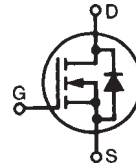


### Polar3™ HiperFET™ Power MOSFET

**IXFT94N30P3**  
**IXFQ94N30P3**  
**IXFH94N30P3**

**$V_{DSS} = 300V$**   
 **$I_{D25} = 94A$**   
 **$R_{DS(on)} \leq 36m\Omega$**

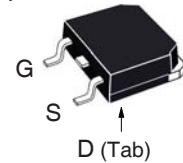
N-Channel Enhancement Mode  
Avalanche Rated  
Fast Intrinsic Rectifier



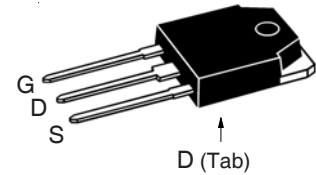
| Symbol     | Test Conditions                                                    | Maximum Ratings |            |
|------------|--------------------------------------------------------------------|-----------------|------------|
| $V_{DSS}$  | $T_J = 25^\circ C$ to $150^\circ C$                                | 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          |
| $I_{D25}$  | $T_C = 25^\circ C$                                                 | 94              | A          |
| $I_{DM}$   | $T_C = 25^\circ C$ , Pulse Width Limited by $T_{JM}$               | 235             | A          |
| $I_A$      | $T_C = 25^\circ C$                                                 | 47              | A          |
| $E_{AS}$   | $T_C = 25^\circ C$                                                 | 2.5             | J          |
| $dv/dt$    | $I_S \leq I_{DM}$ , $V_{DD} \leq V_{DSS}$ , $T_J \leq 150^\circ C$ | 35              | V/ns       |
| $P_D$      | $T_C = 25^\circ C$                                                 | 1040            | 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 & TO-3P)                                   | 1.13 / 10       | Nm/lb.in   |
| Weight     | TO-268                                                             | 4.0             | g          |
|            | TO-3P                                                              | 5.5             | g          |
|            | TO-247                                                             | 6.0             | g          |

| Symbol       | Test Conditions<br>( $T_J = 25^\circ C$ Unless Otherwise Specified) | Characteristic Values |      |                           |
|--------------|---------------------------------------------------------------------|-----------------------|------|---------------------------|
|              |                                                                     | Min.                  | Typ. | Max.                      |
| $BV_{DSS}$   | $V_{GS} = 0V$ , $I_D = 1mA$                                         | 300                   |      | V                         |
| $V_{GS(th)}$ | $V_{DS} = V_{GS}$ , $I_D = 4mA$                                     | 3.0                   |      | 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>750 $\mu A$ |
| $R_{DS(on)}$ | $V_{GS} = 10V$ , $I_D = 0.5 \cdot I_{D25}$ , Note 1                 |                       |      | 36 m $\Omega$             |

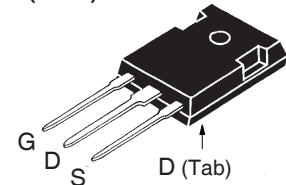
TO-268 (IXFT)



TO-3P (IXFQ)



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

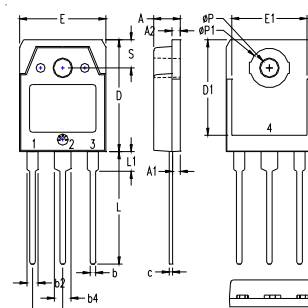
| Symbol<br>(T <sub>J</sub> = 25°C Unless Otherwise Specified) | Test Conditions                                                                                                                                                                 | Characteristic Values |      |           |
|--------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|------|-----------|
|                                                              |                                                                                                                                                                                 | Min.                  | Typ. | Max.      |
| <b>g<sub>fs</sub></b>                                        | V <sub>DS</sub> = 20V, I <sub>D</sub> = 0.5 • I <sub>D25</sub> , Note 1                                                                                                         | 40                    | 68   | S         |
| <b>C<sub>iss</sub></b>                                       | V <sub>GS</sub> = 0V, V <sub>DS</sub> = 25V, f = 1MHz                                                                                                                           |                       | 5510 | pF        |
| <b>C<sub>oss</sub></b>                                       |                                                                                                                                                                                 |                       | 965  | pF        |
| <b>C<sub>rss</sub></b>                                       |                                                                                                                                                                                 |                       | 25   | pF        |
| <b>R<sub>Gi</sub></b>                                        | Gate Input Resistance                                                                                                                                                           |                       | 1.2  | Ω         |
| <b>t<sub>d(on)</sub></b>                                     | <b>Resistive Switching Times</b><br>V <sub>GS</sub> = 10V, V <sub>DS</sub> = 0.5 • V <sub>DSS</sub> , I <sub>D</sub> = 0.5 • I <sub>D25</sub><br>R <sub>G</sub> = 1Ω (External) |                       | 23   | ns        |
| <b>t<sub>r</sub></b>                                         |                                                                                                                                                                                 |                       | 19   | ns        |
| <b>t<sub>d(off)</sub></b>                                    |                                                                                                                                                                                 |                       | 49   | ns        |
| <b>t<sub>f</sub></b>                                         |                                                                                                                                                                                 |                       | 11   | ns        |
| <b>Q<sub>g(on)</sub></b>                                     | V <sub>GS</sub> = 10V, V <sub>DS</sub> = 0.5 • V <sub>DSS</sub> , I <sub>D</sub> = 0.5 • I <sub>D25</sub>                                                                       |                       | 102  | nC        |
| <b>Q<sub>gs</sub></b>                                        |                                                                                                                                                                                 |                       | 33   | nC        |
| <b>Q<sub>gd</sub></b>                                        |                                                                                                                                                                                 |                       | 37   | nC        |
| <b>R<sub>thJC</sub></b>                                      | (TO-247 & TO-3P)                                                                                                                                                                |                       | 0.25 | 0.12 °C/W |
| <b>R<sub>thCS</sub></b>                                      |                                                                                                                                                                                 |                       |      | °C/W      |

### Source-Drain Diode

| Symbol<br>(T <sub>J</sub> = 25°C Unless Otherwise Specified) |                                                                                         | Characteristic Values |      |      |    |
|--------------------------------------------------------------|-----------------------------------------------------------------------------------------|-----------------------|------|------|----|
|                                                              |                                                                                         | Min.                  | Typ. | Max. |    |
| I <sub>S</sub>                                               | V <sub>GS</sub> = 0V                                                                    |                       |      | 94   | A  |
| I <sub>SM</sub>                                              | Repetitive, Pulse Width Limited by T <sub>JM</sub>                                      |                       |      | 376  | A  |
| V <sub>SD</sub>                                              | I <sub>F</sub> = I <sub>S</sub> , V <sub>GS</sub> = 0V, Note 1                          |                       |      | 1.5  | V  |
| t <sub>rr</sub>                                              | } I <sub>F</sub> = 47A, -di/dt = 100A/μs<br>V <sub>R</sub> = 100V, V <sub>GS</sub> = 0V |                       |      | 250  | ns |
| I <sub>RM</sub>                                              |                                                                                         |                       |      | 15.6 | A  |
| Q <sub>RM</sub>                                              |                                                                                         |                       |      | 1.4  | μC |

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

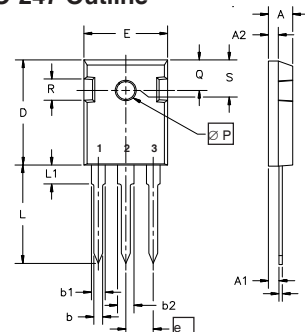
## TO-3P Outline



- 1 - GATE  
2 - DRAIN  
3 - SOURCE  
4 - DRAIN

| SYM | INCHES   |      | MILLIMETERS |       |
|-----|----------|------|-------------|-------|
|     | MIN      | MAX  | MIN         | MAX   |
| A   | .185     | .193 | 4.70        | 4.90  |
| A1  | .051     | .059 | 1.30        | 1.50  |
| A2  | .057     | .065 | 1.45        | 1.65  |
| b   | .035     | .045 | 0.90        | 1.15  |
| b2  | .075     | .087 | 1.90        | 2.20  |
| b4  | .114     | .126 | 2.90        | 3.20  |
| c   | .022     | .031 | 0.55        | 0.80  |
| D   | .780     | .799 | 19.80       | 20.30 |
| D1  | .665     | .677 | 16.90       | 17.20 |
| E   | .610     | .622 | 15.50       | 15.80 |
| E1  | .531     | .539 | 13.50       | 13.70 |
| e   | .215 BSC |      | 5.45 BSC    |       |
| L   | .779     | .795 | 19.80       | 20.20 |
| L1  | .134     | .142 | 3.40        | 3.60  |
| ØP  | .126     | .134 | 3.20        | 3.40  |
| SP  | .272     | .280 | 6.90        | 7.10  |
| S   | .193     | .201 | 4.90        | 5.10  |

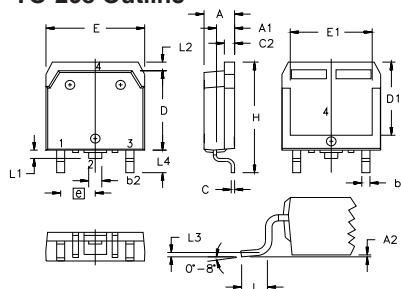
## TO-247 Outline



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   | .844  |
| 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   |

## 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  |

## PRELIMINARY TECHNICAL INFORMATION

The product presented herein is under development. The Technical Specifications offered are derived from a subjective evaluation of the design, based upon prior knowledge and experience, and constitute a "considered reflection" of the anticipated result. IXYS reserves the right to change limits, test conditions, and dimensions without notice.

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 |
|                                                                                  | 4,860,072 | 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    | 6,771,478 B2 | 7,071,537 |              |             |

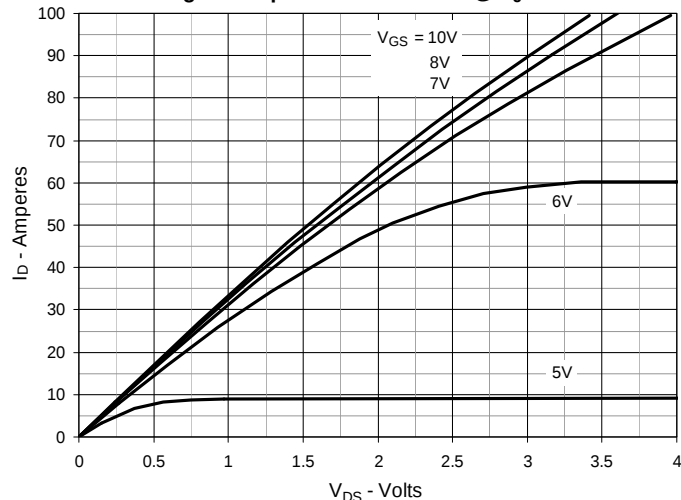
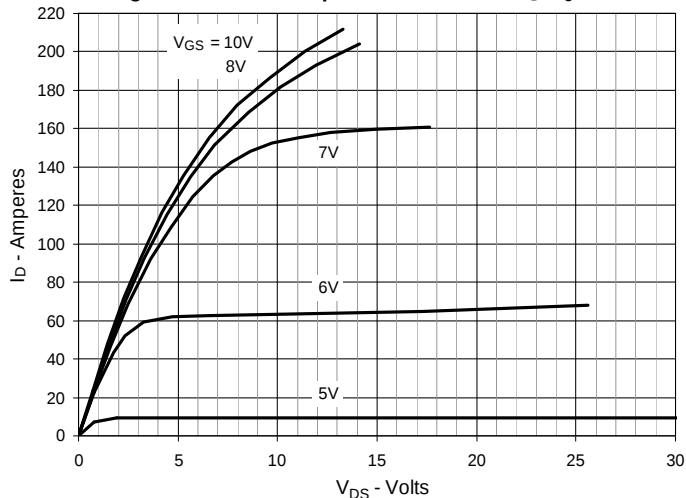
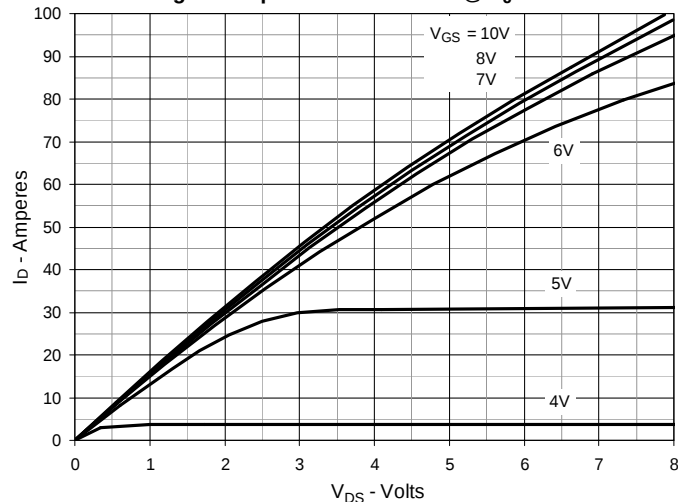
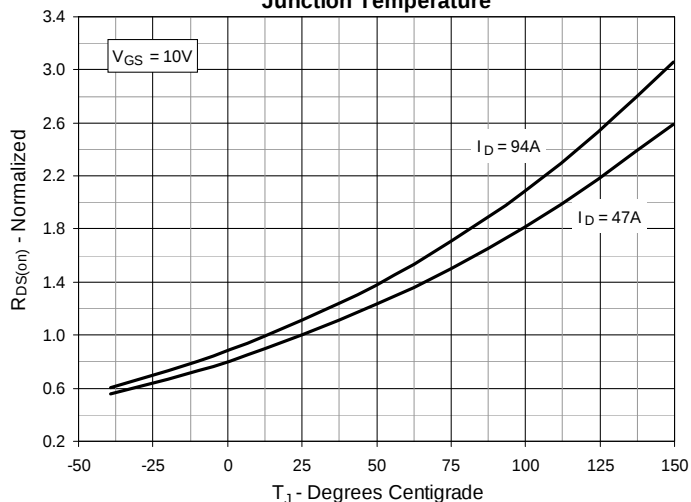
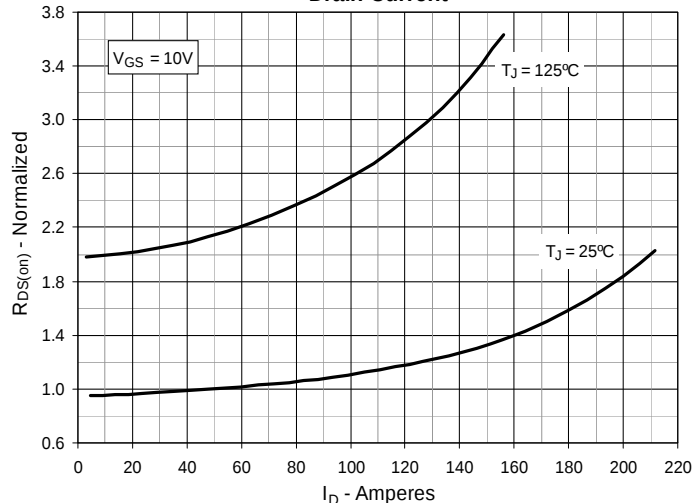
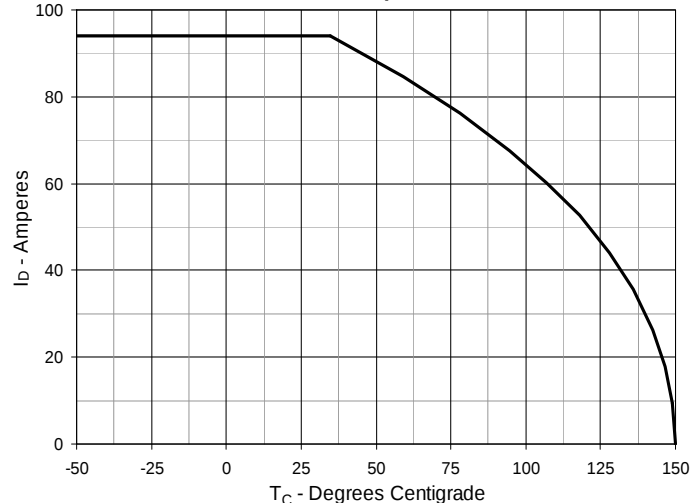
**Fig. 1. Output Characteristics @  $T_J = 25^\circ\text{C}$** 

**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  $I_D = 47\text{A}$  Value vs. Junction Temperature**

**Fig. 5.  $R_{DS(on)}$  Normalized to  $I_D = 47\text{A}$  Value vs. Drain Current**

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


Fig. 7. Input Admittance

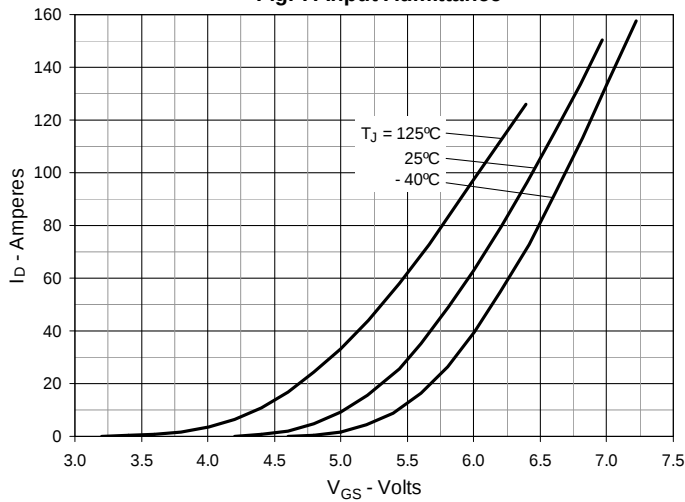


Fig. 8. Transconductance

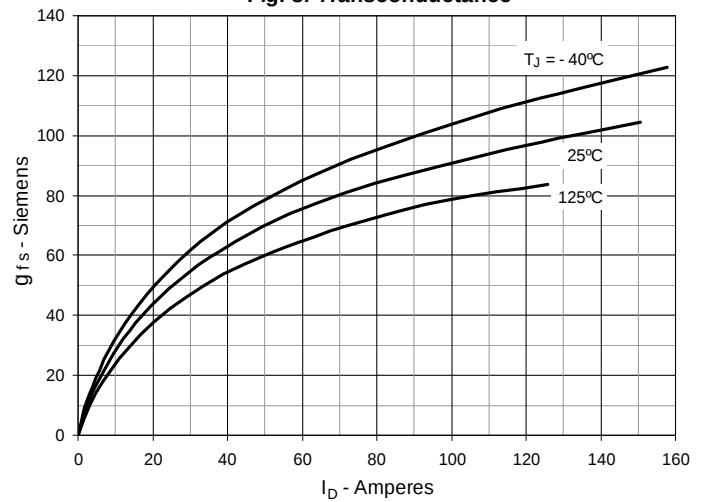


Fig. 9. Forward Voltage Drop of Intrinsic Diode

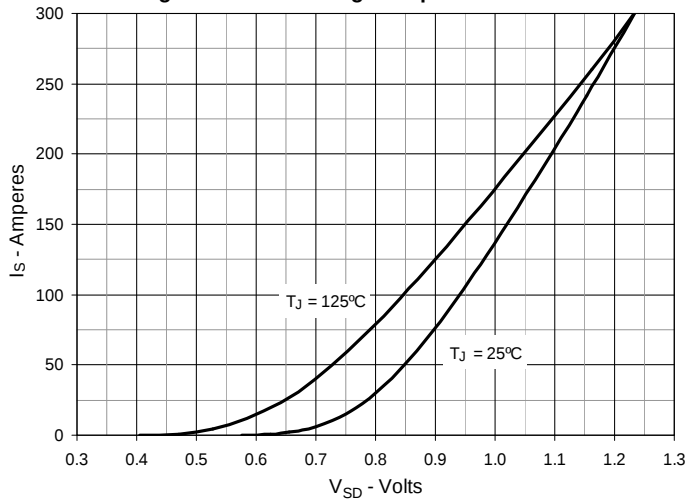


Fig. 10. Gate Charge

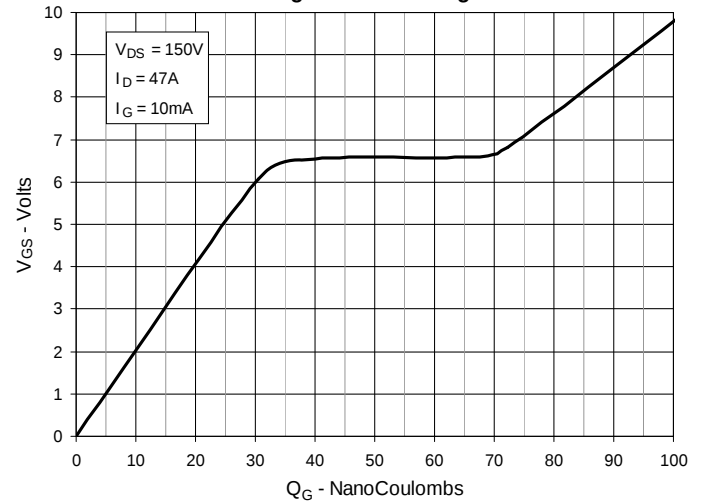


Fig. 11. Capacitance

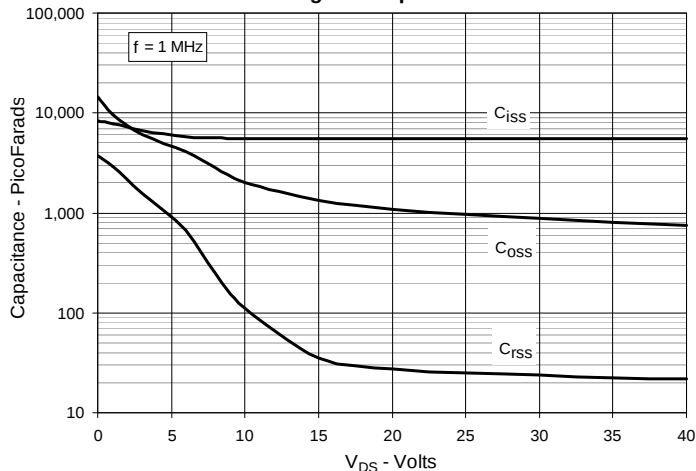


Fig. 12. Forward-Bias Safe Operating Area

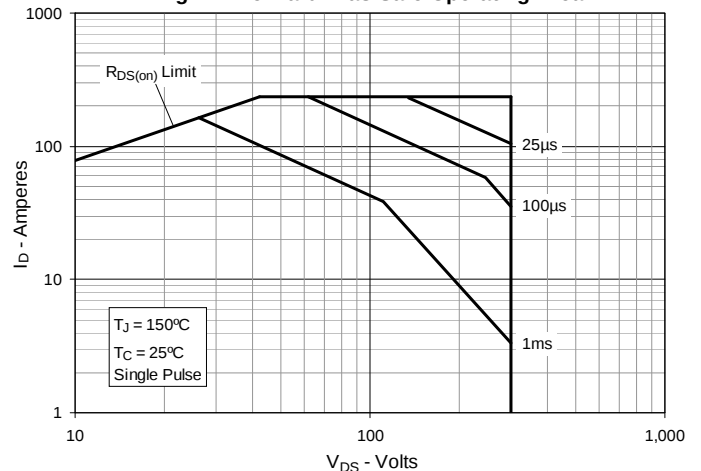


Fig. 13. Maximum Transient Thermal Impedance

