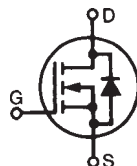


# High Voltage Power MOSFET

# IXTT12N150 IXTH12N150

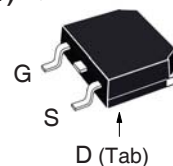
$V_{DSS} = 1500V$   
 $I_{D25} = 12A$   
 $R_{DS(on)} \leq 2.2\Omega$

N-Channel Enhancement Mode  
 Avalanche Rated  
 Fast Intrinsic Diode

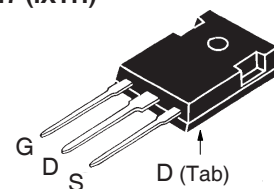


| Symbol     | Test Conditions  | Maximum Ratings |            |
|------------|--|-----------------|------------|
| $V_{DSS}$  | $T_J = 25^\circ C$ to $150^\circ C$                                | 1500            | V          |
| $V_{DGR}$  | $T_J = 25^\circ C$ to $150^\circ C$ , $R_{GS} = 1M\Omega$          | 1500            | V          |
| $V_{GSS}$  | Continuous   | $\pm 30$        | V          |
| $V_{GSM}$  | Transient  | $\pm 40$        | V          |
| $I_{D25}$  | $T_C = 25^\circ C$   | 12              | A          |
| $I_{DM}$   | $T_C = 25^\circ C$ , Pulse Width Limited by $T_{JM}$               | 40              | A          |
| $I_A$      | $T_C = 25^\circ C$   | 6               | A          |
| $E_{AS}$   | $T_C = 25^\circ C$   | 750             | mJ         |
| $dv/dt$    | $I_S \leq I_{DM}$ , $V_{DD} \leq V_{DSS}$ , $T_J \leq 150^\circ C$ | 5               | V/ns       |
| $P_D$      | $T_C = 25^\circ C$   | 890             | W          |
| $T_J$      |  | - 55 ... +150   | $^\circ C$ |
| $T_{JM}$   |  | 150             | $^\circ C$ |
| $T_{stg}$  |  | - 55 ... +150   | $^\circ C$ |
| $T_L$      | 1.6mm (0.062 in.) From Case for 10s                                | 300             | $^\circ C$ |
| $T_{SOLD}$ | Plastic Body for 10s   | 260             | $^\circ C$ |
| $M_d$      | Mounting Torque  | 1.13 / 10       | Nm/lb.in.  |
| Weight     | TO-268   | 4.0             | g          |
|            | TO-247   | 6.0             | g          |

TO-268 (IXTT)



TO-247 (IXTH)



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

## Features

- International Standard Packages
- Molding Epoxies Meet UL 94 V-0 Flammability Classification
- Fast Intrinsic Diode
- Low Package Inductance

## Advantages

- Easy to Mount
- Space Savings
- High Power Density

## Applications

- High Voltage Power Supplies
- Capacitor Discharge
- Pulse Circuits

| Symbol       | Test Conditions<br>( $T_J = 25^\circ C$ , Unless Otherwise Specified) | Characteristic Values |      |                           |
|--------------|---|-----------------------|------|---------------------------|
|              |   | Min.                  | Typ. | Max.                      |
| $BV_{DSS}$   | $V_{GS} = 0V$ , $I_D = 1mA$   | 1500                  |      | V                         |
| $V_{GS(th)}$ | $V_{DS} = V_{GS}$ , $I_D = 250\mu A$                                  | 2.5                   |      | 4.5 V                     |
| $I_{GSS}$    | $V_{GS} = \pm 30V$ , $V_{DS} = 0V$                                    |                       |      | $\pm 100$ nA              |
| $I_{DSS}$    | $V_{DS} = V_{DSS}$ , $V_{GS} = 0V$<br>$T_J = 125^\circ C$             |                       |      | 25 $\mu A$<br>500 $\mu A$ |
| $R_{DS(on)}$ | $V_{GS} = 10V$ , $I_D = 0.5 \cdot I_{D25}$ , Note 1                   |                       |      | 2.2 $\Omega$              |

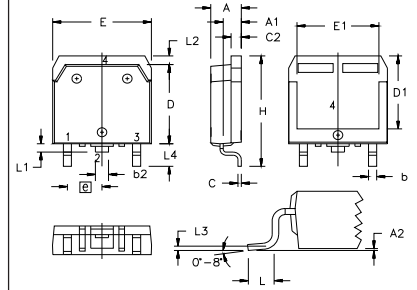
| Symbol       | Test Conditions<br>( $T_J = 25^\circ\text{C}$ , Unless Otherwise Specified)  | Characteristic Values |      |                         |
|--------------|--|-----------------------|------|-------------------------|
|              |  | Min.                  | Typ. | Max.                    |
| $g_{fs}$     | $V_{DS} = 20\text{V}$ , $I_D = 0.5 \cdot I_{D25}$ , Note 1   | 8                     | 13   | S                       |
| $C_{iss}$    | $V_{GS} = 0\text{V}$ , $V_{DS} = 25\text{V}$ , $f = 1\text{MHz}$   |                       | 3720 | pF                      |
| $C_{oss}$    |  |                       | 240  | pF                      |
| $C_{rss}$    |  |                       | 80   | pF                      |
| $t_{d(on)}$  | <b>Resistive Switching Times</b><br>$V_{GS} = 10\text{V}$ , $V_{DS} = 0.5 \cdot V_{DSS}$ , $I_D = 0.5 \cdot I_{D25}$<br>$R_G = 2\Omega$ (External) |                       | 26   | ns                      |
| $t_r$        |  |                       | 16   | ns                      |
| $t_{d(off)}$ |  |                       | 53   | ns                      |
| $t_f$        |  |                       | 14   | ns                      |
| $Q_{g(on)}$  | $V_{GS} = 10\text{V}$ , $V_{DS} = 0.5 \cdot V_{DSS}$ , $I_D = 0.5 \cdot I_{D25}$   |                       | 106  | nC                      |
| $Q_{gs}$     |  |                       | 17   | nC                      |
| $Q_{gd}$     |  |                       | 50   | nC                      |
| $R_{thJC}$   |  |                       |      | 0.14 $^\circ\text{C/W}$ |
| $R_{thCS}$   | TO-247   |                       | 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.          |
| $I_S$    | $V_{GS} = 0\text{V}$   |                       |      | 12 A          |
| $I_{SM}$ | Repetitive, Pulse Width Limited by $T_{JM}$  |                       |      | 48 A          |
| $V_{SD}$ | $I_F = I_S$ , $V_{GS} = 0\text{V}$ , Note 1  |                       |      | 1.4 V         |
| $t_{rr}$ | $I_F = 6\text{A}$ , $-di/dt = 100\text{A}/\mu\text{s}$<br>$V_R = 100\text{V}$ , $V_{GS} = 0\text{V}$ |                       | 1.2  | $\mu\text{s}$ |
| $I_{RM}$ |  |                       | 24.5 | A             |
| $Q_{RM}$ |  |                       | 14.8 | $\mu\text{C}$ |

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

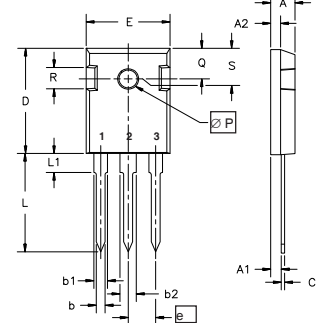
### TO-268 Outline



Terminals: 1 - Gate, 2,4 - Drain, 3 - Source

| SYM | INCHES   |      | MILLIMETERS |       |
|-----|----------|------|-------------|-------|
|     | 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  |
| b2  | .075     | .083 | 1.90        | 2.10  |
| C   | .016     | .026 | 0.40        | 0.65  |
| C2  | .057     | .063 | 1.45        | 1.60  |
| D   | .543     | .551 | 13.80       | 14.00 |
| D1  | .488     | .500 | 12.40       | 12.70 |
| 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   | .094     | .106 | 2.40        | 2.70  |
| L1  | .047     | .055 | 1.20        | 1.40  |
| L2  | .039     | .045 | 1.00        | 1.15  |
| L3  | .010 BSC |      | 0.25 BSC    |       |
| L4  | .150     | .161 | 3.80        | 4.10  |

### TO-247 Outline



Terminals: 1 - Gate, 2 - Drain, 3 - Source

| Dim.           | Millimeter |          | Inches |         |
|----------------|------------|----------|--------|---------|
|                | Min.       | Max.     | Min.   | Max.    |
| A              | 4.7        | 5.3      | .185   | .209    |
| A <sub>1</sub> | 2.2        | 2.54     | .087   | .102    |
| A <sub>2</sub> | 2.2        | 2.6      | .059   | .098    |
| b              | 1.0        | 1.4      | .040   | .055    |
| b <sub>1</sub> | 1.65       | 2.13     | .065   | .084    |
| b <sub>2</sub> | 2.87       | 3.12     | .113   | .123    |
| C              | .4         | .8       | .016   | .031    |
| D              | 20.80      | 21.46    | .819   | .845    |
| E              | 15.75      | 16.26    | .610   | .640    |
| e              | 5.20       | 5.72     | 0.205  | 0.225   |
| L              | 19.81      | 20.32    | .780   | .800    |
| L1             |            | 4.50     |        | .177    |
| ∅P             | 3.55       | 3.65     | .140   | .144    |
| Q              | 5.89       | 6.40     | 0.232  | 0.252   |
| R              | 4.32       | 5.49     | .170   | .216    |
| S              |            | 6.15 BSC |        | 242 BSC |

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

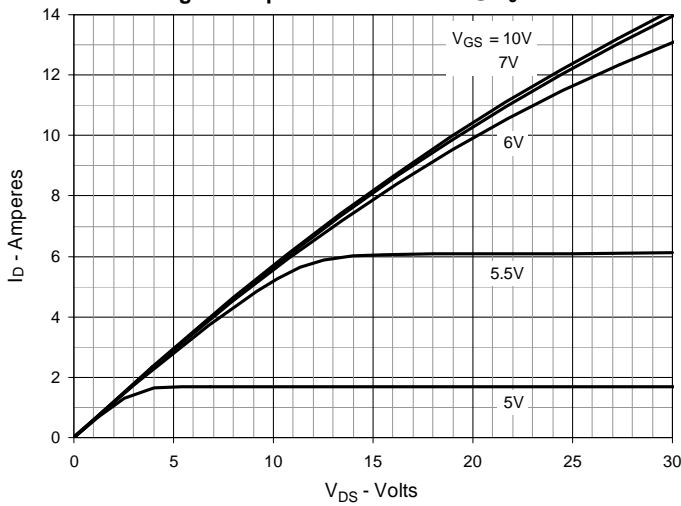


Fig. 2. Output Characteristics @  $T_J = 125^\circ\text{C}$

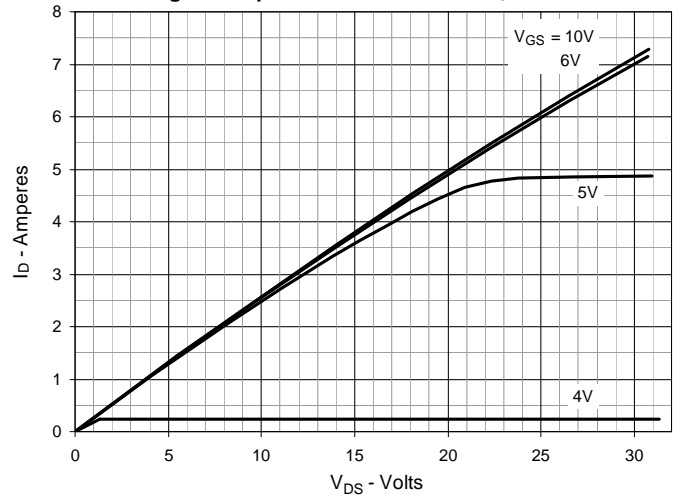


Fig. 3.  $R_{DS(on)}$  Normalized to  $I_D = 6\text{A}$  Value vs. Junction Temperature

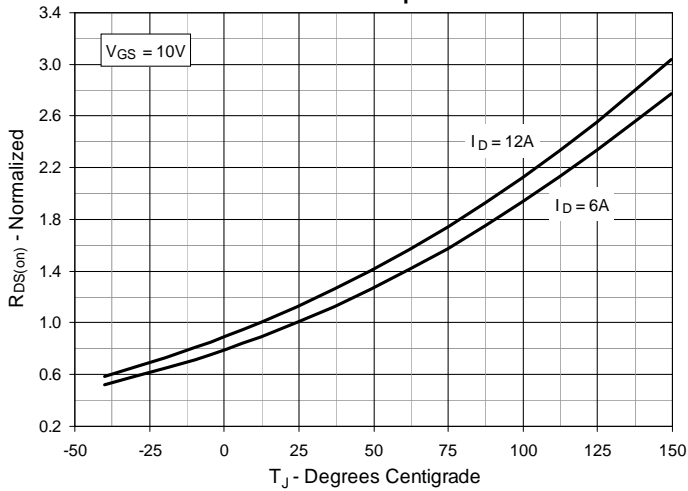


Fig. 4.  $R_{DS(on)}$  Normalized to  $I_D = 6\text{A}$  Value vs. Drain Current

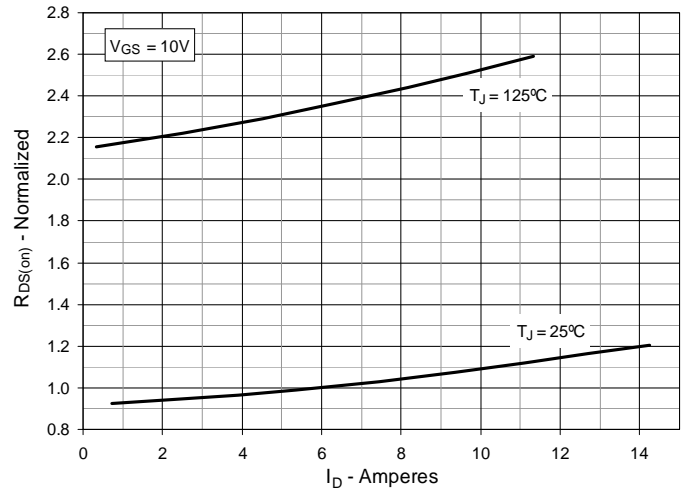


Fig. 5. Maximum Drain Current vs. Case Temperature

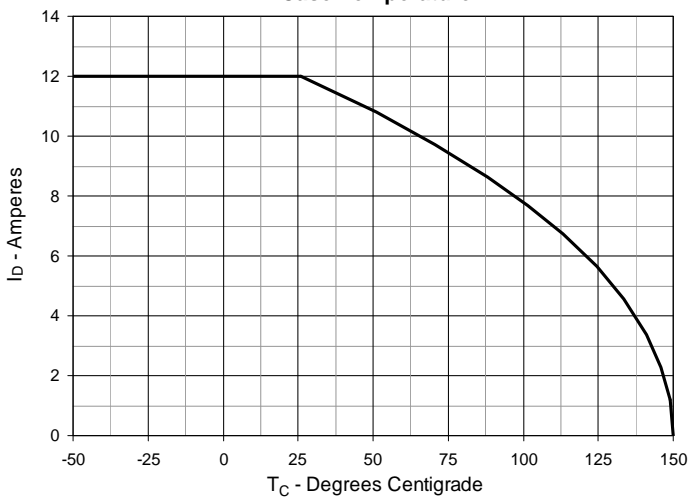
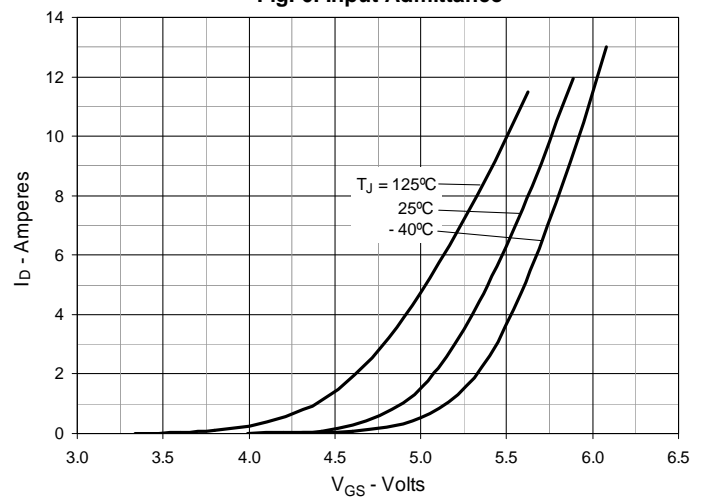
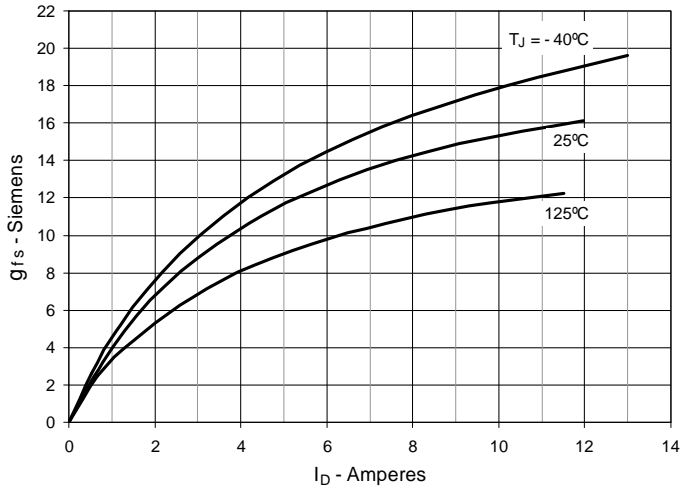


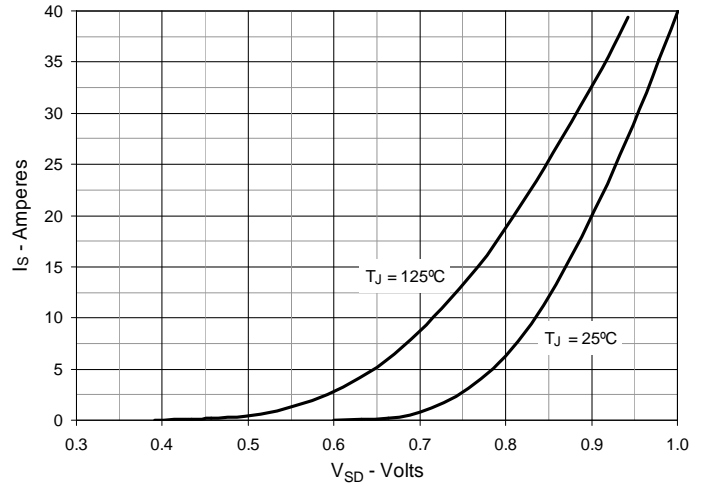
Fig. 6. Input Admittance



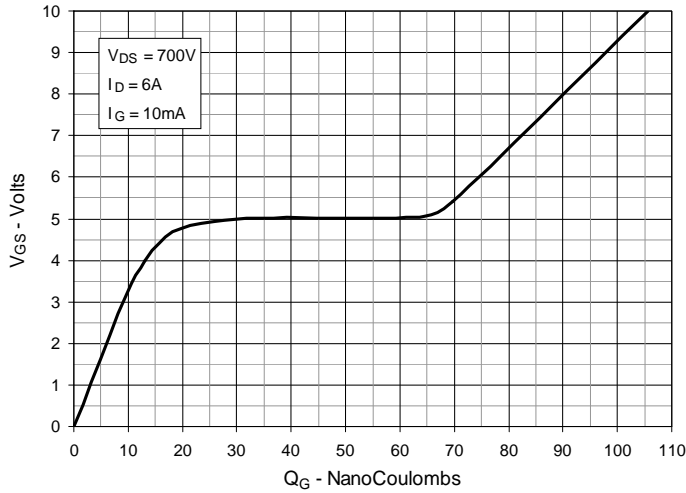
**Fig. 7. Transconductance**



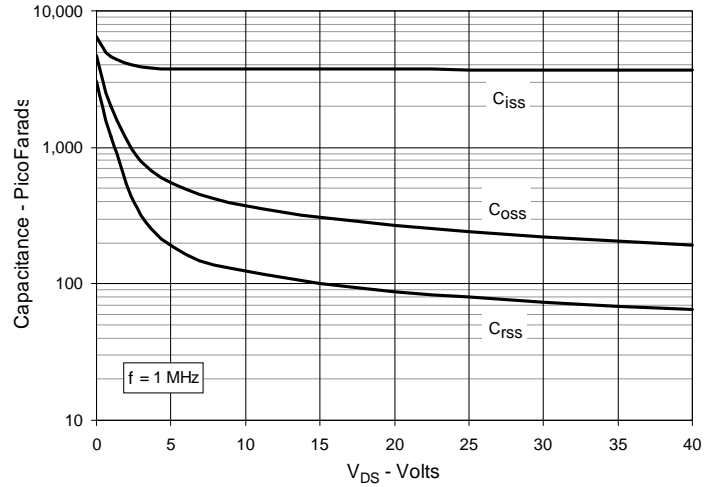
**Fig. 8. Forward Voltage Drop of Intrinsic Diode**



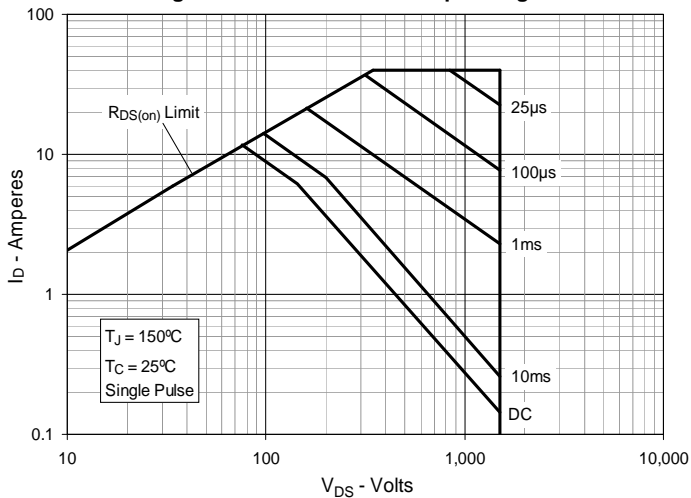
**Fig. 9. Gate Charge**



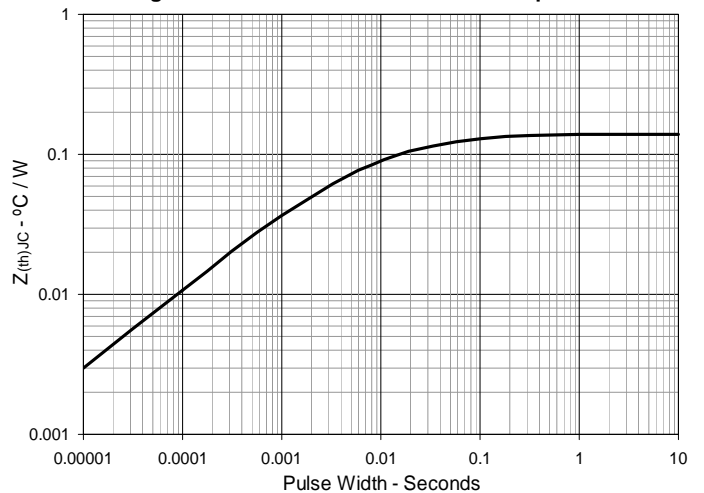
**Fig. 10. Capacitance**



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



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





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