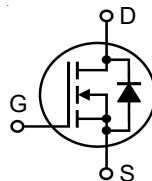


X4-Class Power MOSFET

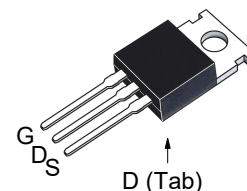
IXTP60N20X4

$V_{DSS} = 200V$
 $I_{D25} = 60A$
 $R_{DS(on)} \leq 21.0m\Omega$

N-Channel Enhancement Mode
Avalanche Rated



TO-220
(IXTP)



G = Gate D = Drain
 S = Source Tab = Drain

Symbol	Test Conditions	Maximum Ratings	
V_{DSS}	$T_J = 25^\circ C$ to $175^\circ C$	200	V
V_{DGR}	$T_J = 25^\circ C$ to $175^\circ C$, $R_{GS} = 1M\Omega$	200	V
V_{GS}	Continuous	± 20	V
V_{GSM}	Transient	± 30	V
I_{D25}	$T_C = 25^\circ C$	60	A
I_{DM}	$T_C = 25^\circ C$, Pulse Width Limited by T_{JM}	106	A
I_A	$T_C = 25^\circ C$	30	A
E_{AS}	$T_C = 25^\circ C$	350	mJ
dv/dt	$I_S \leq I_{DM}$, $V_{DD} \leq V_{DSS}$, $T_J \leq 150^\circ C$	50	V/ns
P_D	$T_C = 25^\circ C$	250	W
T_J		-55 ... +175	$^\circ C$
T_{JM}		175	$^\circ C$
T_{stg}		-55 ... +175	$^\circ C$
T_L	Maximum Lead Temperature for Soldering 1.6 mm (0.062 in.) from Case for 10s	300	$^\circ C$
M_d	Mounting Torque	1.13 / 10	Nm/lb.in
Weight		3	g

Features

- International Standard Package
- Low $R_{DS(ON)}$ and Q_G
- Avalanche Rated
- Low Package Inductance

Advantages

- High Power Density
- Easy to Mount
- Space Savings

Applications

- Switch-Mode and Resonant-Mode Power Supplies
- DC-DC Converters
- PFC Circuits
- AC and DC Motor Drives
- Robotics and Servo Controls

Symbol	Test Conditions ($T_J = 25^\circ C$, Unless Otherwise Specified)	Characteristic Values		
		Min.	Typ.	Max.
BV_{DSS}	$V_{GS} = 0V$, $I_D = 250\mu A$	200		V
$V_{GS(th)}$	$V_{DS} = V_{GS}$, $I_D = 250\mu A$	2.5		4.5 V
I_{GSS}	$V_{GS} = \pm 20V$, $V_{DS} = 0V$			± 100 nA
I_{DSS}	$V_{DS} = V_{DSS}$, $V_{GS} = 0V$ $T_J = 150^\circ C$			5 μA 300 μA
$R_{DS(on)}$	$V_{GS} = 10V$, $I_D = 0.5 \cdot I_{D25}$, Note 1	17.6	21.0	m Ω

Symbol	Test Conditions (T _J = 25°C, Unless Otherwise Specified)	Characteristic Values		
		Min.	Typ.	Max
g_{fs}	V _{DS} = 10V, I _D = 0.5 • I _{D25} , Note 1	34	56	S
R_{Gi}	Gate Input Resistance		7.45	Ω
C_{iss}	V _{GS} = 0V, V _{DS} = 25V, f = 1MHz		2450	pF
C_{oss}			406	pF
C_{rss}			0.95	pF
Effective Output Capacitance				
C_{o(er)}	Energy related	V _{GS} = 0V V _{DS} = 0.8 • V _{DSS}	240	pF
C_{o(tr)}	Time related		880	pF
t_{d(on)}	Resistive Switching Times V _{GS} = 10V, V _{DS} = 0.5 • V _{DSS} , I _D = 0.5 • I _{D25} R _G = 5Ω (External)		13	ns
t_r			22	ns
t_{d(off)}			52	ns
t_f			10	ns
Q_{g(on)}	V _{GS} = 10V, V _{DS} = 0.5 • V _{DSS} , I _D = 0.5 • I _{D25}		33	nC
Q_{gs}			9	nC
Q_{gd}			11	nC
R_{thJC}				0.60 °C/W
R_{thCS}			0.50	°C/W

Source-Drain Diode

Symbol	Test Conditions ($T_J = 25^\circ\text{C}$, Unless Otherwise Specified)	Characteristic Values		
		Min.	Typ.	Max
I_S	$V_{GS} = 0\text{V}$			60 A
I_{SM}	Repetitive, Pulse Width Limited by T_{JM}			240 A
V_{SD}	$I_F = I_S$, $V_{GS} = 0\text{V}$, Note 1			1.4 V
t_{rr}	$I_F = 30\text{A}$, $-di/dt = 200\text{A}/\mu\text{s}$ $V_R = 100\text{V}$		107	ns
Q_{RM}			920	nC
I_{RM}			17	A

Note 1: Pulse test, $t \leq 300\mu\text{s}$, duty cycle, $d \leq 2\%$

Littelfuse reserves the right to change limits, test conditions and dimensions.

IXYS MOSFETs and IGBTs are covered by one or more of the following U.S. patents:	4,835,592	4,931,844	5,049,961	5,237,481	6,162,665	6,404,065 B1	6,683,344	6,727,585	7,005,734 B2	7,157,338B2
	4,860,072	5,017,508	5,063,307	5,381,025	6,259,123B1	6,534,343	6,710,405B2	6,759,692	7,063,975B2	
	4,881,106	5,034,796	5,187,117	5,486,715	6,306,728 B1	6,583,505	6,710,463	6,771,478 B2	7,071,537	

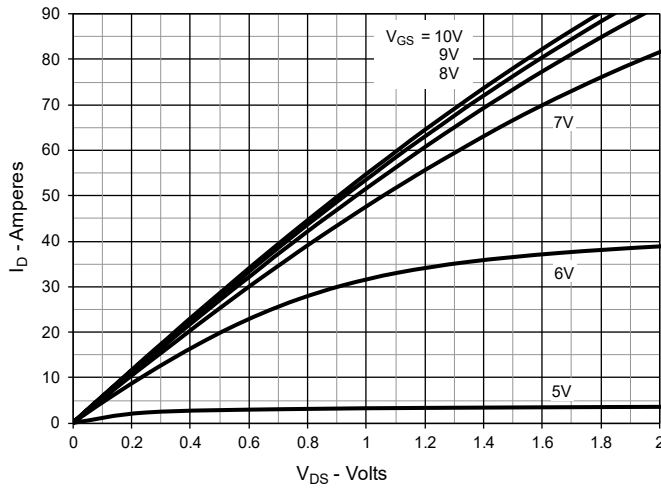
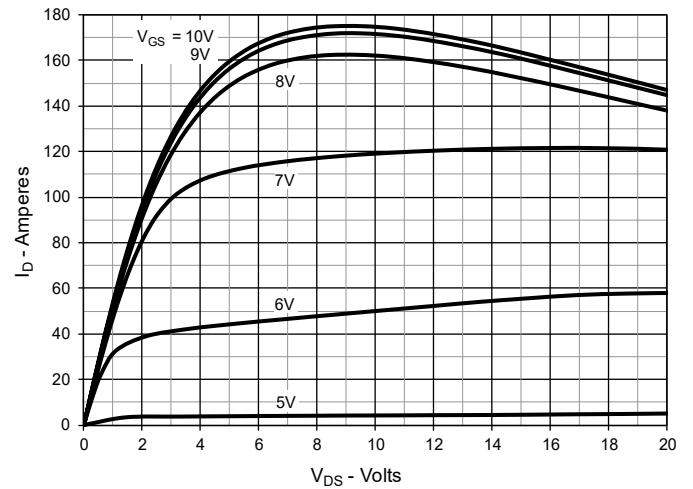
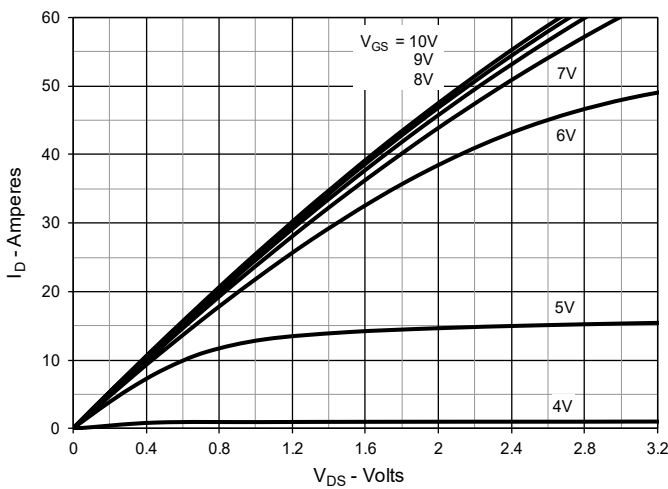
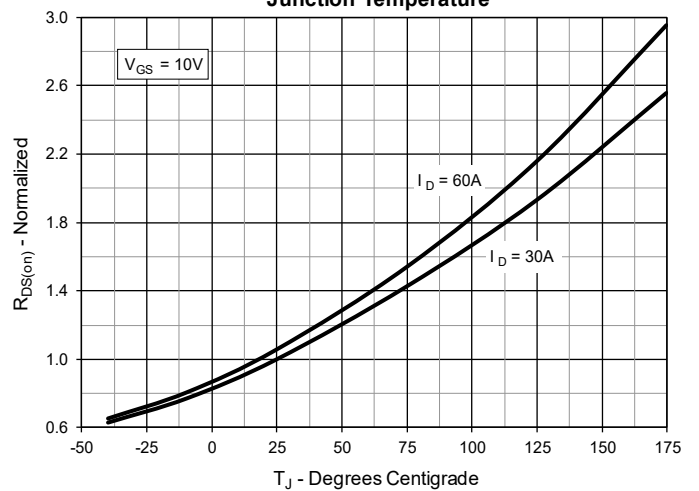
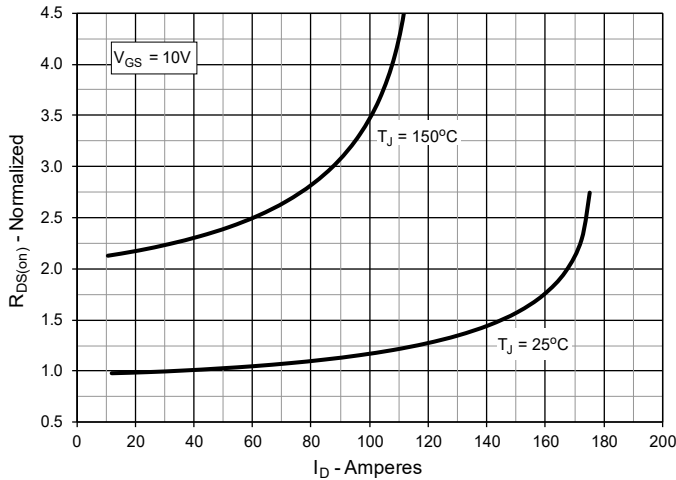
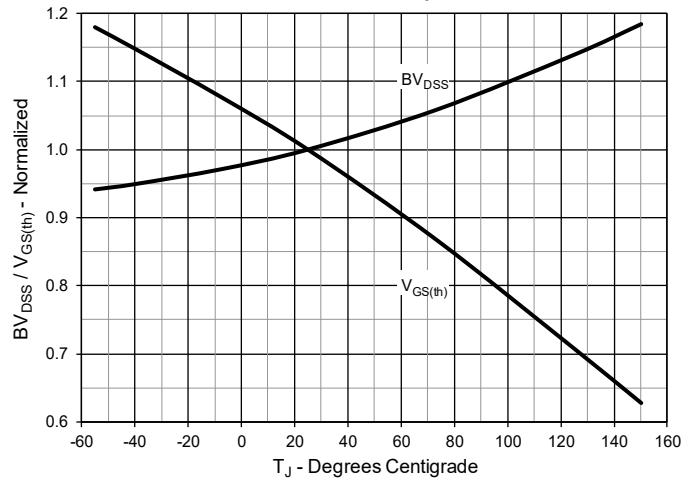
Fig. 1. Output Characteristics @ $T_J = 25^\circ\text{C}$

Fig. 2. Extended Output Characteristics @ $T_J = 25^\circ\text{C}$

Fig. 3. Output Characteristics @ $T_J = 150^\circ\text{C}$

Fig. 4. $R_{DS(on)}$ Normalized to $I_D = 30\text{A}$ Value vs. Junction Temperature

Fig. 5. $R_{DS(on)}$ Normalized to $I_D = 30\text{A}$ Value vs. Drain Current

Fig. 6. Normalized Breakdown & Threshold Voltages vs. Junction Temperature


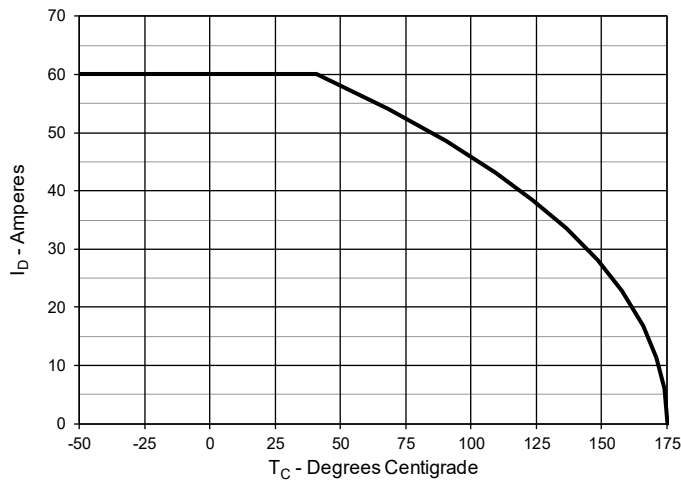
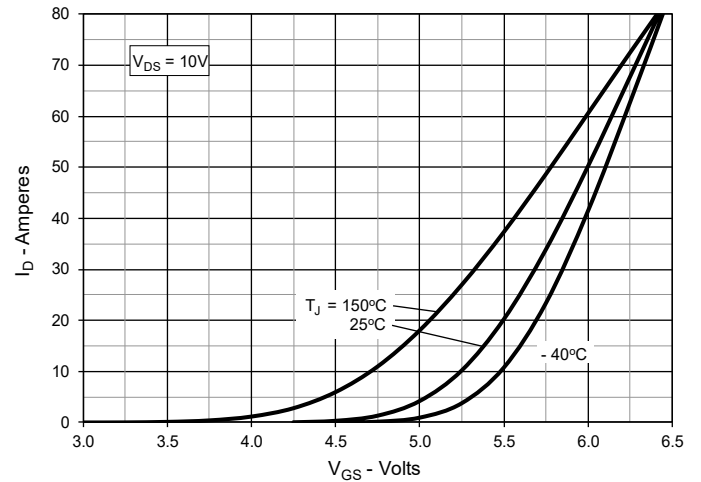
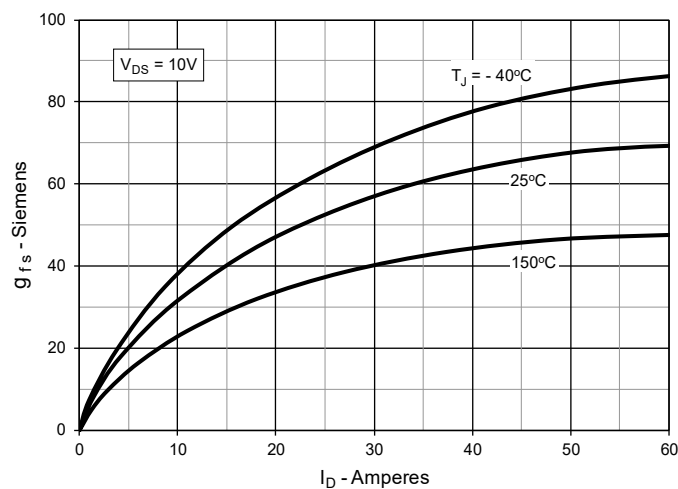
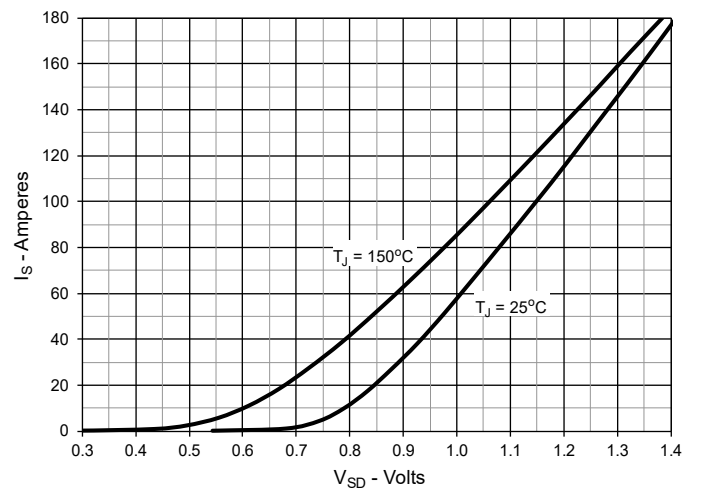
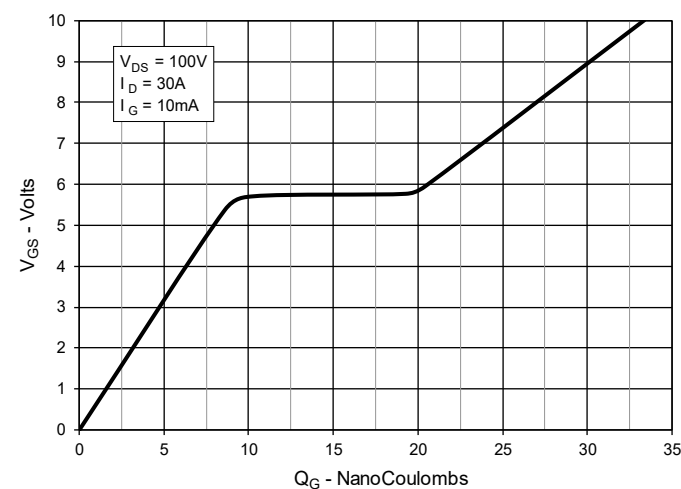
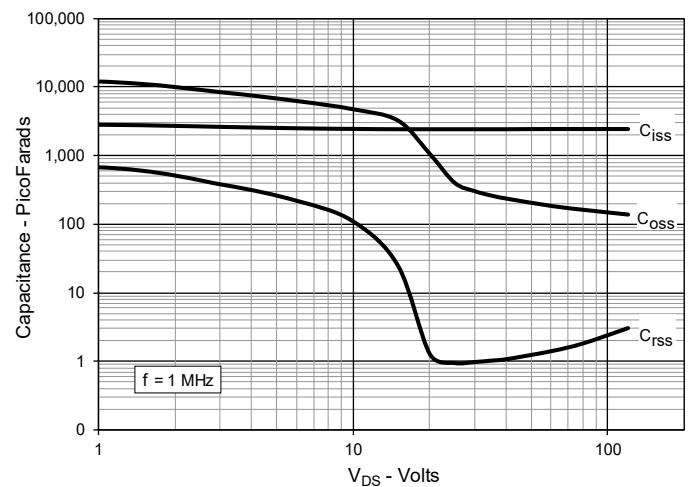
Fig. 7. Maximum Drain Current vs. Case Temperature

Fig. 8. Input Admittance

Fig. 9. Transconductance

Fig. 10. Forward Voltage Drop of Intrinsic Diode

Fig. 11. Gate Charge

Fig. 12. Capacitance


Fig. 13. Output Capacitance Stored Energy

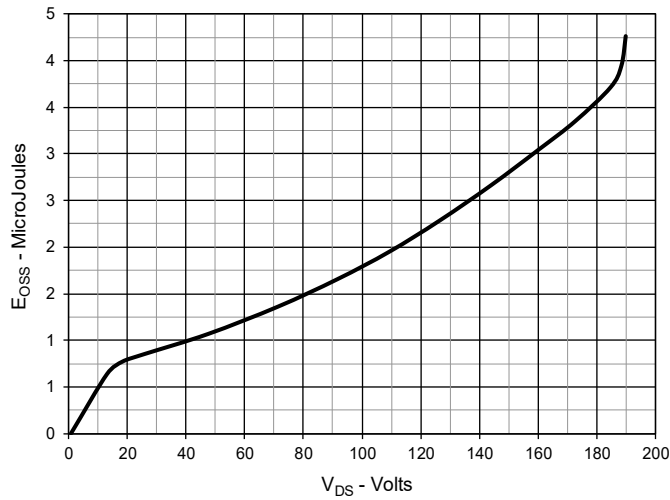


Fig. 14. Forward-Bias Safe Operating Area

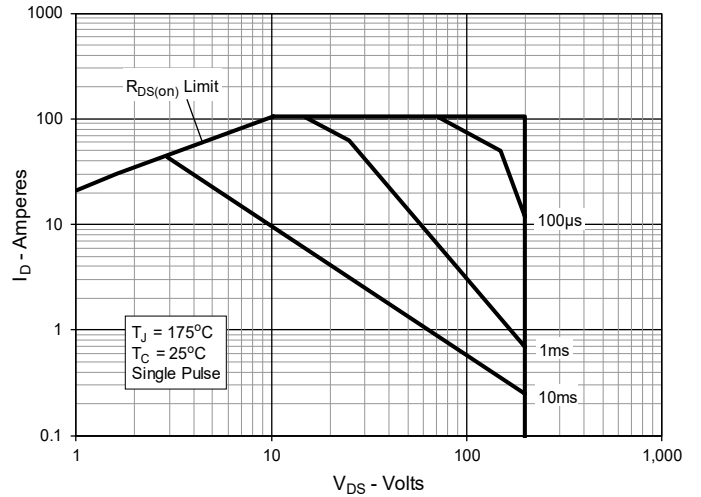
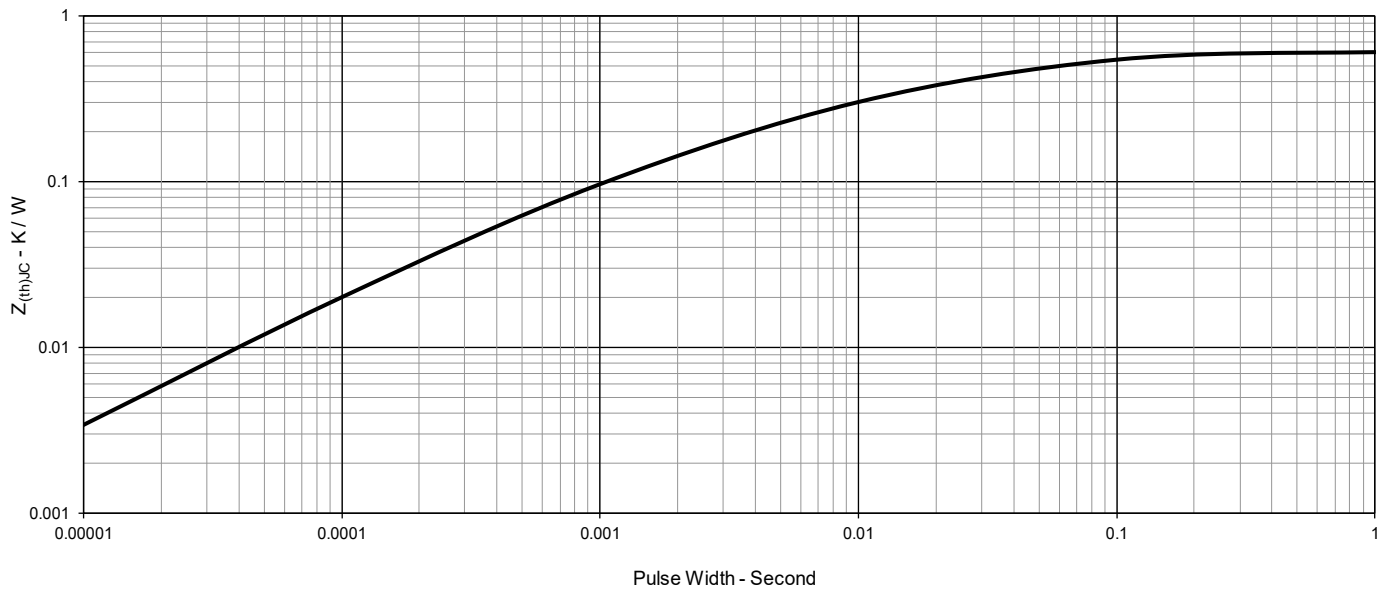
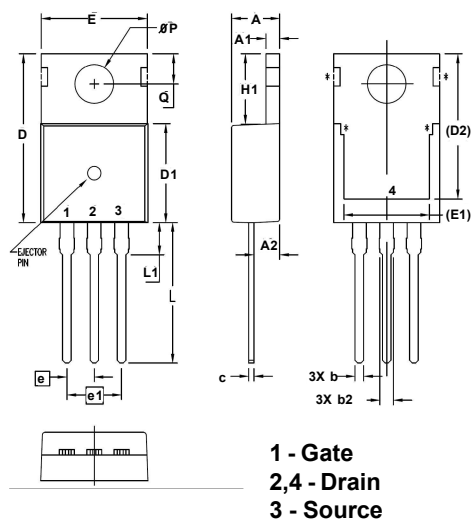


Fig. 15. Maximum Transient Thermal Impedance



TO-220 Outline


SYM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	.169	.185	4.30	4.70
A1	.047	.055	1.20	1.40
A2	.079	.106	2.00	2.70
b	.024	.039	0.60	1.00
b2	.045	.057	1.15	1.45
c	.014	.026	0.35	0.65
D	.587	.626	14.90	15.90
D1	.335	.370	8.50	9.40
(D2)	.500	.531	12.70	13.50
E	.382	.406	9.70	10.30
(E1)	.283	.323	7.20	8.20
e	.100 BSC		2.54 BSC	
e1	.200 BSC		5.08 BSC	
H1	.244	.268	6.20	6.80
L	.492	.547	12.50	13.90
L1	.110	.154	2.80	3.90
ØP	.134	.150	3.40	3.80
Q	.106	.126	2.70	3.20