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## 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<sub>3dB</sub> CW narrowband power
- 10W P<sub>3dB</sub> CW broadband power from 500-1000MHz
- Characterized 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 EAR99 export control



**Broadband  
25 Watt, 28 Volt  
GaN HEMT**



**RF Specifications (CW):** V<sub>DS</sub> = 28V, I<sub>DQ</sub> = 225mA, Frequency = 3000MHz, T<sub>C</sub> = 25°C, Measured in Nitronex Test Fixture

Symbol	Parameter	Min	Typ	Max	Units
P <sub>3dB</sub>	Average Output Power at 3dB Gain Compression	22	25	-	W
P <sub>1dB</sub>	Average Output Power at 1dB Gain Compression	18	21	-	W
G <sub>SS</sub>	Small Signal Gain	12.5	13.5	-	dB
η	Drain Efficiency at 3dB Gain Compression	60	65	-	%
ψ	Output mismatch stress, VSWR = 10:1, all phase angles, P <sub>OUT</sub> = P <sub>SAT</sub>	No Performance Degradation After Test			

**Absolute Maximum Ratings:** Not simultaneous, T<sub>C</sub> = 25°C unless otherwise noted

Symbol	Parameter	Max	Units
V <sub>DS</sub>	Drain-Source Voltage	100	V
V <sub>GS</sub>	Gate-Source Voltage	-10 to 3	V
I <sub>G</sub>	Gate Current	40	mA
P <sub>T</sub>	Total Device Power Dissipation (Derated above 25°C)	33	W
θ <sub>JC</sub>	Thermal Resistance (Junction-to-Case)	5.25	°C/W
T <sub>STG</sub>	Storage Temperature Range	-65 to 150	°C
T <sub>J</sub>	Operating Junction Temperature	200	°C
HBM	Human Body Model ESD Rating (per JESD22-A114)	1A (>250V)	
MM	Machine Model ESD Rating (per JESD22-A115)	M1 (>50V)	

## DC Specifications: $T_C = 25^\circ\text{C}$

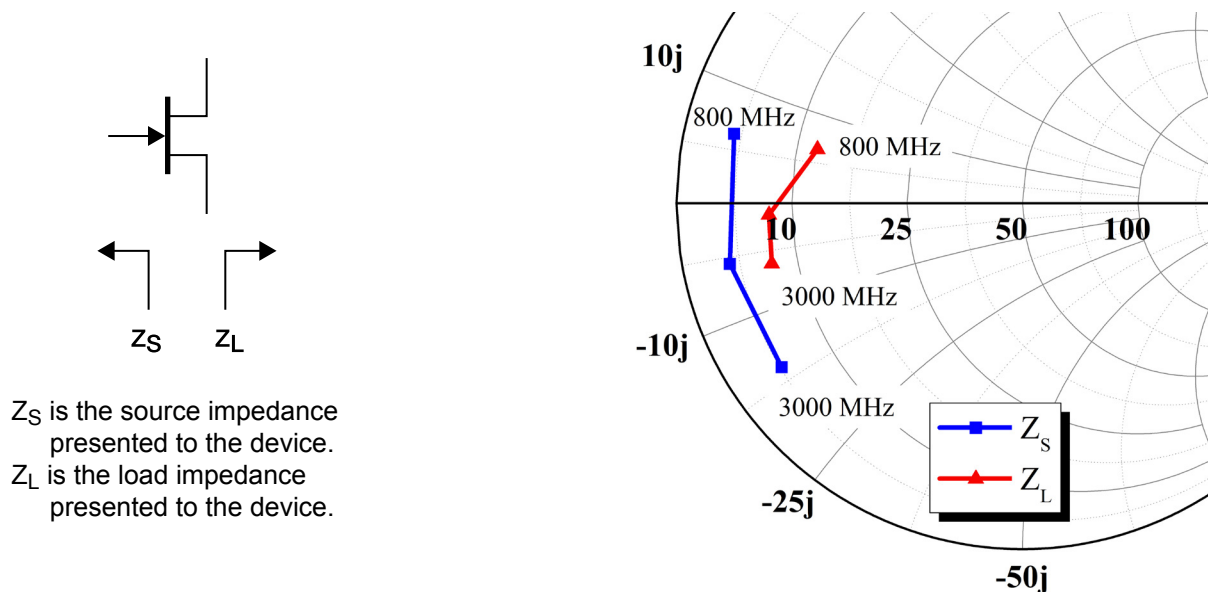
Symbol	Parameter	Min	Typ	Max	Units
<b>Off Characteristics</b>					
$V_{BDS}$	Drain-Source Breakdown Voltage ( $V_{GS} = -8\text{V}$ , $I_D = 8\text{mA}$ )	100	-	-	V
$I_{DLK}$	Drain-Source Leakage Current ( $V_{GS} = -8\text{V}$ , $V_{DS} = 60\text{V}$ )	-	1	5	mA
<b>On Characteristics</b>					
$V_T$	Gate Threshold Voltage ( $V_{DS} = 28\text{V}$ , $I_D = 8\text{mA}$ )	-2.3	-1.8	-1.3	V
$V_{GSQ}$	Gate Quiescent Voltage ( $V_{DS} = 28\text{V}$ , $I_D = 225\text{mA}$ )	-2.0	-1.5	-1.0	V
$R_{ON}$	On Resistance ( $V_{GS} = 2.0\text{V}$ , $I_D = 60\text{mA}$ )	-	0.44	0.55	$\Omega$
$I_D$	Drain Current ( $V_{DS} = 7\text{V}$ pulsed, $300\mu\text{s}$ pulse width, $0.2\%$ duty cycle, $V_{GS} = 2.0\text{V}$ )	4.9	5.4	-	A

## 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

**Table 1:** Optimum Source and Load Impedances for CW Gain, Drain Efficiency, and Output Power Performance

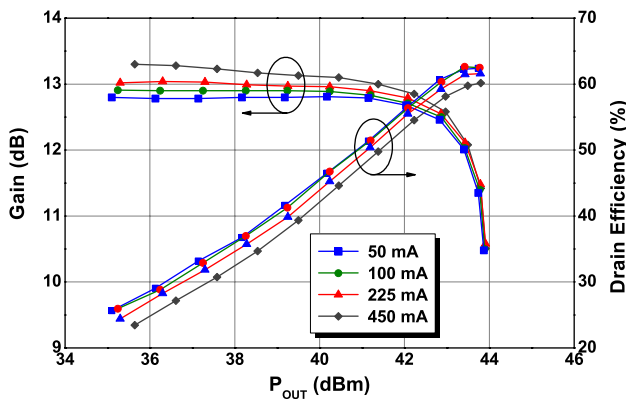
Frequency (MHz)	$Z_S$ ( $\Omega$ )	$Z_L$ ( $\Omega$ )
800	$3.9 + j5.9$	$12.2 + j6.1$
2000	$3.7 - j5.1$	$7.7 - j1.1$
3000	$4.7 - j15.3$	$7.4 - j5.8$



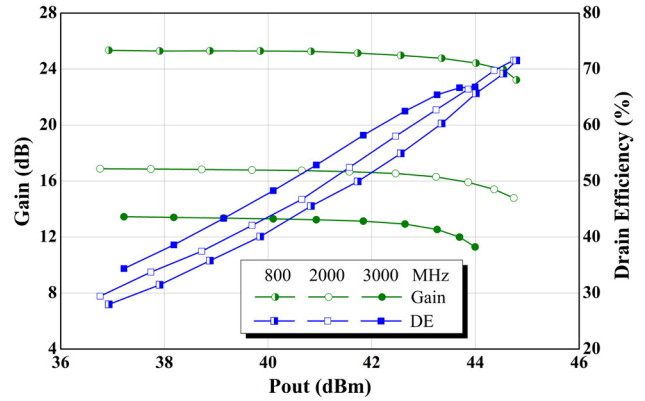
**Figure 1** - Optimal Impedances for CW Performance,  $V_{DS} = 28\text{V}$ ,  $I_{DQ} = 225\text{mA}$

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

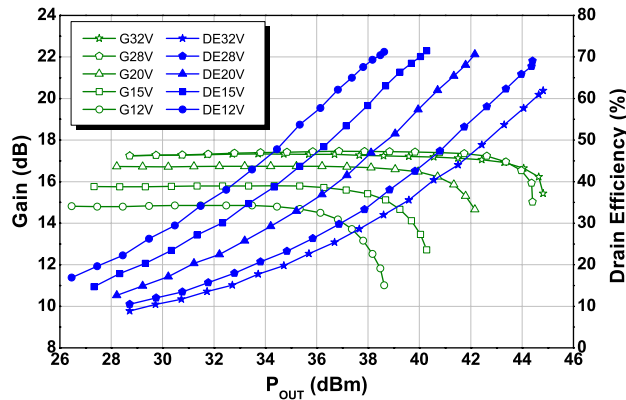
$V_{DS}=28V, I_{DQ}=225mA, T_A=25^{\circ}C$  unless otherwise noted.



**Figure 2** - Typical CW Performance, Over Current, Frequency = 3000MHz



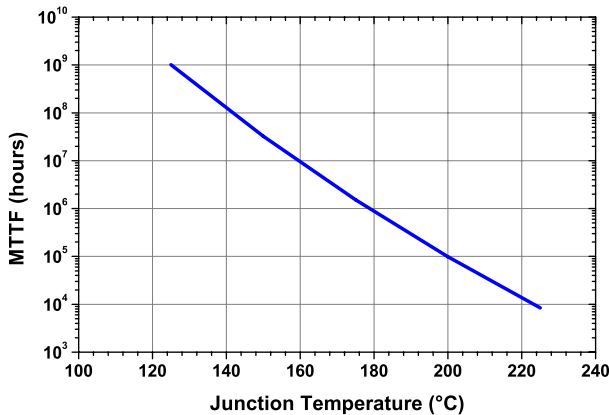
**Figure 3** - Typical CW Performance Over Frequency



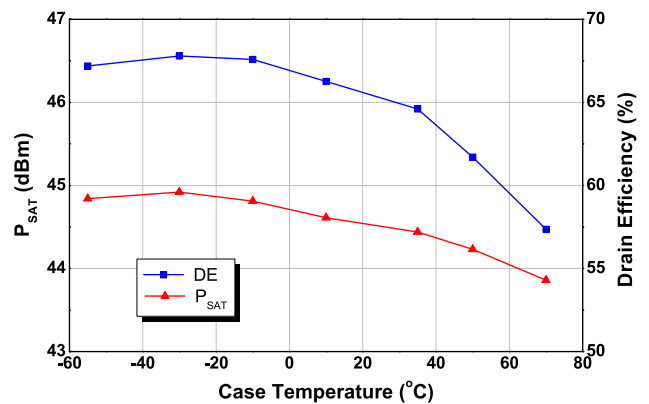
**Figure 4** - Typical CW Performance Over Voltage, Impedances Held Constant, Frequency = 1800MHz

## Typical Device Characteristics

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



**Figure 5** - MTTF of NRF1 Devices as a Function of Junction Temperature



**Figure 6** - Typical CW Performance in Nitronex Test Fixture, Frequency = 3000MHz

## NPTB00025, 3000MHz CW Production Test Fixture

$V_{DS}=28V$ ,  $I_{DQ}=225mA$ ,  $T_A=25^{\circ}C$  unless otherwise noted. Additional design information and data available at [www.nitronex.com](http://www.nitronex.com).

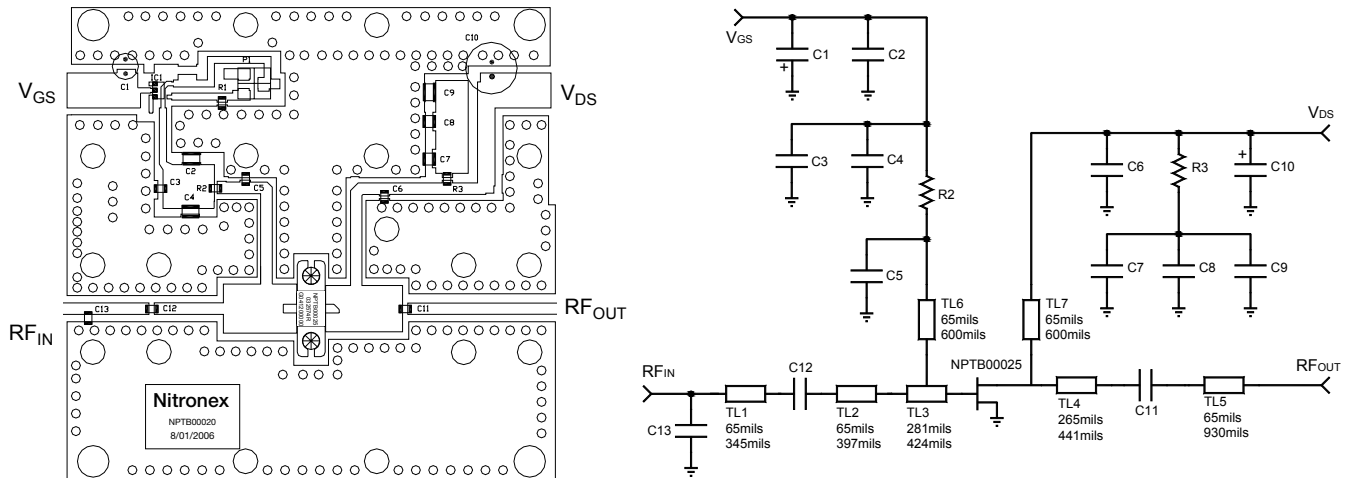


Figure 7 - NPTB00025 3000MHz Test Fixture

Table 2: NPTB00025 3000MHz Test Fixture Bill of Materials

Name	Value	Vendor	Part Number
C1	150uF	Nichicon	UPW1C151MED
C10	270uF	United Chmi-Con	ELXY630ELL271MK25S
C2, C8	0.1uF	Kemet	C1206C104K1RACTU
C3, C7	0.01uF	AVX	12061C103KAT2A
C4, C9	1.0 uF	Panasonic	ECJ-5YB2A105M
C5, C6, C11, C12	5.6pF	ATC	ATC600F5R6CT
C13	1.2pF	ATC	ATC600F1R2AT
R2	49.9 ohm	Panasonic	ERJ-6ENF49R9V
R3	0.33 ohm	Panasonic	ERJ-6RQFR33V
Substrate	-	Taconic	RF35, t=30mil, $\epsilon_r=3.5$

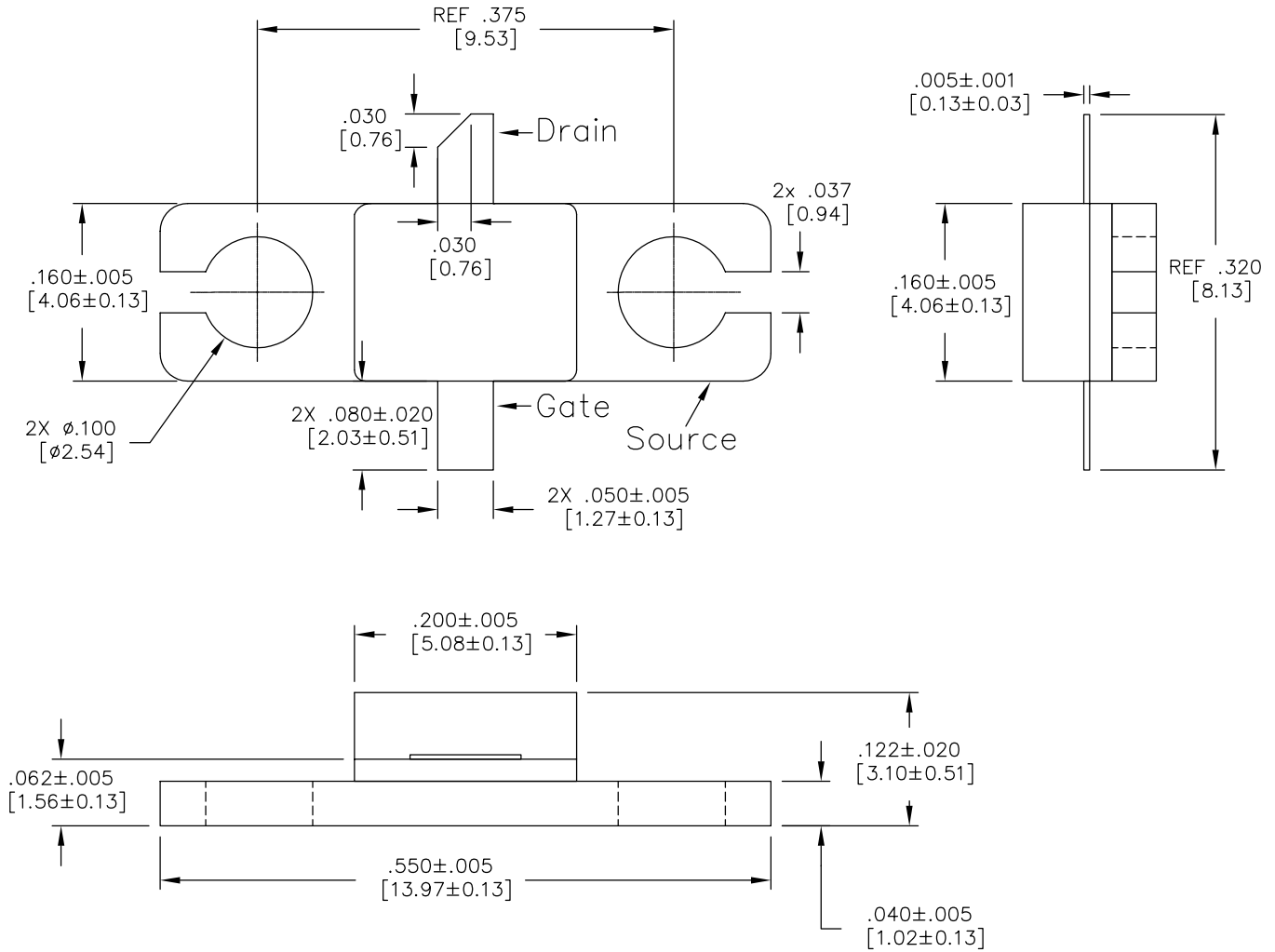
# NPTB00025



## Ordering Information<sup>1</sup>

Part Number	Description
NPTB00025B	NPTB00025 in AC200B-2 Metal-Ceramic Bolt-Down Package

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



**Figure 8 - 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  
(Restrictions on the Use of Certain Hazardous Substances in Electrical and Electronic Equipment).**

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