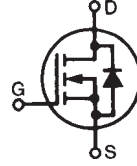


# Polar™ HiPerFET™ Power MOSFET

## IXFR140N30P

$V_{DSS} = 300V$   
 $I_{D25} = 70A$   
 $R_{DS(on)} \leq 28m\Omega$   
 $t_{rr} \leq 200ns$

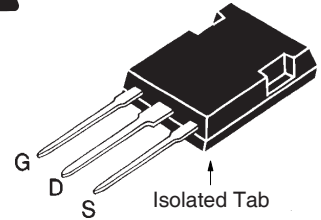
(Electrically Isolated Back Surface)



N-Channel Enhancement Mode  
Avalanche Rated

| Symbol        | Test Conditions  | Maximum Ratings    |            |
|---------------|--|--------------------|------------|
| $V_{DSS}$     | $T_J = 25^\circ C$ to $150^\circ C$                                | 300                | V          |
| $V_{DGR}$     | $T_J = 25^\circ C$ to $150^\circ C$ , $R_{GS} = 1M\Omega$          | 300                | V          |
| $V_{GSS}$     | Continuous   | $\pm 20$           | V          |
| $V_{GSM}$     | Transient  | $\pm 30$           | V          |
| $I_{D25}$     | $T_C = 25^\circ C$   | 70                 | A          |
| $I_{DM}$      | $T_C = 25^\circ C$ , Pulse Width Limited by $T_{JM}$               | 300                | A          |
| $I_A$         | $T_C = 25^\circ C$   | 70                 | A          |
| $E_{AS}$      | $T_C = 25^\circ C$   | 5                  | J          |
| $dV/dt$       | $I_S \leq I_{DM}$ , $V_{DD} \leq V_{DSS}$ , $T_J \leq 150^\circ C$ | 20                 | V/ns       |
| $P_D$         | $T_C = 25^\circ C$   | 300                | 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                | $^\circ C$ |
| $V_{ISOL}$    | 50/60 Hz, RMS  | $t = 1min$<br>2500 | V~         |
|               | $I_{ISOL} \leq 1mA$  | $t = 1s$<br>3000   | V~         |
| $M_d$         | Mounting Force   | 20..120 / 4.5..27  | N/lb.      |
| <b>Weight</b> |  | 5                  | g          |

ISOPLUS247  
E153432



G = Gate      D = Drain  
S = Source

### Features

- Silicon Chip on Direct-Copper-Bond Substrate
  - High Power Dissipation
  - Isolated Mounting Surface
  - 2500V Electrical Isolation
- Unclamped Inductive Switching (UIS) Rated
- Low package inductance
  - Easy to Drive and to Protect
- Fast Intrinsic Diode

### Advantages

- Easy to Mount
- Space Savings
- High Power Density

| Symbol       | Test Conditions<br>( $T_J = 25^\circ C$ , Unless Otherwise Specified) | Characteristic Values |      |                    |
|--------------|---|-----------------------|------|--------------------|
|              |   | Min.                  | Typ. | Max.               |
| $BV_{DSS}$   | $V_{GS} = 0V$ , $I_D = 3mA$   | 300                   |      | V                  |
| $V_{GS(th)}$ | $V_{DS} = V_{GS}$ , $I_D = 8mA$                                       | 3.0                   |      | 5.0 V              |
| $I_{GSS}$    | $V_{GS} = \pm 20V$ , $V_{DS} = 0V$                                    |                       |      | $\pm 200$ nA       |
| $I_{DSS}$    | $V_{DS} = V_{DSS}$ , $V_{GS} = 0V$<br>$T_J = 125^\circ C$             |                       |      | 25 $\mu A$<br>1 mA |
| $R_{DS(on)}$ | $V_{GS} = 10V$ , $I_D = 70A$ , Note 1                                 | 20                    |      | 28 m $\Omega$      |

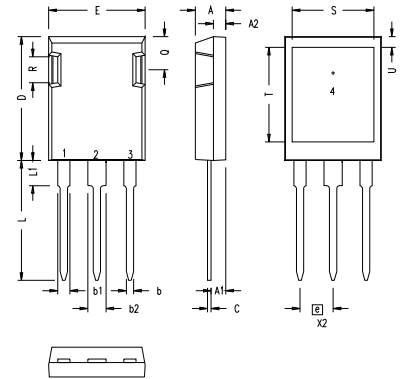
| Symbol       | Test Conditions<br>( $T_J = 25^\circ\text{C}$ , Unless Otherwise Specified)   | Characteristic Values |      |                    |
|--------------|---|-----------------------|------|--------------------|
|              |   | Min.                  | Typ. | Max.               |
| $g_{fs}$     | $V_{DS} = 20\text{V}$ , $I_D = 70\text{A}$ , Note 1   | 50                    | 90   | S                  |
| $C_{iss}$    | $V_{GS} = 0\text{V}$ , $V_{DS} = 25\text{V}$ , $f = 1\text{MHz}$  |                       | 14.8 | nF                 |
| $C_{oss}$    |   |                       | 1830 | pF                 |
| $C_{rss}$    |   |                       | 55   | pF                 |
| $t_{d(on)}$  | <b>Resistive Switching Times</b><br>$V_{GS} = 10\text{V}$ , $V_{DS} = 0.5 \cdot V_{DSS}$ , $I_D = 70\text{A}$<br>$R_G = 1\Omega$ (External) |                       | 30   | ns                 |
| $t_r$        |   |                       | 30   | ns                 |
| $t_{d(off)}$ |   |                       | 100  | ns                 |
| $t_f$        |   |                       | 20   | ns                 |
| $Q_{g(on)}$  | $V_{GS} = 10\text{V}$ , $V_{DS} = 0.5 \cdot V_{DSS}$ , $I_D = 70\text{A}$   |                       | 185  | nC                 |
| $Q_{gs}$     |   |                       | 72   | nC                 |
| $Q_{gd}$     |   |                       | 60   | nC                 |
| $R_{thJC}$   |   |                       | 0.42 | $^\circ\text{C/W}$ |
| $R_{thCS}$   |   | 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.          |
| $I_s$    | $V_{GS} = 0\text{V}$  |                       |      | 140 A         |
| $I_{SM}$ | Repetitive, pulse width limited by $T_{JM}$   |                       |      | 560 A         |
| $V_{SD}$ | $I_F = 70\text{A}$ , $V_{GS} = 0\text{V}$ , Note 1  |                       |      | 1.3 V         |
| $t_{rr}$ | $I_F = 25\text{A}$ , $-di/dt = 100\text{A}/\mu\text{s}$<br>$V_R = 100\text{V}$ , $V_{GS} = 0\text{V}$ |                       |      | 200 ns        |
| $Q_{RM}$ |   |                       | 0.6  | $\mu\text{C}$ |
| $I_{RM}$ |   |                       | 6.0  | A             |

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

### ISOPLUS247 (IXFR) Outline



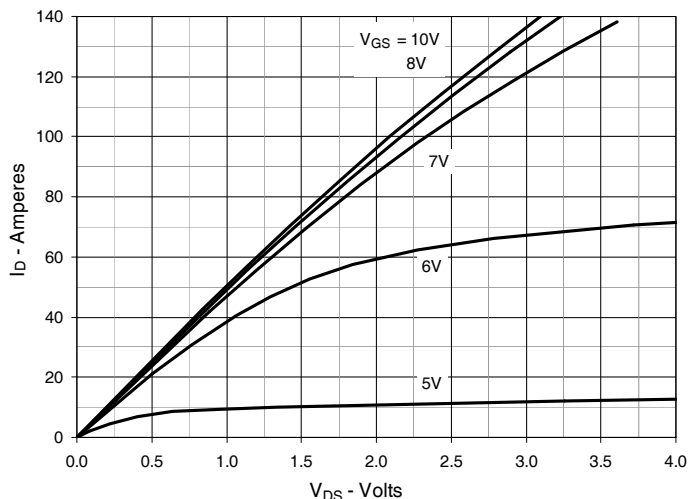
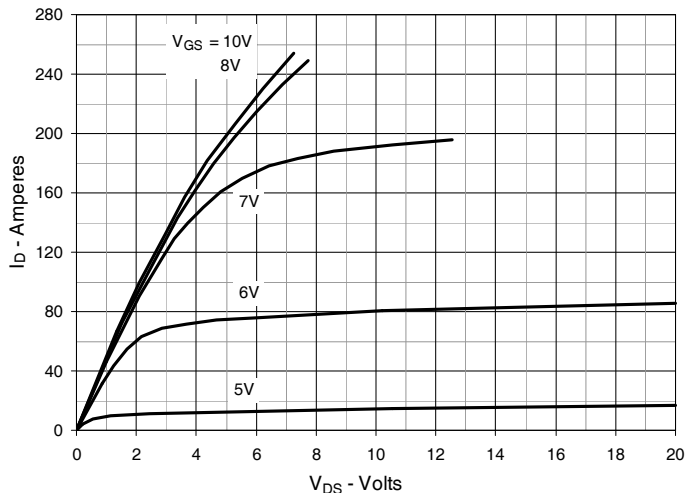
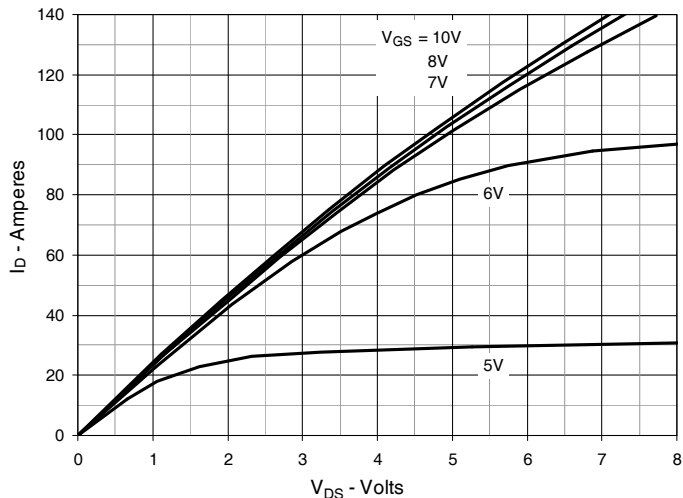
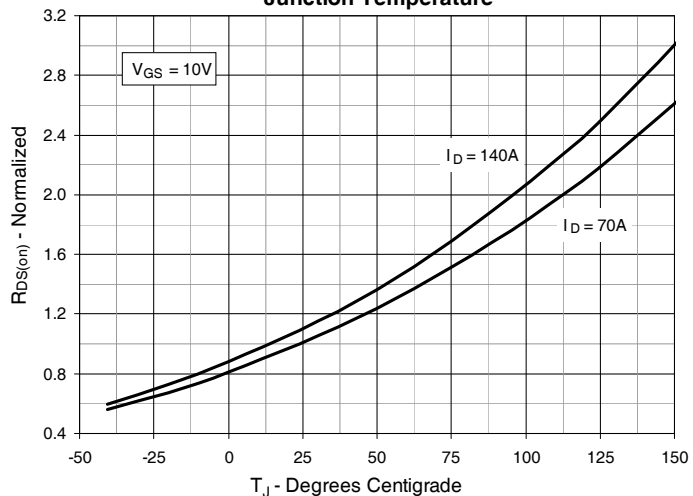
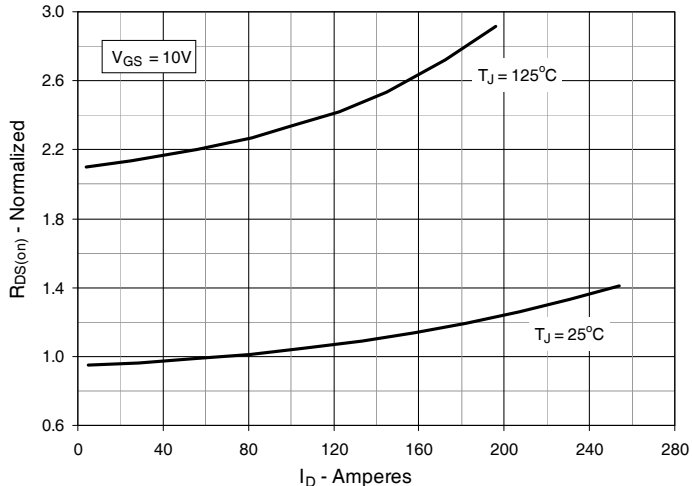
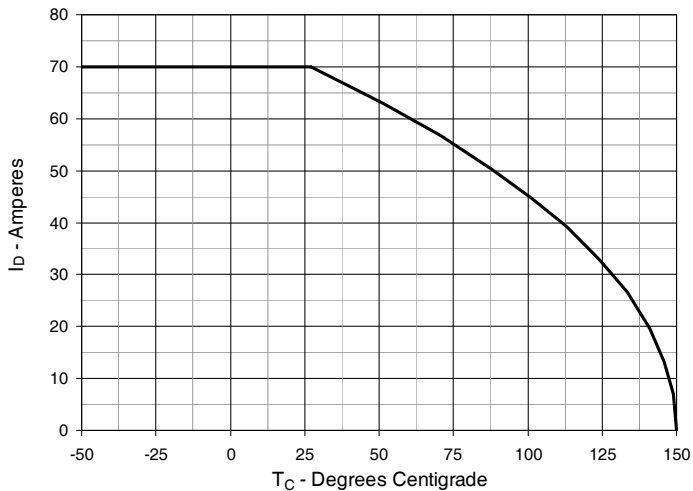
| SYM | INCHES   |      | MILLIMETERS |       |
|-----|----------|------|-------------|-------|
|     | MIN      | MAX  | MIN         | MAX   |
| A   | .190     | .205 | 4.83        | 5.21  |
| A1  | .090     | .100 | 2.29        | 2.54  |
| A2  | .075     | .085 | 1.91        | 2.16  |
| b   | .045     | .055 | 1.14        | 1.40  |
| b1  | .075     | .084 | 1.91        | 2.13  |
| b2  | .115     | .123 | 2.92        | 3.12  |
| C   | .024     | .031 | 0.61        | 0.80  |
| D   | .819     | .840 | 20.80       | 21.34 |
| E   | .620     | .635 | 15.75       | 16.13 |
| e   | .215 BSC |      | 5.45 BSC    |       |
| L   | .780     | .800 | 19.81       | 20.32 |
| L1  | .150     | .170 | 3.81        | 4.32  |
| Q   | .220     | .244 | 5.59        | 6.20  |
| R   | .170     | .190 | 4.32        | 4.83  |
| S   | .520     | .540 | 13.21       | 13.72 |
| T   | .620     | .640 | 15.75       | 16.26 |
| U   | .065     | .080 | 1.65        | 2.03  |

- 1 - Gate      2 - Drain  
3 - Source    4 - Isolated

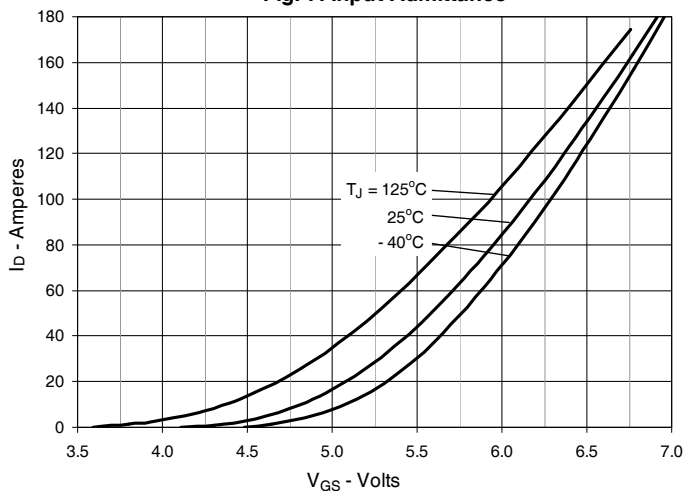
NOTE: This drawing will meet all dimensions requirement of JEDEC outline TO-247AD except screw hole.

IXYS reserves the right to change limits, test conditions, and dimensions.

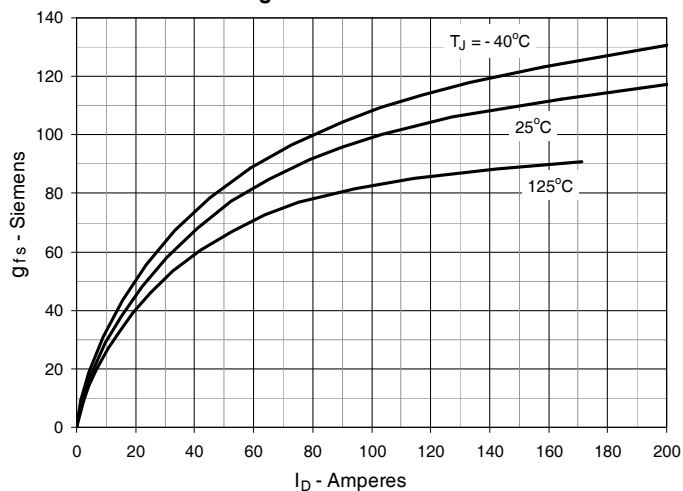
|  |           |           |           |           |              |              |              |              |              |             |
|--|-----------|-----------|-----------|-----------|--------------|--------------|--------------|--------------|--------------|-------------|
| IXYS MOSFETs and 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. Extended Output Characteristics @  $T_J = 25^\circ\text{C}$** 

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

**Fig. 4.  $R_{DS(on)}$  Normalized to  $I_D = 70\text{A}$  Value vs. Junction Temperature**

**Fig. 5.  $R_{DS(on)}$  Normalized to  $I_D = 70\text{A}$  Value vs. Drain Current**

**Fig. 6. Maximum Drain Current vs. Case Temperature**


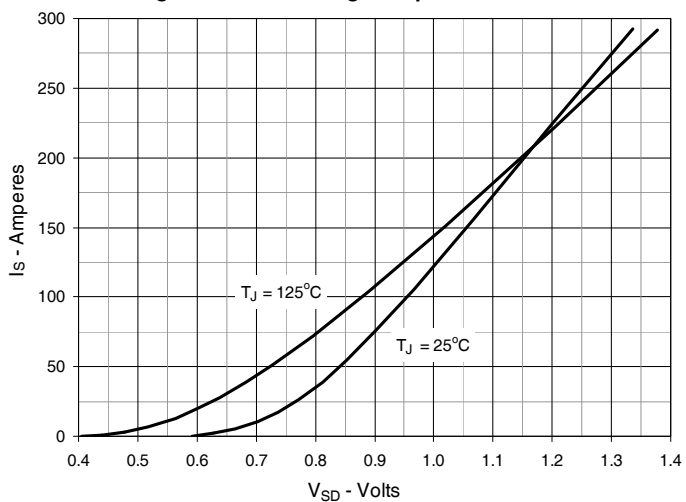
**Fig. 7. Input Admittance**



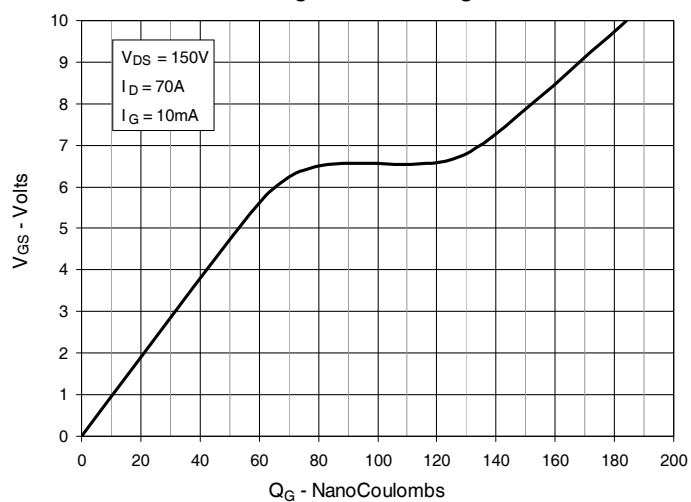
**Fig. 8. Transconductance**



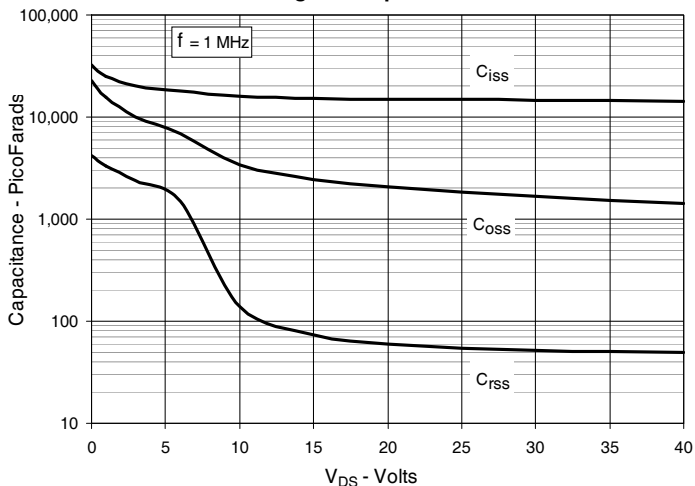
**Fig. 9. Forward Voltage Drop of Intrinsic Diode**



**Fig. 10. Gate Charge**



**Fig. 11. Capacitance**



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

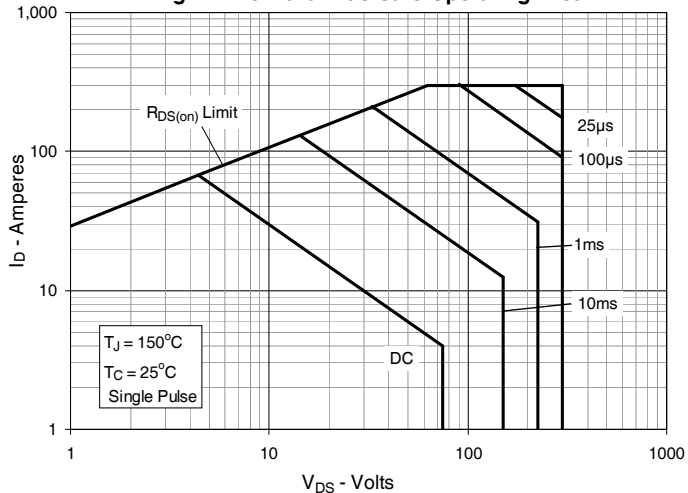
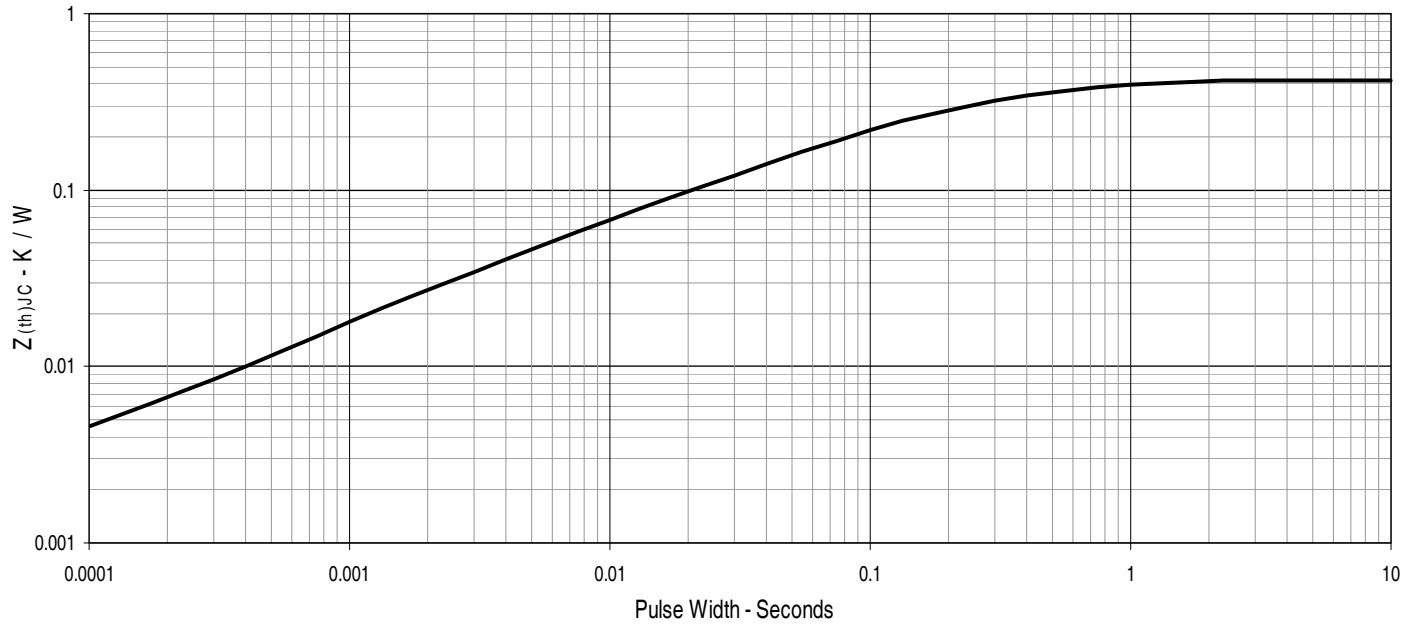


Fig. 13. Maximum Transient Thermal Impedance





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