

## SOT-23 Plastic-Encapsulate MOSFETS

### WNM6001-ALJ

Single N-Channel, 60V, 0.50A, Power MOSFET

#### Features

- Trench Technology
- Supper high density cell design
- Excellent ON resistance for higher DC current
- Extremely Low Threshold Voltage
- Small package SOT-23

#### Applications

- Driver for Relay, Solenoid, Motor, LED etc.
- DC-DC converter circuit
- Power Switch
- Load Switch
- Charging

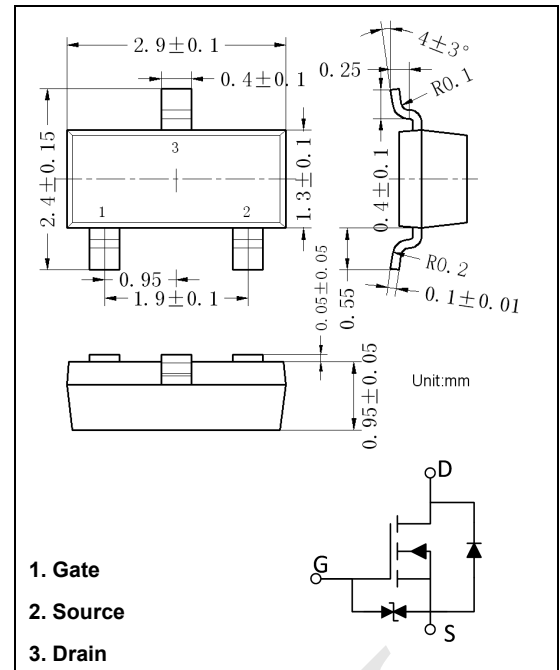
Marking: 6001

#### Maximum Ratings ( $T_a=25^\circ\text{C}$ unless otherwise specified)

| Symbol           | Parameter                                  |                       | 10S      | Steady State | Unit |
|------------------|--------------------------------------------|-----------------------|----------|--------------|------|
| V <sub>DS</sub>  | Drain-Source Voltage                       |                       | 60       |              | V    |
| V <sub>GS</sub>  | Gate-Source Voltage                        |                       | ±20      |              | V    |
| I <sub>D</sub>   | Continuous Drain Current <sup>1, 4)</sup>  | T <sub>A</sub> = 25°C | 0.50     | 0.44         | A    |
|                  |                                            | T <sub>A</sub> = 70°C | 0.40     | 0.35         | A    |
| P <sub>D</sub>   | Maximum Power Dissipation <sup>1, 4)</sup> | T <sub>A</sub> = 25°C | 0.69     | 0.53         | W    |
|                  |                                            | T <sub>A</sub> = 70°C | 0.44     | 0.34         | W    |
| I <sub>D</sub>   | Continuous Drain Current <sup>2, 4)</sup>  | T <sub>A</sub> = 25°C | 0.47     | 0.42         | A    |
|                  |                                            | T <sub>A</sub> = 70°C | 0.38     | 0.33         | A    |
| P <sub>D</sub>   | Maximum Power Dissipation <sup>2, 4)</sup> | T <sub>A</sub> = 25°C | 0.60     | 0.47         | W    |
|                  |                                            | T <sub>A</sub> = 70°C | 0.39     | 0.30         | W    |
| I <sub>DM</sub>  | Pulsed Drain Current <sup>3)</sup>         |                       | 1.0      |              | A    |
| T <sub>J</sub>   | Operating Junction Temperature             |                       | 150      |              | °C   |
| T <sub>L</sub>   | Lead Temperature                           |                       | 260      |              | °C   |
| T <sub>stg</sub> | Storage Temperature Range                  |                       | -55 ~150 |              | °C   |

#### Thermal Characteristics

| Symbol          | Parameter                                            | Typ.                 | Max. | Unit               |
|-----------------|------------------------------------------------------|----------------------|------|--------------------|
| $R_{\theta JA}$ | Junction-to-Ambient Thermal Resistance <sup>1)</sup> | $t \leq 10\text{ s}$ | 140  | $^\circ\text{C/W}$ |
|                 |                                                      | Steady State         | 176  | $^\circ\text{C/W}$ |
| $R_{\theta JA}$ | Junction-to-Ambient Thermal Resistance <sup>2)</sup> | $t \leq 10\text{ s}$ | 165  | $^\circ\text{C/W}$ |
|                 |                                                      | Steady State         | 198  | $^\circ\text{C/W}$ |
| $R_{\theta JC}$ | Junction-to-Case Thermal Resistance                  | Steady State         | 100  | $^\circ\text{C/W}$ |



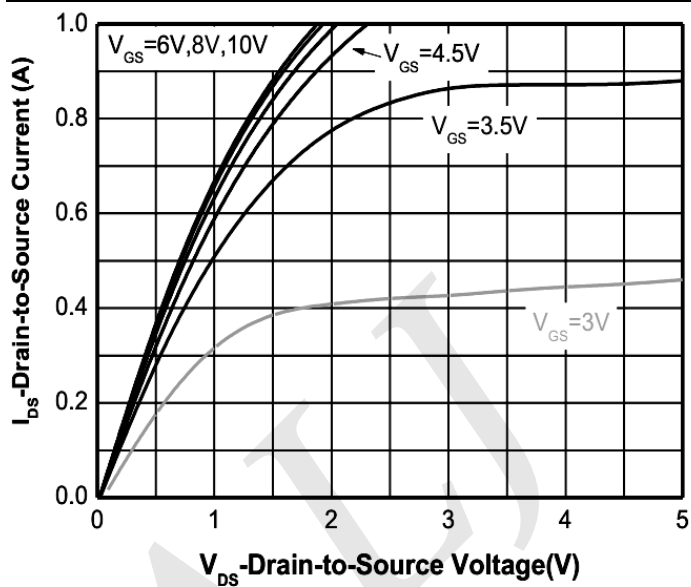
# Electrical Characteristics (T<sub>a</sub>=25°C unless otherwise specified)

| Symbol                                    | Parameter                                   | Test Conditions                                                                               | Min | Typ  | Max  | Unit |
|-------------------------------------------|---------------------------------------------|-----------------------------------------------------------------------------------------------|-----|------|------|------|
| Off Characteristics                       |                                             |                                                                                               |     |      |      |      |
| V <sub>(BR)DSS</sub>                      | Drain-Source Breakdown Voltage              | V <sub>GS</sub> = 0V, I <sub>D</sub> = 250μA                                                  | 60  |      |      | V    |
| I <sub>DSS</sub>                          | Zero Gate Voltage Drain Current             | V <sub>DS</sub> = 60V, V <sub>GS</sub> = 0V                                                   |     |      | 1.0  | μA   |
| I <sub>GSS</sub>                          | Gate-body Leakage current                   | V <sub>DS</sub> = 0V, V <sub>GS</sub> = ±20V                                                  |     |      | ±5.0 | μA   |
| On Characteristics                        |                                             |                                                                                               |     |      |      |      |
| V <sub>GS(th)</sub>                       | Gate-Threshold Voltage                      | V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250μA                                    | 0.8 | 1.3  | 2    | V    |
| R <sub>DS(on)</sub>                       | Drain-Source On-Resistance <sup>2, 3)</sup> | V <sub>GS</sub> = 10V, I <sub>D</sub> = 0.5A                                                  |     | 1.4  | 2.0  | Ω    |
|                                           |                                             | V <sub>GS</sub> = 4.5V, I <sub>D</sub> = 0.2A                                                 |     | 1.7  | 2.6  |      |
| g <sub>fs</sub>                           | Forward Trans conductance                   | V <sub>DS</sub> = 15V, I <sub>D</sub> = 0.25A                                                 |     | 0.42 |      | S    |
| Charges, capacitances and gate resistance |                                             |                                                                                               |     |      |      |      |
| C <sub>iss</sub>                          | Input Capacitance                           | V <sub>GS</sub> = 0V<br>V <sub>DS</sub> = 25V<br>f = 100kHz                                   |     |      | 20   | pF   |
| C <sub>oss</sub>                          | Output Capacitance                          |                                                                                               |     |      | 7    |      |
| C <sub>rss</sub>                          | Reverse Transfer Capacitance                |                                                                                               |     | 5.2  |      |      |
| Q <sub>G(TOT)</sub>                       | Total Gate Charge                           | V <sub>GS</sub> = 10V, V <sub>DD</sub> = 30V,<br>I <sub>D</sub> = 0.37A                       |     | 1.2  |      | nC   |
| Q <sub>G(TH)</sub>                        | Threshold Gate Charge                       |                                                                                               |     | 0.15 |      |      |
| Q <sub>GS</sub>                           | Gate-to-Source Charge                       |                                                                                               |     | 0.21 |      |      |
| Q <sub>GD</sub>                           | Gate-to-Drain Charge                        |                                                                                               |     | 0.12 |      |      |
| Switching Characteristics                 |                                             |                                                                                               |     |      |      |      |
| t <sub>d(on)</sub>                        | Turn-On Delay Time                          | V <sub>DD</sub> = 30V, V <sub>GEN</sub> = 10V,<br>I <sub>D</sub> = 0.2A, R <sub>G</sub> = 10Ω |     | 7.6  |      | ns   |
| t <sub>r</sub>                            | Rise Time                                   |                                                                                               |     | 5.1  |      |      |
| t <sub>d(off)</sub>                       | Turn-Off Delay Time                         |                                                                                               |     | 24.6 |      |      |
| t <sub>f</sub>                            | Fall Time                                   |                                                                                               |     | 10   |      |      |
| Body diode characteristics                |                                             |                                                                                               |     |      |      |      |
| V <sub>SD</sub>                           | Forward Voltage                             | V <sub>GS</sub> = 0V, I <sub>S</sub> = 0.3A                                                   |     | 0.9  | 1.5  | V    |

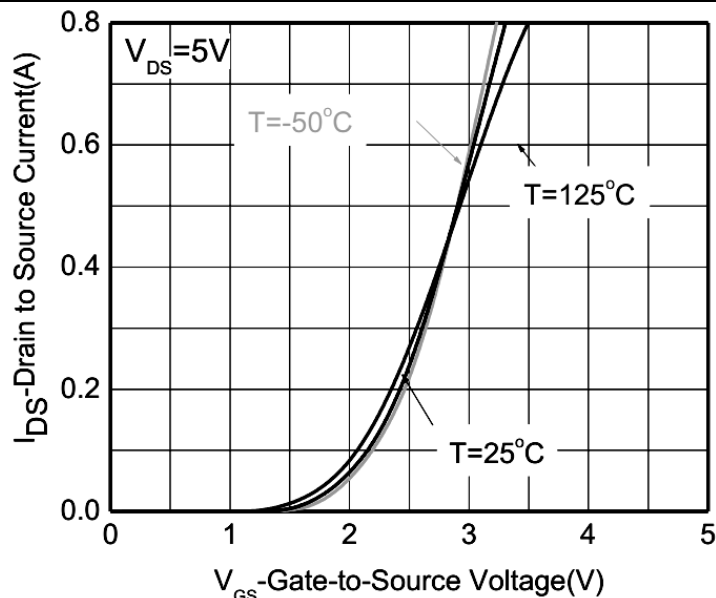
## Notes

1. Surface mounted on FR-4 Board using 1 square inch pad size, 1oz copper
2. Surface mounted on FR-4 board using minimum pad size, 1oz copper
3. Pulse width<380μs
4. Maximum junction temperature T<sub>J</sub> = 150°C.

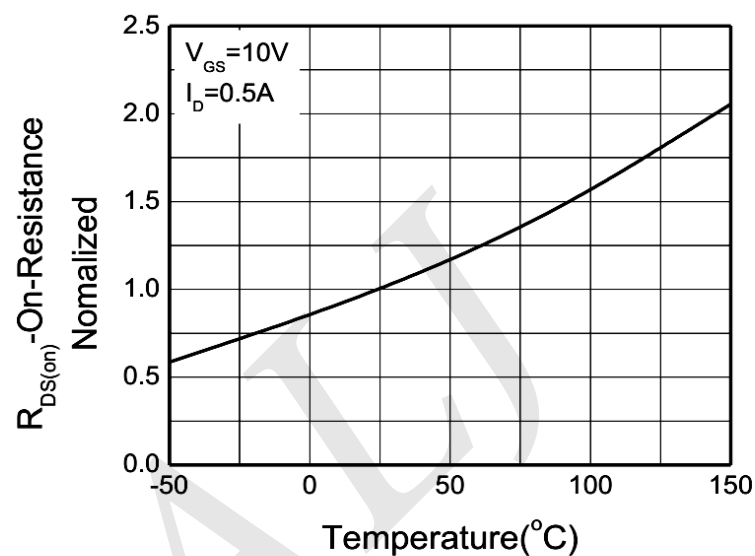
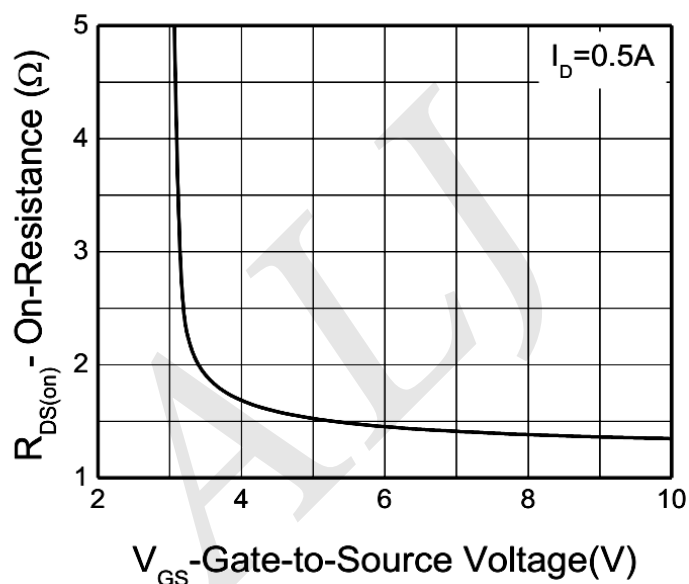
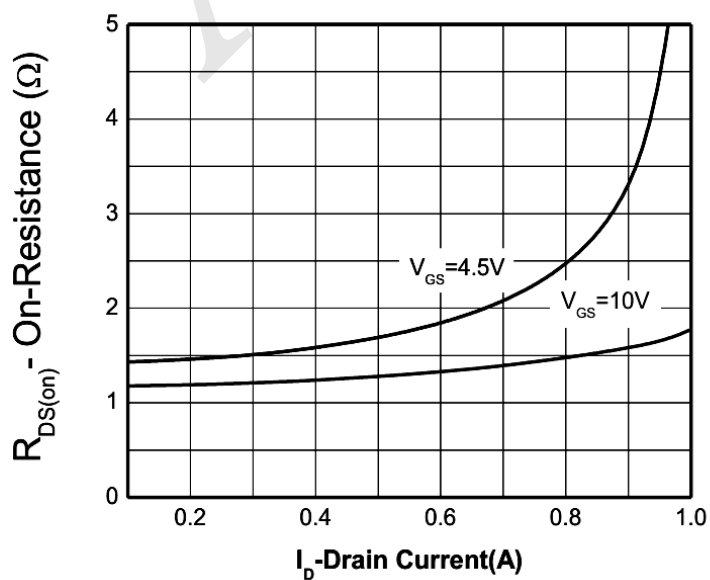
## Typical Characteristics



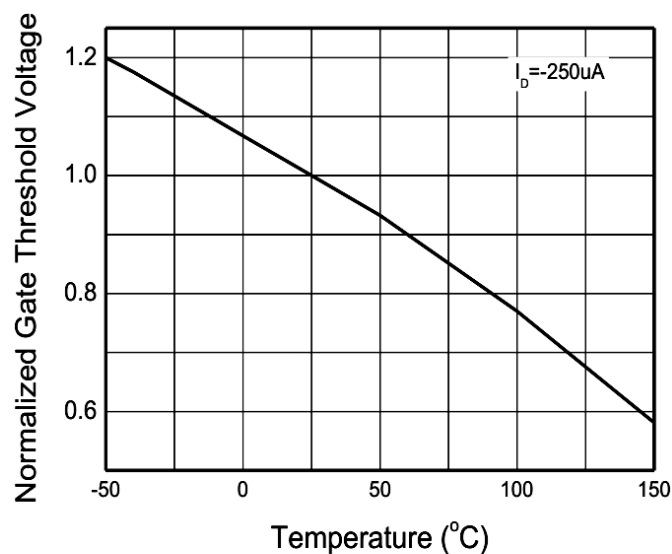
Output characteristics



Transfer characteristics

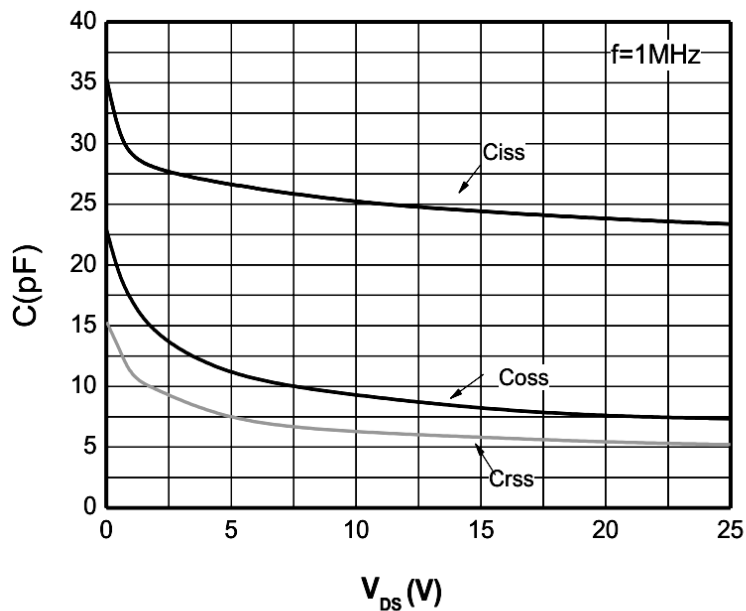


On-Resistance vs. Junction temperature

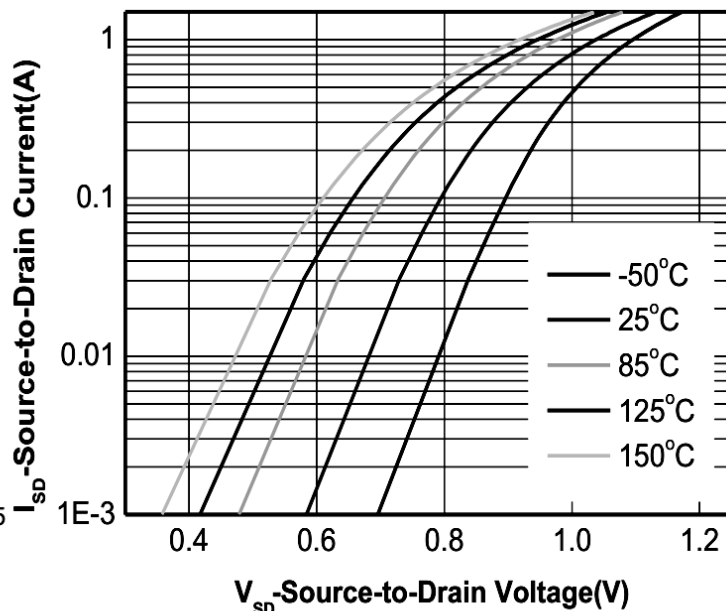


Threshold voltage vs. Temperature

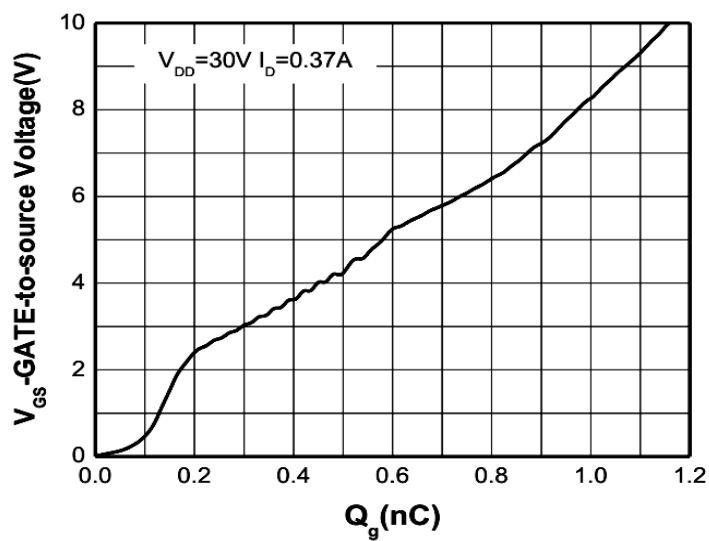
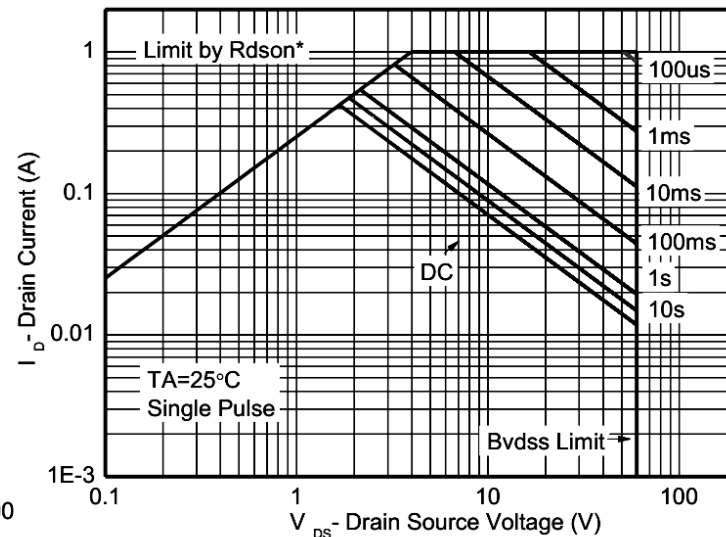
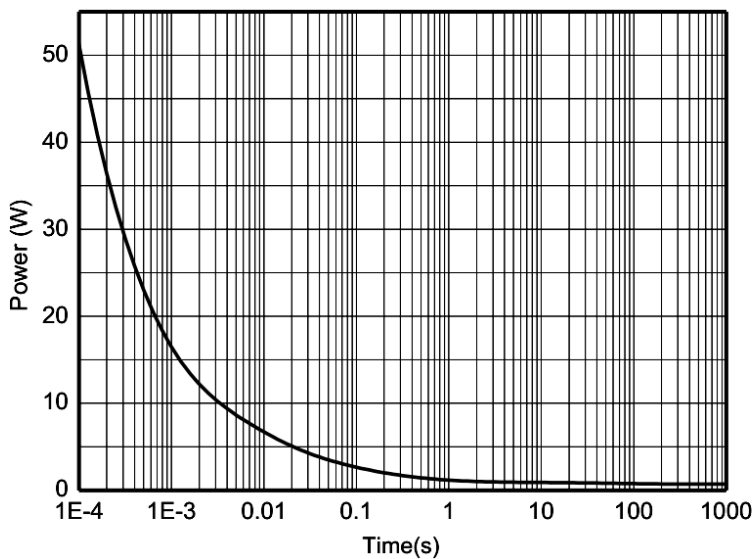
## Typical Characteristics (Cont.)



Capacitance



Body diode forward voltage



Gate Charge Characteristics

IR—Reflow Profile

