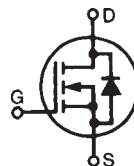


# Polar™ HiPerFET Power MOSFET

**IXFK 180N15P**  
**IXFX 180N15P**

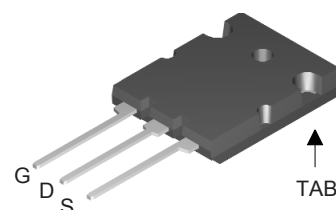
N-Channel Enhancement Mode  
Fast Intrinsic Diode  
Avalanche Rated



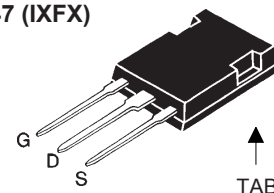
$$\begin{aligned} V_{DSS} &= 150 \text{ V} \\ I_{D25} &= 180 \text{ A} \\ R_{DS(on)} &\leq 11 \text{ m}\Omega \\ t_{rr} &\leq 200 \text{ ns} \end{aligned}$$

| Symbol       | Test Conditions                                                                                                                       | Maximum Ratings |                  |
|--------------|---------------------------------------------------------------------------------------------------------------------------------------|-----------------|------------------|
| $V_{DSS}$    | $T_J = 25^\circ\text{C to } 175^\circ\text{C}$                                                                                        | 150             | V                |
| $V_{DGR}$    | $T_J = 25^\circ\text{C to } 175^\circ\text{C}; R_{GS} = 1 \text{ M}\Omega$                                                            | 150             | V                |
| $V_{DS}$     | Continuous                                                                                                                            | $\pm 20$        | V                |
| $V_{GSM}$    | Transient                                                                                                                             | $\pm 30$        | V                |
| $I_{D25}$    | $T_C = 25^\circ\text{C}$                                                                                                              | 180             | A                |
| $I_{D(RMS)}$ | External lead current limit                                                                                                           | 75              | A                |
| $I_{DM}$     | $T_C = 25^\circ\text{C}$ , pulse width limited by $T_{JM}$                                                                            | 380             | A                |
| $I_{AR}$     | $T_C = 25^\circ\text{C}$                                                                                                              | 60              | A                |
| $E_{AR}$     | $T_C = 25^\circ\text{C}$                                                                                                              | 100             | mJ               |
| $E_{AS}$     | $T_C = 25^\circ\text{C}$                                                                                                              | 4               | 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             |
| $P_D$        | $T_C = 25^\circ\text{C}$                                                                                                              | 830             | W                |
| $T_J$        |                                                                                                                                       | -55 ... +175    | $^\circ\text{C}$ |
| $T_{JM}$     |                                                                                                                                       | 175             | $^\circ\text{C}$ |
| $T_{stg}$    |                                                                                                                                       | -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 (IXFK)                                                                                                                | 1.13/10         | Nm/lb.in.        |
| $F_c$        | Mounting Force (IXFX)                                                                                                                 | 20..120/4.5..25 | N/lb             |
| Weight       | TO-264 (IXFK)                                                                                                                         | 10              | g                |
|              | PLUS247 (IXFX)                                                                                                                        | 6               | g                |

TO-264 (IXFK)



PLUS247 (IXFX)



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

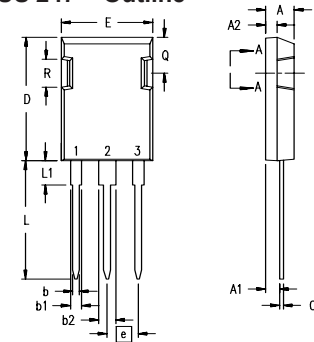
| Symbol       | Test Conditions<br>( $T_J = 25^\circ\text{C}$ , unless otherwise specified) | Characteristic Values |      |                                       |
|--------------|-----------------------------------------------------------------------------|-----------------------|------|---------------------------------------|
|              |                                                                             | Min.                  | Typ. | Max.                                  |
| $BV_{DSS}$   | $V_{GS} = 0 \text{ V}$ , $I_D = 250 \mu\text{A}$                            | 150                   |      | V                                     |
| $V_{GS(th)}$ | $V_{DS} = V_{GS}$ , $I_D = 4 \text{ mA}$                                    | 2.5                   |      | 5.0 V                                 |
| $I_{GSS}$    | $V_{GS} = \pm 20 \text{ V}_{DC}$ , $V_{DS} = 0$                             |                       |      | $\pm 200 \text{ nA}$                  |
| $I_{DSS}$    | $V_{DS} = V_{DSS}$<br>$V_{GS} = 0 \text{ V}$<br>$T_J = 150^\circ\text{C}$   |                       |      | 25 $\mu\text{A}$<br>250 $\mu\text{A}$ |
| $R_{DS(on)}$ | $V_{GS} = 10 \text{ V}$ , $I_D = 0.5 I_{D25}$<br>Note 1                     |                       |      | 11 $\text{m}\Omega$                   |

| Symbol       | Test Conditions                                                                                   | Characteristic Values<br>( $T_J = 25^\circ\text{C}$ , unless otherwise specified) |                        |      |
|--------------|---------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------|------|
|              |                                                                                                   | Min.                                                                              | Typ.                   | Max. |
| $g_{fs}$     | $V_{DS} = 10\text{ V}; I_D = 0.5 I_{D25}$ , Note 1                                                | 55                                                                                | 86                     | S    |
| $C_{iss}$    | $V_{GS} = 0\text{ V}, V_{DS} = 25\text{ V}, f = 1\text{ MHz}$                                     |                                                                                   | 7000                   | pF   |
| $C_{oss}$    |                                                                                                   |                                                                                   | 2250                   | pF   |
| $C_{rss}$    |                                                                                                   |                                                                                   | 515                    | pF   |
| $t_{d(on)}$  | $V_{GS} = 10\text{ V}, V_{DS} = 0.5 V_{DSS}, I_D = 60\text{ A}$<br>$R_G = 3.3\ \Omega$ (External) |                                                                                   | 30                     | ns   |
| $t_r$        |                                                                                                   |                                                                                   | 32                     | ns   |
| $t_{d(off)}$ |                                                                                                   |                                                                                   | 150                    | ns   |
| $t_f$        |                                                                                                   |                                                                                   | 36                     | ns   |
| $Q_{g(on)}$  | $V_{GS} = 10\text{ V}, V_{DS} = 0.5 V_{DSS}, I_D = 0.5 I_{D25}$                                   |                                                                                   | 240                    | nC   |
| $Q_{gs}$     |                                                                                                   |                                                                                   | 55                     | nC   |
| $Q_{gd}$     |                                                                                                   |                                                                                   | 140                    | nC   |
| $R_{thJC}$   |                                                                                                   | 0.15                                                                              | $0.18^\circ\text{C/W}$ |      |
| $R_{thCS}$   |                                                                                                   |                                                                                   | $^\circ\text{C/W}$     |      |

| Source-Drain Diode |                                                                                                     | Characteristic Values<br>( $T_J = 25^\circ\text{C}$ , unless otherwise specified) |      |               |
|--------------------|-----------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------|---------------|
| Symbol             | Test Conditions                                                                                     | Min.                                                                              | Typ. | Max.          |
| $I_S$              | $V_{GS} = 0\text{ V}$                                                                               |                                                                                   |      | 180 A         |
| $I_{SM}$           | Repetitive                                                                                          |                                                                                   |      | 380 A         |
| $V_{SD}$           | $I_F = 90\text{ A}, V_{GS} = 0\text{ V}$ ,<br>Note 1                                                |                                                                                   |      | 1.3 V         |
| $t_{rr}$           | $I_F = 25\text{ A}, -di/dt = 100\text{ A}/\mu\text{s}$<br>$V_R = 100\text{ V}, V_{GS} = 0\text{ V}$ |                                                                                   | 150  | 200 ns        |
| $Q_{RM}$           |                                                                                                     |                                                                                   | 0.6  | $\mu\text{C}$ |

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

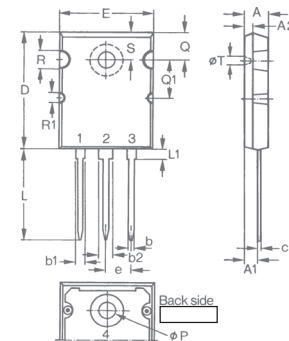
### PLUS 247™ Outline



Terminals: 1 - Gate  
2 - Drain (Collector)  
3 - Source (Emitter)  
4 - Drain (Collector)

| Dim.           | Millimeter<br>Min. Max. | Inches<br>Min. Max. |
|----------------|-------------------------|---------------------|
| A              | 4.83 5.21               | .190 .205           |
| A <sub>1</sub> | 2.29 2.54               | .090 .100           |
| A <sub>2</sub> | 1.91 2.16               | .075 .085           |
| b              | 1.14 1.40               | .045 .055           |
| b <sub>1</sub> | 1.91 2.13               | .075 .084           |
| b <sub>2</sub> | 2.92 3.12               | .115 .123           |
| C              | 0.61 0.80               | .024 .031           |
| D              | 20.80 21.34             | .819 .840           |
| E              | 15.75 16.13             | .620 .635           |
| e              | 5.45 BSC                | .215 BSC            |
| L              | 19.81 20.32             | .780 .800           |
| L1             | 3.81 4.32               | .150 .170           |
| Q              | 5.59 6.20               | .220 .244           |
| R              | 4.32 4.83               | .170 .190           |

### TO-264 AA Outline



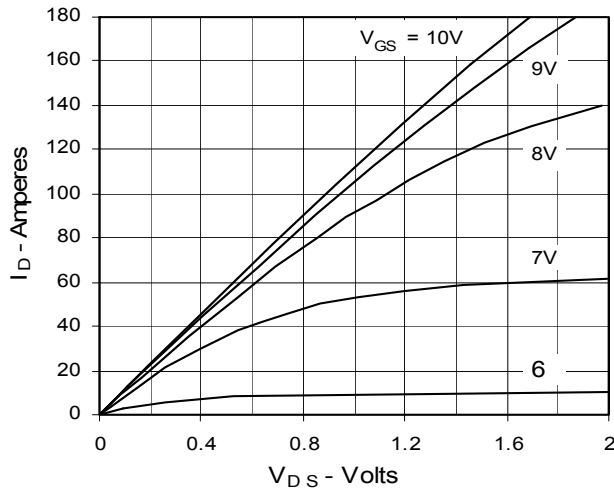
| Dim.           | Millimeter<br>Min. Max. | Inches<br>Min. Max. |
|----------------|-------------------------|---------------------|
| A              | 4.82 5.13               | .190 .202           |
| A <sub>1</sub> | 2.54 2.89               | .100 .114           |
| A <sub>2</sub> | 2.00 2.10               | .079 .083           |
| b              | 1.12 1.42               | .044 .056           |
| b <sub>1</sub> | 2.39 2.69               | .094 .106           |
| b <sub>2</sub> | 2.90 3.09               | .114 .122           |
| c              | 0.53 0.83               | .021 .033           |
| D              | 25.91 26.16             | 1.020 1.030         |
| E              | 19.81 19.96             | .780 .786           |
| e              | 5.46 BSC                | .215 BSC            |
| J              | 0.00 0.25               | .000 .010           |
| K              | 0.00 0.25               | .000 .010           |
| L              | 20.32 20.83             | .800 .820           |
| L1             | 2.29 2.59               | .090 .102           |
| P              | 3.17 3.66               | .125 .144           |
| Q              | 6.07 6.27               | .239 .247           |
| Q1             | 8.38 8.69               | .330 .342           |
| R              | 3.81 4.32               | .150 .170           |
| R1             | 1.78 2.29               | .070 .090           |
| S              | 6.04 6.30               | .238 .248           |
| T              | 1.57 1.83               | .062 .072           |

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

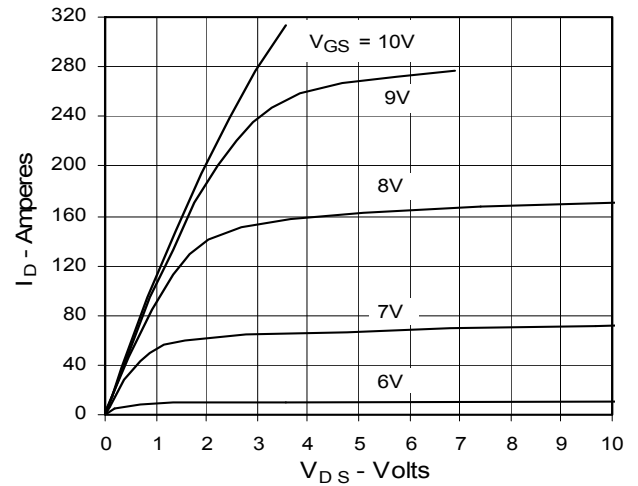
IXYS MOSFETs and IGBTs are covered by one or more of the following U.S. patents:

|           |           |           |           |              |              |             |              |
|-----------|-----------|-----------|-----------|--------------|--------------|-------------|--------------|
| 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 |

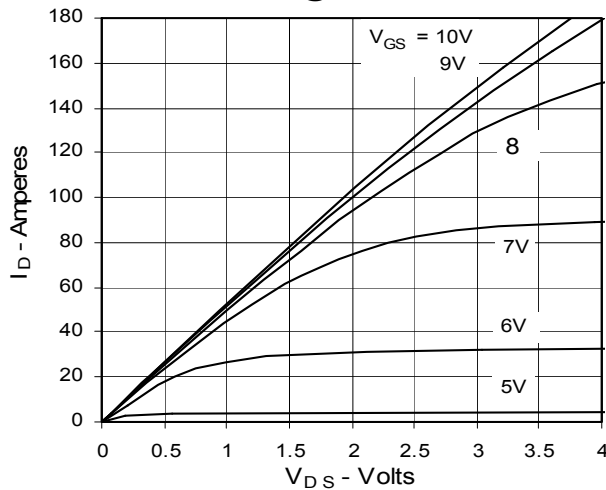
**Fig. 1. Output Characteristics  
@ 25°C**



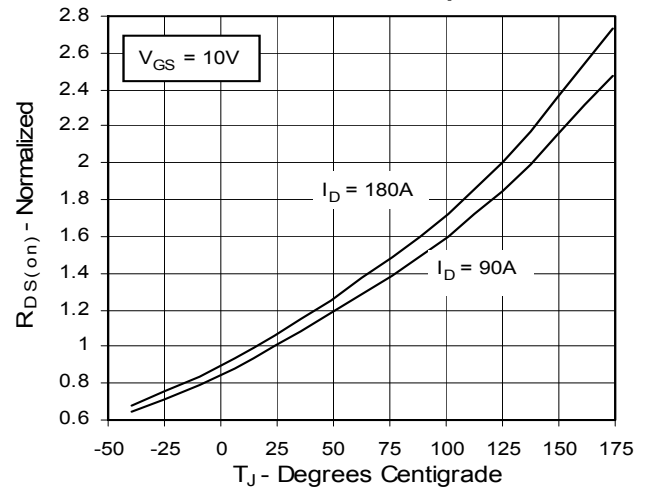
**Fig. 2. Extended Output Characteristics  
@ 25°C**



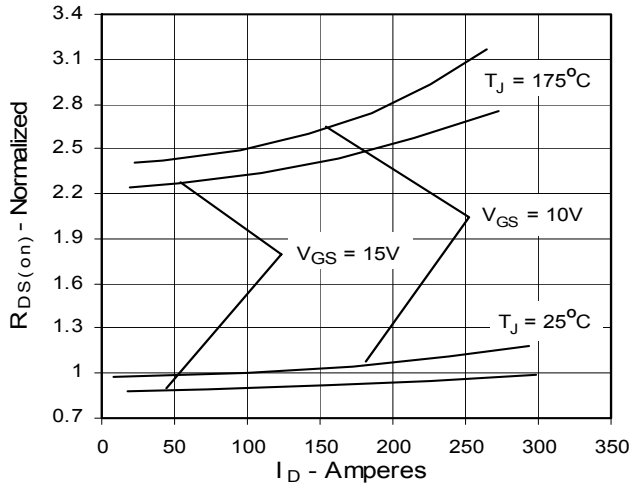
**Fig. 3. Output Characteristics  
@ 150°C**



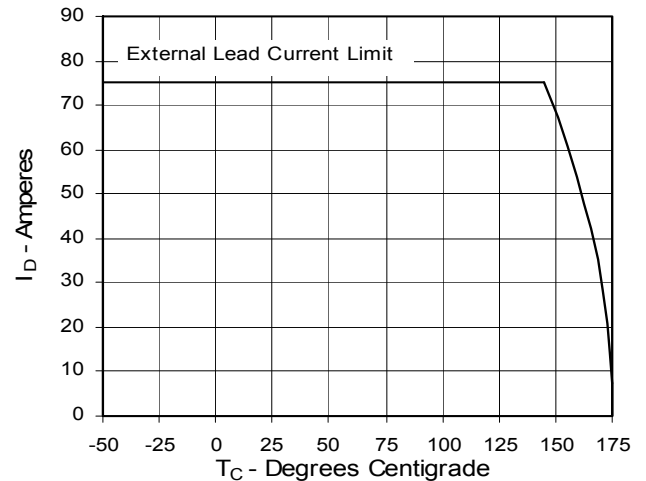
**Fig. 4.  $R_{DS(on)}$  Normalized to  $0.5 I_{D25}$   
Value vs. Junction Temperature**



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



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



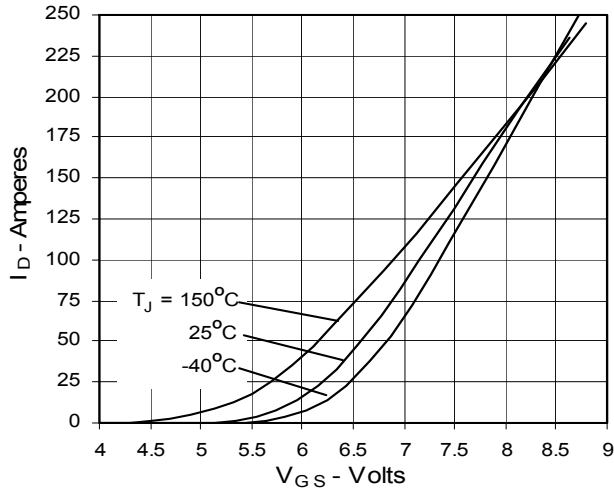
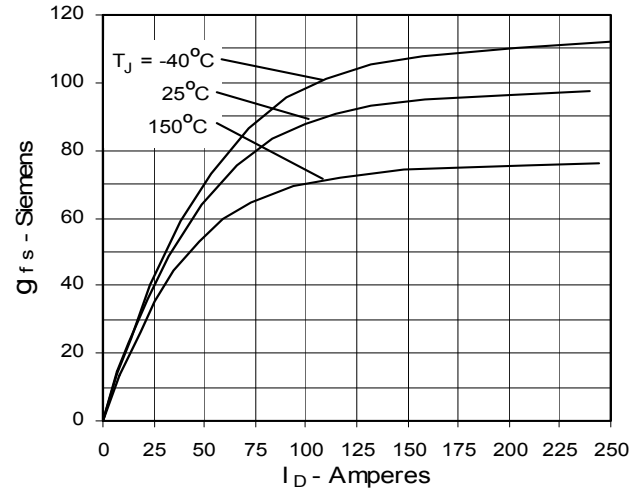
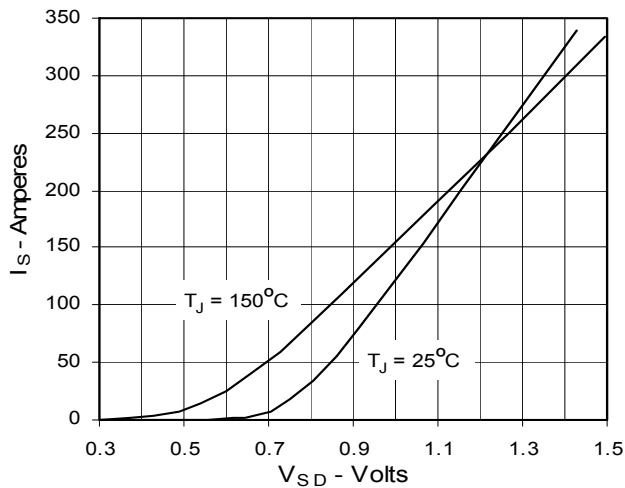
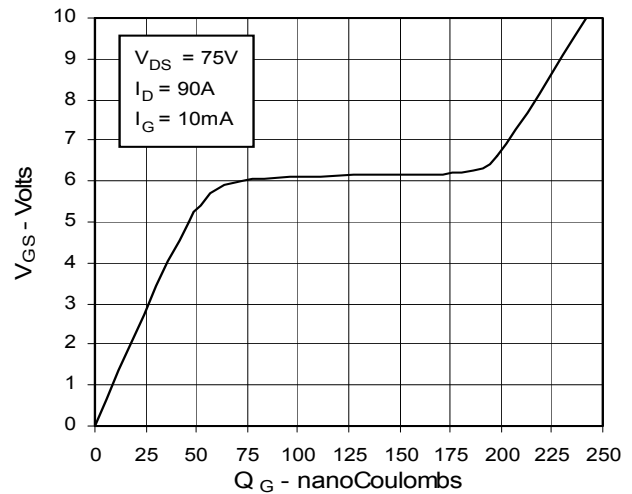
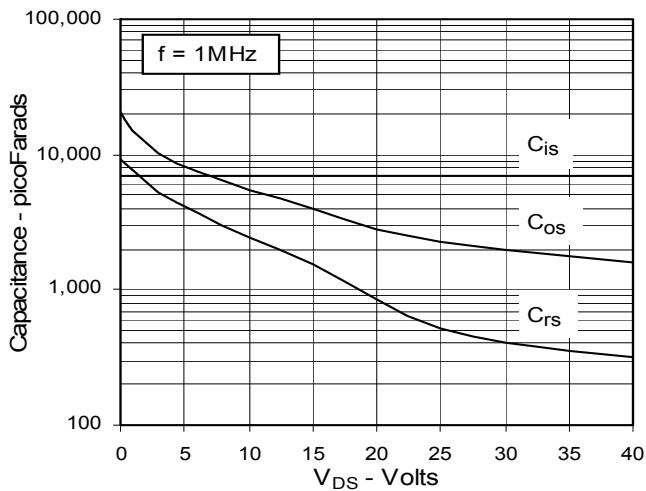
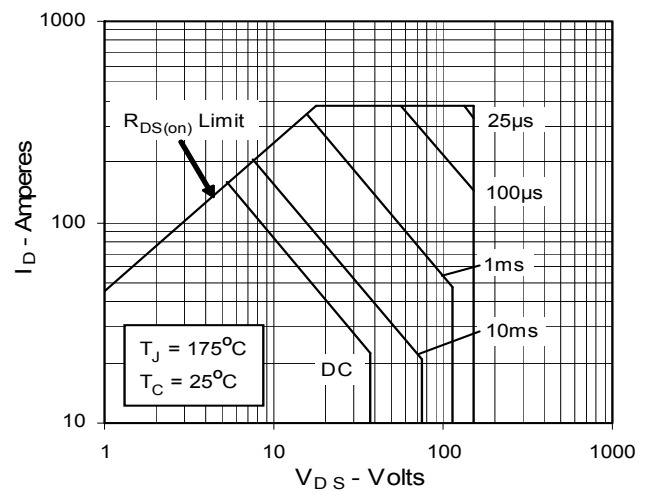
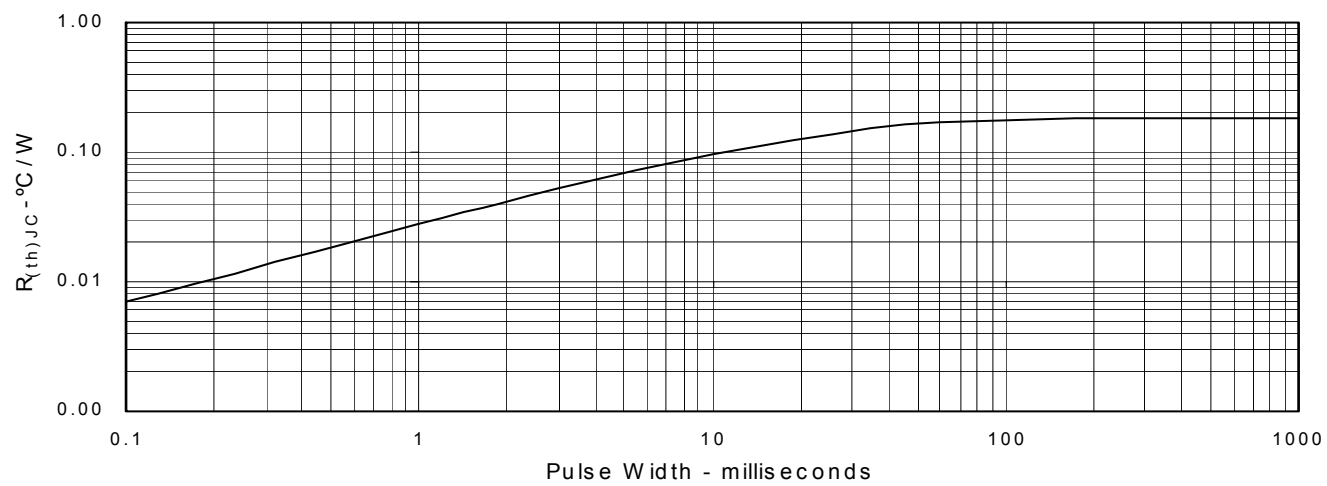
**Fig. 7. Input Admittance**

**Fig. 8. Transconductance**

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

**Fig. 10. Gate Charge**

**Fig. 11. Capacitance**

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


Fig. 13. Maximum Transient Thermal Resistance





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