

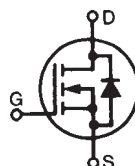
## PolarHT™ Power MOSFET

(Electrically Isolated Tab)

## IXTP50N20PM

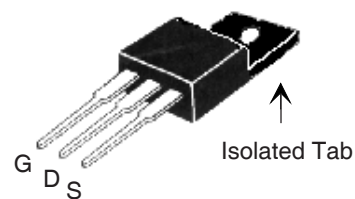
$$\begin{aligned} V_{DSS} &= 200V \\ I_{D25} &= 20A \\ R_{DS(on)} &\leq 60m\Omega \end{aligned}$$

N-Chlnnel Enhancement Mode



| Symbol     | Test Conditions                                                          | Maximum Ratings |                  |
|------------|--------------------------------------------------------------------------|-----------------|------------------|
| $V_{DSS}$  | $T_J = 25^\circ\text{C}$ to $175^\circ\text{C}$                          | 200             | V                |
| $V_{DGR}$  | $T_J = 25^\circ\text{C}$ to $175^\circ\text{C}$ , $R_{GS} = 1M\Omega$    | 200             | V                |
| $V_{GSS}$  | Continuous                                                               | $\pm 20$        | V                |
| $V_{GSM}$  | Transient                                                                | $\pm 30$        | V                |
| $I_{D25}$  | $T_C = 25^\circ\text{C}$                                                 | 20              | A                |
| $I_{DM}$   | $T_C = 25^\circ\text{C}$ , pulse width limited by $T_{JM}$               | 120             | A                |
| $I_A$      | $T_C = 25^\circ\text{C}$                                                 | 50              | A                |
| $E_{AS}$   | $T_C = 25^\circ\text{C}$                                                 | 1               | J                |
| $dV/dt$    | $I_S \leq I_{DM}$ , $V_{DD} \leq V_{DSS}$ , $T_J \leq 175^\circ\text{C}$ | 10              | V/ns             |
| $P_D$      | $T_C = 25^\circ\text{C}$                                                 | 90              | W                |
| $T_J$      |                                                                          | - 55 ... +175   | $^\circ\text{C}$ |
| $T_{JM}$   |                                                                          | 175             | $^\circ\text{C}$ |
| $T_{stg}$  |                                                                          | - 55 ... +175   | $^\circ\text{C}$ |
| $T_L$      | 1.6mm (0.062 in.) from case for 10s                                      | 300             | $^\circ\text{C}$ |
| $T_{SOLD}$ | Plastic body for 10s                                                     | 260             | $^\circ\text{C}$ |
| $M_d$      | Mounting torque                                                          | 1.13/10         | Nm/lb.in.        |
| Weight     |                                                                          | 2.5             | g                |

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



G = Gate      D = Drain  
S = Source

### Features

- Isolated Package
- International Standard Package

### Application

- DC-DC Converters
- Battery Chargers
- Switched-Mode and Reasonant-Mode Power Supplies
- DC Choppers
- AC Motor Control
- Uninterrupted Power Supplies
- High Speed Power Switching Applications

### Benefits

- Low Gate Charge Results in Simple Drive Requirement
- Improved Gate, Avalanche and Dynamic dv/dt Ruggedness
- Low Drain Capacitance to Ground
- Fast Switching

| Symbol       | Test Conditions<br>( $T_J = 25^\circ\text{C}$ , unless otherwise specified) | Characteristic Values |      |                           |
|--------------|-----------------------------------------------------------------------------|-----------------------|------|---------------------------|
|              |                                                                             | Min.                  | Typ. | Max.                      |
| $BV_{DSS}$   | $V_{GS} = 0V$ , $I_D = 250\mu A$                                            | 200                   |      | V                         |
| $V_{GS(th)}$ | $V_{DS} = V_{GS}$ , $I_D = 250\mu A$                                        | 2.5                   |      | 5.0 V                     |
| $I_{GSS}$    | $V_{GS} = \pm 20V$ , $V_{DS} = 0V$                                          |                       |      | $\pm 100$ nA              |
| $I_{DSS}$    | $V_{DS} = V_{DSS}$<br>$V_{GS} = 0V$<br>$T_J = 150^\circ\text{C}$            |                       |      | 25 $\mu A$<br>250 $\mu A$ |
| $R_{DS(on)}$ | $V_{GS} = 10V$ , $I_D = 25A$ , Note 1                                       |                       |      | 60 m $\Omega$             |

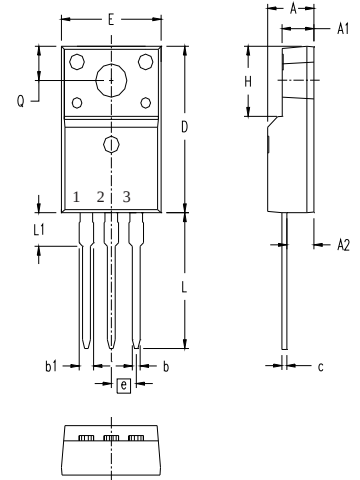
| Symbol       | Test Conditions<br>( $T_J = 25^\circ\text{C}$ , unless otherwise specified)                                                                  | Characteristic Values |      |                         |
|--------------|----------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|------|-------------------------|
|              |                                                                                                                                              | Min.                  | Typ. | Max.                    |
| $g_{fs}$     | $V_{DS} = 10\text{V}$ , $I_D = 25\text{A}$ , Note 1                                                                                          | 12                    | 23   | S                       |
| $C_{iss}$    | $V_{GS} = 0\text{V}$ , $V_{DS} = 25\text{V}$ , $f = 1\text{MHz}$                                                                             |                       | 2720 | pF                      |
| $C_{oss}$    |                                                                                                                                              |                       | 490  | pF                      |
| $C_{rss}$    |                                                                                                                                              |                       | 105  | pF                      |
| $t_{d(on)}$  | <b>Resistive Switching Times</b><br>$V_{GS} = 10\text{V}$ , $V_{DS} = 0.5 \cdot V_{DSS}$ , $I_D = 25\text{A}$<br>$R_G = 10\Omega$ (External) |                       | 26   | ns                      |
| $t_r$        |                                                                                                                                              |                       | 35   | ns                      |
| $t_{d(off)}$ |                                                                                                                                              |                       | 70   | ns                      |
| $t_f$        |                                                                                                                                              |                       | 30   | ns                      |
| $Q_{g(on)}$  | $V_{GS} = 10\text{V}$ , $V_{DS} = 0.5 \cdot V_{DSS}$ , $I_D = 25\text{A}$                                                                    |                       | 70   | nC                      |
| $Q_{gs}$     |                                                                                                                                              |                       | 17   | nC                      |
| $Q_{gd}$     |                                                                                                                                              |                       | 37   | nC                      |
| $R_{thJC}$   |                                                                                                                                              |                       |      | 1.66 $^\circ\text{C/W}$ |
| $R_{thCS}$   |                                                                                                                                              | 0.50                  |      | $^\circ\text{C/W}$      |

## Source-Drain Diode

| Symbol   | Test Conditions<br>( $T_J = 25^\circ\text{C}$ , unless otherwise specified)                           | Characteristic Values |      |               |
|----------|-------------------------------------------------------------------------------------------------------|-----------------------|------|---------------|
|          |                                                                                                       | Min.                  | Typ. | Max.          |
| $I_S$    | $V_{GS} = 0\text{V}$                                                                                  |                       |      | 50 A          |
| $I_{SM}$ | Repetitive, pulse width limited by $T_{JM}$                                                           |                       |      | 120 A         |
| $V_{SD}$ | $I_F = 50\text{A}$ , $V_{GS} = 0\text{V}$ , Note 1                                                    |                       |      | 1.5 V         |
| $t_{rr}$ | $I_F = 25\text{A}$ , $-di/dt = 100\text{A}/\mu\text{s}$<br>$V_R = 100\text{V}$ , $V_{GS} = 0\text{V}$ |                       | 150  | ns            |
| $Q_{RM}$ |                                                                                                       |                       | 2.0  | $\mu\text{C}$ |

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

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



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

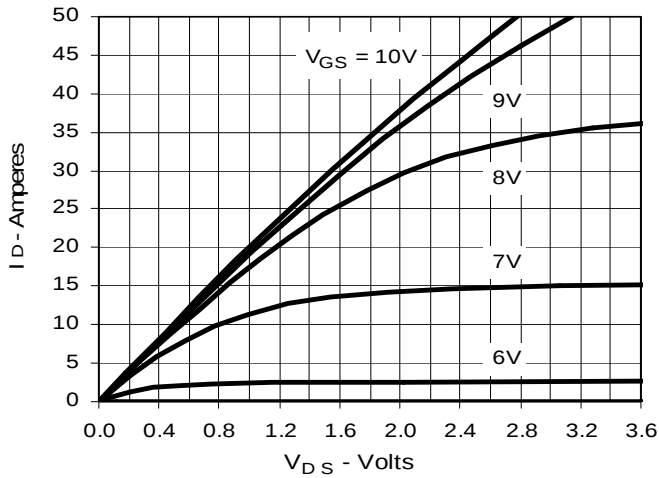
| SYM | INCHES   |      | MILLIMETERS |       |
|-----|----------|------|-------------|-------|
|     | MIN      | MAX  | MIN         | MAX   |
| A   | .177     | .193 | 4.50        | 4.90  |
| A1  | .092     | .108 | 2.34        | 2.74  |
| A2  | .101     | .117 | 2.56        | 2.96  |
| b   | .028     | .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  |
| ØP  | .121     | .129 | 3.08        | 3.28  |
| Q   | .126     | .134 | 3.20        | 3.40  |

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

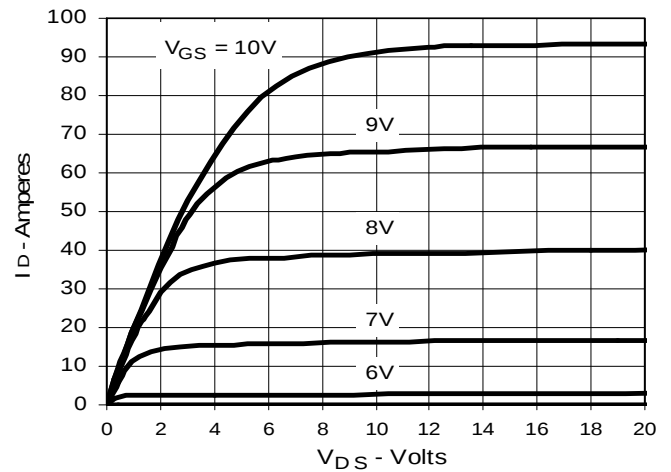
IXYS MOSFETs and IGBTs are covered by one or more of the following U.S. patents:

|           |           |           |           |              |              |              |              |              |             |
|-----------|-----------|-----------|-----------|--------------|--------------|--------------|--------------|--------------|-------------|
| 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 |
| 4,850,072 | 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    |             |

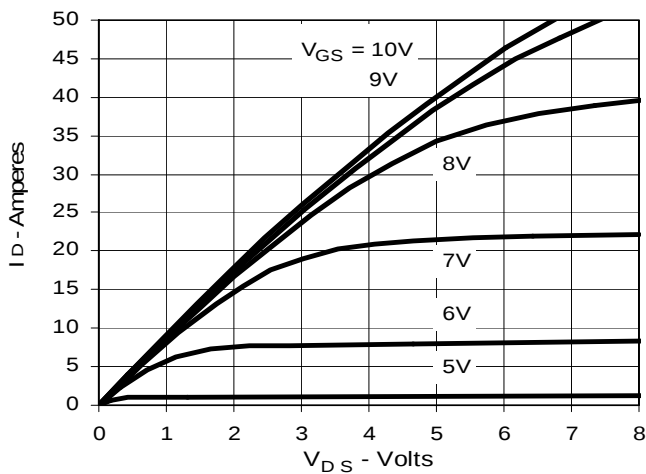
**Fig. 1. Output Characteristics**  
@ 25°C



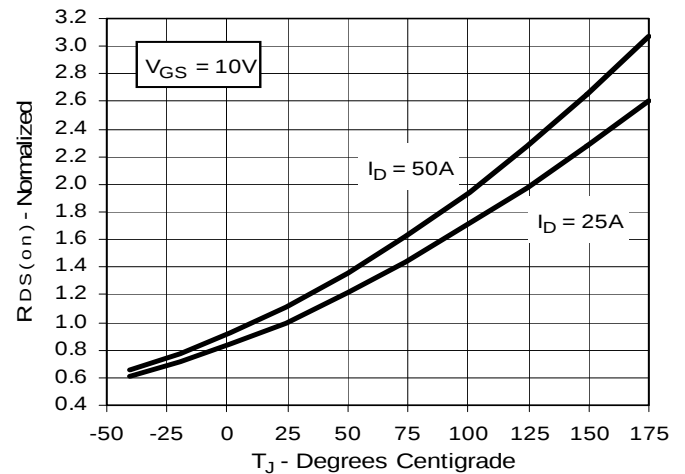
**Fig. 2. Extended Output Characteristics**  
@ 25°C



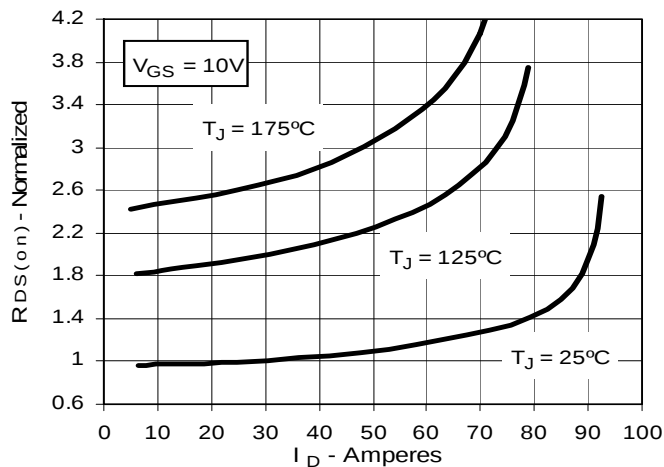
**Fig. 3. Output Characteristics**  
@ 150°C



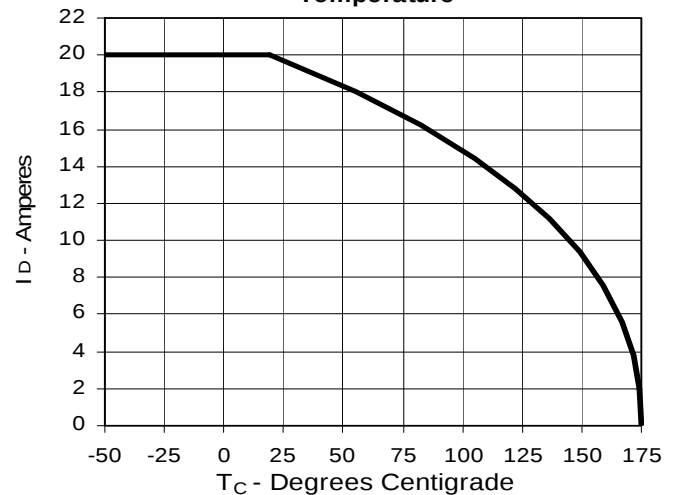
**Fig. 4.  $R_{DS(on)}$  Normalized to  $I_D = 25A$  Value**  
vs. Junction Temperature



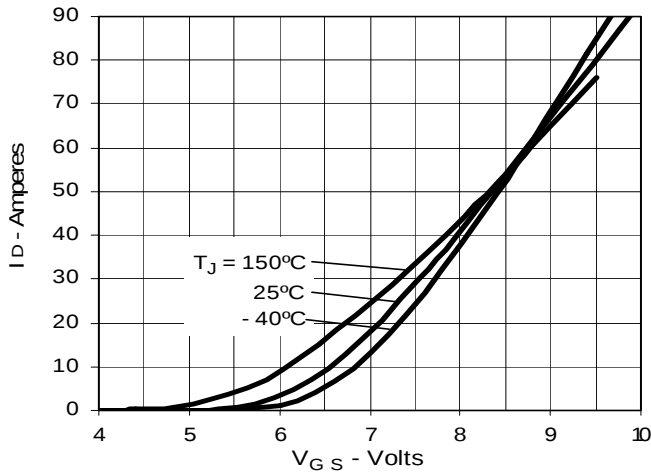
**Fig. 5.  $R_{DS(on)}$  Normalized to  $I_D = 25A$  Value**  
vs. Drain Current



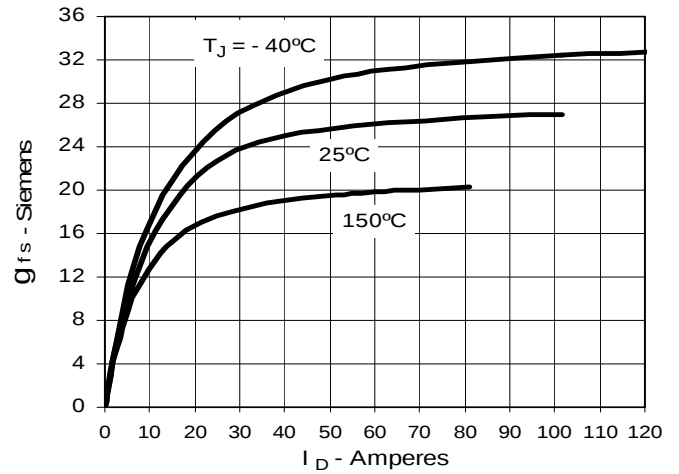
**Fig. 6. Drain Current vs. Case Temperature**



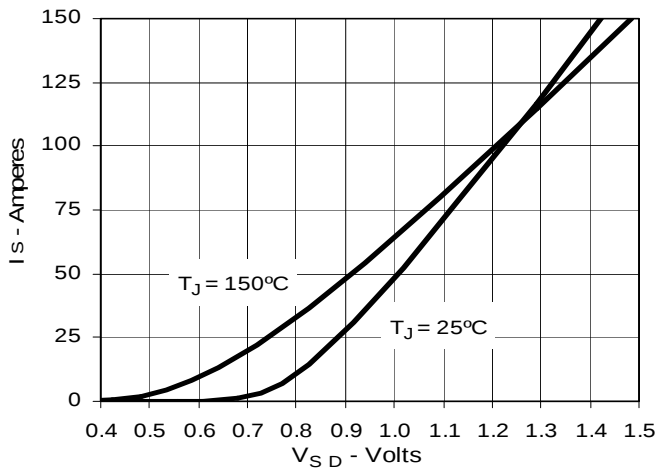
**Fig. 7. Input Admittance**



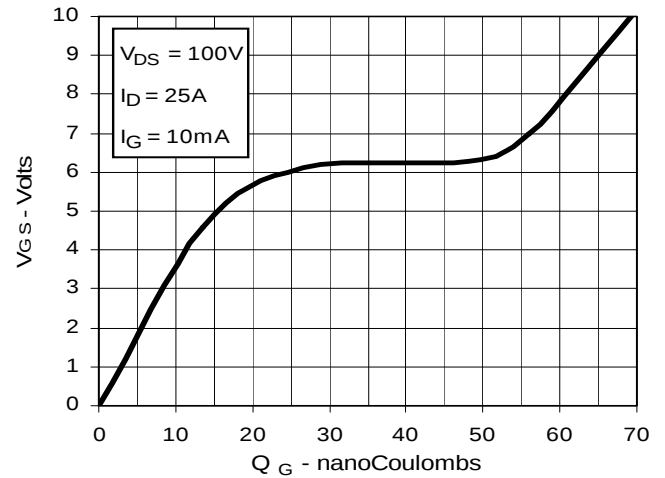
**Fig. 8. Transconductance**



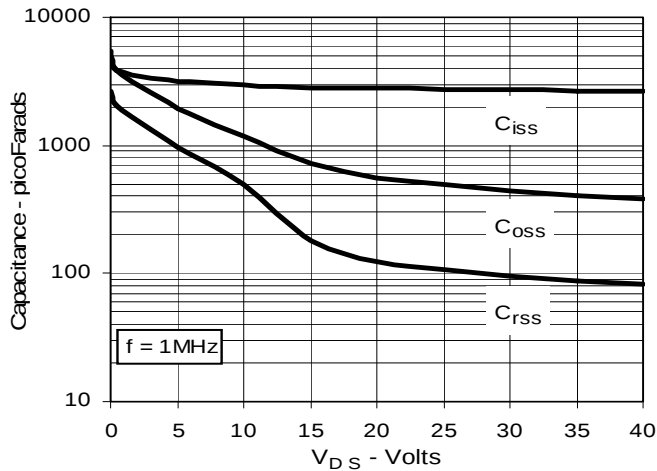
**Fig. 9. Source Current vs. Source-To-Drain Voltage**



**Fig. 10. Gate Charge**



**Fig. 11. Capacitance**



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

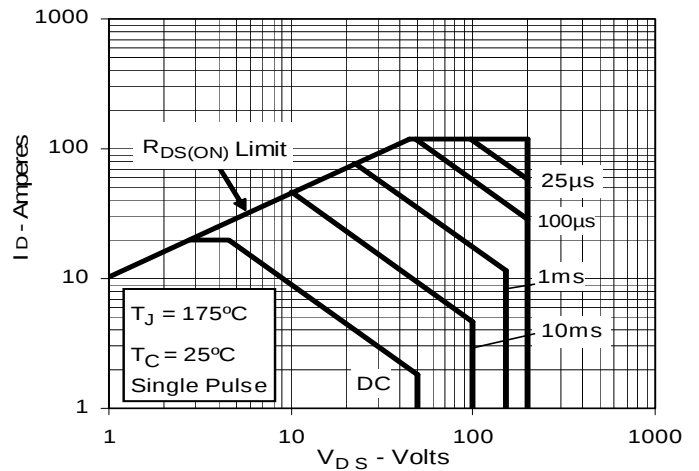


Fig. 13. Maximum Transient Thermal Resistance

