

NTD4813NH, NVD4813NH

MOSFET – Power, Single, N-Channel, DPAK/IPAK 30 V, 40 A

Features

- Low $R_{DS(on)}$ to Minimize Conduction Losses
- Low Capacitance to Minimize Driver Losses
- Optimized Gate Charge to Minimize Switching Losses
- Low R_G
- NVD Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC-Q101 Qualified and PPAP Capable
- These Devices are Pb-Free and are RoHS Compliant

Applications

- CPU Power Delivery
- DC-DC Converters
- High Side Switching

MAXIMUM RATINGS ($T_J = 25^\circ\text{C}$ unless otherwise stated)

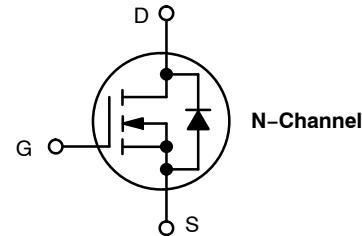
Parameter		Symbol	Value	Unit
Drain-to-Source Voltage		V_{DSS}	30	V
Gate-to-Source Voltage		V_{GS}	± 20	V
Continuous Drain Current $R_{\theta JA}$ (Note 1)	$T_A = 25^\circ\text{C}$	I_D	9.0	A
			7.0	
Power Dissipation $R_{\theta JA}$ (Note 1)	$T_A = 25^\circ\text{C}$	P_D	1.94	W
	$T_A = 25^\circ\text{C}$	I_D	7.6	A
			5.9	
	$T_A = 25^\circ\text{C}$	P_D	1.27	W
Continuous Drain Current $R_{\theta JC}$ (Note 1)	$T_C = 25^\circ\text{C}$	I_D	40	A
			31	
	$T_C = 25^\circ\text{C}$	P_D	35.3	W
	$T_A = 25^\circ\text{C}$	I_{DM}	90	A
Current Limited by Package		$I_{DmaxPkg}$	35	A
Operating Junction and Storage Temperature		T_J, T_{STG}	-55 to +175	°C
Source Current (Body Diode)		I_S	29	A
Drain to Source dV/dt		dV/dt	6	V/ns

ON

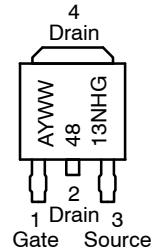
ON Semiconductor®

<http://onsemi.com>

$V_{(BR)DSS}$	$R_{DS(ON) \text{ MAX}}$	$I_D \text{ MAX}$
30 V	13 mΩ @ 10 V 25.9 mΩ @ 4.5 V	40 A



MARKING DIAGRAM & PIN ASSIGNMENT



A = Assembly Location*
 Y = Year
 WW = Work Week
 4813NH = Device Code
 G = Pb-Free Package

* The Assembly Location code (A) is front side optional. In cases where the Assembly Location is stamped in the package, the front side assembly code may be blank.

ORDERING INFORMATION

See detailed ordering and shipping information on page 7 of this data sheet.

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MAXIMUM RATINGS (T_J = 25°C unless otherwise stated)

Parameter	Symbol	Value	Unit
Single Pulse Drain-to-Source Avalanche Energy (V _{DD} = 24 V, V _{GS} = 10 V, I _L = 17.2 A _{pk} , L = 0.3 mH, R _G = 25 Ω)	EAS	44.4	mJ
Lead Temperature for Soldering Purposes (1/8" from case for 10 s)	T _L	260	°C

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

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THERMAL RESISTANCE MAXIMUM RATINGS

Parameter	Symbol	Value	Unit
Junction-to-Case (Drain)	$R_{\theta JC}$	4.25	$^{\circ}\text{C}/\text{W}$
Junction-to-TAB (Drain)	$R_{\theta JC-TAB}$	3.5	
Junction-to-Ambient – Steady State (Note 1)	$R_{\theta JA}$	77.5	
Junction-to-Ambient – Steady State (Note 2)	$R_{\theta JA}$	118.5	

1. Surface-mounted on FR4 board using 1 sq-in pad, 1 oz Cu.
2. Surface-mounted on FR4 board using the minimum recommended pad size.

ELECTRICAL CHARACTERISTICS ($T_J = 25^{\circ}\text{C}$ unless otherwise specified)

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
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OFF CHARACTERISTICS

Drain-to-Source Breakdown Voltage	$V_{(\text{BR})\text{DSS}}$	$V_{\text{GS}} = 0 \text{ V}$, $I_D = 250 \mu\text{A}$	30			V
Drain-to-Source Breakdown Voltage Temperature Coefficient	$V_{(\text{BR})\text{DSS}}/T_J$			24.5		$\text{mV}/^{\circ}\text{C}$
Zero Gate Voltage Drain Current	I_{DSS}	$V_{\text{GS}} = 0 \text{ V}$, $V_{\text{DS}} = 24 \text{ V}$	$T_J = 25^{\circ}\text{C}$		1	μA
			$T_J = 125^{\circ}\text{C}$		10	
Gate-to-Source Leakage Current	I_{GSS}	$V_{\text{DS}} = 0 \text{ V}$, $V_{\text{GS}} = \pm 20 \text{ V}$			± 100	nA

ON CHARACTERISTICS (Note 3)

Gate Threshold Voltage	$V_{\text{GS}(\text{TH})}$	$V_{\text{GS}} = V_{\text{DS}}$, $I_D = 250 \mu\text{A}$	1.5		2.5	V
Negative Threshold Temperature Coefficient	$V_{\text{GS}(\text{TH})}/T_J$			5.4		$\text{mV}/^{\circ}\text{C}$
Drain-to-Source On Resistance	$R_{\text{DS}(\text{on})}$	$V_{\text{GS}} = 10 \text{ V}$ to 11.5 V	$I_D = 30 \text{ A}$		10.9	13
			$I_D = 15 \text{ A}$		10.7	
		$V_{\text{GS}} = 4.5 \text{ V}$	$I_D = 30 \text{ A}$		20.9	25.9
			$I_D = 15 \text{ A}$		18.5	
Forward Transconductance	g_{FS}	$V_{\text{DS}} = 15 \text{ V}$, $I_D = 10 \text{ A}$		6.7		S

CHARGES AND CAPACITANCES

Input Capacitance	C_{ISS}	$V_{\text{GS}} = 0 \text{ V}$, $f = 1.0 \text{ MHz}$, $V_{\text{DS}} = 12 \text{ V}$		940		pF
Output Capacitance	C_{OSS}			201		
Reverse Transfer Capacitance	C_{RSS}			115		
Total Gate Charge	$Q_{\text{G}(\text{TOT})}$	$V_{\text{GS}} = 4.5 \text{ V}$, $V_{\text{DS}} = 15 \text{ V}$; $I_D = 30 \text{ A}$		7.1	10	nC
Threshold Gate Charge	$Q_{\text{G}(\text{TH})}$			1.6		
Gate-to-Source Charge	Q_{GS}			3.4		
Gate-to-Drain Charge	Q_{GD}			3.0		
Total Gate Charge	$Q_{\text{G}(\text{TOT})}$	$V_{\text{GS}} = 11.5 \text{ V}$, $V_{\text{DS}} = 15 \text{ V}$; $I_D = 30 \text{ A}$		18.2		nC

SWITCHING CHARACTERISTICS (Note 4)

Turn-On Delay Time	$t_{\text{d}(\text{ON})}$	$V_{\text{GS}} = 4.5 \text{ V}$, $V_{\text{DS}} = 15 \text{ V}$, $I_D = 15 \text{ A}$, $R_G = 3.0 \Omega$		10		ns
Rise Time	t_r			19.5		
Turn-Off Delay Time	$t_{\text{d}(\text{OFF})}$			10.3		
Fall Time	t_f			2.9		

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

3. Pulse Test: pulse width $\leq 300 \mu\text{s}$, duty cycle $\leq 2\%$.
4. Switching characteristics are independent of operating junction temperatures.

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ELECTRICAL CHARACTERISTICS (T_J = 25°C unless otherwise specified) (continued)

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
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SWITCHING CHARACTERISTICS (Note 4)

Turn-On Delay Time	t _{d(ON)}	V _{GS} = 11.5 V, V _{DS} = 15 V, I _D = 15 A, R _G = 3.0 Ω	5.1		ns
Rise Time	t _r		16.1		
Turn-Off Delay Time	t _{d(OFF)}		17.2		
Fall Time	t _f		1.8		

DRAIN-SOURCE DIODE CHARACTERISTICS

Forward Diode Voltage	V _{SD}	V _{GS} = 0 V, I _S = 30 A	T _J = 25°C		0.95	1.2	V
			T _J = 125°C		0.9		
Reverse Recovery Time	t _{RR}	V _{GS} = 0 V, dI _S /dt = 100 A/μs, I _S = 30 A		15			ns
Charge Time	t _a			9.9			
Discharge Time	t _b			5.1			
Reverse Recovery Charge	Q _{RR}			7.0		nC	

PACKAGE PARASITIC VALUES

Source Inductance	L _S	T _A = 25°C	2.49		nH
	L _D		0.0164		
	L _D		1.88		
	L _G		3.46		
	R _G		0.55		

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

3. Pulse Test: pulse width \leq 300 μs, duty cycle \leq 2%.
4. Switching characteristics are independent of operating junction temperatures.

TYPICAL PERFORMANCE CURVES

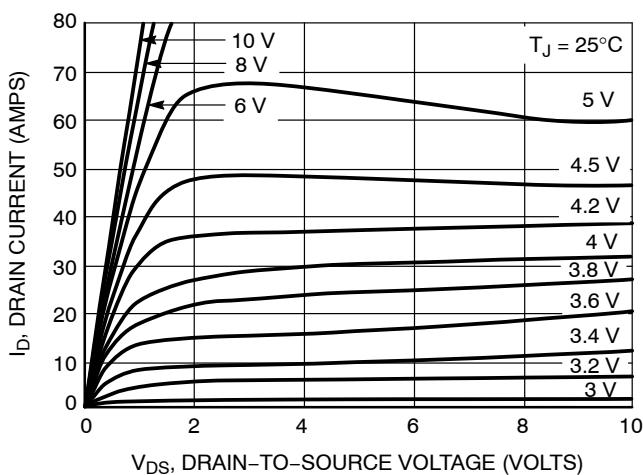


Figure 1. On-Region Characteristics

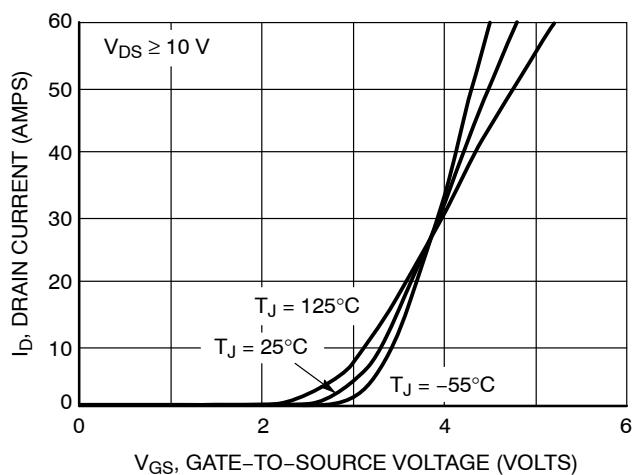


Figure 2. Transfer Characteristics

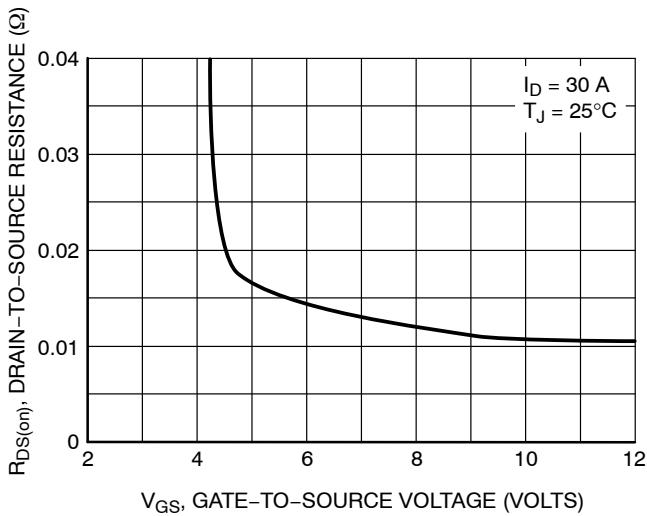


Figure 3. On-Resistance vs. Gate-to-Source Voltage

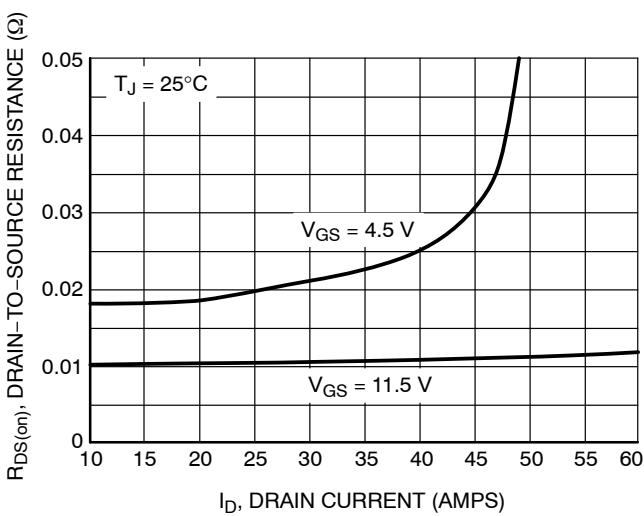


Figure 4. On-Resistance vs. Drain Current and Gate Voltage

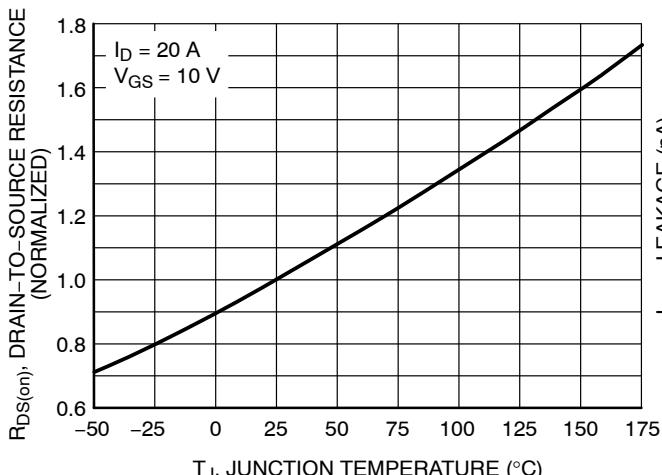


Figure 5. On-Resistance Variation with Temperature

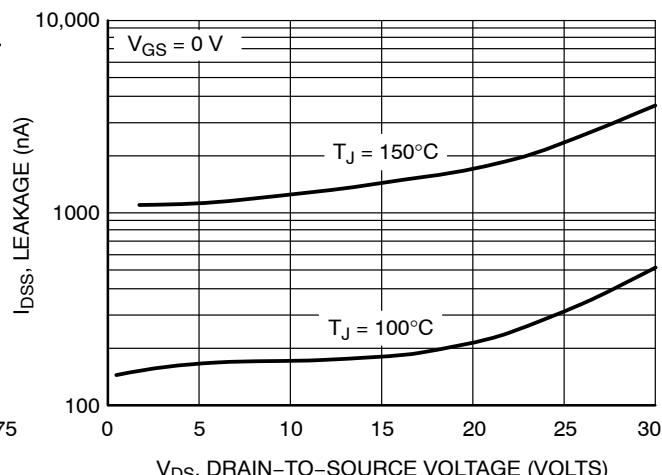


Figure 6. Drain-to-Source Leakage Current vs. Drain Voltage

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TYPICAL PERFORMANCE CURVES

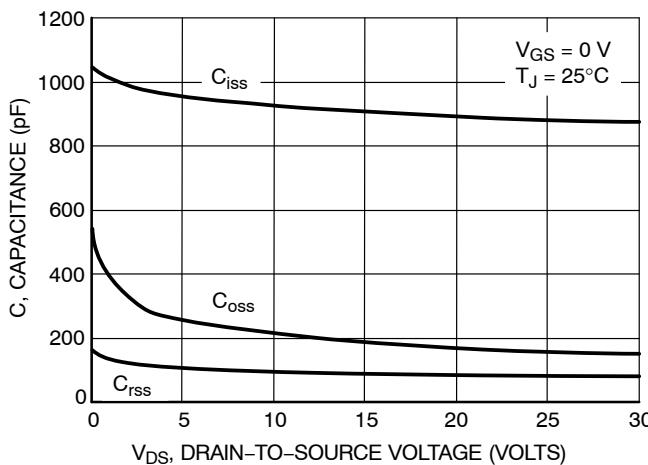


Figure 7. Capacitance Variation

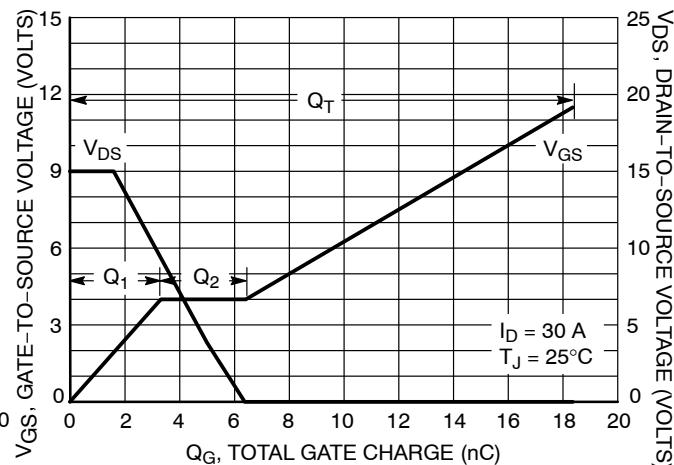


Figure 8. Gate-To-Source and Drain-To-Source Voltage vs. Total Charge

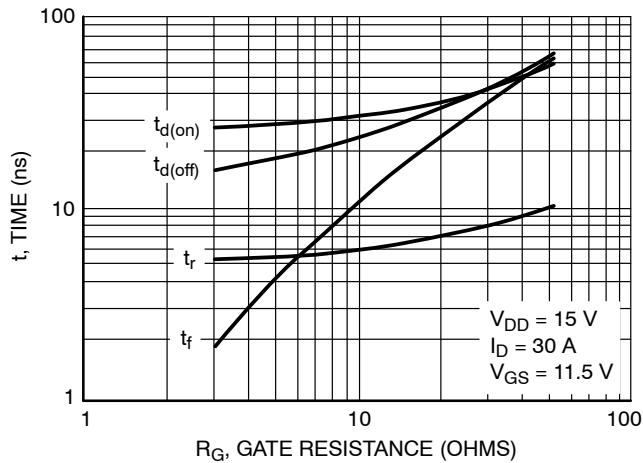


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

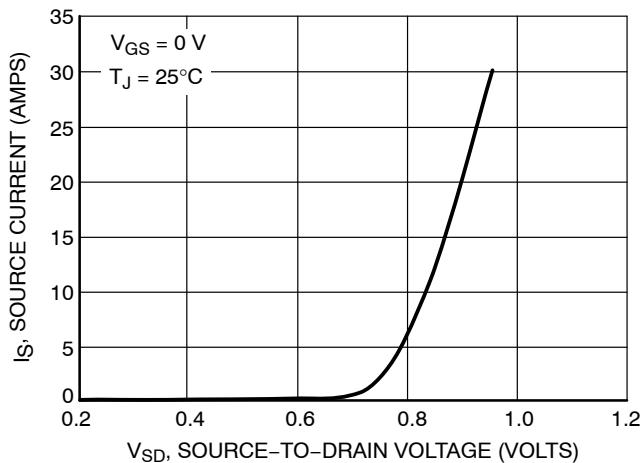


Figure 10. Diode Forward Voltage vs. Current

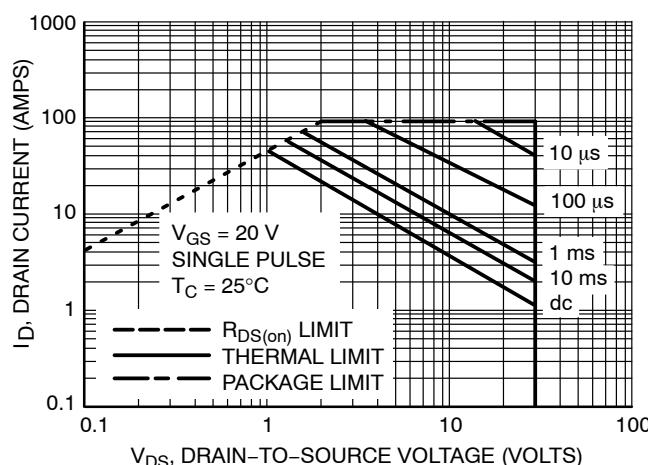


Figure 11. Maximum Rated Forward Biased Safe Operating Area

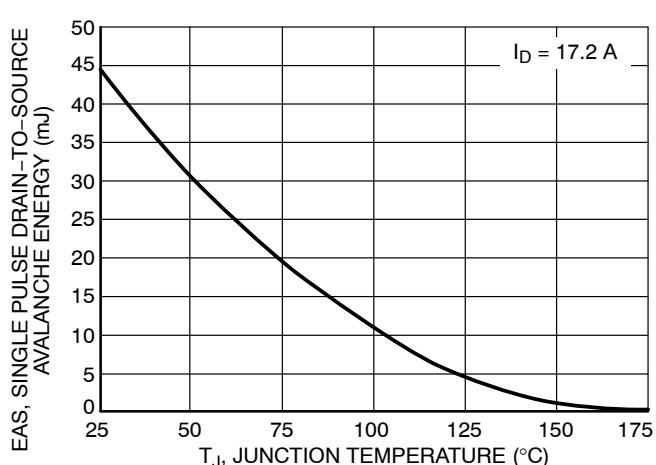


Figure 12. Maximum Avalanche Energy vs. Starting Junction Temperature

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TYPICAL PERFORMANCE CURVES

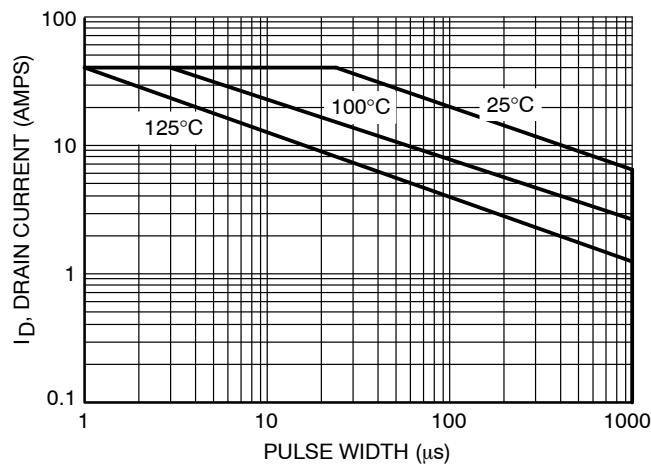


Figure 13. Avalanche Characteristics

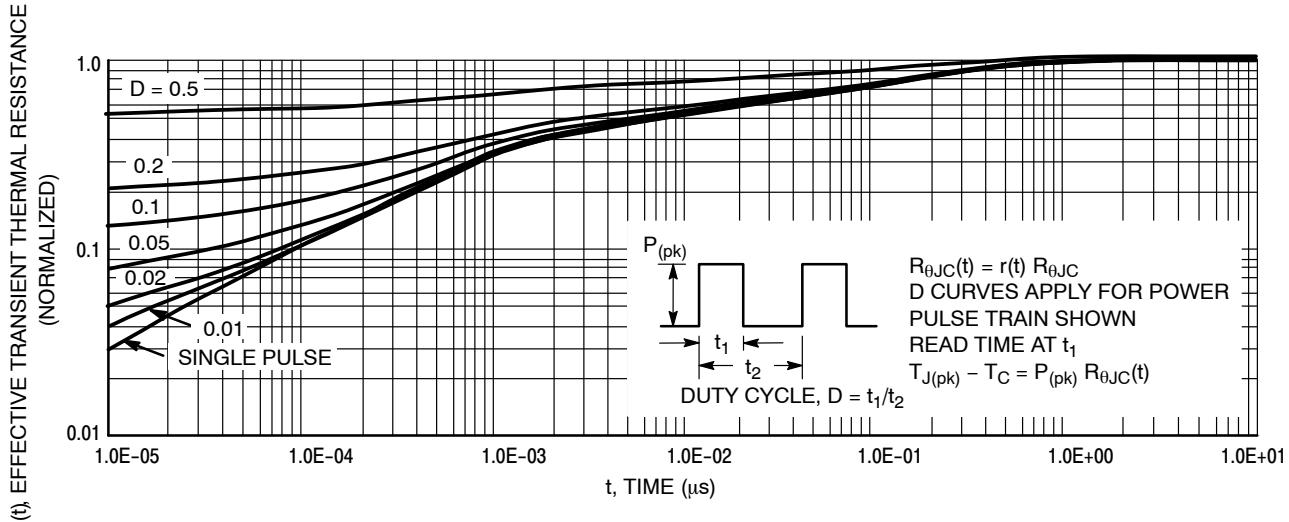


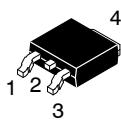
Figure 14. Thermal Response

ORDERING INFORMATION

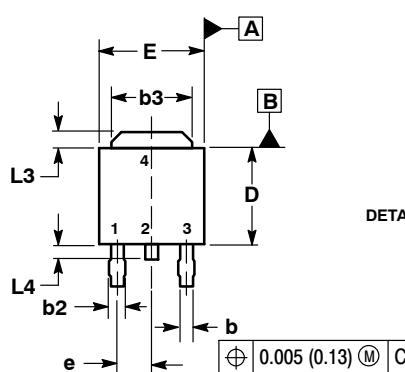
Device	Package	Shipping [†]
NTD4813NHT4G	DPAK (Pb-Free)	2500 / Tape & Reel
NVD4813NHT4G*	DPAK (Pb-Free)	2500 / Tape & Reel

[†]For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

*NVD Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC-Q101 Qualified and PPAP Capable.



SCALE 1:1



**DPAK (SINGLE GUAGE)
CASE 369AA
ISSUE B**

DATE 03 JUN 2010

NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: INCHES.
3. THERMAL PAD CONTOUR OPTIONAL WITHIN DIMENSIONS b3, L3 and Z.
4. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR BURRS. MOLD FLASH, PROTRUSIONS, OR GATE BURRS SHALL NOT EXCEED 0.006 INCHES PER SIDE.
5. DIMENSIONS D AND E ARE DETERMINED AT THE OUTERMOST EXTREMES OF THE PLASTIC BODY.
6. DATUMS A AND B ARE DETERMINED AT DATUM PLANE H

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.086	0.094	2.18	2.38
A1	0.000	0.005	0.00	0.13
b	0.025	0.035	0.63	0.89
b2	0.030	0.045	0.76	1.14
b3	0.180	0.215	4.57	5.46
c	0.018	0.024	0.46	0.61
c2	0.018	0.024	0.46	0.61
D	0.235	0.245	5.97	6.22
E	0.250	0.265	6.35	6.73
e	0.090	BSC	2.29	BSC
H	0.370	0.410	9.40	10.41
L	0.055	0.070	1.40	1.78
L1	0.108	REF	2.74	REF
L2	0.020	BSC	0.51	BSC
L3	0.035	0.050	0.89	1.27
L4	---	0.040	---	1.01
Z	0.155	---	3.93	---

STYLE 1:
PIN 1. BASE
2. COLLECTOR
3. Emitter
4. COLLECTOR

STYLE 2:
PIN 1. GATE
2. DRAIN
3. SOURCE
4. DRAIN

STYLE 3:
PIN 1. ANODE
2. CATHODE
3. ANODE
4. CATHODE

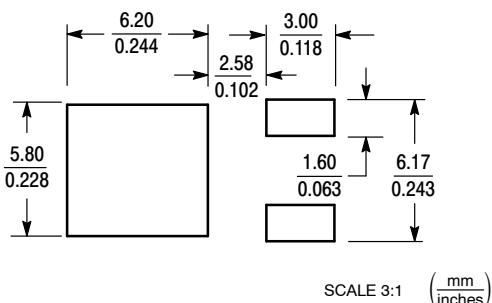
STYLE 4:
PIN 1. CATHODE
2. ANODE
3. GATE
4. ANODE

STYLE 5:
PIN 1. GATE
2. ANODE
3. CATHODE
4. ANODE

STYLE 6:
PIN 1. MT1
2. MT2
3. GATE
4. MT2

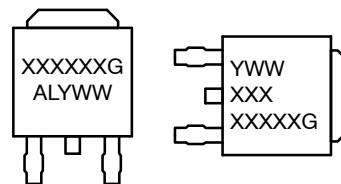
STYLE 7:
PIN 1. GATE
2. COLLECTOR
3. Emitter
4. COLLECTOR

SOLDERING FOOTPRINT*



*For additional information on our Pb-Free strategy and soldering details, please download the [onsemi](#) Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

GENERIC MARKING DIAGRAM*



IC	Discrete
XXXXXX	= Device Code
A	= Assembly Location
L	= Wafer Lot
Y	= Year
WW	= Work Week
G	= Pb. Free Package

*This information is generic. Please refer to device data sheet for actual part marking.

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DESCRIPTION:	DPAK (SINGLE GAUGE)	PAGE 1 OF 1

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