

# HiPerFET™ Power MOSFETs

## IXFK 20N120 IXFX 20N120

$$V_{DSS} = 1200 \text{ V}$$

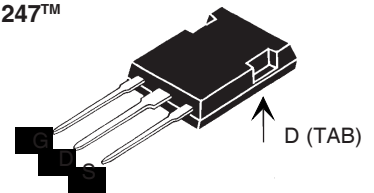
$$I_{D25} = 20 \text{ A}$$

$$R_{DS(on)} = 0.75 \Omega$$

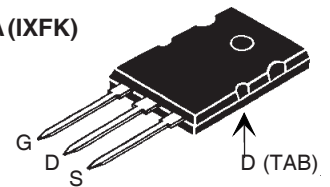
$$t_{rr} \leq 300 \text{ ns}$$



| Symbol    | Test Conditions   | Maximum Ratings |                  |
|-----------|---|-----------------|------------------|
| $V_{DSS}$ | $T_J = 25^\circ\text{C}$ to $150^\circ\text{C}$   | 1200            | V                |
| $V_{DGR}$ | $T_J = 25^\circ\text{C}$ to $150^\circ\text{C}$ ; $R_{GS} = 1 \text{ M}\Omega$  | 1200            | V                |
| $V_{GS}$  | Continuous  | $\pm 30$        | V                |
| $V_{GSM}$ | Transient   | $\pm 40$        | V                |
| $I_{D25}$ | $T_C = 25^\circ\text{C}$  | 20              | A                |
| $I_{DM}$  | $T_C = 25^\circ\text{C}$ , Note 1   | 80              | A                |
| $I_{AR}$  | $T_C = 25^\circ\text{C}$  | 10              | A                |
| $E_{AR}$  | $T_C = 25^\circ\text{C}$  | 40              | mJ               |
| $E_{AS}$  | $T_C = 25^\circ\text{C}$  | 2               | J                |
| $dv/dt$   | $I_S \leq I_{DM}$ , $di/dt \leq 100 \text{ A}/\mu\text{s}$ , $V_{DD} \leq V_{DSS}$<br>$T_J \leq 150^\circ\text{C}$ , $R_G = 2 \Omega$ | 5               | V/ns             |
| $P_D$     | $T_C = 25^\circ\text{C}$  | 780             | 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/lb.in.  |
| Weight    |   | PLUS 247        | 6 g              |
|           |   | TO-264          | 10 g             |

 PLUS 247™  
(IXFX)


TO-264 AA (IXFK)


 G = Gate  
S = Source

 D = Drain  
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

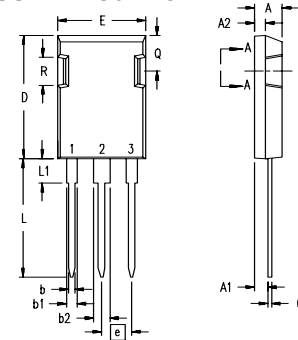
- PLUS 247™ package for clip or spring mounting
- Space savings
- High power density

| Symbol       | Test Conditions   | Characteristic Values<br>( $T_J = 25^\circ\text{C}$ , unless otherwise specified) |      |                           |
|--------------|---|---|------|---------------------------|
|              |   | min.  | typ. | max.                      |
| $V_{DSS}$    | $V_{GS} = 0 \text{ V}$ , $I_D = 1 \text{ mA}$                 | 1200  |      | V                         |
| $V_{GS(th)}$ | $V_{DS} = V_{GS}$ , $I_D = 8 \text{ mA}$                      | 2.5   |      | 4.5 V                     |
| $I_{GSS}$    | $V_{GS} = \pm 30 \text{ V}$ , $V_{DS} = 0$                    |   |      | $\pm 100 \text{ nA}$      |
| $I_{DSS}$    | $V_{DS} = V_{DSS}$<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 2 |   |      | 0.75 $\Omega$             |

| Symbol       | Test Conditions  | Characteristic Values  |      |      |     |
|--------------|--|--|------|------|-----|
|              |  | $(T_J = 25^\circ\text{C}, \text{ unless otherwise specified})$ |      |      |     |
|              |  | min.   | typ. | max. |     |
| $g_{fs}$     | $V_{DS} = 10\text{ V}; I_D = 0.5 \cdot I_{D25}$ Note 2   | 15   | 27   |      | S   |
| $C_{iss}$    | $V_{GS} = 0\text{ V}, V_{DS} = 25\text{ V}, f = 1\text{ MHz}$  |  | 7400 |      | pF  |
| $C_{oss}$    |  |  | 550  |      | pF  |
| $C_{rss}$    |  |  | 100  |      | 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), |  | 25   |      | ns  |
| $t_r$        |  |  | 45   |      | ns  |
| $t_{d(off)}$ |  |  | 75   |      | ns  |
| $t_f$        |  |  | 20   |      | ns  |
| $Q_{g(on)}$  | $V_{GS} = 10\text{ V}, V_{DS} = 0.5 \cdot V_{DSS}, I_D = 0.5 \cdot I_{D25}$                                  |  | 160  |      | nC  |
| $Q_{gs}$     |  |  | 35   |      | nC  |
| $Q_{gd}$     |  |  | 60   |      | nC  |
| $R_{thJC}$   |  |  |      | 0.16 | K/W |
| $R_{thCK}$   |  |  | 0.15 |      | K/W |

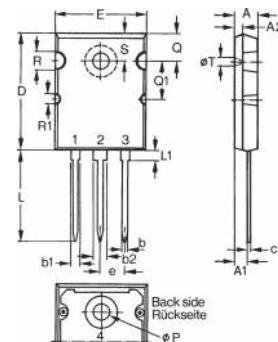
| Source-Drain Diode |  | Characteristic Values  |      |      |               |   |
|--------------------|--|--|------|------|---------------|---|
|                    |  | $(T_J = 25^\circ\text{C}, \text{ unless otherwise specified})$ |      |      |               |   |
| Symbol             | Test Conditions  | min.   | typ. | max. |               |   |
| $I_S$              | $V_{GS} = 0\text{ V}$  |  |      | 20   | A             |   |
| $I_{SM}$           | Repetitive;<br>pulse width limited by $T_{JM}$                     |  |      | 80   | A             |   |
| $V_{SD}$           | $I_F = I_S, V_{GS} = 0\text{ V}, \text{ Note 1}$                   |  |      | 1.5  | V             |   |
| $t_{rr}$           | $I_F = I_S, -di/dt = 100\text{ A}/\mu\text{s}, V_R = 100\text{ V}$ |  |      | 300  | ns            |   |
| $Q_{RM}$           |  |  | 1.4  |      | $\mu\text{C}$ |   |
| $I_{RM}$           |  |  |      | 8    |               | A |

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

**PLUS247™ Outline**


Terminals: 1 - Gate  
 2 - Drain (Collector)  
 3 - Source (Emitter)  
 4 - Drain (Collector)

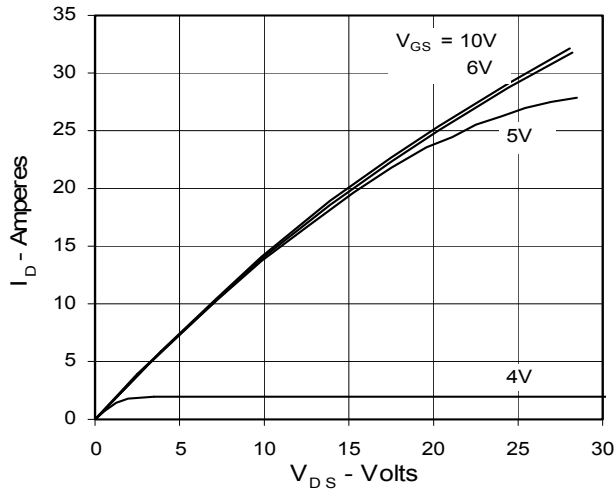
| Dim.           | Millimeter |       | Inches   |       |
|----------------|------------|-------|----------|-------|
|                | Min.       | Max.  | Min.     | Max.  |
| A              | 4.83       | 5.21  | .190     | .205  |
| A <sub>1</sub> | 2.29       | 2.54  | .090     | .100  |
| A <sub>2</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     | 0.244 |
| R              | 4.32       | 4.83  | .170     | .190  |

**TO-264 AA Outline**


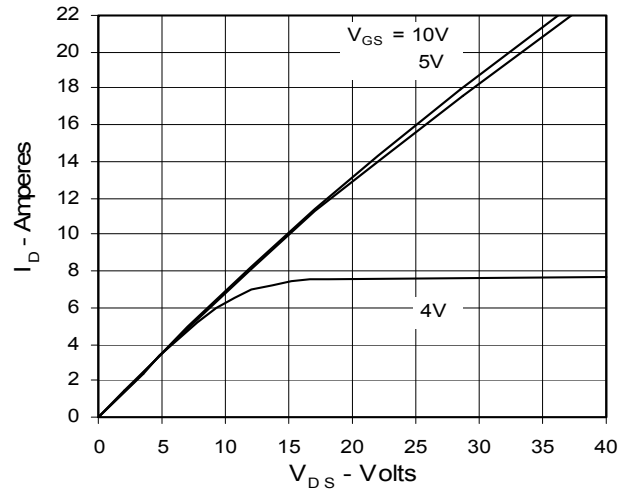
| Dim.           | Millimeter |       | Inches   |       |
|----------------|------------|-------|----------|-------|
|                | Min.       | Max.  | Min.     | Max.  |
| A              | 4.82       | 5.13  | .190     | .202  |
| A <sub>1</sub> | 2.54       | 2.89  | .100     | .114  |
| A <sub>2</sub> | 2.00       | 2.10  | .079     | .083  |
| b              | 1.12       | 1.42  | .044     | .056  |
| b <sub>1</sub> | 2.39       | 2.69  | .094     | .106  |
| b <sub>2</sub> | 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.

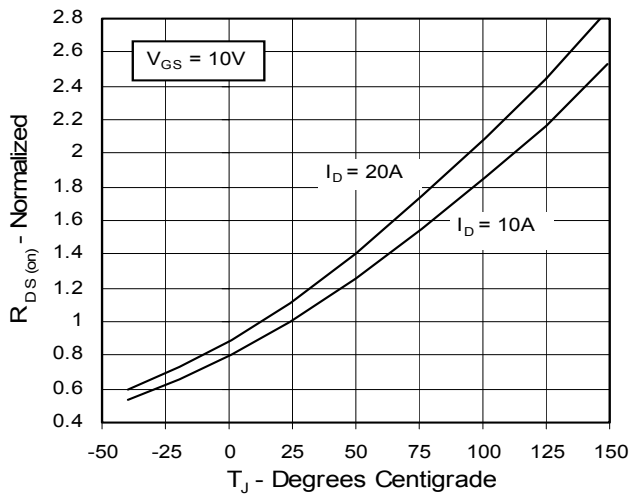
**Fig. 1. Output Characteristics @ 25 deg. C**



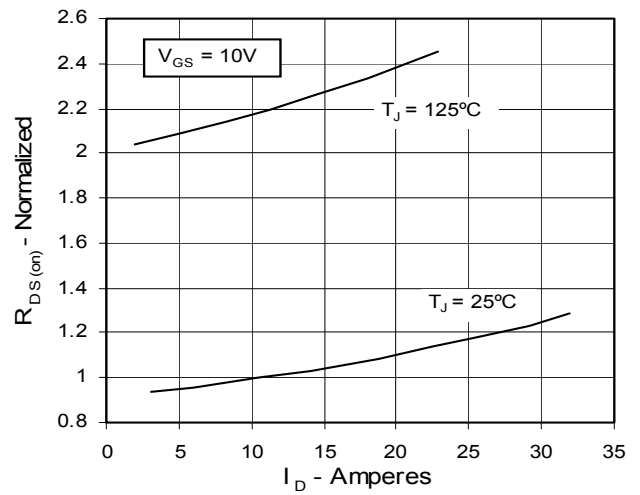
**Fig. 2. Output Characteristics @ 125 Deg. C**



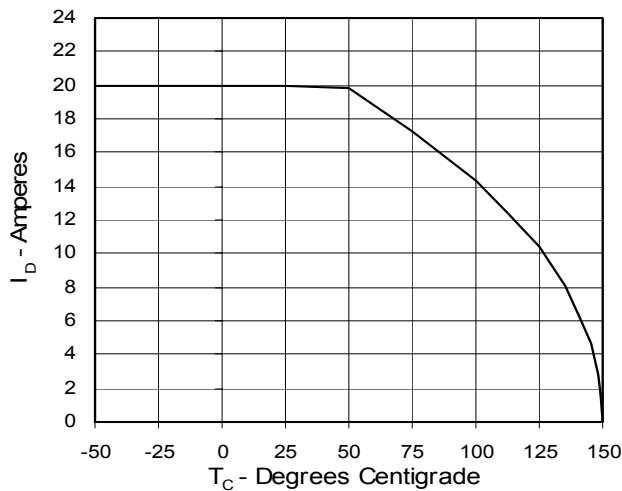
**Fig. 3.  $R_{DS(on)}$  Normalized to  $I_{D25}$  Value vs. Junction Temperature**



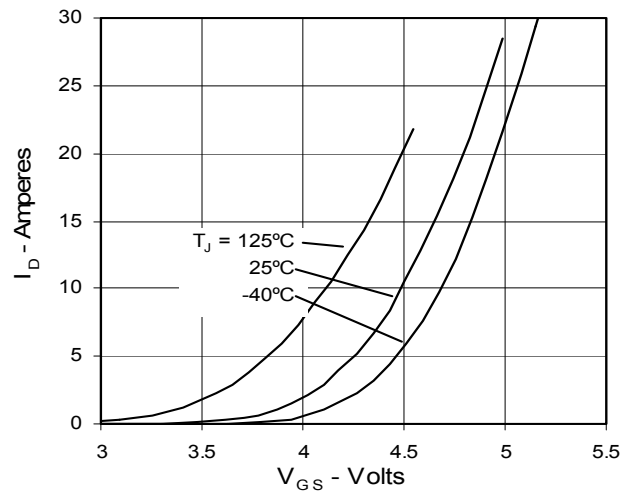
**Fig. 4.  $R_{DS(on)}$  Normalized to  $I_{D25}$  Value vs.  $I_D$**



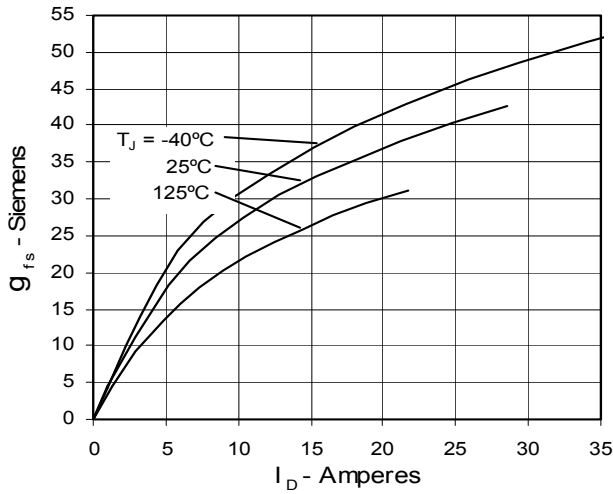
**Fig. 5. Drain Current vs. Case Temperature**



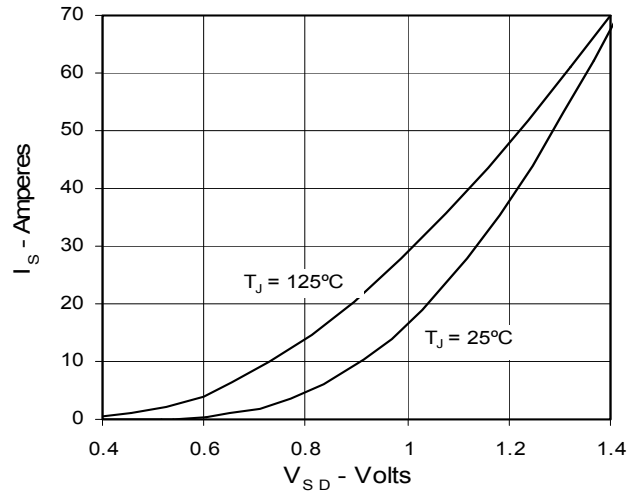
**Fig. 6. Input Admittance**



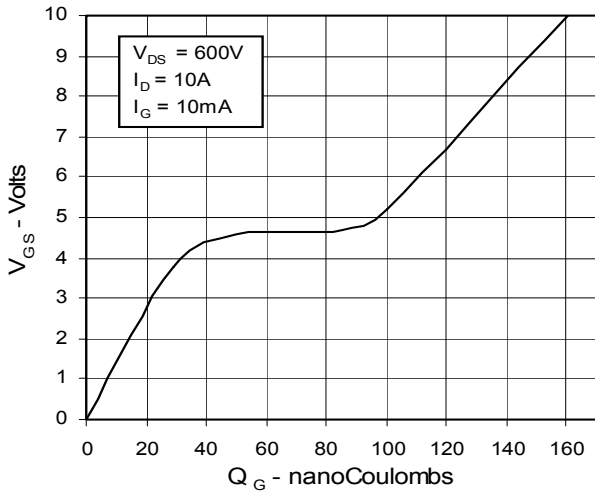
**Fig. 7. Transconductance**



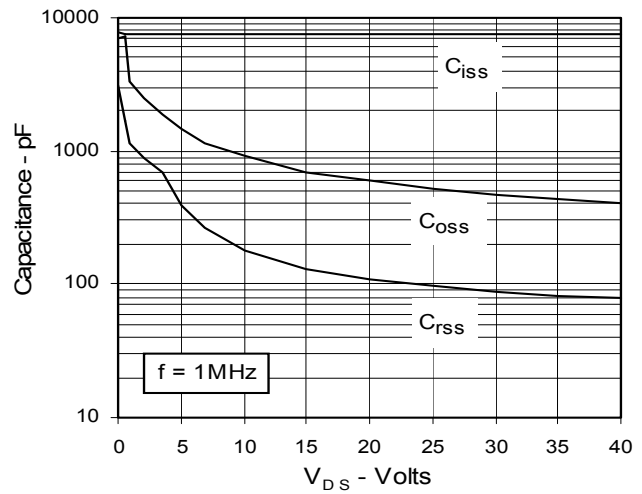
**Fig. 8. Source Current vs. Source-To-Drain Voltage**



**Fig. 9. Gate Charge**



**Fig. 10. Capacitance**



**Fig. 11. Maximum Transient Thermal Resistance**

