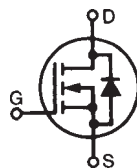


### Polar™ HiPerFET™ Power MOSFET

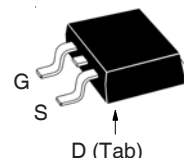
N-Channel Enhancement Mode  
Avalanche Rated  
Fast Intrinsic Diode

### IXFA6N120P IXFP6N120P IXFH6N120P

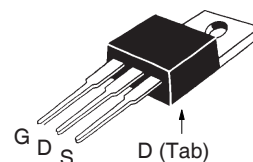


$$\begin{aligned} V_{DSS} &= 1200V \\ I_{D25} &= 6A \\ R_{DS(on)} &\leq 2.75\Omega \end{aligned}$$

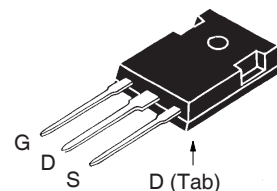
TO-263 AA (IXFA)



TO-220AB (IXFP)



TO-247 (IXFH)



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

| Symbol     | Test Conditions                                                          | Maximum Ratings |                  |
|------------|--------------------------------------------------------------------------|-----------------|------------------|
| $V_{DSS}$  | $T_J = 25^\circ\text{C}$ to $150^\circ\text{C}$                          | 1200            | V                |
| $V_{DGR}$  | $T_J = 25^\circ\text{C}$ to $150^\circ\text{C}$ , $R_{GS} = 1M\Omega$    | 1200            | V                |
| $V_{GSS}$  | Continuous                                                               | $\pm 30$        | V                |
| $V_{GSM}$  | Transient                                                                | $\pm 40$        | V                |
| $I_{D25}$  | $T_C = 25^\circ\text{C}$                                                 | 6               | A                |
| $I_{DM}$   | $T_C = 25^\circ\text{C}$ , Pulse Width Limited by $T_{JM}$               | 18              | A                |
| $I_A$      | $T_C = 25^\circ\text{C}$                                                 | 3               | A                |
| $E_{AS}$   | $T_C = 25^\circ\text{C}$                                                 | 300             | mJ               |
| $dv/dt$    | $I_S \leq I_{DM}$ , $V_{DD} \leq V_{DSS}$ , $T_J \leq 150^\circ\text{C}$ | 10              | V/ns             |
| $P_D$      | $T_C = 25^\circ\text{C}$                                                 | 250             | 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) from Case for 10s                                          | 300             | $^\circ\text{C}$ |
| $T_{SOLD}$ | Plastic Body for 10s                                                     | 260             | $^\circ\text{C}$ |
| $M_d$      | Mounting Torque (TO-220 & TO-247)                                        | 1.13 / 10       | Nm/lb.in.        |
| Weight     | TO-263                                                                   | 2.5             | g                |
|            | TO-220                                                                   | 3.0             | g                |
|            | TO-247                                                                   | 6.0             | g                |

| Symbol       | Test Conditions<br>( $T_J = 25^\circ\text{C}$ , Unless Otherwise Specified) | Characteristic Values |      |                    |
|--------------|-----------------------------------------------------------------------------|-----------------------|------|--------------------|
|              |                                                                             | Min.                  | Typ. | Max.               |
| $BV_{DSS}$   | $V_{GS} = 0V$ , $I_D = 250\mu A$                                            | 1200                  |      | V                  |
| $V_{GS(th)}$ | $V_{DS} = V_{GS}$ , $I_D = 1mA$                                             | 2.5                   |      | 5.0 V              |
| $I_{GSS}$    | $V_{GS} = \pm 30V$ , $V_{DS} = 0V$                                          |                       |      | $\pm 100$ nA       |
| $I_{DSS}$    | $V_{DS} = V_{DSS}$ , $V_{GS} = 0V$<br>$T_J = 125^\circ\text{C}$             |                       |      | 10 $\mu A$<br>1 mA |
| $R_{DS(on)}$ | $V_{GS} = 10V$ , $I_D = 0.5 \cdot I_{D25}$ , Note 1                         |                       |      | 2.75 $\Omega$      |

#### Features

- International Standard Packages
- Dynamic  $dv/dt$  Rating
- Avalanche Rated
- Fast Intrinsic Diode
- Low  $Q_G$
- Low  $R_{DS(on)}$
- Low Drain-to-Tab Capacitance
- Low Package Inductance

#### Advantages

- Easy to Mount
- Space Savings

#### Applications

- DC-DC Converters
- Battery Chargers
- Switch-Mode and Resonant-Mode Power Supplies
- Uninterrupted Power Supplies
- AC Motor Drives
- High Speed Power Switching Applications

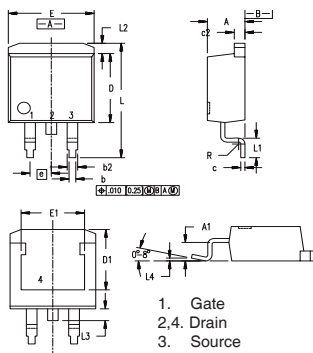
| Symbol                    | Test Conditions                                                                                                                                                                 | Characteristic Values |      |           |
|---------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|------|-----------|
|                           | (T <sub>J</sub> = 25°C, Unless Otherwise Specified)                                                                                                                             | Min.                  | Typ. | Max       |
| <b>g<sub>fs</sub></b>     | V <sub>DS</sub> = 20V, I <sub>D</sub> = 0.5 • I <sub>D25</sub> , Note 1                                                                                                         | 3.0                   | 5.0  | S         |
| <b>R<sub>Gi</sub></b>     | Gate Input Resistance                                                                                                                                                           |                       | 1.8  | Ω         |
| <b>C<sub>iss</sub></b>    | V <sub>GS</sub> = 0V, V <sub>DS</sub> = 25V, f = 1MHz                                                                                                                           |                       | 2830 | pF        |
| <b>C<sub>oss</sub></b>    |                                                                                                                                                                                 |                       | 150  | pF        |
| <b>C<sub>rss</sub></b>    |                                                                                                                                                                                 |                       | 30   | pF        |
| <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> = 3Ω (External) |                       | 24   | ns        |
| <b>t<sub>r</sub></b>      |                                                                                                                                                                                 |                       | 11   | ns        |
| <b>t<sub>d(off)</sub></b> |                                                                                                                                                                                 |                       | 60   | ns        |
| <b>t<sub>f</sub></b>      |                                                                                                                                                                                 |                       | 14   | 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>                                                                       |                       | 92   | nC        |
| <b>Q<sub>gs</sub></b>     |                                                                                                                                                                                 |                       | 15   | nC        |
| <b>Q<sub>gd</sub></b>     |                                                                                                                                                                                 |                       | 50   | nC        |
| <b>R<sub>thJC</sub></b>   | TO-220<br>TO-247                                                                                                                                                                |                       |      | 0.50 °C/W |
| <b>R<sub>thCS</sub></b>   |                                                                                                                                                                                 |                       | 0.50 | °C/W      |
| <b>R<sub>thCS</sub></b>   |                                                                                                                                                                                 |                       | 0.21 | °C/W      |

## Source-Drain Diode

| 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> = 0V                                                                   |                       |      | 6 A    |
| <b>I<sub>SM</sub></b> | Repetitive, Pulse Width Limited by T <sub>JM</sub>                                     |                       |      | 24 A   |
| <b>V<sub>SD</sub></b> | I <sub>F</sub> = I <sub>S</sub> , V <sub>GS</sub> = 0V, Note 1                         |                       |      | 1.4 V  |
| <b>t<sub>rr</sub></b> | I <sub>F</sub> = 3A, V <sub>GS</sub> = 0V<br>-di/dt = 100A/μs<br>V <sub>R</sub> = 100V |                       |      | 300 ns |
| <b>I<sub>RM</sub></b> |                                                                                        |                       | 7.8  | A      |
| <b>Q<sub>RM</sub></b> |                                                                                        |                       | 1.1  | μC     |

Note 1: Pulse test, t ≤ 300μs, duty cycle, d ≤ 2%.

## TO-263 Outline



| Dim. | Millimeter |       | Inches |      |
|------|------------|-------|--------|------|
|      | Min.       | Max.  | Min.   | Max. |
| A    | 4.06       | 4.83  | .160   | .190 |
| b    | 0.51       | 0.99  | .020   | .039 |
| b2   | 1.14       | 1.40  | .045   | .055 |
| c    | 0.40       | 0.74  | .016   | .029 |
| c2   | 1.14       | 1.40  | .045   | .055 |
| D    | 8.64       | 9.65  | .340   | .380 |
| D1   | 8.00       | 8.89  | .280   | .320 |
| E    | 9.65       | 10.41 | .380   | .405 |
| E1   | 6.22       | 8.13  | .270   | .320 |
| e    | 2.54       | BSC   | .100   | BSC  |
| L    | 14.61      | 15.88 | .575   | .625 |
| L1   | 2.29       | 2.79  | .090   | .110 |
| L2   | 1.02       | 1.40  | .040   | .055 |
| L3   | 1.27       | 1.78  | .050   | .070 |
| L4   | 0          | 0.13  | 0      | .005 |

1. Gate  
2,4. Drain  
3. Source

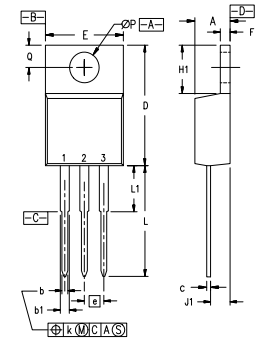
## PRELIMINARY TECHNICAL INFORMATION

The product presented herein is under development. The Technical Specifications offered are derived from data gathered during objective characterizations of preliminary engineering lots; but also may yet contain some information supplied during a pre-production design evaluation. 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   | 6,404,065B1 | 6,683,344   | 6,727,585   | 7,005,734B2 | 7,157,338B2 |
|                                                                                  | 4,850,072 | 5,017,508 | 5,063,307 | 5,381,025 | 6,259,123B1 | 6,534,343   | 6,710,405B2 | 6,759,692   | 7,063,975B2 |             |
|                                                                                  | 4,881,106 | 5,034,796 | 5,187,117 | 5,486,715 | 6,306,728B1 | 6,583,505   | 6,710,463   | 6,771,478B2 | 7,071,537   |             |

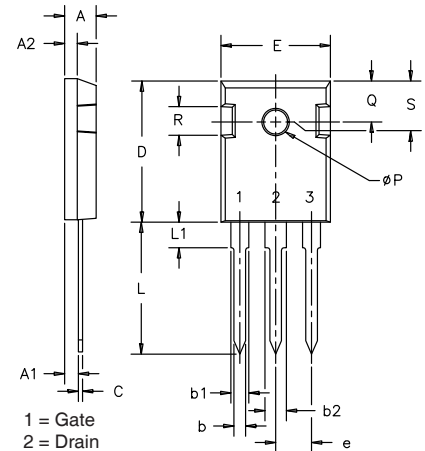
## TO-220 Outline



Pins: 1 - Gate  
2 - Drain  
3 - Source

| SYM | INCHES   |      | MILLIMETERS |       |
|-----|----------|------|-------------|-------|
|     | MIN      | MAX  | MIN         | MAX   |
| A   | .170     | .190 | 4.32        | 4.83  |
| b   | .025     | .040 | 0.64        | 1.02  |
| b1  | .045     | .065 | 1.15        | 1.65  |
| c   | .014     | .022 | 0.35        | 0.56  |
| D   | .580     | .630 | 14.73       | 16.00 |
| E   | .390     | .420 | 9.91        | 10.66 |
| e   | .100 BSC |      | 2.54 BSC    |       |
| F   | .045     | .055 | 1.14        | 1.40  |
| H1  | .230     | .270 | 5.85        | 6.85  |
| J1  | .090     | .110 | 2.29        | 2.79  |
| k   | 0        | .015 | 0           | 0.38  |
| L   | .500     | .550 | 12.70       | 13.97 |
| L1  | .110     | .230 | 2.79        | 5.84  |
| ØP  | .139     | .161 | 3.53        | 4.08  |
| Q   | .100     | .125 | 2.54        | 3.18  |

## TO-247 AD Outline



1 = Gate  
2 = Drain  
3 = Source

| SYM | INCHES   |      | MILLIMETERS |       |
|-----|----------|------|-------------|-------|
|     | MIN      | MAX  | MIN         | MAX   |
| A   | .185     | .209 | 4.7         | 5.3   |
| A1  | .087     | .102 | 2.2         | 2.54  |
| A2  | .059     | .098 | 2.2         | 2.6   |
| b   | .040     | .055 | 1.0         | 1.4   |
| b1  | .065     | .084 | 1.65        | 2.13  |
| b2  | .113     | .123 | 2.87        | 3.12  |
| C   | .016     | .031 | .4          | .8    |
| D   | .819     | .845 | 20.80       | 21.46 |
| E   | .610     | .640 | 15.75       | 16.26 |
| e   | .215 BSC |      | 5.45 BSC    |       |
| L   | .780     | .800 | 19.81       | 20.32 |
| L1  |          | .177 |             | 4.50  |
| ØP  | .140     | .144 | 3.55        | 3.65  |
| Q   | .212     | .244 | 5.4         | 6.2   |
| R   | .170     | .216 | 4.32        | 5.49  |
| S   | .242 BSC |      | 6.15 BSC    |       |

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

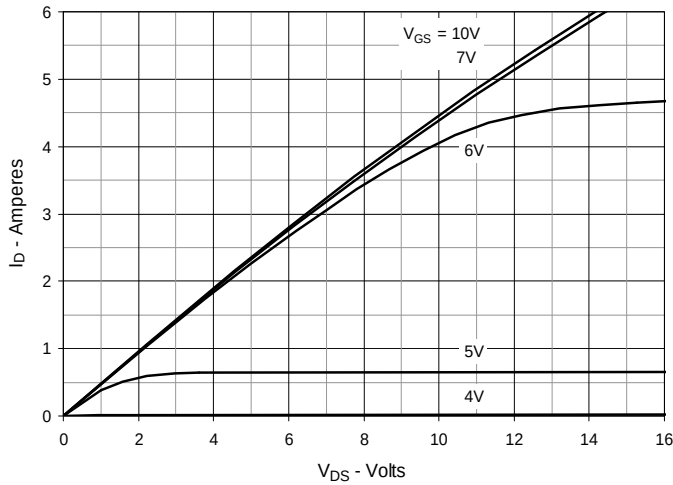


Fig. 2. Extended Output Characteristics @  $T_J = 25^\circ\text{C}$

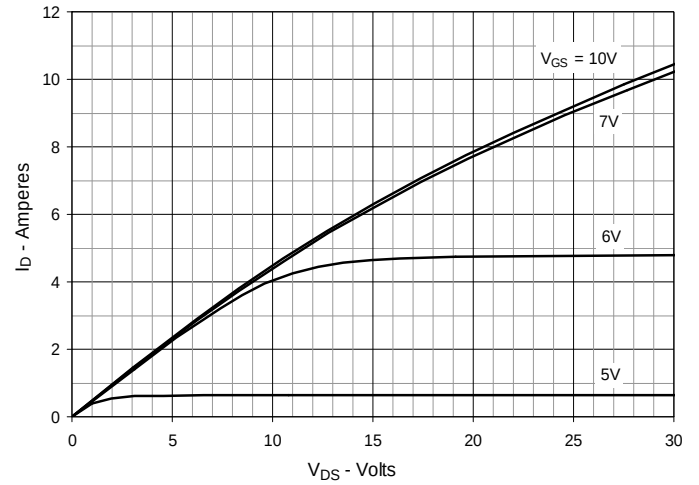


Fig. 3. Output Characteristics @  $T_J = 125^\circ\text{C}$

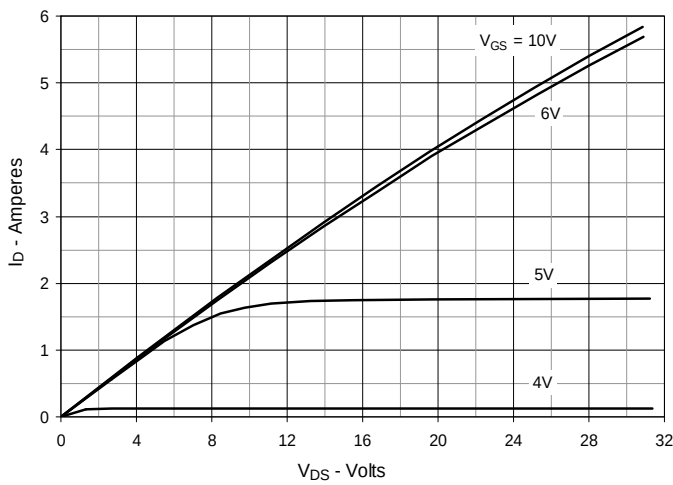


Fig. 4.  $R_{DS(on)}$  Normalized to  $I_D = 3A$  Value vs. Junction Temperature

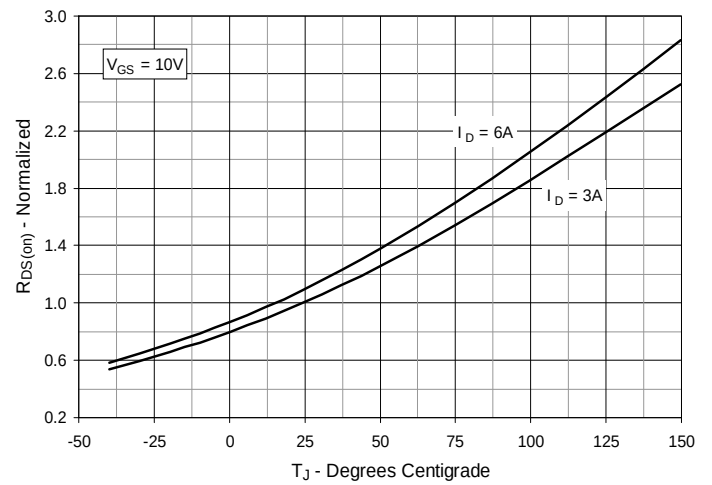


Fig. 5.  $R_{DS(on)}$  Normalized to  $I_D = 3A$  Value vs. Drain Current

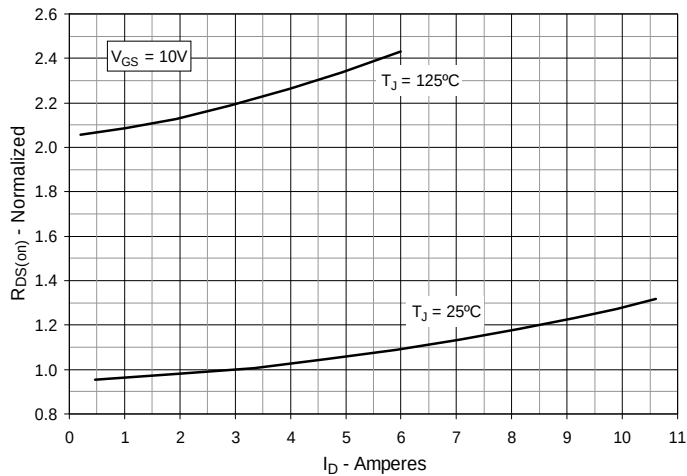


Fig. 6. Maximum Drain Current vs. Case Temperature

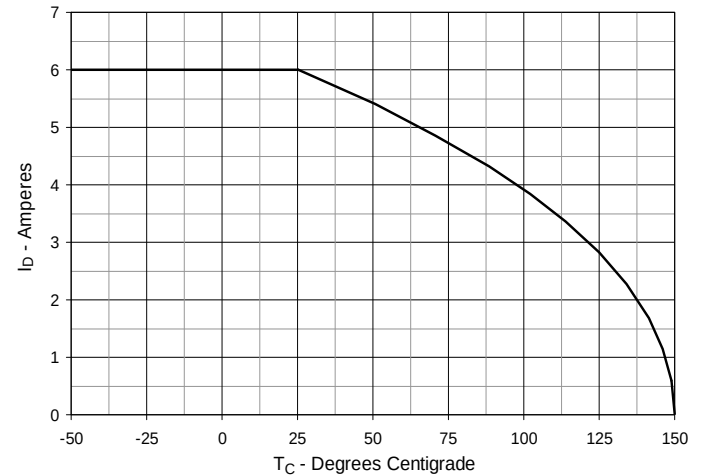


Fig. 7. Input Admittance

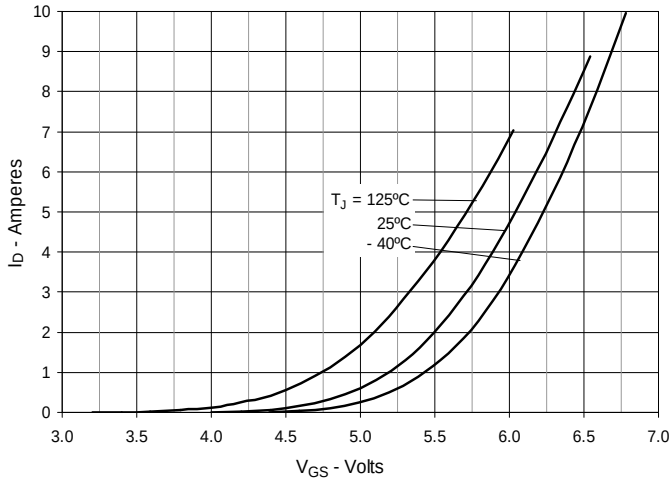


Fig. 8. Transconductance

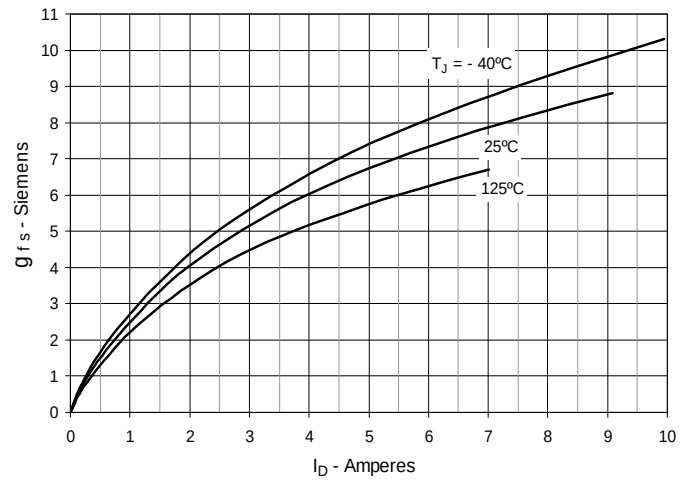


Fig. 9. Forward Voltage Drop of Intrinsic Diode

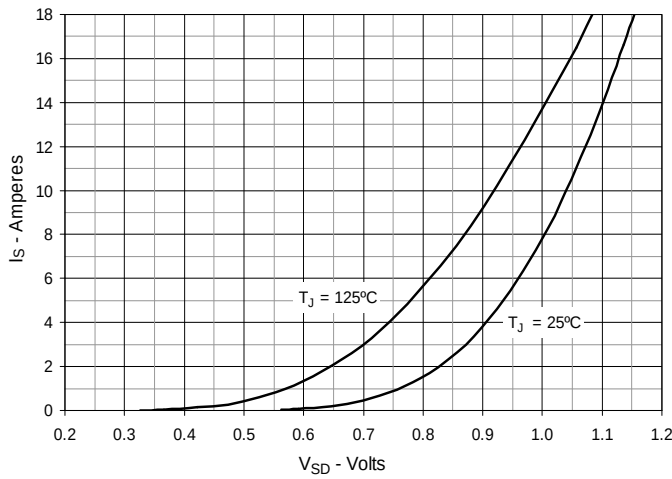


Fig. 10. Gate Charge

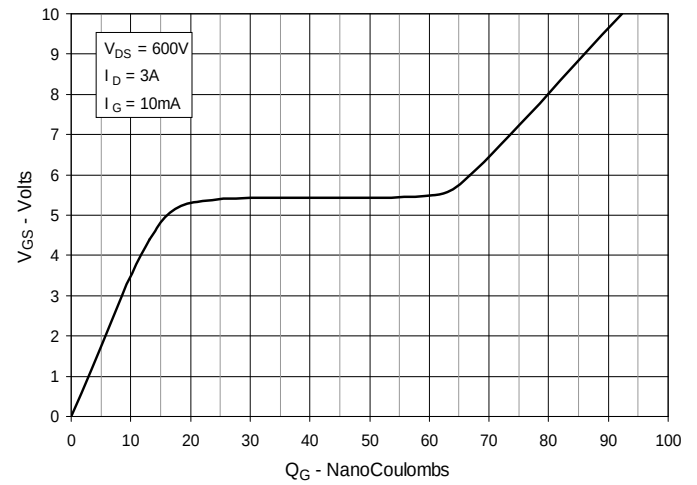


Fig. 11. Capacitance

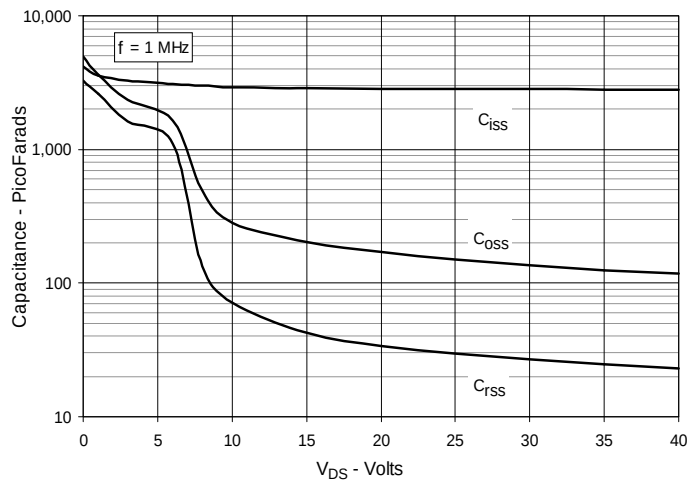


Fig. 12. Maximum Transient Thermal Impedance

