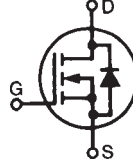


# Polar™ Power MOSFET

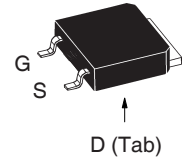
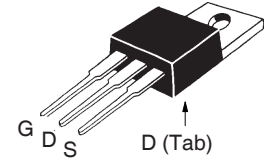
## IXTY03N90PHV IXTP03N90P

$$\begin{aligned} V_{DSS} &= 900V \\ I_{D25} &= 300mA \\ R_{DS(on)} &\leq 80\Omega \end{aligned}$$

N-Channel Enhancement Mode



| Symbol     | Test Conditions                                                          | Maximum Ratings |                  |
|------------|--------------------------------------------------------------------------|-----------------|------------------|
| $V_{DSS}$  | $T_J = 25^\circ\text{C to } 150^\circ\text{C}$                           | 900             | V                |
| $V_{DGR}$  | $T_J = 25^\circ\text{C to } 150^\circ\text{C}, R_{GS} = 1M\Omega$        | 900             | V                |
| $V_{GSS}$  | Continuous                                                               | $\pm 20$        | V                |
| $V_{GSM}$  | Transient                                                                | $\pm 30$        | V                |
| $I_{D25}$  | $T_C = 25^\circ\text{C}$                                                 | 300             | mA               |
| $I_{DM}$   | $T_C = 25^\circ\text{C}$ , Pulse Width Limited by $T_{JM}$               | 600             | mA               |
| $dv/dt$    | $I_S \leq I_{DM}$ , $V_{DD} \leq V_{DSS}$ , $T_J \leq 150^\circ\text{C}$ | 10              | V/ns             |
| $P_D$      | $T_C = 25^\circ\text{C}$                                                 | 28              | W                |
| $T_J$      |                                                                          | -55 ... +150    | $^\circ\text{C}$ |
| $T_{JM}$   |                                                                          | 150             | $^\circ\text{C}$ |
| $T_{stg}$  |                                                                          | -55 ... +150    | $^\circ\text{C}$ |
| $T_L$      | Maximum Lead Temperature for Soldering                                   | 300             | $^\circ\text{C}$ |
| $T_{SOLD}$ | 1.6 mm (0.062in.) from Case for 10s                                      | 260             | $^\circ\text{C}$ |
| $M_d$      | Mounting Torque (TO-220)                                                 | 1.13 / 10       | Nm/lb.in         |
| Weight     | TO-252HV                                                                 | 0.35            | g                |
|            | TO-220                                                                   | 3.00            | g                |

TO-252  
(IXTY..HV)

TO-220  
(IXTP)


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

### Features

- International Standard Package
- High Voltage Package
- Low  $Q_g$
- Suitable for  $V_{GE} = 5V$  Drive

### Advantages

- High Power Density
- Easy to Mount
- Space Savings

### Applications

- DC-DC Converters
- Switch-Mode and Resonant-Mode Power Supplies
- AC and DC Motor Drives
- Discharge Circuits in Lasers, Spark Igniters, RF Generators
- High Voltage Pulse Power Applications

| Symbol       | Test Conditions<br>( $T_J = 25^\circ\text{C}$ , Unless Otherwise Specified) | Characteristic Values |      |                    |
|--------------|-----------------------------------------------------------------------------|-----------------------|------|--------------------|
|              |                                                                             | Min.                  | Typ. | Max.               |
| $BV_{DSS}$   | $V_{GS} = 0V, I_D = 250\mu A$                                               | 900                   |      | V                  |
| $V_{GS(th)}$ | $V_{DS} = V_{GS}, I_D = 100\mu A$                                           | 1.5                   |      | 3.0 V              |
| $I_{GSS}$    | $V_{GS} = \pm 20V, V_{DS} = 0V$                                             |                       |      | $\pm 25$ nA        |
| $I_{DSS}$    | $V_{DS} = V_{DSS}, V_{GS} = 0V$<br>$T_J = 125^\circ\text{C}$                |                       |      | 25 nA<br>2 $\mu A$ |
| $R_{DS(on)}$ | $V_{GS} = 5V, I_D = 0.5 \cdot I_{D25}$ , Note 1                             | 70                    |      | 85 $\Omega$        |
|              | $V_{GS} = 10V, I_D = 0.5 \cdot I_{D25}$ , Note 1                            | 66                    |      | 80 $\Omega$        |

| Symbol       | Test Conditions<br>( $T_J = 25^\circ\text{C}$ , Unless Otherwise Specified)                                                                  | Characteristic Values |      |                        |
|--------------|----------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|------|------------------------|
|              |                                                                                                                                              | Min.                  | Typ. | Max                    |
| $g_{fs}$     | $V_{DS} = 50\text{V}$ , $I_D = 0.5 \cdot I_{D25}$ , Note 1                                                                                   | 85                    | 140  | mS                     |
| $C_{iss}$    | $V_{GS} = 0\text{V}$ , $V_{DS} = 25\text{V}$ , $f = 1\text{MHz}$                                                                             |                       | 80.0 | pF                     |
| $C_{oss}$    |                                                                                                                                              |                       | 6.3  | pF                     |
| $C_{rss}$    |                                                                                                                                              |                       | 1.7  | pF                     |
| $t_{d(on)}$  | <b>Resistive Switching Times</b><br>$V_{GS} = 10\text{V}$ , $V_{DS} = 50\text{V}$ , $I_D = 0.5 \cdot I_{D25}$<br>$R_G = 50\Omega$ (External) |                       | 7    | ns                     |
| $t_r$        |                                                                                                                                              |                       | 20   | ns                     |
| $t_{d(off)}$ |                                                                                                                                              |                       | 26   | ns                     |
| $t_f$        |                                                                                                                                              |                       | 38   | ns                     |
| $Q_{g(on)}$  | $V_{GS} = 10\text{V}$ , $V_{DS} = 0.5 \cdot V_{DSS}$ , $I_D = 0.5 \cdot I_{D25}$                                                             |                       | 4.0  | nC                     |
| $Q_{gs}$     |                                                                                                                                              |                       | 0.4  | nC                     |
| $Q_{gd}$     |                                                                                                                                              |                       | 2.4  | nC                     |
| $R_{thJC}$   | TO-220                                                                                                                                       |                       |      | 4.4 $^\circ\text{C/W}$ |
| $R_{thCS}$   |                                                                                                                                              | 0.50                  |      | $^\circ\text{C/W}$     |

#### Source-Drain Diode

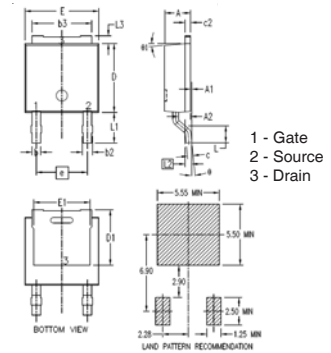
| Symbol   | Test Conditions<br>( $T_J = 25^\circ\text{C}$ , Unless Otherwise Specified)   | Characteristic Values |      |               |
|----------|-------------------------------------------------------------------------------|-----------------------|------|---------------|
|          |                                                                               | Min.                  | Typ. | Max           |
| $I_S$    | $V_{GS} = 0\text{V}$                                                          |                       |      | 0.3 A         |
| $I_{SM}$ | Repetitive, pulse Width Limited by $T_{JM}$                                   |                       |      | 1.2 A         |
| $V_{SD}$ | $I_F = I_S$ , $V_{GS} = 0\text{V}$ , Note 1                                   |                       |      | 1.4 V         |
| $t_{rr}$ | $I_F = 1\text{A}$ , $-di/dt = 100\text{A}/\mu\text{s}$<br>$V_R = 100\text{V}$ |                       | 280  | ns            |
| $Q_{RM}$ |                                                                               |                       | 0.9  | $\mu\text{C}$ |
| $I_{RM}$ |                                                                               |                       | 6.5  | A             |

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

#### ADVANCE TECHNICAL INFORMATION

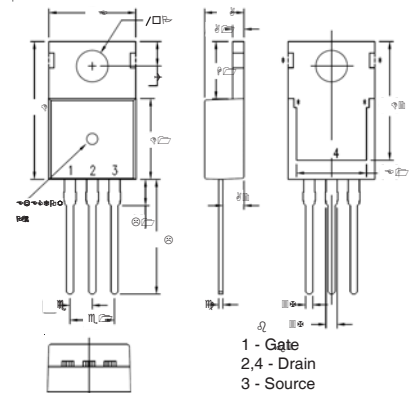
The product presented herein is under development. The Technical Specifications offered are derived from a subjective evaluation of the design, based upon prior knowledge and experience, and constitute a "considered reflection" of the anticipated result. IXYS reserves the right to change limits, test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

#### TO-252HV Outline



| SYM | INCHES   |      | MILLIMETERS |       |
|-----|----------|------|-------------|-------|
|     | MIN      | MAX  | MIN         | MAX   |
| A   | .086     | .094 | 2.18        | 2.39  |
| A1  | 0        | .005 | 0           | 0.13  |
| A2  | .038     | .046 | 0.97        | 1.17  |
| b   | .025     | .035 | 0.64        | 0.89  |
| b2  | .030     | .045 | 0.76        | 1.14  |
| b3  | .200     | .220 | 5.08        | 5.59  |
| c   | .018     | .024 | 0.46        | 0.61  |
| c2  | .018     | .023 | 0.46        | 0.58  |
| D   | .235     | .245 | 5.97        | 6.22  |
| D1  | .180     | .205 | 4.57        | 5.21  |
| E   | .250     | .265 | 6.35        | 6.73  |
| E1  | .170     | .205 | 4.32        | 5.21  |
| e   | .180 BSC |      | 4.57 BSC    |       |
| H   | .370     | .410 | 9.40        | 10.41 |
| L   | .055     | .070 | 1.40        | 1.78  |
| L1  | .100     | .115 | 2.54        | 2.92  |
| L2  | .020 BSC |      | 0.50 BSC    |       |
| L3  | .025     | .040 | 0.64        | 1.02  |
| Ø   | 0*       | 10*  | 0*          | 10*   |
| Ø1  | 0*       | 10*  | 0*          | 10*   |

#### TO-220 Outline

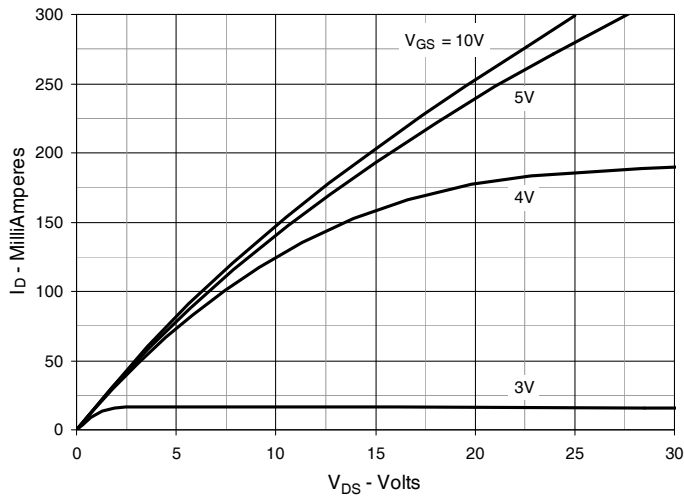


| SYM  | INCHES   |      | MILLIMETERS |       |
|------|----------|------|-------------|-------|
|      | MIN      | MAX  | MIN         | MAX   |
| A    | .169     | .185 | 4.30        | 4.70  |
| A1   | .047     | .055 | 1.20        | 1.40  |
| A2   | .079     | .106 | 2.00        | 2.70  |
| b    | .024     | .039 | 0.60        | 1.00  |
| b2   | .045     | .057 | 1.15        | 1.45  |
| c    | .014     | .026 | 0.35        | 0.65  |
| D    | .587     | .626 | 14.90       | 15.90 |
| D1   | .335     | .370 | 8.50        | 9.40  |
| (D2) | .500     | .531 | 12.70       | 13.50 |
| E    | .382     | .406 | 9.70        | 10.30 |
| (E1) | .283     | .323 | 7.20        | 8.20  |
| e    | .100 BSC |      | 2.54 BSC    |       |
| e1   | .200 BSC |      | 5.08 BSC    |       |
| H1   | .244     | .268 | 6.20        | 6.80  |
| L    | .492     | .547 | 12.50       | 13.90 |
| L1   | .110     | .154 | 2.80        | 3.90  |
| ØP   | .134     | .150 | 3.40        | 3.80  |
| Q    | .106     | .126 | 2.70        | 3.20  |

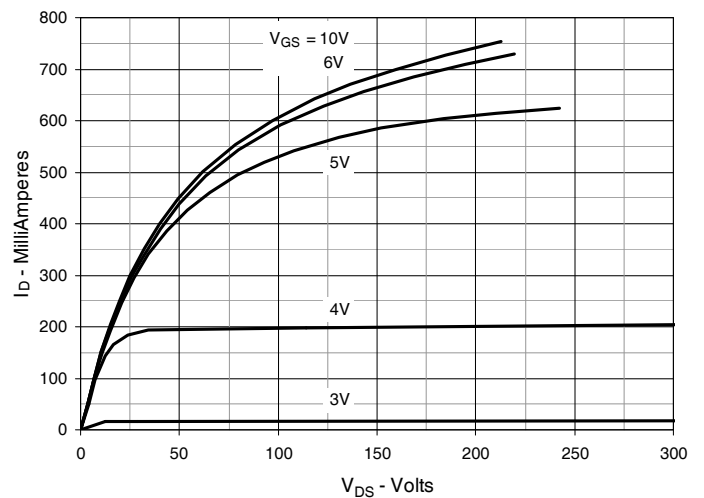
IXYS Reserves the Right to Change Limits, Test Conditions, and Dimensions.

|                                                                                  |           |           |           |           |             |             |             |             |             |             |
|----------------------------------------------------------------------------------|-----------|-----------|-----------|-----------|-------------|-------------|-------------|-------------|-------------|-------------|
| 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 |
|                                                                                  | 4,860,072 | 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   |             |

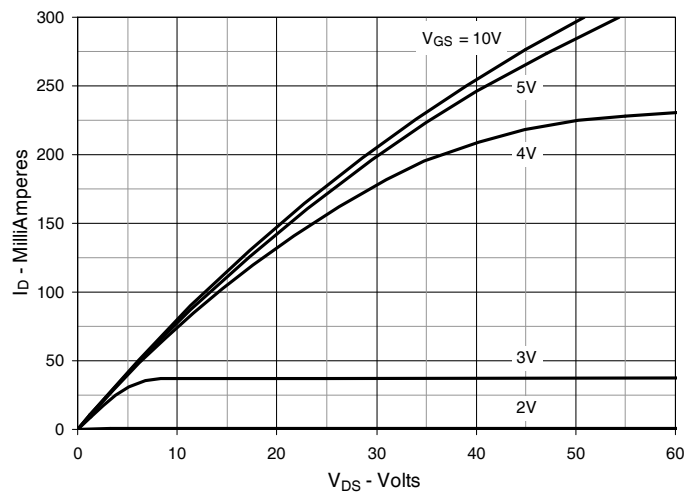
**Fig. 1. Output Characteristics @  $T_J = 25^\circ\text{C}$**



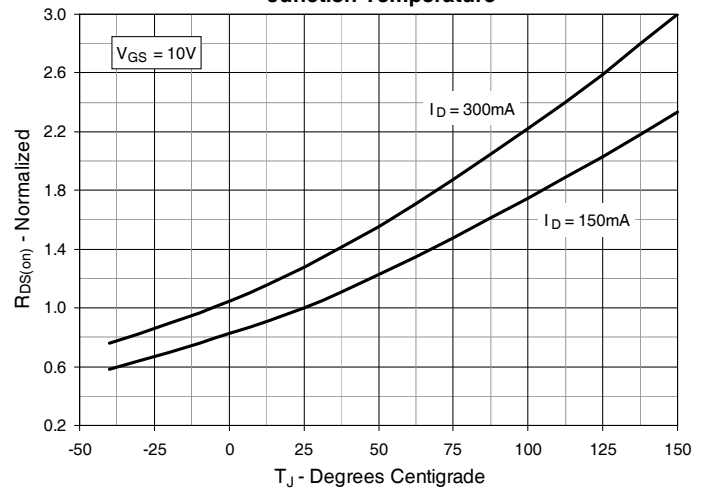
**Fig. 2. Extended Output Characteristics @  $T_J = 25^\circ\text{C}$**



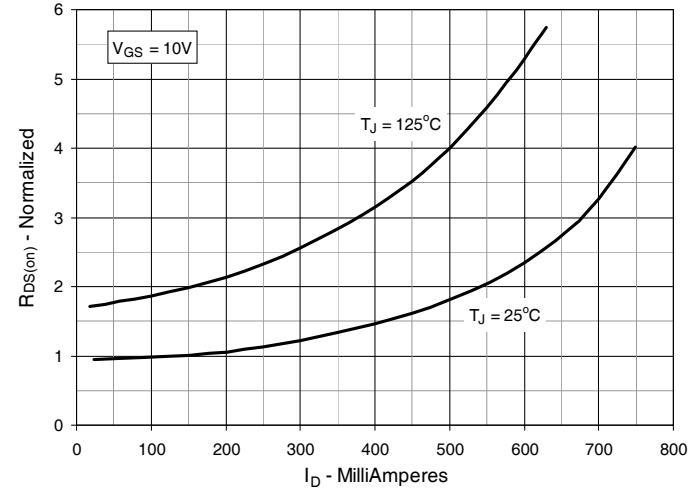
**Fig. 3. Output Characteristics @  $T_J = 125^\circ\text{C}$**



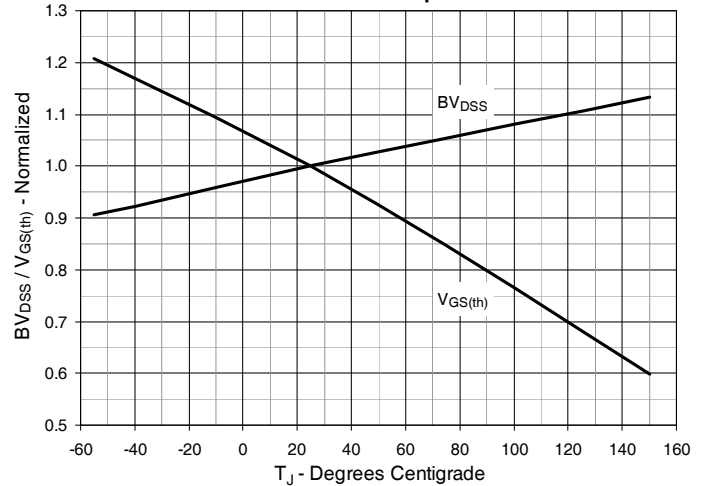
**Fig. 4.  $R_{DS(on)}$  Normalized to  $I_D = 150\text{mA}$  Value vs. Junction Temperature**



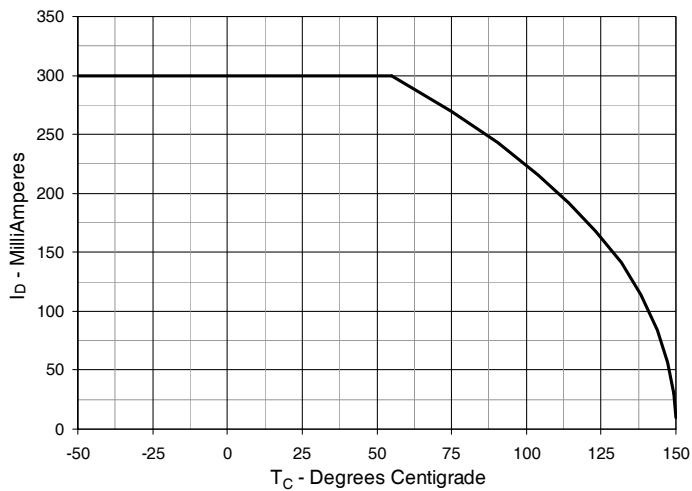
**Fig. 5.  $R_{DS(on)}$  Normalized to  $I_D = 150\text{mA}$  Value vs. Drain Current**



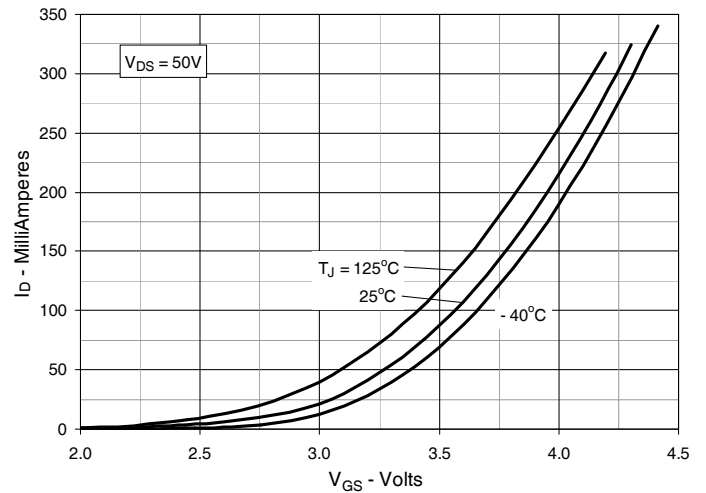
**Fig. 6. Normalized Breakdown & Threshold Voltages vs. Junction Temperature**



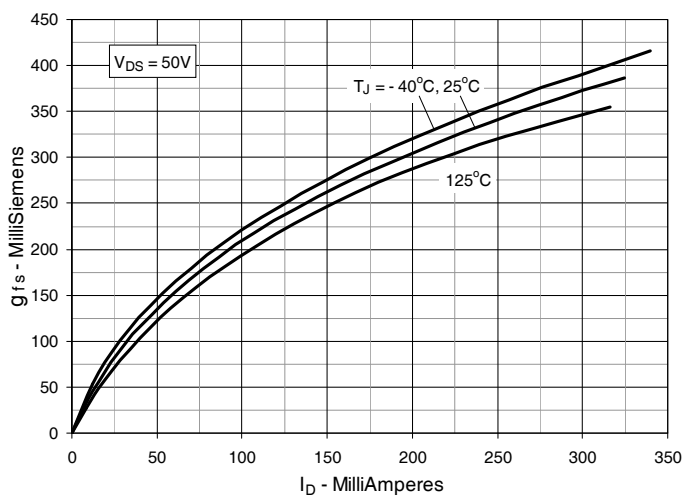
**Fig. 7. Maximum Drain Current vs. Case Temperature**



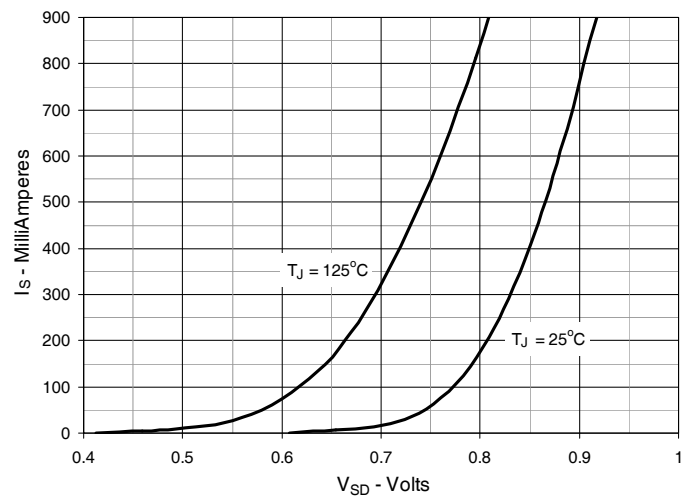
**Fig. 8. Input Admittance**



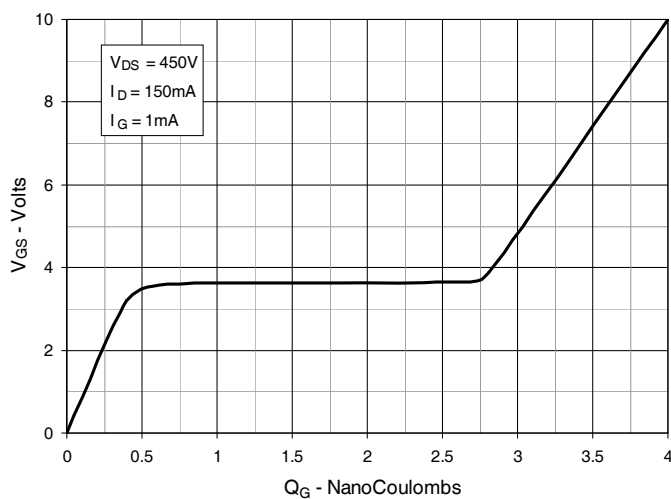
**Fig. 9. Transconductance**



**Fig. 10. Forward Voltage Drop of Intrinsic Diode**



**Fig. 11. Gate Charge**



**Fig. 12. Capacitance**

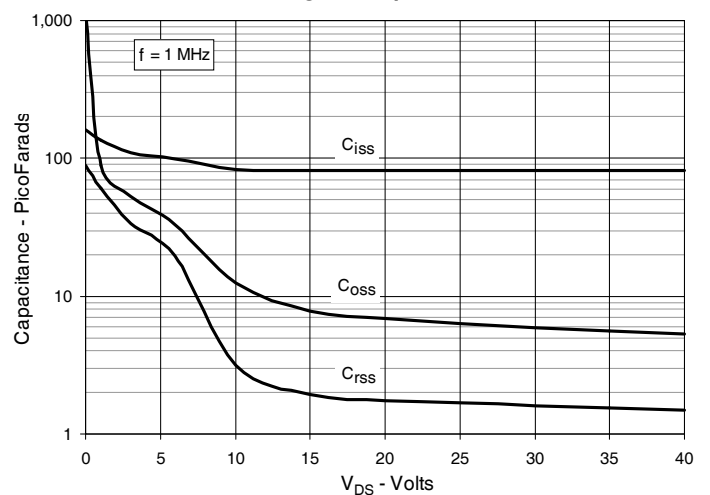


Fig. 13. Forward-Bias Safe Operating Area

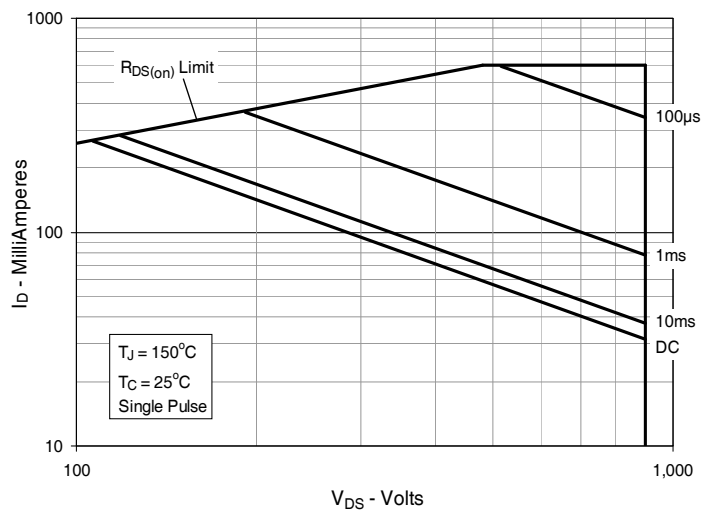
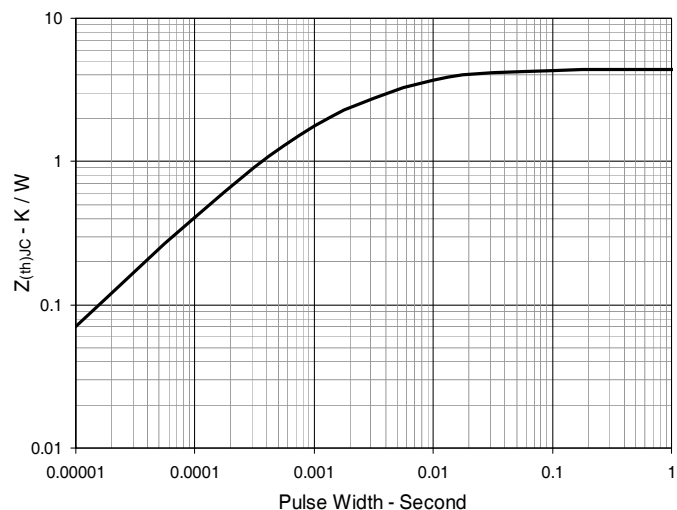


Fig. 14. Maximum Transient Thermal Impedance





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