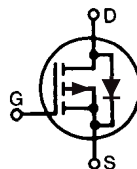


## PolarP™ Power MOSFET

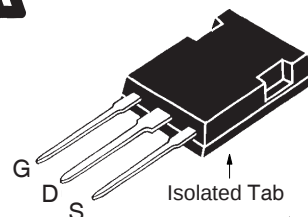
## IXTR40P50P

$$\begin{aligned} V_{DSS} &= -500V \\ I_{D25} &= -22A \\ R_{DS(on)} &\leq 260m\Omega \end{aligned}$$

P-Channel Enhancement Mode  
Avalanche Rated



ISOPLUS247  
E153432



G = Gate      D = Drain  
S = Source

| Symbol     | Test Conditions                                                          | Maximum Ratings |                  |
|------------|--------------------------------------------------------------------------|-----------------|------------------|
| $V_{DSS}$  | $T_J = 25^\circ\text{C}$ to $150^\circ\text{C}$                          | - 500           | V                |
| $V_{DGR}$  | $T_J = 25^\circ\text{C}$ to $150^\circ\text{C}$ , $R_{GS} = 1M\Omega$    | - 500           | V                |
| $V_{GSS}$  | Continuous                                                               | $\pm 20$        | V                |
| $V_{GSM}$  | Transient                                                                | $\pm 30$        | V                |
| $I_{D25}$  | $T_C = 25^\circ\text{C}$                                                 | - 22            | A                |
| $I_{DM}$   | $T_C = 25^\circ\text{C}$ , Pulse Width Limited by $T_{JM}$               | - 120           | A                |
| $I_A$      | $T_C = 25^\circ\text{C}$                                                 | - 40            | A                |
| $E_{AS}$   | $T_C = 25^\circ\text{C}$                                                 | 3.5             | J                |
| $dv/dt$    | $I_S \leq I_{DM}$ , $V_{DD} \leq V_{DSS}$ , $T_J \leq 150^\circ\text{C}$ | 10              | V/ns             |
| $P_D$      | $T_C = 25^\circ\text{C}$                                                 | 312             | W                |
| $T_J$      |                                                                          | -55 ... +150    | $^\circ\text{C}$ |
| $T_{JM}$   |                                                                          | 150             | $^\circ\text{C}$ |
| $T_{stg}$  |                                                                          | -55 ... +150    | $^\circ\text{C}$ |
| $T_L$      | Maximum Lead Temperature for Soldering                                   | 300             | $^\circ\text{C}$ |
| $T_{SOLD}$ | 1.6 mm (0.062in.) from Case for 10s                                      | 260             | $^\circ\text{C}$ |
| $V_{ISOL}$ | 50/60 $H_z$ , RMS, $t = 1\text{min}$                                     | 2500            | V~               |
| $M_d$      | Mounting Force                                                           | 20..120/4.5..27 | N/lb             |
| Weight     |                                                                          | 5               | g                |

### Features

- Silicon Chip on Direct-Copper Bond (DCB) Substrate
  - UL Recognized Package
  - Isolated Mounting Surface
  - 2500V~ Electrical Isolation
- Dynamic  $dv/dt$  Rating
- Avalanche Rated
- Fast Intrinsic Diode
- The Rugged PolarP™ Process
- Low  $Q_G$
- Low Drain-to-Tab Capacitance
- Low Package Inductance

### Advantages

- Easy to Mount
- Space Savings
- High Power Density

### Applications

- High-Side Switches
- Push Pull Amplifiers
- DC Choppers
- Automatic Test Equipment
- Current Regulators

| Symbol       | Test Conditions<br>( $T_J = 25^\circ\text{C}$ , Unless Otherwise Specified) | Characteristic Values |      |                               |
|--------------|-----------------------------------------------------------------------------|-----------------------|------|-------------------------------|
|              |                                                                             | Min.                  | Typ. | Max.                          |
| $BV_{DSS}$   | $V_{GS} = 0V$ , $I_D = -250\mu A$                                           | - 500                 |      | V                             |
| $V_{GS(th)}$ | $V_{DS} = V_{GS}$ , $I_D = -1mA$                                            | - 2.0                 |      | - 4.5 V                       |
| $I_{GSS}$    | $V_{GS} = \pm 20V$ , $V_{DS} = 0V$                                          |                       |      | $\pm 100$ nA                  |
| $I_{DSS}$    | $V_{DS} = V_{DSS}$ , $V_{GS} = 0V$<br>$T_J = 125^\circ\text{C}$             |                       |      | - 50 $\mu A$<br>- 250 $\mu A$ |
| $R_{DS(on)}$ | $V_{GS} = -10V$ , $I_D = -20A$ , Note 1                                     |                       |      | 260 m $\Omega$                |

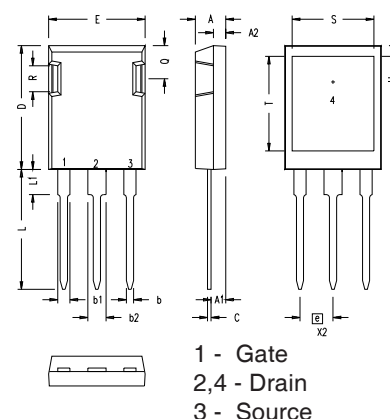
| Symbol       | Test Conditions<br>( $T_J = 25^\circ\text{C}$ , Unless Otherwise Specified)                                                                   | Characteristic Values |      |                         |
|--------------|-----------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|------|-------------------------|
|              |                                                                                                                                               | Min.                  | Typ. | Max.                    |
| $g_{fs}$     | $V_{DS} = -10\text{V}$ , $I_D = -20\text{A}$ , Note 1                                                                                         | 23                    | 38   | S                       |
| $C_{iss}$    | $V_{GS} = 0\text{V}$ , $V_{DS} = -25\text{V}$ , $f = 1\text{MHz}$                                                                             |                       | 11.5 | nF                      |
| $C_{oss}$    |                                                                                                                                               |                       | 1150 | pF                      |
| $C_{rss}$    |                                                                                                                                               |                       | 93   | pF                      |
| $t_{d(on)}$  | <b>Resistive Switching Times</b><br>$V_{GS} = -10\text{V}$ , $V_{DS} = 0.5 \cdot V_{DSS}$ , $I_D = -20\text{A}$<br>$R_G = 1\Omega$ (External) |                       | 37   | ns                      |
| $t_r$        |                                                                                                                                               |                       | 59   | ns                      |
| $t_{d(off)}$ |                                                                                                                                               |                       | 90   | ns                      |
| $t_f$        |                                                                                                                                               |                       | 34   | ns                      |
| $Q_{g(on)}$  | $V_{GS} = -10\text{V}$ , $V_{DS} = 0.5 \cdot V_{DSS}$ , $I_D = -20\text{A}$                                                                   |                       | 205  | nC                      |
| $Q_{gs}$     |                                                                                                                                               |                       | 55   | nC                      |
| $Q_{gd}$     |                                                                                                                                               |                       | 75   | nC                      |
| $R_{thJC}$   |                                                                                                                                               |                       |      | 0.40 $^\circ\text{C/W}$ |
| $R_{thCS}$   |                                                                                                                                               |                       | 0.15 | $^\circ\text{C/W}$      |

## Source-Drain Diode

| Symbol   | Test Conditions<br>( $T_J = 25^\circ\text{C}$ , Unless Otherwise Specified)                              | Characteristic Values |      |               |
|----------|----------------------------------------------------------------------------------------------------------|-----------------------|------|---------------|
|          |                                                                                                          | Min.                  | Typ. | Max.          |
| $I_S$    | $V_{GS} = 0\text{V}$                                                                                     |                       |      | - 40 A        |
| $I_{SM}$ | Repetitive, Pulse Width Limited by $T_{JM}$                                                              |                       |      | -160 A        |
| $V_{SD}$ | $I_F = -20\text{A}$ , $V_{GS} = 0\text{V}$ , Note 1                                                      |                       |      | - 3.0 V       |
| $t_{rr}$ | $I_F = -20\text{A}$ , $-di/dt = -150\text{A}/\mu\text{s}$<br>$V_R = -100\text{V}$ , $V_{GS} = 0\text{V}$ |                       | 477  | ns            |
| $Q_{RM}$ |                                                                                                          |                       | 14.5 | $\mu\text{C}$ |
| $I_{RM}$ |                                                                                                          |                       | - 61 | A             |

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

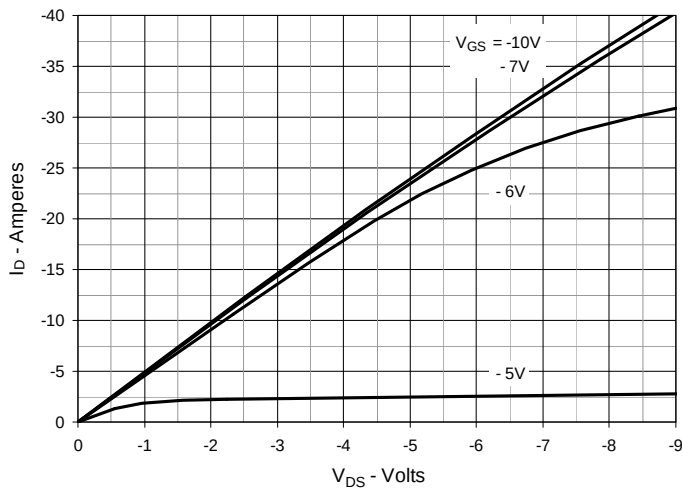
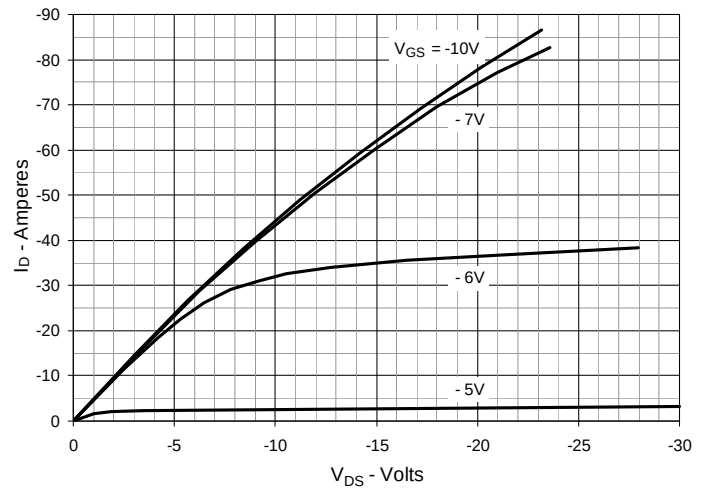
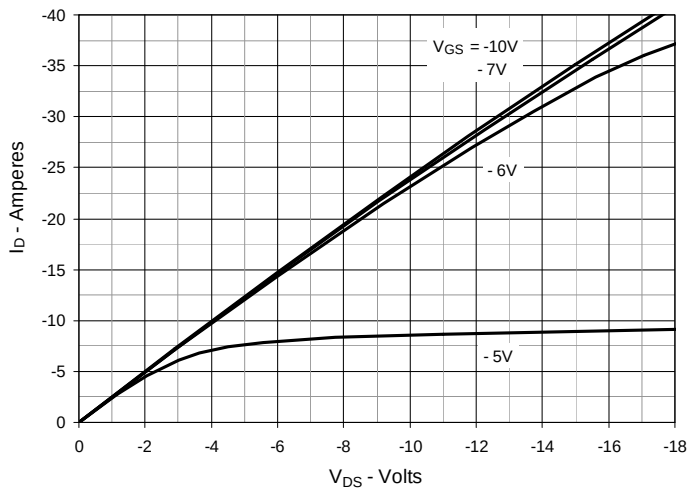
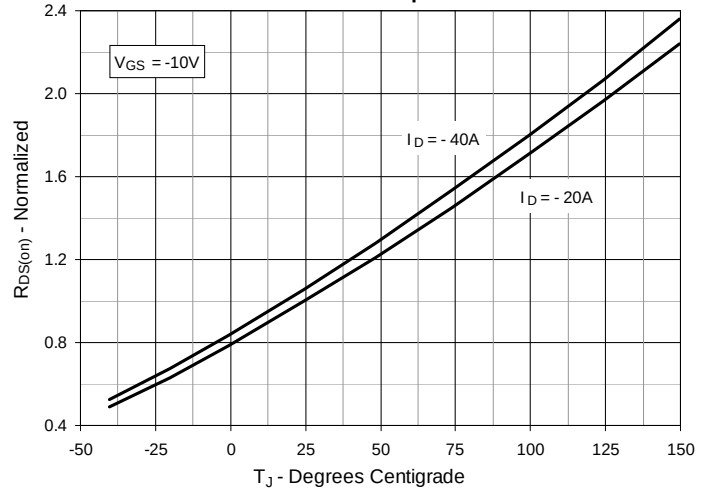
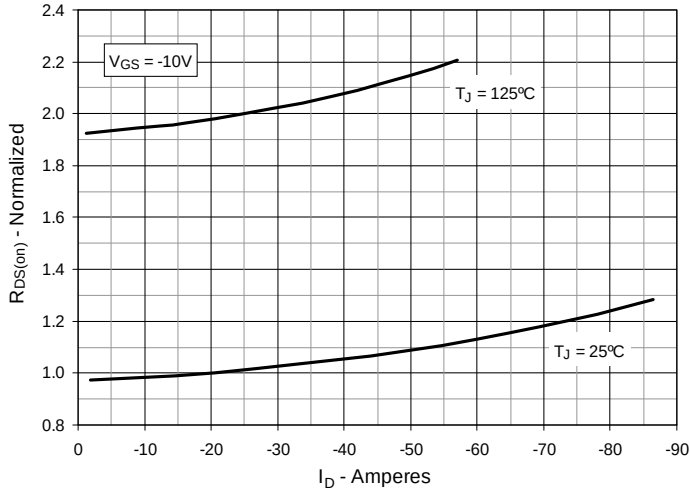
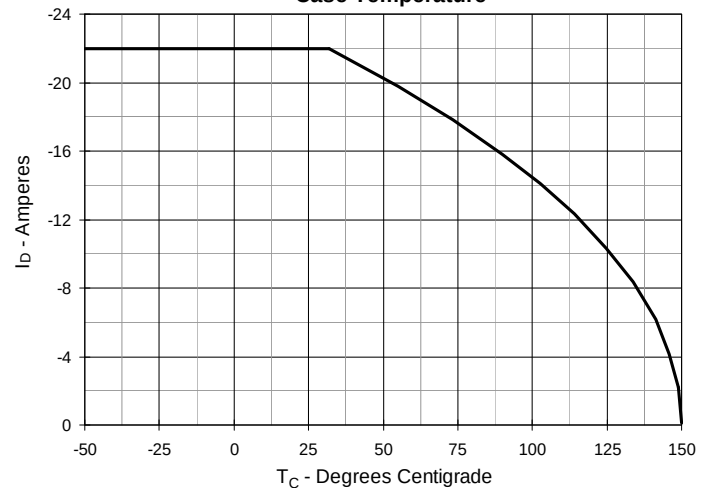
## ISOPLUS247 (IXTR) Outline



| 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  |

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    | 7,005,734 B2 | 7,157,338B2 |
|                                                                                  | 4,860,072 | 5,017,508 | 5,063,307 | 5,381,025 | 6,259,123 B1 | 6,534,343    | 6,710,405 B2 | 6,759,692    | 7,063,975 B2 |             |
|                                                                                  | 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 | 7,071,537    |             |

**Fig. 1. Output Characteristics @  $T_J = 25^\circ\text{C}$** 

**Fig. 2. Extended Output Characteristics @  $T_J = 25^\circ\text{C}$** 

**Fig. 3. Output Characteristics @  $T_J = 125^\circ\text{C}$** 

**Fig. 4.  $R_{DS(on)}$  Normalized to  $I_D = -20\text{A}$  Value vs. Junction Temperature**

**Fig. 5.  $R_{DS(on)}$  Normalized to  $I_D = -20\text{A}$  Value vs. Drain Current**

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


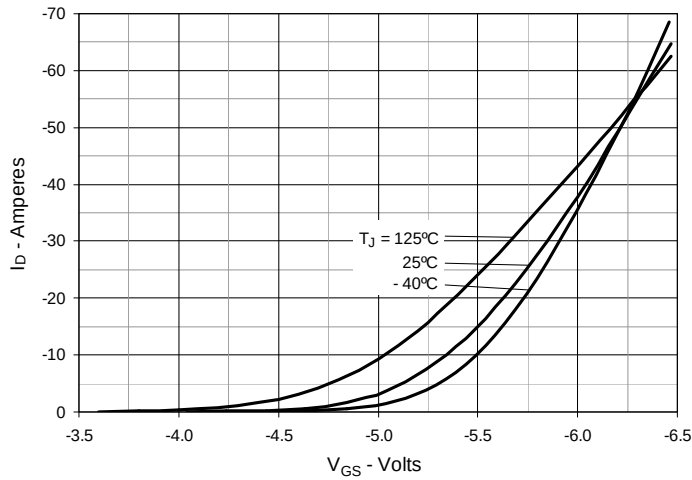
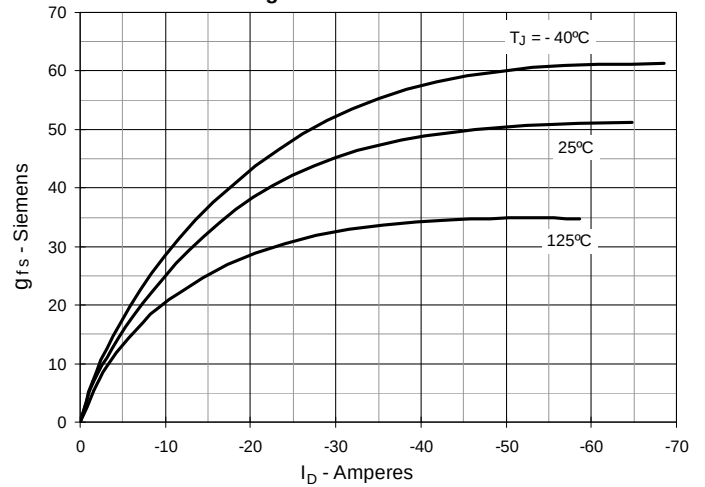
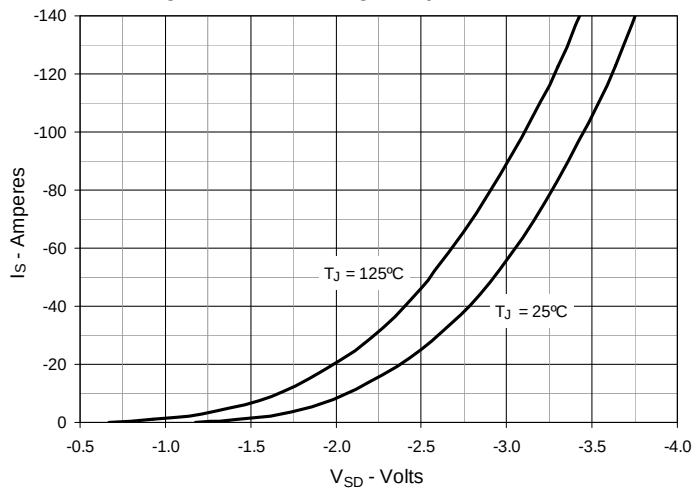
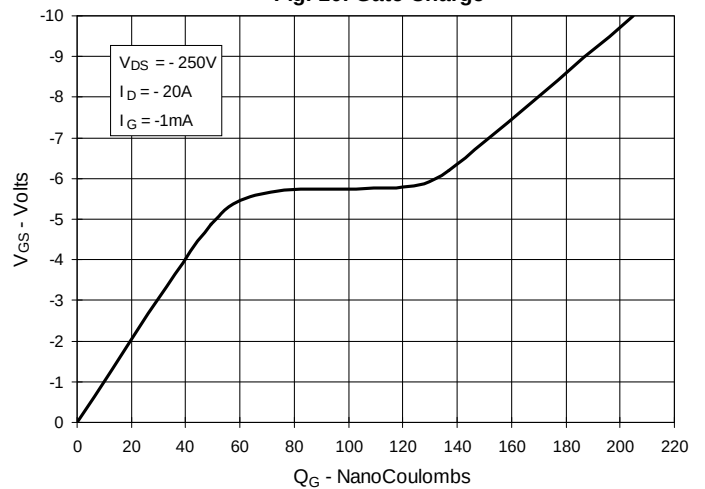
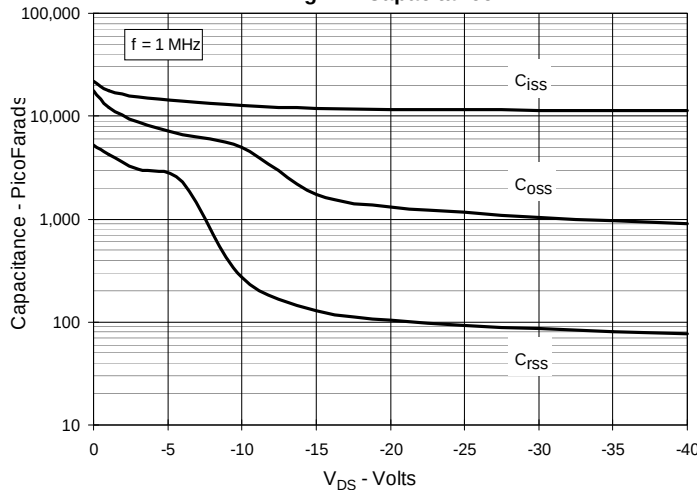
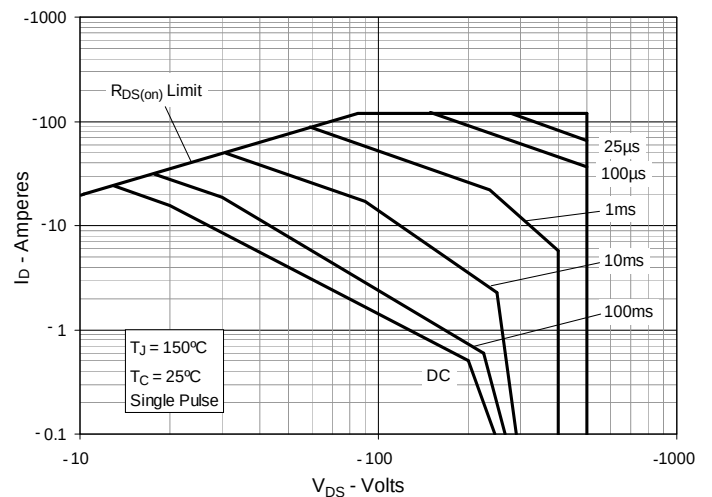
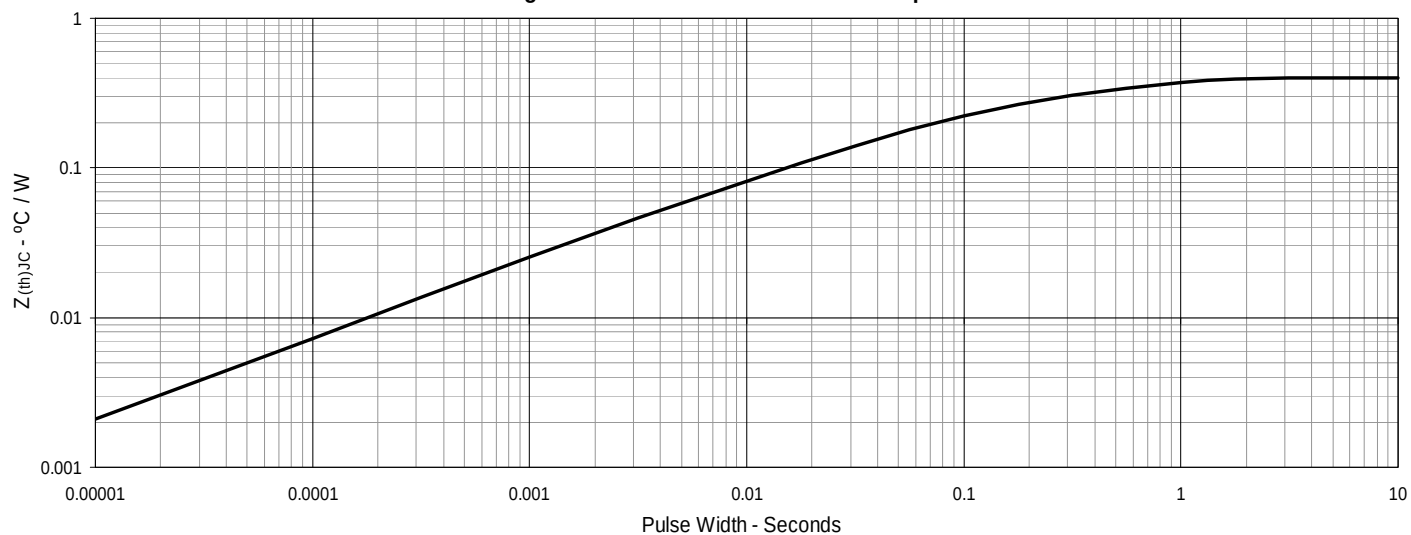
**Fig. 7. Input Admittance**

**Fig. 8. Transconductance**

**Fig. 9. Forward Voltage Drop of Intrinsic Diode**

**Fig. 10. Gate Charge**

**Fig. 11. Capacitance**

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


Fig. 13. Maximum Transient Thermal Impedance





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