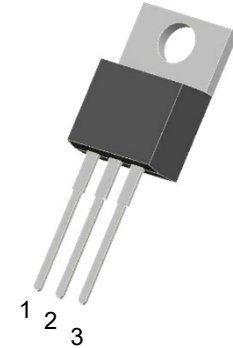


## Description

The PNMTO600V20 is a high voltage MOSFET and is designed to have better characteristics, such as fast switching time, low gate charge, low on-state resistance and have a high rugged avalanche characteristics. This power MOSFET is usually used at high speed switching applications in power supplies, PWM motor controls, high efficient DC to DC converters and bridge circuits.


**TO-220 (Top View)**

### MOSFET Product Summary

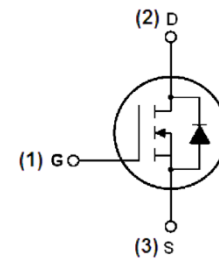
| $V_{DS}(V)$ | $R_{DS(on)}(\Omega)$  | $I_D(A)$ |
|-------------|-----------------------|----------|
| 600         | 0.31 @ $V_{GS} = 10V$ | 20       |

## Feature

- Fast switching capability
- Avalanche energy tested
- Improved dv/dt capability, high ruggedness

## Mechanical Characteristics

- Case: TO-220-3L
- Approx. Weight: 2.0g ( 0.07oz)
- Lead free finish, RoHS compliant
- Case Material: "Green" molding compound, UL flammability classification 94V-0, "Halogen-free".


**Schematic diagram**

## Absolute maximum rating@25°C

| Rating                                       | Symbol          | Value    | Units |
|--|-----------------|----------|-------|
| Drain-Source Voltage                         | $V_{DSS}$       | 600      | V     |
| Gate-Source Voltage                          | $V_{GSS}$       | ± 30     | V     |
| Drain Current-Continuous                     | $I_D$           | Tc=25°C  | 20    |
|  |                 | Tc=100°C | 14.4  |
| Pulsed Drain Current <sup>2)</sup>           | $I_{DM}$        | 80       | A     |
| Avalanche Energy Single Pulsed <sup>3)</sup> | $E_{AS}$        | 1500     | mJ    |
| Peak Diode Recovery dv/dt <sup>4)</sup>      | dv/dt           | 50       | V/ns  |
| Maximum Power Dissipation                    | $P_D$           | 82       | W     |
| Thermal Resistance , Junction-case           | $R_{\theta JC}$ | 1.52     | °C/W  |
| Thermal Resistance Junction-to-Ambient       | $R_{\theta JA}$ | 62.5     | °C/W  |
| Junction and Storage Temperature Range       | $T_J, T_{STG}$  | -55~+150 | °C    |

Notes:

1. Absolute maximum ratings are those values beyond which the device could be permanently damaged. Absolute maximum ratings are stress ratings only and functional device operation is not implied.

2. Repetitive Rating: Pulse width limited by maximum junction temperature.

3. L = 10mH,  $I_{AS} = 6.2A$ ,  $V_{DD} = 50V$ ,  $R_G = 25 \Omega$ , Starting  $T_J = 25^\circ C$

4.  $I_{SD} \leq 20A$ ,  $di/dt \leq 200A/\mu s$ ,  $V_{DD} \leq BV_{DSS}$ , Starting  $T_J = 25^\circ C$

## Electrical characteristics per line@25°C (unless otherwise specified)

| Parameter                                 | Symbol       | Conditions  | Min. | Typ. | Max.      | Units    |
|---|--------------|---|------|------|-----------|----------|
| <b>Off Characteristics</b>                |              |   |      |      |           |          |
| Drain-Source Breakdown Voltage            | $BV_{DSS}$   | $V_{GS} = 0V, I_D = 250\mu A$   | 600  | -    | -         | V        |
| Zero Gate Voltage Drain Current           | $I_{DSS}$    | $V_{DS} = 600V, V_{GS} = 0V$  | -    | -    | 1.0       | $\mu A$  |
| Gate-Body Leakage Current                 | $I_{GSS}$    | $V_{GS} = \pm 30V, V_{DS} = 0V$                                       | -    | -    | $\pm 100$ | nA       |
| <b>On Characteristics</b>                 |              |   |      |      |           |          |
| Gate Threshold Voltage                    | $V_{GS(th)}$ | $V_{DS} = V_{GS}, I_D = 250\mu A$                                     | 2.0  | -    | 4.0       | V        |
| Drain-Source On-State Resistance          | $R_{DS(on)}$ | $V_{GS} = 10V, I_D = 10A$   | -    | 0.31 | 0.43      | $\Omega$ |
| <b>Dynamic Characteristics</b>            |              |   |      |      |           |          |
| Input Capacitance                         | $C_{iss}$    | $V_{DS} = 25V, V_{GS} = 0V,$<br>$f = 1.0MHz$                          | -    | 2760 | -         | pF       |
| Output Capacitance                        | $C_{oss}$    |   | -    | 252  | -         |          |
| Reverse Transfer Capacitance              | $C_{rss}$    |   | -    | 9.5  | -         |          |
| <b>Switching Characteristics</b>          |              |   |      |      |           |          |
| Total Gate Charge <sup>1)</sup>           | $Q_g$        | $V_{DS} = 480V, V_{GS} = 10V$<br>$I_D = 20A, I_G = 1mA^{1) 2)}$       | -    | 47   | -         | nC       |
| Gate-Source Charge                        | $Q_{gs}$     |   | -    | 17   | -         |          |
| Gate-Drain Charge                         | $Q_{gd}$     |   | -    | 15   | -         |          |
| Turn-on Delay Time <sup>1)</sup>          | $t_{d(on)}$  | $V_{DD} = 300V, V_{GS} = 10V,$<br>$I_D = 20A, R_G = 25\Omega^{1) 2)}$ | -    | 27   | -         | ns       |
| Turn-on Rise Time                         | $t_r$        |   | -    | 44   | -         |          |
| Turn-Off Delay Time                       | $t_{d(off)}$ |   | -    | 82   | -         |          |
| Turn-Off Fall Time                        | $t_f$        |   | -    | 44   | -         |          |
| <b>Drain-Source Diode Characteristics</b> |              |   |      |      |           |          |
| Diode Forward Current                     | $I_{SD}$     |   | -    | -    | 20        | A        |
| Pulsed Drain-Source Current               | $I_{SM}$     |   | -    | -    | 80        | A        |
| Diode Forward Voltage <sup>1)</sup>       | $V_{SD}$     | $V_{GS} = 0V, I_S = 20A$  | -    | -    | 1.4       | V        |
| Reverse Recovery Time <sup>1)</sup>       | $t_{rr}$     | $V_{GS} = 0V, I_S = 20A,$<br>$di/dt = 100A/\mu s$                     | -    | 630  | -         | nS       |
| Reverse Recovery Charge                   | $Q_{rr}$     |   | -    | 8.2  | -         | $\mu C$  |

## Notes:

1. Pulse Test: Pulse width  $\leq 300\mu s$ , Duty cycle  $\leq 2\%$ .
2. Essentially independent of operating temperature.

## Typical Characteristics

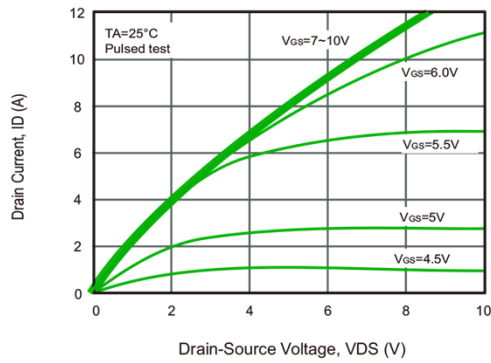


Fig.1 Drain Current vs. Gate-Source Voltage

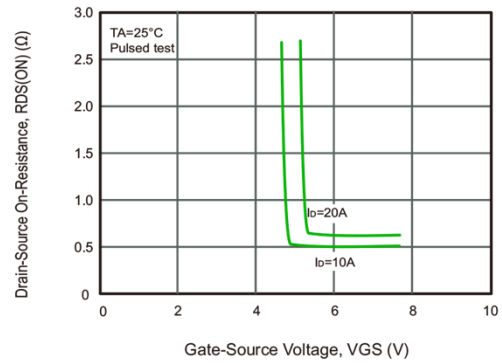


Fig.2 Drain-Source On-Resistance vs. Gate-Source Voltage

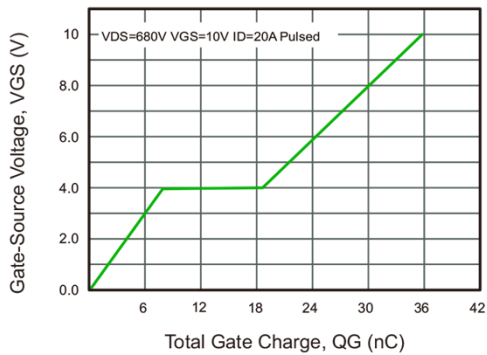


Fig.3 Gate Charge Characteristics

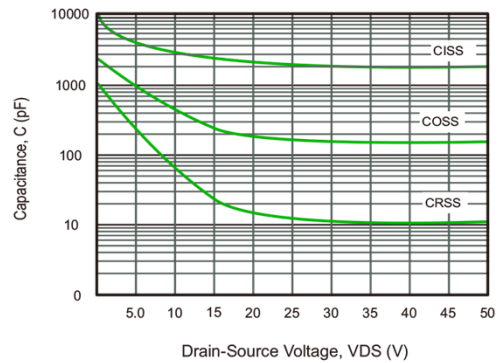


Fig.4 Capacitance Characteristics

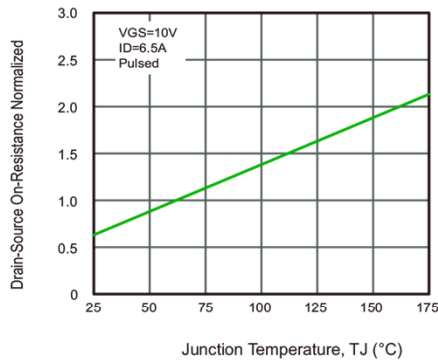


Fig.5 Drain-Source On-Resistance vs. Junction Temperature

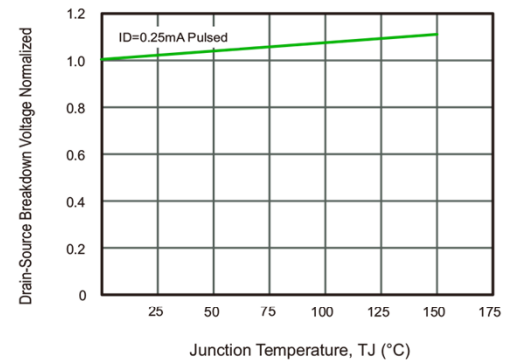


Fig.6 Breakdown Voltage vs. Junction Temperature

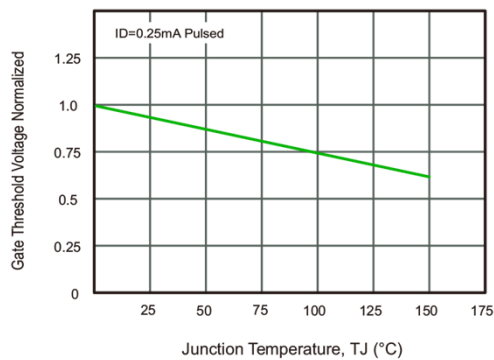


Fig.7 Gate Threshold Voltage vs. Junction Temperature

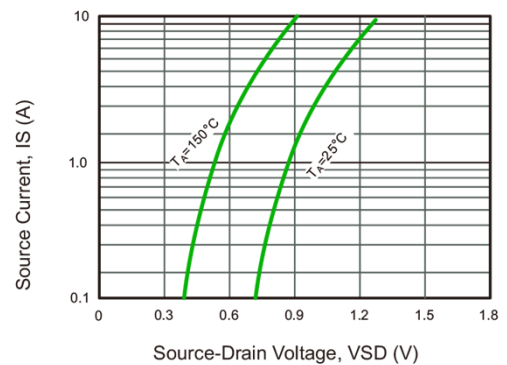


Fig.8 Source Current vs. Source-Drain Voltage

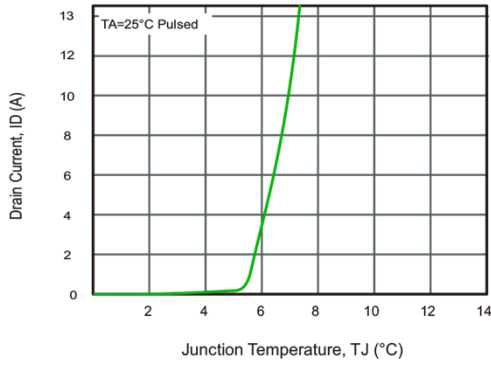


Fig.9 Drain Current vs. Gate-Source Voltage

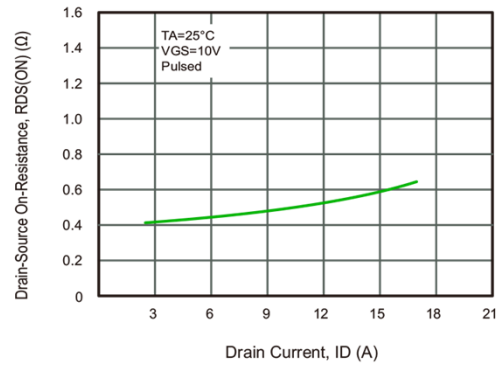


Fig.10 Drain-Source On-Resistance vs. Drain Current

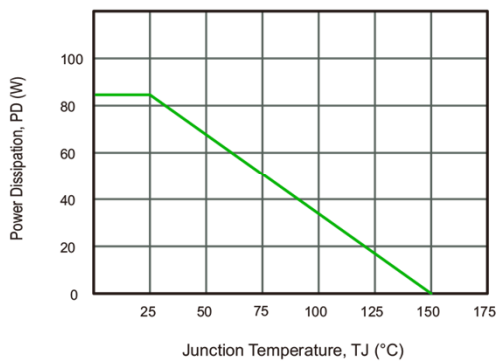


Fig.11 Power Dissipation vs. Junction Temperature

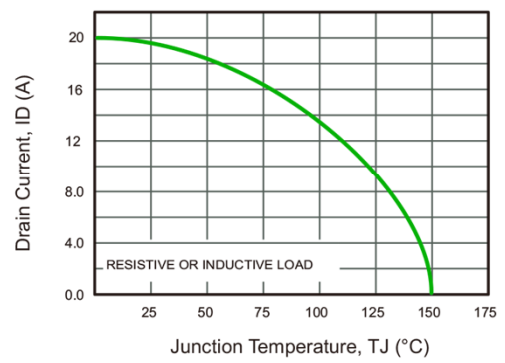


Fig.12 Drain Current vs. Junction Temperature

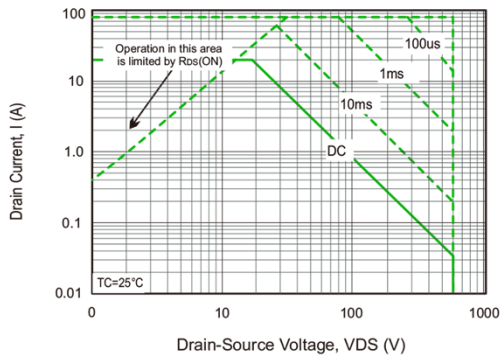
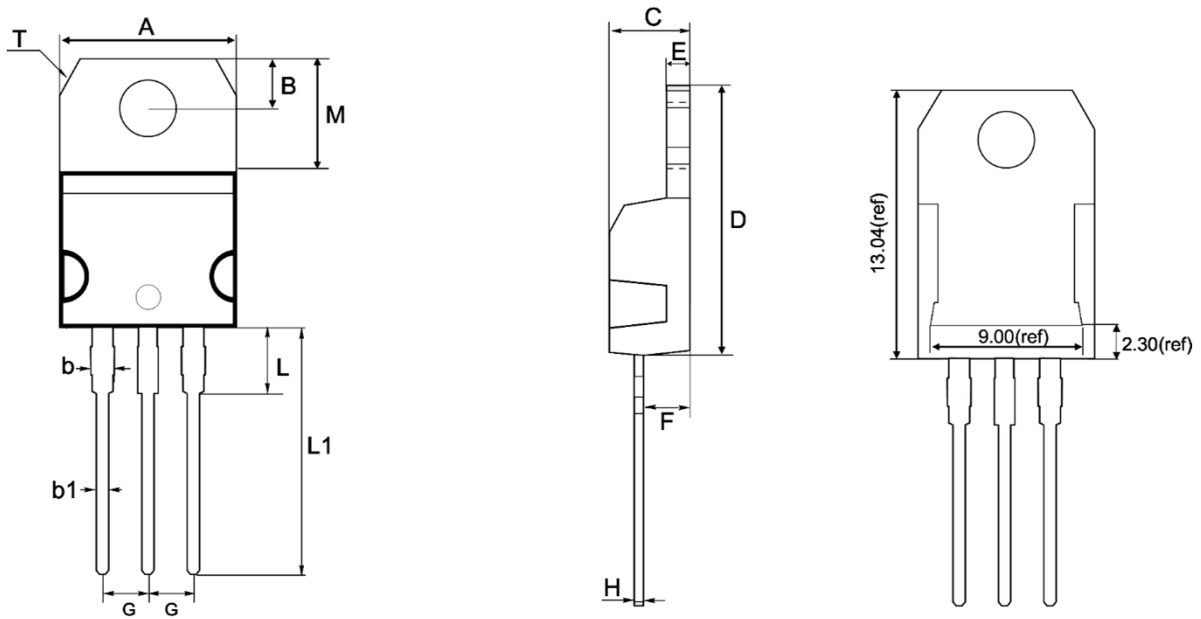



Fig.13 Safe Operating Area

Product dimension (TO-220-3L)



| Dim | Millimeters |       | Inches     |       |
|-----|-------------|-------|------------|-------|
|     | Min         | Max   | Min        | Max   |
| A   | 10.08       | 10.28 | 0.397      | 0.405 |
| B   | 2.64        | 2.84  | 0.104      | 0.112 |
| b   | 1.18        | 1.48  | 0.046      | 0.058 |
| b1  | 0.70        | 0.90  | 0.028      | 0.035 |
| C   | 4.25        | 4.65  | 0.167      | 0.183 |
| D   | 15.14       | 15.54 | 0.596      | 0.612 |
| E   | 1.17        | 1.37  | 0.046      | 0.054 |
| F   | 2.39        | 2.79  | 0.094      | 0.110 |
| G   | 2.44        | 2.64  | 0.096      | 0.104 |
| H   | 0.40        | 0.60  | 0.016      | 0.024 |
| L   | 3.48        | 3.88  | 0.137      | 0.153 |
| L1  | 12.73       | 13.13 | 0.501      | 0.517 |
| M   | 5.99        | 6.39  | 0.236      | 0.252 |
| N   | 3.82 Typ.   |       | 0.150 Typ. |       |
| T   | 1.19 Typ.   |       | 0.047 Typ. |       |


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