

### Description

The SX10N06MSI 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

$V_{DS} = 60V$   $I_D = 10A$

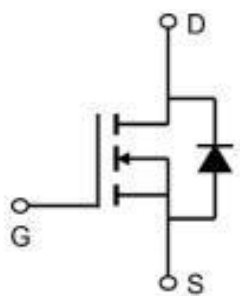
$R_{DS(ON)} < 36m\Omega$  @  $V_{GS} = 10V$

### Application

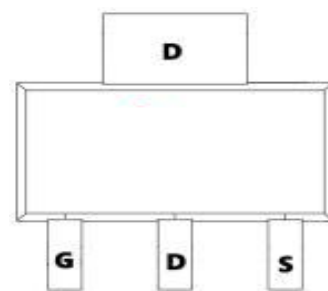
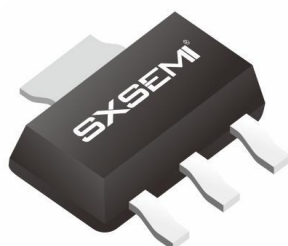
LED lamp

Load switch

Uninterruptible power supply



SOT-223-3L



### Absolute Maximum Ratings@ $T_J = 25^\circ C$ (unless otherwise specified)

| Symbol                    | Parameter                                        | Max.        | Units        |
|---------------------------|--------------------------------------------------|-------------|--------------|
| $V_{DSS}$                 | Drain-Source Voltage                             | 60          | V            |
| $V_{GSS}$                 | Gate-Source Voltage                              | $\pm 20$    | V            |
| $I_D @ T_C = 25^\circ C$  | Continuous Drain Current, $V_{GS} @ 10V^1$       | 10          | A            |
| $I_D @ T_C = 100^\circ C$ | Continuous Drain Current, $V_{GS} @ 10V^1$       | 8           | A            |
| $I_{DM}$                  | Pulsed Drain Current                             | 30          | A            |
| $E_{AS}$                  | Single Pulsed Avalanche Energy                   | 22          | mJ           |
| $P_D @ T_C = 25^\circ C$  | Power Dissipation                                | 31.3        | W            |
| $T_J, T_{STG}$            | Operating and Storage Temperature Range          | -55 to +150 | $^\circ C$   |
| $R_{\theta JA}$           | Thermal Resistance Junction-Ambient <sup>1</sup> | 60          | $^\circ C/W$ |
| $R_{\theta JC}$           | Thermal Resistance Junction-Case <sup>1</sup>    | 4           | $^\circ C/W$ |

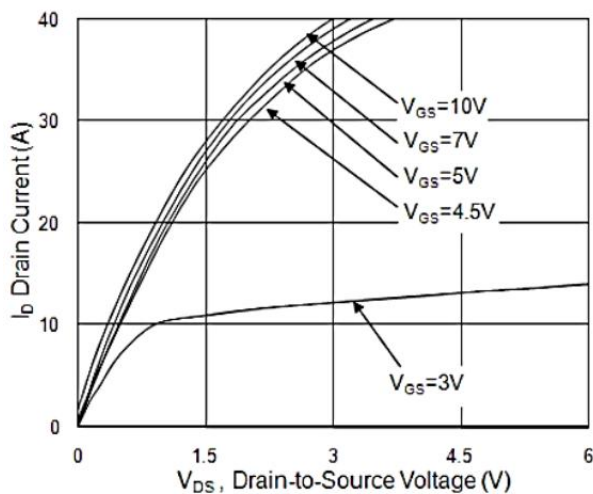
**Electrical Characteristics (T<sub>J</sub>=25 °C, unless otherwise noted)**

| Symbol                 | Parameter                                      | Conditions                                                                                | Min. | Typ.  | Max. | Unit  |
|------------------------|------------------------------------------------|-------------------------------------------------------------------------------------------|------|-------|------|-------|
| BVDSS                  | Drain-Source Breakdown Voltage                 | V <sub>GS</sub> =0V , I <sub>D</sub> =250uA                                               | 60   | 65    | ---  | V     |
| ΔBVDSS/ΔT <sub>J</sub> | BVDSS Temperature Coefficient                  | Reference to 25°C , I <sub>D</sub> =1mA                                                   | ---  | 0.044 | ---  | V/°C  |
| RDS(ON)                | Static Drain-Source On-Resistance <sup>2</sup> | V <sub>GS</sub> =10V , I <sub>D</sub> =15A                                                | ---  | 28    | 36   | mΩ    |
|                        |                                                | V <sub>GS</sub> =4.5V , I <sub>D</sub> =7A                                                | ---  | 38    | 45   | mΩ    |
| VGS(th)                | Gate Threshold Voltage                         | V <sub>GS</sub> =V <sub>DS</sub> , I <sub>D</sub> =250uA                                  | 1.2  | 1.6   | 2.5  | V     |
| ΔVGS(th)               | VGS(th) Temperature Coefficient                |                                                                                           | ---  | -4.8  | ---  | mV/°C |
| IDSS                   | Drain-Source Leakage Current                   | V <sub>DS</sub> =48V , V <sub>GS</sub> =0V , T <sub>J</sub> =25°C                         | ---  | ---   | 1    | uA    |
|                        |                                                | V <sub>DS</sub> =48V , V <sub>GS</sub> =0V , T <sub>J</sub> =55°C                         | ---  | ---   | 5    |       |
| IGSS                   | Gate-Source Leakage Current                    | V <sub>GS</sub> =±20V , V <sub>DS</sub> =0V                                               | ---  | ---   | ±100 | nA    |
| gfs                    | Forward Transconductance                       | V <sub>DS</sub> =5V , I <sub>D</sub> =15A                                                 | ---  | 25.3  | ---  | S     |
| R <sub>g</sub>         | Gate Resistance                                | V <sub>DS</sub> =0V , V <sub>GS</sub> =0V , f=1MHz                                        | ---  | 2.5   | ---  | Ω     |
| Q <sub>g</sub>         | Total Gate Charge (10V)                        | V <sub>DS</sub> =48V , V <sub>GS</sub> =10V , I <sub>D</sub> =15A                         | ---  | 19    | ---  | nC    |
| Q <sub>gs</sub>        | Gate-Source Charge                             |                                                                                           | ---  | 2.5   | ---  |       |
| Q <sub>gd</sub>        | Gate-Drain Charge                              |                                                                                           | ---  | 5     | ---  |       |
| Td(on)                 | Turn-On Delay Time                             | V <sub>DD</sub> =30V , V <sub>GS</sub> =10V , R <sub>G</sub> =3.3Ω<br>I <sub>D</sub> =15A | ---  | 2.8   | ---  | ns    |
| T <sub>r</sub>         | Rise Time                                      |                                                                                           | ---  | 16.6  | ---  |       |
| Td(off)                | Turn-Off Delay Time                            |                                                                                           | ---  | 21.2  | ---  |       |
| T <sub>f</sub>         | Fall Time                                      |                                                                                           | ---  | 5.6   | ---  |       |
| C <sub>iss</sub>       | Input Capacitance                              | V <sub>DS</sub> =15V , V <sub>GS</sub> =0V , f=1MHz                                       | ---  | 1027  | ---  | pF    |
| C <sub>oss</sub>       | Output Capacitance                             |                                                                                           | ---  | 65    | ---  |       |
| C <sub>rss</sub>       | Reverse Transfer Capacitance                   |                                                                                           | ---  | 46    | ---  |       |
| I <sub>s</sub>         | Continuous Source Current <sup>1,6</sup>       | V <sub>G</sub> =V <sub>D</sub> =0V , Force Current                                        | ---  | ---   | 20   | A     |
| ISM                    | Pulsed Source Current <sup>2,6</sup>           |                                                                                           | ---  | ---   | 40   | A     |
| VSD                    | 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     |
| t <sub>rr</sub>        | Reverse Recovery Time                          | IF=15A , dI/dt=100A/μs ,<br>T <sub>J</sub> =25°C                                          | ---  | 12.2  | ---  | nS    |
| Q <sub>rr</sub>        | Reverse Recovery Charge                        |                                                                                           | ---  | 7.3   | ---  | nC    |

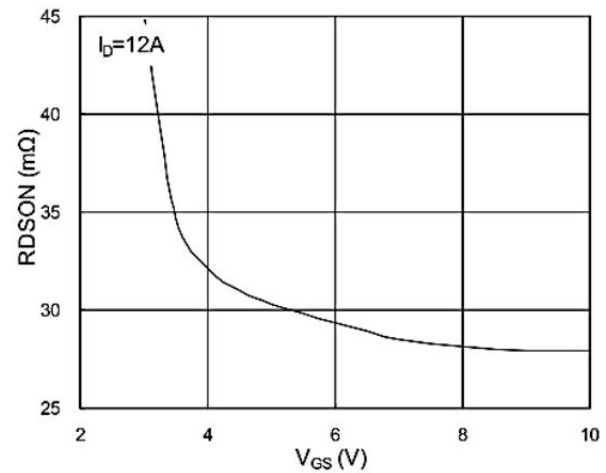
**Note :**

- 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 .The EAS data shows Max. rating .
- 3、The test cond ≅ 300us duty cycle ≅ 2% , duty cycle ition is T<sub>J</sub> =25°C , VDD =48V , VG =10V , RG =25Ω , L=0.1mH , IAS =13A
- 4、The power dissipation is limited by 175°C junction temperature
- 5、The data is theoretically the same as ID and IDM , in real applications , should be limited by total power dissipation.

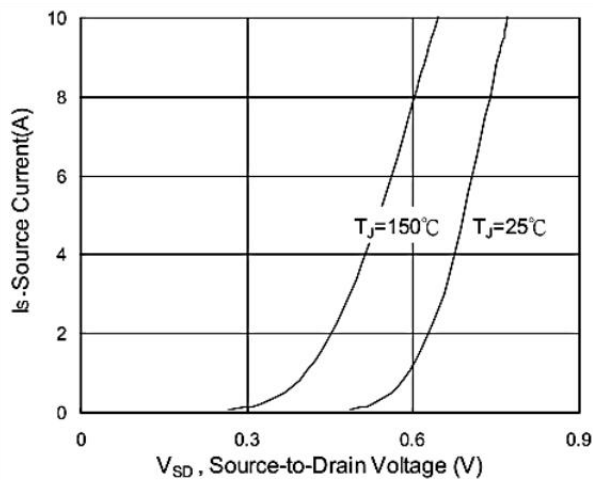
## Typical Characteristics



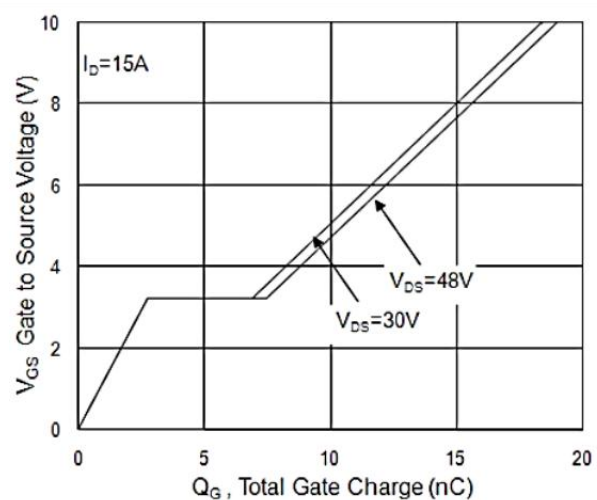
**Fig.1 Typical Output Characteristics**



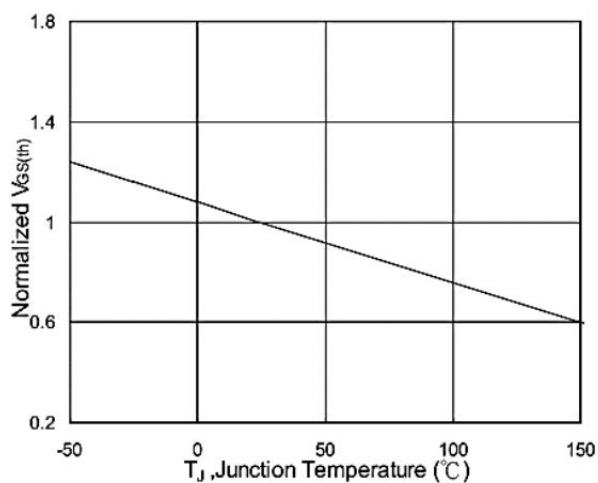
**Fig.2 On-Resistance vs. Gate-Source**



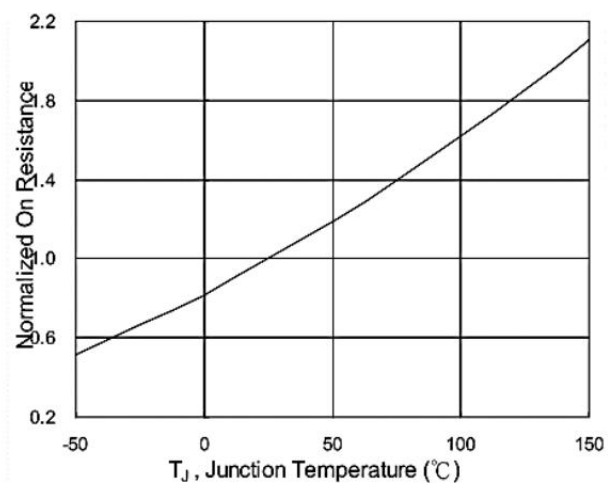
**Fig.3 Forward Characteristics Of Reverse**



**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

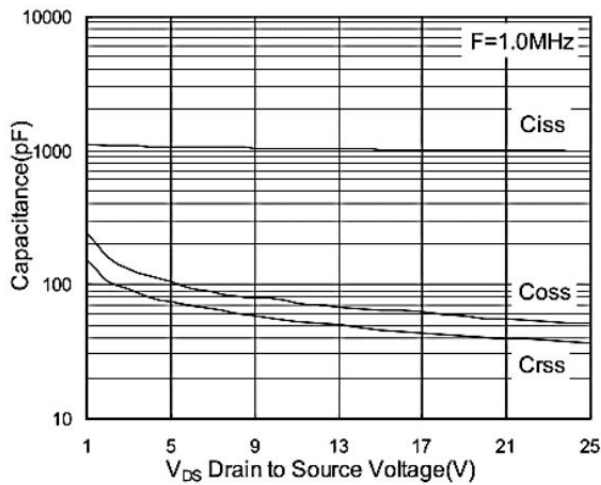


Fig.7 Capacitance

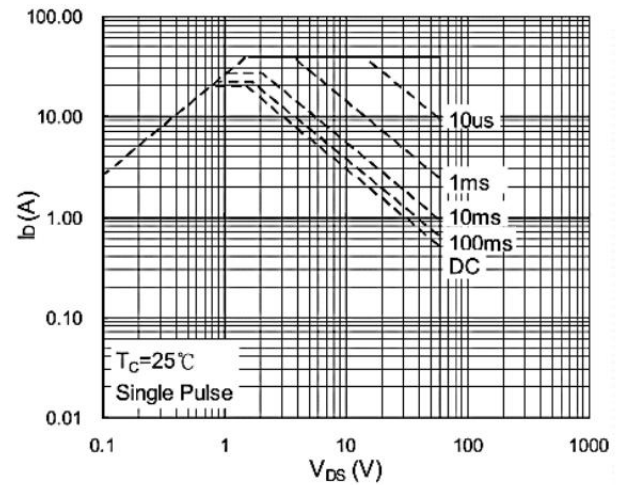


Fig.8 Safe Operating Area

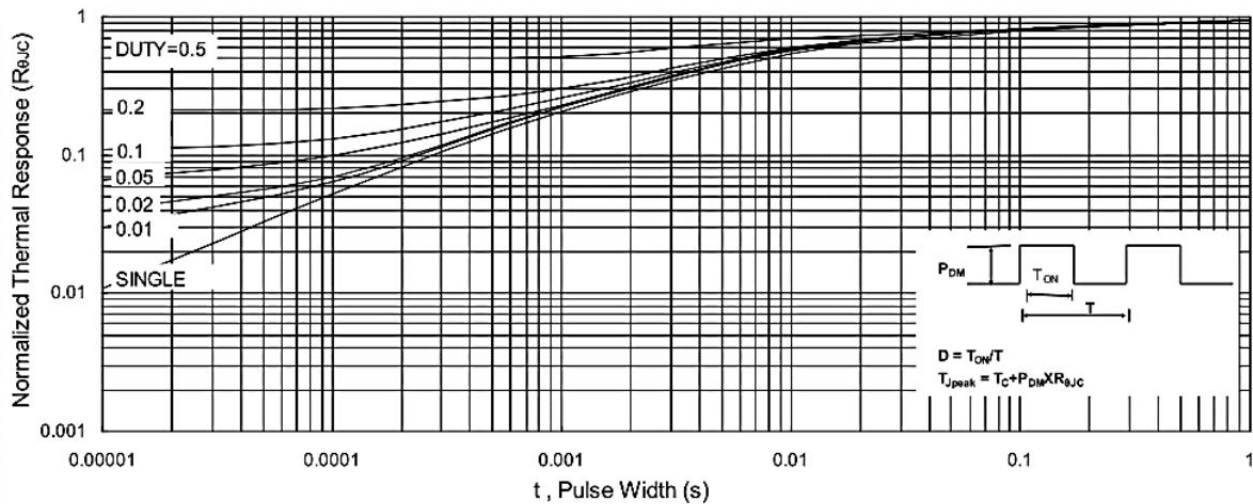


Fig.9 Normalized Maximum Transient Thermal Impedance

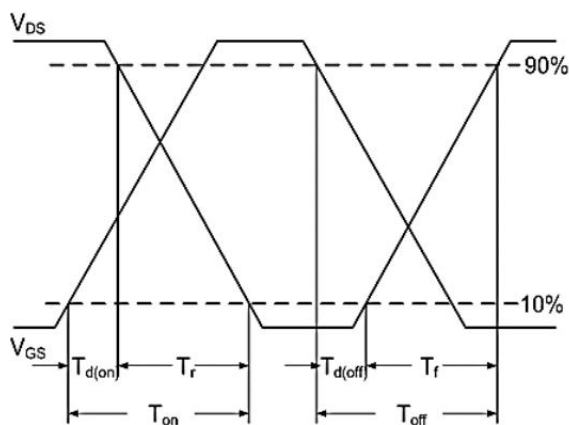


Fig.10 Switching Time Waveform

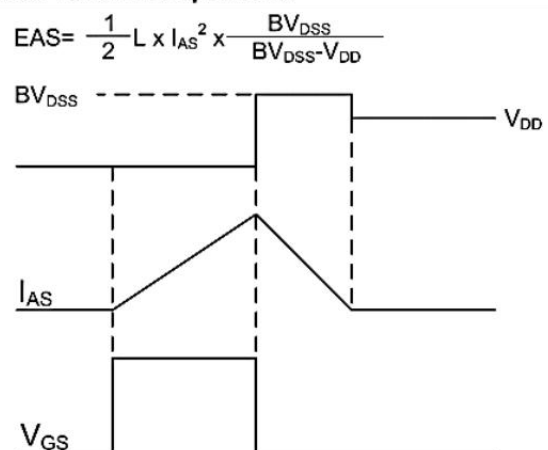
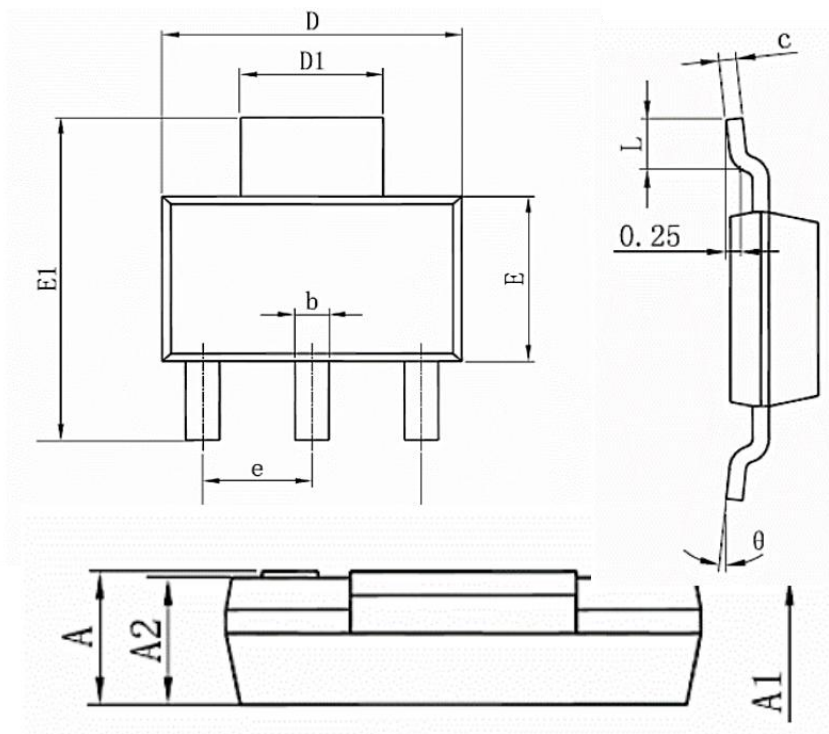


Fig.11 Unclamped Inductive Switching Waveform

**Package Mechanical Data:SOT223-3L**


| Symbol | Dimensions In Millimeters |       | Dimensions In Inches |       |
|--------|---------------------------|-------|----------------------|-------|
|        | Min.                      | Max.  | Min.                 | Max.  |
| A      | 1.52                      | 1.8   | 0.06                 | 0.049 |
| A1     | 0.000                     | 0.100 | 0.000                | 0.004 |
| A2     | 1.5                       | 1.7   | 0.059                | 0.045 |
| b      | 0.66                      | 0.82  | 0.026                | 0.032 |
| c      | 0.25                      | 0.35  | 0.010                | 0.014 |
| D      | 6.2                       | 6.4   | 0.244                | 0.252 |
| D1     | 2.9                       | 3.1   | 0.114                | 0.122 |
| E      | 3.3                       | 3.7   | 0.130                | 0.146 |
| E1     | 6.83                      | 7.07  | 0.269                | 0.278 |
| e      | 2.300(BSC)                |       | 0.037(BSC)           |       |
| e1     | 4.500                     | 4.700 | 0.177                | 0.185 |
| L      | 0.900                     | 1.15  | 0.035                | 0.045 |
| θ      | 0°                        | 10°   | 0°                   | 10°   |

**Package Marking and Ordering Information**

| Product ID | Pack      | Marking | Qty(PCS) |
|------------|-----------|---------|----------|
| TAPING     | SOT223-3L |         | 3000     |