

# W band MMIC Single-Balanced Mixer

**W-SBM-9296** Previously named TU-W1340307  
**Single-Balanced GaAs Diode MMIC Mixer, 92 - 96GHz**

## Overview

W-SBM-9296 is a single balanced diode mixer with integrated filter to increase image rejection. This MMIC is designed for output frequencies in the range from 92GHz to 96GHz using LO signals within the 86GHz to 90GHz band. The circuit typically supplies low conversion loss for frequencies up to 6GHz and by using a 4-pole filter the image signal is effectively removed.

All bond pads and the die underside are gold plated. The MMIC is compatible with precision die attach methods, as well as thermo-compression and thermosonic wire bonding, making it ideal for MCM and hybrid microcircuit applications. All data shown herein is measured with the chip in a 50 Ohm environment and contacted with RF probes

## Features

- 92 – 96GHz.
- <17 dB conversion loss.
- 10dB return loss.
- >25dB LO-RF isolation.
- >25dB image rejection.

## Applications

- Narrow and wide bandwidth Millimeter-wave Imaging.
- High resolution radar.
- Sensing.
- P2P communications; short haul/high capacity/low interference links.

 <b>Arralis</b>	<b>W band Datasheet</b>	<b>W-SBM-9296</b>	Issue date: 30 April 2021	<b>DOC REV 3</b>	Page 1 of 10
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## Specification Overview

(based on tests where IF = 5.4 GHz, LO = +13dBm)

Parameter	Min.	Typ.	Max.	Units
Frequency	92		96	GHz
LO Frequency	86.6		90.6	GHz
LO Power	10	13		dBm
IF Frequency	2	5.4	6	GHz
Conversion Loss		16	20	dB
Image Rejection*	25	30		dB
LO-RF Isolation	25	30		dB

### Notes

All tests are carried out at 25°C.

\*to wanted signal

## Absolute Maximum Ratings

Parameter	Rating
VC Voltages	-10V to +2V dc
LO Power	25dBm
IF / RF Power	22dBm
Storage Temperature	-65°C to +150°C
Channel Temperature	+150°C
Operating Temperature	-40°C to +85°C



ESD (electrostatic discharge) sensitive device. Charged devices and circuit boards can discharge without detection. Although this product features proprietary protection circuitry, damage may occur on devices subjected to ESD. Proper ESD precautions should be taken to avoid performance degradation or loss of functionality.

## Measured Performance Data

Test Conditions:- IF = Fixed, 5.4GHz, 10dBm, LO = 86.6GHz – 90.6GHz, (LO=(RF-IF); IF=5.4GHz, 10dBm)

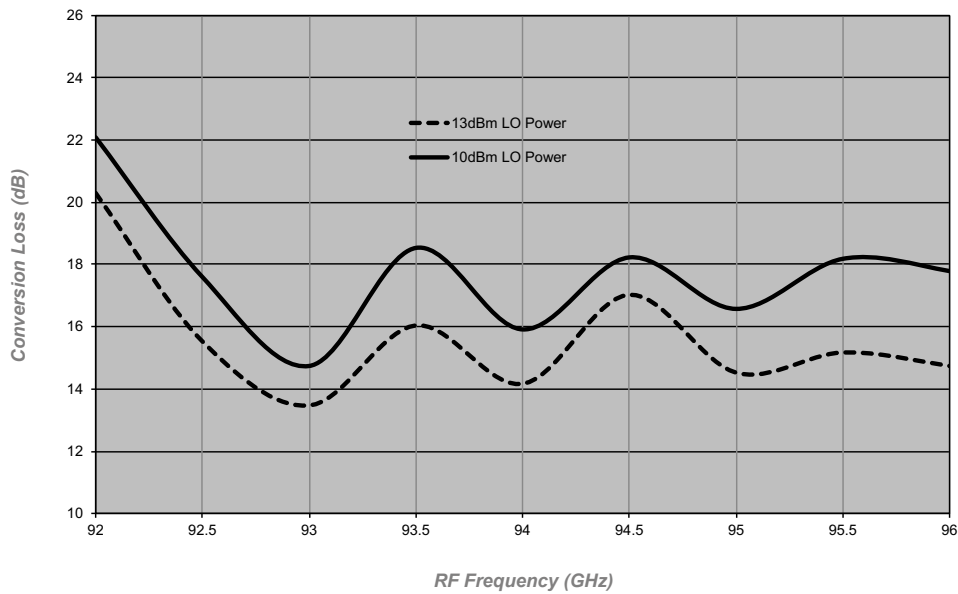


Figure 1  
 Conversion Loss v RF Frequency

Test Conditions:- IF = Fixed, 5.4GHz, 10dBm, LO = 86.6GHz – 90.6GHz, (@(RF-2IF); IF=5.4GHz, 10dBm)

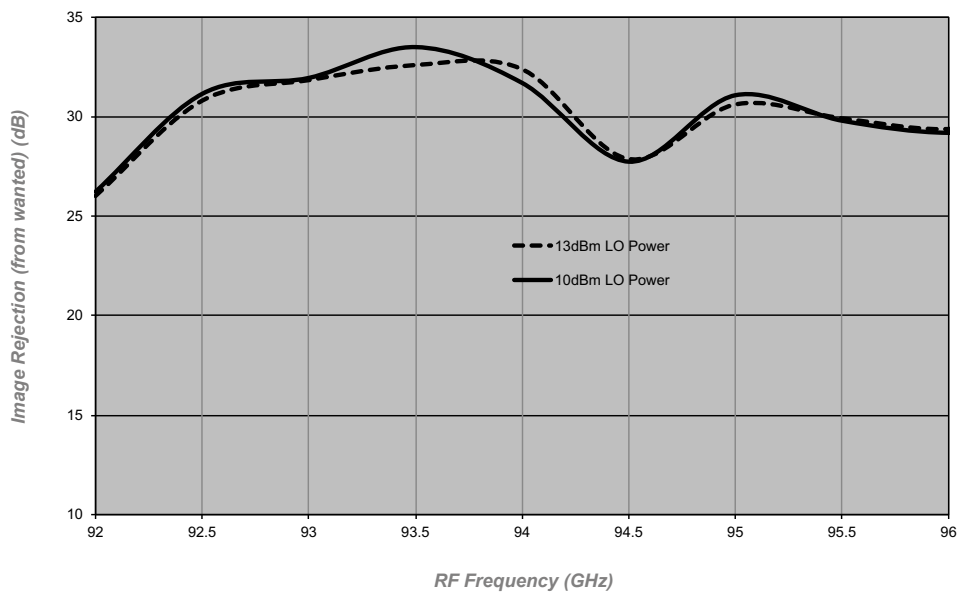


Figure 2  
 Image Rejection v RF Frequency

## Measured Performance Data

Test Conditions:- IF = Fixed, 5.4GHz, 10dBm, LO = 86.6GHz – 90.6GHz, (IF=5.4GHz, 10dBm)

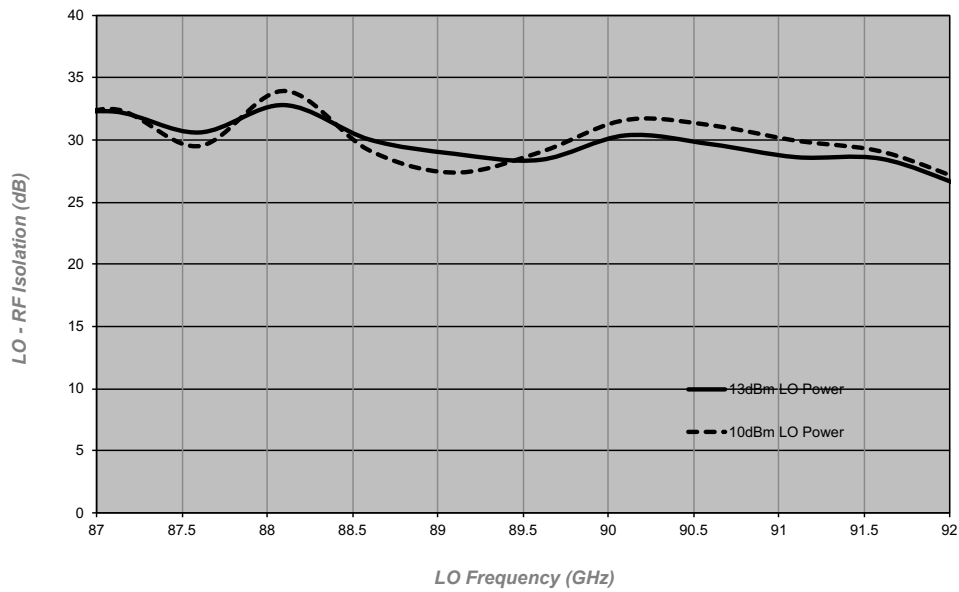


Figure 3  
LO - RF Isolation

Test Conditions:- RF = Fixed, 94GHz, LO = 84 – 92GHz, 13dBm, IF = 2GHz – 10GHz, 10dBm,  
 (RF=94GHz; LO=(RF-IF), 13dBm; IF=10dBm)

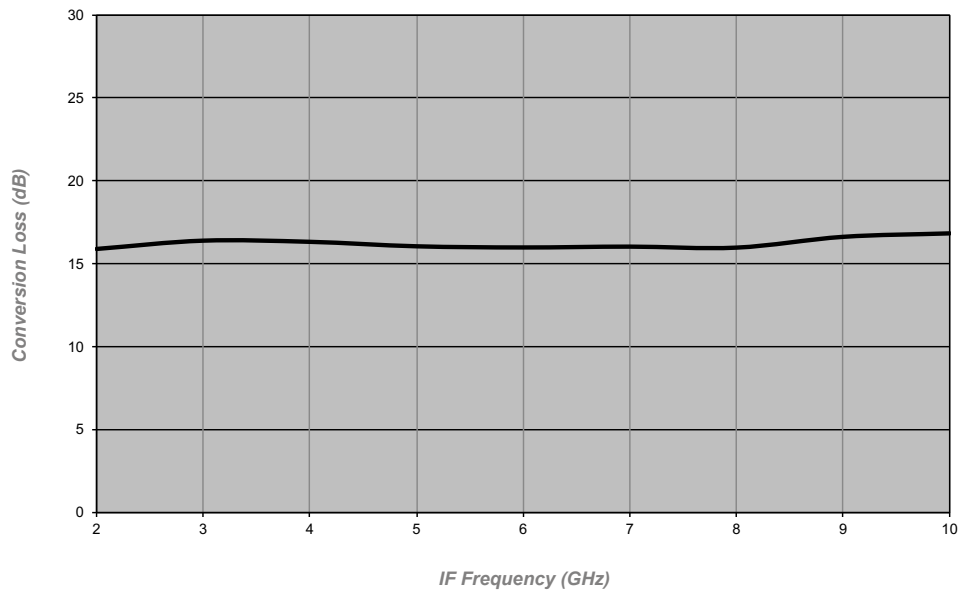


Figure 4  
Conversion Loss v IF Frequency

## Measured Performance Data

Test Conditions:- RF = Fixed, 94GHz, LO = 84 – 92GHz, 13dBm, IF = 2GHz – 10GHz, 10dBm,  
(RF=94GHz; LO=(RF-IF), 13dBm; IF=10dBm)

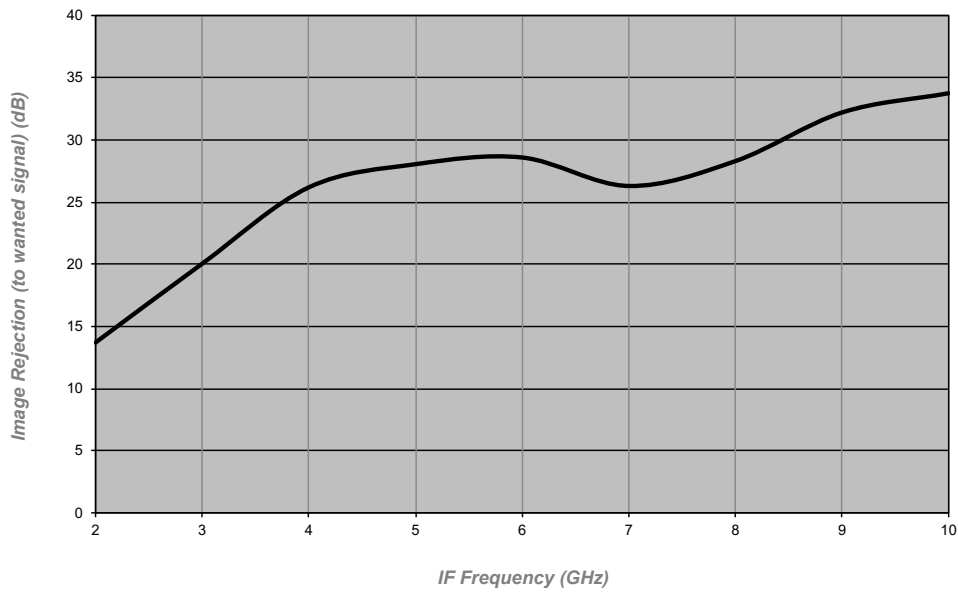


Figure 5  
Image Rejection v IF Frequency

Test Conditions:- RF = Fixed, 94GHz, LO = 84 – 92GHz, 13dBm, IF = 2GHz – 10GHz, 10dBm,  
(RF=94GHz; LO=(RF-IF), 13dBm; IF=10dBm)

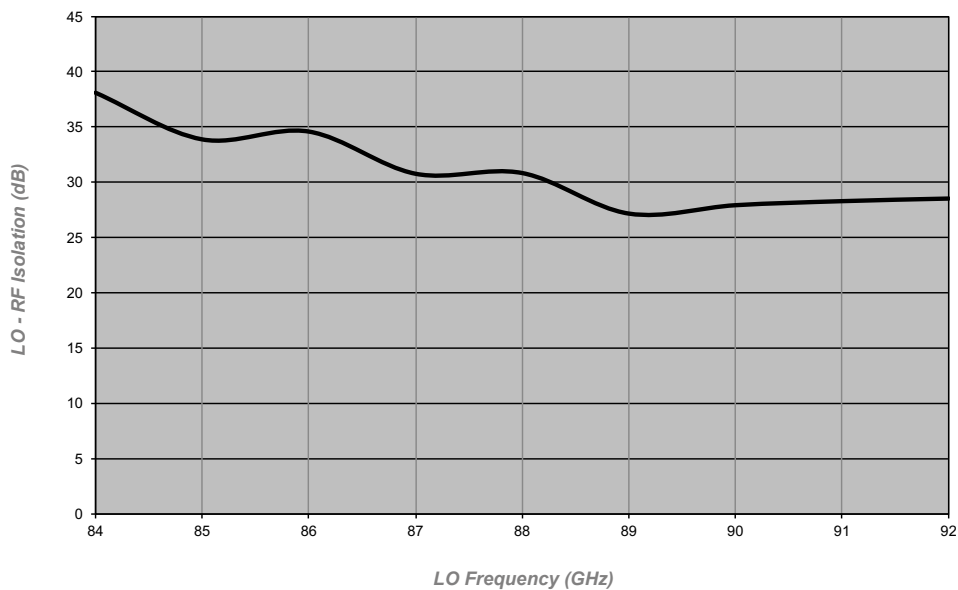


Figure 6  
LO - RF Isolation

## Measured Performance Data

Test Conditions:- RF = Fixed, 94GHz, LO = 88.6GHz, 13dBm, IF = 5.4GHz, (RF=94GHz; LO=88.6GHz, 13dBm; IF=5.4GHz)

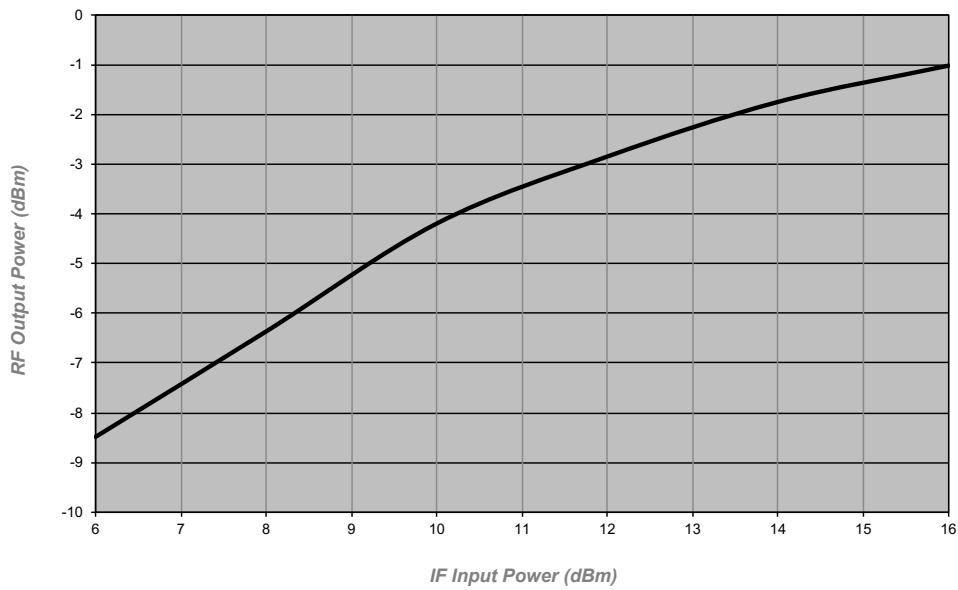
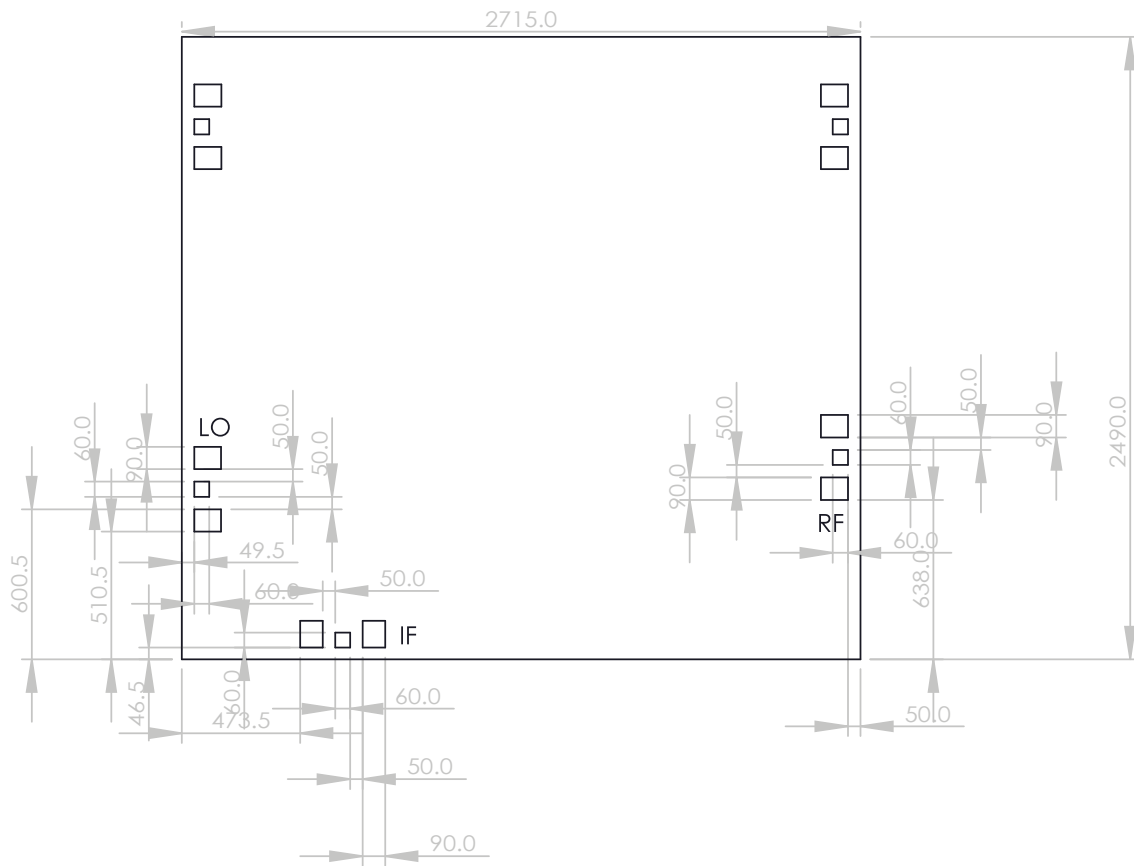


Figure 7  
RF Output Power

## Outline Drawing



## Pad Descriptions

Name	Description
LO	LO pad. This pad is dc coupled.
RF	RF pad. This pad is ac coupled.
IF	IF pad. This pad is dc coupled.
BOTTOM	The die backside must be connected to RF/dc ground.

### Notes

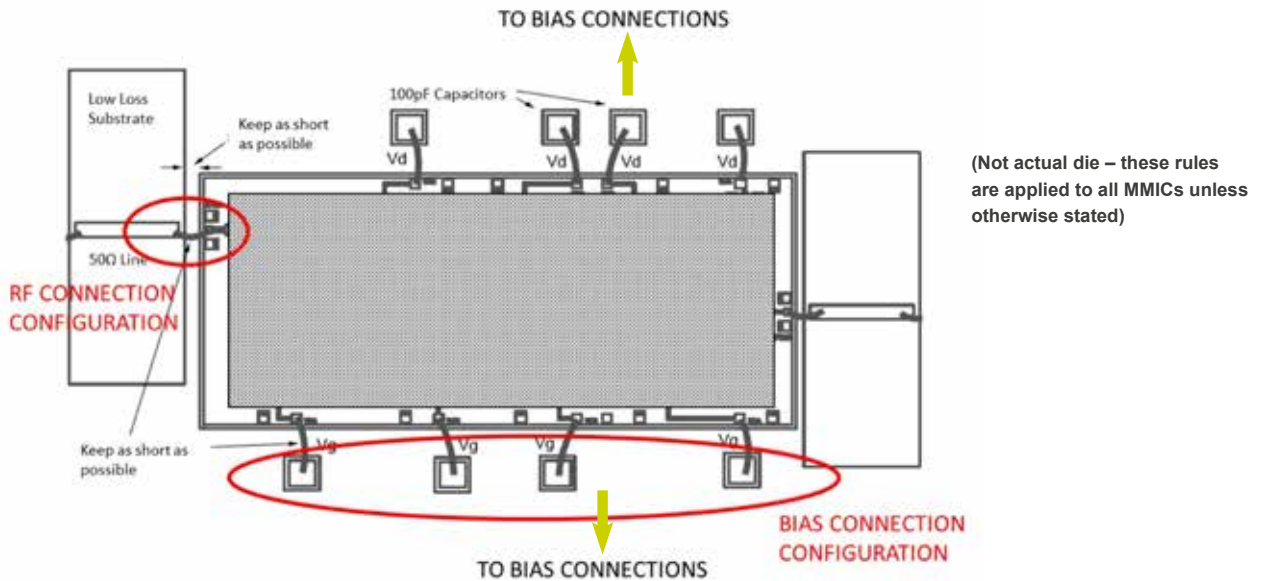
1. All dimensions are in um.
2. Typical dc bond pads are 80um square.
3. RF bond pads are 60um square.
4. All pads have gold metalisation.
5. Gold backside metalisation.
6. Backside metal is ground.
7. Connections are not required for unlabelled bond pads.
8. Die thickness is 50um

### Die Packing Information

All die are delivered using gel-paks unless otherwise requested.



## General Notes on Assembly



Die should be mounted on conductive material such as gold-plated metal to provide a good ground and suitable heat sink, if necessary.

1. Attaching the die using Au/Sn preforms is preferable. The Eutectic melt for Au/Sn occurs at approximately 280°C so the die (plus mount and preform) is initially heated up to 180°C and then it is heated for approximately 10 seconds to 280°C using a nitrogen heat gun. The device will survive 10 seconds at this temperature. The static breakdown for GaAs devices is approximately 330°C.
2. Pure, dry nitrogen should be used as the heat source
3. If the devices cannot be lifted/ placed by a vacuum device, then ESD die-lifting tweezers are preferable.
4. Supply lines should be decoupled with 100pF capacitors. Larger planar capacitors could be used if available.
5. Aluminium wire must not be used.

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