

## QIAOXIN N-Channel **Super Trench** Power MOSFET

### Description

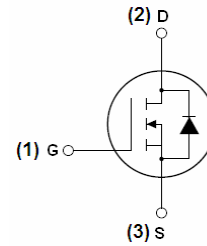
The VCRR85T12D uses **Super Trench** technology that is uniquely optimized to provide the most efficient high frequency switching performance. Both conduction and switching power losses are minimized due to an extremely low combination of  $R_{DS(ON)}$  and  $Q_g$ . This device is ideal for high-frequency switching and synchronous rectification.

### General Features

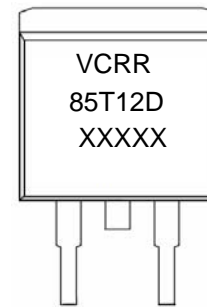
- $V_{DS} = 85V, I_D = 120A$   
 $R_{DS(ON)} < 5.5m\Omega @ V_{GS} = 10V$
- Excellent gate charge x  $R_{DS(on)}$  product(FOM)
- Very low on-resistance  $R_{DS(on)}$
- 175 °C operating temperature
- Pb-free lead plating
- 100% UIS tested

### Application

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



Schematic diagram



Marking and pin assignment



TO-263-2L top view

### Package Marking and Ordering Information

Device Marking	Device	Device Package
VCRR85T12D		TO-263-2L

### 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	$V_{GS}$	$\pm 20$	V
Drain Current-Continuous	$I_D$	120	A
Drain Current-Continuous( $T_C = 100^\circ C$ )	$I_D(100^\circ C)$	88	A
Pulsed Drain Current	$I_{DM}$	320	A
Maximum Power Dissipation	$P_D$	160	W
Derating factor		1.1	W/ $^\circ C$
Single pulse avalanche energy <sup>(Note 5)</sup>	$E_{AS}$	784	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>	$R_{\theta JC}$	0.94	$^{\circ}C/W$
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## Electrical Characteristics ( $T_C=25^{\circ}C$ unless otherwise noted)

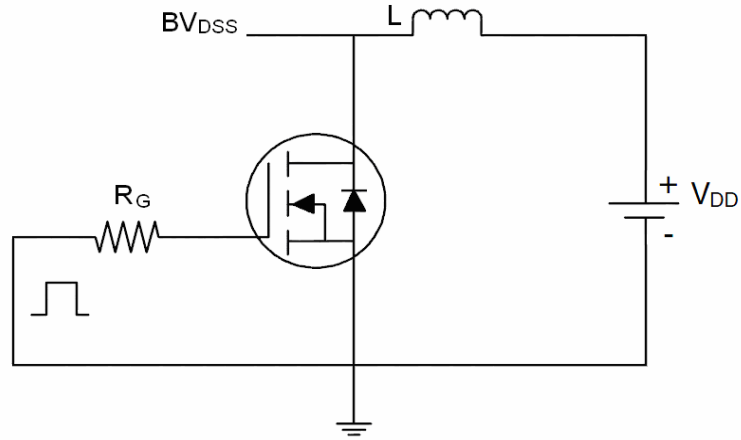
Parameter	Symbol	Condition	Min	Typ	Max	Unit
<b>Off Characteristics</b>						
Drain-Source Breakdown Voltage	$BV_{DSS}$	$V_{GS}=0V, I_D=250\mu A$	85		-	V
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS}=85V, V_{GS}=0V$	-	-	1	$\mu A$
Gate-Body Leakage Current	$I_{GSS}$	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	$\pm 100$	nA
<b>On Characteristics</b> <sup>(Note 3)</sup>						
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=250\mu A$	2.5	3.3	4.5	V
Drain-Source On-State Resistance	$R_{DS(ON)}$	$V_{GS}=10V, I_D=60A$	-	-	5.5	m $\Omega$
Forward Transconductance	$g_{FS}$	$V_{DS}=10V, I_D=60A$	40	-	-	S
<b>Dynamic Characteristics</b> <sup>(Note 4)</sup>						
Input Capacitance	$C_{iss}$	$V_{DS}=40V, V_{GS}=0V,$ $F=1.0MHz$	-	4300	-	PF
Output Capacitance	$C_{oss}$		-	830	-	PF
Reverse Transfer Capacitance	$C_{rss}$		-	57	-	PF
<b>Switching Characteristics</b> <sup>(Note 4)</sup>						
Turn-on Delay Time	$t_{d(on)}$	$V_{DD}=40V, I_D=60A$ $V_{GS}=10V, R_G=4.7\Omega$	-	13.5	-	nS
Turn-on Rise Time	$t_r$		-	12.5	-	nS
Turn-Off Delay Time	$t_{d(off)}$		-	38	-	nS
Turn-Off Fall Time	$t_f$		-	13.5	-	nS
Total Gate Charge	$Q_g$	$V_{DS}=40V, I_D=60A,$ $V_{GS}=10V$	-	55		nC
Gate-Source Charge	$Q_{gs}$		-	21		nC
Gate-Drain Charge	$Q_{gd}$		-	9		nC
<b>Drain-Source Diode Characteristics</b>						
Diode Forward Voltage <sup>(Note 3)</sup>	$V_{SD}$	$V_{GS}=0V, I_S=120A$	-		1.2	V
Diode Forward Current <sup>(Note 2)</sup>	$I_S$		-	-	120	A
Reverse Recovery Time	$t_{rr}$	$T_J = 25^{\circ}C, I_F = I_S$	-	74		nS
Reverse Recovery Charge	$Q_{rr}$	$di/dt = 100A/\mu S$ <sup>(Note 3)</sup>	-	176		nC

### Notes:

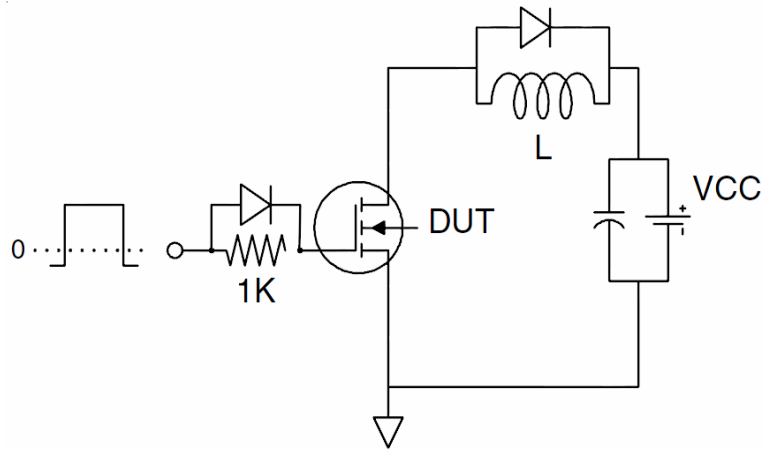
1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. Surface Mounted on FR4 Board,  $t \leq 10$  sec.
3. Pulse Test: Pulse Width  $\leq 300\mu s$ , Duty Cycle  $\leq 2\%$ .
4. Guaranteed by design, not subject to production
5. EAS condition :  $T_J=25^{\circ}C, V_{DD}=42.5V, V_G=10V, L=0.5mH, R_G=25\Omega$

**Test Circuit**

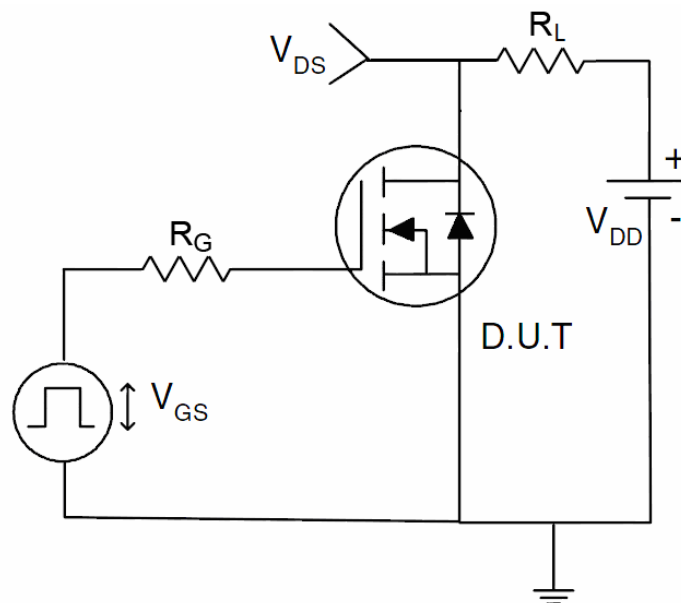
**1)  $E_{AS}$  test Circuit**



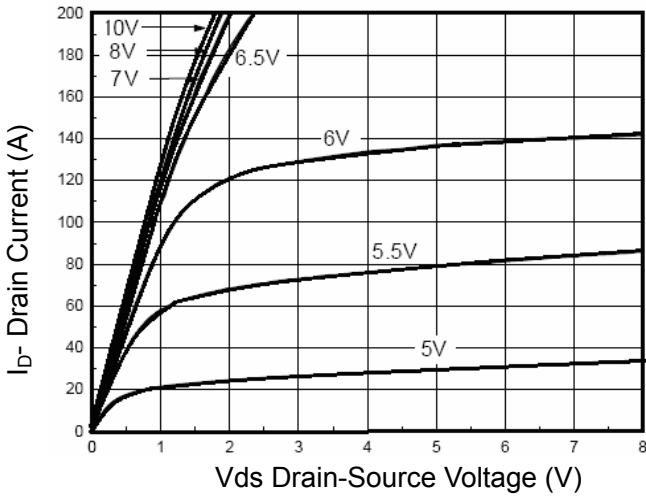
**2) Gate charge test Circuit**



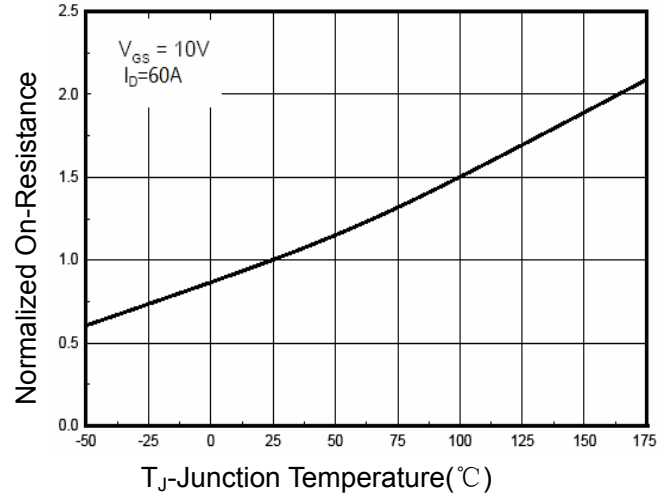
**3) Switch Time Test Circuit**



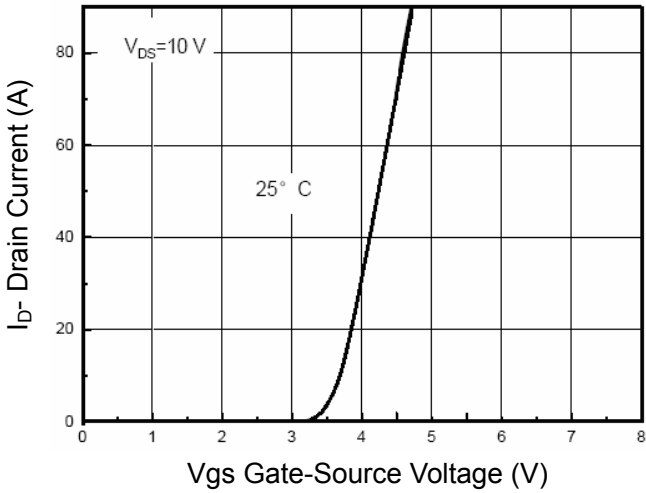
**Typical Electrical and Thermal Characteristics**



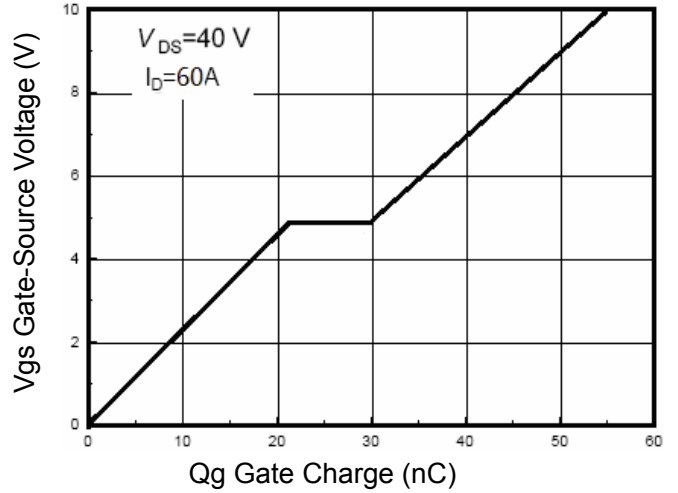
**Figure 1 Output Characteristics**



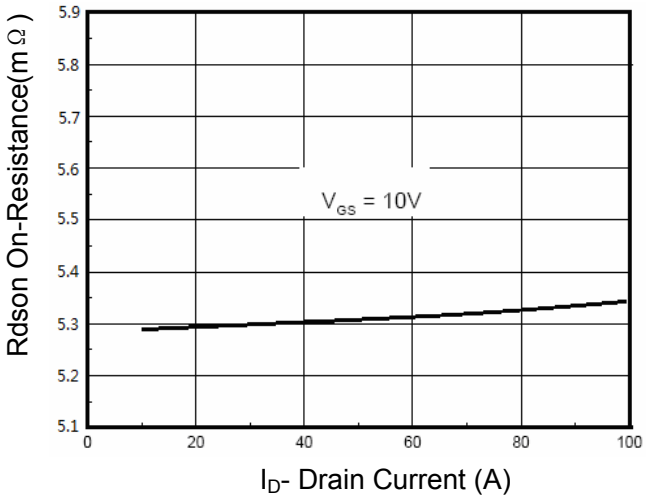
**Figure 4 Rds(on)-Junction Temperature**



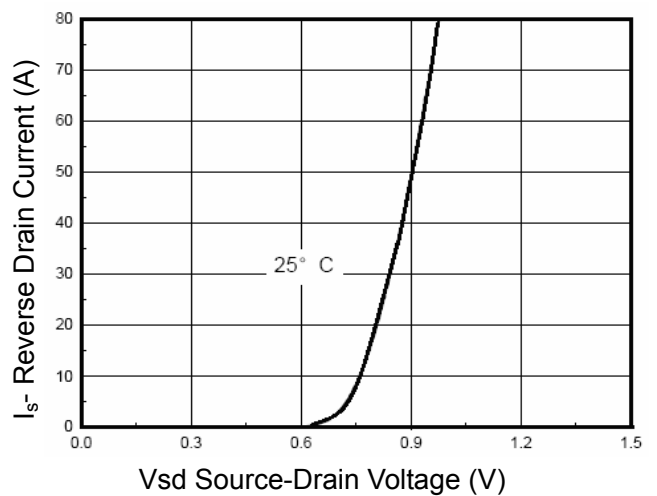
**Figure 2 Transfer Characteristics**



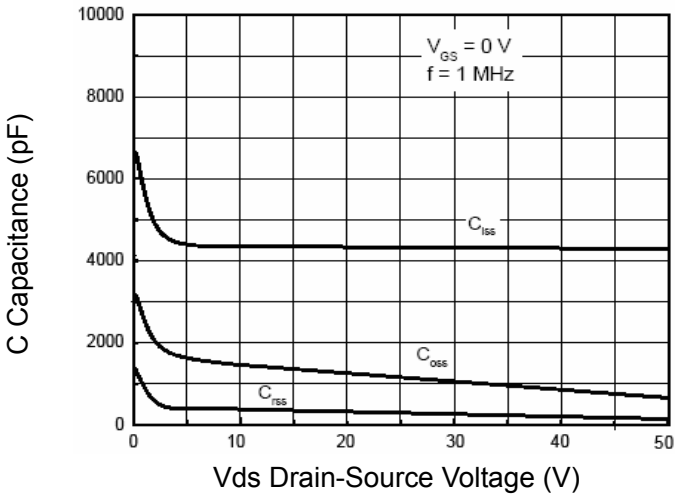
**Figure 5 Gate Charge**



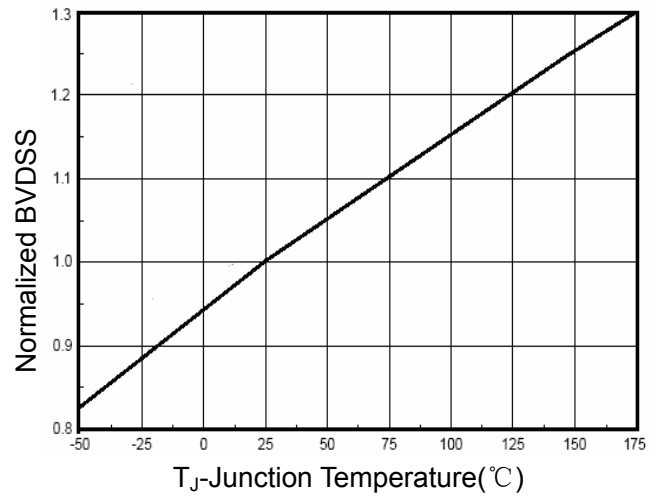
**Figure 3 Rds(on)- Drain Current**



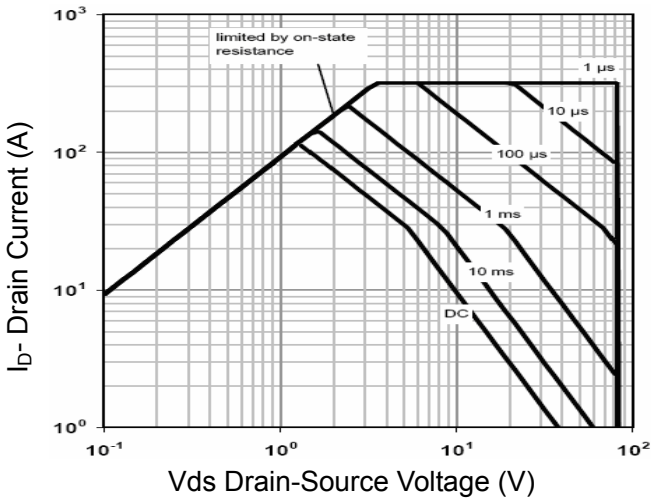
**Figure 6 Source- Drain Diode Forward**



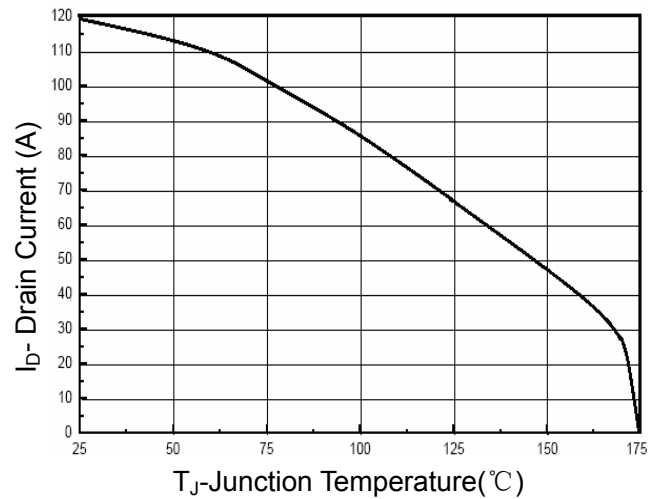
**Figure 7 Capacitance vs Vds**



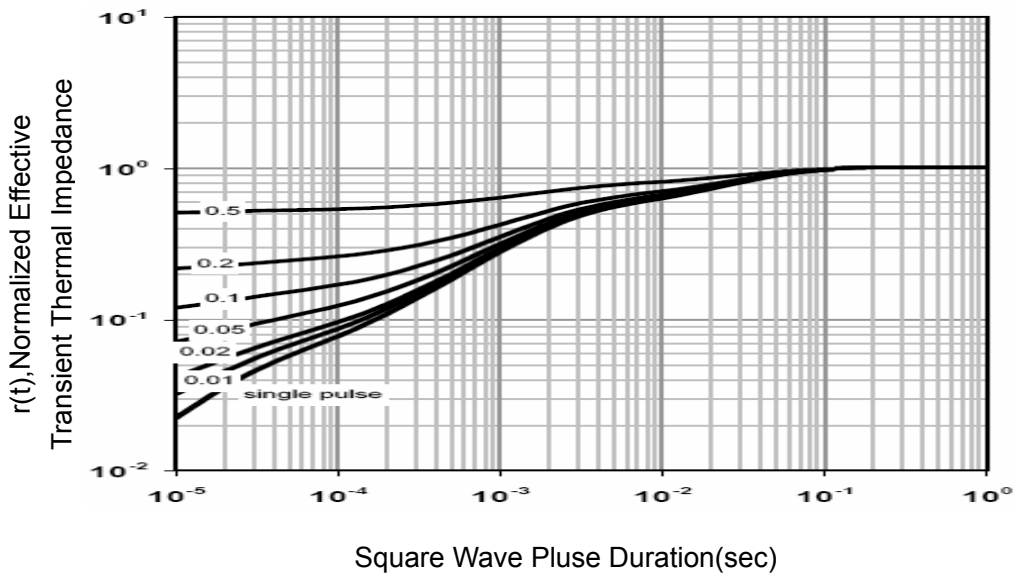
**Figure 9 BV<sub>DSS</sub> vs Junction Temperature**



**Figure 8 Safe Operation Area**

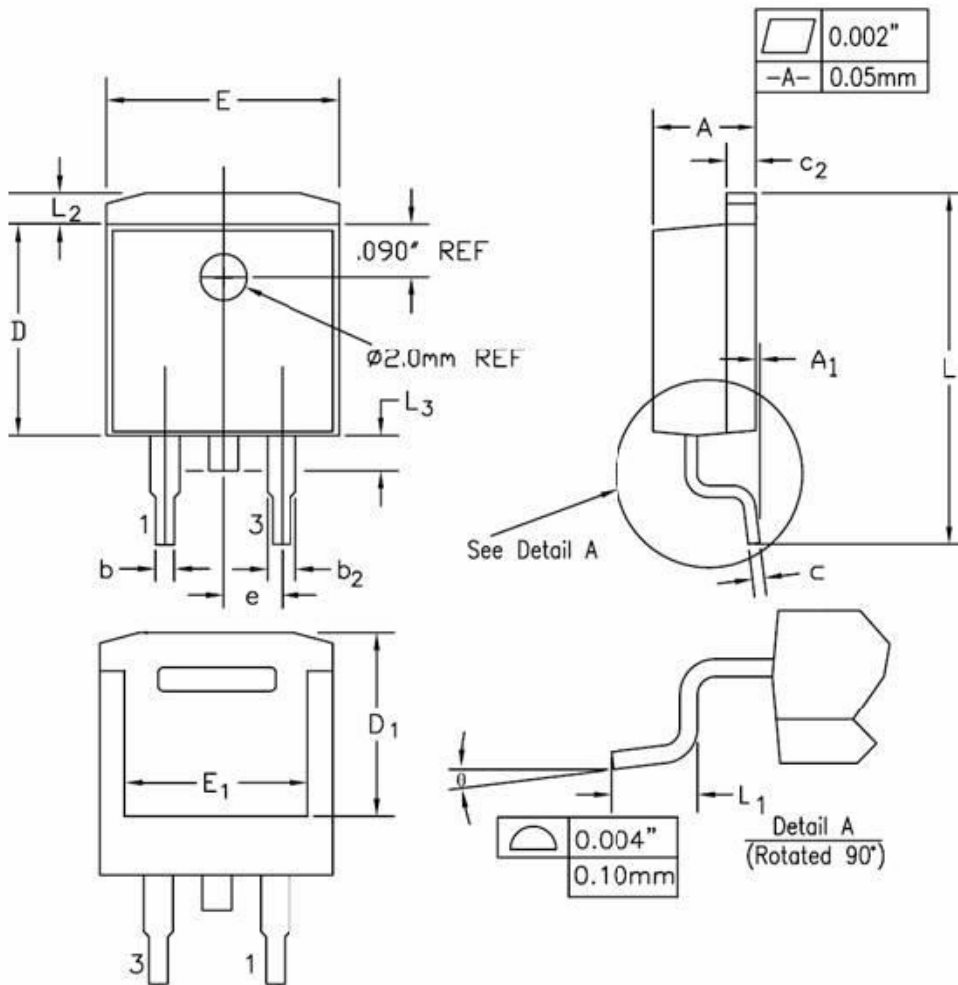


**Figure 10 Current De-rating**



**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°	

## Attention

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