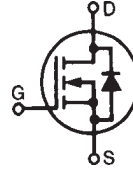


## LinearL2™ Power MOSFET w/Extended FBSOA

**IXTT40N50L2**  
**IXTQ40N50L2**  
**IXTH40N50L2**

**V<sub>DSS</sub> = 500V**  
**I<sub>D25</sub> = 40A**  
**R<sub>DS(on)</sub> ≤ 170mΩ**

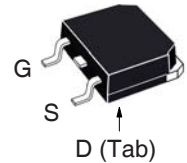
N-Channel Enhancement Mode  
Avalanche rated



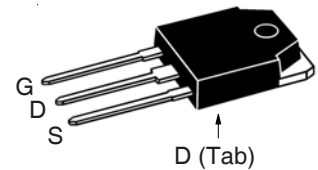
| Symbol            | Test Conditions   | Maximum Ratings |          |
|-------------------|---|-----------------|----------|
| V <sub>DSS</sub>  | T <sub>J</sub> = 25°C to 150°C                                | 500             | V        |
| V <sub>DGR</sub>  | T <sub>J</sub> = 25°C to 150°C, R <sub>GS</sub> = 1MΩ         | 500             | V        |
| V <sub>GSS</sub>  | Continuous  | ±20             | V        |
| V <sub>GSM</sub>  | Transient   | ±30             | V        |
| I <sub>D25</sub>  | T <sub>C</sub> = 25°C   | 40              | A        |
| I <sub>DM</sub>   | T <sub>C</sub> = 25°C, Pulse Width Limited by T <sub>JM</sub> | 80              | A        |
| I <sub>A</sub>    | T <sub>C</sub> = 25°C   | 40              | A        |
| E <sub>AS</sub>   | T <sub>C</sub> = 25°C   | 2               | J        |
| P <sub>D</sub>    | T <sub>C</sub> = 25°C   | 540             | W        |
| T <sub>J</sub>    |   | -55 to +150     | °C       |
| T <sub>JM</sub>   |   | +150            | °C       |
| T <sub>stg</sub>  |   | -55 to +150     | °C       |
| T <sub>L</sub>    | Maximum Lead Temperature for Soldering                        | 300             | °C       |
| T <sub>SOLD</sub> | 1.6 mm (0.062in.) from Case for 10s                           | 260             | °C       |
| M <sub>d</sub>    | Mounting Torque (TO-247&TO-3P)                                | 1.13/10         | Nm/lb.in |
| Weight            | TO-268  | 4.0             | g        |
|                   | TO-3P   | 5.5             | g        |
|                   | TO-247  | 6.0             | g        |

| Symbol              | Test Conditions<br>(T <sub>J</sub> = 25°C, Unless Otherwise Specified)              | Characteristic Values |      |                 |
|---------------------|---|-----------------------|------|-----------------|
|                     |   | Min.                  | Typ. | Max.            |
| BV <sub>DSS</sub>   | V <sub>GS</sub> = 0V, I <sub>D</sub> = 1mA  | 500                   |      | V               |
| V <sub>GS(th)</sub> | V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250μA                          | 2.5                   |      | 4.5 V           |
| I <sub>GSS</sub>    | V <sub>GS</sub> = ±20V, V <sub>DS</sub> = 0V  |                       |      | ±100 nA         |
| I <sub>DSS</sub>    | V <sub>DS</sub> = V <sub>DSS</sub> , V <sub>GS</sub> = 0V<br>T <sub>J</sub> = 125°C |                       |      | 50 μA<br>300 μA |
| R <sub>DS(on)</sub> | V <sub>GS</sub> = 10V, I <sub>D</sub> = 0.5 • I <sub>D25</sub> , Note 1             |                       |      | 170 mΩ          |

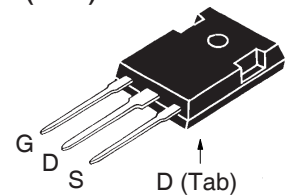
TO-268 (IXTT)



TO-3P (IXTQ)



TO-247 (IXTH)



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

### Features

- Designed for Linear Operation
- International Standard Packages
- Avalanche Rated
- Molding Epoxies Meet UL 94 V-0 Flammability Classification
- Guaranteed FBSOA at 75°C

### Applications

- Solid State Circuit Breakers
- Soft Start Controls
- Linear Amplifiers
- Programmable Loads
- Current Regulators

| Symbol       | Test Conditions<br>( $T_J = 25^\circ\text{C}$ , Unless Otherwise Specified)  | Characteristic Values |      |                         |
|--------------|--|-----------------------|------|-------------------------|
|              |  | Min.                  | Typ. | Max.                    |
| $g_{fs}$     | $V_{DS} = 10\text{V}, I_D = 0.5 \cdot I_{D25}$ , Note 1  | 11                    | 15   | 19 S                    |
| $C_{iss}$    | $V_{GS} = 0\text{V}, V_{DS} = 25\text{V}, f = 1\text{MHz}$   |                       | 10.4 | nF                      |
| $C_{oss}$    |  |                       | 655  | pF                      |
| $C_{rss}$    |  |                       | 155  | 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>$R_G = 2\Omega$ (External) |                       | 50   | ns                      |
| $t_r$        |  |                       | 133  | ns                      |
| $t_{d(off)}$ |  |                       | 127  | ns                      |
| $t_f$        |  |                       | 44   | ns                      |
| $Q_{g(on)}$  | $V_{GS} = 10\text{V}, V_{DS} = 0.5 \cdot V_{DSS}, I_D = 0.5 \cdot I_{D25}$   |                       | 320  | nC                      |
| $Q_{gs}$     |  |                       | 64   | nC                      |
| $Q_{gd}$     |  |                       | 198  | nC                      |
| $R_{thJC}$   | (TO-247&TO-3P)   |                       |      | 0.23 $^\circ\text{C/W}$ |
| $R_{thCS}$   |  |                       | 0.25 | $^\circ\text{C/W}$      |

#### Safe Operating Area Specification

| Symbol | Test Conditions  | Min. | Typ. | Max. |
|--------|--|------|------|------|
| SOA    | $V_{DS} = 400\text{V}, I_D = 0.8\text{A}, T_C = 75^\circ\text{C}, t_p = 3\text{s}$ | 320  |      | W    |

#### Source-Drain Diode

| Symbol   | Test Conditions<br>( $T_J = 25^\circ\text{C}$ , Unless Otherwise Specified) | Characteristic Values |      |       |
|----------|---|-----------------------|------|-------|
|          |   | Min.                  | Typ. | Max.  |
| $I_S$    | $V_{GS} = 0\text{V}$  |                       |      | 40 A  |
| $I_{SM}$ | Repetitive, Pulse Width Limited by $T_{JM}$                                 |                       |      | 160 A |
| $V_{SD}$ | $I_F = I_S, V_{GS} = 0\text{V}$ , Note 1                                    |                       |      | 1.5 V |
| $t_{rr}$ | $I_F = I_S, -di/dt = 100\text{A}/\mu\text{s}, V_R = 100\text{V}$            |                       | 500  | ns    |

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 @  $T_J = 25^\circ\text{C}$

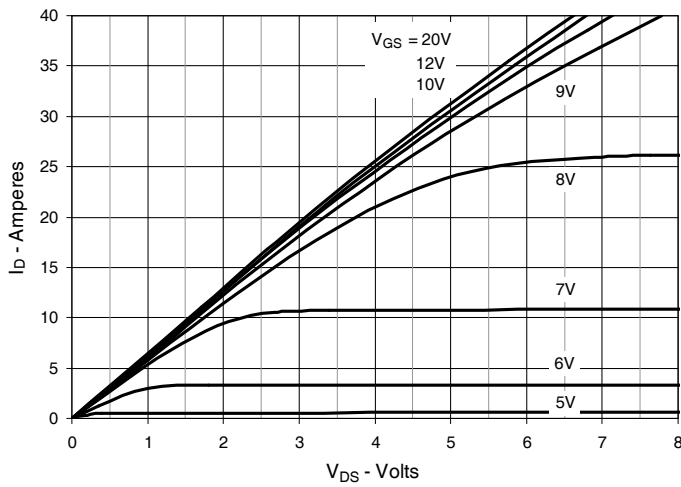


Fig. 2. Extended Output Characteristics @  $T_J = 25^\circ\text{C}$

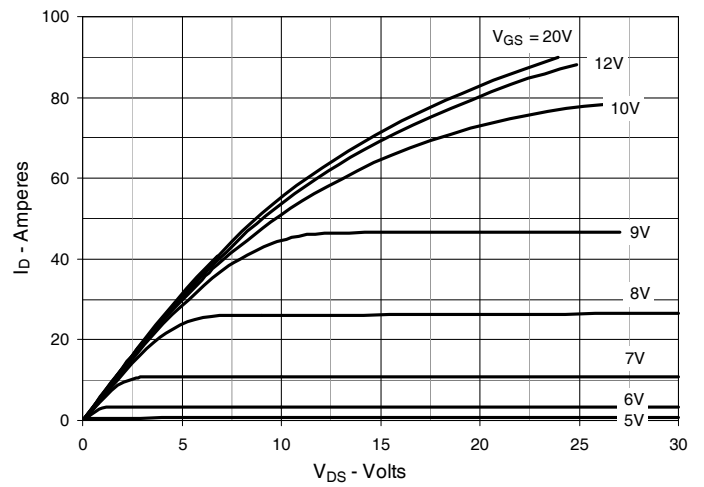


Fig. 3. Output Characteristics @  $T_J = 125^\circ\text{C}$

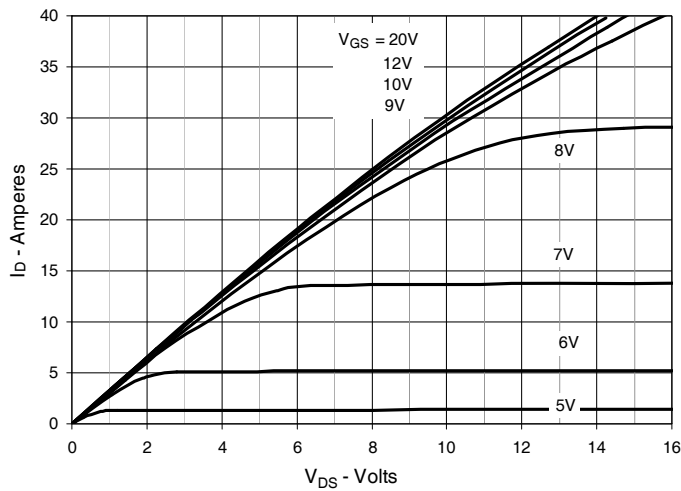


Fig. 4.  $R_{DS(on)}$  Normalized to  $I_D = 20\text{A}$  Value vs. Junction Temperature

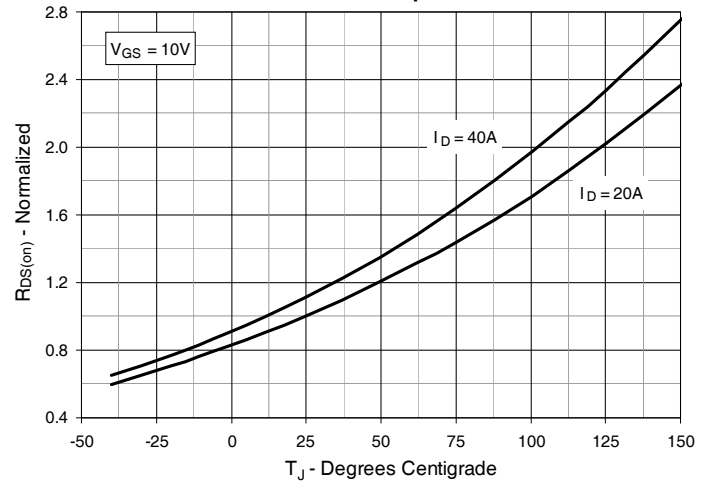


Fig. 5.  $R_{DS(on)}$  Normalized to  $I_D = 20\text{A}$  Value vs. Drain Current

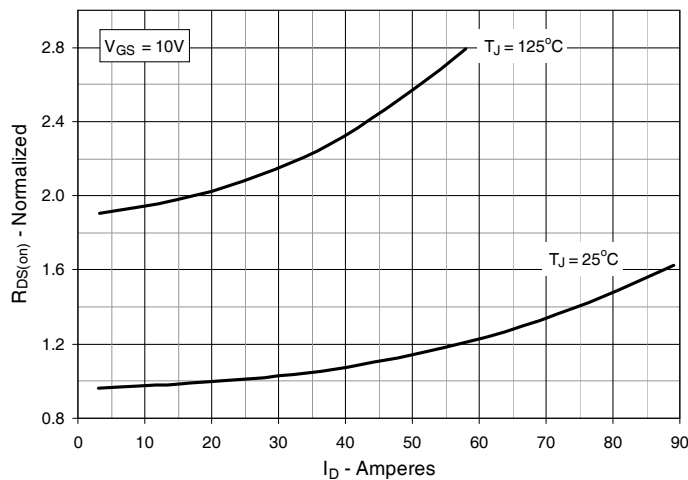


Fig. 6. Maximum Drain Current vs. Case Temperature

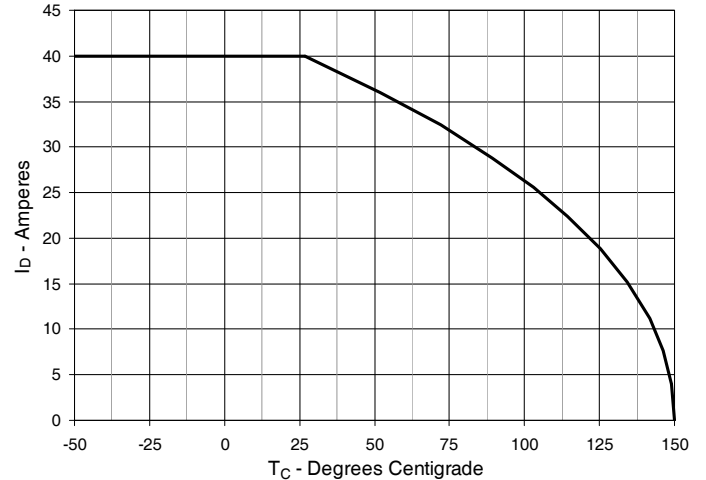


Fig. 7. Input Admittance

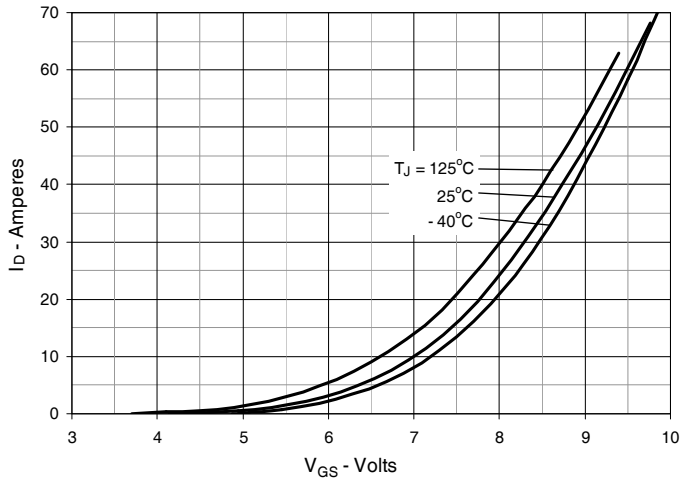


Fig. 8. Transconductance

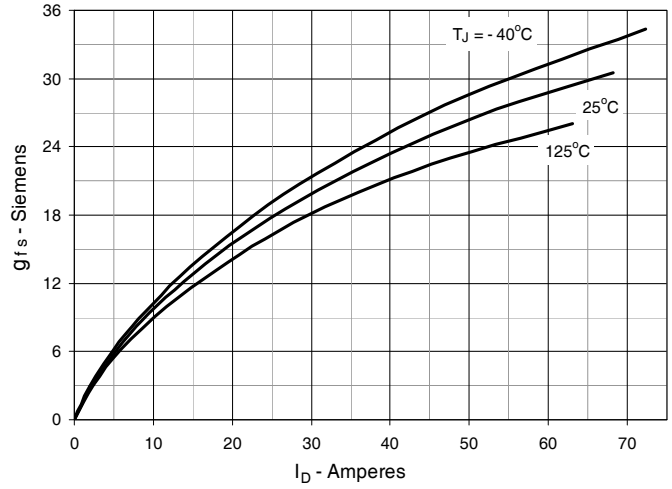


Fig. 9. Forward Voltage Drop of Intrinsic Diode

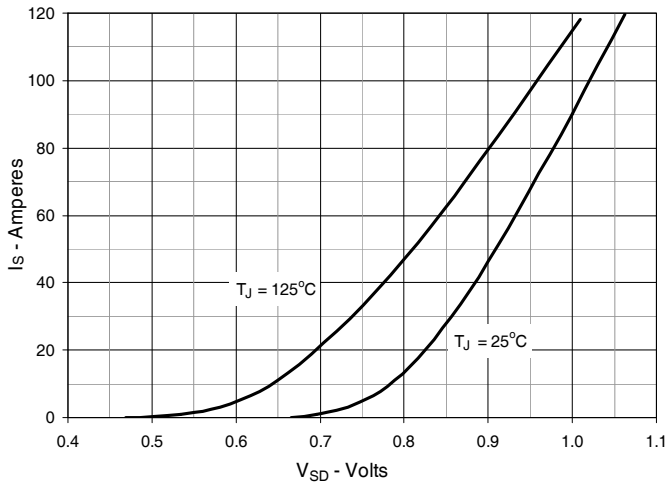


Fig. 10. Gate Charge

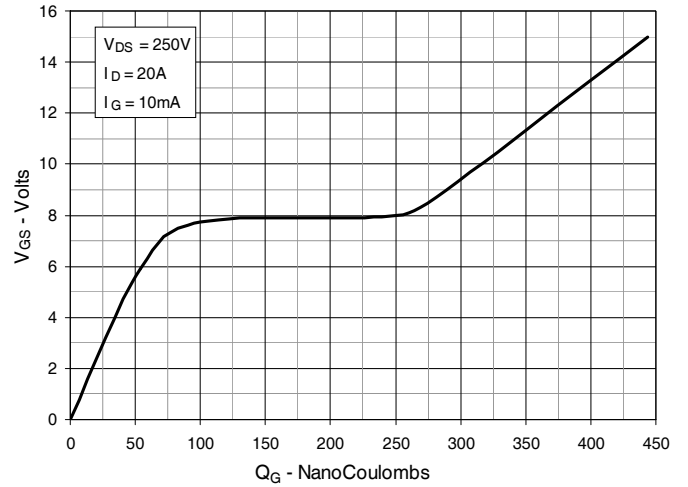


Fig. 11. Capacitance

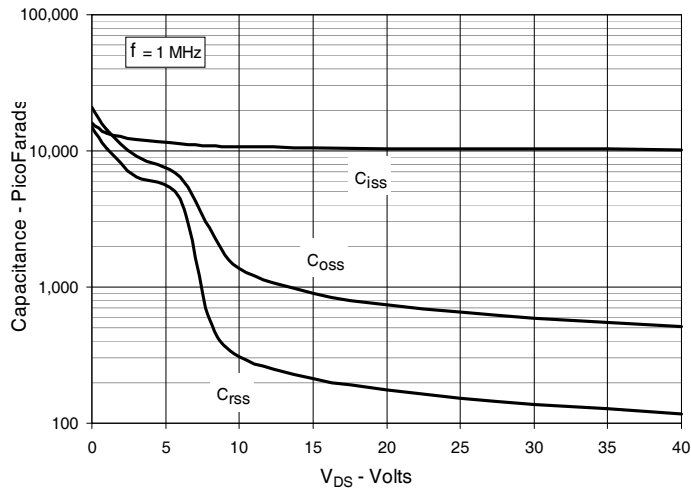


Fig. 12. Maximum Transient Thermal Impedance

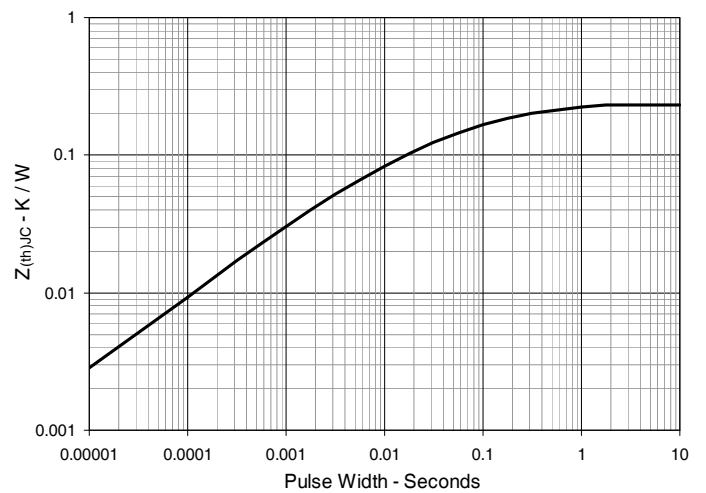


Fig. 13. Forward-Bias Safe Operating Area

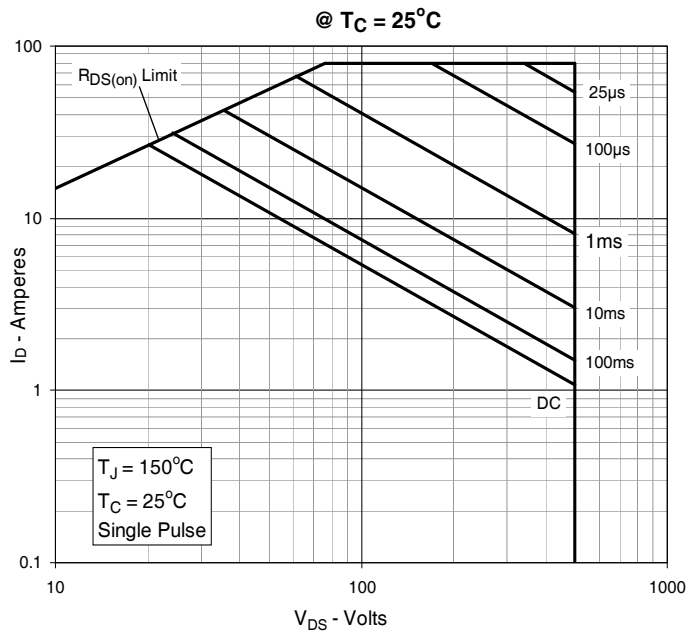
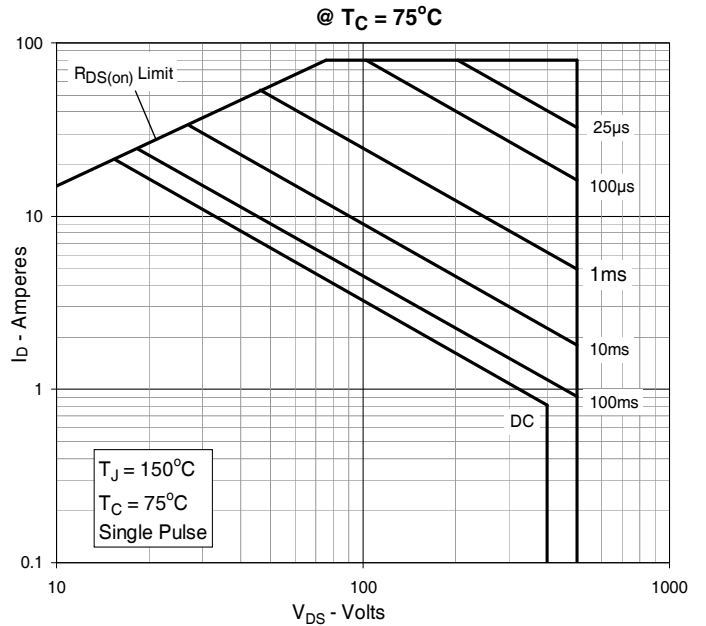
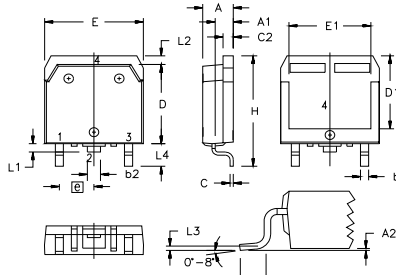


Fig. 14. Forward-Bias Safe Operating Area



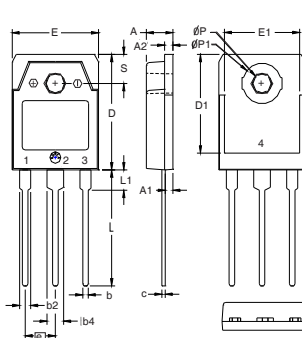
### TO-268 Outline



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

| 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  |

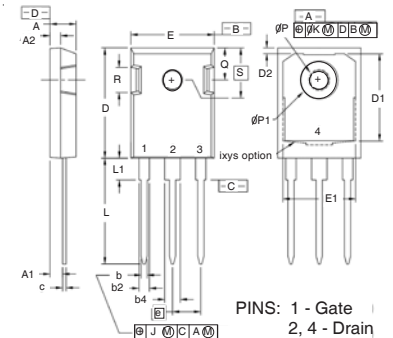
### TO-3P Outline



PINS: 1 - Gate  
2, 4 - Drain  
3 - Source

| SYM | INCHES   |      | MILLIMETERS |       |
|-----|----------|------|-------------|-------|
|     | MIN      | MAX  | MIN         | MAX   |
| A   | .185     | .193 | 4.70        | 4.90  |
| A1  | .051     | .059 | 1.30        | 1.50  |
| A2  | .057     | .065 | 1.45        | 1.65  |
| b   | .035     | .045 | 0.90        | 1.15  |
| b2  | .075     | .087 | 1.90        | 2.20  |
| b4  | .114     | .126 | 2.90        | 3.20  |
| c   | .022     | .031 | 0.55        | 0.80  |
| D   | .780     | .799 | 19.80       | 20.30 |
| D1  | .665     | .677 | 16.90       | 17.20 |
| E   | .610     | .622 | 15.50       | 15.80 |
| E1  | .531     | .539 | 13.50       | 13.70 |
| e   | .215 BSC |      | 5.45 BSC    |       |
| L   | .779     | .795 | 19.80       | 20.20 |
| L1  | .134     | .142 | 3.40        | 3.60  |
| øP  | .126     | .134 | 3.20        | 3.40  |
| øP1 | .272     | .280 | 6.90        | 7.10  |
| S   | .193     | .201 | 4.90        | 5.10  |

### TO-247 Outline



PINS: 1 - Gate  
2, 4 - Drain  
3 - Source

| SYM | INCHES   |      | MILLIMETERS |       |
|-----|----------|------|-------------|-------|
|     | MIN      | MAX  | MIN         | MAX   |
| A   | .190     | .205 | 4.83        | 5.21  |
| A1  | .090     | .100 | 2.29        | 2.54  |
| A2  | .075     | .085 | 1.91        | 2.16  |
| b   | .045     | .055 | 1.14        | 1.40  |
| b2  | .075     | .087 | 1.91        | 2.20  |
| b4  | .115     | .126 | 2.92        | 3.20  |
| C   | .024     | .031 | 0.61        | 0.80  |
| D   | .819     | .840 | 20.80       | 21.34 |
| D1  | .650     | .690 | 16.51       | 17.53 |
| D2  | .035     | .050 | 0.89        | 1.27  |
| E   | .620     | .635 | 15.75       | 16.13 |
| E1  | .545     | .565 | 13.84       | 14.35 |
| e   | .215 BSC |      | 5.45 BSC    |       |
| J   | --       | .010 | --          | 0.25  |
| K   | --       | .025 | --          | 0.64  |
| L   | .780     | .810 | 19.81       | 20.57 |
| L1  | .150     | .170 | 3.81        | 4.32  |
| øP  | .140     | .144 | 3.55        | 3.65  |
| øP1 | .275     | .290 | 6.99        | 7.37  |
| Q   | .220     | .244 | 5.59        | 6.20  |
| R   | .170     | .190 | 4.32        | 4.83  |
| S   | .242 BSC |      | 6.15 BSC    |       |



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