NITRONEX CORPORATION

Gallium Nitride 28V, 5W 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 DC to 6GHz
- 100% RF Tested at 2500MHz
- 5W P3dB CW Power
- 15.5dB Power Gain
- Low cost, surface mount SOIC package
- High reliability gold metallization process
- Lead-free and RoHS compliant
- Subject to EAR99 Export Control

DC - 6000MHz
5 Watt, 28 Volt
GaN HEMT

RoHS

2-Tone Performance: V_{DS} = 28V, I_{DQ} = 50mA, Frequency = 2500MHz, Tone spacing = 1MHz, T_C = 25°C
Measured in Nitronex Test Fixture

Symbol	Parameter	Min	Typ	Max	Units
$P_{1dB,PEP}$	Peak Envelope Power at 1dB Compression	5.0	7.5	-	W
G_{SS}	Small Signal Gain	14.5	15.5	-	dB
P_{IMD3}	Peak Envelope Power at -35dBm IMD3	-	2.5	-	W
η	Drain Efficiency at 3dB Compression	55	60	-	%

RF Specifications (CW): V_{DS} = 28V, I_{DQ} = 50mA, Frequency = 2500MHz, T_C = 25°C, Measured in Nitronex Test Fixture

Symbol	Parameter	Typ	Units
P_{3dB}	Average Output Power at 3dB Compression	5.1	W
P_{1dB}	Average Output Power at 1dB Compression	2.9	W
η	Drain Efficiency at 3dB Compression	56	%

OFDM Performance: V_{DS} = 28V, I_{DQ} = 100mA, Single carrier OFDM waveform 64-QAM 3/4, 8 burst, continuous frame data, 3.5 MHz channel bandwidth. Peak/Avg. = 10.3dB @ 0.01% probability on CCDF. Frequency = 3500MHz, $P_{OUT,AVG}$ = 24dBm, T_C = 25°C. Measured in Load Pull System

Symbol	Parameter	Typ	Units
G_P	Power Gain	11.2	dB
η	Drain Efficiency	9	%
EVM	Error Vector Magnitude	1.0	%

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 = 2mA)	100	-	-	V
I_{DLK}	Drain-Source Leakage Current (V_{GS} = -8V, V_{DS} = 60V)	-	0.5	2	mA
On Characteristics					
V_T	Gate Threshold Voltage (V_{DS} = 28V, I_D = 2mA)	-2.0	-1.5	-1.0	V
V_{GSQ}	Gate Quiescent Voltage (V_{DS} = 28V, I_D = 50mA)	-1.8	-1.3	-0.8	V
R_{ON}	On Resistance (V_{GS} = 2V, I_D = 15mA)	-	2.0	2.2	Ω
I_D	Drain Current (V_{DS} = 7V pulsed, 300µs pulse width, 0.2% duty cycle, V_{GS} = 2V)	1.1	1.3	-	A

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

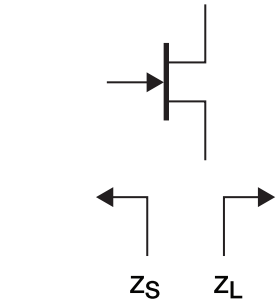
Symbol	Parameter	Max	Units
V_{DS}	Drain-Source Voltage	100	V
V_{GS}	Gate-Source Voltage	-10 to 3	V
P_T	Total Device Power Dissipation (Derated above 25°C)	7.6	W
θ_{JC}	Thermal Resistance (Junction-to-Case)	23	°C/W
T_{STG}	Storage Temperature Range	-65 to 150	°C
T_J	Operating Junction Temperature	200	°C
HBM	Human Body Model ESD Rating (per JESD22-A114)	1A (>250V)	
MM	Machine Model ESD Rating (per JESD22-A115)	M1(>50V)	
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, T_A=25°C unless otherwise noted

Table 1: Optimum Source and Load Impedances (V_{DS} = 28V)

Frequency	Z_S (Ω)	Z_L (Ω)	I_{DQ} (mA)	Optimized Tuning Condtion
900	9.2 + j23.8	52.6 + j22.8	50	CW Power and Efficiency
1800	5.2 + j0.5	24.5 + j18.3	50	CW Power and Efficiency
2140	5.0 - j2.6	17.1 + j15.0	50	CW Power and Efficiency
2500	5.4 - j10.5	14.7 + j10.0	50	CW Power and Efficiency
3500	5.0 - j21.0	11.2 + j4.7	50	CW Power and Efficiency
900	21.9 + j43.4	59.5 + j33.7	100	W-CDMA, $P_{OUT,}$ Efficiency, -45dBc ACPR
1800	13.1 + j24.3	34.5 + j48.8	100	W-CDMA, $P_{OUT,}$ Efficiency, -45dBc ACPR
2140	5.4 + j17.3	25.4 + j36.4	100	W-CDMA, $P_{OUT,}$ Efficiency, -45dBc ACPR
2600	4.0 + j6.8	12.2 + j25.8	100	LTE, $P_{OUT,}$ Efficiency, -45dBc ACPR
2500	5.0 + j16.2	13.2 + j20.4	100	OFDM, Maximum $P_{OUT,}$ 1.5% EVM
3500	4.1 - j0.6	6.6 + j10.5	100	OFDM, Maximum $P_{OUT,}$ 1.5% EVM
5100	17.8 - j16.4	10.7 - j4.9	100	OFDM, Maximum $P_{OUT,}$ 1.5% EVM
5200	21.5 - j29.0	11.9 - j4.8	100	OFDM, Maximum $P_{OUT,}$ 1.5% EVM
5700	10.2 - j13.2	11.3 - j17.0	100	OFDM, Maximum $P_{OUT,}$ 1.5% EVM
5800	11.0 - j16.3	12.1 - j15.3	100	OFDM, Maximum $P_{OUT,}$ 1.5% EVM



Z_S is the source impedance presented to the device.

Z_L is the load impedance presented to the device.

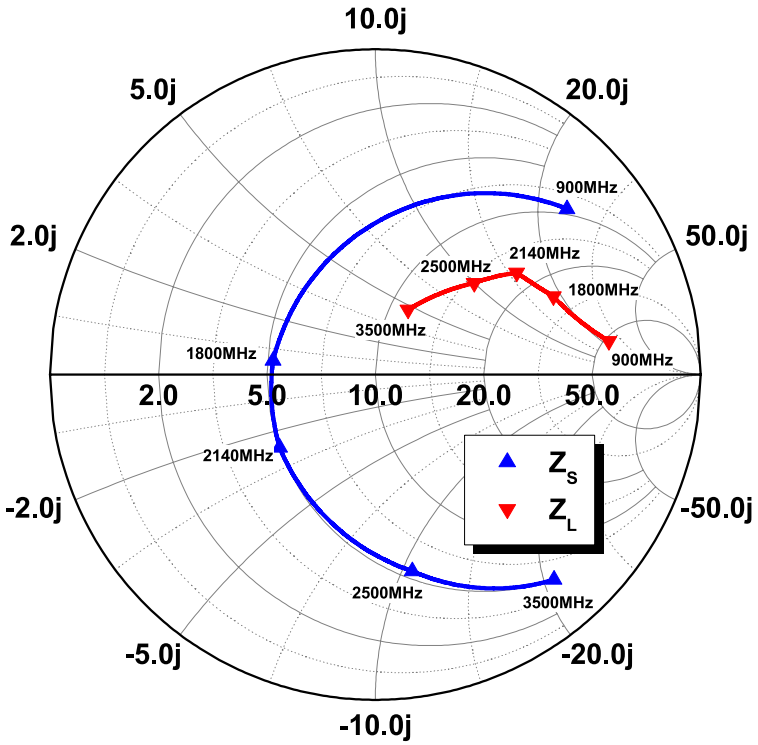


Figure 1 - Impedances for Optimum CW Power, V_{DS} = 28V, I_{DQ} = 50mA

Load-Pull Data, Reference Plane at Device Leads

V_{DS}=28V, I_{DQ}=50mA, T_A=25°C unless otherwise noted.

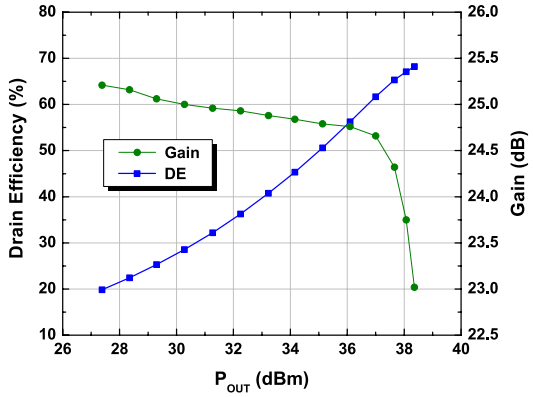


Figure 2 - Typical CW Performance
Frequency = 900MHz

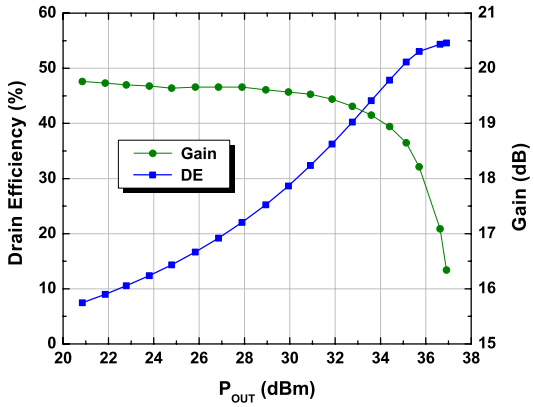


Figure 3 - Typical CW Performance
Frequency = 2500MHz

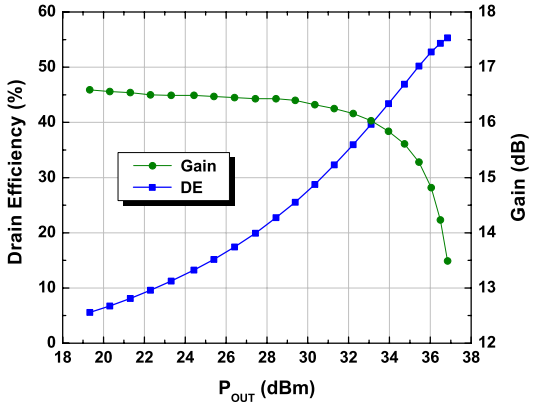


Figure 4 - Typical CW Performance
Frequency = 3500MHz

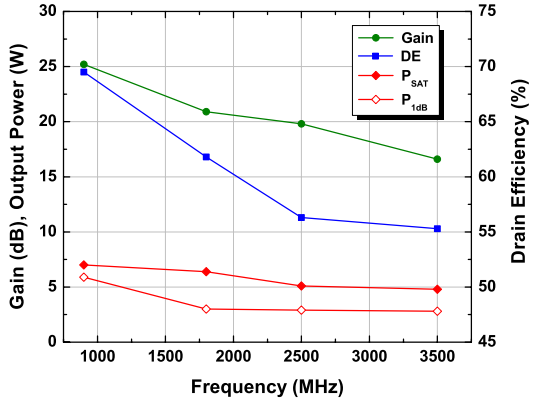


Figure 5 - Typical CW Performance
Frequency = 900 to 3500MHz

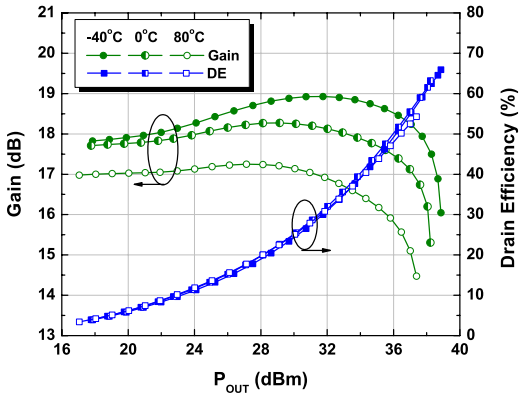


Figure 6 - Typical CW Performance
Over Temperature, Frequency = 2500MHz

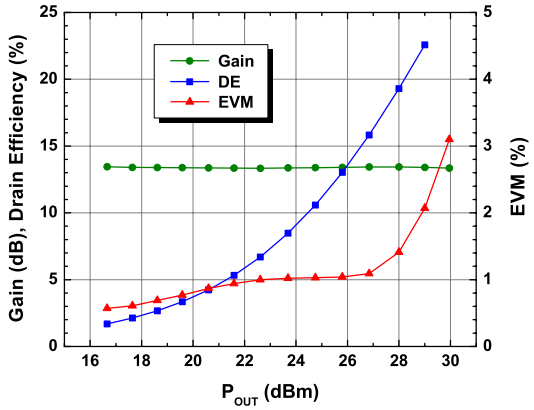


Figure 7 - Typical OFDM Performance
I_{DQ} = 100mA, Frequency = 2500MHz

Load-Pull Data, Reference Plane at Device Leads

V_{DS}=28V, I_{DQ}=50mA, T_A=25°C unless otherwise noted.

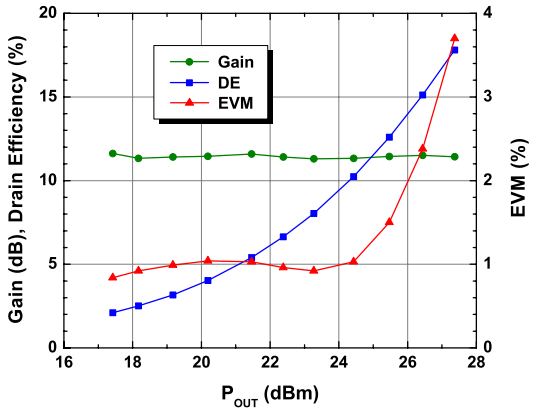


Figure 8 - Typical OFDM Performance
I_{DQ} = 100mA, Frequency = 3500MHz

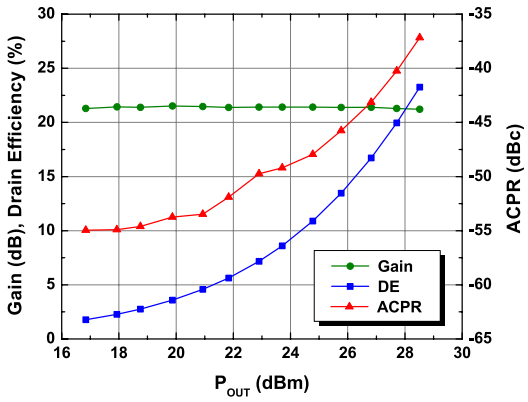


Figure 9 - Typical W-CDMA Performance
I_{DQ} = 100mA, Frequency = 900MHz

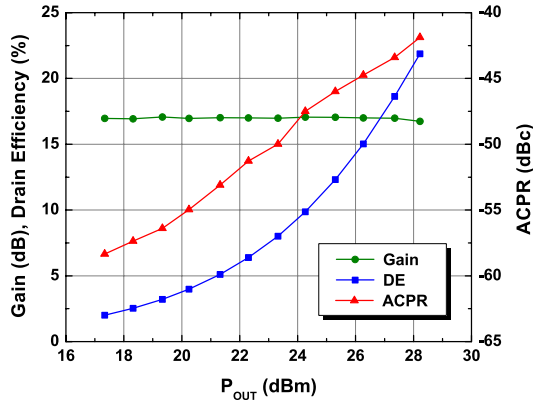


Figure 10 - Typical W-CDMA Performance
I_{DQ} = 100mA, Frequency = 1800MHz

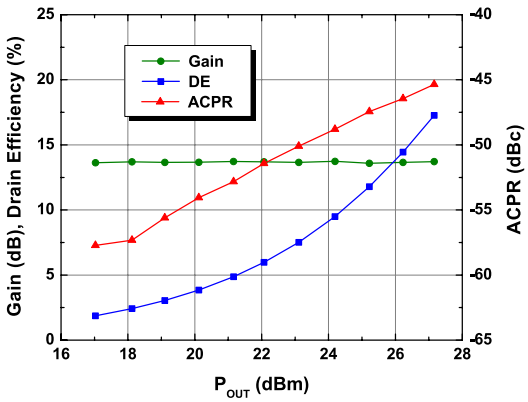


Figure 11 - Typical W-CDMA Performance
I_{DQ} = 100mA, Frequency = 2140MHz

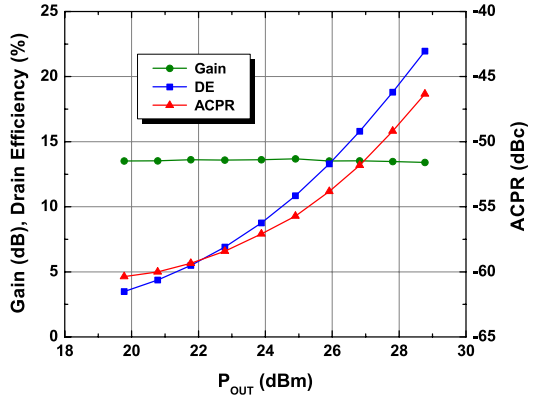


Figure 12 - Typical LTE Performance
I_{DQ} = 100mA, Frequency = 2600MHz

Typical Device Characteristics

V_{DS}=28V, I_{DQ}=50mA, T_A=25°C unless otherwise noted.

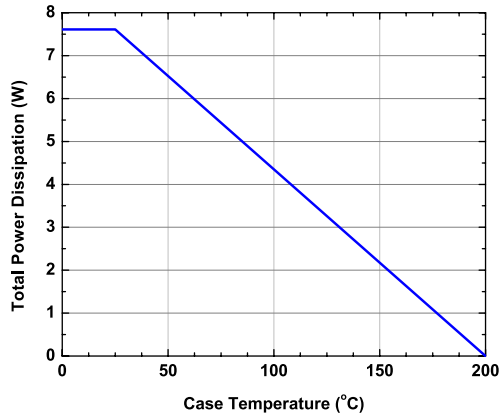


Figure 13 - Power Derating Curve

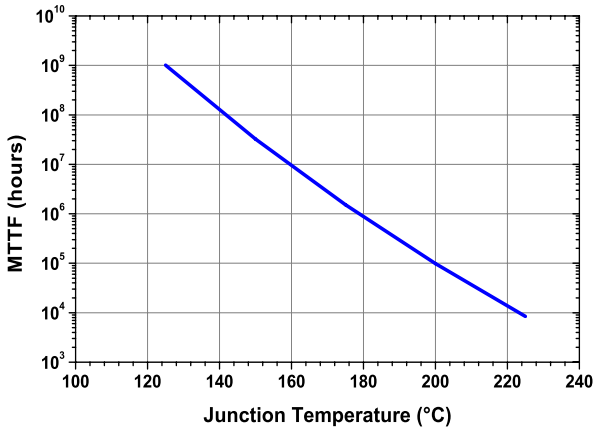


Figure 14 - MTTF of NRF1 Devices as a Function of Junction Temperature

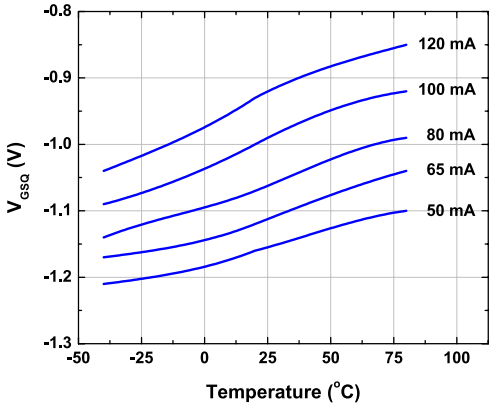


Figure 15 - Quiescient Gate Voltage (V_{GSQ}) Required to Reach I_{DQ} = 50mA as a Function of Ambient Temperature

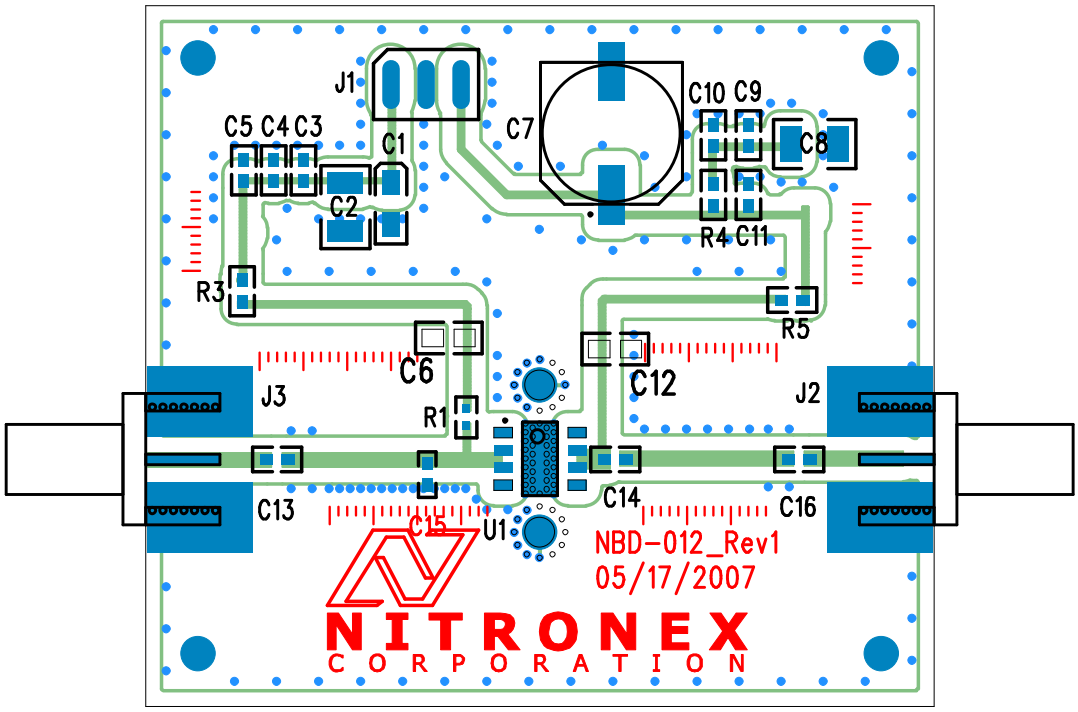


Figure 16 - APP-NPTB00004-25 2500MHz Demonstration Board

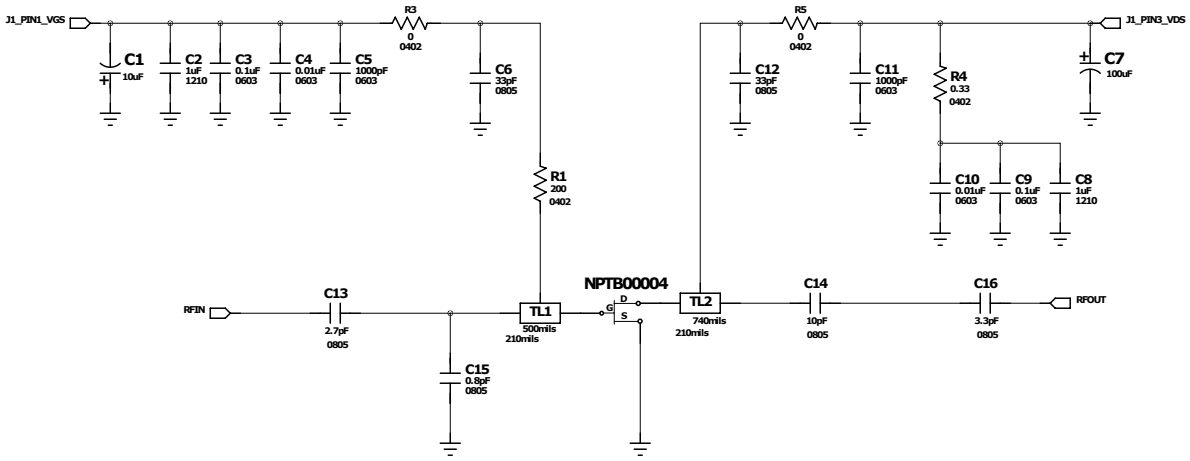


Figure 17 - APP-NPTB00004-25 2500MHz Demonstration Board Equivalent Circuit

Table 2: APP-NPTB00004-25 2500MHz Demonstration Board Bill of Materials

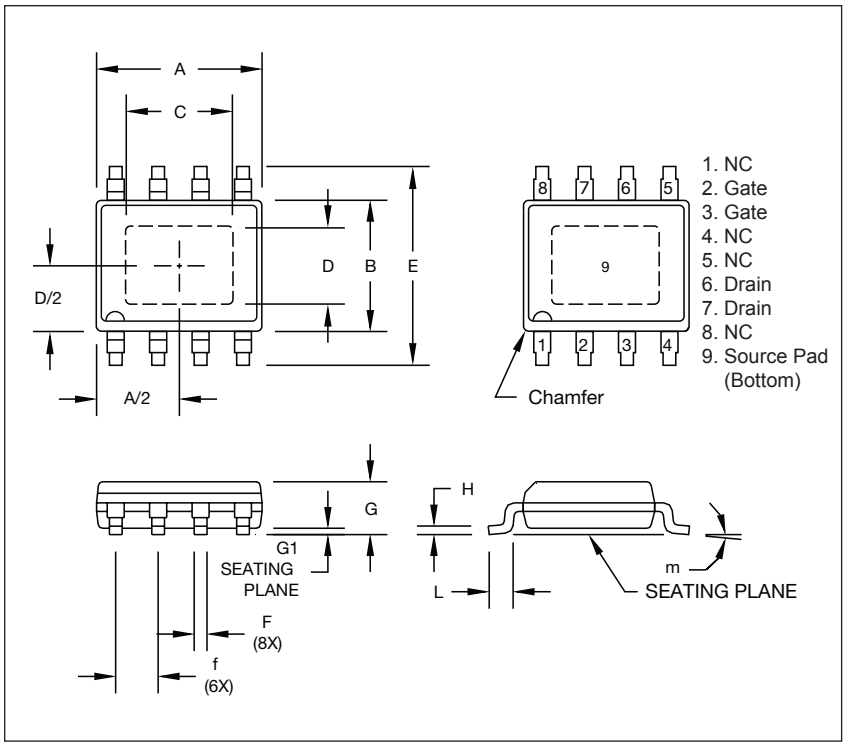
Name	Value	Tolerance	Vendor	Vendor Number
C1	10uF	20%	AVX	TAJA106M016R
C2	1uF	10%	AVX	12101C105KAT2A
C3	0.1uF	10%	Murata	GRM188R72A104KA35D
C4	0.01uF	10%	AVX	06031C103KAT2A
C5	0.001uF	10%	AVX	06031C102KAT2A
C6	33pF	5%	ATC	ATC600F330B
C7	100uF	20%	Panasonic	ECE-V1JA101P
C8	1uF	10%	AVX	12101C105KAT2A
C9	0.1uF	10%	Murata	GRM188R72A104KA35D
C10	0.01uF	10%	AVX	06031C103KAT2A
C11	0.001uF	10%	AVX	06031C102KAT2A
C12	33pF	5%	ATC	ATC600F330B
C13	2.7pF	+/- 0.1pF	ATC	ATC600F2R7B
C14	10pF	1%	ATC	ATC600F100B
C15	0.8pF	+/-0.1pF	ATC	ATC600F0R8B
C16	3.3pF	+/-0.1pF	ATC	ATC600F3R3B
R1	200 ohm	1%	Panasonic	ERJ-2GEJ201X
R3, R5	0 ohm	--	Panasonic	ERJ-2GE0R00X
R4	0.033 ohm	1%	Panasonic	ERJ-6BWJR033W
NBD-012_Rev1	--	--	Alberta Printed Circuits	NBD-012_Rev1
Substrate			Rogers	R04350, t = 30mil ε_r = 3.5

Ordering Information[1]

Part Number	Order Multiple	Description
NPTB00004DT	97	Tube; NPTB00004 in D (PSOP2) Package
NPTB00004DR	1500	Tape and Reel; NPTB00004 in D (PSOP2) Package

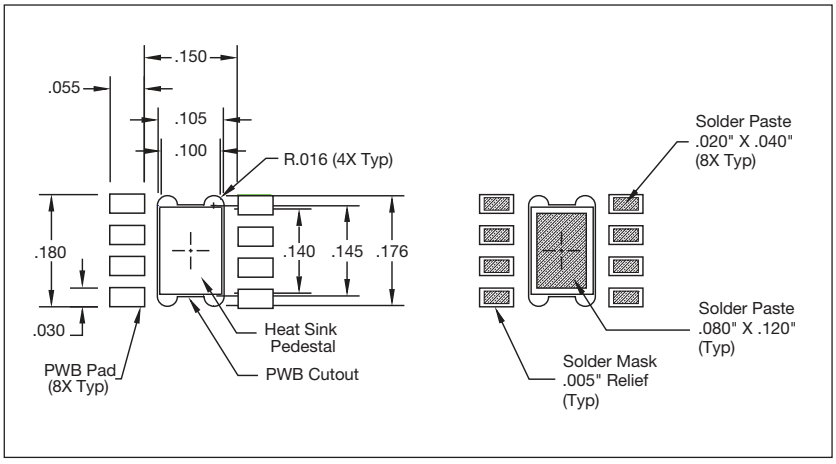
1: To find a Nitronex contact in your area, visit our website at http://www.nitronex.com

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	0.087	1.80	2.21
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	0.0075	0.0098	0.19	0.25
L	0.016	0.035	0.41	0.89
m	0°	8°	0°	8°

Mounting Footprints



Nitronex Corporation
2305 Presidential Drive
Durham, NC 27703 USA
+1.919.807.9100 (telephone)
+1.919.807.9200 (fax)
info@nitronex.com
www.nitronex.com

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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