NPT1004

Gallium Nitride 28V, 45W RF Power Transistor

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

FEATURES

- Optimized for pulsed, WiMAX, W-CDMA, LTE, and other light thermal load applications from DC to 4.0GHz
- 2500MHz performance
  - 45W P_{3dB} CW power
  - 13.5 dB small signal gain
  - 55% efficiency at P_{3dB}
- 100% RF tested
- Low cost, surface mount SOIC package
- High reliability gold metallization process
- Lead-free and RoHS compliant
- Subject to EAR99 Export Control



DC - 4000MHz
45 Watt, 28 Volt
GaN HEMT

RoHS

RF Specifications (2-Tone): V_{DS} = 28V, I_{DQ} = 400mA, Frequency = 2500MHz, Tone Spacing = 1MHz, T_C = 25°C, Measured in Nitronex Test Fixture

Symbol	Parameter	Min	Typ	Max	Units
P_{3dB}	Average Output Power at 3dB Compression	35	45	-	W
P_{1dB}	Average Output Power at 1dB Compression	-	28	-	W
G_{SS}	Small Signal Gain	12.5	13.5	-	dB
η	Drain Efficiency at 3dB Gain Compression	50	55	-	%

Typical OFDM Performance (2500-2700MHz): V_{DS} = 28V, I_{DQ} = 350mA, $P_{OUT,AVG}$ = 37dBm, single carrier OFDM waveform 64-QAM 3/4, 8 burst, continuous frame data, 10 MHz channel bandwidth. Peak/Avg = 10.3dB @ 0.01% probability on CCDF. T_C = 25°C. Measured in Load Pull System (Refer to Table 2 and Figure 1)

Symbol	Parameter	Typ	Units
EVM	Error Vector Magnitude	2.0	%
G_P	Power Gain	13.0	dB
η	Drain Efficiency	27	%

Typical OFDM Performance (3300-3500MHz): V_{DS} = 28V, I_{DQ} = 350mA, $P_{OUT,AVG}$ = 36.5dBm, 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. T_C = 25°C. Measured in Load Pull System (Refer to Table 2 and Figure 1)

Symbol	Parameter	Typ	Units
EVM	Error Vector Magnitude	2.0	%
G_P	Power Gain	10.5	dB
η	Drain Efficiency	25	%

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 = 16mA)	100	-	-	V
I_{DLK}	Drain-Source Leakage Current (V_{GS} = -8V, V_{DS} = 60V)	-	2	10	mA
On Characteristics					
V_T	Gate Threshold Voltage (V_{DS} = 28V, I_D = 16mA)	-2.3	-1.8	-1.3	V
V_{GSQ}	Gate Quiescent Voltage (V_{DS} = 28V, I_D = 350mA)	-2.0	-1.5	-1.0	V
R_{ON}	On Resistance (V_{GS} = 2V, I_D = 120mA)	-	0.25	0.30	Ω
I_D	Drain Current (V_{DS} = 7V pulsed, 300ms pulse width, 0.2% duty cycle, V_{GS} = 2V)	7.5	9.5	-	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)	40	W
θ_{JC}	Thermal Resistance (Junction-to-Case)	4.3	°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)	1B (>500V)	
MM	Machine Model ESD Rating (per JESD22-A113)	M1(>50V)	
MSL	Moisture Sensitivity Level (per IPC/JEDEC J-STD-020): Rating of 3 at 260 °C Package Peak Temperature		

Load-Pull Data, Reference Plane at Device Leads

V_{DS}=28V, I_{DQ}=350mA, T_A=25°C unless otherwise noted

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

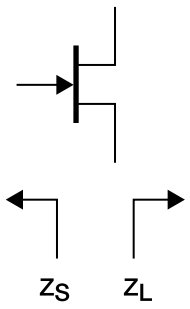
Frequency (MHz)	Z_S (Ω)	Z_L (Ω)	P_{SAT} (W)	G_{SS} (dB)	Drain Efficiency @ P_{SAT} (%)
900	2.0 + j2.7	6.0 + j3.3	45	22.5	72
1500	1.6 - j0.8	4.5 + j0.5	45	18.5	70
2500	2.0 - j3.2	3.5 - j5.0	45	14.0	65
3500	3.2 - j6.5	2.9 - j8.0	35	12.0	60

Table 2: Optimum Source and Load Impedances for WiMAX Gain, Drain Efficiency, Output Power, and Linearity Performance

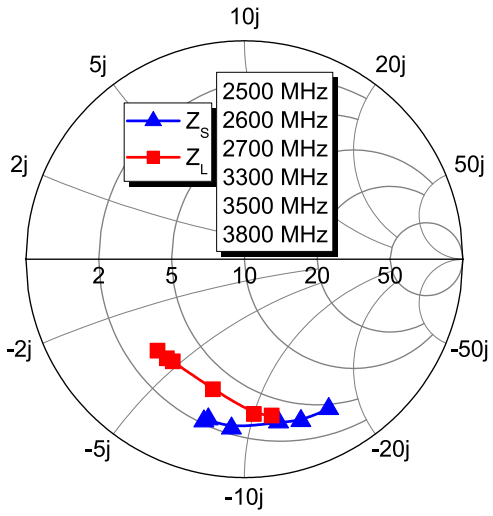
Frequency (MHz)	Z_S (Ω)	Z_L (Ω)	P_{OUT} (W)	Gain (dB)	Drain Efficiency (%)
2500[1]	2.1 - j7.6	3.1 - j3.9	5	14.0	27
2600[1]	2.3 - j7.7	3.3 - j4.4	5	13.0	27
2700[1]	2.3 - j9.0	3.4 - j4.7	5	13.0	27
3300[2]	3.3 - j11.8	3.7 - j7.2	6.3	11.5	30
3500[2]	3.5 - j13.5	3.5 - j10.0	4.5	10.5	25
3800[2]	4.5 - j16.2	3.7 - j11.2	3.2	8.0	17

Note 1: Single carrier OFDM waveform 64-QAM 3/4, 8 burst, continuous frame data, 10 MHz channel bandwidth. Peak/Avg = 10.3dB @ 0.01% probability on CCDF, 2% EVM.

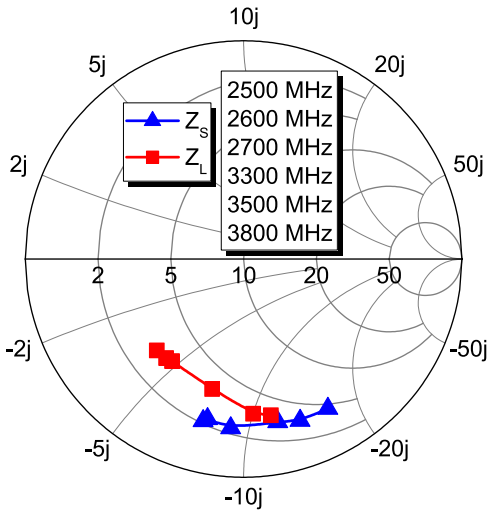
Note 2: Single carrier OFDM waveform 64-QAM 3/4, 8 burst, 20ms frame, 15ms frame data, 3.5 MHz channel bandwidth. Peak/Avg = 10.3dB @ 0.01% probability on CCDF, 2% EVM.



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



(a) CW Impedances



(b) OFDM Impedances

Figure 1 - Optimal Impedances for CW and OFDM Performance

Load-Pull Data, Reference Plane at Device Leads

V_{DS}=28V, I_{DQ}=350mA, T_A=25°C unless otherwise noted.

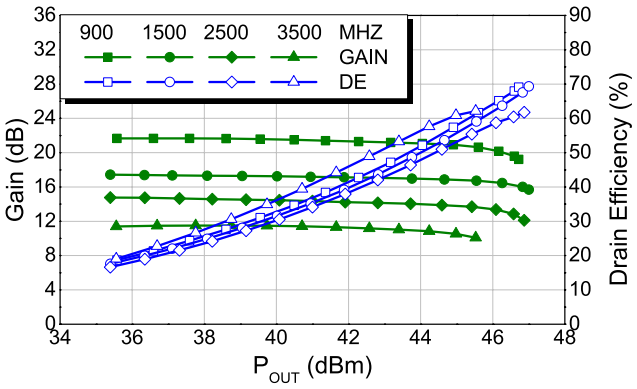


Figure 2 - Typical CW Performance, Frequency = 900 to 3500MHz, I_{DQ}=400mA

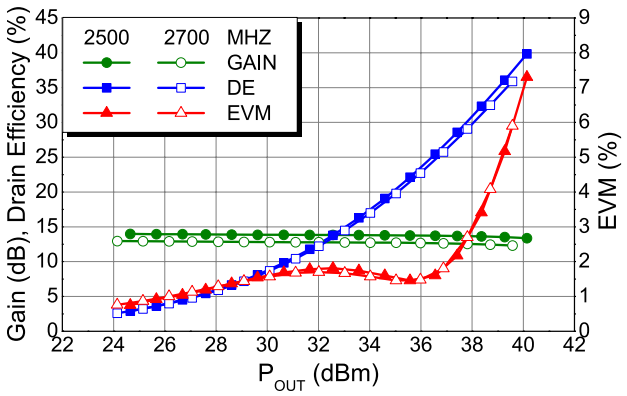


Figure 3 - OFDM Performance Tuned for P_{OUT} at 2% EVM in Load-Pull System

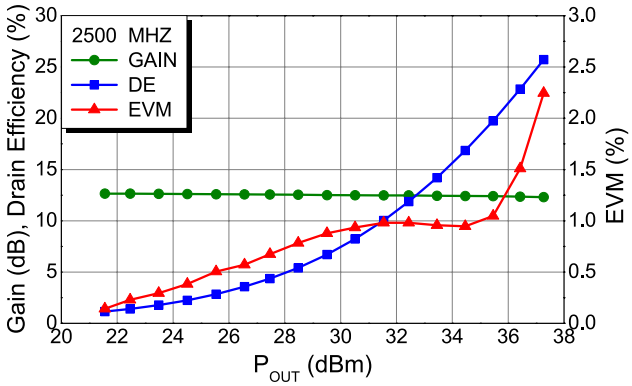


Figure 4 - OFDM Performance Tuned for P_{OUT} at 1.5% EVM in Load-Pull System

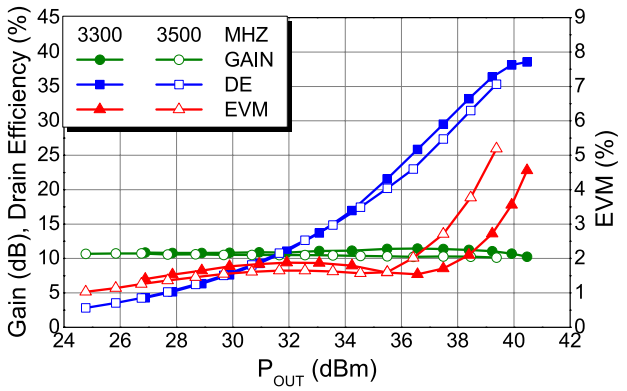


Figure 5 - OFDM Performance Tuned for P_{OUT} at 2% EVM in Load-Pull System

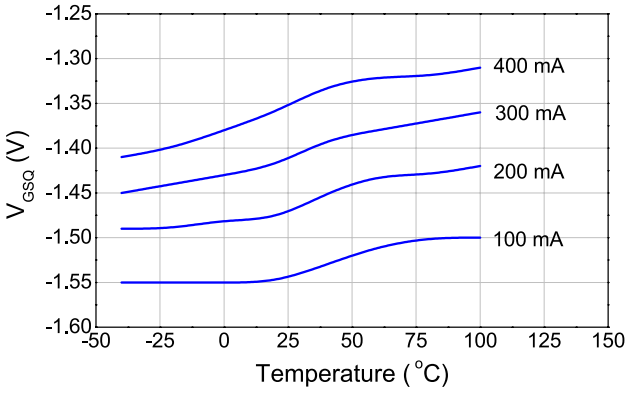


Figure 6 - Quiescient Gate Voltage (V_{GSQ}) Required to Reach I_{DQ} as a Function of Case Temperature

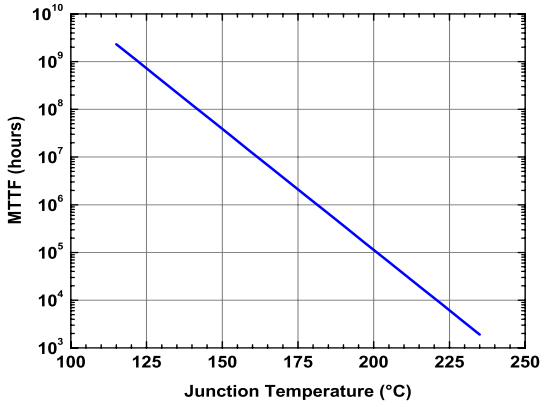


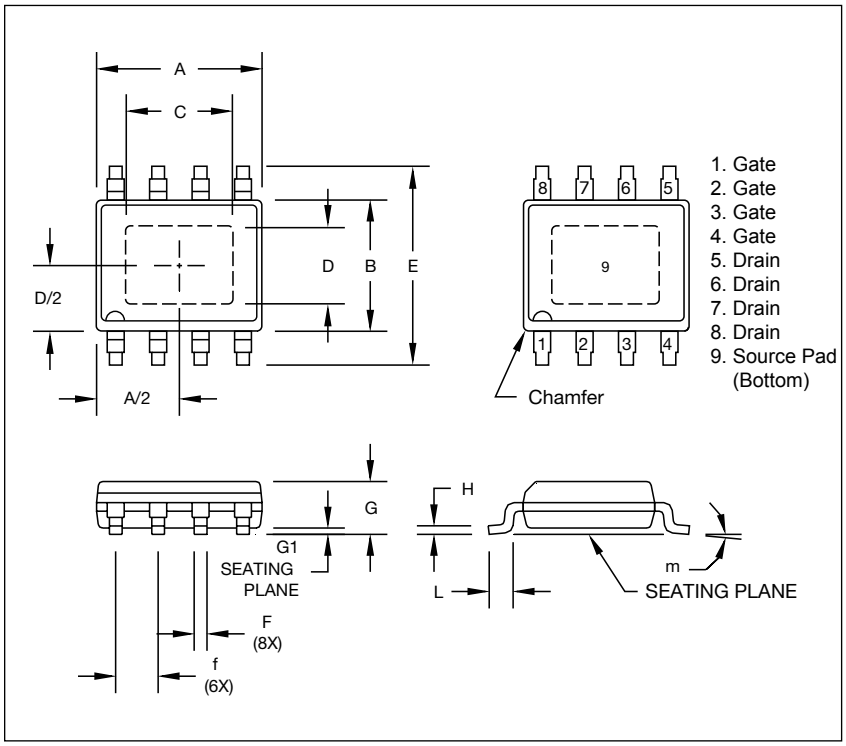
Figure 7 - MTTF of NRF1 devices as a function of junction temperature

Ordering Information

Part Number	Order Multiple	Description
NPT1004DT	97	Tube; NPT1004 in D (PSOP2) Package
NPT1004DR	1500	Tape and Reel; NPT1004 in D (PSOP2) Package

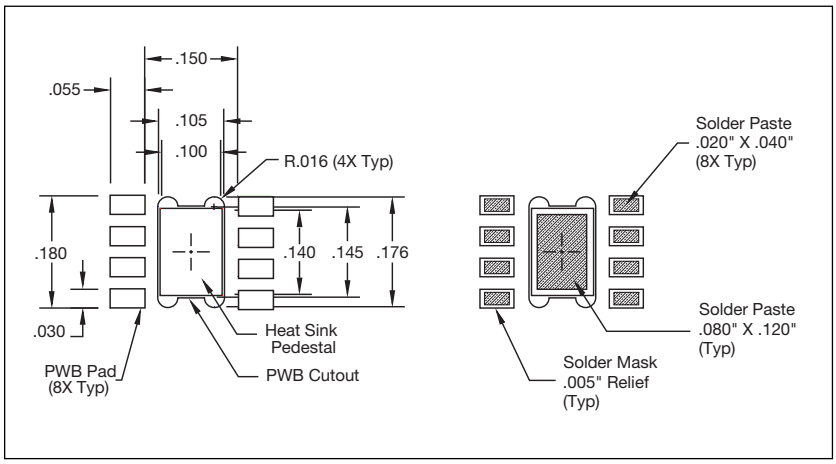
1: To find a Nitronex contact in your area, visit our website at http://www.nitronex.com

D Package Dimensions and Pinout



	Inches		Millimeters	
Dim	Min	Max	Min	Max
A	0.189	0.196	4.80	4.98
B	0.150	0.157	3.81	3.99
C	0.107	0.123	2.72	3.12
D	0.071	0.870	1.80	2.21
E	0.230	0.244	5.84	6.22
f	0.50 BSC		1.270 BSC	
F	0.0138	0.0192	0.35	0.49
G	0.055	0.065	1.40	1.65
G1	0.000	0.004	0.00	0.10
H	0.0075	0.0098	0.19	0.25
L	0.016	0.035	0.40	0.89
m	0°	8°	0°	8°

Mounting Footprints



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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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