P-Channel Enhancement Mode Power MOSFET

Description

The 45P40A uses advanced trench technology to provide excellent $R_{DS(ON)}$, low gate charge. It can be used in a wide variety of applications.

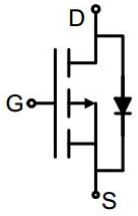
AEC-Q101 Qualified

General Features

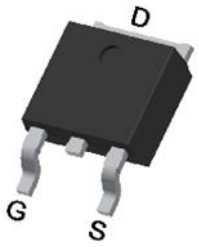
- V_{DS} -40V
- I_D (at V_{GS} = -10V) -50A
- $R_{DS(ON)}$ (at V_{GS} = -10V) < 13mΩ
- $R_{DS(ON)}$ (at V_{GS} = -4.5V) < 18mΩ
- 100% Avalanche Tested
- RoHS Compliant

Application

- Power switch
- DC/DC converters



Schematic diagram



TO-252

Device	Package	Marking	Packaging
45P40A	TO-252	45P40	2500pcs/Reel

Absolute Maximum Ratings T_C = 25ºC, unless otherwise noted

Parameter		Symbol	Value	Unit
Drain-Source Voltage		V_{DS}	-40	V
Continuous Drain Current	T_C = 25ºC	I_D	-50	A
	T_C = 100ºC		-36	
Pulsed Drain Current (note1)		I_{DM}	-200	A
Gate-Source Voltage		V_{GS}	±20	V
Power Dissipation		P_D	96	W
Single pulse avalanche energy （note2）		E_{AS}	72	mJ
Operating Junction and Storage Temperature Range		T_J, T_{stg}	-55 To 175	ºC

Thermal Resistance

Parameter	Symbol	Value	Unit
Thermal Resistance, Junction-to-Ambient	R_{thJA}	50	ºC/W
Maximum Junction-to-Case	R_{thJC}	1.56	ºC/W

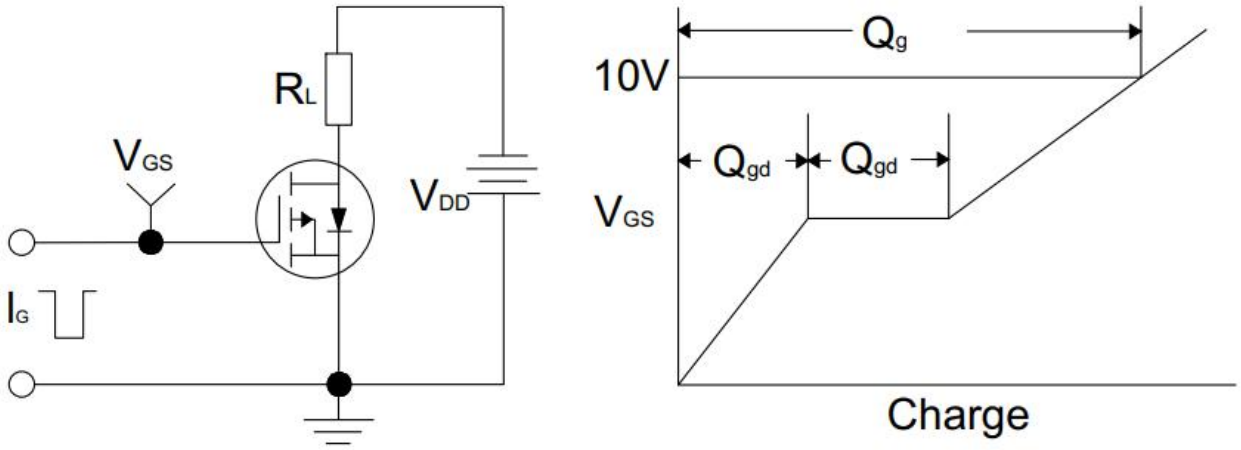
Specifications T_J = 25ºC, unless otherwise noted

Parameter	Symbol	Test Conditions	Value			Unit
			Min.	Typ.	Max.	
Static Parameters						
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	V_{GS} = 0V, I_D = -250μA	-40	--	--	V
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS} = -40V, V_{GS} = 0V	--	--	-1	μA
Gate-Source Leakage	I_{GSS}	V_{GS} = ±20V	--	--	±100	nA
Gate-Source Threshold Voltage	$V_{GS(th)}$	V_{DS} = V_{GS}, I_D = -250μA	-1.2	-1.6	-2.5	V
Drain-Source On-Resistance	$R_{DS(on)}$	V_{GS} = -10V, I_D = - 20A	--	10	13	mΩ
		V_{GS} = -4.5V, I_D = - 20A	--	14	18	
Forward Transconductance	g_{FS}	V_{DS} = -5V,I_D = -20A	--	32	--	S
Dynamic Parameters						
Input Capacitance	C_{iss}	V_{GS} = 0V, V_{DS} = -20V, f = 1.0MHz	--	3300	--	pF
Output Capacitance	C_{oss}		--	340	--	
Reverse Transfer Capacitance	C_{rss}		--	280	--	
Total Gate Charge	Q_g	V_{DD} = -20V, I_D = -20A, V_{GS} = -10V	--	73	--	nC
Gate-Source Charge	Q_{gs}		--	10	--	
Gate-Drain Charge	Q_{gd}		--	18	--	
Turn-on Delay Time	$t_{d(on)}$	V_{DD} = -20V, I_D = -20A, R_G = 3Ω	--	10	--	ns
Turn-on Rise Time	t_r		--	18	--	
Turn-off Delay Time	$t_{d(off)}$		--	38	--	
Turn-off Fall Time	t_f		--	24	--	
Drain-Source Body Diode Characteristics						
Continuous Body Diode Current	I_S	T_C = 25ºC	--	--	-50	A
Body Diode Voltage	V_{SD}	T_J = 25ºC, I_{SD} = -20A, V_{GS} = 0V	--	--	-1.2	V
Reverse Recovery Charge	Q_{rr}	I_F = -20A, V_{GS} = 0V di/dt=-100A/us	--	42	--	nC
Reverse Recovery Time	Trr		--	40	--	ns

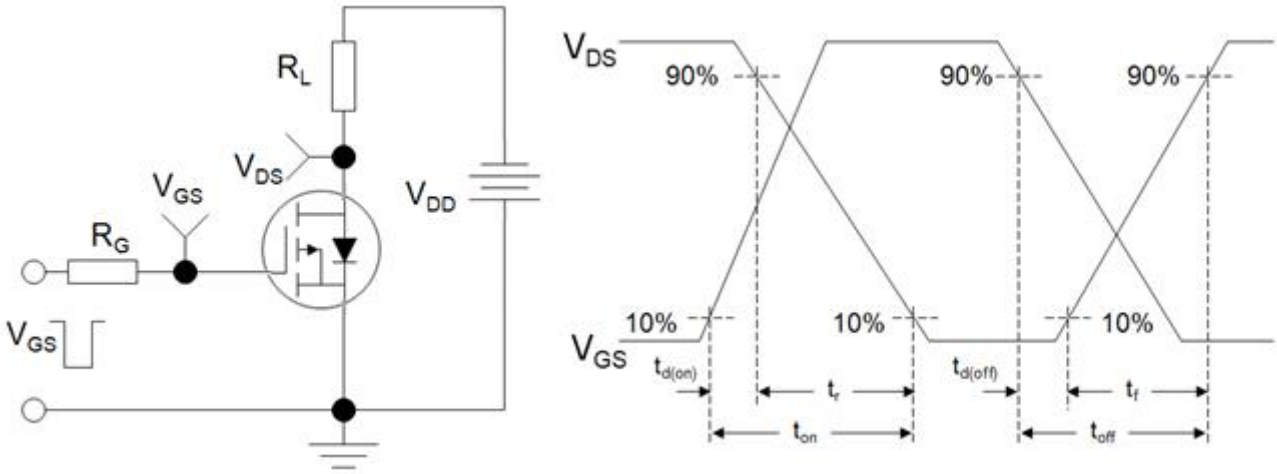
Notes

1. Repetitive Rating: Pulse width limited by maximum junction temperature
2. EAS condition : Tj=25℃ ,VDD=-40V,VGS=-10V,L=0.5mH,Rg=25Ω
   The table shows the minimum avalanche energy, which is 196mJ when the device is tested until failure
3. Identical low side and high side switch with identical R_G

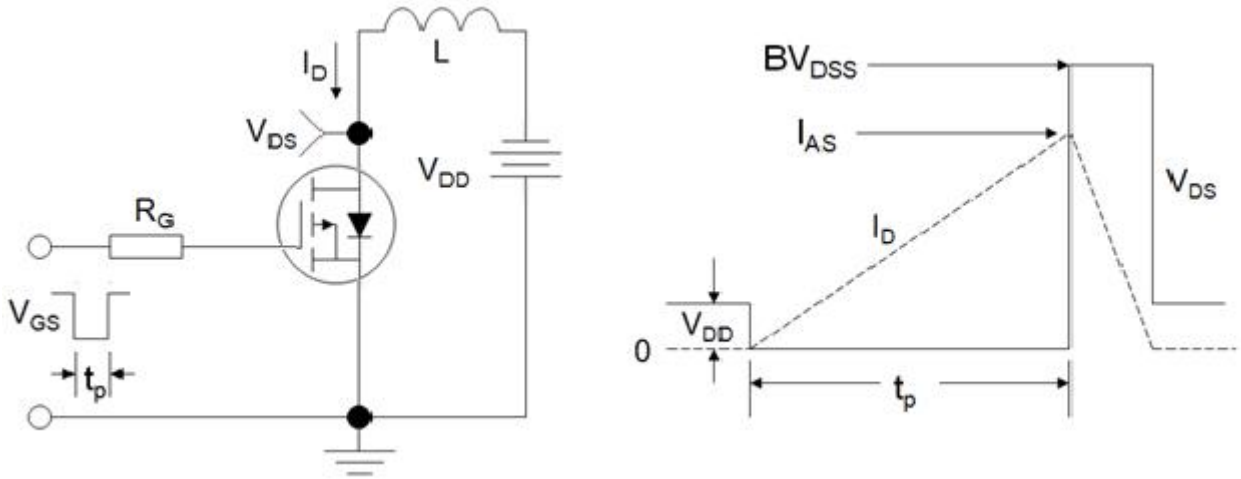
Gate Charge Test Circuit



Switch Time Test Circuit



EAS Test Circuit



Typical Characteristics T_J = 25ºC, unless otherwise noted

Figure 1. Output Characteristics

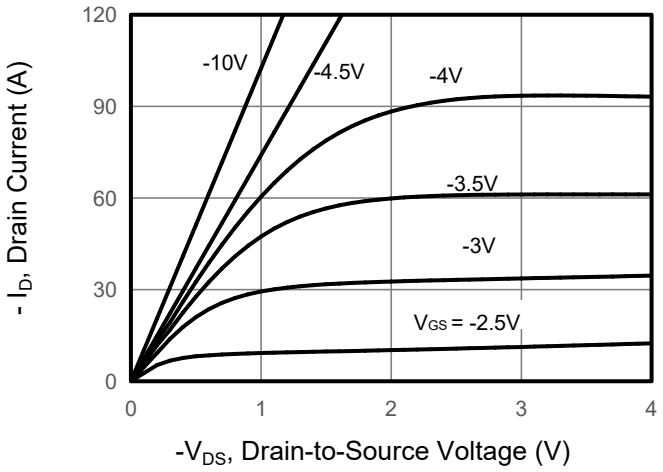


Figure 2. Transfer Characteristics

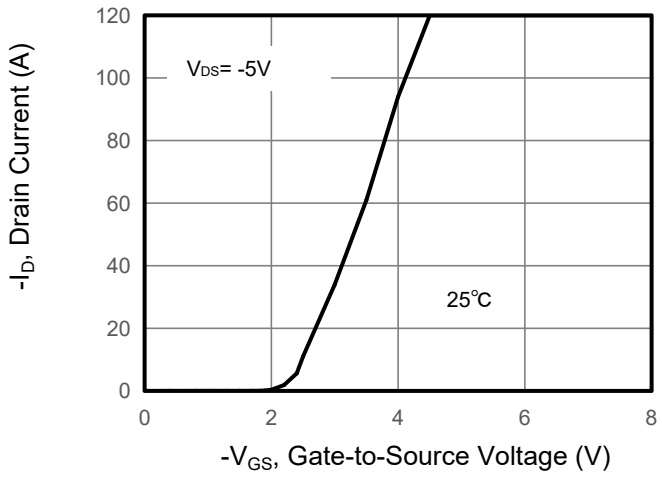


Figure 3. Drain Source On Resistance

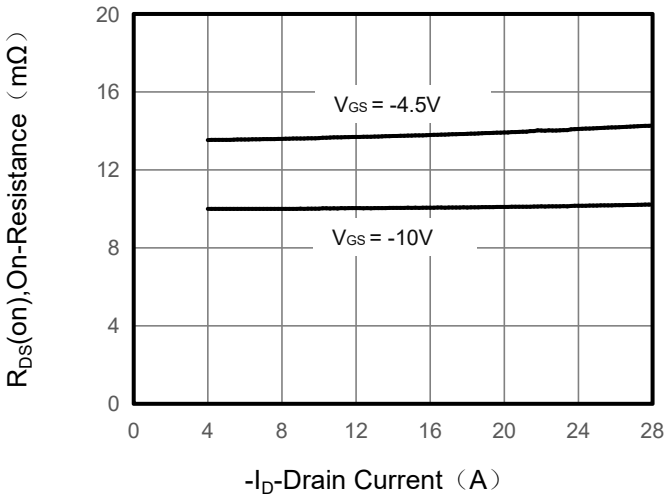


Figure 4. Gate Charge

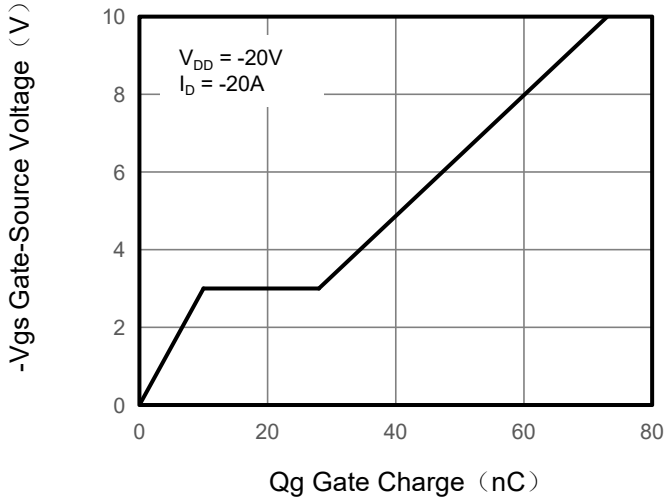


Figure 5. Capacitance

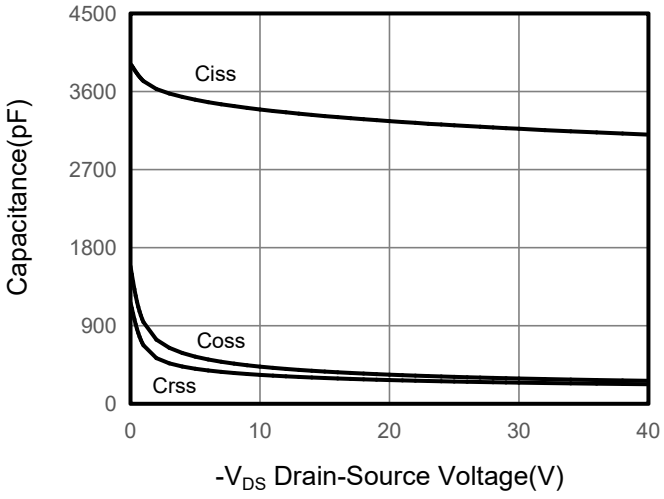
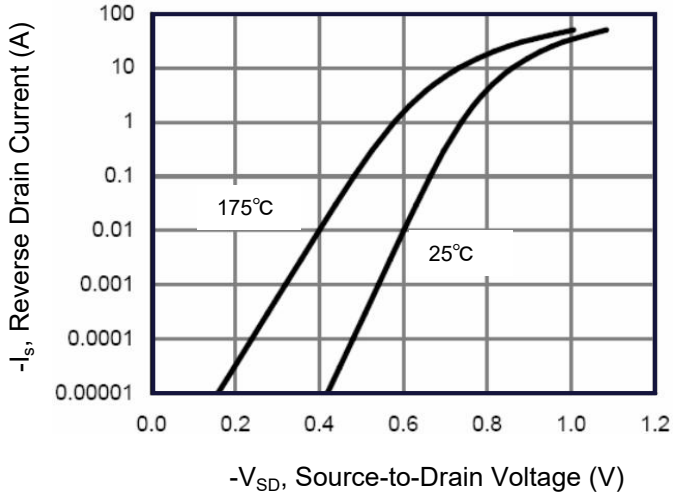


Figure 6. Source-Drain Diode Forward



Typical Characteristics T_J = 25ºC, unless otherwise noted

Figure 7. Drain-Source On-Resistance

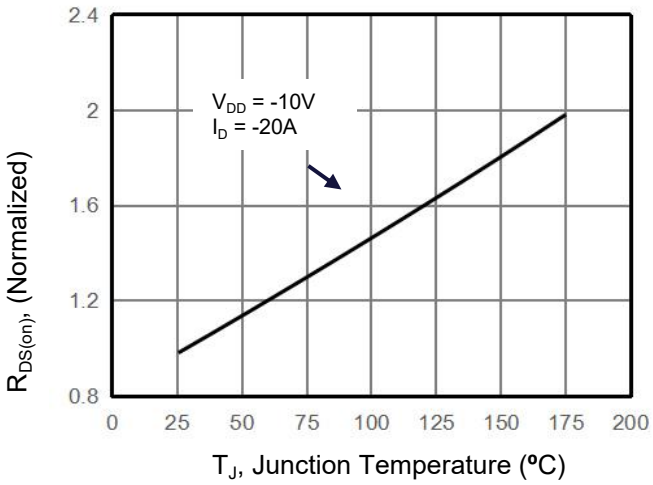


Figure 8. Safe Operation Area

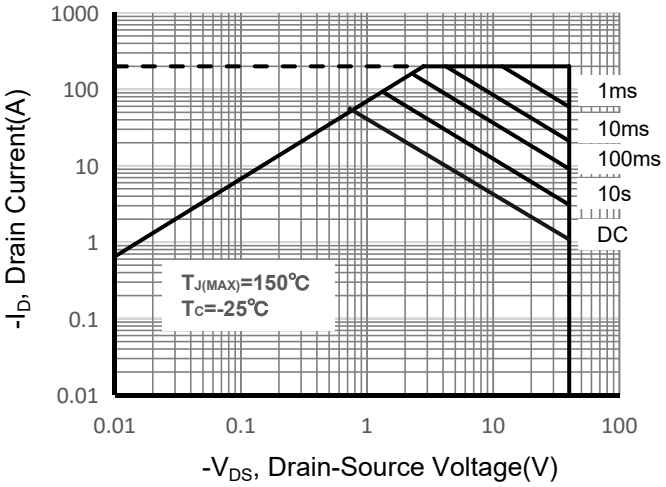


Figure 9. Maximum Continuous Drain Current vs Case Temperature

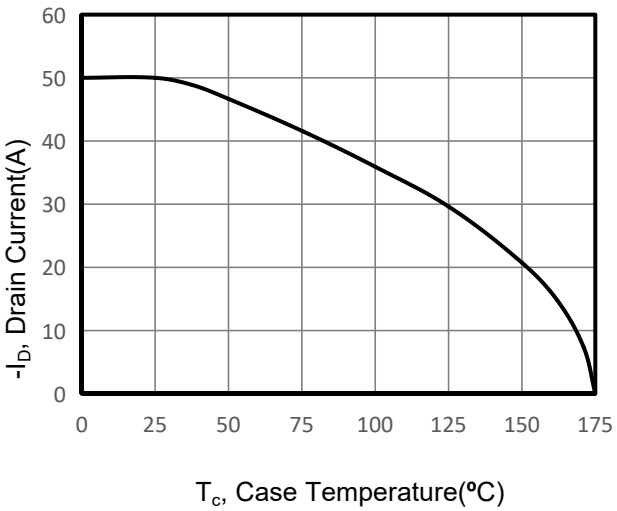
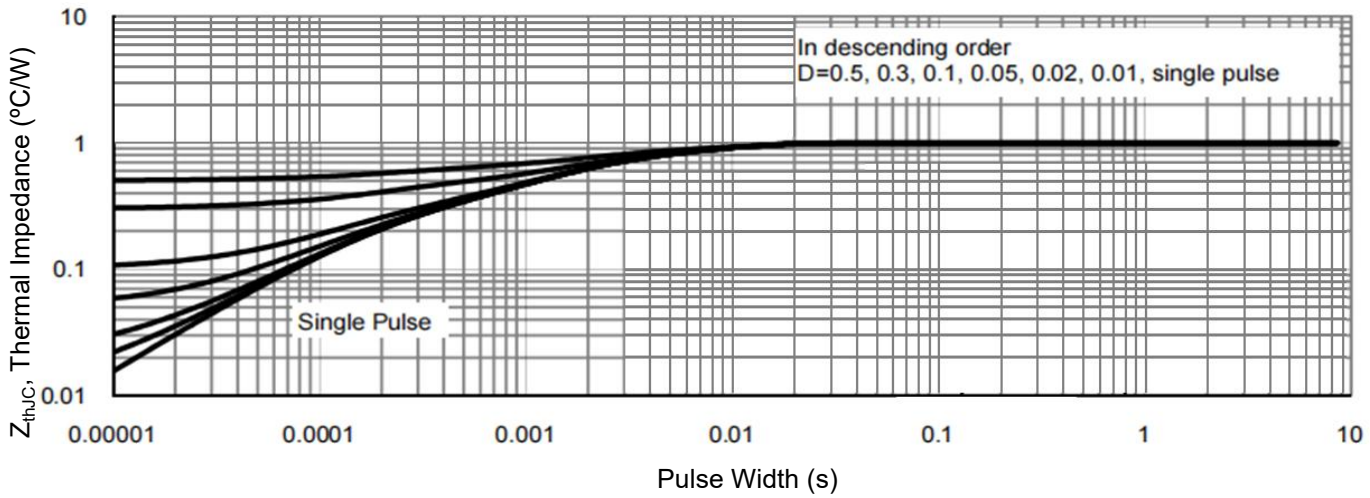
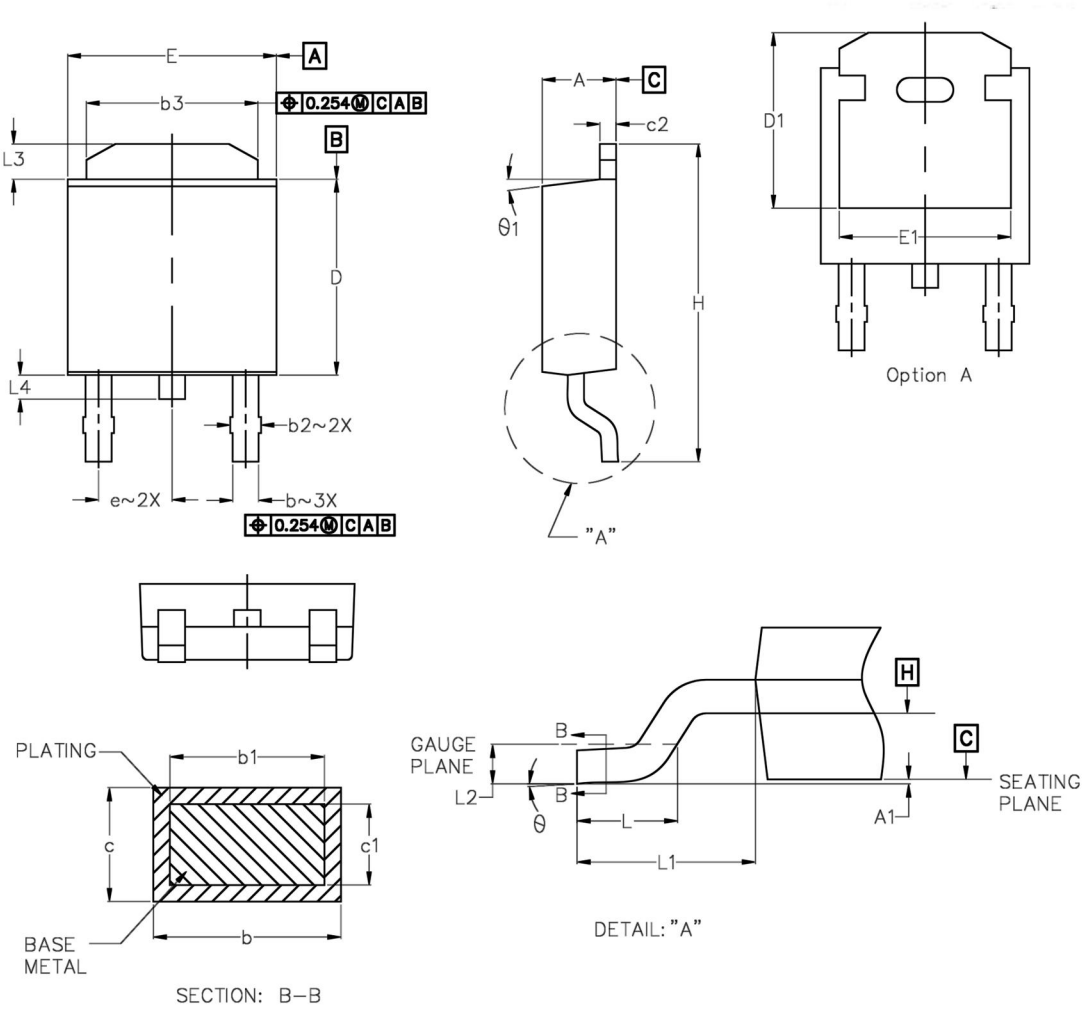


Figure 10. Normalized Maximum Transient Thermal Impedance



TO-252 Package Information



SYMBOLS	COMMON			
	MM		INCH	
	MIN.	MAX.	MIN.	MAX.
A	2.184	2.387	0.086	0.094
A1	—	0.127	—	0.005
b	0.750	0.890	0.029	0.035
b1	0.750	0.860	0.029	0.034
b2	0.762	1.143	0.030	0.045
b3	4.953	5.461	0.195	0.215
c	0.460	0.610	0.018	0.024
c1	0.410	0.559	0.016	0.022
c2	0.460	0.889	0.018	0.035
D	5.969	6.223	0.235	0.245
D1	5.207	—	0.205	—
E	6.350	6.731	0.250	0.265
E1	4.318	—	0.170	—
e	2.290 BSC		0.090 BSC	
H	9.398	10.414	0.370	0.410
L	1.397	1.778	0.055	0.070
L1	2.743 BSC		0.108 BSC	
L2	0.508 BSC		0.020 BSC	
L3	0.889	1.270	0.035	0.050
L4	—	1.016	—	0.040
θ	0°	10°	0°	10°
θ1	0°	15°	0°	15°