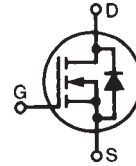


## PolarHV™ Power MOSFET

N-Channel Enhancement Mode  
Avalanche Rated

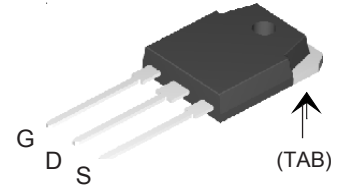
**IXTH 36N50P**  
**IXTQ 36N50P**  
**IXTT 36N50P**  
**IXTV 36N50P**  
**IXTV 36N50PS**

$V_{DSS} = 500 \text{ V}$   
 $I_{D25} = 36 \text{ A}$   
 $R_{DS(on)} \leq 170 \text{ m}\Omega$

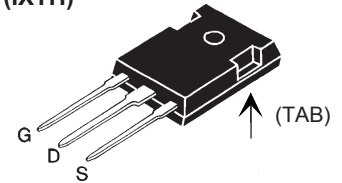


| Symbol     | Test Conditions   | Maximum Ratings |                  |
|------------|---|-----------------|------------------|
| $V_{DSS}$  | $T_J = 25^\circ\text{C}$ to $150^\circ\text{C}$   | 500             | V                |
| $V_{DGR}$  | $T_J = 25^\circ\text{C}$ to $150^\circ\text{C}$ ; $R_{GS} = 1 \text{ M}\Omega$  | 500             | V                |
| $V_{GS}$   | Continuous  | $\pm 30$        | V                |
| $V_{GSM}$  | Transient   | $\pm 40$        | V                |
| $I_{D25}$  | $T_C = 25^\circ\text{C}$  | 36              | A                |
| $I_{DM}$   | $T_C = 25^\circ\text{C}$ , pulse width limited by $T_{JM}$  | 108             | A                |
| $I_{AR}$   | $T_C = 25^\circ\text{C}$  | 36              | A                |
| $E_{AR}$   | $T_C = 25^\circ\text{C}$  | 50              | mJ               |
| $E_{AS}$   | $T_C = 25^\circ\text{C}$  | 1.5             | J                |
| $dv/dt$    | $I_S \leq I_{DM}$ , $di/dt \leq 100 \text{ A}/\mu\text{s}$ , $V_{DD} \leq V_{DSS}$ ,<br>$T_J \leq 150^\circ\text{C}$ , $R_G = 3 \Omega$ | 10              | V/ns             |
| $P_D$      | $T_C = 25^\circ\text{C}$  | 540             | 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(TO-247)   | 1.13/10         | Nm/lb.in.        |
| $F_c$      | Mounting force (PLUS220)  | 20..120/4.5..15 | N/lb             |
| Weight     | TO-247  | 6               | g                |
|            | TO-268  | 5               | g                |
|            | PLUS220   | 2               | g                |
|            | TO-3P   | 5.5             | g                |

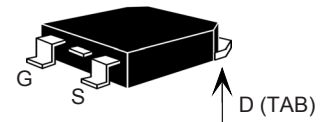
TO-3P (IXTQ)



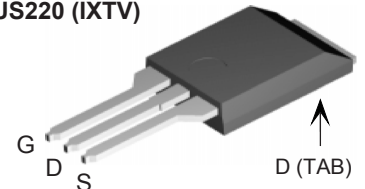
TO-247 (IXTH)



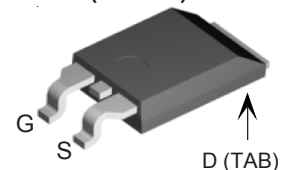
TO-268 (IXTT)



PLUS220 (IXTV)



PLUS220 SMD(IXTV..S)



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.                 |
| $V_{DSS}$    | $V_{GS} = 0 \text{ V}$ , $I_D = 250 \mu\text{A}$   | 500                   |      | V                    |
| $V_{GS(th)}$ | $V_{DS} = V_{GS}$ , $I_D = 250 \mu\text{A}$  | 3.0                   |      | 5.0 V                |
| $I_{GSS}$    | $V_{GS} = \pm 30 \text{ V}_{DC}$ , $V_{DS} = 0$  |                       |      | $\pm 100 \text{ nA}$ |
| $I_{DSS}$    | $V_{DS} = V_{DSS}$<br>$V_{GS} = 0 \text{ V}$<br>$T_J = 125^\circ\text{C}$  |                       |      | 25 $\mu\text{A}$     |
|              |  |                       |      | 250 $\mu\text{A}$    |
| $R_{DS(on)}$ | $V_{GS} = 10 \text{ V}$ , $I_D = 0.5 I_{D25}$<br>Pulse test, $t \leq 300 \mu\text{s}$ , duty cycle $d \leq 2 \%$ |                       |      | 170 $\text{m}\Omega$ |

### Features

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

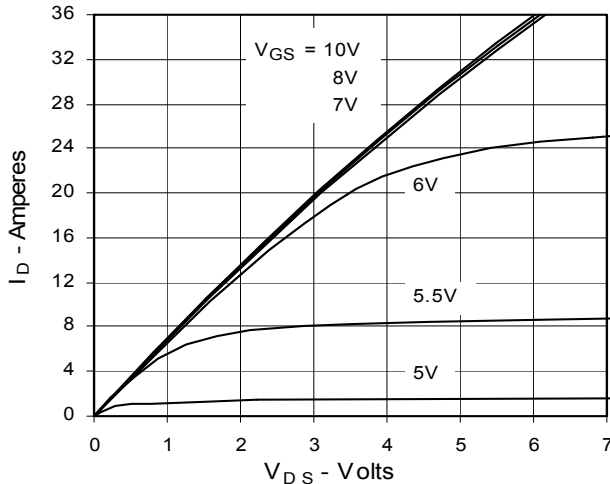
| Symbol       | Test Conditions   | Characteristic Values<br>( $T_J = 25^\circ\text{C}$ unless otherwise specified) |      |                         |
|--------------|---|---|------|-------------------------|
|              |   | Min.  | Typ. | Max.                    |
| $g_{fs}$     | $V_{DS} = 20\text{ V}; I_D = 0.5 I_{D25}$ , pulse test                                      | 23  | 36   | S                       |
| $C_{iss}$    | $V_{GS} = 0\text{ V}, V_{DS} = 25\text{ V}, f = 1\text{ MHz}$                               |   | 5500 | pF                      |
| $C_{oss}$    |   |   | 510  | pF                      |
| $C_{rss}$    |   |   | 40   | pF                      |
| $t_{d(on)}$  | $V_{GS} = 10\text{ V}, V_{DS} = 0.5 V_{DSS}, I_D = I_{D25}$<br>$R_G = 3\ \Omega$ (External) |   | 25   | ns                      |
| $t_r$        |   |   | 27   | ns                      |
| $t_{d(off)}$ |   |   | 75   | ns                      |
| $t_f$        |   |   | 21   | ns                      |
| $Q_{g(on)}$  | $V_{GS} = 10\text{ V}, V_{DS} = 0.5 V_{DSS}, I_D = 0.5 I_{D25}$                             |   | 85   | nC                      |
| $Q_{gs}$     |   |   | 30   | nC                      |
| $Q_{gd}$     |   |   | 31   | nC                      |
| $R_{thJC}$   |   |   |      | 0.23 $^\circ\text{C/W}$ |
| $R_{thCS}$   | (TO-247 and TO-3P)<br>(PLUS220)   |   | 0.21 | $^\circ\text{C/W}$      |

**Source-Drain Diode**

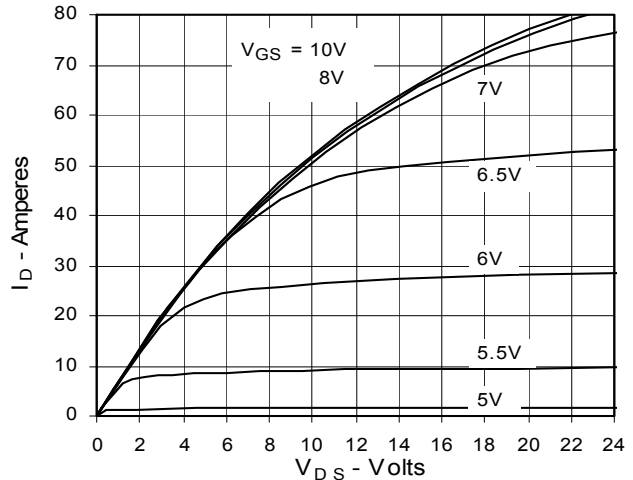
| Symbol   | Test Conditions   | Characteristic Values<br>( $T_J = 25^\circ\text{C}$ unless otherwise specified) |      |       |
|----------|---|---|------|-------|
|          |   | Min.  | Typ. | Max.  |
| $I_S$    | $V_{GS} = 0\text{ V}$   |   |      | 36 A  |
| $I_{SM}$ | Repetitive  |   |      | 108 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>$V_R = 100\text{ V}, V_{GS} = 0\text{ V}$   |   | 400  | ns    |

**Characteristic Curves**

**Fig. 1. Output Characteristics  
@ 25°C**



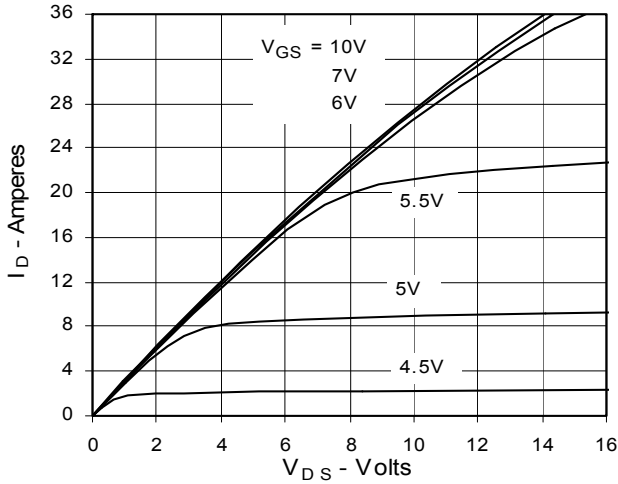
**Fig. 2. Extended Output Characteristics  
@ 25°C**



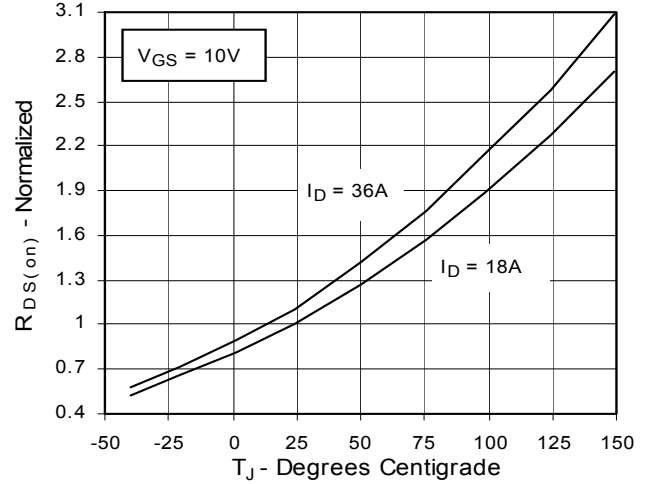
IXYS reserves the right to change limits, test conditions, and dimensions.

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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 6,710,405B2 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

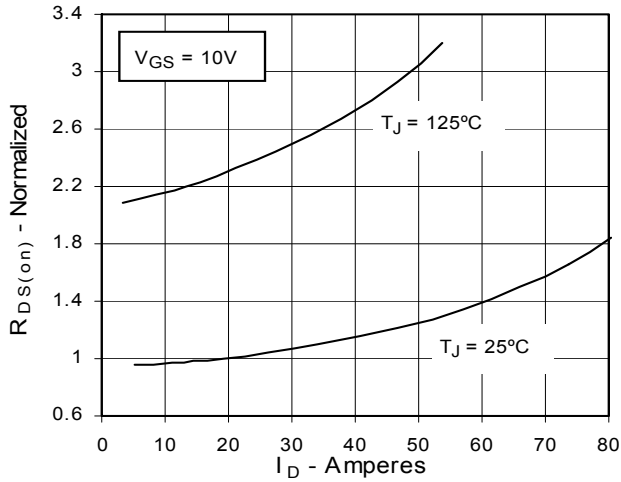
**Fig. 3. Output Characteristics @ 125°C**



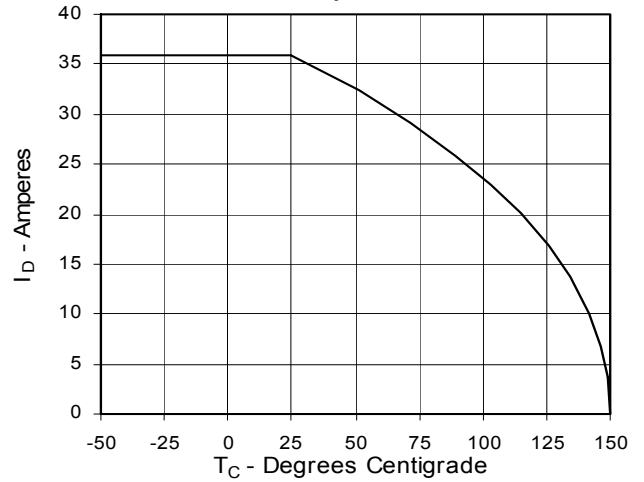
**Fig. 4.  $R_{DS(on)}$  Normalized to  $I_D = 18\text{A}$  Value vs. Junction Temperature**



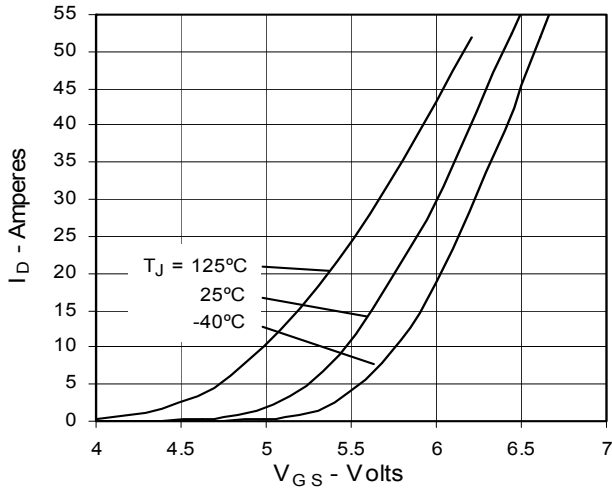
**Fig. 5.  $R_{DS(on)}$  Normalized to  $I_D = 18\text{A}$  Value vs. Drain Current**



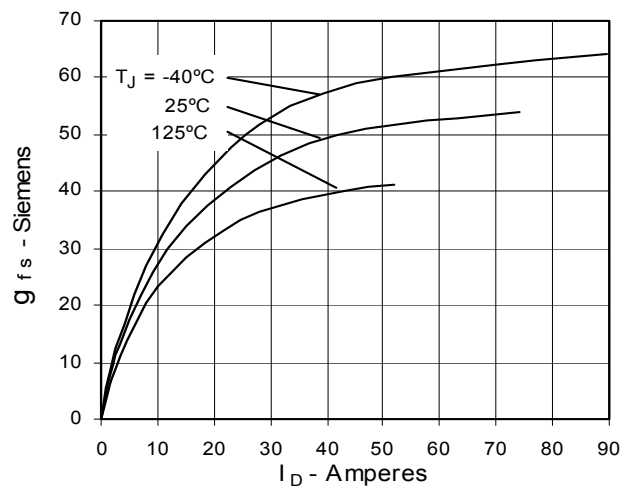
**Fig. 6. Drain Current vs. Case Temperature**



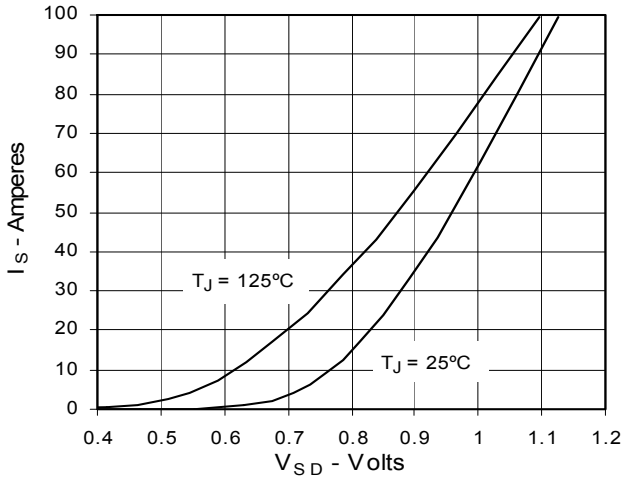
**Fig. 7. Input Admittance**



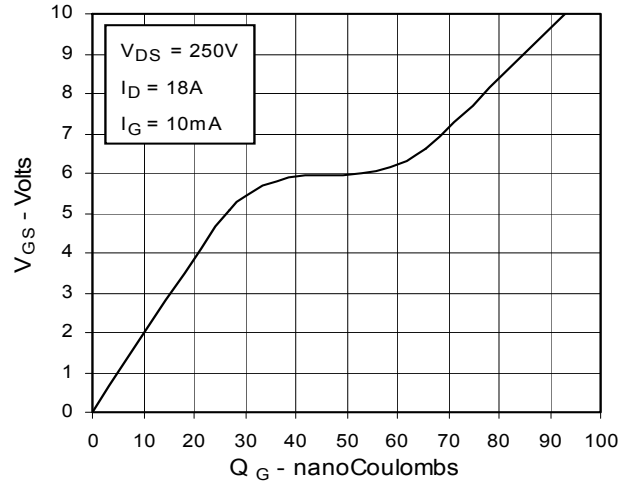
**Fig. 8. Transconductance**



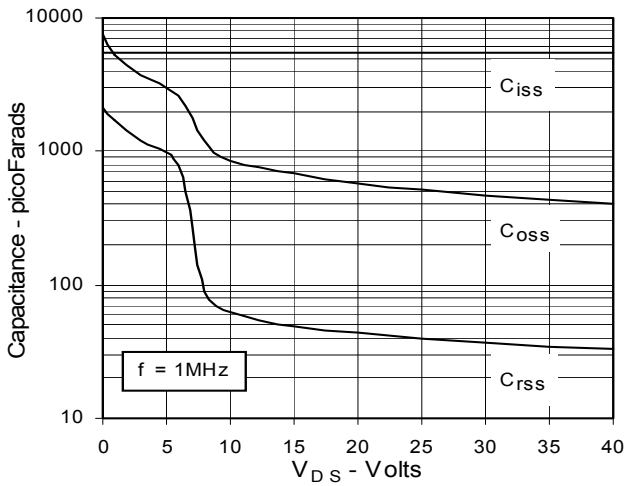
**Fig. 9. Source Current vs. Source-To-Drain Voltage**



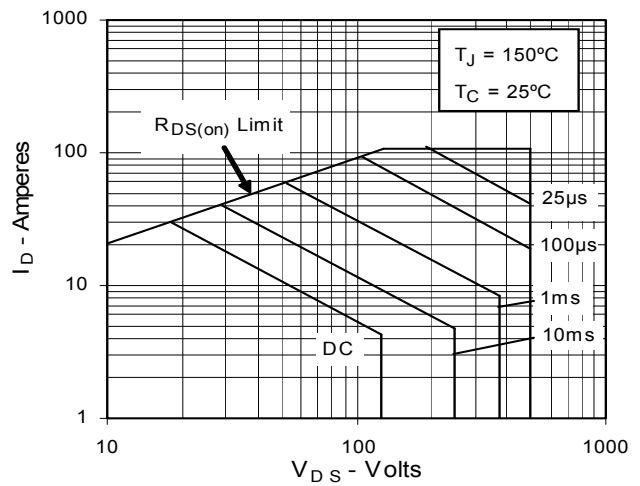
**Fig. 10. Gate Charge**



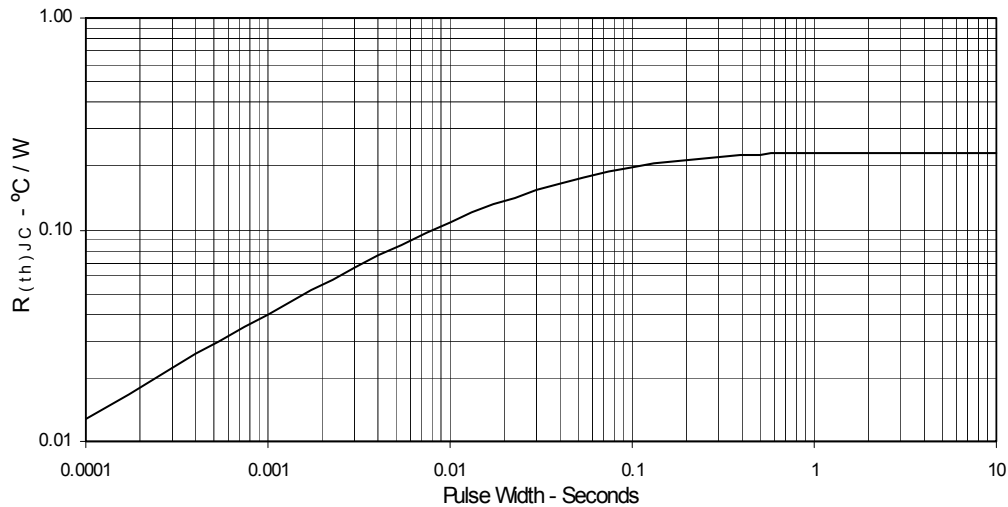
**Fig. 11. Capacitance**



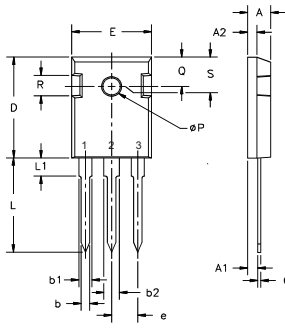
**Fig. 12. Forward-Bias Safe Operating Area**



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



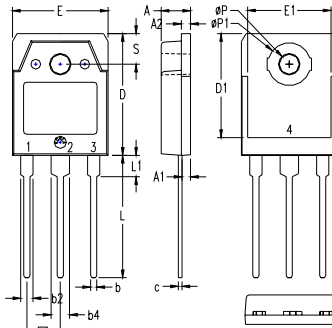
**TO-247 AD (IXTH) Outline**



- Terminals:  
1 - Gate  
2 - 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  |
| L <sub>1</sub> |            | 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   |

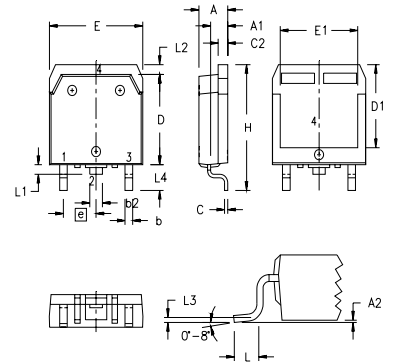
**TO-3P (IXTQ) Outline**



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

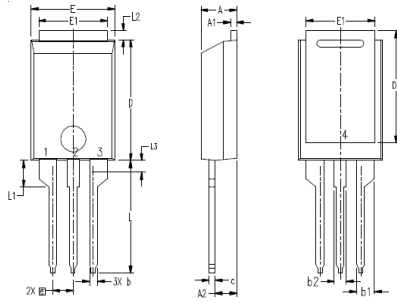
| SYM             | INCHES   |      | MILLIMETERS |       |
|-----------------|----------|------|-------------|-------|
|                 | MIN      | MAX  | MIN         | MAX   |
| A               | .185     | .193 | 4.70        | 4.90  |
| A <sub>1</sub>  | .051     | .059 | 1.30        | 1.50  |
| A <sub>2</sub>  | .057     | .065 | 1.45        | 1.65  |
| b               | .035     | .045 | 0.90        | 1.15  |
| b <sub>2</sub>  | .075     | .087 | 1.90        | 2.20  |
| b <sub>4</sub>  | .114     | .126 | 2.90        | 3.20  |
| c               | .022     | .031 | 0.55        | 0.80  |
| D               | .780     | .799 | 19.80       | 20.30 |
| D <sub>1</sub>  | .665     | .677 | 16.90       | 17.20 |
| E               | .610     | .622 | 15.50       | 15.80 |
| E <sub>1</sub>  | .531     | .539 | 13.50       | 13.70 |
| e               | .215 BSC |      | 5.45 BSC    |       |
| L               | .779     | .795 | 19.80       | 20.20 |
| L <sub>1</sub>  | .134     | .142 | 3.40        | 3.60  |
| ØP <sub>1</sub> | .126     | .134 | 3.20        | 3.40  |
| S               | .272     | .280 | 6.90        | 7.10  |
| S               | .193     | .201 | 4.90        | 5.10  |

**TO-268 (IXTT) Outline**



| SYM            | INCHES   |      | MILLIMETERS |       |
|----------------|----------|------|-------------|-------|
|                | MIN      | MAX  | MIN         | MAX   |
| A              | .193     | .201 | 4.90        | 5.10  |
| A <sub>1</sub> | .106     | .114 | 2.70        | 2.90  |
| A <sub>2</sub> | .001     | .010 | 0.02        | 0.25  |
| b              | .045     | .057 | 1.15        | 1.45  |
| b <sub>2</sub> | .075     | .083 | 1.90        | 2.10  |
| C              | .016     | .026 | 0.40        | 0.65  |
| C <sub>2</sub> | .057     | .063 | 1.45        | 1.60  |
| D              | .543     | .551 | 13.80       | 14.00 |
| D <sub>1</sub> | .488     | .500 | 12.40       | 12.70 |
| E              | .624     | .632 | 15.85       | 16.05 |
| E <sub>1</sub> | .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  |
| L <sub>1</sub> | .047     | .055 | 1.20        | 1.40  |
| L <sub>2</sub> | .039     | .045 | 1.00        | 1.15  |
| L <sub>3</sub> | .010 BSC |      | 0.25 BSC    |       |
| L <sub>4</sub> | .150     | .161 | 3.80        | 4.10  |

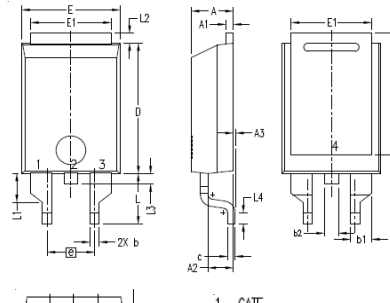
**PLUS220 (IXTV) Outline**



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

| SYM            | INCHES   |      | MILLIMETER |       |
|----------------|----------|------|------------|-------|
|                | MIN      | MAX  | MIN        | MAX   |
| A              | .169     | .185 | 4.30       | 4.70  |
| A <sub>1</sub> | .028     | .035 | 0.70       | 0.90  |
| A <sub>2</sub> | .098     | .118 | 2.50       | 3.00  |
| b              | .035     | .047 | 0.90       | 1.20  |
| b <sub>1</sub> | .080     | .095 | 2.03       | 2.41  |
| b <sub>2</sub> | .054     | .064 | 1.37       | 1.63  |
| c              | .028     | .035 | 0.70       | 0.90  |
| D              | .551     | .591 | 14.00      | 15.00 |
| D <sub>1</sub> | .512     | .539 | 13.00      | 13.70 |
| E              | .394     | .433 | 10.00      | 11.00 |
| E <sub>1</sub> | .331     | .346 | 8.40       | 8.80  |
| e              | .100 BSC |      | 2.54 BSC   |       |
| L              | .512     | .551 | 13.00      | 14.00 |
| L <sub>1</sub> | .118     | .138 | 3.00       | 3.50  |
| L <sub>2</sub> | .035     | .051 | 0.90       | 1.30  |
| L <sub>3</sub> | .047     | .059 | 1.20       | 1.50  |

**PLUS220SMD (IXTV\_S) Outline**



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

| SYM            | INCHES   |      | MILLIMETER |       |
|----------------|----------|------|------------|-------|
|                | MIN      | MAX  | MIN        | MAX   |
| A              | .169     | .185 | 4.30       | 4.70  |
| A <sub>1</sub> | .028     | .035 | 0.70       | 0.90  |
| A <sub>2</sub> | .098     | .118 | 2.50       | 3.00  |
| A <sub>3</sub> | .000     | .010 | 0.00       | 0.25  |
| b              | .035     | .047 | 0.90       | 1.20  |
| b <sub>1</sub> | .080     | .095 | 2.03       | 2.41  |
| b <sub>2</sub> | .054     | .064 | 1.37       | 1.63  |
| c              | .028     | .035 | 0.70       | 0.90  |
| D              | .551     | .591 | 14.00      | 15.00 |
| D <sub>1</sub> | .512     | .539 | 13.00      | 13.70 |
| E              | .394     | .433 | 10.00      | 11.00 |
| E <sub>1</sub> | .331     | .346 | 8.40       | 8.80  |
| e              | .200 BSC |      | 5.08 BSC   |       |
| L              | .209     | .228 | 5.30       | 5.80  |
| L <sub>1</sub> | .118     | .138 | 3.00       | 3.50  |
| L <sub>2</sub> | .035     | .051 | 0.90       | 1.30  |
| L <sub>3</sub> | .047     | .059 | 1.20       | 1.50  |
| L <sub>4</sub> | .039     | .059 | 1.00       | 1.50  |

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