# NPT2018 *Preliminary*

## Gallium Nitride 48V, 12.5W, DC-6 GHz HEMT

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

### Features

- Suitable for linear and saturated applications
- Tunable from DC-6 GHz
- 48V Operation
- Industry Standard Plastic Package
- High Drain Efficiency (>60%)


### Applications

- Defense Communications
- Land Mobile Radio
- Avionics
- Wireless Infrastructure
- ISM Applications
- VHF/UHF/L/S-Band Radar

**DC-6 GHz**
**12.5W**
**GaN HEMT**

RoHS

### Product Description

The NPT2018 GaN HEMT is a wideband transistor optimized for DC-6 GHz operation. This device has been designed for CW, pulsed, and linear operation with output power levels to 12.5W (41 dBm) in an industry standard surface mount plastic package.

**RF Specifications (CW, 2.5 GHz):** $V_{DS}$ = 48V, $I_{DQ}$ = 75mA, $T_C$= 25°C

| Symbol | Parameter | Min | Typ | Max | Units |
|---|---|---|---|---|---|
| $G_{SS}$ | Small-signal Gain | - | 17.5 | - | dB |
| $P_{SAT}$ | Saturated Output Power | - | 41.8 | - | dBm |
| $\eta_{SAT}$ | Efficiency at Saturated Output Power | - | 60 | - | % |
| $G_P$ | Gain at $P_{OUT}$ = 12.5W | - | 16.5 | - | dB |
| $\eta$ | Drain Efficiency at $P_{OUT}$ = 12.5W | - | 55 | - | % |
| $V_{DS}$ | Drain Voltage | - | 48 | - | V |
| $\Psi$ | Ruggedness: Output Mismatch, all phase angles | VSWR = 10:1, No Device Damage | | | |

**DC Specifications**: $T_C$ = 25°C

| Symbol | Parameter | Min | Typ | Max | Units |
|---|---|---|---|---|---|
| **Off Characteristics** | | | | | |
| $I_{DLK}$ | Drain-Source Leakage Current ($V_{GS}$=-8V, $V_{DS}$=160V) | - | - | 3 | mA |
| $I_{GLK}$ | Gate-Source Leakage Current ($V_{GS}$=-8V, $V_{DS}$=0V) | - | - | 1.5 | mA |
| **On Characteristics** | | | | | |
| $V_T$ | Gate Threshold Voltage ($V_{DS}$=48V, $I_D$=3mA) | -2.5 | -1.5 | -0.5 | V |
| $V_{GSQ}$ | Gate Quiescent Voltage ($V_{DS}$=48V, $I_D$=75mA) | -2.1 | -1.2 | -0.3 | V |
| $R_{ON}$ | On Resistance ($V_{DS}$=2V, $I_D$=22mA) | - | 1.6 | - | Ω |
| $I_{D, MAX}$ | Maximum Drain Current ($V_{DS}$=7V pulsed, 300µS pulse width, 0.2% Duty Cycle) | - | 1.75 | - | A |

**Thermal Resistance Specification:**

| Symbol | Parameter | Typ | Units |
|---|---|---|---|
| $R_{\theta JC}$ | Thermal Resistance (Junction-to-Case), $T_J$ = 200 °C | 6.5 | °C/W |

Junction Temperature ($T_J$) measured using IR Microscopy, Case Temperature ($T_C$) measured using a thermocouple embedded in heatsink.

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

| Symbol | Parameter | Max | Units |
|---|---|---|---|
| $V_{DS}$ | Drain-Source Voltage | 160 | V |
| $V_{GS}$ | Gate-Source Voltage | -10 to 3 | V |
| $I_G$ | Gate Current | 6 | mA |
| $P_T$ | Total Device Power Dissipation (Derated above 25°C) | 26.9 | 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) | Class 1A | |
| MSL | Moisture sensitivity level (per IPC/JEDEC J-STD-020) | TBD | |

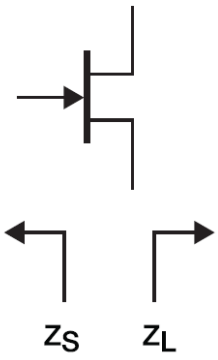
## Load-Pull Data, Reference Plane at Device Leads

$V_{DS}$=48V, $I_{DQ}$=75mA, $T_C$=25°C unless otherwise noted

### Optimum Source and Load Impedances:

(CW Drain Efficiency and Output Power Tradeoff Impedance)

| Frequency (MHz) | $Z_S$ (Ω) | $Z_L$ (Ω) | $P_{SAT}$ (W) | $G_{SS}$ (dB) | Drain Efficiency @ $P_{SAT}$ (%) |
|---|---|---|---|---|---|
| 900 | 8.8 + j10.3 | 31 + j36 | 17 | 25.0 | 64 |
| 2500 | 4.1 - j2.9 | 12.5 + j18 | 16 | 18.0 | 59 |
| 4000 | 4.5 - j9.5 | 7.5 + j9.4 | 14 | 15.0 | 51 |
| 5800 | 5.3 - j21.5 | 5.0 - j1.6 | 12 | 13.5 | 45 |



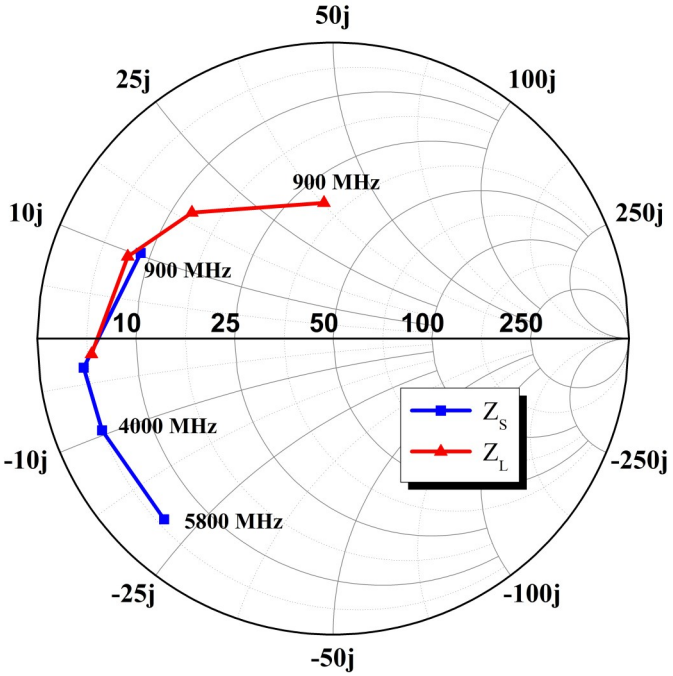




**Figure 1:** CW Power/Drain Efficiency Tradeoff Impedances, $Z_O$=50Ω

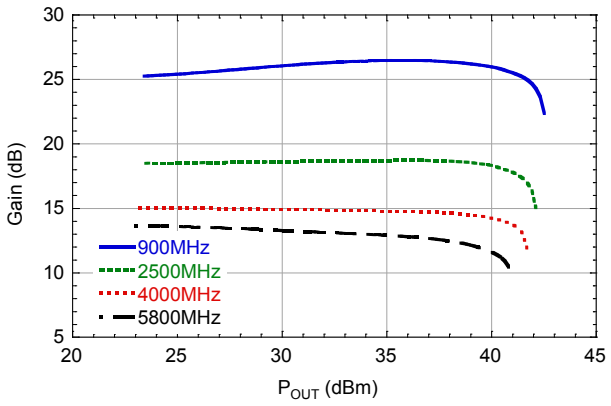



**Figure 2:** Gain vs. $P_{OUT}$

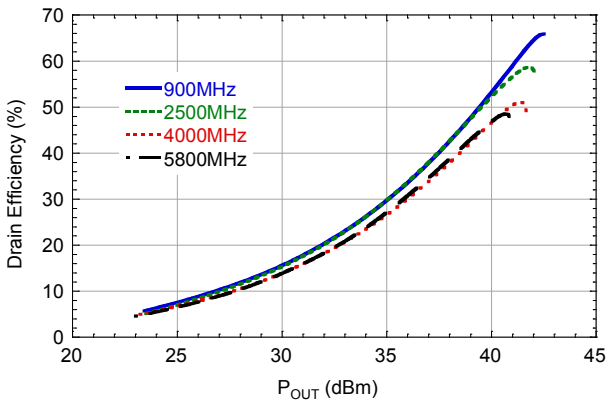



**Figure 3:** Efficiency vs. $P_{OUT}$

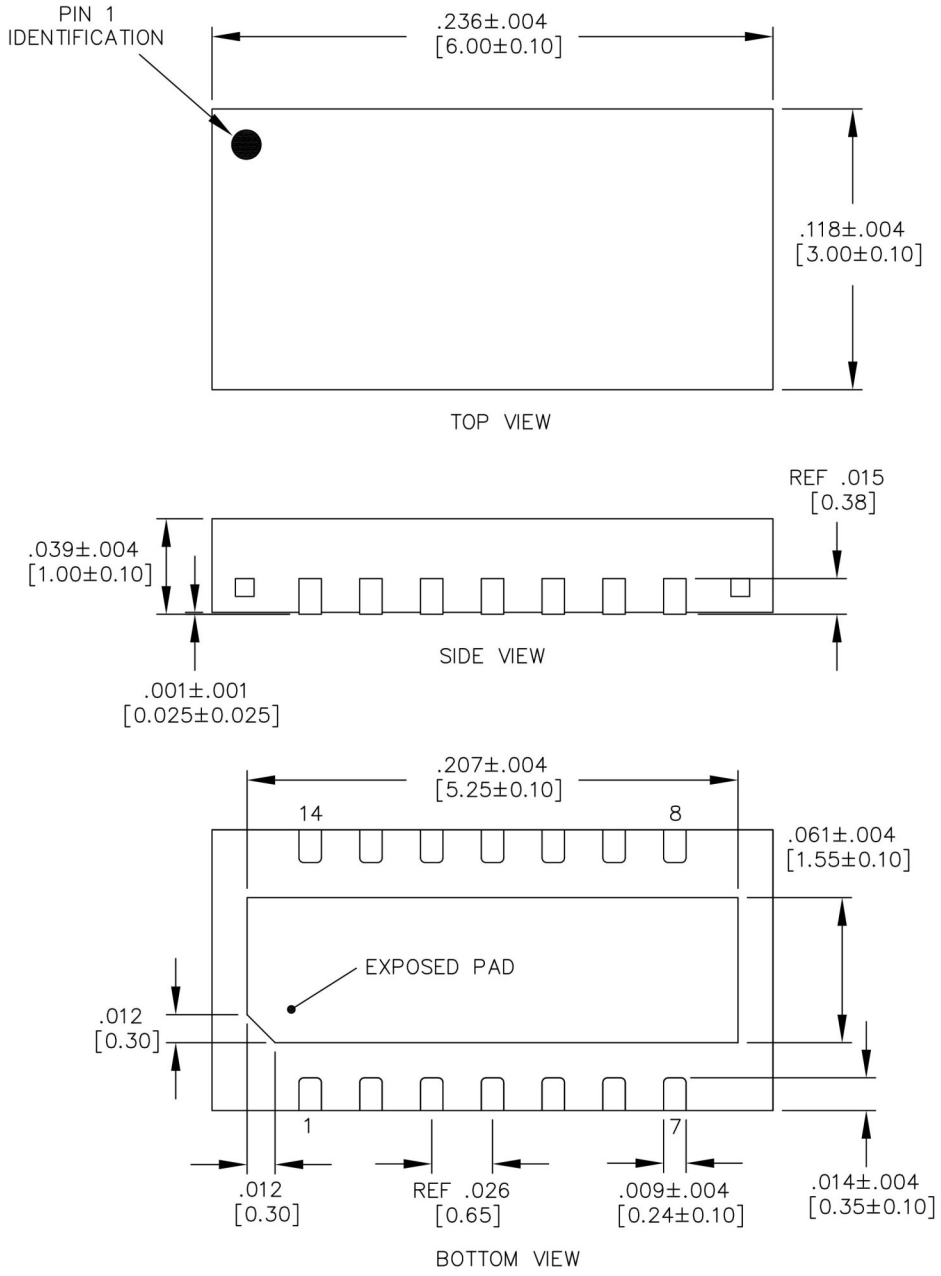



**Figure 4 -** DFN3X6-14 Plastic Package Dimensions (all dimensions in inches [millimeters])

| Pin | Function |
|---|---|
| 10, 11, 12 | Gate — RF Input |
| 3, 4, 5 | Drain — RF Output |
| Exposed Pad | Source — Ground |
| 1, 2, 6-9, 13, 14 | No Connect* |

* All No Connect pins may be left floating or grounded

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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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