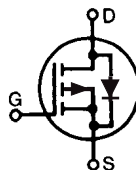


## PolarP™ Power MOSFETs

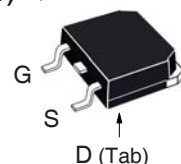
## IXTT48P20P IXTH48P20P

$$\begin{aligned} V_{DSS} &= -200V \\ I_{D25} &= -48A \\ R_{DS(on)} &\leq 85m\Omega \end{aligned}$$

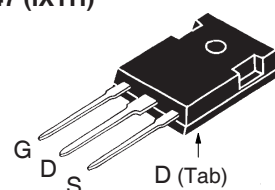
P-Channel Enhancement Mode  
Avalanche Rated



TO-268 (IXTT)



TO-247 (IXTH)



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

| Symbol     | Test Conditions                                                          | Maximum Ratings |                  |
|------------|--------------------------------------------------------------------------|-----------------|------------------|
| $V_{DSS}$  | $T_J = 25^\circ\text{C}$ to $150^\circ\text{C}$                          | - 200           | V                |
| $V_{DGR}$  | $T_J = 25^\circ\text{C}$ to $150^\circ\text{C}$ , $R_{GS} = 1M\Omega$    | - 200           | V                |
| $V_{GSS}$  | Continuous                                                               | $\pm 20$        | V                |
| $V_{GSM}$  | Transient                                                                | $\pm 30$        | V                |
| $I_{D25}$  | $T_C = 25^\circ\text{C}$                                                 | - 48            | A                |
| $I_{DM}$   | $T_C = 25^\circ\text{C}$ , Pulse Width Limited by $T_{JM}$               | -144            | A                |
| $I_A$      | $T_C = 25^\circ\text{C}$                                                 | - 48            | A                |
| $E_{AS}$   | $T_C = 25^\circ\text{C}$                                                 | 2.5             | J                |
| $dv/dt$    | $I_S \leq I_{DM}$ , $V_{DD} \leq V_{DSS}$ , $T_J \leq 150^\circ\text{C}$ | 10              | V/ns             |
| $P_D$      | $T_C = 25^\circ\text{C}$                                                 | 462             | 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 in.) from Case for 10s                                      | 300             | $^\circ\text{C}$ |
| $T_{SOLD}$ | Plastic Body for 10s                                                     | 260             | $^\circ\text{C}$ |
| $M_d$      | Mounting Torque (TO-247)                                                 | 1.13 / 10       | Nm/lb.in.        |
| Weight     | TO-268                                                                   | 4               | g                |
|            | TO-247                                                                   | 6               | g                |

| Symbol       | Test Conditions<br>( $T_J = 25^\circ\text{C}$ , Unless Otherwise Specified) | Characteristic Values |      |                               |
|--------------|-----------------------------------------------------------------------------|-----------------------|------|-------------------------------|
|              |                                                                             | Min.                  | Typ. | Max.                          |
| $BV_{DSS}$   | $V_{GS} = 0V$ , $I_D = -250\mu A$                                           | - 200                 |      | V                             |
| $V_{GS(th)}$ | $V_{DS} = V_{GS}$ , $I_D = -250\mu A$                                       | - 2.0                 |      | V                             |
| $I_{GSS}$    | $V_{GS} = \pm 20V$ , $V_{DS} = 0V$                                          |                       |      | $\pm 100$ nA                  |
| $I_{DSS}$    | $V_{DS} = V_{DSS}$ , $V_{GS} = 0V$<br>$T_J = 125^\circ\text{C}$             |                       |      | - 25 $\mu A$<br>- 200 $\mu A$ |
| $R_{DS(on)}$ | $V_{GS} = -10V$ , $I_D = 0.5 \cdot I_{D25}$ , Note 1                        |                       |      | 85 m $\Omega$                 |

### Features

- International Standard Packages
- Rugged PolarP™ Process
- Avalanche Rated
- Low Package Inductance
- Fast intrinsic Diode

### Advantages

- Easy to Mount
- Space Savings
- High Power Density

### Applications

- High-Side Switches
- Push Pull Amplifiers
- DC Choppers
- Automatic Test Equipment
- Current Regulators

| Symbol       | Test Conditions                                                                                                                                     | Characteristic Values |      |                        |
|--------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|------|------------------------|
|              | ( $T_J = 25^\circ\text{C}$ , Unless Otherwise Specified)                                                                                            | Min.                  | Typ. | Max.                   |
| $g_{fs}$     | $V_{DS} = -10\text{V}$ , $I_D = 0.5 \cdot I_{D25}$ , Note 1                                                                                         | 19                    | 32   | S                      |
| $C_{iss}$    | $V_{GS} = 0\text{V}$ , $V_{DS} = -25\text{V}$ , $f = 1\text{MHz}$                                                                                   |                       | 5400 | pF                     |
| $C_{oss}$    |                                                                                                                                                     |                       | 1040 | pF                     |
| $C_{rss}$    |                                                                                                                                                     |                       | 170  | 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>$R_G = 3\Omega$ (External) |                       | 30   | ns                     |
| $t_r$        |                                                                                                                                                     |                       | 46   | ns                     |
| $t_{d(off)}$ |                                                                                                                                                     |                       | 67   | ns                     |
| $t_f$        |                                                                                                                                                     |                       | 27   | ns                     |
| $Q_{g(on)}$  | $V_{GS} = -10\text{V}$ , $V_{DS} = 0.5 \cdot V_{DSS}$ , $I_D = 0.5 \cdot I_{D25}$                                                                   |                       | 103  | nC                     |
| $Q_{gs}$     |                                                                                                                                                     |                       | 23   | nC                     |
| $Q_{gd}$     |                                                                                                                                                     |                       | 40   | nC                     |
| $R_{thJC}$   | TO-247                                                                                                                                              |                       |      | $0.27^\circ\text{C/W}$ |
| $R_{thCS}$   |                                                                                                                                                     | 0.21                  |      | $^\circ\text{C/W}$     |

## Safe Operating Area Specification

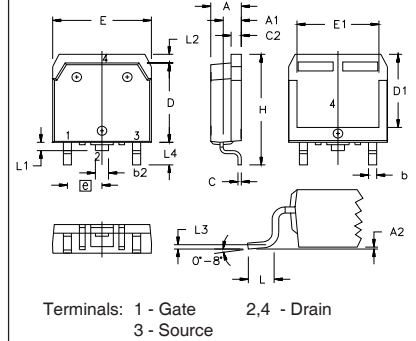
| Symbol | Test Conditions                                                                                | Characteristic Values |      |      |
|--------|------------------------------------------------------------------------------------------------|-----------------------|------|------|
|        |                                                                                                | Min.                  | Typ. | Max. |
| SOA    | $V_{DS} = -200\text{V}$ , $I_D = -1.35\text{A}$ , $T_C = 70^\circ\text{C}$ , $T_p = 5\text{s}$ | 270                   |      | W    |

## Source-Drain Diode

| Symbol   | Test Conditions                                                                                          | Characteristic Values |      |               |
|----------|----------------------------------------------------------------------------------------------------------|-----------------------|------|---------------|
|          | ( $T_J = 25^\circ\text{C}$ , Unless Otherwise Specified)                                                 | Min.                  | Typ. | Max.          |
| $I_S$    | $V_{GS} = 0\text{V}$                                                                                     |                       |      | - 48 A        |
| $I_{SM}$ | Repetitive, Pulse Width Limited by $T_{JM}$                                                              |                       |      | -192 A        |
| $V_{SD}$ | $I_F = -24\text{A}$ , $V_{GS} = 0\text{V}$ , Note 1                                                      |                       |      | - 3.3 V       |
| $t_{rr}$ | $I_F = -24\text{A}$ , $-di/dt = -100\text{A}/\mu\text{s}$<br>$V_R = -100\text{V}$ , $V_{GS} = 0\text{V}$ |                       | 260  | ns            |
| $Q_{RM}$ |                                                                                                          |                       | 4.2  | $\mu\text{C}$ |
| $I_{RM}$ |                                                                                                          | - 32.2                |      | A             |

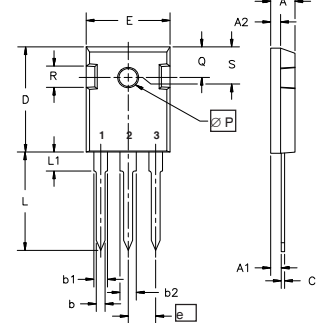
Note 1. Pulse test,  $t \leq 300\mu\text{s}$ , duty cycle,  $d \leq 2\%$ .

## TO-268 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     | .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  |

## TO-247 Outline



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

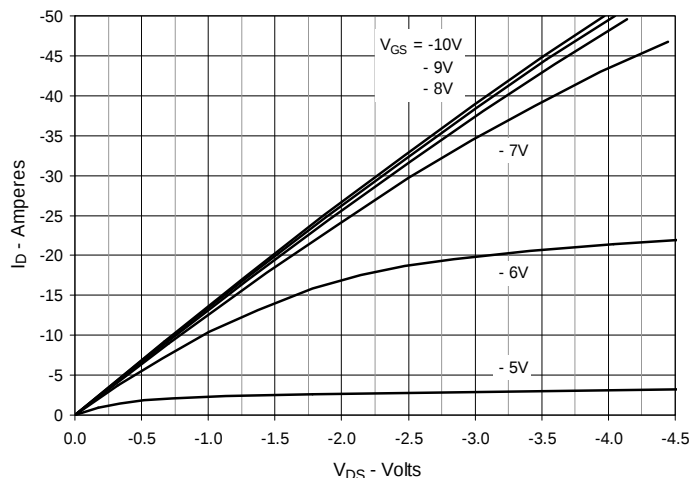
| Dim. | Millimeter |       | Inches  |       |
|------|------------|-------|---------|-------|
|      | Min.       | Max.  | Min.    | Max.  |
| A    | 4.7        | 5.3   | .185    | .209  |
| A1   | 2.2        | 2.54  | .087    | .102  |
| A2   | 2.2        | 2.6   | .059    | .098  |
| b    | 1.0        | 1.4   | .040    | .055  |
| b1   | 1.65       | 2.13  | .065    | .084  |
| b2   | 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  |
| 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 |       |

IXYS Reserves the Right to Change Limits, Test Conditions, and Dimensions.

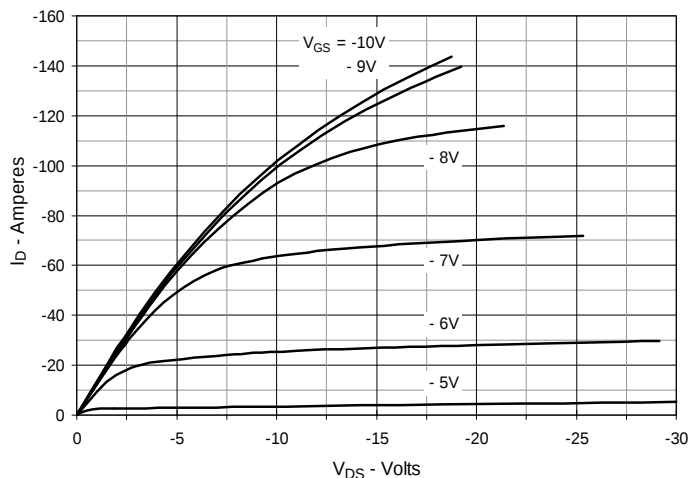
IXYS MOSFETs and IGBTs are covered by one or more of the following U.S. patents:

|           |           |           |           |              |              |              |              |              |             |
|-----------|-----------|-----------|-----------|--------------|--------------|--------------|--------------|--------------|-------------|
| 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    | 6,710,463    | 6,771,478 B2 | 7,071,537    |             |

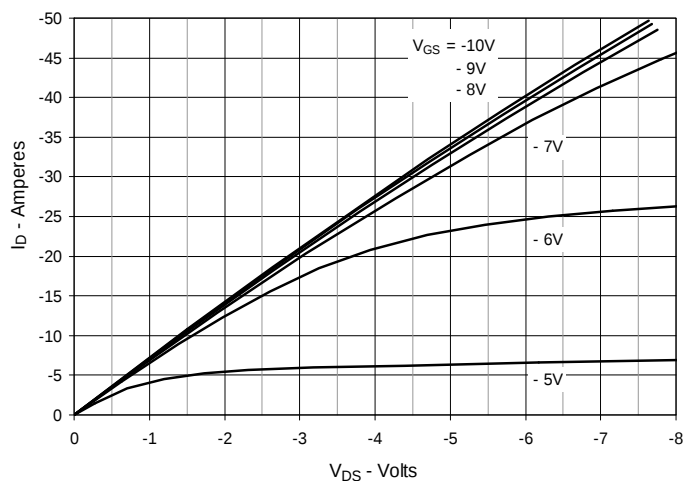
**Fig. 1. Output Characteristics @  $T_J = 25^\circ\text{C}$**



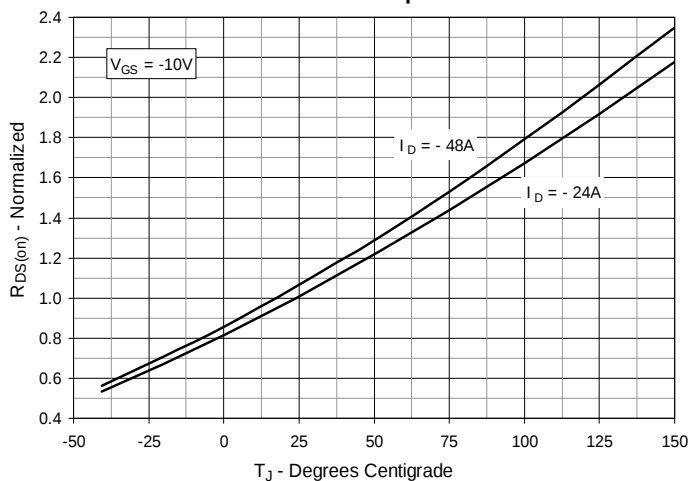
**Fig. 2. Extended Output Characteristics @  $T_J = 25^\circ\text{C}$**



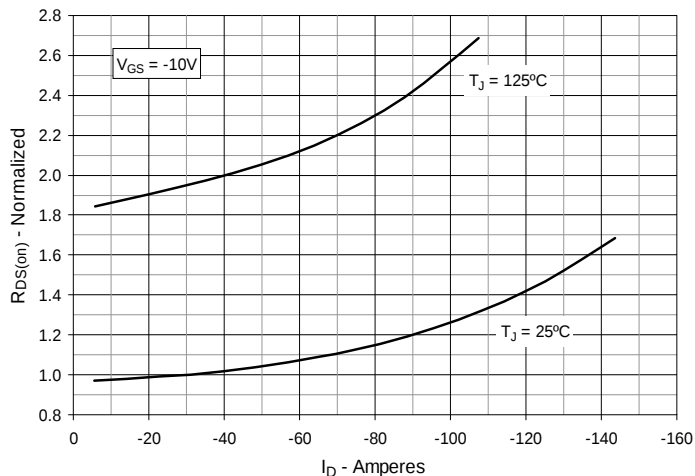
**Fig. 3. Output Characteristics @  $T_J = 125^\circ\text{C}$**



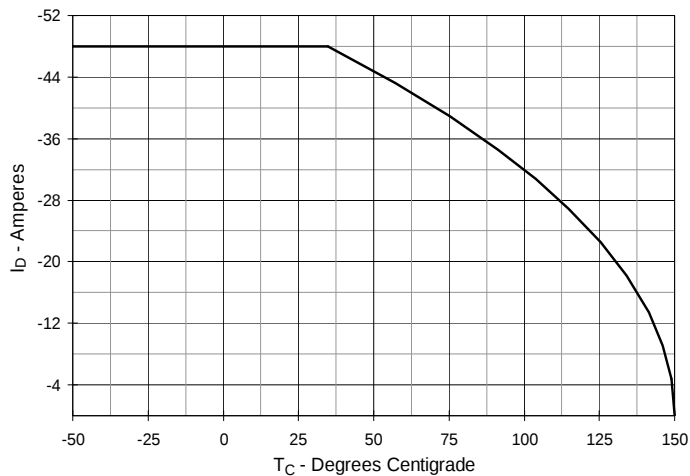
**Fig. 4.  $R_{DS(on)}$  Normalized to  $I_D = -24\text{A}$  Value vs. Junction Temperature**



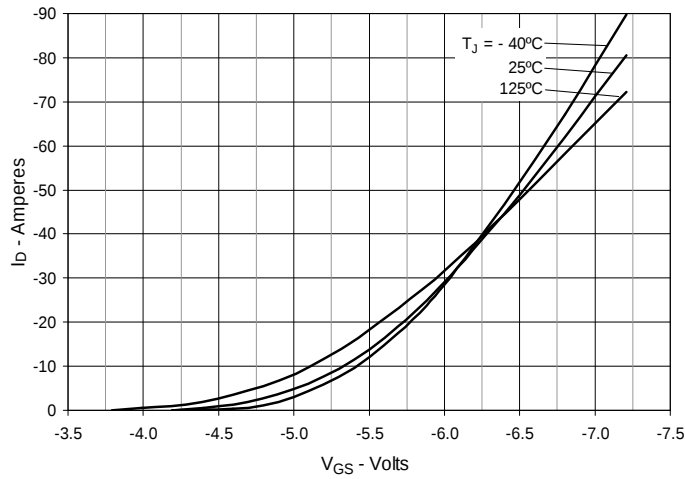
**Fig. 5.  $R_{DS(on)}$  Normalized to  $I_D = -24\text{A}$  Value vs. Drain Current**



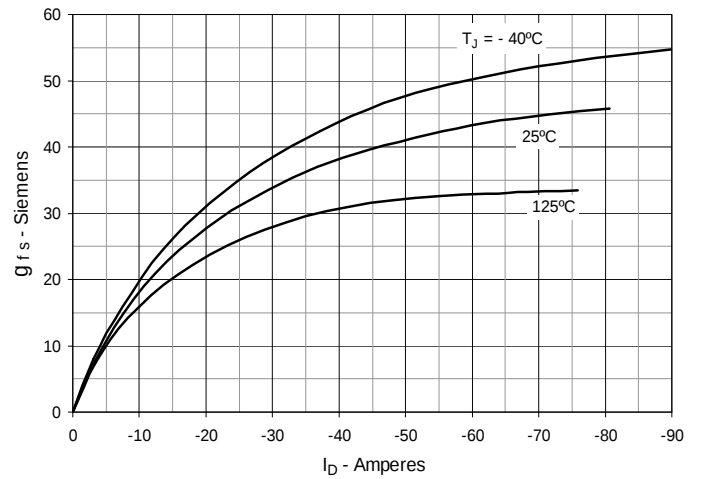
**Fig. 6. Maximum Drain Current vs. Case Temperature**



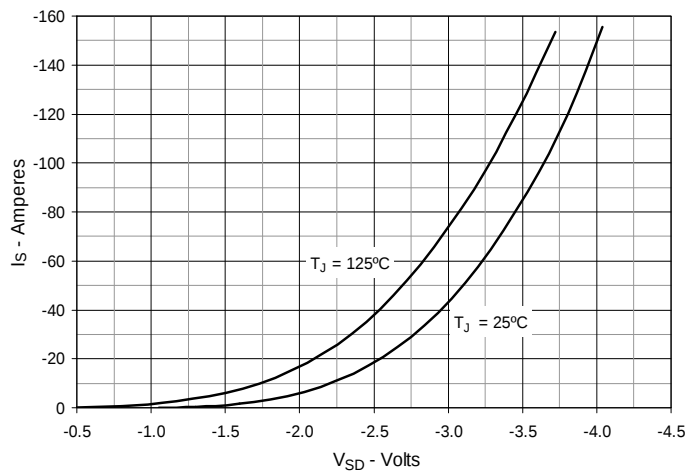
**Fig. 7. Input Admittance**



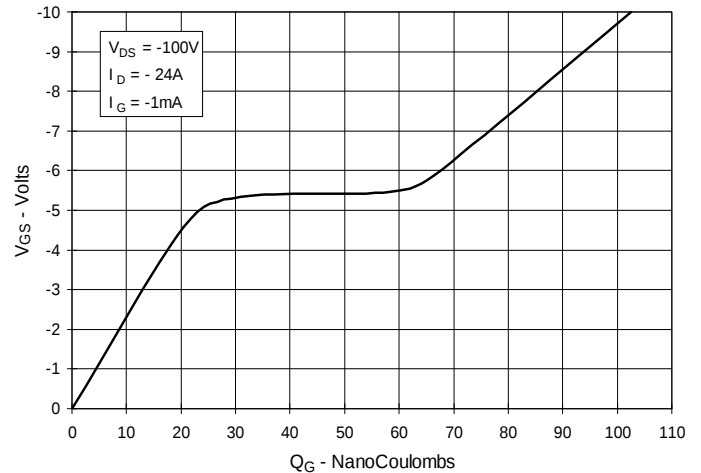
**Fig. 8. Transconductance**



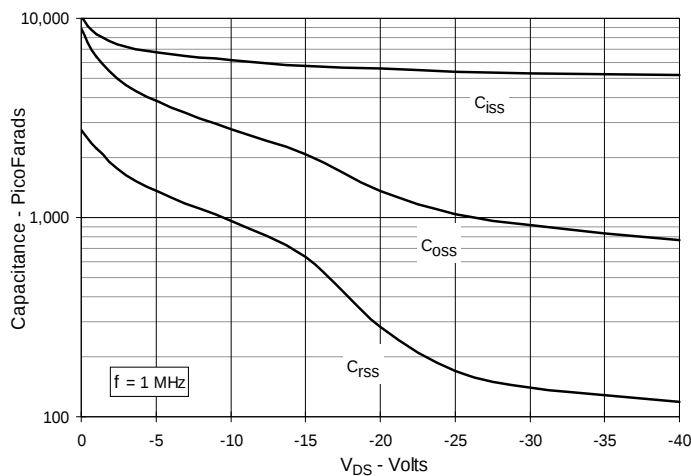
**Fig. 9. Forward Voltage Drop of Intrinsic Diode**



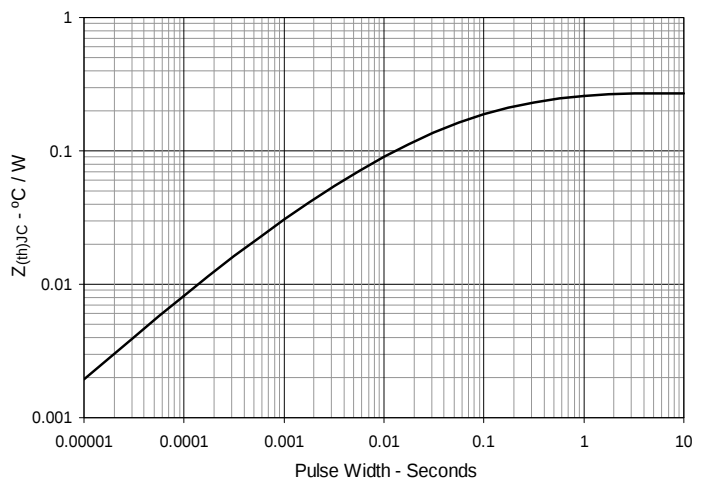
**Fig. 10. Gate Charge**



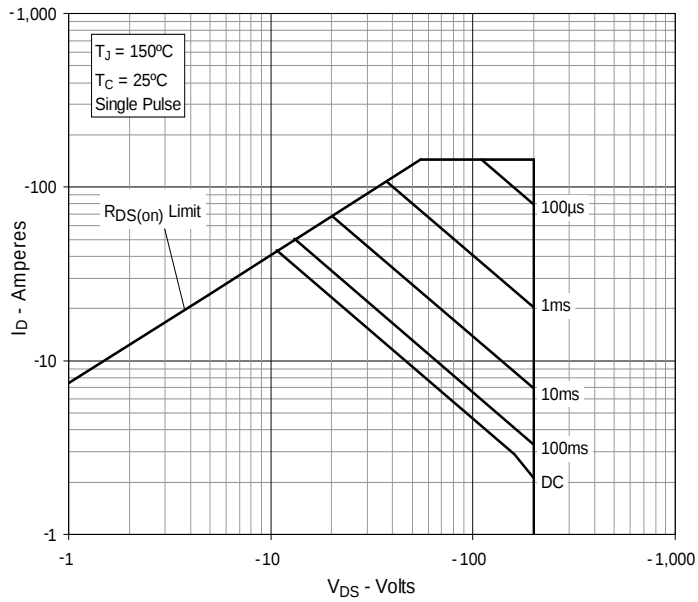
**Fig. 11. Capacitance**



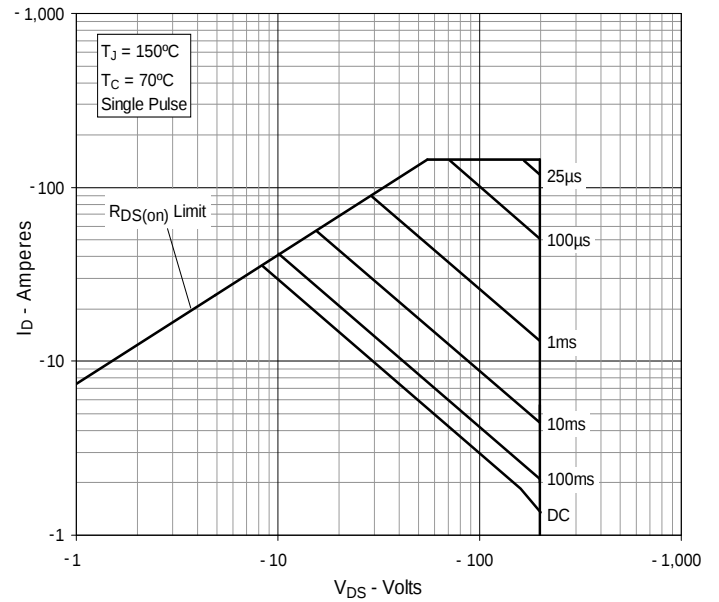
**Fig. 12. Maximum Transient Thermal Impedance**



**Fig. 13. Forward-Bias Safe Operating Area**  
**@  $T_C = 25^\circ\text{C}$**



**Fig. 14. Forward-Bias Safe Operating Area**  
**@  $T_C = 70^\circ\text{C}$**



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