

## NCE N-Channel Enhancement Mode Power MOSFET

### Description

The NCE30H29D uses advanced trench technology and design to provide excellent  $R_{DS(ON)}$  with low gate charge. It can be used in a wide variety of applications.

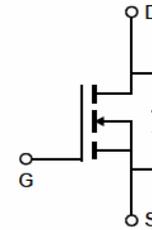
### General Features

- $V_{DS} = 30V$ ,  $I_D = 290A$   
 $R_{DS(ON)} < 1.8m\Omega$  @  $V_{GS} = 10V$
- High density cell design for ultra low  $R_{ds(on)}$
- Fully characterized avalanche voltage and current
- Good stability and uniformity with high  $E_{AS}$
- Excellent package for good heat dissipation
- Special process technology for high ESD capability

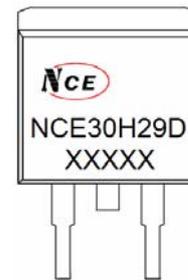
### Application

- Power switching application
- Hard switched and high frequency circuits
- Uninterruptible power supply

**100% UIS TESTED!**  
**100%  $\Delta V_{ds}$  TESTED!**



Schematic diagram



Marking and pin assignment



TO-263-2L top view

### Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
NCE30H29D	NCE30H29D	TO-263-2L	-	-	-

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

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	$V_{DS}$	30	V
Gate-Source Voltage	$V_{GS}$	$\pm 20$	V
Drain Current-Continuous (Silicon Limited)	$I_D$	290	A
Drain Current-Continuous ( $T_C = 100^\circ C$ ) (Silicon Limited)	$I_D(100^\circ C)$	205	A
Pulsed Drain Current	$I_{DM}$	1160	A
Maximum Power Dissipation	$P_D$	270	W
Derating factor		1.8	W/ $^\circ C$
Single pulse avalanche energy <sup>(Note 5)</sup>	$E_{AS}$	1600	mJ
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>	$R_{\theta JC}$	0.56	°C/W
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**Electrical Characteristics ( $T_A=25^\circ\text{C}$  unless otherwise noted)**

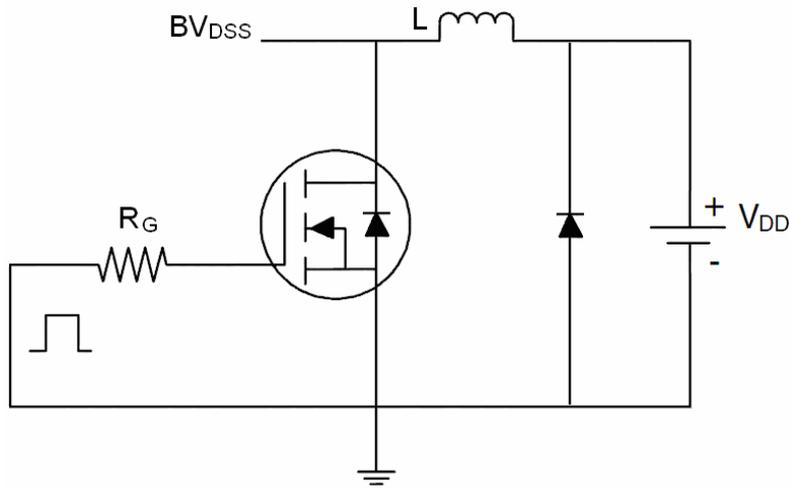
Parameter	Symbol	Condition	Min	Typ	Max	Unit
<b>Off Characteristics</b>						
Drain-Source Breakdown Voltage	$BV_{DSS}$	$V_{GS}=0V, I_D=250\mu A$	30		-	V
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS}=30V, V_{GS}=0V$	-	-	1	$\mu A$
Gate-Body Leakage Current	$I_{GSS}$	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	$\pm 100$	nA
<b>On Characteristics</b> <sup>(Note 3)</sup>						
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=250\mu A$	1.0	1.6	2.5	V
Drain-Source On-State Resistance	$R_{DS(ON)}$	$V_{GS}=10V, I_D=160A$	-	1.4	1.8	m $\Omega$
Forward Transconductance	$g_{FS}$	$V_{DS}=5V, I_D=160A$	50	-	-	S
<b>Dynamic Characteristics</b> <sup>(Note 4)</sup>						
Input Capacitance	$C_{iss}$	$V_{DS}=15V, V_{GS}=0V,$ $F=1.0\text{MHz}$	-	13873	-	PF
Output Capacitance	$C_{oss}$		-	1672	-	PF
Reverse Transfer Capacitance	$C_{rss}$		-	1508	-	PF
<b>Switching Characteristics</b> <sup>(Note 4)</sup>						
Turn-on Delay Time	$t_{d(on)}$	$V_{DD}=15V, R_L=15\Omega,$ $R_G=2.5\Omega, V_{GS}=10V$	-	18	-	nS
Turn-on Rise Time	$t_r$		-	200	-	nS
Turn-Off Delay Time	$t_{d(off)}$		-	85	-	nS
Turn-Off Fall Time	$t_f$		-	125	-	nS
Total Gate Charge	$Q_g$	$I_D=160A, V_{DD}=15V, V_{GS}=10V$	-	231	-	nC
Gate-Source Charge	$Q_{gs}$		-	27.5	-	nC
Gate-Drain Charge	$Q_{gd}$		-	55	-	nC
<b>Drain-Source Diode Characteristics</b>						
Diode Forward Voltage <sup>(Note 3)</sup>	$V_{SD}$	$V_{GS}=0V, I_S=160A$	-	0.85	1.2	V
Diode Forward Current <sup>(Note 2)</sup>	$I_S$		-	-	320	A
Reverse Recovery Time	$t_{rr}$	$T_J = 25^\circ\text{C}, I_F = 160A$ $di/dt = 100A/\mu s$ <sup>(Note 3)</sup>	-	70		nS
Reverse Recovery Charge	$Q_{rr}$		-	180		nC
Forward Turn-On Time	$t_{on}$	Intrinsic turn-on time is negligible (turn-on is dominated by LS+LD)				

**Notes:**

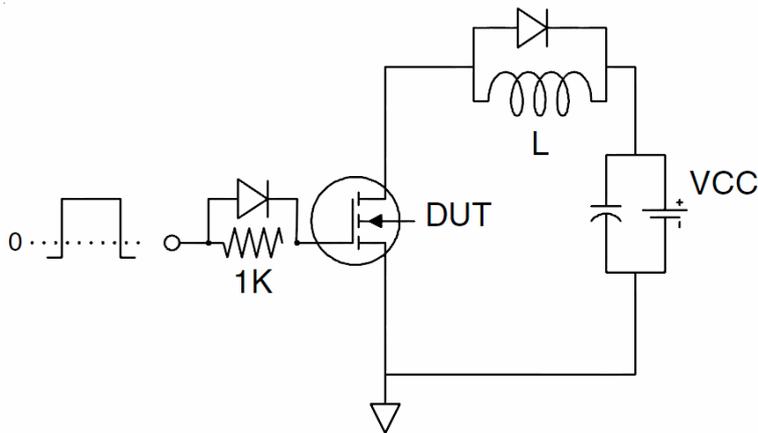
1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. Surface Mounted on FR4 Board,  $t \leq 10$  sec.
3. Pulse Test: Pulse Width  $\leq 300\mu s$ , Duty Cycle  $\leq 2\%$ .
4. Guaranteed by design, not subject to production
5. EAS condition:  $T_J=25^\circ\text{C}, V_{DD}=15V, V_G=10V, L=0.5\text{mH}, R_G=25\Omega$

**Test circuit**

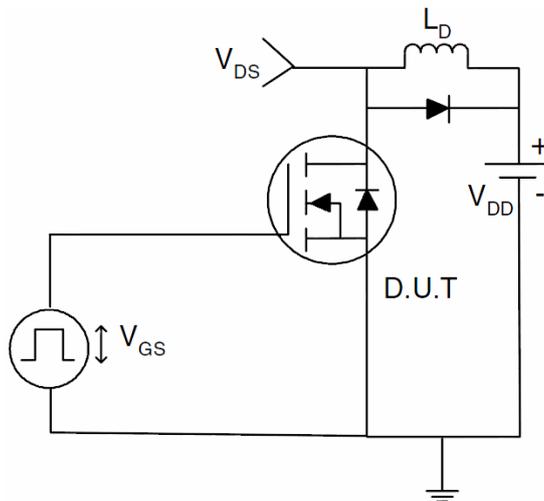
**1) E<sub>AS</sub> test Circuits**



**2) Gate charge test Circuit:**



**3) Switch Time Test Circuit:**



Typical Electrical and Thermal Characteristics (Curves)

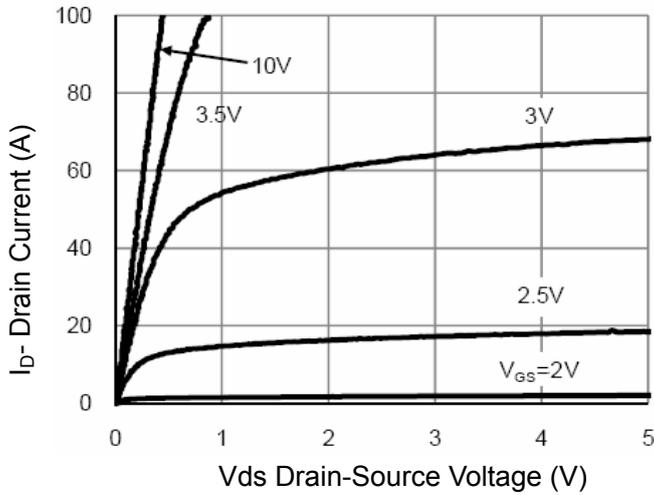


Figure 1 Output Characteristics

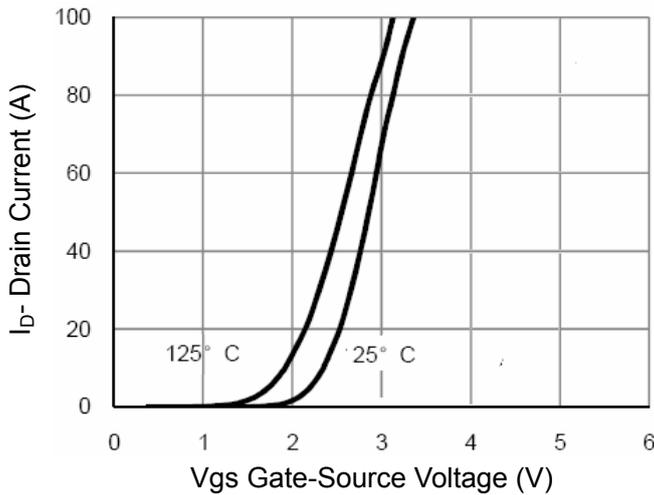


Figure 2 Transfer Characteristics

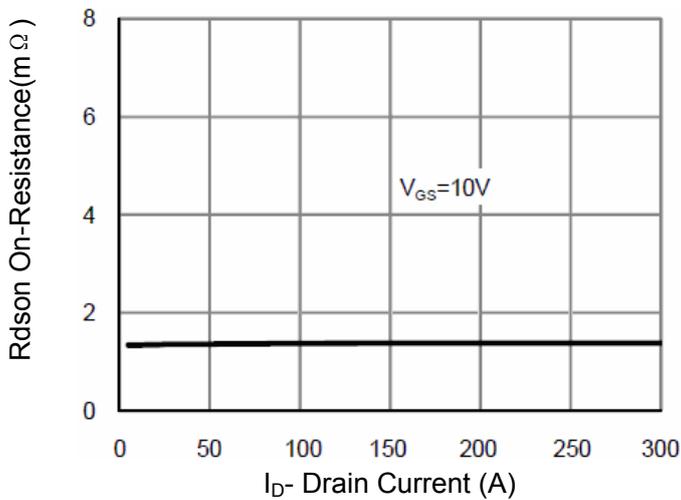


Figure 3  $R_{DS(on)}$ - Drain Current

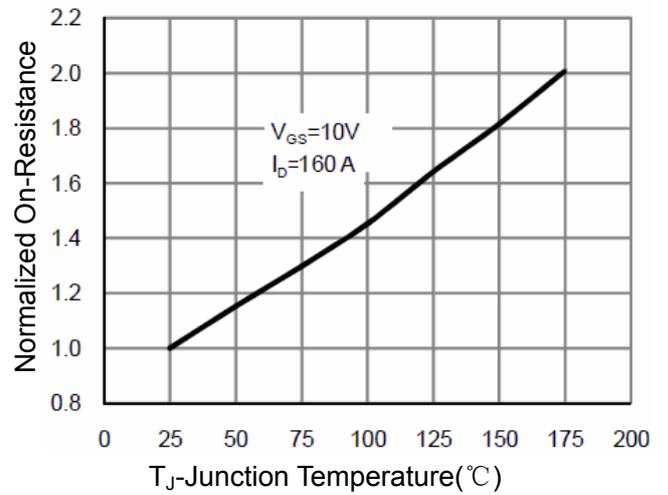


Figure 4  $R_{DS(on)}$ -Junction Temperature

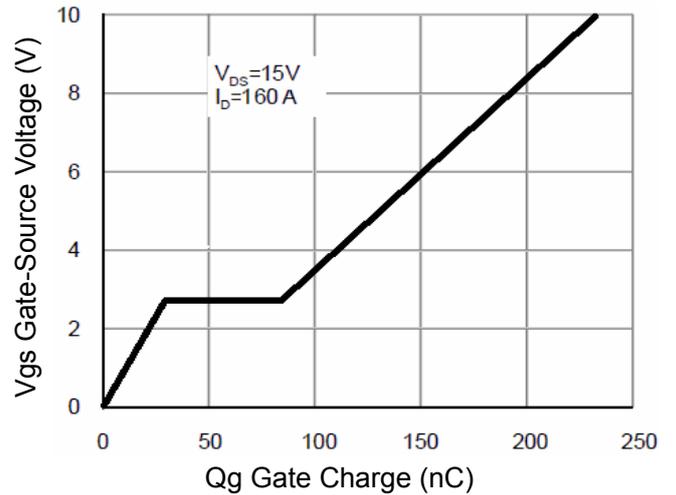


Figure 5 Gate Charge

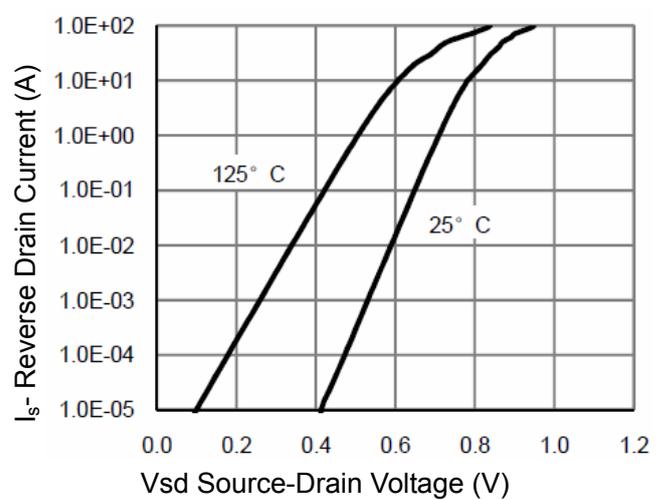


Figure 6 Source- Drain Diode Forward

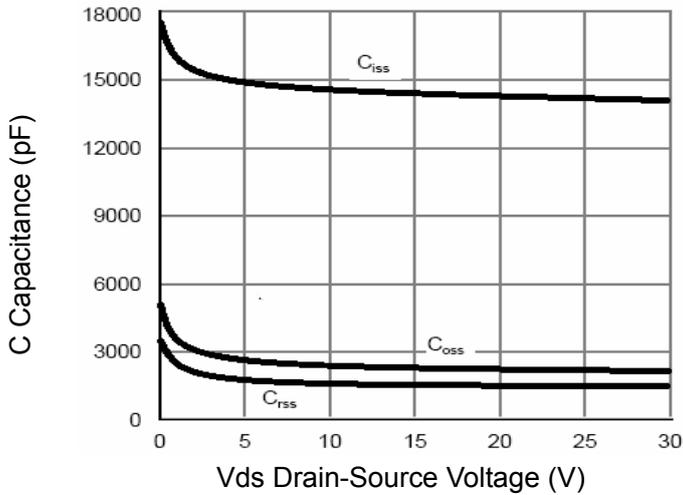


Figure 7 Capacitance vs Vds

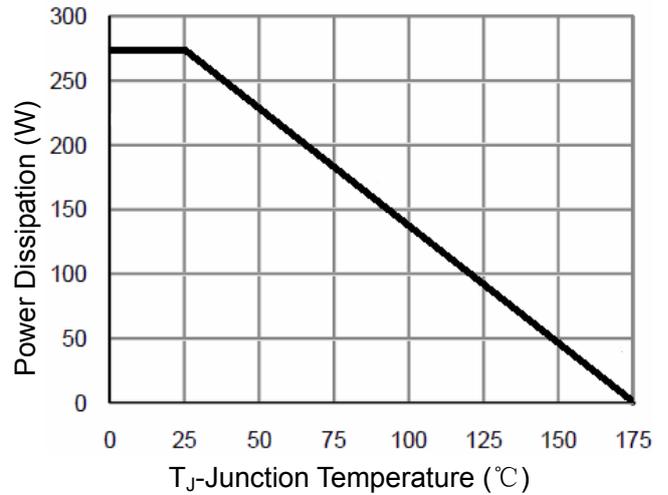


Figure 9 Power De-rating

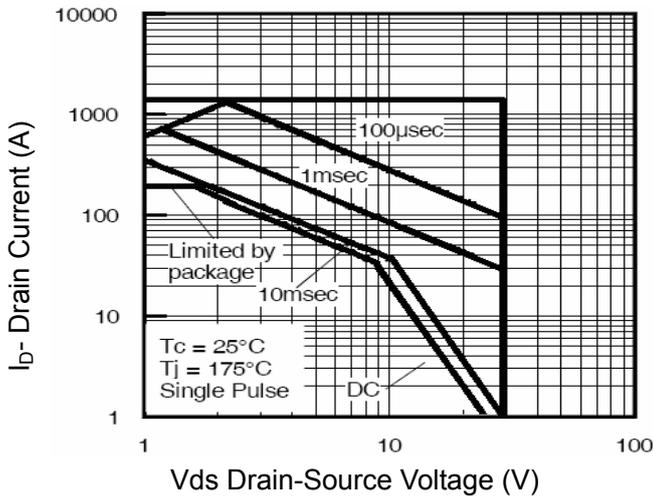


Figure 8 Safe Operation Area

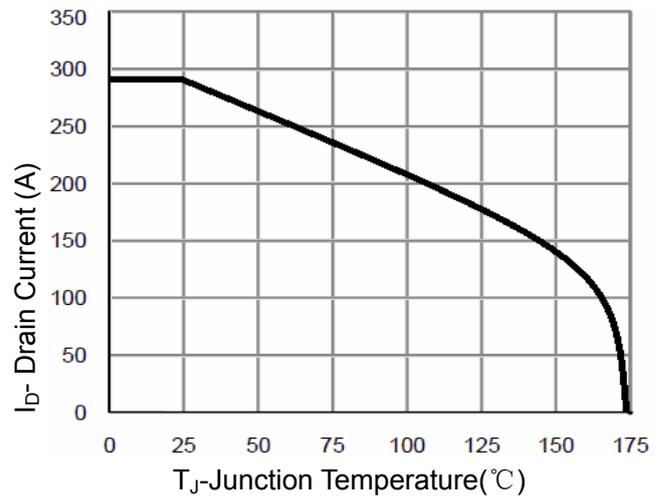


Figure 10 Current vs Junction Temperature

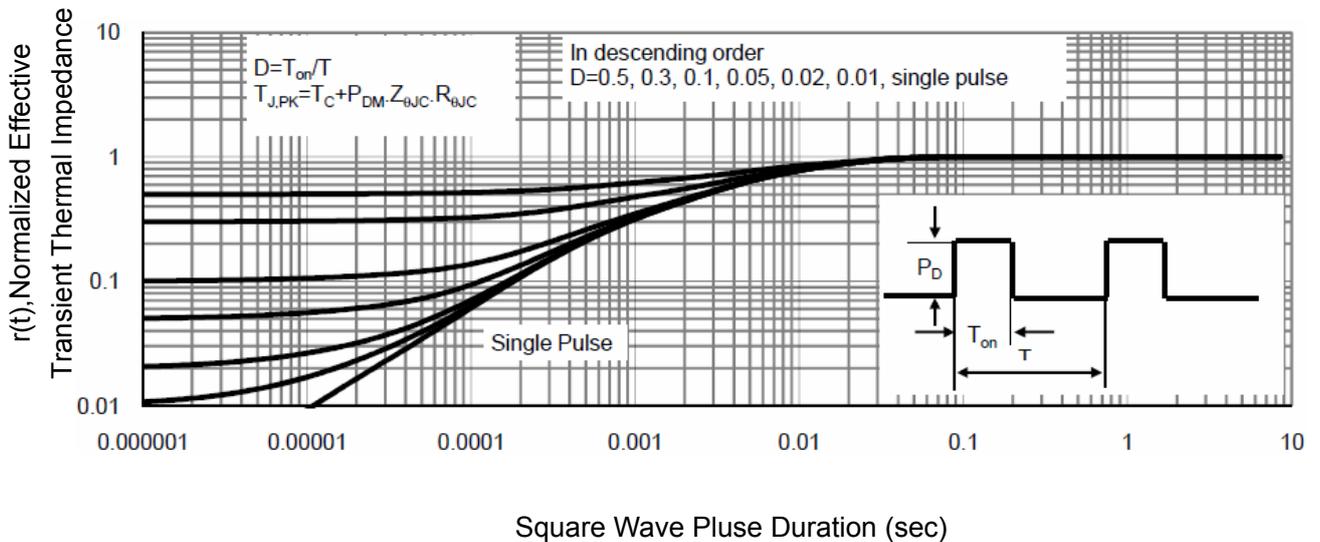
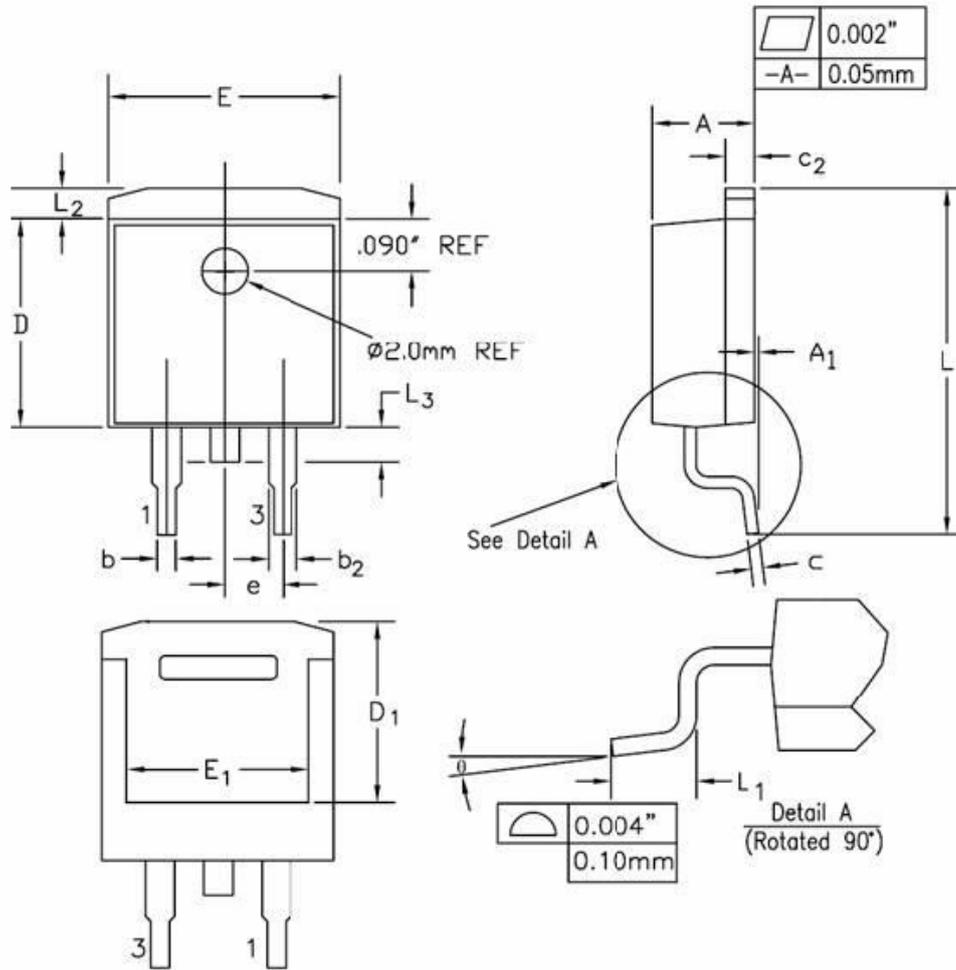


Figure 11 Normalized Maximum Transient Thermal Impedance

TO-263-2L Package Information



SYMBOL	INCHES		MILLIMETERS		NOTES
	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	
b2	0.045	0.055	1.15	1.40	
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	0.100 BSC.		2.54 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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