

# High Voltage Power MOSFET

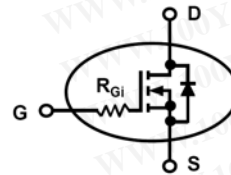
## IXTL2N450

$$V_{DSS} = 4500V$$

$$I_{D25} = 2A$$

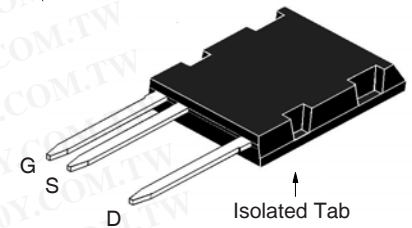
$$R_{DS(on)} \leq 23\Omega$$

(Electrically Isolated Tab)



N-Channel Enhancement Mode

ISOPLUS i5-Pak™



G = Gate  
D = Drain  
S = Source

| 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                |
| $I_{D25}$     | $T_C = 25^\circ\text{C}$  | 2                 | A                |
| $I_{DM}$      | $T_C = 25^\circ\text{C}$ , Pulse Width Limited by $T_{JM}$            | 8                 | A                |
| $P_D$         | $T_C = 25^\circ\text{C}$  | 220               | 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               | $^\circ\text{C}$ |
| $T_{SOLD}$    | Plastic Body for 10s  | 260               | $^\circ\text{C}$ |
| $F_C$         | Mounting Force  | 20..120 / 4.5..27 | N/lb.            |
| $V_{ISOL}$    | 50/60Hz, 1 Minute   | 4000              | V~               |
| <b>Weight</b> |   | 8                 | g                |

### Features

- Silicon Chip on Direct-Copper Bond (DCB) Substrate
- Isolated Mounting Surface
- 4000V~ RMS Electrical Isolation
- Molding Epoxies meet UL 94 V-0 Flammability Classification

### 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                   |      | 5.5 V            |
| $I_{GSS}$    | $V_{GS} = \pm 20V$ , $V_{DS} = 0V$  |                       |      | $\pm 200$ nA     |
| $I_{DSS}$    | $V_{DS} = 3.6kV$ , $V_{GS} = 0V$  |                       |      | 25 $\mu\text{A}$ |
|              | $V_{DS} = 4.5kV$  |                       |      | 50 $\mu\text{A}$ |
|              | $V_{DS} = 3.6kV$ Note 2, $T_J = 125^\circ\text{C}$                          | 250                   |      | $\mu\text{A}$    |
| $R_{DS(on)}$ | $V_{GS} = 10V$ , $I_D = 0.5 \cdot I_{D25}$ , Note 1                         |                       |      | 23 $\Omega$      |

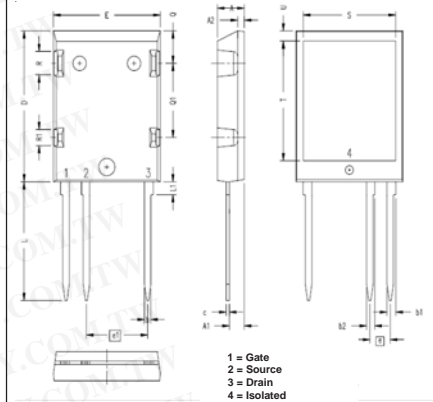
| Symbol       | Test Conditions<br>( $T_J = 25^\circ\text{C}$ , Unless Otherwise Specified)   | Characteristic Values |      |                    |
|--------------|---|-----------------------|------|--------------------|
|              |   | Min.                  | Typ. | Max.               |
| $g_{fs}$     | $V_{DS} = 60\text{V}$ , $I_D = 0.5 \cdot I_{D25}$ , Note 1  | 1.3                   | 2.2  | S                  |
| $C_{iss}$    | $V_{GS} = 0\text{V}$ , $V_{DS} = 25\text{V}$ , $f = 1\text{MHz}$  |                       | 6900 | pF                 |
| $C_{oss}$    |   |                       | 264  | pF                 |
| $C_{rss}$    |   |                       | 88   | pF                 |
| $R_{Gi}$     | Integrated Gate Input Resistance  |                       | 3.0  | $\Omega$           |
| $t_{d(on)}$  | <b>Resistive Switching Times</b><br>$V_{GS} = 10\text{V}$ , $V_{DS} = 1\text{kV}$ , $I_D = 1\text{A}$<br>$R_G = 0\Omega$ (External) |                       | 44   | ns                 |
| $t_r$        |   |                       | 38   | ns                 |
| $t_{d(off)}$ |   |                       | 100  | ns                 |
| $t_f$        |   |                       | 205  | ns                 |
| $Q_{g(on)}$  | $V_{GS} = 10\text{V}$ , $V_{DS} = 1\text{kV}$ , $I_D = 0.5 \cdot I_{D25}$   |                       | 156  | nC                 |
| $Q_{gs}$     |   |                       | 38   | nC                 |
| $Q_{gd}$     |   |                       | 67   | nC                 |
| $R_{thJC}$   |   |                       | 0.56 | $^\circ\text{C/W}$ |
| $R_{thCS}$   |   |                       | 0.15 | $^\circ\text{C/W}$ |

### Source-Drain Diode

| Symbol   | Test Conditions<br>( $T_J = 25^\circ\text{C}$ , Unless Otherwise Specified)  | Characteristic Values |      |               |
|----------|--|-----------------------|------|---------------|
|          |  | Min.                  | Typ. | Max.          |
| $I_S$    | $V_{GS} = 0\text{V}$   |                       |      | 2 A           |
| $I_{SM}$ | Repetitive, Pulse Width Limited by $T_{JM}$                                  |                       |      | 8 A           |
| $V_{SD}$ | $I_F = I_S$ , $V_{GS} = 0\text{V}$ , Note 1                                  |                       |      | 3 V           |
| $t_{rr}$ | $I_F = 2\text{A}$ , $-di/dt = 100\text{A}/\mu\text{s}$ , $V_R = 100\text{V}$ |                       | 1.75 | $\mu\text{s}$ |

- 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.

### ISOPLUS i5-Pak™ (IXTL) Outline



| SYM | INCHES    |       | MILLIMETER |       |
|-----|-----------|-------|------------|-------|
|     | MIN       | MAX   | MIN        | MAX   |
| A   | 0.190     | 0.205 | 4.83       | 5.21  |
| A1  | 0.102     | 0.118 | 2.59       | 3.00  |
| A2  | 0.046     | 0.055 | 1.17       | 1.40  |
| b   | 0.045     | 0.055 | 1.14       | 1.40  |
| b1  | 0.063     | 0.072 | 1.60       | 1.83  |
| b2  | 0.058     | 0.068 | 1.47       | 1.73  |
| c   | 0.020     | 0.029 | 0.51       | 0.74  |
| D   | 1.020     | 1.040 | 25.91      | 26.42 |
| E   | 0.770     | 0.799 | 19.56      | 20.29 |
| e   | 0.150 BSC |       | 3.81 BSC   |       |
| e1  | 0.450 BSC |       | 11.43 BSC  |       |
| L   | 0.780     | 0.820 | 19.81      | 20.83 |
| L1  | 0.080     | 0.102 | 2.03       | 2.59  |
| Q   | 0.210     | 0.235 | 5.33       | 5.97  |
| Q1  | 0.490     | 0.513 | 12.45      | 13.03 |
| R   | 0.150     | 0.180 | 3.81       | 4.57  |
| R1  | 0.100     | 0.130 | 2.54       | 3.30  |
| S   | 0.668     | 0.690 | 16.97      | 17.53 |
| T   | 0.801     | 0.821 | 20.34      | 20.85 |
| U   | 0.065     | 0.080 | 1.65       | 2.03  |

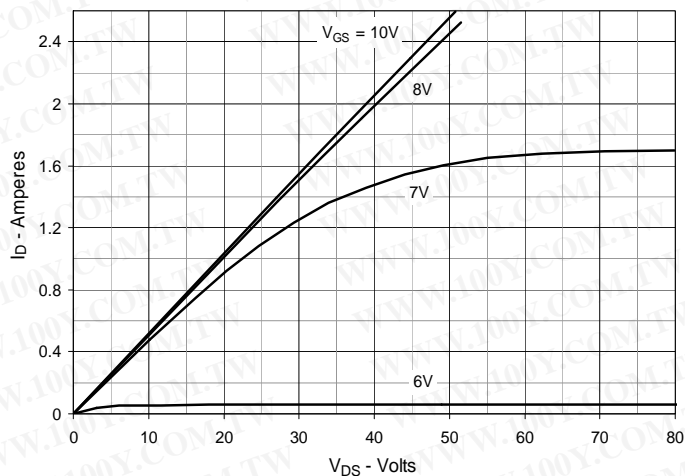
### PRELIMINARY TECHNICAL INFORMATION

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.

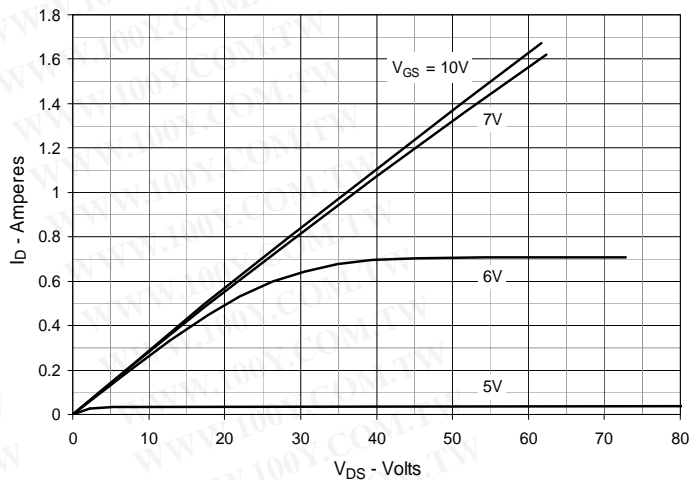
IXYS Reserves the Right to Change Limits, Test Conditions, and Dimensions.

|  |           |           |           |           |              |              |              |              |              |             |
|--|-----------|-----------|-----------|-----------|--------------|--------------|--------------|--------------|--------------|-------------|
| 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 | 7,157,338B2 |
|  | 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    |             |

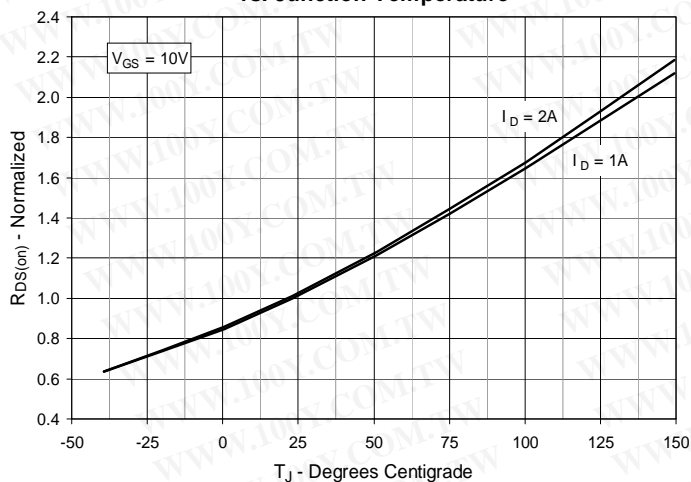
**Fig. 1. Output Characteristics @  $T_J = 25^\circ\text{C}$**



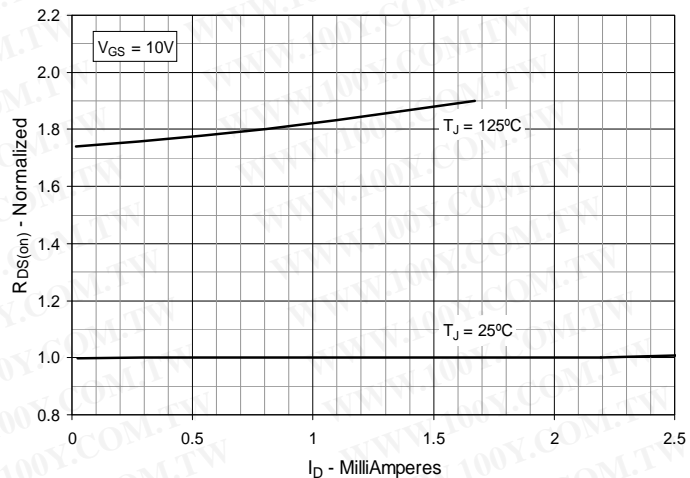
**Fig. 3. Output Characteristics @  $T_J = 125^\circ\text{C}$**



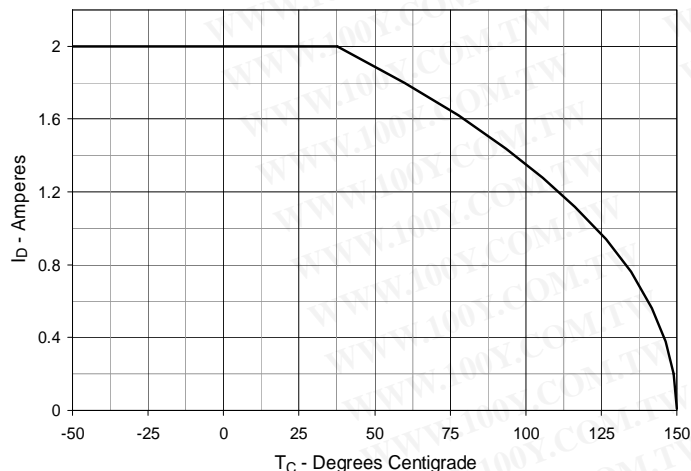
**Fig. 3.  $R_{DS(on)}$  Normalized to  $I_D = 1\text{A}$  Value vs. Junction Temperature**



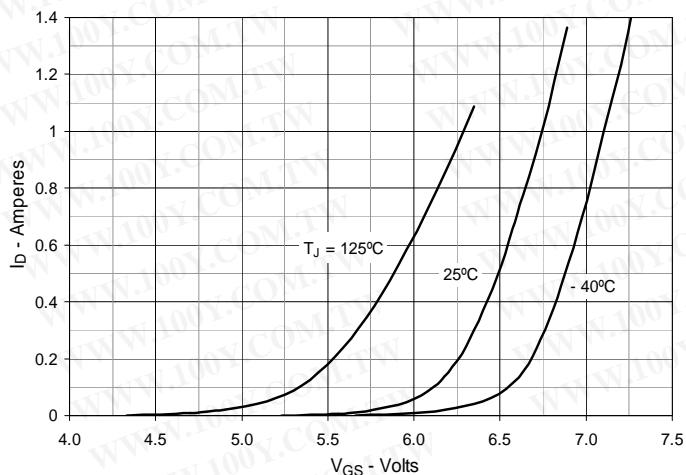
**Fig. 4.  $R_{DS(on)}$  Normalized to  $I_D = 1\text{A}$  Value vs. Drain Current**



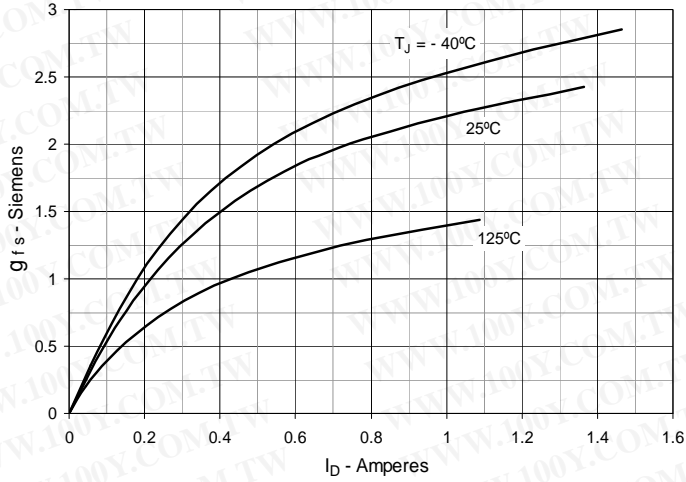
**Fig. 5. Maximum Drain Current vs. Case Temperature**



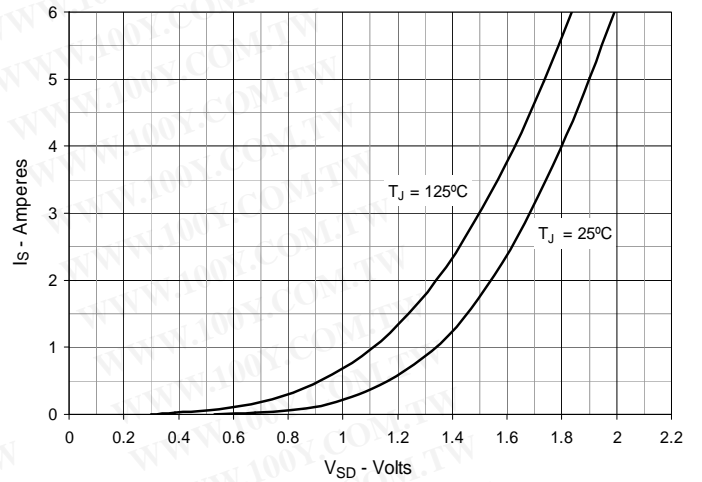
**Fig. 6. Input Admittance**



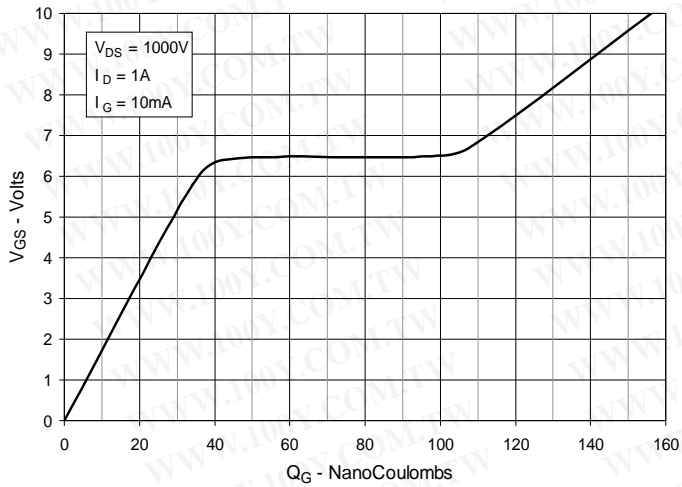
**Fig. 7. Transconductance**



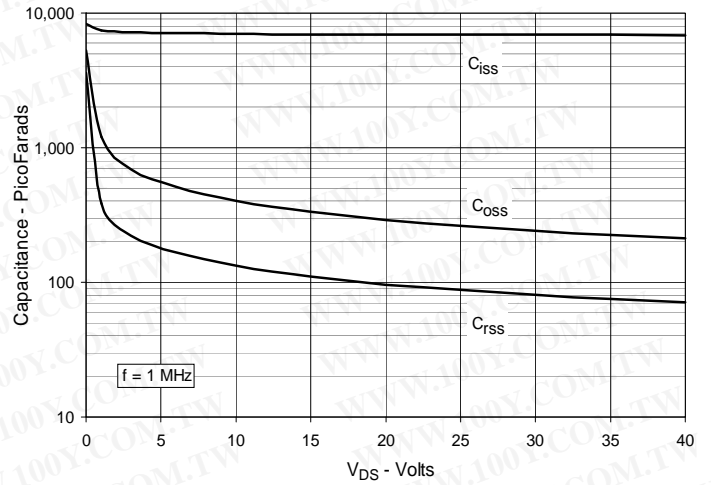
**Fig. 8. Forward Voltage Drop of Intrinsic Diode**



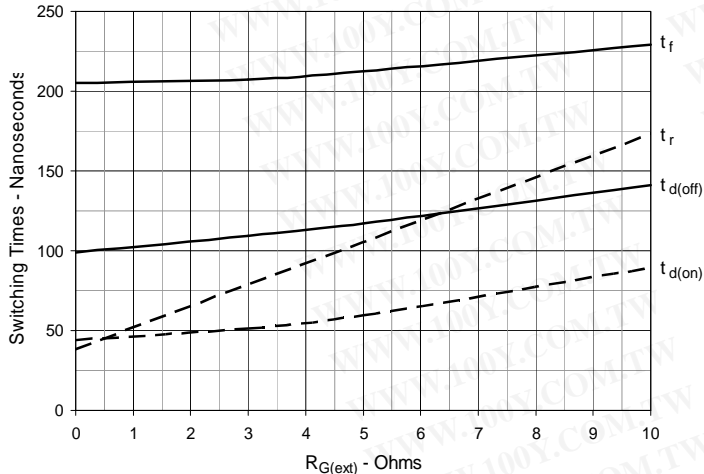
**Fig. 9. Gate Charge**



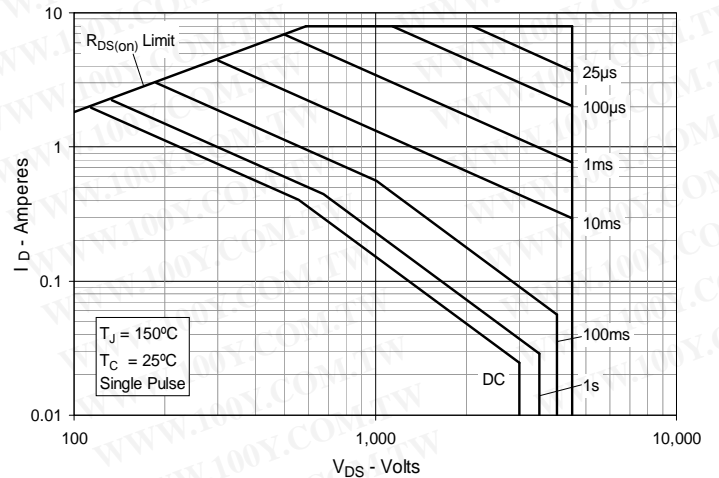
**Fig. 10. Capacitance**



**Fig. 11. Resistive Switching Times vs. External Gate Resistance**

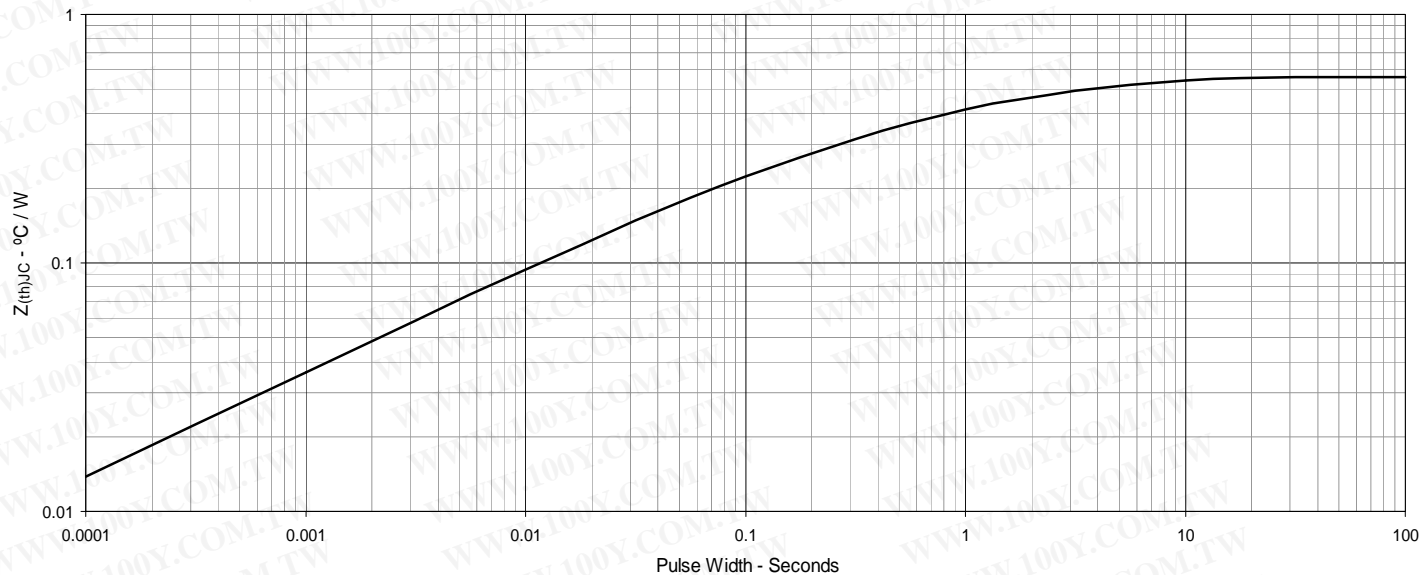


**Fig. 12. Forward-Bias Safe Operating Area**





**Fig. 13. Maximum Transient Thermal Impedance**



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