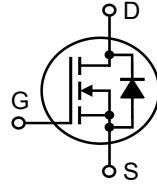


# X3-Class HiPerFET™ Power MOSFET

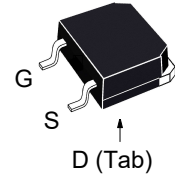
**IXFT220N20X3HV**  
**IXFH220N20X3**  
**IXFK220N20X3**

**V<sub>DSS</sub> = 200V**  
**I<sub>D25</sub> = 220A**  
**R<sub>DS(on)</sub> ≤ 6.2mΩ**

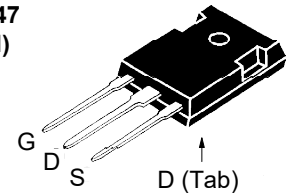
N-Channel Enhancement Mode  
Avalanche Rated



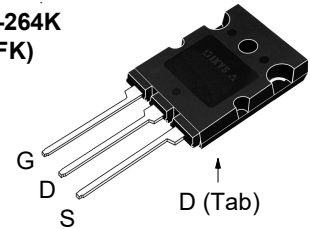
**TO-268HV  
(IXFT..HV)**



**TO-247  
(IXFH)**



**TO-264K  
(IXFK)**



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

Symbol	Test Conditions	Maximum Ratings	
V <sub>DSS</sub>	T <sub>J</sub> = 25°C to 150°C	200	V
V <sub>DGR</sub>	T <sub>J</sub> = 25°C to 150°C, R <sub>GS</sub> = 1MΩ	200	V
V <sub>GSS</sub>	Continuous	±20	V
V <sub>GSM</sub>	Transient	±30	V
I <sub>D25</sub>	T <sub>C</sub> = 25°C (Chip Capability)	220	A
I <sub>L(RMS)</sub>	External Lead Current Limit	160	A
I <sub>DM</sub>	T <sub>C</sub> = 25°C, Pulse Width Limited by T <sub>JM</sub>	500	A
I <sub>A</sub>	T <sub>C</sub> = 25°C	110	A
E <sub>AS</sub>	T <sub>C</sub> = 25°C	2.5	J
dv/dt	I <sub>S</sub> ≤ I <sub>DM</sub> , V <sub>DD</sub> ≤ V <sub>DSS</sub> , T <sub>J</sub> ≤ 150°C	50	V/ns
P <sub>D</sub>	T <sub>C</sub> = 25°C	890	W
T <sub>J</sub>		-55 ... +150	°C
T <sub>JM</sub>		150	°C
T <sub>stg</sub>		-55 ... +150	°C
T <sub>L</sub>	Maximum Lead Temperature for Soldering	300	°C
T <sub>SOLD</sub>	1.6 mm (0.062 in.) from Case for 10s	260	°C
M <sub>d</sub>	Mounting Torque (TO-247 & TO-264K)	1.13 / 10	Nm/lb.in
Weight	TO-268HV	4	g
	TO-247	6	g
	TO-264	10	g

Symbol	Test Conditions (T <sub>J</sub> = 25°C, Unless Otherwise Specified)	Characteristic Values		
		Min.	Typ.	Max.
BV <sub>DSS</sub>	V <sub>GS</sub> = 0V, I <sub>D</sub> = 1mA	200		V
V <sub>GS(th)</sub>	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 4mA	2.5		4.5 V
I <sub>GSS</sub>	V <sub>GS</sub> = ±20V, V <sub>DS</sub> = 0V			±100 nA
I <sub>DSS</sub>	V <sub>DS</sub> = V <sub>DSS</sub> , V <sub>GS</sub> = 0V T <sub>J</sub> = 125°C			10 μA 1 mA
R <sub>DS(on)</sub>	V <sub>GS</sub> = 10V, I <sub>D</sub> = 0.5 • I <sub>D25</sub> , Note 1	5.2		6.2 mΩ

## Features

- International Standard Packages
- Low R<sub>DS(ON)</sub> and Q<sub>G</sub>
- 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 ( $T_J = 25^\circ\text{C}$ , Unless Otherwise Specified)	Characteristic Values		
		Min.	Typ.	Max
$g_{fs}$	$V_{DS} = 10\text{V}$ , $I_D = 60\text{A}$ , Note 1	70	120	S
$R_{Gi}$	Gate Input Resistance		1.6	$\Omega$
$C_{iss}$	} $V_{GS} = 0\text{V}$ , $V_{DS} = 25\text{V}$ , $f = 1\text{MHz}$		13.6	nF
$C_{oss}$			2.2	nF
$C_{rss}$			9.0	pF
<b>Effective Output Capacitance</b>				
$C_{o(er)}$	Energy related } $V_{GS} = 0\text{V}$		1000	pF
$C_{o(tr)}$	Time related } $V_{DS} = 0.8 \cdot V_{DSS}$		3250	pF
$t_{d(on)}$	} <b>Resistive Switching Times</b> $V_{GS} = 10\text{V}$ , $V_{DS} = 0.5 \cdot V_{DSS}$ , $I_D = 0.5 \cdot I_{D25}$ $R_G = 5\Omega$ (External)		37	ns
$t_r$			27	ns
$t_{d(off)}$			155	ns
$t_f$			17	ns
$Q_{g(on)}$	} $V_{GS} = 10\text{V}$ , $V_{DS} = 0.5 \cdot V_{DSS}$ , $I_D = 0.5 \cdot I_{D25}$		204	nC
$Q_{gs}$			65	nC
$Q_{gd}$			47	nC
$R_{thJC}$				0.14 $^\circ\text{C/W}$
$R_{thCS}$	TO-247		0.21	$^\circ\text{C/W}$
	TO-264K		0.15	$^\circ\text{C/W}$

**Source-Drain Diode**

Symbol	Test Conditions ( $T_J = 25^\circ\text{C}$ , Unless Otherwise Specified)	Characteristic Values		
		Min.	Typ.	Max
$I_S$	$V_{GS} = 0\text{V}$			220 A
$I_{SM}$	Repetitive, Pulse Width Limited by $T_{JM}$			880 A
$V_{SD}$	$I_F = 100\text{A}$ , $V_{GS} = 0\text{V}$ , Note 1			1.4 V
$t_{rr}$	} $I_F = 110\text{A}$ , $-di/dt = 100\text{A}/\mu\text{s}$ $V_R = 100\text{V}$		128	ns
$Q_{RM}$			580	nC
$I_{RM}$			9	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.

LFMOSFETs 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	6,404,065B1	6,683,344	6,727,585	7,005,734B2	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	6,306,728B1	6,583,505	6,710,463	6,771,478B2	7,071,537	

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

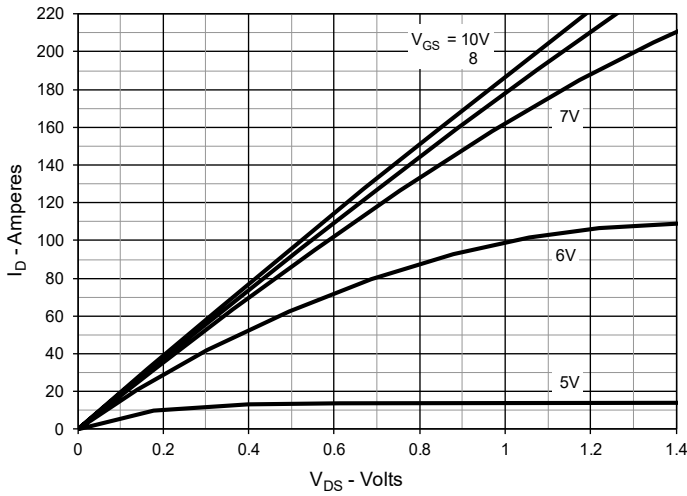


Fig. 2. Extended Output Characteristics @  $T_J = 25^\circ\text{C}$

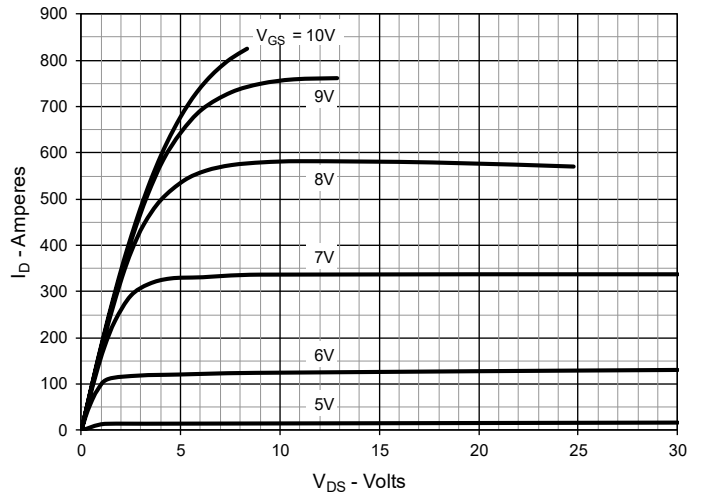


Fig. 3. Output Characteristics @  $T_J = 125^\circ\text{C}$

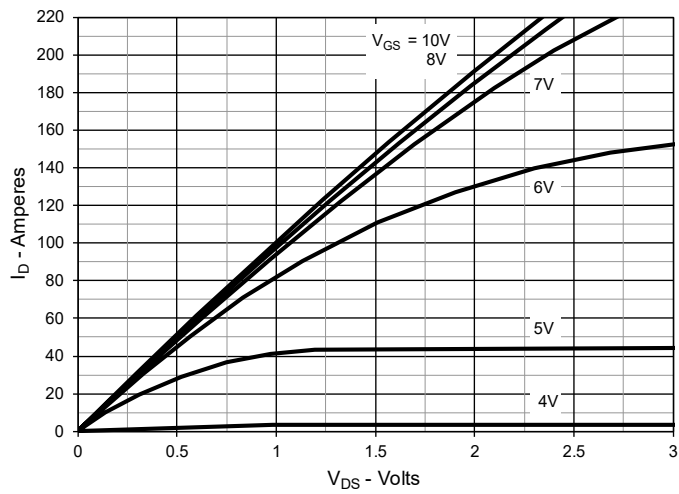


Fig. 4.  $R_{DS(on)}$  Normalized to  $I_D = 110\text{A}$  Value vs. Junction Temperature

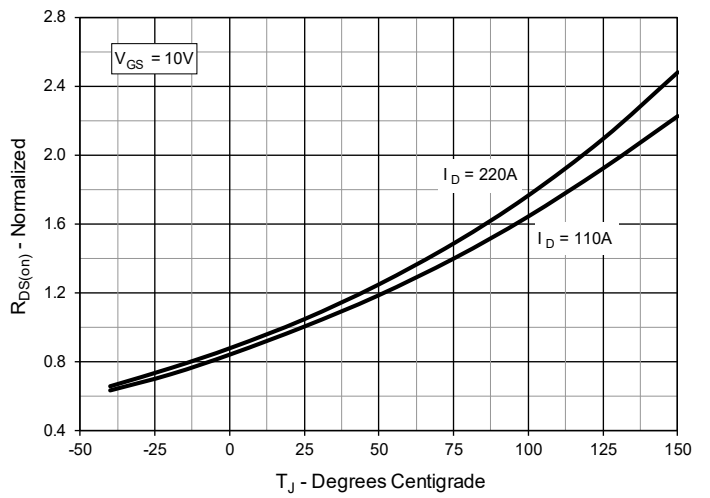


Fig. 5.  $R_{DS(on)}$  Normalized to  $I_D = 110\text{A}$  Value vs. Drain Current

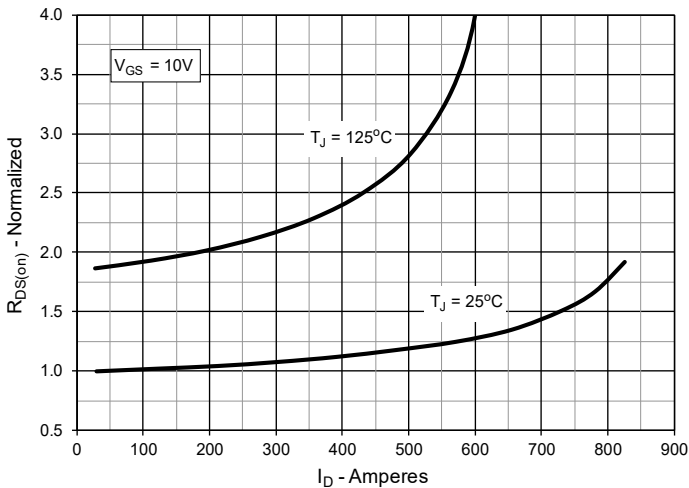


Fig. 6. Normalized Breakdown & Threshold Voltages vs. Junction Temperature

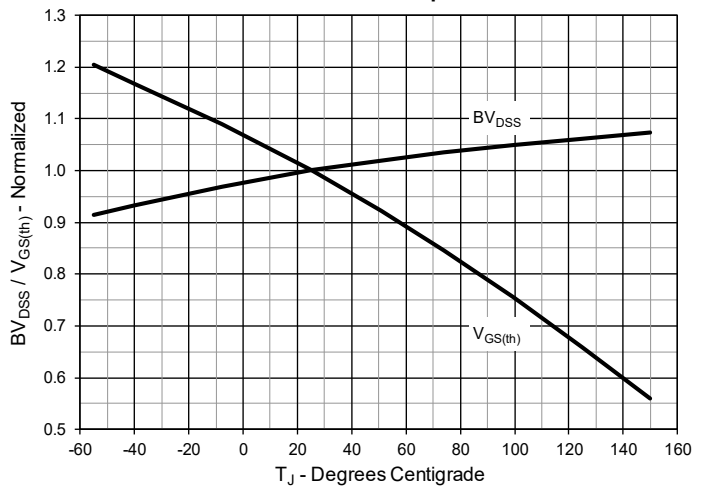


Fig. 7. Maximum Drain Current vs. Case Temperature

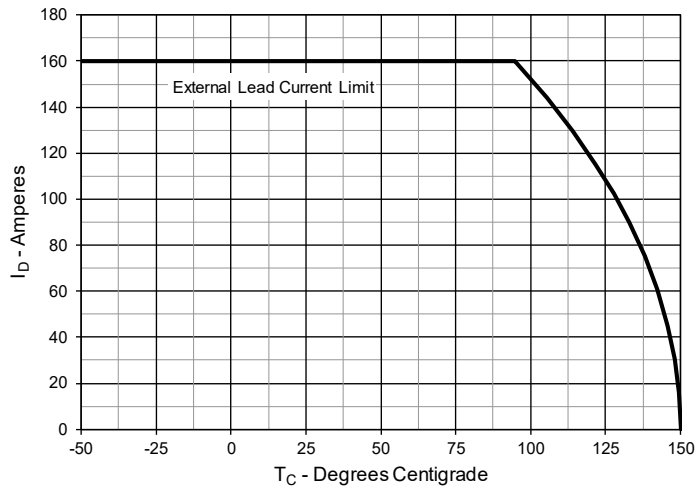


Fig. 8. Input Admittance

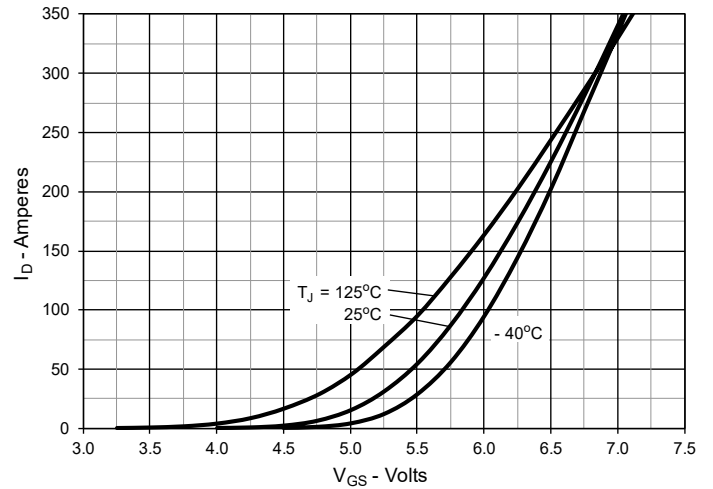


Fig. 9. Transconductance

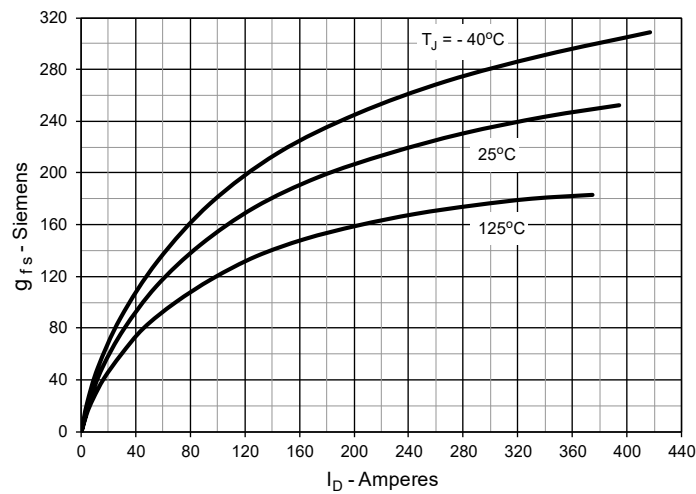


Fig. 10. Forward Voltage Drop of Intrinsic Diode

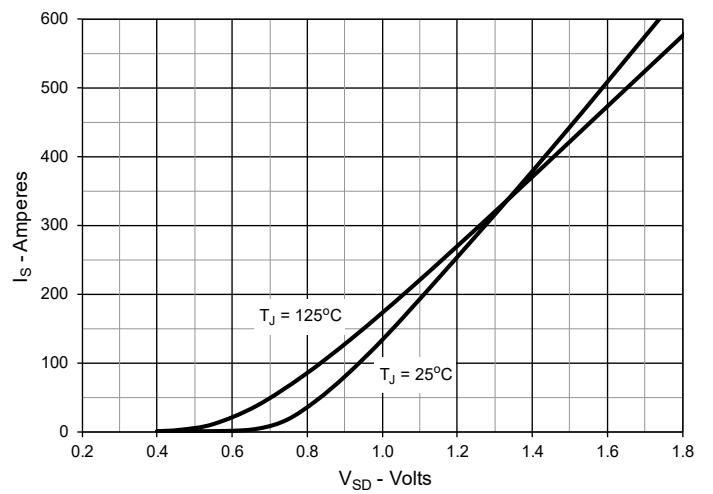


Fig. 11. Gate Charge

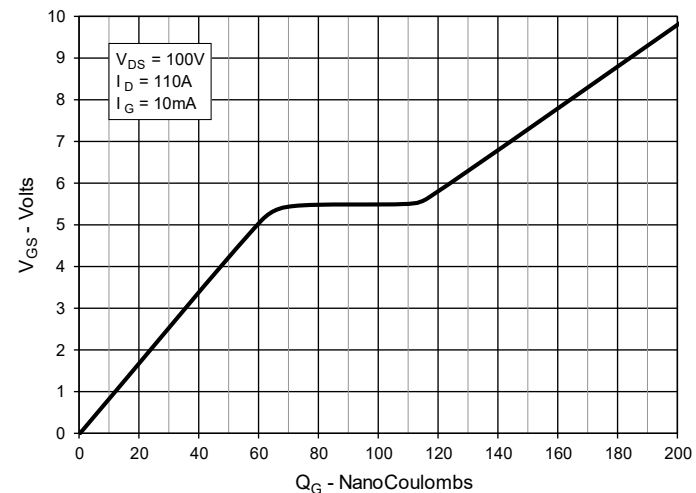


Fig. 12. Capacitance

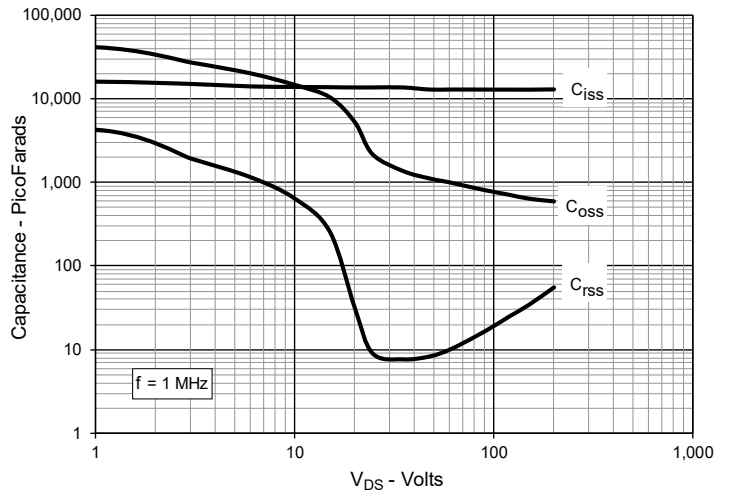


Fig. 13. Output Capacitance Stored Energy

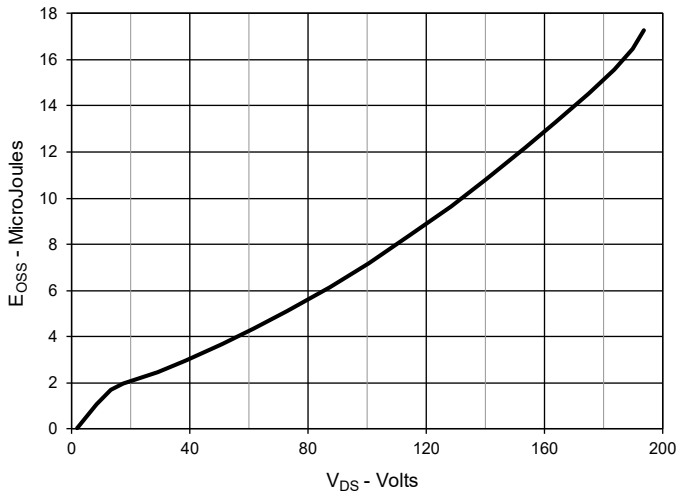


Fig. 14. Forward-Bias Safe Operating Area

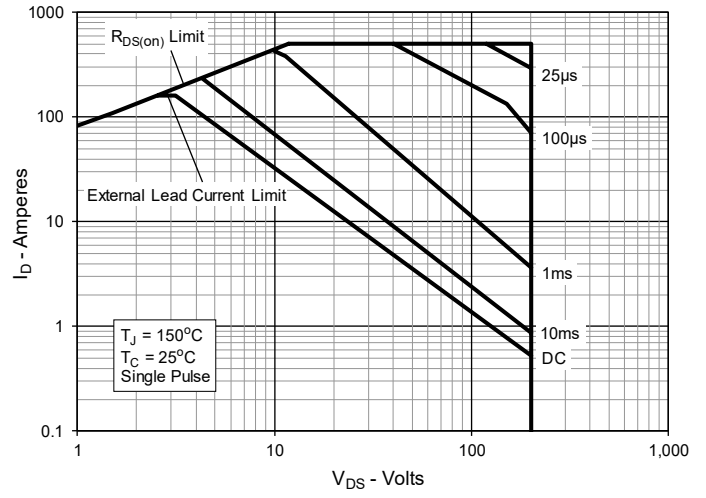
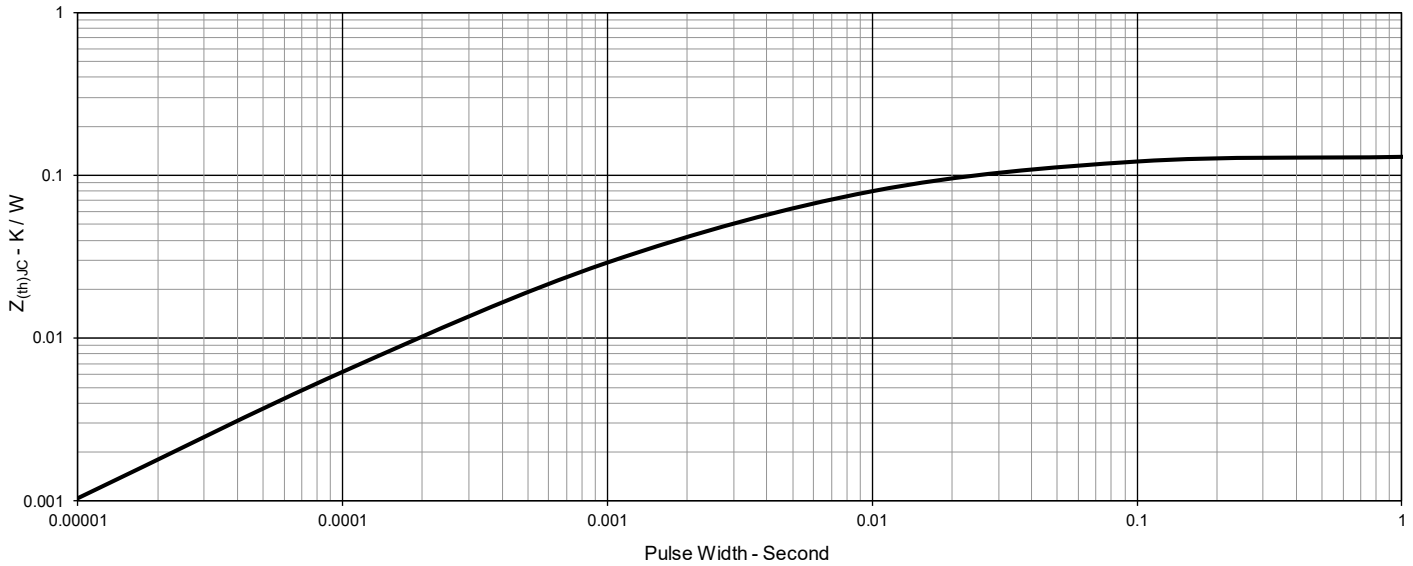
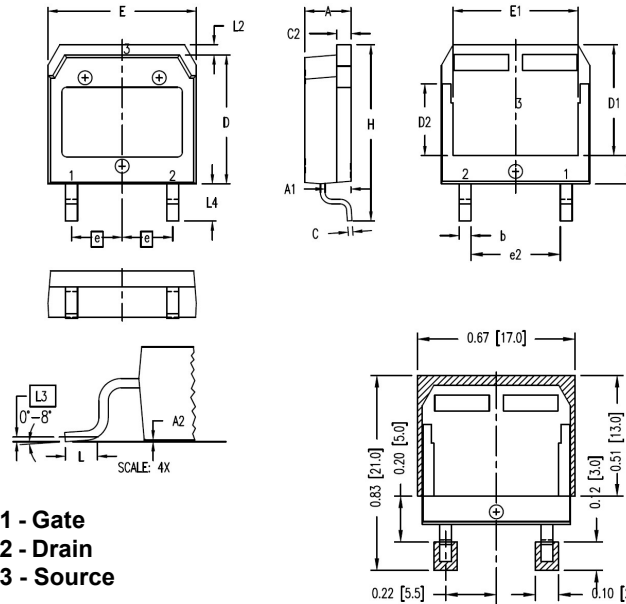


Fig. 15. Maximum Transient Thermal Impedance

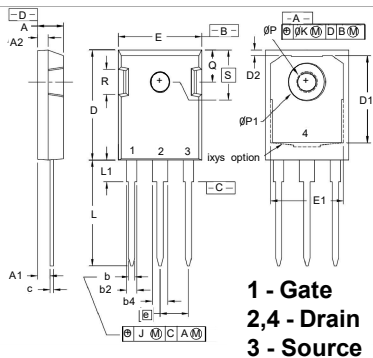


**TO-268HV Outline**



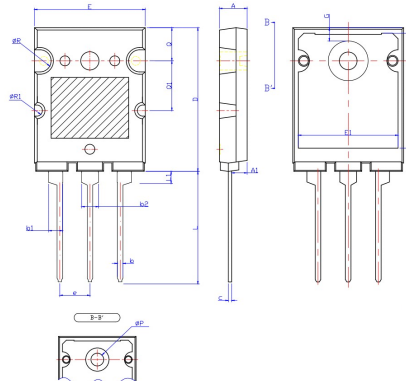
SYM	INCHES		MILLIMETER	
	MIN	MAX	MIN	MAX
A	.193	.201	4.90	5.10
A1	.106	.114	2.70	2.90
A2	.001	.010	0.02	0.25
b	.045	.057	1.15	1.45
C	.016	.026	0.40	0.65
C2	.057	.063	1.45	1.60
D	.543	.551	13.80	14.00
D1	.465	.476	11.80	12.10
D2	.295	.307	7.50	7.80
D3	.114	.126	2.90	3.20
E	.624	.632	15.85	16.05
E1	.524	.535	13.30	13.60
e	.215 BSC		5.45 BSC	
(e2)	.374	.386	9.50	9.80
H	.736	.752	18.70	19.10
L	.067	.079	1.70	2.00
L2	.039	.045	1.00	1.15
L3	.010 BSC		0.25 BSC	
L4	.150	.161	3.80	4.10

**TO-247 Outline**



SYM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	.190	.205	4.83	5.21
A1	.090	.100	2.29	2.54
A2	.075	.085	1.91	2.16
b	.045	.055	1.14	1.40
b2	.075	.087	1.91	2.20
b4	.115	.126	2.92	3.20
C	.024	.031	0.61	0.80
D	.819	.840	20.80	21.34
D1	.650	.690	16.51	17.53
D2	.035	.050	0.89	1.27
E	.620	.635	15.75	16.13
E1	.545	.565	13.84	14.35
e	.215 BSC		5.45 BSC	
J	--	.010	--	0.25
K	--	.025	--	0.64
L	.780	.810	19.81	20.57
L1	.150	.170	3.81	4.32
øP	.140	.144	3.55	3.65
øP1	.275	.290	6.99	7.37
Q	.220	.244	5.59	6.20
R	.170	.190	4.32	4.83
S	.242 BSC		6.15 BSC	

**TO-264K Outline**



SYM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.189	0.205	4.80	5.20
A1	0.098	0.122	2.50	3.10
b	0.035	0.049	0.90	1.25
b1	0.091	0.106	2.30	2.70
b2	0.110	0.126	2.80	3.20
c	0.020	0.033	0.50	0.85
D	1.016	1.031	25.80	26.20
E	0.780	0.795	19.80	20.20
e	0.203	0.226	5.15	5.75
L	0.768	0.807	19.50	20.50
L1	0.094	0.102	2.40	2.60
øP	0.118	0.134	3.00	3.40
Q	0.228	0.244	5.80	6.20
Q1	0.346	0.362	8.80	9.20
E1	0.701	0.717	17.80	18.20
D1	0.811	0.827	20.60	21.00
G	0.087	0.102	2.20	2.60
øR	0.079		2.00	
øR1	0.039		1.00	



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