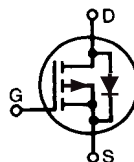


## TrenchP™ Power MOSFETs

**IXTA140P05T**  
**IXTP140P05T**  
**IXTH140P05T**

$V_{DSS} = -50V$   
 $I_{D25} = -140A$   
 $R_{DS(on)} \leq 9m\Omega$

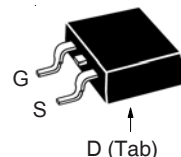
P-Channel Enhancement Mode  
Avalanche Rated



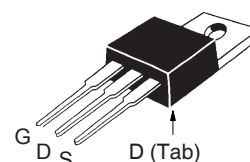
| Symbol     | Test Conditions                                           | Maximum Ratings |            |
|------------|-----------------------------------------------------------|-----------------|------------|
| $V_{DSS}$  | $T_J = 25^\circ C$ to $150^\circ C$                       | - 50            | V          |
| $V_{DGR}$  | $T_J = 25^\circ C$ to $150^\circ C$ , $R_{GS} = 1M\Omega$ | - 50            | V          |
| $V_{GSS}$  | Continuous                                                | $\pm 15$        | V          |
| $V_{GSM}$  | Transient                                                 | $\pm 25$        | V          |
| $I_{D25}$  | $T_C = 25^\circ C$ (Chip Capability)                      | -140            | A          |
| $I_{LRMS}$ | Lead Current Limit, RMS                                   | -120            | A          |
| $I_{DM}$   | $T_C = 25^\circ C$ , Pulse Width Limited by $T_{JM}$      | - 420           | A          |
| $I_A$      | $T_C = 25^\circ C$                                        | - 70            | A          |
| $E_{AS}$   | $T_C = 25^\circ C$                                        | 1               | J          |
| $P_D$      | $T_C = 25^\circ C$                                        | 298             | W          |
| $T_J$      |                                                           | -55 ... +150    | $^\circ C$ |
| $T_{JM}$   |                                                           | 150             | $^\circ C$ |
| $T_{stg}$  |                                                           | -55 ... +150    | $^\circ C$ |
| $T_L$      | 1.6mm (0.062 in.) from Case for 10s                       | 300             | $^\circ C$ |
| $T_{SOLD}$ | Plastic Body for 10s                                      | 260             | $^\circ C$ |
| $M_d$      | Mounting Torque (TO-220 & TO-247)                         | 1.13/10         | Nm/lb.in.  |
| Weight     | TO-263                                                    | 2.5             | g          |
|            | TO-220                                                    | 3.0             | g          |
|            | TO-247                                                    | 6.0             | g          |

| Symbol       | Test Conditions<br>( $T_J = 25^\circ C$ , Unless Otherwise Specified) | Characteristic Values |      |                              |
|--------------|-----------------------------------------------------------------------|-----------------------|------|------------------------------|
|              |                                                                       | Min.                  | Typ. | Max.                         |
| $BV_{DSS}$   | $V_{GS} = 0V$ , $I_D = -250\mu A$                                     | - 50                  |      | V                            |
| $V_{GS(th)}$ | $V_{DS} = V_{GS}$ , $I_D = -250\mu A$                                 | - 2.0                 |      | - 4.0 V                      |
| $I_{GSS}$    | $V_{GS} = \pm 15V$ , $V_{DS} = 0V$                                    |                       |      | $\pm 100$ nA                 |
| $I_{DSS}$    | $V_{DS} = V_{DSS}$ , $V_{GS} = 0V$<br>$T_J = 125^\circ C$             |                       |      | -10 $\mu A$<br>- 750 $\mu A$ |
| $R_{DS(on)}$ | $V_{GS} = -10V$ , $I_D = 0.5 \cdot I_{D25}$ , Note 1                  |                       |      | 9 m $\Omega$                 |

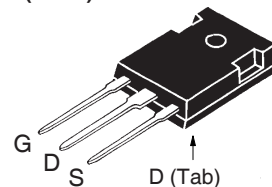
TO-263 AA (IXTA)



TO-220AB (IXTP)



TO-247 (IXTH)



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

### 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

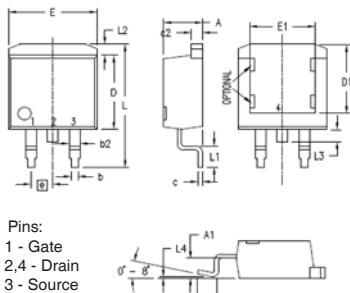
| Symbol       | Test Conditions<br>( $T_J = 25^\circ\text{C}$ , Unless Otherwise Specified)                                                             | Characteristic Values |      |                         |
|--------------|-----------------------------------------------------------------------------------------------------------------------------------------|-----------------------|------|-------------------------|
|              |                                                                                                                                         | Min.                  | Typ. | Max.                    |
| $g_{fs}$     | $V_{DS} = -10\text{V}$ , $I_D = 0.5 \cdot I_{D25}$ , Note 1                                                                             | 44                    | 72   | S                       |
| $C_{iss}$    | $V_{GS} = 0\text{V}$ , $V_{DS} = -25\text{V}$ , $f = 1\text{MHz}$                                                                       |                       | 13.5 | nF                      |
| $C_{oss}$    |                                                                                                                                         |                       | 1640 | pF                      |
| $C_{rss}$    |                                                                                                                                         |                       | 640  | pF                      |
| $t_{d(on)}$  | <b>Resistive Switching Times</b><br>$V_{GS} = -10\text{V}$ , $V_{DS} = -30\text{V}$ , $I_D = -50\text{A}$<br>$R_G = 1\Omega$ (External) |                       | 28   | ns                      |
| $t_r$        |                                                                                                                                         |                       | 34   | ns                      |
| $t_{d(off)}$ |                                                                                                                                         |                       | 38   | ns                      |
| $t_f$        |                                                                                                                                         |                       | 25   | ns                      |
| $Q_{g(on)}$  | $V_{GS} = -10\text{V}$ , $V_{DS} = 0.5 \cdot V_{DSS}$ , $I_D = 0.5 \cdot I_{D25}$                                                       |                       | 200  | nC                      |
| $Q_{gs}$     |                                                                                                                                         |                       | 50   | nC                      |
| $Q_{gd}$     |                                                                                                                                         |                       | 65   | nC                      |
| $R_{thJC}$   |                                                                                                                                         |                       |      | 0.42 $^\circ\text{C/W}$ |
| $R_{thCS}$   | TO-220                                                                                                                                  |                       | 0.50 | $^\circ\text{C/W}$      |
|              | TO-247                                                                                                                                  |                       | 0.21 | $^\circ\text{C/W}$      |

## Source-Drain Diode

| Symbol   | Test Conditions<br>( $T_J = 25^\circ\text{C}$ , Unless Otherwise Specified)                             | Characteristic Values |      |        |
|----------|---------------------------------------------------------------------------------------------------------|-----------------------|------|--------|
|          |                                                                                                         | Min.                  | Typ. | Max.   |
| $I_S$    | $V_{GS} = 0\text{V}$                                                                                    |                       |      | -140 A |
| $I_{SM}$ | Repetitive, Pulse Width Limited by $T_{JM}$                                                             |                       |      | -560 A |
| $V_{SD}$ | $I_F = -70\text{A}$ , $V_{GS} = 0\text{V}$ , Note 1                                                     |                       |      | -1.3 V |
| $t_{rr}$ | $I_F = -70\text{A}$ , $-di/dt = -100\text{A}/\mu\text{s}$<br>$V_R = -25\text{V}$ , $V_{GS} = 0\text{V}$ |                       | 53   | ns     |
| $Q_{RM}$ |                                                                                                         |                       | 58   | nC     |
| $I_{RM}$ |                                                                                                         |                       | -2.2 | A      |

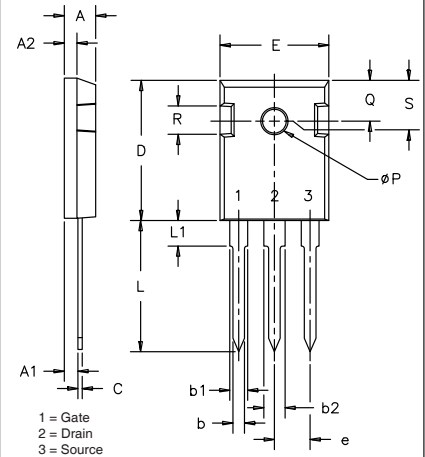
Note 1. Pulse test,  $t \leq 300\mu\text{s}$ , duty cycle,  $d \leq 2\%$ .

## TO-263 Outline



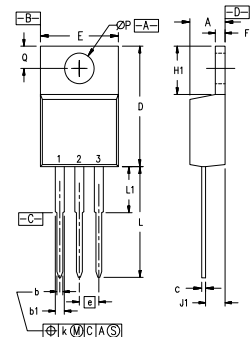
| SYM | INCHES   |      | MILLIMETERS |       |
|-----|----------|------|-------------|-------|
|     | MIN      | MAX  | MIN         | MAX   |
| A   | .160     | .190 | 4.06        | 4.83  |
| A1  | .080     | .110 | 2.03        | 2.79  |
| b   | .020     | .039 | 0.51        | 0.99  |
| b2  | .045     | .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 Outline



| SYM      | INCHES   |      | MILLIMETERS |       |
|----------|----------|------|-------------|-------|
|          | MIN      | MAX  | MIN         | MAX   |
| A        | .185     | .209 | 4.7         | 5.3   |
| A1       | .087     | .102 | 2.2         | 2.54  |
| A2       | .059     | .098 | 2.2         | 2.6   |
| b        | .040     | .055 | 1.0         | 1.4   |
| b1       | .065     | .084 | 1.65        | 2.13  |
| b2       | .113     | .123 | 2.87        | 3.12  |
| C        | .016     | .031 | .4          | .8    |
| D        | .819     | .845 | 20.80       | 21.46 |
| E        | .610     | .640 | 15.75       | 16.26 |
| e        | .215 BSC |      | 5.45 BSC    |       |
| L        | .780     | .800 | 19.81       | 20.32 |
| L1       |          | .177 |             | 4.50  |
| $\phi P$ | .140     | .144 | 3.55        | 3.65  |
| Q        | .212     | .244 | 5.4         | 6.2   |
| R        | .170     | .216 | 4.32        | 5.49  |
| S        | .242 BSC |      | 6.15 BSC    |       |

## TO-220 Outline



Pins:  
1 - Gate  
2 - Drain  
3 - Source

| 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  |
| $\phi P$ | .139     | .161 | 3.53        | 4.08  |
| Q        | .100     | .125 | 2.54        | 3.18  |

IXYS Reserves the Right to Change Limits, Test Conditions, and Dimensions.

IXYS MOSFETs and IGBTs are covered 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  
by one or more of the following U.S. patents: 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 @  $T_J = 25^\circ\text{C}$

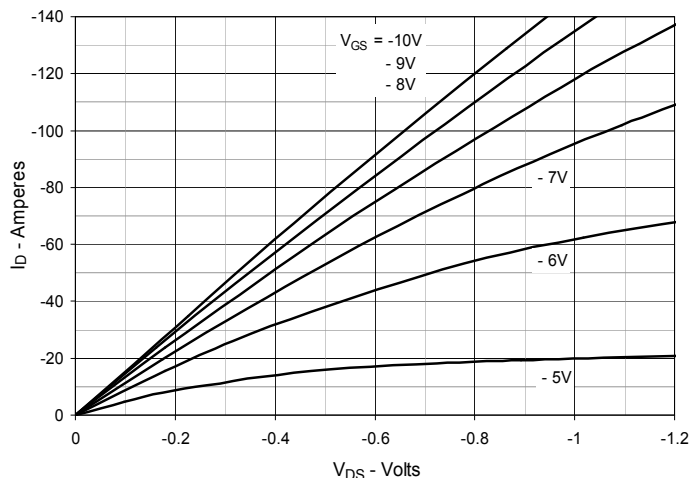


Fig. 2. Extended Output Characteristics @  $T_J = 25^\circ\text{C}$

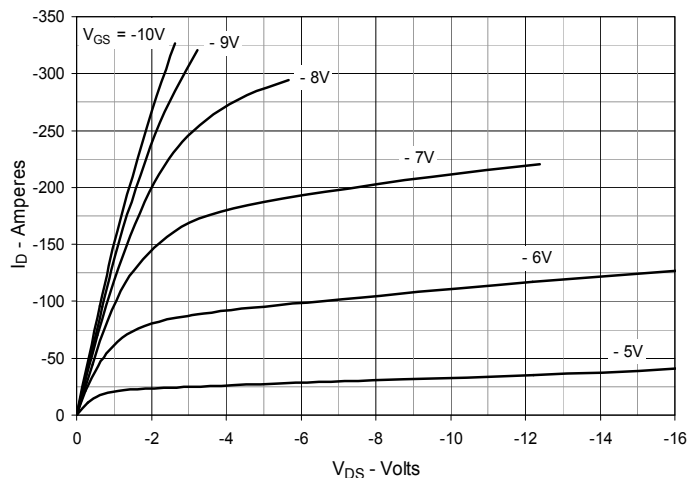


Fig. 3. Output Characteristics @  $T_J = 125^\circ\text{C}$

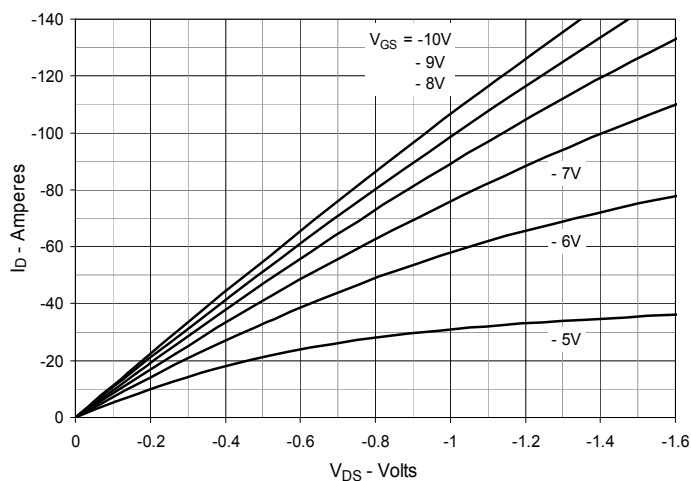


Fig. 4.  $R_{DS(on)}$  Normalized to  $I_D = -70\text{A}$  Value vs. Junction Temperature

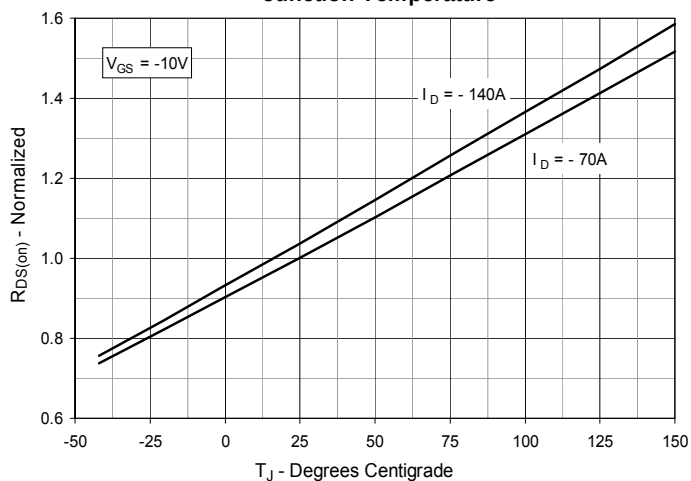


Fig. 5.  $R_{DS(on)}$  Normalized to  $I_D = -70\text{A}$  Value vs. Drain Current

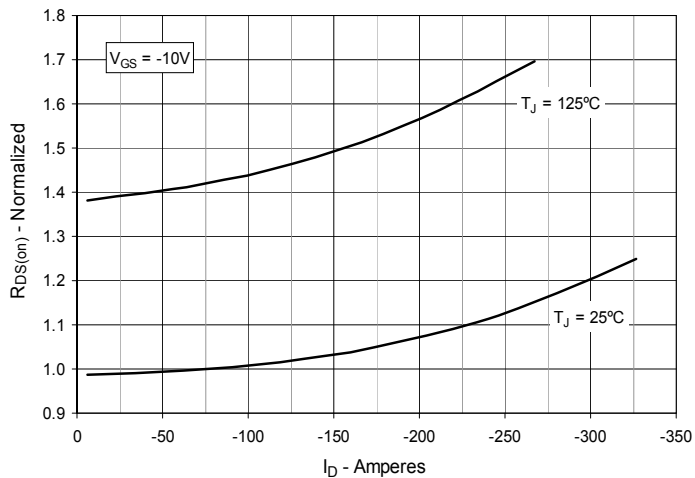
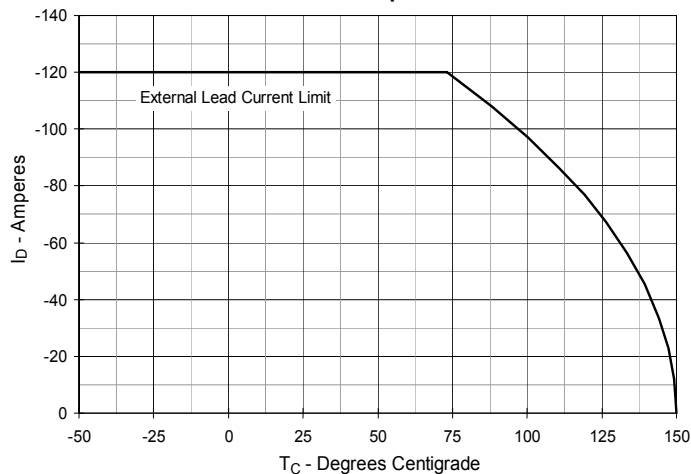
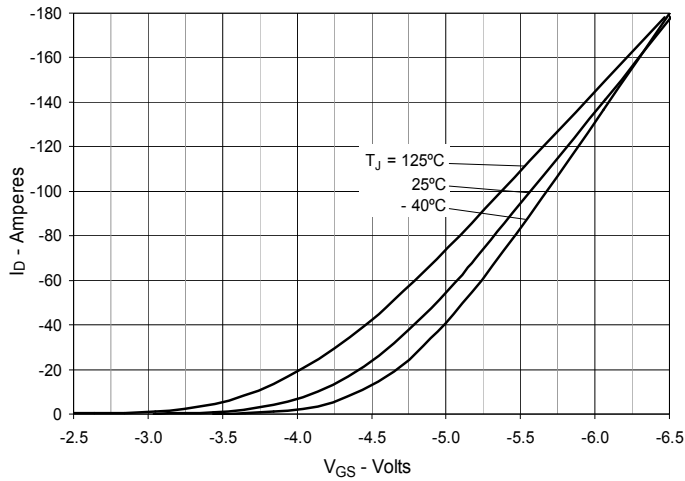


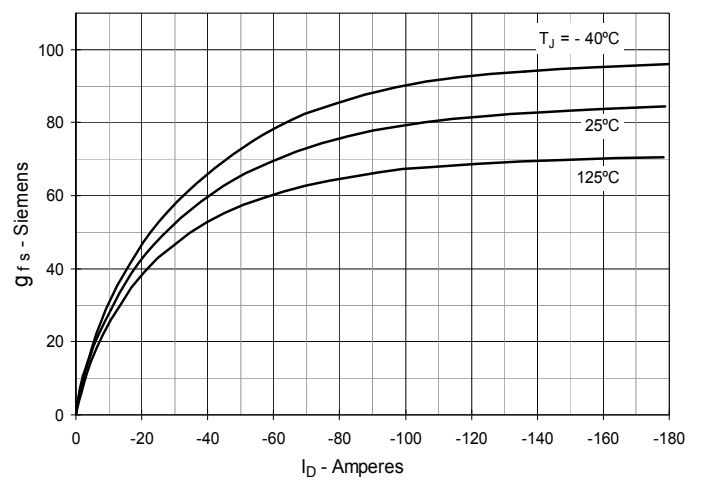
Fig. 6. Maximum Drain Current vs. Case Temperature



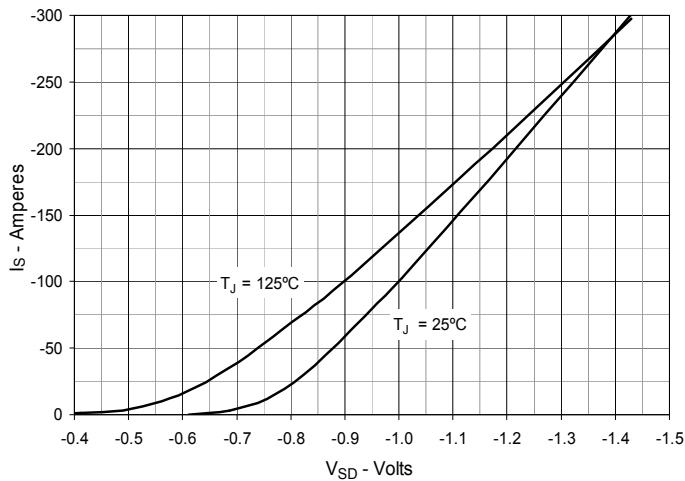
**Fig. 7. Input Admittance**



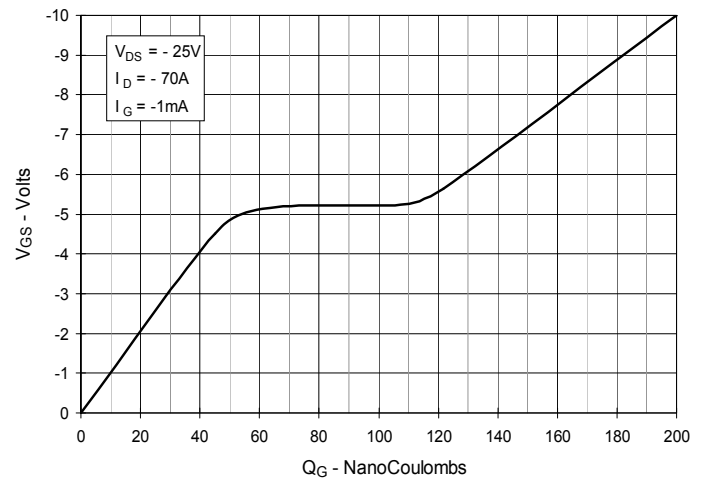
**Fig. 8. Transconductance**



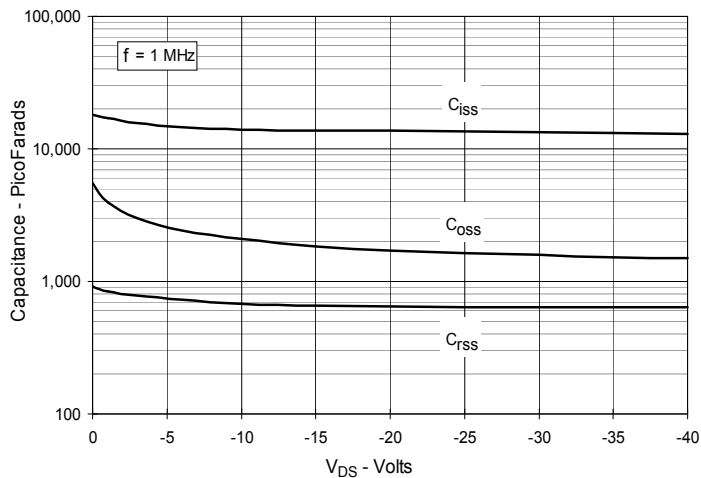
**Fig. 9. Forward Voltage Drop of Intrinsic Diode**



**Fig. 10. Gate Charge**



**Fig. 11. Capacitance**



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

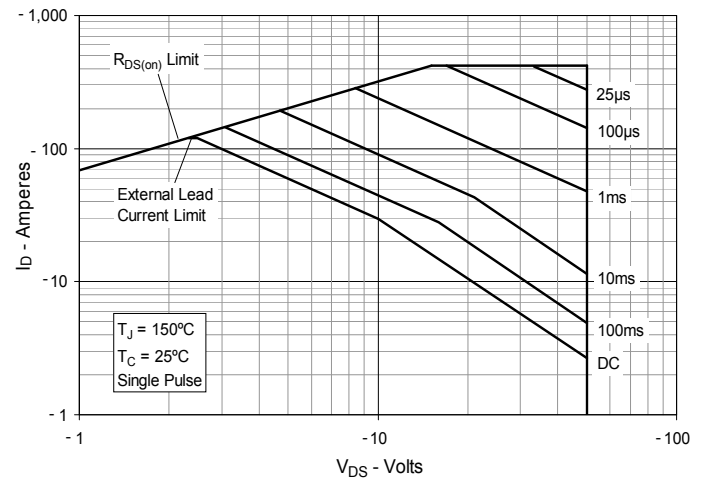


Fig. 13. Resistive Turn-on Rise Time vs. Junction Temperature

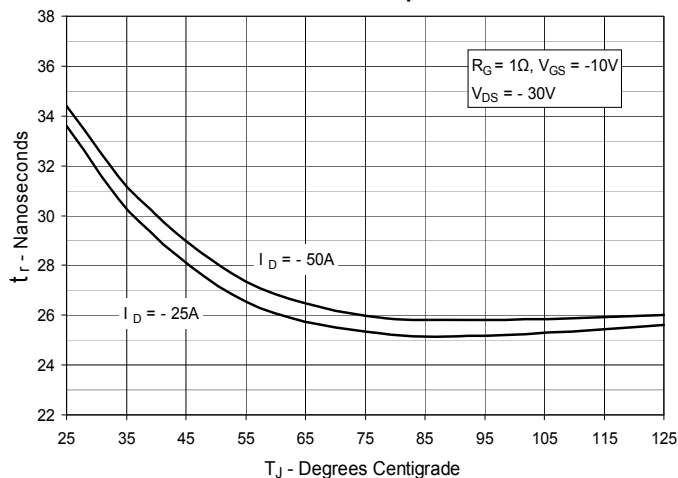


Fig. 14. Resistive Turn-on Rise Time vs. Drain Current

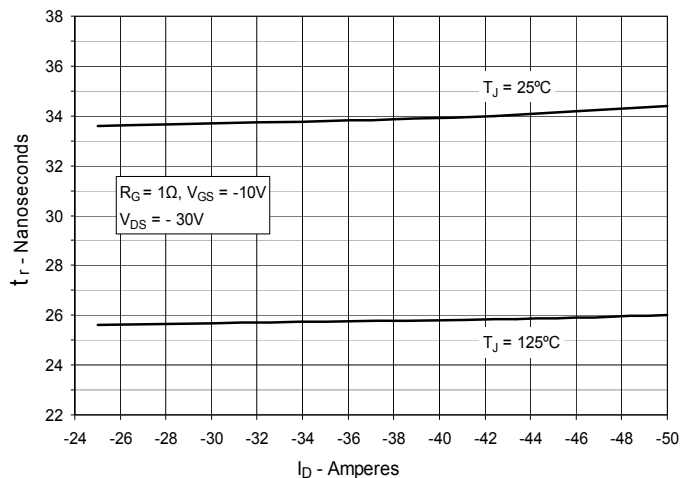


Fig. 15. Resistive Turn-on Switching Times vs. Gate Resistance

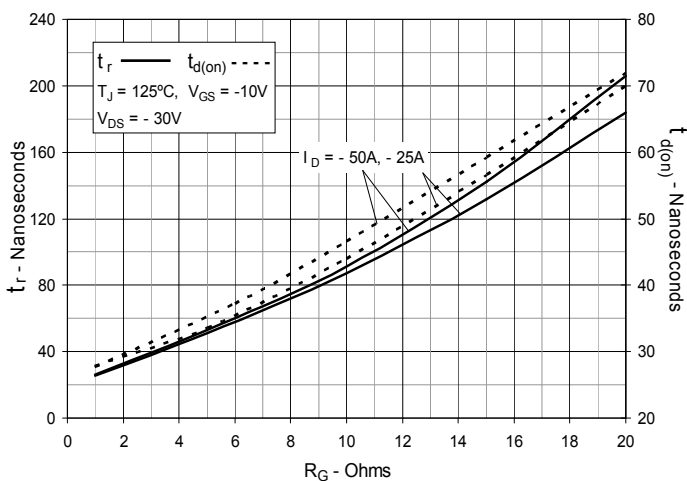


Fig. 16. Resistive Turn-off Switching Times vs. Junction Temperature

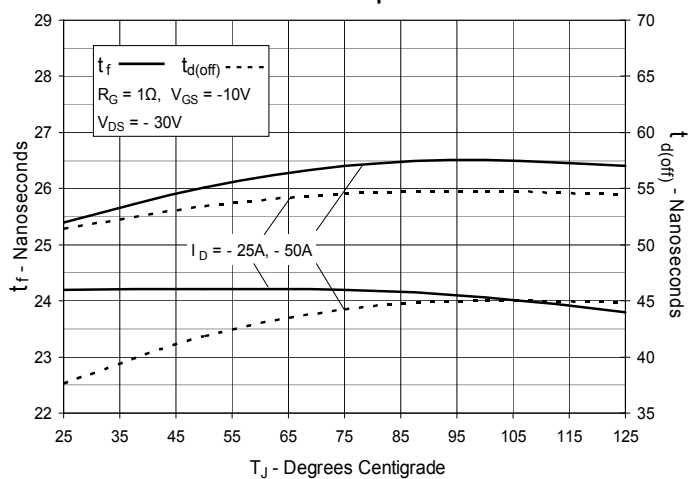


Fig. 17. Resistive Turn-off Switching Times vs. Drain Current

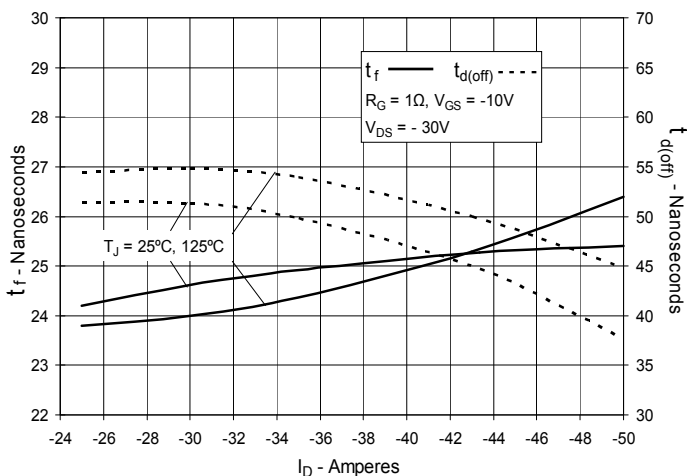


Fig. 18. Resistive Turn-off Switching Times vs. Gate Resistance

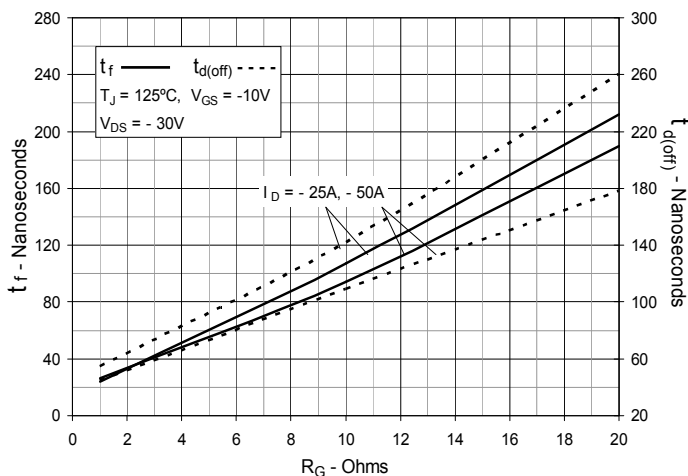


Fig. 19. Maximum Transient Thermal Impedance

