

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

**Description**

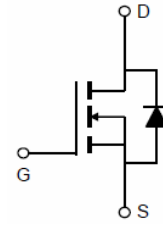
The VCRR15T14D uses **Super Trench** technology that is uniquely optimized to provide the most efficient high frequency switching performance. Both conduction and switching power losses are minimized due to an extremely low combination of  $R_{DS(ON)}$  and  $Q_g$ . This device is ideal for high-frequency switching and synchronous rectification.

**General Features**

- $V_{DS} = 150V, I_D = 140A$   
 $R_{DS(ON)} = 5.6m\Omega$ , typical @  $V_{GS} = 10V$
- 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-263-2L top view

**Package Marking and Ordering Information**

Device Marking	Device	Device Package
VCRR15T14D		TO-263-2L

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

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	$V_{DS}$	150	V
Gate-Source Voltage	$V_{GS}$	$\pm 20$	V
Drain Current-Continuous	$I_D$	140	A
Drain Current-Continuous( $T_C = 100^\circ C$ )	$I_D(100^\circ C)$	100	A
Pulsed Drain Current	$I_{DM}$	560	A
Maximum Power Dissipation	$P_D$	320	W
Derating factor		2.1	W/ $^\circ C$
Single pulse avalanche energy <sup>(Note 3)</sup>	$E_{AS}$	1296	mJ
Operating Junction and Storage Temperature Range	$T_J, T_{STG}$	-55 To 175	$^\circ C$

**Thermal Characteristic**

Thermal Resistance, Junction-to-Case	$R_{\theta JC}$	0.47	$^\circ C/W$
Thermal Resistance, Junction-to-Ambient <sup>(Note 1)</sup>	$R_{\theta JA}$	60	$^\circ C/W$

### Electrical Characteristics (T<sub>C</sub>=25°C unless otherwise noted)

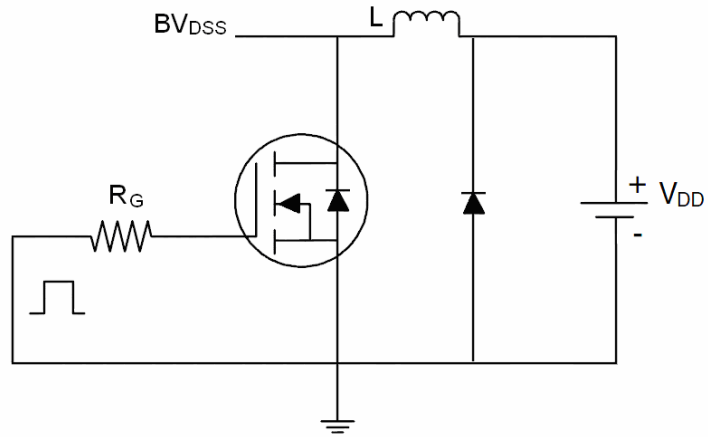
Parameter	Symbol	Condition	Min	Typ	Max	Unit
<b>Off Characteristics</b>						
Drain-Source Breakdown Voltage	BV <sub>DSS</sub>	V <sub>GS</sub> =0V I <sub>D</sub> =250μA	150	-	-	V
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	V <sub>DS</sub> =150V, V <sub>GS</sub> =0V	-	-	1	μA
Gate-Body Leakage Current	I <sub>GSS</sub>	V <sub>GS</sub> =±20V, V <sub>DS</sub> =0V	-	-	±100	nA
<b>On Characteristics</b>						
Gate Threshold Voltage	V <sub>GS(th)</sub>	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250μA	2.0	3.0	4.0	V
Drain-Source On-State Resistance	R <sub>DS(ON)</sub>	V <sub>GS</sub> =10V, I <sub>D</sub> =70A	-	5.6	6.4	mΩ
Gate resistance	R <sub>G</sub>		-	4.5	-	Ω
Forward Transconductance	g <sub>FS</sub>	V <sub>DS</sub> =10V, I <sub>D</sub> =70A	70	-	-	S
<b>Dynamic Characteristics</b> (Note2)						
Input Capacitance	C <sub>iss</sub>	V <sub>DS</sub> =75V, V <sub>GS</sub> =0V, F=1.0MHz	-	5500	7150	PF
Output Capacitance	C <sub>OSS</sub>		-	690	890	PF
Reverse Transfer Capacitance	C <sub>rss</sub>		-	24	31	PF
<b>Switching Characteristics</b> (Note 2)						
Turn-on Delay Time	t <sub>d(on)</sub>	V <sub>DD</sub> =75V, I <sub>D</sub> =70A V <sub>GS</sub> =10V, R <sub>G</sub> =4.7Ω	-	26	-	nS
Turn-on Rise Time	t <sub>r</sub>		-	36	-	nS
Turn-Off Delay Time	t <sub>d(off)</sub>		-	47	-	nS
Turn-Off Fall Time	t <sub>f</sub>		-	15	-	nS
Total Gate Charge	Q <sub>g</sub>	V <sub>DS</sub> =75V, I <sub>D</sub> =70A, V <sub>GS</sub> =10V	-	80	104	nC
Gate-Source Charge	Q <sub>gs</sub>		-	32	41	nC
Gate-Drain Charge	Q <sub>gd</sub>		-	22	28	nC
<b>Drain-Source Diode Characteristics</b>						
Diode Forward Voltage	V <sub>SD</sub>	V <sub>GS</sub> =0V, I <sub>F</sub> = I <sub>S</sub>	-		1.2	V
Diode Forward Current	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>	-	146		nS
Reverse Recovery Charge	Q <sub>rr</sub>	di/dt = 100A/μs	-	485		nC

#### Notes:

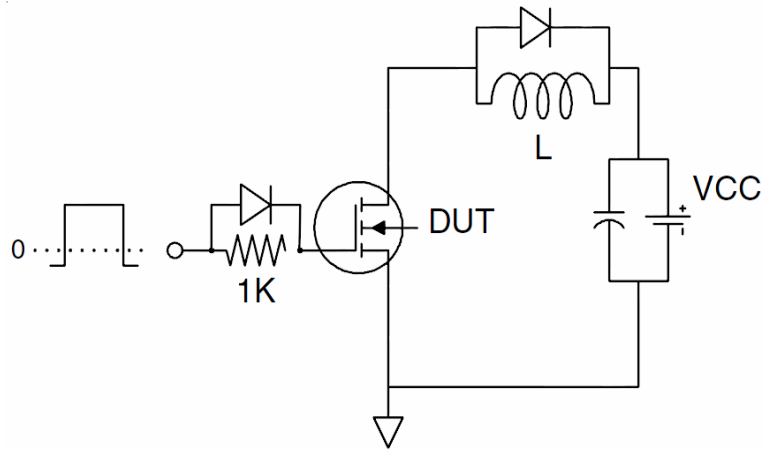
1. The value of R<sub>θJA</sub> is measured with the device mounted on 1in2 FR-4 board with 2oz. Copper, in a still air environment with T<sub>A</sub> =25° C.
2. Guaranteed by design, not subject to production
3. EAS condition : T<sub>J</sub>=25°C, V<sub>DD</sub>=50V, V<sub>G</sub>=10V, L=0.5mH, R<sub>G</sub>=25Ω

**Test Circuit**

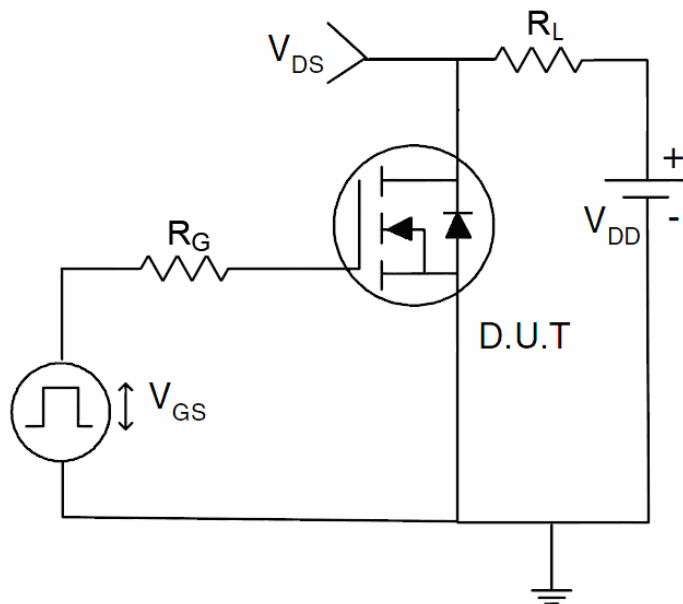
**1)  $E_{AS}$  test Circuit**



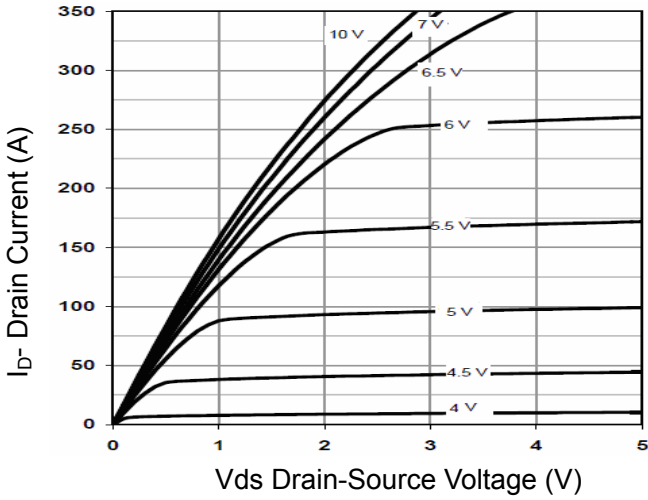
**2) Gate charge test Circuit**



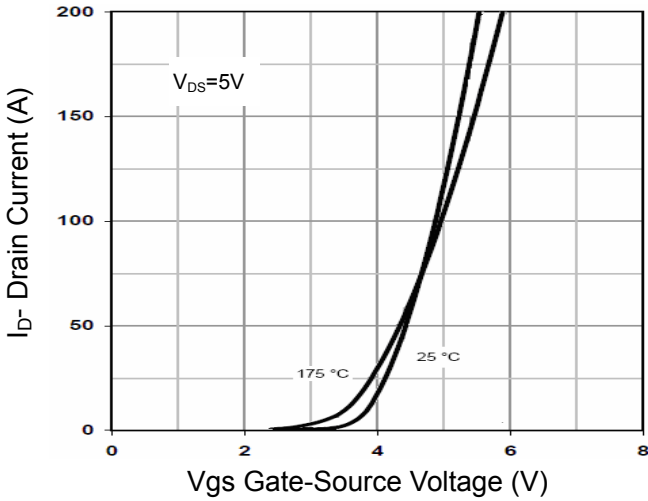
**3) Switch Time Test Circuit**



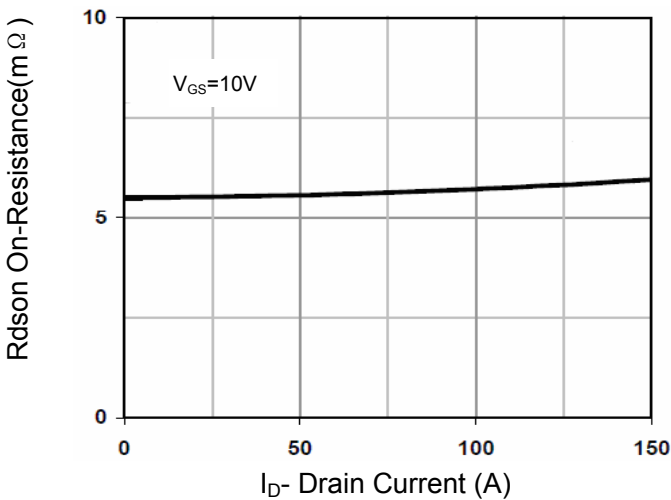
**Typical Electrical and Thermal Characteristics**



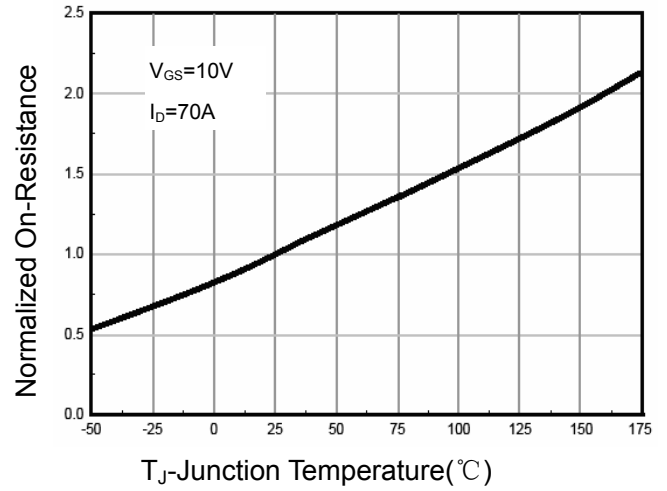
**Figure 1 Output Characteristics**



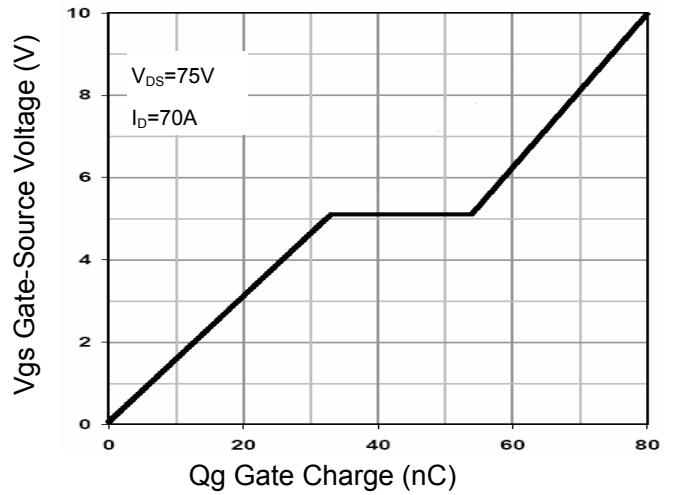
**Figure 2 Transfer Characteristics**



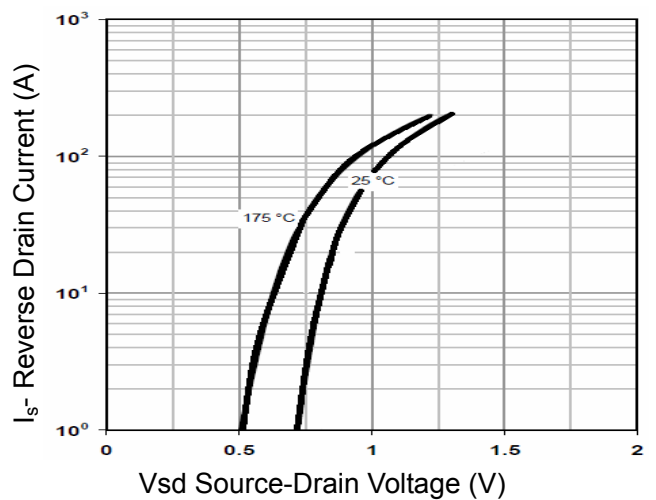
**Figure 3 Rdson- Drain Current**



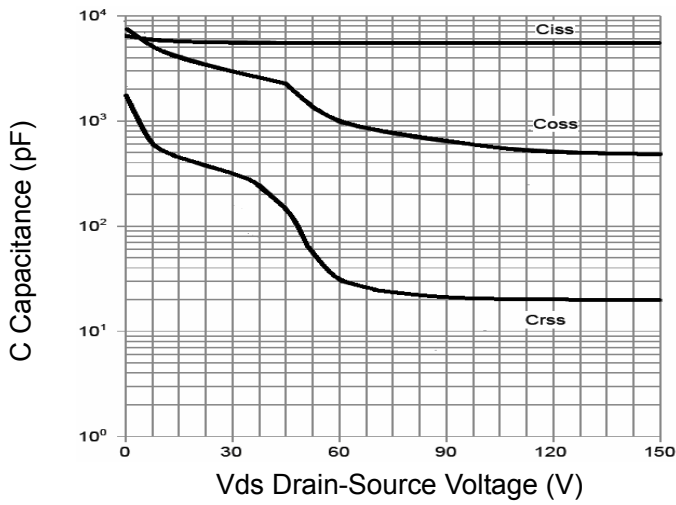
**Figure 4 Rdson-Junction Temperature**



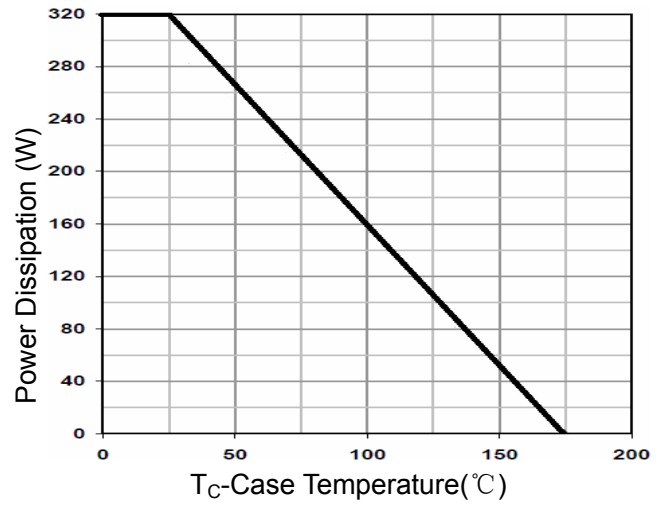
**Figure 5 Gate Charge**



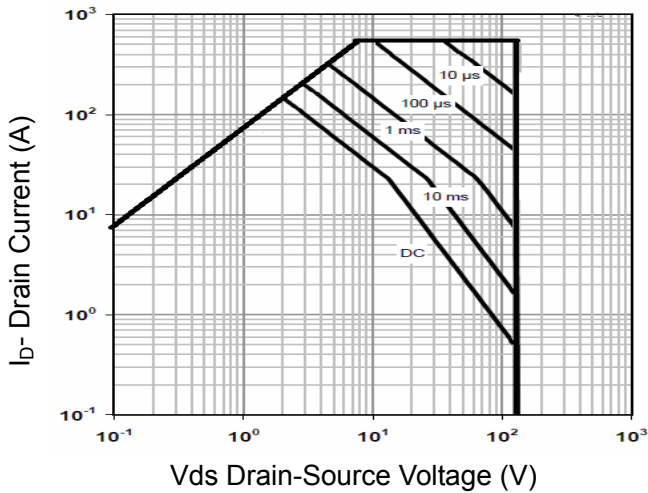
**Figure 6 Source- Drain Diode Forward**



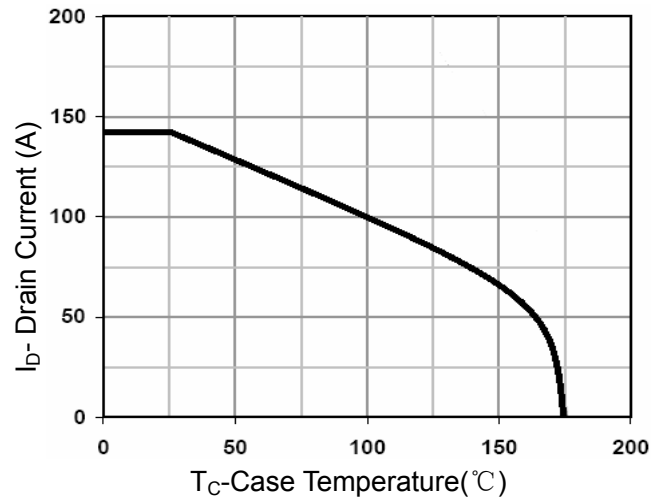
**Figure 7 Capacitance vs Vds**



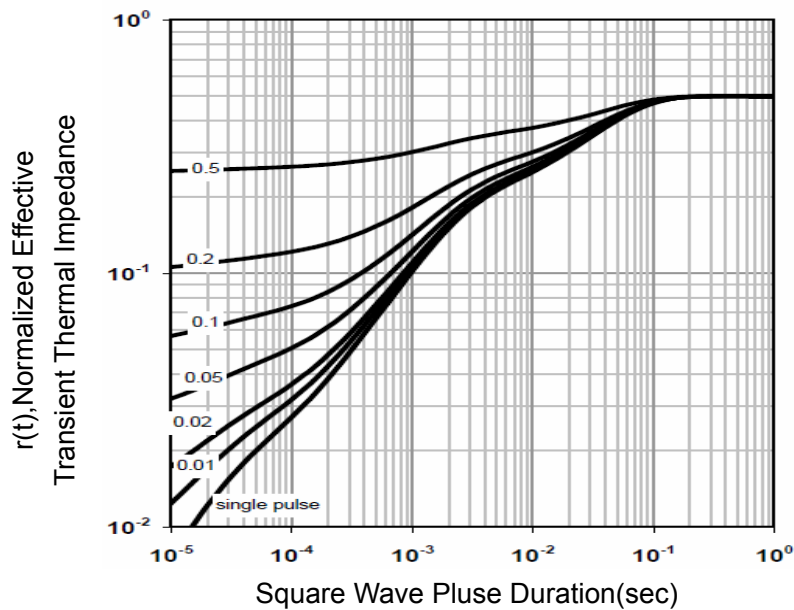
**Figure 9 Power De-rating**



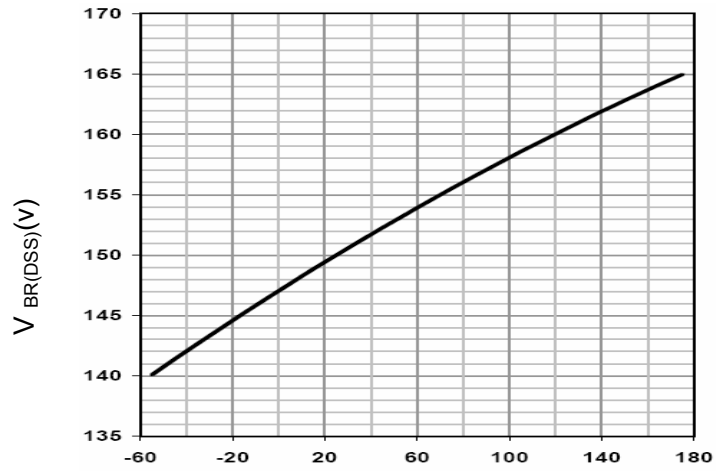
**Figure 8 Safe Operation Area**



**Figure 10 Current De-rating**



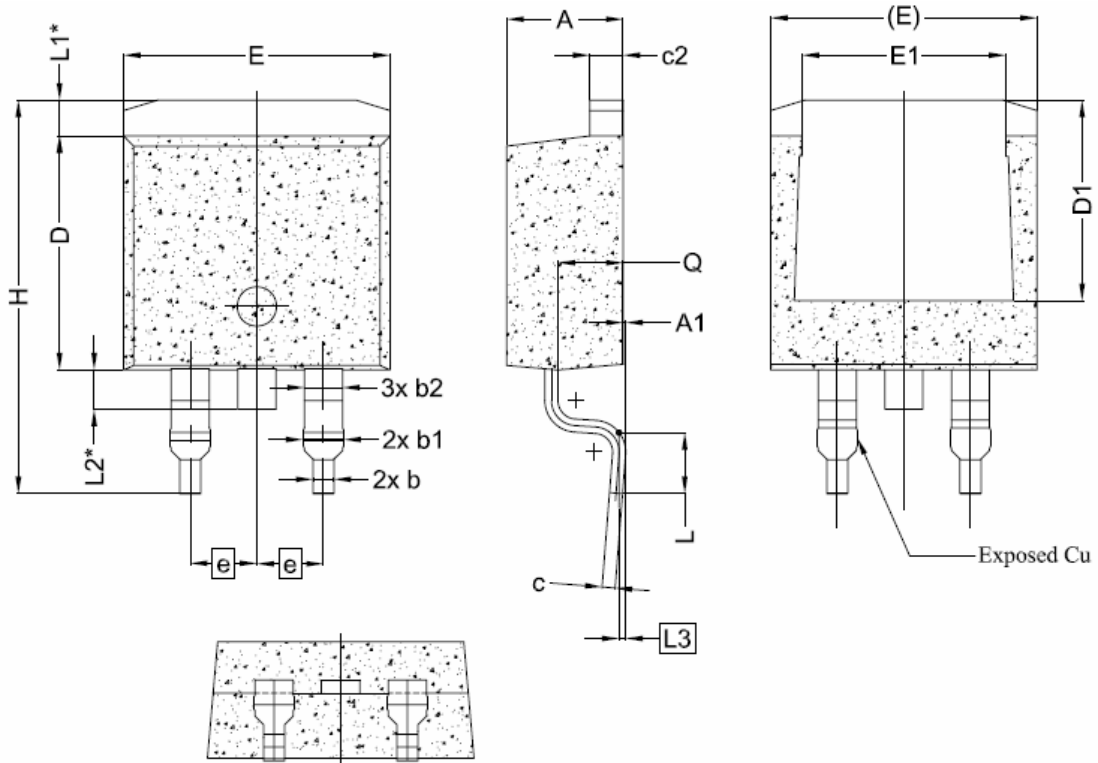
**Figure 11 Normalized Maximum Transient Thermal Impedance**



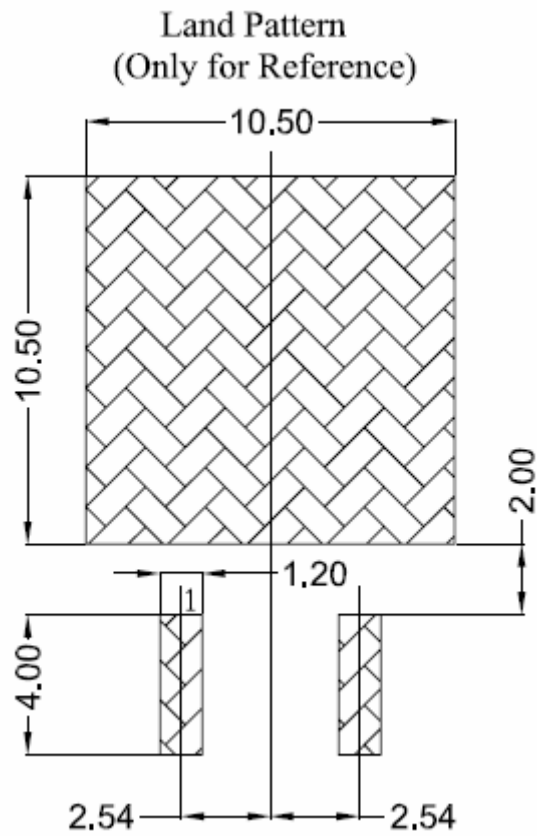
$T_J$ - Junction Temperature( $^{\circ}C$ )

**Figure 12  $BV_{DSS}$  vs Junction Temperature**

**TO-263-2L Package Information**



SYMBOL	DIMENSIONS		
	MIN.	NOM.	MAX.
A	4.24	4.44	4.64
A1	0.00	0.10	0.15
b	0.70	0.80	0.90
b1	1.20	1.55	1.75
b2	1.20	1.45	1.70
c	0.40	0.50	0.60
c2	1.15	1.27	1.40
D	8.82	8.92	9.02
D1	6.86	7.65	—
E	9.96	10.16	10.36
E1	6.89	7.77	7.89
e	2.54 BSC		
H	14.61	15.00	15.88
L	1.78	2.32	2.79
L1	1.36 REF.		
L2	1.50 REF.		
L3	0.25 BSC		
Q	2.30	2.48	2.70





### **Attention**

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