CMD303

13-21 GHz Sub-harmonic ×2 Mixer

Product Overview

The CMD303 is a sub-harmonically pumped mixer die with an integrated LO amplifier which can be used as an upconverter or downconverter. The device has low conversion loss and excellent 2LO to RF isolation eliminating the need for additional filtering. The CMD303 requires as low as 0 dBm LO drive and operates on a single positive supply voltage. The sub-harmonic design and low LO drive level allows for less stringent oscillator requirements.

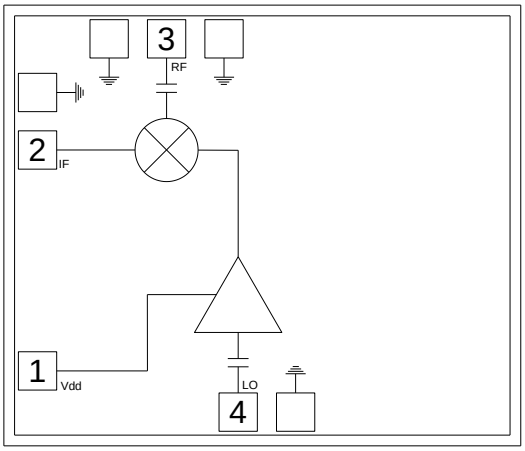
Key Features

- Integrated LO Amplifier
- High Isolations
- Sub-Harmonic ×2 LO
- Single Positive Supply Voltage
- HMC258 Replacement
- Small Die Size: 1350 um x 1150 um

Ordering Information

Part No.	Description
CMD303	13-21 GHz Sub-harmonic ×2 Mixer, 100 Piece Gel Pack

Functional Block Diagram



Electrical Performance (V_{dd} = 3 V, IF = 100 MHz, LO = +2 dBm, RF = 18 GHz, T_A = 25 °C)

Parameter	Min	Typ	Max	Units
Frequency Range, RF		13 - 21		GHz
Frequency Range, LO		6.5 - 10.5		GHz
Frequency Range, IF	DC		3	GHz
Conversion Loss		8.5		dB
Noise Figure (SSB)		8.5		dB
2LO to RF Isolation		28		dB
2LO to IF Isolation		48		dB
Input IP3		12		dBm
Input P1dB		4		dBm
Supply Current	22	32	42	mA

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

Absolute Maximum Ratings

Parameter	Rating
RF / IF Input Power	+13 dBm
LO Drive	+13 dBm
Drain Voltage, V_{dd}	5.5 V
Channel Temperature, Tch	150 ºC
Power Dissipation, Pdiss	0.67 W
Thermal Resistance, θ_{JC}	97.2 ºC /W
Operating Temperature	-55 to 85 °C
Storage Temperature	-55 to 150 °C

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

Recommended Operating Conditions

Parameter	Min	Typ	Max	Units
V_{dd}	2	3	5	V
I_{dd}		32		mA

Electrical performance is measured at specific test conditions. Electrical specifications are not guaranteed over all recommended operating conditions.

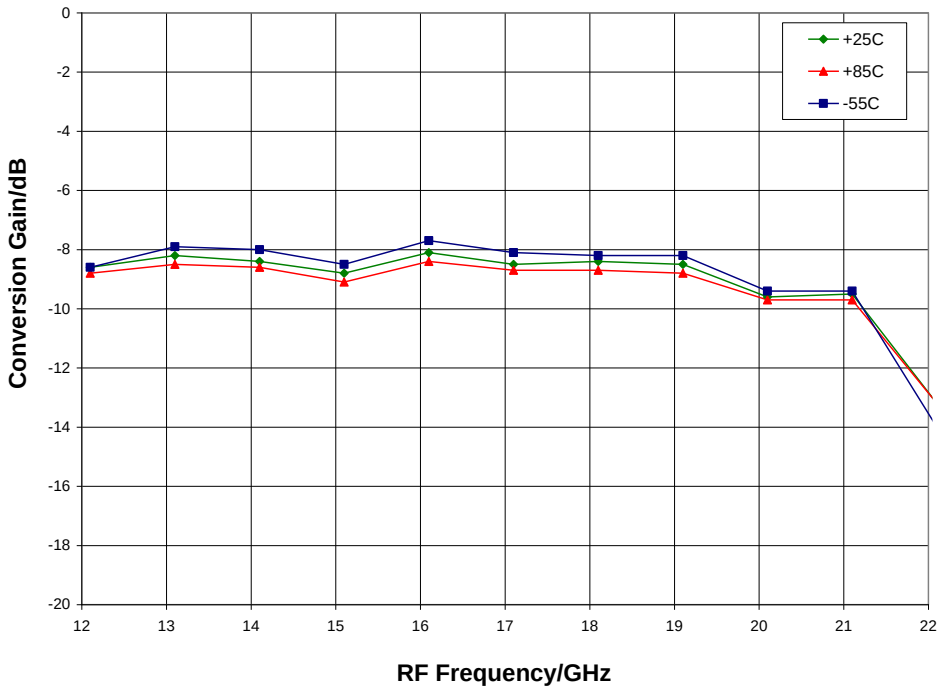
Electrical Specifications (V_{dd} = 3 V, IF = 100 MHz, LO = +2 dBm, T_A = 25 ºC)

Parameter	Min	Typ	Max	Min	Typ	Max	Units
Frequency Range, RF		13 - 17			17 - 21		GHz
Frequency Range, LO		6.5 - 8.5			8.5 - 10.5		GHz
Frequency Range, IF		DC - 3			DC - 3		GHz
Conversion Loss		8.5	12		9	12.5	dB
Noise Figure (SSB)		8.5	12		9	12.5	dB
2LO to RF Isolation	17	24		22	28		dB
2LO to IF Isolation	36	43		42	50		dB
Input IP3		13			9		dBm
Input P1dB		3			3		dBm
Supply Current	22	32	42	22	32	42	mA

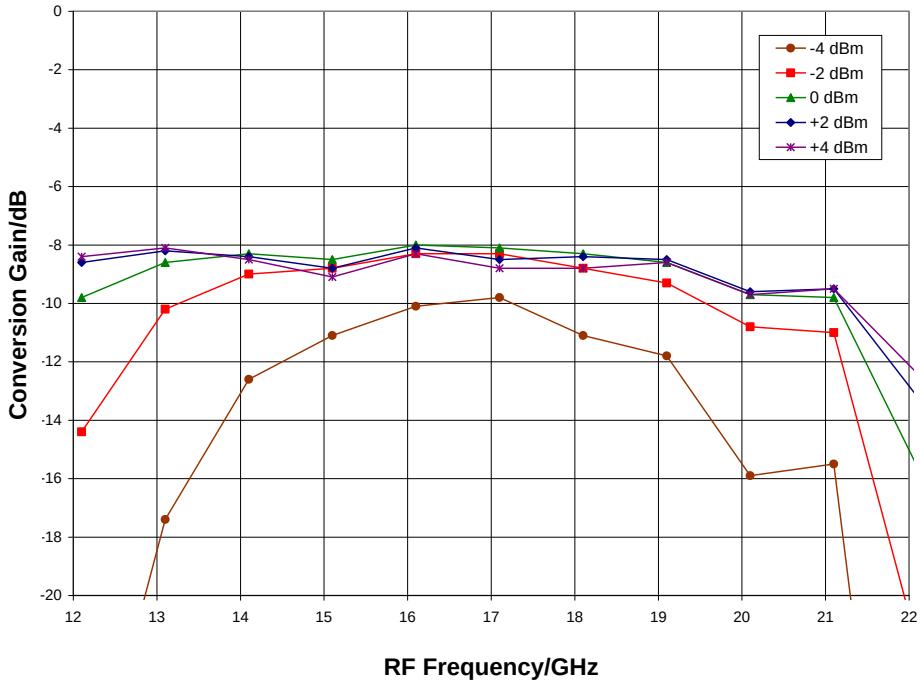
Unless otherwise noted, all measurements performed as a downconverter, IF = 100 MHz USB

Typical Performance

Conversion Gain vs. Temperature, LO = +2 dBm, IF = 100 MHz USB

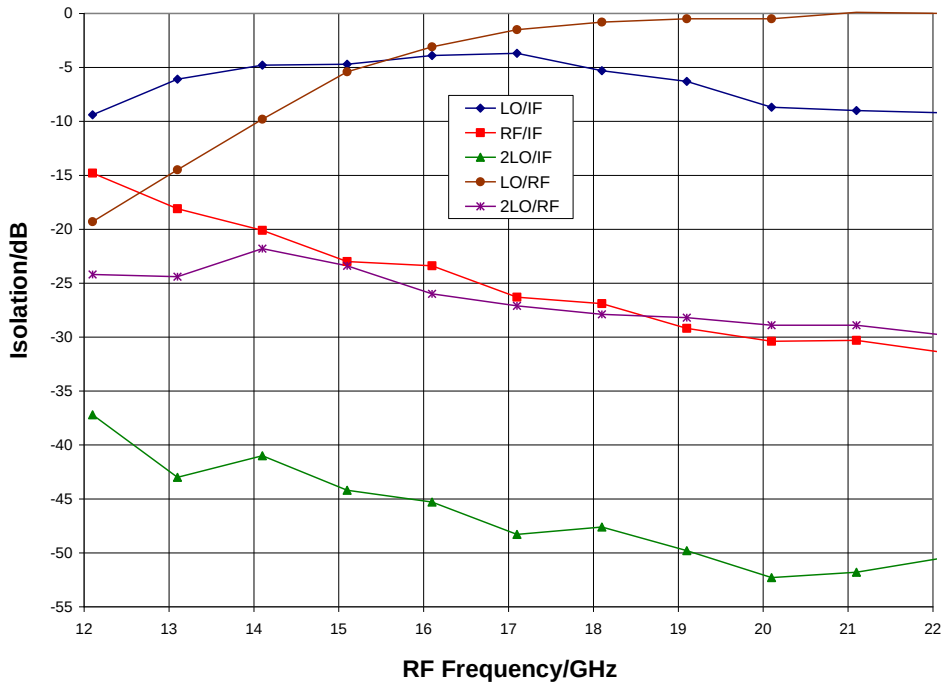


Conversion Gain vs. LO Drive, IF = 100 MHz USB, T_A = 25 °C

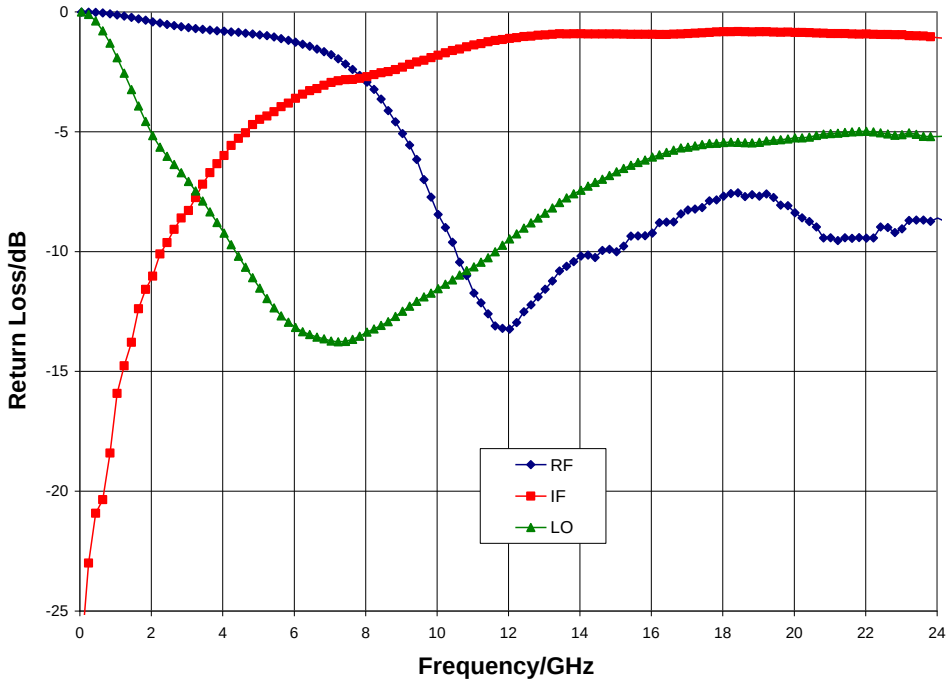


Typical Performance

Isolations, LO = +2 dBm, T_A = 25 °C

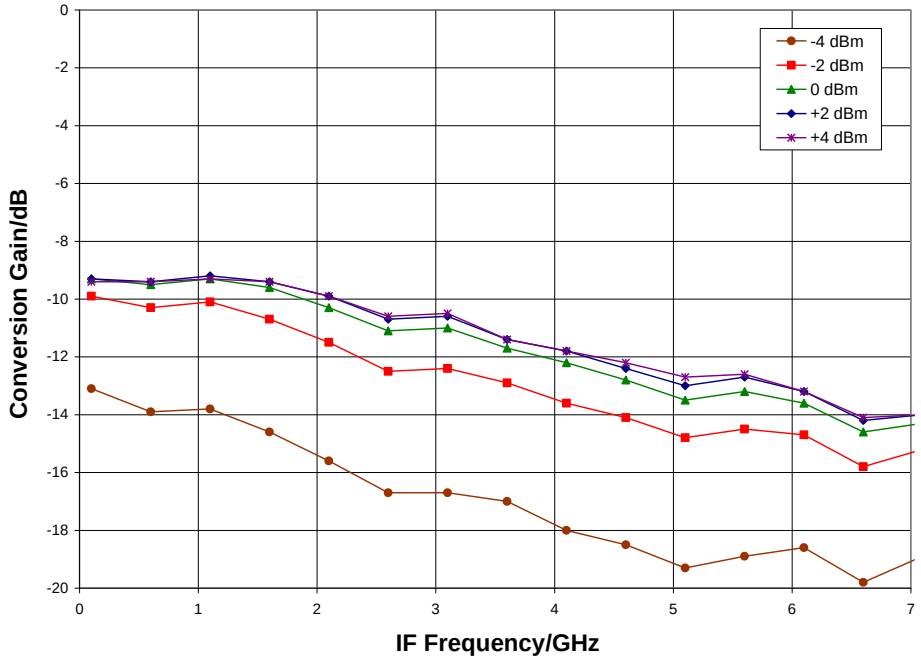


Return Loss, LO = + 2 dBm, T_A = 25 °C

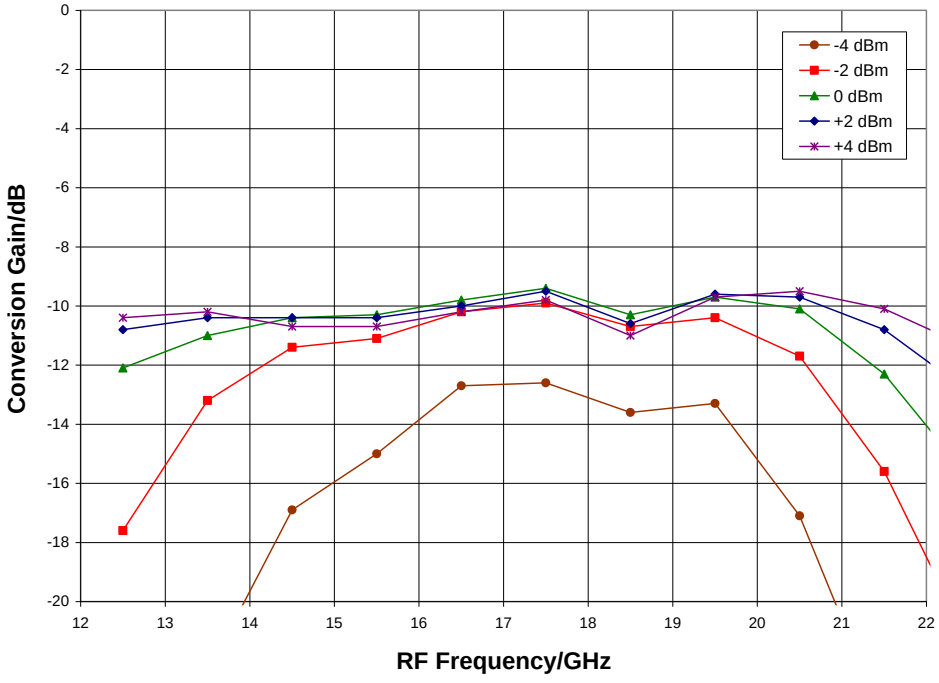


Typical Performance

IF Bandwidth, LO = +2 dBm, T_A = 25 °C

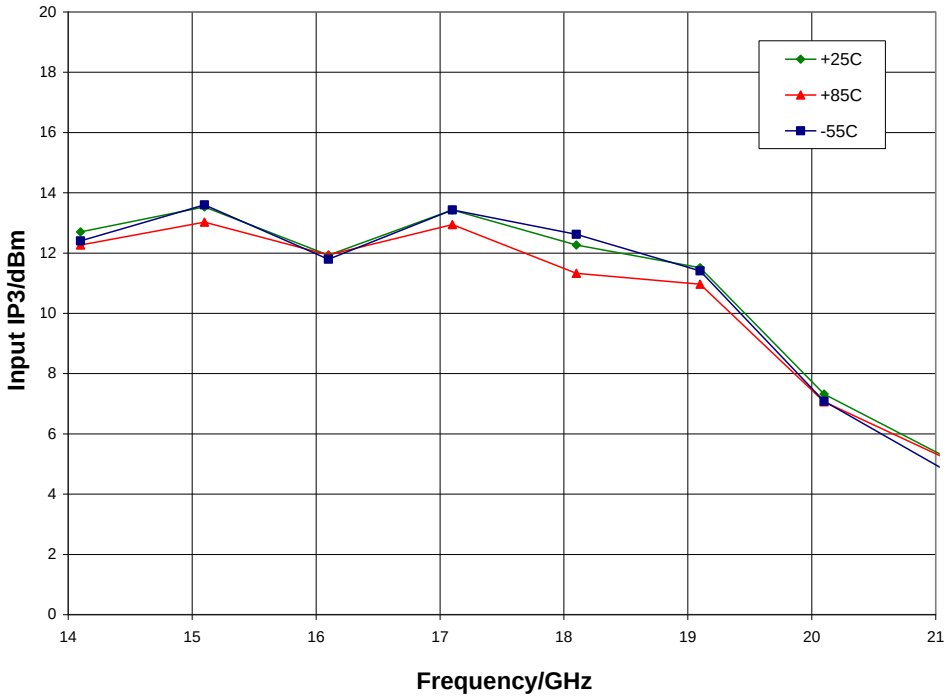


Upconverter Performance, Conversion Gain vs. LO Drive, T_A = 25 °C

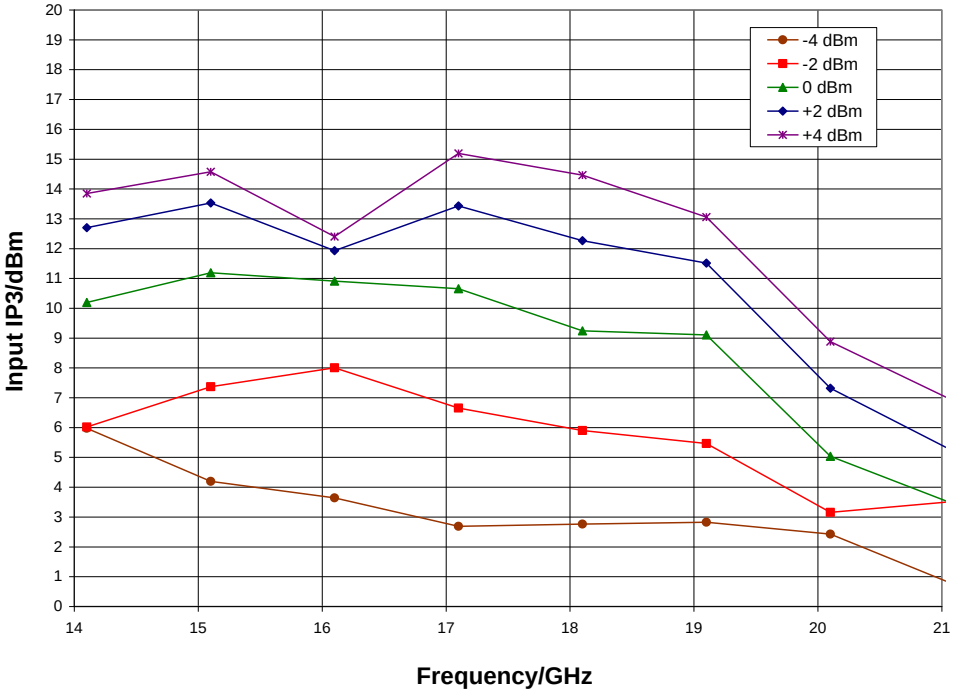


Typical Performance

Input IP3 vs. Temperature, LO = +2 dBm

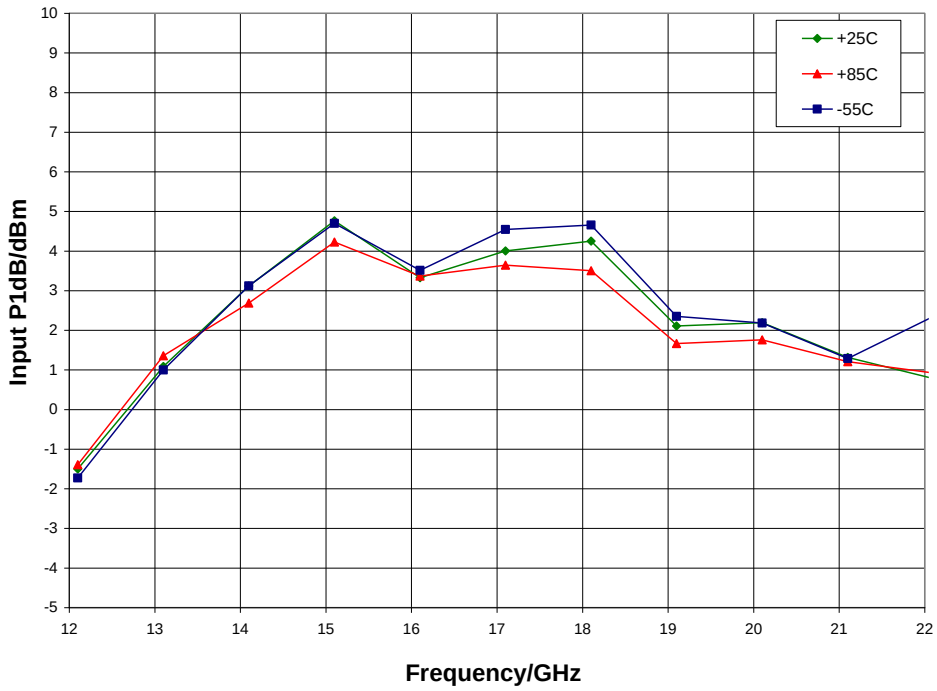


Input IP3 vs. LO Drive, T_A = 25 °C



Typical Performance

Input P1dB vs. Temperature, LO = +2 dBm



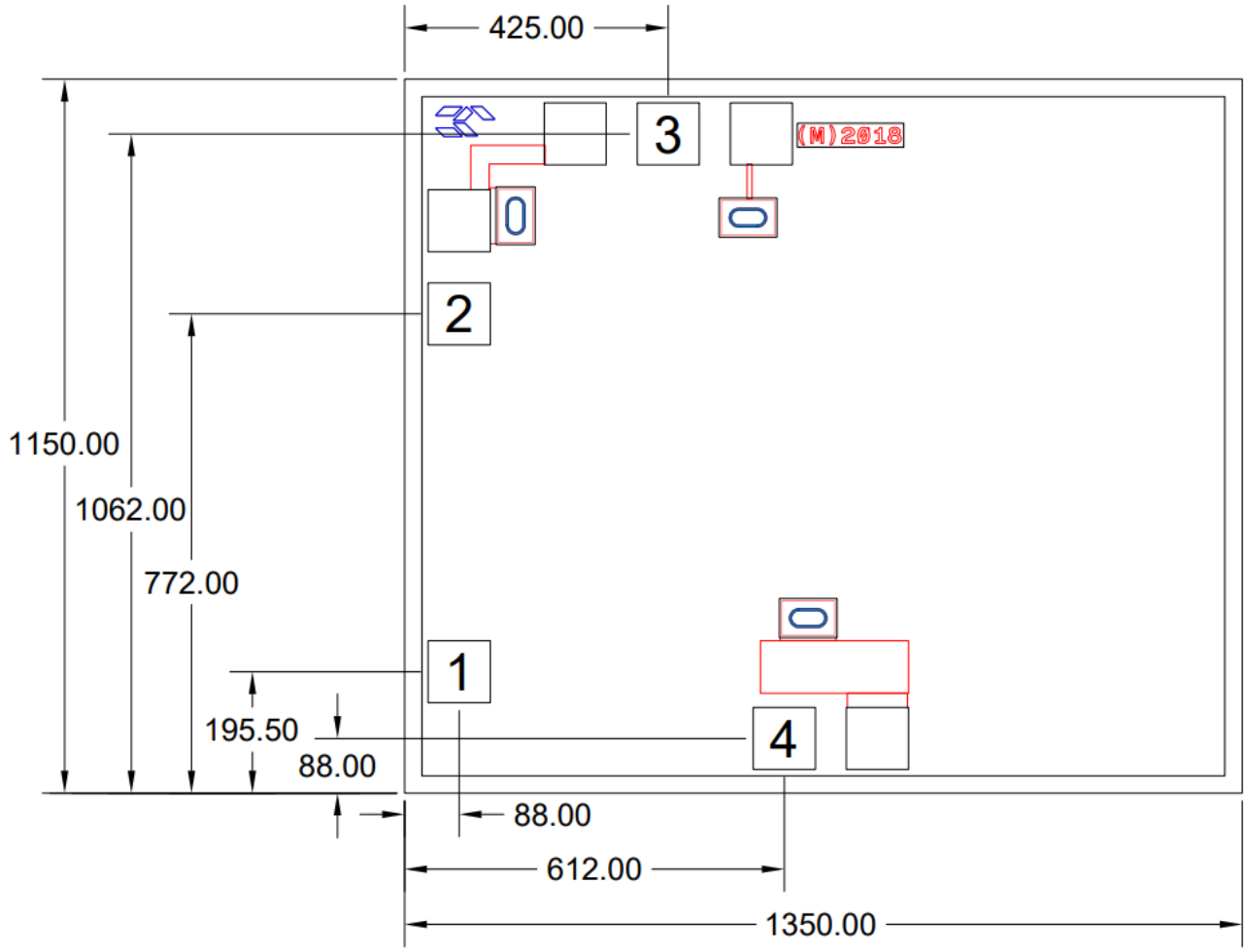
MxN Spur Table

mRF	nLO				
	0	1	2	3	4
0	X	-9	38	31	61
1	18	31	0	35	41
2	76	60	60	32	45
3	76	76	76	76	68
4	-14	76	76	76	76

RF = 18 GHz @ -10 dBm
LO = 8.55 GHz @ 0 dBm
All values in dBc below the IF output power level (1RF - 2LO)

Mechanical Information

Die Outline (all dimensions in microns)

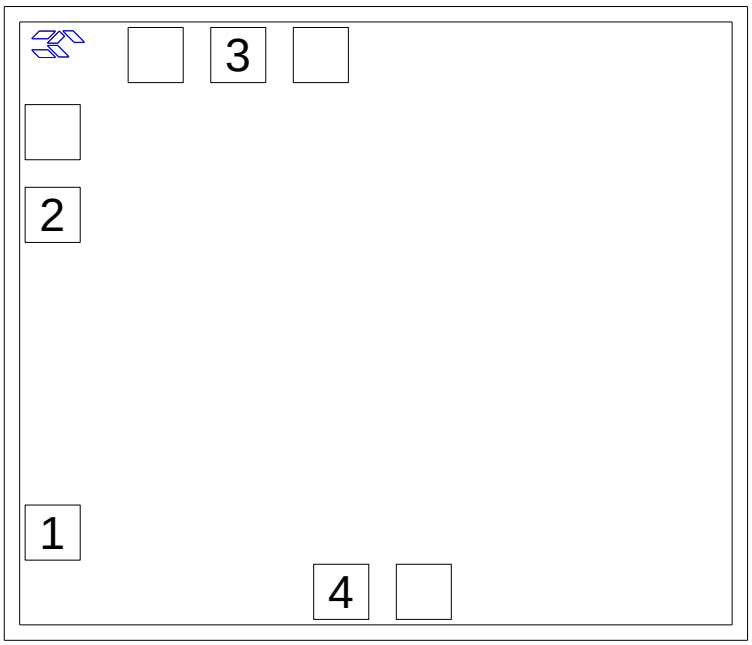


Notes:

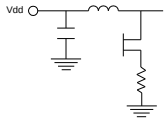
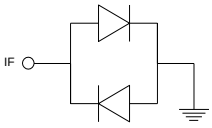
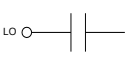
1. No connection required for unlabeled pads
2. Backside is RF and DC ground
3. Backside and bond pad metal: Gold
4. Die is 100 microns thick
5. All bond pads are 100 x 100 microns square

Pin Description

Pad Diagram



Functional Description

Pin	Function	Description	Schematic
1	V_{dd}	Power supply voltage Decoupling and bypass caps required	
2	IF	This pin is DC coupled and should be DC blocked externally using a series capacitor whose value has been chosen to pass the necessary IF frequency. Any applied DC voltage to this pin will result in die non-function and possible die failure.	
3	RF	DC blocked and 50 ohm matched	
4	LO	DC blocked and 50 ohm matched	
Backside	Ground	Connect to RF / DC ground	

Applications Information

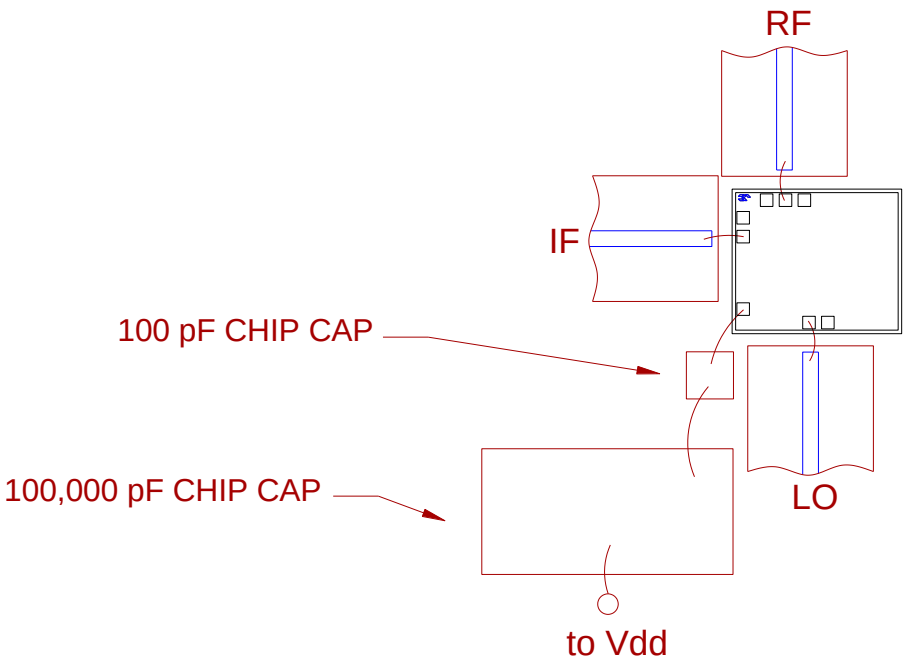
Assembly Guidelines

The backside of the CMD303 is RF ground. Die attach should be accomplished with electrically and thermally conductive epoxy only. Eutectic attach is not recommended. Standard assembly procedures should be followed for high frequency devices. The top surface of the semiconductor should be made planar to the adjacent RF transmission lines.

RF connections should be made as short as possible to reduce the inductive effect of the bond wire. Use of a 0.8 mil thermosonic wedge bonding is highly recommended as the loop height will be minimized.

The semiconductor is 100 um thick and should be handled by the sides of the die or with a custom collet. Do not make contact directly with the die surface as this will damage the monolithic circuitry. Handle with care.

Assembly Diagram



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

Handling Precautions

Parameter	Rating	Standard
ESD – Human Body Model (HBM)	Class 1A	ESDA / JEDEC JS-001-2012

Caution!
ESD-Sensitive Device

RoHS Compliance

This part is compliant with 2011/65/EU RoHS directive (Restrictions on the Use of Certain Hazardous Substances in Electrical and Electronic Equipment) as amended by Directive 2015/863/EU.

This product also has the following attributes:

- Lead Free
- Antimony Free
- TBBP-A ($C_{15}H_{12}Br_40_2$) Free
- SVHC Free
- Halogen Free
- PFOS Free

Contact Information

For the latest specifications, additional product information, worldwide sales and distribution locations:

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