ANALOG DEVICES

HMC203

v03.1007

GaAs MMIC DOUBLE-BALANCED MIXER, 14 - 23 GHz

Typical Applications

The HMC203 is ideal for:

- DBS & SATCOM
- Microwave Radio
- Military & Space
- Radar & EW
- Test Equipment & Sensors

Features

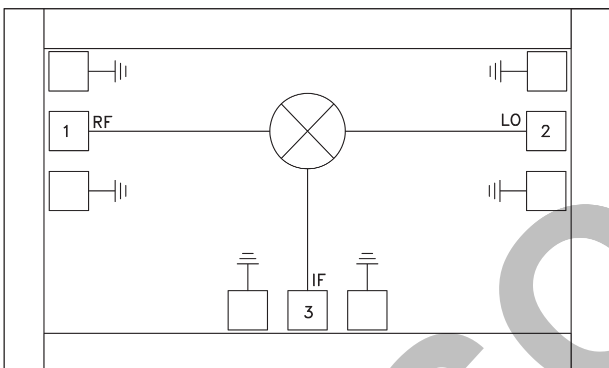
Conversion Loss: 10 dB

LO / RF Isolation: 38 dB

Passive: No DC Bias Required

Die Size: 1.49 x 0.89 x 0.1 mm

Functional Diagram



General Description

The HMC203 chip is a miniature double-balanced mixer which can be used as an upconverter or down-converter. Excellent isolations are provided by on-chip baluns, which require no external components and no DC bias. The mixer chip can be integrated directly into MMIC hybrid applications. Unless otherwise stated, all data was measured with the mixer mounted in a MMIC test fixture. The MMIC was connected to thin film 50 ohm transmission lines with 1 mil diameter wirebonds of <10 mils in length.

Electrical Specifications, T_A = +25° C, LO Drive = +15 dBm

Parameter	Min.	Typ.	Max.	Min.	Typ.	Max.	Units
Frequency Range, RF & LO		14 - 23			15 - 21		GHz
Frequency Range, IF		DC - 2			DC -2		GHz
Conversion Loss		10	12		8.5	10	dB
Noise Figure (SSB)		10	12		8.5	10	dB
LO to RF Isolation	30	38		30	38		dB
LO to IF Isolation	35	45		35	45		dB
RF to IF Isolation	12	17		12	17		dB
IP3 (Input)		18			18		dBm
IP2 (Input)		40			40		dBm
1 dB Gain Compression (Input)		7			7		dBm

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Application Support: Phone: 1-800-ANALOG-D*

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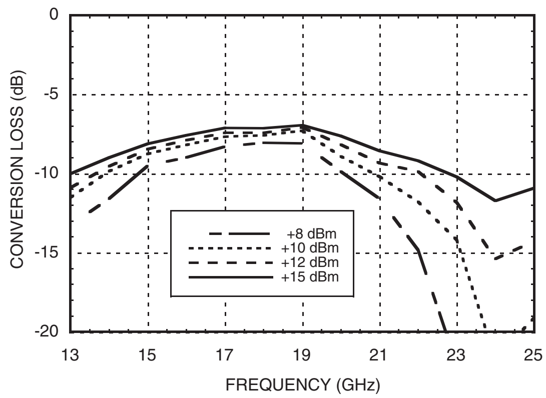
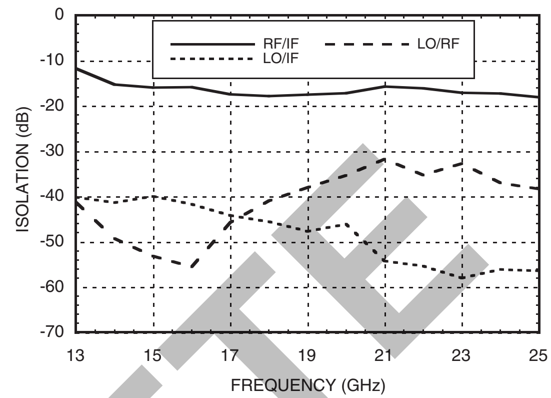
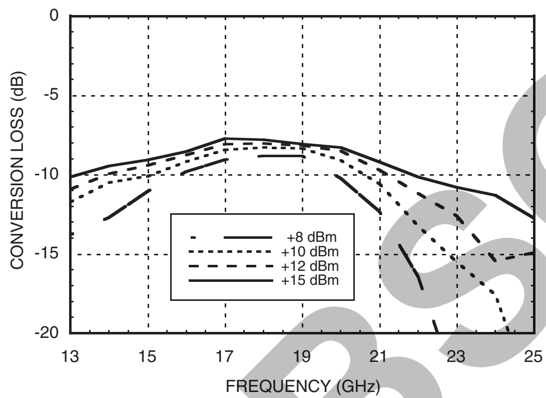
Conversion Loss vs LO Drive



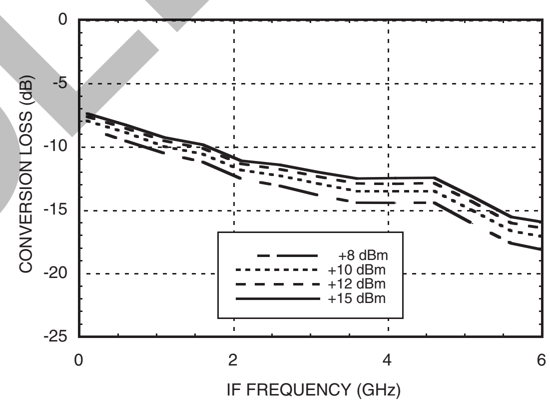
Isolation, LO = +15 dBm



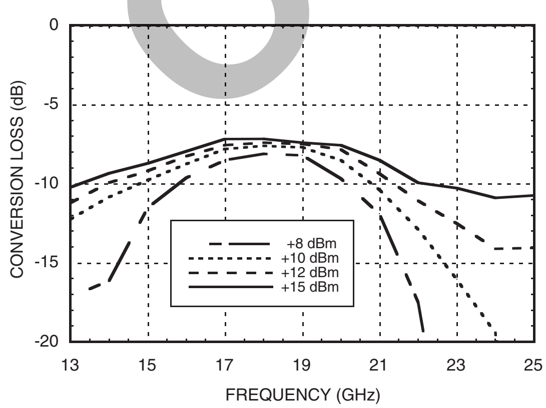
Conversion Loss @ +85 C vs. LO Drive



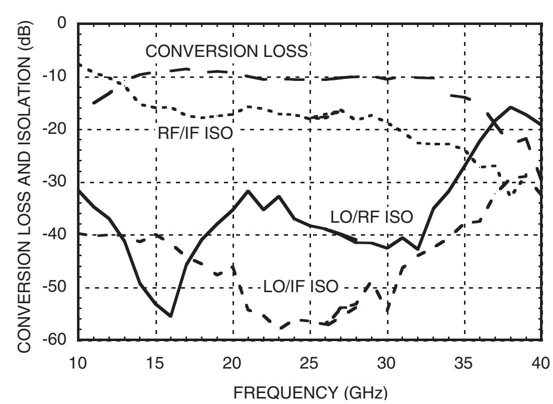
IF Bandwidth LO = 18 GHz @ +15 dBm



Conversion Loss @ -55 C vs LO Drive



RF Coplanar Probe Data LO = +12 dBm



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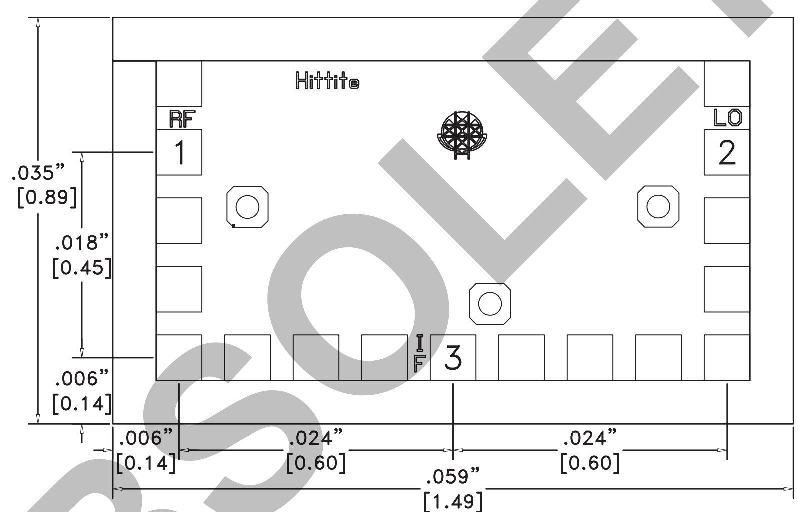
Absolute Maximum Ratings

RF / IF Input	+13 dBm
LO Drive	+27 dBm
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
WP-8 (Waffle Pack)	[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 ARE IN INCHES [MM].
2. DIE THICKNESS IS .004”.
3. BOND PADS ARE .004” SQUARE.
4. BOND PAD SPACING CENTER TO CENTER IS .006”.
5. BACKSIDE METALLIZATION: GOLD.
6. BOND PAD METALLIZATION: GOLD.
7. BACKSIDE METAL IS GROUND.
8. CONNECTION NOT REQUIRED FOR UNLABELED BOND PADS.

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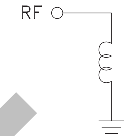
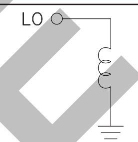
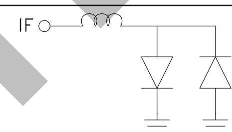
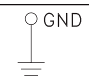
Pad Descriptions

Pad Number	Function	Description	Interface Schematic
1	RF	This pin is AC coupled and matched to 50 Ohms.	
2	LO	This pin is AC coupled and matched to 50 Ohms.	
3	IF	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 2 mA of current or die non-function and possible die failure will result.	
Die Bottom	GND	Die bottom must be connected to RF/DC ground.	

Handling Precautions

Follow these precautions to avoid permanent damage.

Storage: All bare die are placed in either Waffle or Gel based ESD protective containers, and then sealed in an ESD protective bag for shipment. Once the sealed ESD protective bag has been opened, all die should be stored in a dry nitrogen environment.

Cleanliness: Handle the chips in a clean environment. DO NOT attempt to clean the chip using liquid cleaning systems.

Static Sensitivity: Follow ESD precautions to protect against ESD strikes.

Transients: Suppress instrument and bias supply transients while bias is applied. Use shielded signal and bias cables to minimize inductive pick-up.

General Handling: Handle the chip along the edges with a vacuum collet or with a sharp pair of bent tweezers. The surface of the chip has fragile air bridges and should not be touched with vacuum collet, tweezers, or fingers.

Mounting

The chip is back-metallized and can be die mounted with AuSn eutectic preforms or with electrically conductive epoxy. The mounting surface should be clean and flat.

Eutectic Die Attach: A 80/20 gold tin preform is recommended with a work surface temperature of 255 °C and a tool temperature of 265 °C. When hot 90/10 nitrogen/hydrogen gas is applied, tool tip temperature should be 290 °C. DO NOT expose the chip to a temperature greater than 320 °C for more than 20 seconds. No more than 3 seconds of scrubbing should be required for attachment.

Epoxy Die Attach: Apply a minimum amount of epoxy to the mounting surface so that a thin epoxy fillet is observed around the perimeter of the chip once it is placed into position. Cure epoxy per the manufacturer's schedule.

Wire Bonding

RF bonds made with 0.003" x 0.0005" ribbon are recommended. These bonds should be thermosonically bonded with a force of 40-60 grams. DC bonds of 0.001" (0.025 mm) diameter, thermosonically bonded, are recommended. Ball bonds should be made with a force of 40-50 grams and wedge bonds at 18-22 grams. All bonds should be made with a nominal stage temperature of 150 °C. A minimum amount of ultrasonic energy should be applied to achieve reliable bonds. All bonds should be as short as possible, less than 12 mils (0.31 mm).

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