

# PolarHV™ HiPerFET Power MOSFET

N-Channel Enhancement Mode  
Avalanche Rated  
Fast Intrinsic Diode

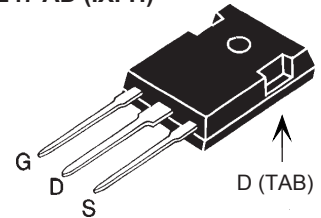
**IXFH 30N50P**  
**IXFT 30N50P**  
**IXFV 30N50P**  
**IXFV 30N50PS**

$V_{DSS} = 500 \text{ V}$   
 $I_{D25} = 30 \text{ A}$   
 $R_{DS(on)} \leq 200 \text{ m}\Omega$   
 $t_{rr} \leq 200 \text{ ns}$

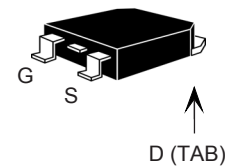


| Symbol     | Test Conditions   | Maximum Ratings |                  |
|------------|---|-----------------|------------------|
|            |   |                 |                  |
| $V_{DSS}$  | $T_J = 25^\circ\text{C to } 150^\circ\text{C}$  | 500             | V                |
| $V_{DGR}$  | $T_J = 25^\circ\text{C to } 150^\circ\text{C}; R_{GS} = 1 \text{ M}\Omega$  | 500             | V                |
| $V_{GSS}$  | Continuous  | $\pm 30$        | V                |
| $V_{GSM}$  | Transient   | $\pm 40$        | V                |
| $I_{D25}$  | $T_C = 25^\circ\text{C}$  | 30              | A                |
| $I_{DM}$   | $T_C = 25^\circ\text{C}$ , pulse width limited by $T_{JM}$  | 75              | A                |
| $I_{AR}$   | $T_C = 25^\circ\text{C}$  | 30              | A                |
| $E_{AR}$   | $T_C = 25^\circ\text{C}$  | 40              | mJ               |
| $E_{AS}$   | $T_C = 25^\circ\text{C}$  | 1.2             | J                |
| $dv/dt$    | $I_S \leq I_{DM}$ , $di/dt \leq 100 \text{ A}/\mu\text{s}$ , $V_{DD} \leq V_{DSS}$ ,<br>$T_J \leq 150^\circ\text{C}$ , $R_G = 5 \Omega$ | 10              | V/ns             |
| $P_D$      | $T_C = 25^\circ\text{C}$  | 460             | 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               | g                |
|            | TO-268  | 5               | g                |
|            | TO-247  | 6               | g                |

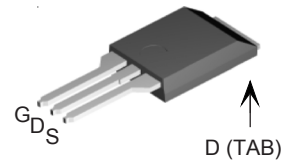
TO-247 AD (IXFH)



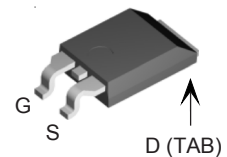
TO-268 (IXFT)



PLUS220 (IXFV)



PLUS220 SMD(IXFV..S)



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

| Symbol       | Test Conditions<br>( $T_J = 25^\circ\text{C}$ , unless otherwise specified)                                      | Characteristic Values |      |                      |
|--------------|--|-----------------------|------|----------------------|
|              |  | Min.                  | Typ. | Max.                 |
| $BV_{DSS}$   | $V_{GS} = 0 \text{ V}$ , $I_D = 250 \mu\text{A}$   | 500                   |      | V                    |
| $V_{GS(th)}$ | $V_{DS} = V_{GS}$ , $I_D = 4 \text{ mA}$   | 3.0                   |      | 5.0 V                |
| $I_{GSS}$    | $V_{GS} = \pm 30 \text{ V}$ , $V_{DS} = 0 \text{ V}$   |                       |      | $\pm 100 \text{ nA}$ |
| $I_{DSS}$    | $V_{DS} = V_{DSS}$<br>$V_{GS} = 0 \text{ V}$<br>$T_J = 125^\circ\text{C}$  |                       |      | 25 $\mu\text{A}$     |
|              |  |                       |      | 750 $\mu\text{A}$    |
| $R_{DS(on)}$ | $V_{GS} = 10 \text{ V}$ , $I_D = 0.5 I_{D25}$<br>Pulse test, $t \leq 300 \mu\text{s}$ , duty cycle $d \leq 2 \%$ | 165                   | 200  | $\text{m}\Omega$     |

## Features

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

## Advantages

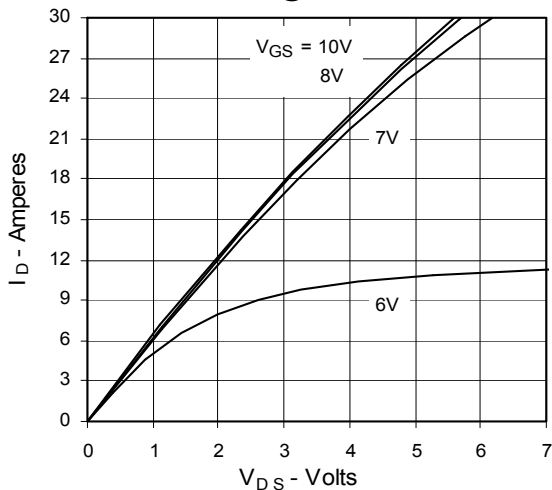
- Easy to mount
- Space savings
- High power density

| Symbol       | Test Conditions   | Characteristic Values<br>( $T_J = 25^\circ\text{C}$ , unless otherwise specified) |      |           |
|--------------|---|---|------|-----------|
|              |   | Min.  | Typ. | Max.      |
| $g_{fs}$     | $V_{DS} = 20\text{ V}; I_D = 0.5 I_{D25}$ , pulse test  | 17  | 27   | S         |
| $C_{iss}$    | $V_{GS} = 0\text{ V}, V_{DS} = 25\text{ V}, f = 1\text{ MHz}$                                   |   | 4150 | pF        |
| $C_{oss}$    |   |   | 445  | pF        |
| $C_{rss}$    |   |   | 28   | pF        |
| $t_{d(on)}$  | $V_{GS} = 10\text{ V}, V_{DS} = 0.5 V_{DSS}, I_D = 0.5 I_{D25}$<br>$R_G = 5\ \Omega$ (External) |   | 25   | ns        |
| $t_r$        |   |   | 24   | ns        |
| $t_{d(off)}$ |   |   | 82   | ns        |
| $t_f$        |   |   | 24   | ns        |
| $Q_{g(on)}$  | $V_{GS} = 10\text{ V}, V_{DS} = 0.5 V_{DSS}, I_D = 0.5 I_{D25}$                                 |   | 70   | nC        |
| $Q_{gs}$     |   |   | 27   | nC        |
| $Q_{gd}$     |   |   | 22   | nC        |
| $R_{thJC}$   |   |   |      | 0.27° C/W |
| $R_{thCs}$   | (TO-247, PLUS220)   | 0.21  |      | ° C/W     |

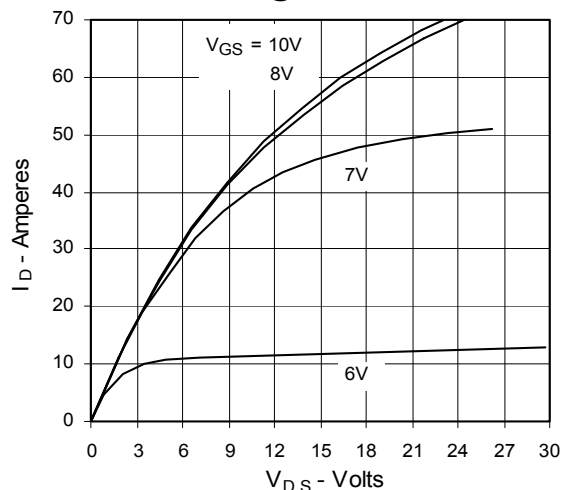
| Source-Drain Diode |   | Characteristic Values<br>( $T_J = 25^\circ\text{C}$ , unless otherwise specified) |      |               |
|--------------------|---|---|------|---------------|
| Symbol             | Test Conditions   | Min.  | Typ. | Max.          |
| $I_S$              | $V_{GS} = 0\text{ V}$   |   |      | 30 A          |
| $I_{SM}$           | Repetitive  |   |      | 90 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         |
| $t_{rr}$           | $I_F = 25\text{ A}; -di/dt = 100\text{ A}/\mu\text{s}$  |   |      | 200 ns        |
| $I_{RM}$           | $V_R = 100\text{ V}; V_{GS} = 0\text{ V}$   |   | 6    | A             |
| $Q_{RM}$           |   |   | 0.6  | $\mu\text{C}$ |

### Characteristic Curves

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



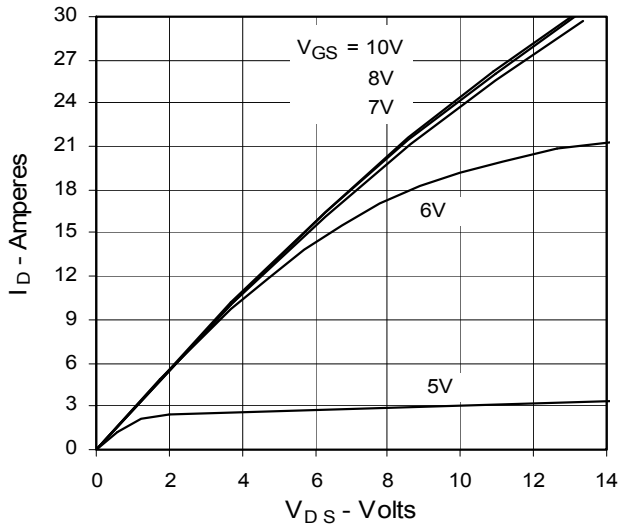
**Fig. 2. Extended Output Characteristics**  
**@ 25°C**



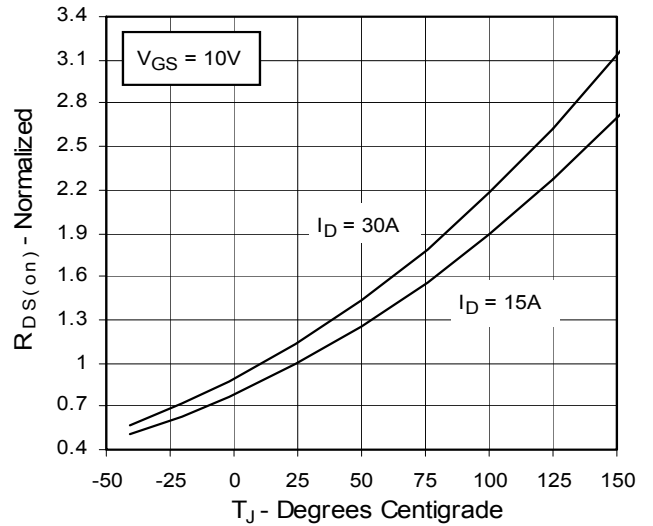
IXYS reserves the right to change limits, test conditions, and dimensions.

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

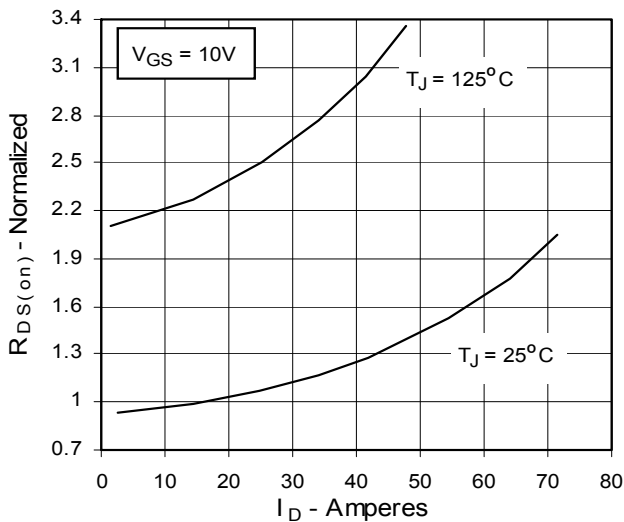
**Fig. 3. Output Characteristics @ 125°C**



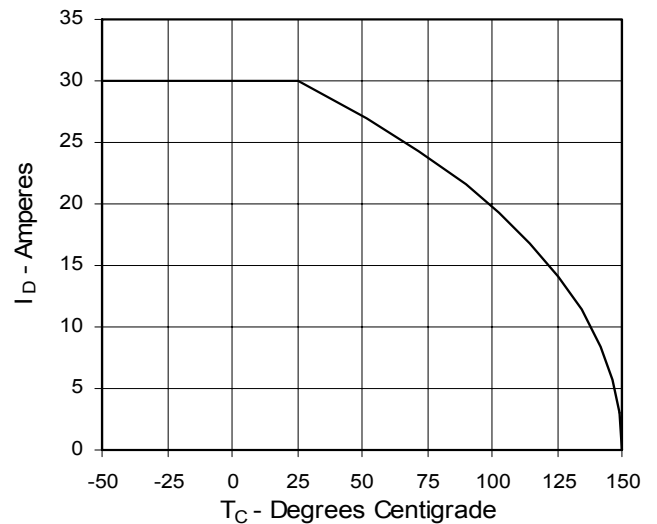
**Fig. 4.  $R_{DS(on)}$  Normalized to 0.5  $I_{D25}$  Value vs. Junction Temperature**



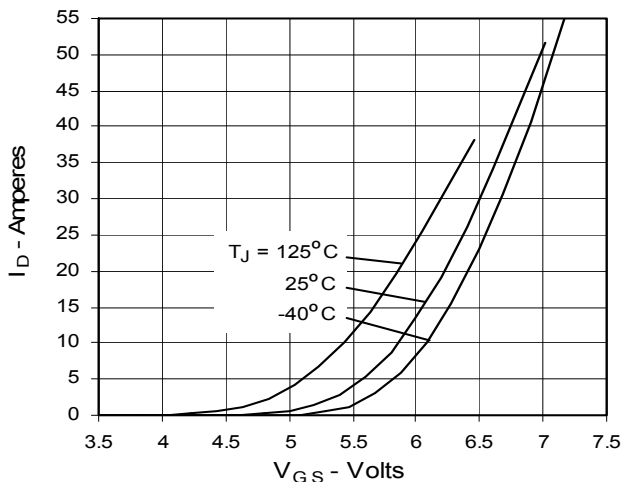
**Fig. 5.  $R_{DS(on)}$  Normalized to 0.5  $I_{D25}$  Value vs.  $I_D$**



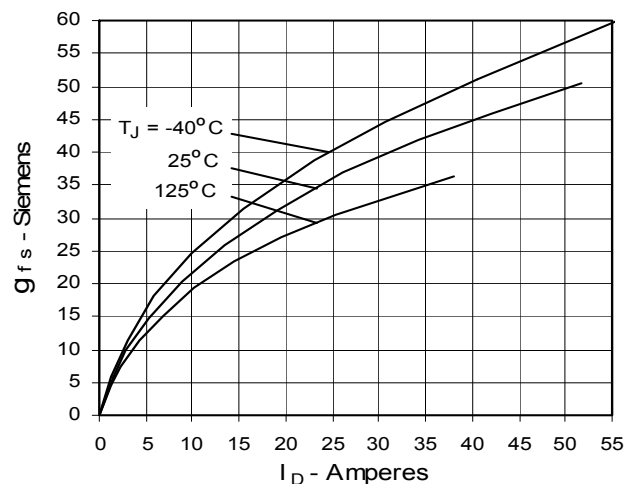
**Fig. 6. Drain Current vs. Case Temperature**



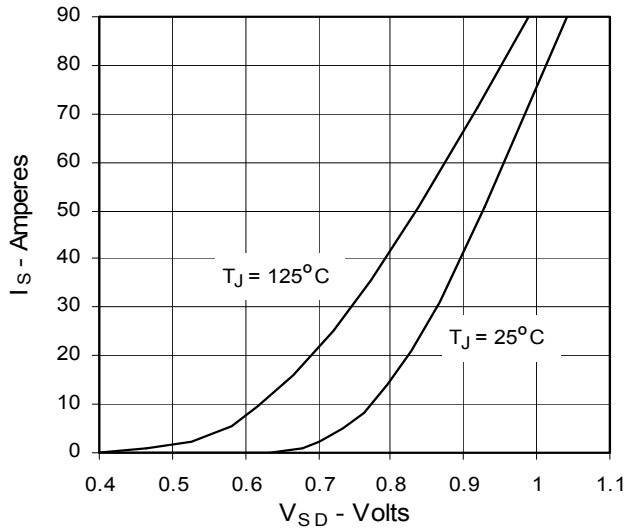
**Fig. 7. Input Admittance**



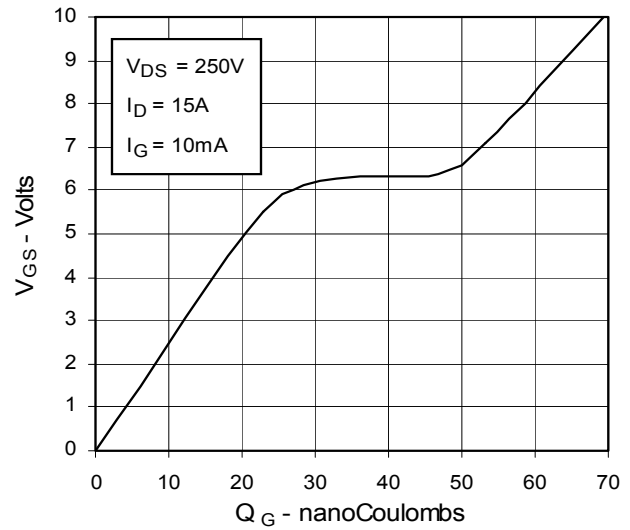
**Fig. 8. Transconductance**



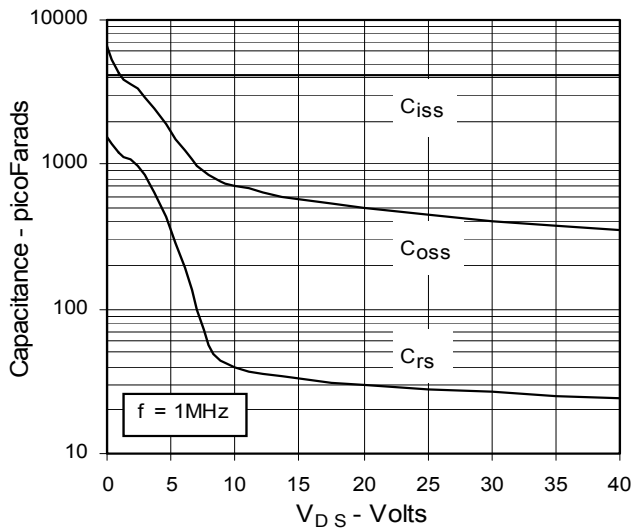
**Fig. 9. Source Current vs. Source-To-Drain Voltage**



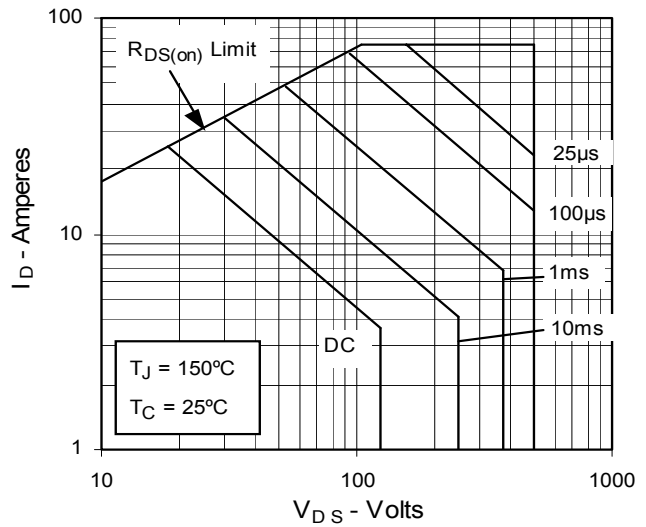
**Fig. 10. Gate Charge**



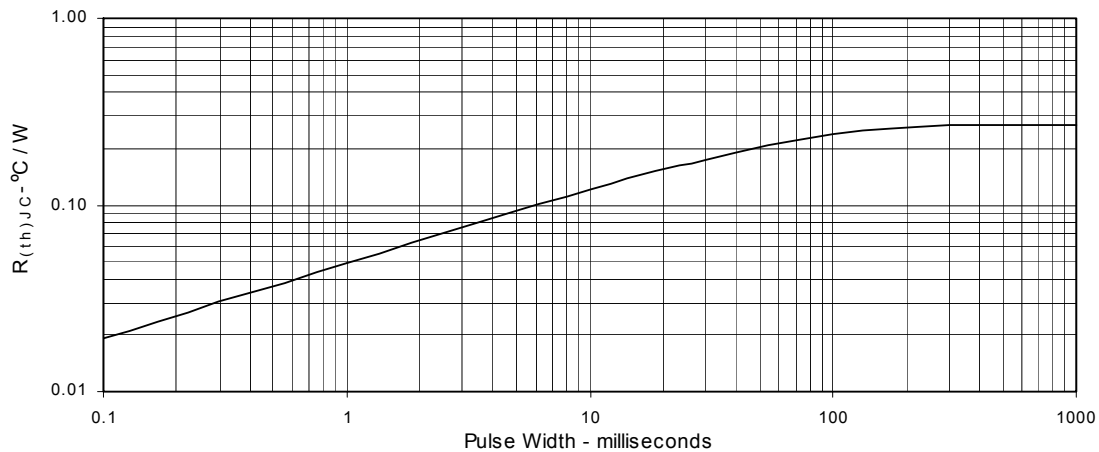
**Fig. 11. Capacitance**



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



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



### Package Outline Drawings

#### TO-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 <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  |
| L <sub>1</sub> |            | 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 (IXFT) Outline

| SYM            | INCHES   |      | MILLIMETERS |       |
|----------------|----------|------|-------------|-------|
|                | MIN      | MAX  | MIN         | MAX   |
| A              | .193     | .201 | 4.90        | 5.10  |
| A <sub>1</sub> | .106     | .114 | 2.70        | 2.90  |
| A <sub>2</sub> | .001     | .010 | 0.02        | 0.25  |
| b              | .045     | .057 | 1.15        | 1.45  |
| b <sub>2</sub> | .075     | .083 | 1.90        | 2.10  |
| C              | .016     | .026 | 0.40        | 0.65  |
| C <sub>2</sub> | .057     | .063 | 1.45        | 1.60  |
| D              | .543     | .551 | 13.80       | 14.00 |
| D <sub>1</sub> | .488     | .500 | 12.40       | 12.70 |
| E              | .624     | .632 | 15.85       | 16.05 |
| E <sub>1</sub> | .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 <sub>1</sub> | .047     | .055 | 1.20        | 1.40  |
| L <sub>2</sub> | .039     | .045 | 1.00        | 1.15  |
| L <sub>3</sub> | .010 BSC |      | 0.25 BSC    |       |
| L <sub>4</sub> | .150     | .161 | 3.80        | 4.10  |

#### PLUS220 (IXFV) Outline

| SYM            | INCHES   |      | MILLIMETER |       |
|----------------|----------|------|------------|-------|
|                | MIN      | MAX  | MIN        | MAX   |
| A              | .169     | .185 | 4.30       | 4.70  |
| A <sub>1</sub> | .028     | .035 | 0.70       | 0.90  |
| A <sub>2</sub> | .098     | .118 | 2.50       | 3.00  |
| b              | .035     | .047 | 0.90       | 1.20  |
| b <sub>1</sub> | .080     | .095 | 2.03       | 2.41  |
| b <sub>2</sub> | .054     | .064 | 1.37       | 1.63  |
| c              | .028     | .035 | 0.70       | 0.90  |
| D              | .551     | .591 | 14.00      | 15.00 |
| D <sub>1</sub> | .512     | .539 | 13.00      | 13.70 |
| E              | .394     | .433 | 10.00      | 11.00 |
| E <sub>1</sub> | .331     | .346 | 8.40       | 8.80  |
| e              | .100 BSC |      | 2.54 BSC   |       |
| L              | .512     | .551 | 13.00      | 14.00 |
| L <sub>1</sub> | .118     | .138 | 3.00       | 3.50  |
| L <sub>2</sub> | .035     | .051 | 0.90       | 1.30  |
| L <sub>3</sub> | .047     | .059 | 1.20       | 1.50  |

- GATE
- DRAIN (COLLECTOR)
- SOURCE (EMITTER)
- DRAIN (COLLECTOR)

#### PLUS220SMD (IXFV\_S) Outline

| SYM            | INCHES   |      | MILLIMETER |       |
|----------------|----------|------|------------|-------|
|                | MIN      | MAX  | MIN        | MAX   |
| A              | .169     | .185 | 4.30       | 4.70  |
| A <sub>1</sub> | .028     | .035 | 0.70       | 0.90  |
| A <sub>2</sub> | .098     | .118 | 2.50       | 3.00  |
| A <sub>3</sub> | .000     | .010 | 0.00       | 0.25  |
| b              | .035     | .047 | 0.90       | 1.20  |
| b <sub>1</sub> | .080     | .095 | 2.03       | 2.41  |
| b <sub>2</sub> | .054     | .064 | 1.37       | 1.63  |
| c              | .028     | .035 | 0.70       | 0.90  |
| D              | .551     | .591 | 14.00      | 15.00 |
| D <sub>1</sub> | .512     | .539 | 13.00      | 13.70 |
| E              | .394     | .433 | 10.00      | 11.00 |
| E <sub>1</sub> | .331     | .346 | 8.40       | 8.80  |
| e              | .200 BSC |      | 5.08 BSC   |       |
| L              | .209     | .228 | 5.30       | 5.80  |
| L <sub>1</sub> | .118     | .138 | 3.00       | 3.50  |
| L <sub>2</sub> | .035     | .051 | 0.90       | 1.30  |
| L <sub>3</sub> | .047     | .059 | 1.20       | 1.50  |
| L <sub>4</sub> | .039     | .059 | 1.00       | 1.50  |

- GATE
- DRAIN (COLLECTOR)
- SOURCE (EMITTER)
- DRAIN (COLLECTOR)



---

Disclaimer Notice - Information furnished is believed to be accurate and reliable. However, users should independently evaluate the suitability of and test each product selected for their own applications. Littelfuse products are not designed for, and may not be used in, all applications. Read complete Disclaimer Notice at [www.littelfuse.com/disclaimer-electronics](http://www.littelfuse.com/disclaimer-electronics).