

## NCE N-Channel Enhancement Mode Power MOSFET

### General Description

The NCE7560K 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.

### Features

- $V_{DS}=75V$ ;  $I_D=60A@V_{GS}=10V$ ;  
 $R_{DS(ON)}<8.5m\Omega @V_{GS}=10V$
- Special process technology for high ESD capability
- Special designed for Convertors and power controls
- High density cell design for ultra low Rdson
- Fully characterized Avalanche voltage and current
- Good stability and uniformity with high  $E_{AS}$
- Excellent package for good heat dissipation

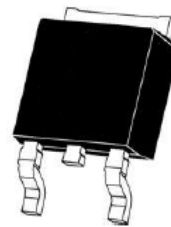
### Application

- Power switching application
- Hard Switched and High Frequency Circuits
- Uninterruptible Power Supply

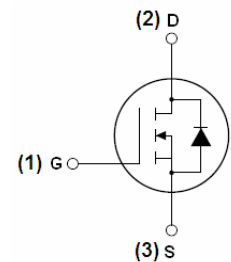
### Product Summary

$BV_{DSS}$ typ.	<b>84</b>	V
$R_{DS(ON)}$ typ.	<b>6.8</b>	m $\Omega$
	<b>8.5</b>	m $\Omega$
$I_D$	<b>60</b>	A

**100% UIS TESTED!**



TO-252-2L top view



Schematic diagram

### Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
NCE7560K	NCE7560K	TO-252-2L	-	-	-

**Table 1. Absolute Maximum Ratings ( $T_C=25^\circ C$ )**

Parameter	Symbol	Value	Unit
Drain-Source Voltage ( $V_{GS}=0V$ )	$V_{DS}$	75	V
Gate-Source Voltage ( $V_{DS}=0V$ )	$V_{GS}$	$\pm 20$	V
Drain Current (DC) at $T_C=25^\circ C$	$I_{D(DC)}$	60	A
Drain Current (DC) at $T_C=100^\circ C$	$I_{D(DC)}$	42	A
Drain Current-Continuous@ Current-Pulsed (Note 1)	$I_{DM(pluse)}$	310	A
Peak diode recovery voltage	$dv/dt$	30	V/ns
Maximum Power Dissipation( $T_C=25^\circ C$ )	$P_D$	140	W
Derating factor		0.95	W/ $^\circ C$
Single pulse avalanche energy (Note 2)	$E_{AS}$	300	mJ
Operating Junction and Storage Temperature Range	$T_J, T_{STG}$	-55 To 175	$^\circ C$

**Notes** 1.Repetitive Rating: Pulse width limited by maximum junction temperature

2.EAS condition:  $T_J=25^\circ C, V_{DD}=37.5V, V_G=10V, L=0.5mH$

**Table 2. Thermal Characteristic**

Parameter	Symbol	Value	Unit
Thermal Resistance, Junction-to-Case (Maximum)	$R_{thJC}$	1.05	$^{\circ}C/W$
Thermal Resistance, Junction-to-Ambient (Maximum)	$R_{thJA}$	50	$^{\circ}C/W$

**Table 3. Electrical Characteristics ( $T_C=25^{\circ}C$  unless otherwise noted)**

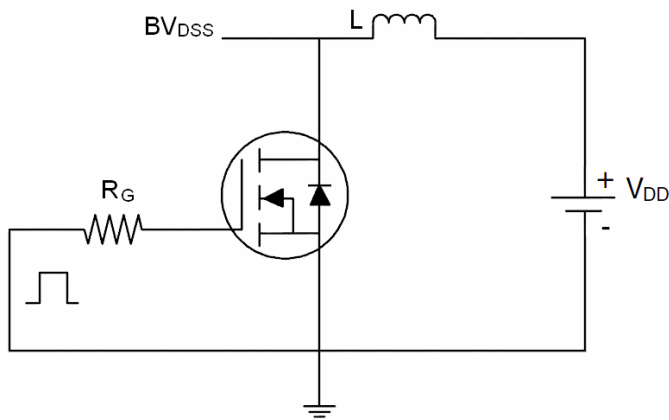
Parameter	Symbol	Condition	Min	Typ	Max	Unit
<b>On/off states</b>						
Drain-Source Breakdown Voltage	$BV_{DSS}$	$V_{GS}=0V, I_D=250\mu A$	75	84	-	V
Zero Gate Voltage Drain Current( $T_C=25^{\circ}C$ )	$I_{DSS}$	$V_{DS}=75V, V_{GS}=0V$	-	-	1	$\mu A$
Zero Gate Voltage Drain Current( $T_C=125^{\circ}C$ )	$I_{DSS}$	$V_{DS}=75V, V_{GS}=0V$	-	-	10	$\mu A$
Gate-Body Leakage Current	$I_{GSS}$	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	$\pm 100$	nA
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=250\mu A$	2	3	4	V
Drain-Source On-State Resistance	$R_{DS(on)}$	$V_{GS}=10V, I_D=30A$	-	6.8	8.5	m $\Omega$
<b>Dynamic Characteristics</b>						
Forward Transconductance	$g_{FS}$	$V_{DS}=5V, I_D=30A$		66	-	S
Input Capacitance	$C_{iss}$	$V_{DS}=25V, V_{GS}=0V,$ $F=1.0MHz$		4400	-	PF
Output Capacitance	$C_{oss}$			340	-	PF
Reverse Transfer Capacitance	$C_{rss}$			260	-	PF
Total Gate Charge	$Q_g$	$V_{DS}=30V, I_D=30A,$ $V_{GS}=10V$		100	-	nC
Gate-Source Charge	$Q_{gs}$			20	-	nC
Gate-Drain Charge	$Q_{gd}$			30	-	nC
<b>Switching times</b>						
Turn-on Delay Time	$t_{d(on)}$	$V_{DD}=30V, I_D=2A, R_L=15\Omega$ $V_{GS}=10V, R_G=2.5\Omega$	-	17.8	-	nS
Turn-on Rise Time	$t_r$		-	11.8	-	nS
Turn-Off Delay Time	$t_{d(off)}$		-	56	-	nS
Turn-Off Fall Time	$t_f$		-	14.6	-	nS
<b>Source- Drain Diode Characteristics</b>						
Source-drain current(Body Diode)	$I_{SD}$		-	-	80	A
Pulsed Source-drain current(Body Diode)	$I_{SDM}$		-	-	320	A
Forward on voltage <sup>(Note 1)</sup>	$V_{SD}$	$T_j=25^{\circ}C, I_{SD}=30A, V_{GS}=0V$	-	-	1.2	V
Reverse Recovery Time <sup>(Note 1)</sup>	$t_{rr}$	$T_j=25^{\circ}C, I_F=75A, di/dt=100A/\mu s$	-	-	36	nS
Reverse Recovery Charge <sup>(Note 1)</sup>	$Q_{rr}$		-	-	56	nC
Forward Turn-on Time	$t_{on}$	Intrinsic turn-on time is negligible(turn-on is dominated by $L_S+L_D$ )				

**Notes**

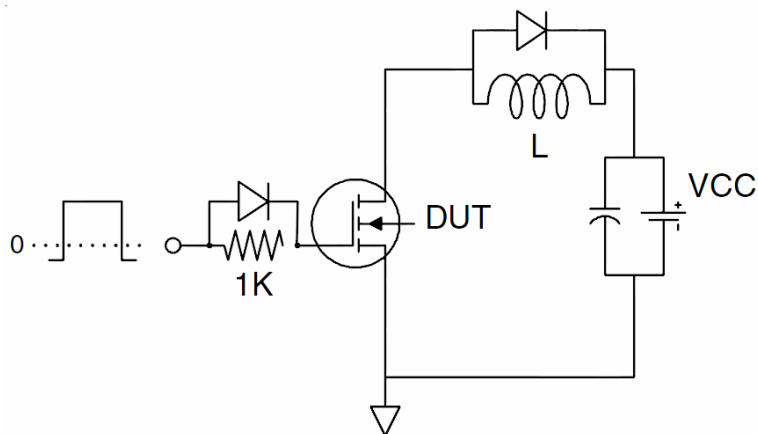
 1. Pulse Test: Pulse Width  $\leq 300\mu s$ , Duty Cycle  $\leq 1.5\%$ ,  $R_G=25\Omega$ , Starting  $T_j=25^{\circ}C$

**Test Circuit**

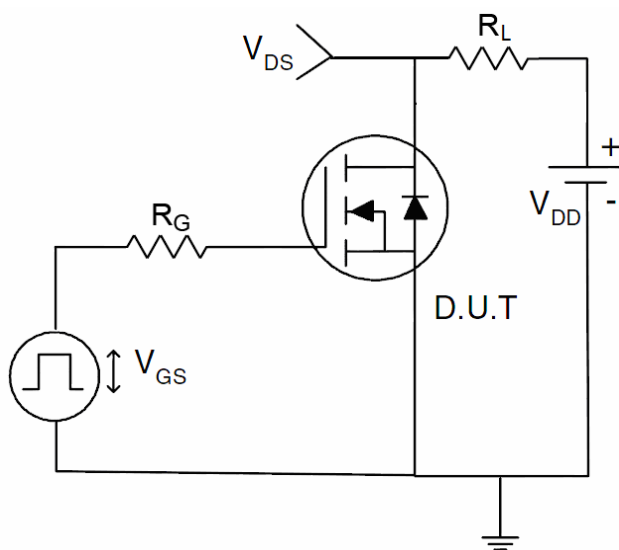
**1) E<sub>AS</sub> test circuit**



**2) Gate charge test circuit**



**3) Switch Time Test Circuit**



Typical Electrical and Thermal Characteristics (curves)

Figure1. Safe operating area

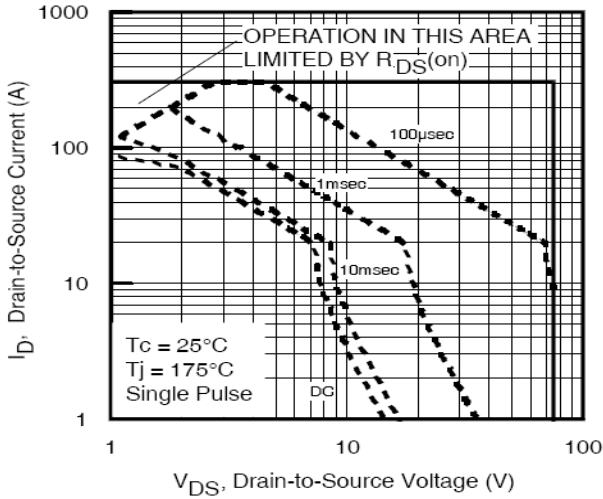


Figure2. Source-Drain Diode Forward Voltage

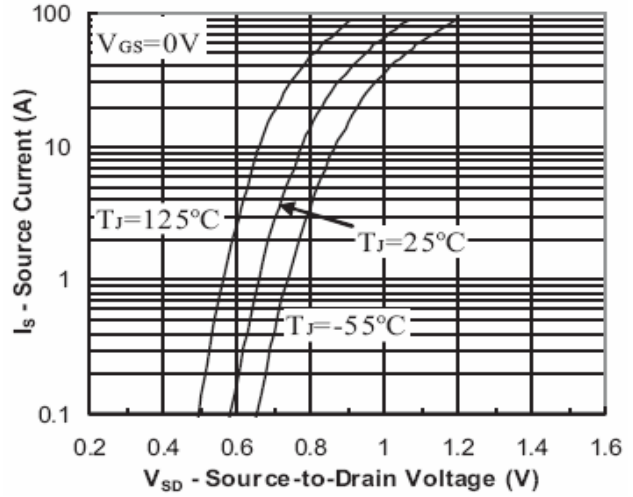


Figure3. Output characteristics

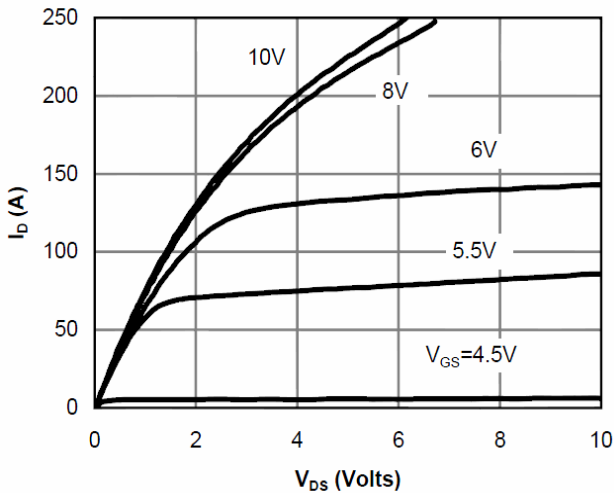


Figure4. Transfer characteristics

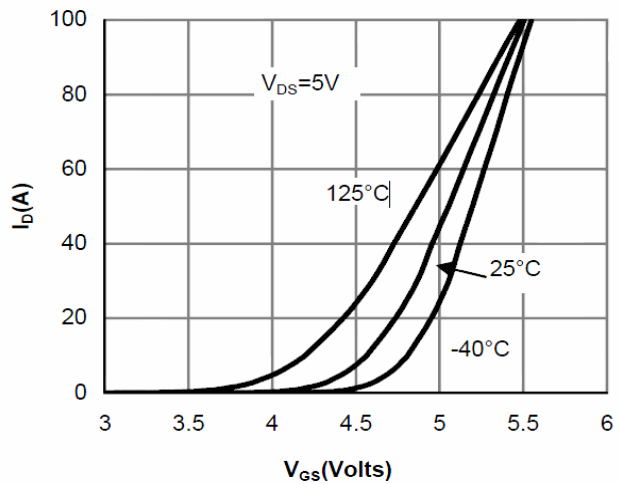


Figure5. Static drain-source on resistance

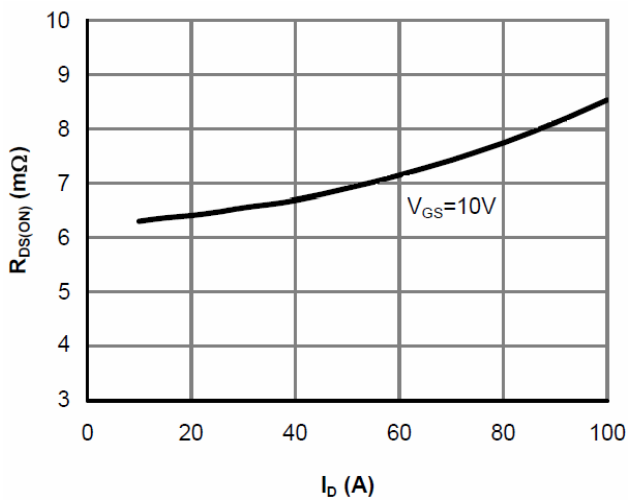


Figure6.  $R_{DS(ON)}$  vs Junction Temperature

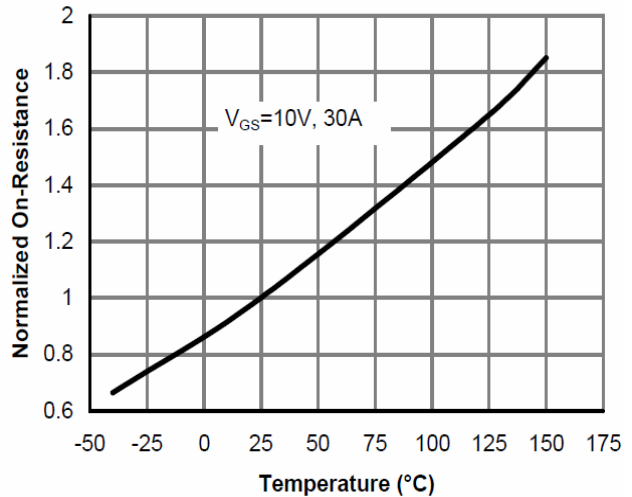


Figure7.  $BV_{DSS}$  vs Junction Temperature

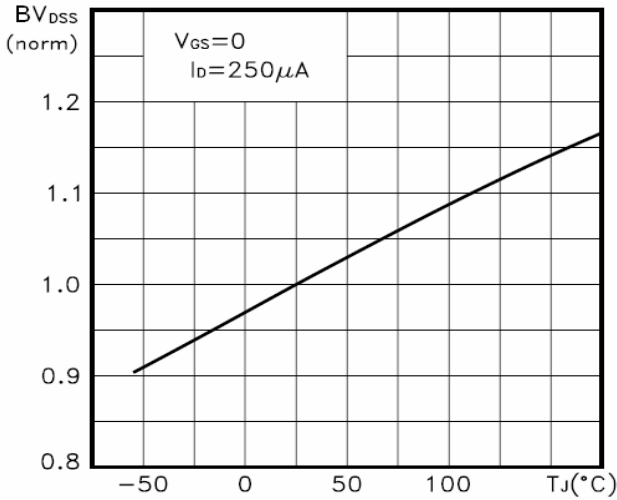


Figure8.  $V_{GS(th)}$  vs Junction Temperature

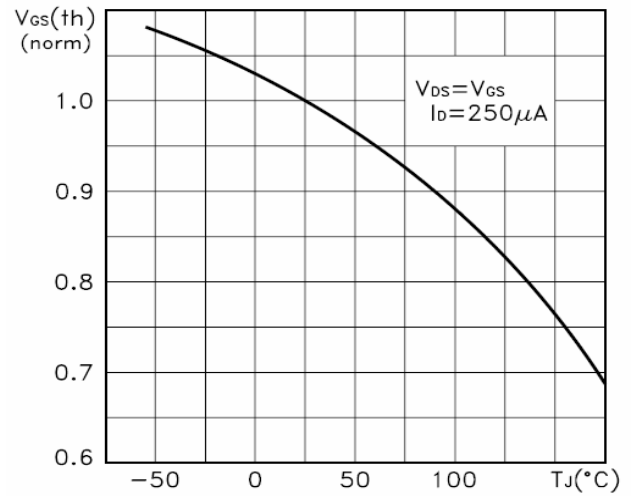


Figure9. Gate charge waveforms

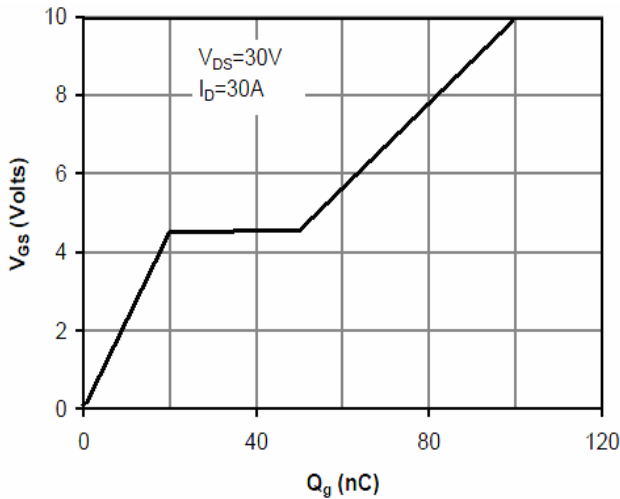


Figure10. Capacitance

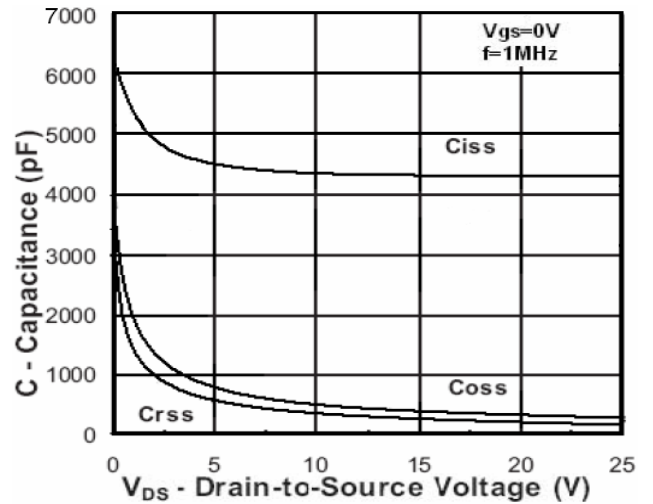
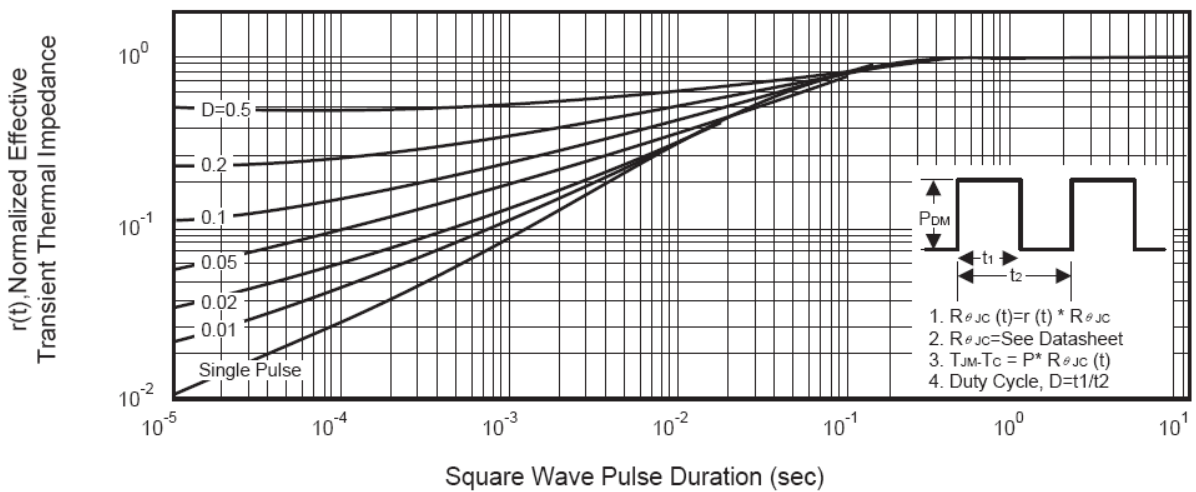
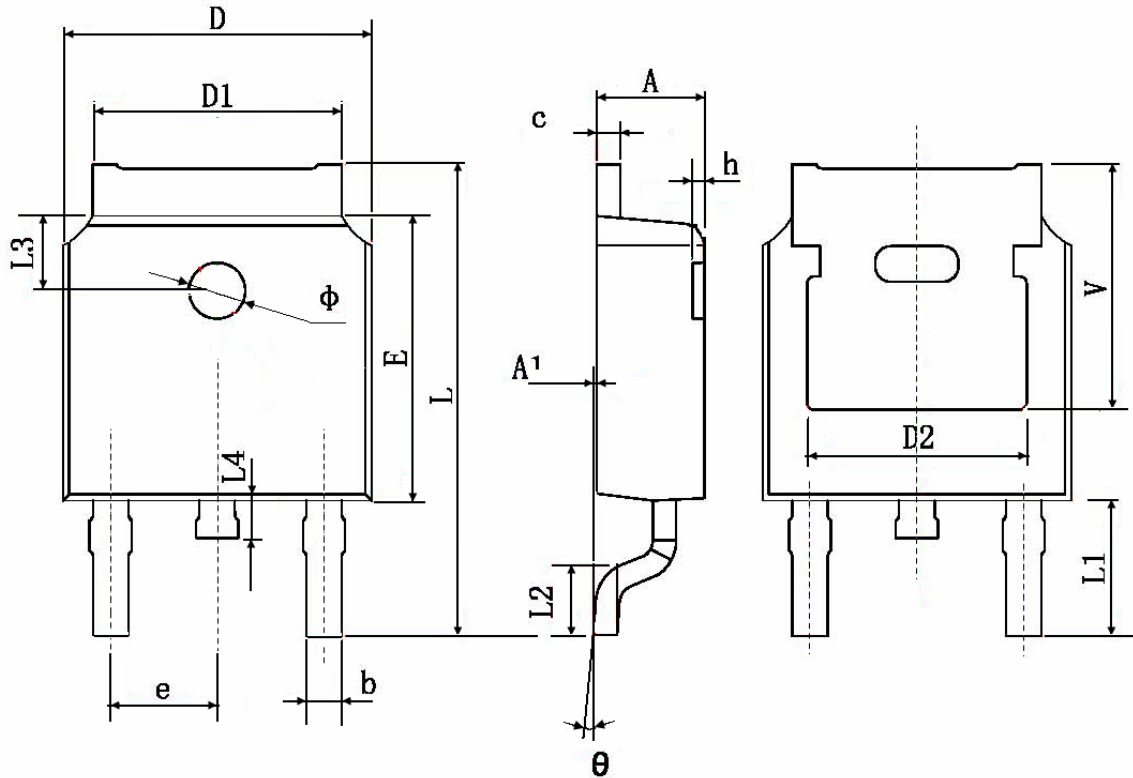


Figure11. Normalized Maximum Transient Thermal Impedance



**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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