

### Description

The SX2301BI uses advanced trench technology to provide excellent  $R_{DS(ON)}$ , low gate charge and operation with gate voltages as low as 4.5V. This device is suitable for use as a Battery protection or in other Switching application.

### General Features

$V_{DS} = -20V$   $I_D = -2.8A$

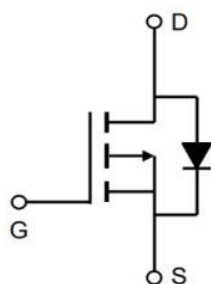
$R_{DS(ON)} < 125m\Omega$  @  $V_{GS} = -4.5V$

### Application

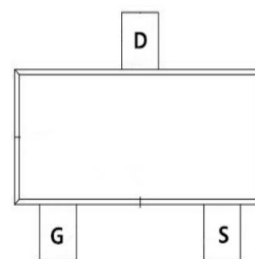
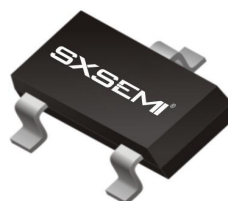
Battery protection

Load switch

Uninterruptible power supply



SOT-23



### 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, $V_{GS} @ -4.5V^1$     | -2.8       | A            |
| $I_D @ T_A = 70^\circ C$ | Continuous Drain Current, $V_{GS} @ -4.5V^1$     | -1.1       | A            |
| $I_{DM}$                 | Pulsed Drain Current <sup>2</sup>                | -8.4       | A            |
| $P_D @ T_A = 25^\circ C$ | Total Power Dissipation <sup>3</sup>             | 1.3        | W            |
| $P_D @ T_A = 70^\circ C$ | Total Power Dissipation <sup>3</sup>             | 0.8        | 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                | 28         | $^\circ C/W$ |

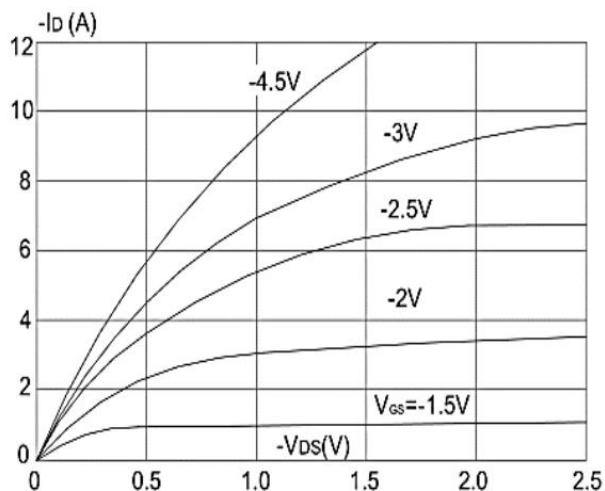
**Electrical Characteristics (T<sub>J</sub>=25°C, unless otherwise noted)**

| Symbol          | Parameter                                                | Test Condition                                                                            | Min. | Typ. | Max. | Units |
|-----------------|----------------------------------------------------------|-------------------------------------------------------------------------------------------|------|------|------|-------|
| V(BR)DSS        | Drain-Source Breakdown Voltage                           | V <sub>GS</sub> =0V, I <sub>D</sub> = -250μA                                              | -20  | -    | -    | V     |
| IDSS            | Zero Gate Voltage Drain Current                          | V <sub>DS</sub> = -20V, V <sub>GS</sub> = 0V,                                             | -    | -    | -1   | μA    |
| IGSS            | Gate to Body Leakage Current                             | V <sub>DS</sub> =0V, V <sub>GS</sub> = ±12V                                               | -    | -    | ±100 | nA    |
| VGS(th)         | Gate Threshold Voltage                                   | V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = -250μA                               | -0.4 | -0.7 | -1.0 | V     |
| RDS(on)         | Static Drain-Source on-Resistance                        | V <sub>GS</sub> =-4.5V, I <sub>D</sub> =-2A                                               | -    | 95   | 125  | mΩ    |
|                 |                                                          | V <sub>GS</sub> =-2.5V, I <sub>D</sub> =-1A                                               | -    | 135  | 190  |       |
| Ciss            | Input Capacitance                                        | V <sub>DS</sub> = -10V, V <sub>GS</sub> = 0V, f = 1.0MHz                                  | -    | 185  | -    | pF    |
| Coss            | Output Capacitance                                       |                                                                                           | -    | 35   | -    | pF    |
| Crss            | Reverse Transfer Capacitance                             |                                                                                           | -    | 25   | -    | pF    |
| Q <sub>g</sub>  | Total Gate Charge                                        | V <sub>DS</sub> = -10V, I <sub>D</sub> = -2A, V <sub>GS</sub> = -4.5V                     | -    | 2.2  | -    | nC    |
| Q <sub>gs</sub> | Gate-Source Charge                                       |                                                                                           | -    | 0.5  | -    | nC    |
| Q <sub>gd</sub> | Gate-Drain("Miller") Charge                              |                                                                                           | -    | 0.5  | -    | nC    |
| td(on)          | Turn-on Delay Time                                       | V <sub>DD</sub> = -10V, R <sub>L</sub> =5Ω, R <sub>GEN</sub> =3Ω, V <sub>GS</sub> =-4.5V, | -    | 10   | -    | ns    |
| t <sub>r</sub>  | Turn-on Rise Time                                        |                                                                                           | -    | 30   | -    | ns    |
| td(off)         | Turn-off Delay Time                                      |                                                                                           | -    | 63   | -    | ns    |
| t <sub>f</sub>  | Turn-off Fall Time                                       |                                                                                           | -    | 50   | -    | ns    |
| IS              | Maximum Continuous Drain to Source Diode Forward Current |                                                                                           | -    | -    | -2.8 | A     |
| ISM             | Maximum Pulsed Drain to Source Diode Forward Current     |                                                                                           | -    | -    | -8   | A     |
| VSD             | Drain to Source Diode Forward Voltage                    | V <sub>GS</sub> = 0V, I <sub>S</sub> = -2A                                                | -    | -    | -1.2 | V     |

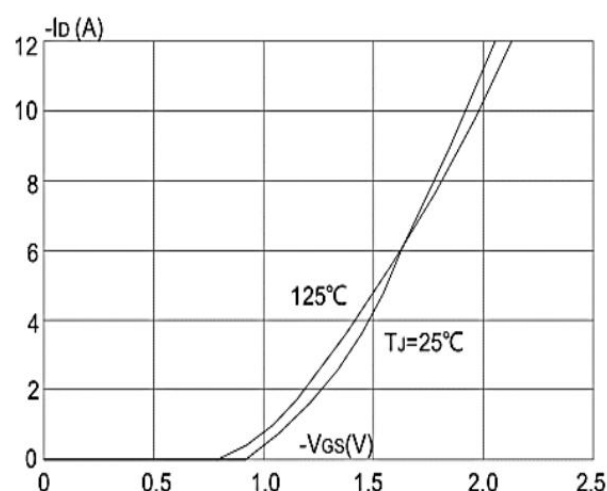
Note :

- 1、The data tested by surface mounted on a 1 inch<sup>2</sup> FR-4 board with 20Z copper.
- 2、The data tested by pulsed , pulse width Δ300us , duty cycle Δ2%
- 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.

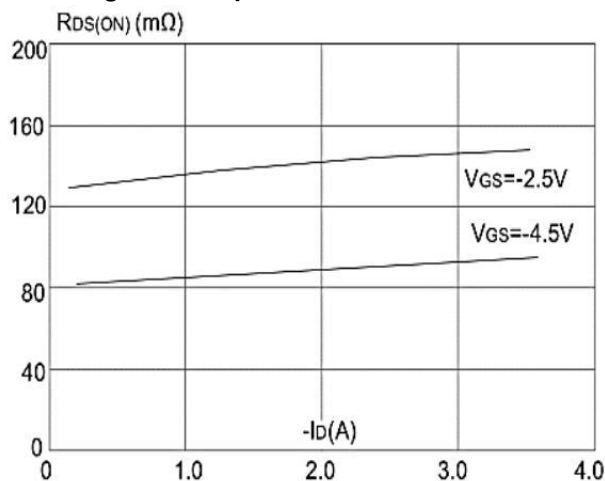
## Typical Characteristics



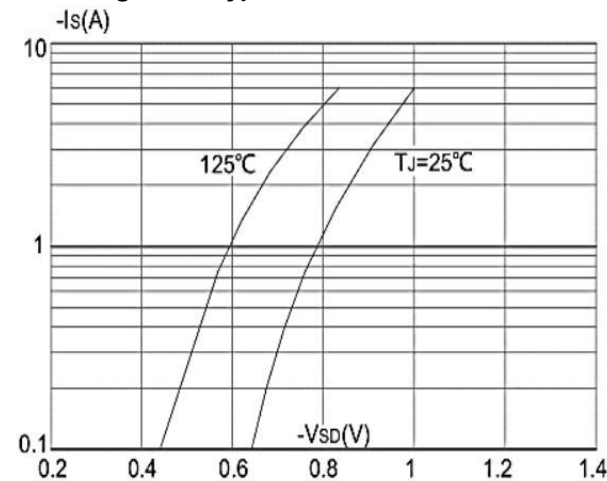
**Figure1: Output Characteristics**



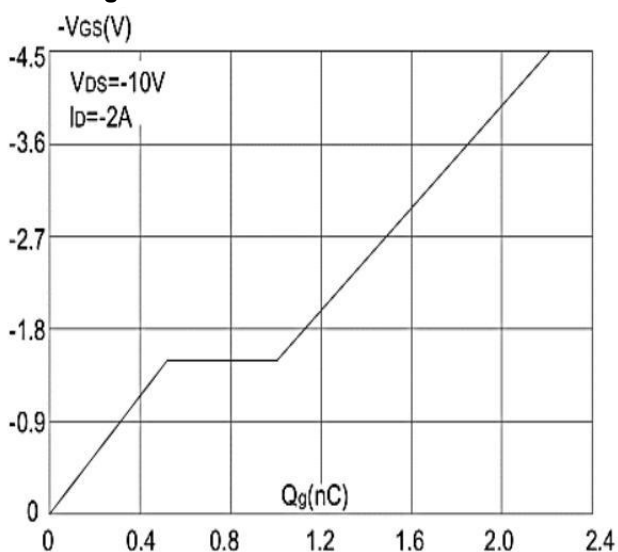
**Figure 2: Typical Transfer Characteristics**



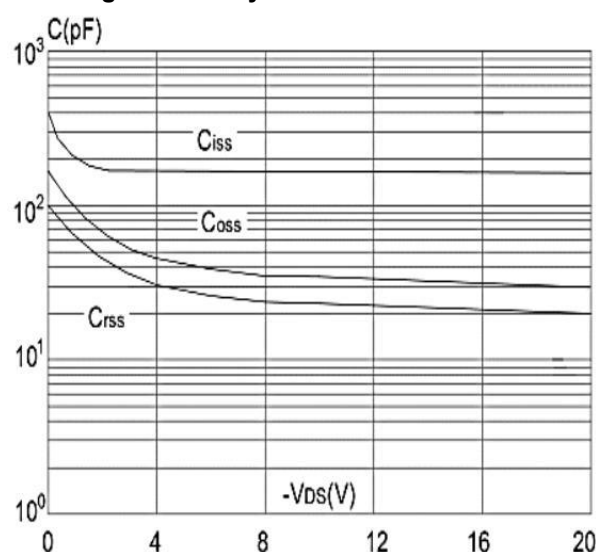
**Figure 3: On-resistance vs. Drain Current**



**Figure 4: Body Diode Characteristics**



**Figure 5: Gate Charge Characteristics**



**Figure 6: Capacitance Characteristics**

## Typical Characteristics

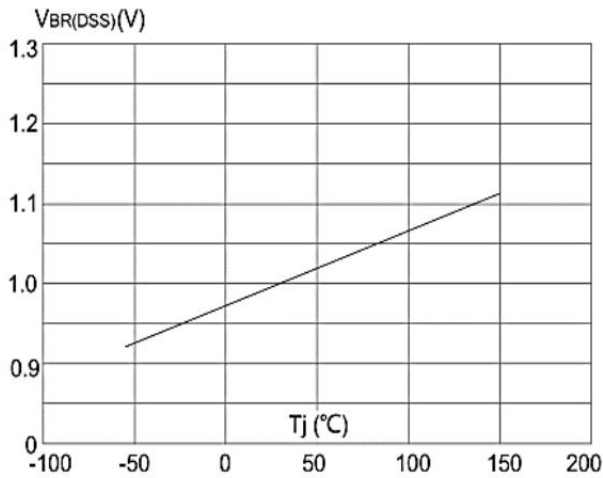


Figure 7: Normalized Breakdown Voltage vs Junction Temperature

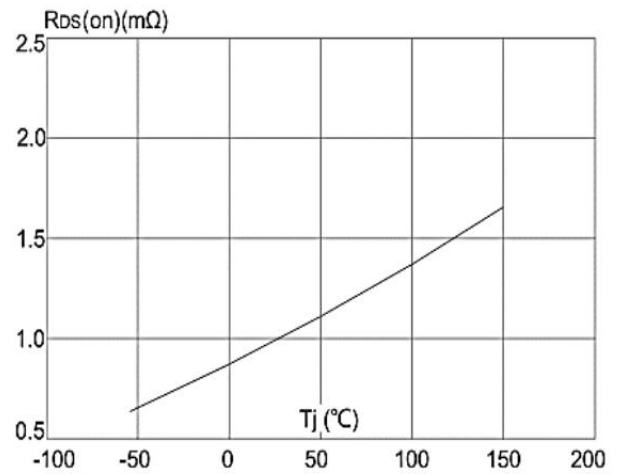


Figure 8: Normalized on Resistance vs. Junction Temperature

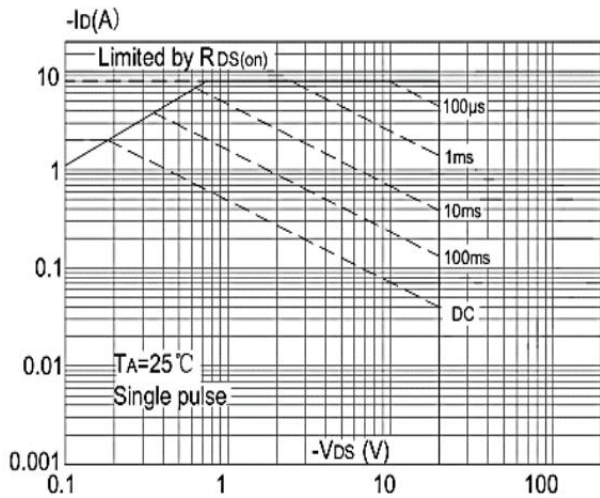


Figure 9: Maximum Safe Operating Area

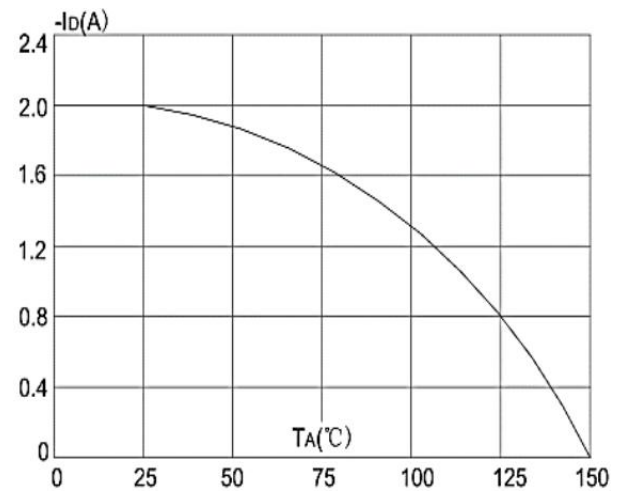


Figure 10: Maximum Continuous Drain Current vs. Ambient Temperature

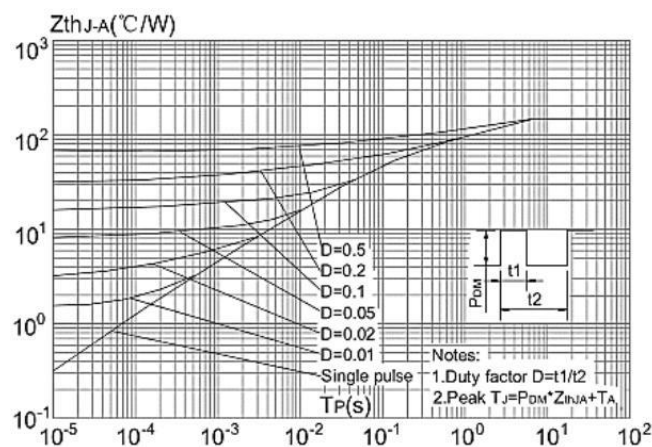
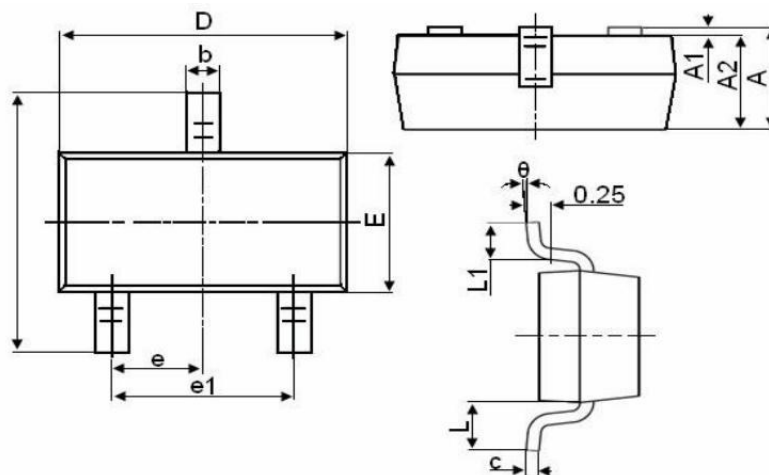


Figure.11: Maximum Effective Transient Thermal Impedance, Junction-to-Ambien

**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     |