

# PolarHT™ Power MOSFET

## IXTK 140N20P

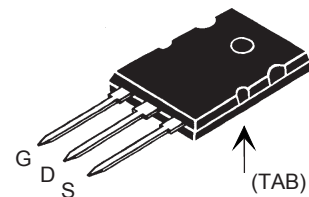
$$\begin{aligned} V_{DSS} &= 200 \text{ V} \\ I_{D25} &= 140 \text{ A} \\ R_{DS(on)} &\leq 18 \text{ m}\Omega \end{aligned}$$

N-Channel Enhancement Mode  
Avalanche Rated



| 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             |
| $P_D$        | $T_C = 25^\circ\text{C}$                                                                                                                | 800             | 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                |

TO-264 (IXTK)



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

### Features

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

### Advantages

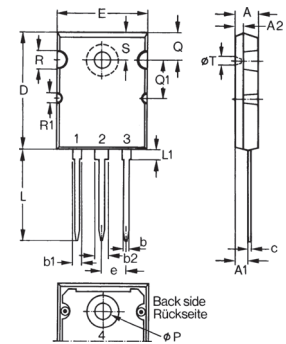
- Easy to mount
- Space savings
- High power density

| Symbol       | Test Conditions<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                    |
| $V_{GS(th)}$ | $V_{DS} = V_{GS}$ , $I_D = 500 \mu\text{A}$                                                                                                                         | 2.5                   |      | 5.0 V                |
| $I_{GSS}$    | $V_{GS} = \pm 20 \text{ V}_{DC}$ , $V_{DS} = 0$                                                                                                                     |                       |      | $\pm 200 \text{ nA}$ |
| $I_{DSS}$    | $V_{DS} = V_{DSS}$                                                                                                                                                  |                       |      | 25 $\mu\text{A}$     |
|              | $V_{GS} = 0 \text{ V}$ $T_J = 150^\circ\text{C}$                                                                                                                    |                       |      | 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 $\text{m}\Omega$  |

| 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                                               | 50                                                                                | 84   | S                      |
| $C_{iss}$    | $V_{GS} = 0\text{ V}$ , $V_{DS} = 25\text{ V}$ , $f = 1\text{ MHz}$                                     |                                                                                   | 7500 | pF                     |
| $C_{oss}$    |                                                                                                         |                                                                                   | 1800 | pF                     |
| $C_{rss}$    |                                                                                                         |                                                                                   | 280  | pF                     |
| $t_{d(on)}$  | $V_{GS} = 10\text{ V}$ , $V_{DS} = 0.5 V_{DSS}$ , $I_D = 60\text{ A}$<br>$R_G = 3.3\ \Omega$ (External) |                                                                                   | 30   | ns                     |
| $t_r$        |                                                                                                         |                                                                                   | 35   | ns                     |
| $t_{d(off)}$ |                                                                                                         |                                                                                   | 150  | ns                     |
| $t_f$        |                                                                                                         |                                                                                   | 90   | ns                     |
| $Q_{g(on)}$  | $V_{GS} = 10\text{ V}$ , $V_{DS} = 0.5 V_{DSS}$ , $I_D = 0.5 I_{D25}$                                   |                                                                                   | 240  | nC                     |
| $Q_{gs}$     |                                                                                                         |                                                                                   | 50   | nC                     |
| $Q_{gd}$     |                                                                                                         |                                                                                   | 100  | nC                     |
| $R_{thJC}$   |                                                                                                         |                                                                                   | 0.15 | $0.18^\circ\text{C/W}$ |
| $R_{thCK}$   |                                                                                                         |                                                                                   |      | $^\circ\text{C/W}$     |

| Symbol   | Test Conditions                                                                                           | Characteristic Values<br>( $T_J = 25^\circ\text{C}$ , unless otherwise specified) |      |               |
|----------|-----------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------|---------------|
|          |                                                                                                           | Min.                                                                              | Typ. | Max.          |
| $I_S$    | $V_{GS} = 0\text{ V}$                                                                                     |                                                                                   |      | 140 A         |
| $I_{SM}$ | Repetitive                                                                                                |                                                                                   |      | 280 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         |
| $t_{rr}$ | $I_F = 25\text{ A}$ , $-di/dt = 100\text{ A}/\mu\text{s}$<br>$V_R = 100\text{ V}$ , $V_{GS} = 0\text{ V}$ |                                                                                   | 180  | ns            |
| $Q_{RM}$ |                                                                                                           |                                                                                   | 3.5  | $\mu\text{C}$ |

TO-264 (IXTK) Outline

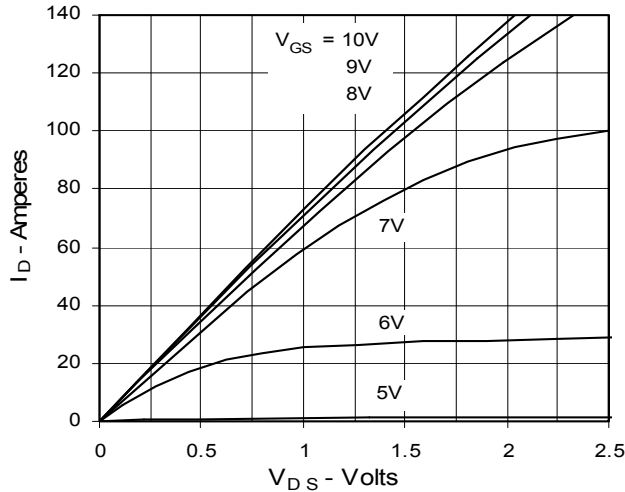


| Dim. | Millimeter<br>Min. | Max.  | Inches<br>Min. | Max.  |
|------|--------------------|-------|----------------|-------|
| A    | 4.82               | 5.13  | .190           | .202  |
| A1   | 2.54               | 2.89  | .100           | .114  |
| A2   | 2.00               | 2.10  | .079           | .083  |
| b    | 1.12               | 1.42  | .044           | .056  |
| b1   | 2.39               | 2.69  | .094           | .106  |
| b2   | 2.90               | 3.09  | .114           | .122  |
| c    | 0.53               | 0.83  | .021           | .033  |
| D    | 25.91              | 26.16 | 1.020          | 1.030 |
| E    | 19.81              | 19.96 | .780           | .786  |
| e    | 5.46 BSC           |       | .215 BSC       |       |
| J    | 0.00               | 0.25  | .000           | .010  |
| K    | 0.00               | 0.25  | .000           | .010  |
| L    | 20.32              | 20.83 | .800           | .820  |
| L1   | 2.29               | 2.59  | .090           | .102  |
| P    | 3.17               | 3.66  | .125           | .144  |
| Q    | 6.07               | 6.27  | .239           | .247  |
| Q1   | 8.38               | 8.69  | .330           | .342  |
| R    | 3.81               | 4.32  | .150           | .170  |
| R1   | 1.78               | 2.29  | .070           | .090  |
| S    | 6.04               | 6.30  | .238           | .248  |
| T    | 1.57               | 1.83  | .062           | .072  |

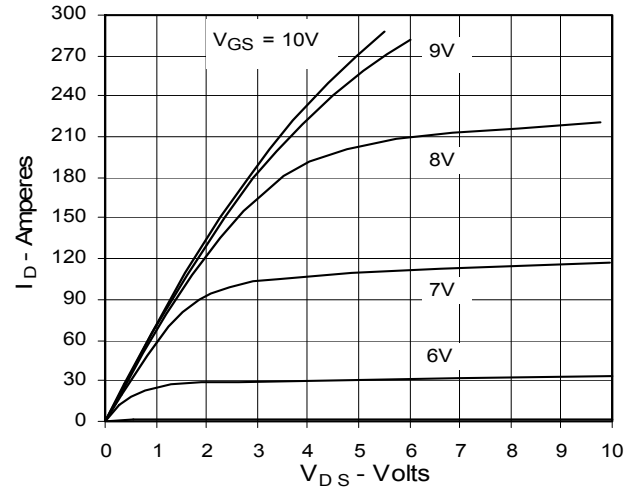
IXYS reserves the right to change limits, test conditions, and dimensions.

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  
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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

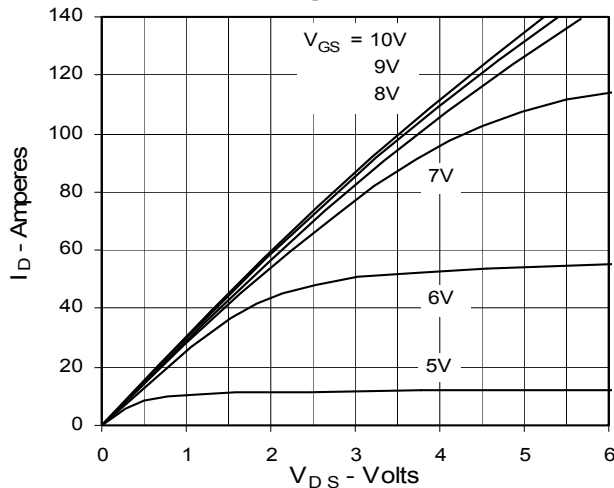
**Fig. 1. Output Characteristics  
@ 25°C**



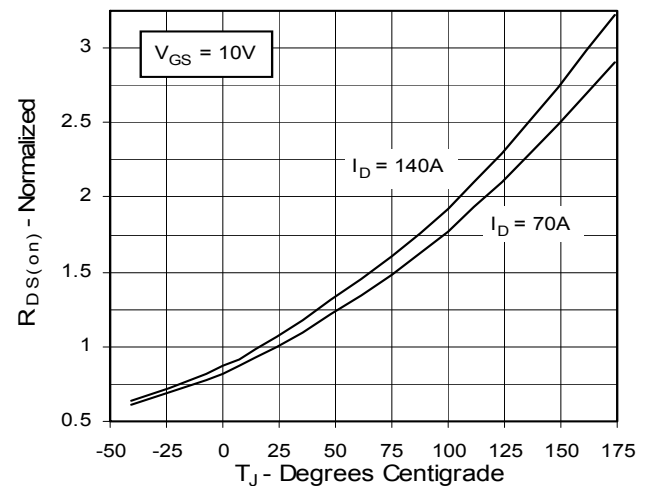
**Fig. 2. Extended Output Characteristics  
@ 25°C**



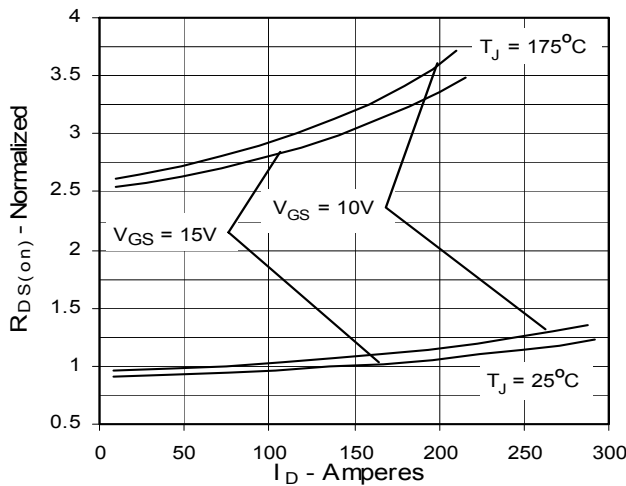
**Fig. 3. Output Characteristics  
@ 150°C**



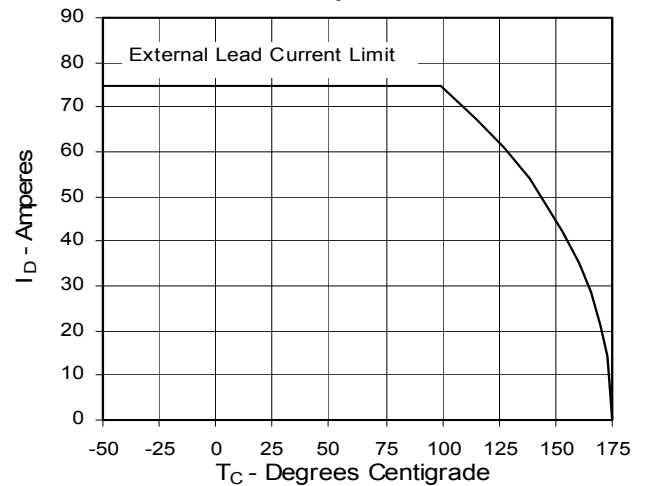
**Fig. 4.  $R_{DS(on)}$  Normalized to 0.5  $I_{D25}$   
Value vs. Junction Temperature**



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



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



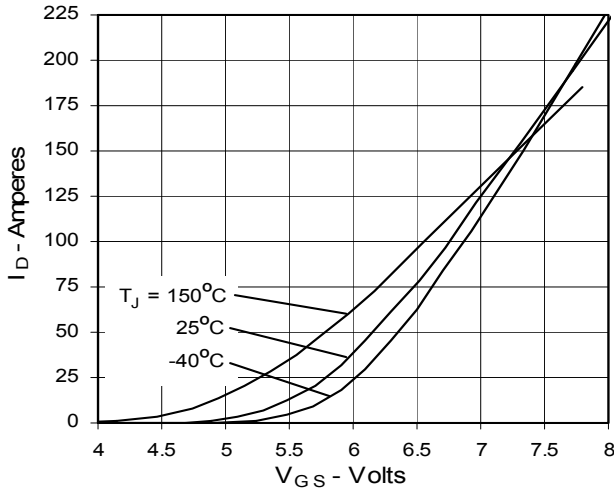
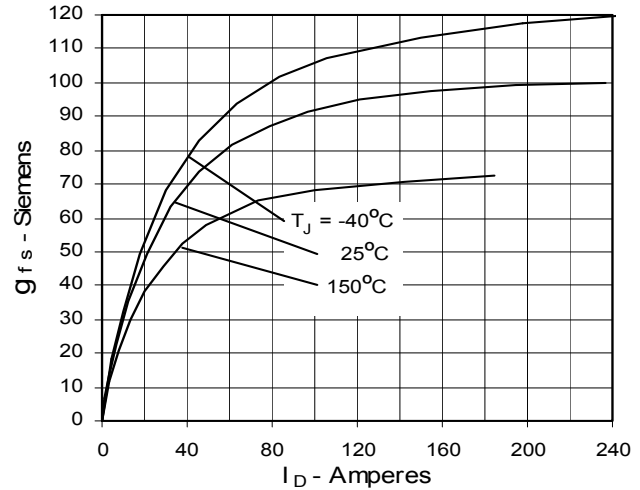
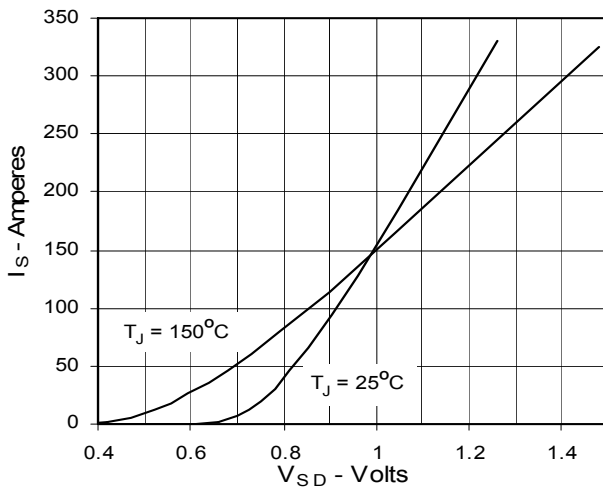
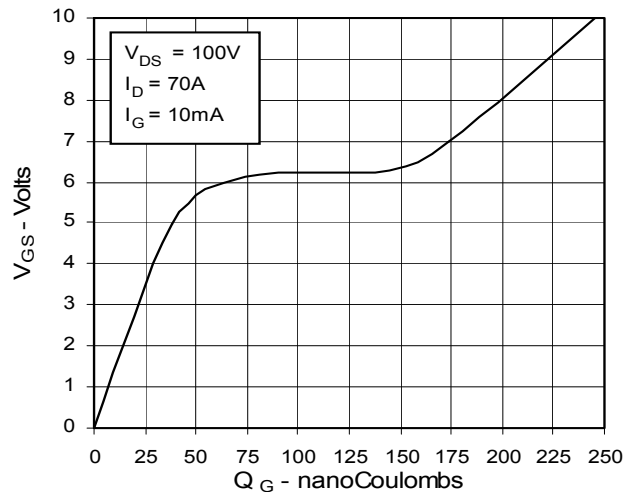
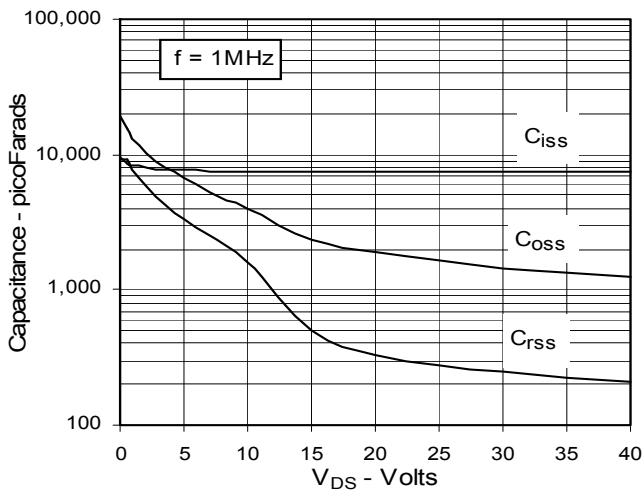
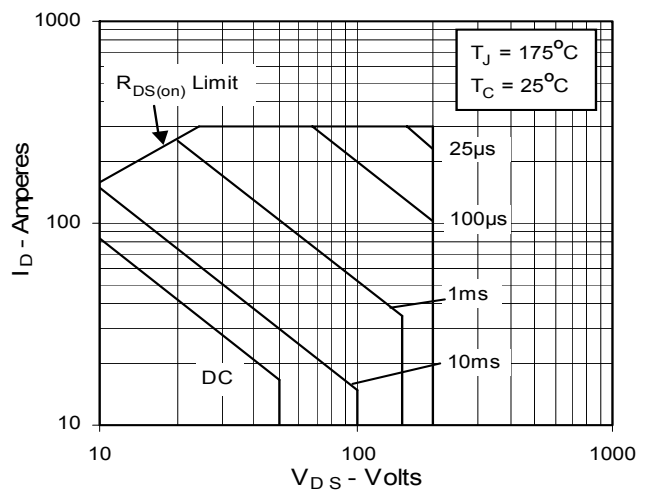
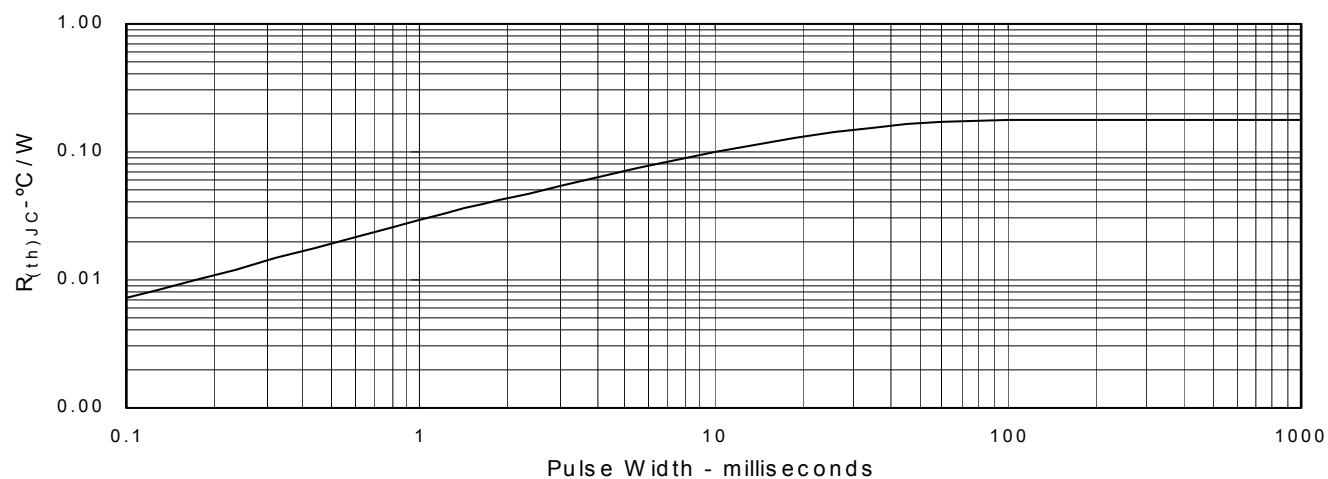
**Fig. 7. Input Admittance**

**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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