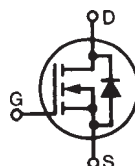


## Polar™ HiPerFET™ Power MOSFETs

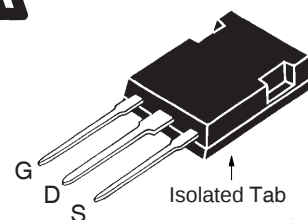
## IXFR40N90P

N-Channel Enhancement Mode  
Avalanche Rated  
Fast Intrinsic Rectifier



$$\begin{aligned} V_{DSS} &= 900V \\ I_{D25} &= 21A \\ R_{DS(on)} &\leq 250m\Omega \\ t_{rr} &\leq 300ns \end{aligned}$$

ISOPLUS247  
E153432



G = Gate    D = Drain  
S = Source

| Symbol     | Test Conditions                                                    | Maximum Ratings |                  |
|------------|--------------------------------------------------------------------|-----------------|------------------|
| $V_{DSS}$  | $T_J = 25^\circ\text{C to } 150^\circ\text{C}$                     | 900             | V                |
| $V_{DGR}$  | $T_J = 25^\circ\text{C to } 150^\circ\text{C}, R_{GS} = 1M\Omega$  | 900             | V                |
| $V_{GSS}$  | Continuous                                                         | $\pm 30$        | V                |
| $V_{GSM}$  | Transient                                                          | $\pm 40$        | V                |
| $I_{D25}$  | $T_C = 25^\circ\text{C}$                                           | 21              | A                |
| $I_{DM}$   | $T_C = 25^\circ\text{C}$ , Pulse Width Limited by $T_{JM}$         | 80              | A                |
| $I_A$      | $T_C = 25^\circ\text{C}$                                           | 20              | A                |
| $E_{AS}$   | $T_C = 25^\circ\text{C}$                                           | 2.5             | J                |
| $dv/dt$    | $I_S \leq I_{DM}, V_{DD} \leq V_{DSS}, T_J \leq 150^\circ\text{C}$ | 15              | V/ns             |
| $P_D$      | $T_C = 25^\circ\text{C}$                                           | 300             | W                |
| $T_J$      |                                                                    | -55 to +150     | $^\circ\text{C}$ |
| $T_{JM}$   |                                                                    | 150             | $^\circ\text{C}$ |
| $T_{stg}$  |                                                                    | -55 to +150     | $^\circ\text{C}$ |
| $T_L$      | 1.6mm (0.062 in.) from Case for 10s                                | 300             | $^\circ\text{C}$ |
| $T_{SOLD}$ | Plastic Body for 10s                                               | 260             | $^\circ\text{C}$ |
| $V_{ISOL}$ | 50/60 Hz, 1 Minute                                                 | 2500            | V~               |
| $F_C$      | Mounting Force                                                     | 20..120/4.5..27 | N/lb.            |
| Weight     |                                                                    | 5               | g                |

| Symbol       | Test Conditions<br>( $T_J = 25^\circ\text{C}$ , Unless Otherwise Specified) | Characteristic Values |      |                            |
|--------------|-----------------------------------------------------------------------------|-----------------------|------|----------------------------|
|              |                                                                             | Min.                  | Typ. | Max.                       |
| $BV_{DSS}$   | $V_{GS} = 0V, I_D = 3mA$                                                    | 900                   |      | 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               |
| $I_{DSS}$    | $V_{DS} = V_{DSS}, V_{GS} = 0V$<br>$T_J = 125^\circ\text{C}$                |                       |      | 50 $\mu\text{A}$<br>3.5 mA |
| $R_{DS(on)}$ | $V_{GS} = 10V, I_D = 20A$ , Note 1                                          |                       |      | 250 m $\Omega$             |

### Features

- Silicon Chip on Direct-Copper Bond (DCB) Substrate
- Isolated Mounting Surface
- 2500V~ Electrical 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

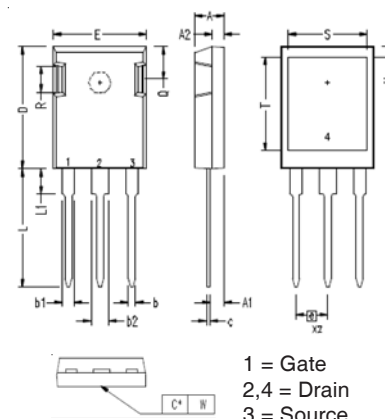
| Symbol       | Test Conditions<br>( $T_J = 25^\circ\text{C}$ , Unless Otherwise Specified)                                                                 | Characteristic Values |      |                    |
|--------------|---------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|------|--------------------|
|              |                                                                                                                                             | Min.                  | Typ. | Max.               |
| $g_{fs}$     | $V_{DS} = 20\text{V}$ , $I_D = 20\text{A}$ , Note 1                                                                                         | 18                    | 30   | S                  |
| $C_{iss}$    | $V_{GS} = 0\text{V}$ , $V_{DS} = 25\text{V}$ , $f = 1\text{MHz}$                                                                            |                       | 14   | nF                 |
| $C_{oss}$    |                                                                                                                                             |                       | 896  | pF                 |
| $C_{rss}$    |                                                                                                                                             |                       | 58   | pF                 |
| $R_{Gi}$     | Gate Input Resistance                                                                                                                       |                       | 1.5  | $\Omega$           |
| $t_{d(on)}$  | <b>Resistive Switching Times</b><br>$V_{GS} = 10\text{V}$ , $V_{DS} = 0.5 \cdot V_{DSS}$ , $I_D = 20\text{A}$<br>$R_G = 1\Omega$ (External) |                       | 53   | ns                 |
| $t_r$        |                                                                                                                                             |                       | 50   | ns                 |
| $t_{d(off)}$ |                                                                                                                                             |                       | 77   | ns                 |
| $t_f$        |                                                                                                                                             |                       | 46   | ns                 |
| $Q_{g(on)}$  | $V_{GS} = 10\text{V}$ , $V_{DS} = 0.5 \cdot V_{DSS}$ , $I_D = 20\text{A}$                                                                   |                       | 230  | nC                 |
| $Q_{gs}$     |                                                                                                                                             |                       | 70   | nC                 |
| $Q_{gd}$     |                                                                                                                                             |                       | 100  | nC                 |
| $R_{thJC}$   |                                                                                                                                             |                       | 0.42 | $^\circ\text{C/W}$ |
| $R_{thCS}$   |                                                                                                                                             |                       | 0.15 | $^\circ\text{C/W}$ |

## Source-Drain Diode

| Symbol   | Test Conditions<br>( $T_J = 25^\circ\text{C}$ , Unless Otherwise Specified)                             | Characteristic Values |      |               |
|----------|---------------------------------------------------------------------------------------------------------|-----------------------|------|---------------|
|          |                                                                                                         | Min.                  | Typ. | Max.          |
| $I_S$    | $V_{GS} = 0\text{V}$                                                                                    |                       |      | 40 A          |
| $I_{SM}$ | Repetitive, Pulse Width Limited by $T_{JM}$                                                             |                       |      | 160 A         |
| $V_{SD}$ | $I_F = I_S$ , $V_{GS} = 0\text{V}$ , Note 1                                                             |                       |      | 1.5 V         |
| $t_{rr}$ | $I_F = 20\text{A}$ , $-di/dt = 100\text{A}/\mu\text{s}$ ,<br>$V_R = 100\text{V}$ , $V_{GS} = 0\text{V}$ |                       | 14.0 | ns            |
| $I_{RM}$ |                                                                                                         |                       | 1.7  | A             |
| $Q_{RM}$ |                                                                                                         |                       |      | $\mu\text{C}$ |

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

## ISOPLUS247 (IXFR) Outline

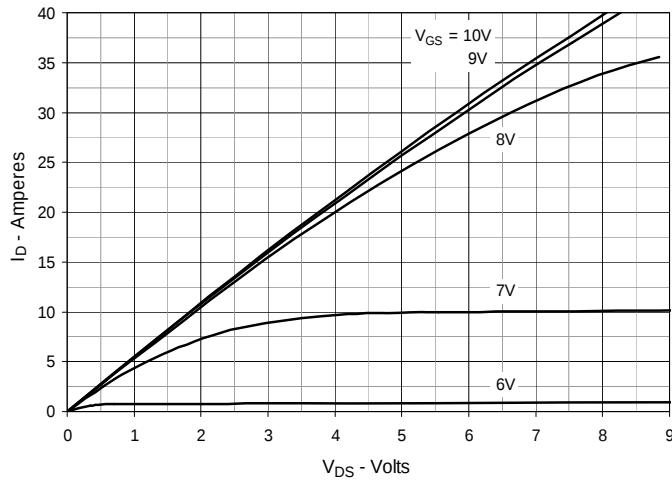
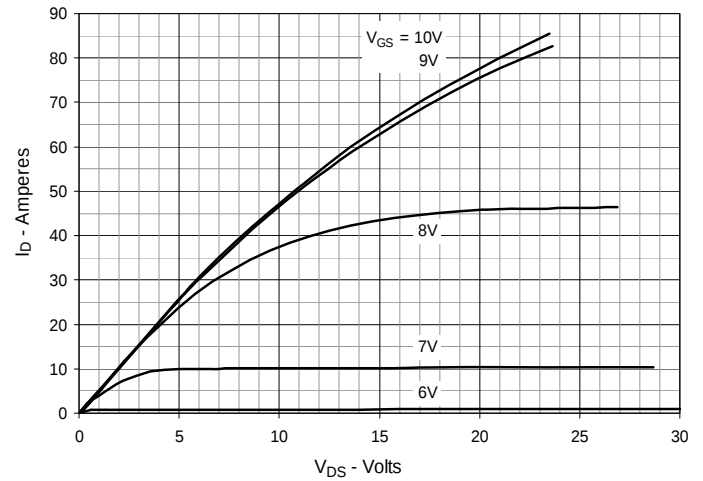
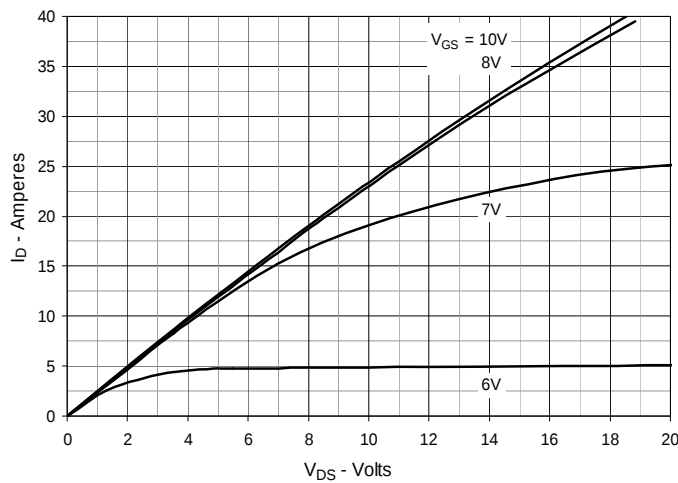
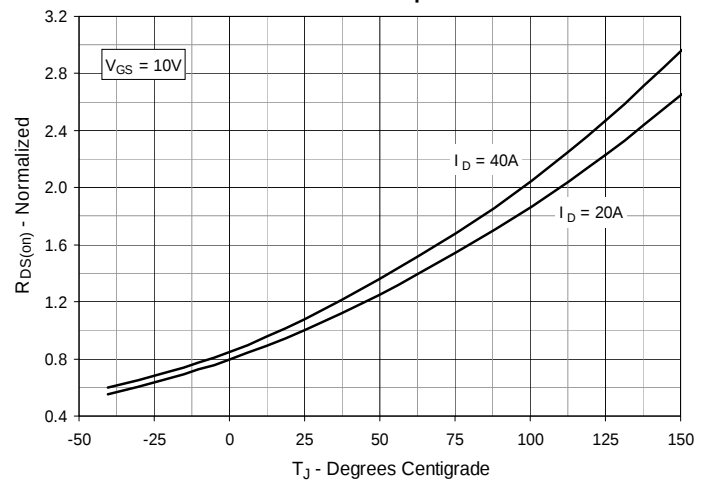
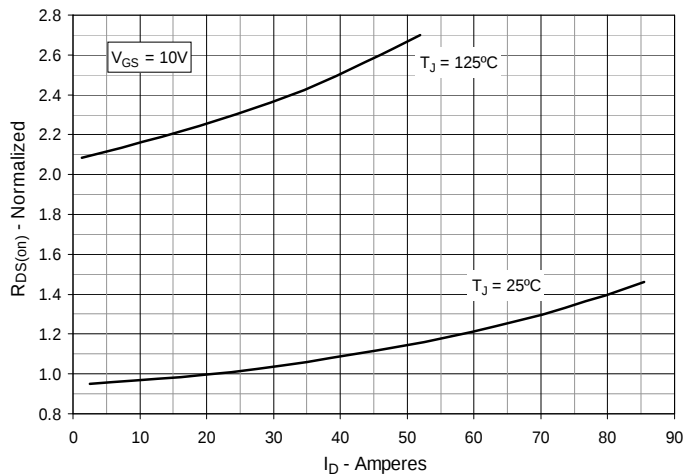
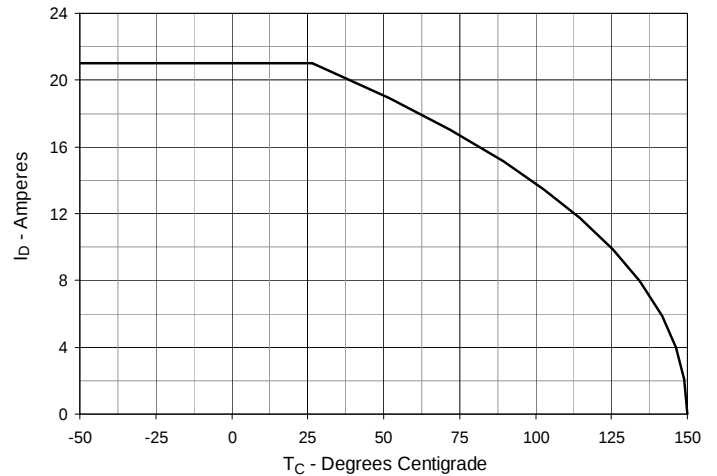


| SYM | INCHES   |      | MILLIMETERS |       |
|-----|----------|------|-------------|-------|
|     | MIN      | MAX  | MIN         | MAX   |
| A   | .190     | .205 | 4.83        | 5.21  |
| A1  | .090     | .100 | 2.29        | 2.54  |
| A2  | .075     | .085 | 1.91        | 2.16  |
| b   | .045     | .055 | 1.14        | 1.40  |
| b1  | .075     | .085 | 1.91        | 2.15  |
| b2  | .115     | .126 | 2.92        | 3.20  |
| C   | .024     | .033 | 0.61        | 0.83  |
| D   | .819     | .840 | 20.80       | 21.34 |
| E   | .620     | .635 | 15.75       | 16.13 |
| e   | .215 BSC |      | 5.45 BSC    |       |
| L   | .780     | .811 | 19.81       | 20.60 |
| L1  | .150     | .172 | 3.81        | 4.38  |
| Q   | .220     | .244 | 5.59        | 6.20  |
| R   | .170     | .191 | 4.32        | 4.85  |
| S   | .520     | .540 | 13.21       | 13.72 |
| T   | .620     | .640 | 15.75       | 16.26 |
| U   | .065     | .080 | 1.65        | 2.03  |
| W   | 0        | .004 | 0           | 0.10  |

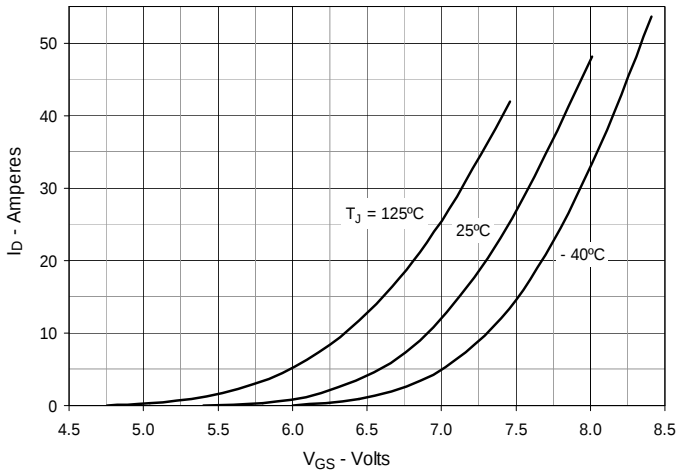
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IXYS MOSFETs and IGBTs are covered by one or more of the following U.S. patents:

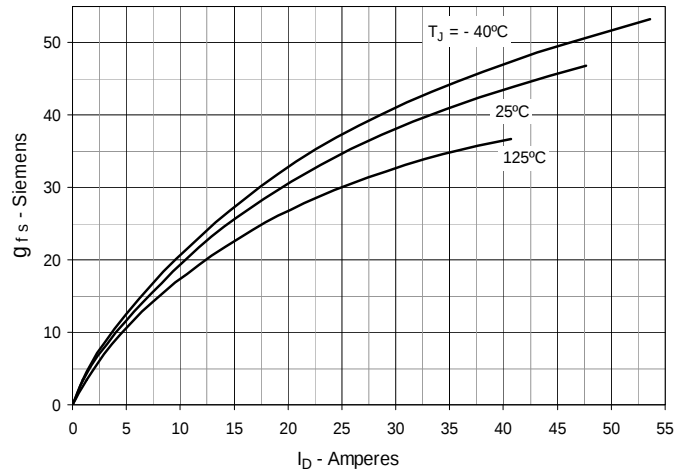
|           |           |           |           |              |              |              |              |              |              |
|-----------|-----------|-----------|-----------|--------------|--------------|--------------|--------------|--------------|--------------|
| 4,835,592 | 4,931,844 | 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 @  $T_J = 25^\circ\text{C}$** 

**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  $I_D = 20\text{A}$  Value vs. Junction Temperature**

**Fig. 5.  $R_{DS(on)}$  Normalized to  $I_D = 20\text{A}$  Value vs. Drain Current**

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


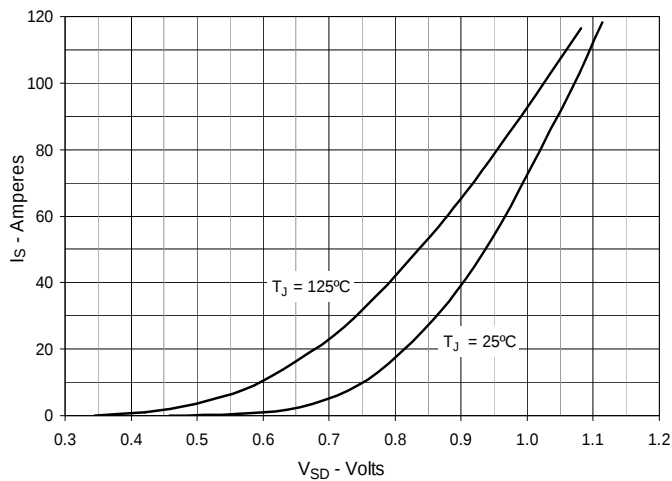
**Fig. 7. Input Admittance**



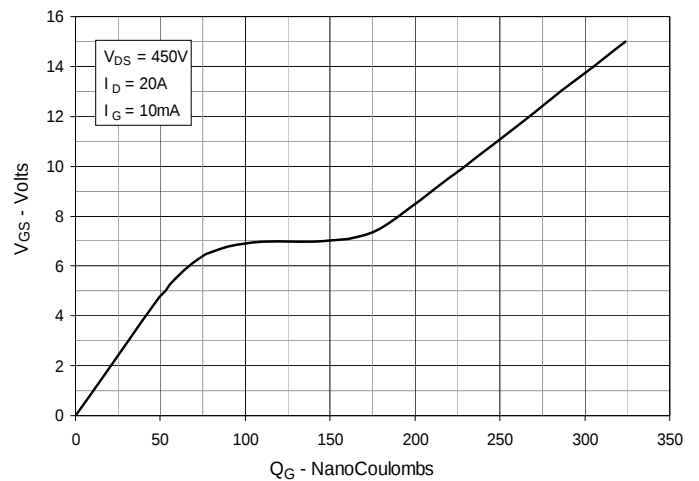
**Fig. 8. Transconductance**



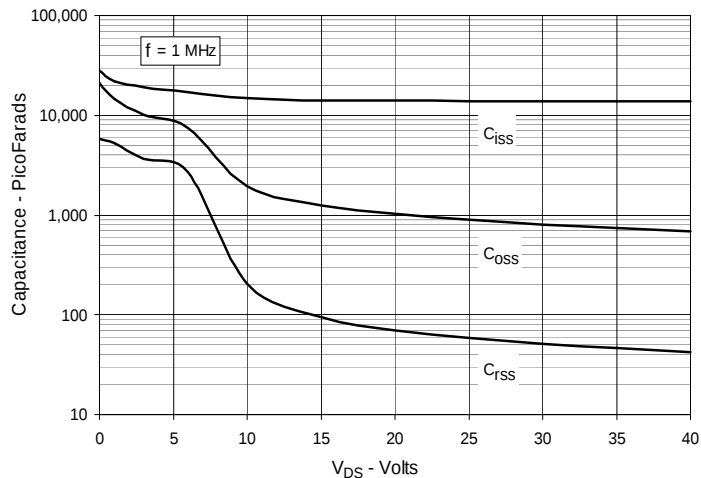
**Fig. 9. Forward Voltage Drop of Intrinsic Diode**



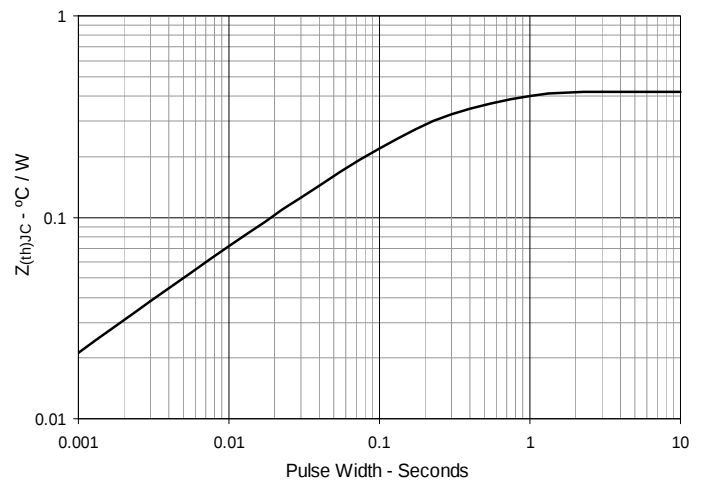
**Fig. 10. Gate Charge**



**Fig. 11. Capacitance**



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



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