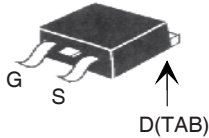


# PolarP™ Power MOSFET

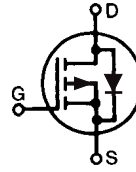
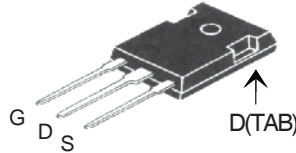
P-Channel Enhancement Mode  
Avalanche Rated

TO-263 (IXTA)



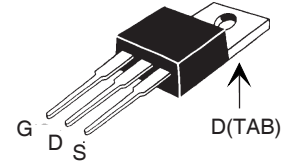
IXTA26P20P  
IXTH26P20P  
IXTP26P20P  
IXTQ26P20P

TO-247 (IXTH)

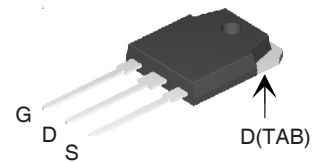


$V_{DSS} = -200V$   
 $I_{D25} = -26A$   
 $R_{DS(on)} \leq 170m\Omega$

TO-220 (IXTP)



TO-3P (IXTQ)



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

| Symbol     | Test Conditions  | Maximum Ratings |            |
|------------|--|-----------------|------------|
| $V_{DSS}$  | $T_J = 25^\circ C$ to $175^\circ C$                                | - 200           | V          |
| $V_{DGR}$  | $T_J = 25^\circ C$ to $175^\circ C$ , $R_{GS} = 1M\Omega$          | - 200           | V          |
| $V_{GSS}$  | Continuous   | $\pm 20$        | V          |
| $V_{GSM}$  | Transient  | $\pm 30$        | V          |
| $I_{D25}$  | $T_C = 25^\circ C$   | - 26            | A          |
| $I_{DM}$   | $T_C = 25^\circ C$ , pulse width limited by $T_{JM}$               | - 70            | A          |
| $I_{AR}$   | $T_C = 25^\circ C$   | - 26            | A          |
| $E_{AR}$   | $T_C = 25^\circ C$   | 50              | mJ         |
| $E_{AS}$   | $T_C = 25^\circ C$   | 1.5             | J          |
| $dV/dt$    | $I_S \leq I_{DM}$ , $V_{DD} \leq V_{DSS}$ , $T_J \leq 175^\circ C$ | 10              | V/ns       |
| $P_D$      | $T_C = 25^\circ C$   | 300             | W          |
| $T_J$      |  | -55 ... +175    | $^\circ C$ |
| $T_{JM}$   |  | 175             | $^\circ C$ |
| $T_{stg}$  |  | -55 ... +175    | $^\circ C$ |
| $T_L$      | 1.6mm (0.062 in.) from case for 10s                                | 300             | $^\circ C$ |
| $T_{SOLD}$ | Plastic body for 10s   | 260             | $^\circ C$ |
| $M_d$      | Mounting torque (TO-3P, TO-220, TO-247)                            | 1.13/10         | Nm/lb.in.  |
| Weight     | TO-247   | 6.0             | g          |
|            | TO-3P  | 5.5             | g          |
|            | TO-220   | 3.0             | g          |
|            | TO-263   | 2.5             | g          |

| Symbol       | Test Conditions<br>( $T_J = 25^\circ C$ , unless otherwise specified) | Characteristic Values |      |                |
|--------------|---|-----------------------|------|----------------|
|              |   | Min.                  | Typ. | Max.           |
| $BV_{DSS}$   | $V_{GS} = 0V$ , $I_D = -250 \mu A$                                    | - 200                 |      | V              |
| $V_{GS(th)}$ | $V_{DS} = V_{GS}$ , $I_D = -250 \mu A$                                | - 2.5                 |      | V              |
| $I_{GSS}$    | $V_{GS} = \pm 20V$ , $V_{DS} = 0V$                                    |                       |      | $\pm 100$ nA   |
| $I_{DSS}$    | $V_{DS} = V_{DSS}$  |                       |      | - 10 $\mu A$   |
|              | $V_{GS} = 0V$ $T_J = 150^\circ C$                                     |                       |      | - 250 $\mu A$  |
| $R_{DS(on)}$ | $V_{GS} = -10V$ , $I_D = 0.5 \cdot I_{D25}$ , Note 1                  |                       |      | 170 m $\Omega$ |

### Features:

- International standard packages
- Fast intrinsic diode
- Dynamic  $dV/dt$  Rated
- Avalanche Rated
- Rugged PolarP™ process
- Low  $Q_G$  and  $R_{ds(on)}$  characterization
- Low Drain-to-Tab capacitance
- Low package inductance
- easy to drive and to protect

### Applications:

- High side switching
- Push-pull amplifiers
- DC Choppers
- Current regulators
- Automatic test equipment

### Advantages:

- Low gate charge results in simple drive requirement
- Improved Gate, Avalanche and dynamic  $dV/dt$  ruggedness
- High power density
- Fast switching

| Symbol       | Test Conditions<br>( $T_J = 25^\circ\text{C}$ , unless otherwise specified)   | Characteristic Values |      |                        |
|--------------|---|-----------------------|------|------------------------|
|              |   | Min.                  | Typ. | Max.                   |
| $g_{fs}$     | $V_{DS} = -10\text{V}$ , $I_D = 0.5 \cdot I_{D25}$ (Note 1)   | 10                    | 17   | S                      |
| $C_{iss}$    | $V_{GS} = 0\text{V}$ , $V_{DS} = -25\text{V}$ , $f = 1\text{MHz}$   |                       | 2920 | pF                     |
| $C_{oss}$    |   |                       | 540  | pF                     |
| $C_{rss}$    |   |                       | 100  | 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>$R_G = 3.3\Omega$ (External) |                       | 18   | ns                     |
| $t_r$        |   |                       | 33   | ns                     |
| $t_{d(off)}$ |   |                       | 46   | ns                     |
| $t_f$        |   |                       | 21   | ns                     |
| $Q_{g(on)}$  | $V_{GS} = -10\text{V}$ , $V_{DS} = 0.5 \cdot V_{DSS}$ , $I_D = 0.5 \cdot I_{D25}$   |                       | 56   | nC                     |
| $Q_{gs}$     |   |                       | 18   | nC                     |
| $Q_{gd}$     |   |                       | 20   | nC                     |
| $R_{thJC}$   |   |                       |      | 0.5 $^\circ\text{C/W}$ |
| $R_{thCS}$   | (TO-3P)(TO-247)   | 0.21                  |      | $^\circ\text{C/W}$     |
|              | (TO-220)  | 0.25                  |      | $^\circ\text{C/W}$     |

**Source-Drain Diode**

| Symbol   | Test Conditions<br>( $T_J = 25^\circ\text{C}$ , unless otherwise specified)                              | Characteristic Values |       |               |
|----------|--|-----------------------|-------|---------------|
|          |  | Min.                  | Typ.  | Max.          |
| $I_S$    | $V_{GS} = 0\text{V}$   |                       |       | - 26 A        |
| $I_{SM}$ | Repetitive   |                       |       | - 104 A       |
| $V_{SD}$ | $I_F = -13\text{A}$ , $V_{GS} = 0\text{V}$ , Note 1  |                       |       | - 3.0 V       |
| $t_{rr}$ | $I_F = -13\text{A}$ , $-di/dt = -100\text{A}/\mu\text{s}$<br>$V_R = -100\text{V}$ , $V_{GS} = 0\text{V}$ |                       | 240   | ns            |
| $Q_{RM}$ |  |                       | 2.20  | $\mu\text{C}$ |
| $I_{RM}$ |  |                       | -18.0 | A             |

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

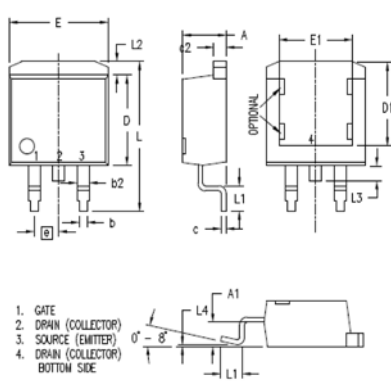
**PRELIMINARY TECHNICAL INFORMATION**

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.

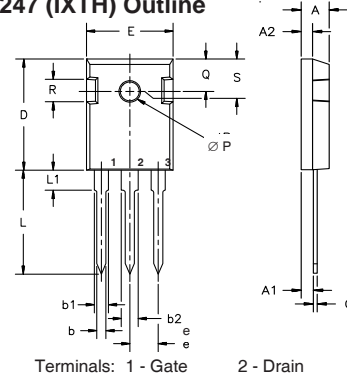
IXYS MOSFETs and IGBTs are covered 4,835,592 4,931,844 5,049,961 5,237,481 6,162,665 6,404,065 B1 6,683,344 6,727,585 7,005,734 B2 7,157,338B2  
by one or more of the following U.S. patents: 4,850,072 5,017,508 5,063,307 5,381,025 6,259,123 B1 6,534,343 6,710,405 B2 6,759,692 7,063,975 B2  
4,881,106 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-263 (IXTA) Outline



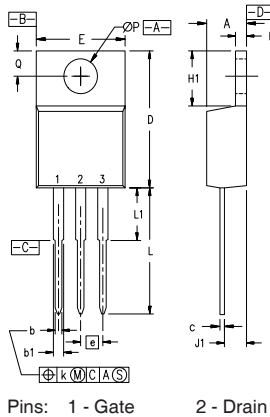
| SYM | INCHES   |      | MILLIMETERS |       |
|-----|----------|------|-------------|-------|
|     | MIN      | MAX  | MIN         | MAX   |
| A   | .160     | .190 | 4.06        | 4.83  |
| A1  | .080     | .110 | 2.03        | 2.79  |
| b   | .020     | .039 | 0.51        | 0.99  |
| b2  | .045     | .055 | 1.14        | 1.40  |
| c   | .016     | .029 | 0.40        | 0.74  |
| c2  | .045     | .055 | 1.14        | 1.40  |
| D   | .340     | .380 | 8.64        | 9.65  |
| D1  | .315     | .350 | 8.00        | 8.89  |
| E   | .380     | .410 | 9.65        | 10.41 |
| E1  | .245     | .320 | 6.22        | 8.13  |
| e   | .100 BSC |      | 2.54 BSC    |       |
| L   | .575     | .625 | 14.61       | 15.88 |
| L1  | .090     | .110 | 2.29        | 2.79  |
| L2  | .040     | .055 | 1.02        | 1.40  |
| L3  | .050     | .070 | 1.27        | 1.78  |
| L4  | 0        | .005 | 0           | 0.13  |

### TO-247 (IXTH) Outline



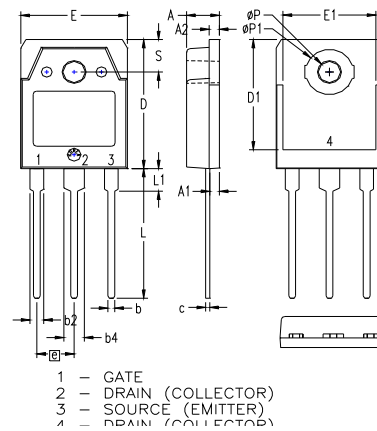
| Dim.           | Millimeter |       | Inches |       |
|----------------|------------|-------|--------|-------|
|                | Min.       | Max.  | Min.   | Max.  |
| A              | 4.7        | 5.3   | .185   | .209  |
| A <sub>1</sub> | 2.2        | 2.54  | .087   | .102  |
| A <sub>2</sub> | 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  |

### TO-220 (IXTP) Outline



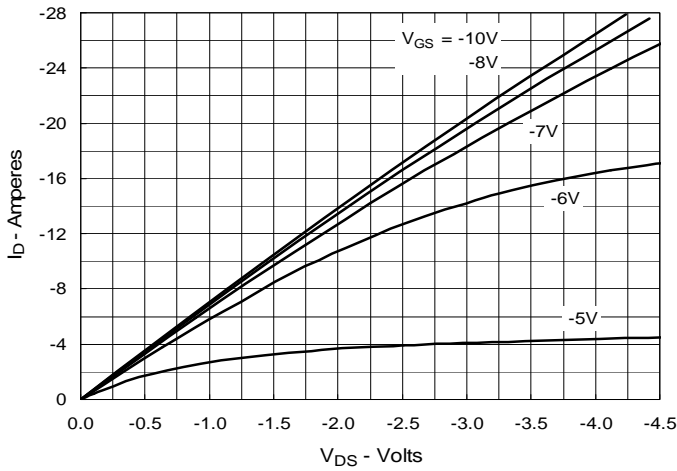
| SYM | INCHES   |      | MILLIMETERS |       |
|-----|----------|------|-------------|-------|
|     | MIN      | MAX  | MIN         | MAX   |
| A   | .170     | .190 | 4.32        | 4.83  |
| b   | .025     | .040 | 0.64        | 1.02  |
| b1  | .045     | .065 | 1.15        | 1.65  |
| c   | .014     | .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  |
| ∅P  | .139     | .161 | 3.53        | 4.08  |
| Q   | .100     | .125 | 2.54        | 3.18  |

### TO-3P (IXTQ) Outline

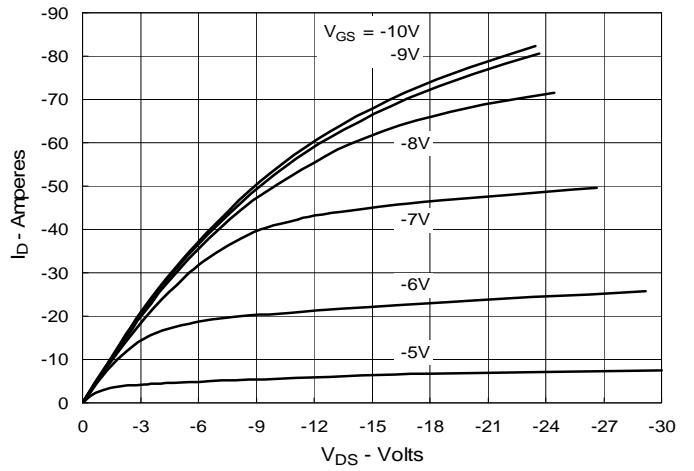


| SYM | INCHES   |      | MILLIMETERS |       |
|-----|----------|------|-------------|-------|
|     | MIN      | MAX  | MIN         | MAX   |
| A   | .185     | .193 | 4.70        | 4.90  |
| A1  | .051     | .059 | 1.30        | 1.50  |
| A2  | .057     | .065 | 1.45        | 1.65  |
| b   | .035     | .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  |
| ∅P  | .126     | .134 | 3.20        | 3.40  |
| ∅P1 | .272     | .280 | 6.90        | 7.10  |
| S   | .193     | .201 | 4.90        | 5.10  |

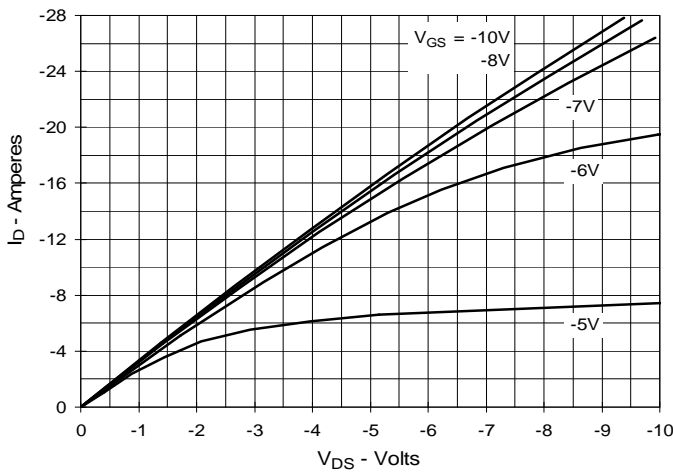
**Fig. 1. Output Characteristics  
@ 25°C**



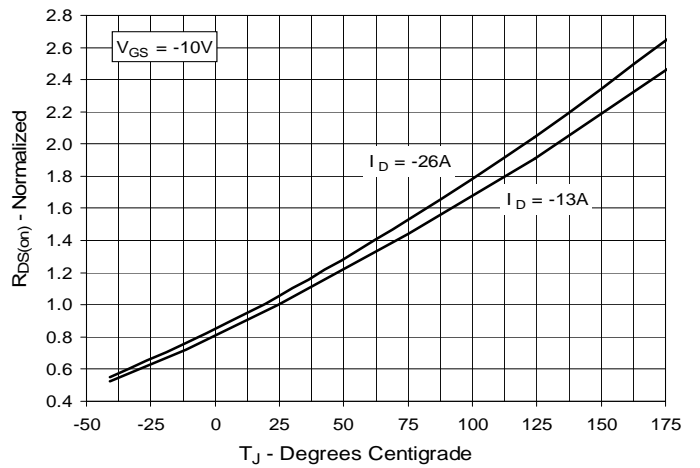
**Fig. 2. Extended Output Characteristics  
@ 25°C**



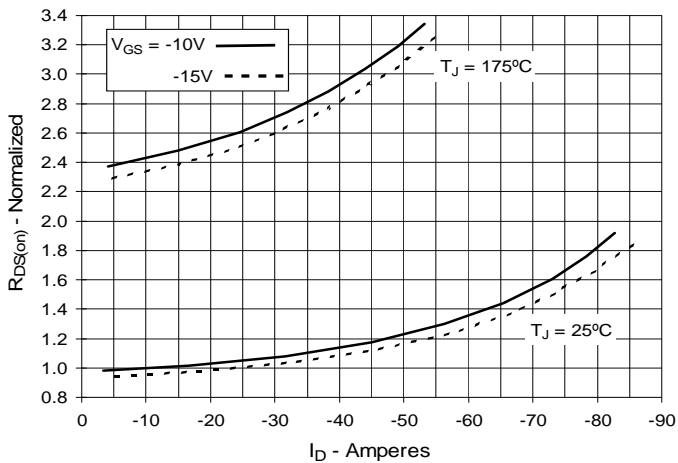
**Fig. 3. Output Characteristics  
@ 150°C**



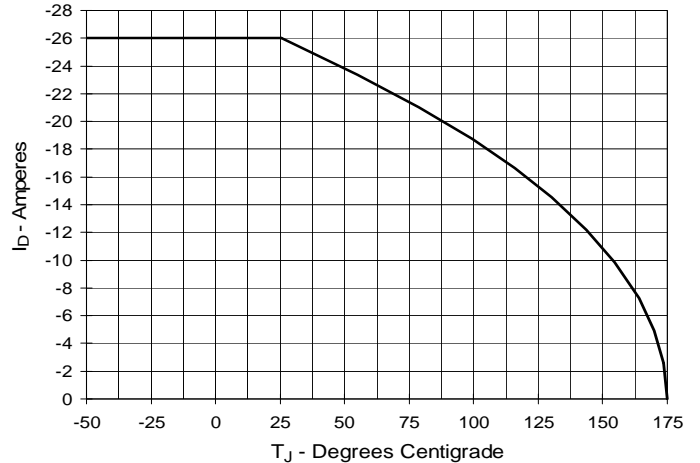
**Fig. 4.  $R_{DS(on)}$  Normalized to  $I_D = -13A$  vs.  
Junction Temperature**



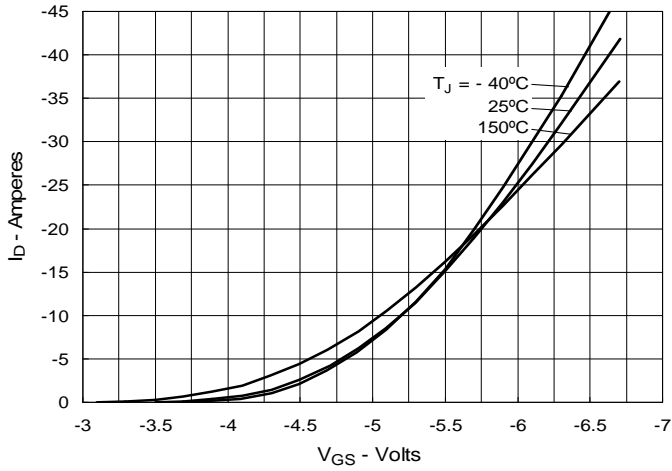
**Fig. 5.  $R_{DS(on)}$  Normalized to  $I_D = -13A$  vs.  
Drain Current**



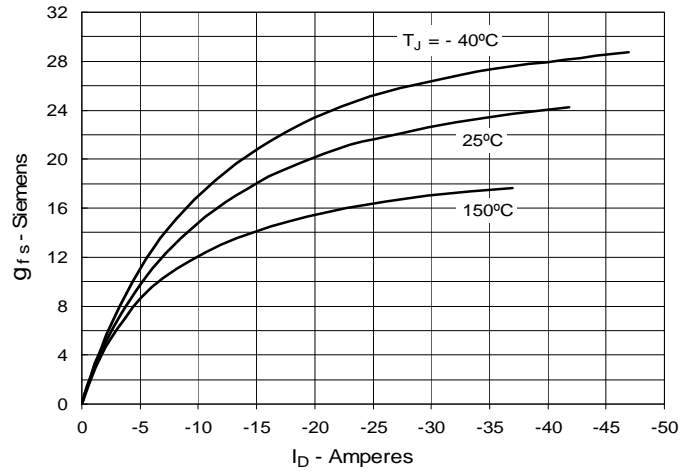
**Fig. 6. Maximum Drain Current vs.  
Case Temperature**



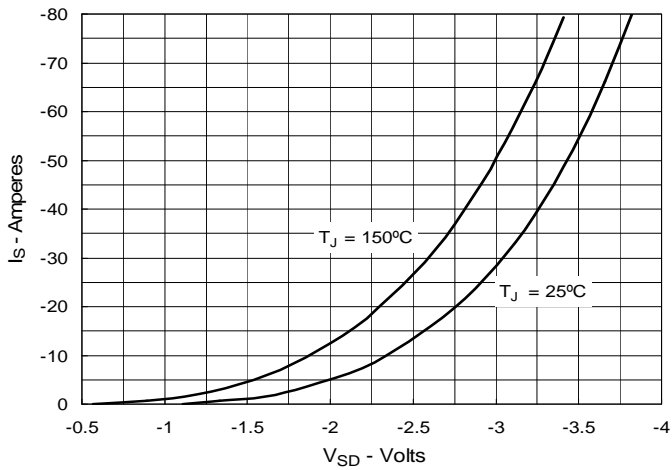
**Fig. 7. Input Admittance**



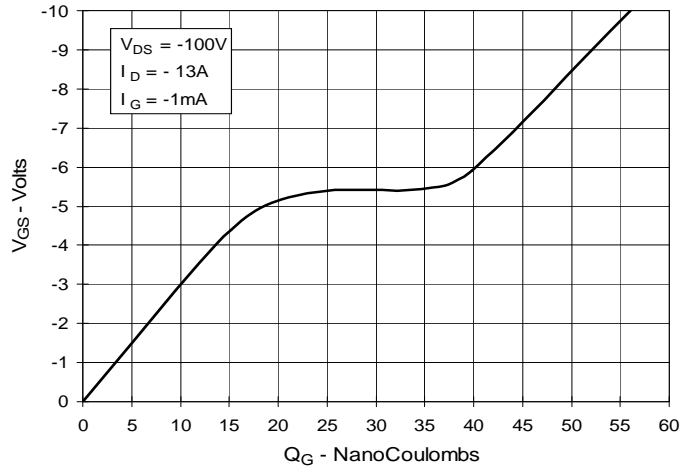
**Fig. 8. Transconductance**



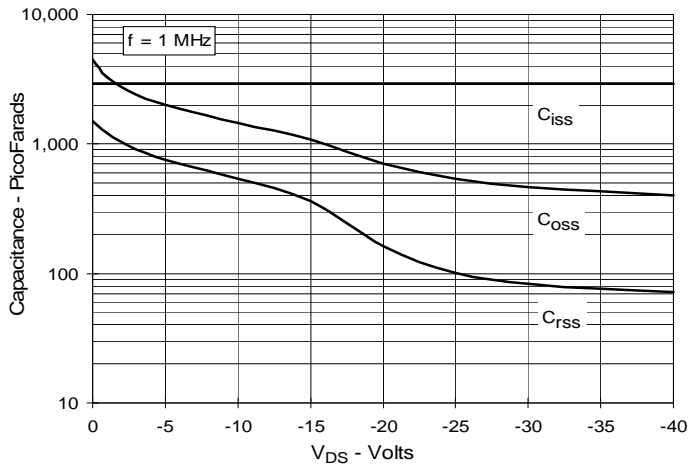
**Fig. 9. Forward Voltage Drop of Intrinsic Diode**



**Fig. 10. Gate Charge**



**Fig. 11. Capacitance**



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

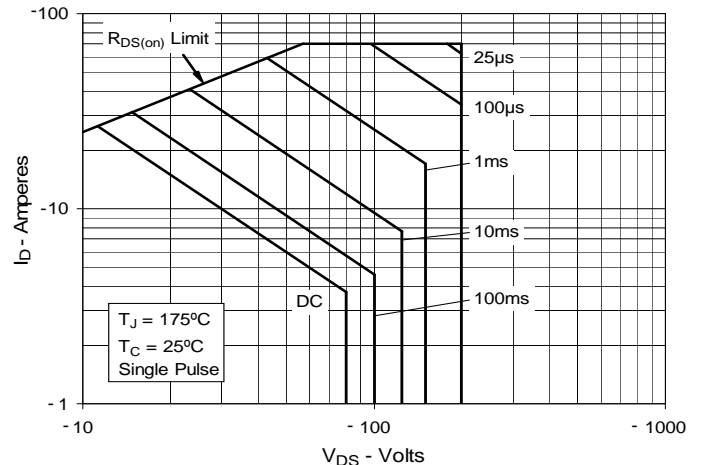


Fig. 13. Maximum Transient Thermal Impedance

