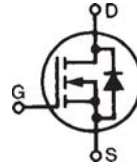


# HiPerFET™

## Power MOSFET

### Q2-Class

## IXFK40N50Q2

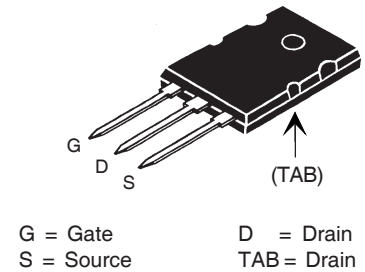


$$\begin{aligned} V_{DSS} &= 500V \\ I_{D25} &= 40A \\ R_{DS(on)} &\leq 160m\Omega \\ t_{rr} &\leq 250ns \end{aligned}$$

N-Channel Enhancement Mode  
Avalanche Rated, High dv/dt, Low  $Q_g$   
Low intrinsic  $R_g$ , low  $t_{rr}$

| Symbol    | Test Conditions                                                          | Maximum Ratings |                  |
|-----------|--------------------------------------------------------------------------|-----------------|------------------|
| $V_{DSS}$ | $T_J = 25^\circ\text{C}$ to $150^\circ\text{C}$                          | 500             | V                |
| $V_{DGR}$ | $T_J = 25^\circ\text{C}$ to $150^\circ\text{C}$ , $R_{GS} = 1M\Omega$    | 500             | V                |
| $V_{GSS}$ | Continuous                                                               | $\pm 30$        | V                |
| $V_{GSM}$ | Transient                                                                | $\pm 40$        | V                |
| $I_{D25}$ | $T_C = 25^\circ\text{C}$                                                 | 40              | A                |
| $I_{DM}$  | $T_C = 25^\circ\text{C}$ , pulse width limited by $T_{JM}$               | 160             | A                |
| $I_A$     | $T_C = 25^\circ\text{C}$                                                 | 40              | A                |
| $E_{AS}$  | $T_C = 25^\circ\text{C}$                                                 | 2.5             | J                |
| $dv/dt$   | $I_S \leq I_{DM}$ , $V_{DD} \leq V_{DSS}$ , $T_J \leq 150^\circ\text{C}$ | 20              | 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    | $^\circ\text{C}$ |
| $T_L$     | 1.6mm (0.063 in) from case for 10s                                       | 300             | $^\circ\text{C}$ |
| $M_d$     | Mounting torque                                                          | 1.13/10         | Nm/lb.in.        |
| Weight    |                                                                          | 10              | g                |

### TO-264 (IXFK)



### Features

- Double metal process for low gate resistance
- International standard package
- Epoxy meet UL 94 V-0, flammability classification
- Avalanche energy and current rated
- Fast intrinsic Rectifier

### Applications

- DC-DC converters
- Switched-mode and resonant-mode power supplies, >500kHz switching
- DC choppers
- Pulse generation
- Laser drivers

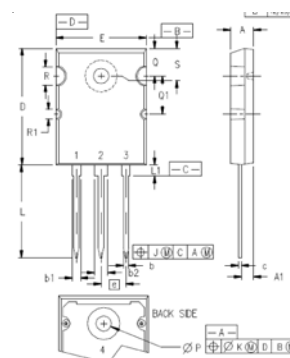
### Advantages

- Easy to mount
- Space savings
- High power density

| Symbol       | Test Conditions<br>( $T_J = 25^\circ\text{C}$ , unless otherwise specified) | Characteristic Values |      |                    |
|--------------|-----------------------------------------------------------------------------|-----------------------|------|--------------------|
|              |                                                                             | Min.                  | Typ. | Max.               |
| $BV_{DSS}$   | $V_{GS} = 0V$ , $I_D = 250\mu A$                                            | 500                   |      | V                  |
| $V_{GS(th)}$ | $V_{DS} = V_{GS}$ , $I_D = 4mA$                                             | 3.0                   |      | 5.5 V              |
| $I_{GSS}$    | $V_{GS} = \pm 30V$ , $V_{DS} = 0V$                                          |                       |      | $\pm 200$ nA       |
| $I_{DSS}$    | $V_{DS} = V_{DSS}$<br>$V_{GS} = 0V$<br>$T_J = 125^\circ\text{C}$            |                       |      | 25 $\mu A$<br>1 mA |
| $R_{DS(on)}$ | $V_{GS} = 10V$ , $I_D = 0.5 \cdot I_{D25}$ , Note 1                         |                       |      | 160 m $\Omega$     |

| Symbol       | Test Conditions<br>( $T_J = 25^\circ\text{C}$ , unless otherwise specified)                                                                        | Characteristic Values |      |                         |
|--------------|----------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|------|-------------------------|
|              |                                                                                                                                                    | Min.                  | Typ. | Max.                    |
| $g_{fs}$     | $V_{DS} = 10\text{V}$ , $I_D = 0.5 \cdot I_{D25}$ , Note 1                                                                                         | 15                    | 28   | S                       |
| $C_{iss}$    | $V_{GS} = 0\text{V}$ , $V_{DS} = 25\text{V}$ , $f = 1\text{MHz}$                                                                                   |                       | 4850 | pF                      |
| $C_{oss}$    |                                                                                                                                                    |                       | 680  | pF                      |
| $C_{rss}$    |                                                                                                                                                    |                       | 170  | pF                      |
| $t_{d(on)}$  | <b>Resistive Switching Times</b><br>$V_{GS} = 10\text{V}$ , $V_{DS} = 0.5 \cdot V_{DSS}$ , $I_D = 0.5 \cdot I_{D25}$<br>$R_G = 2\Omega$ (External) |                       | 17   | ns                      |
| $t_r$        |                                                                                                                                                    |                       | 13   | ns                      |
| $t_{d(off)}$ |                                                                                                                                                    |                       | 42   | ns                      |
| $t_f$        |                                                                                                                                                    |                       | 8    | ns                      |
| $Q_{g(on)}$  | $V_{GS} = 10\text{V}$ , $V_{DS} = 0.5 \cdot V_{DSS}$ , $I_D = 0.5 \cdot I_{D25}$                                                                   |                       | 110  | nC                      |
| $Q_{gs}$     |                                                                                                                                                    |                       | 25   | nC                      |
| $Q_{gd}$     |                                                                                                                                                    |                       | 50   | nC                      |
| $R_{thJC}$   |                                                                                                                                                    |                       |      | 0.22 $^\circ\text{C/W}$ |
| $R_{thCK}$   |                                                                                                                                                    |                       | 0.15 | $^\circ\text{C/W}$      |

TO-264 (IXFK) Outline



- 1 - GATE  
2, 4 - DRAIN (COLLECTOR)  
3 - SOURCE (EMITTER)

| SYM | INCHES   |       | MILLIMETERS |       |
|-----|----------|-------|-------------|-------|
|     | MIN      | MAX   | MIN         | MAX   |
| A   | .185     | .209  | 4.70        | 5.31  |
| A1  | .102     | .118  | 2.59        | 3.00  |
| b   | .037     | .055  | 0.94        | 1.40  |
| b1  | .087     | .102  | 2.21        | 2.59  |
| b2  | .110     | .126  | 2.79        | 3.20  |
| c   | .017     | .029  | 0.43        | 0.74  |
| D   | 1.007    | 1.047 | 25.58       | 26.59 |
| E   | .760     | .799  | 19.30       | 20.29 |
| e   | .215 BSC |       | 5.46 BSC    |       |
| J   | .000     | .010  | 0.00        | 0.25  |
| K   | .000     | .010  | 0.00        | 0.25  |
| L   | .779     | .842  | 19.79       | 21.39 |
| L1  | .087     | .102  | 2.21        | 2.59  |
| ØP  | .122     | .138  | 3.10        | 3.51  |
| Q   | .240     | .256  | 6.10        | 6.50  |
| Q1  | .330     | .346  | 8.38        | 8.79  |
| ØR  | .155     | .187  | 3.94        | 4.75  |
| ØR1 | .085     | .093  | 2.16        | 2.36  |
| S   | .243     | .253  | 6.17        | 6.43  |

## Source-Drain Diode

| Symbol   | Test Conditions<br>( $T_J = 25^\circ\text{C}$ , unless otherwise specified)   | Characteristic Values |      |               |
|----------|-------------------------------------------------------------------------------|-----------------------|------|---------------|
|          |                                                                               | Min.                  | Typ. | Max.          |
| $I_S$    | $V_{GS} = 0\text{V}$                                                          |                       |      | 40 A          |
| $I_{SM}$ | Repetitive, pulse width limited by $T_{JM}$                                   |                       |      | 160 A         |
| $V_{SD}$ | $I_F = I_S$ , $V_{GS} = 0\text{V}$ , Note 1                                   |                       |      | 1.5 V         |
| $t_{rr}$ | $I_F = 25\text{A}$ , $-di/dt = 100\text{A}/\mu\text{s}$ , $V_R = 100\text{V}$ |                       | 1    | 250 ns        |
| $Q_{RM}$ |                                                                               |                       | 9    | $\mu\text{C}$ |
| $I_{RM}$ |                                                                               |                       |      | A             |

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

## PRELIMINARY TECHNICAL INFORMATION

The product presented herein is under development. The Technical Specifications offered are derived from data gathered during objective characterizations of preliminary engineering lots; but also may yet contain some information supplied during a pre-production design evaluation. IXYS reserves the right to change limits, test conditions, and dimensions without notice.

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|                                                                                  |           |           |           |           |              |              |              |              |              |              |
|----------------------------------------------------------------------------------|-----------|-----------|-----------|-----------|--------------|--------------|--------------|--------------|--------------|--------------|
| IXYS MOSFETs and IGBTs are covered by one or more of the following U.S. patents: | 4,835,592 | 4,931,844 | 5,049,961 | 5,237,481 | 6,162,665    | 6,404,065 B1 | 6,683,344    | 6,727,585    | 7,005,734 B2 | 7,157,338 B2 |
|                                                                                  | 4,850,072 | 5,017,508 | 5,063,307 | 5,381,025 | 6,259,123 B1 | 6,534,343    | 6,710,405 B2 | 6,759,692    | 7,063,975 B2 |              |
|                                                                                  | 4,881,106 | 5,034,796 | 5,187,117 | 5,486,715 | 6,306,728 B1 | 6,583,505    | 6,710,463    | 6,771,478 B2 | 7,071,537    |              |

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

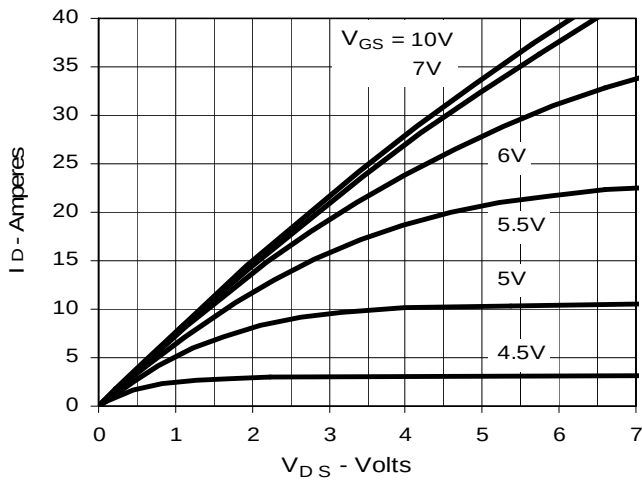


**Fig. 2. Extended Output Characteristics**  
@ 25°C

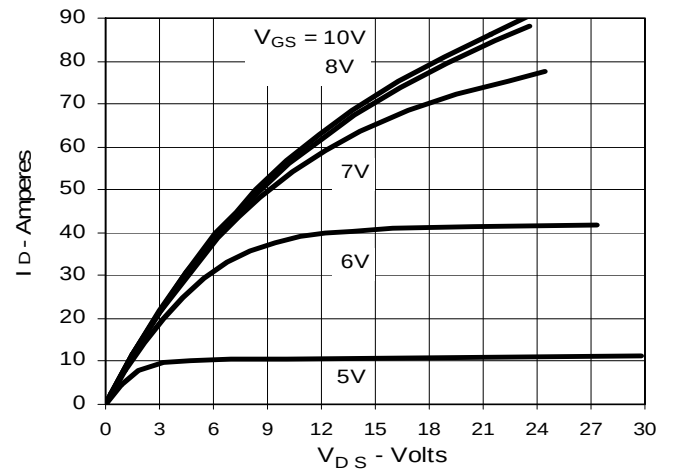


**Fig. 3. Output Characteristics**  
@ 125°C

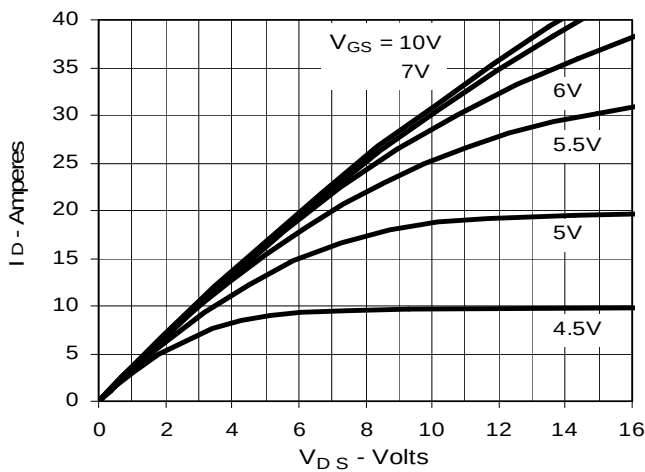


**Fig. 4.  $R_{DS(on)}$  Normalized to 0.5  $I_{D25}$  Value**  
vs. Junction Temperature

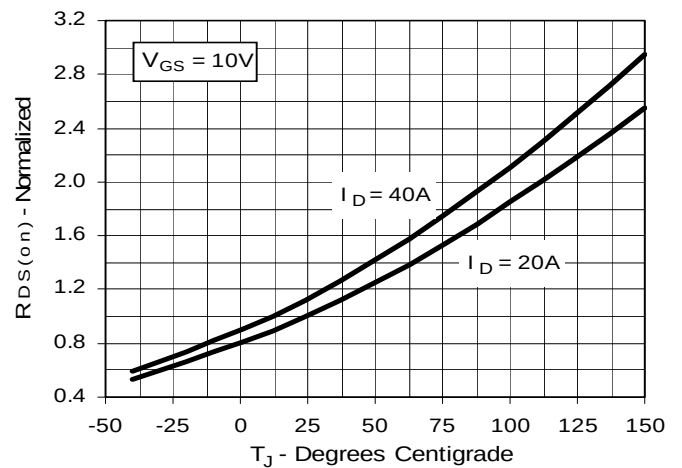


**Fig. 5.  $R_{DS(on)}$  Normalized to 0.5  $I_{D25}$  Value**  
vs.  $I_D$

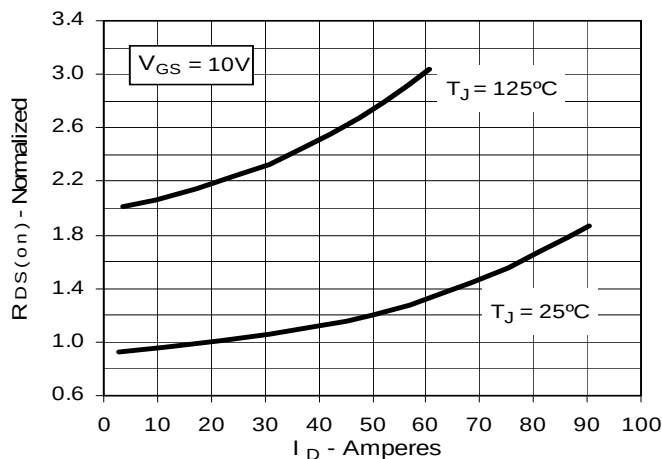


**Fig. 6. Drain Current vs. Case Temperature**

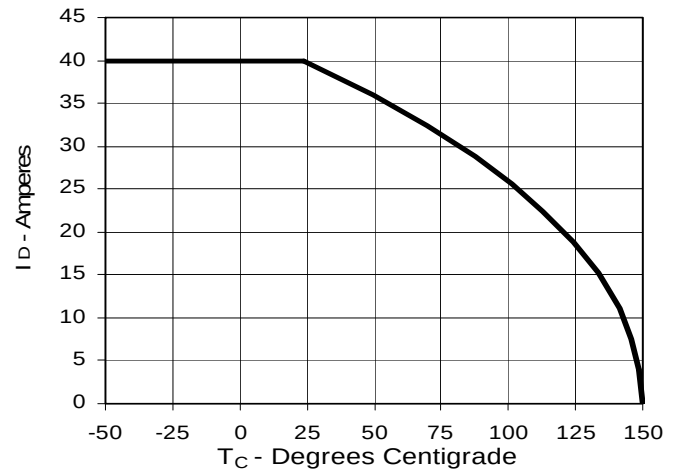


**Fig. 7. Input Admittance**

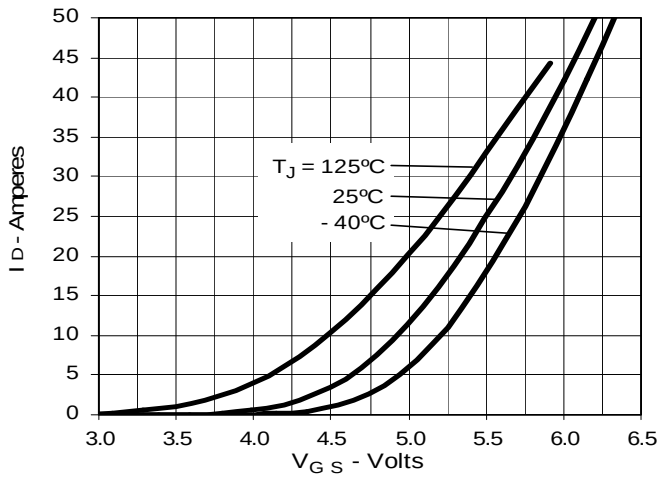


**Fig. 8. Transconductance**

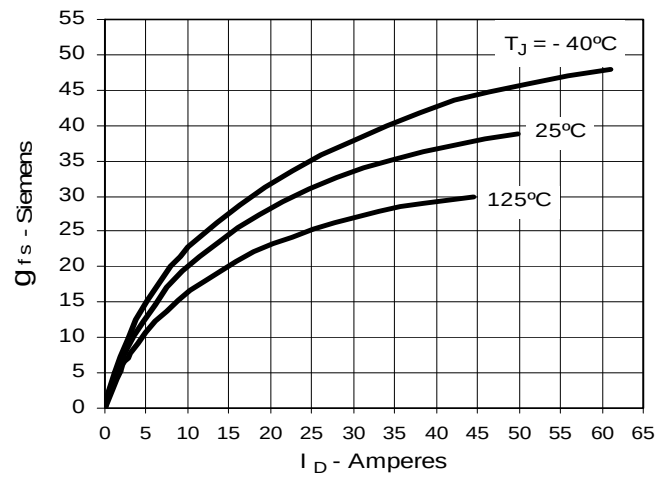


**Fig. 9. Source Current vs. Source-To-Drain Voltage**

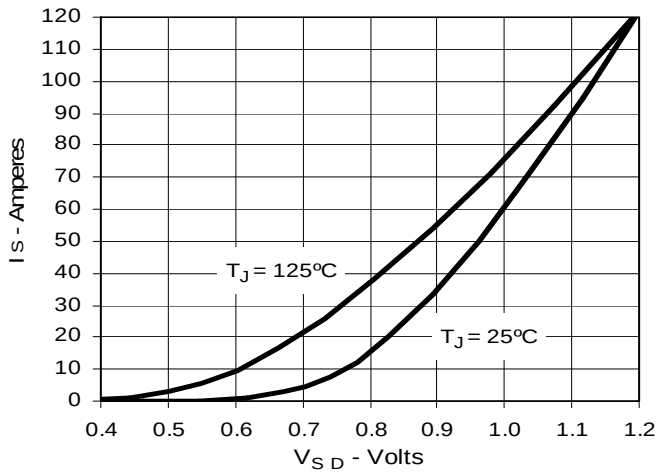


**Fig. 10. Gate Charge**

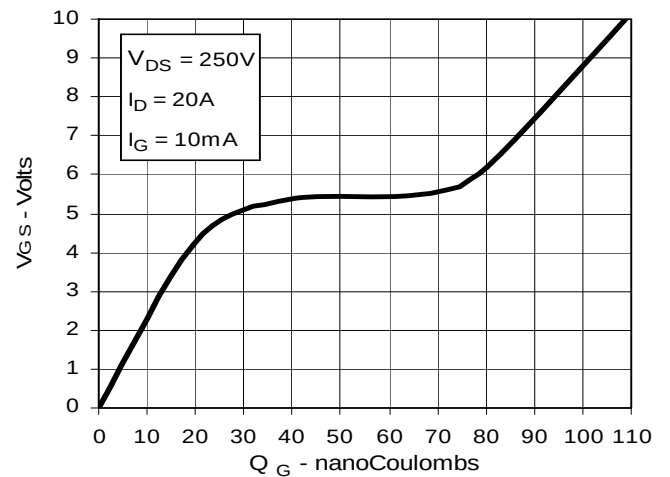


**Fig. 11. Capacitance**

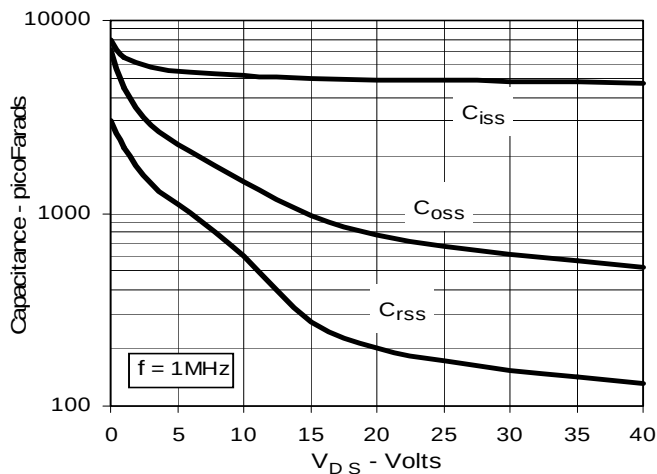


**Fig. 12. Forward-Bias Safe Operating Area**

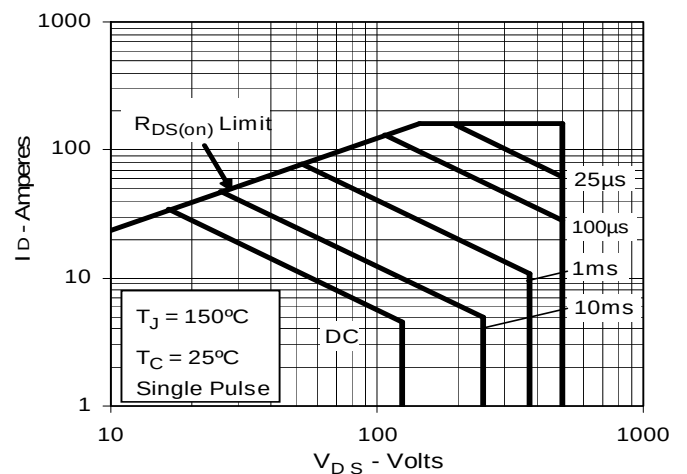


Fig. 13. Maximum Transient Thermal Impedance

