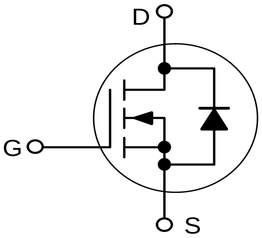
NTD4804N

30V N-Channel MOSFET

Description

- Low $R_{DS(on)}$ to Minimize Conduction Losses
- Low Capacitance to Minimize Driver Losses
- Optimized Gate Charge to Minimize Switching Losses
- These Devices are Pb−Free and are RoHS Compliant
- CPU Power Delivery
- DC−DC Converters
- Low Side Switching



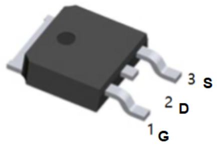
Features

V_{DS} (V) = 30V

I_D = 117A (V_{GS} = 10V)

$R_{DS(ON)}$ < 4mΩ (V_{GS} = 10V)

$R_{DS(ON)}$ < 5.5mΩ (V_{GS} = 4.5V)



TO-252(DPAK) top view

MAXIMUM RATINGS (T_J = 25°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 ($R_{\theta JA}$) (Note 1)	Steady State	T_A = 25°C	I_D	19.6	A
		T_A = 85°C		15.2	
Power Dissipation ($R_{\theta JA}$) (Note 1)		T_A = 25°C	P_D	2.66	W
Continuous Drain Current ($R_{\theta JA}$) (Note 2)		T_A = 25°C	I_D	14.5	A
		T_A = 85°C		11	
Power Dissipation ($R_{\theta JA}$) (Note 2)		T_A = 25°C	P_D	1.43	W
Continuous Drain Current ($R_{\theta JC}$) (Note 1)		T_C = 25°C	I_D	124	A
		T_C = 85°C		96	
Power Dissipation ($R_{\theta JC}$) (Note 1)		T_C = 25°C	P_D	107	W
Pulsed Drain Current	t_p=10µs	T_A = 25°C	I_{DM}	230	A
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	78	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, $I_{L(pk)}$ = 30 A, R_G = 25 Ω)			E_{AS}	450	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.

THERMAL RESISTANCE MAXIMUM RATINGS

Parameter	Symbol	Value	Unit
Junction−to−Case (Drain)	$R_{\theta JC}$	1.4	°C/W
Junction−to−TAB (Drain)	$R_{\theta JC-TAB}$	3.5	
Junction−to−Ambient − Steady State (Note 1)	$R_{\theta JA}$	56.4	
Junction−to−Ambient − Steady State (Note 2)	$R_{\theta JA}$	105	

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°C unless otherwise noted)

Parameter	Symbol	Test Condition		Min	Typ	Max	Unit
OFF CHARACTERISTICS							
Drain−to−Source Breakdown Voltage	$V_{(BR)DSS}$	V_{GS} = 0 V, I_D = 250 μA		30			V
Drain−to−Source Breakdown Voltage Temperature Coefficient	$V_{(BR)DSS}/T_J$				26		mV/°C
Zero Gate Voltage Drain Current	I_{DSS}	V_{GS} = 0 V, V_{DS} = 24 V	T_J = 25°C			1.0	μA
			T_J = 125°C			10	
Gate−to−Source Leakage Current	I_{GSS}	V_{DS} = 0 V, V_{GS} = ±20 V				±100	nA
ON CHARACTERISTICS (Note 3)							
Gate Threshold Voltage	$V_{GS(TH)}$	V_{GS} = V_{DS}, I_D = 250 μA		1.5		2.5	V
Negative Threshold Temperature Coefficient	$V_{GS(TH)}/T_J$				7.6		mV/°C
Drain−to−Source On Resistance	$R_{DS(on)}$	V_{GS} = 10 to 11.5 V	I_D = 30 A		3.4	4.0	mΩ
			I_D = 15 A		3.4		
		V_{GS} = 4.5 V	I_D = 30 A		4.7	5.5	
			I_D = 15 A		4.6		
Forward Transconductance	gFS	V_{DS} = 15 V, I_D = 15 A			23		S
CHARGES AND CAPACITANCES							
Input Capacitance	C_{iss}	V_{GS} = 0 V, f = 1.0 MHz, V_{DS} = 12 V			4490		pF
Output Capacitance	C_{oss}				952		
Reverse Transfer Capacitance	C_{rss}				556		
Total Gate Charge	$Q_{G(TOT)}$	V_{GS} = 4.5 V, V_{DS} = 15 V, I_D = 30 A			30	40	nC
Threshold Gate Charge	$Q_{G(TH)}$				5.5		
Gate−to−Source Charge	Q_{GS}				13		
Gate−to−Drain Charge	Q_{GD}				13		
Total Gate Charge	$Q_{G(TOT)}$	V_{GS} = 11.5 V, V_{DS} = 15 V, I_D = 30 A			73		nC
SWITCHING CHARACTERISTICS (Note 4)							
Turn−On Delay Time	$t_{d(on)}$	V_{GS} = 4.5 V, V_{DS} = 15 V, I_D = 15 A, R_G = 3.0 Ω			18		ns
Rise Time	t_r				20		
Turn−Off Delay Time	$t_{d(off)}$				24		
Fall Time	t_f				8		
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			10		ns
Rise Time	t_r				19		
Turn−Off Delay Time	$t_{d(off)}$				35		
Fall Time	t_f				5		

3. Pulse Test: Pulse Width ≤ 300 μs, Duty Cycle ≤ 2%.
4. Switching characteristics are independent of operating junction temperatures.

ELECTRICAL CHARACTERISTICS (T_J = 25°C unless otherwise noted)

Parameter	Symbol	Test Condition		Min	Typ	Max	Unit
DRAIN−SOURCE DIODE CHARACTERISTICS							
Forward Diode Voltage	V_{SD}	V_{GS} = 0 V, I_S = 30 A	T_J = 25°C		0.81	1.2	V
			T_J = 125°C		0.72		
Reverse Recovery Time	t_{RR}	V_{GS} = 0 V, dIs/dt = 100 A/µs, I_S = 30 A			34		ns
Charge Time	ta				19		
Discharge Time	tb				15		
Reverse Recovery Time	Q_{RR}				30		nC
PACKAGE PARASITIC VALUES							
Source Inductance	L_S	T_A = 25°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				0.6		Ω

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.

TYPICAL PERFORMANCE CURVES

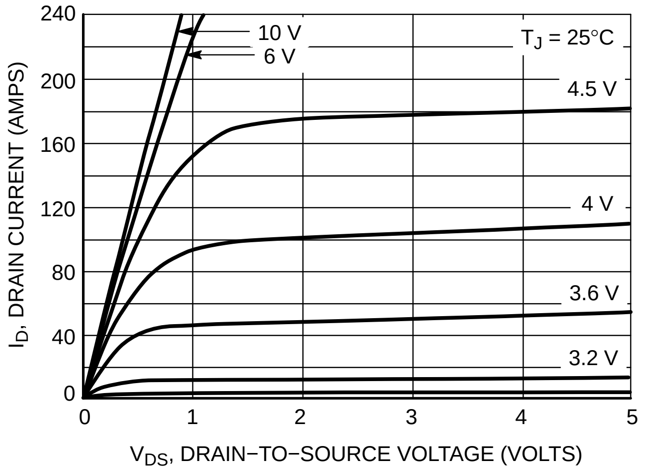


Figure 1. On−Region Characteristics

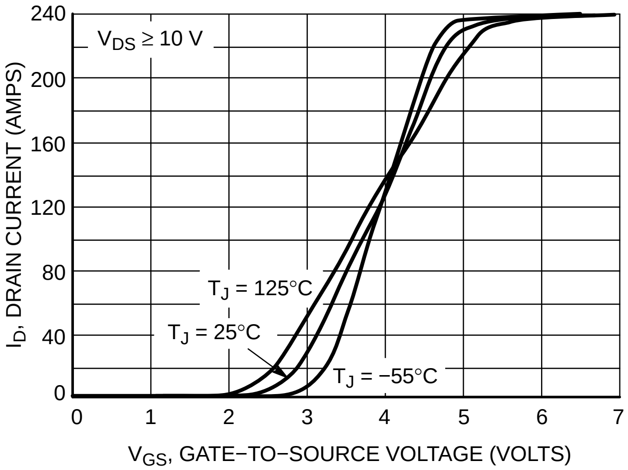


Figure 2. Transfer Characteristics

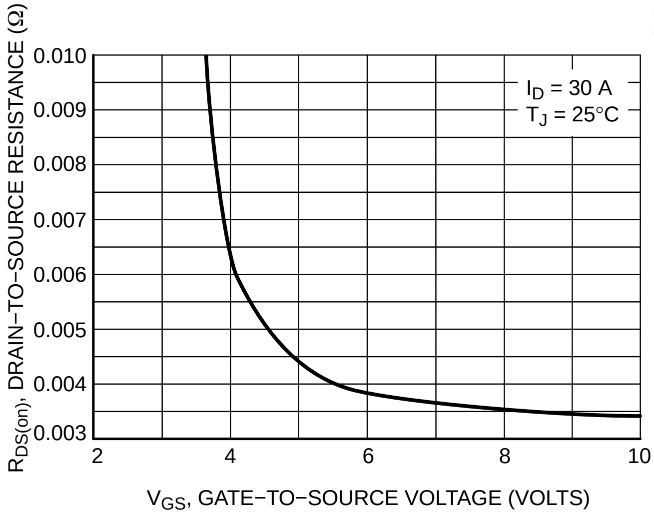


Figure 3. On−Resistance vs. Gate−to−Source Voltage

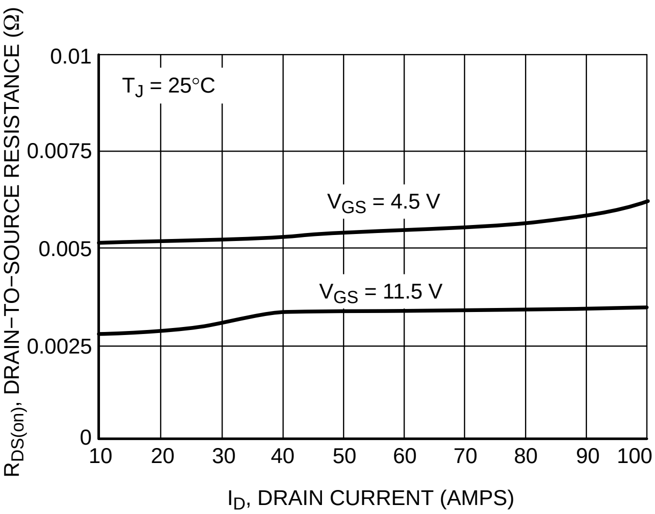


Figure 4. On−Resistance vs. Drain Current and Gate Voltage

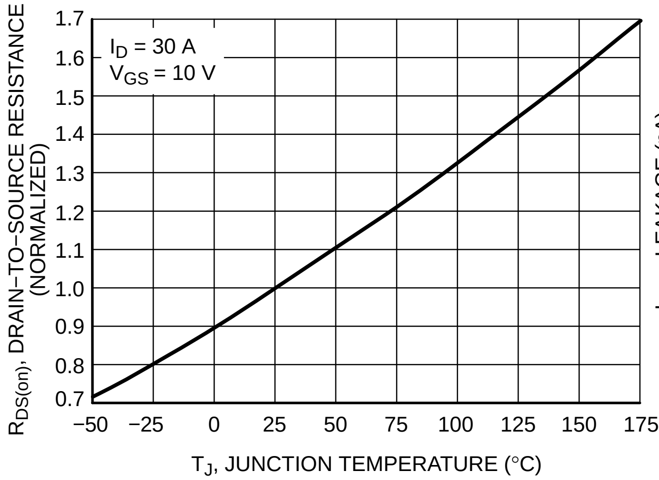


Figure 5. On−Resistance Variation with Temperature

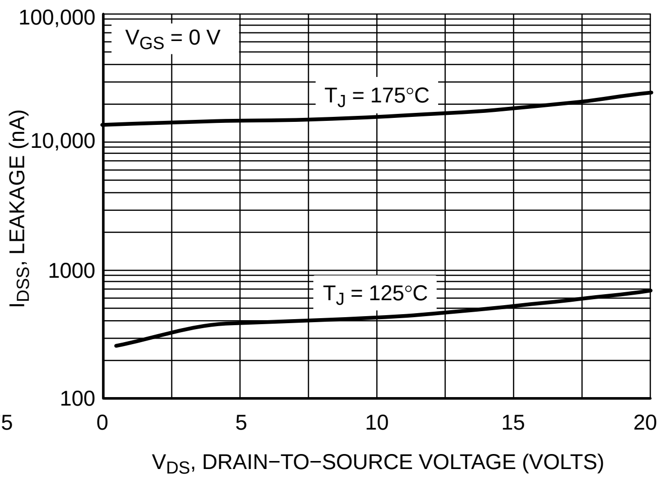


Figure 6. Drain−to−Source Leakage Current vs. Drain Voltage

TYPICAL PERFORMANCE CURVES

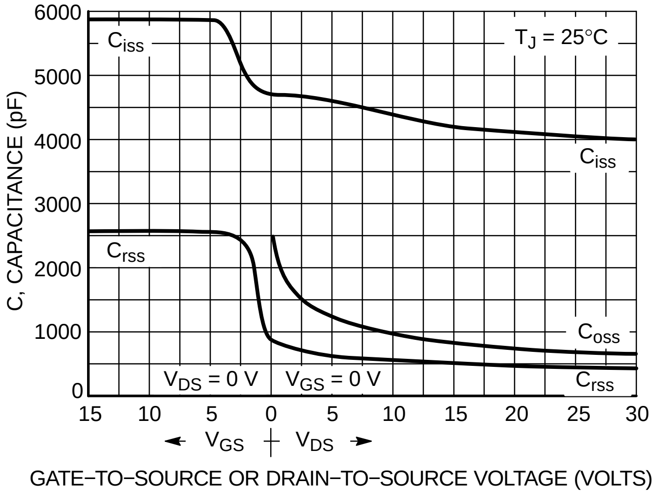


Figure 7. Capacitance Variation

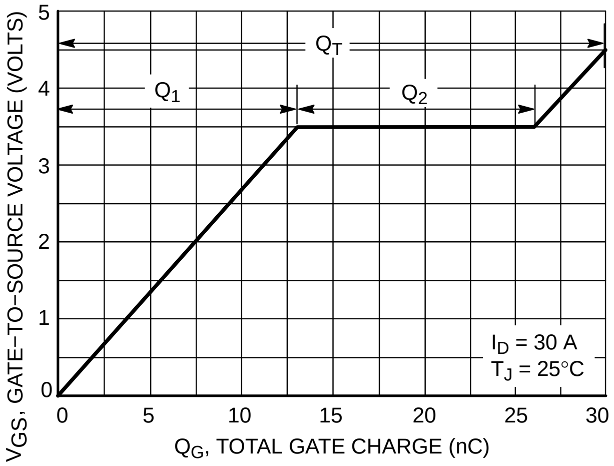


Figure 8. Gate−To−Source and Drain−To−Source Voltage vs. Total Charge

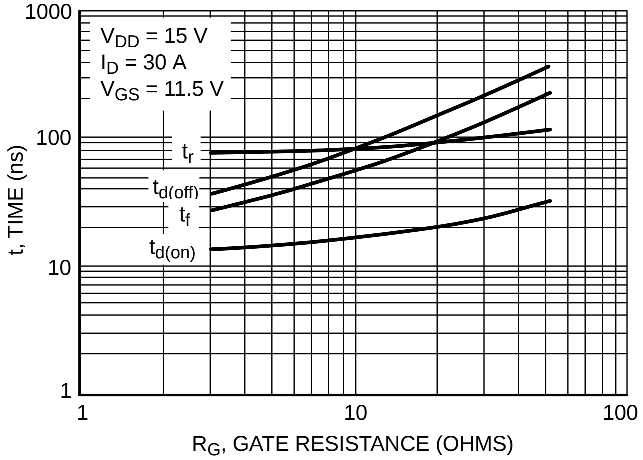


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

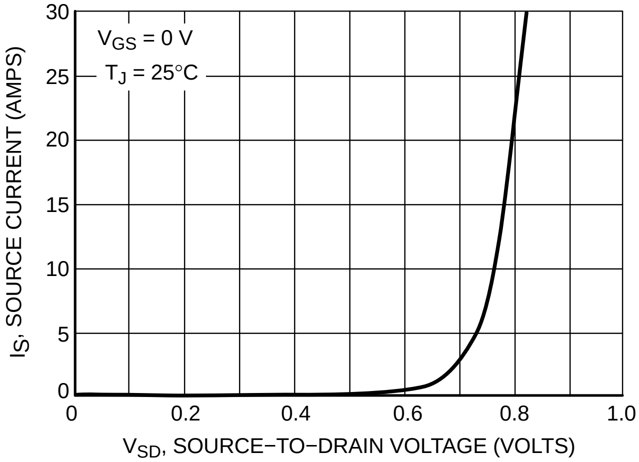


Figure 10. Diode Forward Voltage vs. Current

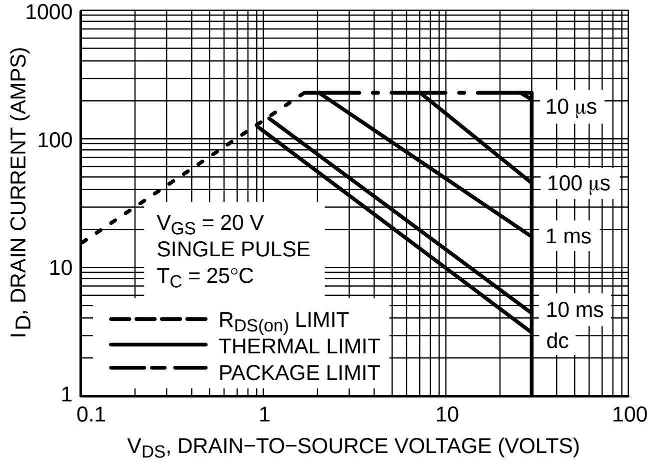


Figure 11. Maximum Rated Forward Biased Safe Operating Area

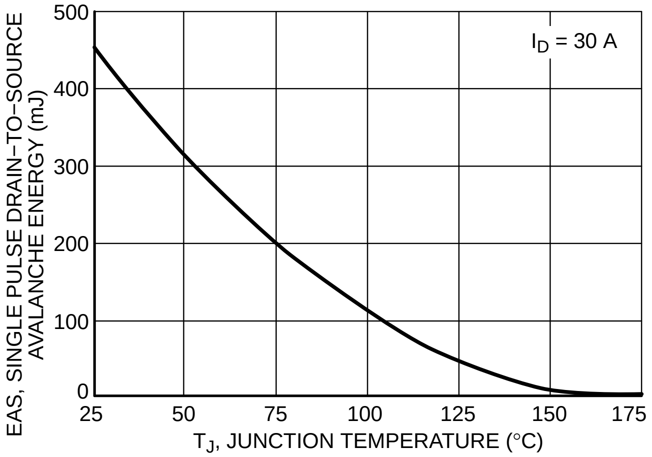


Figure 12. Maximum Avalanche Energy vs. Starting Junction Temperature

TYPICAL PERFORMANCE CURVES

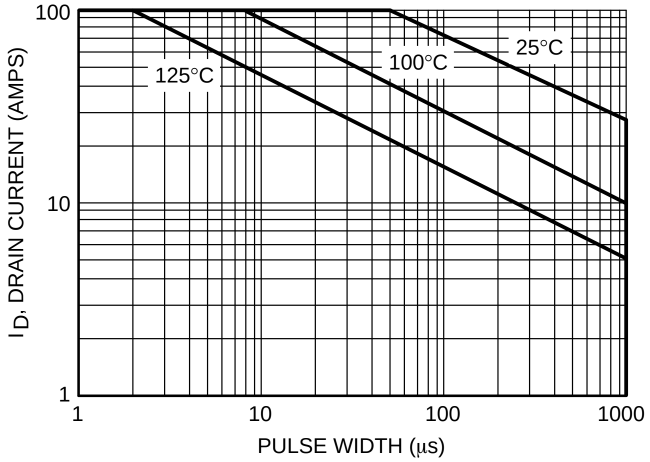


Figure 13. Avalanche Characteristics

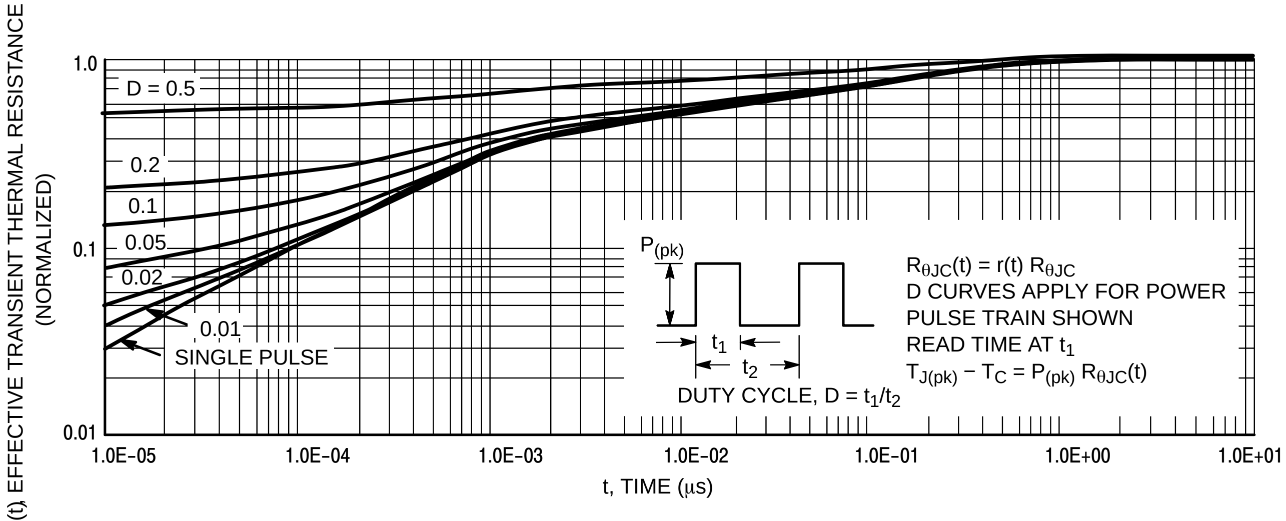
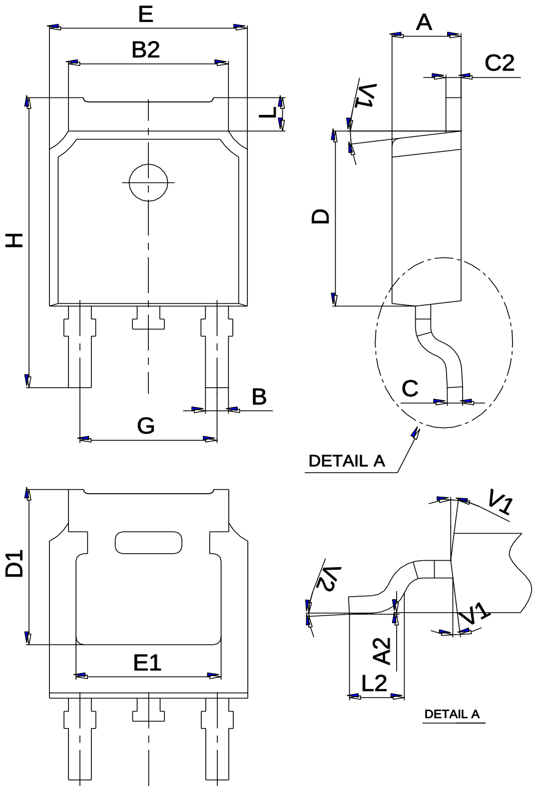


Figure 14. Thermal Response

Package Mechanical Data TO-252



Ref.	Dimensions					
	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	2.10		2.50	0.083		0.098
A2	0		0.10	0		0.004
B	0.66		0.86	0.026		0.034
B2	5.18		5.48	0.202		0.216
C	0.40		0.60	0.016		0.024
C2	0.44		0.58	0.017		0.023
D	5.90		6.30	0.232		0.248
D1	5.30REF			0.209REF		
E	6.40		6.80	0.252		0.268
E1	4.63			0.182		
G	4.47		4.67	0.176		0.184
H	9.50		10.70	0.374		0.421
L	1.09		1.21	0.043		0.048
L2	1.35		1.65	0.053		0.065
V1		7°			7°	
V2	0°		6°	0°		6°

Ordering information

Order code	**Package**	**Baseqty**	**Delivery mode**
UMW NTD4804NT4G	TO-252	2500	Tape and reel