

| 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                                                                                         | 65                    | 110  | S                  |
| $C_{iss}$    | $V_{GS} = 0\text{V}$ , $V_{DS} = 25\text{V}$ , $f = 1\text{MHz}$                                                                                   |                       | 9400 | pF                 |
| $C_{oss}$    |                                                                                                                                                    |                       | 850  | pF                 |
| $C_{rss}$    |                                                                                                                                                    |                       | 55   | pF                 |
| $t_{d(on)}$  | <b>Resistive Switching Times</b><br>$V_{GS} = 15\text{V}$ , $V_{DS} = 0.5 \cdot V_{DSS}$ , $I_D = 0.5 \cdot I_{D25}$<br>$R_G = 2\Omega$ (External) |                       | 19   | ns                 |
| $t_r$        |                                                                                                                                                    |                       | 27   | ns                 |
| $t_{d(off)}$ |                                                                                                                                                    |                       | 60   | ns                 |
| $t_f$        |                                                                                                                                                    |                       | 27   | ns                 |
| $Q_{g(on)}$  |                                                                                                                                                    |                       | 157  | nC                 |
| $Q_{gs}$     | $V_{GS} = 10\text{V}$ , $V_{DS} = 0.5 \cdot V_{DSS}$ , $I_D = 25\text{A}$                                                                          |                       | 40   | nC                 |
| $Q_{gd}$     |                                                                                                                                                    |                       | 50   | nC                 |
| $R_{thJC}$   |                                                                                                                                                    |                       | 0.25 | $^\circ\text{C/W}$ |
| $R_{thCS}$   |                                                                                                                                                    |                       |      | $^\circ\text{C/W}$ |

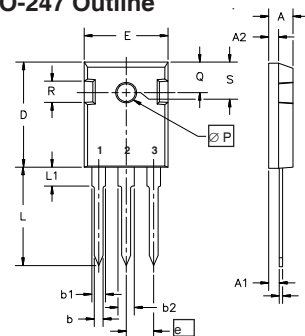
### Source-Drain Diode

| Symbol   | Test Conditions<br>( $T_J = 25^\circ\text{C}$ , Unless Otherwise Specified)                             | Characteristic Values |      |               |
|----------|---------------------------------------------------------------------------------------------------------|-----------------------|------|---------------|
|          |                                                                                                         | Min.                  | Typ. | Max.          |
| $I_S$    | $V_{GS} = 0\text{V}$                                                                                    |                       |      | 110 A         |
| $I_{SM}$ | Repetitive, Pulse Width Limited by $T_{JM}$                                                             |                       |      | 350 A         |
| $V_{SD}$ | $I_F = 55\text{A}$ , $V_{GS} = 0\text{V}$ , Note 1                                                      |                       |      | 1.2 V         |
| $t_{rr}$ | $I_F = 55\text{A}$ , $-di/dt = 250\text{A}/\mu\text{s}$ ,<br>$V_R = 100\text{V}$ , $V_{GS} = 0\text{V}$ |                       | 170  | ns            |
| $I_{RM}$ |                                                                                                         |                       | 27   | A             |
| $Q_{RM}$ |                                                                                                         |                       | 2.3  | $\mu\text{C}$ |

### Notes:

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

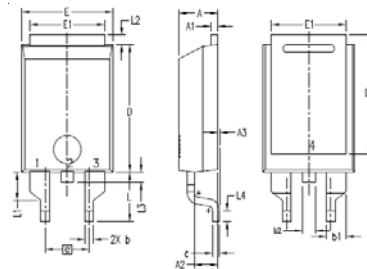
### TO-247 Outline



Terminals: 1 - Gate 2 - Drain  
3 - Source

| Dim.           | Millimeter<br>Min. Max. | Inches<br>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            |

### PLUS220SMD Outline



Terminals: 1 - Gate 2,4 - Drain  
3 - Source

| SYM | INCHES |      | MILLIMETER |       |
|-----|--------|------|------------|-------|
|     | MIN    | MAX  | MIN        | MAX   |
| A   | .169   | .185 | 4.30       | 4.70  |
| A1  | .028   | .035 | 0.70       | 0.90  |
| A2  | .098   | .118 | 2.50       | 3.00  |
| A3  | .000   | .010 | 0.00       | 0.25  |
| b   | .035   | .047 | 0.90       | 1.20  |
| b1  | .080   | .095 | 2.03       | 2.41  |
| b2  | .054   | .064 | 1.37       | 1.63  |
| c   | .028   | .035 | 0.70       | 0.90  |
| D   | .551   | .591 | 14.00      | 15.00 |
| D1  | .512   | .539 | 13.00      | 13.70 |
| E   | .394   | .433 | 10.00      | 11.00 |
| E1  | .331   | .346 | 8.40       | 8.80  |
| e   | .200   | BSC  | 5.08       | BSC   |
| L   | .209   | .228 | 5.30       | 5.80  |
| L1  | .118   | .138 | 3.00       | 3.50  |
| L2  | .035   | .051 | 0.90       | 1.30  |
| L3  | .047   | .059 | 1.20       | 1.50  |
| L4  | .039   | .059 | 1.00       | 1.50  |

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 @  $T_J = 25^\circ\text{C}$

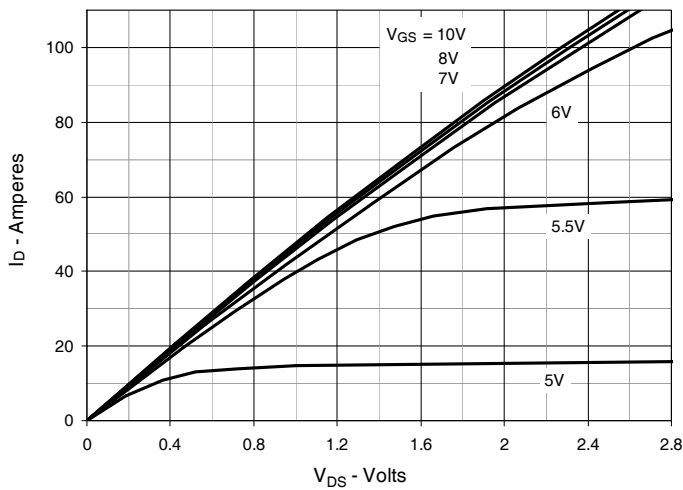


Fig. 2. Extended Output Characteristics @  $T_J = 25^\circ\text{C}$

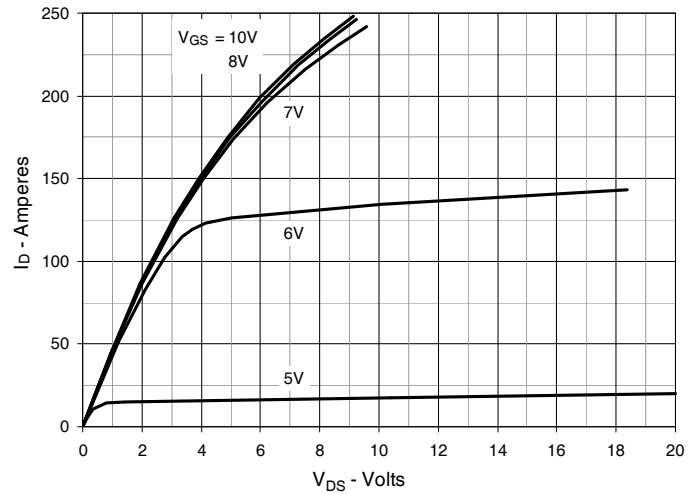


Fig. 3. Output Characteristics @  $T_J = 125^\circ\text{C}$

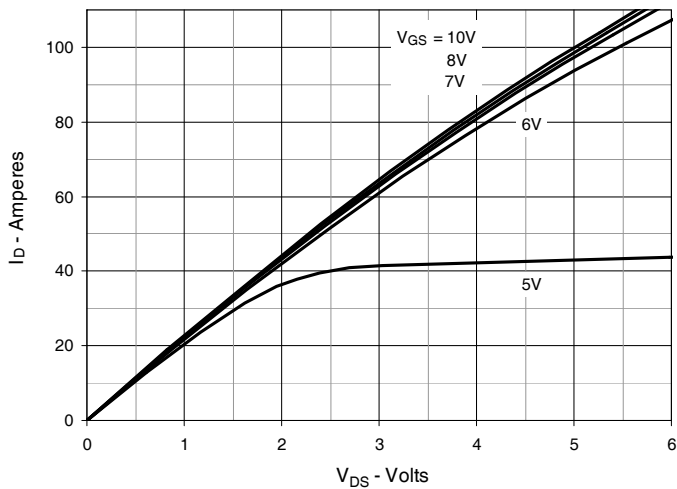


Fig. 4.  $R_{DS(on)}$  Normalized to  $I_D = 55\text{A}$  Value vs. Junction Temperature

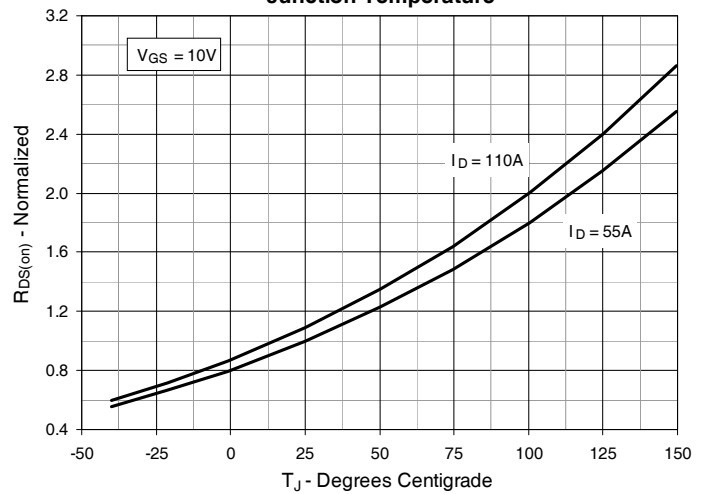


Fig. 5.  $R_{DS(on)}$  Normalized to  $I_D = 55\text{A}$  Value vs. Drain Current

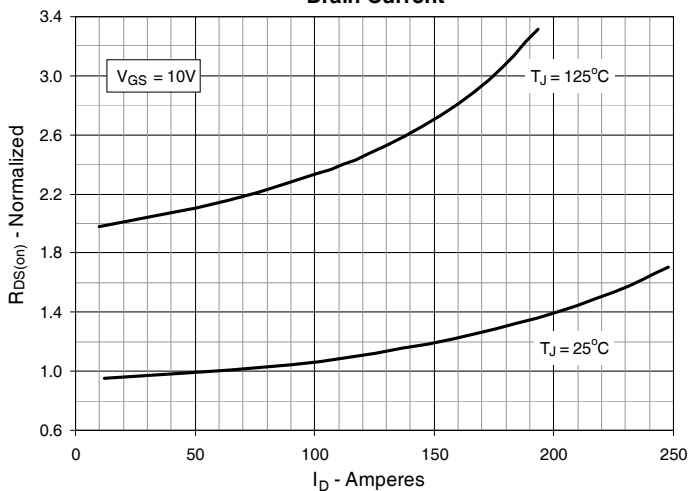
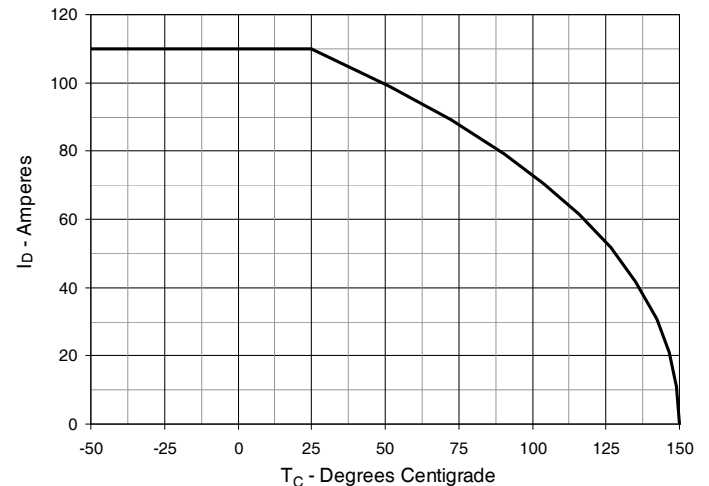
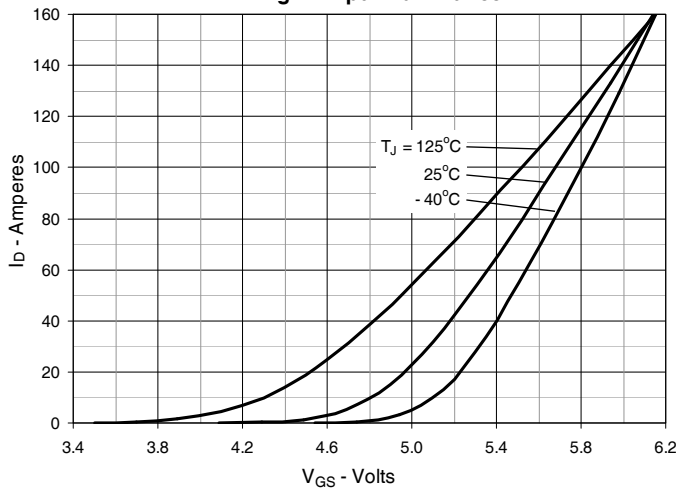


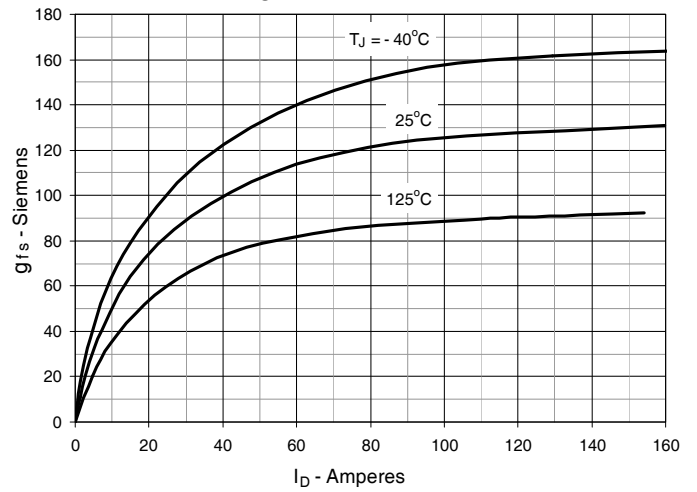
Fig. 6. Drain Current vs. Case Temperature



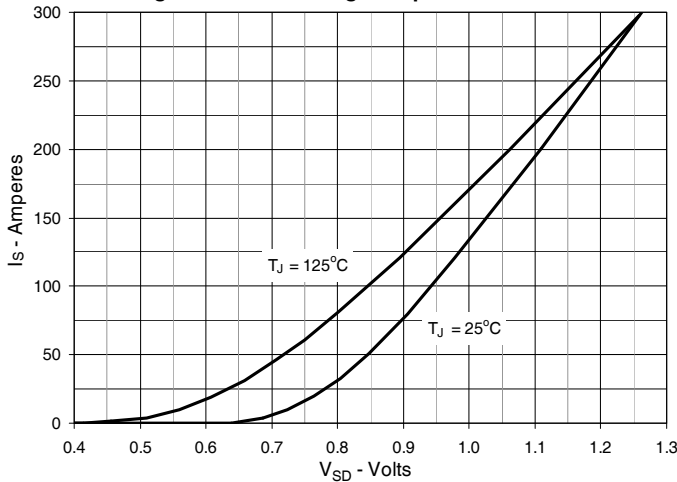
**Fig. 7. Input Admittance**



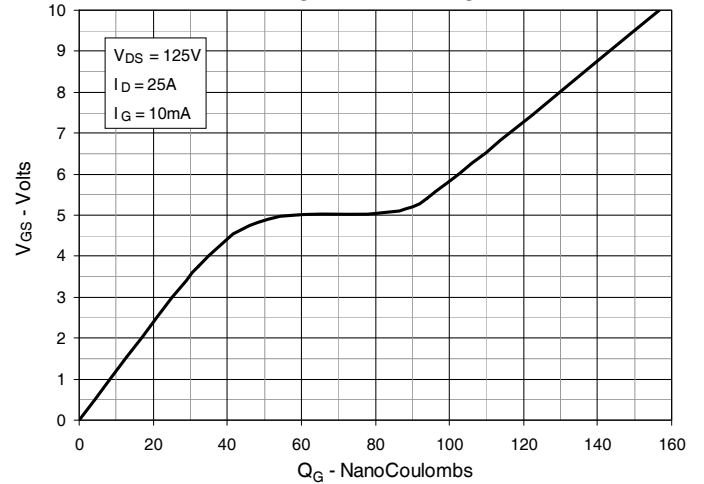
**Fig. 8. Transconductance**



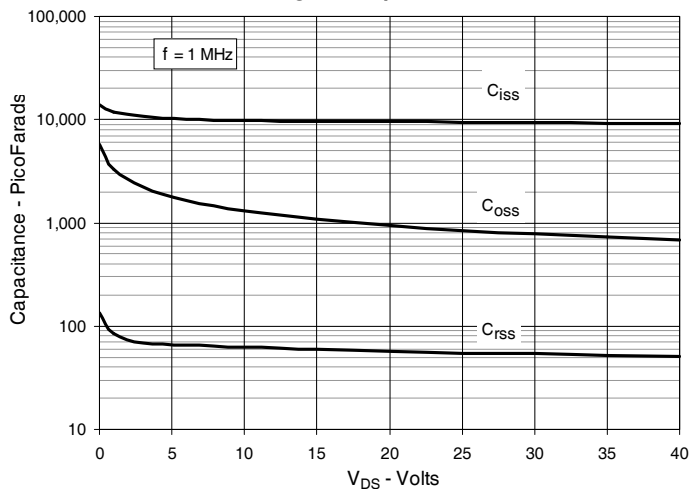
**Fig. 9. Forward Voltage Drop of Intrinsic Diode**



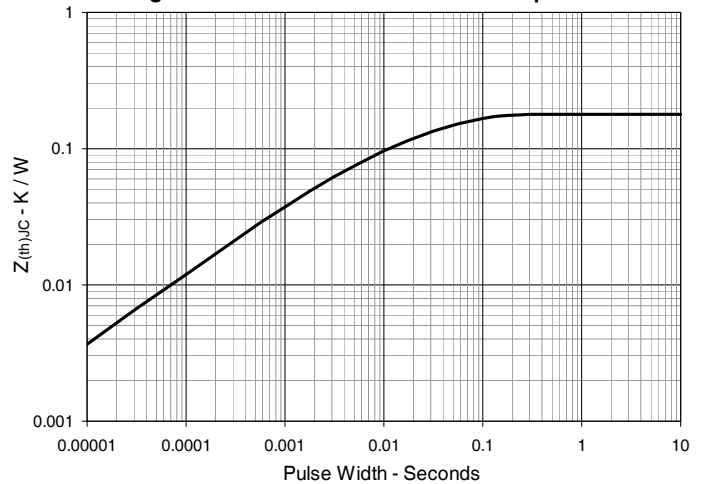
**Fig. 10. Gate Charge**



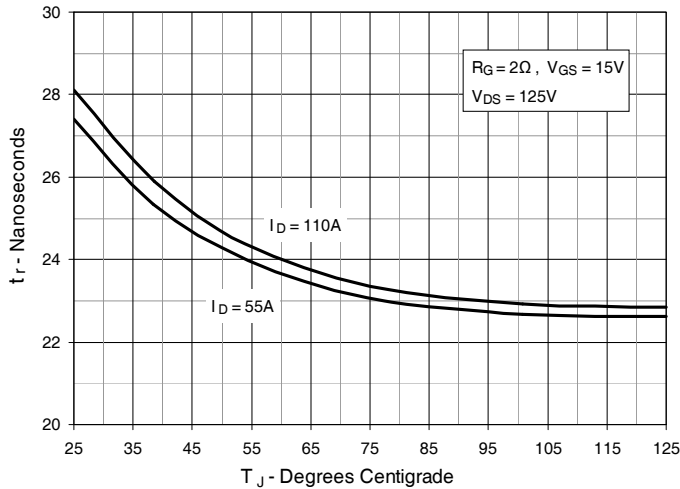
**Fig. 11. Capacitance**



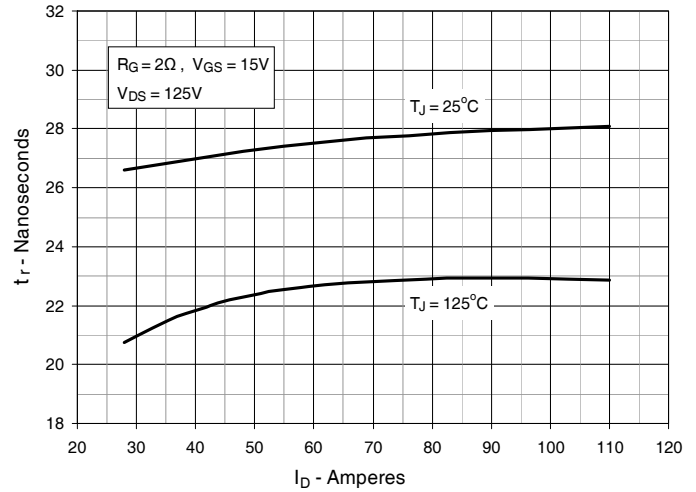
**Fig. 12. Maximum Transient Thermal Impedance**



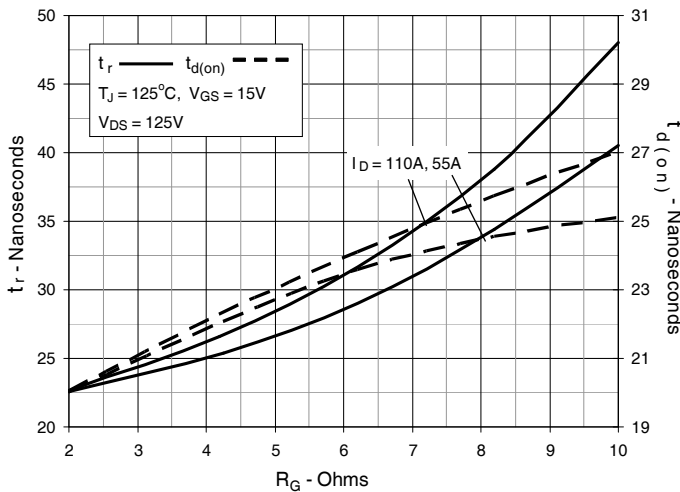
**Fig. 13. Resistive Turn-on Rise Time vs. Junction Temperature**



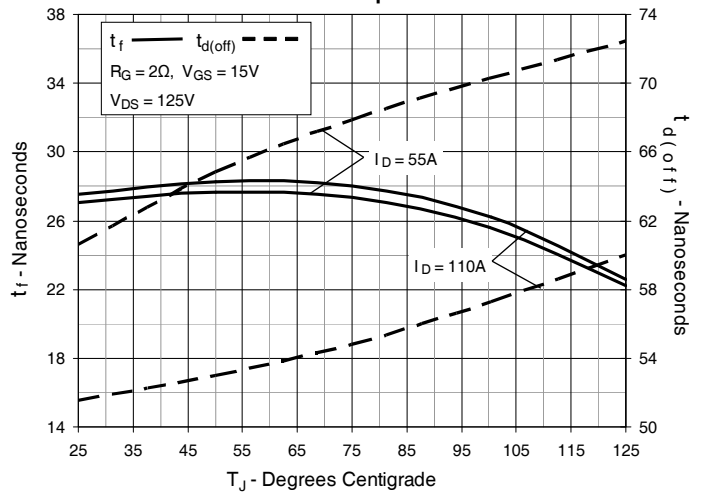
**Fig. 14. Resistive Turn-on Rise Time vs. Drain Current**



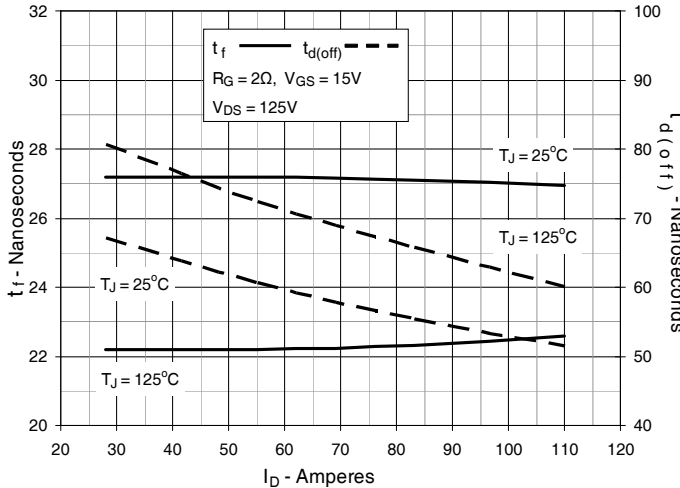
**Fig. 15. Resistive Turn-on Switching Times vs. Gate Resistance**



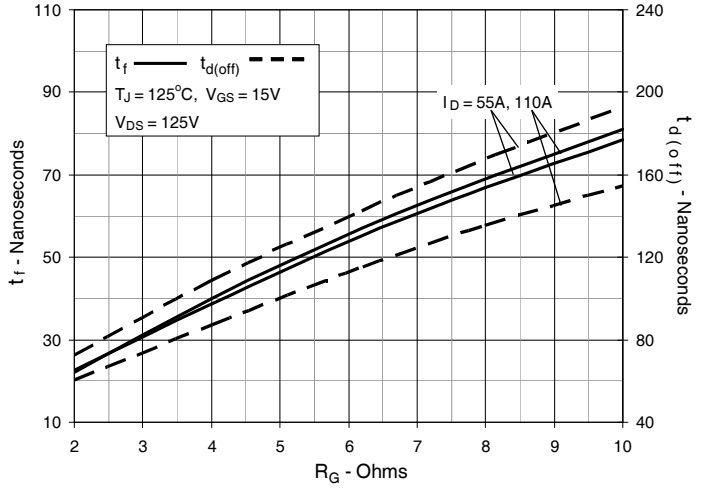
**Fig. 16. Resistive Turn-off Switching Times vs. Junction Temperature**



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



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





---

Disclaimer Notice - Information furnished is believed to be accurate and reliable. However, users should independently evaluate the suitability of and test each product selected for their own applications. Littelfuse products are not designed for, and may not be used in, all applications. Read complete Disclaimer Notice at [www.littelfuse.com/disclaimer-electronics](http://www.littelfuse.com/disclaimer-electronics).