FEATURES

- Optimized for broadband operation from DC-4000MHz
- 25W $P_{3dB}$ CW power at 3000MHz
- 16-20W $P_{3dB}$ CW power from 1000-2500MHz in application board with >45% drain efficiency
- 10-20W $P_{3dB}$ CW power from 30-1000MHz in application board with >50% drain efficiency
- High efficiency from 14 - 28V
- 4.0 °C/W $R_{TH}$ 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

RF Specifications (CW, 3000MHz): $V_{DS} = 28V$, $I_{DO} = 225mA$, $T_C = 25°C$, 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>$P_{3dB}$</td>
<td>Average Output Power at 3dB Gain Compression</td>
<td>43</td>
<td>44</td>
<td>-</td>
<td>dBm</td>
</tr>
<tr>
<td>$P_{1dB}$</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></td>
<td></td>
<td></td>
<td>No damage to the device</td>
</tr>
</tbody>
</table>

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

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

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>
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<tr>
<td>CDM</td>
<td>Charge Device Model ESD Rating (per JESD22-C101)</td>
<td>IV (&gt;1000V)</td>
<td></td>
</tr>
</tbody>
</table>
Load-Pull Data, Reference Plane at Device Leads

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

**Table 1:** Optimum Source and Load Impedances\(^1\) 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>76</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

\( Z_S \) is the source impedance presented to the device.
\( Z_L \) is the load impedance presented to the device.

**Figure 3** - Optimum Impedances for CW Performance, \( V_{DS} = 28V \)
Load-Pull Data, Reference Plane at Device Leads

\[ V_{DS} = 28\text{V}, \; I_{DQ} = 225\text{mA}, \; T_{A} = 25^\circ\text{C} \] unless otherwise noted

**Figure 4** - Load-Pull Contours\(^1\), 500MHz,
\[ P_{IN} = 14.5\text{dBm}, \; Z_S = 7.0 + j8.2 \Omega \]

**Figure 5** - Load-Pull Contours\(^1\), 900MHz,
\[ P_{IN} = 21.0\text{dBm}, \; Z_S = 5.8 + j3.1 \Omega \]

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

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

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

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

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

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

Figure 10 - Typical CW Performance in Load-Pull

Figure 11 - Typical CW Performance$^1$ 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
Load-Pull Data, Reference Plane at Device Leads

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

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\(^1\) 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
Figure 18 - AC200B-2 Metal-Ceramic Package Dimensions and Pinout (all dimensions are in inches [mm])

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>NPT1012B</td>
<td>NPT1012 in AC200B-2 Metal-Ceramic Bolt-Down Package</td>
</tr>
</tbody>
</table>

1: To find a Nitronex contact in your area, visit our website at http://www.nitronex.com
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Additional Information

This part is lead-free and is compliant with the RoHS directive
(Restrictions on the Use of Certain Hazardous Substances in Electrical and Electronic Equipment).

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