



Let Performance Drive

CMD178C3

11-21 GHz Fundamental Mixer



Features

- ▶ Low conversion loss
- ▶ Low LO to RF, LO to IF leakages
- ▶ Wide IF bandwidth
- ▶ Passive double balanced topology
- ▶ Pb-free RoHs compliant 3x3 mm SMT package

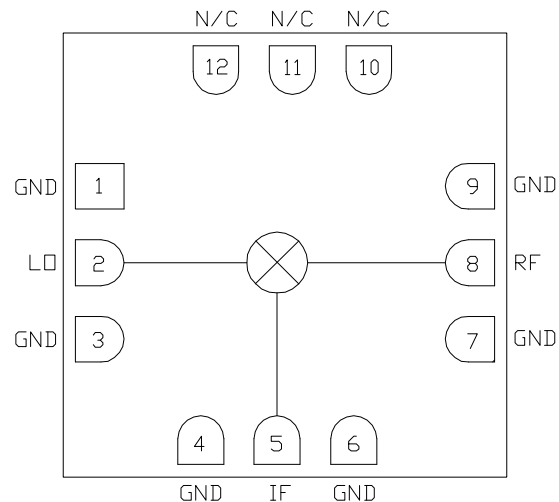
Description

The CMD178C3 is a general purpose double balanced mixer in a leadless surface mount package that can be used for up- and downconverting applications between 11 and 20 GHz. The CMD178C3 has very low leakage to both the RF and IF ports due to the optimized balun structures, and can operate with an LO drive level as low as +9 dBm. The CMD178C3 can easily be configured as an image reject mixer or single sideband modulator with external hybrids and power splitters.

Applications

- ▶ Point-to-point radios
- ▶ Point-to-multi-point radios
- ▶ Test equipment and sensors
- ▶ Military end-use

Functional Block Diagram



Electrical Performance - IF = 100 MHz, LO = +13 dBm, T_A = 25 °C, F = 15 GHz

Parameter	Min	Typ	Max	Units
Frequency Range, RF & LO	11 - 21			GHz
Frequency Range, IF	DC		6	GHz
Conversion Loss		6		dB
LO to RF Leakage		-25		dBm
LO to IF Leakage		-30		dBm
RF to IF Isolation		-23		dBc
Input P1dB		9		dBm

Unless otherwise noted, all measurements performed as a downconverter, IF = 100 MHz

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Specifications

Absolute Maximum Ratings

Parameter	Rating
RF / IF Input Power	+25 dBm
LO Drive	+25 dBm
Operating Temperature	-40 to 85 °C
Storage Temperature	-55 to 150 °C

Operation of this device outside the maximum ratings may cause permanent damage.

Electrical Specifications - IF = 100 MHz, LO = +13 dBm, T_A = 25 °C

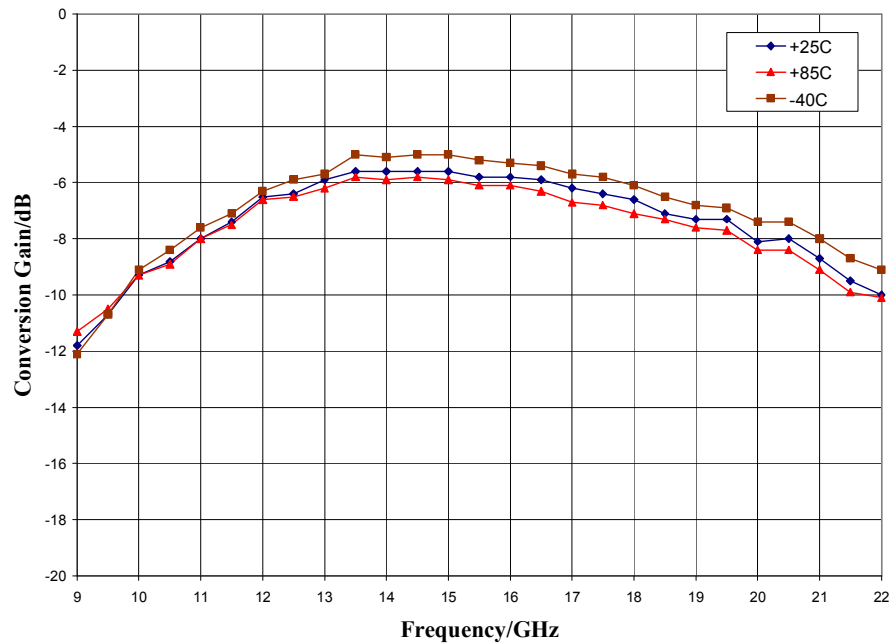
Parameter	Min	Typ	Max	Min	Typ	Max	Units
Frequency Range, RF & LO	13 - 17			11 - 21			GHz
Frequency Range, IF	DC		6	DC		6	GHz
Conversion Loss		6	8		7	10	dB
Noise Figure (SSB)		6	8		7	10	dB
LO to RF Leakage		-30	-22		-30	-18	dBm
LO to IF Leakage		-35	-20		-25	-17	dBm
RF to IF Isolation		-25	-17		-25	-15	dBc
Input P1dB		9			9		dBm
Input IP3		16			16		dBm

Unless otherwise noted, all measurements performed as a downconverter, IF = 100 MHz

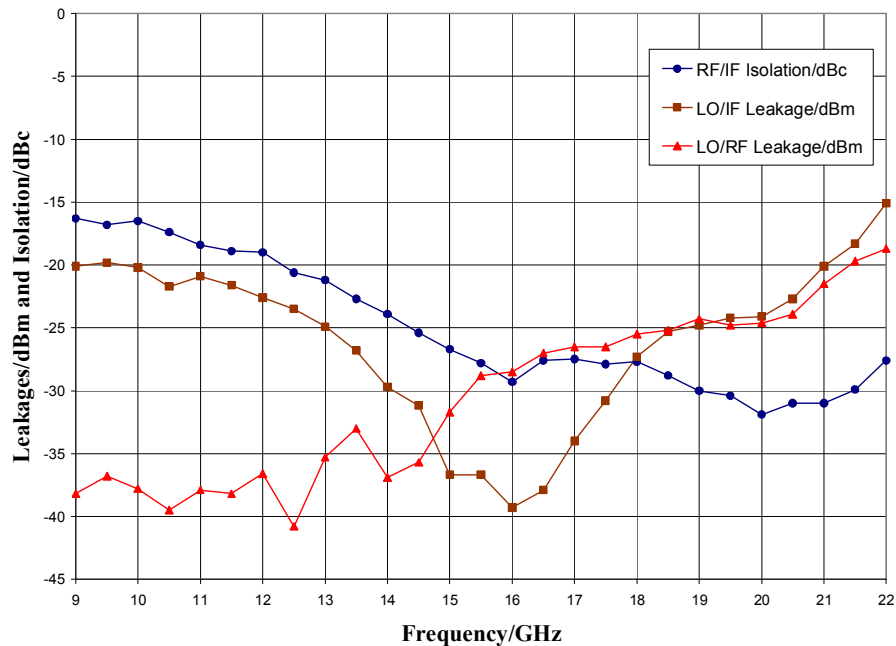
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Typical Performance

Conversion Gain vs. Temperature, LO = +13 dBm, IF = 100 MHz USB



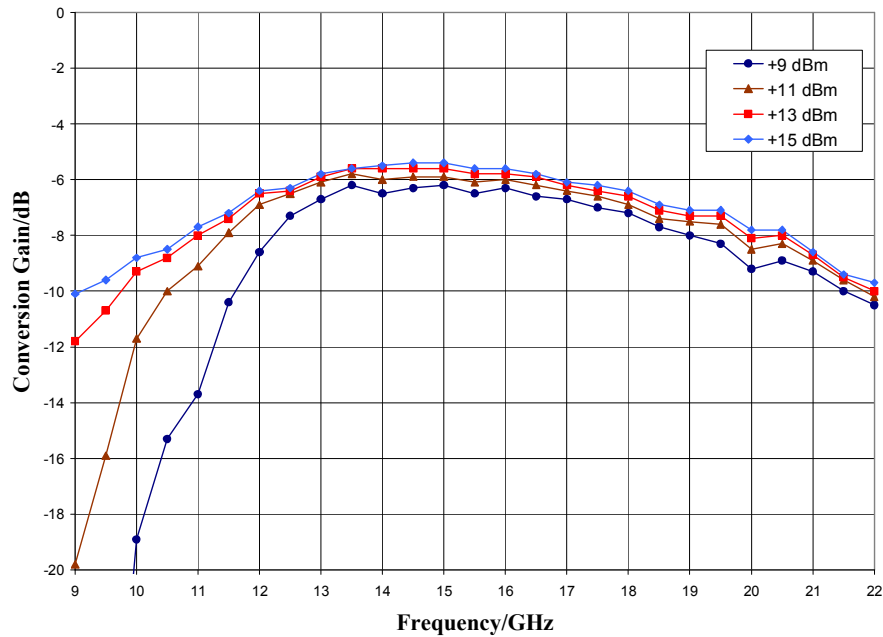
Leakages and Isolation, LO = +13 dBm



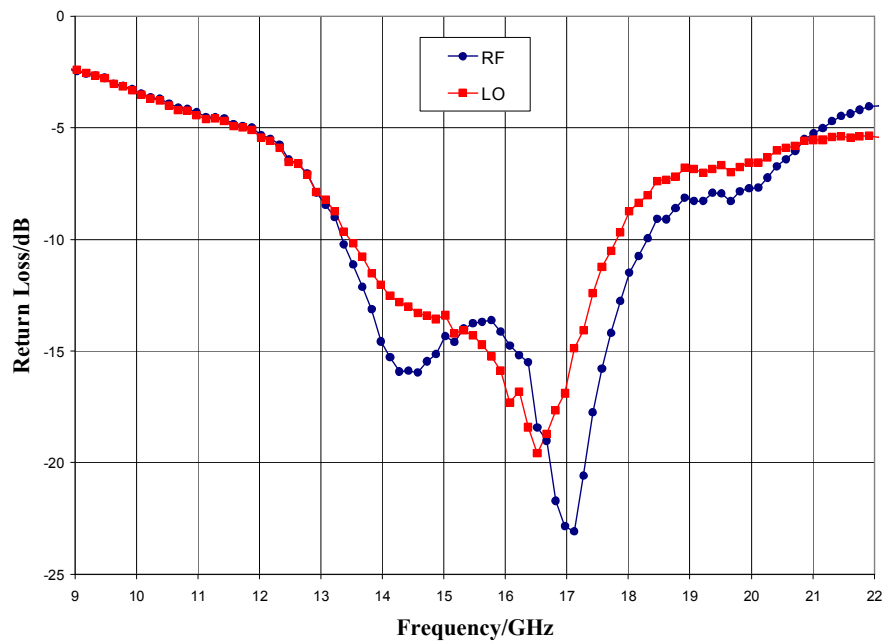
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Typical Performance

Conversion Gain vs. LO Drive, IF = 100 MHz USB



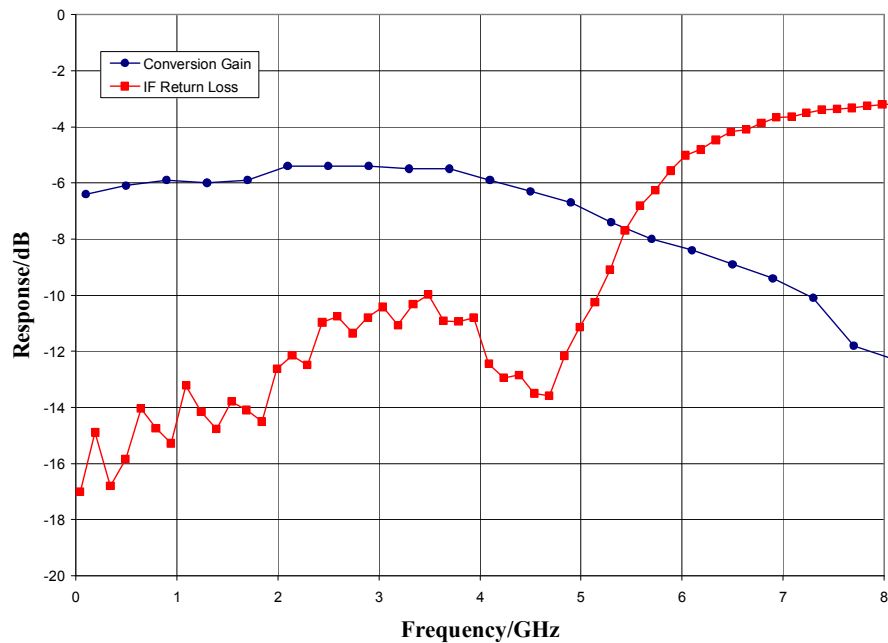
Return Loss, LO = + 13 dBm



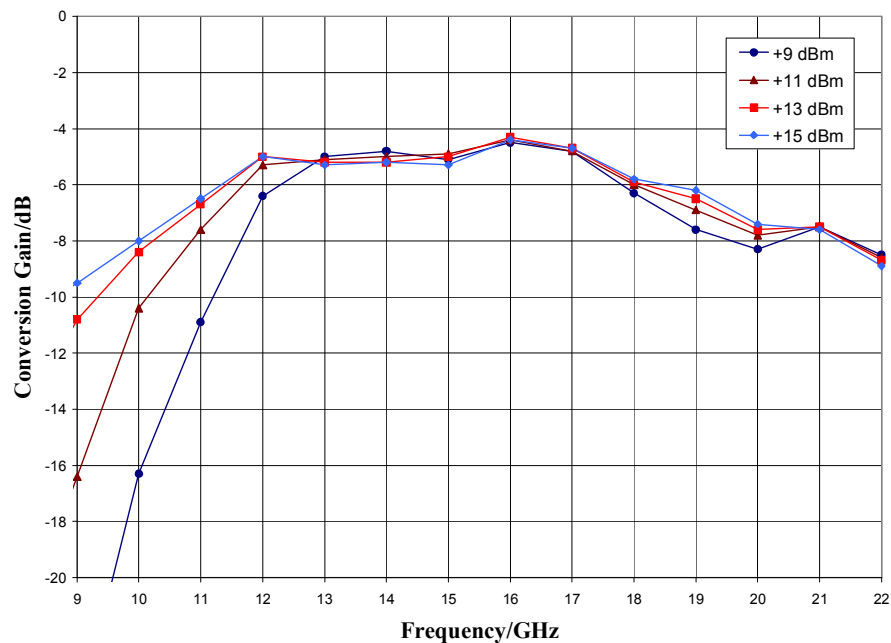
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Typical Performance

IF Bandwidth, LO = +13 dBm



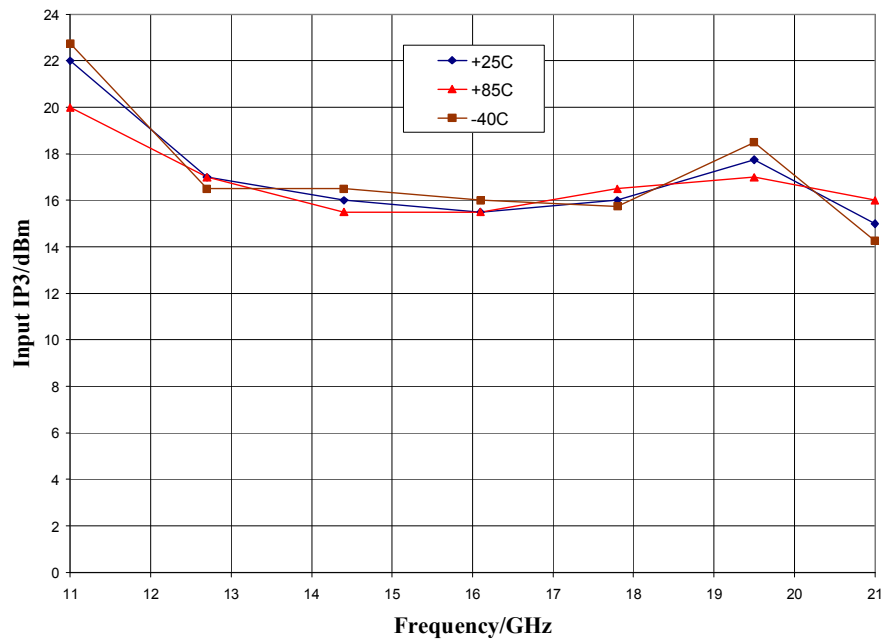
Upconverter Performance, Conversion Gain vs. LO Drive, IF input = 100 MHz



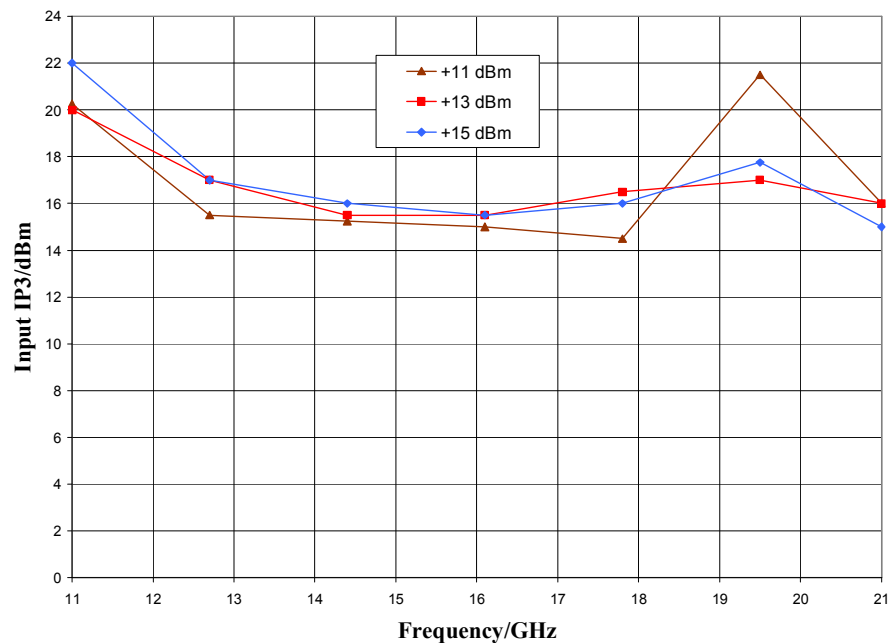
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Typical Performance

Input IP3 vs. Temperature, LO = +13 dBm, IF = 100 MHz



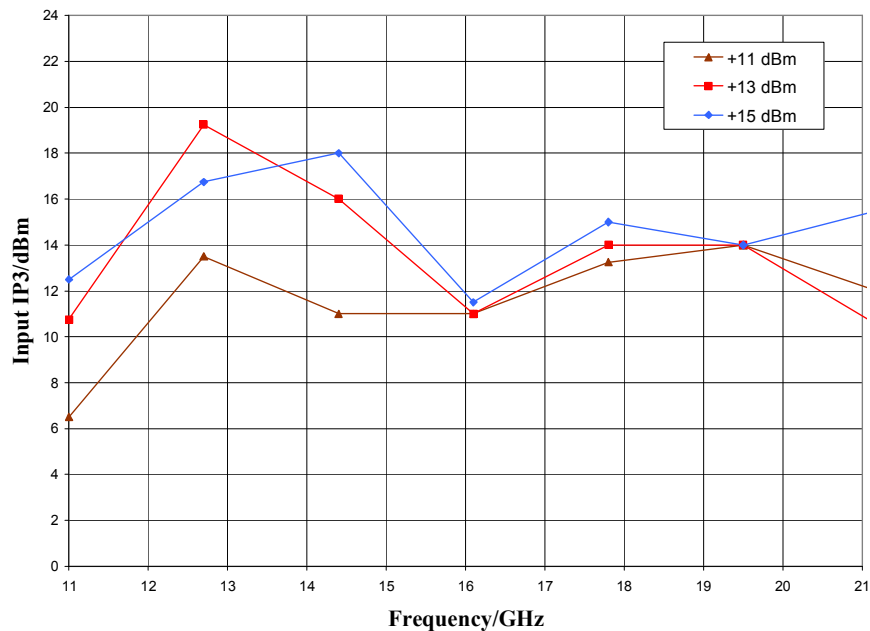
Input IP3 vs. LO Drive, IF = 100 MHz



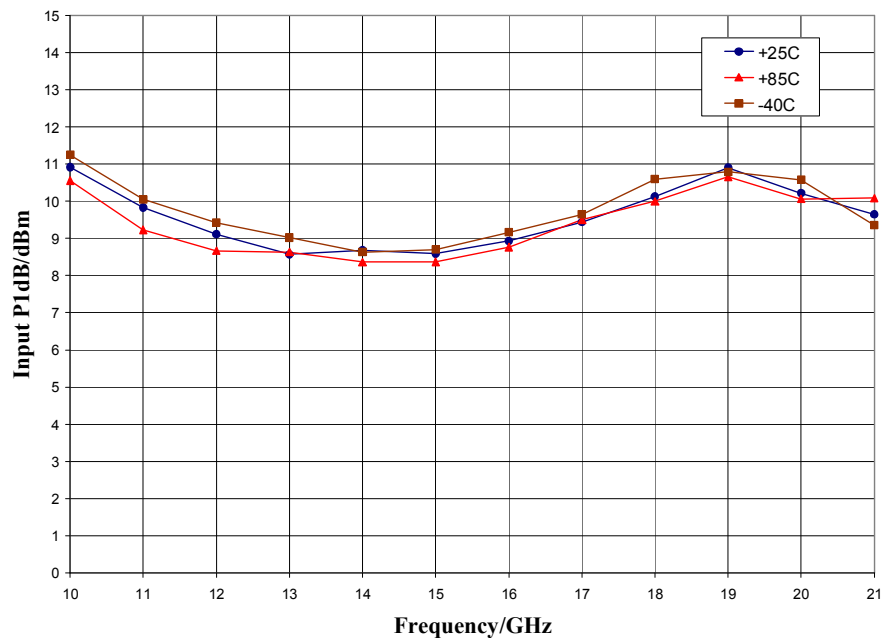
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Typical Performance

Upconverter Performance, Input IP3 vs. LO Drive, IF = 500 MHz



Input P1dB vs. Temperature, LO = +13 dBm, IF = 100 MHz USB



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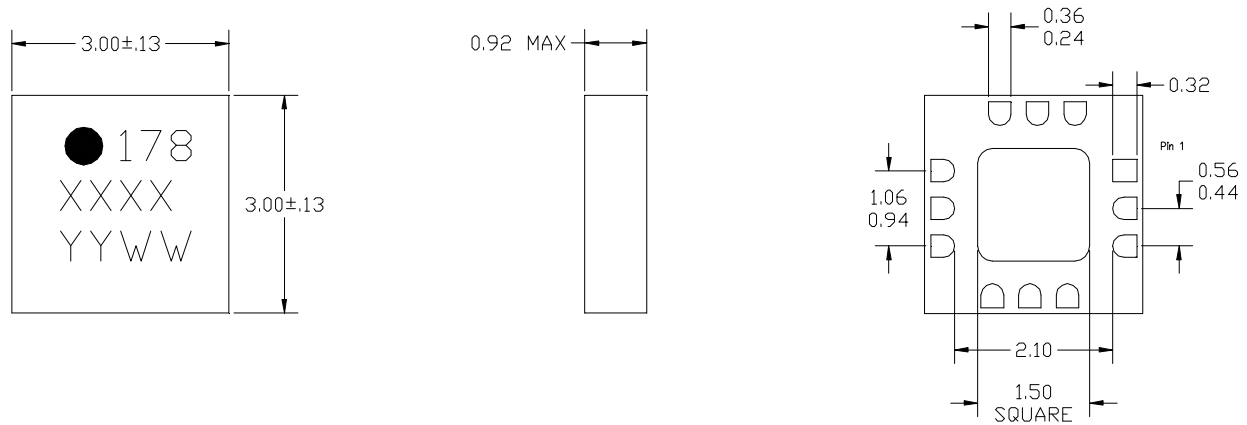
Typical Performance

MxN Spurious Outputs

	nLO				
mRF	0	1	2	3	4
0	xx	25	33	> 90	> 90
1	28	0	47	40	> 90
2	72	64	64	67	75
3	> 90	> 90	> 90	64	> 90
4	> 90	> 90	> 90	> 90	> 90
RF = 15.1 GHz @ -10 dBm LO = 15.0 GHz @ +13 dBm All values in dBc below the IF output power level (1RF - 1LO)					

Mechanical Information

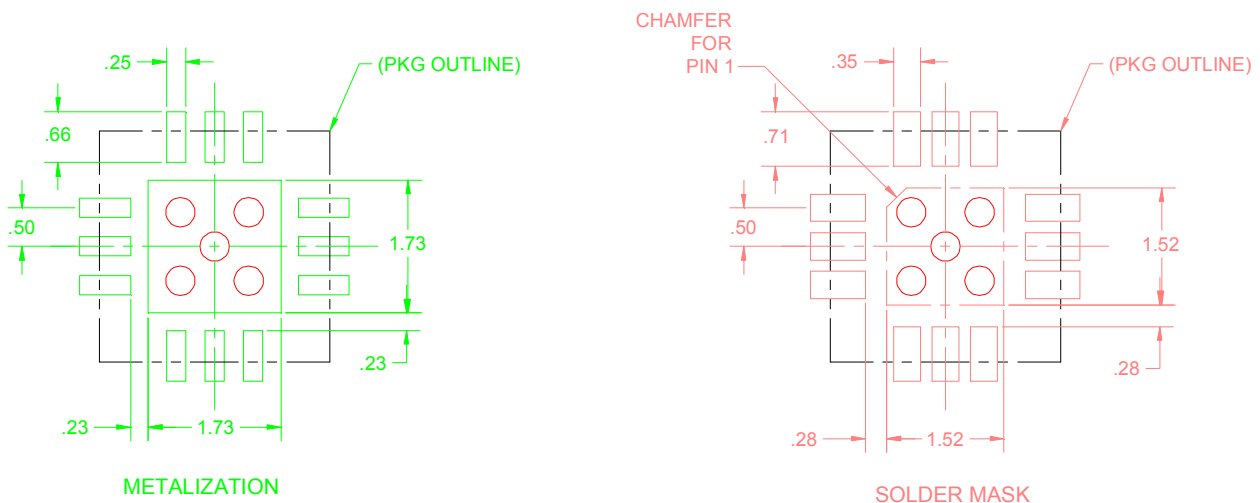
Package Information and Dimensions



NOTES:

1. DIMENSIONS ARE IN MILLIMETERS
2. MATERIAL: BLACK ALUMINA
3. LEAD FINISH: 30-80 MICROINCHES GOLD OVER 50 MICROINCHES NICKEL.
4. ALTERNATE PIN #1 IDENTIFIER IS SINGLE SQUARE PAD.

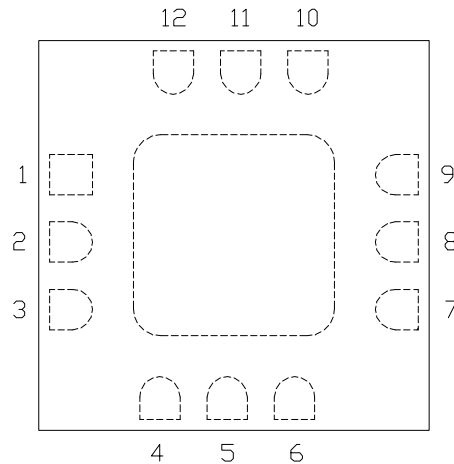
Recommended PCB Land Pattern



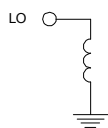
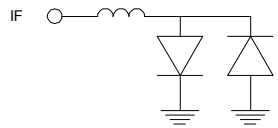
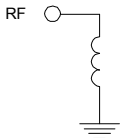
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Pin Description

Pin Diagram



Functional Description

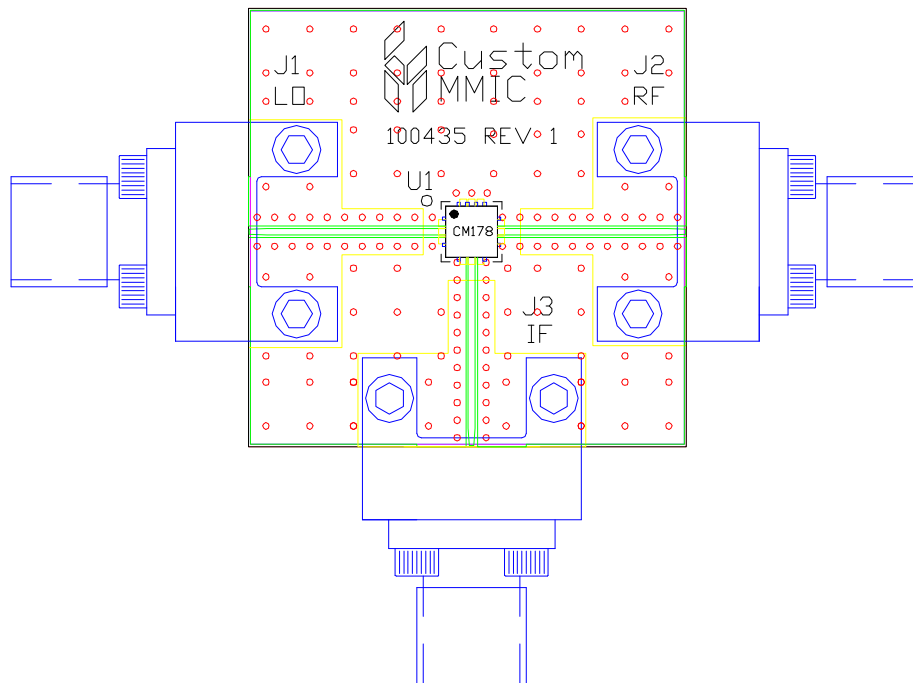
Pin	Function	Description	Schematic
1,3,4,6,7,9 and die paddle	Ground	Connect to RF / DC ground.	
2	LO	This pin is DC coupled and matched to 50 ohms.	
5	IF	This pin is DC coupled. For applications not requiring operation to DC, this port should be DC blocked externally using a series capacitor whose value has been chosen to pass the necessary IF frequency range. For operation to DC, this pin must not source or sink more than 16 mA of current or part non-function or part failure may result.	
8	RF	This pin is DC coupled and matched to 50 ohms.	
10-12	N/C	No connection required. These pins may be connected to RF/DC ground	

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Applications Information

Evaluation Board

The circuit board shown has been developed for optimized assembly at Custom MMIC. A sufficient number of via holes should be used to connect the top and bottom ground planes. As surface mount processes vary, careful process development is recommended.



Bill of Material

Designator	Value	Description
J1 - J3		SMA End Launch Connector
U1		CMD178C3 Fundamental Mixer
PCB		100435 Evaluation PCB

GaAs MMIC devices are susceptible to damage from Electrostatic Discharge. Proper precautions should be observed during handling, assembly and test.

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