Gallium Nitride 28V, 25W RF Power Transistor
Built using the SIGANTIC® NRF1 process - A proprietary GaN-on-Silicon technology

FEATURES
• Optimized for broadband operation from DC-4000MHz
• 25W $P_{3\text{dB}}$ CW power at 3000MHz
• 16-20W $P_{3\text{dB}}$ CW power from 1000-2500MHz in application board with >45% drain efficiency
• 10-20W $P_{3\text{dB}}$ CW power from 30-1000MHz in application board with >50% drain efficiency
• High efficiency from 14 - 28V
• 4.0 °C/W $R_{\text{TH}}$ with maximum $T_J$ rating of 200 °C
• Robust up to 10:1 VSWR mismatch at all angles with no device damage at 90 °C flange
• Subject to EAR99 export control

DC – 4000 MHz
25 Watt, 28 Volt
GaN HEMT

RF Specifications (CW, 3000MHz): $V_{DS} = 28V$, $I_{DQ} = 225mA$, $T_C = 25°C$, Measured in Nitronex Test Fixture

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>Min</th>
<th>Typ</th>
<th>Max</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>$P_{3\text{dB}}$</td>
<td>Average Output Power at 3dB Gain Compression</td>
<td>43</td>
<td>44</td>
<td>-</td>
<td>dBm</td>
</tr>
<tr>
<td>$P_{1\text{dB}}$</td>
<td>Average Output Power at 1dB Gain Compression</td>
<td>-</td>
<td>43</td>
<td>-</td>
<td>dBm</td>
</tr>
<tr>
<td>$G_{SS}$</td>
<td>Small Signal Gain</td>
<td>12</td>
<td>13</td>
<td>-</td>
<td>dB</td>
</tr>
<tr>
<td>$\eta$</td>
<td>Drain Efficiency at 3dB Gain Compression</td>
<td>57</td>
<td>65</td>
<td>-</td>
<td>%</td>
</tr>
<tr>
<td>VSWR</td>
<td>10:1 VSWR at all phase angles</td>
<td>No damage to the device</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Figure 1 - Typical CW Performance in Load-Pull, $V_{DS} = 28V$, $I_{DQ} = 225mA$

Figure 2 - Typical CW Performance$^1$ in Load-Pull, $V_{DS} = 28V$, $I_{DQ} = 225mA$

Note 1: 500MHz and 900MHz Load-Pull data collected using a 4.7 Ω resistor in the RF path added for stability
## Absolute Maximum Ratings

Not simultaneous, $T_C = 25^\circ C$ unless otherwise noted

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>Max</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>$V_{DS}$</td>
<td>Drain-Source Voltage</td>
<td>100</td>
<td>V</td>
</tr>
<tr>
<td>$V_{GS}$</td>
<td>Gate-Source Voltage</td>
<td>-10 to 3</td>
<td>V</td>
</tr>
<tr>
<td>$I_G$</td>
<td>Gate Current</td>
<td>40</td>
<td>mA</td>
</tr>
<tr>
<td>$P_T$</td>
<td>Total Device Power Dissipation (Derated above 25°C)</td>
<td>44</td>
<td>W</td>
</tr>
<tr>
<td>$T_{STG}$</td>
<td>Storage Temperature Range</td>
<td>-65 to 150</td>
<td>°C</td>
</tr>
<tr>
<td>$T_J$</td>
<td>Operating Junction Temperature</td>
<td>200</td>
<td>°C</td>
</tr>
<tr>
<td>HBM</td>
<td>Human Body Model ESD Rating (per JESD22-A114)</td>
<td>1B (+/-500V)</td>
<td></td>
</tr>
<tr>
<td>MM</td>
<td>Machine Model ESD Rating (per JESD22-A115)</td>
<td>A (&gt;100V)</td>
<td></td>
</tr>
<tr>
<td>CDM</td>
<td>Charge Device Model ESD Rating (per JESD22-C101)</td>
<td>IV (&gt;1000V)</td>
<td></td>
</tr>
</tbody>
</table>
### Table 1: Optimum Source and Load Impedances for CW Gain, Drain Efficiency, and Output Power Performance

<table>
<thead>
<tr>
<th>Frequency (MHz)</th>
<th>( V_{DS} ) (V)</th>
<th>( Z_S ) (Ω)</th>
<th>( Z_L ) (Ω)</th>
<th>( P_{SAT} ) (W)</th>
<th>( G_{SS} ) (dB)</th>
<th>Drain Efficiency @ ( P_{SAT} ) (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>500</td>
<td>14</td>
<td>7.0 + j8.2</td>
<td>8.6 + j7.4</td>
<td>12</td>
<td>27.8</td>
<td>67</td>
</tr>
<tr>
<td>500</td>
<td>22</td>
<td>7.0 + j8.2</td>
<td>9.7 + j11.3</td>
<td>21</td>
<td>29.2</td>
<td>74</td>
</tr>
<tr>
<td>500</td>
<td>28</td>
<td>7.0 + j8.2</td>
<td>9.7 + j14.1</td>
<td>26</td>
<td>29.7</td>
<td>68</td>
</tr>
<tr>
<td>900</td>
<td>14</td>
<td>5.8 + j3.1</td>
<td>6.8 + j4.7</td>
<td>12</td>
<td>22.4</td>
<td>74</td>
</tr>
<tr>
<td>900</td>
<td>22</td>
<td>5.8 + j3.1</td>
<td>9.6 + j5.3</td>
<td>24</td>
<td>23.3</td>
<td>74</td>
</tr>
<tr>
<td>900</td>
<td>28</td>
<td>5.8 + j3.1</td>
<td>9.8 + j7.8</td>
<td>26</td>
<td>23.6</td>
<td>67</td>
</tr>
<tr>
<td>1800</td>
<td>28</td>
<td>3.5 - j3.6</td>
<td>6.9 + j2.0</td>
<td>26</td>
<td>18.4</td>
<td>69</td>
</tr>
<tr>
<td>2500</td>
<td>14</td>
<td>3.9 - j7.5</td>
<td>6.2 - j8.0</td>
<td>13</td>
<td>13.7</td>
<td>70</td>
</tr>
<tr>
<td>2500</td>
<td>22</td>
<td>4.8 - j7.0</td>
<td>5.5 - j4.1</td>
<td>19</td>
<td>14.9</td>
<td>69</td>
</tr>
<tr>
<td>2500</td>
<td>28</td>
<td>4.8 - j7.0</td>
<td>5.5 - j4.1</td>
<td>26</td>
<td>15.2</td>
<td>69</td>
</tr>
<tr>
<td>3000</td>
<td>28</td>
<td>5.3 - j8.8</td>
<td>5.3 - j6.4</td>
<td>26</td>
<td>13.2</td>
<td>66</td>
</tr>
<tr>
<td>3500</td>
<td>28</td>
<td>5.0 - j14.5</td>
<td>7.0 - j9.5</td>
<td>26</td>
<td>12.9</td>
<td>63</td>
</tr>
</tbody>
</table>

Note 1: 500MHz and 900MHz Load-Pull data collected using a 4.7 Ω resistor in the RF path added for stability

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**Figure 3** - Optimum Impedances for CW Performance, \( V_{DS} = 28V \)

\( Z_S \) is the source impedance presented to the device.
\( Z_L \) is the load impedance presented to the device.
Load-Pull Data, Reference Plane at Device Leads

$V_{DS}=28V$, $I_{DQ}=225mA$, $T_A=25^\circ C$ unless otherwise noted

**Figure 4** - Load-Pull Contours¹, 500MHz,
$P_{IN} = 14.5$dBm, $Z_S = 7.0 + j8.2 \, \Omega$

**Figure 5** - Load-Pull Contours¹, 900MHz,
$P_{IN} = 21.0$dBm, $Z_S = 5.8 + j3.1 \, \Omega$

**Figure 6** - Load-Pull Contours, 1800MHz,
$P_{IN} = 26.5$dBm, $Z_S = 3.5 - j3.6 \, \Omega$

**Figure 7** - Load-Pull Contours, 2500MHz,
$P_{IN} = 29.4$dBm, $Z_S = 4.8 - j7.0 \, \Omega$

Note 1: 500MHz and 900MHz Load-Pull data collected using a 4.7 $\Omega$ resistor in the RF path added for stability
Load-Pull Data, Reference Plane at Device Leads

$V_{DS}=28V$, $I_{DQ}=225mA$, $T_A=25°C$ unless otherwise noted

Figure 8 - Load-Pull Contours, 3000MHz, $P_{IN}=31.7$ dBm, $Z_S=5.3 - j8.8 \Omega$

Figure 9 - Load-Pull Contours, 3500MHz, $P_{IN}=33.5$ dBm, $Z_S=5.0 - j14.5 \Omega$

Figure 10 - Typical CW Performance in Load-Pull

Figure 11 - Typical CW Performance\textsuperscript{1} Over Voltage in Load-Pull, 500MHz

Note 1: 500MHz and 900MHz Load-Pull data collected using a 4.7 $\Omega$ resistor in the RF path added for stability
Figure 12 - Typical CW Performance Over Voltage in Load-Pull, 900MHz

Figure 13 - Typical CW Performance Over Voltage in Load-Pull, 2500MHz

Figure 14 - Typical CW Performance Over Temperature in Nitronex Test Fixture, 3000MHz

Figure 15 - Quiescent Gate Voltage ($V_{GSQ}$) Required to Reach $I_{DQ}$ as a Function of Case Temperature, $V_{DS} = 28V$

Figure 16 - MTTF of NRF1 Devices as a Function of Junction Temperature

Figure 17 - Power Derating Curve

Note 1: 500MHz and 900MHz Load-Pull data collected using a 4.7 Ω resistor in the RF path added for stability.
Figure 18 - AC200B-2 Metal-Ceramic Package Dimensions and Pinout (all dimensions are in inches [mm])
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Additional Information

This part is lead-free and is compliant with the RoHS directive
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