

## NCE N-Channel Super Trench Power MOSFET

### Description

The NCEP02503S 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.

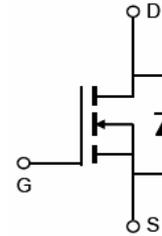
### General Features

- $V_{DS} = 250V, I_D = 3A$   
 $R_{DS(ON)} = 100m\Omega$  (typical) @  $V_{GS} = 10V$
- Excellent gate charge x  $R_{DS(on)}$  product(FOM)
- Very low on-resistance  $R_{DS(on)}$
- 150 °C operating temperature
- Pb-free lead plating

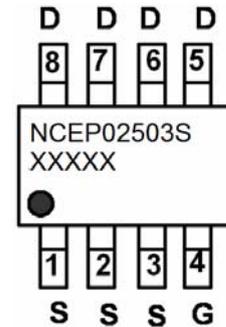
### Application

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

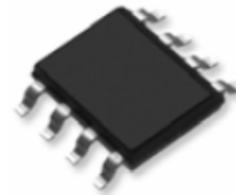
**100% UIS TESTED!**



Schematic diagram



Marking and pin assignment



SOP-8 top view

### Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
NCEP02503S	NCEP02503S	SOP-8	Ø330mm	12mm	4000 units

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

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	$V_{DS}$	250	V
Gate-Source Voltage	$V_{GS}$	$\pm 20$	V
Drain Current-Continuous	$I_D$	3	A
Drain Current-Continuous( $T_C = 100^\circ C$ )	$I_D(100^\circ C)$	2.1	A
Pulsed Drain Current	$I_{DM}$	12	A
Maximum Power Dissipation	$P_D$	3.5	W
Single pulse avalanche energy <sup>(Note 5)</sup>	$E_{AS}$	180	mJ
Operating Junction and Storage Temperature Range	$T_J, T_{STG}$	-55 To 150	$^\circ C$

### Thermal Characteristic

Thermal Resistance, Junction-to-Ambient <sup>(Note 2)</sup>	$R_{\theta JA}$	36	$^\circ C/W$
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## Electrical Characteristics ( $T_A=25^\circ\text{C}$ unless otherwise noted)

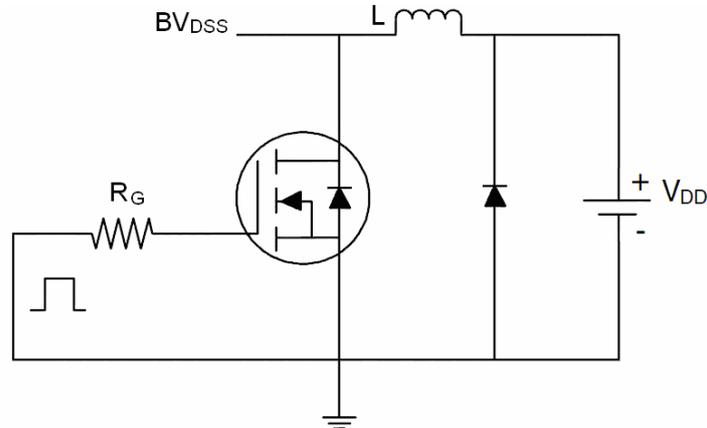
Parameter	Symbol	Condition	Min	Typ	Max	Unit
<b>Off Characteristics</b>						
Drain-Source Breakdown Voltage	$BV_{DSS}$	$V_{GS}=0V, I_D=250\mu A$	250	-	-	V
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS}=250V, V_{GS}=0V$	-	-	1	$\mu A$
Gate-Body Leakage Current	$I_{GSS}$	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	$\pm 100$	nA
<b>On Characteristics</b> (Note 3)						
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=250\mu A$	2.5	3.5	4.5	V
Drain-Source On-State Resistance	$R_{DS(ON)}$	$V_{GS}=10V, I_D=3A$	-	100	110	m $\Omega$
Forward Transconductance	$g_{FS}$	$V_{DS}=5V, I_D=3A$	20	-	-	S
<b>Dynamic Characteristics</b> (Note 4)						
Input Capacitance	$C_{ISS}$	$V_{DS}=125V, V_{GS}=0V,$ $F=1.0MHz$	-	951		PF
Output Capacitance	$C_{OSS}$		-	68		PF
Reverse Transfer Capacitance	$C_{RSS}$		-	2.4		PF
<b>Switching Characteristics</b> (Note 4)						
Turn-on Delay Time	$t_{d(on)}$	$V_{DD}=125V, R_L=8\Omega$ $V_{GS}=10V, R_G=3\Omega$	-	6	-	nS
Turn-on Rise Time	$t_r$		-	7	-	nS
Turn-Off Delay Time	$t_{d(off)}$		-	15	-	nS
Turn-Off Fall Time	$t_f$		-	4	-	nS
Total Gate Charge	$Q_g$	$V_{DS}=125V, I_D=3A,$ $V_{GS}=10V$	-	17.9	-	nC
Gate-Source Charge	$Q_{gs}$		-	6.7	-	nC
Gate-Drain Charge	$Q_{gd}$		-	5	-	nC
<b>Drain-Source Diode Characteristics</b>						
Diode Forward Voltage (Note 3)	$V_{SD}$	$V_{GS}=0V, I_S=3A$	-	-	1.2	V
Diode Forward Current (Note 2)	$I_S$		-	-	3	A
Reverse Recovery Time	$t_{rr}$	$T_J = 25^\circ\text{C}, I_F = I_S$ $di/dt = 100A/\mu s$ (Note 3)	-	30	-	nS
Reverse Recovery Charge	$Q_{rr}$		-	125	-	nC

### Notes:

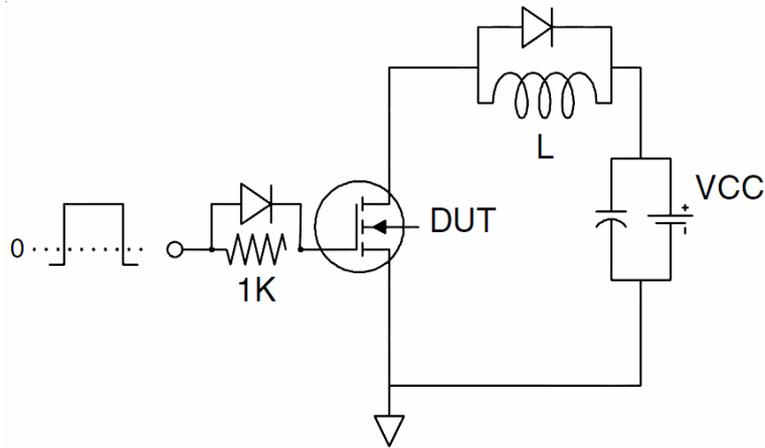
1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. Surface Mounted on FR4 Board,  $t \leq 10$  sec.
3. Pulse Test: Pulse Width  $\leq 300\mu s$ , Duty Cycle  $\leq 2\%$ .
4. Guaranteed by design, not subject to production
5. EAS condition :  $T_J=25^\circ\text{C}, V_{DD}=50V,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

## Test Circuit

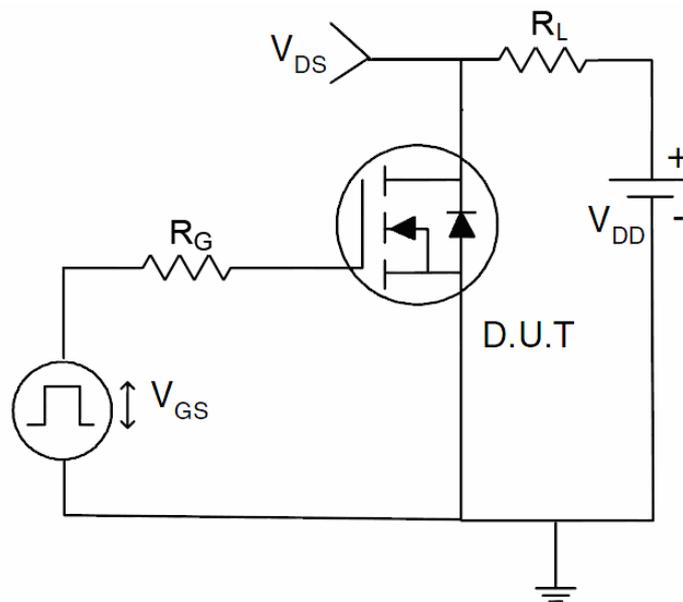
### 1) E<sub>AS</sub> test Circuit



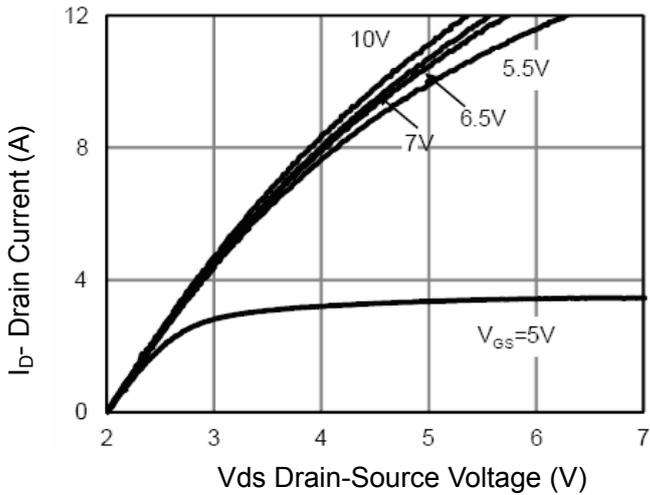
### 2) Gate charge test Circuit



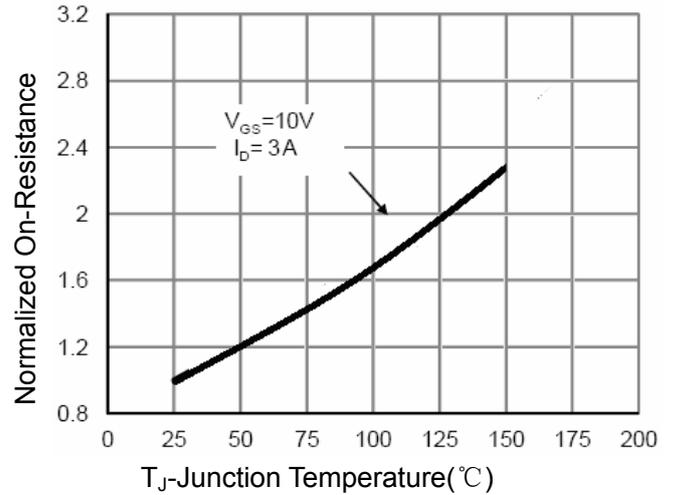
### 3) Switch Time Test Circuit



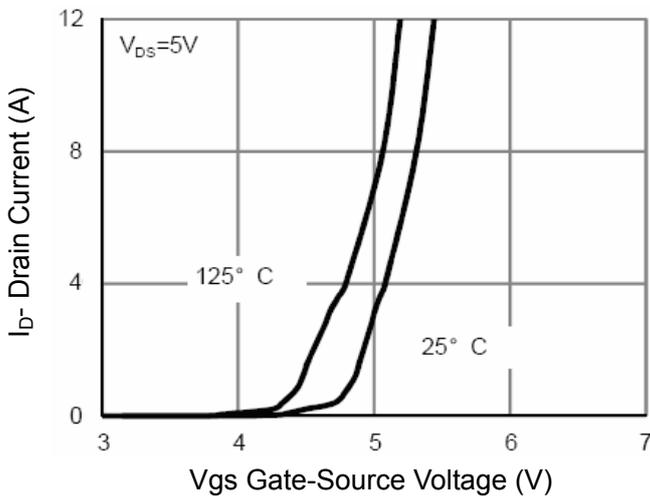
## Typical Electrical and Thermal Characteristics



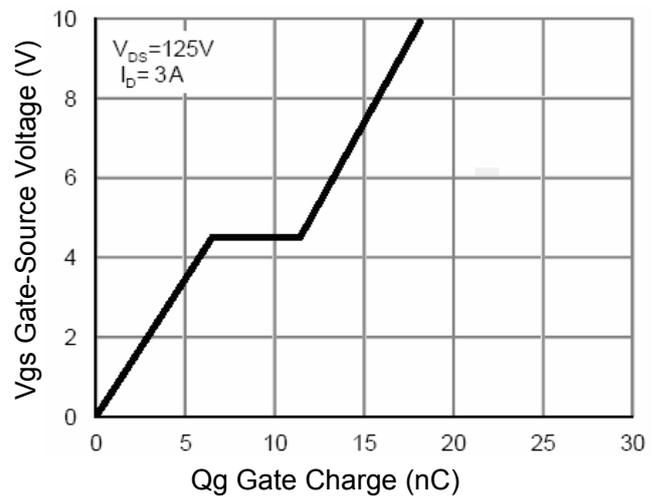
**Figure 1 Output Characteristics**



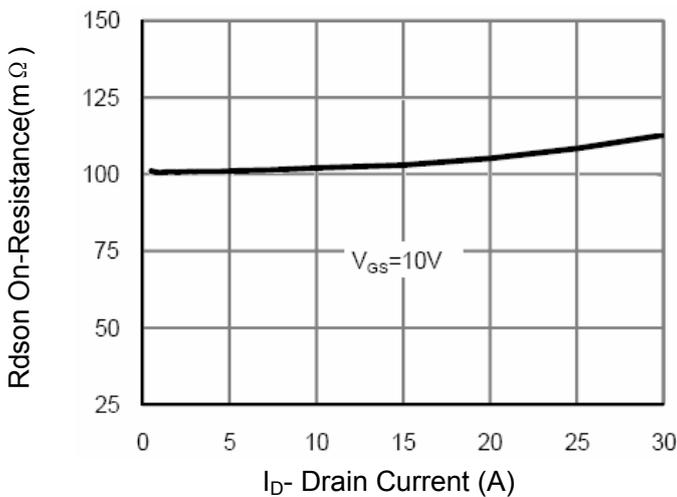
**Figure 4  $R_{dson}$ -Junction Temperature**



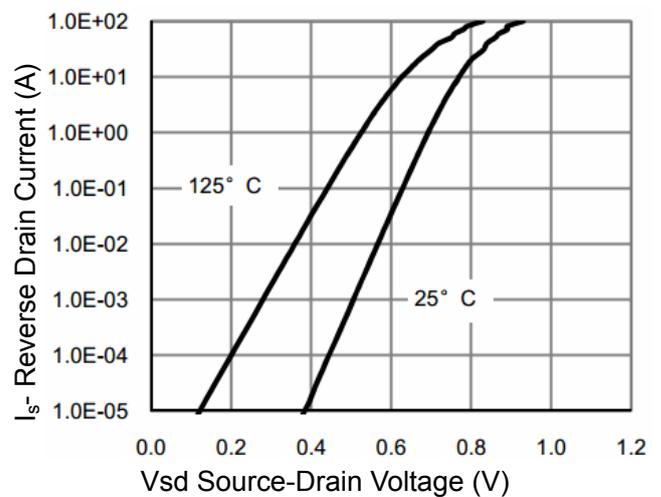
**Figure 2 Transfer Characteristics**



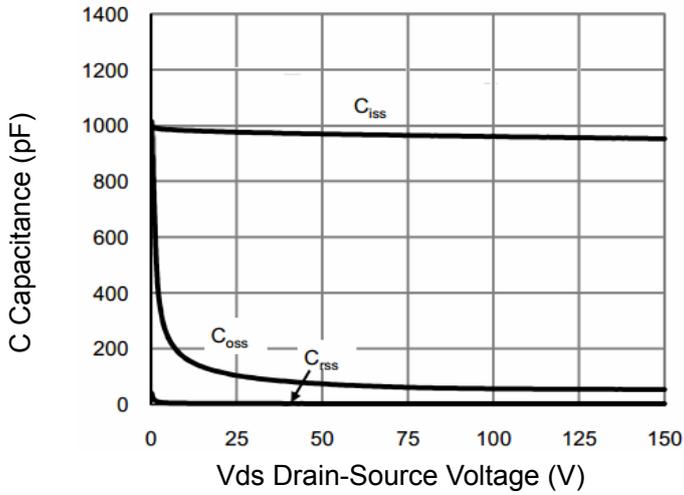
**Figure 5 Gate Charge**



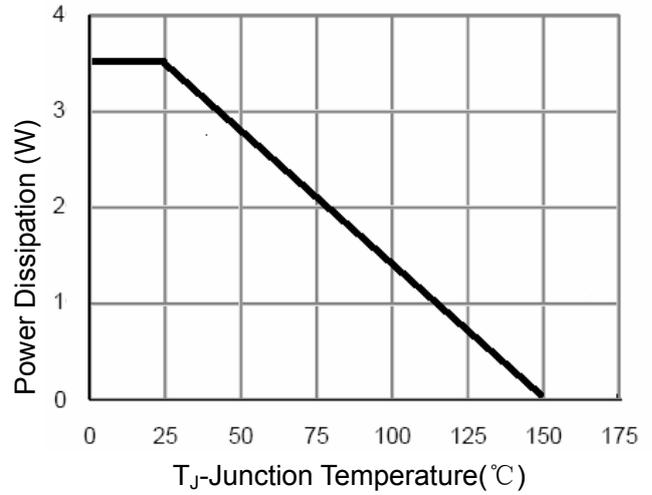
**Figure 3  $R_{dson}$ - Drain Current**



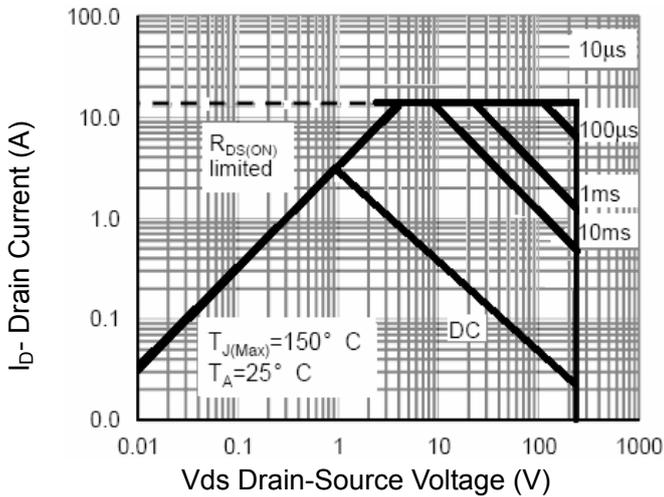
**Figure 6 Source- Drain Diode Forward**



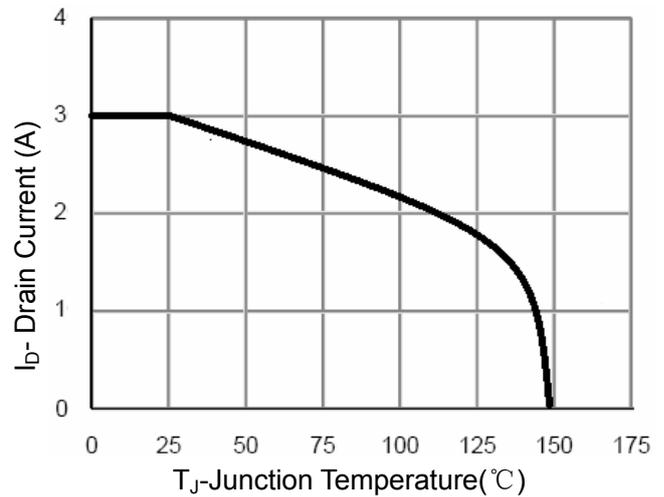
**Figure 7 Capacitance vs Vds**



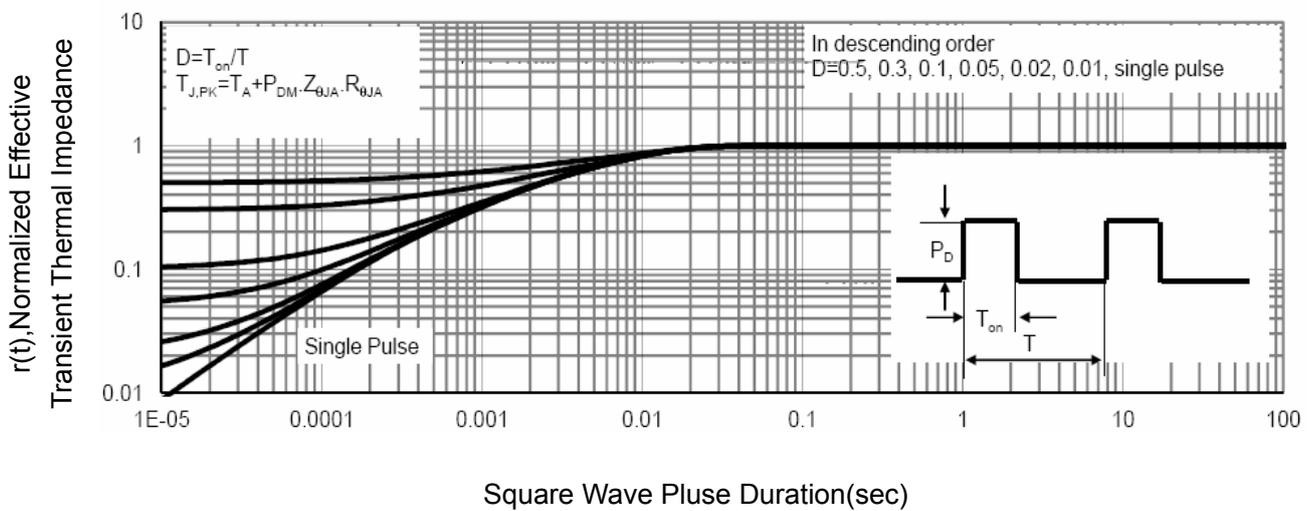
**Figure 9 Power De-rating**



**Figure 8 Safe Operation Area**

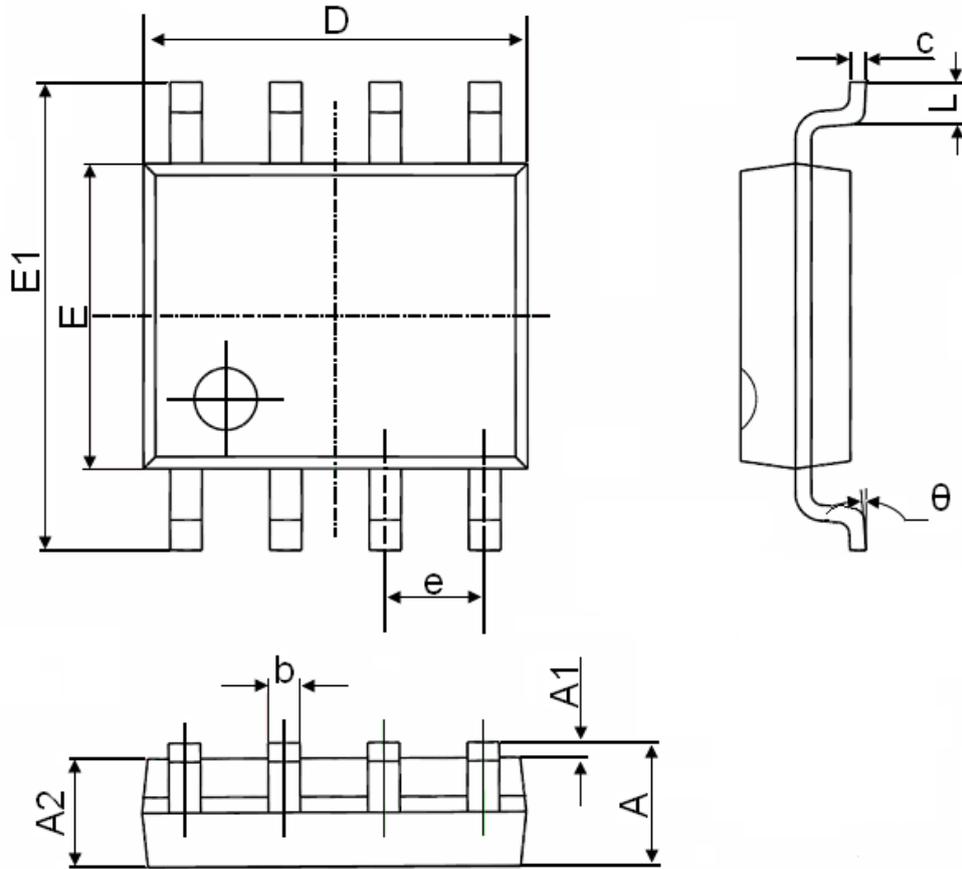


**Figure 10 Current De-rating**



**Figure 11 Normalized Maximum Transient Thermal Impedance**

## SOP-8 Package Information



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	1.350	1.750	0.053	0.069
A1	0.100	0.250	0.004	0.010
A2	1.350	1.550	0.053	0.061
b	0.330	0.510	0.013	0.020
c	0.170	0.250	0.006	0.010
D	4.700	5.100	0.185	0.200
E	3.800	4.000	0.150	0.157
E1	5.800	6.200	0.228	0.244
e	1.270(BSC)		0.050(BSC)	
L	0.400	1.270	0.016	0.050
θ	0°	8°	0°	8°

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