

# PolarHV™ HiPerFET

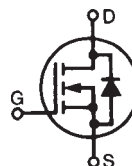
## Power MOSFET

### ISOPLUS247™

(Electrically Isolated Back Surface)

N-Channel Enhancement Mode  
Avalanche Rated  
Fast Intrinsic Diode

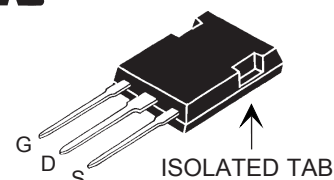
IXFR 180N15P



$$\begin{aligned} V_{DSS} &= 150 \text{ V} \\ I_{D25} &= 100 \text{ A} \\ R_{DS(on)} &\leq 13 \text{ m}\Omega \\ t_{rr} &\leq 200 \text{ ns} \end{aligned}$$

| Symbol       | Test Conditions                                                                                                                         | Maximum Ratings   |                  |
|--------------|-----------------------------------------------------------------------------------------------------------------------------------------|-------------------|------------------|
| $V_{DSS}$    | $T_J = 25^\circ\text{C}$ to $175^\circ\text{C}$                                                                                         | 150               | V                |
| $V_{DGR}$    | $T_J = 25^\circ\text{C}$ to $175^\circ\text{C}$ ; $R_{GS} = 1 \text{ M}\Omega$                                                          | 150               | V                |
| $V_{GSS}$    | Continuous                                                                                                                              | $\pm 20$          | V                |
| $V_{GSM}$    | Transient                                                                                                                               | $\pm 30$          | V                |
| $I_{D25}$    | $T_C = 25^\circ\text{C}$                                                                                                                | 100               | A                |
| $I_{D(RMS)}$ | External Lead current limit                                                                                                             | 75                | A                |
| $I_{DM}$     | $T_C = 25^\circ\text{C}$ , pulse width limited by $T_{JM}$                                                                              | 380               | 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             |
| $P_D$        | $T_C = 25^\circ\text{C}$                                                                                                                | 300               | 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               | $^\circ\text{C}$ |
| $V_{ISOL}$   | 50/60 Hz, RMS, 1 minute                                                                                                                 | 2500              | V~               |
| $F_d$        | Mounting force                                                                                                                          | 20..120 / 4.5..26 | N/lb             |
| Weight       |                                                                                                                                         | 5                 | g                |

ISOPLUS247 (IXFR)  
E153432



G = Gate  
S = Source  
D = Drain

#### Features

- International standard isolated package
- UL recognized package
- Silicon chip on Direct-Copper-Bond substrate
  - High power dissipation
  - Isolated mounting surface
  - 2500V electrical isolation
- Unclamped Inductive Switching (UIS) rated
- Low package inductance
  - easy to drive and to protect
- Fast intrinsic diode

#### Advantages

- Easy to mount
- Space savings
- High power density

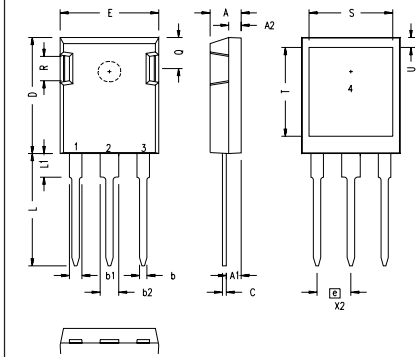
| Symbol       | Test Conditions<br>( $T_J = 25^\circ\text{C}$ , unless otherwise specified) | Characteristic Values |      |                            |
|--------------|-----------------------------------------------------------------------------|-----------------------|------|----------------------------|
|              |                                                                             | Min.                  | Typ. | Max.                       |
| $V_{DSS}$    | $V_{GS} = 0 \text{ V}$ , $I_D = 250 \mu\text{A}$                            | 150                   |      | V                          |
| $V_{GS(th)}$ | $V_{DS} = V_{GS}$ , $I_D = 4 \text{ mA}$                                    | 2.5                   |      | 5.0 V                      |
| $I_{GSS}$    | $V_{GS} = \pm 20 \text{ V}_{DC}$ , $V_{DS} = 0$                             |                       |      | $\pm 100 \text{ nA}$       |
| $I_{DSS}$    | $V_{DS} = V_{DSS}$ , $V_{GS} = 0 \text{ V}$<br>$T_J = 150^\circ\text{C}$    |                       |      | 25 $\mu\text{A}$<br>1.5 mA |
| $R_{DS(on)}$ | $V_{GS} = 10 \text{ V}$ , $I_D = I_T$ , Note 1                              |                       |      | 13 m $\Omega$              |

| Symbol       | Test Conditions                                                                                   | Characteristic Values<br>( $T_J = 25^\circ\text{C}$ , unless otherwise specified) |      |                         |
|--------------|---------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------|-------------------------|
|              |                                                                                                   | Min.                                                                              | Typ. | Max.                    |
| $g_{fs}$     | $V_{DS} = 10\text{ V}; I_D = I_T$ , Notes 1, 2                                                    | 55                                                                                | 86   | S                       |
| $C_{iss}$    | $V_{GS} = 0\text{ V}, V_{DS} = 25\text{ V}, f = 1\text{ MHz}$                                     |                                                                                   | 7000 | pF                      |
| $C_{oss}$    |                                                                                                   |                                                                                   | 2250 | pF                      |
| $C_{rss}$    |                                                                                                   |                                                                                   | 515  | 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                      |
| $t_r$        |                                                                                                   |                                                                                   | 32   | ns                      |
| $t_{d(off)}$ |                                                                                                   |                                                                                   | 150  | ns                      |
| $t_f$        |                                                                                                   |                                                                                   | 36   | ns                      |
| $Q_{g(on)}$  | $V_{GS} = 10\text{ V}, V_{DS} = 0.5 V_{DSS}, I_D = I_T$                                           |                                                                                   | 240  | nC                      |
| $Q_{gs}$     |                                                                                                   |                                                                                   | 55   | nC                      |
| $Q_{gd}$     |                                                                                                   |                                                                                   | 140  | nC                      |
| $R_{thJC}$   |                                                                                                   | 0.15                                                                              |      | $0.5\ ^\circ\text{C/W}$ |
| $R_{thCS}$   |                                                                                                   |                                                                                   |      | $^\circ\text{C/W}$      |

| Source-Drain Diode |                                                                                                     | Characteristic Values<br>( $T_J = 25^\circ\text{C}$ , unless otherwise specified) |      |               |
|--------------------|-----------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------|---------------|
| Symbol             | Test Conditions                                                                                     | min.                                                                              | typ. | max.          |
| $I_S$              | $V_{GS} = 0\text{ V}$                                                                               |                                                                                   |      | 180 A         |
| $I_{SM}$           | Repetitive                                                                                          |                                                                                   |      | 380 A         |
| $V_{SD}$           | $I_F = I_S, V_{GS} = 0\text{ V}$ , Note 1                                                           |                                                                                   |      | 1.5 V         |
| $t_{rr}$           | $I_F = 25\text{ A}, -di/dt = 100\text{ A}/\mu\text{s}$<br>$V_R = 100\text{ V}, V_{GS} = 0\text{ V}$ |                                                                                   | 0.6  | 200 ns        |
| $Q_{RM}$           |                                                                                                     |                                                                                   |      | $\mu\text{C}$ |
| $I_{RM}$           |                                                                                                     |                                                                                   |      | A             |

**Notes:**

- Pulse test,  $t \leq 300\ \mu\text{s}$ , duty cycle  $d \leq 2\%$ ;
- Test current  $I_T = 90\text{ A}$ .

**ISOPLUS247 Outline**


| SYM | INCHES   |      | MILLIMETERS |       |
|-----|----------|------|-------------|-------|
|     | MIN      | MAX  | MIN         | MAX   |
| A   | .190     | .205 | 4.83        | 5.21  |
| A1  | .090     | .100 | 2.29        | 2.54  |
| A2  | .075     | .085 | 1.91        | 2.16  |
| b   | .045     | .055 | 1.14        | 1.40  |
| b1  | .075     | .084 | 1.91        | 2.13  |
| b2  | .115     | .123 | 2.92        | 3.12  |
| C   | .024     | .031 | 0.61        | 0.80  |
| D   | .819     | .840 | 20.80       | 21.34 |
| E   | .620     | .635 | 15.75       | 16.13 |
| e   | .215 BSC |      | 5.45 BSC    |       |
| L   | .780     | .800 | 19.81       | 20.32 |
| L1  | .150     | .170 | 3.81        | 4.32  |
| Q   | .220     | .244 | 5.59        | 6.20  |
| R   | .170     | .190 | 4.32        | 4.83  |
| S   | .520     | .540 | 13.21       | 13.72 |
| T   | .620     | .640 | 15.75       | 16.26 |
| U   | .065     | .080 | 1.65        | 2.03  |

- 1 - GATE
- 2 - DRAIN (COLLECTOR)
- 3 - SOURCE (EMITTER)
- 4 - NO CONNECTION

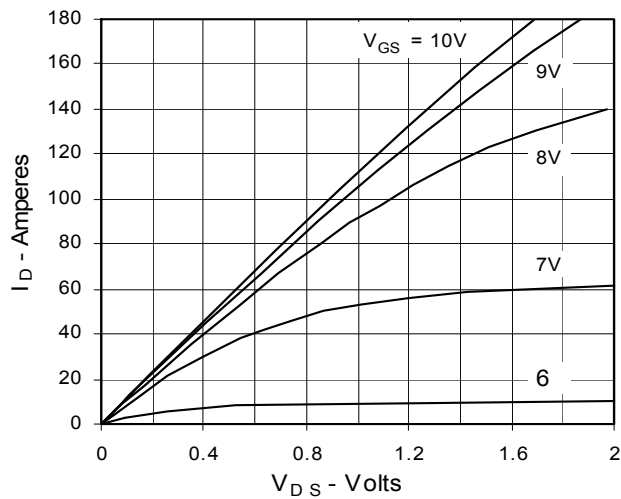
NOTE: This drawing will meet all dimensions requirement of JEDEC outline TO-247AD except screw hole.

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

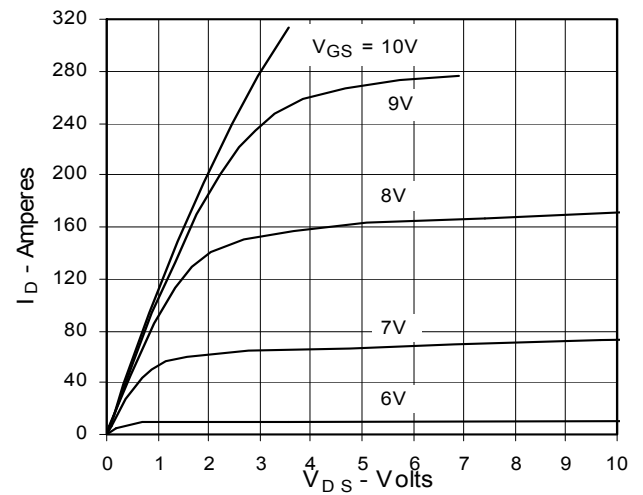
IXYS MOSFETs and IGBTs are covered by one or more of the following U.S. patents:

|           |           |           |           |              |              |              |              |
|-----------|-----------|-----------|-----------|--------------|--------------|--------------|--------------|
| 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 |

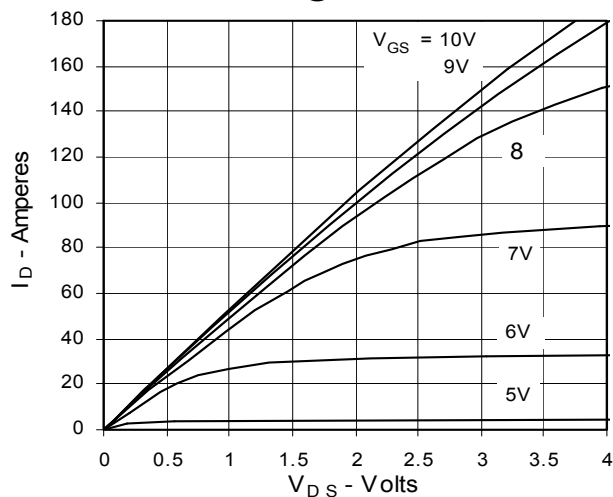
**Fig. 1. Output Characteristics  
@ 25°C**



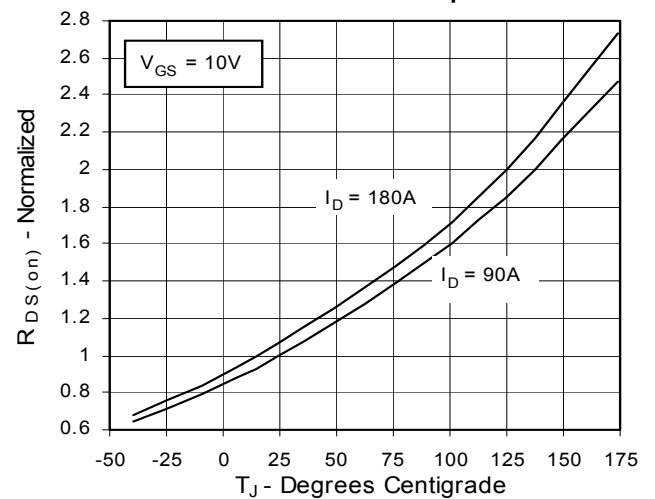
**Fig. 2. Extended Output Characteristics  
@ 25°C**



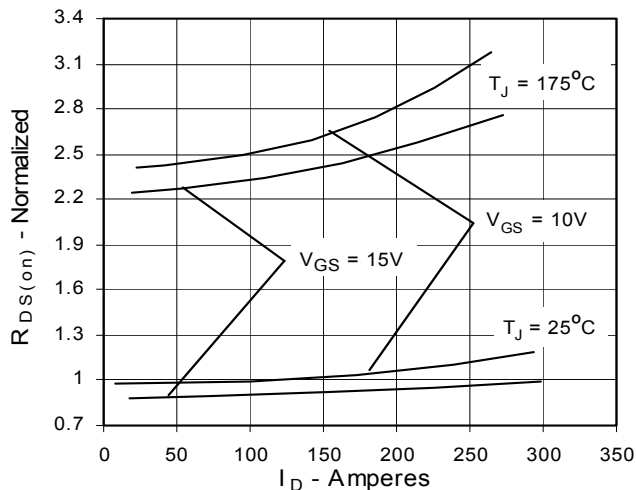
**Fig. 3. Output Characteristics  
@ 150°C**



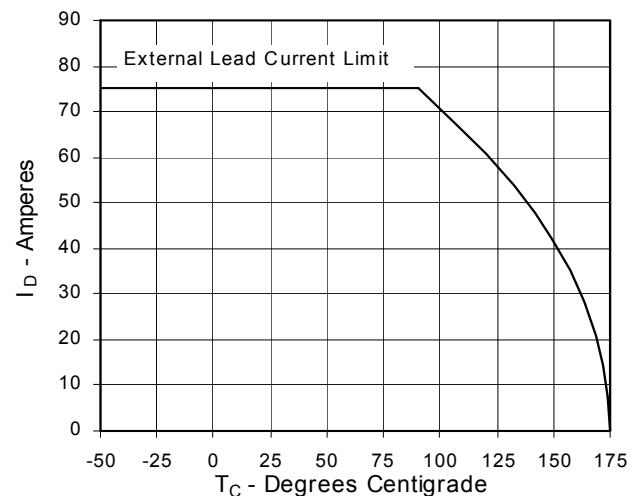
**Fig. 4.  $R_{DS(on)}$  Normalized to  $I_D = 90A$   
Value vs. Junction Temperature**



**Fig. 5.  $R_{DS(on)}$  Normalized to  $I_D = 90A$   
Value vs. Drain Current**



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



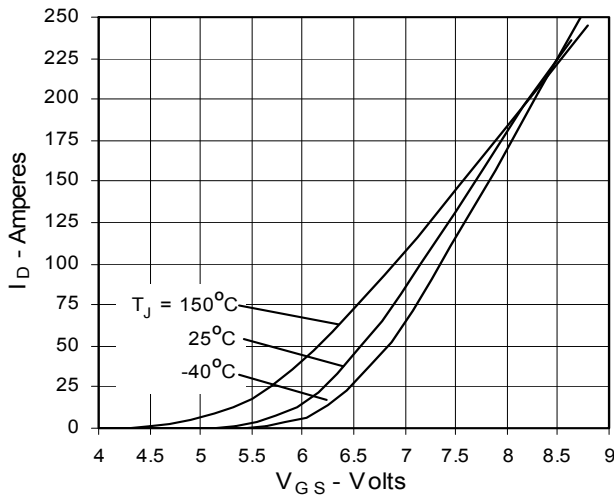
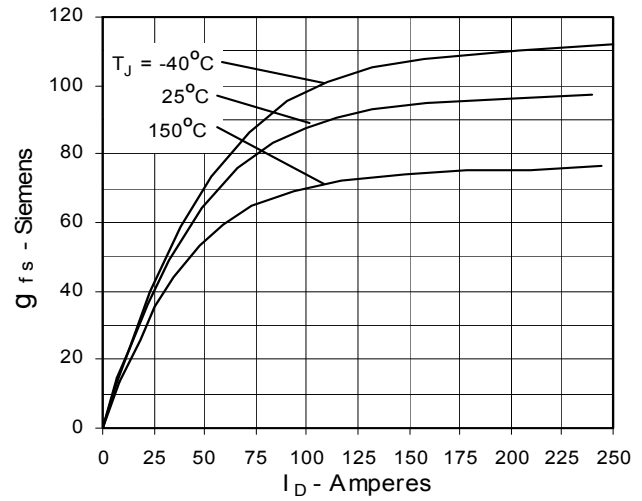
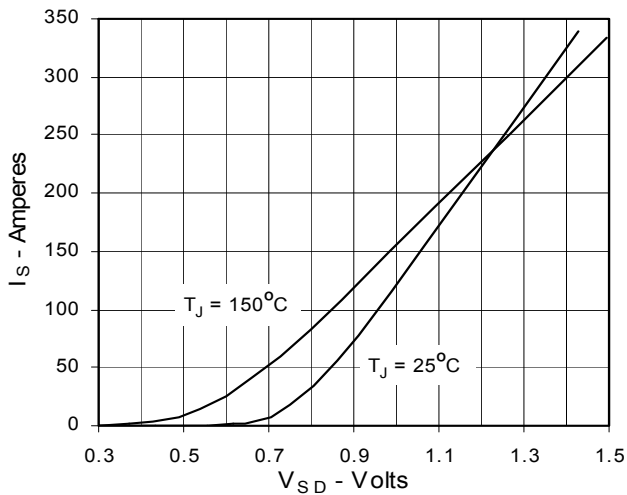
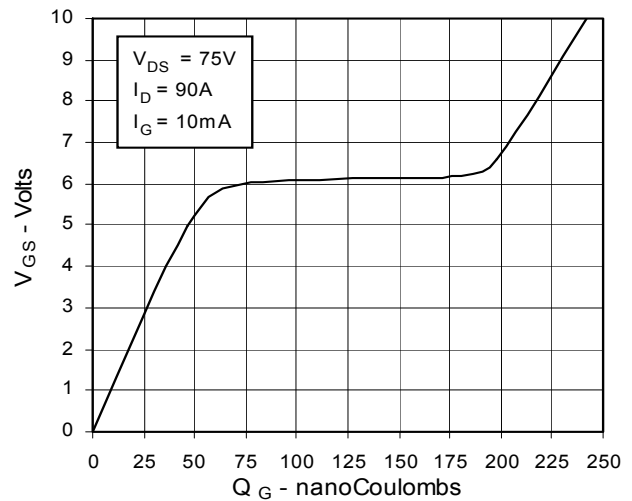
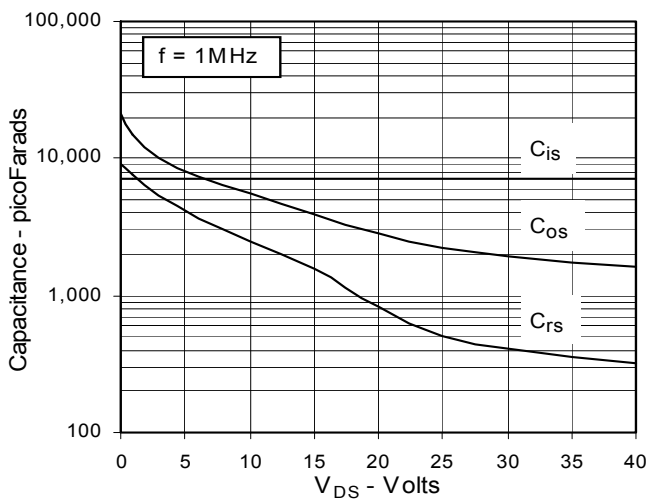
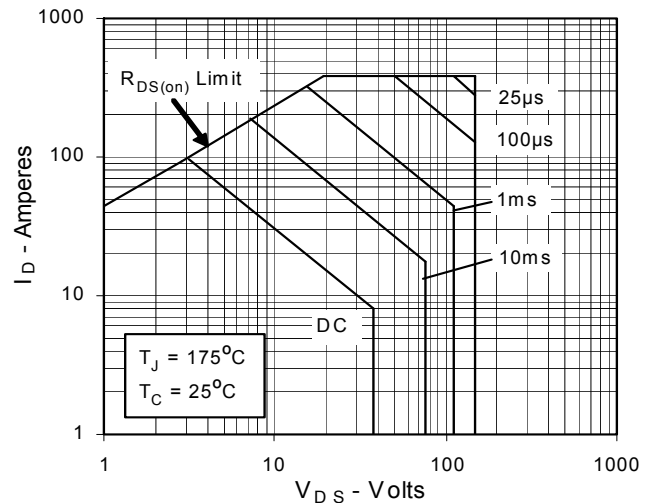
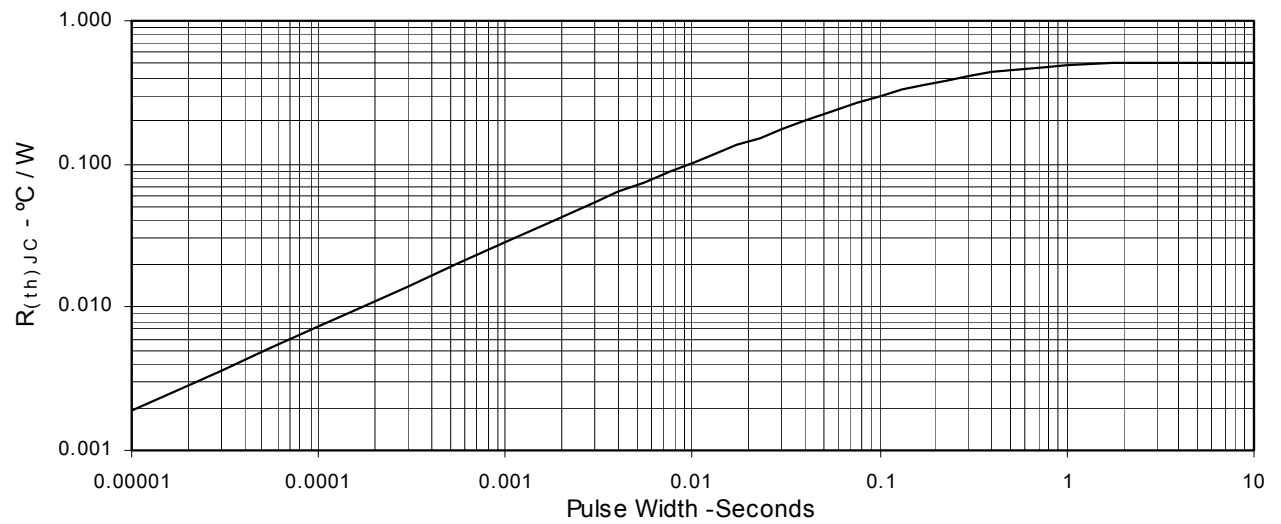
**Fig. 7. Input Admittance**

**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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