

## X2-Class HiPerFET™ Power MOSFET

**IXFA34N65X2**  
**IXFP34N65X2**  
**IXFH34N65X2**

**$V_{DSS} = 650V$**   
 **$I_{D25} = 34A$**   
 **$R_{DS(on)} \leq 100m\Omega$**

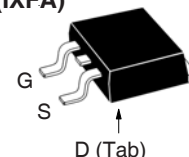
N-Channel Enhancement Mode  
Avalanche Rated  
Fast Intrinsic Diode



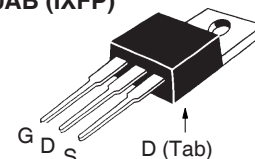
| Symbol        | Test Conditions                                                    | Maximum Ratings   |            |
|---------------|--------------------------------------------------------------------|-------------------|------------|
| $V_{DSS}$     | $T_J = 25^\circ C$ to $150^\circ C$                                | 650               | V          |
| $V_{DGR}$     | $T_J = 25^\circ C$ to $150^\circ C$ , $R_{GS} = 1M\Omega$          | 650               | V          |
| $V_{GSS}$     | Continuous                                                         | $\pm 30$          | V          |
| $V_{GSM}$     | Transient                                                          | $\pm 40$          | V          |
| $I_{D25}$     | $T_C = 25^\circ C$                                                 | 34                | A          |
| $I_{DM}$      | $T_C = 25^\circ C$ , Pulse Width Limited by $T_{JM}$               | 68                | A          |
| $I_A$         | $T_C = 25^\circ C$                                                 | 10                | A          |
| $E_{AS}$      | $T_C = 25^\circ C$                                                 | 1                 | J          |
| $dv/dt$       | $I_S \leq I_{DM}$ , $V_{DD} \leq V_{DSS}$ , $T_J \leq 150^\circ C$ | 50                | V/ns       |
| $P_D$         | $T_C = 25^\circ C$                                                 | 540               | 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               | $^\circ C$ |
| $F_C$         | Mounting Force (TO-263)                                            | 10.65 / 2.2..14.6 | N/lb       |
| $M_d$         | Mounting Torque (TO-220 & TO-247)                                  | 1.13 / 10         | Nm/lb.in   |
| <b>Weight</b> | TO-263                                                             | 2.5               | g          |
|               | TO-220                                                             | 3.0               | g          |
|               | TO-247                                                             | 6.0               | g          |

| Symbol       | Test Conditions<br>( $T_J = 25^\circ C$ , Unless Otherwise Specified) | Characteristic Values |      |                       |
|--------------|-----------------------------------------------------------------------|-----------------------|------|-----------------------|
|              |                                                                       | Min.                  | Typ. | Max.                  |
| $BV_{DSS}$   | $V_{GS} = 0V$ , $I_D = 1mA$                                           | 650                   |      | V                     |
| $V_{GS(th)}$ | $V_{DS} = V_{GS}$ , $I_D = 2.5mA$                                     | 3.5                   |      | 5.0 V                 |
| $I_{GSS}$    | $V_{GS} = \pm 30V$ , $V_{DS} = 0V$                                    |                       |      | $\pm 100$ nA          |
| $I_{DSS}$    | $V_{DS} = V_{DSS}$ , $V_{GS} = 0V$<br>$T_J = 125^\circ C$             |                       |      | 10 $\mu A$<br>1.75 mA |
| $R_{DS(on)}$ | $V_{GS} = 10V$ , $I_D = 0.5 \cdot I_{D25}$ , Note 1                   |                       |      | 100 m $\Omega$        |

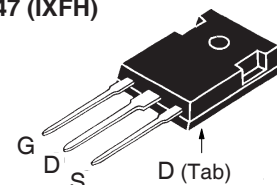
TO-263 AA (IXFA)



TO-220AB (IXFP)



TO-247 (IXFH)



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

### Features

- International Standard Packages
- Low  $R_{DS(on)}$  and  $Q_G$
- Avalanche Rated
- Low Package Inductance

### Advantages

- High Power Density
- Easy to Mount
- Space Savings

### Applications

- Switch-Mode and Resonant-Mode Power Supplies
- DC-DC Converters
- PFC Circuits
- AC and DC Motor Drives
- Robotics and Servo Controls

| Symbol                              | Test Conditions<br>(T <sub>J</sub> = 25°C, Unless Otherwise Specified)                                                                                                           | Characteristic Values                                            |      |           |
|-------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------|------|-----------|
|                                     |                                                                                                                                                                                  | Min.                                                             | Typ. | Max       |
| <b>g<sub>fs</sub></b>               | V <sub>DS</sub> = 10V, I <sub>D</sub> = 0.5 • I <sub>D25</sub> , Note 1                                                                                                          | 12                                                               | 20   | S         |
| <b>R<sub>Gi</sub></b>               | Gate Input Resistance                                                                                                                                                            |                                                                  | 0.8  | Ω         |
| <b>C<sub>iss</sub></b>              | V <sub>GS</sub> = 0V, V <sub>DS</sub> = 25V, f = 1MHz                                                                                                                            |                                                                  | 3230 | pF        |
| <b>C<sub>oss</sub></b>              |                                                                                                                                                                                  |                                                                  | 2000 | pF        |
| <b>C<sub>rss</sub></b>              |                                                                                                                                                                                  |                                                                  | 2    | pF        |
| <b>Effective Output Capacitance</b> |                                                                                                                                                                                  |                                                                  |      |           |
| <b>C<sub>o(er)</sub></b>            | Energy related                                                                                                                                                                   | V <sub>GS</sub> = 0V<br>V <sub>DS</sub> = 0.8 • V <sub>DSS</sub> | 130  | pF        |
| <b>C<sub>o(tr)</sub></b>            | Time related                                                                                                                                                                     |                                                                  | 486  | pF        |
| <b>t<sub>d(on)</sub></b>            | <b>Resistive Switching Times</b><br>V <sub>GS</sub> = 10V, V <sub>DS</sub> = 0.5 • V <sub>DSS</sub> , I <sub>D</sub> = 0.5 • I <sub>D25</sub><br>R <sub>G</sub> = 10Ω (External) |                                                                  | 37   | ns        |
| <b>t<sub>r</sub></b>                |                                                                                                                                                                                  |                                                                  | 60   | ns        |
| <b>t<sub>d(off)</sub></b>           |                                                                                                                                                                                  |                                                                  | 64   | ns        |
| <b>t<sub>f</sub></b>                |                                                                                                                                                                                  |                                                                  | 30   | ns        |
| <b>Q<sub>g(on)</sub></b>            | V <sub>GS</sub> = 10V, V <sub>DS</sub> = 0.5 • V <sub>DSS</sub> , I <sub>D</sub> = 0.5 • I <sub>D25</sub>                                                                        |                                                                  | 56   | nC        |
| <b>Q<sub>gs</sub></b>               |                                                                                                                                                                                  |                                                                  | 19   | nC        |
| <b>Q<sub>gd</sub></b>               |                                                                                                                                                                                  |                                                                  | 18   | nC        |
| <b>R<sub>thJC</sub></b>             |                                                                                                                                                                                  |                                                                  |      | 0.23 °C/W |
| <b>R<sub>thCS</sub></b>             | TO-220                                                                                                                                                                           |                                                                  | 0.50 | °C/W      |
|                                     | TO-247                                                                                                                                                                           |                                                                  | 0.25 | °C/W      |

## Source-Drain Diode

| Symbol   | Test Conditions<br>( $T_J = 25^{\circ}\text{C}$ , Unless Otherwise Specified)  | Characteristic Values |      |               |
|----------|--------------------------------------------------------------------------------|-----------------------|------|---------------|
|          |                                                                                | Min.                  | Typ. | Max           |
| $I_S$    | $V_{GS} = 0\text{V}$                                                           |                       |      | 34 A          |
| $I_{SM}$ | Repetitive, pulse Width Limited by $T_{JM}$                                    |                       |      | 136 A         |
| $V_{SD}$ | $I_F = I_S$ , $V_{GS} = 0\text{V}$ , Note 1                                    |                       |      | 1.4 V         |
| $t_{rr}$ | $I_F = 17\text{A}$ , $-di/dt = 100\text{A}/\mu\text{s}$<br>$V_R = 100\text{V}$ |                       | 164  | ns            |
| $Q_{RM}$ |                                                                                |                       | 1.2  | $\mu\text{C}$ |
| $I_{RM}$ |                                                                                |                       | 14.4 | A             |

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   | 6,404,065B1 | 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   |             |

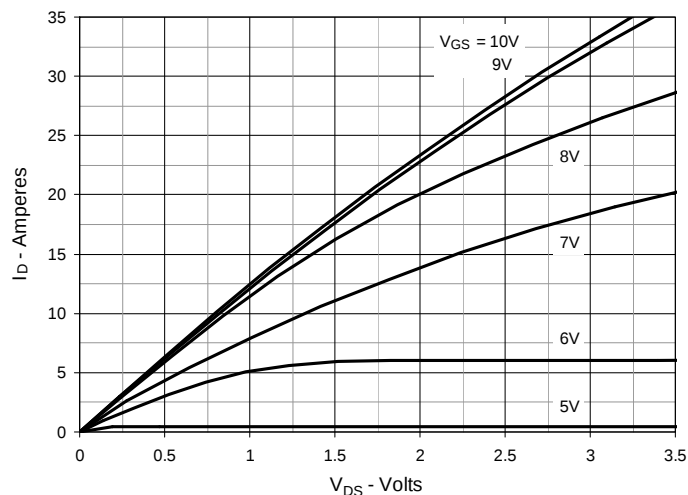
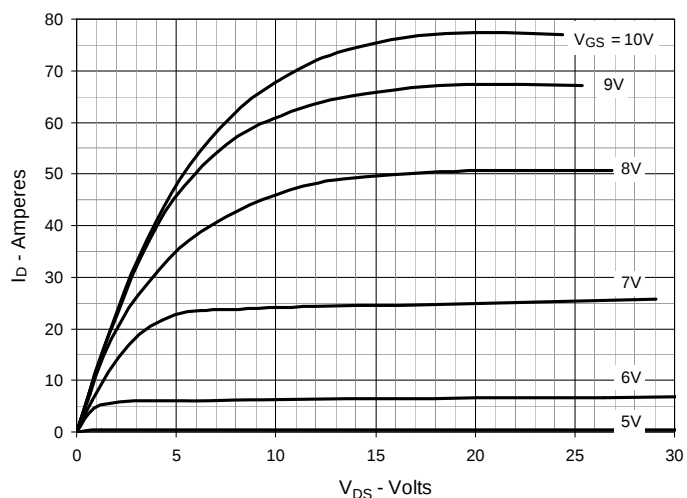
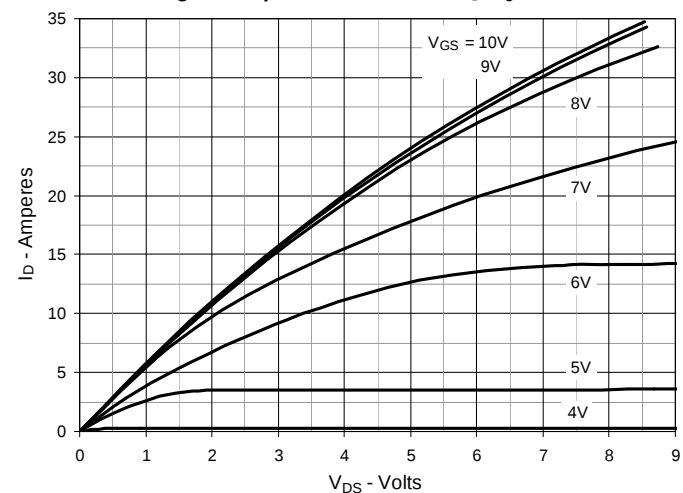
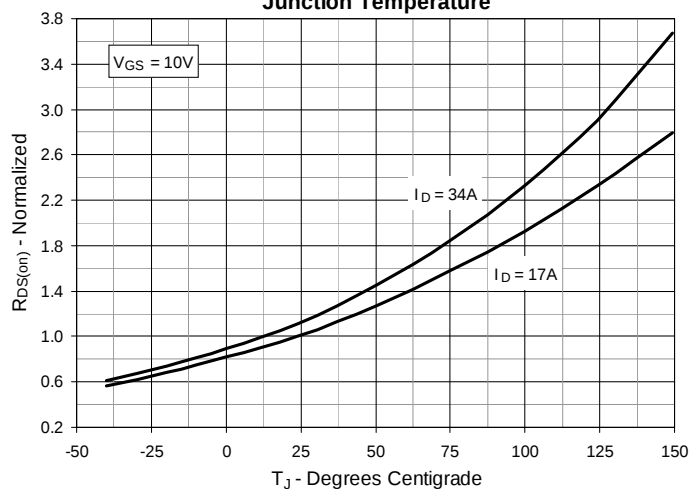
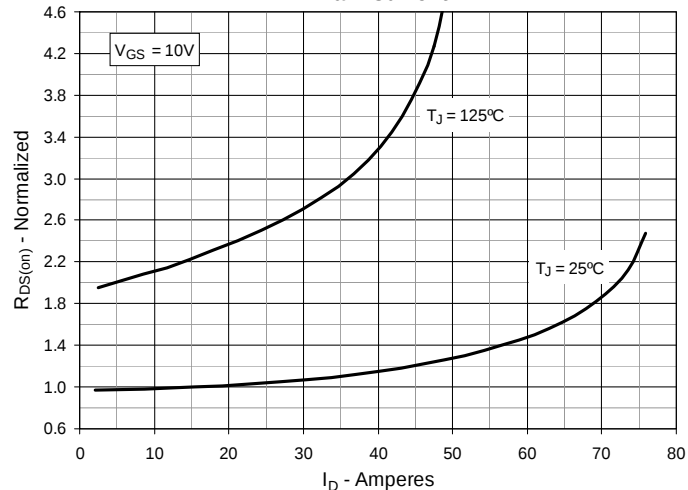
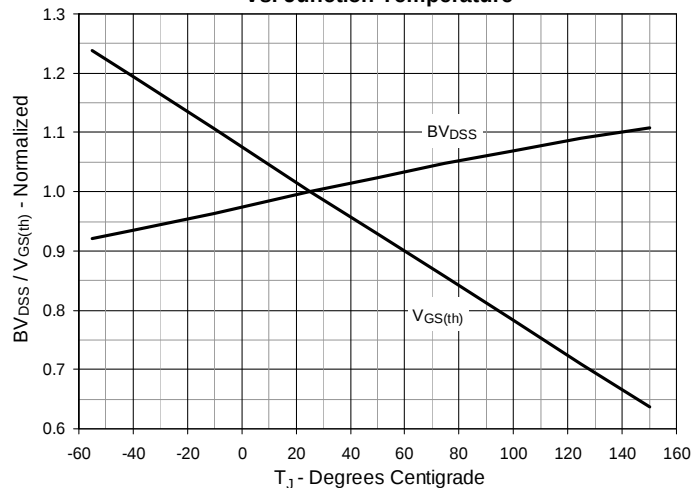
**Fig. 1. Output Characteristics @  $T_J = 25^\circ\text{C}$** 

**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  $I_D = 17\text{A}$  Value vs. Junction Temperature**

**Fig. 5.  $R_{DS(on)}$  Normalized to  $I_D = 17\text{A}$  Value vs. Drain Current**

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


Fig. 7. Maximum Drain Current vs. Case Temperature

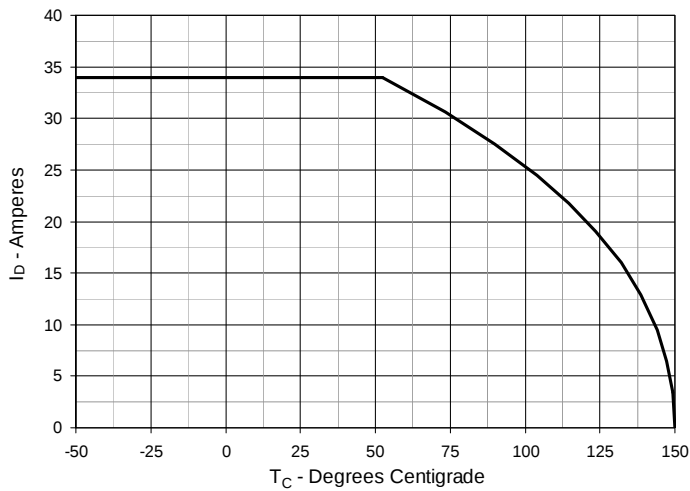


Fig. 8. Input Admittance

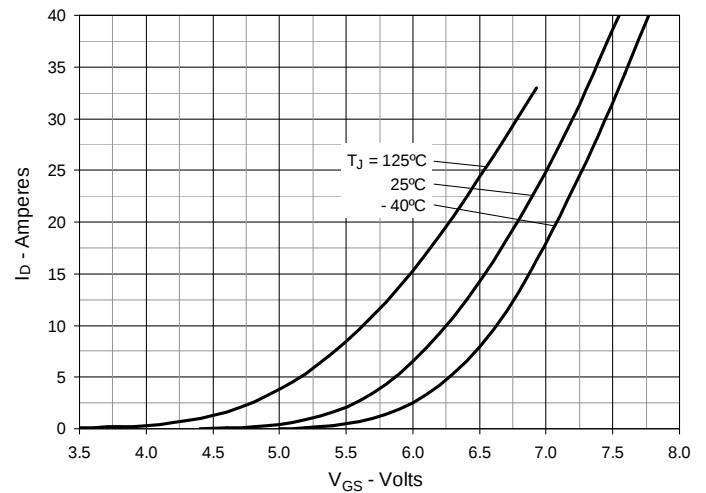


Fig. 9. Transconductance

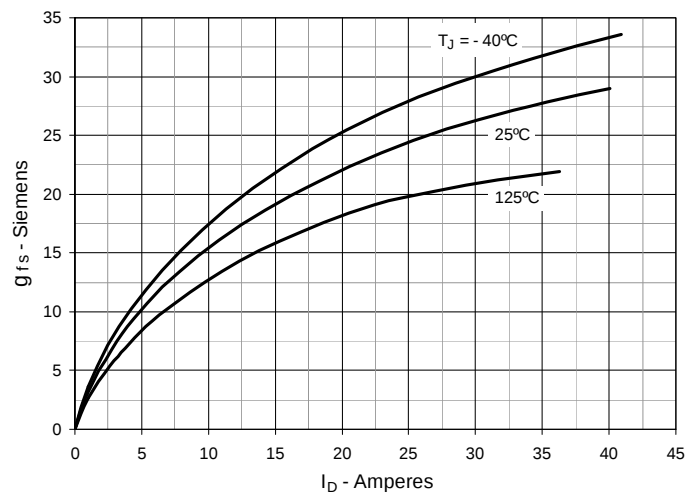


Fig. 10. Forward Voltage Drop of Intrinsic Diode

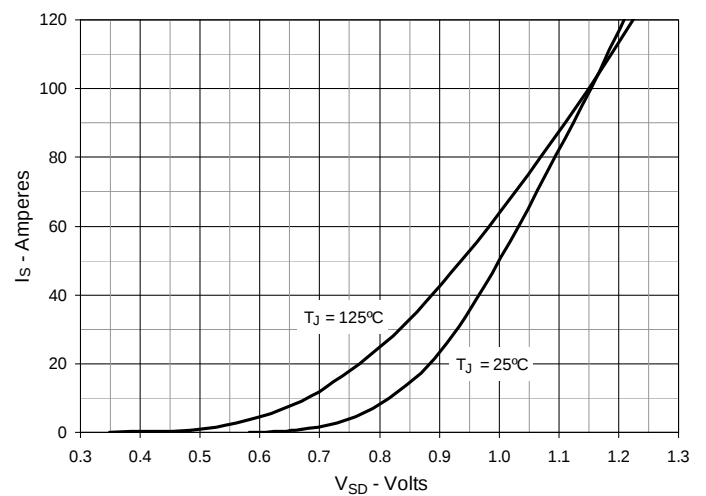


Fig. 11. Gate Charge

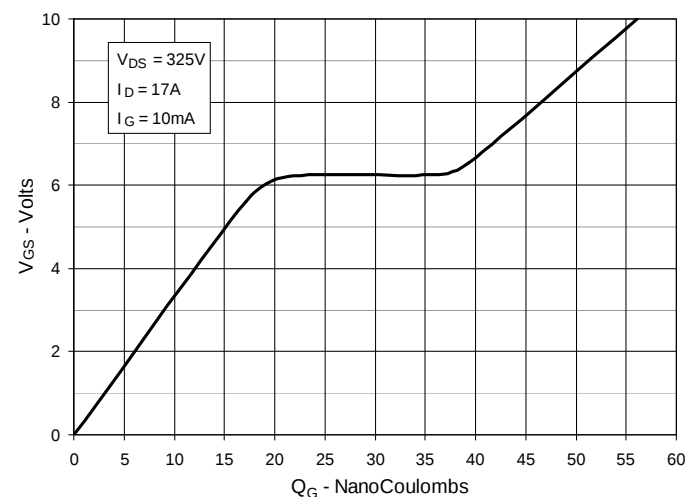


Fig. 12. Capacitance

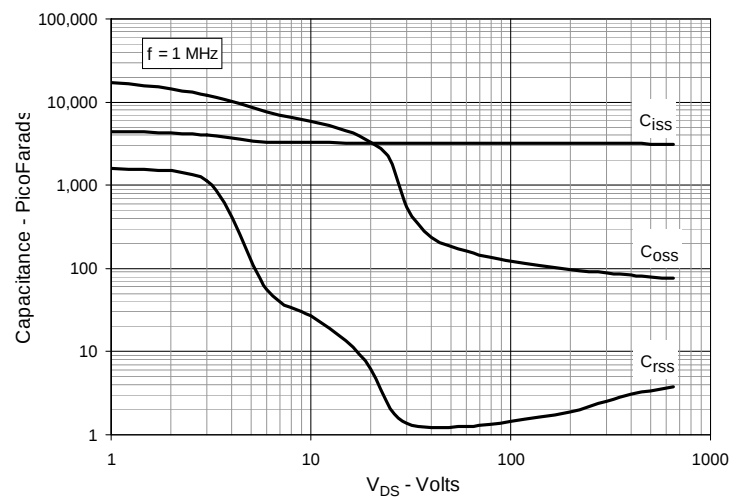


Fig. 13. Output Capacitance Stored Energy

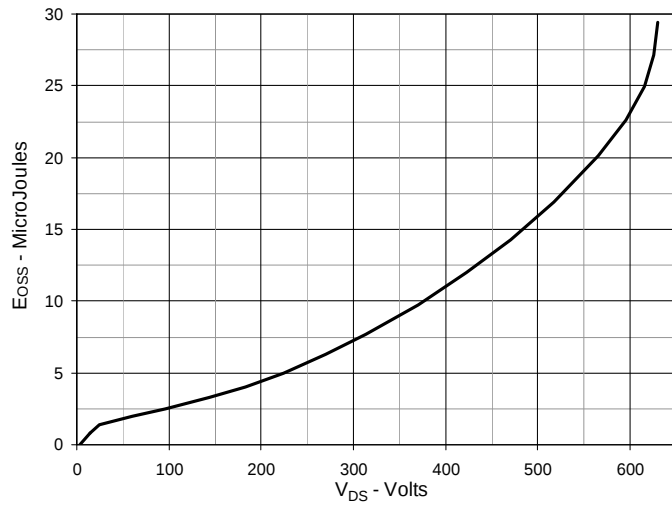


Fig. 14. Forward-Bias Safe Operating Area

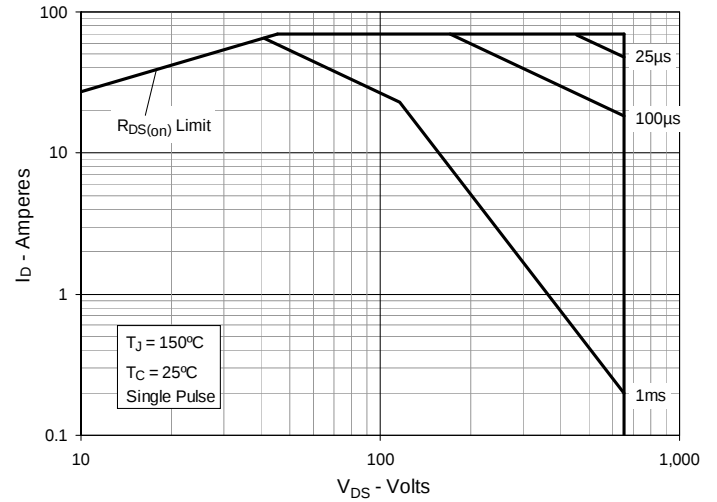
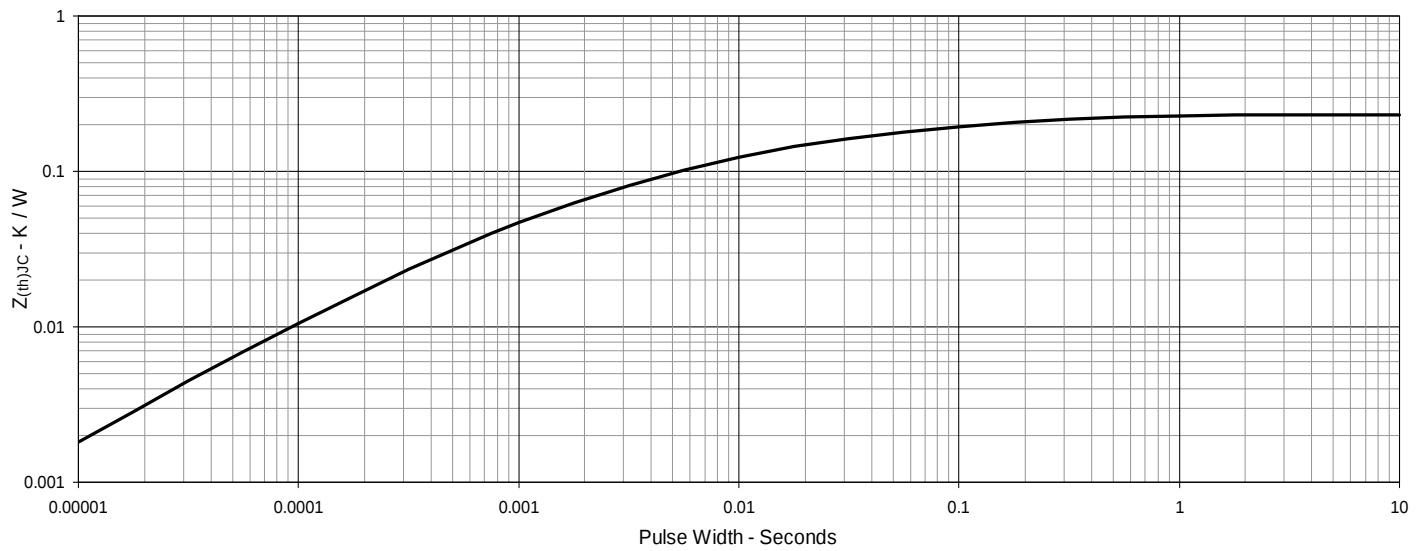
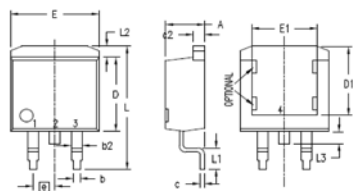


Fig. 15. Maximum Transient Thermal Impedance



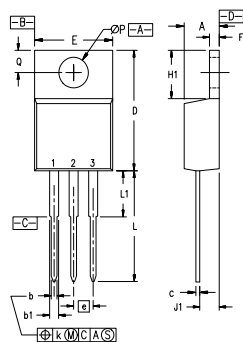
## TO-263 Outline



- 1 = Gate  
2 = Drain  
3 = Source  
4 = Drain

| SYM | INCHES   |      | MILLIMETERS |       |
|-----|----------|------|-------------|-------|
|     | MIN      | MAX  | MIN         | MAX   |
| A   | .160     | .190 | 4.06        | 4.83  |
| A1  | .080     | .110 | 2.03        | 2.79  |
| b   | .020     | .039 | 0.51        | 0.99  |
| b2  | .045     | .055 | 1.14        | 1.40  |
| c   | .016     | .029 | 0.40        | 0.74  |
| c2  | .045     | .055 | 1.14        | 1.40  |
| D   | .340     | .380 | 8.64        | 9.65  |
| D1  | .315     | .350 | 8.00        | 8.89  |
| E   | .380     | .410 | 9.65        | 10.41 |
| E1  | .245     | .320 | 6.22        | 8.13  |
| e   | .100 BSC |      | 2.54 BSC    |       |
| L   | .575     | .625 | 14.61       | 15.88 |
| L1  | .090     | .110 | 2.29        | 2.79  |
| L2  | .040     | .055 | 1.02        | 1.40  |
| L3  | .050     | .070 | 1.27        | 1.78  |
| l4  | 0        | .005 | 0           | 0.13  |

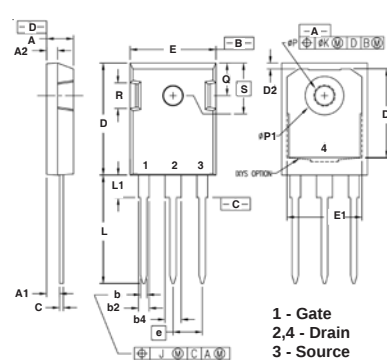
## TO-220 Outline



- Pins: 1 - Gate      2 - Drain  
3 - Source

| SYM | INCHES   |      | MILLIMETERS |       |
|-----|----------|------|-------------|-------|
|     | MIN      | MAX  | MIN         | MAX   |
| A   | .170     | .190 | 4.32        | 4.83  |
| b   | .025     | .040 | 0.64        | 1.02  |
| b1  | .045     | .065 | 1.15        | 1.65  |
| c   | .014     | .022 | 0.35        | 0.56  |
| D   | .580     | .630 | 14.73       | 16.00 |
| E   | .390     | .420 | 9.91        | 10.66 |
| e   | .100 BSC |      | 2.54 BSC    |       |
| F   | .045     | .055 | 1.14        | 1.40  |
| H1  | .230     | .270 | 5.85        | 6.85  |
| J1  | .090     | .110 | 2.29        | 2.79  |
| k   | 0        | .015 | 0           | 0.38  |
| L   | .500     | .550 | 12.70       | 13.97 |
| L1  | .110     | .230 | 2.79        | 5.84  |
| ØP  | .139     | .161 | 3.53        | 4.08  |
| Q   | .100     | .125 | 2.54        | 3.18  |

## TO-247 Outline



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

| Dim. | Millimeter |       | Inches    |       |
|------|------------|-------|-----------|-------|
|      | min        | max   | min       | max   |
| A    | 4.70       | 5.30  | 0.185     | 0.209 |
| A1   | 2.21       | 2.59  | 0.087     | 0.102 |
| A2   | 1.50       | 2.49  | 0.059     | 0.098 |
| b    | 0.99       | 1.40  | 0.039     | 0.055 |
| b2   | 1.65       | 2.39  | 0.065     | 0.094 |
| b4   | 2.59       | 3.43  | 0.102     | 0.135 |
| c    | 0.38       | 0.89  | 0.015     | 0.035 |
| D    | 20.79      | 21.45 | 0.819     | 0.845 |
| D1   | 13.07      | -     | 0.515     | -     |
| D2   | 0.51       | 1.35  | 0.020     | 0.053 |
| E    | 15.48      | 16.24 | 0.610     | 0.640 |
| E1   | 13.45      | -     | 0.53      | -     |
| E2   | 4.31       | 5.48  | 0.170     | 0.216 |
| e    | 5.45 BSC   |       | 0.215 BSC |       |
| L    | 19.80      | 20.30 | 0.078     | 0.800 |
| L1   | -          | 4.49  | -         | 0.177 |
| OP   | 3.55       | 3.65  | 0.140     | 0.144 |
| OP1  | -          | 7.39  | -         | 0.290 |
| Q    | 5.38       | 6.19  | 0.212     | 0.244 |
| S    | 6.14 BSC   |       | 0.242 BSC |       |