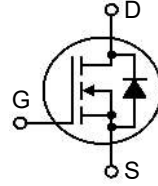


**X3-Class  
HiPerFET™  
Power MOSFET**

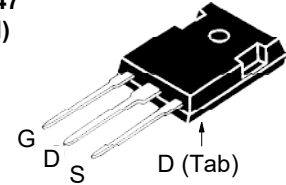
**IXFH98N60X3**

**V<sub>DSS</sub> = 600V**  
**I<sub>D25</sub> = 98A**  
**R<sub>DS(on)</sub> ≤ 30mΩ**

N-Channel Enhancement Mode  
Avalanche Rated



**TO-247  
(IXFH)**



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  | 98              | A        |
| I <sub>DM</sub>  | T <sub>C</sub> = 25°C, Pulse Width Limited by T <sub>JM</sub>                                  | 160             | A        |
| I <sub>A</sub>   | T <sub>C</sub> = 25°C  | 20              | A        |
| E <sub>AS</sub>  | T <sub>C</sub> = 25°C  | 2.8             | 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  | 960             | 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<br>1.6 mm (0.062 in.) from Case for 10s                 | 300             | °C       |
| M <sub>d</sub>   | Mounting Torque  | 1.13 / 10       | Nm/lb.in |
| Weight           |  | 6               | 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 |                       |      | 50 μA<br>2.5 mA |
| R <sub>DS(on)</sub> | V <sub>GS</sub> = 10V, I <sub>D</sub> = 0.5 • I <sub>D25</sub> , Note 1             |                       |      | 30 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   | 38                    | 64    | S                       |
| $R_{Gi}$                            | Gate Input Resistance  |                       | 2.0   | $\Omega$                |
| $C_{iss}$                           | } $V_{GS} = 0\text{V}$ , $V_{DS} = 25\text{V}$ , $f = 1\text{MHz}$   |                       | 6250  | pF                      |
| $C_{oss}$                           |  |                       | 10000 | pF                      |
| $C_{rss}$                           |  |                       | 41    | pF                      |
| <b>Effective Output Capacitance</b> |  |                       |       |                         |
| $C_{o(er)}$                         | Energy related } $V_{GS} = 0\text{V}$  |                       | 285   | pF                      |
| $C_{o(tr)}$                         | Time related } $V_{DS} = 0.8 \cdot V_{DSS}$  |                       | 1560  | 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>$R_G = 2\Omega$ (External) |                       | 35    | ns                      |
| $t_r$                               |  |                       | 13    | ns                      |
| $t_{d(off)}$                        |  |                       | 76    | ns                      |
| $t_f$                               |  |                       | 6     | ns                      |
| $Q_{g(on)}$                         | } $V_{GS} = 10\text{V}$ , $V_{DS} = 0.5 \cdot V_{DSS}$ , $I_D = 0.5 \cdot I_{D25}$                               |                       | 90    | nC                      |
| $Q_{gs}$                            |  |                       | 31    | nC                      |
| $Q_{gd}$                            |  |                       | 25    | nC                      |
| $R_{thJC}$                          |  |                       |       | 0.13 $^\circ\text{C/W}$ |
| $R_{thCS}$                          |  | 0.21                  |       | $^\circ\text{C/W}$      |

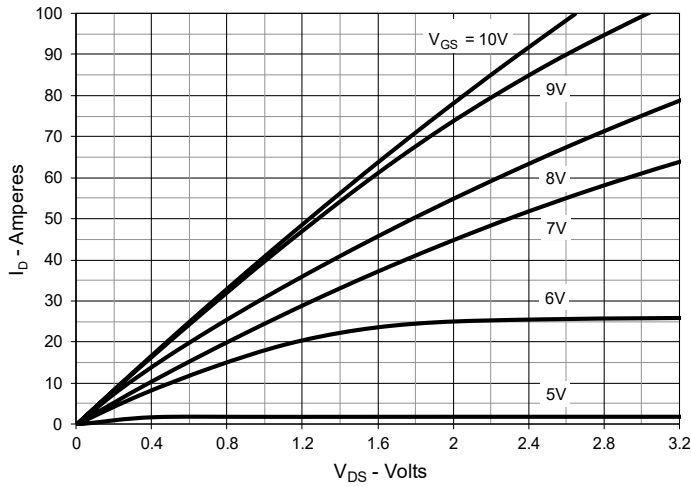
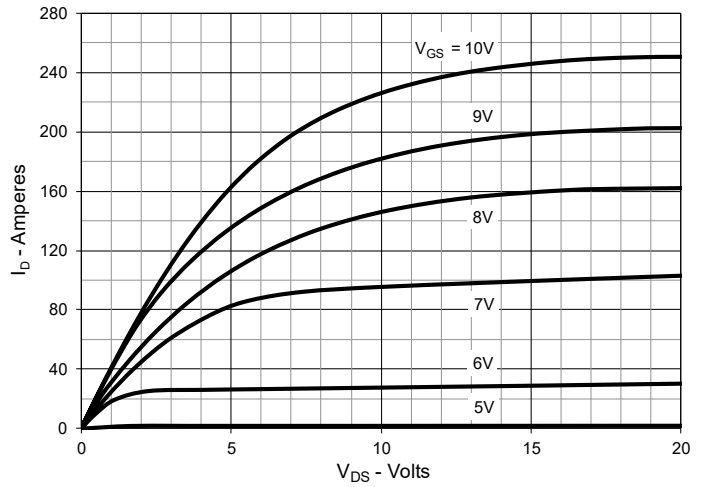
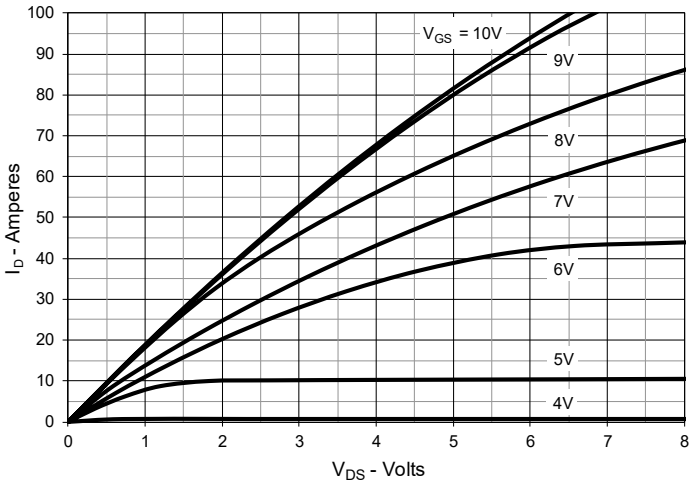
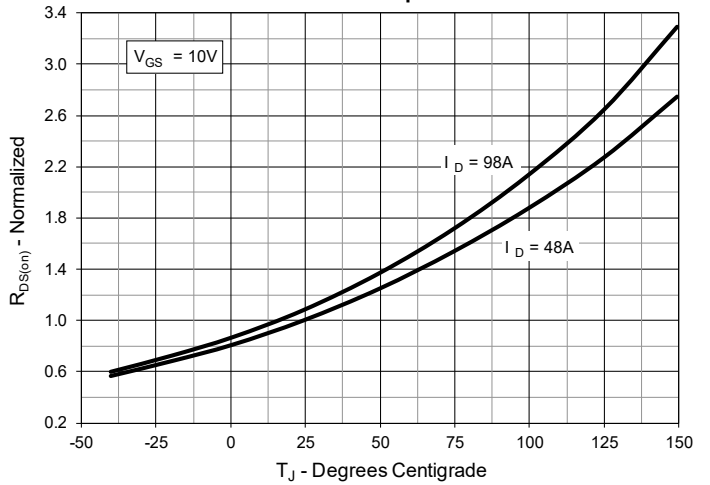
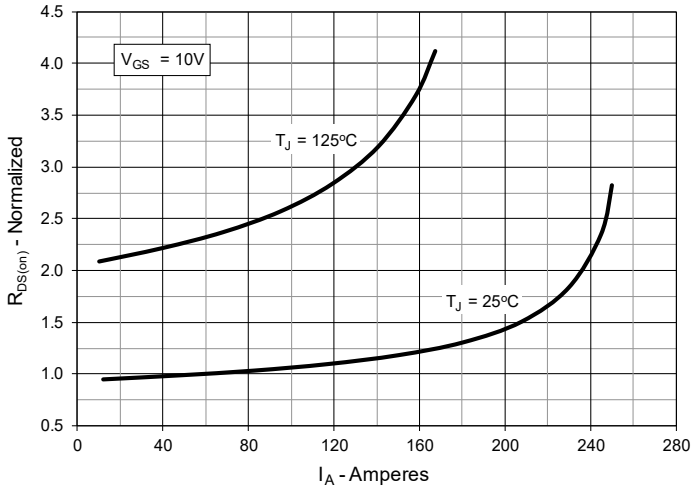
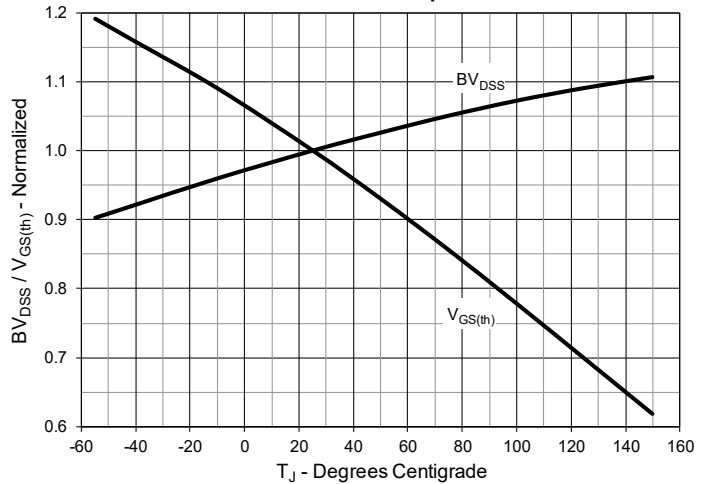
**Source-Drain Diode**

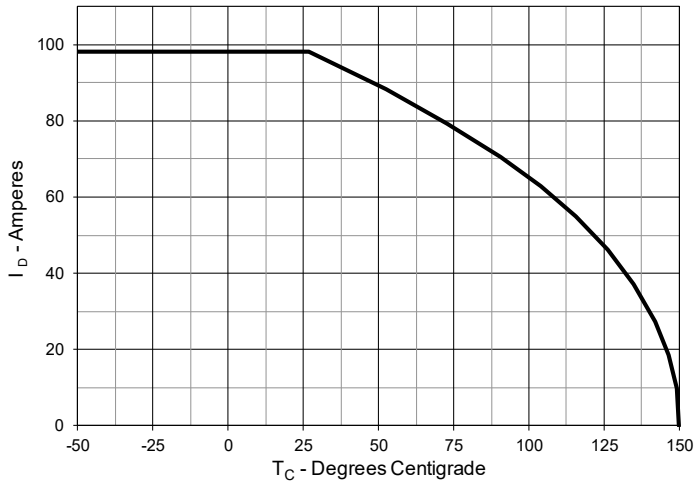
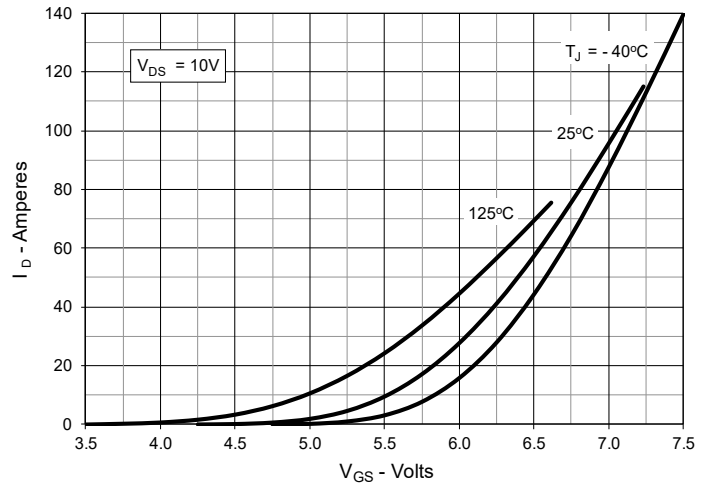
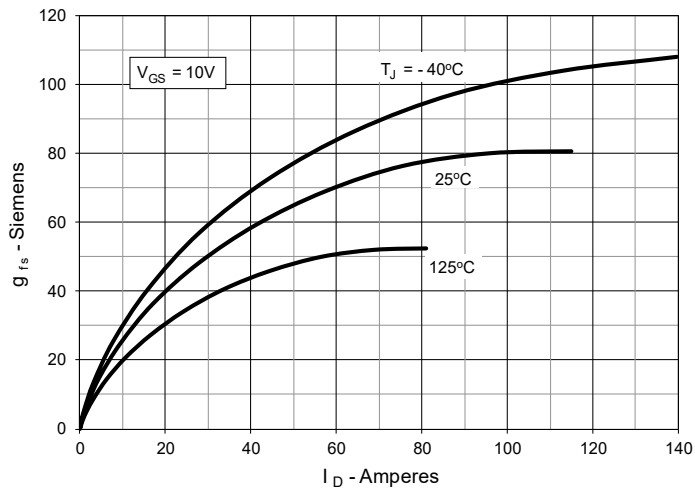
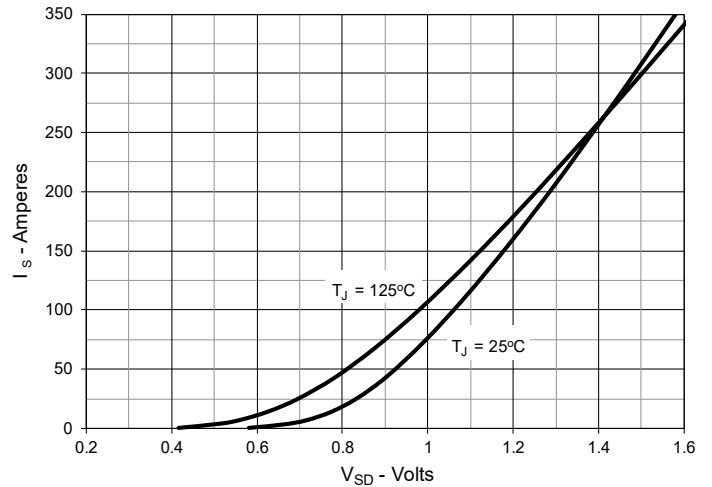
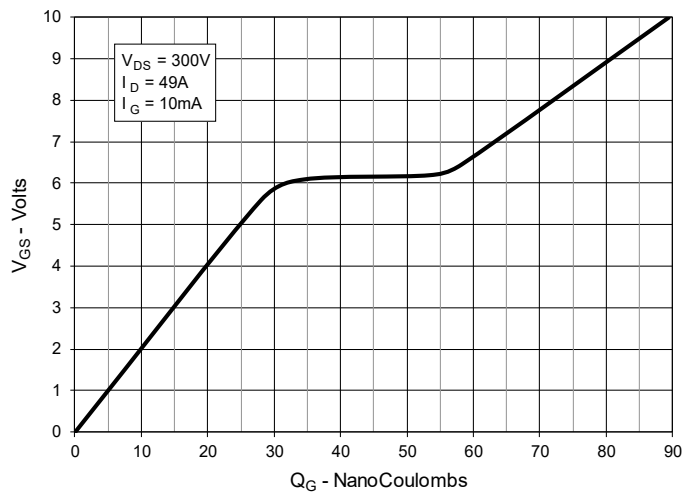
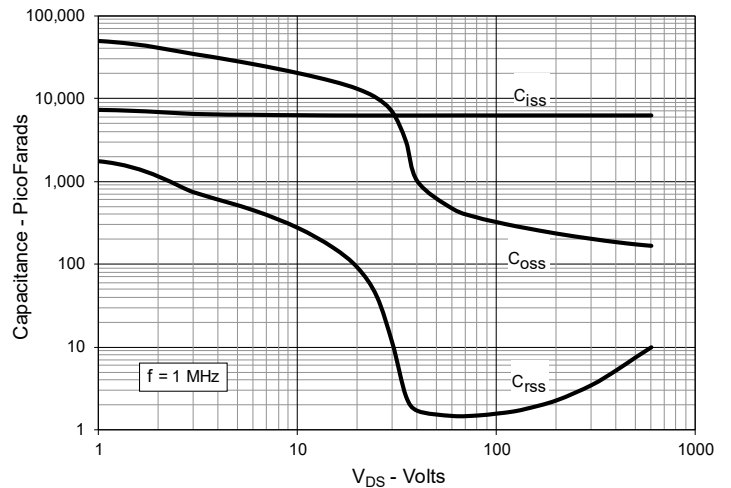
| Symbol   | Test Conditions<br>( $T_J = 25^\circ\text{C}$ , Unless Otherwise Specified)      | Characteristic Values |      |               |
|----------|--|-----------------------|------|---------------|
|          |  | Min.                  | Typ. | Max           |
| $I_S$    | $V_{GS} = 0\text{V}$   |                       |      | 98 A          |
| $I_{SM}$ | Repetitive, Pulse Width Limited by $T_{JM}$                                      |                       |      | 392 A         |
| $V_{SD}$ | $I_F = I_S$ , $V_{GS} = 0\text{V}$ , Note 1                                      |                       |      | 1.4 V         |
| $t_{rr}$ | } $I_F = 49\text{A}$ , $-di/dt = 200\text{A}/\mu\text{s}$<br>$V_R = 100\text{V}$ |                       | 220  | ns            |
| $Q_{RM}$ |  |                       | 4.1  | $\mu\text{C}$ |
| $I_{RM}$ |  |                       | 37.6 | A             |

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

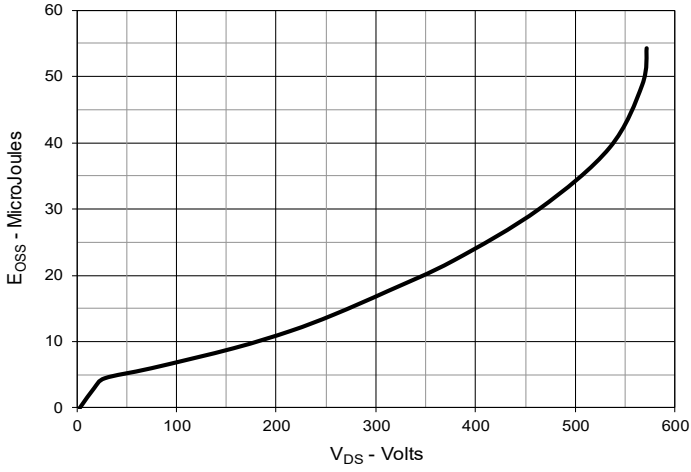
Littelfuse reserves the right to change limits, test conditions and dimensions.

|   |           |           |           |           |             |             |             |             |             |             |
|---|-----------|-----------|-----------|-----------|-------------|-------------|-------------|-------------|-------------|-------------|
| IXYS MOSFETs and IGBTs are covered            | 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 |
| by one or more of the following U.S. patents: | 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   |             |

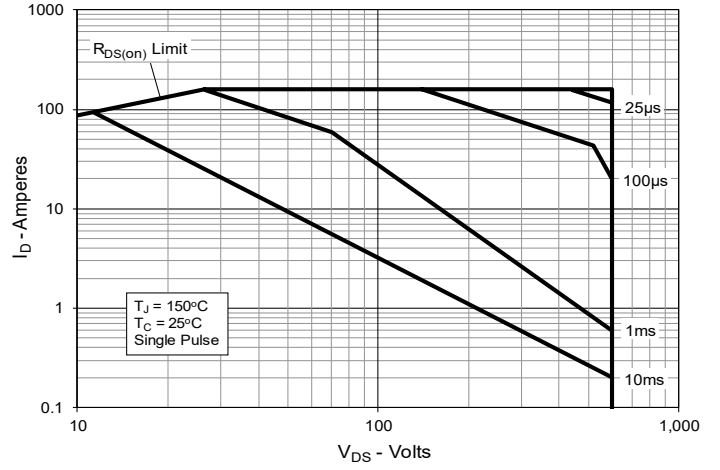
**Fig. 1. Output Characteristics @  $T_J = 25^\circ\text{C}$** 

**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  $I_D = 49\text{A}$  Value vs. Junction Temperature**

**Fig. 5.  $R_{DS(on)}$  Normalized to  $I_D = 49\text{A}$  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**


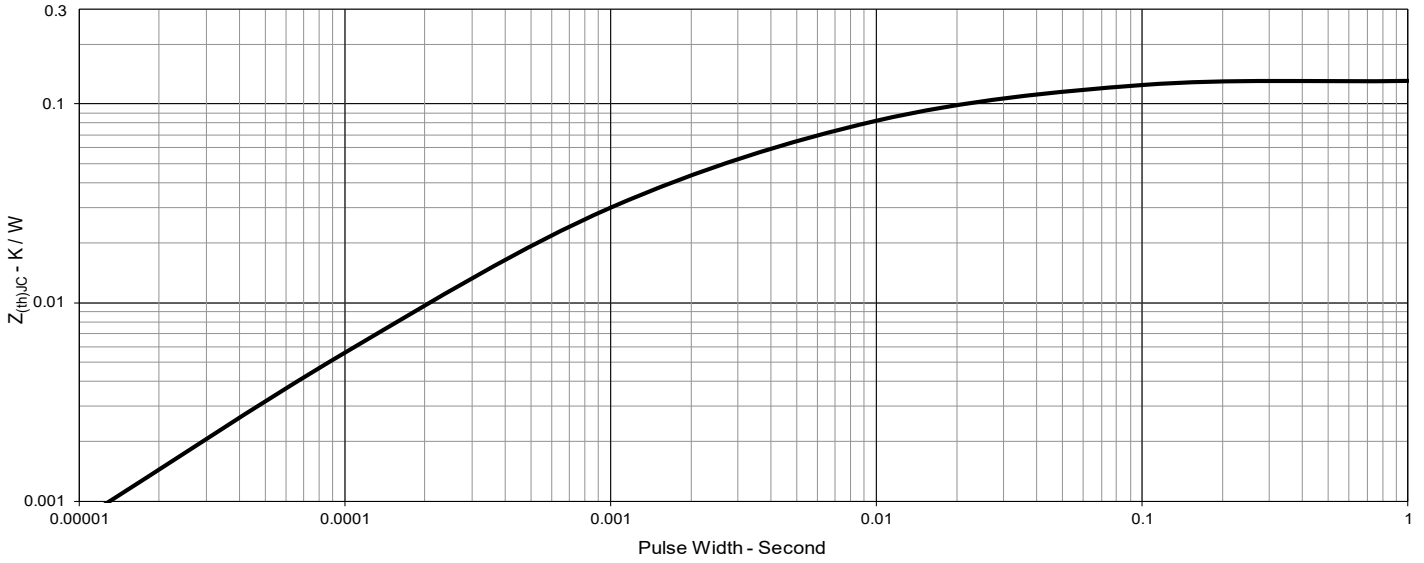
**Fig. 13. Output Capacitance Stored Energy**

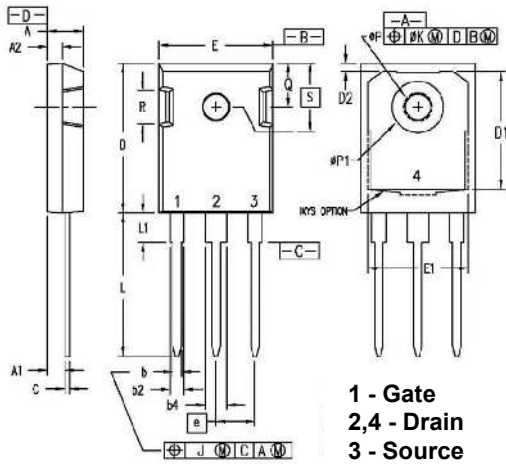


**Fig. 14. Forward-Bias Safe Operating Area**



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



**TO-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    |       |

NOTE: This drawing will meet all dimensions requirement of JEDEC outlines TO-247 AD (R-PSIP-F3)



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