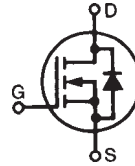


# Trench™ HiperFET™ Power MOSFET

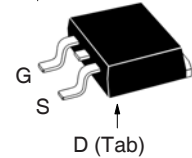
**IXFA130N10T**  
**IXFP130N10T**

N-Channel Enhancement Mode  
Avalanche Rated  
Fast Intrinsic Diode

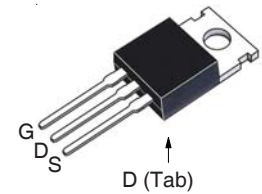


$$\begin{aligned} V_{DSS} &= 100V \\ I_{D25} &= 130A \\ R_{DS(on)} &\leq 9.1m\Omega \end{aligned}$$

TO-263  
(IXFA)



TO-220  
(IXFP)



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

## 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                                                       | 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                |
| $I_{D25}$  | $T_C = 25^\circ\text{C}$                                              | 130                | A                |
| $I_{LRMS}$ | Lead Current Limit, RMS                                               | 120                | A                |
| $I_{DM}$   | $T_C = 25^\circ\text{C}$ , Pulse Width Limited by $T_{JM}$            | 350                | A                |
| $I_A$      | $T_C = 25^\circ\text{C}$                                              | 65                 | A                |
| $E_{AS}$   | $T_C = 25^\circ\text{C}$                                              | 750                | mJ               |
| $P_D$      | $T_C = 25^\circ\text{C}$                                              | 360                | 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                |

| Symbol       | Test Conditions<br>( $T_J = 25^\circ\text{C}$ Unless Otherwise Specified) | Characteristic Values |           |                    |
|--------------|---------------------------------------------------------------------------|-----------------------|-----------|--------------------|
|              |                                                                           | Min.                  | Typ.      | Max.               |
| $BV_{DSS}$   | $V_{GS} = 0V$ , $I_D = 250\mu A$                                          | 100                   |           | V                  |
| $V_{GS(th)}$ | $V_{DS} = V_{GS}$ , $I_D = 1mA$                                           | 2.5                   |           | 4.5 V              |
| $I_{GSS}$    | $V_{GS} = \pm 20V$ , $V_{DS} = 0V$                                        |                       | $\pm 200$ | nA                 |
| $I_{DSS}$    | $V_{DS} = V_{DSS}$ , $V_{GS} = 0V$<br>$T_J = 150^\circ\text{C}$           |                       | 10<br>500 | $\mu A$<br>$\mu A$ |
| $R_{DS(on)}$ | $V_{GS} = 10V$ , $I_D = 25A$ , Notes 1, 2                                 |                       | 9.1       | 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                                                                                      | 55                    | 93   | S                  |
| $C_{iss}$    | $V_{GS} = 0\text{V}, V_{DS} = 25\text{V}, f = 1\text{MHz}$                                                                            |                       | 5080 | pF                 |
| $C_{oss}$    |                                                                                                                                       |                       | 630  | pF                 |
| $C_{rss}$    |                                                                                                                                       |                       | 95   | 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) |                       | 30   | ns                 |
| $t_r$        |                                                                                                                                       |                       | 47   | ns                 |
| $t_{d(off)}$ |                                                                                                                                       |                       | 44   | ns                 |
| $t_f$        |                                                                                                                                       |                       | 28   | ns                 |
| $Q_{g(on)}$  | $V_{GS} = 10\text{V}, V_{DS} = 0.5 \cdot V_{DSS}, I_D = 25\text{A}$                                                                   |                       | 104  | nC                 |
| $Q_{gs}$     |                                                                                                                                       |                       | 30   | nC                 |
| $Q_{gd}$     |                                                                                                                                       |                       | 29   | nC                 |
| $R_{thJC}$   | TO-220                                                                                                                                |                       | 0.50 | $^\circ\text{C/W}$ |
| $R_{thCH}$   |                                                                                                                                       |                       |      | $^\circ\text{C/W}$ |

#### Source-Drain Diode

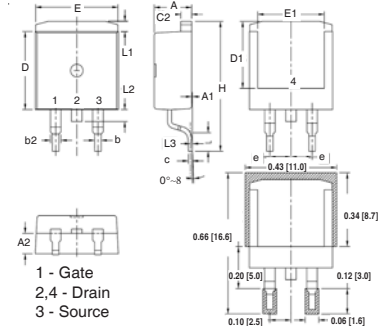
| Symbol   | Test Conditions<br>( $T_J = 25^\circ\text{C}$ Unless Otherwise Specified)                             | Characteristic Values |      |       |
|----------|-------------------------------------------------------------------------------------------------------|-----------------------|------|-------|
|          |                                                                                                       | Min.                  | Typ. | Max.  |
| $I_S$    | $V_{GS} = 0\text{V}$                                                                                  |                       |      | 130 A |
| $I_{SM}$ | Repetitive, Pulse Width Limited by $T_{JM}$                                                           |                       |      | 350 A |
| $V_{SD}$ | $I_F = 25\text{A}, V_{GS} = 0\text{V}$ , Note 1                                                       |                       |      | 1.0 V |
| $t_{rr}$ | $I_F = 65\text{A}, -di/dt = 100\text{A}/\mu\text{s}$<br>$V_R = 0.5 \cdot V_{DSS}, V_{GS} = 0\text{V}$ |                       | 67   | ns    |
| $I_{RM}$ |                                                                                                       |                       | 4.7  | A     |
| $Q_{rr}$ |                                                                                                       |                       | 160  | nC    |

- 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 5 mm or less from the package body.

#### PRELIMINARY TECHNICAL INFORMATION

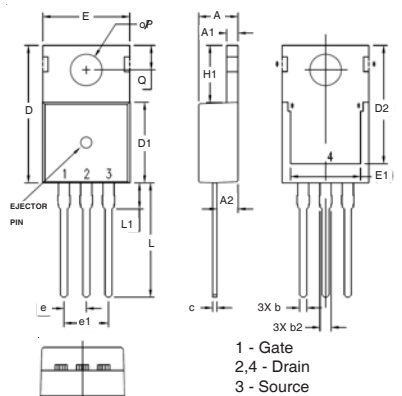
The product presented herein is under development. The Technical Specifications offered are derived from data gathered during objective characterizations of preliminary engineering lots; but also may yet contain some information supplied during a pre-production design evaluation. IXYS reserves the right 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

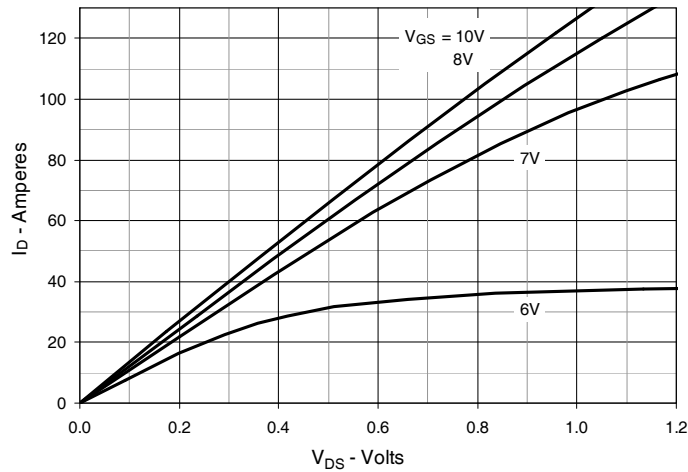


| SYM  | INCHES |      | MILLIMETERS |       |
|------|--------|------|-------------|-------|
|      | MIN    | MAX  | MIN         | MAX   |
| A    | .169   | .185 | 4.30        | 4.70  |
| A1   | .047   | .055 | 1.20        | 1.40  |
| A2   | .079   | .106 | 2.00        | 2.70  |
| b    | .024   | .039 | 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  |

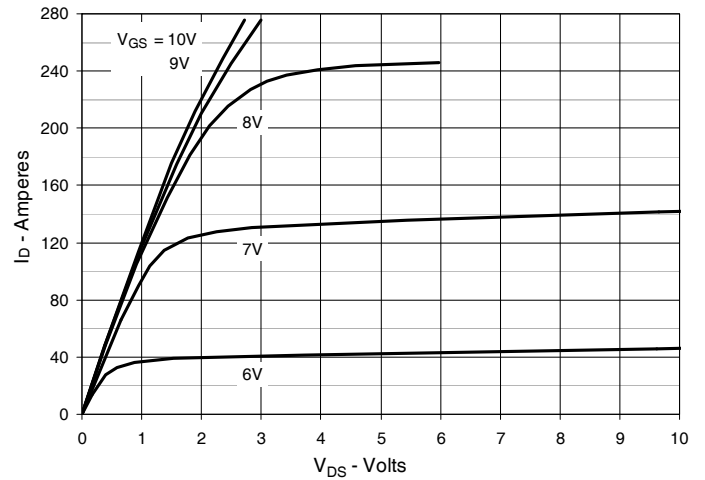
IXYS reserves the right to change limits, test conditions, and dimensions.

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

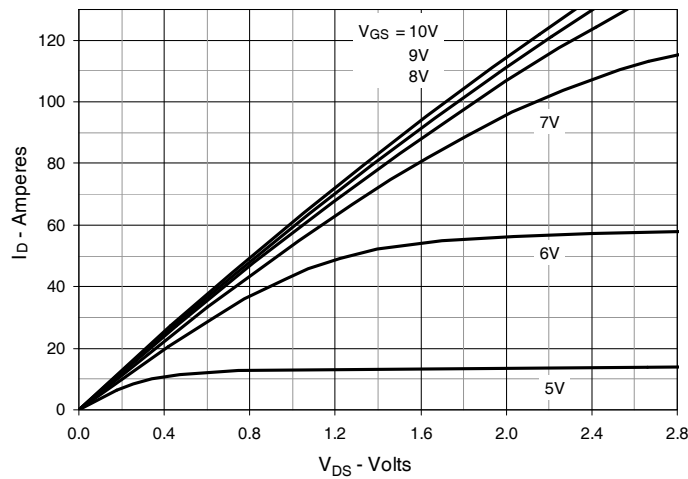
**Fig. 1. Output Characteristics @  $T_J = 25^\circ\text{C}$**



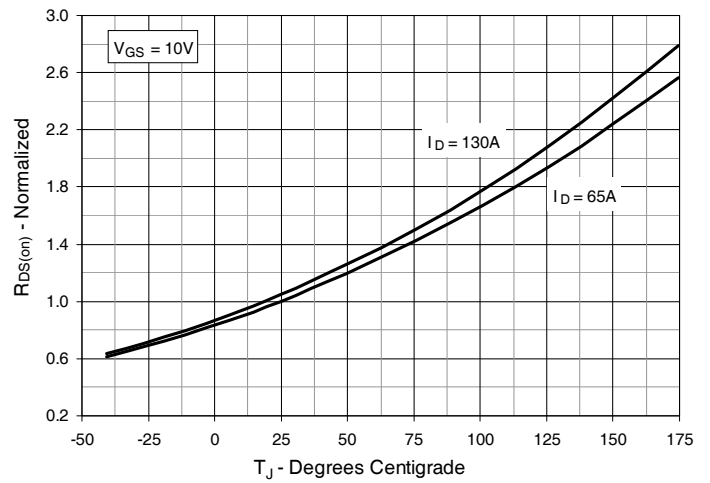
**Fig. 2. Extended Output Characteristics @  $T_J = 25^\circ\text{C}$**



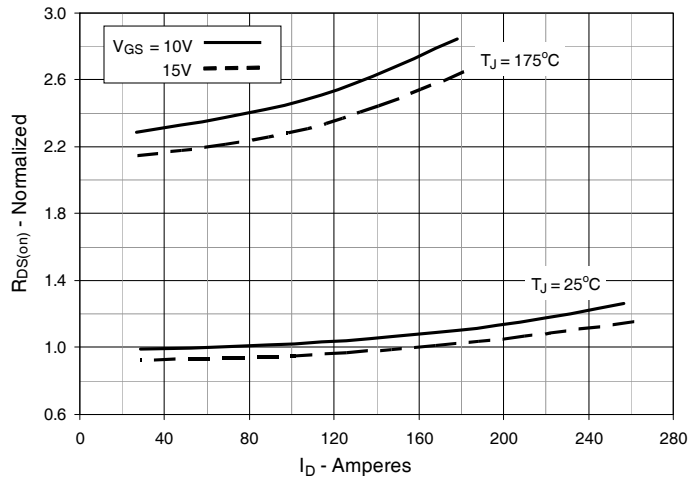
**Fig. 3. Output Characteristics @  $T_J = 150^\circ\text{C}$**



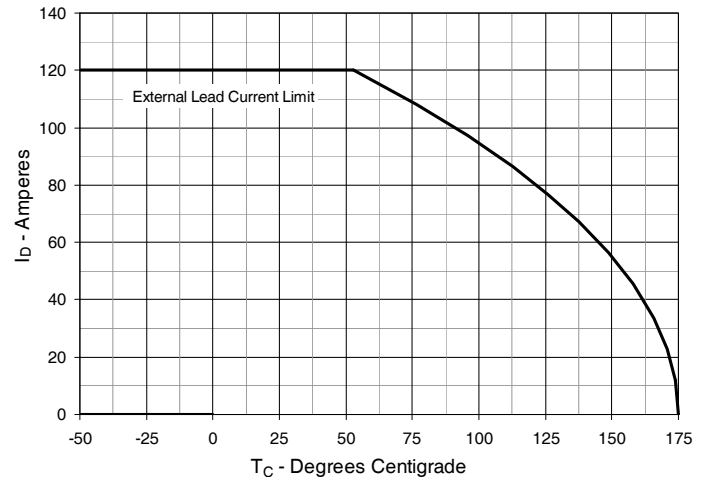
**Fig. 4.  $R_{DS(on)}$  Normalized to  $I_D = 65\text{A}$  Value vs. Junction Temperature**

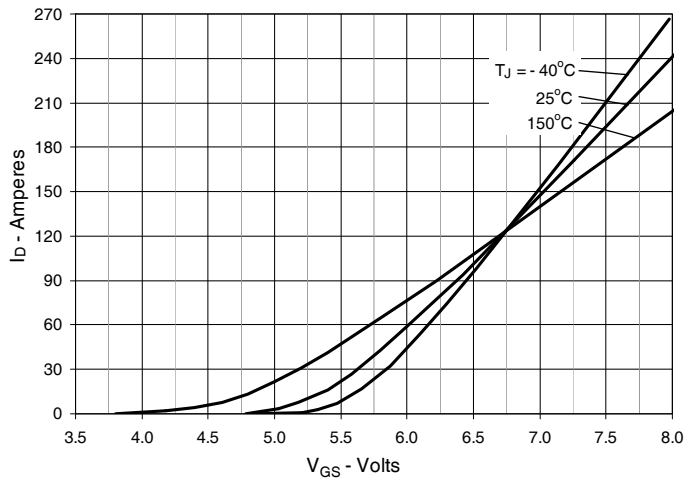
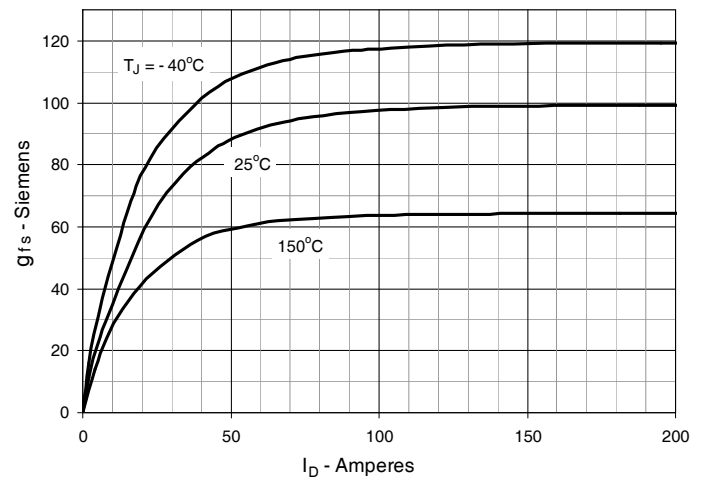
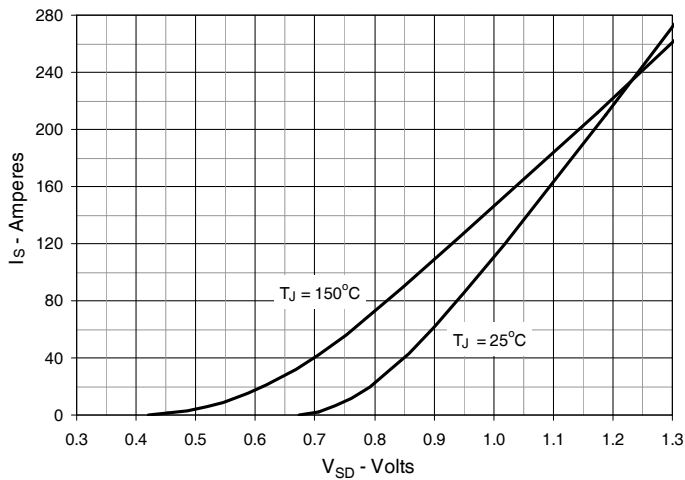
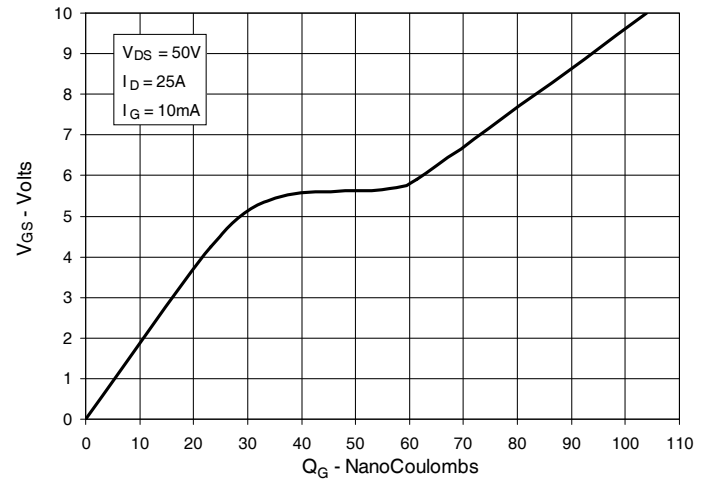
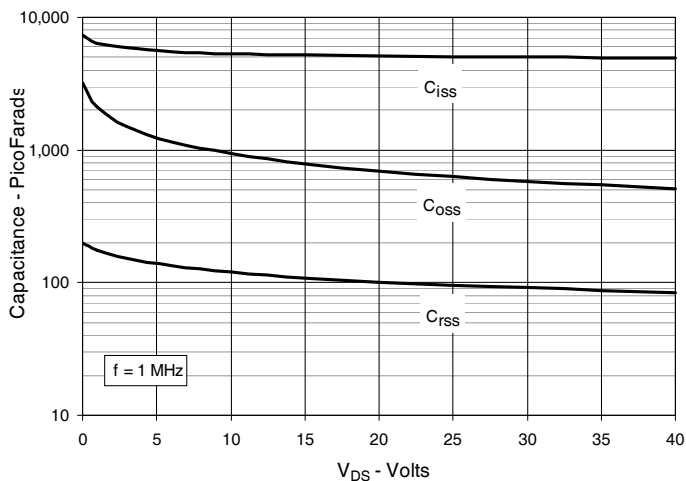
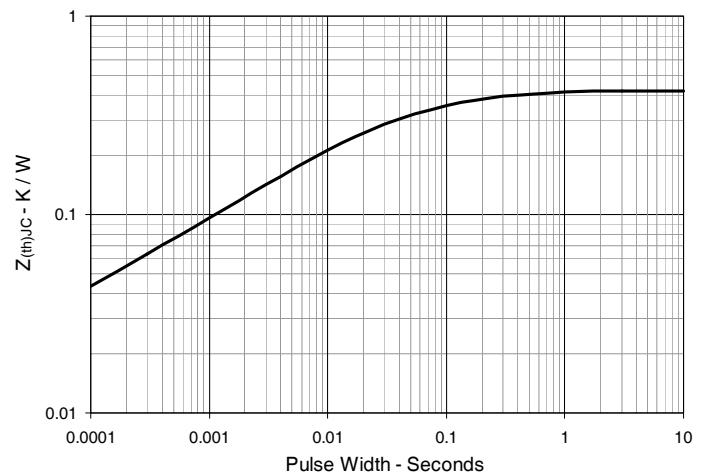


**Fig. 5.  $R_{DS(on)}$  Normalized to  $I_D = 65\text{A}$  Value vs. Drain Current**

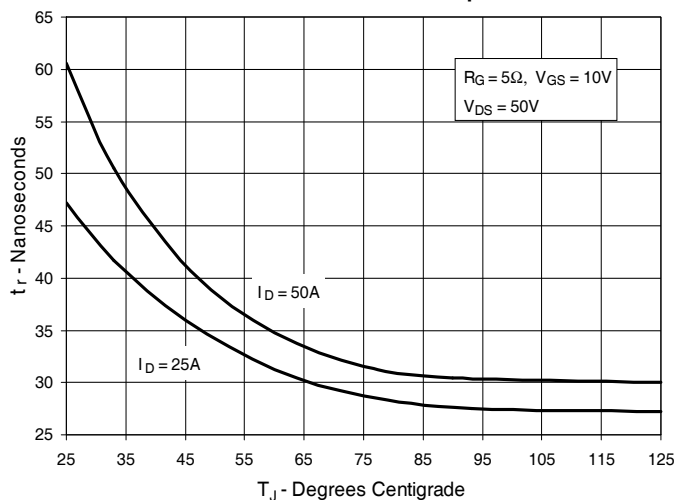


**Fig. 6. Drain Current vs. Case Temperature**

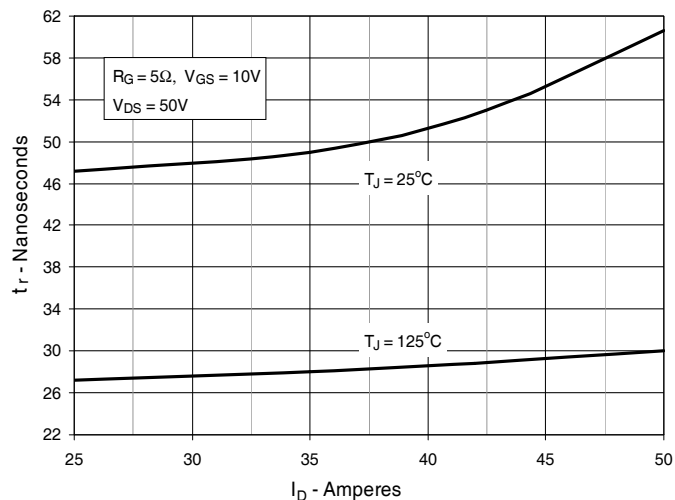


**Fig. 7. Input Admittance**

**Fig. 8. Transconductance**

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

**Fig. 10. Gate Charge**

**Fig. 11. Capacitance**

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


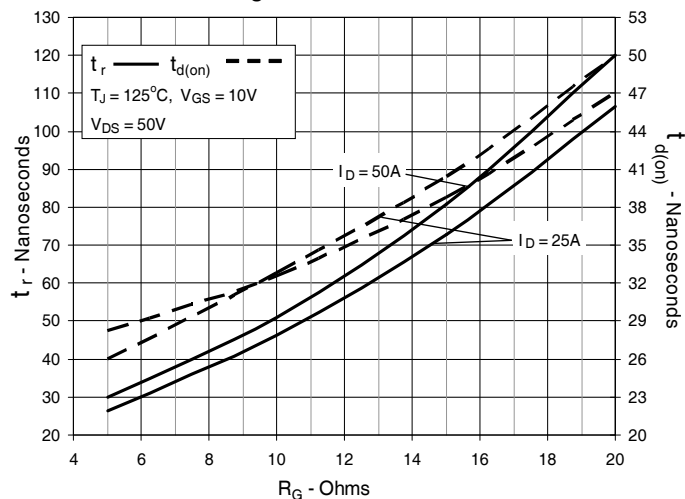
**Fig. 13. Resistive Turn-on**  
Rise Time vs. Junction Temperature



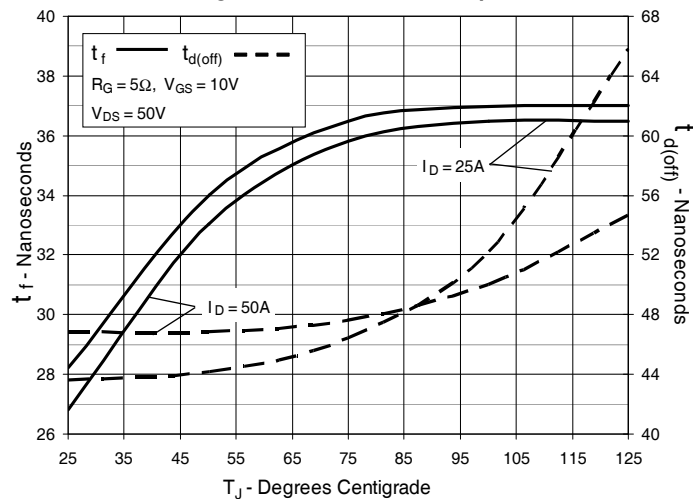
**Fig. 14. Resistive Turn-on**  
Rise Time vs. Drain Current



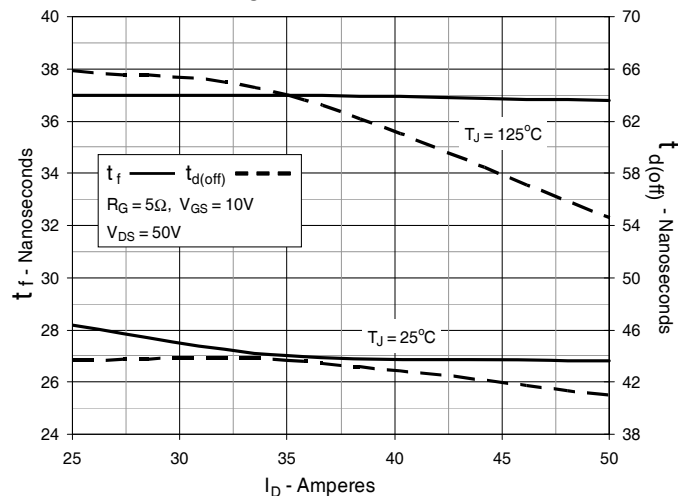
**Fig. 15. Resistive Turn-on**  
Switching Times vs. Gate Resistance



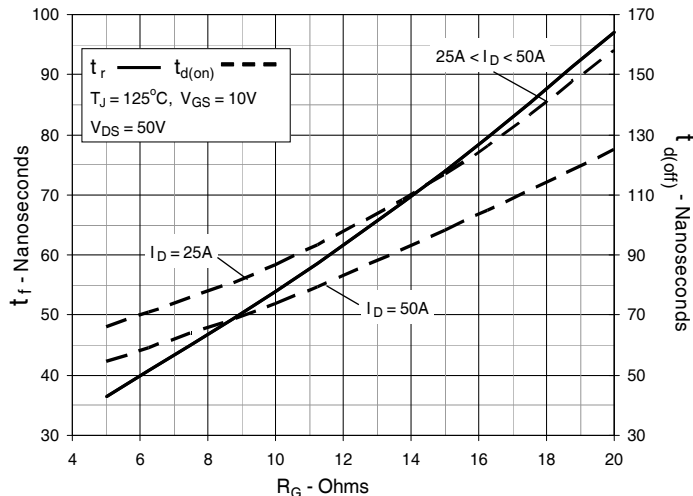
**Fig. 16. Resistive Turn-off**  
Switching Times vs. Junction Temperature



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



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



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