

# PolarHT™ Power MOSFET

(Electrically Isolated Tab)

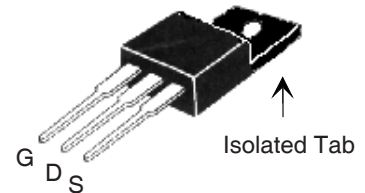
## IXTP50N20PM

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



N-Chlnnel Enhancement Mode

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

### 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>( $T_J = 25^\circ C$ , 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>$V_{GS} = 0V$ $T_J = 150^\circ C$               |                       |      | 25 $\mu A$<br>250 $\mu A$ |
| $R_{DS(on)}$ | $V_{GS} = 10V$ , $I_D = 25A$ , Note 1                                 |                       |      | 60 m $\Omega$             |

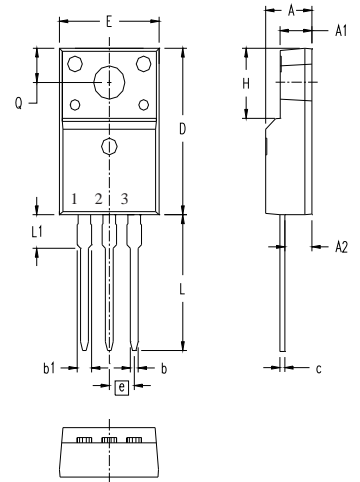
| Symbol       | Test Conditions<br>( $T_J = 25^\circ\text{C}$ , unless otherwise specified)  | Characteristic Values |      |                         |
|--------------|--|-----------------------|------|-------------------------|
|              |  | Min.                  | Typ. | Max.                    |
| $g_{fs}$     | $V_{DS} = 10\text{V}, I_D = 25\text{A}$ , 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)

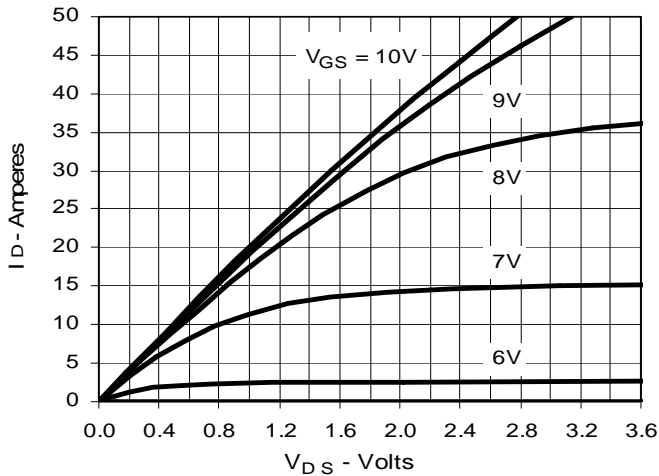


Terminals: 1 - Gate  
2 - Drain (Collector)  
3 - Source (Emitter)

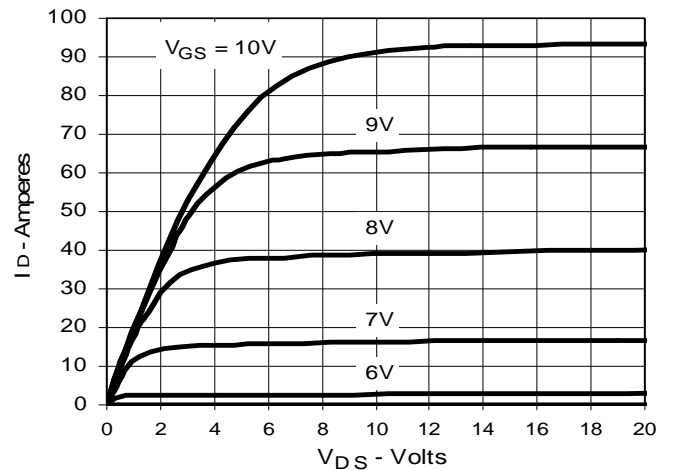
| SYM             | INCHES   |      | MILLIMETERS |       |
|-----------------|----------|------|-------------|-------|
|                 | MIN      | MAX  | MIN         | MAX   |
| A               | .177     | .193 | 4.50        | 4.90  |
| A1              | .092     | .108 | 2.34        | 2.74  |
| 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  |
| $\varnothing P$ | .121     | .129 | 3.08        | 3.28  |
| Q               | .126     | .134 | 3.20        | 3.40  |

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

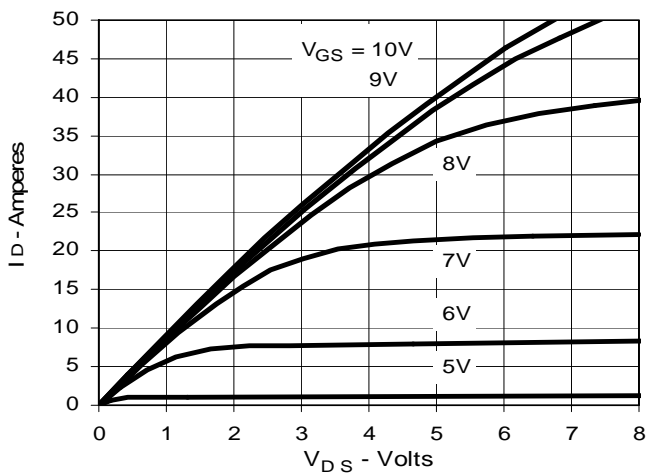
**Fig. 1. Output Characteristics @ 25°C**



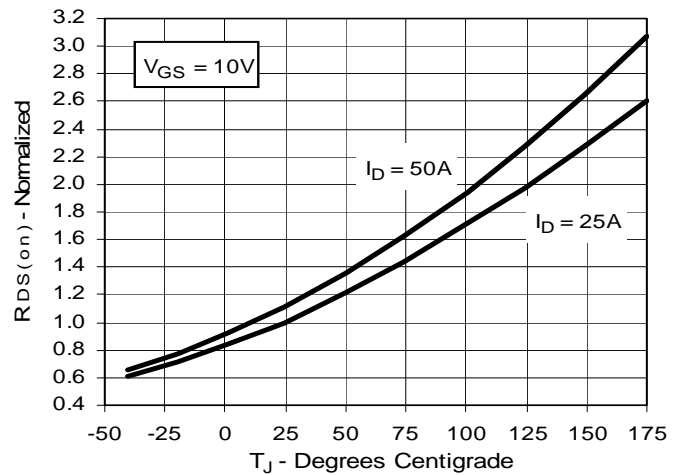
**Fig. 2. Extended Output Characteristics @ 25°C**



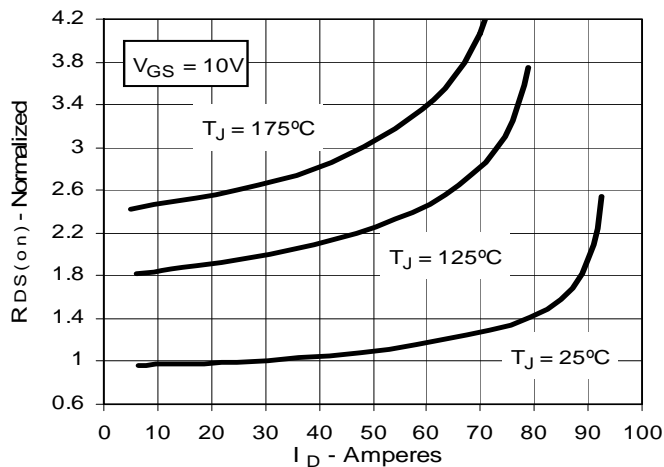
**Fig. 3. Output Characteristics @ 150°C**



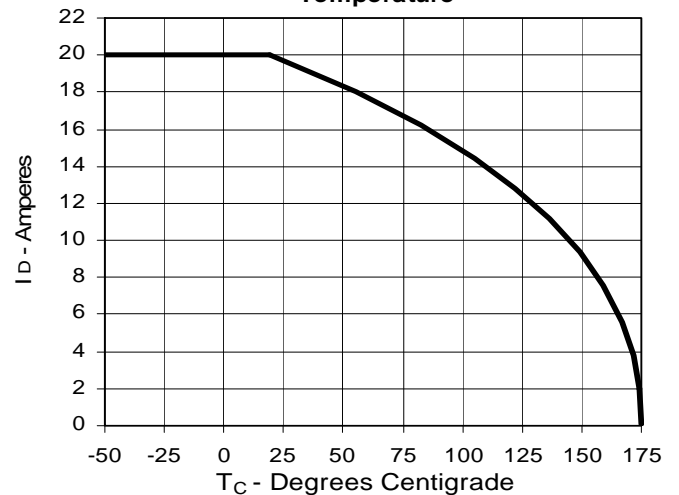
**Fig. 4.  $R_{DS(on)}$  Normalized to  $I_D = 25A$  Value vs. Junction Temperature**



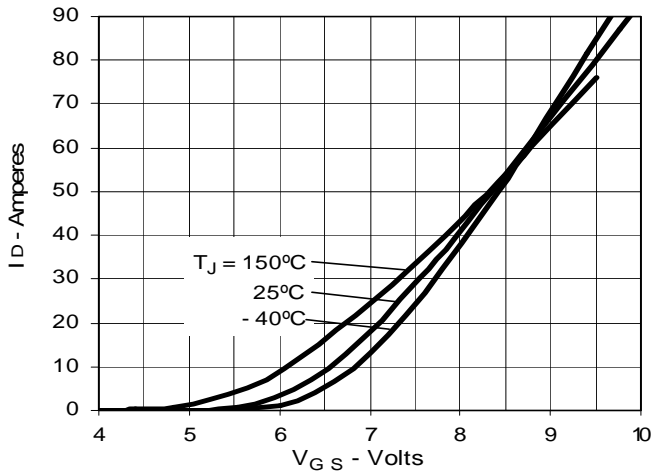
**Fig. 5.  $R_{DS(on)}$  Normalized to  $I_D = 25A$  Value vs. Drain Current**



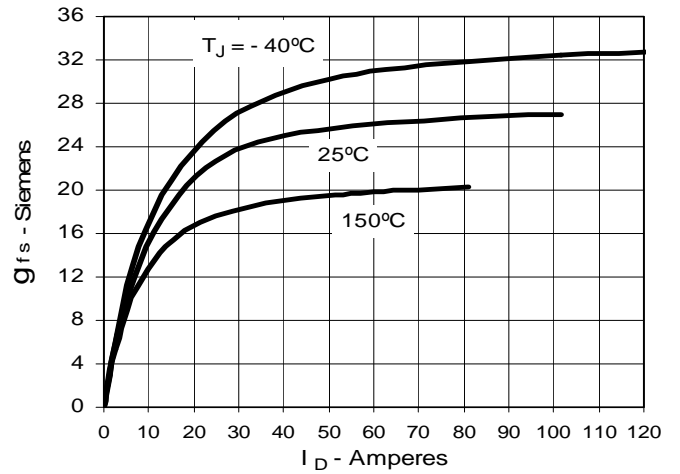
**Fig. 6. Drain Current vs. Case Temperature**



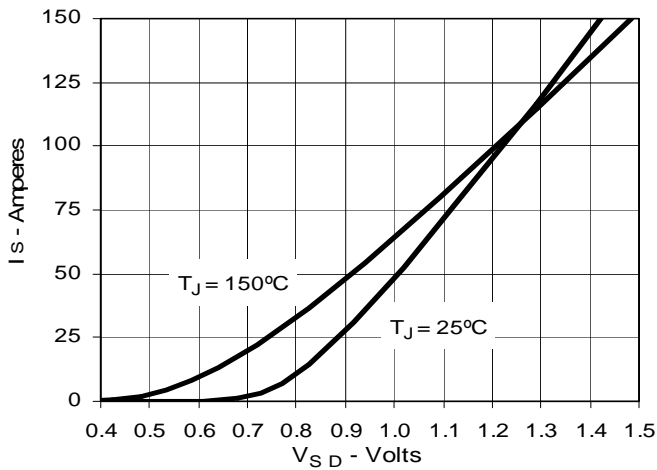
**Fig. 7. Input Admittance**



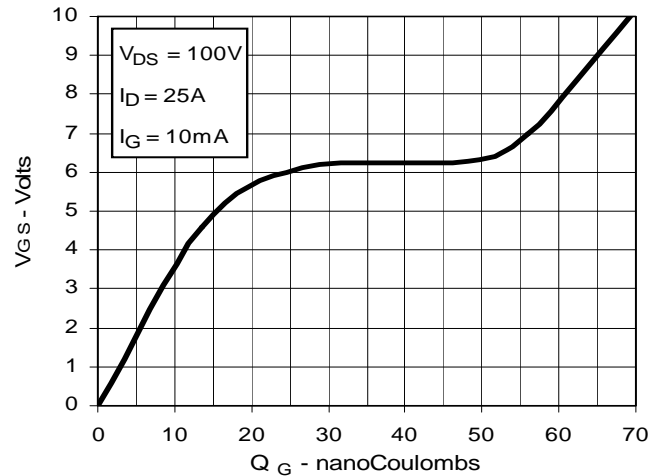
**Fig. 8. Transconductance**



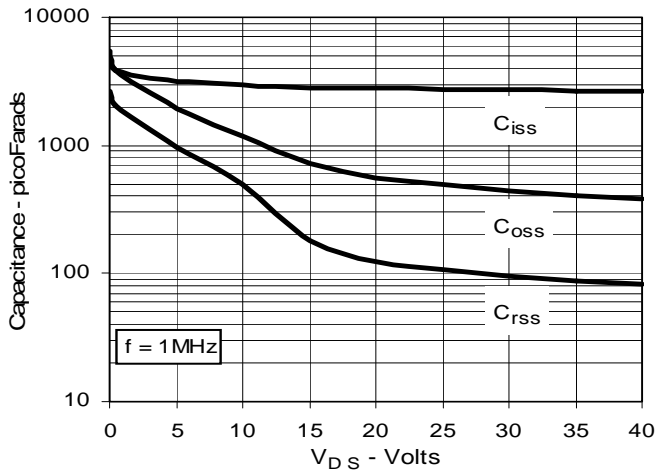
**Fig. 9. Source Current vs. Source-To-Drain Voltage**



**Fig. 10. Gate Charge**



**Fig. 11. Capacitance**



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

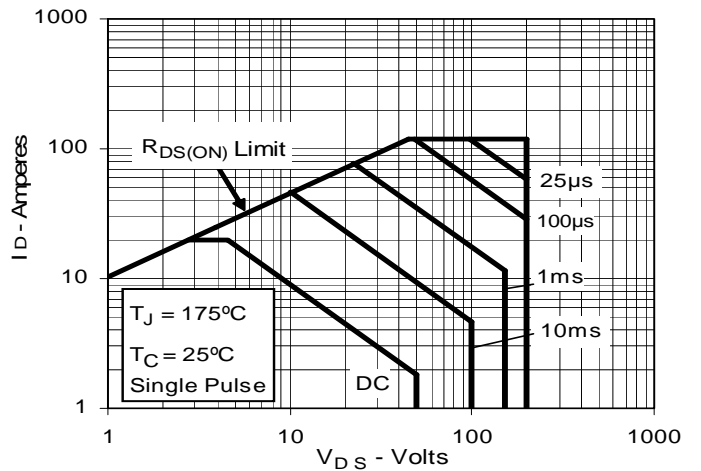


Fig. 13. Maximum Transient Thermal Resistance

