N-Channel Enhancement Mode Power MOSFET

Description

The HM180N02D 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

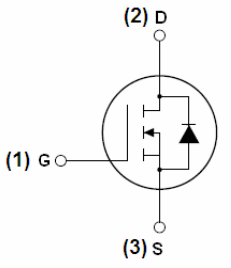
- V_{DS} =20V,I_D =185A
  $R_{DS(ON)}$ <2.0 mΩ @ V_{GS}=4.5V
  $R_{DS(ON)}$ <2.4mΩ @ V_{GS}=2.5V
- High density cell design for ultra low Rdson
- Fully characterized avalanche voltage and current
- Good stability and uniformity with high E_{AS}
- Excellent package for good heat dissipation
- Special process technology for high ESD capability

Application

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

100% UIS TESTED!

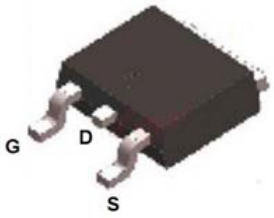
100% ΔVds TESTED!



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
HM180N02D	HM180N02D	TO-263-2L	-	-	-

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

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	V_{DS}	20	V
Gate-Source Voltage	V_{GS}	±12	V
Drain Current-Continuous	I_D	185	A
Drain Current-Continuous(T_C=100℃)	I_D (100℃)	130	A
Pulsed Drain Current	I_{DM}	400	A
Maximum Power Dissipation	P_D	130	W
Derating factor		0.87	W/℃
Single pulse avalanche energy (Note 5)	E_{AS}	1700	mJ

Operating Junction and Storage Temperature Range	T_J, T_{STG}	-55 To 175	℃

Thermal Characteristic

Thermal Resistance,Junction-to-Case (Note 2)	$R_{\theta JC}$	1.15	℃/W

Electrical Characteristics (T_C=25℃unless otherwise noted)

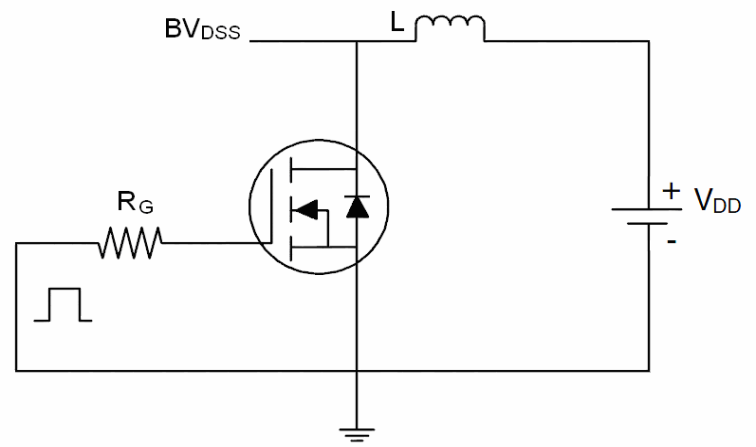
Parameter	Symbol	Condition	Min	Typ	Max	Unit
Off Characteristics						
Drain-Source Breakdown Voltage	BV_{DSS}	V_{GS}=0V I_D=250μA	20	-	-	V
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS}=20V,V_{GS}=0V	-	-	1	μA
Gate-Body Leakage Current	I_{GSS}	V_{GS}=±12V,V_{DS}=0V	-	-	±100	nA
On Characteristics (Note 3)						
Gate Threshold Voltage	$V_{GS(th)}$	V_{DS}=V_{GS},I_D=250μA	0.5	0.75	1.2	V
Drain-Source On-State Resistance	$R_{DS(ON)}$	V_{GS}=4.5V, I_D=20A	-	1.4	2.0	mΩ
		V_{GS}=2.5V, I_D=15A		1.6	2.4	
Forward Transconductance	g_{FS}	V_{DS}=5V,I_D=20A	100	-	-	S
Dynamic Characteristics (Note4)						
Input Capacitance	C_{lss}	V_{DS}=10V,V_{GS}=0V, F=1.0MHz	-	5000	-	PF
Output Capacitance	C_{oss}		-	1200	-	PF
Reverse Transfer Capacitance	C_{rss}		-	900	-	PF
Switching Characteristics (Note 4)						
Turn-on Delay Time	$t_{d(on)}$	V_{DD}=10V,I_D=2A,R_L=15Ω V_{GS}=10V,R_G=2.5Ω	-	12	-	nS
Turn-on Rise Time	t_r		-	13	-	nS
Turn-Off Delay Time	$t_{d(off)}$		-	45	-	nS
Turn-Off Fall Time	t_f		-	32	-	nS
Total Gate Charge	Q_g	V_{DS}=10V,I_D=20A, V_{GS}=10V	-	70		nC
Gate-Source Charge	Q_{gs}		-	16		nC
Gate-Drain Charge	Q_{gd}		-	20		nC
Drain-Source Diode Characteristics						
Diode Forward Voltage (Note 3)	V_{SD}	V_{GS}=0V,I_S=20A	-		1.2	V
Diode Forward Current (Note 2)	I_S		-	-	150	A
Reverse Recovery Time	t_{rr}	TJ = 25°C, IF = 20A di/dt = 100A/μs (Note3)	-	49	-	nS
Reverse Recovery Charge	Qrr		-	66	-	nC
Forward Turn-On Time	t_{on}	Intrinsic turn-on time is negligible (turn-on is dominated by LS+LD)				

Notes:

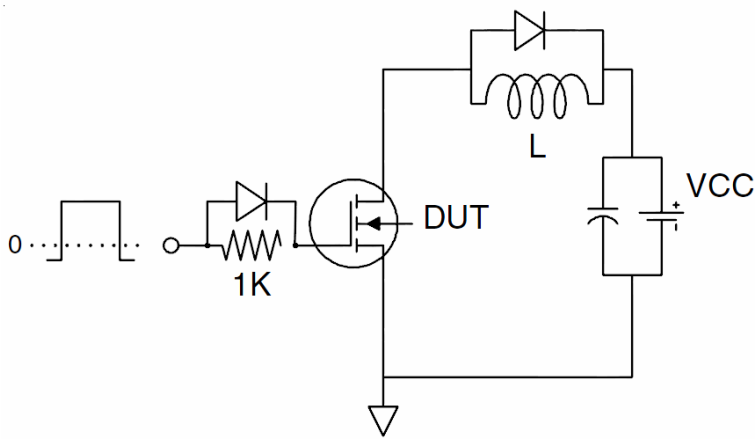
1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. Surface Mounted on FR4 Board, t ≤ 10 sec.
3. Pulse Test: Pulse Width ≤ 300μs, Duty Cycle ≤ 2%.
4. Guaranteed by design, not subject to production
5. E_{AS} condition : Tj=25℃,V_{DD}=20V,V_G=10V,L=1mH,Rg=25Ω，I_{AS}=58.5A

Test circuit

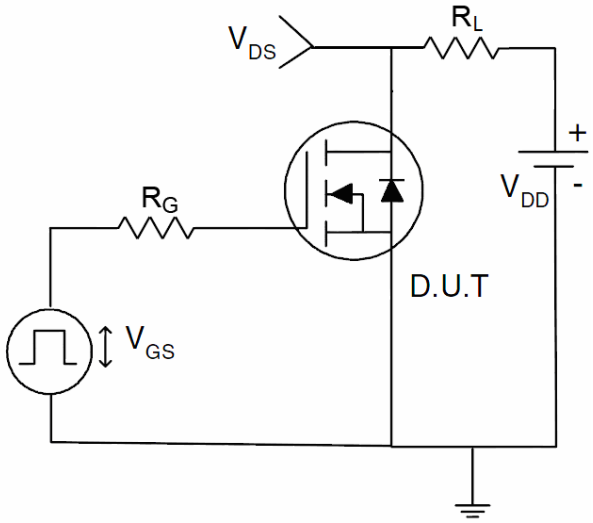
1) E_{AS} Test Circuit



2) Gate Charge Test Circuit



3) Switch Time Test Circuit



Typical Electrical and Thermal Characteristics (Curves)

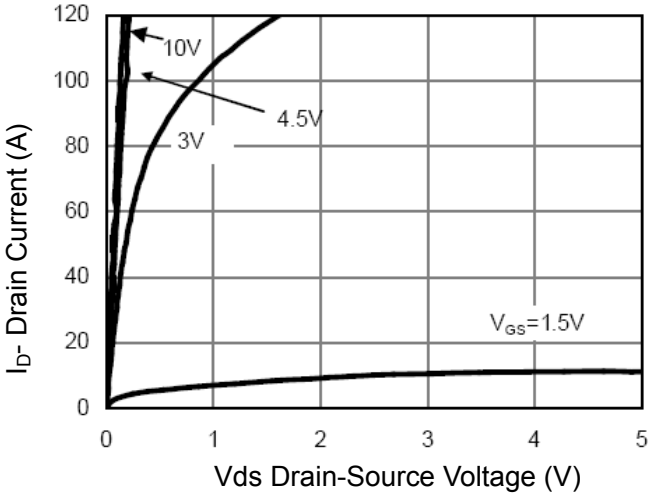


Figure 1 Output Characteristics

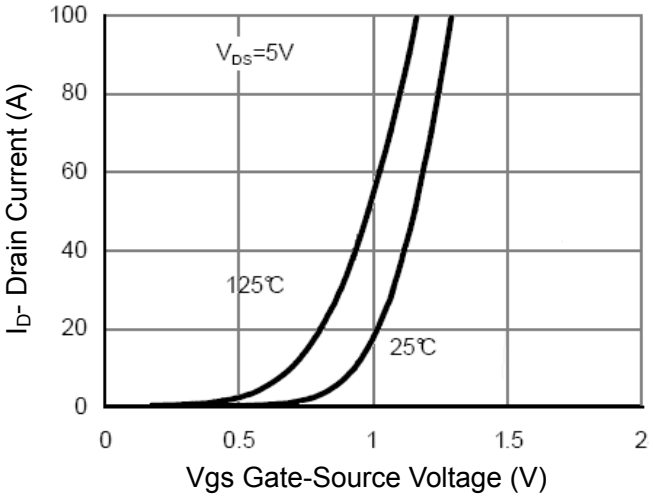


Figure 2 Transfer Characteristics

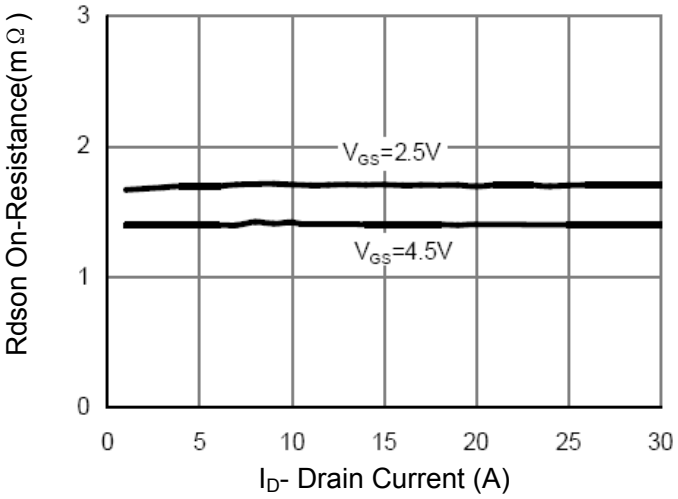


Figure 3 Rdson- Drain Current

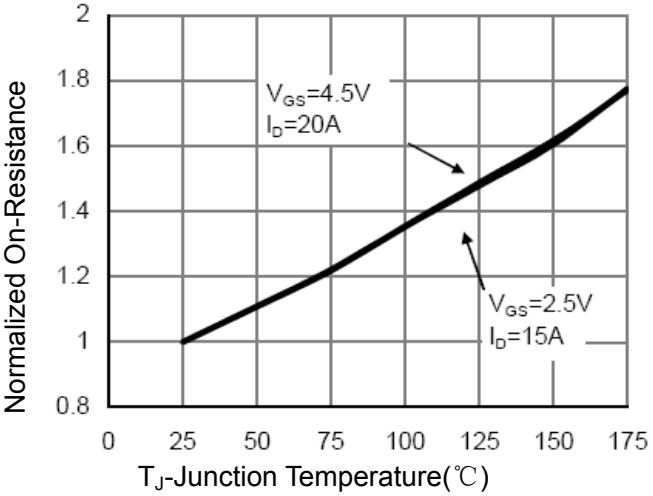


Figure 4 Rdson-JunctionTemperature

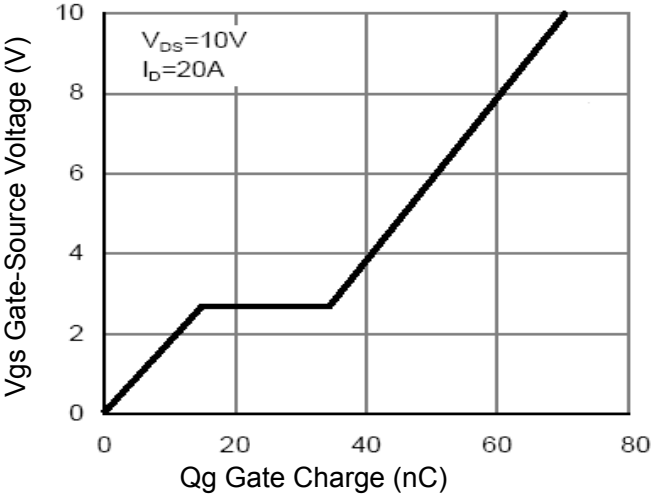


Figure 5 Gate Charge

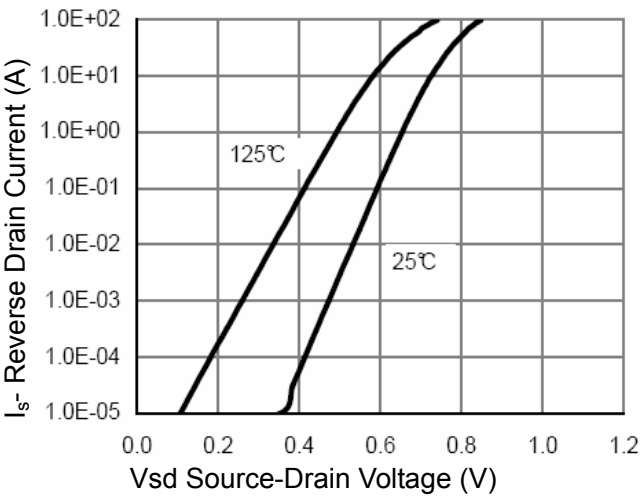


Figure 6 Source- Drain Diode Forward

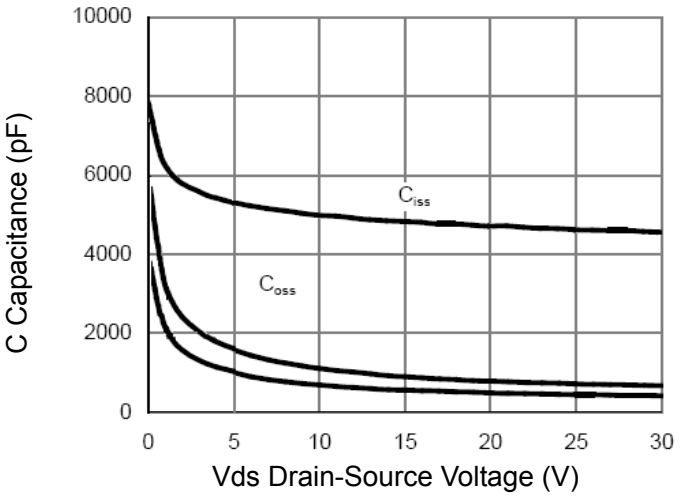


Figure 7 Capacitance vs Vds

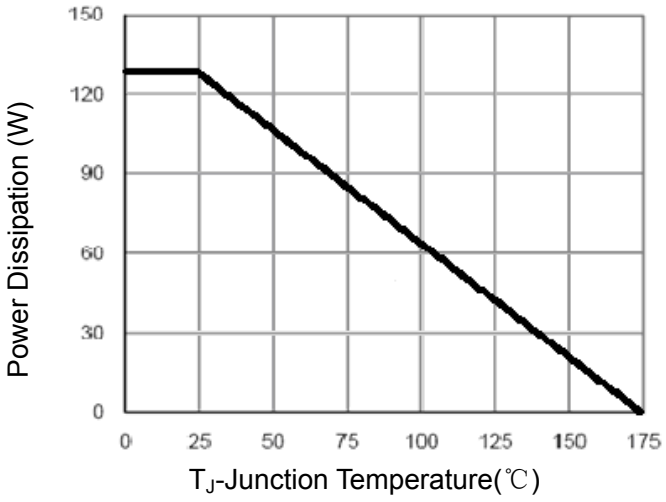


Figure 9 Power De-rating

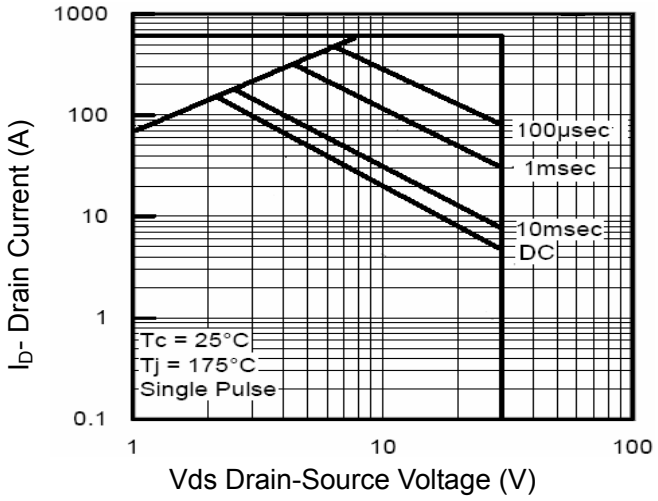


Figure 8 Safe Operation Area

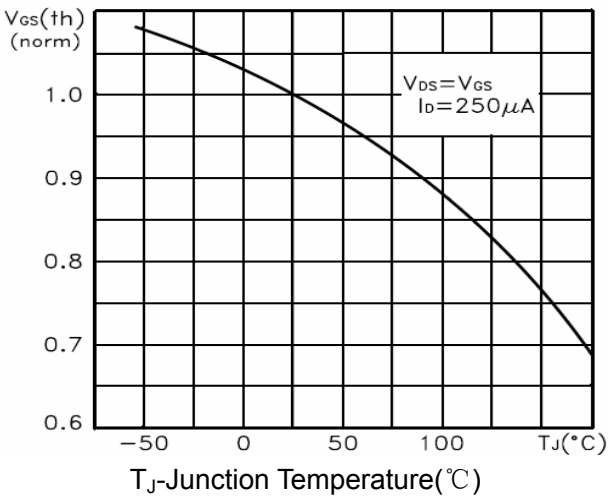


Figure 10 $V_{GS(th)}$ vs Junction Temperature

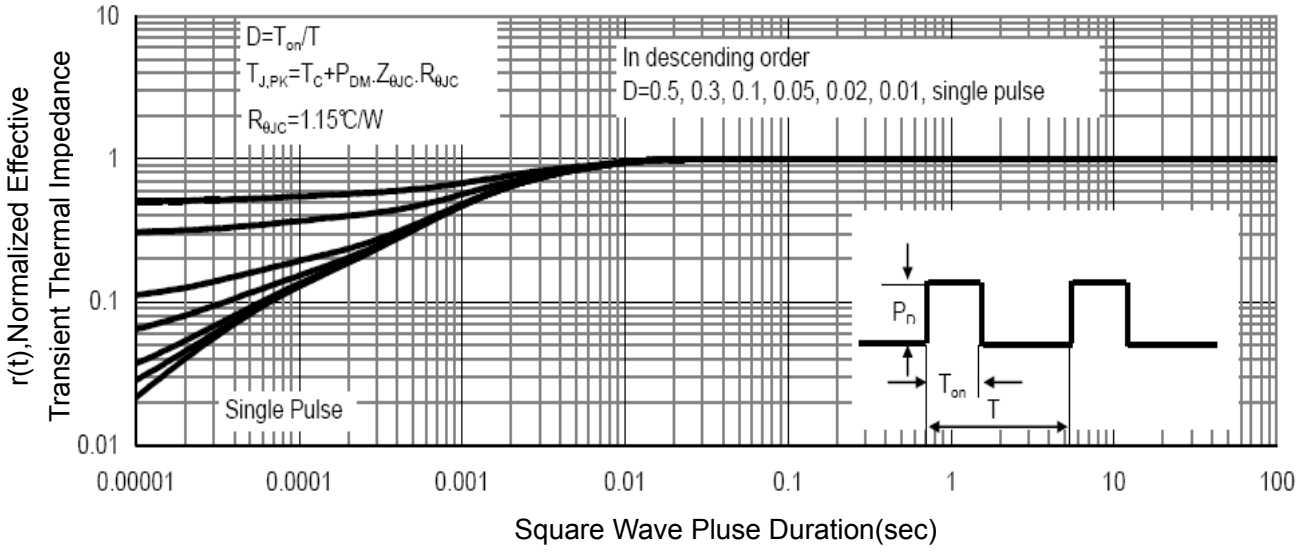
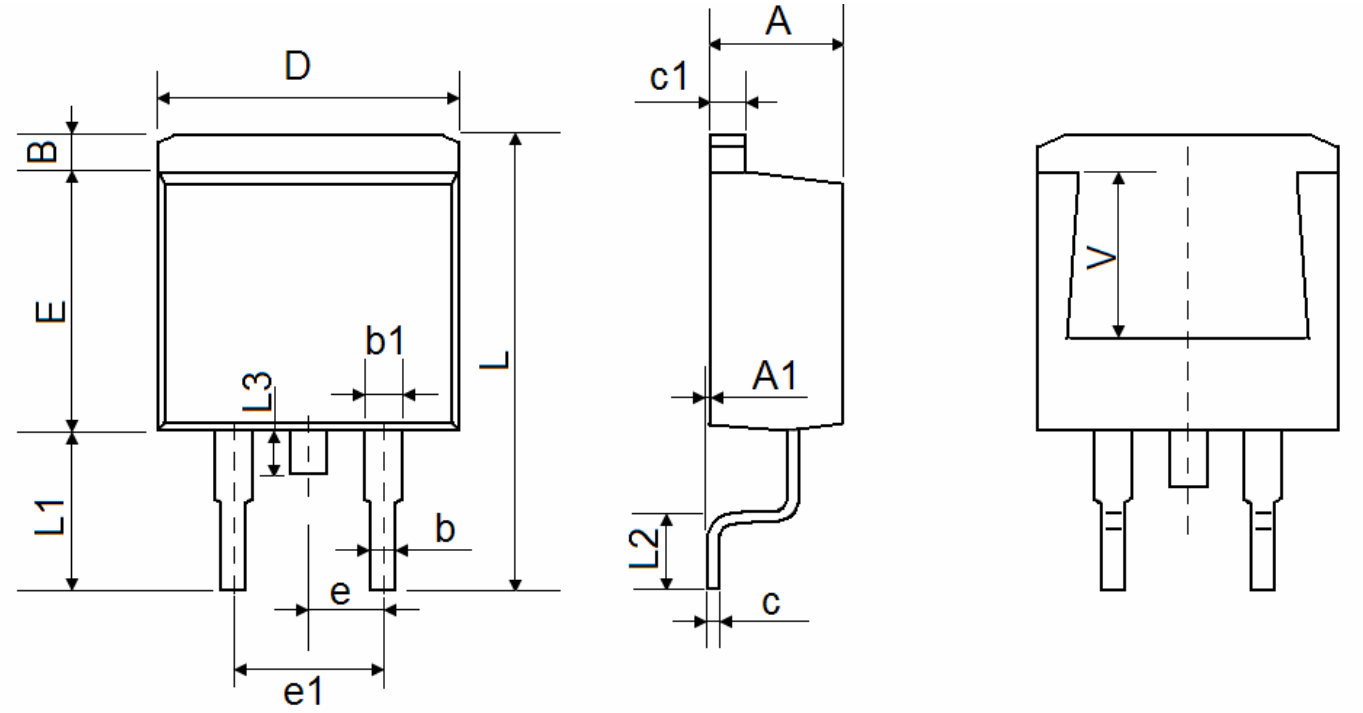


Figure 11 Normalized Maximum Transient Thermal Impedance

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	

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