Keysight 1GG8-4031
35 GHz Double Balanced Ring Diode Mixer

Data Sheet

Features
- 10 to 35 GHz RF/LO
- 0 to 16 GHz IF
- Choice of LO ports
Description

The 1GG8-4031 is a general purpose broadband double balanced ring-diode mixer operating across 10-35 GHz RF/LO and 0 to 16 GHz IF for upconversion or downconversion applications. The mixer is fabricated using Keysight Technologies, Inc. GaAs diode process which provides excellent process uniformity and reliability.

Vital stats

- Chip size: 1290 × 1150 µm (50.8 × 45.3 mils)
- Chip size tolerance: ±10 µm (±0.4 mils)
- Chip thickness: 127 ±15 µm (5.0 ±0.6 mils)
- Pad dimensions: 70 × 70 µm (2.8 × 2.8 mils) DC pads
  140 × 70 µm (5.6 × 2.8 mils) RF pads

Absolute maximum ratings¹

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter/condition</th>
<th>Continuous use</th>
<th>Damage level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pcw</td>
<td>Total LO + RF CW power</td>
<td>+24 dBm</td>
<td></td>
</tr>
<tr>
<td>VdcRF</td>
<td>DC voltage on RF Port</td>
<td>-10 +10 V</td>
<td></td>
</tr>
<tr>
<td>VdcIF</td>
<td>DC voltage on IF Port</td>
<td>-0.5 +0.5 V</td>
<td></td>
</tr>
<tr>
<td>Ttherm</td>
<td>Thermocouple temperature</td>
<td>+85 °C</td>
<td></td>
</tr>
<tr>
<td>Tstg</td>
<td>Storage temperature</td>
<td>-65 +150 °C</td>
<td></td>
</tr>
<tr>
<td>Tmax</td>
<td>Assembly temperature</td>
<td>+260 °C</td>
<td></td>
</tr>
</tbody>
</table>

1. Operation in excess of any of the values may result in permanent damage to the device.
2. Operation above the stated max temperature will significantly degrade IC reliability.
3. Refer to JEDEC J-STD-020D for detailed reflow profile, three reflows maximum.
Applications

The 1GG8-4031 is designed for use in RF and microwave communication systems and applications where broadband upconversion or downconversion is required.

Additional mixing diodes (A1-C1, A2-C2) are provided for device troubleshooting and temperature sensing.

Frequency-domain AC specifications

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter/condition</th>
<th>Min</th>
<th>Typ</th>
<th>Max</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>CE16</td>
<td>Up-conversion efficiency</td>
<td>-7.5</td>
<td>-6</td>
<td></td>
<td>dB</td>
</tr>
<tr>
<td></td>
<td>LO 27 GHz, IF 11 GHz, RF 16 GHz</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LO27</td>
<td>LO-RF isolation</td>
<td>-40</td>
<td>-38</td>
<td></td>
<td>dB</td>
</tr>
<tr>
<td></td>
<td>27 GHz</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1. $T_{bs} = 25^\circ C$, LO drive +18 dBm

ESD sensitivity

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter/condition</th>
<th>Min</th>
<th>Max</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>RF-GND</td>
<td>HBM</td>
<td>-350</td>
<td>350</td>
<td>V</td>
</tr>
<tr>
<td>A1-C1</td>
<td>HBM</td>
<td>-600</td>
<td>600</td>
<td>V</td>
</tr>
<tr>
<td>A2-C2</td>
<td>HBM</td>
<td>&lt; -1000</td>
<td>&gt; 1000</td>
<td>V</td>
</tr>
<tr>
<td>LO-GND</td>
<td>HBM</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IF-GND</td>
<td>HBM</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1. $T_{bs} = 25^\circ C$
2. Human body model: 100 pF, 1.5 kΩ.
3. Failure definition: 20% change in current for I/V sweep, ignoring leakage currents less than 10 uA
Assembly Techniques

Die attach should be done with conductive epoxy. Gold thermosonic bonding is recommended for all bonds. The top and bottom metallization is gold.

ESD Warning

III-V MMICs are ESD sensitive. Damage from ESD events can significantly affect III-IV MMIC performance and reliability. Preventative ESD measures must be employed in all aspects of storage, handling, and assembly, in compliance with the Keysight Technologies, Inc. ESD Control Program. Information on the Keysight ESD Control Program can be found at:

http://emg.communications.keysight.com/quality/esd/

For information on ESD precautions during die attach and bonding, please refer to Keysight Technologies GaAs MMIC ESD, Die Attach and Bonding Guidelines - Application Note, literature number 5991-3484EN.

Reliability Warning

The maximum CW input power (LO plus IF or RF, depending on up or down conversion) must be +24 dBM or less. A thermocouple placed on the ground plane adjacent to the chip near the die attach must read 85°C or less.

RoHS Compliance

This device is RoHS Compliant. This means the component meets the requirements of the European Parliament and the Council of the European Union Restriction of Hazardous Substances Directive 2011/65/EU, commonly known as RoHS. The six regulated substances are lead, mercury, cadmium, chromium VI (hexavalent), polybrominated biphenyls (PBB) and polybrominated biphenyl ethers (PBDE). RoHS compliance implies that any residual concentration of these substances is below the RoHS Directive's maximum concentration values (MVC); being less than 1000 ppm by weight for all substances except for cadmium which is less than 100 ppm by weight.
Figure 1. 1GG8-4031 chip circuit simplified schematic.

Figure 2. 1GG8-4031 chip bond-pad locations. Dimensions in micrometers.
Figure 3. 1GG8-4031 chip conversion efficiency.

1GG8-4031 Conversion efficiency, LO fixed 27 GHz 15 dBm
RF below LO
IF = Port 1, RF = Port 2

Figure 4. 1GG8-4031 chip conversion efficiency.

1GG8-4031 Conversion efficiency, IF 10 GHz
LO 15 dBm, LO above RF
IF = Port 1, RF = Port 2
Figure 4. 1GG8-4031 chip conversion efficiency.

Figure 6. 1GG8-4031 chip LO-RF and LO-IF isolation.
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The product described in this data sheet is RoHS Compliant. See RoHS Compliance section for more details.

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