

# Polar™ HiPerFET™ Power MOSFET

## IXFN56N90P

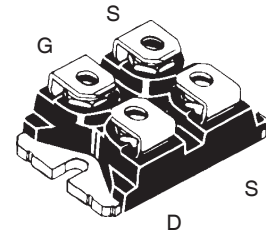
N-Channel Enhancement Mode  
Avalanche Rated  
Fast Intrinsic Diode



$V_{DSS} = 900V$   
 $I_{D25} = 56A$   
 $R_{DS(on)} \leq 145m\Omega$   
 $t_{rr} \leq 300ns$

| Symbol        | Test Conditions  | Maximum Ratings        |                          |
|---------------|--|------------------------|--------------------------|
| $V_{DSS}$     | $T_J = 25^\circ C$ to $150^\circ C$                                | 900                    | V                        |
| $V_{DGR}$     | $T_J = 25^\circ C$ to $150^\circ C$ , $R_{GS} = 1M\Omega$          | 900                    | V                        |
| $V_{GSS}$     | Continuous   | $\pm 30$               | V                        |
| $V_{GSM}$     | Transient  | $\pm 40$               | V                        |
| $I_{D25}$     | $T_C = 25^\circ C$   | 56                     | A                        |
| $I_{DM}$      | $T_C = 25^\circ C$ , Pulse Width Limited by $T_{JM}$               | 168                    | A                        |
| $I_A$         | $T_C = 25^\circ C$   | 28                     | A                        |
| $E_{AS}$      | $T_C = 25^\circ C$   | 2                      | J                        |
| $dv/dt$       | $I_S \leq I_{DM}$ , $V_{DD} \leq V_{DSS}$ , $T_J \leq 150^\circ C$ | 20                     | V/ns                     |
| $P_D$         | $T_C = 25^\circ C$   | 1000                   | W                        |
| $T_J$         |  | -55 ... +150           | $^\circ C$               |
| $T_{JM}$      |  | 150                    | $^\circ C$               |
| $T_{stg}$     |  | -55 ... +150           | $^\circ C$               |
| $T_L$         | 1.6mm (0.062 in.) from case for 10s                                | 300                    | $^\circ C$               |
| $V_{ISOL}$    | 50/60 Hz, RMS<br>$I_{ISOL} \leq 1mA$                               | $t = 1min$<br>$t = 1s$ | 2500<br>3000<br>V~<br>V~ |
| $M_d$         | Mounting Torque<br>Terminal Connection Torque                      | 1.5/13<br>1.3/11.5     | Nm/lb.in.<br>Nm/lb.in.   |
| <b>Weight</b> |  | 30                     | g                        |

miniBLOC  
E153432



G = Gate  
S = Source  
D = Drain

Either Source terminal S can be used as the Source terminal or the Kelvin Source (gate return) terminal.

### Features

- International Standard Package
- miniBLOC, with Aluminium Nitride Isolation
- Low  $R_{DS(on)}$  and  $Q_G$
- Avalanche Rated
- Low Package Inductance
- Fast Intrinsic Rectifier

### Advantages

- High Power Density
- Easy to Mount
- Space Savings

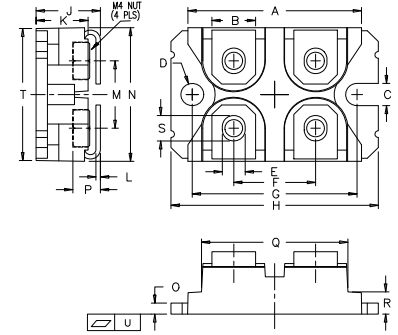
### Applications

- Switch-Mode and Resonant-Mode Power Supplies
- DC-DC Converters
- Laser Drivers
- AC and DC Motor Drives
- Robotics and Servo Controls

| Symbol       | Test Conditions<br>( $T_J = 25^\circ C$ , Unless Otherwise Specified) | Characteristic Values |      |                    |
|--------------|---|-----------------------|------|--------------------|
|              |   | Min.                  | Typ. | Max.               |
| $BV_{DSS}$   | $V_{GS} = 0V$ , $I_D = 8mA$   | 900                   |      | V                  |
| $V_{GS(th)}$ | $V_{DS} = V_{GS}$ , $I_D = 3mA$                                       | 3.5                   |      | 6.5 V              |
| $I_{GSS}$    | $V_{GS} = \pm 30V$ , $V_{DS} = 0V$                                    |                       |      | $\pm 200$ nA       |
| $I_{DSS}$    | $V_{DS} = V_{DSS}$ , $V_{GS} = 0V$<br>$T_J = 125^\circ C$             |                       |      | 50 $\mu A$<br>5 mA |
| $R_{DS(on)}$ | $V_{GS} = 10V$ , $I_D = 0.5 \cdot I_{D25}$ , Note 1                   |                       |      | 145 m $\Omega$     |

| Symbol       | Test Conditions<br>( $T_J = 25^\circ\text{C}$ Unless Otherwise Specified)  | Characteristic Values |       |                    |
|--------------|--|-----------------------|-------|--------------------|
|              |  | Min.                  | Typ.  | Max.               |
| $g_{fs}$     | $V_{DS} = 20\text{V}, I_D = 0.5 \cdot I_{D25}$ , Note 1  | 27                    | 44    | S                  |
| $R_{Gi}$     | Gate Input Resistance  |                       | 0.85  | $\Omega$           |
| $C_{iss}$    | $V_{GS} = 0\text{V}, V_{DS} = 25\text{V}, f = 1\text{MHz}$   |                       | 23    | nF                 |
| $C_{oss}$    |  |                       | 1385  | pF                 |
| $C_{rss}$    |  |                       | 106   | pF                 |
| $t_{d(on)}$  | <b>Resistive Switching Times</b><br>$V_{GS} = 10\text{V}, V_{DS} = 0.5 \cdot V_{DSS}, I_D = 0.5 \cdot I_{D25}$<br>$R_G = 1\Omega$ (External) |                       | 74    | ns                 |
| $t_r$        |  |                       | 80    | ns                 |
| $t_{d(off)}$ |  |                       | 93    | ns                 |
| $t_f$        |  |                       | 38    | ns                 |
| $Q_{g(on)}$  | $V_{GS} = 10\text{V}, V_{DS} = 0.5 \cdot V_{DSS}, I_D = 0.5 \cdot I_{D25}$   |                       | 375   | nC                 |
| $Q_{gs}$     |  |                       | 80    | nC                 |
| $Q_{gd}$     |  |                       | 145   | nC                 |
| $R_{thJC}$   |  |                       | 0.125 | $^\circ\text{C/W}$ |
| $R_{thCS}$   |  | 0.05                  |       | $^\circ\text{C/W}$ |

### SOT-227B (IXFN) Outline



(M4 screws (4x) supplied)

| SYM | INCHES |       | MILLIMETERS |       |
|-----|--------|-------|-------------|-------|
|     | MIN    | MAX   | MIN         | MAX   |
| A   | 1.240  | 1.255 | 31.50       | 31.88 |
| B   | .307   | .323  | 7.80        | 8.20  |
| C   | .161   | .169  | 4.09        | 4.29  |
| D   | .161   | .169  | 4.09        | 4.29  |
| E   | .161   | .169  | 4.09        | 4.29  |
| F   | .587   | .595  | 14.91       | 15.11 |
| G   | 1.186  | 1.193 | 30.12       | 30.30 |
| H   | 1.496  | 1.505 | 38.00       | 38.23 |
| J   | .460   | .481  | 11.68       | 12.22 |
| K   | .351   | .378  | 8.92        | 9.60  |
| L   | .030   | .033  | 0.76        | 0.84  |
| M   | .496   | .506  | 12.60       | 12.85 |
| N   | .990   | 1.001 | 25.15       | 25.42 |
| O   | .078   | .084  | 1.98        | 2.13  |
| P   | .195   | .235  | 4.95        | 5.97  |
| Q   | 1.045  | 1.059 | 26.54       | 26.90 |
| R   | .155   | .174  | 3.94        | 4.42  |
| S   | .186   | .191  | 4.72        | 4.85  |
| T   | .968   | .987  | 24.59       | 25.07 |
| U   | -.002  | .004  | -0.05       | 0.1   |

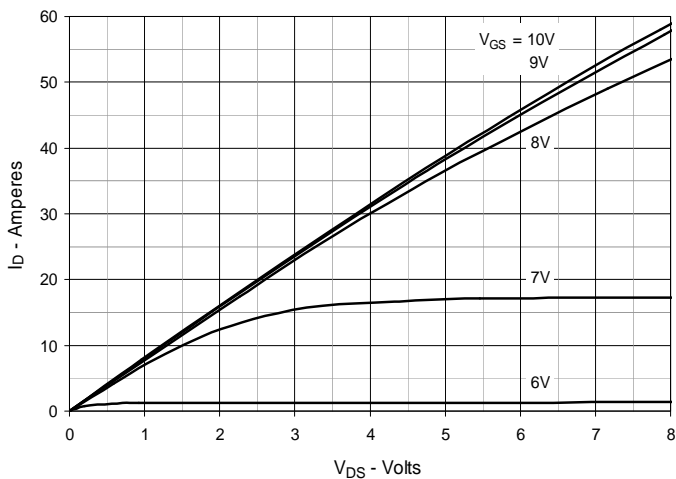
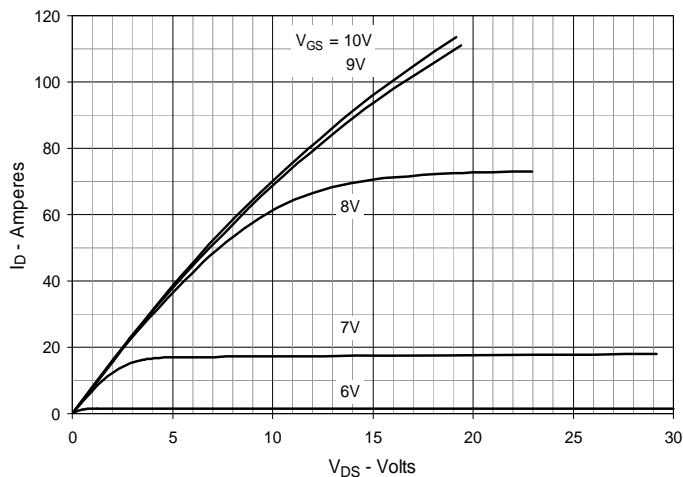
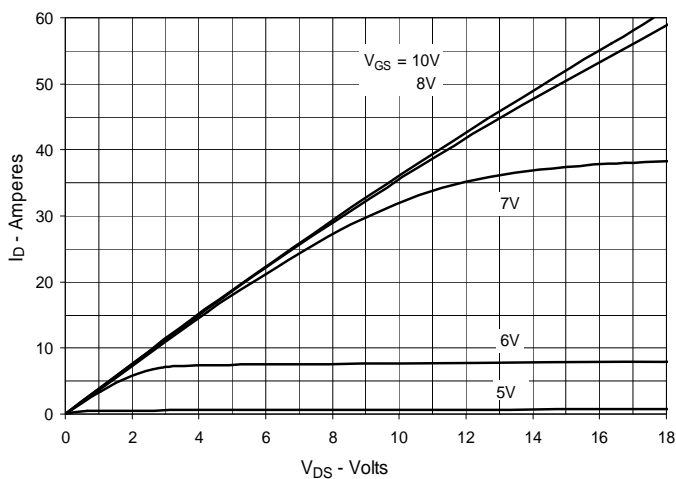
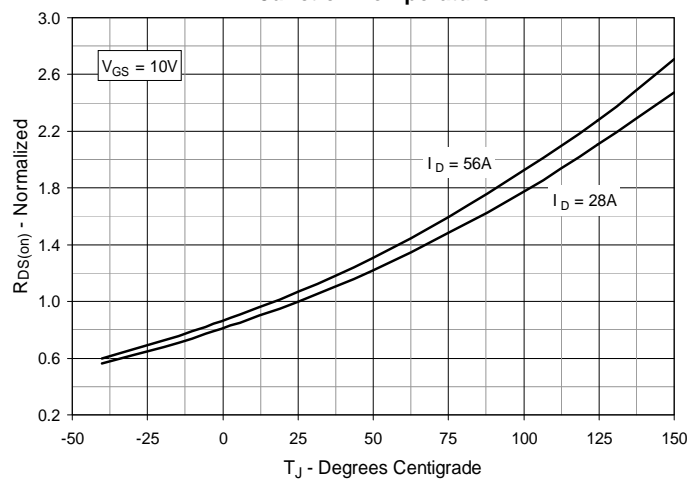
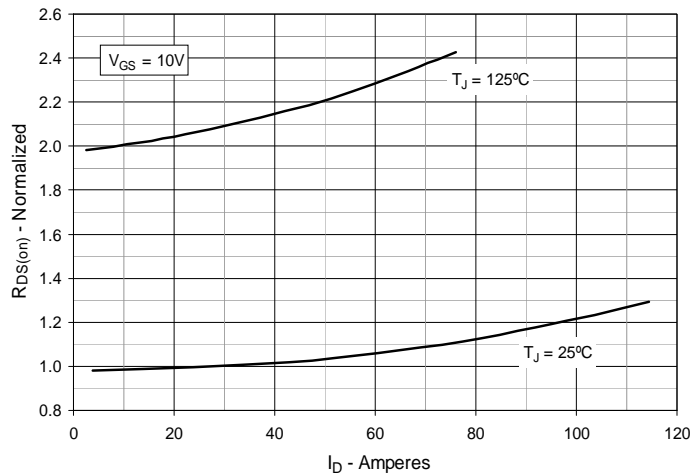
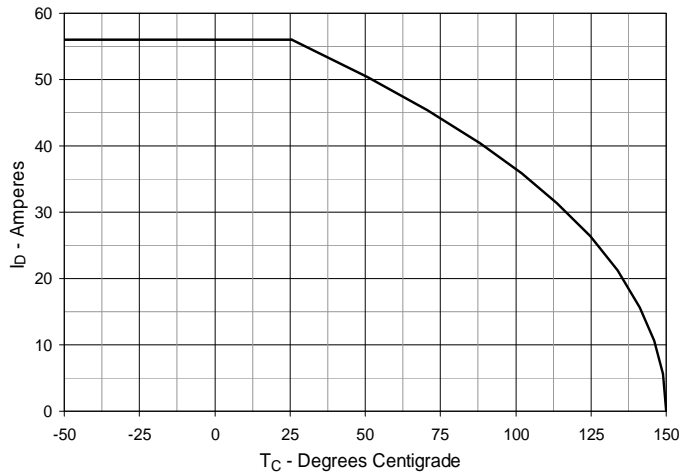
### Source-Drain Diode

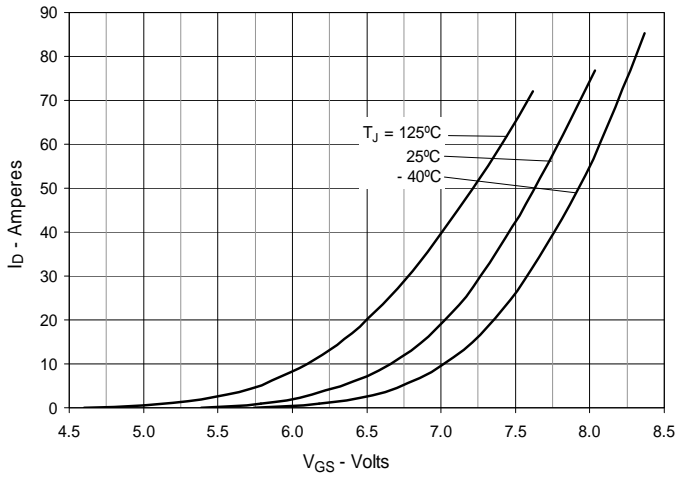
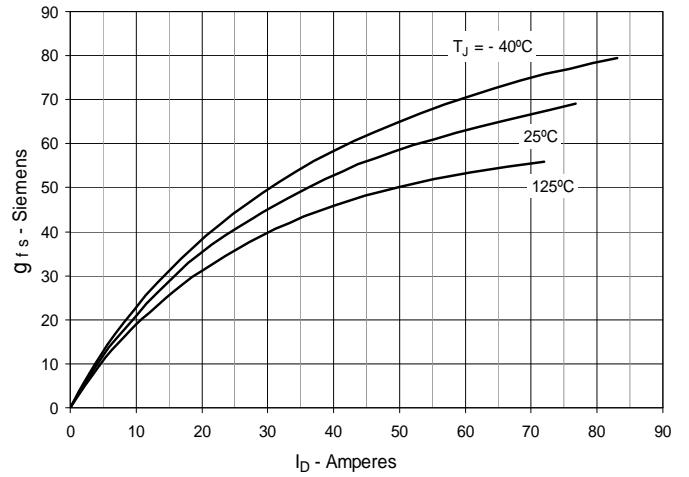
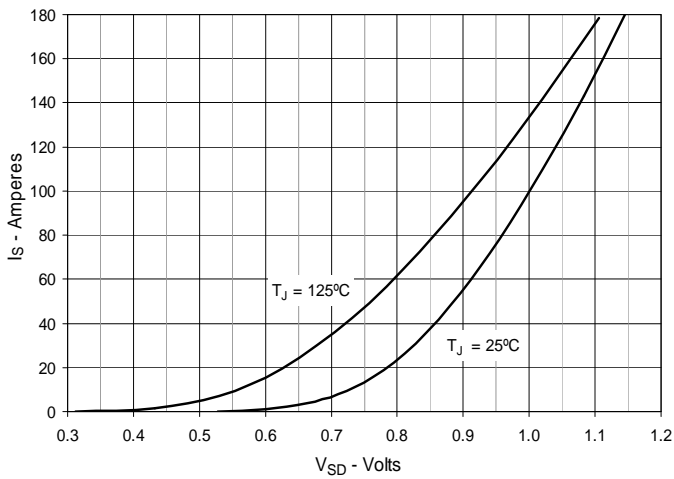
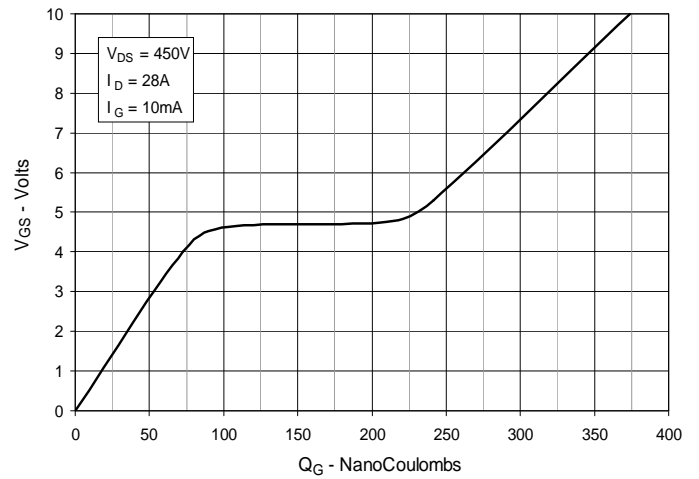
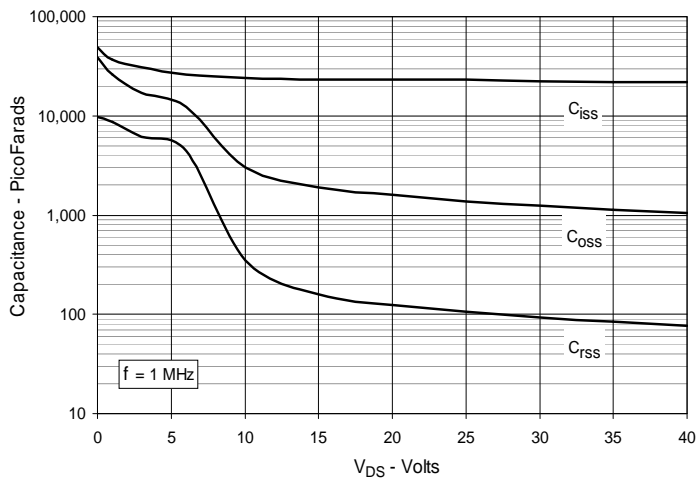
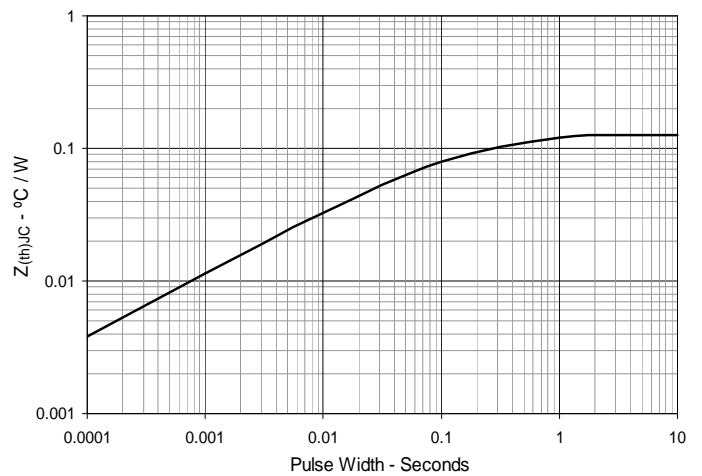
| Symbol   | Test Conditions<br>( $T_J = 25^\circ\text{C}$ Unless Otherwise Specified)                              | Characteristic Values |      |               |
|----------|--|-----------------------|------|---------------|
|          |  | Min.                  | Typ. | Max.          |
| $I_S$    | $V_{GS} = 0\text{V}$   |                       |      | 56 A          |
| $I_{SM}$ | Repetitive, Pulse Width Limited by $T_{JM}$  |                       |      | 224 A         |
| $V_{SD}$ | $I_F = I_S, V_{GS} = 0\text{V}$ , Note 1   |                       |      | 1.5 V         |
| $t_{rr}$ | $I_F = 0.5 \cdot I_{D25}, -di/dt = 100\text{A}/\mu\text{s}$<br>$V_R = 100\text{V}, V_{GS} = 0\text{V}$ |                       |      | 300 ns        |
| $Q_{RM}$ |  |                       | 1.8  | $\mu\text{C}$ |
| $I_{RM}$ |  |                       | 15   | A             |

Note 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 | 7,157,338B2 |
|  | 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 @  $T_J = 25^\circ\text{C}$** 

**Fig. 2. Extended Output Characteristics @  $T_J = 25^\circ\text{C}$** 

**Fig. 3. Output Characteristics @  $T_J = 125^\circ\text{C}$** 

**Fig. 4.  $R_{DS(on)}$  Normalized to  $I_D = 28\text{A}$  Value vs. Junction Temperature**

**Fig. 5.  $R_{DS(on)}$  Normalized to  $I_D = 28\text{A}$  Value vs. Drain Current**

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


**Fig. 7. Input Admittance**

**Fig. 8. Transconductance**

**Fig. 9. Forward Voltage Drop of Intrinsic Diode**

**Fig. 10. Gate Charge**

**Fig. 11. Capacitance**

**Fig. 12. Maximum Transient Thermal Impedance**


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