

## 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.

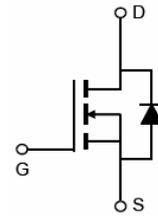
### General Features

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

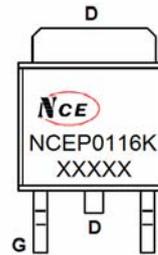
### Application

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

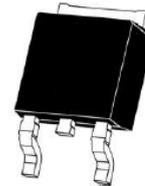
**100% UIS TESTED!**



Schematic diagram



Marking and pin assignment



TO-252 -2Ltop 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	$^{\circ}\text{C/W}$
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## Electrical Characteristics ( $T_A=25^{\circ}\text{C}$ unless otherwise noted)

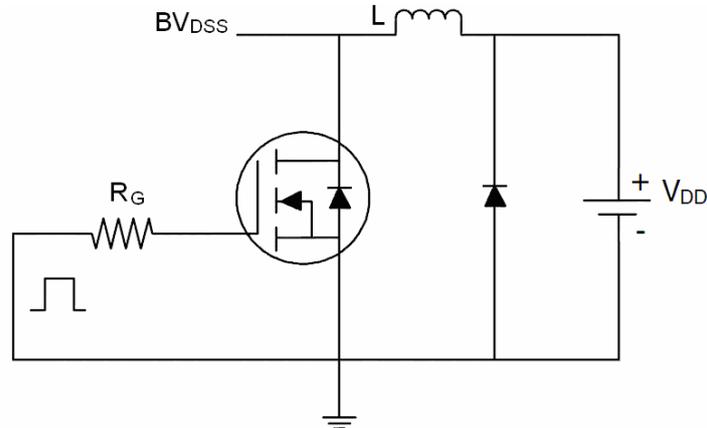
Parameter	Symbol	Condition	Min	Typ	Max	Unit
<b>Off Characteristics</b>						
Drain-Source Breakdown Voltage	$BV_{DSS}$	$V_{GS}=0V, I_D=250\mu A$	100	-	-	V
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS}=100V, V_{GS}=0V$	-	-	1	$\mu A$
Gate-Body Leakage Current	$I_{GSS}$	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	$\pm 100$	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	$C_{ISS}$	$V_{DS}=50V, V_{GS}=0V,$ $F=1.0\text{MHz}$	-	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	$t_{rr}$	$T_J = 25^{\circ}\text{C}, I_F = I_S$ $di/dt = 100A/\mu s$ <sup>(Note 3)</sup>	-	15	-	nS
Reverse Recovery Charge	$Q_{rr}$		-	53	-	nC

### Notes:

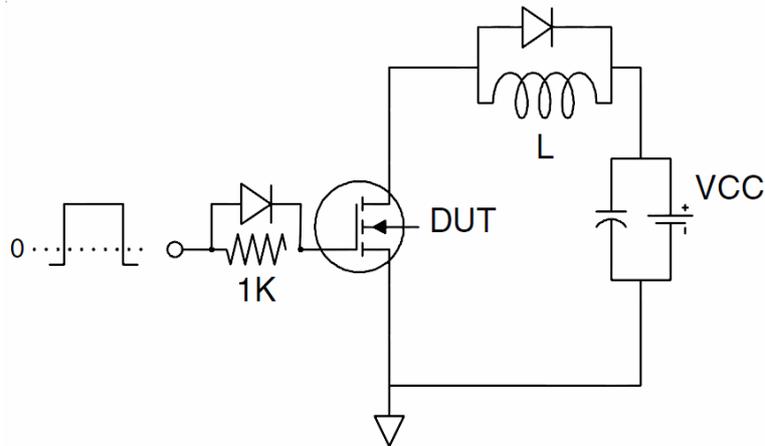
1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. Surface Mounted on FR4 Board,  $t \leq 10$  sec.
3. Pulse Test: Pulse Width  $\leq 300\mu s$ , Duty Cycle  $\leq 2\%$ .
4. Guaranteed by design, not subject to production
5. EAS condition :  $T_J=25^{\circ}\text{C}, V_{DD}=50V,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

**Test Circuit**

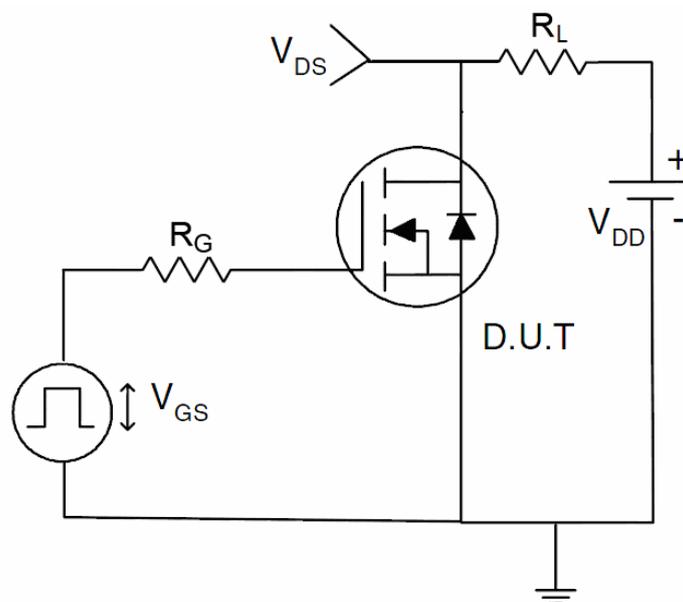
**1) E<sub>AS</sub> test Circuit**



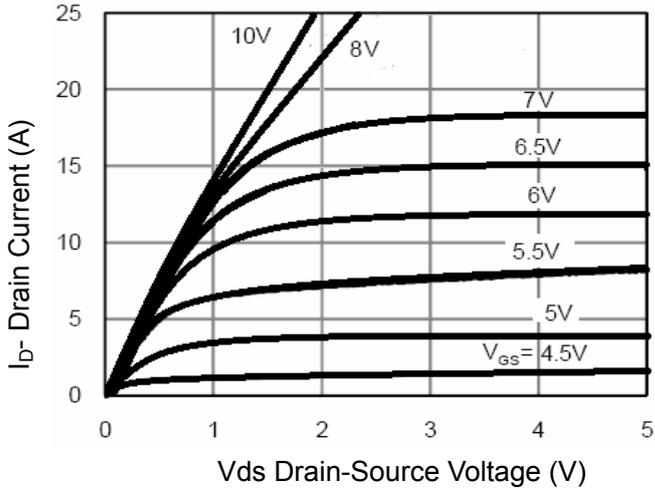
**2) Gate charge test Circuit**



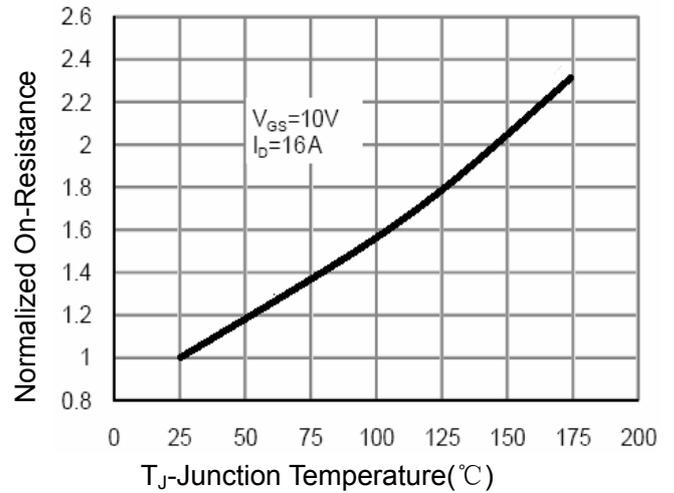
**3) Switch Time Test Circuit**



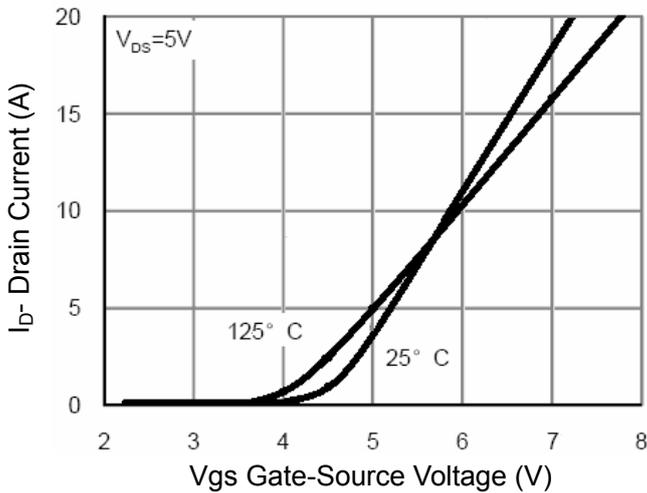
**Typical Electrical and Thermal Characteristics**



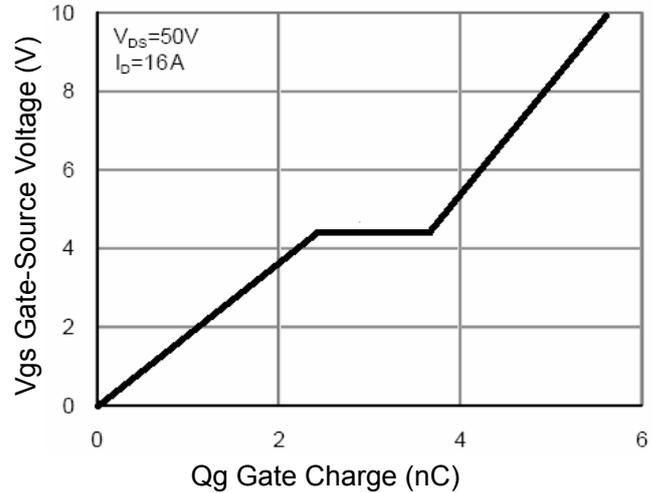
**Figure 1 Output Characteristics**



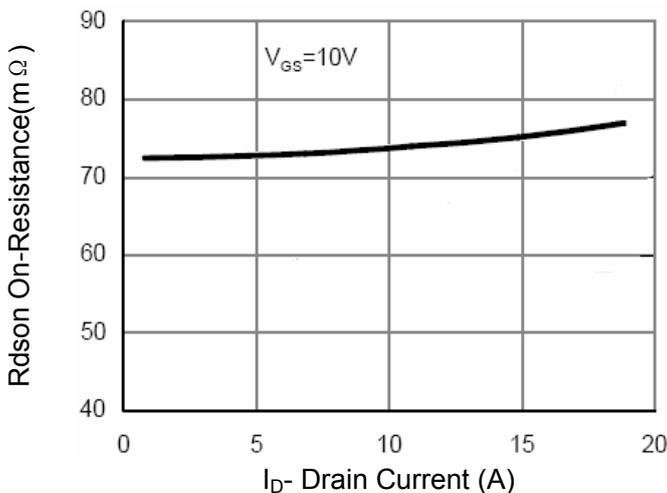
**Figure 4  $R_{dson}$ -Junction Temperature**



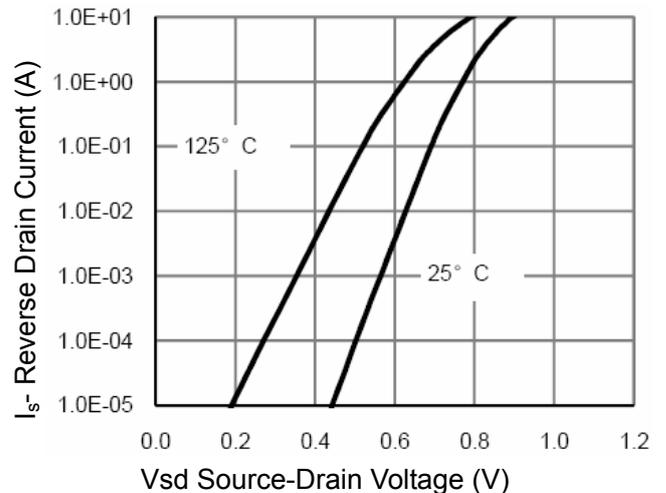
**Figure 2 Transfer Characteristics**



**Figure 5 Gate Charge**



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



**Figure 6 Source- Drain Diode Forward**

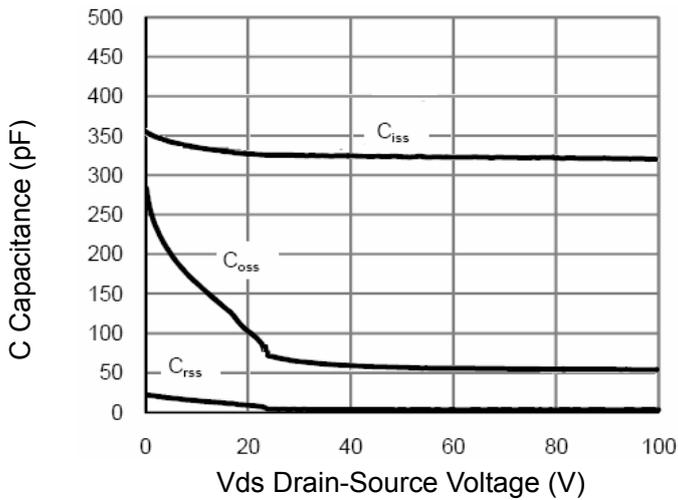


Figure 7 Capacitance vs Vds

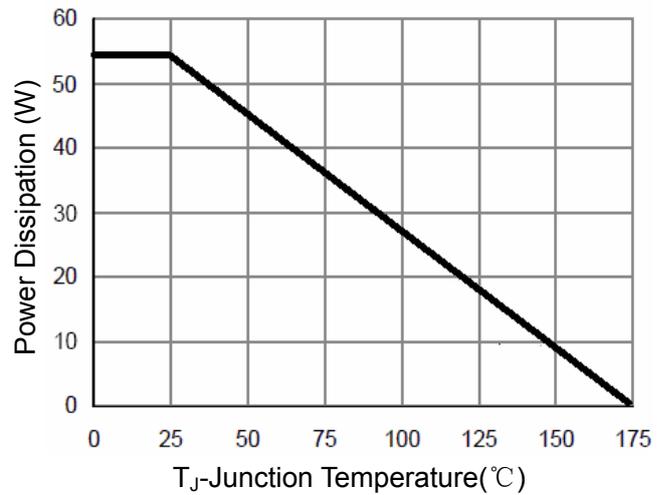


Figure 9 Power De-rating

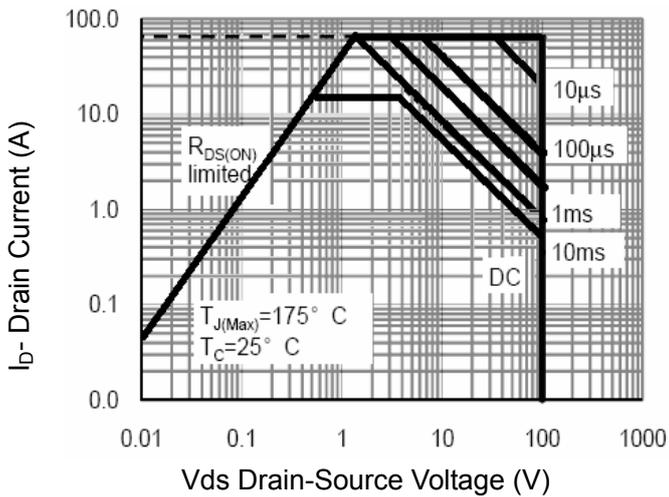


Figure 8 Safe Operation Area

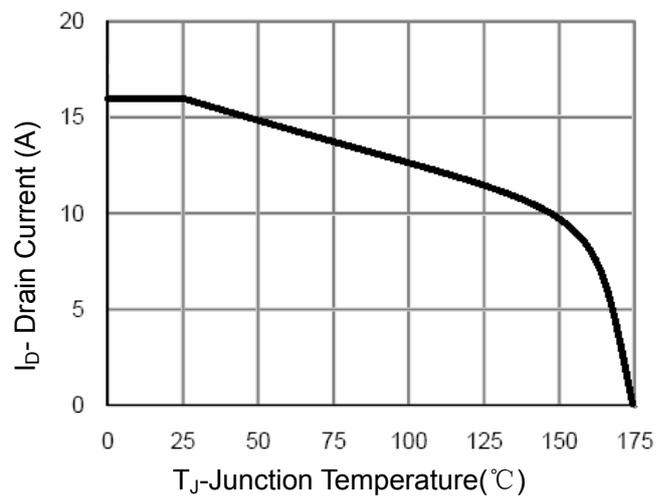


Figure 10 Current De-rating

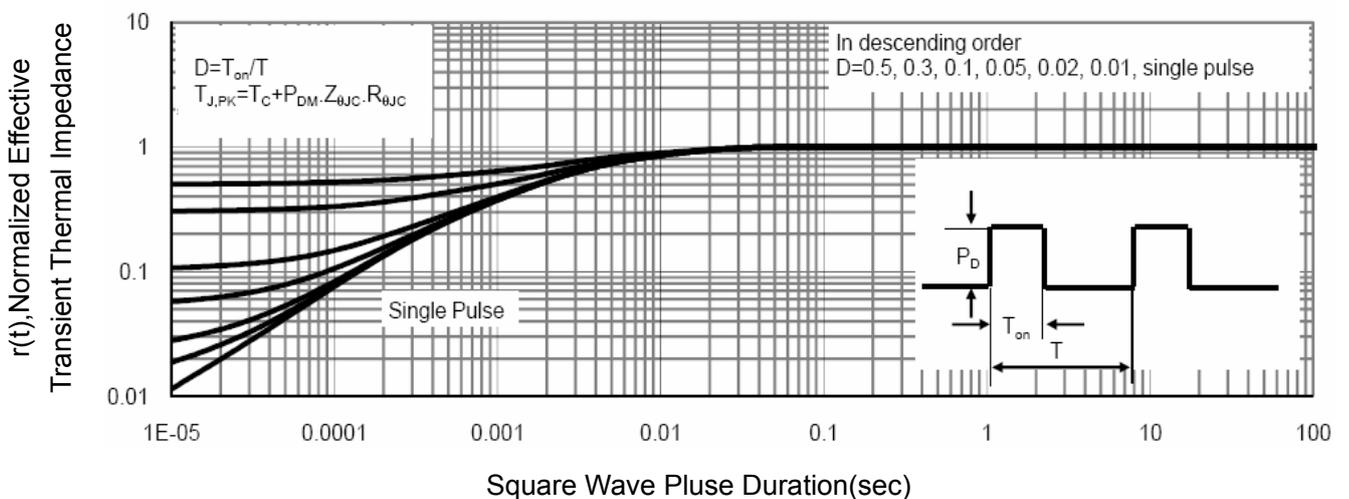
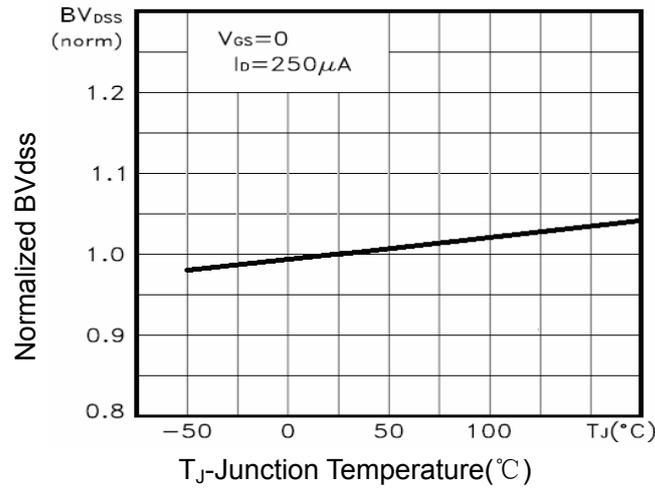
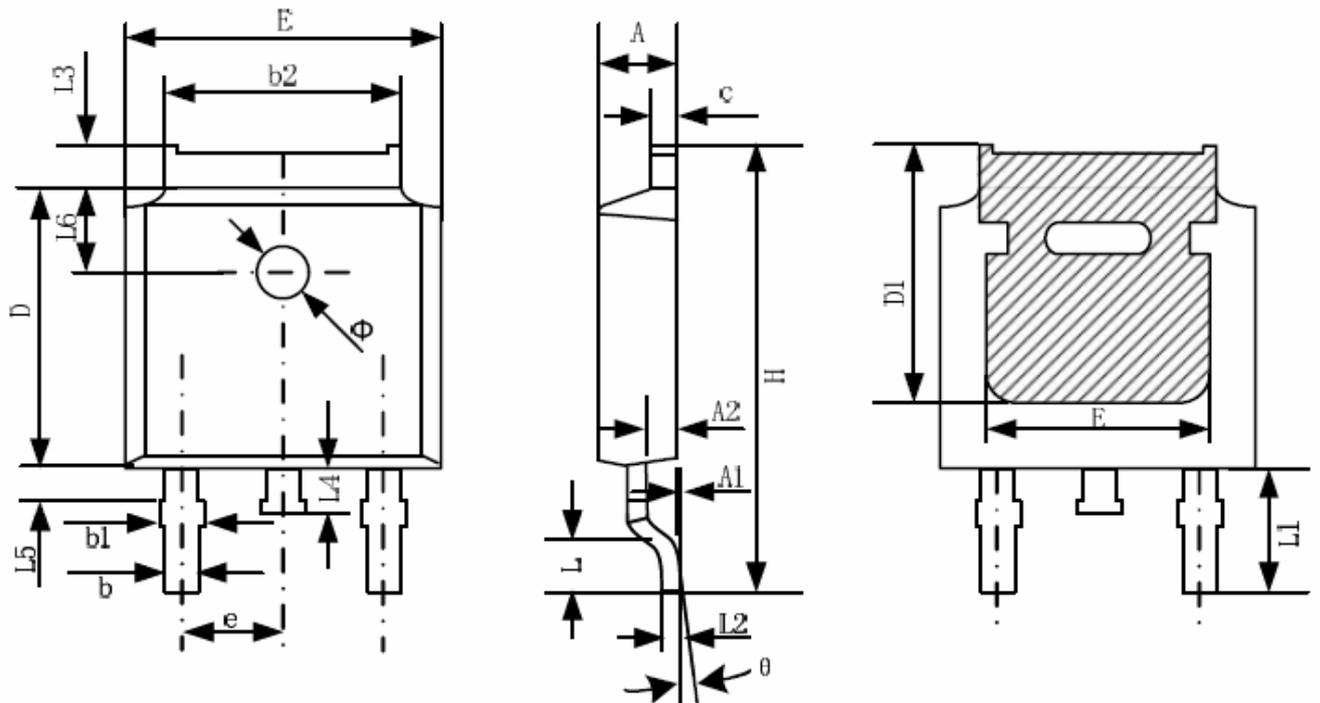


Figure 11 Normalized Maximum Transient Thermal Impedance



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

**TO-252-2L Package Information**


Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	2.20	2.38	0.087	0.094
A1	0.00	0.10	0.000	0.004
A2	0.90	1.10	0.035	0.043
b	0.72	0.85	0.028	0.033
b1	0.72	0.90	0.028	0.035
b2	5.13	5.46	0.202	0.215
c	0.47	0.60	0.019	0.024
D	6.00	6.20	0.236	0.244
D1	5.25	--	0.207	--
E	6.50	6.70	0.256	0.264
E1	4.70	--	0.185	--
e	2.19	2.39	0.086	0.094
H	9.80	10.40	0.386	0.409
L	1.40	1.70	0.055	0.067
L1	2.90 REF		0.114 REF	
L2	0.508 BSC		0.020 BSC	
L3	0.90	1.25	0.035	0.049
L4	0.60	1.00	0.024	0.039
L5	0.15	0.75	0.006	0.030
L6	1.80 REF		0.071 REF	
$\Phi$	1.20	1.40	0.047	0.055
$\theta$	0°	8°	0°	8°

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