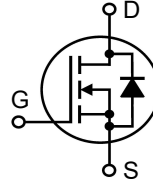


**X3-Class  
HiPerFET™  
Power MOSFET**

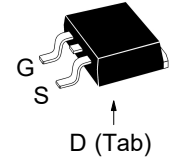
**IXFA36N60X3**

**V<sub>DSS</sub> = 600V**  
**I<sub>D25</sub> = 36A**  
**R<sub>DS(on)</sub> ≤ 90mΩ**

N-Channel Enhancement Mode  
Avalanche Rated



**TO-263  
(IXFA)**



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  | 36                 | A    |
| I <sub>DM</sub>   | T <sub>C</sub> = 25°C, Pulse Width Limited by T <sub>JM</sub>                                  | 48                 | A    |
| I <sub>A</sub>    | T <sub>C</sub> = 25°C  | 8                  | A    |
| E <sub>AS</sub>   | T <sub>C</sub> = 25°C  | 750                | mJ   |
| 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  | 446                | 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   |
| F <sub>C</sub>    | Mounting Force   | 10..65 / 2.2..14.6 | N/lb |
| Weight            |  | 2.5                | 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> = 2.5mA                          | 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 |                       |      | 25 μA<br>1 mA |
| R <sub>DS(on)</sub> | V <sub>GS</sub> = 10V, I <sub>D</sub> = 0.5 • I <sub>D25</sub> , Note 1             |                       |      | 90 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  | 16                    | 26   | S                       |
| $R_{Gi}$                            | Gate Input Resistance   |                       | 2.1  | $\Omega$                |
| $C_{iss}$                           | } $V_{GS} = 0\text{V}$ , $V_{DS} = 25\text{V}$ , $f = 1\text{MHz}$  |                       | 2030 | pF                      |
| $C_{oss}$                           |   |                       | 3050 | pF                      |
| $C_{rss}$                           |   |                       | 3.6  | pF                      |
| <b>Effective Output Capacitance</b> |   |                       |      |                         |
| $C_{o(er)}$                         | Energy related } $V_{GS} = 0\text{V}$   |                       | 110  | pF                      |
| $C_{o(tr)}$                         | Time related } $V_{DS} = 0.8 \cdot V_{DSS}$   |                       | 510  | pF                      |
| $t_{d(on)}$                         | } <b>Resistive Switching Times</b><br>$V_{GS} = 10\text{V}$ , $V_{DS} = 0.5 \cdot V_{DSS}$ , $I_D = 0.5 \cdot I_{D25}$<br>$R_G = 10\Omega$ (External) |                       | 23   | ns                      |
| $t_r$                               |   |                       | 8    | ns                      |
| $t_{d(off)}$                        |   |                       | 45   | ns                      |
| $t_f$                               |   |                       | 4    | ns                      |
| $Q_{g(on)}$                         | } $V_{GS} = 10\text{V}$ , $V_{DS} = 0.5 \cdot V_{DSS}$ , $I_D = 0.5 \cdot I_{D25}$  |                       | 29   | nC                      |
| $Q_{gs}$                            |   |                       | 10   | nC                      |
| $Q_{gd}$                            |   |                       | 10   | nC                      |
| $R_{thJC}$                          |   |                       |      | 0.28 $^\circ\text{C/W}$ |

**Source-Drain Diode**

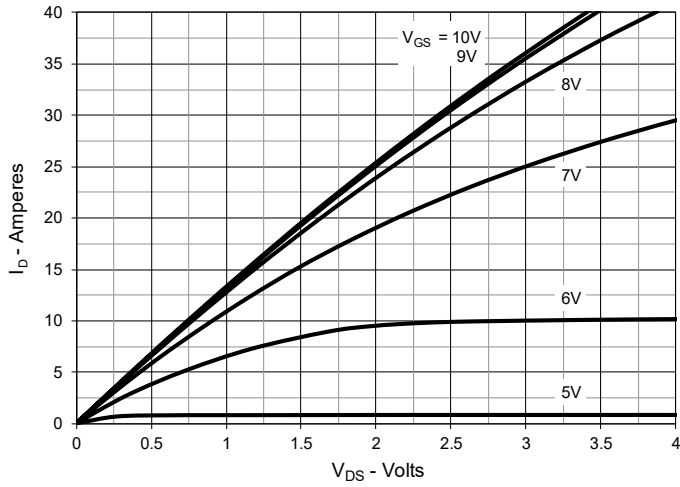
| Symbol   | Test Conditions<br>( $T_J = 25^\circ\text{C}$ , Unless Otherwise Specified)      | Characteristic Values |      |               |
|----------|--|-----------------------|------|---------------|
|          |  | Min.                  | Typ. | Max           |
| $I_S$    | $V_{GS} = 0\text{V}$   |                       |      | 36 A          |
| $I_{SM}$ | Repetitive, Pulse Width Limited by $T_{JM}$                                      |                       |      | 144 A         |
| $V_{SD}$ | $I_F = I_S$ , $V_{GS} = 0\text{V}$ , Note 1                                      |                       |      | 1.4 V         |
| $t_{rr}$ | } $I_F = 18\text{A}$ , $-di/dt = 100\text{A}/\mu\text{s}$<br>$V_R = 100\text{V}$ |                       | 180  | ns            |
| $Q_{RM}$ |  |                       | 1.6  | $\mu\text{C}$ |
| $I_{RM}$ |  |                       | 18.0 | A             |

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

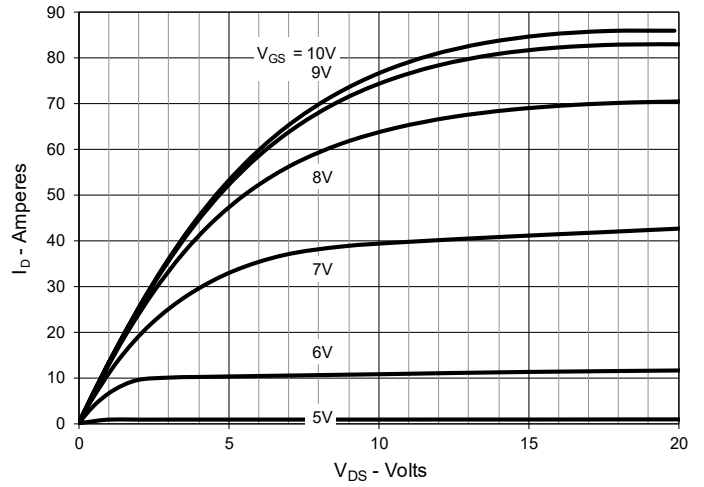
Littelfuse reserves the right to change limits, test conditions and dimensions.

|  |           |           |           |           |             |             |             |             |             |             |
|--|-----------|-----------|-----------|-----------|-------------|-------------|-------------|-------------|-------------|-------------|
| 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   |             |

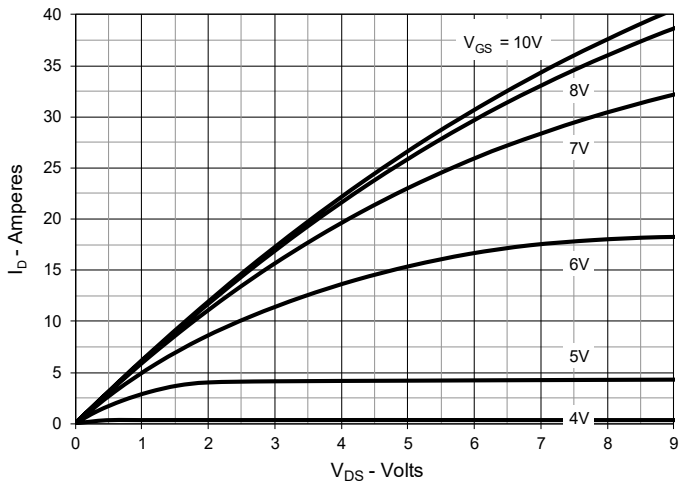
**Fig. 1. Output Characteristics @  $T_J = 25^\circ\text{C}$**



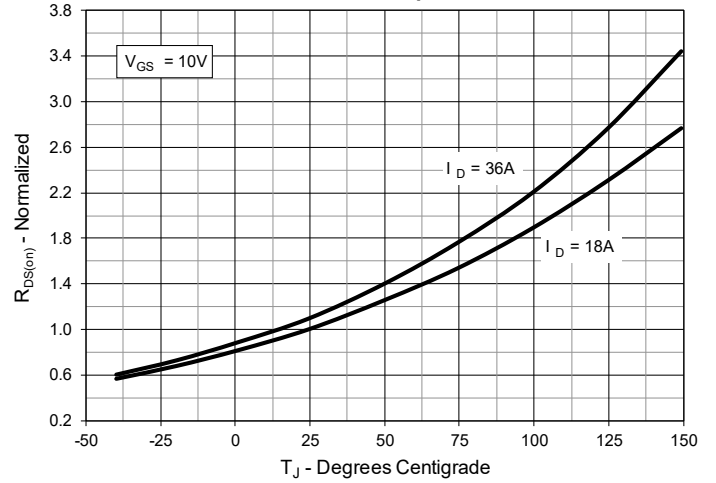
**Fig. 2. Extended Output Characteristics @  $T_J = 25^\circ\text{C}$**



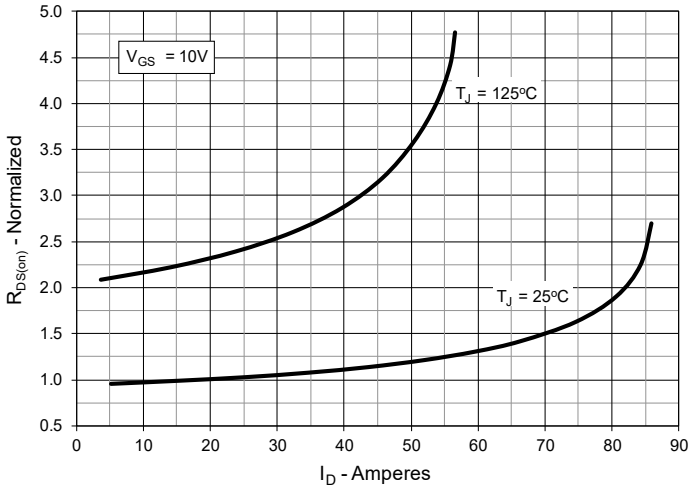
**Fig. 3. Output Characteristics @  $T_J = 125^\circ\text{C}$**



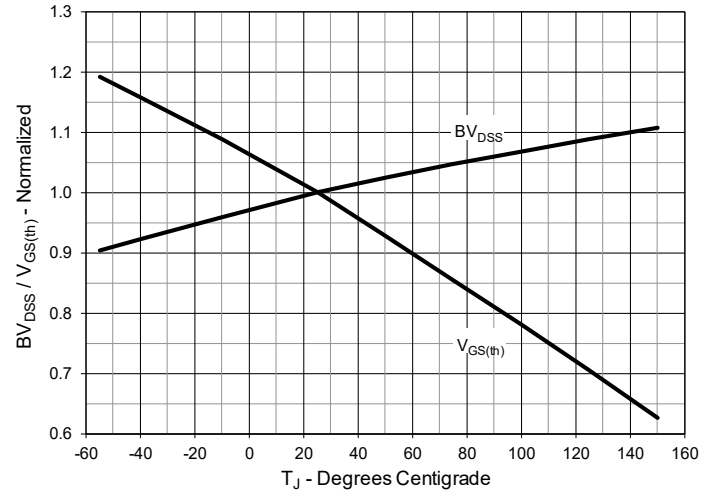
**Fig. 4.  $R_{DS(on)}$  Normalized to  $I_D = 18\text{A}$  Value vs. Junction Temperature**

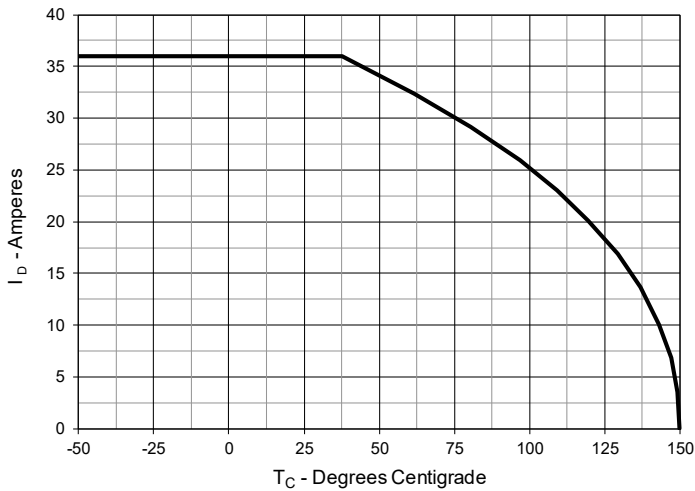
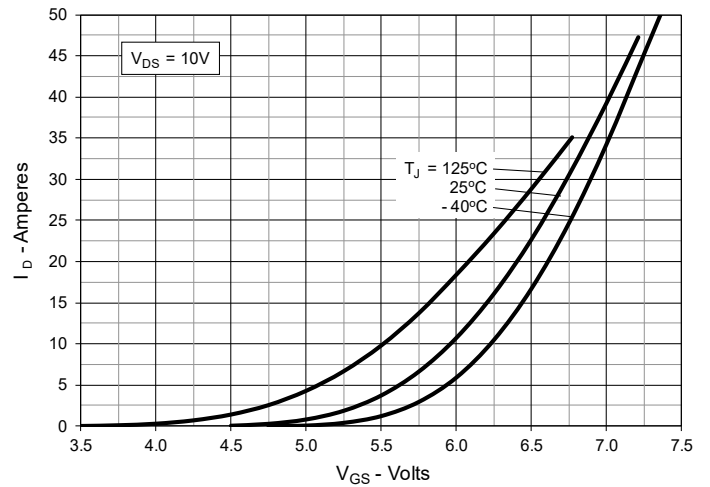
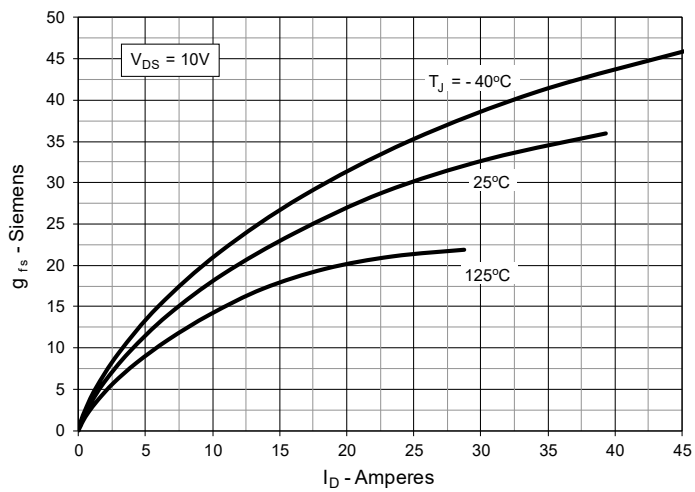
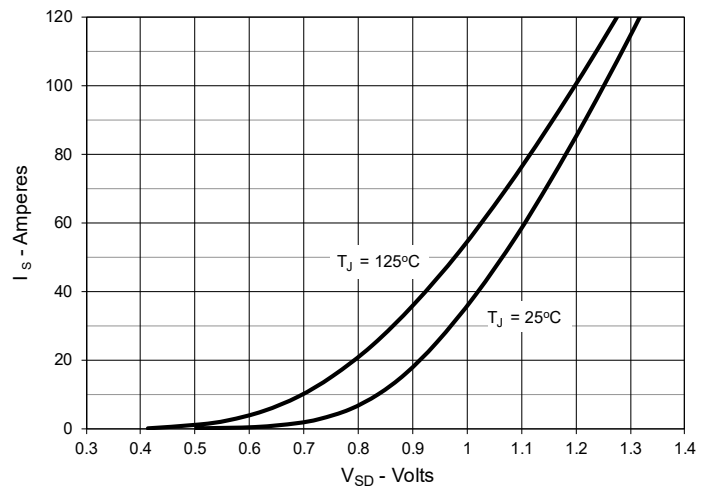
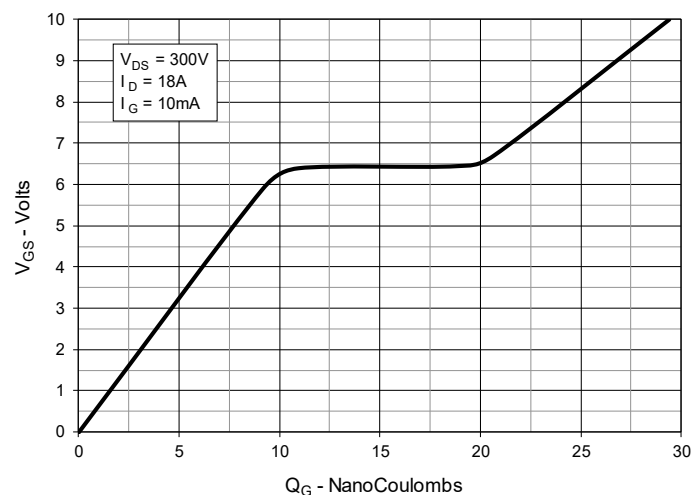
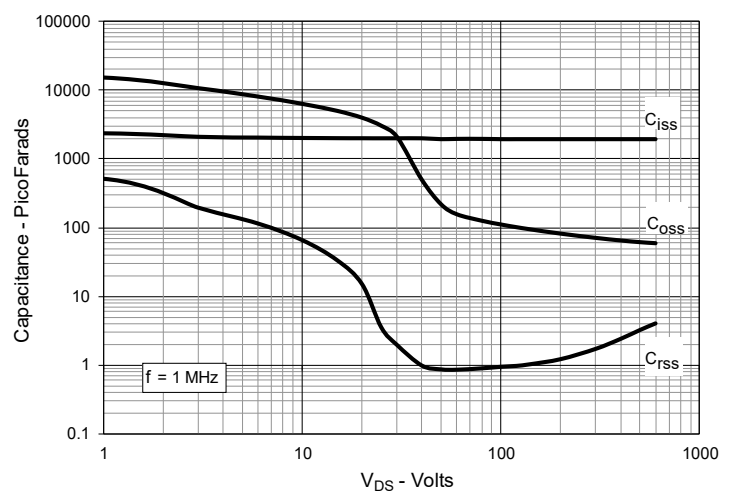


**Fig. 5.  $R_{DS(on)}$  Normalized to  $I_D = 18\text{A}$  Value vs. Drain Current**

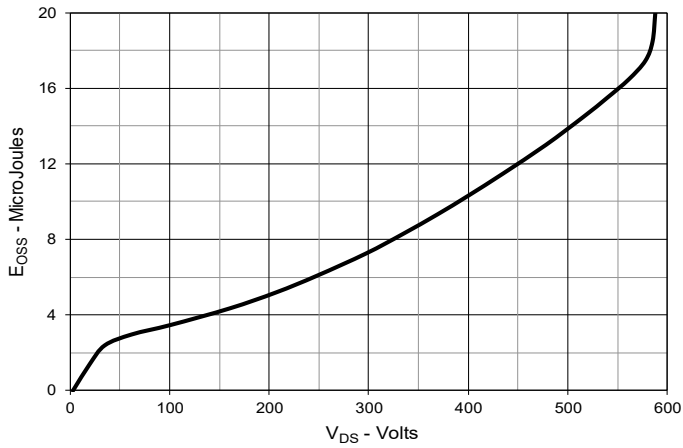


**Fig. 6. Normalized Breakdown & Threshold Voltages vs. Junction Temperature**

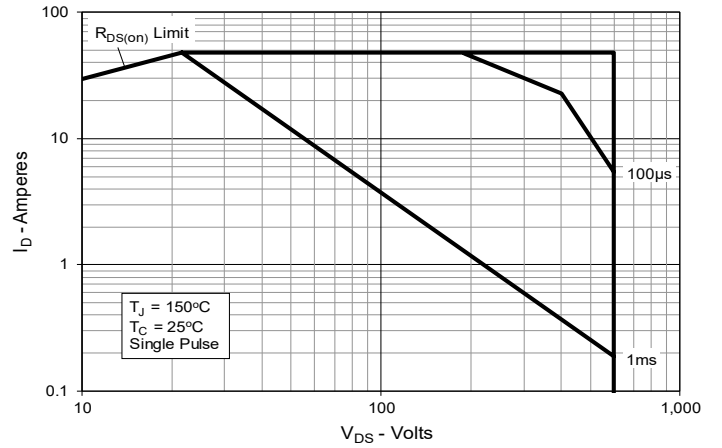


**Fig. 7. Maximum Drain Current vs. Case Temperature**

**Fig. 8. Input Admittance**

**Fig. 9. Transconductance**

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

**Fig. 11. Gate Charge**

**Fig. 12. Capacitance**


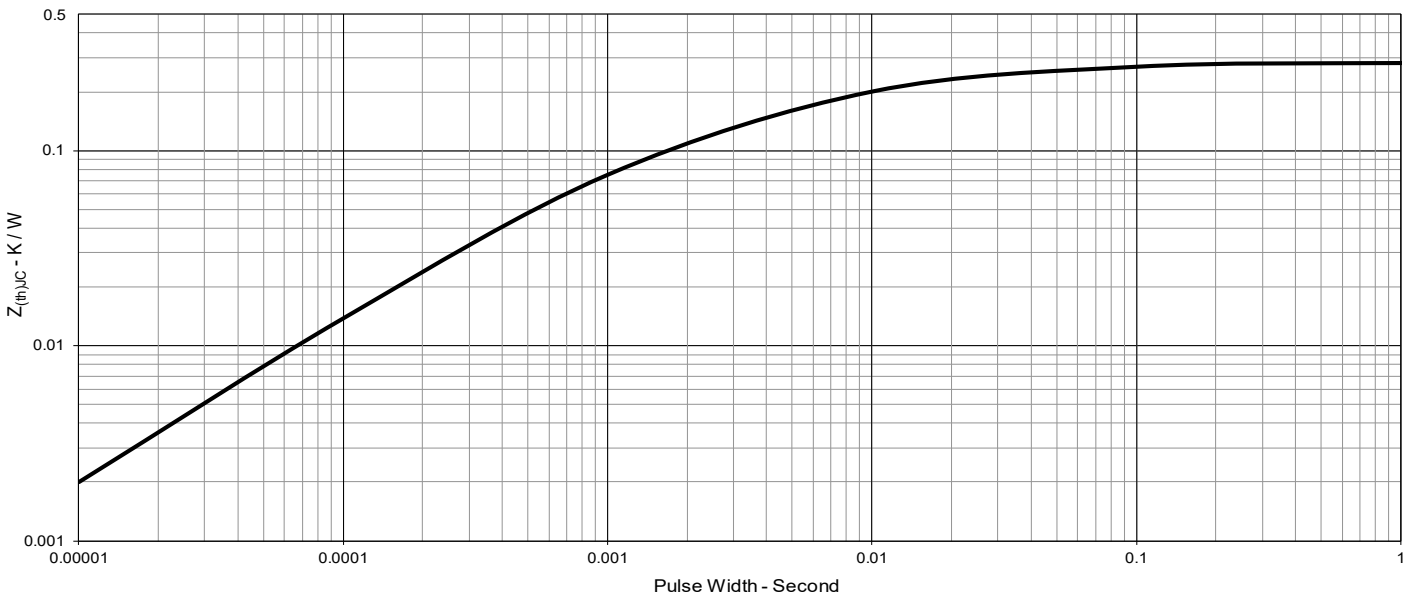
**Fig. 13. Output Capacitance Stored Energy**

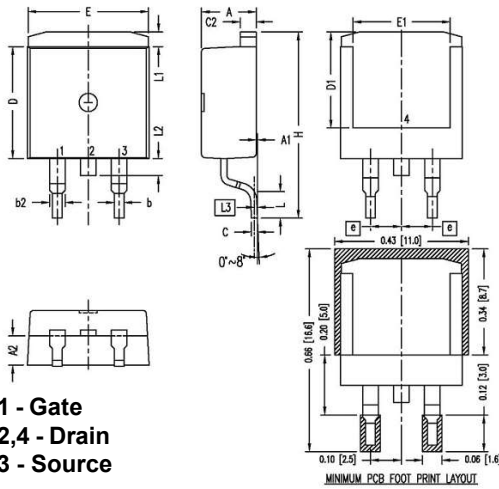


**Fig. 14. Forward-Bias Safe Operating Area**



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



**TO-263 Outline**


- 1 - Gate**
- 2,4 - Drain**
- 3 - Source**

| SYM         | INCHES |      | MILLIMETER |       |
|-------------|--------|------|------------|-------|
|             | MIN    | MAX  | MIN        | MAX   |
| A           | .170   | .185 | 4.30       | 4.70  |
| A1          | .000   | .008 | 0.00       | 0.20  |
| A2          | .091   | .098 | 2.30       | 2.50  |
| b           | .028   | .035 | 0.70       | 0.90  |
| b2          | .046   | .060 | 1.18       | 1.52  |
| C           | .018   | .024 | 0.45       | 0.60  |
| C2          | .049   | .060 | 1.25       | 1.52  |
| D           | .340   | .370 | 8.63       | 9.40  |
| D1          | .300   | .327 | 7.62       | 8.30  |
| E           | .380   | .410 | 9.65       | 10.41 |
| E1          | .270   | .330 | 6.86       | 8.38  |
| <b>(e)</b>  | .100   | BSC  | 2.54       | BSC   |
| H           | .580   | .620 | 14.73      | 15.75 |
| L           | .075   | .105 | 1.91       | 2.67  |
| L1          | .039   | .060 | 1.00       | 1.52  |
| L2          | —      | .070 | —          | 1.77  |
| <b>(L3)</b> | .010   | BSC  | 0.254      | BSC   |

- NOTE:**
1. This drawing meets all dimensions requirement of JEDEC outlines TO-263AB.
  2. All metal surface are matte pure tin plated except trimmed area.
  3. **(L3)** is Gauge plane to measure L.
  4. These dimension do not include mold flash and they will not exceed 0.005[0.13] per side.



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