HMC404

v03.0907

GaAs MMIC SUB-HARMONICALLY PUMPED IRM MIXER, 26 - 33 GHz

Typical Applications

The HMC404 is ideal for:

- 26 to 33 GHz Microwave Radios
- Up and Down Converter for Point-to-Point Radios
- Satellite Communication Systems

Features

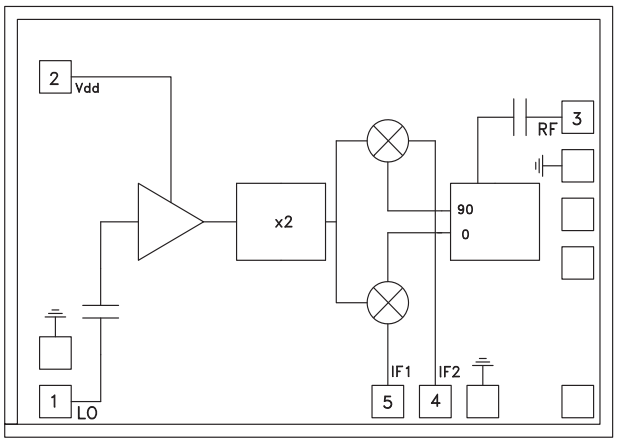
Integrated LO Amplifier: +2 dBm Input

Sub-Harmonically Pumped (x2) LO

Image Rejection: 22 dB

Small Size: 1.90 x 1.25mm

Functional Diagram



General Description

The HMC404 chip is a sub-harmonically pumped (x2) MMIC image rejection mixer with an integrated LO amplifier which can be used as an upconverter or downconverter. The chip utilizes a GaAs PHEMT technology that results in a small overall chip area of 2.31mm^2. The on-chip 90° hybrid provides excellent amplitude and phase balance resulting in greater than 22 dB of image rejection. The LO amplifier is a single bias (+4V) two stage design with only +2 dBm nominal drive required.

Electrical Specifications, T_A = +25° C

Parameter	IF = 1 GHz LO = +2 dBm & Vdd = +4V			Units
	Min.	Typ.	Max.	
Frequency Range, RF		26 - 33		GHz
Frequency Range, LO		13 - 16.5		GHz
Frequency Range, IF		DC - 3		GHz
Conversion Loss (As IRM)		11	15	dB
Image Rejection	15	22		dB
Noise Figure		11	15	dB
1 dB Compression (Input)	+2	+6		dBm
2LO to RF Isolation	20	35		dB
2LO to IF Isolation	20	35		dB
IP3 (Input)	8	16		dBm
Amplitude Balance		±1.5		dB
Phase Balance		±7		Deg
Supply Current (Idd)		28	38	mA

* Unless otherwise noted, all measurements performed as downconverter.

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GaAs MMIC SUB-HARMONICALLY PUMPED IRM MIXER, 26 - 33 GHz

Data Taken As IRM With 1 GHz IF Hybrid

Conversion Gain vs. Temperature @ LO= +2 dBm, Vdd= +4V

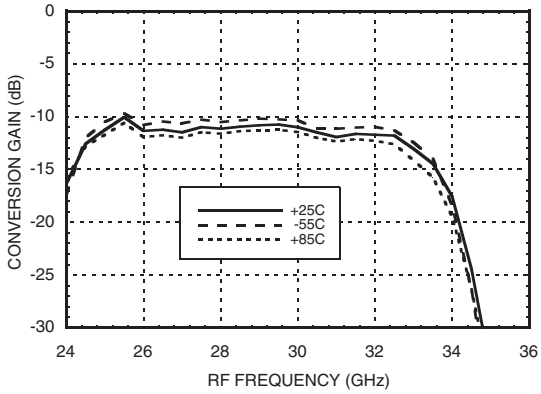
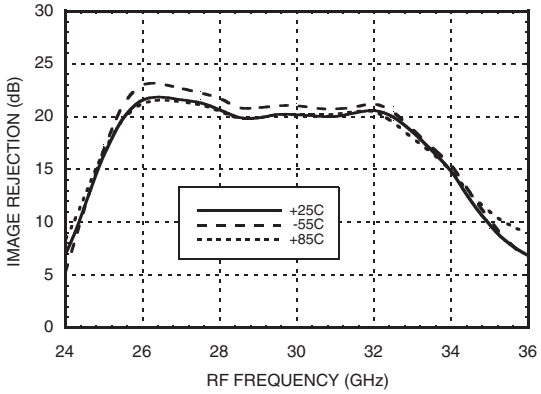
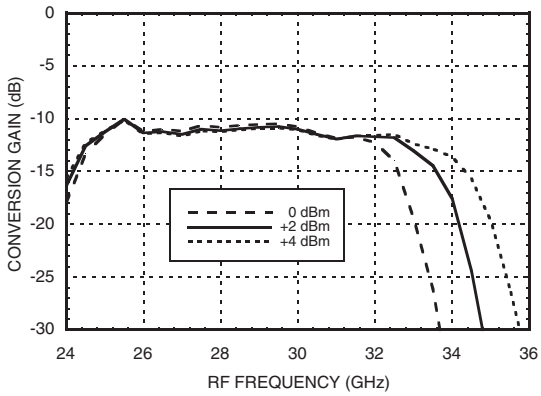


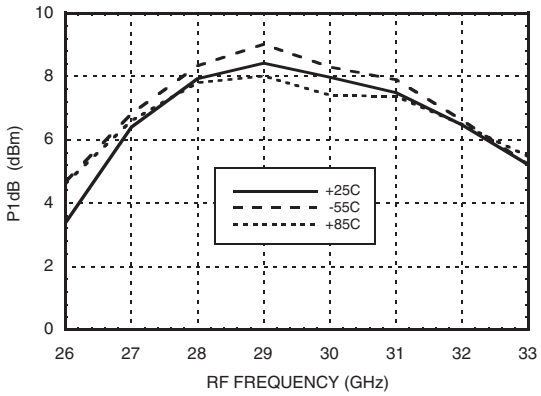
Image Rejection vs. Temperature @ LO= +2 dBm, Vdd= +4V



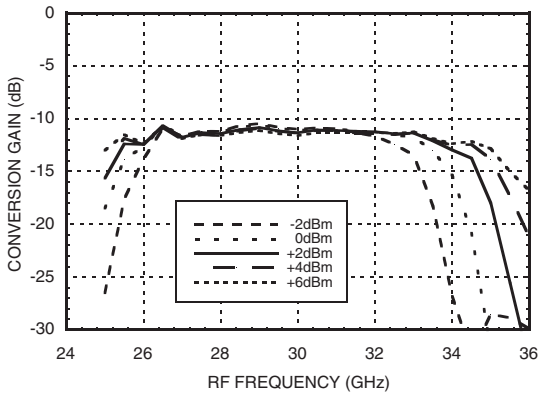
Conversion Gain vs. LO Drive @ Vdd= +4V



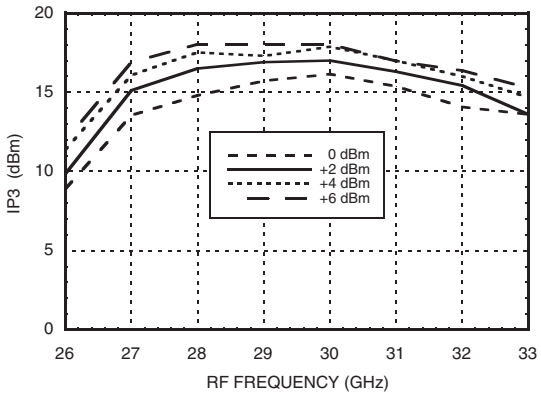
Input P1dB vs. Temperature @ LO= +2 dBm, Vdd= +4V



Upconverter Performance Conversion Gain vs. LO Drive @ Vdd= +4V



Input IP3 vs. LO Drive @ Vdd= +4V*



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

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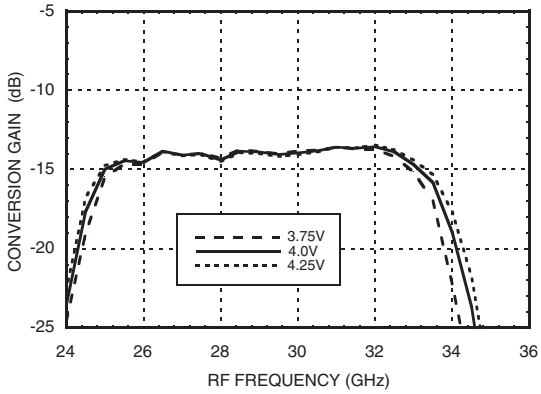
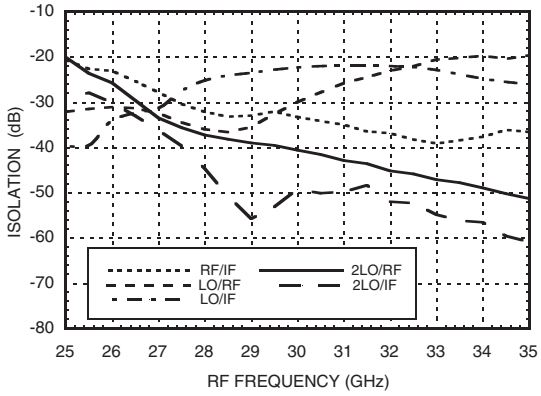
Quadrature Channel Data Taken Without IF Hybrid

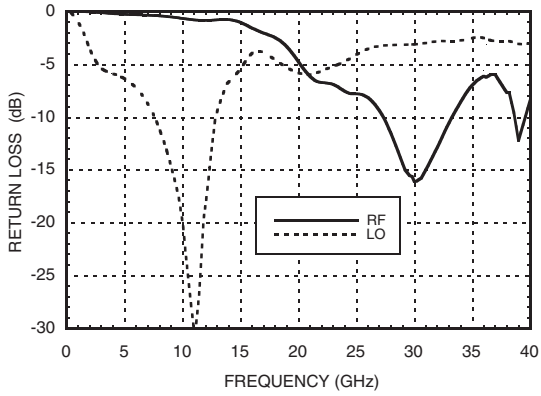
Conversion Gain vs. Vdd @ LO= +2 dBm, IF= 100 MHz



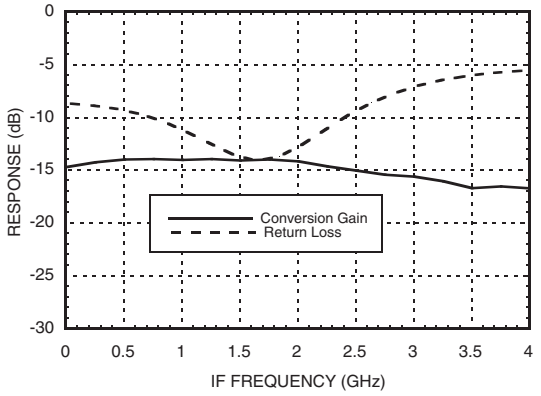
Isolation @ LO= +2 dBm, IF= 100 MHz, Vdd= +4V



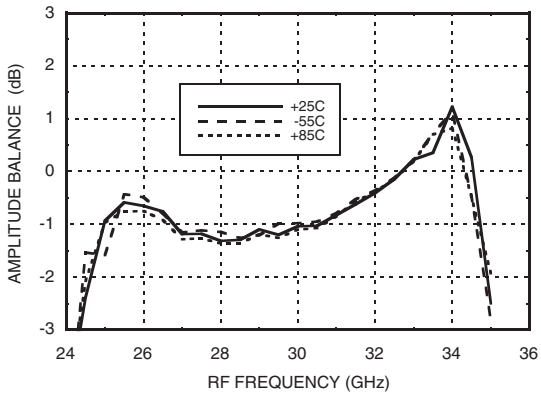
Return Loss @ LO= +2 dBm, Vdd= +4V



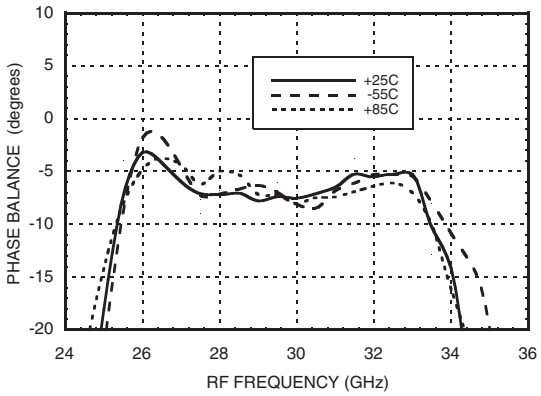
IF Bandwidth @ LO= +2 dBm, Vdd= +4V



Amplitude Balance vs. Temperature @ LO= +2 dBm, IF= 100 MHz, Vdd= +4V



Phase Balance vs. Temperature @ LO= +2 dBm, IF= 100 MHz, Vdd= +4V



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MxN Spurious @ IF Port, Vdd = +4V

	nLO					
mRF	±5	±4	±3	±2	±1	0
-3						
-2	65					
-1		28	71			
0				22	-3	
1				X	55	18
2		76	56			
3						

RF = 30.5 GHz @ -10 dBm
LO = 15 GHz @ +2 dBm
All values in dBc below IF power level.
Measured as downconverter

MxN Spurious @ RF Port, Vdd = +4V

	nLO					
mIF	±5	±4	±3	±2	±1	0
-3				66		
-2				64	64	
-1				X	53	
0				17	6	
1				22	57	36
2				76	65	
3				55		

IF = 0.5 GHz @ -10 dBm
LO = 15 GHz @ +2 dBm
All values in dBc below RF power level.
Measured as upconverter.

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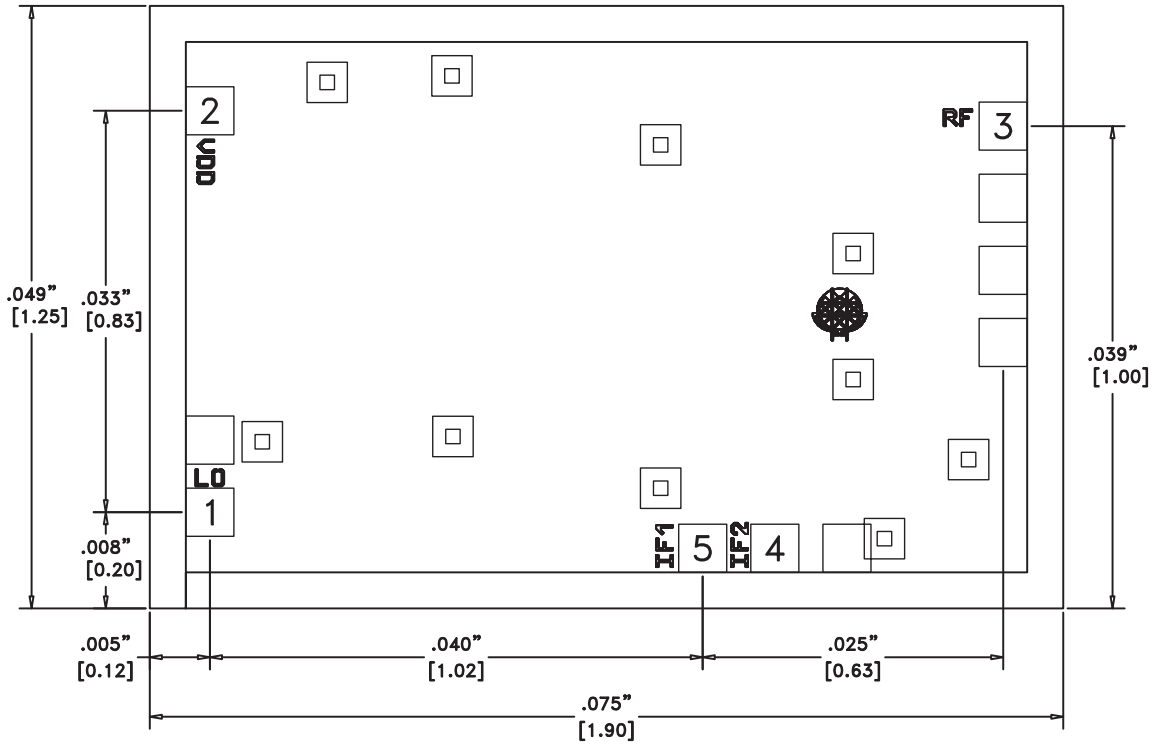
Absolute Maximum Ratings

RF / IF Input (Vdd = +5V)	+13 dBm
LO Drive (Vdd = +5V)	+13 dBm
Vdd	5.5V
Continuous Pdiss (Ta = 85 °C) (derate 2.64 mW/°C above 85 °C)	238 mW
Storage Temperature	-65 to +150 °C
Operating Temperature	-55 to +85 °C

ELECTROSTATIC SENSITIVE DEVICE
OBSERVE HANDLING PRECAUTIONS

Outline Drawing



Die Packaging Information [1]

Standard	Alternate
GP-2	[2]

[1] Refer to the "Packaging Information" section for die packaging dimensions.
[2] For alternate packaging information contact Hittite Microwave Corporation.

NOTES:

1. ALL DIMENSIONS IN INCHES (MILLIMETERS)
2. ALL TOLERANCES ARE ±0.001 (0.025)
3. DIE THICKNESS IS 0.004 (0.100) BACKSIDE IS GROUND
4. BOND PADS ARE 0.004 (0.100) SQUARE
5. BOND PAD SPACING, CTR-CTR: 0.006 (0.150)
6. BACKSIDE METALLIZATION: GOLD
7. BOND PAD METALLIZATION: GOLD
8. NO CONNECTION REQUIRED TO UNLABED BOND PADS

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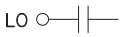
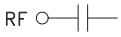
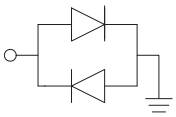
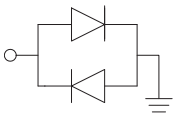
Pad Descriptions

Pad Number	Function	Description	Interface Schematic
1	LO	This pad is AC coupled and matched to 50 Ohm.	
2	Vdd	Power supply for the LO Amplifier. An external RF bypass capacitor of 100 - 330 pF is required. A MIM border capacitor is recommended. The bond length to the capacitor should be as short as possible. The ground side of the capacitor should be connected to the housing ground.	
3	RF	This pad is AC coupled and matched to 50 Ohm.	
4	IF2	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.	
5	IF1	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.	

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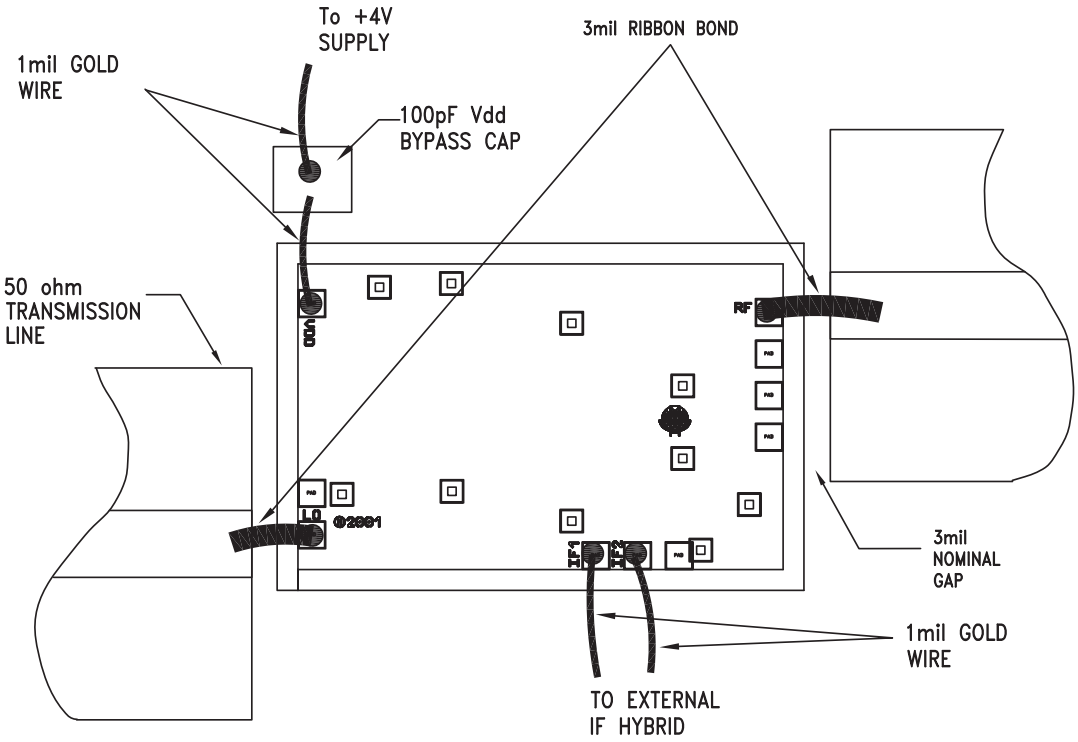
Assembly Diagrams



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