# W band MMIC
# Image Cancellation Mixer

**W-ICM-9296** Previously named TU-W1340310

**Image Cancellation MMIC Mixer, 92 - 96GHz**

## Overview

W-ICM-9296 is a MMIC diode mixer with integrated quadrature coupler for single sideband (LO+IF / RF-LO) operation in both upconverter and downconverter modes. This MMIC is fabricated using GaAs Shottky diode technology and is designed for output frequencies in the range from 92GHz to 96GHz using either fixed IF and varying LO (86GHz - 90GHz) or fixed LO and varying IF (2GHz – 6GHz) signals. The circuit typically supplies flat conversion loss at moderate levels of LO power and low dc consumption.

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, with results calibrated to the probe tips.

## Features

- 92 – 96GHz.
- 15 dB conversion loss.
- 13dBm LO drive.
- >20dB RF/ LO isolation.
- 20dB image rejection.

## Applications

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

## Measured Performance Data

*Test Conditions:- IF = Fixed, 5.4GHz, 4dBm, LO = 86.6GHz – 90.6GHz, Bias=0.5V, 4mA*

| Parameter | Min. | Typ. | Max. | Units |
|---|---|---|---|---|
| **Frequency** | 90 | | 97 | GHz |
| **LO Frequency** | 86.6 | | 90.6 | GHz |
| **LO Power** | 10 | 13 | | dBm |
| **IF Frequency** | 2 | 5.4 | 6 | GHz |
| **Conversion Loss** | | 15 | 18 | dB |
| **Image Rejection** | 18 | 22 | | dB |
| **LO Leakage** | | 23 | | dB |
| **Vcx** | | 0.5 | | V |
| **Icx** | | 2 | | mA |

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

## 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.

## Specification Overview

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

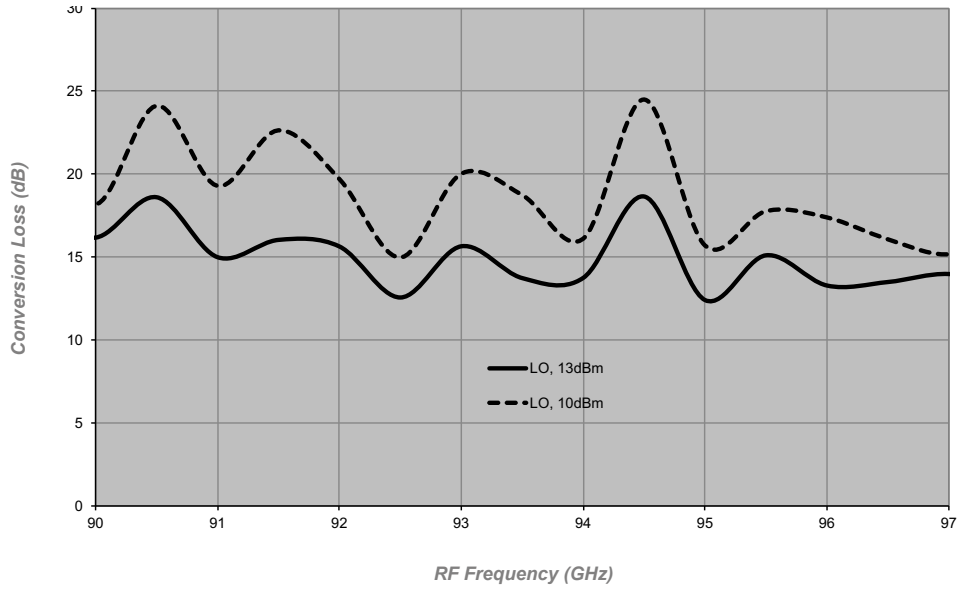



Figure 1
*Conversion Loss*

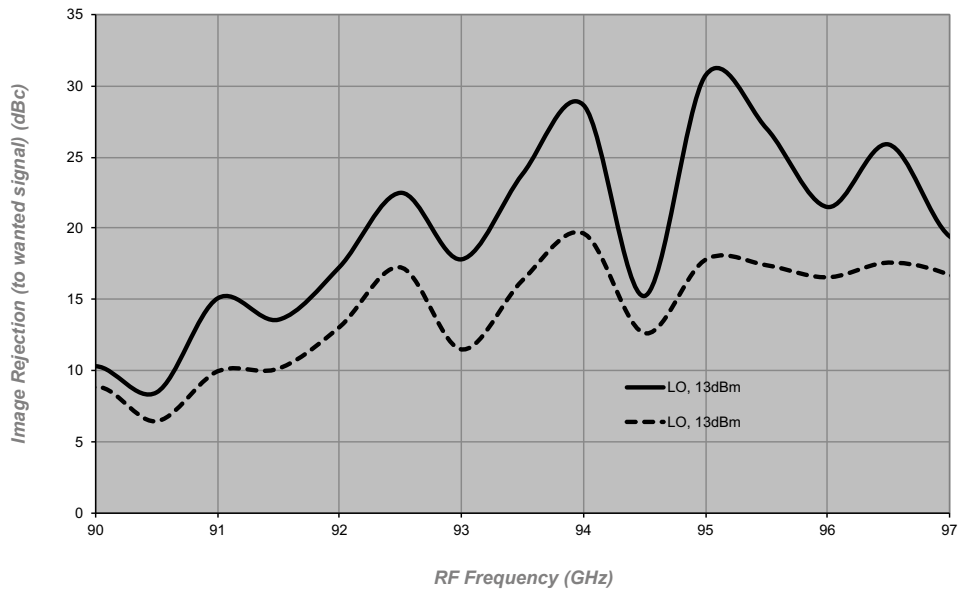



Figure 2
*Image Rejection*

## Measured Performance Data

*Test Conditions:- IF = Fixed, 5.4GHz, 4dBm, LO = 86.6GHz – 90.6GHz, Bias=0.5V, 4mA*

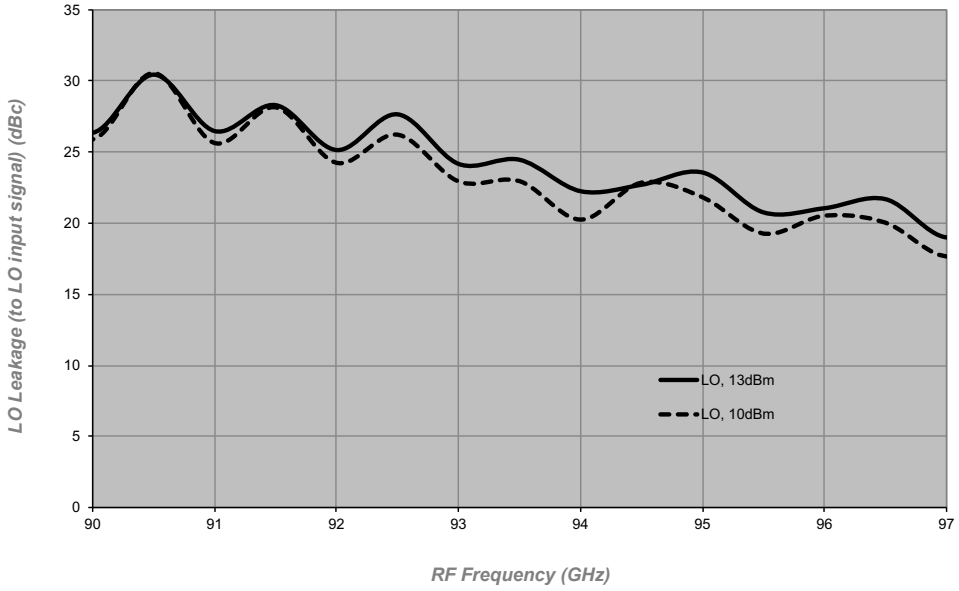



Figure 3
*LO Leakage*

## Measured Performance Data

*Test Conditions:- LO = Fixed, 88.6GHz, 13dBm, IF = 2GHz – 6GHz, 4dBm, Bias=0.5V, 4mA*

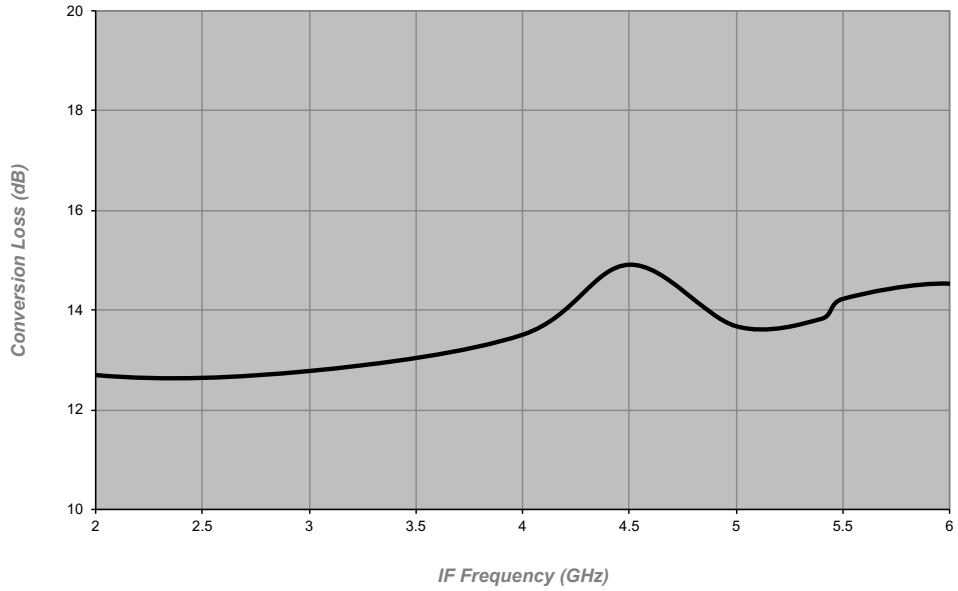



Figure 4
*Conversion Loss*

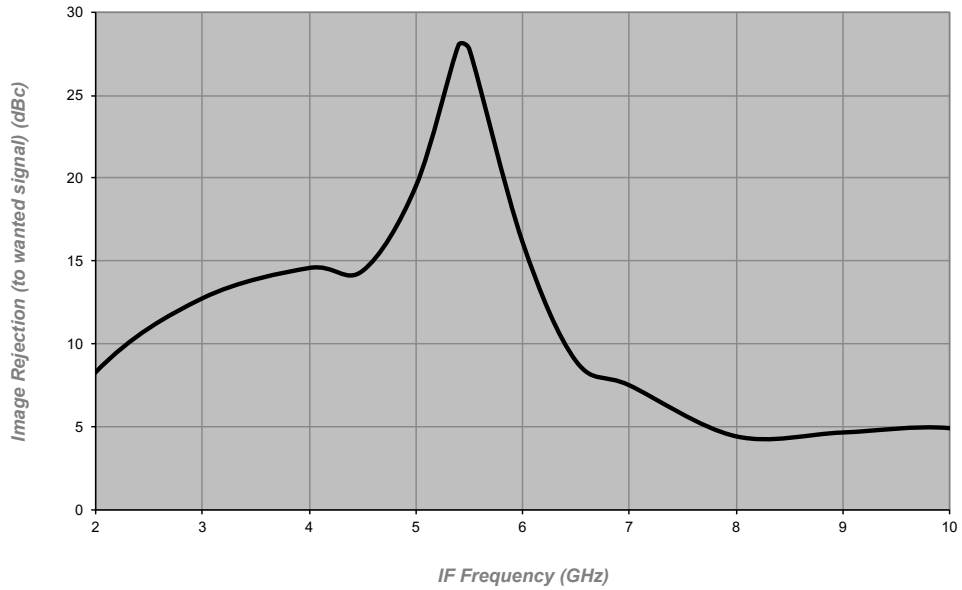



Figure 5
*Image Rejection*

## Measured Performance Data

*Test Conditions:- LO = Fixed, 88.6GHz, 13dBm, IF = 2GHz – 6GHz, 4dBm, Bias=0.5V, 4mA*

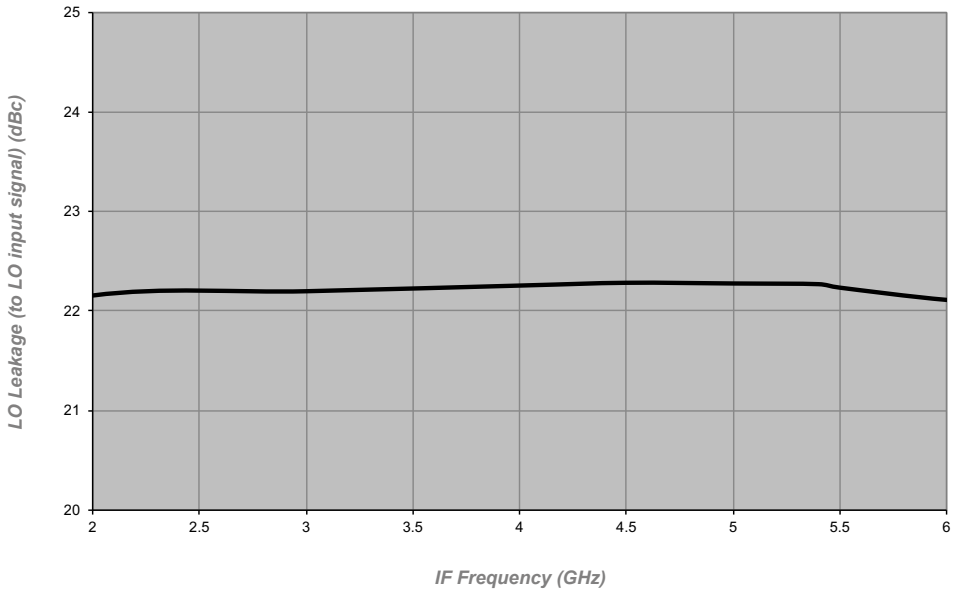
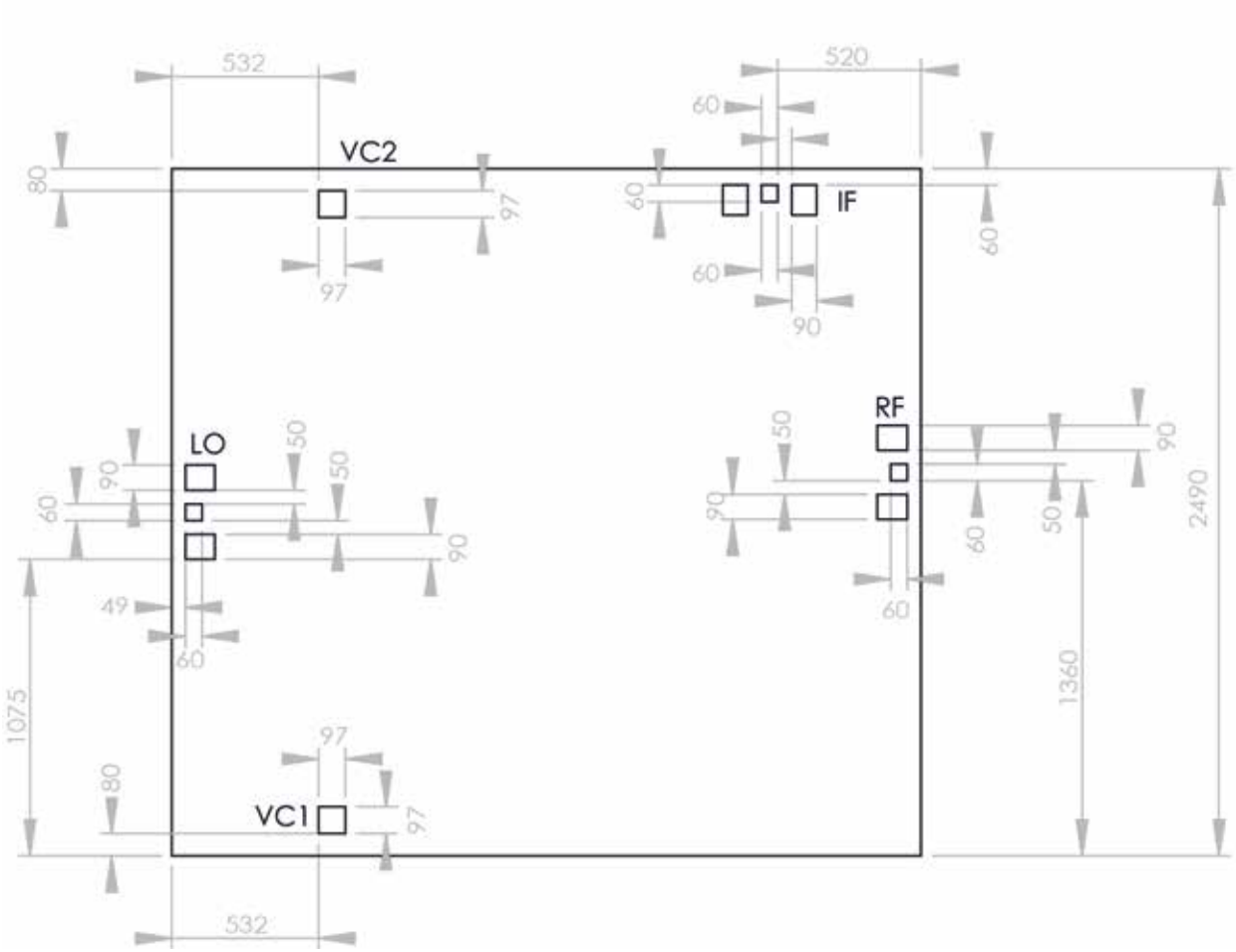



Figure 6
*LO Leakage*

## Outline Drawing



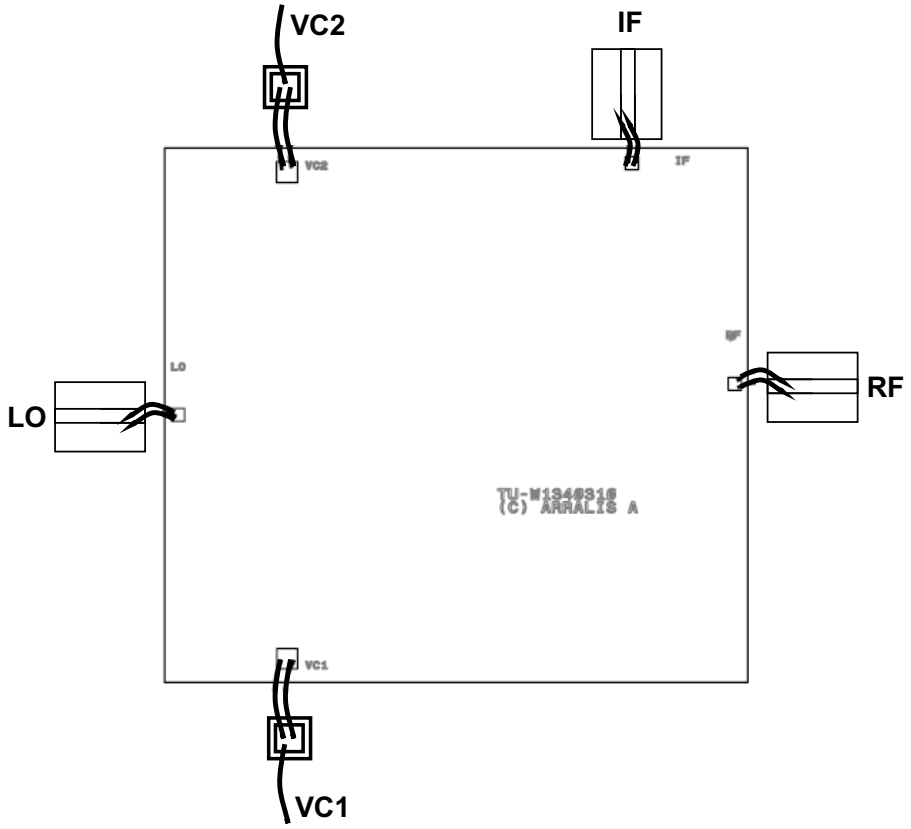

**Notes**

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.

## Pad Descriptions

| Name | Description |
|---|---|
| **LO** | LO pad. This pad is AC coupled. |
| **RF** | RF pad. This pad is AC coupled. |
| **IF** | IF pad. This pad is AC coupled. |
| **VC1** | Diode bias pad 1. |
| **VC2** | Diode bias pad 2. |
| **BOTTOM** | The die backside must be connected to RF/DC ground. |

## General Notes on Assembly



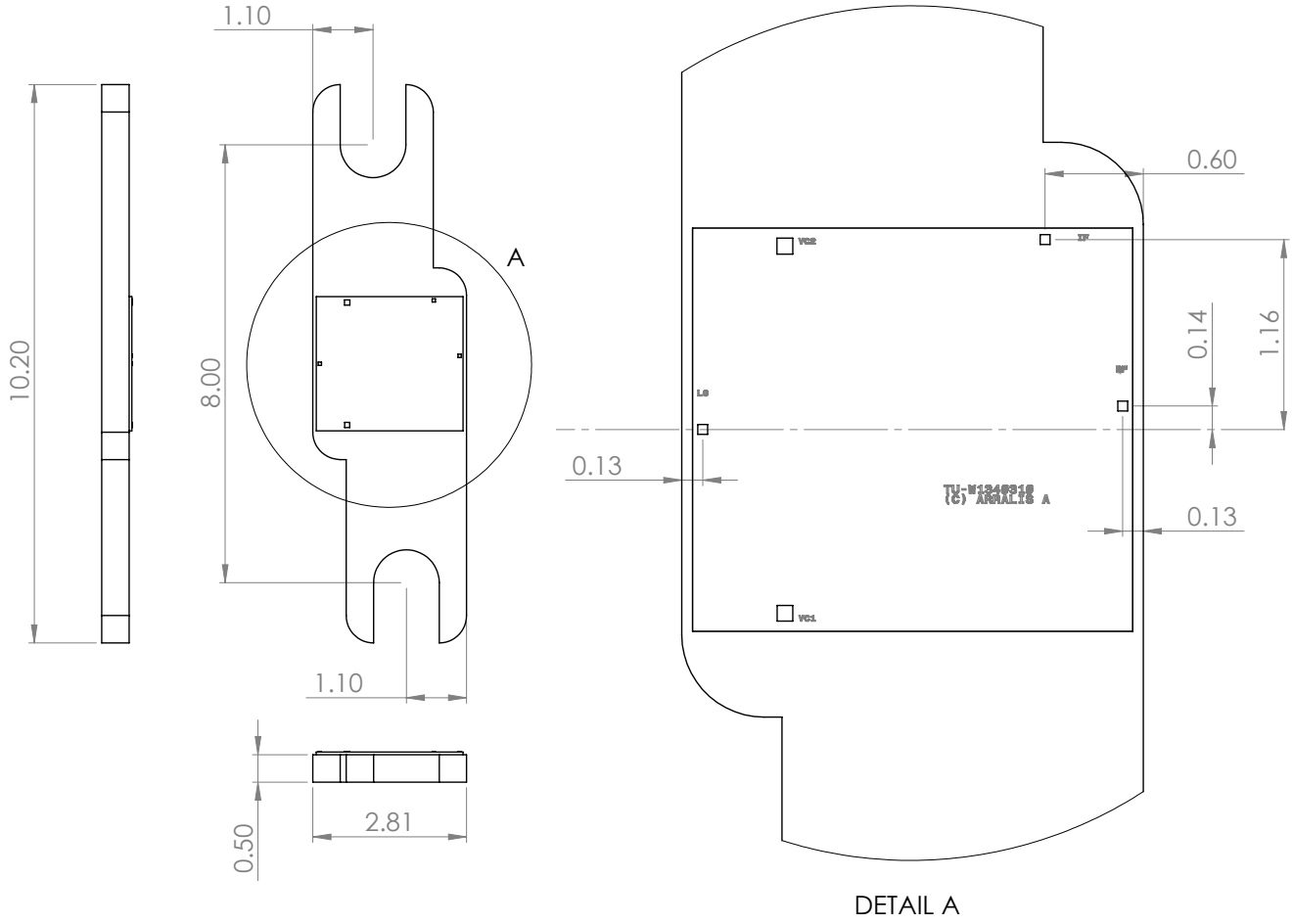
Die should be mounted on conductive material such as gold-plated metal to provide a good ground and suitable heat sink, if necessary.

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.

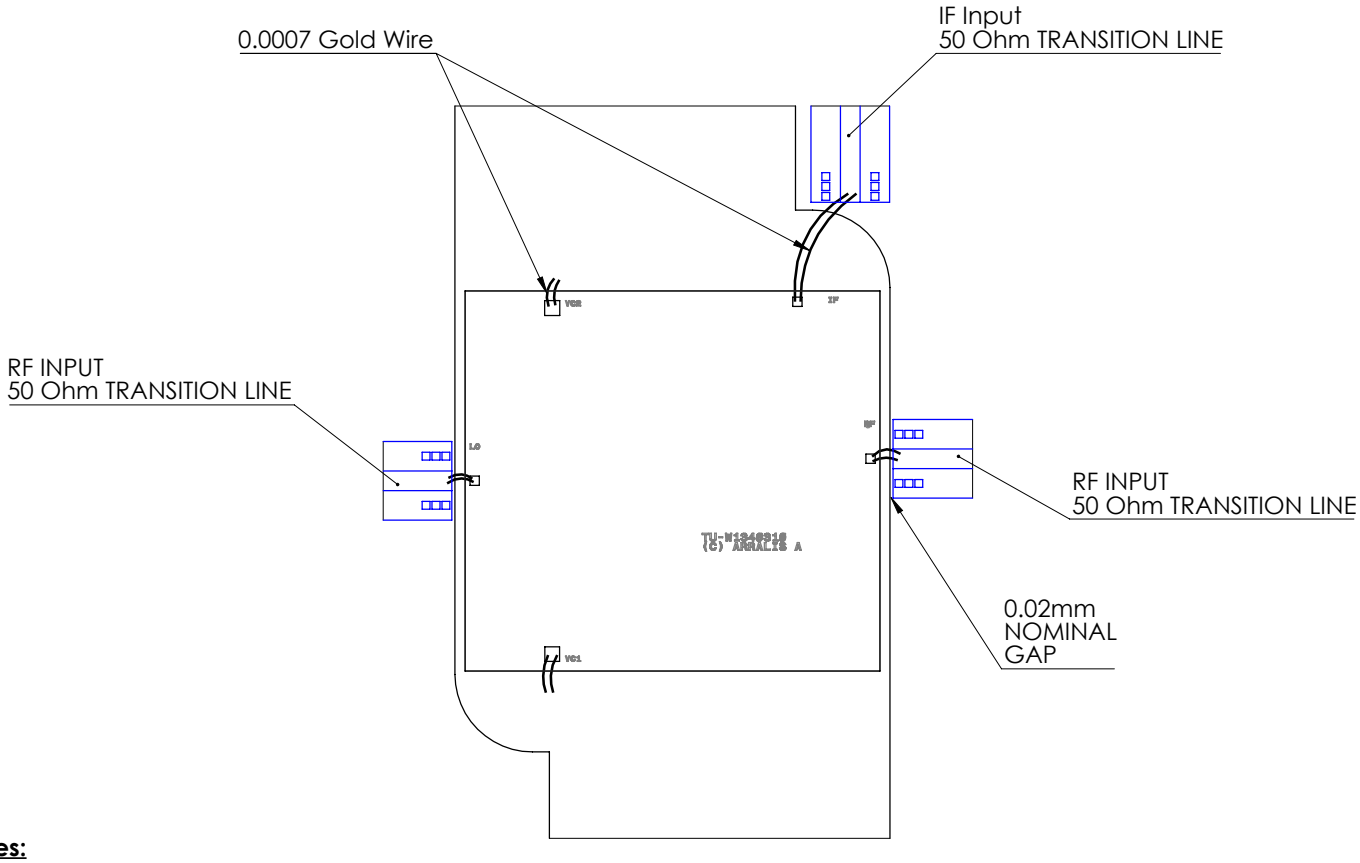
**Die Packing Information**

All die are normally delivered using gel-paks, Arralis also offer the W-ICM-9296 die already eutectically die-attached on a gold plated carrier, product code W-ICM-C-9296.

## Carrier Outline Drawing



## Carrier Bonding Diagram




**Notes:**

1) 0.0007 99.99% Au wire

2) Bond to be of minimal lenght and loop ( as allowed by the available wire-bonder)

***Disclaimer***

*The information contained herein is believed to be reliable; however, Arralis makes no warranties regarding the information and assumes no responsibility or liability whatsoever for the use of the information contained herein. All information is subject to change without notice, therefore customers should obtain the latest relevant information before placing orders for Arralis products. The information contained herein does not grant, explicitly or implicitly, to any party any patent rights, licenses, or any other intellectual property rights.*

*This information does not constitute a warranty with respect to the product described, and Arralis disclaims any and all warranties either expressed or implied, relating to sale and/or use of Arralis products including liability or warranties relating to fitness for a particular purpose, consequential or incidental damages, merchantability, or infringement of any patent, copyright or other intellectual property right.*

*Without limiting the generality of the foregoing, Arralis products are not warranted or authorised 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.*



Arralis European Offices
t: +(44) 1793 239670 (UK)
e: sales@arralis.com

**arralis.com**

Arralis USA Office
+(1) 386 301 3249 (USA)
e: emilie.wren@arralis.com