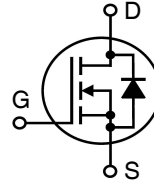


# X2-Class HiPERFET Power MOSFET

**IXFY8N65X2**  
**IXFA8N65X2**  
**IXFP8N65X2**

**$V_{DSS} = 650V$**   
 **$I_{D25} = 8A$**   
 **$R_{DS(on)} \leq 450m\Omega$**

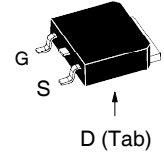
N-Channel Enhancement Mode  
Avalanche Rated



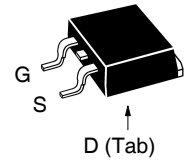
| Symbol        | Test Conditions                                                    | Maximum Ratings   |            |
|---------------|--------------------------------------------------------------------|-------------------|------------|
| $V_{DSS}$     | $T_J = 25^\circ C$ to $150^\circ C$                                | 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          |
| $I_{D25}$     | $T_C = 25^\circ C$                                                 | 8                 | A          |
| $I_{DM}$      | $T_C = 25^\circ C$ , Pulse Width Limited by $T_{JM}$               | 16                | A          |
| $I_A$         | $T_C = 25^\circ C$                                                 | 4                 | A          |
| $E_{AS}$      | $T_C = 25^\circ C$                                                 | 250               | mJ         |
| $dv/dt$       | $I_S \leq I_{DM}$ , $V_{DD} \leq V_{DSS}$ , $T_J \leq 150^\circ C$ | 50                | V/ns       |
| $P_D$         | $T_C = 25^\circ C$                                                 | 150               | 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)                                           | 1.13 / 10         | Nm/lb.in   |
| <b>Weight</b> | 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.                      |
| $BV_{DSS}$   | $V_{GS} = 0V$ , $I_D = 250\mu A$                                      | 650                   |      | V                         |
| $V_{GS(th)}$ | $V_{DS} = V_{GS}$ , $I_D = 250\mu A$                                  | 3.0                   |      | 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>500 $\mu A$ |
| $R_{DS(on)}$ | $V_{GS} = 10V$ , $I_D = 0.5 \cdot I_{D25}$ , Note 1                   |                       |      | 450 m $\Omega$            |

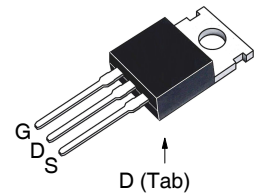
TO-252  
(IXFY)



TO-263  
(IXFA)



TO-220  
(IXFP)



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>( $T_J = 25^\circ\text{C}$ , Unless Otherwise Specified)                                                                         | Characteristic Values                                |      |                         |
|-------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------|------|-------------------------|
|                                     |                                                                                                                                                     | Min.                                                 | Typ. | Max                     |
| $g_{fs}$                            | $V_{DS} = 10\text{V}$ , $I_D = 0.5 \cdot I_{D25}$ , Note 1                                                                                          | 3.6                                                  | 6.0  | S                       |
| $R_{Gi}$                            | Gate Input Resistance                                                                                                                               |                                                      | 5    | $\Omega$                |
| $C_{iss}$                           | $V_{GS} = 0\text{V}$ , $V_{DS} = 25\text{V}$ , $f = 1\text{MHz}$                                                                                    |                                                      | 790  | pF                      |
| $C_{oss}$                           |                                                                                                                                                     |                                                      | 590  | pF                      |
| $C_{rss}$                           |                                                                                                                                                     |                                                      | 2.2  | pF                      |
| <b>Effective Output Capacitance</b> |                                                                                                                                                     |                                                      |      |                         |
| $C_{o(er)}$                         | Energy related                                                                                                                                      | $V_{GS} = 0\text{V}$<br>$V_{DS} = 0.8 \cdot V_{DSS}$ | 42   | pF                      |
| $C_{o(tr)}$                         | Time related                                                                                                                                        |                                                      | 130  | 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>$R_G = 30\Omega$ (External) |                                                      | 17   | ns                      |
| $t_r$                               |                                                                                                                                                     |                                                      | 11   | ns                      |
| $t_{d(off)}$                        |                                                                                                                                                     |                                                      | 29   | ns                      |
| $t_f$                               |                                                                                                                                                     |                                                      | 15   | ns                      |
| $Q_{g(on)}$                         | $V_{GS} = 10\text{V}$ , $V_{DS} = 0.5 \cdot V_{DSS}$ , $I_D = 0.5 \cdot I_{D25}$                                                                    |                                                      | 11.0 | nC                      |
| $Q_{gs}$                            |                                                                                                                                                     |                                                      | 2.3  | nC                      |
| $Q_{gd}$                            |                                                                                                                                                     |                                                      | 6.2  | nC                      |
| $R_{thJC}$                          | TO-220                                                                                                                                              |                                                      |      | 0.83 $^\circ\text{C/W}$ |
| $R_{thCS}$                          |                                                                                                                                                     |                                                      | 0.50 | $^\circ\text{C/W}$      |

#### Source-Drain Diode

| Symbol   | Test Conditions<br>( $T_J = 25^\circ\text{C}$ , Unless Otherwise Specified)   | Characteristic Values |      |       |
|----------|-------------------------------------------------------------------------------|-----------------------|------|-------|
|          |                                                                               | Min.                  | Typ. | Max   |
| $I_S$    | $V_{GS} = 0\text{V}$                                                          |                       |      | 8 A   |
| $I_{SM}$ | Repetitive, Pulse Width Limited by $T_{JM}$                                   |                       |      | 32 A  |
| $V_{SD}$ | $I_F = I_S$ , $V_{GS} = 0\text{V}$ , Note 1                                   |                       |      | 1.4 V |
| $t_{rr}$ | $I_F = 4\text{A}$ , $-di/dt = 100\text{A}/\mu\text{s}$<br>$V_R = 100\text{V}$ |                       | 105  | ns    |
| $Q_{RM}$ |                                                                               |                       | 460  | nC    |
| $I_{RM}$ |                                                                               |                       | 8.7  | 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   | 6,771,478B2 | 6,771,478B2 | 7,071,537   |             |

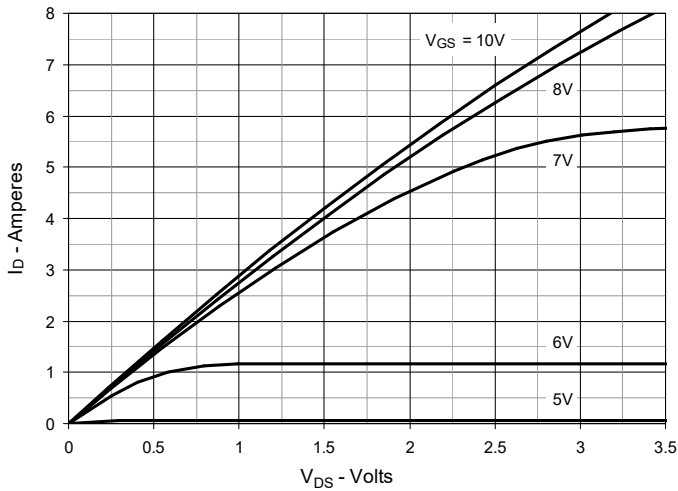
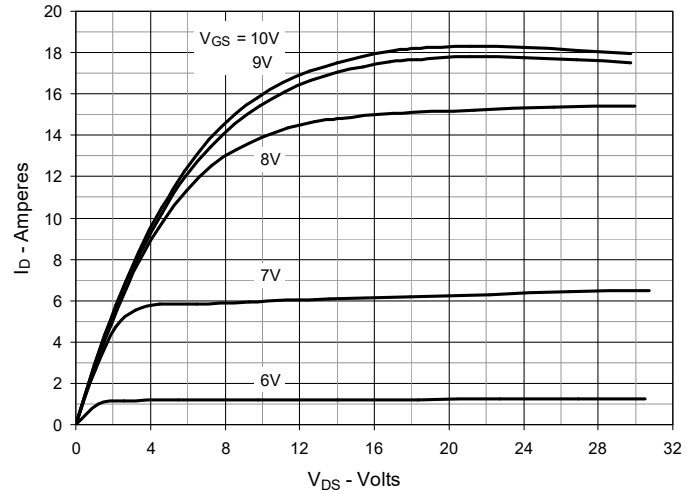
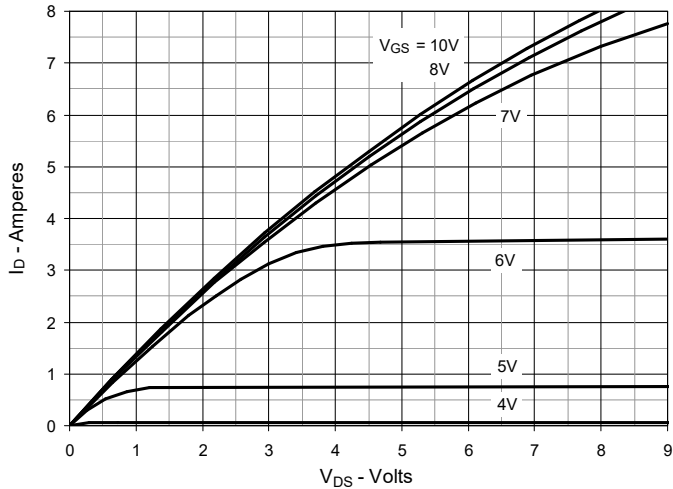
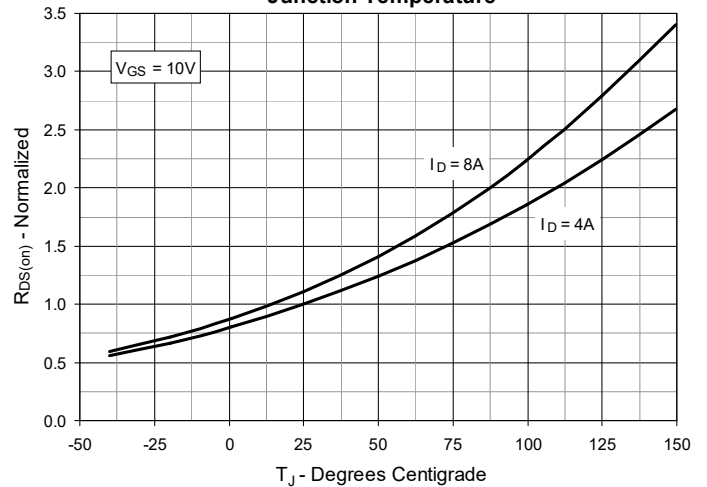
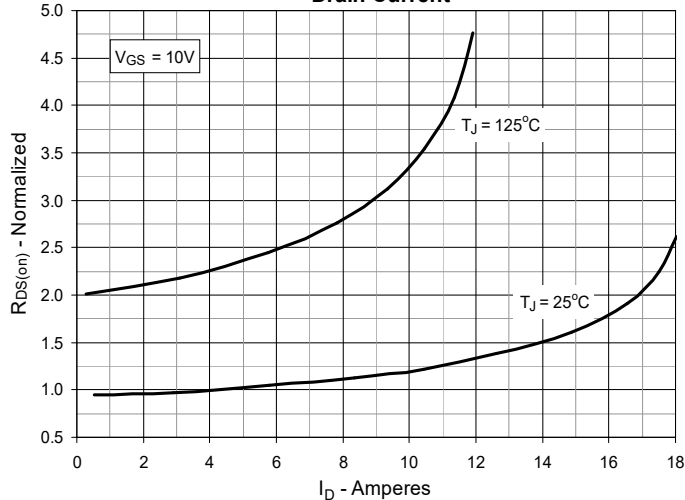
Fig. 1. Output Characteristics @  $T_J = 25^\circ\text{C}$ 

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  $I_D = 4\text{A}$  Value vs. Junction Temperature

Fig. 5.  $R_{DS(on)}$  Normalized to  $I_D = 4\text{A}$  Value vs. Drain Current


Fig. 6. Maximum Drain Current vs. Case Temperature

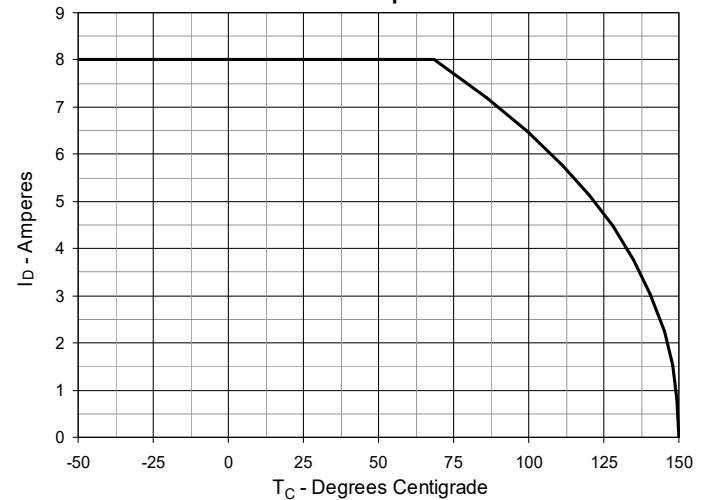


Fig. 7. Input Admittance

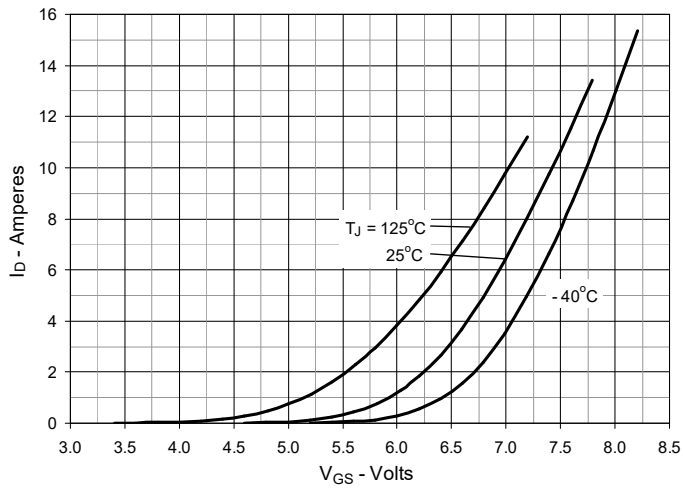


Fig. 8. Transconductance

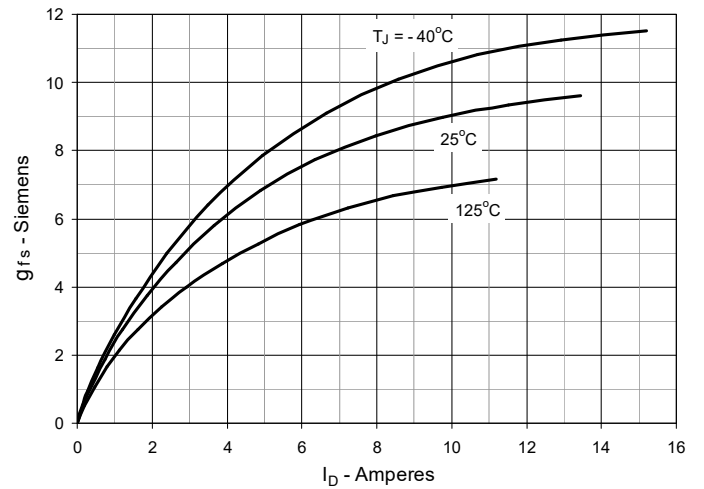


Fig. 9. Forward Voltage Drop of Intrinsic Diode

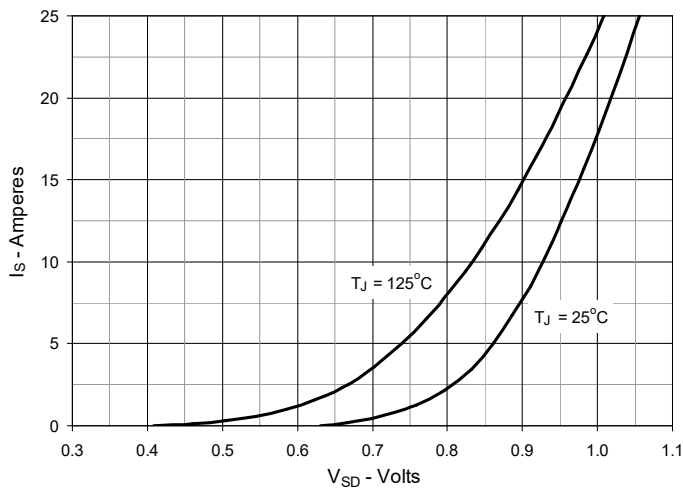


Fig. 10. Gate Charge

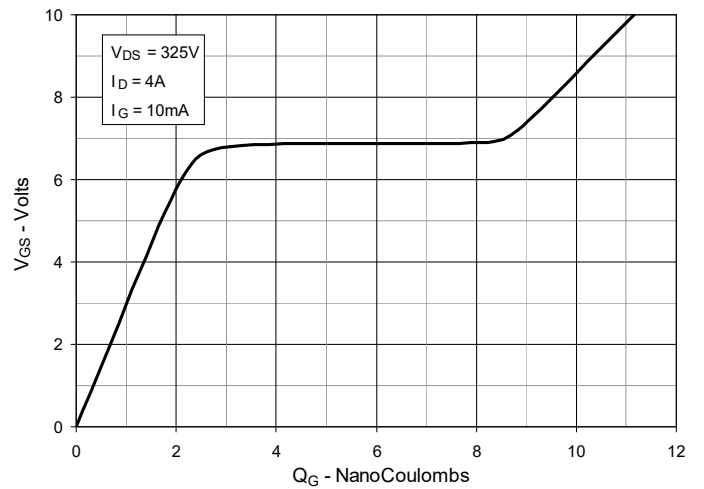


Fig. 11. Capacitance

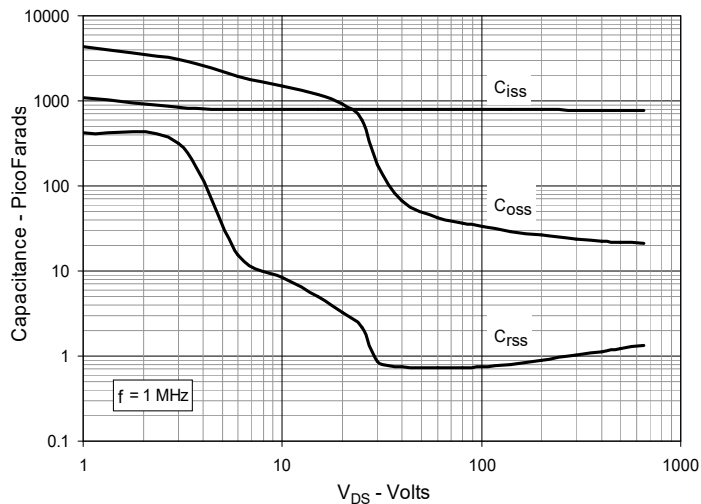


Fig. 12. Output Capacitance Stored Energy

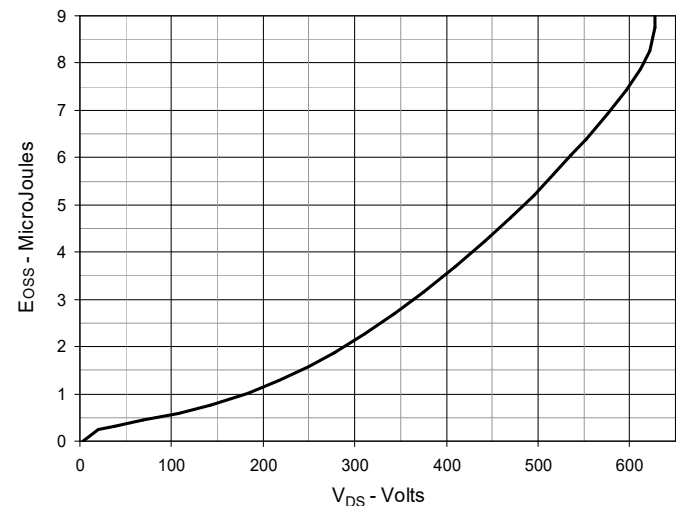


Fig. 13. Forward-Bias Safe Operating Area

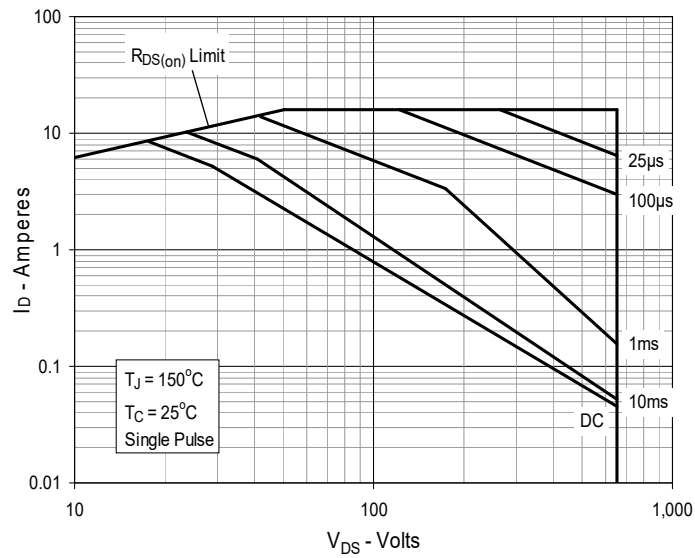
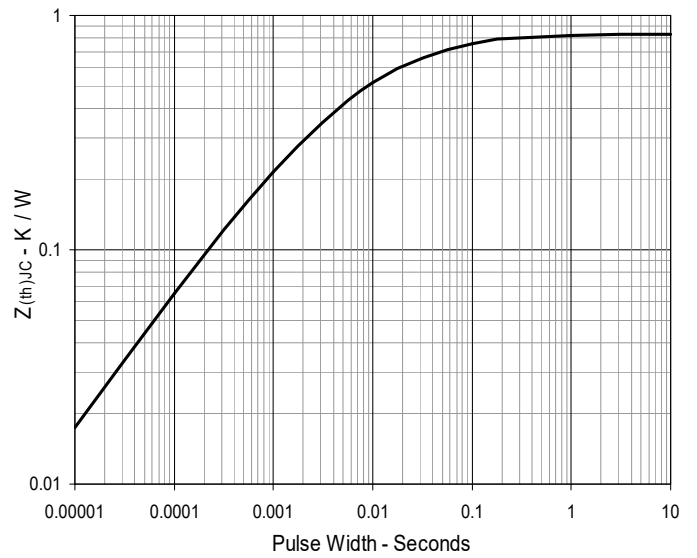
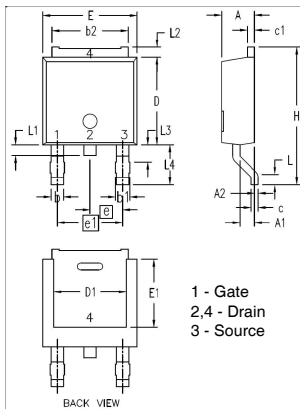


Fig. 14. Maximum Transient Thermal Impedance

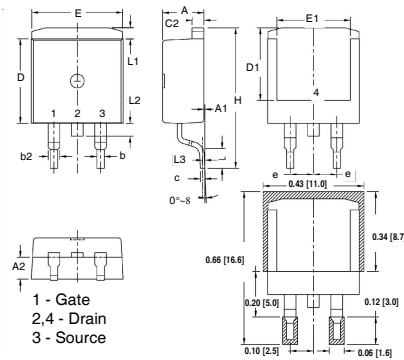


### TO-252 Outline



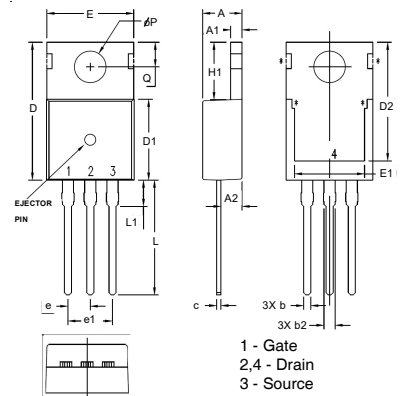
| SYM | INCHES   |      | MILLIMETERS |       |
|-----|----------|------|-------------|-------|
|     | MIN      | MAX  | MIN         | MAX   |
| A   | .086     | .094 | 2.19        | 2.38  |
| A1  | .035     | .045 | 0.89        | 1.14  |
| A2  | 0        | .004 | 0           | 0.10  |
| b   | .025     | .035 | 0.64        | 0.89  |
| b1  | .030     | .045 | 0.76        | 1.14  |
| b2  | .205     | .215 | 5.21        | 5.46  |
| c   | .018     | .023 | 0.46        | 0.58  |
| c1  | .018     | .023 | 0.46        | 0.58  |
| D   | .235     | .245 | 5.97        | 6.22  |
| D1  | .170     | .205 | 4.32        | 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   | .020     | .040 | 0.51        | 1.02  |
| L1  | .025     | .040 | 0.64        | 1.02  |
| L2  | .024     | .036 | 0.60        | 0.90  |
| L3  | .045     | .060 | 1.15        | 1.52  |
| L4  | .100     | .115 | 2.54        | 2.92  |

### 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  |

