

# High Voltage Power MOSFET w/ Extended FBSOA

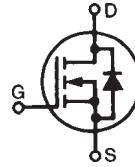
## IXTN5N250

$$V_{DSS} = 2500V$$

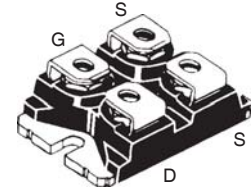
$$I_{D25} = 5A$$

$$R_{DS(on)} \leq 8.8\Omega$$

N-Channel Enhancement Mode  
Avalanche Rated  
Guaranteed FBSOA



miniBLOC  
E153432



G = Gate      D = Drain  
S = Source

Either Source Terminal S can be used as the Source Terminal or the Kelvin Source (Gate Return) Terminal.

| Symbol        | Test Conditions   | Maximum Ratings |            |
|---------------|---|-----------------|------------|
| $V_{DSS}$     | $T_J = 25^\circ C$ to $150^\circ C$                       | 2500            | V          |
| $V_{DGR}$     | $T_J = 25^\circ C$ to $150^\circ C$ , $R_{GS} = 1M\Omega$ | 2500            | V          |
| $V_{GSS}$     | Continuous  | $\pm 30$        | V          |
| $V_{GSM}$     | Transient   | $\pm 40$        | V          |
| $I_{D25}$     | $T_C = 25^\circ C$  | 5               | A          |
| $I_{DM}$      | $T_C = 25^\circ C$ , Pulse Width Limited by $T_{JM}$      | 20              | A          |
| $I_A$         | $T_C = 25^\circ C$  | 2.5             | A          |
| $E_{AS}$      | $T_C = 25^\circ C$  | 2.5             | J          |
| $P_D$         | $T_C = 25^\circ C$  | 700             | W          |
| $T_J$         |   | -55 to +150     | $^\circ C$ |
| $T_{JM}$      |   | 150             | $^\circ C$ |
| $T_{stg}$     |   | -55 to +150     | $^\circ C$ |
| $V_{ISOL}$    | 50/60 Hz, RMS, $t = 1$ minute                             | 2500            | V~         |
|               | $I_{ISOL} \leq 1mA$ , $t = 1s$                            | 3000            | V~         |
| $M_d$         | Mounting Torque for Base Plate                            | 1.5/13          | Nm/lb.in.  |
|               | Terminal Connection Torque                                | 1.3/11.5        | Nm/lb.in.  |
| <b>Weight</b> |   | 30              | g          |

### Features

- International Standard Package
- Molding Epoxies Meet UL94 V-0 Flammability Classification
- Guaranteed FBSOA at  $75^\circ C$
- miniBLOC with Aluminum Nitride Isolation
- Low Package Inductance

### Advantages

- Easy to Mount
- Space Savings
- High Power Density

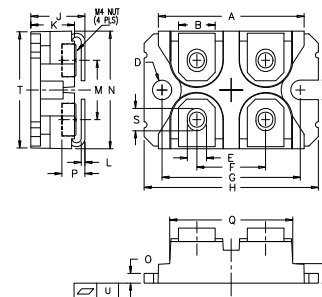
### Applications

- 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.               |
| $BV_{DSS}$   | $V_{GS} = 0V$ , $I_D = 1mA$   | 2500                  |      | V                  |
| $V_{GS(th)}$ | $V_{DS} = V_{GS}$ , $I_D = 1mA$                                       | 2.0                   |      | 5.0 V              |
| $I_{GSS}$    | $V_{GS} = \pm 30V$ , $V_{DS} = 0V$                                    |                       |      | $\pm 200$ nA       |
| $I_{DSS}$    | $V_{DS} = 2kV$ , $V_{GS} = 0V$<br>$T_J = 125^\circ C$                 |                       |      | 50 $\mu A$<br>4 mA |
| $R_{DS(on)}$ | $V_{GS} = 10V$ , $I_D = 0.5 \cdot I_{D25}$ , Note 1                   |                       |      | 8.8 $\Omega$       |

| Symbol       | Test Conditions<br>( $T_J = 25^\circ\text{C}$ , Unless Otherwise Specified)  | Characteristic Values   |      |      |                    |
|--------------|--|---|------|------|--------------------|
|              |  | Min.  | Typ. | Max. |                    |
| $g_{fs}$     | $V_{DS} = 50\text{V}$ , $I_D = 0.5 \cdot I_{D25}$ , Note 1   | 3.0   | 4.5  | 6.0  | S                  |
| $C_{iss}$    | $V_{GS} = 0\text{V}$ , $V_{DS} = 25\text{V}$ , $f = 1\text{MHz}$   |   | 8560 |      | pF                 |
| $C_{oss}$    |  |   | 315  |      | pF                 |
| $C_{rss}$    |  |   | 90   |      | 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>$R_G = 1\Omega$ (External) |   | 33   |      | ns                 |
| $t_r$        |  |   | 20   |      | ns                 |
| $t_{d(off)}$ |  |   | 90   |      | ns                 |
| $t_f$        |  |   | 44   |      | ns                 |
| $Q_{g(on)}$  |  | $V_{GS} = 10\text{V}$ , $V_{DS} = 1000\text{V}$ , $I_D = 0.5 \cdot I_{D25}$ |      | 200  |                    |
| $Q_{gs}$     |  |   | 28   |      | nC                 |
| $Q_{gd}$     |  |   | 70   |      | nC                 |
| $R_{thJC}$   |  |   |      | 0.18 | $^\circ\text{C/W}$ |
| $R_{thCS}$   |  | 0.05  |      |      | $^\circ\text{C/W}$ |

### SOT-227B (IXTN) Outline



(M4 screws (4x) supplied)

| SYM | INCHES |       | MILLIMETERS |       |
|-----|--------|-------|-------------|-------|
|     | MIN    | MAX   | MIN         | MAX   |
| A   | 1.240  | 1.255 | 31.50       | 31.88 |
| B   | .307   | .323  | 7.80        | 8.20  |
| C   | .161   | .169  | 4.09        | 4.29  |
| D   | .161   | .169  | 4.09        | 4.29  |
| E   | .161   | .169  | 4.09        | 4.29  |
| F   | .587   | .595  | 14.91       | 15.11 |
| G   | 1.186  | 1.193 | 30.12       | 30.30 |
| H   | 1.496  | 1.505 | 38.00       | 38.23 |
| J   | .460   | .481  | 11.68       | 12.22 |
| K   | .351   | .378  | 8.92        | 9.60  |
| L   | .030   | .033  | 0.76        | 0.84  |
| M   | .496   | .506  | 12.60       | 12.85 |
| N   | .990   | 1.001 | 25.15       | 25.42 |
| O   | .078   | .084  | 1.98        | 2.13  |
| P   | .195   | .235  | 4.95        | 5.97  |
| Q   | 1.045  | 1.059 | 26.54       | 26.90 |
| R   | .155   | .174  | 3.94        | 4.42  |
| S   | .186   | .191  | 4.72        | 4.85  |
| T   | .968   | .987  | 24.59       | 25.07 |
| U   | -.002  | .004  | -0.05       | 0.1   |

### Safe Operating Area Specification

| Symbol | Test Conditions  | Characteristic Values |      |      |
|--------|--|-----------------------|------|------|
|        |  | Min.                  | Typ. | Max. |
| SOA    | $V_{DS} = 2000\text{V}$ , $I_D = 0.11\text{A}$ , $T_C = 75^\circ\text{C}$ , $tp = 3\text{s}$ | 220                   |      | W    |

### Source-Drain Diode

| Symbol   | Test Conditions<br>( $T_J = 25^\circ\text{C}$ , Unless Otherwise Specified)    | Characteristic Values |      |      |               |
|----------|--|-----------------------|------|------|---------------|
|          |  | Min.                  | Typ. | Max. |               |
| $I_S$    | $V_{GS} = 0\text{V}$   |                       |      | 5    | A             |
| $I_{SM}$ | Repetitive, Pulse Width Limited by $T_{JM}$                                    |                       |      | 20   | A             |
| $V_{SD}$ | $I_F = I_S$ , $V_{GS} = 0\text{V}$ , Note 1                                    |                       |      | 1.5  | V             |
| $t_{rr}$ | $I_F = 2.5\text{A}$ , $-di/dt = 100\text{A}/\mu\text{s}$ , $V_R = 100\text{V}$ |                       | 1.2  |      | $\mu\text{s}$ |

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

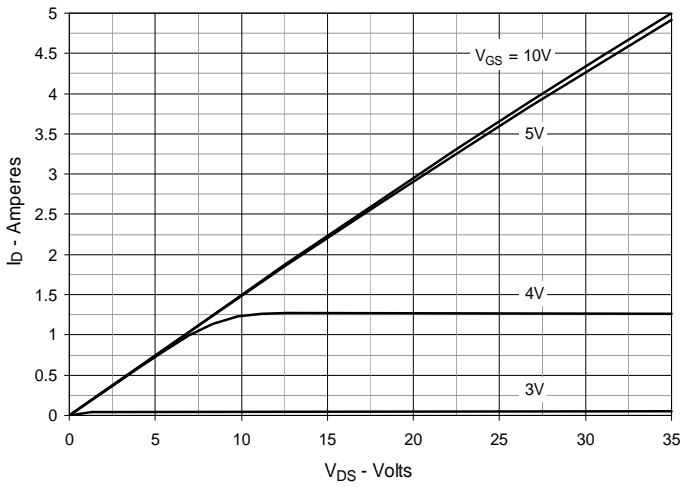
### PRELIMINARY TECHNICAL INFORMATION

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.

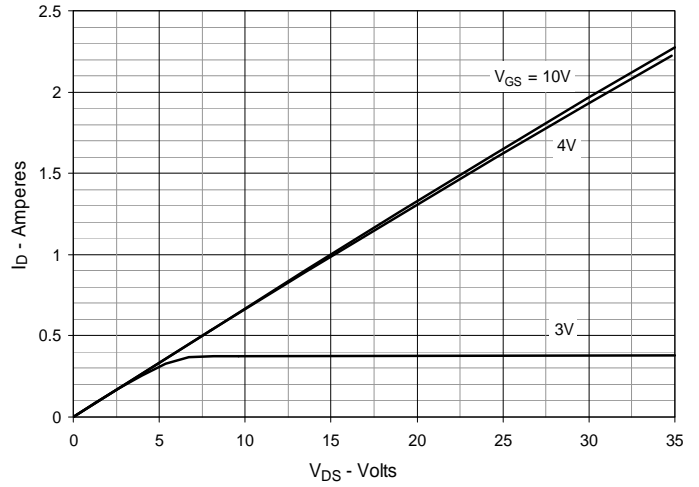
IXYS Reserves the Right to Change Limits, Test Conditions, and Dimensions.

|  |           |           |           |           |              |              |              |              |              |             |
|--|-----------|-----------|-----------|-----------|--------------|--------------|--------------|--------------|--------------|-------------|
| 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 |
|  | 4,850,072 | 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    |             |

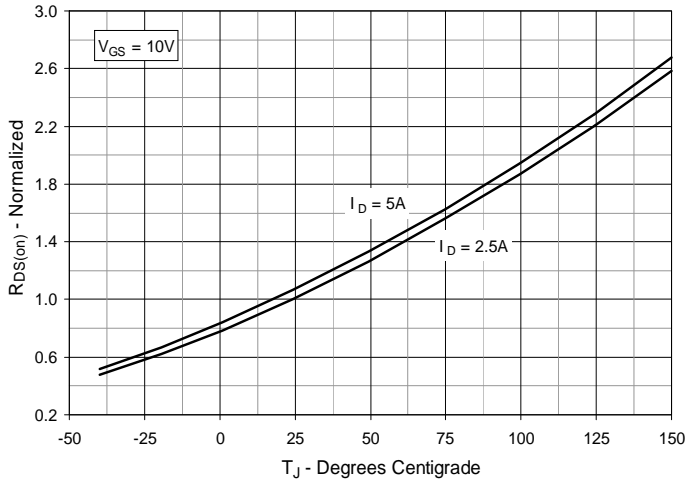
**Fig. 1. Output Characteristics @  $T_J = 25^\circ\text{C}$**



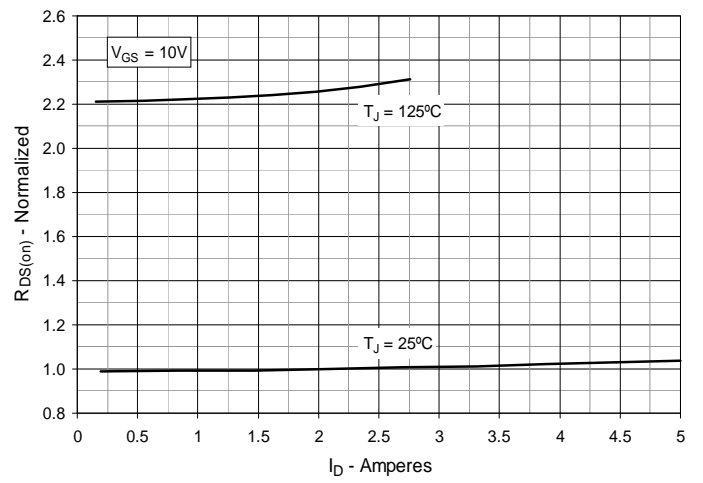
**Fig. 2. Output Characteristics @  $T_J = 125^\circ\text{C}$**



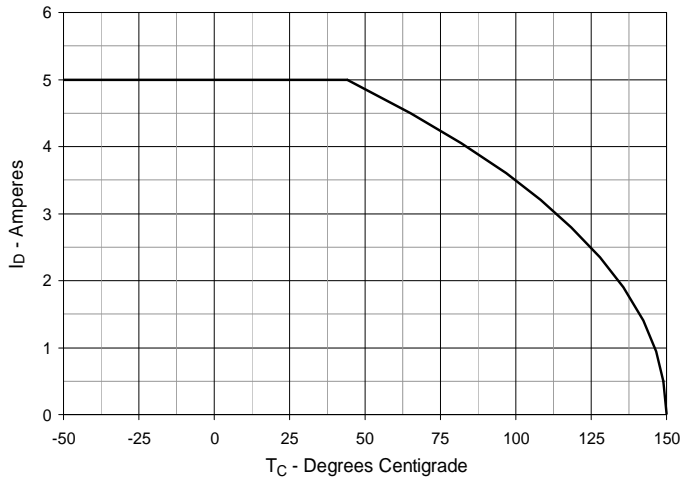
**Fig. 3.  $R_{DS(on)}$  Normalized to  $I_D = 2.5\text{A}$  Value vs. Junction Temperature**



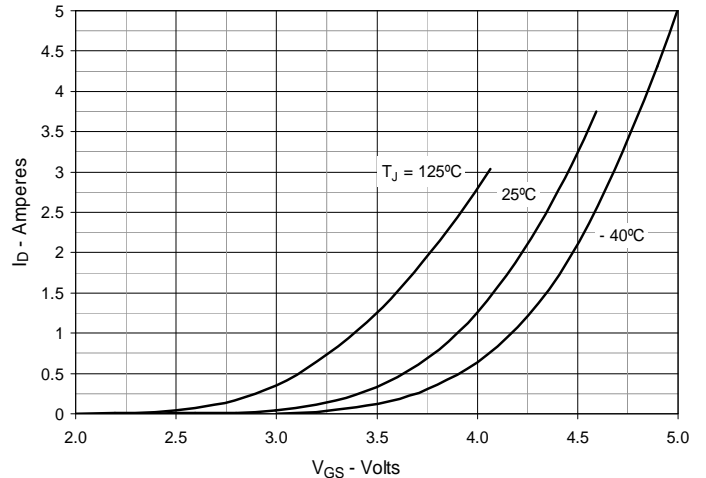
**Fig. 4.  $R_{DS(on)}$  Normalized to  $I_D = 2.5\text{A}$  Value vs. Drain Current**



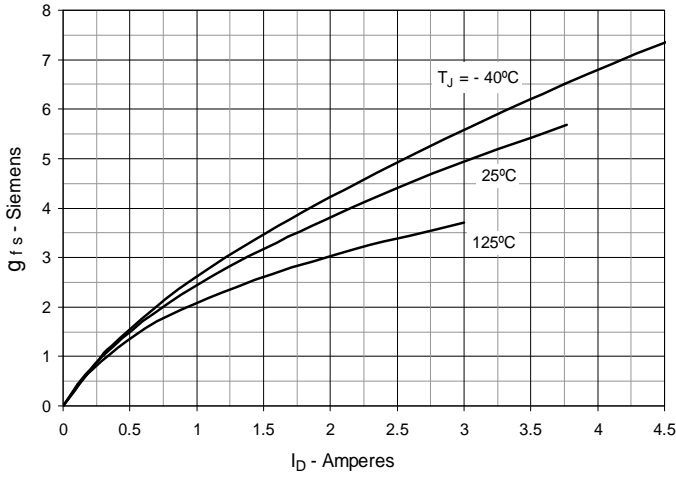
**Fig. 5. Maximum Drain Current vs. Case Temperature**



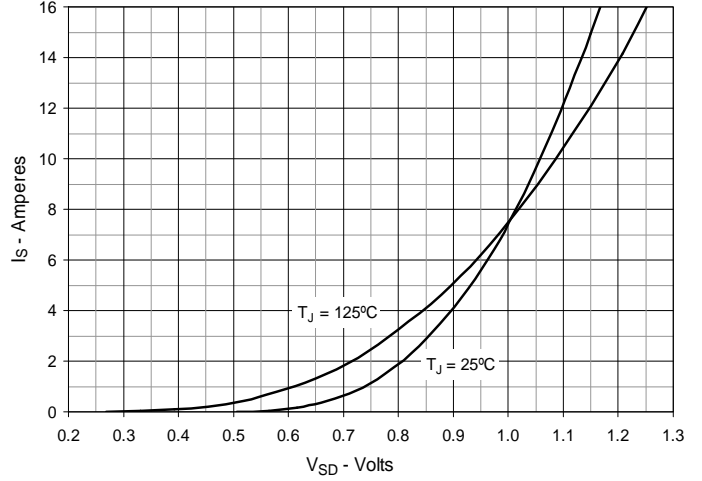
**Fig. 6. Input Admittance**



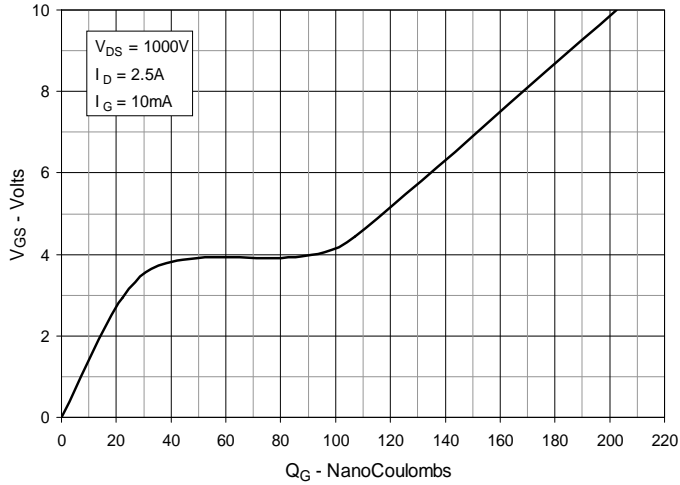
**Fig. 7. Transconductance**



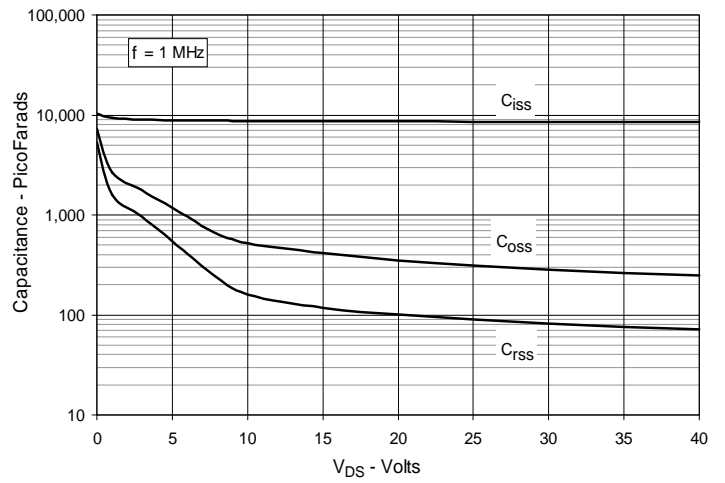
**Fig. 8. Forward Voltage Drop of Intrinsic Diode**



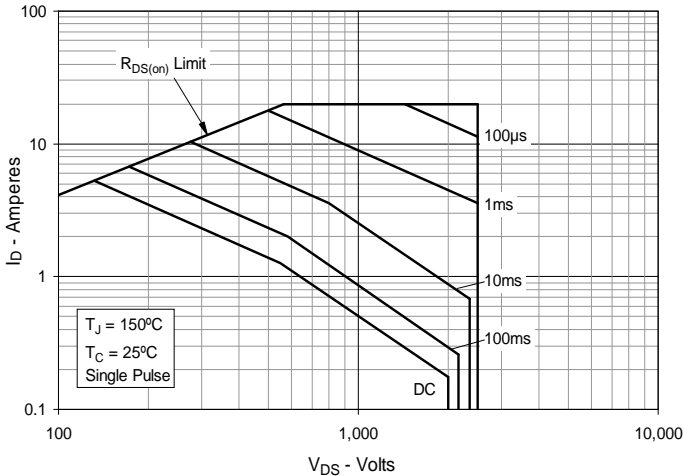
**Fig. 9. Gate Charge**



**Fig. 10. Capacitance**



**Fig. 11. Forward-Bias Safe Operating Area @  $T_C = 25^\circ\text{C}$**



**Fig. 12. Forward-Bias Safe Operating Area @  $T_C = 75^\circ\text{C}$**

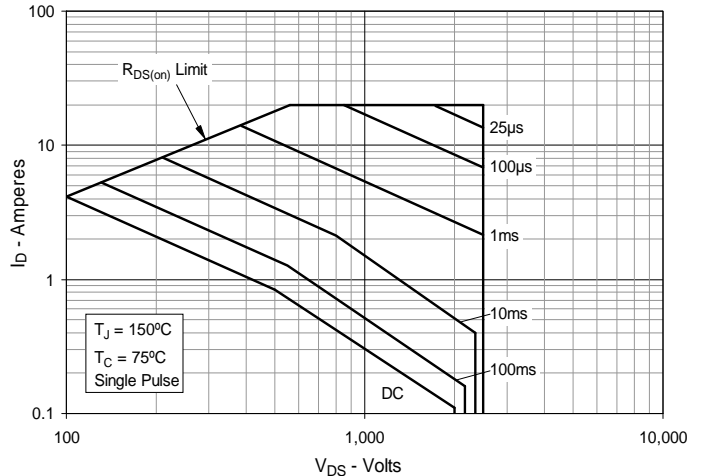
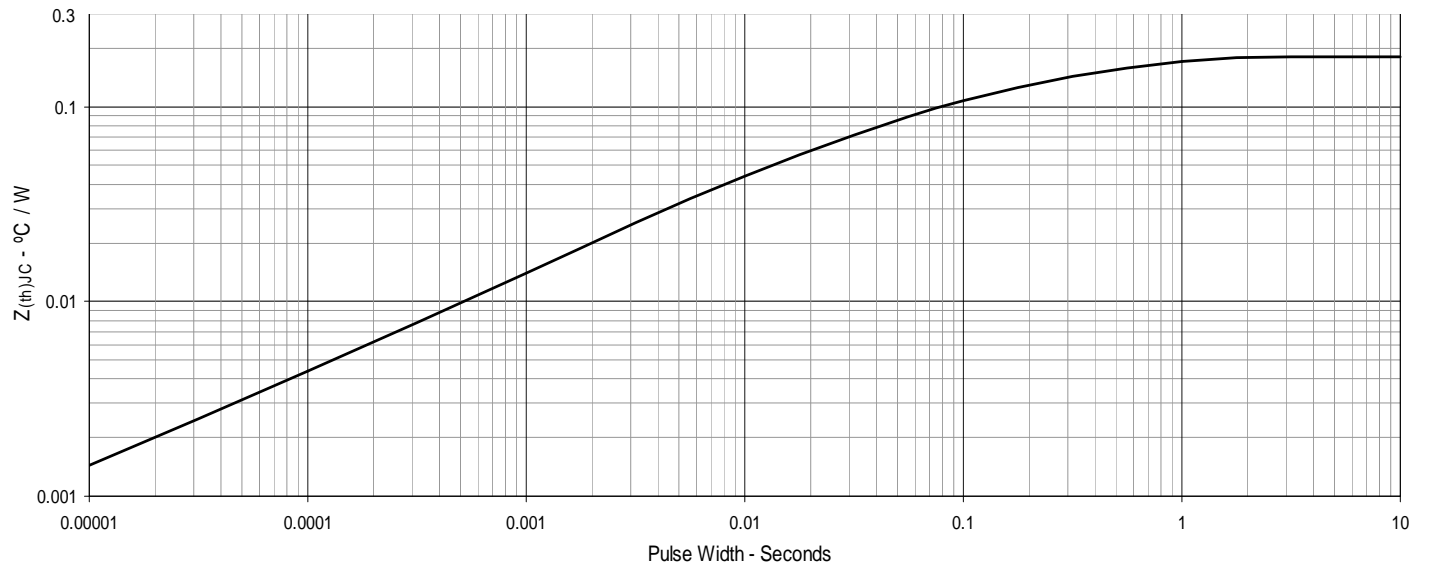


Fig. 13. Maximum Transient Thermal Impedance





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