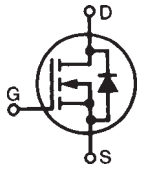
IXYS

# Polar™ HiPerFET™ Power MOSFETs

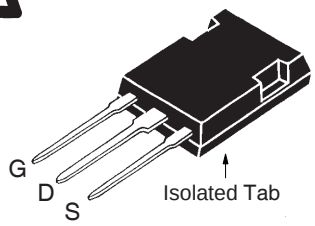
# IXFR40N90P

$V_{DSS}$ = 900V
$I_{D25}$ = 21A
$R_{DS(on)}$ ≤ 250mΩ
$t_{rr}$ ≤ 300ns

N-Channel Enhancement Mode
Avalanche Rated
Fast Intrinsic Rectifier




**ISOPLUS247**
E153432




G = Gate D = Drain
S = Source

| Symbol | Test Conditions | Maximum Ratings | |
|---|---|---|---|
| $V_{DSS}$ | $T_J$ = 25°C to 150°C | 900 | V |
| $V_{DGR}$ | $T_J$ = 25°C to 150°C, $R_{GS}$ = 1MΩ | 900 | V |
| $V_{GSS}$ | Continuous | ±30 | V |
| $V_{GSM}$ | Transient | ±40 | V |
| $I_{D25}$ | $T_C$ = 25°C | 21 | A |
| $I_{DM}$ | $T_C$ = 25°C, Pulse Width Limited by $T_{JM}$ | 80 | A |
| $I_A$ | $T_C$ = 25°C | 20 | A |
| $E_{AS}$ | $T_C$ = 25°C | 2.5 | J |
| dv/dt | $I_S \le I_{DM}$, $V_{DD} \le V_{DSS}$, $T_J \le 150°C$ | 15 | V/ns |
| $P_D$ | $T_C$ = 25°C | 300 | W |
| $T_J$ | | -55 to +150 | °C |
| $T_{JM}$ | | 150 | °C |
| $T_{stg}$ | | -55 to +150 | °C |
| $T_L$ | 1.6mm (0.062 in.) from Case for 10s | 300 | °C |
| $T_{SOLD}$ | Plastic Body for 10s | 260 | °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 ($T_J$ = 25°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 |
| $I_{GSS}$ | $V_{GS}$ = ±30V, $V_{DS}$ = 0V | | | ±200 | nA |
| $I_{DSS}$ | $V_{DS} = V_{DSS}$, $V_{GS}$ = 0V | | | 50 | μA |
| | $T_J$ = 125°C | | | 3.5 | mA |
| $R_{DS(on)}$ | $V_{GS}$ = 10V, $I_D$ = 20A, Note 1 | | | 250 | mΩ |

### 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

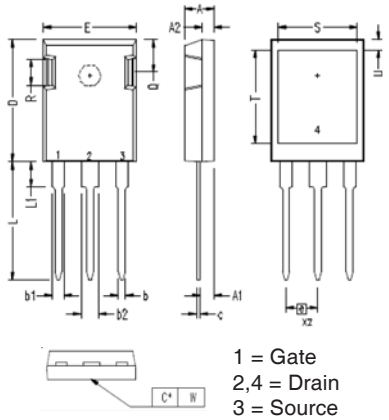
### Applications

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

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

**ISOPLUS247 (IXFR) Outline**




1 = Gate
2,4 = Drain
3 = Source

| SYM | INCHES MIN | INCHES MAX | MILLIMETERS MIN | MILLIMETERS 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 |

**Source-Drain Diode**

| Symbol | Test Conditions ($T_J$ = 25°C, Unless Otherwise Specified) | Characteristic Values Min. | Typ. | Max. | |
|---|---|---|---|---|---|
| $I_S$ | $V_{GS}$ = 0V | | | 40 | A |
| $I_{SM}$ | Repetitive, Pulse Width Limited by $T_{JM}$ | | | 160 | A |
| $V_{SD}$ | $I_F$ = $I_S$, $V_{GS}$ = 0V, Note 1 | | | 1.5 | V |
| $t_{rr}$ | $I_F$ = 20A, -di/dt = 100A/μs, | | | 300 | ns |
| $I_{RM}$ | $V_R$ = 100V, $V_{GS}$ = 0V | | 14.0 | | A |
| $Q_{RM}$ | | | 1.7 | | μC |

Note: 1. Pulse test, t ≤ 300μs, duty cycle, d ≤ 2%.

IXYS Reserves the Right to Change Limits, Test Conditions, and Dimensions.

IXYS MOSFETs and IGBTs are covered by one or moreof the following U.S. patents: 4,835,592 4,850,072 4,881,106 4,931,844 5,017,508 5,034,796 5,049,961 5,063,307 5,187,117 5,237,481 5,381,025 5,486,715 6,162,665 6,259,123 B1 6,306,728 B1 6,404,065 B1 6,534,343 6,583,505 6,683,344 6,710,405 B2 6,710,463 6,727,585 6,759,692 6,771,478 B2 7,005,734 B2 7,063,975 B2 7,071,537 7,157,338B2

**Fig. 1. Output Characteristics @ $T_J$ = 25ºC**

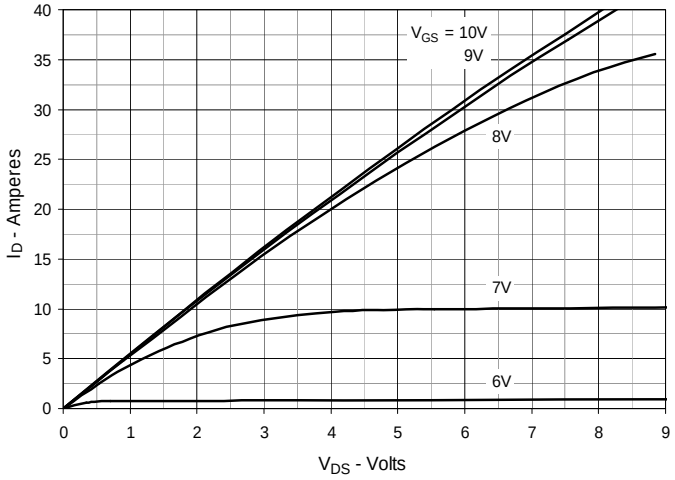



**Fig. 2. Extended Output Characteristics @ $T_J$ = 25ºC**

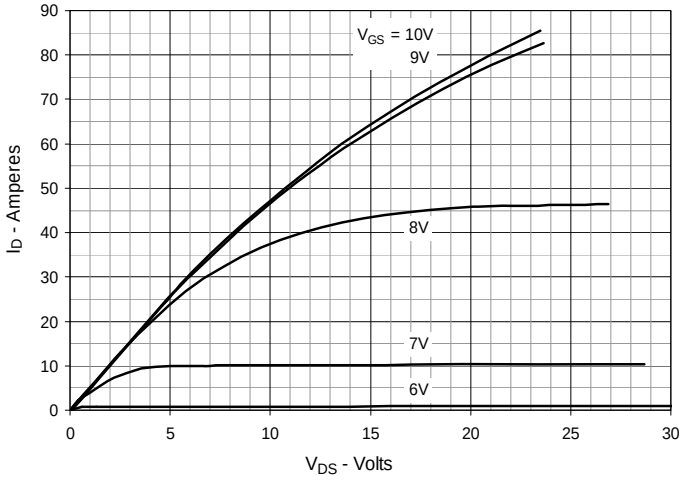



**Fig. 3. Output Characteristics @ $T_J$ = 125ºC**

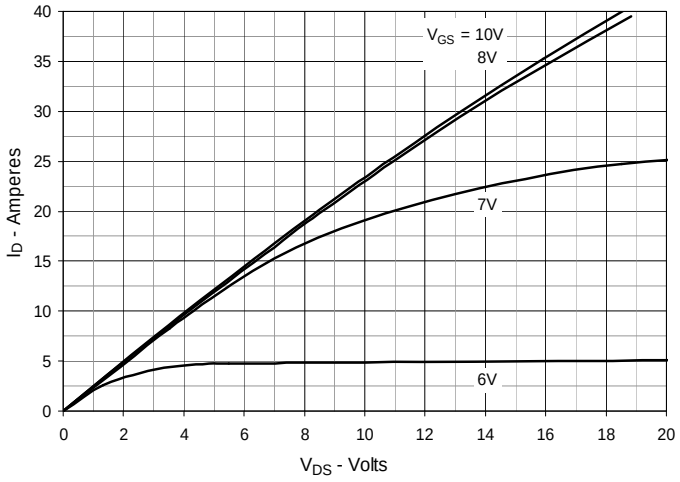



**Fig. 4. $R_{DS(on)}$ Normalized to $I_D$ = 20A Value vs. Junction Temperature**

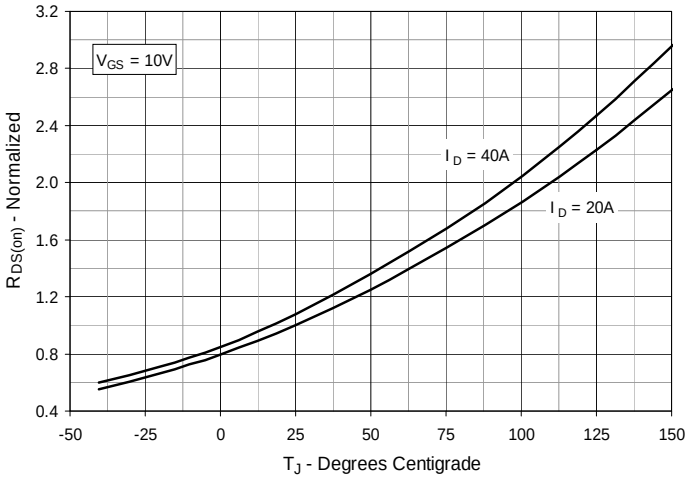



**Fig. 5. $R_{DS(on)}$ Normalized to $I_D$ = 20A Value vs. Drain Current**

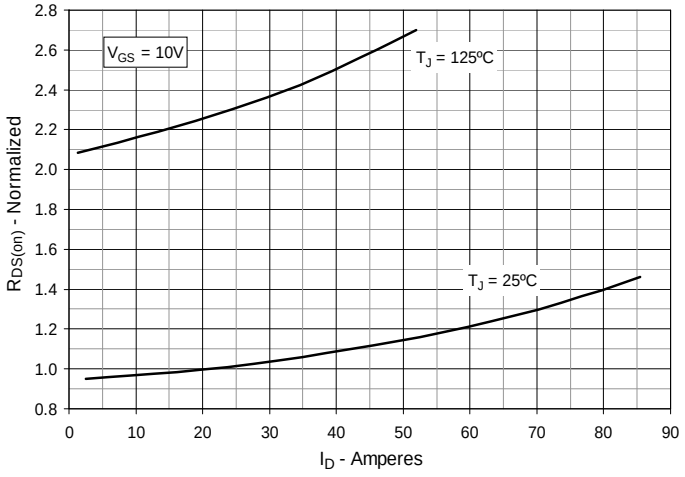
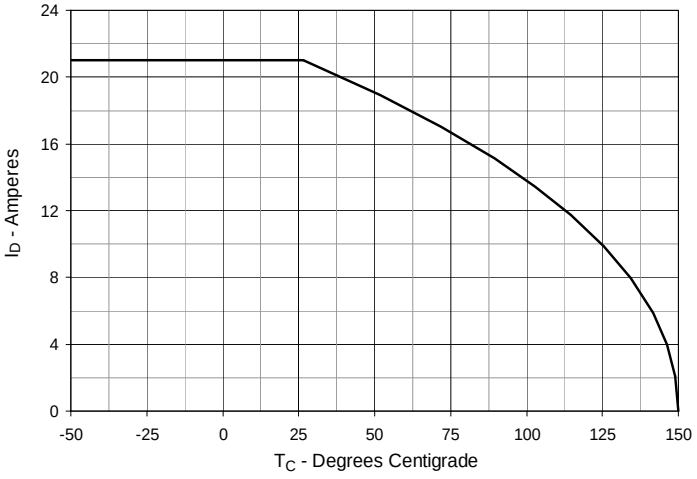



**Fig. 6. Maximum Drain Current vs. Case Temperature**




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**Fig. 7. Input Admittance**

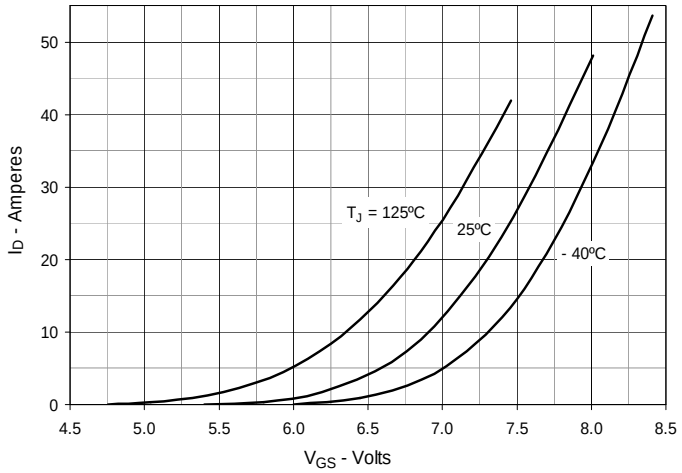



**Fig. 8. Transconductance**

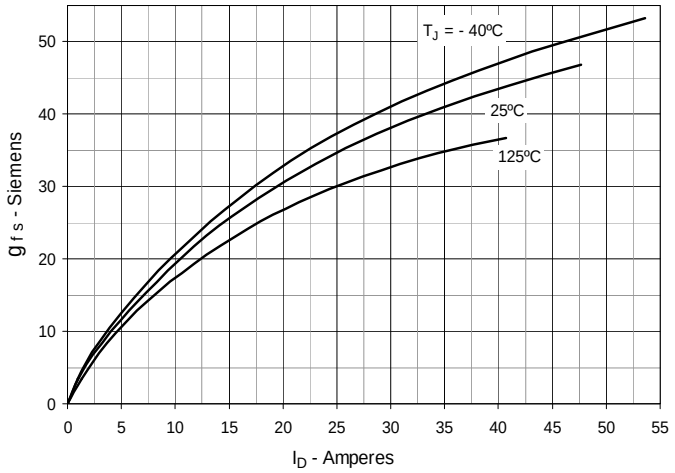



**Fig. 9. Forward Voltage Drop of Intrinsic Diode**

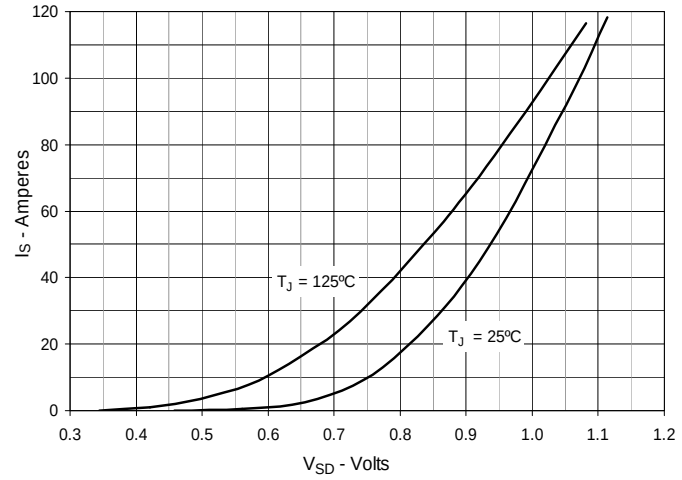



**Fig. 10. Gate Charge**

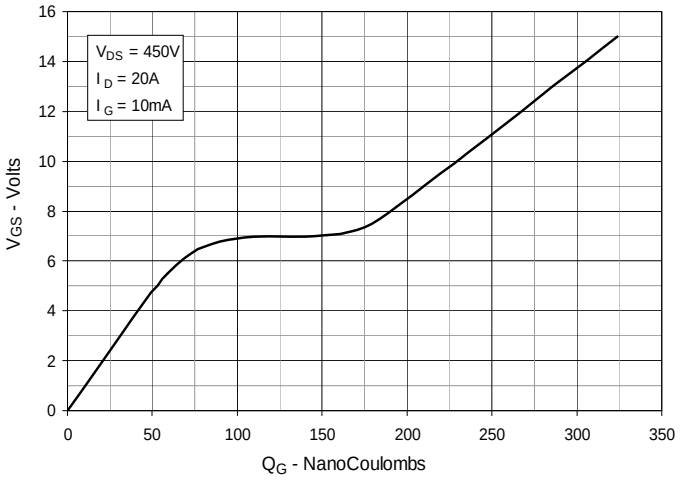



**Fig. 11. Capacitance**

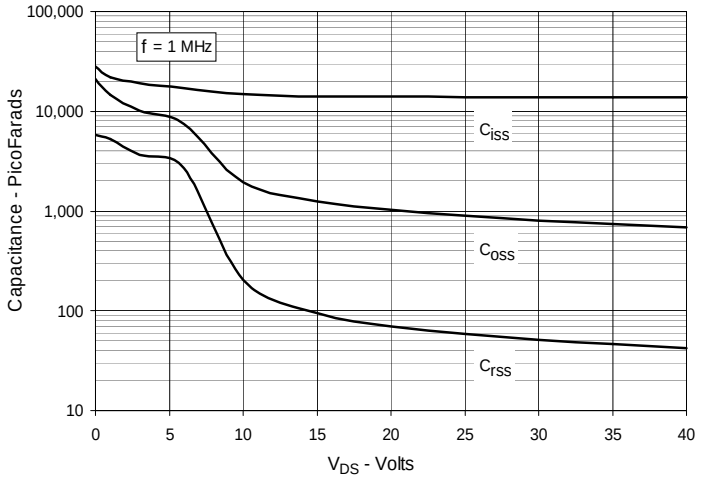
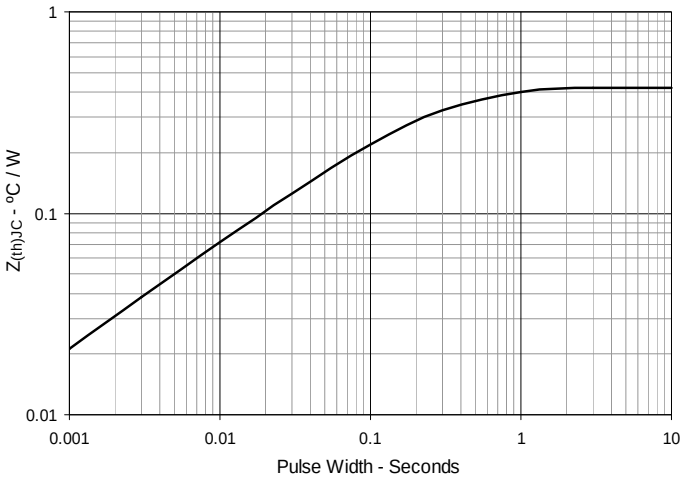



**Fig. 12. Maximum Transient Thermal Impedance**




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