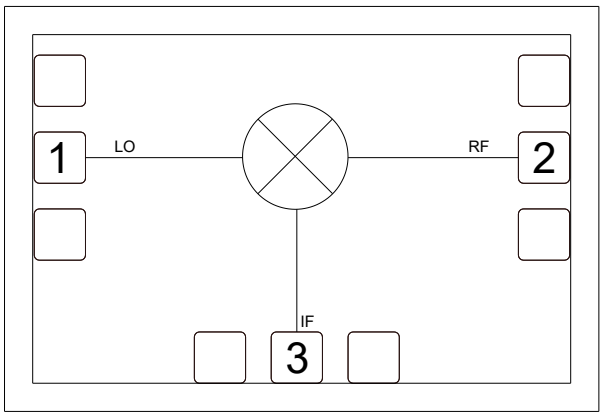
CMD178

11-21 GHz Fundamental Mixer

Features

- Low conversion loss
- High isolation
- Wide IF bandwidth
- Passive double balanced topology
- Small die size

Functional Block Diagram



Description

The CMD178 is a general purpose double balanced mixer die that can be used for up- and downconverting applications between 11 and 21 GHz. The CMD178 has very high isolation 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 CMD178 can easily be configured as an image reject mixer or single sideband modulator with external hybrids and power splitters.

Electrical Performance - IF = 100 MHz, LO = +13 dBm , T_A = 25 °C, F = 21 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 Isolation		45		dB
LO to IF Isolation		45		dB
RF to IF Isolation		26		dB
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	+22 dBm
LO Drive	+22 dBm
Operating Temperature	-40 to 85 °C
Storage Temperature	-55 to 150 °C
Thermal Resistance, Θ_{JC}	470 °C / W
Power Dissipation, Pdiss	138 mW

Exceeding any one or combination of the maximum ratings may cause permanent damage to the device.

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 Isolation	35	43		31	43		dB
LO to IF Isolation	33	48		30	38		dB
RF to IF Isolation	17	25		15	25		dB
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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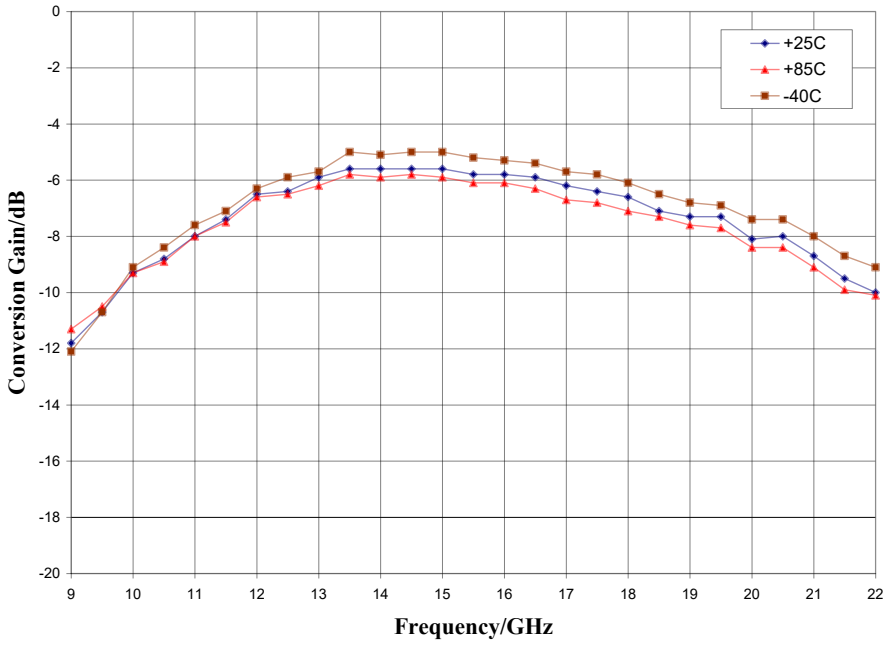
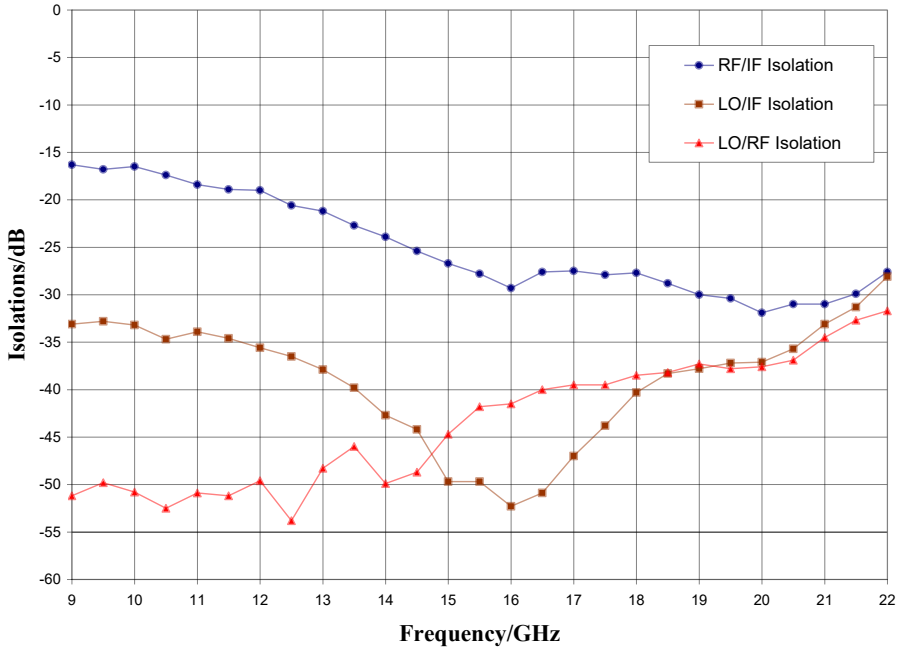
Typical Performance

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



Isolation, LO = +13 dBm



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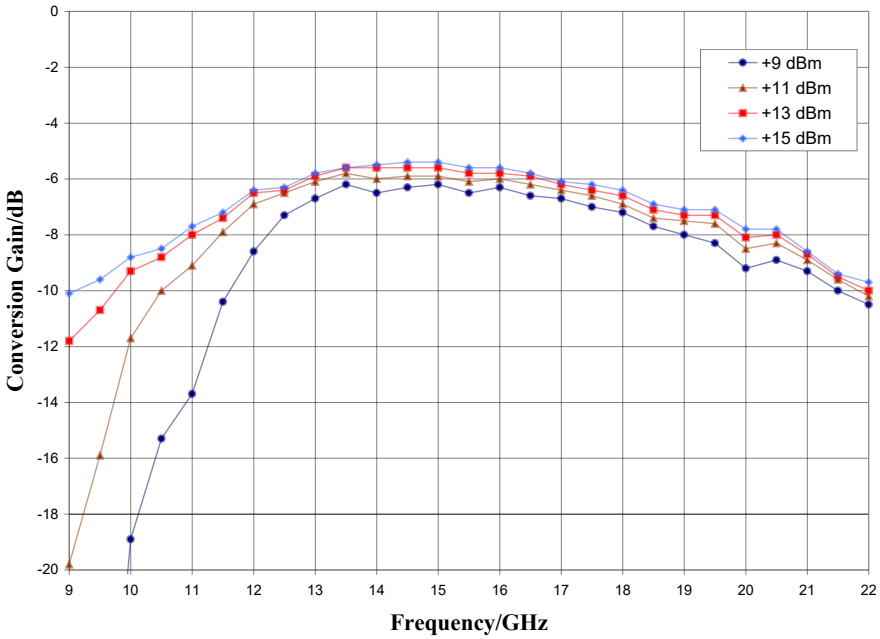
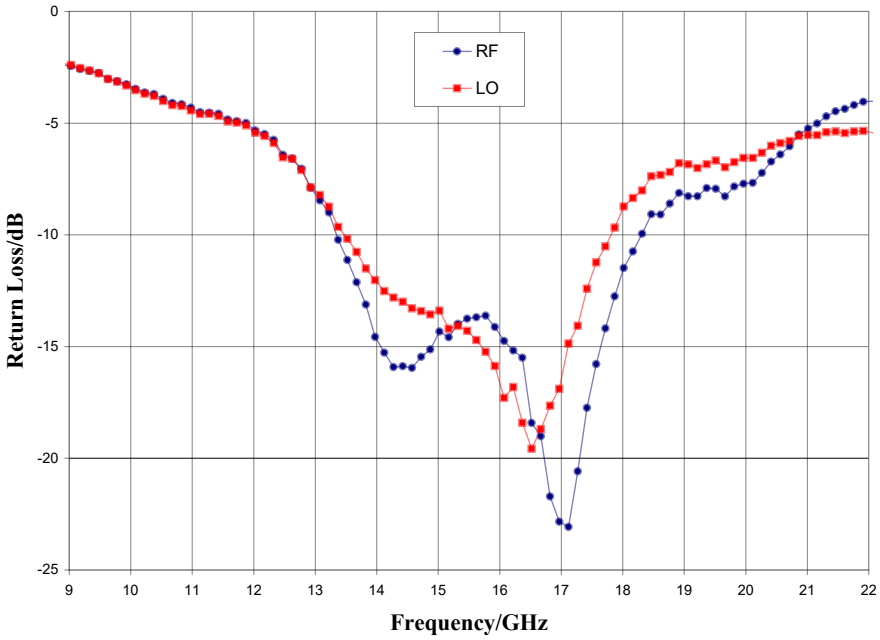
Typical Performance

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



Return Loss, LO = + 13 dBm



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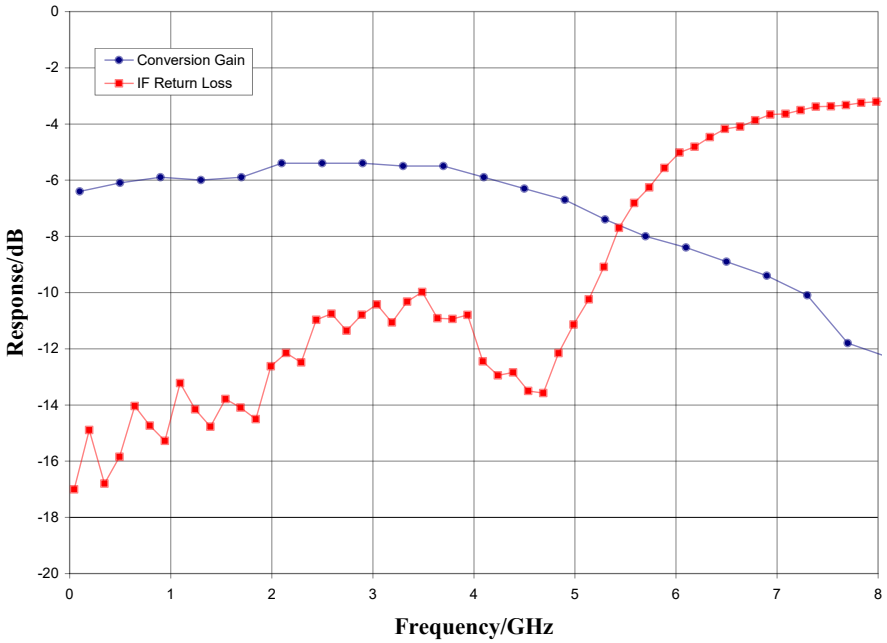
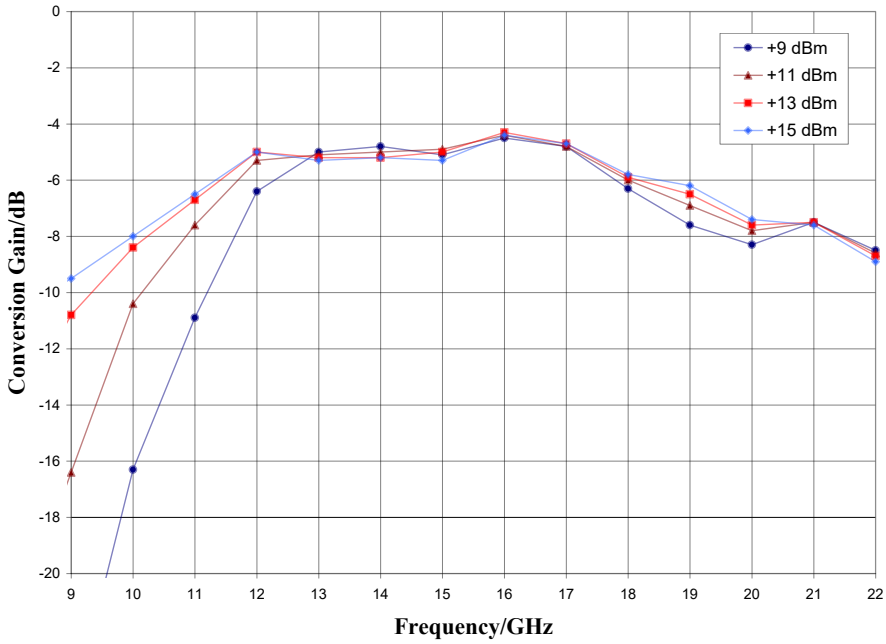
Typical Performance

IF Bandwidth, LO = +13 dBm



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



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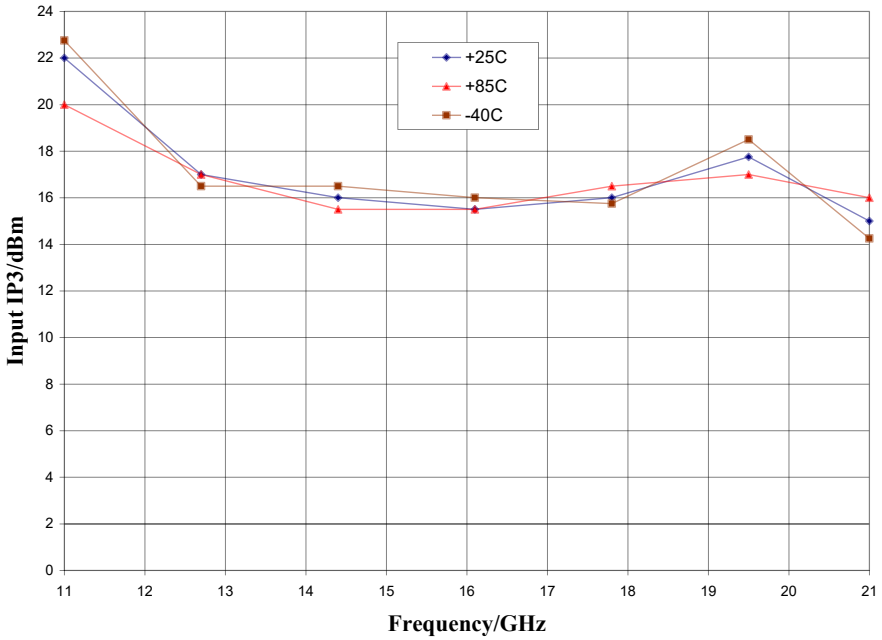
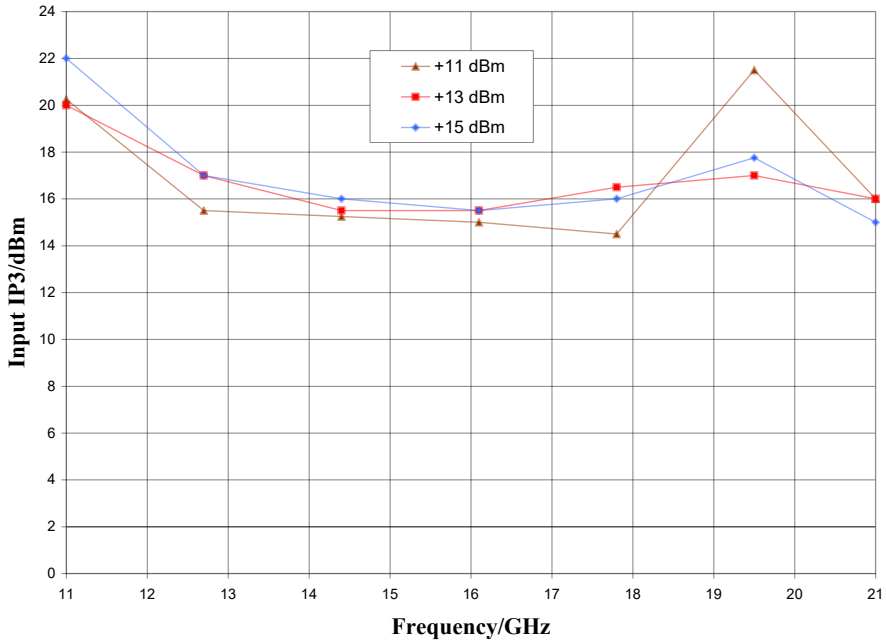
Typical Performance

Input IP3 vs. Temperature, LO = +15 dBm, IF = 100 MHz



Input IP3 vs. LO Drive, IF = 100 MHz



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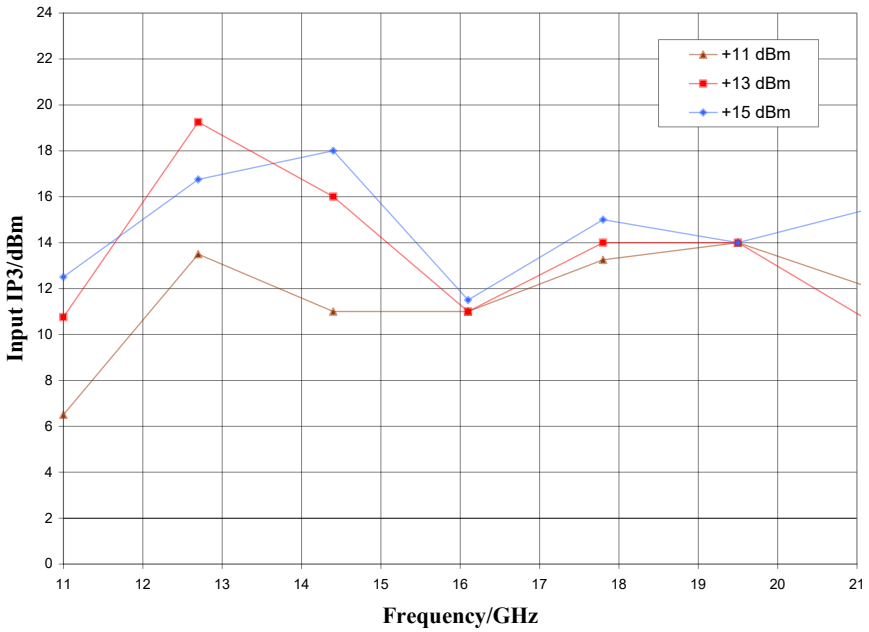
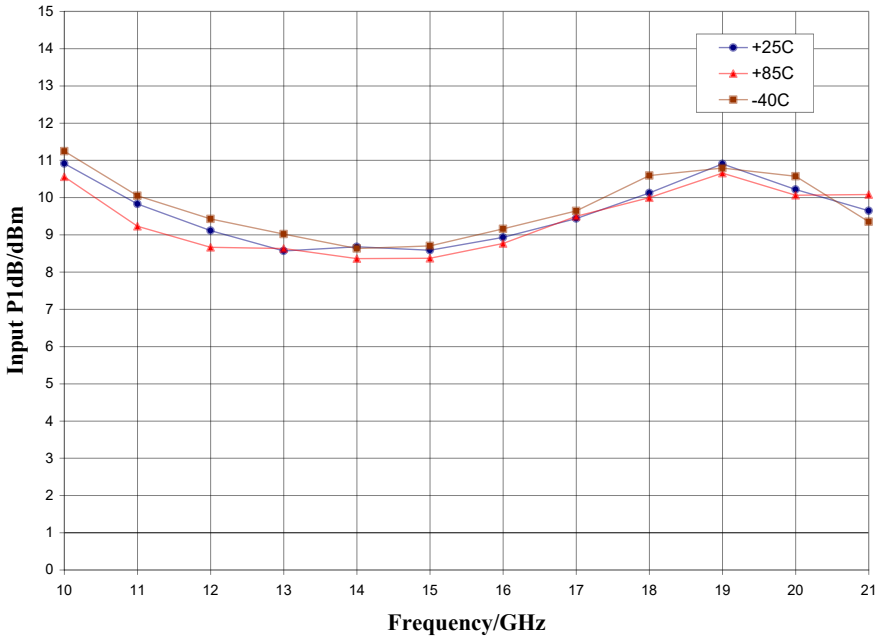
Typical Performance

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)

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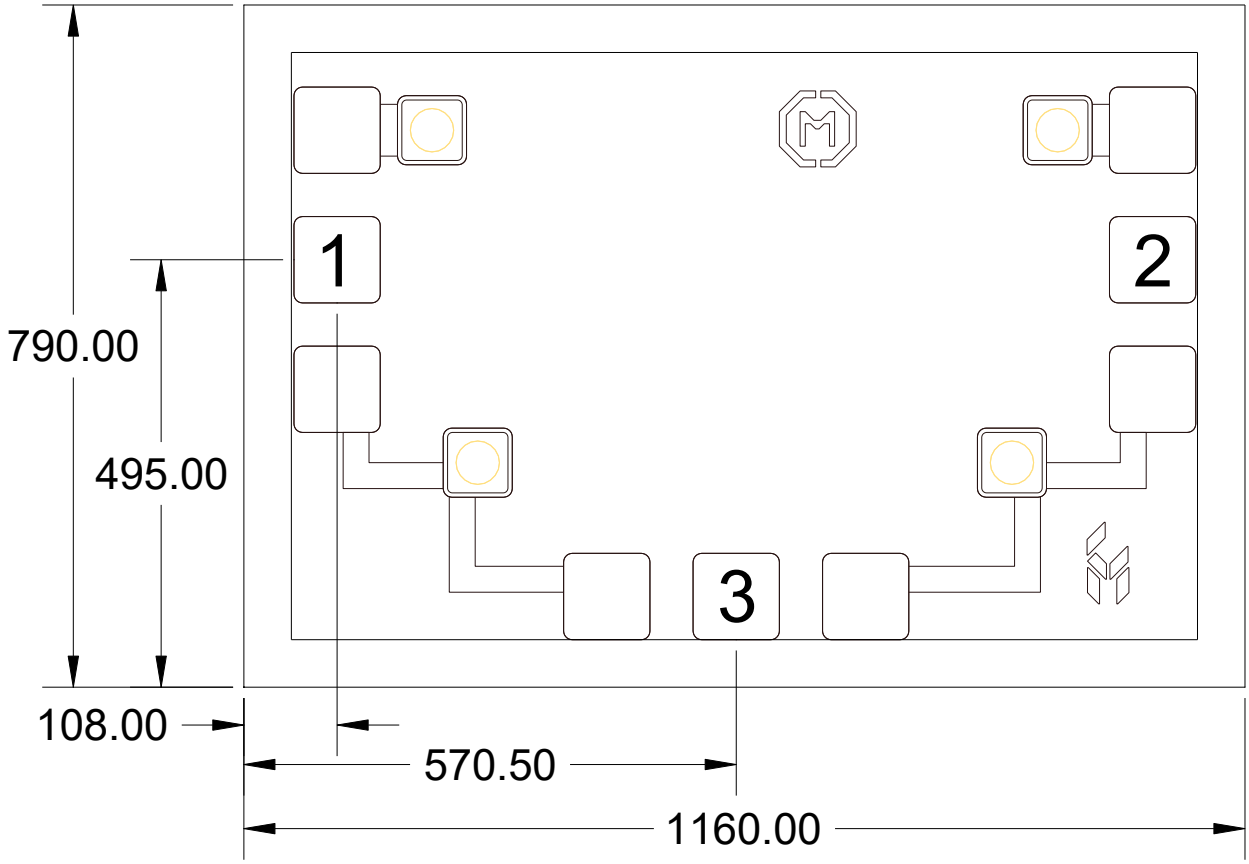
Mechanical Information

Die Outline (all dimensions in microns)



Notes:
1. No connection required for unlabeled pads
2. Backside is RF and DC ground
3. Backside and bond pad metal: Gold
4. Die is 100 microns thick
5. All bond pads (1, 2, 3) are 100 x 100 microns square

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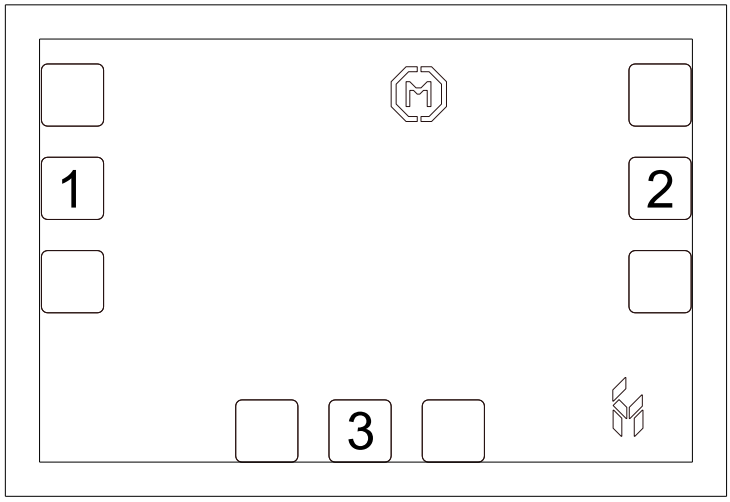
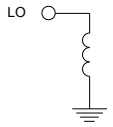
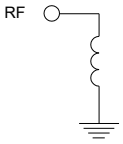
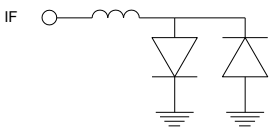
Pin Description

Pad Diagram



Functional Description

Pin	Function	Description	Schematic
1	LO	This pin is DC coupled and matched to 50 ohms.	
2	RF	This pin is DC 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 or sink more than 16 mA of current or part non-function or part failure may result.	
Backside	Ground	Connect to RF / DC ground.	

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