

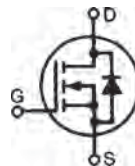
# HiPerFET™ Power MOSFETs

**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

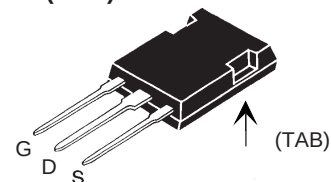
Preliminary data sheet



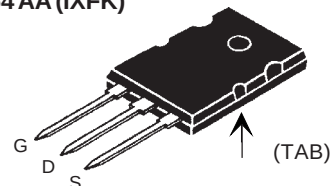
$$t_{rr} \leq 250 \text{ ns}$$

| 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<br>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

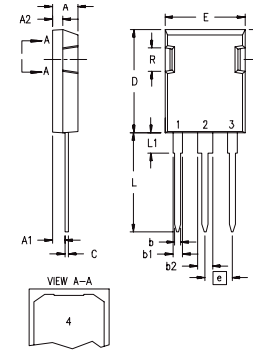
| Symbol       | Test Conditions                                               | Characteristic Values<br>( $T_J = 25^\circ\text{C}$ , unless otherwise specified) |      |                      |
|--------------|---------------------------------------------------------------|-----------------------------------------------------------------------------------|------|----------------------|
|              |                                                               | 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>$V_{GS} = 0 \text{ V}$                  | $T_J = 25^\circ\text{C}$                                                          |      | 100 $\mu\text{A}$    |
|              |                                                               | $T_J = 125^\circ\text{C}$                                                         |      | 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             |

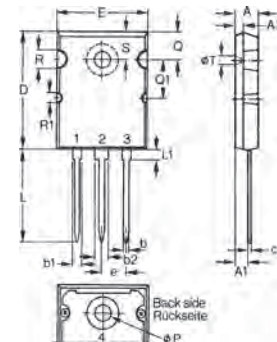
Note: 1. Pulse test,  $t \leq 300\ \mu\text{s}$ , duty cycle  $d \leq 2\%$

## 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

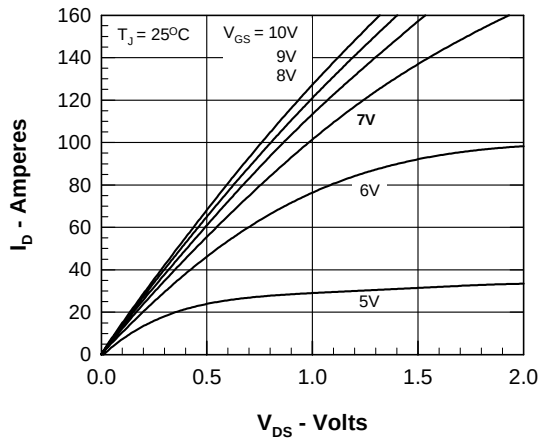


Fig. 2. Output Characteristics at 125°C

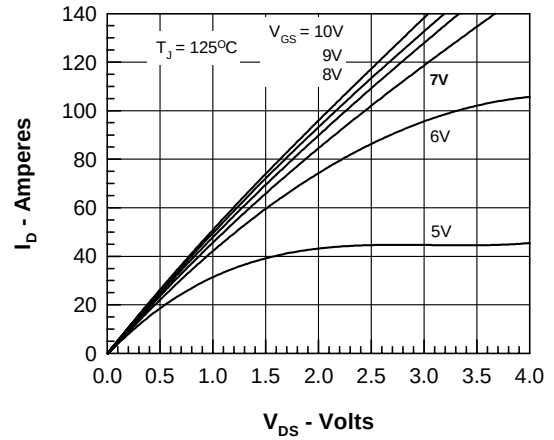
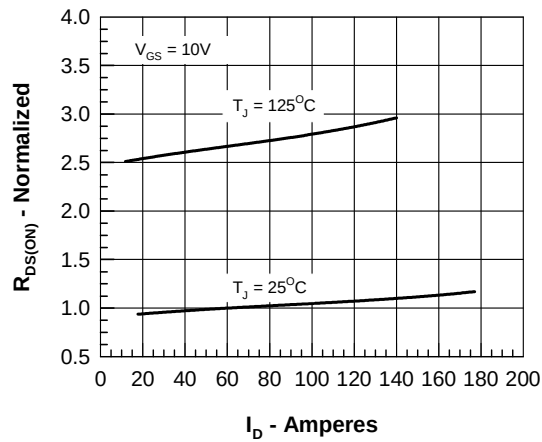
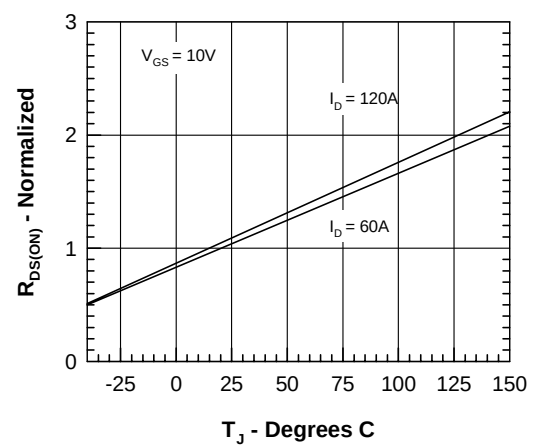

Fig. 3.  $R_{DS(ON)}$  vs. Drain Current

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


Fig. 5. Drain vs. Case Temperature

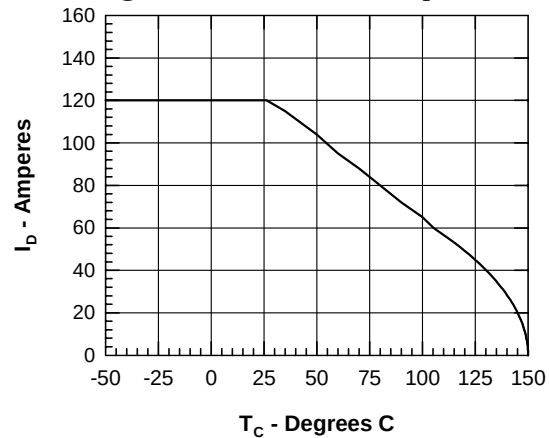


Fig. 6. Admittance Curves

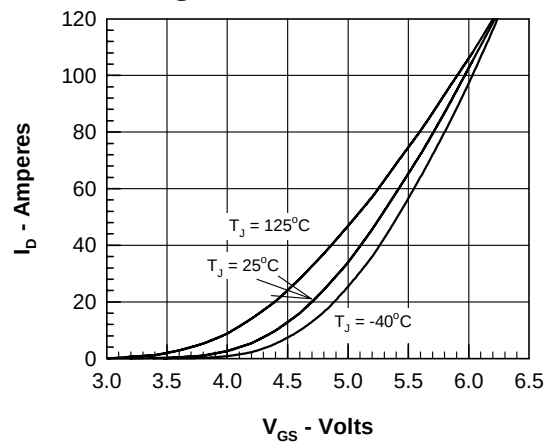


Fig. 7. Gate Charge Characteristic Curve

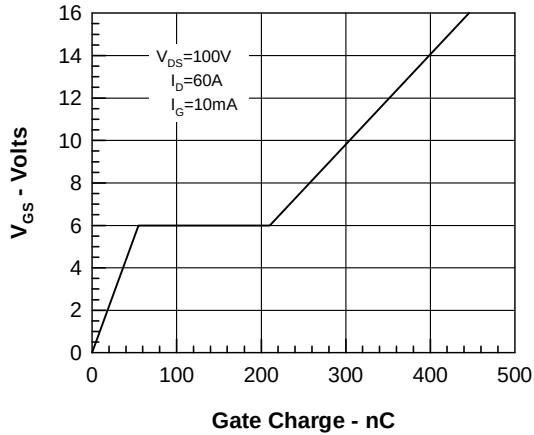


Fig. 8. Capacitance Curves

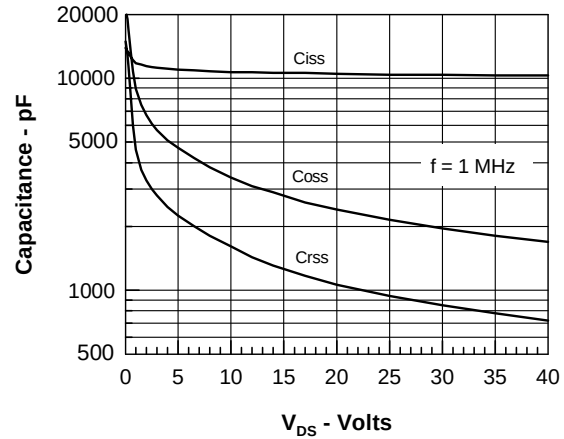


Fig. 9. Source Current vs. Source to Drain Voltage

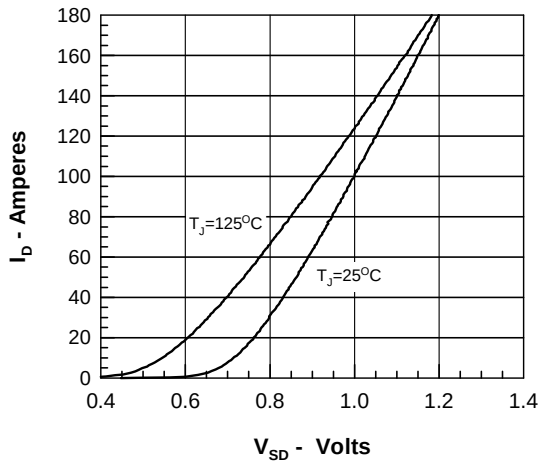
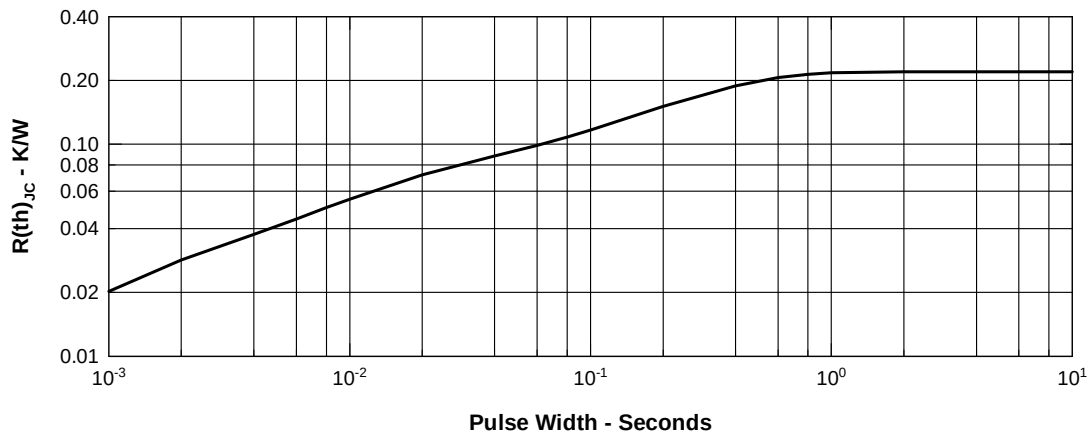


Fig. 10. Maximum Thermal Impedance





---

Disclaimer Notice - Information furnished is believed to be accurate and reliable. However, users should independently evaluate the suitability of and test each product selected for their own applications. Littelfuse products are not designed for, and may not be used in, all applications. Read complete Disclaimer Notice at [www.littelfuse.com/disclaimer-electronics](http://www.littelfuse.com/disclaimer-electronics).