

## Single P-Channel MOSFET

### DESCRIPTION

SMC3401AS is the P-Channel enhancement mode power field effect transistors are using trench DMOS technology. This advanced trench technology 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 3401A S - TR G**  
 a      b      c      d      e

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

### FEATURES

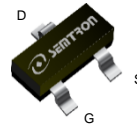
**$V_{DS}=-20V$ ,  $I_D=-4.2A$**

- $R_{DS(ON)}=38m\Omega(Typ.)@V_{GS}=-10V$
- $R_{DS(ON)}=45m\Omega(Typ.)@V_{GS}=-4.5V$
- $R_{DS(ON)}=60m\Omega(Typ.)@V_{GS}=-2.5V$
- $R_{DS(ON)}=80m\Omega(Typ.)@V_{GS}=-1.8V$

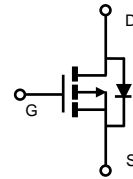
- ◆ Fast switch
- ◆ 1.8V Low gate drive applications
- ◆ High power and current handling capability

### 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 <sup>A</sup> ( $V_{GS}=-4.5V$ ) | $T_A=25^{\circ}C$ | -4.2        | A |
|           |  | $T_A=70^{\circ}C$ | -3.4        | A |
| $I_{DM}$  | Pulsed Drain Current <sup>B</sup>                        | 16.8              | 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<sub>A</sub>=25°C Unless otherwise noted )

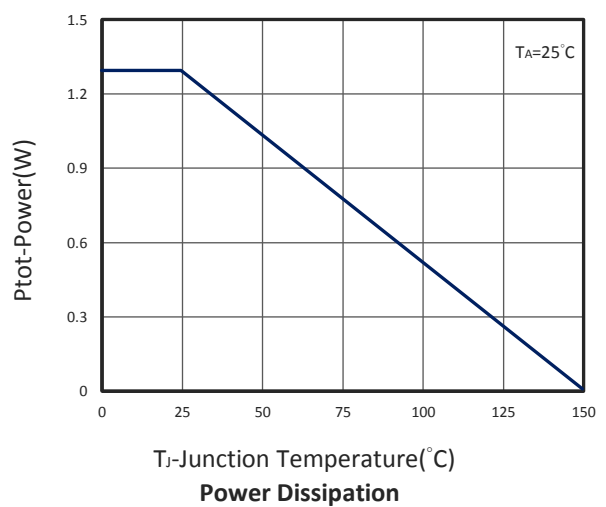
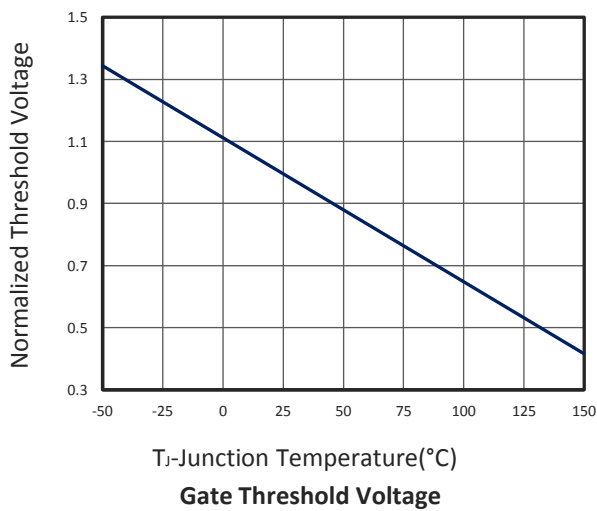
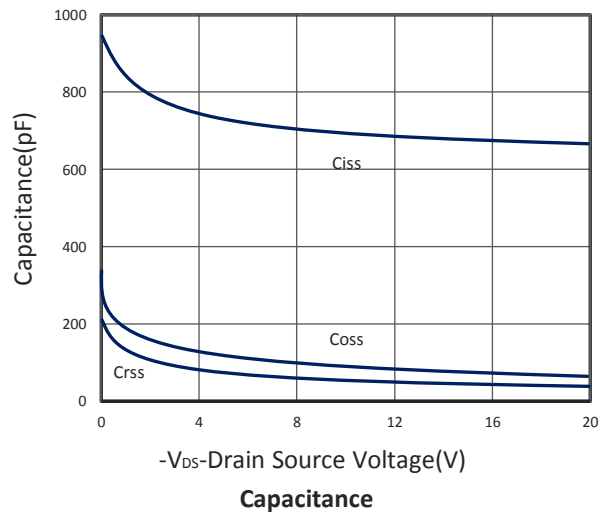
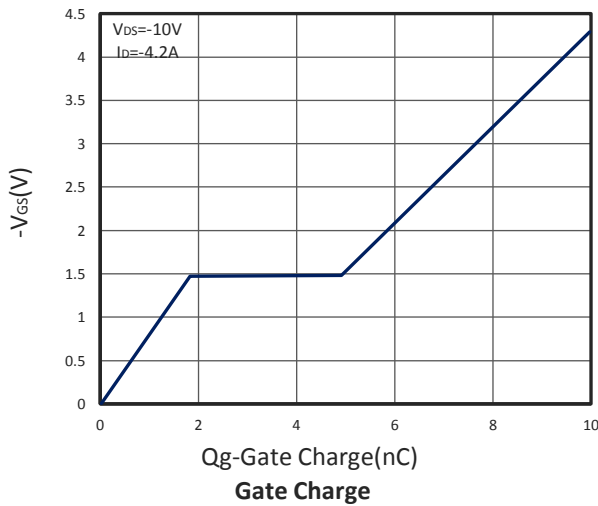
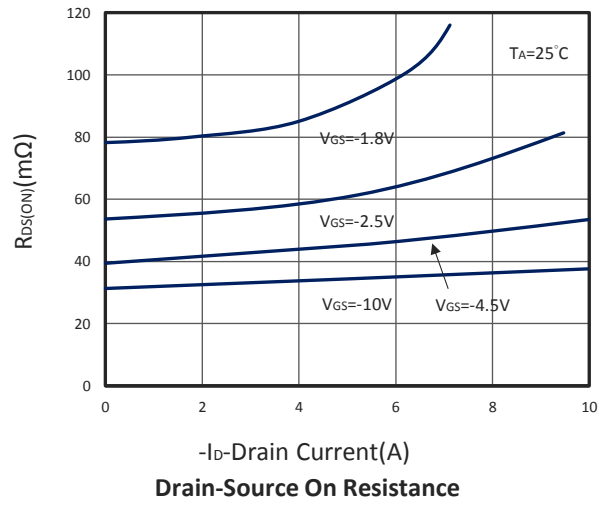
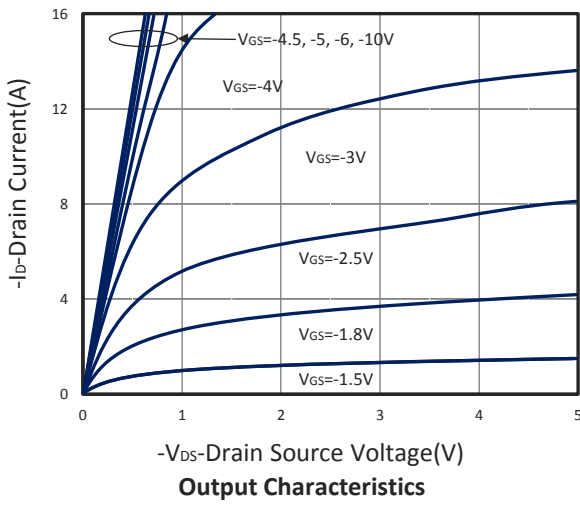
| Symbol   | Parameter                               | Condition   | Min  | Typ  | Max  | Unit |
|--|---|---|------|------|------|------|
| <b>Static Parameters</b>                             |   |   |      |      |      |      |
| BV <sub>DSS</sub>                                    | Drain-Source Breakdown Voltage          | V <sub>GS</sub> =0V, I <sub>D</sub> =-250μA   | -20  |      |      | V    |
| V <sub>GS(th)</sub>                                  | Gate Threshold Voltage                  | V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =-250μA                                   | -0.5 | -0.7 | -1   | V    |
| I <sub>GSS</sub>                                     | Gate Leakage Current                    | V <sub>DS</sub> =0V, V <sub>GS</sub> =±12V  |      |      | ±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°C                            |      |      | -1   | μA   |
|  |   | V <sub>DS</sub> =-16V, V <sub>GS</sub> =0V, T <sub>J</sub> =75°C                            |      |      | -10  |      |
| R <sub>DS(ON)</sub>                                  | Drain-source On-Resistance <sup>D</sup> | V <sub>GS</sub> =-10V, I <sub>D</sub> =-4.5A  |      | 38   | 43   | mΩ   |
|  |   | V <sub>GS</sub> =-4.5V, I <sub>D</sub> =-4.2A   |      | 45   | 50   |      |
|  |   | V <sub>GS</sub> =-2.5V, I <sub>D</sub> =-2.5A   |      | 60   | 68   |      |
|  |   | V <sub>GS</sub> =-1.8V, I <sub>D</sub> =-2A   |      | 80   | 95   |      |
| G <sub>fs</sub>                                      | Forward Transconductance                | V <sub>DS</sub> =-5V, I <sub>D</sub> =-3A   |      | 12   |      | 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        |   |      |      | -2.1 | A    |
| t <sub>rr</sub>                                      | Reverse Recovery Time                   | I <sub>S</sub> =-3A, di/dt=100A/μs  |      | 20   |      | ns   |
| Q <sub>rr</sub>                                      | Reverse Recovery Charge                 |   |      | 6.7  |      | 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<br>I <sub>D</sub> =-4.2A                      |      | 10.3 | 14.4 | nC   |
| Q <sub>gs</sub>                                      | Gate-Source Charge                      |   |      | 1.9  | 2.5  |      |
| Q <sub>gd</sub>                                      | Gate-Drain Charge                       |   |      | 3    | 4.2  |      |
| C <sub>iss</sub>                                     | Input Capacitance                       | V <sub>DS</sub> =-10V, V <sub>GS</sub> =0V, f=1MHz  |      | 680  |      | pF   |
| C <sub>oss</sub>                                     | Output Capacitance                      |   |      | 76   |      |      |
| C <sub>rss</sub>                                     | Reverse Transfer Capacitance            |   |      | 45   |      |      |
| t <sub>d(on)</sub>                                   | Turn-On Time                            | V <sub>DD</sub> =-10V, V <sub>GEN</sub> =-4.5V<br>R <sub>G</sub> =3.3Ω, I <sub>D</sub> =-1A |      | 5.8  | 11   | nS   |
| t <sub>r</sub>                                       |   |   |      | 21   | 40   |      |
| t <sub>d(off)</sub>                                  | Turn-Off Time                           |   |      | 32   | 61   |      |
| t <sub>f</sub>                                       |   |   |      | 16   | 30   |      |

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

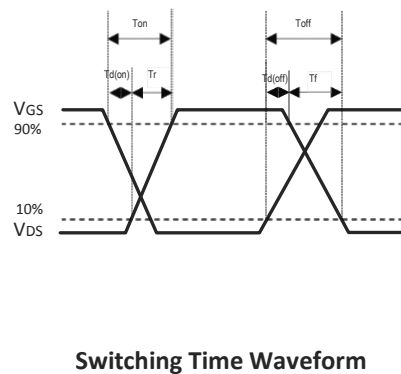
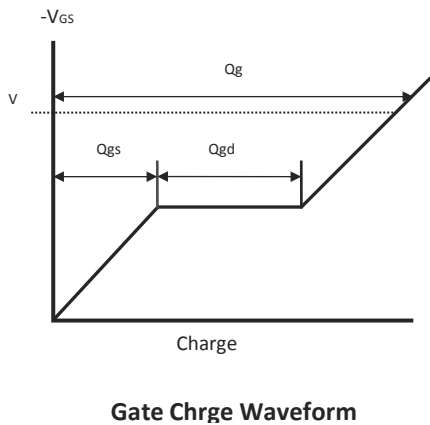
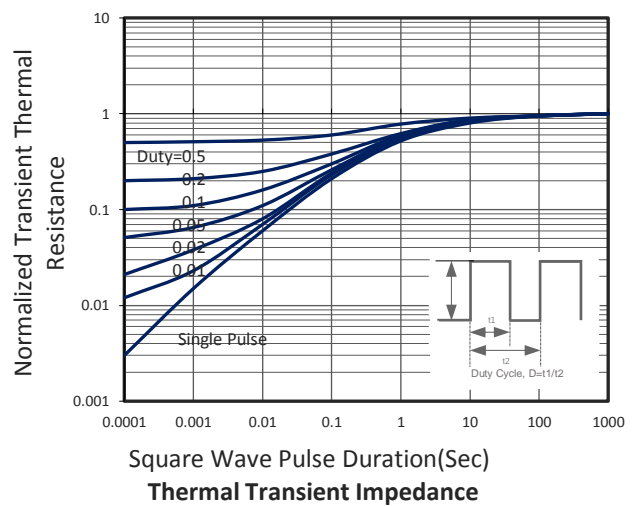
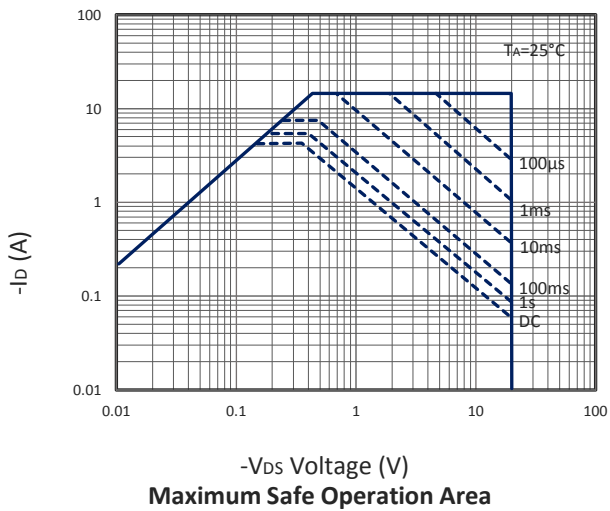
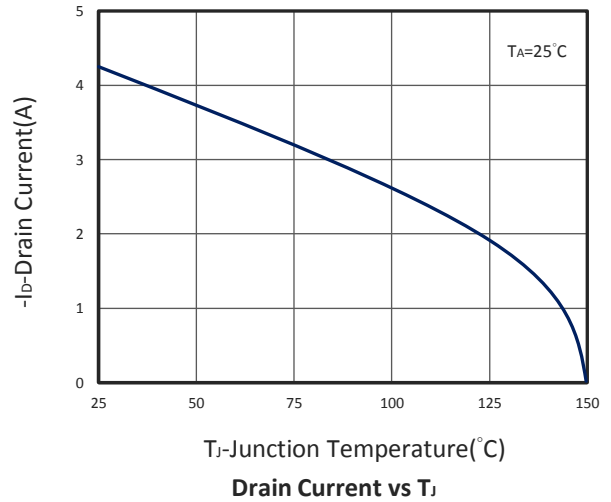
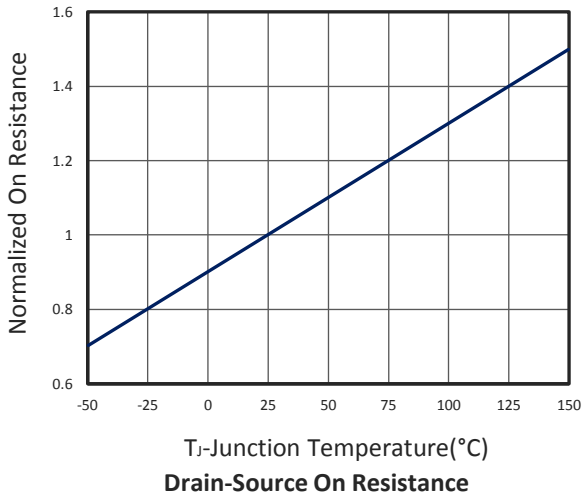
- A. Surface mounted on FR4 board using 1 in<sup>2</sup> pad size.
- B. Pulsed width limited by maximum junction temperature, T<sub>J(MAX)</sub>=150°C (initial temperature T<sub>J</sub>=25°C).
- C. Using ≤ 10s junction-to-ambient thermal resistance is base on T<sub>J(MAX)</sub>=150°C.
- D. Pulse test width ≤300μs and duty cycle ≤ 2%.
- E. Guaranteed by design, not subject to production testing.

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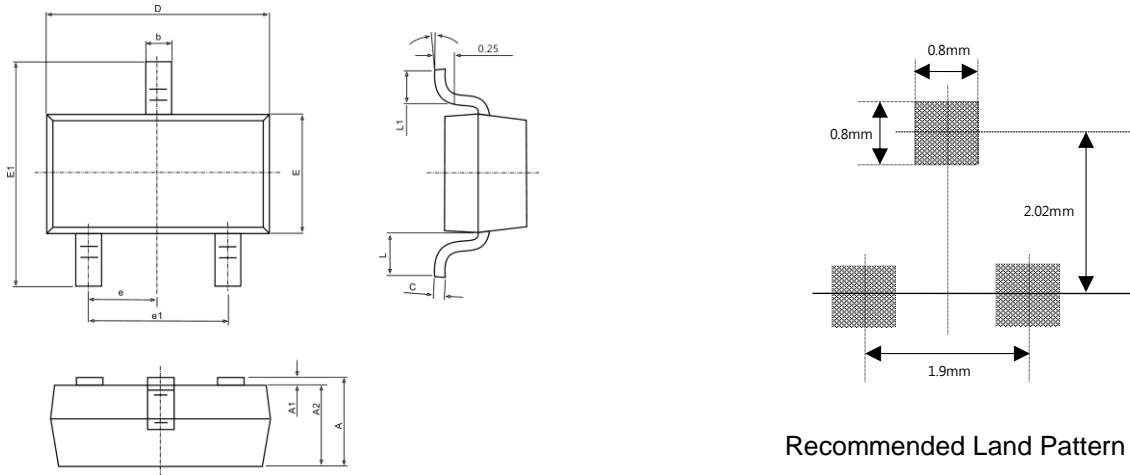
## TYPICAL CHARACTERISTICS



## TYPICAL CHARACTERISTICS



## ■ 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°    |