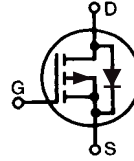


# TrenchP™ Power MOSFET

**IXTY10P15T**  
**IXTA10P15T**  
**IXTP10P15T**

$$\begin{aligned} V_{DSS} &= -150V \\ I_{D25} &= -10A \\ R_{DS(on)} &\leq 350m\Omega \end{aligned}$$

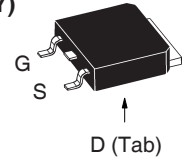
P-Channel Enhancement Mode  
Avalanche Rated



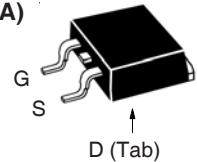
| Symbol        | Test Conditions                                                       | Maximum Ratings |                  |
|---------------|-----------------------------------------------------------------------|-----------------|------------------|
| $V_{DSS}$     | $T_J = 25^\circ\text{C}$ to $150^\circ\text{C}$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

| 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                            |
| $V_{GS(th)}$ | $V_{DS} = V_{GS}$ , $I_D = -250\mu A$                                       | - 2.0                 |      | - 4.5 V                      |
| $I_{GSS}$    | $V_{GS} = \pm 15V$ , $V_{DS} = 0V$                                          |                       |      | $\pm 50$ nA                  |
| $I_{DSS}$    | $V_{DS} = V_{DSS}$ , $V_{GS} = 0V$<br>$T_J = 125^\circ\text{C}$             |                       |      | - 3 $\mu A$<br>- 100 $\mu A$ |
| $R_{DS(on)}$ | $V_{GS} = -10V$ , $I_D = 0.5 \cdot I_{D25}$ , Note 1                        |                       |      | 350 m $\Omega$               |

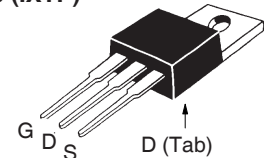
TO-252 (IXTY)



TO-263 (IXTA)



TO-220 (IXTP)



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                                                                                         | 5                     | 9    | S                      |
| $C_{iss}$    | $V_{GS} = 0\text{V}$ , $V_{DS} = -25\text{V}$ , $f = 1\text{MHz}$                                                                                   |                       | 2210 | pF                     |
| $C_{oss}$    |                                                                                                                                                     |                       | 146  | pF                     |
| $C_{rss}$    |                                                                                                                                                     |                       | 43   | 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>$R_G = 5\Omega$ (External) |                       | 19   | ns                     |
| $t_r$        |                                                                                                                                                     |                       | 16   | ns                     |
| $t_{d(off)}$ |                                                                                                                                                     |                       | 40   | ns                     |
| $t_f$        |                                                                                                                                                     |                       | 12   | ns                     |
| $Q_{g(on)}$  | $V_{GS} = -10\text{V}$ , $V_{DS} = 0.5 \cdot V_{DSS}$ , $I_D = 0.5 \cdot I_{D25}$                                                                   |                       | 36   | nC                     |
| $Q_{gs}$     |                                                                                                                                                     |                       | 12   | nC                     |
| $Q_{gd}$     |                                                                                                                                                     |                       | 8    | nC                     |
| $R_{thJC}$   | TO-220                                                                                                                                              |                       |      | 1.5 $^\circ\text{C/W}$ |
| $R_{thCS}$   |                                                                                                                                                     | 0.50                  |      | $^\circ\text{C/W}$     |

#### Source-Drain Diode

| Symbol   | Test Conditions<br>( $T_J = 25^\circ\text{C}$ , Unless Otherwise Specified)                                    | Characteristic Values |      |        |
|----------|----------------------------------------------------------------------------------------------------------------|-----------------------|------|--------|
|          |                                                                                                                | Min.                  | Typ. | Max.   |
| $I_S$    | $V_{GS} = 0\text{V}$                                                                                           |                       |      | - 10 A |
| $I_{SM}$ | Repetitive, Pulse Width Limited by $T_{JM}$                                                                    |                       |      | - 40 A |
| $V_{SD}$ | $I_F = I_S$ , $V_{GS} = 0\text{V}$ , Note 1                                                                    |                       |      | -1.5 V |
| $t_{rr}$ | $I_F = 0.5 \cdot I_{D25}$ , $-di/dt = -100\text{A}/\mu\text{s}$<br>$V_R = -100\text{V}$ , $V_{GS} = 0\text{V}$ |                       | 120  | ns     |
| $Q_{RM}$ |                                                                                                                |                       | 530  | nC     |
| $I_{RM}$ |                                                                                                                |                       | - 9  | A      |

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

#### PRELIMINARY 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.

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   | 6,404,065B1 | 6,683,344   | 6,727,585   | 7,005,734B2 | 7,157,338B2 |
|                                                                                  | 4,860,072 | 5,017,508 | 5,063,307 | 5,381,025 | 6,259,123B1 | 6,534,343   | 6,710,405B2 | 6,759,692   | 7,063,975B2 |             |
|                                                                                  | 4,881,106 | 5,034,796 | 5,187,117 | 5,486,715 | 6,306,728B1 | 6,583,505   | 6,710,463   | 6,771,478B2 | 7,071,537   |             |

Fig. 1. Output Characteristics @  $T_J = 25^\circ\text{C}$

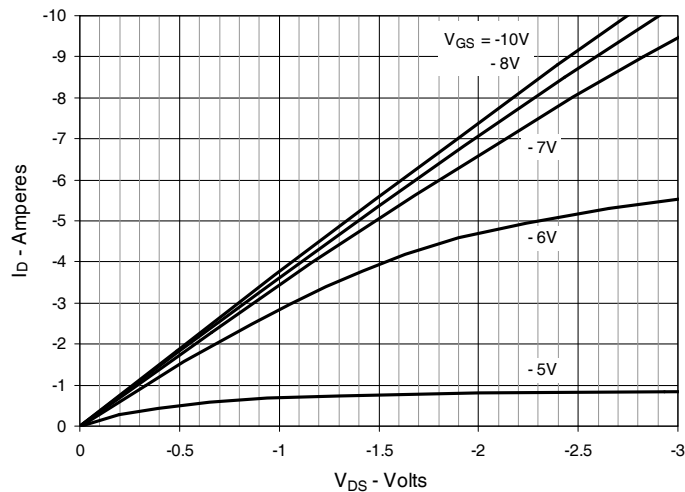


Fig. 2. Extended Output Characteristics @  $T_J = 25^\circ\text{C}$

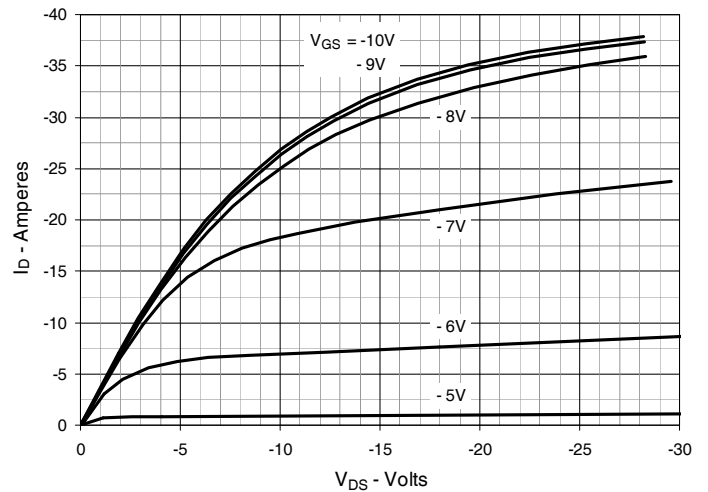


Fig. 3. Output Characteristics @  $T_J = 125^\circ\text{C}$

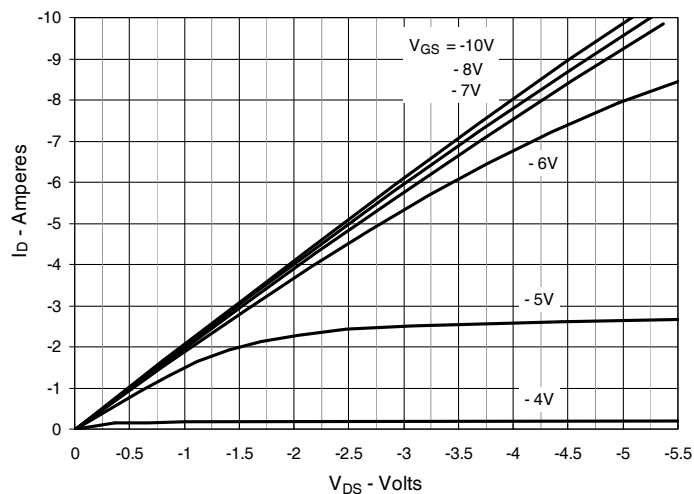


Fig. 4.  $R_{DS(on)}$  Normalized to  $I_D = -5\text{A}$  Value vs. Junction Temperature

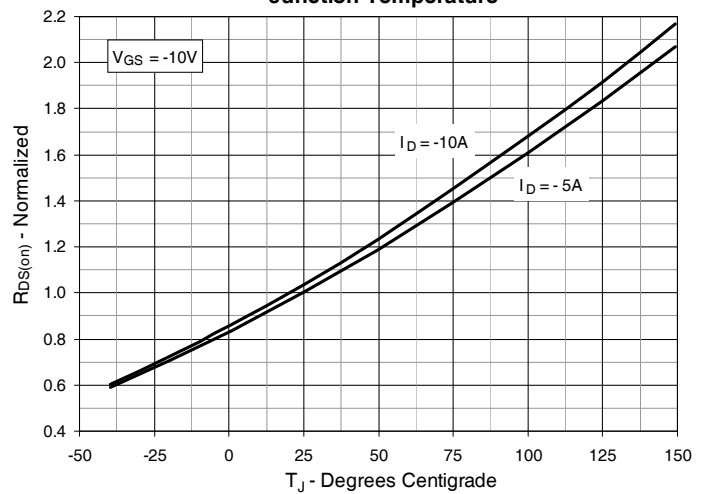


Fig. 5.  $R_{DS(on)}$  Normalized to  $I_D = -5\text{A}$  Value vs. Drain Current

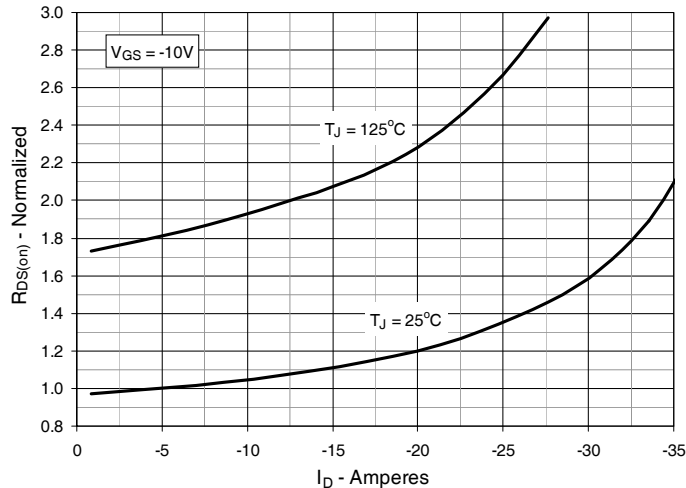


Fig. 6. Maximum Drain Current vs. Case Temperature

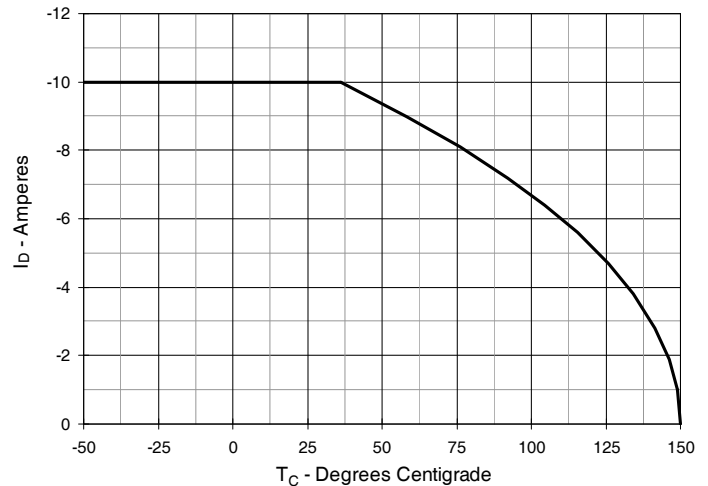


Fig. 7. Input Admittance

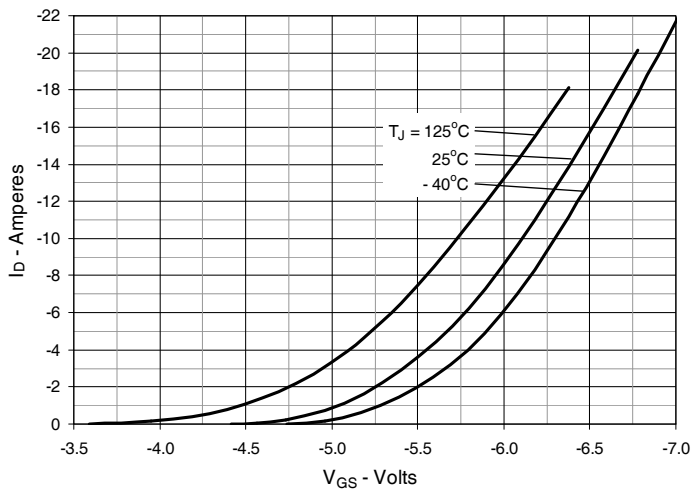


Fig. 8. Transconductance

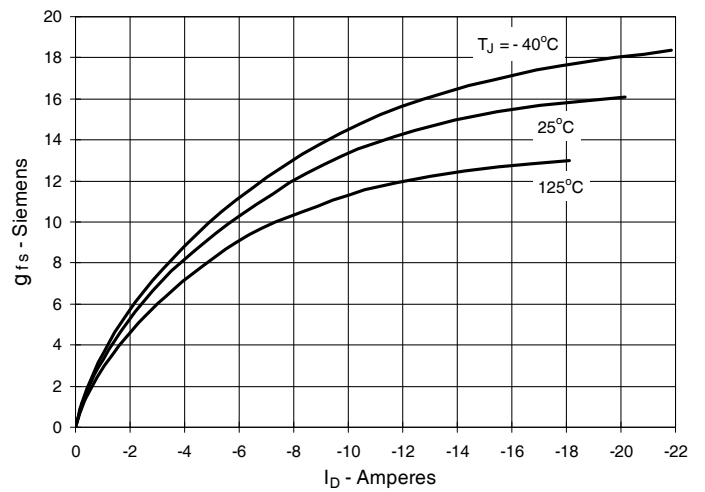


Fig. 9. Forward Voltage Drop of Intrinsic Diode

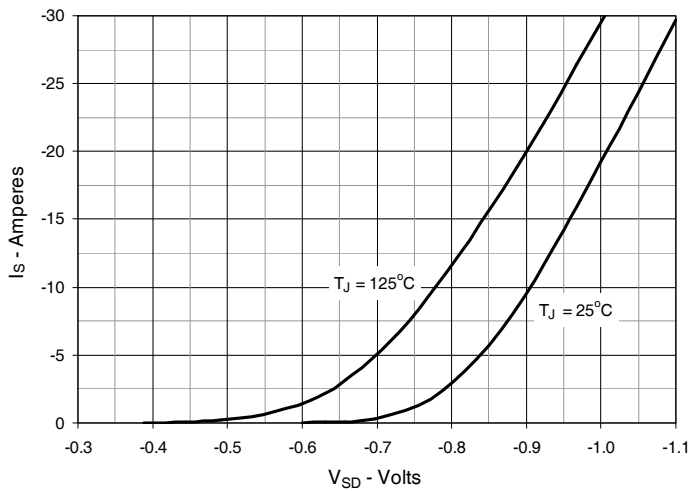


Fig. 10. Gate Charge

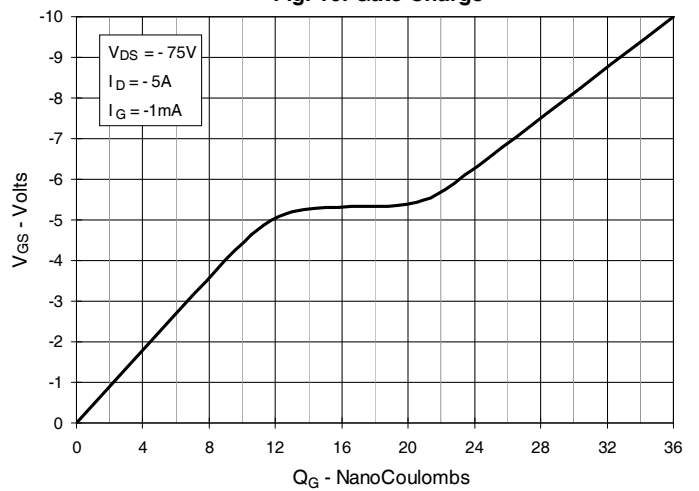


Fig. 11. Capacitance

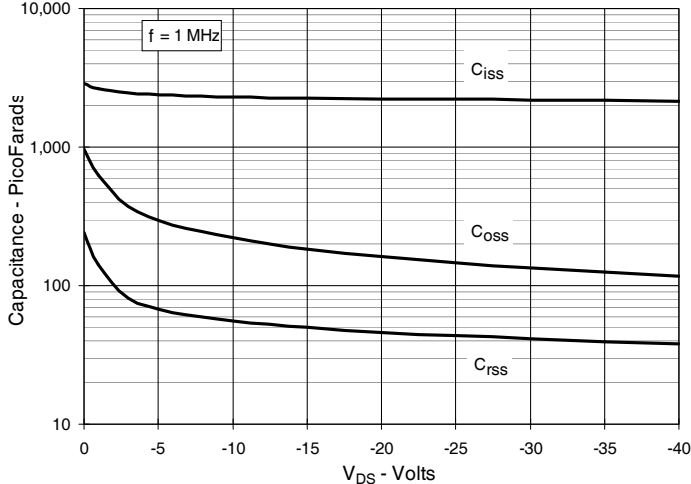
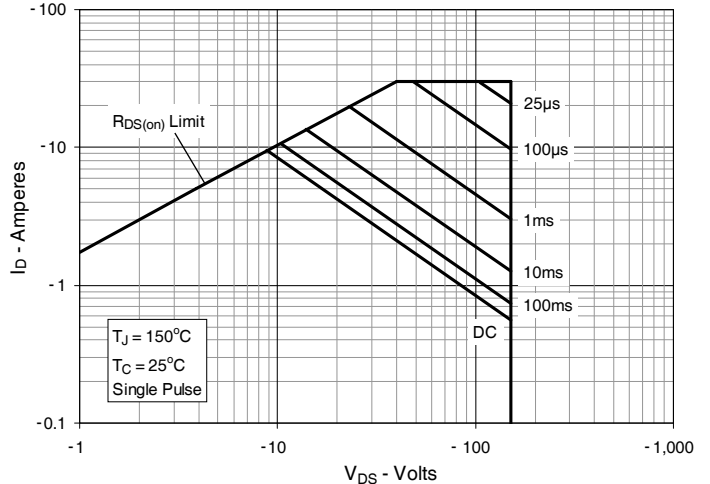
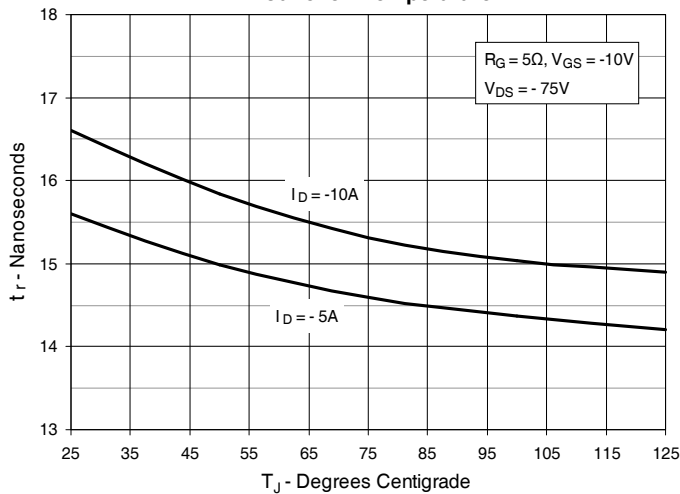


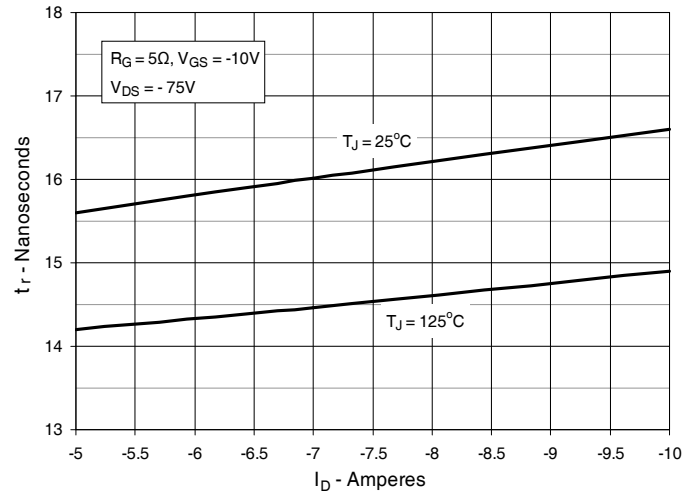
Fig. 12. Forward-Bias Safe Operating Area



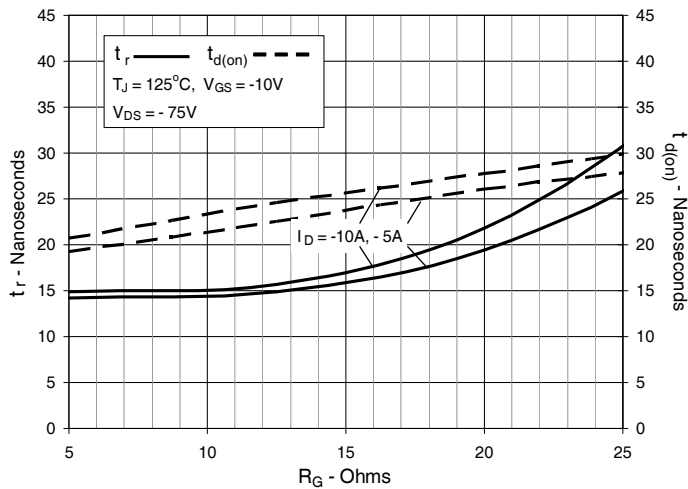
**Fig. 13. Resistive Turn-on Rise Time vs. Junction Temperature**



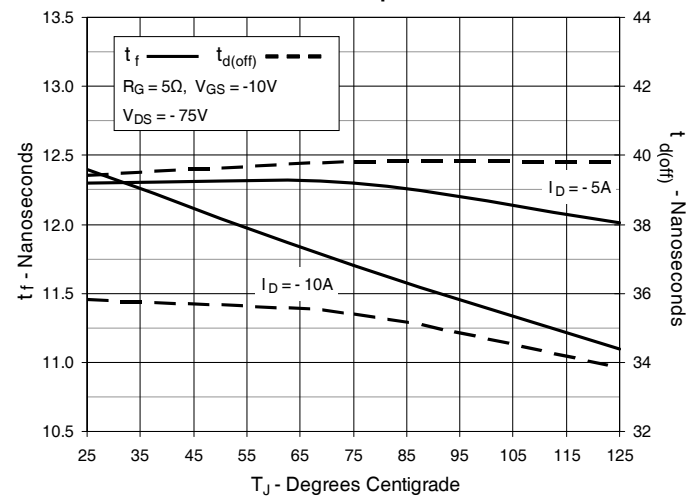
**Fig. 14. Resistive Turn-on Rise Time vs. Drain Current**



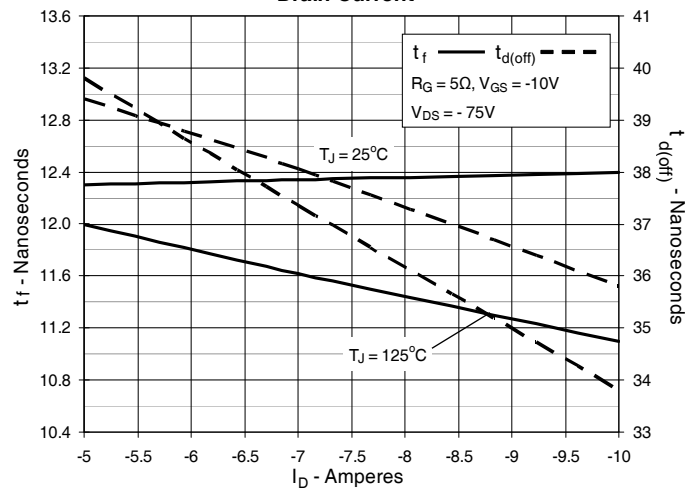
**Fig. 15. Resistive Turn-on Switching Times vs. Gate Resistance**



**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**

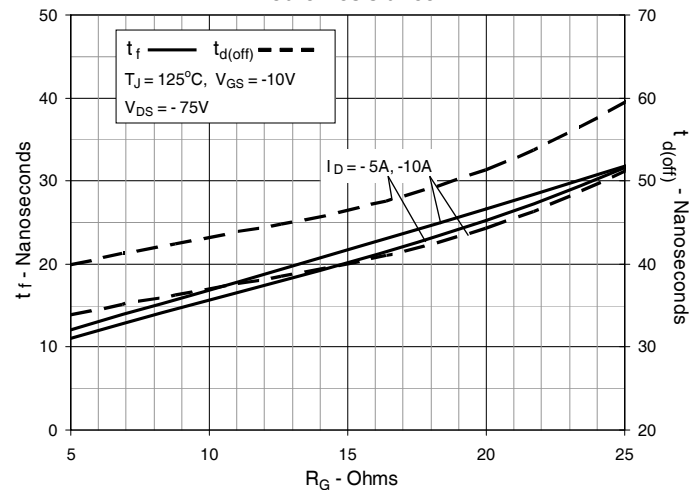
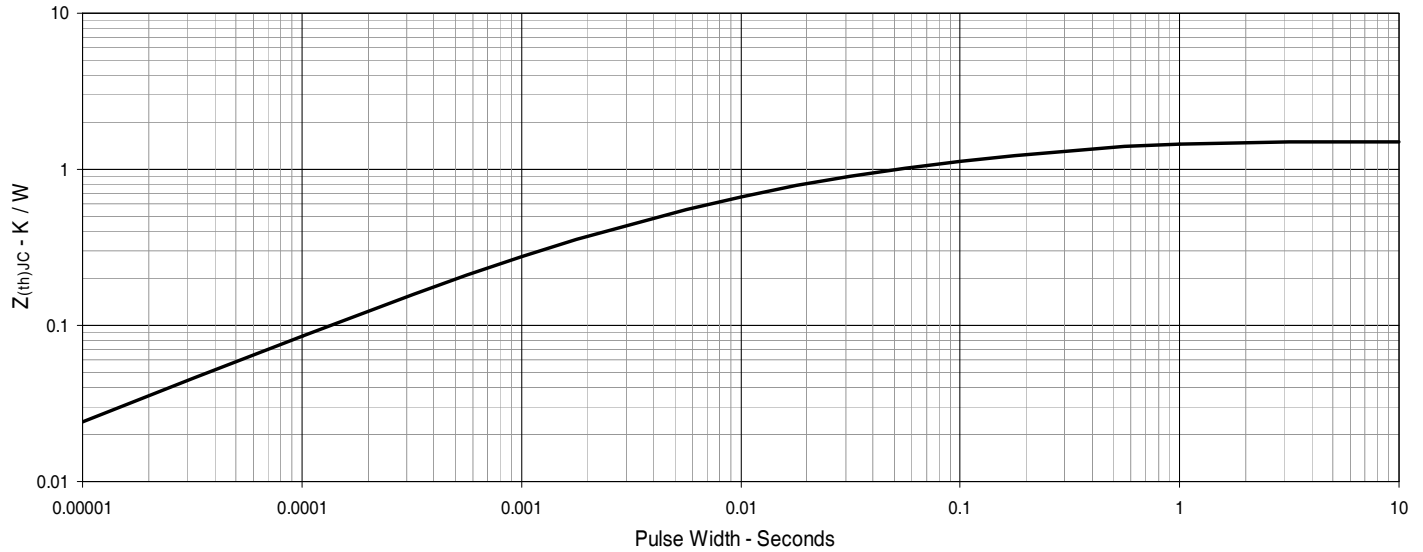
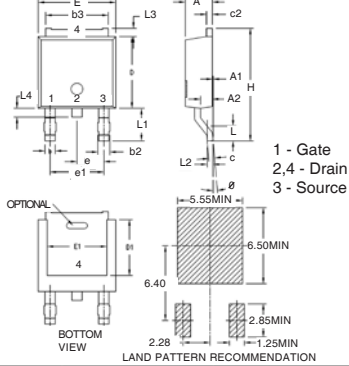


Fig. 19. Maximum Transient Thermal Impedance

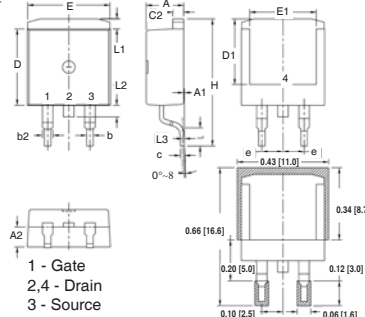


## TO-252 AA Outline



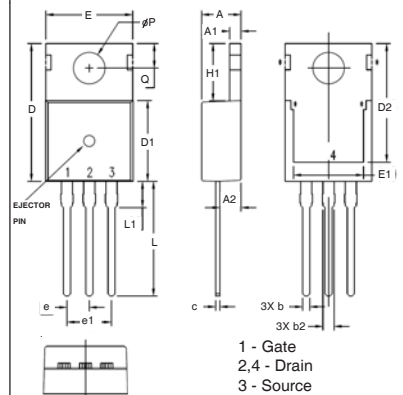
| SYM | INCHES   |      | MILLIMETERS |       |
|-----|----------|------|-------------|-------|
|     | MIN      | MAX  | MIN         | MAX   |
| A   | .086     | .094 | 2.19        | 2.38  |
| A1  | 0        | .005 | 0           | 0.12  |
| A2  | .038     | .046 | 0.97        | 1.17  |
| b   | .025     | .035 | 0.64        | 0.89  |
| b2  | .030     | .045 | 0.76        | 1.14  |
| b3  | .200     | .215 | 5.08        | 5.46  |
| c   | .018     | .024 | 0.46        | 0.61  |
| c2  | .018     | .023 | 0.46        | 0.58  |
| D   | .235     | .245 | 5.97        | 6.22  |
| D1  | .180     | .205 | 4.57        | 5.21  |
| E   | .250     | .265 | 6.35        | 6.73  |
| E1  | .170     | .205 | 4.32        | 5.21  |
| e   | .090 BSC |      | 2.28 BSC    |       |
| e1  | .180 BSC |      | 4.57 BSC    |       |
| H   | .370     | .410 | 9.40        | 10.42 |
| L   | .055     | .070 | 1.40        | 1.78  |
| L1  | .100     | .115 | 2.54        | 2.92  |
| L2  | .020 BSC |      | 0.50 BSC    |       |
| L3  | .025     | .040 | 0.64        | 1.02  |
| L4  | .025     | .040 | 0.64        | 1.02  |
| ø   | 0*       | 10*  | 0*          | 10*   |

## TO-263 Outline



| SYM  | INCHES   |      | MILLIMETER |       |
|------|----------|------|------------|-------|
|      | MIN      | MAX  | MIN        | MAX   |
| A    | .170     | .185 | 4.30       | 4.70  |
| A1   | .000     | .008 | 0.00       | 0.20  |
| A2   | .091     | .098 | 2.30       | 2.50  |
| b    | .028     | .035 | 0.70       | 0.90  |
| b2   | .046     | .060 | 1.18       | 1.52  |
| C    | .018     | .024 | 0.45       | 0.60  |
| C2   | .049     | .060 | 1.25       | 1.52  |
| D    | .340     | .370 | 8.63       | 9.40  |
| D1   | .300     | .327 | 7.62       | 8.30  |
| E    | .380     | .410 | 9.65       | 10.41 |
| E1   | .270     | .330 | 6.86       | 8.38  |
| [e]  | .100 BSC |      | 2.54 BSC   |       |
| H    | .580     | .620 | 14.73      | 15.75 |
| L    | .075     | .105 | 1.91       | 2.67  |
| L1   | .039     | .060 | 1.00       | 1.52  |
| L2   | —        | .070 | —          | 1.77  |
| [L3] | .010 BSC |      | 0.254 BSC  |       |

## TO-220 Outline



| SYM  | INCHES   |      | MILLIMETERS |       |
|------|----------|------|-------------|-------|
|      | MIN      | MAX  | MIN         | MAX   |
| A    | .169     | .185 | 4.30        | 4.70  |
| A1   | .047     | .055 | 1.20        | 1.40  |
| A2   | .079     | .106 | 2.00        | 2.70  |
| b    | .024     | .039 | 0.60        | 1.00  |
| b2   | .045     | .057 | 1.15        | 1.45  |
| c    | .014     | .026 | 0.35        | 0.65  |
| D    | .587     | .626 | 14.90       | 15.90 |
| D1   | .335     | .370 | 8.50        | 9.40  |
| (D2) | .500     | .531 | 12.70       | 13.50 |
| E    | .382     | .406 | 9.70        | 10.30 |
| (E1) | .283     | .323 | 7.20        | 8.20  |
| e    | .100 BSC |      | 2.54 BSC    |       |
| e1   | .200 BSC |      | 5.08 BSC    |       |
| H1   | .244     | .268 | 6.20        | 6.80  |
| L    | .492     | .547 | 12.50       | 13.90 |
| L1   | .110     | .154 | 2.80        | 3.90  |
| ØP   | .134     | .150 | 3.40        | 3.80  |
| Q    | .106     | .126 | 2.70        | 3.20  |



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