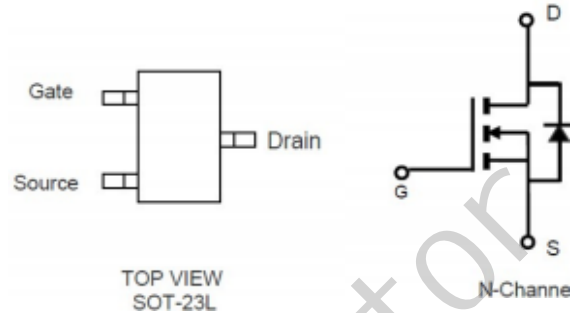


## ■ FEATURE

- ◆ 20V/4.5A,  $R_{DS(ON)}=25m\Omega$  (typ.)@ $V_{GS}=4.5V$
- ◆ 20V/2.5A,  $R_{DS(ON)}=55m\Omega$  (typ.)@ $V_{GS}=2.5V$
- ◆ 20V/2.0A,  $R_{DS(ON)}=80m\Omega$  (typ.)@ $V_{GS}=1.8V$
- ◆ Super high design for extremely low  $R_{DS(ON)}$
- ◆ Exceptional on-resistance and Maximum DC current capability
- ◆ Full RoHS compliance
- ◆ SOT23-3L package design



## ■ DESCRIPTION

The AF2302N is the N-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.

## ■ APPLICATIONS

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

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

| Symbol          | Parameter                                     |                  | Typical  | Unit         |
|-----------------|---|------------------|----------|--------------|
| $V_{DSS}$       | Drain-Source Voltage                          |                  | 20       | V            |
| $V_{GSS}$       | Gate-Source Voltage                           |                  | ±10      | V            |
| $I_D$           | Continuous Drain Current ( $T_C=25^\circ C$ ) | $V_{GS}=10V$     | 4.5      | A            |
|                 | Continuous Drain Current ( $T_C=70^\circ C$ ) |                  | 3.0      |              |
| $I_{DM}$        | Pulsed Drain Current                          |                  | 20       | A            |
| $I_S$           | Continuous Source Current (Diode Conduction)  |                  | 1.5      | A            |
| $P_D$           | Power Dissipation                             | $T_A=25^\circ C$ | 1.5      | W            |
|                 |   | $T_A=70^\circ C$ | 0.9      |              |
| $T_J$           | Operation Junction Temperature                |                  | 150      | $^\circ C$   |
| $T_{STG}$       | Storage Temperature Range                     |                  | -55~+150 | $^\circ C$   |
| $R_{\theta JA}$ | Thermal Resistance Junction to Ambient        |                  | 90       | $^\circ C/W$ |

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

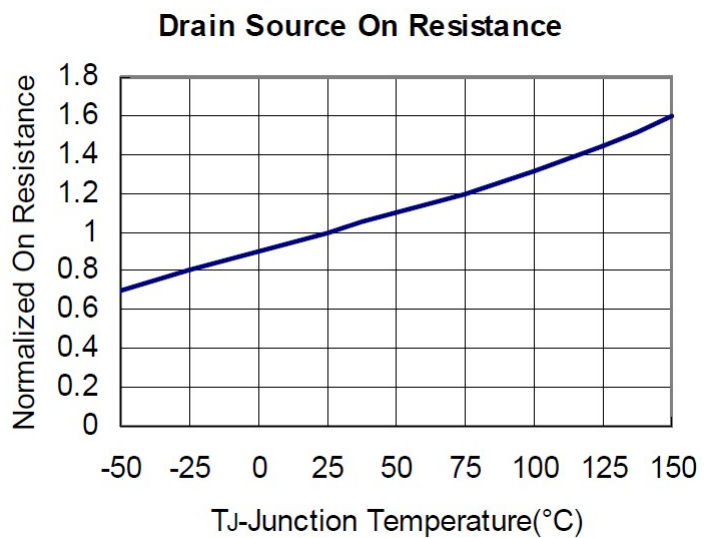
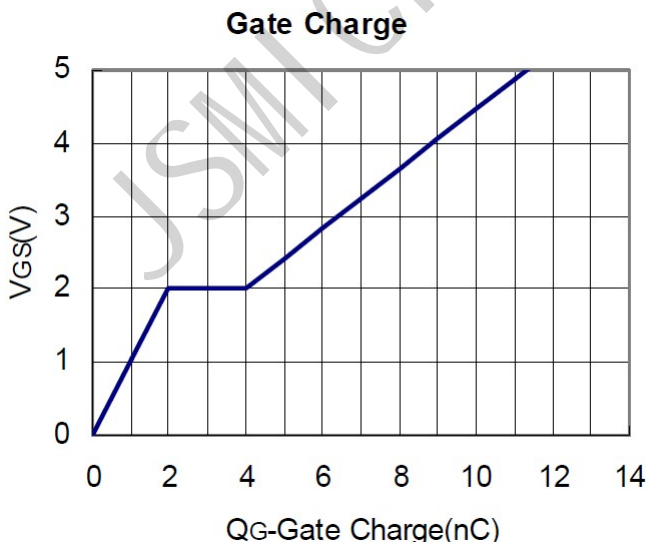
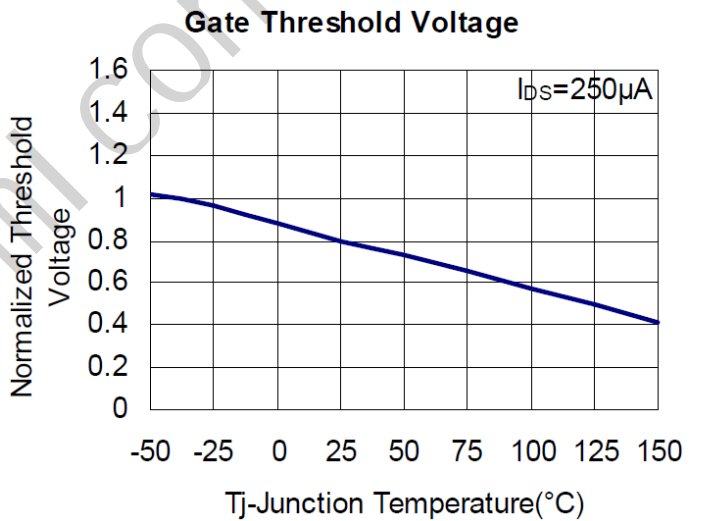
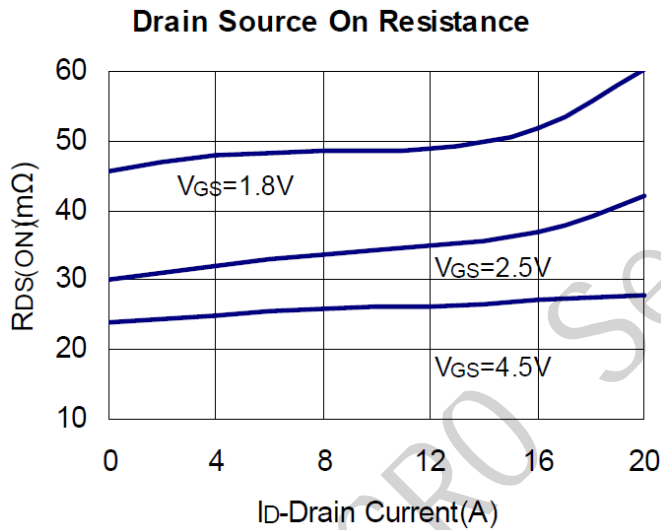
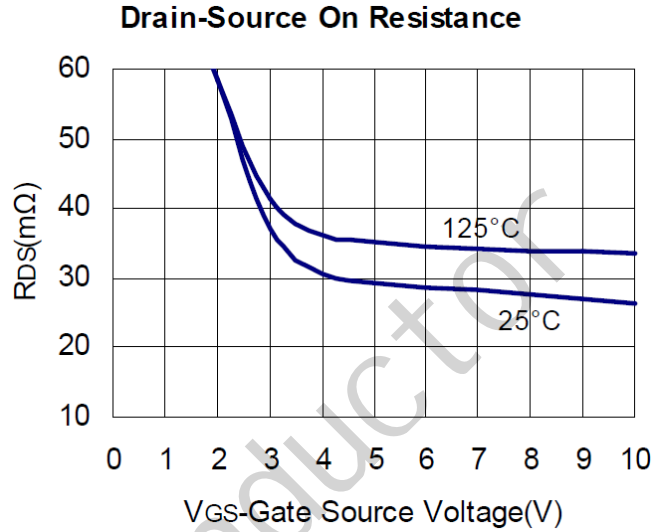
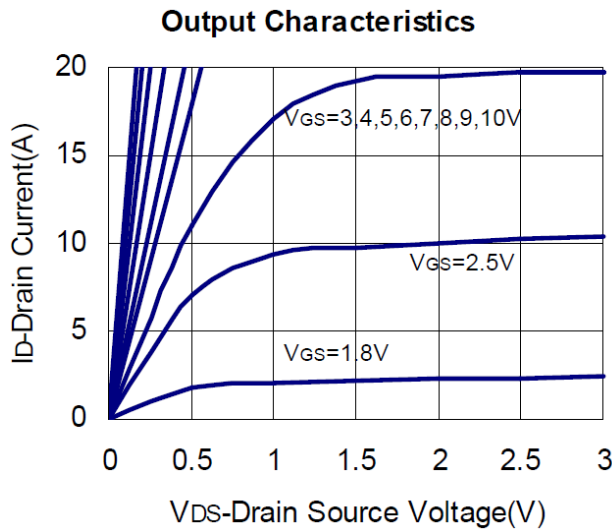
Absolute maximum ratings are stress rating only and functional device operation is not implied

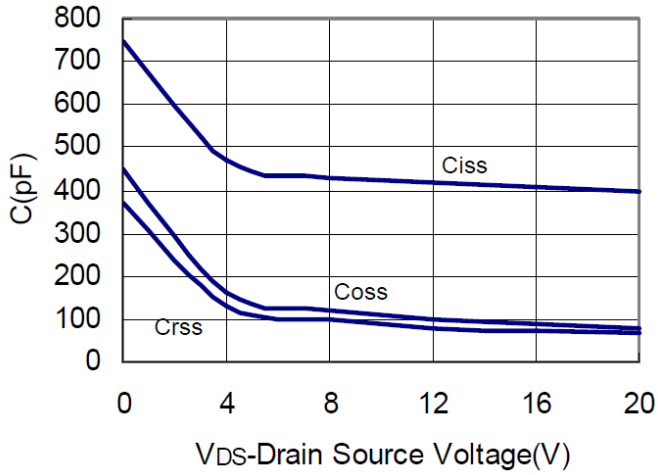
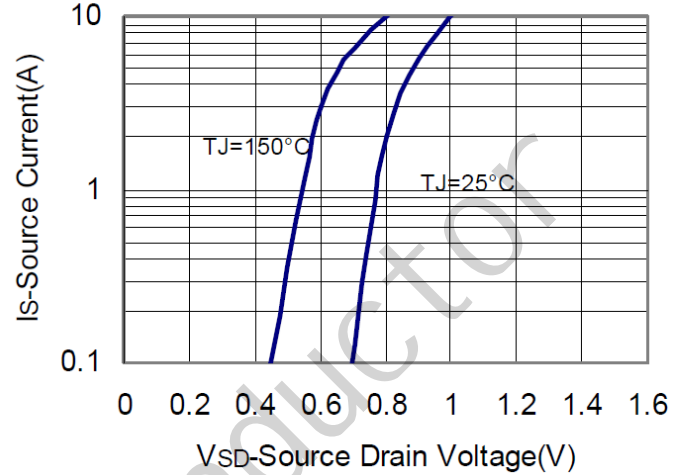
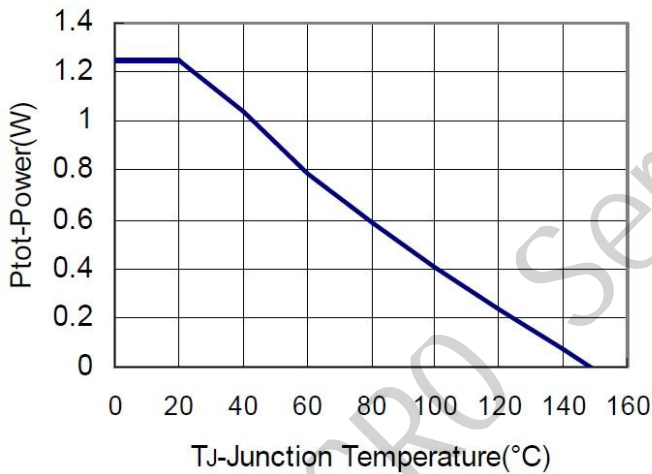
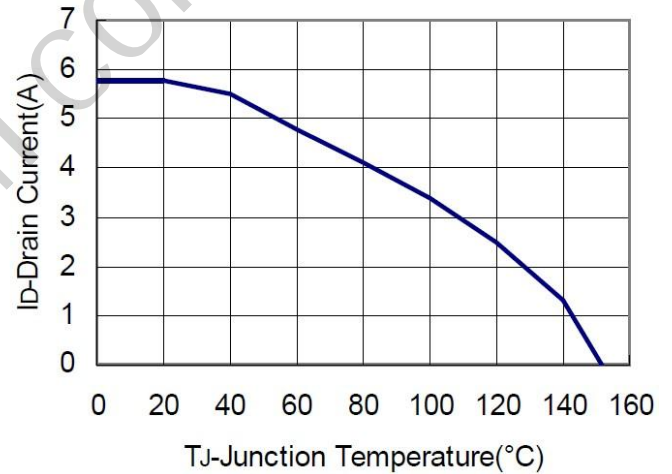
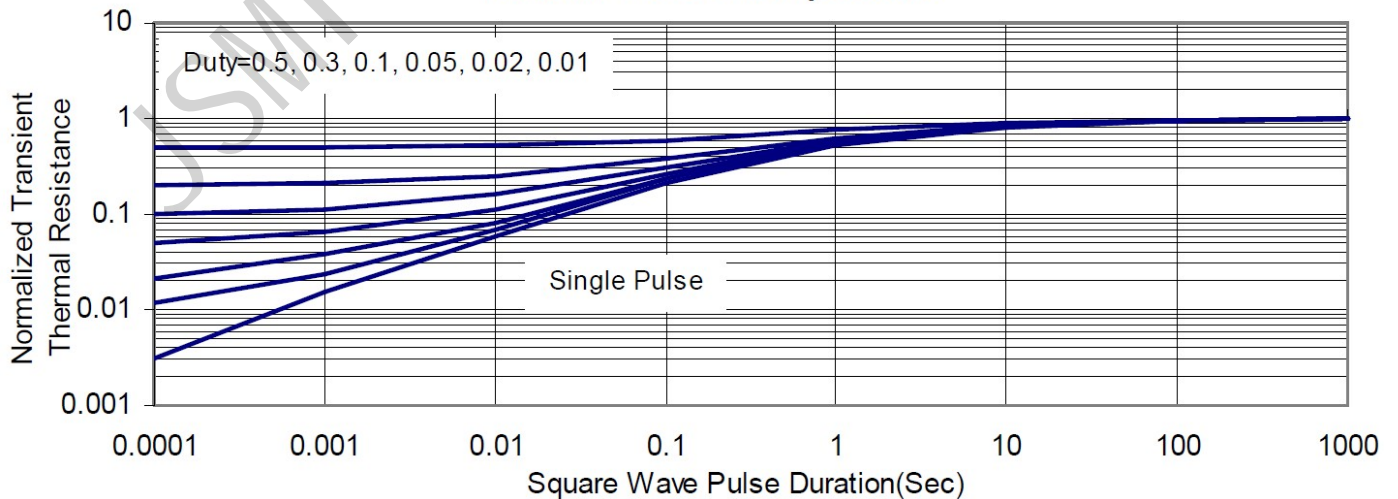
**■ ELECTRICAL CHARACTERISTICS** ( $T_A=25^\circ\text{C}$  Unless otherwise noted)

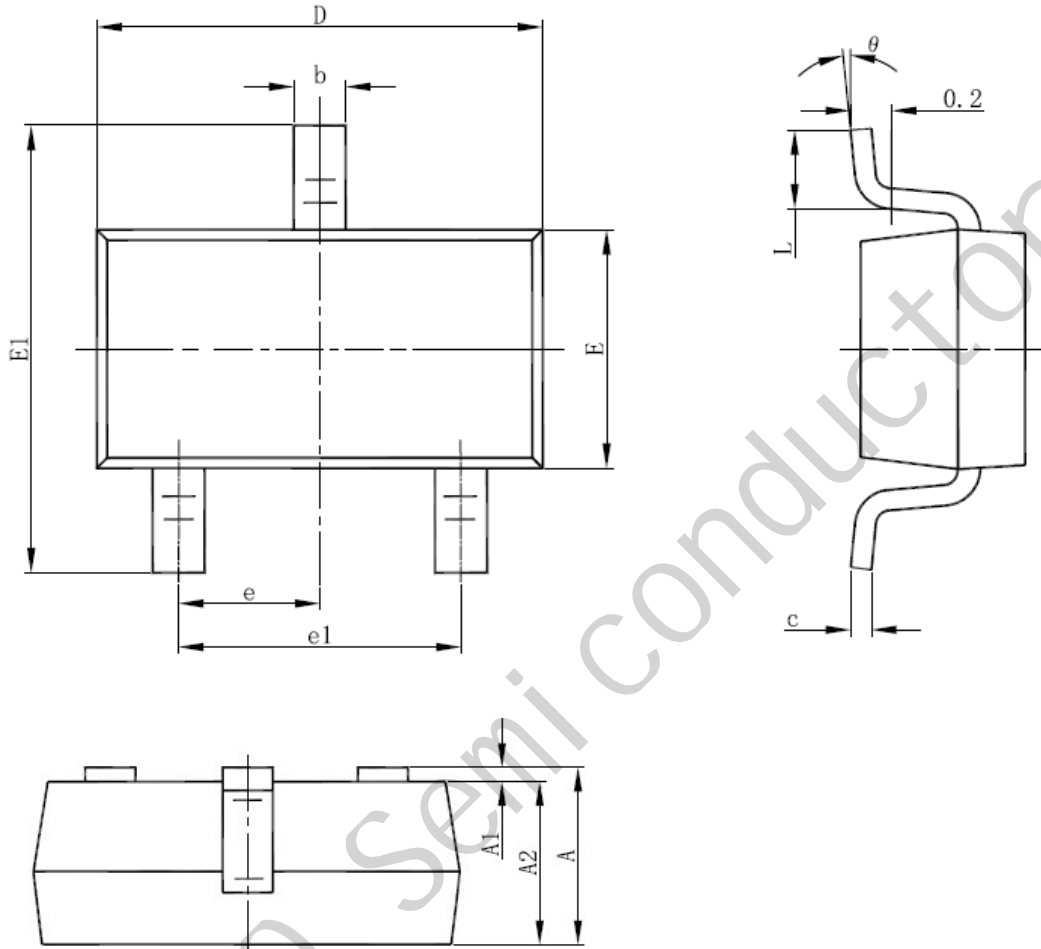
| Symbol                    | Parameter                       | Condition  | Min | Typ  | Max       | Unit       |
|---------------------------|---------------------------------|--|-----|------|-----------|------------|
| <b>Static Parameters</b>  |                                 |  |     |      |           |            |
| $V_{(BR)DSS}$             | Drain-Source Breakdown Voltage  | $V_{GS}=0V, I_D=250\mu A$                        | 20  |      |           | V          |
| $V_{GS(th)}$              | Gate Threshold Voltage          | $V_{DS}=V_{GS}, I_D=250\mu A$                    | 0.5 |      | 1.0       | V          |
| $I_{GSS}$                 | Gate Leakage Current            | $V_{DS}=0V, V_{GS}=\pm 12V$                      |     |      | $\pm 100$ | nA         |
| $I_{DSS}$                 | Zero Gate Voltage Drain Current | $V_{DS}=20V, V_{GS}=0$                           |     |      | 1         | uA         |
|                           |                                 | $V_{DS}=20V, V_{GS}=0$<br>$T_J=55^\circ\text{C}$ |     |      | 5         |            |
| $R_{DS(ON)}$              | Drain-Source On-Resistance      | $V_{GS}=4.5V, I_D=3.0A$                          |     | 25   | 45        | m $\Omega$ |
|                           |                                 | $V_{GS}=2.5V, I_D=2.5A$                          |     | 40   | 60        |            |
|                           |                                 | $V_{GS}=1.8V, I_D=2.0A$                          |     | 65   | 90        |            |
| <b>Source-Drain Diode</b> |                                 |  |     |      |           |            |
| $V_{SD}$                  | Diode Forward Voltage           | $I_S=1.7A, V_{GS}=0V$                            |     | 0.78 | 1.2       | V          |
| <b>Dynamic Parameters</b> |                                 |  |     |      |           |            |
| $Q_g$                     | Total Gate Charge               | $V_{DS}=10V$<br>$V_{GS}=4.5V$<br>$I_D=5.0A$      |     | 11   | 13        | nC         |
| $Q_{gs}$                  | Gate-Source Charge              |  |     | 1.45 |           |            |
| $Q_{gd}$                  | Gate-Drain Charge               |  |     | 2.3  |           |            |
| $C_{iss}$                 | Input Capacitance               | $V_{DS}=10V$                                     |     | 578  |           | pF         |
| $C_{oss}$                 | Output Capacitance              | $V_{GS}=0V$                                      |     | 116  |           |            |
| $C_{rss}$                 | Reverse Transfer Capacitance    | $f=1\text{MHz}$                                  |     | 96   |           |            |
| $T_{d(on)}$               | Turn-On Time                    | $V_{DS}=10V$<br>$I_D=1.0A$                       |     | 14.5 | 25        | nS         |
| $T_r$                     |                                 |  |     | 42   | 62        |            |
| $T_{d(off)}$              | Turn-Off Time                   | $V_{GEN}=4.5V$<br>$R_G=6\Omega$                  |     | 46   | 67        |            |
| $T_f$                     |                                 |  |     | 34   | 43        |            |

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)**
**Capacitance**

**Source Drain Diode Forward**

**Power Dissipation**

**Drain Current**

**Thermal Transient Impedance**


**■ SOT23-3L PACKAGE OUTLINE DIMENSIONS**


| Symbol | Dimensions In Millimeters |       | Dimensions In Inches |       |
|--------|---------------------------|-------|----------------------|-------|
|        | Min                       | Max   | Min                  | Max   |
| A      | 1.050                     | 1.250 | 0.041                | 0.049 |
| A1     | 0.000                     | 0.100 | 0.000                | 0.004 |
| A2     | 1.050                     | 1.150 | 0.041                | 0.045 |
| b      | 0.300                     | 0.500 | 0.012                | 0.020 |
| c      | 0.100                     | 0.200 | 0.004                | 0.008 |
| D      | 2.820                     | 3.020 | 0.111                | 0.119 |
| E      | 1.500                     | 1.700 | 0.059                | 0.067 |
| E1     | 2.650                     | 2.950 | 0.104                | 0.116 |
| e      | 0.950(BSC)                |       | 0.037(BSC)           |       |
| e1     | 1.800                     | 2.000 | 0.071                | 0.079 |
| L      | 0.300                     | 0.600 | 0.012                | 0.024 |
| theta  | 0°                        | 8°    | 0°                   | 8°    |

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