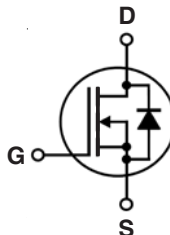


## Depletion Mode MOSFET

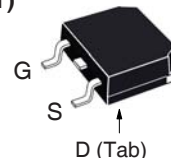
**IXTT16N20D2**  
**IXTH16N20D2**

$$\begin{aligned} V_{DSX} &= 200V \\ I_{D(on)} &\geq 16A \\ R_{DS(on)} &\leq 80m\Omega \end{aligned}$$

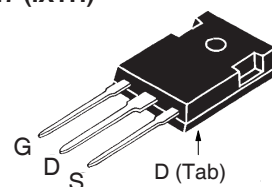
N-Channel



TO-268 (IXTT)



TO-247 (IXTH)



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

| Symbol     | Test Conditions                                                   | Maximum Ratings |                  |
|------------|-------------------------------------------------------------------|-----------------|------------------|
| $V_{DSX}$  | $T_J = 25^\circ\text{C to } 150^\circ\text{C}$                    | 200             | V                |
| $V_{DGX}$  | $T_J = 25^\circ\text{C to } 150^\circ\text{C}, R_{GS} = 1M\Omega$ | 200             | V                |
| $V_{GSX}$  | Continuous                                                        | $\pm 20$        | V                |
| $V_{GSM}$  | Transient                                                         | $\pm 30$        | V                |
| $P_D$      | $T_C = 25^\circ\text{C}$                                          | 695             | 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-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.                     |
| $BV_{DSX}$     | $V_{GS} = -5V, I_D = 250\mu A$                                              | 200                   |      | V                        |
| $V_{GS(off)}$  | $V_{DS} = 25V, I_D = 4mA$                                                   | - 2.0                 |      | - 4.5 V                  |
| $I_{GSX}$      | $V_{GS} = \pm 20V, V_{DS} = 0V$                                             |                       |      | $\pm 100$ nA             |
| $I_{DSX(off)}$ | $V_{DS} = V_{DSX}, V_{GS} = -5V$<br>$T_J = 125^\circ\text{C}$               |                       |      | 5 $\mu A$<br>100 $\mu A$ |
| $R_{DS(on)}$   | $V_{GS} = 0V, I_D = 8A, \text{ Note 1}$                                     |                       |      | 80 m $\Omega$            |
| $I_{D(on)}$    | $V_{GS} = 0V, V_{DS} = 25V, \text{ Note 1}$                                 | 16                    |      | A                        |

### Features

- Normally ON Mode
- International Standard Packages
- Molding Epoxies Meet UL 94 V-0 Flammability Classification

### Advantages

- Easy to Mount
- Space Savings
- High Power Density

### Applications

- Audio Amplifiers
- Start-up Circuits
- Protection Circuits
- Ramp Generators
- Current Regulators
- Active Loads

| Symbol       | Test Conditions<br>( $T_J = 25^\circ\text{C}$ , Unless Otherwise Specified)                                                               | Characteristic Values |      |                                              |
|--------------|-------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|------|----------------------------------------------|
|              |                                                                                                                                           | Min.                  | Typ. | Max.                                         |
| $g_{fs}$     | $V_{DS} = 20\text{V}$ , $I_D = 8\text{A}$ , Note 1                                                                                        | 7                     | 12   | S                                            |
| $C_{iss}$    | $V_{GS} = -10\text{V}$ , $V_{DS} = 25\text{V}$ , $f = 1\text{MHz}$                                                                        |                       | 5500 | pF                                           |
| $C_{oss}$    |                                                                                                                                           |                       | 1360 | pF                                           |
| $C_{rss}$    |                                                                                                                                           |                       | 607  | pF                                           |
| $t_{d(on)}$  | <b>Resistive Switching Times</b><br>$V_{GS} = \pm 5\text{V}$ , $V_{DS} = 100\text{V}$ , $I_D = 8\text{A}$<br>$R_G = 3.3\Omega$ (External) |                       | 46   | ns                                           |
| $t_r$        |                                                                                                                                           |                       | 130  | ns                                           |
| $t_{d(off)}$ |                                                                                                                                           |                       | 270  | ns                                           |
| $t_f$        |                                                                                                                                           |                       | 135  | ns                                           |
| $Q_{g(on)}$  | $V_{GS} = \pm 5\text{V}$ , $V_{DS} = 100\text{V}$ , $I_D = 8\text{A}$                                                                     |                       | 208  | nC                                           |
| $Q_{gs}$     |                                                                                                                                           |                       | 28   | nC                                           |
| $Q_{gd}$     |                                                                                                                                           |                       | 110  | nC                                           |
| $R_{thJC}$   | TO-247                                                                                                                                    |                       | 0.21 | $0.18^\circ\text{C/W}$<br>$^\circ\text{C/W}$ |
| $R_{thCS}$   |                                                                                                                                           |                       |      |                                              |

## Safe-Operating-Area Specification

| Symbol | Test Conditions                                                                             | Characteristic Values |      |      |
|--------|---------------------------------------------------------------------------------------------|-----------------------|------|------|
|        |                                                                                             | Min.                  | Typ. | Max. |
| SOA    | $V_{DS} = 200\text{V}$ , $I_D = 2.1\text{A}$ , $T_C = 75^\circ\text{C}$ , $t_p = 5\text{s}$ | 420                   |      | W    |

## Source-Drain Diode

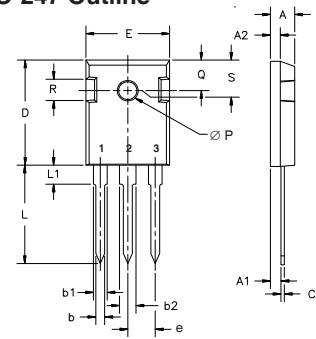
| Symbol   | Test Conditions<br>( $T_J = 25^\circ\text{C}$ , Unless Otherwise Specified)                            | Characteristic Values |      |               |
|----------|--------------------------------------------------------------------------------------------------------|-----------------------|------|---------------|
|          |                                                                                                        | Min.                  | Typ. | Max.          |
| $V_{SD}$ | $I_F = 16\text{A}$ , $V_{GS} = -10\text{V}$ , Note 1                                                   |                       | 0.8  | 1.3 V         |
| $t_{rr}$ | $I_F = 8\text{A}$ , $-di/dt = 100\text{A}/\mu\text{s}$<br>$V_R = 100\text{V}$ , $V_{GS} = -10\text{V}$ |                       | 265  | ns            |
| $I_{RM}$ |                                                                                                        |                       | 14.3 | A             |
| $Q_{RM}$ |                                                                                                        |                       | 1.9  | $\mu\text{C}$ |

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

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    |             |

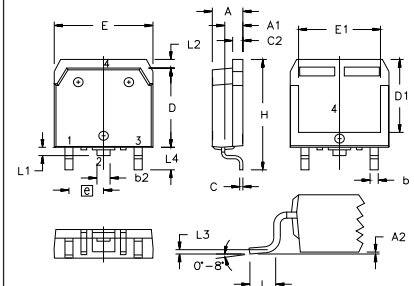
## TO-247 Outline



Terminals: 1 - Gate  
2 - Drain  
3 - Source

| 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  |
| L <sub>1</sub> |            | 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   |

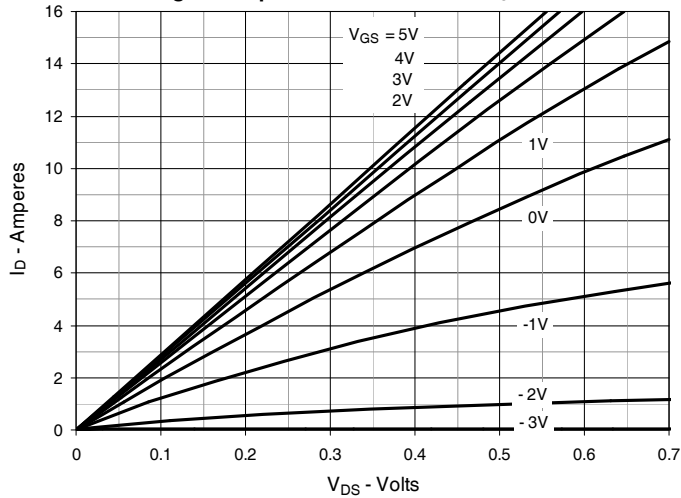
## TO-268 Outline



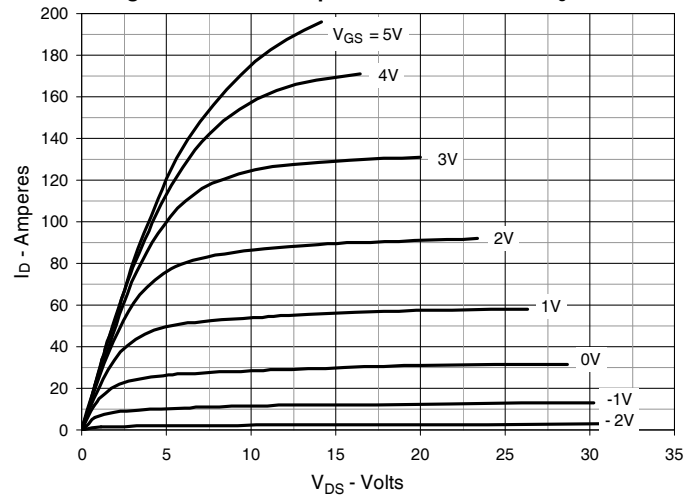
Terminals: 1 - Gate  
2 - Drain  
3 - Source  
4 - Drain

| SYM            | INCHES |      | MILLIMETERS |       |
|----------------|--------|------|-------------|-------|
|                | MIN    | MAX  | MIN         | MAX   |
| A              | .193   | .201 | 4.90        | 5.10  |
| A <sub>1</sub> | .106   | .114 | 2.70        | 2.90  |
| A <sub>2</sub> | .001   | .010 | 0.02        | 0.25  |
| b              | .045   | .057 | 1.15        | 1.45  |
| b <sub>2</sub> | .075   | .083 | 1.90        | 2.10  |
| C              | .016   | .026 | 0.40        | 0.65  |
| C <sub>2</sub> | .057   | .063 | 1.45        | 1.60  |
| D              | .543   | .551 | 13.80       | 14.00 |
| D <sub>1</sub> | .488   | .500 | 12.40       | 12.70 |
| E              | .624   | .632 | 15.85       | 16.05 |
| E <sub>1</sub> | .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  |
| L <sub>1</sub> | .047   | .055 | 1.20        | 1.40  |
| L <sub>2</sub> | .039   | .045 | 1.00        | 1.15  |
| L <sub>3</sub> | .010   | BSC  | 0.25        | BSC   |
| L <sub>4</sub> | .150   | .161 | 3.80        | 4.10  |

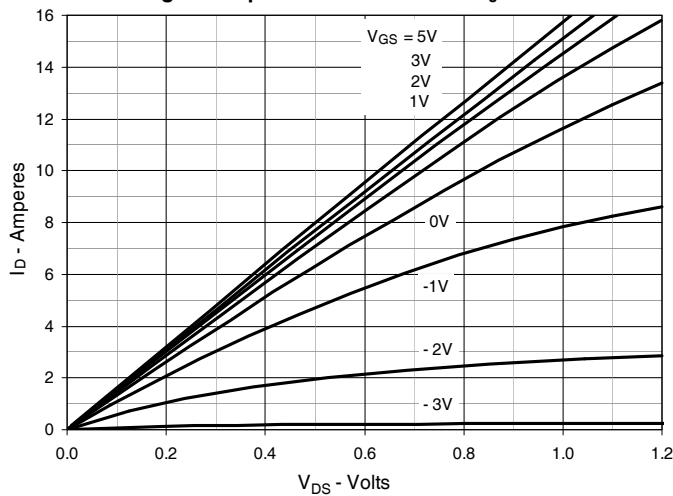
**Fig. 1. Output Characteristics @  $T_J = 25^\circ\text{C}$**



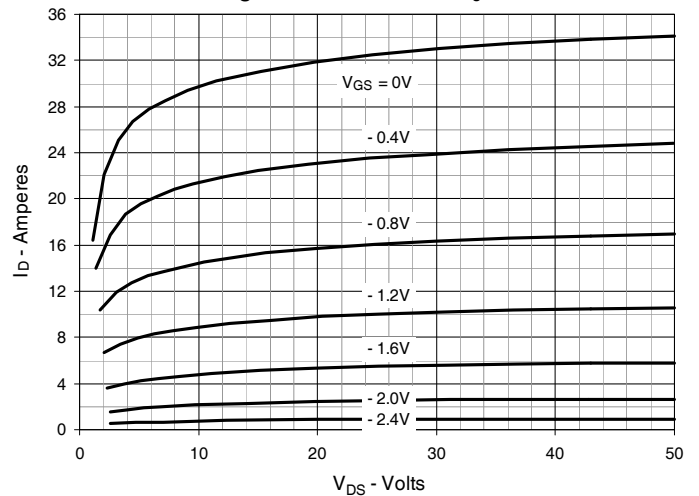
**Fig. 2. Extended Output Characteristics @  $T_J = 25^\circ\text{C}$**



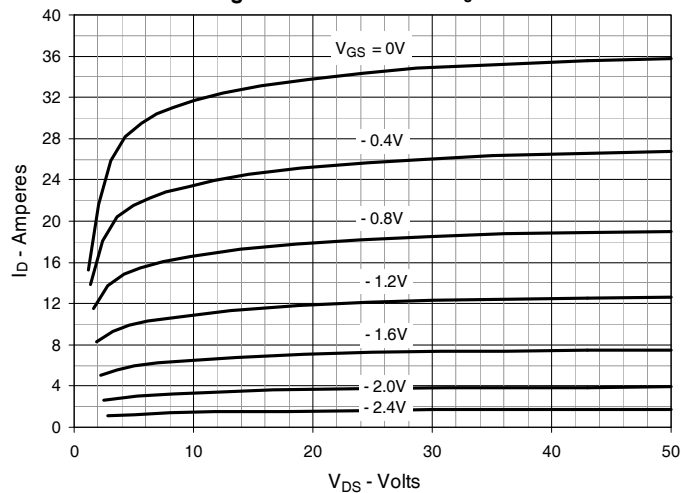
**Fig. 3. Output Characteristics @  $T_J = 125^\circ\text{C}$**



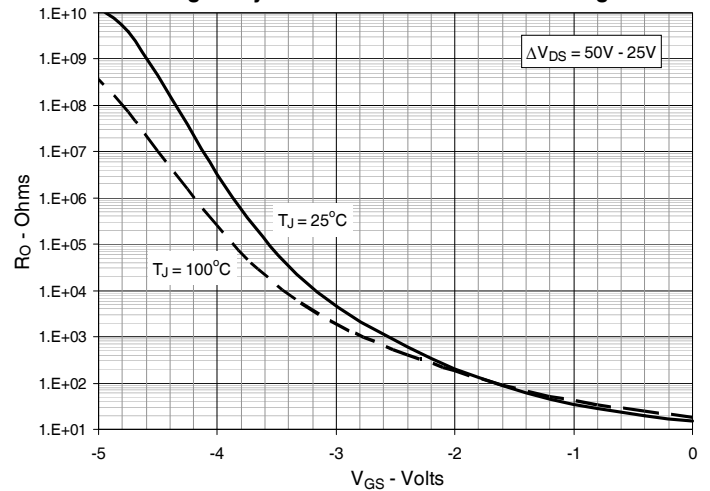
**Fig. 4. Drain Current @  $T_J = 25^\circ\text{C}$**



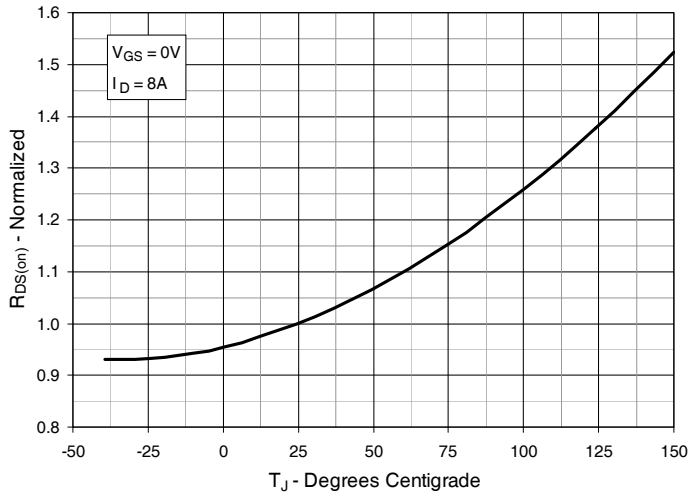
**Fig. 5. Drain Current @  $T_J = 100^\circ\text{C}$**



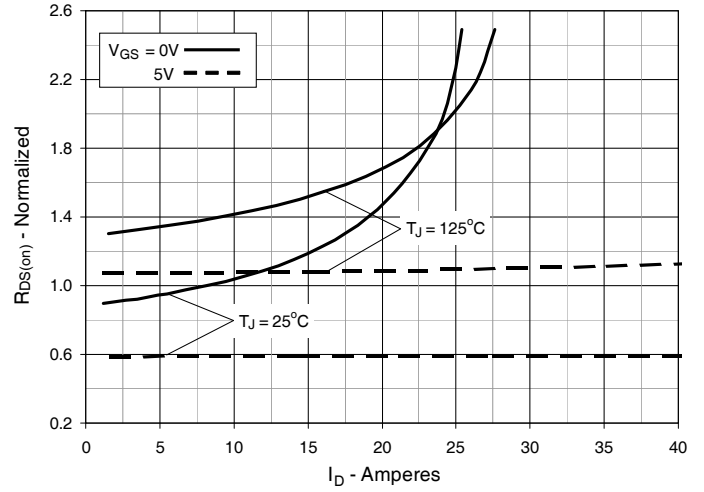
**Fig. 6. Dynamic Resistance vs. Gate Voltage**



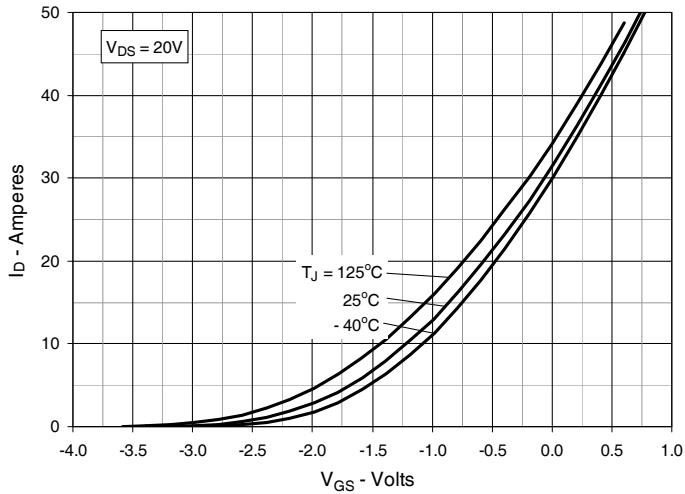
**Fig. 7. Normalized  $R_{DS(on)}$  vs. Junction Temperature**



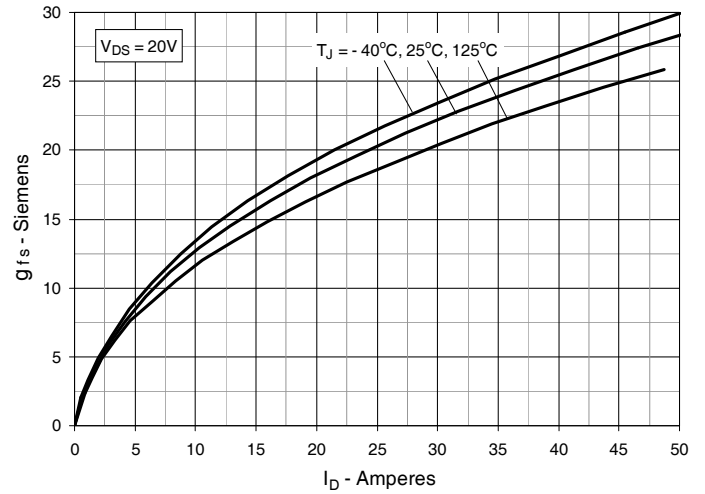
**Fig. 8.  $R_{DS(on)}$  Normalized to  $I_D = 8A$  Value vs. Drain Current**



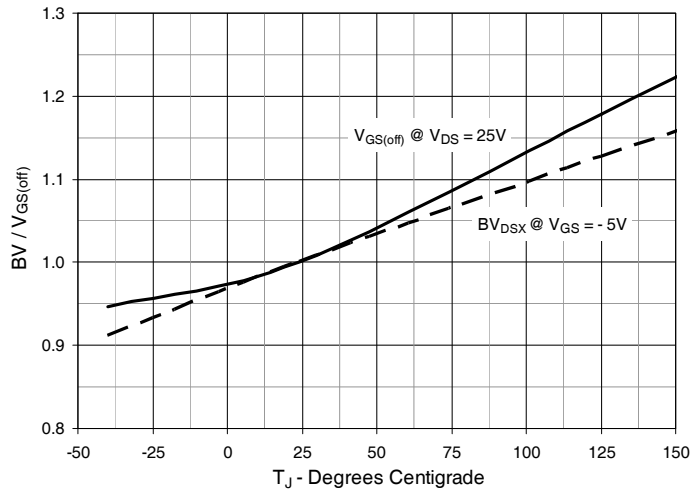
**Fig. 9. Input Admittance**



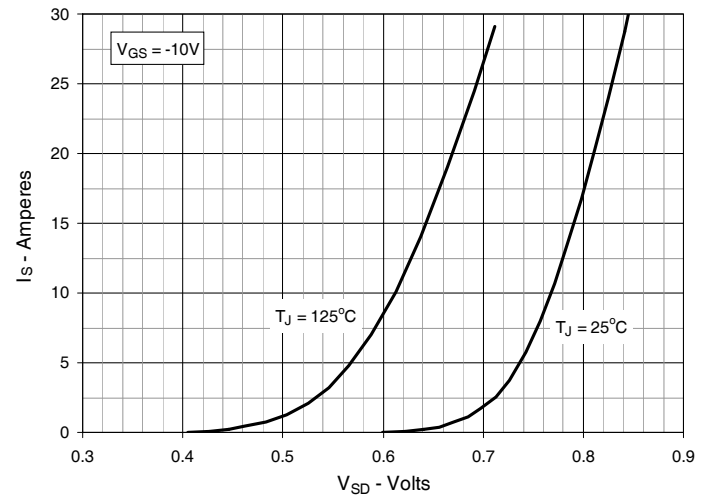
**Fig. 10. Transconductance**



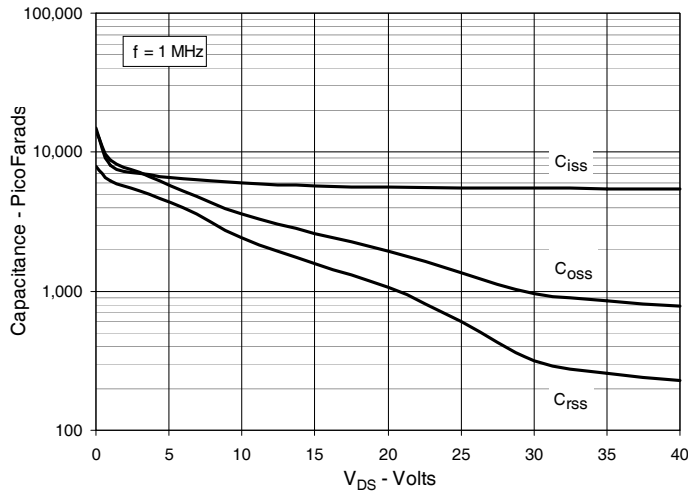
**Fig. 11. Normalized Breakdown and Threshold Voltages vs. Junction Temperature**



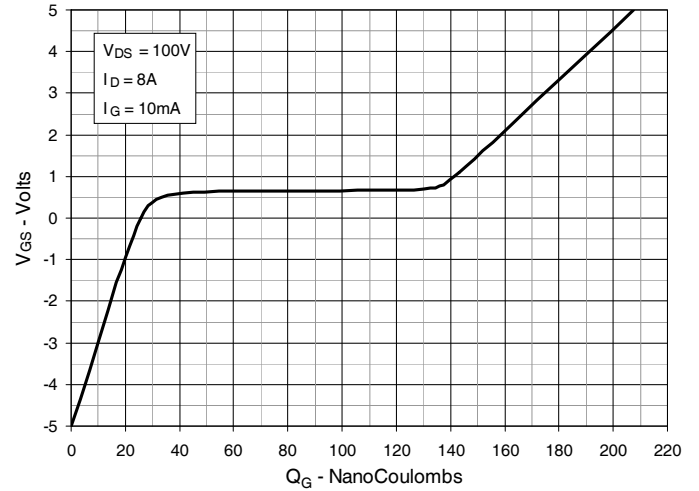
**Fig. 12. Forward Voltage Drop of Intrinsic Diode**



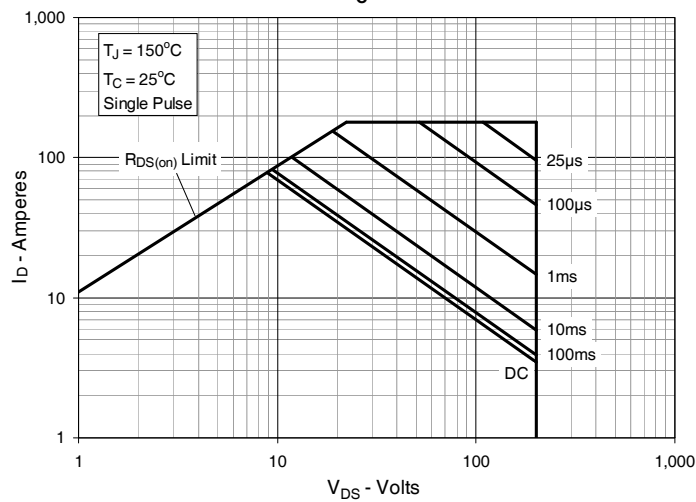
**Fig. 13. Capacitance**



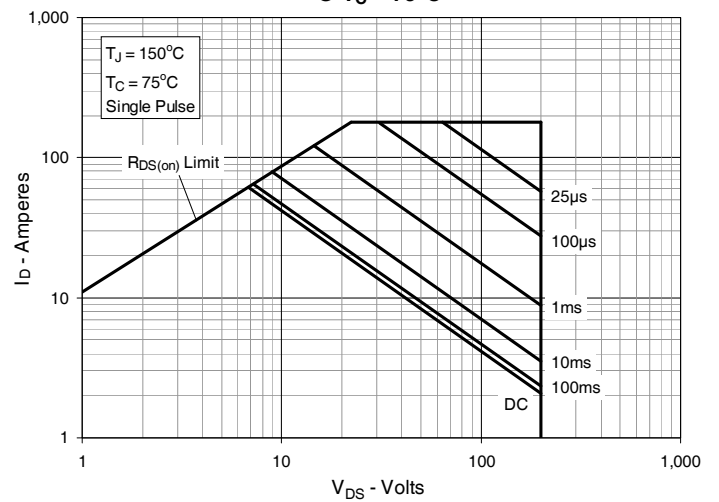
**Fig. 14. Gate Charge**



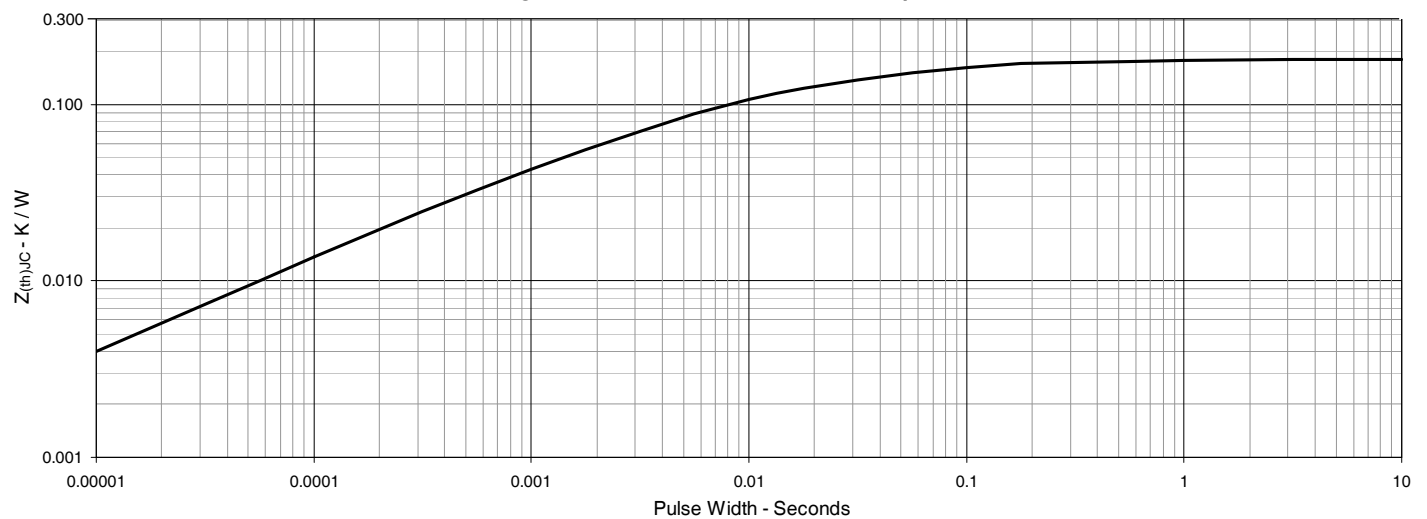
**Fig. 15. Forward-Bias Safe Operating Area**  
**@  $T_C = 25^\circ\text{C}$**



**Fig. 16. Forward-Bias Safe Operating Area**  
**@  $T_C = 75^\circ\text{C}$**



**Fig. 17. Maximum Transient Thermal Impedance**





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