

# PolarHV™ HiPerFET Power MOSFET

**IXFK 80N50P**  
**IXFX 80N50P**

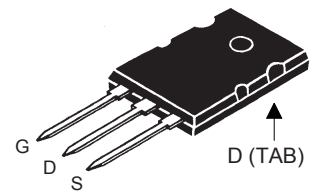
**V<sub>DSS</sub> = 500 V**  
**I<sub>D25</sub> = 80 A**  
**R<sub>DS(on)</sub> ≤ 65 mΩ**  
**t<sub>rr</sub> ≤ 200 ns**

N-Channel Enhancement Mode  
Avalanche Rated  
Fast Intrinsic Diode

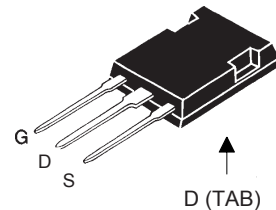


| Symbol            | Test Conditions  | Maximum Ratings |           |
|-------------------|--|-----------------|-----------|
| V <sub>DSS</sub>  | T <sub>J</sub> = 25° C to 150° C   | 500             | V         |
| V <sub>DGR</sub>  | T <sub>J</sub> = 25° C to 150° C; R <sub>GS</sub> = 1 MΩ   | 500             | V         |
| V <sub>GSM</sub>  | Transient  | ± 40            | V         |
| V <sub>GSM</sub>  | Continuous   | ± 30            | V         |
| I <sub>D25</sub>  | T <sub>C</sub> = 25° C   | 80              | A         |
| I <sub>L</sub>    | Lead Current Limit, RMS  | 75              | A         |
| I <sub>DM</sub>   | T <sub>C</sub> = 25° C, pulse width limited by T <sub>JM</sub>   | 200             | A         |
| I <sub>AR</sub>   | T <sub>C</sub> = 25° C   | 80              | A         |
| E <sub>AR</sub>   | T <sub>C</sub> = 25° C   | 80              | mJ        |
| E <sub>AS</sub>   | T <sub>C</sub> = 25° C   | 3.5             | J         |
| dv/dt             | I <sub>S</sub> ≤ I <sub>DM</sub> , di/dt ≤ 100 A/μs, V <sub>DD</sub> ≤ V <sub>DSS</sub> ,<br>T <sub>J</sub> ≤ 150° C, R <sub>G</sub> = 2 Ω | 20              | V/ns      |
| P <sub>D</sub>    | T <sub>C</sub> = 25° C   | 1040            | W         |
| T <sub>J</sub>    |  | -55 ... +150    | °C        |
| T <sub>JM</sub>   |  | 150             | °C        |
| T <sub>stg</sub>  |  | -55 ... +150    | °C        |
| T <sub>L</sub>    | 1.6 mm (0.062 in.) from case for 10 s  | 300             | °C        |
| T <sub>SOLD</sub> | Plastic body for 10 seconds  | 260             | °C        |
| F <sub>C</sub>    | Mounting force (PLUS247)   | 20..120/4.5..25 | N/lb      |
| M <sub>d</sub>    | Mounting torque (TO-264)   | 1.13/10         | Nm/lb.in. |
| Weight            | TO-264   | 10              | g         |
|                   | PLUS247  | 6               | g         |

TO-264 (IXFK)



PLUS247 (IXFX)



G = Gate      S = Source  
D = Drain      Tab = Collector

## Features

- † International standard package
- † Unclamped Inductive Switching (UIS) rated
- † Low package inductance
- easy to drive and to protect

## Advantages

- † Easy to mount
- † Space savings
- † High power density

| Symbol              | Test Conditions<br>(T <sub>J</sub> = 25° C unless otherwise specified)                 | Characteristic Values |      |               |
|---------------------|--|-----------------------|------|---------------|
|                     |  | Min.                  | Typ. | Max.          |
| BV <sub>DSS</sub>   | V <sub>GS</sub> = 0 V, I <sub>D</sub> = 500 μA   | 500                   |      | V             |
| V <sub>GS(th)</sub> | V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 8 mA                              | 3.0                   |      | 5.0 V         |
| I <sub>GSS</sub>    | V <sub>GS</sub> = ± 30 V <sub>DC</sub> , V <sub>DS</sub> = 0                           |                       |      | ± 200 nA      |
| I <sub>DSS</sub>    | V <sub>DS</sub> = V <sub>DSS</sub><br>V <sub>GS</sub> = 0 V<br>T <sub>J</sub> = 125° C |                       |      | 25 μA<br>2 mA |
| R <sub>DS(on)</sub> | V <sub>GS</sub> = 10 V, I <sub>D</sub> = 0.5 I <sub>D25</sub>                          |                       |      | 65 mΩ         |

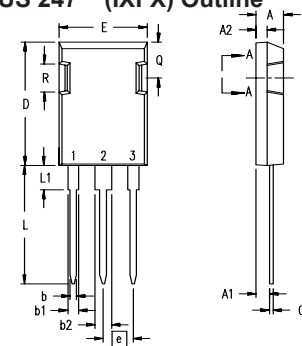
| Symbol       | Test Conditions   | Characteristic Values                                 |      |                        |
|--------------|---|---|------|------------------------|
|              |   | $(T_J = 25^\circ\text{C}$ unless otherwise specified) |      |                        |
|              |   | Min.  | Typ. | Max.                   |
| $g_{fs}$     | $V_{DS} = 20\text{ V}; I_D = 0.5 I_{D25}$ , Note 1  | 45  | 70   | S                      |
| $C_{iss}$    | $V_{GS} = 0\text{ V}, V_{DS} = 25\text{ V}, f = 1\text{ MHz}$                                   |   | 12.7 | nF                     |
| $C_{oss}$    |   |   | 1280 | pF                     |
| $C_{rss}$    |   |   | 120  | pF                     |
| $t_{d(on)}$  | $V_{GS} = 10\text{ V}, V_{DS} = 0.5 V_{DSS}, I_D = 0.5 I_{D25}$<br>$R_G = 1\ \Omega$ (External) |   | 25   | ns                     |
| $t_r$        |   |   | 27   | ns                     |
| $t_{d(off)}$ |   |   | 70   | ns                     |
| $t_f$        |   |   | 16   | ns                     |
| $Q_{g(on)}$  | $V_{GS} = 10\text{ V}, V_{DS} = 0.5 V_{DSS}, I_D = 0.5 I_{D25}$                                 |   | 197  | nC                     |
| $Q_{gs}$     |   |   | 70   | nC                     |
| $Q_{gd}$     |   |   | 64   | nC                     |
| $R_{thJC}$   |   |   |      | $0.12^\circ\text{C/W}$ |
| $R_{thCS}$   |   | 0.15  |      | $^\circ\text{C/W}$     |

| Symbol   | Test Conditions   | Characteristic Values                                 |      |        |
|----------|---|---|------|--------|
|          |   | $(T_J = 25^\circ\text{C}$ unless otherwise specified) |      |        |
|          |   | Min.  | Typ. | Max.   |
| $I_S$    | $V_{GS} = 0\text{ V}$   |   |      | 80 A   |
| $I_{SM}$ | Repetitive  |   |      | 200 A  |
| $V_{SD}$ | $I_F = I_S, V_{GS} = 0\text{ V}$  |   |      | 1.5 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  |        |
| $I_{RM}$ |   |   | 6    | A      |

**Notes:**

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

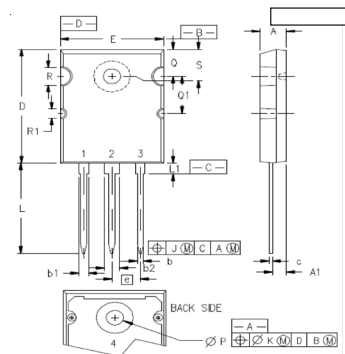
**PLUS 247™ (IXFX) Outline**



- Terminals: 1 - Gate  
2 - Drain (Collector)  
3 - Source (Emitter)  
4 - Drain (Collector)

| Dim.           | Millimeter |       | Inches   |       |
|----------------|------------|-------|----------|-------|
|                | Min.       | Max.  | Min.     | Max.  |
| A              | 4.83       | 5.21  | .190     | .205  |
| A <sub>1</sub> | 2.29       | 2.54  | .090     | .100  |
| A <sub>2</sub> | 1.91       | 2.16  | .075     | .085  |
| b              | 1.14       | 1.40  | .045     | .055  |
| b <sub>1</sub> | 1.91       | 2.13  | .075     | .084  |
| b <sub>2</sub> | 2.92       | 3.12  | .115     | .123  |
| C              | 0.61       | 0.80  | .024     | .031  |
| D              | 20.80      | 21.34 | .819     | .840  |
| E              | 15.75      | 16.13 | .620     | .635  |
| e              | 5.45 BSC   |       | .215 BSC |       |
| L              | 19.81      | 20.32 | .780     | .800  |
| L1             | 3.81       | 4.32  | .150     | .170  |
| Q              | 5.59       | 6.20  | .220     | 0.244 |
| R              | 4.32       | 4.83  | .170     | .190  |

**TO-264 (IXFK) Outline**



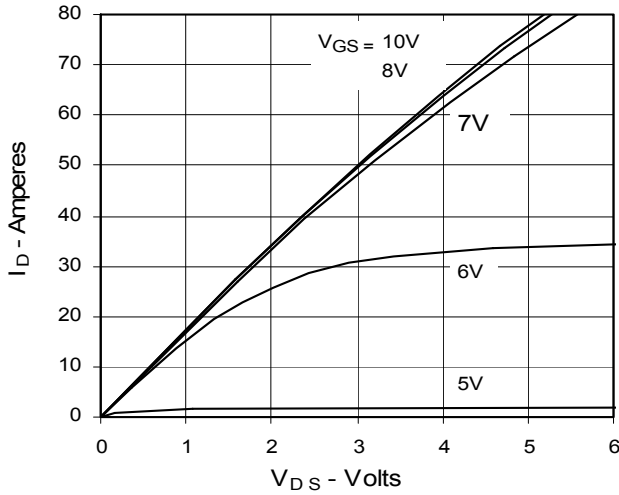
- 1 - GATE  
2, 4 - DRAIN (COLLECTOR)  
3 - SOURCE (EMITTER)

| SYM | INCHES  |       | MILLIMETERS |       |
|-----|---------|-------|-------------|-------|
|     | MIN     | MAX   | MIN         | MAX   |
| A   | .185    | .209  | 4.70        | 5.31  |
| A1  | .102    | .118  | 2.59        | 3.00  |
| b   | .037    | .055  | 0.94        | 1.40  |
| b1  | .087    | .102  | 2.21        | 2.59  |
| b2  | .110    | .126  | 2.79        | 3.20  |
| c   | .017    | .029  | 0.43        | 0.74  |
| D   | 1.007   | 1.047 | 25.58       | 26.59 |
| E   | .760    | .799  | 19.30       | 20.29 |
| e   | .215BSC |       | 5.46 BSC    |       |
| J   | .000    | .010  | 0.00        | 0.25  |
| K   | .000    | .010  | 0.00        | 0.25  |
| L   | .779    | .842  | 19.79       | 21.39 |
| L1  | .087    | .102  | 2.21        | 2.59  |
| ØP  | .122    | .138  | 3.10        | 3.51  |
| Q   | .240    | .256  | 6.10        | 6.50  |
| Q1  | .330    | .346  | 8.38        | 8.79  |
| ØR  | .155    | .187  | 3.94        | 4.75  |
| ØR1 | .085    | .093  | 2.16        | 2.36  |
| S   | .243    | .253  | 6.17        | 6.43  |

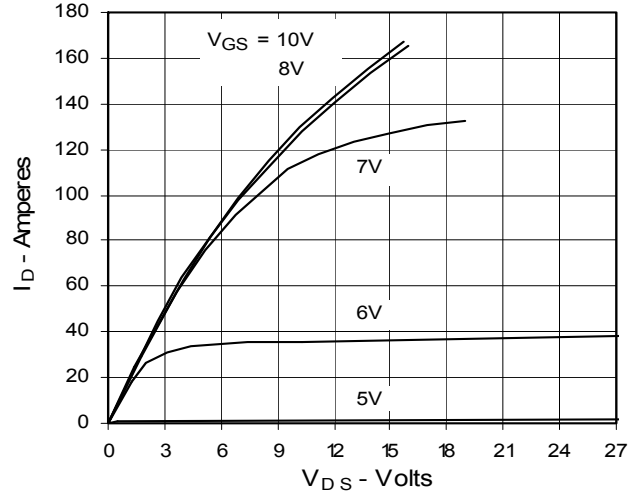
IXYS reserves the right to change limits, test conditions, and dimensions.

IXYS MOSFETs and IGBTs are covered by 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  
one or more of the following U.S. patents: 4,850,072 5,017,508 5,063,307 5,381,025 6,259,123 B1 6,534,343 6,710,405B2 6,759,692  
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

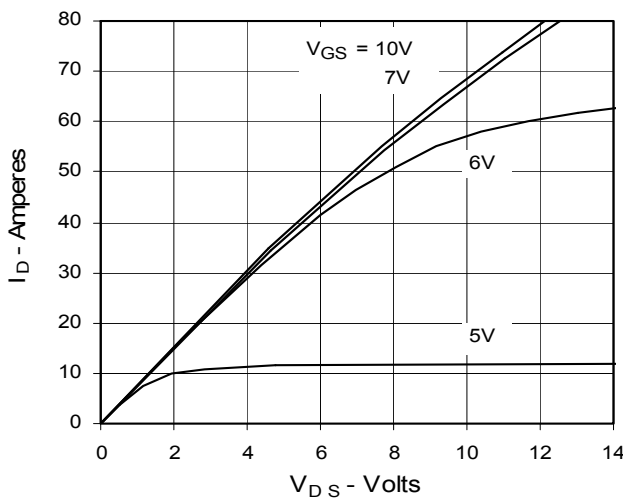
**Fig. 1. Output Characteristics**  
**@ 25°C**



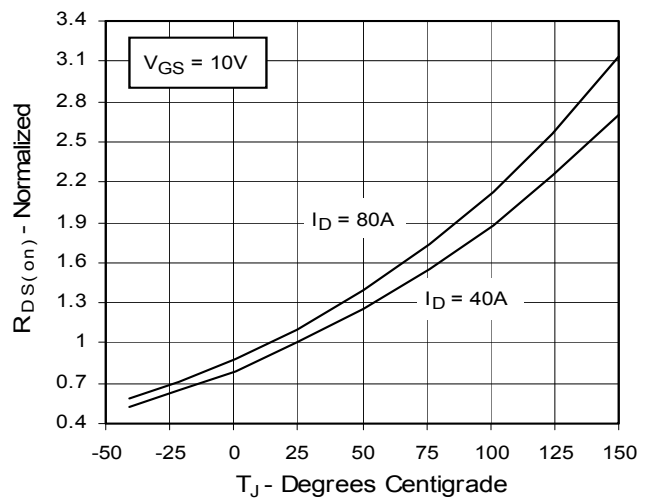
**Fig. 2. Extended Output Characteristics**  
**@ 25°C**



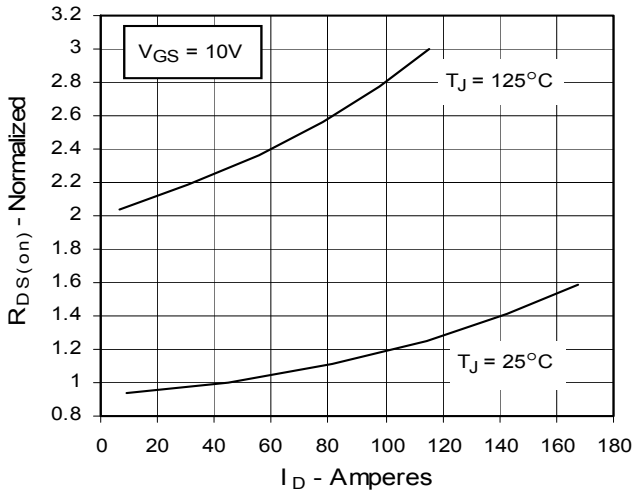
**Fig. 3. Output Characteristics**  
**@ 125°C**



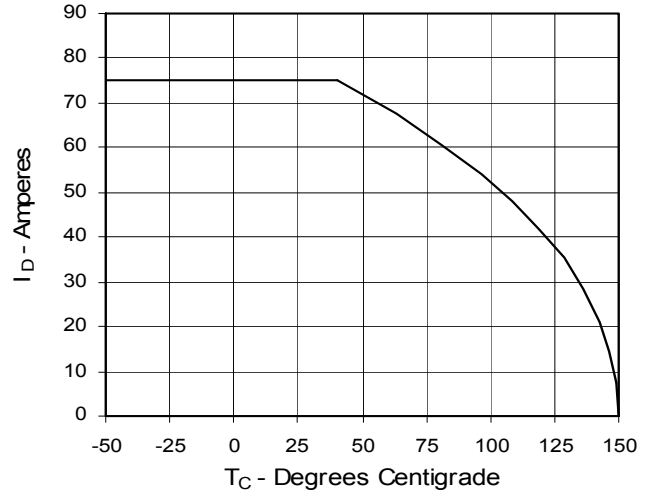
**Fig. 4.  $R_{DS(on)}$  Normalized to 0.5  $I_{D25}$  Value vs. Junction Temperature**



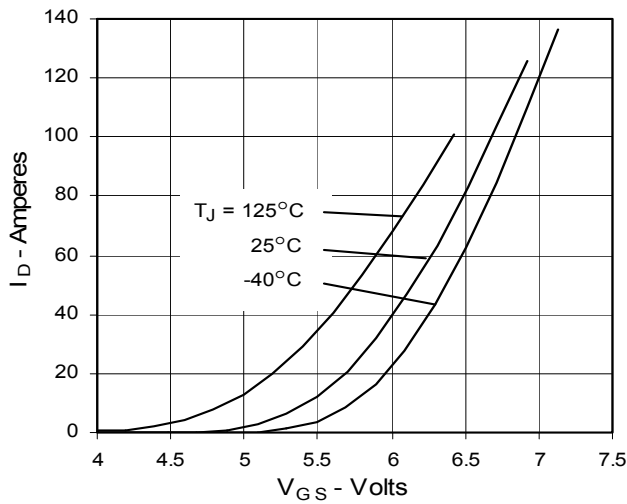
**Fig. 5.  $R_{DS(on)}$  Normalized to 0.5  $I_{D25}$  Value vs.  $I_D$**



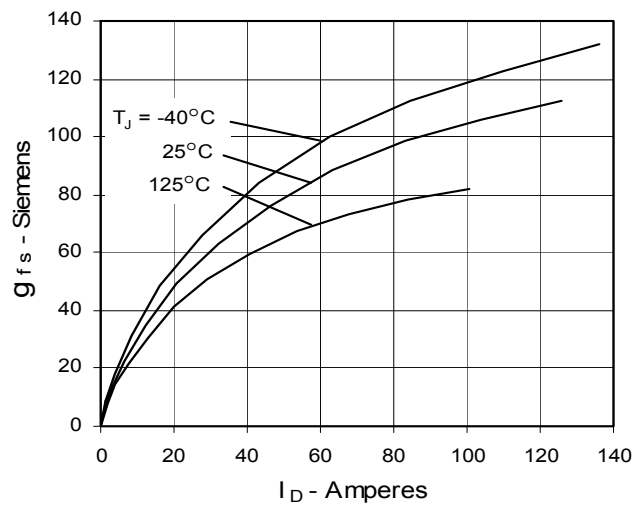
**Fig. 6. Drain Current vs. Case Temperature**



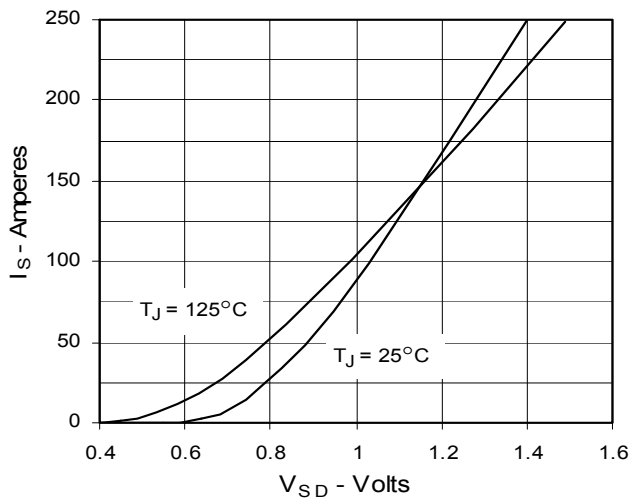
**Fig. 7. Input Admittance**



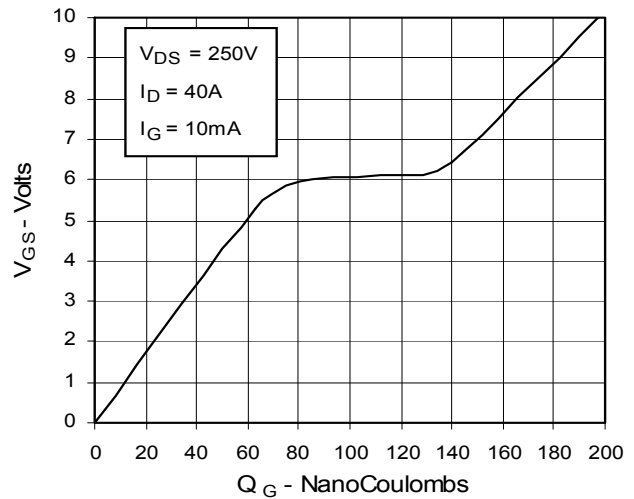
**Fig. 8. Transconductance**



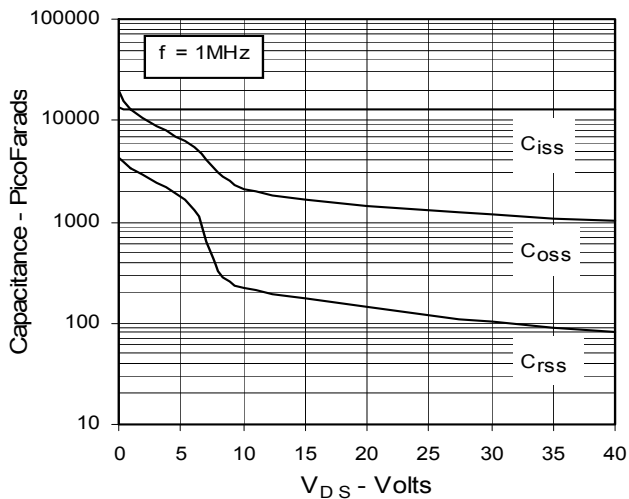
**Fig. 9. Source Current vs. Source-To-Drain Voltage**



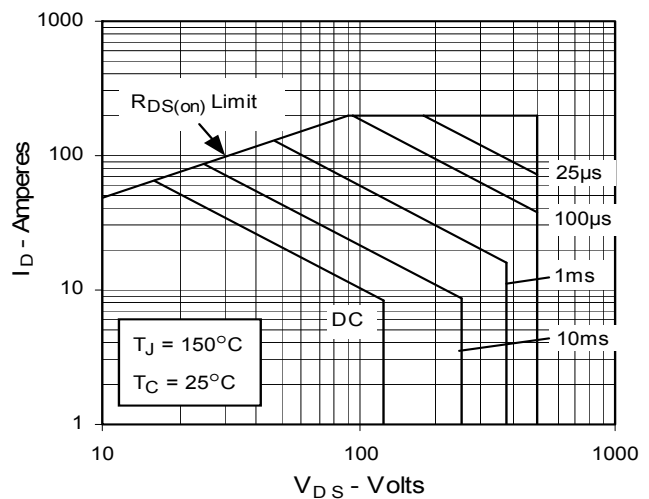
**Fig. 10. Gate Charge**



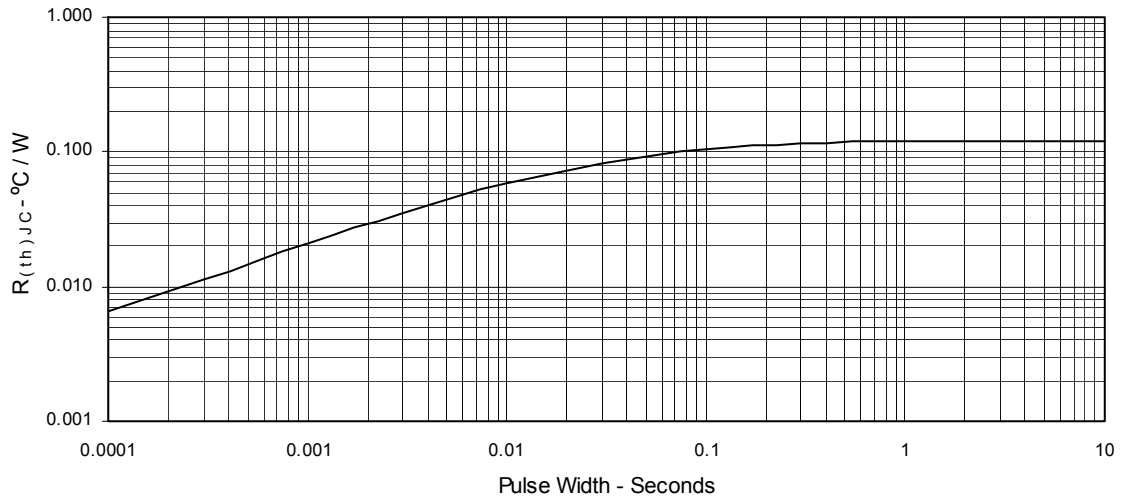
**Fig. 11. Capacitance**



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



**Fig. 13. Maximum Transient Thermal Resistance**





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