

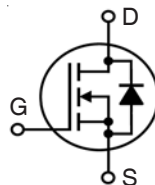
## X-Class HiPerFET™ Power MOSFET

### IXFJ20N85X

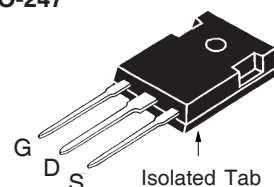
$$\begin{aligned} V_{DSS} &= 850V \\ I_{D25} &= 9.5A \\ R_{DS(on)} &\leq 360m\Omega \end{aligned}$$

(Electrically Isolated Tab)

N-Channel Enhancement Mode  
Avalanche Rated



ISO TO-247™



G = Gate      D = Drain  
S = Source

| Symbol     | Test Conditions                                                          | Maximum Ratings |                  |
|------------|--------------------------------------------------------------------------|-----------------|------------------|
| $V_{DSS}$  | $T_J = 25^\circ\text{C}$ to $150^\circ\text{C}$                          | 850             | V                |
| $V_{DGR}$  | $T_J = 25^\circ\text{C}$ to $150^\circ\text{C}$ , $R_{GS} = 1M\Omega$    | 850             | V                |
| $V_{GSS}$  | Continuous                                                               | $\pm 30$        | V                |
| $V_{GSM}$  | Transient                                                                | $\pm 40$        | V                |
| $I_{D25}$  | $T_C = 25^\circ\text{C}$                                                 | 9.5             | A                |
| $I_{DM}$   | $T_C = 25^\circ\text{C}$ , Pulse Width Limited by $T_{JM}$               | 50.0            | A                |
| $I_A$      | $T_C = 25^\circ\text{C}$                                                 | 10              | A                |
| $E_{AS}$   | $T_C = 25^\circ\text{C}$                                                 | 800             | mJ               |
| $dv/dt$    | $I_S \leq I_{DM}$ , $V_{DD} \leq V_{DSS}$ , $T_J \leq 150^\circ\text{C}$ | 50              | V/ns             |
| $P_D$      | $T_C = 25^\circ\text{C}$                                                 | 110             | W                |
| $T_J$      |                                                                          | -55 ... +150    | $^\circ\text{C}$ |
| $T_{JM}$   |                                                                          | 150             | $^\circ\text{C}$ |
| $T_{stg}$  |                                                                          | -55 ... +150    | $^\circ\text{C}$ |
| $T_L$      | Maximum Lead Temperature for Soldering                                   | 300             | $^\circ\text{C}$ |
| $T_{SOLD}$ | Plastic Body for 10s                                                     | 260             | $^\circ\text{C}$ |
| $F_C$      | Mounting Torque                                                          | 1.13 / 10       | Nm/lb.in         |
| $V_{ISOL}$ | 50/60 Hz, RM, $t = 1\text{min}$                                          | 2500            | V~               |
| Weight     |                                                                          | 5               | g                |

### Features

- Silicon Chip on Direct-Copper Bond (DCB) Substrate
- Isolated Mounting Surface
- 2500V~ Electrical Isolation
- Avalanche Rated
- Low  $R_{DS(ON)}$  and  $Q_G$
- Low Package Inductance

### Advantages

- High Power Density
- Easy to Mount
- Space Savings

### Applications

- Switch-Mode and Resonant-Mode Power Supplies
- DC-DC Converters
- Laser Drivers
- AC and DC Motor Drives
- Robotics and Servo Controls

| Symbol       | Test Conditions<br>( $T_J = 25^\circ\text{C}$ , Unless Otherwise Specified) | Characteristic Values |      |                      |
|--------------|-----------------------------------------------------------------------------|-----------------------|------|----------------------|
|              |                                                                             | Min.                  | Typ. | Max.                 |
| $BV_{DSS}$   | $V_{GS} = 0V$ , $I_D = 1mA$                                                 | 850                   |      | V                    |
| $V_{GS(th)}$ | $V_{DS} = V_{GS}$ , $I_D = 2.5mA$                                           | 3.5                   |      | 5.5 V                |
| $I_{GSS}$    | $V_{GS} = \pm 30V$ , $V_{DS} = 0V$                                          |                       |      | $\pm 100$ nA         |
| $I_{DSS}$    | $V_{DS} = V_{DSS}$ , $V_{GS} = 0V$<br>$T_J = 125^\circ\text{C}$             |                       |      | 25 $\mu A$<br>1.5 mA |
| $R_{DS(on)}$ | $V_{GS} = 10V$ , $I_D = 10A$ , Note 1                                       |                       |      | 360 m $\Omega$       |

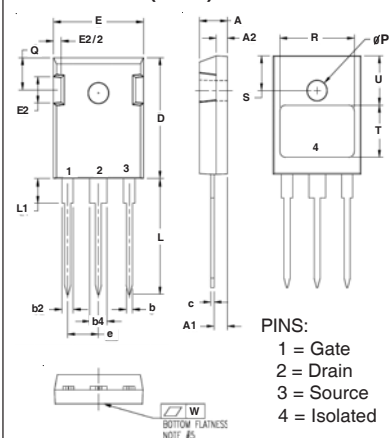
| Symbol                              | Test Conditions<br>(T <sub>J</sub> = 25°C, Unless Otherwise Specified)                                                                                         | Characteristic Values |           |     |
|-------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|-----------|-----|
|                                     |                                                                                                                                                                | Min.                  | Typ.      | Max |
| <b>g<sub>fs</sub></b>               | V <sub>DS</sub> = 10V, I <sub>D</sub> = 10A, Note 1                                                                                                            | 6                     | 10        | S   |
| <b>R<sub>Gi</sub></b>               | Gate Input Resistance                                                                                                                                          |                       | 0.8       | Ω   |
| <b>C<sub>iss</sub></b>              | } V <sub>GS</sub> = 0V, V <sub>DS</sub> = 25V, f = 1MHz                                                                                                        |                       | 1660      | pF  |
| <b>C<sub>oss</sub></b>              |                                                                                                                                                                |                       | 1730      | pF  |
| <b>C<sub>rss</sub></b>              |                                                                                                                                                                |                       | 24        | pF  |
| <b>Effective Output Capacitance</b> |                                                                                                                                                                |                       |           |     |
| <b>C<sub>o(er)</sub></b>            | Energy related } V <sub>GS</sub> = 0V                                                                                                                          |                       | 67        | pF  |
| <b>C<sub>o(tr)</sub></b>            | Time related } V <sub>DS</sub> = 0.8 • V <sub>DSS</sub>                                                                                                        |                       | 270       | pF  |
| <b>t<sub>d(on)</sub></b>            | <b>Resistive Switching Times</b><br>} V <sub>GS</sub> = 10V, V <sub>DS</sub> = 0.5 • V <sub>DSS</sub> , I <sub>D</sub> = 10A<br>R <sub>G</sub> = 5Ω (External) |                       | 20        | ns  |
| <b>t<sub>r</sub></b>                |                                                                                                                                                                |                       | 28        | ns  |
| <b>t<sub>d(off)</sub></b>           |                                                                                                                                                                |                       | 44        | ns  |
| <b>t<sub>f</sub></b>                |                                                                                                                                                                |                       | 20        | ns  |
| <b>Q<sub>g(on)</sub></b>            | } V <sub>GS</sub> = 10V, V <sub>DS</sub> = 0.5 • V <sub>DSS</sub> , I <sub>D</sub> = 10A                                                                       |                       | 63        | nC  |
| <b>Q<sub>gs</sub></b>               |                                                                                                                                                                |                       | 12        | nC  |
| <b>Q<sub>gd</sub></b>               |                                                                                                                                                                |                       | 26        | nC  |
| <b>R<sub>thJC</sub></b>             |                                                                                                                                                                |                       | 1.13 °C/W |     |
| <b>R<sub>thCS</sub></b>             |                                                                                                                                                                | 0.30                  | °C/W      |     |

## Source-Drain Diode

| Symbol   | Test Conditions<br>( $T_J = 25^\circ\text{C}$ , Unless Otherwise Specified)    | Characteristic Values |      |               |
|----------|--------------------------------------------------------------------------------|-----------------------|------|---------------|
|          |                                                                                | Min.                  | Typ. | Max           |
| $I_S$    | $V_{GS} = 0\text{V}$                                                           |                       |      | 20 A          |
| $I_{SM}$ | Repetitive, pulse Width Limited by $T_{JM}$                                    |                       |      | 80 A          |
| $V_{SD}$ | $I_F = I_S$ , $V_{GS} = 0\text{V}$ , Note 1                                    |                       |      | 1.4 V         |
| $t_{rr}$ | $I_F = 10\text{A}$ , $-di/dt = 100\text{A}/\mu\text{s}$<br>$V_R = 100\text{V}$ |                       | 190  | ns            |
| $Q_{RM}$ |                                                                                |                       | 1.6  | $\mu\text{C}$ |
| $I_{RM}$ |                                                                                |                       | 16.5 | A             |

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

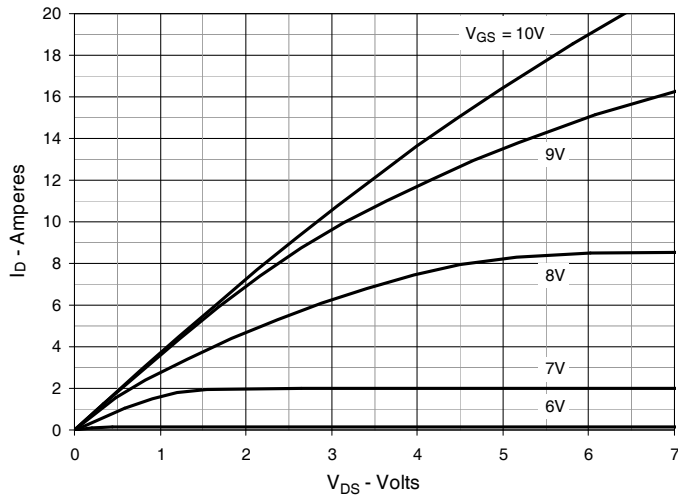
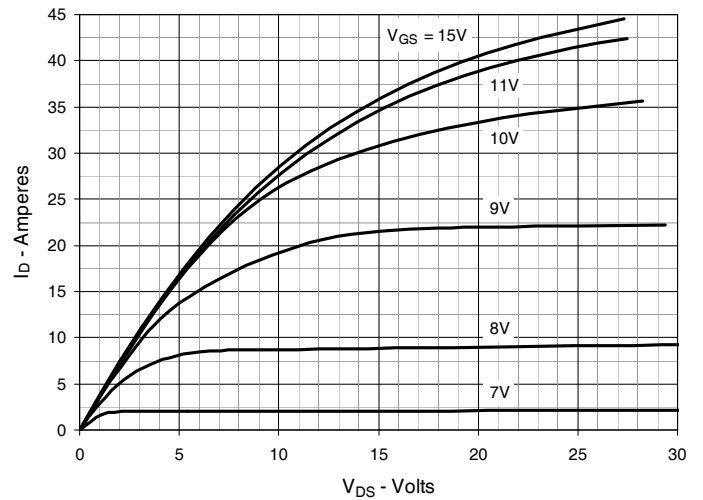
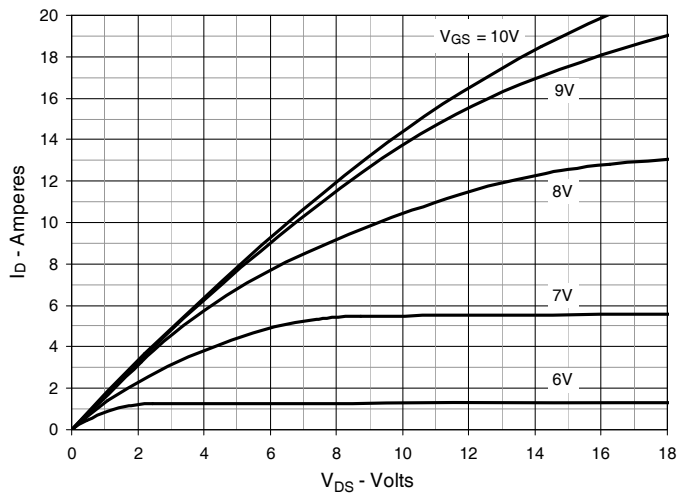
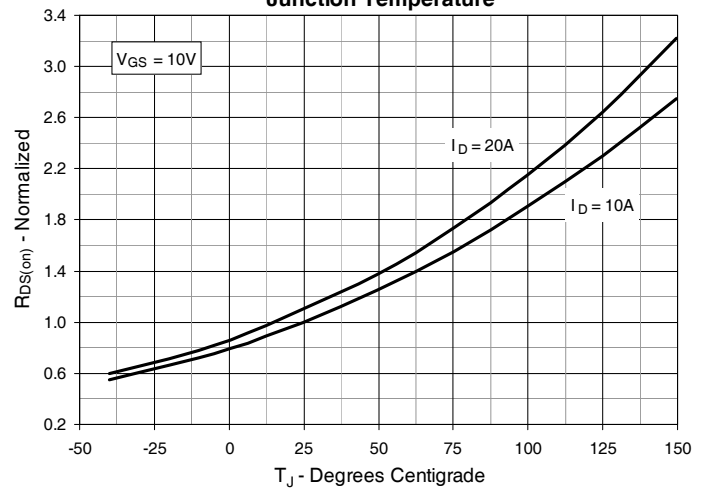
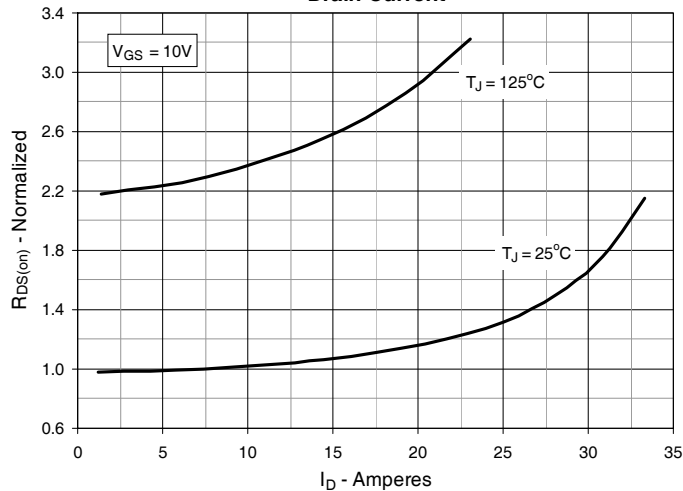
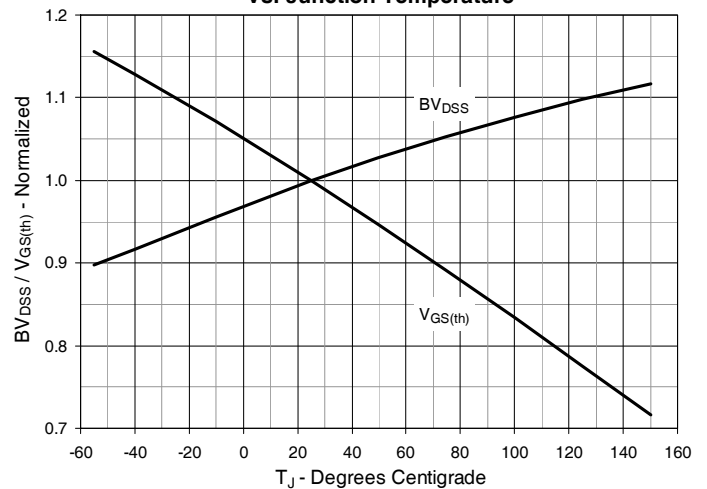
## ISO TO-247 (IXFJ) OUTLINE

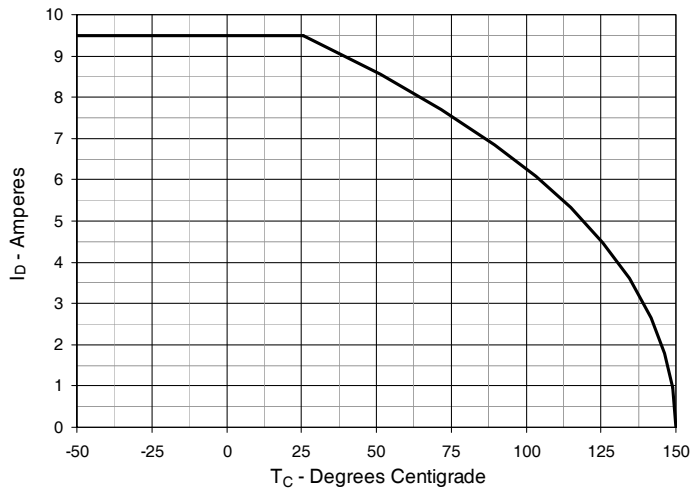
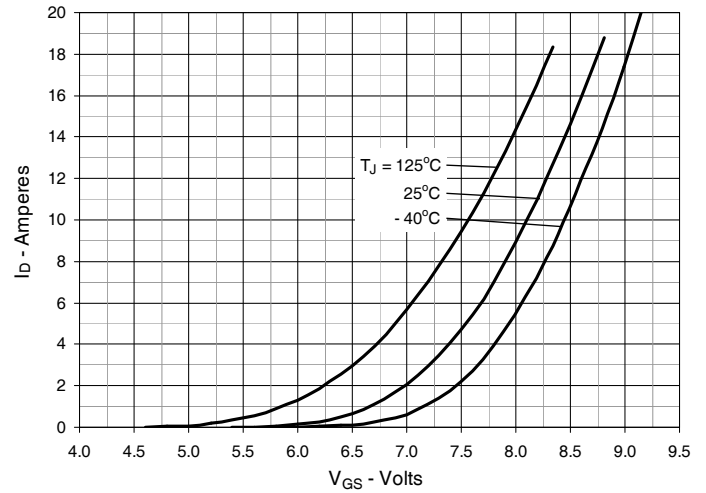
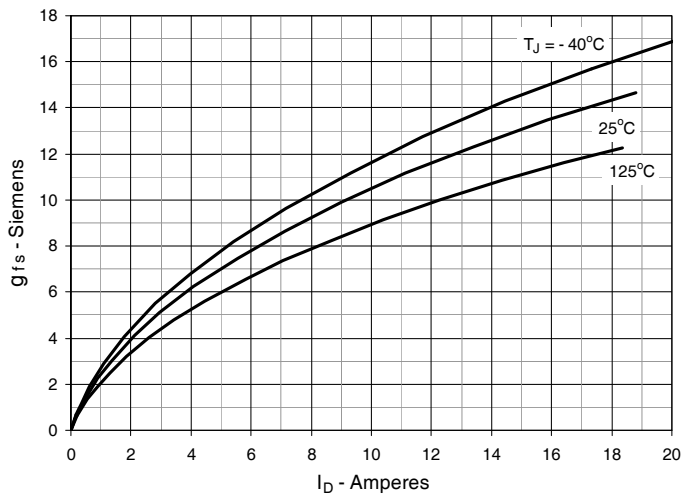
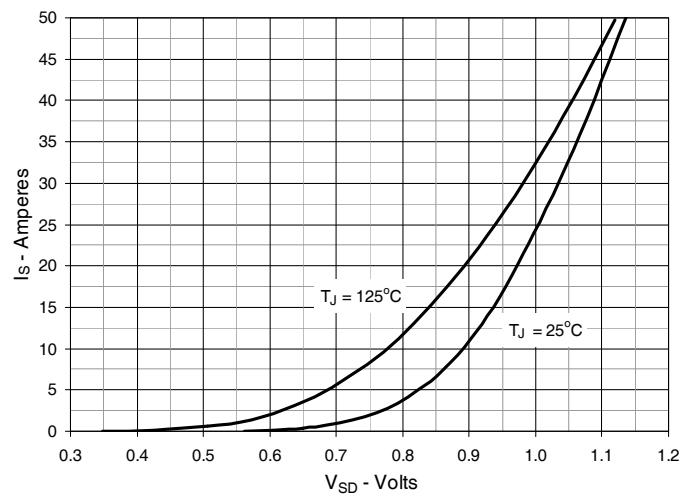
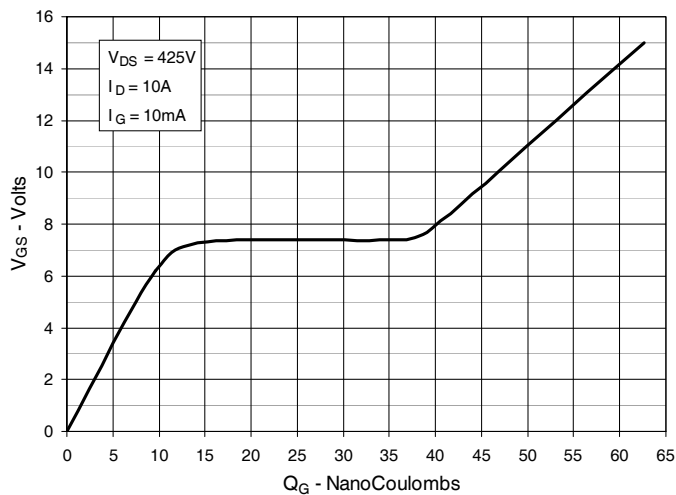
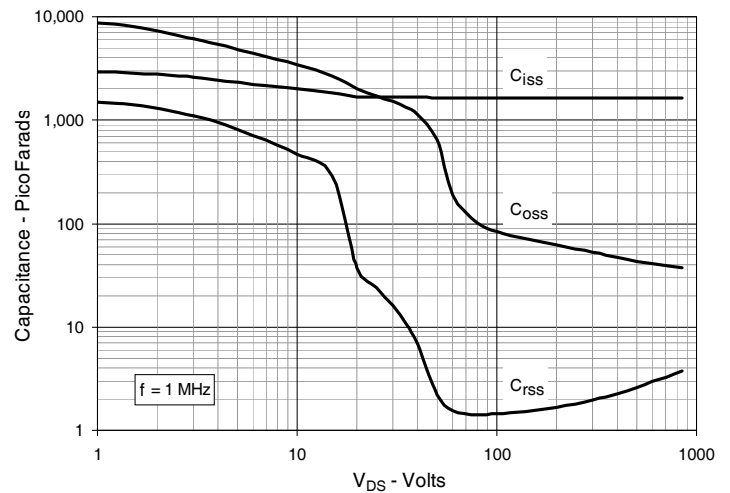


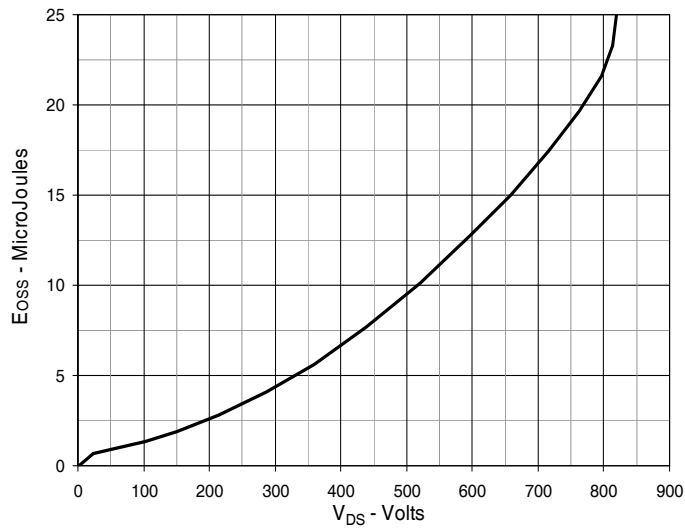
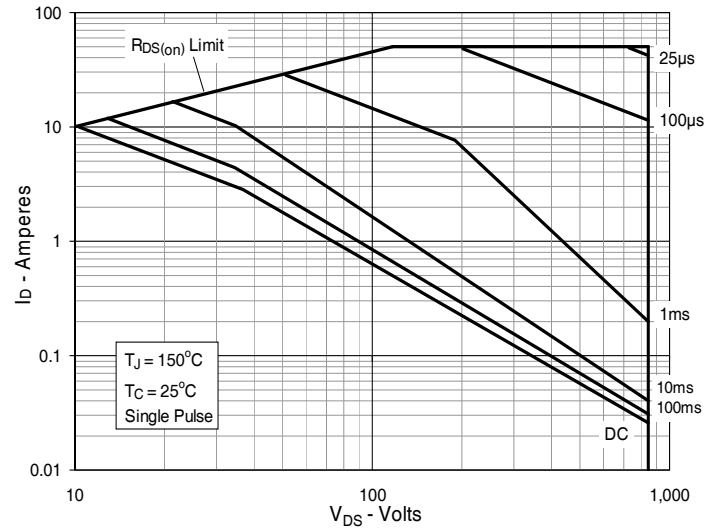
| SYM | INCHES   |      | MILLIMETERS |       |
|-----|----------|------|-------------|-------|
|     | MIN      | MAX  | MIN         | MAX   |
| A   | .190     | .205 | 4.83        | 5.21  |
| A1  | .087     | .100 | 2.21        | 2.54  |
| A2  | .075     | .085 | 1.91        | 2.16  |
| b   | .045     | .055 | 1.14        | 1.40  |
| b2  | .075     | .085 | 1.91        | 2.16  |
| b4  | .115     | .126 | 2.92        | 3.20  |
| c   | .023     | .033 | 0.58        | 0.84  |
| D   | .820     | .840 | 20.83       | 21.34 |
| E   | .620     | .635 | 15.75       | 16.13 |
| E2  | .175     | .195 | 4.44        | 4.95  |
| e   | .215 BSC |      | 5.45 BSC    |       |
| L   | .780     | .810 | 19.81       | 20.57 |
| L1  | .160     | .177 | 4.06        | 4.50  |
| Q   | .220     | .240 | 5.59        | 6.10  |
| R   | .520     | .540 | 13.21       | 13.72 |
| S   | .242 BSC |      | 6.15 BSC    |       |
| T   | .355     | .375 | 9.02        | 9.53  |
| U   | .345     | .370 | 8.76        | 9.40  |
| ØP  | .140     | .144 | 3.55        | 3.66  |
| W   | .000     | .004 | 0.00        | 0.10  |

IXYS 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    | 6,404,065 B1 | 6,683,344    | 6,727,585    | 7,005,734 B2 | 7,157,338B2 |
|                                                                                  | 4,860,072 | 5,017,508 | 5,063,307 | 5,381,025 | 6,259,123 B1 | 6,534,343    | 6,710,405 B2 | 6,759,692    | 7,063,975 B2 |             |
|                                                                                  | 4,881,106 | 5,034,796 | 5,187,117 | 5,486,715 | 6,306,728 B1 | 6,583,505    | 6,710,463    | 6,771,478 B2 | 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  $I_D = 10\text{A}$  Value vs. Junction Temperature**

**Fig. 5.  $R_{DS(on)}$  Normalized to  $I_D = 10\text{A}$  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**
