

# HiPerFET™ Power MOSFETs Q-Class

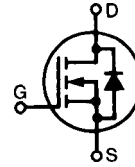
N-Channel Enhancement Mode  
Avalanche Rated, Low  $Q_g$ , High  $dv/dt$

Preliminary Data Sheet

**IXFH 4N100Q**  
**IXFT 4N100Q**

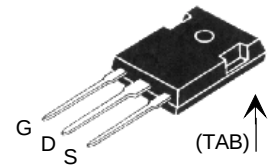
$$\begin{aligned} V_{DSS} &= 1000 \text{ V} \\ I_{D25} &= 4 \text{ A} \\ R_{DS(on)} &= 3.0 \Omega \end{aligned}$$

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

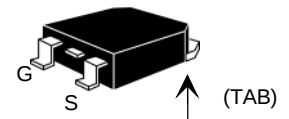


| Symbol    | Test Conditions                                                                                                                         | Maximum Ratings |                  |
|-----------|-----------------------------------------------------------------------------------------------------------------------------------------|-----------------|------------------|
| $V_{DSS}$ | $T_J = 25^\circ\text{C}$ to $150^\circ\text{C}$                                                                                         | 1000            | V                |
| $V_{DGR}$ | $T_J = 25^\circ\text{C}$ to $150^\circ\text{C}$ ; $R_{GS} = 1 \text{ M}\Omega$                                                          | 1000            | V                |
| $V_{GS}$  | Continuous                                                                                                                              | $\pm 20$        | V                |
| $V_{GSM}$ | Transient                                                                                                                               | $\pm 30$        | V                |
| $I_{D25}$ | $T_C = 25^\circ\text{C}$                                                                                                                | 4               | A                |
| $I_{DM}$  | $T_C = 25^\circ\text{C}$ , pulse width limited by $T_{JM}$                                                                              | 16              | A                |
| $I_{AR}$  | $T_C = 25^\circ\text{C}$                                                                                                                | 4               | A                |
| $E_{AR}$  | $T_C = 25^\circ\text{C}$                                                                                                                | 20              | mJ               |
| $E_{AS}$  |                                                                                                                                         | 700             | mJ               |
| $dv/dt$   | $I_S \leq I_{DM}$ , $di/dt \leq 100 \text{ A}/\mu\text{s}$ , $V_{DD} \leq V_{DSS}$ ,<br>$T_J \leq 150^\circ\text{C}$ , $R_G = 2 \Omega$ | 5               | V/ns             |
| $P_D$     | $T_C = 25^\circ\text{C}$                                                                                                                | 150             | W                |
| $T_J$     |                                                                                                                                         | -55 to +150     | $^\circ\text{C}$ |
| $T_{JM}$  |                                                                                                                                         | 150             | $^\circ\text{C}$ |
| $T_{stg}$ |                                                                                                                                         | -55 to +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                                                                                                                         | 1.13/10         | Nm/lb.in.        |
| Weight    | TO-247                                                                                                                                  | 6               | g                |
|           | TO-268                                                                                                                                  | 4               | g                |

TO-247 AD (IXFH)



TO-268 (D3) (IXFT)



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

## Features

- IXYS advanced low  $Q_g$  process
- Low gate charge and capacitances
  - easier to drive
  - faster switching
- International standard packages
- Low  $R_{DS(on)}$
- Unclamped Inductive Switching (UIS) rated
- Molding epoxies meet UL 94 V-0 flammability classification

## Advantages

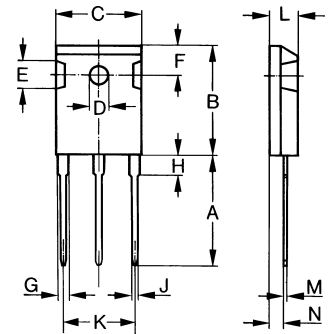
- Easy to mount
- Space savings
- High power density

| Symbol       | Test Conditions                                                                                                 | Characteristic Values<br>( $T_J = 25^\circ\text{C}$ , unless otherwise specified) |      |                      |
|--------------|-----------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------|----------------------|
|              |                                                                                                                 | min.                                                                              | typ. | max.                 |
| $V_{DSS}$    | $V_{GS} = 0 \text{ V}$ , $I_D = 1 \text{ mA}$                                                                   | 1000                                                                              |      | V                    |
| $V_{GS(th)}$ | $V_{DS} = V_{GS}$ , $I_D = 1.5 \text{ mA}$                                                                      | 3.0                                                                               |      | 5.0 V                |
| $I_{GSS}$    | $V_{GS} = \pm 20 \text{ V}_{DC}$ , $V_{DS} = 0$                                                                 |                                                                                   |      | $\pm 100 \text{ nA}$ |
| $I_{DSS}$    | $V_{DS} = V_{DSS}$<br>$V_{GS} = 0 \text{ V}$                                                                    | $T_J = 25^\circ\text{C}$<br>$T_J = 125^\circ\text{C}$                             |      | 50 $\mu\text{A}$     |
|              |                                                                                                                 |                                                                                   |      | 1 mA                 |
| $R_{DS(on)}$ | $V_{GS} = 10 \text{ V}$ , $I_D = 0.5 I_{D25}$<br>Pulse test, $t \leq 300 \mu\text{s}$ , duty cycle $d \leq 2\%$ |                                                                                   |      | 3.0 $\Omega$         |

| Symbol       | Test Conditions                                                                                                | Characteristic Values<br>( $T_j = 25^\circ\text{C}$ , unless otherwise specified) |      |         |
|--------------|----------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------|---------|
|              |                                                                                                                | min.                                                                              | typ. | max.    |
| $g_{fs}$     | $V_{DS} = 20\text{ V}; I_D = 0.5 \cdot I_{D25}$ , pulse test                                                   | 1.5                                                                               | 2.5  | S       |
| $C_{iss}$    | $V_{GS} = 0\text{ V}, V_{DS} = 25\text{ V}, f = 1\text{ MHz}$                                                  |                                                                                   | 1050 | pF      |
| $C_{oss}$    |                                                                                                                |                                                                                   | 120  | pF      |
| $C_{rss}$    |                                                                                                                |                                                                                   | 30   | pF      |
| $t_{d(on)}$  | $V_{GS} = 10\text{ V}, V_{DS} = 0.5 \cdot V_{DSS}, I_D = 0.5 \cdot I_{D25}$<br>$R_G = 4.7\ \Omega$ (External), |                                                                                   | 17   | ns      |
| $t_r$        |                                                                                                                |                                                                                   | 15   | ns      |
| $t_{d(off)}$ |                                                                                                                |                                                                                   | 32   | ns      |
| $t_f$        |                                                                                                                |                                                                                   | 18   | ns      |
| $Q_{g(on)}$  | $V_{GS} = 10\text{ V}, V_{DS} = 0.5 \cdot V_{DSS}, I_D = 0.5 \cdot I_{D25}$                                    |                                                                                   | 39   | nC      |
| $Q_{gs}$     |                                                                                                                |                                                                                   | 9    | nC      |
| $Q_{gd}$     |                                                                                                                |                                                                                   | 22   | nC      |
| $R_{thJC}$   | (TO-247)                                                                                                       |                                                                                   | 0.25 | 0.8 K/W |
| $R_{thCK}$   |                                                                                                                |                                                                                   |      | K/W     |

| Symbol   | Test Conditions                                                                                       | Characteristic Values<br>( $T_j = 25^\circ\text{C}$ , unless otherwise specified) |      |               |
|----------|-------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------|---------------|
|          |                                                                                                       | min.                                                                              | typ. | max.          |
| $I_S$    | $V_{GS} = 0\text{ V}$                                                                                 |                                                                                   |      | 4 A           |
| $I_{SM}$ | Repetitive; pulse width limited by $T_{JM}$                                                           |                                                                                   |      | 16 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         |
| $t_{rr}$ | $I_F = I_S, -di/dt = 100\text{ A}/\mu\text{s}, V_R = 100\text{ V}$                                    |                                                                                   | 0.52 | 250 ns        |
| $Q_{RM}$ |                                                                                                       |                                                                                   |      | $\mu\text{C}$ |
| $I_{RM}$ |                                                                                                       |                                                                                   |      | 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-268AA (D <sup>3</sup> PAK) |  | Dim.           |  | Millimeter |       | Inches   |      |
|-------------------------------|--|----------------|--|------------|-------|----------|------|
|                               |  |                |  | Min.       | Max.  | Min.     | Max. |
|                               |  | A              |  | 4.9        | 5.1   | .193     | .201 |
|                               |  | A <sub>1</sub> |  | 2.7        | 2.9   | .106     | .114 |
|                               |  | A <sub>2</sub> |  | .02        | .25   | .001     | .010 |
|                               |  | b              |  | 1.15       | 1.45  | .045     | .057 |
|                               |  | b <sub>2</sub> |  | 1.9        | 2.1   | .75      | .83  |
|                               |  | C              |  | .4         | .65   | .016     | .026 |
|                               |  | D              |  | 13.80      | 14.00 | .543     | .551 |
|                               |  | E              |  | 15.85      | 16.05 | .624     | .632 |
|                               |  | E <sub>1</sub> |  | 13.3       | 13.6  | .524     | .535 |
|                               |  | e              |  | 5.45 BSC   |       | .215 BSC |      |
|                               |  | H              |  | 18.70      | 19.10 | .736     | .752 |
|                               |  | L              |  | 2.40       | 2.70  | .094     | .106 |
|                               |  | L <sub>1</sub> |  | 1.20       | 1.40  | .047     | .055 |
|                               |  | L <sub>2</sub> |  | 1.00       | 1.15  | .039     | .045 |
|                               |  | L <sub>3</sub> |  | 0.25 BSC   |       | .010 BSC |      |
|                               |  | L <sub>4</sub> |  | 3.80       | 4.10  | .150     | .161 |

Min. Recommended Footprint

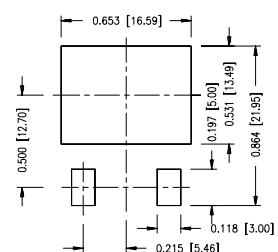


Figure 1. Output Characteristics at 25°C

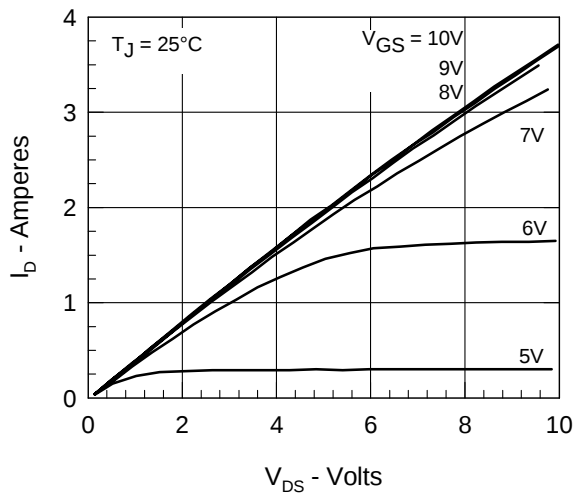


Figure 2. Extended Output Characteristics at 125°C

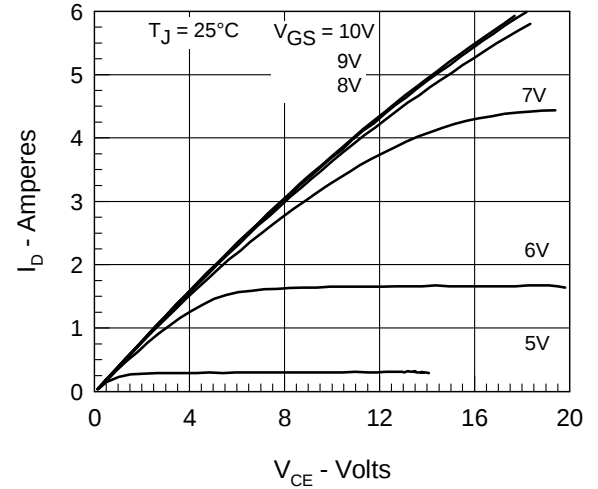


Figure 3.  $R_{DS(on)}$  normalized to 0.5  $I_{D25}$  value vs.  $I_D$

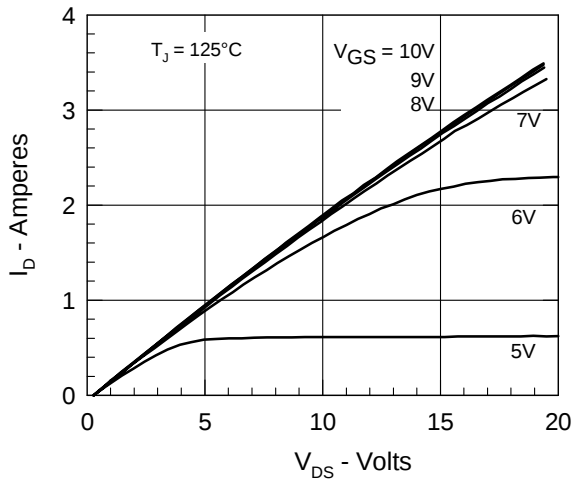


Figure 4. Admittance Curves

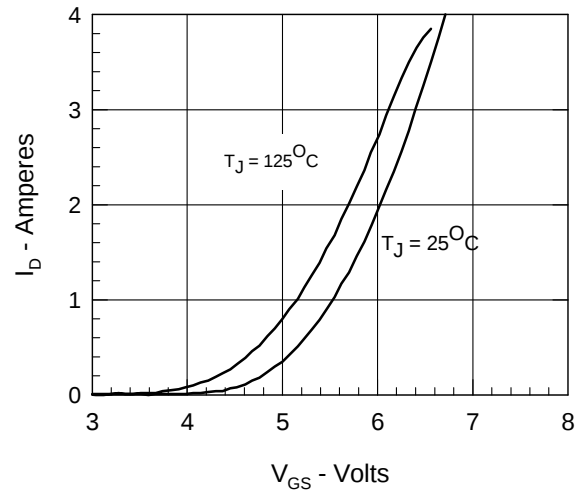


Figure 5.  $R_{DS(on)}$  normalized to 0.5  $I_{D25}$  value vs.  $I_D$

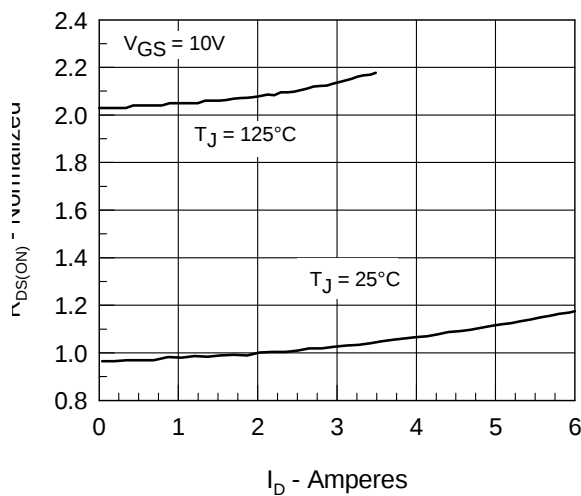


Figure 6.  $R_{DS(on)}$  normalized to 0.5  $I_{D25}$  value vs.  $T_J$

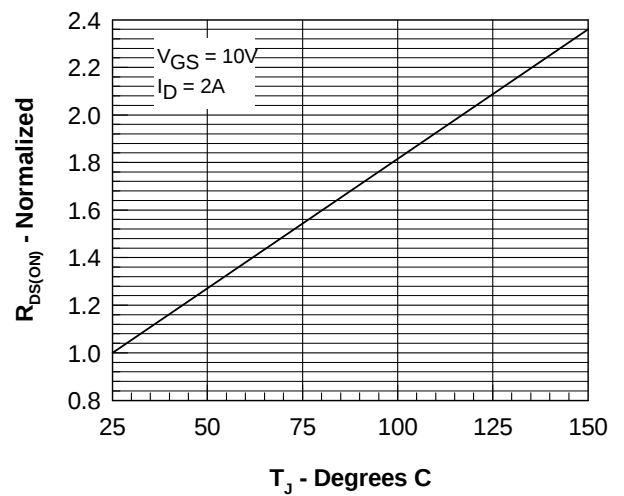


Figure 7. Gate Charge

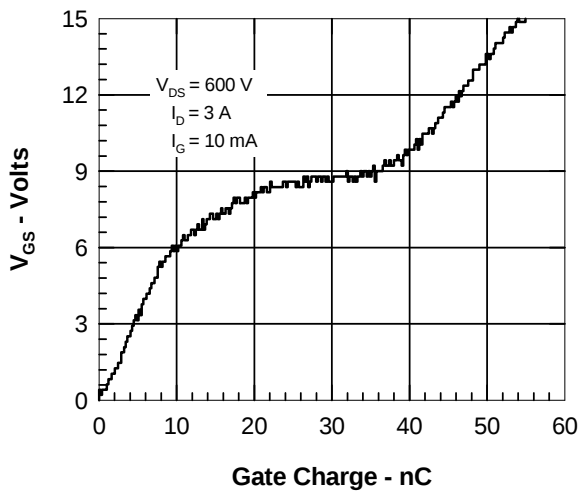


Figure 8. Capacitance Curves

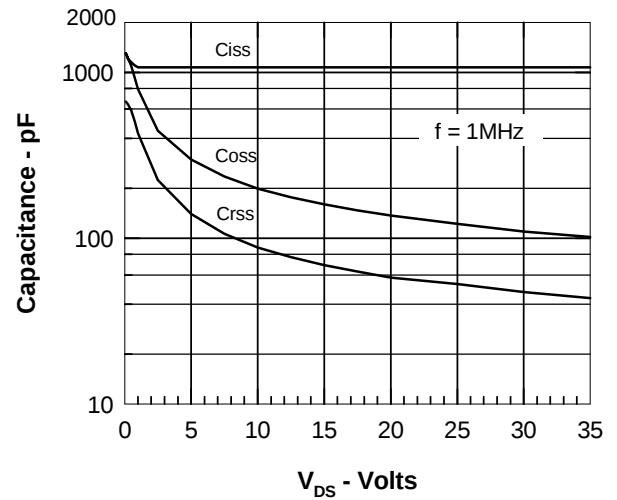


Figure 9. Forward Voltage Drop of the Intrinsic Diode

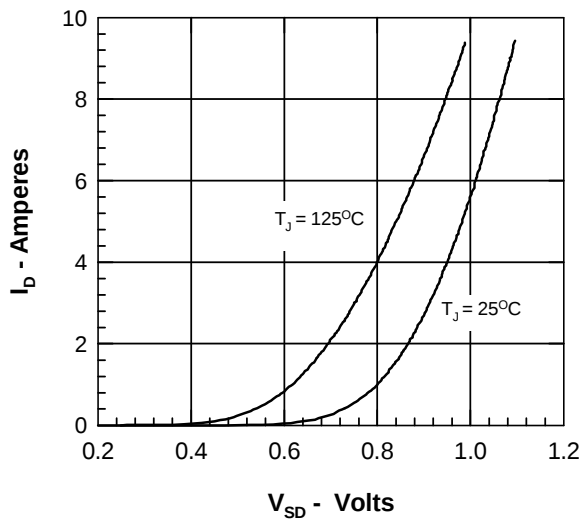


Figure 10. Drain Current vs. Case Temperature

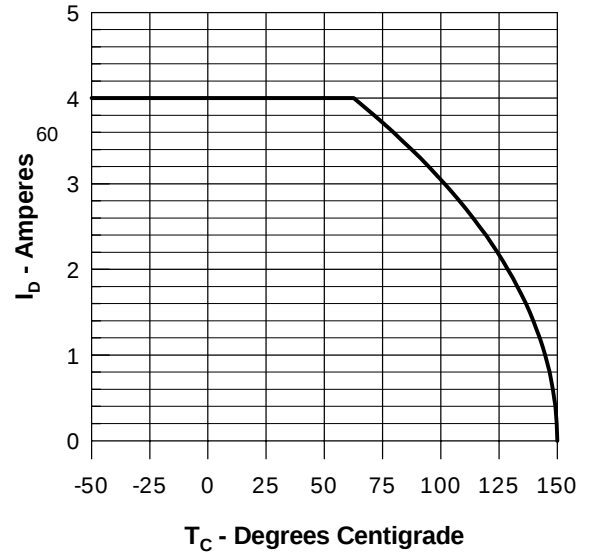
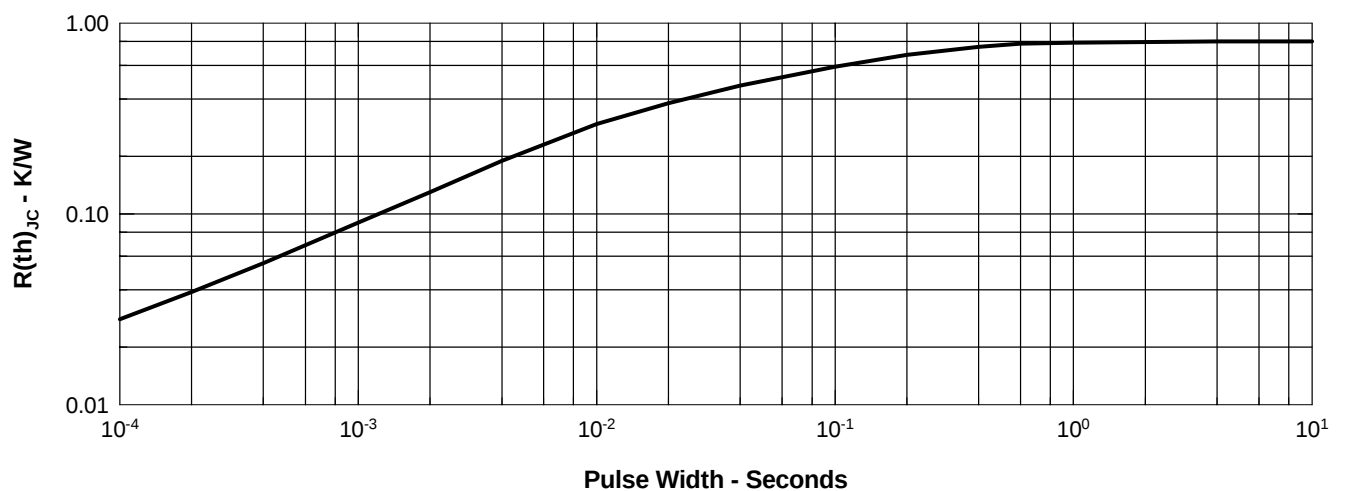


Figure 11. Transient Thermal Resistance





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