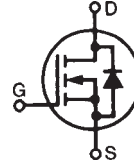


# PolarHV™ HiPerFET Power MOSFET

N-Channel Enhancement Mode  
Fast Recovery Diode  
Avalanche Rated

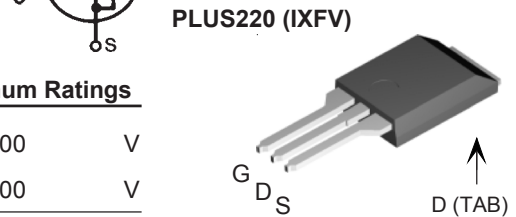
**IXFH 30N60P**  
**IXFT 30N60P**  
**IXFV 30N60P**  
**IXFV 30N60PS**

$V_{DSS} = 600 \text{ V}$   
 $I_{D25} = 30 \text{ A}$   
 $R_{DS(on)} \leq 240 \text{ m}\Omega$   
 $t_{rr} \leq 200 \text{ ns}$



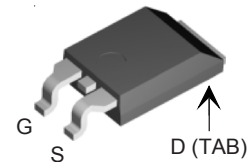
| Symbol     | Test Conditions                                                                                                                         | Maximum Ratings |                  |
|------------|-----------------------------------------------------------------------------------------------------------------------------------------|-----------------|------------------|
|            |                                                                                                                                         |                 |                  |
| $V_{DSS}$  | $T_J = 25^\circ\text{C to } 150^\circ\text{C}$                                                                                          | 600             | V                |
| $V_{DGR}$  | $T_J = 25^\circ\text{C to } 150^\circ\text{C}; R_{GS} = 1 \text{ M}\Omega$                                                              | 600             | 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 $T_{JM}$                                                                              | 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                |
| $dv/dt$    | $I_s \leq I_{DM}$ , $di/dt \leq 100 \text{ A}/\mu\text{s}$ , $V_{DD} \leq V_{DSS}$ ,<br>$T_J \leq 150^\circ\text{C}$ , $R_G = 4 \Omega$ | 20              | 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    | $^\circ\text{C}$ |
| $T_L$      | 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)                                                                                                                | 1.13/10         | Nm/lb.in.        |
| $F_C$      | Mounting force (PLUS220)                                                                                                                | 11..65/2.5..15  | N/lb.            |
| Weight     | TO-247                                                                                                                                  | 6               | g                |
|            | TO-268                                                                                                                                  | 5               | g                |
|            | PLUS220                                                                                                                                 | 4               | g                |

| Symbol       | Test Conditions<br>( $T_J = 25^\circ\text{C}$ , unless otherwise specified)                                      | Characteristic Values |      |                      |
|--------------|------------------------------------------------------------------------------------------------------------------|-----------------------|------|----------------------|
|              |                                                                                                                  | Min.                  | Typ. | Max.                 |
| $BV_{DSS}$   | $V_{GS} = 0 \text{ V}$ , $I_D = 250 \mu\text{A}$                                                                 | 600                   |      | V                    |
| $V_{GS(th)}$ | $V_{DS} = V_{GS}$ , $I_D = 4 \text{ mA}$                                                                         | 2.5                   |      | 5.0 V                |
| $I_{GSS}$    | $V_{GS} = \pm 30 \text{ V}$ , $V_{DS} = 0$                                                                       |                       |      | $\pm 100 \text{ nA}$ |
| $I_{DSS}$    | $V_{DS} = V_{DSS}$<br>$V_{GS} = 0 \text{ V}$<br>$T_J = 125^\circ\text{C}$                                        |                       |      | 25 $\mu\text{A}$     |
|              |                                                                                                                  |                       |      | 250 $\mu\text{A}$    |
| $R_{DS(on)}$ | $V_{GS} = 10 \text{ V}$ , $I_D = 0.5 I_{D25}$<br>Pulse test, $t \leq 300 \mu\text{s}$ , duty cycle $d \leq 2 \%$ |                       |      | 240 $\text{m}\Omega$ |

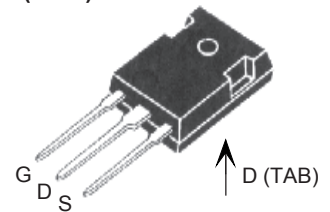


PLUS220 (IXFV)

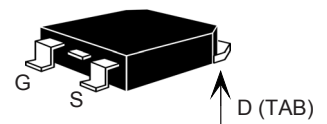
PLUS220 SMD (IXFV...S)



TO-247 (IXFH)



TO-268 (IXFT)



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

## Features

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

| Symbol                    | Test Conditions                                                                                        | Characteristic Values                               |      |           |
|---------------------------|--------------------------------------------------------------------------------------------------------|-----------------------------------------------------|------|-----------|
|                           |                                                                                                        | (T <sub>J</sub> = 25° C unless otherwise specified) |      |           |
|                           |                                                                                                        | Min.                                                | Typ. | Max.      |
| <b>g<sub>fs</sub></b>     | V <sub>DS</sub> = 20 V; I <sub>D</sub> = 0.5 I <sub>D25</sub> , pulse test                             | 15                                                  | 27   | S         |
| <b>C<sub>iss</sub></b>    | V <sub>GS</sub> = 0 V, V <sub>DS</sub> = 25 V, f = 1 MHz                                               |                                                     | 4000 | pF        |
| <b>C<sub>oss</sub></b>    |                                                                                                        |                                                     | 430  | pF        |
| <b>C<sub>rss</sub></b>    |                                                                                                        |                                                     | 42   | pF        |
| <b>t<sub>d(on)</sub></b>  | V <sub>GS</sub> = 10 V, V <sub>DS</sub> = 0.5 I <sub>D25</sub><br>R <sub>G</sub> = 4 Ω (External)      |                                                     | 29   | ns        |
| <b>t<sub>r</sub></b>      |                                                                                                        |                                                     | 20   | ns        |
| <b>t<sub>d(off)</sub></b> |                                                                                                        |                                                     | 80   | ns        |
| <b>t<sub>f</sub></b>      |                                                                                                        |                                                     | 25   | ns        |
| <b>Q<sub>g(on)</sub></b>  | V <sub>GS</sub> = 10 V, V <sub>DS</sub> = 0.5 V <sub>DSS</sub> , I <sub>D</sub> = 0.5 I <sub>D25</sub> |                                                     | 82   | nC        |
| <b>Q<sub>gs</sub></b>     |                                                                                                        |                                                     | 28   | nC        |
| <b>Q<sub>gd</sub></b>     |                                                                                                        |                                                     | 28   | nC        |
| <b>R<sub>thJC</sub></b>   | TO-247, PLUS220                                                                                        |                                                     |      | 0.25 °C/W |
| <b>R<sub>thCS</sub></b>   |                                                                                                        |                                                     | 0.21 | °C/W      |

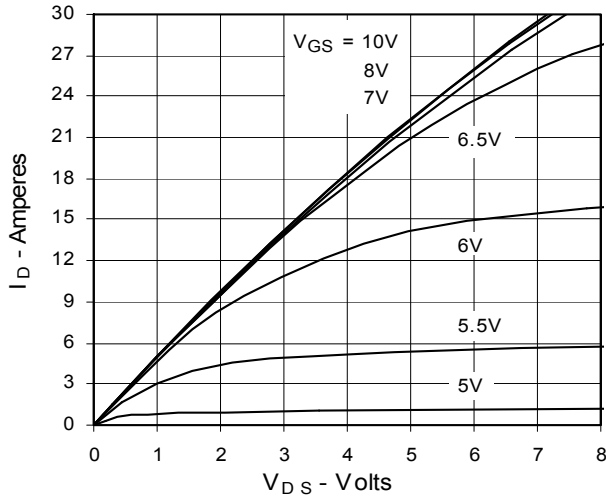
| Source-Drain Diode    |                                                                                                        | Characteristic Values                                |      |        |
|-----------------------|--------------------------------------------------------------------------------------------------------|------------------------------------------------------|------|--------|
|                       |                                                                                                        | (T <sub>J</sub> = 25° C, unless otherwise specified) |      |        |
| Symbol                | Test Conditions                                                                                        | Min.                                                 | Typ. | Max.   |
| <b>I<sub>S</sub></b>  | V <sub>GS</sub> = 0 V                                                                                  |                                                      |      | 30 A   |
| <b>I<sub>SM</sub></b> | Repetitive                                                                                             |                                                      |      | 80 A   |
| <b>V<sub>SD</sub></b> | I <sub>F</sub> = I <sub>S</sub> , V <sub>GS</sub> = 0 V,<br>Pulse test, t ≤ 300 μs, duty cycle d ≤ 2 % |                                                      |      | 1.5 V  |
| <b>t<sub>rr</sub></b> | I <sub>F</sub> = 25A, -di/dt = 100 A/μs<br>V <sub>R</sub> = 100V, V <sub>GS</sub> = 0 V                |                                                      |      | 200 ns |
| <b>Q<sub>RM</sub></b> |                                                                                                        |                                                      | 0.8  |        |

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

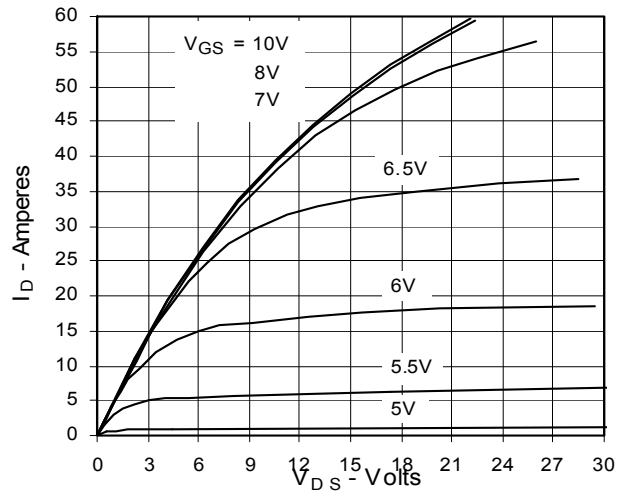
IXYS MOSFETs and IGBTs are covered by one or more of the following U.S. patents:

|           |           |           |           |              |              |             |              |
|-----------|-----------|-----------|-----------|--------------|--------------|-------------|--------------|
| 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    | 6,710,405B2 | 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 |

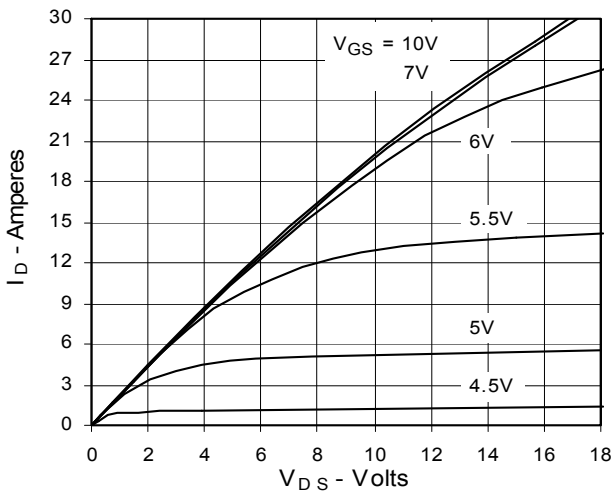
**Fig. 1. Output Characteristics**  
@ 25°C



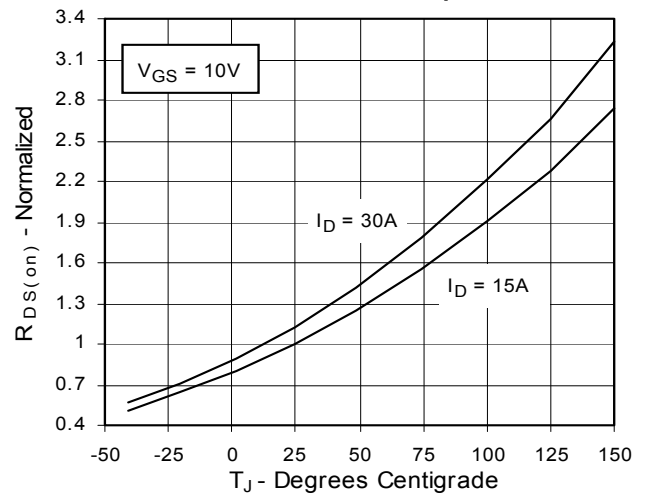
**Fig. 2. Extended Output Characteristics**  
@ 25°C



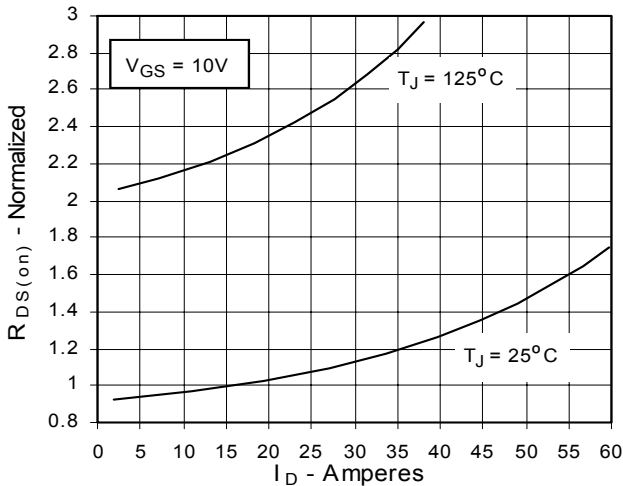
**Fig. 3. Output Characteristics**  
@ 125°C



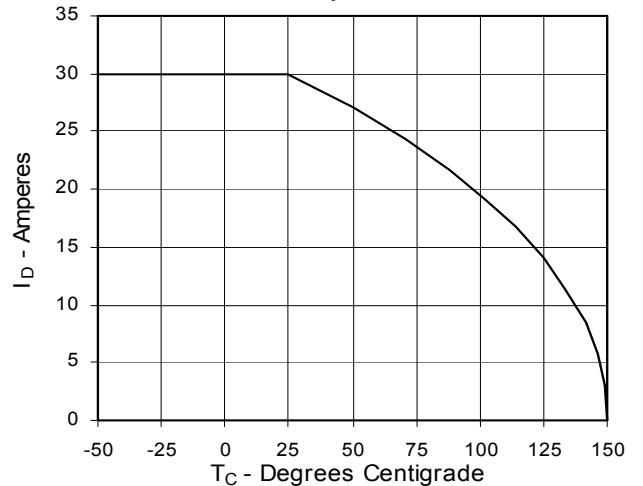
**Fig. 4.  $R_{DS(on)}$  Normalized to  $I_D = 15A$  Value vs. Junction Temperature**



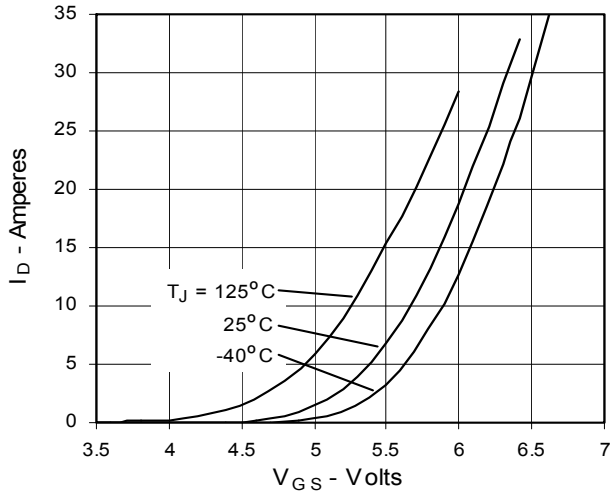
**Fig. 5.  $R_{DS(on)}$  Normalized to  $I_D = 15A$  Value vs. Drain Current**



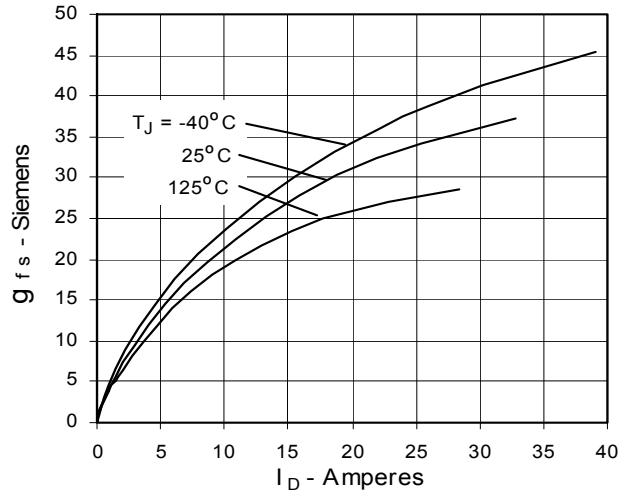
**Fig. 6. Drain Current vs. Case Temperature**



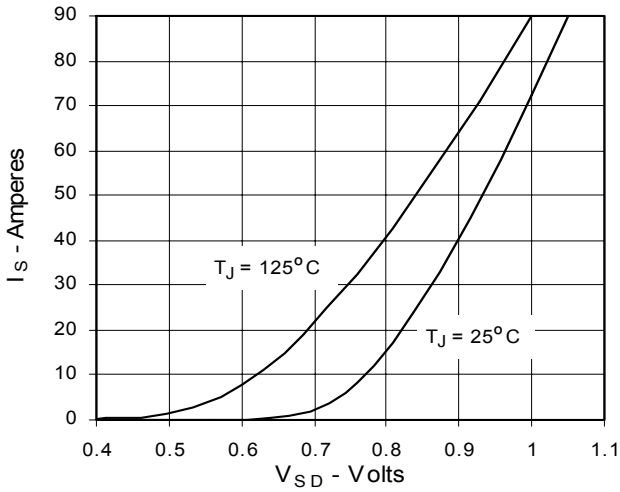
**Fig. 7. Input Admittance**



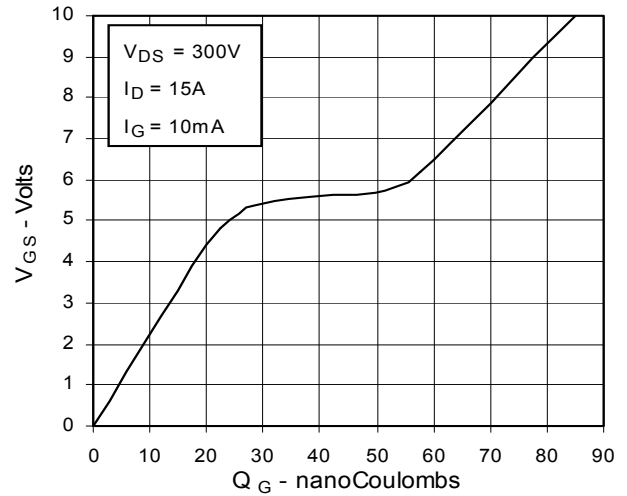
**Fig. 8. Transconductance**



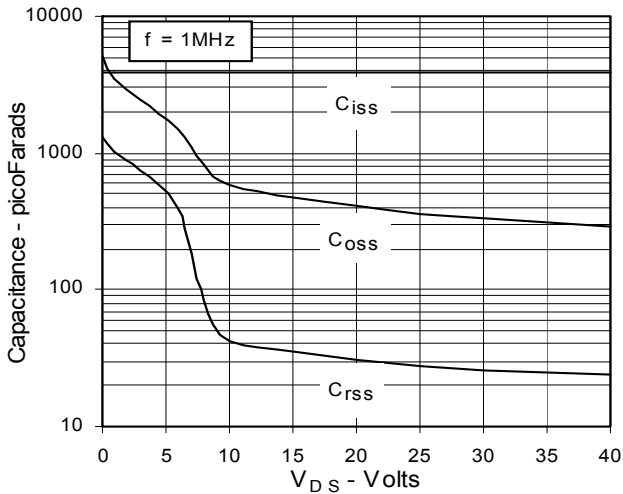
**Fig. 9. Source Current vs. Source-To-Drain Voltage**



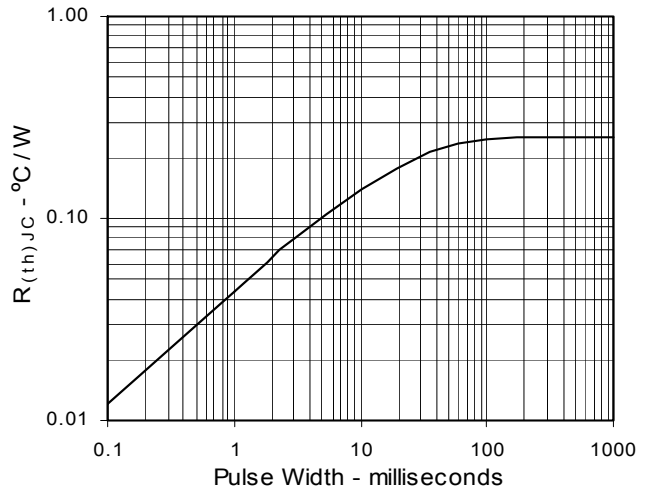
**Fig. 10. Gate Charge**



**Fig. 11. Capacitance**

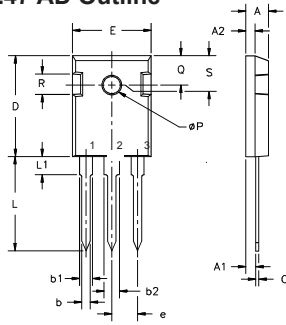


**Fig. 12. Maximum Transient Thermal Resistance**



**Package Outline Drawings**

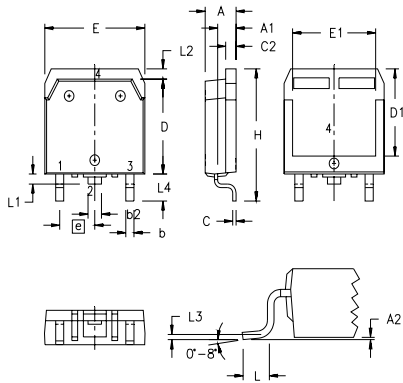
**TO-247 AD Outline**



Terminals: 1 - Gate  
2 - Drain  
3 - Source  
Tab - Drain

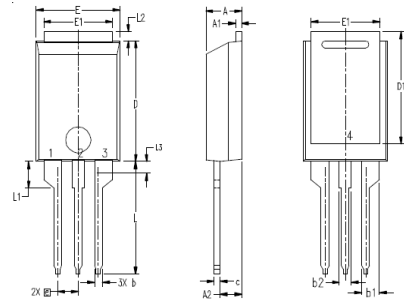
| Dim.           | Millimeter |       | Inches |       |
|----------------|------------|-------|--------|-------|
|                | Min.       | Max.  | Min.   | Max.  |
| A              | 4.7        | 5.3   | .185   | .209  |
| A <sub>1</sub> | 2.2        | 2.54  | .087   | .102  |
| A <sub>2</sub>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

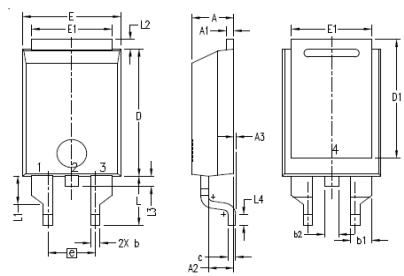
**PLUS220 (IXFV) Outline**



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 <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     |

**PLUS220SMD (IXFV\_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     |
| 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     |



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[DMN1006UCA6-7](#) [DMN16M9UCA6-7](#)