IXYS

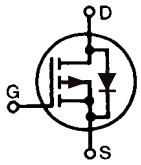
Advance Technical Information

# TrenchP™ Power MOSFET

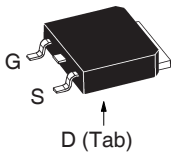
# IXTY10P15T
# IXTA10P15T
# IXTP10P15T

$V_{DSS}$ = -150V
$I_{D25}$ = -10A
$R_{DS(on)}$ ≤ 350mΩ

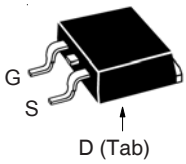
P-Channel Enhancement Mode
Avalanche Rated



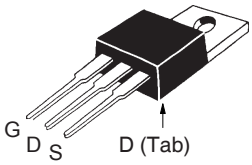

**TO-252 (IXTY)**




**TO-263 AA (IXTA)**




**TO-220AB (IXTP)**




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

| Symbol | Test Conditions | Maximum Ratings | |
|---|---|---|---|
| $V_{DSS}$ | $T_J$ = 25°C to 150°C | -150 | V |
| $V_{DGR}$ | $T_J$ = 25°C to 150°C, $R_{GS}$ = 1MΩ | -150 | V |
| $V_{GSS}$ | Continuous | ± 15 | V |
| $V_{GSM}$ | Transient | ± 25 | |
| $I_{D25}$ | $T_C$ = 25°C | -10 | A |
| $I_{DM}$ | $T_C$ = 25°C, Pulse Width Limited by $T_{JM}$ | - 30 | A |
| $I_A$ | $T_C$ = 25°C | -10 | A |
| $E_{AS}$ | $T_C$ = 25°C | 200 | mJ |
| $P_D$ | $T_C$ = 25°C | 83 | W |
| $T_J$ | | -55 ... +150 | °C |
| $T_{JM}$ | | 150 | °C |
| $T_{stg}$ | | -55 ... +150 | °C |
| $T_L$ | 1.6mm (0.062 in.) from Case for 10s | 300 | °C |
| $T_{SOLD}$ | Plastic Body for 10s | 260 | °C |
| $M_d$ | Mounting Torque (TO-220) | 1.13 / 10 | Nm/lb.in. |
| **Weight** | TO-252 | 0.35 | g |
| | TO-263 | 2.50 | g |
| | TO-220 | 3.00 | g |

| Symbol | Test Conditions ($T_J$ = 25°C, Unless Otherwise Specified) | Characteristic Values Min. | Typ. | Max. | |
|---|---|---|---|---|---|
| $BV_{DSS}$ | $V_{GS}$ = 0V, $I_D$ = - 250μA | -150 | | | V |
| $V_{GS(th)}$ | $V_{DS}$ = $V_{GS}$, $I_D$ = - 250μA | - 2.0 | | - 4.5 | V |
| $I_{GSS}$ | $V_{GS}$ = ± 15V, $V_{DS}$ = 0V | | | ±50 | nA |
| $I_{DSS}$ | $V_{DS}$ = $V_{DSS}$, $V_{GS}$ = 0V | | | - 3 | μA |
| | $T_J$ = 125°C | | | -100 | μA |
| $R_{DS(on)}$ | $V_{GS}$ = -10V, $I_D$ = 0.5 • $I_{D25}$, Note 1 | | | 350 | mΩ |

## Features

- International Standard Packages
- Avalanche Rated
- Extended FBSOA
- Fast Intrinsic Diode
- Low $R_{DS(ON)}$ and $Q_G$

## Advantages

- Easy to Mount
- Space Savings
- High Power Density

## Applications

- High-Side Switching
- Push Pull Amplifiers
- DC Choppers
- Automatic Test Equipment
- Current Regulators
- Battery Charger Applications

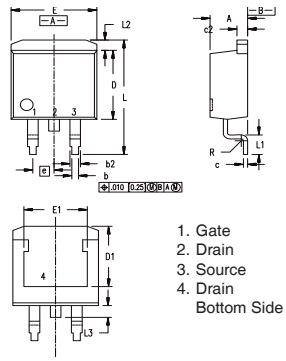
| Symbol | Test Conditions ($T_J$ = 25°C, Unless Otherwise Specified) | Characteristic Values Min. | Typ. | Max. | |
|---|---|---|---|---|---|
| $g_{fs}$ | $V_{DS}$ = -10V, $I_D$ = 0.5 • $I_{D25}$, Note 1 | 5 | 9 | | S |
| $C_{iss}$ | $V_{GS}$ = 0V, $V_{DS}$ = - 25V, f = 1MHz | | 2210 | | pF |
| $C_{oss}$ | | | 146 | | pF |
| $C_{rss}$ | | | 43 | | pF |
| $t_{d(on)}$ | **Resistive Switching Times** | | 19 | | ns |
| $t_r$ | $V_{GS}$ = -10V, $V_{DS}$ = 0.5 • $V_{DSS}$, $I_D$ = 0.5 • $I_{D25}$ | | 16 | | ns |
| $t_{d(off)}$ | $R_G$ = 5Ω (External) | | 40 | | ns |
| $t_f$ | | | 12 | | ns |
| $Q_{g(on)}$ | $V_{GS}$ = -10V, $V_{DS}$ = 0.5 • $V_{DSS}$, $I_D$ = 0.5 • $I_{D25}$ | | 36 | | nC |
| $Q_{gs}$ | | | 12 | | nC |
| $Q_{gd}$ | | | 8 | | nC |
| $R_{thJC}$ | | | | 1.5 | °C/W |
| $R_{thCS}$ | TO-220 | | 0.50 | | °C/W |

**Source-Drain Diode**

| Symbol | Test Conditions ($T_J$ = 25°C, Unless Otherwise Specified) | Characteristic Values Min. | Typ. | Max. | |
|---|---|---|---|---|---|
| $I_S$ | $V_{GS}$ = 0V | | | -10 | A |
| $I_{SM}$ | Repetitive, Pulse Width Limited by $T_{JM}$ | | | - 40 | A |
| $V_{SD}$ | $I_F$ = $I_S$, $V_{GS}$ = 0V, Note 1 | | | -1.3 | V |
| $t_{rr}$ | $I_F$ = 0.5 • $I_{D25}$, -di/dt = -100A/μs | | 120 | | ns |
| $Q_{RM}$ | $V_R$ = - 100V, $V_{GS}$ = 0V | | 530 | | nC |
| $I_{RM}$ | | | - 9 | | A |

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

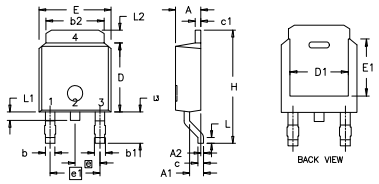
**TO-263 Outline**



1. Gate
2. Drain
3. Source
4. Drain
Bottom Side

| Dim. | Millimeter Min. | Max. | Inches Min. | Max. |
|---|---|---|---|---|
| A | 4.06 | 4.83 | .160 | .190 |
| b | 0.51 | 0.99 | .020 | .039 |
| b2 | 1.14 | 1.40 | .045 | .055 |
| c | 0.40 | 0.74 | .016 | .029 |
| c2 | 1.14 | 1.40 | .045 | .055 |
| D | 8.64 | 9.65 | .340 | .380 |
| D1 | 8.00 | 8.89 | .280 | .320 |
| E | 9.65 | 10.41 | .380 | .405 |
| E1 | 6.22 | 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 | 0.13 | 0 | .005 |

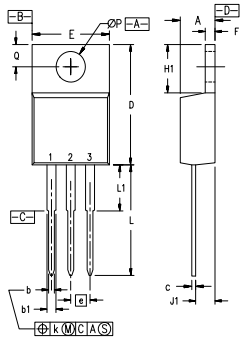
**TO-252 Outline**



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

| Dim. | Millimeter Min. | Max. | Inches Min. | Max. |
|---|---|---|---|---|
| A | 2.19 | 2.38 | 0.086 | 0.094 |
| A1 | 0.89 | 1.14 | 0.035 | 0.045 |
| A2 | 0 | 0.13 | 0 | 0.005 |
| b | 0.64 | 0.89 | 0.025 | 0.035 |
| b1 | 0.76 | 1.14 | 0.030 | 0.045 |
| b2 | 5.21 | 5.46 | 0.205 | 0.215 |
| c | 0.46 | 0.58 | 0.018 | 0.023 |
| c1 | 0.46 | 0.58 | 0.018 | 0.023 |
| D | 5.97 | 6.22 | 0.235 | 0.245 |
| D1 | 4.32 | 5.21 | 0.170 | 0.205 |
| E | 6.35 | 6.73 | 0.250 | 0.265 |
| E1 | 4.32 | 5.21 | 0.170 | 0.205 |
| e | 2.28 BSC | | 0.090 BSC | |
| e1 | 4.57 BSC | | 0.180 BSC | |
| H | 9.40 | 10.42 | 0.370 | 0.410 |
| L | 0.51 | 1.02 | 0.020 | 0.040 |
| L1 | 0.64 | 1.02 | 0.025 | 0.040 |
| L2 | 0.89 | 1.27 | 0.035 | 0.050 |
| L3 | 2.54 | 2.92 | 0.100 | 0.115 |

**TO-220 Outline**



Pins: 1 - Gate 2 - Drain
3 - Source

| SYM | INCHES MIN | MAX | MILLIMETERS 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 |

**ADVANCE 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.

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**Fig. 1. Output Characteristics @ $T_J$ = 25ºC**

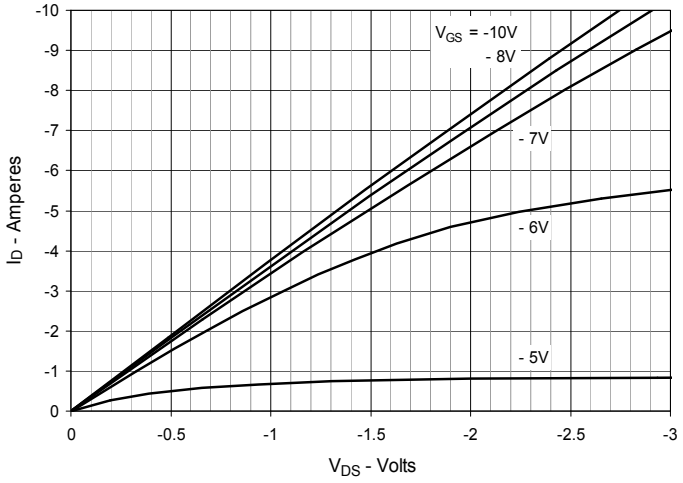


**Fig. 2. Extended Output Characteristics @ $T_J$ = 25ºC**

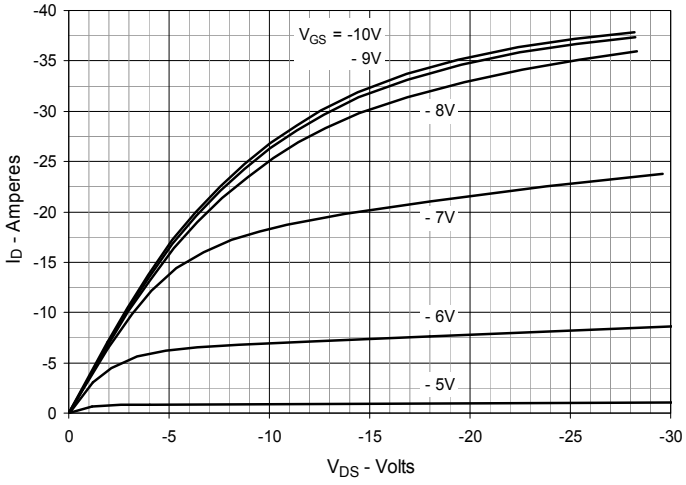


**Fig. 3. Output Characteristics @ $T_J$ = 125ºC**

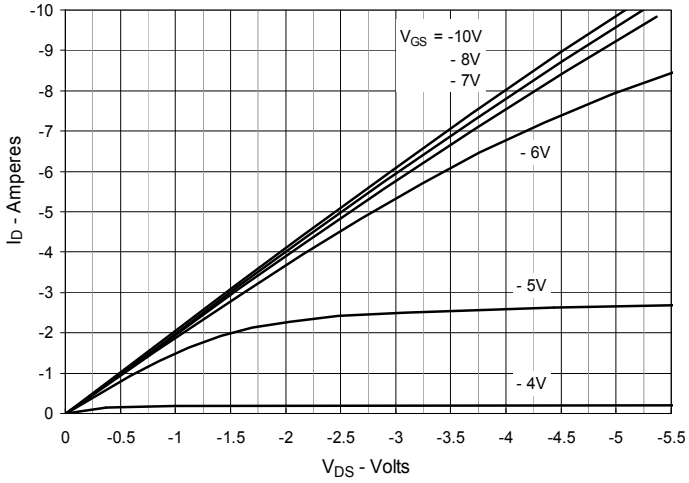


**Fig. 4. $R_{DS(on)}$ Normalized to $I_D$ = - 5A vs. Junction Temperature**

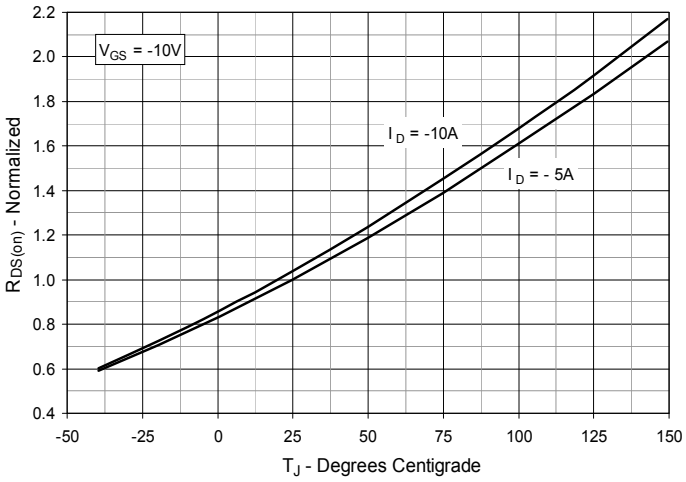


**Fig. 5. $R_{DS(on)}$ Normalized to $I_D$ = - 5A vs. Drain Current**

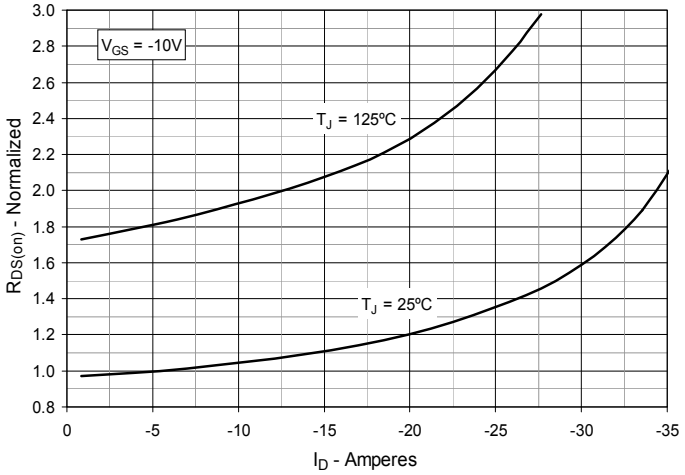


**Fig. 6. Maximum Drain Current vs. Case Temperature**

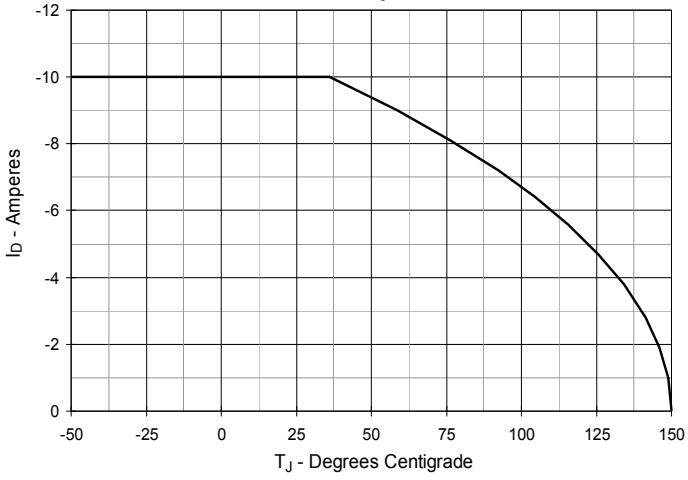

**Fig. 7. Input Admittance**

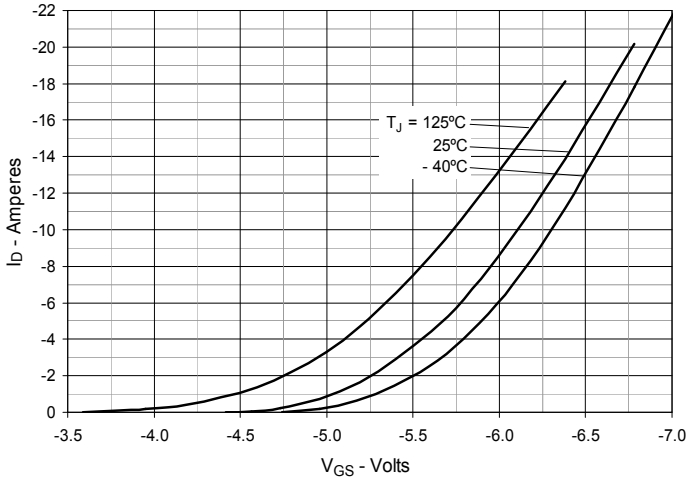


**Fig. 8. Transconductance**

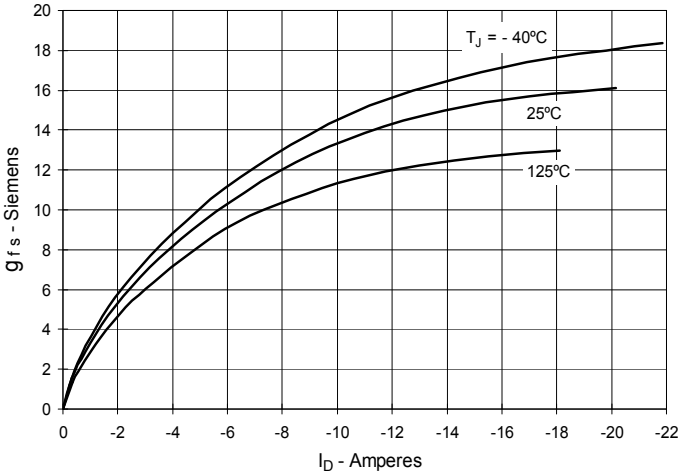


**Fig. 9. Forward Voltage Drop of Intrinsic Diode**

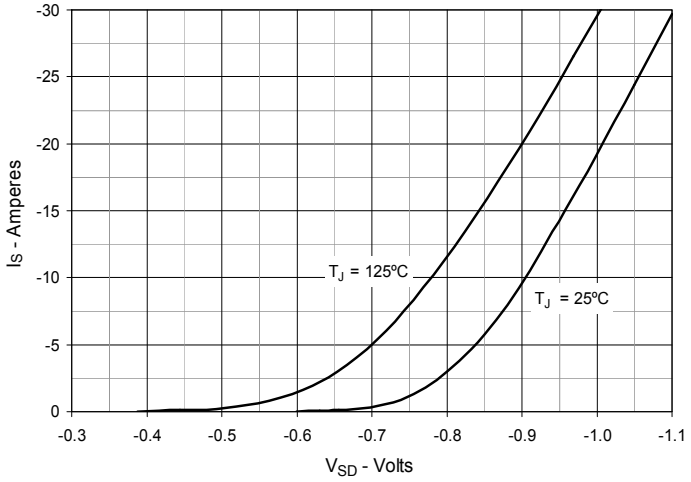


**Fig. 10. Gate Charge**

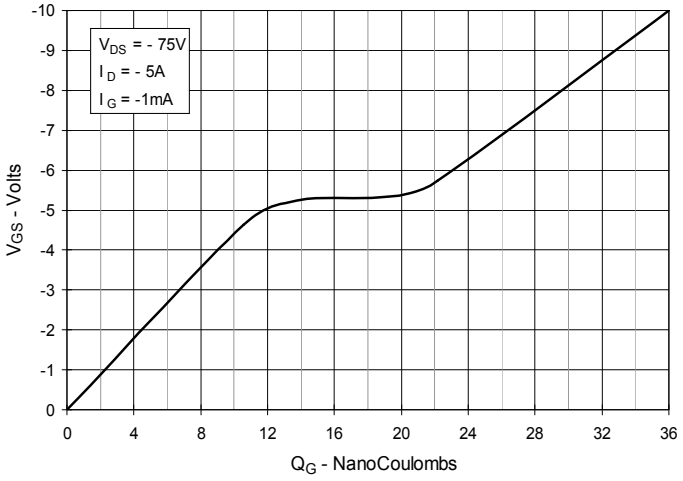


**Fig. 11. Capacitance**

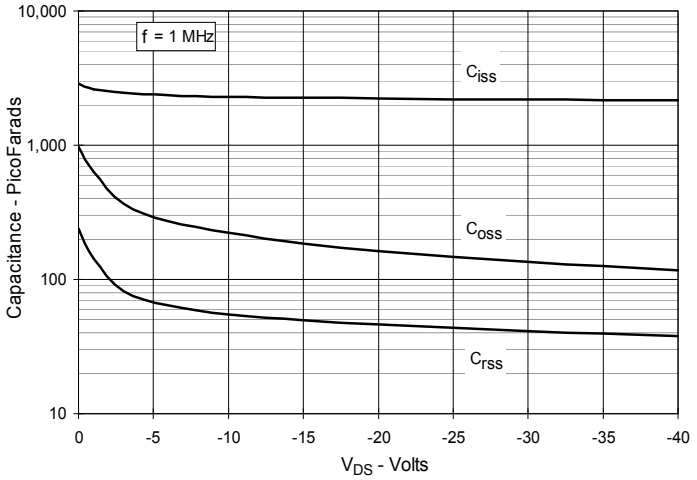


**Fig. 12. Forward-Bias Safe Operating Area**

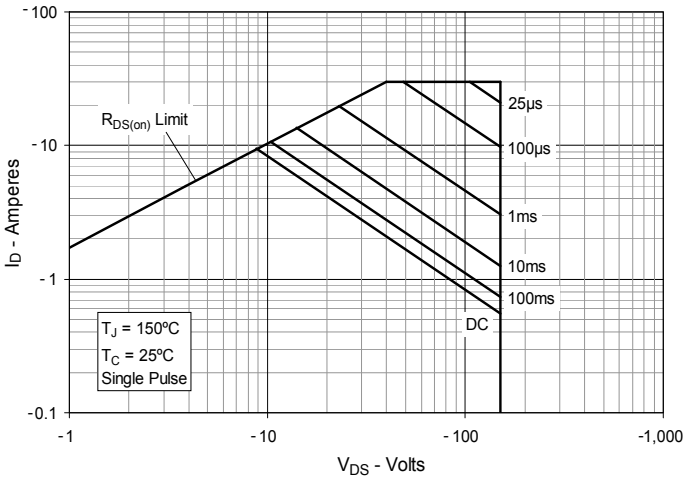

**Fig. 13. Resistive Turn-on Rise Time vs. Junction Temperature**

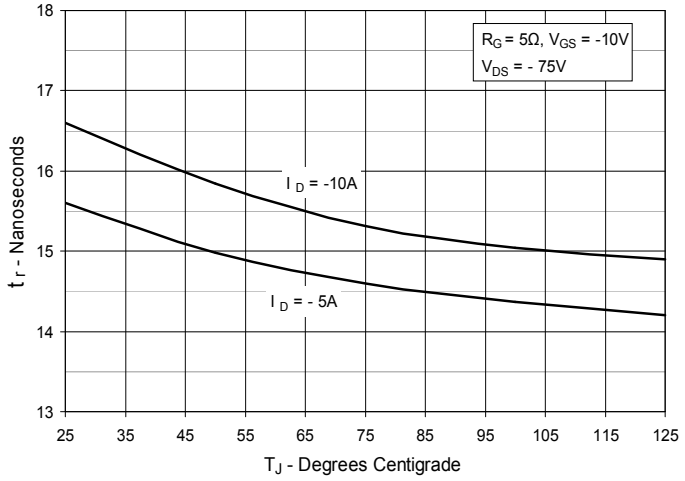


**Fig. 14. Resistive Turn-on Rise Time vs. Drain Current**

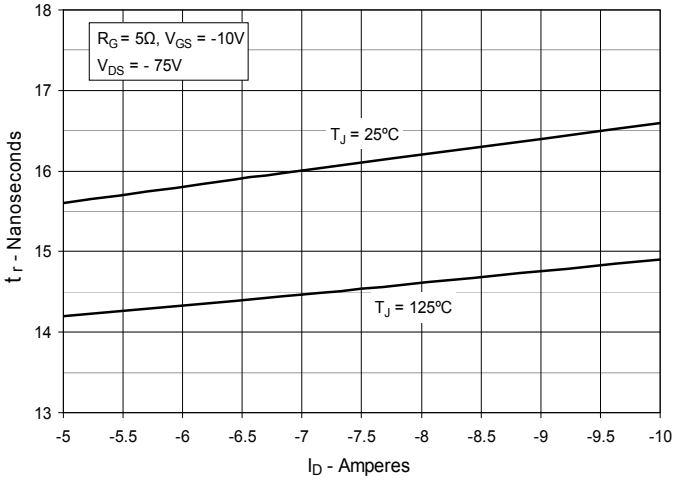


**Fig. 15. Resistive Turn-on Switching Times vs. Gate Resistance**

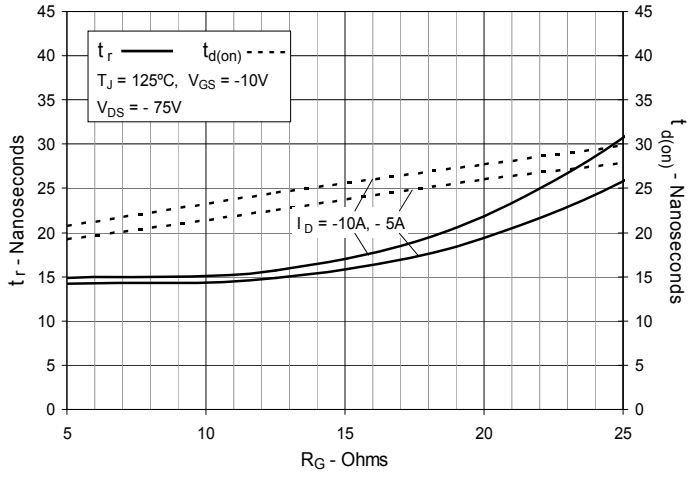


**Fig. 16. Resistive Turn-off Switching Times vs. Junction Temperature**

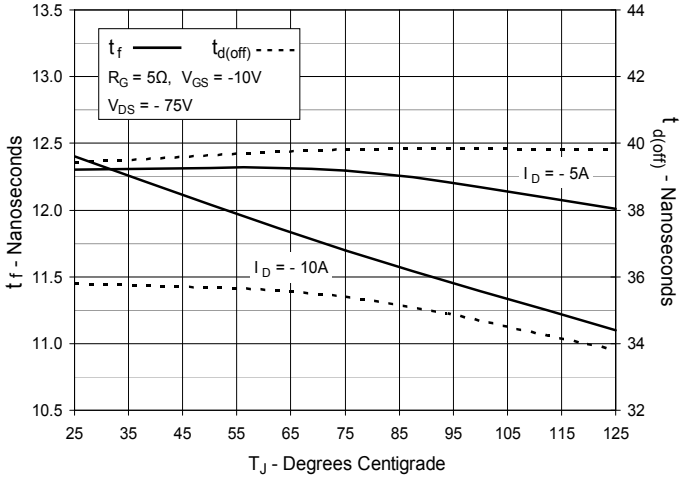


**Fig. 17. Resistive Turn-off Switching Times vs. Drain Current**

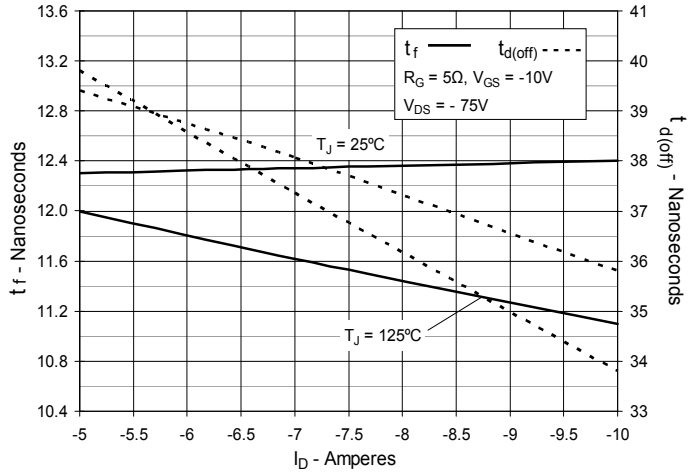


**Fig. 18. Resistive Turn-off Switching Times vs. Gate Resistance**

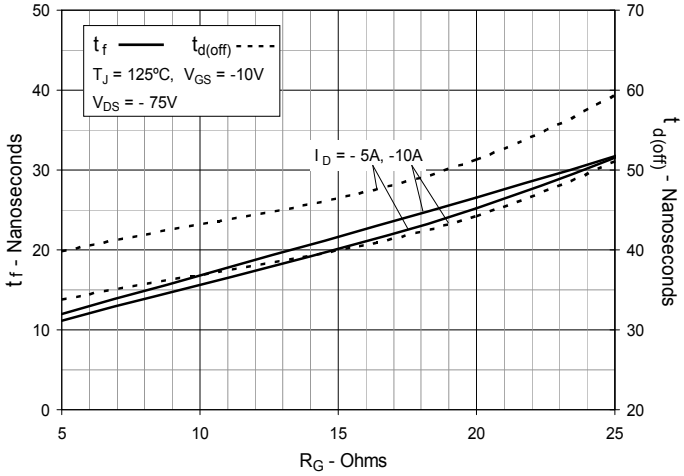

**Fig. 19. Maximum Transient Thermal Impedance**