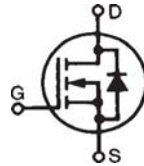


# High Voltage Power MOSFET

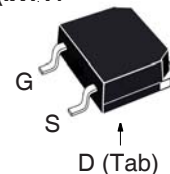
## IXTT1N450HV IXTH1N450HV

$V_{DSS} = 4500V$   
 $I_{D25} = 1A$   
 $R_{DS(on)} \leq 80\Omega$

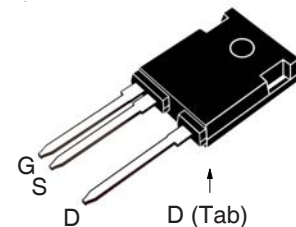
N-Channel Enhancement Mode



TO-268HV (IXTT)



TO-247HV (IXTH)



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

| Symbol        | Test Conditions   | Maximum Ratings   |            |
|---------------|---|-------------------|------------|
| $V_{DSS}$     | $T_J = 25^\circ C$ to $150^\circ C$                       | 4500              | V          |
| $V_{DGR}$     | $T_J = 25^\circ C$ to $150^\circ C$ , $R_{GS} = 1M\Omega$ | 4500              | V          |
| $V_{GSS}$     | Continuous  | $\pm 20$          | V          |
| $V_{GSM}$     | Transient   | $\pm 30$          | V          |
| $I_{D25}$     | $T_C = 25^\circ C$  | 1                 | A          |
| $I_{DM}$      | $T_C = 25^\circ C$ , Pulse Width Limited by $T_{JM}$      | 3                 | A          |
| $P_D$         | $T_C = 25^\circ C$  | 520               | W          |
| $T_J$         |   | - 55 ... +150     | $^\circ C$ |
| $T_{JM}$      |   | 150               | $^\circ C$ |
| $T_{stg}$     |   | - 55 ... +150     | $^\circ C$ |
| $T_L$         | Maximum Lead Temperature for Soldering                    | 300               | $^\circ C$ |
| $T_{SOLD}$    | 1.6 mm (0.062in.) from Case for 10s                       | 260               | $^\circ C$ |
| $F_C$         | Mounting Force (TO-263HV)                                 | 10..65 / 22..14.6 | N/lb       |
| $M_d$         | Mounting Torque (TO-247HV)                                | 1.13/10           | Nm/lb.in   |
| <b>Weight</b> | TO-263HV  | 2.5               | g          |
|               | TO-247HV  | 6.0               | g          |

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

### 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

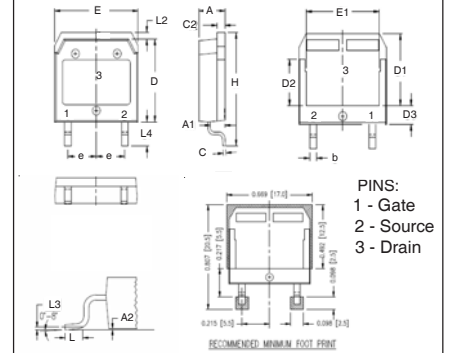
| Symbol       | Test Conditions<br>( $T_J = 25^\circ\text{C}$ , Unless Otherwise Specified)   | Characteristic Values |      |                    |
|--------------|---|-----------------------|------|--------------------|
|              |   | Min.                  | Typ. | Max.               |
| $g_{fs}$     | $V_{DS} = 50\text{V}$ , $I_D = 200\text{mA}$ , 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  |                       | 0.24 | $^\circ\text{C/W}$ |
| $R_{thCS}$   |   |                       | 0.21 | $^\circ\text{C/W}$ |

### Source-Drain Diode

| Symbol   | Test Conditions<br>( $T_J = 25^\circ\text{C}$ , Unless Otherwise Specified) | Characteristic Values |      |               |
|----------|---|-----------------------|------|---------------|
|          |   | Min.                  | Typ. | Max.          |
| $I_S$    | $V_{GS} = 0\text{V}$  |                       |      | 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 | $\mu\text{s}$ |

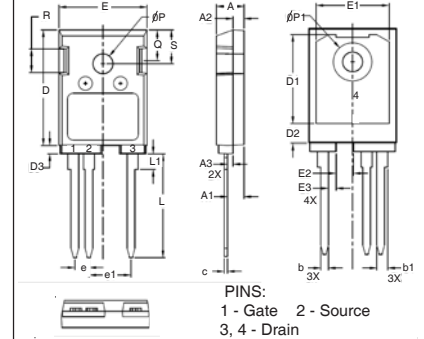
Note 1. Pulse test,  $t \leq 300\mu\text{s}$ , duty cycle,  $d \leq 2\%$ .

### TO-268HV Outline



| SYM | INCHES |      | MILLIMETER |       |
|-----|--------|------|------------|-------|
|     | MIN    | MAX  | MIN        | MAX   |
| A   | .193   | .201 | 4.90       | 5.10  |
| A1  | .106   | .114 | 2.70       | 2.90  |
| A2  | .001   | .010 | 0.02       | 0.25  |
| b   | .045   | .057 | 1.15       | 1.45  |
| C   | .016   | .026 | 0.40       | 0.65  |
| C2  | .057   | .063 | 1.45       | 1.60  |
| D   | .543   | .551 | 13.80      | 14.00 |
| D1  | .465   | .476 | 11.80      | 12.10 |
| D2  | .295   | .307 | 7.50       | 7.80  |
| D3  | .114   | .126 | 2.90       | 3.20  |
| E   | .624   | .632 | 15.85      | 16.05 |
| E1  | .524   | .535 | 13.30      | 13.60 |
| E   | .215   | BSC  | 5.45       | BSC   |
| H   | .736   | .752 | 18.70      | 19.10 |
| L   | .067   | .079 | 1.70       | 2.00  |
| L2  | .039   | .045 | 1.00       | 1.15  |
| L3  | .010   | BSC  | 0.25       | BSC   |
| L4  | .150   | .161 | 3.80       | 4.10  |

### TO-247HV Outline



| SYM | INCHES |      | MILLIMETERS |       |
|-----|--------|------|-------------|-------|
|     | MIN    | MAX  | MIN         | MAX   |
| A   | .193   | .201 | 4.90        | 5.10  |
| A1  | .114   | .122 | 2.90        | 3.10  |
| A2  | .075   | .083 | 1.90        | 2.10  |
| A3  | .035   | .043 | 0.90        | 1.10  |
| b   | .053   | .059 | 1.35        | 1.50  |
| b1  | .075   | .083 | 1.90        | 2.10  |
| c   | .022   | .030 | 0.55        | 0.75  |
| D   | .819   | .843 | 20.80       | 21.40 |
| D1  | .638   | .646 | 16.20       | 16.40 |
| D2  | .134   | .146 | 3.40        | 3.70  |
| D3  | .055   | .063 | 1.40        | 1.60  |
| E   | .622   | .638 | 15.80       | 16.20 |
| E1  | .520   | .528 | 13.20       | 13.40 |
| E2  | .118   | .126 | 3.00        | 3.20  |
| E3  | .051   | .059 | 1.30        | 1.50  |
| e   | .100   | BSC  | 2.54        | BSC   |
| e1  | .300   | BSC  | 7.62        | BSC   |
| L   | .732   | .748 | 18.60       | 19.00 |
| L1  | .106   | .118 | 2.70        | 3.00  |
| ØP  | .138   | .142 | 3.50        | 3.60  |
| ØP1 | .272   | .280 | 6.90        | 7.10  |
| Q   | .216   | .224 | 5.50        | 5.70  |
| R   | .165   | .169 | 4.20        | 4.30  |
| S   | .240   | .248 | 6.10        | 6.30  |

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 @  $T_J = 25^\circ\text{C}$

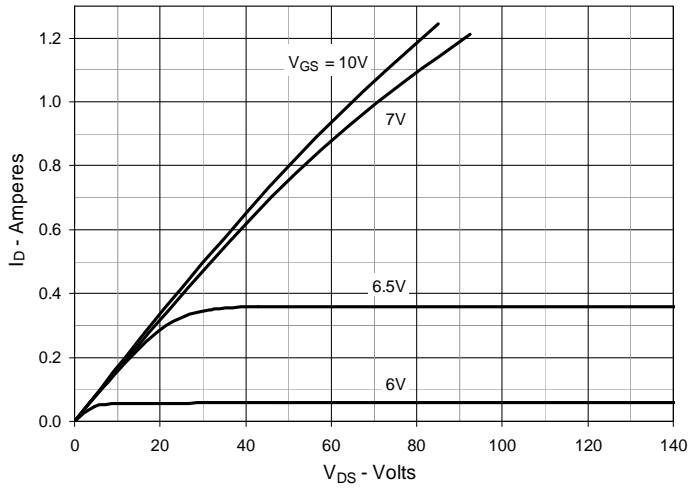


Fig. 2. Output Characteristics @  $T_J = 125^\circ\text{C}$

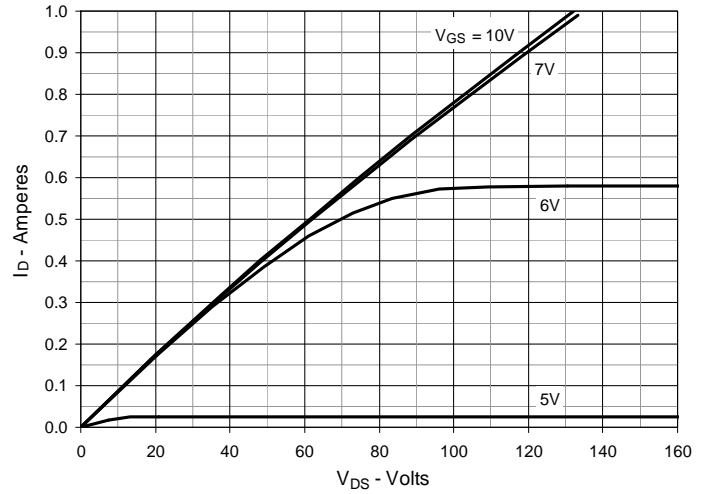


Fig. 3.  $R_{DS(on)}$  Normalized to  $I_D = 0.5\text{A}$  Value vs. Junction Temperature

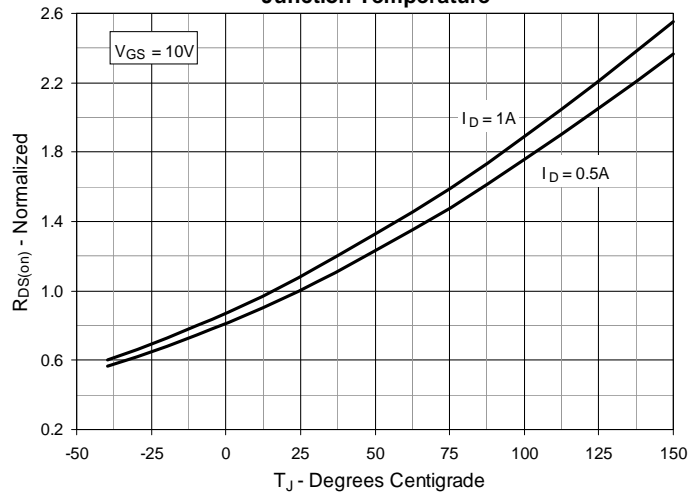


Fig. 4.  $R_{DS(on)}$  Normalized to  $I_D = 0.5\text{A}$  Value vs. Drain Current

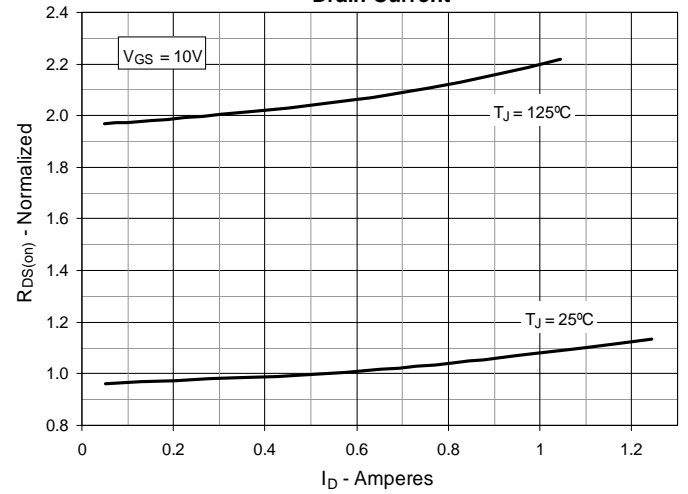


Fig. 5. Maximum Drain Current vs. Case Temperature

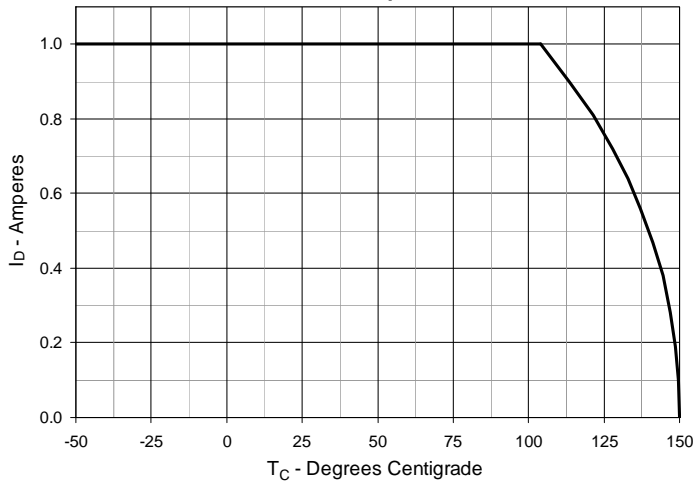


Fig. 6. Input Admittance

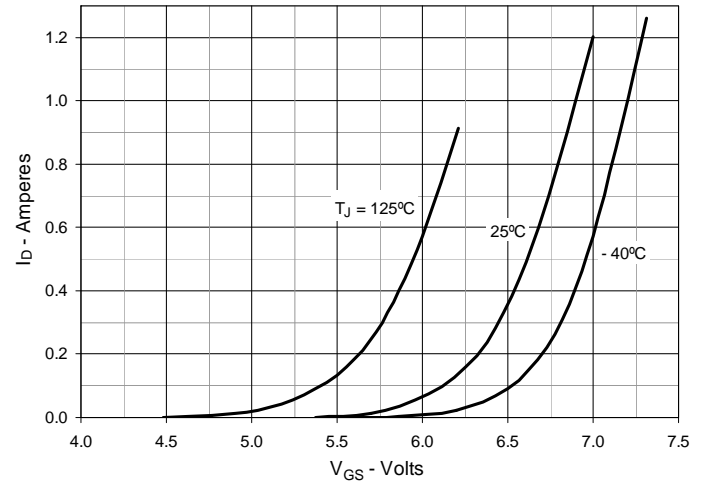


Fig. 7. Transconductance

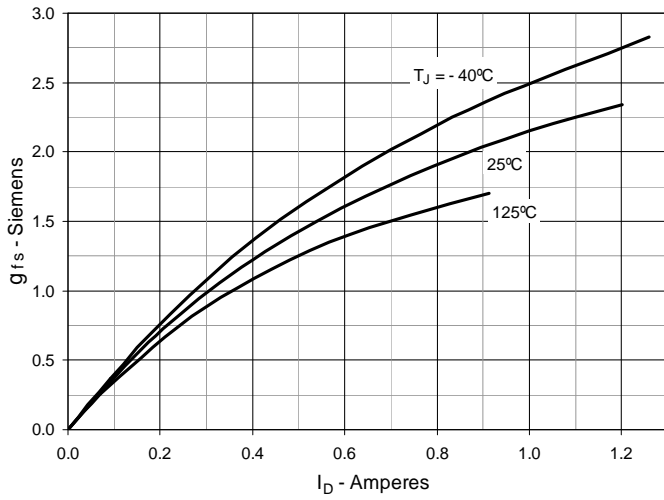


Fig. 8. Forward Voltage Drop of Intrinsic Diode

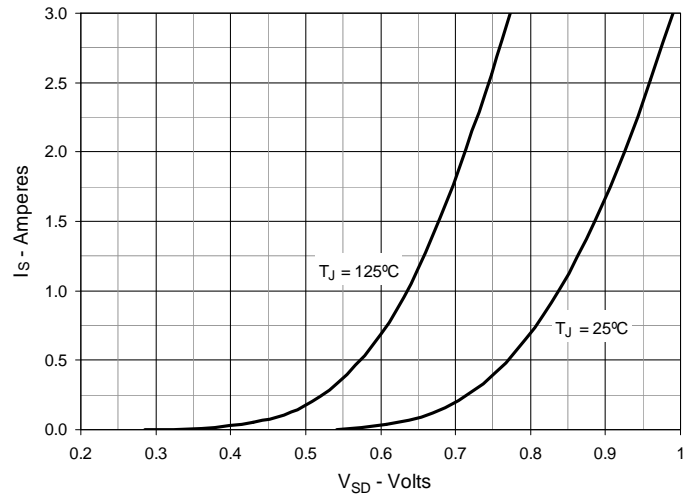


Fig. 9. Gate Charge

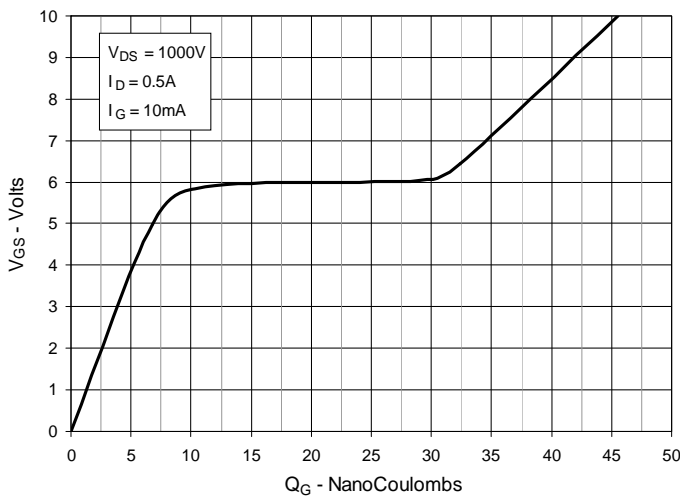


Fig. 10. Capacitance

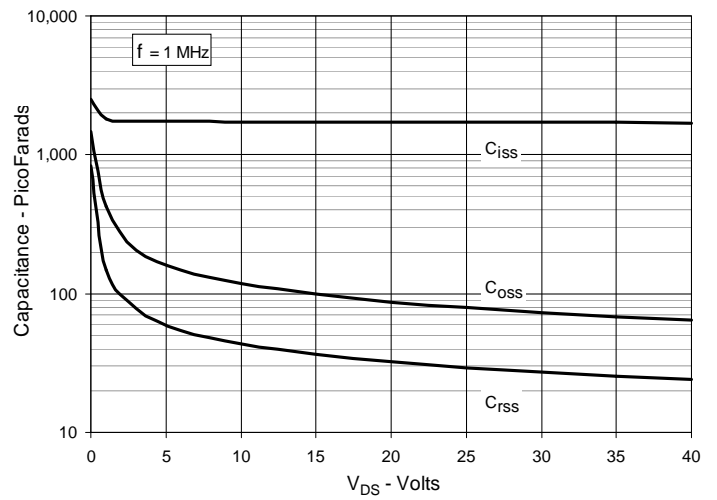
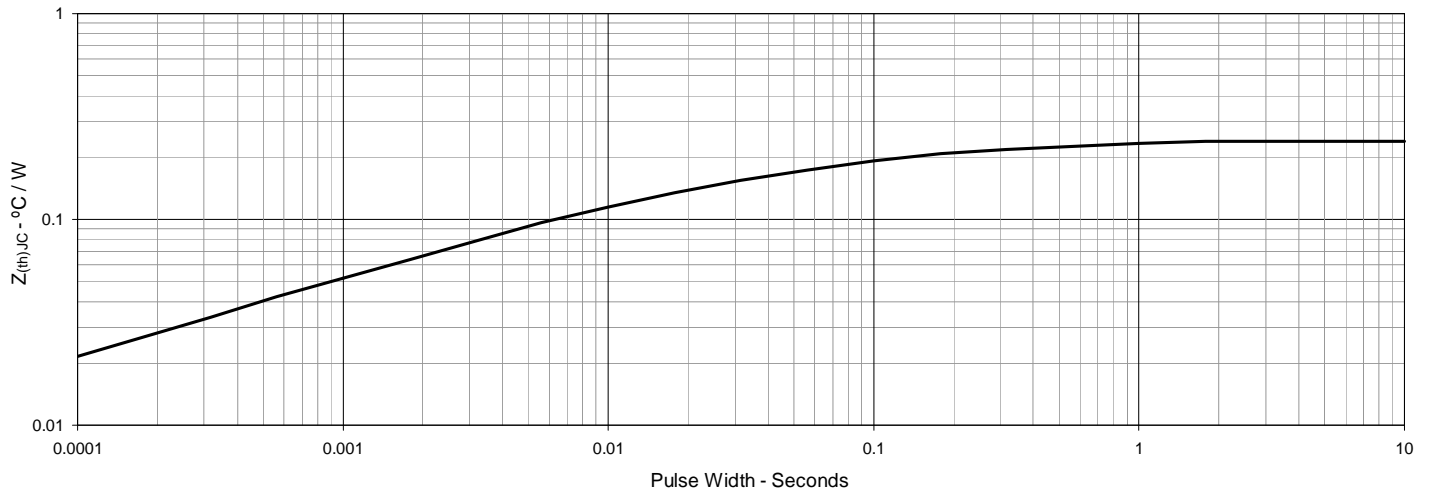
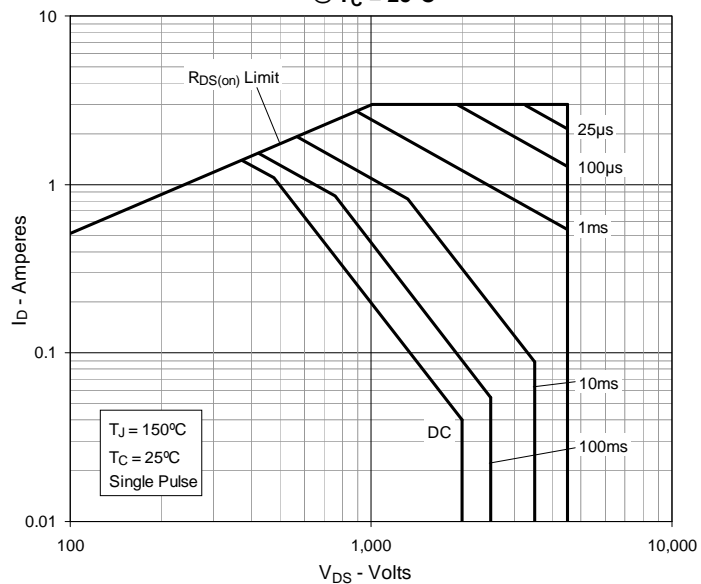


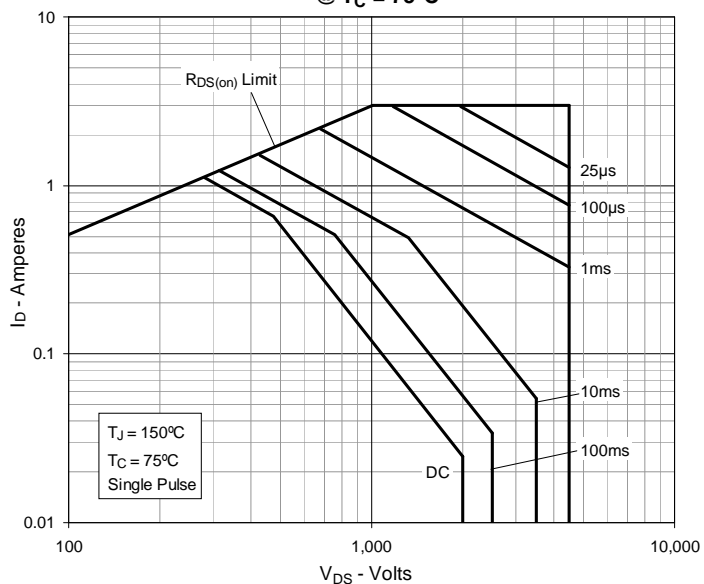
Fig. 11. Maximum Transient Thermal Impedance



**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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