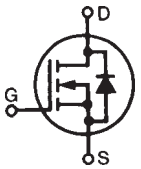
# IXYS

## High Voltage Power MOSFET

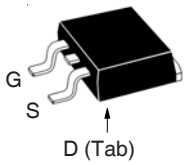
# IXTA3N120
# IXTP3N120
# IXTH3N120

$V_{DSS}$ = 1200V
$I_{D25}$ = 3A
$R_{DS(on)}$ ≤ 4.5Ω

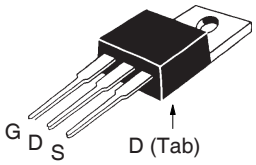
N-Channel Enhancement Mode
Avalanche Rated
Fast Intrinsic Diode



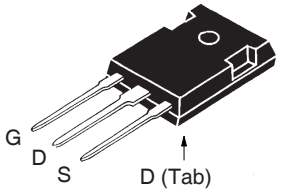

**TO-263 AA (IXTA)**




**TO-220AB (IXTP)**




**TO-247 (IXTH)**




G = Gate D = Drain
S = Source Tab = Drain

| Symbol | Test Conditions | Maximum Ratings | |
|---|---|---|---|
| $V_{DSS}$ | $T_J$ = 25°C to 150°C | 1200 | V |
| $V_{DGR}$ | $T_J$ = 25°C to 150°C, $R_{GS}$ = 1MΩ | 1200 | V |
| $V_{GSS}$ | Continuous | ±20 | V |
| $V_{GSM}$ | Transient | ±30 | V |
| $I_{D25}$ | $T_C$ = 25°C | 3 | A |
| $I_{DM}$ | $T_C$ = 25°C, Pulse Width Limited by $T_{JM}$ | 12 | A |
| $I_A$ | $T_C$ = 25°C | 3 | A |
| $E_{AS}$ | $T_C$ = 25°C | 700 | mJ |
| dv/dt | $I_S \le I_{DM}$, $V_{DD} \le V_{DSS}$, $T_J \le 150°C$ | 5 | V/ns |
| $P_D$ | $T_C$ = 25°C | 200 | W |
| $T_J$ | | -55 ... +150 | °C |
| $T_{JM}$ | | 150 | °C |
| $T_{stg}$ | | -55 ... +150 | °C |
| $T_L$ | Maximum Lead Temperature for Soldering | 300 | °C |
| $T_{SOLD}$ | 1.6 mm (0.062in.) from Case for 10s | 260 | °C |
| $F_C$ | Mounting Force (TO-263) | 10..65 / 2.2..14.6 | N/lb |
| $M_d$ | Mounting Torque (TO-247 & TO-220) | 1.13 / 10 | Nm/lb.in |
| Weight | TO-263 | 2.5 | g |
| | TO-220 | 3.0 | g |
| | TO-247 | 6.0 | g |

| Symbol | Test Conditions ($T_J$ = 25°C, Unless Otherwise Specified) | Characteristic Values Min. | Typ. | Max. | |
|---|---|---|---|---|---|
| $BV_{DSS}$ | $V_{GS}$ = 0V, $I_D$ = 1mA | 1200 | | | V |
| $V_{GS(th)}$ | $V_{DS} = V_{GS}$, $I_D$ = 250μA | 2.5 | | 5.0 | V |
| $I_{GSS}$ | $V_{GS}$ = ±20V, $V_{DS}$ = 0V | | | ±100 | nA |
| $I_{DSS}$ | $V_{DS} = V_{DSS}$, $V_{GS}$ = 0V | | | 25 | μA |
| | $T_J$ = 125°C | | | 1 | mA |
| $R_{DS(on)}$ | $V_{GS}$ = 10V, $I_D = 0.5 \bullet I_{D25}$, Note 1 | | | 4.5 | Ω |

### Features

- International Standard Packages
- High Voltage Package
- Fast Intrinsic Diode
- Avalanche Rated
- Molding Epoxies meet UL 94 V-0 Flammability Classification
- High Blocking Voltage

### Advantages

- Easy to Mount
- Space Savings
- High Power Density

### Applications

- High Voltage Power Supplies
- Capacitor Discharge Applications
- Pulse Circuits

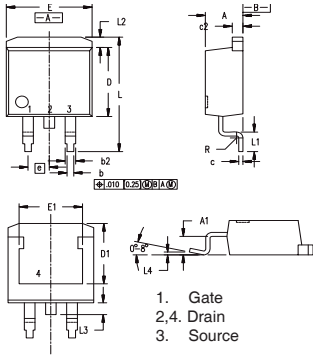
| Symbol | Test Conditions ($T_J$ = 25°C, Unless Otherwise Specified) | Characteristic Values Min. | Typ. | Max | |
|---|---|---|---|---|---|
| $g_{fs}$ | $V_{DS}$ = 20V, $I_D$ = 0.5 • $I_{D25}$, Note 1 | 1.5 | 2.6 | | S |
| $C_{iss}$ | $V_{GS}$ = 0V, $V_{DS}$ = 25V, f = 1MHz | | 1100 | 1350 | pF |
| $C_{oss}$ | | | 110 | 135 | pF |
| $C_{rss}$ | | | 40 | 60 | pF |
| $t_{d(on)}$ | **Resistive Switching Times** | | 17 | | ns |
| $t_r$ | $V_{GS}$ = 10V, $V_{DS}$ = 0.5 • $V_{DSS}$, $I_D$ = 0.5 • $I_{D25}$ | | 15 | | ns |
| $t_{d(off)}$ | $R_G$ = 4.7Ω (External) | | 32 | | ns |
| $t_f$ | | | 18 | | ns |
| $Q_{g(on)}$ | $V_{GS}$ = 10V, $V_{DS}$ = 0.5 • $V_{DSS}$, $I_D$ = 0.5 • $I_{D25}$ | | 42 | | nC |
| $Q_{gs}$ | | | 8 | | nC |
| $Q_{gd}$ | | | 21 | | nC |
| $R_{thJC}$ | | | | 0.62 | °C/W |
| $R_{thCS}$ | TO-220 | | 0.50 | | °C/W |
| $R_{thCS}$ | TO-247 | | 0.21 | | °C/W |

**Source-Drain Diode**

| Symbol | Test Conditions ($T_J$ = 25°C, Unless Otherwise Specified) | Characteristic Values Min. | Typ. | Max | |
|---|---|---|---|---|---|
| $I_S$ | $V_{GS}$ = 0V | | | 3 | A |
| $I_{SM}$ | Repetitive, Pulse Width Limited by $T_{JM}$ | | | 12 | A |
| $V_{SD}$ | $I_F$ = $I_S$, $V_{GS}$ = 0V, Note 1 | | | 1.5 | V |
| $t_{rr}$ | $I_F$ = 3A, $V_{GS}$ = 0V,-di/dt = 100A/μs<br>$V_R$ = 100V | | 700 | | ns |

Note 1: Pulse test, t ≤ 300μs, duty cycle, d ≤ 2%.

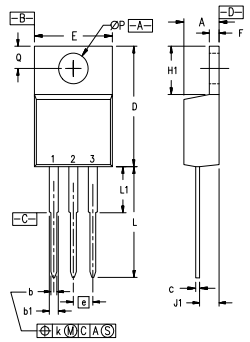
**TO-263 Outline**



1. Gate
2,4. Drain
3. Source

| Dim. | Millimeter Min. | Max. | Inches Min. | Max. |
|---|---|---|---|---|
| A | 4.06 | 4.83 | .160 | .190 |
| b | 0.51 | 0.99 | .020 | .039 |
| b2 | 1.14 | 1.40 | .045 | .055 |
| c | 0.40 | 0.74 | .016 | .029 |
| c2 | 1.14 | 1.40 | .045 | .055 |
| D | 8.64 | 9.65 | .340 | .380 |
| D1 | 8.00 | 8.89 | .280 | .320 |
| E | 9.65 | 10.41 | .380 | .405 |
| E1 | 6.22 | 8.13 | .270 | .320 |
| e | 2.54 | BSC | .100 | BSC |
| L | 14.61 | 15.88 | .575 | .625 |
| L1 | 2.29 | 2.79 | .090 | .110 |
| L2 | 1.02 | 1.40 | .040 | .055 |
| L3 | 1.27 | 1.78 | .050 | .070 |
| L4 | 0 | 0.13 | 0 | .005 |

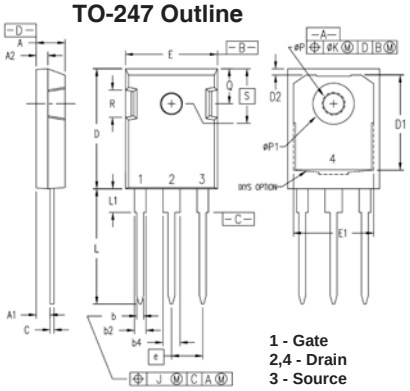
**TO-220 Outline**



Pins: 1 - Gate 2 - Drain
3 - Source

| SYM | INCHES MIN | MAX | MILLIMETERS 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 |

**TO-247 Outline**



**1 - Gate**
**2,4 - Drain**
**3 - Source**

| Dim. | Millimeter min | max | Inches min | max |
|---|---|---|---|---|
| A | 4.70 | 5.30 | 0.185 | 0.209 |
| A1 | 2.21 | 2.59 | 0.087 | 0.102 |
| A2 | 1.50 | 2.49 | 0.059 | 0.098 |
| b | 0.99 | 1.40 | 0.039 | 0.055 |
| b2 | 1.65 | 2.39 | 0.065 | 0.094 |
| b4 | 2.59 | 3.43 | 0.102 | 0.135 |
| c | 0.38 | 0.89 | 0.015 | 0.035 |
| D | 20.79 | 21.45 | 0.819 | 0.845 |
| D1 | 13.07 | - | 0.515 | - |
| D2 | 0.51 | 1.35 | 0.020 | 0.053 |
| E | 15.48 | 16.24 | 0.610 | 0.640 |
| E1 | 13.45 | - | 0.53 | - |
| E2 | 4.31 | 5.48 | 0.170 | 0.216 |
| e | 5.45 BSC | | 0.215 BSC | |
| L | 19.80 | 20.30 | 0.078 | 0.800 |
| L1 | - | 4.49 | - | 0.177 |
| Ø P | 3.55 | 3.65 | 0.140 | 0.144 |
| Ø P1 | - | 7.39 | - | 0.290 |
| Q | 5.38 | 6.19 | 0.212 | 0.244 |
| S | 6.14 BSC | | 0.242 BSC | |

IXYS Reserves the Right to Change Limits, Test Conditions, and Dimensions.

**Fig. 1. Output Characteristics @ $T_J$ = 25ºC**

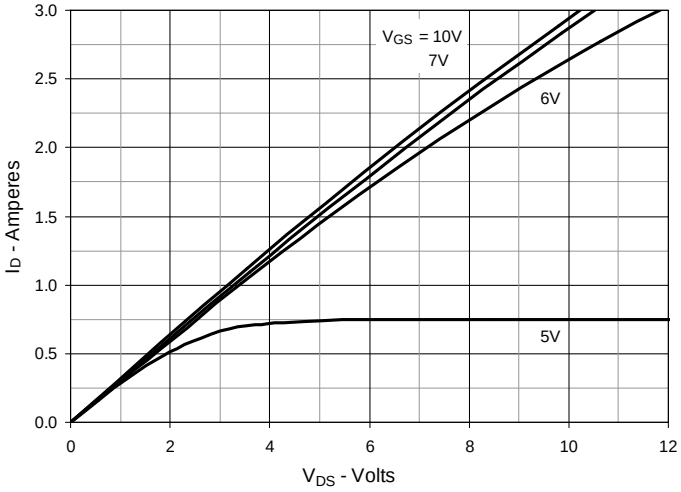



**Fig. 2. Extended Output Characteristics @ $T_J$ = 25ºC**

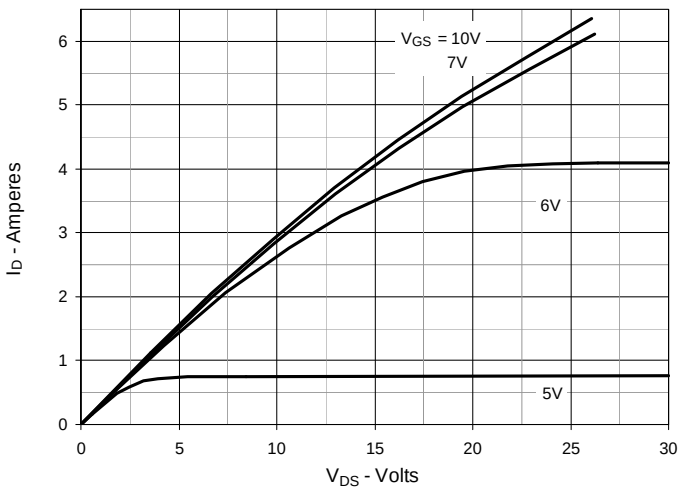



**Fig. 3. Output Characteristics @ $T_J$ = 125ºC**

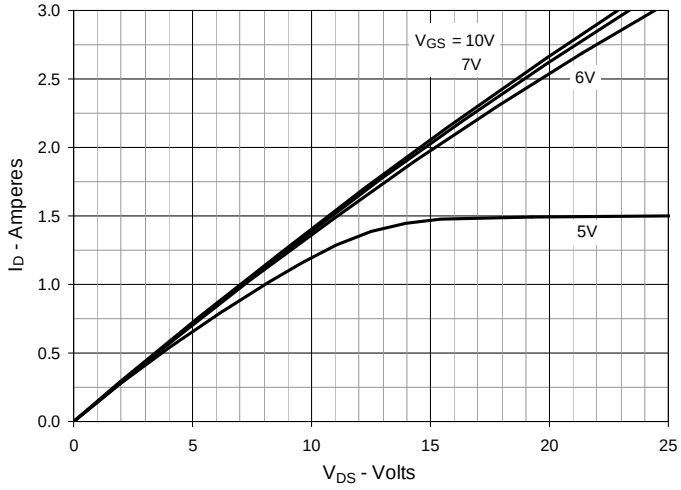



**Fig. 4. $R_{DS(on)}$ Normalized to $I_D$ = 1.5A Value vs. Junction Temperature**

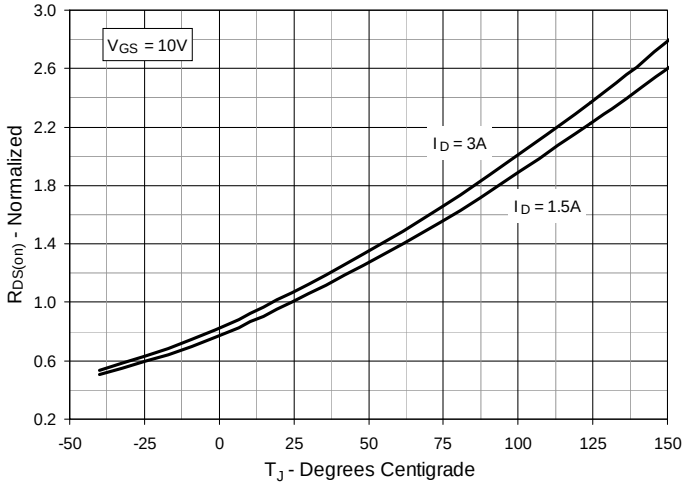



**Fig. 5. $R_{DS(on)}$ Normalized to $I_D$ = 1.5A Value vs. Drain Current**

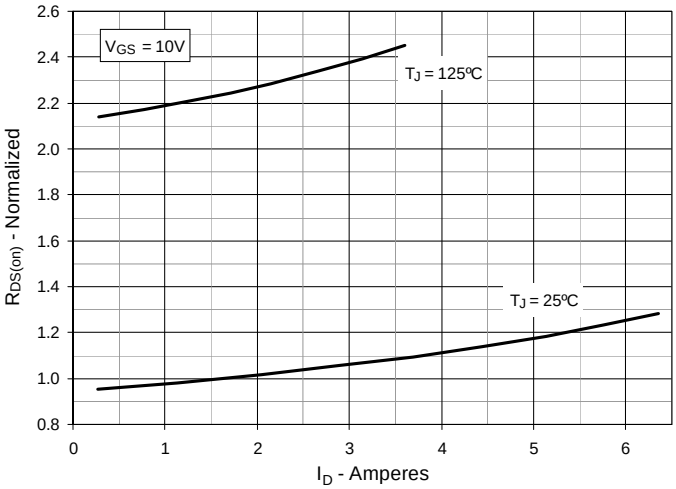



**Fig. 6. Maximum Drain Current vs. Case Temperature**

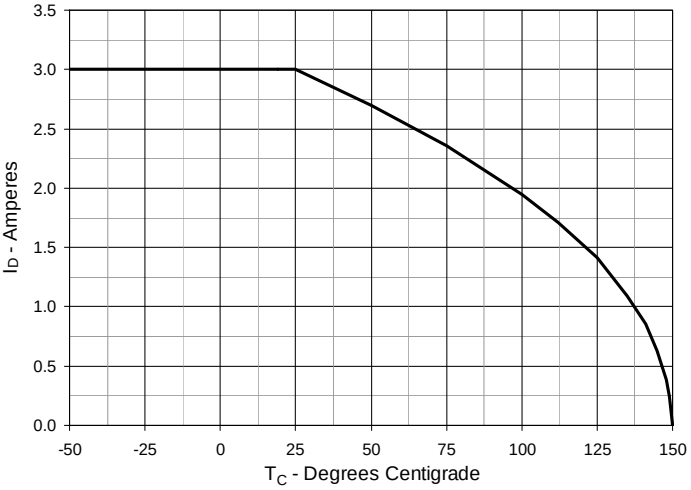


**Fig. 7. Input Admittance**

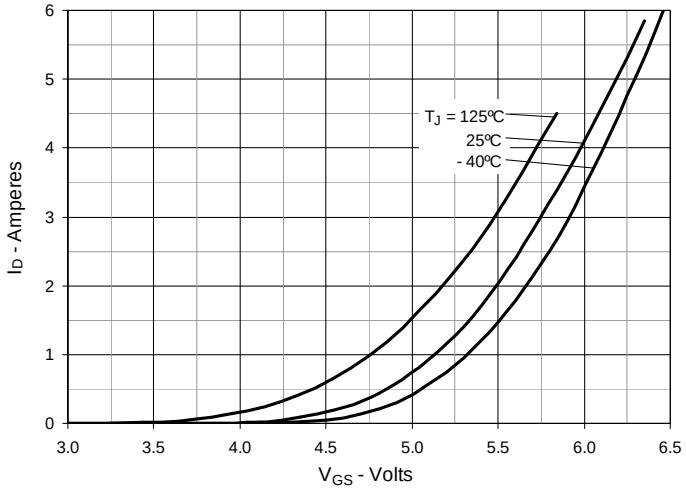



**Fig. 8. Transconductance**

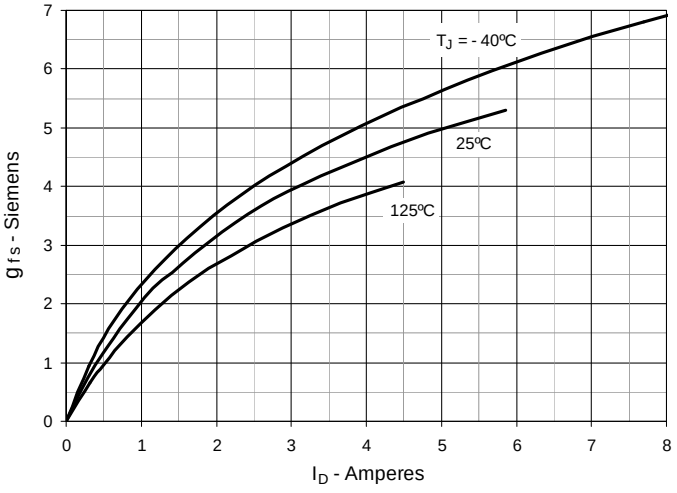



**Fig. 9. Forward Voltage Drop of Intrinsic Diode**

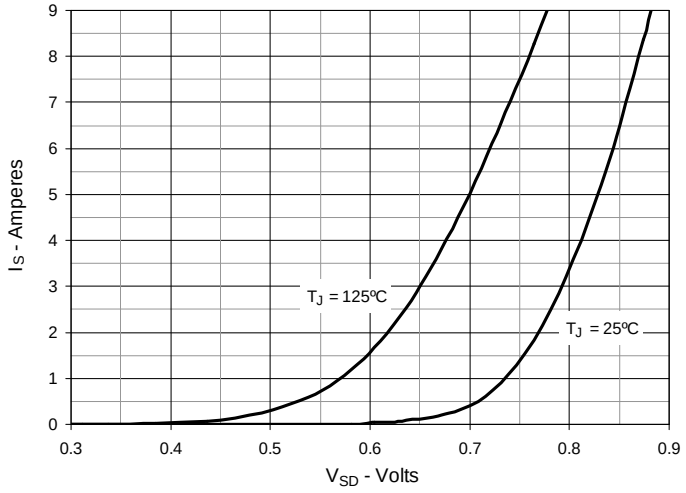



**Fig. 10. Gate Charge**

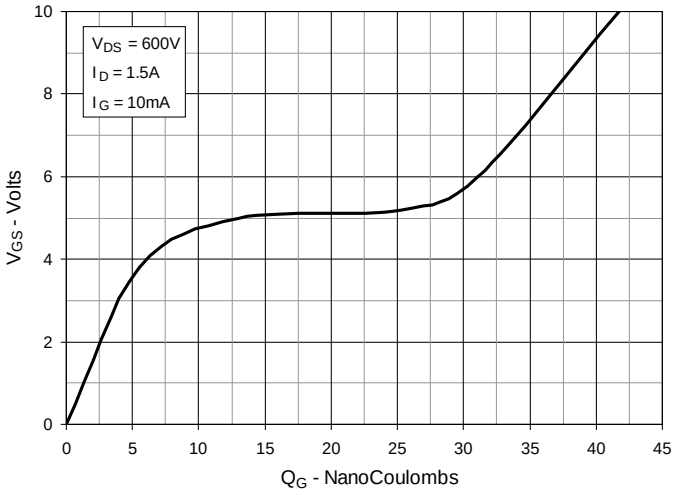



**Fig. 11. Capacitance**

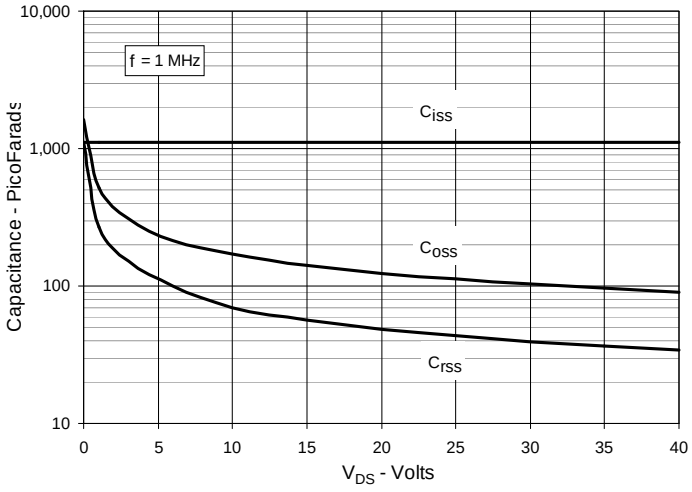



**Fig.12. Forward-Bias Safe Operating Area**

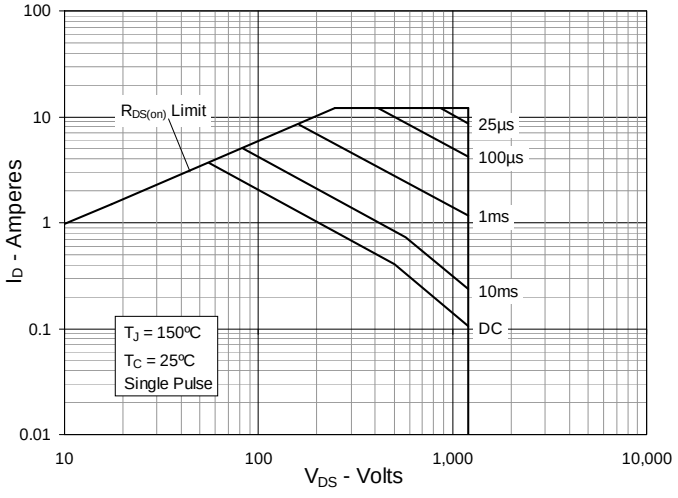


**Fig. 13. Maximum Transient Thermal Impedance**