

## NCE N-Channel Enhancement Mode Power MOSFET

### Description

The NCE0250D uses advanced trench technology and design to provide excellent  $R_{DS(ON)}$  with low gate charge. It can be used in a wide variety of applications.

### General Features

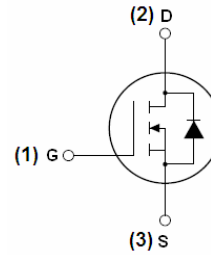
- $V_{DS} = 200V, I_D = 50A$   
 $R_{DS(ON)} < 40m\Omega @ V_{GS} = 10V$  (Typ:30m $\Omega$ )
- High density cell design for ultra low  $R_{dson}$
- Fully characterized avalanche voltage and current
- Good stability and uniformity with high  $E_{AS}$
- Excellent package for good heat dissipation
- Special process technology for high ESD capability

### Application

- Power switching application
- Hard switched and high frequency circuits
- Uninterruptible power supply

**100% UIS TESTED!**

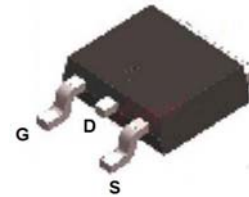
**100%  $\Delta V_{ds}$  TESTED!**



Schematic diagram



Marking and pin assignment



TO-263-2L top view

### Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
NCE0250D	NCE0250D	TO-263-2L	-	-	-

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

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	$V_{DS}$	200	V
Gate-Source Voltage	$V_{GS}$	$\pm 20$	V
Drain Current-Continuous	$I_D$	50	A
Drain Current-Continuous( $T_C = 100^\circ C$ )	$I_D(100^\circ C)$	35	A
Pulsed Drain Current	$I_{DM}$	200	A
Maximum Power Dissipation	$P_D$	270	W
Single pulse avalanche energy <sup>(Note 5)</sup>	$E_{AS}$	500	mJ
Operating Junction and Storage Temperature Range	$T_J, T_{STG}$	-55 To 175	$^\circ C$

### Thermal Characteristic

Thermal Resistance, Junction-to-Case <sup>(Note 2)</sup>	$R_{\theta JC}$	0.6	$^\circ C/W$
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**Electrical Characteristics (T<sub>C</sub>=25°C unless otherwise noted)**

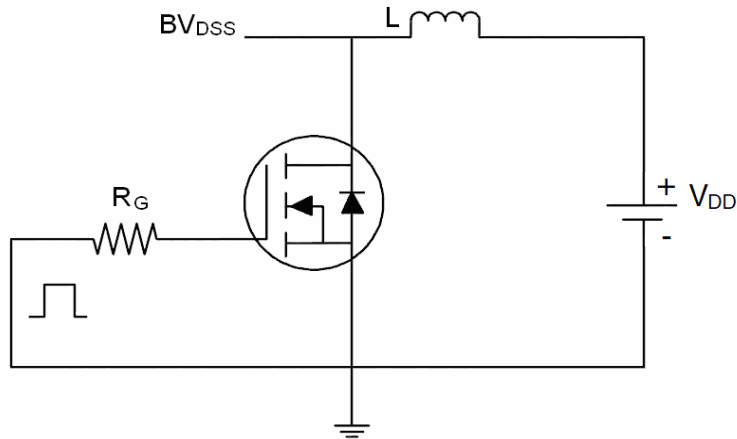
Parameter	Symbol	Condition	Min	Typ	Max	Unit
<b>Off Characteristics</b>						
Drain-Source Breakdown Voltage	BV <sub>DSS</sub>	V <sub>GS</sub> =0V, I <sub>D</sub> =250μA	200	220	-	V
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	V <sub>DS</sub> =200V, V <sub>GS</sub> =0V	-	-	1	μA
Gate-Body Leakage Current	I <sub>GSS</sub>	V <sub>GS</sub> =±20V, V <sub>DS</sub> =0V	-	-	±100	nA
<b>On Characteristics (Note 3)</b>						
Gate Threshold Voltage	V <sub>GS(th)</sub>	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250μA	2	3	4	V
Drain-Source On-State Resistance	R <sub>DS(ON)</sub>	V <sub>GS</sub> =10V, I <sub>D</sub> =28A	-	30	40	mΩ
Forward Transconductance	g <sub>FS</sub>	V <sub>DS</sub> =10V, I <sub>D</sub> =20A	25	-	-	S
<b>Dynamic Characteristics (Note4)</b>						
Input Capacitance	C <sub>ISS</sub>	V <sub>DS</sub> =25V, V <sub>GS</sub> =0V, F=1.0MHz		5460		PF
Output Capacitance	C <sub>OSS</sub>			603		PF
Reverse Transfer Capacitance	C <sub>rss</sub>			161		PF
<b>Switching Characteristics (Note 4)</b>						
Turn-on Delay Time	t <sub>d(on)</sub>	V <sub>DD</sub> =100V, I <sub>D</sub> =28A V <sub>GS</sub> =10V, R <sub>GEN</sub> =2.5Ω	-	17	-	nS
Turn-on Rise Time	t <sub>r</sub>		-	60	-	nS
Turn-Off Delay Time	t <sub>d(off)</sub>		-	55	-	nS
Turn-Off Fall Time	t <sub>f</sub>		-	48	-	nS
Total Gate Charge	Q <sub>g</sub>	V <sub>DS</sub> =100V, I <sub>D</sub> =28A, V <sub>GS</sub> =10V		150		nC
Gate-Source Charge	Q <sub>gs</sub>			25		nC
Gate-Drain Charge	Q <sub>gd</sub>			50		nC
<b>Drain-Source Diode Characteristics</b>						
Diode Forward Voltage (Note 3)	V <sub>SD</sub>	V <sub>GS</sub> =0V, I <sub>S</sub> =20A	-	-	1.2	V
Diode Forward Current (Note 2)	I <sub>S</sub>	-	-	-	50	A
Reverse Recovery Time	t <sub>rr</sub>	T <sub>J</sub> = 25°C, I <sub>F</sub> =28A di/dt = 100A/μs (Note3)	-	100	-	nS
Reverse Recovery Charge	Q <sub>rr</sub>		-	320	-	nC
Forward Turn-On Time	t <sub>on</sub>	Intrinsic turn-on time is negligible (turn-on is dominated by LS+LD)				

**Notes:**

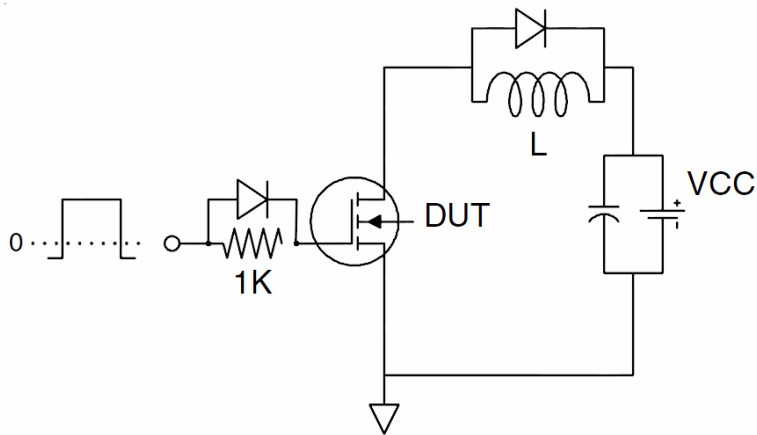
1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. Surface Mounted on FR4 Board, t ≤ 10 sec.
3. Pulse Test: Pulse Width ≤ 300μs, Duty Cycle ≤ 2%.
4. Guaranteed by design, not subject to production
5. EAS condition: T<sub>J</sub>=25°C, V<sub>DD</sub>=50V, V<sub>G</sub>=10V, L=0.5mH, R<sub>g</sub>=25Ω

**Test Circuit**

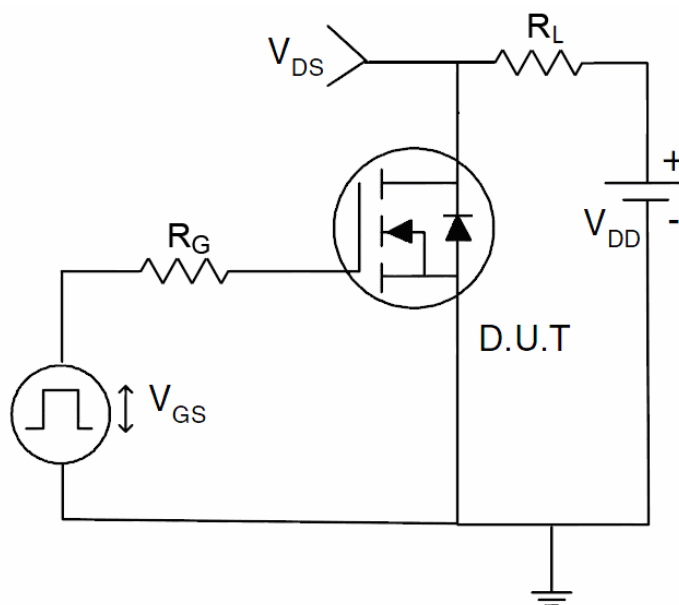
**1) E<sub>AS</sub> test Circuits**



**2) Gate charge test Circuit:**



**3) Switch Time Test Circuit:**



Typical Electrical and Thermal Characteristics (Curves)

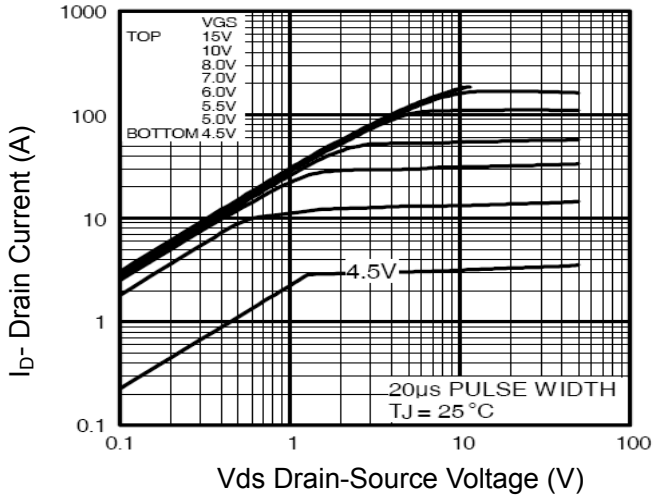


Figure 1 Output Characteristics

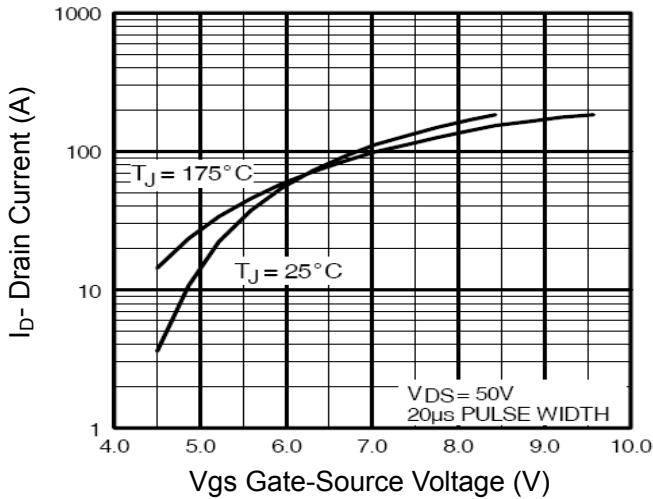


Figure 2 Transfer Characteristics

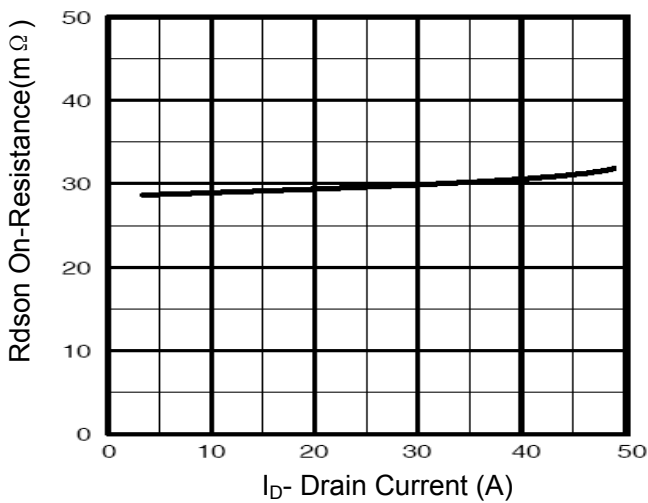


Figure 3  $R_{DS(on)}$ - Drain Current

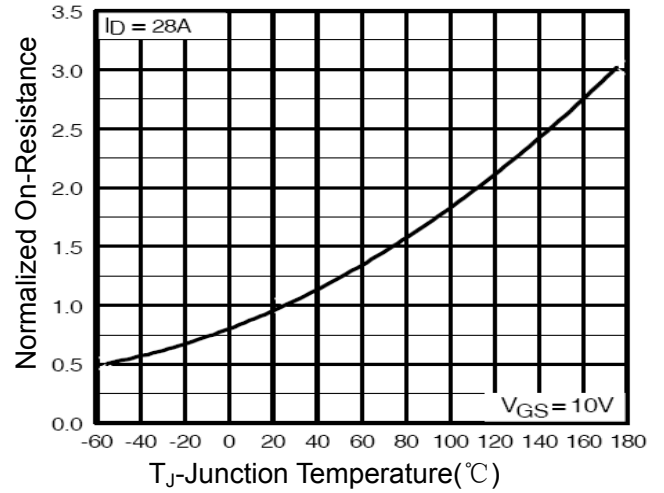


Figure 4  $R_{DS(on)}$ -Junction Temperature

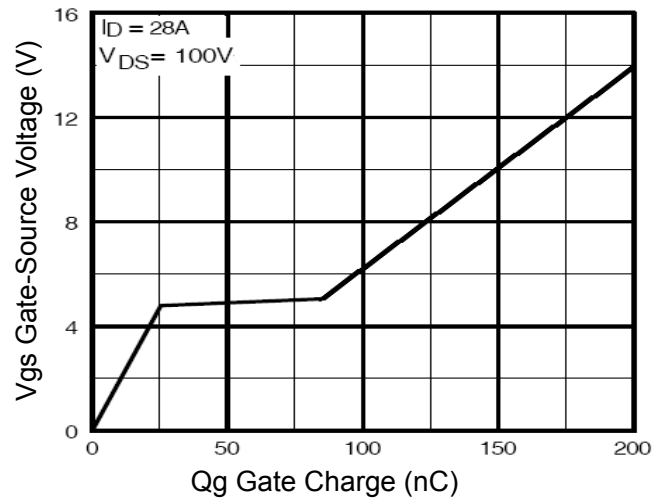


Figure 5 Gate Charge

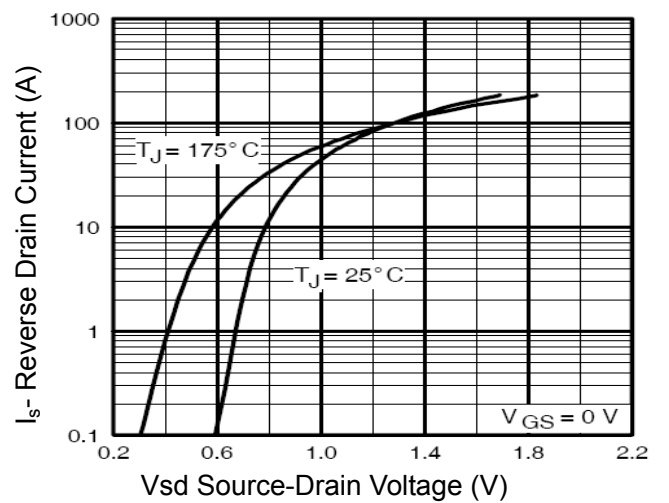


Figure 6 Source- Drain Diode Forward

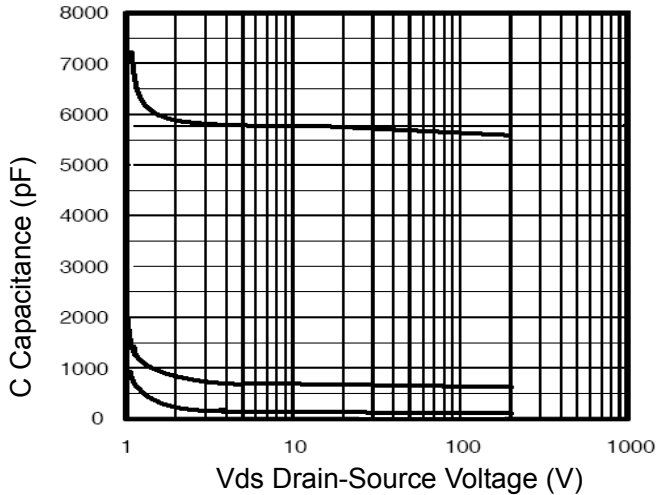


Figure 7 Capacitance vs Vds

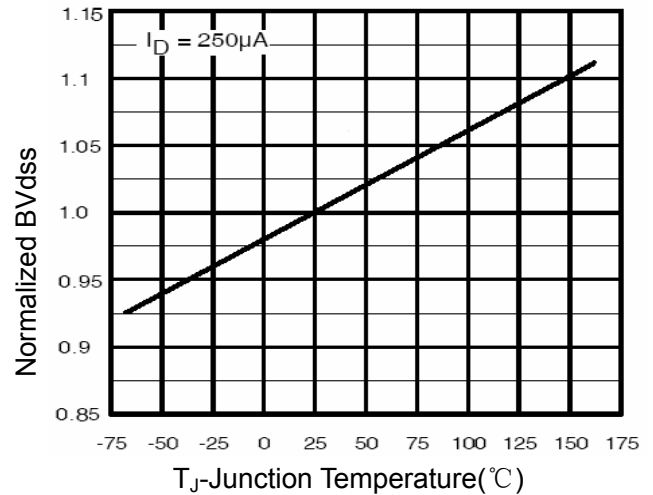


Figure 9  $BV_{DSS}$  vs Junction Temperature

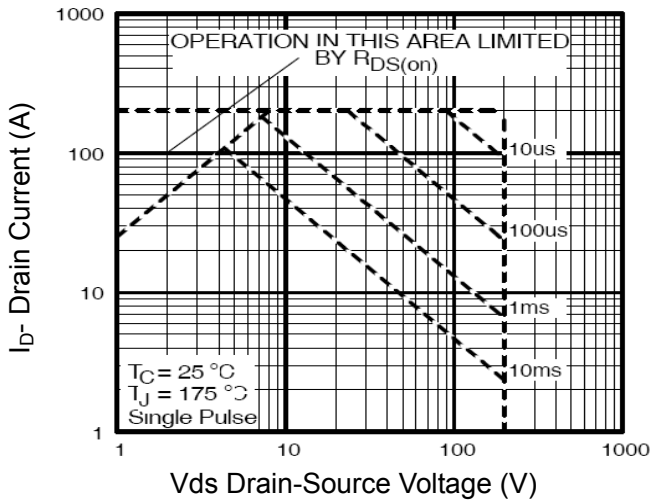


Figure 8 Safe Operation Area

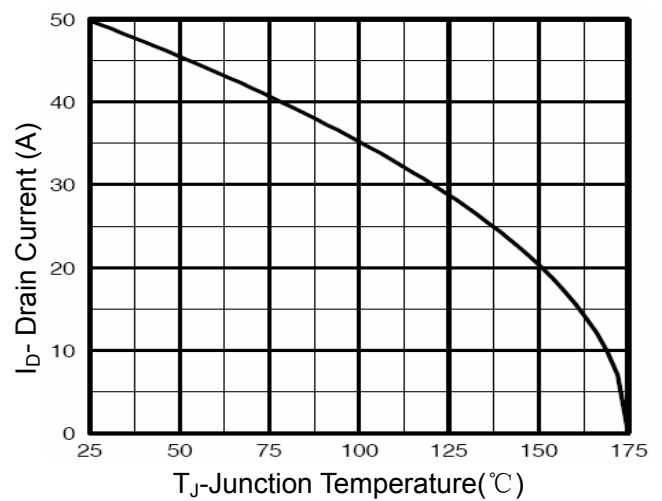


Figure 10  $I_D$  Current De-rating

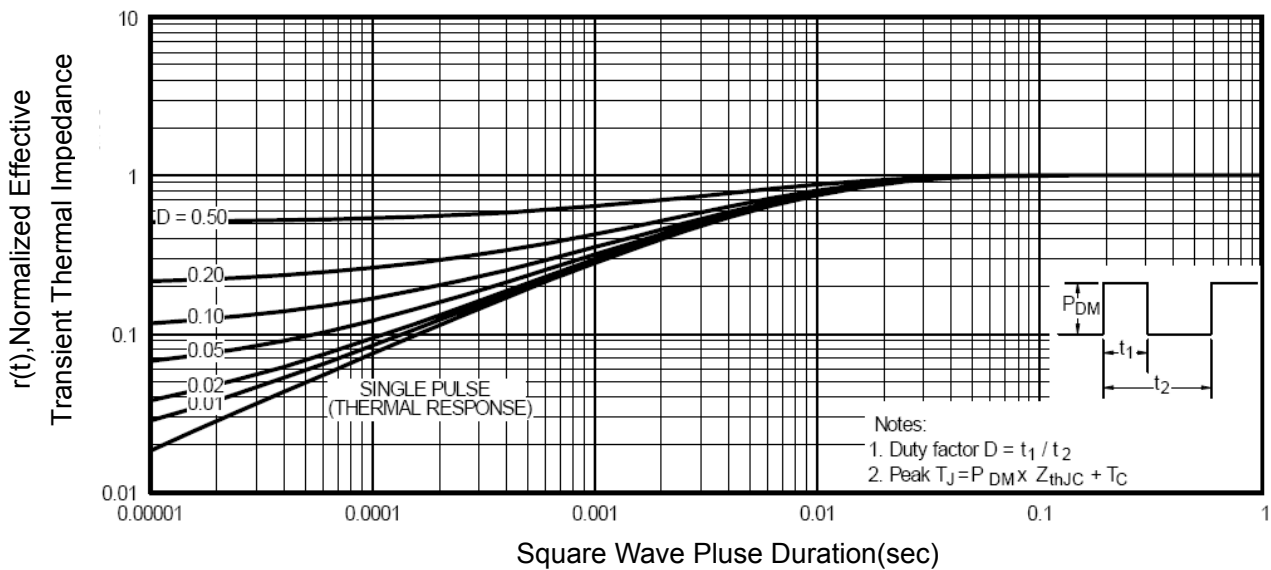
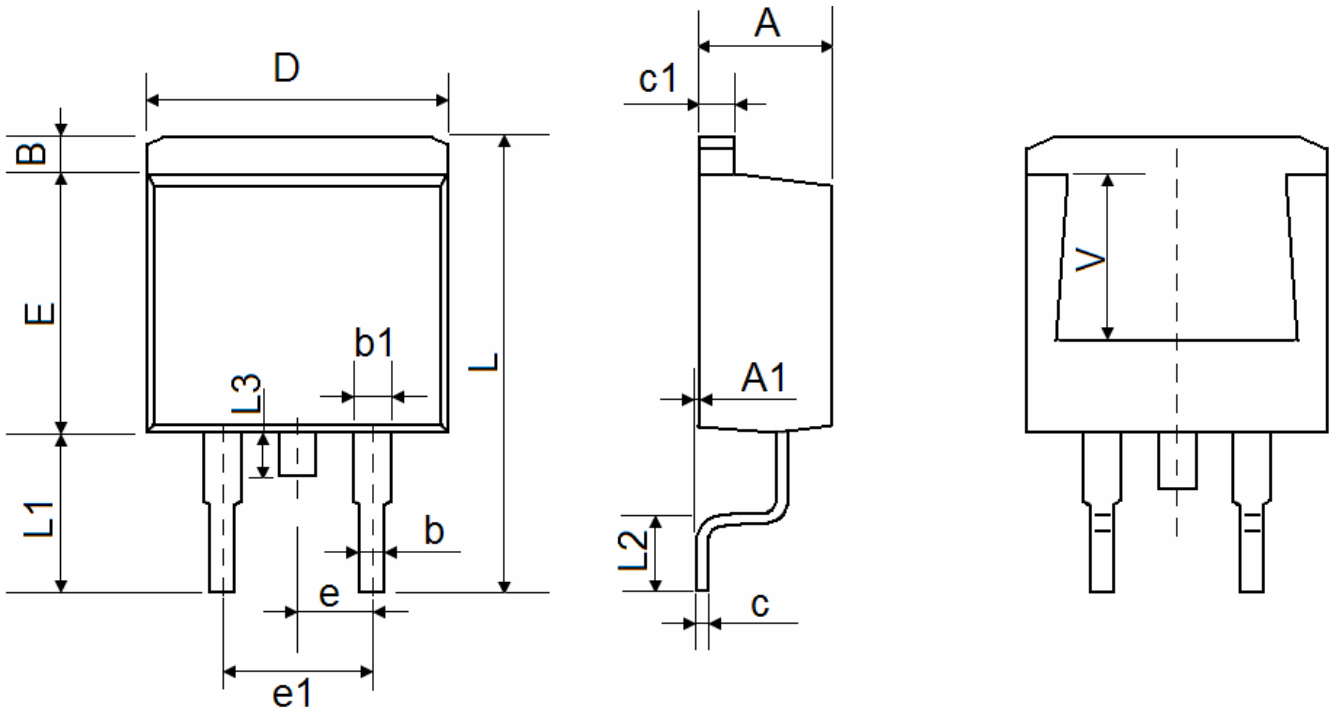


Figure 11 Normalized Maximum Transient Thermal Impedance

**TO-263-2L Package Information**


Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	4.470	4.670	0.176	0.184
A1	0.000	0.150	0.000	0.006
B	1.170	1.370	0.046	0.054
b	0.710	0.910	0.028	0.036
b1	1.170	1.370	0.046	0.054
c	0.310	0.530	0.012	0.021
c1	1.170	1.370	0.046	0.054
D	10.010	10.310	0.394	0.406
E	8.500	8.900	0.335	0.350
e	2.540 TYP.		0.100 TYP.	
e1	4.980	5.180	0.196	0.204
L	15.050	15.450	0.593	0.608
L1	5.080	5.480	0.200	0.216
L2	2.340	2.740	0.092	0.108
L3	1.300	1.700	0.051	0.067
V	5.600 REF		0.220 REF	

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