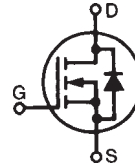


PolarHV™ HiPerFET Power MOSFET

IXFH12N80P
IXFQ12N80P
IXFV12N80P
IXFV12N80PS

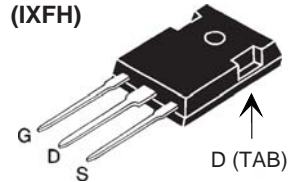
$V_{DSS} = 800 \text{ V}$
 $I_{D25} = 12 \text{ A}$
 $R_{DS(on)} \leq 0.85 \text{ } \Omega$
 $t_{rr} \leq 250 \text{ ns}$

N-Channel Enhancement Mode

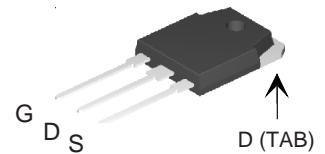


| Symbol | Test Conditions | Maximum Ratings | |
|------------|--|-----------------|------------------|
| | | | |
| V_{DSS} | $T_J = 25^\circ\text{C to } 150^\circ\text{C}$ | 800 | V |
| V_{DGR} | $T_J = 25^\circ\text{C to } 150^\circ\text{C}; R_{GS} = 1 \text{ M}\Omega$ | 800 | V |
| V_{GS} | Continuous | ± 30 | V |
| V_{GSM} | Transient | ± 40 | V |
| I_{D25} | $T_C = 25^\circ\text{C}$ | 12 | A |
| I_{DM} | $T_C = 25^\circ\text{C}$, pulse width limited by T_{JM} | 36 | A |
| I_{AR} | $T_C = 25^\circ\text{C}$ | 6 | A |
| E_{AR} | $T_C = 25^\circ\text{C}$ | 30 | mJ |
| E_{AS} | $T_C = 25^\circ\text{C}$ | 0.8 | J |
| dv/dt | $I_S \leq I_{DM}$, $di/dt \leq 100 \text{ A}/\mu\text{s}$, $V_{DD} \leq V_{DSS}$, $T_J \leq 150^\circ\text{C}$, $R_G = 5 \text{ } \Omega$ | 10 | V/ns |
| P_D | $T_C = 25^\circ\text{C}$ | 360 | 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, TO-3P) | 1.13/10 | Nm/lb.in. |
| F_C | Mounting force (PLUS220, PLUS220SMD) | 11..65/2.5..15 | N/lb. |
| Weight | PLUS220 & PLUS220SMD | 4.0 | g |
| | TO-3P | 5.5 | g |
| | TO-247 | 6.0 | g |

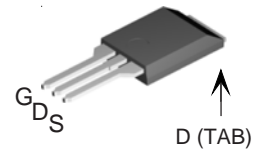
TO-247 (IXFH)



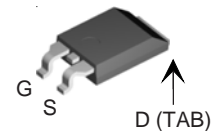
TO-3P (IXFQ)



PLUS220 (IXFV)



PLUS220 SMD (IXFV...S)



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

Features

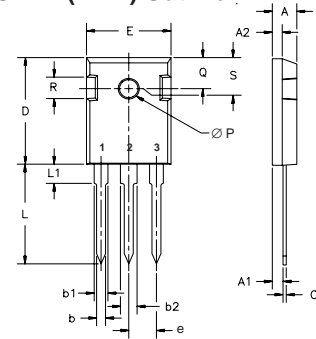
- International standard packages
- Unclamped Inductive Switching (UIS) rated
- Low package inductance
 - easy to drive and to protect

Advantages

- Easy to mount
- Space savings
- High power density

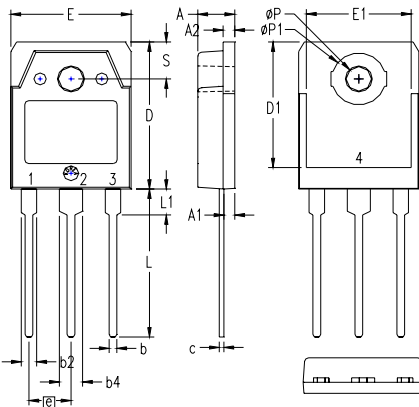
| Symbol | Test Conditions | Characteristic Values | | |
|--------------|--|-----------------------|------|----------------------|
| | | Min. | Typ. | Max. |
| BV_{DSS} | $V_{GS} = 0 \text{ V}$, $I_D = 250 \text{ } \mu\text{A}$ | 800 | | V |
| $V_{GS(th)}$ | $V_{DS} = V_{GS}$, $I_D = 2.5 \text{ mA}$ | 3.0 | | 5.5 V |
| I_{GSS} | $V_{GS} = \pm 30 \text{ V}$, $V_{DS} = 0 \text{ V}$ | | | $\pm 100 \text{ nA}$ |
| I_{DSS} | $V_{DS} = V_{DSS}$ $V_{GS} = 0 \text{ V}$ $T_J = 125^\circ\text{C}$ | | | 25 μA |
| | | | | 250 μA |
| $R_{DS(on)}$ | $V_{GS} = 10 \text{ V}$, $I_D = 0.5 I_{D25}$, Note 1 | | | 0.85 Ω |

| Symbol | Test Conditions | Characteristic Values | | |
|--|---|-----------------------|------|--------------------|
| | | Min. | Typ. | Max. |
| ($T_J = 25^\circ\text{C}$ unless otherwise specified) | | | | |
| g_{fs} | $V_{DS} = 20\text{ V}; I_D = 0.5 I_{D25}$, Note 1 | 8 | 14 | S |
| C_{iss} | $V_{GS} = 0\text{ V}, V_{DS} = 25\text{ V}, f = 1\text{ MHz}$ | 2800 | | pF |
| C_{oss} | | 210 | | pF |
| C_{rss} | | 19 | | pF |
| $t_{d(on)}$ | $V_{GS} = 10\text{ V}, V_{DS} = 0.5 V_{DSS}, I_D = I_{D25}$ $R_G = 5\ \Omega$ (External) | 23 | | ns |
| t_r | | 26 | | ns |
| $t_{d(off)}$ | | 70 | | ns |
| t_f | | 25 | | ns |
| $Q_{g(on)}$ | $V_{GS} = 10\text{ V}, V_{DS} = 0.5 V_{DSS}, I_D = 0.5 I_{D25}$ | 51 | | nC |
| Q_{gs} | | 13 | | nC |
| Q_{gd} | | 19 | | nC |
| R_{thJC} | (TO-247 & TO-3P) | 0.35 | | $^\circ\text{C/W}$ |
| R_{thCS} | | 0.21 | | $^\circ\text{C/W}$ |

TO-247 (IXFH) 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 |

| Symbol | Test Conditions | Characteristic Values | | |
|--|---|-----------------------|------|---------------|
| | | Min. | Typ. | Max. |
| ($T_J = 25^\circ\text{C}$, unless otherwise specified) | | | | |
| I_S | $V_{GS} = 0\text{ V}$ | | 12 | A |
| I_{SM} | Repetitive | | 36 | A |
| V_{SD} | $I_F = I_S, V_{GS} = 0\text{ V}$, Note 1 | | 1.5 | V |
| t_{rr} | $I_S = 12\text{ A}, V_{GS} = 0\text{ V}$ $-di/dt = 100\text{ A}/\mu\text{s}, V_R = 100\text{ V}$ | 200 | | ns |
| Q_{rm} | | 0.8 | | μC |
| I_{rm} | | 4 | | A |

 Note 1: Pulse test, $t \leq 300\ \mu\text{s}$, duty cycle $d \leq 2\%$
TO-3P (IXFQ) Outline


| 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 |

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

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 | 7,005,734 B2 |
| 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 | 7,063,975 B2 |
| | 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 | 7,071,537 |

Fig. 1. Output Characteristics @ 25°C

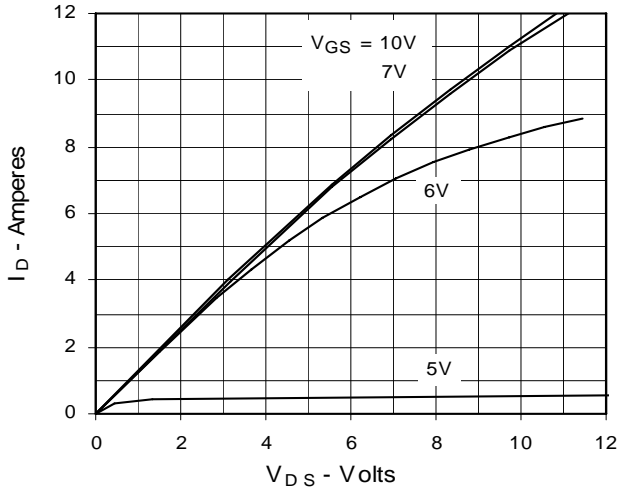


Fig. 2. Extended Output Characteristics @ 25°C

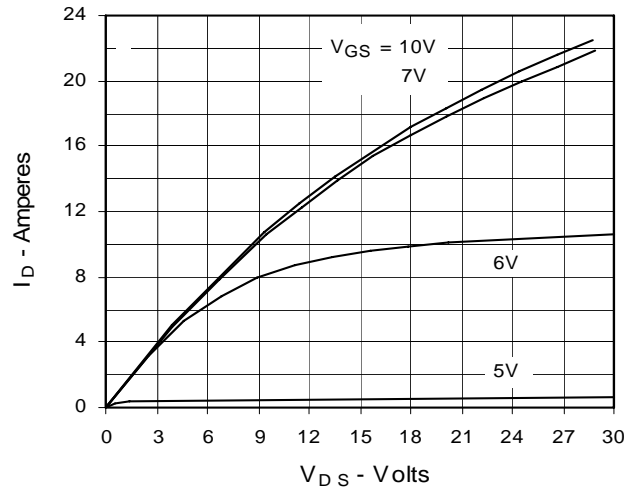


Fig. 3. Output Characteristics @ 125°C

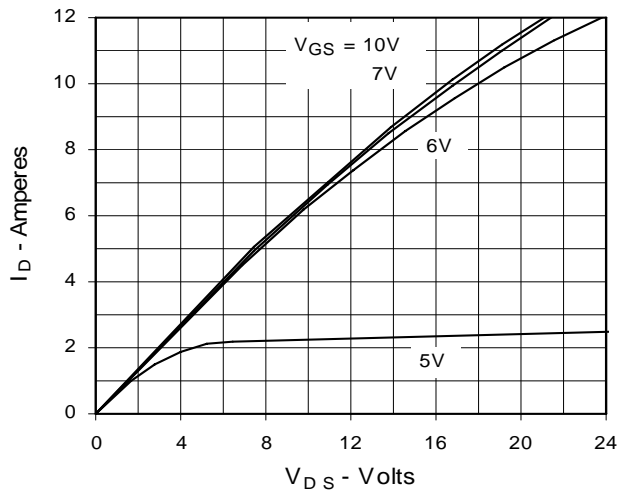


Fig. 4. $R_{DS(on)}$ Normalized to 0.5 I_{D25} Value vs. Junction Temperature

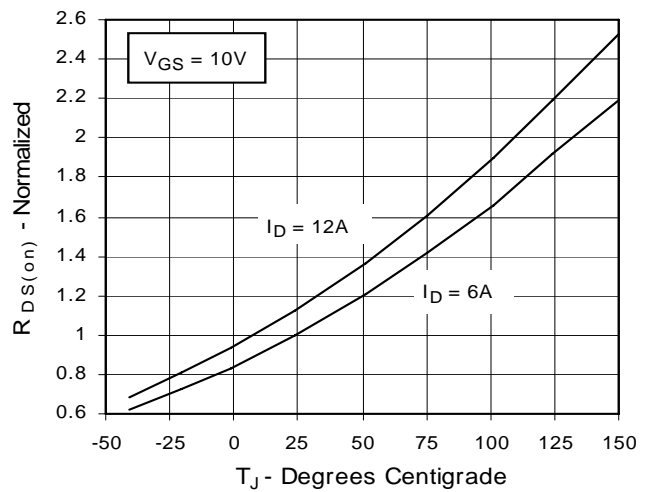


Fig. 5. $R_{DS(on)}$ Normalized to 0.5 I_{D25} Value vs. I_D

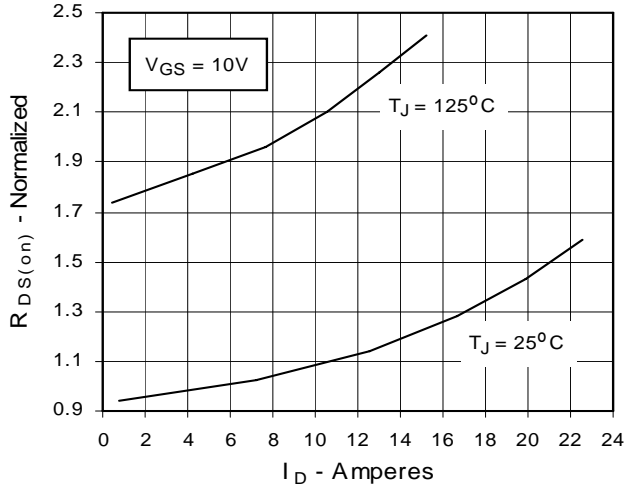


Fig. 6. Drain Current vs. Case Temperature

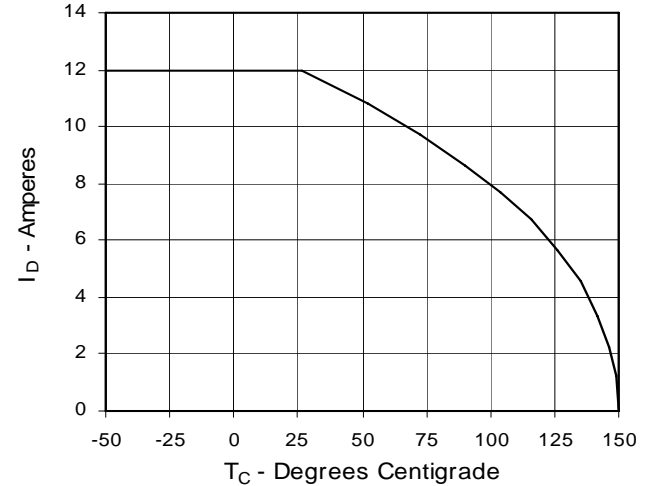


Fig. 7. Input Admittance

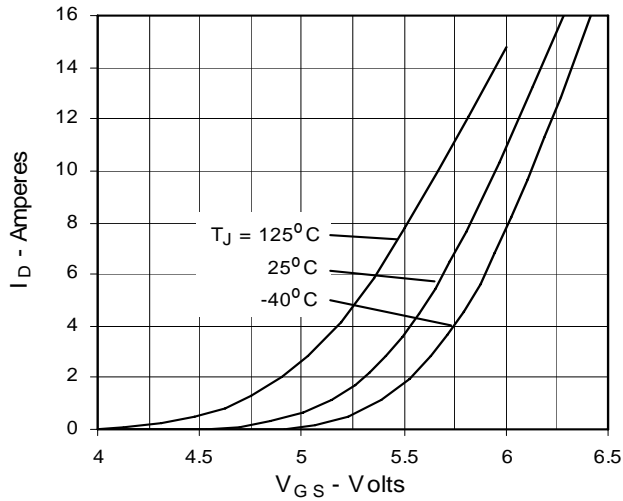


Fig. 8. Transconductance

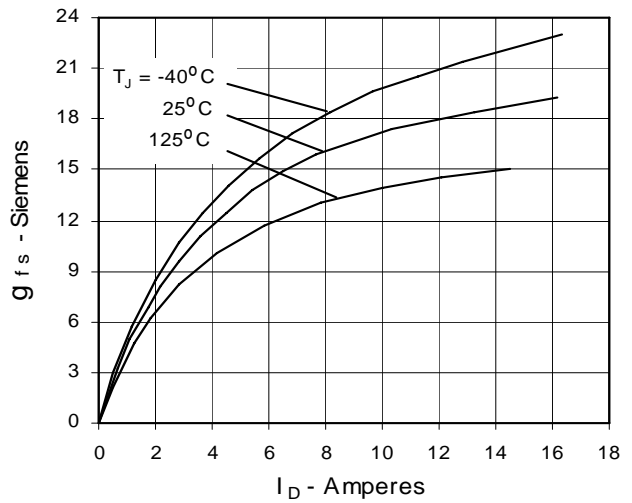


Fig. 9. Source Current vs. Source-To-Drain Voltage

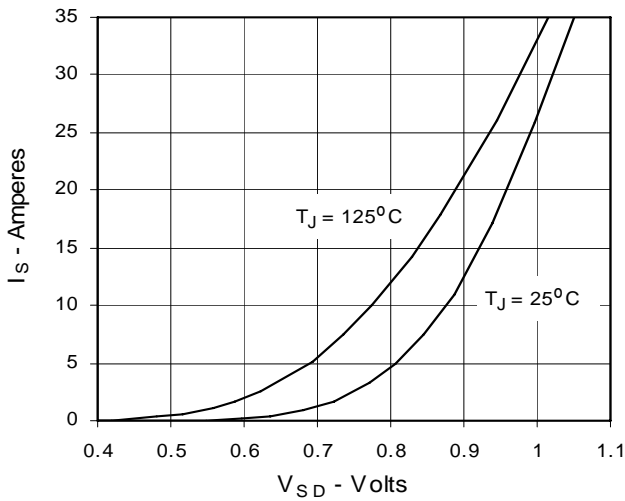


Fig. 10. Gate Charge

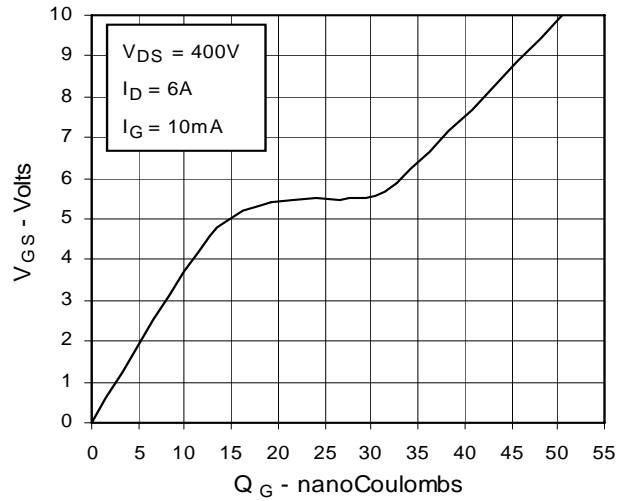


Fig. 11. Capacitance

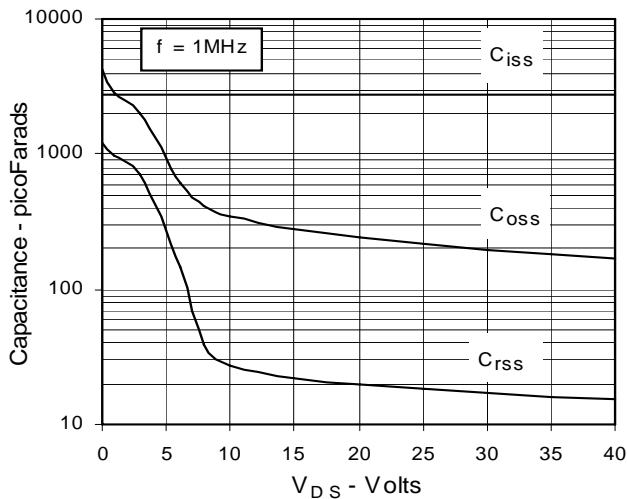
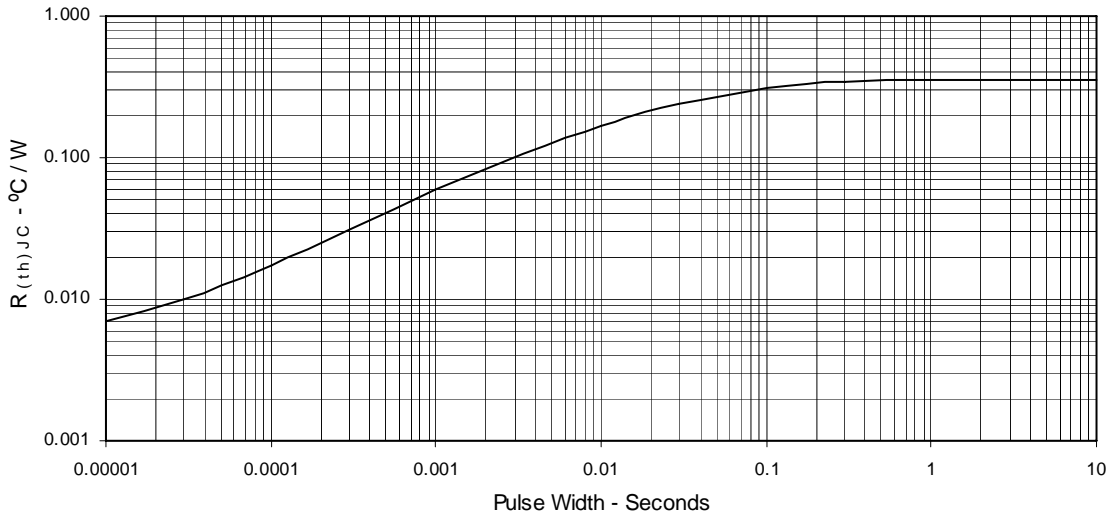
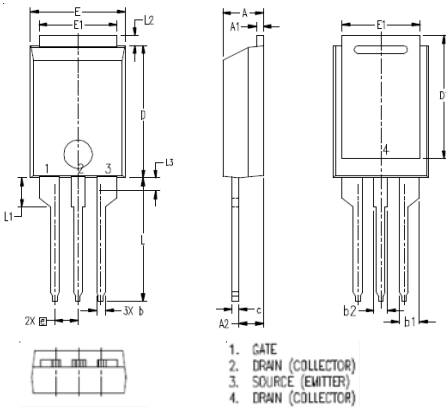


Fig. 12. Maximum Transient Thermal Resistance

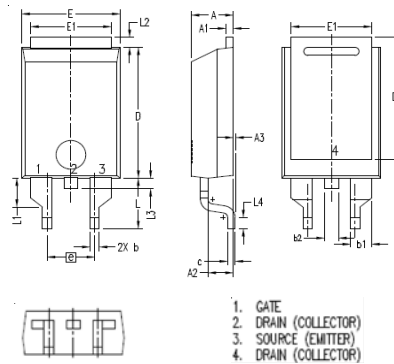


PLUS220 (IXFV) Outline



| 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 |

PLUS220SMD (IXFV_S) Outline



| 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 | .200 BSC | | 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 |



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