



v00.0901

HMC333

GaAs MMIC MIXER w/ INTEGRATED LO AMPLIFIER, 3.0 - 3.8 GHz

Typical Applications

The HMC333 is ideal for:

- Wireless Local Loop

Features

Integrated LO Amplifier w/ P_{diss}: < 25 mW

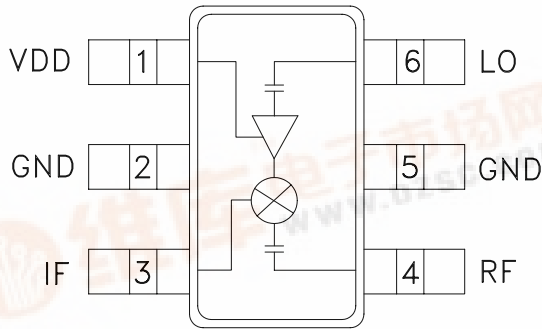
Conversion Loss / Noise Figure: 8.5 dB

Low LO Drive Level: 0 dBm

Input IP₃: +10 dBm

Single Positive Supply: 3V to 5V

Functional Diagram



General Description

The HMC333 is a single balanced mixer IC with an integrated LO amplifier. This converter IC can operate as an upconverter or downconverter between 3.0 GHz and 3.8 GHz. With the integrated LO amplifier, the mixer requires an LO drive level of only 0 dBm, and requires only 7 mA from a single positive +3V rail. The mixer has 8.5 dB of conversion loss, an input P_{1dB} of 0 dBm and an input third order intercept point of +10 dBm at 3.5 GHz.

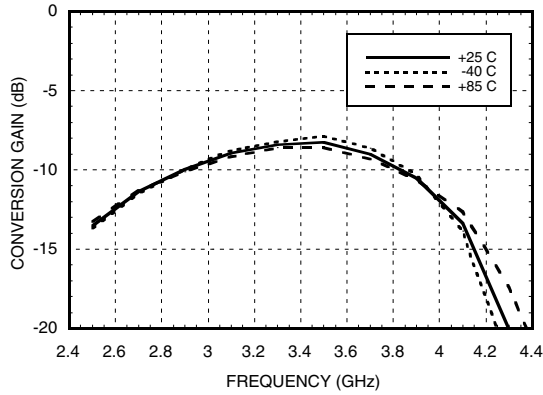
Electrical Specifications, T_A = +25° C

Parameter	IF = 100 MHz LO = 0 dBm & V _{dd} = +3V			Units
	Min.	Typ.	Max.	
Frequency Range, RF & LO	3.0 - 3.8			GHz
Frequency Range, IF	DC - 1.0			GHz
Conversion Loss		8.5	11	dB
Noise Figure (SSB)		8.5	11	dB
LO to RF Isolation	10	15		dB
LO to IF Isolation	5	10		dB
RF to IF Isolation	10	15		dB
IP ₃ (Input)	3	10		dBm
1 dB Compression (Input)	-3	+1		dBm
Supply Current (I _{dd})		7		mA

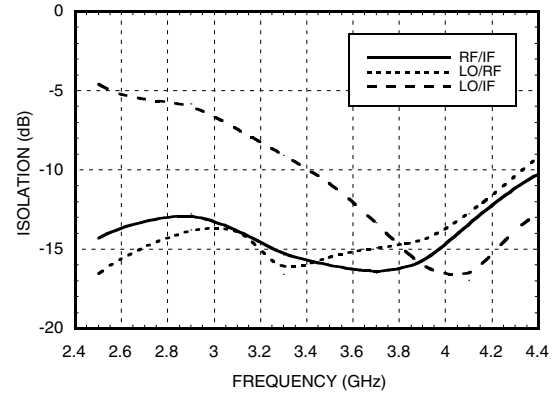
Unless otherwise noted, all measurements performed as downconverter, IF = 100 MHz.

GaAs MMIC MIXER w/ INTEGRATED LO AMPLIFIER, 3.0 - 3.8 GHz

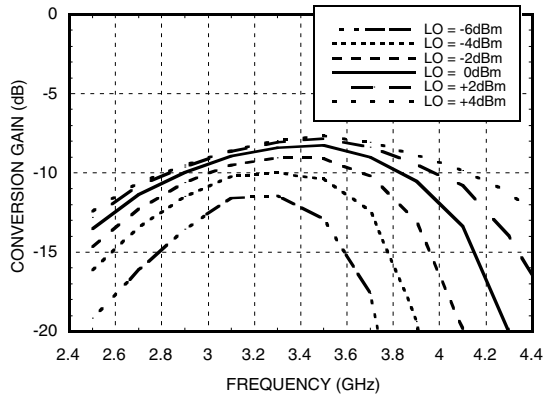
Conversion Gain vs. Temperature @ LO = 0 dBm



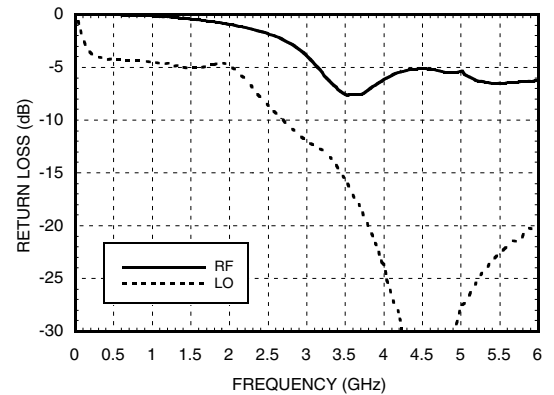
Isolation @ LO = 0 dBm



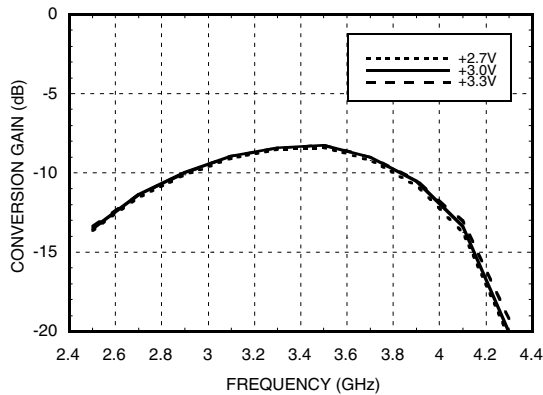
Conversion Gain vs. LO Drive



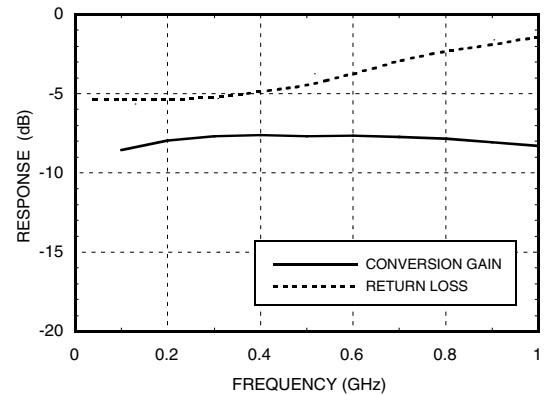
Return Loss @ LO = 0 dBm



Conversion Gain vs. Vdd @ LO = 0 dBm

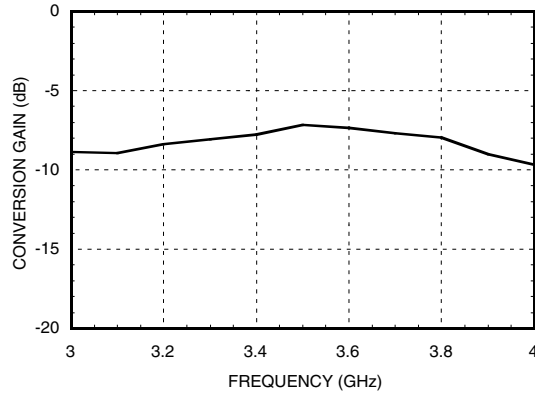


IF Bandwidth @ LO = 0 dBm

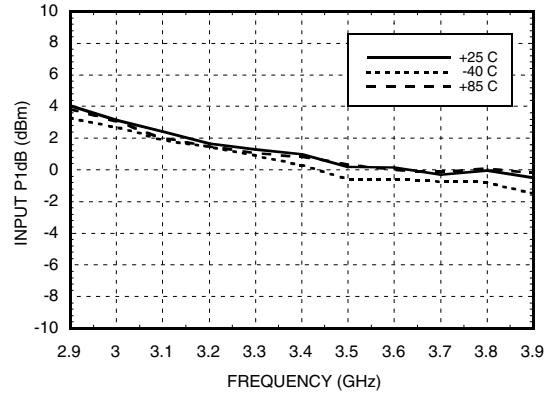


GaAs MMIC MIXER w/ INTEGRATED LO AMPLIFIER, 3.0 - 3.8 GHz

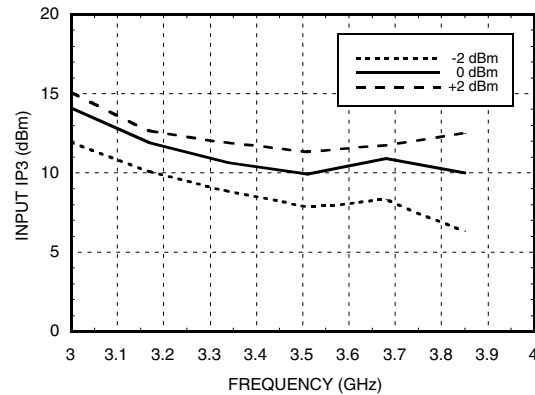
**Upconverter Performance
Conversion Gain @ LO = 0 dBm**



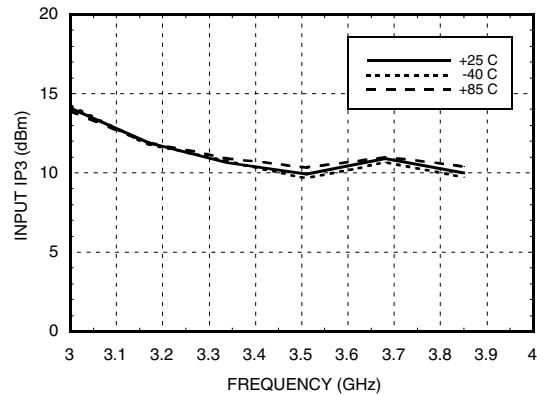
**Input P1dB vs.
Temperature @ LO = 0 dBm**



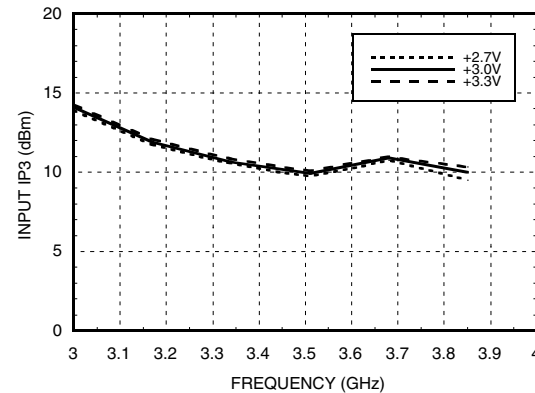
Input IP3 vs. LO Drive*



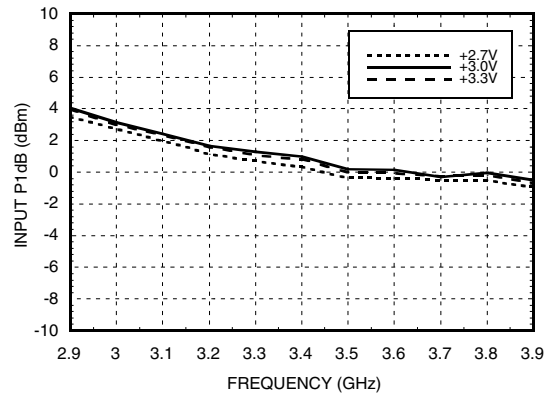
**Input IP3 vs.
Temperature @ LO = 0 dBm***



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, 3.0 - 3.8 GHz

MxN Spurious @ IF Port

mRF	nLO				
	0	1	2	3	4
0	xx	-9	-5	12	34
1	8	0	32	25	34
2	33	49	40	40	43
3	68	56	68	48	72
4	77	80	79	80	71

RF = 3.5 GHz @ -10 dBm
 LO = 3.4 GHz @ 0 dBm
 All values in dBc below IF power level.

Harmonics of LO

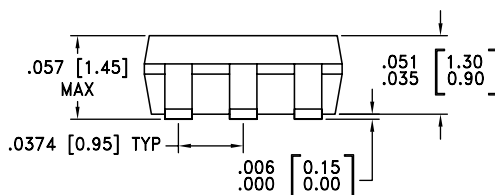
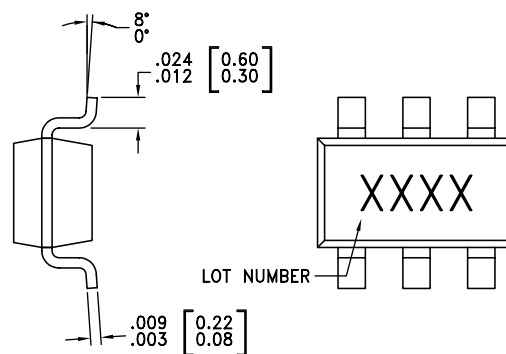
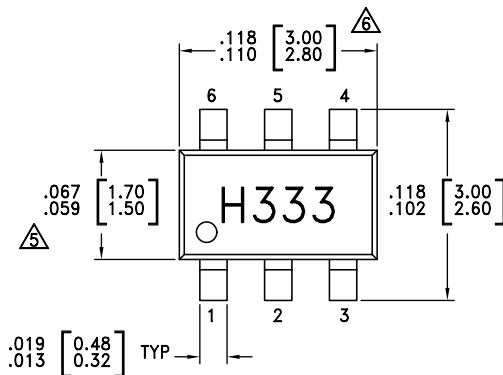
LO Freq. (GHz)	nLO Spur @ RF Port			
	1	2	3	4
3	12	8	16	49
3.17	13	8	20	39
3.34	17	10	22	42
3.51	15	14	26	48
3.68	14	17	25	42
3.85	14	18	22	43

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

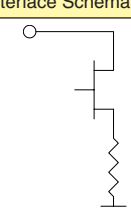
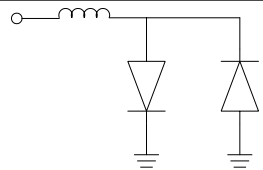
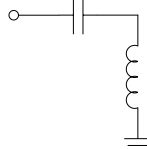
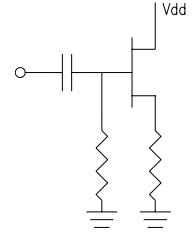


NOTES:

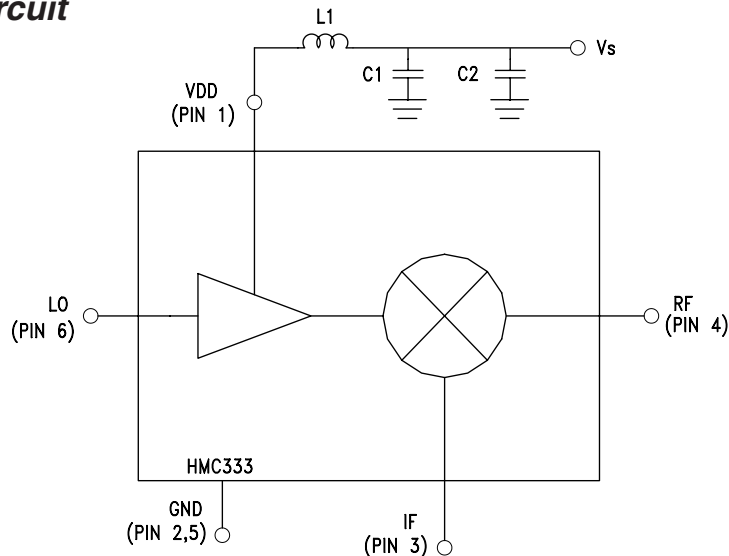
- PACKAGE BODY MATERIAL: LOW STRESS INJECTION MOLDED PLASTIC SILICA AND SILICON IMPREGNATED.
- LEADFRAME MATERIAL: COPPER ALLOY
- LEADFRAME PLATING: Sn/Pb SOLDER
- DIMENSIONS ARE IN INCHES [MILLIMETERS].
- DIMENSION DOES NOT INCLUDE MOLDFLASH OF 0.15mm PER SIDE.
- DIMENSION DOES NOT INCLUDE MOLDFLASH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

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Pin Descriptions

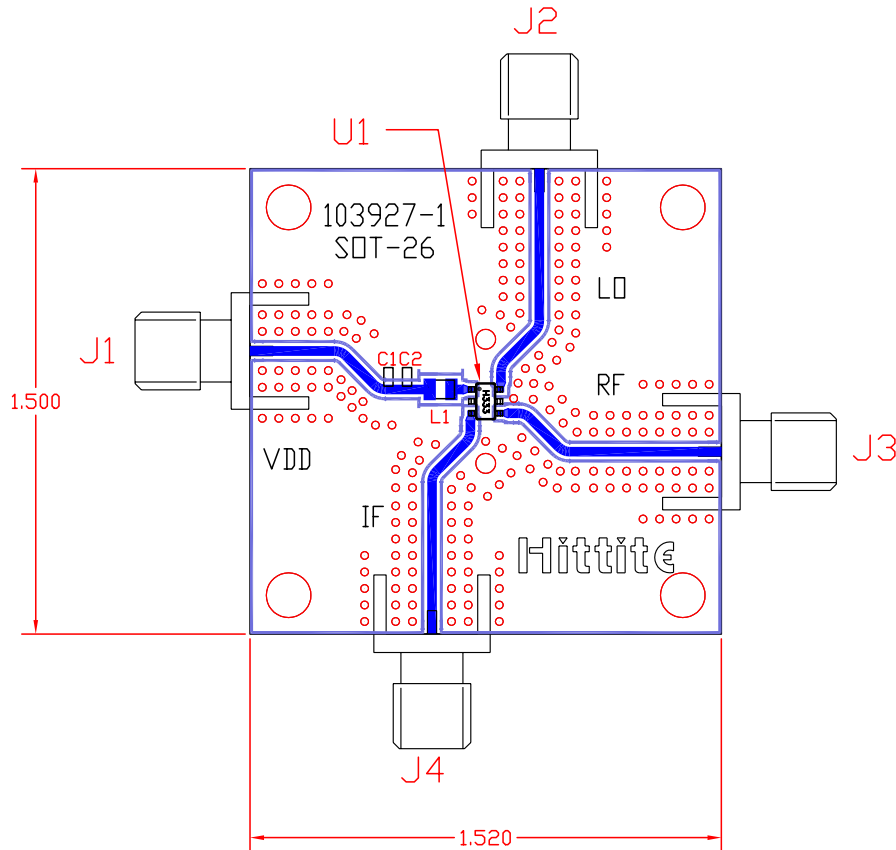
Pin Number	Function	Description	Interface Schematic
1	Vdd	Power supply for the LO Amplifier. Two external RF bypass capacitors (10 pF & 10,000 pF) and an external inductor (1.8 nH) are required.	
2, 5	GND	Ground: Pin must connect to RF ground.	
3	IF Port	IF Port: This pin is DC coupled. For applications not requiring operation to DC, this port should be DC blocked externally using a series capacitor whose value has 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 3.0 - 3.8 GHz.	
6	LO Port	LO Port: This pin is AC coupled and matched to 50 Ohm from 3.0 - 3.8 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 μ F Capacitor, 0603 Pkg.
L1	1.8 nH Inductor, 0805 Pkg.
U1	HMC333 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.