

# HiPerFET™

## Power MOSFETs

### Q-Class

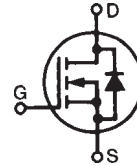
N-Channel Enhancement Mode  
Avalanche Rated, High dv/dt, Low  $Q_g$

IXFH 17N80Q  
IXFT 17N80Q

$V_{DSS} = 800 \text{ V}$   
 $I_{D25} = 17 \text{ A}$   
 $R_{DS(on)} = 0.60 \Omega$

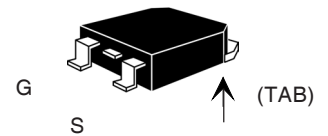
$t_{rr} \leq 250 \text{ ns}$

Preliminary Data Sheet

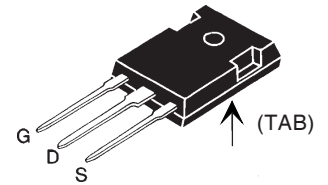


| Symbol    | Test Conditions                                                                                                                         | Maximum Ratings |                  |
|-----------|-----------------------------------------------------------------------------------------------------------------------------------------|-----------------|------------------|
| $V_{DSS}$ | $T_J = 25^\circ\text{C}$ to $150^\circ\text{C}$                                                                                         | 800             | V                |
| $V_{DGR}$ | $T_J = 25^\circ\text{C}$ to $150^\circ\text{C}$ ; $R_{GS} = 1 \text{ M}\Omega$                                                          | 800             | V                |
| $V_{GS}$  | Continuous                                                                                                                              | $\pm 20$        | V                |
| $V_{GSM}$ | Transient                                                                                                                               | $\pm 30$        | V                |
| $I_{D25}$ | $T_C = 25^\circ\text{C}$                                                                                                                | 17              | A                |
| $I_{DM}$  | $T_C = 25^\circ\text{C}$ , pulse width limited by $T_{JM}$                                                                              | 68              | A                |
| $I_{AR}$  | $T_C = 25^\circ\text{C}$                                                                                                                | 17              | A                |
| $E_{AR}$  | $T_C = 25^\circ\text{C}$                                                                                                                | 30              | mJ               |
| $E_{AS}$  | $T_C = 25^\circ\text{C}$                                                                                                                | 1.0             | J                |
| dv/dt     | $I_S \leq I_{DM}$ , $di/dt \leq 100 \text{ A}/\mu\text{s}$ , $V_{DD} \leq V_{DSS}$ ,<br>$T_J \leq 150^\circ\text{C}$ , $R_G = 2 \Omega$ | 5               | V/ns             |
| $P_D$     | $T_C = 25^\circ\text{C}$                                                                                                                | 400             | 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             | $^\circ\text{C}$ |
| $M_d$     | Mounting torque                                                                                                                         | 1.13/10         | Nm/lb.in.        |
| Weight    | TO-247                                                                                                                                  | 6               | g                |
|           | TO-268                                                                                                                                  | 4               | g                |

TO-268 (D3) (IXFT) Case Style



TO-247 AD (IXFH)



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

#### Features

- IXYS advanced low  $Q_g$  process
- International standard packages
- Low  $R_{DS(on)}$
- Unclamped Inductive Switching (UIS) rated
- Fast switching
- Molding epoxies meet UL 94 V-0 flammability classification

#### Advantages

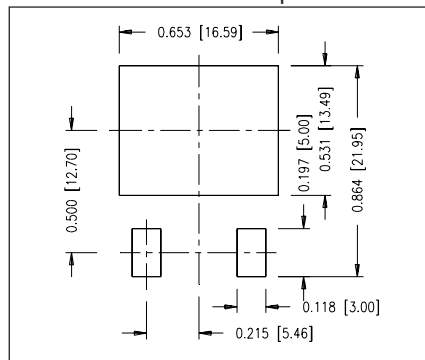
- Easy to mount
- Space savings
- High power density

| Symbol       | Test Conditions<br>( $T_J = 25^\circ\text{C}$ , unless otherwise specified)                                      | Characteristic Values |      |                      |
|--------------|------------------------------------------------------------------------------------------------------------------|-----------------------|------|----------------------|
|              |                                                                                                                  | Min.                  | Typ. | Max.                 |
| $V_{DSS}$    | $V_{GS} = 0 \text{ V}$ , $I_D = 3 \text{ mA}$                                                                    | 800                   |      | V                    |
| $V_{GS(th)}$ | $V_{DS} = V_{GS}$ , $I_D = 4 \text{ mA}$                                                                         | 2.0                   |      | 4.5 V                |
| $I_{GSS}$    | $V_{GS} = \pm 20 \text{ V}_{DC}$ , $V_{DS} = 0$                                                                  |                       |      | $\pm 100 \text{ nA}$ |
| $I_{DSS}$    | $V_{DS} = V_{DSS}$ , $T_J = 25^\circ\text{C}$                                                                    |                       |      | 25 $\mu\text{A}$     |
|              | $V_{GS} = 0 \text{ V}$ , $T_J = 125^\circ\text{C}$                                                               |                       |      | 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 $d \leq 2 \%$ |                       |      | 0.60 $\Omega$        |

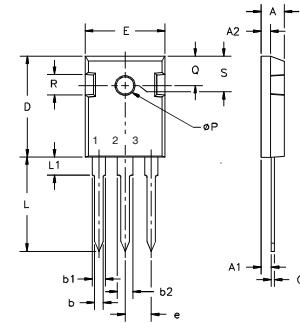
| Symbol       | Test Conditions                                                                                   | Characteristic Values<br>( $T_J = 25^\circ\text{C}$ , unless otherwise specified) |      |          |
|--------------|---------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------|----------|
|              |                                                                                                   | Min.                                                                              | Typ. | Max.     |
| $g_{fs}$     | $V_{DS} = 10\text{ V}; I_D = 0.5 I_{D25}$ , pulse test                                            | 9                                                                                 | 17   | S        |
| $C_{iss}$    | $V_{GS} = 0\text{ V}, V_{DS} = 25\text{ V}, f = 1\text{ MHz}$                                     |                                                                                   | 3600 | pF       |
| $C_{oss}$    |                                                                                                   |                                                                                   | 350  | pF       |
| $C_{rss}$    |                                                                                                   |                                                                                   | 100  | pF       |
| $t_{d(on)}$  | $V_{GS} = 10\text{ V}, V_{DS} = 0.5 V_{DSS}, I_D = 0.5 I_{D25}$<br>$R_G = 1.5\ \Omega$ (External) |                                                                                   | 18   | ns       |
| $t_r$        |                                                                                                   |                                                                                   | 27   | ns       |
| $t_{d(off)}$ |                                                                                                   |                                                                                   | 53   | ns       |
| $t_f$        |                                                                                                   |                                                                                   | 16   | ns       |
| $Q_{g(on)}$  | $V_{GS} = 10\text{ V}, V_{DS} = 0.5 V_{DSS}, I_D = 0.5 I_{D25}$                                   |                                                                                   | 95   | nC       |
| $Q_{gs}$     |                                                                                                   |                                                                                   | 20   | nC       |
| $Q_{gd}$     |                                                                                                   |                                                                                   | 40   | nC       |
| $R_{thJC}$   | (TO-247)                                                                                          |                                                                                   | 0.25 | 0.31 K/W |
| $R_{thCK}$   |                                                                                                   |                                                                                   |      | K/W      |

| Source-Drain Diode |                                                                                                       | Characteristic Values<br>( $T_J = 25^\circ\text{C}$ , unless otherwise specified) |      |               |
|--------------------|-------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------|---------------|
| Symbol             | Test Conditions                                                                                       | min.                                                                              | typ. | max.          |
| $I_S$              | $V_{GS} = 0\text{ V}$                                                                                 |                                                                                   |      | 15 A          |
| $I_{SM}$           | Repetitive;                                                                                           |                                                                                   |      | 60 A          |
| $V_{SD}$           | $I_F = I_S, V_{GS} = 0\text{ V}$ ,<br>Pulse test, $t \leq 300\ \mu\text{s}$ , duty cycle $d \leq 2\%$ |                                                                                   |      | 1.5 V         |
| $t_{rr}$           | $I_F = I_S - di/dt = 100\text{ A}/\mu\text{s}, V_R = 100\text{ V}$                                    |                                                                                   | 0.85 | 250 ns        |
| $Q_{RM}$           |                                                                                                       |                                                                                   |      | $\mu\text{C}$ |
| $I_{RM}$           |                                                                                                       |                                                                                   |      | A             |

## Min Recommended Footprint



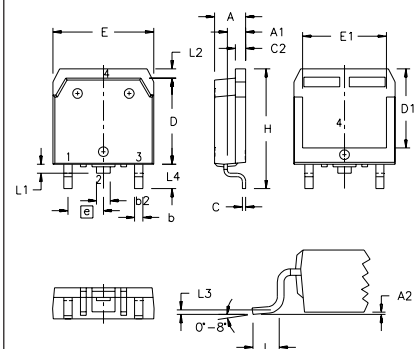
## TO-247 AD Outline



Terminals: 1 - Gate 2 - Drain  
3 - Source Tab - Drain

| Dim.           | Millimeter Min. | Max.  | Inches Min. | Max.  |
|----------------|-----------------|-------|-------------|-------|
| A              | 4.7             | 5.3   | .185        | .209  |
| A <sub>1</sub> | 2.2             | 2.54  | .087        | .102  |
| A <sub>2</sub> | 2.2             | 2.6   | .059        | .098  |
| b              | 1.0             | 1.4   | .040        | .055  |
| b <sub>1</sub> | 1.65            | 2.13  | .065        | .084  |
| b <sub>2</sub> | 2.87            | 3.12  | .113        | .123  |
| C              | .4              | .8    | .016        | .031  |
| D              | 20.80           | 21.46 | .819        | .845  |
| E              | 15.75           | 16.26 | .610        | .640  |
| e              | 5.20            | 5.72  | 0.205       | 0.225 |
| L              | 19.81           | 20.32 | .780        | .800  |
| L <sub>1</sub> |                 | 4.50  |             | .177  |
| ØP             | 3.55            | 3.65  | .140        | .144  |
| Q              | 5.89            | 6.40  | 0.232       | 0.252 |
| R              | 4.32            | 5.49  | .170        | .216  |
| S              | 6.15 BSC        |       | .242 BSC    |       |

## TO-268 Outline



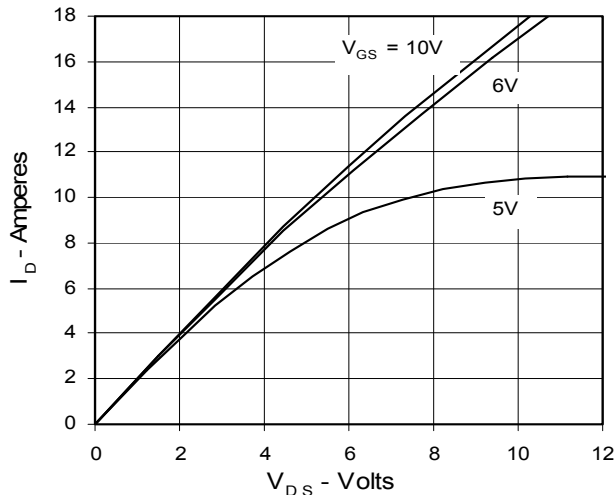
| SYM            | INCHES   |      | MILLIMETERS |       |
|----------------|----------|------|-------------|-------|
|                | MIN      | MAX  | MIN         | MAX   |
| A              | .193     | .201 | 4.90        | 5.10  |
| A <sub>1</sub> | .106     | .114 | 2.70        | 2.90  |
| A <sub>2</sub> | .001     | .010 | 0.02        | 0.25  |
| b              | .045     | .057 | 1.15        | 1.45  |
| b <sub>2</sub> | .075     | .083 | 1.90        | 2.10  |
| C              | .016     | .026 | 0.40        | 0.65  |
| C <sub>2</sub> | .057     | .063 | 1.45        | 1.60  |
| D              | .543     | .551 | 13.80       | 14.00 |
| D <sub>1</sub> | .488     | .500 | 12.40       | 12.70 |
| E              | .624     | .632 | 15.85       | 16.05 |
| E <sub>1</sub> | .524     | .535 | 13.30       | 13.60 |
| e              | .215 BSC |      | 5.45 BSC    |       |
| H              | .736     | .752 | 18.70       | 19.10 |
| L              | .094     | .106 | 2.40        | 2.70  |
| L <sub>1</sub> | .047     | .055 | 1.20        | 1.40  |
| L <sub>2</sub> | .039     | .045 | 1.00        | 1.15  |
| L <sub>3</sub> | .010 BSC |      | 0.25 BSC    |       |
| L <sub>4</sub> | .150     | .161 | 3.80        | 4.10  |

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

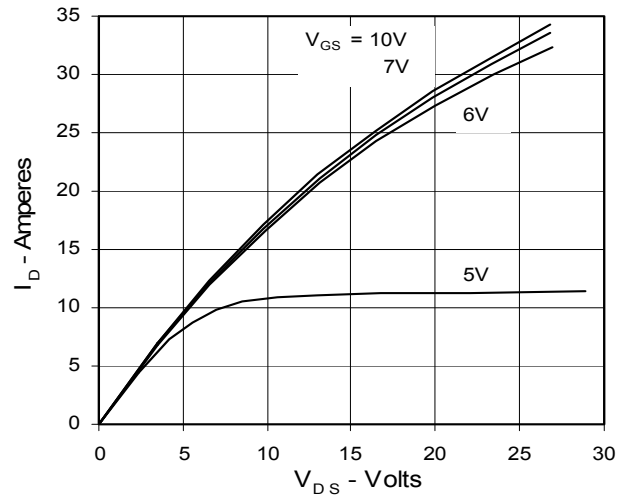
IXYS MOSFETs and IGBTs are covered by one or more of the following U.S. patents:

4,835,592 4,881,106 5,017,508 5,049,961 5,187,117 5,486,715 6,306,728B1 6,259,123B1 6,306,728B1  
4,850,072 4,931,844 5,034,796 5,063,307 5,237,481 5,381,025 6,404,065B1 6,162,665 6,534,343

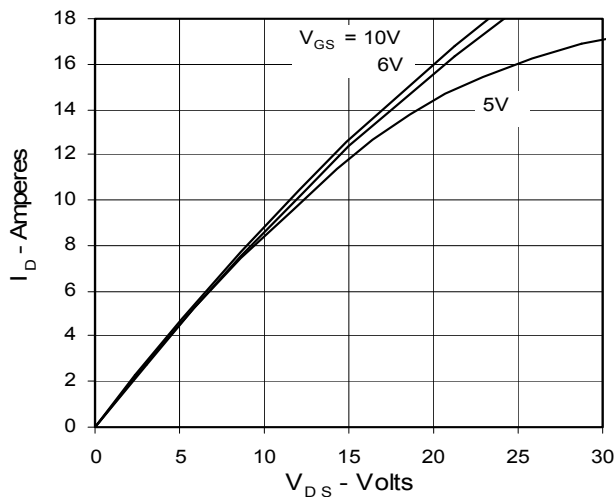
**Fig. 1. Output Characteristics  
@ 25 Deg. C**



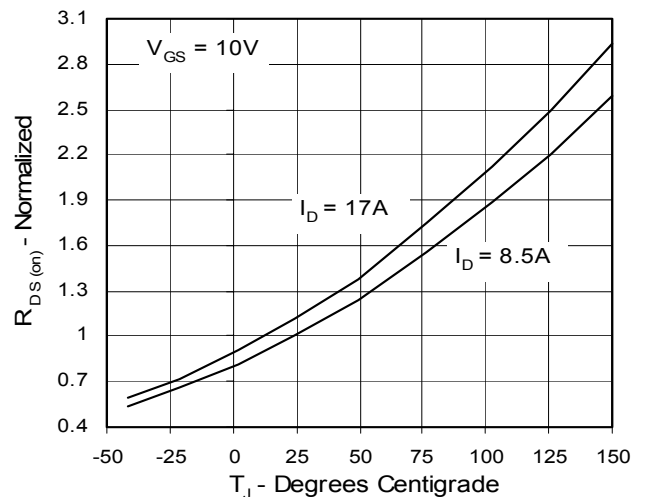
**Fig. 2. Extended Output Characteristics  
@ 25 deg. C**



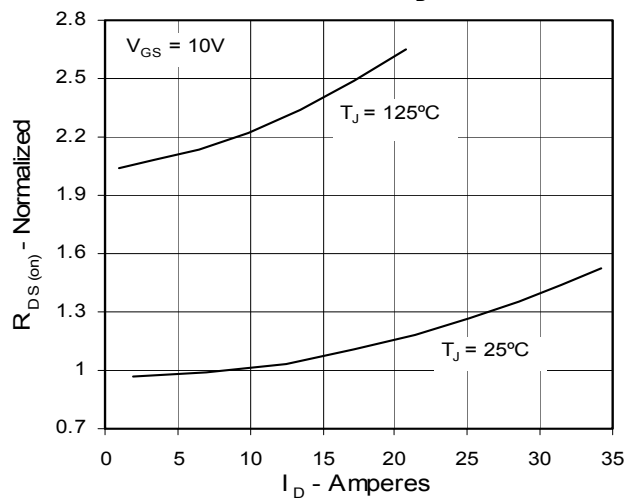
**Fig. 3. Output Characteristics  
@ 125 Deg. C**



**Fig. 4.  $R_{DS(on)}$  Normalized to  $I_{D25}$  Value vs.  
Junction Temperature**



**Fig. 5.  $R_{DS(on)}$  Normalized to  $I_{D25}$   
Value vs.  $I_D$**



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

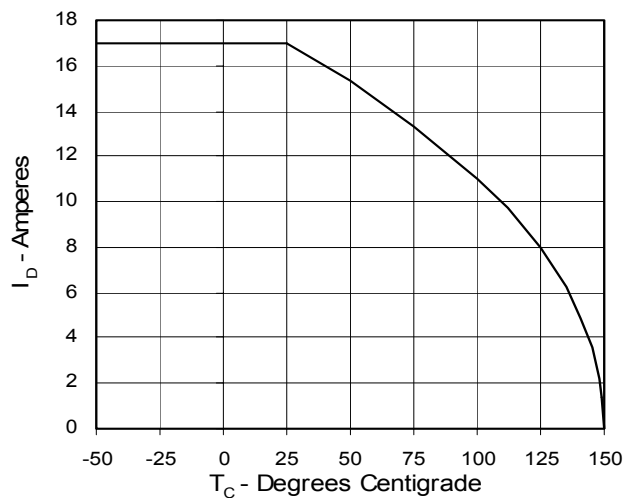


Fig. 7. Input Admittance

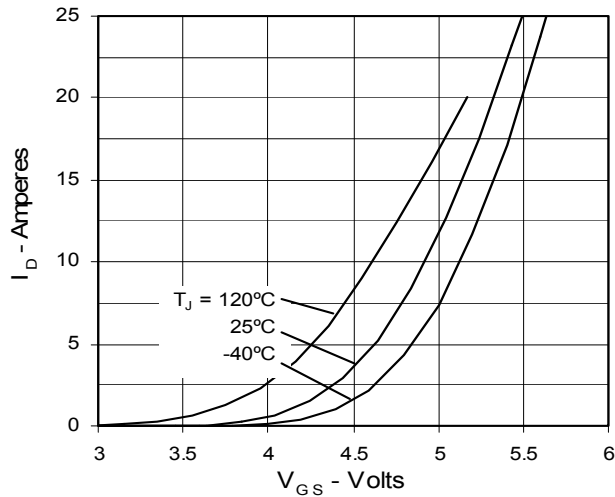


Fig. 8. Transconductance

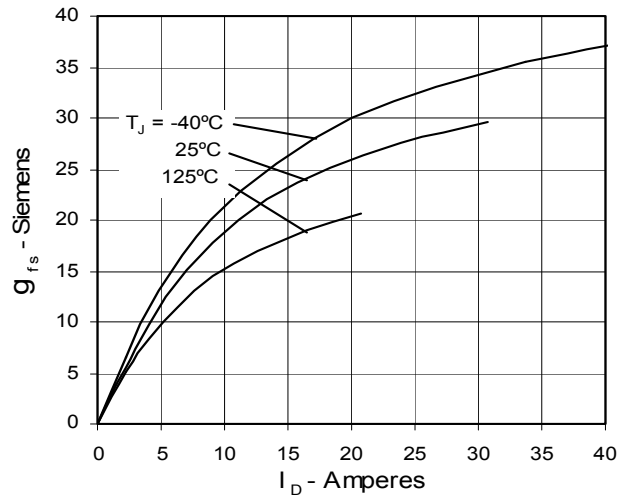


Fig. 9. Source Current vs. Source-To-Drain Voltage

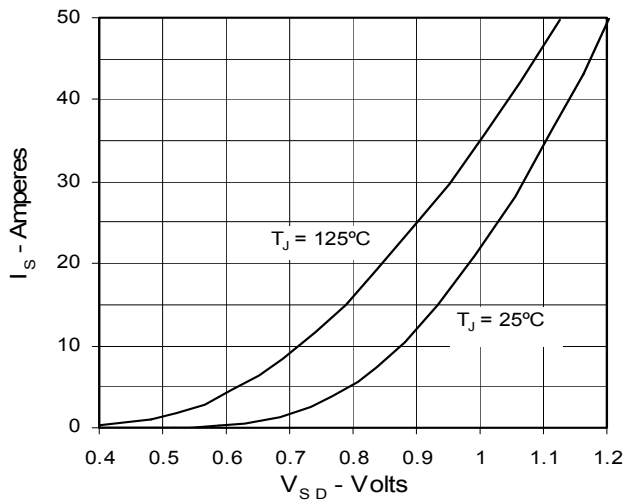


Fig. 10. Gate Charge

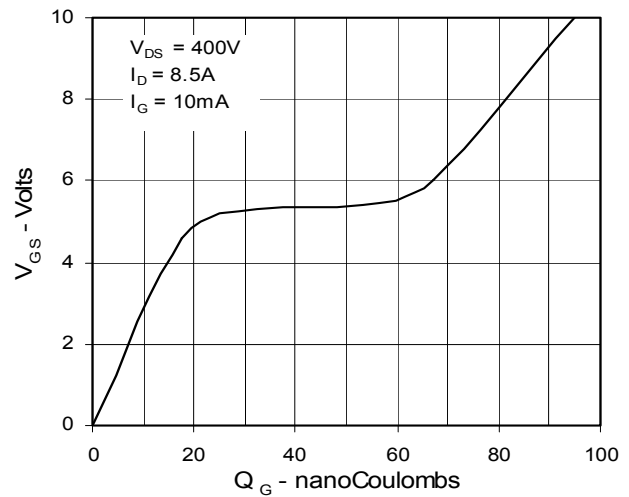


Fig. 11. Capacitance

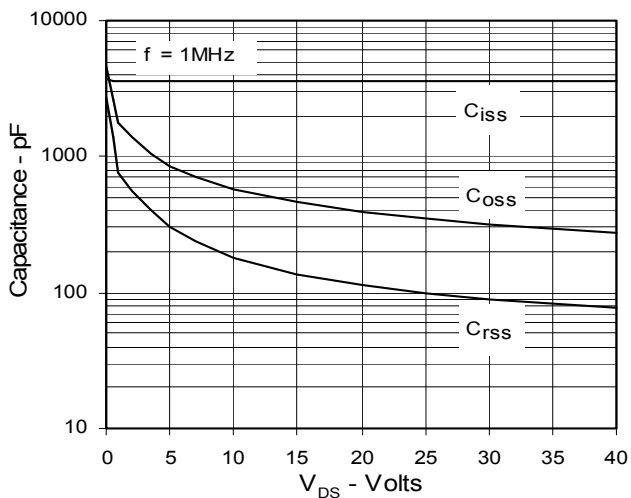
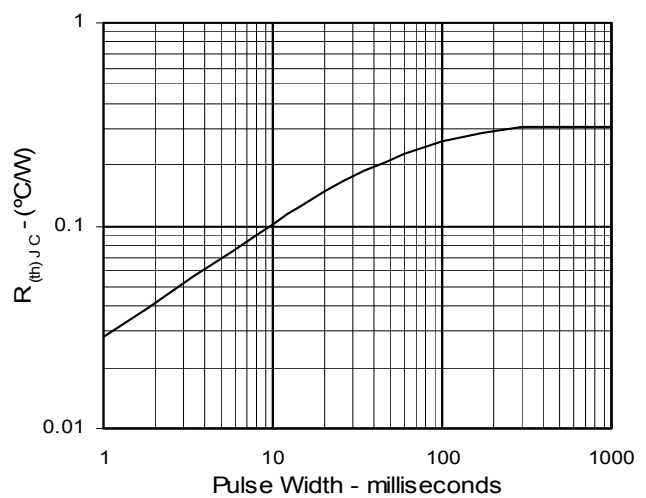


Fig. 12. Maximum Transient Thermal Resistance



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4,850,072 4,931,844 5,034,796 5,063,307 5,237,481 5,381,025 6,404,065B1 6,162,665 6,534,343

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