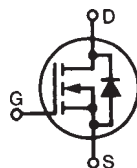


## Polar™ HiPerFET™ Power MOSFETs

N-Channel Enhancement Mode  
Avalanche Rated  
Fast Intrinsic Diode

**IXFV36N50PS**  
**IXFV36N50P**  
**IXFH36N50P**  
**IXFT36N50P**

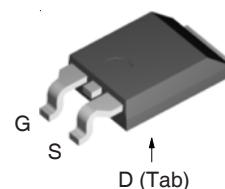


| Symbol        | Test Conditions                                                              | Maximum Ratings   |                  |
|---------------|------------------------------------------------------------------------------|-------------------|------------------|
| $V_{DSS}$     | $T_J = 25^\circ\text{C}$ to $150^\circ\text{C}$                              | 500               | V                |
| $V_{DGR}$     | $T_J = 25^\circ\text{C}$ to $150^\circ\text{C}$ , $R_{GS} = 1\text{M}\Omega$ | 500               | V                |
| $V_{GSS}$     | Continuous                                                                   | $\pm 30$          | V                |
| $V_{GSM}$     | Transient                                                                    | $\pm 40$          | V                |
| $I_{D25}$     | $T_C = 25^\circ\text{C}$                                                     | 36                | A                |
| $I_{DM}$      | $T_C = 25^\circ\text{C}$ , Pulse Width Limited by $T_{JM}$                   | 90                | A                |
| $I_A$         | $T_C = 25^\circ\text{C}$                                                     | 36                | A                |
| $E_{AS}$      | $T_C = 25^\circ\text{C}$                                                     | 1.5               | J                |
| $dv/dt$       | $I_S \leq I_{DM}$ , $V_{DD} \leq V_{DSS}$ , $T_J \leq 150^\circ\text{C}$     | 10                | V/ns             |
| $P_D$         | $T_C = 25^\circ\text{C}$                                                     | 540               | W                |
| $T_J$         |                                                                              | -55 ... +150      | $^\circ\text{C}$ |
| $T_{JM}$      |                                                                              | 150               | $^\circ\text{C}$ |
| $T_{stg}$     |                                                                              | -55 ... +150      | $^\circ\text{C}$ |
| $T_L$         | 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-247)                                                     | 1.13/10           | Nm/lb.in.        |
| $F_C$         | Mounting Force (PLUS220)                                                     | 20..120 / 4.5..27 | N/lb.            |
| <b>Weight</b> | PLUS220                                                                      | 4.0               | g                |
|               | TO-268                                                                       | 4.0               | g                |
|               | TO-247                                                                       | 6.0               | g                |

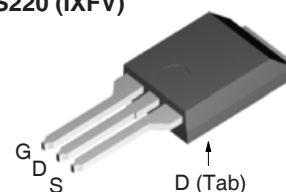
| Symbol       | Test Conditions<br>( $T_J = 25^\circ\text{C}$ Unless Otherwise Specified) | Characteristic Values |      |                                       |
|--------------|---------------------------------------------------------------------------|-----------------------|------|---------------------------------------|
|              |                                                                           | Min.                  | Typ. | Max.                                  |
| $BV_{DSS}$   | $V_{GS} = 0\text{V}$ , $I_D = 250\mu\text{A}$                             | 500                   |      | V                                     |
| $V_{GS(th)}$ | $V_{DS} = V_{GS}$ , $I_D = 4\text{mA}$                                    | 3.0                   |      | 5.0 V                                 |
| $I_{GSS}$    | $V_{GS} = \pm 30\text{V}$ , $V_{DS} = 0\text{V}$                          |                       |      | $\pm 100$ nA                          |
| $I_{DSS}$    | $V_{DS} = V_{DSS}$ , $V_{GS} = 0\text{V}$                                 |                       |      | 25 $\mu\text{A}$<br>500 $\mu\text{A}$ |
|              | $T_J = 125^\circ\text{C}$                                                 |                       |      |                                       |
| $R_{DS(on)}$ | $V_{GS} = 10\text{V}$ , $I_D = 0.5 \cdot I_{D25}$ , Note 1                |                       |      | 170 m $\Omega$                        |

$$\begin{aligned} V_{DSS} &= 500\text{V} \\ I_{D25} &= 36\text{A} \\ R_{DS(on)} &\leq 170\text{m}\Omega \\ t_{rr} &\leq 200\text{ns} \end{aligned}$$

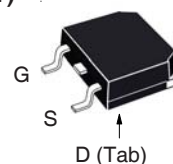
PLUS220SMD (IXFV...S)



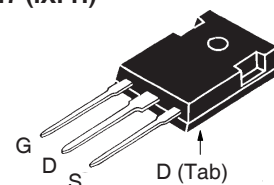
PLUS220 (IXFV)



TO-268 (IXFT)



TO-247 (IXFH)



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

### Features

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

### Advantages

- High Power Density
- Easy to Mount
- Space Savings

| Symbol       | Test Conditions<br>( $T_J = 25^\circ\text{C}$ Unless Otherwise Specified)                                                                          | Characteristic Values |      |                         |
|--------------|----------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|------|-------------------------|
|              |                                                                                                                                                    | Min.                  | Typ. | Max.                    |
| $g_{fs}$     | $V_{DS} = 20\text{V}$ , $I_D = 0.5 \cdot I_{D25}$ , Note 1                                                                                         | 23                    | 36   | S                       |
| $C_{iss}$    | $V_{GS} = 0\text{V}$ , $V_{DS} = 25\text{V}$ , $f = 1\text{MHz}$                                                                                   |                       | 5500 | pF                      |
| $C_{oss}$    |                                                                                                                                                    |                       | 510  | pF                      |
| $C_{rss}$    |                                                                                                                                                    |                       | 40   | 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>$R_G = 3\Omega$ (External) |                       | 25   | ns                      |
| $t_r$        |                                                                                                                                                    |                       | 27   | ns                      |
| $t_{d(off)}$ |                                                                                                                                                    |                       | 75   | ns                      |
| $t_f$        |                                                                                                                                                    |                       | 21   | ns                      |
| $Q_{g(on)}$  | $V_{GS} = 10\text{V}$ , $V_{DS} = 0.5 \cdot V_{DSS}$ , $I_D = 0.5 \cdot I_{D25}$                                                                   |                       | 93   | nC                      |
| $Q_{gs}$     |                                                                                                                                                    |                       | 30   | nC                      |
| $Q_{gd}$     |                                                                                                                                                    |                       | 31   | nC                      |
| $R_{thJC}$   | (TO-247 & PLUS220)                                                                                                                                 |                       | 0.25 | 0.23 $^\circ\text{C/W}$ |
| $R_{thCS}$   |                                                                                                                                                    |                       |      | $^\circ\text{C/W}$      |

## Source-Drain Diode

| Symbol   | Test Conditions<br>( $T_J = 25^\circ\text{C}$ Unless Otherwise Specified)                             | Characteristic Values |      |               |
|----------|-------------------------------------------------------------------------------------------------------|-----------------------|------|---------------|
|          |                                                                                                       | Min.                  | Typ. | Max.          |
| $I_S$    | $V_{GS} = 0\text{V}$                                                                                  |                       |      | 36 A          |
| $I_{SM}$ | Repetitive, Pulse Width Limited by $T_{JM}$                                                           |                       |      | 144 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>$V_R = 100\text{V}$ , $V_{GS} = 0\text{V}$ |                       | 0.8  | 200 ns        |
| $Q_{RM}$ |                                                                                                       |                       |      | $\mu\text{C}$ |
| $I_{RM}$ |                                                                                                       |                       |      | A             |

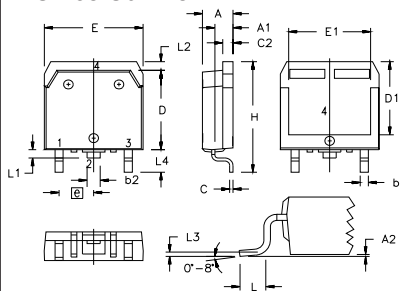
Note 1. Pulse test,  $t \leq 300\mu\text{s}$ , duty cycle,  $d \leq 2\%$ .

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    |             |

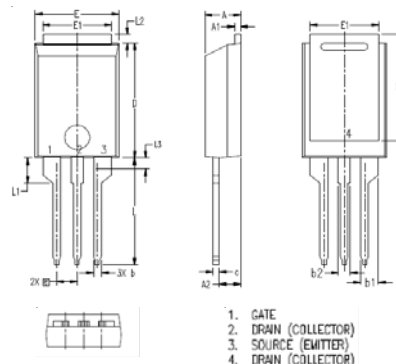
## TO-268 Outline



Terminals: 1 - Gate 2,4 - Drain  
3 - Source

| SYM | INCHES   |      | MILLIMETERS |       |
|-----|----------|------|-------------|-------|
|     | MIN      | MAX  | MIN         | MAX   |
| A   | .193     | .201 | 4.90        | 5.10  |
| A1  | .106     | .114 | 2.70        | 2.90  |
| A2  | .001     | .010 | 0.02        | 0.25  |
| b   | .045     | .057 | 1.15        | 1.45  |
| b2  | .075     | .083 | 1.90        | 2.10  |
| C   | .016     | .026 | 0.40        | 0.65  |
| C2  | .057     | .063 | 1.45        | 1.60  |
| D   | .543     | .551 | 13.80       | 14.00 |
| D1  | .488     | .500 | 12.40       | 12.70 |
| E   | .624     | .632 | 15.85       | 16.05 |
| E1  | .524     | .535 | 13.30       | 13.60 |
| e   | .215 BSC |      | 5.45 BSC    |       |
| H   | .736     | .752 | 18.70       | 19.10 |
| L   | .094     | .106 | 2.40        | 2.70  |
| L1  | .047     | .055 | 1.20        | 1.40  |
| L2  | .039     | .045 | 1.00        | 1.15  |
| L3  | .010 BSC |      | 0.25 BSC    |       |
| L4  | .150     | .161 | 3.80        | 4.10  |

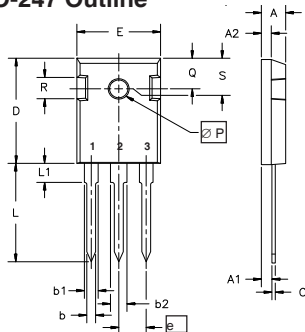
## PLUS220 (IXFV) Outline



1. GATE  
2. DRAIN (COLLECTOR)  
3. SOURCE (EMITTER)  
4. DRAIN (COLLECTOR)

| 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  |

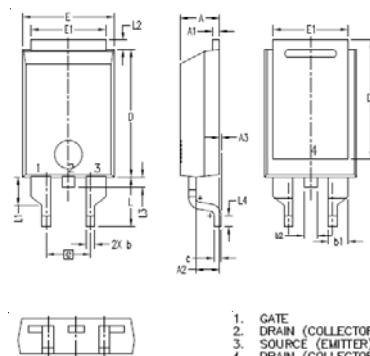
## TO-247 Outline



Terminals: 1 - Gate 2 - Drain  
3 - Source

| Dim.           | Millimeter |       | Inches  |       |
|----------------|------------|-------|---------|-------|
|                | Min.       | Max.  | Min.    | Max.  |
| A              | 4.7        | 5.3   | .185    | .209  |
| A <sub>1</sub> | 2.2        | 2.54  | .087    | .102  |
| A <sub>2</sub> | 2.2        | 2.6   | .059    | .098  |
| b              | 1.0        | 1.4   | .040    | .055  |
| b <sub>1</sub> | 1.65       | 2.13  | .065    | .084  |
| b <sub>2</sub> | 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 |       |

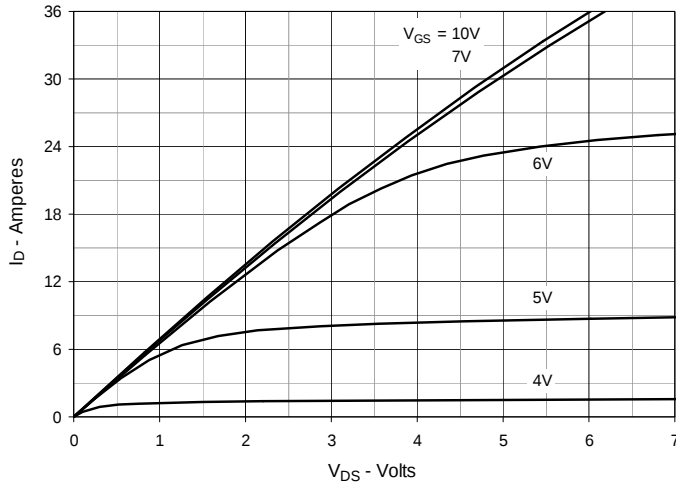
## PLUS220SMD (IXFV\_S) Outline



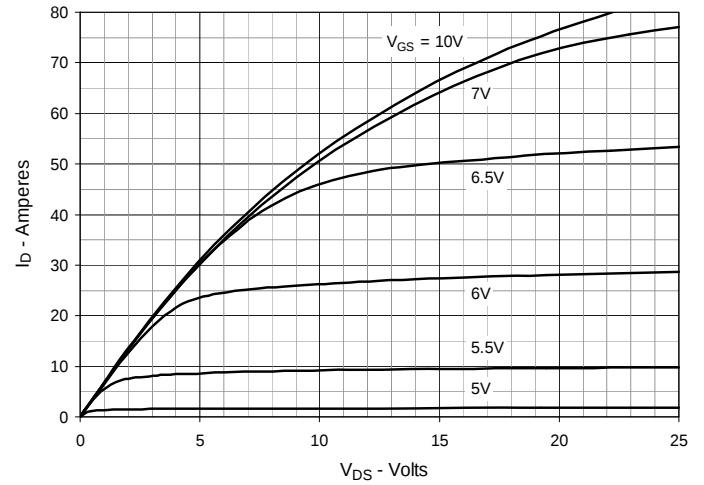
1. GATE  
2. DRAIN (COLLECTOR)  
3. SOURCE (EMITTER)  
4. DRAIN (COLLECTOR)

| 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   | .200 BSC |      | 5.08 BSC   |       |
| L   | .209     | .228 | 5.30       | 5.80  |
| 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  |

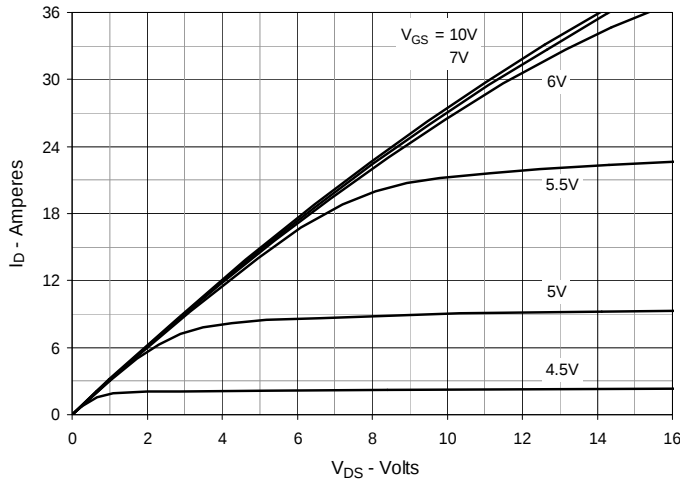
**Fig. 1. Output Characteristics @  $T_J = 25^\circ\text{C}$**



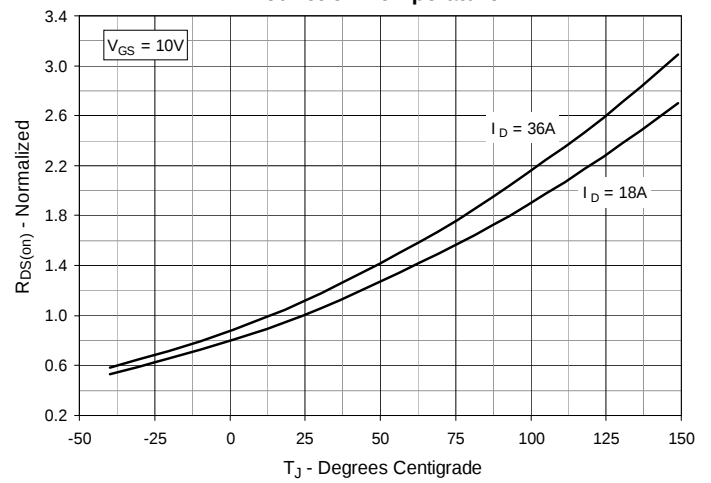
**Fig. 2. Extended Output Characteristics @  $T_J = 25^\circ\text{C}$**



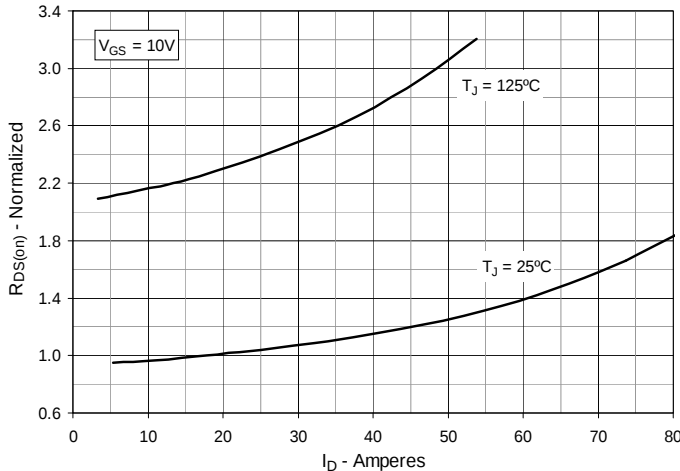
**Fig. 3. Output Characteristics @  $T_J = 125^\circ\text{C}$**



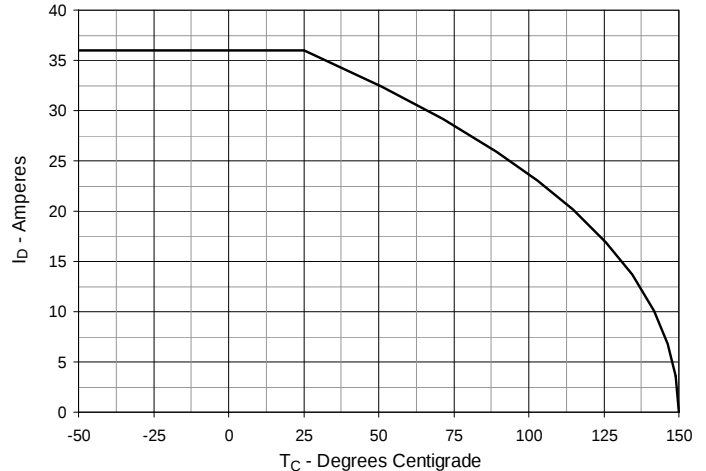
**Fig. 4.  $R_{DS(on)}$  Normalized to  $I_D = 18\text{A}$  Value vs. Junction Temperature**



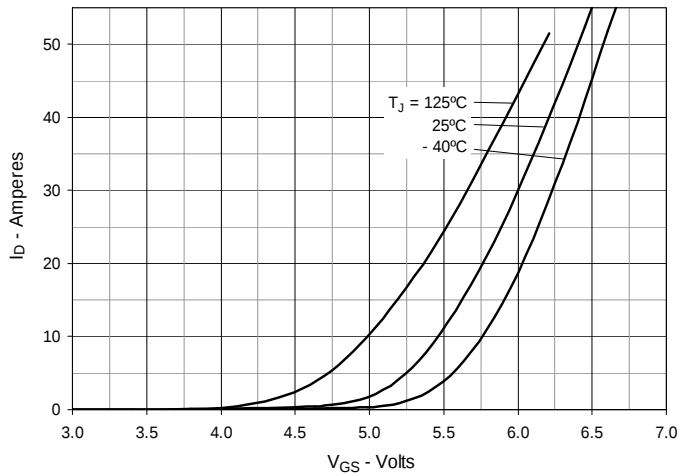
**Fig. 5.  $R_{DS(on)}$  Normalized to  $I_D = 18\text{A}$  Value vs. Drain Current**



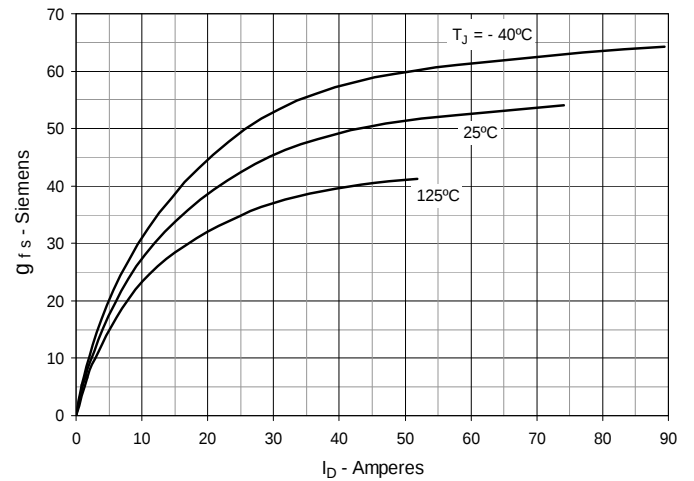
**Fig. 6. Maximum Drain Current vs. Case Temperature**



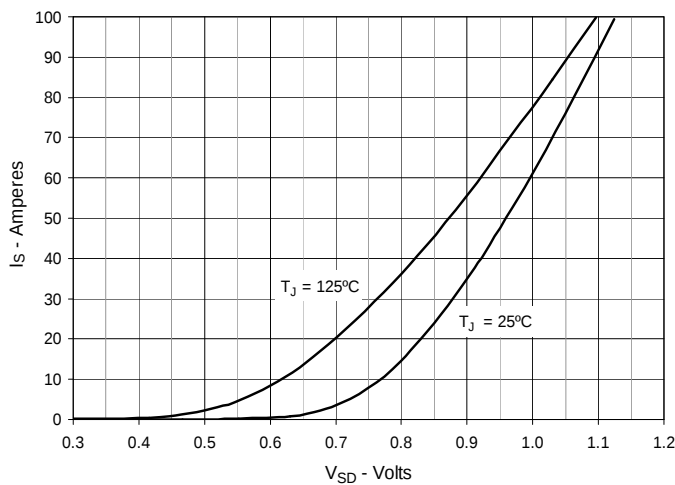
**Fig. 7. Input Admittance**



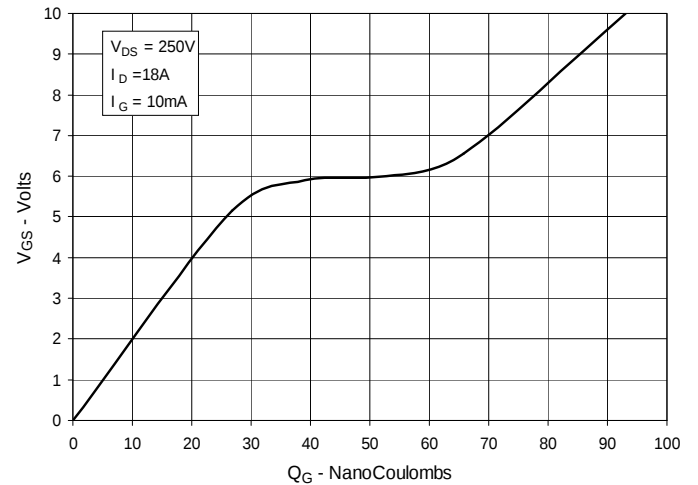
**Fig. 8. Transconductance**



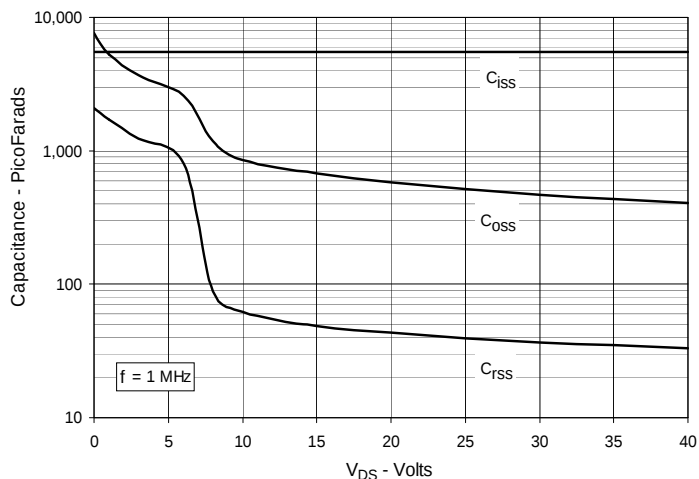
**Fig. 9. Forward Voltage Drop of Intrinsic Diode**



**Fig. 10. Gate Charge**



**Fig. 11. Capacitance**



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

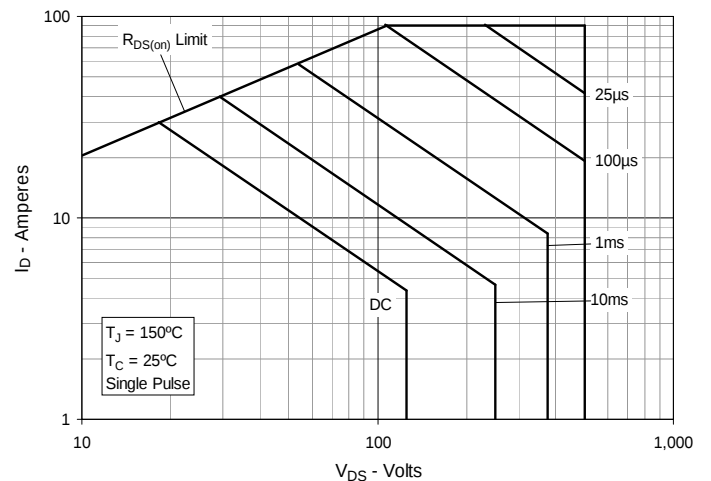
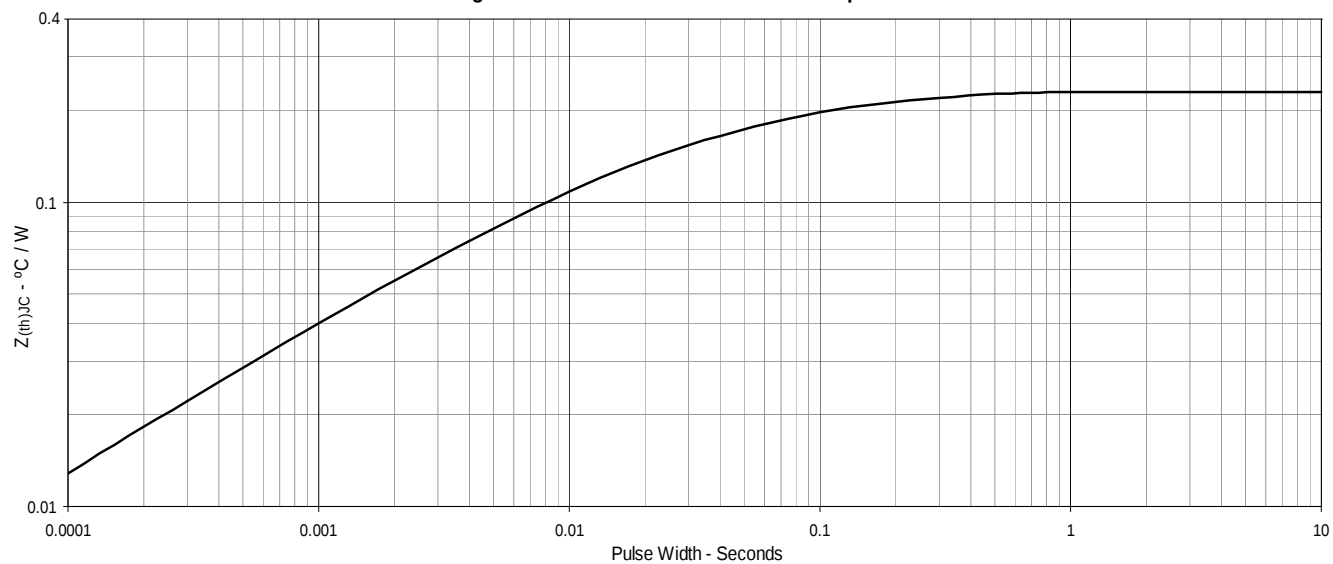


Fig. 13. Maximum Transient Thermal Impedance





---

Disclaimer Notice - Information furnished is believed to be accurate and reliable. However, users should independently evaluate the suitability of and test each product selected for their own applications. Littelfuse products are not designed for, and may not be used in, all applications. Read complete Disclaimer Notice at [www.littelfuse.com/disclaimer-electronics](http://www.littelfuse.com/disclaimer-electronics).