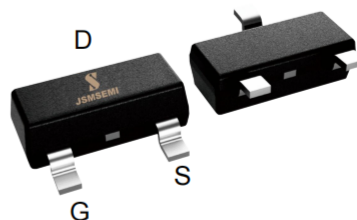


## DESCRIPTION

The AP2301N is the P-Channel logic enhancement mode power field effect transistor is produced using high cell density advanced trench technology..

This high density process is especially tailored to minimize on-state resistance. These devices are particularly suited for low voltage application, and low in-line power loss are needed in a very small outline surface mount package.

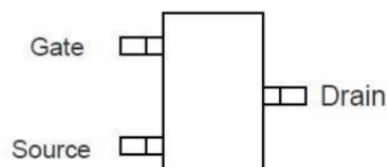
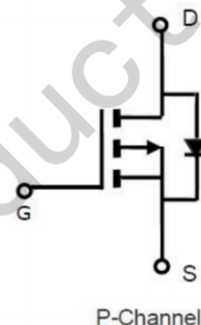


## FEATURE

- ◆ -20V/-4.3A,  $R_{DS(ON)}=30m\Omega$  (typ.)@ $V_{GS}=-4.5V$
- ◆ -20V/-3.5A,  $R_{DS(ON)}=40m\Omega$  (typ.)@ $V_{GS}=-2.5V$
- ◆ -20V/-2.0A,  $R_{DS(ON)}=56m\Omega$  (typ.)@ $V_{GS}=-1.8V$
- ◆ -20V/-1.0A,  $R_{DS(ON)}=85m\Omega$  (typ.)@ $V_{GS}=-1.5V$
- ◆ Super high design for extremely low  $R_{DS(ON)}$
- ◆ Exceptional on-resistance and Maximum DC current capability
- ◆ Full RoHS compliance
- ◆ SOT23-3 package design

## APPLICATIONS

- ◆ Power Management
- ◆ Portable Equipment
- ◆ DC/DC Converter
- ◆ Load Switch
- ◆ DSC
- ◆ LCD Display inverter



TOP VIEW  
SOT-23

## ABSOLUTE MAXIMUM RATINGS ( $T_A = 25^\circ\text{C}$ Unless otherwise noted )

| Symbol           | Parameter                                      |                       | Typical  | Unit |
|------------------|------------------------------------------------|-----------------------|----------|------|
| V <sub>DSS</sub> | Drain-Source Voltage                           |                       | -20      | V    |
| V <sub>GSS</sub> | Gate-Source Voltage                            |                       | ±10      | V    |
| I <sub>D</sub>   | Continuous Drain Current (T <sub>C</sub> =25℃) | V <sub>GS</sub> =-10V | -4.2     | A    |
|                  | Continuous Drain Current (T <sub>C</sub> =70℃) |                       | -3.5     | A    |
| I <sub>DM</sub>  | Pulsed Drain Current                           |                       | -20      | A    |
| P <sub>D</sub>   | Power Dissipation                              | T <sub>A</sub> =25℃   | 1.5      | W    |
|                  |                                                | T <sub>A</sub> =70℃   | 0.9      |      |
| T <sub>J</sub>   | Operation Junction Temperature                 |                       | 150      | ℃    |
| T <sub>STG</sub> | Storage Temperature Range                      |                       | -55~+150 | ℃    |
| R <sub>θJA</sub> | Thermal Resistance Junction to Ambient         |                       | 120      | ℃/W  |

**Note: Absolute maximum ratings are those values beyond which the device could be permanently damaged.**

**Absolute maximum ratings are stress rating only and functional device operation is not implied**

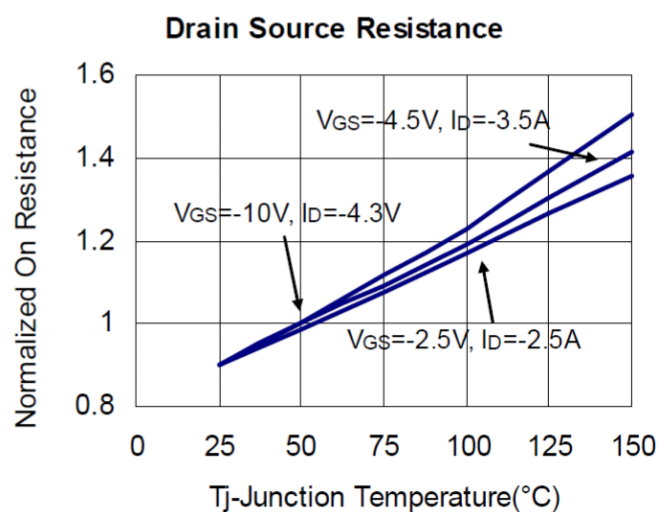
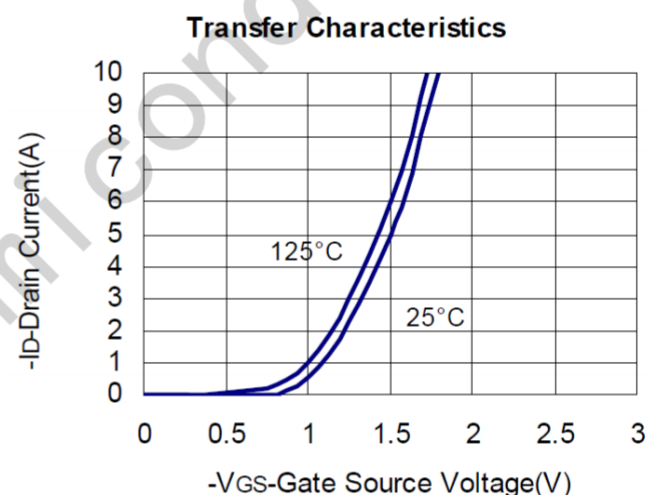
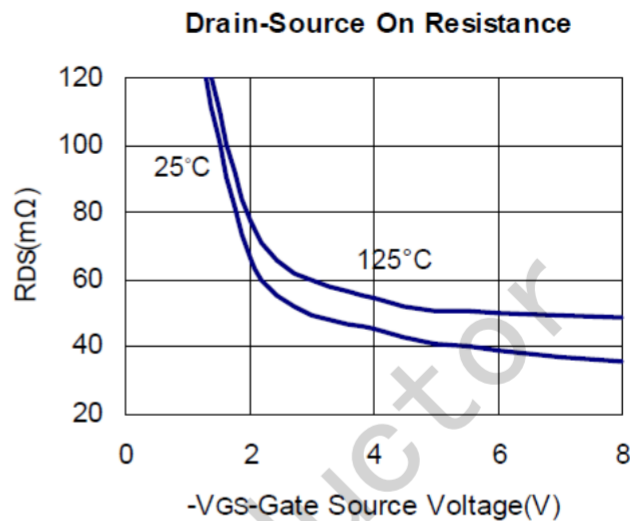
■ **ELECTRICAL CHARACTERISTICS** ( $T_A=25^\circ\text{C}$  Unless otherwise noted)

| Symbol             | Parameter                       | Condition                                                        | Min  | Typ   | Max       | Unit       |
|--------------------|---------------------------------|------------------------------------------------------------------|------|-------|-----------|------------|
| Static Parameters  |                                 |                                                                  |      |       |           |            |
| $V_{(BR)DSS}$      | Drain-Source Breakdown Voltage  | $V_{GS}=0V, I_D=-250\mu A$                                       | -20  |       |           | V          |
| $V_{GS(th)}$       | Gate Threshold Voltage          | $V_{DS}=V_{GS}, I_D=-250\mu A$                                   | -0.3 |       | -1.0      | V          |
| $I_{GSS}$          | Gate Leakage Current            | $V_{DS}=0V, V_{GS}=\pm 10V$                                      |      |       | $\pm 100$ | nA         |
| $I_{DSS}$          | Zero Gate Voltage Drain Current | $V_{DS}=-20V, V_{GS}=0$                                          |      |       | -1        | $\mu A$    |
|                    |                                 | $V_{DS}=-20V, V_{GS}=0$<br>$T_J=55^{\circ}C$                     |      |       | -5        |            |
| $R_{DS(ON)}$       | Drain-Source On-Resistance      | $V_{GS}=-4.5V, I_D=-4.0A$                                        |      | 30    | 40        | m $\Omega$ |
|                    |                                 | $V_{GS}=-2.5V, I_D=-4.0A$                                        |      | 40    | 60        |            |
|                    |                                 | $V_{GS}=-1.8V, I_D=-2.0A$                                        |      | 56    | 78        |            |
|                    |                                 | $V_{GS}=-1.5V, I_D=-1.0A$                                        |      | 85    | 110       |            |
| Gfs                | Forward Transconductance        | $V_{DS}=-5V, I_D=-4.0A$                                          |      | 22    |           | S          |
| Source-Drain Diode |                                 |                                                                  |      |       |           |            |
| $V_{SD}$           | Diode Forward Voltage           | $I_S=-1.0A, V_{GS}=0V$                                           |      | -0.67 | -1.2      | V          |
| Dynamic Parameters |                                 |                                                                  |      |       |           |            |
| $Q_g$              | Total Gate Charge               | $V_{DS}=-10V$<br>$V_{GS}=-4.5V$<br>$I_D=-4.0A$                   |      | 11.1  |           | nC         |
| $Q_{gs}$           | Gate-Source Charge              |                                                                  |      | 3.1   |           |            |
| $Q_{gd}$           | Gate-Drain Charge               |                                                                  |      | 2.4   |           |            |
| $C_{iss}$          | Input Capacitance               | $V_{DS}=-10V$<br>$V_{GS}=0V$<br>$f=1MHz$                         |      | 989   |           | pF         |
| $C_{oss}$          | Output Capacitance              |                                                                  |      | 167   |           |            |
| $C_{rss}$          | Reverse Transfer Capacitance    |                                                                  |      | 75.5  |           |            |
| $T_{d(on)}$        | Turn-On Time                    | $V_{DS}=-10V$<br>$I_D=-3.7A$<br>$V_{GEN}=-4.5V$<br>$R_G=1\Omega$ |      | 712   |           | nS         |
| $T_r$              |                                 |                                                                  |      | 1386  |           |            |
| $T_{d(off)}$       | Turn-Off Time                   |                                                                  |      | 9.1   |           |            |
| $T_f$              |                                 |                                                                  |      | 4     |           |            |

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

2. Static parameters are based on package level with recommended wire bonding

■ **TYPICAL CHARACTERISTICS** (25 °C Unless Note)



■ **TYPICAL CHARACTERISTICS** (continuous)



## Package Information

SOT-23



| Symbol | Dimensions in Millimeters(mm) |       | Dimensions In Inches |       |
|--------|-------------------------------|-------|----------------------|-------|
|        | Min                           | Max   | Min                  | Max   |
| A      | 0.900                         | 1.150 | 0.035                | 0.045 |
| A1     | 0.000                         | 0.100 | 0.000                | 0.004 |
| A2     | 0.900                         | 1.050 | 0.035                | 0.041 |
| b      | 0.300                         | 0.500 | 0.012                | 0.020 |
| c      | 0.080                         | 0.150 | 0.003                | 0.006 |
| D      | 2.800                         | 3.000 | 0.110                | 0.118 |
| E      | 1.200                         | 1.400 | 0.047                | 0.055 |
| E1     | 2.250                         | 2.550 | 0.089                | 0.100 |
| e      | 0.950TYP                      |       | 0.037TYP             |       |
| e1     | 1.800                         | 2.000 | 0.071                | 0.079 |
| L      | 0.550REF                      |       | 0.022REF             |       |
| L1     | 0.300                         | 0.500 | 0.012                | 0.020 |
| θ      | 0°                            | 8°    | 0°                   | 8°    |