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NPT1007

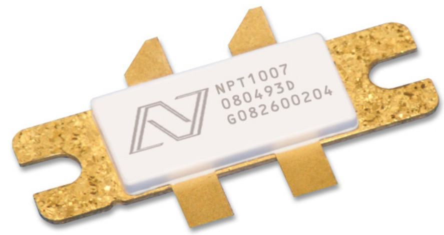
NITRONEX

Gallium Nitride 28V, 200W RF Power Transistor

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

FEATURES

- Optimized for narrowband and broadband applications from from DC – 1200MHz
- 200W P_{3dB} CW power at 900MHz in quadrature combined or push-pull configuration
- 90W CW power from 500-1000MHz in application design AD-014
- High efficiency from 14V to 28V
- 1.0 °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 degradation
- Subject to EAR99 export control



DC – 1200 MHz
14 – 28 Volt
GaN HEMT

RoHS

RF Specifications (CW): V_{DS} = 28V, I_{DQ} = 1400mA[1], Frequency = 900MHz, T_A = 25°C, Measured in Nitronex Quadrature Combined Test Fixture[2].

Symbol	Parameter	Min	Typ	Max	Units
P_{3dB}	Average Output Power at 3dB Gain Compression	52.0	53.0	-	dBm
G_{SS}	Small Signal Gain	17.3	18.3	-	dB
η	Drain Efficiency at 3dB Gain Compression[2]	57	63	-	%
VSWR	10:1 VSWR at all phase angles	No change in device performance			

Note 1: 700mA per transistor. Each gate should be biased independently to set desired I_{DQ}.
Note 2: Includes ~ 0.2 dB quadrature combiner loss.

Typical 2-Tone Performance: V_{DS} = 28V, I_{DQ} = 1400mA[1], Frequency = 900MHz, Tone spacing = 1MHz, T_A = 25°C Measured in Nitronex Quadrature Combined Test Fixture[2] .

Symbol	Parameter	Typ	Units
$P_{3dB,PEP}$	Peak Envelope Power at 3dB Gain Compression	53.4	dBm
$P_{1dB,PEP}$	Peak Envelope Power at 1dB Gain Compression	52.6	dBm
P_{IMD3}	Peak Envelope Power at -35dBc IMD3	50.8	dBm

Note 1: 700mA per transistor. Each gate should be biased independently to set desired I_{DQ}.
Note 2: Includes ~ 0.2 dB quadrature combiner loss.

DC Specifications: Per Transistor, T_A = 25°C

Symbol	Parameter	Min	Typ	Max	Units
Off Characteristics					
V_{BDS}	Drain-Source Breakdown Voltage (V_{GS} = -8V, I_D = 36mA)	100	-	-	V
I_{DLK}	Drain-Source Leakage Current (V_{GS} = -8V, V_{DS} = 60V)	-	9	18	mA
On Characteristics					
V_T	Gate Threshold Voltage (V_{DS} = 28V, I_D = 36mA)	-2.3	-1.8	-1.3	V
V_{GSQ}	Gate Quiescent Voltage (V_{DS} = 28V, I_D = 700mA)	-2.0	-1.5	-1.0	V
R_{ON}	On Resistance (V_{GS} = 2V, I_D = 270mA)	-	0.13	0.14	Ω
$I_{D,MAX}$	Drain Current (V_{DS} = 7V pulsed, 300μs pulse width, 0.2% duty cycle)	19.0	20.5	-	A

Absolute Maximum Ratings: Not Simultaneous, Per Transistor, T_A = 25°C Unless Otherwise Noted

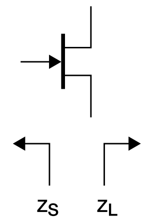
Symbol	Parameter	Max	Units
V_{DS}	Drain-Source Voltage	100	V
V_{GS}	Gate-Source Voltage	-10 to 3	V
I_G	Gate Current	180	mA
P_T	Total Device Power Dissipation (Derated above 25°C), both transistors on	175	W
θ_{JC}	Thermal Resistance (Junction-to-Case), composite for both transistors on, T_J = 180°C	1.0	°C/W
	Thermal Resistance (Junction-to-Case), one transistor on, one off, T_J = 180°C	1.8	
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)	A (>100V)	
CDM	Charge Device Model ESD Rating (per JESD22-C101)	IV (>4000V)	

Load-Pull Data, Reference Plane at Device Leads

V_{DS}=28V, I_{DQ}=700mA, One Single-Ended Transistor, T_A=25°C Unless Otherwise Noted

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

Frequency (MHz)	Z_S (Ω)	Z_L (Ω)	P_{SAT} (dBm)	G_{SS} (dB)	Drain Efficiency @ P_{SAT} (%)
500	1.4 + j0.1	2.0 + j0.5	50.0	24.0	70%
900	1.6 - j1.5	2.3 - j1.5	50.0	18.5	74%
1200	1.8 - j2.7	3.5 - j2.8	49.5	16.5	62%



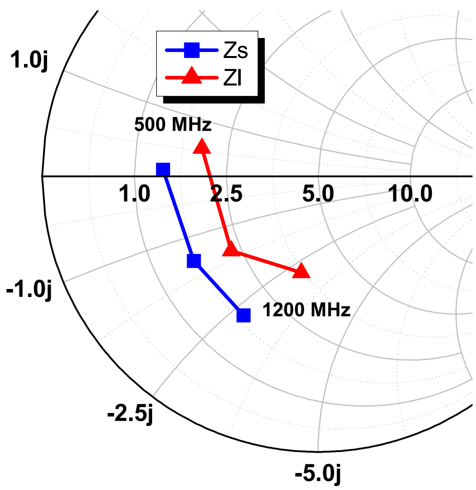


Figure 1 - Optimum Impedances for CW Performance

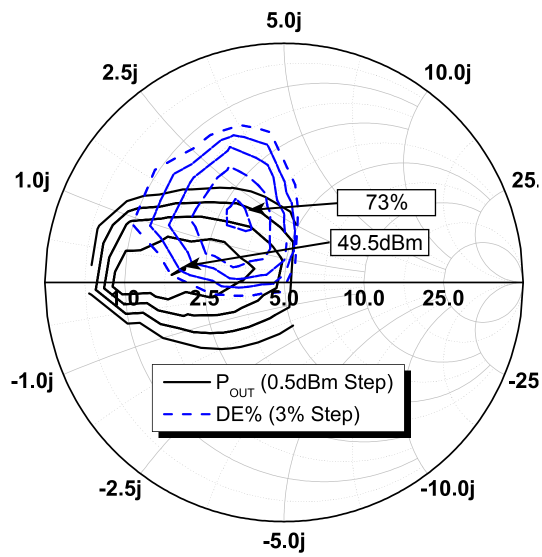


Figure 2 - Load-Pull Contours, 500MHz, P_{IN} = 25dBm, Z_S = 1.4 + j0.1 Ω

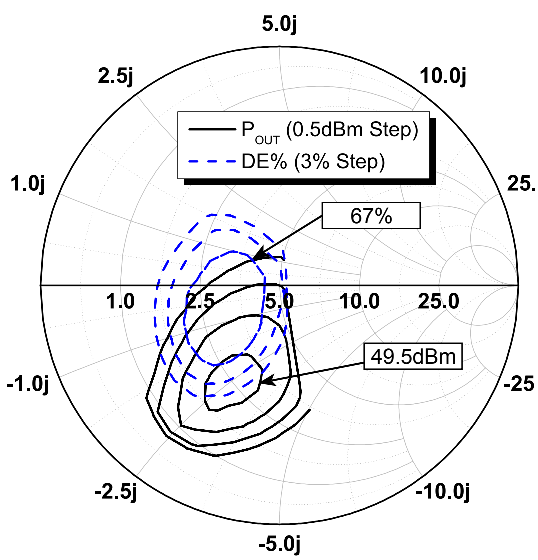


Figure 3 - Load-Pull Contours, 900MHz, P_{IN} = 30dBm, Z_S = 1.6 - j1.5 Ω

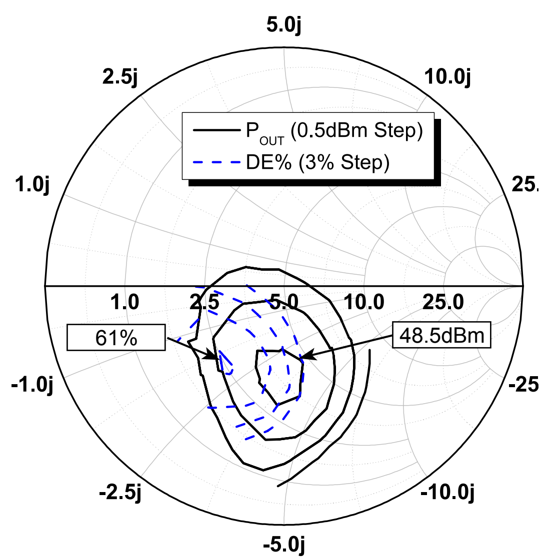


Figure 4 - Load-Pull Contours, 1200MHz, P_{IN} = 32dBm, Z_S = 1.8 - j2.7 Ω

Load-Pull Data per Device Lead, Reference Plane at Device Leads

V_{DS}=28V, I_{DQ}=700mA, One Single-Ended Transistor, T_A=25°C unless otherwise noted.

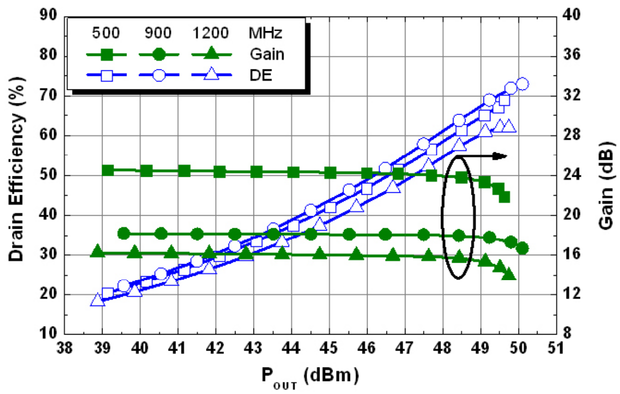


Figure 5 - Typical CW Performance, over Frequency

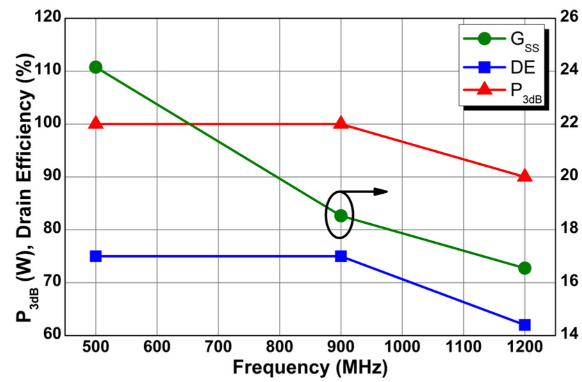


Figure 6 - Typical CW Performance over Frequency

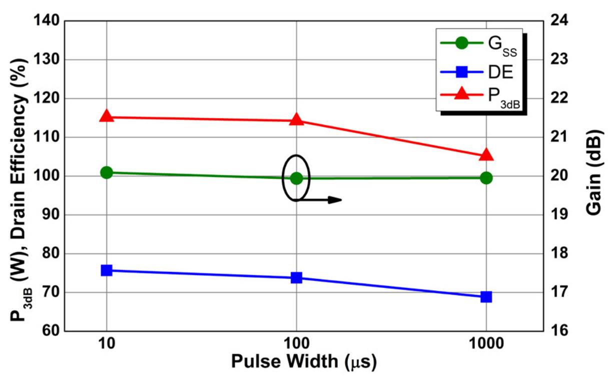


Figure 7 - Typical Pulsed Performance, Frequency = 900MHz, Duty Cycle = 10%

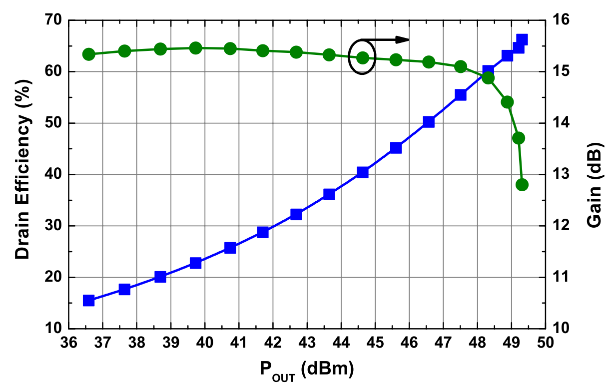


Figure 8 - Typical CW Performance at V_{DS} = 20V Frequency = 900MHz

Nitronex Quadrature Combined Test Fixture

V_{DS}=28V, I_{DQ}=1400mA, T_A=25°C unless otherwise noted.

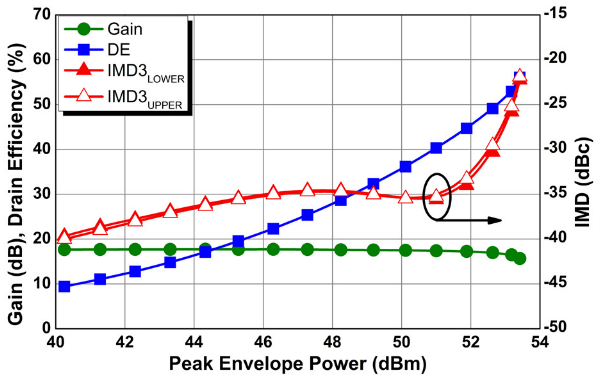


Figure 9 - Typical IMD3 Performance, Frequency = 900MHz, Tone spacing = 1MHz

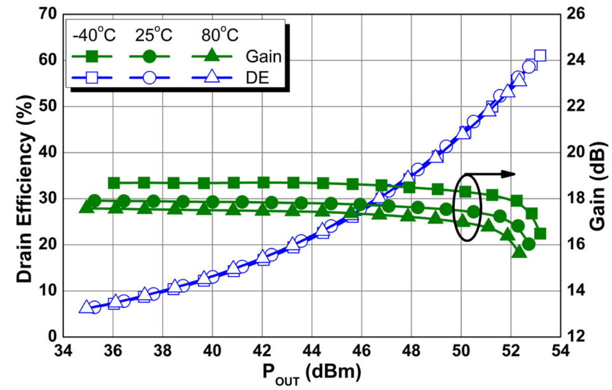


Figure 10 - Typical CW Performance over Temperature, Frequency = 900MHz

Typical Device Characteristics

V_{DS}=28V, I_{DQ}=700mA, One Single-Ended Transistor, T_A=25°C unless otherwise noted.

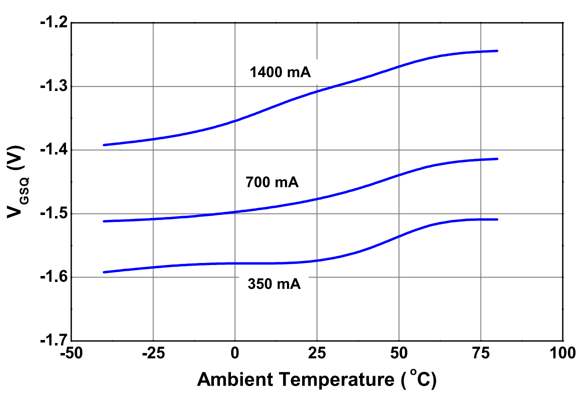


Figure 11 - Quiescent Gate Voltage (V_{GSQ}) Required to Reach I_{DQ} over Temperature

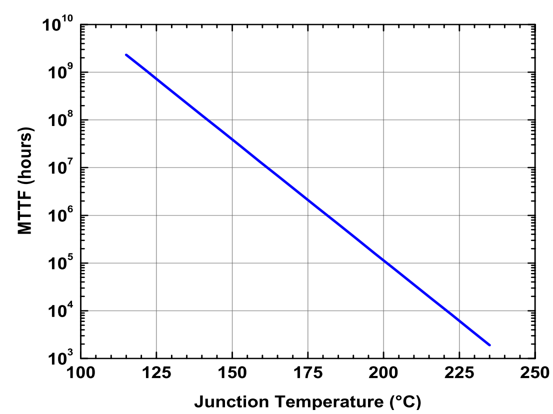


Figure 12 - MTTF of NRF1 devices as a function of junction temperature

Ordering Information[1]

Part Number	Description
NPT1007B	NPT1007 in AC780B-4 Metal-Ceramic Bolt-Down Package

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

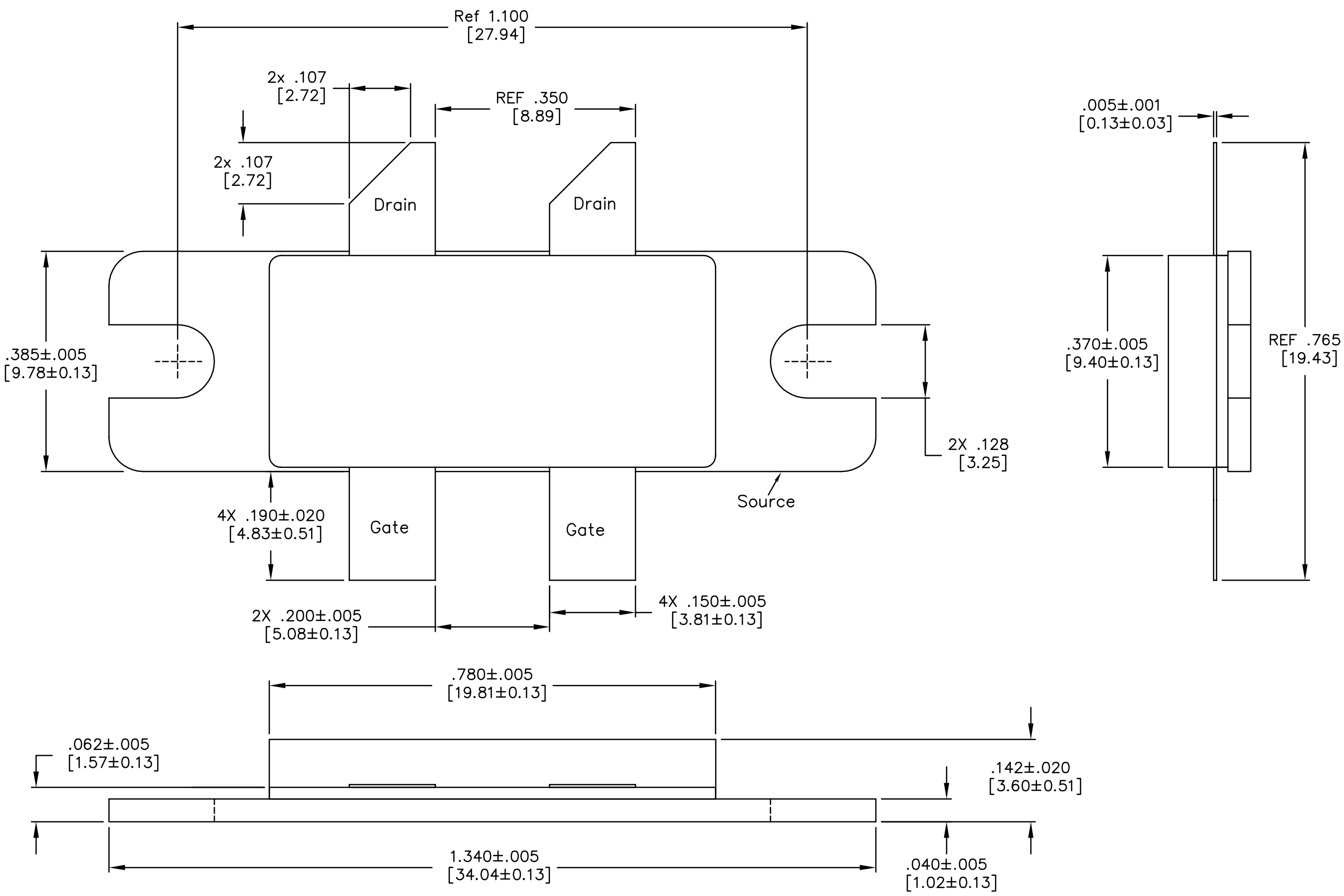


Figure 13 - AC780B-4 Metal-Ceramic Package Dimensions and Pinout (all dimensions are in inches [mm])

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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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