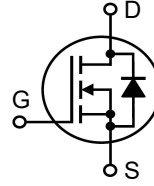


**X3-Class  
HiPerFET™  
Power MOSFET**

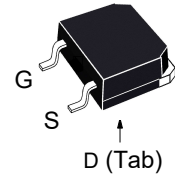
**IXFT60N60X3HV**

**V<sub>DSS</sub> = 600V**  
**I<sub>D25</sub> = 60A**  
**R<sub>DS(on)</sub> ≤ 51mΩ**

N-Channel Enhancement Mode  
Avalanche Rated



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



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   | 600             | V    |
| V <sub>DGR</sub>  | T <sub>J</sub> = 25°C to 150°C, R <sub>GS</sub> = 1MΩ  | 600             | 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  | 60              | A    |
| I <sub>DM</sub>   | T <sub>C</sub> = 25°C, Pulse Width Limited by T <sub>JM</sub>                                  | 90              | A    |
| I <sub>A</sub>    | T <sub>C</sub> = 25°C  | 12              | A    |
| E <sub>AS</sub>   | T <sub>C</sub> = 25°C  | 1.7             | 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  | 625             | W    |
| T <sub>J</sub>    |  | -55 ... +150    | °C   |
| T <sub>JM</sub>   |  | 150             | °C   |
| T <sub>stg</sub>  |  | -55 ... +150    | °C   |
| T <sub>SOLD</sub> | Plastic Body for 10s   | 260             | °C   |
| Weight            |  | 4               | g    |

**Features**

- International Standard Package
- 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<br>(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  | 600                   |      | V               |
| V <sub>GS(th)</sub> | V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 4mA                            | 3.5                   |      | 5.0 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<br>T <sub>J</sub> = 125°C |                       |      | 35 μA<br>1.5 mA |
| R <sub>DS(on)</sub> | V <sub>GS</sub> = 10V, I <sub>D</sub> = 0.5 • I <sub>D25</sub> , Note 1             |                       |      | 51 mΩ           |

| Symbol                              | Test Conditions<br>( $T_J = 25^\circ\text{C}$ , Unless Otherwise Specified)                                      | Characteristic Values                                  |      |                         |
|-------------------------------------|--|--|------|-------------------------|
|                                     |  | Min.   | Typ. | Max                     |
| $g_{fs}$                            | $V_{DS} = 10\text{V}$ , $I_D = 0.5 \cdot I_{D25}$ , Note 1   | 20   | 34   | S                       |
| $R_{Gi}$                            | Gate Input Resistance  |  | 2.7  | $\Omega$                |
| $C_{iss}$                           | } $V_{GS} = 0\text{V}$ , $V_{DS} = 25\text{V}$ , $f = 1\text{MHz}$   |  | 3450 | pF                      |
| $C_{oss}$                           |  |  | 5200 | pF                      |
| $C_{rss}$                           |  |  | 53   | pF                      |
| <b>Effective Output Capacitance</b> |  |  |      |                         |
| $C_{o(er)}$                         | Energy related   | } $V_{GS} = 0\text{V}$<br>$V_{DS} = 0.8 \cdot V_{DSS}$ | 170  | pF                      |
| $C_{o(tr)}$                         | Time related   |  | 830  | pF                      |
| <b>Resistive Switching Times</b>    |  |  |      |                         |
| $t_{d(on)}$                         | } $V_{GS} = 10\text{V}$ , $V_{DS} = 0.5 \cdot V_{DSS}$ , $I_D = 0.5 \cdot I_{D25}$<br>$R_G = 3\Omega$ (External) |  | 35   | ns                      |
| $t_r$                               |  |  | 18   | ns                      |
| $t_{d(off)}$                        |  |  | 76   | ns                      |
| $t_f$                               |  |  | 5    | ns                      |
| $Q_{g(on)}$                         | } $V_{GS} = 10\text{V}$ , $V_{DS} = 0.5 \cdot V_{DSS}$ , $I_D = 0.5 \cdot I_{D25}$                               |  | 51   | nC                      |
| $Q_{gs}$                            |  |  | 19   | nC                      |
| $Q_{gd}$                            |  |  | 17   | nC                      |
| $R_{thJC}$                          |  |  |      | 0.20 $^\circ\text{C/W}$ |

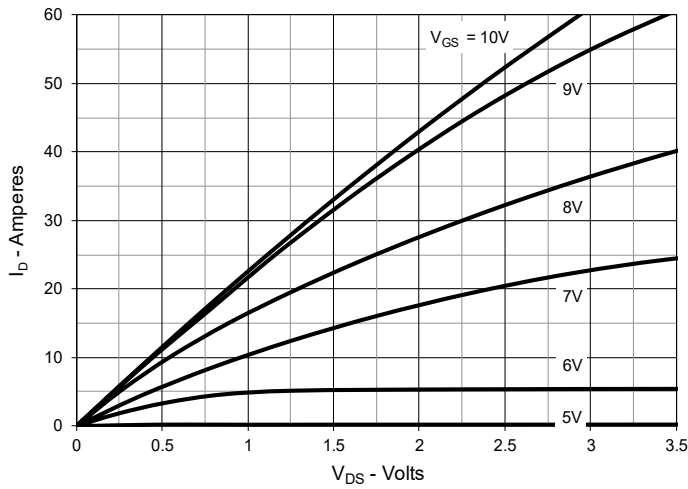
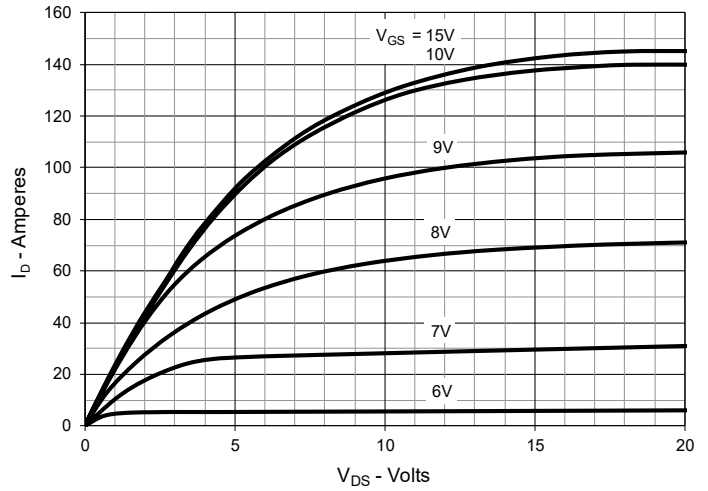
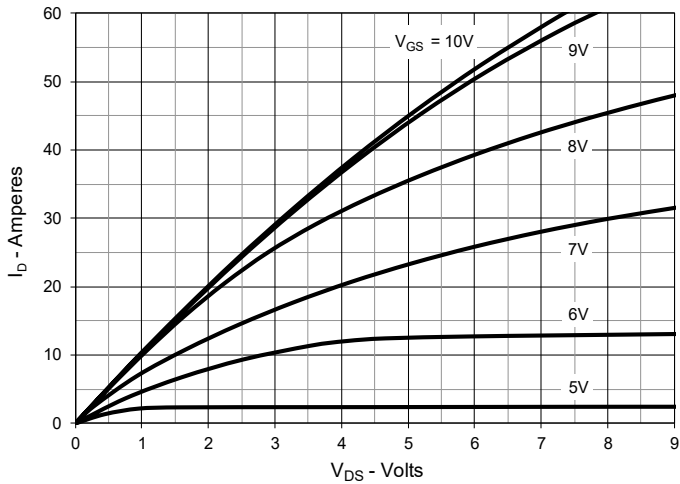
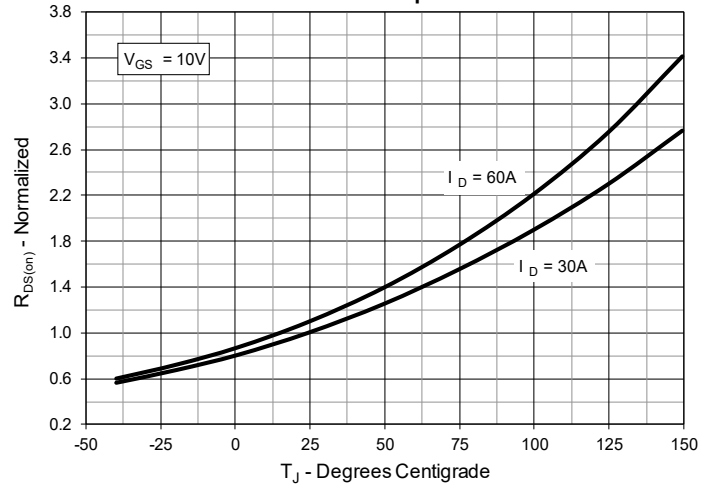
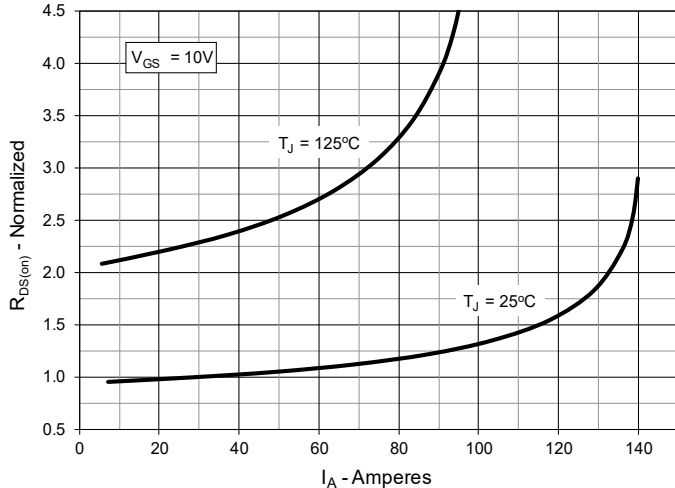
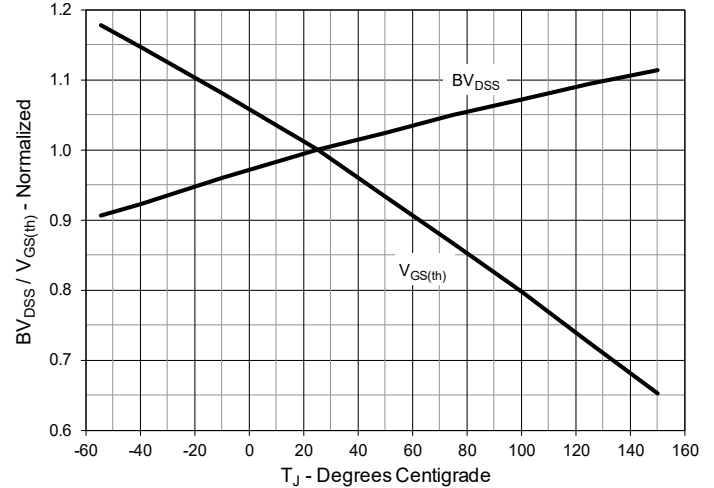
**Source-Drain Diode**

| Symbol   | Test Conditions<br>( $T_J = 25^\circ\text{C}$ , 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         |
| $t_{rr}$ | } $I_F = 30\text{A}$ , $-di/dt = 200\text{A}/\mu\text{s}$<br>$V_R = 100\text{V}$ |                       | 175  | ns            |
| $Q_{RM}$ |  |                       | 2.7  | $\mu\text{C}$ |
| $I_{RM}$ |  |                       | 31.0 | A             |

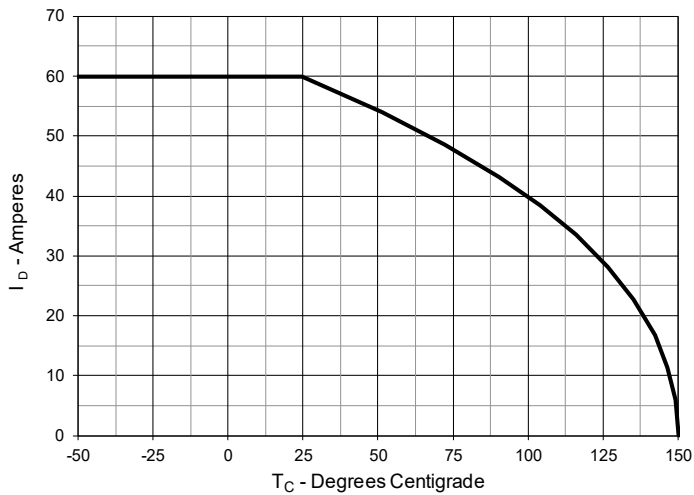
Note 1. Pulse test,  $t \leq 300\mu\text{s}$ , duty cycle,  $d \leq 2\%$ .

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

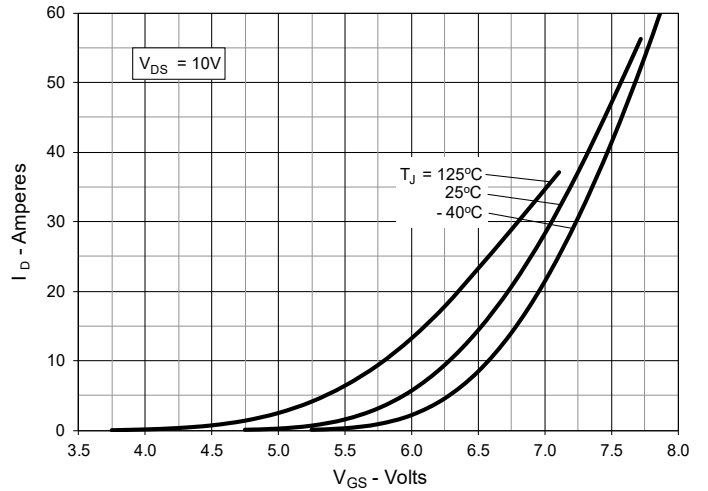
|  |           |           |           |           |             |             |             |             |             |             |
|--|-----------|-----------|-----------|-----------|-------------|-------------|-------------|-------------|-------------|-------------|
| IXYS MOSFETs and IGBTs are 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   | 6,404,065B1 | 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  $I_D = 30\text{A}$  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**


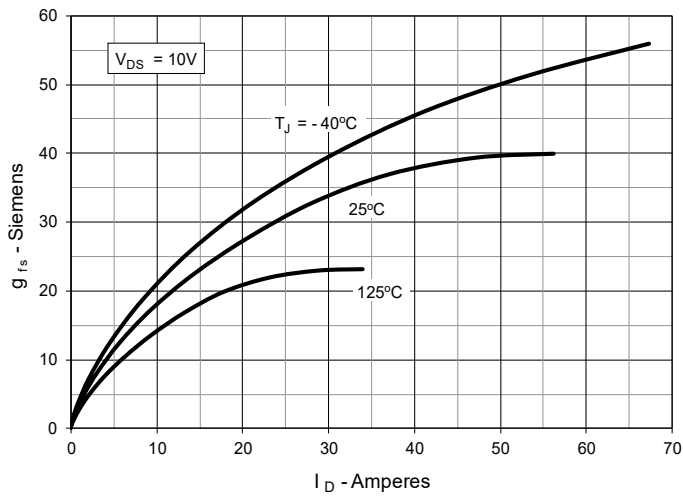
**Fig. 7. Maximum Drain Current vs. Case Temperature**



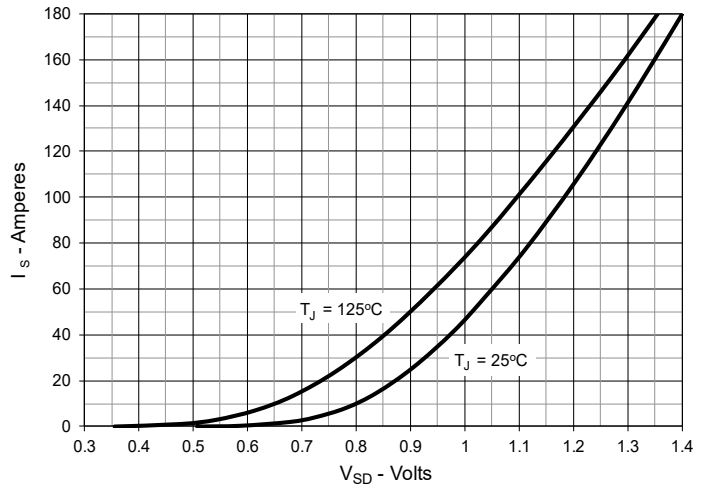
**Fig. 8. Input Admittance**



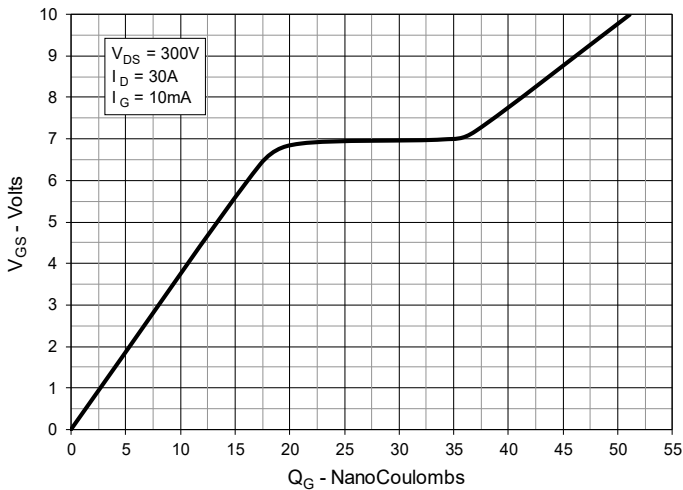
**Fig. 9. Transconductance**



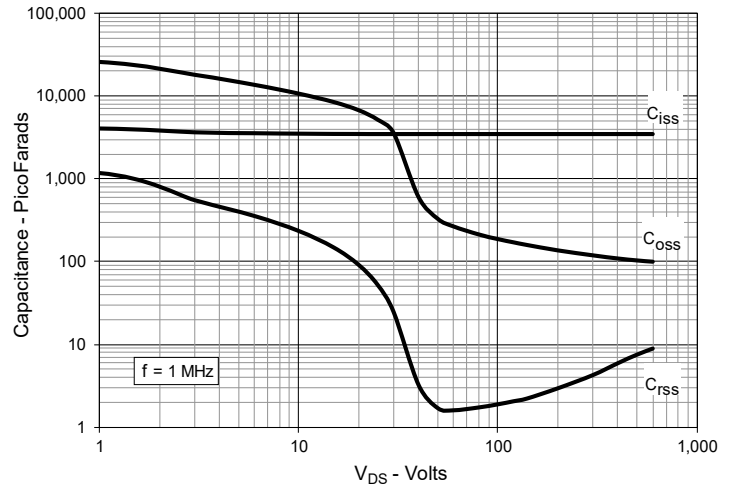
**Fig. 10. Forward Voltage Drop of Intrinsic Diode**



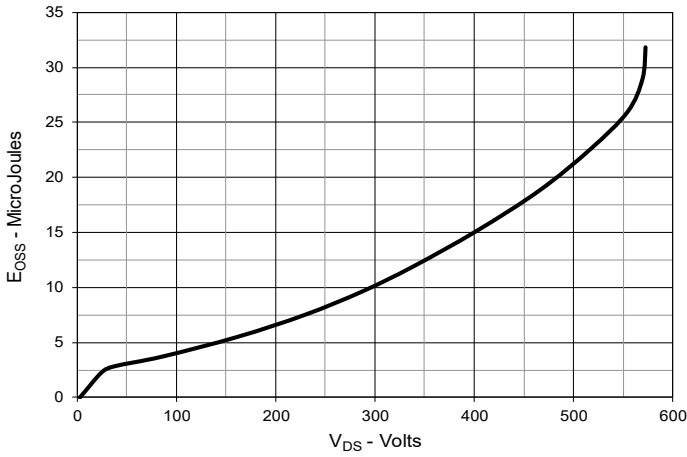
**Fig. 11. Gate Charge**



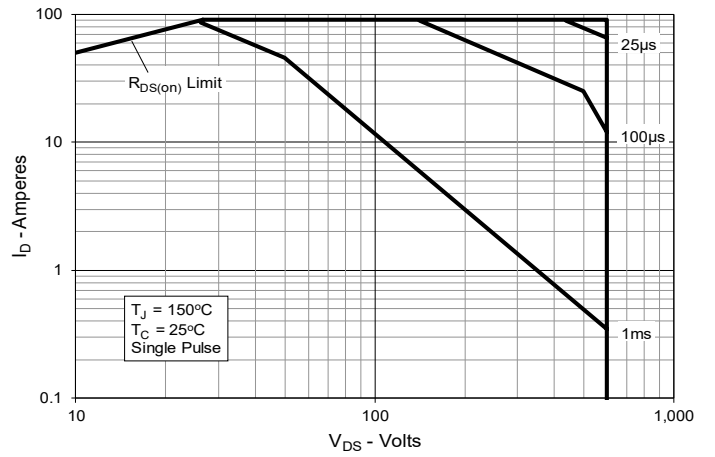
**Fig. 12. Capacitance**



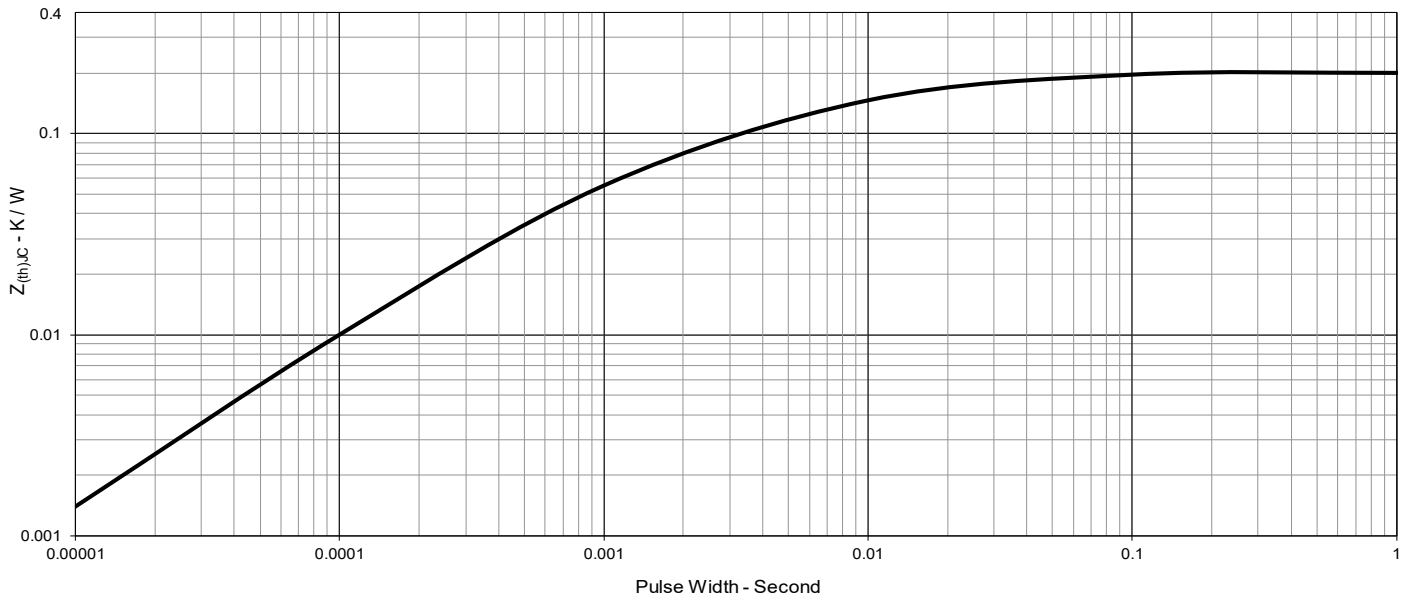
**Fig. 13. Output Capacitance Stored Energy**

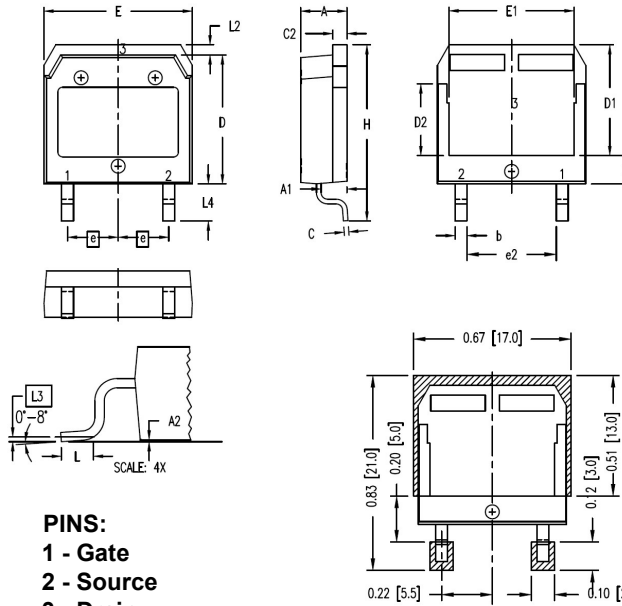


**Fig. 14. Forward-Bias Safe Operating Area**



**Fig. 15. Maximum Transient Thermal Impedance**



**TO-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 |
| <b>e</b>  | .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  |
| <b>L3</b> | .010 BSC |      | 0.25 BSC   |       |
| L4        | .150     | .161 | 3.80       | 4.10  |



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