



GaAs MMIC SUB HARMONIC MIXER, 37 - 46.5 GHz

Typical Applications

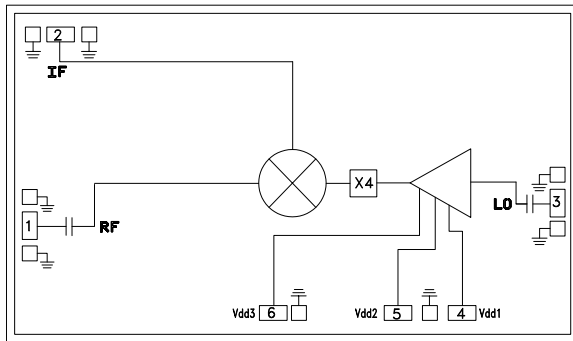
The HMC1093 is ideal for:

- 38 GHz Microwave Radio
- 42 GHz Microwave Radio
- Military End-Use

Features

- Sub-Harmonically Pumped (x4) LO
- Low LO Power: -1 dBm
- High 4LO/RF Isolation: 20 dB
- Wide IF Bandwidth: DC to 7.5 GHz
- Downconversion Applications
- Die Size: 1.45 X 3.85 X 0.1 mm

Functional Diagram



General Description

The HMC1093 chip is a sub-harmonically pumped (x4) MMIC mixer with an integrated LO amplifier. The HMC1093 chip is ideal for use as a downconverter with 37 to 46.5 GHz at the RF port and DC to 7.5 GHz at the IF port. The HMC1093 utilizes a GaAs PHEMT technology and delivers excellent 4LO to RF isolation of 20 dB, which eliminates the need for additional filtering. The LO amplifier is a single bias (+3V) two-stage design requiring only -1 dBm of LO power. The RF and LO ports are DC blocked and matched to 50 Ohms for ease of use. All data shown herein is measured with the chip in a 50 Ohm test fixture connected via 0.025mm (1 mil) wire bonds of minimal length <0.31 mm (<12 mils).

Electrical Specifications, $T_A = +25^\circ\text{C}$, $V_{DD} = +3\text{V}$, USB ^[1]

Parameter	Min.	Typ.	Max.	Min.	Typ.	Max.	Min.	Typ.	Max.	Units
RF Frequency Range	37 - 40			40 - 43			43 - 46.5			GHz
LO Frequency Range	8.5 - 11									GHz
IF Frequency Range	DC - 7.5									GHz
Conversion Loss		14	16		11	13		9	11	dB
4LO to RF Isolation		22			15			15		dB
4LO to IF Isolation		16			18			25		dB
Input Third Order Intercept (IP3)		30			26			21		dB
Input Power for 1 dB Compression ^[2]		20			18			16		dBm
I _{DD}	140	160	210	140	160	210	140	160	210	mA

[1] Unless otherwise noted, all measurements performed as a downconverter with LO = -1 dBm.

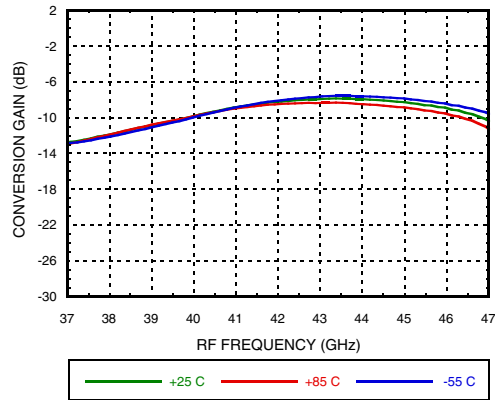
[2] Data taken at IF = 7.5 GHz, USB.



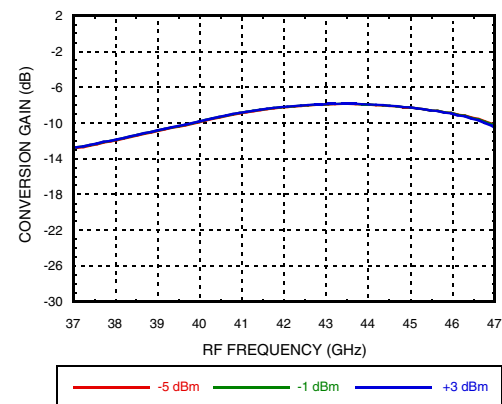
GaAs MMIC SUB HARMONIC MIXER, 37 - 46.5 GHz

Data taken at IF = 1 GHz, USB

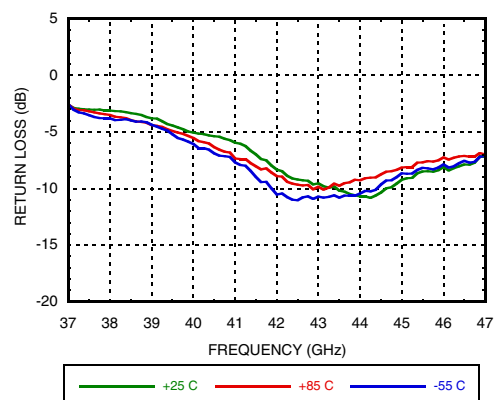
Conversion Loss vs. Temperature



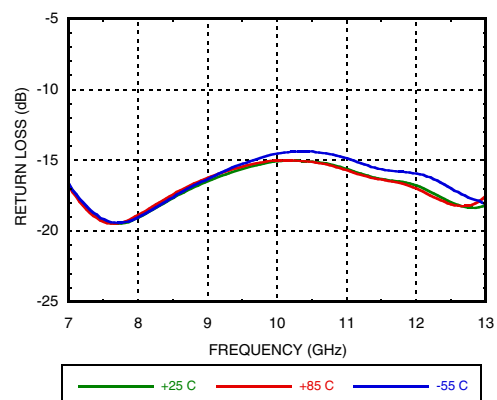
Conversion Loss vs. LO Drive



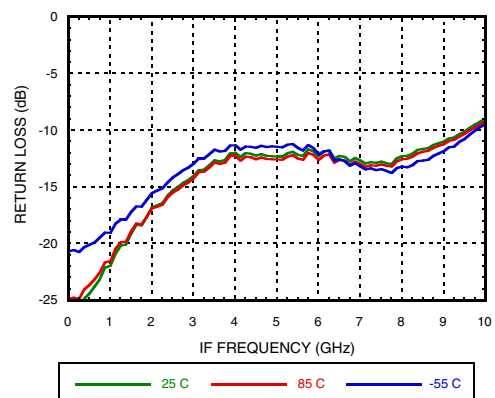
RF Return Loss



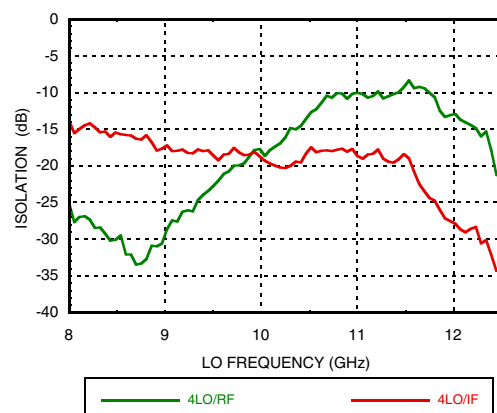
LO Return Loss vs. Temperature



IF Return Loss



4LO Isolation



Information furnished by Analog Devices is believed to be accurate and reliable. However, no responsibility is assumed by Analog Devices for its use, nor for any infringements of patents or other rights of third parties that may result from its use. Specifications subject to change without notice. No license is granted by implication or otherwise under any patent or patent rights of Analog Devices. Trademarks and registered trademarks are the property of their respective owners.

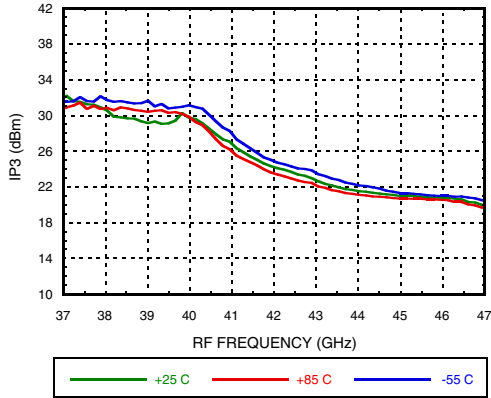
For price, delivery, and to place orders: Analog Devices, Inc., One Technology Way, P.O. Box 9106, Norwood, MA 02062-9106 Phone: 781-329-4700 • Order online at www.analog.com Application Support: Phone: 1-800-ANALOG-D



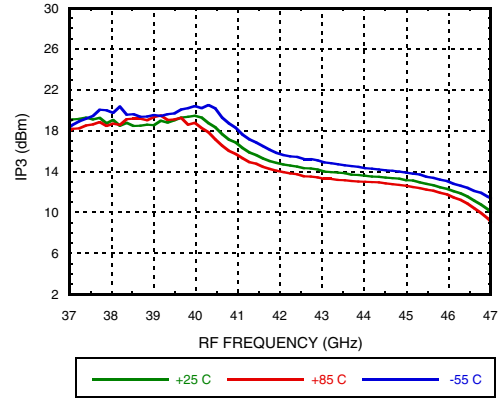
**GaAs MMIC SUB HARMONIC
MIXER, 37 - 46.5 GHz**

Data taken at IF = 1 GHz, USB

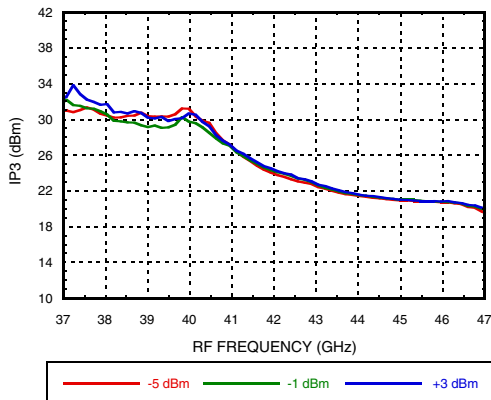
Input IP3 vs. Temperature



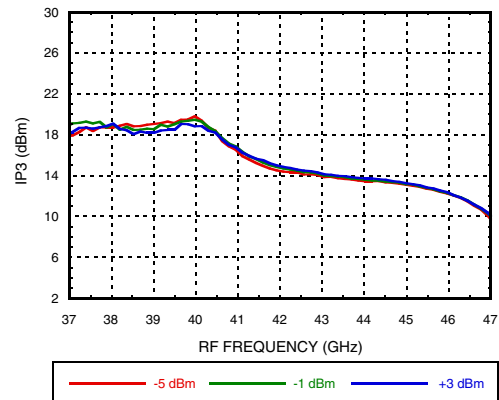
Output IP3 vs. Temperature



Input IP3 vs. LO Power



Output IP3 vs. LO Power



Information furnished by Analog Devices is believed to be accurate and reliable. However, no responsibility is assumed by Analog Devices for its use, nor for any infringements of patents or other rights of third parties that may result from its use. Specifications subject to change without notice. No license is granted by implication or otherwise under any patent or patent rights of Analog Devices. Trademarks and registered trademarks are the property of their respective owners.

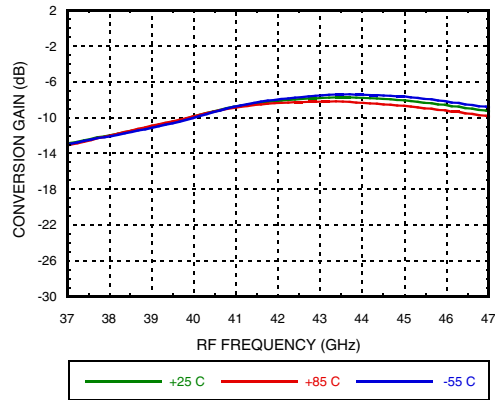
For price, delivery, and to place orders: Analog Devices, Inc., One Technology Way, P.O. Box 9106, Norwood, MA 02062-9106 Phone: 781-329-4700 • Order online at www.analog.com Application Support: Phone: 1-800-ANALOG-D



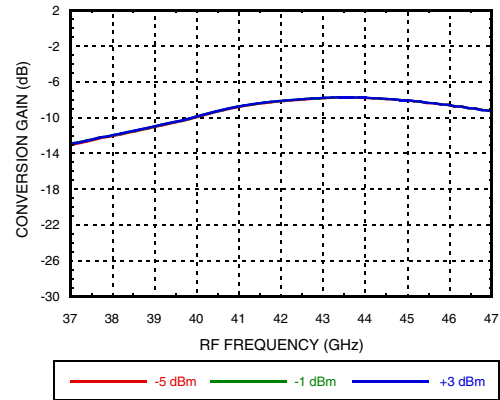
GaAs MMIC SUB HARMONIC MIXER, 37 - 46.5 GHz

Data taken at IF = 2 GHz, USB

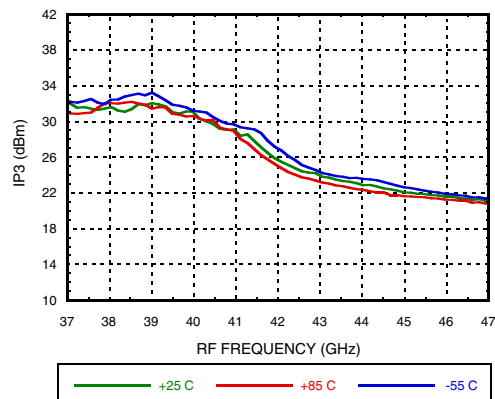
Conversion Loss vs. Temperature



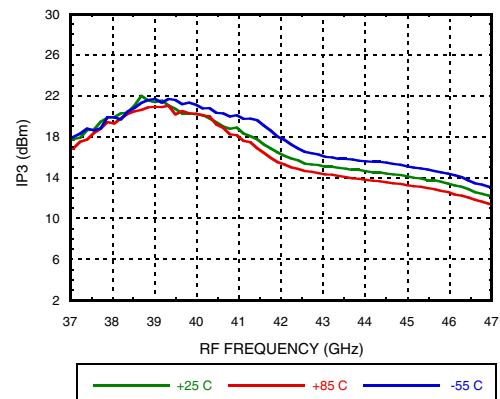
Conversion Loss vs. LO Drive



Input IP3 vs. Temperature



Output IP3 vs. Temperature



Information furnished by Analog Devices is believed to be accurate and reliable. However, no responsibility is assumed by Analog Devices for its use, nor for any infringements of patents or other rights of third parties that may result from its use. Specifications subject to change without notice. No license is granted by implication or otherwise under any patent or patent rights of Analog Devices. Trademarks and registered trademarks are the property of their respective owners.

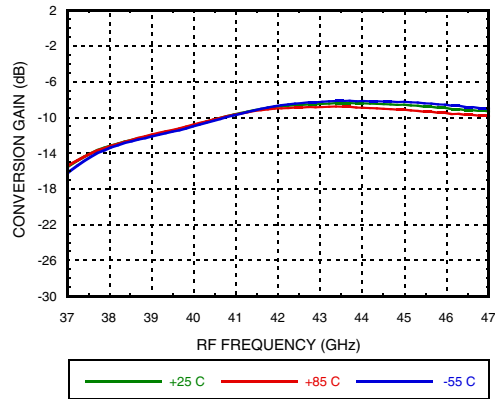
For price, delivery, and to place orders: Analog Devices, Inc., One Technology Way, P.O. Box 9106, Norwood, MA 02062-9106 Phone: 781-329-4700 • Order online at www.analog.com Application Support: Phone: 1-800-ANALOG-D



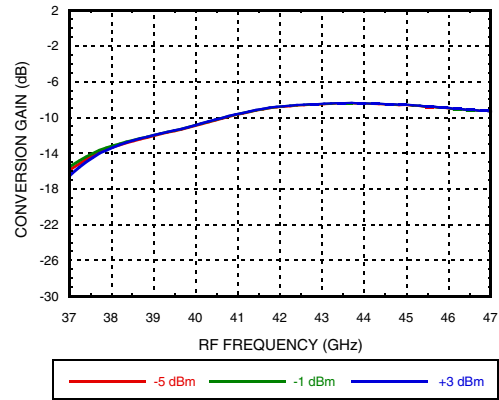
GaAs MMIC SUB HARMONIC MIXER, 37 - 46.5 GHz

Data taken at IF = 3.5 GHz, USB

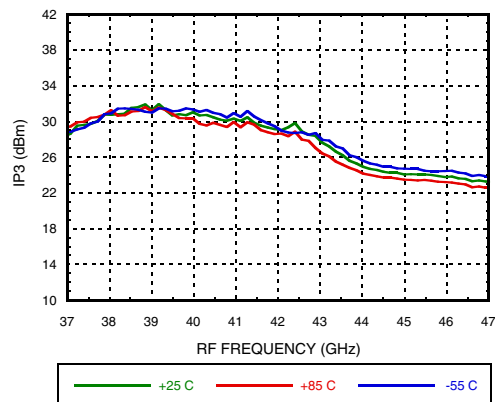
Conversion Loss vs. Temperature



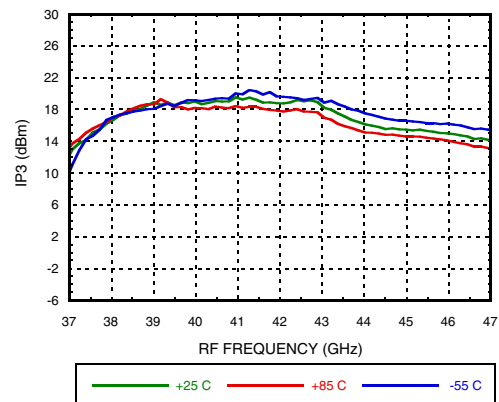
Conversion Loss vs. LO Drive



Input IP3 vs. Temperature



Output IP3 vs. Temperature



Information furnished by Analog Devices is believed to be accurate and reliable. However, no responsibility is assumed by Analog Devices for its use, nor for any infringements of patents or other rights of third parties that may result from its use. Specifications subject to change without notice. No license is granted by implication or otherwise under any patent or patent rights of Analog Devices. Trademarks and registered trademarks are the property of their respective owners.

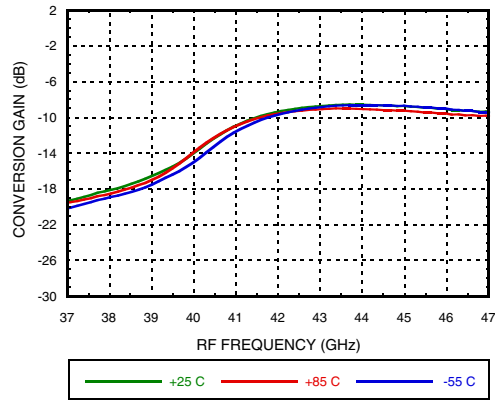
For price, delivery, and to place orders: Analog Devices, Inc., One Technology Way, P.O. Box 9106, Norwood, MA 02062-9106 Phone: 781-329-4700 • Order online at www.analog.com Application Support: Phone: 1-800-ANALOG-D



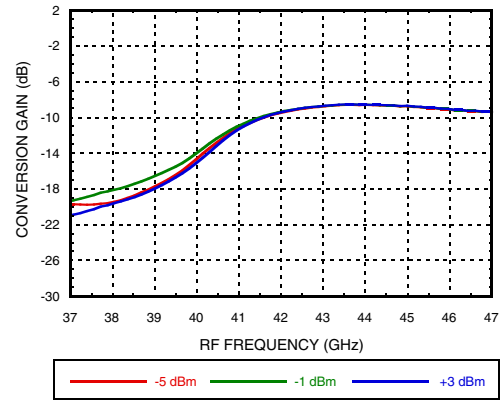
GaAs MMIC SUB HARMONIC MIXER, 37 - 46.5 GHz

Data taken at IF = 7 GHz, USB

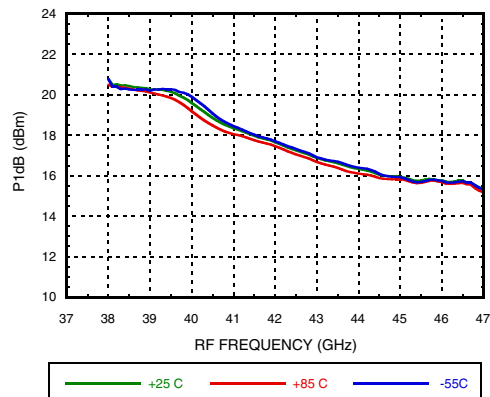
Conversion Loss vs. Temperature



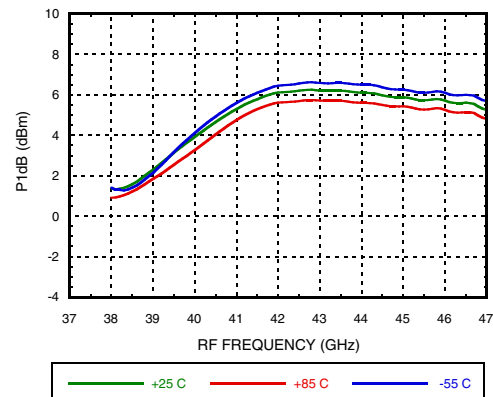
Conversion Loss vs. LO Drive



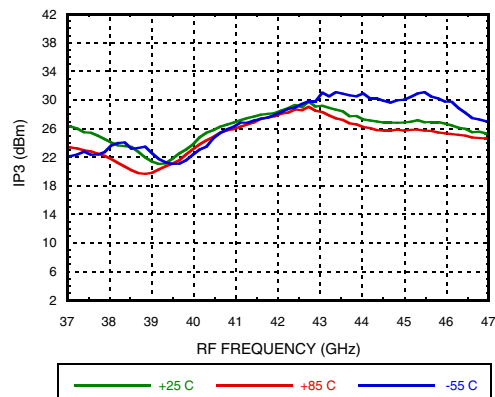
Input P1dB vs. Temperature [1]



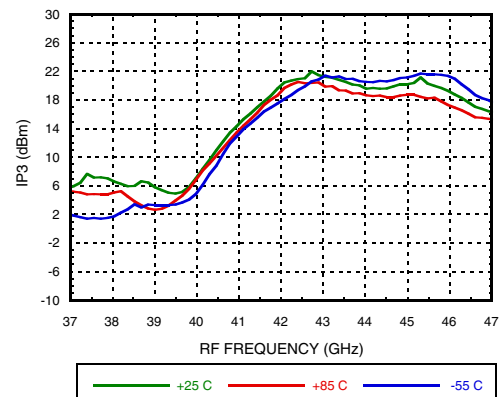
Output P1dB vs. Temperature [1]



Input IP3 vs. Temperature



Output IP3 vs. Temperature



[1] Data taken at IF = 7.5 GHz, USB



GaAs MMIC SUB HARMONIC MIXER, 37 - 46.5 GHz

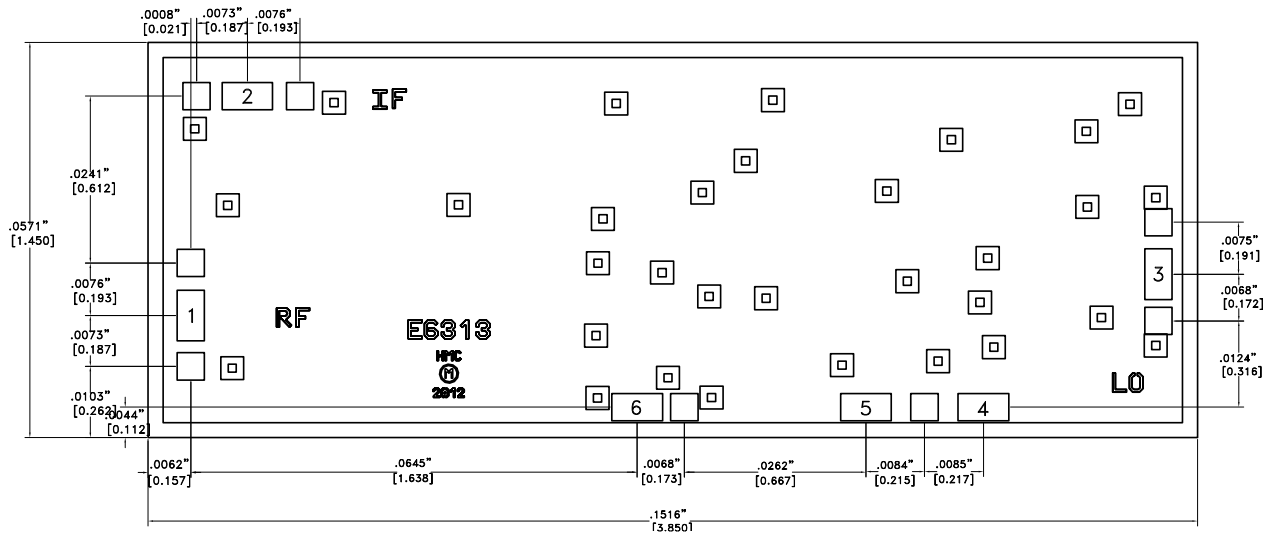
Absolute Maximum Ratings

Bias Voltage	+3.5V
RF Input Power	+18dBm
LO Input Power	+5dBm
Channel Temperature	175 °C
Continuous P _{diss} (T = 85 °C) (derate 15mW/ °C above 85 °C)	1.6
Thermal Resistance (R _{TH}) (channel to die bottom)	66.7 °C/W
Operating Temperature	-55°C to +85°C
Storage Temperature	-65°C to 125°C
ESD Sensitivity (HBM)	Class 0, Passed 150V



ELECTROSTATIC SENSITIVE DEVICE
OBSERVE HANDLING PRECAUTIONS

Outline Drawing



NOTES:

1. ALL DIMENSIONS ARE IN INCHES [MM]
2. DIE THICKNESS IS .004"
3. TYPICAL BOND PAD IS 0.0026" [0.066] SQUARE
4. BACKSIDE METALLIZATION: GOLD
5. BOND PAD METALLIZATION: GOLD
6. BACKSIDE METAL IS GROUND.
7. CONNECTION NOT REQUIRED FOR UNLABELED BOND PADS.
8. OVERALL DIE SIZE ± .002

Die Packaging Information [1]

Standard	Alternate
GP-2 (Gel Pack)	[2]

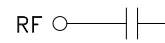
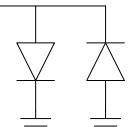
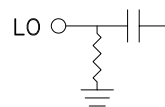
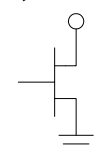

[1] Refer to the "Packaging Information" section for die packaging dimensions.

[2] For alternate packaging information contact Hittite Microwave Corporation.

GaAs MMIC SUB HARMONIC MIXER, 37 - 46.5 GHz



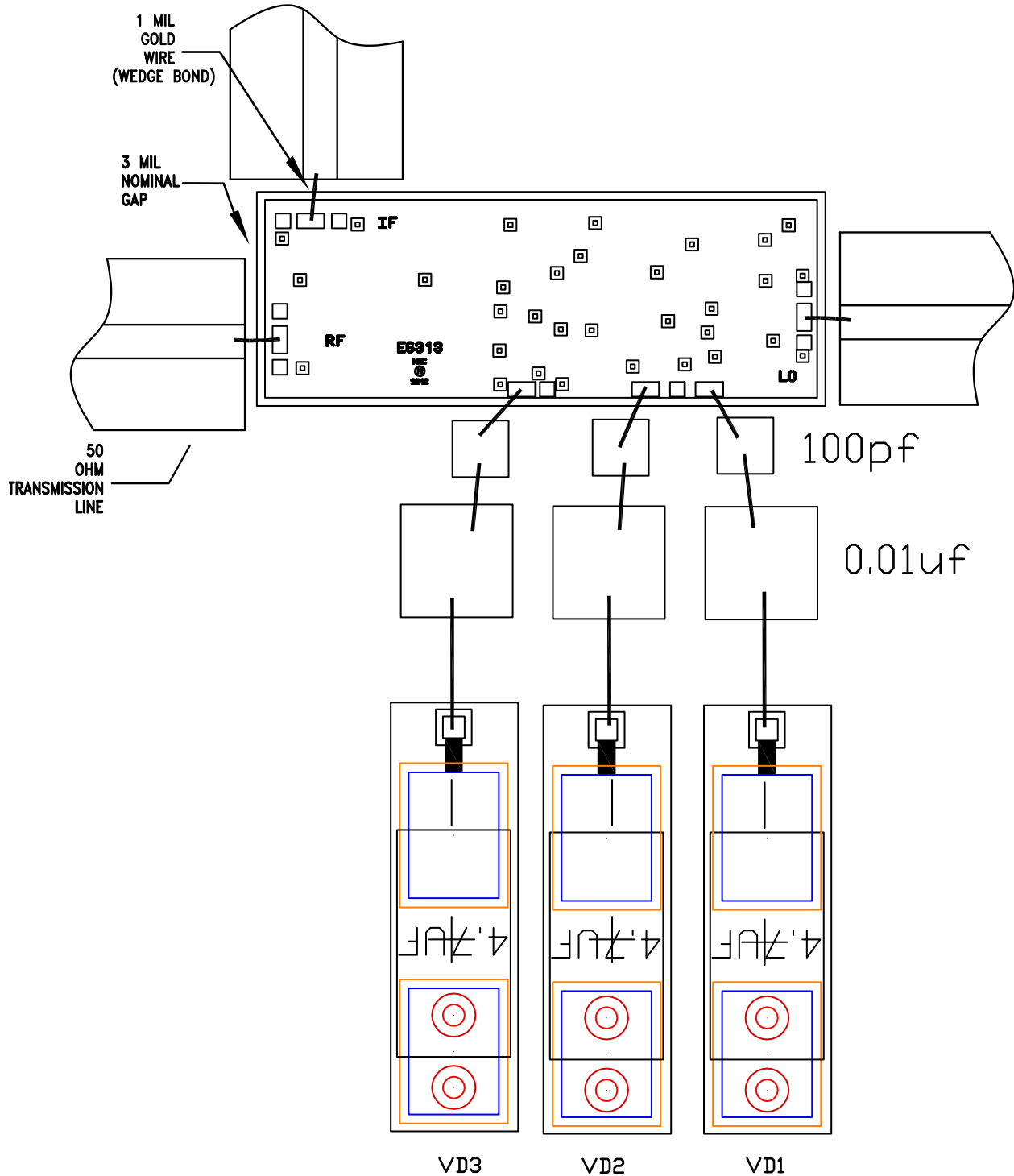
Pad Descriptions

Pad Number	Function	Description	Pad Schematic
1	RF	This pad is AC coupled and matched to 50 Ohms.	RF 
2	IF	This pad is DC coupled and matched to 50 Ohms.	IF 
3	LO	This pad is AC coupled and matched to 50 Ohms.	LO 
4, 5, 6	Vdd1, Vdd2, Vdd3	Power Supply Voltage for the LO Amplifier. External bypass capacitors 100pF, 0.01uF, and 4.7uF are required.	Vdd1, Vdd2, Vdd3 
Die Bottom	Ground	Die bottom must be connected to RF/DC ground.	GND 



GaAs MMIC SUB HARMONIC MIXER, 37 - 46.5 GHz

Assembly Diagram



Information furnished by Analog Devices is believed to be accurate and reliable. However, no responsibility is assumed by Analog Devices for its use, nor for any infringements of patents or other rights of third parties that may result from its use. Specifications subject to change without notice. No license is granted by implication or otherwise under any patent or patent rights of Analog Devices. Trademarks and registered trademarks are the property of their respective owners.

For price, delivery, and to place orders: Analog Devices, Inc., One Technology Way, P.O. Box 9106, Norwood, MA 02062-9106 Phone: 781-329-4700 • Order online at www.analog.com Application Support: Phone: 1-800-ANALOG-D