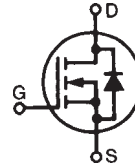


# PolarHV™ HiPerFET Power MOSFET

N-Channel Enhancement Mode  
Fast Intrinsic Diode  
Avalanche Rated

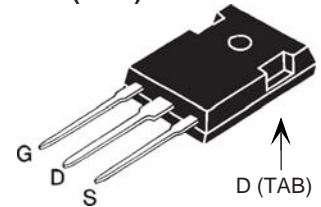
**IXFH 18N60P**  
**IXFV 18N60P**  
**IXFV 18N60PS**

$V_{DSS} = 600 \text{ V}$   
 $I_{D25} = 18 \text{ A}$   
 $R_{DS(on)} \leq 400 \text{ m}\Omega$   
 $t_{rr} \leq 200 \text{ ns}$

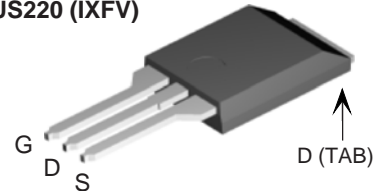


| Symbol     | Test Conditions   | Maximum Ratings |                  |
|------------|---|-----------------|------------------|
| $V_{DSS}$  | $T_J = 25^\circ\text{C}$ to $150^\circ\text{C}$   | 600             | V                |
| $V_{DGR}$  | $T_J = 25^\circ\text{C}$ to $150^\circ\text{C}$ ; $R_{GS} = 1 \text{ M}\Omega$  | 600             | V                |
| $V_{GS}$   | Continuous  | $\pm 30$        | V                |
| $V_{GSM}$  | Transient   | $\pm 40$        | V                |
| $I_{D25}$  | $T_C = 25^\circ\text{C}$  | 18              | A                |
| $I_{DM}$   | $T_C = 25^\circ\text{C}$ , pulse width limited by $T_{JM}$  | 45              | A                |
| $I_{AR}$   | $T_C = 25^\circ\text{C}$  | 18              | 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>$T_J \leq 150^\circ\text{C}$ , $R_G = 5 \Omega$ | 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)  | 1.13/10         | Nm/lb.in.        |
| Weight     | TO-247  | 6               | g                |
|            | PLUS220 & PLUS220SMD  | 4               | g                |

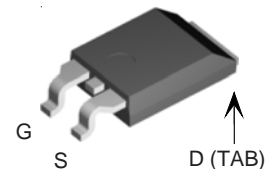
TO-247 AD (IXFH)



PLUS220 (IXFV)



PLUS220SMD (IXFV...S)



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

| Symbol       | Test Conditions  | Characteristic Values |      |                      |
|--------------|--|-----------------------|------|----------------------|
|              |  | Min.                  | Typ. | Max.                 |
| $BV_{DSS}$   | $V_{GS} = 0 \text{ V}$ , $I_D = 250 \mu\text{A}$   | 600                   |      | V                    |
| $V_{GS(th)}$ | $V_{DS} = V_{GS}$ , $I_D = 2.5 \text{ mA}$   | 3.0                   |      | 5.5 V                |
| $I_{GSS}$    | $V_{GS} = \pm 30 \text{ V}$ , $V_{DS} = 0 \text{ V}$   |                       |      | $\pm 100 \text{ nA}$ |
| $I_{DSS}$    | $V_{DS} = V_{DSS}$<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 $d \leq 2 \%$ |                       |      | 400 $\text{m}\Omega$ |

### Features

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

### Advantages

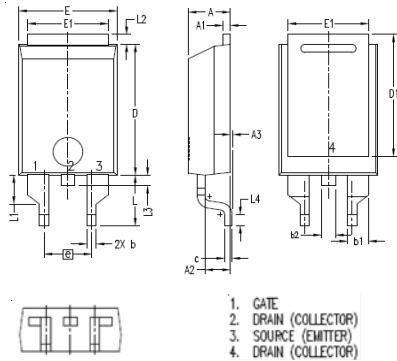
- † Easy to mount
- † Space savings
- † High power density

| Symbol       | Test Conditions   | Characteristic Values |      |                      |
|--------------|---|-----------------------|------|----------------------|
|              |   | Min.                  | Typ. | Max.                 |
| $g_{fs}$     | $V_{DS} = 20\text{ V}; I_D = 0.5 I_{D25}$ , Note 1  | 9                     | 16   | S                    |
| $C_{iss}$    | $V_{GS} = 0\text{ V}, V_{DS} = 25\text{ V}, f = 1\text{ MHz}$                               | 2500                  |      | pF                   |
| $C_{oss}$    |   | 280                   |      | pF                   |
| $C_{rss}$    |   | 23                    |      | pF                   |
| $t_{d(on)}$  | $V_{GS} = 10\text{ V}, V_{DS} = 0.5 V_{DSS}, I_D = I_{D25}$<br>$R_G = 5\ \Omega$ (External) | 21                    |      | ns                   |
| $t_r$        |   | 22                    |      | ns                   |
| $t_{d(off)}$ |   | 62                    |      | ns                   |
| $t_f$        |   | 22                    |      | ns                   |
| $Q_{g(on)}$  | $V_{GS} = 10\text{ V}, V_{DS} = 0.5 V_{DSS}, I_D = 0.5 I_{D25}$                             | 50                    |      | nC                   |
| $Q_{gs}$     |   | 15                    |      | nC                   |
| $Q_{gd}$     |   | 18                    |      | nC                   |
| $R_{thJC}$   | (TO-247, PLUS220)   | 0.35                  |      | $^{\circ}\text{C/W}$ |
| $R_{thCS}$   |   | 0.21                  |      | $^{\circ}\text{C/W}$ |

| Symbol   | Test Conditions   | Characteristic Values |      |               |
|----------|---|-----------------------|------|---------------|
|          |   | Min.                  | Typ. | Max.          |
| $I_S$    | $V_{GS} = 0\text{ V}$   | 18                    |      | A             |
| $I_{SM}$ | Repetitive  | 54                    |      | A             |
| $V_{SD}$ | $I_F = I_S, V_{GS} = 0\text{ V}$ , Note 1   | 1.5                   |      | V             |
| $t_{rr}$ | $I_S = 18\text{ A}, -di/dt = 100\text{ A}/\mu\text{s}$<br>$V_R = 100\text{ V}, V_{GS} = 0\text{ V}$ | 200                   |      | ns            |
| $Q_{RM}$ |   | 0.8                   |      | $\mu\text{C}$ |
| $F_{RM}$ |   | 5                     |      | A             |

Note 1: Pulse test,  $t \leq 300\ \mu\text{s}$ , duty cycled  $\leq 2\%$

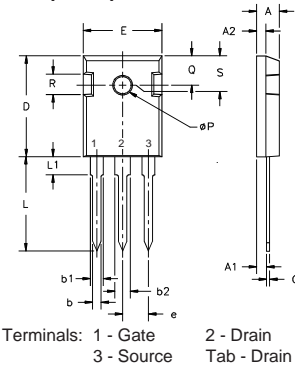
### PLUS220SMD (IXFV\_S) Outline



| 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   | .200BSC |      | 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  |

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

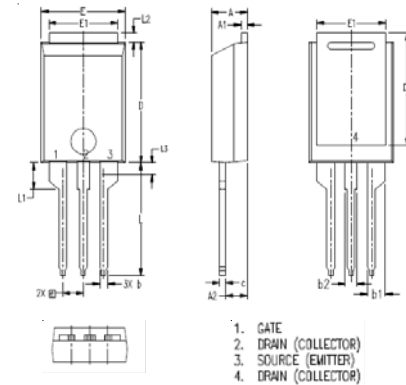
### TO-247 (IXFH) Outline



- 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  |
| L1             | 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   |

### PLUS220 (IXFV) Outline



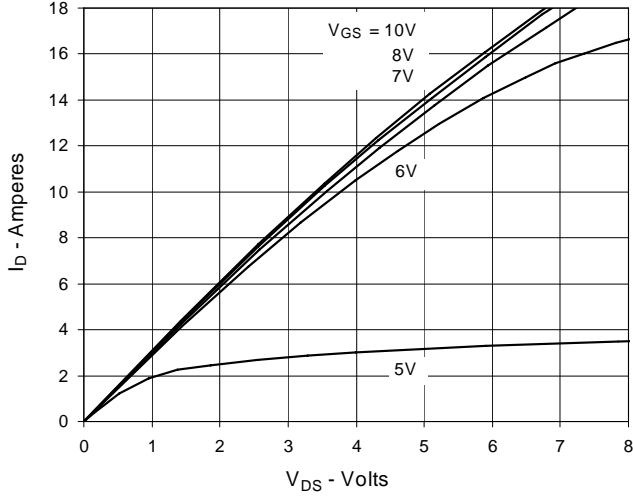
1. GATE
2. DRAIN (COLLECTOR)
3. SOURCE (EMITTER)
4. DRAIN (COLLECTOR)

| SYM | INCHES  |      | MILLIMETER |       |
|-----|---------|------|------------|-------|
|     | MIN     | MAX  | MIN        | MAX   |
| A   | .169    | .185 | 4.30       | 4.70  |
| 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   | .100BSC |      | 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  |

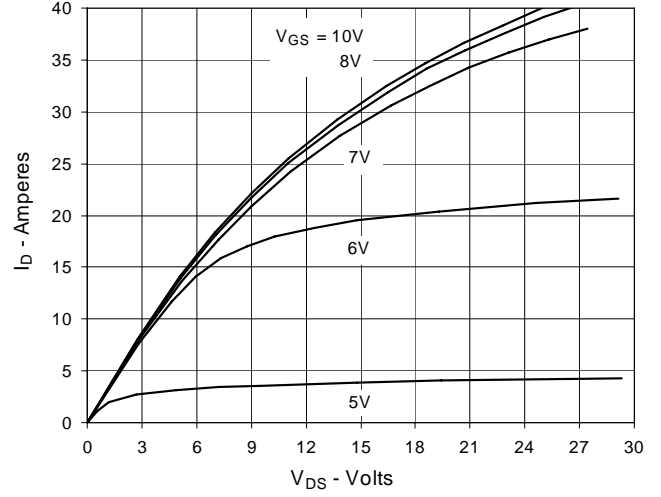
IXYS reserves the right to change limits, test conditions, and dimensions.

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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  
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

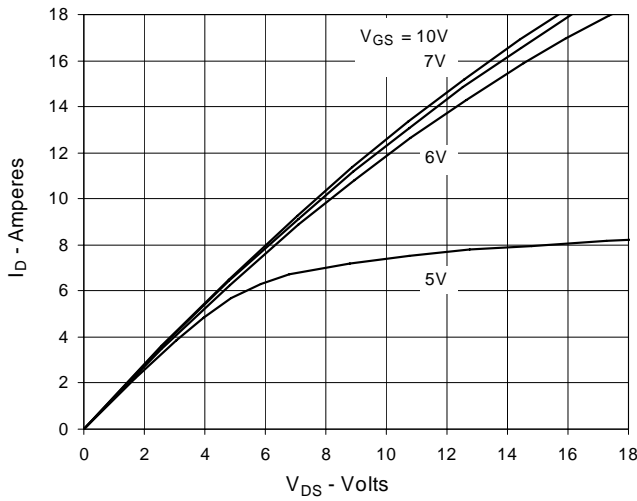
**Fig. 1. Output Characteristics @ 25°C**



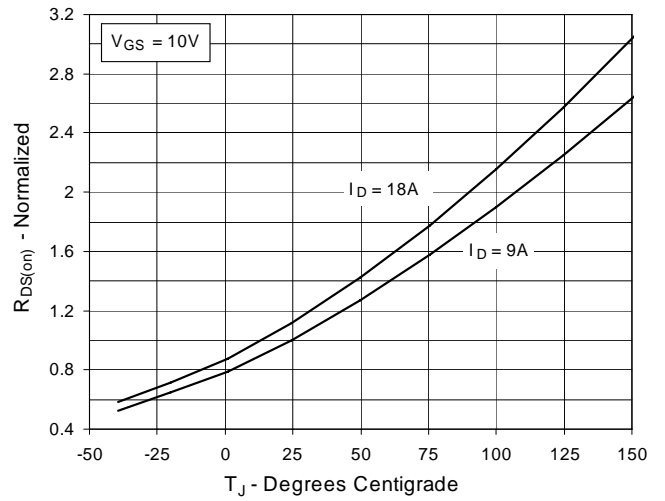
**Fig. 2. Extended Output Characteristics @ 25°C**



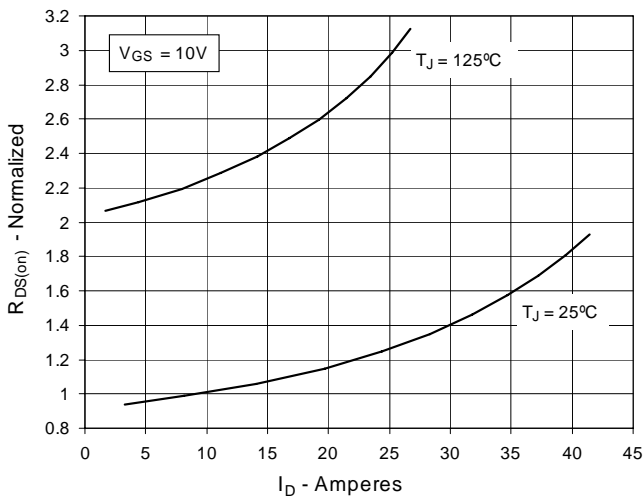
**Fig. 3. Output Characteristics @ 125°C**



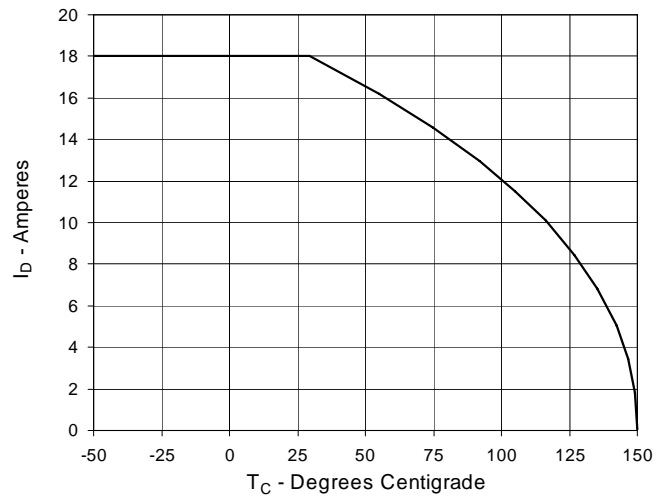
**Fig. 4.  $R_{DS(on)}$  Normalized to  $I_D = 9\text{A}$  Value vs. Junction Temperature**



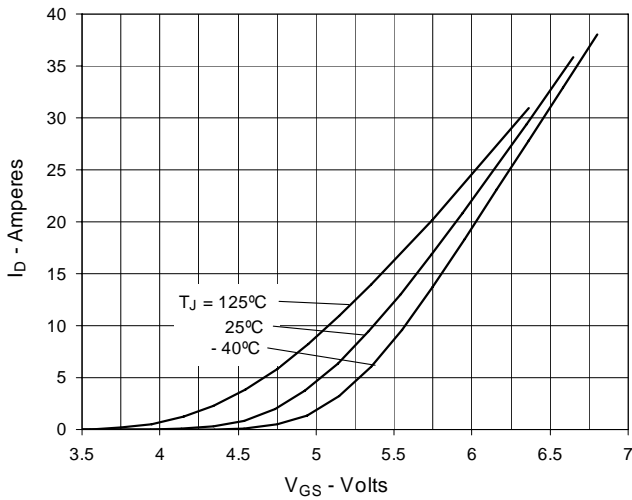
**Fig. 5.  $R_{DS(on)}$  Normalized to  $I_D = 9\text{A}$  Value vs. Drain Current**



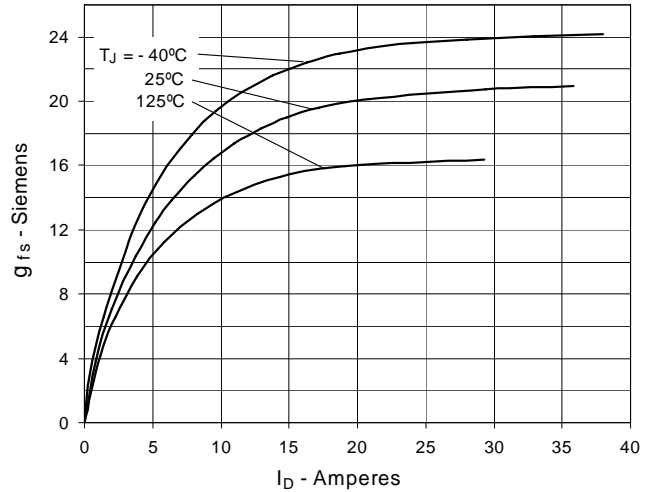
**Fig. 6. Maximum Drain Current vs. Case Temperature**



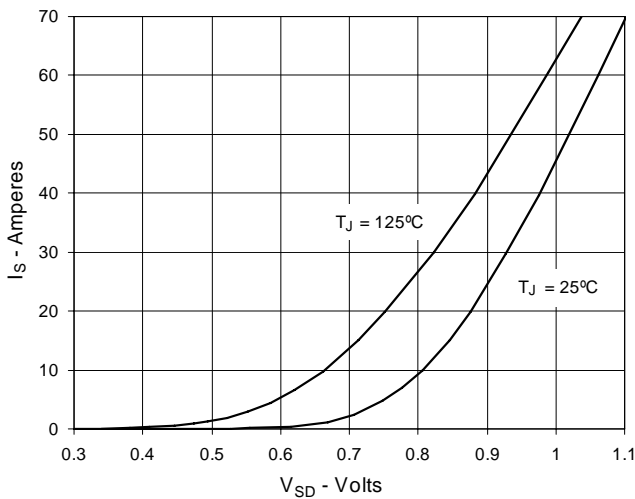
**Fig. 7. Input Admittance**



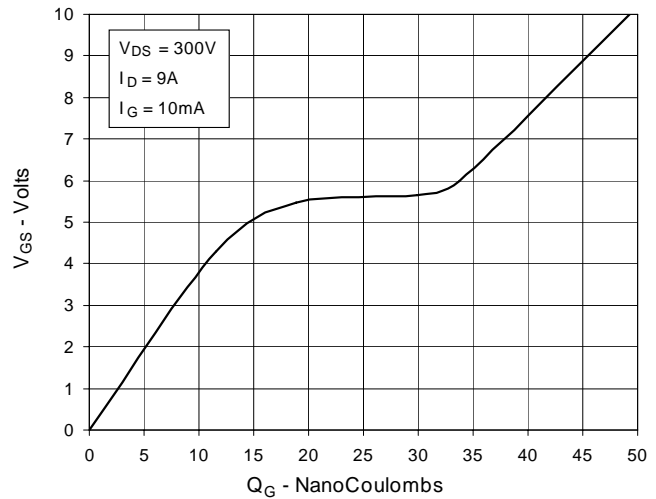
**Fig. 8. Transconductance**



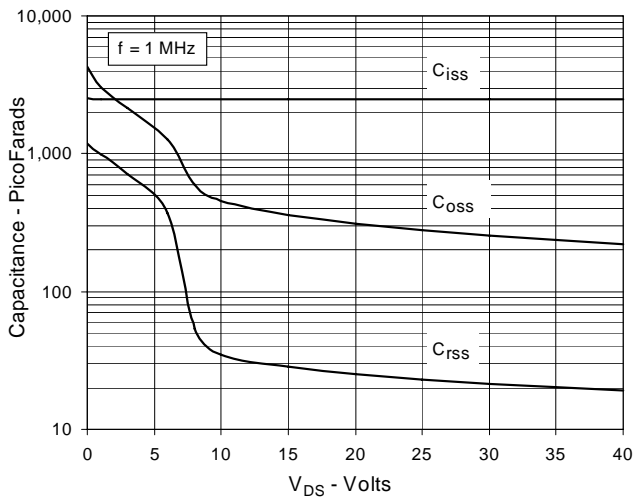
**Fig. 9. Forward Voltage Drop of Intrinsic Diode**



**Fig. 10. Gate Charge**



**Fig. 11. Capacitance**



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

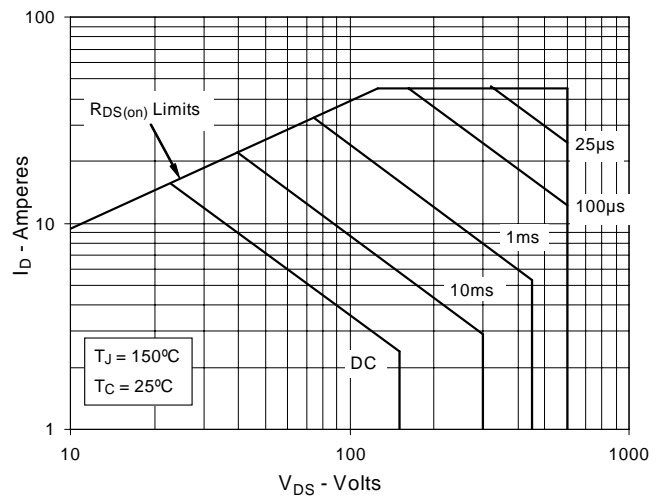
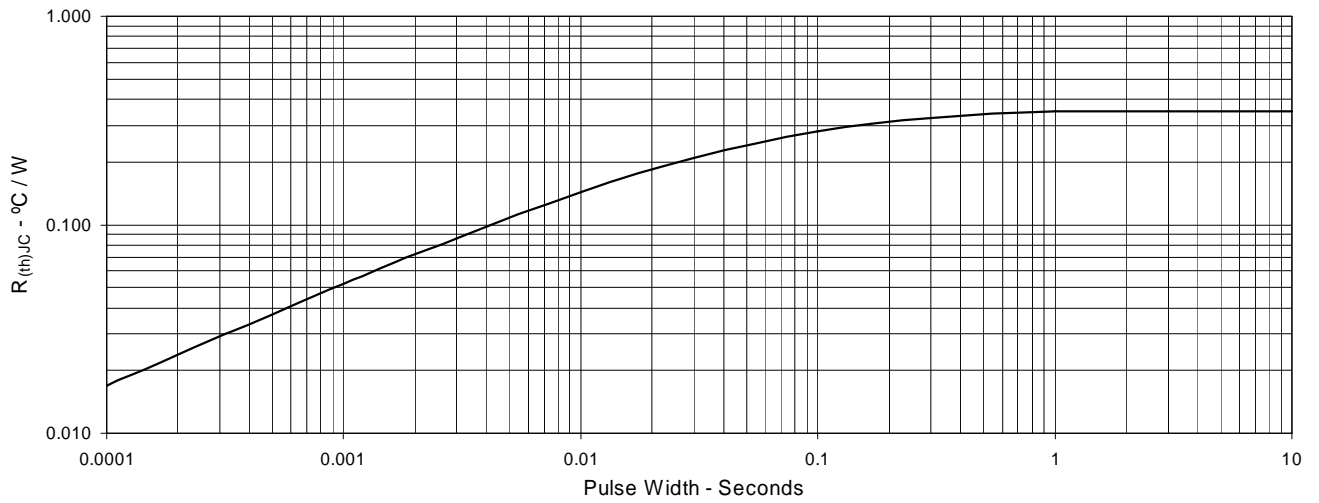


Fig. 13. Maximum Transient Thermal Resistance





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