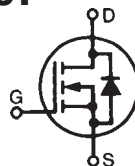


## PolarHT™ Power MOSFET

**IXTA50N20P**  
**IXTP50N20P**  
**IXTQ50N20P**

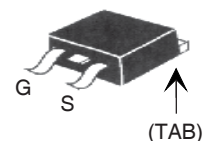
N-Channel Enhancement Mode  
Avalanche Rated



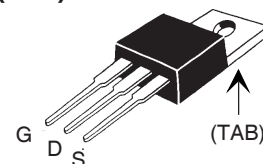
$$\begin{aligned} V_{DSS} &= 200V \\ I_{D25} &= 50A \\ R_{DS(on)} &\leq 60m\Omega \end{aligned}$$

| Symbol     | Test Conditions                                                          | Maximum Ratings |                  |
|------------|--------------------------------------------------------------------------|-----------------|------------------|
| $V_{DSS}$  | $T_J = 25^\circ\text{C}$ to $175^\circ\text{C}$                          | 200             | V                |
| $V_{DGR}$  | $T_J = 25^\circ\text{C}$ to $175^\circ\text{C}$ , $R_{GS} = 1M\Omega$    | 200             | V                |
| $V_{GSS}$  | Continuous                                                               | $\pm 20$        | V                |
| $V_{GSM}$  | Transient                                                                | $\pm 30$        | V                |
| $I_{D25}$  | $T_C = 25^\circ\text{C}$                                                 | 50              | A                |
| $I_{DM}$   | $T_C = 25^\circ\text{C}$ , pulse width limited by $T_{JM}$               | 120             | A                |
| $I_A$      | $T_C = 25^\circ\text{C}$                                                 | 50              | A                |
| $E_{AS}$   | $T_C = 25^\circ\text{C}$                                                 | 1               | J                |
| $dV/dt$    | $I_S \leq I_{DM}$ , $V_{DD} \leq V_{DSS}$ , $T_J \leq 175^\circ\text{C}$ | 10              | V/ns             |
| $P_D$      | $T_C = 25^\circ\text{C}$                                                 | 360             | W                |
| $T_J$      |                                                                          | - 55 ... +175   | $^\circ\text{C}$ |
| $T_{JM}$   |                                                                          | 175             | $^\circ\text{C}$ |
| $T_{stg}$  |                                                                          | - 55 ... +175   | $^\circ\text{C}$ |
| $T_L$      | 1.6mm (0.062 in.) from case for 10s                                      | 300             | $^\circ\text{C}$ |
| $T_{SOLD}$ | Plastic body for 10s                                                     | 260             | $^\circ\text{C}$ |
| $M_d$      | Mounting torque (TO-3P, TO-220)                                          | 1.13/10         | Nm/lb.in.        |
| Weight     | TO-263                                                                   | 2.5             | g                |
|            | TO-220                                                                   | 3.0             | g                |
|            | TO-3P                                                                    | 5.5             | g                |

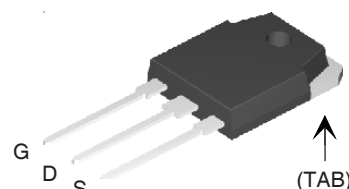
TO-263 (IXTA)



TO-220 (IXTP)



TO-3P (IXTQ)



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.                      |
| $BV_{DSS}$   | $V_{GS} = 0V$ , $I_D = 250\mu A$                                            | 200                   |      | V                         |
| $V_{GS(th)}$ | $V_{DS} = V_{GS}$ , $I_D = 250\mu A$                                        | 2.5                   |      | 5.0 V                     |
| $I_{GSS}$    | $V_{GS} = \pm 20V$ , $V_{DS} = 0V$                                          |                       |      | $\pm 100$ nA              |
| $I_{DSS}$    | $V_{DS} = V_{DSS}$<br>$V_{GS} = 0V$ $T_J = 150^\circ\text{C}$               |                       |      | 25 $\mu A$<br>250 $\mu A$ |
| $R_{DS(on)}$ | $V_{GS} = 10V$ , $I_D = 0.5 \cdot I_{D25}$ , Note 1                         |                       |      | 60 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

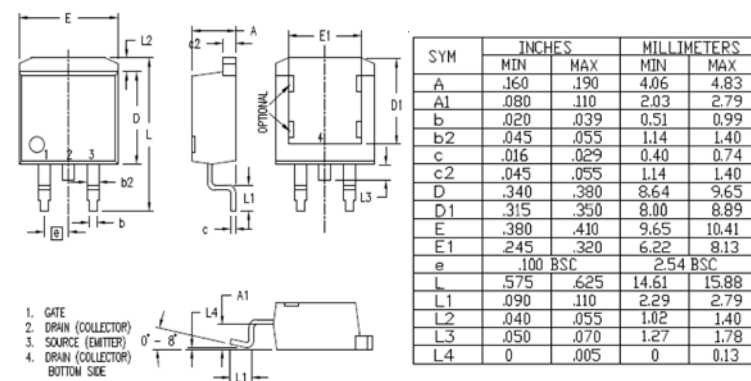
| Symbol       | Test Conditions<br>( $T_J = 25^\circ\text{C}$ , unless otherwise specified)                                                                         | Characteristic Values |      |                         |
|--------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|------|-------------------------|
|              |                                                                                                                                                     | Min.                  | Typ. | Max.                    |
| $g_{fs}$     | $V_{DS} = 10\text{V}$ , $I_D = 0.5 \cdot I_{D25}$ , Note 1                                                                                          | 12                    | 23   | S                       |
| $C_{iss}$    | $V_{GS} = 0\text{V}$ , $V_{DS} = 25\text{V}$ , $f = 1\text{MHz}$                                                                                    |                       | 2720 | pF                      |
| $C_{oss}$    |                                                                                                                                                     |                       | 490  | pF                      |
| $C_{rss}$    |                                                                                                                                                     |                       | 105  | pF                      |
| $t_{d(on)}$  | <b>Resistive Switching Times</b><br>$V_{GS} = 10\text{V}$ , $V_{DS} = 0.5 \cdot V_{DSS}$ , $I_D = 0.5 \cdot I_{D25}$<br>$R_G = 10\Omega$ (External) |                       | 26   | ns                      |
| $t_r$        |                                                                                                                                                     |                       | 35   | ns                      |
| $t_{d(off)}$ |                                                                                                                                                     |                       | 70   | ns                      |
| $t_f$        |                                                                                                                                                     |                       | 30   | ns                      |
| $Q_{g(on)}$  | $V_{GS} = 10\text{V}$ , $V_{DS} = 0.5 \cdot V_{DSS}$ , $I_D = 0.5 \cdot I_{D25}$                                                                    |                       | 70   | nC                      |
| $Q_{gs}$     |                                                                                                                                                     |                       | 17   | nC                      |
| $Q_{gd}$     |                                                                                                                                                     |                       | 37   | nC                      |
| $R_{thJC}$   |                                                                                                                                                     |                       |      | 0.42 $^\circ\text{C/W}$ |
| $R_{thCS}$   | (TO-3P)                                                                                                                                             |                       | 0.21 | $^\circ\text{C/W}$      |
|              | (TO-220)                                                                                                                                            |                       | 0.25 | $^\circ\text{C/W}$      |

## Source-Drain Diode

| Symbol   | Test Conditions<br>( $T_J = 25^\circ\text{C}$ , unless otherwise specified)                           | Characteristic Values |      |               |
|----------|-------------------------------------------------------------------------------------------------------|-----------------------|------|---------------|
|          |                                                                                                       | Min.                  | Typ. | Max.          |
| $I_s$    | $V_{GS} = 0\text{V}$                                                                                  |                       |      | 50 A          |
| $I_{SM}$ | Repetitive, pulse width limited by $T_{JM}$                                                           |                       |      | 120 A         |
| $V_{SD}$ | $I_F = 50\text{A}$ , $V_{GS} = 0\text{V}$ , Note 1                                                    |                       |      | 1.5 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  | ns            |
| $Q_{RM}$ |                                                                                                       |                       | 2.0  | $\mu\text{C}$ |

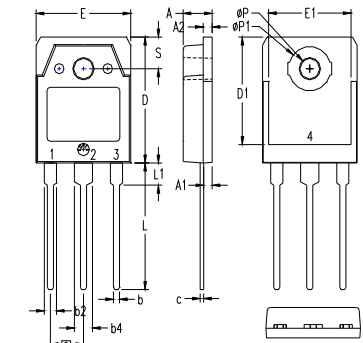
Note 1: Pulse test,  $t \leq 300\mu\text{s}$ ; duty cycle,  $d \leq 2\%$ .

## TO-263 (IXTA) Outline



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

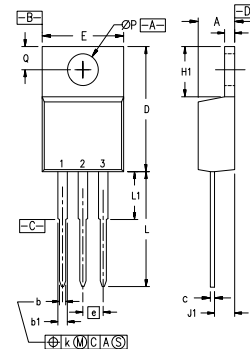
## TO-3P (IXTQ) Outline



- 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  |
| L2  | .126     | .134 | 3.20        | 3.40  |
| ØP1 | .272     | .280 | 6.90        | 7.10  |
| S   | .193     | .201 | 4.90        | 5.10  |

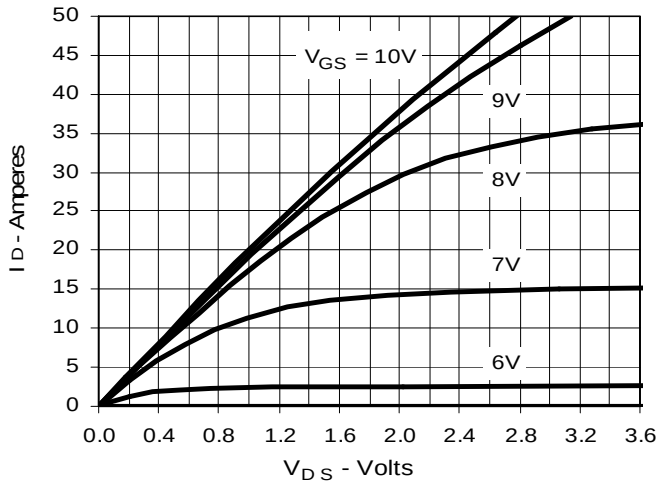
## TO-220 (IXTP) Outline



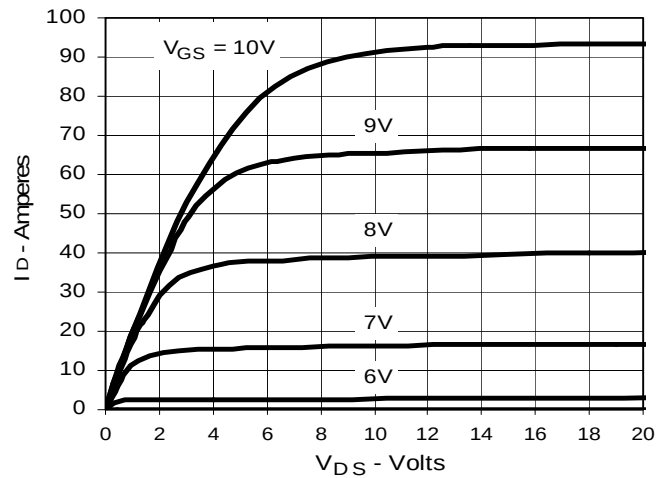
- Pins: 1 - Gate 2 - Drain  
3 - Source 4 - Drain

| SYM | INCHES   |      | MILLIMETERS |       |
|-----|----------|------|-------------|-------|
|     | MIN      | MAX  | MIN         | MAX   |
| A   | .170     | .190 | 4.32        | 4.83  |
| b   | .025     | .040 | 0.64        | 1.02  |
| b1  | .045     | .065 | 1.15        | 1.65  |
| c   | .014     | .022 | 0.35        | 0.56  |
| D   | .580     | .630 | 14.73       | 16.00 |
| E   | .390     | .420 | 9.91        | 10.66 |
| e   | .100 BSC |      | 2.54 BSC    |       |
| F   | .045     | .055 | 1.14        | 1.40  |
| H1  | .230     | .270 | 5.85        | 6.85  |
| J1  | .090     | .110 | 2.29        | 2.79  |
| k   | 0        | .015 | 0           | 0.38  |
| L   | .500     | .550 | 12.70       | 13.97 |
| L1  | .110     | .230 | 2.79        | 5.84  |
| ØP  | .139     | .161 | 3.53        | 4.08  |
| Q   | .100     | .125 | 2.54        | 3.18  |

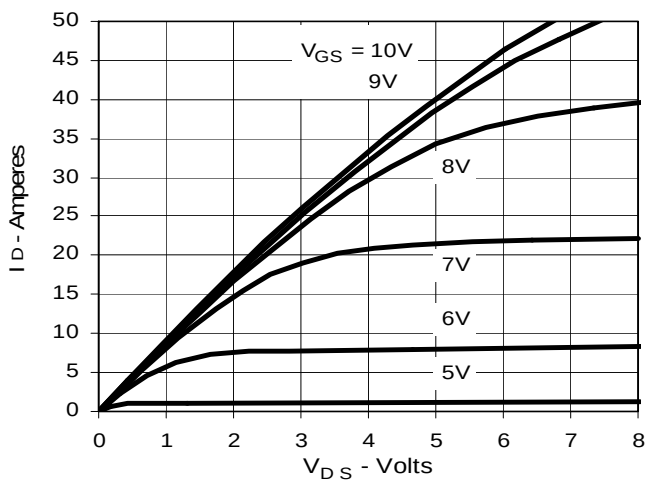
**Fig. 1. Output Characteristics**  
@ 25°C



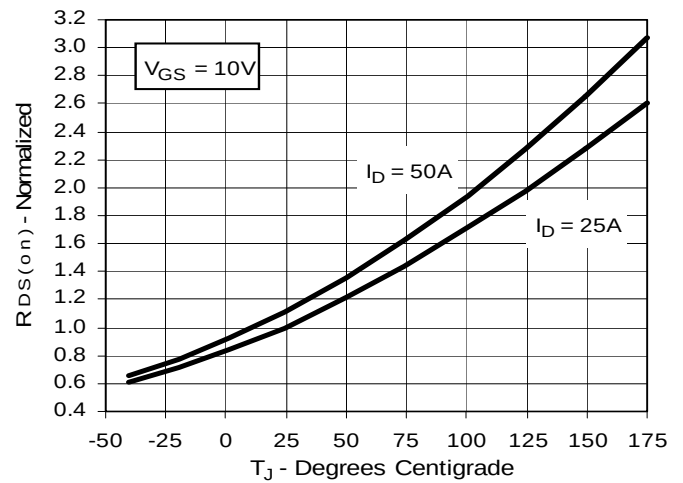
**Fig. 2. Extended Output Characteristics**  
@ 25°C



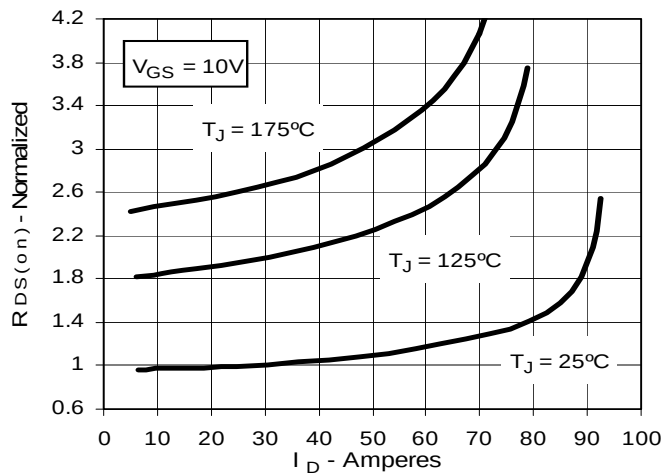
**Fig. 3. Output Characteristics**  
@ 150°C



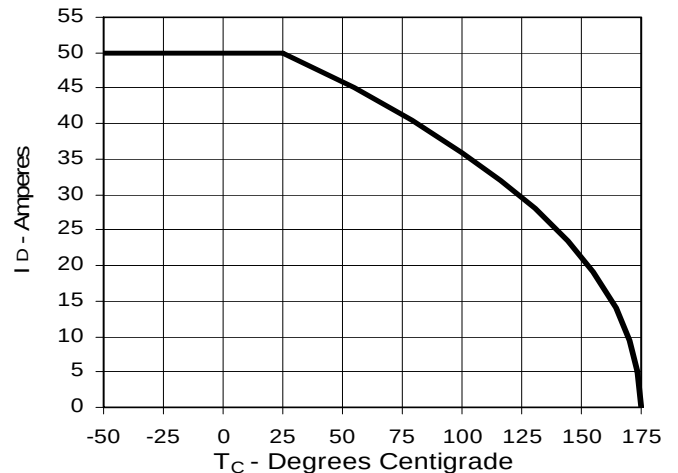
**Fig. 4.  $R_{DS(on)}$  Normalized to  $I_D = 25A$  Value  
vs. Junction Temperature**



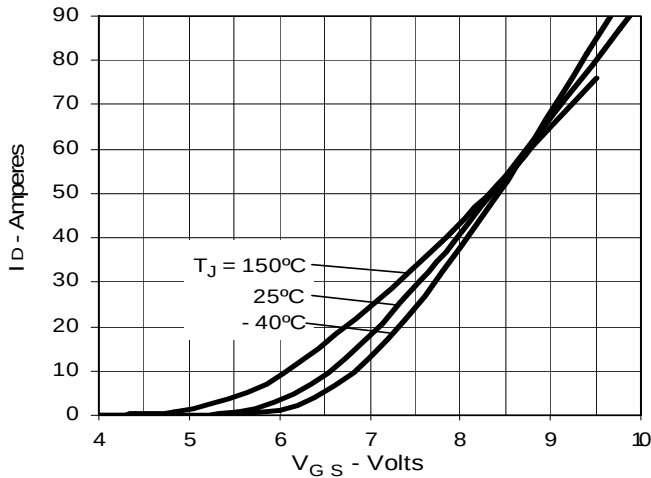
**Fig. 5.  $R_{DS(on)}$  Normalized to  $I_D = 25A$  Value  
vs. Drain Current**



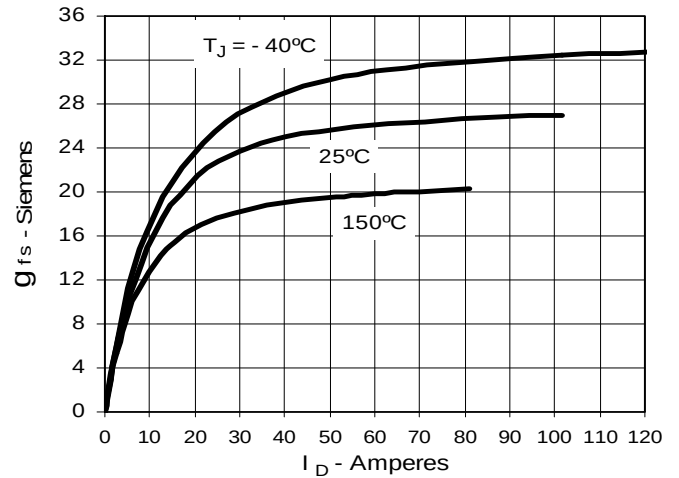
**Fig. 6. Drain Current vs. Case  
Temperature**



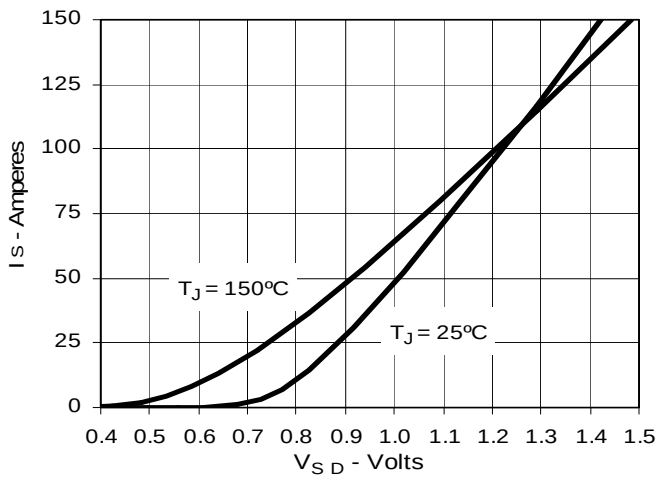
**Fig. 7. Input Admittance**



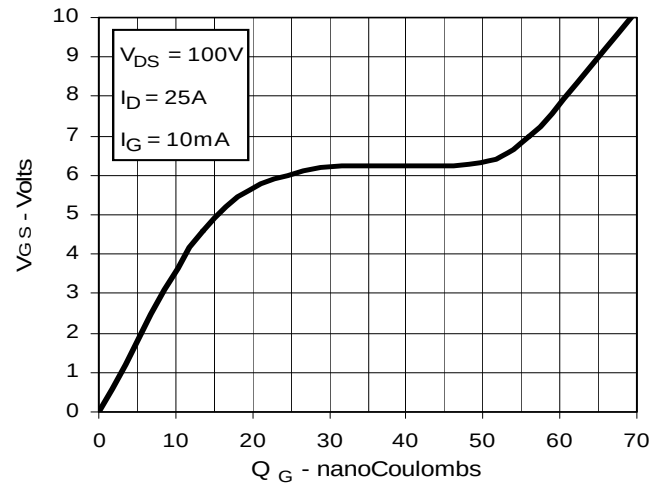
**Fig. 8. Transconductance**



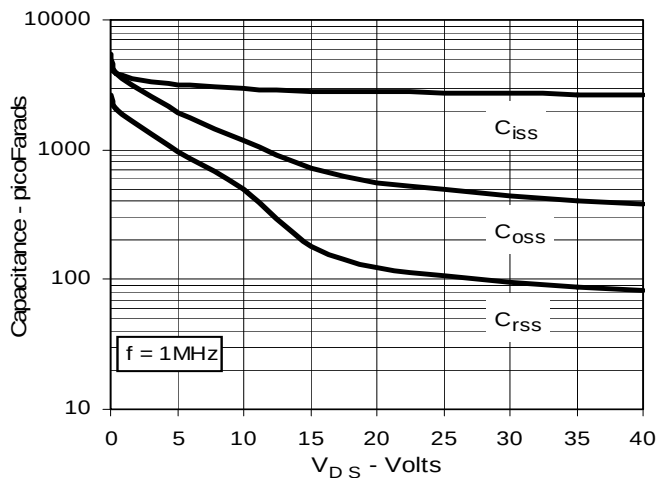
**Fig. 9. Source Current vs. Source-To-Drain Voltage**



**Fig. 10. Gate Charge**



**Fig. 11. Capacitance**



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

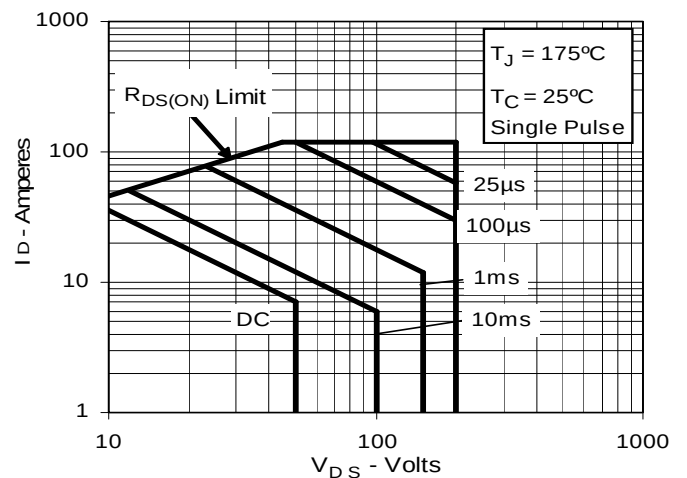
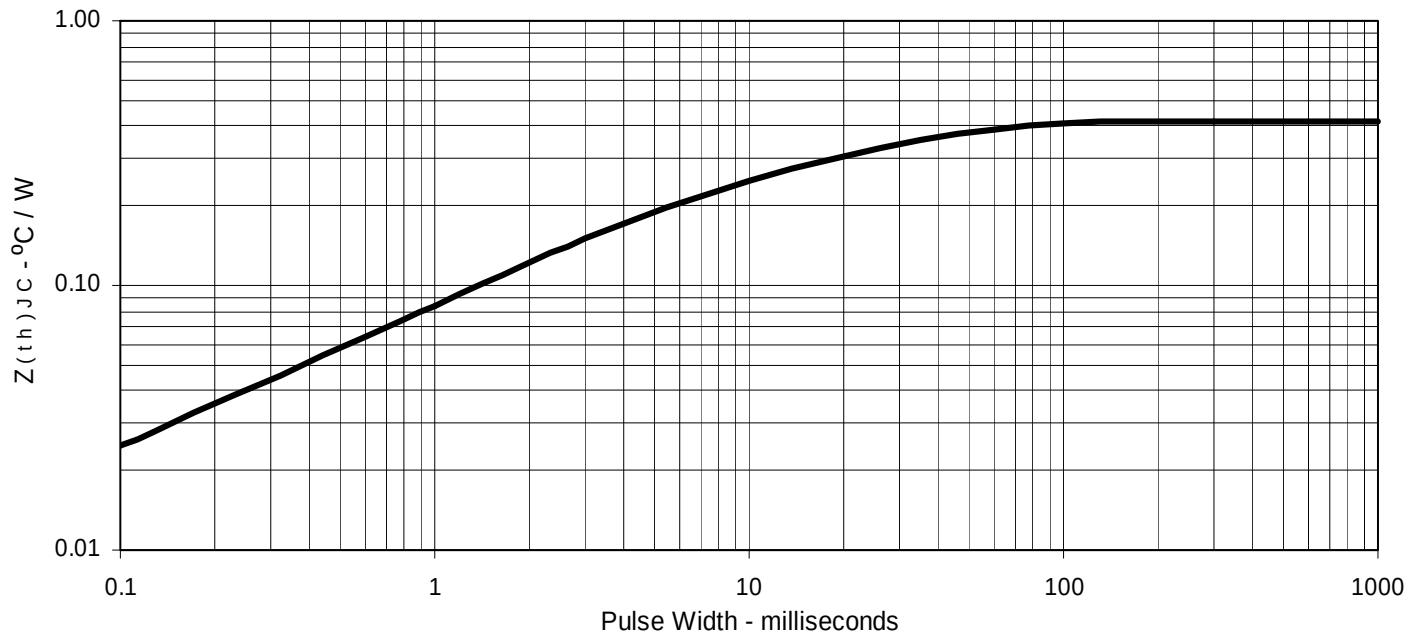


Fig. 13. Maximum Transient Thermal Impedance





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