

## NCE N-Channel Super Trench Power MOSFET

### Description

The NCEP60T15G 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.

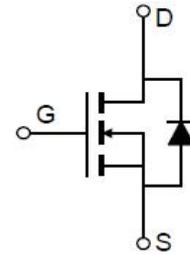
### General Features

- $V_{DS} = 60V, I_D = 150A$   
 $R_{DS(on)} < 3.3m\Omega @ V_{GS}=10V$  (Typ:2.8m $\Omega$ )
- Excellent gate charge x  $R_{DS(on)}$  product
- Very low on-resistance  $R_{DS(on)}$
- 150 °C operating temperature
- Pb-free lead plating
- 100% UIS tested

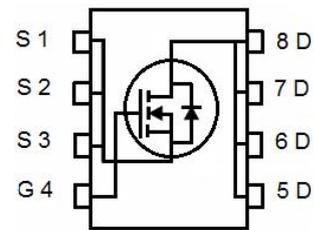
### Application

- DC/DC Converter
- Ideal for high-frequency switching and synchronous rectification

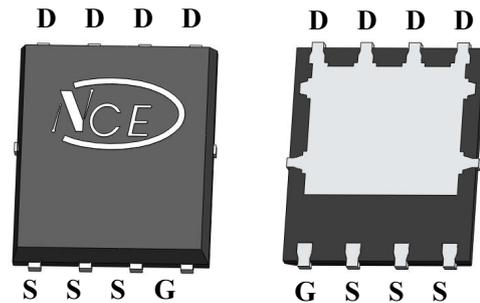
**100% UIS TESTED!**  
**100%  $\Delta V_d$ s TESTED!**



Schematic diagram



Marking and pin assignment



Top View

Bottom View

### Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
P60T15G	NCEP60T15G	DFN5X6-8L	-	-	-

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

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	$V_{DS}$	60	V
Gate-Source Voltage	$V_{GS}$	$\pm 20$	V
Drain Current-Continuous	$I_D$	150	A
Drain Current-Continuous( $T_c=100^\circ C$ )	$I_D(100^\circ C)$	106	A
Pulsed Drain Current	$I_{DM}$	600	A
Maximum Power Dissipation	$P_D$	200	W
Derating factor		1.6	W/ $^\circ C$
Single pulse avalanche energy (Note 1)	$E_{AS}$	819	mJ
Operating Junction and Storage Temperature Range	$T_J, T_{STG}$	-55 To 150	$^\circ C$

## Thermal Characteristic

Thermal Resistance, Junction-to-Case	$R_{\theta JC}$	0.625	$^{\circ}\text{C}/\text{W}$
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## Electrical Characteristics ( $T_c=25^{\circ}\text{C}$ unless otherwise noted)

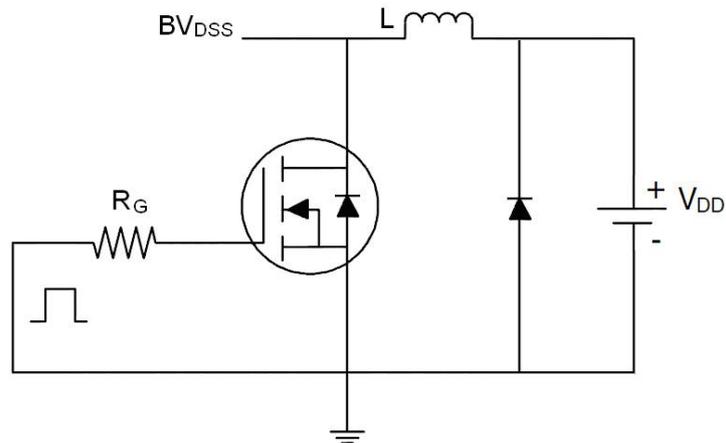
Parameter	Symbol	Condition	Min	Typ	Max	Unit
<b>Off Characteristics</b>						
Drain-Source Breakdown Voltage	$BV_{DSS}$	$V_{GS}=0V, I_D=250\mu A$	60	-	-	V
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS}=60V, V_{GS}=0V$	-	-	1	$\mu A$
Gate-Body Leakage Current	$I_{GSS}$	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	$\pm 100$	nA
<b>On Characteristics</b>						
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=250\mu A$	2.0	3.0	4.0	V
Drain-Source On-State Resistance	$R_{DS(ON)}$	$V_{GS}=10V, I_D=20A$	-	2.8	3.3	m $\Omega$
Forward Transconductance	$g_{FS}$	$V_{DS}=5V, I_D=20A$	50	-	-	S
<b>Dynamic Characteristics</b>						
Input Capacitance	$C_{iss}$	$V_{DS}=30V, V_{GS}=0V,$ $F=1.0\text{MHz}$	-	4500	-	PF
Output Capacitance	$C_{oss}$		-	965	-	PF
Reverse Transfer Capacitance	$C_{rss}$		-	24	-	PF
<b>Switching Characteristics</b> (Note 2)						
Turn-on Delay Time	$t_{d(on)}$	$V_{DD}=30V, I_D=20A$ $V_{GS}=10V, R_G=4.7\Omega$	-	6	-	nS
Turn-on Rise Time	$t_r$		-	11	-	nS
Turn-Off Delay Time	$t_{d(off)}$		-	23	-	nS
Turn-Off Fall Time	$t_f$		-	3	-	nS
Total Gate Charge	$Q_g$	$V_{DS}=30V, I_D=20A,$ $V_{GS}=10V$	-	70	-	nC
Gate-Source Charge	$Q_{gs}$		-	19	-	nC
Gate-Drain Charge	$Q_{gd}$		-	15.3	-	nC
<b>Drain-Source Diode Characteristics</b>						
Diode Forward Voltage	$V_{SD}$	$V_{GS}=0V, I_S=150A$	-	-	1.2	V
Diode Forward Current	$I_S$		-	-	150	A
Reverse Recovery Time	$t_{rr}$	$T_J = 25^{\circ}\text{C}, I_F = I_S$	-	50	-	nS
Reverse Recovery Charge	$Q_{rr}$	$di/dt = 100A/\mu s$	-	66	-	nC

### Notes:

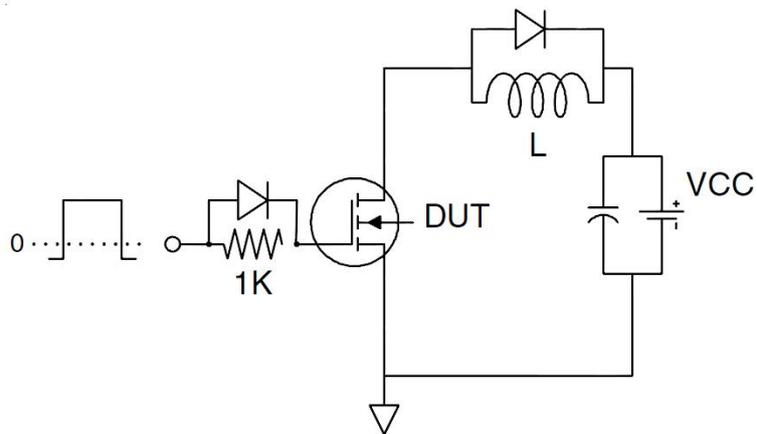
1. EAS condition :  $T_J=25^{\circ}\text{C}, V_{DD}=30V, V_G=10V, L=0.5\text{mH}, R_G=25\Omega$
2. Guaranteed by design, not subject to production
3. These curves are based on the junction-to-case thermal impedance which is measured with the device mounted to a large heatsink, assuming a maximum junction temperature of  $T_J(\text{MAX})=150^{\circ}\text{C}$ . The SOA curve provides a single pulse rating..

## Test Circuit

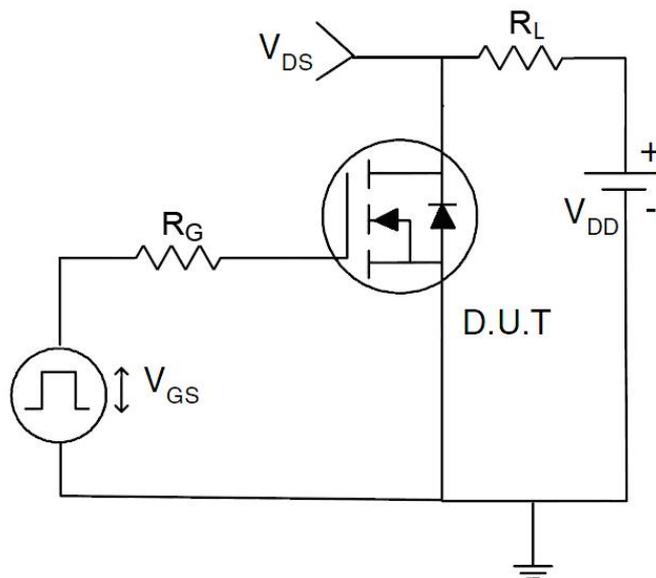
### 1) $E_{AS}$ test Circuit



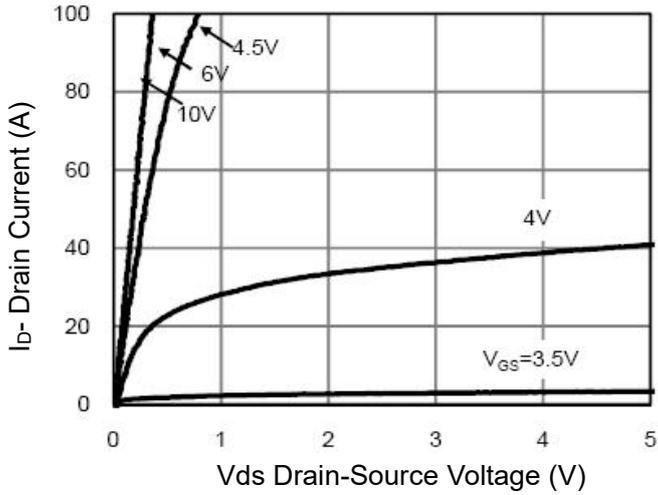
### 2) Gate charge test Circuit



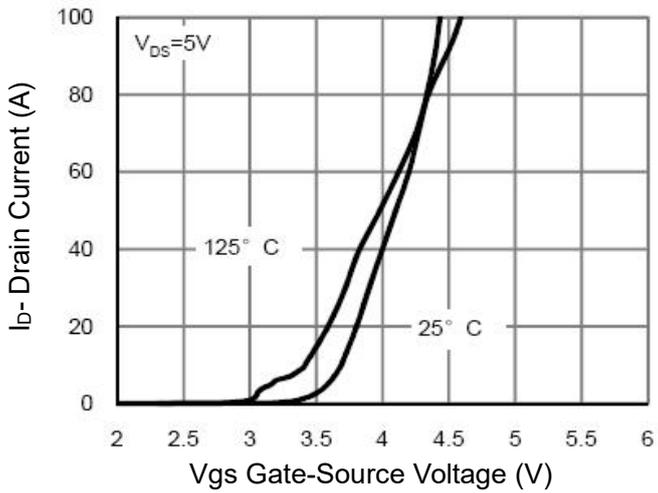
### 3) Switch Time Test Circuit



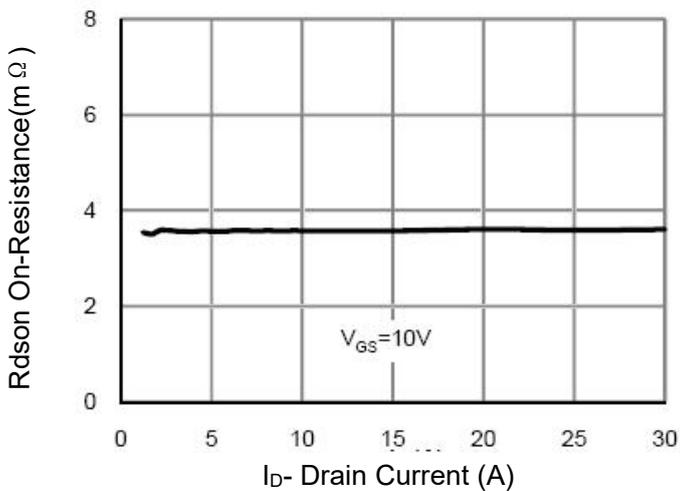
## Typical Electrical and Thermal Characteristics



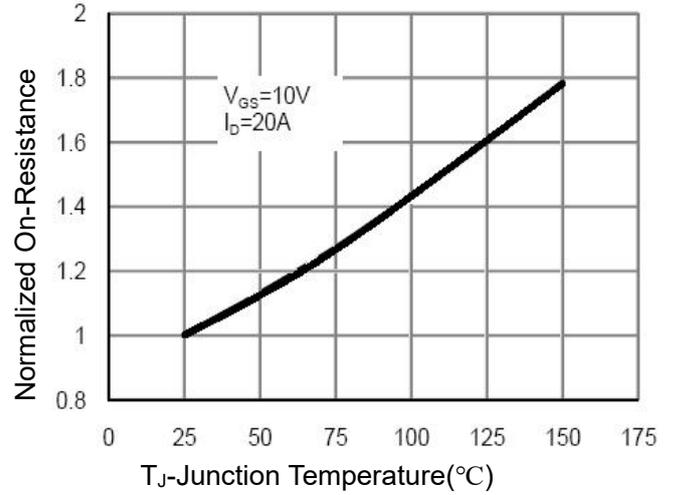
**Figure 1 Output Characteristics**



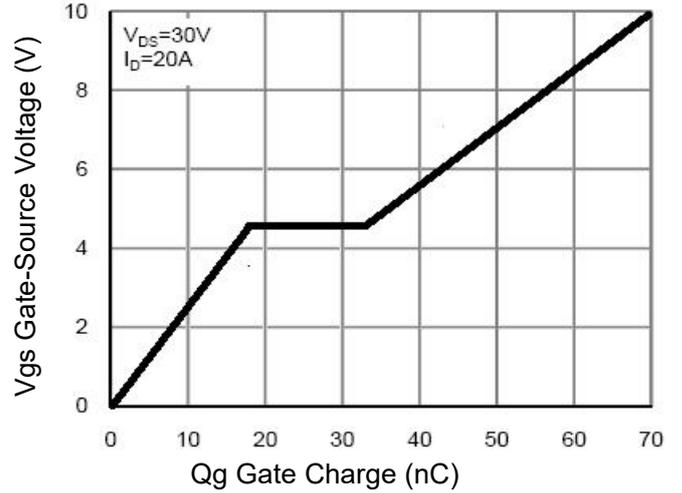
**Figure 2 Transfer Characteristics**



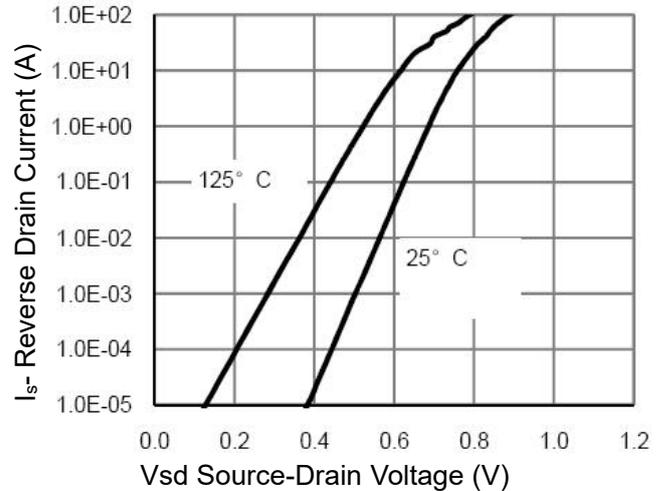
**Figure 3 Rdson- Drain Current**



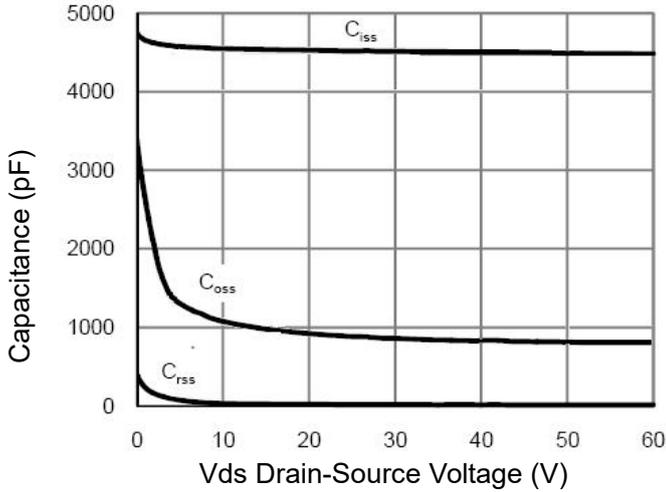
**Figure 4 Rdson-Junction Temperature**



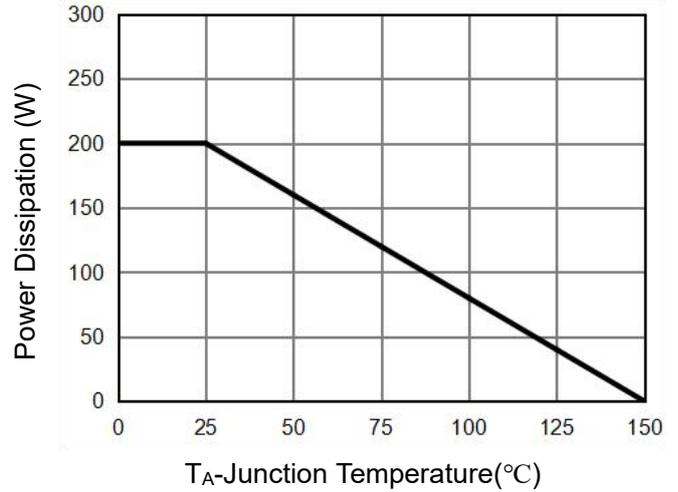
**Figure 5 Gate Charge**



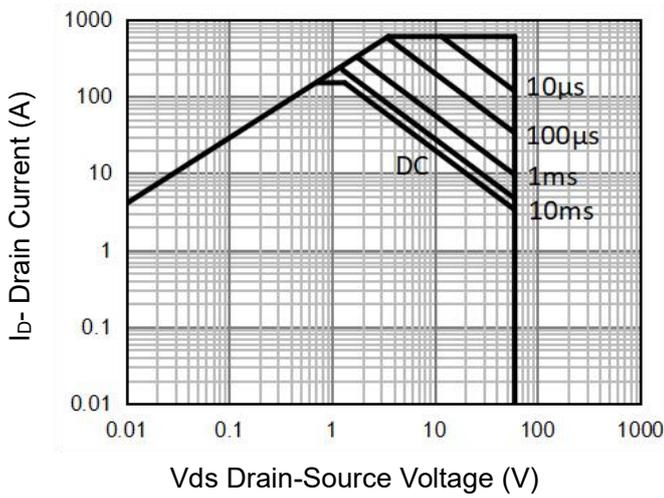
**Figure 6 Source- Drain Diode Forward**



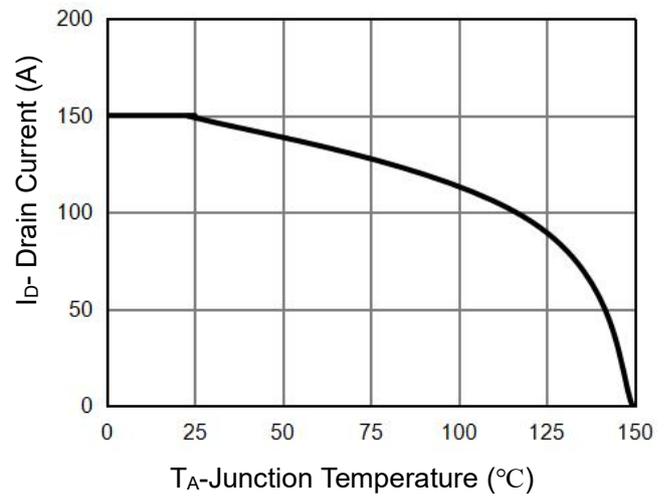
**Figure 7 Capacitance vs Vds**



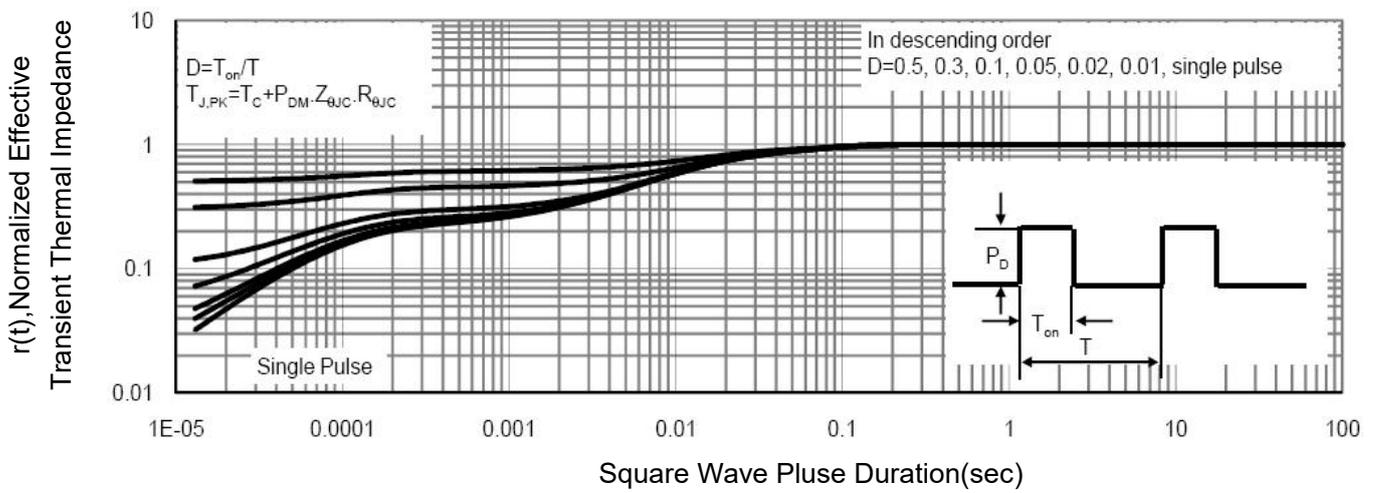
**Figure 9 Power De-rating**



**Figure 8 Safe Operation Area** (Note 3)

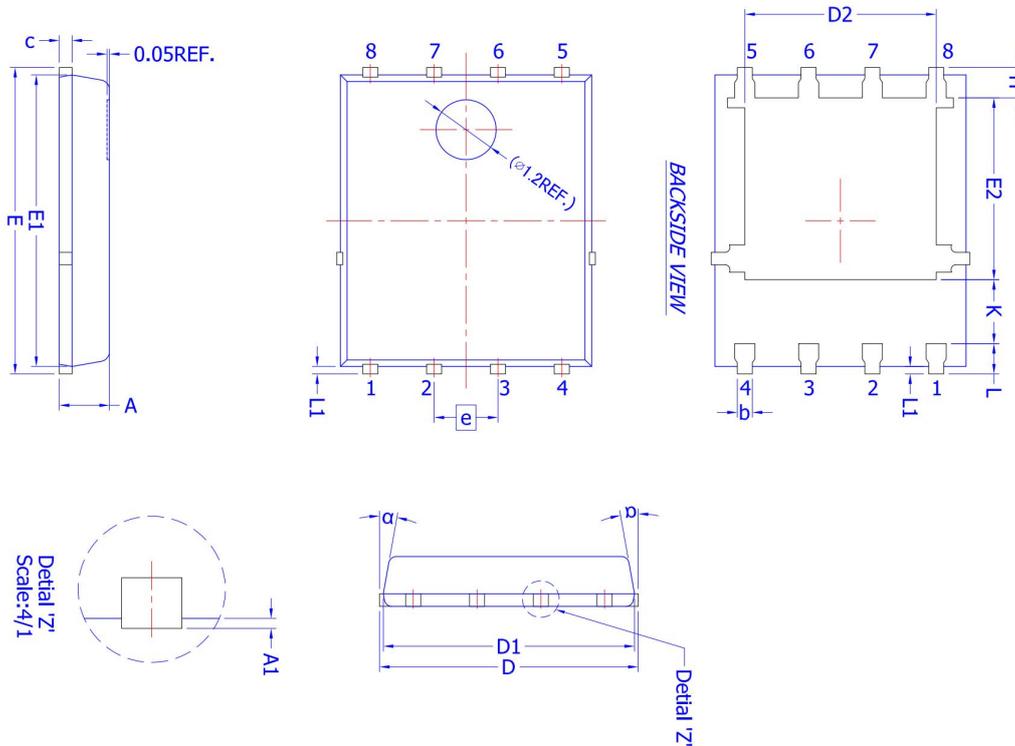


**Figure 10 Current De-rating**



**Figure 11 Normalized Maximum Transient Thermal Impedance**

## DFN5X6-8L Package Information



DIM.	MILLIMETERS		
	MIN.	NOM.	MAX.
A	0.90	1.00	1.10
A1	0	-	0.05
b	0.30	0.40	0.50
c	0.20	0.25	0.30
D	5.15 BSC		
D1	5.00 BSC		
D2	3.76	3.81	3.86
E	6.15 BSC		
E1	5.80	5.85	5.90
E2	3.45	3.65	3.85
e	1.27 BSC		
H	0.51	0.61	0.71
K	1.10	-	-
L	0.51	0.61	0.71
L1	0.08	0.15	0.23
α	10°	11°	12°

**Note:**

- All Dimension Are In mm;
- Package Body Sizes Exclude Mold Flash,Protrusion Or Gate Burrs.  
Mold Flash,Protrusion Or Gate Burrs Shall Not Exceed 0.10mm Per Side.
- Package Body Sizes Determined At The Outermost Extremes Of The Plastic.  
Body Exclusive Of Mold Flash,Tie Bar, Tie Bar Burrs Gate Burrs And Interlead Flash,  
But Including Any Mismatch Between The Top And Bottom Of The Plastic Body.
- The Package Top May Be Smaller Than The Package Bottom.

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