

# TrenchMV™ Power MOSFET

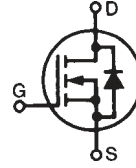
## IXTA220N055T IXTP220N055T

$$V_{DSS} = 55 \text{ V}$$

$$I_{D25} = 220 \text{ A}$$

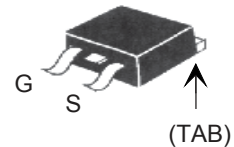
$$R_{DS(on)} \leq 4.0 \text{ m}\Omega$$

N-Channel Enhancement Mode  
Avalanche Rated

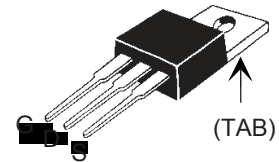


| Symbol     | Test Conditions   | Maximum Ratings |                  |
|------------|---|-----------------|------------------|
| $V_{DSS}$  | $T_J = 25^\circ\text{C}$ to $175^\circ\text{C}$   | 55              | V                |
| $V_{DGR}$  | $T_J = 25^\circ\text{C}$ to $175^\circ\text{C}$ ; $R_{GS} = 1 \text{ M}\Omega$  | 55              | V                |
| $V_{GSM}$  | Transient   | $\pm 20$        | V                |
| $I_{D25}$  | $T_C = 25^\circ\text{C}$  | 220             | A                |
| $I_{LRMS}$ | Lead Current Limit, RMS   | 75              | A                |
| $I_{DM}$   | $T_C = 25^\circ\text{C}$ , pulse width limited by $T_{JM}$  | 600             | A                |
| $I_{AR}$   | $T_C = 25^\circ\text{C}$  | 25              | A                |
| $E_{AS}$   | $T_C = 25^\circ\text{C}$  | 1.0             | J                |
| $dv/dt$    | $I_S \leq I_{DM}$ , $di/dt \leq 100 \text{ A}/\mu\text{s}$ , $V_{DD} \leq V_{DSS}$<br>$T_J \leq 175^\circ\text{C}$ , $R_G = 5 \Omega$ | 3               | V/ns             |
| $P_D$      | $T_C = 25^\circ\text{C}$  | 430             | W                |
| $T_J$      |   | -55 ... +175    | $^\circ\text{C}$ |
| $T_{JM}$   |   | 175             | $^\circ\text{C}$ |
| $T_{stg}$  |   | -55 ... +175    | $^\circ\text{C}$ |
| $T_L$      | 1.6 mm (0.062 in.) from case for 10 s   | 300             | $^\circ\text{C}$ |
| $T_{SOLD}$ | Plastic body for 10 seconds   | 260             | $^\circ\text{C}$ |
| $M_d$      | 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

- Ultra-low On Resistance
- Unclamped Inductive Switching (UIS) rated
- Low package inductance
  - easy to drive and to protect
- $175^\circ\text{C}$  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>( $T_J = 25^\circ\text{C}$ unless otherwise specified) | Characteristic Values |      |                      |
|--------------|---|-----------------------|------|----------------------|
|              |   | Min.                  | Typ. | Max.                 |
| $BV_{DSS}$   | $V_{GS} = 0 \text{ V}$ , $I_D = 250 \mu\text{A}$                          | 55                    |      | V                    |
| $V_{GS(th)}$ | $V_{DS} = V_{GS}$ , $I_D = 250 \mu\text{A}$                               | 2.0                   |      | V                    |
| $I_{GSS}$    | $V_{GS} = \pm 20 \text{ V}$ , $V_{DS} = 0 \text{ V}$                      |                       |      | $\pm 200 \text{ nA}$ |
| $I_{DSS}$    | $V_{DS} = V_{DSS}$  |                       |      | 5 $\mu\text{A}$      |
|              | $V_{GS} = 0 \text{ V}$ $T_J = 150^\circ\text{C}$                          |                       |      | 250 $\mu\text{A}$    |
| $R_{DS(on)}$ | $V_{GS} = 10 \text{ V}$ , $I_D = 25$ , Notes 1, 2                         | 3.4                   | 4.0  | m $\Omega$           |

| Symbol  | Test Conditions   | Characteristic Values |      |                          |
|---|---|-----------------------|------|--------------------------|
|   |   | Min.                  | Typ. | Max.                     |
| $(T_J = 25^\circ\text{C}$ unless otherwise specified) |   |                       |      |                          |
| $g_{fs}$  | $V_{DS} = 10\text{ V}; I_D = 60\text{ A}$ , Note 1              | 75                    | 120  | S                        |
| $C_{iss}$   |   |                       | 7200 | pF                       |
| $C_{oss}$   | $V_{GS} = 0\text{ V}, V_{DS} = 25\text{ V}, f = 1\text{ MHz}$   |                       | 1270 | pF                       |
| $C_{rss}$   |   |                       | 285  | pF                       |
| <b>Resistive Switching Times</b>                      |   |                       |      |                          |
| $t_{d(on)}$   | $V_{GS} = 10\text{ V}, V_{DS} = 30\text{ V}, I_D = 25\text{ A}$ |                       | 36   | ns                       |
| $t_r$   | $R_G = 5\ \Omega$ (External)                                    |                       | 62   | ns                       |
| $t_{d(off)}$  |   |                       | 53   | ns                       |
| $t_f$   |   |                       | 53   | ns                       |
| $Q_{g(on)}$   |   |                       | 158  | nC                       |
| $Q_{gs}$  | $V_{GS} = 10\text{ V}, V_{DS} = 0.5 V_{DSS}, I_D = 25\text{ A}$ |                       | 42   | nC                       |
| $Q_{gd}$  |   |                       | 46   | nC                       |
| $R_{thJC}$  |   |                       |      | $0.35\ ^\circ\text{C/W}$ |
| $R_{thCH}$  | TO-220  | 0.50                  |      | $^\circ\text{C/W}$       |

### Source-Drain Diode

| Symbol   | Test Conditions  | Characteristic Values |      |       |
|--|--|-----------------------|------|-------|
|  |  | Min.                  | Typ. | Max.  |
| $T_J = 25^\circ\text{C}$ unless otherwise specified) |  |                       |      |       |
| $I_S$  | $V_{GS} = 0\text{ V}$  |                       |      | 220 A |
| $I_{SM}$   | Pulse width limited by $T_{JM}$  |                       |      | 600 A |
| $V_{SD}$   | $I_F = 25\text{ A}, V_{GS} = 0\text{ V}$ , Note 1  |                       |      | 1.0 V |
| $t_{rr}$   | $I_F = 25\text{ A}, -di/dt = 100\text{ A}/\mu\text{s}$<br>$V_R = 25\text{ V}, V_{GS} = 0\text{ V}$ |                       | 70   | ns    |

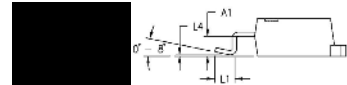
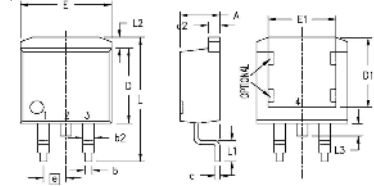
- Notes: 1. Pulse test,  $t \leq 300\ \mu\text{s}$ , duty cycle  $d \leq 2\%$ ;  
2. On through-hole packages,  $R_{DS(on)}$  Kelvin test contact location must be 5 mm or less from the package body.

### 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.

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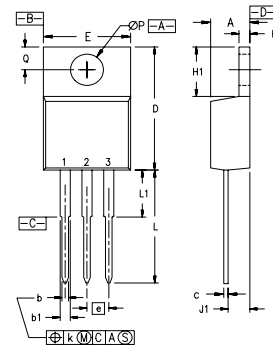
### TO-263 (IXTA) Outline



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

| Dim. | Millimeter |       | Inches |      |
|------|------------|-------|--------|------|
|      | Min.       | Max.  | Min.   | Max. |
| A    | 4.06       | 4.83  | .160   | .190 |
| A1   | 2.03       | 2.79  | .080   | .110 |
| b    | 0.51       | 0.99  | .020   | .039 |
| b2   | 1.14       | 1.40  | .045   | .055 |
| c    | 0.46       | 0.74  | .018   | .029 |
| c2   | 1.14       | 1.40  | .045   | .055 |
| D    | 8.64       | 9.65  | .340   | .380 |
| D1   | 7.11       | 8.13  | .280   | .320 |
| E    | 9.65       | 10.29 | .380   | .405 |
| E1   | 6.86       | 8.13  | .270   | .320 |
| e    | 2.54       | BSC   | .100   | BSC  |
| L    | 14.61      | 15.88 | .575   | .625 |
| L1   | 2.29       | 2.79  | .090   | .110 |
| L2   | 1.02       | 1.40  | .040   | .055 |
| L3   | 1.27       | 1.78  | .050   | .070 |
| L4   | 0          | 0.38  | 0      | .015 |
| R    | 0.46       | 0.74  | .018   | .029 |

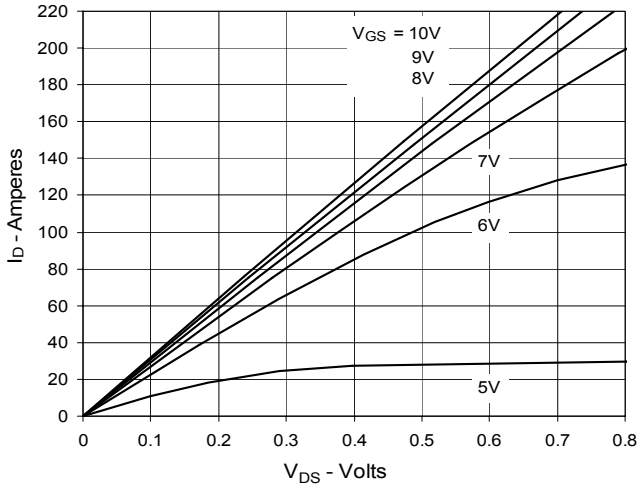
### TO-220 (IXTP) Outline



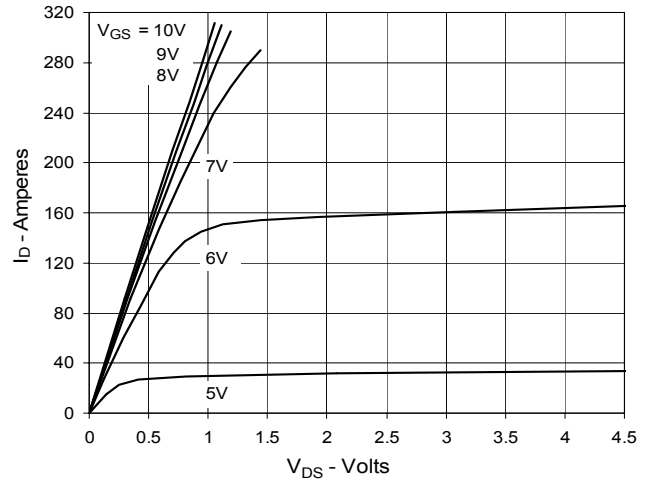
Pins: 1 - Gate 2 - Drain  
3 - Source 4, TAB - Drain

| 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  |

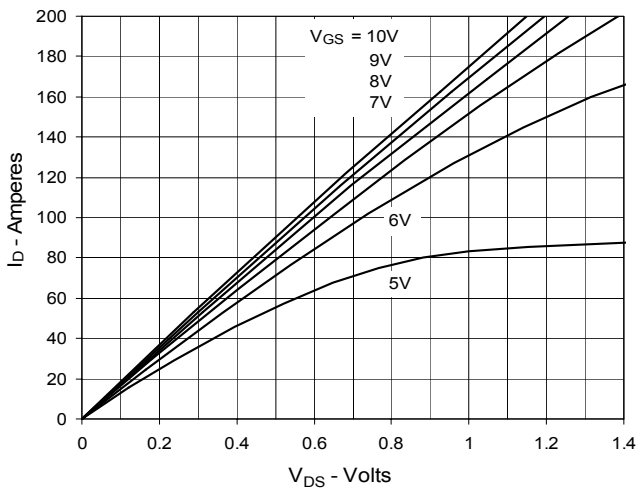
**Fig. 1. Output Characteristics @ 25°C**



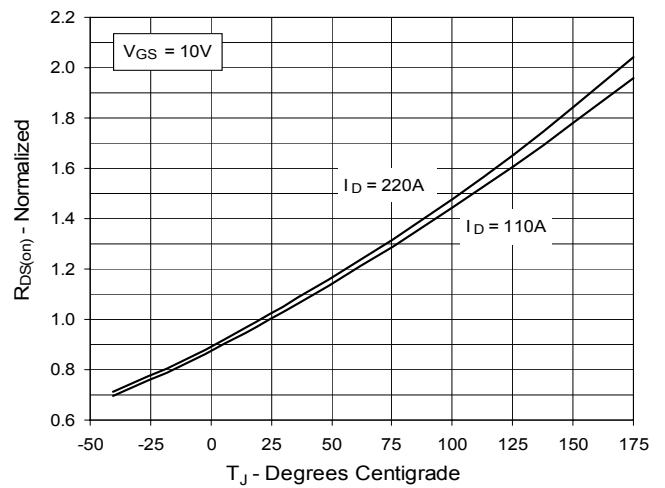
**Fig. 2. Extended Output Characteristics @ 25°C**



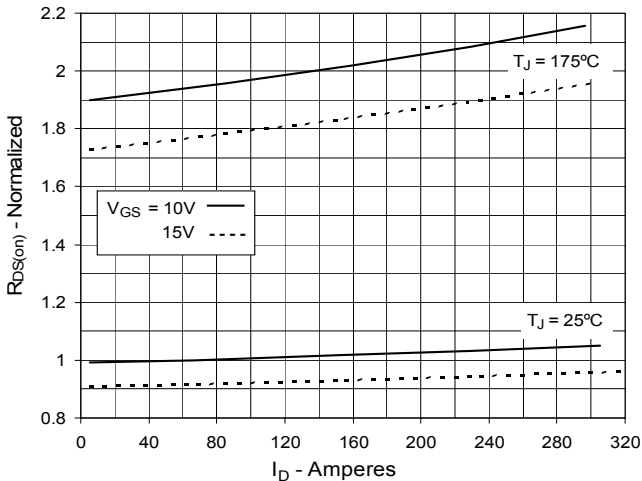
**Fig. 3. Output Characteristics @ 150°C**



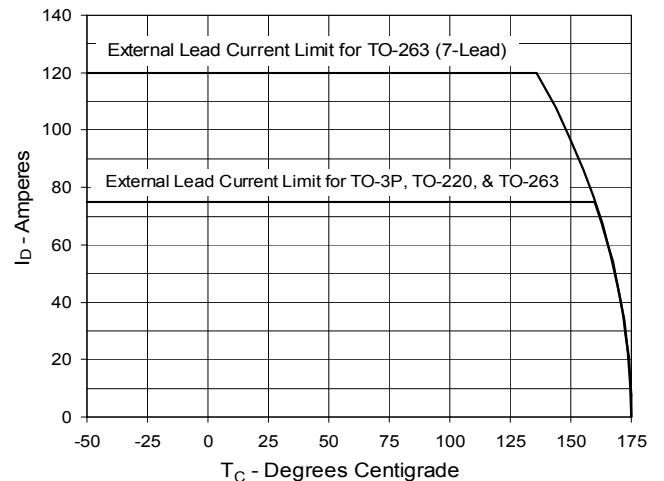
**Fig. 4.  $R_{DS(on)}$  Normalized to  $I_D = 110A$  Value vs. Junction Temperature**



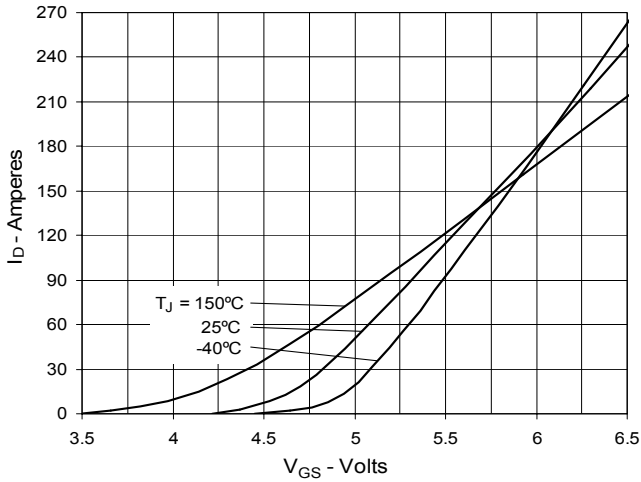
**Fig. 5.  $R_{DS(on)}$  Normalized to  $I_D = 110A$  Value vs. Drain Current**



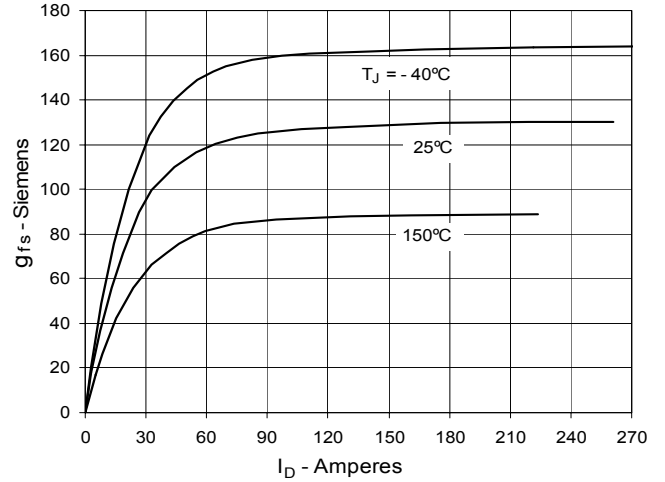
**Fig. 6. Drain Current vs. Case Temperature**



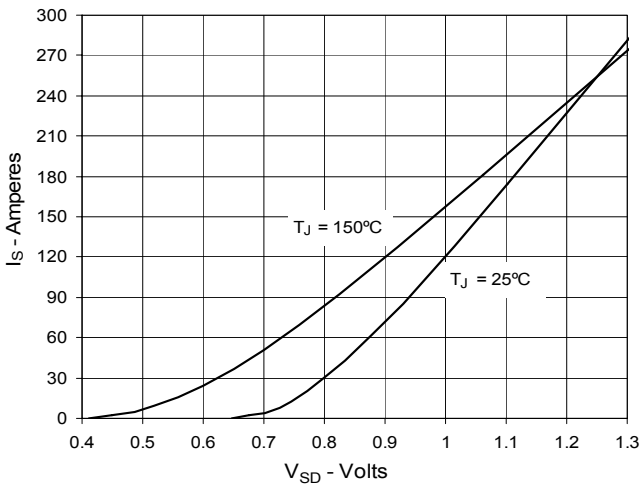
**Fig. 7. Input Admittance**



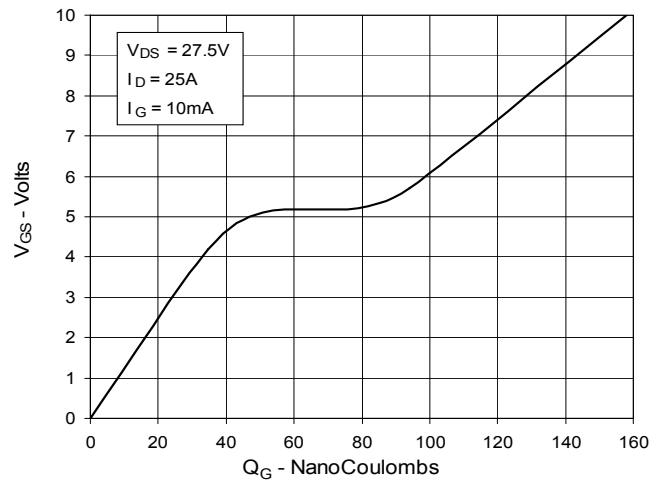
**Fig. 8. Transconductance**



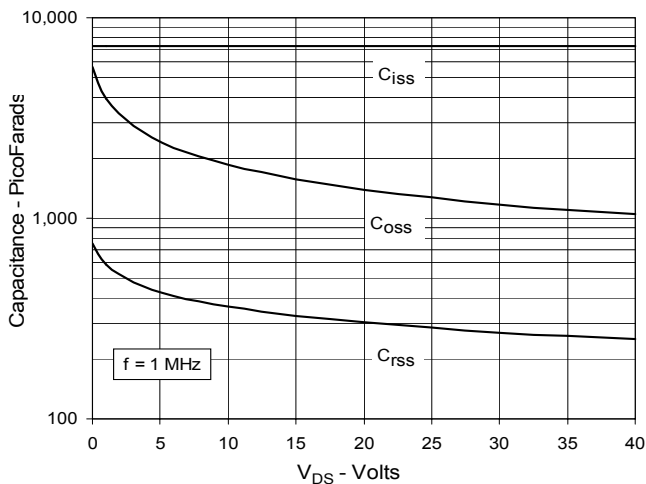
**Fig. 9. Forward Voltage Drop of Intrinsic Diode**



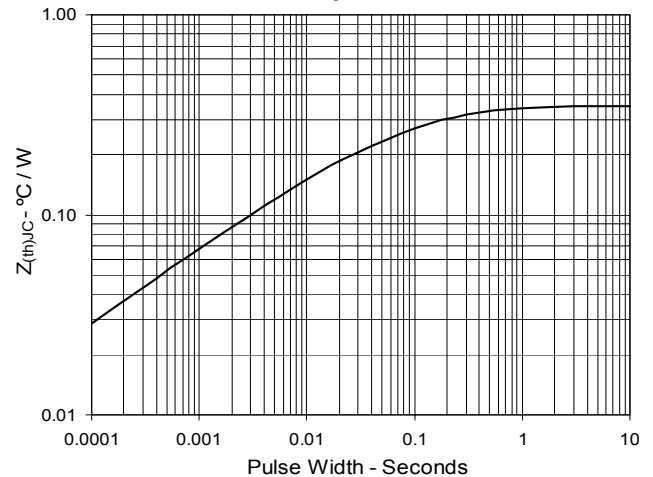
**Fig. 10. Gate Charge**



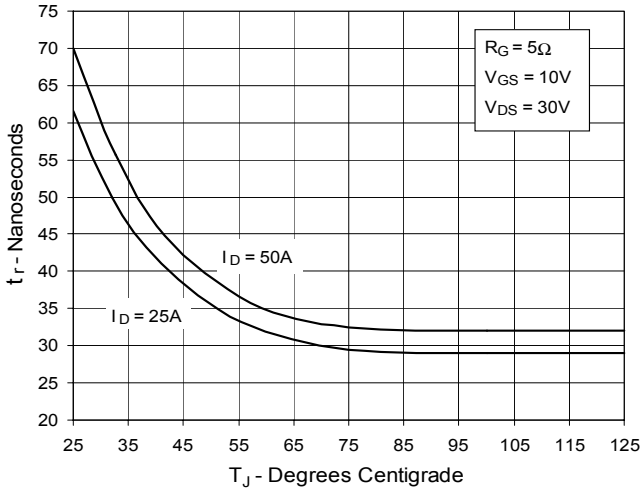
**Fig. 11. Capacitance**



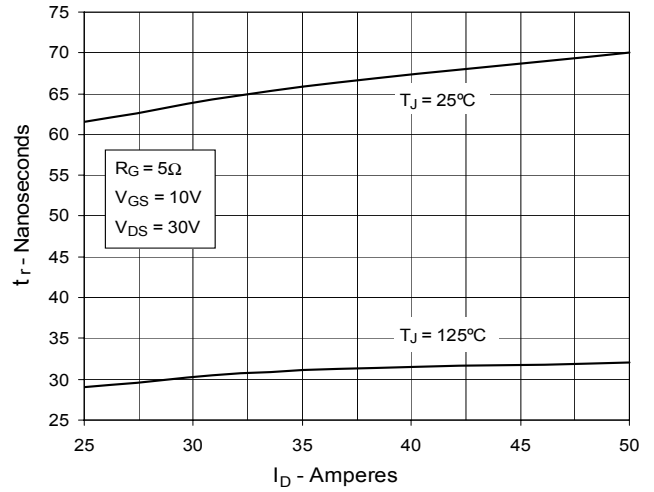
**Fig. 12. Maximum Transient Thermal Impedance**



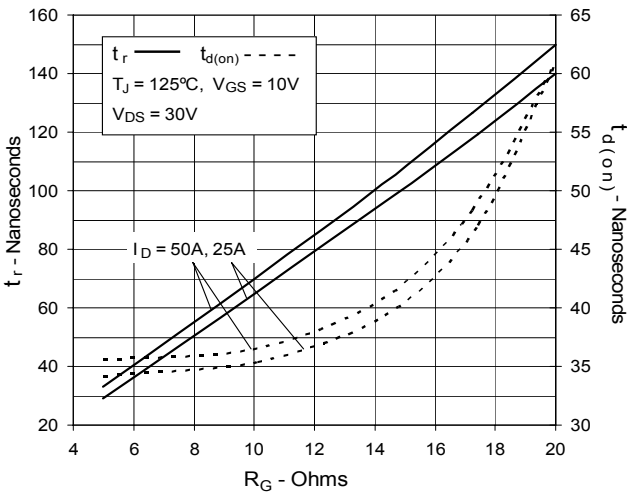
**Fig. 13. Resistive Turn-on**  
**Rise Time vs. Junction Temperature**



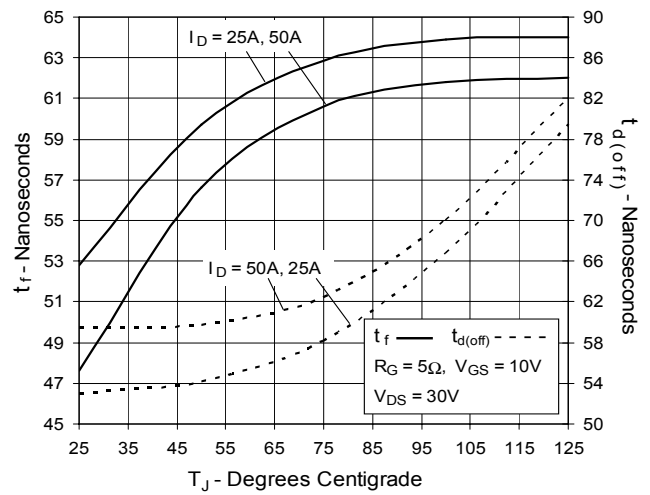
**Fig. 14. Resistive Turn-on**  
**Rise Time vs. Drain Current**



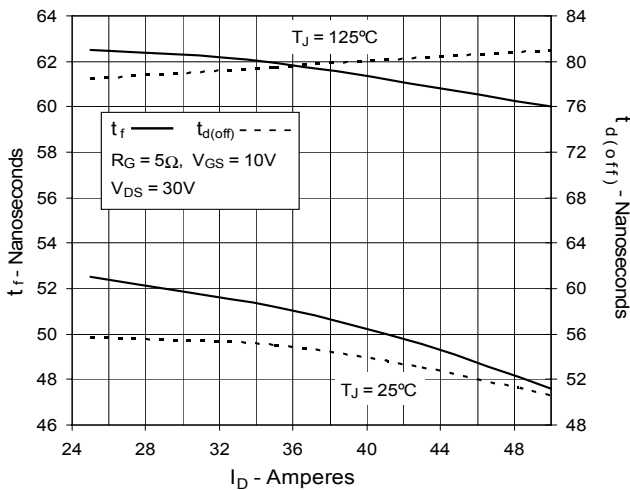
**Fig. 15. Resistive Turn-on**  
**Switching Times vs. Gate Resistance**



**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**

