MD57-0001

Low Cost MMIC Mixer with Local Oscillator Amplifier 0.8 - 1.0 GHz

Rev. V3

Features

- -5 to +5 dBm LO Drive Level
- High Isolation, 28 dB LO to RF
- SOT-26 package

Description

The MD57-0001 is a floating FET mixer with an on-chip LO amplifier. The LO drive for the MD57-0001 can range from –5 to +5 dBm without severely impacting the mixer's performance. The MD57-0001 is ideally suited for cellular band communications handsets' that can provide only minimal amounts of LO drive. Typical applications include frequency up/ down conversion and IQ modulation and demodulation in digital receivers and transmitters.

The MD57-0001 utilizes a patented "floating-FET" architecture. The on-chip LO amplifier allows the MD57-0001 to operate with as little as –5 dBm of LO drive making it an ideal choice for low power portable designs.

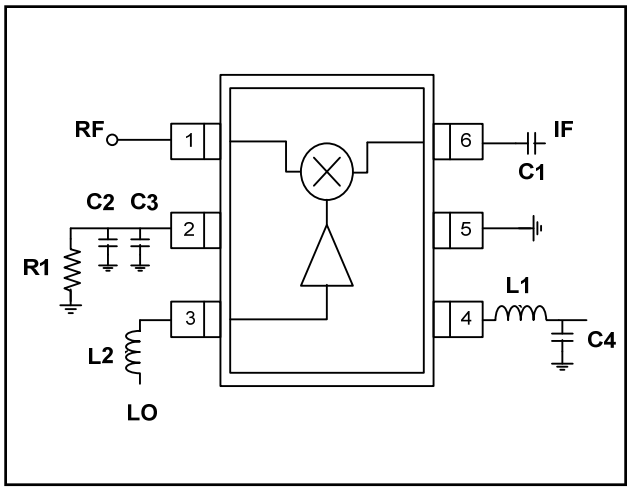
The MD57-0001 is fabricated using M/A-COM's 0.5 micron low noise GaAs MESFET process. This process features full passivation for increased performance and reliability. The MD57-0001 is 100% RF tested to ensure superior performance specification compliance.

Ordering Information[1]

Part Number	Package
MD57-0001	SOT-26, 6-Lead Plastic Package
MD57-0001TR	Forward Tape & Reel
MD57-0001SMB	Sample Test Board

1. Reference Application Note M513 for reel size information.

Functional Schematic



Pin Configuration

Pin No.	Pin Name	Description
1	RF Port	RF Input/Output
2	Bias	LO Amplifier Bias Resistor
3	LO Port	LO Input
4	V_{DD}	LO Amplifier V_{DD}
5	GND	Ground
6	IF Port	IF Input/Output

Absolute Maximum Ratings [2,3,4,5]

Parameter	Absolute Maximum
Input RF/IF Power[4]	+27 dBm
Input LO Power[4]	+17 dBm
Operating Voltages[4]	V_{DD} = +6 V
Operating Temperature	-30°C to +80°C
Storing Temperature	-65°C to +150°C

2. Exceeding any one or combination of these limits may cause permanent damage to this device.
3. M/A-COM does not recommend sustained operation near these survivability limits.
4. Ambient Temperature (TA) = +25°C
5. Typical Thermal Resistance (θ_{jc}) = 108°C/W at nominal bias

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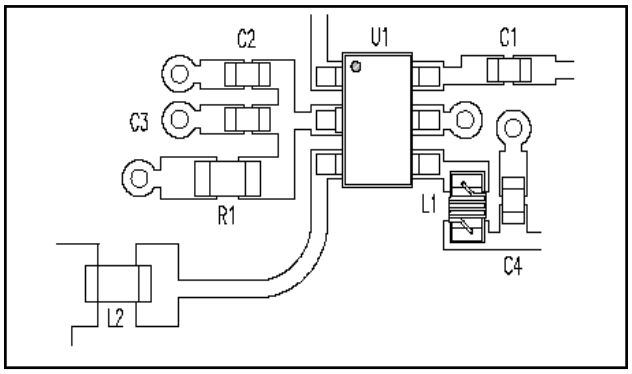
Electrical Specifications[6]: T_A = +25°C, RF = 900 MHz (-15 dBm), LO = 730 MHz (-5 dBm), IF = 170 MHz, V_{DD} = 2.7 V, Typical I_{IDD} = 5 mA

Parameter	Test Conditions	Units	Min.	Typ.	Max.
Conversion Loss		dB	—	9.3	11
Isolation	LO to RF LO to IF RF to IF	dB dB dB	20 10 —	28 12 20	— — —
VSWR	RF Port LO Port IF Port	Ratio Ratio Ratio	— — —	2.0:1 2.0:1 2.0:1	— — —
Input 1 dB Compression	RF Freq = 900 MHz, LO = -5 dBm	dBm	—	14	—
Two Tone IM Ratio	Two tones @ -10 dBm each; Two spacing = 1 MHz, IF = 170 MHz	dBc	—	59	—

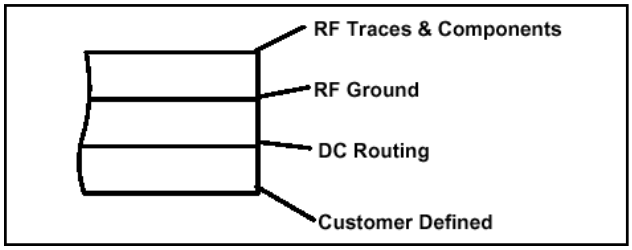
6. IMR vs. RF drive can be calculated by the formula: IMR = [44 - 1.5(PIN)]

Recommended PCB Configuration

Layout View



PCB Cross Section View

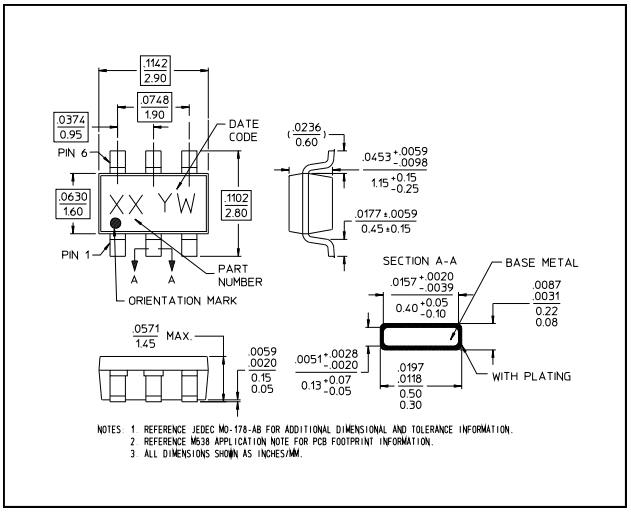


PCB dielectric between RF traces and RF ground layers should be chosen to reduce RF discontinuities between 50 Ω lines and package pins. M/A-COM recommends an FR-4 dielectric thickness of 0.008" (0.2 mm) yielding a 50 Ω line width of 0.015" (0.38 mm). The recommended metalization thickness is 1 oz. Copper.

External Circuitry Parts List

Part	Value	Purpose
R1	200 Ω	LO Amplifier Bias Resistor
L1	22 nH	LO Amplifier Bias Input
L2	10 nH	LO Port Matching
C1	10 nF	IF Port Matching
C2	10 nF	IF Bypass Capacitor
C3	22 pF	RF Bypass Capacitor
C4	47 pF	V_{DD} Bypass

SOT-26†



† Meets JEDEC moisture sensitivity level 1 requirements.

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Spurious Table

LO Harmonic (n)		RF Harmonic (m)				
		0X	1X	2X	3X	4X
0X	-10 dBm	X	4.1	44.9	69.5	79.7
	0 dBm	X	3.9	31.9	48.4	70.0
1X	-10 dBm	13.8	0	47.6	82.0	76.6
	0 dBm	22.9	0	35.1	73.0	83.8
2X	-10 dBm	10.8	18.9	46.5	70.6	78.0
	0 dBm	20.4	18.9	36.6	55.9	84.0
3X	-10 dBm	12.1	23.8	41.5	76.9	77.1
	0 dBm	22.7	23.8	31.0	63.1	74.0
4X	-10 dBm	13.6	50.9	68.5	64.5	80.6
	0 dBm	24.0	49.4	58.9	45.4	63.4

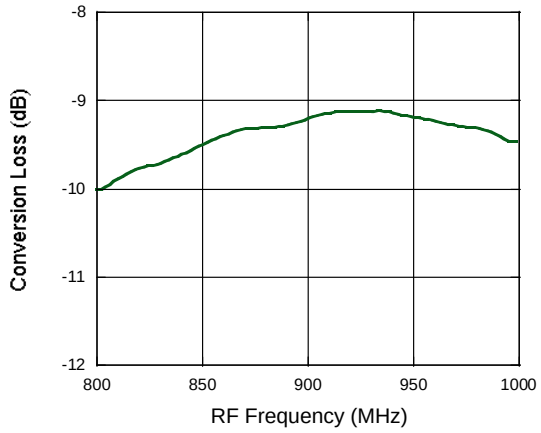
- The spurious table shows the spurious signals resulting from the mixing of the RF and LO input signals assuming down conversion.
- Mixing products are indicated relative to the IF level.
- The lower frequency mixing term is shown for two different RF input levels.
- The RF frequency is 900 MHz, the LO frequency

[nFRF - mFLO] RF = -10 dBm
[nFRF - mFLO] RF = 0 dBm

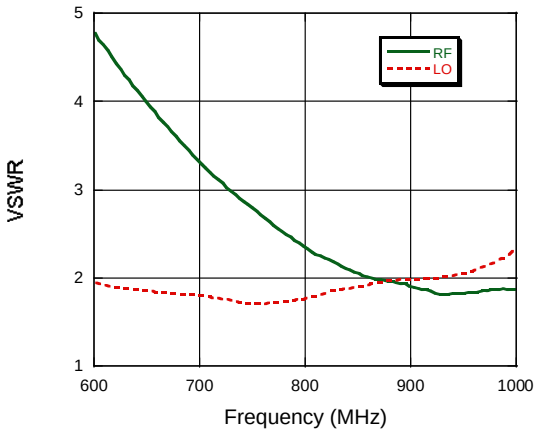
Typical Performance Data

Down Converter Application Test Conditions: RF=900 MHz, IF=170 MHz, LO=730 MHz (LO Power = -5dBm)

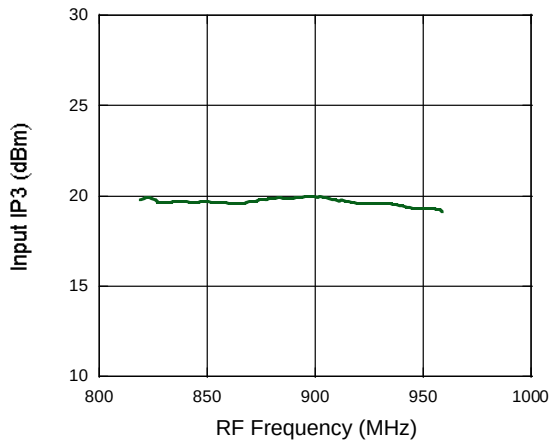
Conversion Loss vs. Frequency



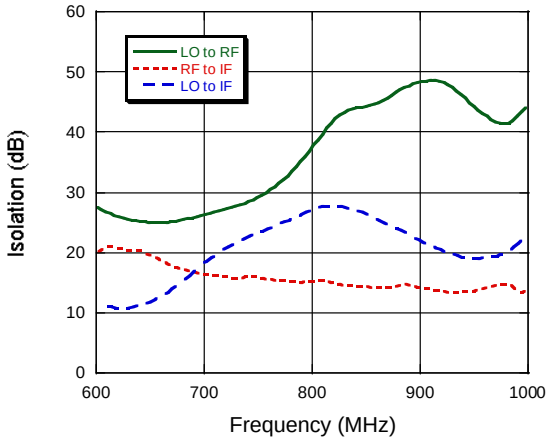
VSWR vs. Frequency



IMR Plot



Isolations



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