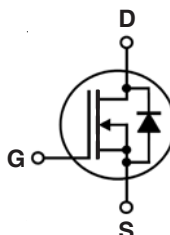


## Depletion Mode MOSFET

**IXTY08N50D2**  
**IXTA08N50D2**  
**IXTP08N50D2**

$V_{DSX} = 500V$   
 $I_{D(on)} \geq 800mA$   
 $R_{DS(on)} \leq 4.6\Omega$

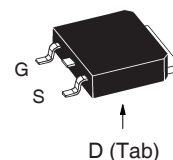
### N-Channel



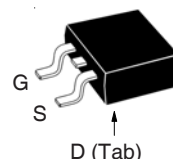
| Symbol     | Test Conditions                        | Maximum Ratings |             |
|------------|----------------------------------------|-----------------|-------------|
| $V_{DSX}$  | $T_J = 25^{\circ}C$ to $150^{\circ}C$  | 500             | V           |
| $V_{GSX}$  | Continuous                             | $\pm 20$        | V           |
| $V_{GSM}$  | Transient                              | $\pm 30$        | V           |
| $P_D$      | $T_C = 25^{\circ}C$                    | 60              | 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             | $^{\circ}C$ |
| $T_{SOLD}$ | Plastic Body for 10s                   | 260             | $^{\circ}C$ |
| $M_d$      | Mounting Torque (TO-220)               | 1.13 / 10       | Nm/lb.in.   |
| Weight     | TO-252                                 | 0.35            | g           |
|            | TO-263                                 | 2.50            | g           |
|            | TO-220                                 | 3.00            | g           |

| Symbol         | Test Conditions<br>( $T_J = 25^{\circ}C$ , Unless Otherwise Specified) | Characteristic Values |      |                         |
|----------------|------------------------------------------------------------------------|-----------------------|------|-------------------------|
|                |                                                                        | Min.                  | Typ. | Max.                    |
| $BV_{DSX}$     | $V_{GS} = -5V, I_D = 25\mu A$                                          | 500                   |      | V                       |
| $V_{GS(off)}$  | $V_{DS} = 25V, I_D = 25\mu A$                                          | - 2.5                 |      | - 4.5 V                 |
| $I_{GSX}$      | $V_{GS} = \pm 20V, V_{DS} = 0V$                                        |                       |      | $\pm 50$ nA             |
| $I_{DSX(off)}$ | $V_{DS} = V_{DSX}, V_{GS} = -5V$<br>$T_J = 125^{\circ}C$               |                       |      | 1 $\mu A$<br>10 $\mu A$ |
| $R_{DS(on)}$   | $V_{GS} = 0V, I_D = 400mA$ , Note 1                                    |                       |      | 4.6 $\Omega$            |
| $I_{D(on)}$    | $V_{GS} = 0V, V_{DS} = 25V$ , Note 1                                   | 800                   |      | mA                      |

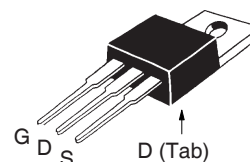
#### TO-252 (IXTY)



#### TO-263 (IXTA)



#### TO-220 (IXTP)



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

#### 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.                    |
| $g_{fs}$     | $V_{DS} = 30\text{V}$ , $I_D = 400\text{mA}$ , Note 1                                                                                       | 340                   | 570  | mS                      |
| $C_{iss}$    | $V_{GS} = -10\text{V}$ , $V_{DS} = 25\text{V}$ , $f = 1\text{MHz}$                                                                          |                       | 312  | pF                      |
| $C_{oss}$    |                                                                                                                                             |                       | 35   | pF                      |
| $C_{rss}$    |                                                                                                                                             |                       | 11   | pF                      |
| $t_{d(on)}$  | <b>Resistive Switching Times</b><br>$V_{GS} = \pm 5\text{V}$ , $V_{DS} = 250\text{V}$ , $I_D = 400\text{mA}$<br>$R_G = 10\Omega$ (External) |                       | 28   | ns                      |
| $t_r$        |                                                                                                                                             |                       | 54   | ns                      |
| $t_{d(off)}$ |                                                                                                                                             |                       | 35   | ns                      |
| $t_f$        |                                                                                                                                             |                       | 52   | ns                      |
| $Q_{g(on)}$  | $V_{GS} = 5\text{V}$ , $V_{DS} = 250\text{V}$ , $I_D = 400\text{mA}$                                                                        |                       | 12.7 | nC                      |
| $Q_{gs}$     |                                                                                                                                             |                       | 1.2  | nC                      |
| $Q_{gd}$     |                                                                                                                                             |                       | 7.3  | nC                      |
| $R_{thJC}$   | TO-220                                                                                                                                      |                       | 0.50 | 2.08 $^\circ\text{C/W}$ |
| $R_{thCS}$   |                                                                                                                                             |                       |      |                         |

#### Safe-Operating-Area Specification

| Symbol | Test Conditions                                                                             | Characteristic Values |      |      |
|--------|---------------------------------------------------------------------------------------------|-----------------------|------|------|
|        |                                                                                             | Min.                  | Typ. | Max. |
| SOA    | $V_{DS} = 400\text{V}$ , $I_D = 90\text{mA}$ , $T_C = 75^\circ\text{C}$ , $T_p = 5\text{s}$ | 36                    |      | W    |

#### Source-Drain Diode

| Symbol   | Test Conditions<br>( $T_J = 25^\circ\text{C}$ , Unless Otherwise Specified)                               | Characteristic Values |      |               |
|----------|-----------------------------------------------------------------------------------------------------------|-----------------------|------|---------------|
|          |                                                                                                           | Min.                  | Typ. | Max.          |
| $V_{SD}$ | $I_F = 800\text{mA}$ , $V_{GS} = -10\text{V}$ , Note 1                                                    |                       | 0.8  | 1.3 V         |
| $t_{rr}$ | $I_F = 800\text{mA}$ , $-di/dt = 100\text{A}/\mu\text{s}$<br>$V_R = 100\text{V}$ , $V_{GS} = -10\text{V}$ |                       | 400  | ns            |
| $I_{RM}$ |                                                                                                           |                       | 5.2  | A             |
| $Q_{RM}$ |                                                                                                           |                       | 1.04 | $\mu\text{C}$ |

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    |             |

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

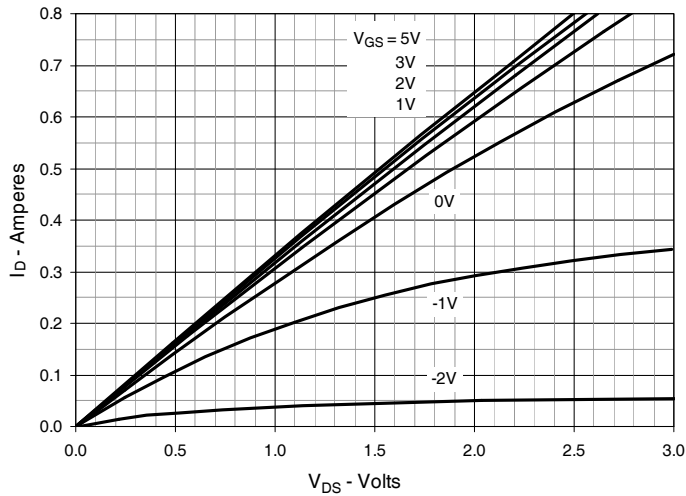


Fig. 2. Extended Output Characteristics @  $T_J = 25^\circ\text{C}$

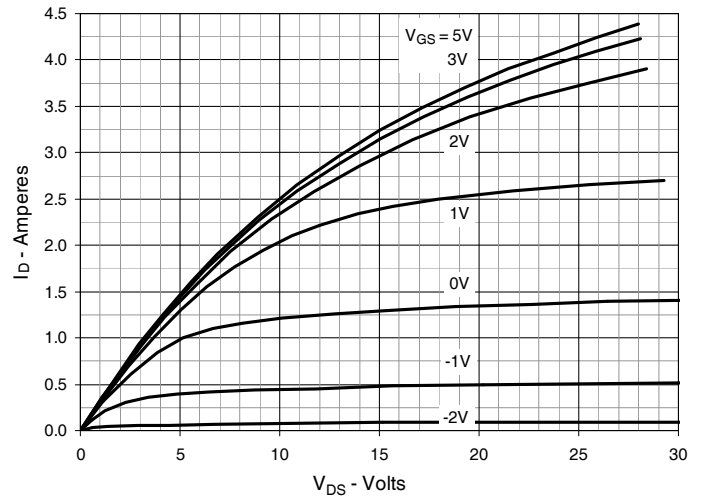


Fig. 3. Output Characteristics @  $T_J = 125^\circ\text{C}$

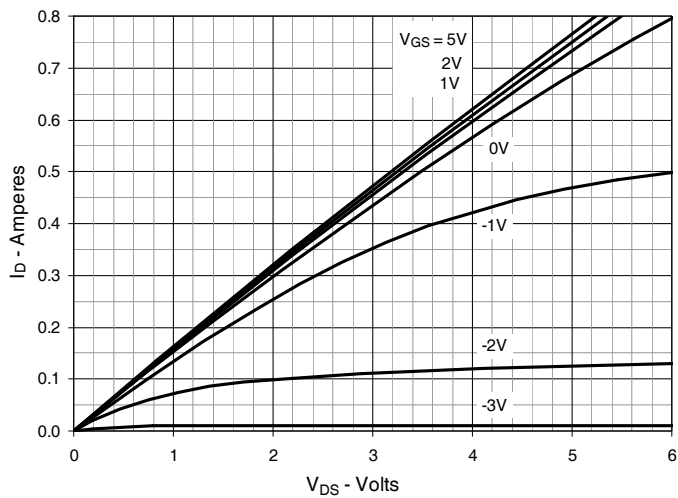


Fig. 4. Drain Current @  $T_J = 25^\circ\text{C}$

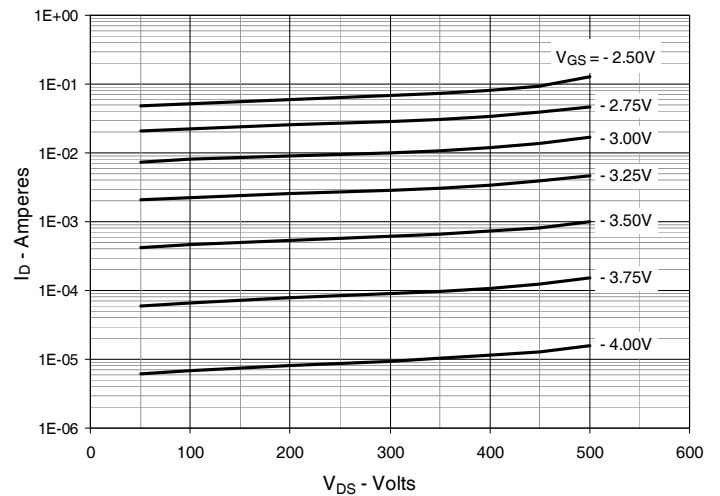


Fig. 5. Drain Current @  $T_J = 100^\circ\text{C}$

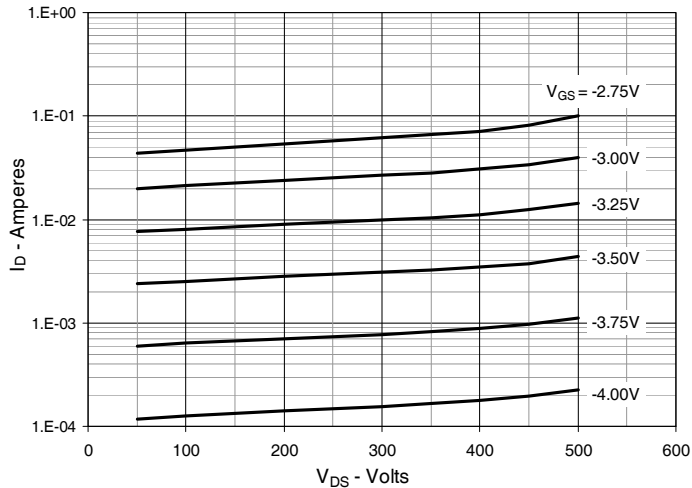


Fig. 6. Dynamic Resistance vs. Gate Voltage

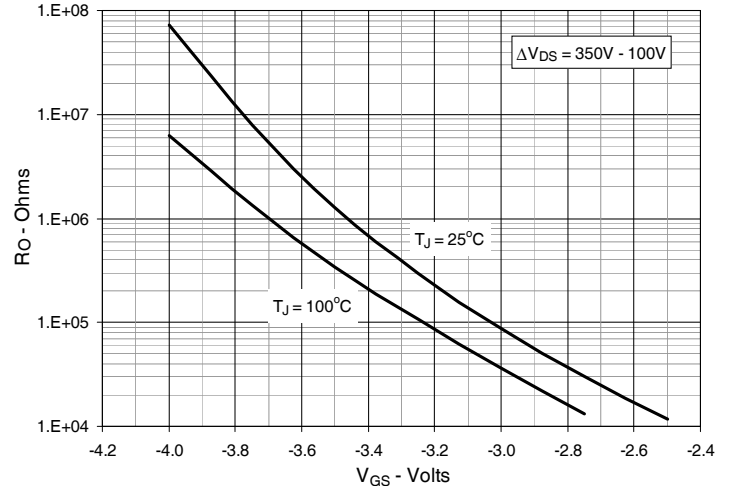


Fig. 7. Normalized  $R_{DS(on)}$  vs. Junction Temperature

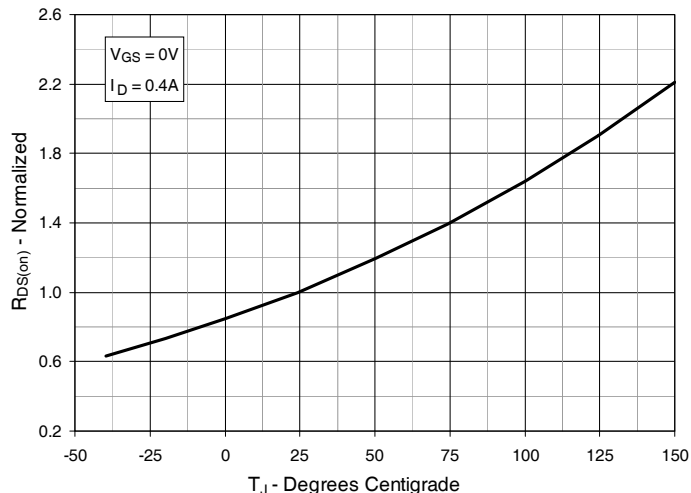


Fig. 8.  $R_{DS(on)}$  Normalized to  $I_D = 0.4A$  Value vs. Drain Current

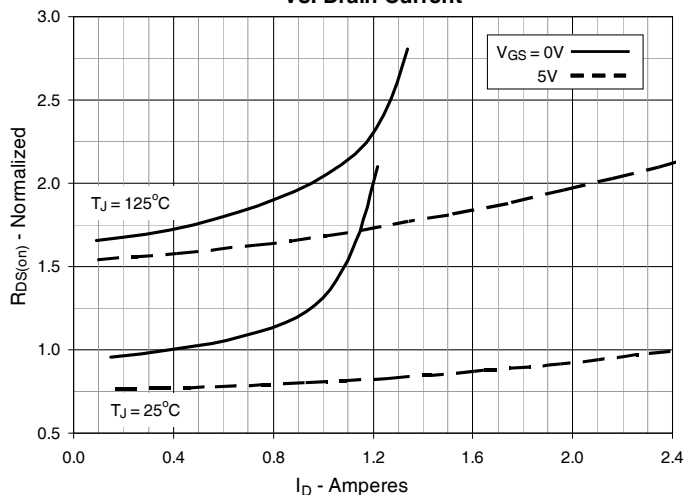


Fig. 9. Input Admittance

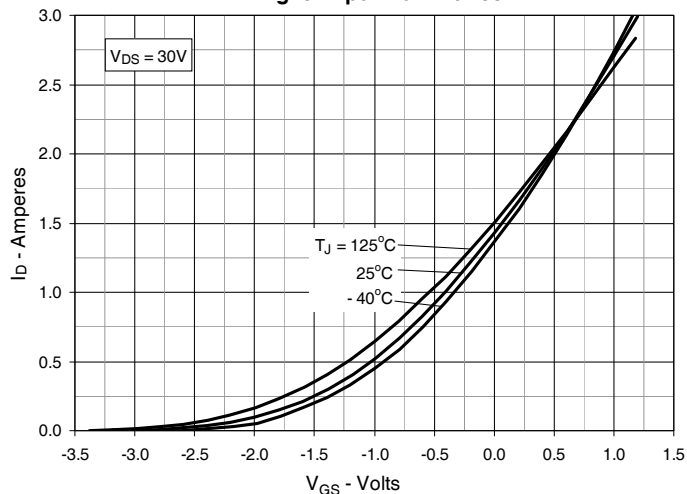


Fig. 10. Transconductance

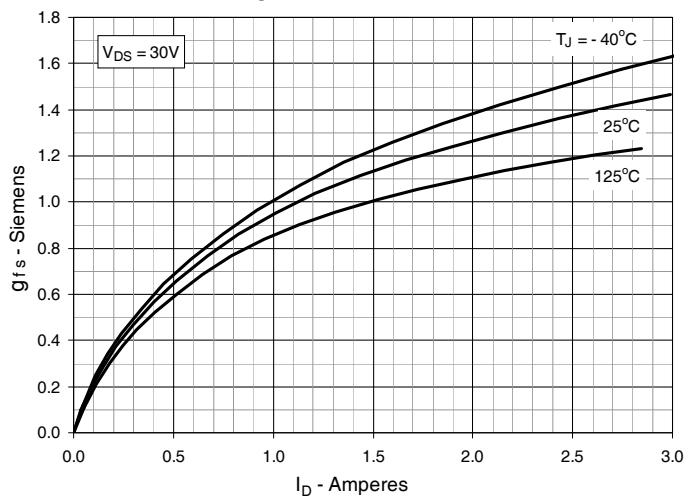


Fig. 11. Breakdown and Threshold Voltages vs. Junction Temperature

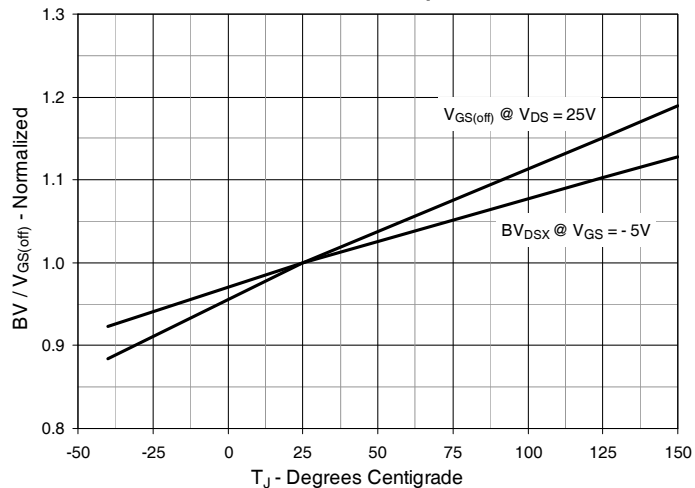
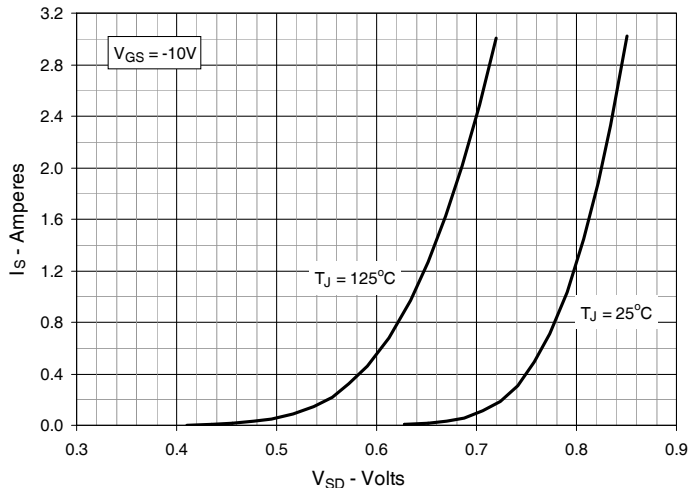
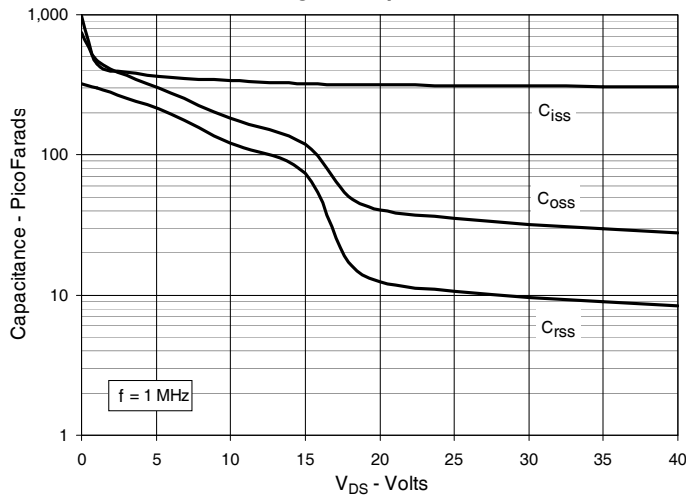


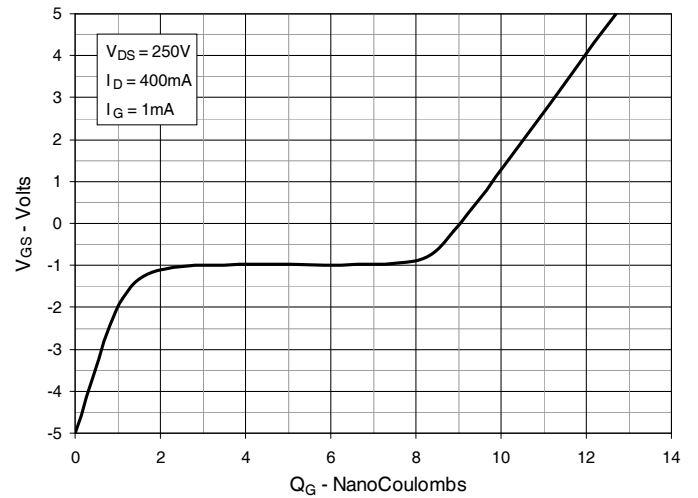
Fig. 12. Forward Voltage Drop of Intrinsic Diode



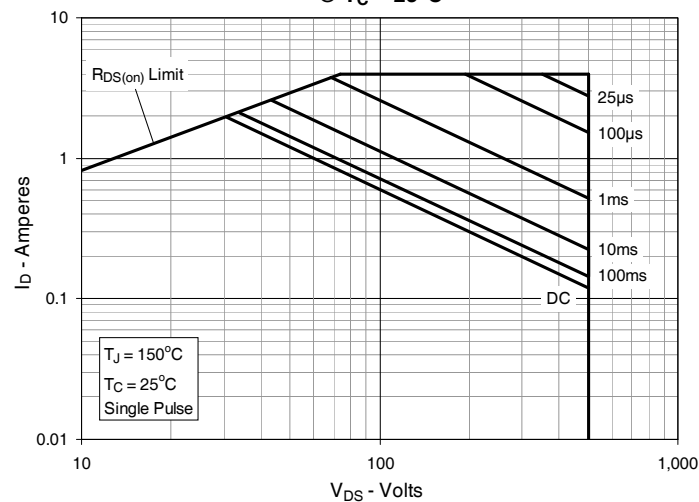
**Fig. 13. Capacitance**



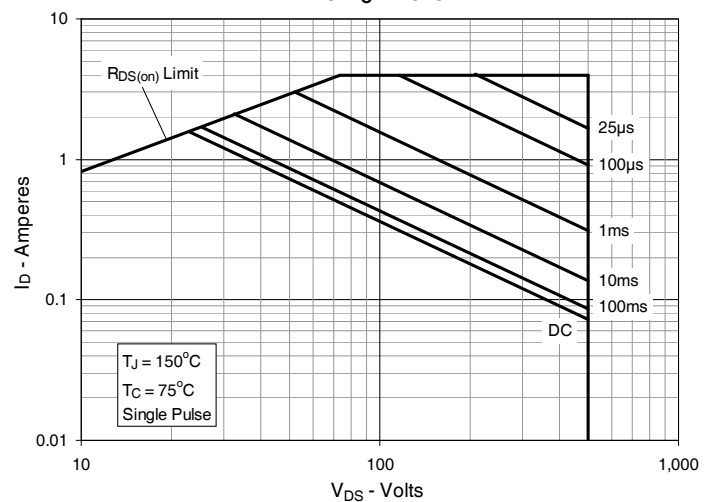
**Fig. 14. Gate Charge**



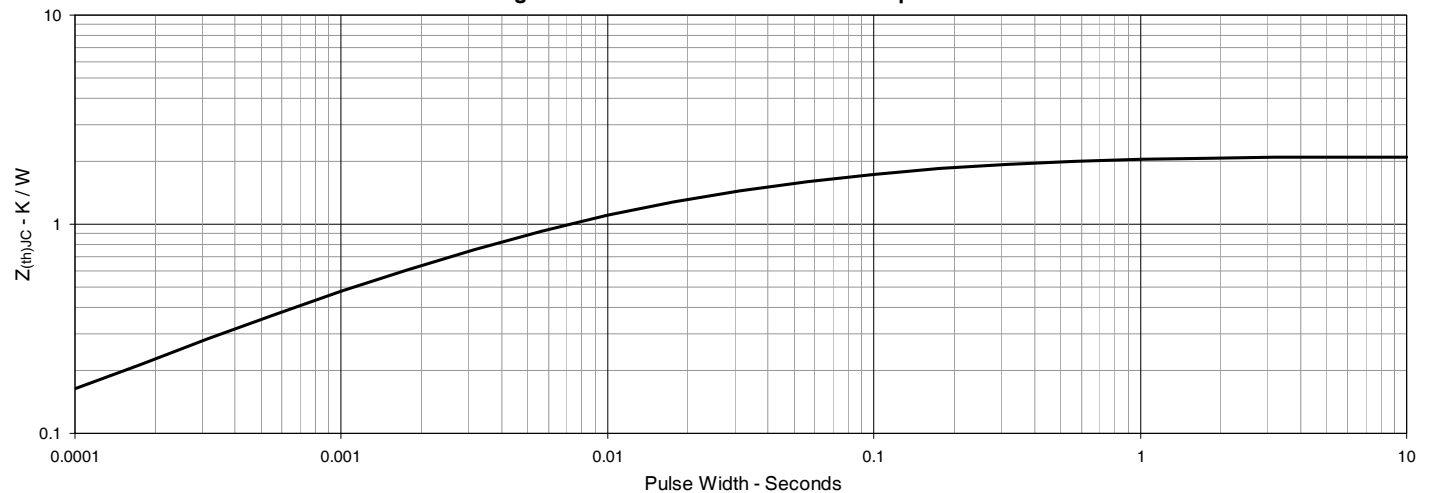
**Fig. 15. Forward-Bias Safe Operating Area  
@  $T_C = 25^\circ C$**



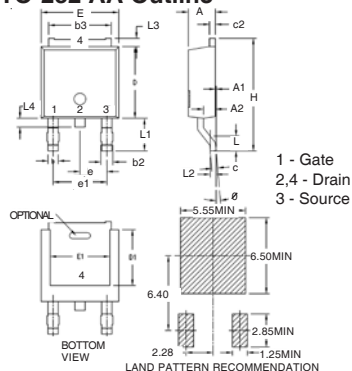
**Fig. 16. Forward-Bias Safe Operating Area  
@  $T_C = 75^\circ C$**



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

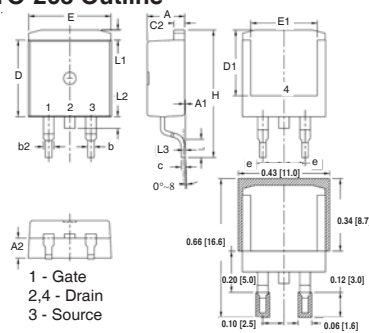


## TO-252 AA Outline



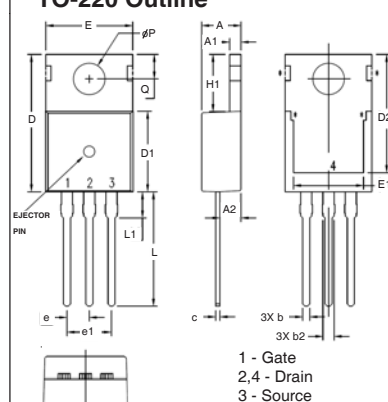
| SYM | INCHES   |      | MILLIMETERS |       |
|-----|----------|------|-------------|-------|
|     | MIN      | MAX  | MIN         | MAX   |
| A   | .086     | .094 | 2.19        | 2.38  |
| A1  | 0        | .005 | 0           | 0.12  |
| A2  | .038     | .046 | 0.97        | 1.17  |
| b   | .025     | .035 | 0.64        | 0.89  |
| b2  | .030     | .045 | 0.76        | 1.14  |
| b3  | .200     | .215 | 5.08        | 5.46  |
| 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   | .090 BSC |      | 2.28 BSC    |       |
| e1  | .180 BSC |      | 4.57 BSC    |       |
| H   | .370     | .410 | 9.40        | 10.42 |
| 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  |
| L4  | .025     | .040 | 0.64        | 1.02  |
| θ   | 0°       | 10°  | 0°          | 10°   |

## TO-263 Outline



| SYM  | INCHES   |      | MILLIMETER |       |
|------|----------|------|------------|-------|
|      | MIN      | MAX  | MIN        | MAX   |
| A    | .170     | .185 | 4.30       | 4.70  |
| A1   | .000     | .008 | 0.00       | 0.20  |
| A2   | .091     | .098 | 2.30       | 2.50  |
| b    | .028     | .035 | 0.70       | 0.90  |
| b2   | .046     | .060 | 1.18       | 1.52  |
| C    | .018     | .024 | 0.45       | 0.60  |
| C2   | .049     | .060 | 1.25       | 1.52  |
| D    | .340     | .370 | 8.63       | 9.40  |
| D1   | .300     | .327 | 7.62       | 8.30  |
| E    | .380     | .410 | 9.65       | 10.41 |
| E1   | .270     | .330 | 6.86       | 8.38  |
| [e]  | .100 BSC |      | 2.54 BSC   |       |
| H    | .580     | .620 | 14.73      | 15.75 |
| L    | .075     | .105 | 1.91       | 2.67  |
| L1   | .039     | .060 | 1.00       | 1.52  |
| L2   | —        | .070 | —          | 1.77  |
| [L3] | .010 BSC |      | 0.254 BSC  |       |

## 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  |



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