

# HiPerFET™ Power MOSFETs

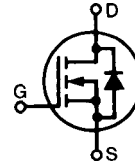
~~IXFH/IXFM11N80~~  
~~IXFH/IXFM13N80~~

| $V_{DSS}$ | $I_{D25}$ | $R_{DS(on)}$  |
|-----------|-----------|---------------|
| 800 V     | 11 A      | 0.95 $\Omega$ |
| 800 V     | 13 A      | 0.80 $\Omega$ |

$t_{rr} \leq 250$  ns

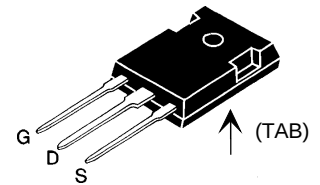
N-Channel Enhancement Mode  
High dv/dt, Low  $t_{rr}$ , HDMOS™ Family

Obsolete:  
IXFM11N80  
IXFM13N80



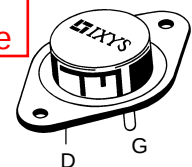
| Symbol    | Test Conditions                                                                                                                      | Maximum Ratings             |                  |   |
|-----------|--------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|------------------|---|
| $V_{DSS}$ | $T_J = 25^\circ\text{C}$ to $150^\circ\text{C}$                                                                                      | 800                         | V                |   |
| $V_{DGR}$ | $T_J = 25^\circ\text{C}$ to $150^\circ\text{C}$ ; $R_{GS} = 1$ M $\Omega$                                                            | 800                         | V                |   |
| $V_{GS}$  | Continuous                                                                                                                           | $\pm 20$                    | V                |   |
| $V_{GSM}$ | Transient                                                                                                                            | $\pm 30$                    | V                |   |
| $I_{D25}$ | $T_C = 25^\circ\text{C}$                                                                                                             | 11N80                       | 11               | A |
|           |                                                                                                                                      | 13N80                       | 13               | A |
| $I_{DM}$  | $T_C = 25^\circ\text{C}$ , pulse width limited by $T_{JM}$                                                                           | 11N80                       | 44               | A |
|           |                                                                                                                                      | 13N80                       | 52               | A |
| $I_{AR}$  | $T_C = 25^\circ\text{C}$                                                                                                             | 11N80                       | 11               | A |
|           |                                                                                                                                      | 13N80                       | 13               | A |
| $E_{AR}$  | $T_C = 25^\circ\text{C}$                                                                                                             | 30                          | mJ               |   |
| dv/dt     | $I_S \leq I_{DM}$ , $di/dt \leq 100$ A/ $\mu\text{s}$ , $V_{DD} \leq V_{DSS}$ ,<br>$T_J \leq 150^\circ\text{C}$ , $R_G = 2$ $\Omega$ | 5                           | V/ns             |   |
| $P_D$     | $T_C = 25^\circ\text{C}$                                                                                                             | 300                         | 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 (0.062 in.) from case for 10 s                                                                                                | 300                         | $^\circ\text{C}$ |   |
| $M_d$     | Mounting torque                                                                                                                      | 1.13/10                     | Nm/lb.in.        |   |
| Weight    |                                                                                                                                      | TO-204 = 18 g, TO-247 = 6 g |                  |   |

TO-247 AD (IXFH)



TO-204 AA (IXFM)

Package  
unavailable



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
- Synchronous rectification
- Battery chargers
- Switched-mode and resonant-mode power supplies
- DC choppers
- AC motor control
- Temperature and lighting controls
- Low voltage relays

## Advantages

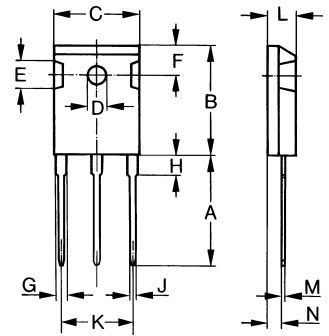
- Easy to mount with 1 screw (TO-247) (isolated mounting screw hole)
- Space savings
- High power density

| Symbol       | Test Conditions                                                  | Characteristic Values<br>( $T_J = 25^\circ\text{C}$ , unless otherwise specified) |      |                   |
|--------------|------------------------------------------------------------------|-----------------------------------------------------------------------------------|------|-------------------|
|              |                                                                  | min.                                                                              | typ. | max.              |
| $V_{DSS}$    | $V_{GS} = 0$ V, $I_D = 3$ mA                                     | 800                                                                               |      | V                 |
| $V_{GS(th)}$ | $V_{DS} = V_{GS}$ , $I_D = 4$ mA                                 | 2.0                                                                               |      | 4.5 V             |
| $I_{GSS}$    | $V_{GS} = \pm 20$ V $_{DC}$ , $V_{DS} = 0$                       |                                                                                   |      | $\pm 100$ nA      |
| $I_{DSS}$    | $V_{DS} = 0.8 \cdot V_{DSS}$ , $T_J = 25^\circ\text{C}$          |                                                                                   |      | 250 $\mu\text{A}$ |
|              | $V_{GS} = 0$ V, $T_J = 125^\circ\text{C}$                        |                                                                                   |      | 1 mA              |
| $R_{DS(on)}$ | $V_{GS} = 10$ V, $I_D = 0.5 \cdot I_{D25}$                       | 11N80                                                                             |      | 0.95 $\Omega$     |
|              |                                                                  | 13N80                                                                             |      | 0.80 $\Omega$     |
|              | Pulse test, $t \leq 300$ $\mu\text{s}$ , duty cycle $d \leq 2$ % |                                                                                   |      |                   |

| Symbol       | Test Conditions                                                                                                   | Characteristic Values<br>( $T_j = 25^\circ\text{C}$ , unless otherwise specified) |      |          |
|--------------|-------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------|----------|
|              |                                                                                                                   | min.                                                                              | typ. | max.     |
| $g_{fs}$     | $V_{DS} = 10\text{ V}$ ; $I_D = 0.5 \cdot I_{D25}$ , pulse test                                                   | 8                                                                                 | 14   | S        |
| $C_{iss}$    | $V_{GS} = 0\text{ V}$ , $V_{DS} = 25\text{ V}$ , $f = 1\text{ MHz}$                                               |                                                                                   | 4200 | pF       |
| $C_{oss}$    |                                                                                                                   |                                                                                   | 360  | 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>$R_G = 2\ \Omega$ (External) |                                                                                   | 20   | 50 ns    |
| $t_r$        |                                                                                                                   |                                                                                   | 33   | 50 ns    |
| $t_{d(off)}$ |                                                                                                                   |                                                                                   | 63   | 100 ns   |
| $t_f$        |                                                                                                                   |                                                                                   | 32   | 50 ns    |
| $Q_{g(on)}$  | $V_{GS} = 10\text{ V}$ , $V_{DS} = 0.5 \cdot V_{DSS}$ , $I_D = 0.5 \cdot I_{D25}$                                 |                                                                                   | 128  | 155 nC   |
| $Q_{gs}$     |                                                                                                                   |                                                                                   | 30   | 45 nC    |
| $Q_{gd}$     |                                                                                                                   |                                                                                   | 55   | 80 nC    |
| $R_{thJC}$   |                                                                                                                   |                                                                                   | 0.25 | 0.42 K/W |
| $R_{thCK}$   |                                                                                                                   |                                                                                   |      | K/W      |

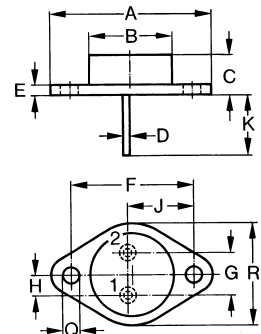
| Source-Drain Diode |                                                                                                          | Characteristic Values<br>( $T_j = 25^\circ\text{C}$ , unless otherwise specified) |      |                 |
|--------------------|----------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------|-----------------|
| Symbol             | Test Conditions                                                                                          | min.                                                                              | typ. | max.            |
| $I_S$              | $V_{GS} = 0\text{ V}$                                                                                    | 11N80<br>13N80                                                                    |      | 11 A<br>13 A    |
| $I_{SM}$           | Repetitive;<br>pulse width limited by $T_{JM}$                                                           | 11N80<br>13N80                                                                    |      | 44 A<br>52 A    |
| $V_{SD}$           | $I_F = I_S$ , $V_{GS} = 0\text{ V}$ ,<br>Pulse test, $t \leq 300\ \mu\text{s}$ , duty cycle $d \leq 2\%$ |                                                                                   |      | 1.5 V           |
| $t_{rr}$           | $I_F = I_S$<br>$-di/dt = 100\text{ A}/\mu\text{s}$ ,<br>$V_R = 100\text{ V}$                             | $T_j = 25^\circ\text{C}$<br>$T_j = 125^\circ\text{C}$                             |      | 250 ns          |
| $Q_{RM}$           |                                                                                                          |                                                                                   |      | 400 ns          |
| $I_{RM}$           |                                                                                                          |                                                                                   |      | 1 $\mu\text{C}$ |
|                    |                                                                                                          |                                                                                   |      | 8.5 A           |

## TO-247 AD (IXFH) Outline



| Dim. | Millimeter |       | Inches |       |
|------|------------|-------|--------|-------|
|      | Min.       | Max.  | Min.   | Max.  |
| A    | 19.81      | 20.32 | 0.780  | 0.800 |
| B    | 20.80      | 21.46 | 0.819  | 0.845 |
| C    | 15.75      | 16.26 | 0.610  | 0.640 |
| D    | 3.55       | 3.65  | 0.140  | 0.144 |
| E    | 4.32       | 5.49  | 0.170  | 0.216 |
| F    | 5.4        | 6.2   | 0.212  | 0.244 |
| G    | 1.65       | 2.13  | 0.065  | 0.084 |
| H    | -          | 4.5   | -      | 0.177 |
| J    | 1.0        | 1.4   | 0.040  | 0.055 |
| K    | 10.8       | 11.0  | 0.426  | 0.433 |
| L    | 4.7        | 5.3   | 0.185  | 0.209 |
| M    | 0.4        | 0.8   | 0.016  | 0.031 |
| N    | 1.5        | 2.49  | 0.087  | 0.102 |

## TO-204 AA (IXFM) Outline



| Dim. | Millimeter |       | Inches |       |
|------|------------|-------|--------|-------|
|      | Min.       | Max.  | Min.   | Max.  |
| A    | 38.61      | 39.12 | 1.520  | 1.540 |
| B    | 19.43      | 19.94 | -      | 0.785 |
| C    | 6.40       | 9.14  | 0.252  | 0.360 |
| D    | 0.97       | 1.09  | 0.038  | 0.043 |
| E    | 1.53       | 2.92  | 0.060  | 0.115 |
| F    | 30.15      | BSC   | 1.187  | BSC   |
| G    | 10.67      | 11.17 | 0.420  | 0.440 |
| H    | 5.21       | 5.71  | 0.205  | 0.225 |
| J    | 16.64      | 17.14 | 0.655  | 0.675 |
| K    | 11.18      | 12.19 | 0.440  | 0.480 |
| Q    | 3.84       | 4.19  | 0.151  | 0.165 |
| R    | 25.16      | 25.90 | 0.991  | 1.020 |

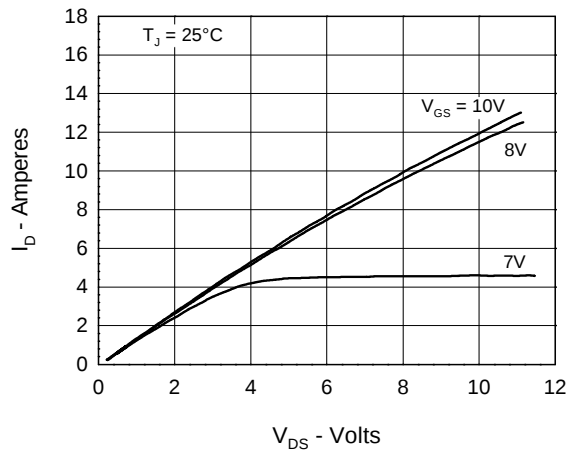
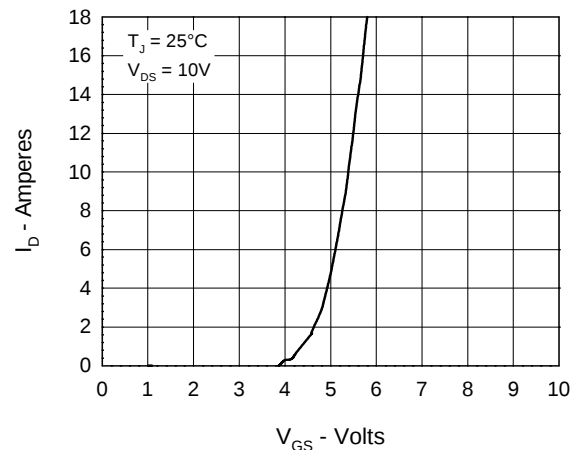
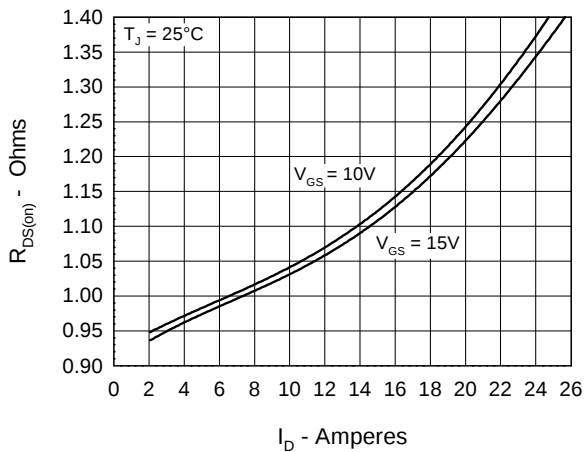
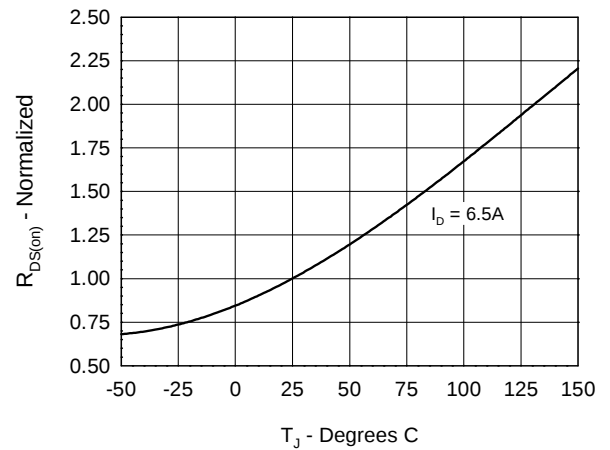
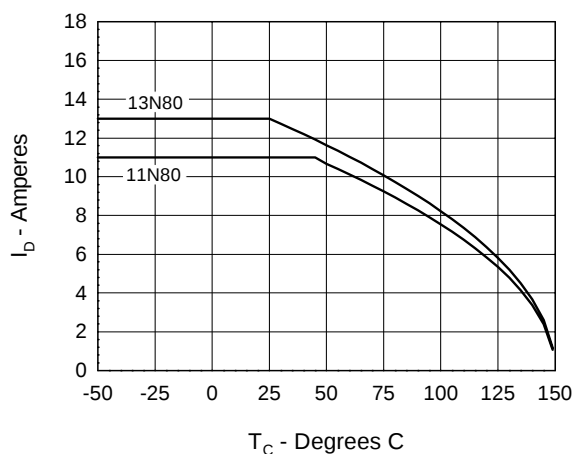
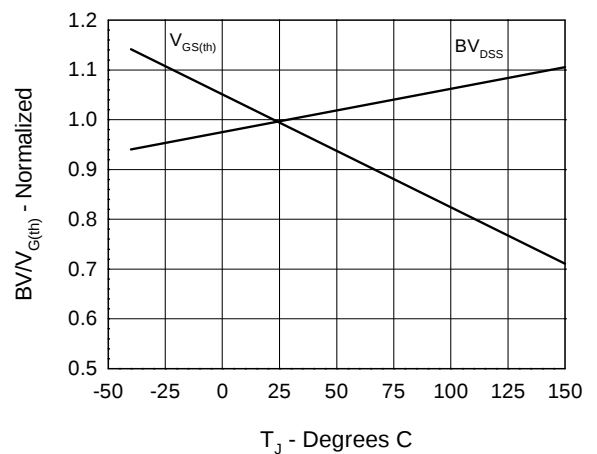
**Fig. 1 Output Characteristics**

**Fig. 2 Input Admittance**

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

**Fig. 4 Temperature Dependence of Drain to Source Resistance**

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

**Fig. 6 Temperature Dependence of Breakdown and Threshold Voltage**


Fig.7 Gate Charge Characteristic Curve

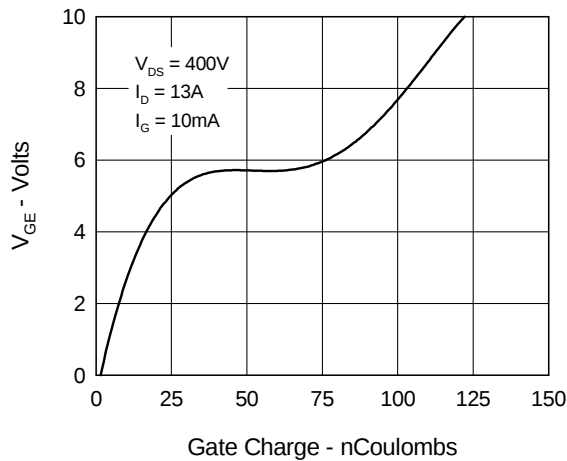


Fig.8 Forward Bias Safe Operating Area

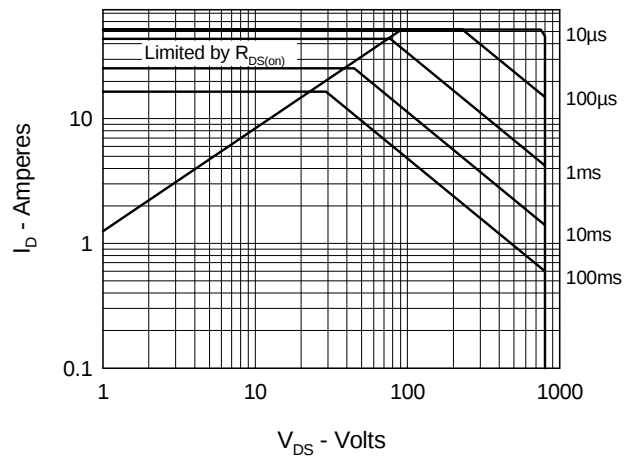


Fig.9 Capacitance Curves

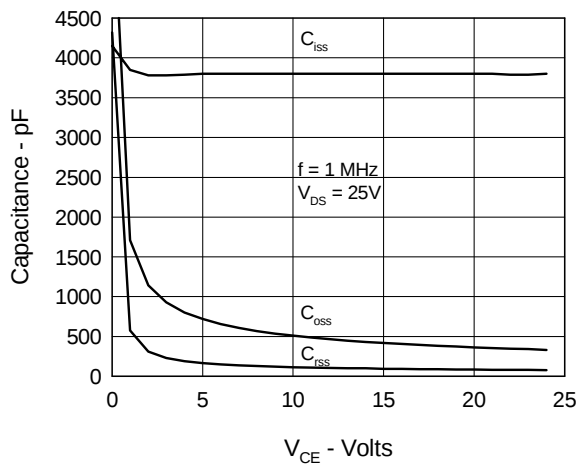


Fig.10 Source Current vs. Source to Drain Voltage

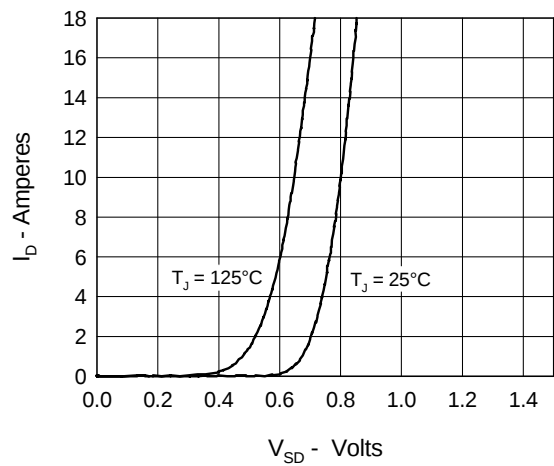


Fig.11 Transient Thermal Impedance

