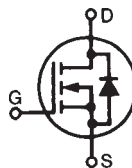


# PolarHV™ HiPerFET Power MOSFET

N-Channel Enhancement Mode  
Avalanche Rated  
Fast Intrinsic Diode

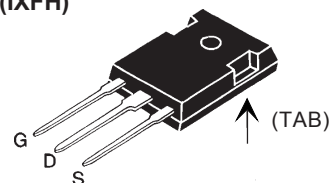
IXFH 20N80P  
IXFT 20N80P  
IXFV 20N80P  
IXFV 20N80PS



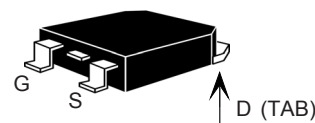
$$\begin{aligned} V_{DSS} &= 800 \text{ V} \\ I_{D25} &= 20 \text{ A} \\ R_{DS(on)} &\leq 520 \text{ m}\Omega \\ t_{rr} &\leq 250 \text{ ns} \end{aligned}$$

| 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                |
| $V_{GSS}$  | Continuous                                                                                                                              | $\pm 30$          | V                |
| $V_{GSM}$  | Transient                                                                                                                               | $\pm 40$          | V                |
| $I_{D25}$  | $T_C = 25^\circ\text{C}$                                                                                                                | 20                | A                |
| $I_{DM}$   | $T_C = 25^\circ\text{C}$ , pulse width limited by $T_{JM}$                                                                              | 50                | A                |
| $I_{AR}$   | $T_C = 25^\circ\text{C}$                                                                                                                | 10                | A                |
| $E_{AR}$   | $T_C = 25^\circ\text{C}$                                                                                                                | 30                | mJ               |
| $E_{AS}$   | $T_C = 25^\circ\text{C}$                                                                                                                | 1.0               | J                |
| $dv/dt$    | $I_S \leq I_{DM}$ , $di/dt \leq 100 \text{ A}/\mu\text{s}$ , $V_{DD} \leq V_{DSS}$ ,<br>$T_J \leq 150^\circ\text{C}$ , $R_G = 4 \Omega$ | 10                | V/ns             |
| $P_D$      | $T_C = 25^\circ\text{C}$                                                                                                                | 500               | W                |
| $T_J$      |                                                                                                                                         | -55 ... +150      | $^\circ\text{C}$ |
| $T_{JM}$   |                                                                                                                                         | 150               | $^\circ\text{C}$ |
| $T_{stg}$  |                                                                                                                                         | -55 ... +150      | $^\circ\text{C}$ |
| $T_L$      | Maximum lead temperature for soldering                                                                                                  | 300               | $^\circ\text{C}$ |
| $T_{SOLD}$ | Plastic case for 10 s                                                                                                                   | 260               | $^\circ\text{C}$ |
| $M_d$      | Mounting torque (TO-247)                                                                                                                | 1.13/10 Nm/lb.in. |                  |
| $F_c$      | Mounting force (PLUS220)                                                                                                                | 1..65 / 2.5..15   | N/lb             |
| Weight     | TO-247                                                                                                                                  | 6                 | g                |
|            | TO-268                                                                                                                                  | 5.5               | g                |
|            | PLUS220 types                                                                                                                           | 4                 | g                |

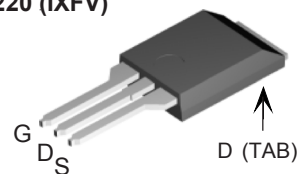
TO-247 (IXFH)



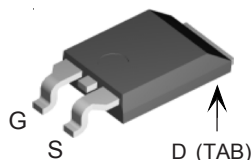
TO-268 (IXFT)



PLUS220 (IXFV)



PLUS220 SMD(IXFV..S)



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

## Features

- International standard packages
- Fast recovery diode
- 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<br>( $T_J = 25^\circ\text{C}$ , unless otherwise specified)                                       | Characteristic Values |      |                      |
|--------------|-------------------------------------------------------------------------------------------------------------------|-----------------------|------|----------------------|
|              |                                                                                                                   | Min.                  | Typ. | Max.                 |
| $BV_{DSS}$   | $V_{GS} = 0 \text{ V}$ , $I_D = 250 \mu\text{A}$                                                                  | 800                   |      | V                    |
| $V_{GS(th)}$ | $V_{DS} = V_{GS}$ , $I_D = 4 \text{ mA}$                                                                          | 3.0                   |      | 5.0 V                |
| $I_{GSS}$    | $V_{GS} = \pm 30 \text{ V}_{DC}$ , $V_{DS} = 0$                                                                   |                       |      | $\pm 200 \text{ nA}$ |
| $I_{DSS}$    | $V_{DS} = V_{DSS}$<br>$V_{GS} = 0 \text{ V}$<br>$T_J = 125^\circ\text{C}$                                         |                       |      | 25 $\mu\text{A}$     |
|              |                                                                                                                   |                       |      | 1000 $\mu\text{A}$   |
| $R_{DS(on)}$ | $V_{GS} = 10 \text{ V}$ , $I_D = 10 \text{ A}$<br>Pulse test, $t \leq 300 \mu\text{s}$ , duty cycle $d \leq 2 \%$ |                       |      | 520 m $\Omega$       |

DS99511E(03/06)

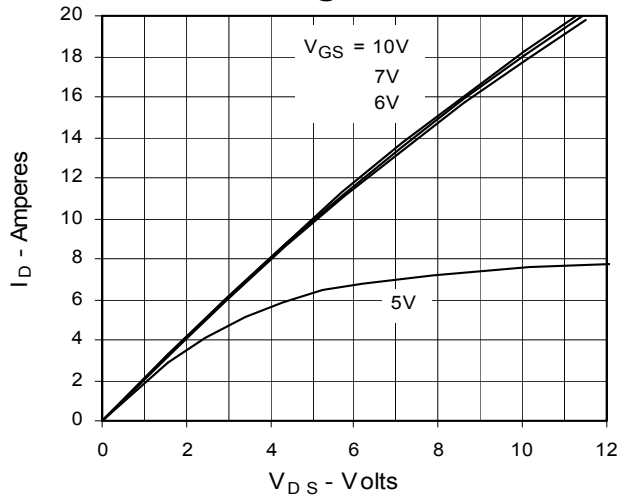
| Symbol       | Test Conditions                                                                                 | Characteristic Values<br>( $T_J = 25^\circ\text{C}$ unless otherwise specified) |      |                   |
|--------------|-------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------|------|-------------------|
|              |                                                                                                 | Min.                                                                            | Typ. | Max.              |
| $g_{fs}$     | $V_{DS} = 20\text{ V}; I_D = 10\text{ A}$ , pulse test                                          | 14                                                                              | 23   | S                 |
| $C_{iss}$    | $V_{GS} = 0\text{ V}, V_{DS} = 25\text{ V}, f = 1\text{ MHz}$                                   |                                                                                 | 4685 | pF                |
| $C_{oss}$    |                                                                                                 |                                                                                 | 356  | pF                |
| $C_{rss}$    |                                                                                                 |                                                                                 | 26   | pF                |
| $t_{d(on)}$  | $V_{GS} = 10\text{ V}, V_{DS} = 0.5 V_{DSS}, I_D = 10\text{ A}$<br>$R_G = 2\ \Omega$ (External) |                                                                                 | 30   | ns                |
| $t_r$        |                                                                                                 |                                                                                 | 24   | ns                |
| $t_{d(off)}$ |                                                                                                 |                                                                                 | 85   | ns                |
| $t_f$        |                                                                                                 |                                                                                 | 24   | ns                |
| $Q_{g(on)}$  | $V_{GS} = 10\text{ V}, V_{DS} = 0.5 V_{DSS}, I_D = 10\text{ A}$                                 |                                                                                 | 86   | nC                |
| $Q_{gs}$     |                                                                                                 |                                                                                 | 27   | nC                |
| $Q_{gd}$     |                                                                                                 |                                                                                 | 24   | nC                |
| $R_{thJC}$   | (TO-247, PLUS220)                                                                               |                                                                                 | 0.25 | $^\circ\text{CW}$ |
| $R_{thCS}$   |                                                                                                 |                                                                                 | 0.21 | $^\circ\text{CW}$ |

| Source-Drain Diode |                                                                                                       | Characteristic Values<br>( $T_J = 25^\circ\text{C}$ unless otherwise specified) |      |               |
|--------------------|-------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------|------|---------------|
| Symbol             | Test Conditions                                                                                       | Min.                                                                            | Typ. | Max.          |
| $I_S$              | $V_{GS} = 0\text{ V}$                                                                                 |                                                                                 |      | 20 A          |
| $I_{SM}$           | Repetitive                                                                                            |                                                                                 |      | 50 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>$V_R = 100\text{ V}; V_{GS} = 0\text{ V}$   |                                                                                 |      | 250 ns        |
| $Q_{RM}$           |                                                                                                       |                                                                                 | 0.8  | $\mu\text{C}$ |
| $I_{RM}$           |                                                                                                       |                                                                                 | 6.0  | A             |

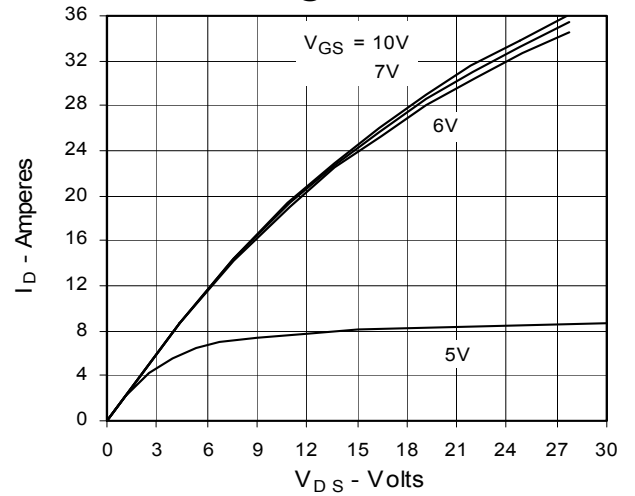
IXYS reserves the right to change limits, test conditions, and dimensions.

|                                                                                  |           |           |           |           |              |              |              |              |
|----------------------------------------------------------------------------------|-----------|-----------|-----------|-----------|--------------|--------------|--------------|--------------|
| IXYS MOSFETs and IGBTs are covered by one or more of the following U.S. patents: | 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    |
|                                                                                  | 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    |
|                                                                                  | 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 |

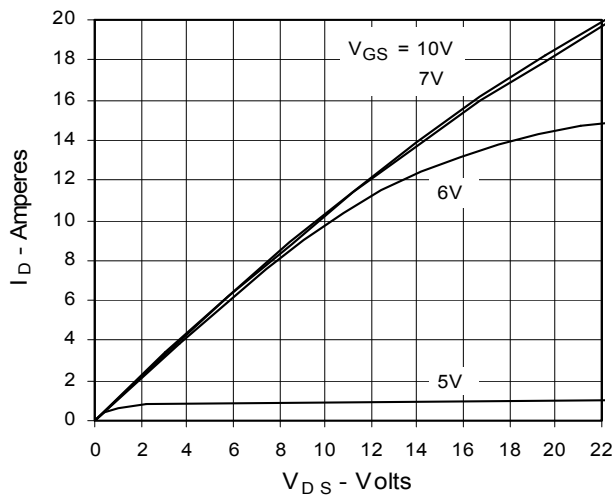
**Fig. 1. Output Characteristics**  
**@ 25°C**



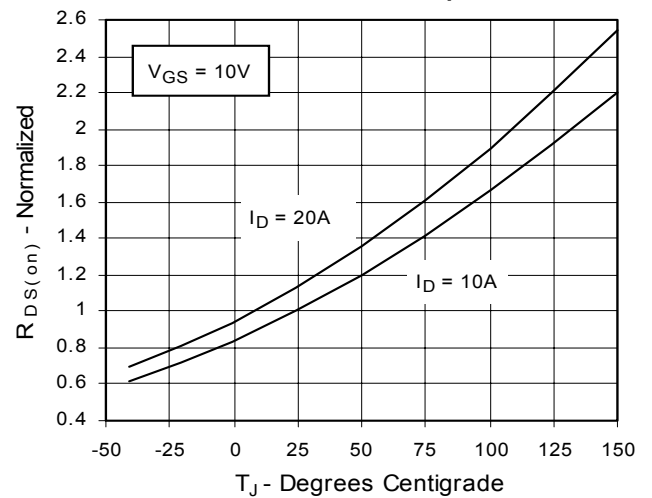
**Fig. 2. Extended Output Characteristics**  
**@ 25°C**



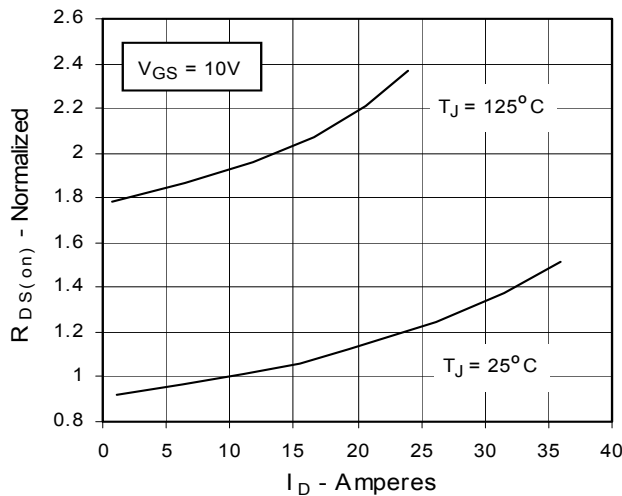
**Fig. 3. Output Characteristics**  
**@ 125°C**



**Fig. 4.  $R_{DS(on)}$  Normalized to  $I_D = 10A$**   
**Value vs. Junction Temperature**



**Fig. 5.  $R_{DS(on)}$  Normalized to**  
 **$I_D = 10A$  Value vs. Drain Current**



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

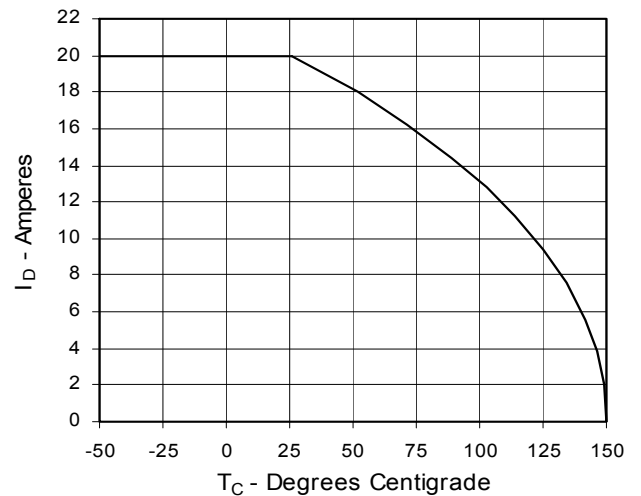


Fig. 7. Input Admittance

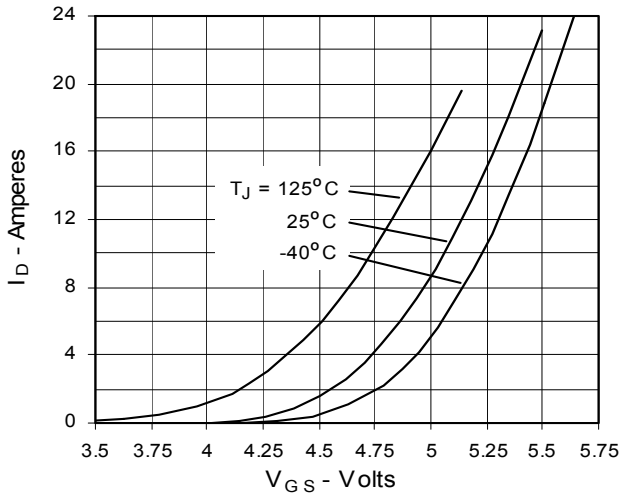


Fig. 8. Transconductance

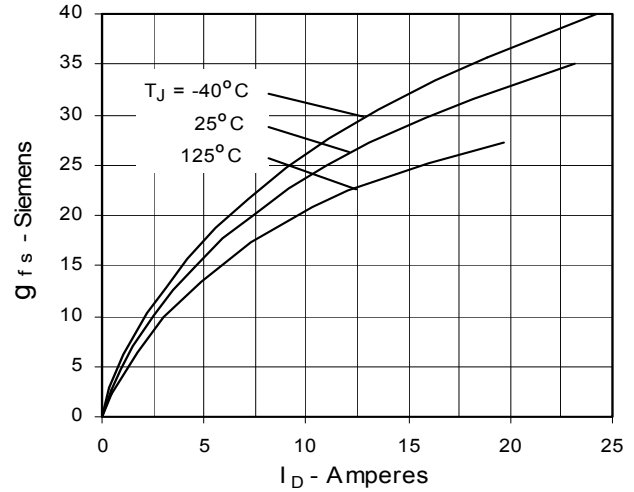


Fig. 9. Source Current vs. Source-To-Drain Voltage

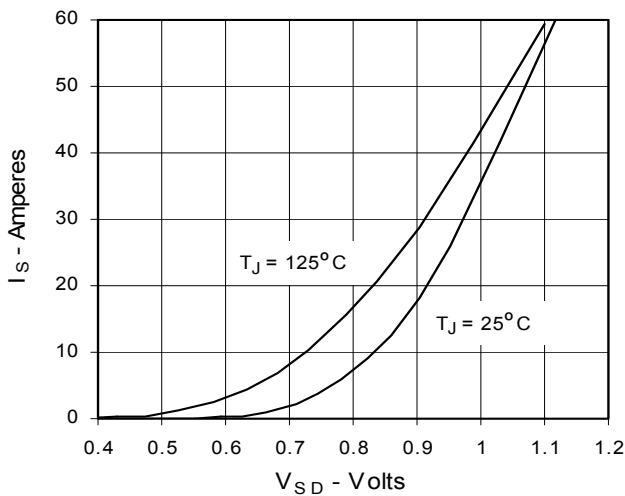


Fig. 10. Gate Charge

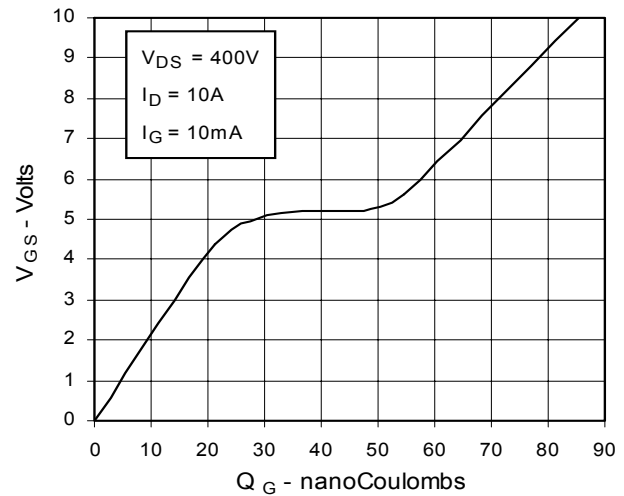


Fig. 11. Capacitance

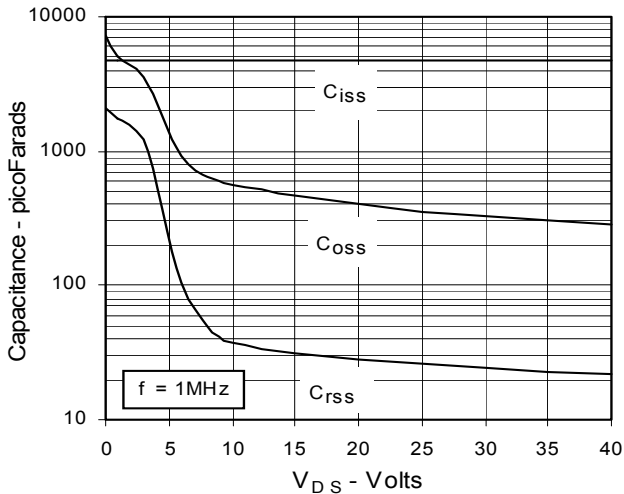
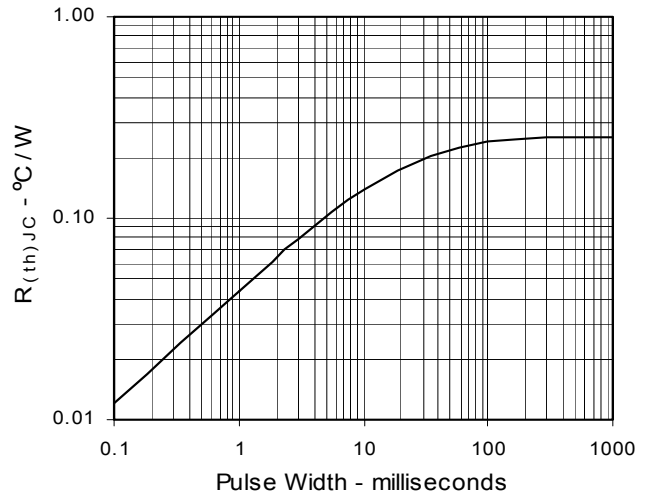
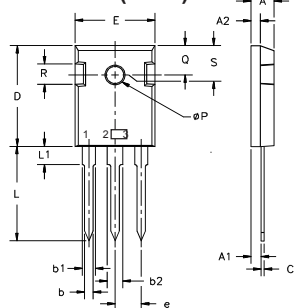


Fig. 12. Maximum Transient Thermal Resistance



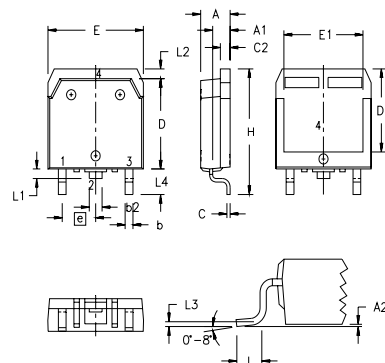
# Package Outline Drawings

## TO-247AD (IXFH) Outline



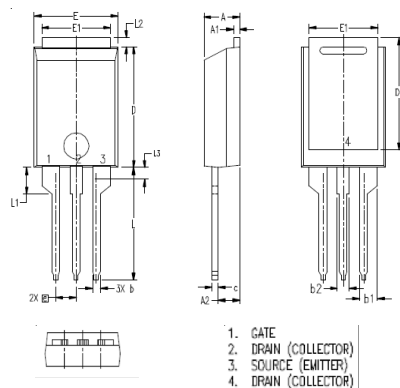
| Dim.           | Millimeter |       | Inches |       |
|----------------|------------|-------|--------|-------|
|                | Min.       | Max.  | Min.   | Max.  |
| A              | 4.7        | 5.3   | .185   | .209  |
| A <sub>1</sub> | 2.2        | 2.54  | .087   | .102  |
| A <sub>2</sub> | 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  |
| L1             |            | 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-268 (IXFT) Outline



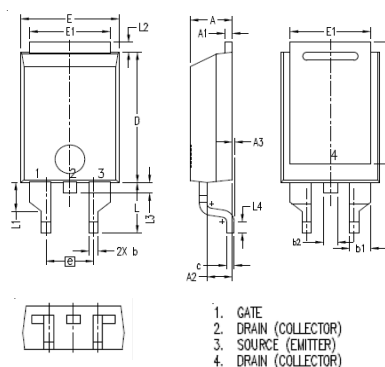
| SYM | INCHES   |      | MILLIMETERS |       |
|-----|----------|------|-------------|-------|
|     | MIN      | MAX  | MIN         | MAX   |
| A   | .193     | .201 | 4.90        | 5.10  |
| A1  | .106     | .114 | 2.70        | 2.90  |
| A2  | .001     | .010 | 0.02        | 0.25  |
| b   | .045     | .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  |

## 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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