

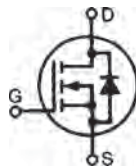
# HiPerFET™ Power MOSFETs

**IXFX 120N20**  
**IXFK 120N20**

$$\begin{aligned} V_{DSS} &= 200 \text{ V} \\ I_{D25} &= 120 \text{ A} \\ R_{DS(on)} &= 17 \text{ m}\Omega \end{aligned}$$

Single MOSFET Die

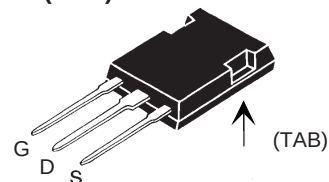
Preliminary data sheet



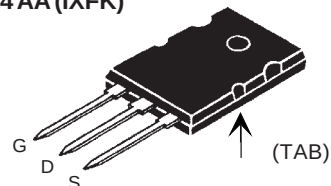
$$t_{rr} \leq 250 \text{ ns}$$

| Symbol     | Test Conditions                                                                                                                       | Maximum Ratings |                  |
|------------|---------------------------------------------------------------------------------------------------------------------------------------|-----------------|------------------|
| $V_{DSS}$  | $T_J = 25^\circ\text{C}$ to $150^\circ\text{C}$                                                                                       | 200             | V                |
| $V_{DGR}$  | $T_J = 25^\circ\text{C}$ to $150^\circ\text{C}$ ; $R_{GS} = 1 \text{ M}\Omega$                                                        | 200             | V                |
| $V_{GS}$   | Continuous                                                                                                                            | $\pm 20$        | V                |
| $V_{GSM}$  | Transient                                                                                                                             | $\pm 30$        | V                |
| $I_{D25}$  | $T_C = 25^\circ\text{C}$ (MOSFET chip capability)                                                                                     | 120             | A                |
| $I_{D104}$ | $T_C = 104^\circ\text{C}$ (External lead capability)                                                                                  | 76              | A                |
| $I_{DM}$   | $T_C = 25^\circ\text{C}$ , pulse width limited by $T_{JM}$                                                                            | 480             | A                |
| $I_{AR}$   | $T_C = 25^\circ\text{C}$                                                                                                              | 120             | A                |
| $E_{AR}$   | $T_C = 25^\circ\text{C}$                                                                                                              | 64              | mJ               |
| $E_{AS}$   | $T_C = 25^\circ\text{C}$                                                                                                              | 3               | J                |
| $dv/dt$    | $I_S \leq I_{DM}$ , $di/dt \leq 100 \text{ A}/\mu\text{s}$ , $V_{DD} \leq V_{DSS}$<br>$T_J \leq 150^\circ\text{C}$ , $R_G = 2 \Omega$ | 15              | V/ns             |
| $P_D$      | $T_C = 25^\circ\text{C}$                                                                                                              | 560             | W                |
| $T_J$      |                                                                                                                                       | -55 ... +150    | $^\circ\text{C}$ |
| $T_{JM}$   |                                                                                                                                       | 150             | $^\circ\text{C}$ |
| $T_{stg}$  |                                                                                                                                       | -55 ... +150    | $^\circ\text{C}$ |
| $T_L$      | 1.6 mm (0.063 in.) from case for 10 s                                                                                                 | 300             | $^\circ\text{C}$ |
| $M_d$      | Mounting torque                                                                                                                       | TO-264          | 0.9/6 Nm/b.in.   |
| Weight     |                                                                                                                                       | PLUS 247        | 6 g              |
|            |                                                                                                                                       | TO-264          | 10 g             |

PLUS 247™ (IXFX)



TO-264 AA (IXFK)



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

## Features

- International standard packages
- Low  $R_{DS(on)}$  HDMOS™ process
- Rugged polysilicon gate cell structure
- Unclamped Inductive Switching (UIS) rated
- Low package inductance
  - easy to drive and to protect
- Fast intrinsic rectifier

## Applications

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

## Advantages

- PLUS 247™ package for clip or spring mounting
- Space savings
- High power density

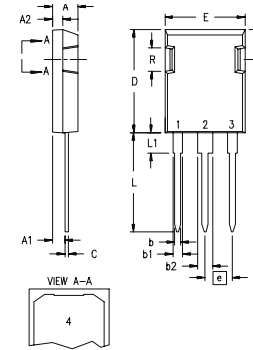
| Symbol       | Test Conditions                                               | Characteristic Values<br>( $T_J = 25^\circ\text{C}$ , unless otherwise specified) |      |                           |
|--------------|---------------------------------------------------------------|-----------------------------------------------------------------------------------|------|---------------------------|
|              |                                                               | min.                                                                              | typ. | max.                      |
| $V_{DSS}$    | $V_{GS} = 0 \text{ V}$ , $I_D = 3 \text{ mA}$                 | 200                                                                               |      | V                         |
| $V_{GS(th)}$ | $V_{DS} = V_{GS}$ , $I_D = 8 \text{ mA}$                      | 2.0                                                                               |      | 4.0 V                     |
| $I_{GSS}$    | $V_{GS} = \pm 20 \text{ V}$ , $V_{DS} = 0$                    |                                                                                   |      | $\pm 200 \text{ nA}$      |
| $I_{DSS}$    | $V_{DS} = V_{DSS}$<br>$V_{GS} = 0 \text{ V}$                  |                                                                                   |      | 100 $\mu\text{A}$<br>2 mA |
| $R_{DS(on)}$ | $V_{GS} = 10 \text{ V}$ , $I_D = 0.5 \cdot I_{D25}$<br>Note 1 |                                                                                   |      | 17 m $\Omega$             |

| Symbol       | Test Conditions                                                                                              | Characteristic Values<br>( $T_J = 25^\circ\text{C}$ , unless otherwise specified) |      |      |     |
|--------------|--------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------|------|-----|
|              |                                                                                                              | min.                                                                              | typ. | max. |     |
| $g_{fs}$     | $V_{DS} = 10\text{ V}; I_D = 0.5 \cdot I_{D25}$ Note 1                                                       | 40                                                                                | 77   |      | S   |
| $C_{iss}$    | $V_{GS} = 0\text{ V}, V_{DS} = 25\text{ V}, f = 1\text{ MHz}$                                                |                                                                                   | 9100 |      | pF  |
| $C_{oss}$    |                                                                                                              |                                                                                   | 2200 |      | pF  |
| $C_{rss}$    |                                                                                                              |                                                                                   | 1000 |      | 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), |                                                                                   | 40   |      | ns  |
| $t_r$        |                                                                                                              |                                                                                   | 65   |      | ns  |
| $t_{d(off)}$ |                                                                                                              |                                                                                   | 110  |      | ns  |
| $t_f$        |                                                                                                              |                                                                                   | 35   |      | ns  |
| $Q_{g(on)}$  | $V_{GS} = 10\text{ V}, V_{DS} = 0.5 \cdot V_{DSS}, I_D = 0.5 \cdot I_{D25}$                                  |                                                                                   | 300  |      | nC  |
| $Q_{gs}$     |                                                                                                              |                                                                                   | 50   |      | nC  |
| $Q_{gd}$     |                                                                                                              |                                                                                   | 170  |      | nC  |
| $R_{thJC}$   |                                                                                                              |                                                                                   |      | 0.22 | K/W |
| $R_{thCK}$   |                                                                                                              |                                                                                   | 0.15 |      | K/W |

| Source-Drain Diode |                                                                            | Characteristic Values<br>( $T_J = 25^\circ\text{C}$ , unless otherwise specified) |      |               |
|--------------------|----------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------|---------------|
| Symbol             | Test Conditions                                                            | min.                                                                              | typ. | max.          |
| $I_S$              | $V_{GS} = 0\text{ V}$                                                      |                                                                                   |      | 120 A         |
| $I_{SM}$           | Repetitive;<br>pulse width limited by $T_{JM}$                             |                                                                                   |      | 480 A         |
| $V_{SD}$           | $I_F = I_S, V_{GS} = 0\text{ V}$ , Note 1                                  |                                                                                   |      | 1.5 V         |
| $t_{rr}$           | $I_F = 50\text{ A}, -di/dt = 100\text{ A}/\mu\text{s}, V_R = 100\text{ V}$ |                                                                                   |      | 250 ns        |
| $Q_{RM}$           |                                                                            |                                                                                   | 0.8  | $\mu\text{C}$ |
| $I_{RM}$           |                                                                            |                                                                                   | 8    | A             |

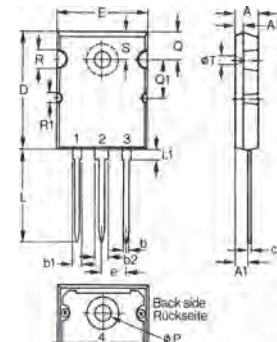
Note: 1. Pulse test,  $t \leq 300\ \mu\text{s}$ , duty cycle  $d \leq 2\%$

## PLUS247™ (IXFX) Outline



| Dim.           | Millimeter |       | Inches   |      |
|----------------|------------|-------|----------|------|
|                | Min.       | Max.  | Min.     | Max. |
| A              | 4.83       | 5.21  | .190     | .205 |
| A <sub>1</sub> | 2.29       | 2.54  | .090     | .100 |
| A <sub>2</sub> | 1.91       | 2.16  | .075     | .085 |
| b              | 1.14       | 1.40  | .045     | .055 |
| b <sub>1</sub> | 1.91       | 2.13  | .075     | .084 |
| b <sub>2</sub> | 2.92       | 3.12  | .115     | .123 |
| C              | 0.61       | 0.80  | .024     | .031 |
| D              | 20.80      | 21.34 | .819     | .840 |
| E              | 15.75      | 16.13 | .620     | .635 |
| e              | 5.45 BSC   |       | .215 BSC |      |
| L              | 19.81      | 20.32 | .780     | .800 |
| L1             | 3.81       | 4.32  | .150     | .170 |
| Q              | 5.59       | 6.20  | .220     | .244 |
| R              | 4.32       | 4.83  | .170     | .190 |

## TO-264 AA Outline



| Dim. | Millimeter |       | Inches   |       |
|------|------------|-------|----------|-------|
|      | Min.       | Max.  | Min.     | Max.  |
| A    | 4.82       | 5.13  | .190     | .202  |
| A1   | 2.54       | 2.89  | .100     | .114  |
| A2   | 2.00       | 2.10  | .079     | .083  |
| b    | 1.12       | 1.42  | .044     | .056  |
| b1   | 2.39       | 2.69  | .094     | .106  |
| b2   | 2.90       | 3.09  | .114     | .122  |
| c    | 0.53       | 0.83  | .021     | .033  |
| D    | 25.91      | 26.16 | 1.020    | 1.030 |
| E    | 19.81      | 19.96 | .780     | .786  |
| e    | 5.46 BSC   |       | .215 BSC |       |
| J    | 0.00       | 0.25  | .000     | .010  |
| K    | 0.00       | 0.25  | .000     | .010  |
| L    | 20.32      | 20.83 | .800     | .820  |
| L1   | 2.29       | 2.59  | .090     | .102  |
| P    | 3.17       | 3.66  | .125     | .144  |
| Q    | 6.07       | 6.27  | .239     | .247  |
| Q1   | 8.38       | 8.69  | .330     | .342  |
| R    | 3.81       | 4.32  | .150     | .170  |
| R1   | 1.78       | 2.29  | .070     | .090  |
| S    | 6.04       | 6.30  | .238     | .248  |
| T    | 1.57       | 1.83  | .062     | .072  |

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  
4,850,072 4,931,844 5,034,796

5,049,961 5,187,117 5,486,715 6,306,728B1  
5,063,307 5,237,481 5,381,025

Fig. 1. Output Characteristics at 25°C

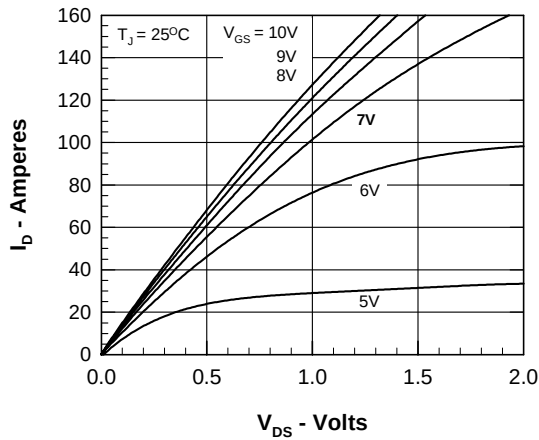


Fig. 2. Output Characteristics at 125°C

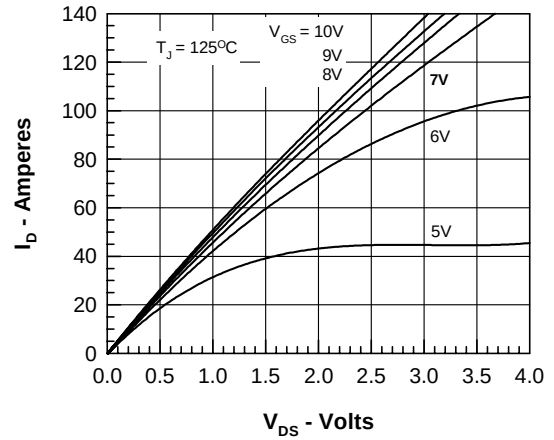
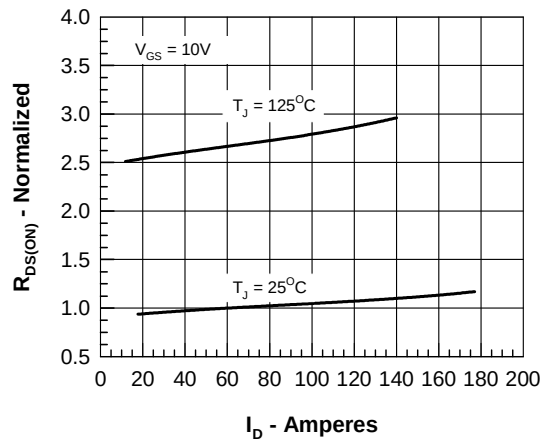
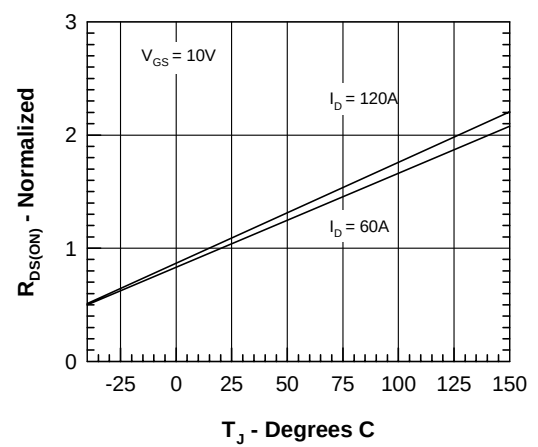

Fig. 3.  $R_{DS(ON)}$  vs. Drain Current

Fig. 4.  $R_{DS(ON)}$  vs.  $T_J$ 


Fig. 5. Drain vs. Case Temperature

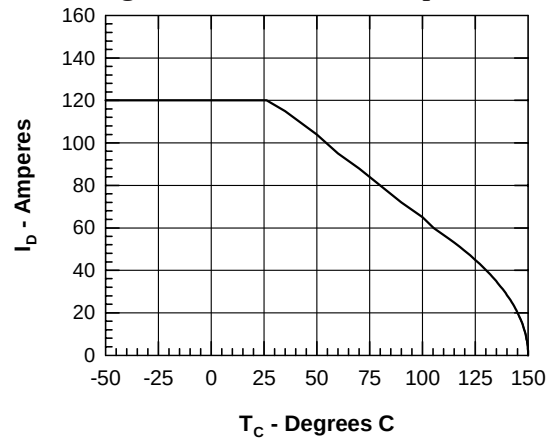


Fig. 6. Admittance Curves

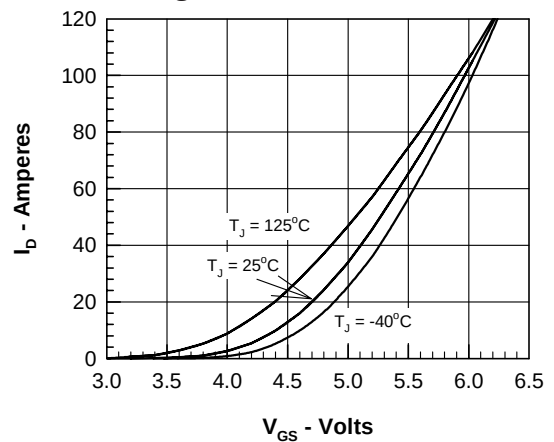


Fig. 7. Gate Charge Characteristic Curve

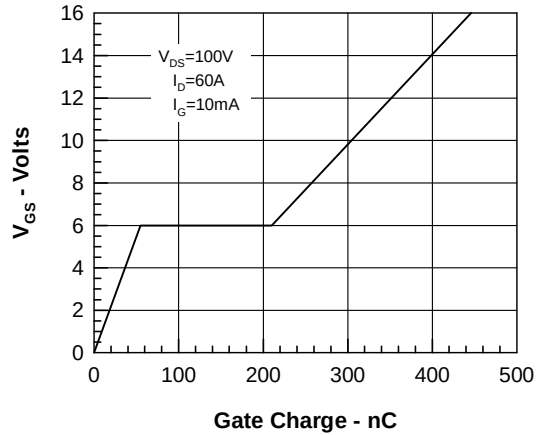


Fig.8. Capacitance Curves

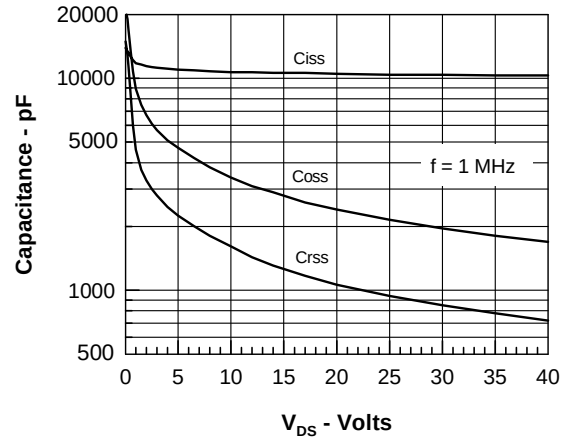


Fig.9. Source Current vs. Source to Drain Voltage

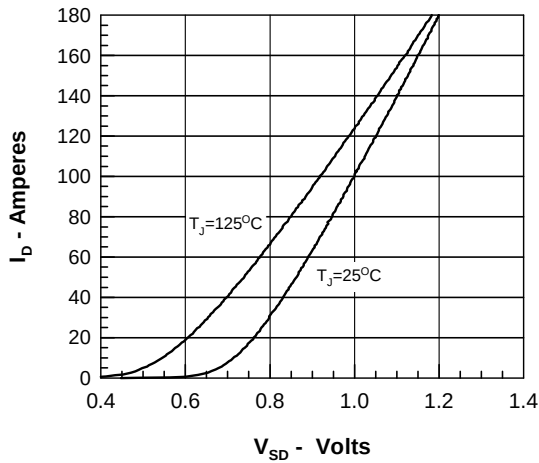
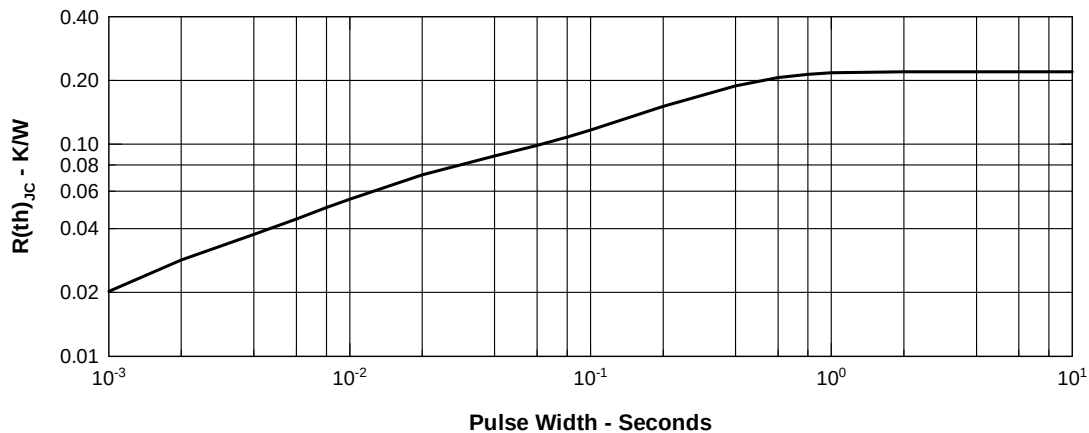


Fig.10. Maximum Thermal Impedance





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