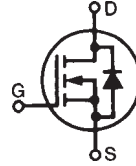


# Trench™ Power MOSFETs

## IXTQ102N20T IXTH102N20T

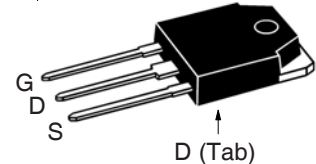
$V_{DSS} = 200V$   
 $I_{D25} = 102A$   
 $R_{DS(on)} \leq 23m\Omega$

N-Channel Enhancement Mode  
Avalanche Rated

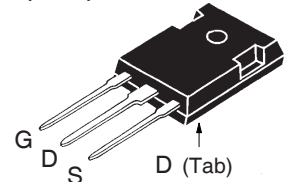


| Symbol     | Test Conditions  | Maximum Ratings |            |
|------------|--|-----------------|------------|
| $V_{DSS}$  | $T_J = 25^\circ C$ to $175^\circ C$                                | 200             | V          |
| $V_{DGR}$  | $T_J = 25^\circ C$ to $175^\circ C$ , $R_{GS} = 1M\Omega$          | 200             | V          |
| $V_{GSM}$  | Transient  | $\pm 30$        | V          |
| $I_{D25}$  | $T_C = 25^\circ C$   | 102             | A          |
| $I_{LRMS}$ | Lead Current Limit, RMS  | 75              | A          |
| $I_{DM}$   | $T_C = 25^\circ C$ , pulse width limited by $T_{JM}$               | 250             | A          |
| $I_A$      | $T_C = 25^\circ C$   | 5               | A          |
| $E_{AS}$   | $T_C = 25^\circ C$   | 1.2             | J          |
| $dv/dt$    | $I_S \leq I_{DM}$ , $V_{DD} \leq V_{DSS}$ , $T_J \leq 175^\circ C$ | 7               | V/ns       |
| $P_D$      | $T_C = 25^\circ C$   | 750             | 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  | 1.13 / 10       | Nm/lb.in   |
| Weight     | TO-3P  | 5.5             | g          |
|            | TO-247   | 6.0             | g          |

TO-3P (IXTQ)



TO-247 (IXTH)



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

### Features

- Ultra-low On Resistance
- Unclamped Inductive Switching (UIS) rated
- Low package inductance
  - easy to drive and to protect
- 175 $^\circ C$  Operating Temperature

### Advantages

- Easy to mount
- Space savings
- High power density

### Applications

- Automotive
  - Motor Drives
  - High Side Switch
  - 12V Battery
  - ABS Systems
- 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.         |
| $BV_{DSS}$   | $V_{GS} = 0V$ , $I_D = 250\mu A$                                    | 200                   |      | V            |
| $V_{GS(th)}$ | $V_{DS} = V_{GS}$ , $I_D = 1mA$                                     | 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>$T_J = 150^\circ C$           |                       |      | 5 $\mu A$    |
|              |   |                       |      | 250 $\mu A$  |
| $R_{DS(on)}$ | $V_{GS} = 10V$ , $I_D = 0.5 \cdot I_{D25}$ , Note 1                 | 18                    | 23   | $m\Omega$    |

| Symbol   | Test Conditions   | Characteristic Values |      |           |
|--|---|-----------------------|------|-----------|
|  |   | Min.                  | Typ. | Max.      |
| (T <sub>J</sub> = 25°C unless otherwise specified) |   |                       |      |           |
| <b>g<sub>fs</sub></b>                              | V <sub>DS</sub> = 10V, I <sub>D</sub> = 0.5 • I <sub>D25</sub> , Note 1   | 55                    | 92   | S         |
| <b>C<sub>iss</sub></b>                             | V <sub>GS</sub> = 0V, V <sub>DS</sub> = 25V, f = 1MHz   |                       | 6800 | pF        |
| <b>C<sub>oss</sub></b>                             |   |                       | 722  | pF        |
| <b>C<sub>rss</sub></b>                             |   |                       | 126  | pF        |
| <b>t<sub>d(on)</sub></b>                           | <b>Resistive Switching Times</b><br>V <sub>GS</sub> = 10V, V <sub>DS</sub> = 0.5 • V <sub>DSS</sub> , I <sub>D</sub> = 0.5 • I <sub>D25</sub><br>R <sub>G</sub> = 2.5Ω (External) |                       | 19   | ns        |
| <b>t<sub>r</sub></b>                               |   |                       | 26   | ns        |
| <b>t<sub>d(off)</sub></b>                          |   |                       | 50   | ns        |
| <b>t<sub>f</sub></b>                               |   |                       | 25   | ns        |
| <b>Q<sub>g(on)</sub></b>                           | V <sub>GS</sub> = 10V, V <sub>DS</sub> = 0.5 • V <sub>DSS</sub> , I <sub>D</sub> = 25A  |                       | 114  | nC        |
| <b>Q<sub>gs</sub></b>                              |   |                       | 34   | nC        |
| <b>Q<sub>gd</sub></b>                              |   |                       | 31   | nC        |
| <b>R<sub>thJC</sub></b>                            |   | 0.25                  |      | 0.20 °C/W |
| <b>R<sub>thCH</sub></b>                            |   |                       |      | °C/W      |

### Source-Drain Diode

| Symbol   | Test Conditions  | Characteristic Values |      |       |
|--|--|-----------------------|------|-------|
|  |  | Min.                  | Typ. | Max.  |
| (T <sub>J</sub> = 25°C unless otherwise specified) |  |                       |      |       |
| <b>I<sub>S</sub></b>                               | V <sub>GS</sub> = 0V   |                       |      | 102 A |
| <b>I<sub>SM</sub></b>                              | Repetitive, pulse width limited by T <sub>JM</sub>                                   |                       |      | 330 A |
| <b>V<sub>SD</sub></b>                              | I <sub>F</sub> = 50A, V <sub>GS</sub> = 0V, Note 1                                   |                       |      | 1.2 V |
| <b>t<sub>rr</sub></b>                              | I <sub>F</sub> = 50A, V <sub>GS</sub> = 0V, -di/dt = 100A/μs<br>V <sub>R</sub> = 50V |                       | 130  | ns    |

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

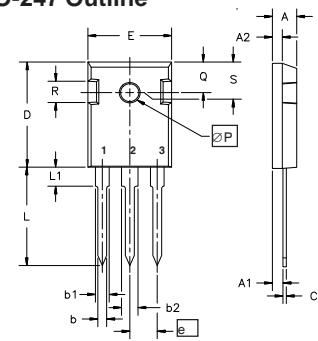
### PRELIMINARY TECHNICAL INFORMATION

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.

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 | 6,259,123B1  | 6,534,343    | 6,710,405B2 | 6,759,692    | 7,063,975B2  |             |
|  | 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    |             |

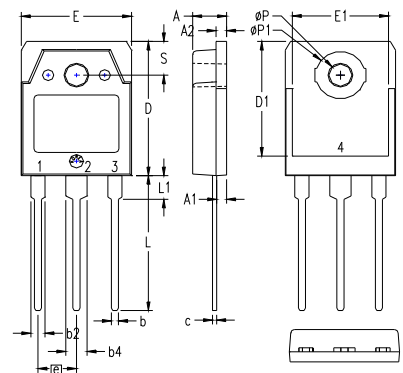
### TO-247 Outline



Terminals: 1 - Gate 2 - Drain

| Dim.           | Millimeter |       | Inches |       |
|----------------|------------|-------|--------|-------|
|                | Min.       | Max.  | Min.   | Max.  |
| A              | 4.7        | 5.3   | .185   | .209  |
| A <sub>1</sub> | 2.2        | 2.54  | .087   | .102  |
| A <sub>2</sub> | 2.2        | 2.6   | .059   | .098  |
| b              | 1.0        | 1.4   | .040   | .055  |
| b <sub>1</sub> | 1.65       | 2.13  | .065   | .084  |
| b <sub>2</sub> | 2.87       | 3.12  | .113   | .123  |
| C              | .4         | .8    | .016   | .031  |
| D              | 20.80      | 21.46 | .819   | .845  |
| E              | 15.75      | 16.26 | .610   | .640  |
| e              | 5.20       | 5.72  | 0.205  | 0.225 |
| L              | 19.81      | 20.32 | .780   | .800  |
| L1             |            | 4.50  |        | .177  |
| øP             | 3.55       | 3.65  | .140   | .144  |
| Q              | 5.89       | 6.40  | 0.232  | 0.252 |
| R              | 4.32       | 5.49  | .170   | .216  |

### TO-3P Outline

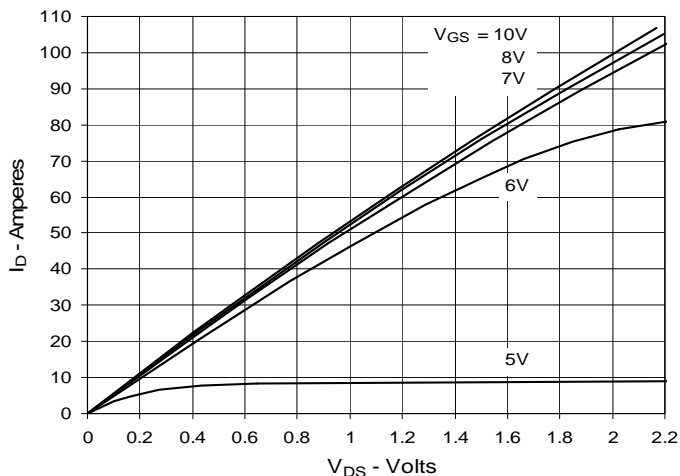


Pins: 1 - Gate 2 - Drain  
3 - Source 4 - Drain

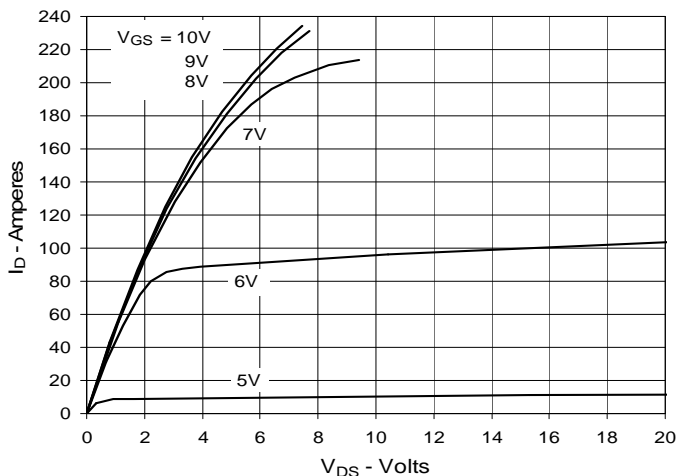
| SYM | INCHES   |      | MILLIMETERS |       |
|-----|----------|------|-------------|-------|
|     | MIN      | MAX  | MIN         | MAX   |
| A   | .185     | .193 | 4.70        | 4.90  |
| A1  | .051     | .059 | 1.30        | 1.50  |
| A2  | .057     | .065 | 1.45        | 1.65  |
| b   | .035     | .045 | 0.90        | 1.15  |
| b2  | .075     | .087 | 1.90        | 2.20  |
| b4  | .114     | .126 | 2.90        | 3.20  |
| c   | .022     | .031 | 0.55        | 0.80  |
| D   | .780     | .791 | 19.80       | 20.10 |
| D1  | .665     | .677 | 16.90       | 17.20 |
| E   | .610     | .622 | 15.50       | 15.80 |
| E1  | .531     | .539 | 13.50       | 13.70 |
| e   | .215 BSC |      | 5.45 BSC    |       |
| L   | .779     | .795 | 19.80       | 20.20 |
| L1  | .134     | .142 | 3.40        | 3.60  |
| øP  | .126     | .134 | 3.20        | 3.40  |
| øP1 | .272     | .280 | 6.90        | 7.10  |
| S   | .193     | .201 | 4.90        | 5.10  |

All metal area are tin plated.

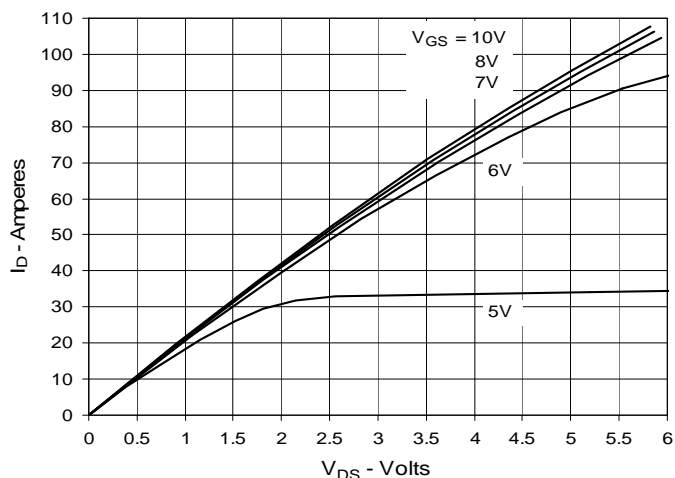
**Fig. 1. Output Characteristics @ 25°C**



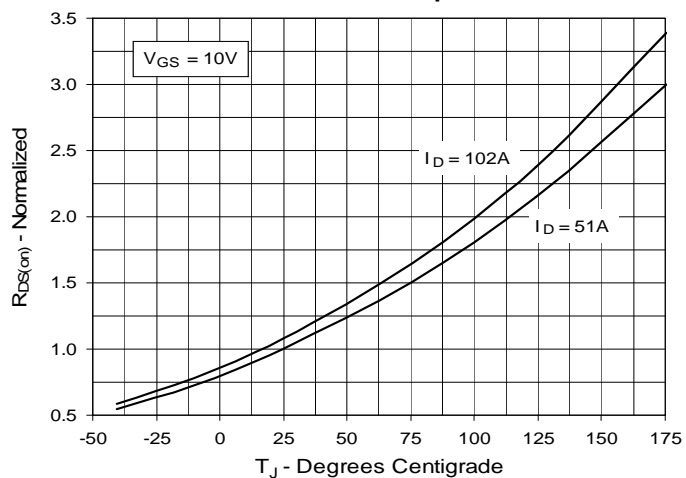
**Fig. 2. Extended Output Characteristics @ 25°C**



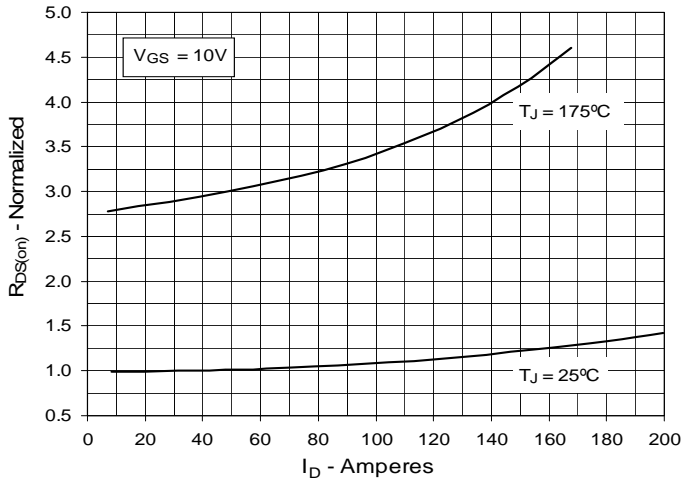
**Fig. 3. Output Characteristics @ 150°C**



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



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



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

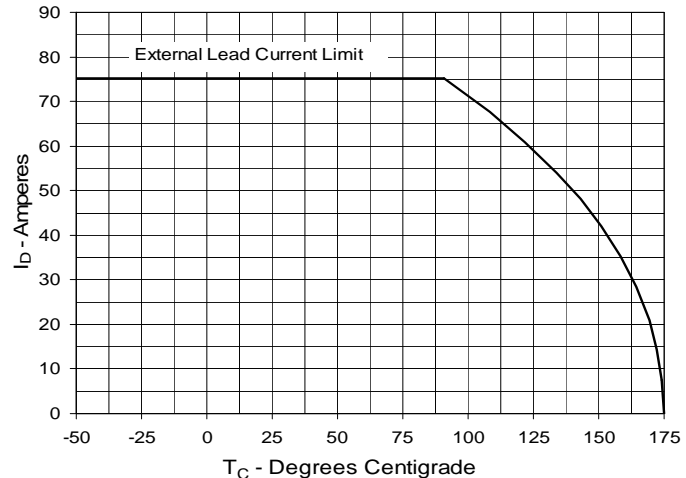


Fig. 7. Input Admittance

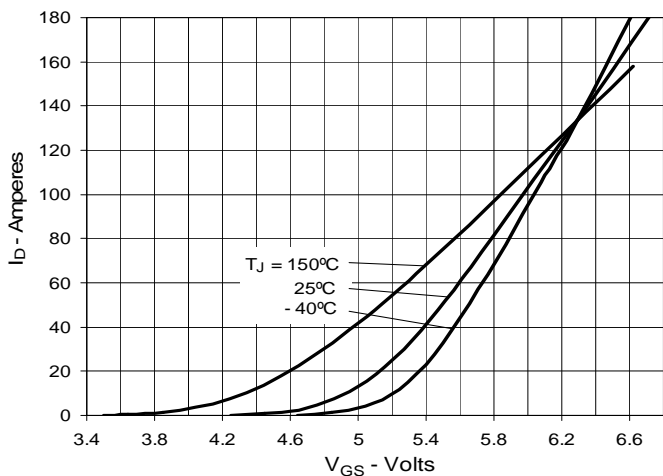


Fig. 8. Transconductance

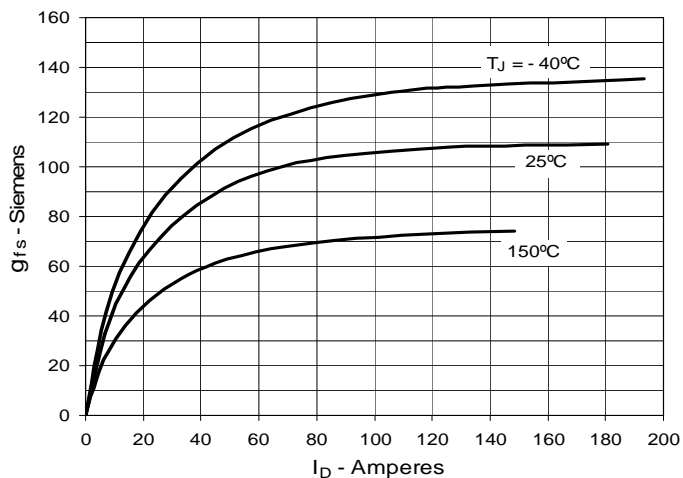


Fig. 9. Forward Voltage Drop of Intrinsic Diode

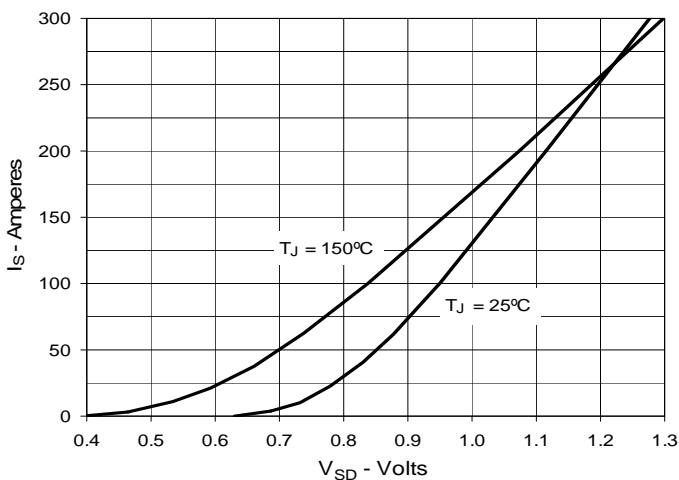


Fig. 10. Gate Charge

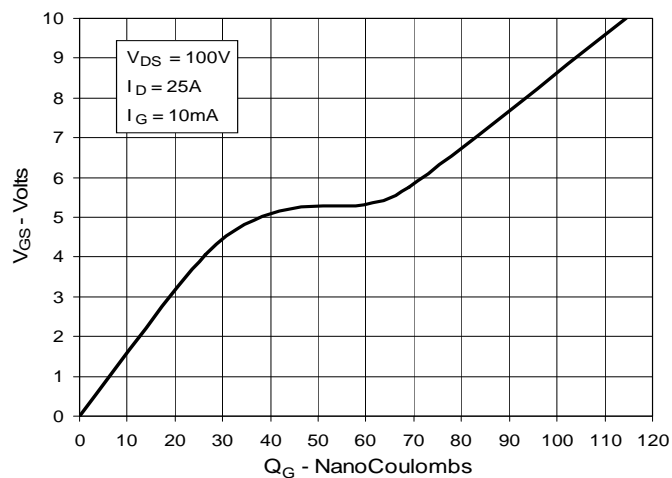


Fig. 11. Capacitance

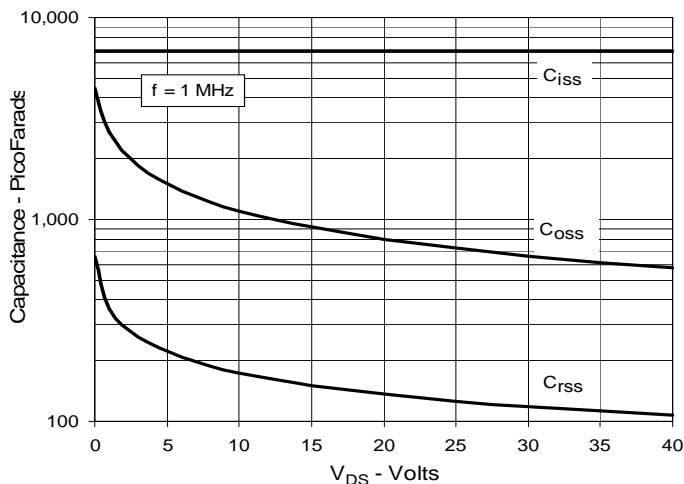
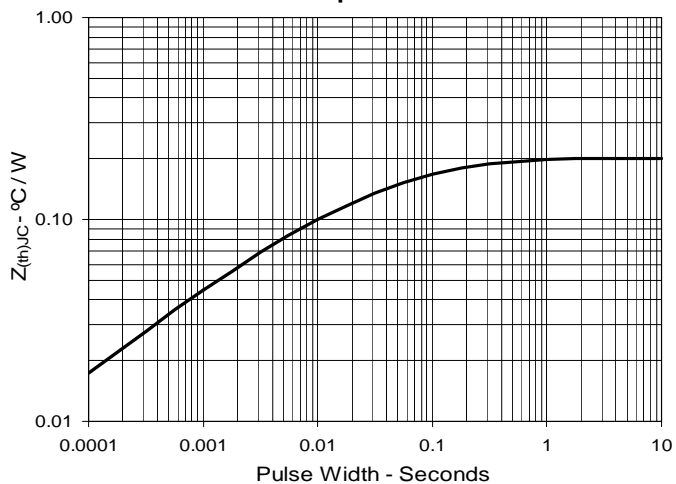
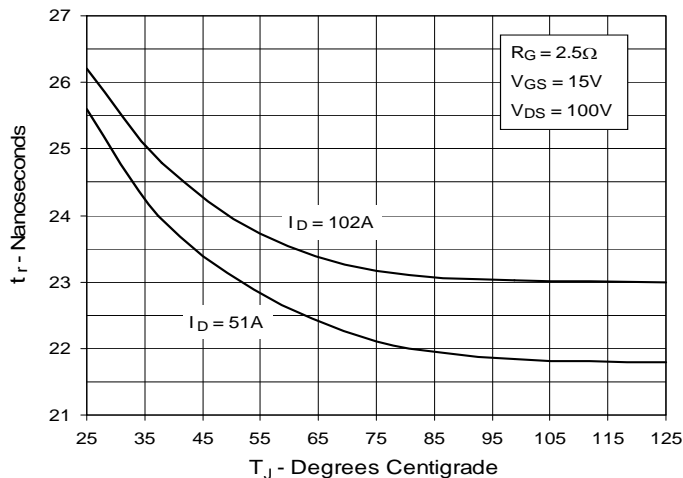


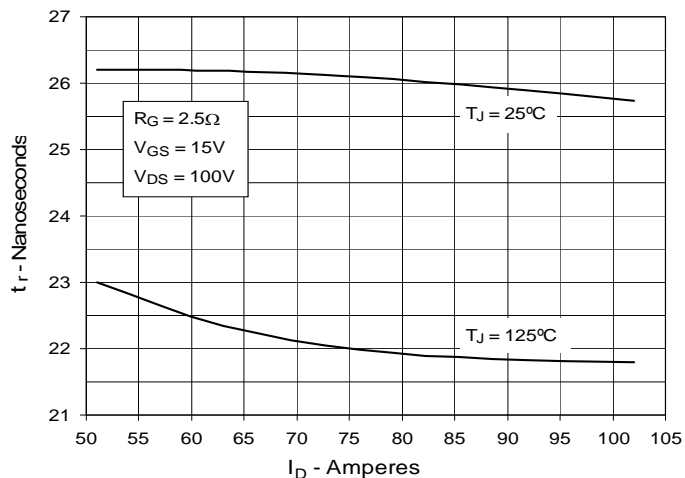
Fig. 12. Maximum Transient Thermal Impedance



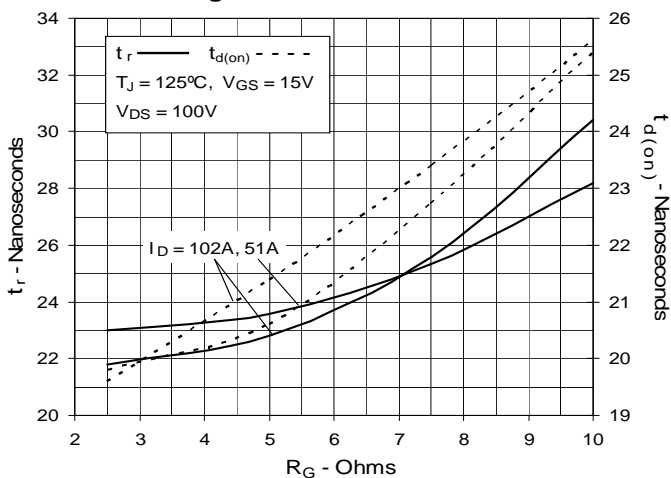
**Fig. 13. Resistive Turn-on Rise Time vs. Junction Temperature**



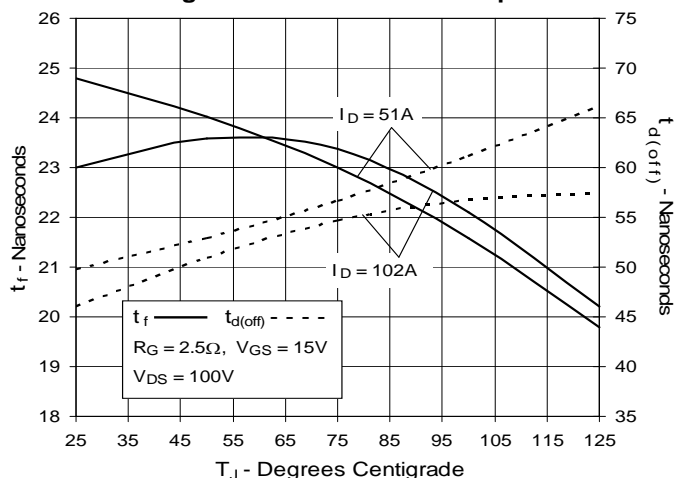
**Fig. 14. Resistive Turn-on Rise Time vs. Drain Current**



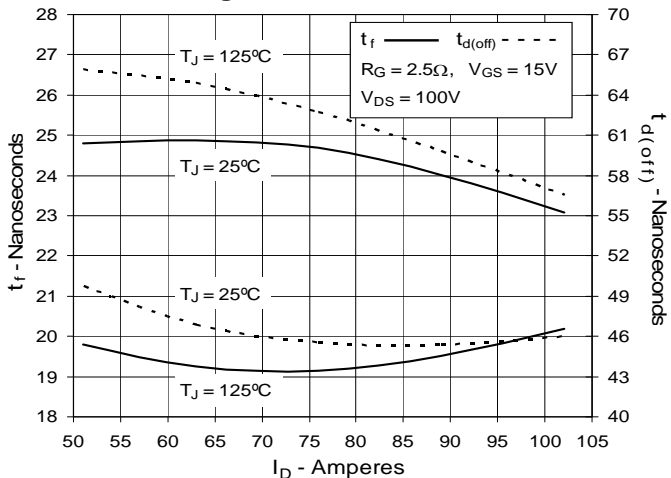
**Fig. 15. Resistive Turn-on Switching Times vs. Gate Resistance**



**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**

