

# HiPerFET™ Power MOSFETs Q-Class

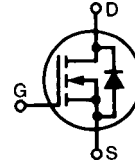
IXFA 4N100Q  
IXFP 4N100Q

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

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

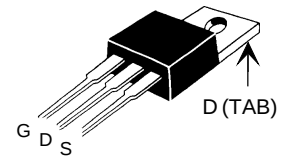
N-Channel Enhancement Mode  
Avalanche Rated, Low  $Q_g$ , High  $dv/dt$

Preliminary Data Sheet

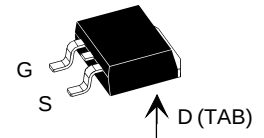


| Symbol    | Test Conditions                                                                                                                           | Maximum Ratings |                  |
|-----------|-------------------------------------------------------------------------------------------------------------------------------------------|-----------------|------------------|
| $V_{DSS}$ | $T_J = 25^\circ\text{C to } 150^\circ\text{C}$                                                                                            | 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               |
| $dv/dt$   | $I_S \leq I_{DM}^1$ , $di/dt \leq 100 \text{ A}/\mu\text{s}$ , $V_{DD} \leq V_{DSS}$ ,<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 (TO-220)                                                                                                                  | 1.13/10         | Nm/lb.in.        |
| Weight    | TO-220                                                                                                                                    | 4               | g                |
|           | TO-263                                                                                                                                    | 2               | g                |

TO-220 (IXFP)



TO-263 (IXFA)



G = Gate  
S = Source

D = Drain  
TAB = Drain

## Features

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

## Advantages

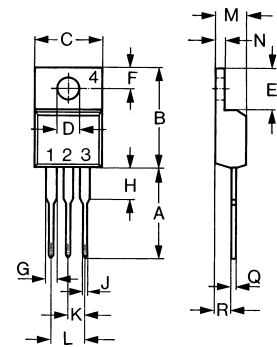
- Easy to mount
- Space savings
- High power density

| 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-220)                                                                                                       |                                                                                   | 0.8  | K/W  |
| $R_{thCK}$   |                                                                                                                | 0.25                                                                              |      | K/W  |

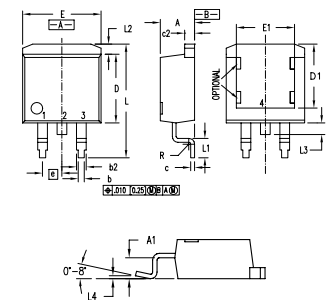
| Symbol   | Test Conditions                                                                                       | Characteristic Values<br>( $T_J = 25^\circ\text{C}$ , unless otherwise specified) |      |               |
|----------|-------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------|---------------|
|          |                                                                                                       | 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        |
| $Q_{RM}$ |                                                                                                       |                                                                                   | 1.8  | $\mu\text{C}$ |
| $I_{RM}$ |                                                                                                       |                                                                                   |      | A             |

## TO-220 AB (IXFP) Outline



| Dim. | Millimeter |       | Inches |       |
|------|------------|-------|--------|-------|
|      | Min.       | Max.  | Min.   | Max.  |
| A    | 12.70      | 13.97 | 0.500  | 0.550 |
| B    | 14.73      | 16.00 | 0.580  | 0.630 |
| C    | 9.91       | 10.66 | 0.390  | 0.420 |
| D    | 3.54       | 4.08  | 0.139  | 0.161 |
| E    | 5.85       | 6.85  | 0.230  | 0.270 |
| F    | 2.54       | 3.18  | 0.100  | 0.125 |
| G    | 1.15       | 1.65  | 0.045  | 0.065 |
| H    | 2.79       | 5.84  | 0.110  | 0.230 |
| J    | 0.64       | 1.01  | 0.025  | 0.040 |
| K    | 2.54       | BSC   | 0.100  | BSC   |
| M    | 4.32       | 4.82  | 0.170  | 0.190 |
| N    | 1.14       | 1.39  | 0.045  | 0.055 |
| Q    | 0.35       | 0.56  | 0.014  | 0.022 |
| R    | 2.29       | 2.79  | 0.090  | 0.110 |

## TO-263 AA (IXFA) Outline



| Dim. | Millimeter |       | Inches |      |
|------|------------|-------|--------|------|
|      | Min.       | Max.  | Min.   | Max. |
| A    | 4.06       | 4.83  | .160   | .190 |
| A1   | 2.03       | 2.79  | .080   | .110 |
| b    | 0.51       | 0.99  | .020   | .039 |
| b2   | 1.14       | 1.40  | .045   | .055 |
| c    | 0.46       | 0.74  | .018   | .029 |
| c2   | 1.14       | 1.40  | .045   | .055 |
| D    | 8.64       | 9.65  | .340   | .380 |
| D1   | 7.11       | 8.13  | .280   | .320 |
| E    | 9.65       | 10.29 | .380   | .405 |
| E1   | 6.86       | 8.13  | .270   | .320 |
| e    | 2.54       | BSC   | .100   | BSC  |
| L    | 14.61      | 15.88 | .575   | .625 |
| L1   | 2.29       | 2.79  | .090   | .110 |
| L2   | 1.02       | 1.40  | .040   | .055 |
| L3   | 1.27       | 1.78  | .050   | .070 |
| L4   | 0          | 0.38  | 0      | .015 |
| R    | 0.46       | 0.74  | .018   | .029 |

Figure 1. Output Characteristics at 25°C

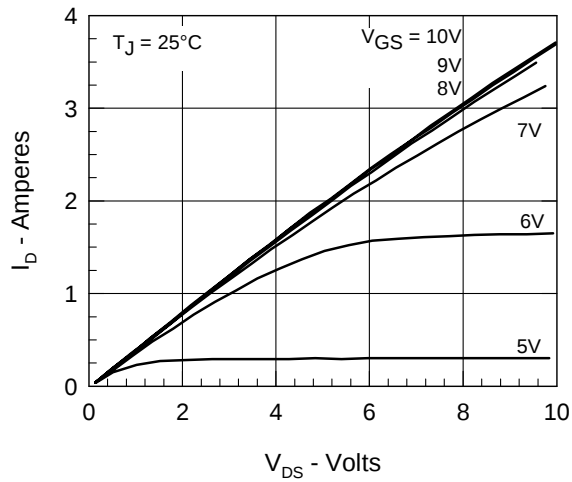


Figure 2. Extended Output Characteristics at 125°C

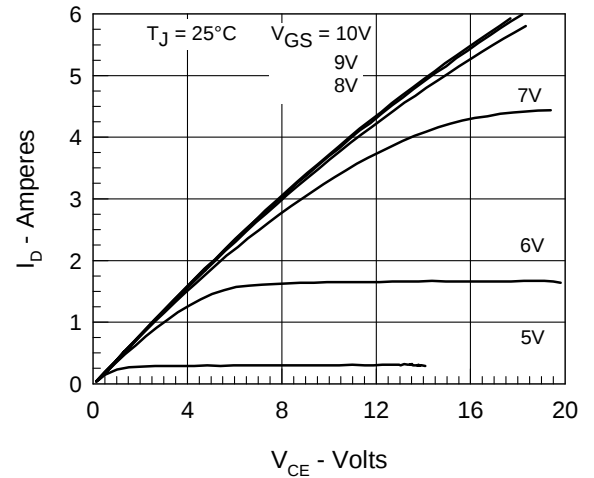


Figure 3. Output characteristics at 125°C

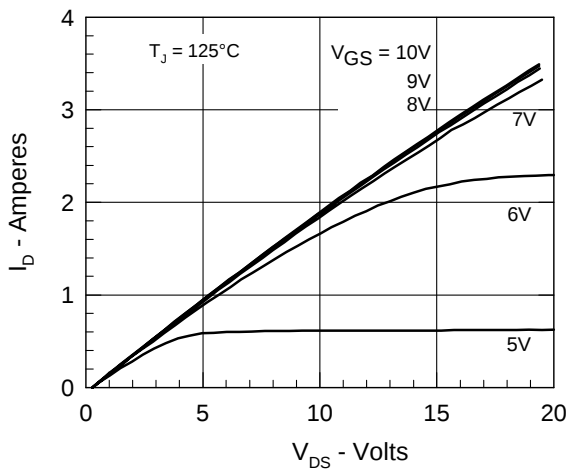


Figure 4. Admittance Curves

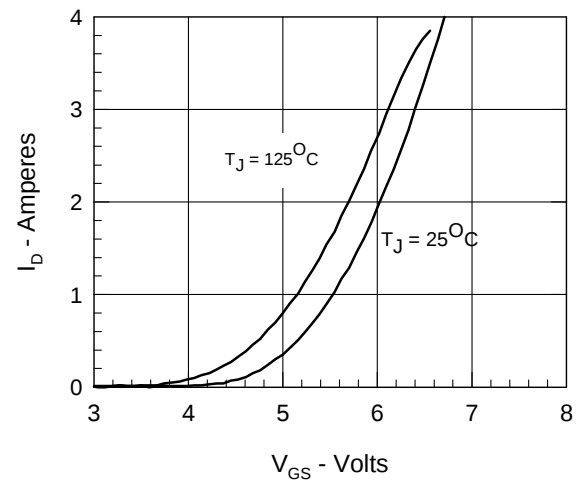


Figure 5.  $R_{DS(on)}$  normalized to 0.5  $I_{D25}$  value vs.  $I_D$

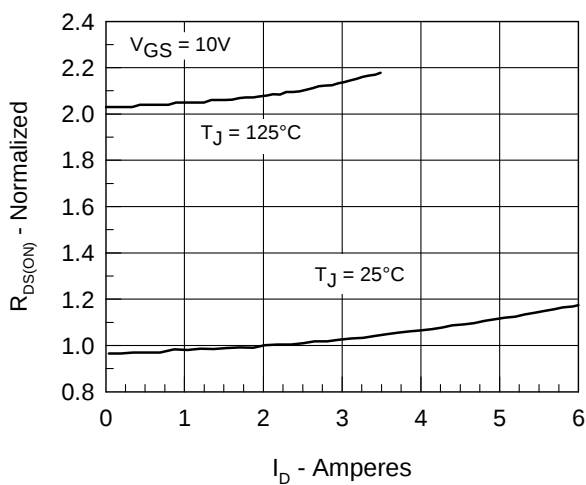


Figure 6.  $R_{DS(on)}$  normalized to 0.5  $I_{D25}$  value vs.  $T_J$

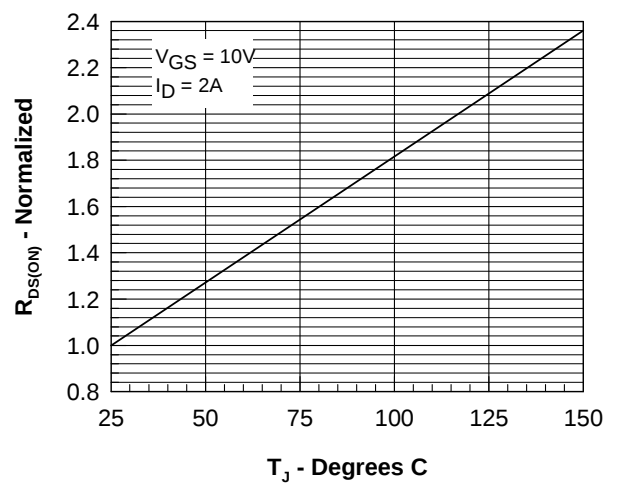


Figure 7. Gate Charge

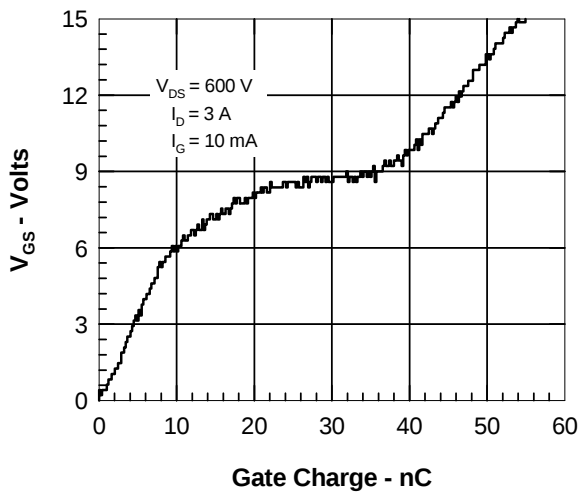


Figure 8. Capacitance Curves

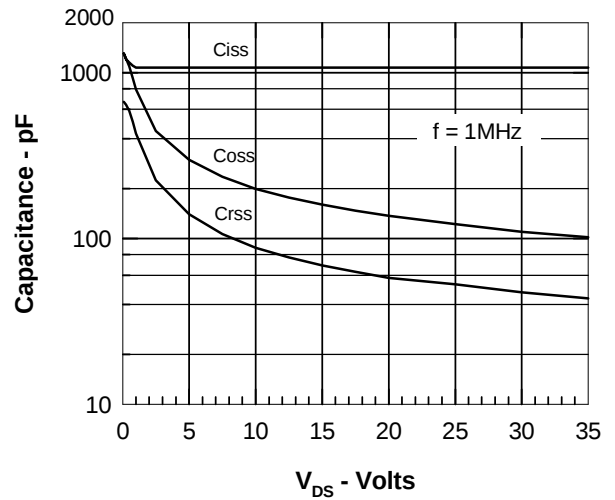


Figure 9. Forward Voltage Drop of the Intrinsic Diode

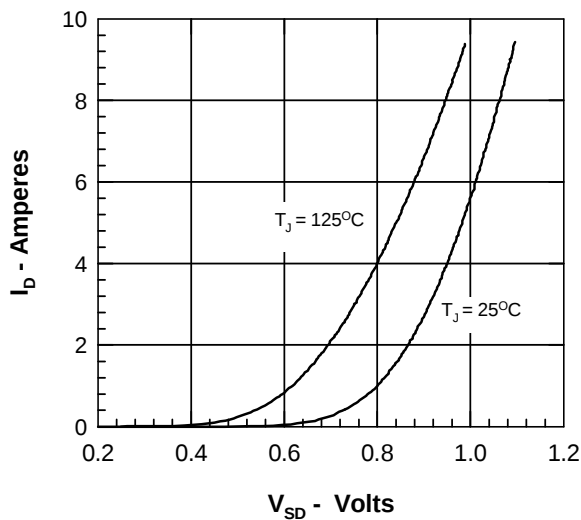


Figure 10. Drain Current vs. Case Temperature

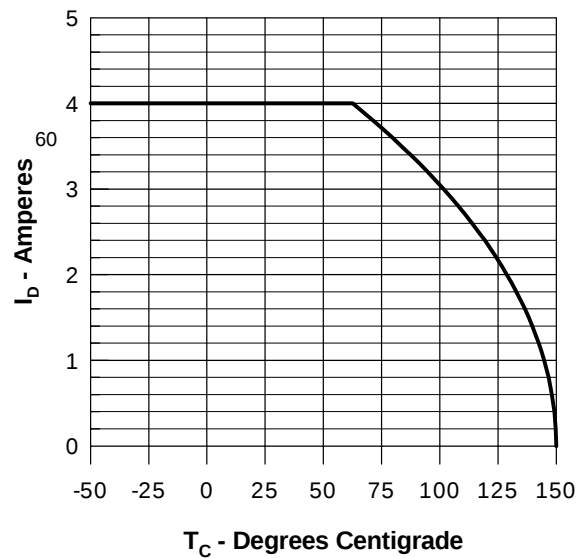


Figure 11. Transient Thermal Resistance

