

## NCE N-Channel Enhancement Mode Power MOSFET

### Description

The NCE3050K 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.

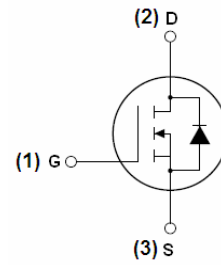
### General Features

- $V_{DS} = 30V, I_D = 50A$   
 $R_{DS(ON)} < 11m\Omega @ V_{GS} = 10V$   
 $R_{DS(ON)} < 16m\Omega @ V_{GS} = 5V$
- High density cell design for ultra low  $R_{DS(ON)}$
- 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

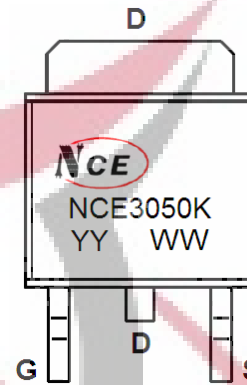
### Application

- Power switching application
- Hard switched and high frequency circuits
- Uninterruptible Power Supply

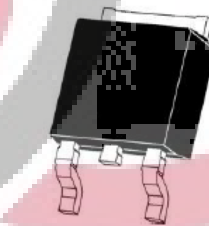
**100% UIS TESTED!**



Schematic diagram



Marking and pin assignment



TO-252-2L top view

### Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
NCE3050K	NCE3050K	TO-252-2L	-	-	-

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

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	$V_{DS}$	30	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	$I_{DM}$	140	A
Maximum Power Dissipation	$P_D$	60	W
Derating factor		0.4	W/ $^\circ C$
Single pulse avalanche energy (Note 5)	$E_{AS}$	70	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>	$R_{\theta JC}$	2.5	$^{\circ}\text{C/W}$
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### Electrical Characteristics ( $T_c=25^{\circ}\text{C}$ unless otherwise noted)

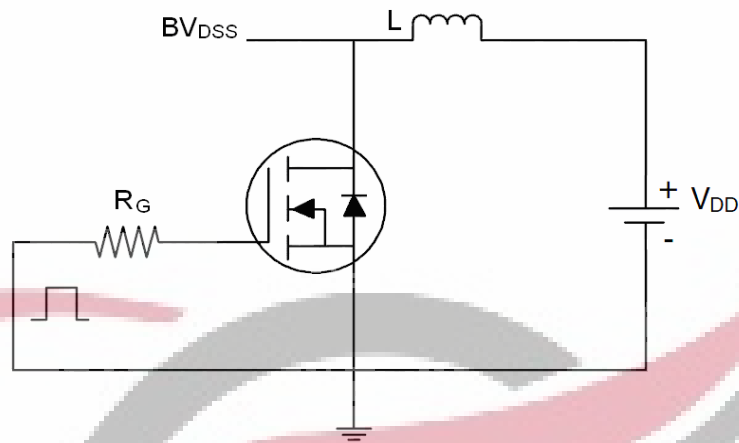
Parameter	Symbol	Condition	Min	Typ	Max	Unit
Off Characteristics						
Drain-Source Breakdown Voltage	BV <sub>DSS</sub>	V <sub>GS</sub> =0V I <sub>D</sub> =250μA	30	33	-	V
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	V <sub>DS</sub> =30V,V <sub>GS</sub> =0V	-	-	1	μA
Gate-Body Leakage Current	I <sub>GSS</sub>	V <sub>GS</sub> =±20V,V <sub>DS</sub> =0V	-	-	±100	nA
On Characteristics (Note 3)						
Gate Threshold Voltage	V <sub>GS(th)</sub>	V <sub>DS</sub> =V <sub>GS</sub> ,I <sub>D</sub> =250μA	1	1.6	3	V
Drain-Source On-State Resistance	R <sub>DS(ON)</sub>	V <sub>GS</sub> =10V, I <sub>D</sub> =25A	-	8	11	mΩ
		V <sub>GS</sub> =5V, I <sub>D</sub> =20A	-	10	16	
Forward Transconductance	g <sub>FS</sub>	V <sub>DS</sub> =5V,I <sub>D</sub> =20A	15	-	-	S
Dynamic Characteristics (Note4)						
Input Capacitance	C <sub>iss</sub>	V <sub>DS</sub> =15V,V <sub>GS</sub> =0V, F=1.0MHz	-	2000	-	PF
Output Capacitance	C <sub>oss</sub>		-	280	-	PF
Reverse Transfer Capacitance	C <sub>rss</sub>		-	160	-	PF
Switching Characteristics (Note 4)						
Turn-on Delay Time	t <sub>d(on)</sub>	V <sub>DD</sub> =15V,I <sub>D</sub> =20A V <sub>GS</sub> =10V,R <sub>GEN</sub> =1.8Ω	-	10	-	nS
Turn-on Rise Time	t <sub>r</sub>		-	8	-	nS
Turn-Off Delay Time	t <sub>d(off)</sub>		-	30	-	nS
Turn-Off Fall Time	t <sub>f</sub>		-	5	-	nS
Total Gate Charge	Q <sub>g</sub>	V <sub>DS</sub> =10V,I <sub>D</sub> =25A, V <sub>GS</sub> =10V	-	23	-	nC
Gate-Source Charge	Q <sub>gs</sub>		-	7	-	nC
Gate-Drain Charge	Q <sub>gd</sub>		-	4.5	-	nC
Drain-Source Diode Characteristics						
Diode Forward Voltage (Note 3)	V <sub>SD</sub>	V <sub>GS</sub> =0V,I <sub>S</sub> =25A	-	0.85	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> = 50A	-	22	35	nS
Reverse Recovery Charge	Q <sub>rr</sub>	di/dt = 100A/μs (Note3)	-	11	18	nC
Forward Turn-On Time	t <sub>on</sub>	Intrinsic turn-on time is negligible (turn-on is dominated by LS+LD)				

### Notes:

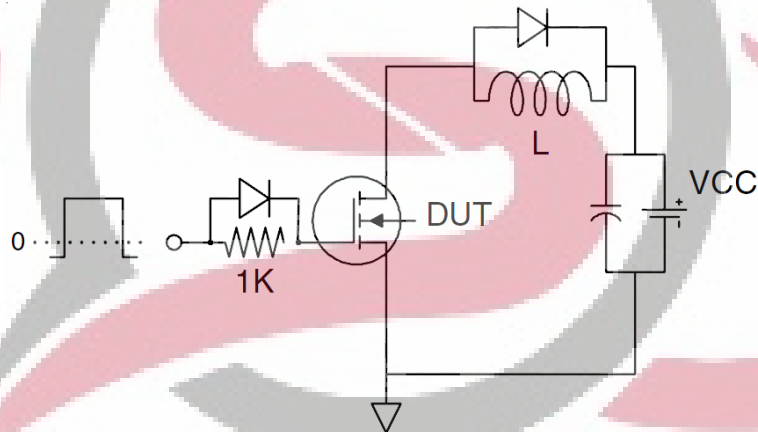
1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. Surface Mounted on FR4 Board,  $t \leq 10$  sec.
3. Pulse Test: Pulse Width  $\leq 300\mu s$ , Duty Cycle  $\leq 2\%$ .
4. Guaranteed by design, not subject to production
5. EAS condition:  $T_J=25^{\circ}\text{C}$ ,  $V_{DD}=15V, V_G=10V, L=1mH, R_g=25\Omega$

## Test circuit

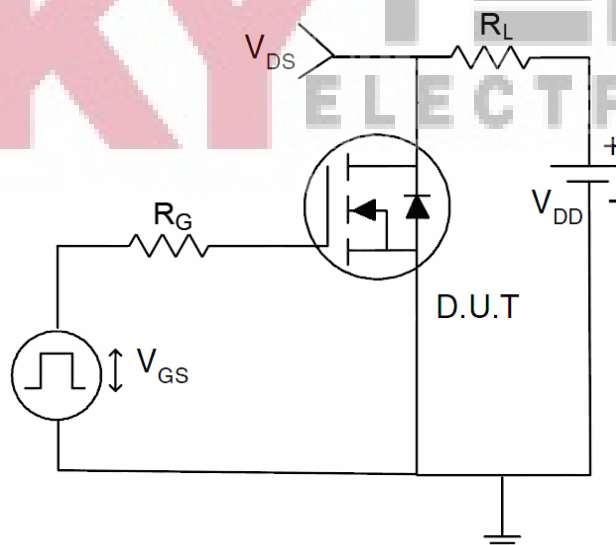
### 1) $E_{AS}$ test Circuits



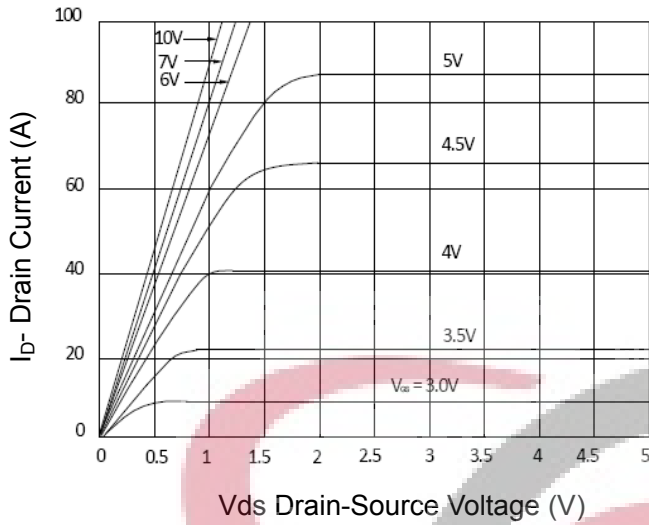
### 2) Gate charge test Circuit:



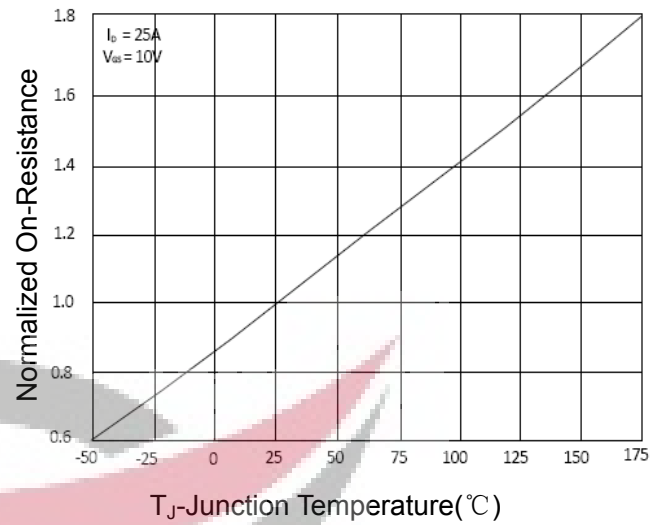
### 3) Switch Time Test Circuit:



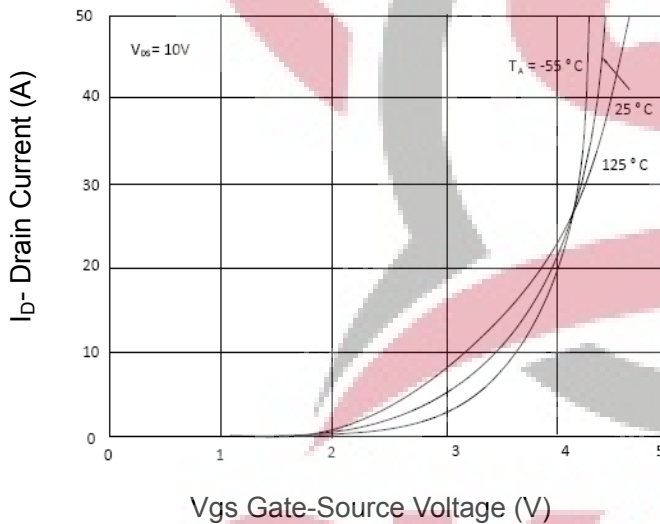
## Typical Electrical and Thermal Characteristics (Curves)



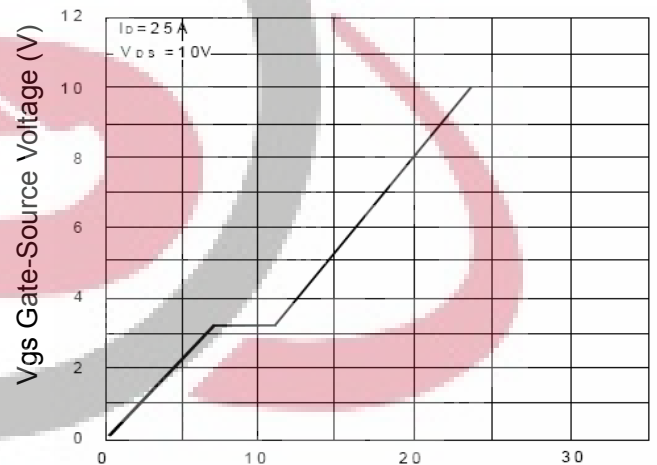
**Figure 1 Output Characteristics**



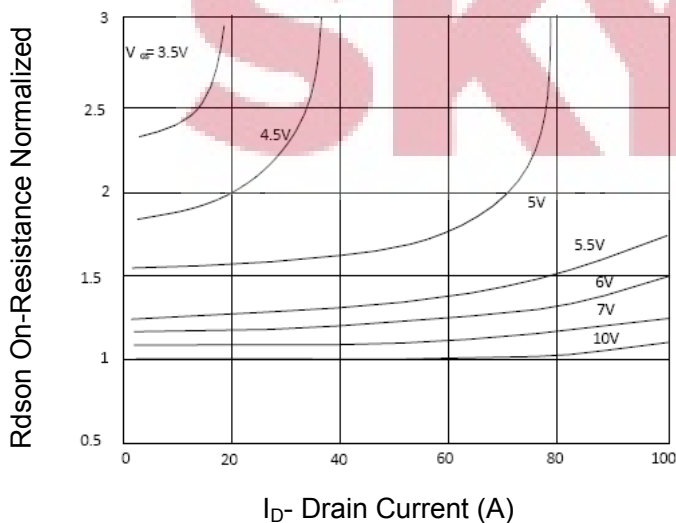
**Figure 4 Rdson-Junction Temperature**



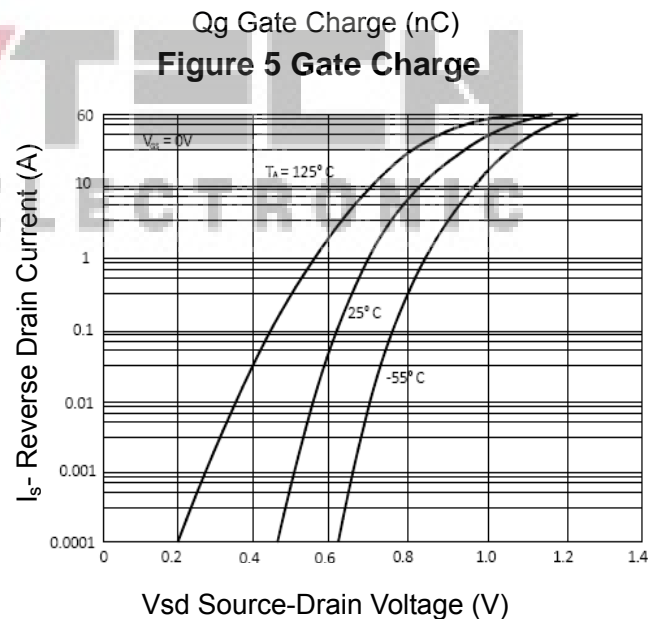
**Figure 2 Transfer Characteristics**



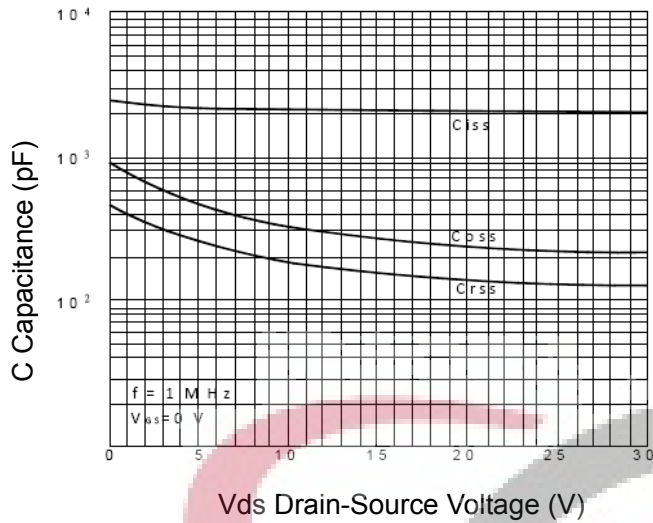
**Figure 5 Gate Charge**



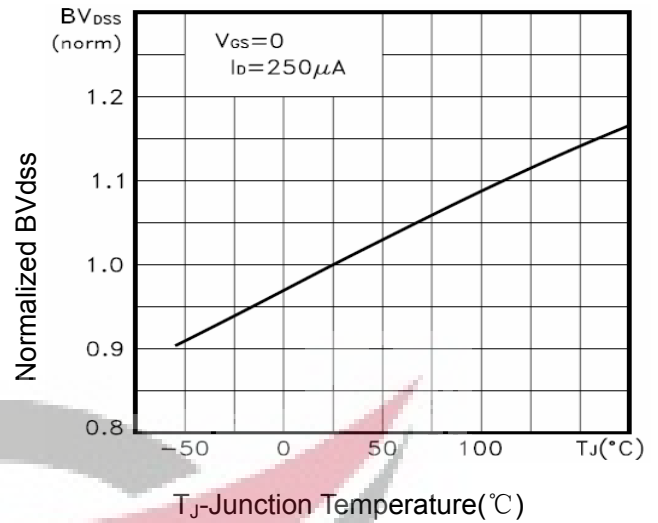
**Figure 3 Rdson- Drain Current**



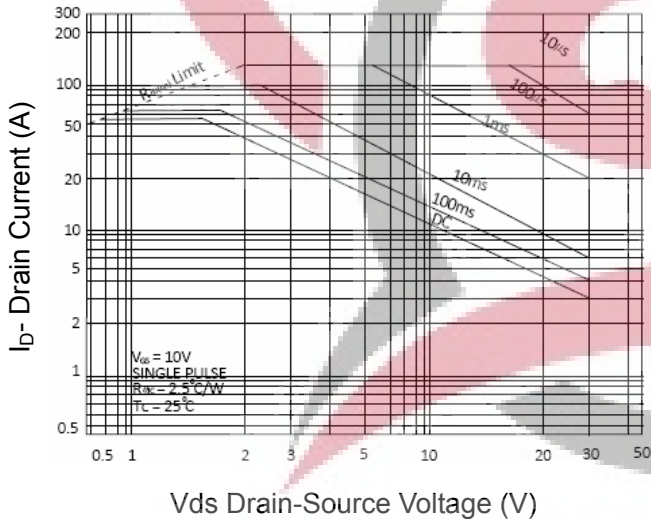
**Figure 6 Source- Drain Diode Forward**



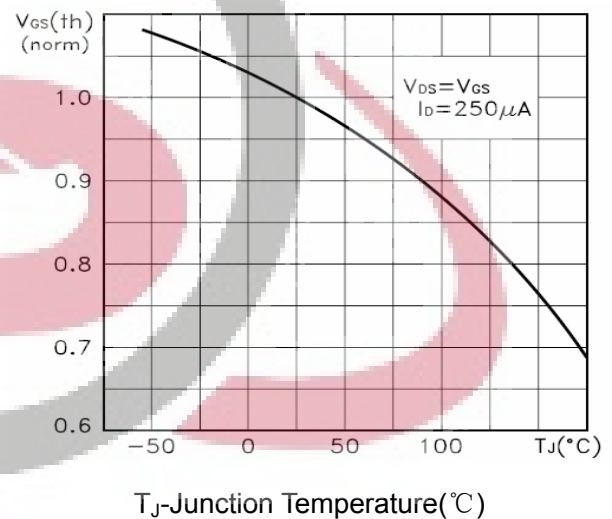
V<sub>ds</sub> Drain-Source Voltage (V)  
Figure 7 Capacitance vs V<sub>ds</sub>



$T_J$ -Junction Temperature( $^{\circ}\text{C}$ )  
Figure 9  $BV_{DSS}$  vs Junction Temperature



V<sub>ds</sub> Drain-Source Voltage (V)  
Figure 8 Safe Operation Area



$T_J$ -Junction Temperature( $^{\circ}\text{C}$ )  
Figure 10  $V_{GS(th)}$  vs Junction Temperature

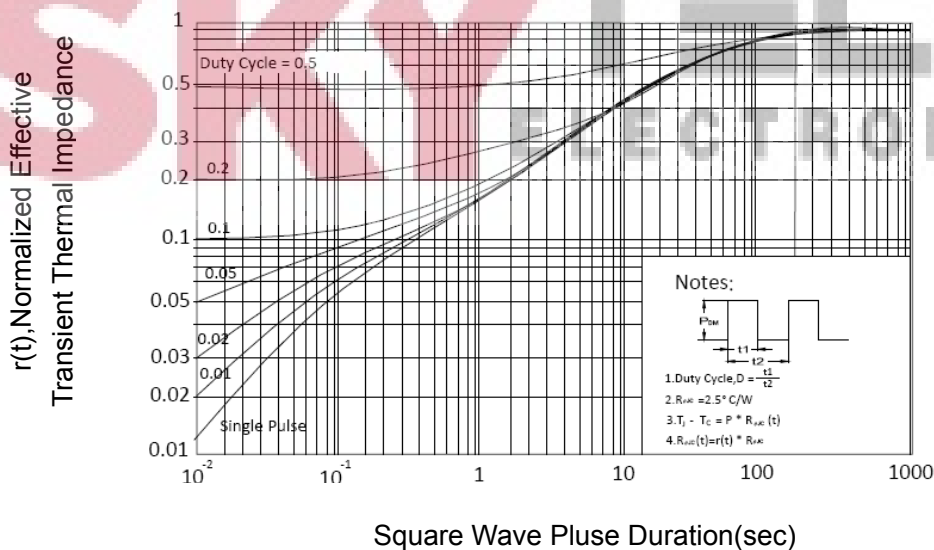
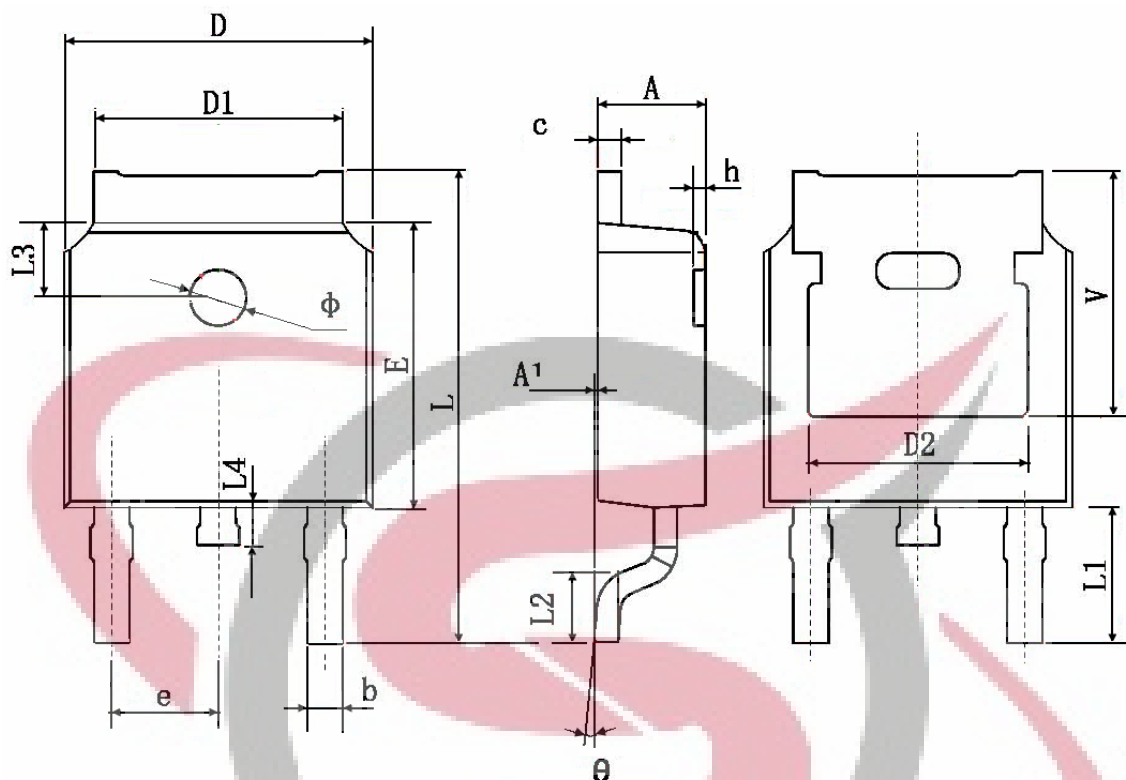


Figure 11 Normalized Maximum Transient Thermal Impedance

## 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	0.660	0.860	0.026	0.034
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 TYP.		0.190 TYP.	
E	6.000	6.200	0.236	0.244
e	2.186	2.386	0.086	0.094
L	9.800	10.400	0.386	0.409
L1	2.900 TYP.		0.114 TYP.	
L2	1.400	1.700	0.055	0.067
L3	1.600 TYP.		0.063 TYP.	
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	5.350 TYP.		0.211 TYP.	



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