

## NCE N-Channel Super Trench Power MOSFET

### Description

The NCEP02515K uses **Super Trench** technology that is uniquely optimized to provide the most efficient high frequency switching performance. Both conduction and switching power losses are minimized due to an extremely low combination of  $R_{DS(ON)}$  and  $Q_g$ . This device is ideal for high-frequency switching and synchronous rectification.

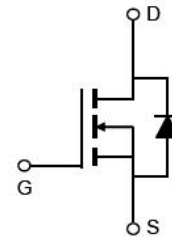
### General Features

- $V_{DS} = 250V, I_D = 15A$   
 $R_{DS(ON)} = 200m\Omega$  (typical) @  $V_{GS} = 10V$
- Excellent gate charge x  $R_{DS(on)}$  product(FOM)
- Very low on-resistance  $R_{DS(on)}$
- 175 °C operating temperature
- Pb-free lead plating

### Application

- LED backlighting
- Ideal for high-frequency switching and synchronous rectification

**100% UIS TESTED!**  
**100% ΔVds TESTED!**



Schematic diagram



Marking and pin assignment



TO-252 -2Ltop view

### Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
NCEP02515K	NCEP02515K	TO-252-2L	-	-	-

### Absolute Maximum Ratings ( $T_A = 25^\circ C$ unless otherwise noted)

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	$V_{DS}$	250	V
Gate-Source Voltage	$V_{GS}$	$\pm 20$	V
Drain Current-Continuous	$I_D$	15	A
Drain Current-Continuous( $T_C = 100^\circ C$ )	$I_D(100^\circ C)$	10.6	A
Pulsed Drain Current	$I_{DM}$	60	A
Maximum Power Dissipation	$P_D$	140	W
Derating factor		0.93	W/ $^\circ C$
Single pulse avalanche energy <sup>(Note 1)</sup>	$E_{AS}$	80	mJ
Operating Junction and Storage Temperature Range	$T_J, T_{STG}$	-55 To 175	$^\circ C$

### Thermal Characteristic

Thermal Résistance, Junction-to-Case	$R_{\theta JC}$	1.1	$^\circ C/W$
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## Electrical Characteristics (T<sub>A</sub>=25°C unless otherwise noted)

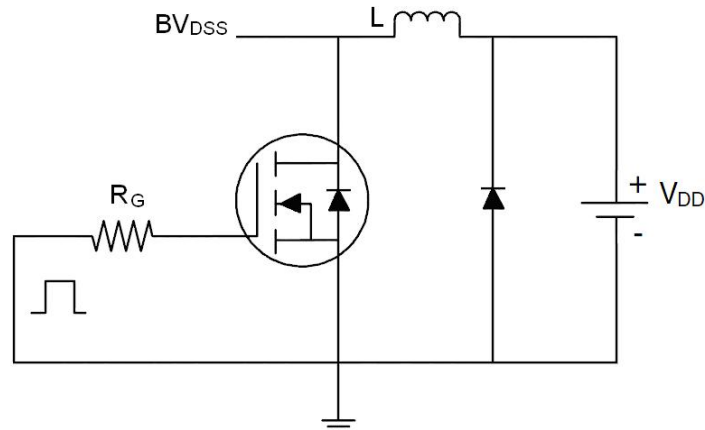
Parameter	Symbol	Condition	Min	Typ	Max	Unit
<b>Off Characteristics</b>						
Drain-Source Breakdown Voltage	BV <sub>DSS</sub>	V <sub>GS</sub> =0V, I <sub>D</sub> =250μA	250	-	-	V
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	V <sub>DS</sub> =250V, V <sub>GS</sub> =0V	-	-	1	μA
Gate-Body Leakage Current	I <sub>GSS</sub>	V <sub>GS</sub> =±20V, V <sub>DS</sub> =0V	-	-	±100	nA
<b>On Characteristics</b>						
Gate Threshold Voltage	V <sub>GS(th)</sub>	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250μA	2.5	3.5	4.5	V
Drain-Source On-State Resistance	R <sub>DS(ON)</sub>	V <sub>GS</sub> =10V, I <sub>D</sub> =7.5A	-	200	250	mΩ
Gate resistance	R <sub>G</sub>		-	4.5	-	Ω
Forward Transconductance	g <sub>FS</sub>	V <sub>DS</sub> =5V, I <sub>D</sub> =15A	15	-	-	S
<b>Dynamic Characteristics</b>						
Input Capacitance	C <sub>iss</sub>	V <sub>DS</sub> =125V, V <sub>GS</sub> =0V, F=1.0MHz	-	475		PF
Output Capacitance	C <sub>oss</sub>		-	34		PF
Reverse Transfer Capacitance	C <sub>rss</sub>		-	1.2		PF
<b>Switching Characteristics</b> (Note 2)						
Turn-on Delay Time	t <sub>d(on)</sub>	V <sub>DD</sub> =125V, R <sub>L</sub> =8Ω V <sub>GS</sub> =10V, R <sub>G</sub> =3Ω	-	4	-	nS
Turn-on Rise Time	t <sub>r</sub>		-	5	-	nS
Turn-Off Delay Time	t <sub>d(off)</sub>		-	10	-	nS
Turn-Off Fall Time	t <sub>f</sub>		-	2	-	nS
Total Gate Charge	Q <sub>g</sub>	V <sub>DS</sub> =125V, I <sub>D</sub> =15A, V <sub>GS</sub> =10V	-	8.9	-	nC
Gate-Source Charge	Q <sub>gs</sub>		-	3.3	-	nC
Gate-Drain Charge	Q <sub>gd</sub>		-	2.5	-	nC
<b>Drain-Source Diode Characteristics</b>						
Diode Forward Voltage	V <sub>SD</sub>	V <sub>GS</sub> =0V, I <sub>S</sub> =15A	-	-	1.2	V
Diode Forward Current	I <sub>S</sub>		-	-	15	A
Reverse Recovery Time	t <sub>rr</sub>	T <sub>J</sub> = 25°C, I <sub>F</sub> = I <sub>S</sub> di/dt = 100A/μs	-	25	-	nS
Reverse Recovery Charge	Q <sub>rr</sub>		-	110	-	nC

### Notes:

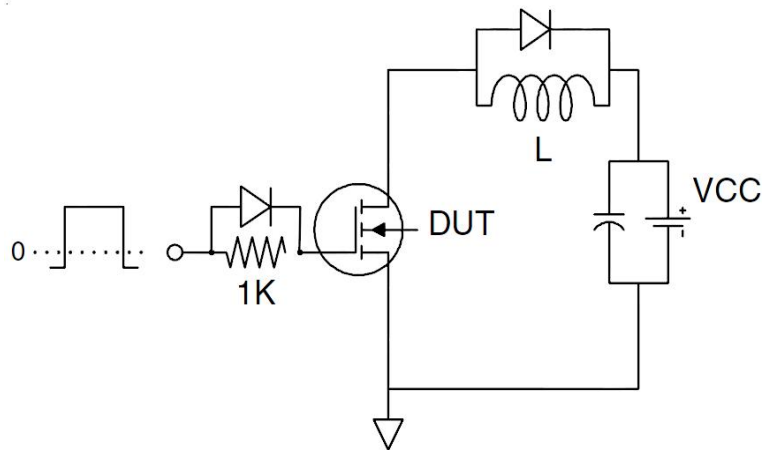
1. EAS condition : T<sub>J</sub>=25°C, V<sub>DD</sub>=50V, V<sub>G</sub>=10V, L=0.5mH, R<sub>G</sub>=25Ω
2. Guaranteed by design, not subject to production
3. These curves are based on the junction-to-case thermal impedance which is measured with the device mounted to a large heatsink, assuming a maximum junction temperature of T<sub>J(MAX)</sub>=175°C. The SOA curve provides a single pulse rating.

## Test Circuit

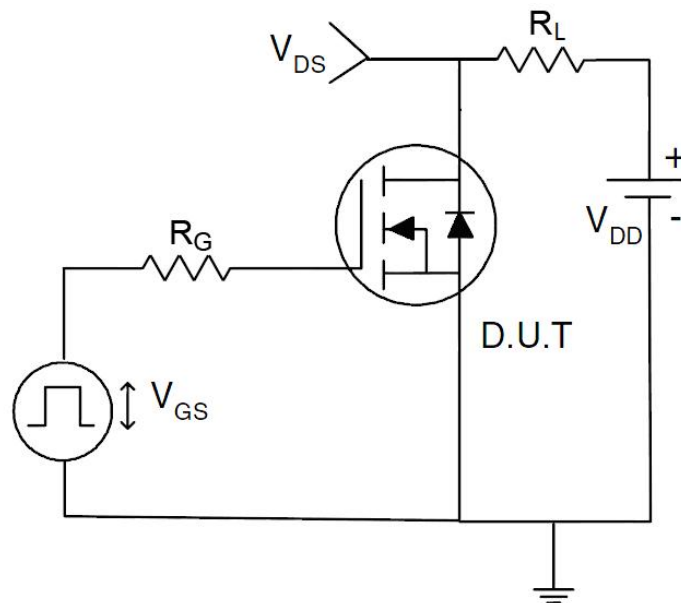
### 1) $E_{AS}$ test Circuit



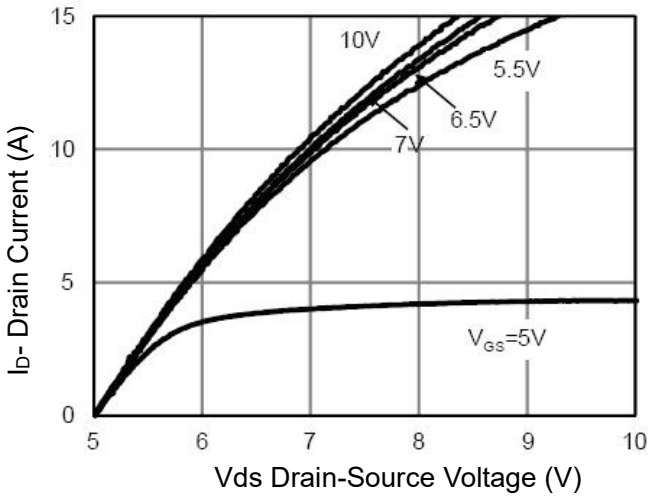
### 2) Gate charge test Circuit



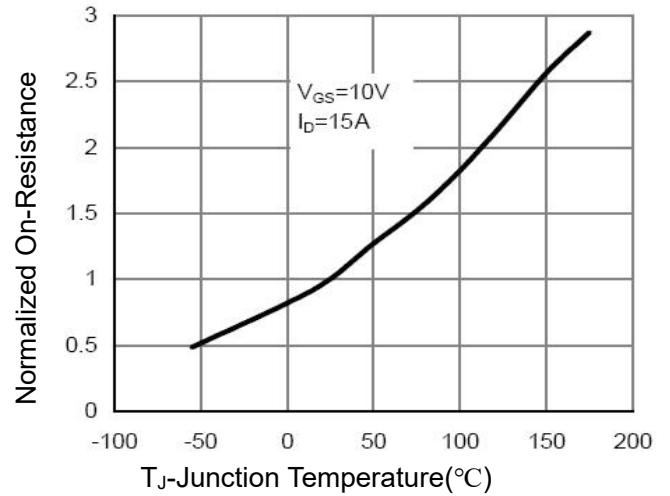
### 3) Switch Time Test Circuit



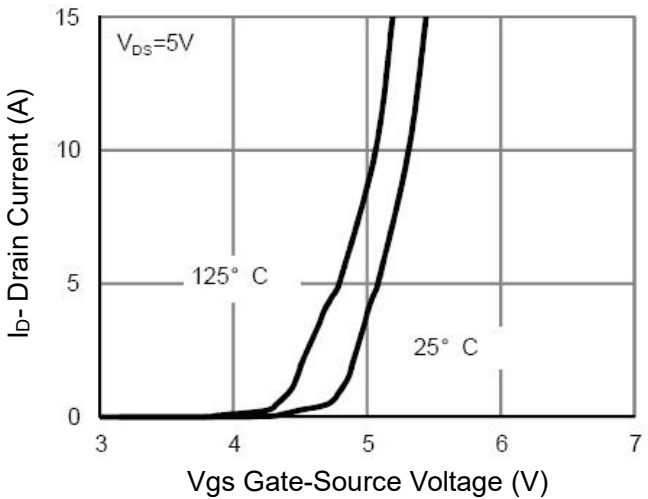
**Typical Electrical and Thermal Characteristics**



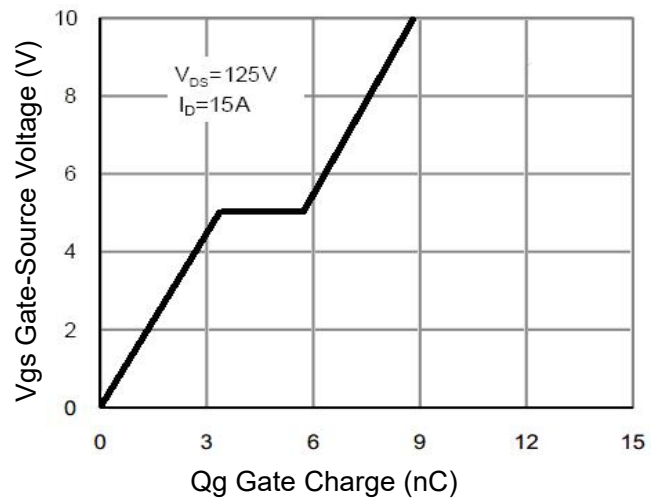
**Figure 1 Output Characteristics**



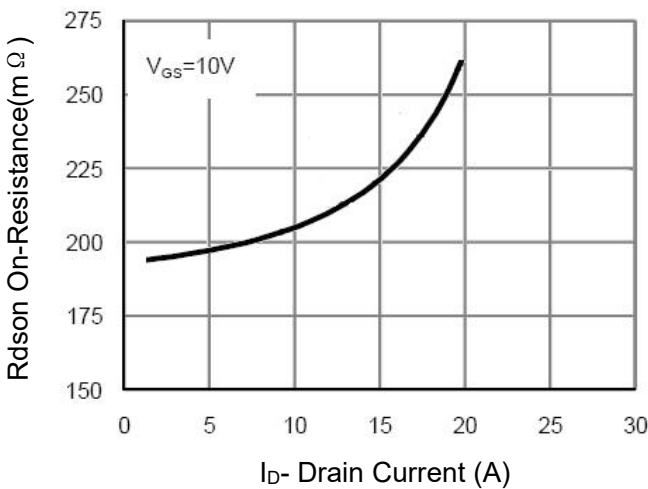
**Figure 4 Rds(on)-Junction Temperature**



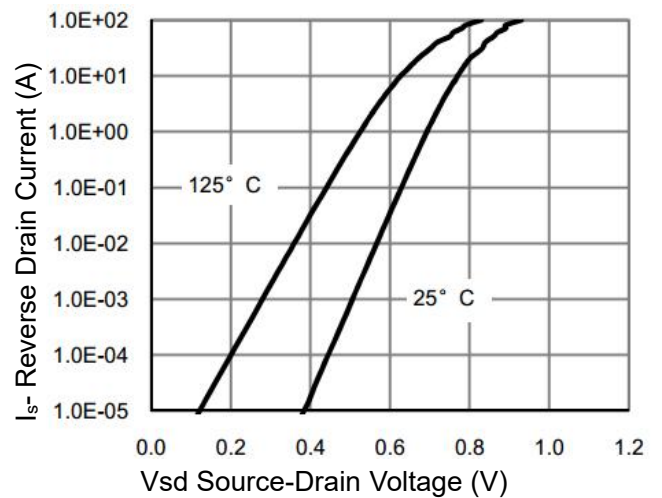
**Figure 2 Transfer Characteristics**



**Figure 5 Gate Charge**



**Figure 3 Rds(on)- Drain Current**



**Figure 6 Source- Drain Diode Forward**

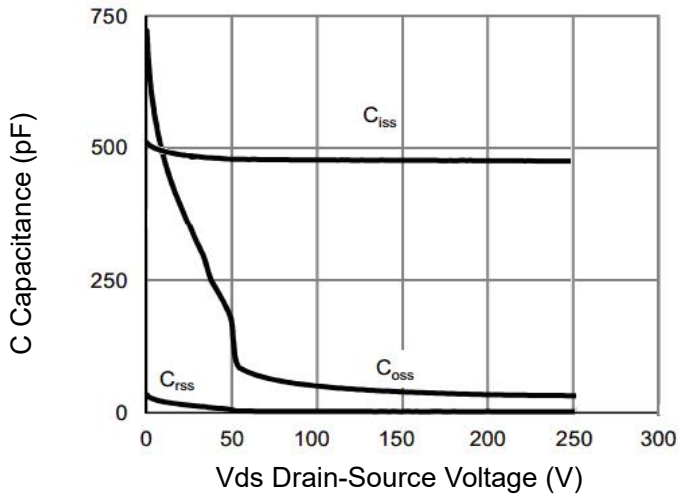


Figure 7 Capacitance vs Vds

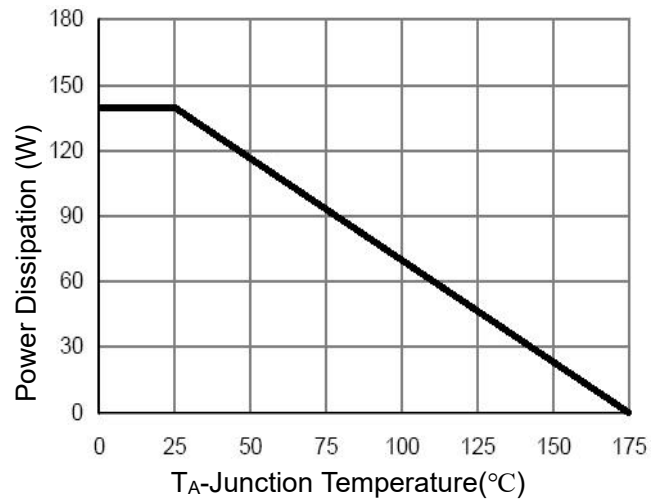


Figure 9 Power De-rating

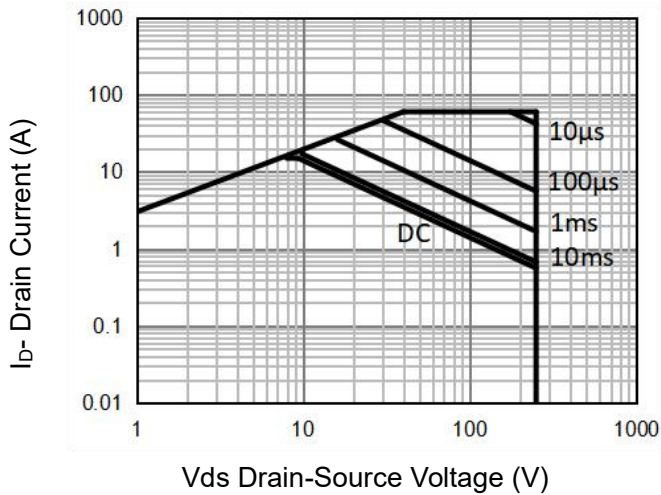


Figure 8 Safe Operation Area (Note 3)

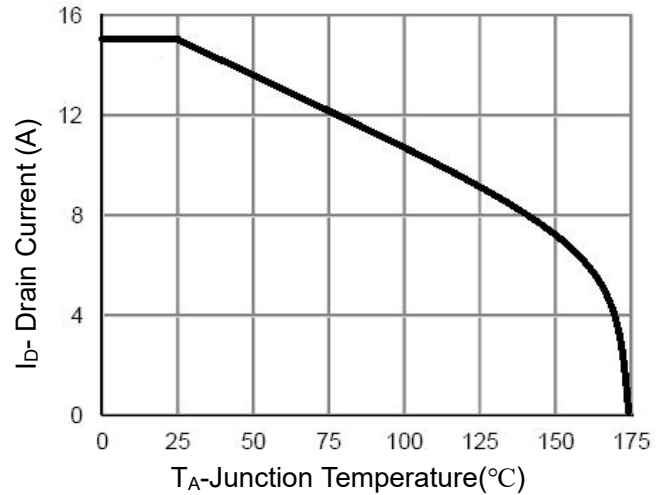


Figure 10 Current De-rating

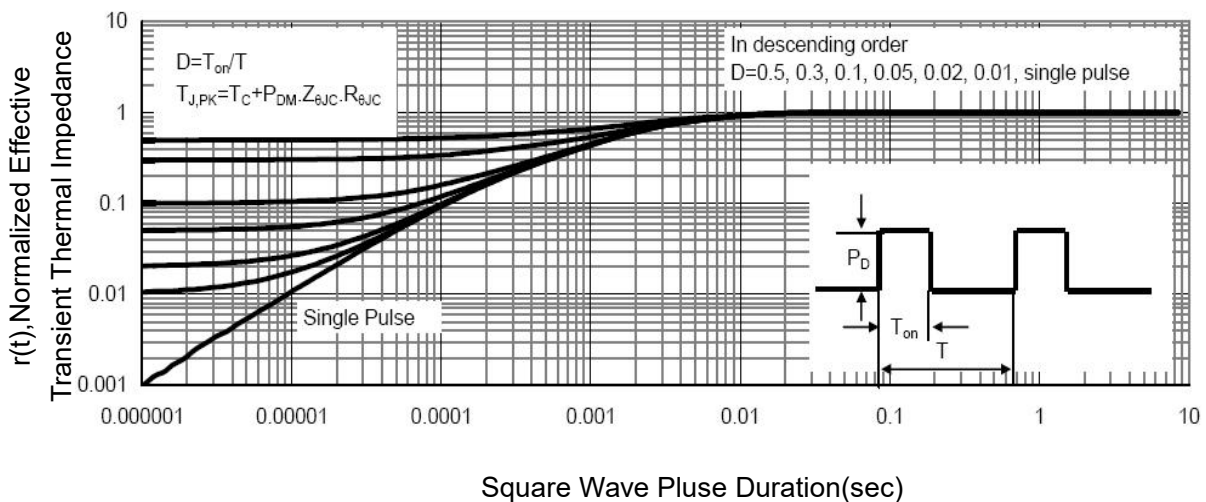
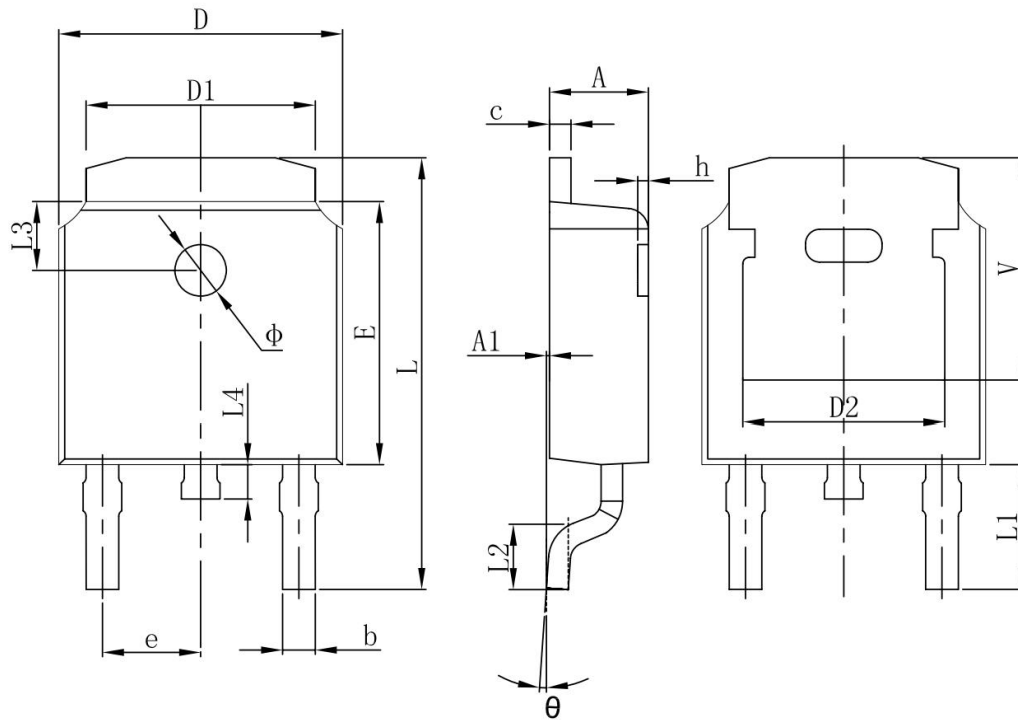


Figure 11 Normalized Maximum Transient Thermal Impedance

TO-252 Package Information



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	2.200	2.400	0.087	0.094
A1	0.000	0.127	0.000	0.005
b	0.635	0.770	0.025	0.030
c	0.460	0.580	0.018	0.023
D	6.500	6.700	0.256	0.264
D1	5.100	5.460	0.201	0.215
D2	4.830 REF.		0.190 REF.	
E	6.000	6.200	0.236	0.244
e	2.186	2.386	0.086	0.094
L	9.712	10.312	0.382	0.406
L1	2.900 REF.		0.114 REF.	
L2	1.400	1.700	0.055	0.067
L3	1.600 REF.		0.063 REF.	
L4	0.600	1.000	0.024	0.039
Φ	1.100	1.300	0.043	0.051
θ	0°	8°	0°	8°
h	0.000	0.300	0.000	0.012
V	5.250 REF.		0.207 REF.	

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