IXYS

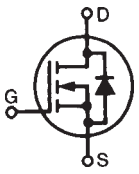
Preliminary Technical Information

# X-Class Power MOSFET

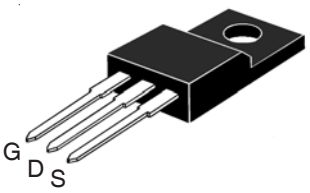
# IXTP32N65XM

$V_{DSS}$ = 650V
$I_{D25}$ = 14A
$R_{DS(on)}$ ≤ 135mΩ

N-Channel Enhancement Mode




**OVERMOLDED**




G = Gate D = Drain
S = Source

| Symbol | Test Conditions | Maximum Ratings | |
|---|---|---|---|
| $V_{DSS}$ | $T_J$ = 25°C to 150°C | 650 | V |
| $V_{DGR}$ | $T_J$ = 25°C to 150°C, $R_{GS}$ = 1MΩ | 650 | V |
| $V_{GSS}$ | Continuous | ±30 | V |
| $V_{GSM}$ | Transient | ±40 | V |
| $I_{D25}$ | $T_C$ = 25°C | 14 | A |
| $I_{DM}$ | $T_C$ = 25°C, Pulse Width Limited by $T_{JM}$ | 64 | A |
| dv/dt | $I_S \le I_{D25}$, $V_{DD} \le V_{DSS}$, $T_J \le 150°C$ | 30 | V/ns |
| $P_D$ | $T_C$ = 25°C | 78 | W |
| $T_J$ | | -55 ... +150 | °C |
| $T_{JM}$ | | 150 | °C |
| $T_{stg}$ | | -55 ... +150 | °C |
| $T_L$ | Maximum Lead Temperature for Soldering | 300 | °C |
| $T_{SOLD}$ | Plastic Body for 10s | 260 | °C |
| $M_d$ | Mounting Torque | 1.13 / 10 | Nm/lb.in |
| Weight | | 2.5 | g |

**Features**

- Low $R_{DS(ON)}$ and $Q_G$
- Low Package Inductance

**Advantages**

- High Power Density
- Easy to Mount
- Space Savings

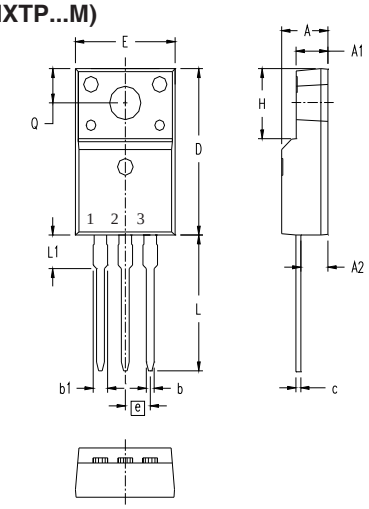
**Applications**

- Switch-Mode and Resonant-Mode Power Supplies
- DC-DC Converters
- PFC Circuits
- AC and DC Motor Drives
- Robotics and Servo Controls

| Symbol | Test Conditions ($T_J$ = 25°C, Unless Otherwise Specified) | Characteristic Values Min. | Typ. | Max. | |
|---|---|---|---|---|---|
| $BV_{DSS}$ | $V_{GS}$ = 0V, $I_D$ = 250μA | 650 | | | V |
| $V_{GS(th)}$ | $V_{DS} = V_{GS}$, $I_D$ = 250μA | 3.0 | | 5.5 | V |
| $I_{GSS}$ | $V_{GS}$ = ±30V, $V_{DS}$ = 0V | | | ±100 | nA |
| $I_{DSS}$ | $V_{DS} = V_{DSS}$, $V_{GS}$ = 0V | | | 5 | μA |
| | $T_J$ = 125°C | | | 50 | μA |
| $R_{DS(on)}$ | $V_{GS}$ = 10V, $I_D$ = 16A, Note 1 | | | 135 | mΩ |

| Symbol | Test Conditions ($T_J$ = 25°C, Unless Otherwise Specified) | Characteristic Values Min. | Typ. | Max | |
|---|---|---|---|---|---|
| $g_{fs}$ | $V_{DS}$ = 10V, $I_D$ = 16A, Note 1 | 13 | 22 | | S |
| $R_{Gi}$ | Gate Input Resistance | | 2.6 | | Ω |
| $C_{iss}$ | $V_{GS}$ = 0V, $V_{DS}$ = 25V, f = 1MHz | | 2205 | | pF |
| $C_{oss}$ | | | 1600 | | pF |
| $C_{rss}$ | | | 30 | | pF |
| | **Effective Output Capacitance** | | | | |
| $C_{o(er)}$ | Energy related; $V_{GS}$ = 0V, $V_{DS}$ = 0.8 • $V_{DSS}$ | | 111 | | pF |
| $C_{o(tr)}$ | Time related; $V_{GS}$ = 0V, $V_{DS}$ = 0.8 • $V_{DSS}$ | | 349 | | pF |
| $t_{d(on)}$ | **Resistive Switching Times** | | 23 | | ns |
| $t_r$ | $V_{GS}$ = 10V, $V_{DS}$ = 0.5 • $V_{DSS}$, $I_D$ = 16A | | 49 | | ns |
| $t_{d(off)}$ | $R_G$ = 5Ω (External) | | 58 | | ns |
| $t_f$ | | | 28 | | ns |
| $Q_{g(on)}$ | $V_{GS}$ = 10V, $V_{DS}$ = 0.5 • $V_{DSS}$, $I_D$ = 16A | | 54 | | nC |
| $Q_{gs}$ | | | 12 | | nC |
| $Q_{gd}$ | | | 29 | | nC |
| $R_{thJC}$ | | | | 1.6 | °C/W |

**OVERMOLDED TO-220 (IXTP...M)**




Terminals: 1 - Gate
2 - Drain
3 - Source

| SYM | INCHES MIN | INCHES MAX | MILLIMETERS MIN | MILLIMETERS MAX |
|---|---|---|---|---|
| A | .177 | .193 | 4.50 | 4.90 |
| A1 | .092 | .108 | 2.34 | 2.74 |
| A2 | .101 | .117 | 2.56 | 2.96 |
| b | .028 | .035 | 0.70 | 0.90 |
| b1 | .050 | .058 | 1.27 | 1.47 |
| c | .018 | .024 | 0.45 | 0.60 |
| D | .617 | .633 | 15.67 | 16.07 |
| E | .392 | .408 | 9.96 | 10.36 |
| e | .100 BSC | | 2.54 BSC | |
| H | .255 | .271 | 6.48 | 6.88 |
| L | .499 | .523 | 12.68 | 13.28 |
| L1 | .119 | .135 | 3.03 | 3.43 |
| ØP | .121 | .129 | 3.08 | 3.28 |
| Q | .126 | .134 | 3.20 | 3.40 |

**Source-Drain Diode**

| Symbol | Test Conditions ($T_J$ = 25°C, Unless Otherwise Specified) | Characteristic Values Min. | Typ. | Max | |
|---|---|---|---|---|---|
| $I_S$ | $V_{GS}$ = 0V, Note1 | | | 32 | A |
| $I_{SM}$ | Repetitive, pulse Width Limited by $T_{JM}$ | | | 128 | A |
| $V_{SD}$ | $I_F$ = $I_S$, $V_{GS}$ = 0V, Note 1 | | | 1.4 | V |
| $t_{rr}$ | $I_F$ = 16A, -di/dt = 100A/μs | | 400 | | ns |
| $Q_{RM}$ | $V_R$ = 100V | | 6.1 | | μC |
| $I_{RM}$ | | | 31 | | A |

Note 1. Pulse test, t ≤ 300μs, duty cycle, d ≤ 2%.

**PRELIMANARY TECHNICAL INFORMATION**

The product presented herein is under development. The Technical Specifications offered are derived from a subjective evaluation of the design, based upon prior knowledge and experience, and constitute a "considered reflection" of the anticipated result. IXYS reserves the right to change limits, test conditions, and dimensions without notice.

**Fig. 1. Output Characteristics @ $T_J$ = 25ºC**

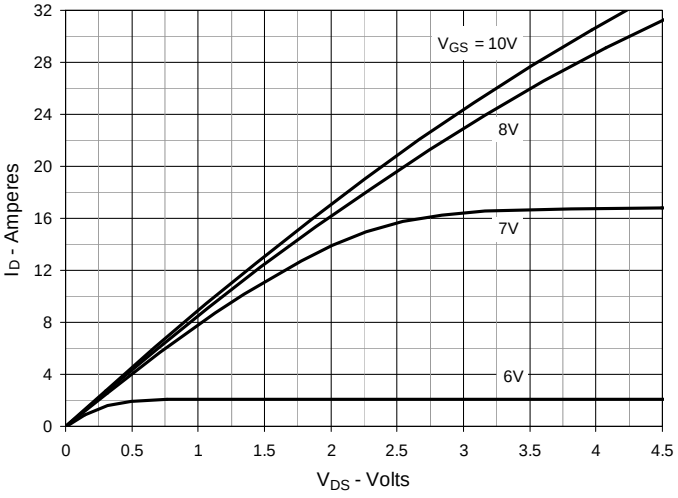



**Fig. 2. Extended Output Characteristics @ $T_J$ = 25ºC**

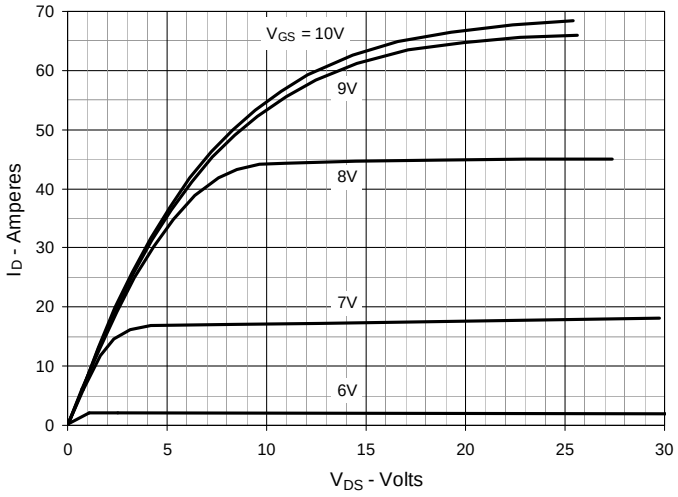



**Fig. 3. Output Characteristics @ $T_J$ = 125ºC**

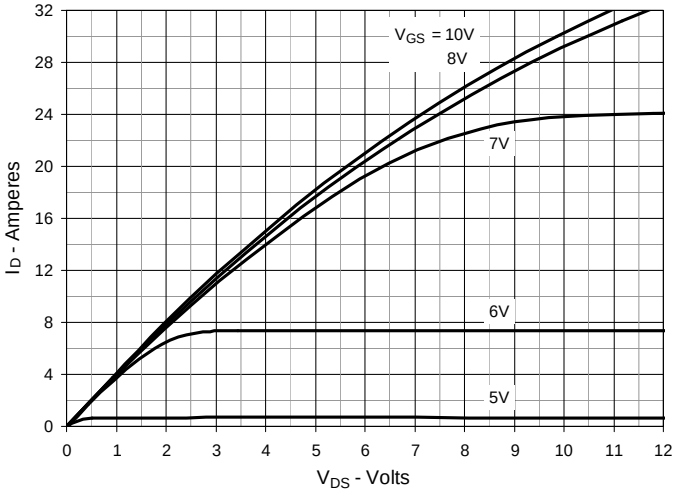



**Fig. 4. $R_{DS(on)}$ Normalized to $I_D$ = 16A Value vs. Junction Temperature**

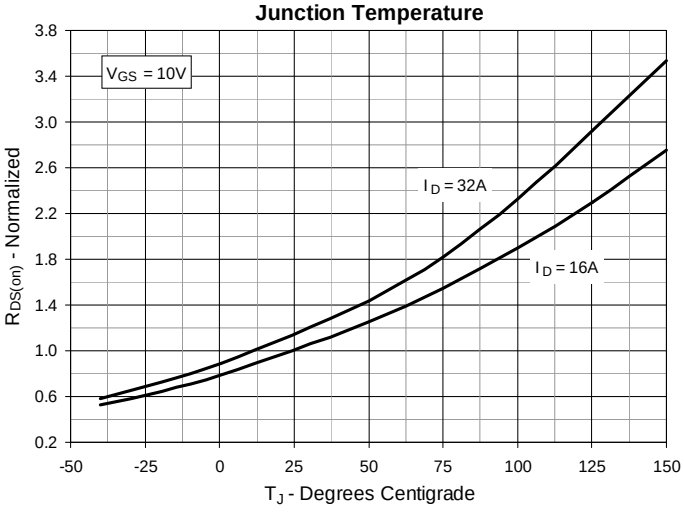



**Fig. 5. $R_{DS(on)}$ Normalized to $I_D$ = 16A Value vs. Drain Current**

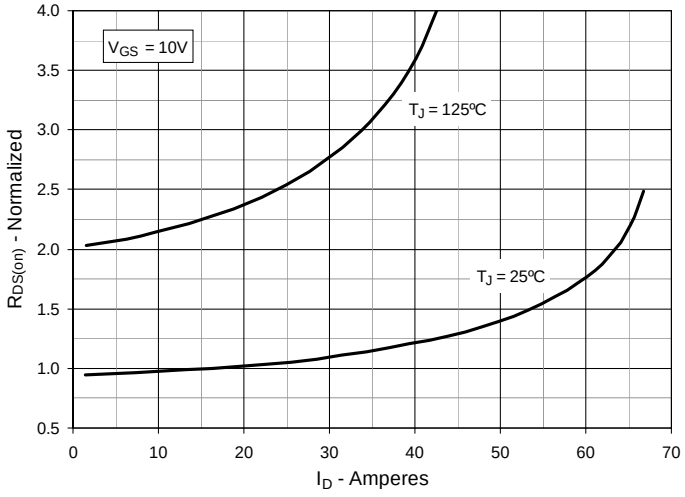



**Fig. 6. Normalized Breakdown & Threshold Voltages vs. Junction Temperature**

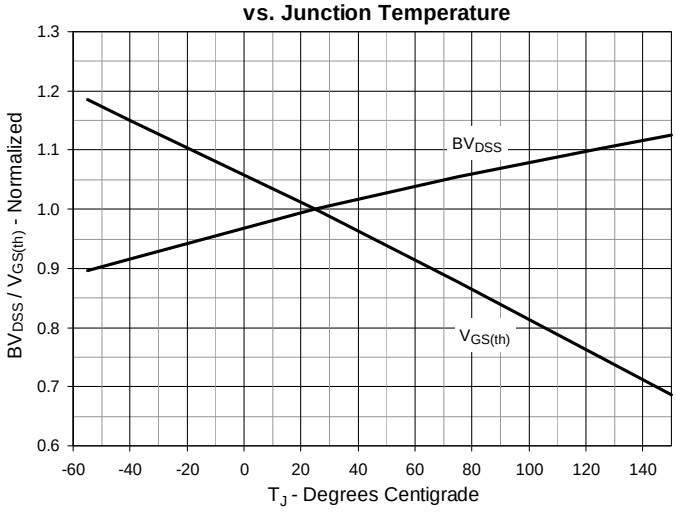


**Fig. 7. Maximum Drain Current vs. Case Temperature**

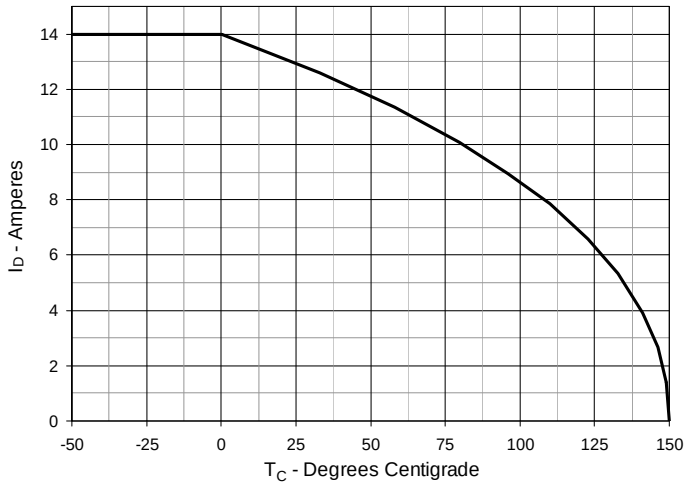



**Fig. 8. Input Admittance**

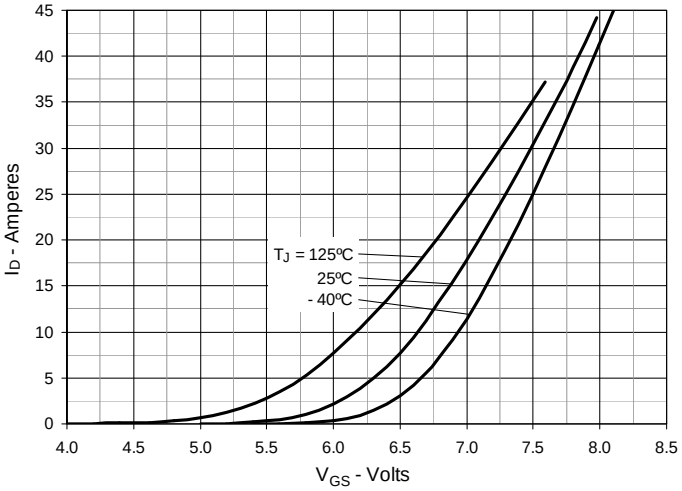



**Fig. 9. Transconductance**

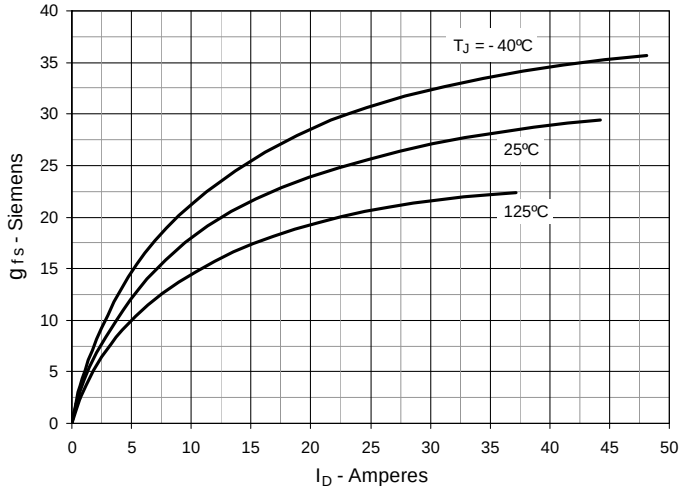



**Fig. 10. Forward Voltage Drop of Intrintsic Diode**

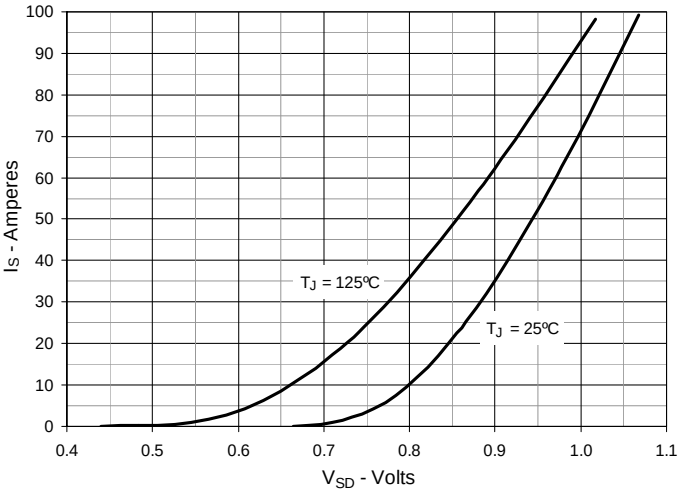



**Fig. 11. Gate Charge**

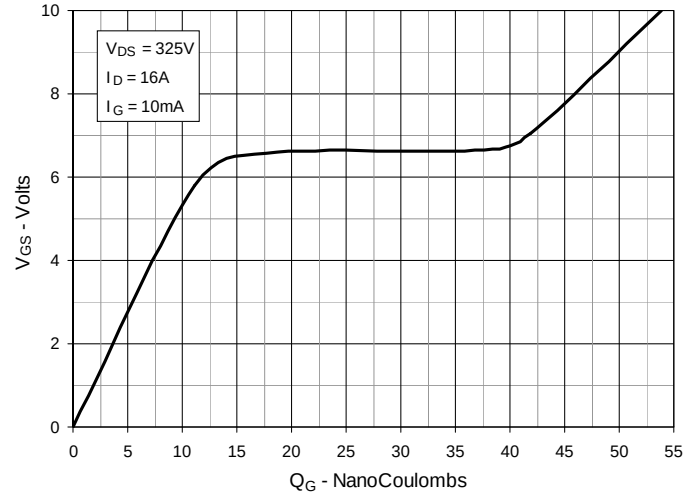



**Fig. 12. Capacitance**

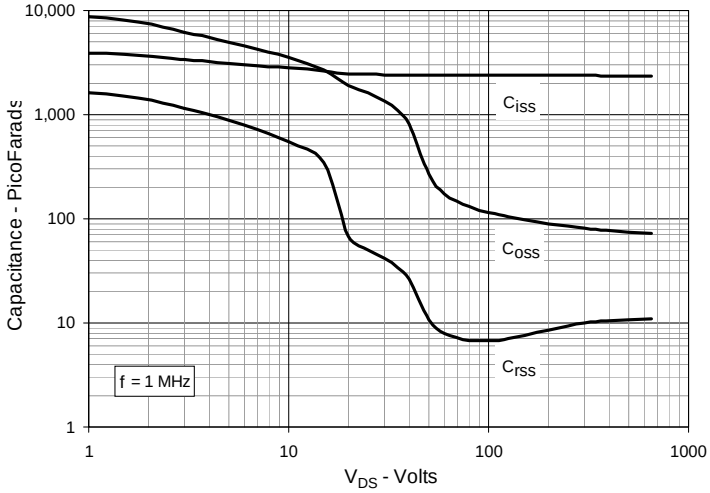


**Fig. 13. Output Capacitance Stored Energy**

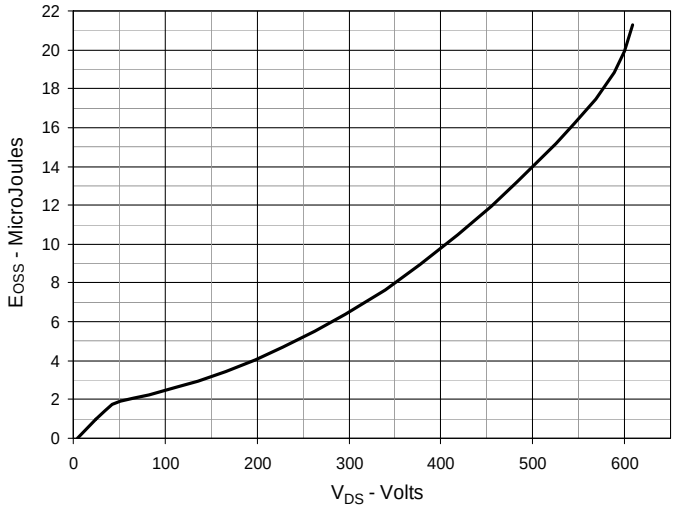



**Fig. 14. Forward-Bias Safe Operating Area**

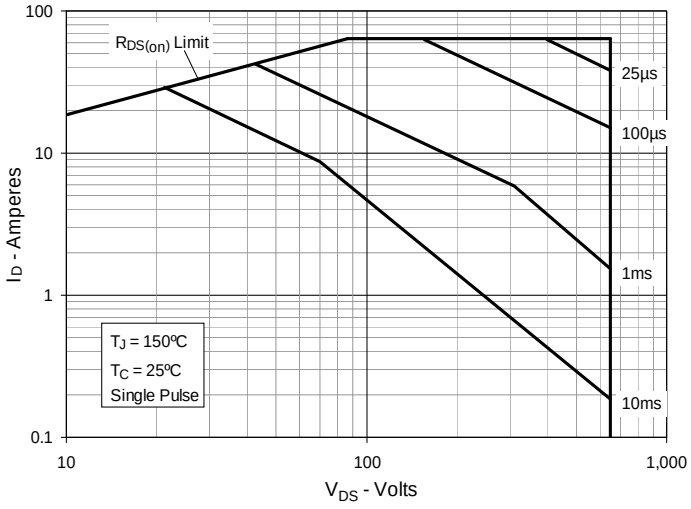



**Fig. 15. Maximum Transient Thermal Impedance**