43 |
| 2.6 | 19 | 13 | 18 | 40 |
| 2.8 | 14 | 18 | 21 | 38 |
| 3 | 11 | 15 | 24 | 39 |

LO = 0 dBm
 All values in dBc below input LO level @ RF port.



Absolute Maximum Ratings

| | |
|------------------------------------------------------------------|----------------|
| RF / IF Input (Vdd = +3V) | +13 dBm |
| LO Drive (Vdd = +3V) | +13 dBm |
| Vdd | 5.5V |
| Continuous Pdiss (Ta = 85 °C) (derate 2.64 mW/°C above 85 °C) | 238 mW |
| IF DC Current | ±3 mA |
| Storage Temperature | -65 to +150 °C |
| Operating Temperature | -40 to +85 °C |

Outline Drawing



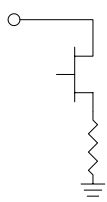

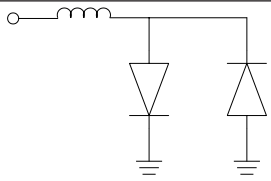
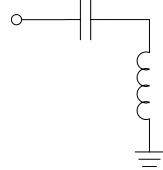
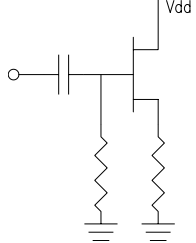
NOTES:

- PACKAGE BODY MATERIAL: LOW STRESS INJECTION MOLDED PLASTIC SILICA AND SILICON IMPREGNATED.
- LEADFRAME MATERIAL: COPPER ALLOY
- LEADFRAME PLATING: Sn/Pb SOLDER
- DIMENSIONS ARE IN INCHES [MILLIMETERS].
-  DIMENSION DOES NOT INCLUDE MOLDFLASH OF 0.15mm PER SIDE.
-  DIMENSION DOES NOT INCLUDE MOLDFLASH OF 0.25mm PER SIDE.
- ALL GROUND LEADS MUST BE SOLDERED TO PCB RF GROUND.

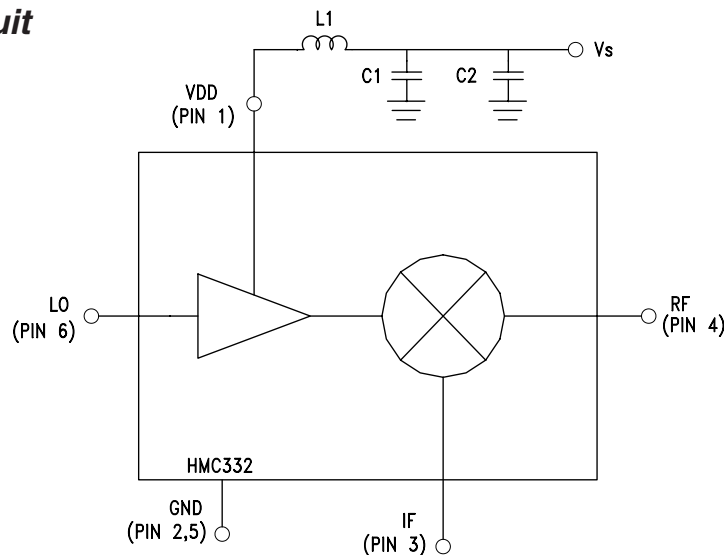
For price, delivery, and to place orders, please contact Hittite Microwave Corporation:
 12 Elizabeth Drive, Chelmsford, MA 01824 Phone: 978-250-3343 Fax: 978-250-3373
 Order Online at www.hittite.com

GaAs MMIC MIXER w/ INTEGRATED LO AMPLIFIER, 2.0 - 2.8 GHz

Pin Descriptions

| Pin Number | Function | Description | Interface Schematic |
|------------|----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| 1 | Vdd | Power supply for the LO Amplifier. Two external RF bypass capacitors (10 pF & 10,000 pF) and an external inductor (4.7 nH) are required. |  |
| 2, 5 | GND | Ground: Pin must connect to RF ground. |  |
| 3 | IF Port | 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 value have been chosen to pass the necessary IF frequency range. For operation to DC, this pin must not source/sink more than 3mA of current or die non-function and possible die failure will result. |  |
| 4 | RF Port | RF Port: This pin is AC coupled and matched to 50 Ohm from 2.0 - 2.8 GHz. |  |
| 6 | LO Port | LO Port: This pin is AC coupled and matched to 50 Ohm from 2.0 - 2.8 GHz. |  |

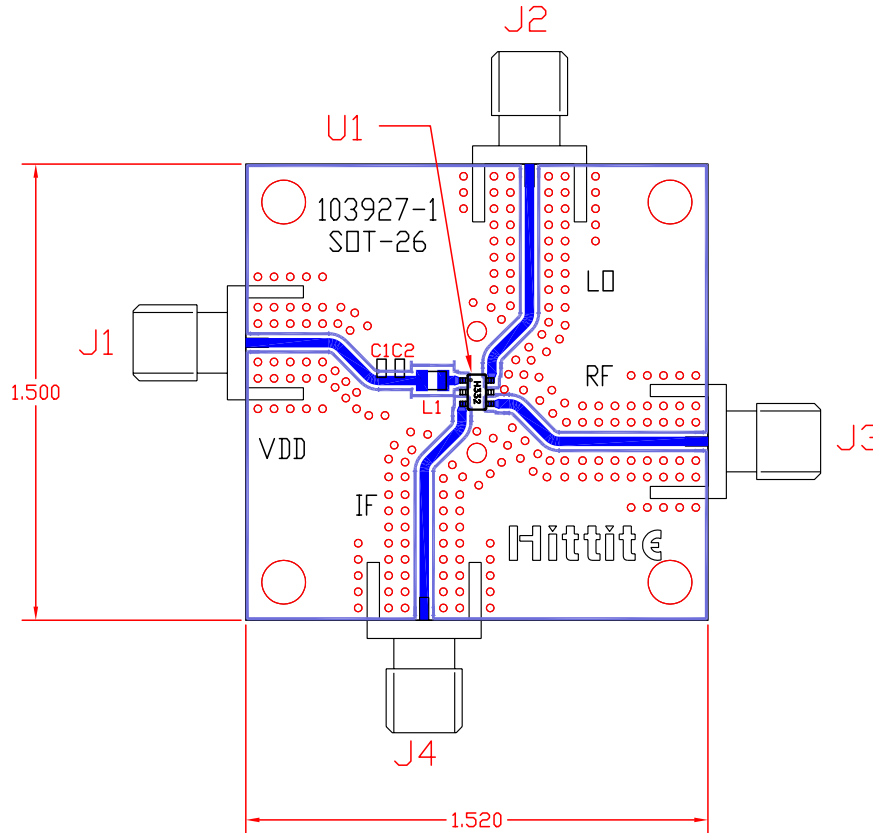
Application Circuit



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Evaluation PCB



List of Materials

| Item | Description |
|---------------------------------------|-----------------------------|
| J1 - J4 | PC Mount SMA RF Connector |
| C1 | 10 pF Capacitor, 0603 Pkg. |
| C2 | .01 μF Capacitor, 0603 Pkg. |
| L1 | 4.7 nH Inductor, 0805 Pkg. |
| U1 | HMC332 Mixer |
| PCB* | 103927 Evaluation Board |
| * 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 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.