M/A-COM

Silicon Double Balanced HMIC™ Mixer Chip 1300 - 1900 MHz

Features

- Fully Monolithic Mixer Chip
- 6.6 dB Typical Conversion Loss at 1600 MHz
- +3 to +7 dBm LO Drive
- DC – 500 MHz IF Bandwidth
- Silicon Low Barrier Schottky Diodes
- Rugged, Glass Encapsulated

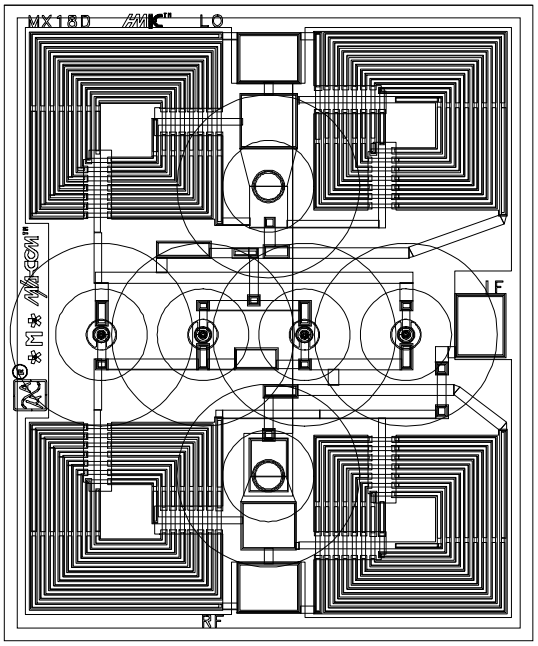
Description

M/A-COM's MA4EX180L is a silicon monolithic double balanced mixer. The circuit uses M/A-COM's unique HMIC™ silicon/glass process to achieve low loss passive elements while retaining the advantages of low barrier silicon Schottky diodes. The die is fully passivated with an additional polymer layer for scratch protection.

Applications

M/A-COM has designed these mixers for use in high volume wireless and cellular applications where small size and repeatability are required. Typical applications include frequency conversion, modulation and demodulation for receivers and transmitters in both portable cellular and base station applications.

Chip Layout



Electrical Specifications @ +25°C

Parameters	Freq Range	Test Conditions	Units	Min.	Typ.	Max.
Conversion Loss	1600 MHz	LO Drive = +5 dBm	dB	—	6.6	—
	1300 - 1900 MHz	RF = -10 dBm, IF = 60 MHz	dB	—	8.5	—
LO - RF Isolation	1600 MHz	LO Drive = +5 dBm	dB	—	39	—
	1300 - 1900 MHz	RF Level = -10 dBm	dB	—	36	—
LO - IF Isolation	1600 MHz	LO Drive = +5 dBm	dB	—	35	—
	1300 - 1900 MHz	RF Level = -10 dBm	dB	—	34	—
LO VSWR	1600 MHz	LO Drive = +5 dBm		—	1.9	—
	1300 - 1900 MHz	RF Level = -10 dBm		—	2.8	—
RF VSWR	1600 MHz	LO Drive = +5 dBm		—	1.2	—
	1300 - 1900 MHz	RF Level = -10 dBm		—	3.0	—
IF VSWR	DC - 500 MHz	LO Drive = +5 dBm @ 1365MHz		—	1.6	—
		IF Level = -10 dBm		—		—
Input IP3	1600 MHz	LO Drive = +5 dBm	dBm	—	+9.0	—
	1300 - 1900 MHz	IF = 60 MHz	DBm	—	+8.0	—
Input 1 dB Compression	1600 MHz	LO Drive = +5 dBm	dBm	—	+1.4	—
	1300 - 1900 MHz	IF = 60 MHz	DBm	—	+1.4	—
IF 1 dB Bandwidth			MHz	0	400	—

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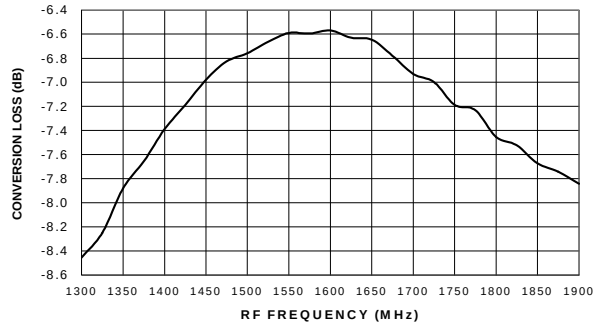
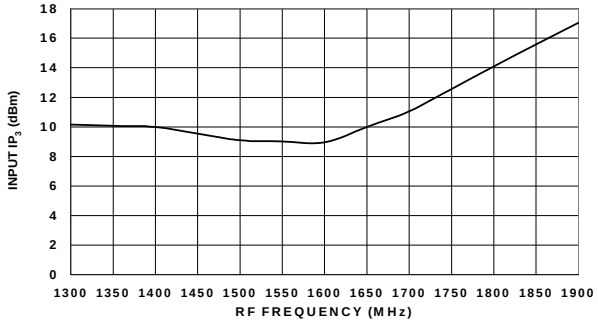
Typical Performance Curves

(LO Drive = +5 dBm, RF = -10 dBm, IF = 60 MHz)

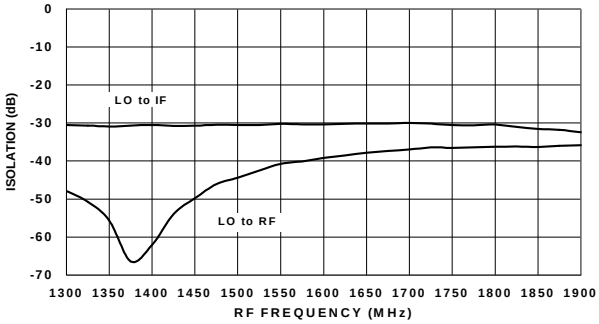
Conversion Loss



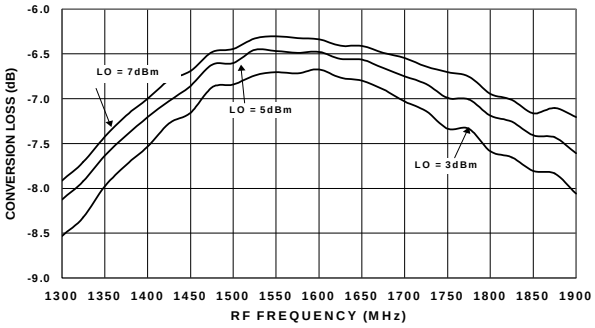
Input IP3



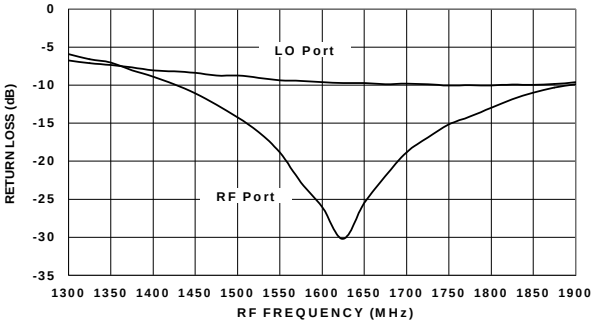
Isolation



Conversion Loss with LO Drive Level Variation



Return Loss



Absolute Maximum Rating[1]

Parameter	Maximum Ratings
Operating Temperature	-40° C to +85°C
Storage Temperature	-65°C to +150°C
Incident LO Power	+20 dBm
Incident RF power	+20 dBm
Mounting Temperature	+235°C for 10 seconds

1. Exceeding these limits may cause permanent damage.

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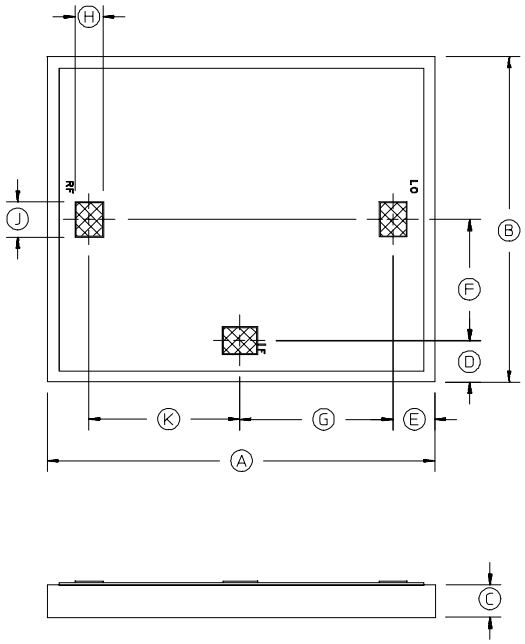
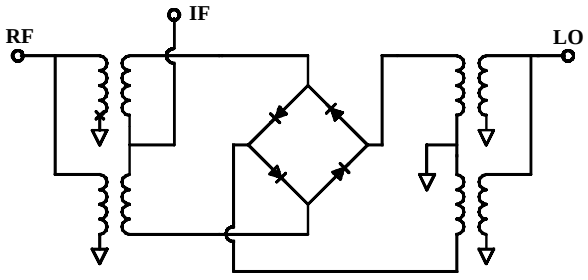
Chip Oultline Drawing (OD-S-1236)[1,2,3]



DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	.047	.051	1.21	1.29
B	.039	.043	1.00	1.08
C	.004	.006	.100	.150
D	.004 REF.		.100 REF.	
E	.004 REF.		.100 REF.	
F	.016 REF.		.420 REF.	
G	.021 REF.		.530 REF.	
H	.004 REF.		.100 REF.	
J	.005 REF.		.125 REF	
K	.019 REF.		.490 REF.	

1. Hatched areas indicate wire bonding pads.
2. Bond pad material Au.
3. Backside metal Au.

Schematic



Handling and Mounting Information

Cleanliness
The die should be handled in a clean environment. Do not attempt to clean die after installation.

Electro-Static Sensitivity
The Schottky barrier diodes in these mixers can be damaged by static electricity. Standard methods for the control of electrostatic discharge should be used. All chip handling equipment and personnel should be DC grounded.

Mounting
The dice have Ti-Pt-Au back metal, with a final gold thickness of 1 micron. They can be die mounted with a gold-tin eutectic solder preform or conductive epoxy. The mounting surface must be clean and flat.

Eutectic Die Attachment
We recommend An 80/20 gold-tin eutectic solder preform with a work surface temperature of 255°C and a tool tip temperature of 265°C. When hot gas is applied, the tool tip temperature should be 290°C. The chip should not be exposed to temperatures greater than 320°C for more than 20 seconds. No more than three seconds should be required for attachment.

Epoxy Die Attachment
Assembly should be preheated to 125-150°C. A minimum amount of epoxy should be used. A thin epoxy fillet should be visible around the perimeter of the chip after placement. Cure epoxy per manufacturer's schedule.

Wire Bonding
The three bond pads on these die have a Ti-Pt-Au metalization scheme, with a final gold thickness of 2.5 microns. The pads are 100 x 125 microns. Thermosonic wedge wire bonding of 0.001" diameter gold wire is recommended with a stage temperature of 150°C and a force of 18 to 22 grams. Ultrasonic energy should be adjusted to the minimum required.

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