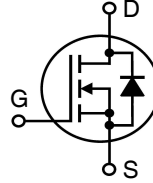


# Q3-Class HiperFET™ Power MOSFET

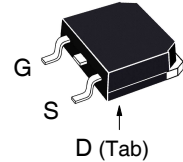
## IXFT50N30Q3 IXFH50N30Q3

$V_{DSS} = 300V$   
 $I_{D25} = 50A$   
 $R_{DS(on)} \leq 80m\Omega$

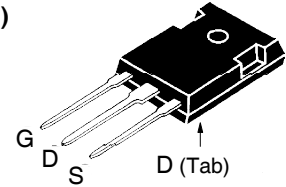
N-Channel Enhancement Mode  
Avalanche Rated  
Fast Intrinsic Rectifier



TO-268  
(IXFT)



TO-247  
(IXFH)



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

| Symbol     | Test Conditions                                                    | Maximum Ratings |            |
|------------|--------------------------------------------------------------------|-----------------|------------|
| $V_{DSS}$  | $T_J = 25^\circ C$ to $150^\circ C$                                | 300             | V          |
| $V_{DGR}$  | $T_J = 25^\circ C$ to $150^\circ C$ , $R_{GS} = 1M\Omega$          | 300             | V          |
| $V_{GSS}$  | Continuous                                                         | $\pm 20$        | V          |
| $V_{GSM}$  | Transient                                                          | $\pm 30$        | V          |
| $I_{D25}$  | $T_C = 25^\circ C$                                                 | 50              | A          |
| $I_{DM}$   | $T_C = 25^\circ C$ , Pulse Width Limited by $T_{JM}$               | 150             | A          |
| $I_A$      | $T_C = 25^\circ C$                                                 | 50              | A          |
| $E_{AS}$   | $T_C = 25^\circ C$                                                 | 1.5             | J          |
| $dv/dt$    | $I_S \leq I_{DM}$ , $V_{DD} \leq V_{DSS}$ , $T_J \leq 150^\circ C$ | 50              | V/ns       |
| $P_D$      | $T_C = 25^\circ C$                                                 | 690             | 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                                                             | 4.0             | g          |
|            | TO-247                                                             | 6.0             | g          |

| Symbol       | Test Conditions<br>( $T_J = 25^\circ C$ Unless Otherwise Specified) | Characteristic Values |      |                           |
|--------------|---------------------------------------------------------------------|-----------------------|------|---------------------------|
|              |                                                                     | Min.                  | Typ. | Max.                      |
| $BV_{DSS}$   | $V_{GS} = 0V$ , $I_D = 1mA$                                         | 300                   |      | V                         |
| $V_{GS(th)}$ | $V_{DS} = V_{GS}$ , $I_D = 4mA$                                     | 3.5                   |      | 6.5 V                     |
| $I_{GSS}$    | $V_{GS} = \pm 20V$ , $V_{DS} = 0V$                                  |                       |      | $\pm 100$ 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                 |                       |      | 80 m $\Omega$             |

### Features

- Low Intrinsic Gate Resistance
- International Standard Packages
- Low Package Inductance
- Fast Intrinsic Rectifier
- Low  $R_{DS(on)}$  and  $Q_G$

### Advantages

- High Power Density
- Easy to Mount
- Space Savings

### Applications

- DC-DC Converters
- Battery Chargers
- Switch-Mode and Resonant-Mode Power Supplies
- DC Choppers
- Temperature and Lighting Controls

| Symbol       | Test Conditions<br>( $T_J = 25^\circ\text{C}$ Unless Otherwise Specified)                                                                    | Characteristic Values |      |                         |
|--------------|----------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|------|-------------------------|
|              |                                                                                                                                              | Min.                  | Typ. | Max.                    |
| $g_{fs}$     | $V_{DS} = 20\text{V}, I_D = 0.5 \cdot I_{D25}$ , Note 1                                                                                      | 19                    | 29   | S                       |
| $C_{iss}$    | $V_{GS} = 0\text{V}, V_{DS} = 25\text{V}, f = 1\text{MHz}$                                                                                   |                       | 3160 | pF                      |
| $C_{oss}$    |                                                                                                                                              |                       | 600  | pF                      |
| $C_{rss}$    |                                                                                                                                              |                       | 60   | pF                      |
| $R_{Gi}$     | Gate Input Resistance                                                                                                                        |                       | 0.17 | $\Omega$                |
| $t_{d(on)}$  | <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) |                       | 14   | ns                      |
| $t_r$        |                                                                                                                                              |                       | 15   | ns                      |
| $t_{d(off)}$ |                                                                                                                                              |                       | 24   | ns                      |
| $t_f$        |                                                                                                                                              |                       | 9    | ns                      |
| $Q_{g(on)}$  | $V_{GS} = 10\text{V}, V_{DS} = 0.5 \cdot V_{DSS}, I_D = 0.5 \cdot I_{D25}$                                                                   |                       | 65   | nC                      |
| $Q_{gs}$     |                                                                                                                                              |                       | 22   | nC                      |
| $Q_{gd}$     |                                                                                                                                              |                       | 32   | nC                      |
| $R_{thJC}$   | TO-247                                                                                                                                       |                       |      | 0.18 $^\circ\text{C/W}$ |
| $R_{thCS}$   |                                                                                                                                              |                       | 0.21 | $^\circ\text{C/W}$      |

## Source-Drain Diode

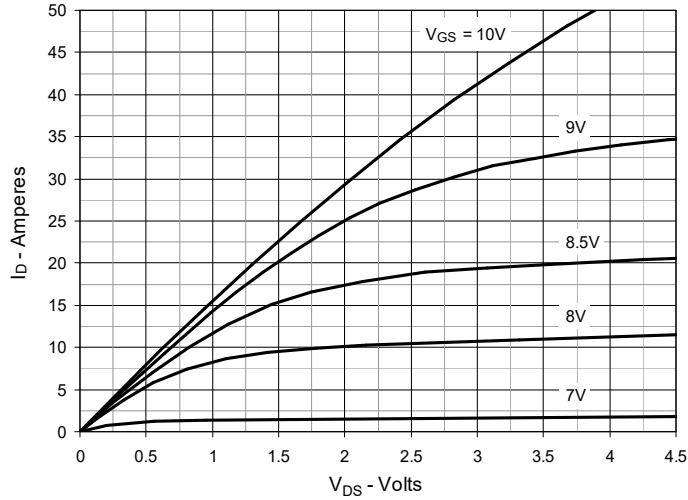
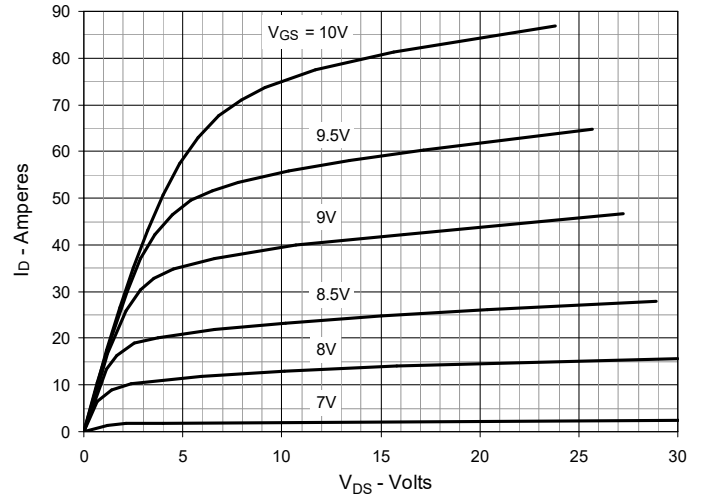
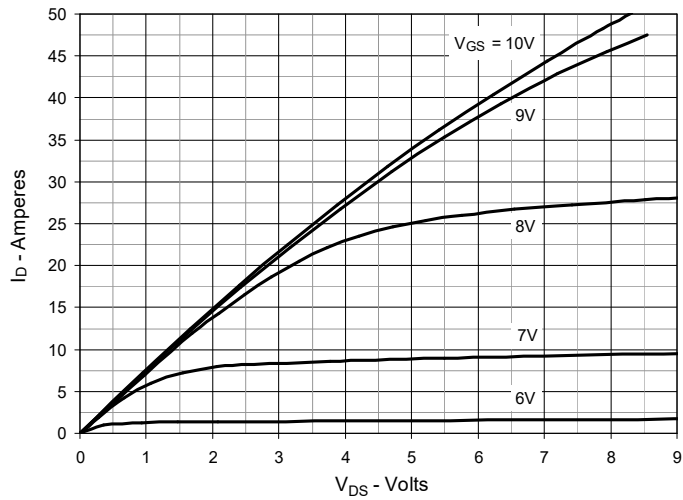
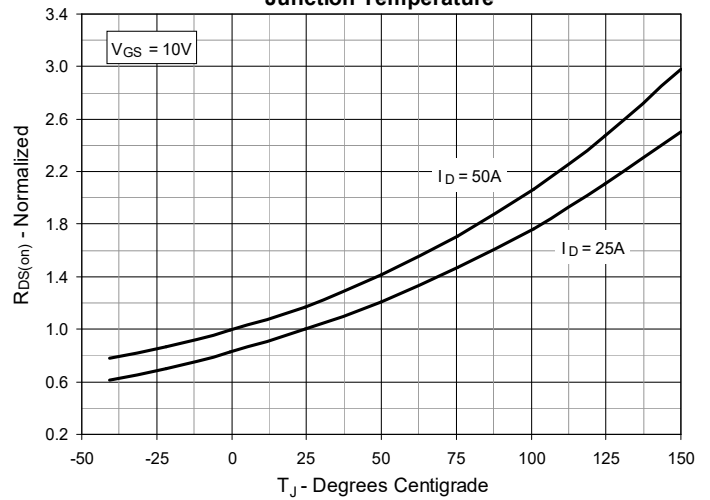
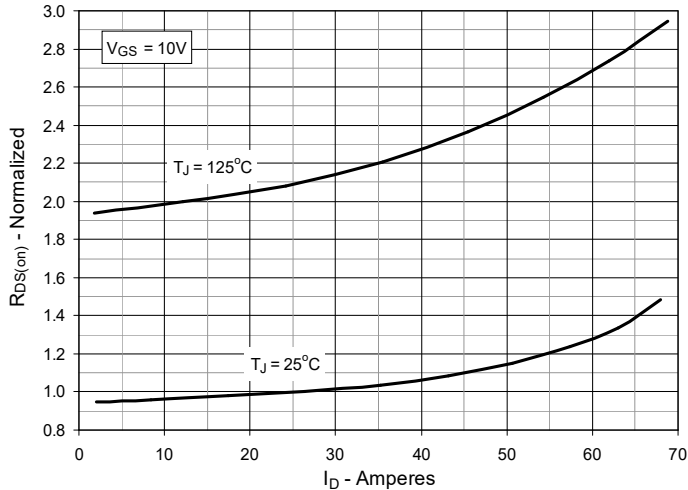
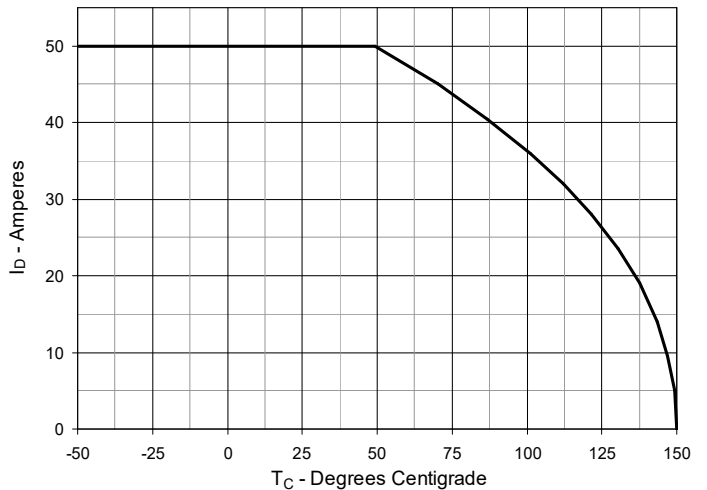
| Symbol   | Test Conditions<br>( $T_J = 25^\circ\text{C}$ Unless Otherwise Specified)                       | Characteristic Values |      |        |
|----------|-------------------------------------------------------------------------------------------------|-----------------------|------|--------|
|          |                                                                                                 | Min.                  | Typ. | Max.   |
| $I_S$    | $V_{GS} = 0\text{V}$                                                                            |                       |      | 50 A   |
| $I_{SM}$ | Repetitive, Pulse Width Limited by $T_{JM}$                                                     |                       |      | 200 A  |
| $V_{SD}$ | $I_F = I_S, V_{GS} = 0\text{V}$ , Note 1                                                        |                       |      | 1.4 V  |
| $t_{rr}$ | $I_F = 25\text{A}, -di/dt = 100\text{A}/\mu\text{s}$<br>$V_R = 100\text{V}, V_{GS} = 0\text{V}$ |                       |      | 250 ns |
| $I_{RM}$ |                                                                                                 |                       | 11.8 | A      |
| $Q_{RM}$ |                                                                                                 |                       | 940  | nC     |

Note 1. Pulse test,  $t \leq 300\mu\text{s}$ , duty cycle,  $d \leq 2\%$ .

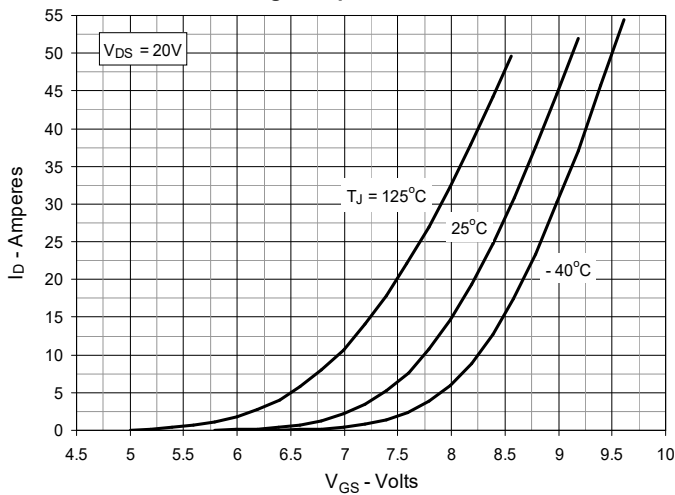
IXYS Reserves the Right to Change Limits, Test Conditions, and Dimensions.

IXYS MOSFETs and IGBTs are covered by one or more of the following U.S. patents:

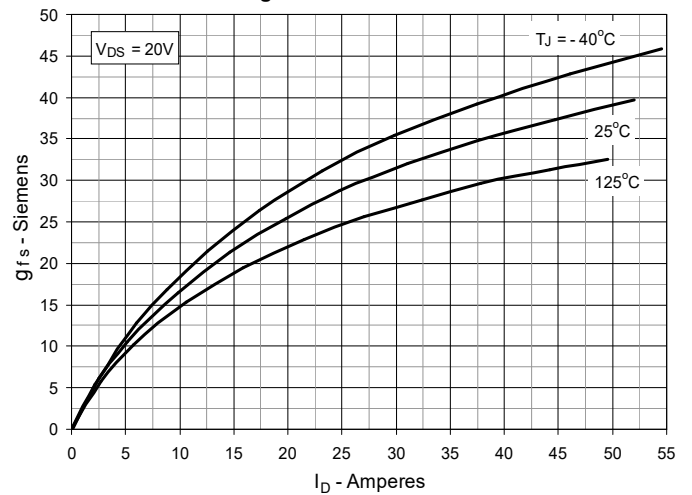
|           |           |           |           |              |              |              |              |              |             |
|-----------|-----------|-----------|-----------|--------------|--------------|--------------|--------------|--------------|-------------|
| 4,835,592 | 4,931,844 | 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  $I_D = 25A$  Value vs. Junction Temperature**

**Fig. 5.  $R_{DS(on)}$  Normalized to  $I_D = 25A$  Value vs. Drain Current**

**Fig. 6. Maximum Drain Current vs. Case Temperature**


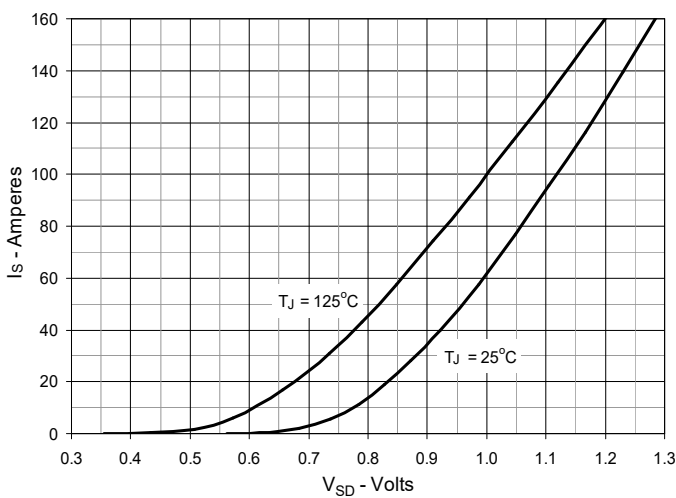
**Fig. 7. Input Admittance**



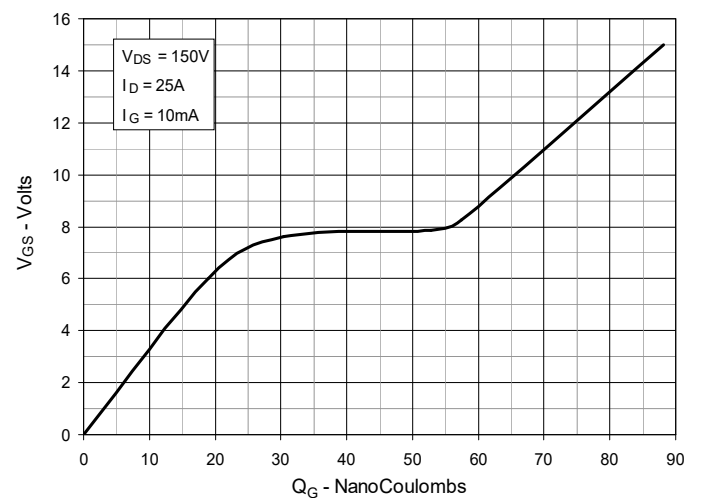
**Fig. 8. Transconductance**



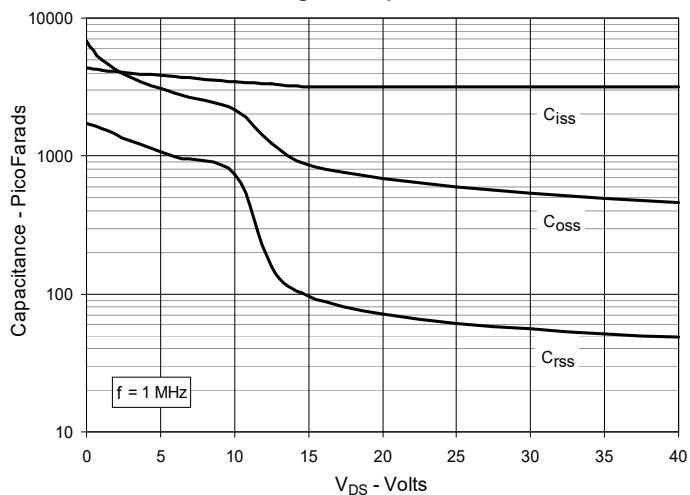
**Fig. 9. Forward Voltage Drop of Intrinsic Diode**



**Fig. 10. Gate Charge**



**Fig. 11. Capacitance**



**Fig. 12. Forward-Bias Safe Operating Area**

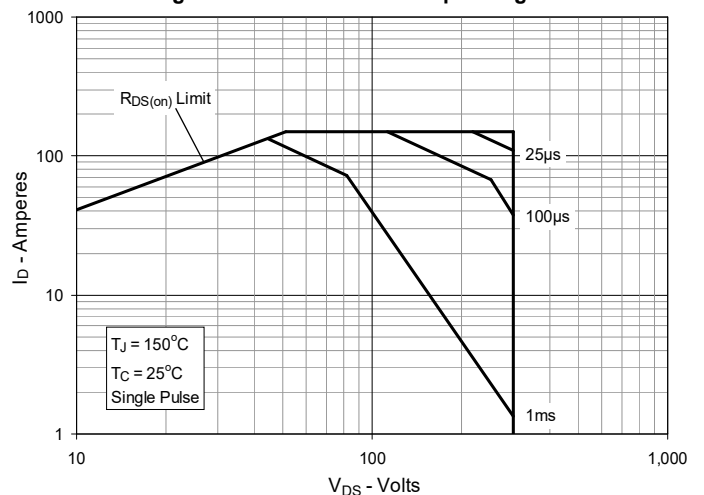
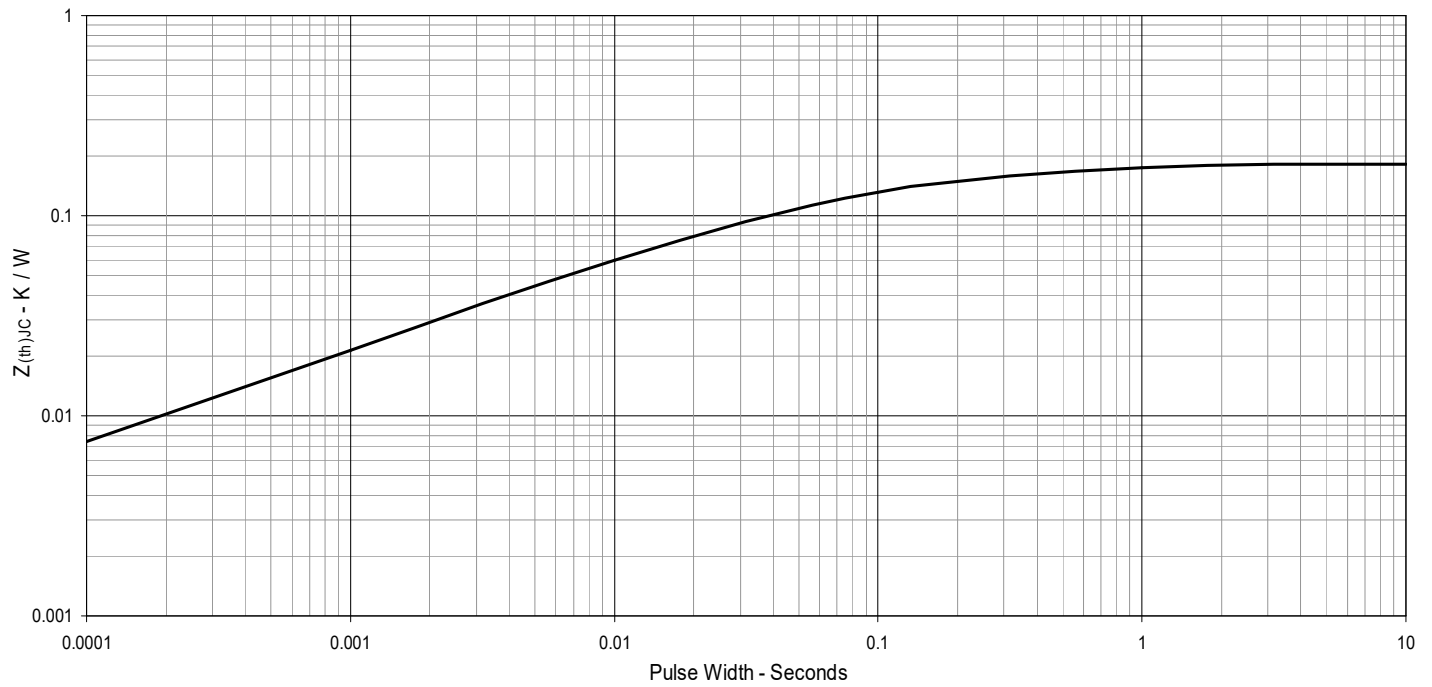
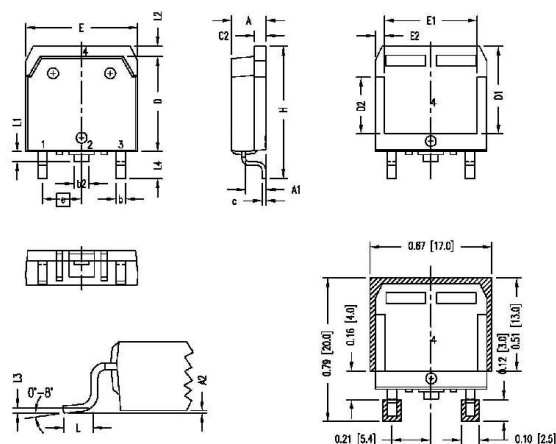


Fig. 13. Maximum Transient Thermal Impedance



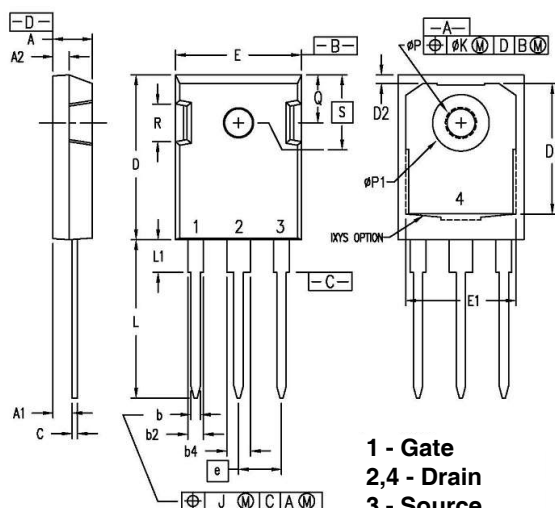
**TO-268 Outline**


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

RECOMMENDED MINIMUM FOOT PRINT FOR SMD

| SYMBOL | 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 |
| D2     | .320     | .335 | 8.13        | 8.50  |
| E      | .624     | .632 | 15.85       | 16.05 |
| E1     | .524     | .535 | 13.30       | 13.60 |
| E2     | .045     | .055 | 1.14        | 1.39  |
| 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  |

NOTE: ALL METAL SURFACE ARE MATTE PURE TIN PLATED EXCEPT TERM AREA.  
 Pb PLATING THICKNESS (4 - 20  $\mu$ m)

**TO-247 Outline**


**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  |
| $\phi$ P  | .140     | .144 | 3.55        | 3.65  |
| $\phi$ P1 | .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    |       |

NOTE: This drawing will meet all dimensions  
 requirement of JEDEC outlines TO-247 AD (R-PSIP-F3)

