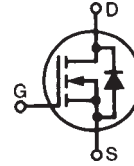


# PolarHT™ Power MOSFET

**IXTQ 140N10P**  
**IXTT 140N10P**

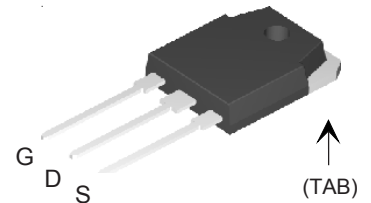
$V_{DSS} = 100 \text{ V}$   
 $I_{D25} = 140 \text{ A}$   
 $R_{DS(on)} \leq 11 \text{ m}\Omega$

N-Channel Enhancement Mode  
Avalanche Rated

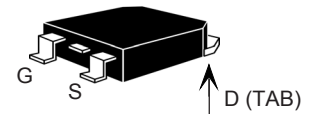


| Symbol       | Test Conditions                                                                                                                          | Maximum Ratings |                   |
|--------------|------------------------------------------------------------------------------------------------------------------------------------------|-----------------|-------------------|
| $V_{DSS}$    | $T_J = 25^\circ \text{C to } 175^\circ \text{C}$                                                                                         | 100             | V                 |
| $V_{DGR}$    | $T_J = 25^\circ \text{C to } 175^\circ \text{C}; R_{GS} = 1 \text{ M}\Omega$                                                             | 100             | V                 |
| $V_{GS}$     | Continuous                                                                                                                               | $\pm 20$        | V                 |
| $V_{GSM}$    | Transient                                                                                                                                | $\pm 30$        | V                 |
| $I_{D25}$    | $T_C = 25^\circ \text{C}$                                                                                                                | 140             | A                 |
| $I_{D(RMS)}$ | External lead current limit                                                                                                              | 75              | A                 |
| $I_{DM}$     | $T_C = 25^\circ \text{C}$ , pulse width limited by $T_{JM}$                                                                              | 300             | A                 |
| $I_{AR}$     | $T_C = 25^\circ \text{C}$                                                                                                                | 60              | A                 |
| $E_{AR}$     | $T_C = 25^\circ \text{C}$                                                                                                                | 80              | mJ                |
| $E_{AS}$     | $T_C = 25^\circ \text{C}$                                                                                                                | 2.5             | J                 |
| $dv/dt$      | $I_S \leq I_{DM}$ , $di/dt \leq 100 \text{ A}/\mu\text{s}$ , $V_{DD} \leq V_{DSS}$ ,<br>$T_J \leq 150^\circ \text{C}$ , $R_G = 4 \Omega$ | 10              | V/ns              |
| $P_D$        | $T_C = 25^\circ \text{C}$                                                                                                                | 600             | 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 (TO-3P)                                                                                                                  | 1.13/10         | Nm/lb.in.         |
| Weight       | TO-3P                                                                                                                                    | 5.5             | g                 |
|              | TO-268                                                                                                                                   | 5.0             | g                 |

TO-3P (IXTQ)



TO-268 (IXTT)



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

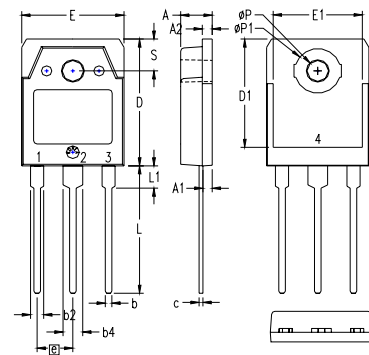
- Easy to mount
- Space savings
- High power density

| Symbol       | Test Conditions<br>( $T_J = 25^\circ \text{C}$ , unless otherwise specified)                                                                                        | Characteristic Values |      |                                         |
|--------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|------|-----------------------------------------|
|              |                                                                                                                                                                     | Min.                  | Typ. | Max.                                    |
| $BV_{DSS}$   | $V_{GS} = 0 \text{ V}$ , $I_D = 250 \mu\text{A}$                                                                                                                    | 100                   |      | V                                       |
| $V_{GS(th)}$ | $V_{DS} = V_{GS}$ , $I_D = 250 \mu\text{A}$                                                                                                                         | 3.0                   |      | 5.0 V                                   |
| $I_{GSS}$    | $V_{GS} = \pm 20 \text{ V}$ , $V_{DS} = 0$                                                                                                                          |                       |      | $\pm 100 \text{ nA}$                    |
| $I_{DSS}$    | $V_{DS} = V_{DSS}$                                                                                                                                                  |                       |      | 25 $\mu\text{A}$                        |
|              | $V_{GS} = 0 \text{ V}$ , $T_J = 175^\circ \text{C}$                                                                                                                 |                       |      | 500 $\mu\text{A}$                       |
| $R_{DS(on)}$ | $V_{GS} = 10 \text{ V}$ , $I_D = 0.5 I_{D25}$<br>$V_{GS} = 15 \text{ V}$ , $I_D = 300 \text{ A}$<br>Pulse test, $t \leq 300 \mu\text{s}$ , duty cycle $d \leq 2 \%$ |                       | 9    | 11 $\text{m}\Omega$<br>$\text{m}\Omega$ |

| Symbol       | Test Conditions                                                                                 | Characteristic Values<br>( $T_J = 25^\circ\text{C}$ , unless otherwise specified) |      |                        |
|--------------|-------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------|------------------------|
|              |                                                                                                 | Min.                                                                              | Typ. | Max.                   |
| $g_{fs}$     | $V_{DS} = 10\text{ V}; I_D = 0.5 I_{D25}$ , pulse test                                          | 45                                                                                | 65   | S                      |
| $C_{iss}$    | $V_{GS} = 0\text{ V}, V_{DS} = 25\text{ V}, f = 1\text{ MHz}$                                   |                                                                                   | 4700 | pF                     |
| $C_{oss}$    |                                                                                                 |                                                                                   | 1850 | pF                     |
| $C_{rss}$    |                                                                                                 |                                                                                   | 600  | pF                     |
| $t_{d(on)}$  | $V_{GS} = 10\text{ V}, V_{DS} = 0.5 V_{DSS}, I_D = 60\text{ A}$<br>$R_G = 4\ \Omega$ (External) |                                                                                   | 35   | ns                     |
| $t_r$        |                                                                                                 |                                                                                   | 50   | ns                     |
| $t_{d(off)}$ |                                                                                                 |                                                                                   | 85   | ns                     |
| $t_f$        |                                                                                                 |                                                                                   | 26   | ns                     |
| $Q_{g(on)}$  | $V_{GS} = 10\text{ V}, V_{DS} = 0.5 V_{DSS}, I_D = 0.5 I_{D25}$                                 |                                                                                   | 155  | nC                     |
| $Q_{gs}$     |                                                                                                 |                                                                                   | 33   | nC                     |
| $Q_{gd}$     |                                                                                                 |                                                                                   | 85   | nC                     |
| $R_{thJC}$   | (TO-3P)                                                                                         |                                                                                   | 0.21 | $0.25^\circ\text{C/W}$ |
| $R_{thCS}$   |                                                                                                 |                                                                                   |      | $^\circ\text{C/W}$     |

| Source-Drain Diode |                                                                                                       | Characteristic Values<br>( $T_J = 25^\circ\text{C}$ , unless otherwise specified) |      |               |
|--------------------|-------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------|---------------|
| Symbol             | Test Conditions                                                                                       | Min.                                                                              | Typ. | Max.          |
| $I_S$              | $V_{GS} = 0\text{ V}$                                                                                 |                                                                                   |      | 140 A         |
| $I_{SM}$           | Repetitive                                                                                            |                                                                                   |      | 300 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>$V_R = 50\text{ V}, V_{GS} = 0\text{ V}$    |                                                                                   | 120  | ns            |
| $Q_{RM}$           |                                                                                                       |                                                                                   |      | $\mu\text{C}$ |

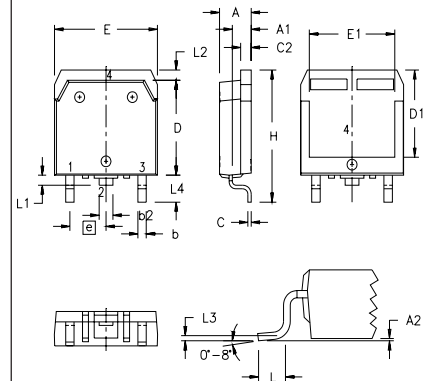
### TO-3P (IXTQ) Outline



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

| SYM       | INCHES   |      | MILLIMETERS |       |
|-----------|----------|------|-------------|-------|
|           | MIN      | MAX  | MIN         | MAX   |
| A         | .185     | .193 | 4.70        | 4.90  |
| A1        | .051     | .059 | 1.30        | 1.50  |
| A2        | .057     | .065 | 1.45        | 1.65  |
| b         | .035     | .045 | 0.90        | 1.15  |
| b2        | .075     | .087 | 1.90        | 2.20  |
| b4        | .114     | .126 | 2.90        | 3.20  |
| c         | .022     | .031 | 0.55        | 0.80  |
| D         | .780     | .799 | 19.80       | 20.30 |
| D1        | .665     | .677 | 16.90       | 17.20 |
| E         | .610     | .622 | 15.50       | 15.80 |
| E1        | .531     | .539 | 13.50       | 13.70 |
| e         | .215 BSC |      | 5.45 BSC    |       |
| L         | .779     | .795 | 19.80       | 20.20 |
| L1        | .134     | .142 | 3.40        | 3.60  |
| $\phi P$  | .126     | .134 | 3.20        | 3.40  |
| $\phi P1$ | .272     | .280 | 6.90        | 7.10  |
| S         | .193     | .201 | 4.90        | 5.10  |

### TO-268 (IXTT) Outline

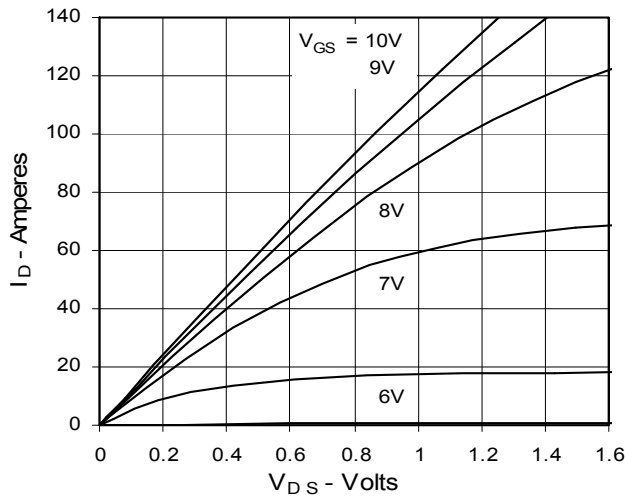


| SYM | INCHES   |      | MILLIMETERS |       |
|-----|----------|------|-------------|-------|
|     | MIN      | MAX  | MIN         | MAX   |
| A   | .193     | .201 | 4.90        | 5.10  |
| A1  | .106     | .114 | 2.70        | 2.90  |
| A2  | .001     | .010 | 0.02        | 0.25  |
| b   | .045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

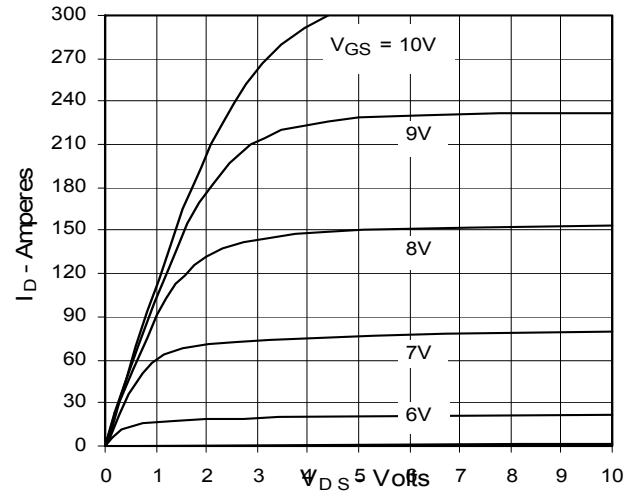
IXYS reserves the right to change limits, test conditions, and dimensions.

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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

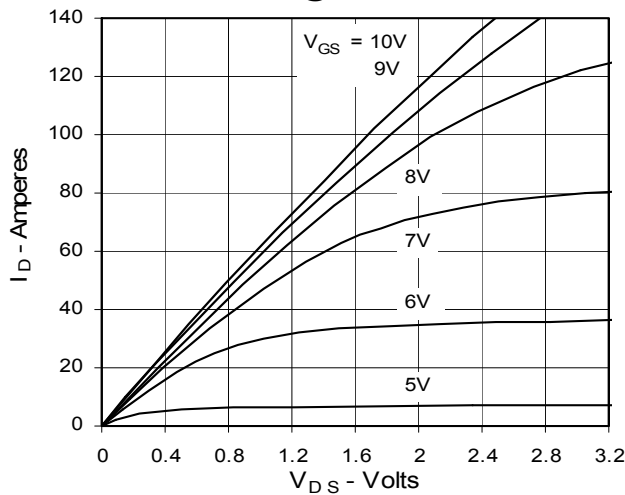
**Fig. 1. Output Characteristics**  
**@ 25°C**



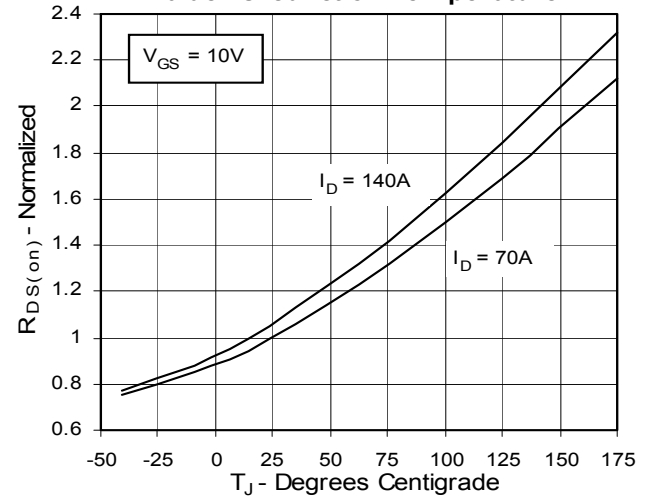
**Fig. 2. Extended Output Characteristics**  
**@ 25°C**



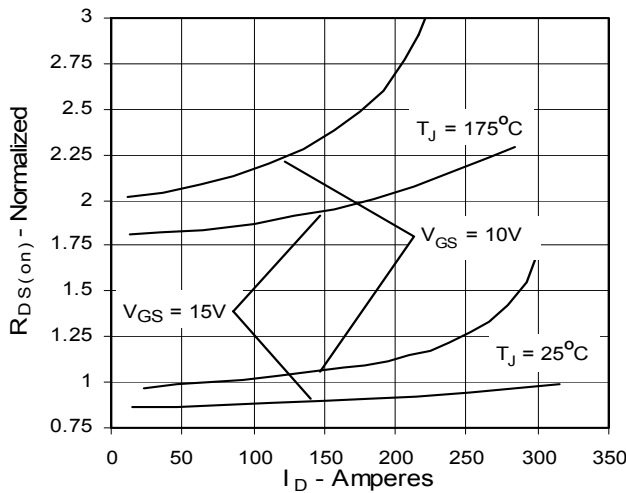
**Fig. 3. Output Characteristics**  
**@ 150°C**



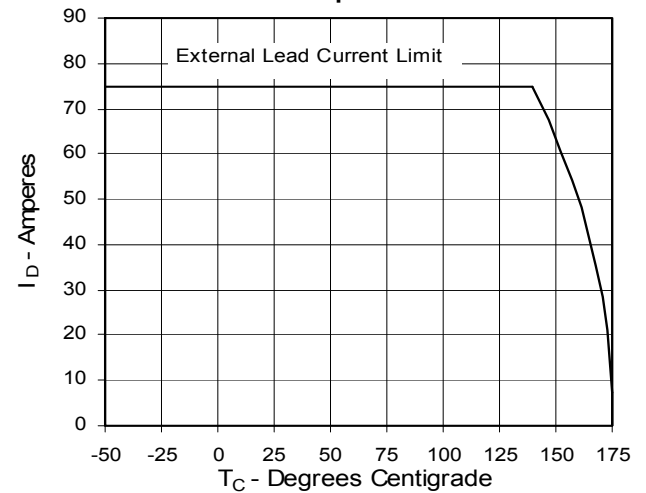
**Fig. 4.  $R_{DS(on)}$  Normalized to 0.5  $I_{D25}$**   
**Value vs. Junction Temperature**



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



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



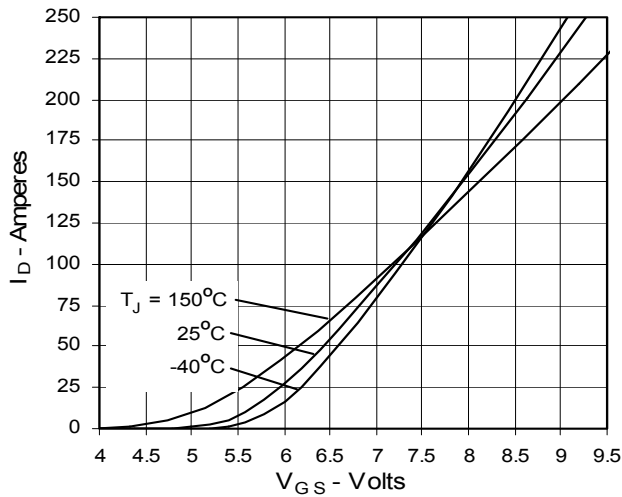
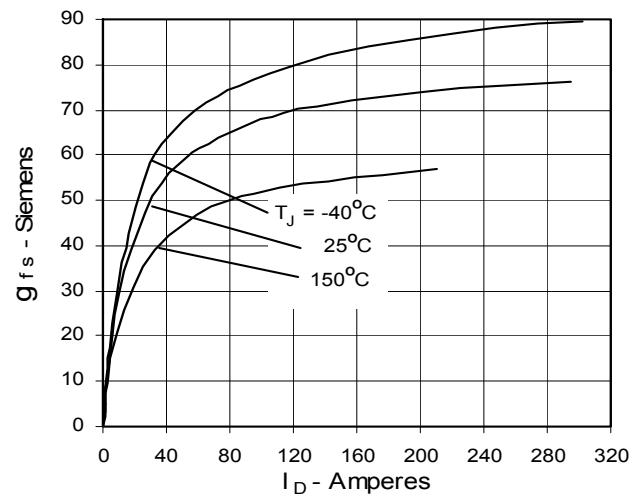
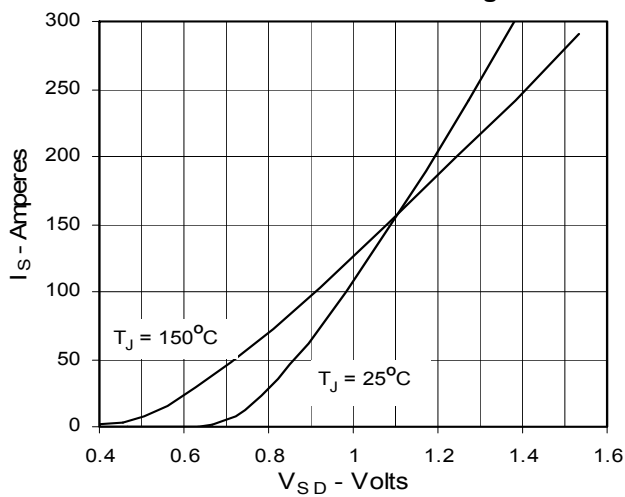
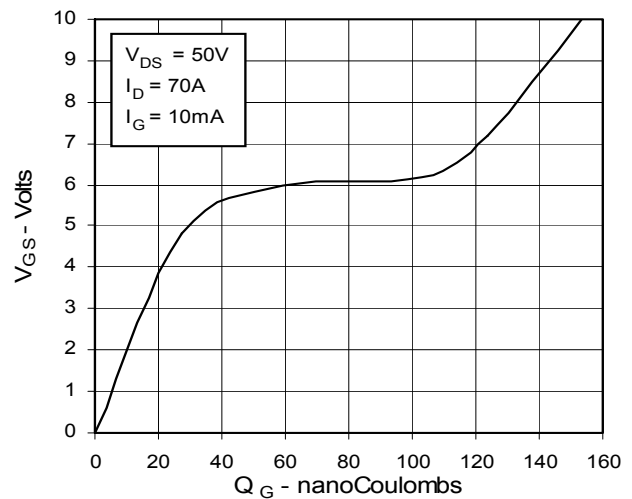
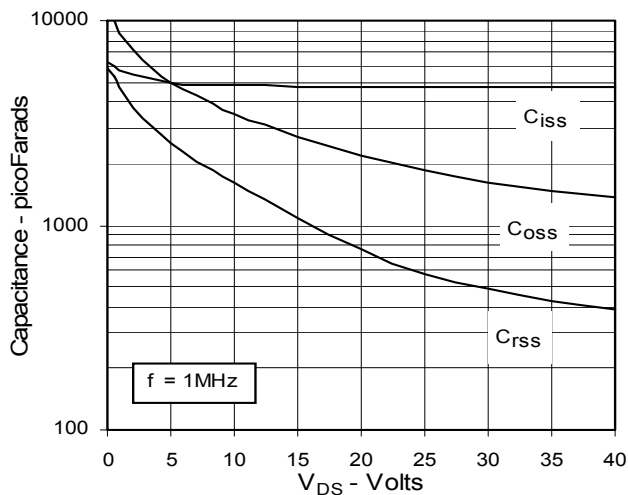
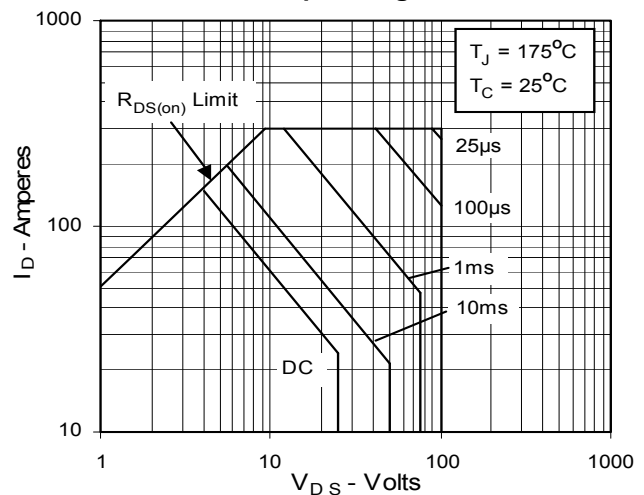
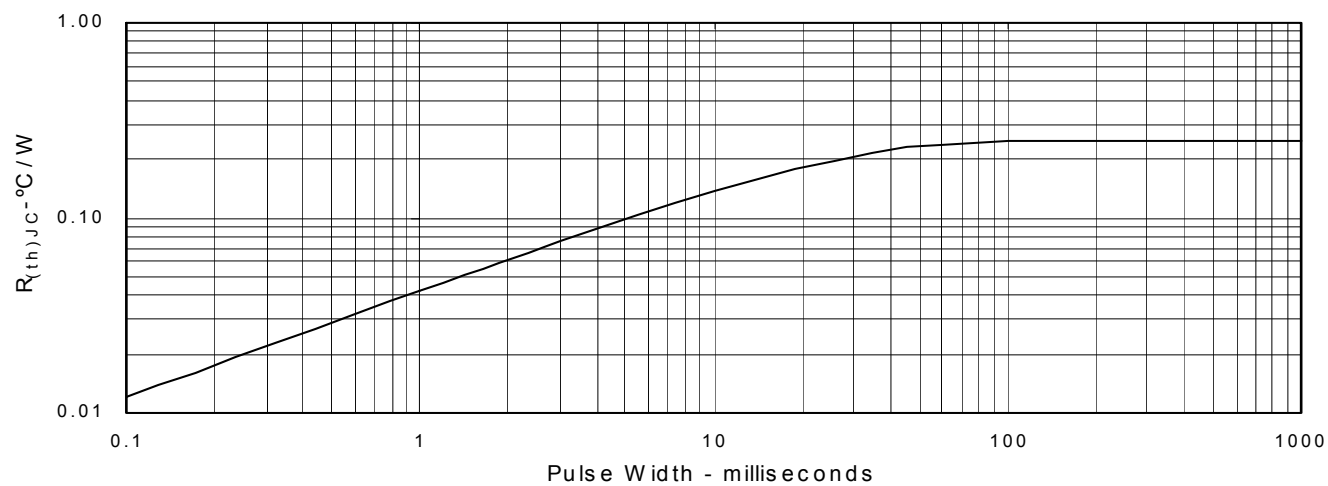
**Fig. 7. Input Admittance**

**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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