

## Single N-Channel MOSFET

### DESCRIPTION

SMC2300SN is the N-Channel MOSFET, this advanced trench technology to provide excellent  $R_{DS(ON)}$ . This devices are well suited for high efficiency fast switching applications, low in-line power loss are needed in small outline surface mount package.

### PART NUMBER INFORMATION

**SMC 2300 SN - TR G**  
 a      b      c      d      e

- a : Company name.
- b : Product Serial number.
- c : Package code      SN: SOT-23
- d : Handling code      TR: Tape&Reel
- e : Green produce code    G: *RoHS Compliant*

### FEATURES

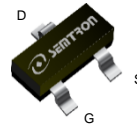
**$V_{DS}=20V, I_D=5.7A$**

$R_{DS(ON)}=22m\Omega(Typ.)@V_{GS}=4.5V$   
 $R_{DS(ON)}=25m\Omega(Typ.)@V_{GS}=2.5V$   
 $R_{DS(ON)}=30m\Omega(Typ.)@V_{GS}=1.8V$

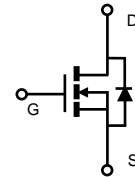
- ◆ Fast switch
- ◆ 1.8V Low gate drive applications
- ◆ High power and current handling capability

### APPLICATIONS

- ◆ Hand-Held Instruments
- ◆ Load Switch



SOT-23



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

| Symbol    | Parameter                         | Rating           | Units      |   |
|-----------|-----------------------------------|------------------|------------|---|
| $V_{DSS}$ | Drain-Source Voltage              | 20               | V          |   |
| $V_{GSS}$ | Gate-Source Voltage               | $\pm 12$         | V          |   |
| $I_D$     | Continuous Drain Current          | $T_A=25^\circ C$ | 5.7        | A |
|           |                                   | $T_A=70^\circ C$ | 4.6        | A |
| $I_{DM}$  | Pulsed Drain Current <sup>B</sup> | 22               | A          |   |
| $P_D$     | Power Dissipation <sup>A</sup>    | $T_A=25^\circ C$ | 1.3        | W |
|           |                                   | $T_A=70^\circ C$ | 0.8        | W |
| $T_J$     | Operation Junction Temperature    | -55/150          | $^\circ C$ |   |
| $T_{STG}$ | Storage Temperature Range         | -55/150          | $^\circ C$ |   |

### THERMAL RESISTANCE

| Symbol          | Parameter  | Typ          | Max | Units        |
|-----------------|--|--------------|-----|--------------|
| $R_{\theta JA}$ | Thermal Resistance Junction to Ambient <sup>A</sup>  | $t \leq 10s$ | 95  | $^\circ C/W$ |
|                 | Thermal Resistance Junction to Ambient <sup>AC</sup> | Steady-State | 130 |              |

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

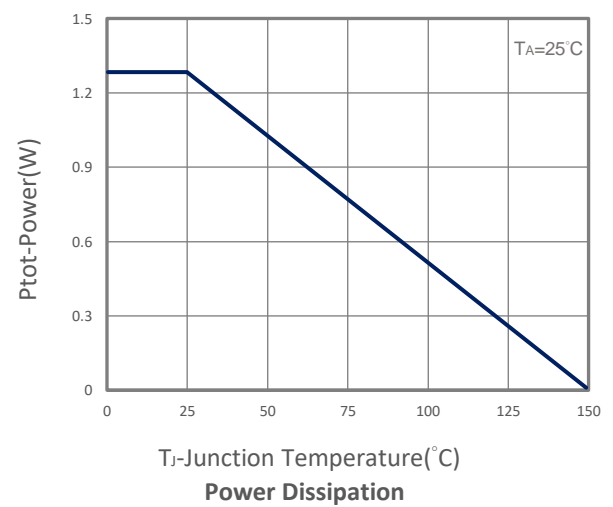
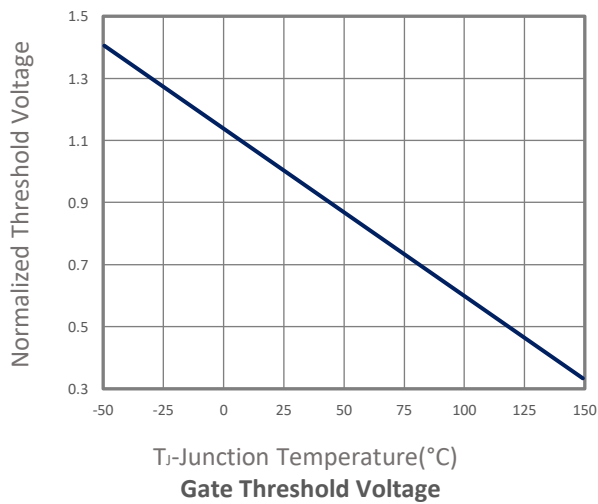
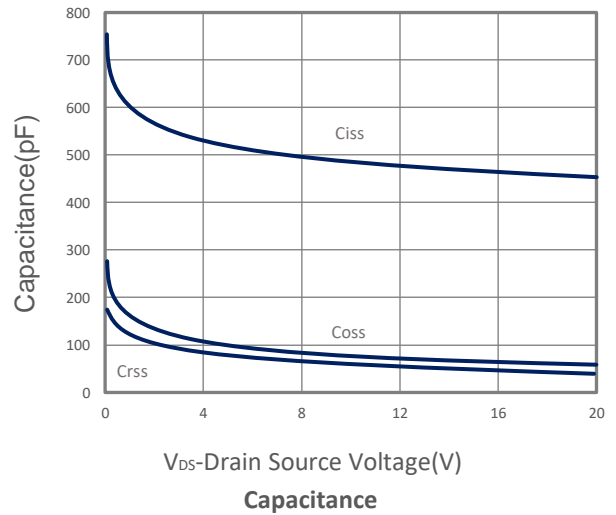
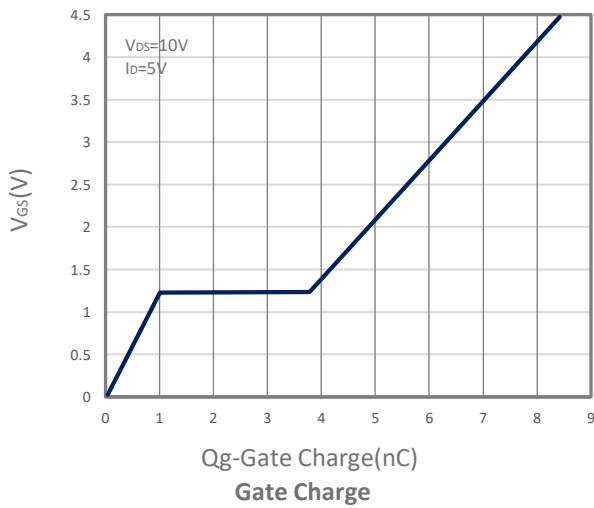
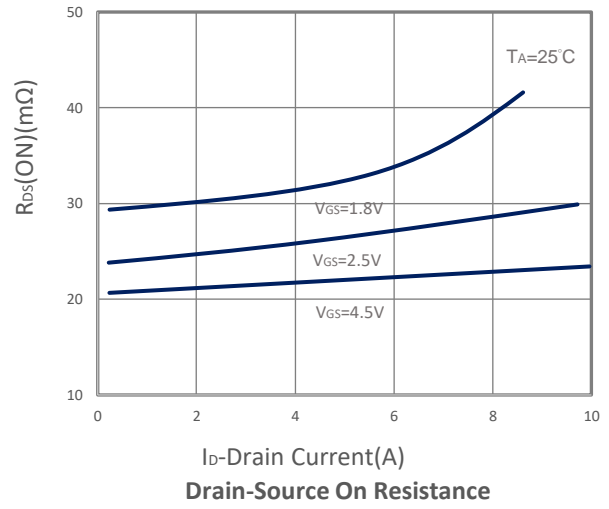
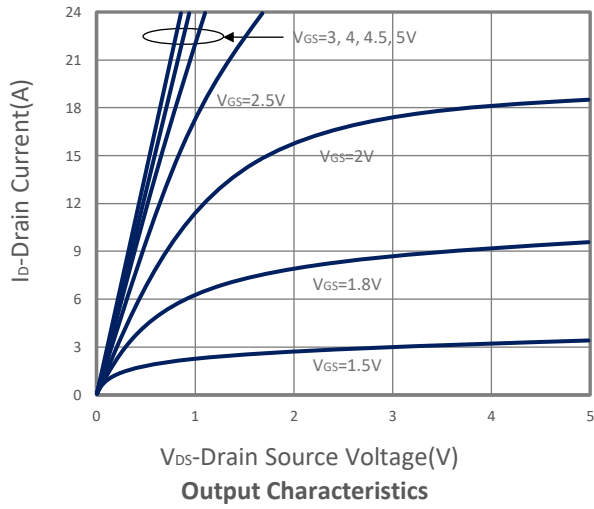
| Symbol  | Parameter                               | Condition   | Min | Typ  | Max       | Unit       |
|---|---|---|-----|------|-----------|------------|
| <b>Static Parameters</b>                            |   |   |     |      |           |            |
| BV <sub>DSS</sub>                                   | Drain-Source Breakdown Voltage          | V <sub>GS</sub> =0V, I <sub>D</sub> =250 $\mu$ A  | 20  |      |           | V          |
| V <sub>GS(th)</sub>                                 | Gate Threshold Voltage                  | V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250 $\mu$ A                                    | 0.4 | 0.7  | 1         | V          |
| I <sub>GSS</sub>                                    | Gate Leakage Current                    | V <sub>DS</sub> =0V, V <sub>GS</sub> = $\pm$ 12V  |     |      | $\pm$ 100 | nA         |
| I <sub>DSS</sub>                                    | Zero Gate Voltage Drain Current         | V <sub>DS</sub> =20V, V <sub>GS</sub> =0V, T <sub>J</sub> =25 $^\circ$ C                          |     |      | 1         | $\mu$ A    |
|   |   | V <sub>DS</sub> =16V, V <sub>GS</sub> =0V, T <sub>J</sub> =75 $^\circ$ C                          |     |      | 10        |            |
| R <sub>DS(ON)</sub>                                 | Drain-source On-Resistance <sup>D</sup> | V <sub>GS</sub> =4.5V, I <sub>D</sub> =5.7A   |     | 22   | 26        | m $\Omega$ |
|   |   | V <sub>GS</sub> =2.5V, I <sub>D</sub> =3A   |     | 25   | 29        |            |
|   |   | V <sub>GS</sub> =1.8V, I <sub>D</sub> =2A   |     | 30   | 38        |            |
| G <sub>fs</sub>                                     | Forward Transconductance                | V <sub>DS</sub> =5V, I <sub>D</sub> =5A   |     | 7    |           | S          |
| <b>Diode Characteristics</b>                        |   |   |     |      |           |            |
| V <sub>SD</sub>                                     | Diode Forward Voltage <sup>D</sup>      | I <sub>S</sub> =1A, V <sub>GS</sub> =0V   |     |      | 1         | V          |
| I <sub>S</sub>                                      | Diode Continuous Forward Current        |   |     |      | 2.9       | A          |
| t <sub>rr</sub>                                     | Reverse Recovery Time                   | I <sub>S</sub> =5A, dI/dt=100A/ $\mu$ s   |     | 8.5  |           | ns         |
| Q <sub>rr</sub>                                     | Reverse Recovery Charge                 |   |     | 2.7  |           | nC         |
| <b>Dynamic and Switching Parameters<sup>E</sup></b> |   |   |     |      |           |            |
| Q <sub>g</sub>                                      | Total Gate Charge                       | V <sub>DS</sub> =10V, V <sub>GS</sub> =4.5V, I <sub>D</sub> =5A                                   |     | 8.4  | 11.8      | nC         |
| Q <sub>gs</sub>                                     | Gate-Source Charge                      |   |     | 1    | 1.4       |            |
| Q <sub>gd</sub>                                     | Gate-Drain Charge                       |   |     | 2.8  | 3.9       |            |
| C <sub>iss</sub>                                    | Input Capacitance                       | V <sub>DS</sub> =10V, V <sub>GS</sub> =0V, f=1MHz   |     | 492  |           | pF         |
| C <sub>oss</sub>                                    | Output Capacitance                      |   |     | 82   |           |            |
| C <sub>rss</sub>                                    | Reverse Transfer Capacitance            |   |     | 70   |           |            |
| R <sub>g</sub>                                      | Gate Resistance                         | V <sub>GS</sub> =0V, V <sub>DS</sub> =0V, F=1MHz  |     | 1.6  |           | $\Omega$   |
| t <sub>d(on)</sub>                                  | Turn-On Time                            | V <sub>DD</sub> =10V, V <sub>GEN</sub> =4.5V<br>R <sub>G</sub> =3.3 $\Omega$ , I <sub>D</sub> =1A |     | 4.7  | 9         | nS         |
| t <sub>r</sub>                                      |   |   |     | 14   | 27        |            |
| t <sub>d(off)</sub>                                 | Turn-Off Time                           |   |     | 23.6 | 45        |            |
| t <sub>f</sub>                                      |   |   |     | 8.5  | 16        |            |

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

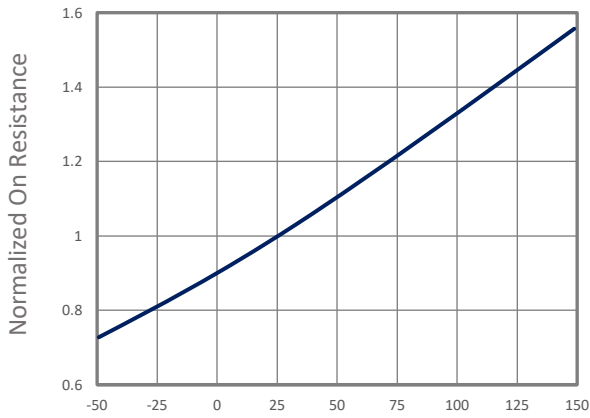
- A. Surface mounted on FR4 board using 1 in<sup>2</sup> pad size.
- B. Pulsed width limited by maximum junction temperature, T<sub>J(MAX)</sub>=150 $^\circ$ C.
- C. Using  $\leq$  10s junction-to-ambient thermal resistance is base on T<sub>J(MAX)</sub>=150 $^\circ$ C.
- D. Pulse test width  $\leq$ 300 $\mu$ s and duty cycle  $\leq$  2%.
- E. Guaranteed by design, not subject to production testing.

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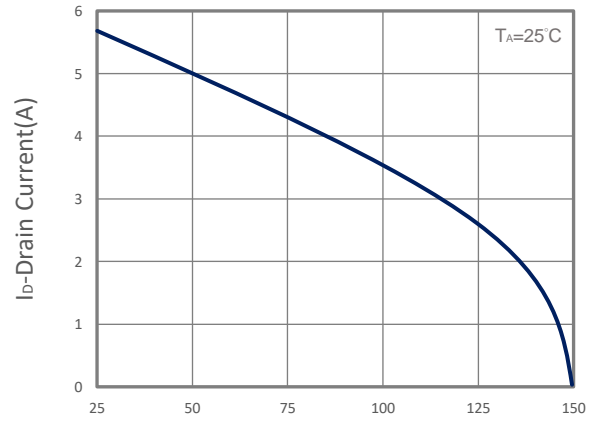
## TYPICAL CHARACTERISTICS



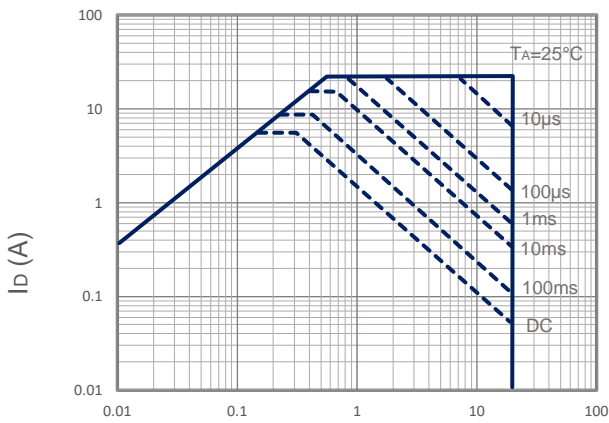
## TYPICAL CHARACTERISTICS



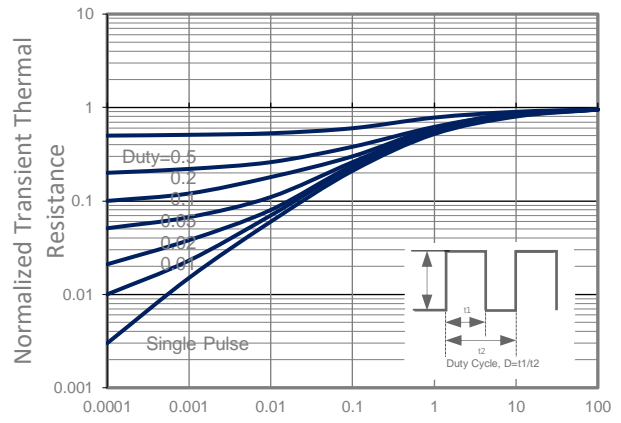
$R_{DS(ON)}$  vs Junction Temperature



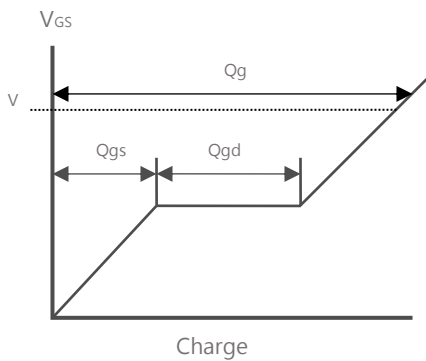
Drain Current vs  $T_j$



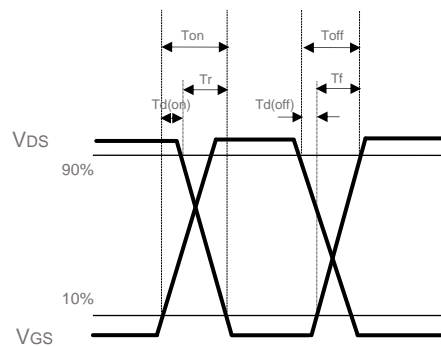
Maximum Safe Operation Area



Thermal Transient Impedance

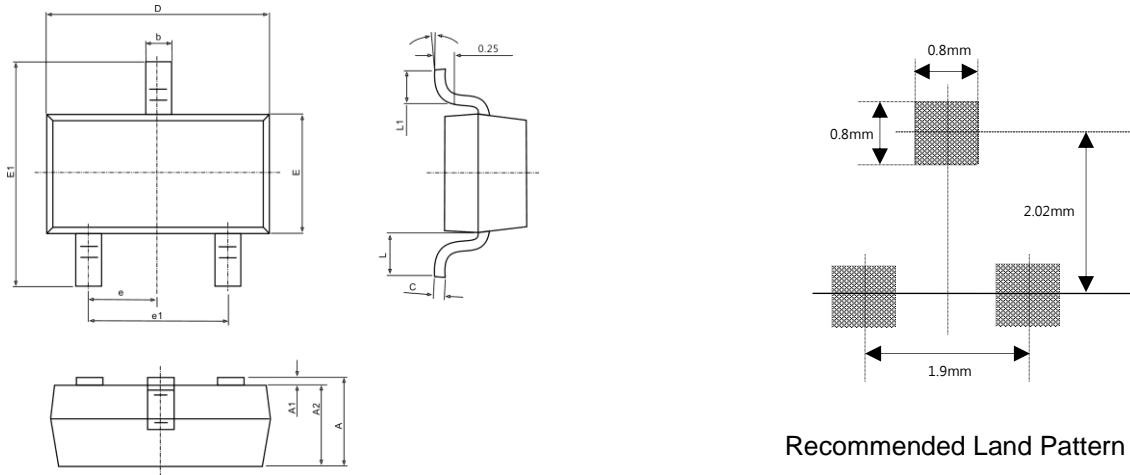


Gate Charge Waveform



Switching Time Waveform

## SOT-23 PACKAGE DIMENSIONS



Recommended Land Pattern

| Symbol   | Dimensions In Millimeters |       | 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        | 0.950 TYP.                |       | 0.037 TYP            |       |
| e1       | 1.800                     | 2.000 | 0.071                | 0.079 |
| L        | 0.550 REF.                |       | 0.022 REF.           |       |
| L1       | 0.300                     | 0.500 | 0.012                | 0.020 |
| $\theta$ | 0°                        | 8°    | 0°                   | 8°    |