product datasheet
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W band MMIC Frequency Downconverter

W-DC-9296 Previously named TU-W1340308

GaAs PHEMT MMIC Downconverter, 92 - 96GHz

Overview

W-DC-9296 is a MMIC trans-conductance (PHEMT) frequency downconverter. This MMIC is designed for RF frequencies in the range from 92GHz to 96GHz using LO signals within the 86GHz to 90GHz range. The circuit typically supplies low conversion loss for IF frequencies up to 6GHz and uses a notch filter to effectively remove any RF or LO signals at the IF port.

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 RF frequency.
- <4 dB conversion loss.
- 10dB return loss.
- 40dB harmonic rejection.

Applications

- Narrow or wide bandwidth millimeter-wave imaging.
- High resolution radar.
- Sensing.
- P2P communications; short haul/high capacity/low interference links.

Specification Overview

Parameter	Min.	Typ.	Max.	Units
RF Frequency	92		96	GHz
LO Frequency	84		90	GHz
IF Frequency	2	5.4	8	GHz
Input Return Loss*	10			dB
Output Return Loss*	10			dB
Conversion Loss	1	2	11	dB
Drain Voltage (VDD)		0.7		V
Gate Voltage (VGG)		-1		V
Current*	11		15	mA

Notes
The tests indicated have all been performed with 100pF de-coupling capacitors on all bias pads.
All tests are carried out at 25°C.

*Under large signal conditions.

Absolute Maximum Ratings

Parameter	Rating
Gate Voltage	-5V to 0.2V dc
Drain Voltage	5V
Drain Current	30mA
RF Input Power (all ports)	+18dBm
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; RF Power =-10dBm; LO Power = 10dBm (@ (RF-IF) GHz)

(Vdd=0.7V, Vgg=-1V, Idd=11-15mA)

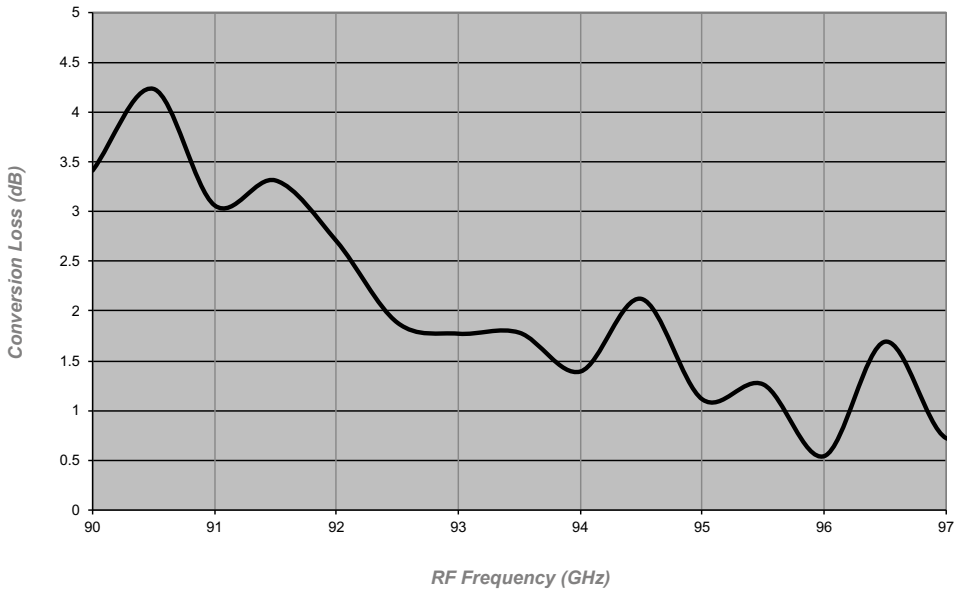


Figure 1
TU-W1340308
Conversion Loss v RF Frequency

(Vdd=0.7V, Vgg=-1V, Idd=11-15mA)

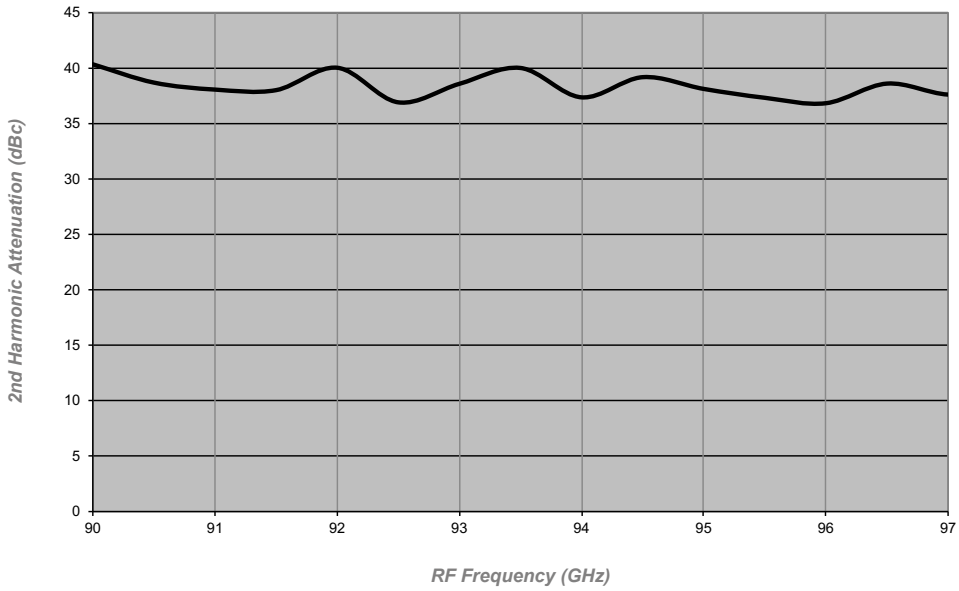


Figure 2
TU-W1340308
2nd Harmonic Attenuation
(from wanted signal)

Measured Performance Data

Test Conditions:- RF Power =-10dBm, 94GHz; LO Power = 10dBm (@ (RF-IF) GHz);

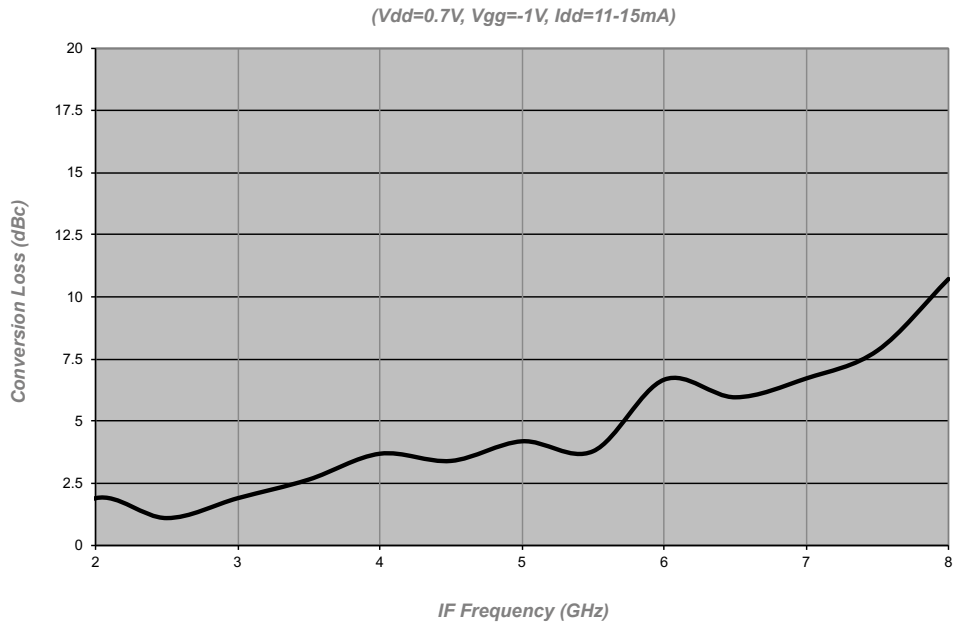
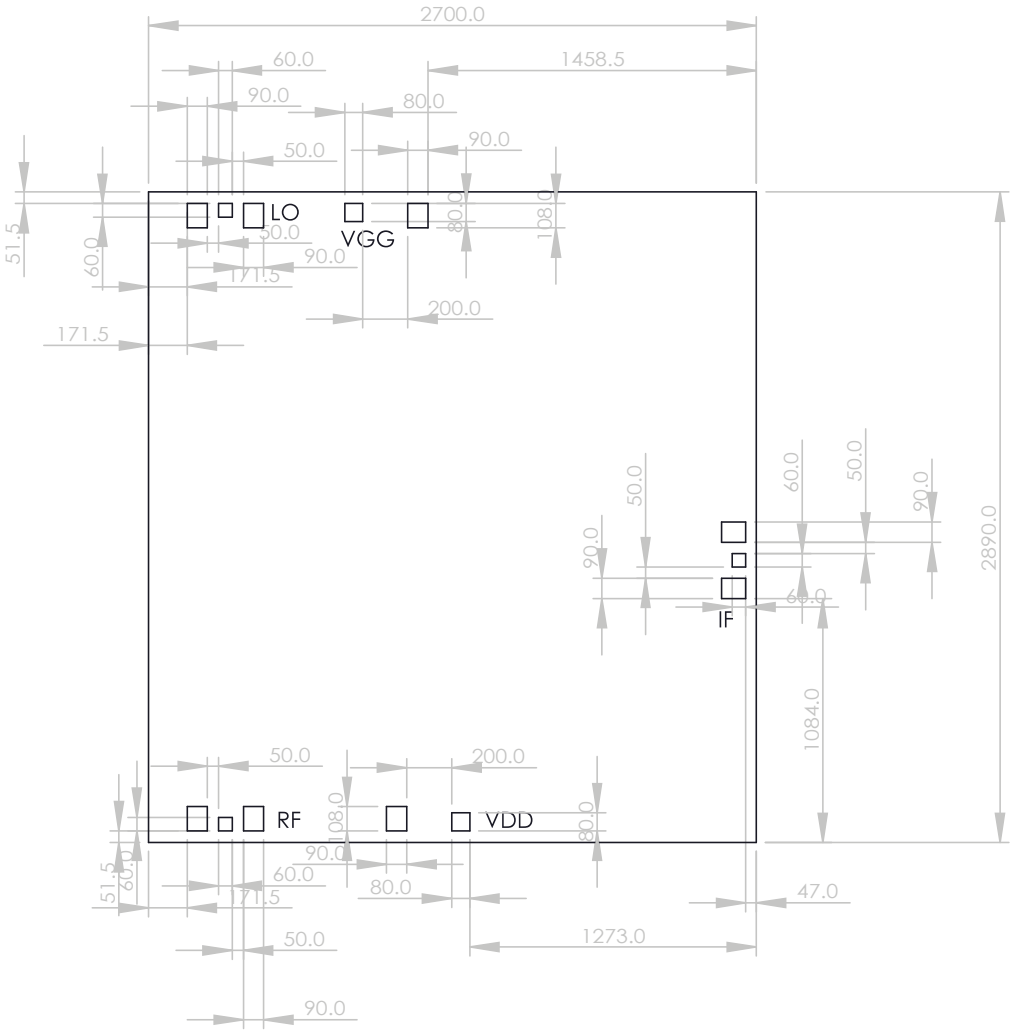


Figure 3
TU-W1340308
Conversion Loss v IF Frequency

Outline Drawing



Pad Descriptions

Name	Description
LO	LO pad. This pad is DC coupled.
RF	RF pad. This pad is DC coupled.
IF	IF pad. This pad is DC coupled.
VDD	Drain Bias pad
VGG	Gate Bias pad.
BOTTOM	The die backside must be connected to RF/DC ground.

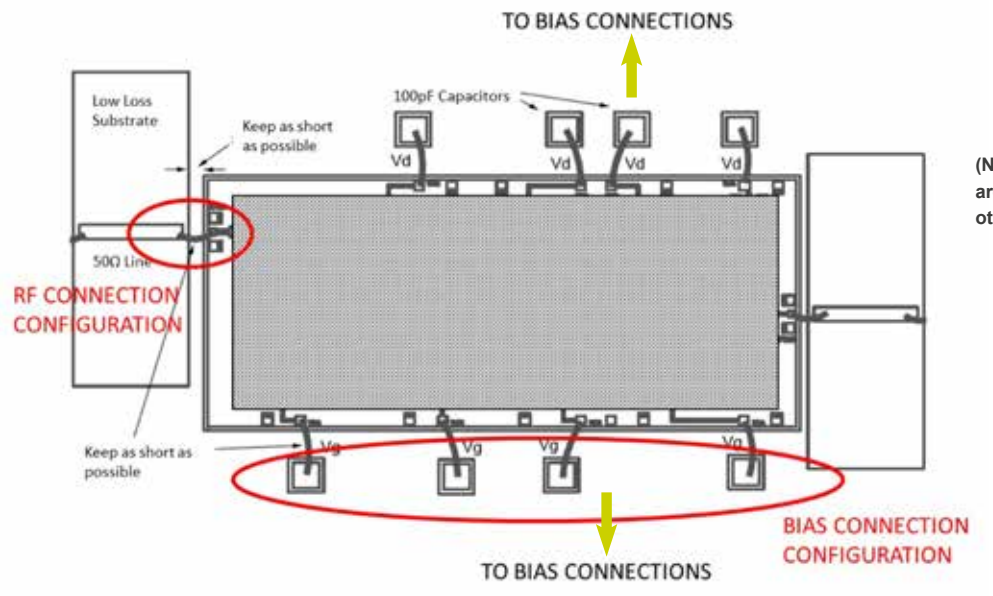
Notes

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



(Not actual die – these rules are applied to all MMICs unless otherwise stated)

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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