

Gallium Nitride 28V, 23W RF Power Transistor

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

FEATURES

- Optimized for CW, pulsed, WiMAX, and other applications from DC - 3000 MHz
- 23W P_{3dB} peak envelope power (PEP)
- 1.5W linear power @ 2% EVM for single carrier OFDM, 10.3dB peak/average, 3.5MHz channel bandwidth, 14dB gain, 23.5% efficiency, 2500-2700MHz
- 100% RF tested
- Thermally-enhanced industry standard package
- High reliability gold metallization process
- Lead-free and RoHS compliant
- Subject to EAR99 export control



DC - 3000 MHz
23 Watt, 28 Volt
GaN HEMT



Typical 2-Tone Performance: V_{DS} = 28V, I_{DQ} = 200mA, Frequency = 2500MHz, Tone Spacing = 1.0MHz, T_C = 25°C
Measured in Nitronex Test Fixture

Symbol	Parameter	Min	Typ	Max	Units
P _{3dB,PEP}	Peak Envelope Power at 3dB Compression	20	25	-	W
P _{1dB,PEP}	Peak Envelope Power at 1dB Compression	-	15	-	W
G _{SS}	Small Signal Gain	13.0	14.0	15.0	dB
η	Drain Efficiency at 3dB Compression	53	58	-	%

Typical OFDM Performance: V_{DS} = 28V, I_{DQ} = 200mA, 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. Frequency = 2500 - 2700MHz. P_{OUT,AVG} = 1.5W, T_C = 25°C. Measured in Load Pull System (Refer to Table 1 and Figure 1)

Symbol	Parameter	Typ	Units
G _p	Power Gain	14.0	dB
η	Drain Efficiency	23.5	%
EVM	Error Vector Magnitude	2.0	%

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

Symbol	Parameter	Min	Typ	Max	Units
Off Characteristics					
V_{BDS}	Drain-Source Breakdown Voltage ($V_{GS} = -8\text{V}$, $I_D = 8\text{mA}$)	100	-	-	V
I_{DLK}	Drain-Source Leakage Current ($V_{GS} = -8\text{V}$, $V_{DS} = 60\text{V}$)	-	-	4	mA
On Characteristics					
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 ($V_{DS} = 28\text{V}$, $I_D = 200\text{mA}$)	-2.0	-1.5	-1.0	V
R_{ON}	On Resistance ($V_{GS} = 2\text{V}$, $I_D = 60\text{mA}$)	-	0.45	0.50	Ω
$I_{D,MAX}$	Drain Current ($V_{DS} = 7\text{V}$ pulsed, 300ms pulse width, 0.2% duty cycle)	-	5.0	-	A

Absolute Maximum Ratings: Not simultaneous, $T_C = 25^\circ\text{C}$ 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)	28	W
θ_{JC}	Thermal Resistance (Junction-to-Case)	6.25	$^\circ\text{C}/\text{W}$
T_{STG}	Storage Temperature Range	-65 to 150	$^\circ\text{C}$
T_J	Operating Junction Temperature	200	$^\circ\text{C}$
HBM	Human Body Model ESD Rating (per JESD22-A114)	1A (>250V)	
MM	Machine Model ESD Rating (per JESD22-A115)	M1 (>50V)	
MSL	Moisture Sensitivity Level (Per IPC/JEDEC J-STD-20) @ 260°C Peak Package Temperature	3	

Load-Pull Data, Reference Plane at Device Leads

$V_{DS}=28V$, $I_{DQ}=200mA$, $T_A=25^\circ C$ unless otherwise noted

Table 1: Optimum Impedance Characteristics for Linear OFDM Tuning, 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

Frequency (MHz)	$Z_S (\Omega)$	$Z_L (\Omega)$	$P_{OUT} (W)$	Gain (dB)	Drain Efficiency (%)
2500	5.2 - j 1.6	3.3 + j 1.7	1.5	14.5	25
2600	4.6 - j 1.9	3.1 + j 2.7	1.5	14.5	25
2700	4.0 - j 2.2	2.9 + j 4.3	1.5	14.4	24

Table 2: Optimum Impedance Characteristics for CW P_{SAT} , Efficiency, and Gain

Frequency (MHz)	$Z_S (\Omega)$	$Z_L (\Omega)$	$P_{SAT} (W)$	$G_{SS} (dB)$	Drain Efficiency (%)
2500	3.7 - j 4.7	6.9 - j 1.2	23	14.5	60

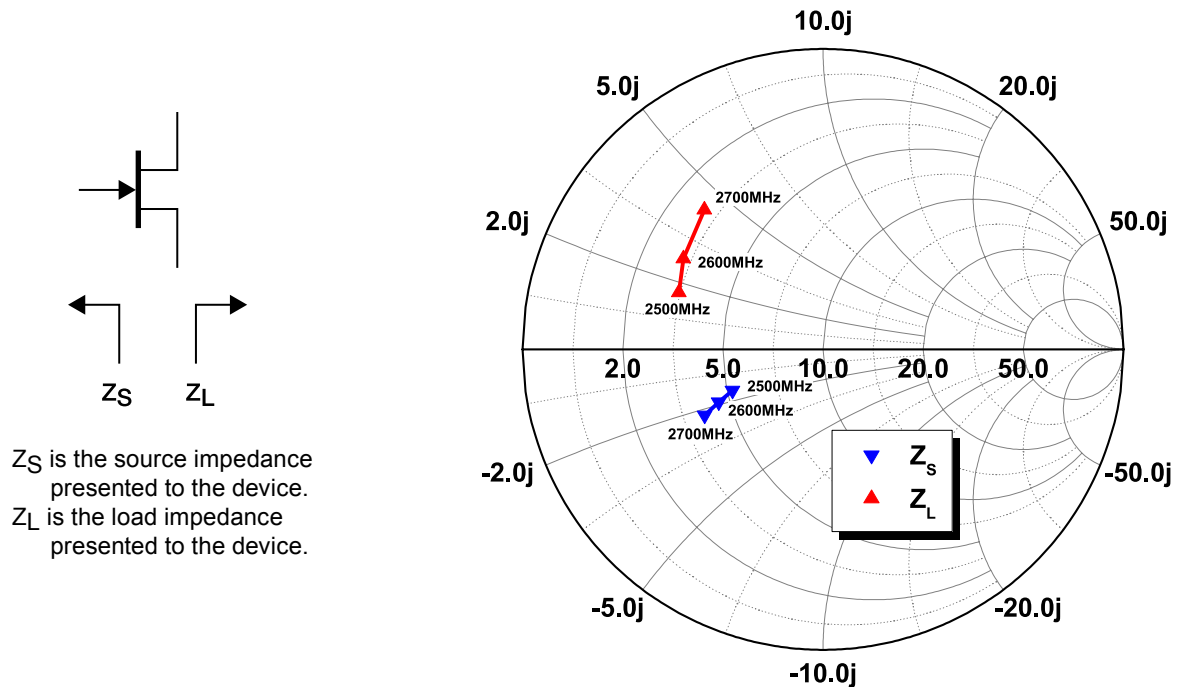


Figure 1 - Optimum Impedance Characteristics for OFDM Tuning, $V_{DS} = 28V$, $I_{DQ} = 200mA$

Load-Pull Data, Reference Plane at Device Leads

$V_{DS}=28V$, $I_{DQ}=200mA$, $T_A=25^\circ C$ unless otherwise noted

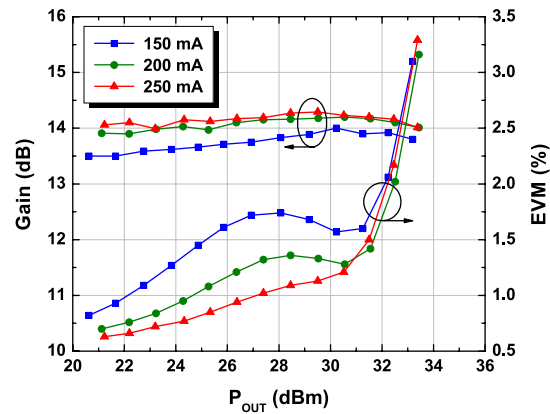


Figure 2 - Typical OFDM Performance at 2500MHz and 28V versus I_{DQ}

Typical Device Characteristics

$V_{DS}=28V$, $I_{DQ}=200mA$, $T_A=25^\circ C$ unless otherwise noted

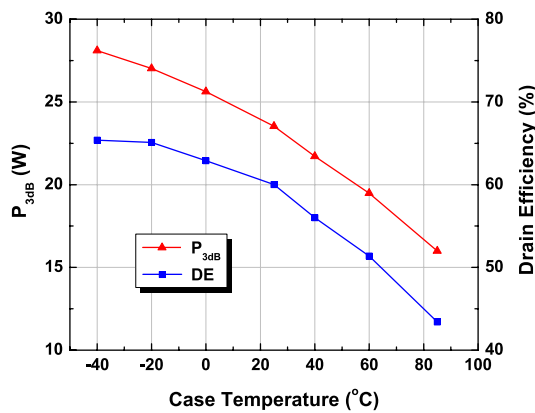


Figure 3 - $P_{3dB,PEP}$ and Drain Efficiency versus Temperature at 2500MHz, Application Board

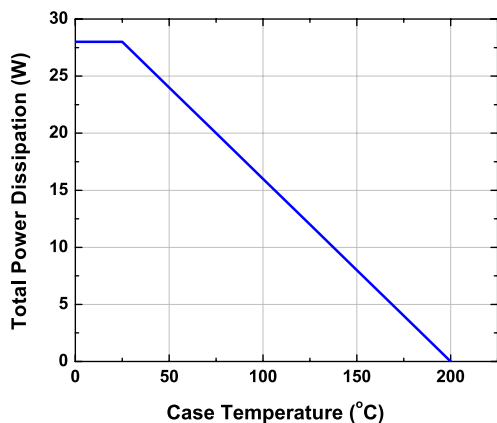


Figure 4 - Power Derating Curve

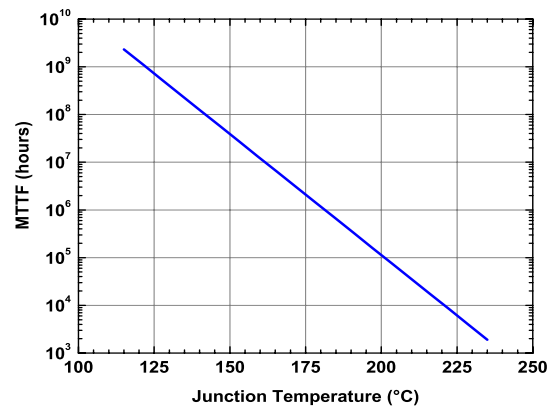


Figure 5 - MTTF of NRF1 devices as a function of junction temperature

APP-NPT25015-25, 2500-2700MHz Linear WiMAX Application Board

802.16e Single Carrier OFDM, 64-QAM 3/4, 8-burst, 20ms frame 75% filled, 10MHz channel bandwidth, PAR=10.3dB @ 0.01% CCDF
 Detailed design information and data available at www.nitronex.com

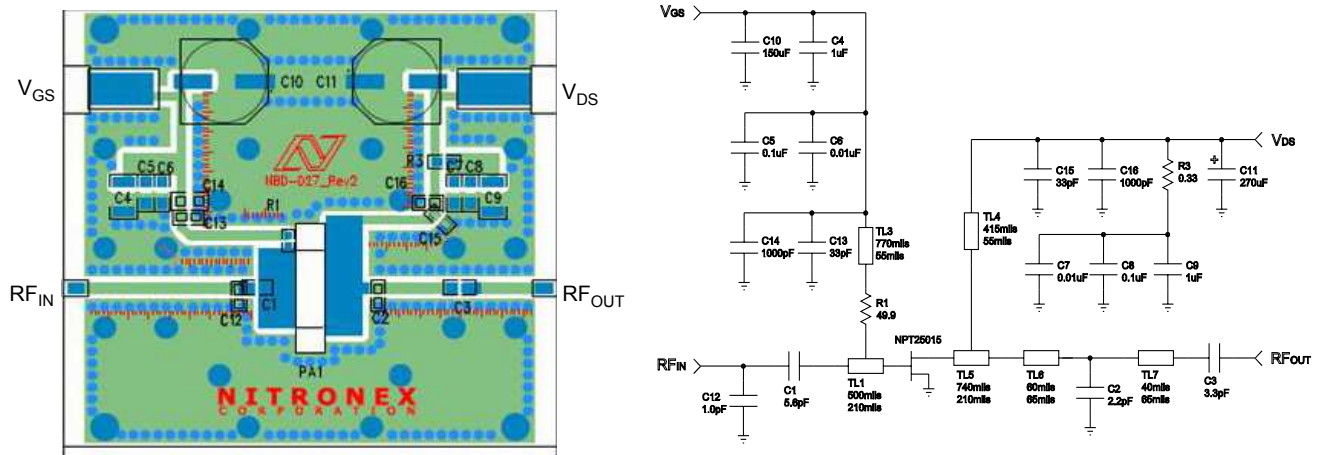


Figure 6 - APP-NPT25015-25 Demonstration Board and Schematic

Table 2: APP-NPT25015-25 Demonstration Board Bill of Materials

Name	Value	Tolerance	Vendor	Vendor Number
C1	5.6pF	+/- 0.1pF	ATC	ATC600F5R6B
C2	2.2pF	+/- 0.1pF	ATC	ATC600F2R2B
C3	3.3pF	+/- 0.1pF	ATC	ATC600F3R3B
C4, C9	1.0uF	10%	Panasonic	ECJ-5YB2A105M
C5, C8	0.1uF	10%	Kemet	C1206C104K1RACTU
C6, C7	0.01uF	10%	AVX	12061C103KAT2A
C10	150uF	20%	Nichicon	UPW1C151MED
C11	270uF	20%	United Chemi-Con	ELXY630ELL271MK25S
C12	1.0pF	+/- 0.1pF	ATC	ATC600F1R0B
C13, C15	33pF	5%	ATC	ATC600F330B
C14, C16	1000pF	10%	Kemet	C0805C102K1RACTU
PA1	--	--	--	NPT25015D
R1	49.9 ohm	1%	Panasonic	ERJ-2RKF49R9X
R3	0.33 ohm	1%	Panasonic	ERJ-6RQFR33V
--	--	--	--	Coin to mount PA1
Substrate			Rogers	R04350, t = 30mil $\epsilon_r = 3.5$

APP-NPT25015-25, 2500-2700MHz Linear WiMAX Application Board

802.16e Single Carrier OFDM, 64-QAM 3/4, 8-burst, continuous frame data, 10MHz channel bandwidth, PAR=10.3dB @ 0.01% CCDF
 Detailed design information and data available at www.nitronex.com

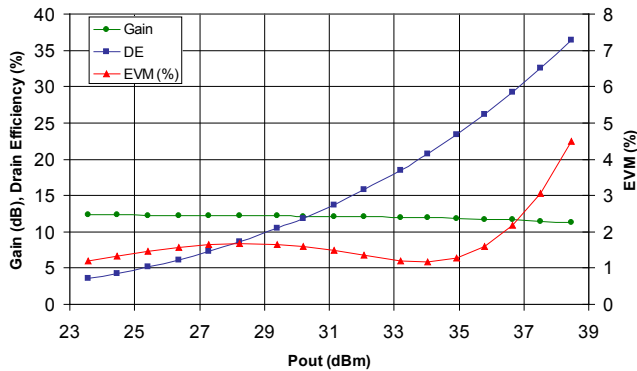


Figure 7 - Gain, Efficiency, EVM at 2500MHz

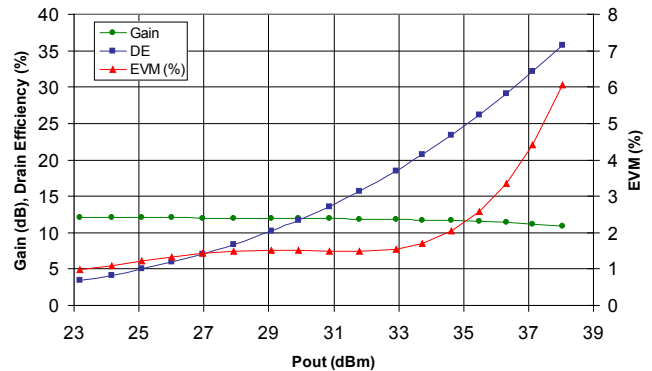


Figure 8 - Gain, Efficiency, EVM at 2600MHz

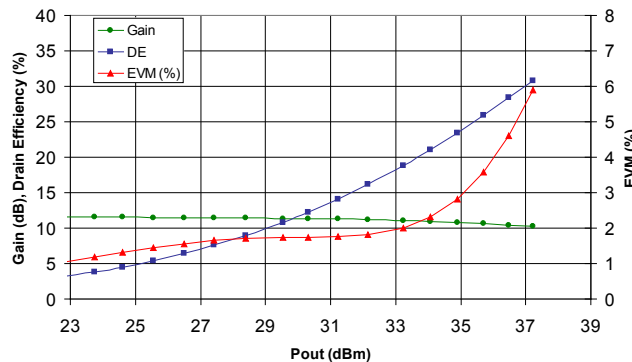


Figure 9 - Gain, Efficiency, EVM at 2700MHz

NPT25015



Ordering Information

Part Number	Order Multiple	Description
NPT25015DT	97	Tube; NPT25015 in D (PSOP2) Package
NPT25015DR	1500	Tape and Reel; NPT25015 in D (PSOP2) Package

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

Figure 10 - D Package Dimensions and Pinout

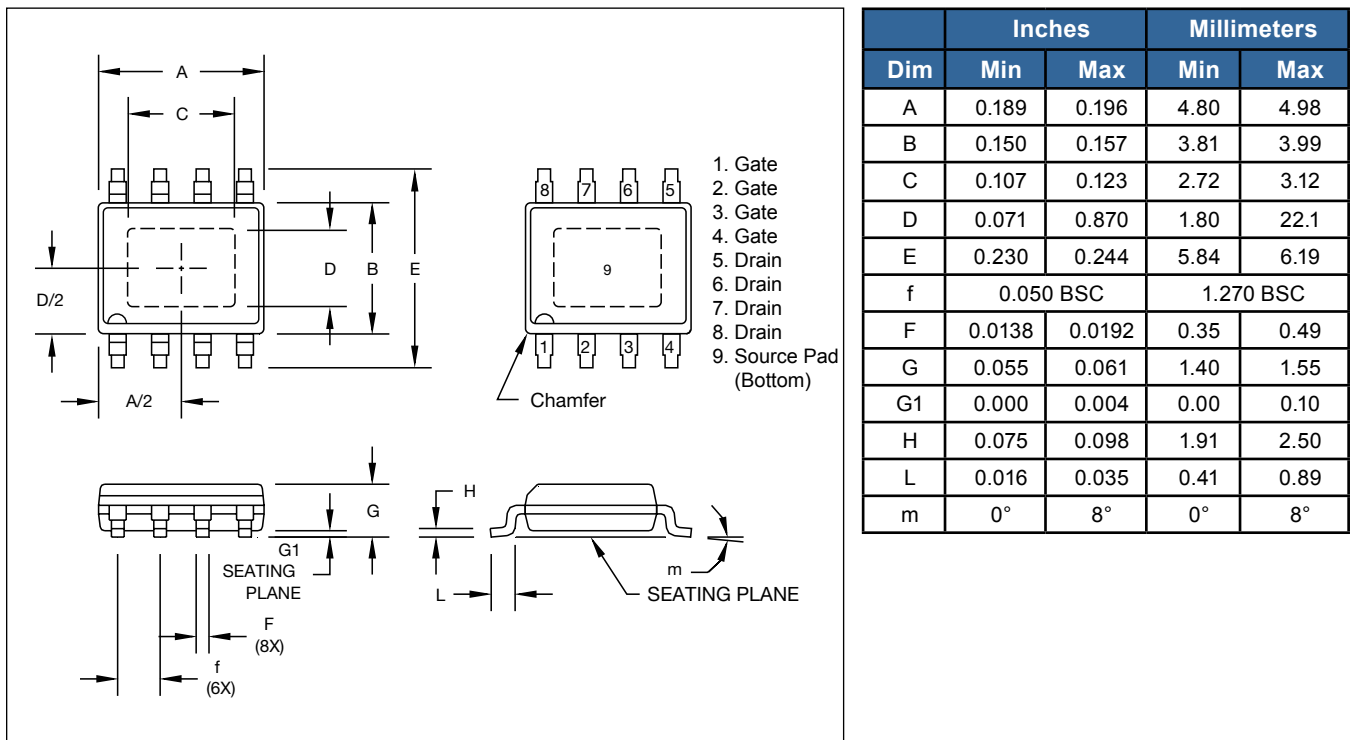
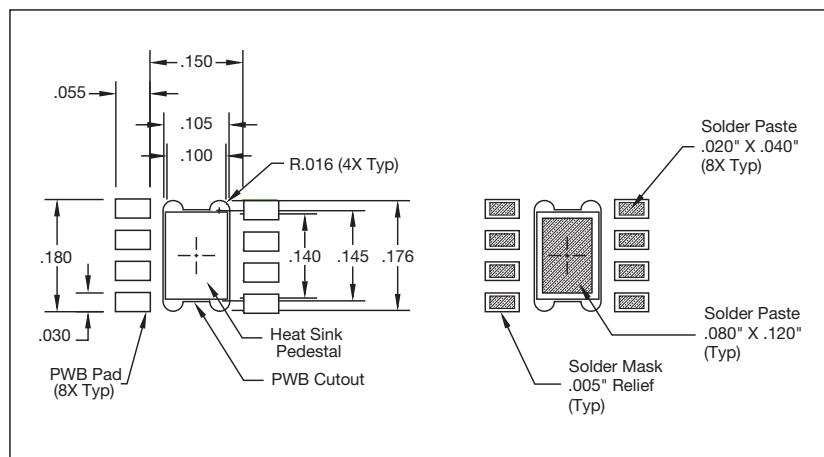


Figure 11 - Mounting Footprint



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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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