

# W band MMIC Downconverter Core Chip

**W-DC-9396** Previously named TU-W1360303  
**GaAs PHEMT Downconverter Core Chip 93 – 96GHz**

## Overview

W-DC-9296 is an integrated mixer and low noise amplifier MMIC that downconverts frequencies from 93 – 96GHz into the 3 - 6GHz frequency band. This MMIC provides conversion gain with a maximum output power of -5dBm and noise figure <5dB while running from a +4V supply voltage and at less than 80mA.

All bond pads and the die underside are gold plated. The MMIC is compatible with conventional 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 provisional and is measured with the chip in a 50 Ohm environment and contacted with RF probes.

The MMIC is available in die form.

## Features

- 93 – 96GHz input.
- 3 – 6GHz output.
- 5dB conversion gain.
- -5dBm output power.
- 5dB noise figure.

## Applications

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

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## Specification Overview

Parameter	Min.	Typ.	Max.	Units
Input Frequency	93		96	GHz
IF Frequency	3		6	GHz
Conversion Gain	3	5	12	dB
LO Frequency	86.6		90.6	GHz
LO Power		13		dBm
Noise Figure		5		dB
Power Output		-5		dBm
Drain Voltage		4		V
Nominal Gate Voltage*		0		V
Current		80		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.

\*Should be adjusted to ensure the correct current is drawn.

## Absolute Maximum Ratings

Parameter	Rating
Gate Voltage	-5V to 0.2V dc
Drain Voltage	5V
Drain Current	200mA
LO Power	25dBm
RF Input Power	-10dBm
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, 4dBm, LO = 86.6GHz – 90.6GHz, 13dBm

(IF=5.4GHz, RF Power=-13dBm, LO=13dBm, Vdd=4V, Vgg=-0.25V, Idd=75mA)

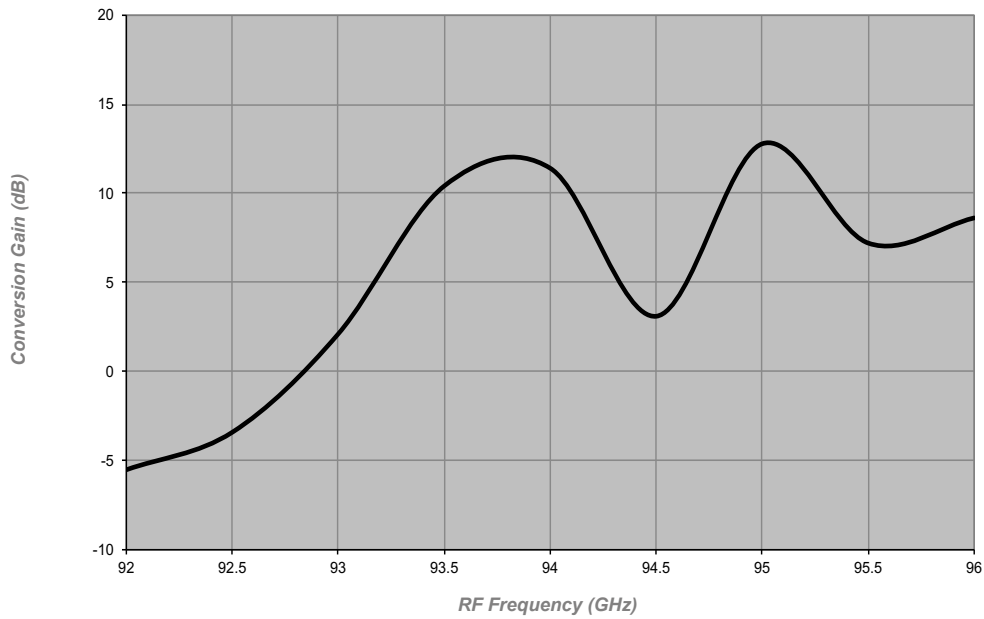


Figure 1  
Conversion Gain

(IF=5.4GHz, RF Power=-13dBm, LO=13dBm, Vdd=4V, Vgg=-0.25V, Idd=75mA)

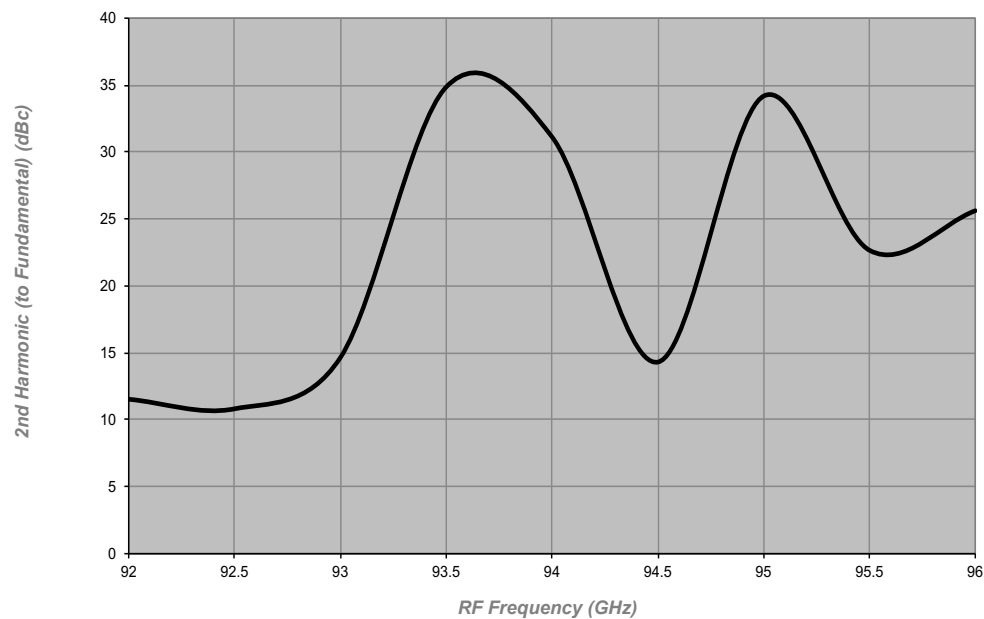


Figure 2  
2nd Harmonic Rejection

## Measured Performance Data

Test Conditions: - IF = Fixed, 5.4GHz, 4dBm, LO = 86.6GHz – 90.6GHz, 13dBm

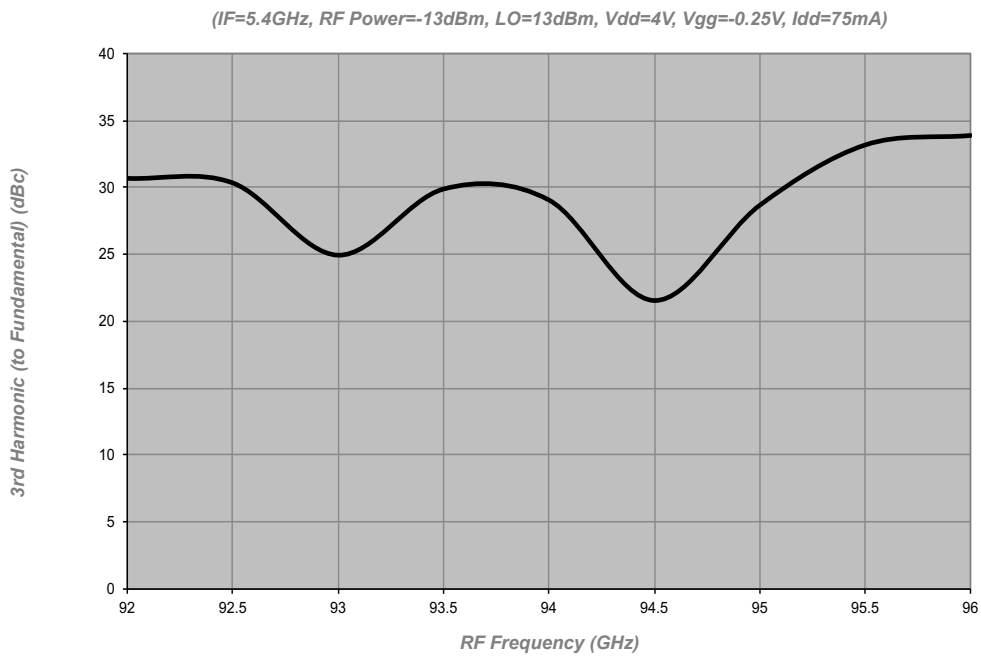
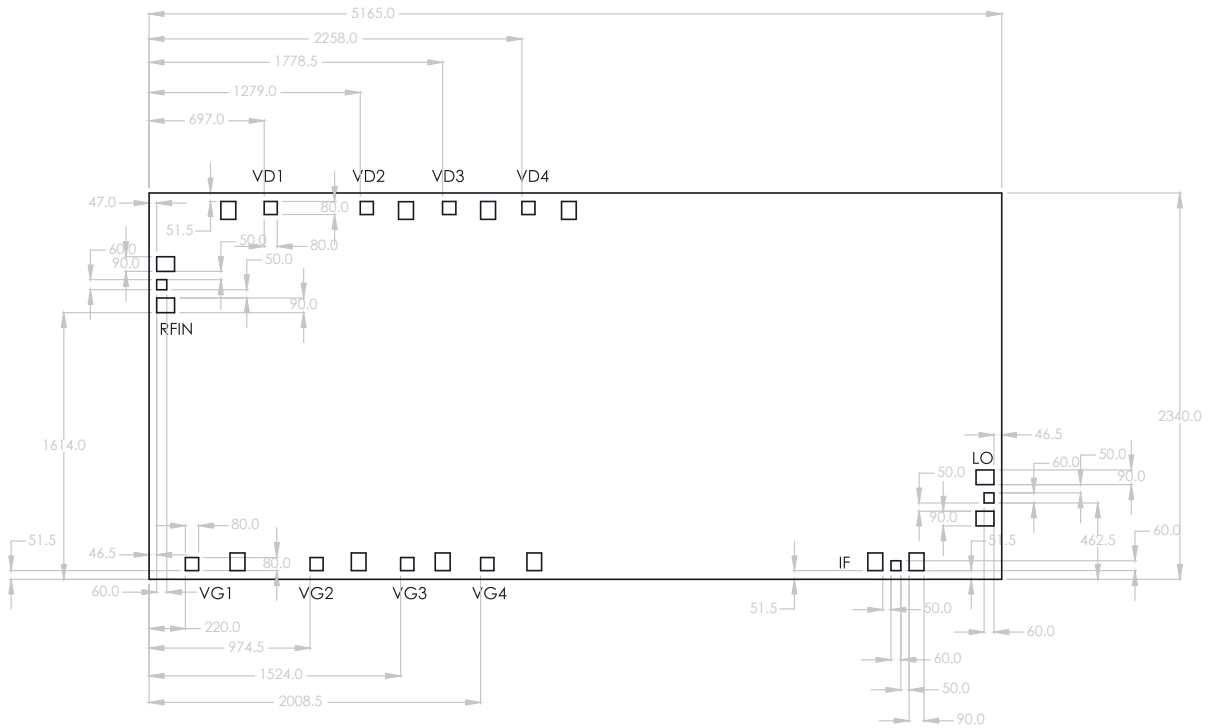


Figure 3  
3rd Harmonic Rejection

## Outline Drawing



## 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

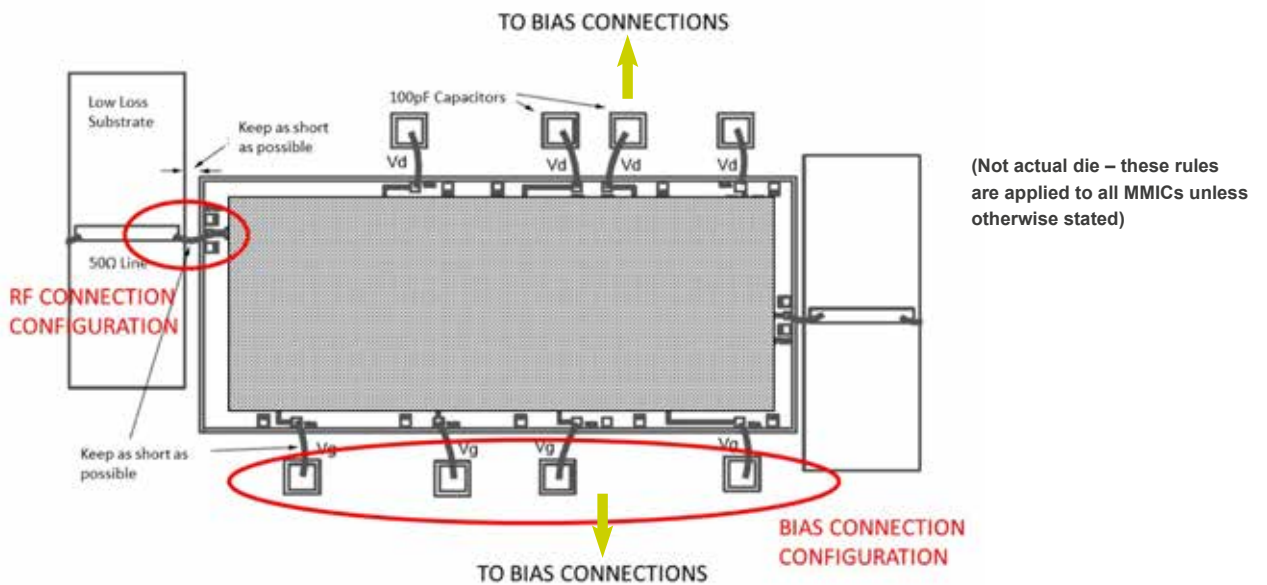
## Die Packing Information

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

## Pad Descriptions

Name	Description
LO	Input for LO signal. Requires AC-coupling.
IF	Output for IF signal. Requires AC-coupling.
RFIN	Input pad for RF signal. This pad is AC coupled.
VDx	Drain Bias pad for stage x.
VGx	Gate Bias pad for stage x.
BOTTOM	The die backside must be connected to RF/DC ground.

## General Notes on Assembly



## 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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