

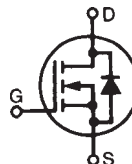
# PolarHV™ HiPerFET IXFR 44N50P

## Power MOSFET

### ISOPLUS247™

(Electrically Isolated Back Surface)

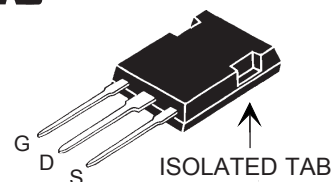
N-Channel Enhancement  
Avalanche Rated  
Fast Intrinsic Diode



$$\begin{aligned} V_{DSS} &= 500 \text{ V} \\ I_{D25} &= 24 \text{ A} \\ R_{DS(on)} &\leq 150 \text{ m}\Omega \\ t_{rr} &\leq 200 \text{ ns} \end{aligned}$$

| Symbol     | Test Conditions                                                                                                                          | Maximum Ratings   |                  |
|------------|------------------------------------------------------------------------------------------------------------------------------------------|-------------------|------------------|
| $V_{DSS}$  | $T_J = 25^\circ\text{C to } 175^\circ\text{C}$                                                                                           | 500               | V                |
| $V_{DGR}$  | $T_J = 25^\circ\text{C to } 175^\circ\text{C}; R_{GS} = 1 \text{ M}\Omega$                                                               | 500               | V                |
| $V_{GSM}$  | Transient                                                                                                                                | $\pm 40$          | V                |
| $V_{GSM}$  | Continuous                                                                                                                               | $\pm 30$          | V                |
| $I_{D25}$  | $T_C = 25^\circ\text{C}$                                                                                                                 | 24                | A                |
| $I_{DM}$   | $T_C = 25^\circ\text{C}$ , pulse width limited by $T_{JM}$                                                                               | 132               | A                |
| $I_{AR}$   | $T_C = 25^\circ\text{C}$                                                                                                                 | 44                | A                |
| $E_{AR}$   | $T_C = 25^\circ\text{C}$                                                                                                                 | 55                | mJ               |
| $E_{AS}$   | $T_C = 25^\circ\text{C}$                                                                                                                 | 1.7               | J                |
| $dv/dt$    | $I_S \leq I_{DM}$ , $di/dt \leq 100 \text{ A}/\mu\text{s}$ , $V_{DD} \leq V_{DSS}$ ,<br>$T_J \leq 150^\circ\text{C}$ , $R_G = 10 \Omega$ | 10                | V/ns             |
| $P_D$      | $T_C = 25^\circ\text{C}$                                                                                                                 | 208               | W                |
| $T_J$      |                                                                                                                                          | -55 ... +150      | $^\circ\text{C}$ |
| $T_{JM}$   |                                                                                                                                          | 150               | $^\circ\text{C}$ |
| $T_{stg}$  |                                                                                                                                          | -55 ... +150      | $^\circ\text{C}$ |
| $T_L$      | 1.6 mm (0.062 in.) from case for 10 s                                                                                                    | 300               | $^\circ\text{C}$ |
| $V_{ISOL}$ | 50/60 Hz, RMS, 1 minute                                                                                                                  | 2500              | V~               |
| $F_c$      | Mounting Force                                                                                                                           | 20..120 / 4.5..25 | N/lb             |
| Weight     |                                                                                                                                          | 5                 | g                |

ISOPLUS247 (IXFR)  
E153432



G = Gate  
S = Source  
D = Drain

#### Features

- International standard isolated package
- UL recognized package
- 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

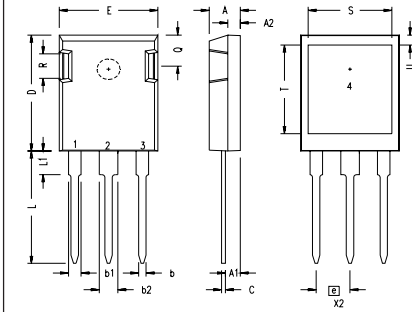
| Symbol       | Test Conditions<br>( $T_J = 25^\circ\text{C}$ , unless otherwise specified) | Characteristic Values |      |                                       |
|--------------|-----------------------------------------------------------------------------|-----------------------|------|---------------------------------------|
|              |                                                                             | Min.                  | Typ. | Max.                                  |
| $BV_{DSS}$   | $V_{GS} = 0 \text{ V}$ , $I_D = 250 \mu\text{A}$                            | 500                   |      | V                                     |
| $V_{GS(th)}$ | $V_{DS} = V_{GS}$ , $I_D = 4 \text{ mA}$                                    | 2.5                   |      | 5.0 V                                 |
| $I_{GSS}$    | $V_{GS} = \pm 30 \text{ V}$ , $V_{DS} = 0$                                  |                       |      | $\pm 100 \text{ nA}$                  |
| $I_{DSS}$    | $V_{DS} = V_{DSS}$<br>$V_{GS} = 0 \text{ V}$<br>$T_J = 125^\circ\text{C}$   |                       |      | 25 $\mu\text{A}$<br>500 $\mu\text{A}$ |
| $R_{DS(on)}$ | $V_{GS} = 10 \text{ V}$ , $I_D = 22 \text{ A}$                              |                       |      | 150 $\text{m}\Omega$                  |

| Symbol                    | Test Conditions                                                                                                           | Characteristic Values<br>(T <sub>J</sub> = 25° C, unless otherwise specified) |      |          |
|---------------------------|---------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------|------|----------|
|                           |                                                                                                                           | Min.                                                                          | Typ. | Max.     |
| <b>g<sub>fs</sub></b>     | V <sub>DS</sub> = 20 V; I <sub>D</sub> = 22 A, Note 1                                                                     |                                                                               | 32   | S        |
| <b>C<sub>iss</sub></b>    | V <sub>GS</sub> = 0 V, V <sub>DS</sub> = 25 V, f = 1 MHz                                                                  |                                                                               | 5440 | pF       |
| <b>C<sub>oss</sub></b>    |                                                                                                                           |                                                                               | 639  | pF       |
| <b>C<sub>rss</sub></b>    |                                                                                                                           |                                                                               | 40   | pF       |
| <b>t<sub>d(on)</sub></b>  | V <sub>GS</sub> = 10 V, V <sub>DS</sub> = 0.5 V <sub>DSS</sub> , I <sub>D</sub> = 22 A<br>R <sub>G</sub> = 3 Ω (External) |                                                                               | 25   | ns       |
| <b>t<sub>r</sub></b>      |                                                                                                                           |                                                                               | 27   | ns       |
| <b>t<sub>d(off)</sub></b> |                                                                                                                           |                                                                               | 70   | ns       |
| <b>t<sub>f</sub></b>      |                                                                                                                           |                                                                               | 18   | ns       |
| <b>Q<sub>g(on)</sub></b>  | V <sub>GS</sub> = 10 V, V <sub>DS</sub> = 0.5 V <sub>DSS</sub> , I <sub>D</sub> = 22 A                                    |                                                                               | 98   | nC       |
| <b>Q<sub>gs</sub></b>     |                                                                                                                           |                                                                               | 35   | nC       |
| <b>Q<sub>gd</sub></b>     |                                                                                                                           |                                                                               | 30   | nC       |
| <b>R<sub>thJC</sub></b>   |                                                                                                                           |                                                                               |      | 0.6 °C/W |
| <b>R<sub>thCS</sub></b>   |                                                                                                                           | 0.15                                                                          |      | °C/W     |

| Source-Drain Diode    |                                                                 | Characteristic Values<br>(T <sub>J</sub> = 25° C, unless otherwise specified) |      |        |
|-----------------------|-----------------------------------------------------------------|-------------------------------------------------------------------------------|------|--------|
| Symbol                | Test Conditions                                                 | Min.                                                                          | Typ. | Max.   |
| <b>I<sub>S</sub></b>  | V <sub>GS</sub> = 0 V                                           |                                                                               |      | 30 A   |
| <b>I<sub>SM</sub></b> | Repetitive                                                      |                                                                               |      | 132 A  |
| <b>V<sub>SD</sub></b> | I <sub>F</sub> = I <sub>S</sub> , V <sub>GS</sub> = 0 V, Note 1 |                                                                               |      | 1.5 V  |
| <b>t<sub>rr</sub></b> | I <sub>F</sub> = 22 A,                                          |                                                                               |      | 200 ns |
| <b>Q<sub>RM</sub></b> | -di/dt = 100 A/μs                                               |                                                                               | 0.6  | μC     |
| <b>I<sub>RM</sub></b> | V <sub>R</sub> = 100V                                           |                                                                               | 6.0  | A      |

Notes: 1. Pulse test, t ≤ 300 ms, duty cycle d ≤ 2 %

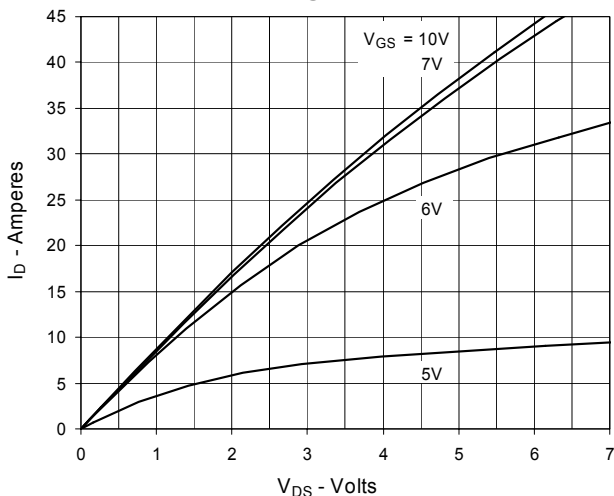
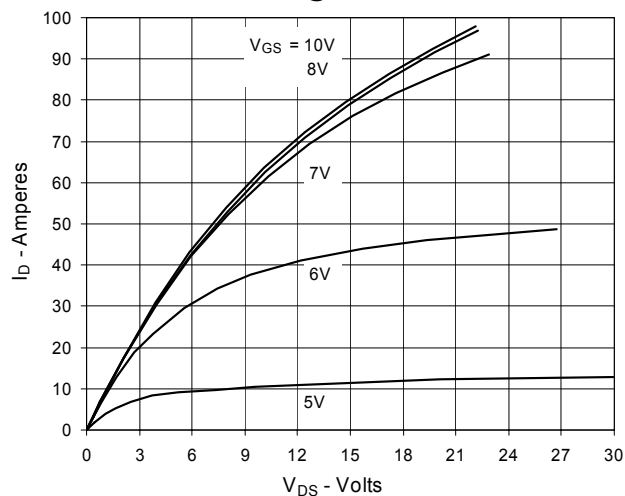
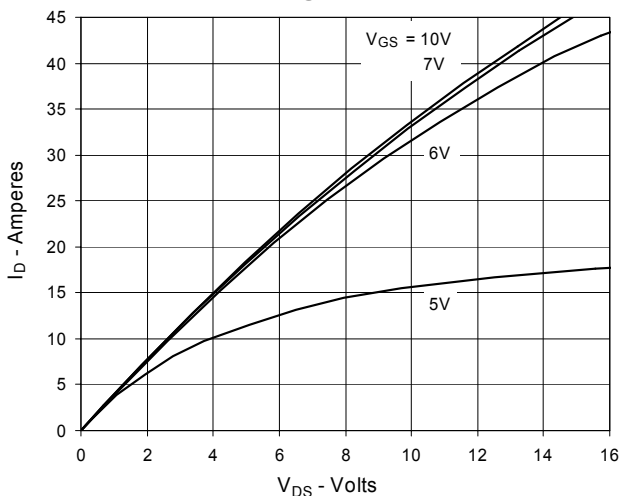
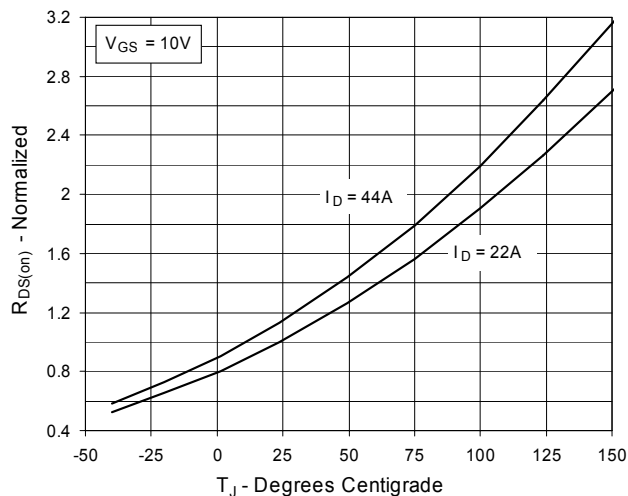
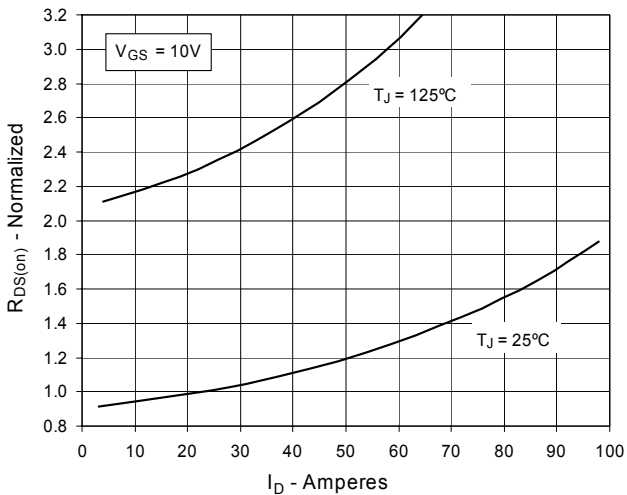
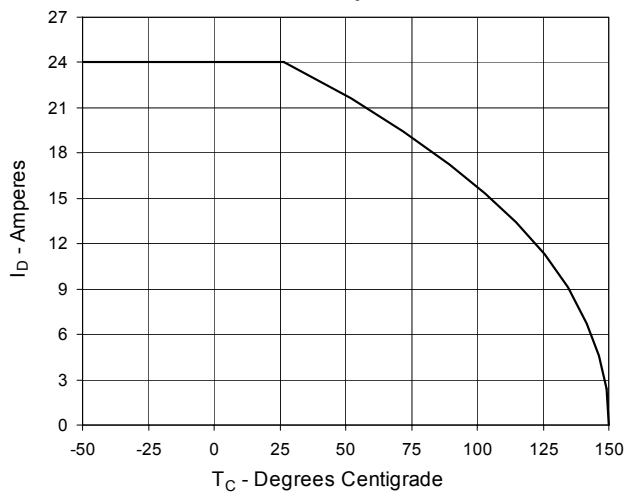
## ISOPLUS247 Outline



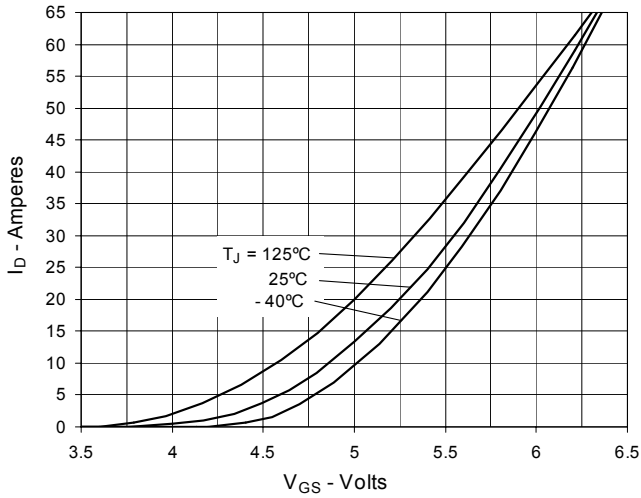
| SYM | INCHES   |      | MILLIMETERS |       |
|-----|----------|------|-------------|-------|
|     | MIN      | MAX  | MIN         | MAX   |
| A   | .190     | .205 | 4.83        | 5.21  |
| A1  | .090     | .100 | 2.29        | 2.54  |
| A2  | .075     | .085 | 1.91        | 2.16  |
| b   | .045     | .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 (COLLECTOR)
- 3 - SOURCE (EMITTER)
- 4 - NO CONNECTION

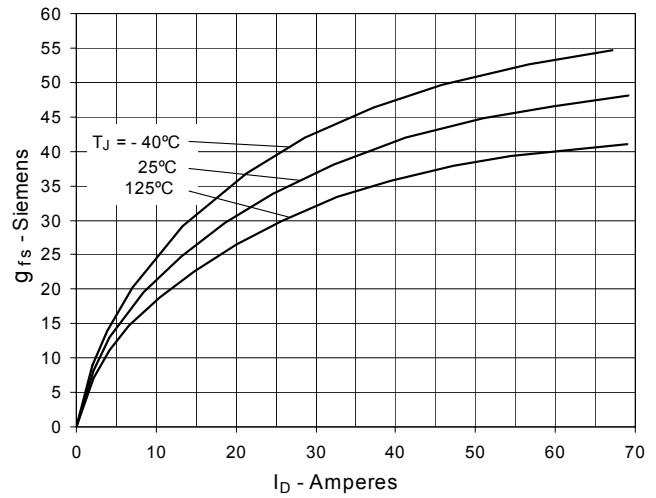
NOTE: This drawing will meet all dimensions requirement of JEDEC outline TO-247AD except screw hole.

**Fig. 1. Output Characteristics  
@ 25°C**

**Fig. 2. Extended Output Characteristics  
@ 25°C**

**Fig. 3. Output Characteristics  
@ 125°C**

**Fig. 4.  $R_{DS(on)}$  Normalized to  $I_D = 22\text{A}$  Value  
vs. Junction Temperature**

**Fig. 5.  $R_{DS(on)}$  Normalized to  $I_D = 22\text{A}$  Value  
vs. Drain Current**

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


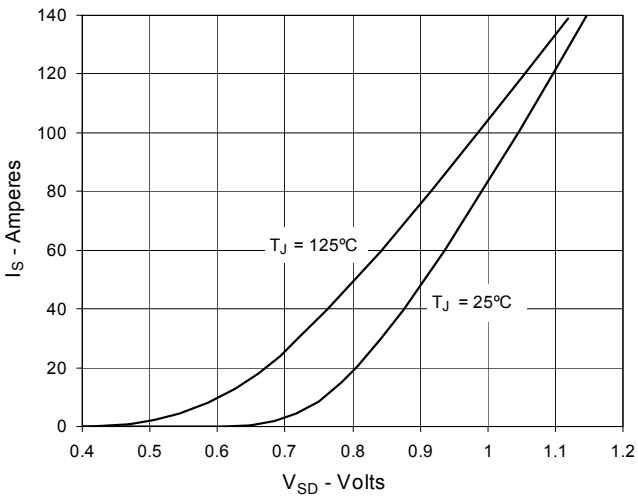
**Fig. 7. Input Admittance**



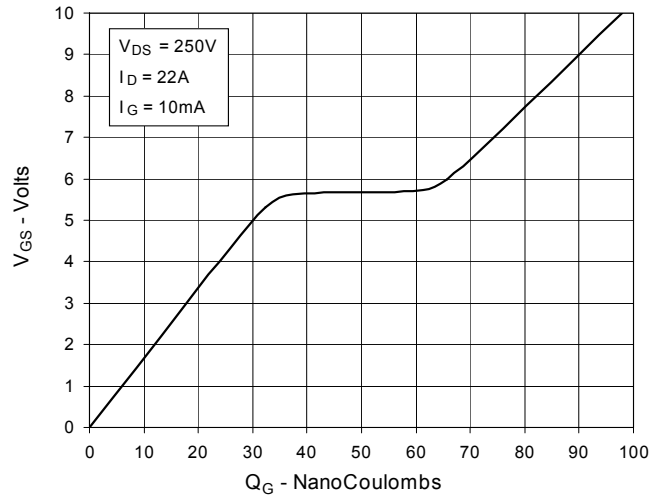
**Fig. 8. Transconductance**



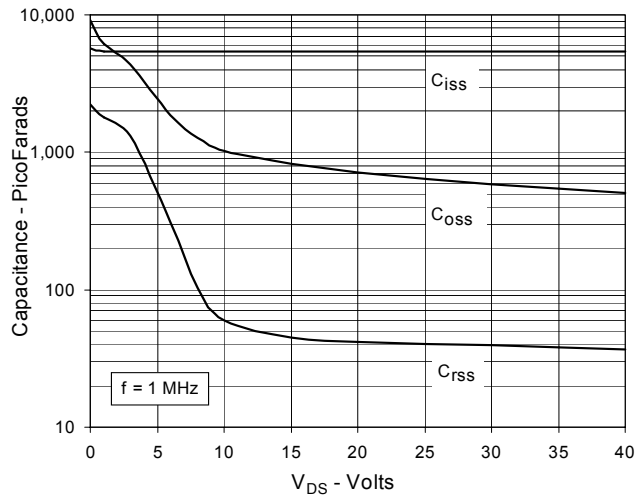
**Fig. 9. Forward Voltage Drop of Intrinsic Diode**



**Fig. 10. Gate Charge**



**Fig. 11. Capacitance**



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

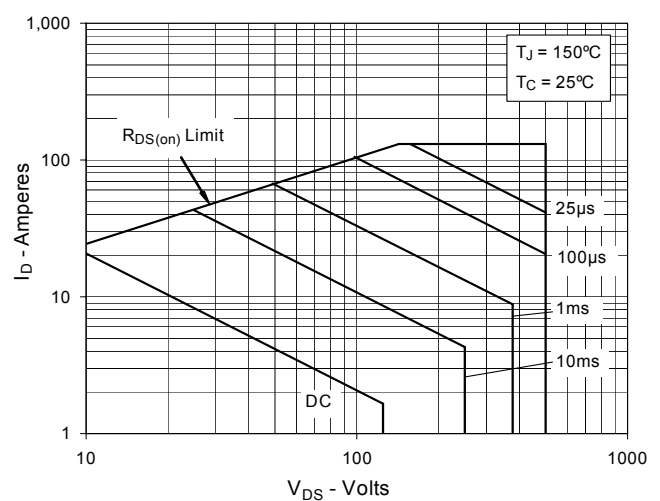
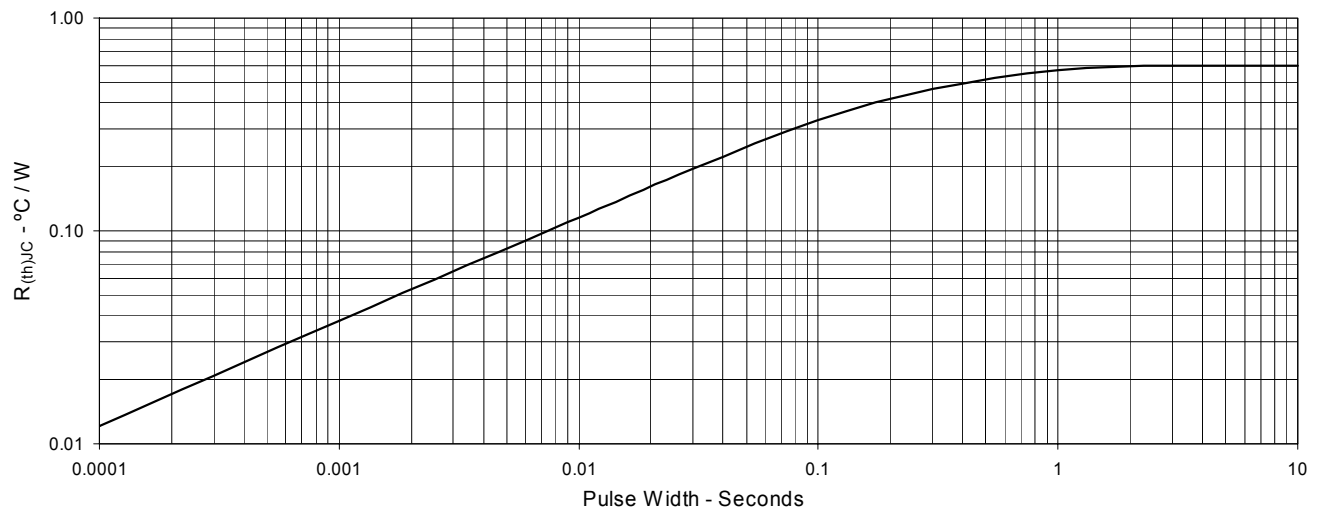


Fig. 13. Maximum Transient Thermal Resistance





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