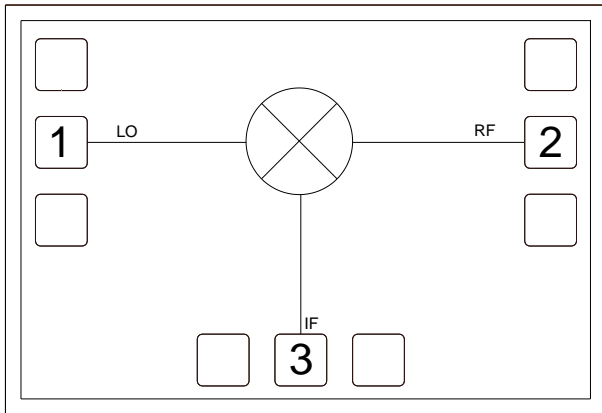


Product Overview

The CMD177 is a general purpose double balanced mixer die that can be used for up- and downconverting applications between 6 and 14 GHz. The CMD177 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 CMD177 can easily be configured as an image reject mixer or single sideband modulator with external hybrids and power splitters.

Functional Block Diagram



Key Features

- Low Conversion Loss
- High Isolation
- Wide IF Bandwidth
- Passive Double Balanced Topology
- Small Die Size: 1160 um x 790 um

Ordering Information

Part No.	Description
CMD177	6-14 GHz Fundamental Mixer, 100 Piece WP Sample

Electrical Performance (IF = 100 MHz, LO = +13 dBm, T_A = 25 °C, F = 10 GHz)

Parameter	Min	Typ	Max	Units
Frequency Range, RF & LO		6 - 14		GHz
Frequency Range, IF	DC		5	GHz
Conversion Loss		6.5		dB
LO to RF Isolation		43		dB
LO to IF Isolation		37		dB
RF to IF Isolation		22		dB
Input P1dB		9.5		dBm

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

Absolute Maximum Ratings

Parameter	Rating
RF / IF Input Power	+23 dBm
LO Drive	+23 dBm
Operating Temperature	-40 to 85 °C
Storage Temperature	-55 to 150 °C
Thermal Resistance, θ_{JC}	331.4 °C/W
Power Dissipation, P_{diss}	196 mW

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

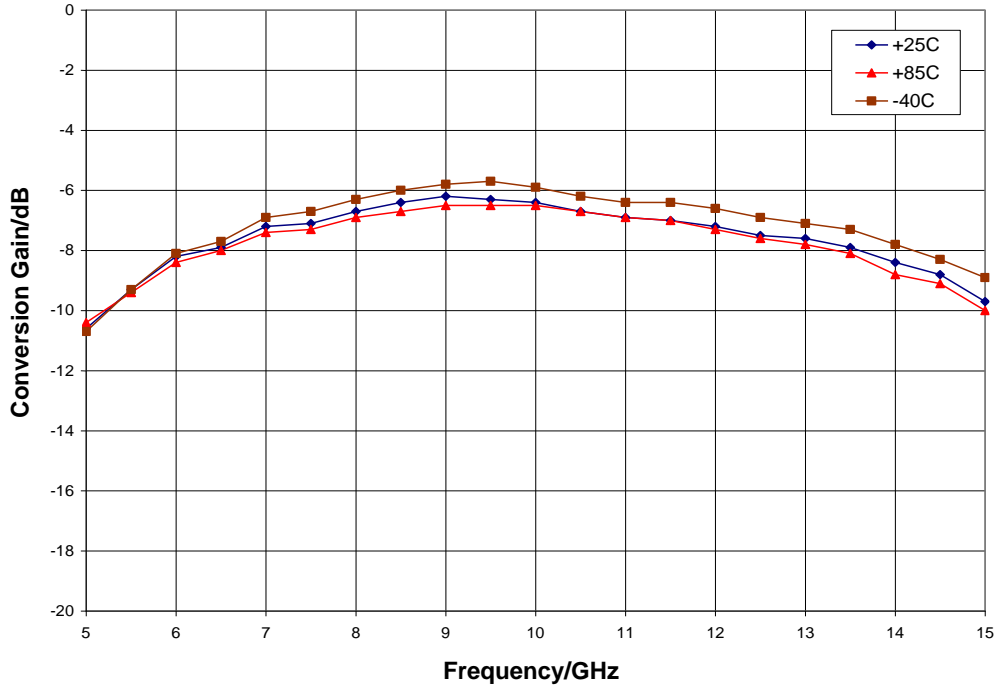
Electrical Specifications (IF = 100 MHz, LO = +13 dBm, $T_A = 25\text{ °C}$)

Parameter	Min	Typ	Max	Min	Typ	Max	Units
Frequency Range, RF & LO	8 - 12			6 - 14			GHz
Frequency Range, IF	DC		5	DC		5	GHz
Conversion Loss		6.5	8		7	10	dB
Noise Figure (SSB)		6.5	8		7	10	dB
LO to RF Isolation	37	43		34	43		dB
LO to IF Isolation	28	37		28	37		dB
RF to IF Isolation	15	22		12	22		dB
Input P1dB		9.5			9.5		dBm
Input IP3		16			16		dBm

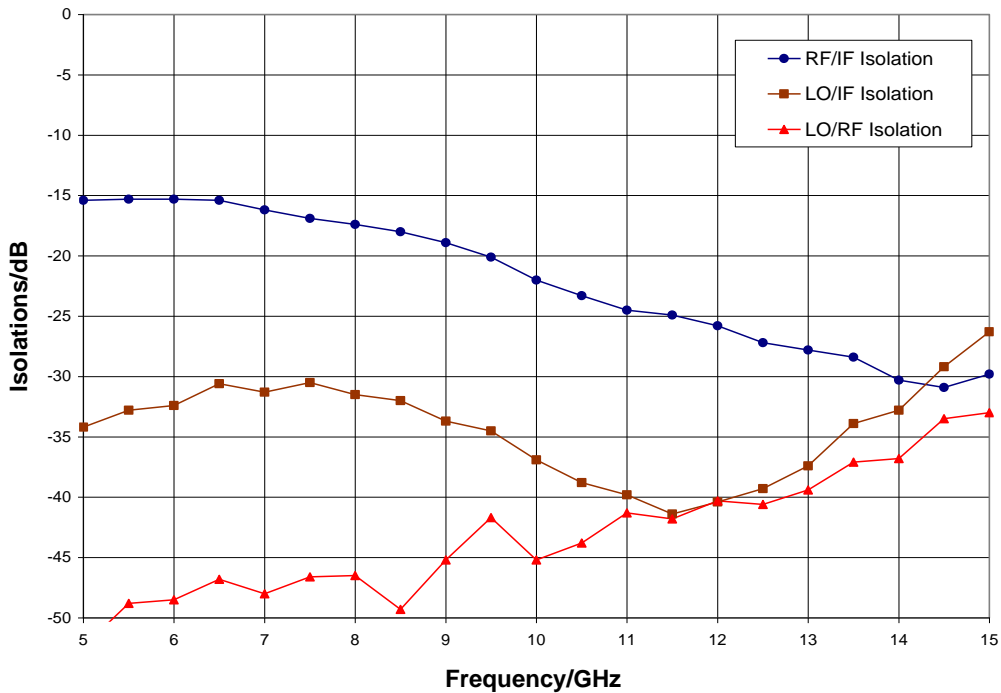
Unless otherwise noted, all measurements performed as a downconverter, IF = 100 MHz

Typical Performance

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

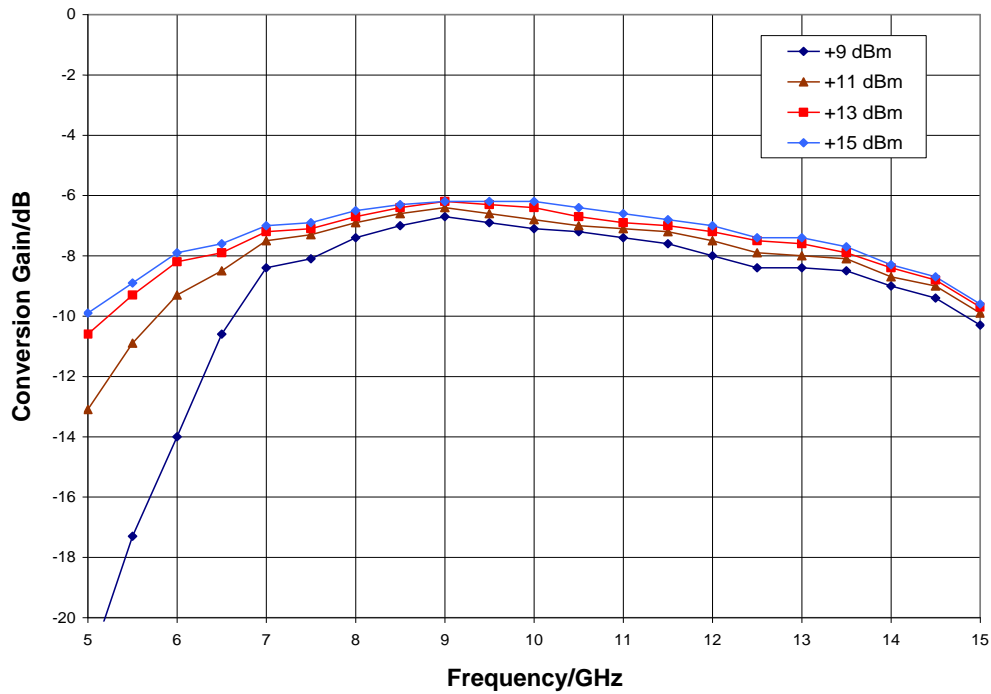


Isolation, LO = +13 dBm

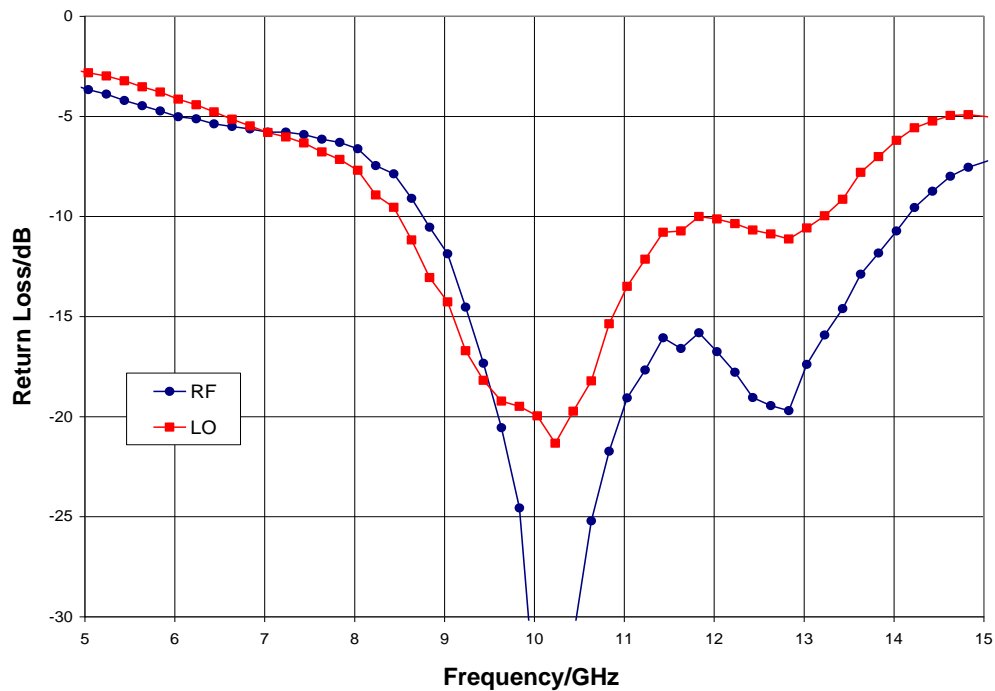


Typical Performance

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

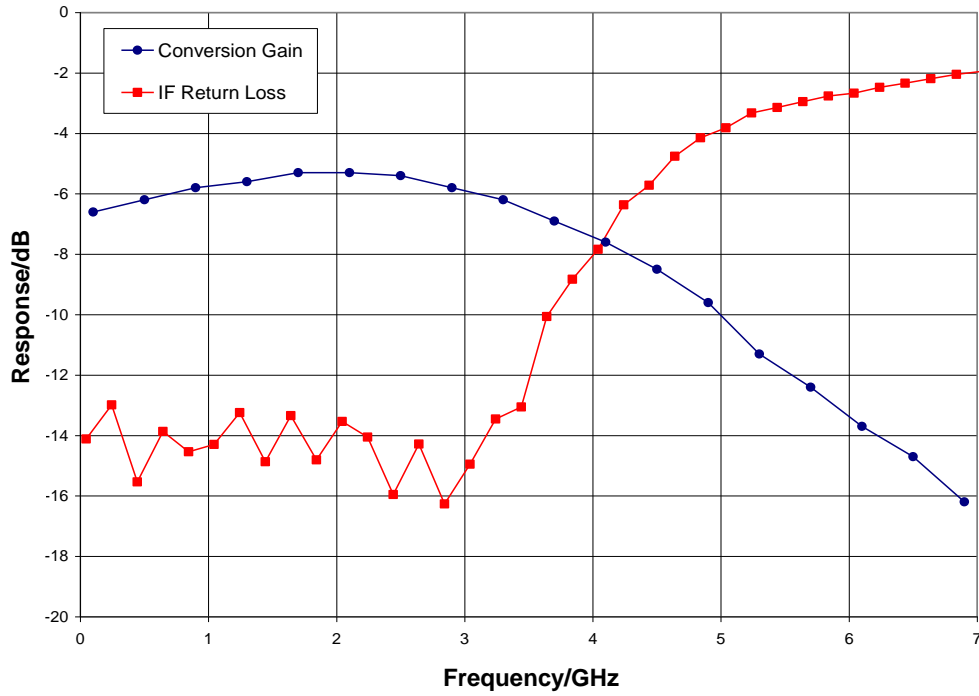


Return Loss, LO = + 13 dBm

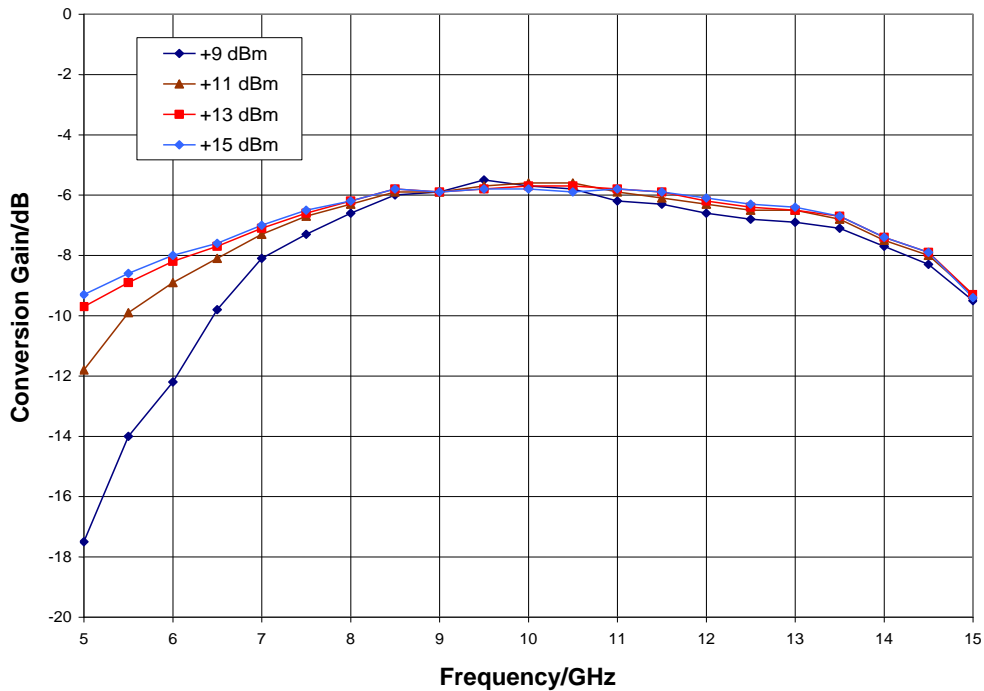


Typical Performance

IF Bandwidth, LO = +13 dBm

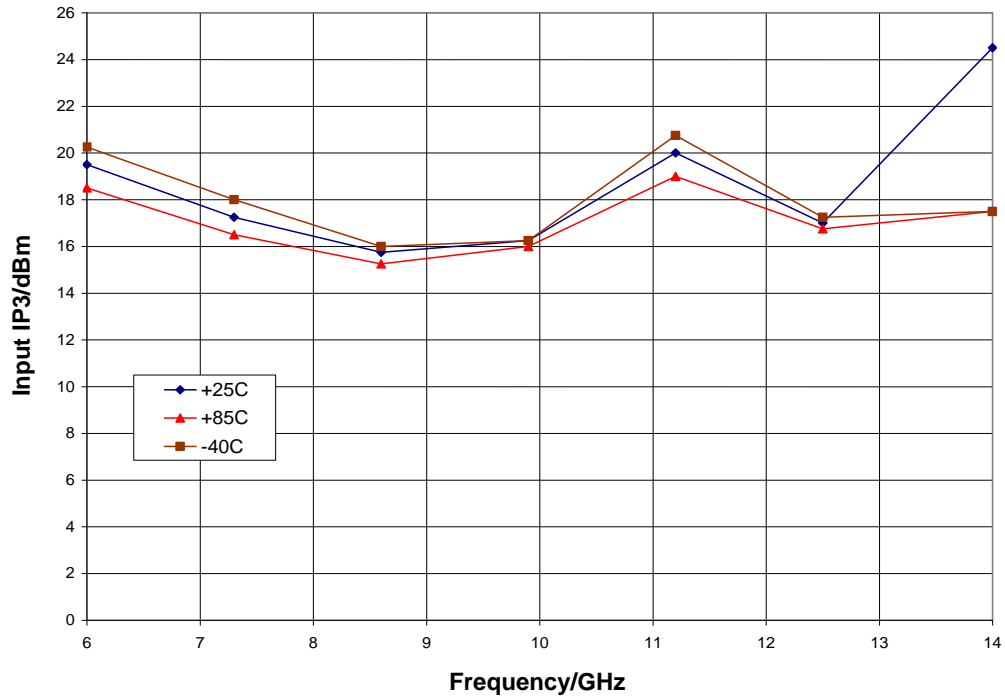


Upconverter Performance, Conversion Gain vs. LO Drive, IF Input = 100 MHz

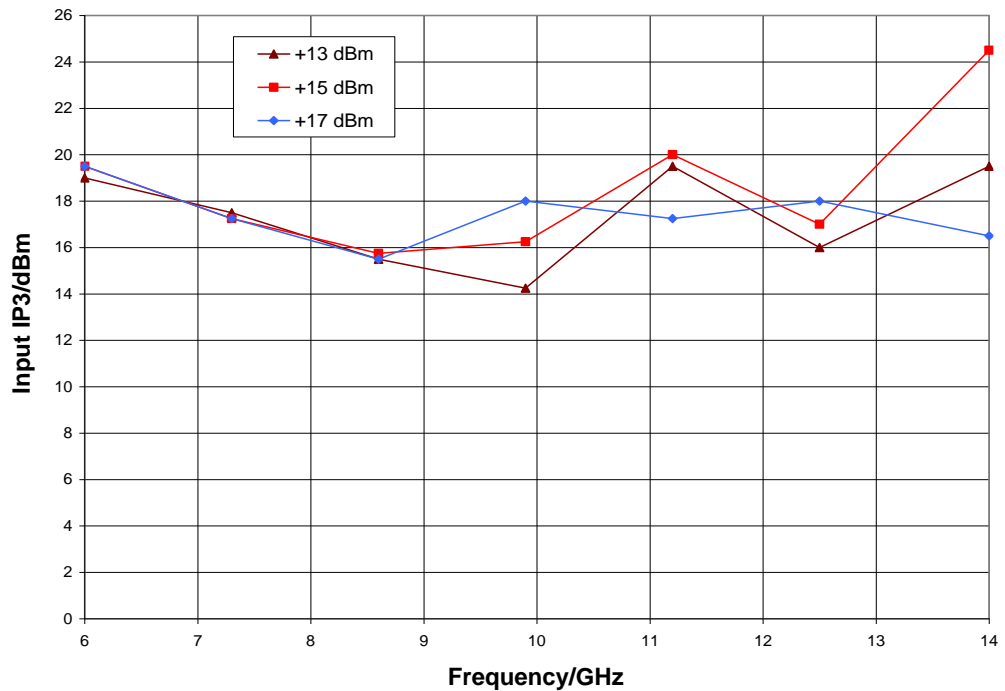


Typical Performance

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

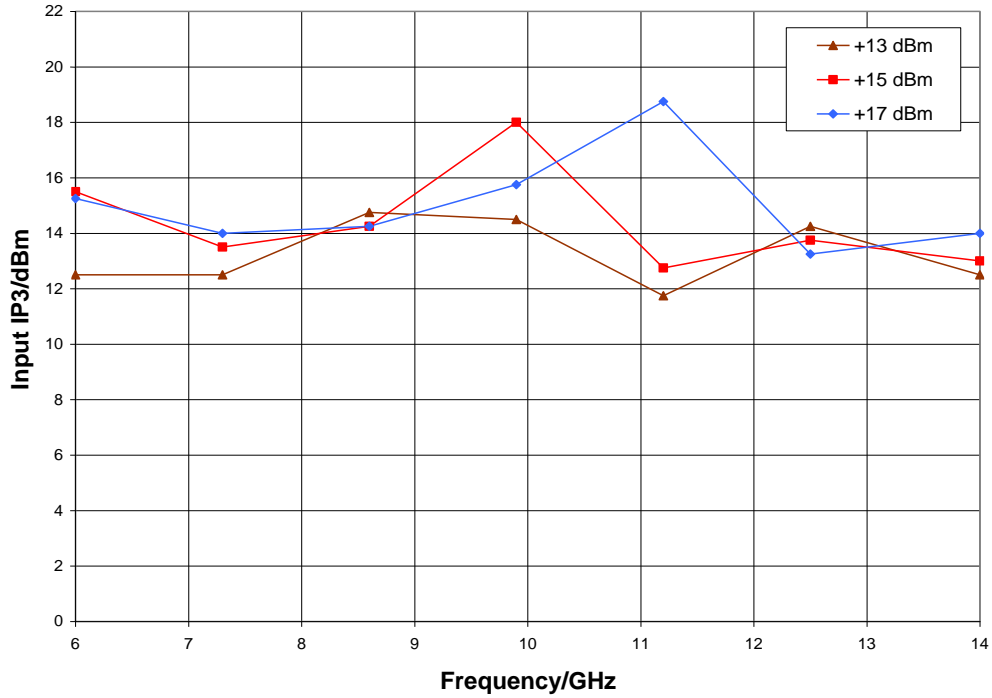


Input IP3 vs. LO Drive, IF = 100 MHz

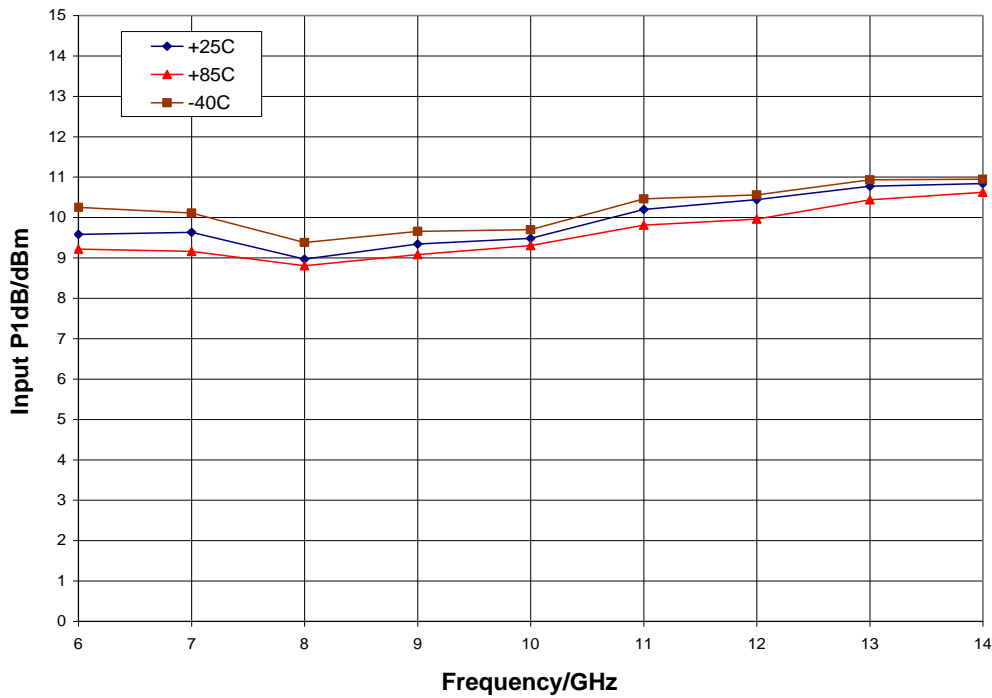


Typical Performance

Upconverter Performance, Input IP3 vs. LO Drive, IF = 100 MHz



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



Typical Performance

MxN Spurious Outputs

mRF	nLO				
	0	1	2	3	4
0	xx	6.5	33.5	30.5	29.5
1	17.5	0	37.5	38.5	57.5
2	> 75	69.5	66.5	66.5	> 75
3	> 75	> 75	> 75	62.5	> 75
4	> 75	> 75	> 75	>75	> 75

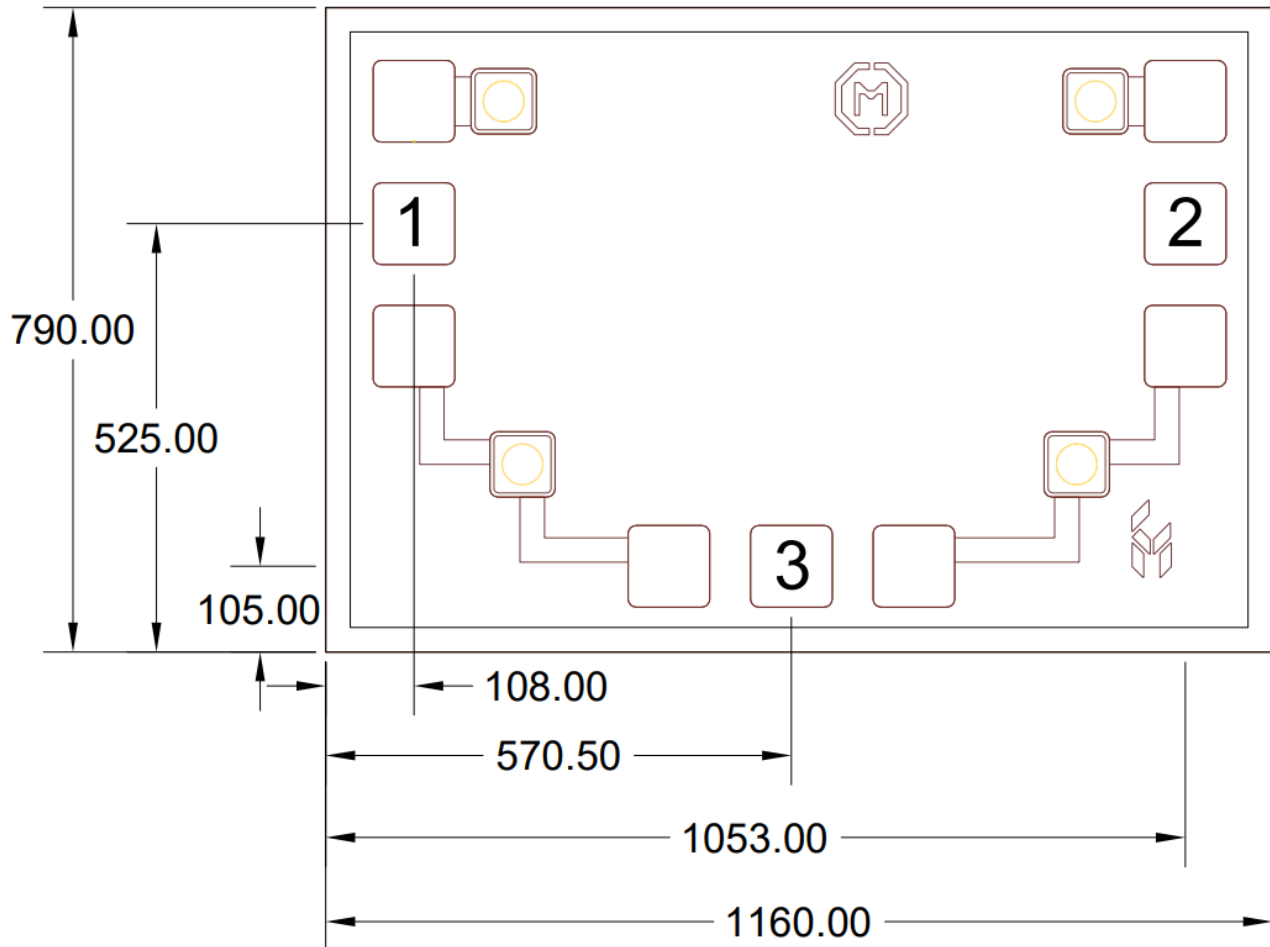
RF = 10.1 GHz @ -10 dBm

LO = 10.0 GHz @ +13 dBm

All values in dBc below the IF output power level (1RF - 1LO)

Mechanical Information

Die Outline (all dimensions in microns)

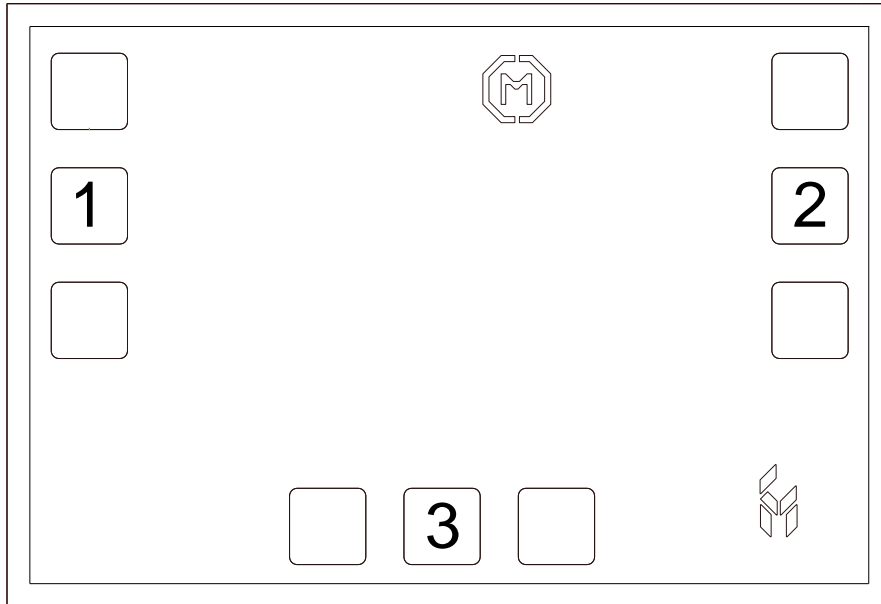


Notes:

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

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	

Applications Information

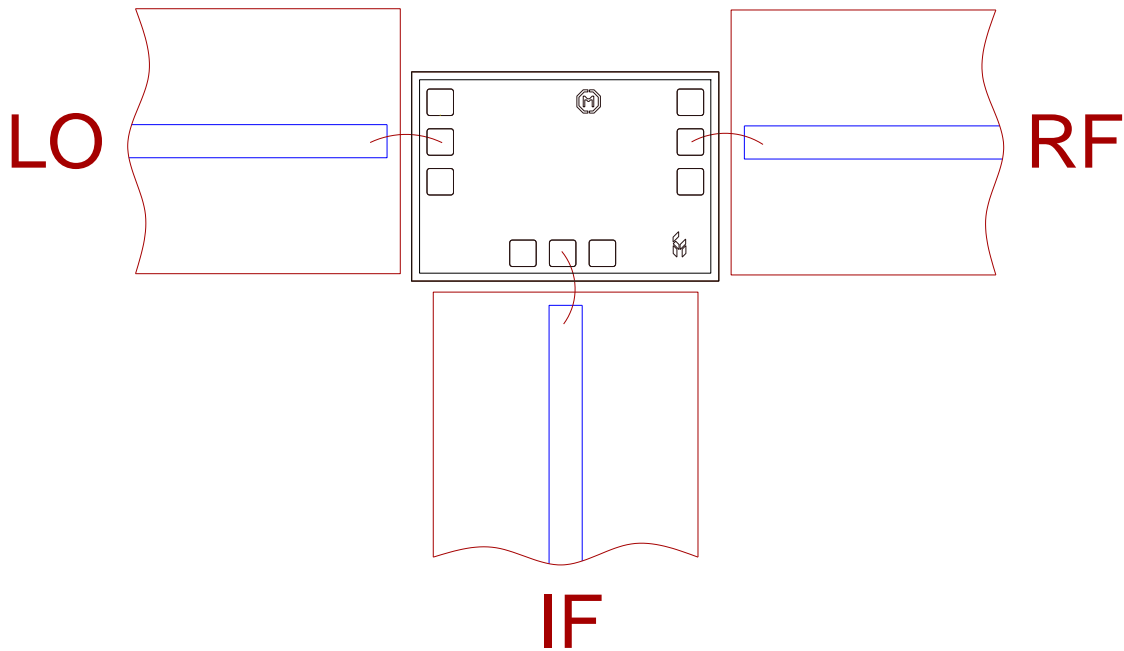
Assembly Guidelines

The backside of the CMD177 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 (C₁₅H₁₂Br₄O₂) Free
- SVHC Free
- Halogen Free
- PFOS Free

Contact Information

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

Web: www.qorvo.com

Tel: 1-844-890-8163

Email: customer.support@qorvo.com

Important Notice

The information contained in this Data Sheet and any associated documents (“Data Sheet Information”) is believed to be reliable; however, Qorvo makes no warranties regarding the Data Sheet Information and assumes no responsibility or liability whatsoever for the use of said information. All Data Sheet Information is subject to change without notice. Customers should obtain and verify the latest relevant Data Sheet Information before placing orders for Qorvo® products. Data Sheet Information or the use thereof does not grant, explicitly, implicitly or otherwise any rights or licenses to any third party with respect to patents or any other intellectual property whether with regard to such Data Sheet Information itself or anything described by such information.

DATA SHEET INFORMATION DOES NOT CONSTITUTE A WARRANTY WITH RESPECT TO THE PRODUCTS DESCRIBED HEREIN, AND QORVO HEREBY DISCLAIMS ANY AND ALL WARRANTIES WITH RESPECT TO SUCH PRODUCTS WHETHER EXPRESS OR IMPLIED BY LAW, COURSE OF DEALING, COURSE OF PERFORMANCE, USAGE OF TRADE OR OTHERWISE, INCLUDING THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. Without limiting the generality of the foregoing, Qorvo® products are not warranted or authorized for use as critical components in medical, life-saving, or life-sustaining applications, or other applications where a failure would reasonably be expected to cause severe personal injury or death. Applications described in the Data Sheet Information are for illustrative purposes only. Customers are responsible for validating that a particular product described in the Data Sheet Information is suitable for use in a particular application.

© 2022 Qorvo US, Inc. All rights reserved. This document is subject to copyright laws in various jurisdictions worldwide and may not be reproduced or distributed, in whole or in part, without the express written consent of Qorvo US, Inc. | QORVO® is a registered trademark of Qorvo US, Inc.