NPA1003 Preliminary Datasheet

NITRONEX CORPORATION

Gallium Nitride 28V, 5W, DC-1500MHz MMIC PA

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

FEATURES

- Optimized for broadband operation from DC-1500-MHz
- Input and output matched to 50 Ohms
- > 38dBm saturated power up to 1000MHz
- High small signal gain
  - 22dB @ 200MHz
  - 18dB @ 1000MHz
- Low noise figure
  - 1.8dB @ 200MHz
  - 2.5dB @ 1000MHz
- Subject to EAR99 export control

4mm x 4mm
QFN Package
With Exposed Pad

RoHS

RF Specifications (CW, DC-1000MHz): V_{DS} = 28V, I_{DQ} = 100mA, T_A = 25°C, Measured in Nitronex 50 Ohm test fixture.

Symbol	Parameter	Min	Typ	Max	Units
G_{SS}	Small-signal Gain	17.5	19.0	-	dB
P_{SAT}	Saturated Output Power	36.5	38	-	dBm
G_P	Gain at P_{SAT}	13	14.5	-	dB
η	Drain Efficiency at P_{SAT}	35	45	-	%
	Gain Flatness at P_{SAT}	-	+/- 3.5	-	dB
	Harmonics at P_{OUT} = 36dBm	-	-20	-	dBc
NF	Noise Figure	-	2.5		
OIP3	Output IP3, 1MHz spacing, 32dBm/tone	-	47	-	dBm
IRL	Input Return Loss	-	-8	-	dB
ORL	Output Return Loss	-	-15	-	dB

DC Specifications: T_C = 25°C

Symbol	Parameter	Min	Typ	Max	Units
Off Characteristics					
V_{BDS}	Drain-Source Breakdown Voltage (V_{GS} = -8V, I_D = 2mA)	100	-	-	V
I_{DLK}	Drain-Source Leakage Current (V_{GS} = -8V, V_{DS} = 60V)	-	0.5	1.0	mA
On Characteristics					
V_T	Gate Threshold Voltage (V_{DS} = 28V, I_D = 2mA)	-2.1	-1.6	-1.1	V
V_{GSQ}	Gate Quiescent Voltage (V_{DS} = 28V, I_D = 100mA)	-1.7	-1.2	-0.7	V
R_{ON}	On Resistance (V_{GS} = 2V, I_D = 15mA)	-	2.0	-	Ω
$I_{D,MAX}$	Drain Current (V_{DS} = 7V pulsed, 300µs pulse width, 0.2% duty cycle, V_{GS} = 2.0V)	1.1	1.4	-	A

Thermal Resistance Specification

Symbol	Parameter	Min	Typ	Max	Units
θ_{JC}	Thermal Resistance (Junction-to-Case), T_J = 180 °C	-	12.0	-	°C/W

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
I_G	Gate Current	10	mA
P_T	Total Device Power Dissipation (Derated above 25°C)	14.5	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)	TBD	
MM	Machine Model ESD Rating (per JESD22-A115)	TBD	
MSL	Moisture sensitivity level (per IPC/JEDEC J-STD-020)	TBD	
P_{IN}	Maximum Input Power	TBD	

RF Performance in 50 Ohm Test Fixture With External Bias Tee

V_{DS} = 28V, I_{DQ} = 100mA, T_A =25°C,
CW signal unless otherwise noted, Reference plane: Connectors

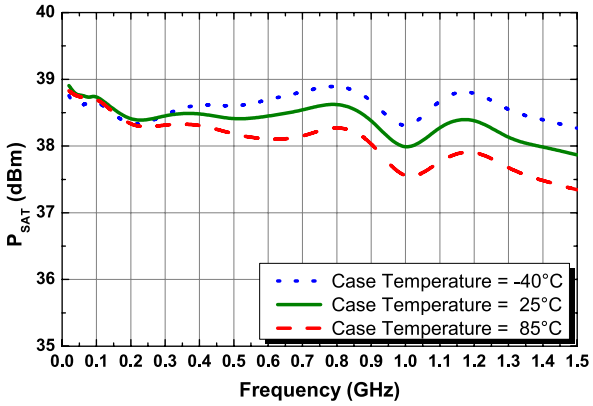

Figure 1 - Saturated Output Power vs Frequency

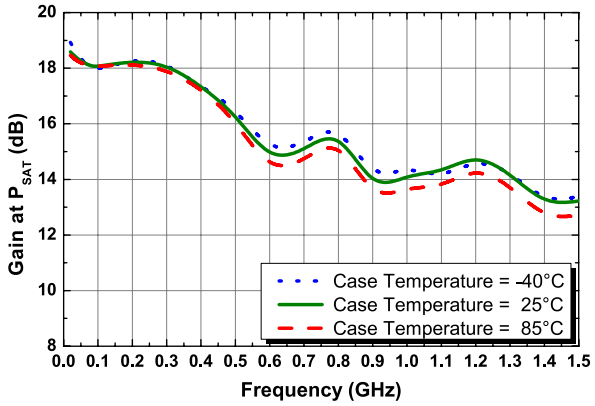

Figure 2 - Gain at Saturated Output Power vs Frequency

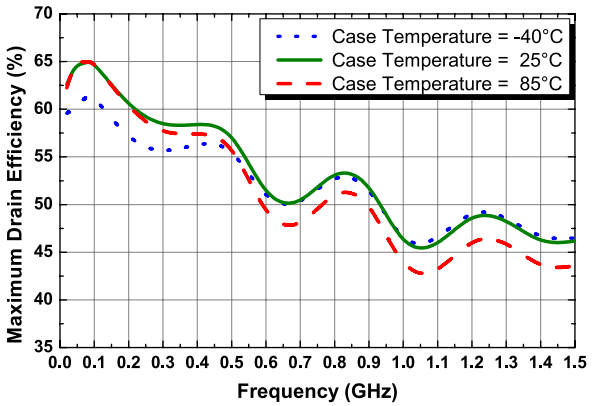

Figure 3 - Maximum Drain Efficiency vs Frequency

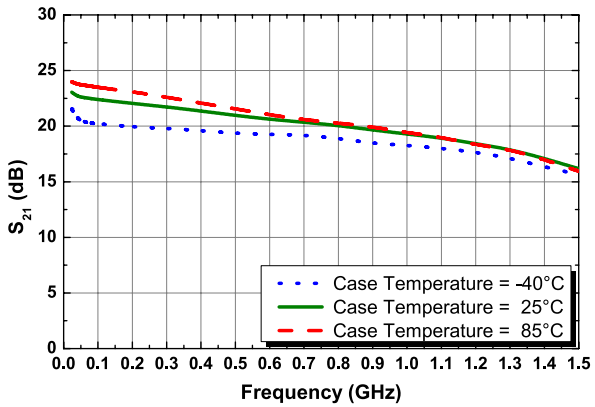

Figure 4 - Small-Signal Gain vs Frequency

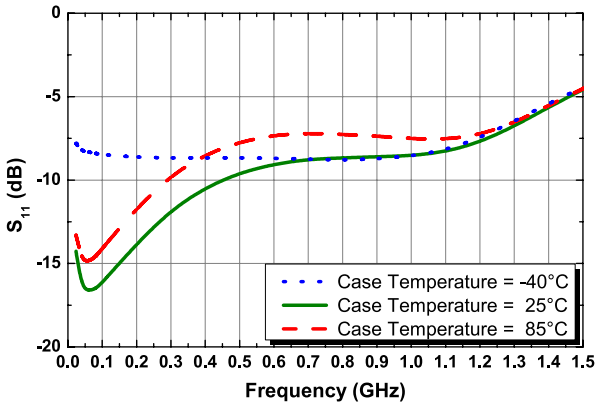

Figure 5 - Input Return Loss vs Frequency

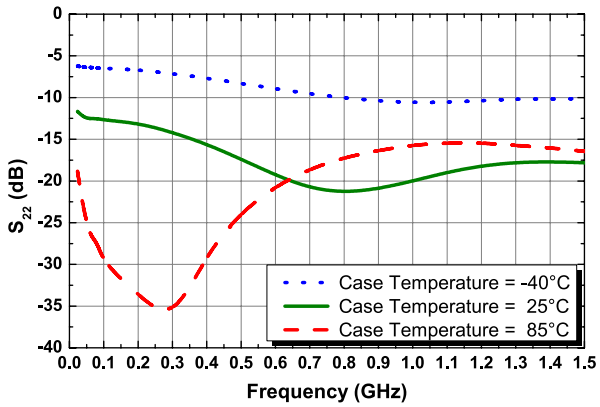

Figure 6 - Output Return Loss vs Frequency

RF Performance in 50 Ohm Test Fixture With External Bias Tee

V_{DS} = 28V, I_{DQ} = 100mA, T_A =25°C,

CW signal unless otherwise noted, Reference plane: Connectors

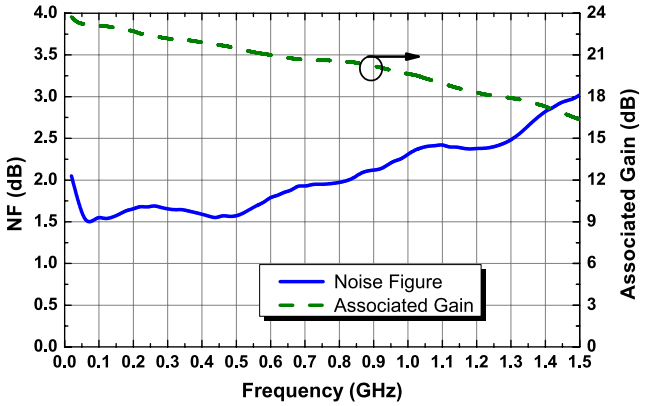

Figure 7 - Noise Figure vs Frequency

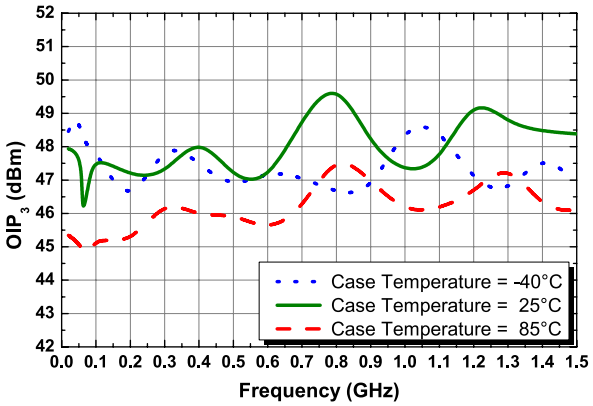

Figure 8 - Output IP_3 at P_{OUT} ~ 35dBm vs Frequency

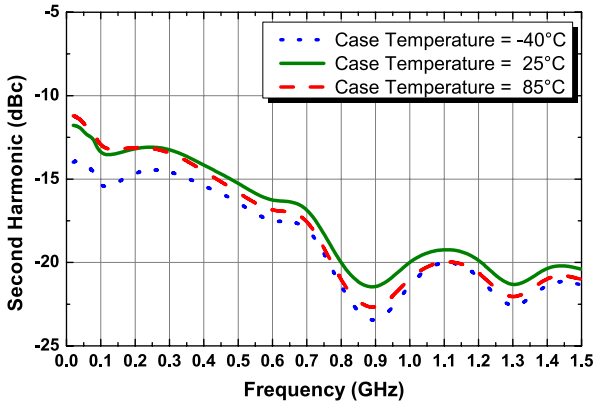

Figure 9 - Second Harmonic at P_{OUT} = 36dBm vs Frequency

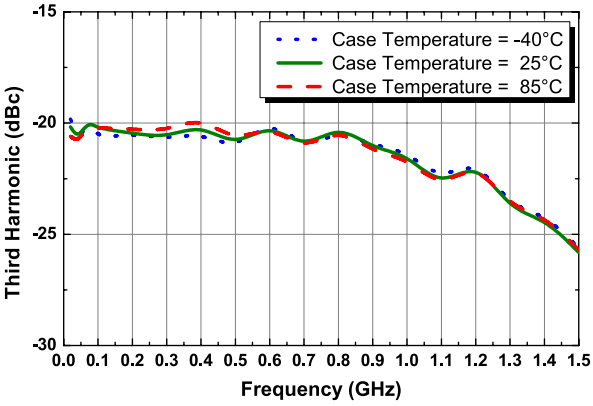

Figure 10 - Third Harmonic at P_{OUT} = 36dBm vs Frequency

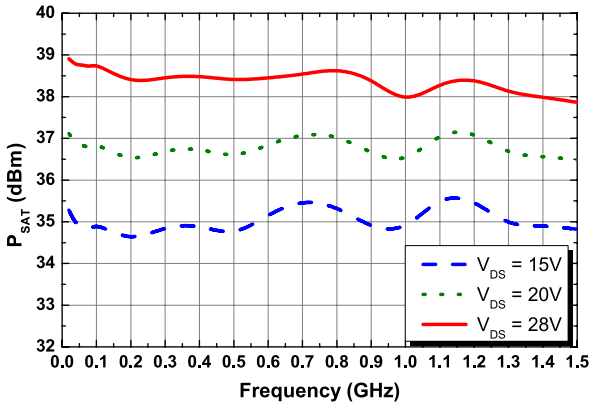

Figure 11 - Saturated Output Power vs V_{DS} and Frequency

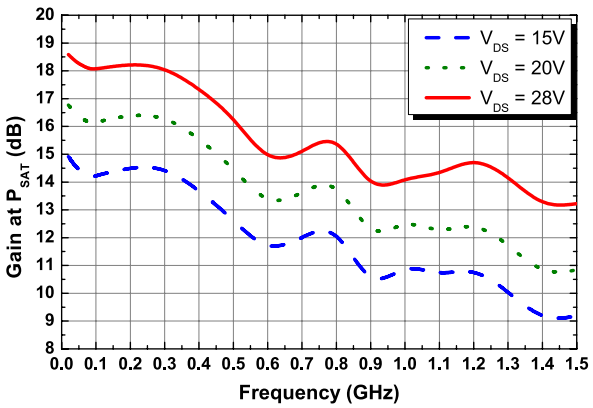

Figure 12 - Gain at Saturated Output Power vs V_{DS} and Frequency

RF Performance in 50 Ohm Test Fixture With External Bias Tee

V_{DS} = 28V, I_{DQ} = 100mA, T_A =25°C,
CW signal unless otherwise noted, Reference plane: Connectors

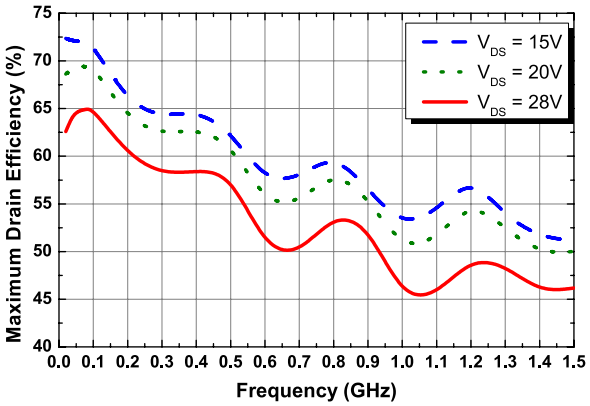

Figure 13 - Maximum Drain Efficiency vs V_{DS} and Frequency

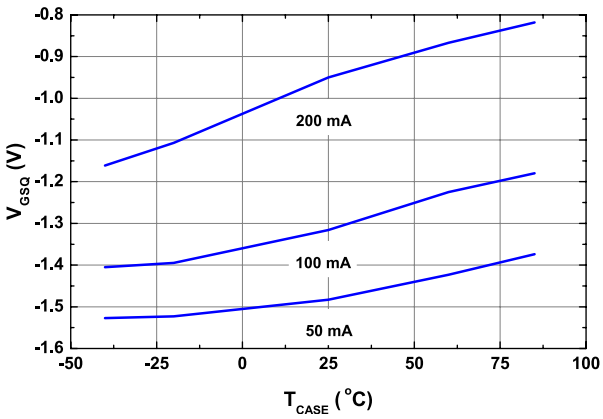

Figure 14 - Quiescent Gate Voltage (V_{GSQ}) Required to Reach I_{DQ} vs T_{CASE}

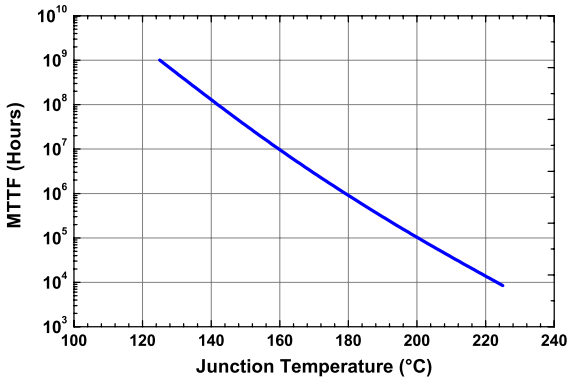

Figure 15 - MTTF of NRF1 Devices as a Function of Junction Temperature

Ordering Information[1]

Part Number	Order Multiple	Description
NPA1003QAT	92	Tube; NPA1003 in QA (4x4 QFN-16 lead with exposed pad) Package
NPA1003QAR	1500	Tape and Reel; NPA1003 in QA (4x4 QFN-16 lead with exposed pad) Package

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

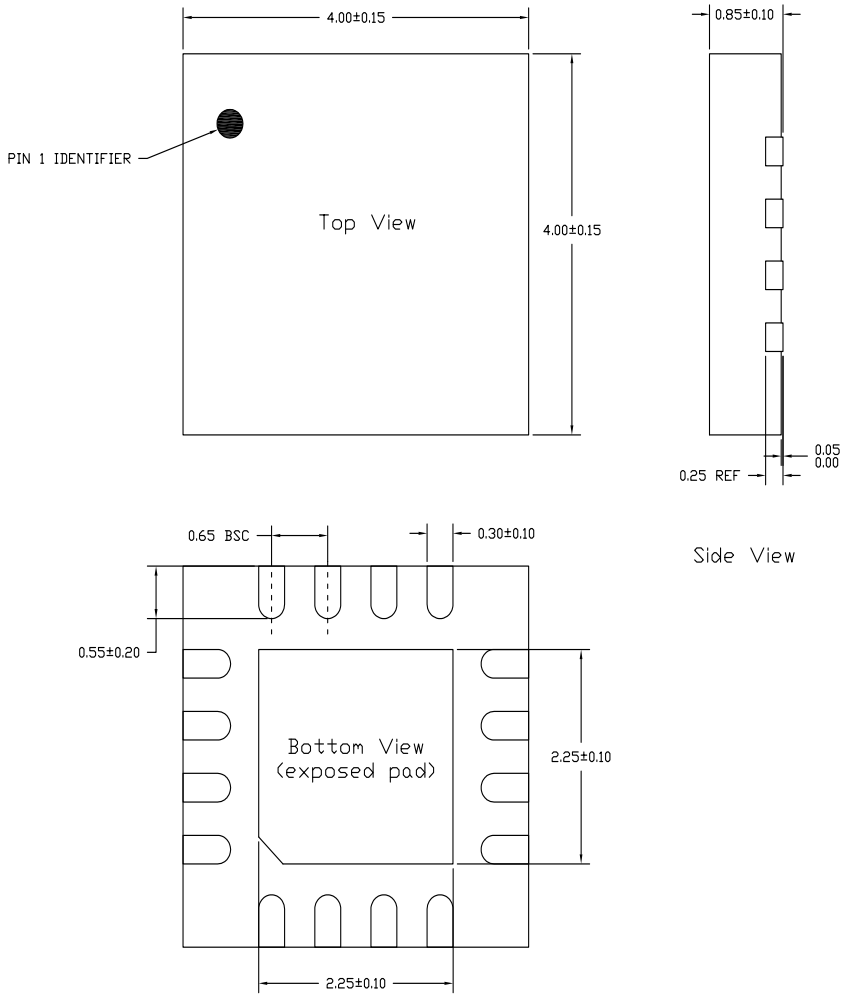

Figure 16 - QA Package Dimensions and Pinout (all dimensions are in millimeters)

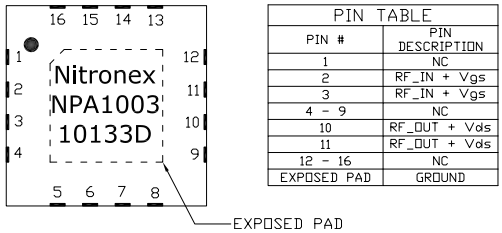

Figure 17 - Terminal Identification

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+1.919.807.9200 (fax)
info@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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