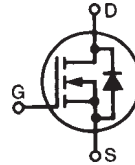


# Trench™ Power MOSFET

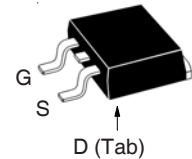
## IXTA160N10T IXTP160N10T

$$\begin{aligned} V_{DSS} &= 100V \\ I_{D25} &= 160A \\ R_{DS(on)} &\leq 7.0m\Omega \end{aligned}$$

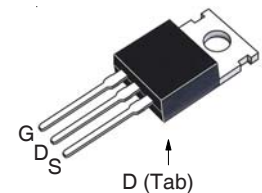
N-Channel Enhancement Mode  
Avalanche Rated



TO-263  
(IXTA)



TO-220  
(IXTP)



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

| Symbol       | Test Conditions                                                          | Maximum Ratings    |                  |
|--------------|--------------------------------------------------------------------------|--------------------|------------------|
| $V_{DSS}$    | $T_J = 25^\circ\text{C}$ to $175^\circ\text{C}$                          | 100                | V                |
| $V_{DGR}$    | $T_J = 25^\circ\text{C}$ to $175^\circ\text{C}$ , $R_{GS} = 1M\Omega$    | 100                | V                |
| $V_{GSS}$    | Continuous                                                               | $\pm 20$           | V                |
| $V_{GSM}$    | Transient                                                                | $\pm 30$           | V                |
| $I_{D25}$    | $T_C = 25^\circ\text{C}$ (Chip Capability)                               | 160                | A                |
| $I_{L(RMS)}$ | Lead Current Limit, RMS                                                  | 120                | A                |
| $I_{DM}$     | $T_C = 25^\circ\text{C}$ , Pulse Width Limited by $T_{JM}$               | 430                | A                |
| $I_A$        | $T_C = 25^\circ\text{C}$                                                 | 25                 | A                |
| $E_{AS}$     | $T_C = 25^\circ\text{C}$                                                 | 500                | mJ               |
| $dV/dt$      | $I_S \leq I_{DM}$ , $V_{DD} \leq V_{DSS}$ , $T_J \leq 175^\circ\text{C}$ | 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       | $^\circ\text{C}$ |
| $T_L$        | Maximum Lead Temperature for Soldering                                   | 300                | $^\circ\text{C}$ |
| $T_{SOLD}$   | 1.6 mm (0.062in.) from Case for 10s                                      | 260                | $^\circ\text{C}$ |
| $F_C$        | Mounting Force (TO-263)                                                  | 10..65 / 2.2..14.6 | N/lb             |
| $M_d$        | Mounting Torque (TO-220)                                                 | 1.13 / 10          | Nm/lb.in         |
| Weight       | TO-263                                                                   | 2.5                | g                |
|              | TO-220                                                                   | 3.0                | g                |

### Features

- Ultra-Low On Resistance
- Avalanche Rated
- Low Package Inductance
  - Easy to Drive and to Protect
- 175°C Operating Temperature
- Fast Intrinsic Diode

### Advantages

- Easy to Mount
- Space Savings
- High Power Density

### Applications

- Automotive
  - Motor Drives
  - 42V Power Bus
  - ABS Systems
- DC/DC Converters and Off-line UPS
- Primary Switch for 24V and 48V Systems
- Distributed Power Architectures and VRMs
- Electronic Valve Train Systems
- High Current Switching Applications
- High Voltage Synchronous Rectifier

| Symbol       | Test Conditions<br>( $T_J = 25^\circ\text{C}$ Unless Otherwise Specified) | Characteristic Values |      |                   |
|--------------|---------------------------------------------------------------------------|-----------------------|------|-------------------|
|              |                                                                           | Min.                  | Typ. | Max.              |
| $BV_{DSS}$   | $V_{GS} = 0V$ , $I_D = 250\mu\text{A}$                                    | 100                   |      | V                 |
| $V_{GS(th)}$ | $V_{DS} = V_{GS}$ , $I_D = 250\mu\text{A}$                                | 2.5                   |      | 4.5 V             |
| $I_{GSS}$    | $V_{GS} = \pm 20V$ , $V_{DS} = 0V$                                        |                       |      | $\pm 200$ nA      |
| $I_{DSS}$    | $V_{DS} = V_{DSS}$ , $V_{GS} = 0V$                                        |                       |      | 5 $\mu\text{A}$   |
|              | $T_J = 150^\circ\text{C}$                                                 |                       |      | 250 $\mu\text{A}$ |
| $R_{DS(on)}$ | $V_{GS} = 10V$ , $I_D = 25A$ , Notes 1 & 2                                | 6.1                   | 7.0  | m $\Omega$        |

| Symbol       | Test Conditions<br>( $T_J = 25^\circ\text{C}$ , Unless Otherwise Specified)                                                                 | Characteristic Values |      |                         |
|--------------|---------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|------|-------------------------|
|              |                                                                                                                                             | Min.                  | Typ. | Max.                    |
| $g_{fs}$     | $V_{DS} = 10\text{V}$ , $I_D = 60\text{A}$ , Note 1                                                                                         | 65                    | 102  | S                       |
| $C_{iss}$    | $V_{GS} = 0\text{V}$ , $V_{DS} = 25\text{V}$ , $f = 1\text{MHz}$                                                                            |                       | 6600 | pF                      |
| $C_{oss}$    |                                                                                                                                             |                       | 880  | pF                      |
| $C_{rss}$    |                                                                                                                                             |                       | 135  | pF                      |
| $t_{d(on)}$  | <b>Resistive Switching Times</b><br>$V_{GS} = 10\text{V}$ , $V_{DS} = 0.5 \cdot V_{DSS}$ , $I_D = 25\text{A}$<br>$R_G = 5\Omega$ (External) |                       | 33   | ns                      |
| $t_r$        |                                                                                                                                             |                       | 61   | ns                      |
| $t_{d(off)}$ |                                                                                                                                             |                       | 49   | ns                      |
| $t_f$        |                                                                                                                                             |                       | 42   | ns                      |
| $Q_{g(on)}$  | $V_{GS} = 10\text{V}$ , $V_{DS} = 0.5 \cdot V_{DSS}$ , $I_D = 25\text{A}$                                                                   |                       | 132  | nC                      |
| $Q_{gs}$     |                                                                                                                                             |                       | 37   | nC                      |
| $Q_{gd}$     |                                                                                                                                             |                       | 40   | nC                      |
| $R_{thJC}$   | TO-220                                                                                                                                      |                       |      | 0.35 $^\circ\text{C/W}$ |
| $R_{thCH}$   |                                                                                                                                             |                       | 0.50 | $^\circ\text{C/W}$      |

## Source-Drain Diode

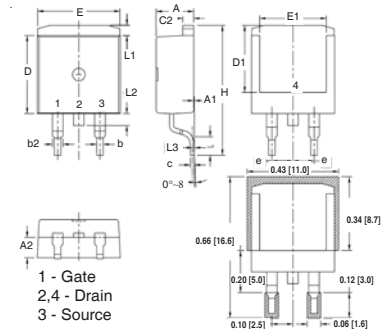
| Symbol   | Test Conditions<br>( $T_J = 25^\circ\text{C}$ , Unless Otherwise Specified)                          | Characteristic Values |      |       |
|----------|------------------------------------------------------------------------------------------------------|-----------------------|------|-------|
|          |                                                                                                      | Min.                  | Typ. | Max.  |
| $I_S$    | $V_{GS} = 0\text{V}$                                                                                 |                       |      | 160 A |
| $I_{SM}$ | Repetitive, Pulse Width Limited by $T_{JM}$                                                          |                       |      | 430 A |
| $V_{SD}$ | $I_F = 25\text{A}$ , $V_{GS} = 0\text{V}$ , Note 1                                                   |                       |      | 1.0 V |
| $t_{rr}$ | $I_F = 25\text{A}$ , $V_{GS} = 0\text{V}$<br>$-di/dt = 100\text{A}/\mu\text{s}$ , $V_R = 50\text{V}$ |                       | 60   | 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 5mm or less from the package body.

## PRELIMINARY TECHNICAL INFORMATION

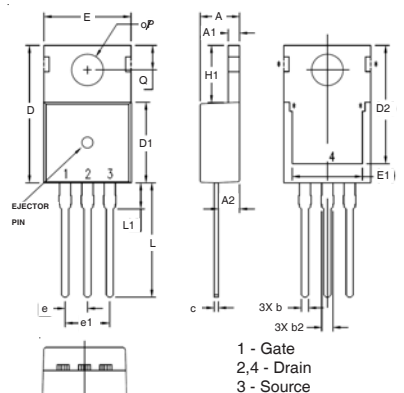
The product presented herein is under development. The Technical Specifications offered are derived from data gathered during objective characterizations of preliminary engineering lots; but also may yet contain some information supplied during a pre-production design evaluation. IXYS reserves the right to change limits, test conditions, and dimensions without notice.

## 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

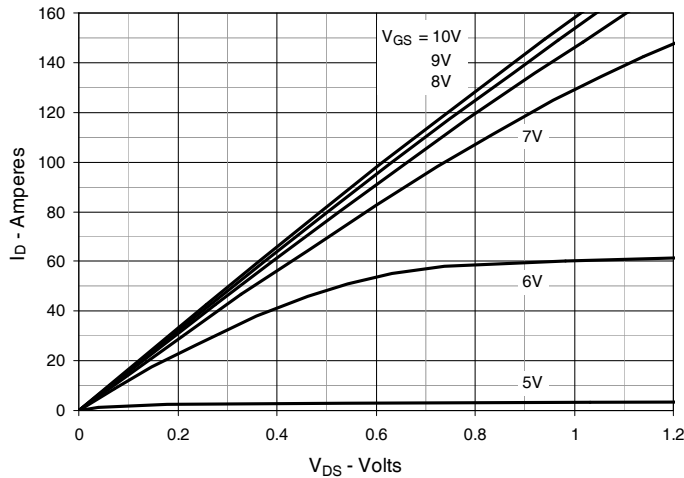


| SYM  | INCHES   |      | MILLIMETERS |       |
|------|----------|------|-------------|-------|
|      | MIN      | MAX  | MIN         | MAX   |
| A    | .169     | .185 | 4.30        | 4.70  |
| A1   | .047     | .055 | 1.20        | 1.40  |
| A2   | .079     | .106 | 2.00        | 2.70  |
| b    | .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  |

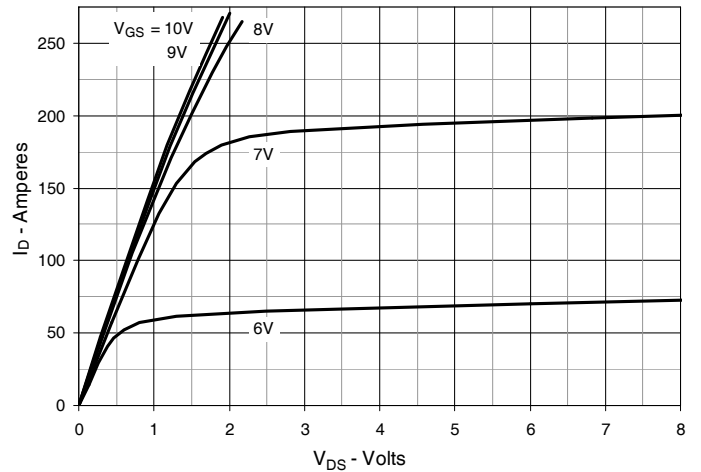
IXYS reserves the right to change limits, test conditions, and dimensions.

|                                                                                  |           |           |           |           |              |              |              |              |              |             |
|----------------------------------------------------------------------------------|-----------|-----------|-----------|-----------|--------------|--------------|--------------|--------------|--------------|-------------|
| 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    |             |

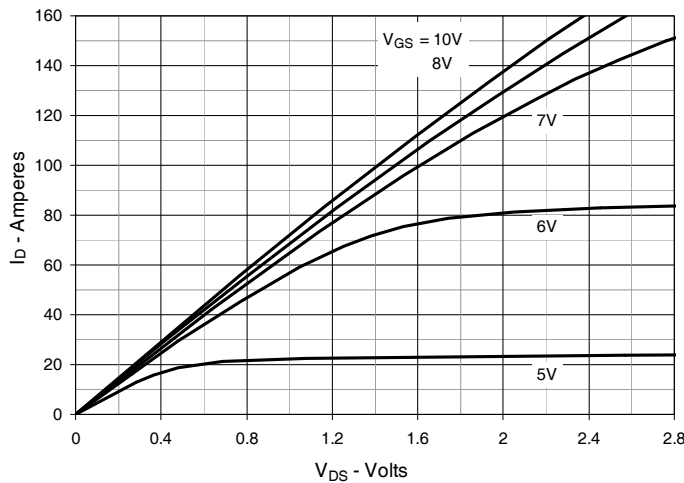
**Fig. 1. Output Characteristics @  $T_J = 25^\circ\text{C}$**



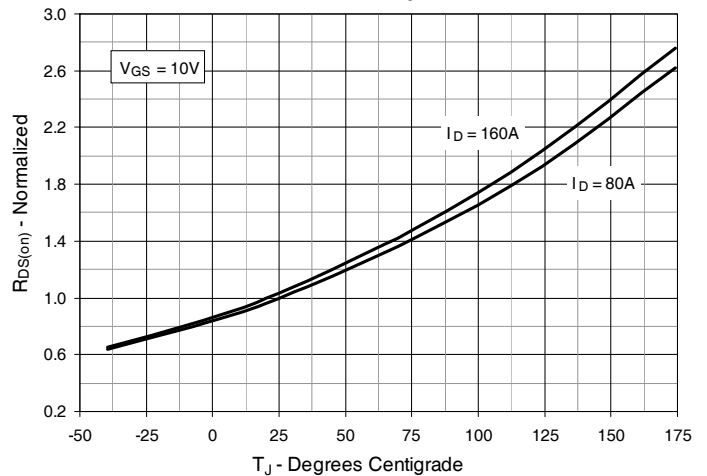
**Fig. 2. Extended Output Characteristics @  $T_J = 25^\circ\text{C}$**



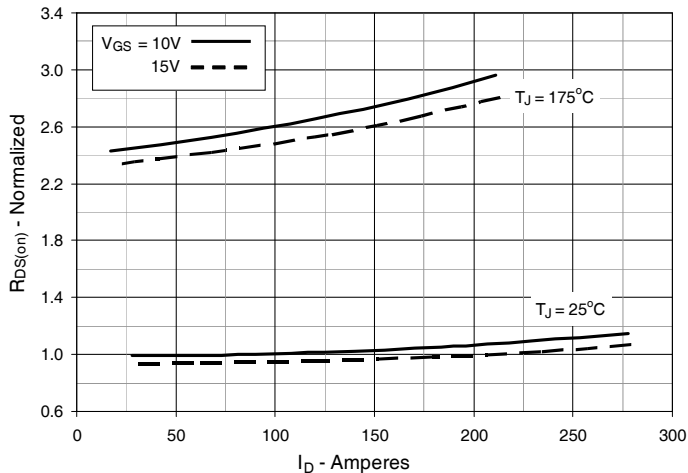
**Fig. 3. Output Characteristics @  $T_J = 150^\circ\text{C}$**



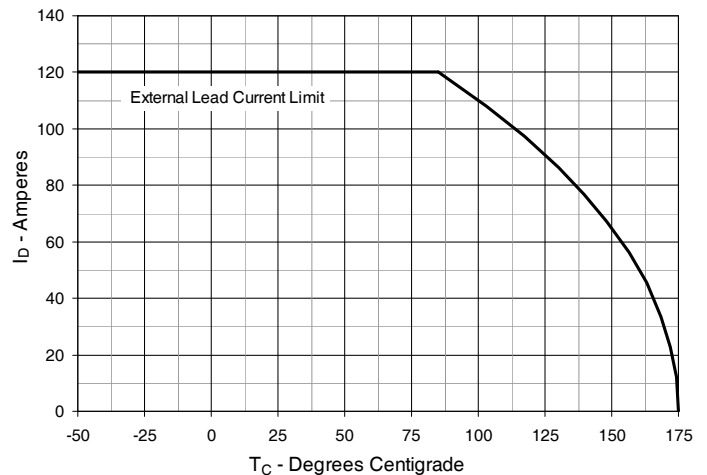
**Fig. 4.  $R_{DS(on)}$  Normalized to  $I_D = 160\text{A}$  Value vs. Junction Temperature**



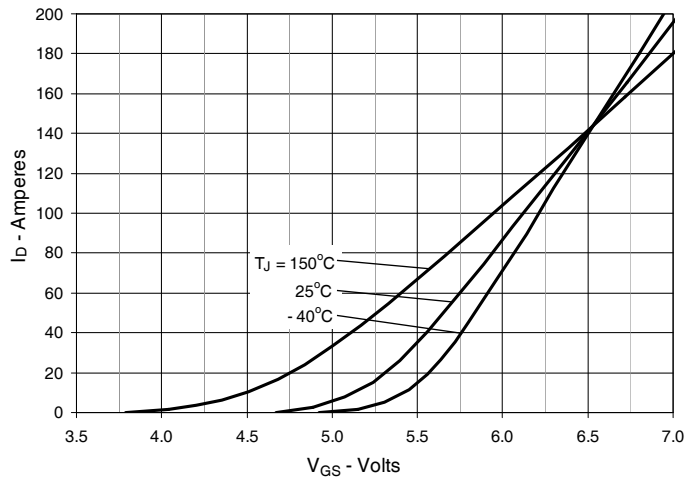
**Fig. 5.  $R_{DS(on)}$  Normalized to  $I_D = 80\text{A}$  Value vs. Drain Current**



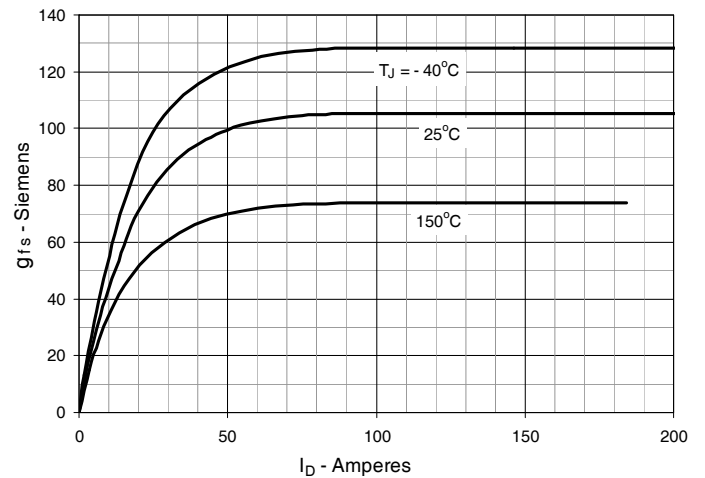
**Fig. 6. Drain Current vs. Case Temperature**



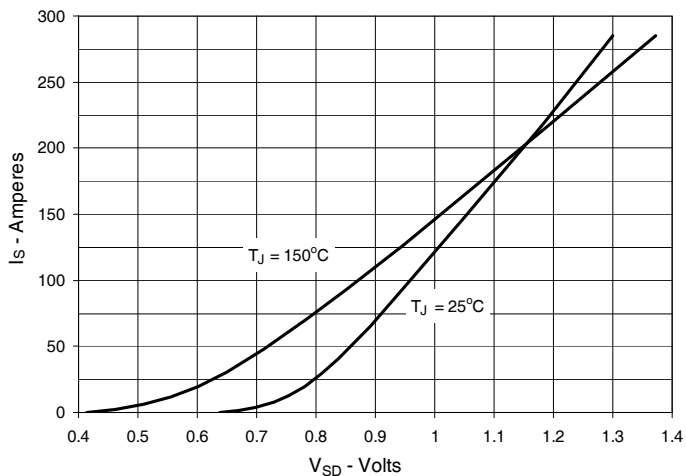
**Fig. 7. Input Admittance**



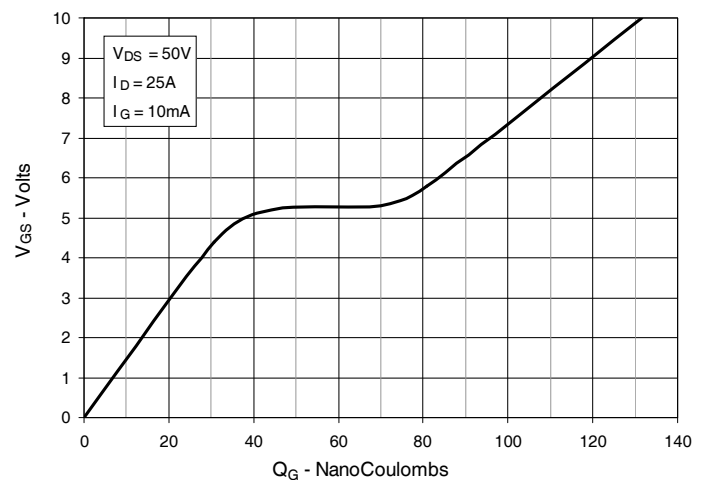
**Fig. 8. Transconductance**



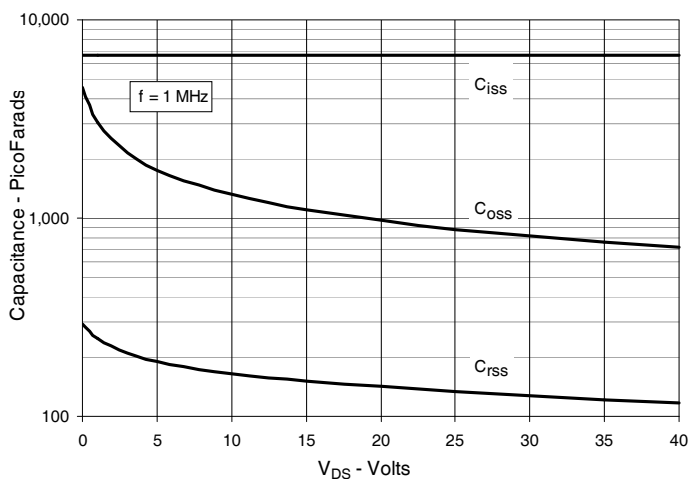
**Fig. 9. Forward Voltage Drop of Intrinsic Diode**



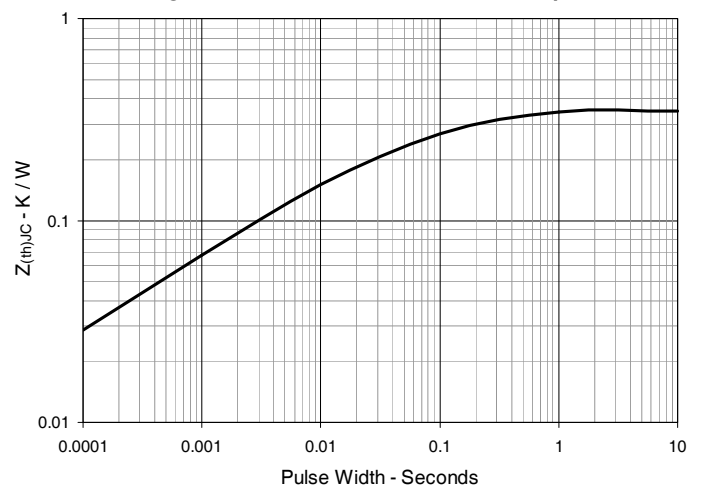
**Fig. 10. Gate Charge**



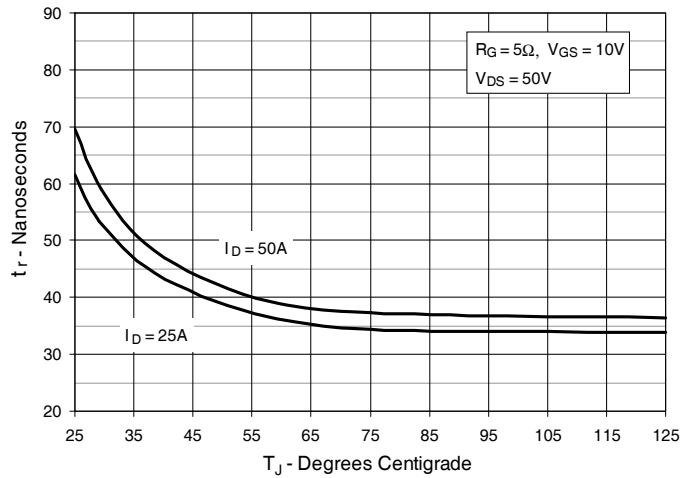
**Fig. 11. Capacitance**



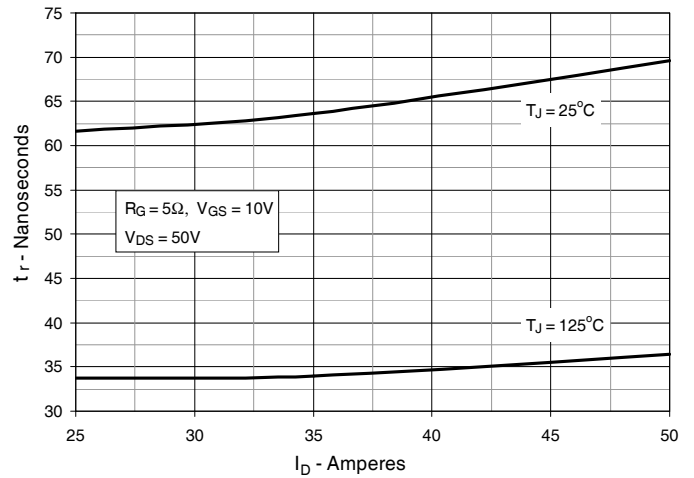
**Fig. 12. Maximum Transient Thermal Impedance**



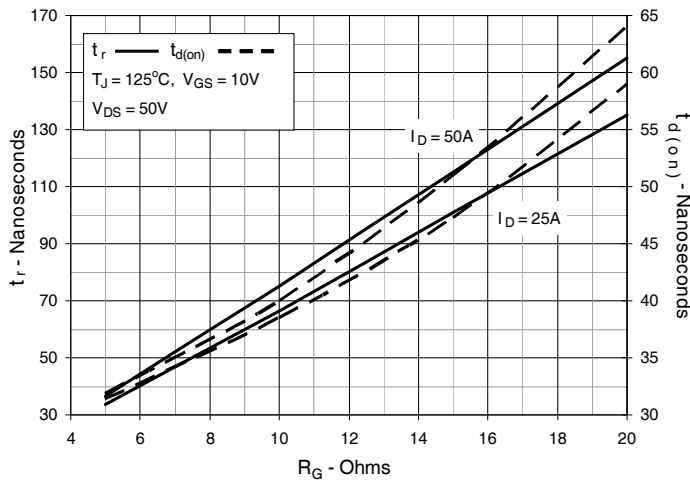
**Fig. 13. Resistive Turn-on**  
**Rise Time vs. Junction Temperature**



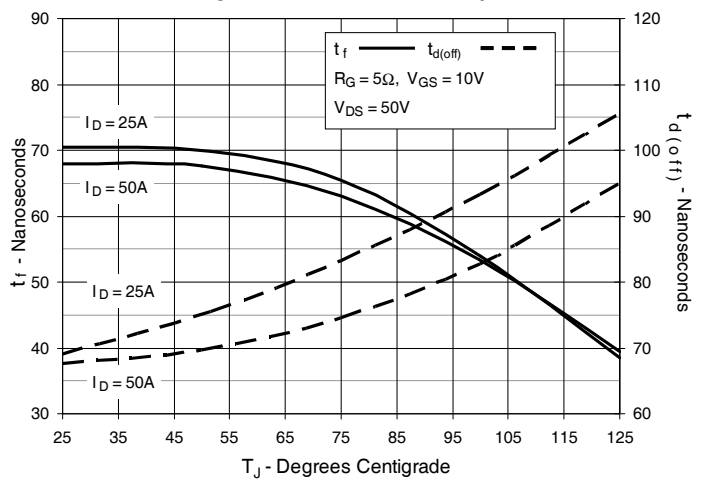
**Fig. 14. Resistive Turn-on**  
**Rise Time vs. Drain Current**



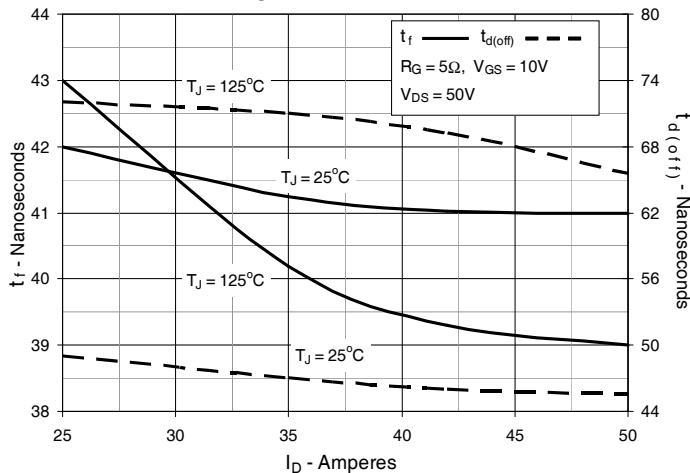
**Fig. 15. Resistive Turn-on**  
**Switching Times vs. Gate Resistance**



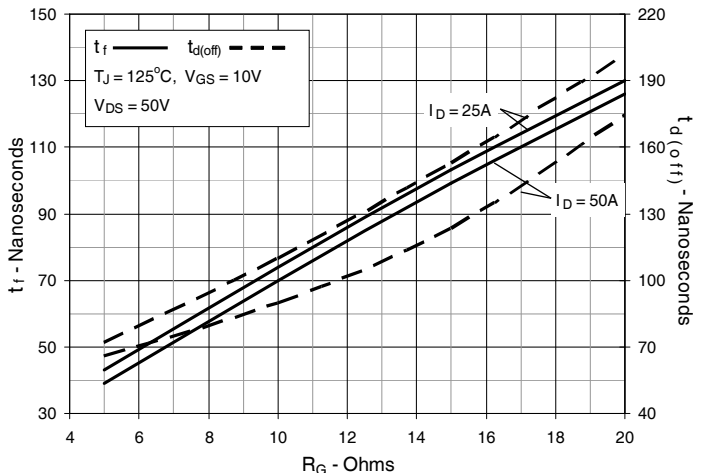
**Fig. 16. Resistive Turn-off**  
**Switching Times vs. Junction Temperature**



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



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





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