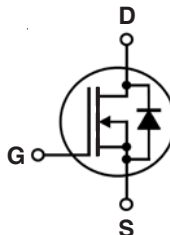


## Depletion Mode MOSFET

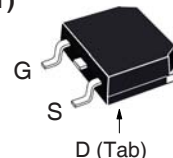
**IXTT16N20D2**  
**IXTH16N20D2**

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

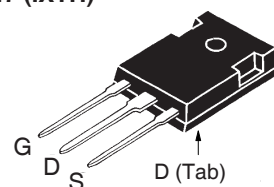
N-Channel



TO-268 (IXTT)



TO-247 (IXTH)



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

| Symbol     | Test Conditions                                             | Maximum Ratings |             |
|------------|-------------------------------------------------------------|-----------------|-------------|
| $V_{DSX}$  | $T_J = 25^{\circ}C$ to $150^{\circ}C$                       | 200             | V           |
| $V_{DGX}$  | $T_J = 25^{\circ}C$ to $150^{\circ}C$ , $R_{GS} = 1M\Omega$ | 200             | V           |
| $V_{GSX}$  | Continuous                                                  | $\pm 20$        | V           |
| $V_{GSM}$  | Transient                                                   | $\pm 30$        | V           |
| $P_D$      | $T_C = 25^{\circ}C$                                         | 695             | W           |
| $T_J$      |                                                             | - 55 ... +150   | $^{\circ}C$ |
| $T_{JM}$   |                                                             | 150             | $^{\circ}C$ |
| $T_{stg}$  |                                                             | - 55 ... +150   | $^{\circ}C$ |
| $T_L$      | Maximum Lead Temperature for Soldering                      | 300             | $^{\circ}C$ |
| $T_{SOLD}$ | 1.6 mm (0.062in.) from Case for 10s                         | 260             | $^{\circ}C$ |
| $M_d$      | Mounting Torque (TO-247)                                    | 1.13 / 10       | Nm/lb.in.   |
| Weight     | TO-268                                                      | 4               | g           |
|            | TO-247                                                      | 6               | g           |

| Symbol         | Test Conditions<br>( $T_J = 25^{\circ}C$ , 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>$T_J = 125^{\circ}C$            |                       |      | 5 $\mu A$<br>100 $\mu A$ |
| $R_{DS(on)}$   | $V_{GS} = 0V$ , $I_D = 8A$ , Note 1                                    |                       |      | 80 m $\Omega$            |
| $I_{D(on)}$    | $V_{GS} = 0V$ , $V_{DS} = 25V$ , 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

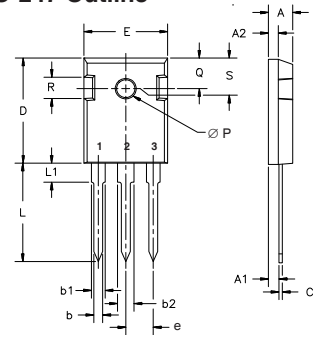
| Symbol | Test Conditions                                                                             | Characteristic Values |      |      |
|--------|---------------------------------------------------------------------------------------------|-----------------------|------|------|
|        |                                                                                             | 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,  $d \leq 2\%$ .

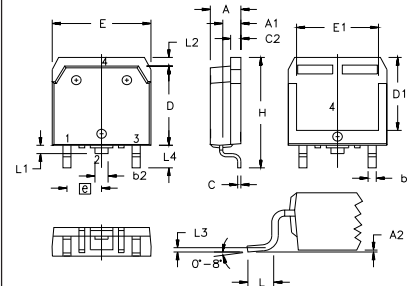
### TO-247 Outline



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



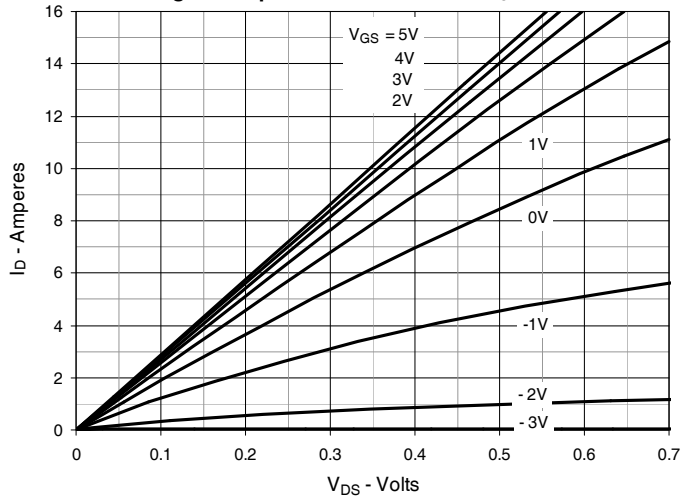
Terminals: 1 - Gate 2 - Drain  
3 - Source 4 - Drain

| 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  |

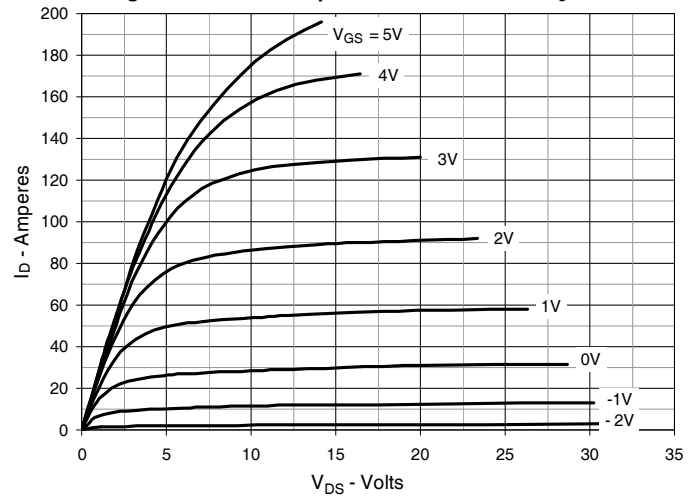
IXYS Reserves the Right to Change Limits, Test Conditions, and Dimensions.

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: 4,860,072 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

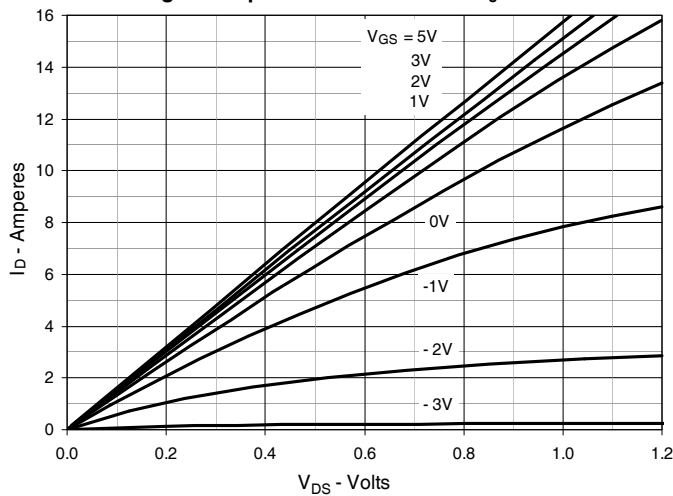
**Fig. 1. Output Characteristics @  $T_J = 25^\circ\text{C}$**



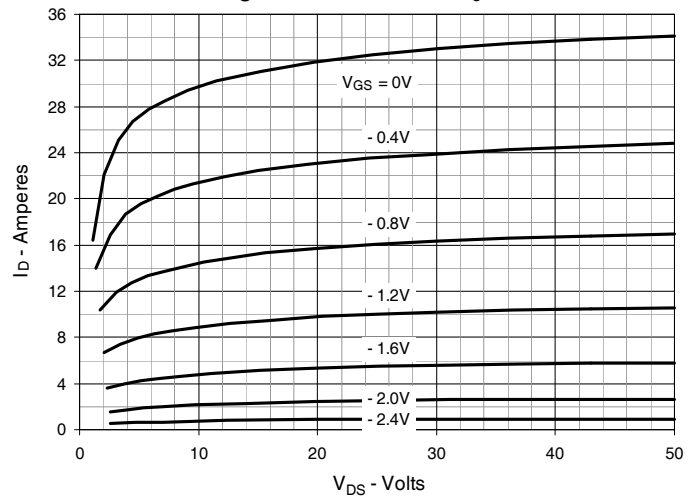
**Fig. 2. Extended Output Characteristics @  $T_J = 25^\circ\text{C}$**



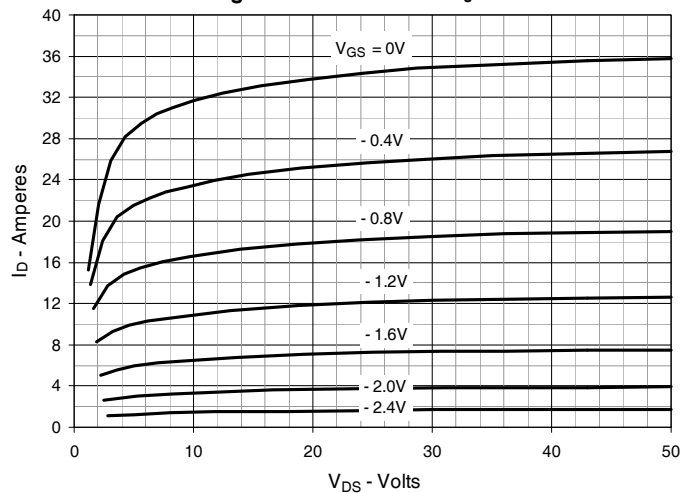
**Fig. 3. Output Characteristics @  $T_J = 125^\circ\text{C}$**



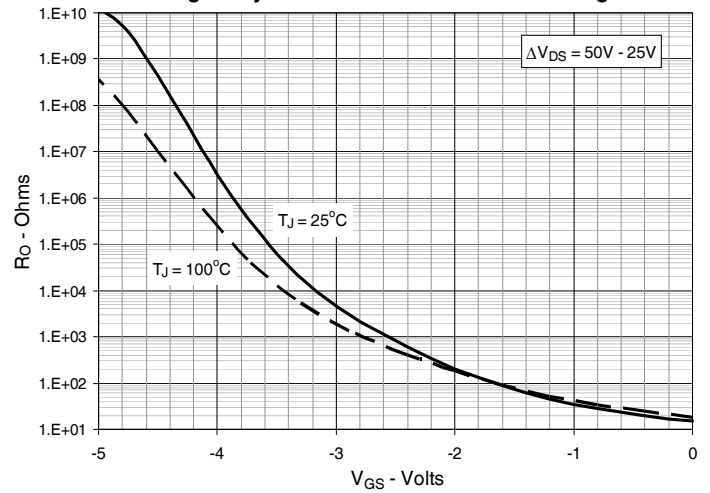
**Fig. 4. Drain Current @  $T_J = 25^\circ\text{C}$**



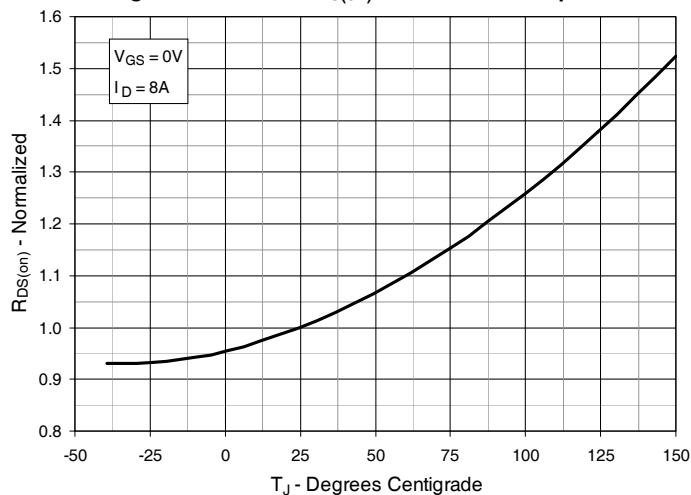
**Fig. 5. Drain Current @  $T_J = 100^\circ\text{C}$**



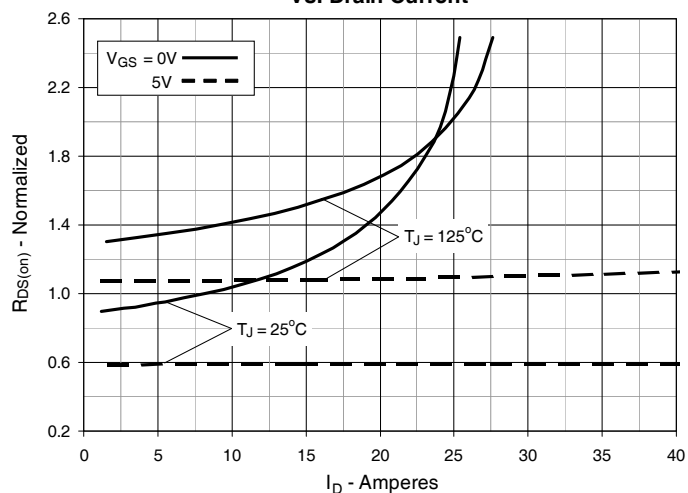
**Fig. 6. Dynamic Resistance vs. Gate Voltage**



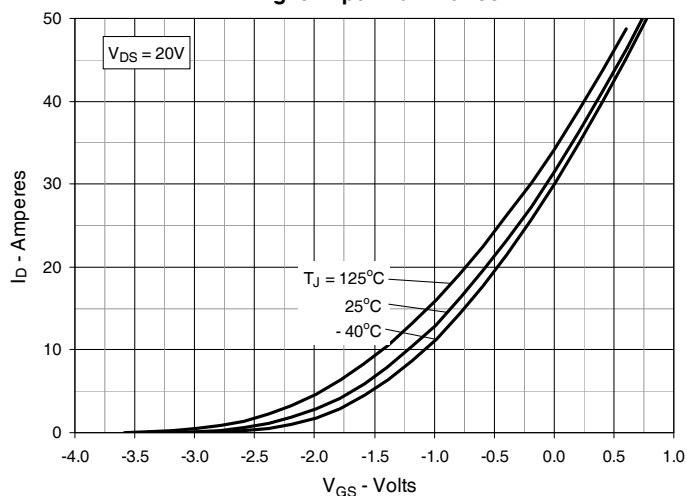
**Fig. 7. Normalized  $R_{DS(on)}$  vs. Junction Temperature**



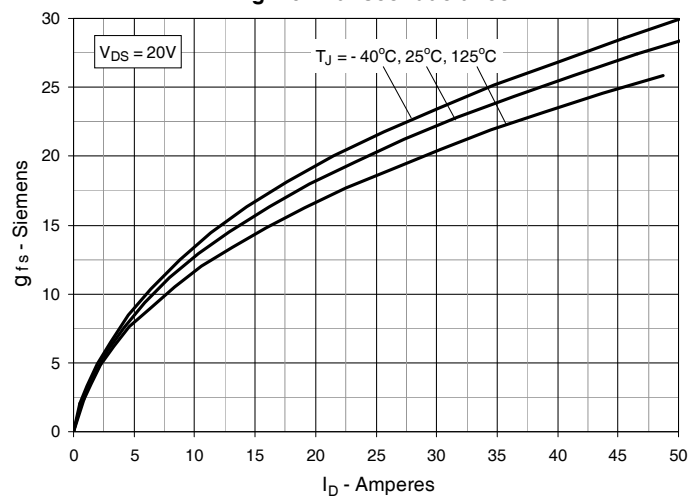
**Fig. 8.  $R_{DS(on)}$  Normalized to  $I_D = 8A$  Value vs. Drain Current**



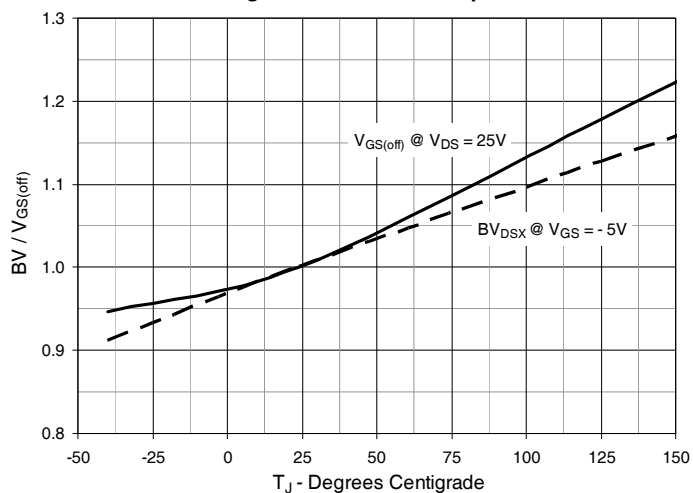
**Fig. 9. Input Admittance**



**Fig. 10. Transconductance**



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



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

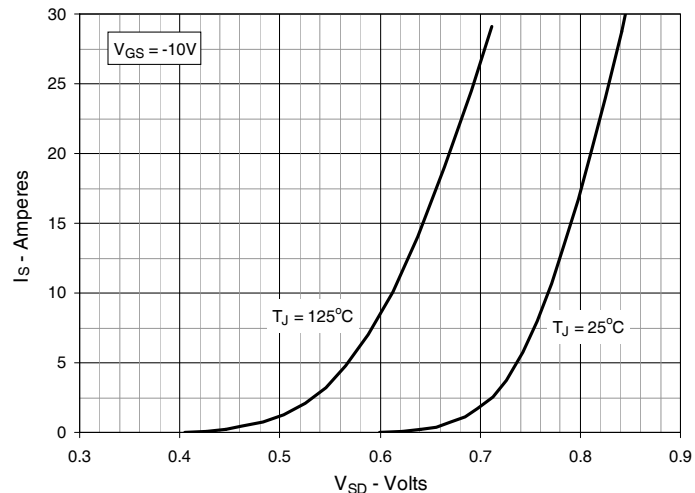


Fig. 13. Capacitance

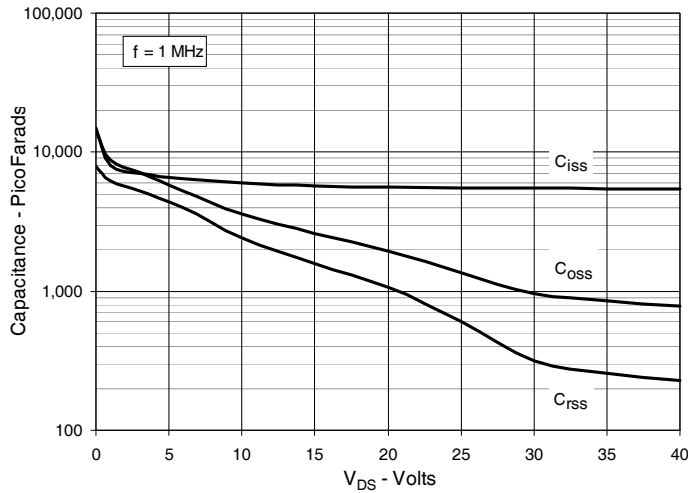


Fig. 14. Gate Charge

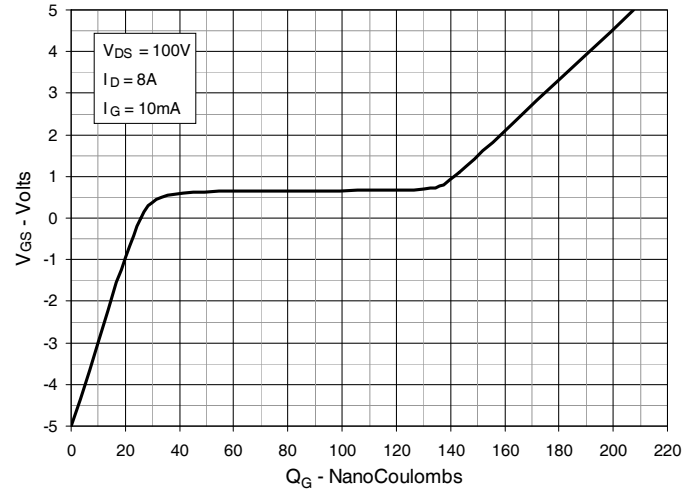


Fig. 15. Forward-Bias Safe Operating Area  
@  $T_C = 25^\circ\text{C}$

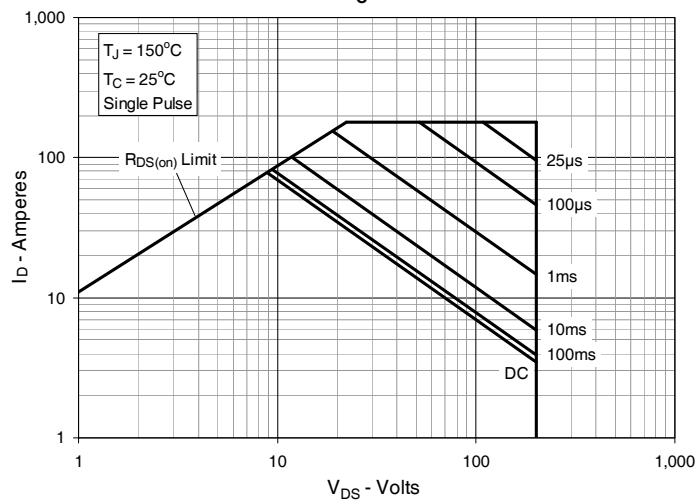


Fig. 16. Forward-Bias Safe Operating Area  
@  $T_C = 75^\circ\text{C}$

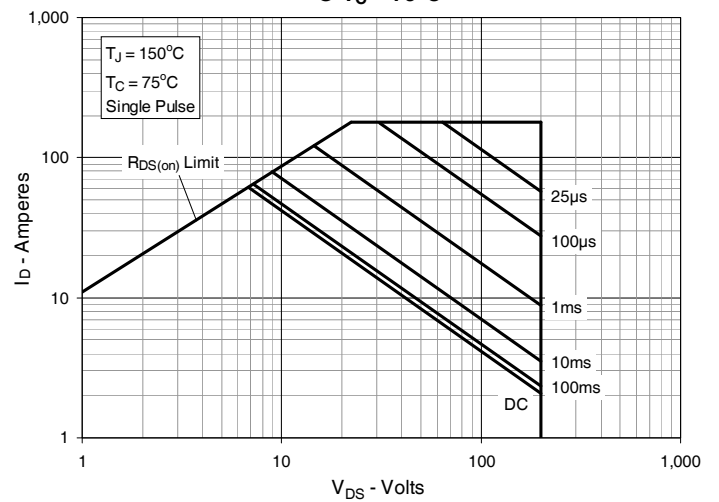
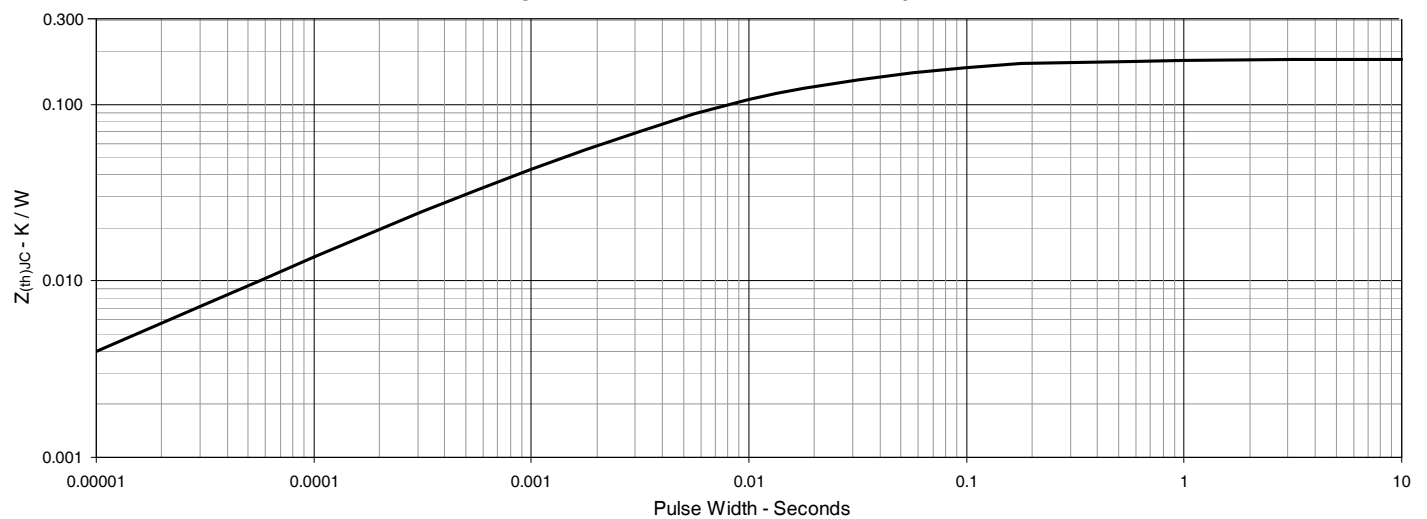


Fig. 17. Maximum Transient Thermal Impedance





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