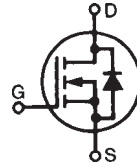


## Polar™ Power MOSFET HiperFET™

## IXFK220N15P IXFX220N15P

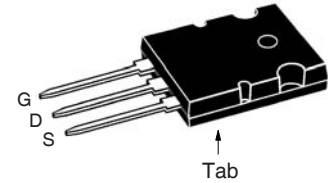
N-Channel Enhancement Mode  
Avalanche Rated  
Fast Intrinsic Rectifier



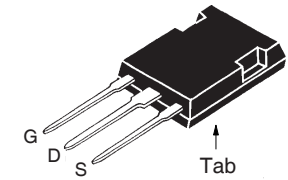
$$\begin{aligned} V_{DSS} &= 150V \\ I_{D25} &= 220A \\ R_{DS(on)} &\leq 9m\Omega \\ t_{rr} &\leq 200ns \end{aligned}$$

| 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 $175^\circ\text{C}$ , $R_{GS} = 1M\Omega$    | 150               | V                |
| $V_{GSS}$  | Continuous                                                               | $\pm 20$          | V                |
| $V_{GSM}$  | Transient                                                                | $\pm 30$          | V                |
| $I_{D25}$  | $T_C = 25^\circ\text{C}$ (Chip Capability)                               | 220               | A                |
| $I_{LRMS}$ | Leads Current Limit, RMS                                                 | 160               | A                |
| $I_{DM}$   | $T_C = 25^\circ\text{C}$ , Pulse Width Limited by $T_{JM}$               | 600               | A                |
| $I_A$      | $T_C = 25^\circ\text{C}$                                                 | 50                | A                |
| $E_{AS}$   | $T_C = 25^\circ\text{C}$                                                 | 3                 | J                |
| $dV/dt$    | $I_S \leq I_{DM}$ , $V_{DD} \leq V_{DSS}$ , $T_J \leq 175^\circ\text{C}$ | 20                | V/ns             |
| $P_D$      | $T_C = 25^\circ\text{C}$                                                 | 1250              | 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               | $^\circ\text{C}$ |
| $T_{SOLD}$ | Plastic Body for 10s                                                     | 260               | $^\circ\text{C}$ |
| $M_d$      | Mounting Torque (TO-264)                                                 | 1.13/10           | Nm/lb.in.        |
| $F_c$      | Mounting Force (PLUS247)                                                 | 20..120 / 4.5..27 | N/lb.            |
| Weight     | TO-264                                                                   | 10                | g                |
|            | PLUS247                                                                  | 6                 | g                |

TO-264 (IXFK)



PLUS247 (IXFX)



G = Gate      D = Drain  
S = Source      Tab = Drain

### Features

- Avalanche Rated
- Low Package Inductance
- Fast Intrinsic Rectifier
- Low  $R_{DS(on)}$  and  $Q_g$

### Advantages

- High Power Density
- Easy to Mount
- Space Savings

### 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.                 |
| $BV_{DSS}$   | $V_{GS} = 0V$ , $I_D = 3mA$                                               | 150                   |      | V                    |
| $V_{GS(th)}$ | $V_{DS} = V_{GS}$ , $I_D = 8mA$                                           | 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>$T_J = 150^\circ\text{C}$           |                       |      | 50 $\mu A$<br>1.5 mA |
| $R_{DS(on)}$ | $V_{GS} = 10V$ , $I_D = 0.5 \cdot I_{D25}$ , Note 1                       |                       |      | 9 m $\Omega$         |

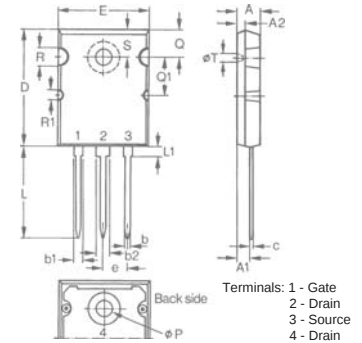
| Symbol       | Test Conditions<br>( $T_J = 25^\circ\text{C}$ Unless Otherwise Specified)                                                                    | Characteristic Values |                         |      |
|--------------|----------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|-------------------------|------|
|              |                                                                                                                                              | Min.                  | Typ.                    | Max. |
| $g_{fs}$     | $V_{DS} = 10\text{V}, I_D = 60\text{A}$ , Note 1                                                                                             | 50                    | 85                      | S    |
| $C_{iss}$    | $V_{GS} = 0\text{V}, V_{DS} = 25\text{V}, f = 1\text{MHz}$                                                                                   |                       | 15.4                    | nF   |
| $C_{oss}$    |                                                                                                                                              |                       | 3040                    | pF   |
| $C_{rss}$    |                                                                                                                                              |                       | 35                      | pF   |
| $t_{d(on)}$  | <b>Resistive Switching Times</b><br>$V_{GS} = 10\text{V}, V_{DS} = 0.5 \cdot V_{DSS}, I_D = 0.5 \cdot I_{D25}$<br>$R_G = 1\Omega$ (External) |                       | 35                      | ns   |
| $t_r$        |                                                                                                                                              |                       | 28                      | ns   |
| $t_{d(off)}$ |                                                                                                                                              |                       | 56                      | ns   |
| $t_f$        |                                                                                                                                              |                       | 17                      | ns   |
| $Q_{g(on)}$  | $V_{GS} = 10\text{V}, V_{DS} = 0.5 \cdot V_{DSS}, I_D = 0.5 \cdot I_{D25}$                                                                   |                       | 162                     | nC   |
| $Q_{gs}$     |                                                                                                                                              |                       | 58                      | nC   |
| $Q_{gd}$     |                                                                                                                                              |                       | 56                      | nC   |
| $R_{thJC}$   |                                                                                                                                              | 0.15                  | 0.12 $^\circ\text{C/W}$ |      |
| $R_{thCS}$   |                                                                                                                                              |                       | $^\circ\text{C/W}$      |      |

## Source-Drain Diode

| Symbol   | Test Conditions<br>( $T_J = 25^\circ\text{C}$ Unless Otherwise Specified)                       | Characteristic Values |      |               |
|----------|-------------------------------------------------------------------------------------------------|-----------------------|------|---------------|
|          |                                                                                                 | Min.                  | Typ. | Max.          |
| $I_S$    | $V_{GS} = 0\text{V}$                                                                            |                       |      | 220 A         |
| $I_{SM}$ | Repetitive, Pulse Width Limited by $T_{JM}$                                                     |                       |      | 800 A         |
| $V_{SD}$ | $I_F = 110\text{A}, V_{GS} = 0\text{V}$ , Note 1                                                |                       |      | 1.4 V         |
| $t_{rr}$ | $I_F = 110\text{A}, -di/dt = 150\text{A}/\mu\text{s}$<br>$V_R = 75\text{V}, V_{GS} = 0\text{V}$ | 1.32                  | 18.8 | 200 ns        |
| $Q_{RM}$ |                                                                                                 |                       |      | $\mu\text{C}$ |
| $I_{RM}$ |                                                                                                 |                       |      | A             |

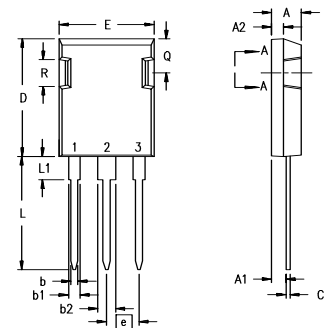
Note 1: Pulse test,  $t \leq 300\mu\text{s}$ , duty cycle,  $d \leq 2\%$ .

## TO-264 Outline



| Dim. | Millimeter |       | Inches   |       |
|------|------------|-------|----------|-------|
|      | Min.       | Max.  | 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  |

## PLUS247™ Outline

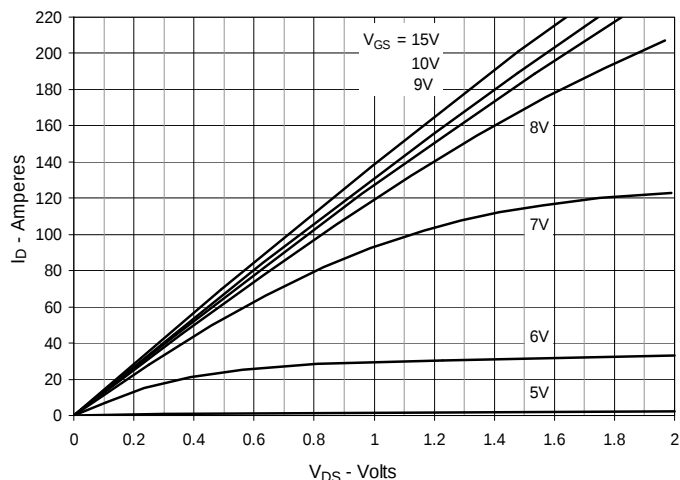


| Dim. | Millimeter |       | Inches   |      |
|------|------------|-------|----------|------|
|      | Min.       | Max.  | Min.     | Max. |
| A    | 4.83       | 5.21  | .190     | .205 |
| A1   | 2.29       | 2.54  | .090     | .100 |
| A2   | 1.91       | 2.16  | .075     | .085 |
| b    | 1.14       | 1.40  | .045     | .055 |
| b1   | 1.91       | 2.13  | .075     | .084 |
| b2   | 2.92       | 3.12  | .115     | .123 |
| C    | 0.61       | 0.80  | .024     | .031 |
| D    | 20.80      | 21.34 | .819     | .840 |
| E    | 15.75      | 16.13 | .620     | .635 |
| e    | 5.45 BSC   |       | .215 BSC |      |
| L    | 19.81      | 20.32 | .780     | .800 |
| L1   | 3.81       | 4.32  | .150     | .170 |
| Q    | 5.59       | 6.20  | .220     | .244 |
| R    | 4.32       | 4.83  | .170     | .190 |

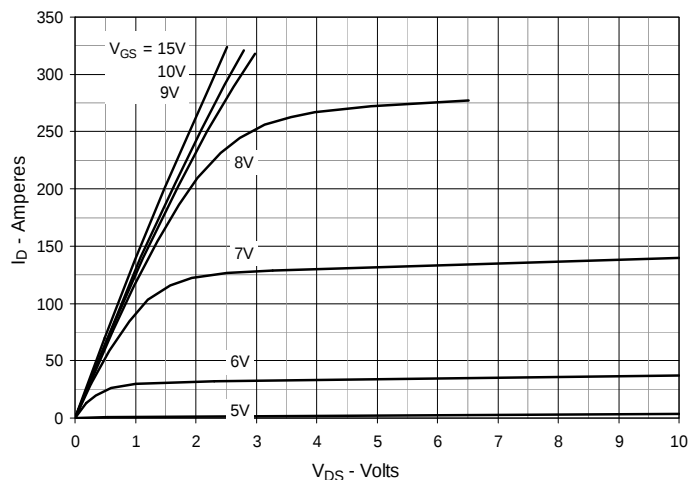
IXYS Reserves the Right to Change Limits, Test Conditions, and Dimensions.

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

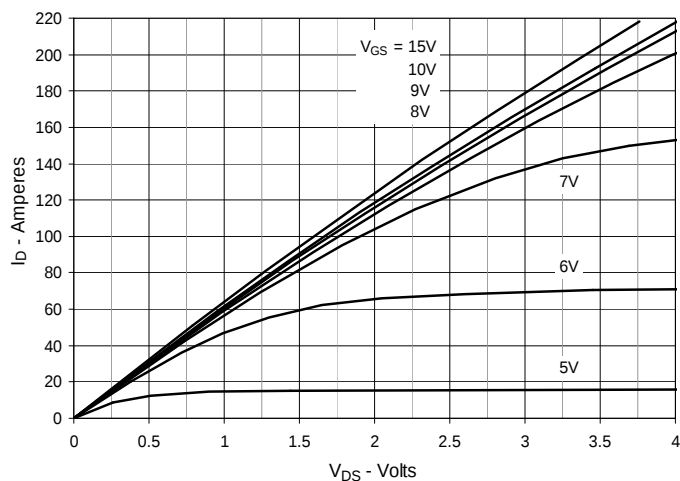
**Fig. 1. Output Characteristics @  $T_J = 25^\circ\text{C}$**



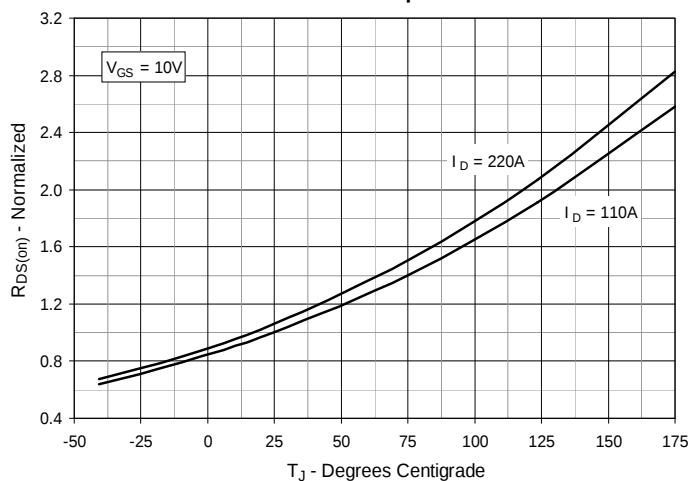
**Fig. 2. Extended Output Characteristics @  $T_J = 25^\circ\text{C}$**



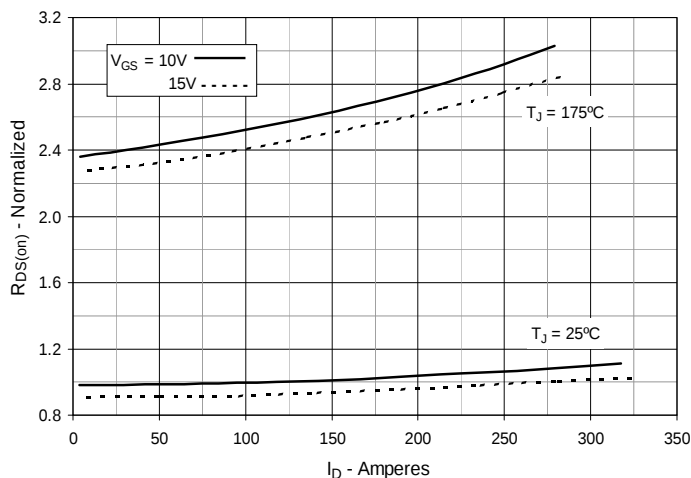
**Fig. 3. Output Characteristics @  $T_J = 150^\circ\text{C}$**



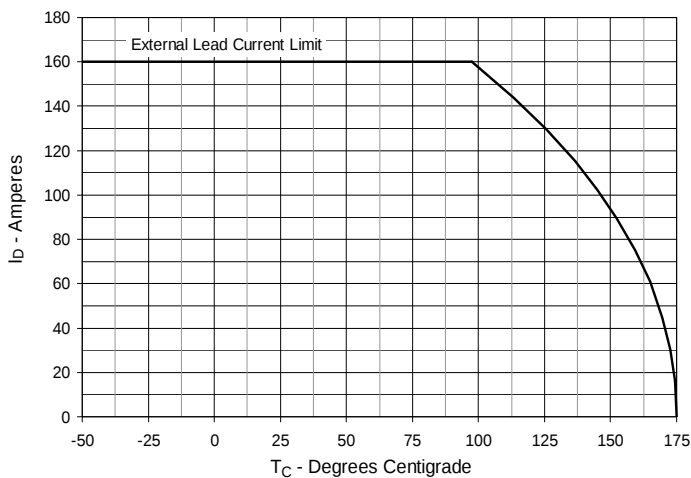
**Fig. 4.  $R_{DS(on)}$  Normalized to  $I_D = 110\text{A}$  Value vs. Junction Temperature**



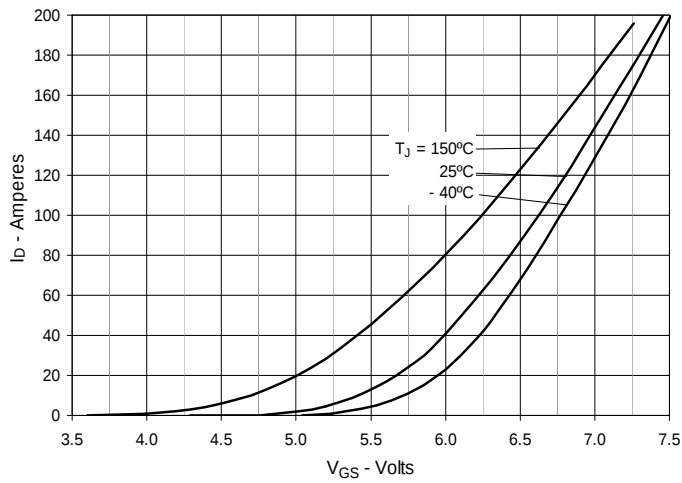
**Fig. 5.  $R_{DS(on)}$  Normalized to  $I_D = 110\text{A}$  Value vs. Drain Current**



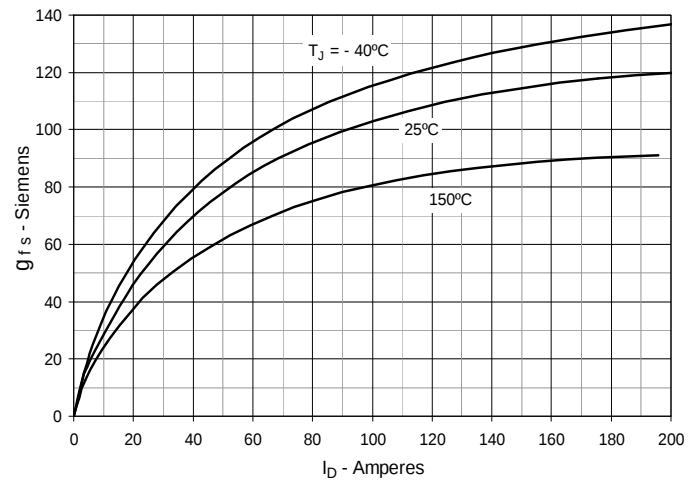
**Fig. 6. Maximum Drain Current vs. Case Temperature**



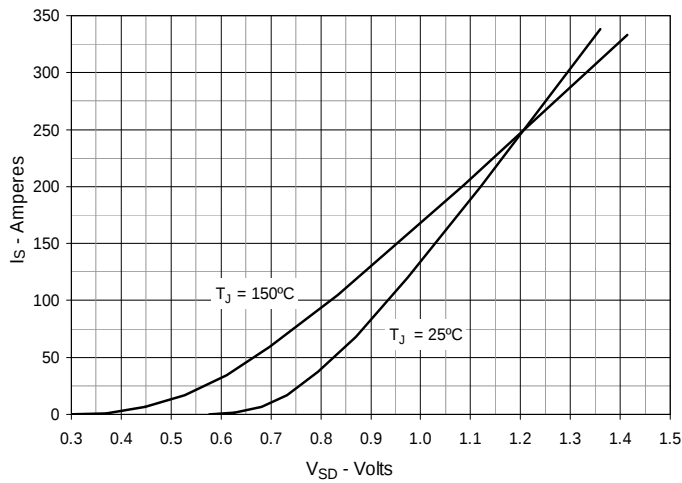
**Fig. 7. Input Admittance**



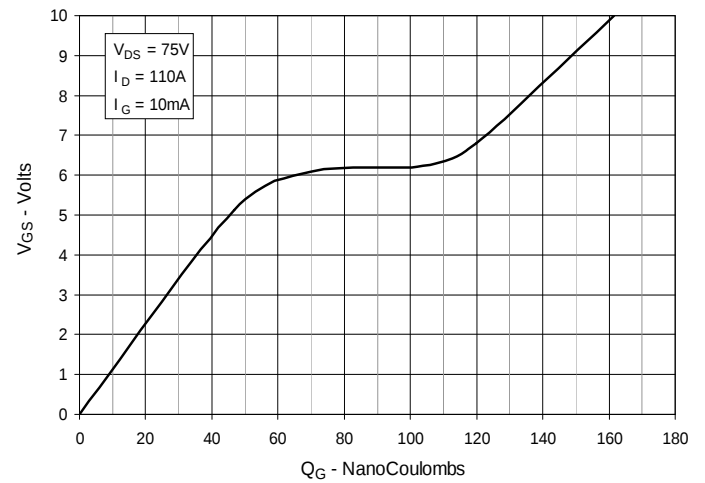
**Fig. 8. Transconductance**



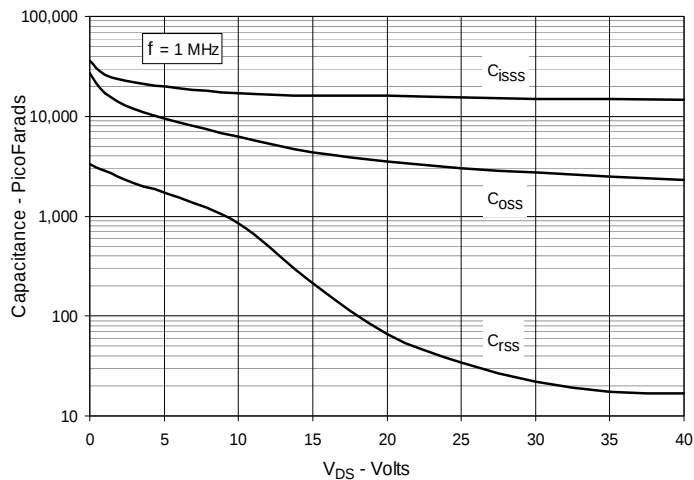
**Fig. 9. Forward Voltage Drop of Intrinsic Diode**



**Fig. 10. Gate Charge**



**Fig. 11. Capacitance**



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

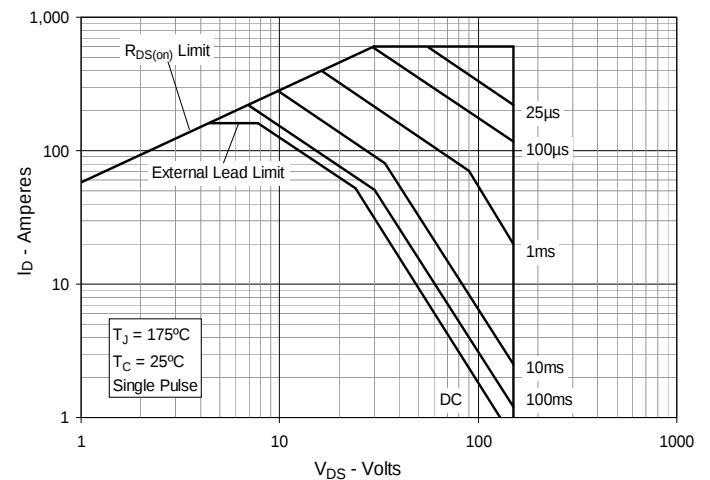
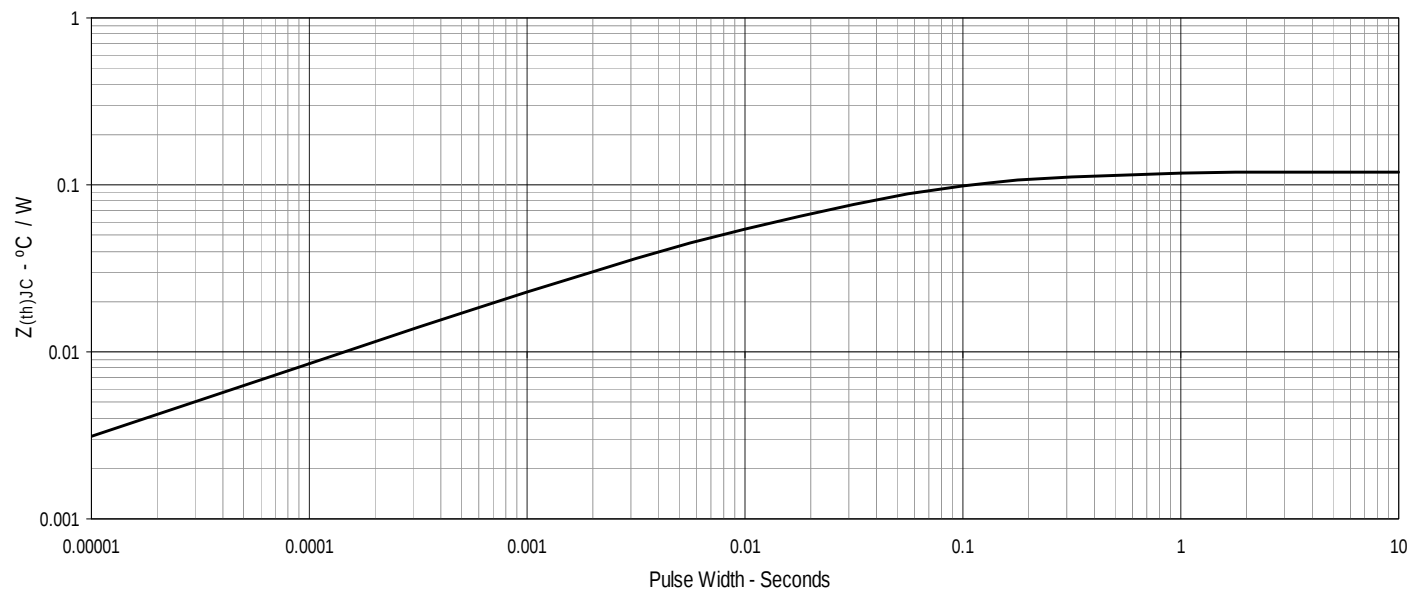


Fig. 13. Maximum Transient Thermal Impedance





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