# NPT35050A

## Gallium Nitride 28V, 65W RF Power Transistor

**Built using the SIGANTIC® NRF1 process - A proprietary GaN-on-Silicon technology**

### FEATURES

- Optimized for CW, pulsed, WiMAX, and other applications from 3300 – 3800 MHz
- 90W $P_{3dB}$ PEP power
- 65W $P_{3dB}$ CW power
- 6W linear power @ 2.0% EVM for single carrier OFDM, 10.3dB peak/avg, 3.5MHz channel bandwidth, 12dB gain, 18% efficiency
- Qualified for operation up to 32V
- 100% RF tested
- Thermally enhanced industry standard package
- High reliability gold metallization process
- Lead-free and RoHS compliant
- Subject to 3A001b.3.a Export Control


**3300 - 3800 MHz**
**65 Watt, 28 Volt**
**GaN HEMT**

RoHS

**RF Specifications (CW):** $V_{DS}$ = 28V, $I_{DQ}$ = 750mA, Frequency = 3500MHz, $T_C$ = 25°C, Measured in Nitronex Test Fixture

| Symbol | Parameter | Min | Typ | Max | Units |
|---|---|---|---|---|---|
| $P_{3dB}$ | Average Output Power at 3dB Compression | - | 65 | - | W |
| $G_{SS}$ | Small Signal Gain | 11 | 12.5 | 13.5 | dB |
| $\eta$ | Drain Efficiency at 3dB Compression | 40 | 45 | - | % |
| $\Psi$ | Output Mismatch Stress, VSWR = 10:1, all phase angles at 3500MHz) | No Performance Degradation After Test | | | |

**Typical 2-Tone Performance:** $V_{DS}$ = 28V, $I_{DQ}$ = 750mA, Frequency = 3500MHz, Tone Spacing = 0.1MHz, $T_C$ = 25°C
Measured in Load-Pull System

| Symbol | Parameter | Typ | Units |
|---|---|---|---|
| $P_{3dB,PEP}$ | Peak Envelope Power at 3dB Compression | 93 | W |
| $P_{1dB,PEP}$ | Peak Envelope Power at 1dB Compression | 55 | W |
| $P_{IMD3}$ | Peak Envelope Power at -35dBm IMD3 | 71 | W |

**Typical OFDM Performance:** $V_{DS}$ = 28V, $I_{DQ}$ = 750mA, Single carrier OFDM waveform 64-QAM 3/4, 8 burst, 20ms frame, 15ms frame data, 3.5 MHz channel bandwidth. Peak/Avg. = 10.3dB @ 0.01% probability on CCDF. Frequency = 3400 - 3600MHz. $P_{OUT,AVG}$ = 6W, $T_C$ = 25°C. Measured in Nitronex Test Fixture

| Symbol | Parameter | Typ | Units |
|---|---|---|---|
| $G_P$ | Power Gain | 12 | dB |
| $\eta$ | Drain Efficiency | 18 | % |
| EVM | Error Vector Magnitude | 2.0 | % |

## DC Specifications: $T_C$=25°C

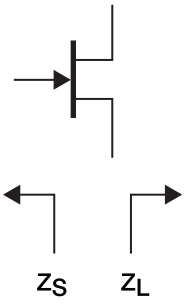
| Symbol | Parameter | Min | Typ | Max | Units |
|---|---|---|---|---|---|
| **Off Characteristics** | | | | | |
| $V_{BDS}$ | Drain-Source Breakdown Voltage ($V_{GS}$=-8V, $I_{DQ}$=36mA) | 100 | - | - | V |
| $I_{DLK}$ | Drain-Source Leakage Current ($V_{GS}$=-8V, $V_{DS}$=60V) | - | - | 18 | mA |
| **On Characteristics** | | | | | |
| $V_T$ | Gate Threshold Voltage ($V_{DS}$ = 28V, $I_{DQ}$ = 36mA) | -2.3 | -1.8 | -1.3 | V |
| $V_{GSQ}$ | Gate Quiescent Voltage ($V_{DS}$ = 28V, $I_{DQ}$ = 750mA) | -2.0 | -1.5 | -1.0 | V |
| $R_{ON}$ | On Resistance ($V_{GS}$ = 2V, $I_{DQ}$ = 270mA) | - | 0.13 | 0.15 | Ω |
| $I_D$ | Drain Current ($V_{DS}$ = 7V pulsed, 300ms pulse width, 0.2% duty cycle, $V_{GS}$=2V) | - | 19.5 | - | A |

## Absolute Maximum Ratings: Not simultaneous, $T_C$=25°C unless otherwise noted

| Symbol | Parameter | Max | Units |
|---|---|---|---|
| $V_{DS}$ | Drain-Source Voltage | 100 | V |
| $V_{GS}$ | Gate-Source Voltage | -10 to 3 | V |
| $P_T$ | Total Device Power Dissipation (Derated above 25°C) | 90 | W |
| $\theta_{JC}$ | Thermal Resistance (Junction-to-Case) | 1.95 | °C/W |
| $T_{STG}$ | Storage Temperature Range | -65 to 150 | °C |
| $T_J$ | Operating Junction Temperature | 200 | °C |
| HBM | Human Body Model ESD Rating (per JESD22-A114) | 1C (>1000V) | |
| MM | Machine Model ESD Rating (per JESD22-A115) | M3 (>200V) | |

**Table 1:** Optimum Impedance Characteristics for OFDM Tuning ($V_{DS}$=28V, $I_{DQ}$=750 mA).

| Frequency (MHz) | $Z_S$ (Ω) | $Z_L$ (Ω) |
|---|---|---|
| 3300 | 5.0 + j1.5 | 5.5 - j11.0 |
| 3400 | 5.2 + j1.2 | 6.4 - j12.3 |
| 3500 | 6.0 + j0.5 | 8.9 - j14.9 |
| 3600 | 6.4 - j0.2 | 11.6 - j17.2 |
| 3700 | 8.2 - j2.1 | 14.0 - j20.1 |
| 3800 | 10.0 - j4.0 | 16.3 - j22.6 |




$Z_S$ is the source impedance presented to the device.
$Z_L$ is the load impedance presented to the device.

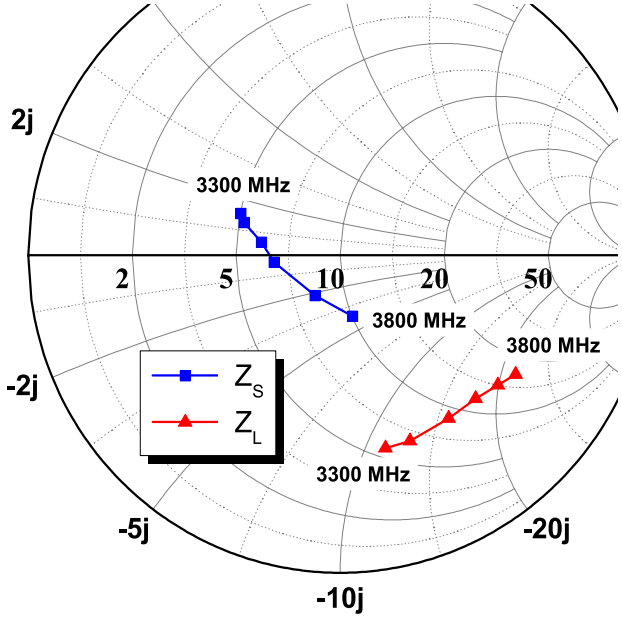



**Figure 1** - Optimal Impedances for OFDM Performance - $V_{DS}$ = 28V, $I_{DQ}$ = 750mA

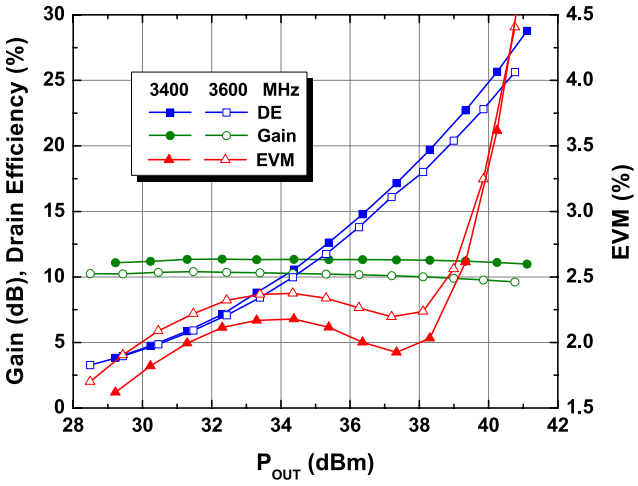



**Figure 2 -** Typical OFDM Performance in Nitronex Demonstration Board

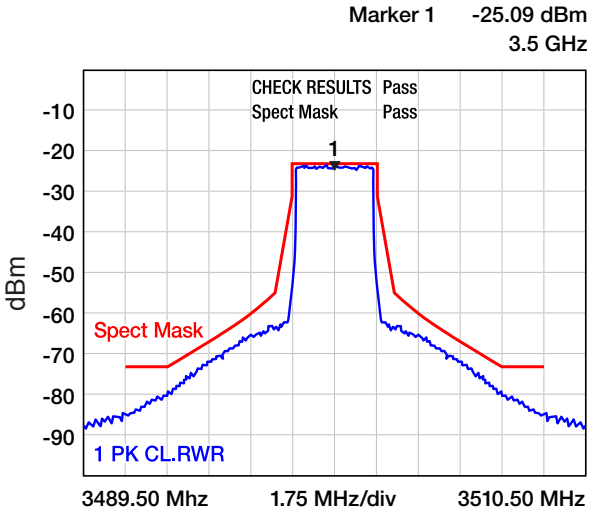



**Figure 3 -** ETSI Mask Compliance in Nitronex Demonstration Board, 3500MHz and $P_{OUT}$ = 6W

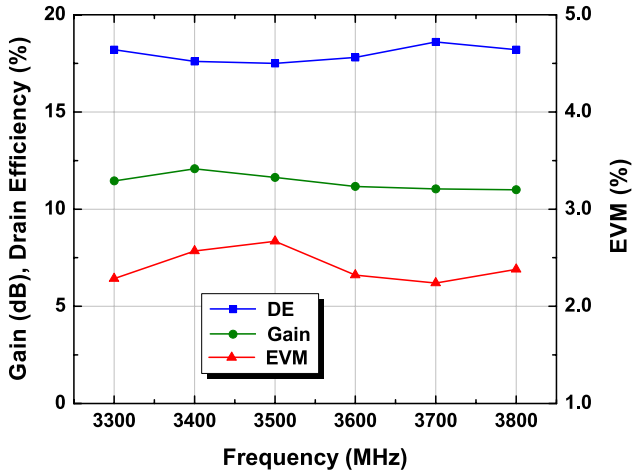



**Figure 4 -** Typical OFDM Performance in Load-Pull System, $P_{OUT}$ = 6W

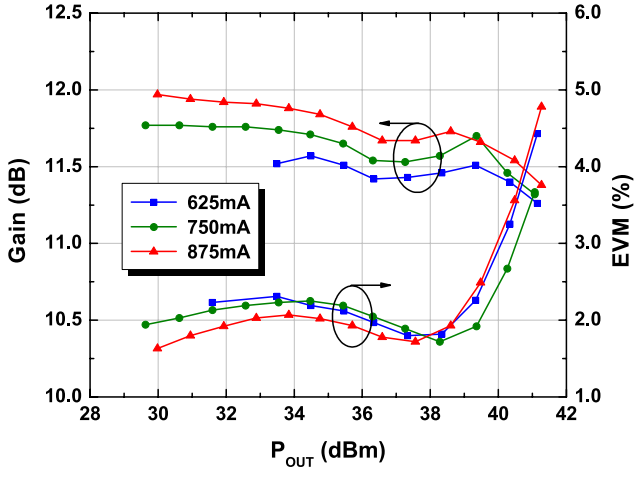



**Figure 5 -** Typical OFDM Performance at 3500MHz versus $I_{DQ}$

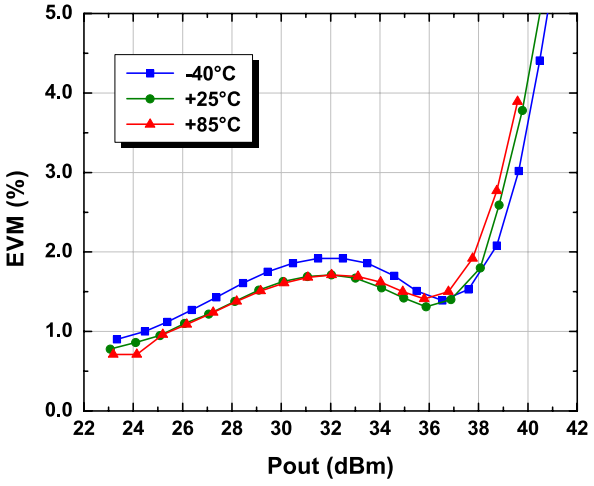



**Figure 6 -** Typical Device Linearity over Temperature in Nitronex Demonstration Board, $V_{DS}$ = 28V, $I_{DQ}$ = 750mA, 3400MHz

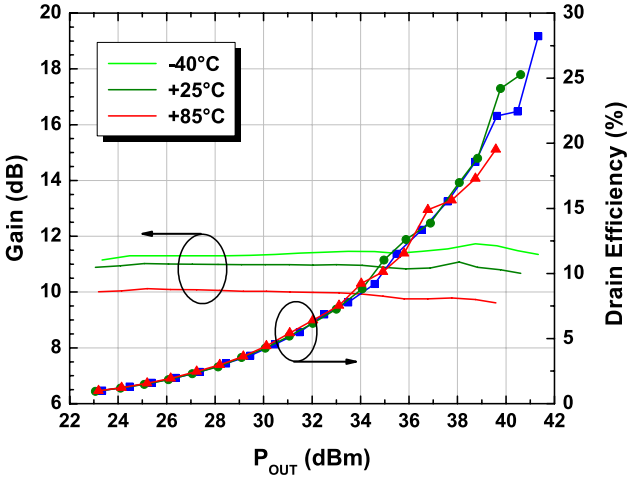



**Figure 7 -** Typical Device Gain and Efficiency over Temperature in Nitronex Demonstration Board, $V_{DS}$ = 28V, $I_{DQ}$ = 750mA, 3400MHz

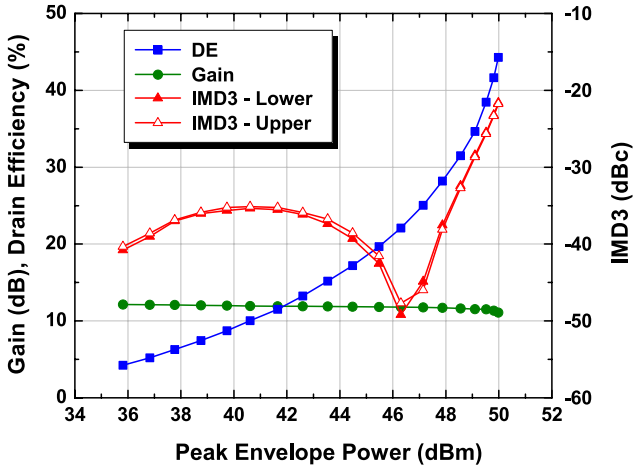



**Figure 8 -** Typical IMD3 Performance at $V_{DS}$ = 28V, $I_{DQ}$ = 750mA, 3500MHa

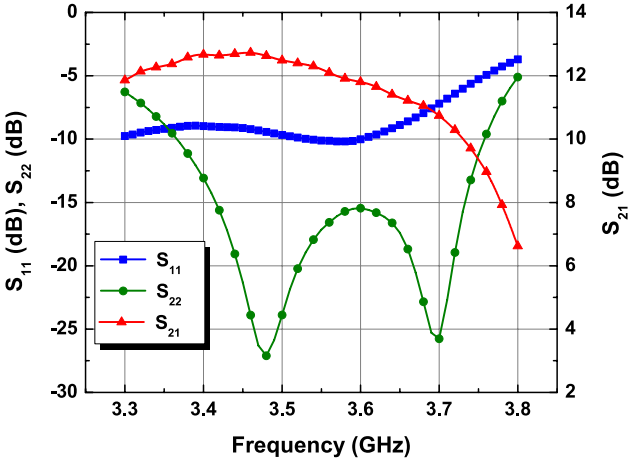



**Figure 9 -** Typical $S_{11}$ and $S_{21}$ in Nitronex Demonstration Board, $P_{IN}$ = 0 dBm, $V_{DS}$ = 28V, $I_{DQ}$ = 750mA

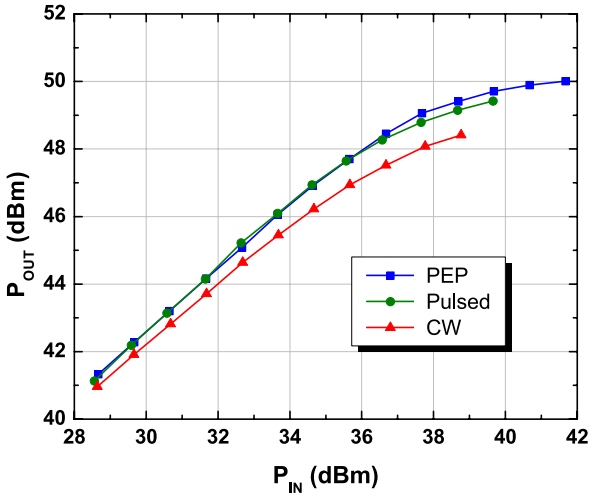



**Figure 10 -** Power Sweeps for CW, pulsed CW, and PEP, $V_{DS}$ = 28V, $I_{DQ}$ = 750mA, 3500MHz, Constant Impedance States for All Sweeps

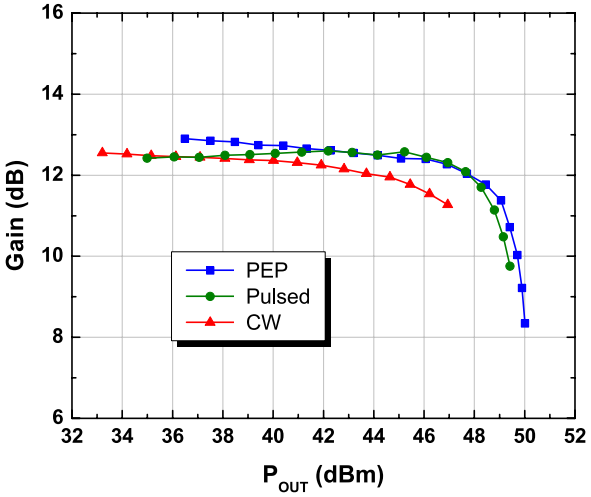



**Figure 11 -** Power Sweeps for CW, pulsed CW, and PEP at $V_{DS}$ = 28V, $I_{DQ}$ = 750mA, 3500MHz, Constant Impedance States for All Sweeps

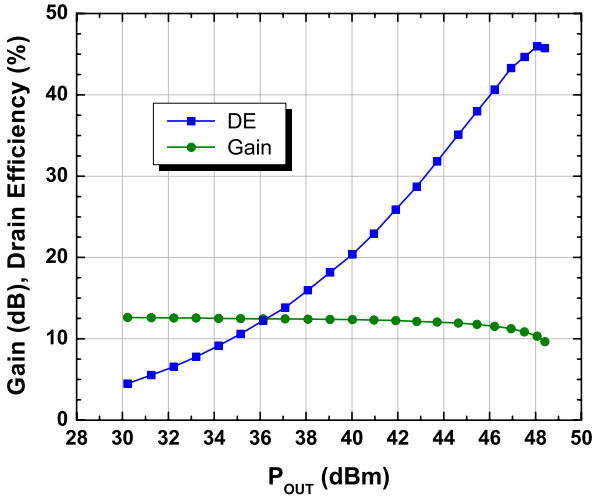



**Figure 12 -** CW Power Sweep, $V_{DS}$ = 28V, $I_{DQ}$ = 750mA, 3500MHz

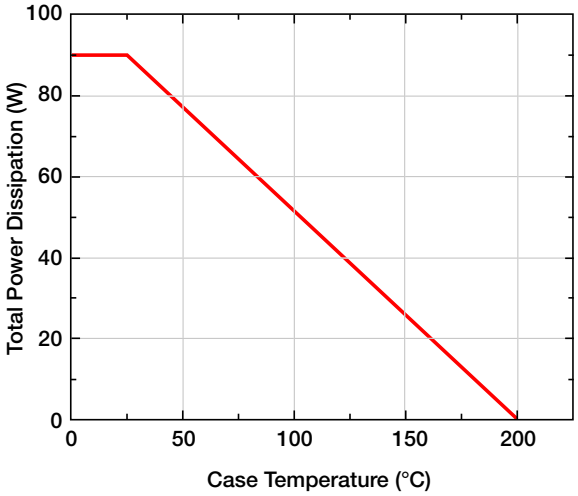



**Figure 13 -** Power Derating Curve

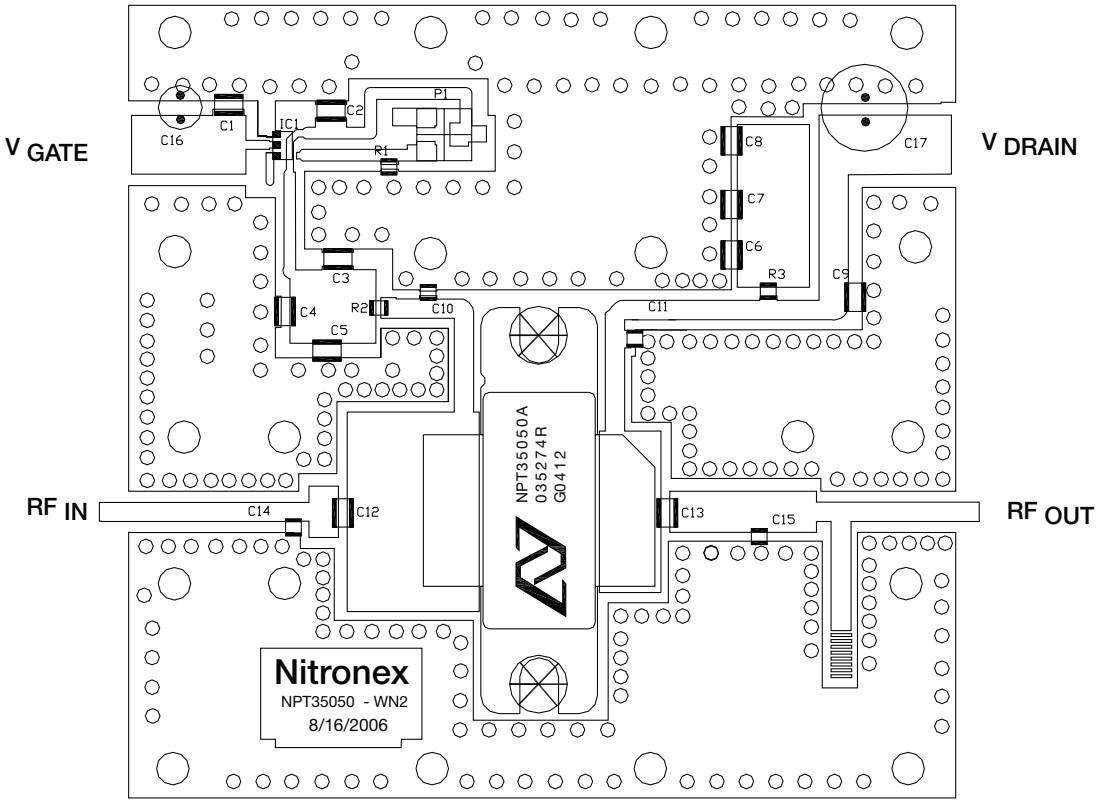



**Figure 14 -** APP-NPT35050A-35 Demonstration Board

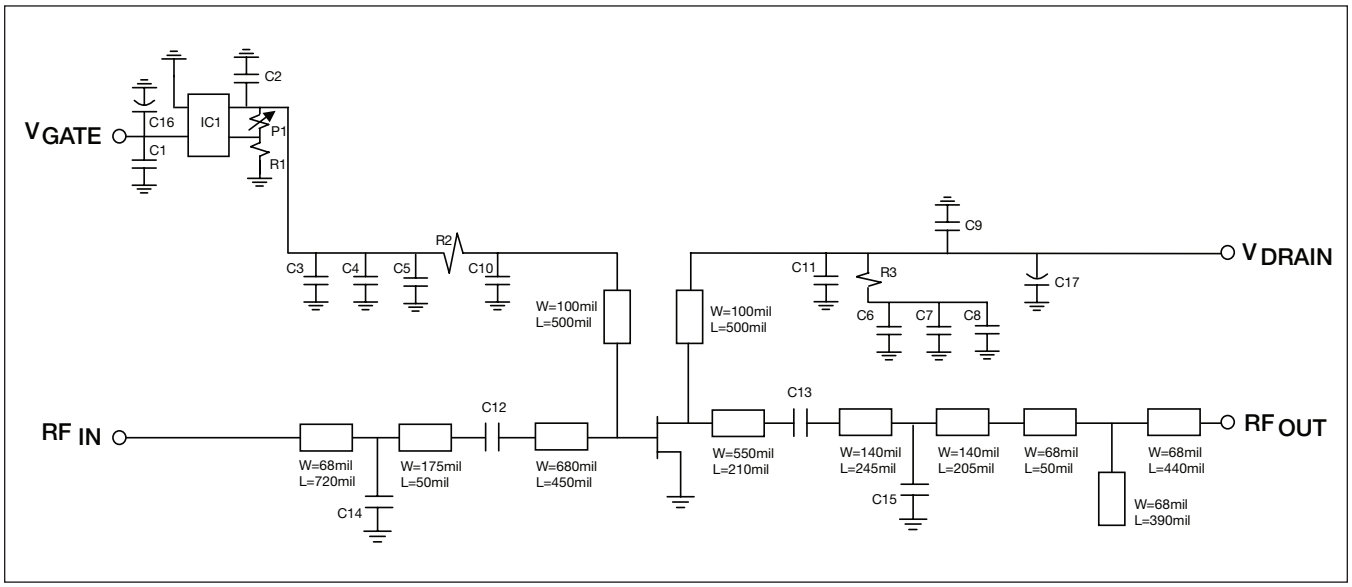



**Figure 15 -** APP-NPT35050A-35 Demonstration Board Equivalent Circuit

**Table 1:** Bill of Materials, APP-NPT35050A-35

| Component | ID Value |
|---|---|
| C1, C2, C3 | 10uF 16V Ceramic X7R (1210) |
| C4, C7 | 0.01uF 100V Ceramic X7R (1206) |
| C5, C8 | 0.1uF 100V Ceramic X7R (1206) |
| C6, C9 | 1.0uF 100V CeramicX7R (1812) |
| C10, C11, C12, C13 | 5.6pF ATC600F5R6CT |
| C14 | 1.0pF ATC600F1R0AT |
| C15 | 1.5pF ATC600F1R5AT |
| C16 | 16V, 150uF Aluminum Electrolytic - Nichicon (PW) |
| C17 | 63V, 270uF Aluminum Electrolytic - UCC (LXY) |
| R1 | 12k Ohm (0603) |
| R2 | 10 Ohm (0805) |
| R3 | 0.33 Ohm (0805) |
| P1 | 20k Ohm Potentiometer - Bourns (3224 series) |
| IC1 | IC LT1964-BYP |
| Substrate | Taconic RF35 t=30mil, $\varepsilon_r$=3.5, 1 oz. Cu |

## Ordering Information[1]

| Part Number | Description |
|---|---|
| NPT35050AB | NPT35050A in AC780BM-F2 Bolt-Down Package |

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

## AC780BM-F2 Package Dimensions and Pinout (all dimensions are in inches)

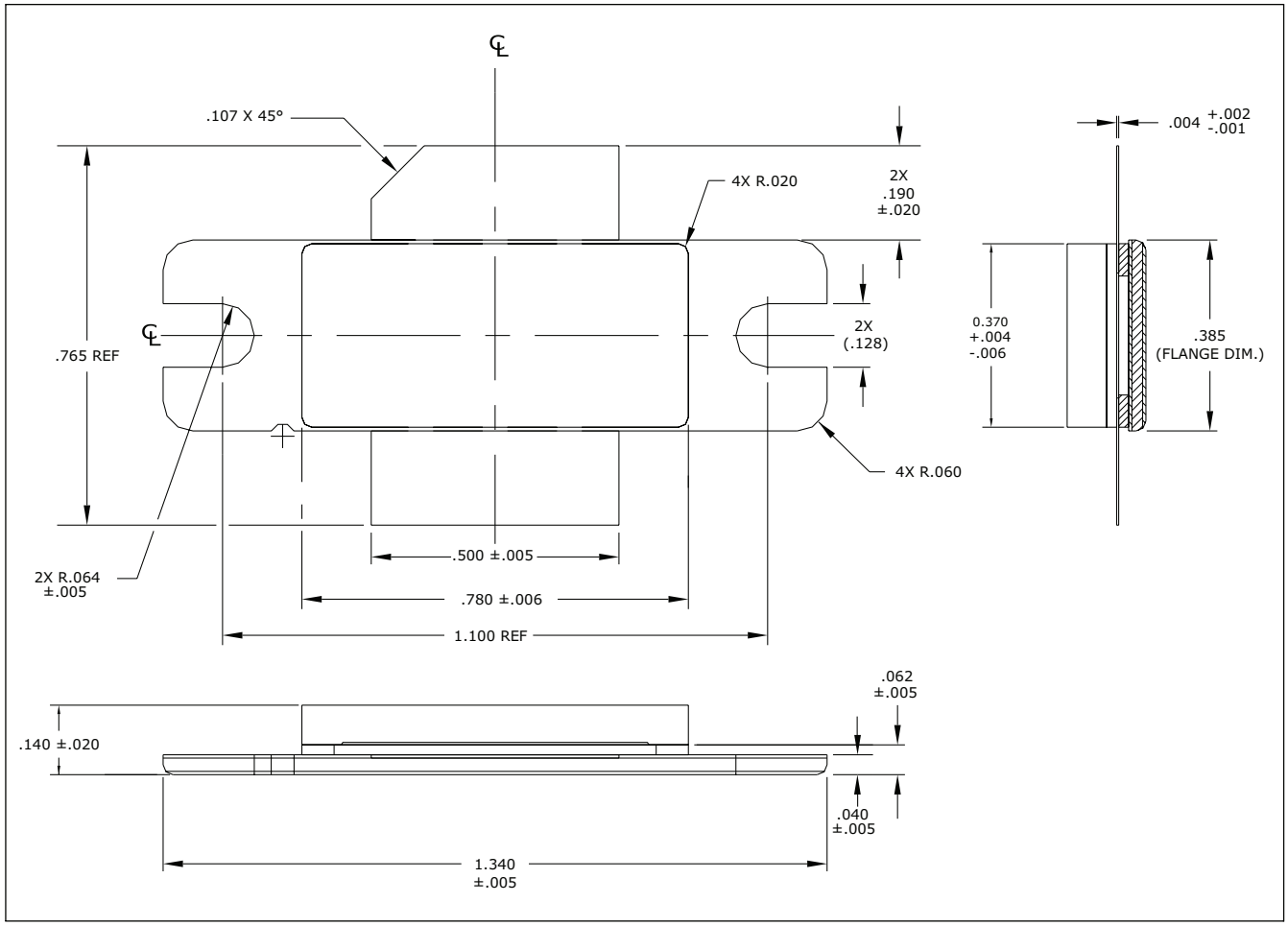
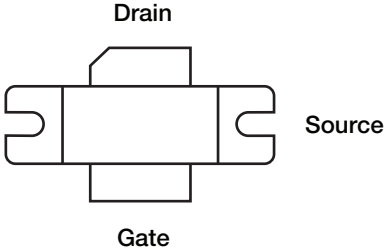



**Figure 16 - Terminal Identification**



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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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