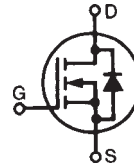


# PolarHT™ HiPerFET IXFK 140N20P

## Power MOSFET

N-Channel Enhancement Mode  
Avalanche Rated  
Fast Intrinsic Diode

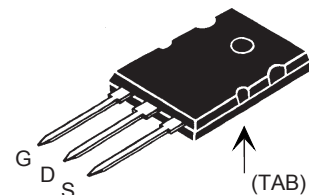
$$\begin{aligned} V_{DSS} &= 200 \text{ V} \\ I_{D25} &= 140 \text{ A} \\ R_{DS(on)} &\leq 18 \text{ m}\Omega \\ t_{rr} &\leq 200 \text{ ns} \end{aligned}$$



| Symbol       | Test Conditions                                                                                                                         | Maximum Ratings |                  |
|--------------|-----------------------------------------------------------------------------------------------------------------------------------------|-----------------|------------------|
| $V_{DSS}$    | $T_J = 25^\circ\text{C to } 175^\circ\text{C}$                                                                                          | 200             | V                |
| $V_{DGR}$    | $T_J = 25^\circ\text{C to } 175^\circ\text{C}; R_{GS} = 1 \text{ M}\Omega$                                                              | 200             | V                |
| $V_{GS}$     | Continuous                                                                                                                              | $\pm 20$        | V                |
| $V_{GSM}$    | Transient                                                                                                                               | $\pm 30$        | V                |
| $I_{D25}$    | $T_C = 25^\circ\text{C}$                                                                                                                | 140             | A                |
| $I_{D(RMS)}$ | External lead current limit                                                                                                             | 75              | A                |
| $I_{DM}$     | $T_C = 25^\circ\text{C}$ , pulse width limited by $T_{JM}$                                                                              | 280             | A                |
| $I_{AR}$     | $T_C = 25^\circ\text{C}$                                                                                                                | 60              | A                |
| $E_{AR}$     | $T_C = 25^\circ\text{C}$                                                                                                                | 100             | mJ               |
| $E_{AS}$     | $T_C = 25^\circ\text{C}$                                                                                                                | 4               | J                |
| $dv/dt$      | $I_S \leq I_{DM}$ , $di/dt \leq 100 \text{ A}/\mu\text{s}$ , $V_{DD} \leq V_{DSS}$ ,<br>$T_J \leq 150^\circ\text{C}$ , $R_G = 4 \Omega$ | 10              | V/ns             |
| $P_D$        | $T_C = 25^\circ\text{C}$                                                                                                                | 830             | W                |
| $T_J$        |                                                                                                                                         | -55 ... +175    | $^\circ\text{C}$ |
| $T_{JM}$     |                                                                                                                                         | 175             | $^\circ\text{C}$ |
| $T_{stg}$    |                                                                                                                                         | -55 ... +150    | $^\circ\text{C}$ |
| $T_L$        | 1.6 mm (0.062 in.) from case for 10 s                                                                                                   | 300             | $^\circ\text{C}$ |
| $T_{SOLD}$   | Plastic body for 10 s                                                                                                                   | 260             | $^\circ\text{C}$ |
| $M_d$        | Mounting torque                                                                                                                         | 1.13/10         | Nm/lb.in.        |
| Weight       |                                                                                                                                         | 10              | g                |

| Symbol       | Test Conditions<br>( $T_J = 25^\circ\text{C}$ , unless otherwise specified)                                                                                         | Characteristic Values |      |                                         |
|--------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|------|-----------------------------------------|
|              |                                                                                                                                                                     | Min.                  | Typ. | Max.                                    |
| $BV_{DSS}$   | $V_{GS} = 0 \text{ V}$ , $I_D = 250 \mu\text{A}$                                                                                                                    | 200                   |      | V                                       |
| $V_{GS(th)}$ | $V_{DS} = V_{GS}$ , $I_D = 4 \text{ mA}$                                                                                                                            | 2.5                   |      | 5.0 V                                   |
| $I_{GSS}$    | $V_{GS} = \pm 20 \text{ V}_{DC}$ , $V_{DS} = 0$                                                                                                                     |                       |      | $\pm 200 \text{ nA}$                    |
| $I_{DSS}$    | $V_{DS} = V_{DSS}$<br>$V_{GS} = 0 \text{ V}$<br>$T_J = 150^\circ\text{C}$                                                                                           |                       |      | 25 $\mu\text{A}$<br>250 $\mu\text{A}$   |
| $R_{DS(on)}$ | $V_{GS} = 10 \text{ V}$ , $I_D = 0.5 I_{D25}$<br>$V_{GS} = 15 \text{ V}$ , $I_D = 140 \text{ A}$<br>Pulse test, $t \leq 300 \mu\text{s}$ , duty cycle $d \leq 2 \%$ | 14                    |      | 18 $\text{m}\Omega$<br>$\text{m}\Omega$ |

TO-264 (IXFK)



G = Gate  
S = Source

D = Drain  
TAB = Drain

### Features

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

### Advantages

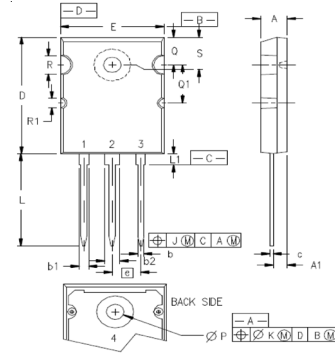
- Easy to mount
- Space savings
- High power density

| Symbol                    | Test Conditions                                                                                                             | 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> = 10 V; I <sub>D</sub> = 0.5 I <sub>D25</sub> , pulse test                                                  | 50                                                                            | 84        | S    |
| <b>C<sub>iss</sub></b>    | V <sub>GS</sub> = 0 V, V <sub>DS</sub> = 25 V, f = 1 MHz                                                                    |                                                                               | 7500      | pF   |
| <b>C<sub>oss</sub></b>    |                                                                                                                             |                                                                               | 1800      | pF   |
| <b>C<sub>rss</sub></b>    |                                                                                                                             |                                                                               | 280       | 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> = 60 A<br>R <sub>G</sub> = 3.3 Ω (External) |                                                                               | 30        | ns   |
| <b>t<sub>r</sub></b>      |                                                                                                                             |                                                                               | 35        | ns   |
| <b>t<sub>d(off)</sub></b> |                                                                                                                             |                                                                               | 150       | ns   |
| <b>t<sub>f</sub></b>      |                                                                                                                             |                                                                               | 90        | 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> = 0.5 I <sub>D25</sub>                      |                                                                               | 240       | nC   |
| <b>Q<sub>gs</sub></b>     |                                                                                                                             |                                                                               | 50        | nC   |
| <b>Q<sub>gd</sub></b>     |                                                                                                                             |                                                                               | 100       | nC   |
| <b>R<sub>thJC</sub></b>   |                                                                                                                             | 0.15                                                                          | 0.18° C/W |      |
| <b>R<sub>thCS</sub></b>   |                                                                                                                             |                                                                               | ° C/W     |      |

**Source-Drain Diode**

Characteristic Values  
(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                                                                                  |      |      | 140 A  |
| <b>I<sub>SM</sub></b> | Repetitive                                                                                             |      |      | 280 A  |
| <b>V<sub>SD</sub></b> | 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  |
| <b>t<sub>rr</sub></b> | I <sub>F</sub> = 25 A<br>-di/dt = 100 A/μs<br>V <sub>R</sub> = 100 V, V <sub>GS</sub> = 0 V            |      | 120  | 200 ns |
| <b>Q<sub>RM</sub></b> |                                                                                                        |      | 3.5  | μC     |

**TO-264 (IXFK) Outline**


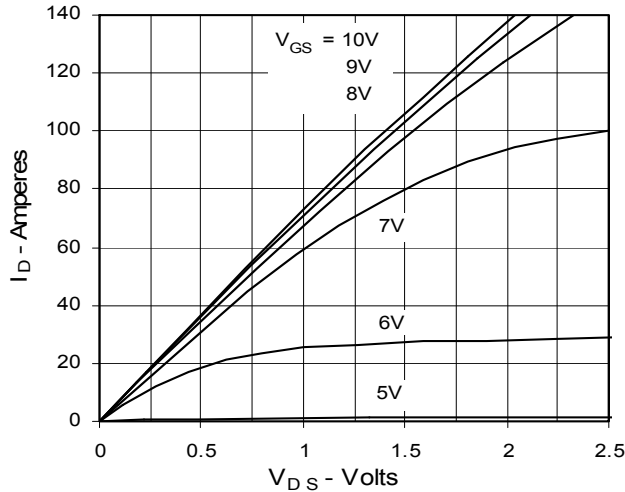
| SYM | INCHES   |       | MILLIMETERS |       |
|-----|----------|-------|-------------|-------|
|     | MIN      | MAX   | MIN         | MAX   |
| A   | .185     | .209  | 4.70        | 5.31  |
| A1  | .102     | .118  | 2.59        | 3.00  |
| b   | .037     | .055  | 0.94        | 1.40  |
| b1  | .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   | .215 BSC |       | 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.

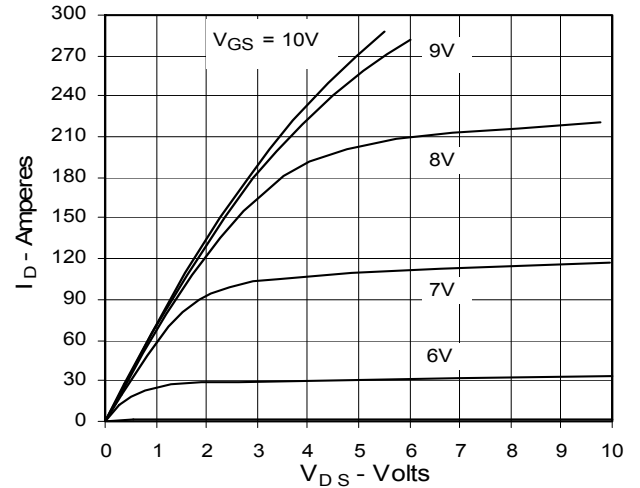
IXYS MOSFETs and IGBTs are covered by one or more of the following U.S. patents:

|           |           |           |           |              |              |              |              |
|-----------|-----------|-----------|-----------|--------------|--------------|--------------|--------------|
| 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    |
| 4,850,072 | 5,017,508 | 5,063,307 | 5,381,025 | 6,259,123 B1 | 6,534,343    | 6,710,405 B2 | 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 |

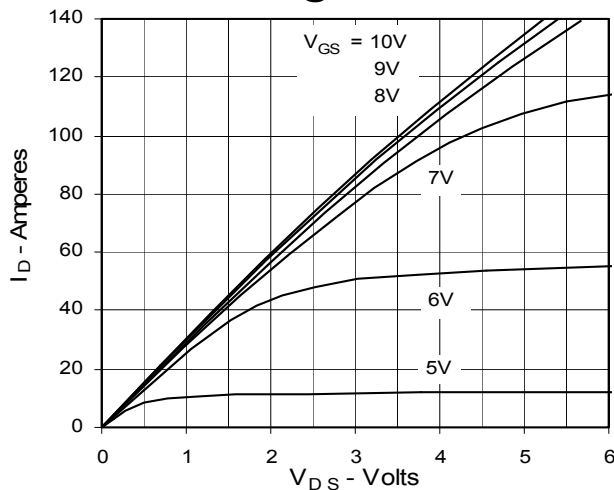
**Fig. 1. Output Characteristics  
@ 25°C**



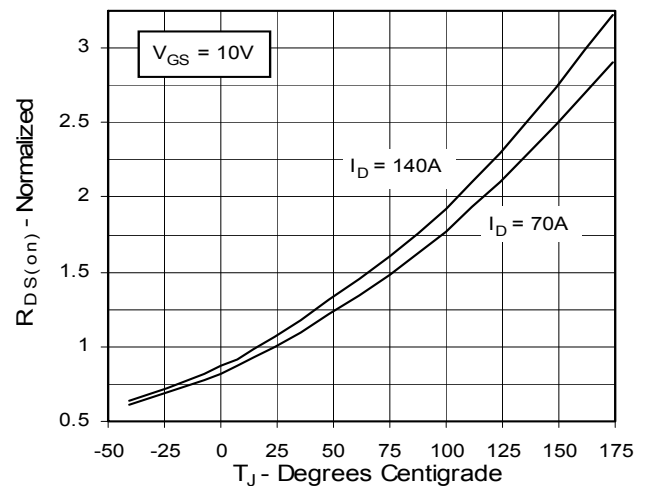
**Fig. 2. Extended Output Characteristics  
@ 25°C**



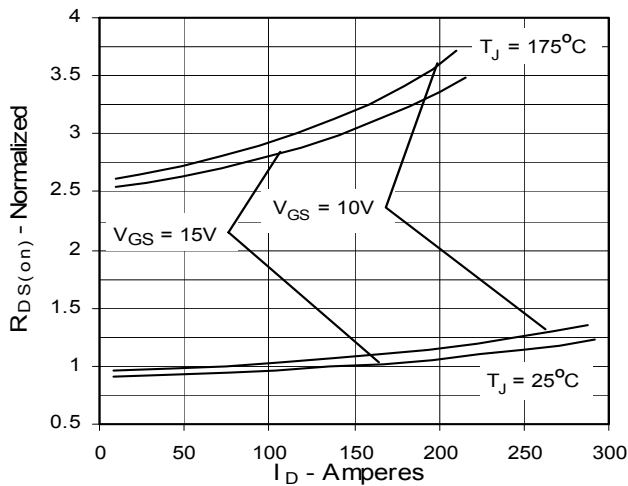
**Fig. 3. Output Characteristics  
@ 150°C**



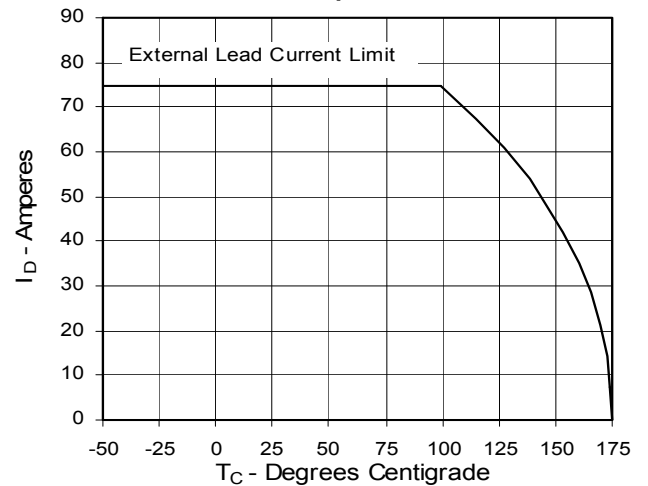
**Fig. 4.  $R_{DS(on)}$  Normalized to 0.5  $I_{D25}$   
Value vs. Junction Temperature**



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



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



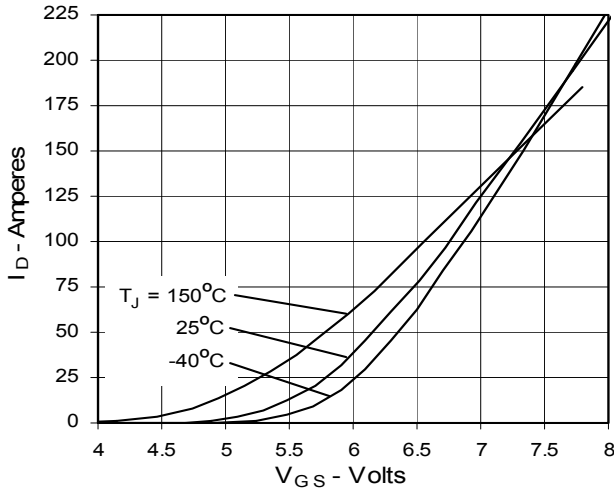
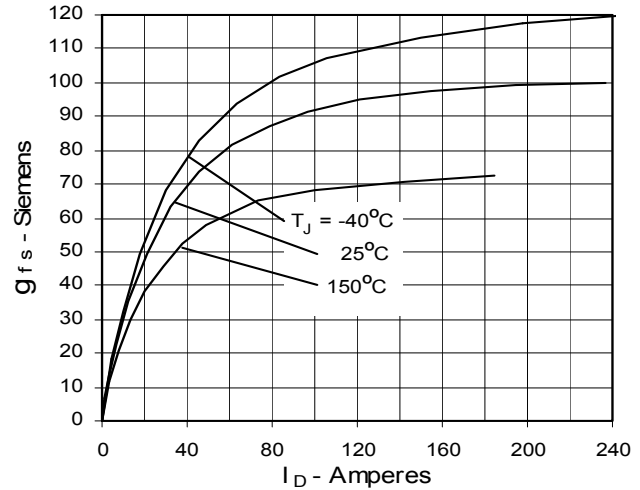
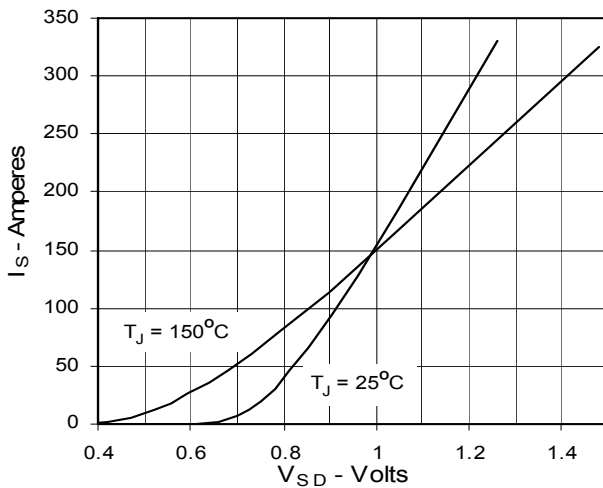
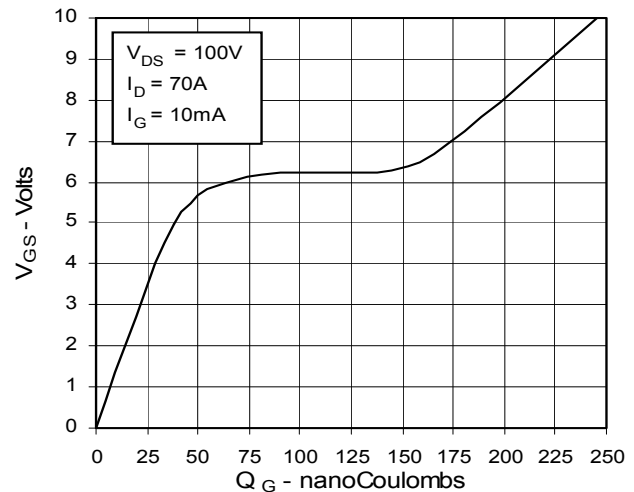
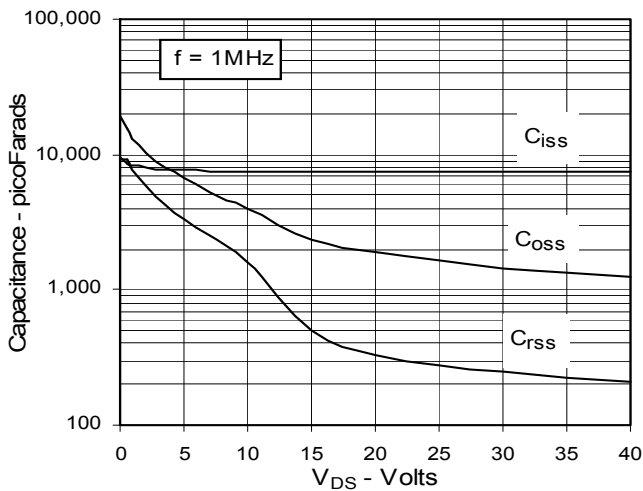
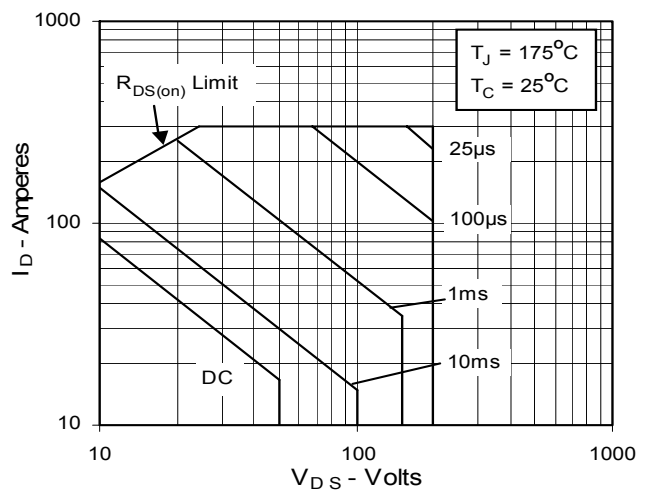
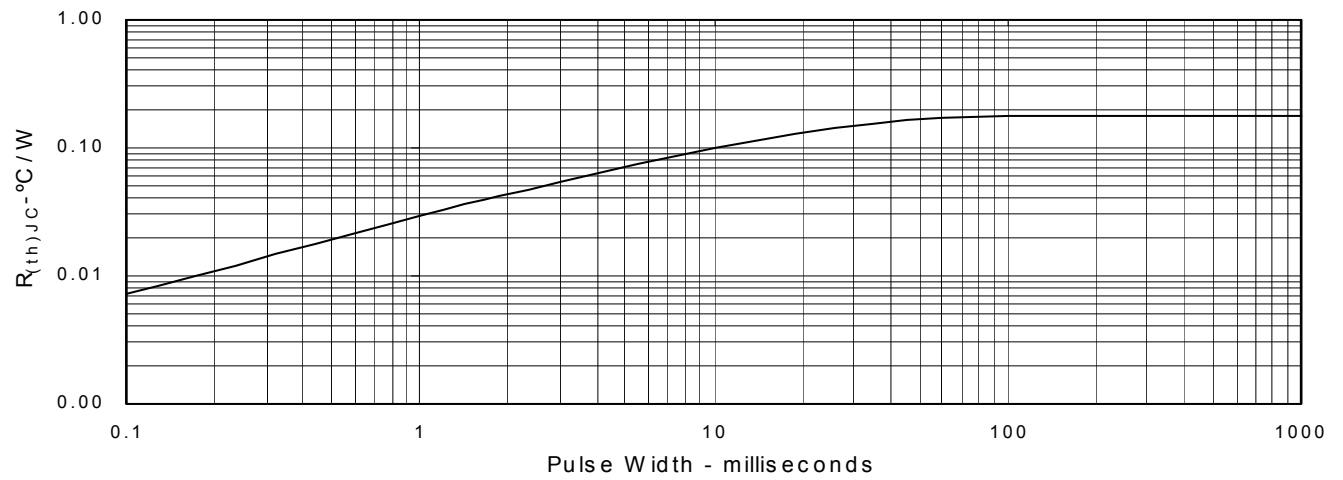
**Fig. 7. Input Admittance**

**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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