

## NCE N-Channel Super Trench Power MOSFET

### Description

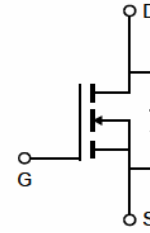
The NCEP85T14WD uses **Super Trench** technology that is uniquely optimized to provide the most efficient high frequency switching performance. Both conduction and switching power losses are minimized due to an extremely low combination of  $R_{DS(ON)}$  and  $Q_g$ . This device is ideal for high-frequency switching and synchronous rectification.

### General Features

- $V_{DS} = 85V, I_D = 140A$   
 $R_{DS(ON)} < 4.0m\Omega @ V_{GS} = 10V$
- 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

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



Schematic diagram



TO-263T-2L top view

**100% UIS TESTED!**  
**100% ΔVds TESTED!**

### Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
NCEP85T14WD	NCEP85T14WD	TO-263T-2L	-	-	-

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

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	$V_{DS}$	85	V
Gate-Source Voltage	$V_{GS}$	±20	V
Drain Current-Continuous	$I_D$	140	A
Drain Current-Continuous( $T_C = 100^\circ C$ )	$I_D(100^\circ C)$	99	A
Pulsed Drain Current	$I_{DM}$	420	A
Maximum Power Dissipation	$P_D$	200	W
Derating factor		1.3	W/°C
Single pulse avalanche energy <sup>(Note 5)</sup>	$E_{AS}$	1000	mJ
Operating Junction and Storage Temperature Range	$T_J, T_{STG}$	-55 To 175	°C

### Thermal Characteristic

Thermal Resistance, Junction-to-Case <sup>(Note 2)</sup>	$R_{\theta JC}$	0.75	°C/W
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**Electrical Characteristics (T<sub>C</sub>=25°C unless otherwise noted)**

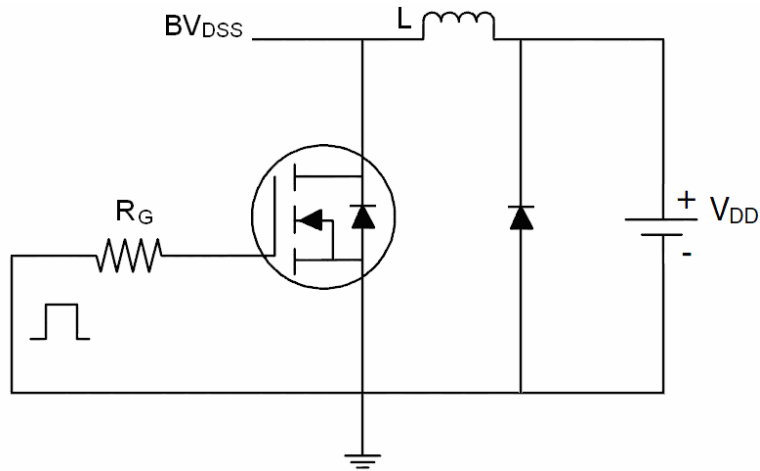
Parameter	Symbol	Condition	Min	Typ	Max	Unit
<b>Off Characteristics</b>						
Drain-Source Breakdown Voltage	BV <sub>DSS</sub>	V <sub>GS</sub> =0V I <sub>D</sub> =250μA	85		-	V
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	V <sub>DS</sub> =85V, V <sub>GS</sub> =0V	-	-	1	μA
Gate-Body Leakage Current	I <sub>GSS</sub>	V <sub>GS</sub> =±20V, V <sub>DS</sub> =0V	-	-	±100	nA
<b>On Characteristics</b> (Note 3)						
Gate Threshold Voltage	V <sub>GS(th)</sub>	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250μA	2.0	3.1	4.0	V
Drain-Source On-State Resistance	R <sub>DS(ON)</sub>	V <sub>GS</sub> =10V, I <sub>D</sub> =70A	-	3.3	4.0	mΩ
Forward Transconductance	g <sub>FS</sub>	V <sub>DS</sub> =10V, I <sub>D</sub> =70A	50	-	-	S
<b>Dynamic Characteristics</b> (Note 4)						
Input Capacitance	C <sub>ISS</sub>	V <sub>DS</sub> =40V, V <sub>GS</sub> =0V, F=1.0MHz	-	5600	-	PF
Output Capacitance	C <sub>OSS</sub>		-	850	-	PF
Reverse Transfer Capacitance	C <sub>rss</sub>		-	60	-	PF
<b>Switching Characteristics</b> (Note 4)						
Turn-on Delay Time	t <sub>d(on)</sub>	V <sub>DD</sub> =40V, I <sub>D</sub> =70A V <sub>GS</sub> =10V, R <sub>G</sub> =4.7Ω	-	20	-	nS
Turn-on Rise Time	t <sub>r</sub>		-	10	-	nS
Turn-Off Delay Time	t <sub>d(off)</sub>		-	30	-	nS
Turn-Off Fall Time	t <sub>f</sub>		-	35	-	nS
Total Gate Charge	Q <sub>g</sub>	V <sub>DS</sub> =40V, I <sub>D</sub> =70A, V <sub>GS</sub> =10V	-	84		nC
Gate-Source Charge	Q <sub>gs</sub>		-	30.6		nC
Gate-Drain Charge	Q <sub>gd</sub>		-	18.5		nC
<b>Drain-Source Diode Characteristics</b>						
Diode Forward Voltage (Note 3)	V <sub>SD</sub>	V <sub>GS</sub> =0V, I <sub>S</sub> =140A	-		1.2	V
Diode Forward Current (Note 2)	I <sub>S</sub>		-	-	140	A
Reverse Recovery Time	t <sub>rr</sub>	T <sub>J</sub> = 25°C, I <sub>F</sub> = I <sub>S</sub>	-	83		nS
Reverse Recovery Charge	Q <sub>rr</sub>	di/dt = 100A/μs (Note 3)	-	194		nC

**Notes:**

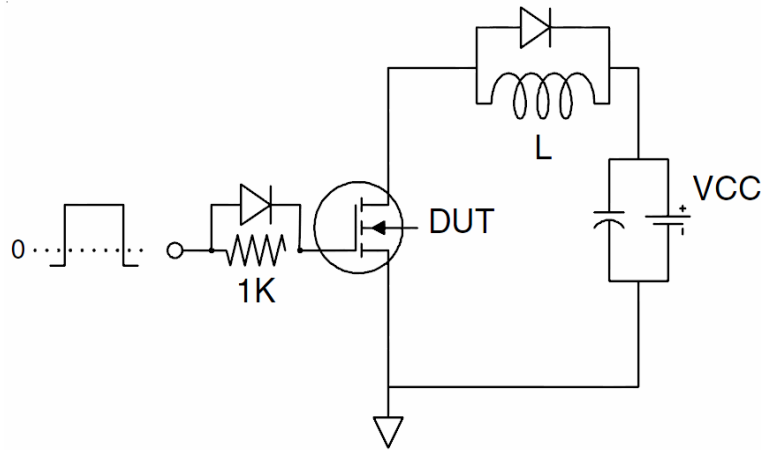
1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. Surface Mounted on FR4 Board, t ≤ 10 sec.
3. Pulse Test: Pulse Width ≤ 300μs, Duty Cycle ≤ 2%.
4. Guaranteed by design, not subject to production
5. EAS condition : T<sub>J</sub>=25°C, V<sub>DD</sub>=42.5V, V<sub>G</sub>=10V, L=0.5mH, R<sub>G</sub>=25Ω

**Test Circuit**

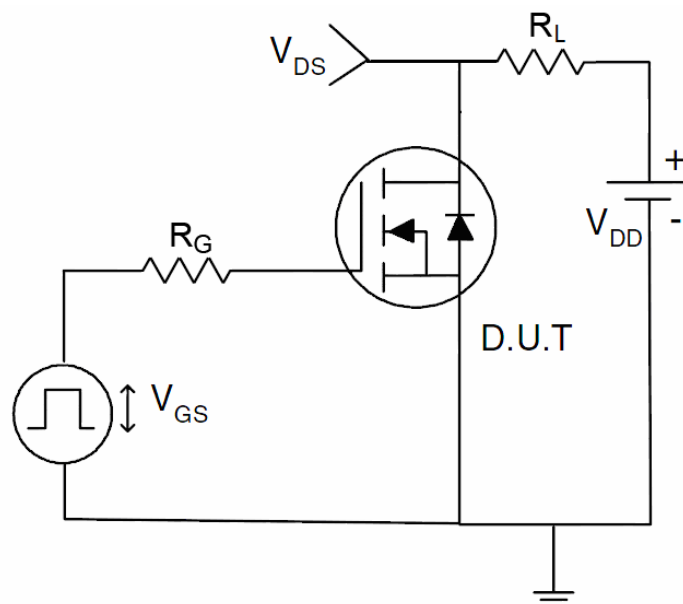
**1) E<sub>AS</sub> test Circuit**



**2) Gate charge test Circuit**



**3) Switch Time Test Circuit**



Typical Electrical and Thermal Characteristics

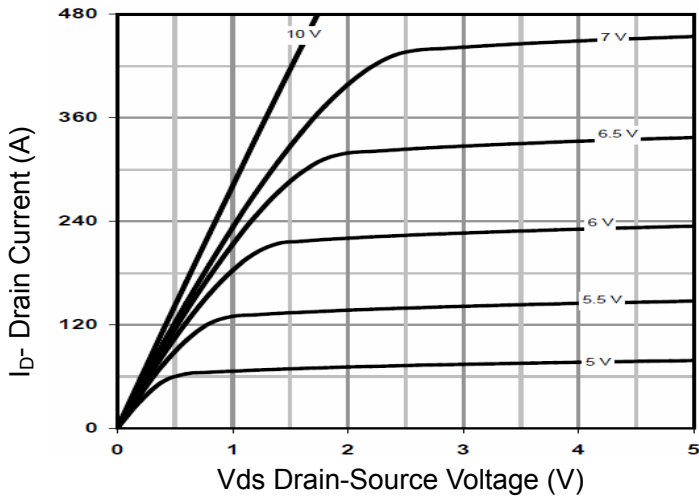


Figure 1 Output Characteristics

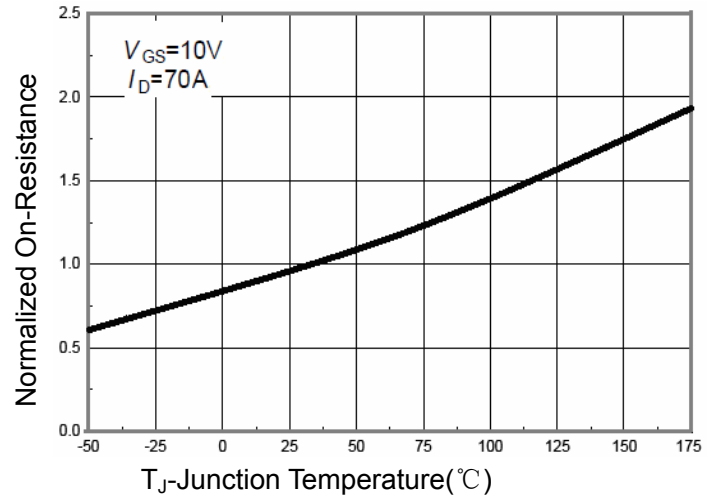


Figure 4 Rds(on)-Junction Temperature

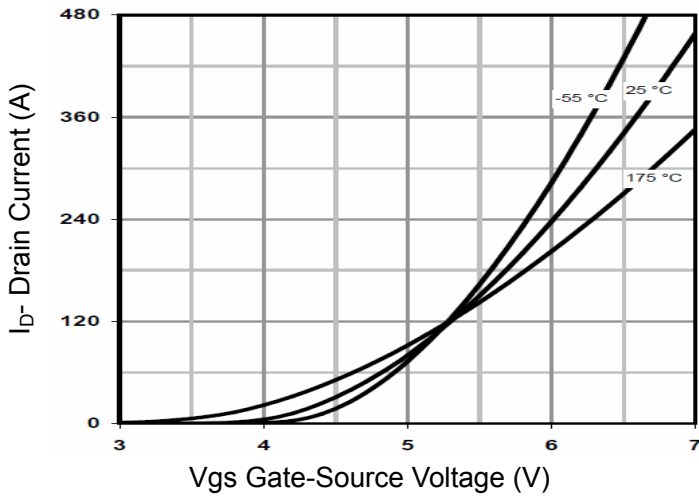


Figure 2 Transfer Characteristics

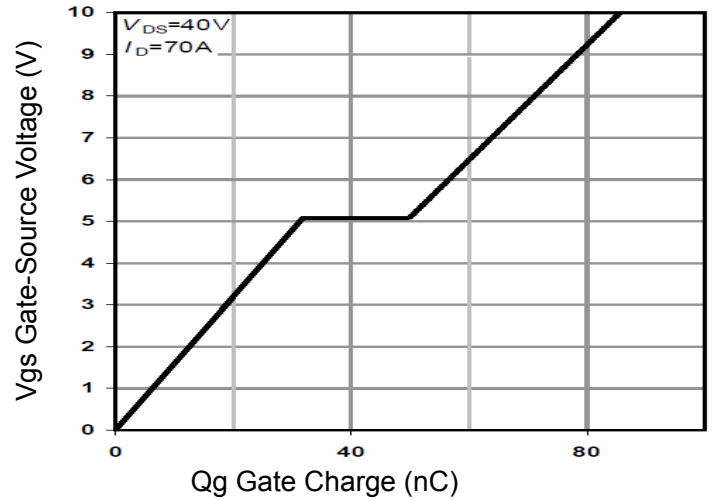


Figure 5 Gate Charge

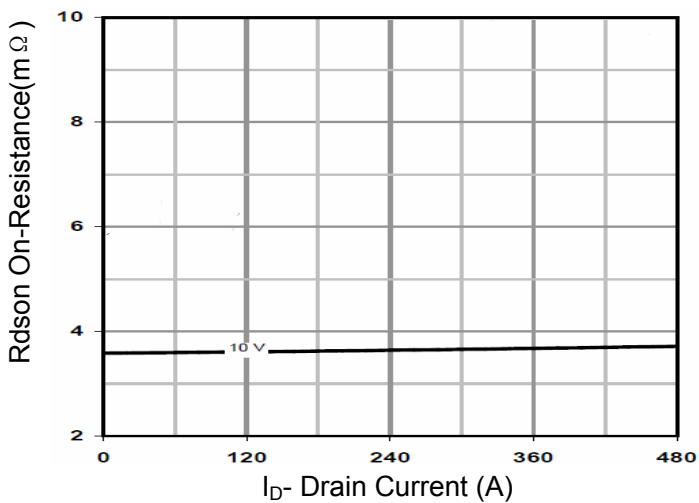


Figure 3 Rds(on)- Drain Current

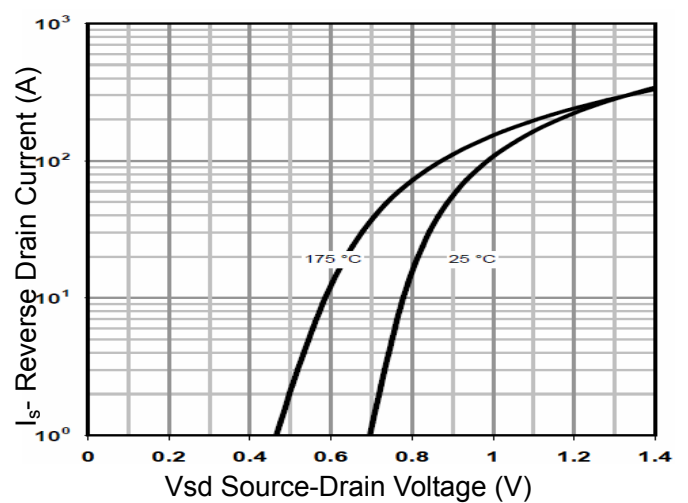


Figure 6 Source- Drain Diode Forward

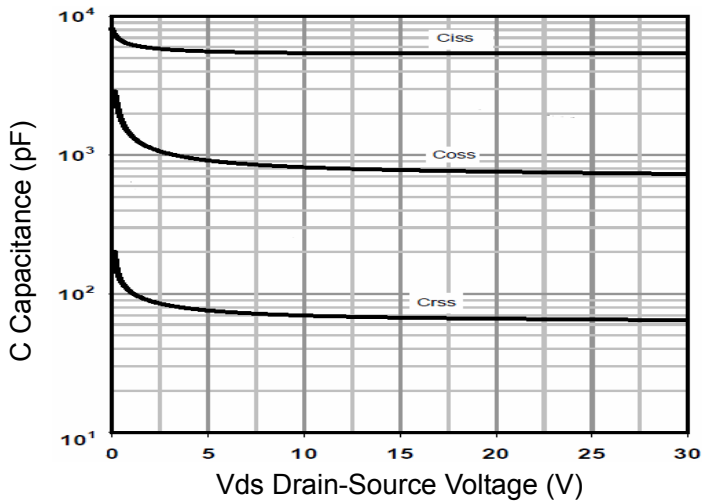


Figure 7 Capacitance vs Vds

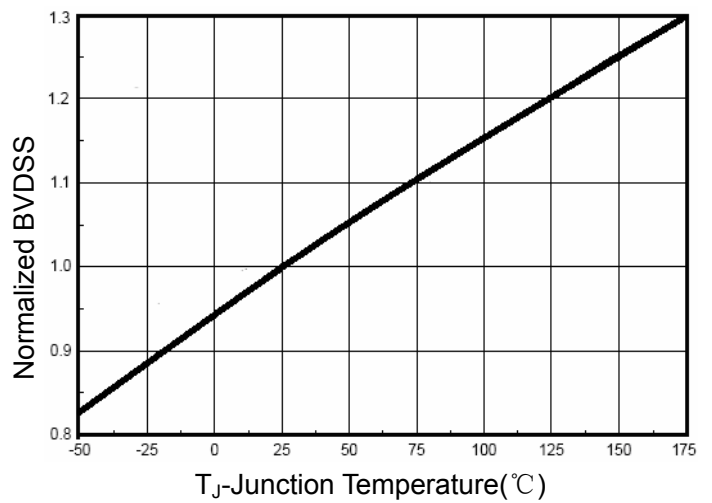


Figure 9  $BV_{DSS}$  vs Junction Temperature

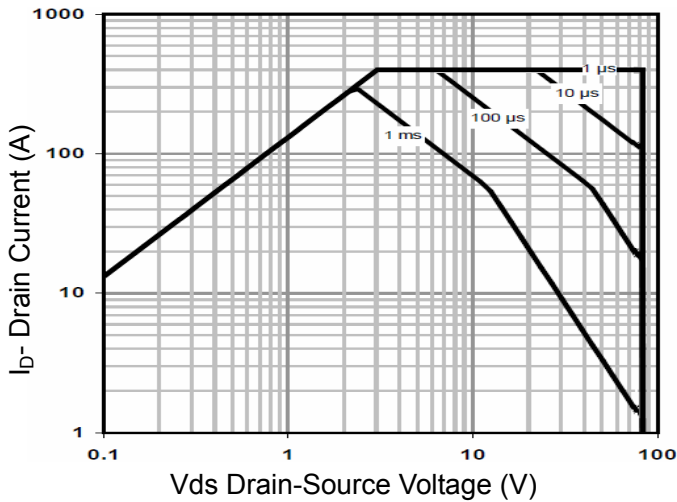


Figure 8 Safe Operation Area

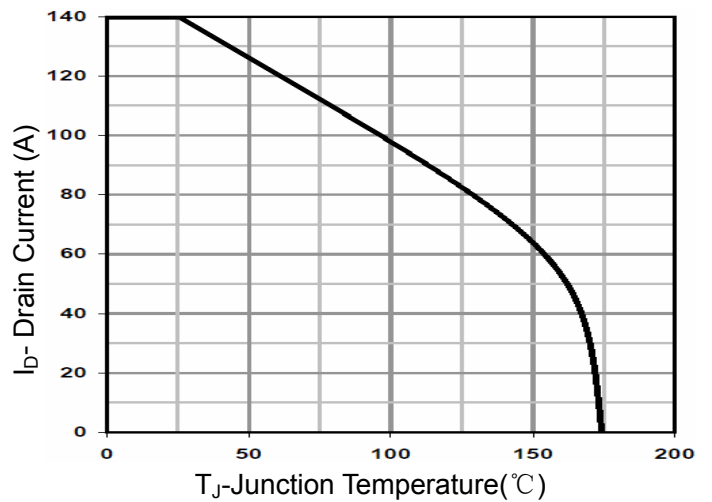


Figure 10 Current De-rating

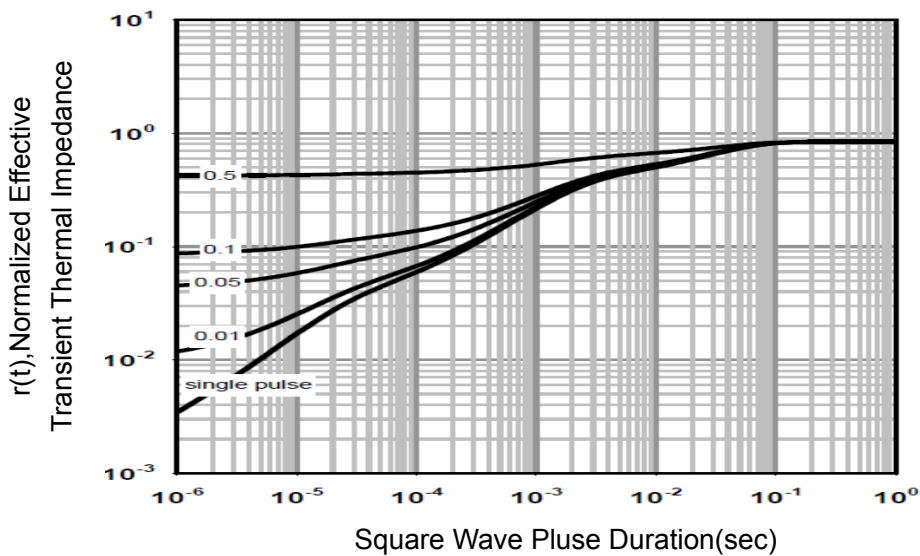
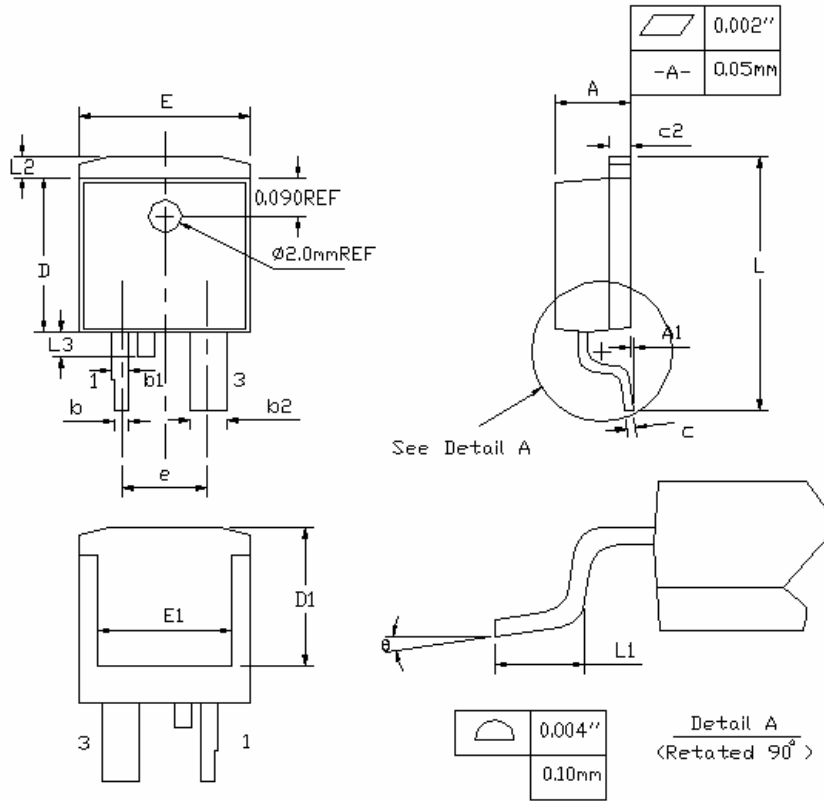


Figure 11 Normalized Maximum Transient Thermal Impedance

TO-263T-2L Package Information



Symbol	Dimensions In Inches		Dimensions In Millimeters	
	Min.	Max.	Min.	Max.
A	0.170	0.180	4.32	4.57
A1	-	0.010	-	0.25
b	0.028	0.037	0.71	0.94
b 1	0.035	0.047	0.9	1.2
b2	0.081	0.095	2.05	2.4
c	0.018	0.024	0.46	0.61
c2	0.048	0.055	1.22	1.40
D	0.350	0.370	8.89	9.40
D1	0.315	0.324	8.01	8.23
E	0.395	0.405	10.04	10.28
E1	0.310	0.318	7.88	8.08
e	0.200 BSC.		5.08 BSC.	
L	0.580	0.620	14.73	15.75
L1	0.090	0.110	2.29	2.79
L2	0.045	0.055	1.15	1.39
L3	0.050	0.070	1.27	1.77
$\theta$	0°	8°	0°	8°

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