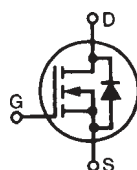


# Polar™ HiPerFET™ Power MOSFET

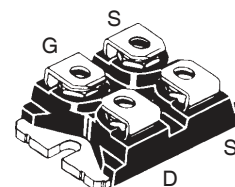
## IXFN210N20P

N-Channel Enhancement Mode  
Avalanche Rated  
Fast Intrinsic Diode



$$\begin{aligned} V_{DSS} &= 200V \\ I_{D25} &= 188A \\ R_{DS(on)} &\leq 10.5m\Omega \\ t_{rr} &\leq 200ns \end{aligned}$$

miniBLOC  
E153432



G = Gate                      D = Drain  
S = Source

Either Source Terminal S can be used as the Source Terminal or the Kelvin Source (Gate Return) Terminal.

| 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 $175^\circ\text{C}$ , $R_{GS} = 1M\Omega$    | 200                    | V                |
| $V_{GSS}$     | Continuous   | $\pm 20$               | V                |
| $V_{GSM}$     | Transient  | $\pm 30$               | V                |
| $I_{D25}$     | $T_C = 25^\circ\text{C}$   | 188                    | A                |
| $I_{DM}$      | $T_C = 25^\circ\text{C}$ , Pulse Width Limited by $T_{JM}$               | 600                    | A                |
| $I_A$         | $T_C = 25^\circ\text{C}$   | 105                    | A                |
| $E_{AS}$      | $T_C = 25^\circ\text{C}$   | 4                      | J                |
| $dv/dt$       | $I_S \leq I_{DM}$ , $V_{DD} \leq V_{DSS}$ , $T_J \leq 175^\circ\text{C}$ | 20                     | V/ns             |
| $P_D$         | $T_C = 25^\circ\text{C}$   | 1070                   | W                |
| $T_J$         |  | -55 ... +175           | $^\circ\text{C}$ |
| $T_{JM}$      |  | 175                    | $^\circ\text{C}$ |
| $T_{stg}$     |  | -55 ... +175           | $^\circ\text{C}$ |
| $T_L$         | 1.6mm (0.062 in.) from Case for 10s                                      | 300                    | $^\circ\text{C}$ |
| $V_{ISOL}$    | 50/60 Hz, RMS  | $t = 1\text{min}$ 2500 | V~               |
|               | $I_{ISOL} \leq 1\text{mA}$   | $t = 1\text{s}$ 3000   | V~               |
| $M_d$         | Mounting Torque  | 1.5/13                 | Nm/lb.in.        |
|               | Terminal Connection Torque   | 1.3/11.5               | Nm/lb.in.        |
| <b>Weight</b> |  | 30                     | g                |

### Features

- International Standard Package
- miniBLOC, with Aluminium Nitride Isolation
- Low Package Inductance
- Avalanche Rated
- Low  $R_{DS(ON)}$  and  $Q_G$
- Fast Intrinsic Diode

### Advantages

- Easy to Mount
- Space Savings
- High Power Density

### Applications

- DC-DC Converters
- Battery Chargers
- Switch-Mode and Resonant-Mode Power Supplies
- DC Choppers
- AC and DC Motor Drives
- Uninterrupted Power Supplies
- High Speed Power Switching Applications

| Symbol       | Test Conditions<br>( $T_J = 25^\circ\text{C}$ , Unless Otherwise Specified) | Characteristic Values |      |                          |
|--------------|---|-----------------------|------|--------------------------|
|              |   | Min.                  | Typ. | Max.                     |
| $BV_{DSS}$   | $V_{GS} = 0V$ , $I_D = 3\text{mA}$  | 200                   |      | V                        |
| $V_{GS(th)}$ | $V_{DS} = V_{GS}$ , $I_D = 8\text{mA}$                                      | 2.5                   |      | 4.5 V                    |
| $I_{GSS}$    | $V_{GS} = \pm 20V$ , $V_{DS} = 0V$  |                       |      | $\pm 200$ nA             |
| $I_{DSS}$    | $V_{DS} = V_{DSS}$ , $V_{GS} = 0V$<br>$T_J = 150^\circ\text{C}$             |                       |      | 25 $\mu\text{A}$<br>2 mA |
| $R_{DS(on)}$ | $V_{GS} = 10V$ , $I_D = 105A$ , Note 1                                      |                       |      | 10.5 m $\Omega$          |

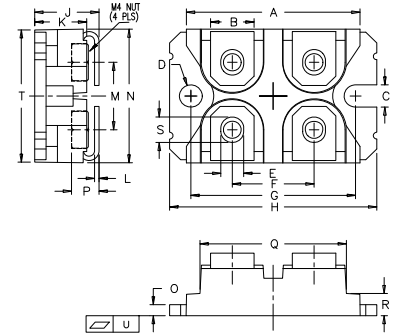
| Symbol       | Test Conditions<br>( $T_J = 25^\circ\text{C}$ , Unless Otherwise Specified)  | Characteristic Values |      |                    |
|--------------|--|-----------------------|------|--------------------|
|              |  | Min.                  | Typ. | Max.               |
| $g_{fs}$     | $V_{DS} = 10\text{V}, I_D = 60\text{A}$ , Note 1   | 60                    | 103  | S                  |
| $C_{iss}$    | $V_{GS} = 0\text{V}, V_{DS} = 25\text{V}, f = 1\text{MHz}$   |                       | 18.6 | nF                 |
| $C_{oss}$    |  |                       | 3270 | pF                 |
| $C_{rss}$    |  |                       | 80   | pF                 |
| $t_{d(on)}$  | <b>Resistive Switching Times</b><br>$V_{GS} = 10\text{V}, V_{DS} = 0.5 \cdot V_{DSS}, I_D = 105\text{A}$<br>$R_G = 1\Omega$ (External) |                       | 43   | ns                 |
| $t_r$        |  |                       | 30   | ns                 |
| $t_{d(off)}$ |  |                       | 70   | ns                 |
| $t_f$        |  |                       | 18   | ns                 |
| $Q_{g(on)}$  | $V_{GS} = 10\text{V}, V_{DS} = 0.5 \cdot V_{DSS}, I_D = 105\text{A}$   |                       | 255  | nC                 |
| $Q_{gs}$     |  |                       | 94   | nC                 |
| $Q_{gd}$     |  |                       | 83   | nC                 |
| $R_{thJC}$   |  |                       | 0.14 | $^\circ\text{C/W}$ |
| $R_{thCS}$   |  | 0.05                  |      | $^\circ\text{C/W}$ |

### Source-Drain Diode

| Symbol   | Test Conditions<br>( $T_J = 25^\circ\text{C}$ , Unless Otherwise Specified)  | Characteristic Values |      |               |
|----------|--|-----------------------|------|---------------|
|          |  | Min.                  | Typ. | Max.          |
| $I_S$    | $V_{GS} = 0\text{V}$   |                       |      | 210 A         |
| $I_{SM}$ | Repetitive, Pulse Width Limited by $T_{JM}$                                  |                       |      | 800 A         |
| $V_{SD}$ | $I_F = 105\text{A}, V_{GS} = 0\text{V}$ , Note 1                             |                       |      | 1.3 V         |
| $t_{rr}$ | $I_F = 105\text{A}, -di/dt = 150\text{A}/\mu\text{s}$<br>$V_R = 100\text{V}$ |                       |      | 200 ns        |
| $Q_{RM}$ |  |                       | 1.34 | $\mu\text{C}$ |
| $I_{RM}$ |  |                       | 18   | A             |

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

### SOT-227B (IXFN) Outline



(M4 screws (4x) supplied)

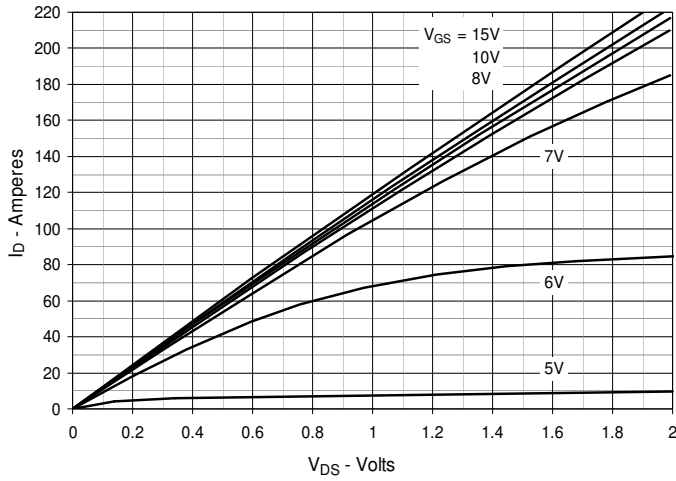
| SYM | INCHES |       | MILLIMETERS |       |
|-----|--------|-------|-------------|-------|
|     | MIN    | MAX   | MIN         | MAX   |
| A   | 1.240  | 1.255 | 31.50       | 31.88 |
| B   | .307   | .323  | 7.80        | 8.20  |
| C   | .161   | .169  | 4.09        | 4.29  |
| D   | .161   | .169  | 4.09        | 4.29  |
| E   | .161   | .169  | 4.09        | 4.29  |
| F   | .587   | .595  | 14.91       | 15.11 |
| G   | 1.186  | 1.193 | 30.12       | 30.30 |
| H   | 1.496  | 1.505 | 38.00       | 38.23 |
| J   | .460   | .481  | 11.68       | 12.22 |
| K   | .351   | .378  | 8.92        | 9.60  |
| L   | .030   | .033  | 0.76        | 0.84  |
| M   | .496   | .506  | 12.60       | 12.85 |
| N   | .990   | 1.001 | 25.15       | 25.42 |
| O   | .078   | .084  | 1.98        | 2.13  |
| P   | .195   | .235  | 4.95        | 5.97  |
| Q   | 1.045  | 1.059 | 26.54       | 26.90 |
| R   | .155   | .174  | 3.94        | 4.42  |
| S   | .186   | .191  | 4.72        | 4.85  |
| T   | .968   | .987  | 24.59       | 25.07 |
| U   | -.002  | .004  | -0.05       | 0.1   |

IXYS Reserves the Right to Change Limits, Test Conditions, and Dimensions.

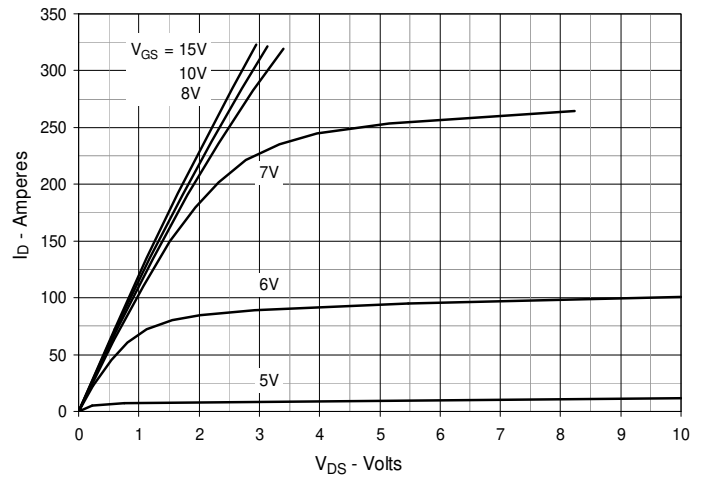
IXYS MOSFETs and IGBTs are covered by one or more of the following U.S. patents:

|           |           |           |           |              |              |              |              |              |             |
|-----------|-----------|-----------|-----------|--------------|--------------|--------------|--------------|--------------|-------------|
| 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 |
| 4,850,072 | 5,017,508 | 5,063,307 | 5,381,025 | 6,259,123 B1 | 6,534,343    | 6,710,405 B2 | 6,759,692    | 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    |             |

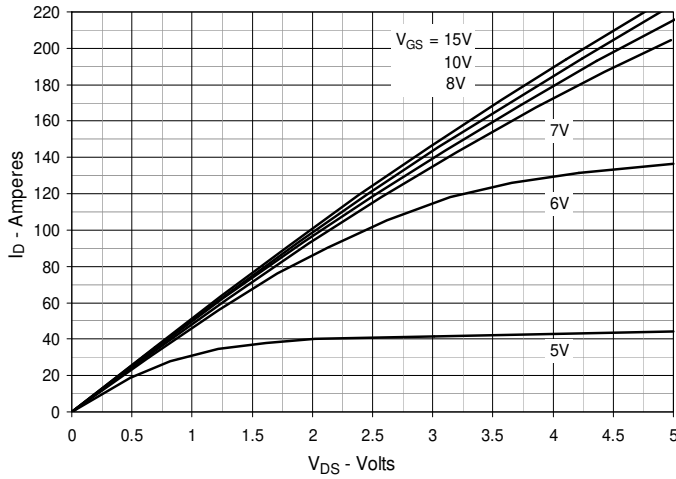
**Fig. 1. Output Characteristics @  $T_J = 25^\circ\text{C}$**



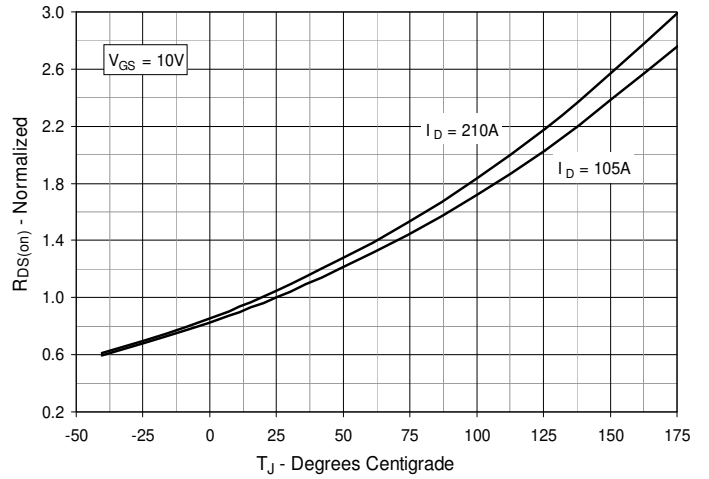
**Fig. 2. Extended Output Characteristics @  $T_J = 25^\circ\text{C}$**



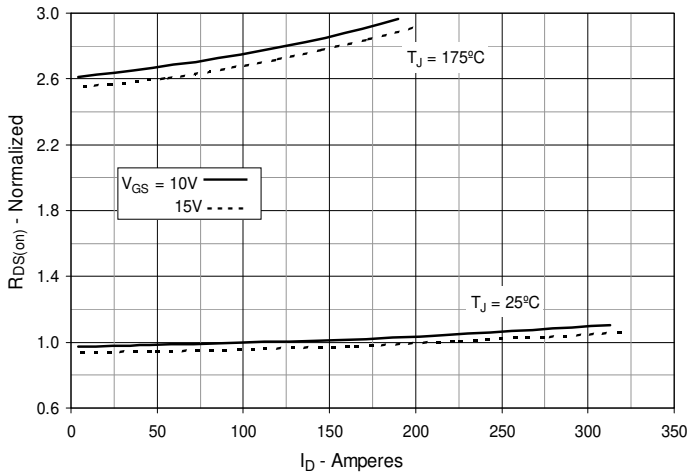
**Fig. 3. Output Characteristics @  $T_J = 150^\circ\text{C}$**



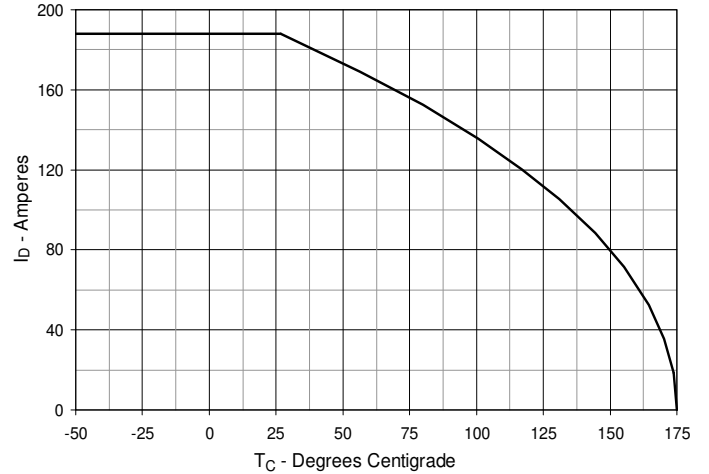
**Fig. 4.  $R_{DS(on)}$  Normalized to  $I_D = 105\text{A}$  Value vs. Junction Temperature**



**Fig. 5.  $R_{DS(on)}$  Normalized to  $I_D = 105\text{A}$  Value vs. Drain Current**



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



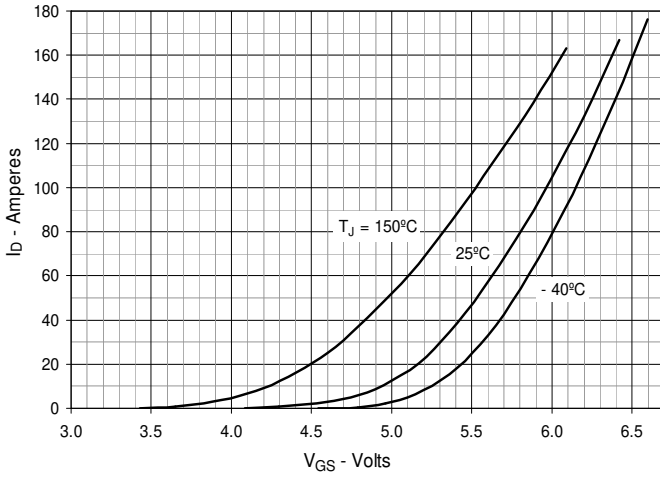
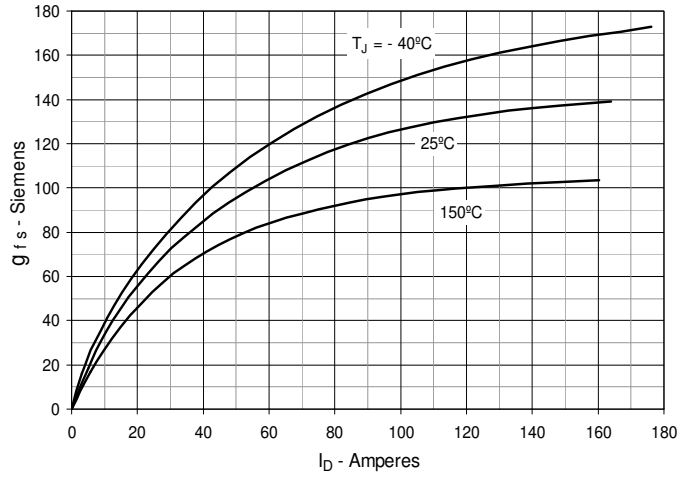
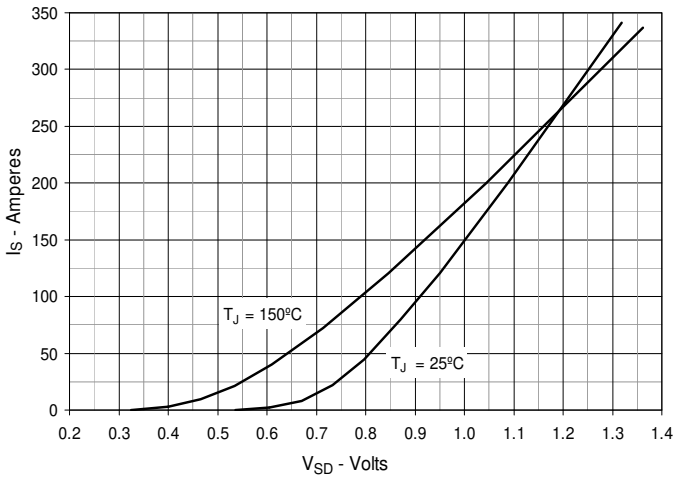
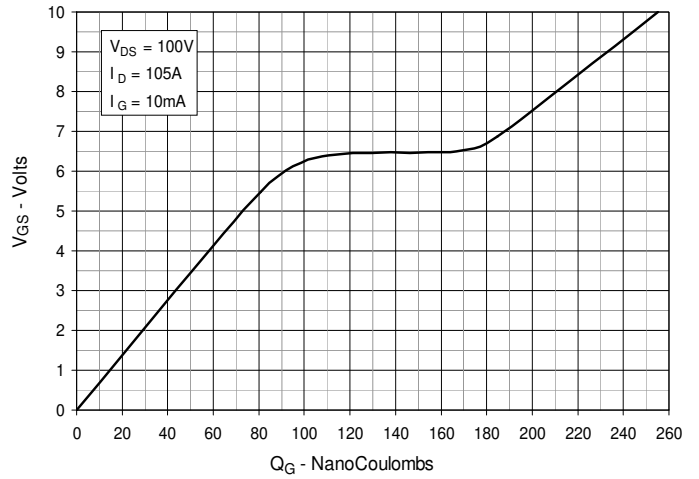
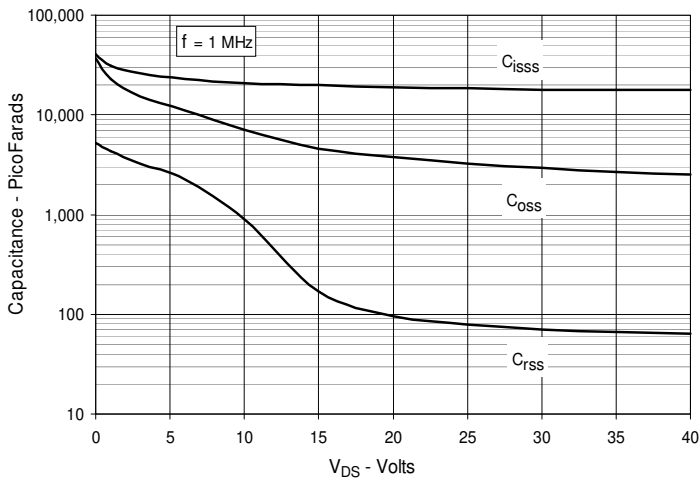
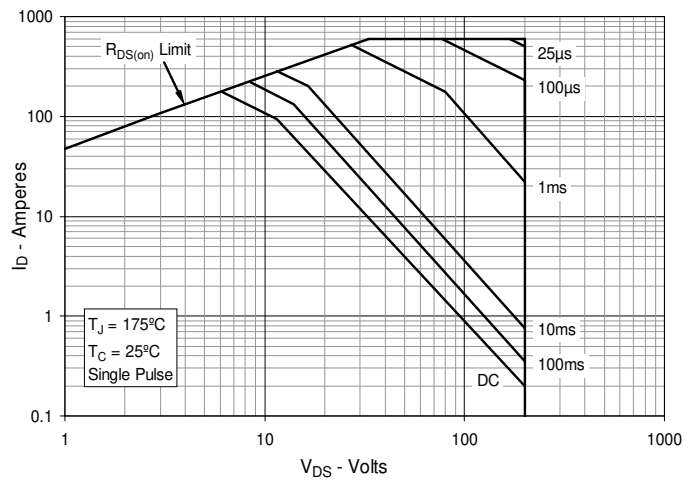
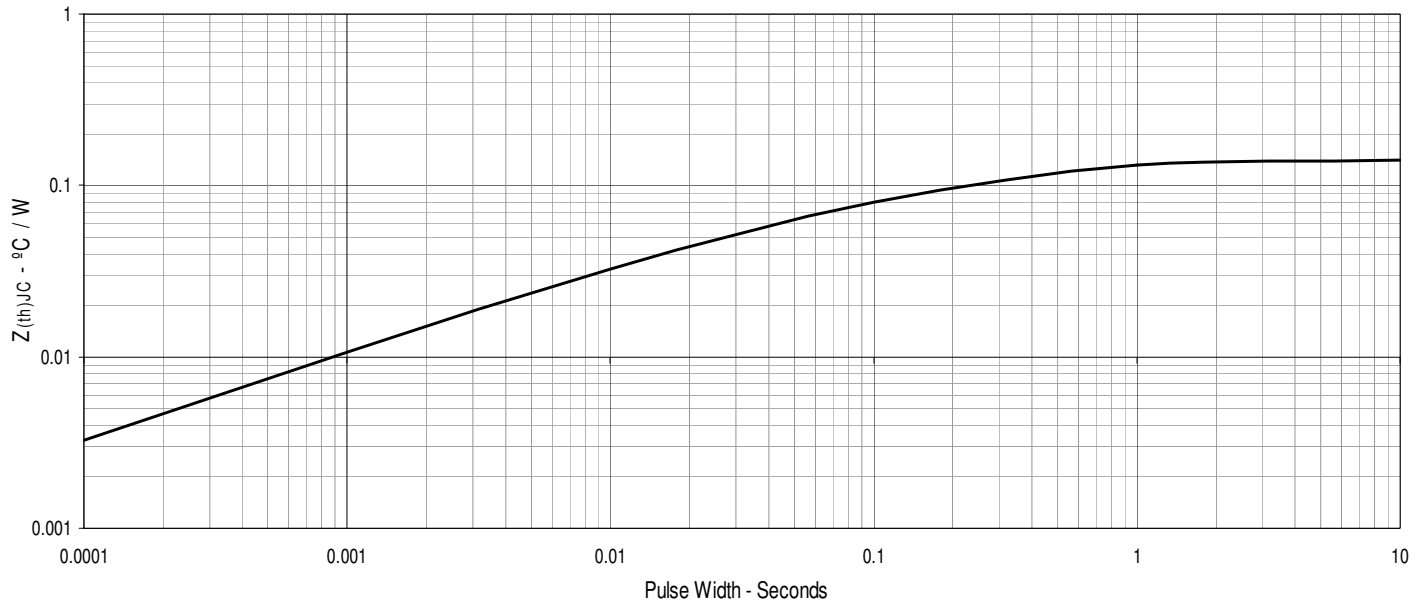
**Fig. 7. Input Admittance**

**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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