IXYS

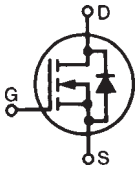
Preliminary Technical Information

# TrenchT2™ GigaMOS™ HiperFET™ Power MOSFET

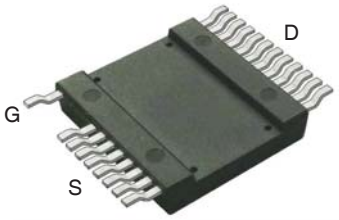
# MMIX1F520N075T2

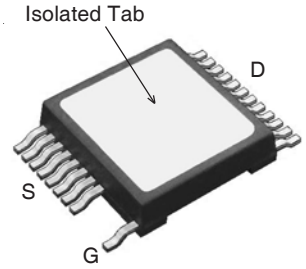
$V_{DSS}$ = 75V
$I_{D25}$ = 500A
$R_{DS(on)}$ ≤ 1.6mΩ

**(Electrically Isolated Tab)**




N-Channel Enhancement Mode
Avalanche Rated
Fast Intrinsic Diode




G = Gate D = Drain
S = Source

| Symbol | Test Conditions | Maximum Ratings | |
|---|---|---|---|
| $V_{DSS}$ | $T_J$ = 25°C to 175°C | 75 | V |
| $V_{DGR}$ | $T_J$ = 25°C to 175°C, $R_{GS}$ = 1MΩ | 75 | V |
| $V_{GSS}$ | Continuous | ±20 | V |
| $V_{GSM}$ | Transient | ±30 | V |
| $I_{D25}$ | $T_C$ = 25°C | 500 | A |
| $I_{DM}$ | $T_C$ = 25°C, Pulse Width Limited by $T_{JM}$ | 1700 | A |
| $I_A$ | $T_C$ = 25°C | 200 | A |
| $E_{AS}$ | $T_C$ = 25°C | 3 | J |
| $P_D$ | $T_C$ = 25°C | 830 | W |
| $T_J$ | | -55 ... +175 | °C |
| $T_{JM}$ | | 175 | °C |
| $T_{stg}$ | | -55 ... +175 | °C |
| $T_L$ | 1.6mm (0.062 in.) from Case for 10s | 300 | °C |
| $T_{SOLD}$ | Plastic Body for 10s | 260 | °C |
| $V_{ISOL}$ | 50/60 Hz, 1 Minute | 2500 | V~ |
| $F_C$ | Mounting Force | 50..200 / 11..45 | N/lb. |
| **Weight** | | 8 | g |

| Symbol | Test Conditions ($T_J$ = 25°C, Unless Otherwise Specified) | Characteristic Values Min. | Typ. | Max. | |
|---|---|---|---|---|---|
| $BV_{DSS}$ | $V_{GS}$ = 0V, $I_D$ = 3mA | 75 | | | V |
| $V_{GS(th)}$ | $V_{DS} = V_{GS}$, $I_D$ = 8mA | 2.5 | | 5.0 | V |
| $I_{GSS}$ | $V_{GS}$ = ±20V, $V_{DS}$ = 0V | | | ±200 | nA |
| $I_{DSS}$ | $V_{DS} = V_{DSS}$, $V_{GS}$ = 0V | | | 25 | μA |
| | $T_J$ = 150°C | | | 2.0 | mA |
| $R_{DS(on)}$ | $V_{GS}$ = 10V, $I_D$ = 100A, Note 1 | | | 1.6 | mΩ |

## Features

- Silicon Chip on Direct-Copper Bond (DCB) Substrate
- Isolated Substrate
  - Excellent Thermal Transfer
  - Increased Temperature and Power Cycling Capability
  - High Isolation Voltage (2500V~)
- 175°C Operating Temperature
- Very High Current Handling Capability
- Fast Intrinsic Diode
- Avalanche Rated
- Very Low $R_{DS(on)}$

## Advantages

- Easy to Mount
- Space Savings
- High Power Density

## Applications

- DC-DC Converters and Off-Line UPS
- Primary-Side Switch
- High Speed Power Switching Applications

| Symbol | Test Conditions ($T_J$ = 25°C, Unless Otherwise Specified) | Characteristic Values Min. | Typ. | Max. | |
|---|---|---|---|---|---|
| $g_{fs}$ | $V_{DS}$ = 10V, $I_D$ = 60A, Note 1 | 95 | 155 | | S |
| $C_{iss}$ | $V_{GS}$ = 0V, $V_{DS}$ = 25V, f = 1MHz | | 41 | | nF |
| $C_{oss}$ | | | 4150 | | pF |
| $C_{rss}$ | | | 530 | | pF |
| $R_{Gi}$ | Gate Input Resistance | | 1.36 | | Ω |
| $t_{d(on)}$ | **Resistive Switching Times** $V_{GS}$ = 10V, $V_{DS}$ = 0.5 • $V_{DSS}$, $I_D$ = 200A $R_G$ = 1Ω (External) | | 48 | | ns |
| $t_r$ | | | 36 | | ns |
| $t_{d(off)}$ | | | 80 | | ns |
| $t_f$ | | | 35 | | ns |
| $Q_{g(on)}$ | $V_{GS}$ = 10V, $V_{DS}$ = 0.5 • $V_{DSS}$, $I_D$ = 260A | | 545 | | nC |
| $Q_{gs}$ | | | 177 | | nC |
| $Q_{gd}$ | | | 135 | | nC |
| $R_{thJC}$ | | | | 0.18 | °C/W |
| $R_{thCS}$ | | | 0.05 | | °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 | | | 520 | A |
| $I_{SM}$ | Repetitive, Pulse Width Limited by $T_{JM}$ | | | 1600 | A |
| $V_{SD}$ | $I_F$ = 100A, $V_{GS}$ = 0V, Note 1 | | | 1.25 | V |
| $t_{rr}$ | $I_F$ = 150A, $V_{GS}$ = 0V | | | 150 | ns |
| $I_{RM}$ | -di/dt = 100A/μs | | 7 | | A |
| $Q_{RM}$ | $V_R$ = 37.5V | | 357 | | nC |

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

**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.

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

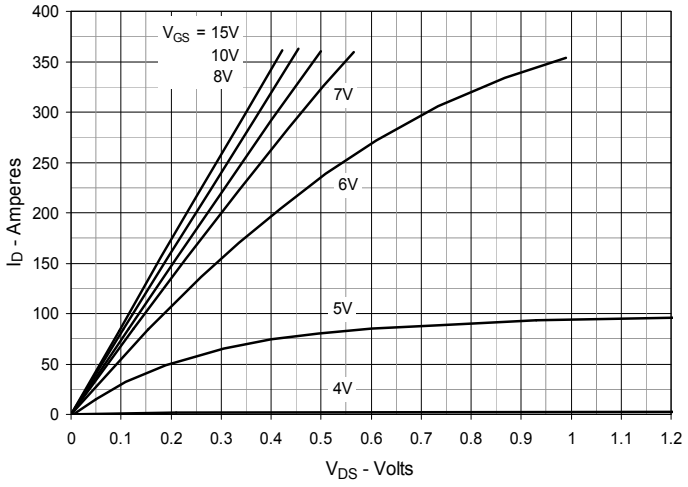



**Fig. 2. Output Characteristics @ $T_J$ = 150ºC**

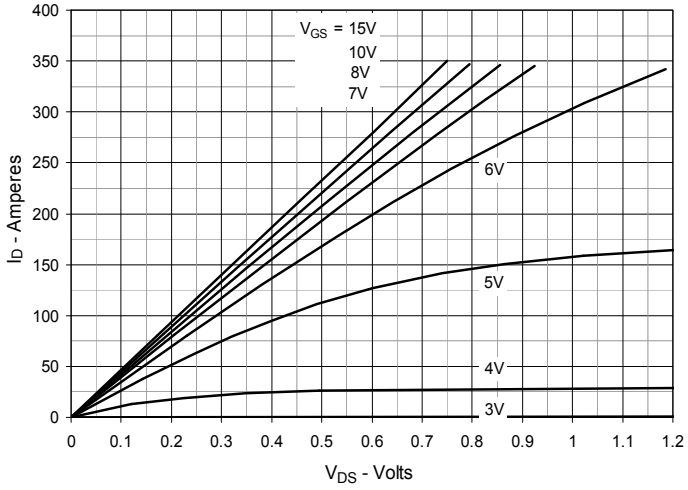



**Fig. 3. Normalized $R_{DS(on)}$ vs. Junction Temperature**

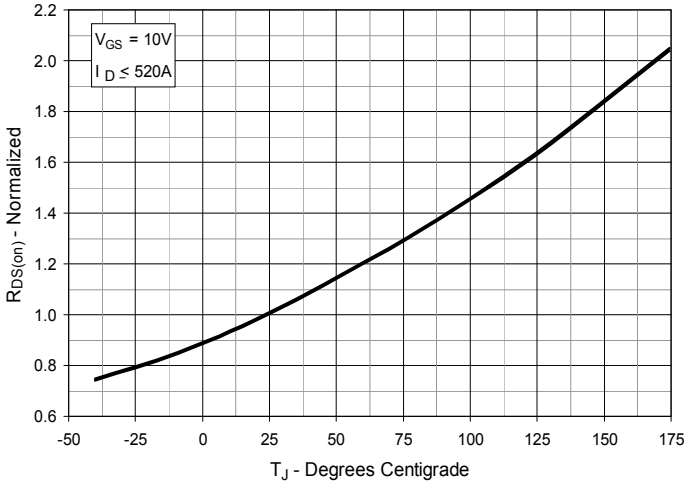



**Fig. 4. Normalized $R_{DS(on)}$ vs. Drain Current**

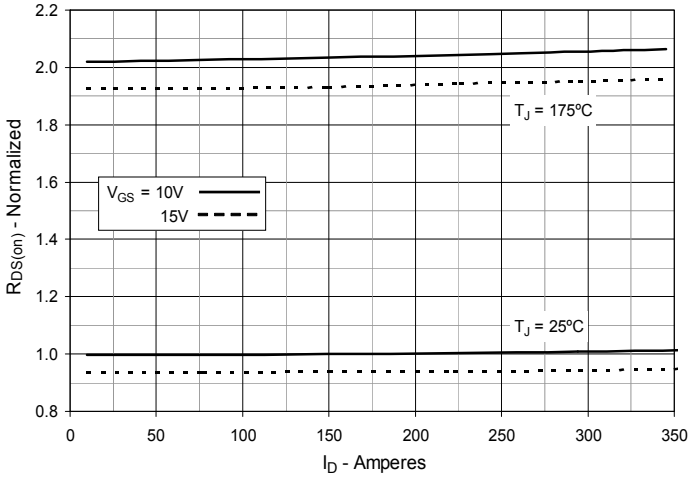



**Fig. 5. Drain Current vs. Case Temperature**

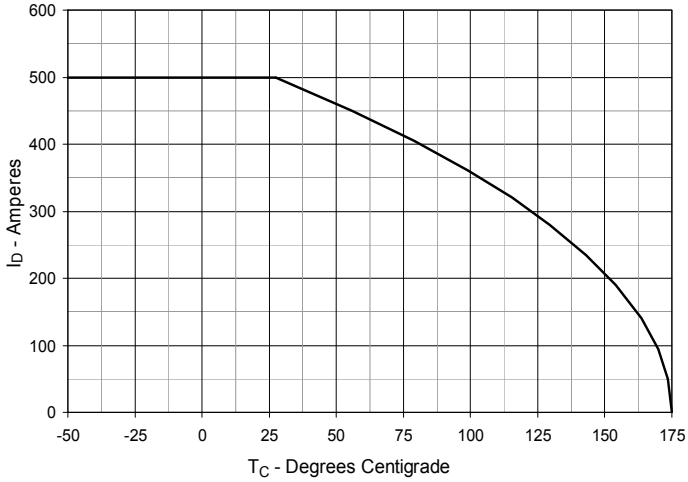



**Fig. 6. Input Admittance**

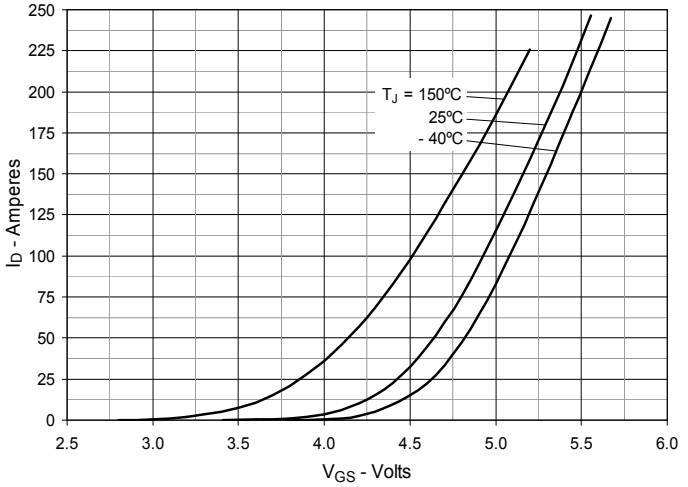


**Fig. 7. Transconductance**

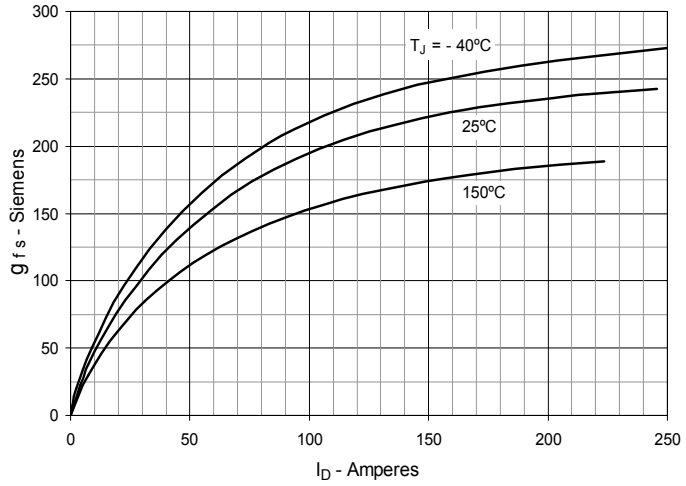



**Fig. 8. Forward Voltage Drop of Intrinsic Diode**

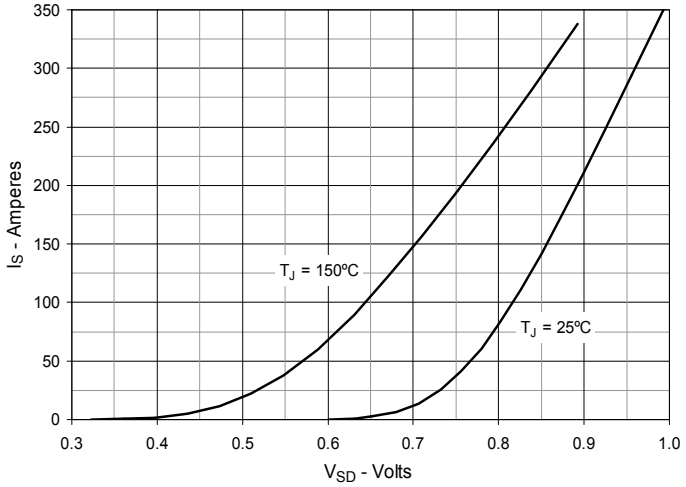



**Fig. 9. Gate Charge**

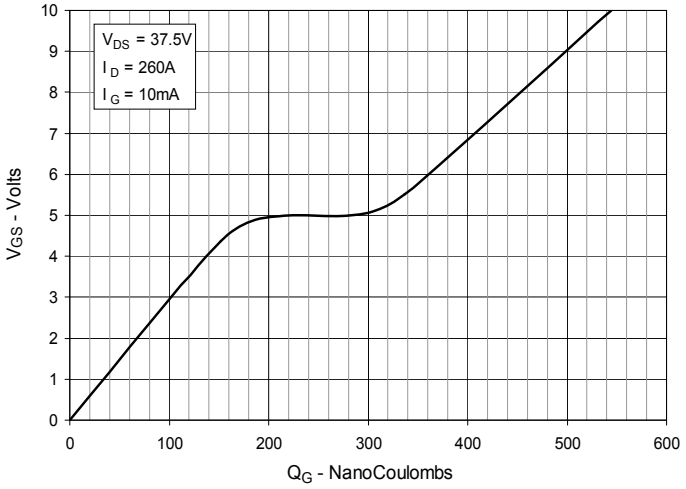



**Fig. 10. Capacitance**

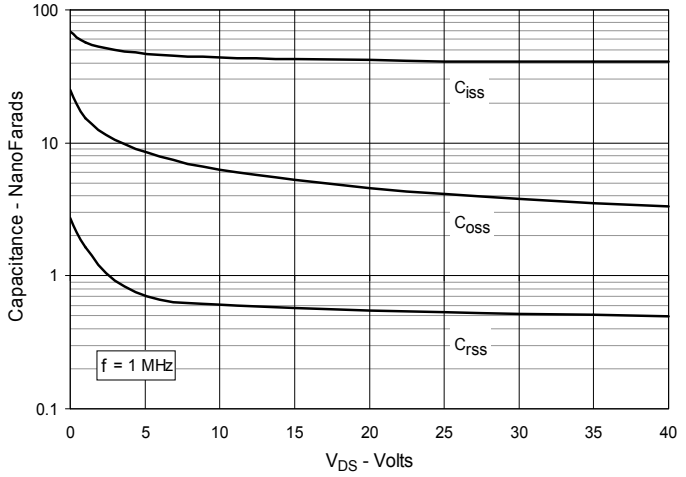



**Fig. 11. Forward-Bias Safe Operating Area**

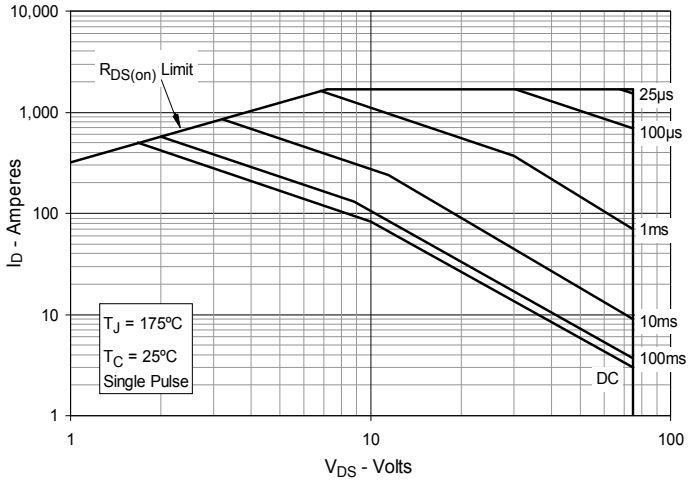



**Fig. 12. Maximum Transient Thermal Impedance**

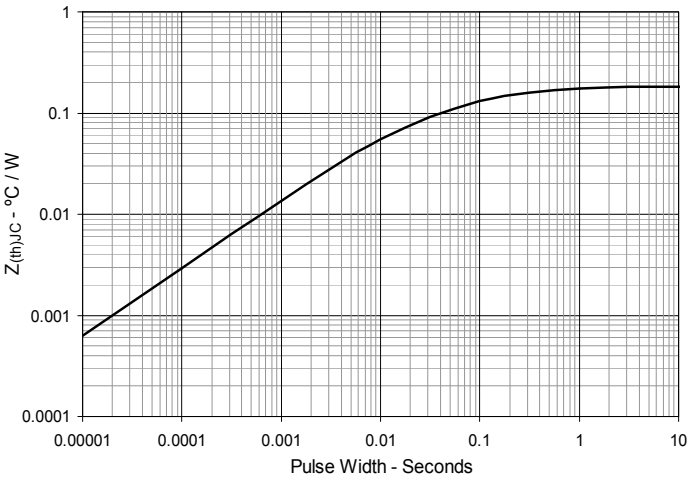


**Fig. 13. Resistive Turn-on Rise Time vs. Junction Temperature**

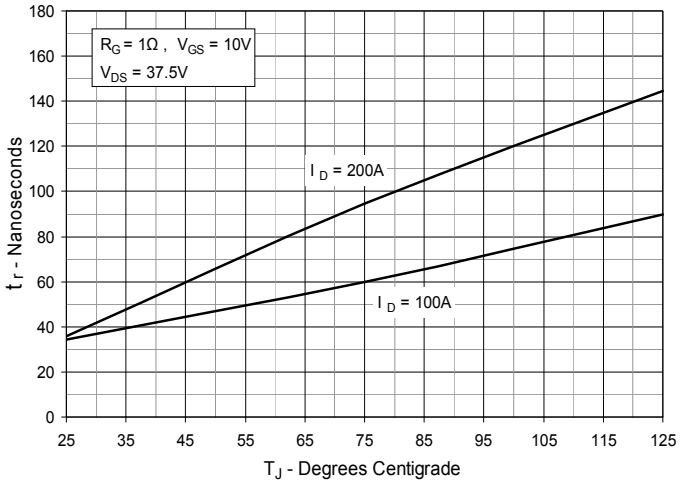



**Fig. 14. Resistive Turn-on Rise Time vs. Drain Current**

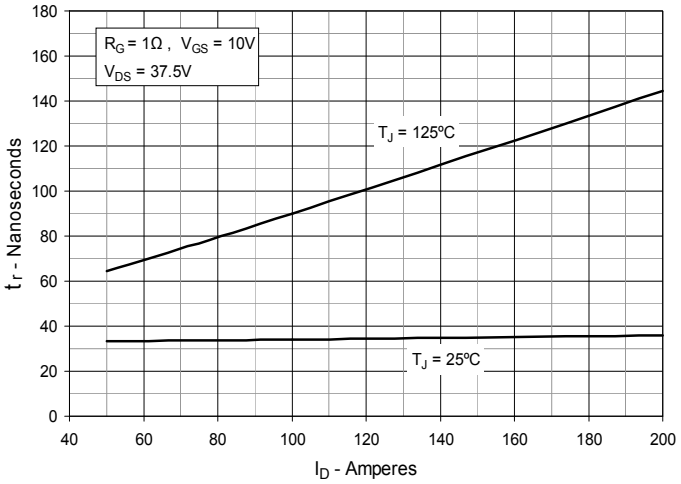



**Fig. 15. Resistive Turn-on Switching Times vs. Gate Resistance**

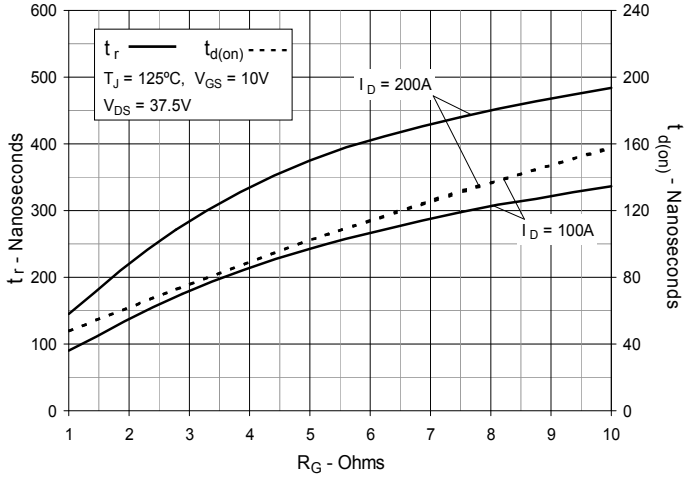



**Fig. 16. Resistive Turn-off Switching Times vs. Junction Temperature**

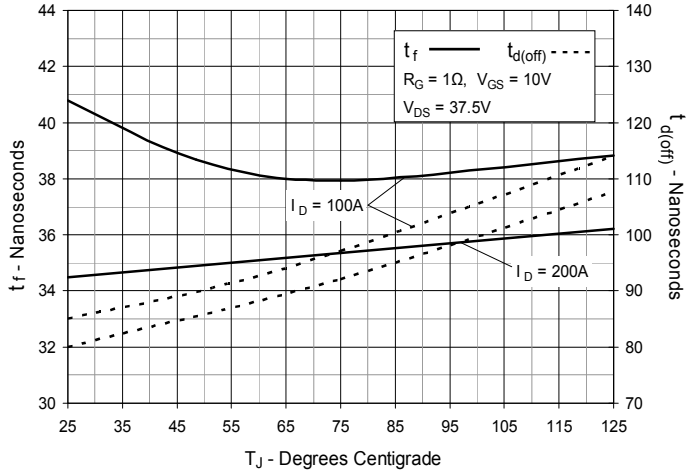



**Fig. 17. Resistive Turn-off Switching Times vs. Drain Current**

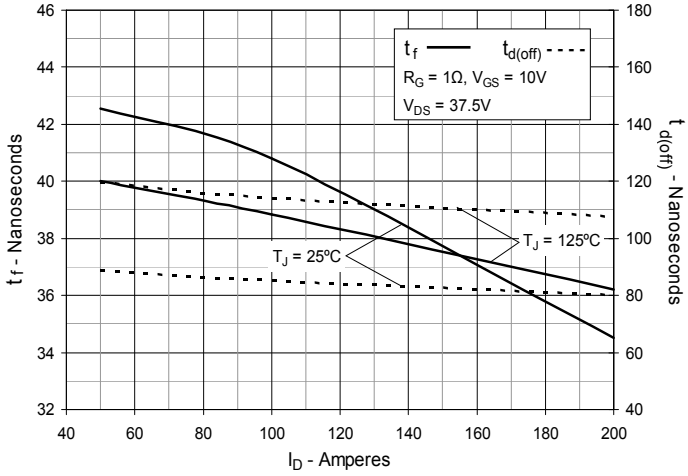
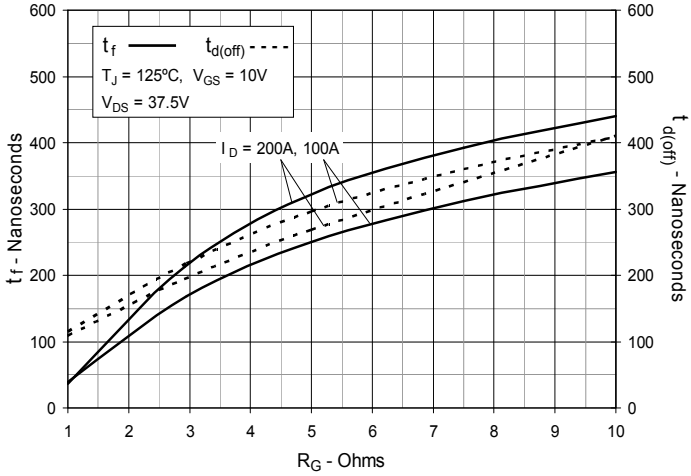
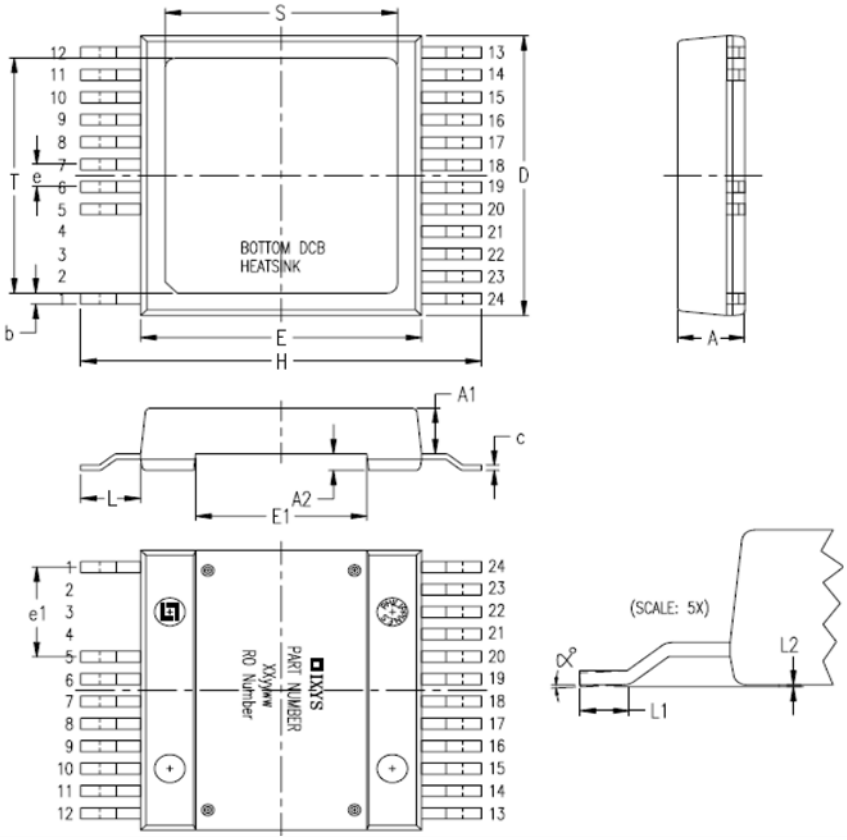



**Fig. 18. Resistive Turn-off Switching Times vs. Gate Resistance**



## Package Outline




| SYM | INCHES | | MILLIMETERS | |
|---|---|---|---|---|
| | MIN | MAX | MIN | MAX |
| A | .209 | .224 | 5.30 | 5.70 |
| A1 | .154 | .161 | 3.90 | 4.10 |
| A2 | .055 | .063 | 1.40 | 1.60 |
| b | .035 | .045 | 0.90 | 1.15 |
| c | .018 | .026 | 0.45 | 0.65 |
| D | .976 | .994 | 24.80 | 25.25 |
| E | .898 | .915 | 22.80 | 23.25 |
| E1 | .543 | .559 | 13.80 | 14.20 |
| e | .079 BSC | | 2.00 BSC | |
| e1 | .315 BSC | | 8.00 BSC | |
| H | 1.272 | 1.311 | 32.30 | 33.30 |
| L | .181 | .209 | 4.60 | 5.30 |
| L1 | .051 | .067 | 1.30 | 1.70 |
| L2 | .000 | .006 | 0.00 | 0.15 |
| S | .736 | .760 | 18.70 | 19.30 |
| T | .815 | .839 | 20.70 | 21.30 |
| α | 0 | 4° | 0 | 4° |

**PIN: 1 = Gate**
**5-12 = Source**
**13-24 = Drain**