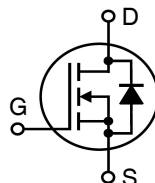


# X2-Class Power MOSFET

## IXTR102N65X2

(Electrically Isolated Tab)

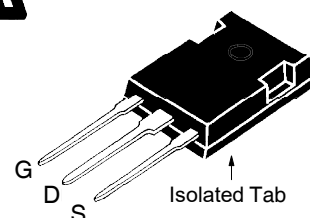
N-Channel Enhancement Mode  
Avalanche Rated



$$\begin{aligned} V_{DSS} &= 650V \\ I_{D25} &= 54A \\ R_{DS(on)} &\leq 33m\Omega \end{aligned}$$

| Symbol     | Test Conditions                                                    | Maximum Ratings |                  |
|------------|--------------------------------------------------------------------|-----------------|------------------|
| $V_{DSS}$  | $T_J = 25^\circ\text{C to } 150^\circ\text{C}$                     | 650             | V                |
| $V_{DGR}$  | $T_J = 25^\circ\text{C to } 150^\circ\text{C}, R_{GS} = 1M\Omega$  | 650             | V                |
| $V_{GSS}$  | Continuous                                                         | $\pm 30$        | V                |
| $V_{GSM}$  | Transient                                                          | $\pm 40$        | V                |
| $I_{D25}$  | $T_C = 25^\circ\text{C}$                                           | 54              | A                |
| $I_{DM}$   | $T_C = 25^\circ\text{C}$ , Pulse Width Limited by $T_{JM}$         | 204             | A                |
| $I_A$      | $T_C = 25^\circ\text{C}$                                           | 25              | A                |
| $E_{AS}$   | $T_C = 25^\circ\text{C}$                                           | 3               | J                |
| $P_D$      | $T_C = 25^\circ\text{C}$                                           | 330             | W                |
| $dv/dt$    | $I_S \leq I_{DM}, V_{DD} \leq V_{DSS}, T_J \leq 150^\circ\text{C}$ | 50              | V/ns             |
| $T_J$      |                                                                    | -55 ... +150    | $^\circ\text{C}$ |
| $T_{JM}$   |                                                                    | 150             | $^\circ\text{C}$ |
| $T_{stg}$  |                                                                    | -55 ... +150    | $^\circ\text{C}$ |
| $T_L$      | Maximum Lead Temperature for Soldering                             | 300             | $^\circ\text{C}$ |
| $T_{SOLD}$ | 1.6 mm (0.062in.) from Case for 10s                                | 260             | $^\circ\text{C}$ |
| $V_{ISOL}$ | 50/60 Hz, 1 Minute                                                 | 2500            | V~               |
| $F_C$      | Mounting Force                                                     | 20..120/4.5..27 | N/lb             |
| Weight     |                                                                    | 5               | g                |

ISOPLUS247  
E153432



G = Gate    D = Drain  
S = Source

### 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

| Symbol       | Test Conditions<br>( $T_J = 25^\circ\text{C}$ Unless Otherwise Specified) | Characteristic Values |      |                           |
|--------------|---------------------------------------------------------------------------|-----------------------|------|---------------------------|
|              |                                                                           | Min.                  | Typ. | Max.                      |
| $BV_{DSS}$   | $V_{GS} = 0V, I_D = 1mA$                                                  | 650                   |      | V                         |
| $V_{GS(th)}$ | $V_{DS} = V_{GS}, I_D = 250\mu A$                                         | 3.0                   |      | 5.0 V                     |
| $I_{GSS}$    | $V_{GS} = \pm 30V, V_{DS} = 0V$                                           |                       |      | $\pm 100$ nA              |
| $I_{DSS}$    | $V_{DS} = V_{DSS}, V_{GS} = 0V$<br>$T_J = 125^\circ\text{C}$              |                       |      | 25 $\mu A$<br>500 $\mu A$ |
| $R_{DS(on)}$ | $V_{GS} = 10V, I_D = 51A$ , Note 1                                        |                       |      | 33 m $\Omega$             |

| Symbol                              | Test Conditions<br>( $T_J = 25^{\circ}\text{C}$ , Unless Otherwise Specified)                                                               | Characteristic Values                                |      |                          |
|-------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------|------|--------------------------|
|                                     |                                                                                                                                             | Min.                                                 | Typ. | Max                      |
| $g_{fs}$                            | $V_{DS} = 10\text{V}$ , $I_D = 51\text{A}$ , Note 1                                                                                         | 50                                                   | 82   | S                        |
| $R_{Gi}$                            | Gate Input Resistance                                                                                                                       |                                                      | 0.7  | $\Omega$                 |
| $C_{iss}$                           | $V_{GS} = 0\text{V}$ , $V_{DS} = 25\text{V}$ , $f = 1\text{MHz}$                                                                            |                                                      | 10.9 | nF                       |
| $C_{oss}$                           |                                                                                                                                             |                                                      | 6100 | pF                       |
| $C_{rss}$                           |                                                                                                                                             |                                                      | 12.6 | pF                       |
| <b>Effective Output Capacitance</b> |                                                                                                                                             |                                                      |      |                          |
| $C_{o(er)}$                         | Energy related                                                                                                                              | $V_{GS} = 0\text{V}$<br>$V_{DS} = 0.8 \cdot V_{DSS}$ | 367  | pF                       |
| $C_{o(tr)}$                         | Time related                                                                                                                                |                                                      | 1420 | pF                       |
| $t_{d(on)}$                         | <b>Resistive Switching Times</b><br>$V_{GS} = 10\text{V}$ , $V_{DS} = 0.5 \cdot V_{DSS}$ , $I_D = 51\text{A}$<br>$R_G = 2\Omega$ (External) |                                                      | 37   | ns                       |
| $t_r$                               |                                                                                                                                             |                                                      | 28   | ns                       |
| $t_{d(off)}$                        |                                                                                                                                             |                                                      | 67   | ns                       |
| $t_f$                               |                                                                                                                                             |                                                      | 11   | ns                       |
| $Q_{g(on)}$                         | $V_{GS} = 10\text{V}$ , $V_{DS} = 0.5 \cdot V_{DSS}$ , $I_D = 51\text{A}$                                                                   |                                                      | 152  | nC                       |
| $Q_{gs}$                            |                                                                                                                                             |                                                      | 57   | nC                       |
| $Q_{gd}$                            |                                                                                                                                             |                                                      | 33   | nC                       |
| $R_{thJC}$                          |                                                                                                                                             |                                                      |      | $0.38^{\circ}\text{C/W}$ |
| $R_{thCS}$                          |                                                                                                                                             |                                                      | 0.15 | $^{\circ}\text{C/W}$     |

## Source-Drain Diode

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

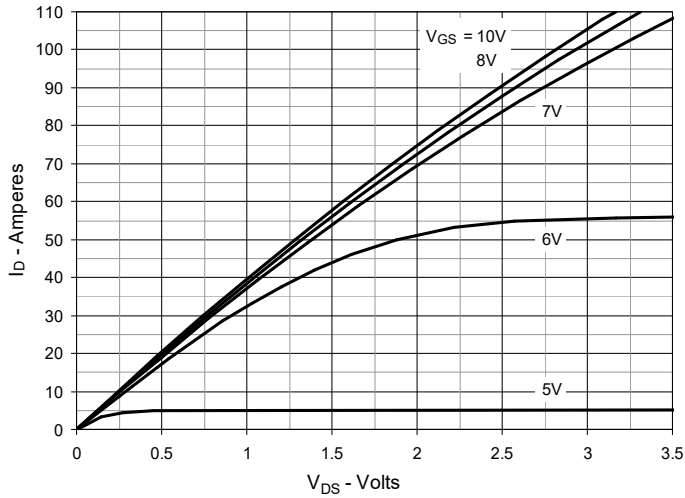
Note 1. Pulse test,  $t \leq 300\mu\text{s}$ , duty cycle,  $d \leq 2\%$ .

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

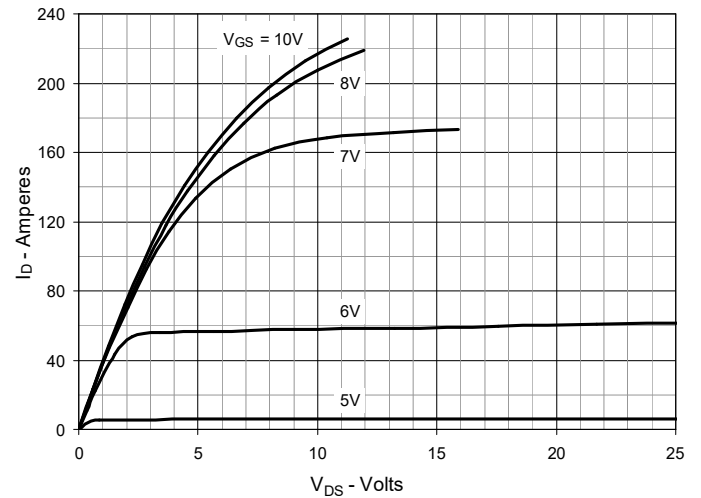
IXYS MOSFETs and IGBTs are covered by one or more of the following U.S. patents:

|           |           |           |           |              |              |              |              |              |             |
|-----------|-----------|-----------|-----------|--------------|--------------|--------------|--------------|--------------|-------------|
| 4,835,592 | 4,931,844 | 5,049,961 | 5,237,481 | 6,162,665    | 6,404,065 B1 | 6,683,344    | 6,727,585    | 7,005,734 B2 | 7,157,338B2 |
| 4,860,072 | 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    |             |

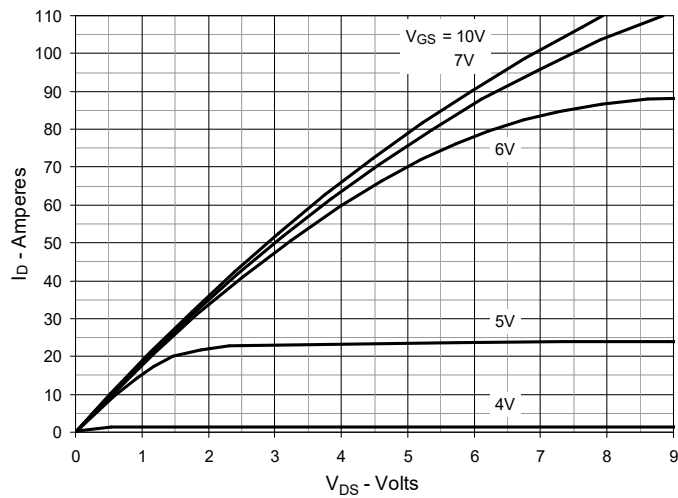
**Fig. 1. Output Characteristics @  $T_J = 25^\circ\text{C}$**



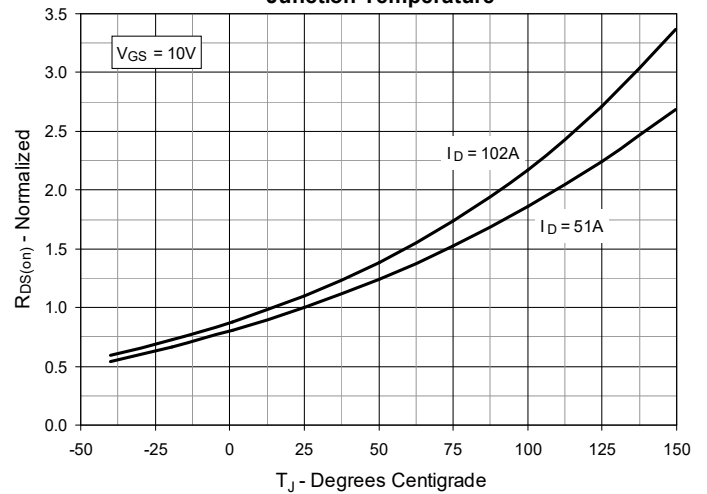
**Fig. 2. Extended Output Characteristics @  $T_J = 25^\circ\text{C}$**



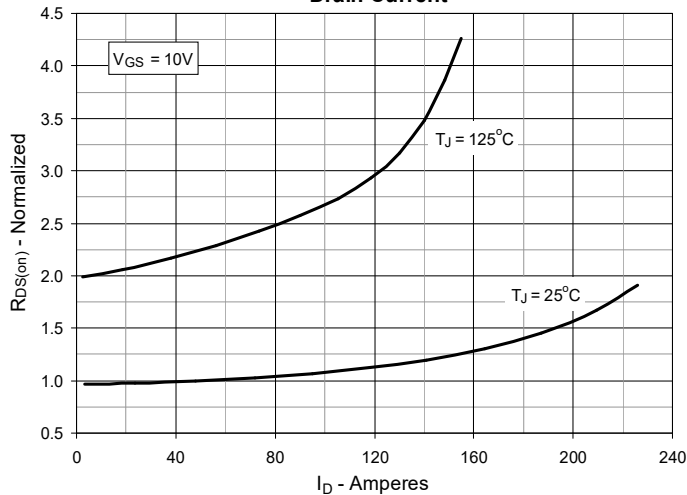
**Fig. 3. Output Characteristics @  $T_J = 125^\circ\text{C}$**



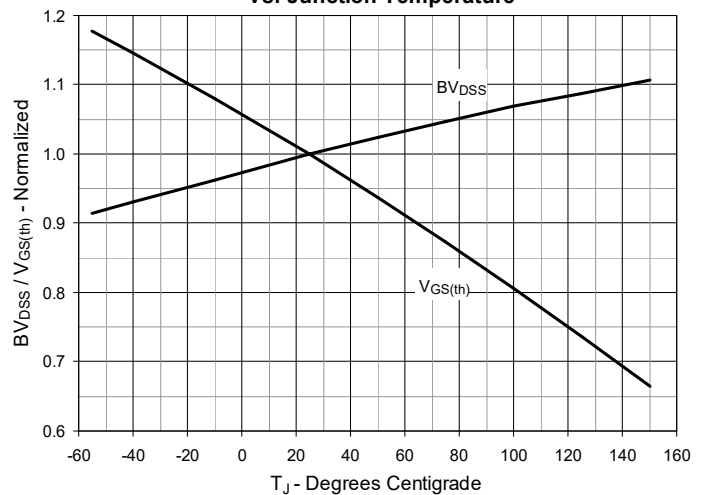
**Fig. 4.  $R_{DS(on)}$  Normalized to  $I_D = 51\text{A}$  Value vs. Junction Temperature**

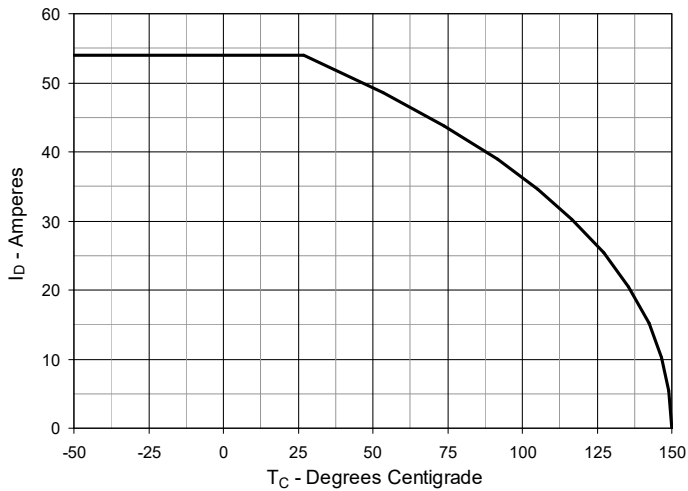
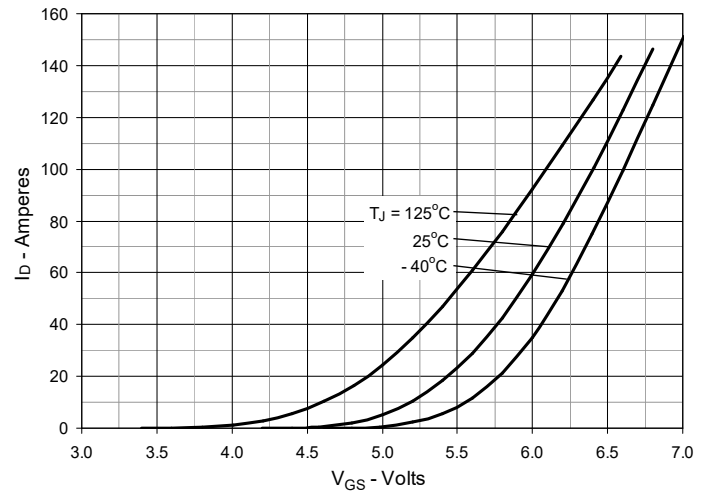
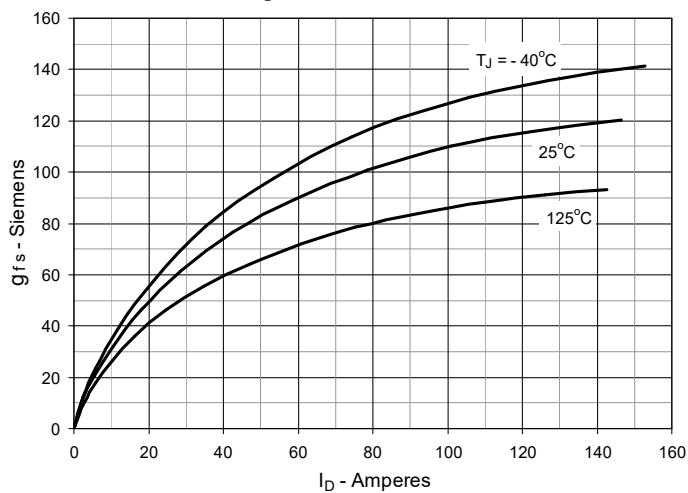
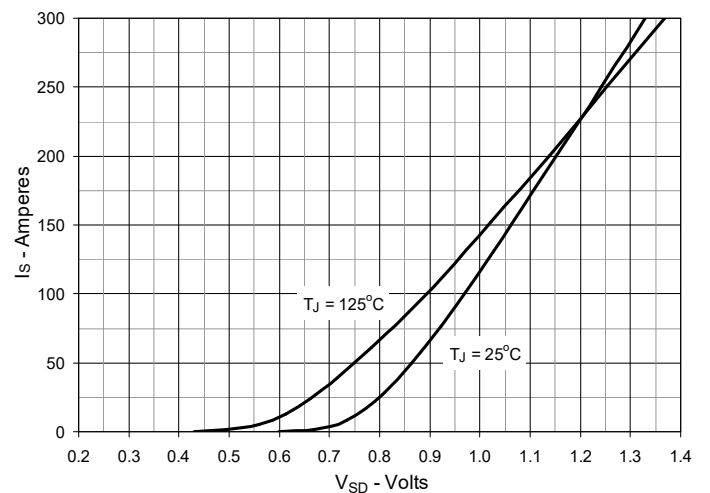
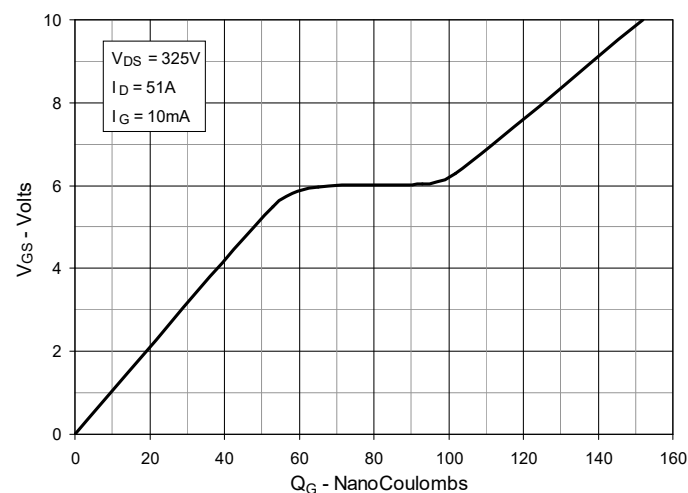
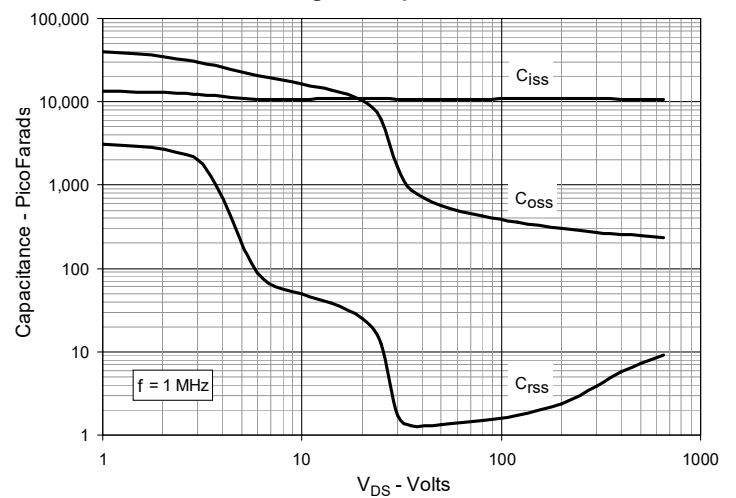


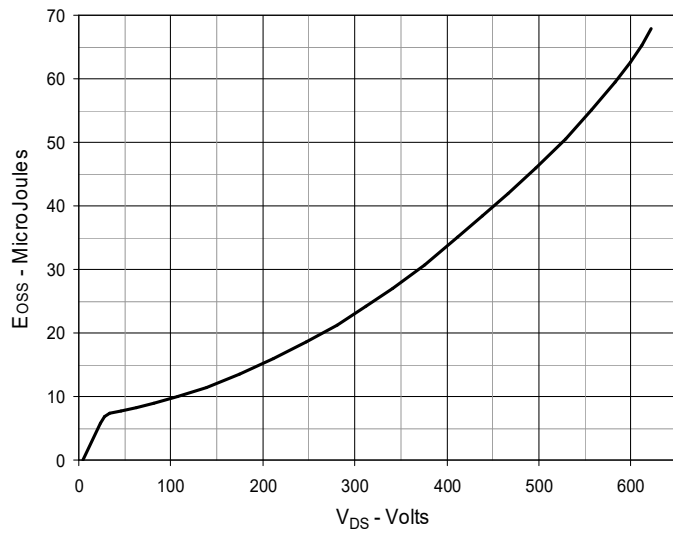
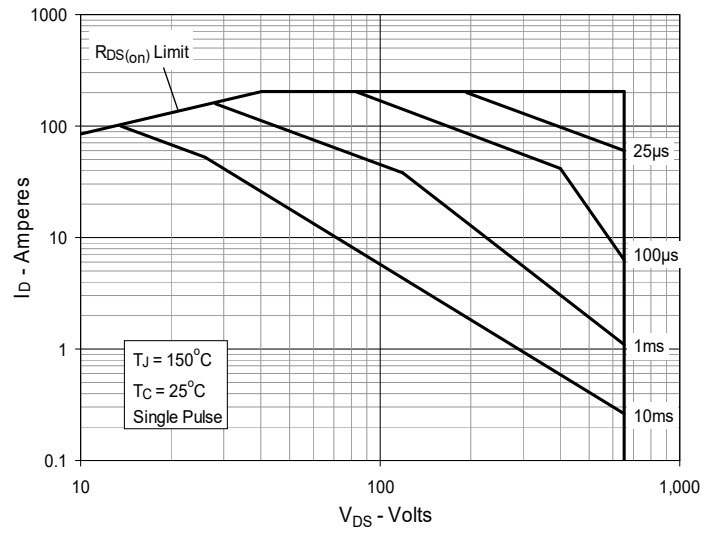
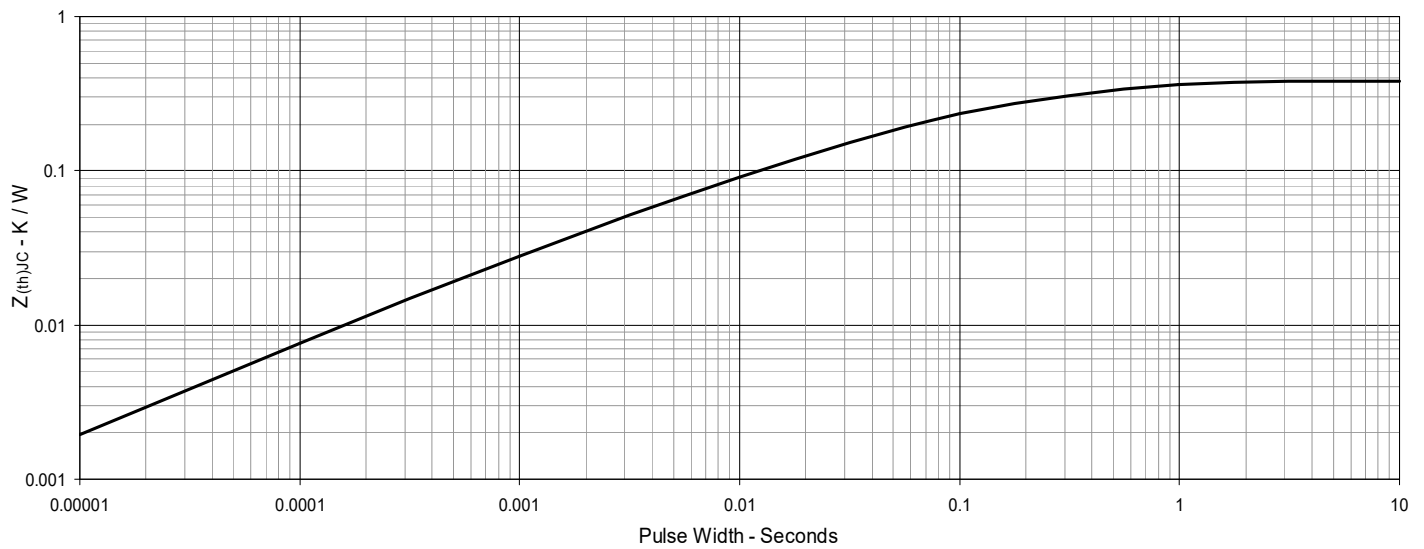
**Fig. 5.  $R_{DS(on)}$  Normalized to  $I_D = 51\text{A}$  Value vs. Drain Current**

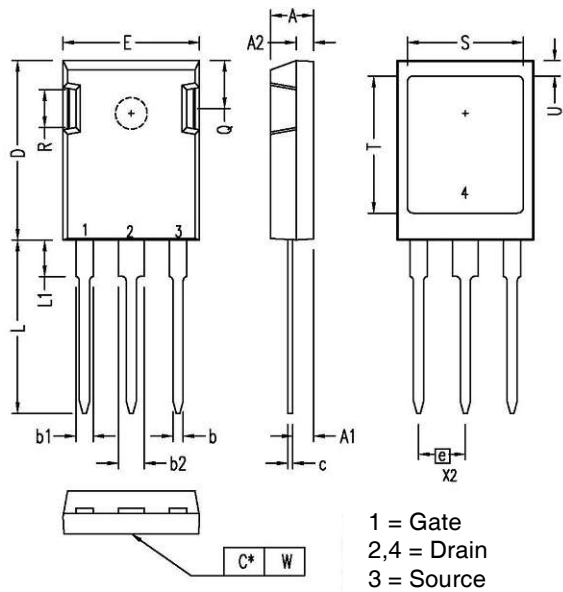


**Fig. 6. Normalized Breakdown & Threshold Voltages vs. Junction Temperature**



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

**Fig. 8. Input Admittance**

**Fig. 9. Transconductance**

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


**ISOPLUS247 (IXTR) Outline**


| 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  |

