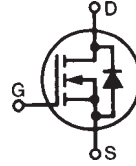


# High Voltage Power MOSFETs

## IXTA 3N120 IXTP 3N120

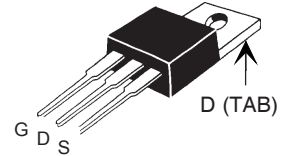
N-Channel Enhancement Mode  
Avalanche Rated, High dv/dt

|           |           |              |
|-----------|-----------|--------------|
| $V_{DSS}$ | $I_{D25}$ | $R_{DS(on)}$ |
| 1200 V    | 3 A       | 4.5 $\Omega$ |

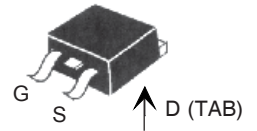


| Symbol    | Test Conditions   | Maximum Ratings |                  |
|-----------|---|-----------------|------------------|
| $V_{DSS}$ | $T_J = 25^\circ\text{C}$ to $150^\circ\text{C}$   | 1200            | V                |
| $V_{DGR}$ | $T_J = 25^\circ\text{C}$ to $150^\circ\text{C}$ ; $R_{GS} = 1\text{ M}\Omega$   | 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>$T_J \leq 150^\circ\text{C}$ , $R_G = 2\ \Omega$ | 5               | 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 (IXTP)



### TO-263 (IXTA)



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

### Features

- 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                   |
| $V_{GS(th)}$ | $V_{DS} = V_{GS}$ , $I_D = 250\ \mu\text{A}$                  | 2.0   |      | V                   |
| $I_{GSS}$    | $V_{GS} = \pm 20\text{ V}_{DC}$ , $V_{DS} = 0$                |   |      | $\pm 100\text{ nA}$ |
| $I_{DSS}$    | $V_{DS} = 0.8\text{ V}_{DSS}$                                 | $T_J = 25^\circ\text{C}$  |      | 25 $\mu\text{A}$    |
|              | $V_{GS} = 0\text{ V}$   | $T_J = 125^\circ\text{C}$   |      | 1 mA                |
| $R_{DS(on)}$ | $V_{GS} = 10\text{ V}$ , $I_D = 0.5\text{ I}_{D25}$<br>Note 1 |   |      | 4.5 $\Omega$        |

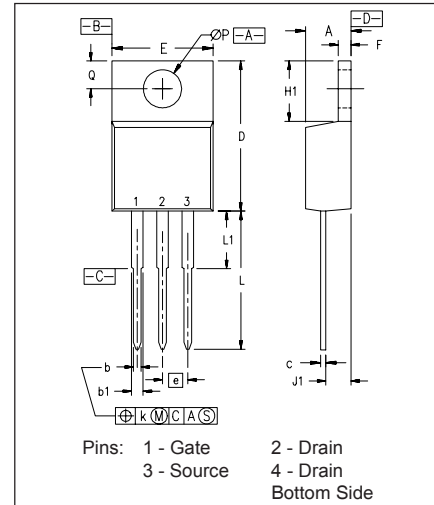
| Symbol       | Test Conditions  | Characteristic Values<br>( $T_J = 25^\circ\text{C}$ , unless otherwise specified) |      |      |
|--------------|--|---|------|------|
|              |  | min.  | typ. | max. |
| $g_{fs}$     | $V_{DS} = 20\text{ V}; I_D = 0.5 \cdot I_{D25}$ , Note 1   | 1.5   | 2.6  | S    |
| $C_{iss}$    | $V_{GS} = 0\text{ V}, V_{DS} = 25\text{ V}, f = 1\text{ MHz}$  | 1100  | 1350 | pF   |
| $C_{oss}$    |  | 110   | 135  | pF   |
| $C_{rss}$    |  | 40  | 60   | 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   |
| $Q_{g(on)}$  | $V_{GS} = 10\text{ V}, V_{DS} = 0.5 \cdot V_{DSS}, I_D = 0.5 \cdot I_{D25}$                                    | 42  |      | nC   |
| $Q_{gs}$     |  | 8   |      | nC   |
| $Q_{gd}$     |  | 21  |      | 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  |
| $V_{SD}$ | $I_F = I_S, V_{GS} = 0\text{ V}$ , Note 1                          |   |      | 1.5 V |
| $t_{rr}$ | $I_F = I_S, -di/dt = 100\text{ A}/\mu\text{s}, V_R = 100\text{ V}$ | 700   |      | ns    |

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

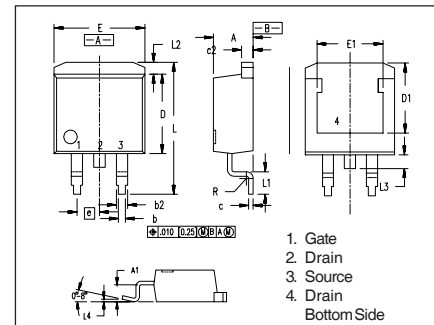
### TO-220 (IXTP) Outline



| SYM | INCHES   |      | MILLIMETERS |       |
|-----|----------|------|-------------|-------|
|     | MIN      | MAX  | MIN         | MAX   |
| A   | .170     | .190 | 4.32        | 4.83  |
| b   | .025     | .040 | 0.64        | 1.02  |
| b1  | .045     | .065 | 1.15        | 1.65  |
| c   | .014     | .022 | 0.35        | 0.56  |
| D   | .580     | .630 | 14.73       | 16.00 |
| E   | .390     | .420 | 9.91        | 10.66 |
| e   | .100 BSC |      | 2.54 BSC    |       |
| F   | .045     | .055 | 1.14        | 1.40  |
| H1  | .230     | .270 | 5.85        | 6.85  |
| J1  | .090     | .110 | 2.29        | 2.79  |
| k   | 0        | .015 | 0           | 0.38  |
| L   | .500     | .550 | 12.70       | 13.97 |
| L1  | .110     | .230 | 2.79        | 5.84  |
| ØP  | .139     | .161 | 3.53        | 4.08  |
| Q   | .100     | .125 | 2.54        | 3.18  |

NOTE: This drawing will meet all dimensions requirement of JEDEC outline TO-220 AB.

### TO-263 (IXTA) Outline



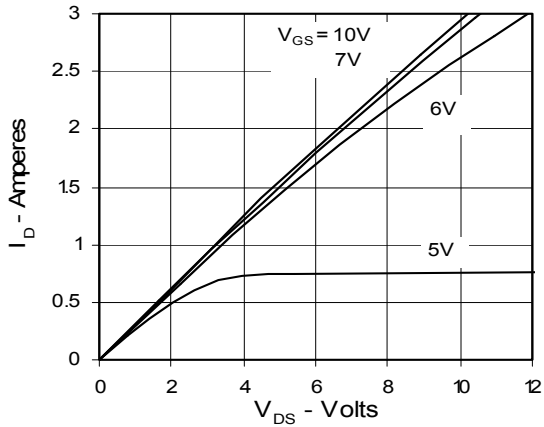
| Dim. | Millimeter |       | Inches |      |
|------|------------|-------|--------|------|
|      | Min.       | Max.  | Min.   | Max. |
| A    | 4.06       | 4.83  | .160   | .190 |
| A1   | 2.03       | 2.79  | .080   | .110 |
| b    | 0.51       | 0.99  | .020   | .039 |
| b2   | 1.14       | 1.40  | .045   | .055 |
| c    | 0.46       | 0.74  | .018   | .029 |
| c2   | 1.14       | 1.40  | .045   | .055 |
| D    | 8.64       | 9.65  | .340   | .380 |
| D1   | 7.11       | 8.13  | .280   | .320 |
| E    | 9.65       | 10.29 | .380   | .405 |
| E1   | 6.86       | 8.13  | .270   | .320 |
| e    | 2.54       | BSC   | .100   | BSC  |
| L    | 14.61      | 15.88 | .575   | .625 |
| L1   | 2.29       | 2.79  | .090   | .110 |
| L2   | 1.02       | 1.40  | .040   | .055 |
| L3   | 1.27       | 1.78  | .050   | .070 |
| L4   | 0          | 0.38  | 0      | .015 |
| R    | 0.46       | 0.74  | .018   | .029 |

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

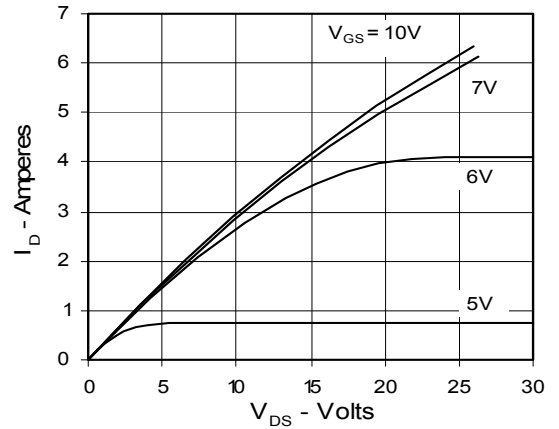
IXYS MOSFETs and IGBTs are covered by one or more of the following U.S. patents:

4,835,592 4,881,106 5,017,508 5,049,961 5,187,117 5,486,715 6,306,728B1 6,259,123B1 6,306,728B1  
4,850,072 4,931,844 5,034,796 5,063,307 5,237,481 5,381,025 6,404,065B1 6,162,665 6,534,343

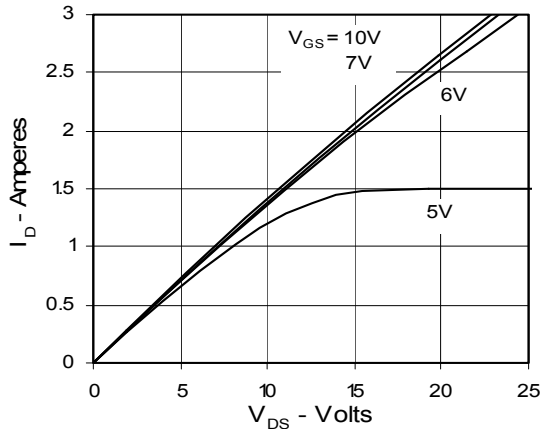
**Fig. 1. Output Characteristics  
@ 25 Deg. C**



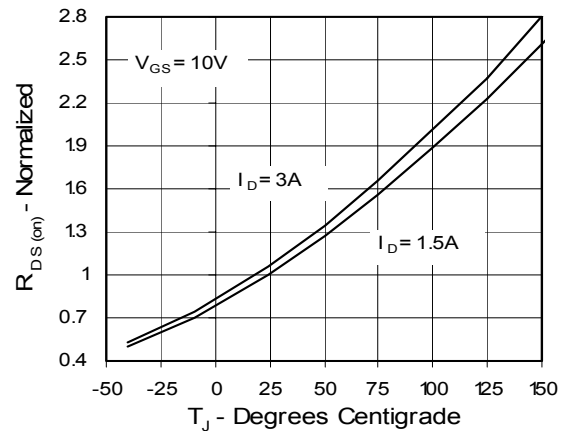
**Fig. 2. Extended Output Characteristics  
@ 25 deg. C**



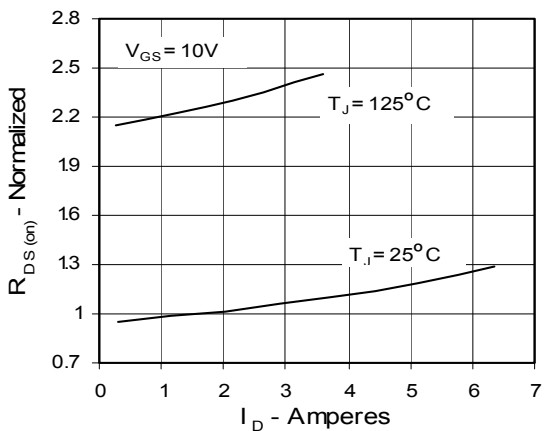
**Fig. 3. Output Characteristics  
@ 125 Deg. C**



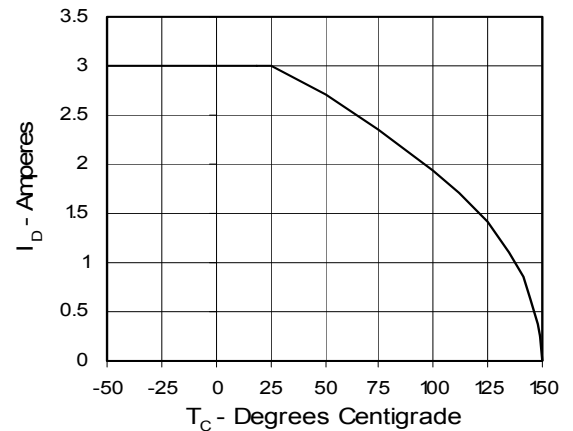
**Fig. 4.  $R_{DS(on)}$  Normalized to  $I_{D25}$  Value vs.  
Junction Temperature**



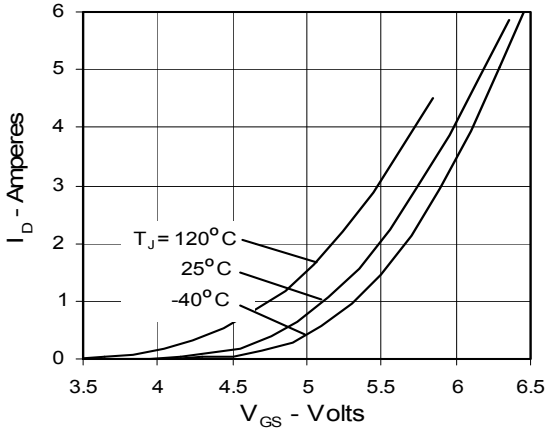
**Fig. 5.  $R_{DS(on)}$  Normalized to  $I_{D25}$   
Value vs.  $I_D$**



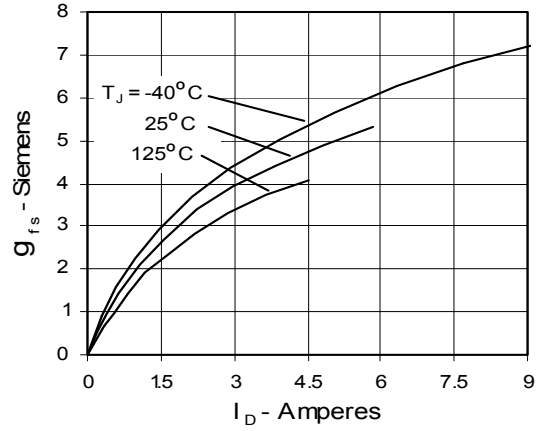
**Fig. 6. Drain Current vs. Case  
Temperature**



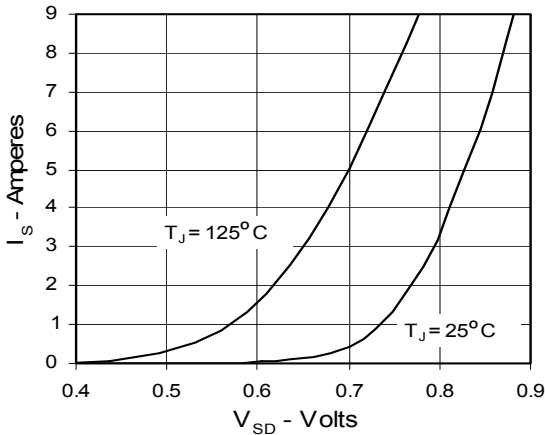
**Fig. 7. Input Admittance**



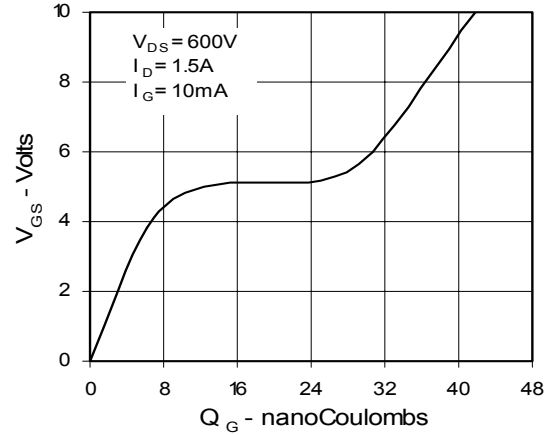
**Fig. 8. Transconductance**



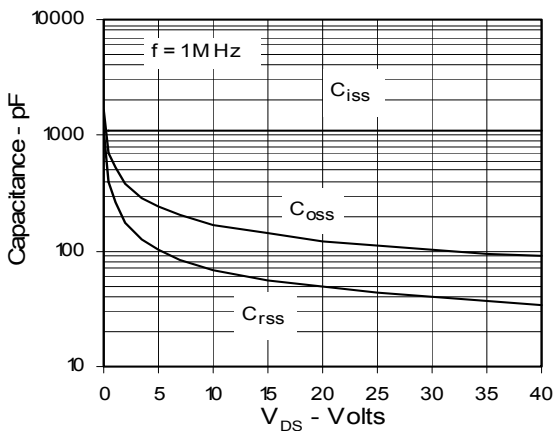
**Fig. 9. Source Current vs. Source-To-Drain Voltage**



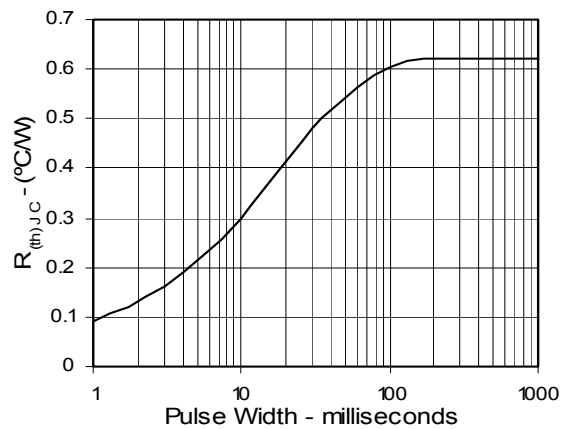
**Fig. 10. Gate Charge**



**Fig. 11. Capacitance**



**Fig. 12. Maximum Transient Thermal Resistance**



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