

## Single P-Channel MOSFET

### DESCRIPTION

SMC3251S is the P-Channel trench technology devices are well suited for high efficiency fast switching applications, low in-line power loss needed in small outline surface mount package.

### PART NUMBER INFORMATION

**SMC 3251 S - TR G**  
 a      b      c      d      e

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

### FEATURES

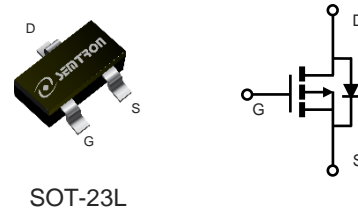
**$V_{DS}=-30V$ ,  $I_D=-4A$**

$R_{DS(ON)}=56m\Omega(Typ.)@V_{GS}=-10V$

$R_{DS(ON)}=78m\Omega(Typ.)@V_{GS}=-4.5V$

### APPLICATIONS

- ◆ Portable Equipment
- ◆ Power Management
- ◆ Load Switch



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

Symbol	Parameter	Rating	Units	
$V_{DSS}$	Drain-Source Voltage	-30	V	
$V_{GSS}$	Gate-Source Voltage	$\pm 20$	V	
$I_D$	Continuous Drain Current <sup>A</sup>	$T_A=25^\circ C$	-4	A
		$T_A=70^\circ C$	-3.2	A
$I_{DM}$	Pulsed Drain Current <sup>B</sup>	-16	A	
$P_D$	Power Dissipation <sup>A</sup>	$T_A=25^\circ C$	1.6	W
		$T_A=70^\circ C$	1	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>	$t \leq 10s$	80	$^\circ C/W$
	Thermal Resistance Junction to Ambient <sup>AC</sup>	Steady-State	120	

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

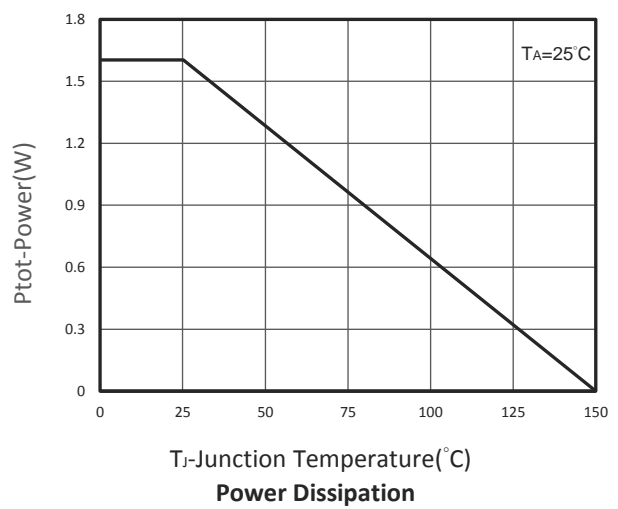
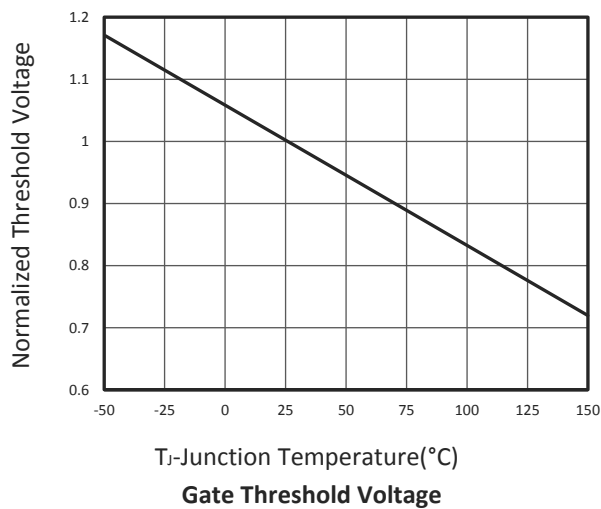
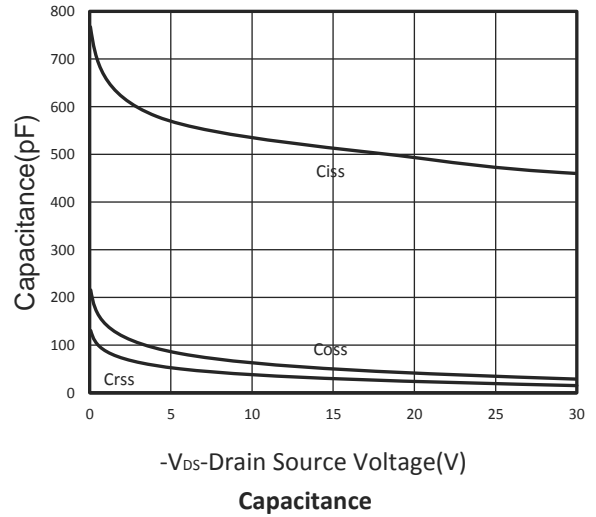
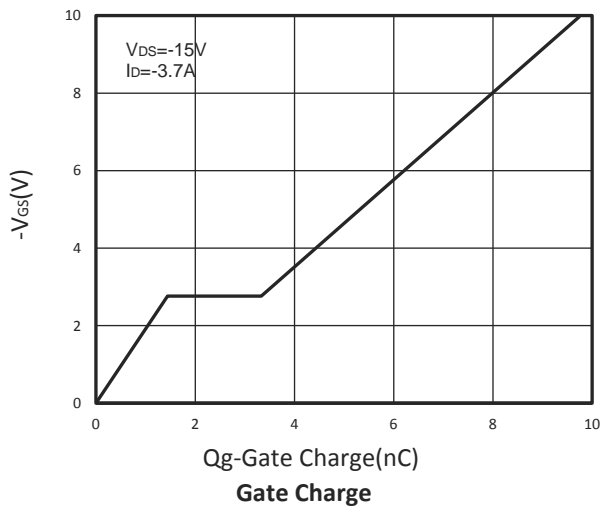
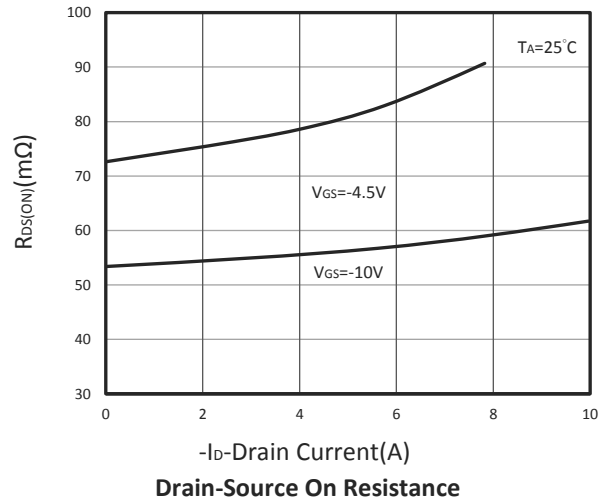
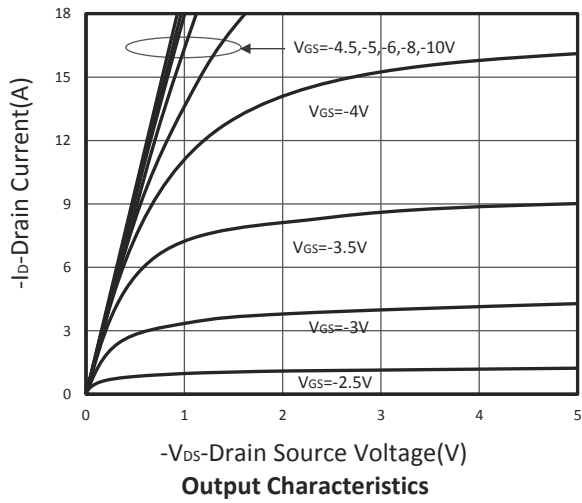
Symbol	Parameter	Condition	Min	Typ	Max	Unit
<b>Static Parameters</b>						
BV <sub>DSS</sub>	Drain-Source Breakdown Voltage	V <sub>GS</sub> =0V, I <sub>D</sub> =-250 $\mu$ A	-30			V
V <sub>GS(th)</sub>	Gate Threshold Voltage	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =-250 $\mu$ A	-1.2	-1.5	-2	V
I <sub>GSS</sub>	Gate Leakage Current	V <sub>DS</sub> =0V, V <sub>GS</sub> = $\pm$ 20V			$\pm$ 100	nA
I <sub>DSS</sub>	Zero Gate Voltage Drain Current	V <sub>DS</sub> =-30V, V <sub>GS</sub> =0V, T <sub>J</sub> =25 $^\circ$ C			-1	$\mu$ A
		V <sub>DS</sub> =-24V, 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> =-10V, I <sub>D</sub> =-4A V <sub>GS</sub> =-4.5V, I <sub>D</sub> =-3A		56 78	65 90	m $\Omega$
G <sub>fs</sub>	Forward Transconductance	V <sub>DS</sub> =-10V, I <sub>D</sub> =-4A		7.1		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		-0.7	-1	V
I <sub>S</sub>	Diode Continuous Forward Current				-4	A
<b>Dynamic and Switching Parameters <sup>E</sup></b>						
Q <sub>g</sub>	Total Gate Charge	V <sub>DS</sub> =-15V, V <sub>GS</sub> =-10V I <sub>D</sub> =-3.7A		9.8	13.8	nC
Q <sub>g</sub>	Total Gate Charge (4.5V)			4.8	5.8	
Q <sub>gs</sub>	Gate-Source Charge			1.7	2	
Q <sub>gd</sub>	Gate-Drain Charge			2	2.8	
C <sub>iss</sub>	Input Capacitance	V <sub>DS</sub> =-15V, V <sub>GS</sub> =0V, f =1MHz		510		pF
C <sub>oss</sub>	Output Capacitance			48		
C <sub>rss</sub>	Reverse Transfer Capacitance			31		
t <sub>d(on)</sub>	Turn-On Time	V <sub>DD</sub> =-15V, V <sub>GEN</sub> =-10V R <sub>G</sub> =3.3 $\Omega$ , I <sub>D</sub> =-1A		3.2	6	nS
t <sub>r</sub>				9.5	18	
t <sub>d(off)</sub>	Turn-Off Time			16	30	
t <sub>f</sub>				5.7	11	

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

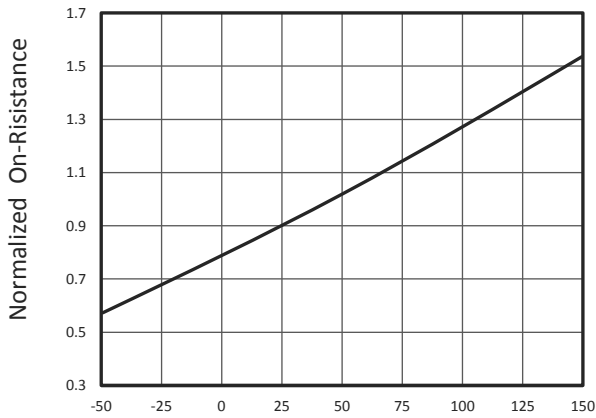
- A. Surface mounted on FR4 board using 1 in<sup>2</sup> pad size.
- B. Pulsed width limited by maximum junction temperature, T<sub>J(MAX)</sub>=150 $^\circ$ C (initial temperature T<sub>J</sub>=25 $^\circ$ C).
- C. Using  $\leq$  10s junction-to-ambient thermal resistance is base on T<sub>J(MAX)</sub>=150 $^\circ$ 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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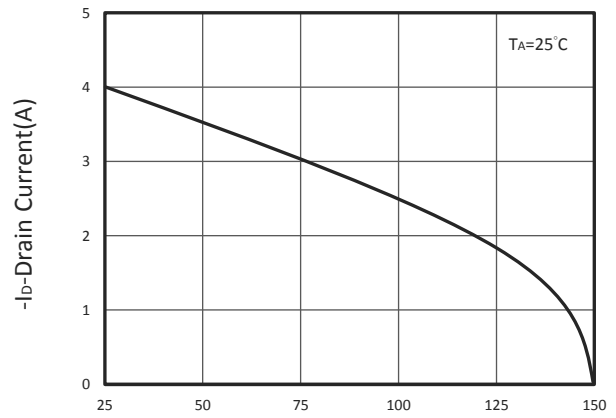
## TYPICAL CHARACTERISTICS



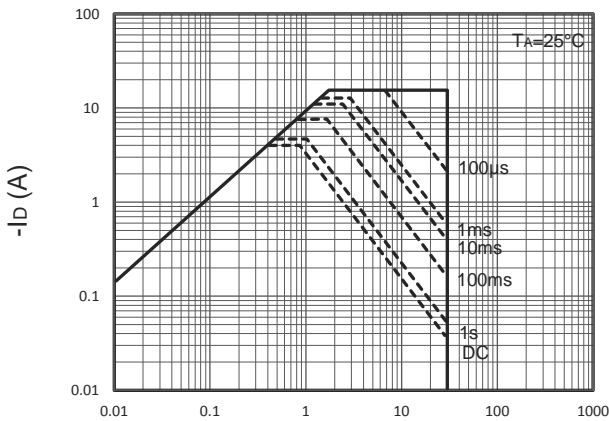
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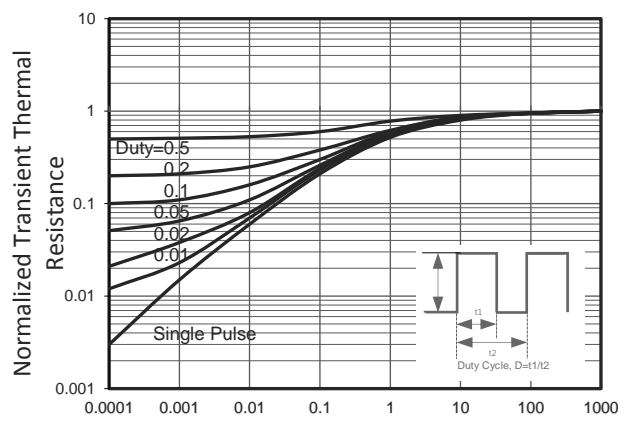
T<sub>J</sub>-Junction Temperature(°C)  
Drain-Source On Resistance



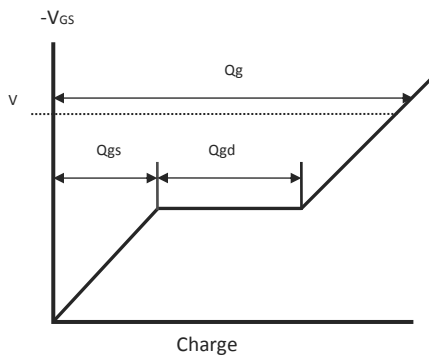
T<sub>J</sub>-Junction Temperature(°C)  
Drain Current vs T<sub>J</sub>



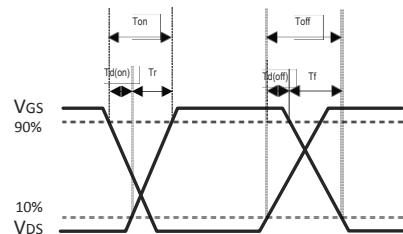
- V<sub>DS</sub> Voltage (V)  
Maximum Safe Operation Area



Square Wave Pulse Duration(Sec)  
Thermal Transient Impedance

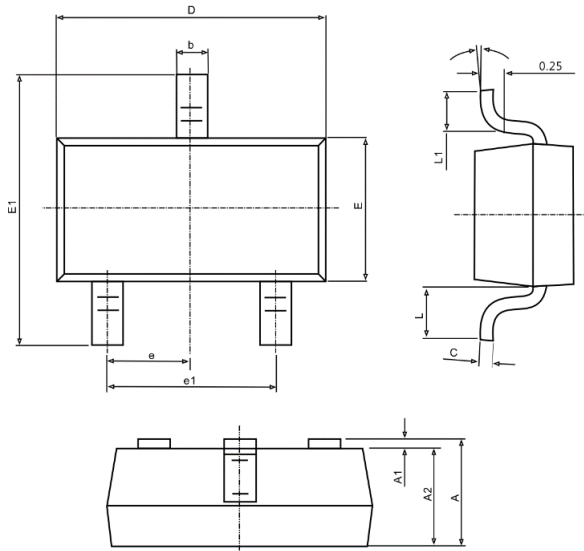


Gate Chrg Waveform

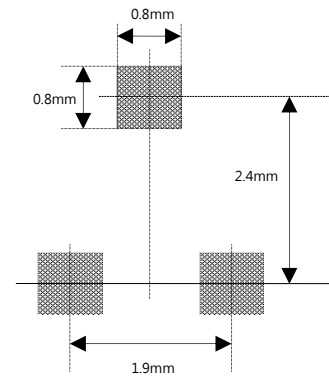


Switching Time Waveform

## ■ SOT-23L PACKAGE DIMENSIONS



Recommended Minimum Pad(mm)



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	1.000	1.300	0.039	0.049
A1	0.000	0.100	0.000	0.004
A2	1.000	1.200	0.039	0.047
b	0.300	0.500	0.012	0.020
c	0.047	0.207	0.002	0.008
D	2.800	3.000	0.110	0.118
E	1.500	1.700	0.059	0.067
E1	2.600	3.000	0.102	0.118
e	0.950 TYP.		0.037 TYP.	
e1	1.900 TYP.		0.075 TYP.	
L1	0.250	0.550	0.010	0.022
θ	0°	8°	0°	8°