Description

The VST15N056 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.

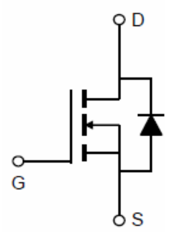
General Features

- V_{DS} =150V,I_D =140A
  $R_{DS(ON)}$=5.6mΩ , 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

TO-263



Schematic Diagram

Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
VST15N056-T3	VST15N056	TO-263	-	-	-

Absolute Maximum Ratings (T_C=25℃unless otherwise noted)

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

Thermal Characteristic

Thermal Resistance,Junction-to-Case	$R_{\theta JC}$	0.47	℃/W
Thermal Resistance,Junction-to-Ambient (Note 1)	$R_{\theta JA}$	60	℃/W

Electrical Characteristics (T_C=25℃unless otherwise noted)

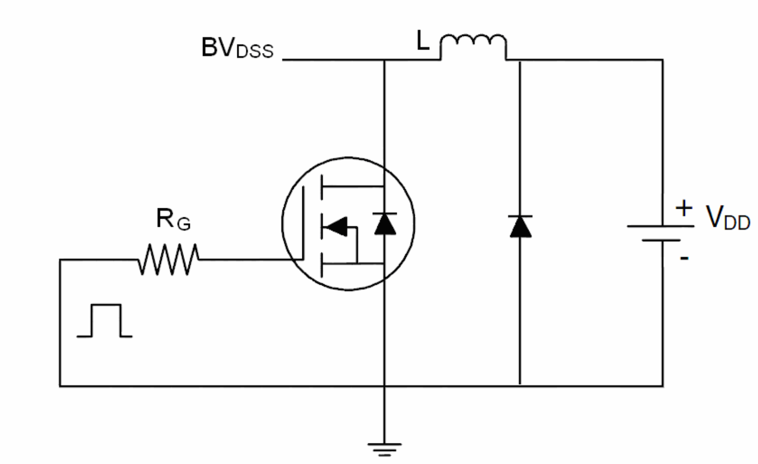
Parameter	Symbol	Condition	Min	Typ	Max	Unit
Off Characteristics						
Drain-Source Breakdown Voltage	BV_{DSS}	V_{GS}=0V I_D=250μA	150	-	-	V
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS}=150V,V_{GS}=0V	-	-	1	μA
Gate-Body Leakage Current	I_{GSS}	V_{GS}=±20V,V_{DS}=0V	-	-	±100	nA
On Characteristics						
Gate Threshold Voltage	$V_{GS(th)}$	V_{DS}=V_{GS},I_D=250μA	2.0	3.0	4.0	V
Drain-Source On-State Resistance	$R_{DS(ON)}$	V_{GS}=10V, I_D=70A	-	5.6	6.4	mΩ
Gate resistance	R_G		-	4.5	-	Ω
Forward Transconductance	g_{FS}	V_{DS}=10V,I_D=70A	70	-	-	S
Dynamic Characteristics (Note2)						
Input Capacitance	C_{lss}	V_{DS}=75V,V_{GS}=0V, F=1.0MHz	-	5500	7150	PF
Output Capacitance	C_{oss}		-	690	890	PF
Reverse Transfer Capacitance	C_{rss}		-	24	31	PF
Switching Characteristics (Note 2)						
Turn-on Delay Time	$t_{d(on)}$	V_{DD}=75V,I_D=70A V_{GS}=10V,R_G=4.7Ω	-	26	-	nS
Turn-on Rise Time	t_r		-	36	-	nS
Turn-Off Delay Time	$t_{d(off)}$		-	47	-	nS
Turn-Off Fall Time	t_f		-	15	-	nS
Total Gate Charge	Q_g	V_{DS}=75V,I_D=70A, V_{GS}=10V	-	80	104	nC
Gate-Source Charge	Q_{gs}		-	32	41	nC
Gate-Drain Charge	Q_{gd}		-	22	28	nC
Drain-Source Diode Characteristics						
Diode Forward Voltage	V_{SD}	V_{GS}=0V,I_F= I_S	-		1.2	V
Diode Forward Current	I_S		-	-	140	A
Reverse Recovery Time	t_{rr}	T_J = 25°C, I_F = I_S di/dt = 100A/μs	-	146		nS
Reverse Recovery Charge	Qrr		-	485		nC

Notes:

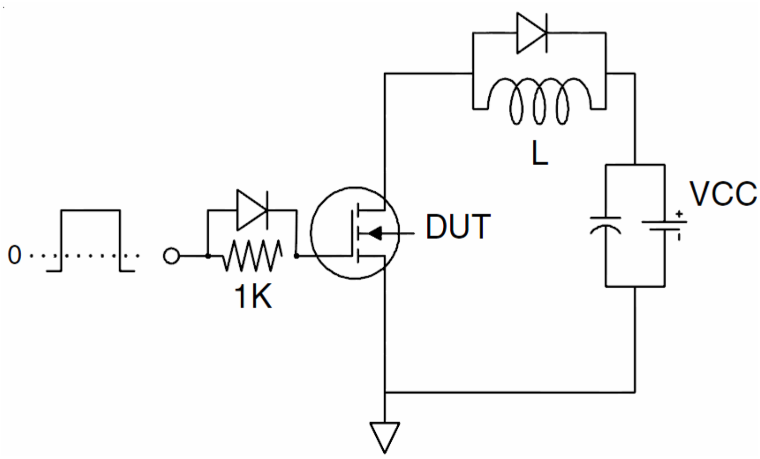
1. The value of $R_{\theta JA}$ is measured with the device mounted on 1in2 FR-4 board with 2oz. Copper, in a still air environment with T_A =25° C.
2. Guaranteed by design, not subject to production
3. EAS condition : Tj=25℃,V_{DD}=50V,V_G=10V,L=0.5mH,Rg=25Ω

Test Circuit

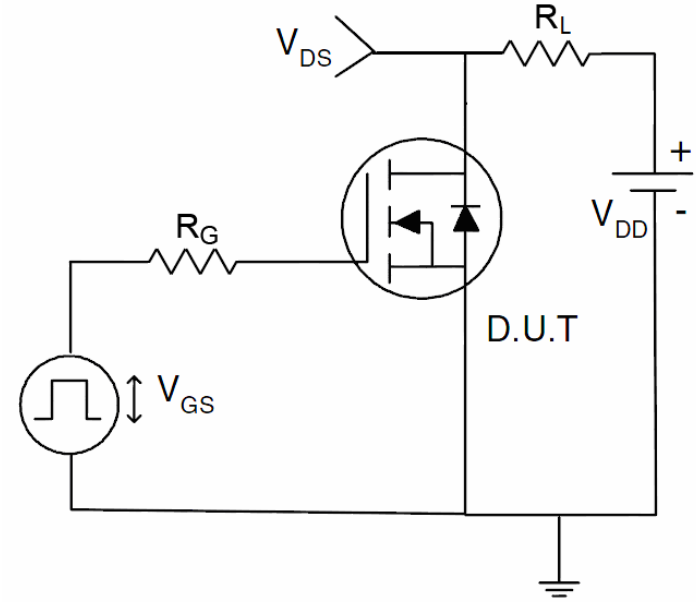
1) E_{AS} test Circuit



2) Gate charge test Circuit



3) Switch Time Test Circuit



Typical Electrical and Thermal Characteristics

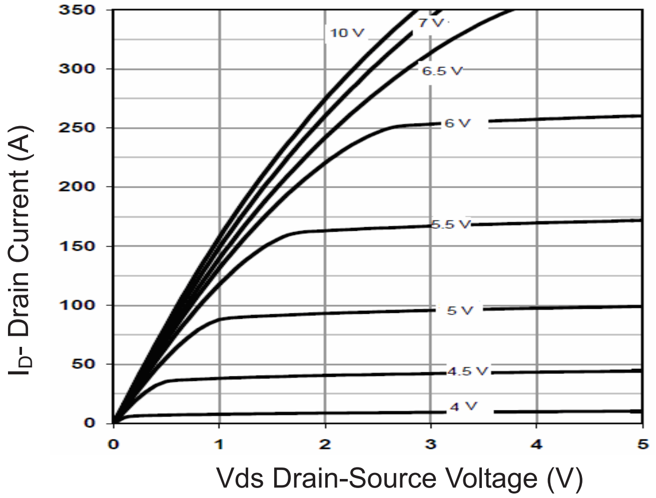


Figure 1 Output Characteristics

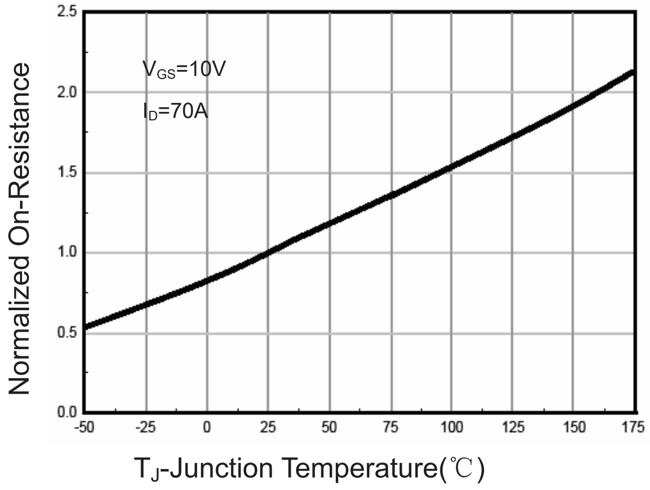


Figure 4 Rdson-JunctionTemperature

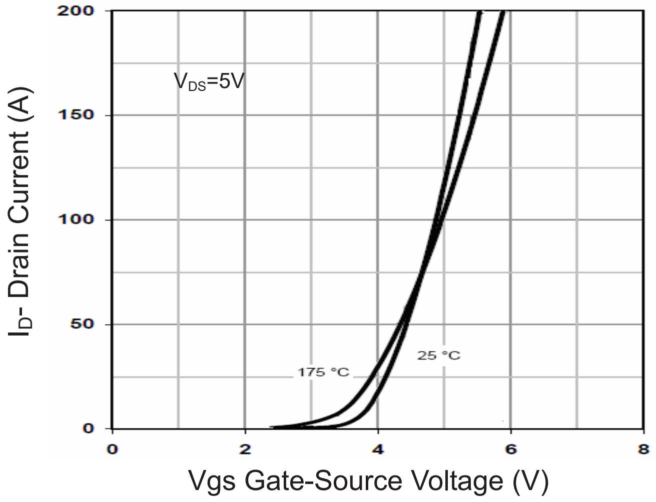


Figure 2 Transfer Characteristics

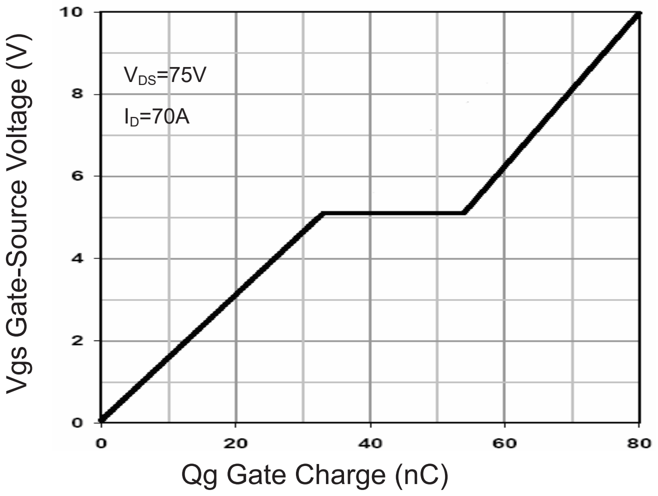


Figure 5 Gate Charge

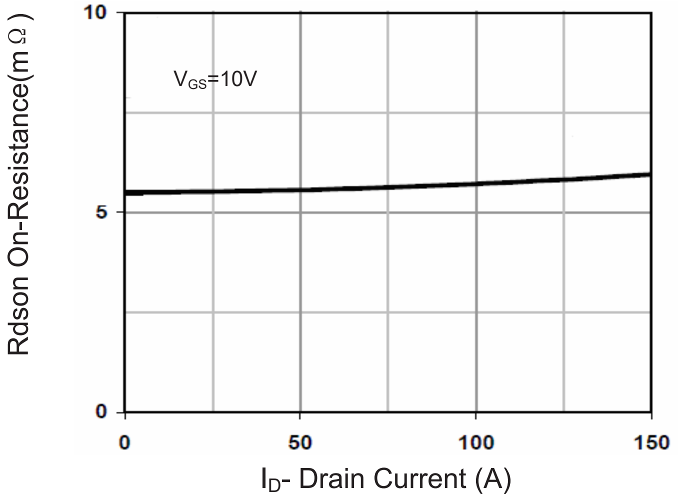


Figure 3 Rdson- Drain Current

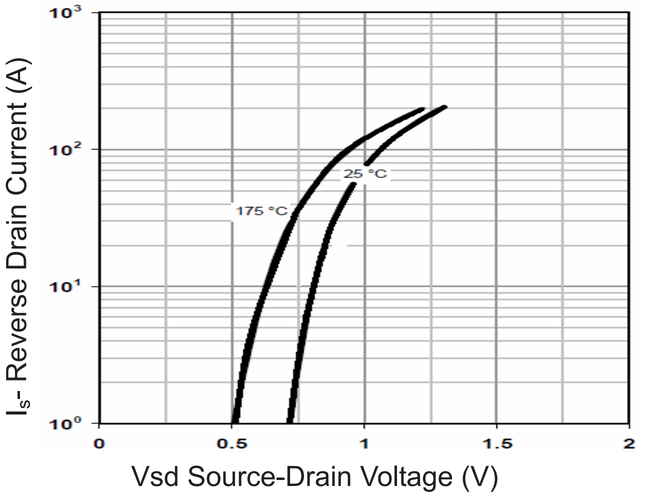


Figure 6 Source- Drain Diode Forward

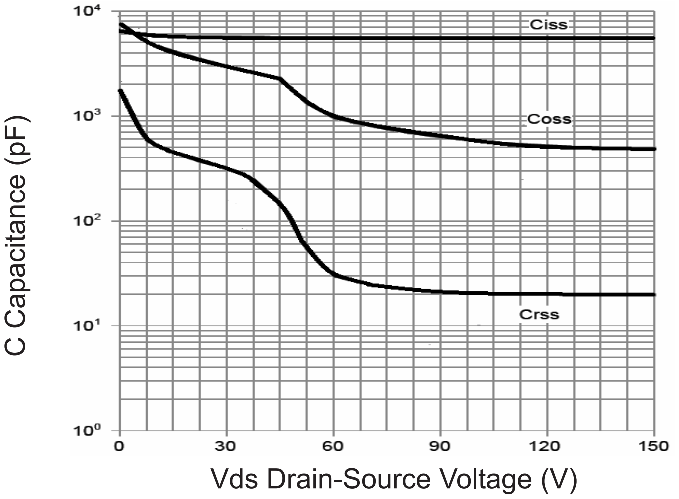


Figure 7 Capacitance vs Vds

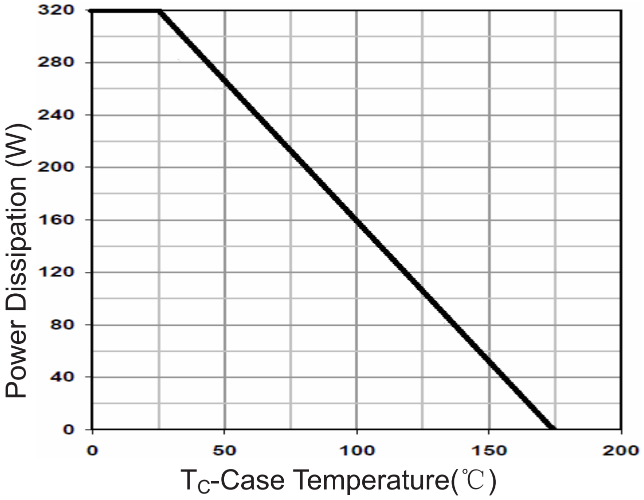


Figure 9 Power De-rating

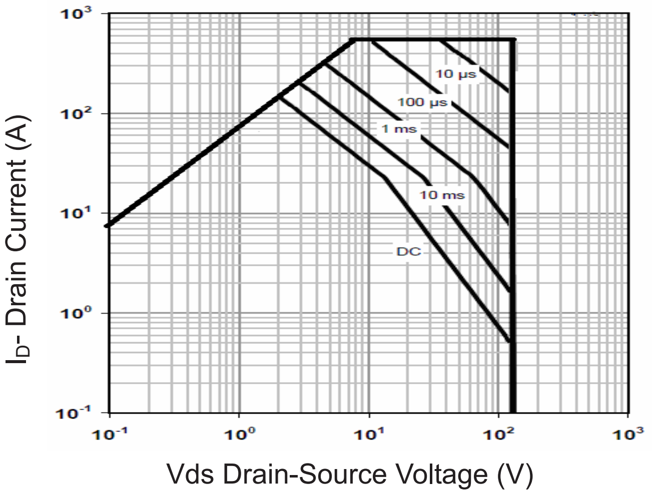


Figure 8 Safe Operation Area

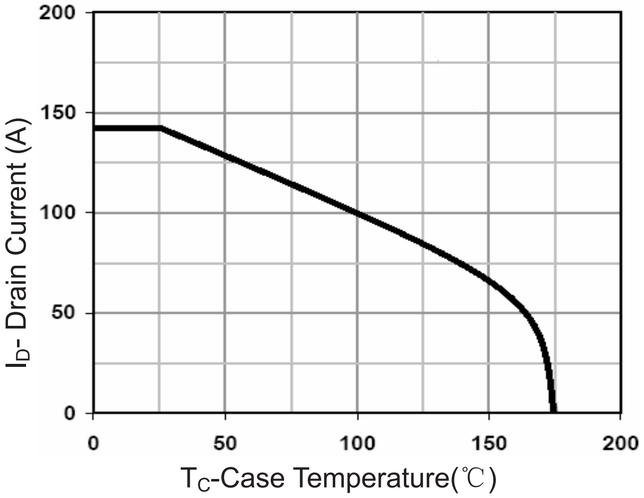


Figure 10 Current De-rating

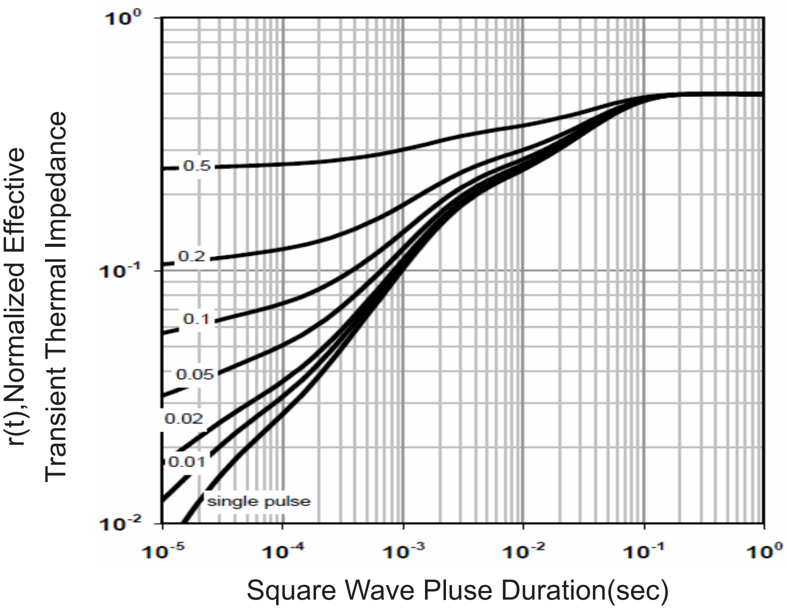


Figure 11 Normalized Maximum Transient Thermal Impedance

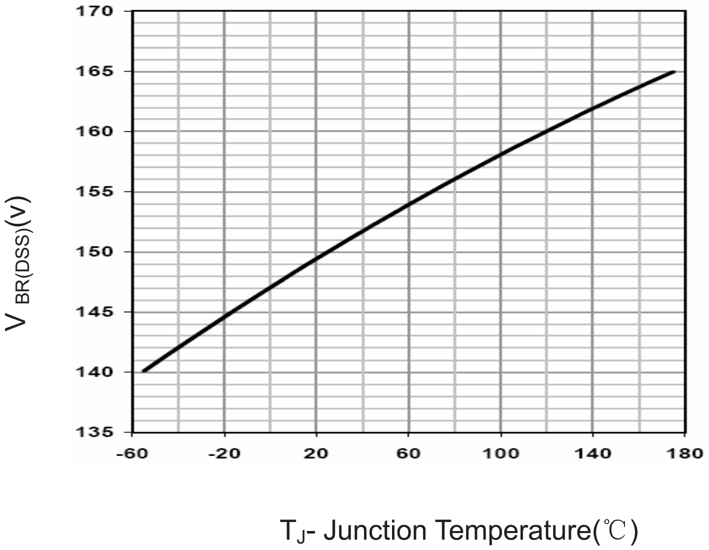
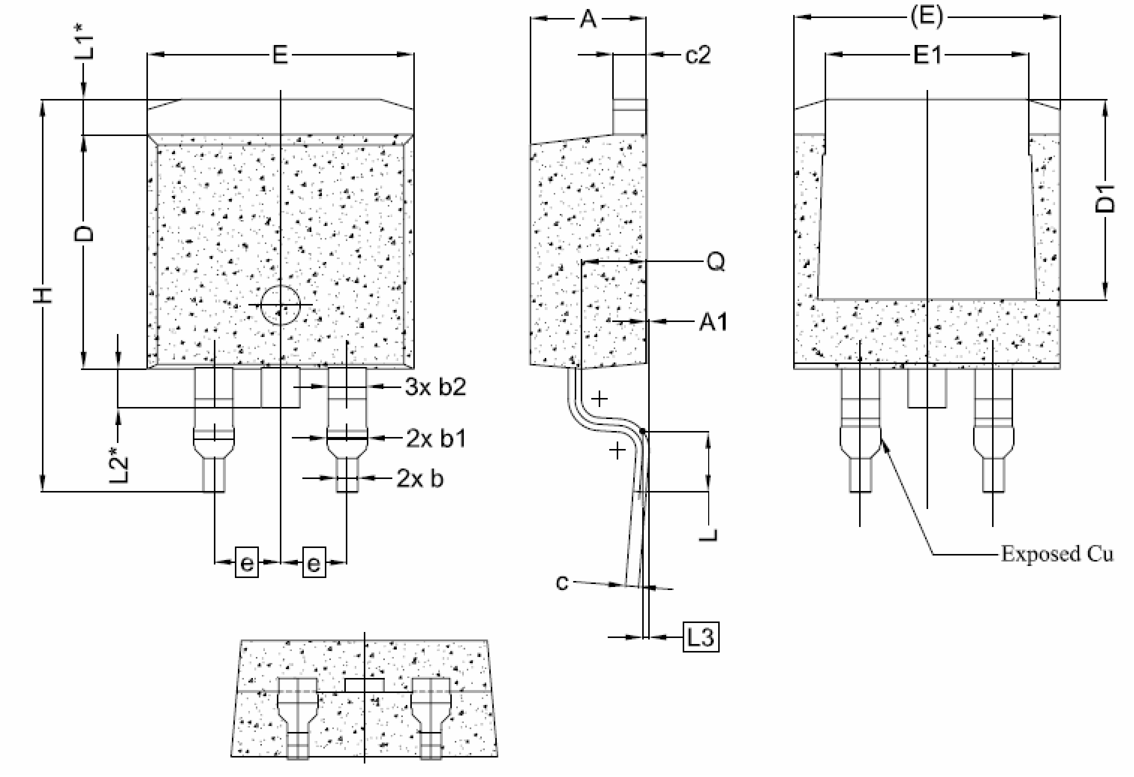


Figure 12 BV_{DSS} vs Junction Temperature

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