IXYS

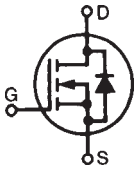
Preliminary Technical Information

# X-Class HiPERFET Power MOSFET

# IXFP4N85XM

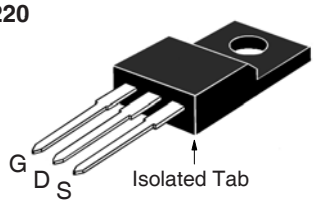
$V_{DSS}$ = 850V
$I_{D25}$ = 3.5A
$R_{DS(on)}$ ≤ 2.5Ω

## (Electrically Isolated Tab)




N-Channel Enhancement Mode

**OVERMOLDED TO-220**




G = Gate D = Drain
S = Source

| Symbol | Test Conditions | Maximum Ratings | |
|---|---|---|---|
| $V_{DSS}$ | $T_J$ = 25°C to 150°C | 850 | V |
| $V_{DGR}$ | $T_J$ = 25°C to 150°C, $R_{GS}$ = 1MΩ | 850 | V |
| $V_{GSS}$ | Continuous | ±30 | V |
| $V_{GSM}$ | Transient | ±40 | V |
| $I_{D25}$ | $T_C$ = 25°C, Limited by $T_{JM}$ | 3.5 | A |
| $I_{DM}$ | $T_C$ = 25°C, Pulse Width Limited by $T_{JM}$ | 10.0 | A |
| $I_A$ | $T_C$ = 25°C | 2 | A |
| $E_{AS}$ | $T_C$ = 25°C | 125 | mJ |
| dv/dt | $I_S \le I_{DM}$, $V_{DD} \le V_{DSS}$, $T_J \le 150°C$ | 50 | V/ns |
| $P_D$ | $T_C$ = 25°C | 35 | W |
| $T_J$ | | -55 ... +150 | °C |
| $T_{JM}$ | | 150 | °C |
| $T_{stg}$ | | -55 ... +150 | °C |
| $T_L$ | Maximum Lead Temperature for Soldering | 300 | °C |
| $T_{SOLD}$ | 1.6 mm (0.062in.) from Case for 10s | 260 | °C |
| $V_{ISOL}$ | 50/60 Hz, 1 Minute | 2500 | V~ |
| $M_d$ | Mounting Torque | 1.13 / 10 | Nm/lb.in |
| Weight | | 2.5 | g |

| Symbol | Test Conditions ($T_J$ = 25°C, Unless Otherwise Specified) | Characteristic Values Min. | Typ. | Max. | |
|---|---|---|---|---|---|
| $BV_{DSS}$ | $V_{GS}$ = 0V, $I_D$ = 250μA | 850 | | | 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 | | | 500 | μA |
| $R_{DS(on)}$ | $V_{GS}$ = 10V, $I_D$ = 2A, Note 1 | | | 2.5 | Ω |

### Features

- International Standard Package
- Plastic Overmolded Tab
- Low $R_{DS(ON)}$ and $Q_G$
- 2500V~ Electrical Isolation
- Avalanche Rated
- 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

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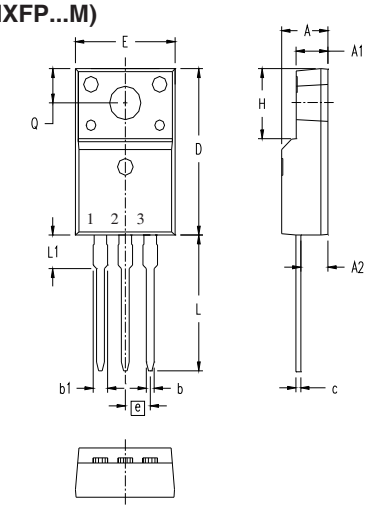
| Symbol | Test Conditions ($T_J$ = 25°C, Unless Otherwise Specified) | Characteristic Values Min. | Typ. | Max | |
|---|---|---|---|---|---|
| $g_{fs}$ | $V_{DS}$ = 10V, $I_D$ = 2A, Note 1 | 1.2 | 2.0 | | S |
| $R_{Gi}$ | Gate Input Resistance | | 3 | | Ω |
| $C_{iss}$ | $V_{GS}$ = 0V, $V_{DS}$ = 25V, f = 1MHz | | 247 | | pF |
| $C_{oss}$ | | | 305 | | pF |
| $C_{rss}$ | | | 5 | | pF |
| | **Effective Output Capacitance** | | | | |
| $C_{o(er)}$ | Energy related, $V_{GS}$ = 0V, $V_{DS}$ = 0.8 • $V_{DSS}$ | | 27 | | pF |
| $C_{o(tr)}$ | Time related, $V_{GS}$ = 0V, $V_{DS}$ = 0.8 • $V_{DSS}$ | | 60 | | pF |
| $t_{d(on)}$ | **Resistive Switching Times** | | 13 | | ns |
| $t_r$ | $V_{GS}$ = 10V, $V_{DS}$ = 0.5 • $V_{DSS}$, $I_D$ = 2A | | 27 | | ns |
| $t_{d(off)}$ | $R_G$ = 30Ω (External) | | 28 | | ns |
| $t_f$ | | | 20 | | ns |
| $Q_{g(on)}$ | $V_{GS}$ = 10V, $V_{DS}$ = 0.5 • $V_{DSS}$, $I_D$ = 2A | | 7.0 | | nC |
| $Q_{gs}$ | | | 2.3 | | nC |
| $Q_{gd}$ | | | 3.3 | | nC |
| $R_{thJC}$ | | | | 3.57 | °C/W |
| $R_{thCS}$ | | | 0.50 | | °C/W |

**OVERMOLDED TO-220 (IXFP...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 | | | 4 | A |
| $I_{SM}$ | Repetitive, pulse Width Limited by $T_{JM}$ | | | 16 | A |
| $V_{SD}$ | $I_F$ = $I_S$, $V_{GS}$ = 0V, Note 1 | | | 1.4 | V |
| $t_{rr}$ | $I_F$ = 2A, -di/dt = 100A/μs, $V_R$ = 100V | | 170 | | ns |
| $Q_{RM}$ | | | 770 | | nC |
| $I_{RM}$ | | | 9 | | A |

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

**PRELIMINARY 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.

IXYS Reserves the Right to Change Limits, Test Conditions, and Dimensions.

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 6,404,065B1 6,683,344 6,727,585 7,005,734B2 7,157,338B2 4,860,072 5,017,508 5,063,307 5,381,025 6,259,123B1 6,534,343 6,710,405B2 6,759,692 7,063,975B2 4,881,106 5,034,796 5,187,117 5,486,715 6,306,728B1 6,583,505 6,710,463 6,771,478B2 7,071,537

**Fig. 1. Output Characteristics @ $T_J$ = 25°C**

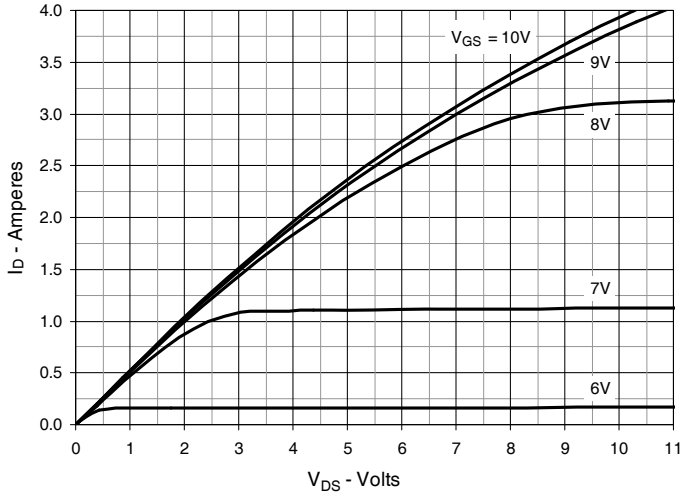



**Fig. 2. Extended Output Characteristics @ $T_J$ = 25°C**

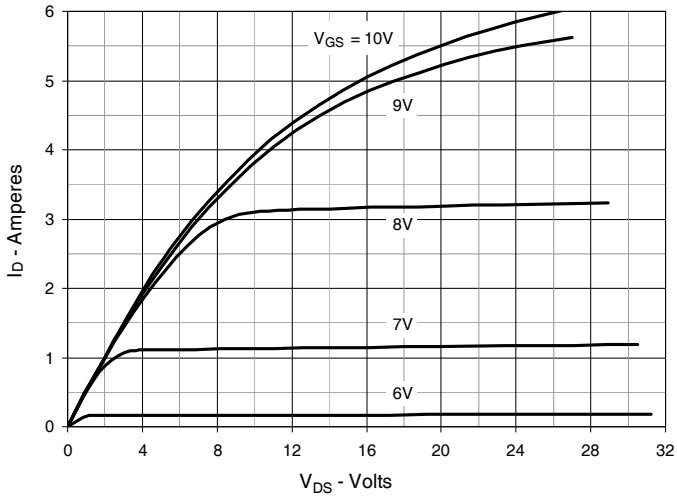



**Fig. 3. Output Characteristics @ $T_J$ = 125°C**

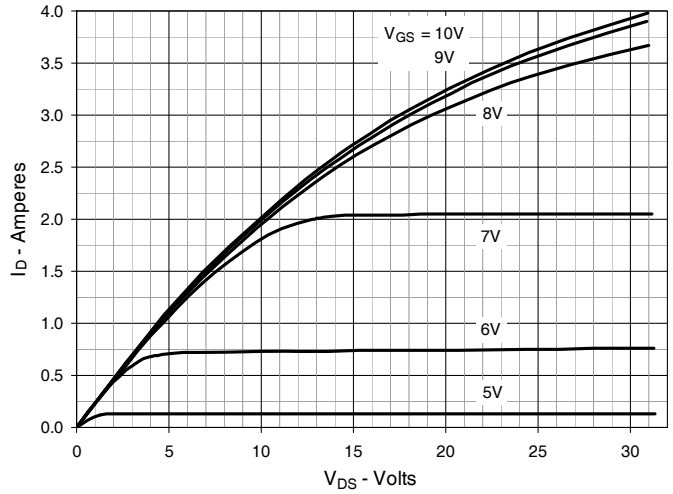



**Fig. 4. $R_{DS(on)}$ Normalized to $I_D$ = 2A Value vs. Junction Temperature**

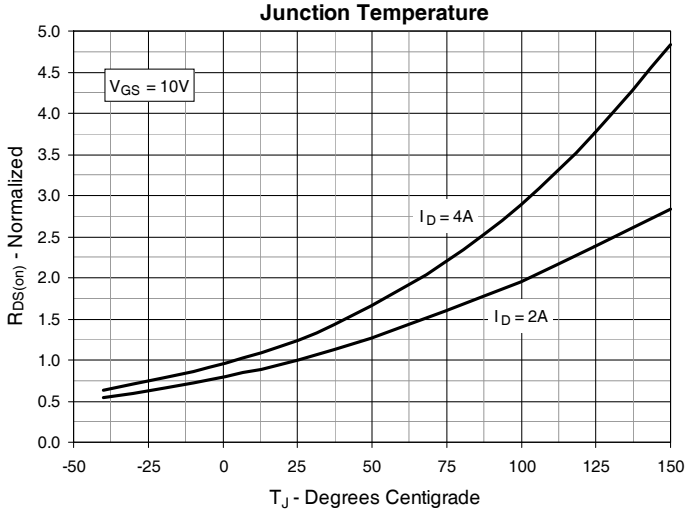



**Fig. 5. $R_{DS(on)}$ Normalized to $I_D$ = 2A Value vs. Drain Current**

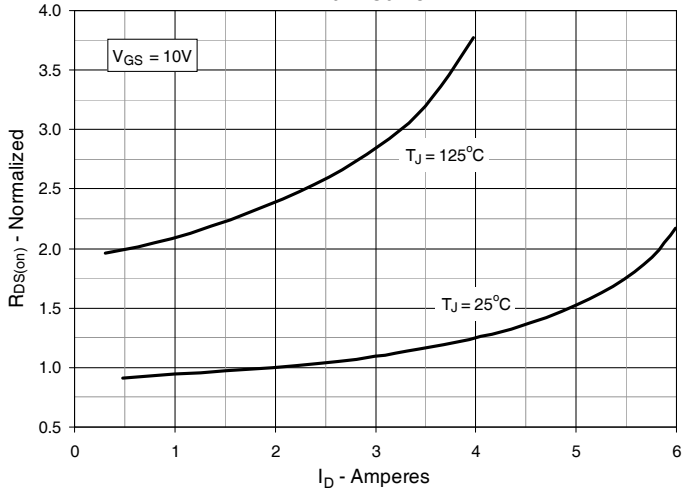



**Fig. 6. Input Admittance**

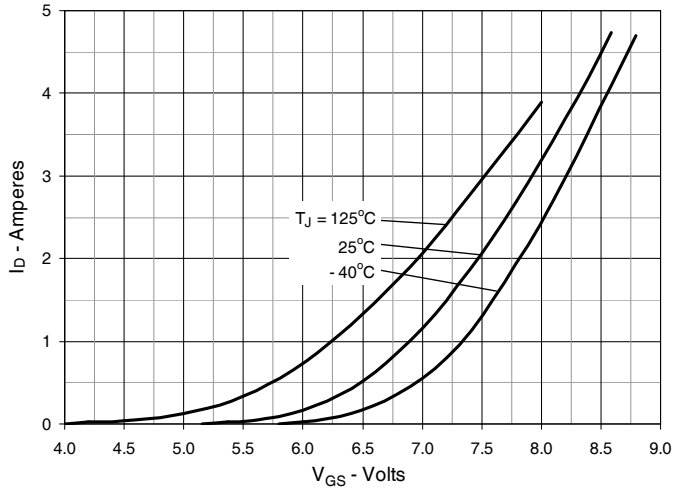



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**Fig. 7. Transconductance**

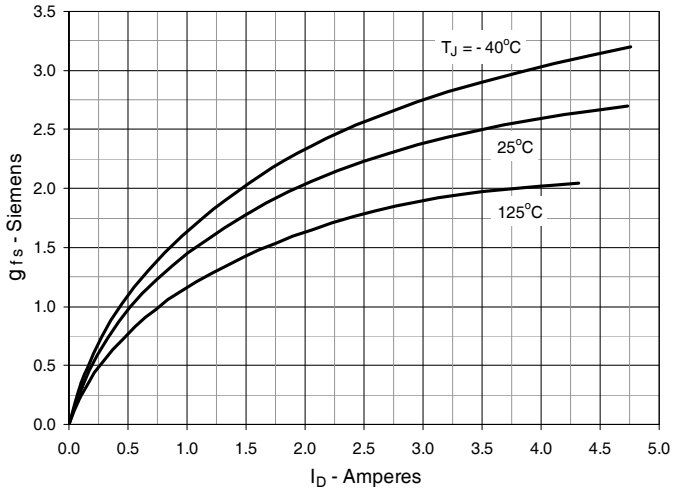



**Fig. 8. Forward Voltage Drop of Intrinsic Diode**

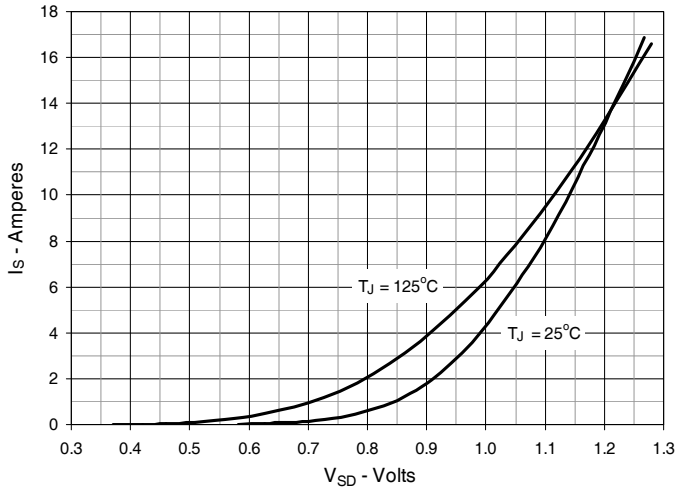



**Fig. 8. Gate Charge**

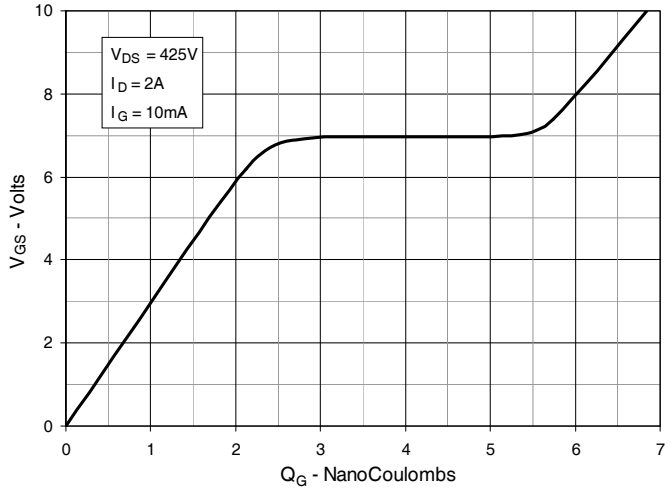



**Fig. 9. Capacitance**

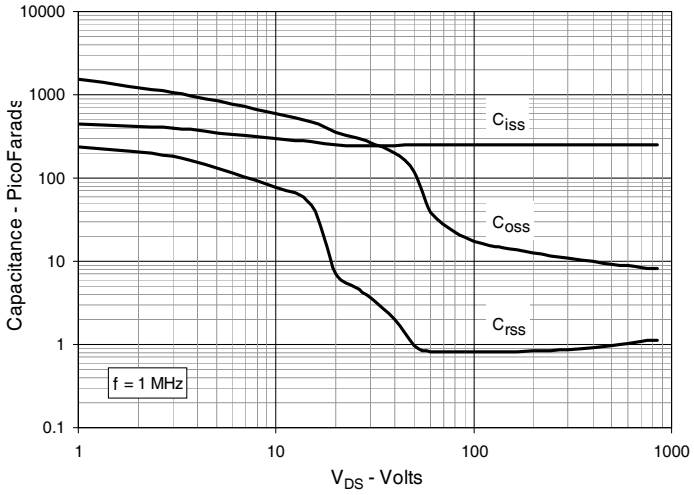



**Fig. 11. Output Capacitance Stored Energy**

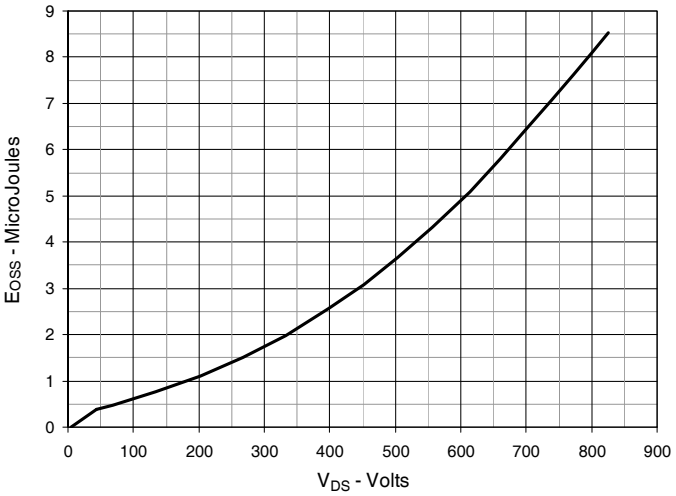
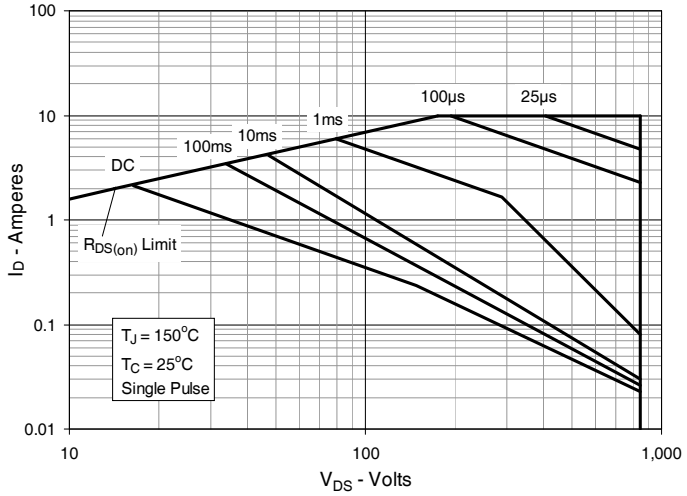
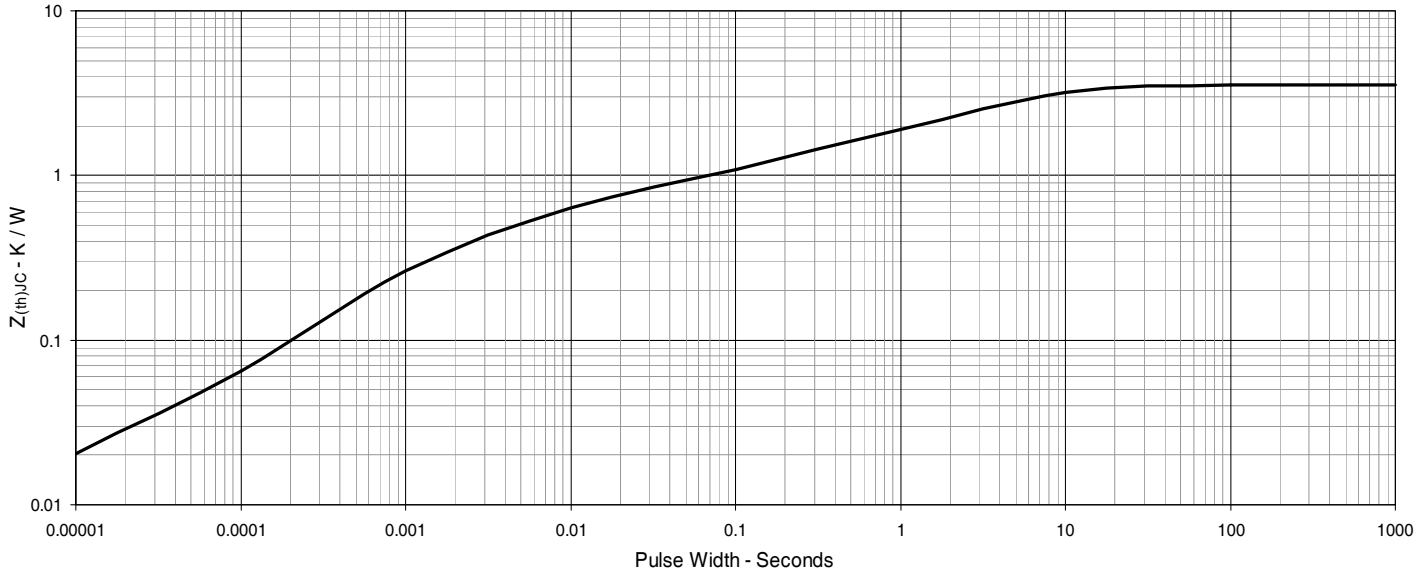



**Fig. 12. Forward-Bias Safe Operating Area**




IXYS Reserves the Right to Change Limits, Test Conditions, and Dimensions.

**Fig. 13. Maximum Transient Thermal Impedance**

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