

# Polar™ Power MOSFET

## HiPerFET™

# IXFN20N120P

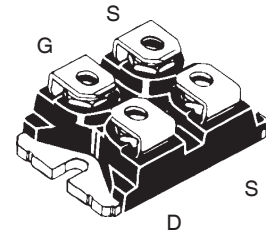
N-Channel Enhancement Mode  
Avalanche Rated  
Fast Intrinsic Diode



$V_{DSS} = 1200V$   
 $I_{D25} = 20A$   
 $R_{DS(on)} \leq 570m\Omega$   
 $t_{rr} \leq 300ns$

| Symbol        | Test Conditions  | Maximum Ratings        |                          |
|---------------|--|------------------------|--------------------------|
|               |  |                        |                          |
| $V_{DSS}$     | $T_J = 25^\circ C$ to $150^\circ C$                                | 1200                   | V                        |
| $V_{DGR}$     | $T_J = 25^\circ C$ to $150^\circ C$ , $R_{GS} = 1M\Omega$          | 1200                   | V                        |
| $V_{GSS}$     | Continuous   | $\pm 30$               | V                        |
| $V_{GSM}$     | Transient  | $\pm 40$               | V                        |
| $I_{D25}$     | $T_C = 25^\circ C$   | 20                     | A                        |
| $I_{DM}$      | $T_C = 25^\circ C$ , pulse width limited by $T_{JM}$               | 50                     | A                        |
| $I_A$         | $T_C = 25^\circ C$   | 10                     | A                        |
| $E_{AS}$      | $T_C = 25^\circ C$   | 1                      | J                        |
| $dV/dt$       | $I_S \leq I_{DM}$ , $V_{DD} \leq V_{DSS}$ , $T_J \leq 150^\circ C$ | 20                     | V/ns                     |
| $P_D$         | $T_C = 25^\circ C$   | 595                    | 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, SOT-227 B (IXFN)  
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
- Encapsulating epoxy meets UL 94 V-0, flammability classification
- miniBLOC with Aluminium nitride isolation
- Fast recovery diode
- Unclamped Inductive Switching (UIS) rated
- Low package inductance  
- easy to drive and to protect

### Advantages

- Easy to mount
- Space savings
- High power density

### Applications:

- High Voltage Switched-mode and resonant-mode power supplies
- High Voltage Pulse Power Applications
- High Voltage Discharge circuits in Lasers Pulsers, Spark Igniters, RF Generators
- High Voltage DC-DC converters
- High Voltage DC-AC inverters

| Symbol       | Test Conditions<br>( $T_J = 25^\circ C$ , unless otherwise specified) | Characteristic Values |      |                    |
|--------------|---|-----------------------|------|--------------------|
|              |   | Min.                  | Typ. | Max.               |
| $BV_{DSS}$   | $V_{GS} = 0V$ , $I_D = 1mA$   | 1200                  |      | V                  |
| $V_{GS(th)}$ | $V_{DS} = V_{GS}$ , $I_D = 1mA$                                       | 3.5                   |      | 6.5 V              |
| $I_{GSS}$    | $V_{GS} = \pm 30V$ , $V_{DS} = 0V$                                    |                       |      | $\pm 200$ nA       |
| $I_{DSS}$    | $V_{DS} = V_{DSS}$<br>$V_{GS} = 0V$<br>$T_J = 125^\circ C$            |                       |      | 25 $\mu A$<br>5 mA |
| $R_{DS(on)}$ | $V_{GS} = 10V$ , $I_D = 10A$ , Note 1                                 |                       |      | 570 m $\Omega$     |

| Symbol       | Test Conditions<br>( $T_J = 25^\circ\text{C}$ unless otherwise specified)   | Characteristic Values |      |                    |
|--------------|---|-----------------------|------|--------------------|
|              |   | Min.                  | Typ. | Max.               |
| $g_{fs}$     | $V_{DS} = 20\text{V}, I_D = 10\text{A}$ , Note 1  | 10                    | 16   | S                  |
| $C_{iss}$    | $V_{GS} = 0\text{V}, V_{DS} = 25\text{V}, f = 1\text{MHz}$  |                       | 11.1 | nF                 |
| $C_{oss}$    |   |                       | 600  | pF                 |
| $C_{rss}$    |   |                       | 60   | pF                 |
| $R_{Gi}$     | Gate input resistance   |                       | 1.60 | $\Omega$           |
| $t_{d(on)}$  | <b>Resistive Switching Times</b><br>$V_{GS} = 10\text{V}, V_{DS} = 0.5 \cdot V_{DSS}, I_D = 10\text{A}$<br>$R_G = 1\Omega$ (External) |                       | 49   | ns                 |
| $t_r$        |   |                       | 45   | ns                 |
| $t_{d(off)}$ |   |                       | 72   | ns                 |
| $t_f$        |   |                       | 70   | ns                 |
| $Q_{g(on)}$  | $V_{GS} = 10\text{V}, V_{DS} = 0.5 \cdot V_{DSS}, I_D = 10\text{A}$   |                       | 193  | nC                 |
| $Q_{gs}$     |   |                       | 74   | nC                 |
| $Q_{gd}$     |   |                       | 85   | nC                 |
| $R_{thJC}$   |   |                       | 0.21 | $^\circ\text{C/W}$ |
| $R_{thCS}$   |   | 0.05                  |      | $^\circ\text{C/W}$ |

| Symbol   | Test Conditions<br>( $T_J = 25^\circ\text{C}$ unless otherwise specified)   | Characteristic Values |      |               |
|----------|---|-----------------------|------|---------------|
|          |   | Min.                  | Typ. | Max.          |
| $I_S$    | $V_{GS} = 0\text{V}$  |                       |      | 20 A          |
| $I_{SM}$ | Repetitive, pulse width limited by $T_{JM}$                                 |                       |      | 80 A          |
| $V_{SD}$ | $I_F = I_S, V_{GS} = 0\text{V}$ , Note 1                                    |                       |      | 1.5 V         |
| $t_{rr}$ | $I_F = 10\text{A}, -di/dt = 100\text{A}/\mu\text{s}$<br>$V_R = 100\text{V}$ |                       |      | 300 ns        |
| $Q_{RM}$ |   |                       | 0.84 | $\mu\text{C}$ |
| $I_{RM}$ |   |                       | 9    | A             |

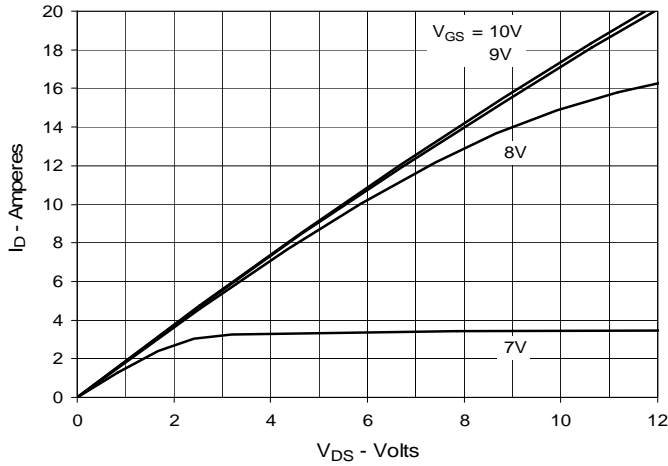
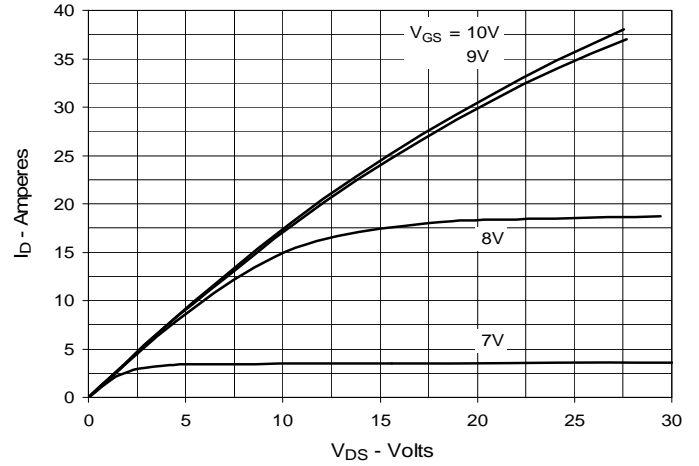
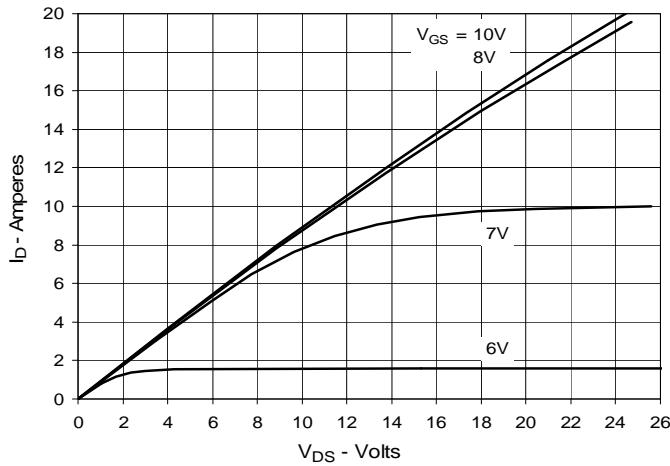
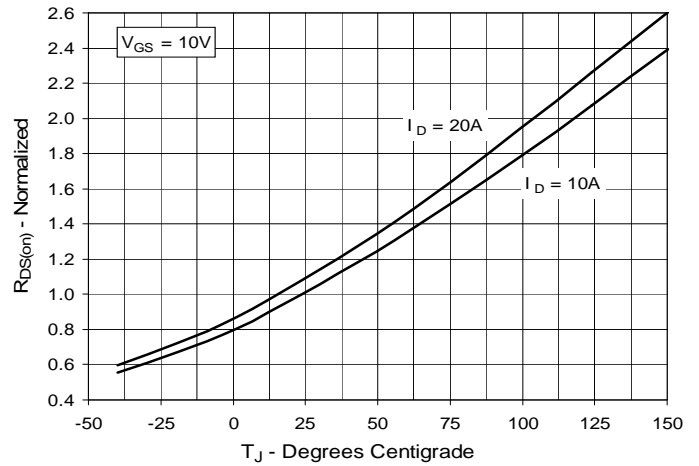
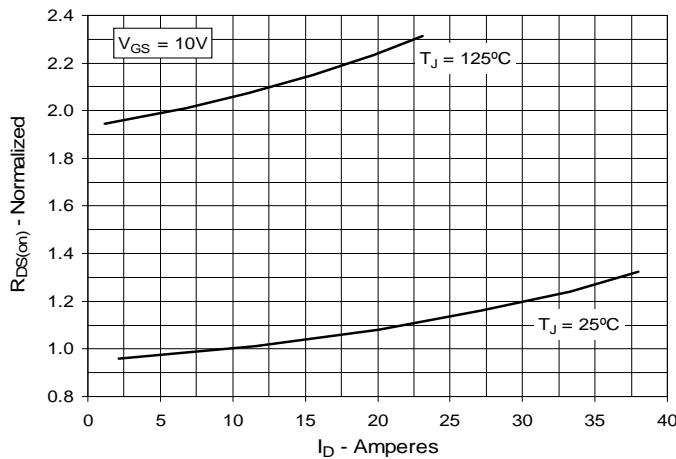
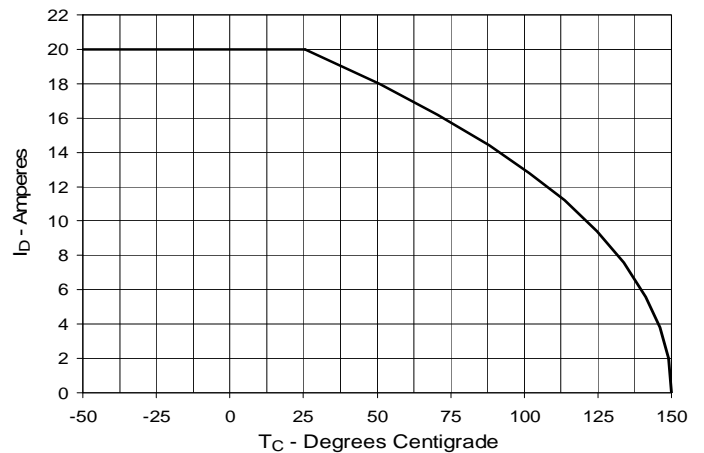
Note 1: Pulse test,  $t \leq 300\mu\text{s}$ ; duty cycle,  $d \leq 2\%$ .

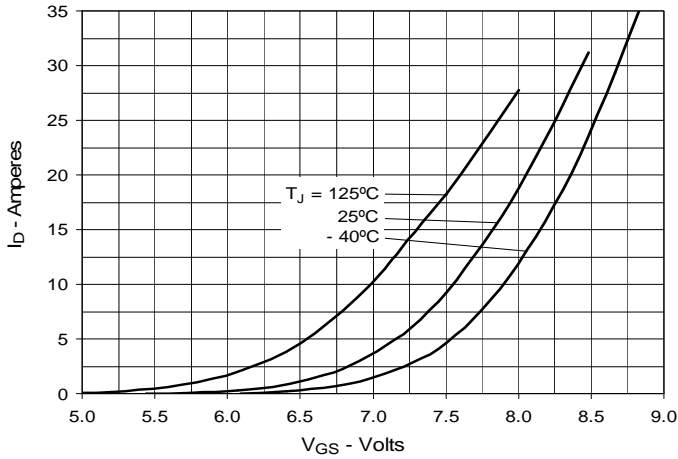
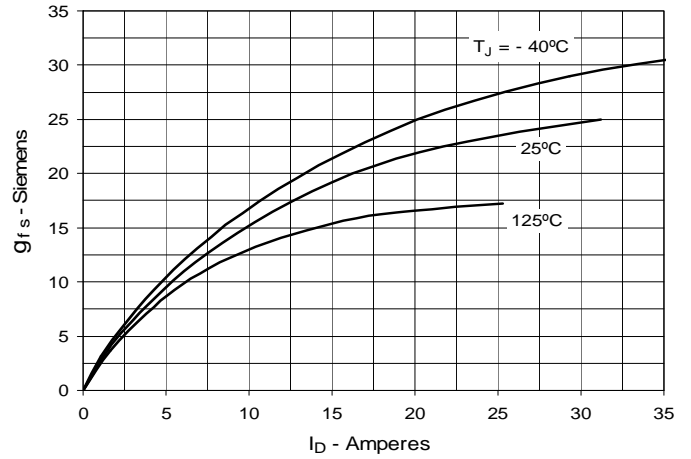
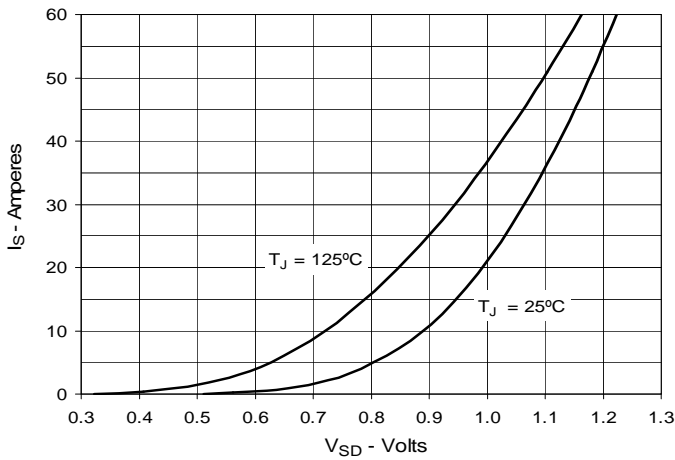
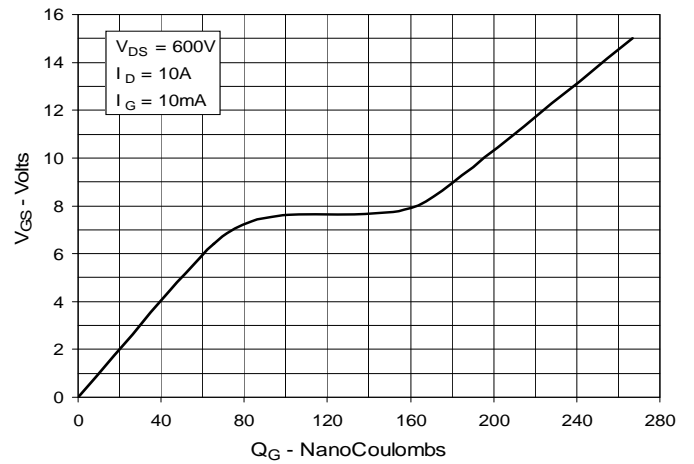
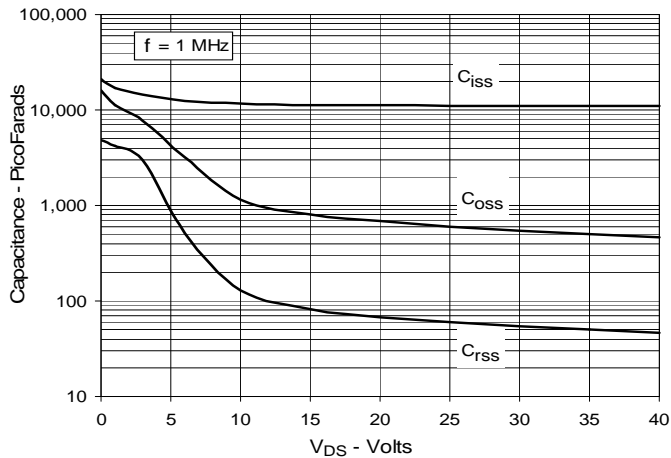
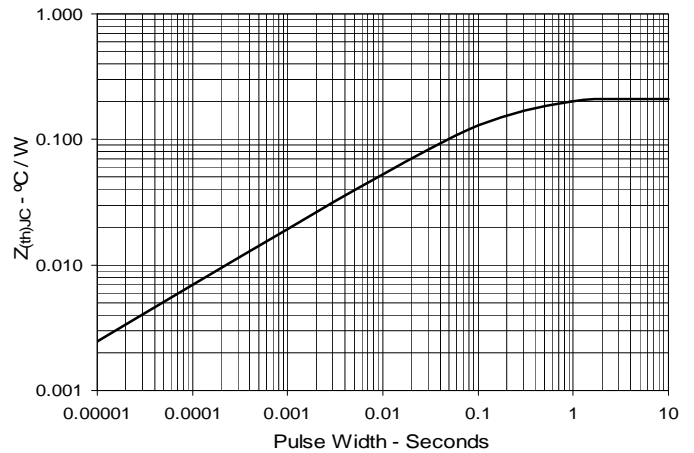
**SOT-227B Outline**


| 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   |

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 @ 125°C**

**Fig. 4.  $R_{DS(on)}$  Normalized to  $I_D = 10\text{A}$  Value vs. Junction Temperature**

**Fig. 5.  $R_{DS(on)}$  Normalized to  $I_D = 10\text{A}$  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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