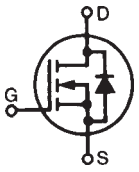
IXYS

# Polar™ Power MOSFET

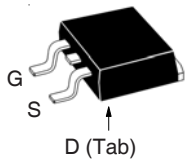
**IXTA2R4N120P**
**IXTP2R4N120P**
**IXTH2R4N120P**

$V_{DSS}$ = 1200V
$I_{D25}$ = 2.4A
$R_{DS(on)}$ ≤ 7.5Ω

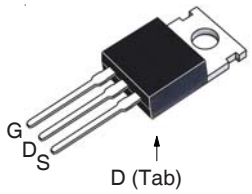
N-Channel Enhancement Mode
Avalanche Rated



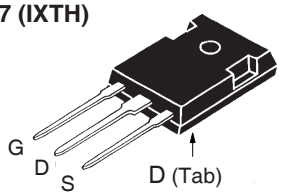

**TO-263 (IXTA)**




**TO-220 (IXTP)**




**TO-247 (IXTH)**




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

| Symbol | Test Conditions | Maximum Ratings | |
|---|---|---|---|
| $V_{DSS}$ | $T_J$ = 25°C to 150°C | 1200 | V |
| $V_{DGR}$ | $T_J$ = 25°C to 150°C, $R_{GS}$ = 1MΩ | 1200 | V |
| $V_{GSS}$ | Continuous | ±30 | V |
| $V_{GSM}$ | Transient | ±40 | V |
| $I_{D25}$ | $T_C$ = 25°C | 2.4 | A |
| $I_{DM}$ | $T_C$ = 25°C, Pulse Width Limited by $T_{JM}$ | 6.0 | A |
| $I_A$ | $T_C$ = 25°C | 2.4 | A |
| $E_{AS}$ | $T_C$ = 25°C | 200 | mJ |
| dv/dt | $I_S \le I_{DM}$, $V_{DD} \le V_{DSS}$, $T_J \le 150°C$ | 10 | V/ns |
| $P_D$ | $T_C$ = 25°C | 125 | W |
| $T_J$ | | -55 ... +150 | °C |
| $T_{JM}$ | | 150 | °C |
| $T_{stg}$ | | -55 ... +150 | °C |
| $T_L$ | Maximum Lead Temperature for Soldering | 300 | °C |
| $T_{SOLD}$ | 1.6 mm (0.062in.) from Case for 10s | 260 | °C |
| $F_C$ | Mounting Force (TO-263) | 10..65 / 2.2..14.6 | N/lb |
| $M_d$ | Mounting Torque (TO-220 & TO-247) | 1.13 / 10 | Nm/lb.in |
| Weight | TO-263 | 2.5 | g |
| | TO-220 | 3.0 | g |
| | TO-247 | 6.0 | g |

| Symbol | Test Conditions ($T_J$ = 25°C, Unless Otherwise Specified) | Characteristic Values Min. | Typ. | Max. | |
|---|---|---|---|---|---|
| $BV_{DSS}$ | $V_{GS}$ = 0V, $I_D$ = 250μA | 1200 | | | V |
| $V_{GS(th)}$ | $V_{DS} = V_{GS}$, $I_D$ = 250μA | 2.5 | | 4.5 | V |
| $I_{GSS}$ | $V_{GS}$ = ±30V, $V_{DS}$ = 0V | | | ±100 | nA |
| $I_{DSS}$ | $V_{DS} = V_{DSS}$, $V_{GS}$ = 0V | | | 5 | μA |
| | $T_J$ = 125°C | | | 300 | μA |
| $R_{DS(on)}$ | $V_{GS}$ = 10V, $I_D = 0.5 \bullet I_{D25}$, Note 1 | | 6.5 | 7.5 | Ω |

### Features

- International Standard Packages
- Low $Q_G$
- Avalanche Rated
- Low Package Inductance
- Fast Intrinsic Rectifier

### Advantages

- High Power Density
- Easy to Mount
- Space Savings

### Applications

- DC-DC Converters
- Switch-Mode and Resonant-Mode Power Supplies
- AC and DC Motor Drives
- Discharge Circiuts in Lasers, Spark Igniters, RF Generators
- High Voltage Pulse Power Applications

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| Symbol | Test Conditions ($T_J$ = 25°C, Unless Otherwise Specified) | Characteristic Values Min. | Typ. | Max | |
|---|---|---|---|---|---|
| $g_{fs}$ | $V_{DS}$ = 20V, $I_D$ = 0.5 • $I_{D25}$, Note 1 | 1.2 | 2.0 | | S |
| $C_{iss}$ | $V_{GS}$ = 0V, $V_{DS}$ = 25V, f = 1MHz | | 1207 | | pF |
| $C_{oss}$ | | | 57 | | pF |
| $C_{rss}$ | | | 11 | | pF |
| $t_{d(on)}$ | **Resistive Switching Times** | | 22 | | ns |
| $t_r$ | $V_{GS}$ = 10V, $V_{DS}$ = 0.5 • $V_{DSS}$, $I_D$ = 0.5 • $I_{D25}$ | | 25 | | ns |
| $t_{d(off)}$ | $R_G$ = 18Ω (External) | | 70 | | ns |
| $t_f$ | | | 32 | | ns |
| $Q_{g(on)}$ | $V_{GS}$ = 10V, $V_{DS}$ = 0.5 • $V_{DSS}$, $I_D$ = 0.5 • $I_{D25}$ | | 37 | | nC |
| $Q_{gs}$ | | | 6 | | nC |
| $Q_{gd}$ | | | 20 | | nC |
| $R_{thJC}$ | | | | 1.0 | °C/W |
| $R_{thCS}$ | TO-220 | | 0.50 | | °C/W |
| | TO-247 | | 0.21 | | °C/W |

**Source-Drain Diode**

| Symbol | Test Conditions ($T_J$ = 25°C, Unless Otherwise Specified) | Characteristic Values Min. | Typ. | Max | |
|---|---|---|---|---|---|
| $I_S$ | $V_{GS}$ = 0V | | | 2.4 | A |
| $I_{SM}$ | Repetitive, pulse Width Limited by $T_{JM}$ | | | 7.2 | A |
| $V_{SD}$ | $I_F$ = $I_S$, $V_{GS}$ = 0V, Note 1 | | | 1.5 | V |
| $t_{rr}$ | $I_F$ = 2.4A, -di/dt = 100A/μs<br>$V_R$ = 100V | | 920 | | ns |

Note 1. Pulse test, t ≤ 300μs, duty cycle, d ≤ 2%.

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

IXYS MOSFETs and IGBTs are covered by one or moreof the following U.S. patents: 4,835,592 4,860,072 4,881,106 4,931,844 5,017,508 5,034,796 5,049,961 5,063,307 5,187,117 5,237,481 5,381,025 5,486,715 6,162,665 6,259,123B1 6,306,728B1 6,404,065B1 6,534,343 6,583,505 6,683,344 6,710,405B2 6,710,463 6,727,585 6,759,692 6,771,478B2 7,005,734B2 7,063,975B2 7,071,537 7,157,338B2

**Fig. 1. Output Characteristics @ $T_J$ = 25°C**

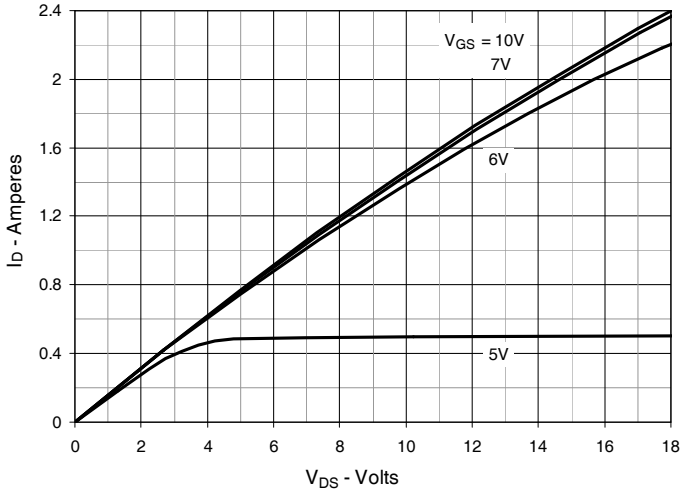


**Fig. 2. Extended Output Characteristics @ $T_J$ = 25°C**

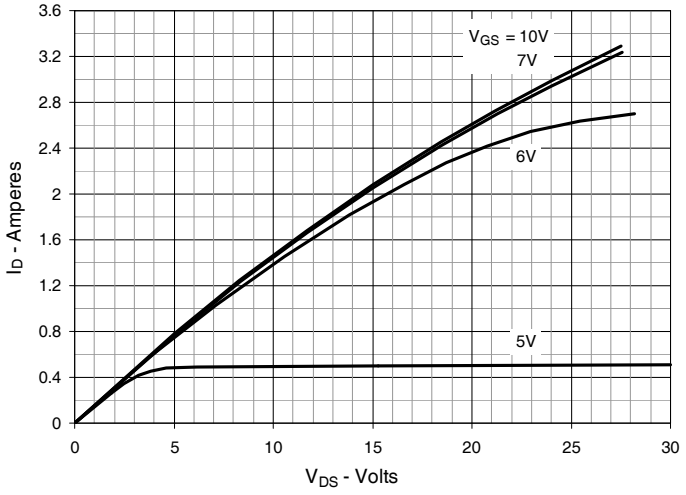


**Fig. 3. Output Characteristics @ $T_J$ = 125°C**

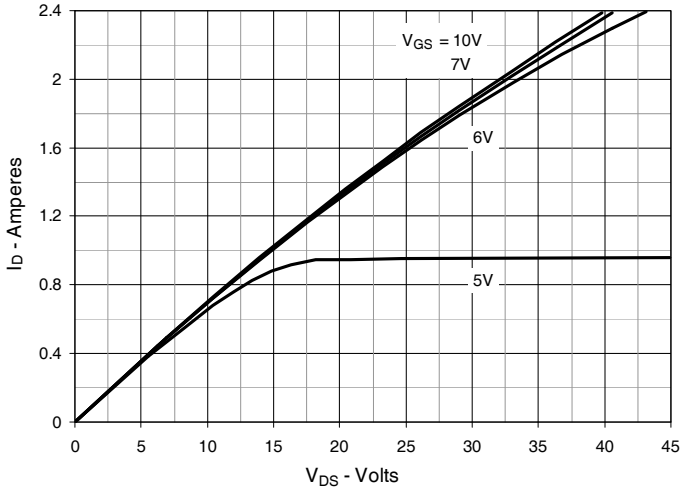


**Fig. 4. $R_{DS(on)}$ Normalized to $I_D$ = 1.2A Value vs. Junction Temperature**

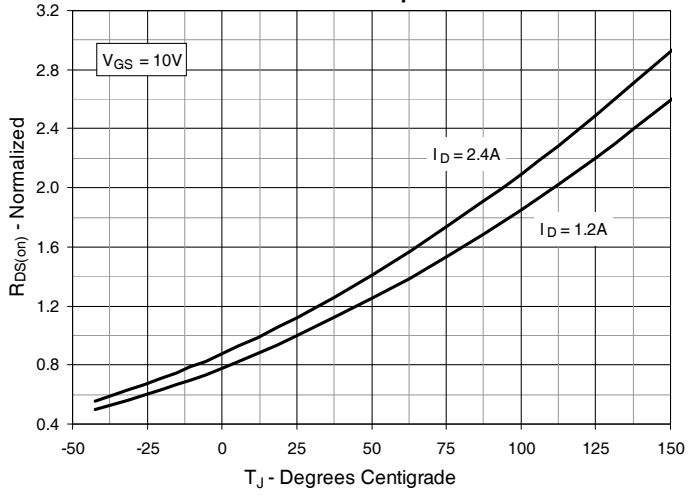


**Fig. 5. $R_{DS(on)}$ Normalized to $I_D$ = 1.2A Value vs. Drain Current**

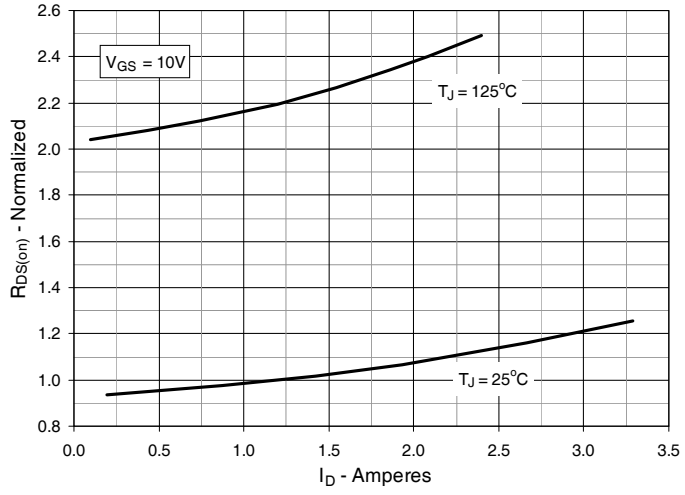


**Fig. 6. Maximum Drain Current vs. Case Temperature**

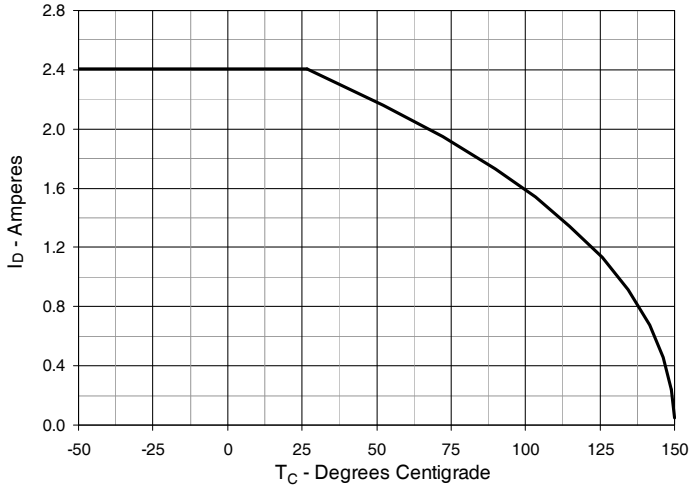


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**Fig. 7. Input Admittance**

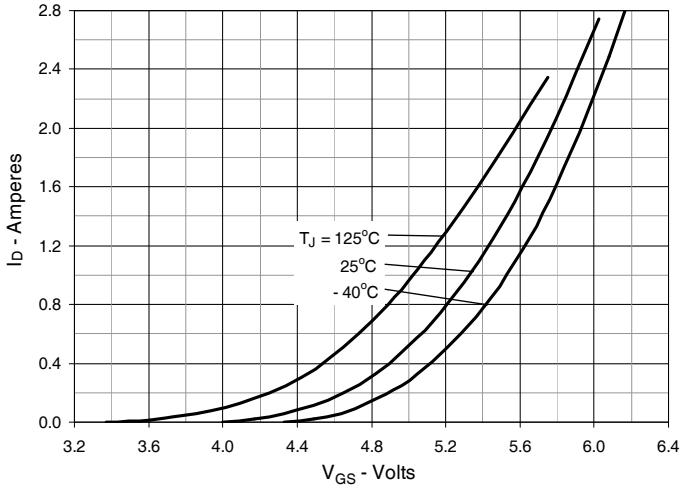



**Fig. 8. Transconductance**

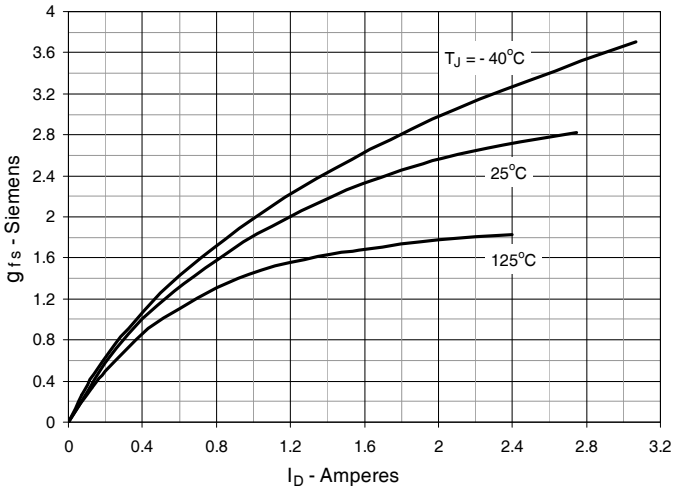



**Fig. 9. Forward Voltage Drop of Intrinsic Diode**

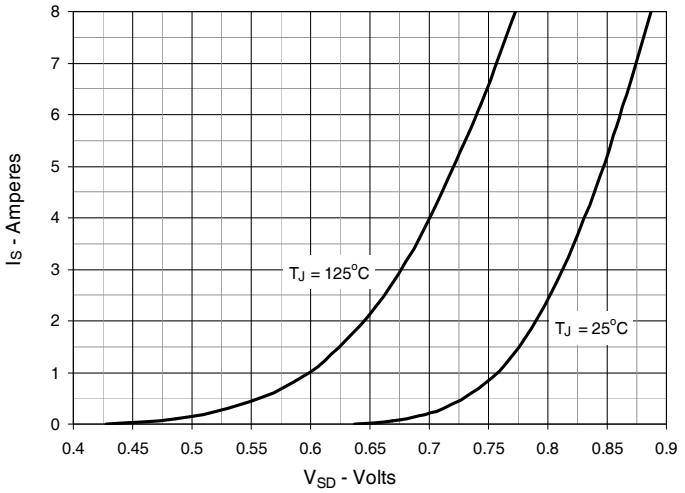



**Fig. 10. Gate Charge**

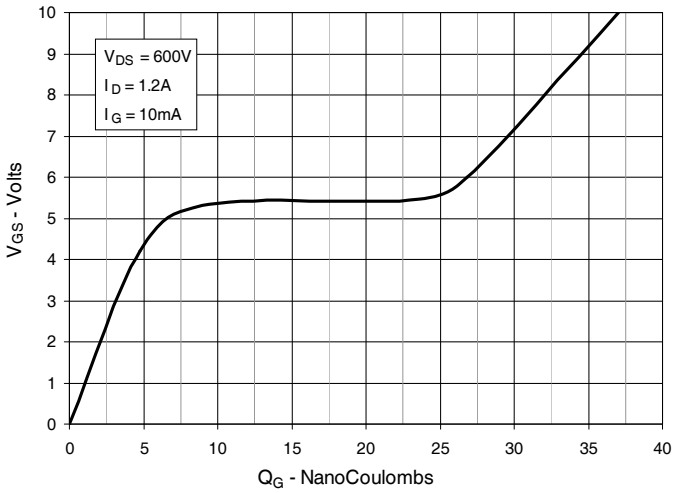



**Fig. 11. Capacitance**

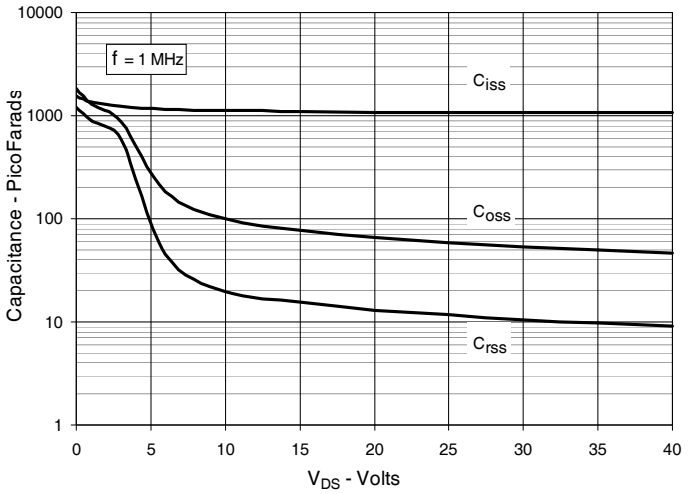
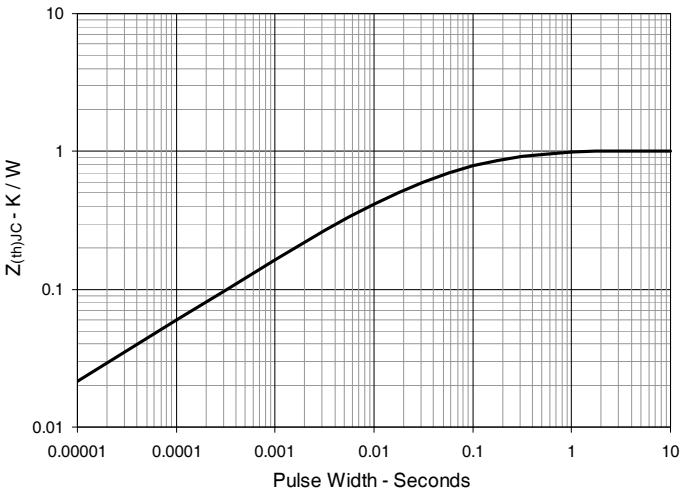
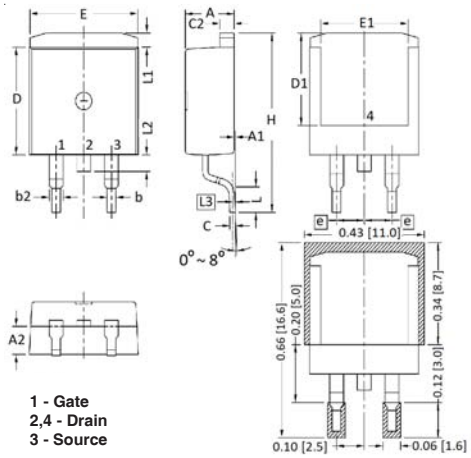



**Fig. 12. Maximum Transient Thermal Impedance**




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

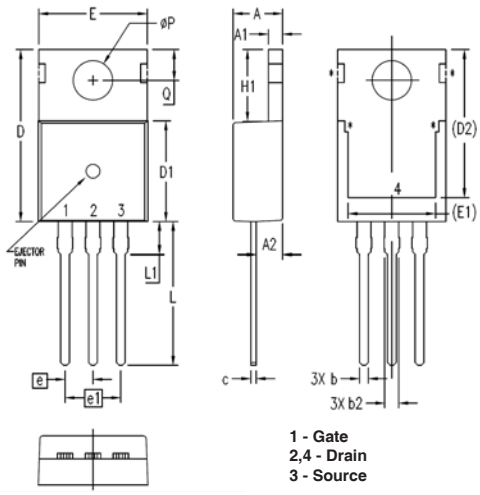
## TO-263 Outline




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

| SYM | INCHES | | MILLIMETER | |
|---|---|---|---|---|
| | MIN | MAX | MIN | MAX |
| A | .170 | .185 | 4.30 | 4.70 |
| A1 | .000 | .008 | 0.00 | 0.20 |
| A2 | .091 | .098 | 2.30 | 2.50 |
| b | .028 | .035 | 0.70 | 0.90 |
| b2 | .046 | .060 | 1.18 | 1.52 |
| C | .018 | .024 | 0.45 | 0.60 |
| C2 | .049 | .060 | 1.25 | 1.52 |
| D | .340 | .370 | 8.63 | 9.40 |
| D1 | .300 | .327 | 7.62 | 8.30 |
| E | .380 | .410 | 9.65 | 10.41 |
| E1 | .270 | .330 | 6.86 | 8.38 |
| e | .100 BSC | | 2.54 BSC | |
| H | .580 | .620 | 14.73 | 15.75 |
| L | .075 | .105 | 1.91 | 2.67 |
| L1 | .039 | .060 | 1.00 | 1.52 |
| L2 | — | .070 | — | 1.77 |
| L3 | .010 BSC | | 0.254 BSC | |

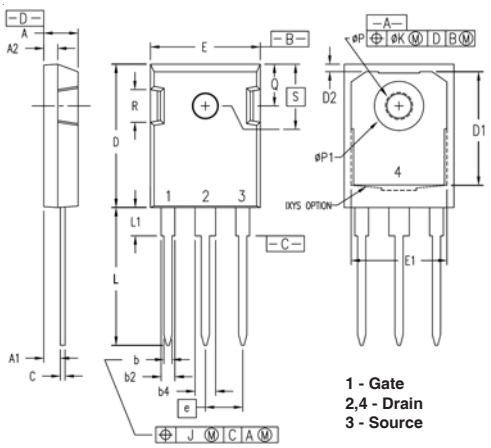
## TO-220 Outline




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

| SYM | INCHES | | MILLIMETERS | |
|---|---|---|---|---|
| | MIN | MAX | MIN | MAX |
| A | .169 | .185 | 4.30 | 4.70 |
| A1 | .047 | .055 | 1.20 | 1.40 |
| A2 | .079 | .106 | 2.00 | 2.70 |
| b | .024 | .039 | 0.60 | 1.00 |
| b2 | .045 | .057 | 1.15 | 1.45 |
| c | .014 | .026 | 0.35 | 0.65 |
| D | .587 | .626 | 14.90 | 15.90 |
| D1 | .335 | .370 | 8.50 | 9.40 |
| (D2) | .500 | .531 | 12.70 | 13.50 |
| E | .382 | .406 | 9.70 | 10.30 |
| (E1) | .283 | .323 | 7.20 | 8.20 |
| e | .100 BSC | | 2.54 BSC | |
| e1 | .200 BSC | | 5.08 BSC | |
| H1 | .244 | .268 | 6.20 | 6.80 |
| L | .492 | .547 | 12.50 | 13.90 |
| L1 | .110 | .154 | 2.80 | 3.90 |
| ØP | .134 | .150 | 3.40 | 3.80 |
| Q | .106 | .126 | 2.70 | 3.20 |

## TO-247 Outline




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

| 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 | .545 | .565 | 13.84 | 14.35 |
| e | .215 BSC | | 5.45 BSC | |
| J | -- | .010 | -- | 0.25 |
| K | -- | .025 | -- | 0.64 |
| L | .780 | .810 | 19.81 | 20.57 |
| L1 | .150 | .170 | 3.81 | 4.32 |
| øP | .140 | .144 | 3.55 | 3.65 |
| øP1 | .275 | .290 | 6.99 | 7.37 |
| Q | .220 | .244 | 5.59 | 6.20 |
| R | .170 | .190 | 4.32 | 4.83 |
| S | .242 BSC | | 6.15 BSC | |

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