

### Description

The SX2302AI uses advanced trench technology to provide excellent  $R_{DS(ON)}$ , low gate charge and operation with gate voltages as low as 2.5V. This device is suitable for use as a Battery protection or in other Switching application.

### General Features

$V_{DS} = 20V$   $I_D = 4.2A$

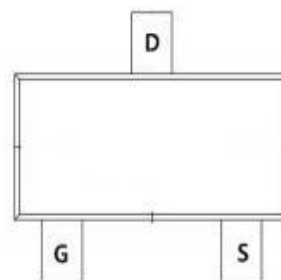
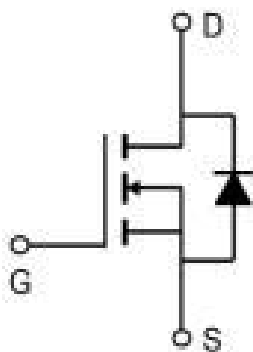
$R_{DS(ON)} < 32m\Omega$  @  $V_{GS}=4.5V$

### Application

Battery protection

Load switch

Uninterruptible power supply



### Absolute Maximum Ratings ( $T_c=25^\circ C$ unless otherwise noted)

| Symbol               | Parameter                                              | Rating     | Units        |
|----------------------|--------------------------------------------------------|------------|--------------|
| $V_{DS}$             | Drain-Source Voltage                                   | 20         | V            |
| $V_{GS}$             | Gate-Source Voltage                                    | $\pm 12$   | V            |
| $I_D@T_A=25^\circ C$ | Continuous Drain Current, $V_{GS}$ @ 4.5V <sup>1</sup> | 4.2        | A            |
| $I_D@T_A=70^\circ C$ | Continuous Drain Current, $V_{GS}$ @ 4.5V <sup>1</sup> | 2.7        | A            |
| $I_{DM}$             | Pulsed Drain Current <sup>2</sup>                      | 14.4       | A            |
| $P_D@T_A=25^\circ C$ | Total Power Dissipation <sup>3</sup>                   | 1          | W            |
| $T_{STG}$            | Storage Temperature Range                              | -55 to 150 | $^\circ C$   |
| $T_J$                | Operating Junction Temperature Range                   | -55 to 150 | $^\circ C$   |
| $R_{\theta JA}$      | Thermal Resistance Junction-ambient <sup>1</sup>       | 125        | $^\circ C/W$ |
| $R_{\theta JC}$      | Thermal Resistance Junction-Case <sup>1</sup>          | 80         | $^\circ C/W$ |

**Electrical Characteristics (T<sub>J</sub>=25°C, unless otherwise noted)**

| Symbol              | Parameter                                      | Conditions                                                                                   | Min. | Typ. | Max. | Unit |
|---------------------|------------------------------------------------|----------------------------------------------------------------------------------------------|------|------|------|------|
| BV <sub>DSS</sub>   | Drain-Source Breakdown Voltage                 | V <sub>GS</sub> =0V , I <sub>D</sub> =250uA                                                  | 20   | 22   | ---  | V    |
| R <sub>DS(ON)</sub> | Static Drain-Source On-Resistance <sup>2</sup> | V <sub>GS</sub> =4.5V , I <sub>D</sub> =3A                                                   | ---  | 24   | 32   | mΩ   |
|                     |                                                | V <sub>GS</sub> =2.5V , I <sub>D</sub> =2A                                                   | ---  | 29   | 38   |      |
| V <sub>GS(th)</sub> | Gate Threshold Voltage                         | V <sub>GS</sub> =V <sub>DS</sub> , I <sub>D</sub> =250uA                                     | 0.5  | 0.75 | 1.2  | V    |
| I <sub>DSS</sub>    | Drain-Source Leakage Current                   | V <sub>DS</sub> =16V , V <sub>GS</sub> =0V , T <sub>J</sub> =25°C                            | ---  | ---  | 1    | uA   |
|                     |                                                | V <sub>DS</sub> =16V , V <sub>GS</sub> =0V , T <sub>J</sub> =55°C                            | ---  | ---  | 5    |      |
| I <sub>GSS</sub>    | Gate-Source Leakage Current                    | V <sub>GS</sub> =±12V , V <sub>DS</sub> =0V                                                  | ---  | ---  | ±100 | nA   |
| g <sub>fs</sub>     | Forward Transconductance                       | V <sub>DS</sub> =5V , I <sub>D</sub> =3A                                                     | ---  | 10.5 | ---  | S    |
| Q <sub>g</sub>      | Total Gate Charge (4.5V)                       | V <sub>DS</sub> =15V , V <sub>GS</sub> =4.5V , I <sub>D</sub> =3A                            | ---  | 4.6  | ---  | nC   |
| Q <sub>gs</sub>     | Gate-Source Charge                             |                                                                                              | ---  | 0.7  | ---  |      |
| Q <sub>gd</sub>     | Gate-Drain Charge                              |                                                                                              | ---  | 1.5  | ---  |      |
| T <sub>d(on)</sub>  | Turn-On Delay Time                             | V <sub>DD</sub> =10V , V <sub>GS</sub> =4.5V ,<br>R <sub>G</sub> =3.3Ω<br>I <sub>D</sub> =3A | ---  | 1.6  | ---  | ns   |
| T <sub>r</sub>      | Rise Time                                      |                                                                                              | ---  | 42   | ---  |      |
| T <sub>d(off)</sub> | Turn-Off Delay Time                            |                                                                                              | ---  | 14   | ---  |      |
| T <sub>f</sub>      | Fall Time                                      |                                                                                              | ---  | 7    | ---  |      |
| C <sub>iss</sub>    | Input Capacitance                              | V <sub>DS</sub> =15V , V <sub>GS</sub> =0V , f=1MHz                                          | ---  | 310  | ---  | pF   |
| C <sub>oss</sub>    | Output Capacitance                             |                                                                                              | ---  | 49   | ---  |      |
| C <sub>rss</sub>    | Reverse Transfer Capacitance                   |                                                                                              | ---  | 35   | ---  |      |
| I <sub>S</sub>      | Continuous Source Current <sup>1,4</sup>       | V <sub>G</sub> =V <sub>D</sub> =0V , Force Current                                           | ---  | ---  | 3.6  | A    |
| V <sub>SD</sub>     | Diode Forward Voltage <sup>2</sup>             | V <sub>GS</sub> =0V , I <sub>S</sub> =1A , T <sub>J</sub> =25°C                              | ---  | ---  | 1.2  | V    |

**Note :**

- 1、 The data tested by surface mounted on a 1 inch<sup>2</sup> FR-4 board with 2OZ copper.
- 2、 The data tested by pulsed , pulse width ≤ 300us , duty cycle ≤ 2%
- 3、 The power dissipation is limited by 150°C junction temperature
- 4、 The data is theoretically the same as I<sub>D</sub> and I<sub>DM</sub> , in real applications , should be limited by total power dissipation.

## Typical Characteristics

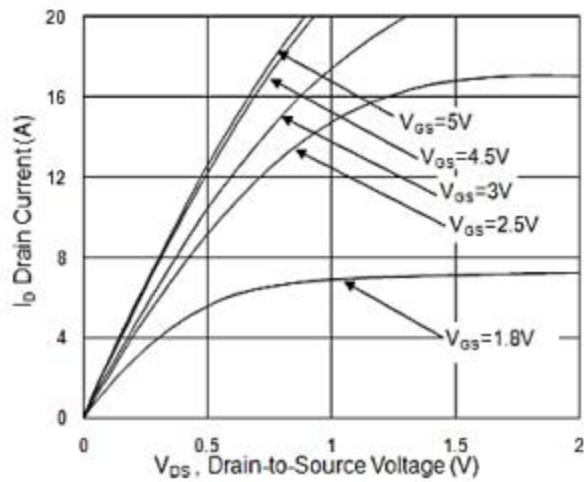


Fig.1 Typical Output Characteristics

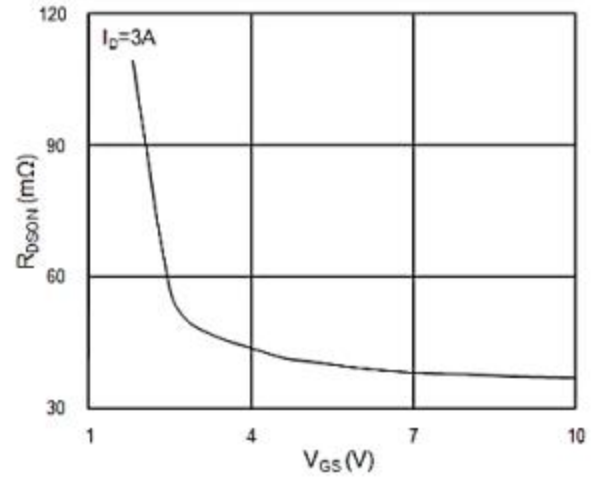


Fig.2 On-Resistance vs. G-S Voltage

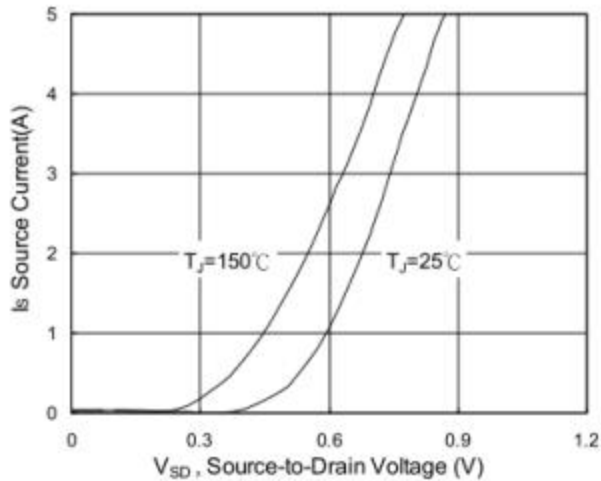


Fig.3 Source Drain Forward Characteristics

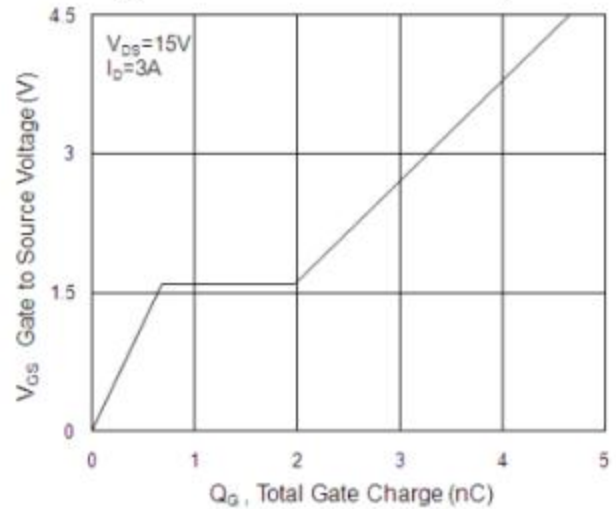


Fig.4 Gate-Charge Characteristics

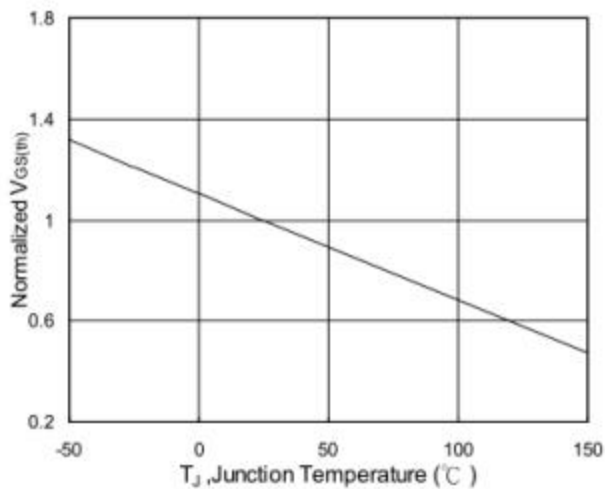


Fig.5 Normalized  $V_{GS(th)}$  vs.  $T_J$

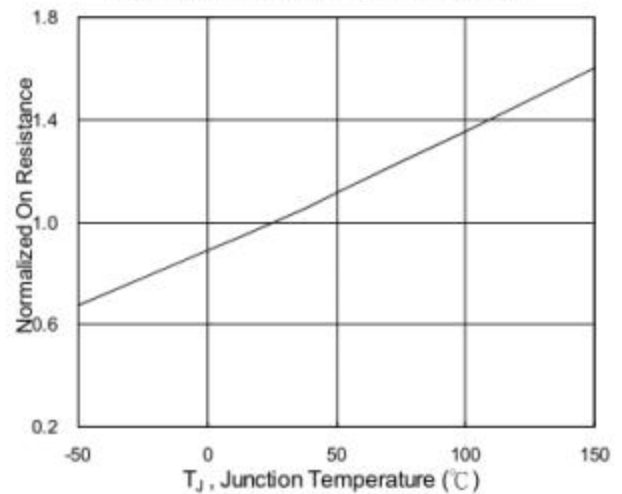
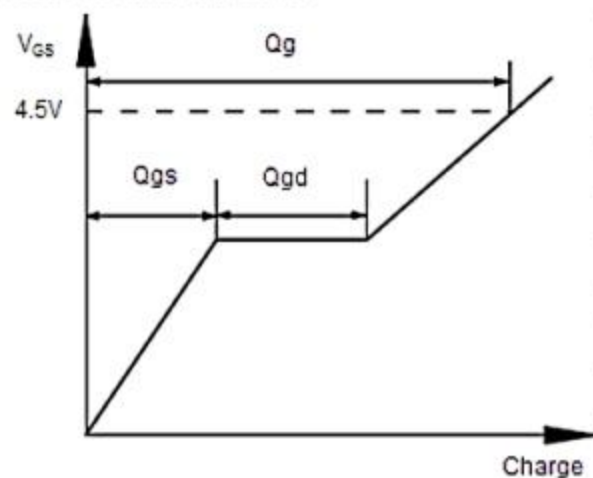
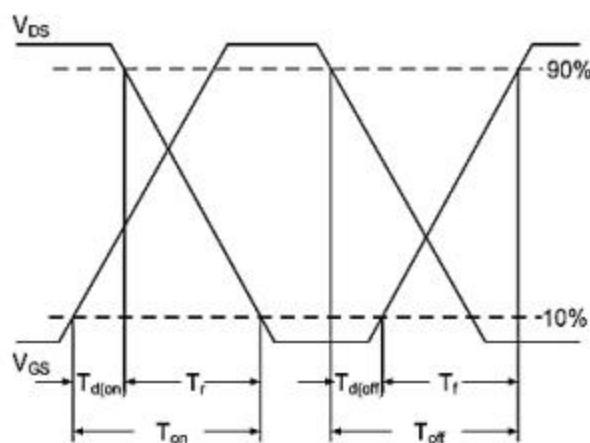
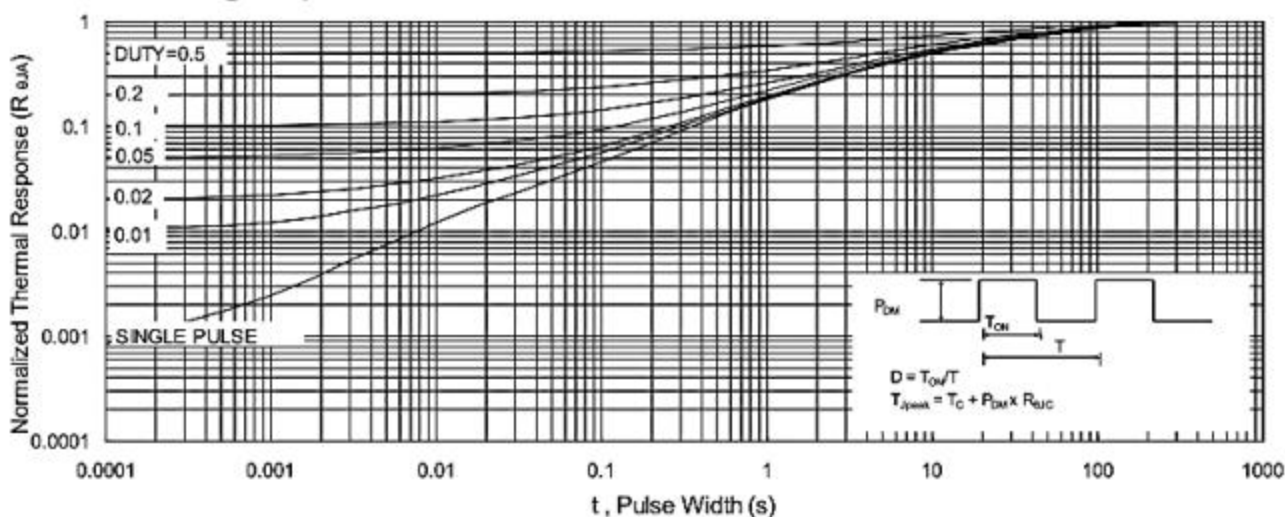
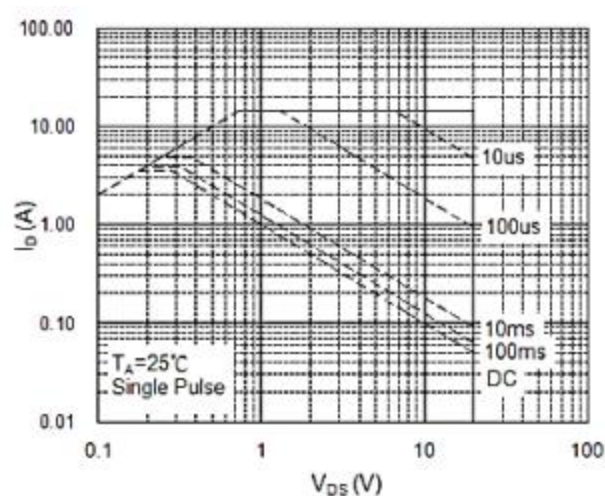
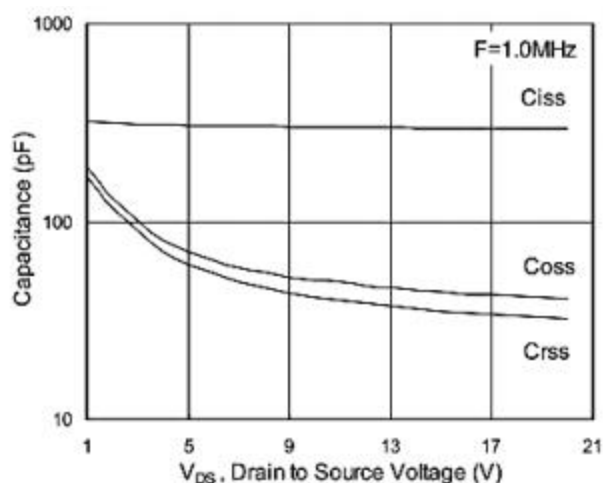
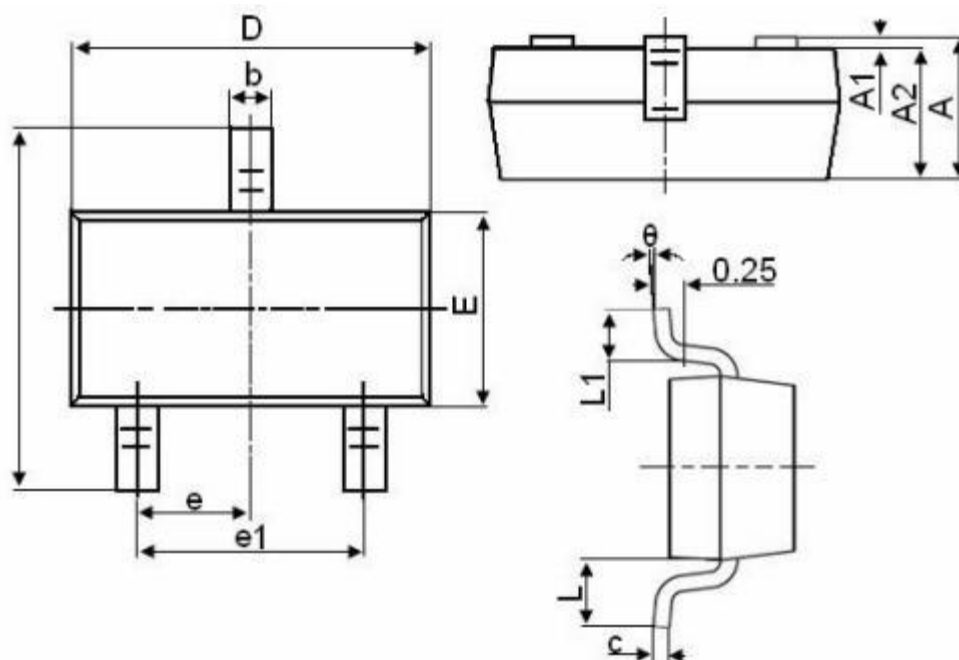


Fig.6 Normalized  $R_{DS(on)}$  vs.  $T_J$

## Typical Characteristics



## Package Mechanical Data-SOT23-XC-Single



| Symbol | Dimensions in Millimeters |       |
|--------|---------------------------|-------|
|        | MIN.                      | MAX.  |
| A      | 0.900                     | 1.150 |
| A1     | 0.000                     | 0.100 |
| A2     | 0.900                     | 1.050 |
| b      | 0.300                     | 0.500 |
| c      | 0.080                     | 0.150 |
| D      | 2.800                     | 3.000 |
| E      | 1.200                     | 1.400 |
| E1     | 2.250                     | 2.550 |
| e      | 0.950TYP                  |       |
| e1     | 1.800                     | 2.000 |
| L      | 0.550REF                  |       |
| L1     | 0.300                     | 0.500 |
| θ      | 0°                        | 8°    |

### Package Marking and Ordering Information

| Product ID | Pack  | Marking | Qty(PCS) |
|------------|-------|---------|----------|
| TAPING     | SOT23 |         | 3000     |