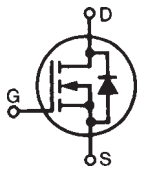
# IXYS

## PolarHV™ Power MOSFET

N-Channel Enhancement Mode
Avalanche Rated

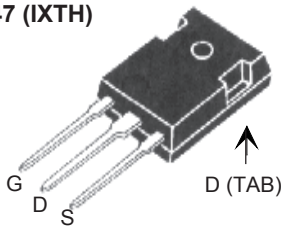
**IXTH 30N60P**
**IXTQ 30N60P**
**IXTT 30N60P**
**IXTV 30N60P**
**IXTV 30N60PS**

$V_{DSS}$ = 600 V
$I_{D25}$ = 30 A
$R_{DS(on)}$ ≤ 240 mΩ

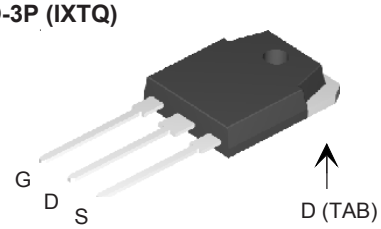



| Symbol | Test Conditions | Maximum Ratings | |
|---|---|---|---|
| $V_{DSS}$ | $T_J$ = 25° C to 150° C | 600 | V |
| $V_{DGR}$ | $T_J$ = 25° C to 150° C; $R_{GS}$ = 1 MΩ | 600 | V |
| $V_{GSS}$ | Continuous | ±30 | V |
| $V_{GSM}$ | Transient | ±40 | V |
| $I_{D25}$ | $T_C$ = 25° C | 30 | A |
| $I_{DM}$ | $T_C$ = 25° C, pulse width limited by $T_{JM}$ | 80 | A |
| $I_{AR}$ | $T_C$ = 25° C | 30 | A |
| $E_{AR}$ | $T_C$ = 25° C | 50 | mJ |
| $E_{AS}$ | $T_C$ = 25° C | 1.5 | J |
| dv/dt | $I_S \le I_{DM}$, di/dt ≤100 A/μs, $V_{DD} \le V_{DSS}$, $T_J$ ≤150° C, $R_G$ = 4 Ω | 10 | V/ns |
| $P_D$ | $T_C$ = 25° C | 540 | W |
| $T_J$ | | -55 ... +150 | °C |
| $T_{JM}$ | | 150 | °C |
| $T_{stg}$ | | -55 ... +150 | °C |
| $T_L$ | 1.6 mm (0.062 in.) from case for 10 s | 300 | °C |
| $T_{SOLD}$ | Plastic body for 10 s | 260 | °C |
| $M_d$ | Mounting torque (TO-3P, TO-247) | 1.13/10 | Nm/lb.in. |
| $F_C$ | Mounting force (PLUS220) | 11..65/2.5..15 | N/lb. |
| Weight | TO-247 | 6.0 | g |
| | TO-3P | 5.5 | g |
| | PLUS220 | 4.0 | g |
| | TO-268 | 5.0 | g |

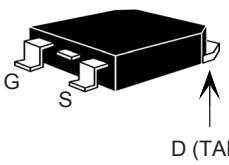
**TO-247 (IXTH)**



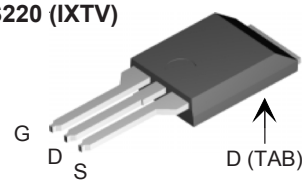

**TO-3P (IXTQ)**



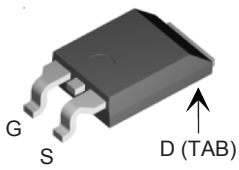

**TO-268 (IXTT)**




**PLUS220 (IXTV)**




**PLUS220 (IXTV...S)**




G = Gate D = Drain
S = Source TAB = Drain

| Symbol | Test Conditions ($T_J$ = 25° C, unless otherwise specified) | Characteristic Values Min. | Typ. | Max. | |
|---|---|---|---|---|---|
| $BV_{DSS}$ | $V_{GS}$ = 0 V, $I_D$ = 250 μA | 600 | | | V |
| $V_{GS(th)}$ | $V_{DS} = V_{GS}$, $I_D$ = 250μA | 3.0 | | 5.0 | V |
| $I_{GSS}$ | $V_{GS}$ = ±30 V, $V_{DS}$ = 0 | | | ±100 | nA |
| $I_{DSS}$ | $V_{DS} = V_{DSS}$, $V_{GS}$ = 0 V | | | 25 | μA |
| | $T_J$ = 125° C | | | 250 | μA |
| $R_{DS(on)}$ | $V_{GS}$ = 10 V, $I_D = 0.5\ I_{D25}$, Pulse test, t ≤300 μs, duty cycle d ≤ 2 % | | | 240 | mΩ |

**Features**

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

| Symbol | Test Conditions | Characteristic Values ($T_J$ = 25° C, unless otherwise specified) Min. | Typ. | Max. |
|---|---|---|---|---|
| $g_{fs}$ | $V_{DS}$ = 20 V; $I_D$ = 0.5 $I_{D25}$, pulse test | 22 | 25 | S |
| $C_{iss}$ | | | 5050 | pF |
| $C_{oss}$ | $V_{GS}$ = 0 V, $V_{DS}$ = 25 V, f = 1 MHz | | 540 | pF |
| $C_{rss}$ | | | 53 | pF |
| $t_{d(on)}$ | | | 29 | ns |
| $t_r$ | $V_{GS}$ = 10 V, $V_{DS}$ = 0.5 $I_{D25}$ | | 20 | ns |
| $t_{d(off)}$ | $R_G$ = 4 Ω (External) | | 80 | ns |
| $t_f$ | | | 25 | ns |
| $Q_{g(on)}$ | | | 82 | nC |
| $Q_{gs}$ | $V_{GS}$ = 10 V, $V_{DS}$ = 0.5 $V_{DSS}$, $I_D$ = 0.5 $I_{D25}$ | | 28 | nC |
| $Q_{gd}$ | | | 30 | nC |
| $R_{thJC}$ | | | | 0.23 °C/W |
| $R_{thCS}$ | | | 0.21 | °C/W |

**Source-Drain Diode**

| Symbol | Test Conditions (Characteristic Values, $T_J$ = 25° C, unless otherwise specified) | Min. | Typ. | Max. |
|---|---|---|---|---|
| $I_S$ | $V_{GS}$ = 0 V | | | 30 A |
| $I_{SM}$ | Repetitive | | | 80 A |
| $V_{SD}$ | $I_F$ = $I_S$, $V_{GS}$ = 0 V, Pulse test, t ≤300 μs, duty cycle d≤ 2 % | | | 1.5 V |
| $t_{rr}$ | $I_F$ = 25A, -di/dt = 100 A/μs | | 500 | ns |
| $Q_{RM}$ | $V_R$ = 100V | | 4.0 | μC |

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

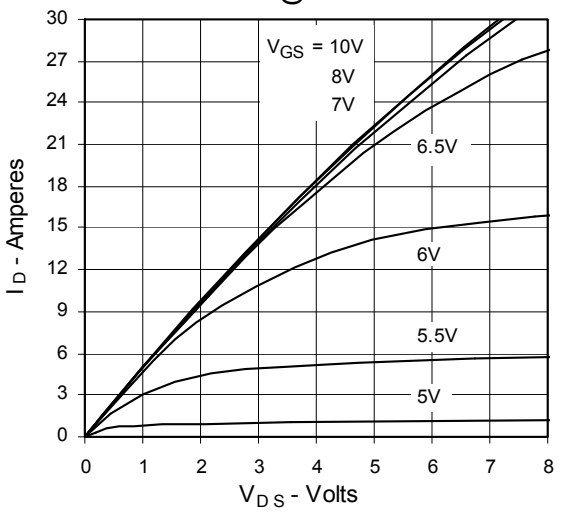



**Fig. 2. Extended Output Characteristics @ 25°C**

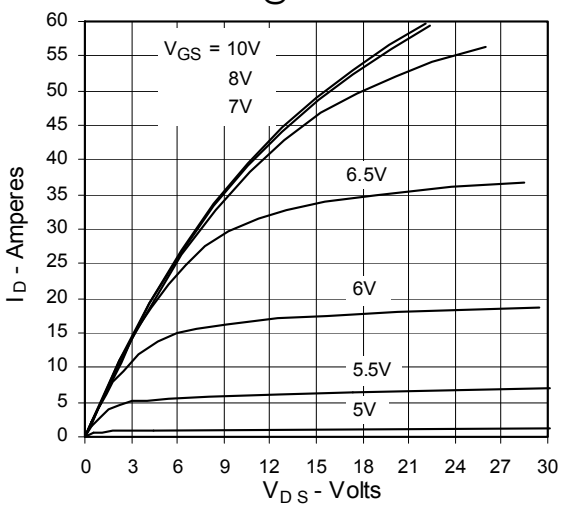


**Fig. 3. Output Characteristics @ 125°C**

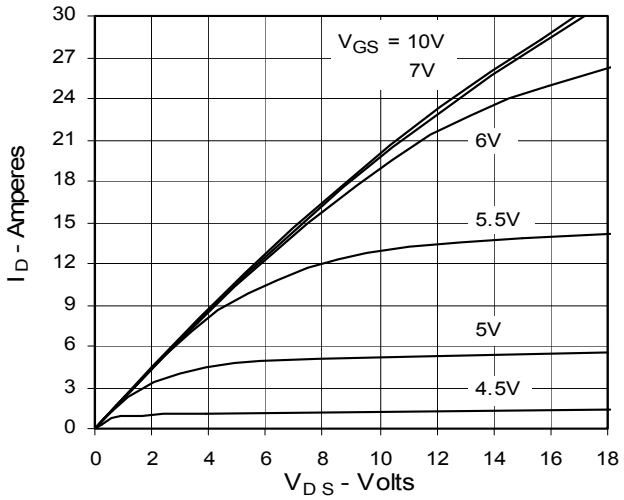



**Fig. 4. $R_{DS(on)}$ Normalized to 0.5 $I_{D25}$ Value vs. Junction Temperature**

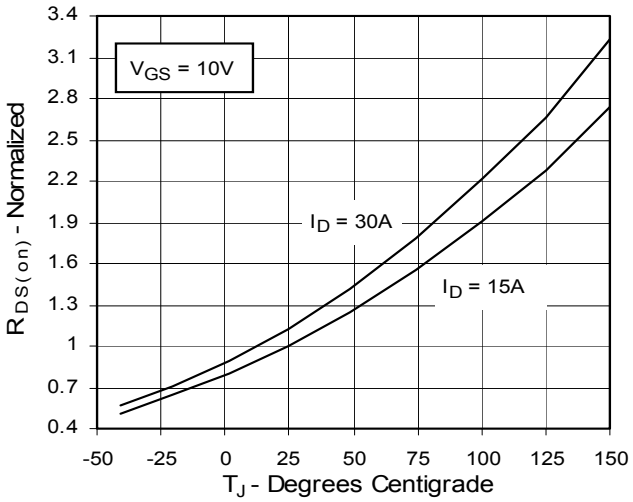



**Fig. 5. $R_{DS(on)}$ Normalized to 0.5 $I_{D25}$ Value vs. $I_D$**

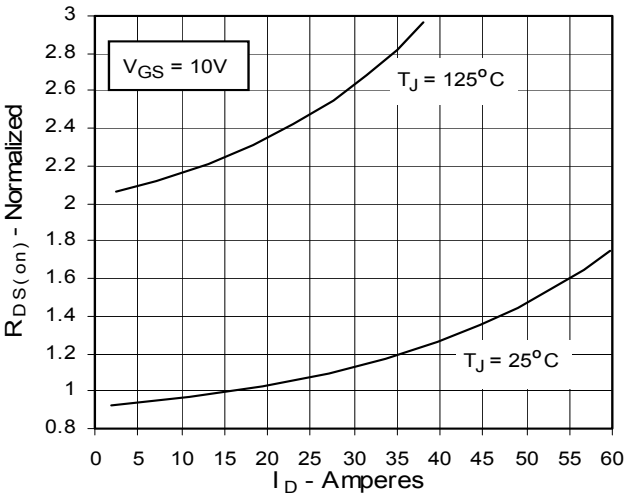



**Fig. 6. Drain Current vs. Case Temperature**

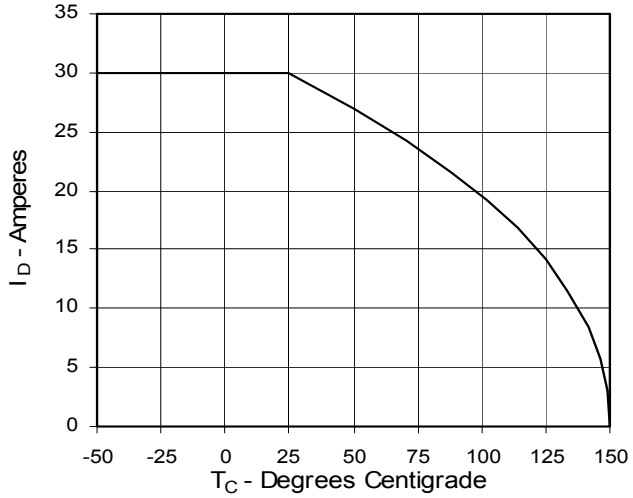



**Fig. 7. Input Admittance**

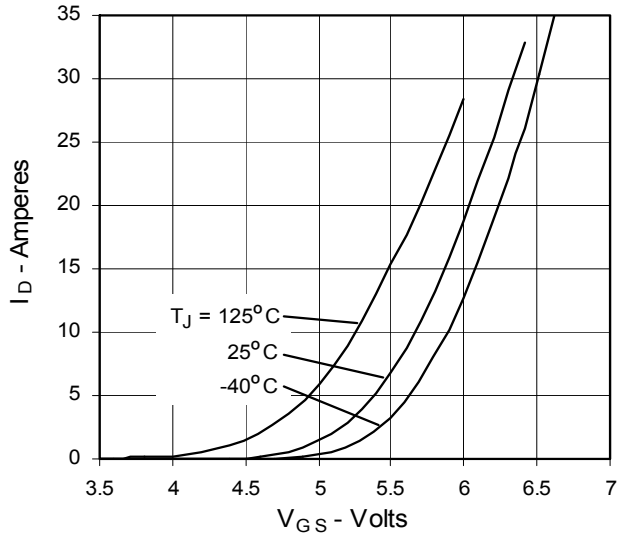



**Fig. 8. Transconductance**

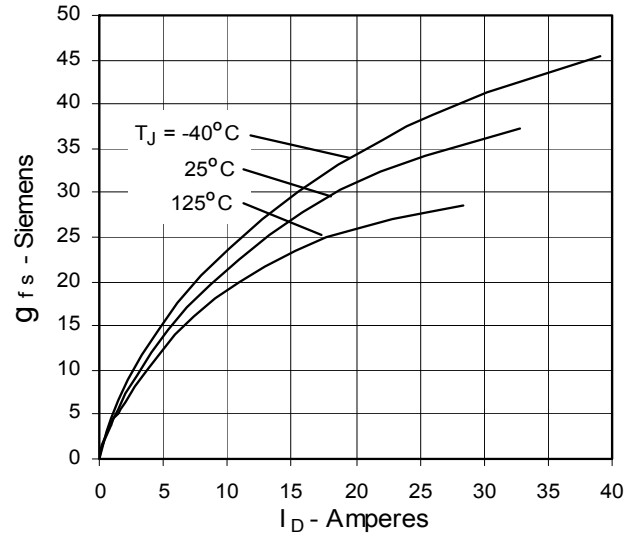


**Fig. 9. Source Current vs. Source-To-Drain Voltage**

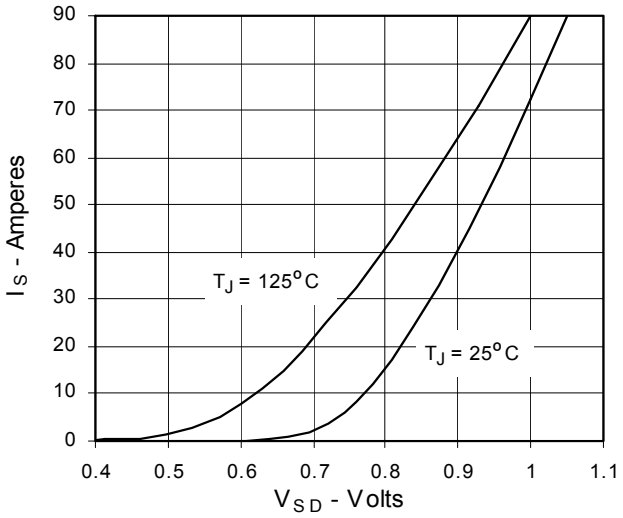



**Fig. 10. Gate Charge**

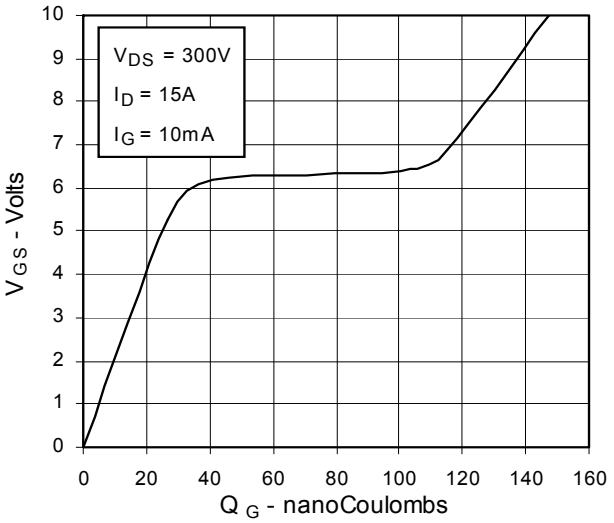



**Fig. 11. Capacitance**

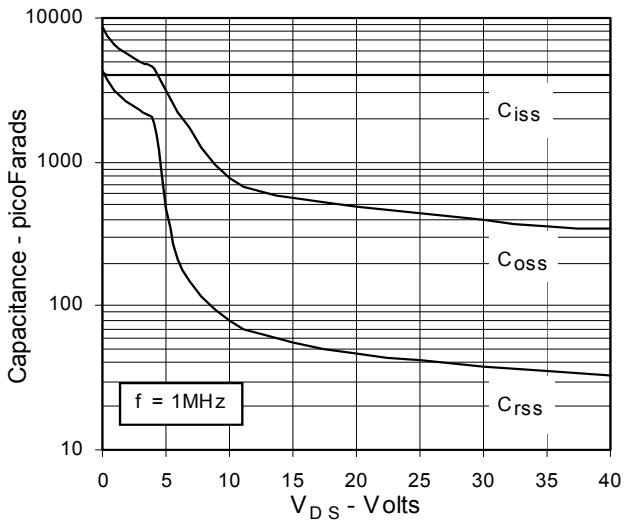



**Fig. 12. Forward-Bias Safe Operating Area**

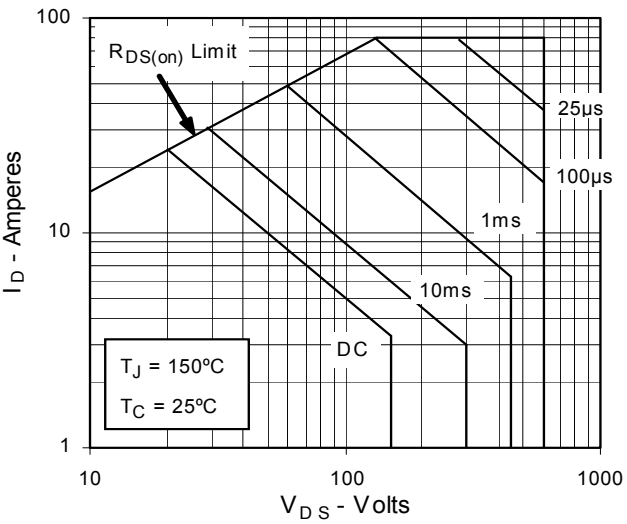
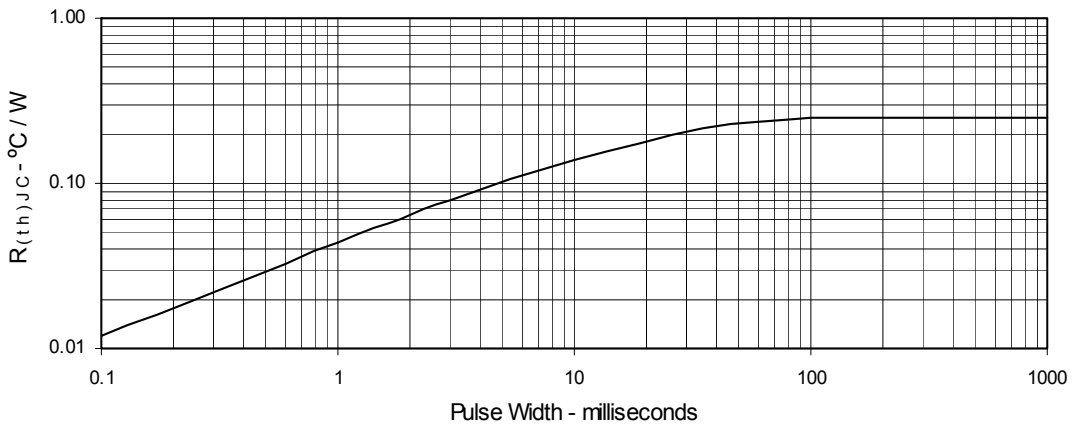
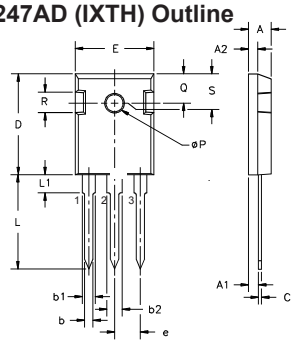



**Fig. 13. Maximum Transient Thermal Resistance**



# Package Outline Drawings

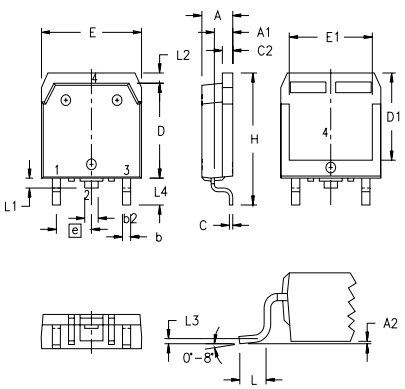
## TO-247AD (IXTH) Outline




Terminals: 1 - Gate 2 - Drain
3 - Source Tab - Drain

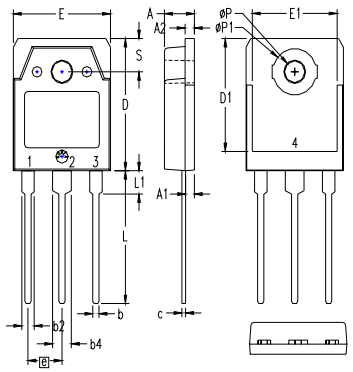
| Dim. | Millimeter | | Inches | |
|---|---|---|---|---|
| | Min. | Max. | Min. | Max. |
| A | 4.7 | 5.3 | .185 | .209 |
| $A_1$ | 2.2 | 2.54 | .087 | .102 |
| $A_2$ | 2.2 | 2.6 | .059 | .098 |
| b | 1.0 | 1.4 | .040 | .055 |
| $b_1$ | 1.65 | 2.13 | .065 | .084 |
| $b_2$ | 2.87 | 3.12 | .113 | .123 |
| 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 |
| ∅P | 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-268 (IXTT) Outline




| 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 |

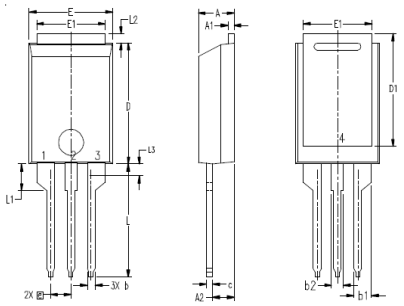
## TO-3P (IXTQ) Outline




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 |

## PLUS220 (IXTV) Outline

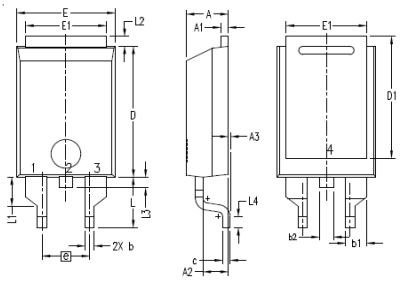


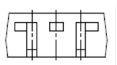

1. GATE
2. DRAIN (COLLECTOR)
3. SOURCE (EMITTER)
4. DRAIN (COLLECTOR)

| SYM | INCHES | | MILLIMETER | |
|---|---|---|---|---|
| | MIN | MAX | MIN | MAX |
| A | .169 | .185 | 4.30 | 4.70 |
| A1 | .028 | .035 | 0.70 | 0.90 |
| A2 | .098 | .118 | 2.50 | 3.00 |
| b | .035 | .047 | 0.90 | 1.20 |
| b1 | .080 | .095 | 2.03 | 2.41 |
| b2 | .054 | .064 | 1.37 | 1.63 |
| c | .028 | .035 | 0.70 | 0.90 |
| D | .551 | .591 | 14.00 | 15.00 |
| D1 | .512 | .539 | 13.00 | 13.70 |
| E | .394 | .433 | 10.00 | 11.00 |
| E1 | .331 | .346 | 8.40 | 8.80 |
| e | .100 BSC | | 2.54 BSC | |
| L | .512 | .551 | 13.00 | 14.00 |
| L1 | .118 | .138 | 3.00 | 3.50 |
| L2 | .035 | .051 | 0.90 | 1.30 |
| L3 | .047 | .059 | 1.20 | 1.50 |

## Package Outline Drawings

**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 |
| A1 | .028 | .035 | 0.70 | 0.90 |
| A2 | .098 | .118 | 2.50 | 3.00 |
| A3 | .000 | .010 | 0.00 | 0.25 |
| b | .035 | .047 | 0.90 | 1.20 |
| b1 | .080 | .095 | 2.03 | 2.41 |
| b2 | .054 | .064 | 1.37 | 1.63 |
| c | .028 | .035 | 0.70 | 0.90 |
| D | .551 | .591 | 14.00 | 15.00 |
| D1 | .512 | .539 | 13.00 | 13.70 |
| E | .394 | .433 | 10.00 | 11.00 |
| E1 | .331 | .346 | 8.40 | 8.80 |
| e | .200BSC | | 5.08 BSC | |
| L | .209 | .228 | 5.30 | 5.80 |
| L1 | .118 | .138 | 3.00 | 3.50 |
| L2 | .035 | .051 | 0.90 | 1.30 |
| L3 | .047 | .059 | 1.20 | 1.50 |
| L4 | .039 | .059 | 1.00 | 1.50 |