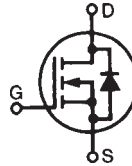


# PolarHT™ HiPerFET Power MOSFET

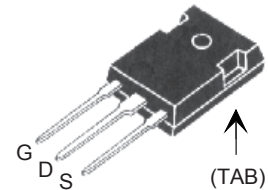
**IXFH 96N15P**  
**IXFV 96N15P**  
**IXFV 96N15PS**

$V_{DSS} = 150 \text{ V}$   
 $I_{D25} = 96 \text{ A}$   
 $R_{DS(on)} \leq 24 \text{ m}\Omega$   
 $t_{rr} \leq 200 \text{ ns}$

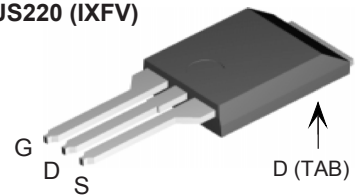
N-Channel Enhancement Mode  
Avalanche Energy Rated  
Fast Intrinsic Diode



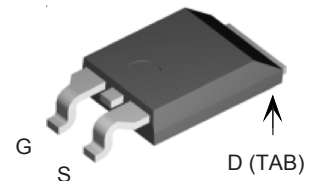
TO-247 (IXFH)



PLUS220 (IXFV)



PLUS220SMD (IXFV\_\_S)



G = Gate      D = Drain  
S = Source    TAB = Drain

| Symbol        | Test Conditions   | Maximum Ratings  |                  |
|---------------|---|------------------|------------------|
| $V_{DSS}$     | $T_J = 25^\circ\text{C to } 175^\circ\text{C}$  | 150              | V                |
| $V_{DGR}$     | $T_J = 25^\circ\text{C to } 175^\circ\text{C}; R_{GS} = 1 \text{ M}\Omega$  | 150              | V                |
| $V_{GS}$      | Continuous  | $\pm 20$         | V                |
| $V_{GSM}$     | Transient   | $\pm 30$         | V                |
| $I_{D25}$     | $T_C = 25^\circ\text{C}$  | 96               | A                |
| $I_{D(RMS)}$  | External lead current limit   | 75               | A                |
| $I_{DM}$      | $T_C = 25^\circ\text{C}$ , pulse width limited by $T_{JM}$  | 250              | A                |
| $I_{AR}$      | $T_C = 25^\circ\text{C}$  | 60               | A                |
| $E_{AR}$      | $T_C = 25^\circ\text{C}$  | 40               | mJ               |
| $E_{AS}$      | $T_C = 25^\circ\text{C}$  | 1.0              | J                |
| $dv/dt$       | $I_S \leq I_{DM}$ , $di/dt \leq 100 \text{ A}/\mu\text{s}$ , $V_{DD} \leq V_{DSS}$ ,<br>$T_J \leq 175^\circ\text{C}$ , $R_G = 4 \Omega$ | 10               | V/ns             |
| $P_D$         | $T_C = 25^\circ\text{C}$  | 480              | W                |
| $T_J$         |   | -55 ... +175     | $^\circ\text{C}$ |
| $T_{JM}$      |   | 175              | $^\circ\text{C}$ |
| $T_{stg}$     |   | -55 ... +150     | $^\circ\text{C}$ |
| $T_L$         | 1.6 mm (0.062 in.) from case for 10 s   | 300              | $^\circ\text{C}$ |
| $T_{SOLD}$    | Plastic body for 10s  | 260              | $^\circ\text{C}$ |
| $F_C$         | Mounting force (PLUS220)  | 11...65/2.4...11 | N/lb             |
| $M_d$         | Mounting torque (TO-247)  | 1.13/10          | Nm/lb.in.        |
| <b>Weight</b> | TO-247  | 6                | g                |
|               | PLUS220   | 4                | g                |

## Features

- † International standard packages
- † Unclamped Inductive Switching (UIS) rated
- † Low package inductance
  - easy to drive and to protect

## Advantages

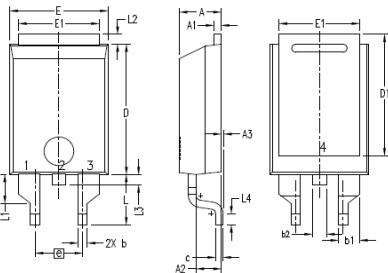
- † Easy to mount
- † Space savings
- † High power density

| Symbol       | Test Conditions<br>( $T_J = 25^\circ\text{C}$ , unless otherwise specified)                                     | Characteristic Values |      |  |
|--------------|---|-----------------------|------|--|
|              |   | Min.                  | Typ. | Max.                                   |
| $BV_{DSS}$   | $V_{GS} = 0 \text{ V}$ , $I_D = 250 \mu\text{A}$  | 150                   |      | V                                      |
| $V_{GS(th)}$ | $V_{DS} = V_{GS}$ , $I_D = 4 \text{ mA}$  | 3.0                   |      | 5.0 V                                  |
| $I_{GSS}$    | $V_{GS} = \pm 20 \text{ V}_{DC}$ , $V_{DS} = 0$   |                       |      | $\pm 100 \text{ nA}$                   |
| $I_{DSS}$    | $V_{DS} = V_{DSS}$<br>$V_{GS} = 0 \text{ V}$  |                       |      | 25 $\mu\text{A}$<br>1000 $\mu\text{A}$ |
| $R_{DS(on)}$ | $V_{GS} = 10 \text{ V}$ , $I_D = 0.5 I_{D25}$<br>Pulse test, $t \leq 300 \mu\text{s}$ , duty cycle $d \leq 2\%$ |                       |      | 24 $\text{m}\Omega$                    |

| Symbol                    | Test Conditions   | Characteristic Values                               |      |           |
|---------------------------|---|---|------|-----------|
|                           |   | (T <sub>J</sub> = 25°C, unless otherwise specified) |      |           |
|                           |   | Min.  | Typ. | Max.      |
| <b>g<sub>fs</sub></b>     | V <sub>DS</sub> = 10 V; I <sub>D</sub> = 0.5 I <sub>D25</sub> , pulse test  | 35  | 45   | S         |
| <b>C<sub>iss</sub></b>    | V <sub>GS</sub> = 0 V, V <sub>DS</sub> = 25 V, f = 1 MHz  |   | 3500 | pF        |
| <b>C<sub>oss</sub></b>    |   |   | 1000 | pF        |
| <b>C<sub>rss</sub></b>    |   |   | 280  | pF        |
| <b>t<sub>d(on)</sub></b>  | V <sub>GS</sub> = 10 V, V <sub>DS</sub> = 0.5 V <sub>DSS</sub> , I <sub>D</sub> = 60 A<br>R <sub>G</sub> = 4 Ω (External) |   | 30   | ns        |
| <b>t<sub>r</sub></b>      |   |   | 33   | ns        |
| <b>t<sub>d(off)</sub></b> |   |   | 66   | ns        |
| <b>t<sub>f</sub></b>      |   |   | 18   | ns        |
| <b>Q<sub>g(on)</sub></b>  | V <sub>GS</sub> = 10 V, V <sub>DS</sub> = 0.5 V <sub>DSS</sub> , I <sub>D</sub> = 0.5 I <sub>D25</sub>                    |   | 110  | nC        |
| <b>Q<sub>gs</sub></b>     |   |   | 26   | nC        |
| <b>Q<sub>gd</sub></b>     |   |   | 59   | nC        |
| <b>R<sub>thJC</sub></b>   | (TO-247, PLUS220)   |   | 0.21 | °C/W      |
| <b>R<sub>thCS</sub></b>   |   |   |      | 0.31 °C/W |

| Symbol                | Test Conditions  | Characteristic Values                               |      |        |
|-----------------------|--|---|------|--------|
|                       |  | (T <sub>J</sub> = 25°C, unless otherwise specified) |      |        |
|                       |  | Min.  | Typ. | Max.   |
| <b>I<sub>S</sub></b>  | V <sub>GS</sub> = 0 V  |   |      | 96 A   |
| <b>I<sub>SM</sub></b> | Repetitive   |   |      | 250 A  |
| <b>V<sub>SD</sub></b> | I <sub>F</sub> = I <sub>S</sub> , V <sub>GS</sub> = 0 V,<br>Pulse test, t ≤ 300 μs, duty cycle d ≤ 2 % |   |      | 1.5 V  |
| <b>t<sub>rr</sub></b> | I <sub>F</sub> = 25 A, -di/dt = 100 A/μs   |   |      | 200 ns |
| <b>Q<sub>RM</sub></b> | V <sub>R</sub> = 100 V, V <sub>GS</sub> = 0 V  |   | 600  | nC     |
| <b>I<sub>RM</sub></b> |  |   | 6    | A      |

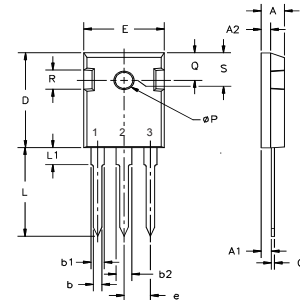
### PLUS220SMD (IXFV\_\_S) Outline



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  |

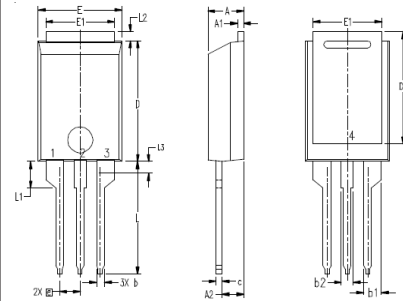
### TO-247 (IXFH) Outline



- Terminals: 1 - Gate 2 - Drain  
3 - Source TAB - Drain

| 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    |       |
| ∅P             | 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 |       |

### PLUS220 (IXFV) Outline



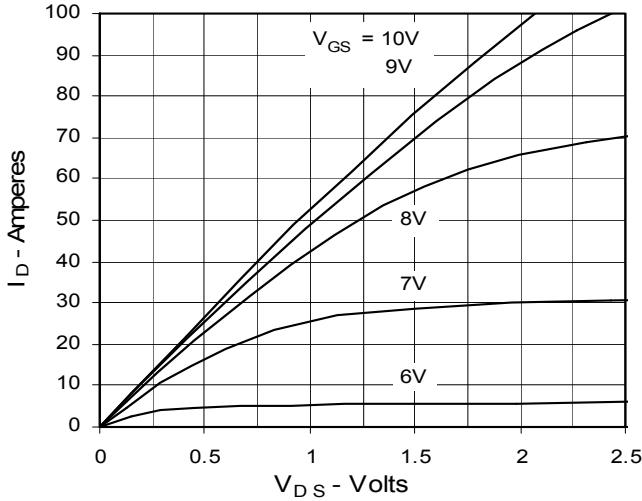
1. GATE
2. DRAIN (COLLECTOR)
3. SOURCE (EMITTER)
4. DRAIN (COLLECTOR)

| 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  |

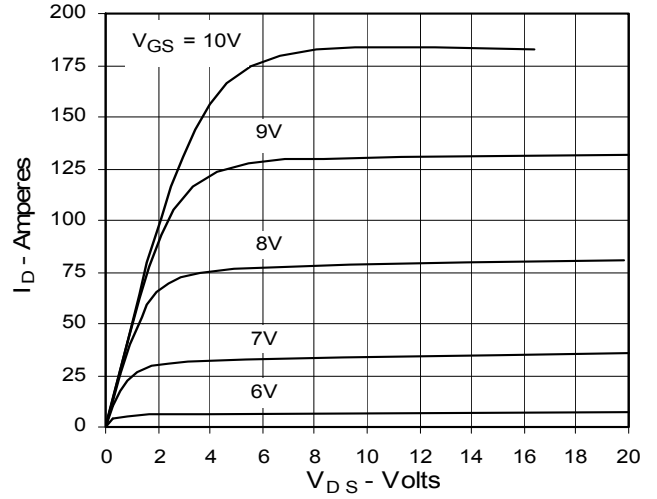
IXYS reserves the right to change limits, test conditions, and dimensions.

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

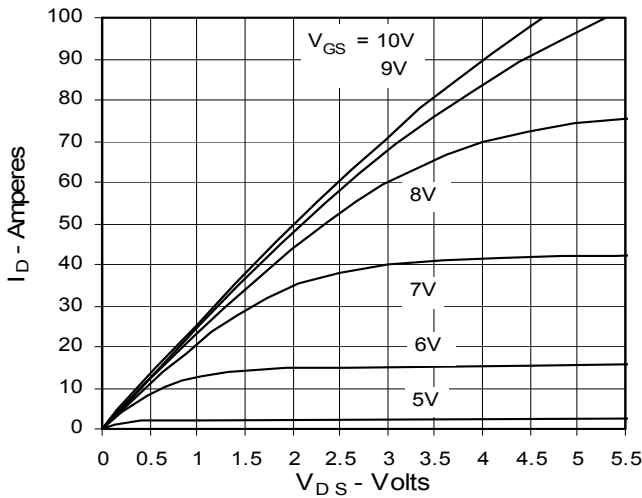
**Fig. 1. Output Characteristics**  
**@ 25°C**



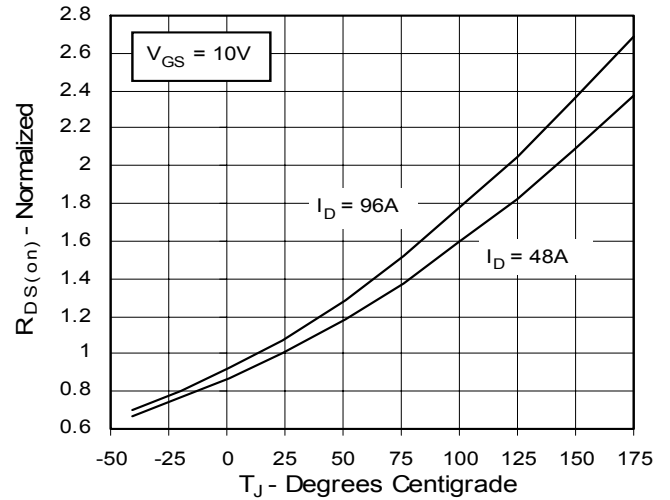
**Fig. 2. Extended Output Characteristics**  
**@ 25°C**



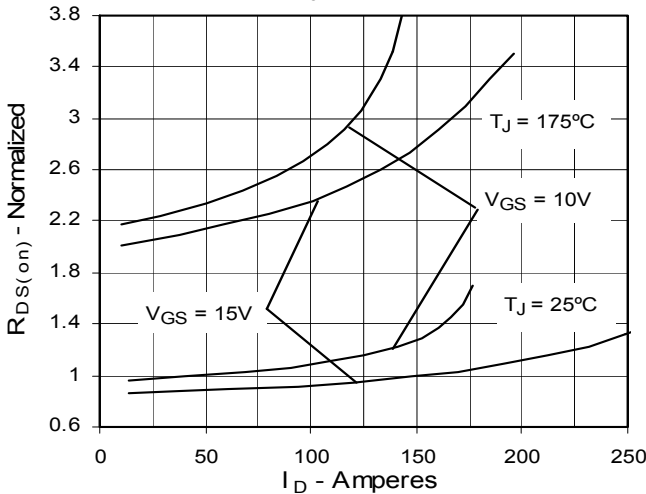
**Fig. 3. Output Characteristics**  
**@ 150°C**



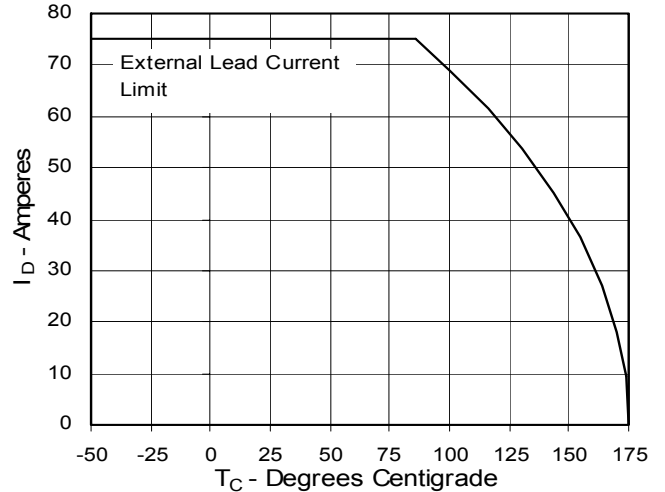
**Fig. 4.  $R_{DS(on)}$  Normalized to 0.5  $I_{D25}$  Value vs. Junction Temperature**



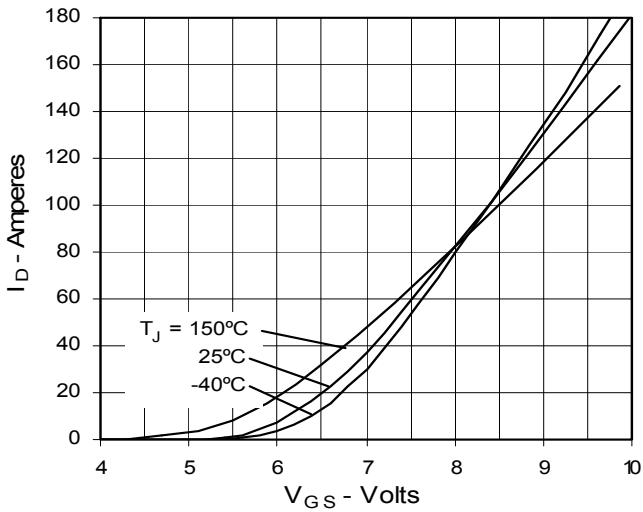
**Fig. 5.  $R_{DS(on)}$  Normalized to 0.5  $I_{D25}$  Value vs.  $I_D$**



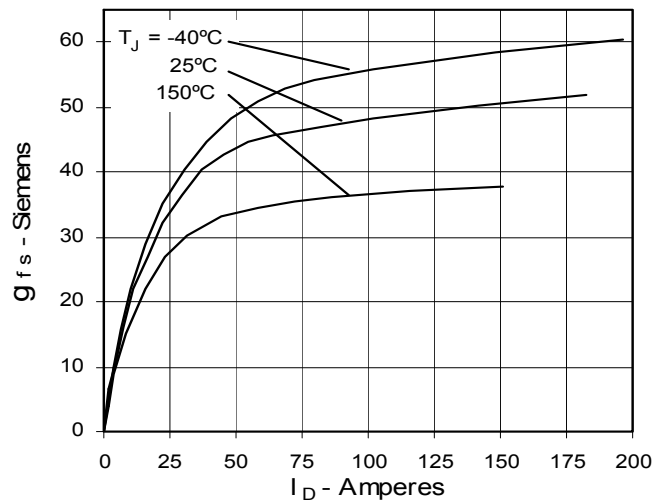
**Fig. 6. Drain Current vs. Case Temperature**



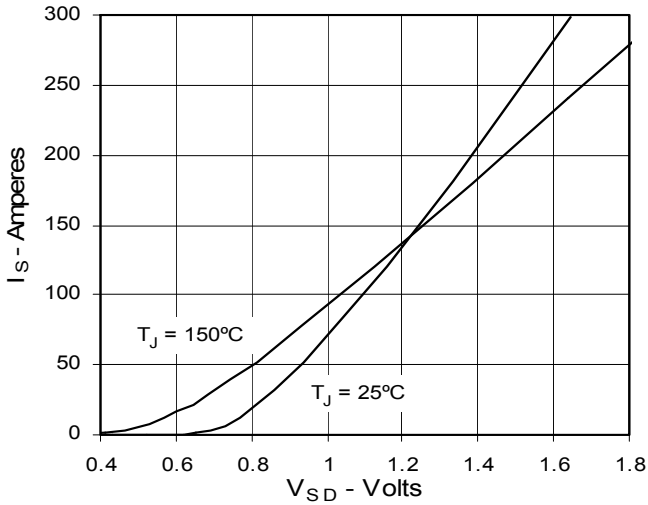
**Fig. 7. Input Admittance**



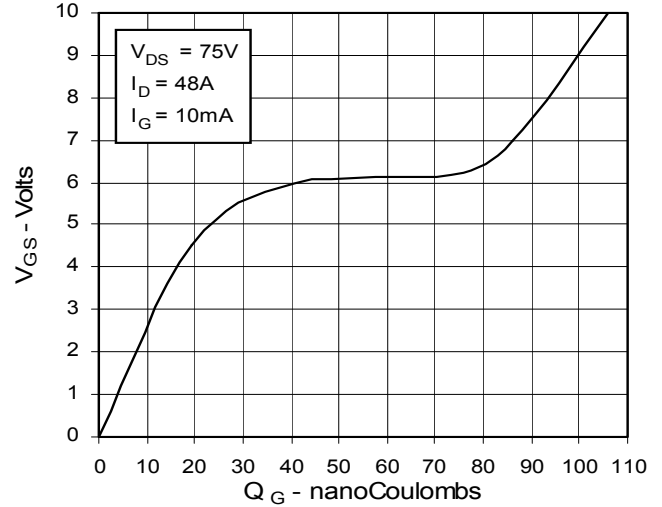
**Fig. 8. Transconductance**



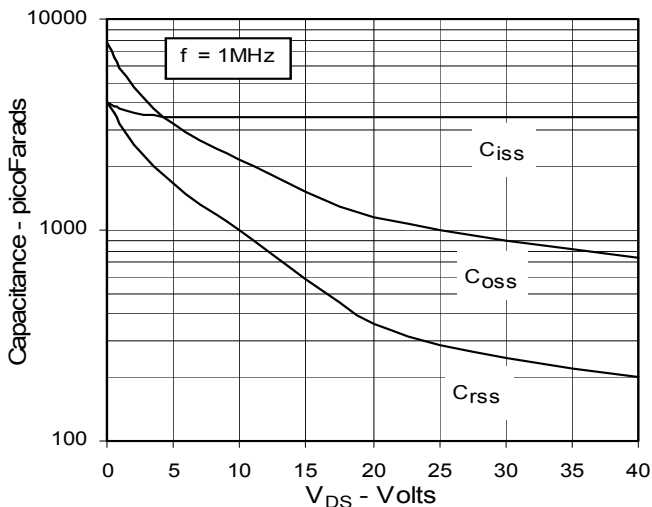
**Fig. 9. Source Current vs. Source-To-Drain Voltage**



**Fig. 10. Gate Charge**



**Fig. 11. Capacitance**



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

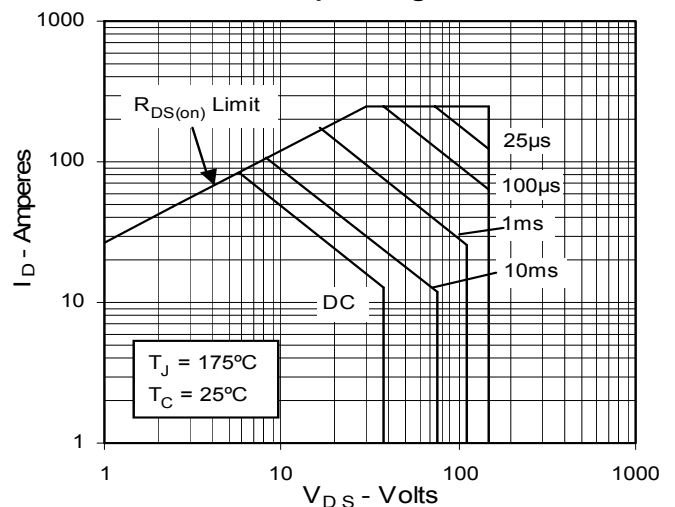


Fig. 13. Maximum Transient Thermal Resistance

