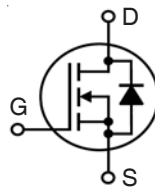


## X-Class HiPerFET™ Power MOSFET

## IXFK52N100X IXFX52N100X

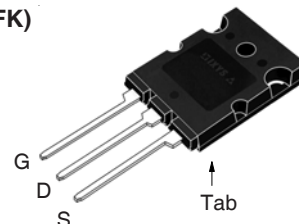
$V_{DSS} = 1000V$   
 $I_{D25} = 52A$   
 $R_{DS(on)} \leq 125m\Omega$

N-Channel Enhancement Mode  
Avalanche Rated

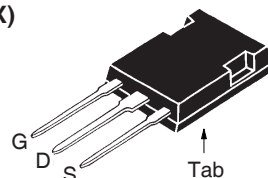


| Symbol     | Test Conditions                                                    | Maximum Ratings   |            |
|------------|--------------------------------------------------------------------|-------------------|------------|
| $V_{DSS}$  | $T_J = 25^\circ C$ to $150^\circ C$                                | 1000              | V          |
| $V_{DGR}$  | $T_J = 25^\circ C$ to $150^\circ C$ , $R_{GS} = 1M\Omega$          | 1000              | V          |
| $V_{GSS}$  | Continuous                                                         | $\pm 30$          | V          |
| $V_{GSM}$  | Transient                                                          | $\pm 40$          | V          |
| $I_{D25}$  | $T_C = 25^\circ C$                                                 | 52                | A          |
| $I_{DM}$   | $T_C = 25^\circ C$ , Pulse Width Limited by $T_{JM}$               | 100               | A          |
| $I_A$      | $T_C = 25^\circ C$                                                 | 10                | A          |
| $E_{AS}$   | $T_C = 25^\circ C$                                                 | 3                 | J          |
| $P_D$      | $T_C = 25^\circ C$                                                 | 1250              | W          |
| $dv/dt$    | $I_S \leq I_{DM}$ , $V_{DD} \leq V_{DSS}$ , $T_J \leq 150^\circ C$ | 50                | V/ns       |
| $T_J$      |                                                                    | -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-264P)                                          | 1.13/10           | Nm/lb.in   |
| $F_C$      | Mounting Force (PLUS247)                                           | 20..120 / 4.5..27 | N/lb       |
| Weight     | TO-264P                                                            | 10                | g          |
|            | PLUS247                                                            | 6                 | g          |

TO-264P  
(IXFK)



PLUS247  
(IXFX)



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

### Features

- International Standard Packages
- Low  $Q_G$
- 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>( $T_J = 25^\circ C$ Unless Otherwise Specified) | Characteristic Values |      |                    |
|--------------|---------------------------------------------------------------------|-----------------------|------|--------------------|
|              |                                                                     | Min.                  | Typ. | Max.               |
| $BV_{DSS}$   | $V_{GS} = 0V$ , $I_D = 1mA$                                         | 1000                  |      | V                  |
| $V_{GS(th)}$ | $V_{DS} = V_{GS}$ , $I_D = 4mA$                                     | 3.5                   |      | 6.0 V              |
| $I_{GSS}$    | $V_{GS} = \pm 30V$ , $V_{DS} = 0V$                                  |                       |      | $\pm 100$ nA       |
| $I_{DSS}$    | $V_{DS} = V_{DSS}$ , $V_{GS} = 0V$<br>$T_J = 125^\circ C$           |                       |      | 50 $\mu A$<br>5 mA |
| $R_{DS(on)}$ | $V_{GS} = 10V$ , $I_D = 0.5 \cdot I_{D25}$ , Note 1                 |                       |      | 125 m $\Omega$     |

| 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                                                                                         | 23                                                   | 37   | S                         |
| $R_{Gi}$                            | Gate Input Resistance                                                                                                                              |                                                      | 0.5  | $\Omega$                  |
| $C_{iss}$                           | $V_{GS} = 0\text{V}$ , $V_{DS} = 25\text{V}$ , $f = 1\text{MHz}$                                                                                   |                                                      | 6725 | pF                        |
| $C_{oss}$                           |                                                                                                                                                    |                                                      | 1620 | pF                        |
| $C_{rss}$                           |                                                                                                                                                    |                                                      | 123  | pF                        |
| <b>Effective Output Capacitance</b> |                                                                                                                                                    |                                                      |      |                           |
| $C_{o(er)}$                         | Energy related                                                                                                                                     | $V_{GS} = 0\text{V}$<br>$V_{DS} = 0.8 \cdot V_{DSS}$ | 220  | pF                        |
| $C_{o(tr)}$                         | Time related                                                                                                                                       |                                                      | 1070 | 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>$R_G = 1\Omega$ (External) |                                                      | 34   | ns                        |
| $t_r$                               |                                                                                                                                                    |                                                      | 13   | ns                        |
| $t_{d(off)}$                        |                                                                                                                                                    |                                                      | 107  | ns                        |
| $t_f$                               |                                                                                                                                                    |                                                      | 9    | ns                        |
| $Q_{g(on)}$                         | $V_{GS} = 10\text{V}$ , $V_{DS} = 0.5 \cdot V_{DSS}$ , $I_D = 0.5 \cdot I_{D25}$                                                                   |                                                      | 245  | nC                        |
| $Q_{gs}$                            |                                                                                                                                                    |                                                      | 53   | nC                        |
| $Q_{gd}$                            |                                                                                                                                                    |                                                      | 125  | nC                        |
| $R_{thJC}$                          |                                                                                                                                                    |                                                      |      | 0.10 $^{\circ}\text{C/W}$ |
| $R_{thCS}$                          |                                                                                                                                                    | 0.15                                                 |      | $^{\circ}\text{C/W}$      |

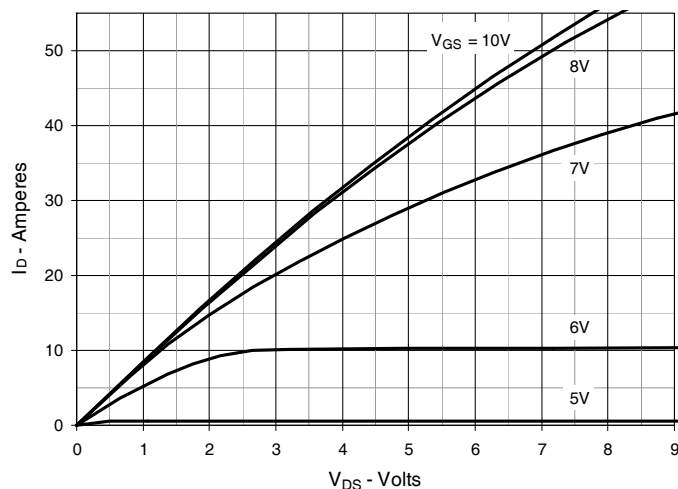
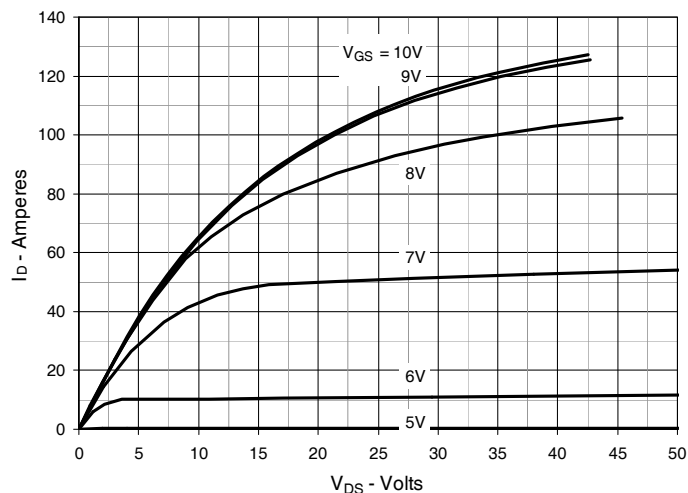
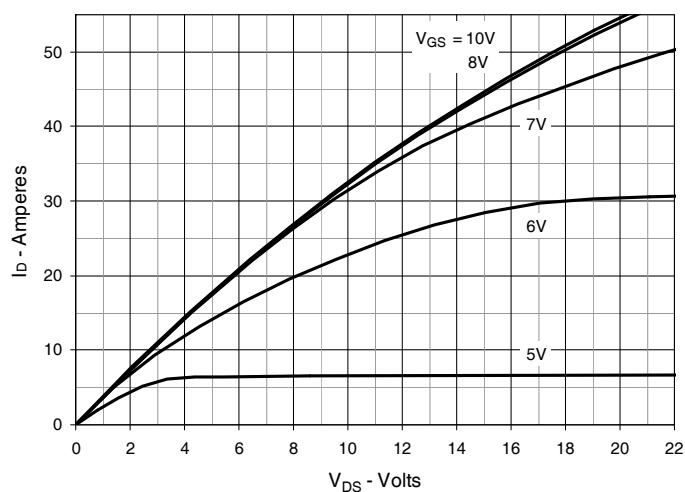
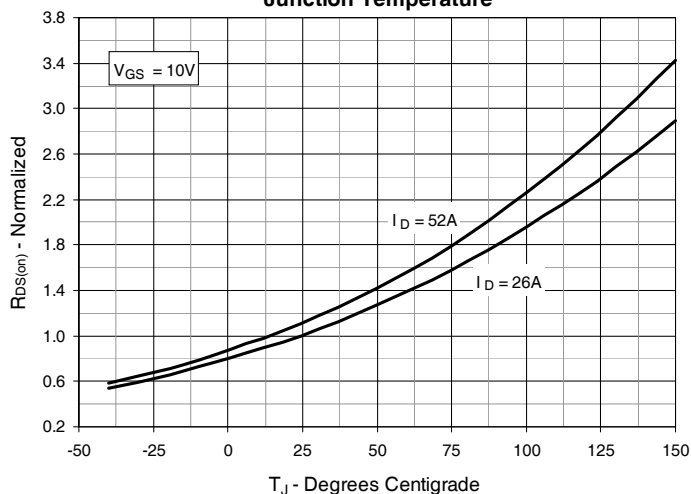
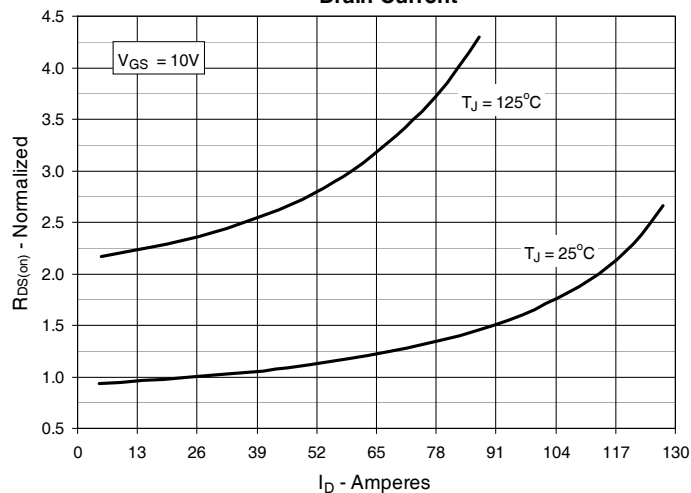
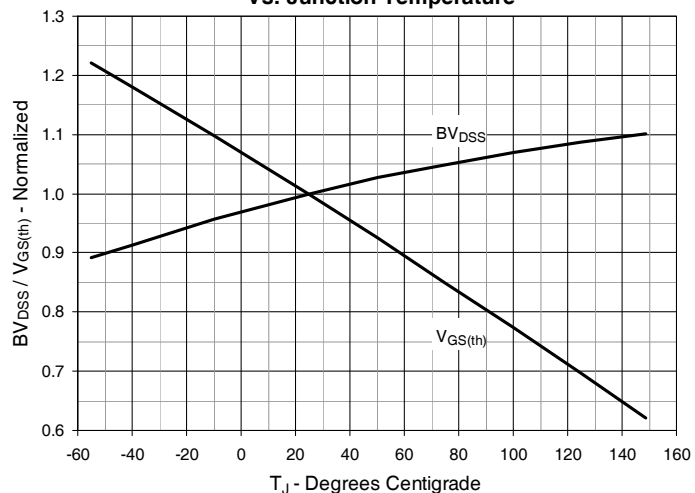
## Source-Drain Diode

| Symbol   | Test Conditions<br>( $T_J = 25^\circ\text{C}$ , Unless Otherwise Specified)                           | Characteristic Values |      |               |
|----------|-------------------------------------------------------------------------------------------------------|-----------------------|------|---------------|
|          |                                                                                                       | Min.                  | Typ. | Max.          |
| $I_S$    | $V_{GS} = 0\text{V}$                                                                                  |                       |      | 52 A          |
| $I_{SM}$ | Repetitive, Pulse Width Limited by $T_{JM}$                                                           |                       |      | 208 A         |
| $V_{SD}$ | $I_F = I_S$ , $V_{GS} = 0\text{V}$ , Note 1                                                           |                       |      | 1.4 V         |
| $t_{rr}$ | $I_F = 26\text{A}$ , $-di/dt = 100\text{A}/\mu\text{s}$<br>$V_R = 100\text{V}$ , $V_{GS} = 0\text{V}$ |                       | 260  | ns            |
| $Q_{RM}$ |                                                                                                       |                       | 2.7  | $\mu\text{C}$ |
| $I_{RM}$ |                                                                                                       |                       | 20.8 | A             |

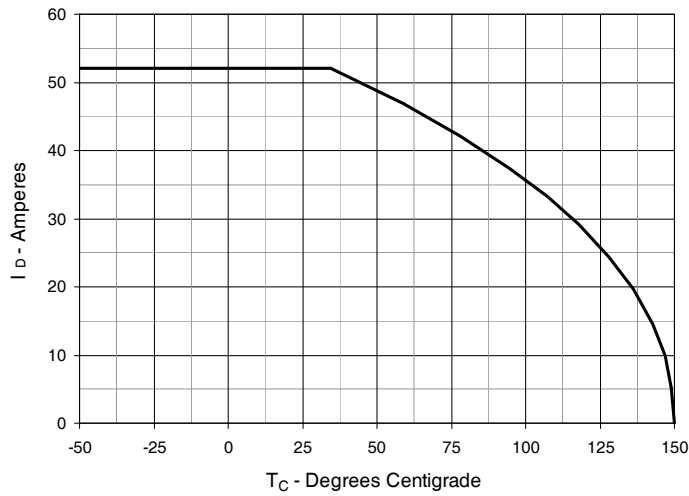
Note 1. Pulse test,  $t \leq 300\mu\text{s}$ , duty cycle,  $d \leq 2\%$ .

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

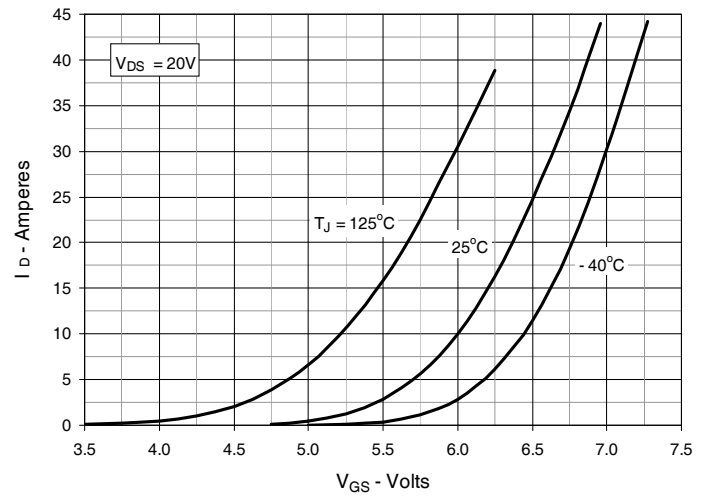
|                                                                                  |           |           |           |           |              |              |              |              |              |             |
|----------------------------------------------------------------------------------|-----------|-----------|-----------|-----------|--------------|--------------|--------------|--------------|--------------|-------------|
| 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    | 6,404,065 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  $I_D = 26A$  Value vs. Junction Temperature**

**Fig. 5.  $R_{DS(on)}$  Normalized to  $I_D = 26A$  Value vs. Drain Current**

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


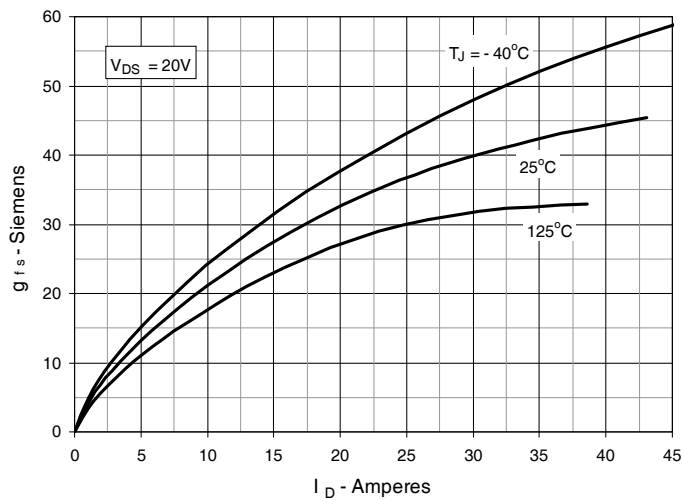
**Fig. 7. Maximum Drain Current vs. Case Temperature**



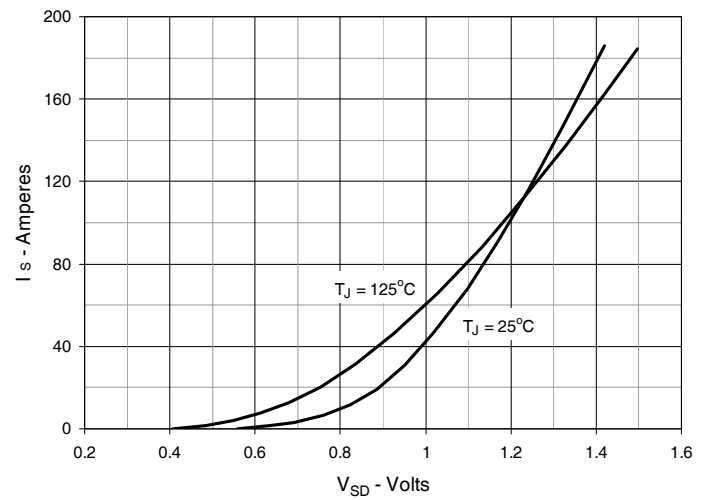
**Fig. 8. Input Admittance**



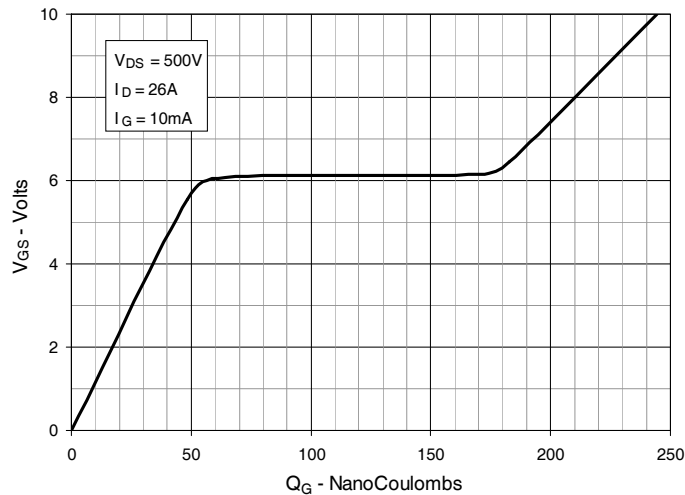
**Fig. 9. Transconductance**



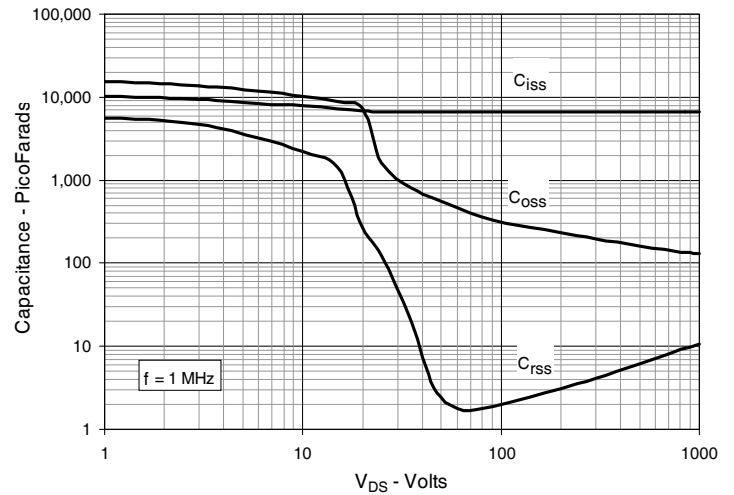
**Fig. 10. Forward Voltage Drop of Intrinsic Diode**



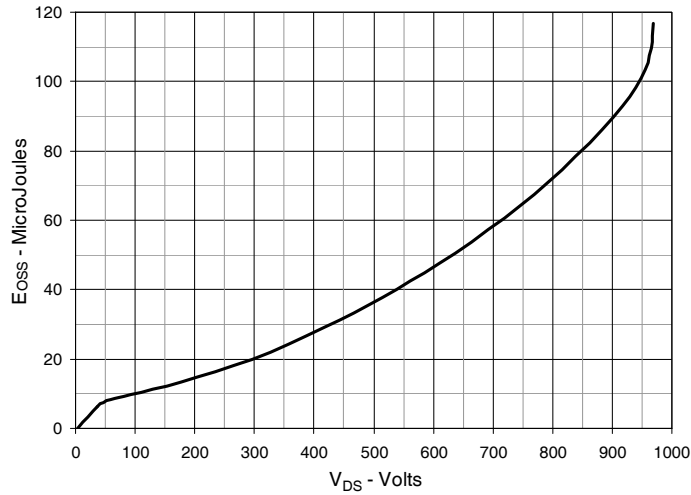
**Fig. 11. Gate Charge**



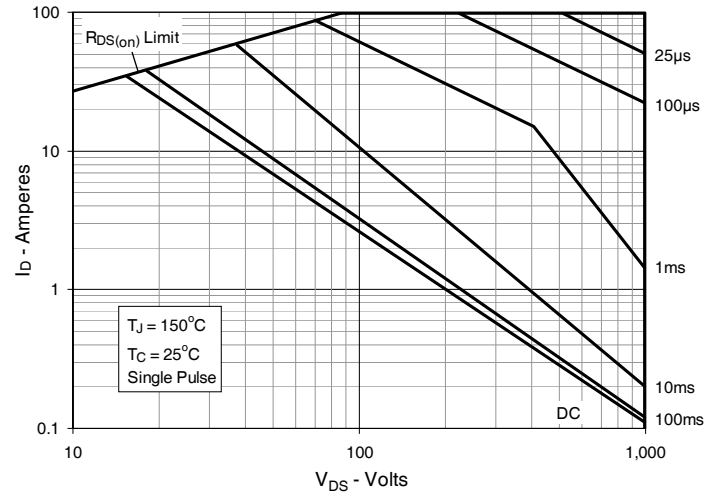
**Fig. 12. Capacitance**



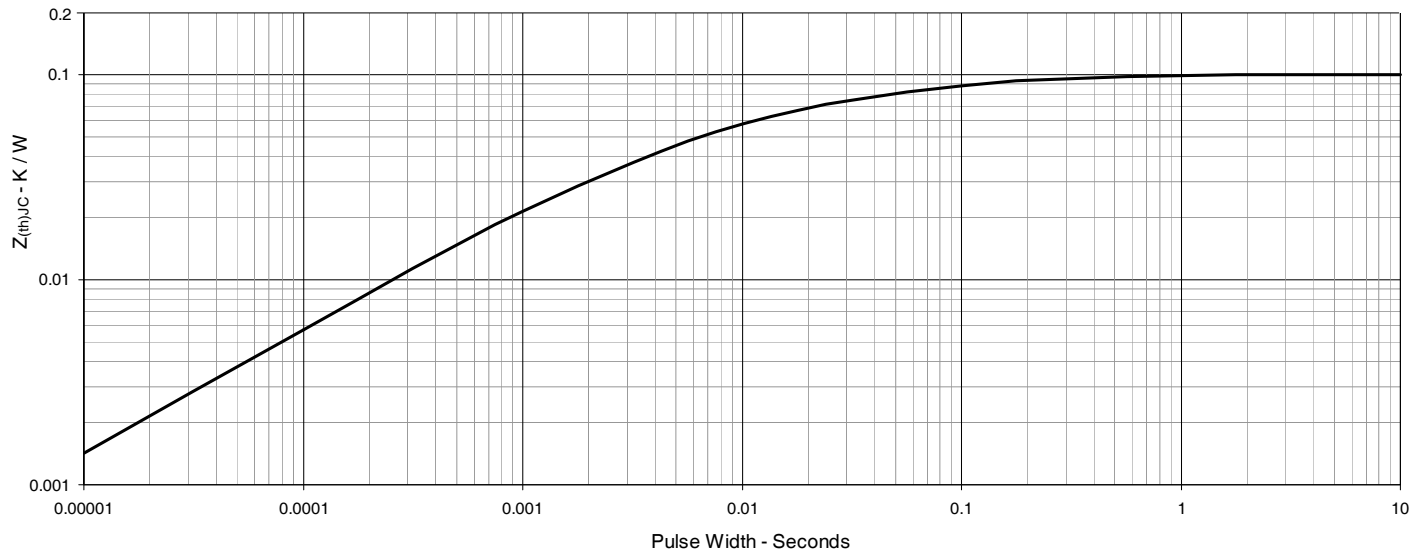
**Fig. 13. Output Capacitance Stored Energy**



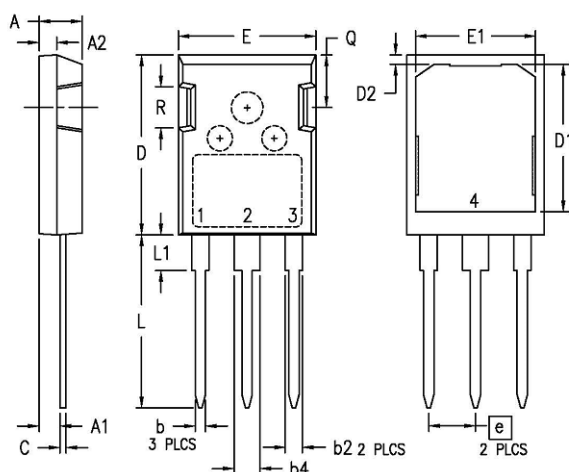
**Fig. 14. Forward-Bias Safe Operating Area**



**Fig. 15. Maximum Transient Thermal Impedance**



## PLUS247 Outline

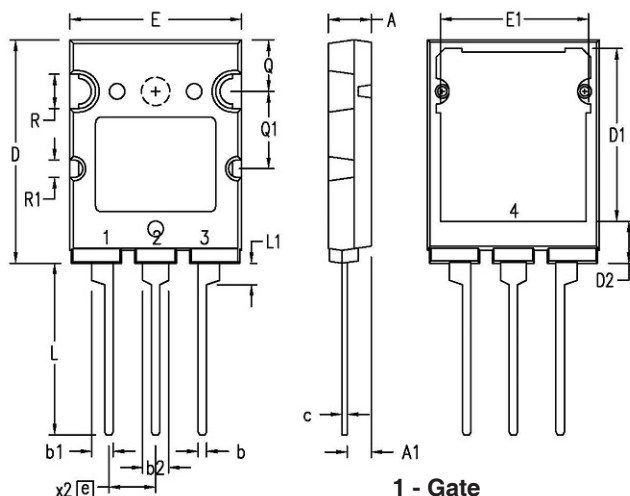


| SYM | INCHES   |      | MILLIMETERS |       |
|-----|----------|------|-------------|-------|
|     | MIN      | MAX  | MIN         | MAX   |
| A   | .190     | .205 | 4.83        | 5.21  |
| A1  | .090     | .100 | 2.29        | 2.54  |
| A2  | .075     | .085 | 1.91        | 2.16  |
| b   | .045     | .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  | .520     | .560 | 13.08       | 14.22 |
| e   | .215 BSC |      | 5.45 BSC    |       |
| L   | .780     | .810 | 19.81       | 20.57 |
| L1  | .150     | .170 | 3.81        | 4.32  |
| Q   | .220     | .244 | 5.59        | 6.20  |
| R   | .170     | .190 | 4.32        | 4.83  |

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

NOTE: 1. This drawing will meet all dimensions requirement of JEDEC outline TO-247 AD (R-PSIP-F3) except screw mounting hole.  
2. Pin #2 is connected to the bottom heatsink (#4).  
3. Lead finish - One of the following depending on the packaging plants.  
3.1 Matte pure tin plating on the leads and back heatsink.  
3.2 Pb free solder dip on the leads and pre Ni plated back heatsink.

## TO-264P Outline



| SYM | INCHES   |       | MILLIMETERS |       |
|-----|----------|-------|-------------|-------|
|     | MIN      | MAX   | MIN         | MAX   |
| A   | .185     | .209  | 4.70        | 5.30  |
| A1  | .102     | .118  | 2.60        | 3.00  |
| b   | .035     | .049  | 0.90        | 1.25  |
| b1  | .091     | .106  | 2.30        | 2.70  |
| b2  | .110     | .126  | 2.80        | 3.20  |
| c   | .020     | .033  | 0.50        | 0.85  |
| D   | 1.012    | 1.035 | 25.70       | 26.30 |
| D1  | .783     | .799  | 19.90       | 20.30 |
| D2  | .185     | .205  | 4.70        | 5.20  |
| E   | .776     | .799  | 19.70       | 20.30 |
| E1  | .661     | .677  | 16.80       | 17.20 |
| e   | .215 BSC |       | 5.46 BSC    |       |
| L   | .768     | .807  | 19.50       | 20.50 |
| L1  | .091     | .106  | 2.30        | 2.70  |
| Q   | .228     | .244  | 5.80        | 6.20  |
| Q1  | .346     | .362  | 8.80        | 9.20  |
| ØR  | .150     | .165  | 3.80        | 4.20  |
| ØR1 | .071     | .087  | 1.80        | 2.20  |

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

NOTE: Leads and back heatsink are Matte Pure Tin plated.

