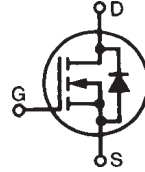


## Trench Gate Power MOSFET

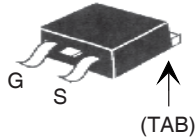
N-Channel Enhancement Mode  
Avalanche Rated

**IXTA102N15T**  
**IXTH102N15T**  
**IXTP102N15T**  
**IXTQ102N15T**

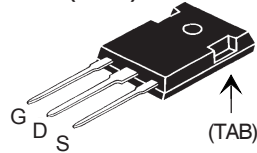


$$\begin{aligned} V_{DSS} &= 150V \\ I_{D25} &= 102A \\ R_{DS(on)} &\leq 18m\Omega \end{aligned}$$

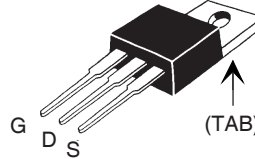
TO-263 (IXTA)



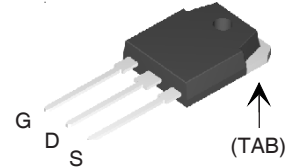
TO-247 (IXTH)



TO-220 (IXTP)



TO-3P (IXTQ)



| Symbol     | Test Conditions                                                          | Maximum Ratings  |                  |
|------------|--------------------------------------------------------------------------|------------------|------------------|
| $V_{DSS}$  | $T_J = 25^\circ\text{C}$ to $175^\circ\text{C}$                          | 150              | V                |
| $V_{DGR}$  | $T_J = 25^\circ\text{C}$ to $175^\circ\text{C}$ $R_{GS} = 1M\Omega$      | 150              | V                |
| $V_{GSS}$  | Continuous                                                               | $\pm 20$         | V                |
| $V_{GSM}$  | Transient                                                                | $\pm 30$         | V                |
| $I_{D25}$  | $T_C = 25^\circ\text{C}$                                                 | 102              | A                |
| $I_{LRMS}$ | Lead Current Limit, RMS                                                  | 75               | A                |
| $I_{DM}$   | $T_C = 25^\circ\text{C}$ , pulse width limited by $T_{JM}$               | 300              | A                |
| $I_A$      | $T_C = 25^\circ\text{C}$                                                 | 51               | A                |
| $E_{AS}$   | $T_C = 25^\circ\text{C}$                                                 | 750              | mJ               |
| $dV/dt$    | $I_S \leq I_{DM}$ , $V_{DD} \leq V_{DSS}$ , $T_J \leq 175^\circ\text{C}$ | 10               | V/ns             |
| $P_D$      | $T_C = 25^\circ\text{C}$                                                 | 455              | W                |
| $T_J$      |                                                                          | -55 ... +175     | $^\circ\text{C}$ |
| $T_{JM}$   |                                                                          | 175              | $^\circ\text{C}$ |
| $T_{stg}$  |                                                                          | -55 ... +175     | $^\circ\text{C}$ |
| $T_L$      | 1.6mm (0.062 in.) from case for 10s                                      | 300              | $^\circ\text{C}$ |
| $T_{SOLD}$ | Plastic body for 10 seconds                                              | 260              | $^\circ\text{C}$ |
| $M_d$      | Mounting Torque (TO-220, TO-3P, TO-247)                                  | 1.13 / 10        | Nmlb.in.         |
| $F_C$      | Mounting Force (TO-263)                                                  | 10..65/2.2..14.6 | N/lb.            |
| Weight     | TO-263                                                                   | 2.5              | g                |
|            | TO-220                                                                   | 3.0              | g                |
|            | TO-3P                                                                    | 5.5              | g                |
|            | TO-247                                                                   | 6.0              | g                |

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

### Features

- International standard packages
- Avalanche rated

### Advantages

- Easy to mount
- Space savings
- High power density

### Applications

- DC-DC converters
- Battery chargers
- Switched-mode and resonant-mode power supplies
- DC choppers
- AC motor drives
- Uninterruptible power supplies
- High speed power switching applications

| Symbol       | Test Conditions<br>( $T_J = 25^\circ\text{C}$ unless otherwise specified) | Characteristic Values |      |               |
|--------------|---------------------------------------------------------------------------|-----------------------|------|---------------|
|              |                                                                           | Min.                  | Typ. | Max.          |
| $BV_{DSS}$   | $V_{GS} = 0V$ , $I_D = 250\mu A$                                          | 150                   |      | V             |
| $V_{GS(th)}$ | $V_{DS} = V_{GS}$ , $I_D = 1mA$                                           | 3.0                   |      | 5.0 V         |
| $I_{GSS}$    | $V_{GS} = \pm 20V$ , $V_{DS} = 0V$                                        |                       |      | $\pm 200$ nA  |
| $I_{DSS}$    | $V_{DS} = V_{DSS}$                                                        |                       |      | 5 $\mu A$     |
|              | $V_{GS} = 0V$ $T_J = 150^\circ\text{C}$                                   |                       |      | 250 $\mu A$   |
| $R_{DS(on)}$ | $V_{GS} = 10V$ , $I_D = 0.5 \cdot I_{D25}$ , Note 1                       |                       |      | 18 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                                                                                           | 50                    | 80   | S                       |
| $C_{iss}$    | $V_{GS} = 0\text{V}$ , $V_{DS} = 25\text{V}$ , $f = 1\text{MHz}$                                                                                     |                       | 5220 | pF                      |
| $C_{oss}$    |                                                                                                                                                      |                       | 685  | pF                      |
| $C_{rss}$    |                                                                                                                                                      |                       | 95   | 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>$R_G = 3.3\Omega$ (External) |                       | 20   | ns                      |
| $t_r$        |                                                                                                                                                      |                       | 14   | ns                      |
| $t_{d(off)}$ |                                                                                                                                                      |                       | 25   | ns                      |
| $t_f$        |                                                                                                                                                      |                       | 22   | ns                      |
| $Q_{g(on)}$  | $V_{GS} = 10\text{V}$ , $V_{DS} = 0.5 \cdot V_{DSS}$ , $I_D = 25\text{A}$                                                                            |                       | 87   | nC                      |
| $Q_{gs}$     |                                                                                                                                                      |                       | 23   | nC                      |
| $Q_{gd}$     |                                                                                                                                                      |                       | 31   | nC                      |
| $R_{thJC}$   |                                                                                                                                                      |                       |      | 0.33 $^\circ\text{C/W}$ |
| $R_{thCH}$   | (TO-220)                                                                                                                                             |                       | 0.50 | $^\circ\text{C/W}$      |
|              | (TO-3P & TO-247)                                                                                                                                     |                       | 0.25 | $^\circ\text{C/W}$      |

#### 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 $T_{JM}$                                                          |                       |      | 400 A |
| $V_{SD}$ | $I_F = 100\text{A}$ , $V_{GS} = 0\text{V}$ , Note 1                                                  |                       |      | 1.3 V |
| $t_{rr}$ | $I_F = 51\text{A}$ , $-di/dt = 100\text{A}/\mu\text{s}$<br>$V_R = 75\text{V}$ , $V_{GS} = 0\text{V}$ |                       | 97   | ns    |
| $I_{RM}$ |                                                                                                      |                       | 8.4  | A     |
| $Q_{RM}$ |                                                                                                      |                       | 409  | nC    |

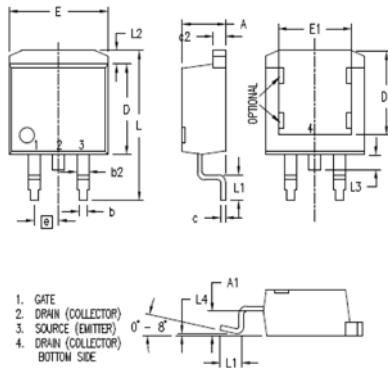
Note 1: Pulse test,  $t \leq 300\mu\text{s}$ ; duty cycle,  $d \leq 2\%$ .

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:

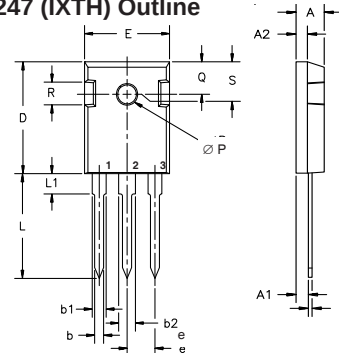
|           |           |           |           |              |              |              |              |              |              |
|-----------|-----------|-----------|-----------|--------------|--------------|--------------|--------------|--------------|--------------|
| 4,835,592 | 4,931,844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

### TO-263 (IXTA) 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  |

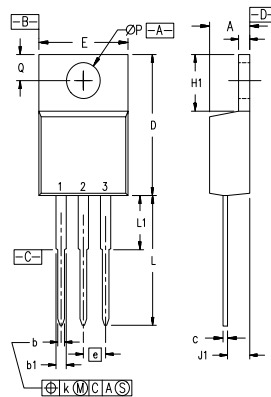
### TO-247 (IXTH) Outline



Terminals: 1 - Gate 2 - Drain  
3 - Source Tab - 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  |
| S              | 6.15 BSC   |       | 242 BSC |       |

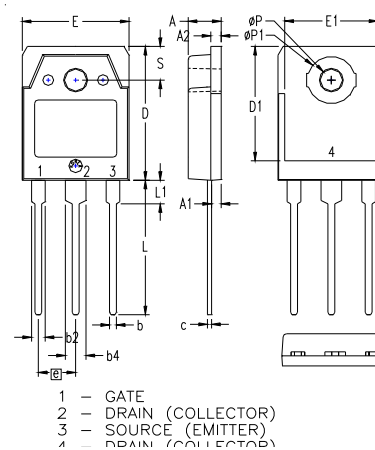
### TO-220 (IXTP) Outline



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

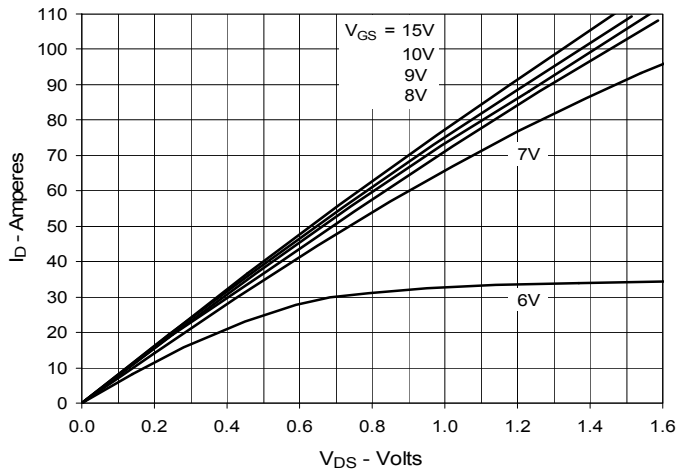
| SYM | INCHES   |      | MILLIMETERS |       |
|-----|----------|------|-------------|-------|
|     | MIN      | MAX  | MIN         | MAX   |
| A   | .170     | .190 | 4.32        | 4.83  |
| b   | .025     | .040 | 0.64        | 1.02  |
| b1  | .045     | .065 | 1.15        | 1.65  |
| c   | .014     | .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  |

### TO-3P (IXTQ) Outline

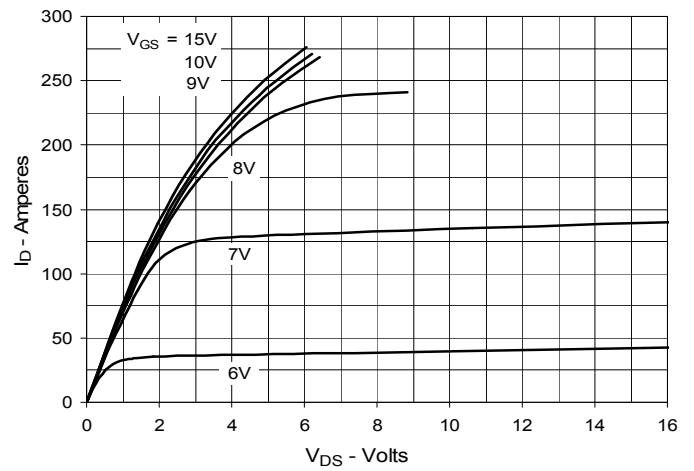


| SYM | INCHES   |      | MILLIMETERS |       |
|-----|----------|------|-------------|-------|
|     | MIN      | MAX  | MIN         | MAX   |
| A   | .185     | .193 | 4.70        | 4.90  |
| A1  | .051     | .059 | 1.30        | 1.50  |
| A2  | .057     | .065 | 1.45        | 1.65  |
| b   | .035     | .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     | .799 | 19.80       | 20.30 |
| 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  |

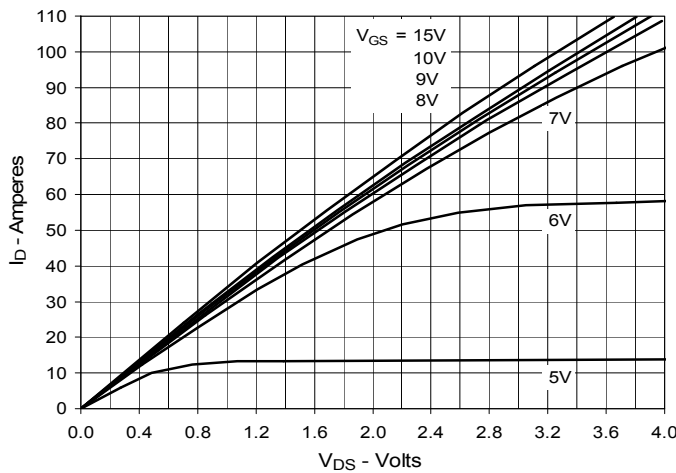
**Fig. 1. Output Characteristics  
@ 25°C**



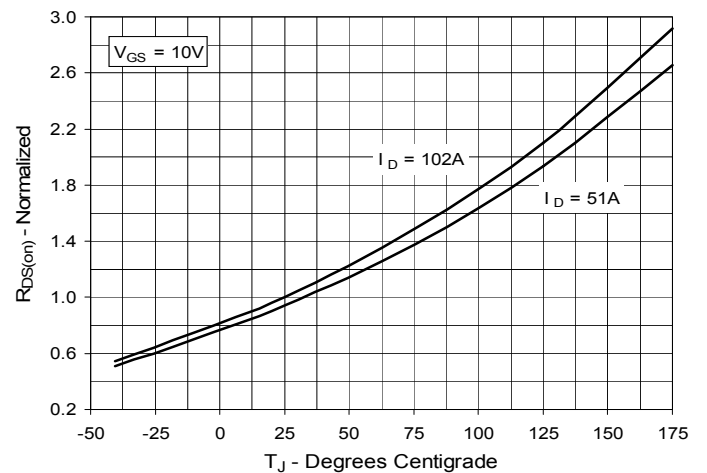
**Fig. 2. Extended Output Characteristics  
@ 25°C**



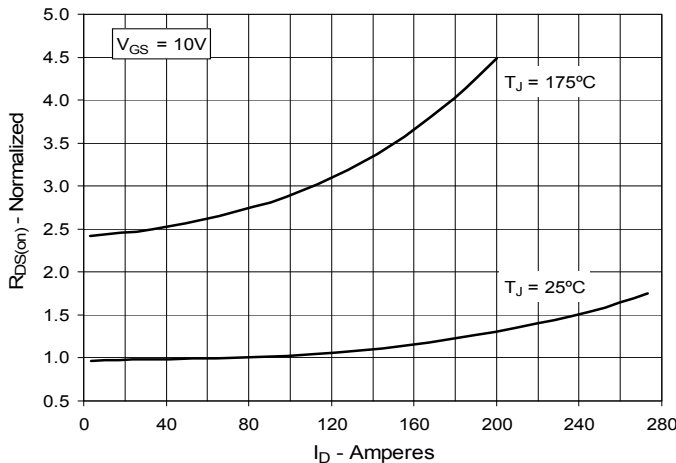
**Fig. 3. Output Characteristics  
@ 150°C**



**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**

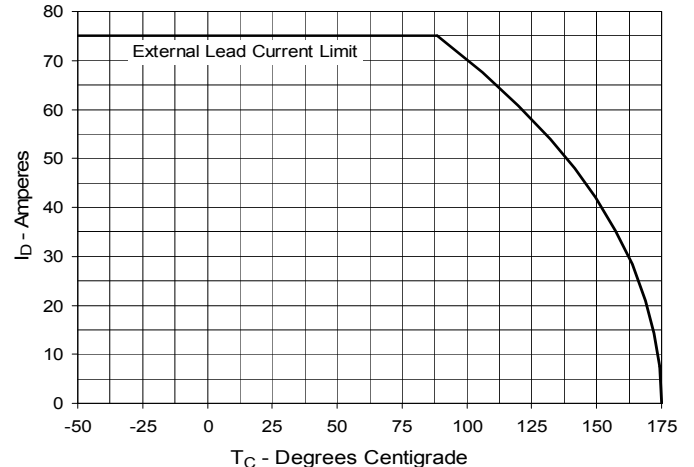


Fig. 7. Input Admittance

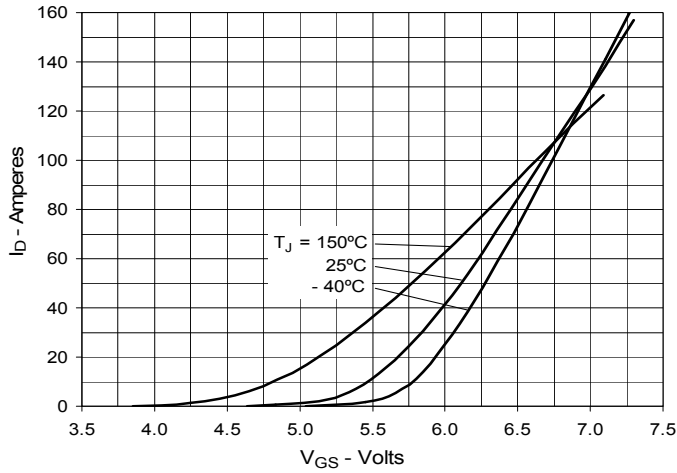


Fig. 8. Transconductance

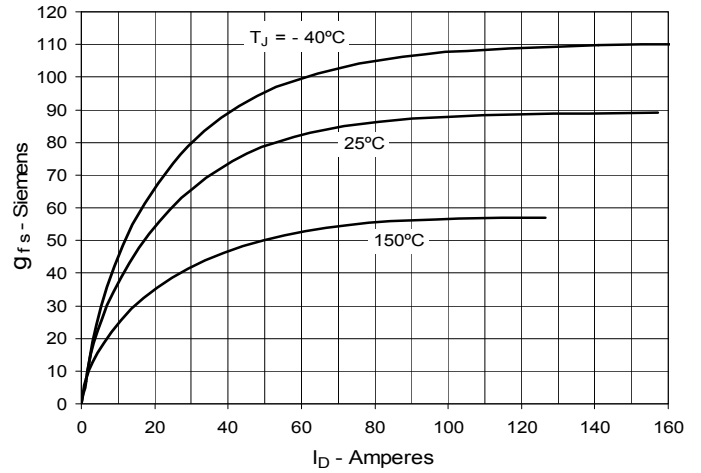


Fig. 9. Forward Voltage Drop of Intrinsic Diode

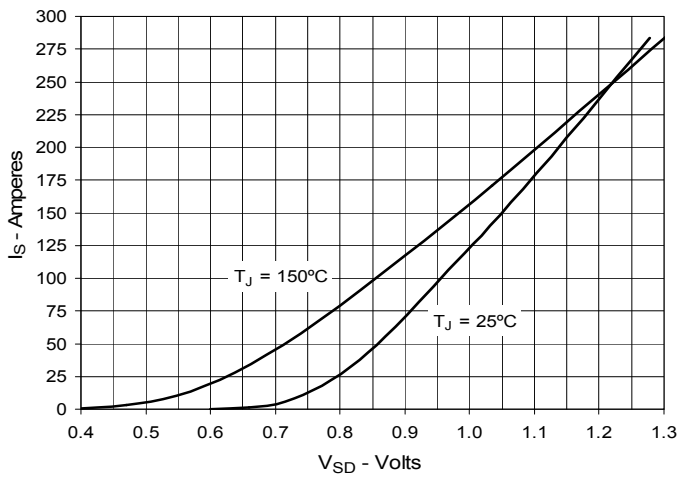


Fig. 10. Gate Charge

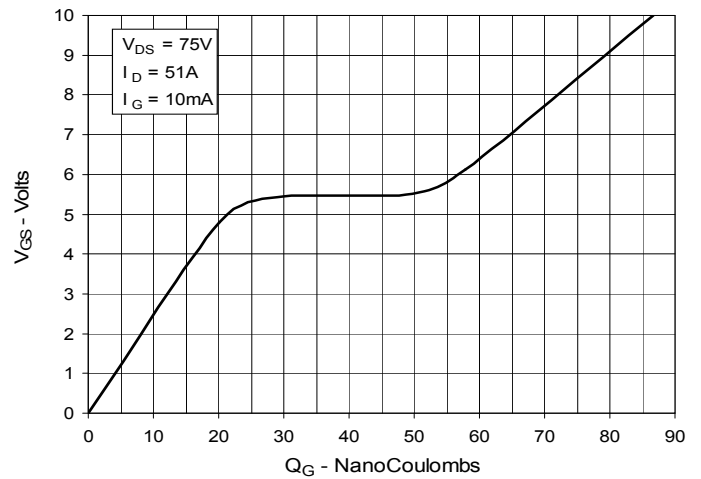


Fig. 11. Capacitance

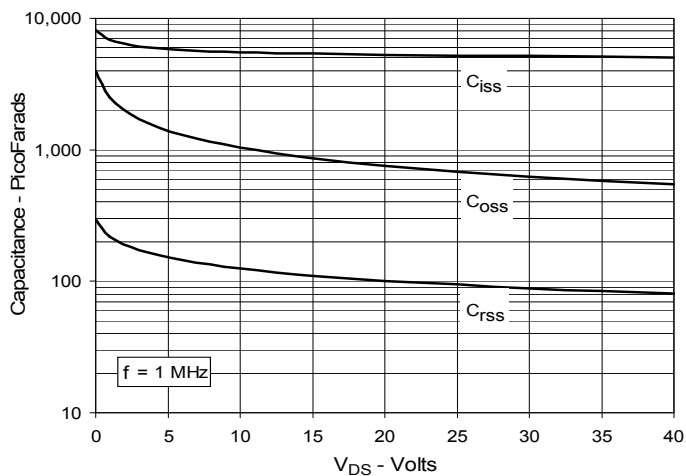
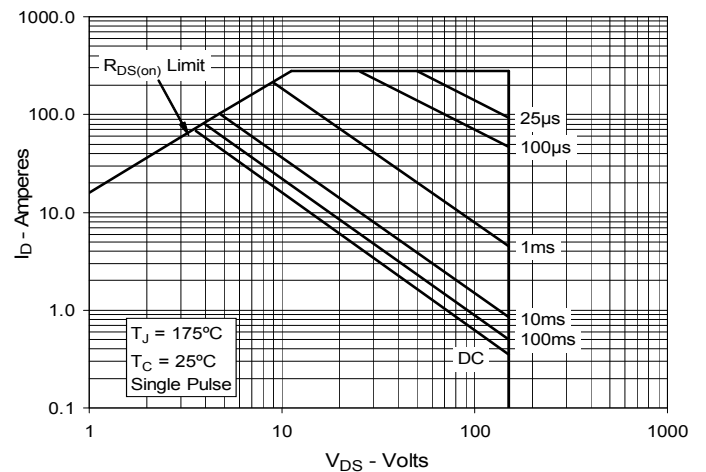
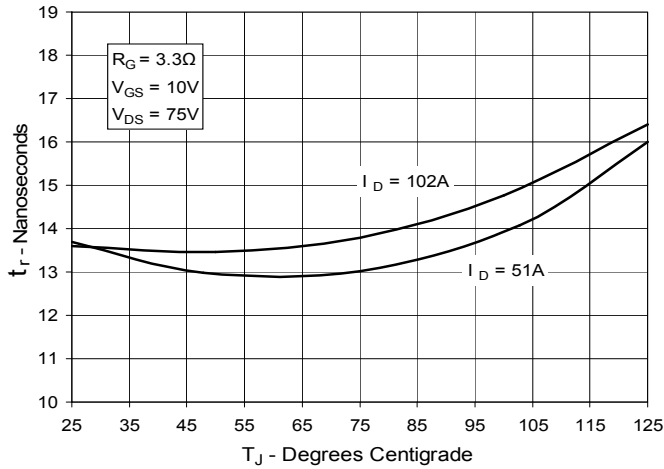


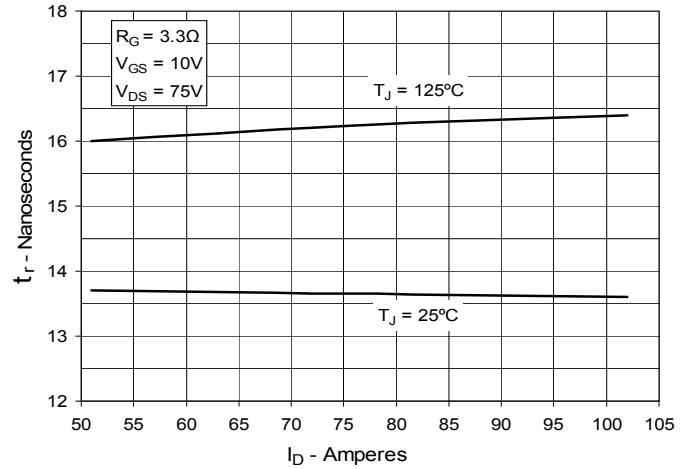
Fig. 12. Forward-Bias Safe Operating Area



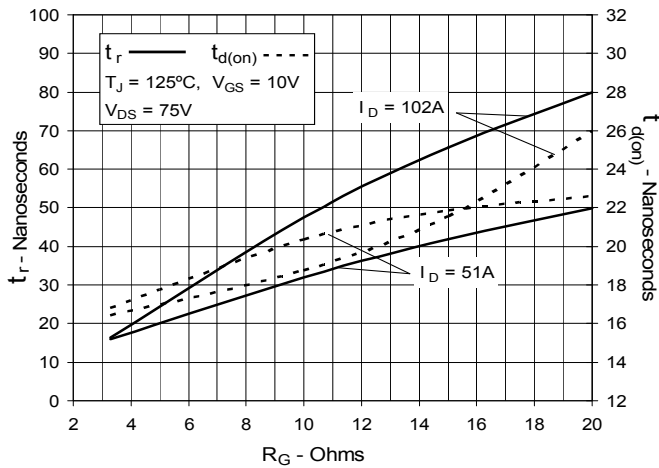
**Fig. 13. Resistive Turn-on  
Rise Time vs. Junction Temperature**



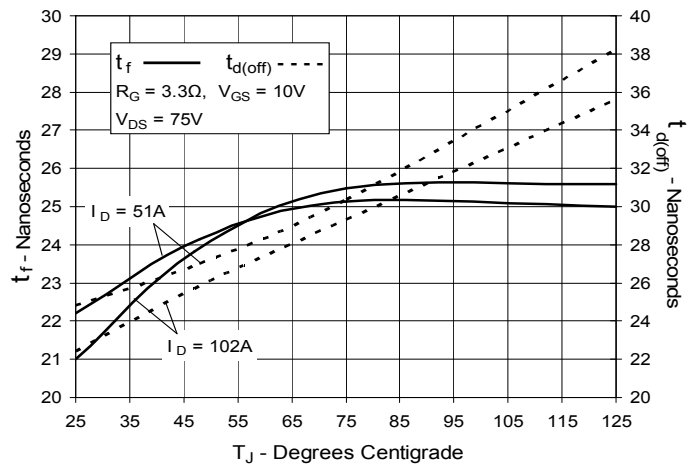
**Fig. 14. Resistive Turn-on  
Rise Time vs. Drain Current**



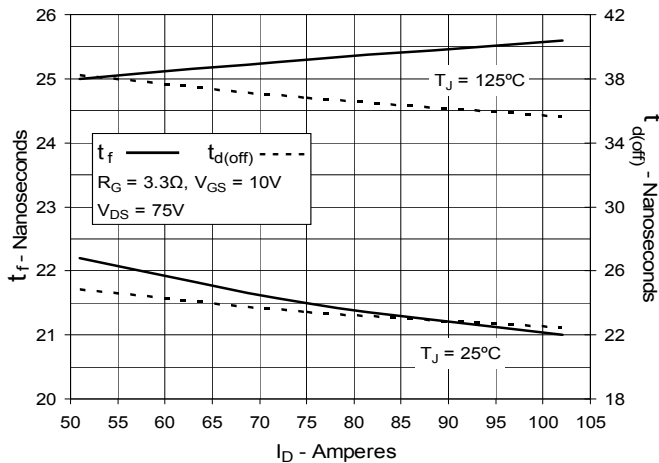
**Fig. 15. Resistive Turn-on  
Switching Times vs. Gate Resistance**



**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**

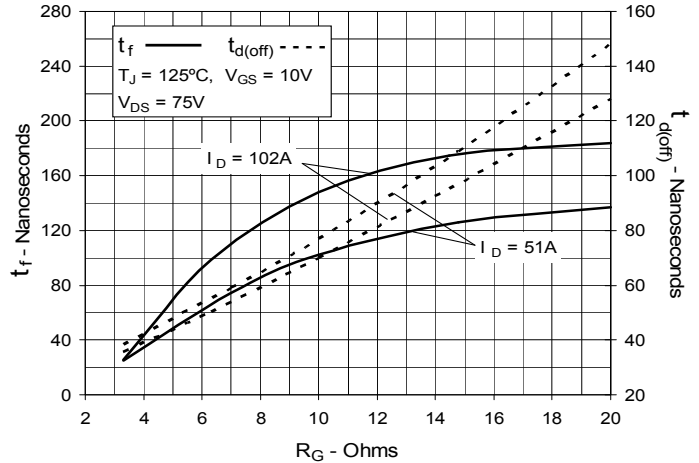


Fig. 19. Maximum Transient Thermal Impedance

