

## High Voltage Power MOSFET

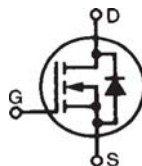
## IXTT1N450HV IXTH1N450HV

$$V_{DSS} = 4500V$$

$$I_{D25} = 1A$$

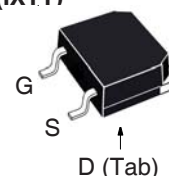
$$R_{DS(on)} \leq 80\Omega$$

N-Channel Enhancement Mode

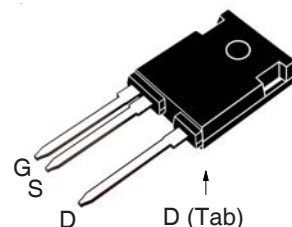


| Symbol     | Test Conditions                                                       | Maximum Ratings   |                  |
|------------|-----------------------------------------------------------------------|-------------------|------------------|
| $V_{DSS}$  | $T_J = 25^\circ\text{C}$ to $150^\circ\text{C}$                       | 4500              | V                |
| $V_{DGR}$  | $T_J = 25^\circ\text{C}$ to $150^\circ\text{C}$ , $R_{GS} = 1M\Omega$ | 4500              | V                |
| $V_{GSS}$  | Continuous                                                            | $\pm 20$          | V                |
| $V_{GSM}$  | Transient                                                             | $\pm 30$          | V                |
| $I_{D25}$  | $T_C = 25^\circ\text{C}$                                              | 1                 | A                |
| $I_{DM}$   | $T_C = 25^\circ\text{C}$ , Pulse Width Limited by $T_{JM}$            | 3                 | A                |
| $P_D$      | $T_C = 25^\circ\text{C}$                                              | 520               | 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               | $^\circ\text{C}$ |
| $F_C$      | Mounting Force (TO-263HV)                                             | 10..65 / 22..14.6 | N/lb             |
| $M_d$      | Mounting Torque (TO-247HV)                                            | 1.13/10           | Nm/lb.in         |
| Weight     | TO-263HV                                                              | 2.5               | g                |
|            | TO-247HV                                                              | 6.0               | g                |

TO-268HV (IXTT)



TO-247HV (IXTH)



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

### Features

- High Blocking Voltage
- High Voltage Package

### Advantages

- Easy to Mount
- Space Savings
- High Power Density

### Applications

- High Voltage Power Supplies
- Capacitor Discharge Applications
- Pulse Circuits
- Laser and X-Ray Generation Systems

| Symbol       | Test Conditions<br>( $T_J = 25^\circ\text{C}$ , Unless Otherwise Specified) | Characteristic Values |      |                  |
|--------------|-----------------------------------------------------------------------------|-----------------------|------|------------------|
|              |                                                                             | Min.                  | Typ. | Max.             |
| $V_{GS(th)}$ | $V_{DS} = V_{GS}$ , $I_D = 250\mu\text{A}$                                  | 3.5                   |      | 6.0 V            |
| $I_{GSS}$    | $V_{GS} = \pm 20V$ , $V_{DS} = 0V$                                          |                       |      | $\pm 100$ nA     |
| $I_{DSS}$    | $V_{DS} = 3.6kV$ , $V_{GS} = 0V$                                            |                       |      | 5 $\mu\text{A}$  |
|              | $V_{DS} = 4.5kV$                                                            |                       |      | 25 $\mu\text{A}$ |
|              | $V_{DS} = 3.6kV$ $T_J = 100^\circ\text{C}$                                  |                       | 15   | $\mu\text{A}$    |
| $R_{DS(on)}$ | $V_{GS} = 10V$ , $I_D = 50mA$ , Note 1                                      |                       |      | 80 $\Omega$      |

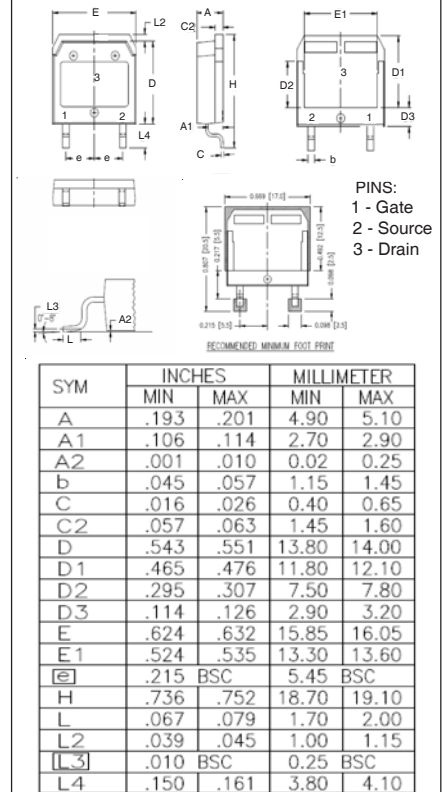
| Symbol       | Test Conditions<br>( $T_J = 25^\circ\text{C}$ , Unless Otherwise Specified)                                                                   | Characteristic Values |      |                        |
|--------------|-----------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|------|------------------------|
|              |                                                                                                                                               | Min.                  | Typ. | Max.                   |
| $g_{fs}$     | $V_{DS} = 50\text{V}$ , $I_D = 200\text{mA}$ , Note 1                                                                                         | 0.40                  | 0.70 | S                      |
| $C_{iss}$    | $V_{GS} = 0\text{V}$ , $V_{DS} = 25\text{V}$ , $f = 1\text{MHz}$                                                                              |                       | 1700 | pF                     |
| $C_{oss}$    |                                                                                                                                               |                       | 80   | pF                     |
| $C_{rss}$    |                                                                                                                                               |                       | 29   | pF                     |
| $R_{Gi}$     | Gate Input Resistance                                                                                                                         |                       | 12   | $\Omega$               |
| $t_{d(on)}$  | <b>Resistive Switching Times</b><br>$V_{GS} = 10\text{V}$ , $V_{DS} = 500\text{V}$ , $I_D = 0.5 \cdot I_{D25}$<br>$R_G = 10\Omega$ (External) |                       | 30   | ns                     |
| $t_r$        |                                                                                                                                               |                       | 43   | ns                     |
| $t_{d(off)}$ |                                                                                                                                               |                       | 73   | ns                     |
| $t_f$        |                                                                                                                                               |                       | 120  | ns                     |
| $Q_{g(on)}$  | $V_{GS} = 10\text{V}$ , $V_{DS} = 1\text{kV}$ , $I_D = 0.5 \cdot I_{D25}$                                                                     |                       | 46   | nC                     |
| $Q_{gs}$     |                                                                                                                                               |                       | 8    | nC                     |
| $Q_{gd}$     |                                                                                                                                               |                       | 23   | nC                     |
| $R_{thJC}$   | TO-247HV                                                                                                                                      |                       | 0.21 | $0.24^\circ\text{C/W}$ |
| $R_{thCS}$   |                                                                                                                                               |                       |      |                        |

## Source-Drain Diode

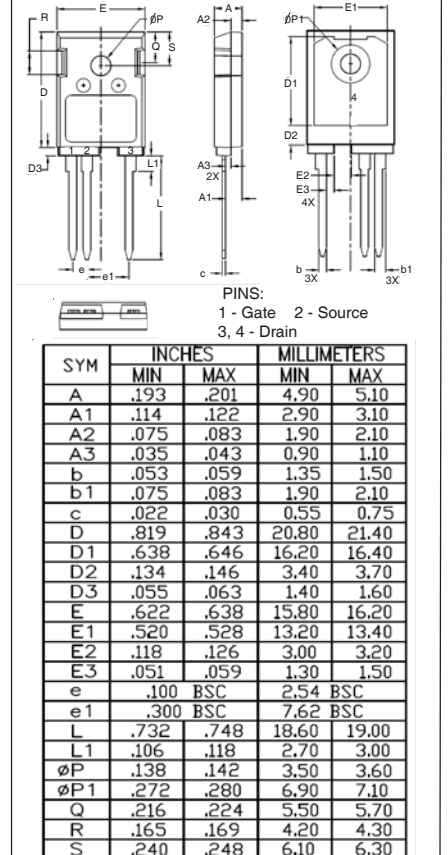
| Symbol   | Test Conditions<br>( $T_J = 25^\circ\text{C}$ , Unless Otherwise Specified) | Characteristic Values |      |               |
|----------|-----------------------------------------------------------------------------|-----------------------|------|---------------|
|          |                                                                             | Min.                  | Typ. | Max.          |
| $I_S$    | $V_{GS} = 0\text{V}$                                                        |                       |      | 1 A           |
| $I_{SM}$ | Repetitive, Pulse Width Limited by $T_{JM}$                                 |                       |      | 5 A           |
| $V_{SD}$ | $I_F = 1\text{A}$ , $V_{GS} = 0\text{V}$ , Note 1                           |                       |      | 2.0 V         |
| $t_{rr}$ | $I_F = 1\text{A}$ , $-di/dt = 50\text{A}/\mu\text{s}$ , $V_R = 100\text{V}$ |                       | 1.75 | $\mu\text{s}$ |

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

## TO-268HV Outline



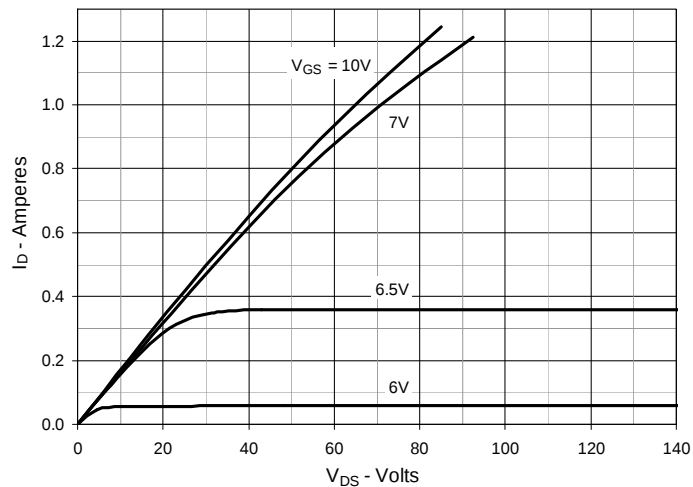
## TO-247HV Outline



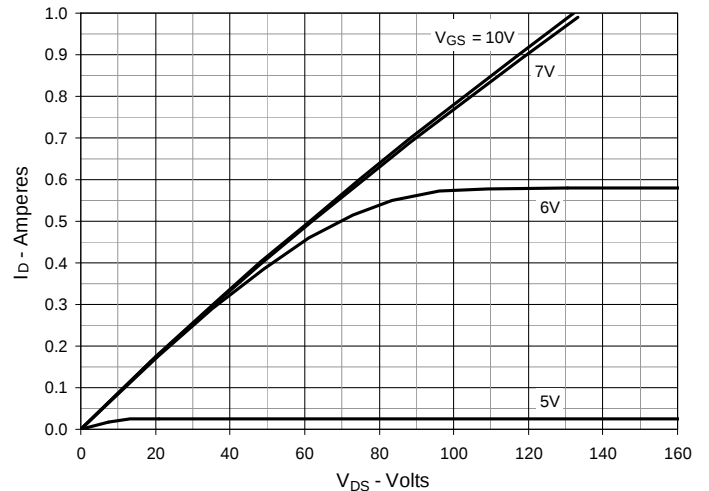
IXYS Reserves the Right to Change Limits, Test Conditions, and Dimensions.

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

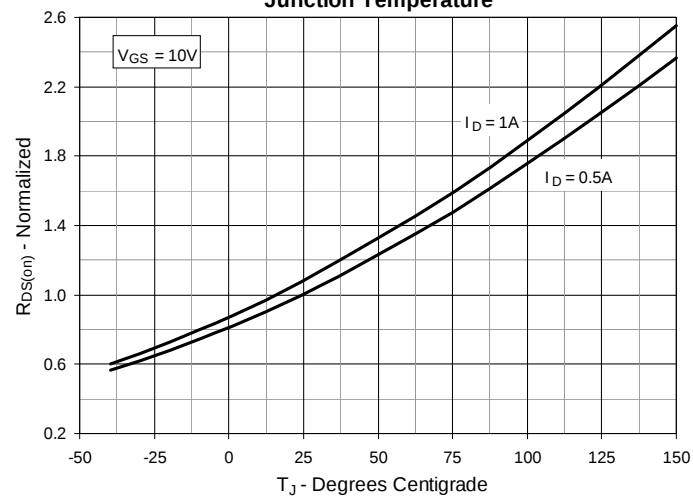
**Fig. 1. Output Characteristics @  $T_J = 25^\circ\text{C}$**



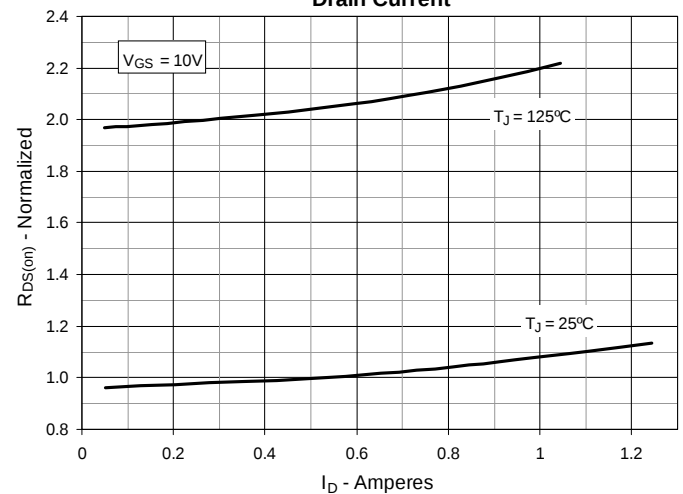
**Fig. 2. Output Characteristics @  $T_J = 125^\circ\text{C}$**



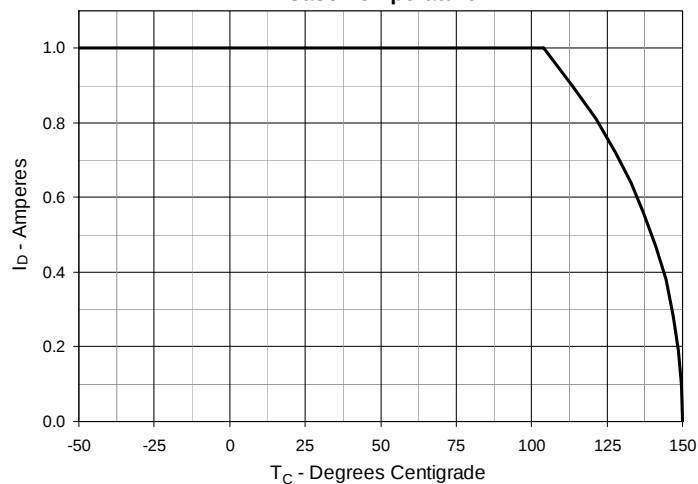
**Fig. 3.  $R_{DS(on)}$  Normalized to  $I_D = 0.5\text{A}$  Value vs. Junction Temperature**



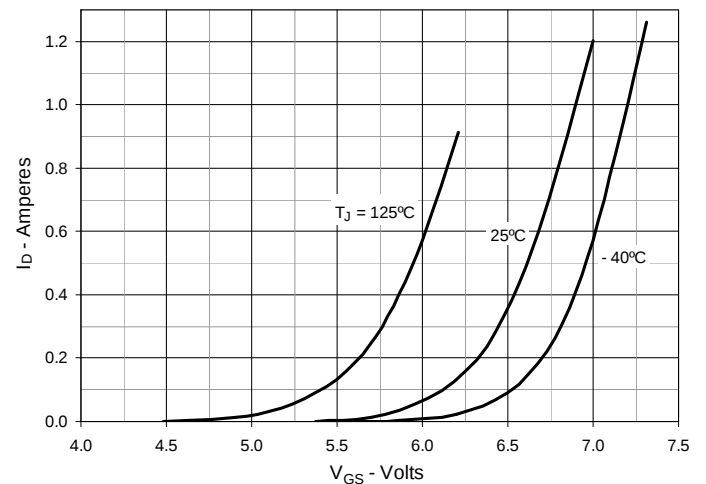
**Fig. 4.  $R_{DS(on)}$  Normalized to  $I_D = 0.5\text{A}$  Value vs. Drain Current**



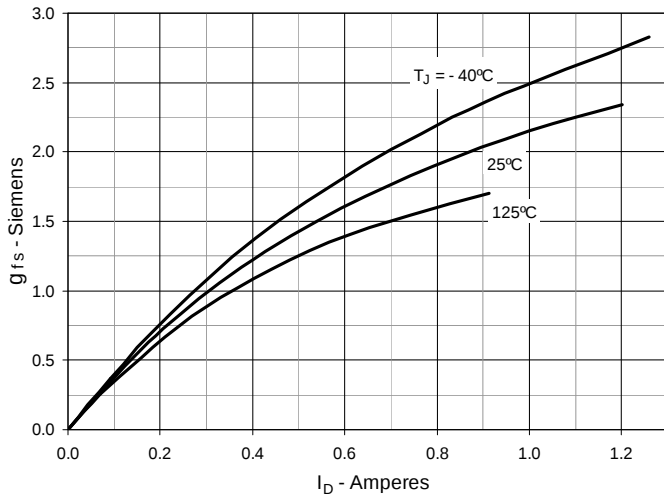
**Fig. 5. Maximum Drain Current vs. Case Temperature**



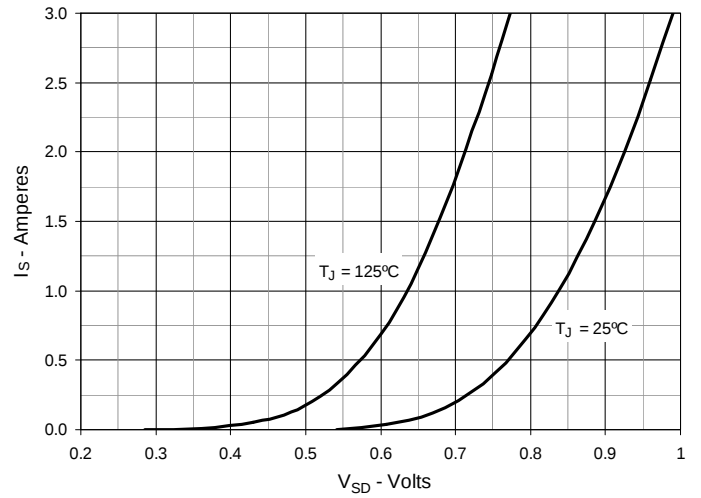
**Fig. 6. Input Admittance**



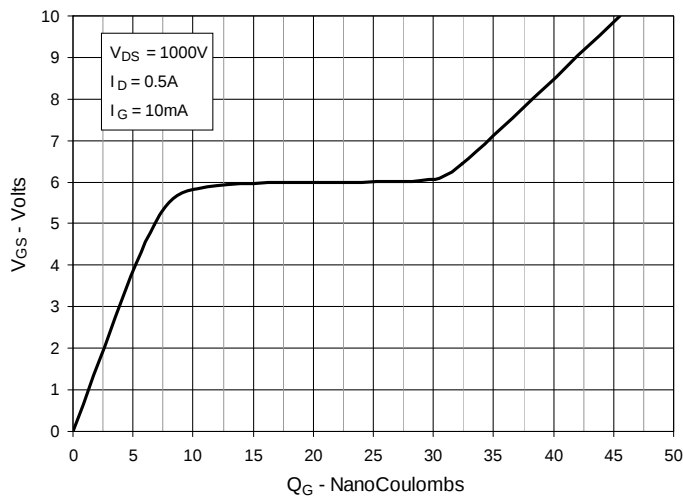
**Fig. 7. Transconductance**



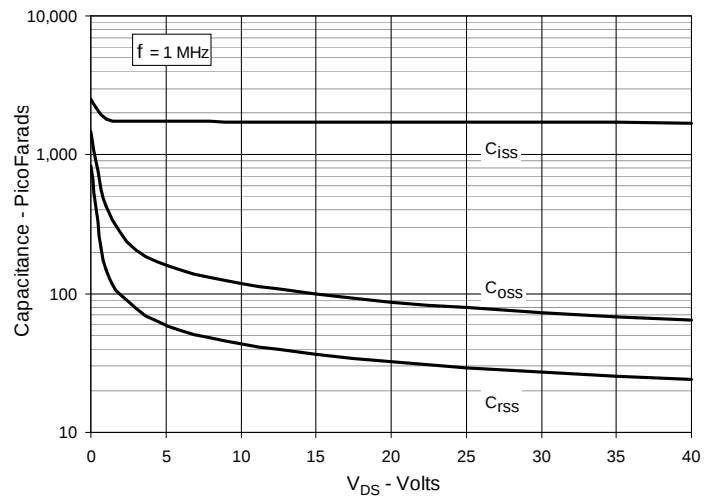
**Fig. 8. Forward Voltage Drop of Intrinsic Diode**



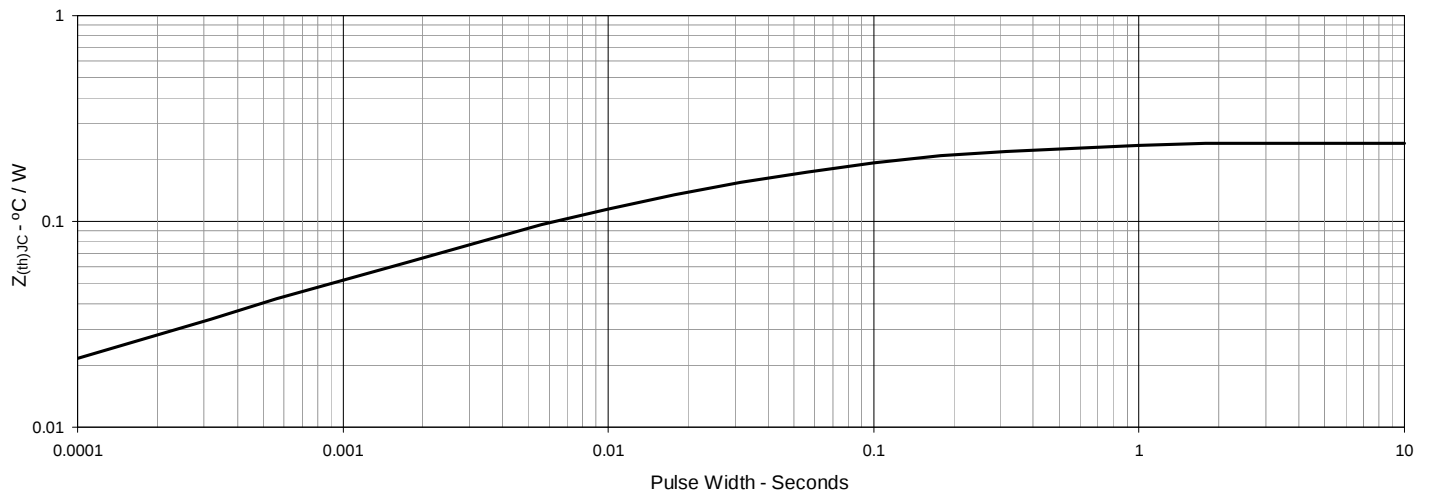
**Fig. 9. Gate Charge**



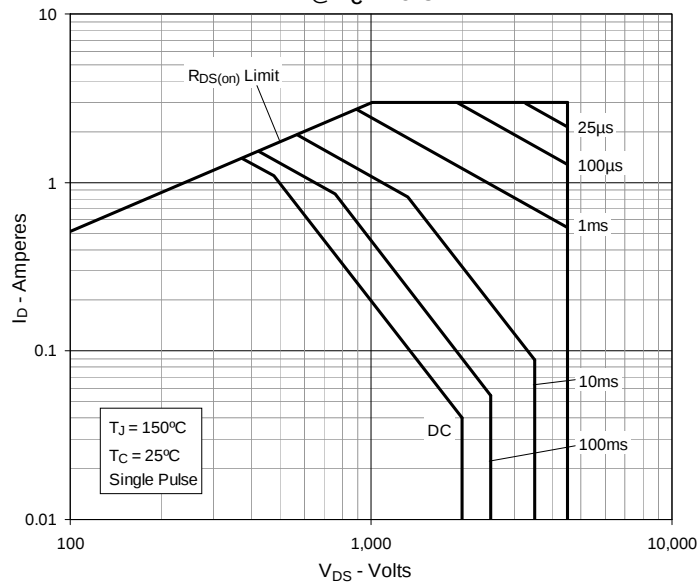
**Fig. 10. Capacitance**



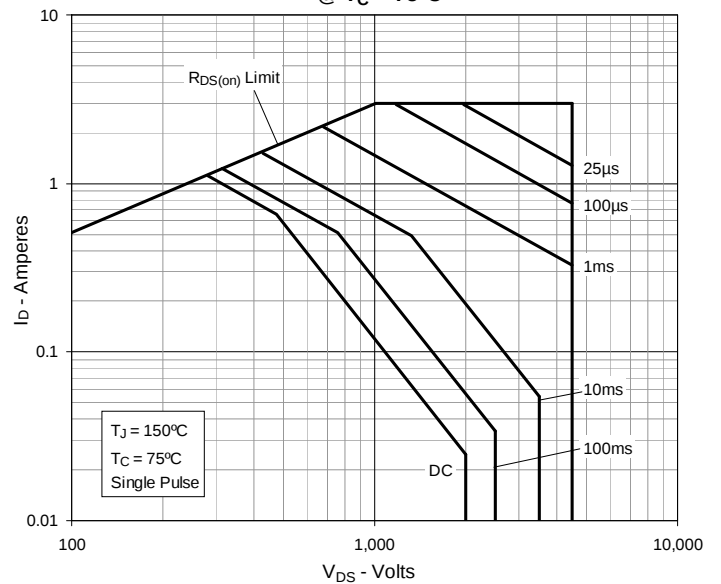
**Fig. 11. Maximum Transient Thermal Impedance**



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



**Fig. 13. Forward-Bias Safe Operating Area**  
**@  $T_C = 75^\circ\text{C}$**





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