

N-Channel Trench Power MOSFET

General Description

The 1H10 combines advanced trench MOSFET technology with a low resistance package to provide extremely low $R_{DS(ON)}$. This device is ideal for power switching application and LED backlighting.

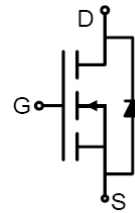
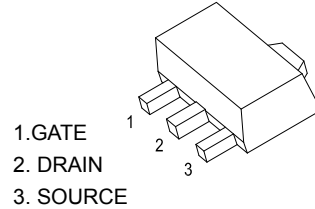
Features

- $V_{DS}=100V$; $I_D=10A$
 $R_{DS(ON)} @V_{GS}= 10V, I_{DS}= 3A, Typ 95m$
 $R_{DS(ON)} @V_{GS}= 4.5V, I_{DS}= 2A, Typ 110m\Omega$
- Ultra Low On-Resistance
- High UIS and UIS 100% Test

Application

- Power switching application
- LED backlighting

SOT-89-3L



Schematic Diagram

Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
1H10	1H10	SOT-89-3L	-	-	-

Table 1. Absolute Maximum Ratings ($T_A=25^\circ C$)

Symbol	Parameter	Value	Unit
V_{DS}	Drain-Source Voltage ($V_{GS}=0V$)	100	V
V_{GS}	Gate-Source Voltage ($V_{DS}=0V$)	± 20	V
$I_{D(DC)}$	Drain Current (DC) at $T_c=25^\circ C$	10	A
$I_{D(DC)}$	Drain Current (DC) at $T_c=100^\circ C$	7.7	A
$I_{DM(pluse)}$	Drain Current-Continuous@ Current-Pulsed (Note 1)	44	A
P_D	Maximum Power Dissipation($T_c=25^\circ C$)	45	W
E_{AS}	Single Pulse Avalanche Energy (Note 2)	16	mJ
T_J, T_{STG}	Operating Junction and Storage Temperature Range	-55 To 175	$^\circ C$

Notes 1.Repetitive Rating: Pulse width limited by maximum junction temperature
 2.EAS condition: $T_J=25^\circ C, V_{DD}=50V, V_G=10V, R_G=25\Omega$

Table 2. Thermal Characteristic

Symbol	Parameter	Value	Max	Unit
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case	---	3.3	$^{\circ}\text{C}/\text{W}$

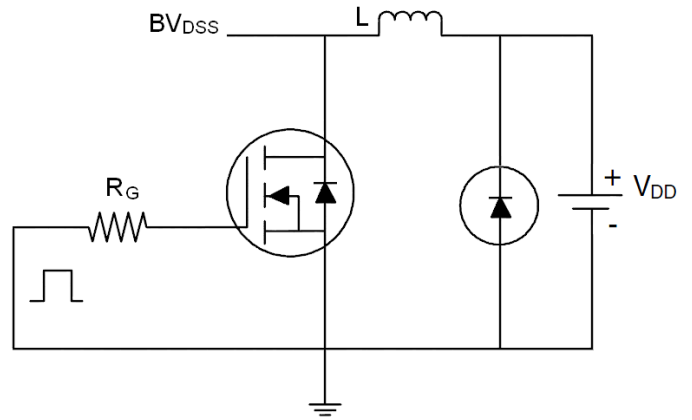
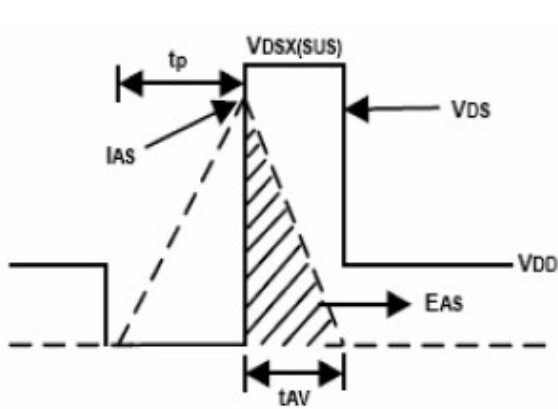
Table 3. Electrical Characteristics (TA=25 $^{\circ}\text{C}$ unless otherwise noted)

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
On/Off States						
BV_{DSS}	Drain-Source Breakdown Voltage	$V_{GS}=0V, I_D=250\mu\text{A}$	100			V
I_{DSS}	Zero Gate Voltage Drain Current(Tc=25 $^{\circ}\text{C}$)	$V_{DS}=100V, V_{GS}=0V$			1	μA
I_{DSS}	Zero Gate Voltage Drain Current(Tc=100 $^{\circ}\text{C}$)	$V_{DS}=100V, V_{GS}=0V$			5	μA
I_{GSS}	Gate-Body Leakage Current	$V_{GS}=\pm 20V, V_{DS}=0V$			± 100	nA
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}, I_D=250\mu\text{A}$	1.0	1.5	2	V
$R_{DS(ON)}$	Drain-Source On-State Resistance	$V_{GS}=10V, I_D=3A$		95	135	m Ω
$R_{DS(ON)}$	Drain-Source On-State Resistance	$V_{GS}=4.5V, I_D=2A$		110	142	m Ω
Dynamic Characteristics						
g_{FS}	Forward Transconductance	$V_{DS}=5V, I_D=4.5A$	5			S
C_{iss}	Input Capacitance	$V_{DS}=50V, V_{GS}=0V$ $f=1.0\text{MHz}$		730		PF
C_{oss}	Output Capacitance			44		PF
C_{rss}	Reverse Transfer Capacitance			30		PF
Q_g	Total Gate Charge	$V_{DS}=50V, I_D=4.5A$ $V_{GS}=10V$		13.4		nC
Q_{gs}	Gate-Source Charge			3.2		nC
Q_{gd}	Gate-Drain Charge			6.2		nC
Switching Times						
$t_{d(on)}$	Turn-on Delay Time	$V_{DS}=50V, R_L=8.6\Omega$ $V_{GS}=10V, R_G=3\Omega$		7		nS
t_r	Turn-on Rise Time			12		nS
$t_{d(off)}$	Turn-Off Delay Time			24		nS
t_f	Turn-Off Fall Time			11		nS
Source-Drain Diode Characteristics						
I_{SD}	Source-Drain Current(Body Diode)			11		A
I_{SDM}	Pulsed Source-Drain Current(Body Diode)			44		A
V_{SD}	Forward On Voltage	$T_J=25^{\circ}\text{C}, I_{SD}=1A, V_{GS}=0V$		0.75	1	V
t_{rr}	Reverse Recovery Time	$T_J=25^{\circ}\text{C}, I_F=4.5A$ $di/dt=500A/\mu\text{s}$		11		nS
Q_{rr}	Reverse Recovery Charge			14		nC
t_{on}	Forward Turn-on Time	Intrinsic turn-on time is negligible(turn-on is dominated by L_S+L_D)				

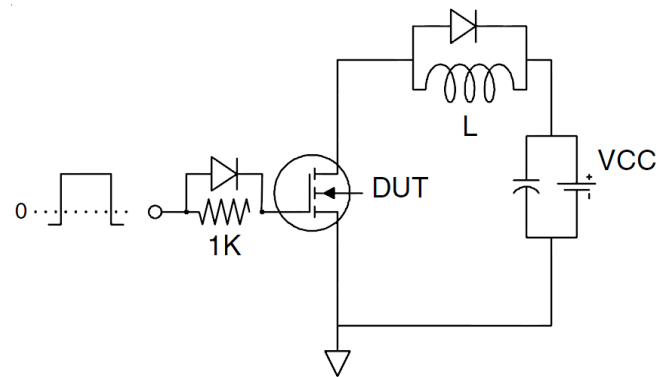
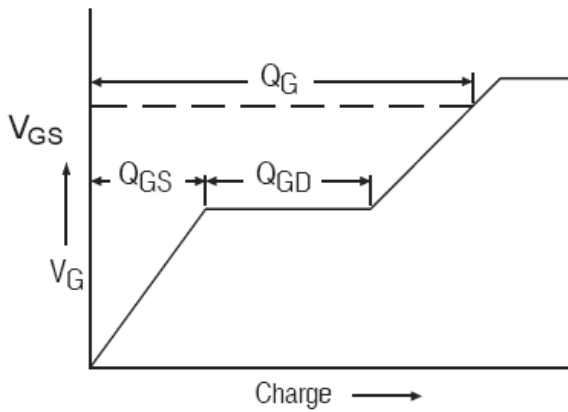
Notes 1. Pulse Test: Pulse Width $\leq 300\mu\text{s}$, Duty Cycle $\leq 1.5\%$, Starting $T_J=25^{\circ}\text{C}$

Test Circuit

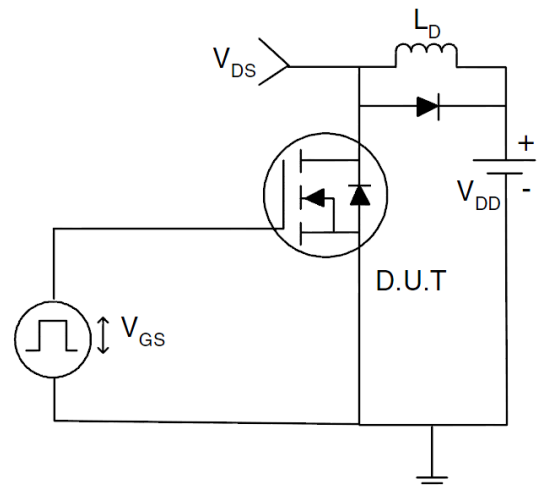
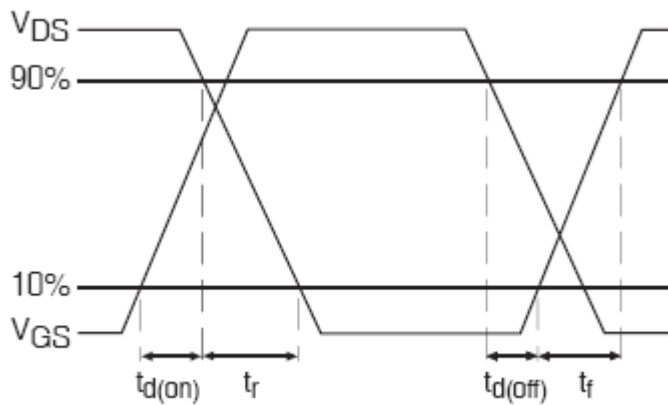
1) E_{AS} Test Circuits



2) Gate Charge Test Circuit:



3) Switch Time Test Circuit:



TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS (Curves)

Figure1. On-Region Characteristics

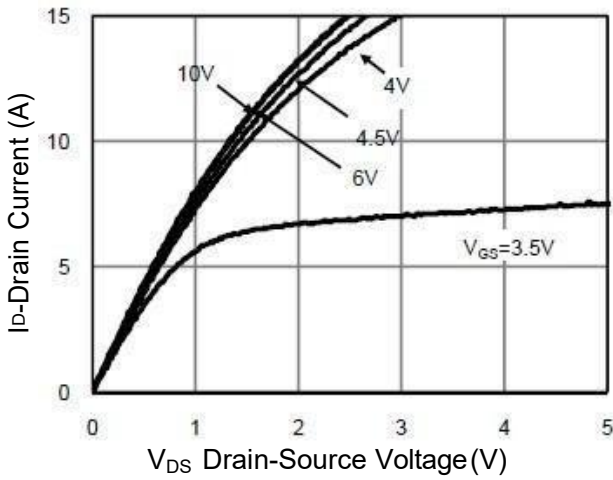


Figure3. ID vs Junction Temperature

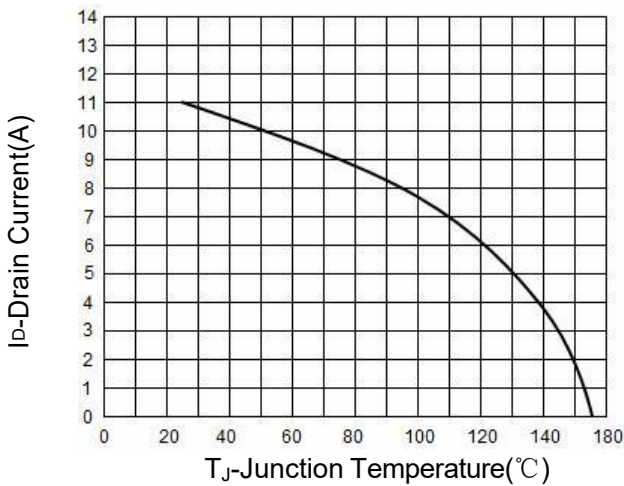


Figure 2: Transfer Characteristics

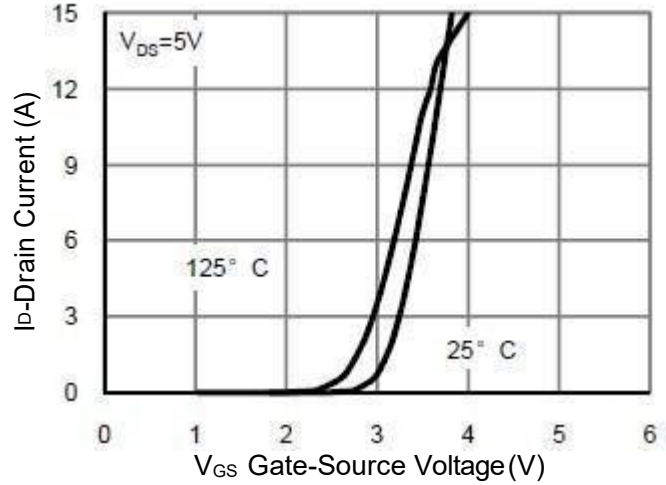


Figure4. On-Resistance vs. Junction Temperature

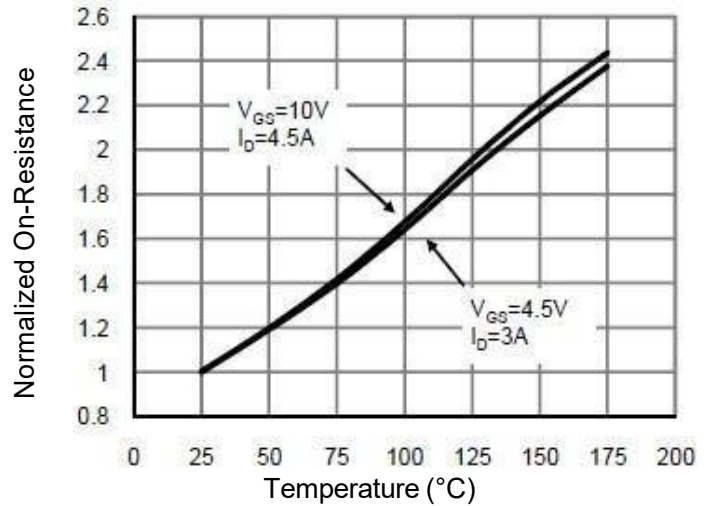


Figure5. On-Resistance vs. Gate-Source Voltage

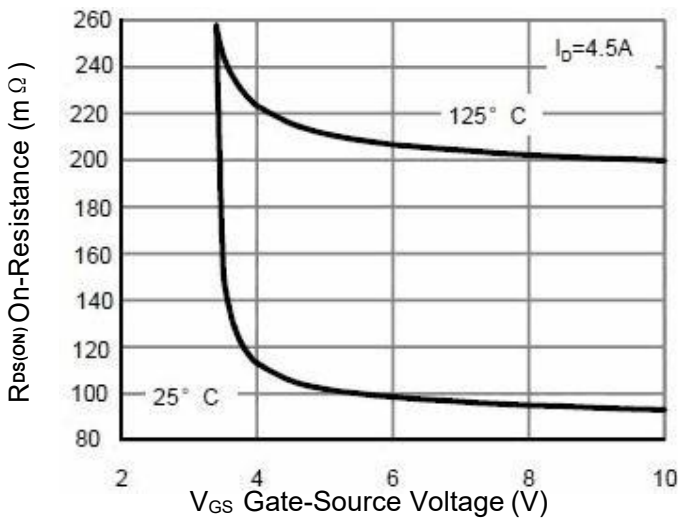


Figure6. Body-Diode Characteristics

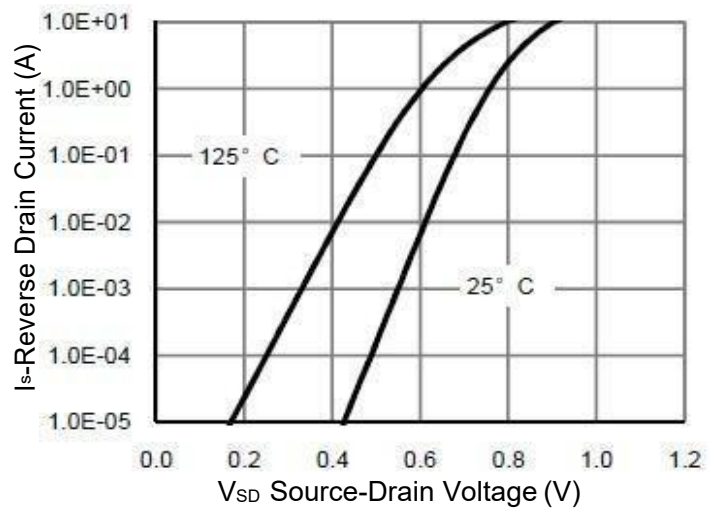


Figure7. Gate-Charge Characteristics

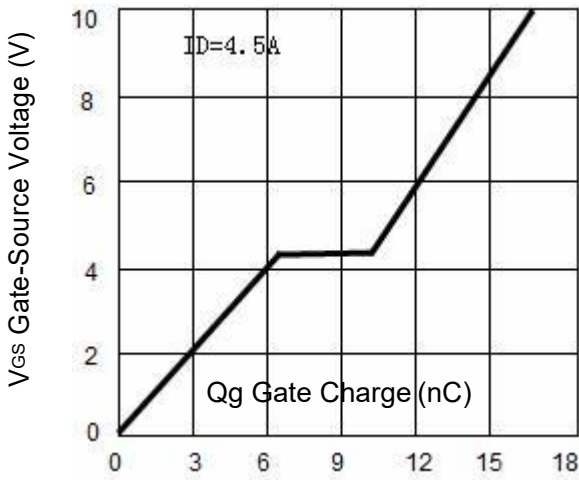


Figure 8. Capacitance Characteristics

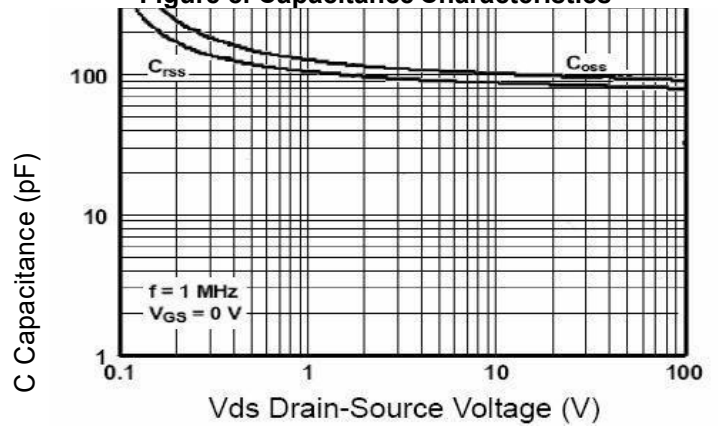


Figure 9. Maximum Forward Biased Safe Operating Area

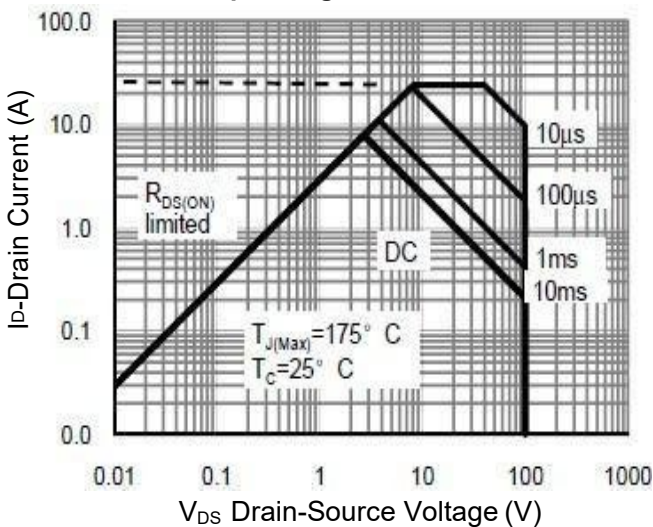


Figure10. Single Pulse Power Rating Junction-to-Case

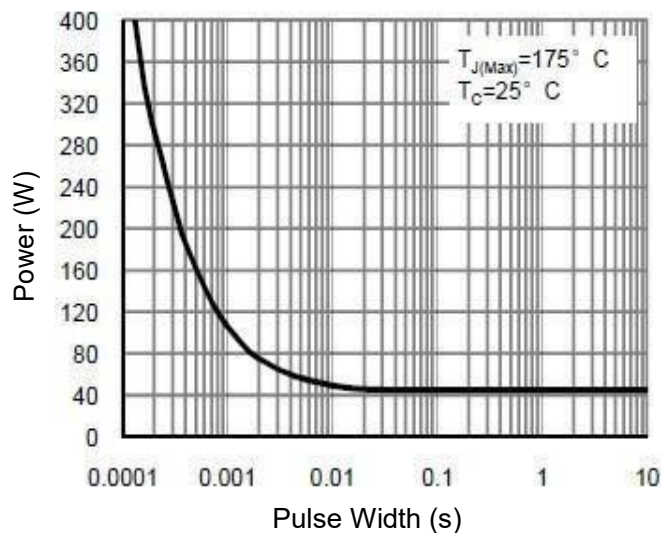
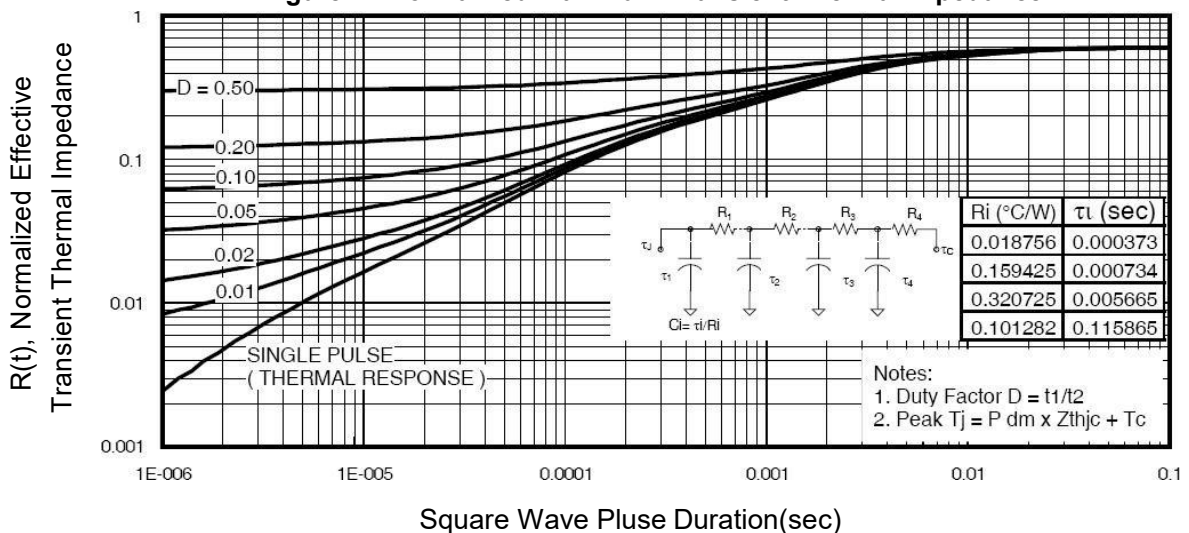
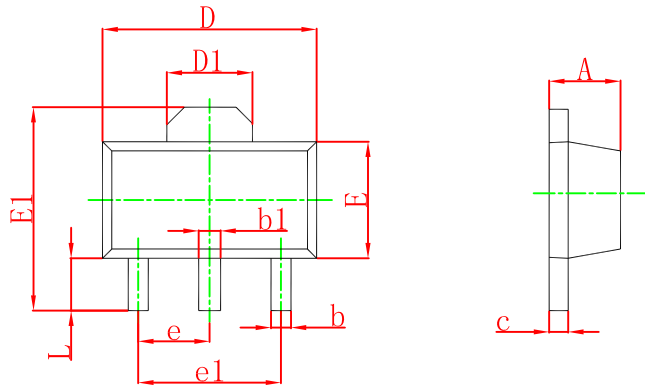


Figure11. Normalized Maximum Transient Thermal Impedance



TO-89 Package Information



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.400	1.600	0.055	0.063
b	0.320	0.520	0.013	0.020
b1	0.400	0.580	0.016	0.023
c	0.350	0.440	0.014	0.017
D	4.400	4.600	0.173	0.181
D1	1.550 REF.		0.061 REF.	
E	2.300	2.600	0.091	0.102
E1	3.940	4.250	0.155	0.167
e	1.500 TYP.		0.060 TYP.	
e1	3.000 TYP.		0.118 TYP.	
L	0.900	1.200	0.035	0.047