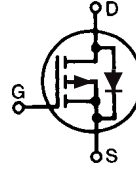


# TrenchP™ Power MOSFET

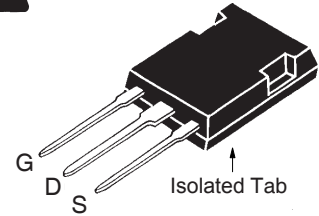
## IXTR120P20T

P-Channel Enhancement Mode  
Avalanche Rated  
Fast Intrinsic Rectifier



$$\begin{aligned} V_{DSS} &= -200V \\ I_{D25} &= -90A \\ R_{DS(on)} &\leq 32m\Omega \\ t_{rr} &\leq 300ns \end{aligned}$$

ISOPLUS247  
E153432



G = Gate      D = Drain  
S = Source

| Symbol     | Test Conditions                                                          | Maximum Ratings |                  |
|------------|--------------------------------------------------------------------------|-----------------|------------------|
| $V_{DSS}$  | $T_J = 25^\circ\text{C}$ to $150^\circ\text{C}$                          | - 200           | V                |
| $V_{DGR}$  | $T_J = 25^\circ\text{C}$ to $150^\circ\text{C}$ , $R_{GS} = 1M\Omega$    | - 200           | V                |
| $V_{GSS}$  | Continuous                                                               | $\pm 15$        | V                |
| $V_{GSM}$  | Transient                                                                | $\pm 25$        | V                |
| $I_{D25}$  | $T_C = 25^\circ\text{C}$                                                 | - 90            | A                |
| $I_{DM}$   | $T_C = 25^\circ\text{C}$ , Pulse Width Limited by $T_{JM}$               | - 400           | A                |
| $I_A$      | $T_C = 25^\circ\text{C}$                                                 | -100            | A                |
| $E_{AS}$   | $T_C = 25^\circ\text{C}$                                                 | 3               | J                |
| $dv/dt$    | $I_S \leq I_{DM}$ , $V_{DD} \leq V_{DSS}$ , $T_J \leq 150^\circ\text{C}$ | 10              | V/ns             |
| $P_D$      | $T_C = 25^\circ\text{C}$                                                 | 595             | 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 (0.062 in.) from Case for 10s                                      | 300             | $^\circ\text{C}$ |
| $T_{SOLD}$ | Plastic Body 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                |

### Features

- Silicon Chip on Direct-Copper Bond (DCB) Substrate
- Isolated Mounting Surface
- 2500V~ Electrical Isolation
- Avalanche Rated
- Extended FBSOA
- Fast Intrinsic Rectifier
- Low  $R_{DS(ON)}$  and  $Q_G$

### Advantages

- Easy to Mount
- Space Savings
- High Power Density

### Applications

- High-Side Switching
- Push Pull Amplifiers
- DC Choppers
- Automatic Test Equipment
- Current Regulators
- Battery Charger Applications

| Symbol       | Test Conditions<br>( $T_J = 25^\circ\text{C}$ Unless Otherwise Specified) | Characteristic Values |      |                               |
|--------------|---------------------------------------------------------------------------|-----------------------|------|-------------------------------|
|              |                                                                           | Min.                  | Typ. | Max.                          |
| $BV_{DSS}$   | $V_{GS} = 0V$ , $I_D = -250\mu A$                                         | - 200                 |      | V                             |
| $V_{GS(th)}$ | $V_{DS} = V_{GS}$ , $I_D = -250\mu A$                                     | - 2.5                 |      | - 4.5 V                       |
| $I_{GSS}$    | $V_{GS} = \pm 15V$ , $V_{DS} = 0V$                                        |                       |      | $\pm 200$ nA                  |
| $I_{DSS}$    | $V_{DS} = V_{DSS}$ , $V_{GS} = 0V$<br>$T_J = 125^\circ\text{C}$           |                       |      | - 25 $\mu A$<br>- 300 $\mu A$ |
| $R_{DS(on)}$ | $V_{GS} = -10V$ , $I_D = -60A$ , Note 1                                   |                       |      | 32 m $\Omega$                 |

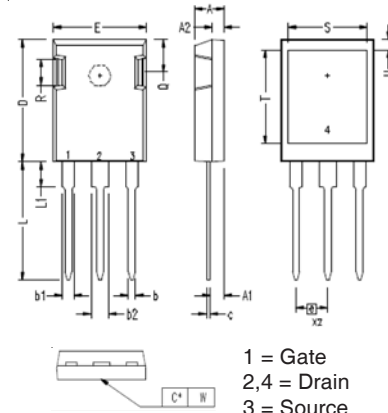
| Symbol       | Test Conditions<br>( $T_J = 25^\circ\text{C}$ Unless Otherwise Specified)                                                                     | Characteristic Values |      |                         |
|--------------|-----------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|------|-------------------------|
|              |                                                                                                                                               | Min.                  | Typ. | Max.                    |
| $g_{fs}$     | $V_{DS} = -10\text{V}$ , $I_D = -60\text{A}$ , Note 1                                                                                         | 85                    | 145  | S                       |
| $C_{iss}$    | $V_{GS} = 0\text{V}$ , $V_{DS} = -25\text{V}$ , $f = 1\text{MHz}$                                                                             |                       | 73   | nF                      |
| $C_{oss}$    |                                                                                                                                               |                       | 2550 | pF                      |
| $C_{rss}$    |                                                                                                                                               |                       | 480  | pF                      |
| $t_{d(on)}$  | <b>Resistive Switching Times</b><br>$V_{GS} = -10\text{V}$ , $V_{DS} = 0.5 \cdot V_{DSS}$ , $I_D = -60\text{A}$<br>$R_G = 1\Omega$ (External) |                       | 90   | ns                      |
| $t_r$        |                                                                                                                                               |                       | 85   | ns                      |
| $t_{d(off)}$ |                                                                                                                                               |                       | 200  | ns                      |
| $t_f$        |                                                                                                                                               |                       | 50   | ns                      |
| $Q_{g(on)}$  | $V_{GS} = -10\text{V}$ , $V_{DS} = 0.5 \cdot V_{DSS}$ , $I_D = -60\text{A}$                                                                   |                       | 740  | nC                      |
| $Q_{gs}$     |                                                                                                                                               |                       | 220  | nC                      |
| $Q_{gd}$     |                                                                                                                                               |                       | 120  | nC                      |
| $R_{thJC}$   |                                                                                                                                               |                       |      | 0.21 $^\circ\text{C/W}$ |
| $R_{thCS}$   |                                                                                                                                               |                       | 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.          |
| $I_S$    | $V_{GS} = 0\text{V}$                                                                                     |                       |      | -120 A        |
| $I_{SM}$ | Repetitive, Pulse Width Limited by $T_{JM}$                                                              |                       |      | -480 A        |
| $V_{SD}$ | $I_F = -100\text{A}$ , $V_{GS} = 0\text{V}$ , Note 1                                                     |                       |      | -1.4 V        |
| $t_{rr}$ | $I_F = -60\text{A}$ , $-di/dt = -100\text{A}/\mu\text{s}$<br>$V_R = -100\text{V}$ , $V_{GS} = 0\text{V}$ |                       |      | 300 ns        |
| $Q_{RM}$ |                                                                                                          |                       | 3.3  | $\mu\text{C}$ |
| $I_{RM}$ |                                                                                                          |                       | 25.6 | A             |

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

## 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  |

## PRELIMINARY TECHNICAL INFORMATION

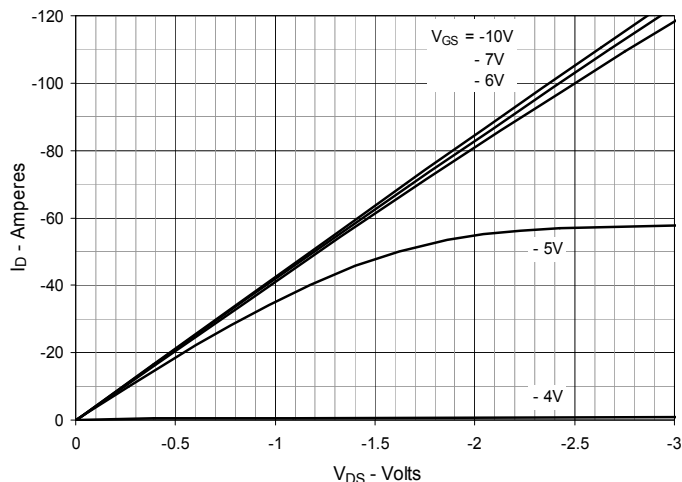
The product presented herein is under development. The Technical Specifications offered are derived from data gathered during objective characterizations of preliminary engineering lots; but also may yet contain some information supplied during a pre-production design evaluation. IXYS reserves the right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

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

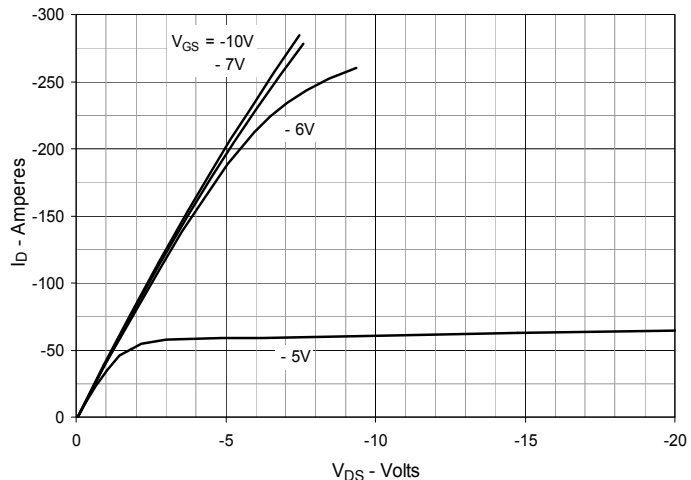
IXYS MOSFETs and IGBTs are covered by one or more of the following U.S. patents:

|           |           |           |           |              |              |              |              |              |             |
|-----------|-----------|-----------|-----------|--------------|--------------|--------------|--------------|--------------|-------------|
| 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    |             |

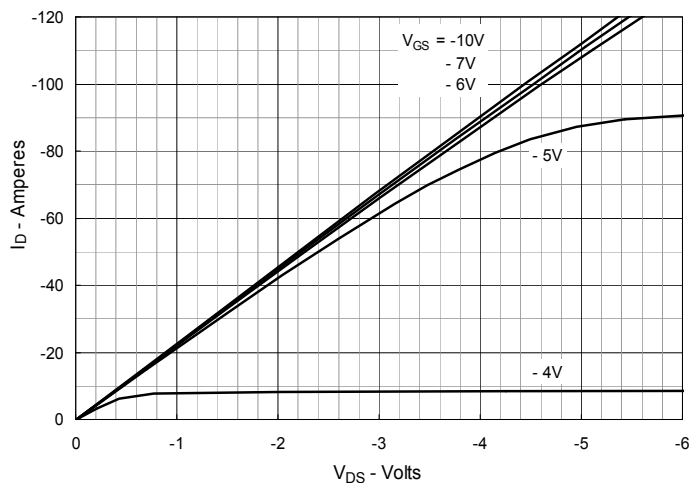
**Fig. 1. Output Characteristics @  $T_J = 25^\circ\text{C}$**



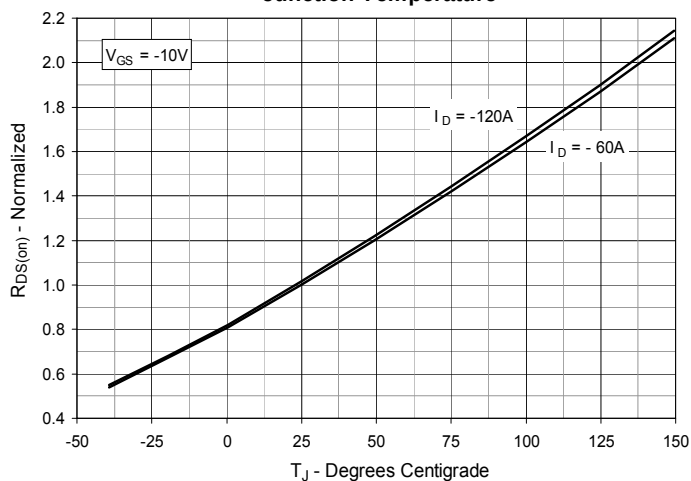
**Fig. 2. Extended Output Characteristics @  $T_J = 25^\circ\text{C}$**



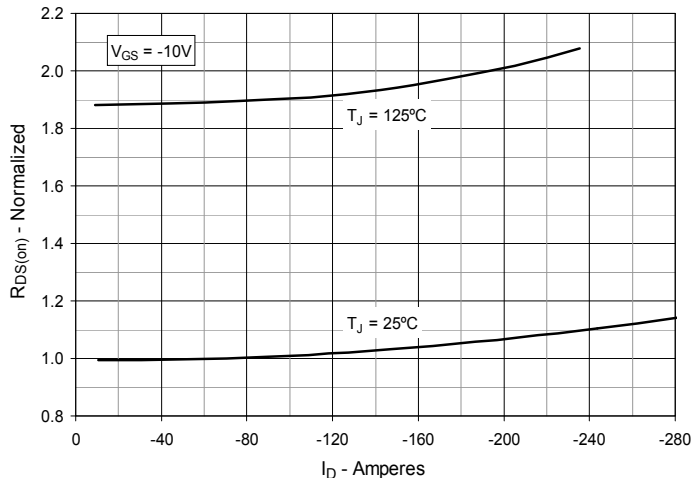
**Fig. 3. Output Characteristics @  $T_J = 125^\circ\text{C}$**



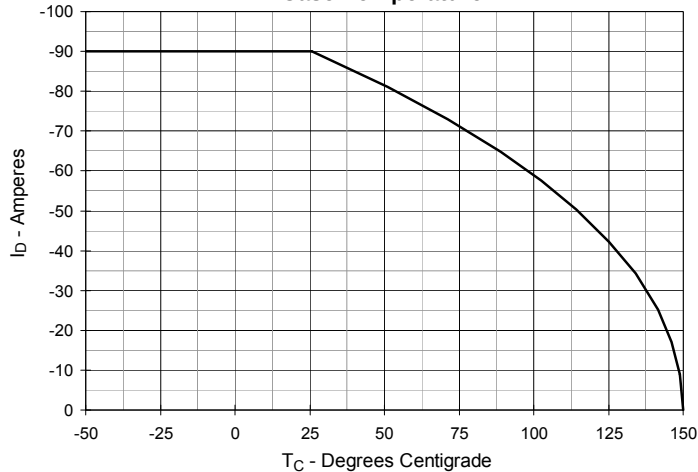
**Fig. 4.  $R_{DS(on)}$  Normalized to  $I_D = -60\text{A}$  Value vs. Junction Temperature**

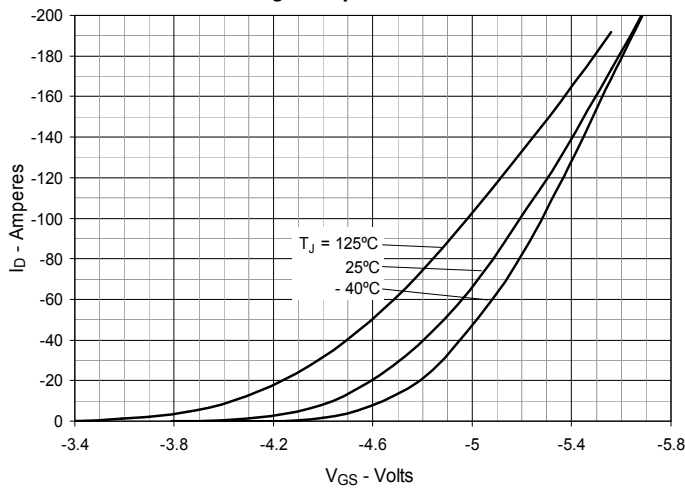
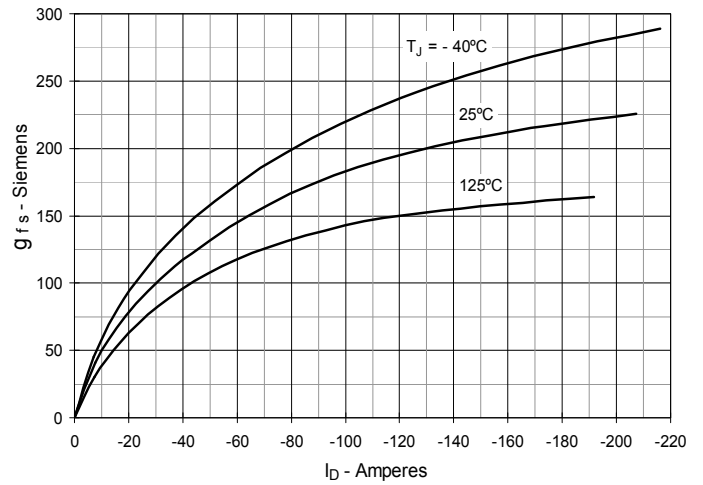
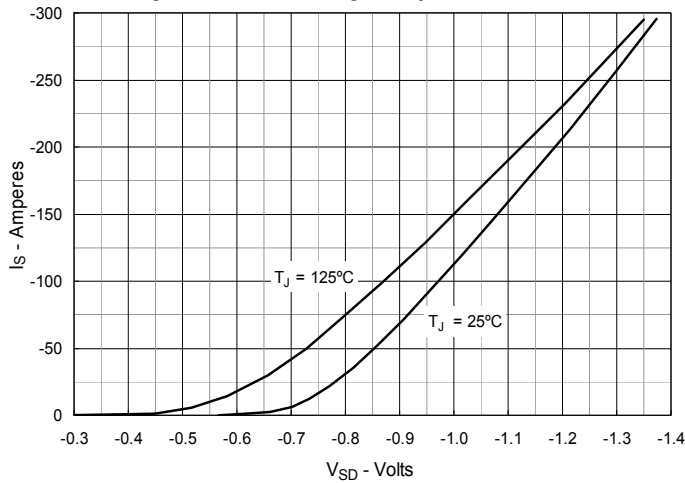
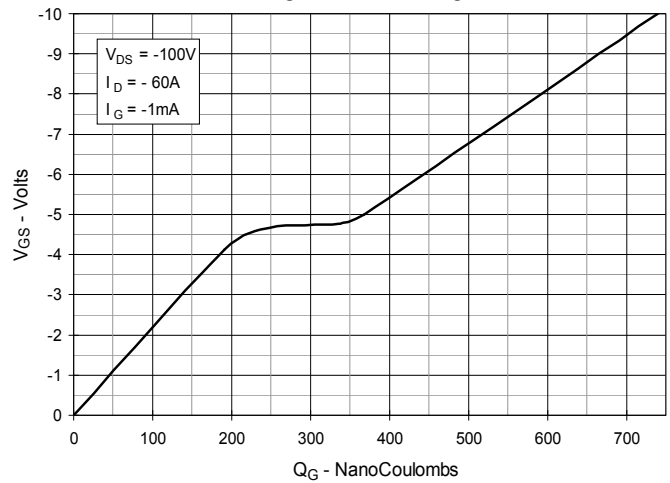
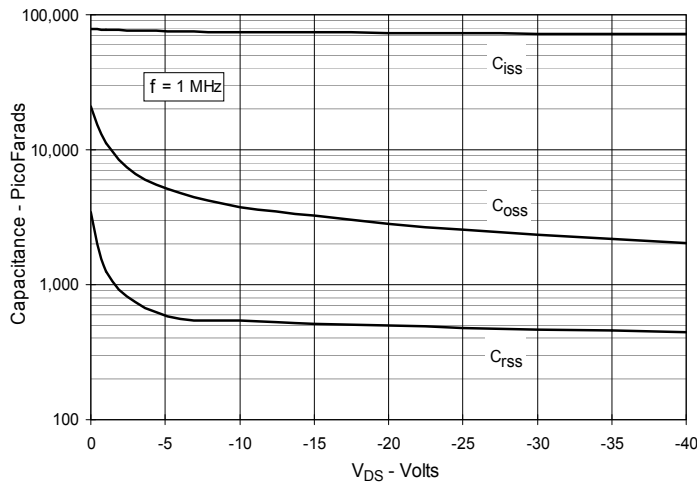
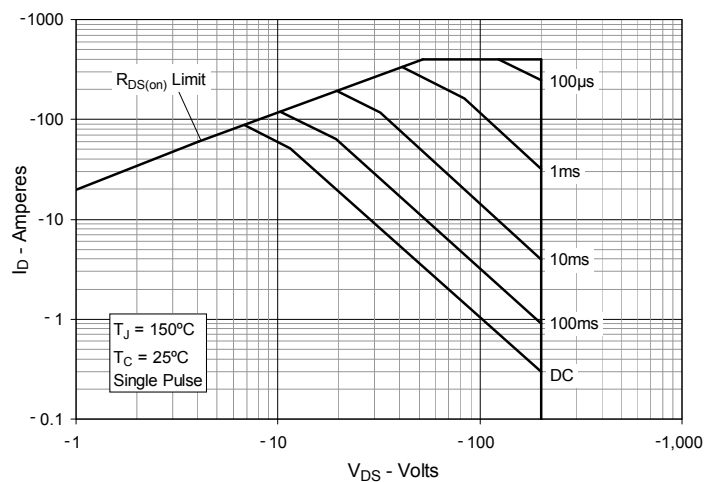


**Fig. 5.  $R_{DS(on)}$  Normalized to  $I_D = -60\text{A}$  Value vs. Drain Current**

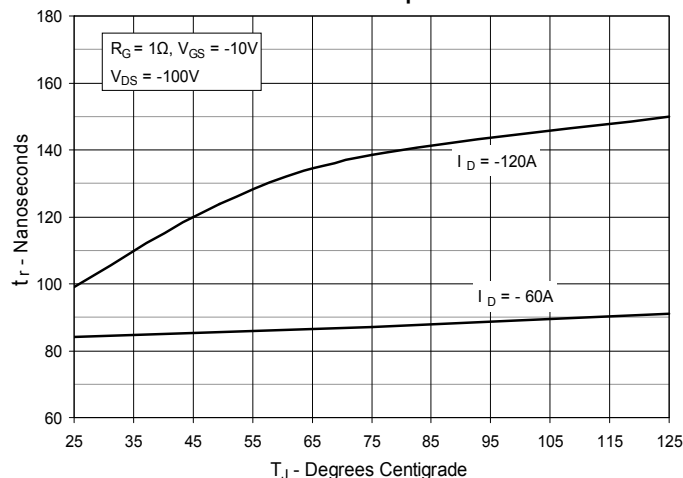


**Fig. 6. Maximum Drain Current vs. Case Temperature**

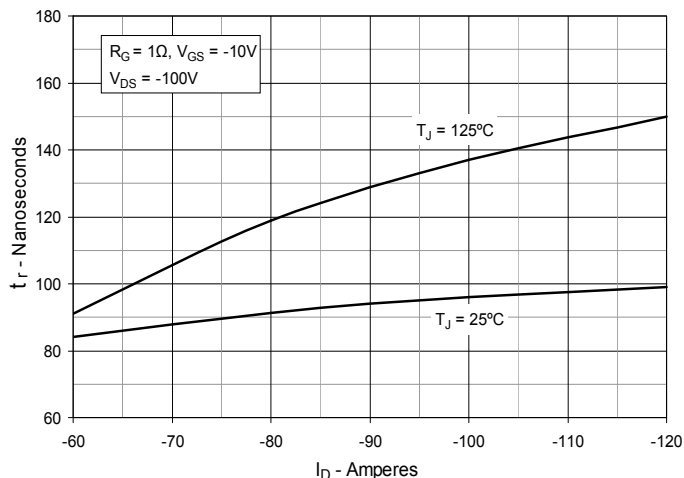


**Fig. 7. Input Admittance**

**Fig. 8. Transconductance**

**Fig. 9. Forward Voltage Drop of Intrinsic Diode**

**Fig. 10. Gate Charge**

**Fig. 11. Capacitance**

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


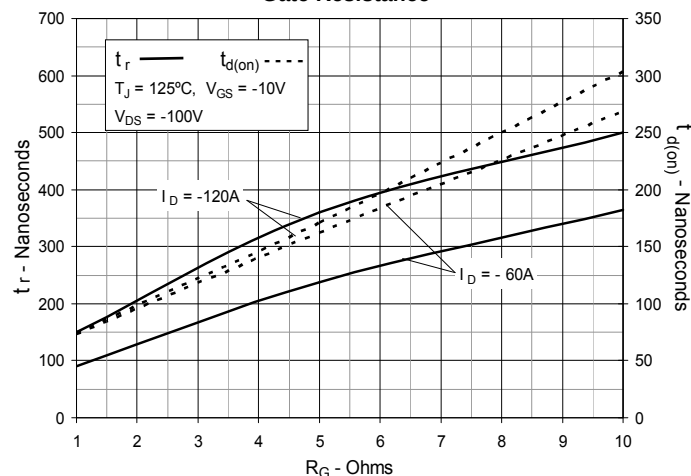
**Fig. 13. Resistive Turn-on Rise Time vs. Junction Temperature**



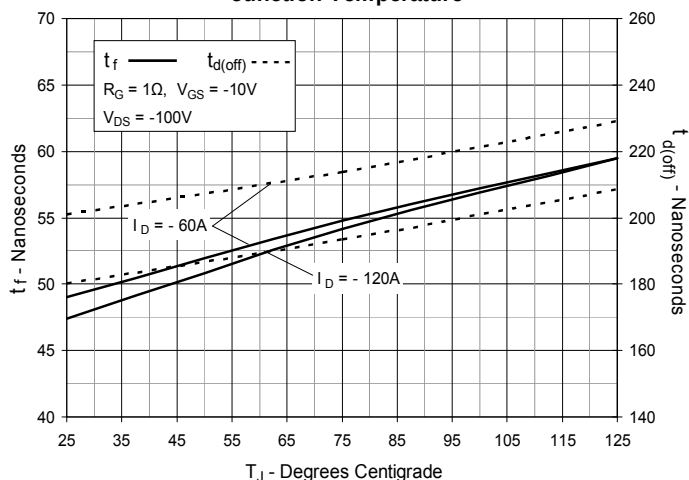
**Fig. 14. Resistive Turn-on Rise Time vs. Drain Current**



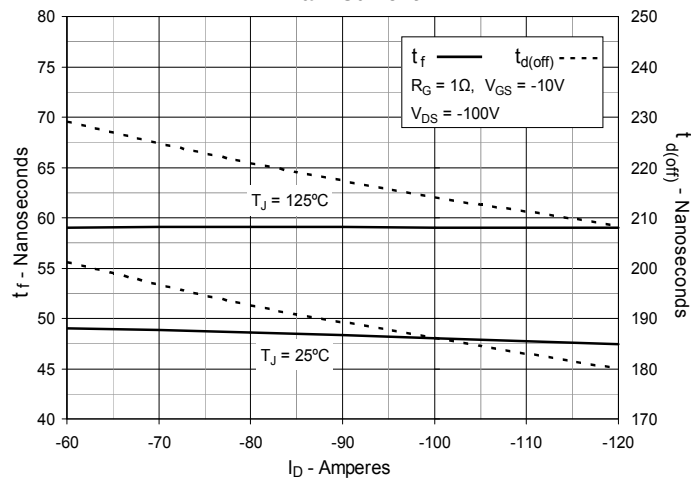
**Fig. 15. Resistive Turn-on Switching Times vs. Gate Resistance**



**Fig. 16. Resistive Turn-off Switching Times vs. Junction Temperature**



**Fig. 17. Resistive Turn-off Switching Times vs. Drain Current**



**Fig. 18. Resistive Turn-off Switching Times vs. Gate Resistance**

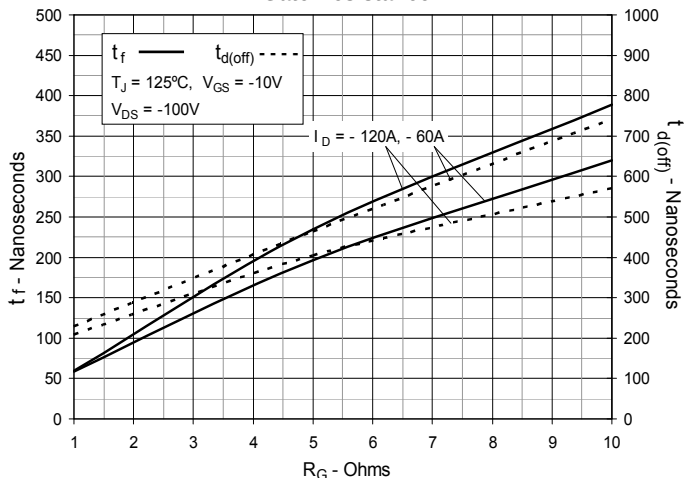
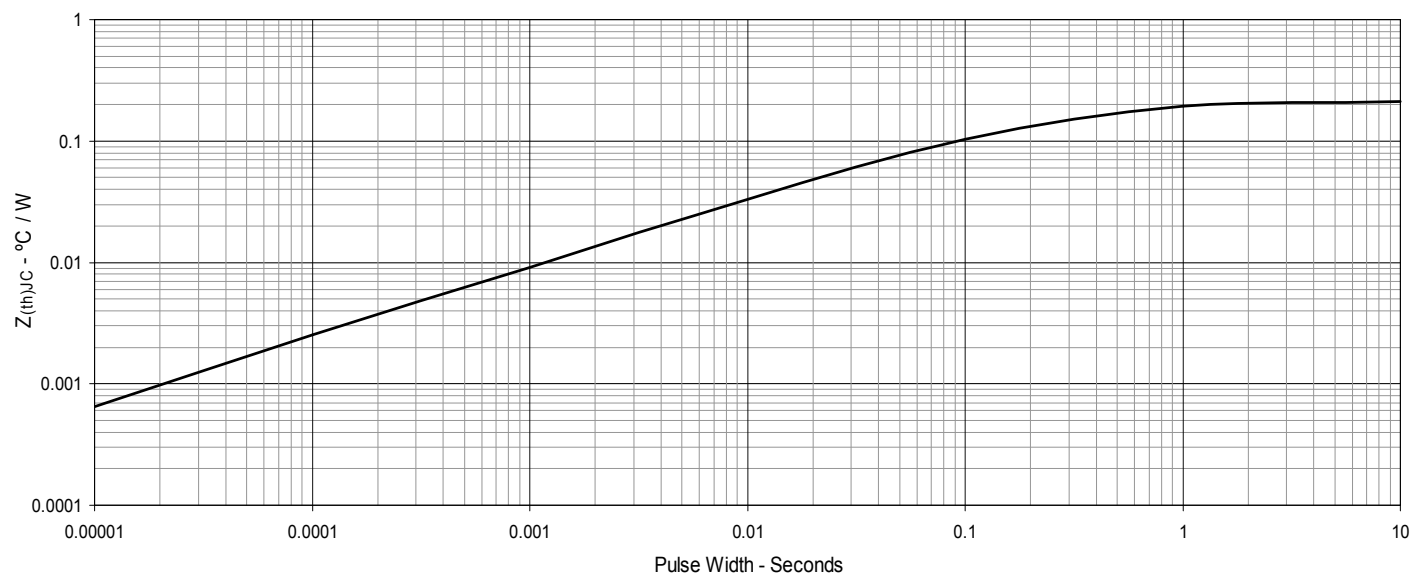


Fig. 19. Maximum Transient Thermal Impedance





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