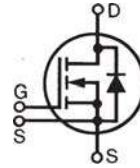


# HiPerFET™

## Power MOSFET

### Single MOSFET Die

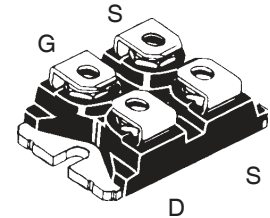
# IXFN39N90



N-Channel Enhancement Mode  
Avalanche Rated

$V_{DSS} = 900V$   
 $I_{D25} = 39A$   
 $R_{DS(on)} \leq 220m\Omega$   
 $t_{rr} \leq 250ns$

miniBLOC, SOT-227  
 E153432



G = Gate      D = Drain  
 S = Source

Either Source Terminal at miniBLOC can be used as Main or Kelvin Source.

| 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   | $\pm 20$        | V          |
| $V_{GSM}$     | Transient  | $\pm 30$        | V          |
| $I_{D25}$     | $T_C = 25^\circ C$   | 39              | A          |
| $I_{DM}$      | $T_C = 25^\circ C$ , Pulse Width Limited by $T_{JM}$               | 154             | A          |
| $I_A$         | $T_C = 25^\circ C$   | 39              | A          |
| $E_{AS}$      | $T_C = 25^\circ C$   | 4               | J          |
| $dv/dt$       | $I_S \leq I_{DM}$ , $V_{DD} \leq V_{DSS}$ , $T_J \leq 150^\circ C$ | 5               | V/ns       |
| $P_D$         | $T_C = 25^\circ C$   | 694             | W          |
| $T_J$         |  | -55 ... +150    | $^\circ C$ |
| $T_{JM}$      |  | 150             | $^\circ C$ |
| $T_{stg}$     |  | -55 ... +150    | $^\circ C$ |
| $V_{ISOL}$    | 50/60 Hz, RMS $t = 1$ minute                                       | 2500            | V~         |
|               | $I_{ISOL} \leq 1mA$ $t = 1$ second                                 | 3000            | V~         |
| $M_d$         | Mounting Torque  | 1.5/13          | Nm/lb.in.  |
|               | Terminal Connection Torque   | 1.3/11.5        | Nm/lb.in.  |
| <b>Weight</b> |  | 30              | g          |

### Features

- International Standard Package
- miniBLOC, with Aluminium Nitride Isolation
- High Current Handling Capability
- Fast Intrinsic Diode
- Avalanche Rated
- Low Package Inductance

### Advantages

- Easy to Mount
- Space Savings
- High Power Density

### Applications

- DC-DC Converters
- Battery Chargers
- Switch-Mode and Resonant-Mode Power Supplies
- DC Choppers
- Temperature and Lighting Controls

| Symbol       | Test Conditions<br>( $T_J = 25^\circ C$ , Unless Otherwise Specified) | Characteristic Values |        |                     |
|--------------|---|-----------------------|--------|---------------------|
|              |   | Min.                  | Typ.   | Max.                |
| $V_{DSS}$    | $V_{GS} = 0V$ , $I_D = 3mA$   | 900                   |        | V                   |
| $BV_{DSS}$   | <b>Temperature Dependence</b>   |                       | 3.68   | V/K                 |
| $V_{GS(th)}$ | $V_{DS} = V_{GS}$ , $I_D = 8mA$                                       | 3.0                   |        | 5.5 V               |
| $V_{GS(th)}$ | <b>Temperature Dependence</b>   |                       | -0.009 | V/K                 |
| $I_{GSS}$    | $V_{GS} = \pm 20V$ , $V_{DS} = 0V$                                    |                       |        | $\pm 200$ nA        |
| $I_{DSS}$    | $V_{DS} = V_{DSS}$ , $V_{GS} = 0V$<br>$T_J = 125^\circ C$             |                       |        | 100 $\mu A$<br>2 mA |
| $R_{DS(on)}$ | $V_{GS} = 10V$ , $I_D = 0.5 \cdot I_{D25}$ , Note 1                   |                       |        | 220 m $\Omega$      |

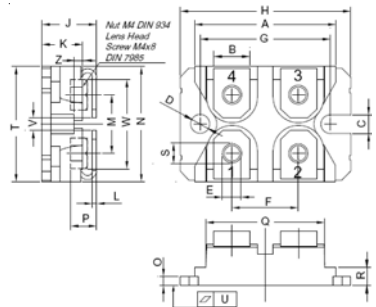
| Symbol       | Test Conditions<br>( $T_J = 25^\circ\text{C}$ , Unless Otherwise Specified)  | Characteristic Values |      |                           |
|--------------|--|-----------------------|------|---------------------------|
|              |  | Min.                  | Typ. | Max.                      |
| $g_{fs}$     | $V_{DS} = 15\text{V}$ , $I_D = 0.5 \cdot I_{D25}$ , Note 1   | 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                        |
| $t_{d(on)}$  | <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) |                       | 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 | $^\circ\text{C}/\text{W}$ |
| $R_{thCS}$   |  | 0.05                  |      | $^\circ\text{C}/\text{W}$ |

### Source-Drain Diode

| Symbol   | Test Conditions<br>( $T_J = 25^\circ\text{C}$ , Unless Otherwise Specified)                            | Characteristic Values |      |               |
|----------|--|-----------------------|------|---------------|
|          |  | Min.                  | Typ. | Max.          |
| $I_S$    | $V_{GS} = 0\text{V}$   |                       |      | 39 A          |
| $I_{SM}$ | Repetitive, Pulse Width Limited by $T_{JM}$  |                       |      | 154 A         |
| $V_{SD}$ | $I_F = I_S$ , $V_{GS} = 0\text{V}$ , Note 1  |                       |      | 1.3 V         |
| $t_{rr}$ | $I_F = 39\text{A}$ , $-di/dt = -100\text{A}/\mu\text{s}$<br>$V_R = 100\text{V}$ , $V_{GS} = 0\text{V}$ |                       |      | 250 ns        |
| $Q_{RM}$ |  |                       | 2.0  | $\mu\text{C}$ |
| $I_{RM}$ |  |                       | 9.0  | A             |

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

### SOT-227B miniBLOC (IXFN)



(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    | 37.80      | 38.23 | 1.488  | 1.505 |
| J    | 11.68      | 12.22 | 0.460  | 0.481 |
| K    | 8.92       | 9.60  | 0.351  | 0.378 |
| L    | 0.74       | 0.84  | 0.029  | 0.033 |
| M    | 12.50      | 13.10 | 0.492  | 0.516 |
| N    | 25.15      | 25.42 | 0.990  | 1.001 |
| O    | 1.95       | 2.13  | 0.077  | 0.084 |
| P    | 4.95       | 6.20  | 0.195  | 0.244 |
| Q    | 26.54      | 26.90 | 1.045  | 1.059 |
| R    | 3.94       | 4.42  | 0.155  | 0.174 |
| S    | 4.55       | 4.85  | 0.179  | 0.191 |
| T    | 24.59      | 25.25 | 0.968  | 0.994 |
| U    | -0.05      | 0.10  | -0.002 | 0.004 |
| V    | 3.20       | 5.50  | 0.126  | 0.217 |
| W    | 19.81      | 21.08 | 0.780  | 0.830 |
| Z    | 2.50       | 2.70  | 0.098  | 0.106 |

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 |
|  | 4,860,072 | 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    |             |

Figure 1. Output Characteristics at 25°C

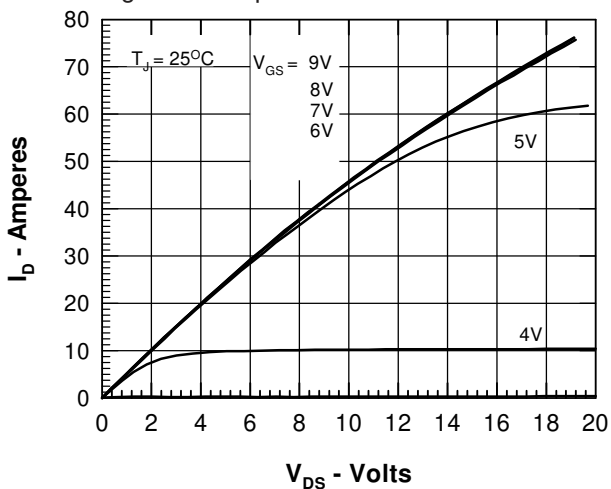


Figure 2. Output Characteristics at 125°C

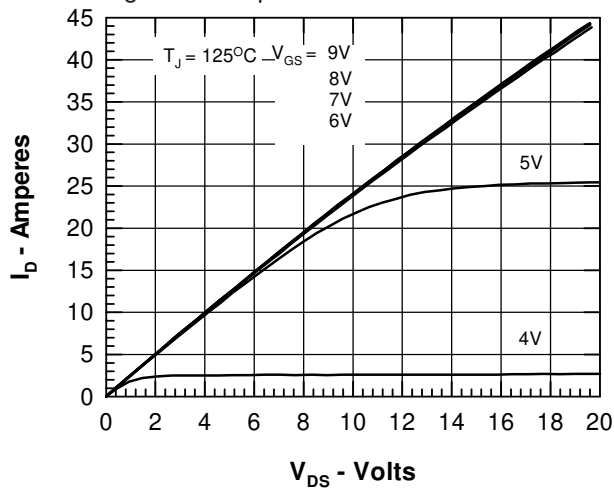


Figure 3.  $R_{DS(on)}$  normalized to 0.5  $I_{D25}$  value vs.  $I_D$

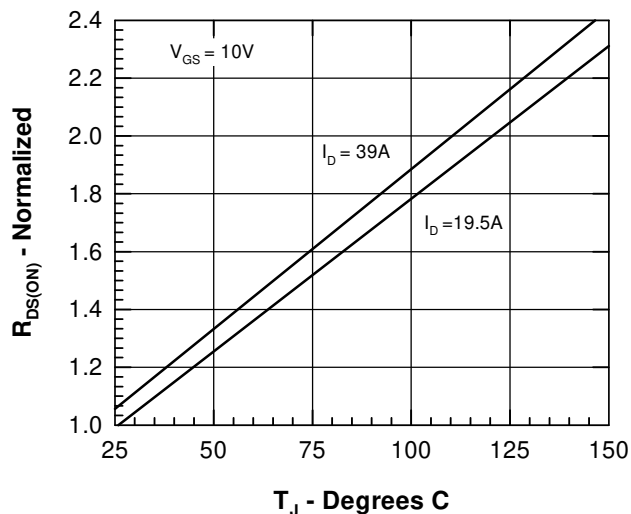
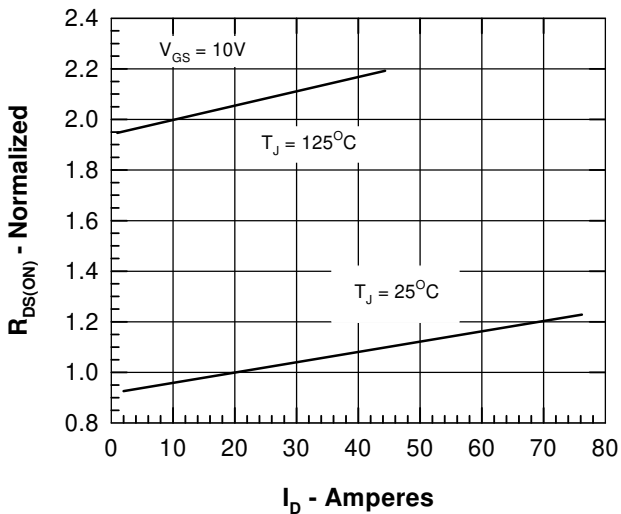


Figure 5. Drain Current vs. Case Temperature

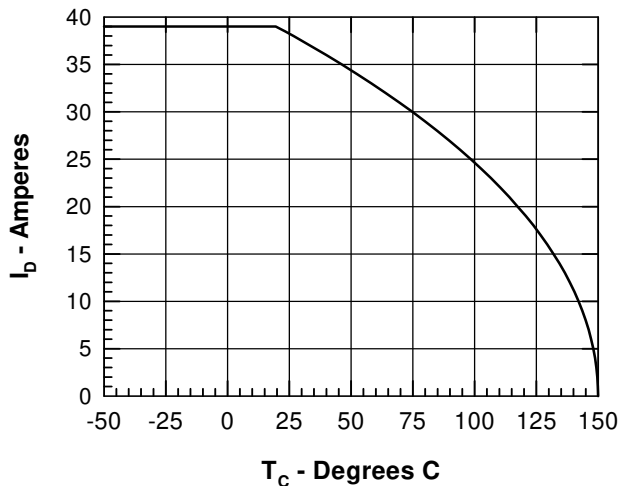


Figure 6. Admittance Curves

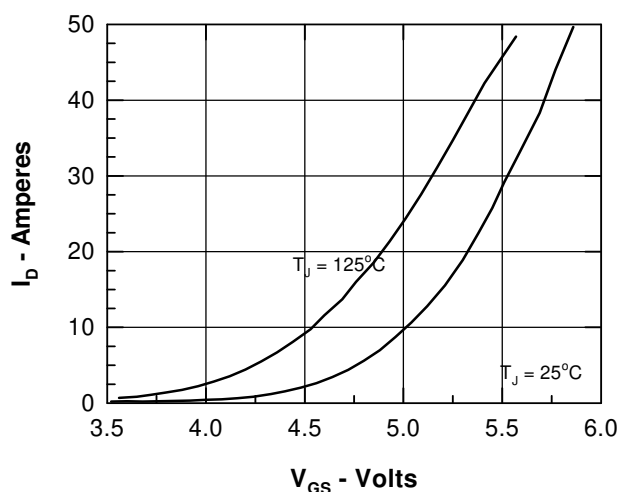


Figure 7. Gate Charge

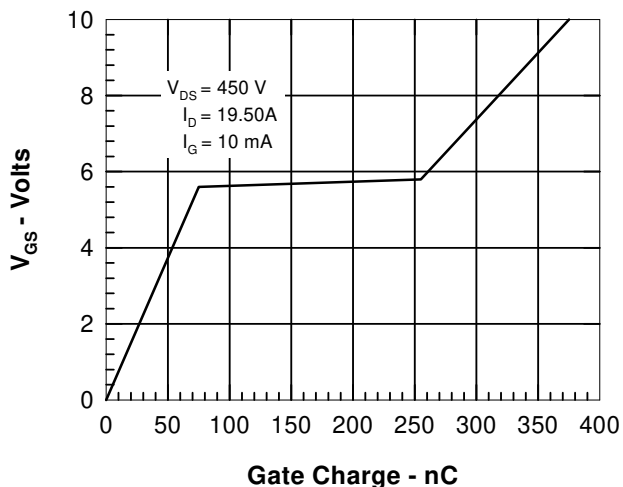


Figure 8. Capacitance Curves

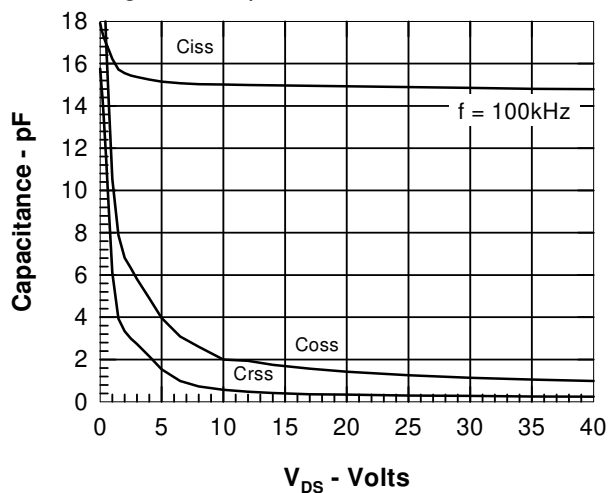


Figure 9. Forward Voltage Drop of the Intrinsic Diode

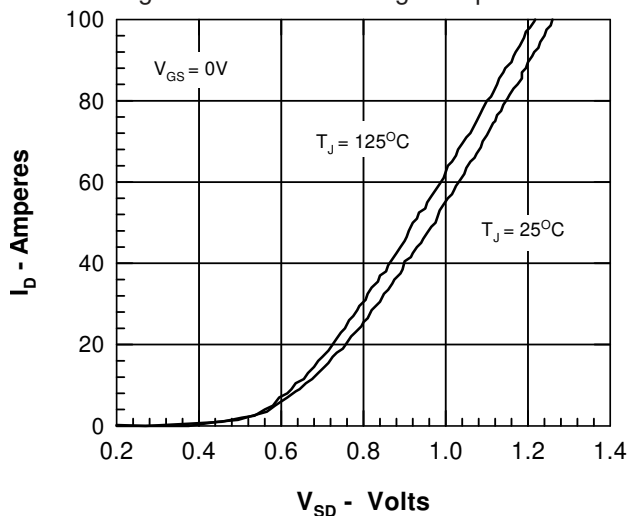
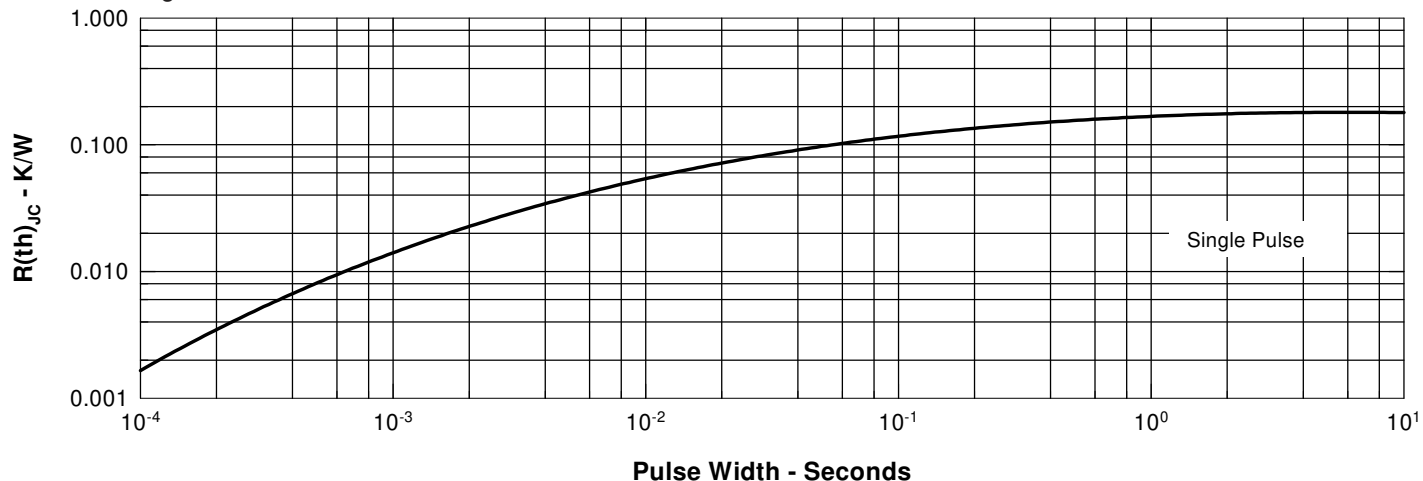


Figure 10. Transient Thermal Resistance





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