

## N-Channel Enhancement Mode Power MOSFET

### Description

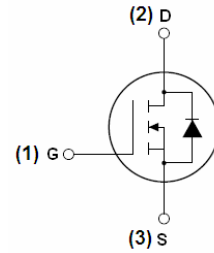
The HM85N95 uses advanced trench technology and design to provide excellent  $R_{DS(ON)}$  with low gate charge. This device is suitable for use in PWM, load switching and general purpose applications.

### General Features

- $V_{DS} = 82V, I_D = 95A$   
 $R_{DS(ON)} < 8.0 \text{ m}\Omega @ V_{GS} = 10V$  (Typ: 6.4m $\Omega$ )
- High density cell design for ultra low Rdson
- Fully characterized avalanche voltage and current
- Special designed for convertors and power controls
- 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



Schematic diagram



Marking and pin Assignment



TO-220-3L top view

### Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
HM85N95	HM85N95	TO-220-3L			

### Absolute Maximum Ratings ( $T_A = 25^\circ\text{C}$ unless otherwise noted)

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	$V_{DS}$	82	V
Gate-Source Voltage	$V_{GS}$	$\pm 20$	V
Drain Current-Continuous	$I_D$	95	A
Drain Current-Continuous( $T_C = 100^\circ\text{C}$ )	$I_D(100^\circ\text{C})$	67	A
Pulsed Drain Current	$I_{DM}$	320	A
Maximum Power Dissipation	$P_D$	170	W
Derating factor		1.13	W/ $^\circ\text{C}$
Single pulse avalanche energy <sup>(Note 5)</sup>	$E_{AS}$	529	mJ
Operating Junction and Storage Temperature Range	$T_J, T_{STG}$	-55 To 175	$^\circ\text{C}$

### Thermal Characteristic

Thermal Resistance, Junction-to-Case <sup>(Note 2)</sup>	$R_{\theta JC}$	0.88	$^\circ\text{C/W}$
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**Electrical Characteristics (T<sub>A</sub>=25°C unless otherwise noted)**

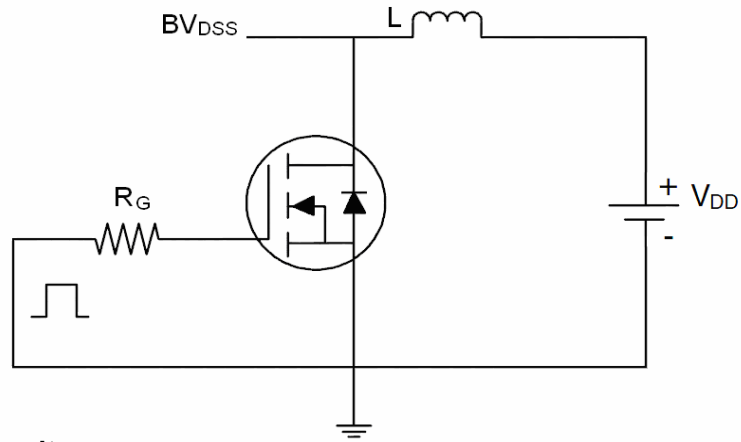
Parameter	Symbol	Condition	Min	Typ	Max	Unit
<b>Off Characteristics</b>						
Drain-Source Breakdown Voltage	BV <sub>DSS</sub>	V <sub>GS</sub> =0V I <sub>D</sub> =250μA	82	-	-	V
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	V <sub>DS</sub> =82V, V <sub>GS</sub> =0V	-	-	1	μA
Gate-Body Leakage Current	I <sub>GSS</sub>	V <sub>GS</sub> =±20V, V <sub>DS</sub> =0V	-	-	±100	nA
<b>On Characteristics (Note 3)</b>						
Gate Threshold Voltage	V <sub>GS(th)</sub>	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250μA	2	2.9	4	V
Drain-Source On-State Resistance	R <sub>DS(ON)</sub>	V <sub>GS</sub> =10V, I <sub>D</sub> =20A	-	6.4	8.0	mΩ
Forward Transconductance	g <sub>FS</sub>	V <sub>DS</sub> =5V, I <sub>D</sub> =20A	-	50	-	S
<b>Dynamic Characteristics (Note4)</b>						
Input Capacitance	C <sub>iss</sub>	V <sub>DS</sub> =25V, V <sub>GS</sub> =0V, F=1.0MHz	-	6800	-	PF
Output Capacitance	C <sub>oss</sub>		-	353	-	PF
Reverse Transfer Capacitance	C <sub>rss</sub>		-	261	-	PF
<b>Switching Characteristics (Note 4)</b>						
Turn-on Delay Time	t <sub>d(on)</sub>	V <sub>DD</sub> =40V, R <sub>L</sub> =15Ω R <sub>G</sub> =2.5Ω, V <sub>GS</sub> =10V	-	18	-	nS
Turn-on Rise Time	t <sub>r</sub>		-	12	-	nS
Turn-Off Delay Time	t <sub>d(off)</sub>		-	56	-	nS
Turn-Off Fall Time	t <sub>f</sub>		-	15	-	nS
Total Gate Charge	Q <sub>g</sub>	V <sub>DS</sub> =40V, I <sub>D</sub> =50A, V <sub>GS</sub> =10V	-	109.3	-	nC
Gate-Source Charge	Q <sub>gs</sub>		-	35.1	-	nC
Gate-Drain Charge	Q <sub>gd</sub>		-	25.8	-	nC
<b>Drain-Source Diode Characteristics</b>						
Diode Forward Voltage (Note 3)	V <sub>SD</sub>	V <sub>GS</sub> =0V, I <sub>S</sub> =95A	-	-	1.2	V
Diode Forward Current (Note 2)	I <sub>S</sub>		-	-	95	A
Reverse Recovery Time	t <sub>rr</sub>	T <sub>j</sub> =25°C, I <sub>F</sub> =100A	-		37	nS
Reverse Recovery Charge	Q <sub>rr</sub>	di/dt=100A/μs (Note3)	-		58	nC

**Notes:**

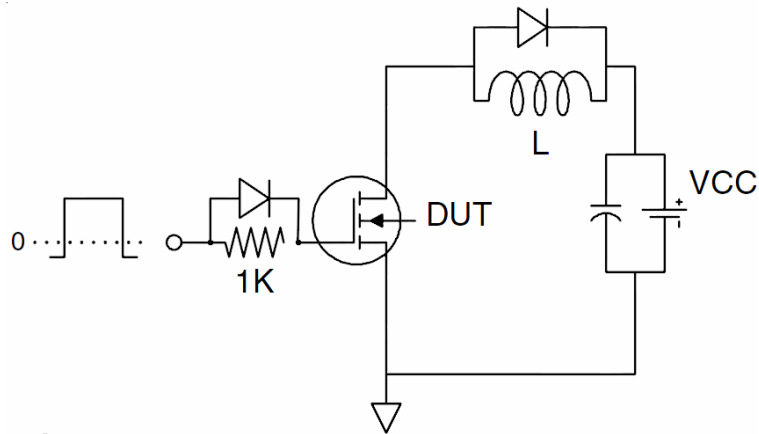
1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. Surface Mounted on FR4 Board, t ≤ 10 sec.
3. Pulse Test: Pulse Width ≤ 300μs, Duty Cycle ≤ 2%.
4. Guaranteed by design, not subject to production
5. EAS condition: T<sub>j</sub>=25°C, V<sub>DD</sub>=40V, V<sub>G</sub>=10V, L=0.5mH, R<sub>g</sub>=25Ω

## Test Circuit

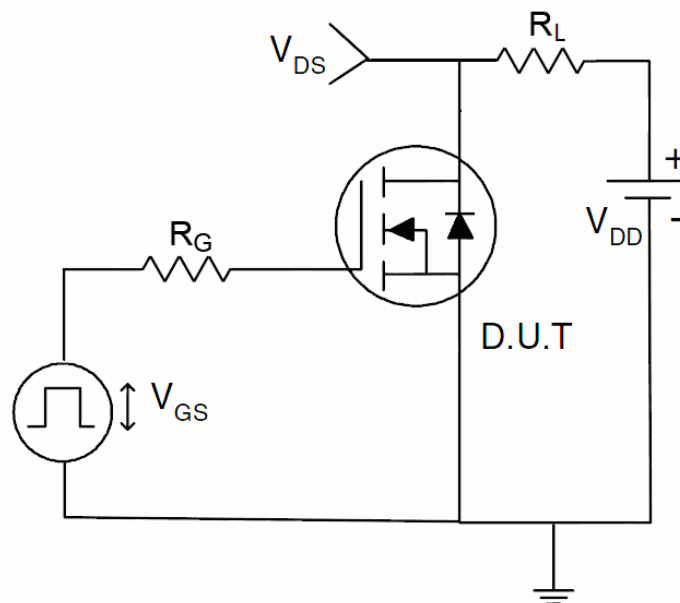
### 1) $E_{AS}$ Test Circuits



### 2) Gate Charge Test Circuit



### 3) Switch Time Test Circuit



Typical Electrical and Thermal Characteristics (Curves)

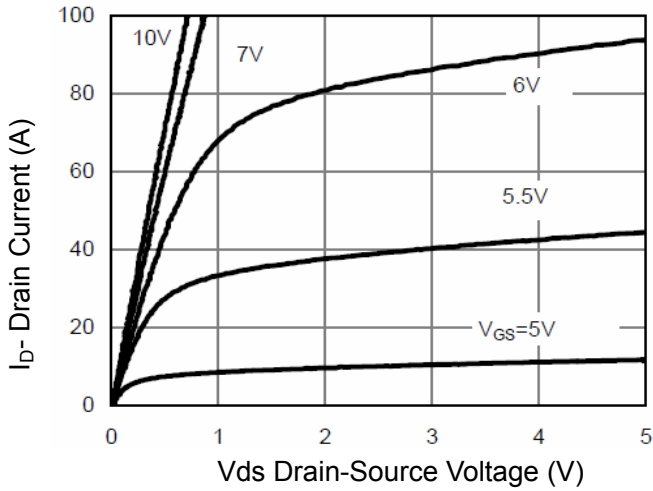


Figure 1 Output Characteristics

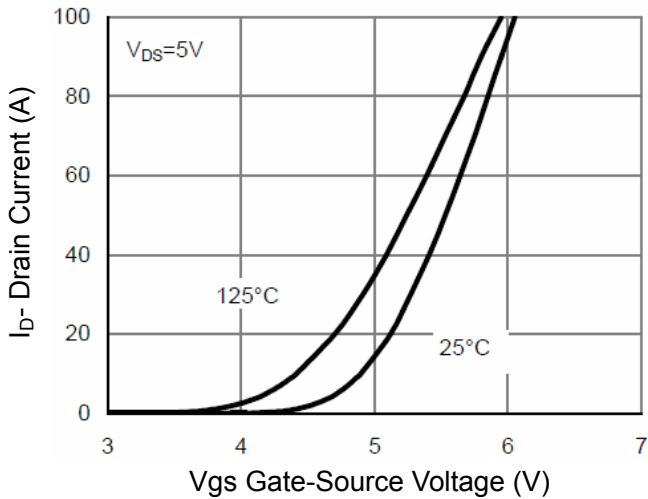


Figure 2 Transfer Characteristics

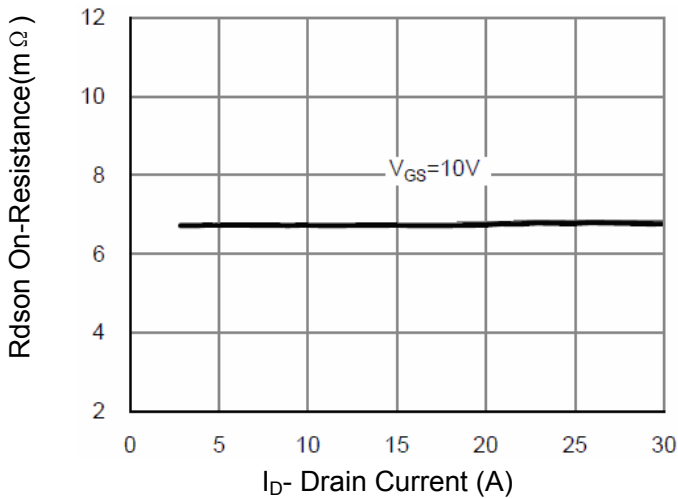


Figure 3 Rdson- Drain Current

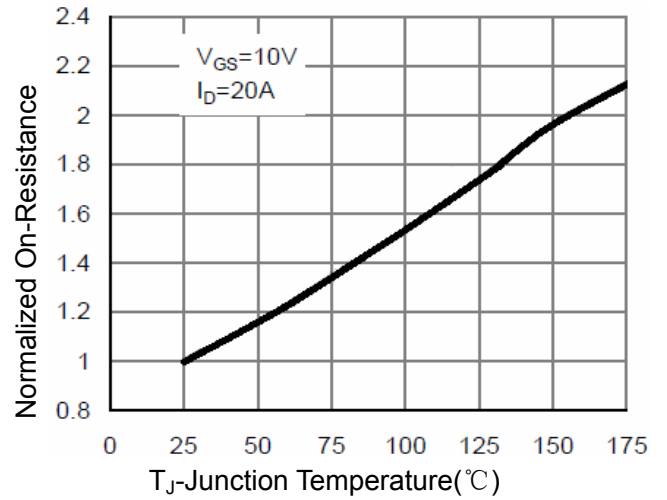


Figure 4 Rdson-Junction Temperature

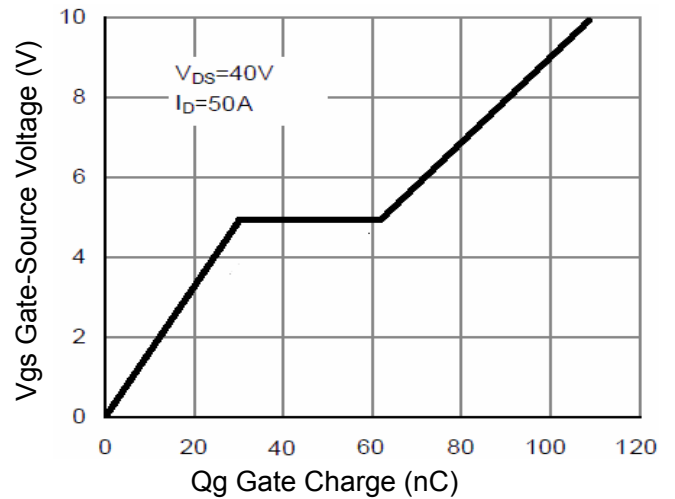


Figure 5 Gate Charge

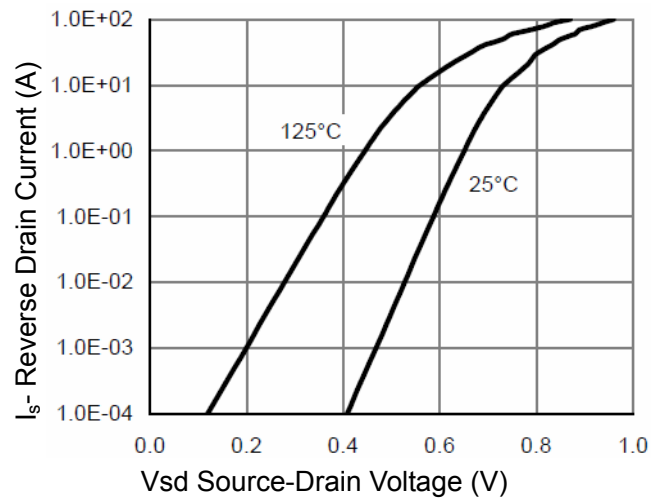


Figure 6 Source- Drain Diode Forward

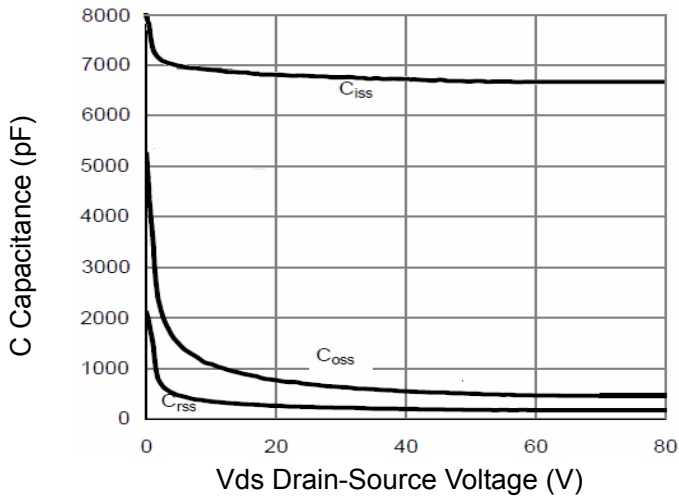


Figure 7 Capacitance vs Vds

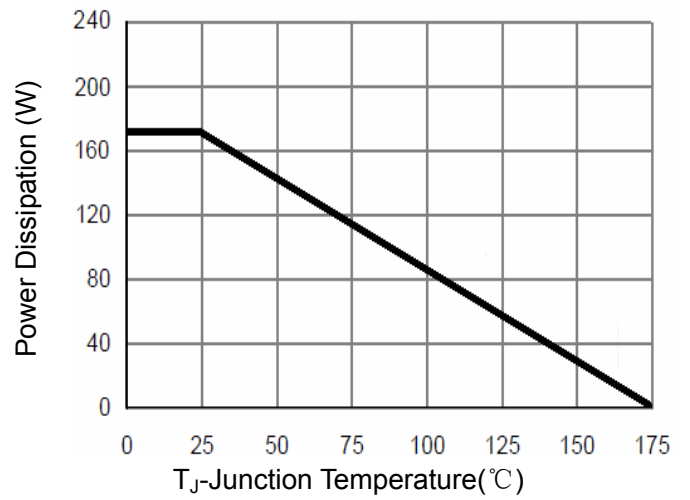


Figure 9 Power De-rating

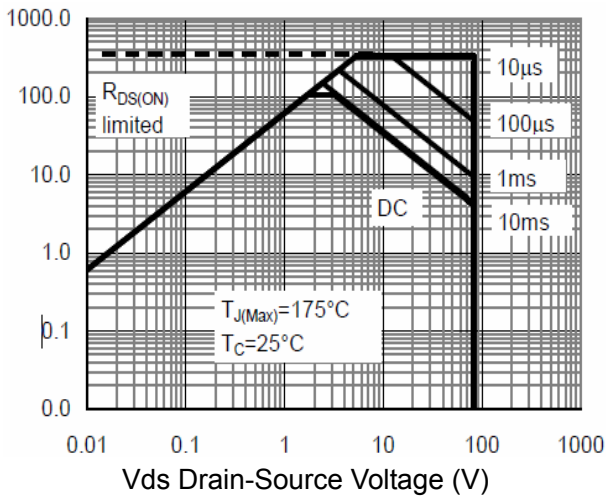


Figure 8 Safe Operation Area

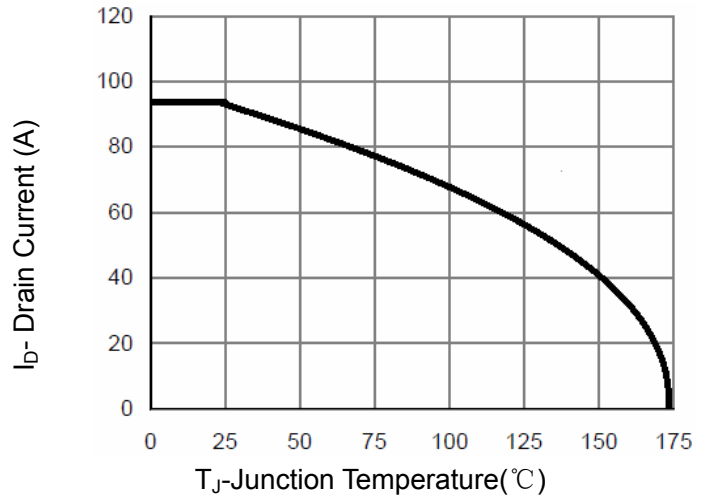


Figure 10 Id Current De-rating

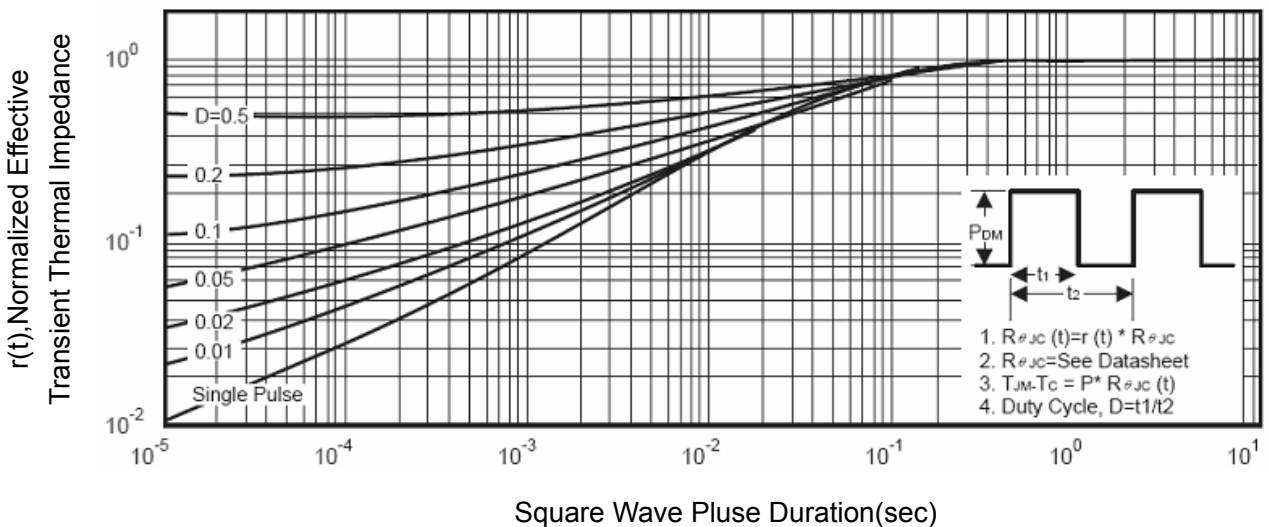
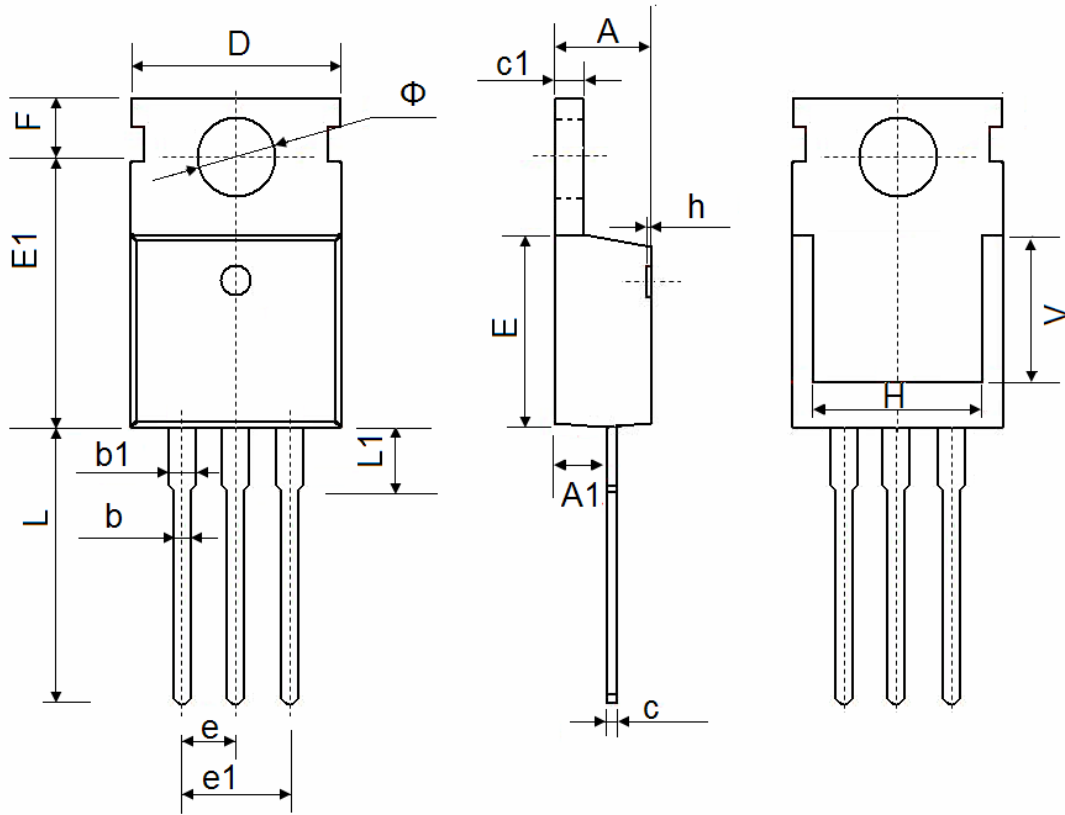


Figure 11 Normalized Maximum Transient Thermal Impedance

## TO-220-3L Package Information



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	4.400	4.600	0.173	0.181
A1	2.250	2.550	0.089	0.100
b	0.710	0.910	0.028	0.036
b1	1.170	1.370	0.046	0.054
c	0.330	0.650	0.013	0.026
c1	1.200	1.400	0.047	0.055
D	9.910	10.250	0.390	0.404
E	8.9500	9.750	0.352	0.384
E1	12.650	12.950	0.498	0.510
e	2.540 TYP.		0.100 TYP.	
e1	4.980	5.180	0.196	0.204
F	2.650	2.950	0.104	0.116
H	7.900	8.100	0.311	0.319
h	0.000	0.300	0.000	0.012
L	12.900	13.400	0.508	0.528
L1	2.850	3.250	0.112	0.128
V	7.500 REF.		0.295 REF.	
Φ	3.400	3.800	0.134	0.150