NPT35015

Gallium Nitride 28V, 18W 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 3300 - 3800 MHz
- 18W P3dB CW Power
- 25W P3dB peak envelope power
- 1.7W linear power @ 2% EVM for single carrier OFDM, 10.3dB peak/average, 10.3dB @ 0.01% probability on CCDF, 10.5dB gain, 18% drain 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 EAR99 export control

3300 – 3800 MHz
18 Watt, 28 Volt
GaN HEMT

RoHS

Typical 2-Tone Performance: V_{DS} = 28V, I_{DQ} = 200mA, Frequency = 3500MHz, Tone spacing = 1MHz, T_C = 25°C. Measured in Nitronex Test Fixture

Symbol	Parameter	Min	Typ	Max	Units
$P_{3dB,PEP}$	Peak Envelope Power at 3dB Compression	14	18	-	W
$P_{1dB,PEP}$	Peak Envelope Power at 1dB Compression	-	10	-	W
G_{SS}	Small Signal Gain	10	11	-	dB
η	Peak Drain Efficiency at $P_{OUT} = P_{3dB}$	43	48	-	%

RF Specifications (CW): V_{DS} = 28V, I_{DQ} = 200mA, Frequency = 3500MHz, T_C = 25°C, Measured in Load Pull System

Symbol	Parameter	Typ	Units
P_{3dB}	Average Output Power at 3dB Gain Compression	18	W
$P_{3dB,Pulsed}$	Pulsed Output Power at 3dB Gain Compression	20	W
$P_{1dB,Pulsed}$	Pulsed Output Power at 1dB Gain Compression	15	W

Typical OFDM Performance: V_{DS} = 28V, I_{DQ} = 200mA, $P_{OUT,AVG}$ = 1.7W, single carrier OFDM waveform 64-QAM 3/4, 8 burst, 20ms frame, 15ms frame data, 3.5MHz channel bandwidth. Peak/Avg = 10.3dB @ 0.01% probability on CCDF. Frequency = 3300 to 3800MHz. T_C=25°C. Measured in Load Pull System (Refer to Table 1 and Figure 1)

Symbol	Parameter	Typ	Units
G_P	Power Gain	10.5	dB
η	Drain Efficiency	18	%
EVM	Error Vector Magnitude	2.0	%
IRL	Input Return Loss	10	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 = 8mA)	100	-	-	V
I_{DLK}	Drain-Source Leakage Current (V_{GS} = -8V, V_{DS} = 60V)	-	-	4	mA
On Characteristics					
V_T	Gate Threshold Voltage (V_{DS} = 28V, I_D = 8mA)	-2.3	-1.8	-1.3	V
V_{GSQ}	Gate Quiescent Voltage (V_{DS} = 28V, I_D = 200mA)	-2.0	-1.5	-1.0	V
R_{ON}	On Resistance (V_{GS} = 2V, I_D = 60mA)	-	0.45	0.50	Ω
I_D	Drain Current (V_{DS} = 7V pulsed, 300µs pulse width, 0.2% duty cycle, V_{GS} = 2V)	-	5.0	-	A

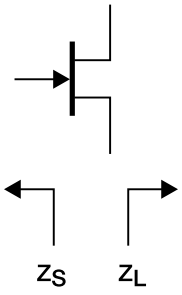
Absolute Maximum Ratings: Not simultaneous, T_C = 25°C unless otherwise noted

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)	28	W
θ_{JC}	Thermal Resistance (Junction-to-Case)	6.25	°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)	1A (>250V)	
MM	Machine Model ESD Rating (per JESD22-A115)	M1 (>50V)	

Table 1: Optimum Source and Load Impedances for OFDM Linearity, V_{DS} = 28V, I_{DQ} = 200mA

Frequency (MHz)	Z_S (Ω)	Z_L (Ω)	P_{OUT} (W)	Gain (dB)	Drain Efficiency (%)
3300[1]	5.4 - j10.3	2.9 - j2.5	1.7	10.9	19
3400[1]	5.0 - j10.7	2.9 - j2.6	1.8	11.0	22
3500[1]	4.4 - j11.2	2.8 - j2.7	1.7	10.9	21
3600[1]	4.0 - j12.5	2.8 - j3.3	1.7	10.9	20
3700[1]	3.5 - j13.4	3.0 - j3.8	1.8	10.8	20
3800[1]	3.5 - j14.6	3.2 - j4.2	1.8	10.7	20

Note 1: 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.

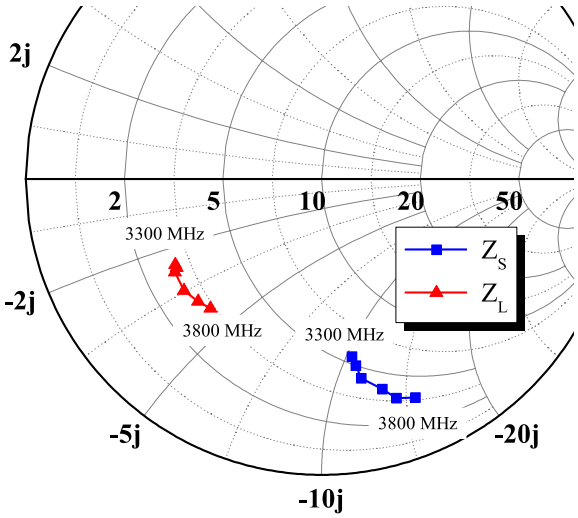


Figure 1 - Optimal Impedances for OFDM Linearity, V_{DS} = 28V, I_{DQ} = 200mA

Load-Pull Data, Reference Plane at Device Leads

V_{DS}=28V, I_{DQ}=200mA, T_A=25°C unless otherwise noted.

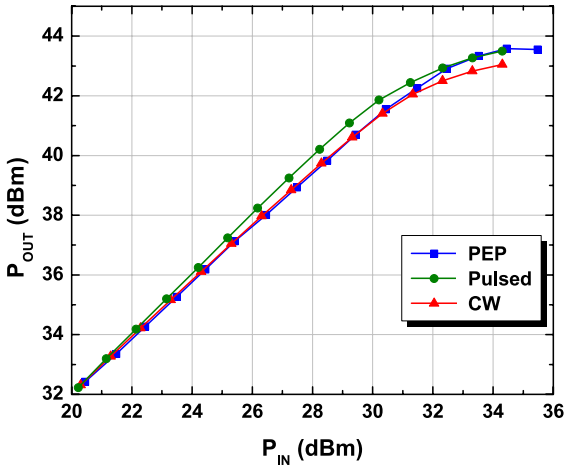


Figure 2 - CW, pulsed CW, and PEP, 3500MHz, Constant Impedance States

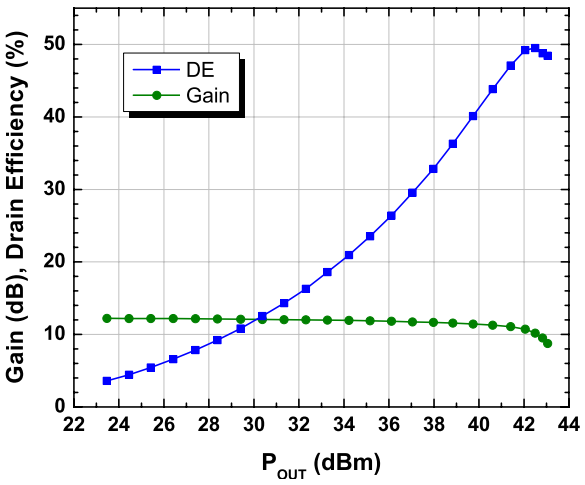


Figure 3 - CW Power Sweep, 3500MHz

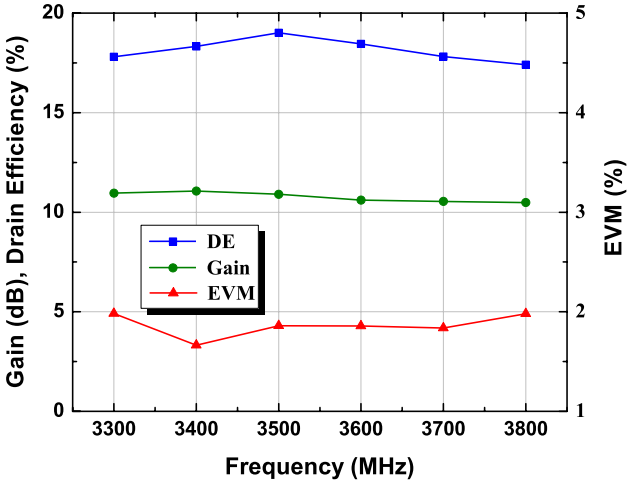


Figure 4 - Typical OFDM Performance P_{OUT} = 1.5W

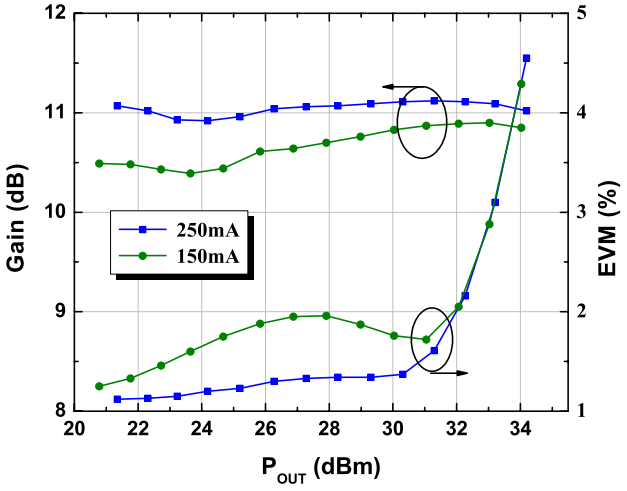


Figure 5 - Typical OFDM Performance at 3500MHz versus I_{DQ}

Load-Pull Data, Reference Plane at Device Leads

V_{DS}=28V, I_{DQ}=200mA, T_A=25°C unless otherwise noted.

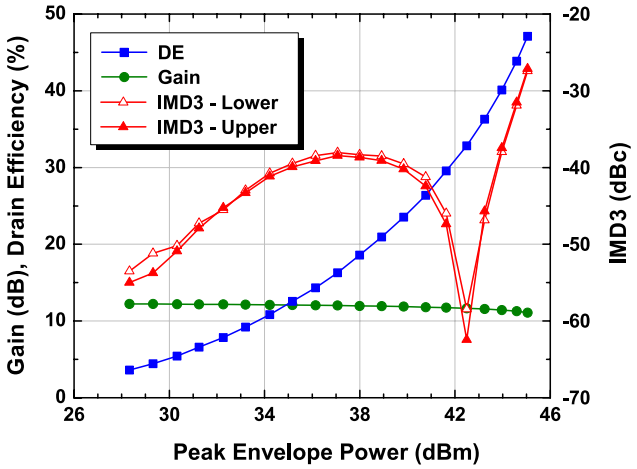


Figure 6 - Typical IMD3 Performance, 3500MHz

Typical Device Characteristics

V_{DS}=28V, I_{DQ}=200mA, T_A=25°C unless otherwise noted.

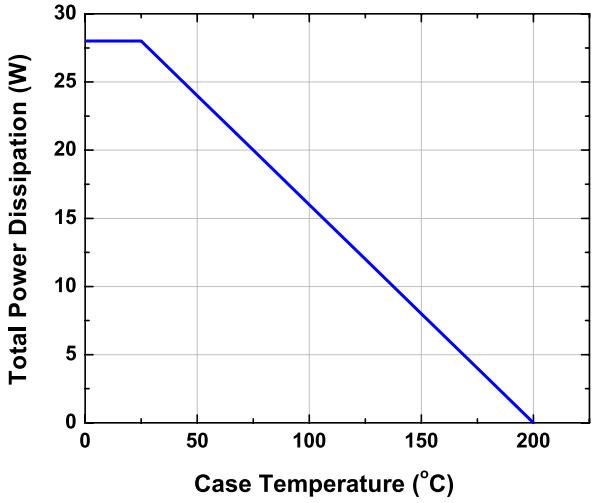


Figure 7 - Power Derating Curve

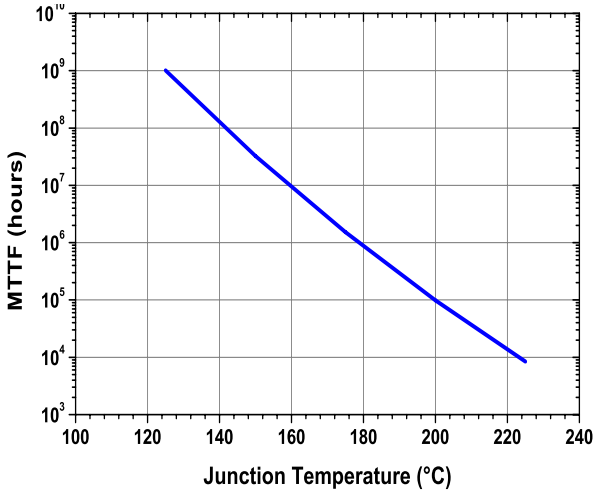


Figure 8 - MTTF of NRF1 Devices

AD-006 3400-3600MHz 1.7W Linear WiMAX Application Design

802.16e Single Carrier OFDM, 64-QAM 3/4, 8-burst, 20ms frame 100% filled, 3.5MHz channel bandwidth, PAR=10.3dB @ 0.01% CCDF

Detailed design information and data available at www.nitronex.com

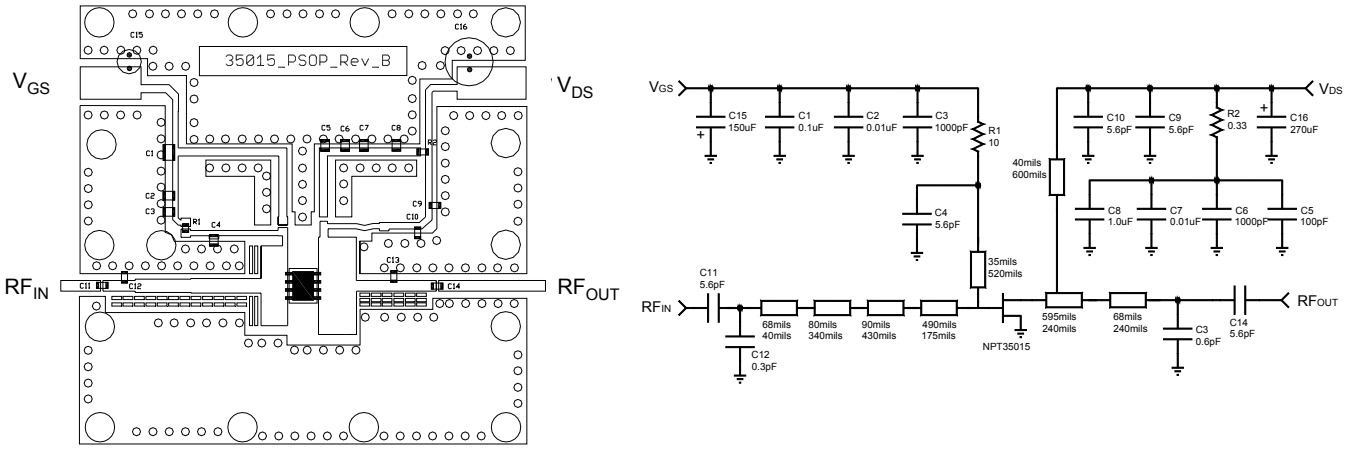


Figure 9 - AD-006 Demonstration Board and Schematic

Table 2: AD-006 Demonstration Board Bill of Materials

Name	Value	Tolerance	Vendor	Vendor Number
C1	0.1uF	10%	Kemet	C1206C104K1RACTU
C2, C7	0.01uF	10%	AVX	12061C103KAT2A
C3, C6	1000pF	10%	Kemet	C0805C102K1RACTU
C5	100pF	10%	Kemet	C0805C101K1RACTU
C8	1.0uF	10%	Panasonic	ECJ-5YB2A105M
C4, C9, C10, C11, C14	5.6pF	+/- 0.1pF	ATC	ATC600F5R6B
C12	0.3pF	+/- 0.1pF	ATC	ATC600F0R3B
C13	0.6pF	+/- 0.1pF	ATC	ATC600F0R6B
C15	150uF	20%	Nichicon	UPW1C151MED
C16	270uF	20%	United Chemi-Con	ELXY630ELL271MK25S
R1	10 ohm	1%	Panasonic	ERJ-2RKF10R0X
R2	0.33 ohm	1%	Panasonic	ERJ-6RQFR33V
PA1	--	--	--	NPT35015D
Substrate			Rogers	R04350, t = 30mil ε_r = 3.5

AD-006 3400-3600MHz 1.7W Linear WiMAX Application Design

802.16e Single Carrier OFDM, 64-QAM 3/4, 8-burst, 20ms frame 100% filled, 3.5MHz channel bandwidth, PAR=10.3dB @ 0.01% CCDF
Detailed design information and data available at www.nitronex.com

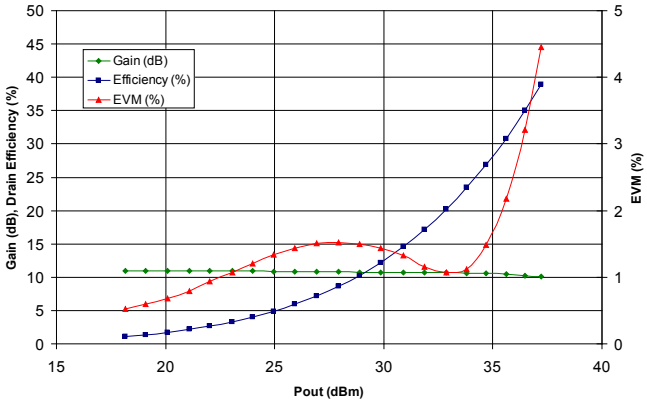


Figure 10 - Gain, Efficiency, EVM at 3400MHz

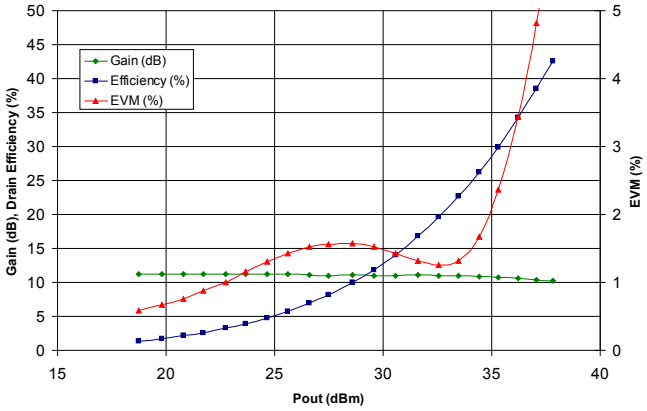


Figure 11 - Gain, Efficiency, EVM at 3500MHz

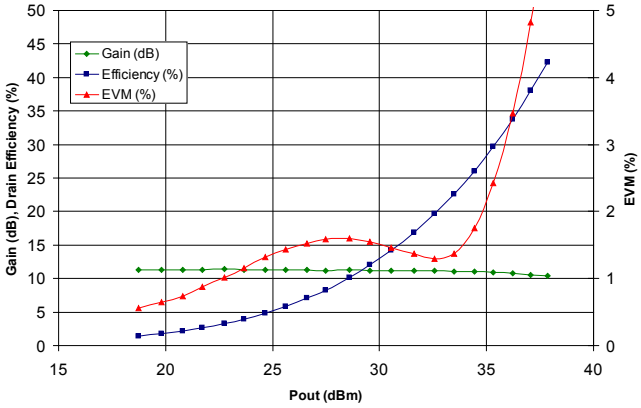


Figure 12 - Gain, Efficiency, EVM at 3600MHz

AD-006 3400-3600MHz 1.7W Linear WiMAX Application Design

802.16e Single Carrier OFDM, 64-QAM 3/4, 8-burst, 20ms frame 100% filled, 3.5MHz channel bandwidth, PAR=10.3dB @ 0.01% CCDF

Detailed design information and data available at www.nitronex.com

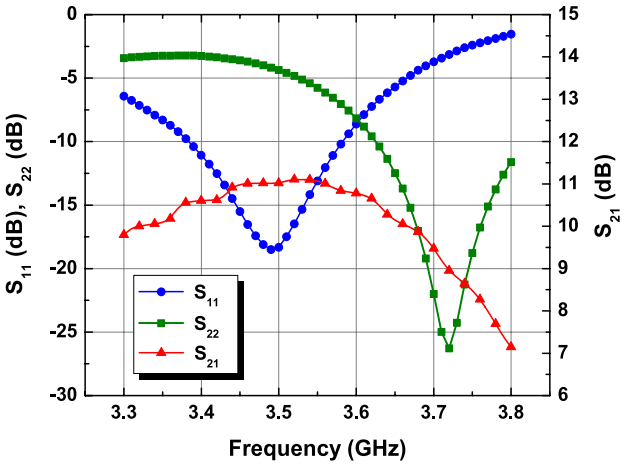


Figure 14 - Typical S_{11} and S_{21}

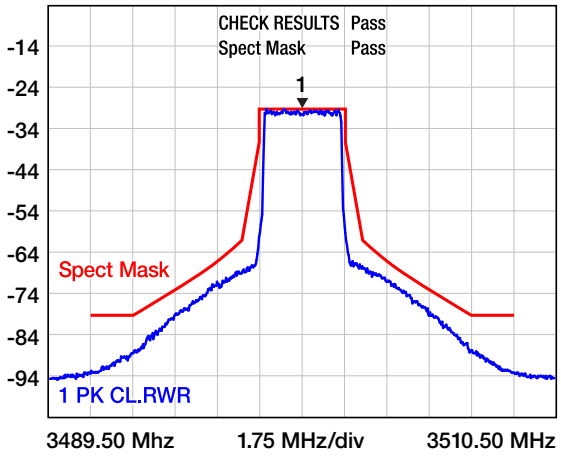


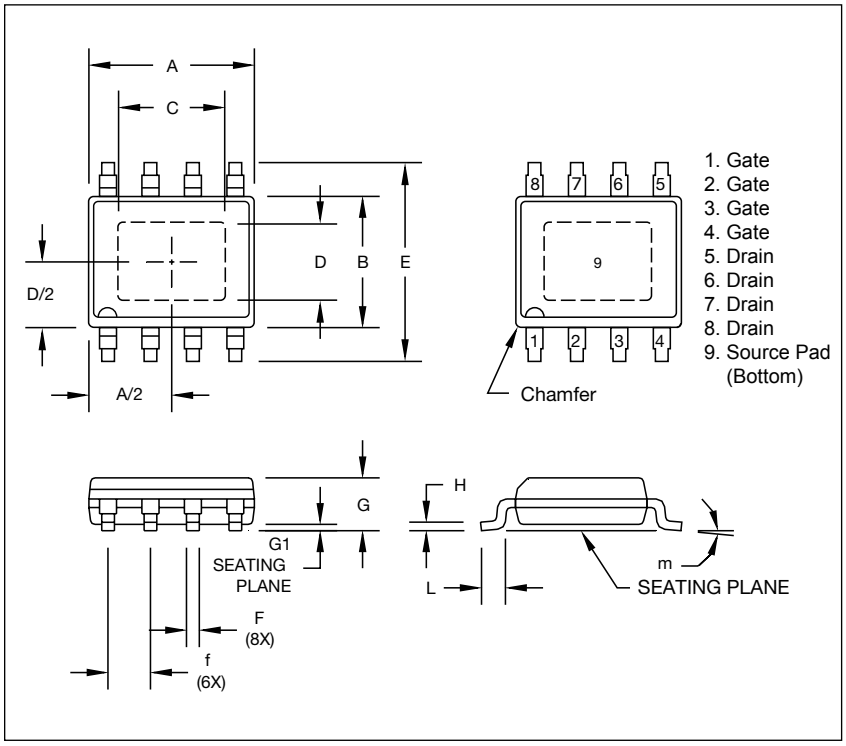
Figure 13 - ETSI Mask Compliance in Nitronex Demonstration Board at 3500MHz and P_{OUT} = 1.5W

Ordering Information

Part Number	Order Multiple	Description
NPT35015DT	97	Tube; NPT35015 in D (PSOP2) Package
NPT35015DR	1500	Tape and Reel; NPT35015 in D (PSOP2) Package

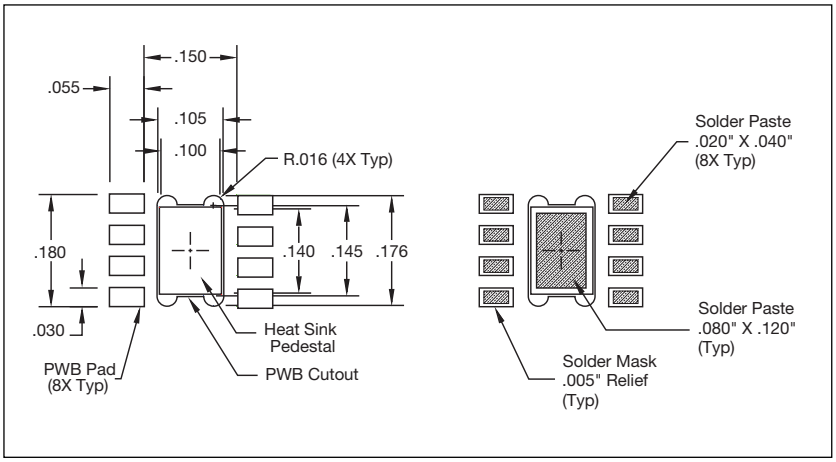
1: To find a Nitronex contact in your area, visit our website at http://www.nitronex.com

Figure 15 - 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	22.1
E	0.230	0.244	5.84	6.19
f	0.050 BSC		1.270 BSC	
F	0.0138	0.0192	0.35	0.49
G	0.055	0.061	1.40	1.55
G1	0.000	0.004	0.00	0.10
H	0.075	0.098	1.91	2.50
L	0.016	0.035	0.41	0.89
m	0°	8°	0°	8°

Figure 16 - 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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