

# HiPerFET™ Power MOSFETs Single MOSFET Die

N-Channel Enhancement Mode  
Avalanche Rated, High dv/dt, Low  $t_{rr}$

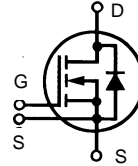
## IXFN 39N90

$$V_{DSS} = 900 \text{ V}$$

$$I_{D25} = 39 \text{ A}$$

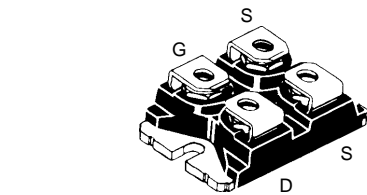
$$R_{DS(on)} = 0.22 \text{ } \Omega$$

$$t_{rr} \leq 250 \text{ ns}$$



| 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 $150^\circ\text{C}$ ; $R_{GS} = 1 \text{ M}\Omega$   | 900              | V                      |
| $V_{GS}$   | Continuous   | $\pm 20$         | V                      |
| $V_{GSM}$  | Transient  | $\pm 30$         | V                      |
| $I_{D25}$  | $T_C = 25^\circ\text{C}$   | 39               | A                      |
| $I_{DM}$   | $T_C = 25^\circ\text{C}$ , pulse width limited by $T_{JM}$   | 154              | A                      |
| $I_{AR}$   | $T_C = 25^\circ\text{C}$   | 39               | A                      |
| $E_{AR}$   | $T_C = 25^\circ\text{C}$   | 64               | mJ                     |
| $E_{AS}$   | $T_C = 25^\circ\text{C}$   | 4                | J                      |
| dv/dt      | $I_S \leq I_{DM}$ , $di/dt \leq 100 \text{ A}/\mu\text{s}$ , $V_{DD} \leq V_{DSS}$ ,<br>$T_J \leq 150^\circ\text{C}$ , $R_G = 2 \text{ } \Omega$ | 5                | V/ns                   |
| $P_D$      | $T_C = 25^\circ\text{C}$   | 700              | W                      |
| $T_J$      |  | -55 ... +150     | $^\circ\text{C}$       |
| $T_{JM}$   |  | 150              | $^\circ\text{C}$       |
| $T_{stg}$  |  | -55 ... +150     | $^\circ\text{C}$       |
| $V_{ISOL}$ | 50/60 Hz, RMS $t = 1 \text{ min}$<br>$I_{ISOL} \leq 1 \text{ mA}$ $t = 1 \text{ s}$  | 2500<br>3000     | V~<br>V~               |
| $M_d$      | Mounting torque<br>Terminal connection torque  | 1.5/13<br>1.5/13 | Nm/lb.in.<br>Nm/lb.in. |
| Weight     |  | 30               | g                      |

miniBLOC, SOT-227 B (IXFN)  
E153432



G = Gate  
S = Source  
D = Drain  
TAB = Drain

Either Source terminal at miniBLOC can be used as Main or Kelvin Source

### Features

- International standard packages
- miniBLOC, with Aluminium nitride isolation
- Low  $R_{DS(on)}$  HDMOS™ process
- Rugged polysilicon gate cell structure
- Unclamped Inductive Switching (UIS) rated
- Low package inductance
- Fast intrinsic Rectifier

### Applications

- DC-DC converters
- Battery chargers
- Switched-mode and resonant-mode power supplies
- DC choppers
- Temperature and lighting controls

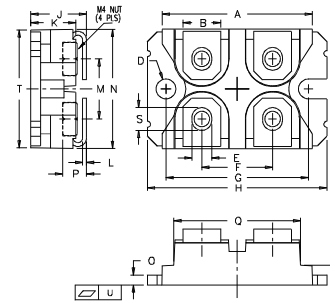
### Advantages

- Easy to mount
- Space savings
- High power density

| Symbol                       | Test Conditions   | Characteristic Values<br>( $T_J = 25^\circ\text{C}$ , unless otherwise specified) |        |                           |
|------------------------------|---|---|--------|---------------------------|
|                              |   | min.  | typ.   | max.                      |
| $V_{DSS}$<br>$BV_{DSS}$      | $V_{GS} = 0 \text{ V}$ , $I_D = 3 \text{ mA}$<br>Temperature dependence   | 900   | 3.68   | V<br>V/K                  |
| $V_{GH(th)}$<br>$V_{GH(th)}$ | $V_{DS} = V_{GS}$ , $I_D = 8 \text{ mA}$<br>Temperature dependence  | 2.5   | -0.009 | 5.0 V<br>V/K              |
| $I_{GSS}$                    | $V_{GS} = \pm 20 V_{DC}$ , $V_{DS} = 0$   |   |        | $\pm 200 \text{ nA}$      |
| $I_{DSS}$                    | $V_{DS} = V_{DSS}$ , $T_J = 25^\circ\text{C}$<br>$V_{GS} = 0 \text{ V}$ , $T_J = 125^\circ\text{C}$                 |   |        | 100 $\mu\text{A}$<br>2 mA |
| $R_{DS(on)}$                 | $V_{GS} = 10 \text{ V}$ , $I_D = 0.5 I_{D25}$<br>Pulse test, $t \leq 300 \mu\text{s}$ ,<br>duty cycle $d \leq 2 \%$ |   |        | 0.22 $\Omega$             |

| Symbol       | Test Conditions  | Characteristic Values<br>( $T_J = 25^\circ\text{C}$ , unless otherwise specified) |      |      |
|--------------|--|---|------|------|
|              |  | min.  | typ. | max. |
| $g_{fs}$     | $V_{DS} = 15\text{ V}; I_D = 0.5 \cdot I_{D25}$ , pulse test   | 30  | 45   | S    |
| $C_{iss}$    | $V_{GS} = 0\text{ V}, V_{DS} = 25\text{ V}, f = 1\text{ MHz}$  |   | 9200 | pF   |
| $C_{oss}$    |  |   | 1360 | pF   |
| $C_{rss}$    |  |   | 380  | pF   |
| $t_{d(on)}$  | $V_{GS} = 10\text{ V}, V_{DS} = 0.5 \cdot V_{DSS}, I_D = 0.5 \cdot I_{D25}$<br>$R_G = 1\ \Omega$ (External), |   | 45   | ns   |
| $t_r$        |  |   | 68   | ns   |
| $t_{d(off)}$ |  |   | 125  | ns   |
| $t_f$        |  |   | 30   | ns   |
| $Q_{g(on)}$  | $V_{GS} = 10\text{ V}, V_{DS} = 0.5 \cdot V_{DSS}, I_D = 0.5 \cdot I_{D25}$                                  |   | 390  | nC   |
| $Q_{gs}$     |  |   | 65   | nC   |
| $Q_{gd}$     |  |   | 190  | nC   |
| $R_{thJC}$   |  |   | 0.18 | K/W  |
| $R_{thCK}$   |  | 0.05  |      | K/W  |

### miniBLOC, SOT-227 B



M4 screws (4x) supplied

| Dim. | Millimeter |       | Inches |       |
|------|------------|-------|--------|-------|
|      | Min.       | Max.  | Min.   | Max.  |
| A    | 31.50      | 31.88 | 1.240  | 1.255 |
| B    | 7.80       | 8.20  | 0.307  | 0.323 |
| C    | 4.09       | 4.29  | 0.161  | 0.169 |
| D    | 4.09       | 4.29  | 0.161  | 0.169 |
| E    | 4.09       | 4.29  | 0.161  | 0.169 |
| F    | 14.91      | 15.11 | 0.587  | 0.595 |
| G    | 30.12      | 30.30 | 1.186  | 1.193 |
| H    | 38.00      | 38.23 | 1.496  | 1.505 |
| J    | 11.68      | 12.22 | 0.460  | 0.481 |
| K    | 8.92       | 9.60  | 0.351  | 0.378 |
| L    | 0.76       | 0.84  | 0.030  | 0.033 |
| M    | 12.60      | 12.85 | 0.496  | 0.506 |
| N    | 25.15      | 25.42 | 0.990  | 1.001 |
| O    | 1.98       | 2.13  | 0.078  | 0.084 |
| P    | 4.95       | 5.97  | 0.195  | 0.235 |
| Q    | 26.54      | 26.90 | 1.045  | 1.059 |
| R    | 3.94       | 4.42  | 0.155  | 0.174 |
| S    | 4.72       | 4.85  | 0.186  | 0.191 |
| T    | 24.59      | 25.07 | 0.968  | 0.987 |
| U    | -0.05      | 0.1   | -0.002 | 0.004 |

| Symbol   | Test Conditions   | Characteristic Values<br>( $T_J = 25^\circ\text{C}$ , unless otherwise specified) |      |               |
|----------|---|---|------|---------------|
|          |   | min.  | typ. | max.          |
| $I_S$    | $V_{GS} = 0\text{ V}$   |   |      | 39 A          |
| $I_{SM}$ | Repetitive;<br>pulse width limited by $T_{JM}$  |   |      | 154 A         |
| $V_{SD}$ | $I_F = I_S, V_{GS} = 0\text{ V}$ ,<br>Pulse test, $t \leq 300\ \mu\text{s}$ , duty cycle $d \leq 2\%$ |   |      | 1.3 V         |
| $t_{rr}$ | $I_F = I_S, -di/dt = 100\text{ A}/\mu\text{s}, V_R = 100\text{ V}$                                    |   | 2.0  | 250 ns        |
| $Q_{RM}$ |   |   | 9.0  | $\mu\text{C}$ |
| $I_{RM}$ |   |   |      | A             |

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 4,881,106 5,017,508 5,049,961 5,187,117 5,486,715  
4,850,072 4,931,844 5,034,796 5,063,307 5,237,481 5,381,025

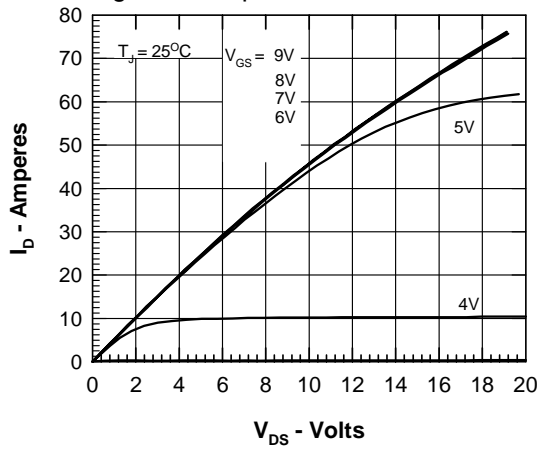
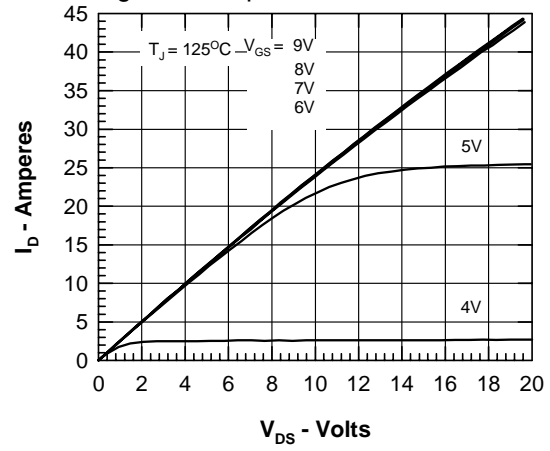
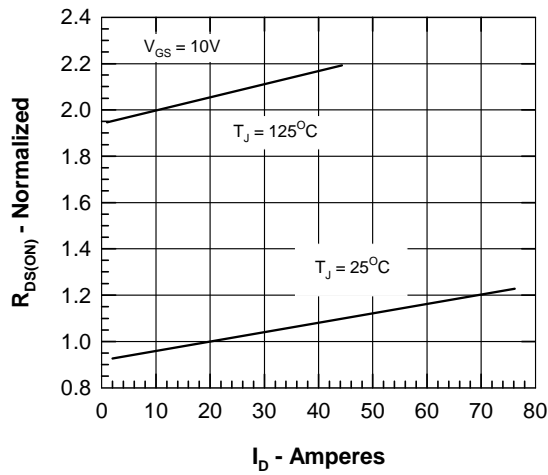
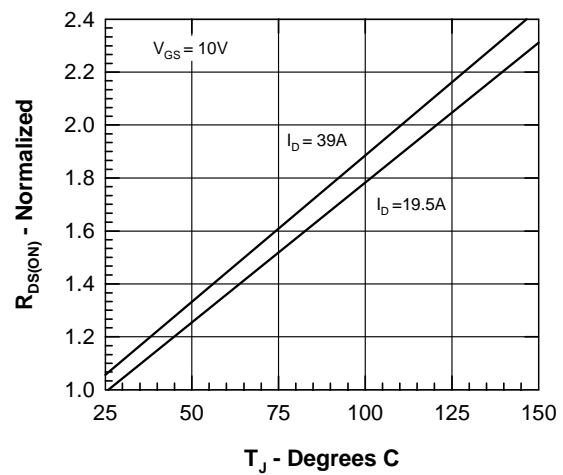
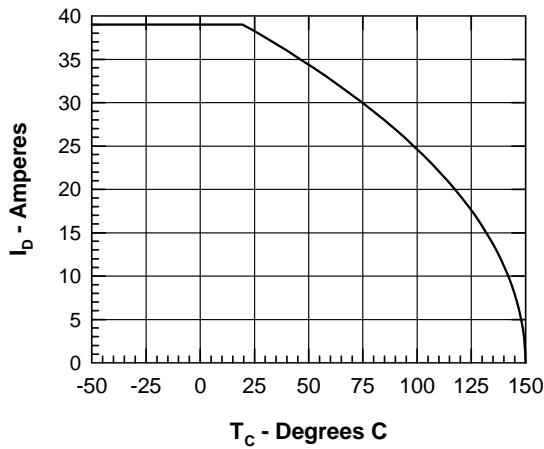
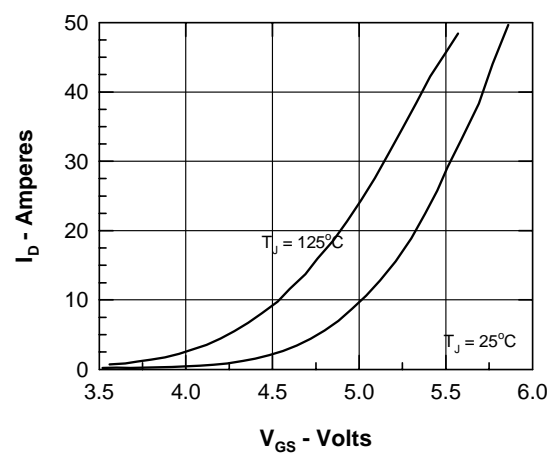
**Figure 1. Output Characteristics at 25°C**

**Figure 2. Output Characteristics at 125°C**

**Figure 3.  $R_{DS(on)}$  normalized to 0.5  $I_{D25}$  value vs.  $I_D$** 

**Figure 4.  $R_{DS(on)}$  normalized to 0.5  $I_{D25}$  value vs.  $T_J$** 

**Figure 5. Drain Current vs. Case Temperature**

**Figure 6. Admittance Curves**


Figure 7. Gate Charge

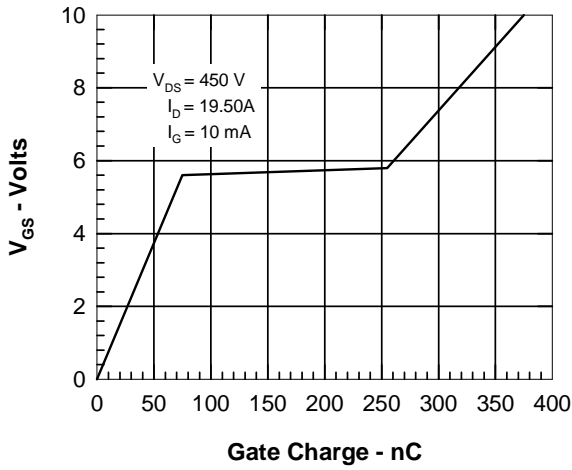


Figure 8. Capacitance Curves

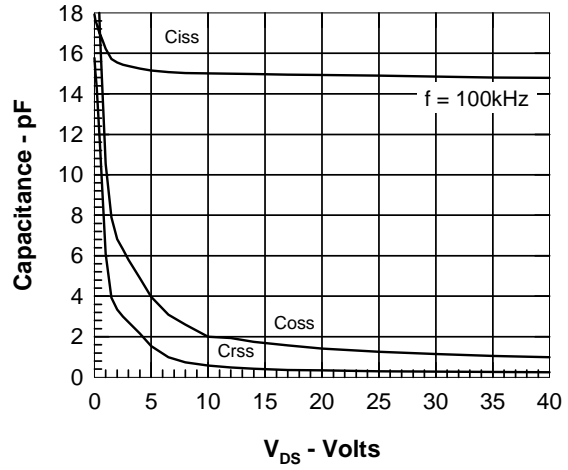


Figure 9. Forward Voltage Drop of the Intrinsic Diode

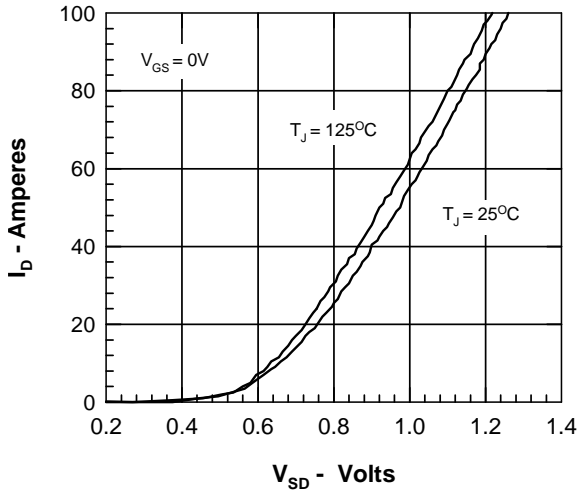
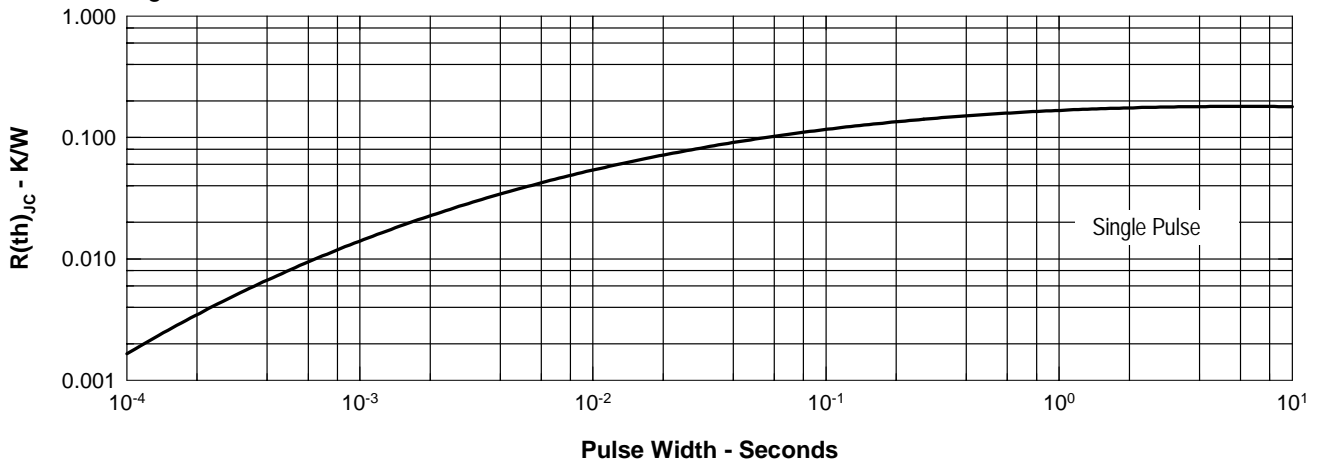


Figure 10. Transient Thermal Resistance



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