

# HiPerFET™ Power MOSFETs Q-Class

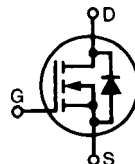
**IXFH 4N100Q**  
**IXFT 4N100Q**

$$\begin{aligned} V_{DSS} &= 1000 \text{ V} \\ I_{D25} &= 4 \text{ A} \\ R_{DS(on)} &= 3.0 \Omega \end{aligned}$$

$$t_{rr} \leq 250 \text{ ns}$$

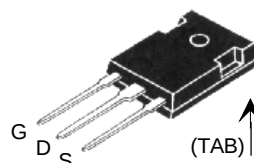
N-Channel Enhancement Mode  
Avalanche Rated, Low  $Q_g$ , High  $dv/dt$

Preliminary Data Sheet

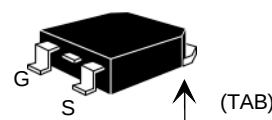


| Symbol    | Test Conditions                                                                                                                         | Maximum Ratings |                  |
|-----------|-----------------------------------------------------------------------------------------------------------------------------------------|-----------------|------------------|
| $V_{DSS}$ | $T_J = 25^\circ\text{C}$ to $150^\circ\text{C}$                                                                                         | 1000            | V                |
| $V_{DGR}$ | $T_J = 25^\circ\text{C}$ to $150^\circ\text{C}$ ; $R_{GS} = 1 \text{ M}\Omega$                                                          | 1000            | V                |
| $V_{GS}$  | Continuous                                                                                                                              | $\pm 20$        | V                |
| $V_{GSM}$ | Transient                                                                                                                               | $\pm 30$        | V                |
| $I_{D25}$ | $T_C = 25^\circ\text{C}$                                                                                                                | 4               | A                |
| $I_{DM}$  | $T_C = 25^\circ\text{C}$ , pulse width limited by $T_{JM}$                                                                              | 16              | A                |
| $I_{AR}$  | $T_C = 25^\circ\text{C}$                                                                                                                | 4               | A                |
| $E_{AR}$  | $T_C = 25^\circ\text{C}$                                                                                                                | 20              | mJ               |
| $E_{AS}$  |                                                                                                                                         | 700             | mJ               |
| $dv/dt$   | $I_S \leq I_{DM}$ , $di/dt \leq 100 \text{ A}/\mu\text{s}$ , $V_{DD} \leq V_{DSS}$ ,<br>$T_J \leq 150^\circ\text{C}$ , $R_G = 2 \Omega$ | 5               | V/ns             |
| $P_D$     | $T_C = 25^\circ\text{C}$                                                                                                                | 150             | W                |
| $T_J$     |                                                                                                                                         | -55 to +150     | $^\circ\text{C}$ |
| $T_{JM}$  |                                                                                                                                         | 150             | $^\circ\text{C}$ |
| $T_{stg}$ |                                                                                                                                         | -55 to +150     | $^\circ\text{C}$ |
| $T_L$     | 1.6 mm (0.063 in) from case for 10 s                                                                                                    | 300             | $^\circ\text{C}$ |
| $M_d$     | Mounting torque                                                                                                                         | 1.13/10         | Nm/lb.in.        |
| Weight    | TO-247                                                                                                                                  | 6               | g                |
|           | TO-268                                                                                                                                  | 4               | g                |

TO-247 AD (IXFH)



TO-268 (D3) (IXFT)



G = Gate      D = Drain  
S = Source    TAB = Drain

## Features

- IXYS advanced low  $Q_g$  process
- Low gate charge and capacitances
  - easier to drive
  - faster switching
- International standard packages
- Low  $R_{DS(on)}$
- Unclamped Inductive Switching (UIS) rated
- Molding epoxies meet UL 94 V-0 flammability classification

## Advantages

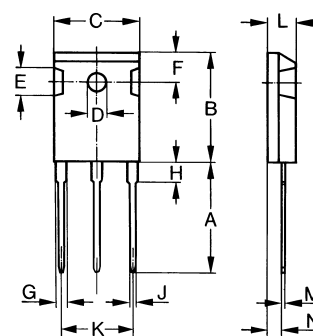
- Easy to mount
- Space savings
- High power density

| Symbol       | Test Conditions                                                                                                 | Characteristic Values<br>( $T_J = 25^\circ\text{C}$ , unless otherwise specified) |      |                      |
|--------------|-----------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------|----------------------|
|              |                                                                                                                 | min.                                                                              | typ. | max.                 |
| $V_{DSS}$    | $V_{GS} = 0 \text{ V}$ , $I_D = 1 \text{ mA}$                                                                   | 1000                                                                              |      | V                    |
| $V_{GS(th)}$ | $V_{DS} = V_{GS}$ , $I_D = 1.5 \text{ mA}$                                                                      | 3.0                                                                               |      | 5.0 V                |
| $I_{GSS}$    | $V_{GS} = \pm 20 \text{ V}_{DC}$ , $V_{DS} = 0$                                                                 |                                                                                   |      | $\pm 100 \text{ nA}$ |
| $I_{DSS}$    | $V_{DS} = V_{DSS}$<br>$V_{GS} = 0 \text{ V}$                                                                    | $T_J = 25^\circ\text{C}$<br>$T_J = 125^\circ\text{C}$                             |      | 50 $\mu\text{A}$     |
|              |                                                                                                                 |                                                                                   |      | 1 mA                 |
| $R_{DS(on)}$ | $V_{GS} = 10 \text{ V}$ , $I_D = 0.5 I_{D25}$<br>Pulse test, $t \leq 300 \mu\text{s}$ , duty cycle $d \leq 2\%$ |                                                                                   |      | 3.0 $\Omega$         |

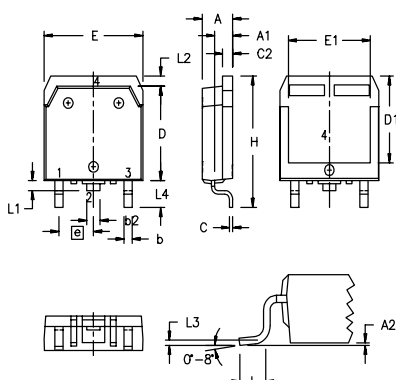
| Symbol                                                                                                | Test Conditions                                                                                                                                                                 | Characteristic Values<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> = 0.5 • I <sub>D25</sub> , pulse test                                                                                                    | 1.5                                                                          | 2.5  | S              |
| <b>C<sub>iss</sub></b><br><b>C<sub>oss</sub></b><br><b>C<sub>rss</sub></b>                            | $\left. \begin{array}{l} \\ \\ \end{array} \right\} V_{GS} = 0 \text{ V}, V_{DS} = 25 \text{ V}, f = 1 \text{ MHz}$                                                             |                                                                              | 1050 | pF             |
|                                                                                                       |                                                                                                                                                                                 |                                                                              | 120  | pF             |
|                                                                                                       |                                                                                                                                                                                 |                                                                              | 30   | pF             |
| <b>t<sub>d(on)</sub></b><br><b>t<sub>r</sub></b><br><b>t<sub>d(off)</sub></b><br><b>t<sub>f</sub></b> | $\left. \begin{array}{l} \\ \\ \\ \end{array} \right\} V_{GS} = 10 \text{ V}, V_{DS} = 0.5 \cdot V_{DSS}, I_D = 0.5 \cdot I_{D25}$<br>$R_G = 4.7 \, \Omega \text{ (External),}$ |                                                                              | 17   | ns             |
|                                                                                                       |                                                                                                                                                                                 |                                                                              | 15   | ns             |
|                                                                                                       |                                                                                                                                                                                 |                                                                              | 32   | ns             |
|                                                                                                       |                                                                                                                                                                                 |                                                                              | 18   | ns             |
| <b>Q<sub>g(on)</sub></b><br><b>Q<sub>gs</sub></b><br><b>Q<sub>gd</sub></b>                            | $\left. \begin{array}{l} \\ \\ \end{array} \right\} V_{GS} = 10 \text{ V}, V_{DS} = 0.5 \cdot V_{DSS}, I_D = 0.5 \cdot I_{D25}$                                                 |                                                                              | 39   | nC             |
|                                                                                                       |                                                                                                                                                                                 |                                                                              | 9    | nC             |
|                                                                                                       |                                                                                                                                                                                 |                                                                              | 22   | nC             |
| <b>R<sub>thJC</sub></b><br><b>R<sub>thCK</sub></b>                                                    | (TO-247)                                                                                                                                                                        |                                                                              | 0.25 | 0.8 K/W<br>K/W |

| Source-Drain Diode                                    |                                                                                                                         | Characteristic Values<br>(T <sub>J</sub> = 25°C, unless otherwise specified) |      |             |         |
|-------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------|------|-------------|---------|
| Symbol                                                | Test Conditions                                                                                                         | min.                                                                         | typ. | max.        |         |
| I <sub>S</sub>                                        | V <sub>GS</sub> = 0 V                                                                                                   |                                                                              |      | 4           | A       |
| I <sub>SM</sub>                                       | Repetitive; pulse width limited by T <sub>JM</sub>                                                                      |                                                                              |      | 16          | A       |
| V <sub>SD</sub>                                       | I <sub>F</sub> = I <sub>S</sub> , V <sub>GS</sub> = 0 V,<br>Pulse test, t ≤ 300 μs, duty cycle d ≤ 2 %                  |                                                                              |      | 1.5         | V       |
| t <sub>rr</sub><br>Q <sub>RM</sub><br>I <sub>RM</sub> | $\left. \begin{array}{l} \\ \\ \end{array} \right\} I_F = I_S, -di/dt = 100 \text{ A}/\mu\text{s}, V_R = 100 \text{ V}$ |                                                                              |      | 250         | ns      |
|                                                       |                                                                                                                         |                                                                              |      | 0.52<br>1.8 | μC<br>A |

## TO-247 AD (IXFH) Outline



| Dim. | Millimeter |       | Inches |       |
|------|------------|-------|--------|-------|
|      | Min.       | Max.  | Min.   | Max.  |
| A    | 19.81      | 20.32 | 0.780  | 0.800 |
| B    | 20.80      | 21.46 | 0.819  | 0.845 |
| C    | 15.75      | 16.26 | 0.610  | 0.640 |
| D    | 3.55       | 3.65  | 0.140  | 0.144 |
| E    | 4.32       | 5.49  | 0.170  | 0.216 |
| F    | 5.4        | 6.2   | 0.212  | 0.244 |
| G    | 1.65       | 2.13  | 0.065  | 0.084 |
| H    | -          | 4.5   | -      | 0.177 |
| J    | 1.0        | 1.4   | 0.040  | 0.055 |
| K    | 10.8       | 11.0  | 0.426  | 0.433 |
| L    | 4.7        | 5.3   | 0.185  | 0.209 |
| M    | 0.4        | 0.8   | 0.016  | 0.031 |
| N    | 1.5        | 2.49  | 0.087  | 0.102 |

**TO-268AA (D<sup>3</sup> PAK)**

| Dim.           | Millimeter |       | Inches   |      |
|----------------|------------|-------|----------|------|
|                | Min.       | Max.  | Min.     | Max. |
| A              | 4.9        | 5.1   | .193     | .201 |
| A <sub>1</sub> | 2.7        | 2.9   | .106     | .114 |
| A <sub>2</sub> | .02        | .25   | .001     | .010 |
| b              | 1.15       | 1.45  | .045     | .057 |
| b <sub>2</sub> | 1.9        | 2.1   | .75      | .83  |
| C              | .4         | .65   | .016     | .026 |
| D              | 13.80      | 14.00 | .543     | .551 |
| E              | 15.85      | 16.05 | .624     | .632 |
| E <sub>1</sub> | 13.3       | 13.6  | .524     | .535 |
| e              | 5.45 BSC   |       | .215 BSC |      |
| H              | 18.70      | 19.10 | .736     | .752 |
| L              | 2.40       | 2.70  | .094     | .106 |
| L1             | 1.20       | 1.40  | .047     | .055 |
| L2             | 1.00       | 1.15  | .039     | .045 |
| L3             | .025 BSC   |       | .010 BSC |      |
| L4             | 3.80       | 4.10  | .150     | .161 |

Min. Recommended Footprint

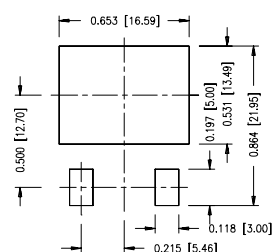


Figure 1. Output Characteristics at 25°C

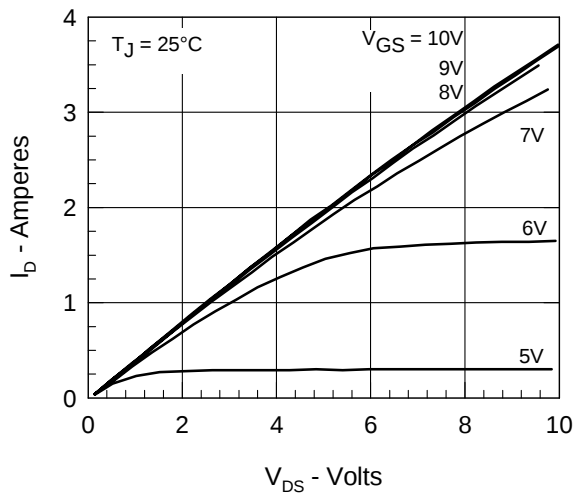


Figure 2. Extended Output Characteristics at 125°C

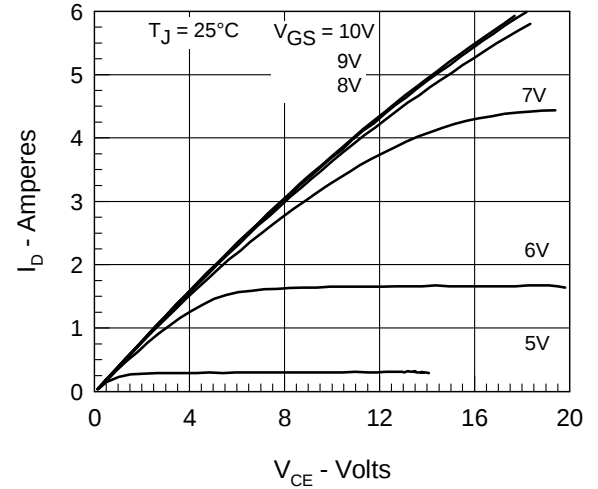


Figure 3.  $R_{DS(on)}$  normalized to 0.5  $I_{D25}$  value vs.  $I_D$

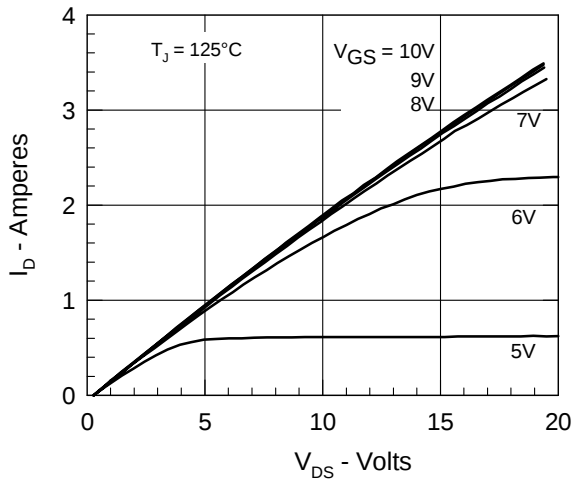


Figure 4. Admittance Curves

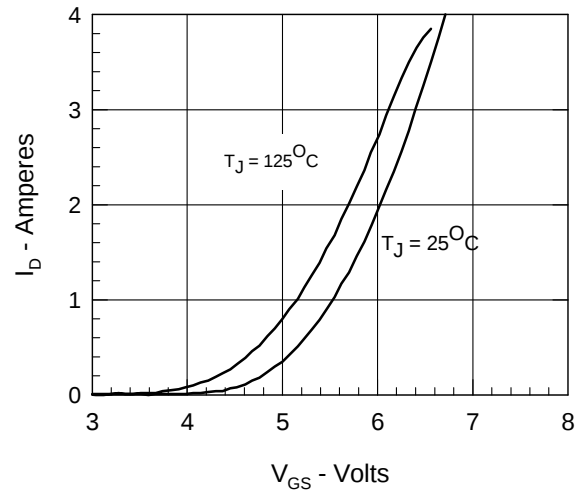


Figure 5.  $R_{DS(on)}$  normalized to 0.5  $I_{D25}$  value vs.  $I_D$

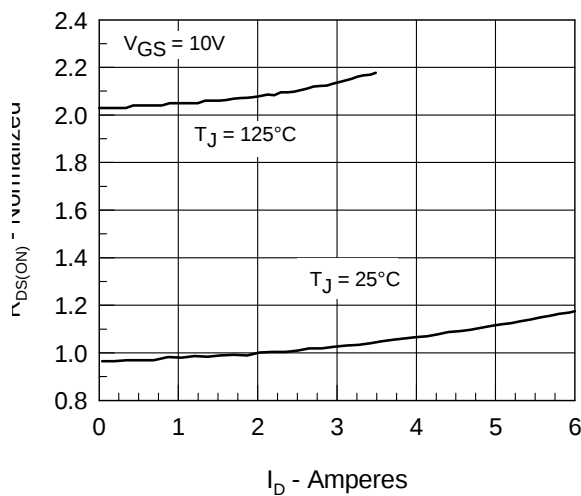


Figure 6.  $R_{DS(on)}$  normalized to 0.5  $I_{D25}$  value vs.  $T_J$

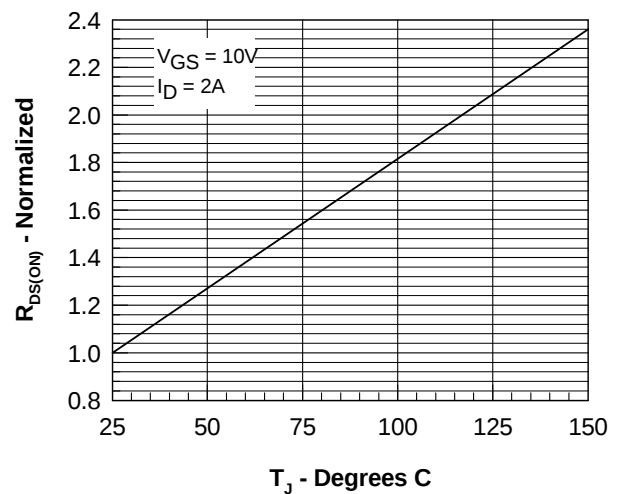


Figure 7. Gate Charge

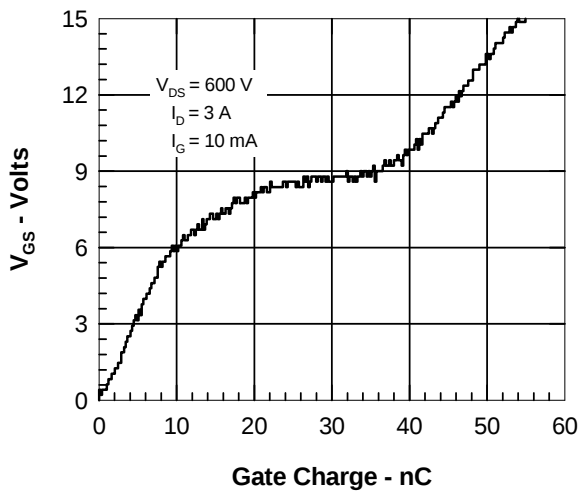


Figure 8. Capacitance Curves

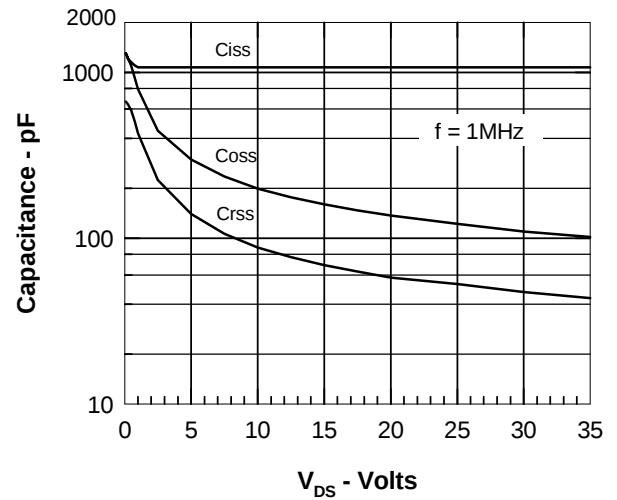


Figure 9. Forward Voltage Drop of the Intrinsic Diode

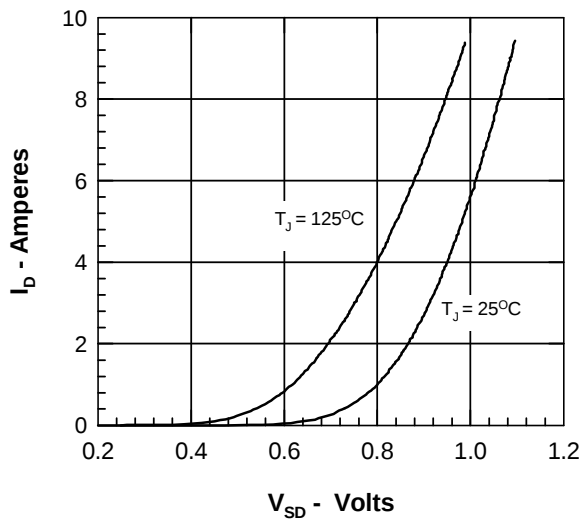


Figure 10. Drain Current vs. Case Temperature

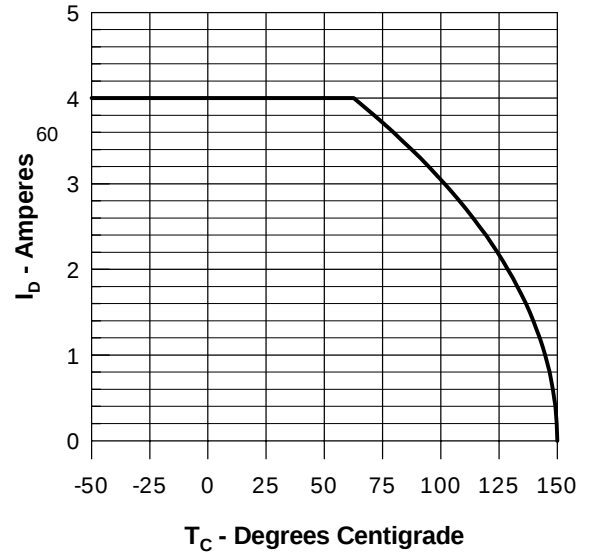
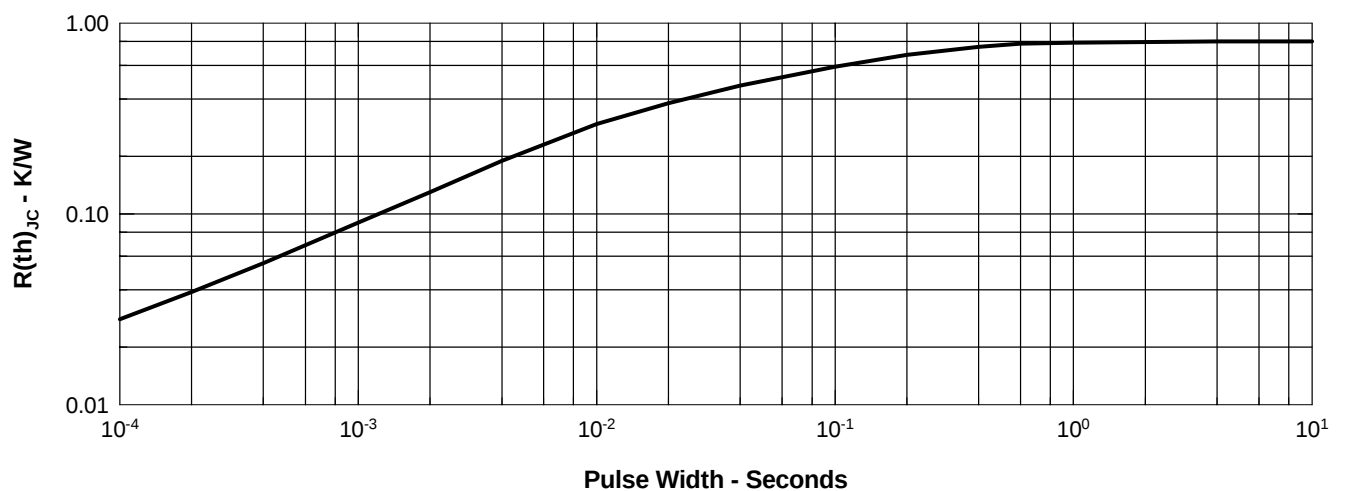


Figure 11. Transient Thermal Resistance





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