

# TrenchT2™ Power MOSFET

## IXTA300N04T2 IXTP300N04T2

$$V_{DSS} = 40V$$

$$I_{D25} = 300A$$

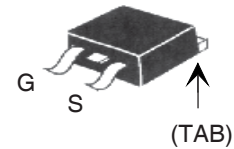
$$R_{DS(on)} \leq 2.5m\Omega$$

N-Channel Enhancement Mode  
Avalanche Rated

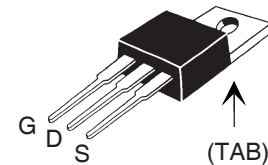


| Symbol     | Test Conditions   | Maximum Ratings |            |
|------------|---|-----------------|------------|
| $V_{DSS}$  | $T_J = 25^\circ C$ to $175^\circ C$                       | 40              | V          |
| $V_{DGR}$  | $T_J = 25^\circ C$ to $175^\circ C$ , $R_{GS} = 1M\Omega$ | 40              | V          |
| $V_{GSM}$  | Transient   | $\pm 20$        | V          |
| $I_{D25}$  | $T_C = 25^\circ C$  | 300             | A          |
| $I_{LRMS}$ | Lead Current Limit, RMS                                   | 75              | A          |
| $I_{DM}$   | $T_C = 25^\circ C$ , pulse width limited by $T_{JM}$      | 900             | A          |
| $I_A$      | $T_C = 25^\circ C$  | 100             | A          |
| $E_{AS}$   | $T_C = 25^\circ C$  | 600             | mJ         |
| $P_D$      | $T_C = 25^\circ C$  | 480             | W          |
| $T_J$      |   | -55 ... +175    | $^\circ C$ |
| $T_{JM}$   |   | 175             | $^\circ C$ |
| $T_{stg}$  |   | -55 ... +175    | $^\circ C$ |
| $T_L$      | 1.6mm (0.062in.) from case for 10s                        | 300             | $^\circ C$ |
| $T_{sold}$ | Plastic body for 10 seconds                               | 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-263 (IXTA)



TO-220 (IXTP)



G = Gate      D = Drain  
S = Source    TAB = Drain

### Features

- International standard packages
- 175°C Operating Temperature
- Avalanche rated
- High current handling capability
- Low  $R_{DS(on)}$

### Advantages

- Easy to mount
- Space savings
- High power density

### Applications

- Synchronous Buck Converters
- High Current Switching Power Supplies
- Battery Powered Electric Motors
- Resonant-mode power supplies
- Electronics Ballast Application
- Class D Audio Amplifiers

| Symbol       | Test Conditions<br>( $T_J = 25^\circ C$ unless otherwise specified) | Characteristic Values |      |               |
|--------------|---|-----------------------|------|---------------|
|              |   | Min.                  | Typ. | Max.          |
| $BV_{DSS}$   | $V_{GS} = 0V$ , $I_D = 250\mu A$                                    | 40                    |      | V             |
| $V_{GS(th)}$ | $V_{DS} = V_{GS}$ , $I_D = 250\mu A$                                | 2.0                   |      | 4.0 V         |
| $I_{GSS}$    | $V_{GS} = \pm 20V$ , $V_{DS} = 0V$                                  |                       |      | $\pm 200$ nA  |
| $I_{DSS}$    | $V_{DS} = V_{DSS}$  |                       |      | 5 $\mu A$     |
|              | $V_{GS} = 0V$ $T_J = 150^\circ C$                                   |                       |      | 150 $\mu A$   |
| $R_{DS(on)}$ | $V_{GS} = 10V$ , $I_D = 0.5 \cdot I_{D25}$ , Notes 1, 2             |                       |      | 2.5 $m\Omega$ |

| 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   | 55                    | 94   | S                       |
| $C_{iss}$    | $V_{GS} = 0\text{V}, V_{DS} = 25\text{V}, f = 1\text{MHz}$   |                       | 10.7 | nF                      |
| $C_{oss}$    |  |                       | 1630 | pF                      |
| $C_{rss}$    |  |                       | 263  | pF                      |
| $t_{d(on)}$  | <b>Resistive Switching Times</b><br>$V_{GS} = 10\text{V}, V_{DS} = 0.5 \cdot V_{DSS}, I_D = 100\text{A}$<br>$R_G = 2\Omega$ (External) |                       | 22   | ns                      |
| $t_r$        |  |                       | 17   | ns                      |
| $t_{d(off)}$ |  |                       | 32   | ns                      |
| $t_f$        |  |                       | 13   | ns                      |
| $Q_{g(on)}$  | $V_{GS} = 10\text{V}, V_{DS} = 0.5 \cdot V_{DSS}, I_D = 0.5 \cdot I_{D25}$   |                       | 145  | nC                      |
| $Q_{gs}$     |  |                       | 44   | nC                      |
| $Q_{gd}$     |  |                       | 36   | nC                      |
| $R_{thJC}$   |  |                       |      | 0.31 $^\circ\text{C/W}$ |
| $R_{thCH}$   | TO-220   | 0.50                  |      | $^\circ\text{C/W}$      |

### Source-Drain Diode

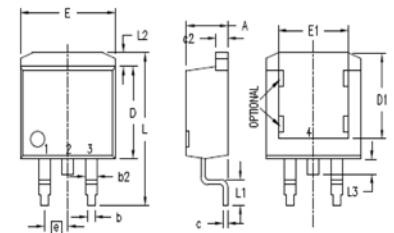
| Symbol   | Test Conditions<br>( $T_J = 25^\circ\text{C}$ , unless otherwise specified)                         | Characteristic Values |      |        |
|----------|---|-----------------------|------|--------|
|          |   | Min.                  | Typ. | Max.   |
| $I_S$    | $V_{GS} = 0\text{V}$  |                       |      | 300 A  |
| $I_{SM}$ | Repetitive, Pulse width limited by $T_{JM}$   |                       |      | 1000 A |
| $V_{SD}$ | $I_F = 100\text{A}, V_{GS} = 0\text{V}$ , Note 1  |                       |      | 1.3 V  |
| $t_{rr}$ | $I_F = 150\text{A}, V_{GS} = 0\text{V}$<br>$-di/dt = 100\text{A}/\mu\text{s}$<br>$V_R = 20\text{V}$ |                       | 53   | ns     |
| $I_{RM}$ |   |                       | 1.8  | A      |
| $Q_{RM}$ |   |                       | 47.7 | 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.

### 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.

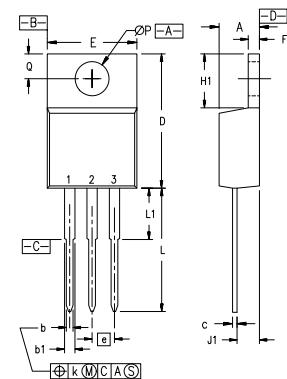
### TO-263 (IXTA) Outline



- GATE
  - DRAIN (COLLECTOR)
  - SOURCE (EMITTER)
  - DRAIN (COLLECTOR)
- BOTTOM SIDE

| 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 (IXTP) Outline



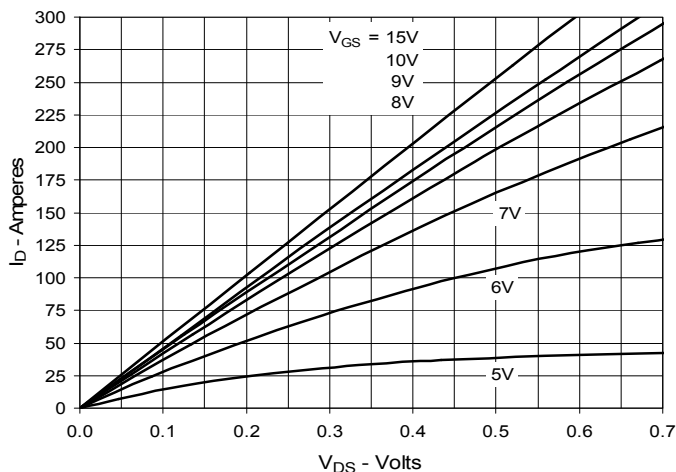
- Pins: 1 - Gate  
2 - Drain  
3 - Source  
4 - Drain

| 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  |

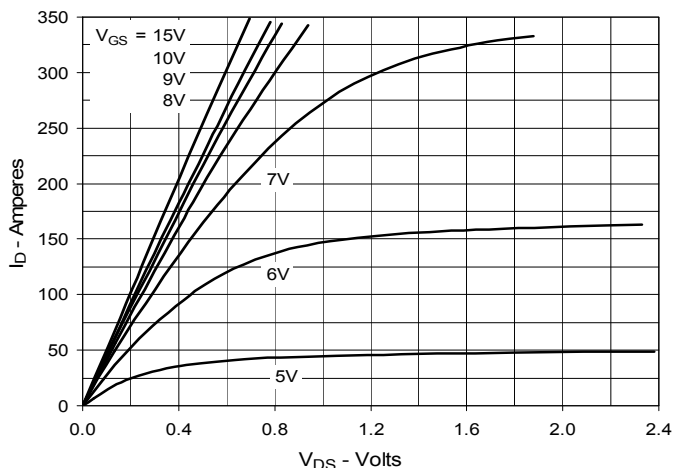
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|  |           |           |           |           |              |              |              |              |              |             |
|--|-----------|-----------|-----------|-----------|--------------|--------------|--------------|--------------|--------------|-------------|
| 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 |
|  | 4,850,072 | 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    |             |

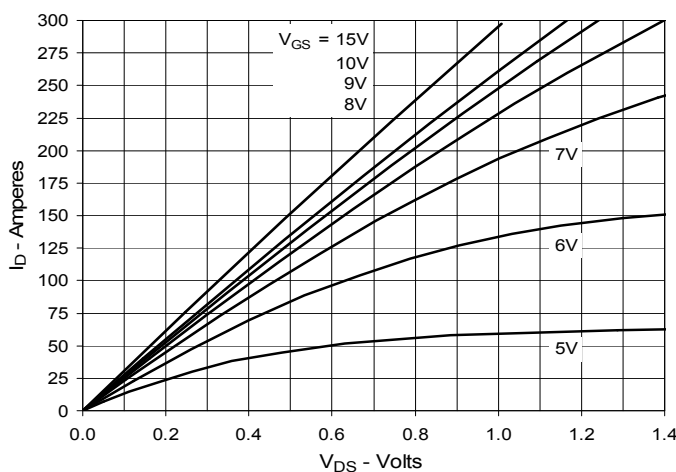
**Fig. 1. Output Characteristics @ 25°C**



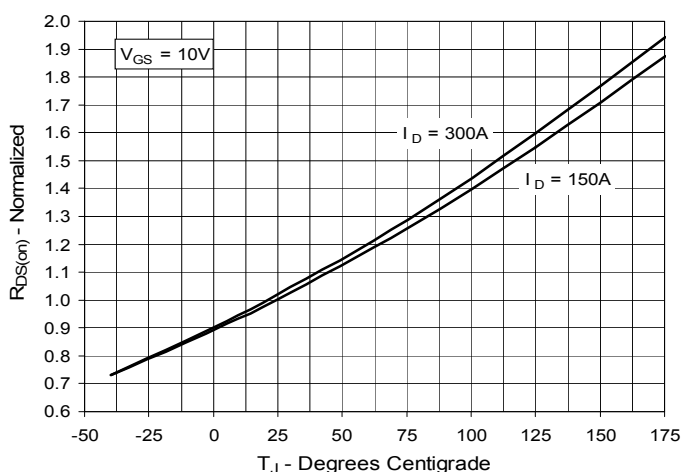
**Fig. 2. Extended Output Characteristics @ 25°C**



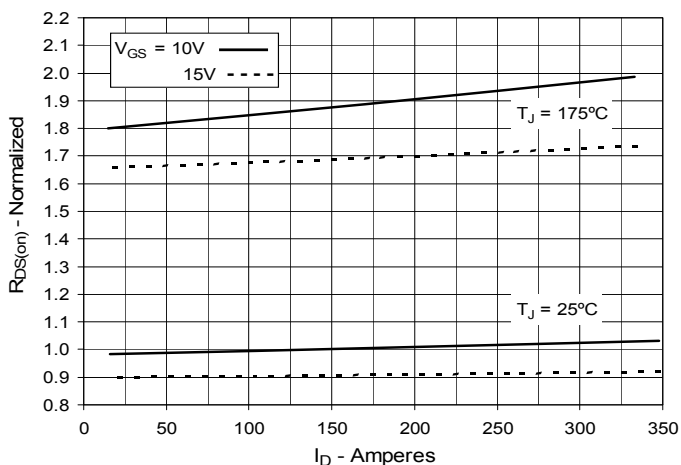
**Fig. 3. Output Characteristics @ 150°C**



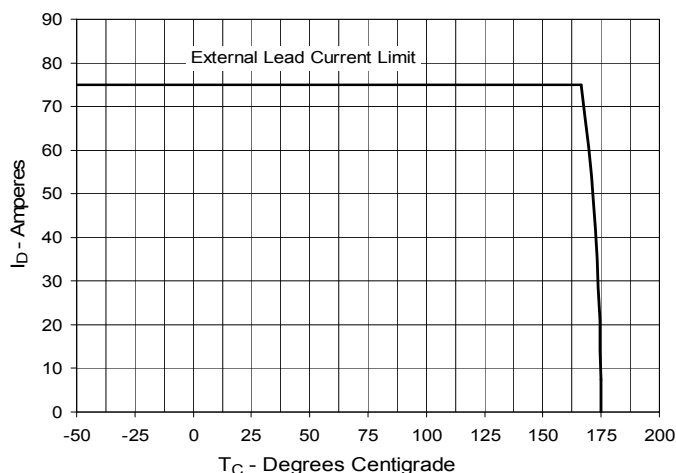
**Fig. 4.  $R_{DS(on)}$  Normalized to  $I_D = 150A$  Value vs. Junction Temperature**



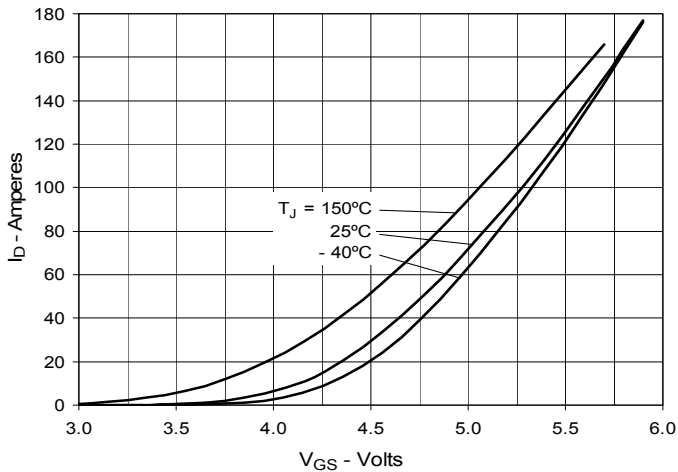
**Fig. 5.  $R_{DS(on)}$  Normalized to  $I_D = 150A$  Value vs. Drain Current**



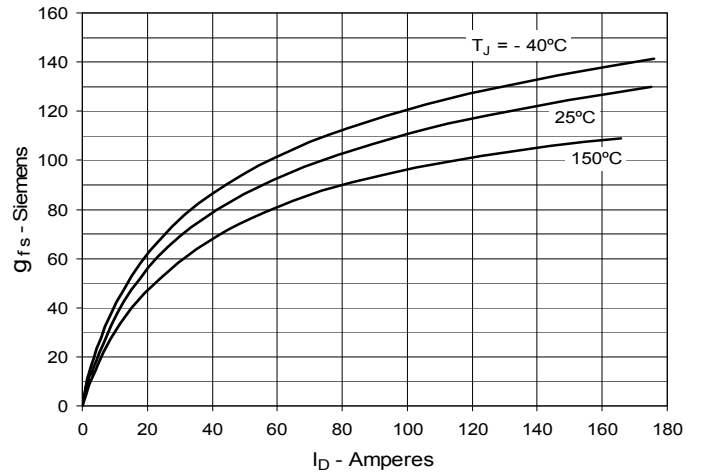
**Fig. 6. Drain Current vs. Case Temperature**



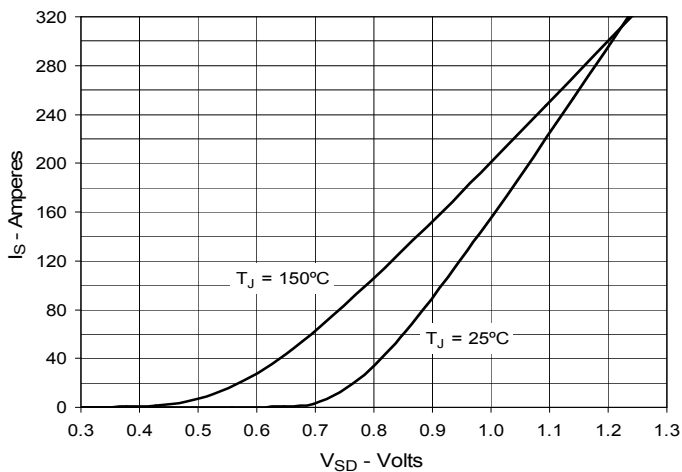
**Fig. 7. Input Admittance**



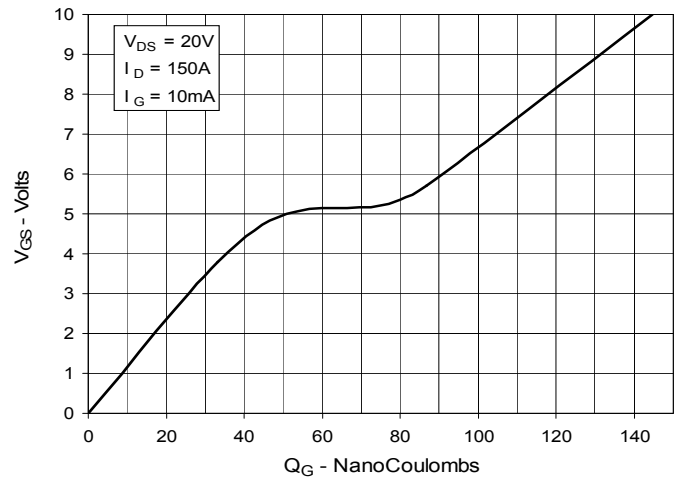
**Fig. 8. Transconductance**



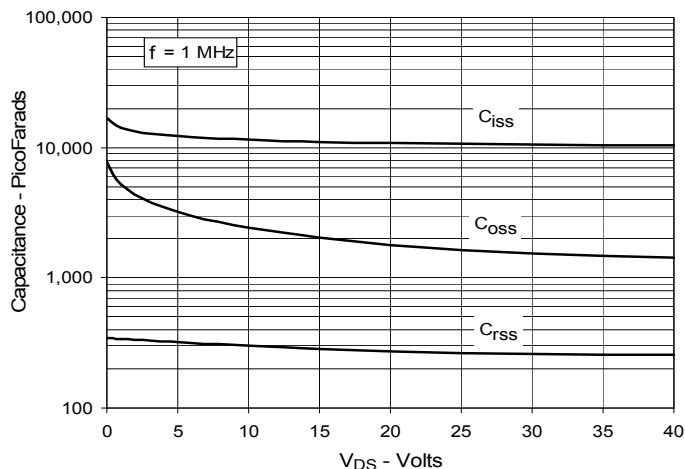
**Fig. 9. Forward Voltage Drop of Intrinsic Diode**



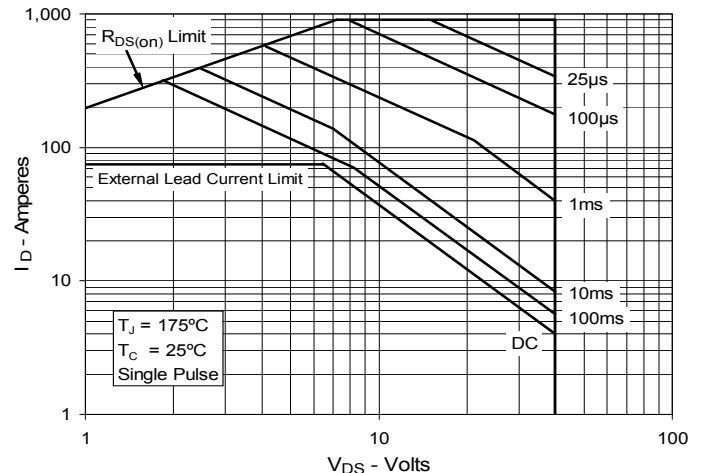
**Fig. 10. Gate Charge**



**Fig. 11. Capacitance**

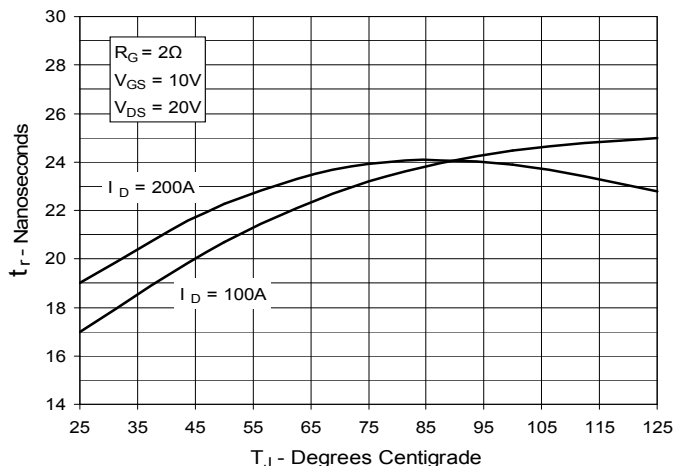


**Fig. 12. Forward-Bias Safe Operating Area**

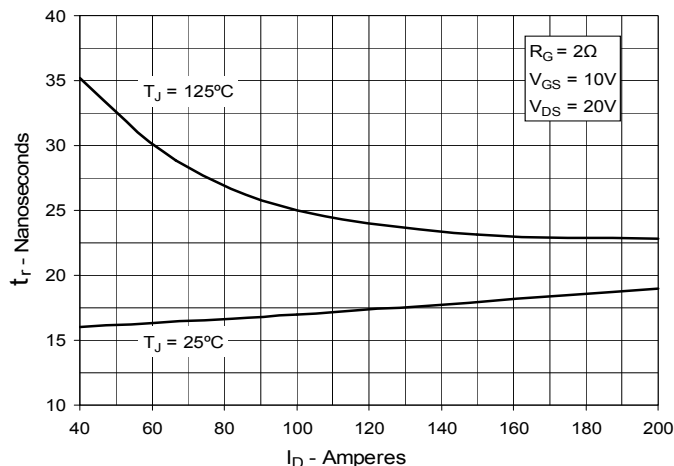


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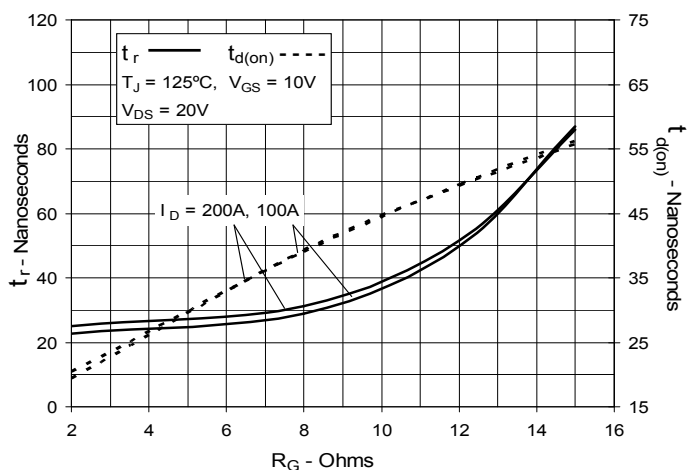
**Fig. 13. Resistive Turn-on Rise Time vs. Junction Temperature**



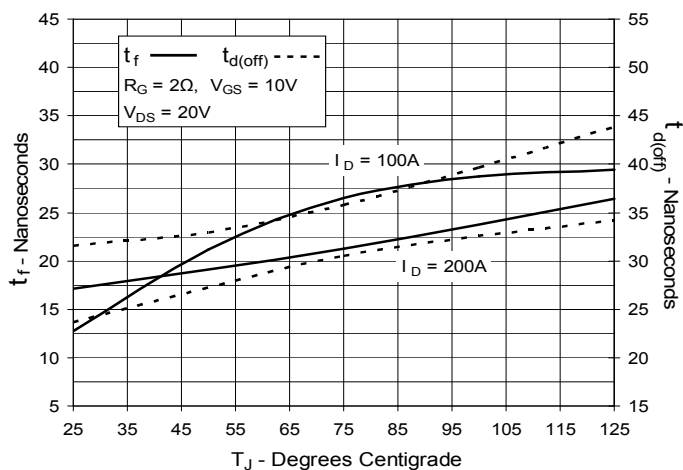
**Fig. 14. Resistive Turn-on Rise Time vs. Drain Current**



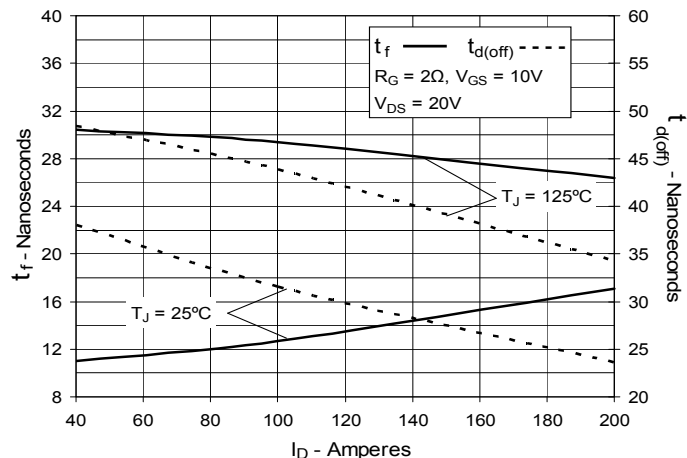
**Fig. 15. Resistive Turn-on Switching Times vs. Gate Resistance**



**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**

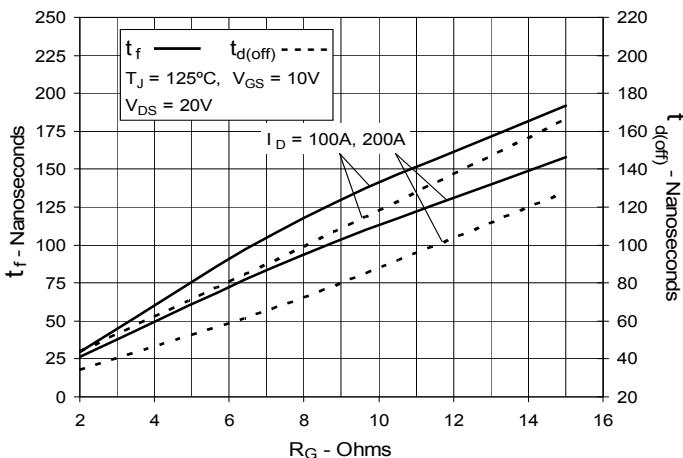


Fig. 19. Maximum Transient Thermal Impedance

