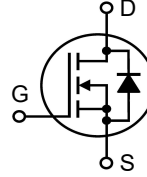


**X3-Class**  
**HiPerFET™**  
**Power MOSFET**

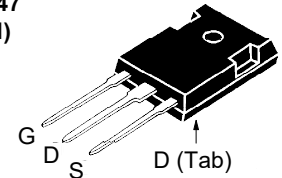
**IXFH90N65X3**

**V<sub>DSS</sub> = 650V**  
**I<sub>D25</sub> = 90A**  
**R<sub>DS(on)</sub> ≤ 33mΩ**

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   | 650             | V        |
| V <sub>DGR</sub> | T <sub>J</sub> = 25°C to 150°C, R <sub>GS</sub> = 1MΩ  | 650             | 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  | 90              | A        |
| I <sub>DM</sub>  | T <sub>C</sub> = 25°C, Pulse Width Limited by T <sub>JM</sub>                                  | 150             | A        |
| I <sub>A</sub>   | T <sub>C</sub> = 25°C  | 20              | A        |
| E <sub>AS</sub>  | T <sub>C</sub> = 25°C  | 3               | 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  | 650                   |      | V             |
| V <sub>GS(th)</sub> | V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 4mA                            | 3.2                   |      | 5.2 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>6 mA |
| R <sub>DS(on)</sub> | V <sub>GS</sub> = 10V, I <sub>D</sub> = 0.5 • I <sub>D25</sub> , Note 1             |                       |      | 33 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   | 65   | S                       |
| $R_{Gi}$                            | Gate Input Resistance  |  | 1.5  | $\Omega$                |
| $C_{iss}$                           | } $V_{GS} = 0\text{V}$ , $V_{DS} = 25\text{V}$ , $f = 1\text{MHz}$   |  | 6080 | pF                      |
| $C_{oss}$                           |  |  | 8020 | pF                      |
| $C_{rss}$                           |  |  | 40   | pF                      |
| <b>Effective Output Capacitance</b> |  |  |      |                         |
| $C_{o(er)}$                         | Energy related   | } $V_{GS} = 0\text{V}$<br>$V_{DS} = 0.8 \cdot V_{DSS}$ | 270  | pF                      |
| $C_{o(tr)}$                         | Time related   |  | 1300 | 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>$R_G = 2\Omega$ (External) |  | 28   | ns                      |
| $t_r$                               |  |  | 11   | ns                      |
| $t_{d(off)}$                        |  |  | 63   | ns                      |
| $t_f$                               |  |  | 10   | ns                      |
| $Q_{g(on)}$                         | } $V_{GS} = 10\text{V}$ , $V_{DS} = 0.5 \cdot V_{DSS}$ , $I_D = 0.5 \cdot I_{D25}$   |  | 95   | nC                      |
| $Q_{gs}$                            |  |  | 31   | nC                      |
| $Q_{gd}$                            |  |  | 31   | nC                      |
| $R_{thJC}$                          |  |  |      | 0.13 $^\circ\text{C/W}$ |
| $R_{thCS}$                          |  | 0.21   |      | $^\circ\text{C/W}$      |

**Source-Drain Diode**

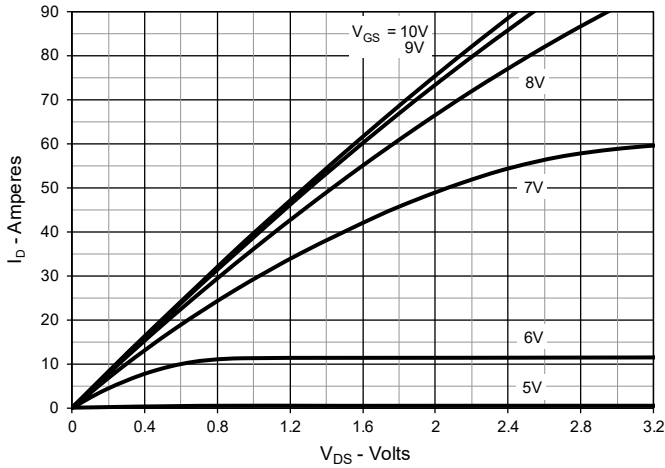
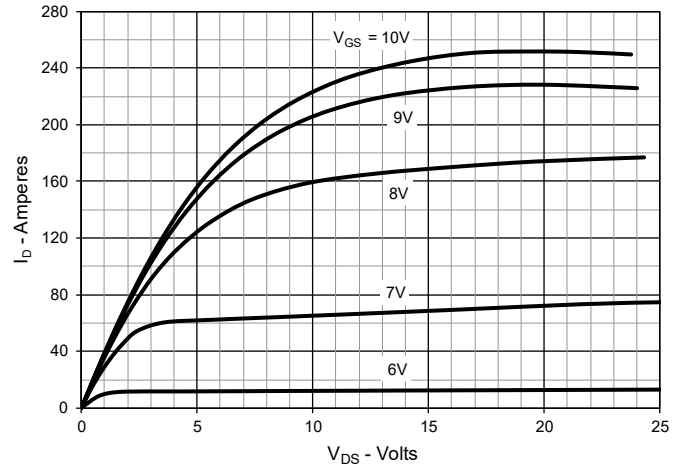
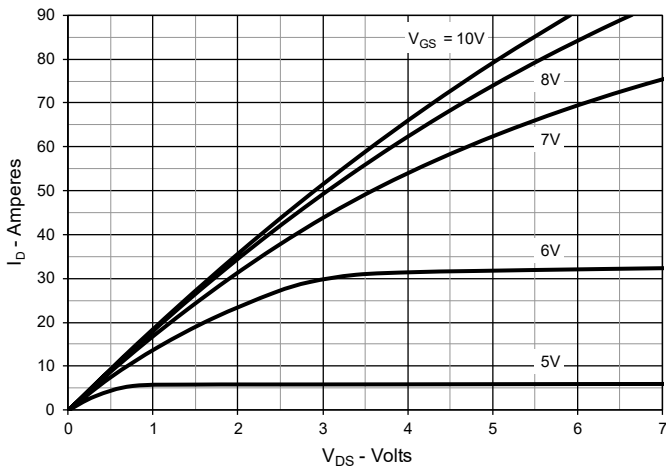
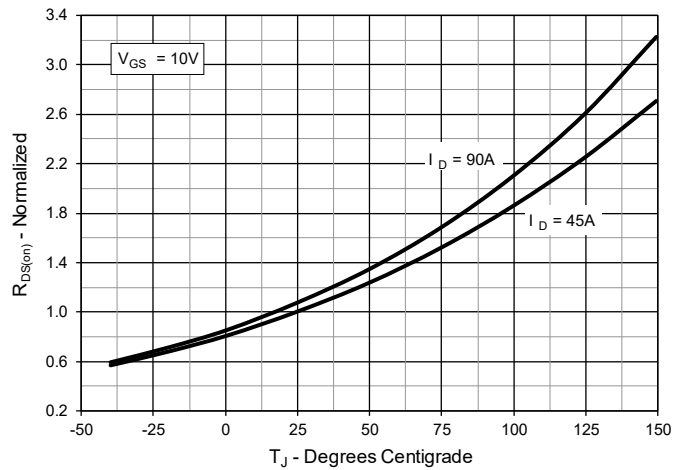
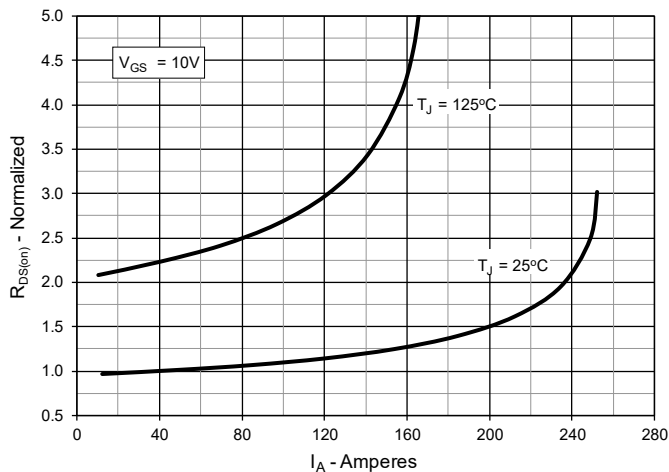
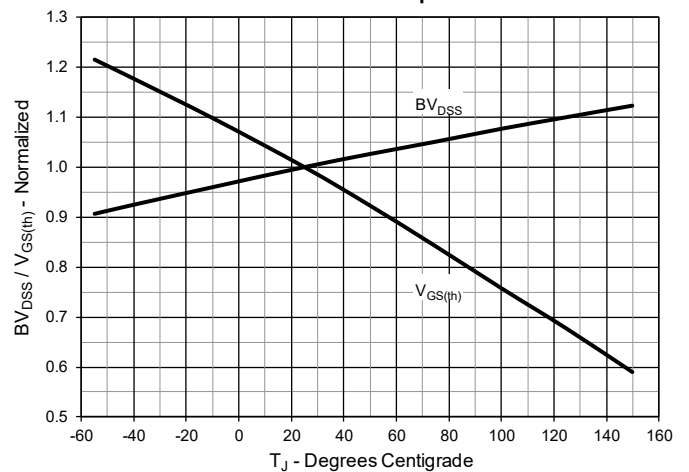
| Symbol   | Test Conditions<br>( $T_J = 25^\circ\text{C}$ , Unless Otherwise Specified)      | Characteristic Values |      |               |
|----------|--|-----------------------|------|---------------|
|          |  | Min.                  | Typ. | Max           |
| $I_S$    | $V_{GS} = 0\text{V}$   |                       |      | 90 A          |
| $I_{SM}$ | Repetitive, Pulse Width Limited by $T_{JM}$                                      |                       |      | 360 A         |
| $V_{SD}$ | $I_F = I_S$ , $V_{GS} = 0\text{V}$ , Note 1                                      |                       |      | 1.4 V         |
| $t_{rr}$ | } $I_F = 45\text{A}$ , $-di/dt = 100\text{A}/\mu\text{s}$<br>$V_R = 100\text{V}$ |                       | 175  | ns            |
| $Q_{RM}$ |  |                       | 1.3  | $\mu\text{C}$ |
| $I_{RM}$ |  |                       | 15.0 | A             |
|          |  |                       |      |               |

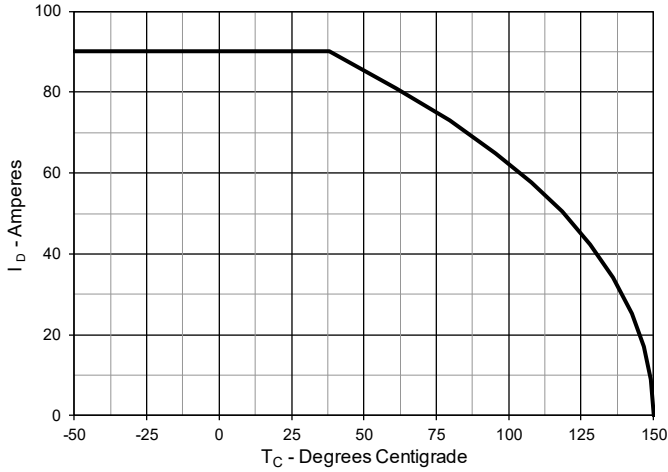
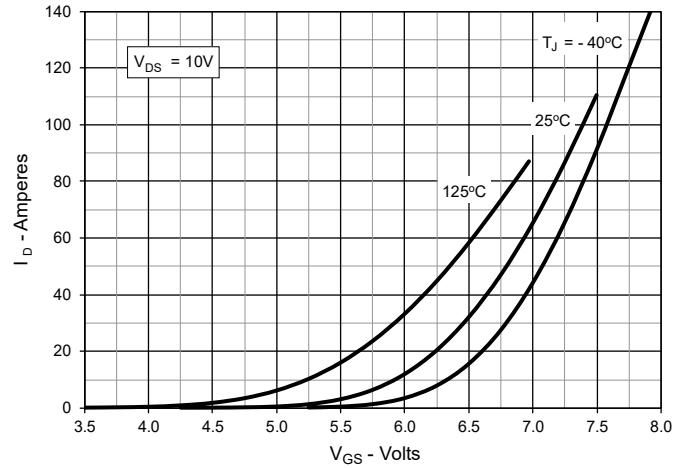
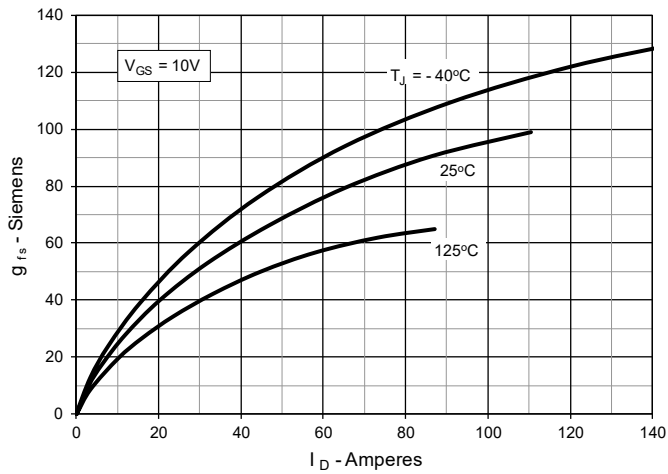
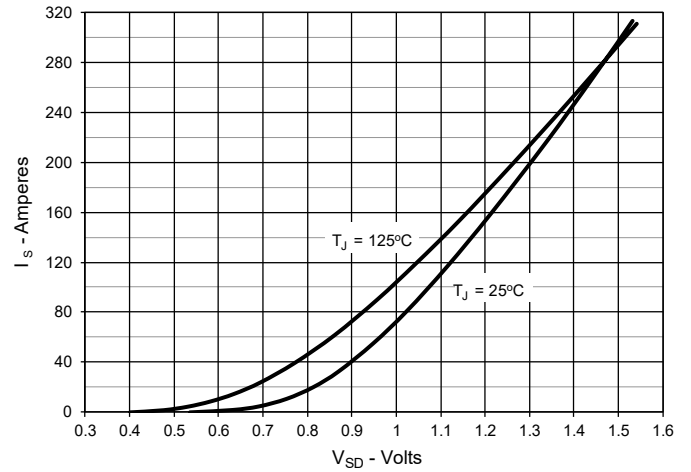
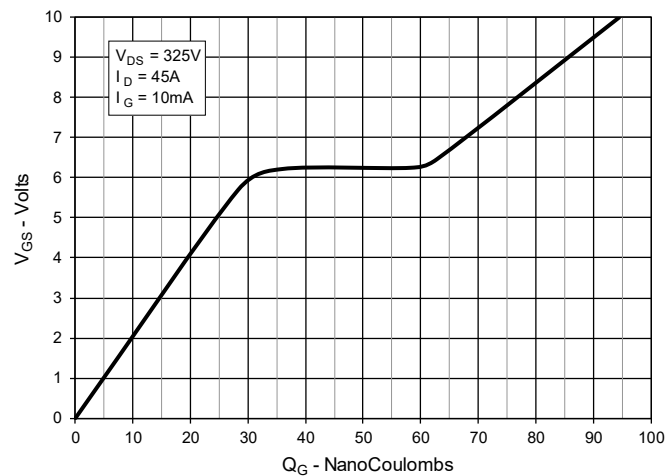
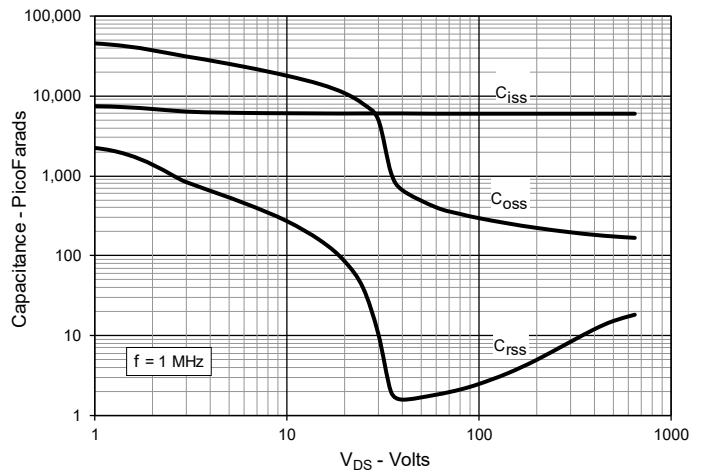
Note 1. Pulse test,  $t \leq 300\mu\text{s}$ , duty cycle,  $d \leq 2\%$ .

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

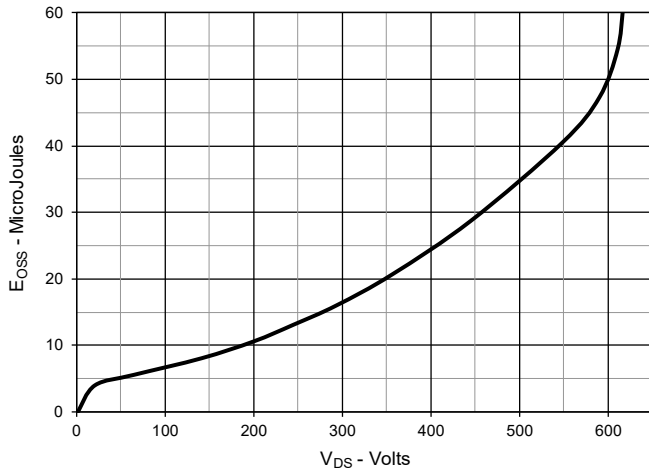
IXYS MOSFETs and IGBTs are covered by one or more of the following U.S. patents:

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

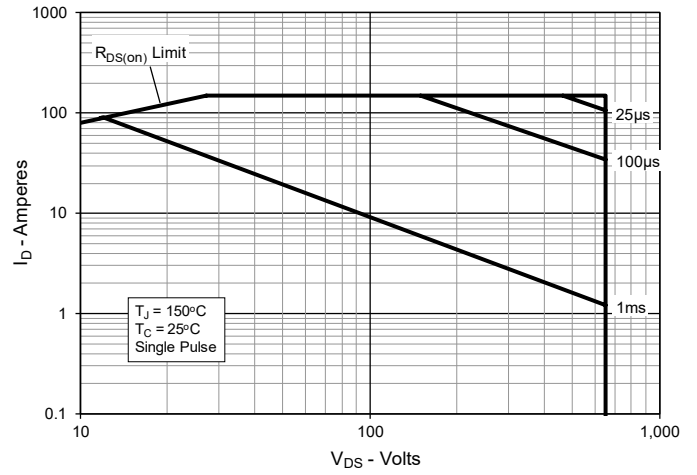
**Fig. 1. Output Characteristics @  $T_J = 25^\circ\text{C}$** 

**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  $I_D = 45\text{A}$  Value vs. Junction Temperature**

**Fig. 5.  $R_{DS(on)}$  Normalized to  $I_D = 45\text{A}$  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**

