**W-SP3T-90110** Previously named TU-W1401503
GaAs Diode SP3T MMIC Switch, 90 – 110 GHz

**Overview**

W-SP3T-90110 is a SP3T diode based switch that covers frequencies from 90 GHz to 110 GHz.

All bond pads and the die backside are gold plated. This 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.

A packaged version of the device is also available with WR10 waveguide input and output.

**Features**

- 90 – 110GHz.
- 6dB insertion loss.
- 10dB return loss.
- >15dB isolation.

**Applications**

- Narrow bandwidth millimeter-wave Imaging.
- Pulse modulation.
- High resolution radar.
- LNA protection.
- Sensing.
- P2P communications; short haul/high capacity/low interference links.
- Radiometry.
Specification Overview

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Min.</th>
<th>Typ.</th>
<th>Max.</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Frequency</strong></td>
<td>90</td>
<td>110</td>
<td>GHz</td>
<td></td>
</tr>
<tr>
<td><strong>Insertion Loss Closed</strong></td>
<td>6</td>
<td></td>
<td>dB</td>
<td></td>
</tr>
<tr>
<td><strong>Isolation (RFIN to RFx)</strong></td>
<td>15</td>
<td></td>
<td>dB</td>
<td></td>
</tr>
<tr>
<td><strong>Return Loss Closed</strong></td>
<td>10</td>
<td></td>
<td>dB</td>
<td></td>
</tr>
<tr>
<td><strong>Return Loss Open</strong></td>
<td>8</td>
<td></td>
<td>dB</td>
<td></td>
</tr>
<tr>
<td><strong>Operating Voltage</strong></td>
<td>-1.5</td>
<td>+1.5</td>
<td>V</td>
<td></td>
</tr>
<tr>
<td><strong>Operating Current</strong></td>
<td>50</td>
<td>0</td>
<td>mA</td>
<td></td>
</tr>
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</table>

Absolute Maximum Ratings

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control Voltage</td>
<td>-2V to +10V dc</td>
</tr>
<tr>
<td>RF Power</td>
<td>25dBm</td>
</tr>
<tr>
<td>Storage Temperature</td>
<td>-65°C to +150°C</td>
</tr>
<tr>
<td>Channel Temperature</td>
<td>+150°C</td>
</tr>
<tr>
<td>Operating Temperature</td>
<td>-40°C to +85°C</td>
</tr>
</tbody>
</table>

Notes

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

Figure 1
'Closed Path' Return Loss

(Vcc=1.5V, Icc=0mA OPEN; Vcc=-1.5V, Icc=50mA Closed)

Return Loss (dB)

RF Frequency (GHz)

Figure 2
'Closed Path' Insertion Loss

(Vcc=1.5V, Icc=0mA OPEN; Vcc=-1.5V, Icc=50mA Closed)

Insertion Loss (dB)

RF Frequency (GHz)
Measured Performance Data

Figure 3
‘Open Side’ Return Loss

(Vcc=1.5V, Icc=0mA OPEN; Vcc=-1.5V, Icc=50mA Closed)

Return Loss (dB)
RF Frequency (GHz)

Figure 4
‘Open Path’ Isolation

(Vcc=1.5V, Icc=0mA OPEN; Vcc=-1.5V, Icc=50mA Closed)

Isolation (dB)
RF Frequency (GHz)
Pad Descriptions

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>RFIN</td>
<td>Common RF pad. This pad is AC coupled.</td>
</tr>
<tr>
<td>RFx</td>
<td>RF pad for branch x. This pad is AC coupled.</td>
</tr>
<tr>
<td>VCx</td>
<td>Control Voltage pad for branch x.</td>
</tr>
<tr>
<td>BOTTOM</td>
<td>The die backside must be connected to RF/DC ground.</td>
</tr>
</tbody>
</table>

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.
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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