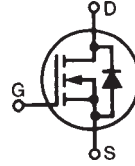


# Polar™ Power MOSFETs

## HiPerFET™

**IXFV52N30P**  
**IXFV52N30PS**  
**IXFH52N30P**

N-Channel Enhancement Mode  
Avalanche Rated  
Fast Intrinsic Diode

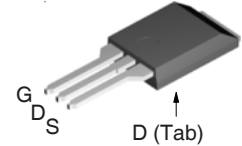


$$\begin{aligned} V_{DSS} &= 300V \\ I_{D25} &= 52A \\ R_{DS(on)} &\leq 73m\Omega \\ t_{rr} &\leq 200ns \end{aligned}$$

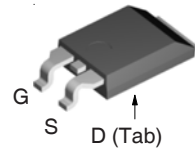
| Symbol     | Test Conditions                                                    | Maximum Ratings  |            |
|------------|--------------------------------------------------------------------|------------------|------------|
| $V_{DSS}$  | $T_J = 25^\circ C$ to $150^\circ C$                                | 300              | V          |
| $V_{DGR}$  | $T_J = 25^\circ C$ to $150^\circ C$ , $R_{GS} = 1M\Omega$          | 300              | V          |
| $V_{GSS}$  | Continuous                                                         | $\pm 20$         | V          |
| $V_{GSM}$  | Transient                                                          | $\pm 30$         | V          |
| $I_{D25}$  | $T_C = 25^\circ C$                                                 | 52               | A          |
| $I_{DM}$   | $T_C = 25^\circ C$ , Pulse Width Limited by $T_{JM}$               | 150              | A          |
| $I_A$      | $T_C = 25^\circ C$                                                 | 52               | A          |
| $E_{AS}$   | $T_C = 25^\circ C$                                                 | 1                | J          |
| $dv/dt$    | $I_S \leq I_{DM}$ , $V_{DD} \leq V_{DSS}$ , $T_J \leq 150^\circ C$ | 10               | V/ns       |
| $P_D$      | $T_C = 25^\circ C$                                                 | 400              | W          |
| $T_J$      |                                                                    | -55 ... +150     | $^\circ C$ |
| $T_{JM}$   |                                                                    | 150              | $^\circ C$ |
| $T_{stg}$  |                                                                    | -55 ... +150     | $^\circ C$ |
| $T_L$      | Maximum Lead Temperature for Soldering                             | 300              | $^\circ C$ |
| $T_{SOLD}$ | Plastic Body for 10s                                               | 260              | $^\circ C$ |
| $M_d$      | Mounting Torque (TO-247)                                           | 1.13/10          | Nm/lb.in   |
| $F_c$      | Mounting Force (PLUS220)                                           | 11..65/2.5..14.6 | N/lb       |
| Weight     | PLUS220 & PLUS220SMD                                               | 4                | g          |
|            | TO-247                                                             | 6                | g          |

| Symbol       | Test Conditions<br>( $T_J = 25^\circ C$ , Unless Otherwise Specified) | Characteristic Values |      |                    |
|--------------|-----------------------------------------------------------------------|-----------------------|------|--------------------|
|              |                                                                       | Min.                  | Typ. | Max.               |
| $BV_{DSS}$   | $V_{GS} = 0V$ , $I_D = 250\mu A$                                      | 300                   |      | V                  |
| $V_{GS(th)}$ | $V_{DS} = V_{GS}$ , $I_D = 4mA$                                       | 2.5                   |      | 5.0 V              |
| $I_{GSS}$    | $V_{GS} = \pm 20V$ , $V_{DS} = 0V$                                    |                       |      | $\pm 100$ nA       |
| $I_{DSS}$    | $V_{DS} = V_{DSS}$ , $V_{GS} = 0V$<br>$T_J = 125^\circ C$             |                       |      | 25 $\mu A$<br>1 mA |
| $R_{DS(on)}$ | $V_{GS} = 10V$ , $I_D = 0.5 \cdot I_{D25}$ , Note 1                   |                       |      | 73 m $\Omega$      |

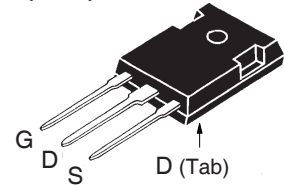
PLUS220 (IXFV)



PLUS220SMD (IXFV\_S)



TO-247 (IXFH)



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

### Features

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

### Advantages

- High Power Density
- Easy to Mount
- Space Savings

### Applications

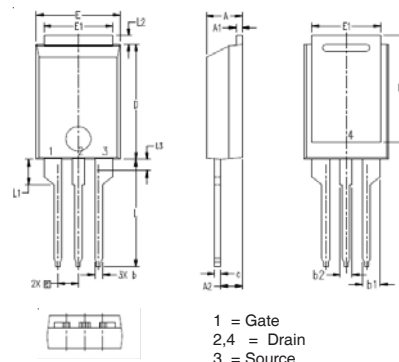
- Switch-Mode and Resonant-Mode Power Supplies
- DC-DC Converters
- Laser Drivers
- AC and DC Motor Drives
- Robotics and Servo Controls

| Symbol       | Test Conditions<br>( $T_J = 25^\circ\text{C}$ Unless Otherwise Specified)                                                                   | Characteristic Values |      |                         |
|--------------|---------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|------|-------------------------|
|              |                                                                                                                                             | Min.                  | Typ. | Max.                    |
| $g_{fs}$     | $V_{DS} = 10\text{V}$ , $I_D = 0.5 \cdot I_{D25}$ , Note 1                                                                                  | 20                    | 30   | S                       |
| $C_{iss}$    | $V_{GS} = 0\text{V}$ , $V_{DS} = 25\text{V}$ , $f = 1\text{MHz}$                                                                            |                       | 3490 | pF                      |
| $C_{oss}$    |                                                                                                                                             |                       | 550  | pF                      |
| $C_{rss}$    |                                                                                                                                             |                       | 130  | pF                      |
| $t_{d(on)}$  | <b>Resistive Switching Times</b><br>$V_{GS} = 10\text{V}$ , $V_{DS} = 0.5 \cdot V_{DSS}$ , $I_D = 52\text{A}$<br>$R_G = 4\Omega$ (External) |                       | 24   | ns                      |
| $t_r$        |                                                                                                                                             |                       | 22   | ns                      |
| $t_{d(off)}$ |                                                                                                                                             |                       | 60   | ns                      |
| $t_f$        |                                                                                                                                             |                       | 20   | ns                      |
| $Q_{g(on)}$  | $V_{GS} = 10\text{V}$ , $V_{DS} = 0.5 \cdot V_{DSS}$ , $I_D = 0.5 \cdot I_{D25}$                                                            |                       | 110  | nC                      |
| $Q_{gs}$     |                                                                                                                                             |                       | 25   | nC                      |
| $Q_{gd}$     |                                                                                                                                             |                       | 53   | nC                      |
| $R_{thJC}$   | (TO-247 & PLUS220)                                                                                                                          |                       |      | 0.31 $^\circ\text{C/W}$ |
| $R_{thCS}$   |                                                                                                                                             | 0.25                  |      | $^\circ\text{C/W}$      |

| Source-Drain Diode                                   |                                                                                                       | Characteristic Values |      |        |
|------------------------------------------------------|-------------------------------------------------------------------------------------------------------|-----------------------|------|--------|
| $T_J = 25^\circ\text{C}$ Unless Otherwise Specified) |                                                                                                       | Min.                  | Typ. | Max.   |
| $I_S$                                                | $V_{GS} = 0\text{V}$                                                                                  |                       |      | 52 A   |
| $I_{SM}$                                             | Repetitive, pulse width limited by $T_{JM}$                                                           |                       |      | 150 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>$V_R = 100\text{V}$ , $V_{GS} = 0\text{V}$ |                       | 160  | 200 ns |
| $Q_{RM}$                                             |                                                                                                       |                       | 800  | nC     |
| $I_{RM}$                                             |                                                                                                       |                       | 7    | A      |

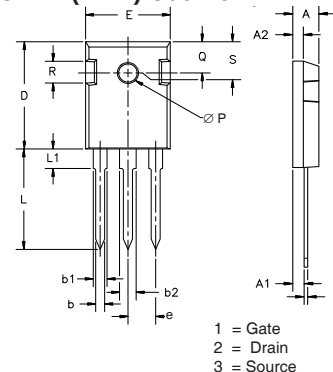
Note 1: Pulse test,  $t \leq 300\mu\text{s}$ , duty cycle,  $d \leq 2\%$ .

### PLUS220 (IXFV) Outline



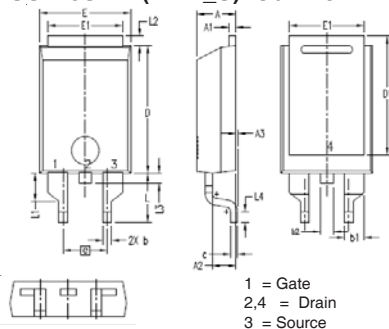
| SYM | INCHES |      | MILLIMETER |       |
|-----|--------|------|------------|-------|
|     | MIN    | MAX  | MIN        | MAX   |
| A   | .169   | .185 | 4.30       | 4.70  |
| A1  | .028   | .035 | 0.70       | 0.90  |
| A2  | .098   | .118 | 2.50       | 3.00  |
| b   | .035   | .047 | 0.90       | 1.20  |
| b1  | .080   | .095 | 2.03       | 2.41  |
| b2  | .054   | .064 | 1.37       | 1.63  |
| c   | .028   | .035 | 0.70       | 0.90  |
| D   | .551   | .591 | 14.00      | 15.00 |
| D1  | .512   | .539 | 13.00      | 13.70 |
| E   | .394   | .433 | 10.00      | 11.00 |
| E1  | .331   | .346 | 8.40       | 8.80  |
| e   | .100   | BSC  | 2.54       | BSC   |
| L   | .512   | .551 | 13.00      | 14.00 |
| L1  | .118   | .138 | 3.00       | 3.50  |
| L2  | .035   | .051 | 0.90       | 1.30  |
| L3  | .047   | .059 | 1.20       | 1.50  |

### TO-247 (IXFH) Outline



| Dim. | Millimeter |       | Inches |       |
|------|------------|-------|--------|-------|
|      | Min.       | Max.  | Min.   | Max.  |
| A    | 4.7        | 5.3   | .185   | .209  |
| A1   | 2.2        | 2.54  | .087   | .102  |
| A2   | 2.2        | 2.6   | .059   | .098  |
| b    | 1.0        | 1.4   | .040   | .055  |
| b1   | 1.65       | 2.13  | .065   | .084  |
| b2   | 2.87       | 3.12  | .113   | .123  |
| C    | .4         | .8    | .016   | .031  |
| D    | 20.80      | 21.46 | .819   | .845  |
| E    | 15.75      | 16.26 | .610   | .640  |
| e    | 5.20       | 5.72  | 0.205  | 0.225 |
| L    | 19.81      | 20.32 | .780   | .800  |
| L1   |            | 4.50  |        | .177  |
| ØP   | 3.55       | 3.65  | .140   | .144  |
| Q    | 5.89       | 6.40  | 0.232  | 0.252 |
| R    | 4.32       | 5.49  | .170   | .216  |
| S    | 6.15       | BSC   | 242    | BSC   |

### PLUS220SMD (IXFV S) Outline

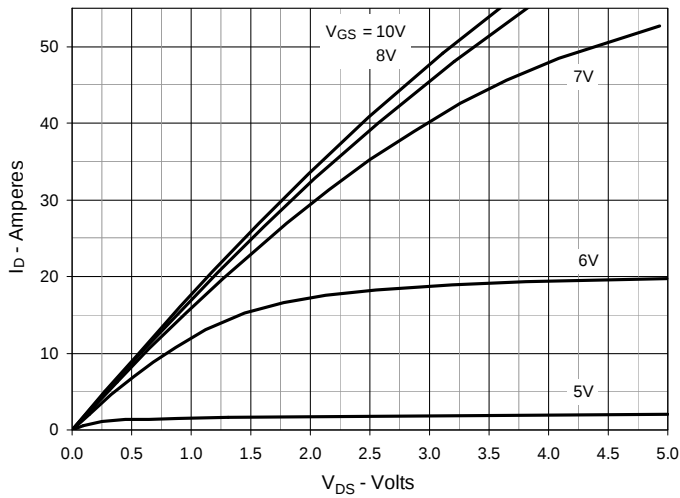


| SYM | INCHES |      | MILLIMETER |       |
|-----|--------|------|------------|-------|
|     | MIN    | MAX  | MIN        | MAX   |
| A   | .169   | .185 | 4.30       | 4.70  |
| A1  | .028   | .035 | 0.70       | 0.90  |
| A2  | .098   | .118 | 2.50       | 3.00  |
| A3  | .000   | .010 | 0.00       | 0.25  |
| b   | .035   | .047 | 0.90       | 1.20  |
| b1  | .080   | .095 | 2.03       | 2.41  |
| b2  | .054   | .064 | 1.37       | 1.63  |
| c   | .028   | .035 | 0.70       | 0.90  |
| D   | .551   | .591 | 14.00      | 15.00 |
| D1  | .512   | .539 | 13.00      | 13.70 |
| E   | .394   | .433 | 10.00      | 11.00 |
| E1  | .331   | .346 | 8.40       | 8.80  |
| e   | .100   | BSC  | 2.54       | BSC   |
| L   | .512   | .551 | 13.00      | 14.00 |
| L1  | .118   | .138 | 3.00       | 3.50  |
| L2  | .035   | .051 | 0.90       | 1.30  |
| L3  | .047   | .059 | 1.20       | 1.50  |
| L4  | .039   | .059 | 1.00       | 1.50  |

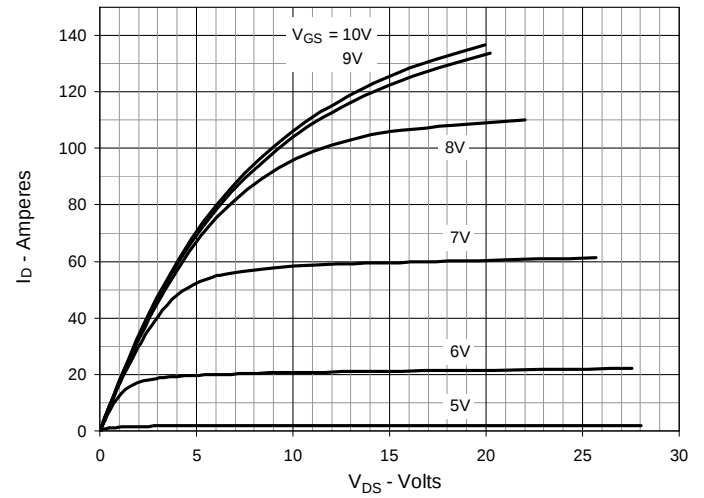
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IXYS MOSFETs and IGBTs are covered 4,835,592 4,931,844 5,049,961 5,237,481 6,162,665 6,404,065 B1 6,683,344 6,727,585 7,005,734 B2 7,157,338 B2  
by one or more of the following U.S. patents: 4,860,072 5,017,508 5,063,307 5,381,025 6,259,123 B1 6,534,343 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

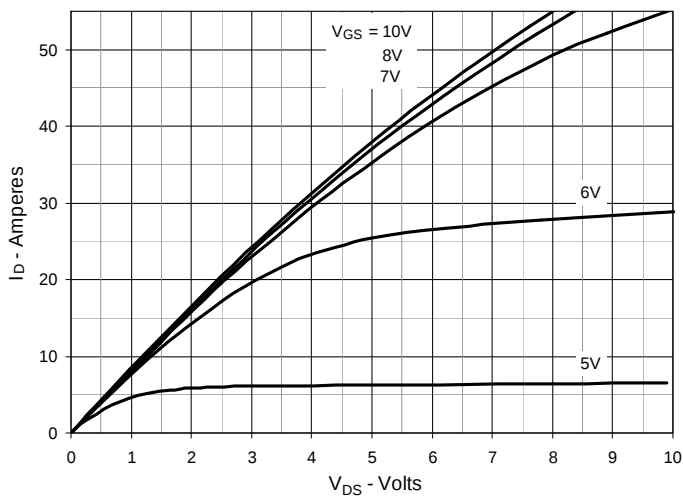
**Fig. 1. Output Characteristics @  $T_J = 25^\circ\text{C}$**



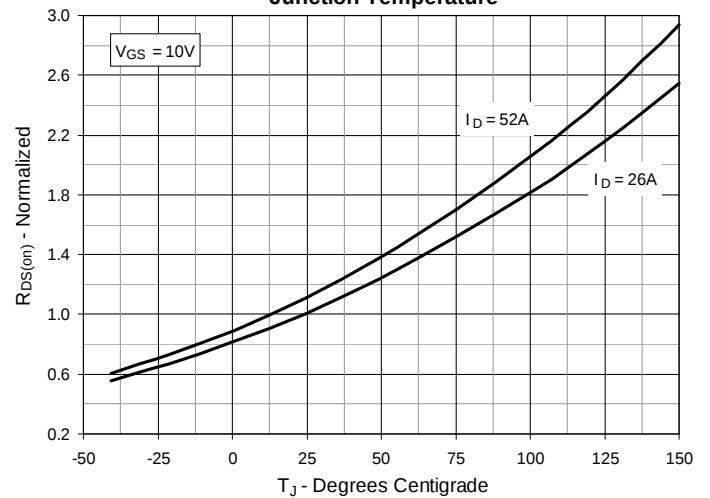
**Fig. 2. Extended Output Characteristics @  $T_J = 25^\circ\text{C}$**



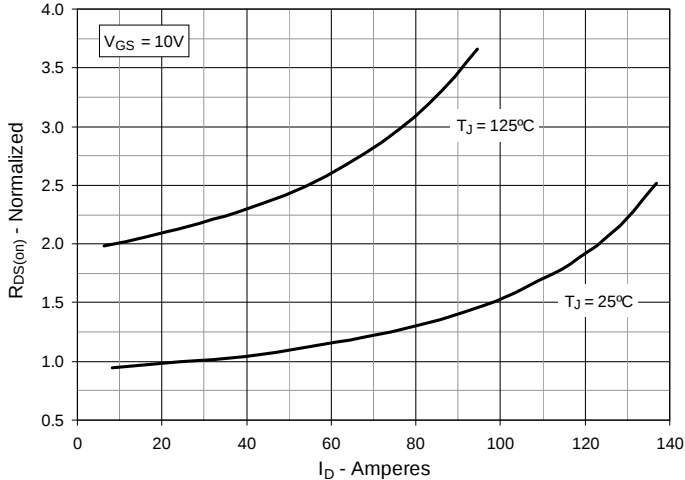
**Fig. 3. Output Characteristics @  $T_J = 125^\circ\text{C}$**



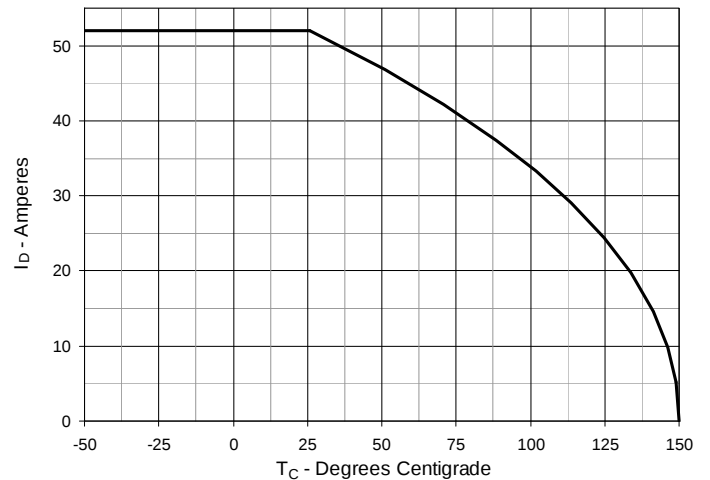
**Fig. 4.  $R_{DS(on)}$  Normalized to  $I_D = 26\text{A}$  Value vs. Junction Temperature**



**Fig. 5.  $R_{DS(on)}$  Normalized to  $I_D = 26\text{A}$  Value vs. Drain Current**



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



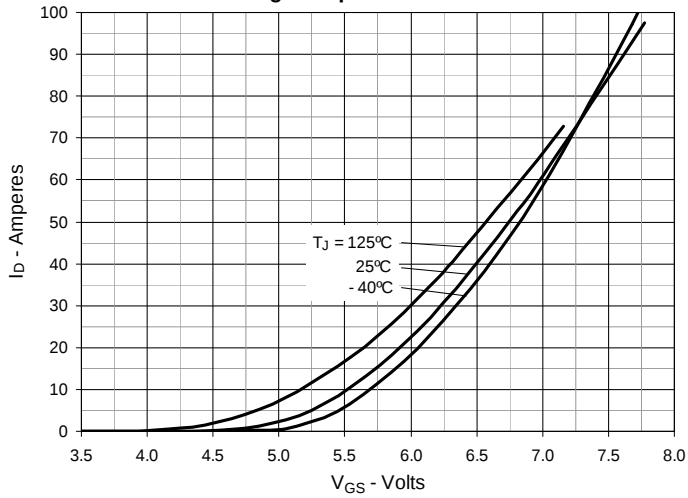
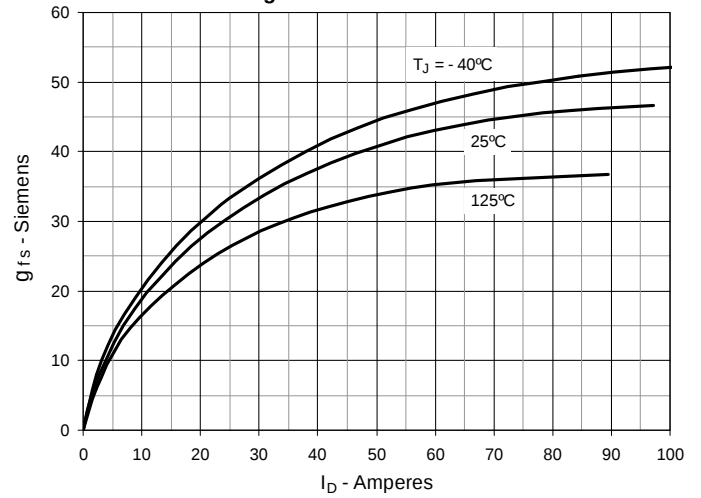
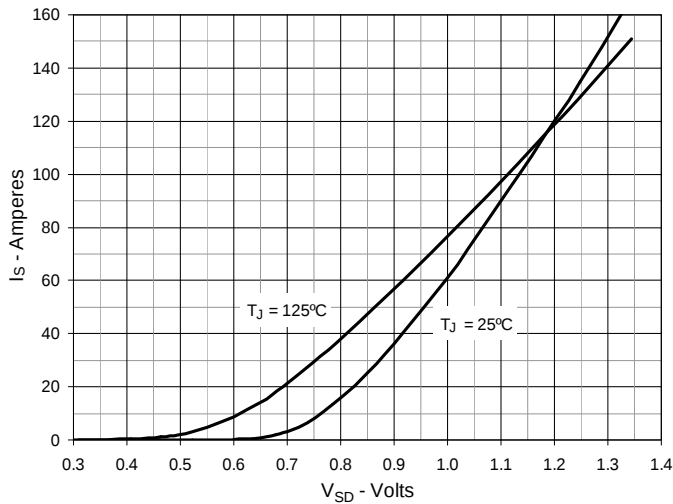
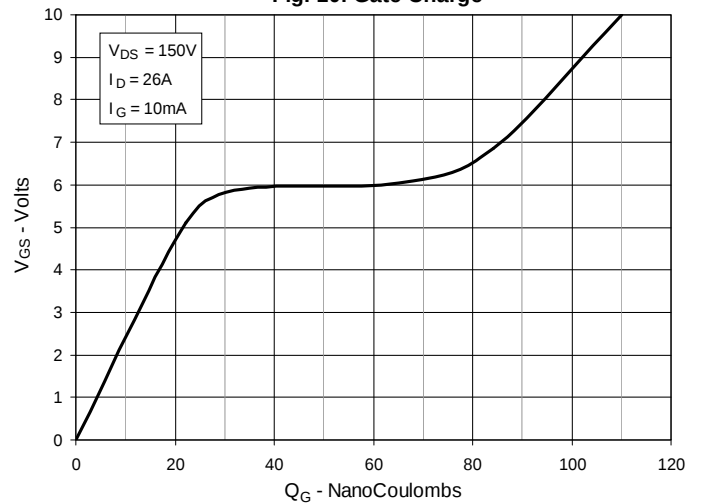
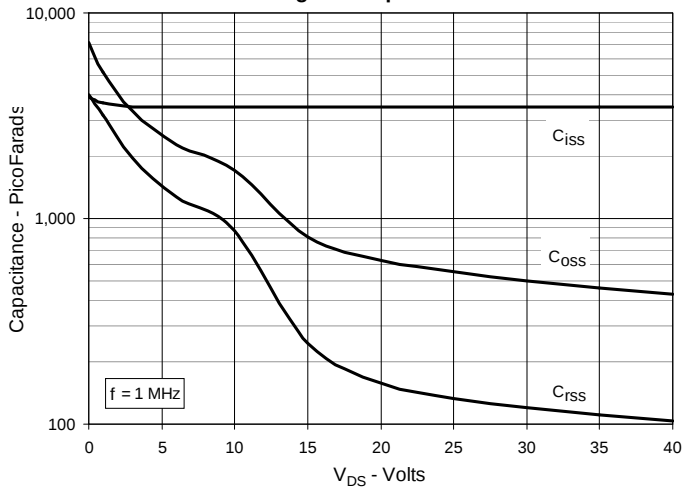
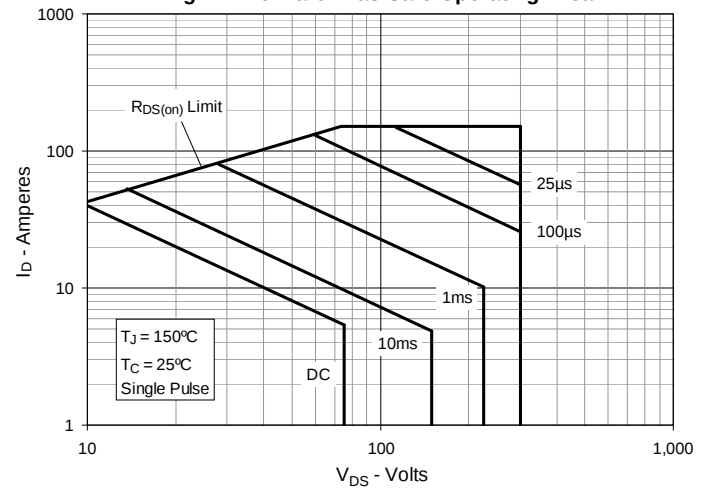
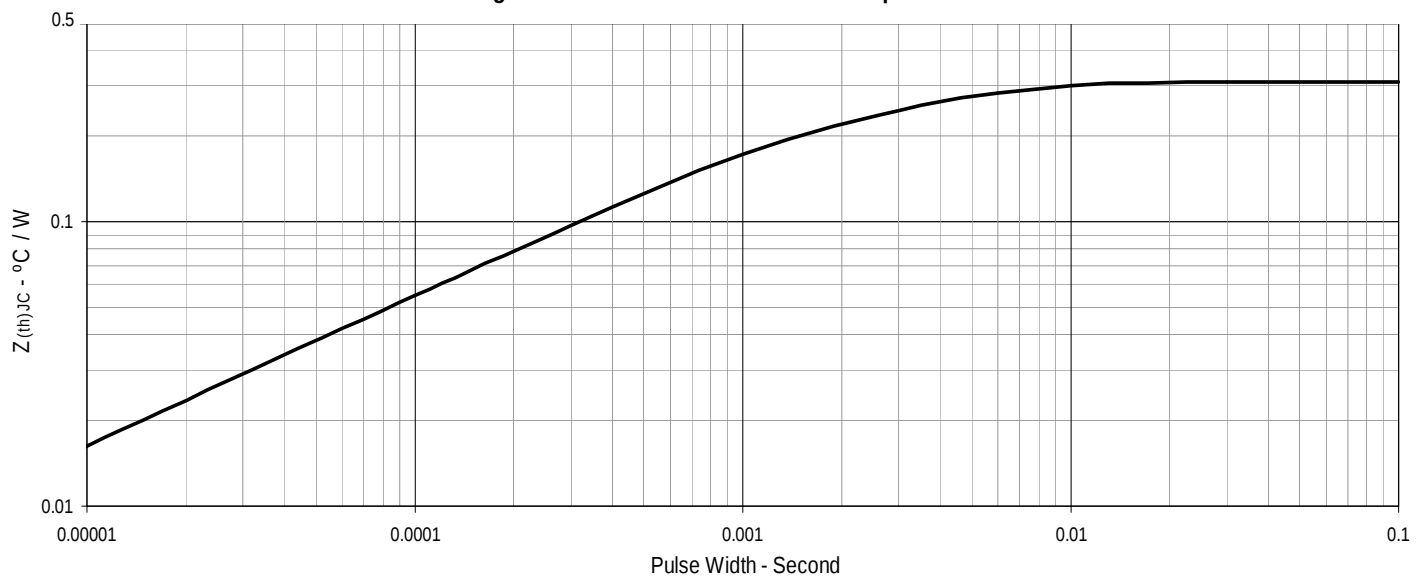
**Fig. 7. Input Admittance**

**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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