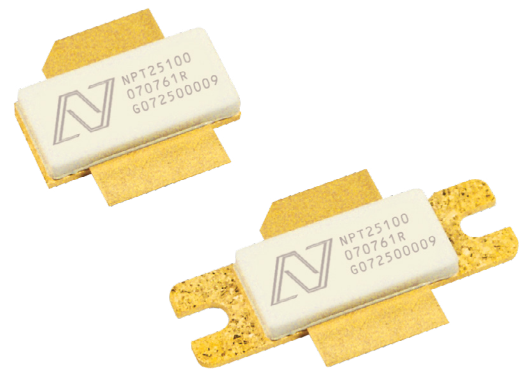
NPT25100

NITRONEX

Gallium Nitride 28V, 125W RF Power Transistor

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



FEATURES

- Optimized for CW, pulsed, WiMAX, W-CDMA, LTE and other applications from 2100 – 2700MHz
- 125W P_{3dB} Peak envelope power
- 90W P_{3dB} CW power
- 10W linear power @ 2.0% EVM for single carrier OFDM, 10.3dB peak/avg, 10MHz channel bandwidth, 16.5dB gain, 26% efficiency
- 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 ECCN 3A982.a.1 export control

2100 – 2700 MHz
125 Watt, 28 Volt
GaN HEMT

RoHS

RF Specifications (CW): V_{DS} = 28V, I_{DQ} = 600mA, Frequency = 2500MHz, T_C = 25°C, Measured in Nitronex Test Fixture

Symbol	Parameter	Min	Typ	Max	Units
P_{3dB}	Average Output Power at 3dB Gain Compression	80	90	-	W
G_{SS}	Small Signal Gain	14	16.5	-	dB
η	Drain Efficiency at 3dB Gain Compression	55	62	-	%

Typical 2-Tone Performance: V_{DS} = 28V, I_{DQ} = 600mA, Frequency = 2500MHz, Tone spacing = 1MHz, T_C = 25°C
Measured in Load Pull System (Refer to Table 1 and Figure 1)

Symbol	Parameter	Typ	Units
$P_{3dB,PEP}$	Peak Envelope Power at 3dB Compression	125	W
$P_{1dB,PEP}$	Peak Envelope Power at 1dB Compression	90	W
P_{IMD3}	Peak Envelope Power at -35dBm IMD3	80	W

Typical OFDM Performance: V_{DS} = 28V, I_{DQ} = 600mA, Single carrier OFDM waveform 64-QAM 3/4, 8 burst, continuous frame data, 10MHz channel bandwidth. Peak/Avg = 10.3dB @ 0.01% probability on CCDF.
Frequency = 2500 to 2700MHz. $P_{OUT,AVG}$ = 10W, T_C=25°C.

Symbol	Parameter	Typ	Units
G_P	Power Gain	16.5	dB
η	Drain Efficiency	26	%
EVM	Error Vector Magnitude	2.0	%

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 = 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)	-	21.0	-	A

Thermal Resistance Specification

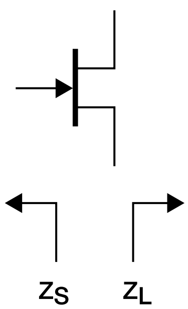
Symbol	Parameter	Min	Typ	Max	Units
θ_{JC}	Thermal Resistance (Junction-to-Case), T_J = 145 °C	-	1.75	-	°C/W

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	180	mA
P_T	Total Device Power Dissipation (Derated above 25°C)	100	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)	2 (>2000V)	
MM	Machine Model ESD Rating (per JESD22-A115)	M2 (>100V)	

Table 1: Optimum Source and Load Impedances for CW Gain, Drain Efficiency, and Output Power Performance, V_{DS} = 28V, I_{DQ} = 600mA

Frequency (MHz)	Z_S (Ω)	Z_L (Ω)
2140	12.1 - j20.0	2.6 - j2.6
2300	10.0 - j3.0	2.5 - j2.3
2400	9.5 - j3.0	2.5 - j2.5
2500	9.0 - j3.0	2.5 - j2.7
2600	8.5 - j3.0	2.5 - j3.1
2700	8.0 - j3.0	2.5 - j3.3



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

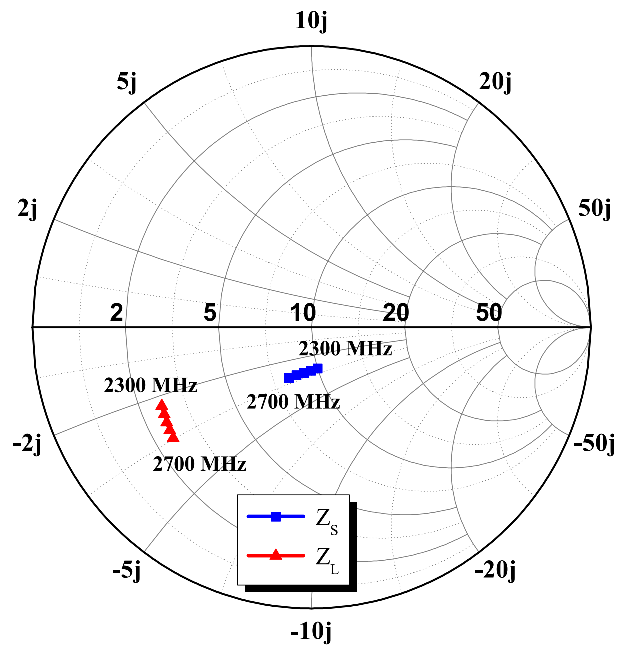


Figure 1 - Optimal Impedances for CW Performance, V_{DS} = 28V, I_{DQ} = 600mA

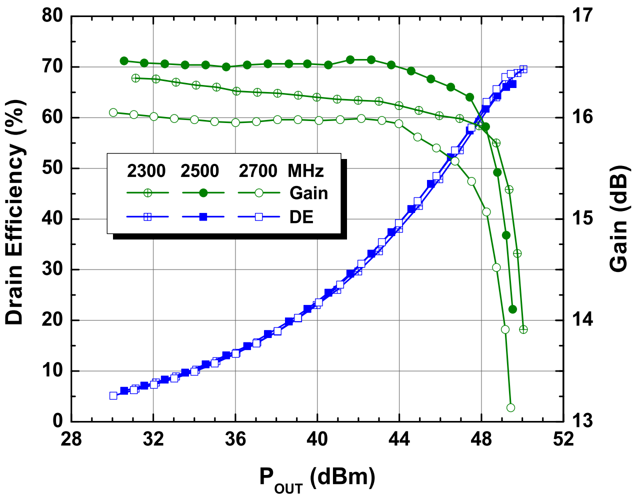


Figure 2 - Typical CW Performance in Load-Pull System, V_{DS} = 28V, I_{DQ} = 600mA, Frequency = 2300 to 2700MHz

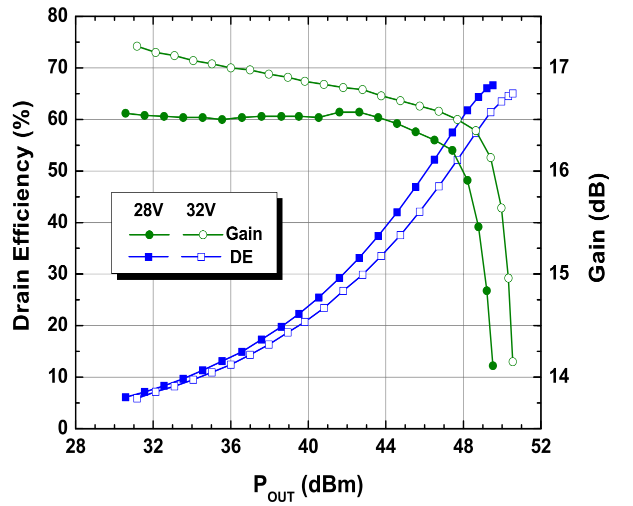


Figure 3 - Typical CW Performance in Load-Pull System, V_{DS} = 28V & 32V, I_{DQ} = 600mA, Frequency = 2500MHz, Impedances Held Constant

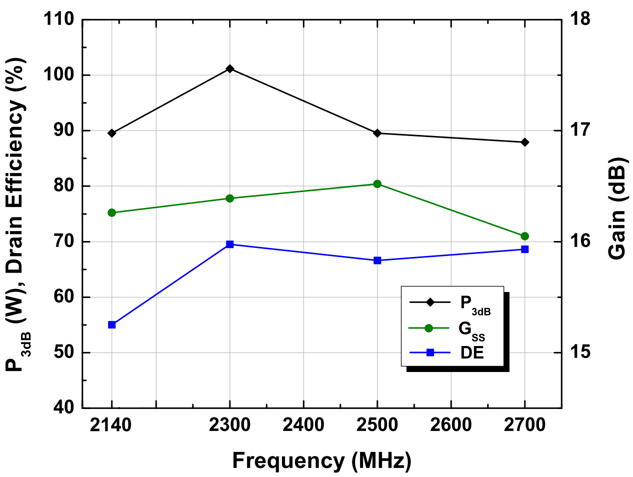


Figure 4 - Typical CW Performance in Load Pull System, V_{DS} = 28V, I_{DQ} = 600mA

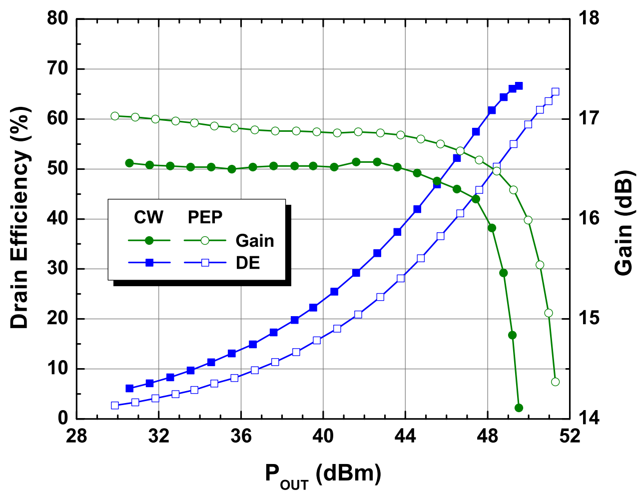


Figure 5 - Typical CW and PEP Performance in Load-Pull System, V_{DS} = 28V, I_{DQ} = 600mA, Frequency = 2500MHz, Tone Spacing = 1MHz

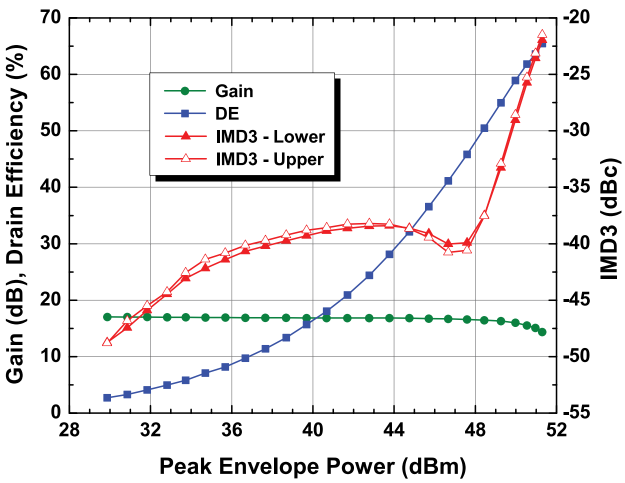


Figure 6 - Typical IMD3 Performance in Load-Pull System, V_{DS} = 28V, I_{DQ} = 600mA, Frequency = 2500MHz, Tone Spacing = 1MHz

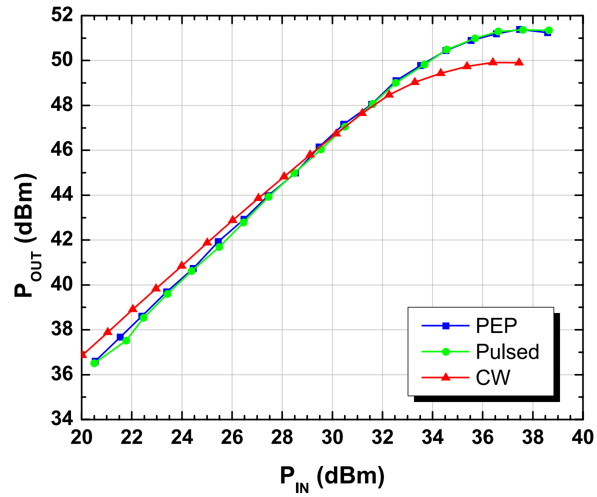


Figure 7 - Typical CW, PEP, and Pulsed Performance in Load-Pull System, Pulse Width = 10µs, Duty Cycle = 1%, V_{DS} = 28V, I_{DQ} = 600mA, Frequency = 2500MHz, Tone Spacing = 1MHz

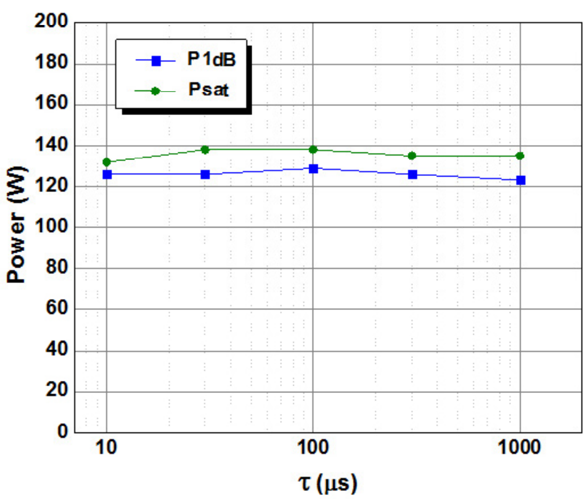


Figure 8 - Typical Pulsed CW Performance in Load-Pull System, 1% Duty Cycle, V_{DS} = 28V, I_{DQ} = 600mA, Frequency = 2500MHz

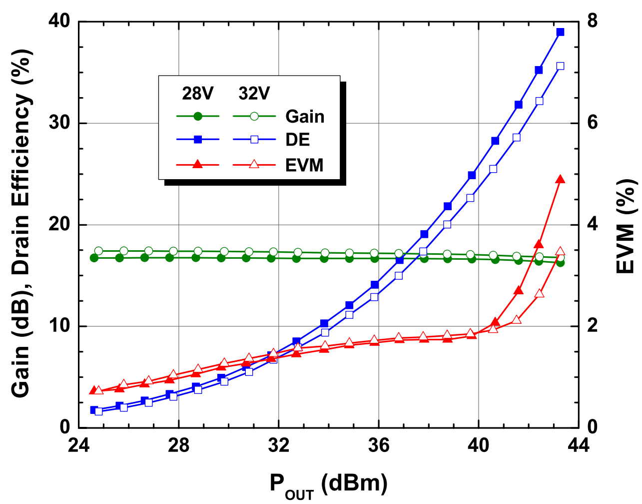


Figure 9 - Typical OFDM Performance in Load-Pull System, V_{DS} = 28V & 32V, I_{DQ} = 600mA, Frequency = 2500MHz

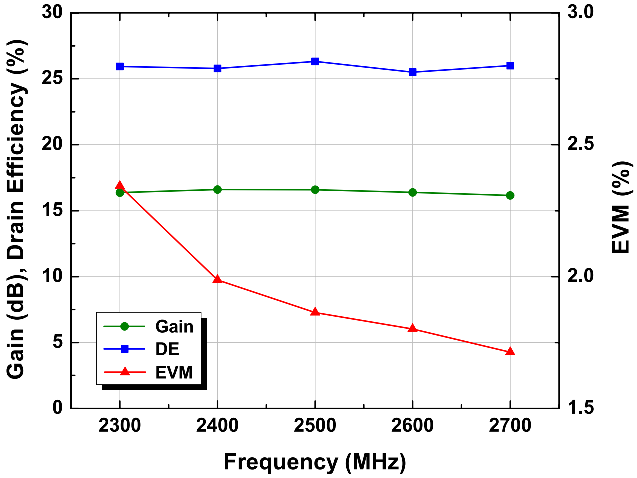


Figure 10 - Typical OFDM Performance in Load-Pull System, $P_{OUT,AVG}$ = 10W, V_{DS} = 28V, I_{DQ} = 600mA

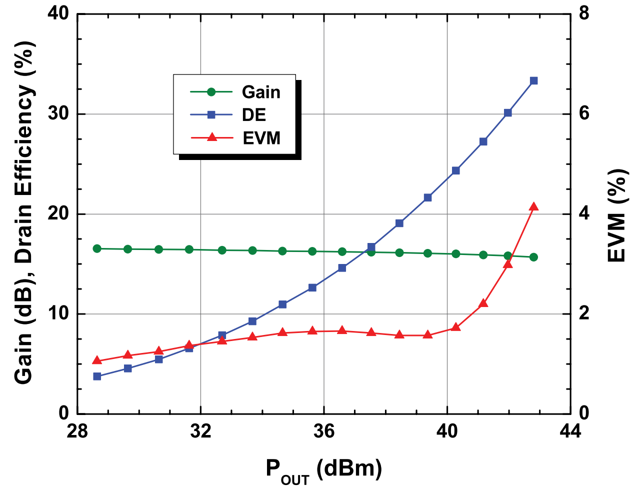


Figure 11 - Typical LTE (Long Term Evolution, 20MHz channel), Nitronex Test Fixture, V_{DS} = 28V, I_{DQ} = 600mA, Frequency = 2600MHz

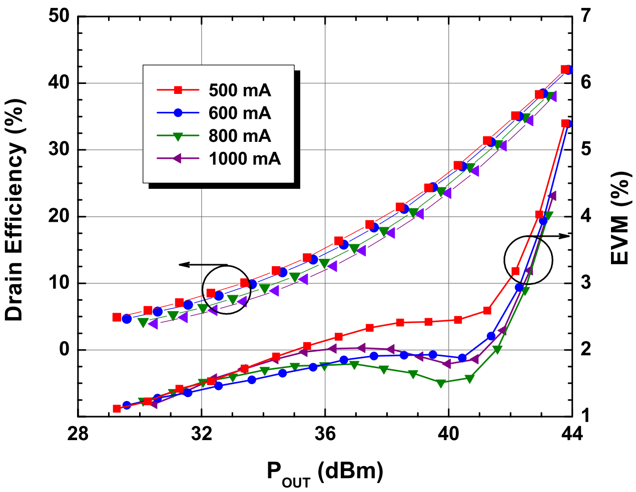


Figure 12 - OFDM Performance in Nitronex Test Fixture as a Function of I_{DQ}, V_{DS} = 28V, I_{DQ} = 500 to 1000mA, Frequency = 2500MHz

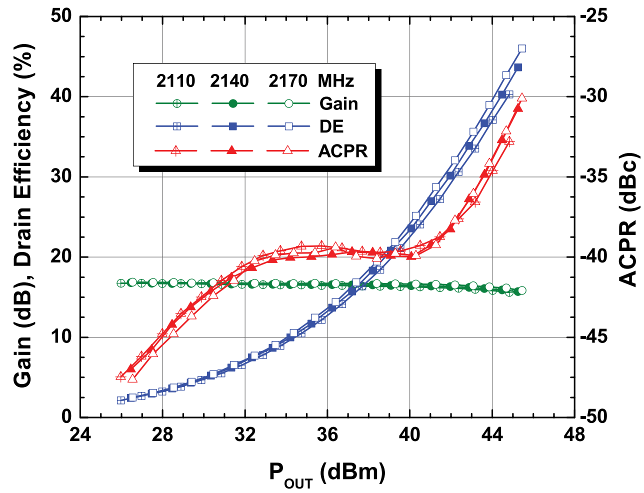


Figure 13 - Typical W-CDMA Performance in Load-Pull System, V_{DS} = 28V, I_{DQ} = 600mA, Frequency = 2110 to 2170MHz

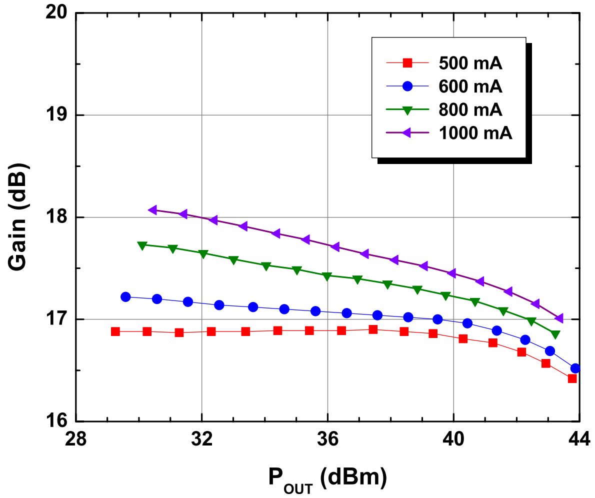


Figure 14 - OFDM performance in Nitronex Test Fixture as a Function of I_{DQ}, V_{DS} = 28V, I_{DQ} = 500mA to 1000mA, Frequency = 2500MHz

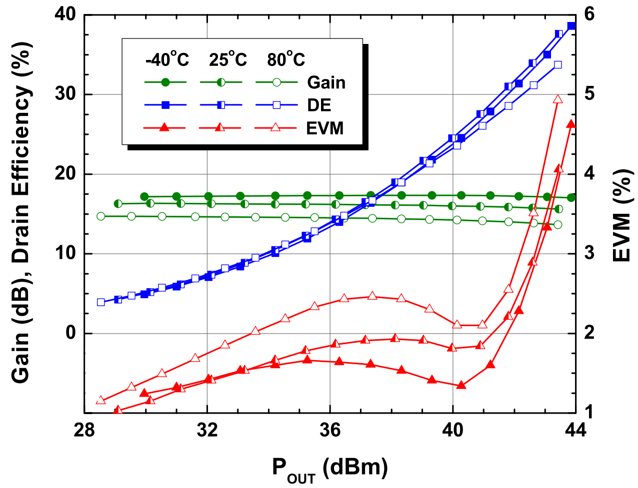


Figure 15 - OFDM performance in Nitronex Test Fixture as a Function of Case Temperature, V_{DS} = 28V, I_{DQ} = 600mA, Frequency = 2500MHz

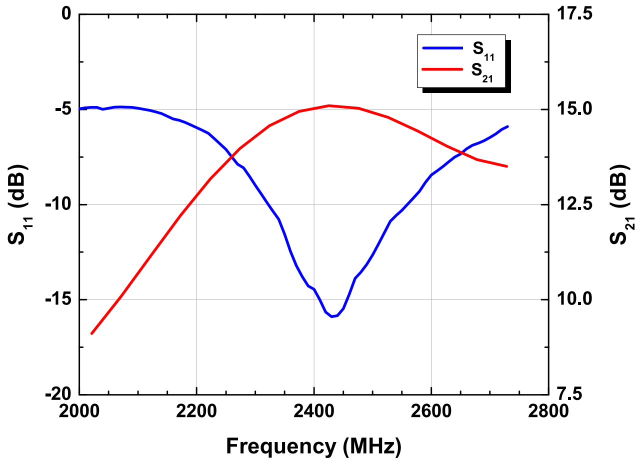


Figure 16 - S-parameters Measured in Nitronex Test Fixture, V_{DS} = 28V, I_{DQ} = 600mA

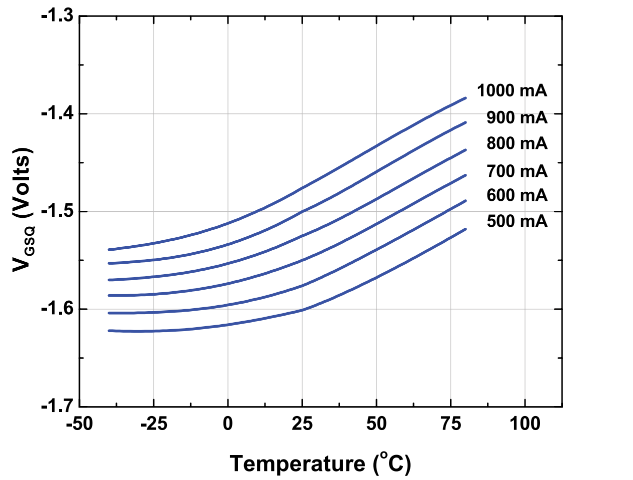


Figure 17 - Quiescient Gate Voltage (V_{GSQ}) Required to Reach I_{DQ} as a Function of Case Temperature, Measured in Nitronex Test Fixture at V_{DS} = 28V

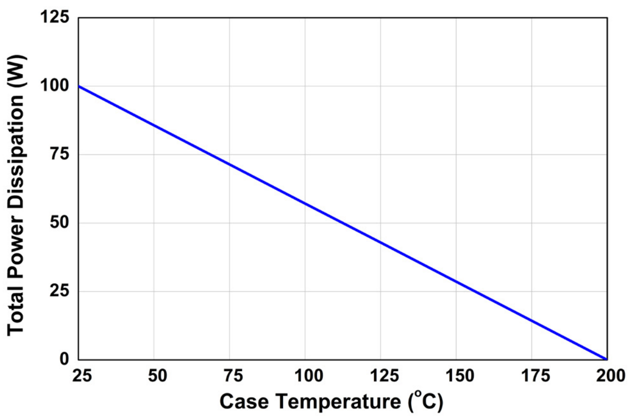


Figure 18 - Power Derating Curve

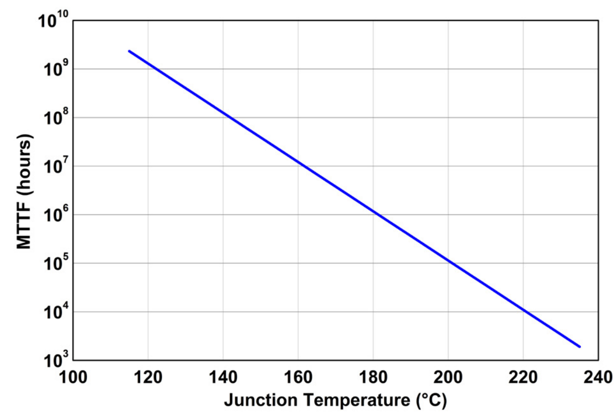


Figure 19 - MTTF of NRF1 Devices as a Function of Junction Temperature

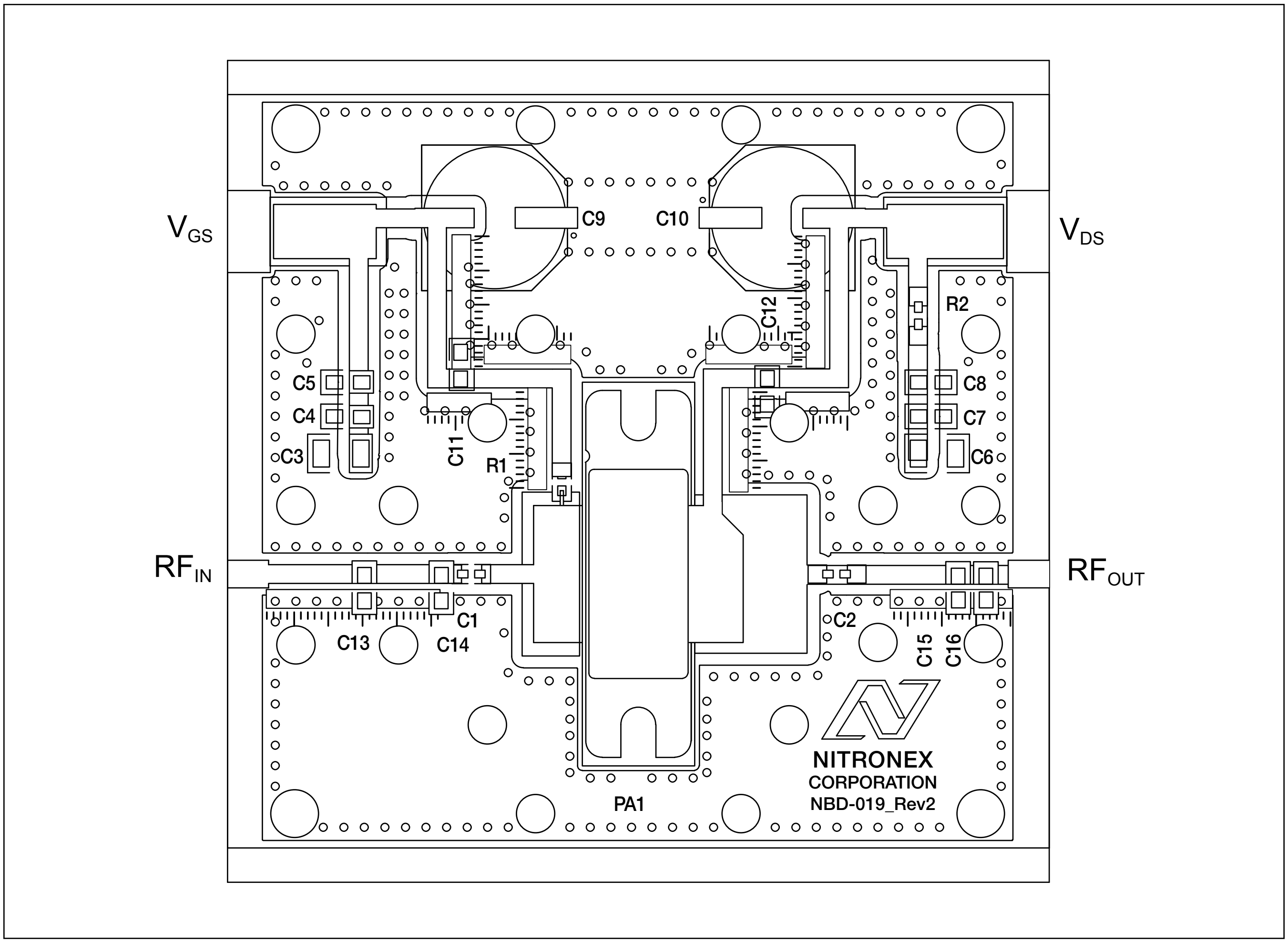


Figure 20 - APP-NPT25100-25 2500MHz Demonstration Board

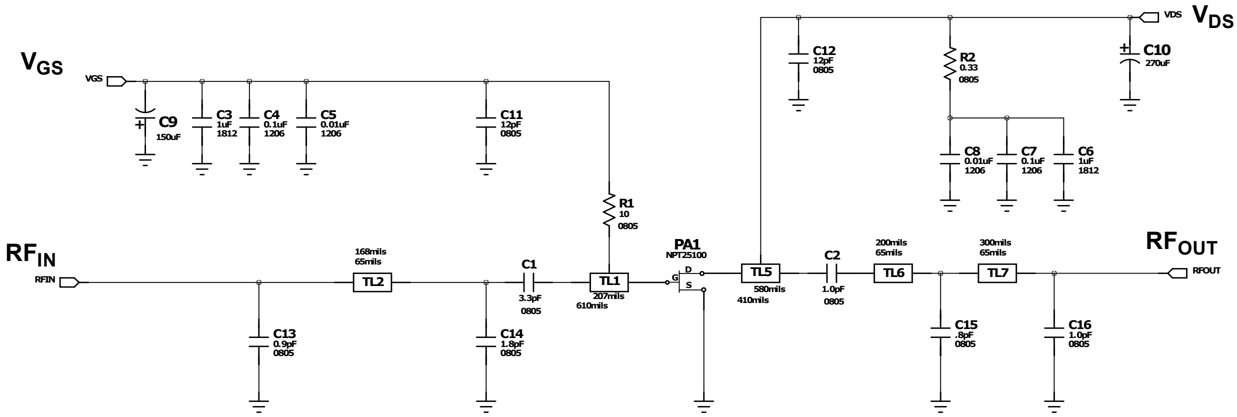


Figure 21 - APP-NPT25100-25 2500MHz Demonstration Board Equivalent Circuit

Table 2: APP-NPT25100-25 2500MHz Demonstration Board Bill of Materials

Name	Value	Tolerance	Vendor	Vendor Number
C1	3.3pF	+/- 0.1pF	ATC	ATC600F3R3B
C2	1.2pF	+/- 0.1pF	ATC	ATC100B1R2BT
C3	1uF	20%	Panasonic	ECJ-5YB2A105M
C4	0.1uF	10%	Kemet	C1206C104K1RACTU
C5	0.01uF	10%	AVX	12061C103KAT2A
C6	1uF	10%	Panasonic	ECJ-5YB2A105M
C7	0.1uF	10%	Kemet	C1206C104K1RACTU
C8	0.01uF	10%	AVX	12061C103KAT2A
C9	150uF	20%	Nichicon	UPW1C151MED
C10	270uF	20%	United Chmi-Con	ELXY630ELL271MK25S
C11	33pF	5%	ATC	ATC600F330B
C12	33pF	5%	ATC	ATC600F330B
C13	0.9pF	+/- 0.1pF	ATC	ATC600F0R9B
C14	1.8pF	+/- 0.1pF	ATC	ATC600F1R8B
C15	Do Not Place			
C16	0.8pF	+/- 0.1pF	ATC	ATC600F0R8B
PA1	--	--	--	NPT25100B
R1	10 ohm	1%	Panasonic	ERJ-6ENF10R0V
R2	0.033 ohm	1%	Panasonic	ERJ-6RQFR33V
NBD-019_Rev2	--	--	Alberta Printed Circuits	NBD-019_Rev2
Substrate			Rogers	R04350, t = 30mil ε_r = 3.5

Ordering Information[1]

Part Number	Description
NPT25100B	NPT25100 in AC780B-2 Metal-Ceramic Bolt-Down Package
NPT25100P	NPT25100 in AC780P-2 Metal-Ceramic Pill Package

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

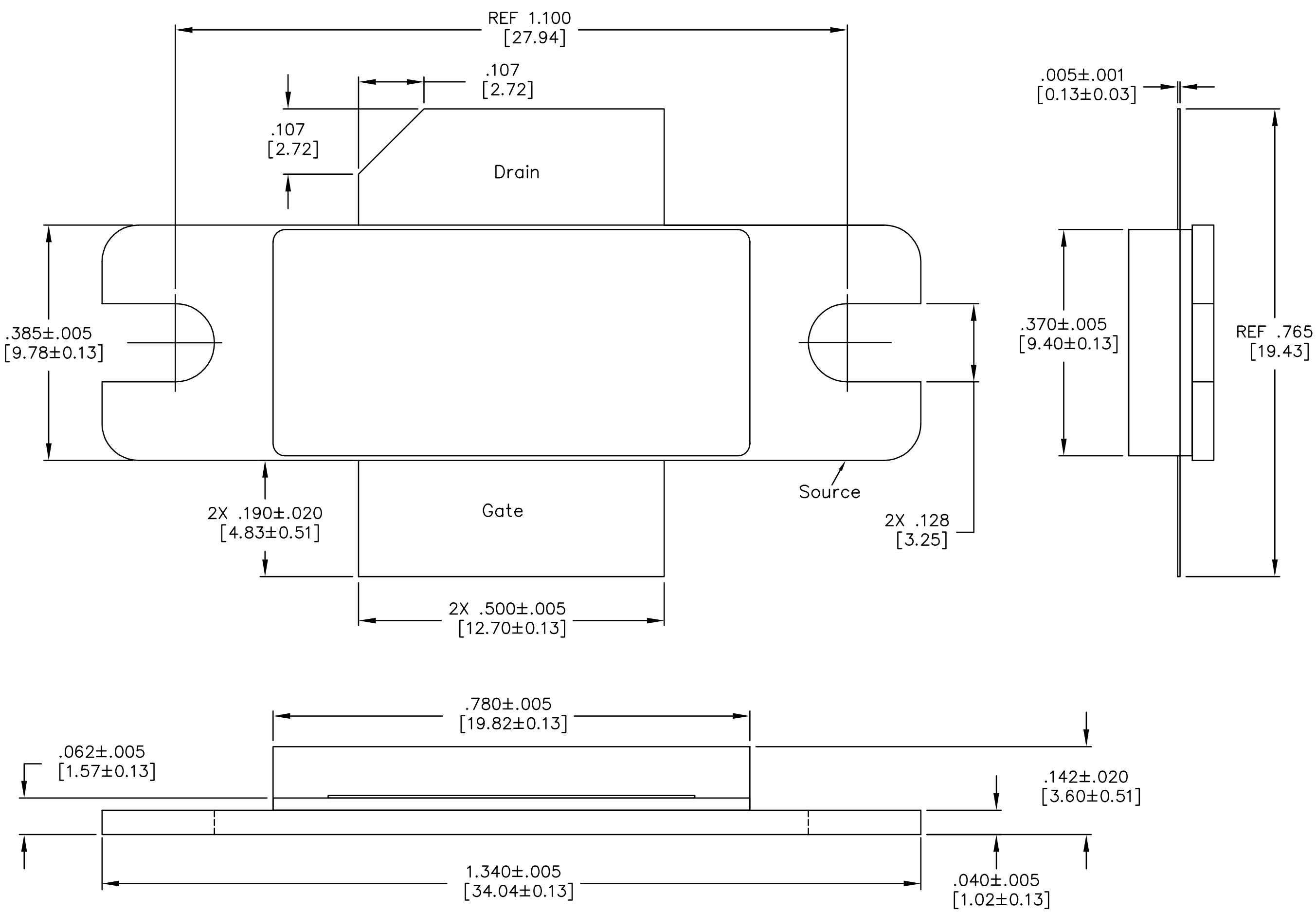


Figure 22 - AC780B-2 Metal-Ceramic Package Dimensions and Pinout (all dimensions are in inches [mm])

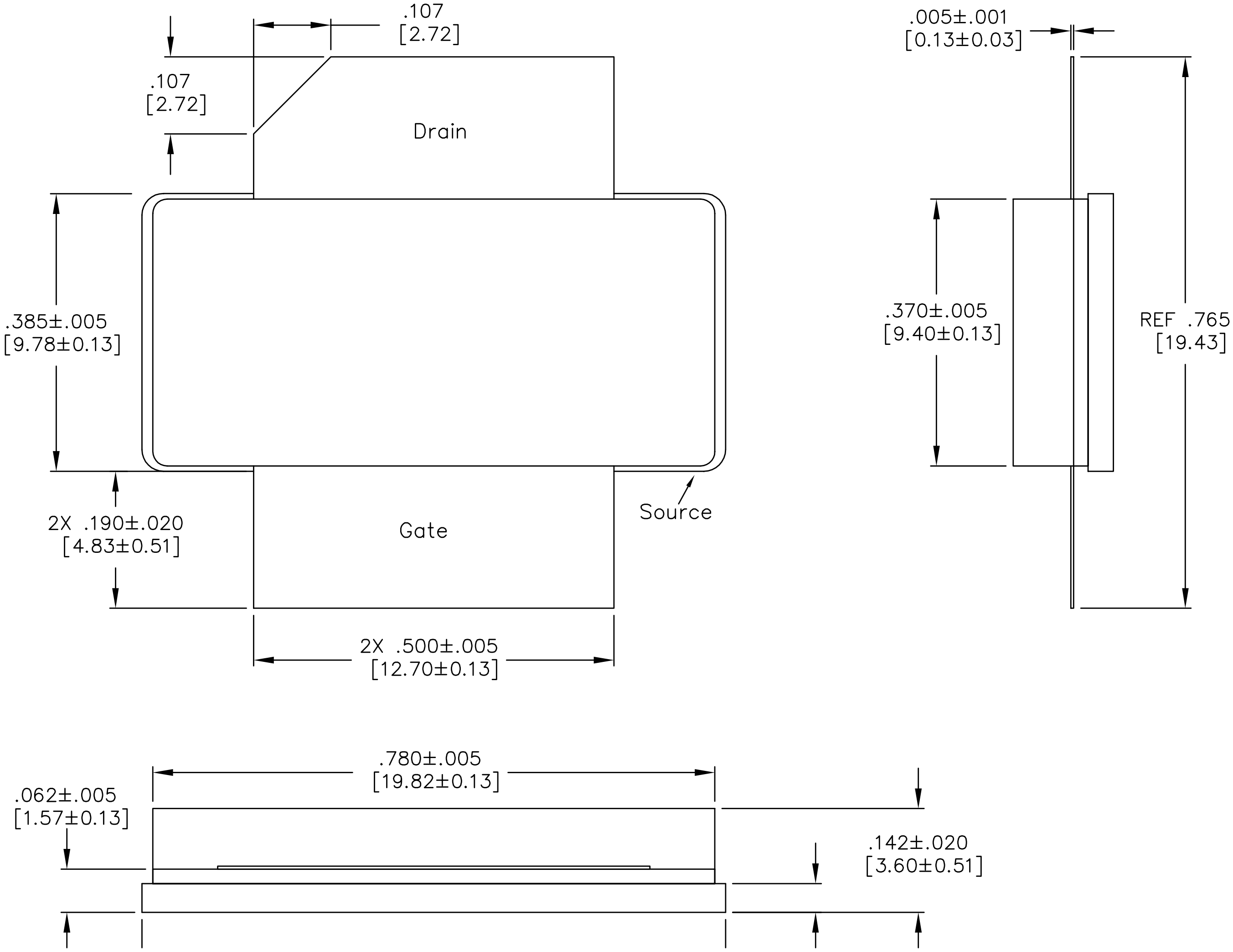


Figure 23 - AC780P-2 Metal-Ceramic Package Dimensions and Pinout (all dimensions are in inches [mm])

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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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