

NTD4809NH

Power MOSFET

30 V, 58 A, Single N-Channel, DPAK/IPAK

Features

- Low $R_{DS(on)}$ to Minimize Conduction Losses
- Low Capacitance to Minimize Driver Losses
- Optimized Gate Charge to Minimize Switching Losses
- These are Pb-Free Devices

Applications

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

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

Parameter			Symbol	Value	Unit
Drain-to-Source Voltage			V _{DSS}	30	V
Gate-to-Source Voltage			V _{GS}	± 20	V
Continuous Drain Current (R _{θJA}) (Note 1)	Steady State	T _A = 25°C	I _D	11.5	A
		T _A = 85°C		9.0	
Power Dissipation (R _{θJA}) (Note 1)		T _A = 25°C	P _D	2.0	W
Continuous Drain Current (R _{θJA}) (Note 2)		T _A = 25°C	I _D	9.0	A
		T _A = 85°C		7.0	
Power Dissipation (R _{θJA}) (Note 2)		T _A = 25°C	P _D	1.3	W
Continuous Drain Current (R _{θJC}) (Note 1)		T _C = 25°C	I _D	58	A
		T _C = 85°C		45	
Power Dissipation (R _{θJC}) (Note 1)		T _C = 25°C	P _D	52	W
Pulsed Drain Current		t _p =10μs	T _A = 25°C	I _{DM}	130
Current Limited by Package		T _A = 25°C	I _{DmaxPkg}	45	A
Operating Junction and Storage Temperature			T _J , T _{stg}	- 55 to 175	°C
Source Current (Body Diode)			I _S	43	A
Drain to Source dV/dt			dV/dt	6.0	V/ns
Single Pulse Drain-to-Source Avalanche Energy (V _{DD} = 24 V, V _{GS} = 10 V, L = 1.0 mH, I _{L(pk)} = 15 A, R _G = 25 Ω)			E _{AS}	112.5	mJ
Lead Temperature for Soldering Purposes (1/8" from case for 10 s)			T _L	260	°C

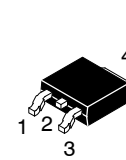
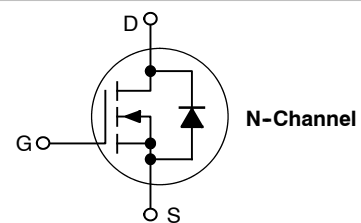
Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.



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<http://onsemi.com>

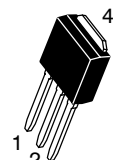
$V_{(BR)DSS}$	$R_{DS(on)}$ MAX	I_D MAX
30 V	9.0 m Ω @ 10 V	58 A
	12.5 m Ω @ 4.5 V	



DPAK
CASE 369AA
(Bent Lead)
STYLE 2

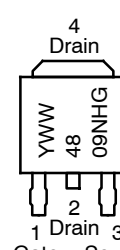


3 IPAK
CASE 369AD
(Straight Lead)

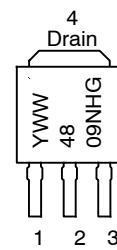


IPAK
CASE 369D
(Straight Lead
DPAK)

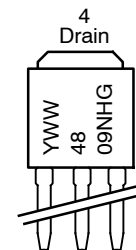
MARKING DIAGRAMS & PIN ASSIGNMENTS



1 Drain 3
Gate Source



1 Drain 3
Gate Drain Source



1 Drain 3
Gate Drain Source

Y = Year
WW = Work Week
4809NH = Device Code
G = Pb-Free Package

ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 6 of this data sheet.

NTD4809NH

THERMAL RESISTANCE MAXIMUM RATINGS

Parameter	Symbol	Value	Unit
Junction-to-Case (Drain)	$R_{\theta JC}$	2.9	°C/W
Junction-to-TAB (Drain)	$R_{\theta JC-TAB}$	3.5	
Junction-to-Ambient - Steady State (Note 1)	$R_{\theta JA}$	74	
Junction-to-Ambient - Steady State (Note 2)	$R_{\theta JA}$	116	

1. Surface-mounted on FR4 board using 1 in sq pad size, 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 noted)

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
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OFF CHARACTERISTICS

Drain-to-Source Breakdown Voltage	$V_{(BR)DSS}$	$V_{GS} = 0\text{ V}, I_D = 250\text{ }\mu\text{A}$	30			V
Drain-to-Source Breakdown Voltage Temperature Coefficient	$V_{(BR)DSS}/T_J$			25		mV/°C
Zero Gate Voltage Drain Current	I_{DSS}	$V_{GS} = 0\text{ V}, V_{DS} = 24\text{ V}$	$T_J = 25^\circ\text{C}$		1.0	μA
			$T_J = 125^\circ\text{C}$		10	
Gate-to-Source Leakage Current	I_{GSS}	$V_{DS} = 0\text{ V}, V_{GS} = \pm 20\text{ V}$			± 100	nA

ON CHARACTERISTICS (Note 3)

Gate Threshold Voltage	$V_{GS(TH)}$	$V_{GS} = V_{DS}, I_D = 250\text{ }\mu\text{A}$	1.5	2.1	2.5	V
Negative Threshold Temperature Coefficient	$V_{GS(TH)}/T_J$			5.7		mV/°C
Drain-to-Source On Resistance	$R_{DS(on)}$	$V_{GS} = 10\text{ to }11.5\text{ V}$	$I_D = 30\text{ A}$	7.0	9.0	m Ω
			$I_D = 15\text{ A}$	7.0		
		$V_{GS} = 4.5\text{ V}$	$I_D = 30\text{ A}$	10.45	12.5	
			$I_D = 15\text{ A}$	9.95		
Forward Transconductance	g_{FS}	$V_{DS} = 15\text{ V}, I_D = 15\text{ A}$		9.0		S

CHARGES AND CAPACITANCES

Input Capacitance	C_{iss}	$V_{GS} = 0\text{ V}, f = 1.0\text{ MHz}, V_{DS} = 12\text{ V}$		1596	2155	pF
Output Capacitance	C_{oss}			331	447	
Reverse Transfer Capacitance	C_{rss}			190	294	
Total Gate Charge	$Q_{G(TOT)}$	$V_{GS} = 4.5\text{ V}, V_{DS} = 15\text{ V}, I_D = 30\text{ A}$		12.5	15	nC
Threshold Gate Charge	$Q_{G(TH)}$			2.4	3.6	
Gate-to-Source Charge	Q_{GS}			5.3	7.9	
Gate-to-Drain Charge	Q_{GD}			5.1	7.7	
Total Gate Charge	$Q_{G(TOT)}$	$V_{GS} = 11.5\text{ V}, V_{DS} = 15\text{ V}, I_D = 30\text{ A}$		29.3	44	nC

SWITCHING CHARACTERISTICS (Note 4)

Turn-On Delay Time	$t_{d(on)}$	$V_{GS} = 4.5\text{ V}, V_{DS} = 15\text{ V}, I_D = 15\text{ A}, R_G = 3.0\text{ }\Omega$		12.0	18	ns
Rise Time	t_r			20	30	
Turn-Off Delay Time	$t_{d(off)}$			14	21	
Fall Time	t_f			5.0	7.5	
Turn-On Delay Time	$t_{d(on)}$	$V_{GS} = 11.5\text{ V}, V_{DS} = 15\text{ V}, I_D = 15\text{ A}, R_G = 3.0\text{ }\Omega$		7.0	10.4	ns
Rise Time	t_r			18	27	
Turn-Off Delay Time	$t_{d(off)}$			22	33	
Fall Time	t_f			3.0	4.6	

3. Pulse Test: Pulse Width $\leq 300\text{ }\mu\text{s}$, Duty Cycle $\leq 2\%$.
4. Switching characteristics are independent of operating junction temperatures.

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

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
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DRAIN-SOURCE DIODE CHARACTERISTICS

Forward Diode Voltage	V_{SD}	$V_{GS} = 0\text{ V},$ $I_S = 30\text{ A}$	$T_J = 25^\circ\text{C}$		0.95	1.2	V
			$T_J = 125^\circ\text{C}$		0.83		
Reverse Recovery Time	t_{RR}	$V_{GS} = 0\text{ V}, dI_S/dt = 100\text{ A}/\mu\text{s},$ $I_S = 30\text{ A}$			15.6		ns
Charge Time	t_a				10.6		
Discharge Time	t_b				5.0		
Reverse Recovery Time	Q_{RR}				7.5		nC

PACKAGE PARASITIC VALUES

Source Inductance	L_S	$T_A = 25^\circ\text{C}$		2.49		nH
Drain Inductance, DPAK	L_D			0.0164		
Drain Inductance, IPAK	L_D			1.88		
Gate Inductance	L_G			3.46		
Gate Resistance	R_G			0.75		Ω

TYPICAL PERFORMANCE CURVES

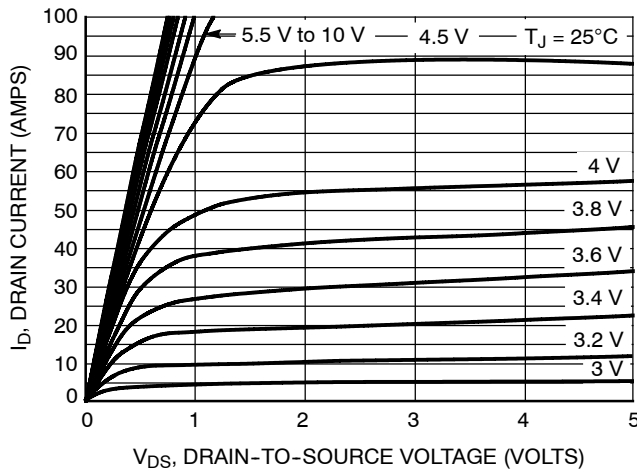


Figure 1. On-Region Characteristics

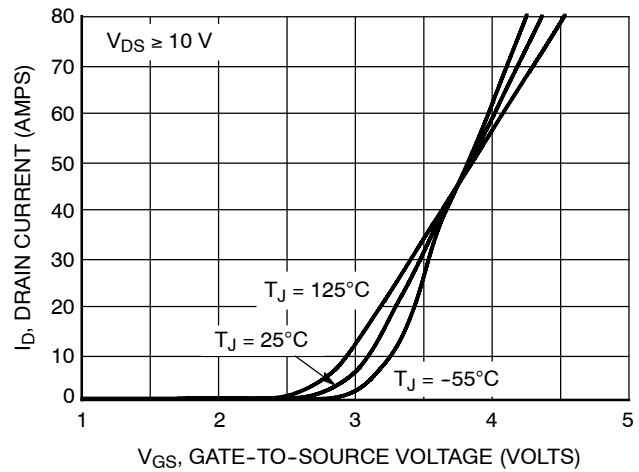


Figure 2. Transfer Characteristics

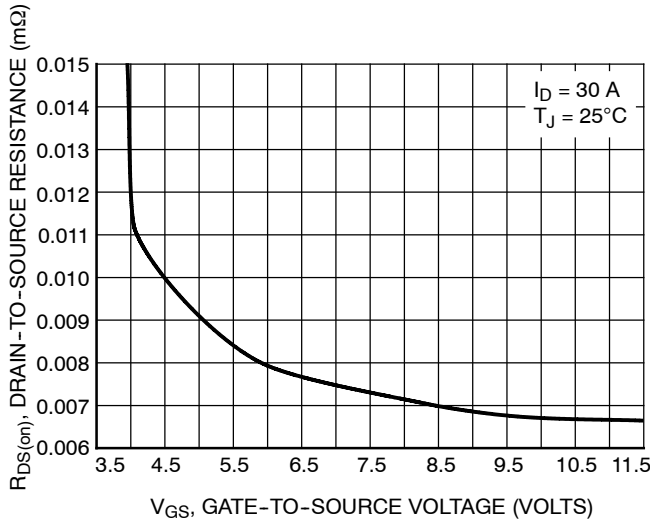


Figure 3. On-Resistance vs. Gate-to-Source Voltage

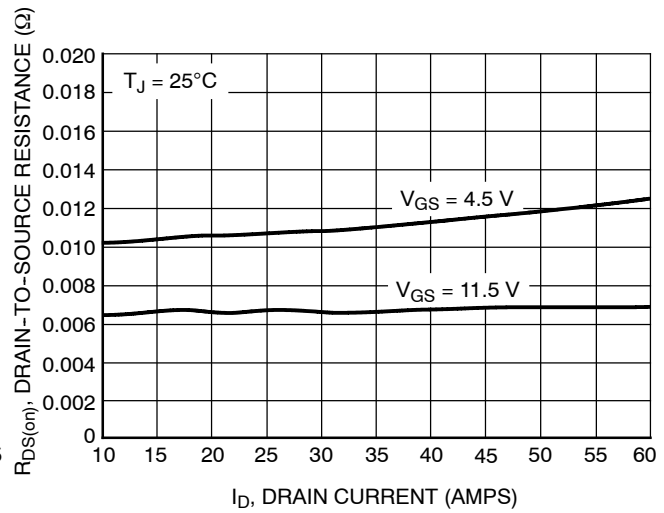


Figure 4. On-Resistance vs. Drain Current and Gate Voltage

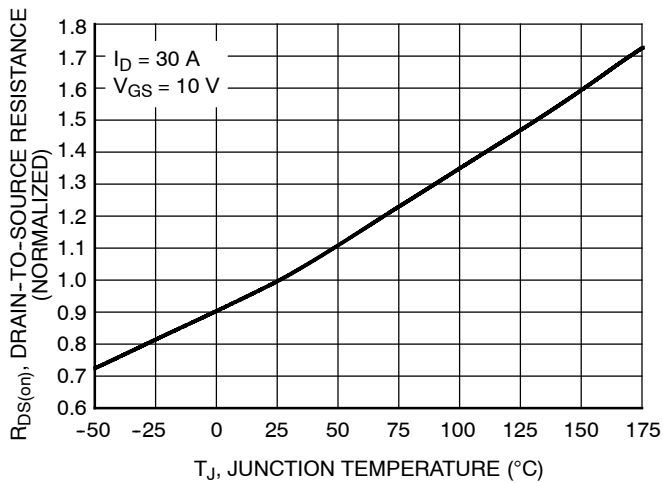


Figure 5. On-Resistance Variation with Temperature

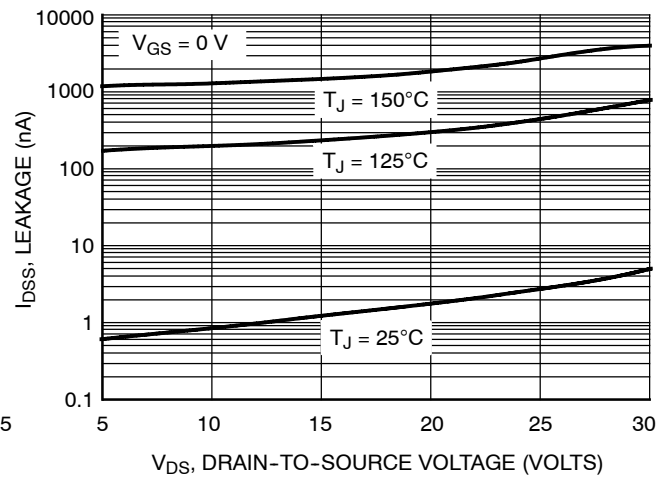


Figure 6. Drain-to-Source Leakage Current vs. Drain Voltage

TYPICAL PERFORMANCE CURVES

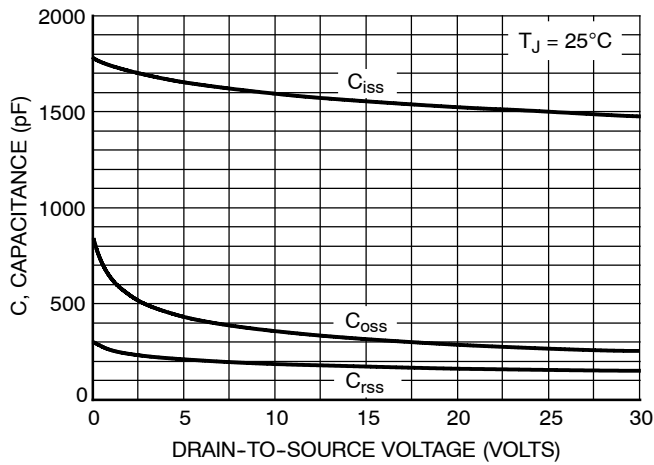


Figure 7. Capacitance Variation

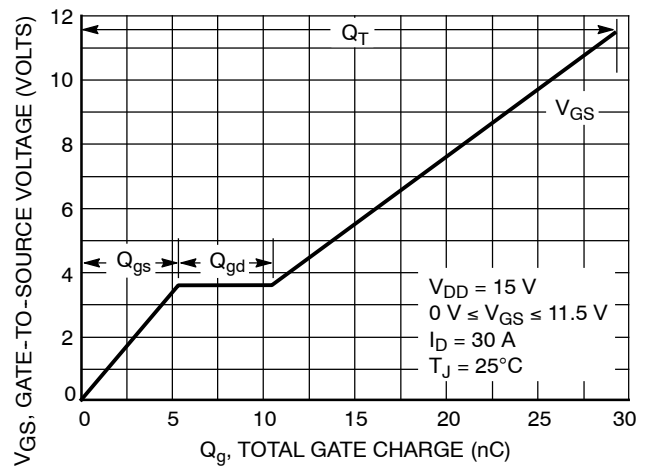


Figure 8. Gate-to-Source Voltage vs. Total Charge

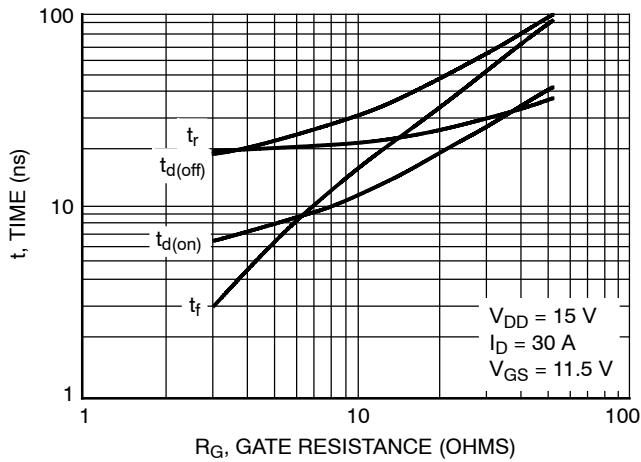


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

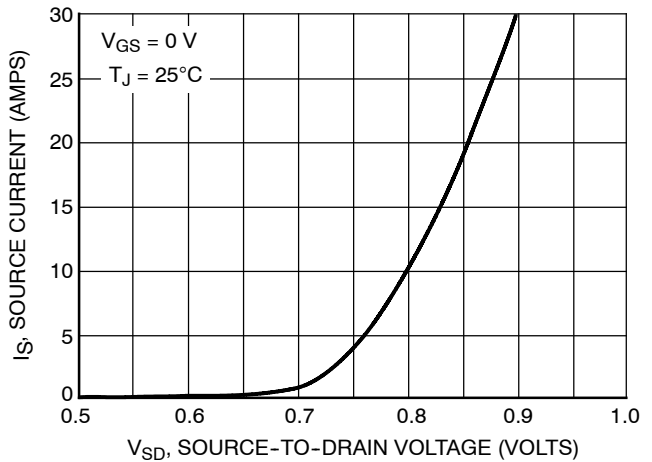


Figure 10. Diode Forward Voltage vs. Current

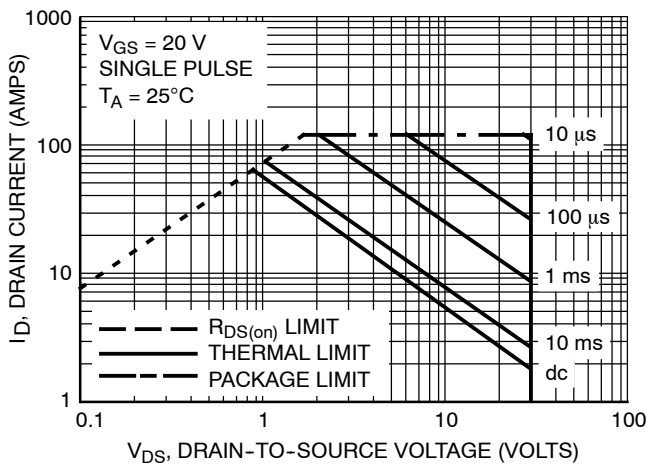


Figure 11. Maximum Rated Forward Biased Safe Operating Area

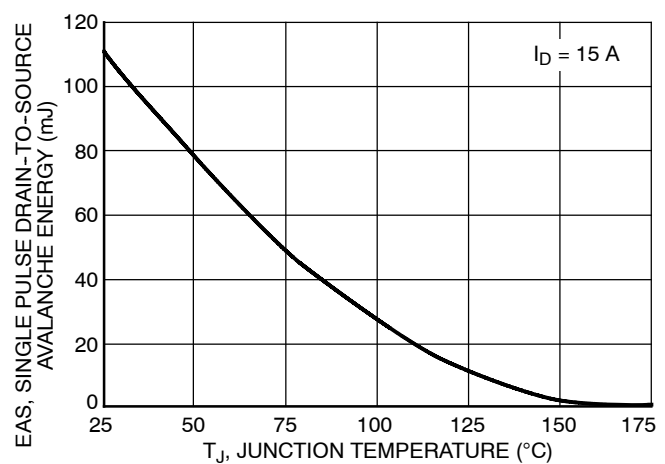


Figure 12. Maximum Avalanche Energy vs. Starting Junction Temperature

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TYPICAL PERFORMANCE CURVES

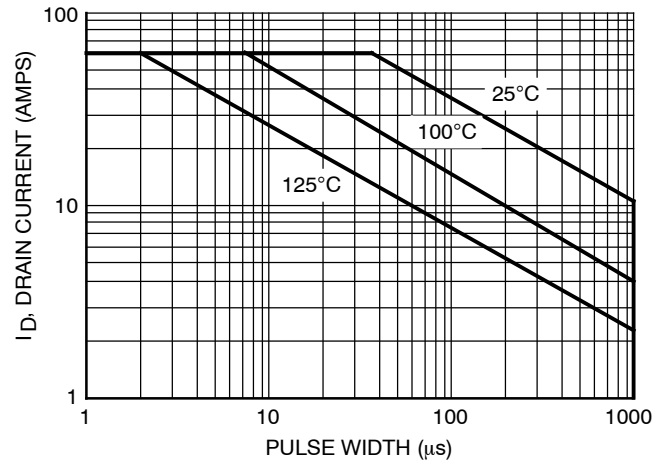


Figure 13. Avalanche Characteristics

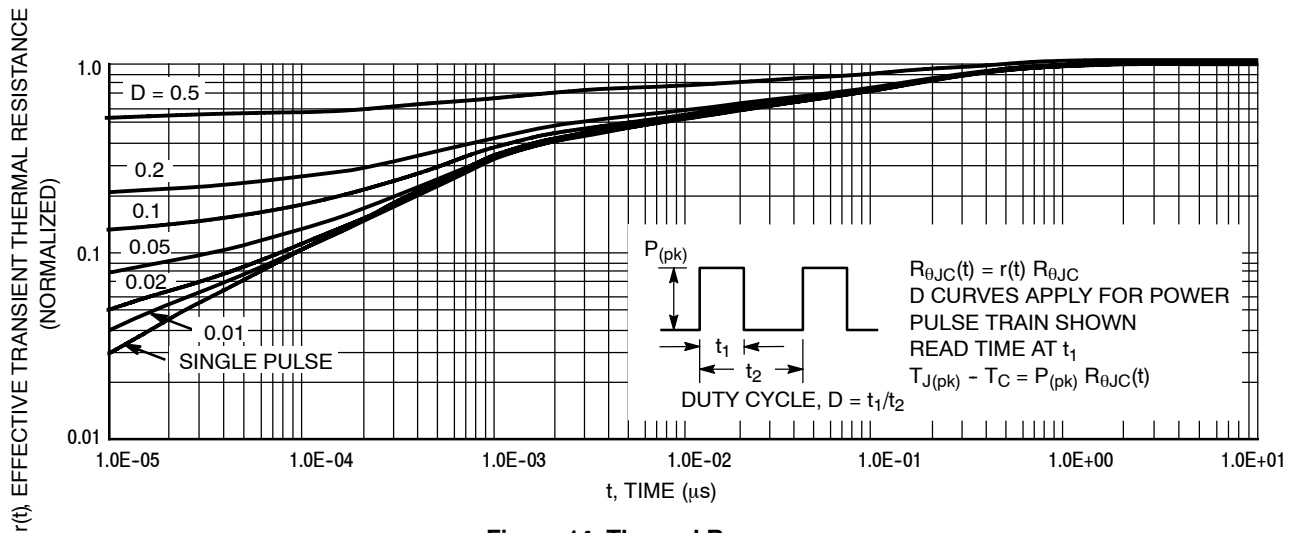


Figure 14. Thermal Response

ORDERING INFORMATION

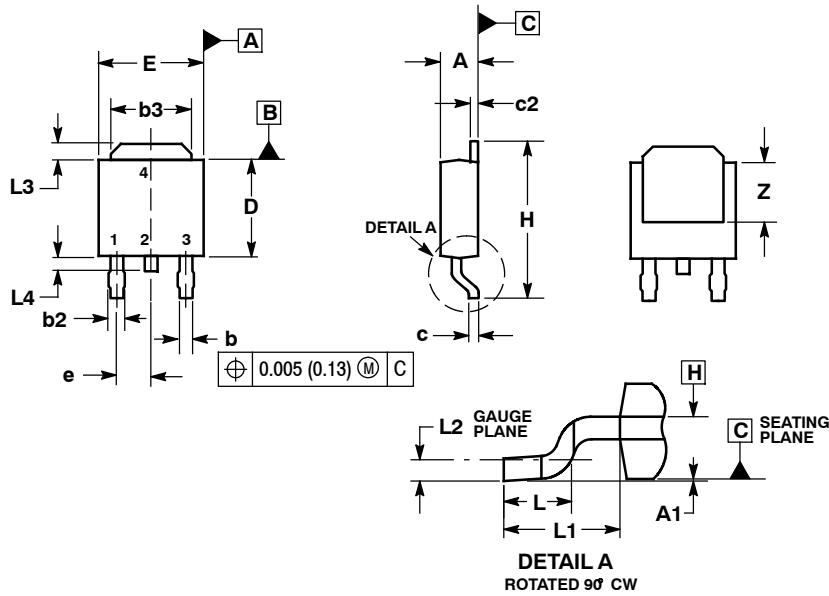
Device	Package	Shipping [†]
NTD4809NHT4G	DPAK (Pb-Free)	2500 / Tape & Reel
NTD4809NH-1G	IPAK (Pb-Free)	75 Units / Rail
NTD4809NH-35G	IPAK Trimmed Lead (3.5 ± 0.15 mm) (Pb-Free)	75 Units / Rail

[†]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.

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PACKAGE DIMENSIONS

DPAK (SINGLE GUAGE) CASE 369AA-01 ISSUE B

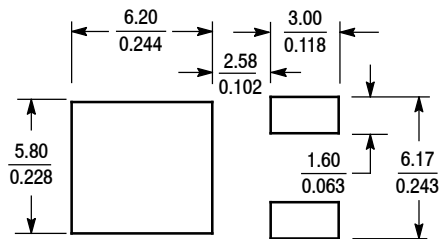


NOTES:

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	---

SOLDERING FOOTPRINT*



SCALE 3:1 $\left(\frac{\text{mm}}{\text{inches}} \right)$

STYLE 2:

- PIN 1. GATE
2. DRAIN
3. SOURCE
4. DRAIN

*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

