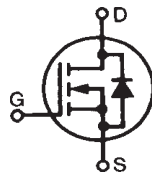


## Polar™ Power MOSFET

**IXTT170N10P**  
**IXTQ170N10P**  
**IXTK170N10P**

**$V_{DSS} = 100V$**   
 **$I_{D25} = 170A$**   
 **$R_{DS(on)} \leq 9m\Omega$**

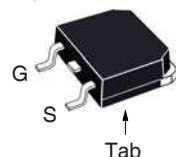
N-Channel Enhancement Mode  
Avalanche Rated



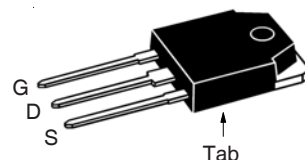
| Symbol        | Test Conditions                                                    | Maximum Ratings |            |
|---------------|--------------------------------------------------------------------|-----------------|------------|
| $V_{DSS}$     | $T_J = 25^\circ C$ to $175^\circ C$                                | 100             | V          |
| $V_{DGR}$     | $T_J = 25^\circ C$ to $175^\circ C$ , $R_{GS} = 1M\Omega$          | 100             | V          |
| $V_{GSS}$     | Continuous                                                         | $\pm 20$        | V          |
| $V_{GSM}$     | Transient                                                          | $\pm 30$        | V          |
| $I_{D25}$     | $T_C = 25^\circ C$                                                 | 170             | A          |
| $I_{L(RMS)}$  | External Lead Current Limit                                        | 160             | A          |
| $I_{DM}$      | $T_C = 25^\circ C$ , Pulse Width Limited by $T_{JM}$               | 350             | A          |
| $I_A$         | $T_C = 25^\circ C$                                                 | 60              | A          |
| $E_{AS}$      | $T_C = 25^\circ C$                                                 | 2               | J          |
| $dv/dt$       | $I_S \leq I_{DM}$ , $V_{DD} \leq V_{DSS}$ , $T_J \leq 175^\circ C$ | 10              | V/ns       |
| $P_D$         | $T_C = 25^\circ C$                                                 | 715             | W          |
| $T_J$         |                                                                    | -55 to +175     | $^\circ C$ |
| $T_{JM}$      |                                                                    | +175            | $^\circ C$ |
| $T_{stg}$     |                                                                    | -55 to +175     | $^\circ C$ |
| $T_L$         | 1.6mm (0.063in) from Case for 10s                                  | 300             | $^\circ C$ |
| $T_{SOLD}$    | Plastic Body for 10s                                               | 260             | $^\circ C$ |
| $M_d$         | Mounting Torque (TO-264 & TO-3P)                                   | 1.13/10         | Nm/lb.in.  |
| <b>Weight</b> | TO-268                                                             | 4.0             | g          |
|               | TO-3P                                                              | 5.5             | g          |
|               | TO-264                                                             | 10.0            | g          |

| Symbol       | Test Conditions<br>( $T_J = 25^\circ C$ , Unless Otherwise Specified)                | Characteristic Values |      |                            |
|--------------|--------------------------------------------------------------------------------------|-----------------------|------|----------------------------|
|              |                                                                                      | Min.                  | Typ. | Max.                       |
| $BV_{DSS}$   | $V_{GS} = 0V$ , $I_D = 250\mu A$                                                     | 100                   |      | V                          |
| $V_{GS(th)}$ | $V_{DS} = V_{GS}$ , $I_D = 250\mu A$                                                 | 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>$T_J = 150^\circ C$                            |                       |      | 25 $\mu A$<br>250 $\mu A$  |
| $R_{DS(on)}$ | $V_{GS} = 10V$ , $I_D = 0.5 \cdot I_{D25}$ , Note 1<br>$V_{GS} = 15V$ , $I_D = 350A$ |                       | 7    | 9 m $\Omega$<br>m $\Omega$ |

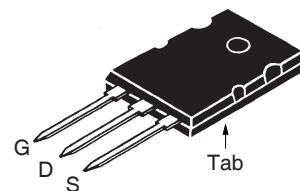
TO-268 (IXTT)



TO-3P (IXTQ)



TO-264 (IXTK)



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

### Features

- International Standard Packages
- 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

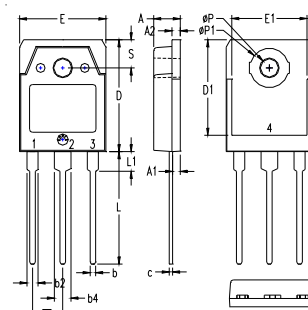
| Symbol                                              |          | Test Conditions                                                                                                                                                | Characteristic Values |      |           |
|-----------------------------------------------------|----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|------|-----------|
| (T <sub>J</sub> = 25°C, Unless Otherwise Specified) |          |                                                                                                                                                                | Min.                  | Typ. | Max.      |
| <b>g<sub>fs</sub></b>                               |          | V <sub>DS</sub> = 10V, I <sub>D</sub> = 0.5 • I <sub>D25</sub> , Note 1                                                                                        | 50                    | 72   | S         |
| <b>C<sub>iss</sub></b>                              | }        | V <sub>GS</sub> = 0V, V <sub>DS</sub> = 25V, f = 1MHz                                                                                                          |                       | 6000 | pF        |
| <b>C<sub>oss</sub></b>                              |          |                                                                                                                                                                |                       | 2340 | pF        |
| <b>C<sub>rss</sub></b>                              |          |                                                                                                                                                                |                       | 730  | 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> = 60A<br>R <sub>G</sub> = 3.3Ω (External) |                       | 35   | ns        |
| <b>t<sub>r</sub></b>                                |          |                                                                                                                                                                |                       | 50   | ns        |
| <b>t<sub>d(off)</sub></b>                           |          |                                                                                                                                                                |                       | 90   | ns        |
| <b>t<sub>f</sub></b>                                |          |                                                                                                                                                                |                       | 33   | 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>                                                      |                       | 198  | nC        |
| <b>Q<sub>gs</sub></b>                               |          |                                                                                                                                                                |                       | 39   | nC        |
| <b>Q<sub>gd</sub></b>                               |          |                                                                                                                                                                |                       | 107  | nC        |
| <b>R<sub>thJC</sub></b>                             |          |                                                                                                                                                                |                       |      | 0.21 °C/W |
| <b>R<sub>thCS</sub></b>                             | (TO-3P)  |                                                                                                                                                                |                       | 0.25 | °C/W      |
|                                                     | (TO-264) |                                                                                                                                                                |                       | 0.15 | °C/W      |

### Source-Drain Diode

| Symbol      Test Conditions<br>(T <sub>J</sub> = 25°C, Unless Otherwise Specified) |                                                                                                                                                                                           | Characteristic Values |      |          |
|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|------|----------|
|                                                                                    |                                                                                                                                                                                           | Min.                  | Typ. | Max.     |
| I <sub>S</sub>                                                                     | V <sub>GS</sub> = 0V                                                                                                                                                                      |                       |      | 170    A |
| I <sub>SM</sub>                                                                    | Repetitive, Pulse Width Limited by T <sub>JM</sub>                                                                                                                                        |                       |      | 350    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>                                                                    | <div style="display: inline-block; vertical-align: middle; font-size: 3em; line-height: 1;">}</div> I <sub>F</sub> = 25A, -di/dt = 100A/μs,<br>V <sub>R</sub> = 50V, V <sub>GS</sub> = 0V |                       | 120  | ns       |
| Q <sub>RM</sub>                                                                    |                                                                                                                                                                                           |                       | 2.0  | μC       |

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

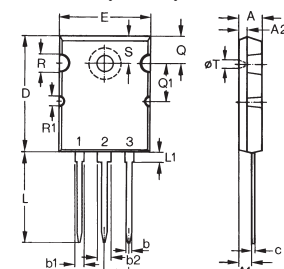
## TO-3P (IXTQ) Outline



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

| 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  |

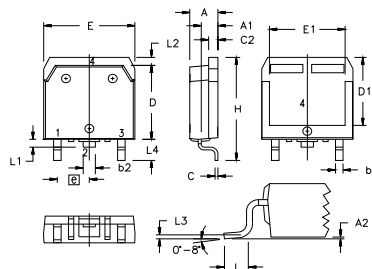
## TO-264 AA ( IXTK) Outline



- 1 = Gate  
2 = Drain  
3 = Source  
Tab = Drain

| Dim. | Millimeter |       | Inches   |       |
|------|------------|-------|----------|-------|
|      | Min.       | Max.  | Min.     | Max.  |
| A    | 4.82       | 5.13  | .190     | .202  |
| A1   | 2.54       | 2.89  | .100     | .114  |
| A2   | 2.00       | 2.10  | .079     | .083  |
| b    | 1.12       | 1.42  | .044     | .056  |
| b1   | 2.39       | 2.69  | .094     | .106  |
| b2   | 2.90       | 3.09  | .114     | .122  |
| c    | 0.53       | 0.83  | .021     | .033  |
| D    | 25.91      | 26.16 | 1.020    | 1.030 |
| E    | 19.81      | 19.96 | .780     | .786  |
| e    | 5.46 BSC   |       | .215 BSC |       |
| J    | 0.00       | 0.25  | .000     | .010  |
| K    | 0.00       | 0.25  | .000     | .010  |
| L    | 20.32      | 20.83 | .800     | .820  |
| L1   | 2.29       | 2.59  | .090     | .102  |
| P    | 3.17       | 3.66  | .125     | .144  |
| Q    | 6.07       | 6.27  | .239     | .247  |
| Q1   | 8.38       | 8.69  | .330     | .342  |
| R    | 3.81       | 4.32  | .150     | .170  |
| R1   | 1.78       | 2.29  | .070     | .090  |
| S    | 6.04       | 6.30  | .238     | .248  |
| T    | 1.57       | 1.83  | .062     | .072  |

## TO-268 (IXTT) Outline



| 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     | .067 | 1.45        | 1.60  |
| D   | .343     | .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  |

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    | 6,771,478 B2 | 7,071,537 |              |             |

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

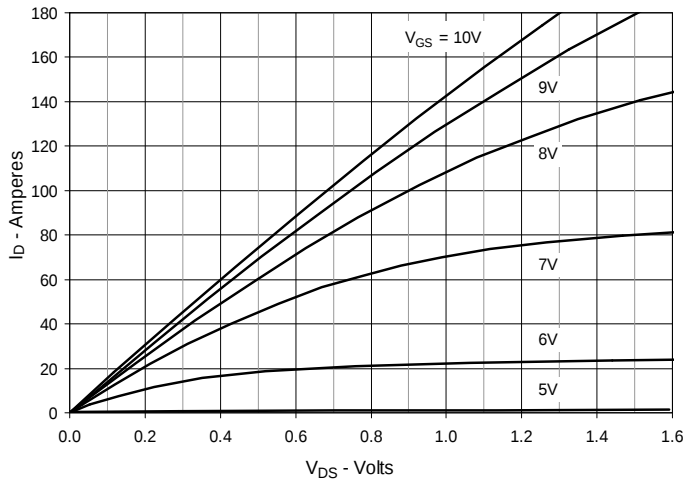


Fig. 2. Extended Output Characteristics @  $T_J = 25^\circ\text{C}$

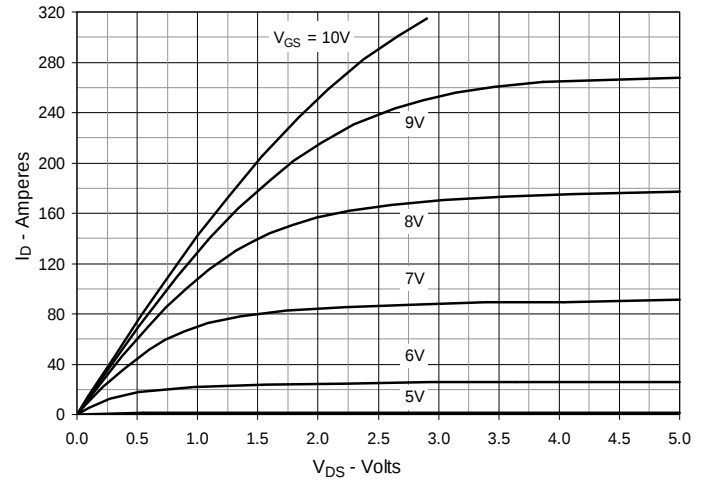


Fig. 3. Output Characteristics @  $T_J = 150^\circ\text{C}$

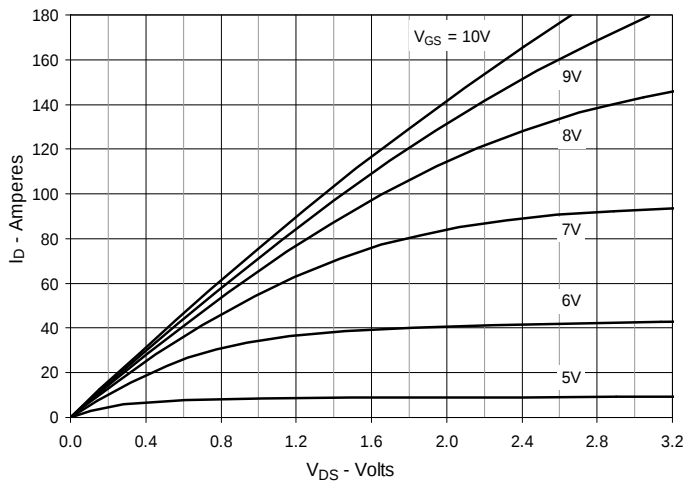


Fig. 4.  $R_{DS(on)}$  Normalized to  $I_D = 85\text{A}$  Value vs. Junction Temperature

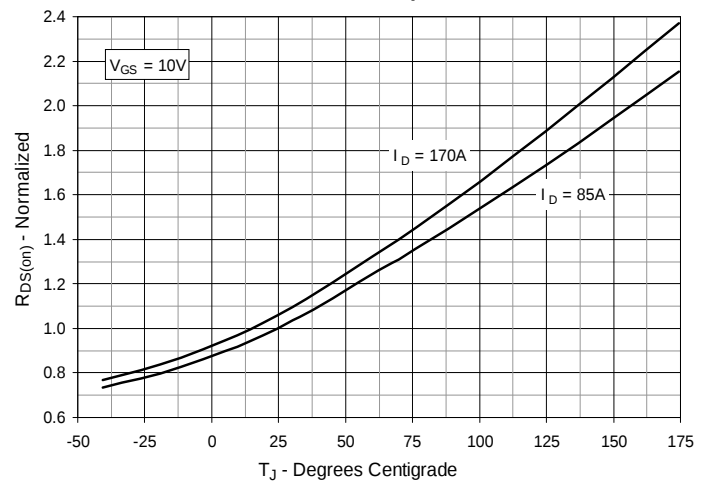


Fig. 5.  $R_{DS(on)}$  Normalized to  $I_D = 85\text{A}$  Value vs. Drain Current

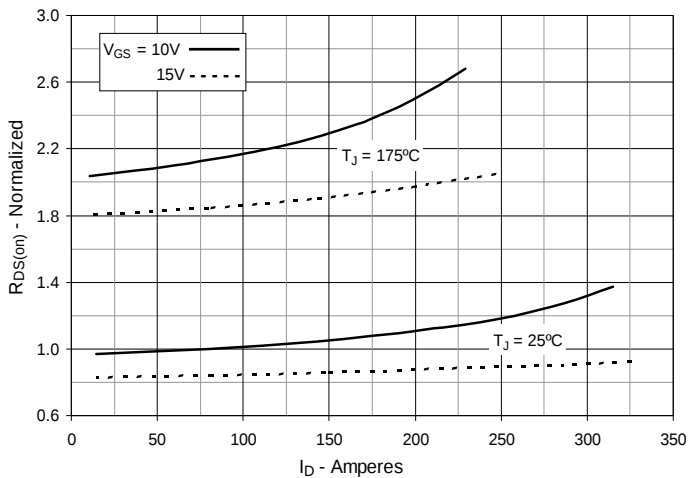
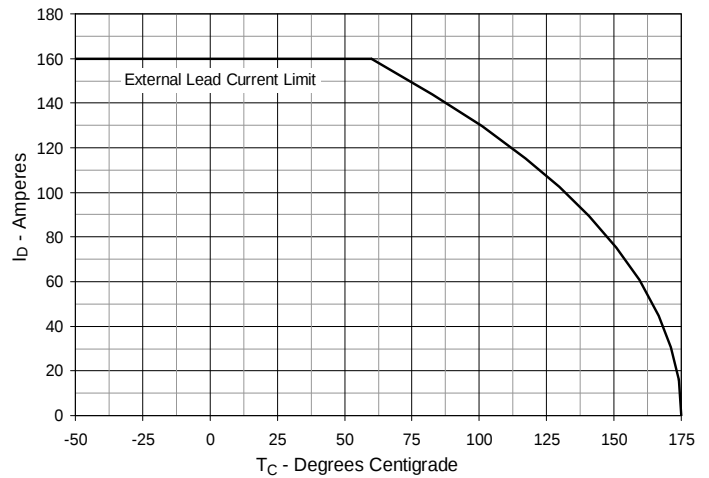
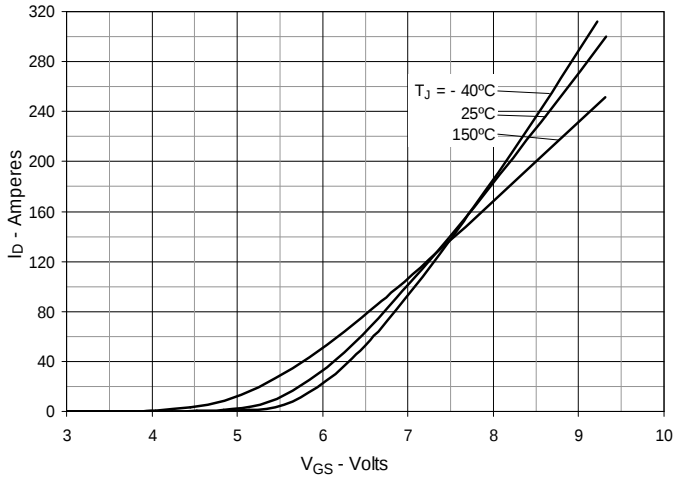


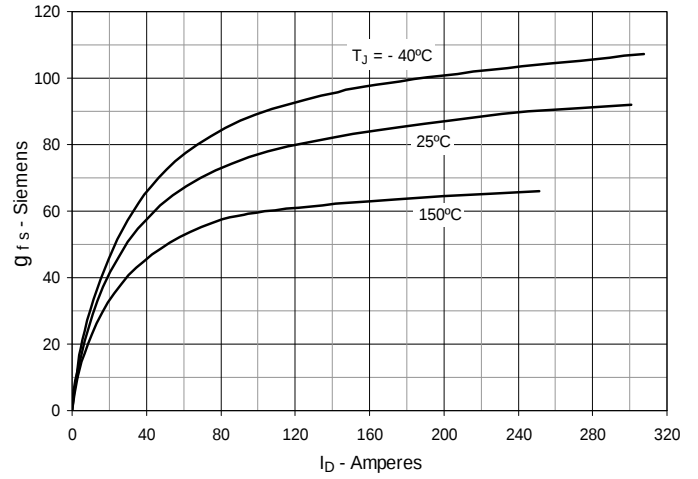
Fig. 6. Maximum Drain Current vs. Case Temperature



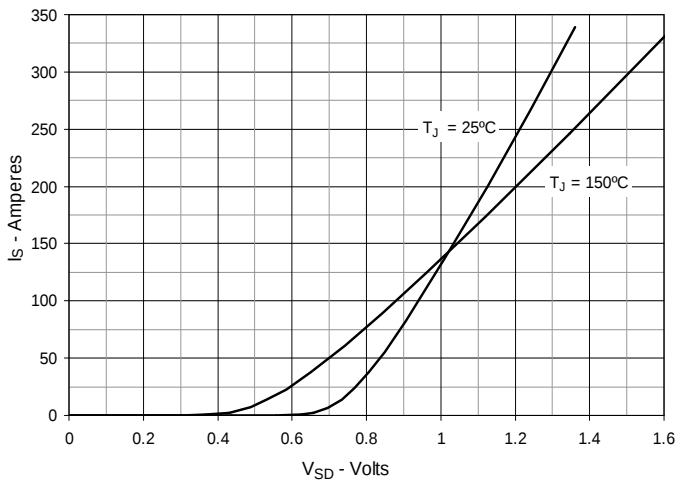
**Fig. 7. Input Admittance**



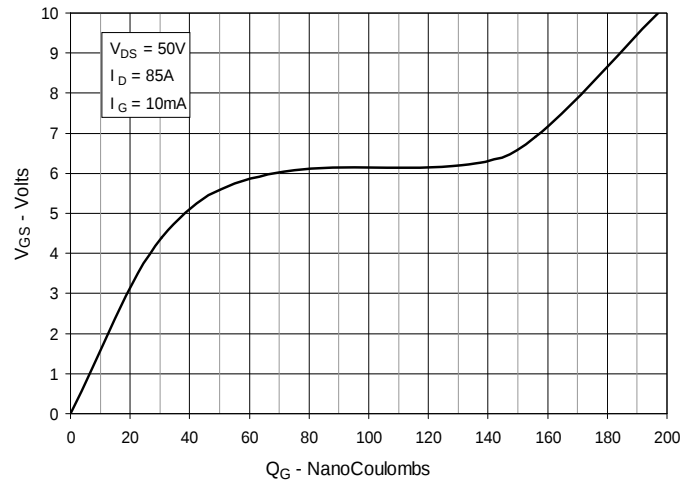
**Fig. 8. Transconductance**



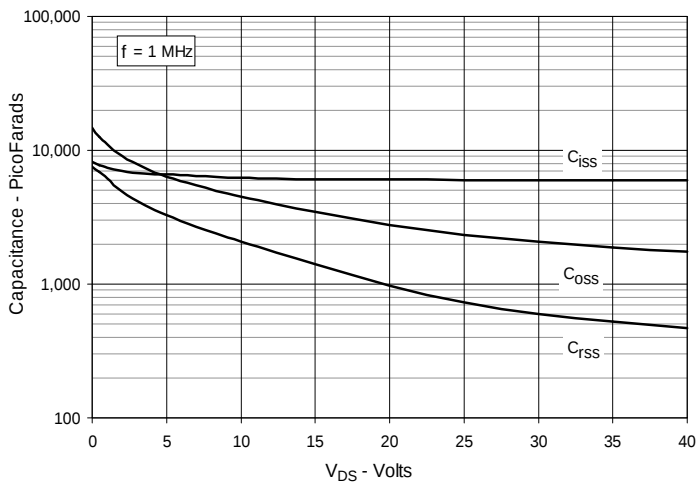
**Fig. 9. Forward Voltage Drop of Intrinsic Diode**



**Fig. 10. Gate Charge**



**Fig. 11. Capacitance**



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

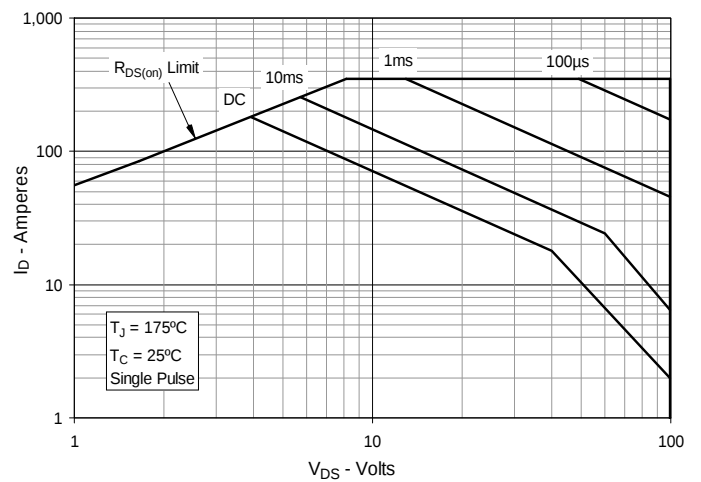


Fig. 13. Maximum Transient Thermal Impedance

