

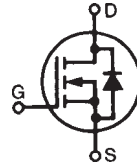
**TrenchT2™**  
**Power MOSFET**
**IXTA140N12T2**  
**IXTP140N12T2**

$$V_{DSS} = 120V$$

$$I_{D25} = 140A$$

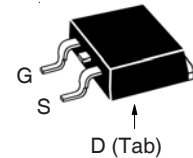
$$R_{DS(on)} \leq 10m\Omega$$

N-Channel Enhancement Mode  
 Avalanche Rated  
 Fast Intrinsic Rectifier

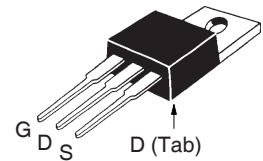


| Symbol     | Test Conditions   | Maximum Ratings |            |
|------------|---|-----------------|------------|
| $V_{DSS}$  | $T_J = 25^\circ C$ to $175^\circ C$                       | 120             | V          |
| $V_{DGR}$  | $T_J = 25^\circ C$ to $175^\circ C$ , $R_{GS} = 1M\Omega$ | 120             | V          |
| $V_{GSS}$  | Continuous  | $\pm 20$        | V          |
| $V_{GSM}$  | Transient   | $\pm 30$        | V          |
| $I_{D25}$  | $T_C = 25^\circ C$  | 140             | A          |
| $I_{DM}$   | $T_C = 25^\circ C$ , Pulse Width Limited by $T_{JM}$      | 350             | A          |
| $I_A$      | $T_C = 25^\circ C$  | 70              | A          |
| $E_{AS}$   | $T_C = 25^\circ C$  | 1.3             | J          |
| $P_D$      | $T_C = 25^\circ C$  | 577             | W          |
| $T_J$      |   | -55 ... +175    | $^\circ C$ |
| $T_{JM}$   |   | 175             | $^\circ C$ |
| $T_{stg}$  |   | -55 ... +175    | $^\circ C$ |
| $T_L$      | Maximum Lead Temperature for Soldering                    | 300             | $^\circ C$ |
| $T_{SOLD}$ | Plastic Body for 10s                                      | 260             | $^\circ C$ |
| $M_d$      | Mounting Torque (TO-220)                                  | 1.13 / 10       | Nm/lb.in.  |
| Weight     | TO-263  | 2.5             | g          |
|            | TO-220  | 3.0             | g          |

TO-263AA (IXTA)



TO-220AB (IXTP)



G = Gate      D = Drain  
 S = Source    Tab = Drain

**Features**

- International Standard Packages
- $175^\circ C$  Operating Temperature
- Avalanche Rated
- Low  $R_{DS(on)}$
- Fast Intrinsic Rectifier
- High Current Handling Capability

**Advantages**

- Easy to Mount
- Space Savings
- High Power Density

**Applications**

- Synchronous Rectification
- DC/DC Converters and Off-Line UPS
- Primary- Side Switch
- High Current Switching Applications

| Symbol       | Test Conditions<br>( $T_J = 25^\circ C$ Unless Otherwise Specified) | Characteristic Values |      |               |
|--------------|---|-----------------------|------|---------------|
|              |   | Min.                  | Typ. | Max.          |
| $BV_{DSS}$   | $V_{GS} = 0V$ , $I_D = 250\mu A$                                    | 120                   |      | V             |
| $V_{GS(th)}$ | $V_{DS} = V_{GS}$ , $I_D = 250\mu A$                                | 2.5                   |      | 4.5 V         |
| $I_{GSS}$    | $V_{GS} = \pm 20V$ , $V_{DS} = 0V$                                  |                       |      | $\pm 200$ nA  |
| $I_{DSS}$    | $V_{DS} = V_{DSS}$ , $V_{GS} = 0V$<br><br>$T_J = 150^\circ C$       |                       |      | 10 $\mu A$    |
|              |   |                       |      | 500 $\mu A$   |
| $R_{DS(on)}$ | $V_{GS} = 10V$ , $I_D = 0.5 \cdot I_{D25}$ , Notes 1, 2             | 8                     |      | 10 m $\Omega$ |

| Symbol       | Test Conditions<br>( $T_J = 25^\circ\text{C}$ , Unless Otherwise Specified)  | Characteristic Values |      |                        |
|--------------|--|-----------------------|------|------------------------|
|              |  | Min.                  | Typ. | Max.                   |
| $g_{fs}$     | $V_{DS} = 10\text{V}$ , $I_D = 0.5 \cdot I_{D25}$ , Note 1   | 66                    | 110  | S                      |
| $C_{iss}$    | $V_{GS} = 0\text{V}$ , $V_{DS} = 25\text{V}$ , $f = 1\text{MHz}$   |                       | 9700 | pF                     |
| $C_{oss}$    |  |                       | 850  | pF                     |
| $C_{rss}$    |  |                       | 58   | pF                     |
| $t_{d(on)}$  | <b>Resistive Switching Times</b><br>$V_{GS} = 10\text{V}$ , $V_{DS} = 0.5 \cdot V_{DSS}$ , $I_D = 0.5 \cdot I_{D25}$<br>$R_G = 2\Omega$ (External) |                       | 27   | ns                     |
| $t_r$        |  |                       | 30   | ns                     |
| $t_{d(off)}$ |  |                       | 39   | ns                     |
| $t_f$        |  |                       | 17   | ns                     |
| $Q_{g(on)}$  | $V_{GS} = 10\text{V}$ , $V_{DS} = 0.5 \cdot V_{DSS}$ , $I_D = 0.5 \cdot I_{D25}$   |                       | 174  | nC                     |
| $Q_{gs}$     |  |                       | 52   | nC                     |
| $Q_{gd}$     |  |                       | 40   | nC                     |
| $R_{thJC}$   | TO-220   |                       | 0.50 | $0.26^\circ\text{C/W}$ |
| $R_{thCH}$   |  |                       |      | $^\circ\text{C/W}$     |

### Source-Drain Diode

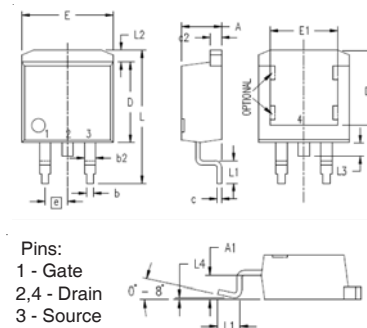
| Symbol   | Test Conditions<br>( $T_J = 25^\circ\text{C}$ , Unless Otherwise Specified)                                  | Characteristic Values |      |       |
|----------|--|-----------------------|------|-------|
|          |  | Min.                  | Typ. | Max.  |
| $I_S$    | $V_{GS} = 0\text{V}$   |                       |      | 140 A |
| $I_{SM}$ | Repetitive, Pulse Width Limited by $T_{JM}$  |                       |      | 560 A |
| $V_{SD}$ | $I_F = I_S$ , $V_{GS} = 0\text{V}$ , Note 1  |                       |      | 1.4 V |
| $t_{rr}$ | $I_F = 0.5 \cdot I_{D25}$ , $V_{GS} = 0\text{V}$<br>$-di/dt = 100\text{A}/\mu\text{s}$<br>$V_R = 60\text{V}$ |                       | 65   | ns    |
| $I_{RM}$ |  |                       | 13   | A     |
| $Q_{RM}$ |  |                       | 430  | nC    |

- Notes: 1. Pulse test,  $t \leq 300\mu\text{s}$ , duty cycle,  $d \leq 2\%$ .  
2. On through-hole packages,  $R_{DS(on)}$  Kelvin test contact location must be 5mm or less from the package body.

### ADVANCE TECHNICAL INFORMATION

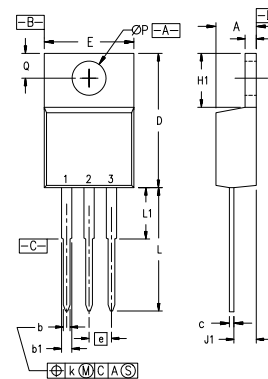
The product presented herein is under development. The Technical Specifications offered are derived from a subjective evaluation of the design, based upon prior knowledge and experience, and constitute a "considered reflection" of the anticipated result. IXYS reserves the right to change limits, test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

### TO-263 Outline



| SYM | INCHES   |      | MILLIMETERS |       |
|-----|----------|------|-------------|-------|
|     | MIN      | MAX  | MIN         | MAX   |
| A   | .160     | .190 | 4.06        | 4.83  |
| A1  | .080     | .110 | 2.03        | 2.79  |
| b   | .020     | .039 | 0.51        | 0.99  |
| b2  | .045     | .055 | 1.14        | 1.40  |
| c   | .016     | .029 | 0.40        | 0.74  |
| c2  | .045     | .055 | 1.14        | 1.40  |
| D   | .340     | .380 | 8.64        | 9.65  |
| D1  | .315     | .350 | 8.00        | 8.89  |
| E   | .380     | .410 | 9.65        | 10.41 |
| E1  | .245     | .320 | 6.22        | 8.13  |
| e   | .100 BSC |      | 2.54 BSC    |       |
| L   | .575     | .625 | 14.61       | 15.88 |
| L1  | .090     | .110 | 2.29        | 2.79  |
| L2  | .040     | .055 | 1.02        | 1.40  |
| L3  | .050     | .070 | 1.27        | 1.78  |
| L4  | 0        | .005 | 0           | 0.13  |

### TO-220 Outline



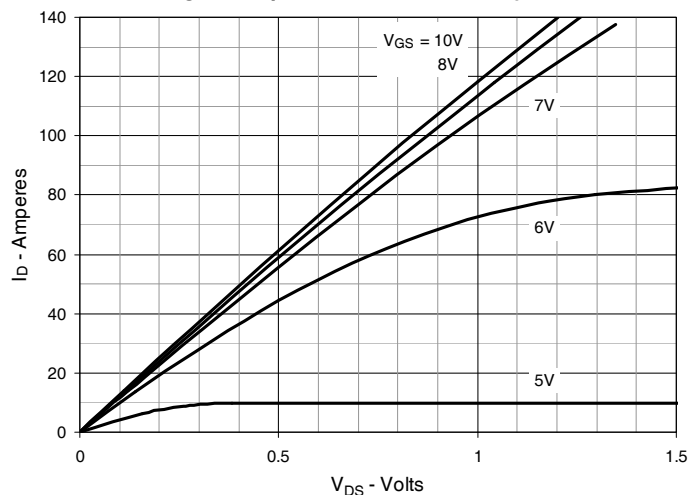
- Pins: 1 - Gate 2 - Drain  
3 - Source

| SYM | INCHES   |      | MILLIMETERS |       |
|-----|----------|------|-------------|-------|
|     | MIN      | MAX  | MIN         | MAX   |
| A   | .170     | .190 | 4.32        | 4.83  |
| b   | .025     | .040 | 0.64        | 1.02  |
| b1  | .045     | .065 | 1.15        | 1.65  |
| c   | .014     | .022 | 0.35        | 0.56  |
| D   | .580     | .630 | 14.73       | 16.00 |
| E   | .390     | .420 | 9.91        | 10.66 |
| e   | .100 BSC |      | 2.54 BSC    |       |
| F   | .045     | .055 | 1.14        | 1.40  |
| H1  | .230     | .270 | 5.85        | 6.85  |
| J1  | .090     | .110 | 2.29        | 2.79  |
| k   | 0        | .015 | 0           | 0.38  |
| L   | .500     | .550 | 12.70       | 13.97 |
| L1  | .110     | .230 | 2.79        | 5.84  |
| ØP  | .139     | .161 | 3.53        | 4.08  |
| Q   | .100     | .125 | 2.54        | 3.18  |

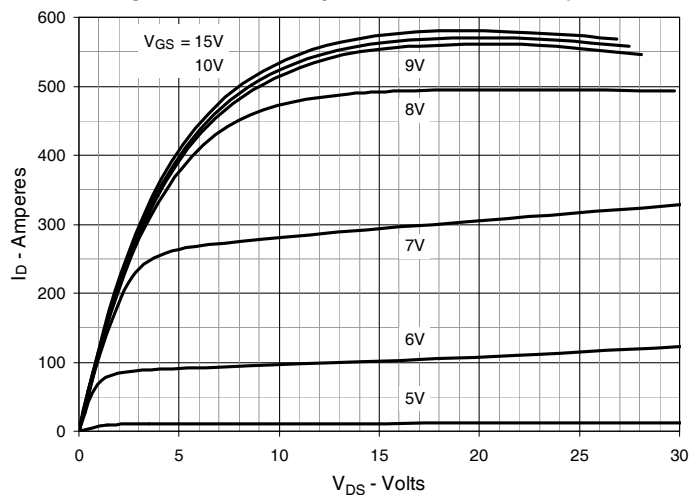
IXYS Reserves the Right to Change Limits, Test Conditions, and Dimensions.

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

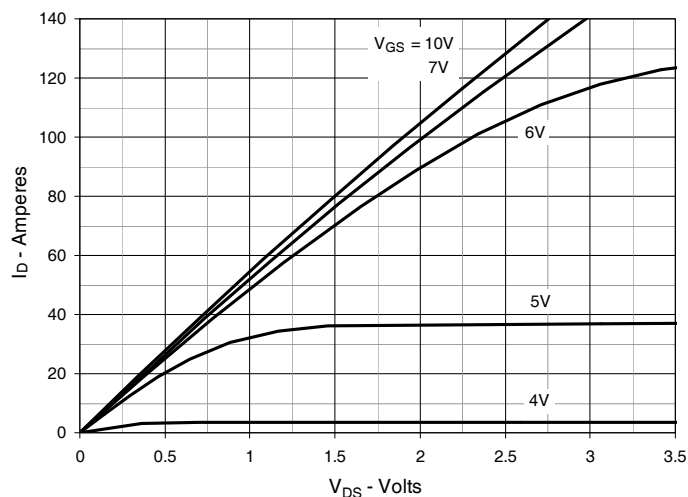
**Fig. 1. Output Characteristics @  $T_J = 25^\circ\text{C}$**



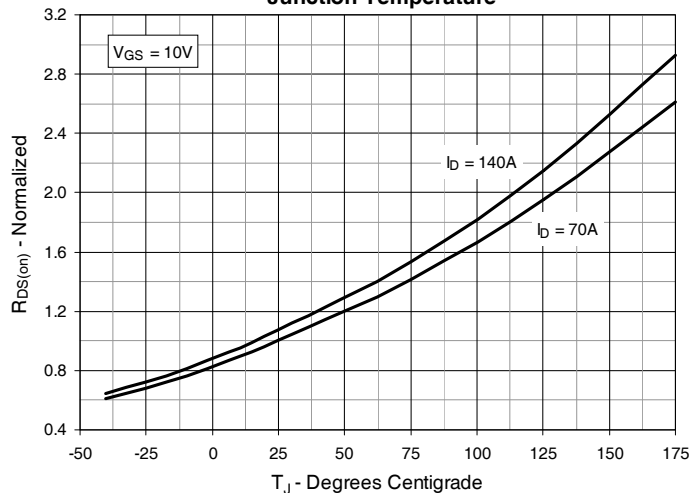
**Fig. 2. Extended Output Characteristics @  $T_J = 25^\circ\text{C}$**



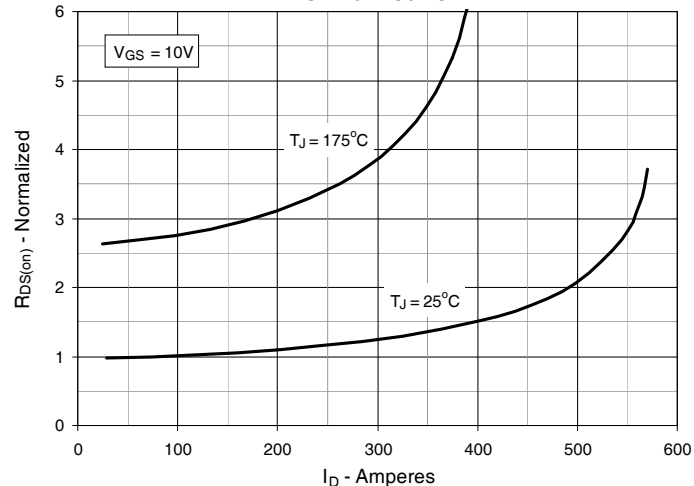
**Fig. 3. Output Characteristics @  $T_J = 150^\circ\text{C}$**



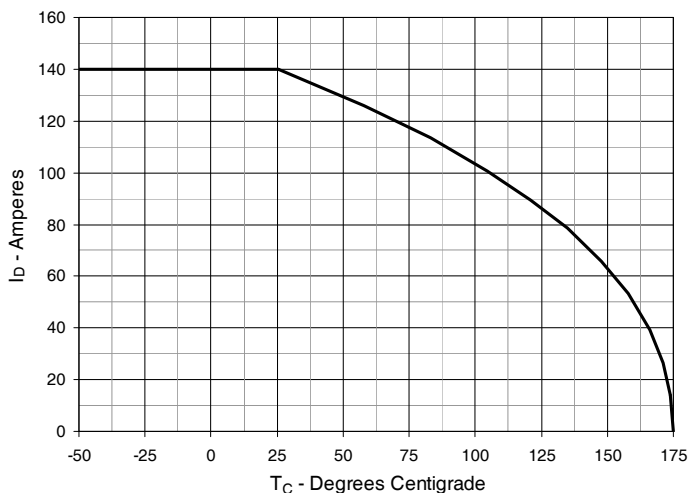
**Fig. 4. Normalized  $R_{DS(on)}$  to  $I_D = 70\text{A}$  Value vs. Junction Temperature**



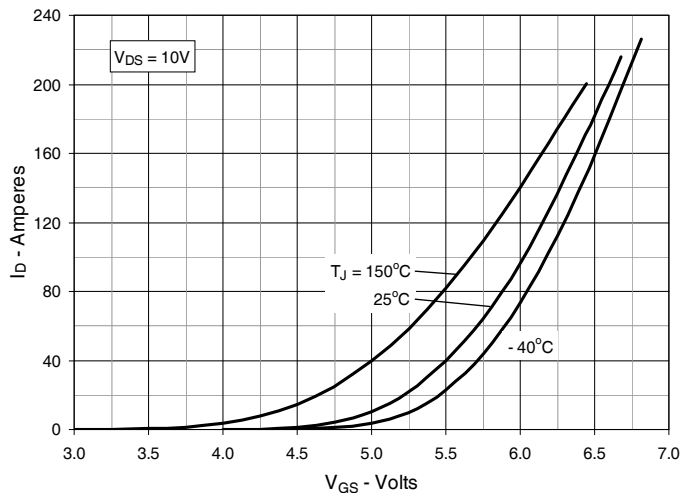
**Fig. 5. Normalized  $R_{DS(on)}$  to  $I_D = 70\text{A}$  vs. Drain Current**



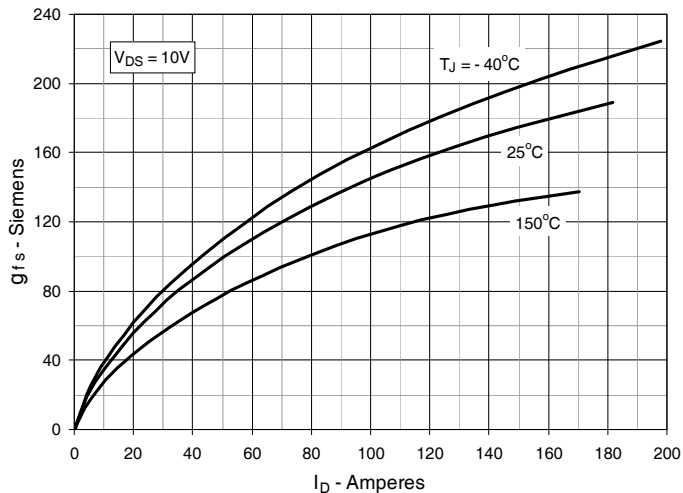
**Fig. 6. Drain Current vs. Case Temperature**



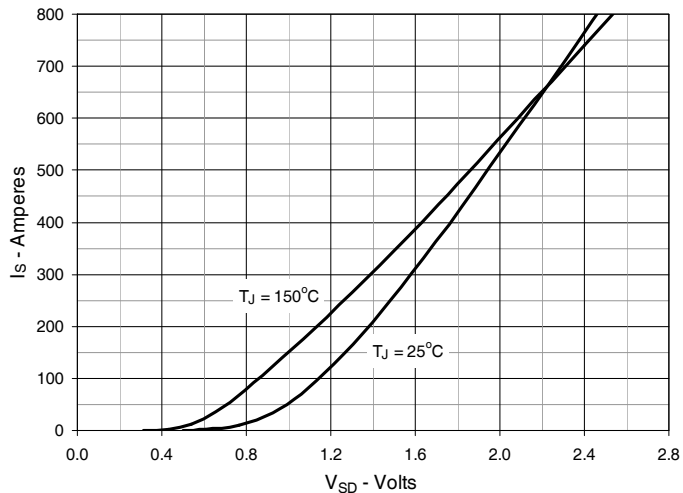
**Fig. 7. Input Admittance**



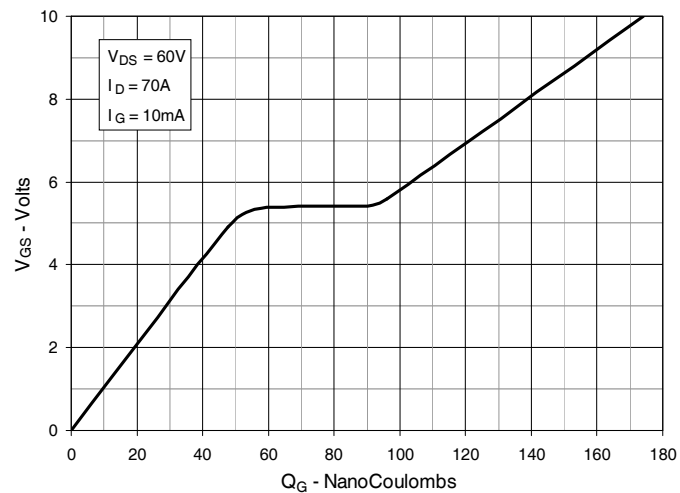
**Fig. 8. Transconductance**



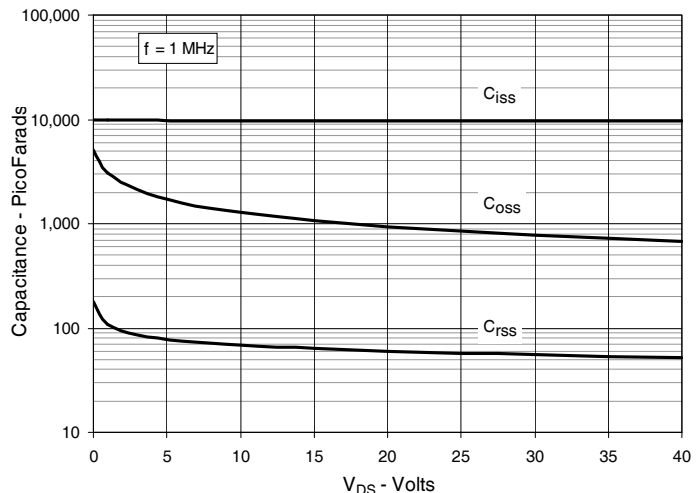
**Fig. 9. Forward Voltage Drop of Intrinsic Diode**



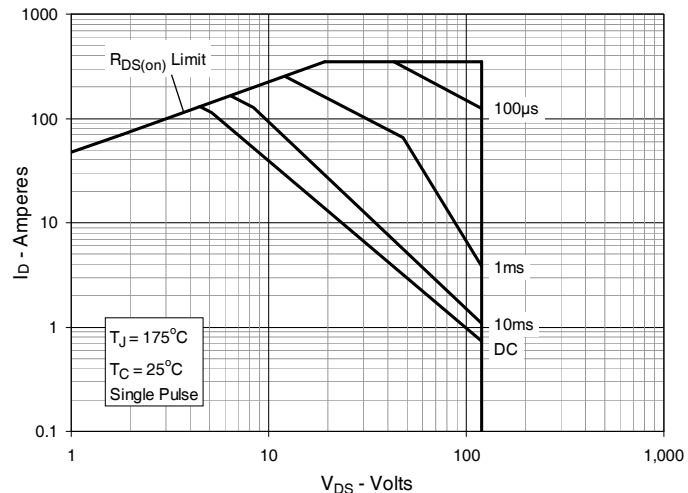
**Fig. 10. Gate Charge**



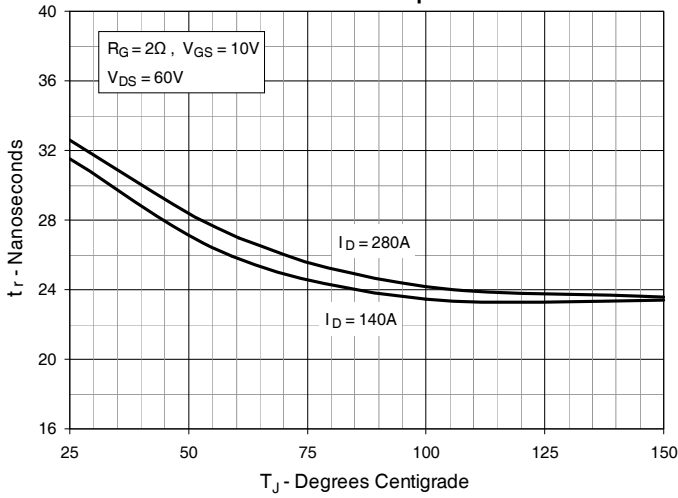
**Fig. 11. Capacitance**



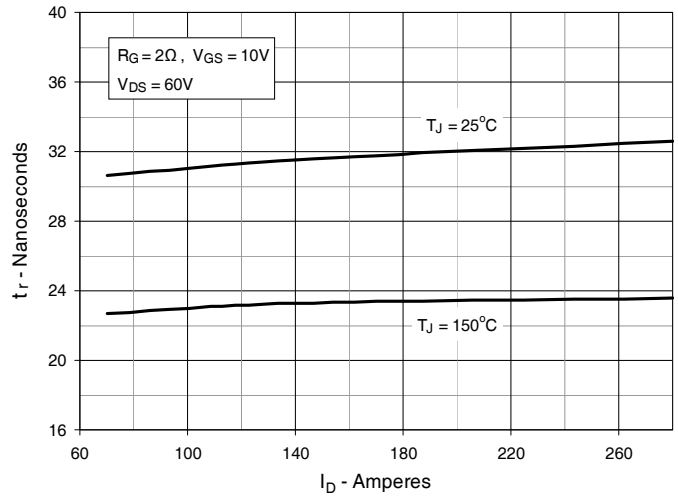
**Fig. 12. Forward-Bias Safe Operating Area**



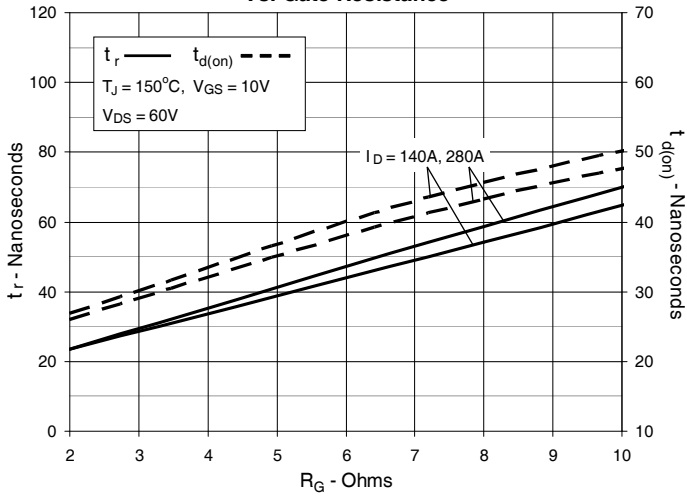
**Fig. 13. Resistive Turn-on Rise Time vs. Junction Temperature**



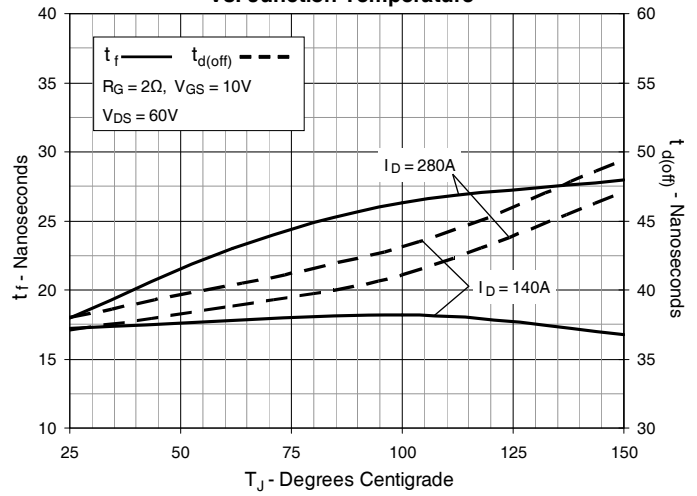
**Fig. 14. Resistive Turn-on Rise Time vs. Drain Current**



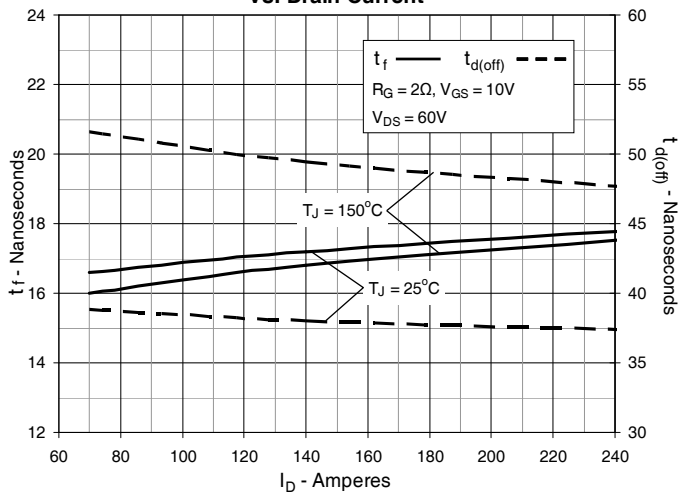
**Fig. 15. Resistive Turn-on Switching Times vs. Gate Resistance**



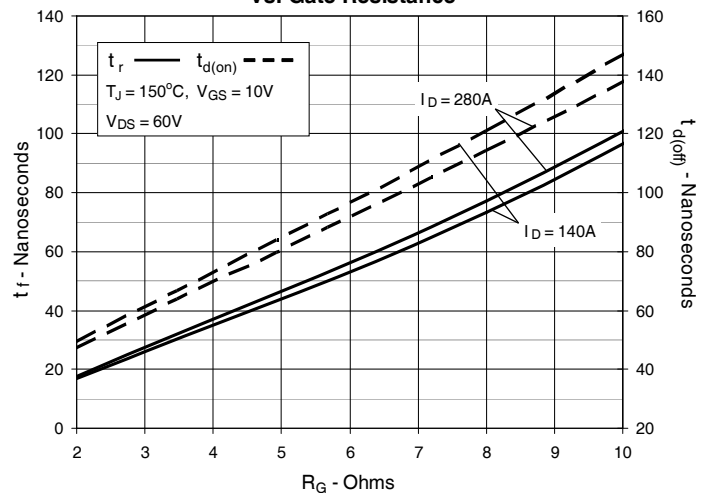
**Fig. 16. Resistive Turn-off Switching Times vs. Junction Temperature**

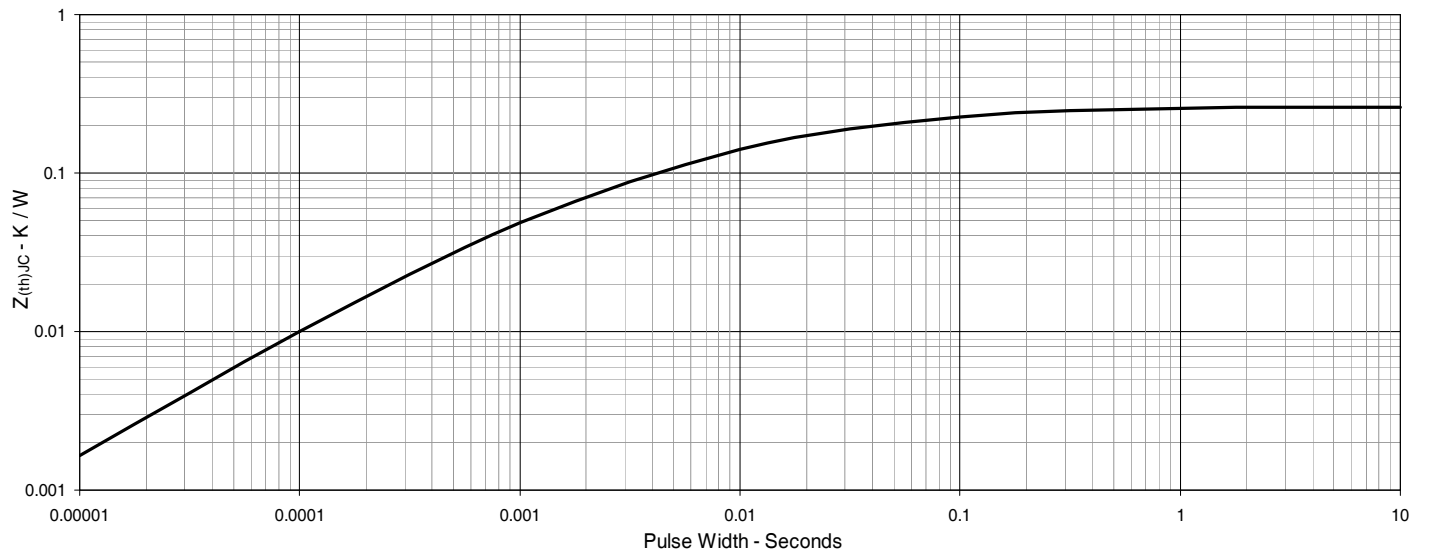


**Fig. 17. Resistive Turn-off Switching Times vs. Drain Current**



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



**Fig. 19. Maximum Transient Thermal Impedance**



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