

## NCE N-Channel Super Trench Power MOSFET

### Description

The NCEP0116K 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.

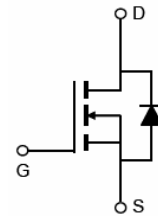
### General Features

- $V_{DS} = 100V, I_D = 16A$   
 $R_{DS(ON)} = 78m\Omega$  (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
- 100% UIS tested

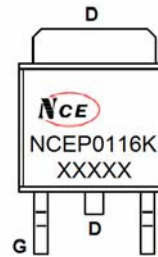
### Application

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

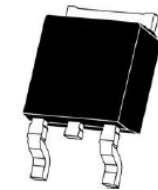
**100% UIS TESTED!**



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
NCEP0116K	NCEP0116K	TO-252-2L	Ø330mm	12mm	2500 units

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

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	$V_{DS}$	100	V
Gate-Source Voltage	$V_{GS}$	$\pm 20$	V
Drain Current-Continuous	$I_D$	16	A
Drain Current-Continuous( $T_C = 100^\circ C$ )	$I_D(100^\circ C)$	11.3	A
Pulsed Drain Current	$I_{DM}$	64	A
Maximum Power Dissipation	$P_D$	55	W
Derating factor		0.37	W/ $^\circ C$
Single pulse avalanche energy <sup>(Note 5)</sup>	$E_{AS}$	26	mJ
Drain Source voltage slope, $V_{DS} \leq 120 V$ ,	$dv/dt$	50	V/ns
Drain Source voltage slope, $V_{DS} \leq 120 V, I_{SD} < I_D$	$dv/dt$	50	V/ns
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>	$R_{\theta JC}$	2.7	$^{\circ}C/W$
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**Electrical Characteristics ( $T_A=25^{\circ}C$  unless otherwise noted)**

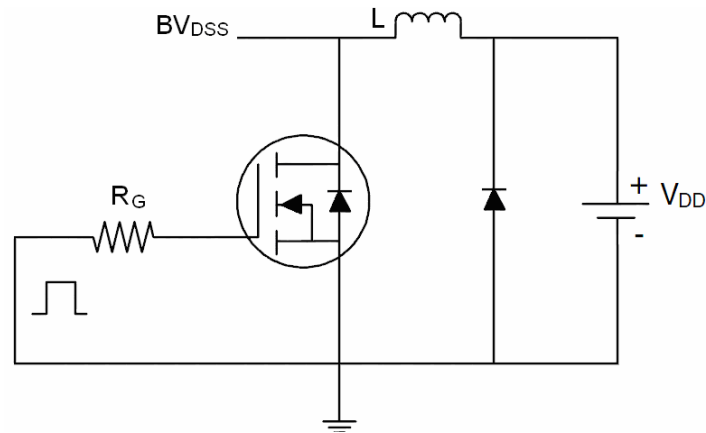
Parameter	Symbol	Condition	Min	Typ	Max	Unit
<b>Off Characteristics</b>						
Drain-Source Breakdown Voltage	$BV_{DSS}$	$V_{GS}=0V, I_D=250\mu A$	100	-	-	V
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS}=100V, V_{GS}=0V$	-	-	1	$\mu A$
Gate-Body Leakage Current	$I_{GSS}$	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	$\pm 100$	nA
<b>On Characteristics</b> <sup>(Note 3)</sup>						
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=250\mu A$	2.0	3.2	4.0	V
Drain-Source On-State Resistance	$R_{DS(ON)}$	$V_{GS}=10V, I_D=16A$	-	78	95	m $\Omega$
Gate resistance	$R_G$		-	10	-	$\Omega$
Forward Transconductance	$g_{FS}$	$V_{DS}=5V, I_D=16A$	-	20	-	S
<b>Dynamic Characteristics</b> <sup>(Note 4)</sup>						
Input Capacitance	$C_{ISS}$	$V_{DS}=50V, V_{GS}=0V,$ $F=1.0MHz$	-	322		PF
Output Capacitance	$C_{OSS}$		-	53		PF
Reverse Transfer Capacitance	$C_{RSS}$		-	5.1		PF
<b>Switching Characteristics</b> <sup>(Note 4)</sup>						
Turn-on Delay Time	$t_{d(on)}$	$V_{DD}=50V, R_L=3\Omega$ $V_{GS}=10V, R_G=3\Omega$	-	6	-	nS
Turn-on Rise Time	$t_r$		-	3	-	nS
Turn-Off Delay Time	$t_{d(off)}$		-	18	-	nS
Turn-Off Fall Time	$t_f$		-	3	-	nS
Total Gate Charge	$Q_g$	$V_{DS}=50V, I_D=10A,$ $V_{GS}=10V$	-	5.6	-	nC
Gate-Source Charge	$Q_{gs}$		-	2.4	-	nC
Gate-Drain Charge	$Q_{gd}$		-	1.3	-	nC
<b>Drain-Source Diode Characteristics</b>						
Diode Forward Voltage <sup>(Note 3)</sup>	$V_{SD}$	$V_{GS}=0V, I_S=10A$	-	-	1.2	V
Diode Forward Current <sup>(Note 2)</sup>	$I_S$		-	-	16	A
Reverse Recovery Time	$t_{rr}$	$T_J = 25^{\circ}C, I_F = I_S$ $di/dt = 100A/\mu s$ <sup>(Note 3)</sup>	-	15	-	nS
Reverse Recovery Charge	$Q_{rr}$		-	53	-	nC

**Notes:**

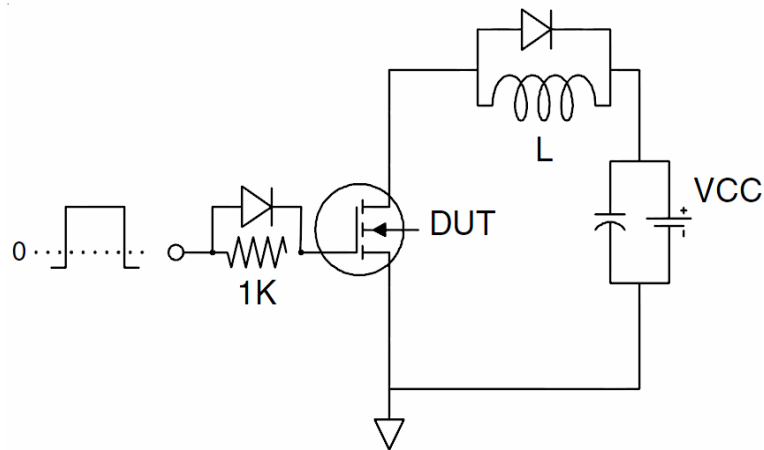
1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. Surface Mounted on FR4 Board,  $t \leq 10$  sec.
3. Pulse Test: Pulse Width  $\leq 300\mu s$ , Duty Cycle  $\leq 2\%$ .
4. Guaranteed by design, not subject to production
5. EAS condition :  $T_J=25^{\circ}C, V_{DD}=50V, V_G=10V, L=0.5mH, R_g=25\Omega$

**Test Circuit**

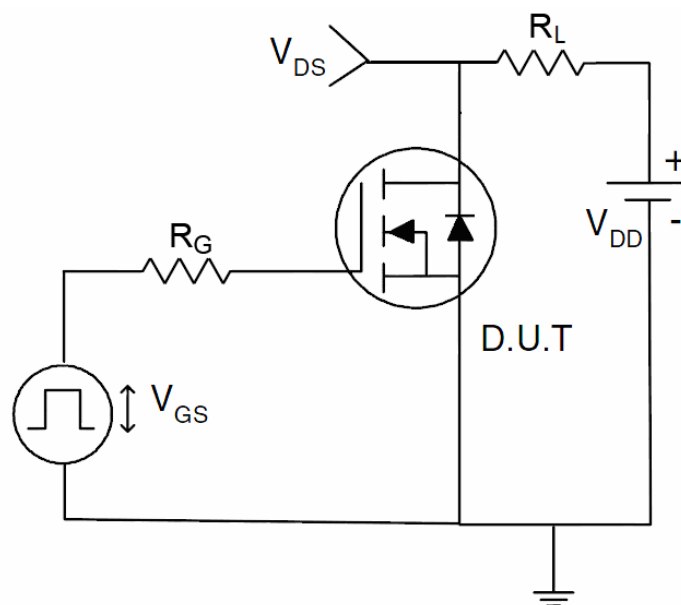
**1) E<sub>AS</sub> test Circuit**



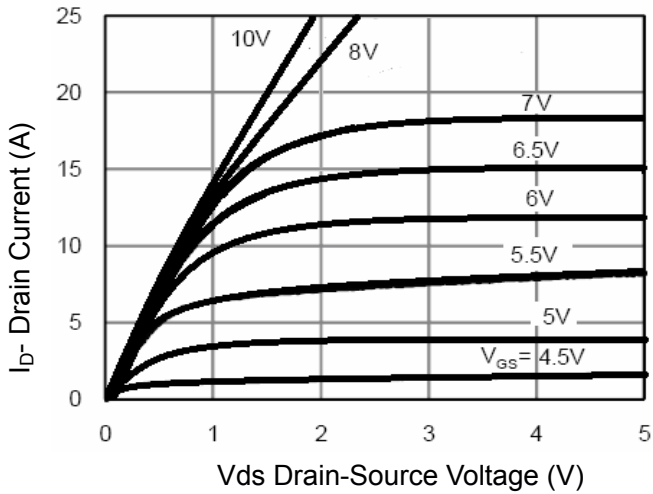
**2) Gate charge test Circuit**



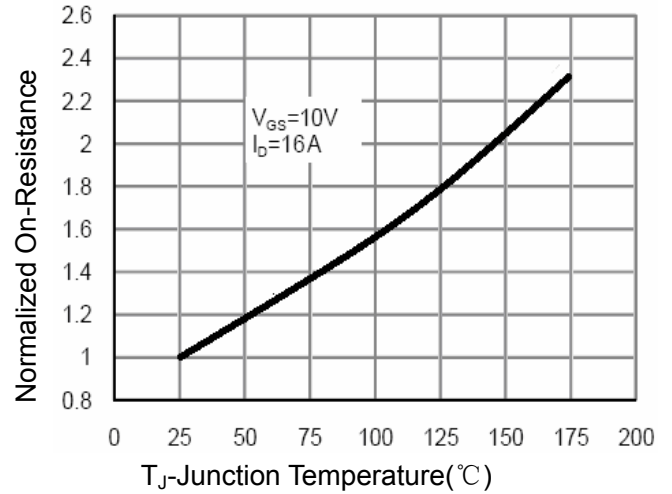
**3) Switch Time Test Circuit**



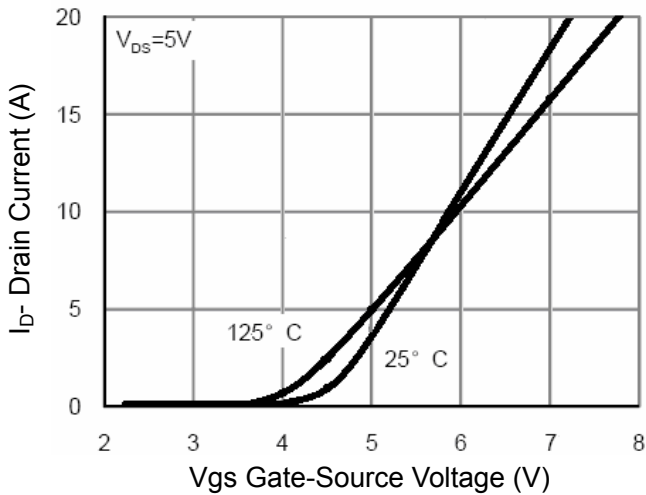
**Typical Electrical and Thermal Characteristics**



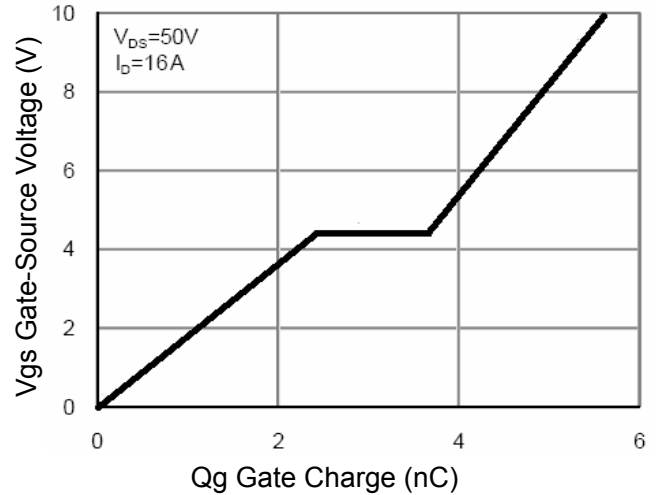
**Figure 1 Output Characteristics**



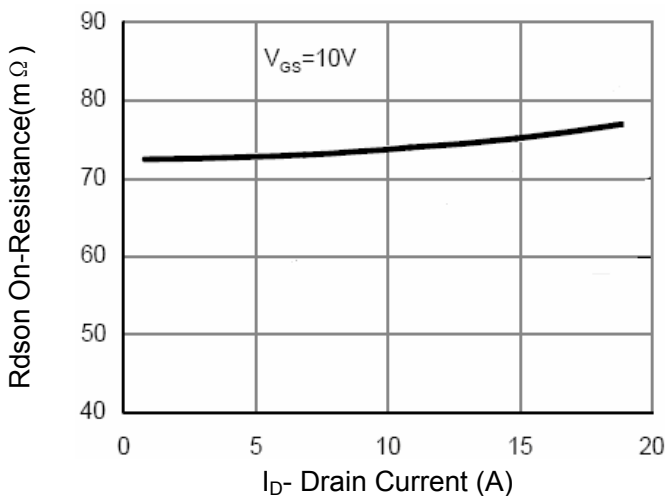
**Figure 4  $R_{dson}$ -Junction Temperature**



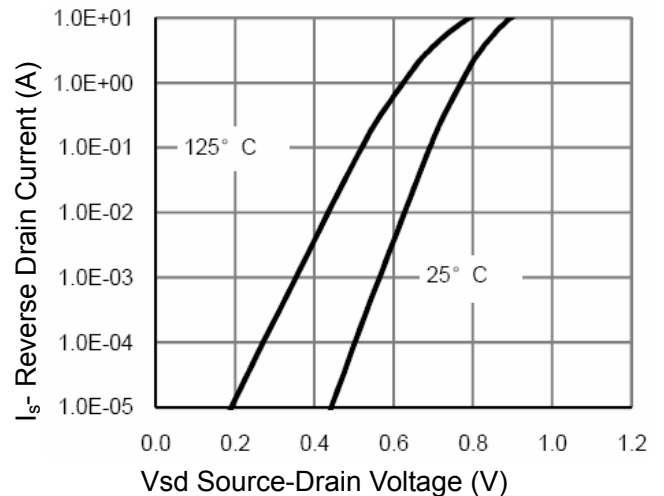
**Figure 2 Transfer Characteristics**



**Figure 5 Gate Charge**



**Figure 3  $R_{dson}$ - Drain Current**



**Figure 6 Source- Drain Diode Forward**

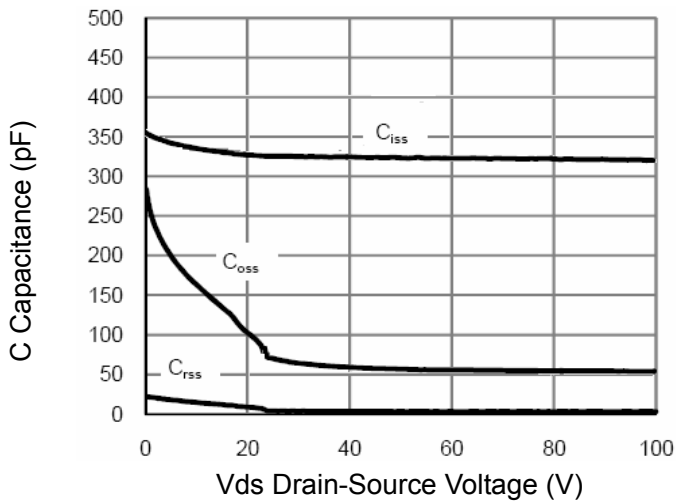


Figure 7 Capacitance vs Vds

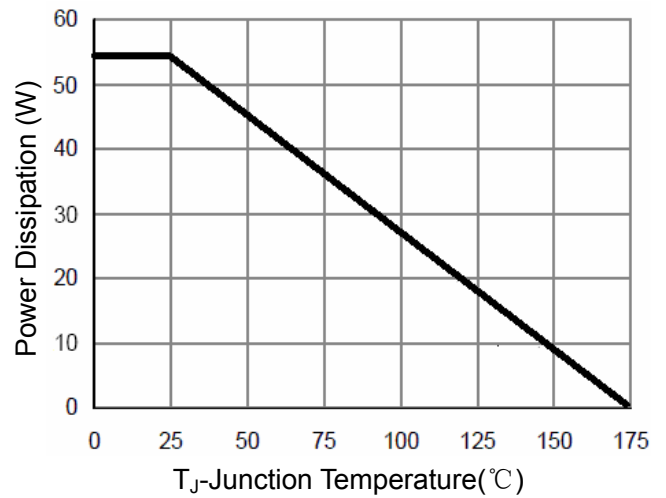


Figure 9 Power De-rating

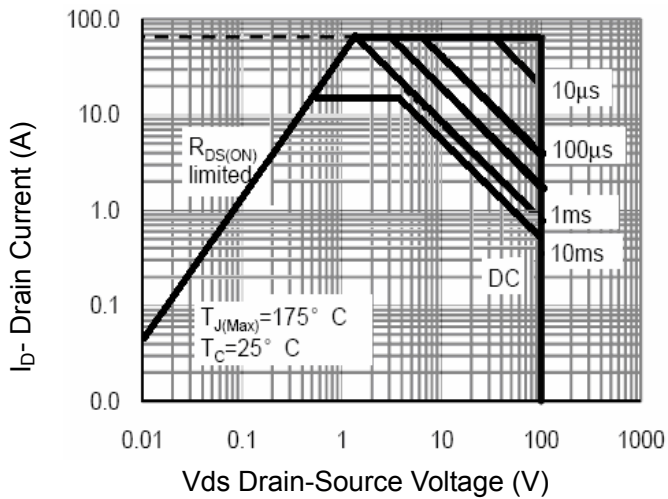


Figure 8 Safe Operation Area

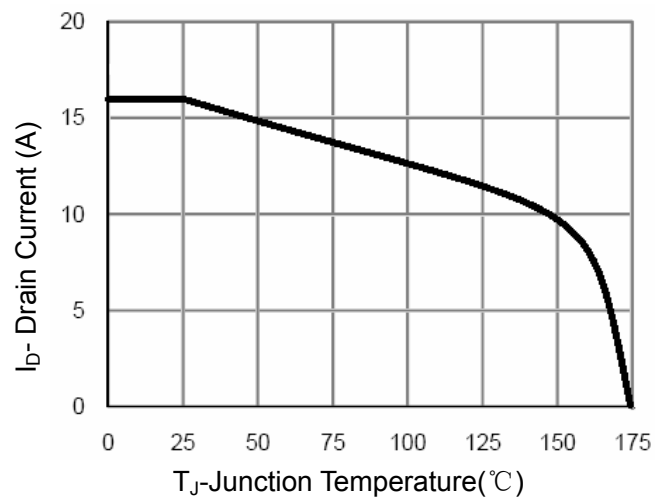


Figure 10 Current De-rating

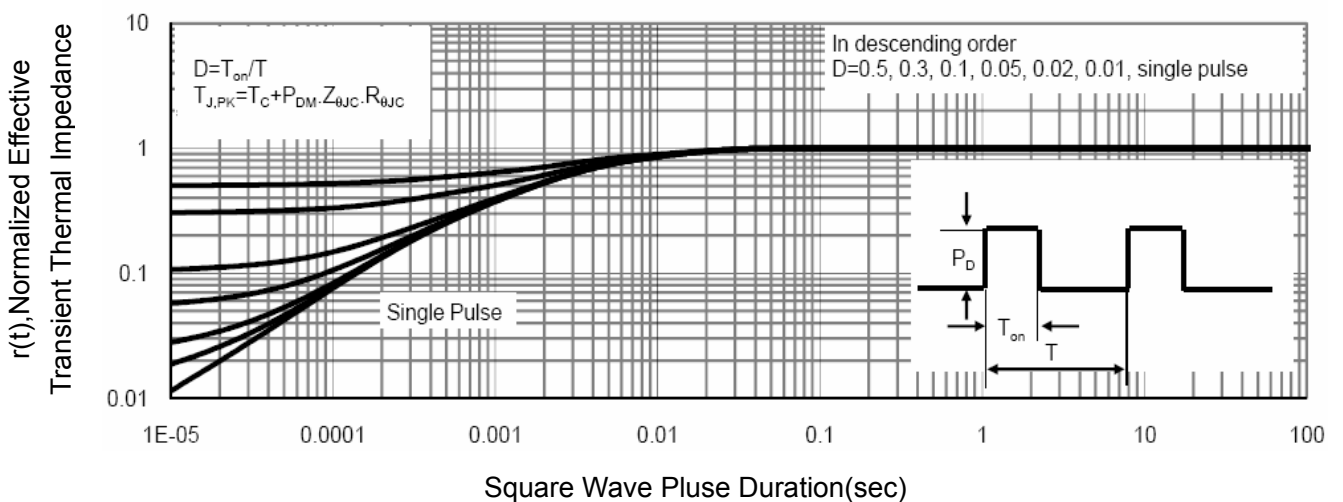
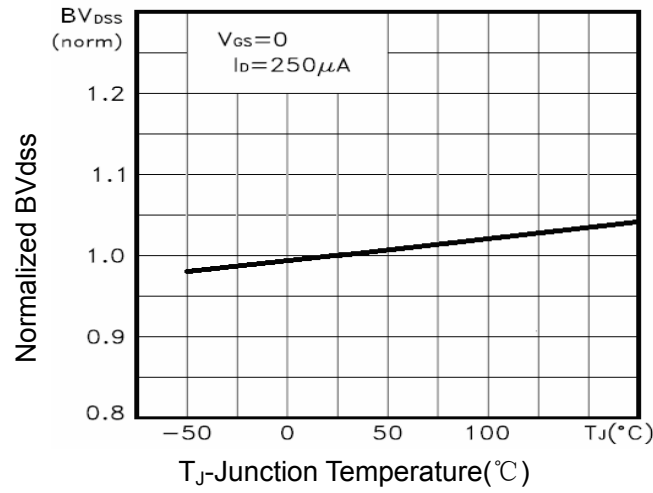
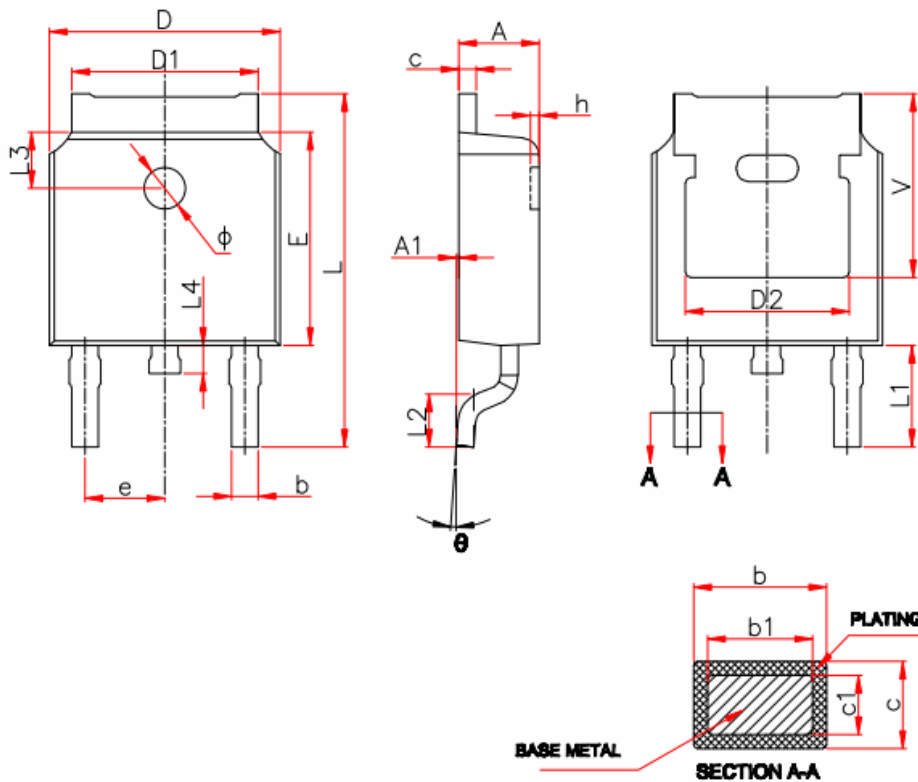


Figure 11 Normalized Maximum Transient Thermal Impedance



**Figure 12 BV<sub>DSS</sub> vs Junction Temperature**

TO-252 Package Information



Symbol	Millimeters	
	Min.	Max.
A	2.20	2.40
A1	0.00	0.13
b	0.66	0.86
b1	0.73	0.79
c	0.46	0.58
c1	0.50	0.52
D	6.50	6.70
D1	5.10	5.46
D2	4.83 REF.	
E	6.00	6.20
e	2.19	2.39
L	9.80	10.40
L1	2.90 REF.	
L2	1.40	1.70
L3	1.60 REF.	
L4	0.60	1.00
Φ	1.10	1.30
θ	0°	8°

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