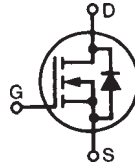


# Polar™ Power MOSFET IXTP12N50PM

(Electrically Isolated Tab)

N-Channel Enhancement Mode  
Avalanche Rated  
Fast Intrinsic Diode



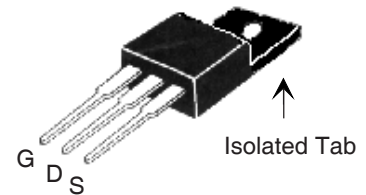
$$V_{DSS} = 500V$$

$$I_{D25} = 6A$$

$$R_{DS(on)} \leq 500m\Omega$$

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

OVERMOLDED TO-220  
(IXTP...M) OUTLINE



G = Gate      D = Drain  
S = Source

| Symbol        | Test Conditions   | Maximum Ratings |            |
|---------------|---|-----------------|------------|
| $V_{DSS}$     | $T_J = 25^\circ C$ to $150^\circ C$                             | 500             | V          |
| $V_{DGR}$     | $T_J = 25^\circ C$ to $150^\circ C$ , $R_{GS} = 1 M\Omega$      | 500             | V          |
| $V_{GSS}$     | Continuous  | $\pm 30$        | V          |
| $V_{GSM}$     | Transient   | $\pm 40$        | V          |
| $I_{D25}$     | $T_C = 25^\circ C$  | 6               | A          |
| $I_{DM}$      | $T_C = 25^\circ C$ , pulse width limited by $T_{JM}$            | 30              | A          |
| $I_A$         | $T_C = 25^\circ C$  | 12              | A          |
| $E_{AS}$      | $T_C = 25^\circ C$  | 600             | mJ         |
| $dv/dt$       | $I_S \leq I_{DM}$ , $V_{DD} \leq V_{DSS}$ , $T_J = 150^\circ C$ | 10              | V/ns       |
| $P_D$         | $T_C = 25^\circ C$  | 50              | W          |
| $T_J$         |   | - 55 ... +150   | $^\circ C$ |
| $T_{JM}$      |   | 150             | $^\circ C$ |
| $T_{stg}$     |   | - 55 ... +150   | $^\circ C$ |
| $T_L$         | 1.6 mm (0.062 in.) from case for 10 s                           | 300             | $^\circ C$ |
| $T_{SOLD}$    | Plastic body for 10 s   | 260             | $^\circ C$ |
| $M_d$         | Mounting torque   | 1.13/10         | Nm/lb.in.  |
| <b>Weight</b> |   | 2.5             | g          |

## Features

- Plastic overmolded tab for electrical isolation
- International standard package
- Unclamped Inductive Switching (UIS) rated
- Low package inductance
  - easy to drive and to protect

## Advantages

- Easy to mount
- Space savings

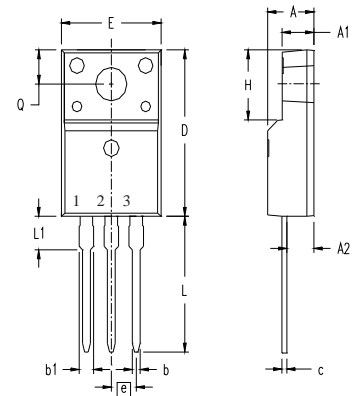
| Symbol       | Test Conditions<br>( $T_J = 25^\circ C$ , unless otherwise specified) | Characteristic Values |      |                          |
|--------------|---|-----------------------|------|--------------------------|
|              |   | Min.                  | Typ. | Max.                     |
| $BV_{DSS}$   | $V_{GS} = 0V$ , $I_D = 250\mu A$                                      | 500                   |      | V                        |
| $V_{GS(th)}$ | $V_{DS} = V_{GS}$ , $I_D = 250\mu A$                                  | 3.0                   |      | V                        |
| $I_{GSS}$    | $V_{GS} = \pm 30V$ , $V_{DS} = 0V$                                    |                       |      | $\pm 100$ nA             |
| $I_{DSS}$    | $V_{DS} = V_{DSS}$<br>$V_{GS} = 0V$ $T_J = 125^\circ C$               |                       |      | 5 $\mu A$<br>250 $\mu A$ |
| $R_{DS(on)}$ | $V_{GS} = 10V$ , $I_D = 6A$ , Note 1                                  |                       |      | 500 m $\Omega$           |

| Symbol       | Test Conditions   | Characteristic Values<br>( $T_J = 25^\circ\text{C}$ , unless otherwise specified) |      |                        |
|--------------|---|---|------|------------------------|
|              |   | Min.  | Typ. | Max.                   |
| $g_{fs}$     | $V_{DS} = 10\text{V}, I_D = 6\text{A}$ , Note 1   | 7.5   | 13   | S                      |
| $C_{iss}$    | $V_{GS} = 0\text{V}, V_{DS} = 25\text{V}, f = 1\text{MHz}$  |   | 1830 | pF                     |
| $C_{oss}$    |   |   | 182  | pF                     |
| $C_{rss}$    |   |   | 16   | pF                     |
| $t_{d(on)}$  | $V_{GS} = 10\text{V}, V_{DS} = 0.5 \cdot V_{DSS}, I_D = 6\text{A}$<br>$R_G = 10\Omega$ (External) |   | 22   | ns                     |
| $t_r$        |   |   | 27   | ns                     |
| $t_{d(off)}$ |   |   | 65   | ns                     |
| $t_f$        |   |   | 20   | ns                     |
| $Q_{g(on)}$  | $V_{GS} = 10\text{V}, V_{DS} = 0.5 \cdot V_{DSS}, I_D = 6\text{A}$                                |   | 29   | nC                     |
| $Q_{gs}$     |   |   | 11   | nC                     |
| $Q_{gd}$     |   |   | 10   | nC                     |
| $R_{thJC}$   |   |   |      | 2.5 $^\circ\text{C/W}$ |

### Source-Drain Diode

| Symbol   | Test Conditions  | Characteristic Values<br>( $T_J = 25^\circ\text{C}$ unless otherwise specified) |      |               |
|----------|--|---|------|---------------|
|          |  | Min.  | Typ. | Max.          |
| $I_S$    | $V_{GS} = 0\text{V}$   |   |      | 12 A          |
| $I_{SM}$ | Repetitive, pulse width limited by $T_{JM}$  |   |      | 48 A          |
| $V_{SD}$ | $I_F = I_S, V_{GS} = 0\text{V}$ , Note 1   |   |      | 1.5 V         |
| $t_{rr}$ | $I_F = 6\text{A}, -di/dt = 150\text{A}/\mu\text{s}$<br>$V_R = 100\text{V}, V_{GS} = 0\text{V}$ |   |      | 300 ns        |
| $Q_{RM}$ |  |   | 2.8  | $\mu\text{C}$ |
| $I_{RM}$ |  |   | 18.2 | A             |

### ISOLATED TO-220 (IXTP...M)



Terminals: 1 - Gate  
2 - Drain (Collector)  
3 - Source (Emitter)

| SYM             | INCHES   |      | MILLIMETERS |       |
|-----------------|----------|------|-------------|-------|
|                 | MIN      | MAX  | MIN         | MAX   |
| A               | .177     | .193 | 4.50        | 4.90  |
| A1              | .092     | .108 | 2.34        | 2.74  |
| A2              | .101     | .117 | 2.56        | 2.96  |
| b               | .028     | .035 | 0.70        | 0.90  |
| b1              | .050     | .058 | 1.27        | 1.47  |
| c               | .018     | .024 | 0.45        | 0.60  |
| D               | .617     | .633 | 15.67       | 16.07 |
| E               | .392     | .408 | 9.96        | 10.36 |
| e               | .100 BSC |      | 2.54 BSC    |       |
| H               | .255     | .271 | 6.48        | 6.88  |
| L               | .499     | .523 | 12.68       | 13.28 |
| L1              | .119     | .135 | 3.03        | 3.43  |
| $\varnothing P$ | .121     | .129 | 3.08        | 3.28  |
| Q               | .126     | .134 | 3.20        | 3.40  |

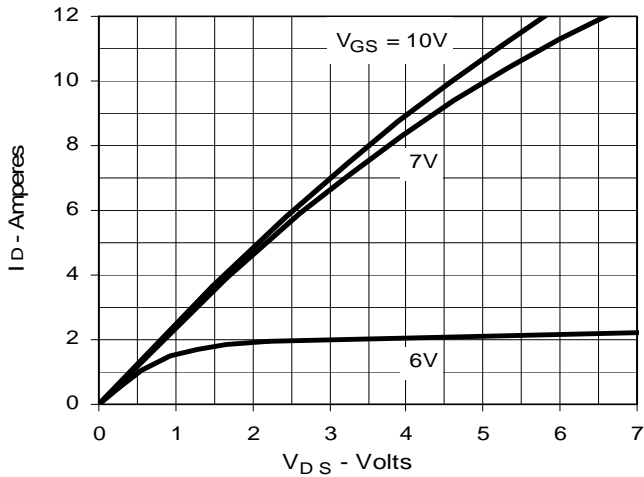
Notes: 1. Pulse test,  $t \leq 300 \mu\text{s}$ ; duty cycle,  $d \leq 2\%$ .

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

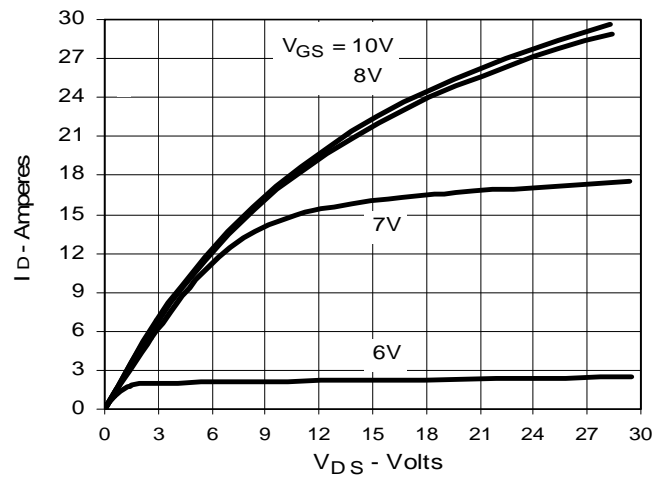
IXYS MOSFETs and IGBTs are covered by one or more of the following U.S. patents:

|           |           |           |           |              |              |              |              |              |              |
|-----------|-----------|-----------|-----------|--------------|--------------|--------------|--------------|--------------|--------------|
| 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 | 7,157,338 B2 |
| 4,850,072 | 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    |              |

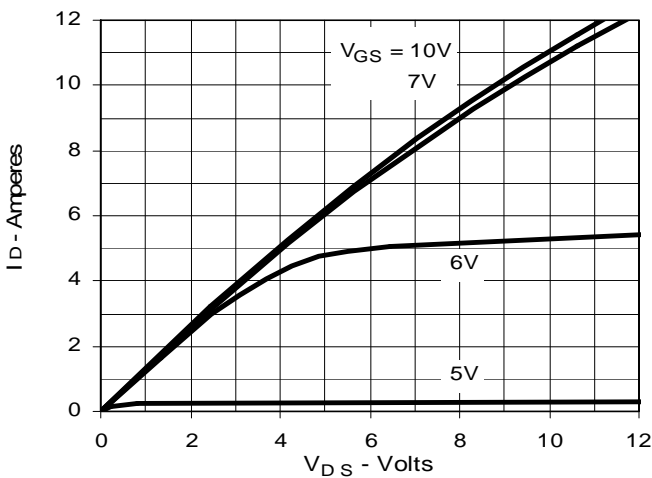
**Fig. 1. Output Characteristics**  
@ 25°C



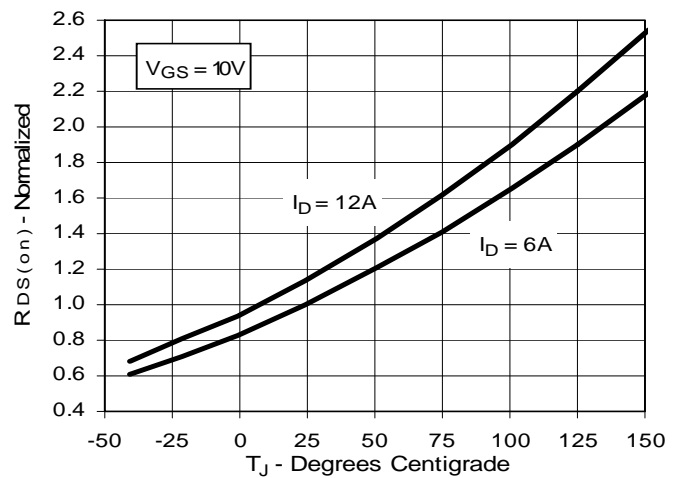
**Fig. 2. Extended Output Characteristics**  
@ 25°C



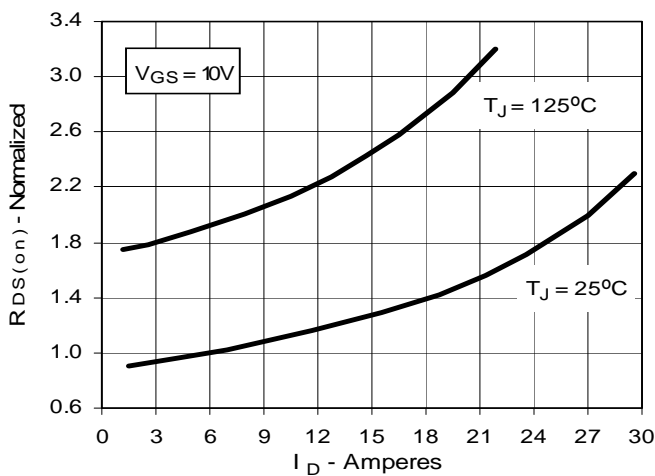
**Fig. 3. Output Characteristics**  
@ 125°C



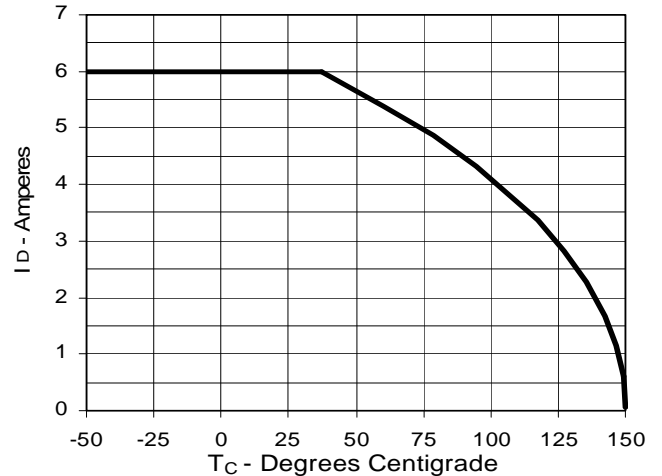
**Fig. 4.  $R_{DS(on)}$  Normalized to  $I_D = 6A$  Value vs. Junction Temperature**



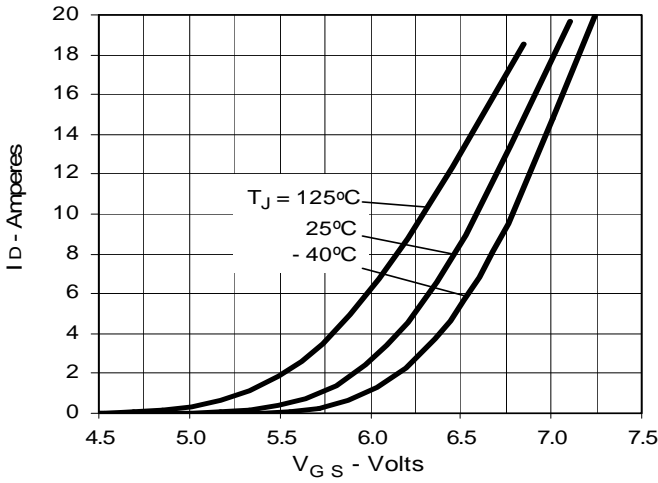
**Fig. 5.  $R_{DS(on)}$  Normalized to  $I_D = 6A$  Value vs. Drain Current**



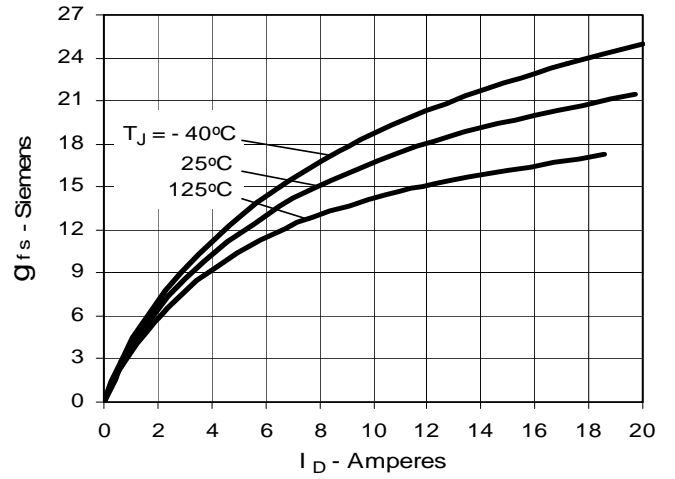
**Fig. 6. Drain Current vs. Case Temperature**



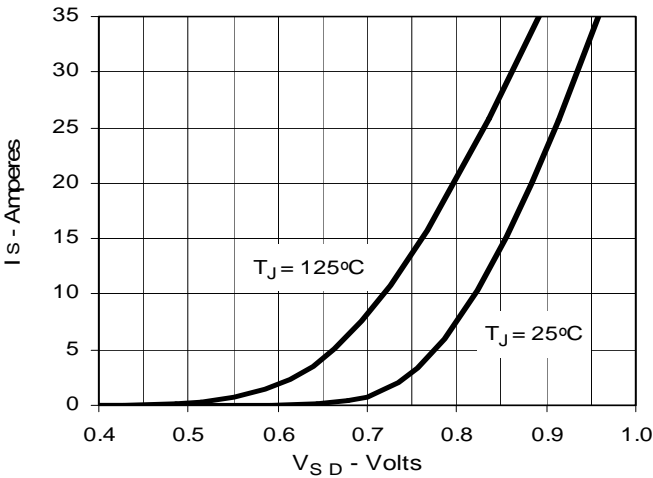
**Fig. 7. Input Admittance**



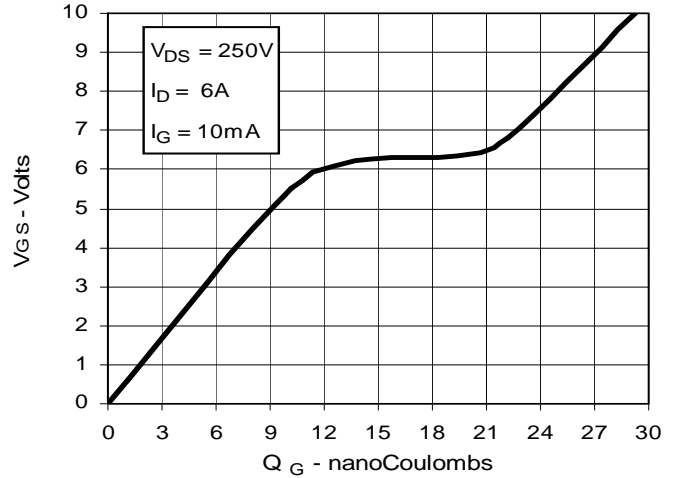
**Fig. 8. Transconductance**



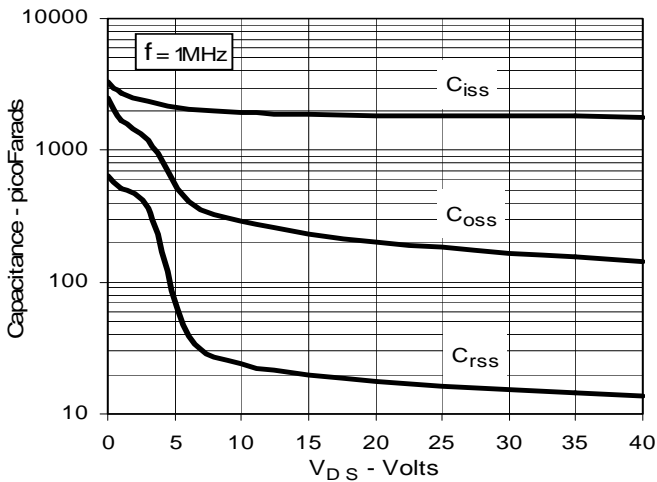
**Fig. 9. Source Current vs. Source-To-Drain Voltage**



**Fig. 10. Gate Charge**



**Fig. 11. Capacitance**



**Fig. 12. Forward-Bias Safe Operating Area**

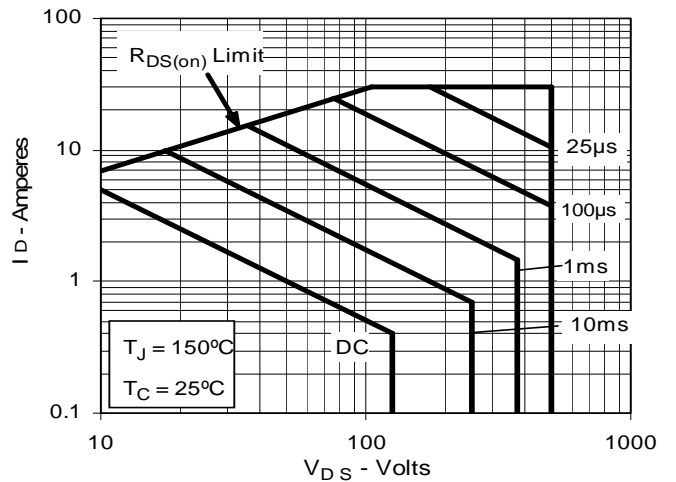


Fig. 13. Maximum Transient Thermal Impedance

