

## HiPerFET™ Power MOSFETs

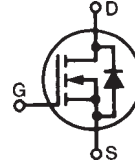
**IXFA 3N120**  
**IXFP 3N120**

$$\begin{aligned} V_{DSS} &= 1200 \text{ V} \\ I_{D25} &= 3 \text{ A} \\ R_{DS(on)} &= 4.5 \Omega \end{aligned}$$

$$t_{rr} \leq 300 \text{ ns}$$

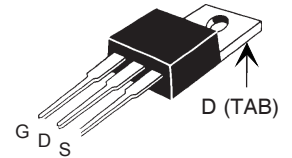
N-Channel Enhancement Mode  
Avalanche Rated, Low  $Q_g$ , High  $dv/dt$

Preliminary Data Sheet

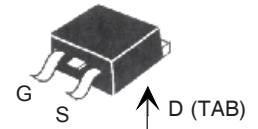


| Symbol    | Test Conditions                                                                                                                           | Maximum Ratings |                  |
|-----------|-------------------------------------------------------------------------------------------------------------------------------------------|-----------------|------------------|
| $V_{DSS}$ | $T_J = 25^\circ\text{C}$ to $150^\circ\text{C}$                                                                                           | 1200            | V                |
| $V_{DGR}$ | $T_J = 25^\circ\text{C}$ to $150^\circ\text{C}$ ; $R_{GS} = 1 \text{ M}\Omega$                                                            | 1200            | V                |
| $V_{GS}$  | Continuous                                                                                                                                | $\pm 20$        | V                |
| $V_{GSM}$ | Transient                                                                                                                                 | $\pm 30$        | V                |
| $I_{D25}$ | $T_C = 25^\circ\text{C}$                                                                                                                  | 3               | A                |
| $I_{DM}$  | $T_C = 25^\circ\text{C}$ , pulse width limited by $T_{JM}$                                                                                | 12              | A                |
| $I_{AR}$  | $T_C = 25^\circ\text{C}$                                                                                                                  | 3               | A                |
| $E_{AR}$  | $T_C = 25^\circ\text{C}$                                                                                                                  | 20              | mJ               |
| $E_{AS}$  |                                                                                                                                           | 700             | mJ               |
| $dv/dt$   | $I_S \leq I_{DM}$ , $di/dt \leq 100 \text{ A}/\mu\text{s}$ , $V_{DD} \leq V_{DSS}$ ,<br>$T_J \leq 150^\circ\text{C}$ , $R_G = 4.7 \Omega$ | 10              | V/ns             |
| $P_D$     | $T_C = 25^\circ\text{C}$                                                                                                                  | 200             | W                |
| $T_J$     |                                                                                                                                           | -55 to +150     | $^\circ\text{C}$ |
| $T_{JM}$  |                                                                                                                                           | 150             | $^\circ\text{C}$ |
| $T_{stg}$ |                                                                                                                                           | -55 to +150     | $^\circ\text{C}$ |
| $T_L$     | 1.6 mm (0.063 in) from case for 10 s                                                                                                      | 300             | $^\circ\text{C}$ |
| $M_d$     | Mounting torque (TO-220)                                                                                                                  | 1.13/10         | Nm/lb.in.        |
| Weight    | TO-220                                                                                                                                    | 4               | g                |
|           | TO-263                                                                                                                                    | 2               | g                |

TO-220 (IXFP)



TO-263 (IXFA)



G = Gate      D = Drain  
S = Source    TAB = Drain

### Features

- Low gate charge and capacitances  
- easier to drive  
- faster switching
- International standard packages
- Low  $R_{DS(on)}$
- Rated for unclamped Inductive load Switching (UIS)
- Molding epoxies meet UL 94 V-0 flammability classification

### Advantages

- Easy to mount
- Space savings
- High power density

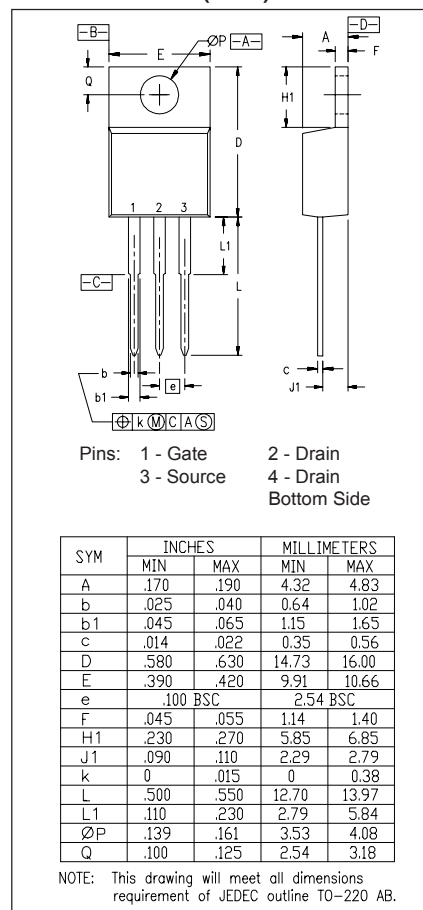
| Symbol       | Test Conditions                                                                                                  | Characteristic Values<br>( $T_J = 25^\circ\text{C}$ , unless otherwise specified) |      |                          |
|--------------|------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------|--------------------------|
|              |                                                                                                                  | min.                                                                              | typ. | max.                     |
| $V_{DSS}$    | $V_{GS} = 0 \text{ V}$ , $I_D = 1 \text{ mA}$                                                                    | 1200                                                                              |      | V                        |
| $V_{GS(th)}$ | $V_{DS} = V_{DSS}$ , $I_D = 1.5 \text{ mA}$                                                                      | 2.5                                                                               |      | 5.0 V                    |
| $I_{GSS}$    | $V_{GS} = \pm 20 \text{ V}$ , $V_{DS} = 0$                                                                       |                                                                                   |      | $\pm 100 \text{ nA}$     |
| $I_{DSS}$    | $V_{DS} = V_{DSS}$ , $V_{GS} = 0 \text{ V}$                                                                      |                                                                                   |      | 50 $\mu\text{A}$<br>2 mA |
| $R_{DS(on)}$ | $V_{GS} = 10 \text{ V}$ , $I_D = 0.5 I_{D25}$<br>Pulse test, $t \leq 300 \mu\text{s}$ , duty cycle $d \leq 2 \%$ |                                                                                   |      | 4.5 $\Omega$             |

| Symbol       | Test Conditions                                                                                                | Characteristic Values<br>( $T_J = 25^\circ\text{C}$ , unless otherwise specified) |      |      |
|--------------|----------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------|------|
|              |                                                                                                                | min.                                                                              | typ. | max. |
| $g_{fs}$     | $V_{DS} = 20\text{ V}; I_D = 0.5 \cdot I_{D25}$ , pulse test                                                   | 1.5                                                                               | 2.5  | S    |
| $C_{iss}$    | $V_{GS} = 0\text{ V}, V_{DS} = 25\text{ V}, f = 1\text{ MHz}$                                                  |                                                                                   | 1050 | pF   |
| $C_{oss}$    |                                                                                                                |                                                                                   | 100  | pF   |
| $C_{rss}$    |                                                                                                                |                                                                                   | 25   | pF   |
| $t_{d(on)}$  | $V_{GS} = 10\text{ V}, V_{DS} = 0.5 \cdot V_{DSS}, I_D = 0.5 \cdot I_{D25}$<br>$R_G = 4.7\ \Omega$ (External), |                                                                                   | 17   | ns   |
| $t_r$        |                                                                                                                |                                                                                   | 15   | ns   |
| $t_{d(off)}$ |                                                                                                                |                                                                                   | 32   | ns   |
| $t_f$        |                                                                                                                |                                                                                   | 18   | ns   |
| $Q_{g(on)}$  | $V_{GS} = 10\text{ V}, V_{DS} = 0.5 \cdot V_{DSS}, I_D = 0.5 \cdot I_{D25}$                                    |                                                                                   | 39   | nC   |
| $Q_{gs}$     |                                                                                                                |                                                                                   | 9    | nC   |
| $Q_{gd}$     |                                                                                                                |                                                                                   | 22   | nC   |
| $R_{thJC}$   | (TO-220)                                                                                                       |                                                                                   | 0.62 | K/W  |
| $R_{thCK}$   |                                                                                                                |                                                                                   | 0.25 | K/W  |

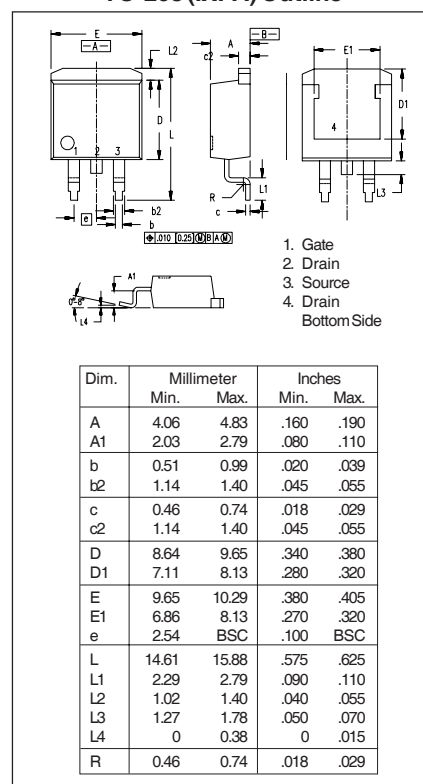
## Source-Drain Diode

| Symbol   | Test Conditions                                                                                       | Characteristic Values<br>( $T_J = 25^\circ\text{C}$ , unless otherwise specified) |      |               |
|----------|-------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------|---------------|
|          |                                                                                                       | min.                                                                              | typ. | max.          |
| $I_S$    | $V_{GS} = 0\text{ V}$                                                                                 |                                                                                   |      | 3 A           |
| $I_{SM}$ | Repetitive; pulse width limited by $T_{JM}$                                                           |                                                                                   |      | 12 A          |
| $V_{SD}$ | $I_F = I_S, V_{GS} = 0\text{ V}$ ,<br>Pulse test, $t \leq 300\ \mu\text{s}$ , duty cycle $d \leq 2\%$ |                                                                                   |      | 1.5 V         |
| $t_{rr}$ | $I_F = I_S, -di/dt = 100\text{ A}/\mu\text{s}, V_R = 100\text{ V}$                                    |                                                                                   | 0.4  | 300 ns        |
| $Q_{RM}$ |                                                                                                       |                                                                                   | 1.2  | $\mu\text{C}$ |
| $I_{RM}$ |                                                                                                       |                                                                                   |      | A             |

## TO-220 (IXFP) Outline



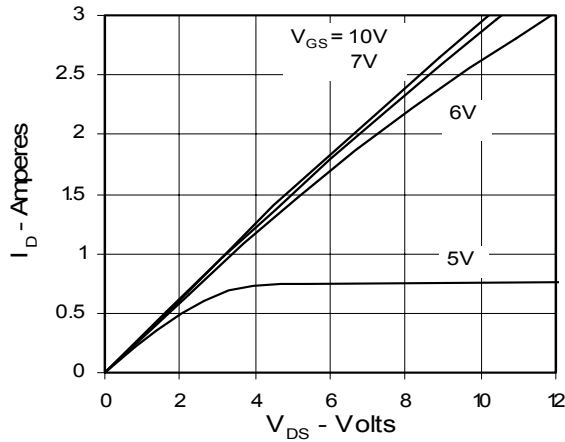
## TO-263 (IXFA) Outline



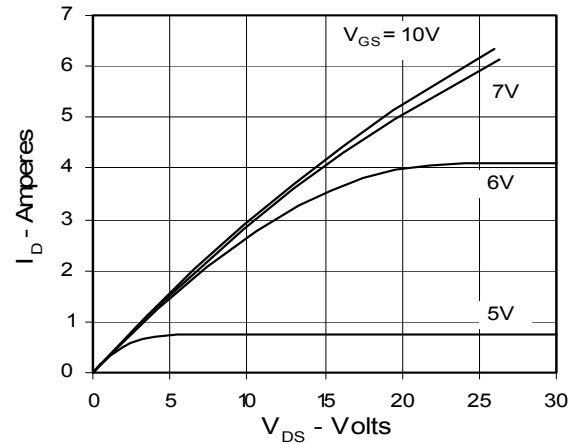
IXYS reserves the right to change limits, test conditions, and dimensions.

|                                                                                  |           |           |           |           |              |              |              |           |
|----------------------------------------------------------------------------------|-----------|-----------|-----------|-----------|--------------|--------------|--------------|-----------|
| 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 |
|                                                                                  | 4,850,072 | 5,017,508 | 5,063,307 | 5,381,025 | 6,259,123 B1 | 6,534,343    | 6,710,405 B2 |           |
|                                                                                  | 4,881,106 | 5,034,796 | 5,187,117 | 5,486,715 | 6,306,728 B1 | 6,583,505    | 6,710,463    |           |

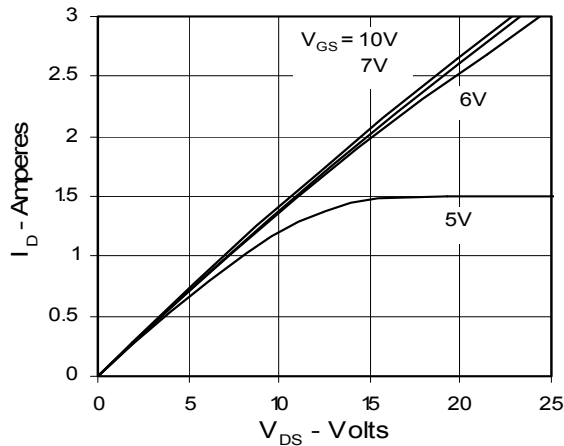
**Fig. 1. Output Characteristics**  
@ 25 Deg. C



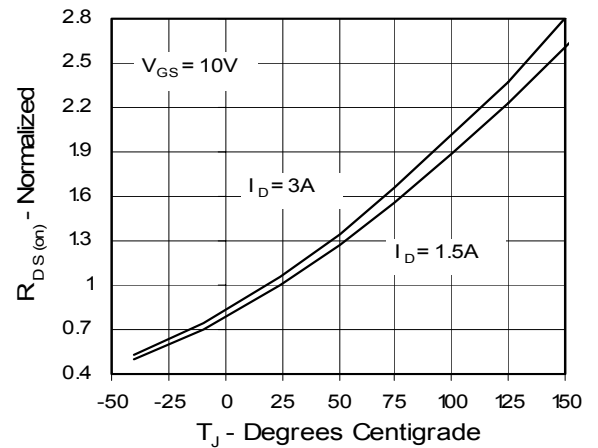
**Fig. 2. Extended Output Characteristics**  
@ 25 deg. C



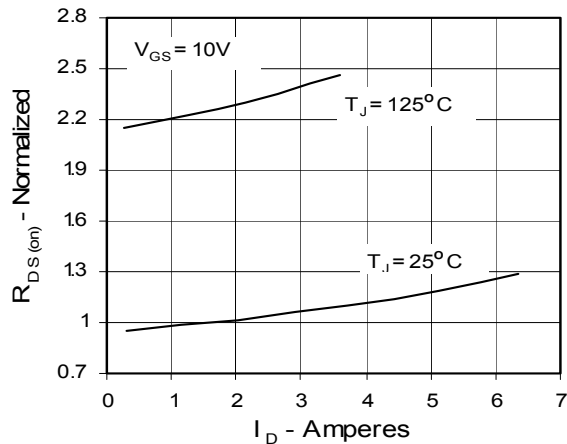
**Fig. 3. Output Characteristics**  
@ 125 Deg. C



**Fig. 4.  $R_{DS(on)}$  Normalized to  $I_{D25}$  Value vs. Junction Temperature**



**Fig. 5.  $R_{DS(on)}$  Normalized to  $I_{D25}$  Value vs.  $I_D$**



**Fig. 6. Drain Current vs. Case Temperature**

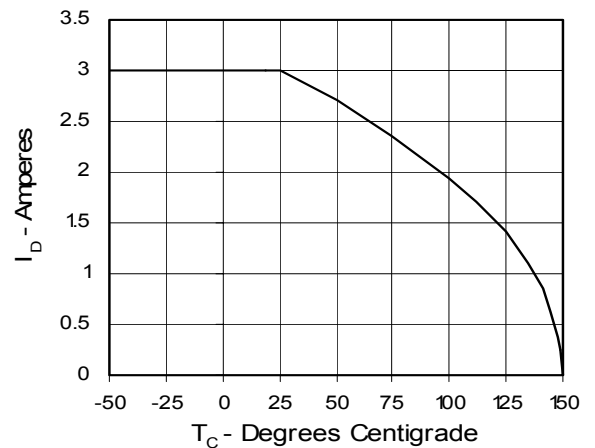


Fig. 7. Input Admittance

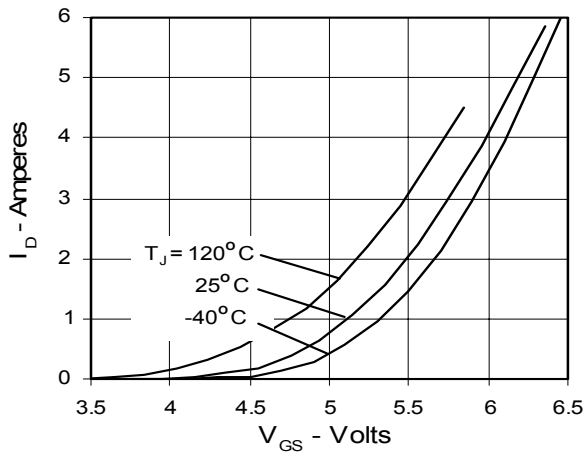


Fig. 8. Transconductance

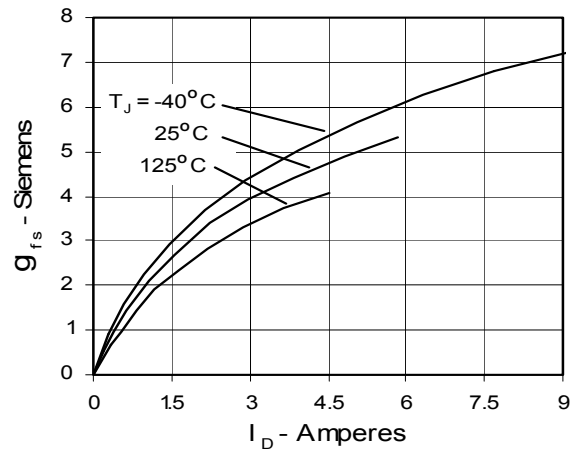


Fig. 9. Source Current vs. Source-To-Drain Voltage

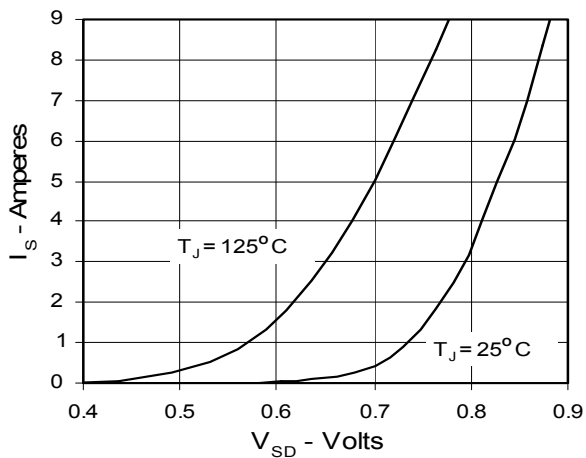


Fig. 10. Gate Charge

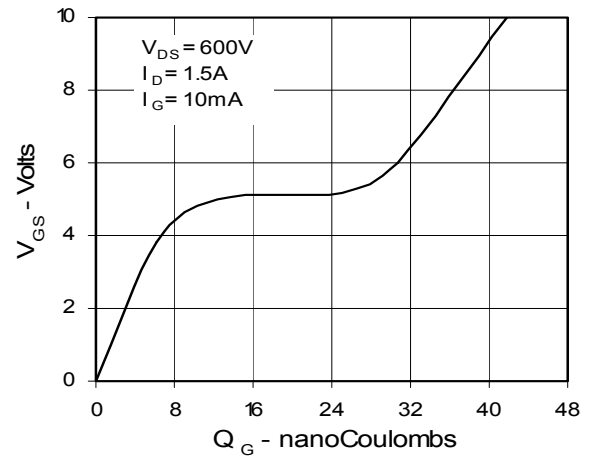


Fig. 11. Capacitance

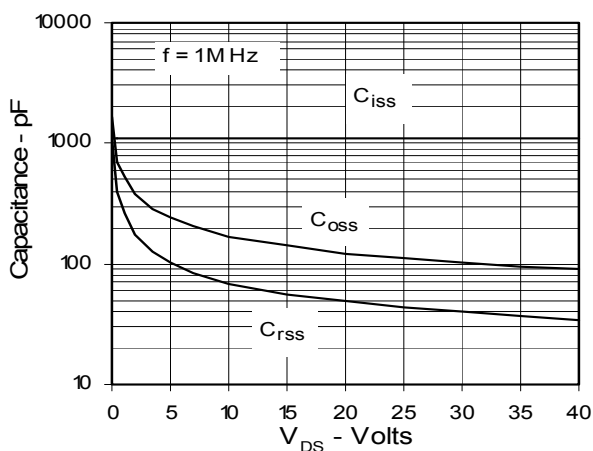


Fig. 12. Maximum Transient Thermal Resistance

