# IXYS

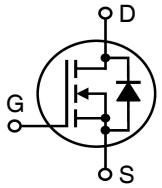
## X2-Class Power MOSFET

## IXTR102N65X2

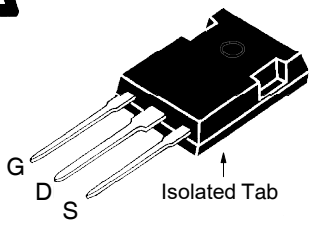
$V_{DSS}$ = 650V
$I_{D25}$ = 54A
$R_{DS(on)}$ ≤ 33mΩ

**(Electrically Isolated Tab)**

N-Channel Enhancement Mode
Avalanche Rated




**ISOPLUS247**
E153432




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 | 54 | A |
| $I_{DM}$ | $T_C$ = 25°C, Pulse Width Limited by $T_{JM}$ | 204 | A |
| $I_A$ | $T_C$ = 25°C | 25 | A |
| $E_{AS}$ | $T_C$ = 25°C | 3 | J |
| $P_D$ | $T_C$ = 25°C | 330 | W |
| dv/dt | $I_S \le I_{DM}$, $V_{DD} \le V_{DSS}$, $T_J \le 150°C$ | 50 | V/ns |
| $T_J$ | | -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~ |
| $F_C$ | Mounting Force | 20..120/4.5..27 | N/lb |
| Weight | | 5 | g |

| Symbol | Test Conditions ($T_J$ = 25°C Unless Otherwise Specified) | Characteristic Values Min. | Typ. | Max. | |
|---|---|---|---|---|---|
| $BV_{DSS}$ | $V_{GS}$ = 0V, $I_D$ = 1mA | 650 | | | V |
| $V_{GS(th)}$ | $V_{DS} = V_{GS}$, $I_D$ = 250μA | 3.0 | | 5.0 | V |
| $I_{GSS}$ | $V_{GS}$ = ± 30V, $V_{DS}$ = 0V | | | ± 100 | nA |
| $I_{DSS}$ | $V_{DS} = V_{DSS}$, $V_{GS}$ = 0V | | | 25 | μA |
| | $T_J$ = 125°C | | | 500 | μA |
| $R_{DS(on)}$ | $V_{GS}$ = 10V, $I_D$ = 51A, Note 1 | | | 33 | mΩ |

### Features

- Silicon Chip on Direct-Copper Bond (DCB) Substrate
- Isolated Mounting Surface
- 2500V~ Electrical Isolation
- Low $Q_G$
- 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, $I_D$ = 51A, Note 1 | 50 | 82 | | S |
| $R_{Gi}$ | Gate Input Resistance | | 0.7 | | Ω |
| $C_{iss}$ | $V_{GS}$ = 0V, $V_{DS}$ = 25V, f = 1MHz | | 10.9 | | nF |
| $C_{oss}$ | | | 6100 | | pF |
| $C_{rss}$ | | | 12.6 | | pF |
| | **Effective Output Capacitance** | | | | |
| $C_{o(er)}$ | Energy related; $V_{GS}$ = 0V, $V_{DS}$ = 0.8 • $V_{DSS}$ | | 367 | | pF |
| $C_{o(tr)}$ | Time related; $V_{GS}$ = 0V, $V_{DS}$ = 0.8 • $V_{DSS}$ | | 1420 | | pF |
| $t_{d(on)}$ | **Resistive Switching Times** | | 37 | | ns |
| $t_r$ | $V_{GS}$ = 10V, $V_{DS}$ = 0.5 • $V_{DSS}$, $I_D$ = 51A | | 28 | | ns |
| $t_{d(off)}$ | $R_G$ = 2Ω (External) | | 67 | | ns |
| $t_f$ | | | 11 | | ns |
| $Q_{g(on)}$ | $V_{GS}$ = 10V, $V_{DS}$ = 0.5 • $V_{DSS}$, $I_D$ = 51A | | 152 | | nC |
| $Q_{gs}$ | | | 57 | | nC |
| $Q_{gd}$ | | | 33 | | nC |
| $R_{thJC}$ | | | | 0.38 | °C/W |
| $R_{thCS}$ | | | 0.15 | | °C/W |

**Source-Drain Diode**

| Symbol | Test Conditions ($T_J$ = 25°C, Unless Otherwise Specified) | Characteristic Values Min. | Typ. | Max. | |
|---|---|---|---|---|---|
| $I_S$ | $V_{GS}$ = 0V | | | 102 | A |
| $I_{SM}$ | Repetitive, Pulse Width Limited by $T_{JM}$ | | | 408 | A |
| $V_{SD}$ | $I_F$ = $I_S$, $V_{GS}$ = 0V, Note 1 | | | 1.4 | V |
| $t_{rr}$ | $I_F$ = 51A, -di/dt = 100A/μs | | 450 | | ns |
| $Q_{RM}$ | $V_R$ = 100V, $V_{GS}$ = 0V | | 11.7 | | μC |
| $I_{RM}$ | | | 52 | | A |

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

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IXYS MOSFETs and IGBTs are covered by one or more of the following U.S. patents: 4,835,592 4,860,072 4,881,106 4,931,844 5,017,508 5,034,796 5,049,961 5,063,307 5,187,117 5,237,481 5,381,025 5,486,715 6,162,665 6,259,123 B1 6,306,728 B1 6,404,065 B1 6,534,343 6,583,505 6,683,344 6,710,405 B2 6,710,463 6,727,585 6,759,692 6,771,478 B2 7,005,734 B2 7,063,975 B2 7,071,537 7,157,338B2

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

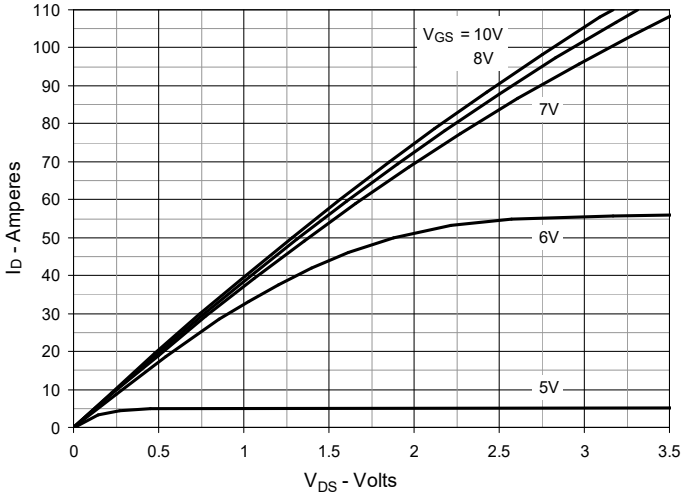



**Fig. 2. Extended Output Characteristics @ $T_J$ = 25°C**

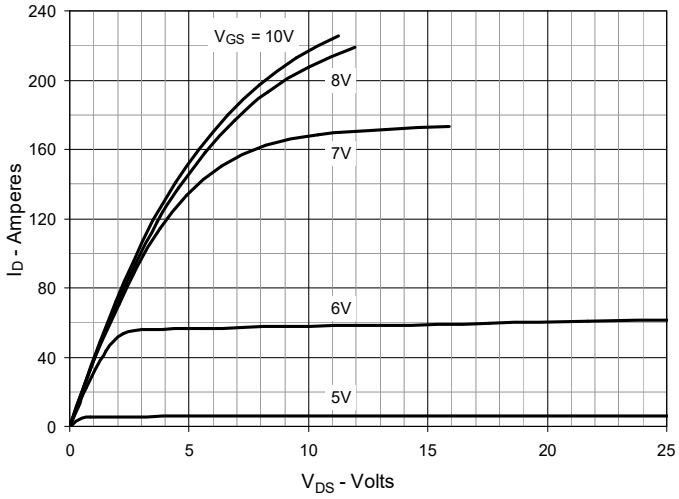



**Fig. 3. Output Characteristics @ $T_J$ = 125°C**

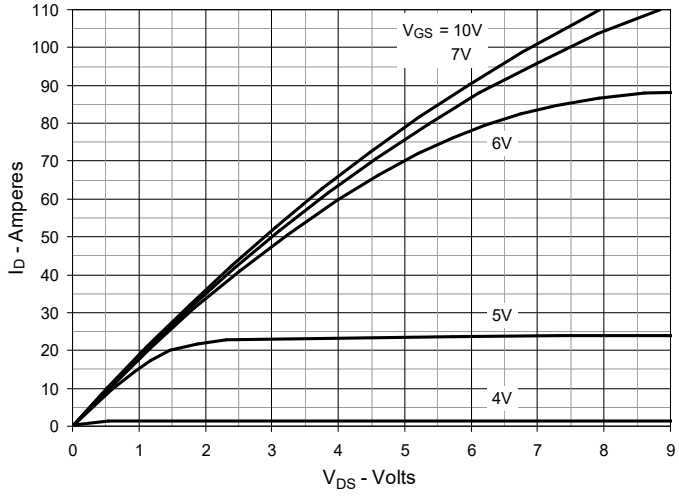



**Fig. 4. $R_{DS(on)}$ Normalized to $I_D$ = 51A Value vs. Junction Temperature**

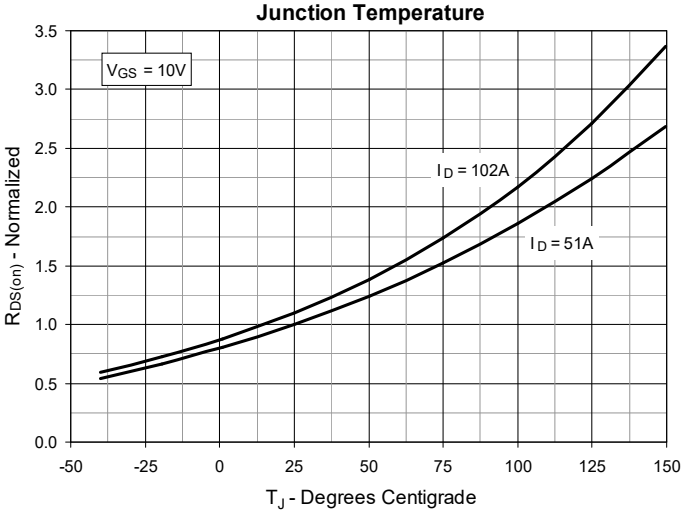



**Fig. 5. $R_{DS(on)}$ Normalized to $I_D$ = 51A Value vs. Drain Current**

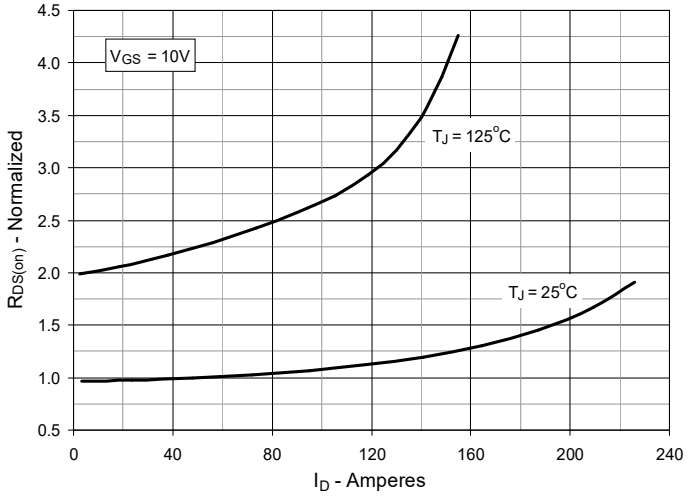
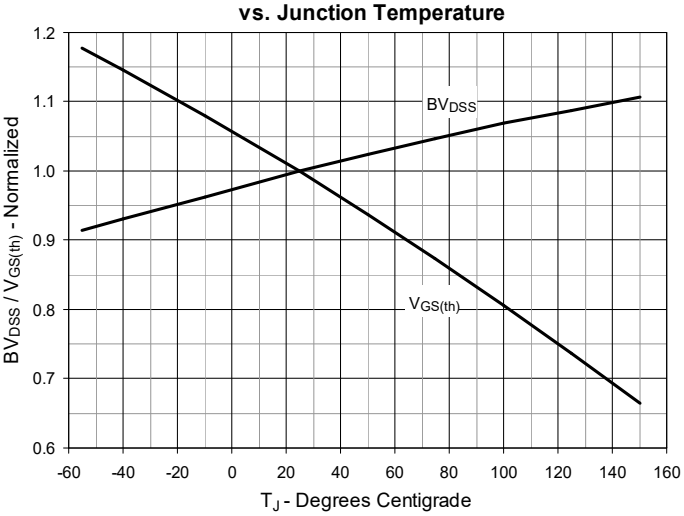



**Fig. 6. Normalized Breakdown & Threshold Voltages vs. Junction Temperature**




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

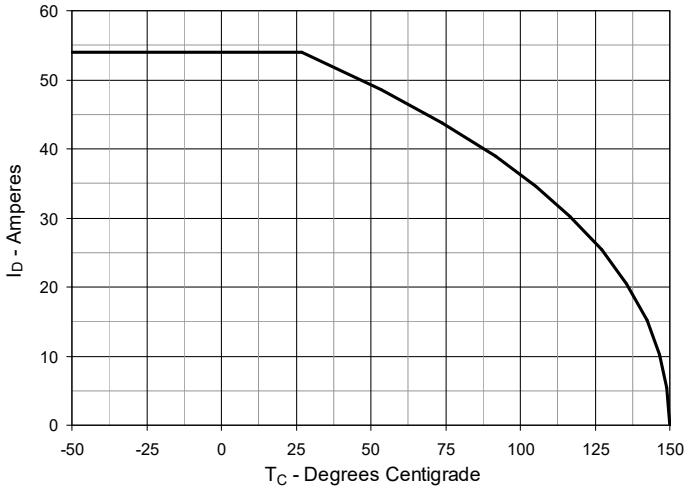



**Fig. 8. Input Admittance**

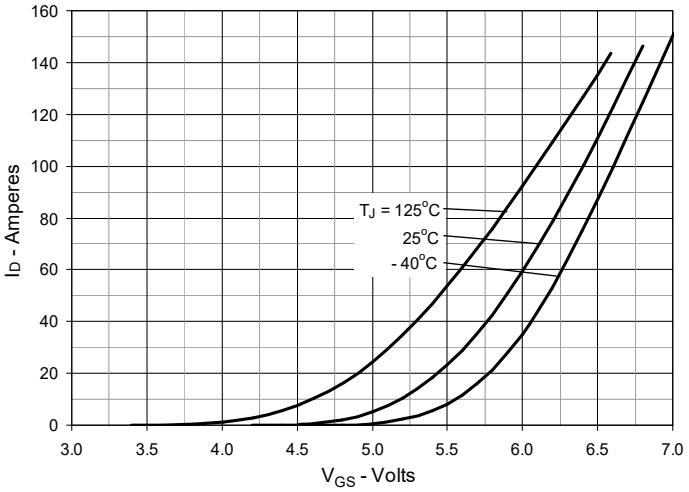



**Fig. 9. Transconductance**

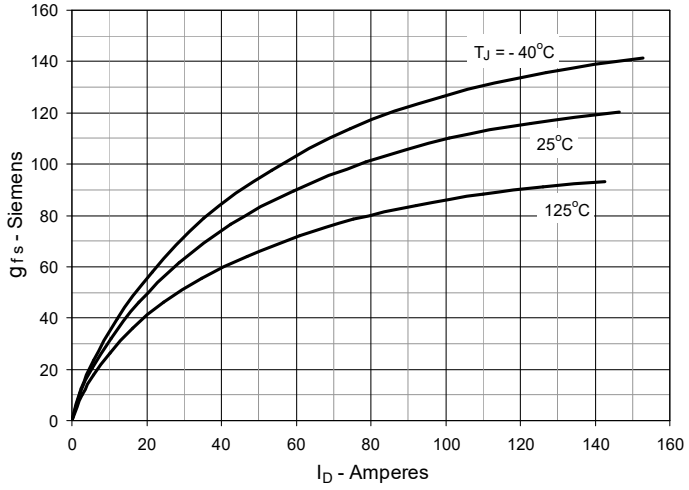



**Fig. 10. Forward Voltage Drop of Intrinsic Diode**

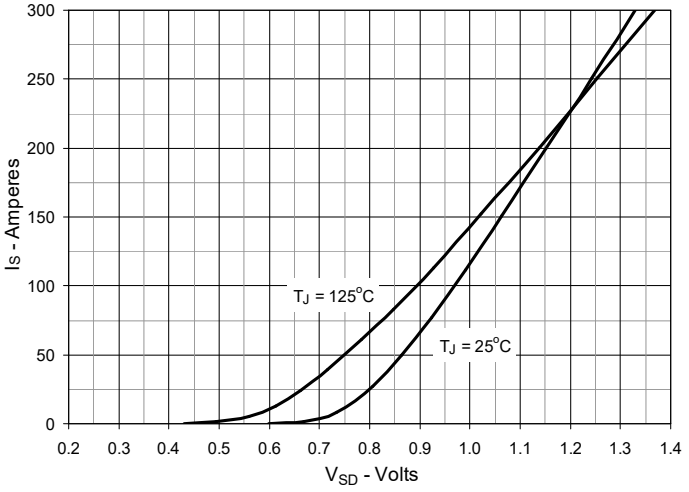



**Fig. 11. Gate Charge**

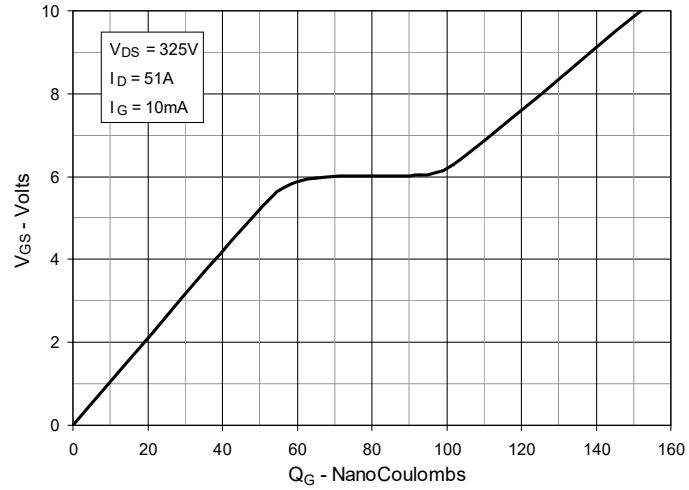
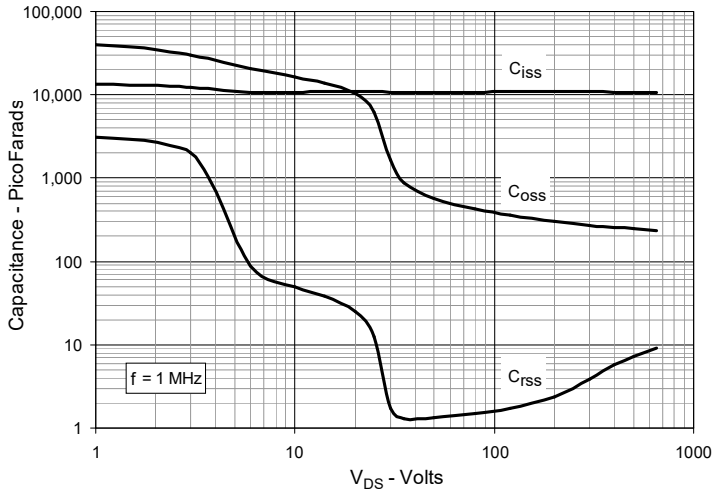



**Fig. 12. Capacitance**




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

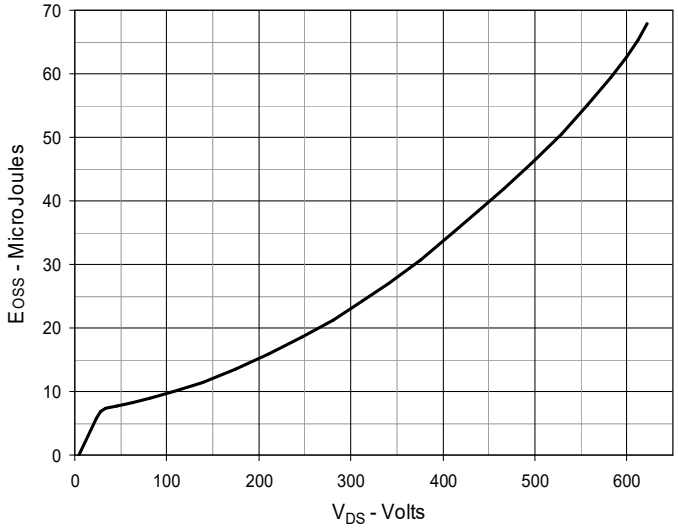



**Fig. 14. Forward-Bias Safe Operating Area**

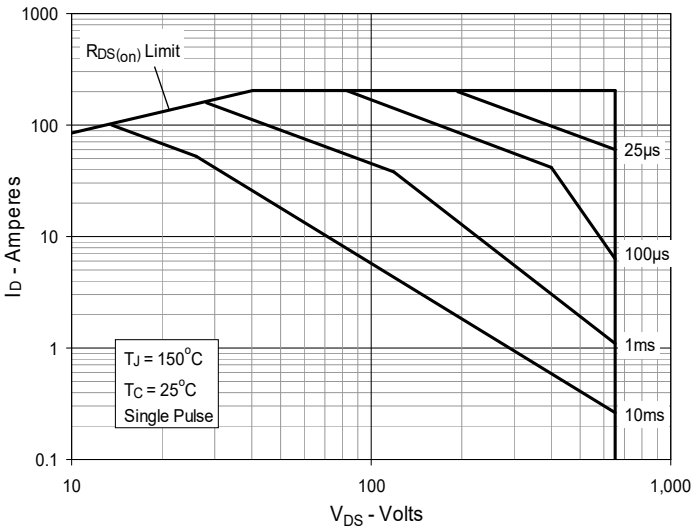
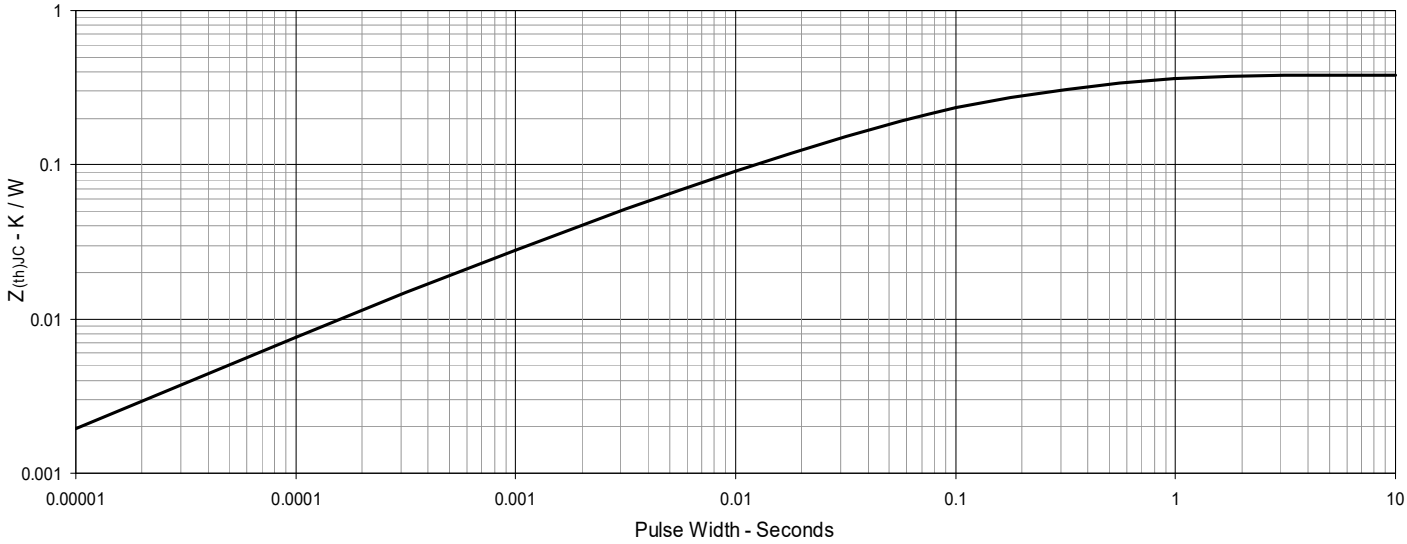
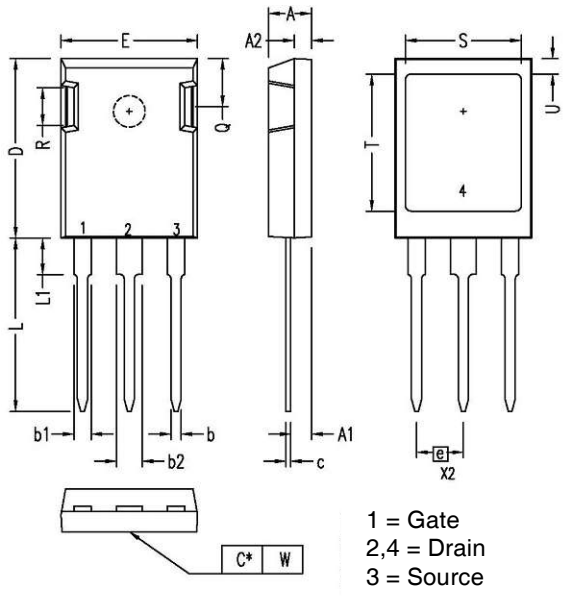



**Fig. 15. Maximum Transient Thermal Impedance**




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**ISOPLUS247 (IXTR) Outline**




1 = Gate
2,4 = Drain
3 = Source

| SYM | INCHES | | MILLIMETERS | |
|---|---|---|---|---|
| | MIN | MAX | MIN | MAX |
| A | .190 | .205 | 4.83 | 5.21 |
| A1 | .090 | .100 | 2.29 | 2.54 |
| A2 | .075 | .085 | 1.91 | 2.16 |
| b | .045 | .055 | 1.14 | 1.40 |
| b1 | .075 | .085 | 1.91 | 2.15 |
| b2 | .115 | .126 | 2.92 | 3.20 |
| C | .024 | .033 | 0.61 | 0.83 |
| D | .819 | .840 | 20.80 | 21.34 |
| E | .620 | .635 | 15.75 | 16.13 |
| e | .215 BSC | | 5.45 BSC | |
| L | .780 | .811 | 19.81 | 20.60 |
| L1 | .150 | .172 | 3.81 | 4.38 |
| Q | .220 | .244 | 5.59 | 6.20 |
| R | .170 | .191 | 4.32 | 4.85 |
| S | .520 | .540 | 13.21 | 13.72 |
| T | .620 | .640 | 15.75 | 16.26 |
| U | .065 | .080 | 1.65 | 2.03 |
| W | 0 | .004 | 0 | 0.10 |

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