CGY2651UH/C1

37 – 43 GHz 10 W Power Amplifier

**Description**

The CGY2651UH/C1 is a high-performance GaN Power Amplifier MMIC designed to operate in the Ka-band.

The CGY2651UH/C1 has 40 dBm of output power and 30% PAE @ Psat & 40 GHz.

The performances of the CGY2651UH/C1 make it well suited to be used in Radar, Telecommunication and Space applications. This technology is being evaluated for space applications.

**Features**

- Operating Range: 37 GHz to 43 GHz
- Gain: 18 dB
- Pout: 40 dBm @40 GHz
- PAE: 30%
- Power Consumption:
  - $V_D = 12$ V
  - $I_{Q_{tot}} = 0.84$ A
- Chip size = 3.6 x 2.8 mm$^2$
- 50 Ohms input and output matched

**Application**

- Radar
- Telecommunications
- Spatial

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innovating with III-V’s

Advance Information

CGY2651UH/C1

Product data sheet

Disclaimer: Subject to change without notice

OMMIC

2, Rue du Moulin – BP11 – 94 453
Liméil-Brévannes Cedex – France.

Website : www.ommic.com

e-mail : information@ommic.com
MAXIMUM VALUES

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>Conditions</th>
<th>MIN.</th>
<th>MAX.</th>
<th>UNIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>V_G1N, V_G2N, V_G3N, V_G1S, V_G2S, V_G3S</td>
<td>Gate Voltage</td>
<td>-2.5</td>
<td>0</td>
<td>V</td>
<td></td>
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<tr>
<td>V_D1N, V_D2N, V_D3N, V_D1S, V_D2S, V_D3S</td>
<td>Drain Voltage</td>
<td>10</td>
<td>15</td>
<td>V</td>
<td></td>
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<tr>
<td>I_DQ1N, I_DQ1S</td>
<td></td>
<td>450</td>
<td></td>
<td>mA</td>
<td></td>
</tr>
<tr>
<td>I_DQ2N, I_DQ2S</td>
<td>Quiescent Drain current</td>
<td>900</td>
<td></td>
<td>mA</td>
<td></td>
</tr>
<tr>
<td>I_DQ3N, I_DQ3S</td>
<td></td>
<td>1800</td>
<td></td>
<td>mA</td>
<td></td>
</tr>
<tr>
<td>P_IN</td>
<td>RF Input Power</td>
<td></td>
<td>+ 25</td>
<td></td>
<td>dBm</td>
</tr>
<tr>
<td>T_j (operating)</td>
<td>Operating Junction temperature</td>
<td></td>
<td>+ 200</td>
<td></td>
<td>°C</td>
</tr>
<tr>
<td>T_j (one minute)</td>
<td>Junction temperature During one minute</td>
<td></td>
<td>+ 310</td>
<td></td>
<td>°C</td>
</tr>
<tr>
<td>T_stg</td>
<td>Storage temperature</td>
<td></td>
<td>- 55</td>
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<td>°C</td>
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THERMAL CHARACTERISTICS

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<th>Symbol</th>
<th>Parameter</th>
<th>Value</th>
<th>UNIT</th>
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<tbody>
<tr>
<td>R_Thamb</td>
<td>Thermal Resistance at ambient temperature</td>
<td>3.25</td>
<td>° C/W</td>
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<tr>
<td>R_Th60°C</td>
<td>Thermal Resistance at 60 °C</td>
<td>4.78</td>
<td>° C/W</td>
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ELECTRICAL CHARACTERISTICS

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<th>Symbol</th>
<th>Parameter</th>
<th>Conditions</th>
<th>MIN.</th>
<th>TYP.</th>
<th>MAX.</th>
<th>UNIT</th>
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<tbody>
<tr>
<td>RF_IN</td>
<td>Input Frequency</td>
<td></td>
<td>37</td>
<td>43</td>
<td>GHz</td>
<td></td>
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<tr>
<td>V_D1N, 2N, 3N V_D1S, 2S, 3S</td>
<td>Drain Supply Voltage</td>
<td></td>
<td>12</td>
<td></td>
<td>V</td>
<td></td>
</tr>
<tr>
<td>I_DD</td>
<td>Total supply current @Psat</td>
<td>Drain Voltage 12 V</td>
<td>2.7</td>
<td></td>
<td>A</td>
<td></td>
</tr>
<tr>
<td>G</td>
<td>Gain</td>
<td></td>
<td>18</td>
<td></td>
<td>dB</td>
<td></td>
</tr>
<tr>
<td>P_sat</td>
<td>Saturated Power</td>
<td></td>
<td>41</td>
<td></td>
<td>dBm</td>
<td></td>
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<tr>
<td>PAE</td>
<td>Power Added Efficiency</td>
<td>PAE at 40 GHz</td>
<td>30.5</td>
<td></td>
<td>%</td>
<td></td>
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<tr>
<td>OIP3</td>
<td>Output Third Order Intercept Point</td>
<td></td>
<td>TBD</td>
<td></td>
<td>dBm</td>
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<tr>
<td>S11</td>
<td>Input Reflexion Coefficient</td>
<td>50 Ohms</td>
<td>- 8</td>
<td></td>
<td>dB</td>
<td></td>
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<tr>
<td>S22</td>
<td>Output Reflexion Coefficient</td>
<td>50 Ohms</td>
<td>- 10</td>
<td></td>
<td>dB</td>
<td></td>
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ON WAFER MEASUREMENTS

Conditions: \( T_{\text{amb}} = +25^\circ\text{C}. \)
\( V_{D1} = V_{D2} = V_{D3} = 12\ \text{V};\ I_{D1} = 120\ \text{mA};\ I_{D2} = 240\ \text{mA};\ I_{D3} = 480\ \text{mA} \)

- **S-PARAMETERS**

**Reflexion Coefficients vs. Frequency**

**Output Forward Gain vs. Frequency**
- **PSAT OUTPUT POWER, POWER GAIN AND PAE**

![Graph 1: Pout/Gain/PAE vs. Pin](image)

- **Output Power vs. Frequency**

![Graph 2: Output Power vs. Frequency](image)
APPLICATION SCHEMATIC

Decoupling scheme depends on customer implementation, in order to prevent unstability it is highly recommended to place a 47pF RF decoupling chip capacitor at each DC terminal with the shortest possible bonding wires. Additionnally, a 10nF chip capacitor can be added on the drain 3 connection.

The decoupling network depends on supply, on grounding environment, on form factor, on all parasitics added by the customer environment. According to this, the appropriate network sometimes need to be fine-tuned in accordance with rules applicable in the high frequency domain.

It may also be required to add very low frequency, high capacitor value. On each drain a 10 Ohms / 10 nF RC serie network made of 0402 format capacitors have been implemented on the reference test-jig.

Figure 1: CGY2651UH Application Schematic
PAD LAYOUT

The Die is symmetrical on the RF axis. The die positionned top view with RF input on the left and RF output on the right show DC accesses on the top labelled north (N) and DC accesses on the bottom labelled south (S).

VD1N, VD2N, VD3N, VG1N, VG2N, VG3N are DC signals applied on the north side while VD1S, VD2S, VD3S, VG1S, VG2S, VG3S are DC signals applied on the south side. Many ground accesses are complementing the pad layout. The backside is the ground reference plan.

Figure 2: CGY2651UH/C1 Pad allocation
DEFINITIONS

Limiting values definition
Limiting values given are in accordance with the Absolute Maximum Rating System (IEC 60134). Stress above one or more of the limiting values may cause permanent damage to the device. These are stress ratings only and operation of the device at these or at any other conditions above those given in the Characteristics sections of the specification is not implied. Exposure to limiting values for extended periods may affect device reliability.

Application information
Applications that are described herein for any of these products are for illustrative purposes only. OMMIC makes no representation or warranty that such applications will be suitable for the specified use without further testing or modification.

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