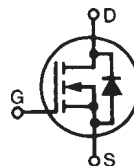


# PolarHT™ Power MOSFET

IXTH 88N30P  
IXTK 88N30P  
IXTQ 88N30P  
IXTT 88N30P

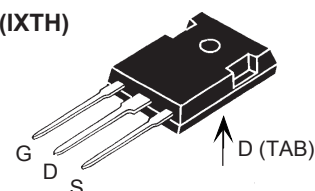
$$\begin{aligned} V_{DSS} &= 300 \text{ V} \\ I_{D25} &= 88 \text{ A} \\ R_{DS(on)} &\leq 40 \text{ m}\Omega \end{aligned}$$

N-Channel Enhancement Mode  
Avalanche Rated

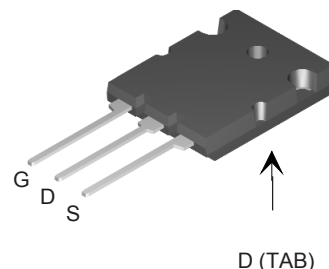


| Symbol       | Test Conditions                                                                                                                       | Maximum Ratings |                  |
|--------------|---------------------------------------------------------------------------------------------------------------------------------------|-----------------|------------------|
| $V_{DSS}$    | $T_J = 25^\circ\text{C to } 150^\circ\text{C}$                                                                                        | 300             | V                |
| $V_{DGR}$    | $T_J = 25^\circ\text{C to } 150^\circ\text{C}; R_{GS} = 1 \text{ M}\Omega$                                                            | 300             | V                |
| $V_{GS}$     | Continuous                                                                                                                            | $\pm 20$        | V                |
| $V_{GSM}$    | Transient                                                                                                                             | $\pm 30$        | V                |
| $I_{D25}$    | $T_C = 25^\circ\text{C}$                                                                                                              | 88              | A                |
| $I_{D(RMS)}$ | External lead current limit                                                                                                           | 75              | A                |
| $I_{DM}$     | $T_C = 25^\circ\text{C}$ , pulse width limited by $T_{JM}$                                                                            | 220             | A                |
| $I_{AR}$     | $T_C = 25^\circ\text{C}$                                                                                                              | 60              | A                |
| $E_{AR}$     | $T_C = 25^\circ\text{C}$                                                                                                              | 60              | mJ               |
| $E_{AS}$     | $T_C = 25^\circ\text{C}$                                                                                                              | 2.0             | J                |
| $dv/dt$      | $I_S \leq I_{DM}$ , $di/dt \leq 100 \text{ A}/\mu\text{s}$ , $V_{DD} \leq V_{DSS}$<br>$T_J \leq 150^\circ\text{C}$ , $R_G = 4 \Omega$ | 10              | V/ns             |
| $P_D$        | $T_C = 25^\circ\text{C}$                                                                                                              | 600             | W                |
| $T_J$        |                                                                                                                                       | -55 ... +150    | $^\circ\text{C}$ |
| $T_{JM}$     |                                                                                                                                       | 150             | $^\circ\text{C}$ |
| $T_{stg}$    |                                                                                                                                       | -55 ... +150    | $^\circ\text{C}$ |
| $T_L$        | 1.6 mm (0.062 in.) from case for 10 s                                                                                                 | 300             | $^\circ\text{C}$ |
| $T_{SOLD}$   | Plastic body for 10 s                                                                                                                 | 260             | $^\circ\text{C}$ |
| $M_d$        | Mounting torque                                                                                                                       | 1.13/10         | Nm/lb.in.        |
| Weight       | TO-247                                                                                                                                | 6.0             | g                |
|              | TO-264                                                                                                                                | 10              | g                |
|              | TO-3P & TO-268                                                                                                                        | 5.5             | g                |

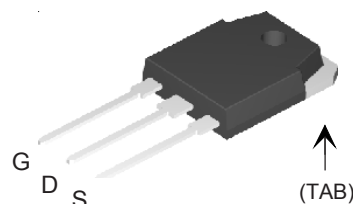
TO-247 (IXTH)



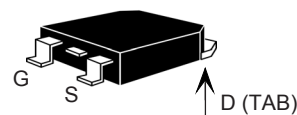
TO-264 (IXTK)



TO-3P (IXTQ)



TO-268 (IXTT)



G = Gate  
S = Source

D = Drain  
TAB = Drain

| Symbol       | Test Conditions<br>( $T_J = 25^\circ\text{C}$ , unless otherwise specified)                                      | Characteristic Values |      |                      |
|--------------|------------------------------------------------------------------------------------------------------------------|-----------------------|------|----------------------|
|              |                                                                                                                  | Min.                  | Typ. | Max.                 |
| $BV_{DSS}$   | $V_{GS} = 0 \text{ V}$ , $I_D = 250 \mu\text{A}$                                                                 | 300                   |      | V                    |
| $V_{GS(th)}$ | $V_{DS} = V_{GS}$ , $I_D = 250 \mu\text{A}$                                                                      | 2.5                   |      | 5.0 V                |
| $I_{GSS}$    | $V_{GS} = \pm 20 \text{ V}$ , $V_{DS} = 0$                                                                       |                       |      | $\pm 100 \text{ nA}$ |
| $I_{DSS}$    | $V_{DS} = V_{DSS}$<br>$V_{GS} = 0 \text{ V}$<br>$T_J = 125^\circ\text{C}$                                        |                       |      | 100 $\mu\text{A}$    |
|              |                                                                                                                  |                       |      | 1 mA                 |
| $R_{DS(on)}$ | $V_{GS} = 10 \text{ V}$ , $I_D = 0.5 I_{D25}$<br>Pulse test, $t \leq 300 \mu\text{s}$ , duty cycle $d \leq 2 \%$ |                       |      | 40 m $\Omega$        |

## Features

- International standard package
- Unclamped Inductive Switching (UIS) rated
- Low package inductance
  - easy to drive and to protect

## Advantages

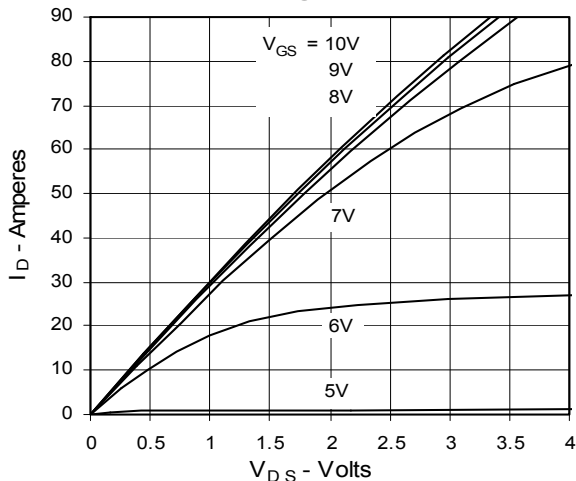
- Easy to mount
- Space savings
- High power density

| Symbol       | Test Conditions                                                                                   | Characteristic Values<br>( $T_J = 25^\circ\text{C}$ unless otherwise specified) |      |                        |
|--------------|---------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------|------|------------------------|
|              |                                                                                                   | Min.                                                                            | Typ. | Max.                   |
| $g_{fs}$     | $V_{DS} = 10\text{ V}; I_D = 0.5 I_{D25}$ , pulse test                                            | 45                                                                              | 60   | S                      |
| $C_{iss}$    | $V_{GS} = 0\text{ V}, V_{DS} = 25\text{ V}, f = 1\text{ MHz}$                                     |                                                                                 | 6300 | pF                     |
| $C_{oss}$    |                                                                                                   |                                                                                 | 950  | pF                     |
| $C_{rss}$    |                                                                                                   |                                                                                 | 190  | pF                     |
| $t_{d(on)}$  | $V_{GS} = 10\text{ V}, V_{DS} = 0.5 V_{DSS}, I_D = 60\text{ A}$<br>$R_G = 3.3\ \Omega$ (External) |                                                                                 | 25   | ns                     |
| $t_r$        |                                                                                                   |                                                                                 | 24   | ns                     |
| $t_{d(off)}$ |                                                                                                   |                                                                                 | 96   | ns                     |
| $t_f$        |                                                                                                   |                                                                                 | 25   | ns                     |
| $Q_{g(on)}$  | $V_{GS} = 10\text{ V}, V_{DS} = 0.5 V_{DSS}, I_D = 0.5 I_{D25}$                                   |                                                                                 | 180  | nC                     |
| $Q_{gs}$     |                                                                                                   |                                                                                 | 44   | nC                     |
| $Q_{gd}$     |                                                                                                   |                                                                                 | 90   | nC                     |
| $R_{thJC}$   | TO-247 and TO-3P<br>TO-264                                                                        |                                                                                 |      | $0.21^\circ\text{C/W}$ |
| $R_{thCS}$   |                                                                                                   | 0.21                                                                            |      | $^\circ\text{C/W}$     |
| $R_{thCS}$   |                                                                                                   | 0.15                                                                            |      | $^\circ\text{C/W}$     |

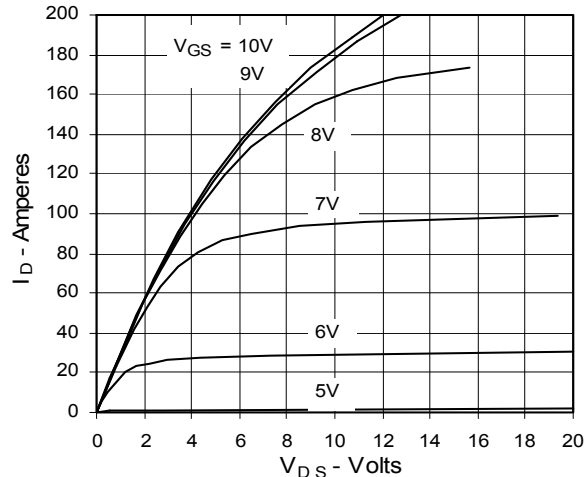
| Source-Drain Diode |                                                                                                       | Characteristic Values<br>( $T_J = 25^\circ\text{C}$ , unless otherwise specified) |      |               |
|--------------------|-------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------|---------------|
| Symbol             | Test Conditions                                                                                       | Min.                                                                              | Typ. | Max.          |
| $I_S$              | $V_{GS} = 0\text{ V}$                                                                                 |                                                                                   |      | 88 A          |
| $I_{SM}$           | Repetitive                                                                                            |                                                                                   |      | 220 A         |
| $V_{SD}$           | $I_F = I_S, V_{GS} = 0\text{ V}$ ,<br>Pulse test, $t \leq 300\ \mu\text{s}$ , duty cycle $d \leq 2\%$ |                                                                                   |      | 1.5 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            |
| $Q_{RM}$           |                                                                                                       |                                                                                   | 3.3  | $\mu\text{C}$ |

### Characteristic Curves

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



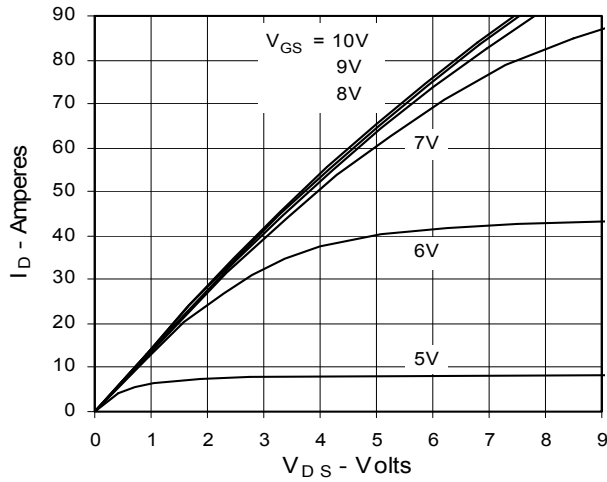
**Fig. 2. Extended Output Characteristics  
@  $25^\circ\text{C}$**



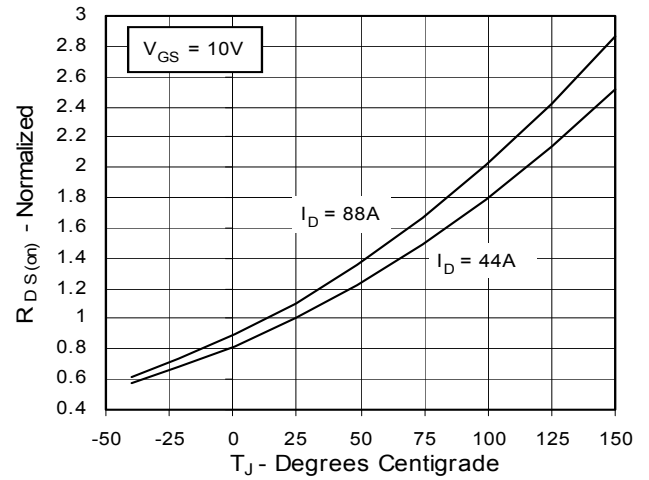
IXYS reserves the right to change limits, test conditions, and dimensions.

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one or more of the following U.S. patents: 4,850,072 5,017,508 5,063,307 5,381,025 6,259,123 B1 6,534,343 6,710,405 B2 6,759,692  
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

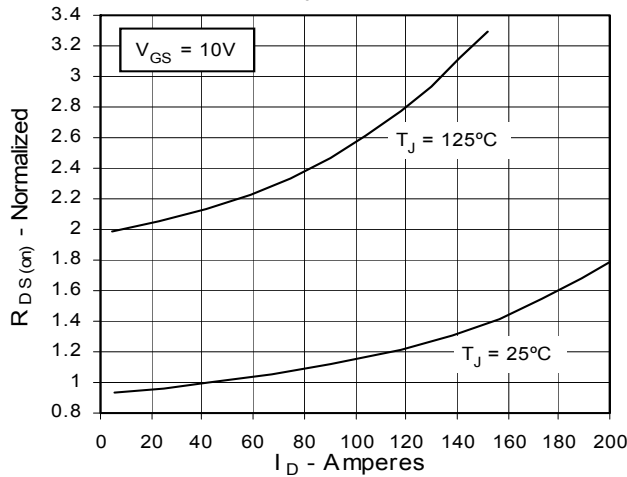
**Fig. 3. Output Characteristics  
@ 125°C**



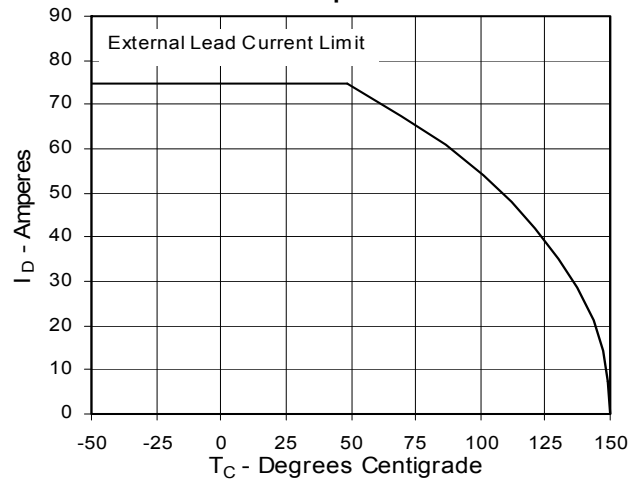
**Fig. 4.  $R_{DS(on)}$  Normalized to 0.5  $I_{D25}$   
Value vs. Junction Temperature**



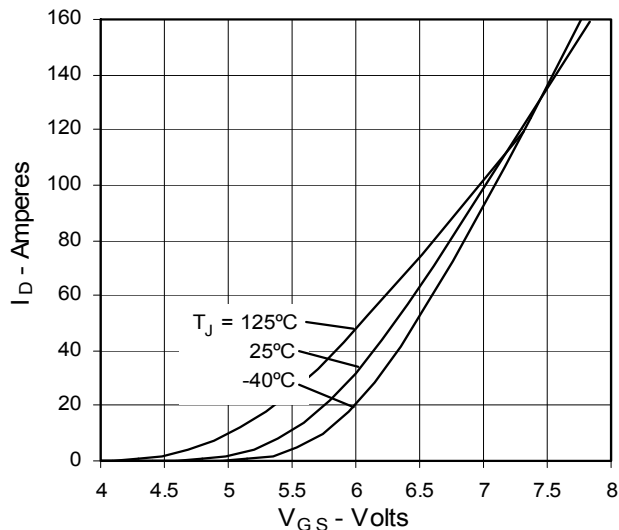
**Fig. 5.  $R_{DS(on)}$  Normalized to  
0.5  $I_{D25}$  Value vs.  $I_D$**



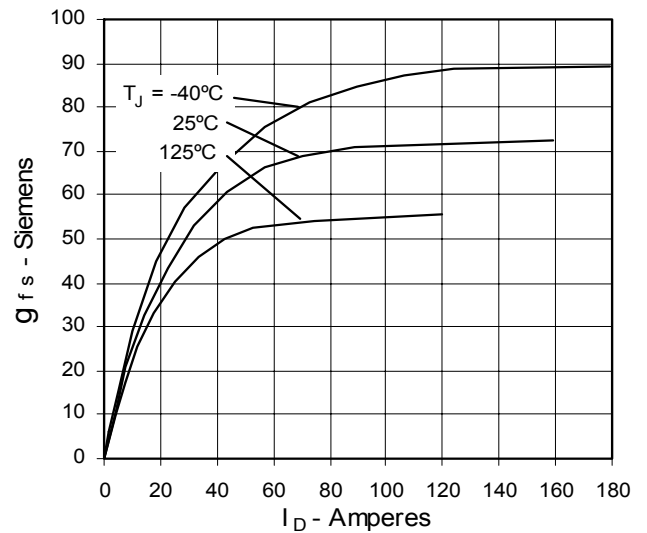
**Fig. 6. Drain Current vs. Case  
Temperature**



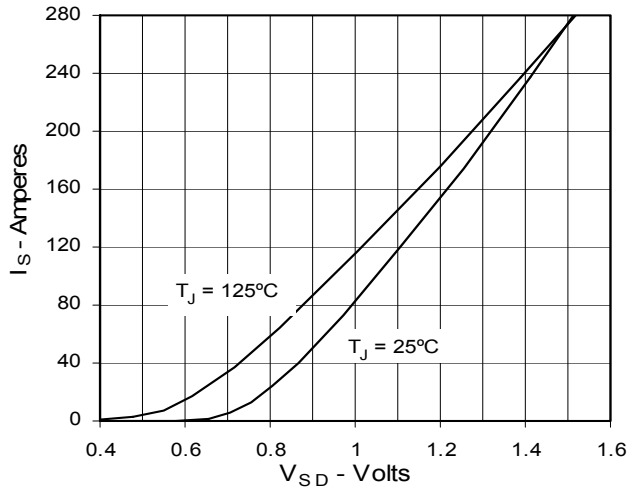
**Fig. 7. Input Admittance**



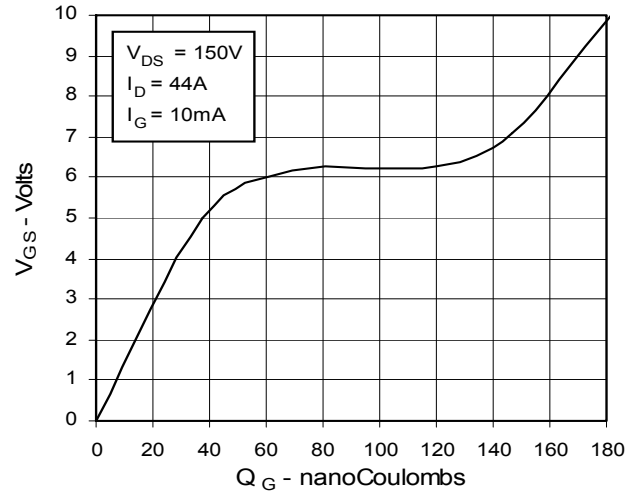
**Fig. 8. Transconductance**



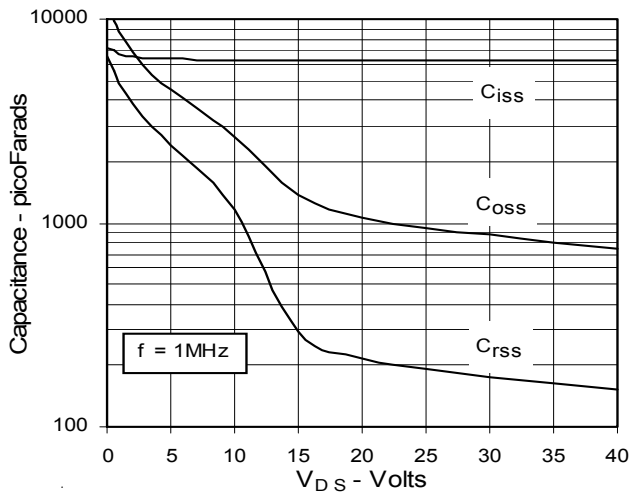
**Fig. 9. Source Current vs.  
Source-To-Drain Voltage**



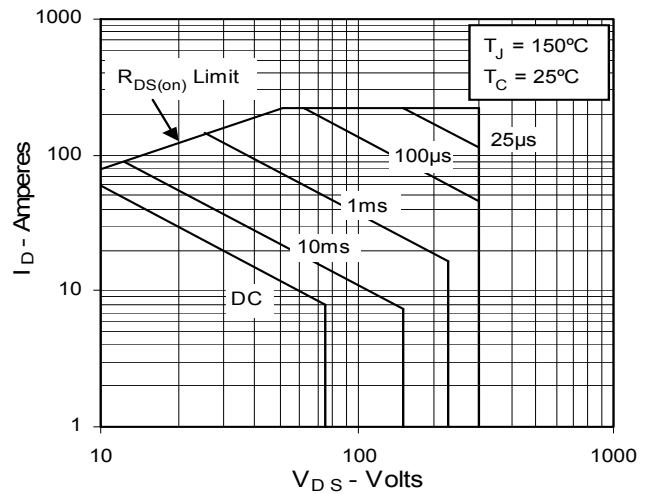
**Fig. 10. Gate Charge**



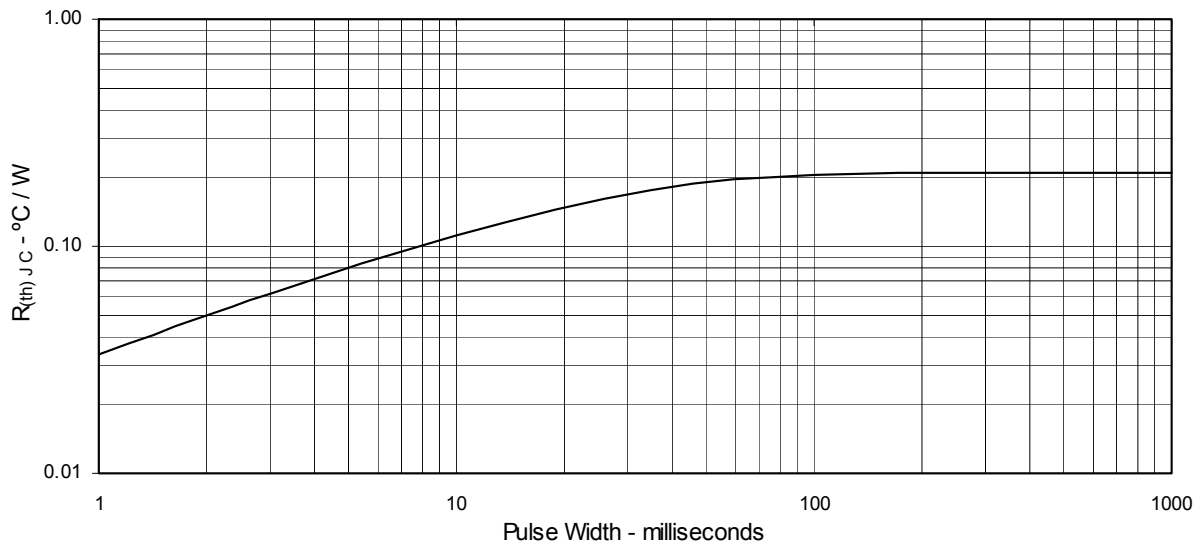
**Fig. 11. Capacitance**

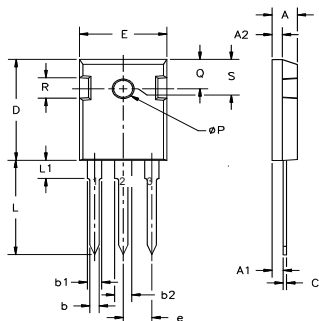


**Fig. 12. Forward-Bias  
Safe Operating Area**



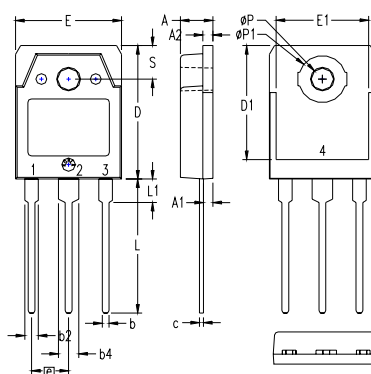
**Fig. 13. Maximum Transient Thermal Resistance**



**TO-247 (IXTH) Outline**

**Terminals:**

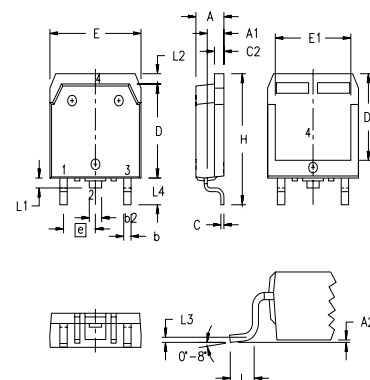
1. Gate 2,4. Drain  
3. Source

| Dim.           | Millimeter |       | Inches  |       |
|----------------|------------|-------|---------|-------|
|                | Min.       | Max.  | Min.    | Max.  |
| A              | 4.7        | 5.3   | .185    | .209  |
| A <sub>1</sub> | 2.2        | 2.54  | .087    | .102  |
| A <sub>2</sub> | 2.2        | 2.6   | .059    | .098  |
| b              | 1.0        | 1.4   | .040    | .055  |
| b <sub>1</sub> | 1.65       | 2.13  | .065    | .084  |
| b <sub>2</sub> | 2.87       | 3.12  | .113    | .123  |
| C              | .4         | .8    | .016    | .031  |
| D              | 20.80      | 21.46 | .819    | .845  |
| E              | 15.75      | 16.26 | .610    | .640  |
| e              | 5.20       | 5.72  | 0.205   | 0.225 |
| L              | 19.81      | 20.32 | .780    | .800  |
| L1             |            | 4.50  |         | .177  |
| ØP             | 3.55       | 3.65  | .140    | .144  |
| Q              | 5.89       | 6.40  | 0.232   | 0.252 |
| R              | 4.32       | 5.49  | .170    | .216  |
| S              | 6.15 BSC   |       | 242 BSC |       |

**TO-3P (IXTQ) Outline**


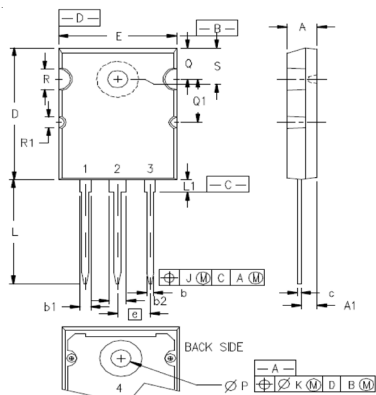
- 1 - GATE  
2 - DRAIN (COLLECTOR)  
3 - SOURCE (EMITTER)  
4 - DRAIN (COLLECTOR)

| 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-268 (IXTT) Outline**

**Terminals:**

1. Gate 2,4. Drain  
3. Source

| 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-264 (IXTK) Outline**


- 1 - GATE  
2, 4 - DRAIN (COLLECTOR)  
3 - SOURCE (EMITTER)

| SYM | INCHES   |       | MILLIMETERS |       |
|-----|----------|-------|-------------|-------|
|     | MIN      | MAX   | MIN         | MAX   |
| A   | .185     | .209  | 4.70        | 5.31  |
| A1  | .102     | .118  | 2.59        | 3.00  |
| b   | .037     | .055  | 0.94        | 1.40  |
| b1  | .087     | .102  | 2.21        | 2.59  |
| b2  | .110     | .126  | 2.79        | 3.20  |
| c   | .017     | .029  | 0.43        | 0.74  |
| D   | 1.007    | 1.047 | 25.58       | 26.59 |
| E   | .760     | .799  | 19.30       | 20.29 |
| e   | .215 BSC |       | 5.46 BSC    |       |
| J   | .000     | .010  | 0.00        | 0.25  |
| K   | .000     | .010  | 0.00        | 0.25  |
| L   | .779     | .842  | 19.79       | 21.39 |
| L1  | .087     | .102  | 2.21        | 2.59  |
| ØP  | .122     | .138  | 3.10        | 3.51  |
| Q   | .240     | .256  | 6.10        | 6.50  |
| Q1  | .330     | .346  | 8.38        | 8.79  |
| ØR  | .155     | .187  | 3.94        | 4.75  |
| ØR1 | .085     | .093  | 2.16        | 2.36  |
| S   | .243     | .253  | 6.17        | 6.43  |



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