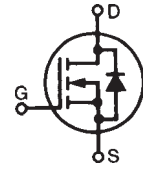


PolarHV™ Power MOSFET

N-Channel Enhancement Mode
Avalanche Rated

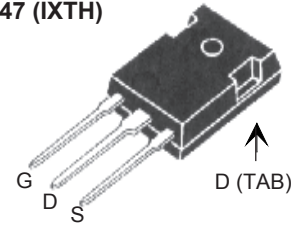
IXTH 30N60P
IXTQ 30N60P
IXTT 30N60P
IXTV 30N60P
IXTV 30N60PS

$V_{DSS} = 600 \text{ V}$
 $I_{D25} = 30 \text{ A}$
 $R_{DS(on)} \leq 240 \text{ m}\Omega$

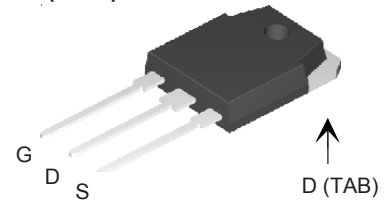


| Symbol | Test Conditions | Maximum Ratings | |
|------------|---|-----------------|------------------|
| V_{DSS} | $T_J = 25^\circ\text{C}$ to 150°C | 600 | V |
| V_{DGR} | $T_J = 25^\circ\text{C}$ to 150°C ; $R_{GS} = 1 \text{ M}\Omega$ | 600 | V |
| V_{GSS} | Continuous | ± 30 | V |
| V_{GSM} | Transient | ± 40 | V |
| I_{D25} | $T_C = 25^\circ\text{C}$ | 30 | A |
| I_{DM} | $T_C = 25^\circ\text{C}$, pulse width limited by T_{JM} | 80 | A |
| I_{AR} | $T_C = 25^\circ\text{C}$ | 30 | A |
| E_{AR} | $T_C = 25^\circ\text{C}$ | 50 | mJ |
| E_{AS} | $T_C = 25^\circ\text{C}$ | 1.5 | J |
| dv/dt | $I_S \leq I_{DM}$, $di/dt \leq 100 \text{ A}/\mu\text{s}$, $V_{DD} \leq V_{DSS}$, $T_J \leq 150^\circ\text{C}$, $R_G = 4 \Omega$ | 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-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 |

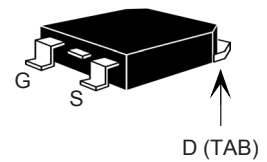
TO-247 (IXTH)



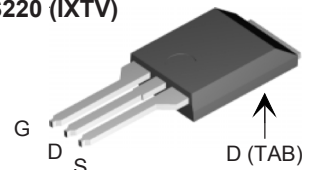
TO-3P (IXTQ)



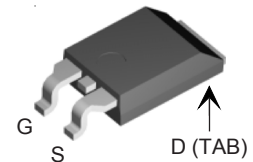
TO-268 (IXTT)



PLUS220 (IXTV)



PLUS220 (IXTV...S)



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

Features

- ¹ Fast Recovery diode
- ¹ Unclamped Inductive Switching (UIS) rated
- ¹ International standard packages
- ¹ Low package inductance
- easy to drive and to protect

| Symbol | Test Conditions ($T_J = 25^\circ\text{C}$, unless otherwise specified) | Characteristic Values | | |
|--------------|---|-----------------------|------|----------------------|
| | | Min. | Typ. | Max. |
| BV_{DSS} | $V_{GS} = 0 \text{ V}$, $I_D = 250 \mu\text{A}$ | 600 | | V |
| $V_{GS(th)}$ | $V_{DS} = V_{GS}$, $I_D = 250 \mu\text{A}$ | 3.0 | | V |
| I_{GSS} | $V_{GS} = \pm 30 \text{ V}$, $V_{DS} = 0$ | | | $\pm 100 \text{ nA}$ |
| I_{DSS} | $V_{DS} = V_{DSS}$ | | | 25 μA |
| | $V_{GS} = 0 \text{ V}$ $T_J = 125^\circ\text{C}$ | | | 250 μA |
| $R_{DS(on)}$ | $V_{GS} = 10 \text{ V}$, $I_D = 0.5 I_{D25}$ Pulse test, $t \leq 300 \mu\text{s}$, duty cycle $d \leq 2\%$ | | | 240 $\text{m}\Omega$ |

| 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 | | Characteristic Values | | |
|-----------------------|--|--|------|-------|
| | | (T _J = 25° C, unless otherwise specified) | | |
| Symbol | Test Conditions | 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

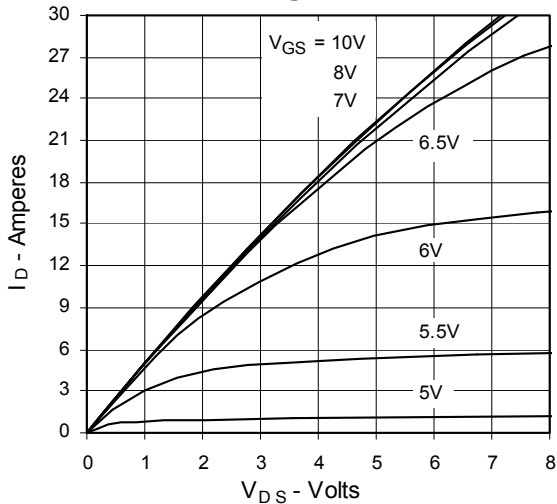
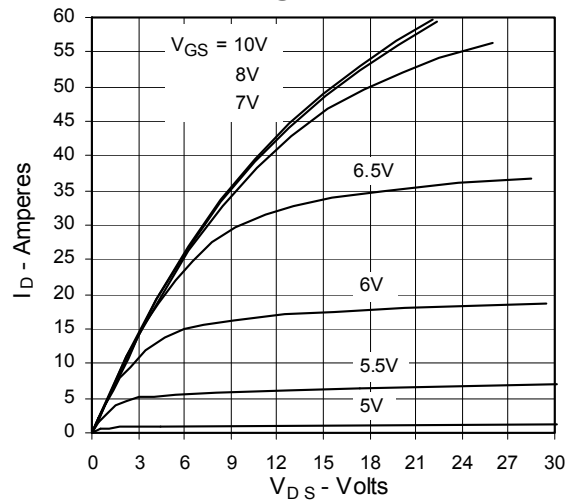


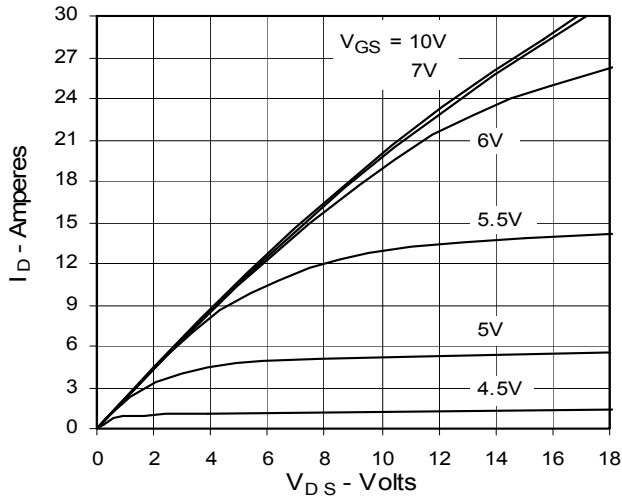
Fig. 2. Extended Output Characteristics @ 25°C



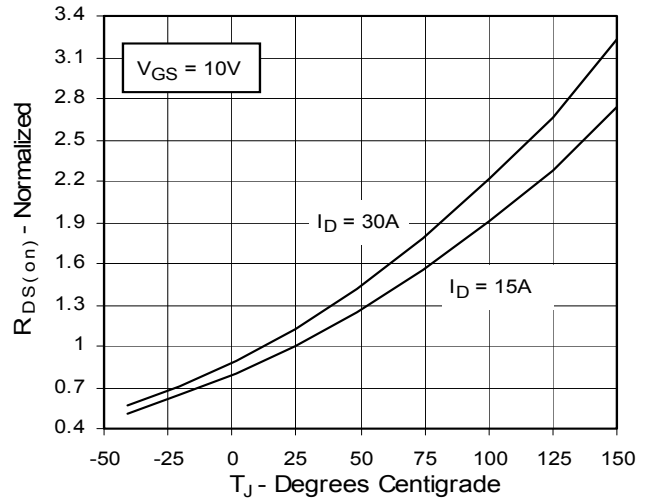
IXYS reserves the right to change limits, test conditions, and dimensions.

IXYS MOSFETs and IGBTs are covered by 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
 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

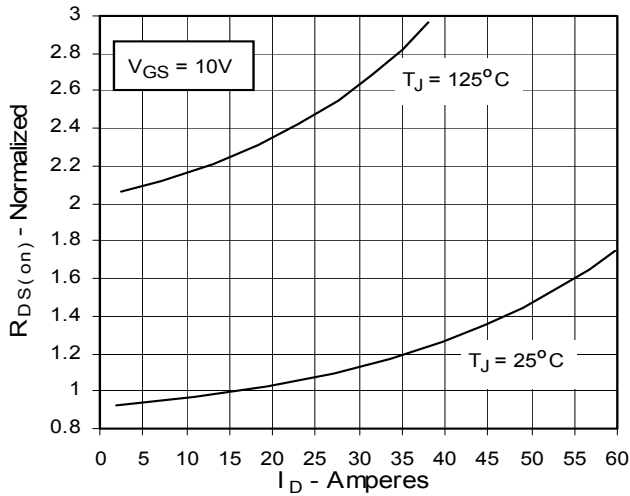
**Fig. 3. Output Characteristics
@ 125°C**



**Fig. 4. $R_{DS(on)}$ Normalized to 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**

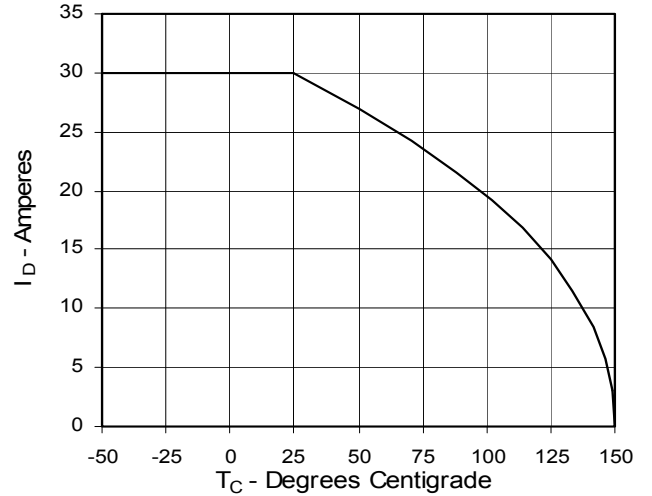


Fig. 7. Input Admittance

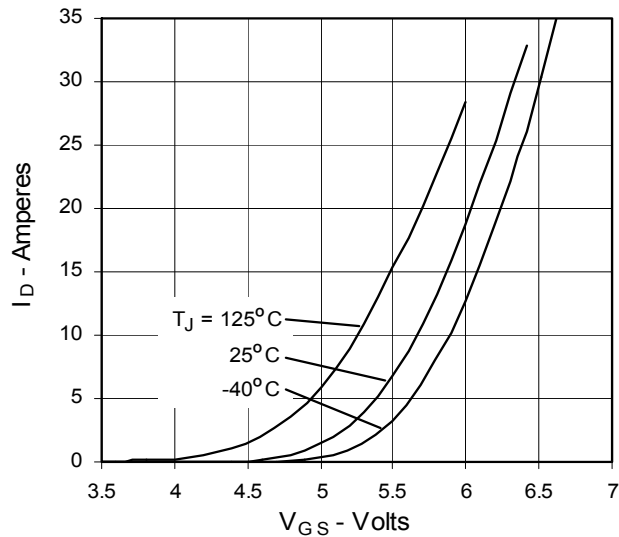


Fig. 8. Transconductance

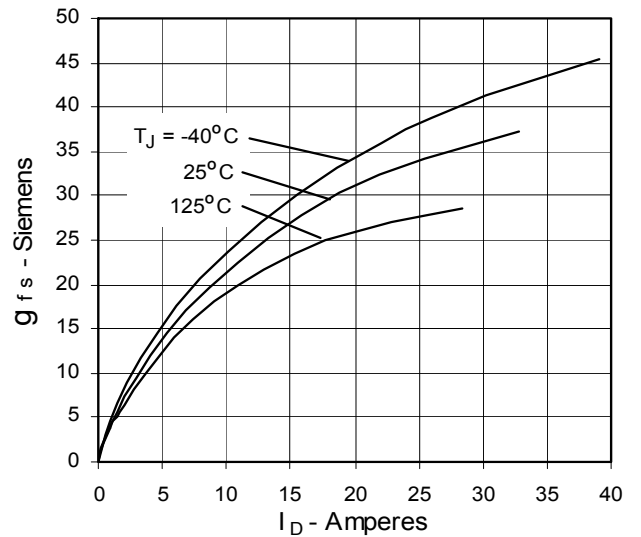


Fig. 9. Source Current vs. Source-To-Drain Voltage

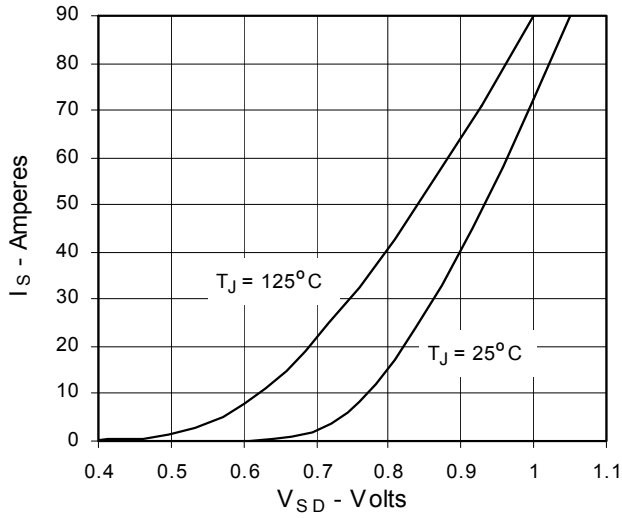


Fig. 10. Gate Charge

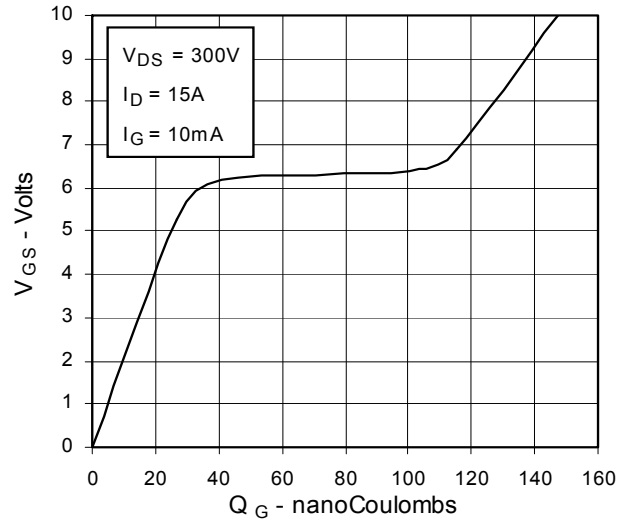


Fig. 11. Capacitance

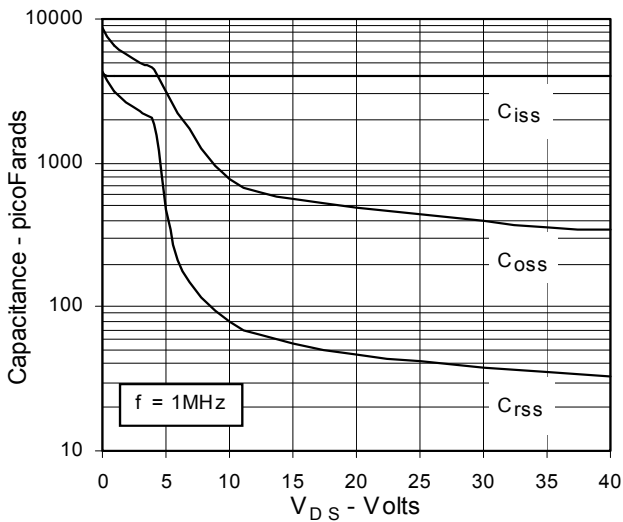


Fig. 12. Forward-Bias Safe Operating Area

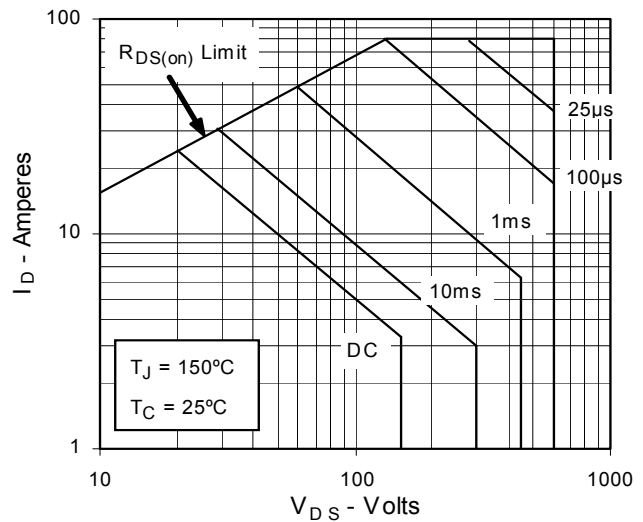
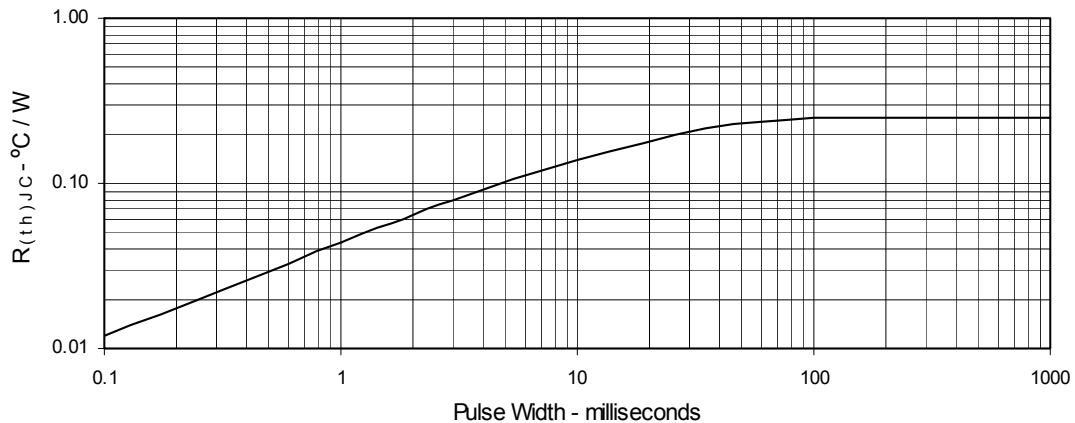
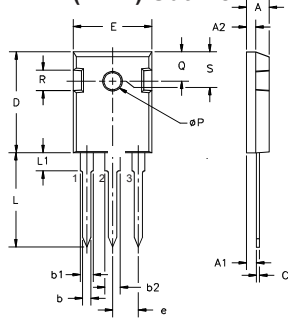


Fig. 13. Maximum Transient Thermal Resistance



Package Outline Drawings

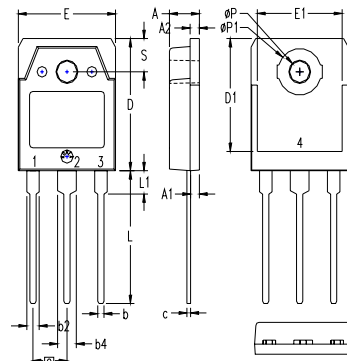
TO-247AD (IXTH) Outline



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 |
| L ₁ | | 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 |

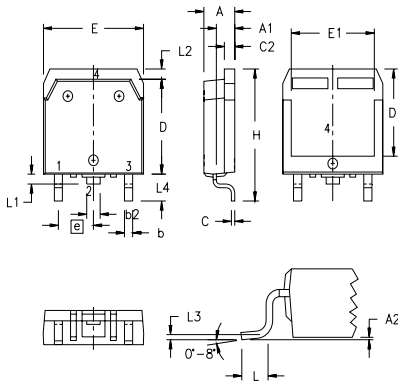
TO-3P (IXTQ) Outline



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

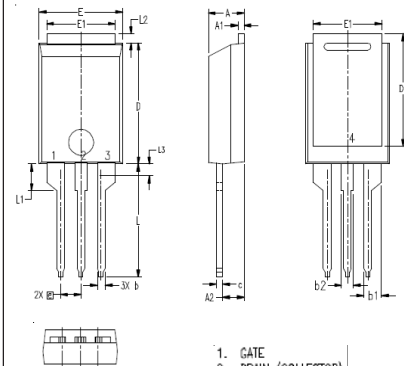
| SYM | INCHES | | MILLIMETERS | |
|-----------------|----------|------|-------------|-------|
| | MIN | MAX | MIN | MAX |
| A | .185 | .193 | 4.70 | 4.90 |
| A ₁ | .051 | .059 | 1.30 | 1.50 |
| A ₂ | .057 | .065 | 1.45 | 1.65 |
| b | .035 | .045 | 0.90 | 1.15 |
| b ₂ | .075 | .087 | 1.90 | 2.20 |
| b ₄ | .114 | .126 | 2.90 | 3.20 |
| c | .022 | .031 | 0.55 | 0.80 |
| D | .780 | .799 | 19.80 | 20.30 |
| D ₁ | .665 | .677 | 16.90 | 17.20 |
| E | .610 | .622 | 15.50 | 15.80 |
| E ₁ | .531 | .539 | 13.50 | 13.70 |
| e | .215 BSC | | 5.45 BSC | |
| L | .779 | .795 | 19.80 | 20.20 |
| L ₁ | .134 | .142 | 3.40 | 3.60 |
| ØP | .126 | .134 | 3.20 | 3.40 |
| ØP ₁ | .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 ₁ | .106 | .114 | 2.70 | 2.90 |
| A ₂ | .001 | .010 | 0.02 | 0.25 |
| b | .045 | .057 | 1.15 | 1.45 |
| b ₂ | .075 | .083 | 1.90 | 2.10 |
| C | .016 | .026 | 0.40 | 0.65 |
| C ₂ | .057 | .063 | 1.45 | 1.60 |
| D | .543 | .551 | 13.80 | 14.00 |
| D ₁ | .488 | .500 | 12.40 | 12.70 |
| E | .624 | .632 | 15.85 | 16.05 |
| E ₁ | .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 ₁ | .047 | .055 | 1.20 | 1.40 |
| L ₂ | .039 | .045 | 1.00 | 1.15 |
| L ₃ | .010 BSC | | 0.25 BSC | |
| L ₄ | .150 | .161 | 3.80 | 4.10 |

PLUS220 (IXTV) Outline

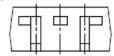
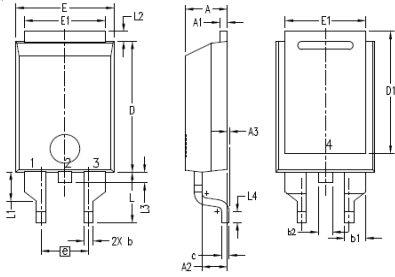


1. GATE
2. DRAIN (COLLECTOR)
3. SOURCE (EMITTER)
4. DRAIN (COLLECTOR)

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