**MECKULNA2**

Ku-Band GaN HEMT Low Noise Amplifier

![Circuit Diagram]

**Main Features**

- 0.25 μm GaN HEMT Technology
- 13 – 16 GHz full performance Frequency Range
- Small Signal Gain > 24.5 dB
- Noise Figure: < 2.5 dB
- P1dB > 21.5 dBm, Psat > 29.5 dBm
- Output TOI > 30 dBm
- Overdrive Pin > 25 dBm
- Bias: Vd = 15 V, Id = 84 mA, Vg = -2.8 V (Typ.)
- Chip Size: 4 x 2 x 0.1 mm³

**Product Description**

**MECKULNA2** is a 0.25 μm GaN HEMT based Low Noise Amplifier designed by MEC for Ku-Band applications.

In the frequency range from 13 GHz to 16 GHz MECKULNA2 provides more than 24.5 dB of linear gain, 2.2 dB of noise figure, P1dB of 21.5 dBm and Output TOI of 30 dBm.

In addition to the high electrical performances, this GaN LNA provides an high level of input power robustness being capable of surviving up to 25 dBm without degrading its performance.

**Typical Applications**

- Radar
- Telecom

**Measured Data**

![Graph: Linear Gain and Noise Figure]
Main Characteristics

Test Conditions: $T_{\text{base, plate}} = 25 \, ^{\circ}\text{C}$, $V_d = 15 \, \text{V}$, $I_{dq} = 84 \, \text{mA}$

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Min</th>
<th>Typ</th>
<th>Max</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating frequency</td>
<td>13</td>
<td>25</td>
<td>16</td>
<td>GHz</td>
</tr>
<tr>
<td>Small Signal Gain</td>
<td>2.2</td>
<td>2.5</td>
<td>dB</td>
<td></td>
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<tr>
<td>Noise Figure</td>
<td>-10</td>
<td>-8</td>
<td>dB</td>
<td></td>
</tr>
<tr>
<td>Input Return Loss</td>
<td>-10</td>
<td>-8</td>
<td>dB</td>
<td></td>
</tr>
<tr>
<td>Output Return Loss</td>
<td>-10</td>
<td>-8</td>
<td>dB</td>
<td></td>
</tr>
<tr>
<td>Output Power at 1 dB of Gain Compression</td>
<td>21.5</td>
<td>29.5</td>
<td>dBm</td>
<td></td>
</tr>
<tr>
<td>Output Power at Saturation</td>
<td>21.5</td>
<td>29.5</td>
<td>dBm</td>
<td></td>
</tr>
<tr>
<td>Max. Overdrive Input Power *</td>
<td>25</td>
<td></td>
<td>dBm</td>
<td></td>
</tr>
<tr>
<td>Output TOI (1 MHz tone spacing)</td>
<td>30</td>
<td></td>
<td>dBm</td>
<td></td>
</tr>
<tr>
<td>Drain Supply Voltage</td>
<td>15</td>
<td></td>
<td>V</td>
<td></td>
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<tr>
<td>Supply Quiescent Drain Current</td>
<td>84</td>
<td></td>
<td>mA</td>
<td></td>
</tr>
<tr>
<td>DC Power Consumption</td>
<td>1.26</td>
<td></td>
<td>W</td>
<td></td>
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<tr>
<td>DC Power Consumption at 1 dB of Gain Compr.</td>
<td>1.5</td>
<td></td>
<td>W</td>
<td></td>
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</tbody>
</table>

* LNA ruggedness to overdrive input power data are available upon request.
Small Signal Measurements

Test Conditions: $T_{\text{base_plate}} = 25^\circ \text{C}$, $V_d = 15 \text{ V}$, $I_{dq} = 84 \text{ mA}$

Linear Gain, Input and Output Return Loss

Broadband Small Signal Measurements
Measured Performances Vs. Pin @ Frequency [13, 14, 15, 16] GHz

Test Conditions: $T_{\text{base,plate}} = 25 \, ^\circ\text{C}$, $V_d = 15 \, \text{V}$, $I_dq = 84 \, \text{mA}$

Output Power Vs. Input Power

PAE Vs. Input Power
Test Conditions: \( T_{\text{base_plate}} = 25 \, ^\circ\text{C} \), \( V_d = 15 \, \text{V} \), \( I_{dq} = 84 \, \text{mA} \)
Measured Performances Vs. Frequency @ Saturation and @ 1dB of Gain Compression

Test Conditions: $T_{\text{base, plate}} = 25 \, ^\circ\text{C}$, $V_d = 15 \, \text{V}$, $I_{dq} = 84 \, \text{mA}$

- P1dB condition reached at $P_{\text{in}} = -1 \, \text{dBm}$
- PSat condition reached at $P_{\text{in}} = 12 \, \text{dBm}$

![Graph of Output Power vs. Frequency]

![Graph of Gain vs. Frequency]
Nonlinear Measurement: Output Power, OTOI, DC Power

Test Conditions: $T_{\text{base, plate}} = 25 ^\circ\text{C}$, $V_d = 15 \text{ V}$, $I_{dq} = 84 \text{ mA}$

- $P_{1\text{dB}}$ condition reached at $P_{in} = -1 \text{ dBm}$
- $P_{3\text{dB}}$ condition reached at $P_{in} = 5 \text{ dBm}$
- OTOI: 2 tone measurements with tone spacing of 1 MHz. Linear regression formula with $P_{in \text{ D.C.L.}} = [-12, -8] \text{ dBm}$

![Graph showing output power, OTOI, and DC power vs. frequency.]

- **Output Power (dBm):**
  - P3dB
  - P1dB
  - OTOI

- **Frequency [GHz]:**
  - 13.0 to 16.0

- **DC Power (Watt):**
  - P3dB
  - P1dB
  - Small Signal

- **Frequency [GHz]:**
  - 13.0 to 16.0
Nonlinear Measurement: 3rd Order Inter-Modulation Distortion

Test Conditions: $T_{\text{base, plate}} = 25^\circ\text{C}$, $V_d = 15\text{ V}$, $I_{dq} = 84\text{ mA}$, 2-tone measurements with tone spacing of 1 MHz - Centre frequency from 13 GHz to 16 GHz
Eutectic Die bond using AuSn (80/20) solder is recommended.

The backside of the die is the Source (ground) contact.

Thermosonic ball or wedge bonding are the preferred connection methods.

Gold wire must be used for connections.

### Bias Procedure

**Bias-Up**

1. Vg set to -4 V.
2. Vd set to +15 V.
3. Adjust Vg until quiescent Id is 84 mA (Vg = -2.8 V Typical).
4. Apply RF signal.

**Bias-Down**

1. Turn off RF signal.
2. Reduce Vg to -4 V (Id0 ≈ 0 mA).
3. Set Vd to 0 V.
4. Turn off Vd.
5. Turn off Vg.
Contact Information

For additional technical Information and Requirements:
Email: contact.mec@mec-mmic.com  Tel: +39 0516333403

For sales Information and Requirements:
Email: sales@mec-mmic.com  Tel: +39 0637511124

Notice

The furnished information is believed to be reliable. However, performances and specifications contained herein are based on preliminary characterizations and then susceptible to possible variations. On the basis of customer requirements the product can be tested and characterized in specific operating conditions and, if needed, tuned to meet custom specifications.

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