



## Advanced Technical Information

# PolarHT™ Power MOSFET

**IXTQ52N30P**  
**IXTT52N30P**

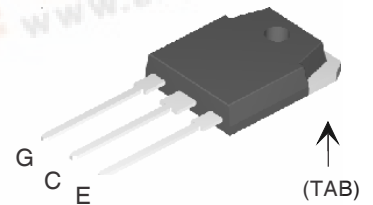
$$\begin{aligned} V_{DSS} &= 300 \text{ V} \\ I_{D25} &= 52 \text{ A} \\ R_{DS(on)} &= 66 \text{ m}\Omega \end{aligned}$$

N-Channel Enhancement Mode

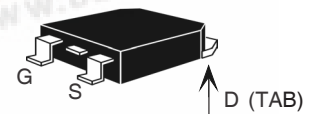


| Symbol    | Test Conditions                                                                                                                         | Maximum Ratings |                  |
|-----------|-----------------------------------------------------------------------------------------------------------------------------------------|-----------------|------------------|
| $V_{DSS}$ | $T_J = 25^\circ\text{C}$ to $150^\circ\text{C}$                                                                                         | 300             | V                |
| $V_{DGR}$ | $T_J = 25^\circ\text{C}$ to $150^\circ\text{C}$ ; $R_{GS} = 1 \text{ M}\Omega$                                                          | 300             | V                |
| $V_{GSS}$ | Continuous                                                                                                                              | $\pm 20$        | V                |
| $V_{GSM}$ | Transient                                                                                                                               | $\pm 30$        | V                |
| $I_{D25}$ | $T_C = 25^\circ\text{C}$                                                                                                                | 52              | A                |
| $I_{DM}$  | $T_C = 25^\circ\text{C}$ , pulse width limited by $T_{JM}$                                                                              | 150             | A                |
| $I_{AR}$  | $T_C = 25^\circ\text{C}$                                                                                                                | 52              | 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>$T_J \leq 150^\circ\text{C}$ , $R_G = 4 \Omega$ | 10              | V/ns             |
| $P_D$     | $T_C = 25^\circ\text{C}$                                                                                                                | 400             | 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             | $^\circ\text{C}$ |
| $M_d$     | 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  
S = Source

D = Drain  
TAB = Drain

## Features

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

## Advantages

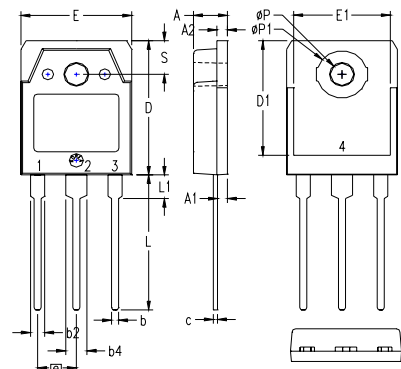
- Easy to mount
- Space savings
- High power density

| Symbol       | Test Conditions                                                                                                 | Characteristic Values |      |                                       |
|--------------|-----------------------------------------------------------------------------------------------------------------|-----------------------|------|---------------------------------------|
|              |                                                                                                                 | Min.                  | Typ. | Max.                                  |
| $V_{DSS}$    | $V_{GS} = 0 \text{ V}$ , $I_D = 250 \mu\text{A}$                                                                | 300                   |      | V                                     |
| $V_{GS(th)}$ | $V_{DS} = V_{GS}$ , $I_D = 250 \mu\text{A}$                                                                     | 2.5                   |      | 5.0 V                                 |
| $I_{GSS}$    | $V_{GS} = \pm 20 \text{ V}_{DC}$ , $V_{DS} = 0$                                                                 |                       |      | $\pm 100 \text{ nA}$                  |
| $I_{DSS}$    | $V_{DS} = V_{DSS}$<br>$V_{GS} = 0 \text{ V}$<br>$T_J = 125^\circ\text{C}$                                       |                       |      | 25 $\mu\text{A}$<br>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 $d \leq 2\%$ | 57                    |      | 66 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                                      | 20                                                                                | 30   | S    |
| $C_{iss}$    | $V_{GS} = 0\text{ V}, V_{DS} = 25\text{ V}, f = 1\text{ MHz}$                               |                                                                                   | 3490 | pF   |
| $C_{oss}$    |                                                                                             |                                                                                   | 550  | pF   |
| $C_{rss}$    |                                                                                             |                                                                                   | 130  | pF   |
| $t_{d(on)}$  | $V_{GS} = 10\text{ V}, V_{DS} = 0.5 V_{DSS}, I_D = I_{D25}$<br>$R_G = 4\ \Omega$ (External) |                                                                                   | 24   | ns   |
| $t_r$        |                                                                                             |                                                                                   | 22   | ns   |
| $t_{d(off)}$ |                                                                                             |                                                                                   | 60   | ns   |
| $t_f$        |                                                                                             |                                                                                   | 20   | ns   |
| $Q_{g(on)}$  | $V_{GS} = 10\text{ V}, V_{DS} = 0.5 V_{DSS}, I_D = 0.5 I_{D25}$                             |                                                                                   | 110  | nC   |
| $Q_{gs}$     |                                                                                             |                                                                                   | 25   | nC   |
| $Q_{gd}$     |                                                                                             |                                                                                   | 53   | nC   |
| $R_{thJC}$   | (TO-3P)                                                                                     |                                                                                   | 0.31 | K/W  |
| $R_{thCK}$   |                                                                                             |                                                                                   | 0.21 | K/W  |

| Symbol   | Test Conditions                                                                                       | Characteristic Values<br>( $T_J = 25^\circ\text{C}$ , unless otherwise specified) |      |               |
|----------|-------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------|---------------|
|          |                                                                                                       | min.                                                                              | typ. | max.          |
| $I_s$    | $V_{GS} = 0\text{ V}$                                                                                 |                                                                                   |      | 52 A          |
| $I_{SM}$ | Repetitive                                                                                            |                                                                                   |      | 150 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         |
| $T_{rr}$ | $I_F = 25\text{ A}$<br>$-di/dt = 100\text{ A}/\mu\text{s}$<br>$V_R = 100\text{ V}$                    |                                                                                   | 250  | ns            |
| $Q_{RM}$ |                                                                                                       |                                                                                   | 3.0  | $\mu\text{C}$ |

### TO-3P (IXTQ) Outline

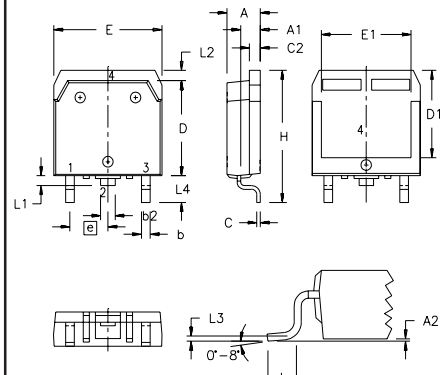


- 1 - GATE  
2 - DRAIN (COLLECTOR)  
3 - SOURCE (EMITTER)  
4 - DRAIN (COLLECTOR)

| 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     | .791 | 19.80       | 20.10 |
| 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  |
| øP  | .126     | .134 | 3.20        | 3.40  |
| øP1 | .272     | .280 | 6.90        | 7.10  |
| S   | .193     | .201 | 4.90        | 5.10  |

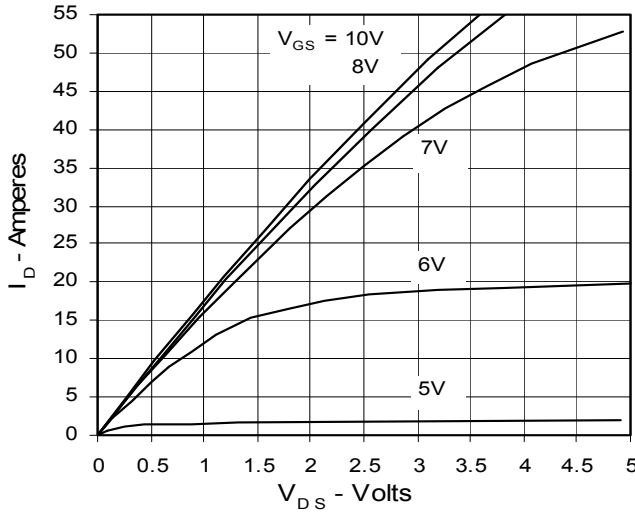
All metal area are tin plated.

### TO-268 Outline

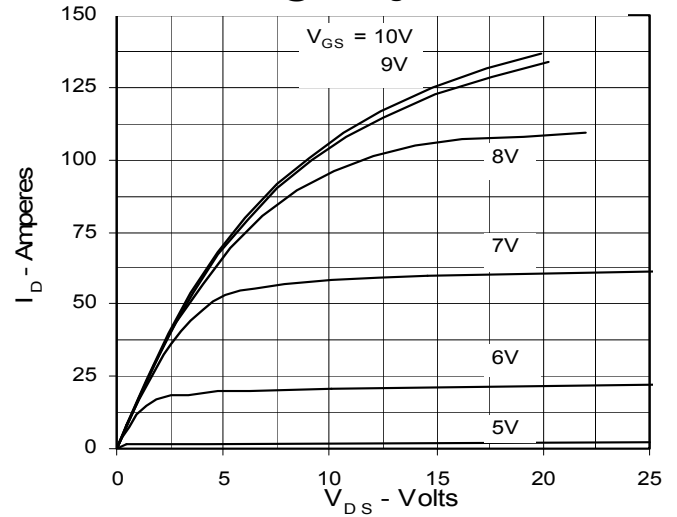


| SYM | INCHES   |      | MILLIMETERS |       |
|-----|----------|------|-------------|-------|
|     | MIN      | MAX  | MIN         | MAX   |
| A   | .193     | .201 | 4.90        | 5.10  |
| A1  | .106     | .114 | 2.70        | 2.90  |
| A2  | .001     | .010 | 0.02        | 0.25  |
| b   | .045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

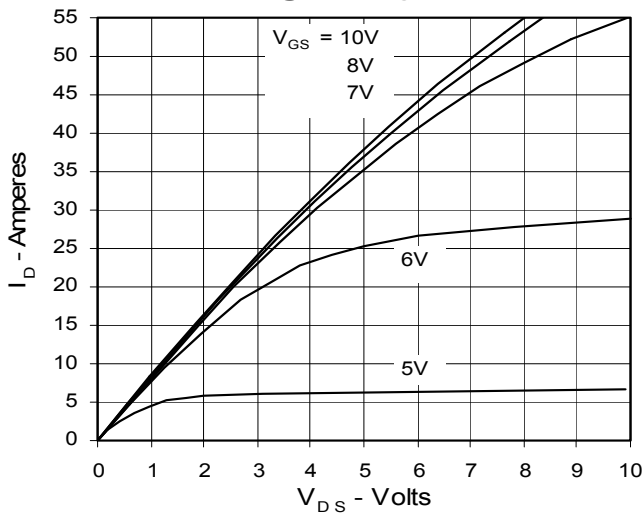
**Fig. 1. Output Characteristics  
@ 25 Deg. C**



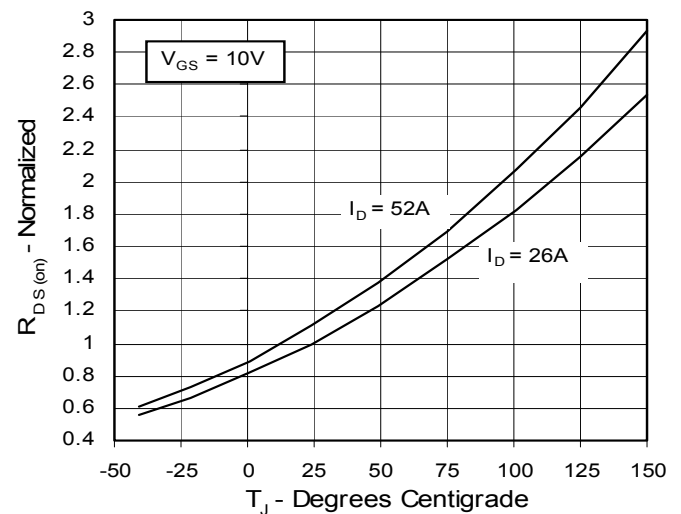
**Fig. 2. Extended Output Characteristics  
@ 25 deg. C**



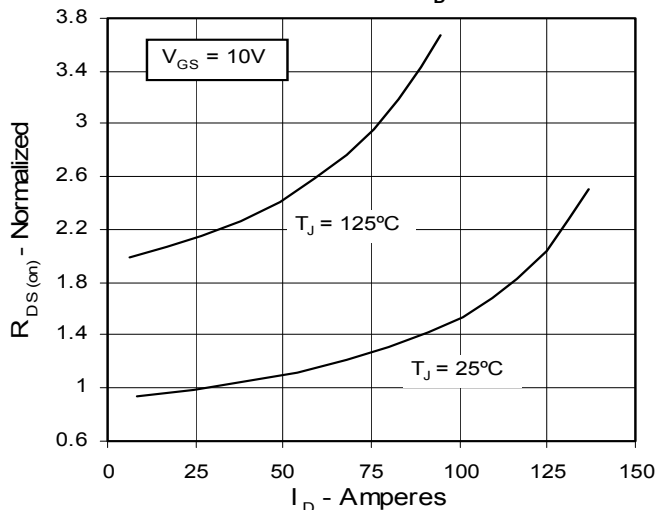
**Fig. 3. Output Characteristics  
@ 125 Deg. C**



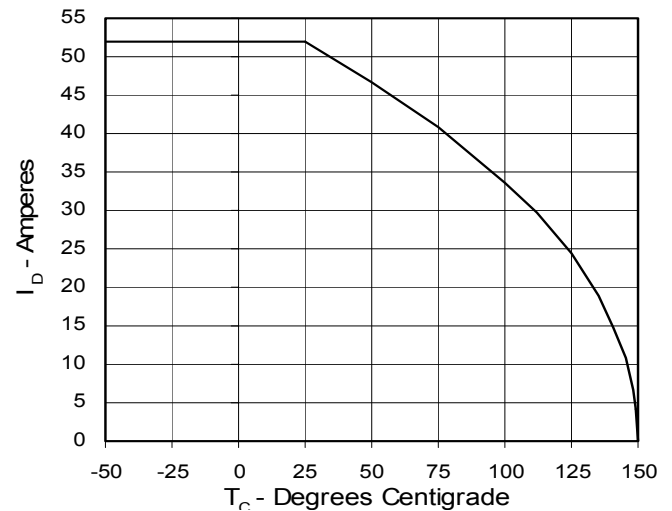
**Fig. 4.  $R_{DS(on)}$  Normalized to  $I_{D25}$  Value vs.  
Junction Temperature**



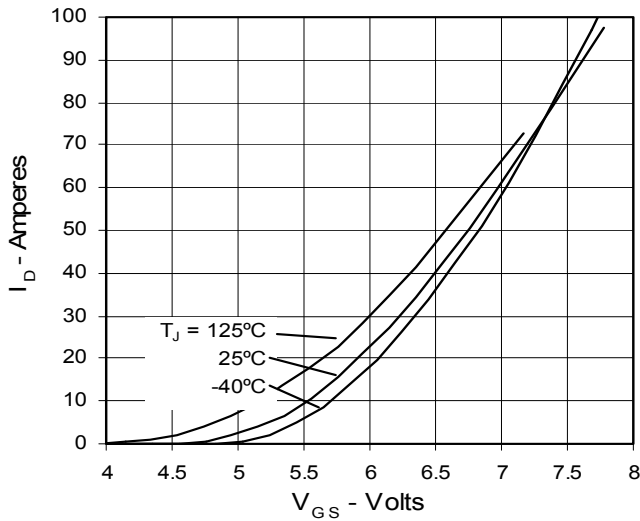
**Fig. 5.  $R_{DS(on)}$  Normalized to  $I_{D25}$   
Value vs.  $I_D$**



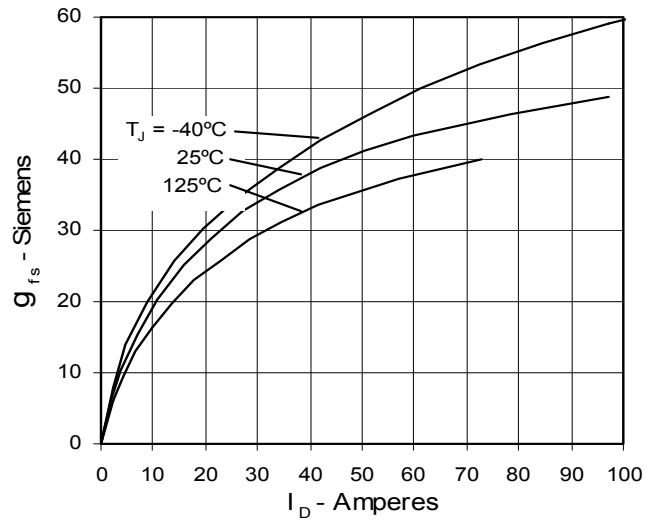
**Fig. 6. Drain Current vs. Case  
Temperature**



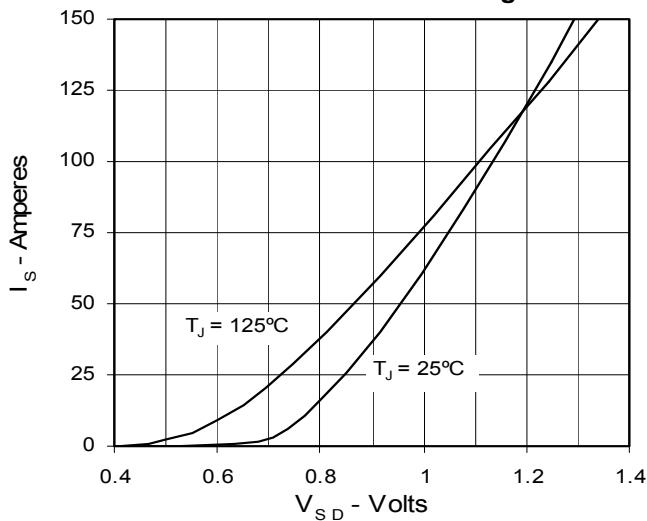
**Fig. 7. Input Admittance**



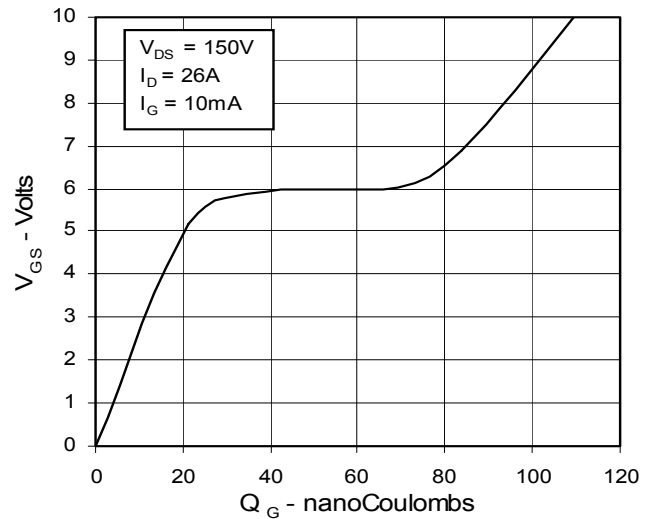
**Fig. 8. Transconductance**



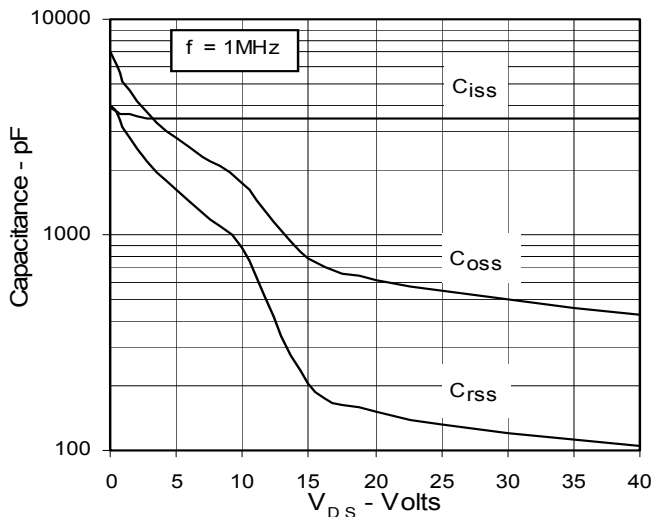
**Fig. 9. Source Current vs. Source-To-Drain Voltage**



**Fig. 10. Gate Charge**



**Fig. 11. Capacitance**



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

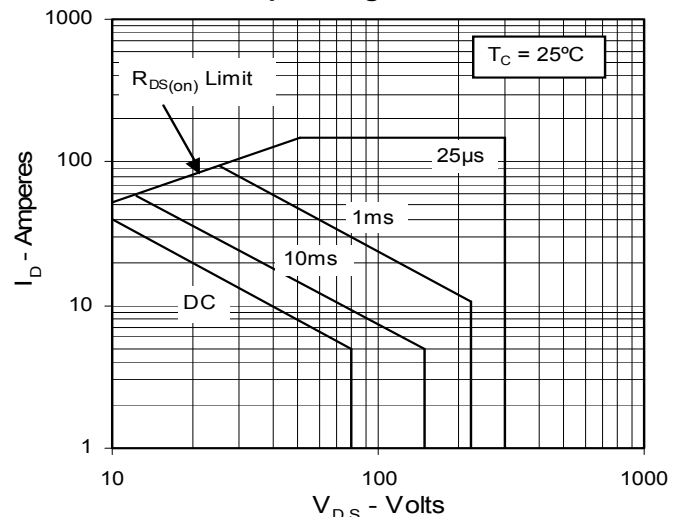


Fig. 13. Maximum Transient Thermal Resistance

