

## P-Channel Enhancement Mode Power MOSFET

### Description

The HM11P20D 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

- $V_{DS} = -200V, I_D = -11A$   
 $R_{DS(ON)} < 300m\Omega @ V_{GS} = -10V$  (Typ. = 120mR)

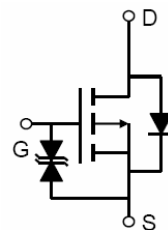
- Super high dense cell design
- Advanced trench process technology
- Reliable and rugged
- High density cell design for ultra low On-Resistance

### Application

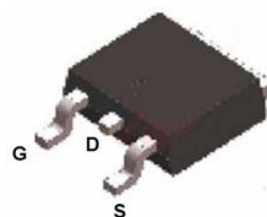
- Portable equipment and battery powered systems

**100% UIS TESTED!**

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



Schematic diagram



TO-263-2L top view

### Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
HM11P20D	HM11P20D	TO-263-2L	Ø330mm	12mm	2500 units

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

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	$V_{DS}$	-200	V
Gate-Source Voltage	$V_{GS}$	$\pm 20$	V
Drain Current-Continuous	$I_D$	-11	A
Drain Current-Continuous( $T_C = 100^\circ C$ )	$I_D (100^\circ C)$	-8	A
Pulsed Drain Current	$I_{DM}$	-33	A
Maximum Power Dissipation	$P_D$	160	W
Derating factor		1.3	W/ $^\circ C$
Operating Junction and Storage Temperature Range	$T_J, T_{STG}$	-55 To 150	$^\circ C$

## Thermal Characteristic

Thermal Resistance, Junction-to-Case <sup>(Note 2)</sup>	$R_{\theta jc}$	0.8	$^{\circ}\text{C/W}$
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## Electrical Characteristics ( $T_C=25^{\circ}\text{C}$ unless otherwise noted)

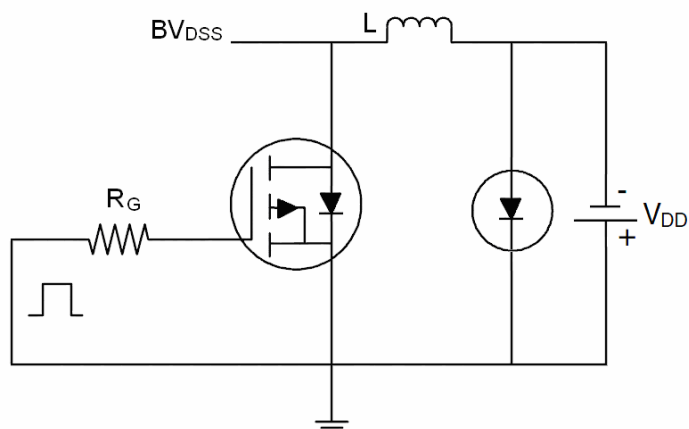
Parameter	Symbol	Condition	Min	Typ	Max	Unit
Off Characteristics						
Drain-Source Breakdown Voltage	BV <sub>DSS</sub>	V <sub>GS</sub> =0V I <sub>D</sub> =-250μA	-145	-155	-	V
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	V <sub>DS</sub> =-145V, V <sub>GS</sub> =0V	-	-	1	μA
Gate-Body Leakage Current	I <sub>GSS</sub>	V <sub>GS</sub> =±20V, V <sub>DS</sub> =0V	-	-	±10	μA
On Characteristics (Note 3)						
Gate Threshold Voltage	V <sub>GS(th)</sub>	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =-250μA	-2	-	-4	V
Drain-Source On-State Resistance	R <sub>DS(ON)</sub>	V <sub>GS</sub> =-10V, I <sub>D</sub> =-20A	-	240	300	mΩ
Forward Transconductance	g <sub>FS</sub>	V <sub>DS</sub> =-5V, I <sub>D</sub> =-20A	5	-	-	S
Dynamic Characteristics (Note4)						
Input Capacitance	C <sub>iss</sub>	V <sub>DS</sub> =-75V, V <sub>GS</sub> =0V, F=1.0MHz	-	7650	-	PF
Output Capacitance	C <sub>oss</sub>		-	148	-	PF
Reverse Transfer Capacitance	C <sub>rss</sub>		-	131	-	PF
Switching Characteristics (Note 4)						
Turn-on Delay Time	t <sub>d(on)</sub>	V <sub>DD</sub> =-75V, I <sub>D</sub> =-20A V <sub>GS</sub> =-10V, R <sub>GEN</sub> =9.1Ω	-	17	-	nS
Turn-on Rise Time	t <sub>r</sub>		-	80	-	nS
Turn-Off Delay Time	t <sub>d(off)</sub>		-	45	-	nS
Turn-Off Fall Time	t <sub>f</sub>		-	65	-	nS
Total Gate Charge	Q <sub>g</sub>	V <sub>DS</sub> =-75V, I <sub>D</sub> =-20A, V <sub>GS</sub> =-10V	-	137	-	nC
Gate-Source Charge	Q <sub>gs</sub>		-	25	-	nC
Gate-Drain Charge	Q <sub>gd</sub>		-	28	-	nC
Drain-Source Diode Characteristics						
Diode Forward Voltage (Note 3)	V <sub>SD</sub>	V <sub>GS</sub> =0V, I <sub>S</sub> =-11A	-	-	-1.2	V
Diode Forward Current (Note 2)	I <sub>S</sub>	-	-	-	-11	A
Reverse Recovery Time	t <sub>rr</sub>	TJ = 25°C, IF =-11A	-	90	-	nS
Reverse Recovery Charge	Q <sub>rr</sub>	di/dt = 100A/μs (Note3)	-	105	-	nC

## Notes:

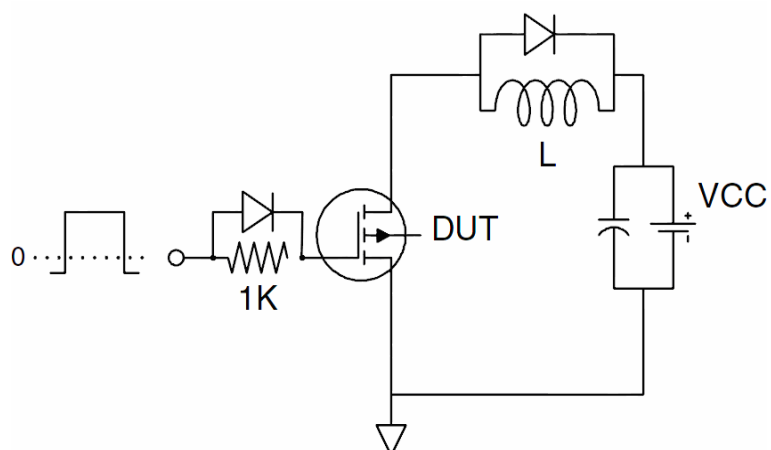
1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. Surface Mounted on FR4 Board,  $t \leq 10$  sec.
3. Pulse Test: Pulse Width  $\leq 300\mu s$ , Duty Cycle  $\leq 2\%$ .
4. Guaranteed by design, not subject to production
5. EAS condition:  $T_J=25^{\circ}\text{C}, V_{DD}=-75V, V_G=-10V, L=0.5mH, R_g=25\Omega$

## Test Circuit

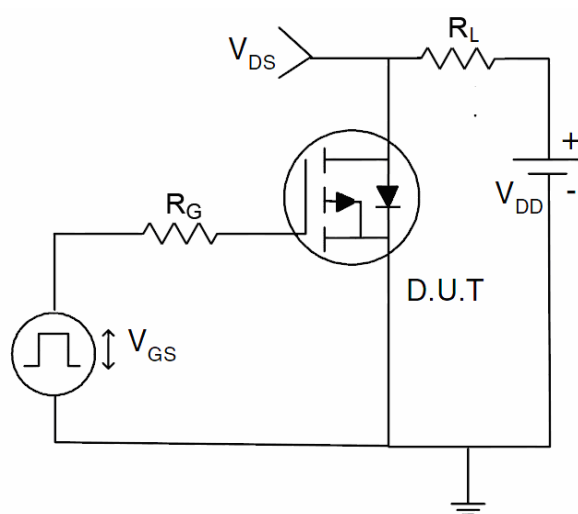
### 1) $E_{AS}$ Test Circuit



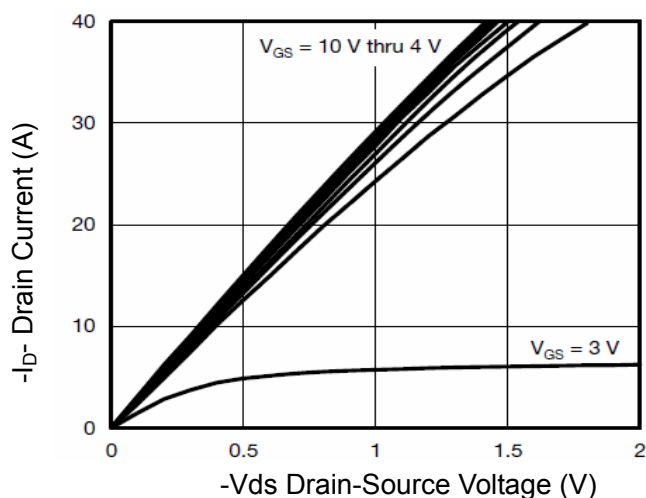
### 2) Gate Charge Test Circuit



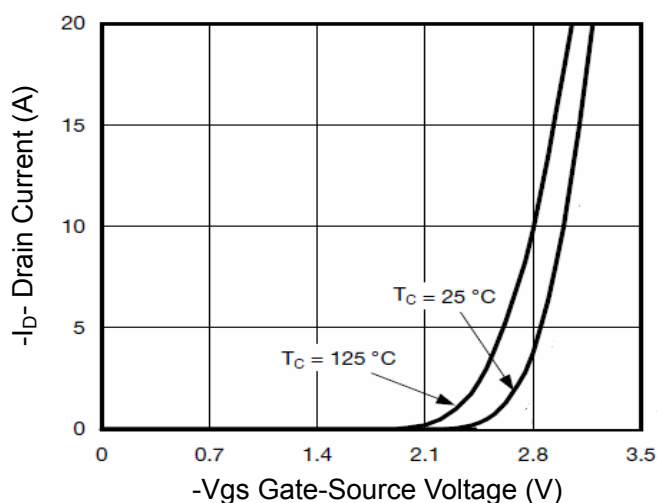
### 3) Switch Time Test Circuit



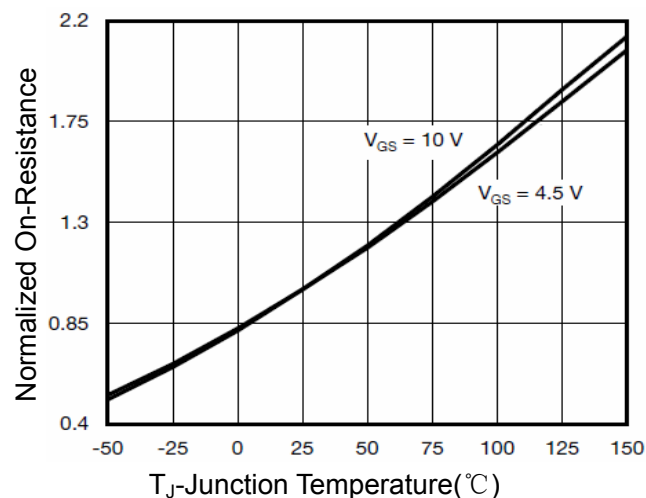
## Typical Electrical and Thermal Characteristics (Curves)



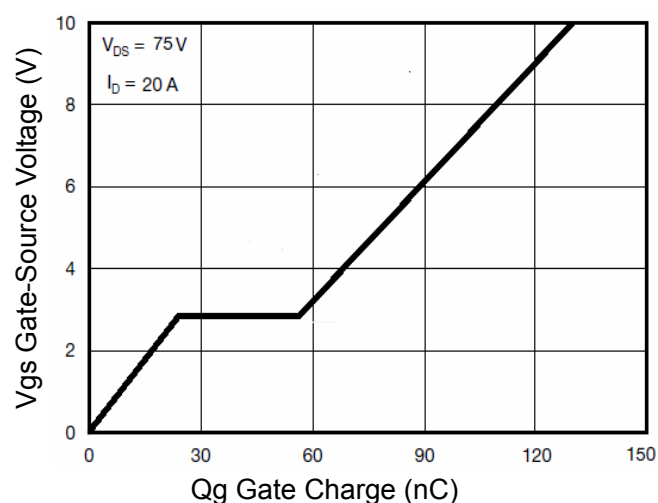
**Figure 1 Output Characteristics**



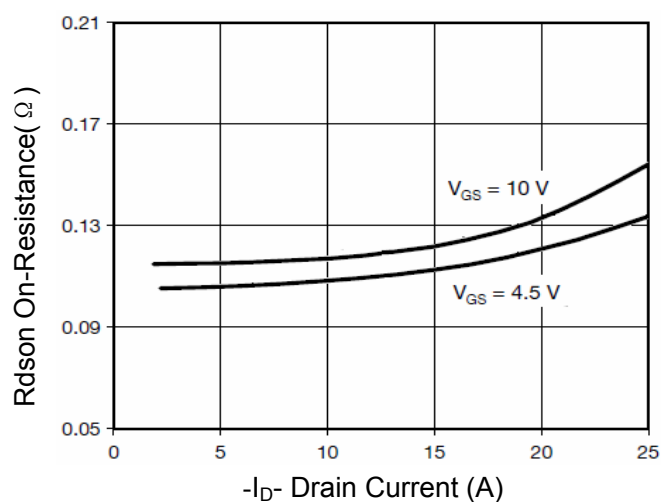
**Figure 2 Transfer Characteristics**



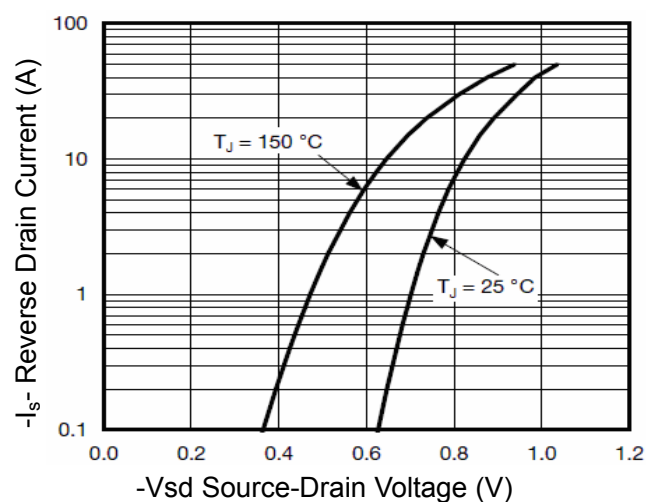
**Figure 4  $R_{DS(on)}$ -Junction Temperature**



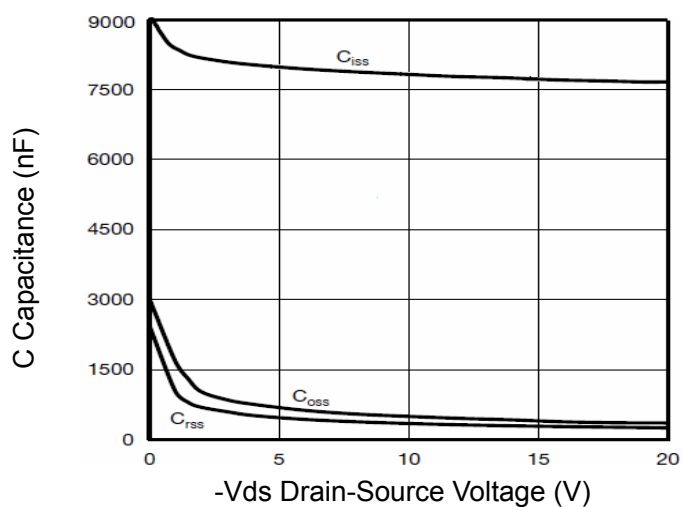
**Figure 5 Gate Charge**



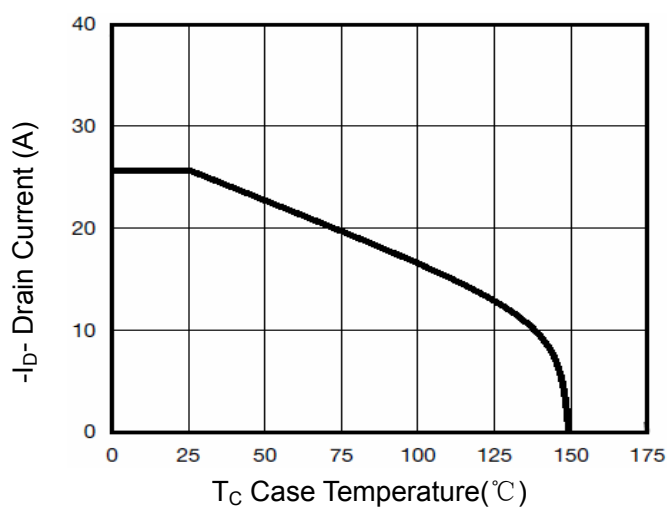
**Figure 3  $R_{DS(on)}$ - Drain Current**



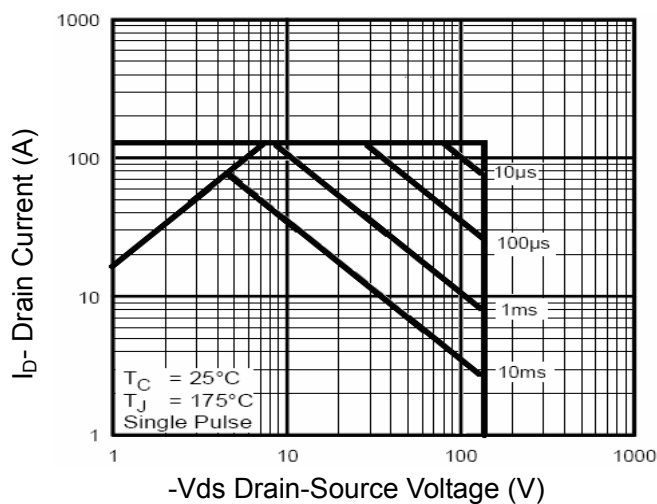
**Figure 6 Source- Drain Diode Forward**



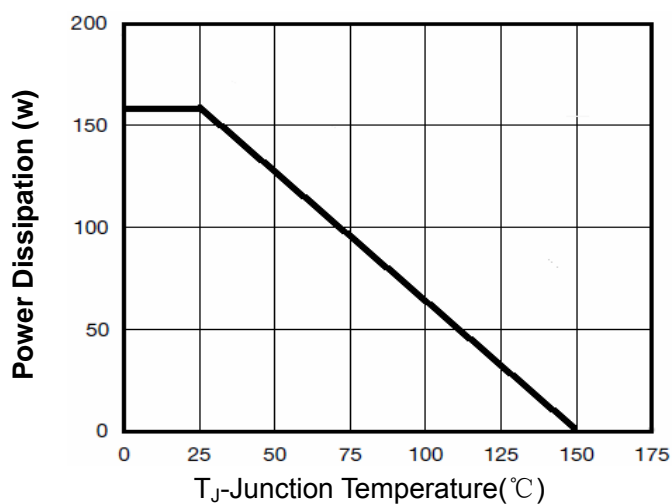
**Figure 7 Capacitance vs Vds**



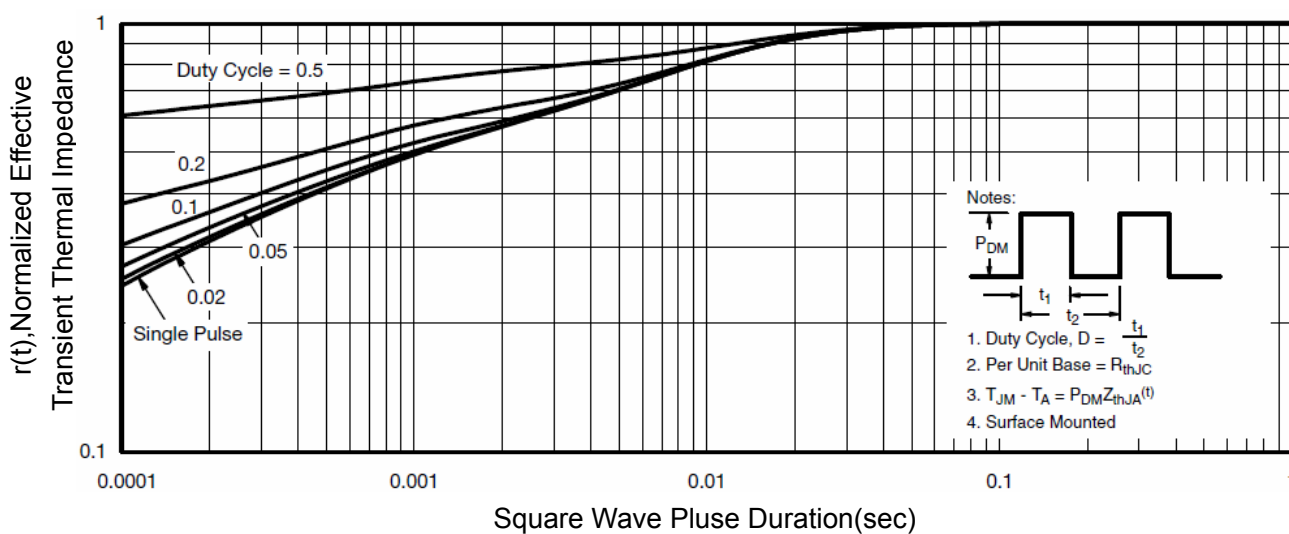
**Figure 9 Drain Current vs Case Temperature**



**Figure 8 Safe Operation Area**

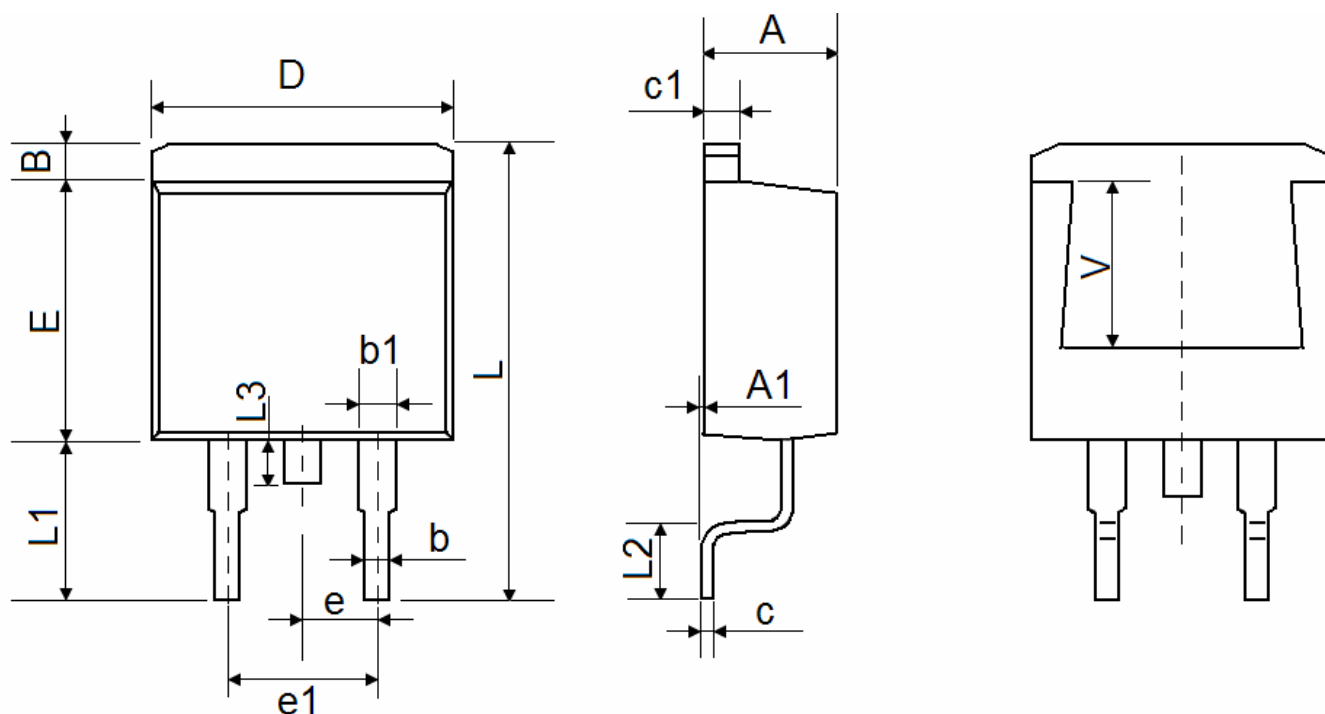


**Figure 10 Power De-rating**



**Figure 11 Normalized Maximum Transient Thermal Impedance**

## TO-263-2L Package Information



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	4.470	4.670	0.176	0.184
A1	0.000	0.150	0.000	0.006
B	1.170	1.370	0.046	0.054
b	0.710	0.910	0.028	0.036
b1	1.170	1.370	0.046	0.054
c	0.310	0.530	0.012	0.021
c1	1.170	1.370	0.046	0.054
D	10.010	10.310	0.394	0.406
E	8.500	8.900	0.335	0.350
e	2.540 TYP.		0.100 TYP.	
e1	4.980	5.180	0.196	0.204
L	15.050	15.450	0.593	0.608
L1	5.080	5.480	0.200	0.216
L2	2.340	2.740	0.092	0.108
L3	1.300	1.700	0.051	0.067
V	5.600 REF		0.220 REF	