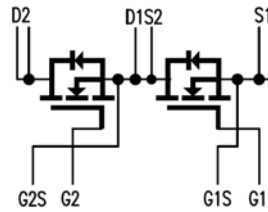


### Trench™ HiperFET™ Power MOSFET

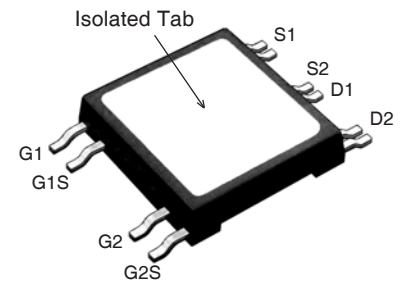
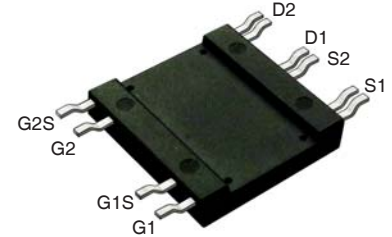
### MMIX2F150N20T

(Electrically Isolated Tab)

N-Channel Enhancement Mode  
Avalanche Rated  
Fast Intrinsic Rectifier



$$\begin{aligned} V_{DSS} &= 200V \\ I_{D25} &= 84A \\ R_{DS(on)} &\leq 16.5m\Omega \end{aligned}$$



G = Gate      D = Drain  
S = Source

| Symbol     | Test Conditions                                                    | Maximum Ratings  |                  |
|------------|--------------------------------------------------------------------|------------------|------------------|
| $V_{DSS}$  | $T_J = 25^\circ\text{C to } 150^\circ\text{C}$                     | 200              | V                |
| $V_{DGR}$  | $T_J = 25^\circ\text{C to } 150^\circ\text{C}, R_{GS} = 1M\Omega$  | 200              | V                |
| $V_{GSS}$  | Continuous                                                         | $\pm 20$         | V                |
| $V_{GSM}$  | Transient                                                          | $\pm 30$         | V                |
| $I_{D25}$  | $T_C = 25^\circ\text{C}$                                           | 84               | A                |
| $I_{DM}$   | $T_C = 25^\circ\text{C}$ , Pulse Width Limited by $T_{JM}$         | 375              | A                |
| $I_A$      | $T_C = 25^\circ\text{C}$                                           | 75               | A                |
| $E_{AS}$   | $T_C = 25^\circ\text{C}$                                           | 1.5              | J                |
| $P_D$      | $T_C = 25^\circ\text{C}$                                           | 305              | W                |
| $dv/dt$    | $I_S \leq I_{DM}, V_{DD} \leq V_{DSS}, T_J \leq 150^\circ\text{C}$ | 20               | V/ns             |
| $T_J$      |                                                                    | -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              | $^\circ\text{C}$ |
| $V_{ISOL}$ | 50/60 Hz, 1 Minute                                                 | 2500             | V~               |
| $F_C$      | Mounting Force                                                     | 50..200 / 11..45 | N/lb             |
| Weight     |                                                                    | 8                | g                |

| Symbol       | Test Conditions<br>( $T_J = 25^\circ\text{C}$ , Unless Otherwise Specified) | Characteristic Values |      |                            |
|--------------|-----------------------------------------------------------------------------|-----------------------|------|----------------------------|
|              |                                                                             | Min.                  | Typ. | Max.                       |
| $BV_{DSS}$   | $V_{GS} = 0V, I_D = 1mA$                                                    | 200                   |      | V                          |
| $V_{GS(th)}$ | $V_{DS} = V_{GS}, I_D = 4mA$                                                | 3.0                   |      | 5.0 V                      |
| $I_{GSS}$    | $V_{GS} = \pm 20V, V_{DS} = 0V$                                             |                       |      | $\pm 200$ nA               |
| $I_{DSS}$    | $V_{DS} = V_{DSS}, V_{GS} = 0V$                                             |                       |      | 25 $\mu\text{A}$<br>1.5 mA |
| $R_{DS(on)}$ | $V_{GS} = 10V, I_D = 60A$ , Note 1                                          |                       |      | 16.5 m $\Omega$            |

Note 2,  $T_J = 150^\circ\text{C}$

#### Features

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

#### Advantages

- Easy to Mount
- Space Savings
- High Power Density

#### Applications

- DC-DC Converters
- Battery Chargers
- Switch-Mode and Resonant-Mode Power Supplies
- DC Choppers
- AC Motor Drives
- Uninterruptible Power Supplies
- High Speed Power Switching Applications

| Symbol       | Test Conditions<br>( $T_J = 25^\circ\text{C}$ , Unless Otherwise Specified)                                                                 | Characteristic Values |      |                         |
|--------------|---------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|------|-------------------------|
|              |                                                                                                                                             | Min.                  | Typ. | Max.                    |
| $g_{fs}$     | $V_{DS} = 10\text{V}$ , $I_D = 60\text{A}$ , Note 1                                                                                         | 66                    | 112  | S                       |
| $C_{iss}$    | $V_{GS} = 0\text{V}$ , $V_{DS} = 25\text{V}$ , $f = 1\text{MHz}$                                                                            |                       | 11.7 | nF                      |
| $C_{oss}$    |                                                                                                                                             |                       | 1250 | pF                      |
| $C_{rss}$    |                                                                                                                                             |                       | 162  | pF                      |
| $R_{GI}$     | Gate Input Resistance                                                                                                                       |                       | 1.9  | $\Omega$                |
| $t_{d(on)}$  | <b>Resistive Switching Times</b><br>$V_{GS} = 10\text{V}$ , $V_{DS} = 0.5 \cdot V_{DSS}$ , $I_D = 75\text{A}$<br>$R_G = 2\Omega$ (External) |                       | 43   | ns                      |
| $t_r$        |                                                                                                                                             |                       | 12   | ns                      |
| $t_{d(off)}$ |                                                                                                                                             |                       | 45   | ns                      |
| $t_f$        |                                                                                                                                             |                       | 12   | ns                      |
| $Q_{g(on)}$  | $V_{GS} = 10\text{V}$ , $V_{DS} = 0.5 \cdot V_{DSS}$ , $I_D = 75\text{A}$                                                                   |                       | 177  | nC                      |
| $Q_{gs}$     |                                                                                                                                             |                       | 70   | nC                      |
| $Q_{gd}$     |                                                                                                                                             |                       | 44   | nC                      |
| $R_{thJC}$   |                                                                                                                                             |                       |      | 0.41 $^\circ\text{C/W}$ |
| $R_{thCS}$   |                                                                                                                                             | 0.05                  |      | $^\circ\text{C/W}$      |
| $R_{thJA}$   |                                                                                                                                             | 30                    |      | $^\circ\text{C/W}$      |

#### Source-Drain Diode

| Symbol   | Test Conditions<br>( $T_J = 25^\circ\text{C}$ , Unless Otherwise Specified)                           | Characteristic Values |      |               |
|----------|-------------------------------------------------------------------------------------------------------|-----------------------|------|---------------|
|          |                                                                                                       | Min.                  | Typ. | Max.          |
| $I_S$    | $V_{GS} = 0\text{V}$                                                                                  |                       |      | 150 A         |
| $I_{SM}$ | Repetitive, Pulse Width Limited by $T_{JM}$                                                           |                       |      | 600 A         |
| $V_{SD}$ | $I_F = 100\text{A}$ , $V_{GS} = 0\text{V}$ , Note 1                                                   |                       |      | 1.4 V         |
| $t_{rr}$ | $I_F = 75\text{A}$ , $V_{GS} = 0\text{V}$<br>$-di/dt = 100\text{A}/\mu\text{s}$<br>$V_R = 75\text{V}$ |                       | 100  | ns            |
| $I_{RM}$ |                                                                                                       |                       | 8.0  | A             |
| $Q_{RM}$ |                                                                                                       |                       | 0.4  | $\mu\text{C}$ |

#### Notes:

1. Pulse test,  $t \leq 300\mu\text{s}$ , duty cycle,  $d \leq 2\%$ .
2. Part must be heatsunk for high-temp  $I_{DSS}$  measurement.

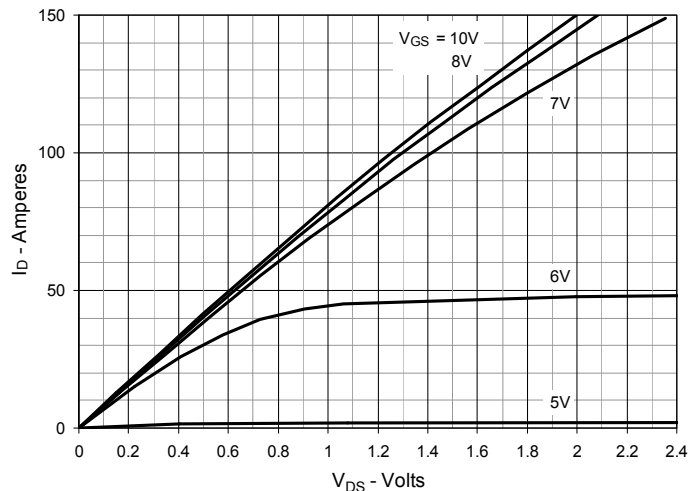
#### PRELIMINARY TECHNICAL INFORMATION

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.

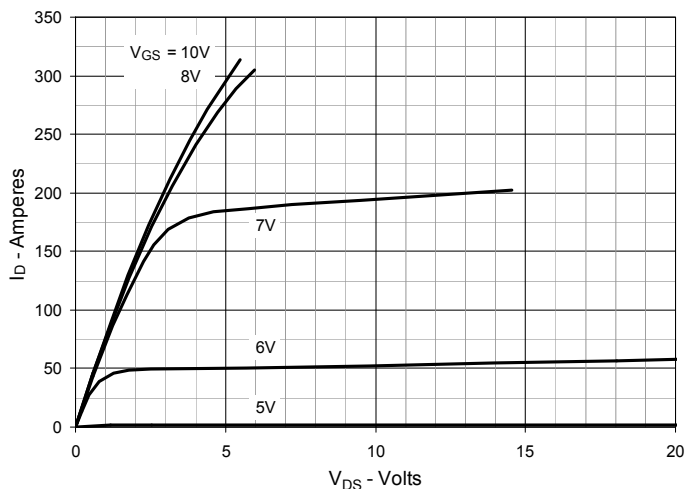
IXYS Reserves the Right to Change Limits, Test Conditions, and Dimensions.

|                                                                                  |           |           |           |           |              |              |              |              |              |              |
|----------------------------------------------------------------------------------|-----------|-----------|-----------|-----------|--------------|--------------|--------------|--------------|--------------|--------------|
| 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    | 6,404,065 B1 | 6,683,344    | 6,727,585    | 7,005,734 B2 | 7,157,338 B2 |
|                                                                                  | 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    |              |

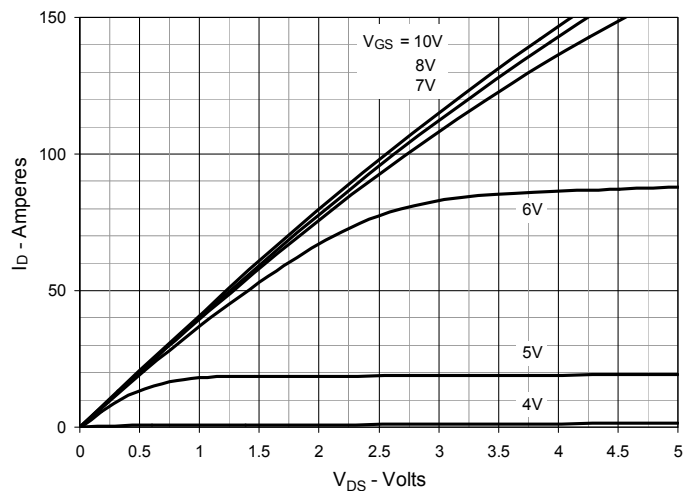
**Fig. 1. Output Characteristics @  $T_J = 25^\circ\text{C}$**



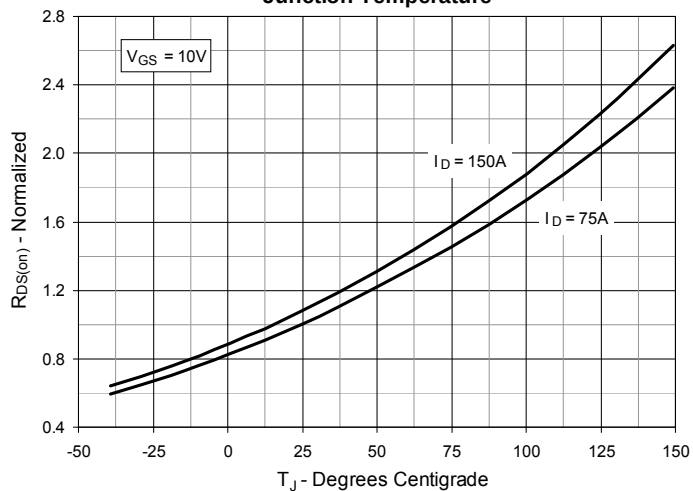
**Fig. 2. Extended Output Characteristics @  $T_J = 25^\circ\text{C}$**



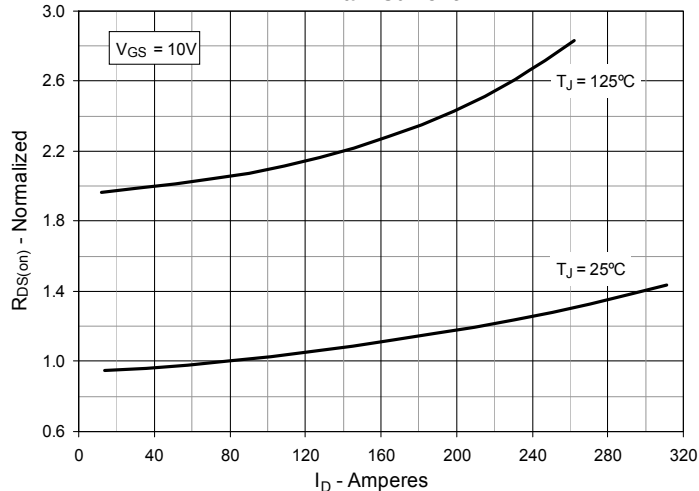
**Fig. 3. Output Characteristics @  $T_J = 125^\circ\text{C}$**



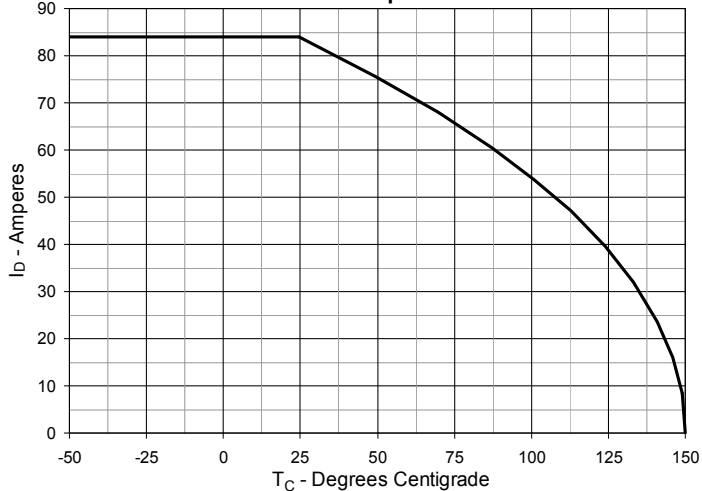
**Fig. 4.  $R_{DS(on)}$  Normalized to  $I_D = 75\text{A}$  Value vs. Junction Temperature**



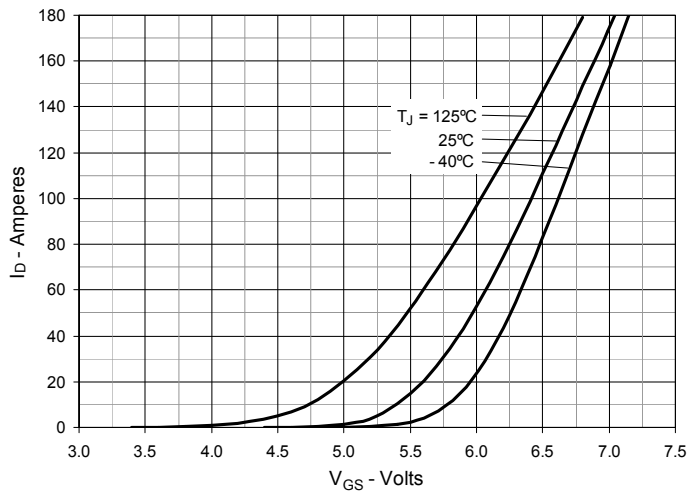
**Fig. 5.  $R_{DS(on)}$  Normalized to  $I_D = 75\text{A}$  Value vs. Drain Current**



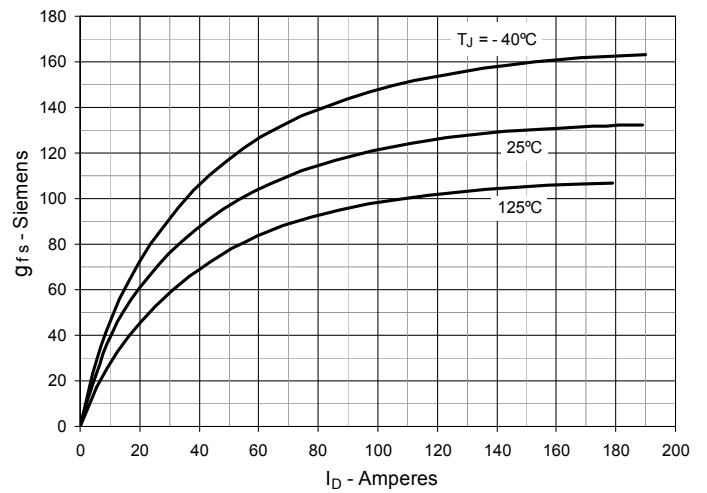
**Fig. 6. Maximum Drain Current vs. Case Temperature**



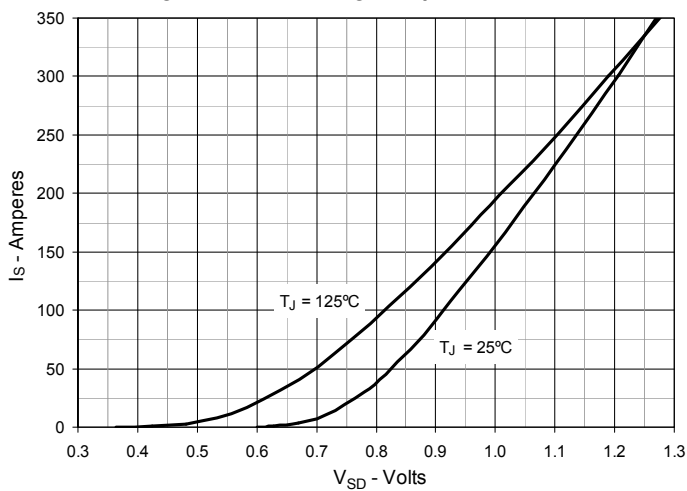
**Fig. 7. Input Admittance**



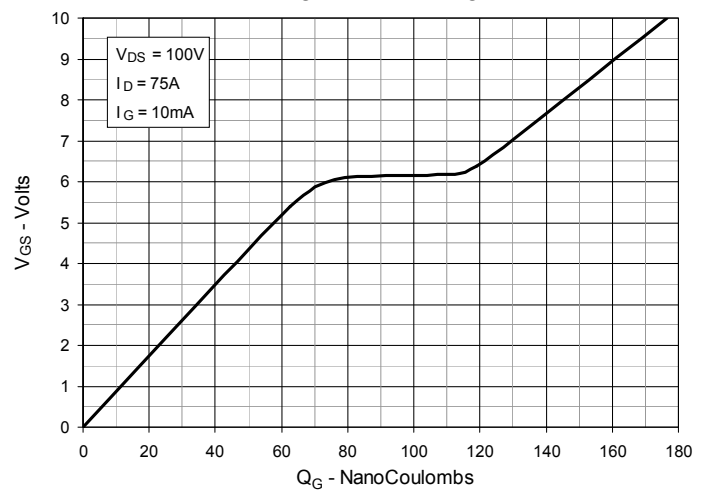
**Fig. 8. Transconductance**



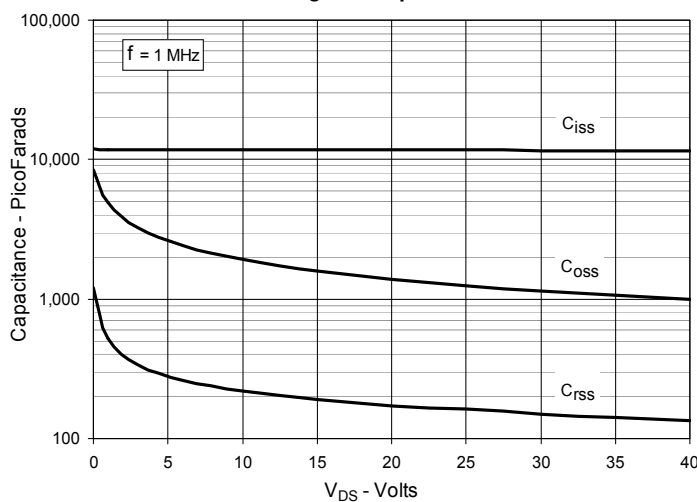
**Fig. 9. Forward Voltage Drop of Intrinsic Diode**



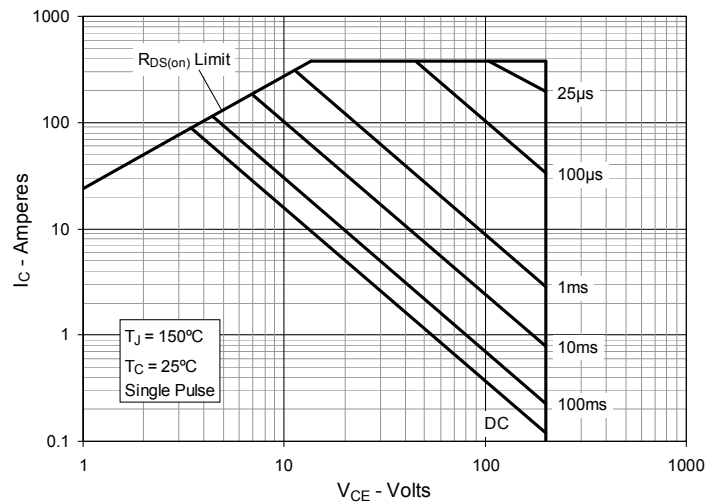
**Fig. 10. Gate Charge**



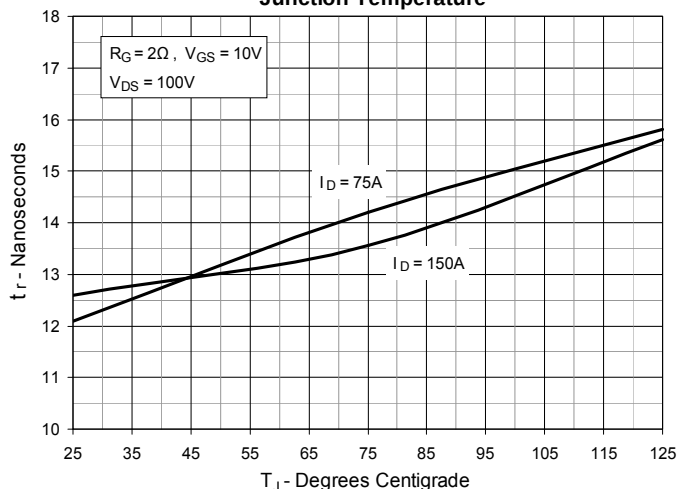
**Fig. 11. Capacitance**



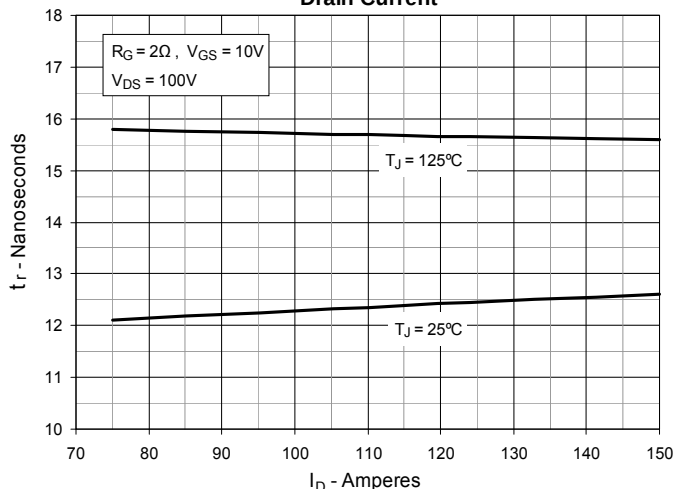
**Fig. 12. Forward-Bias Safe Operating Area @  $T_C = 25^\circ\text{C}$**



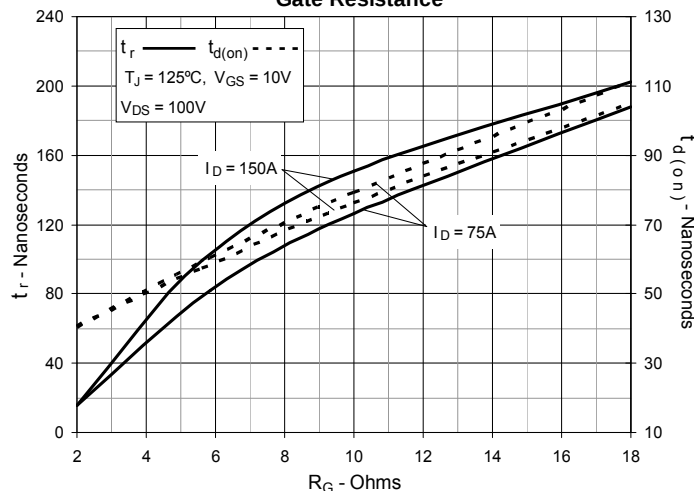
**Fig. 13. Resistive Turn-on Rise Time vs. Junction Temperature**



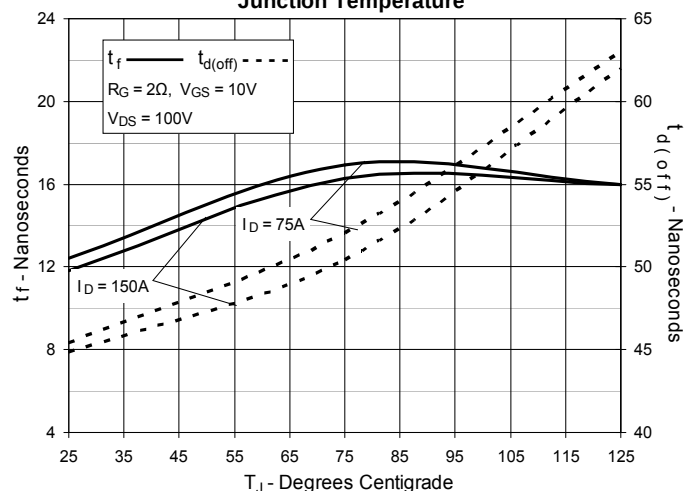
**Fig. 14. Resistive Turn-on Rise Time vs. Drain Current**



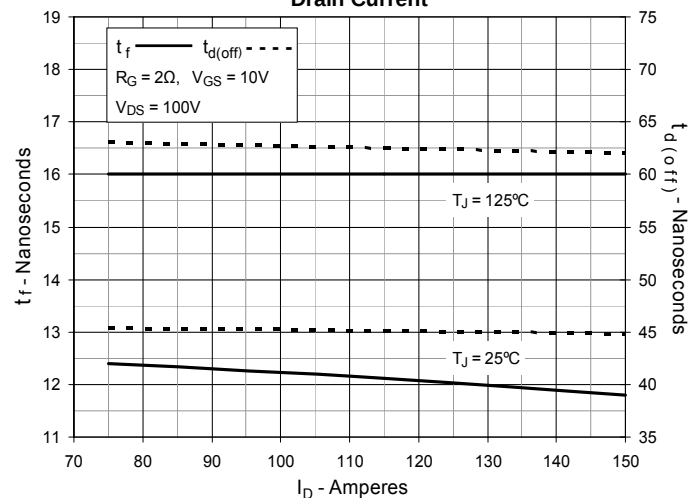
**Fig. 15. Resistive Turn-on Switching Times vs. Gate Resistance**



**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**

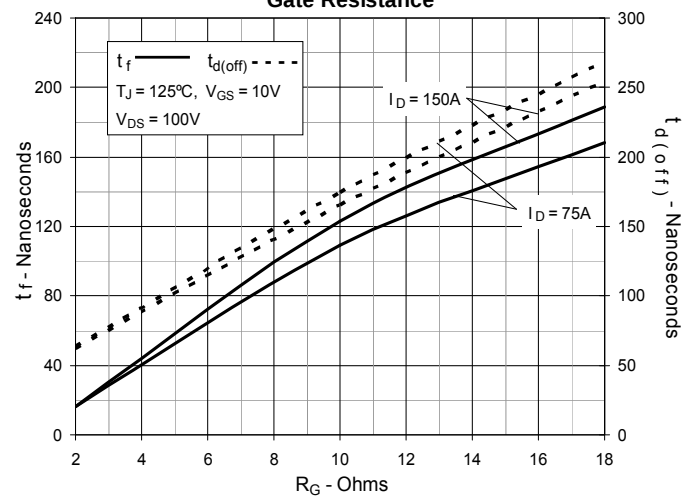
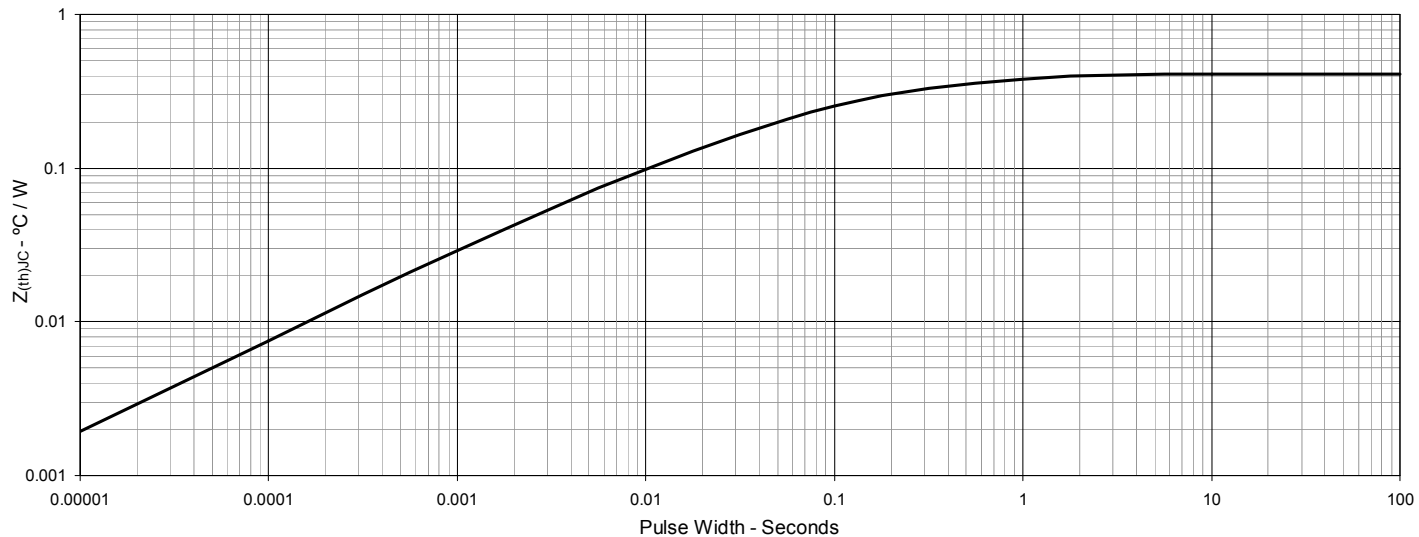
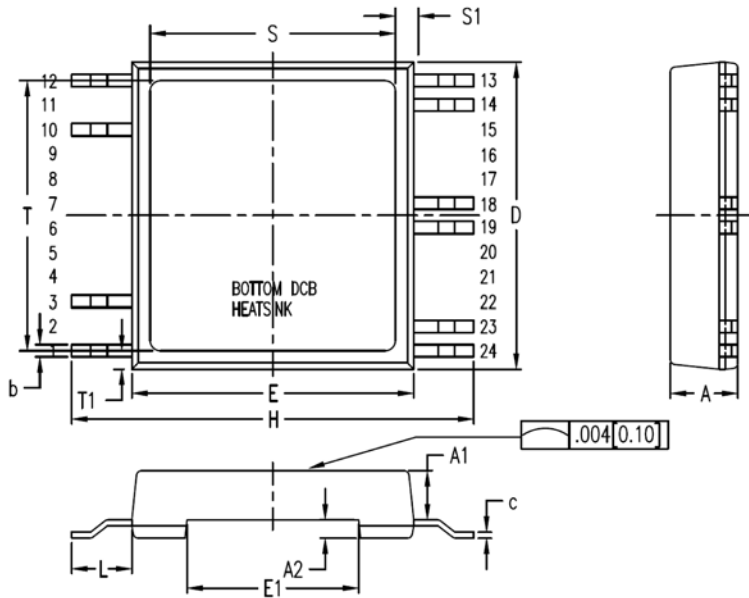


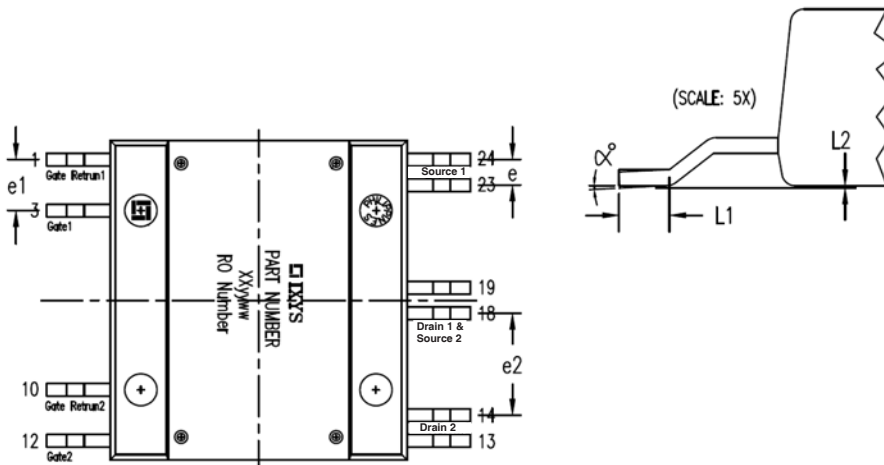
Fig. 19. Maximum Transient Thermal Impedance



## SMPD OUT LINE



| 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  | .157 BSC |       | 4.00 BSC    |       |
| e2  | .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   | .748     | .807  | 19.00       | 20.50 |
| S1  | .039     | .079  | 1.00        | 2.00  |
| T   | .826     | .886  | 21.00       | 22.50 |
| T1  | .039     | .079  | 1.00        | 2.00  |
| α   | 0        | 4°    | 0           | 4°    |





---

Disclaimer Notice - Information furnished is believed to be accurate and reliable. However, users should independently evaluate the suitability of and test each product selected for their own applications. Littelfuse products are not designed for, and may not be used in, all applications. Read complete Disclaimer Notice at [www.littelfuse.com/disclaimer-electronics](http://www.littelfuse.com/disclaimer-electronics).