

## Single N-Channel MOSFET

### DESCRIPTION

SMC2868ESN used trench technology are well suited for high efficiency fast switching applications, this MOSFET has been designed to minimize the on-state resistance and yet maintain superior switching performance, this devices are well suited for applications in the small surface mount package.

### PART NUMBER INFORMATION

**SMC 2868 E SN - TR G**  
 a b c d e f

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

### FEATURES

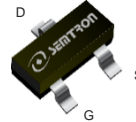
**$V_{DS}=20V, I_D=1A$**

- $R_{DS(ON)}=200m\Omega(Typ.)@V_{GS}=4.5V$
- $R_{DS(ON)}=245m\Omega(Typ.)@V_{GS}=2.5V$
- $R_{DS(ON)}=310m\Omega(Typ.)@V_{GS}=1.8V$
- $R_{DS(ON)}=380m\Omega(Typ.)@V_{GS}=1.5V$
- $R_{DS(ON)}=680m\Omega(Typ.)@V_{GS}=1.2V$

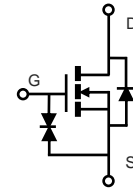
- ◆ High-speed switching, Low On-resistance
- ◆ 1.2V Low gate drive
- ◆ ESD protected

### APPLICATIONS

- ◆ Hand-Held Instruments
- ◆ Switching application



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	$\pm 8$	V	
$I_D$	Continuous Drain Current	$T_A=25^{\circ}C$	1	A
		$T_A=70^{\circ}C$	0.8	A
$I_{DM}$	Pulsed Drain Current <sup>b</sup>	2.5	A	
$P_D$	Power Dissipation <sup>a</sup>	$T_A=25^{\circ}C$	0.42	W
		$T_A=70^{\circ}C$	0.27	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>	$t \leq 10s$	150	$^{\circ}C/W$
	Thermal Resistance Junction to Ambient <sup>AC</sup>	Steady-State	300	$^{\circ}C/W$

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

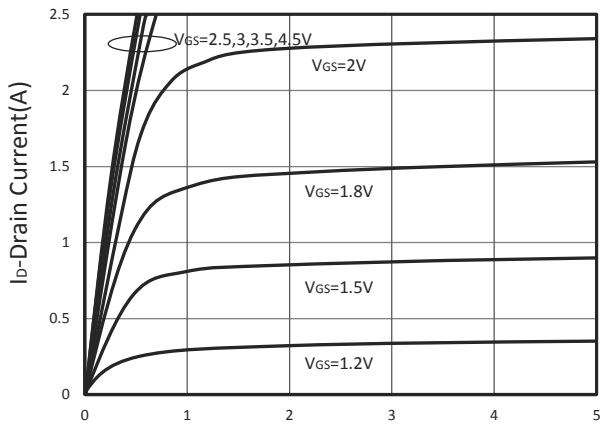
Symbol	Parameter	Condition	Min	Typ	Max	Unit
<b>Static Parameters</b>						
$BV_{DSS}$	Drain-Source Breakdown Voltage	$V_{GS}=0V, I_D=250\mu A$	20			V
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}, I_D=250\mu A$	0.3	0.6	1	V
$I_{GSS}$	Gate Leakage Current	$V_{DS}=0V, V_{GS}=\pm 8V$			$\pm 10$	$\mu A$
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS}=20V, V_{GS}=0V, T_J=25^\circ\text{C}$			1	$\mu A$
		$V_{DS}=12V, V_{GS}=0V, T_J=85^\circ\text{C}$			10	
$R_{DS(on)}$	Drain-source On-Resistance <sup>D</sup>	$V_{GS}=4.5V, I_D=1A$		200	270	m $\Omega$
		$V_{GS}=2.5V, I_D=0.5A$		245	380	
		$V_{GS}=1.8V, I_D=0.3A$		310	500	
		$V_{GS}=1.5V, I_D=0.2A$		380	600	
		$V_{GS}=1.2V, I_D=0.1A$		680	1000	
$G_{fs}$	Forward Transconductance	$V_{DS}=5V, I_D=0.5A$		1.7		S
<b>Diode Characteristics</b>						
$V_{SD}$	Diode Forward Voltage <sup>D</sup>	$I_S=0.2A, V_{GS}=0V$			1	V
$I_S$	Diode Continuous Forward Current				1	A
$t_{rr}$	Reverse Recovery Time	$I_S=0.5A, di/dt=100A/\mu s$		8.8		ns
$Q_{rr}$	Reverse Recovery Charge			0.8		nC
<b>Dynamic and Switching Parameters <sup>E</sup></b>						
$Q_g$	Total Gate Charge	$V_{DS}=10V, V_{GS}=4.5V, I_D=0.5A$		0.97		nC
$Q_{gs}$	Gate-Source Charge			0.28		
$Q_{gd}$	Gate-Drain Charge			0.12		
$C_{iss}$	Input Capacitance	$V_{DS}=10V, V_{GS}=0V, f=1\text{MHz}$		42		pF
$C_{oss}$	Output Capacitance			9		
$C_{rss}$	Reverse Transfer Capacitance			6		
$t_{d(on)}$	Turn-On Time	$V_{DD}=10V, V_{GS}=4.5V$		6	11	nS
$t_r$				3.8	7	
$t_{d(off)}$	Turn-Off Time	$R_G=6\Omega, I_D=0.5A$		14	23	
$t_f$				15	29	

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

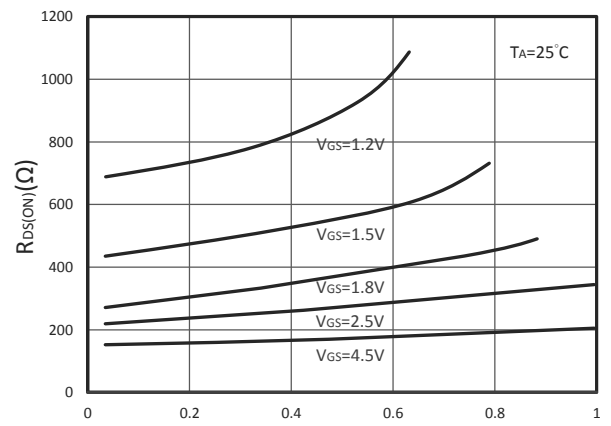
- A. Surface mounted on FR4 board using 1 in<sup>2</sup> pad size.
- B. Pulsed width limited by maximum junction temperature,  $T_{J(MAX)}=150^\circ\text{C}$  (initial temperature  $T_J=25^\circ\text{C}$ ).
- C. Using  $\leq 10\text{s}$  junction-to-ambient thermal resistance is base on  $T_{J(MAX)}=150^\circ\text{C}$ .
- D. Pulse test width  $\leq 300\mu\text{s}$  and duty cycle  $\leq 2\%$ .
- E. Guaranteed by design, not subject to production testing.

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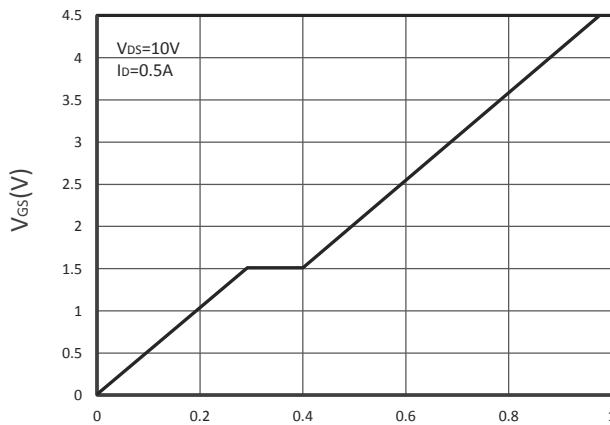
## TYPICAL CHARACTERISTICS



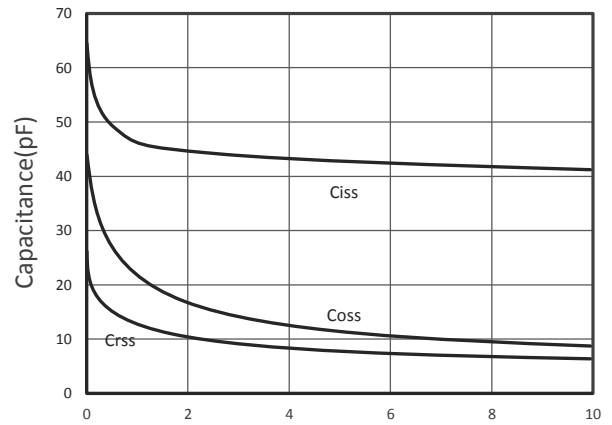
**Output Characteristics**



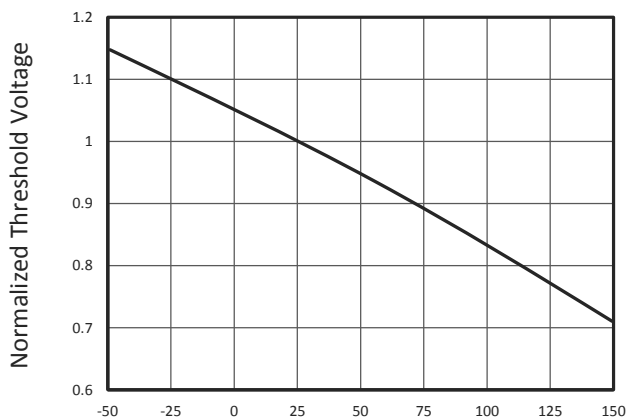
**Drain-Source On Resistance**



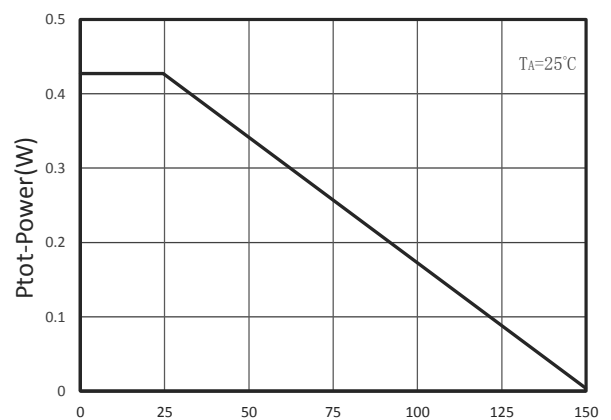
**Gate Charge**



**Capacitance**

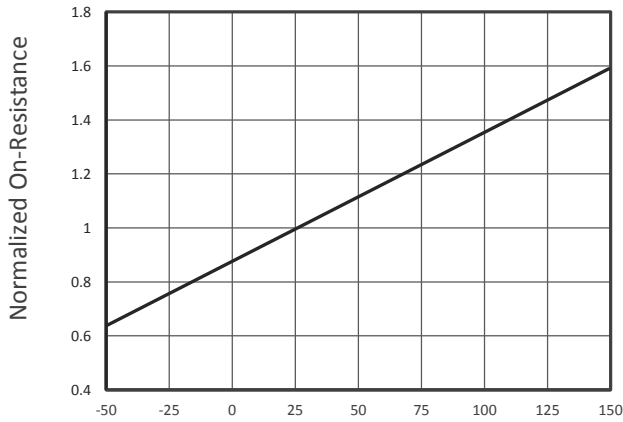


**Gate Threshold Voltage**

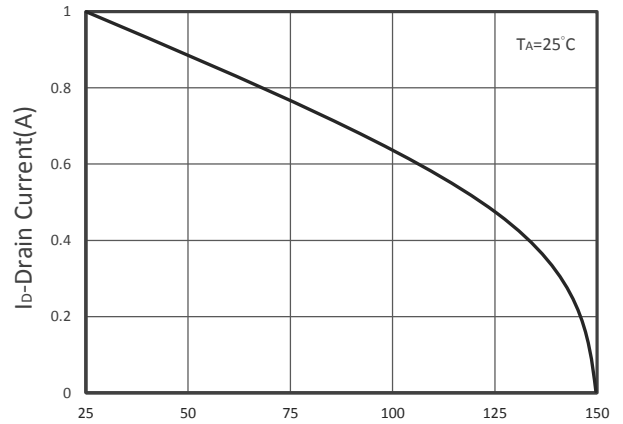


**Power Dissipation**

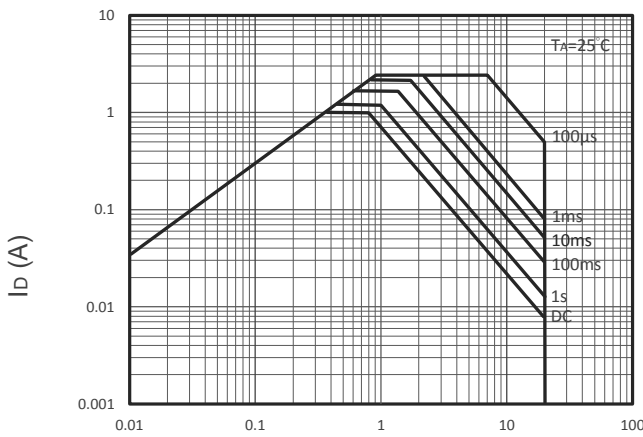
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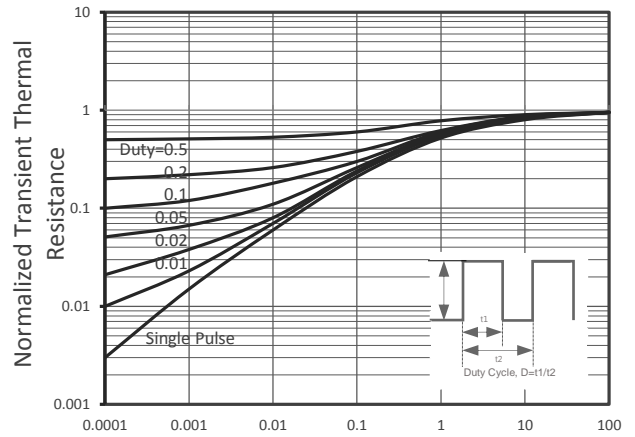
T<sub>J</sub>-Junction Temperature(°C)  
Drain-Source On Resistance



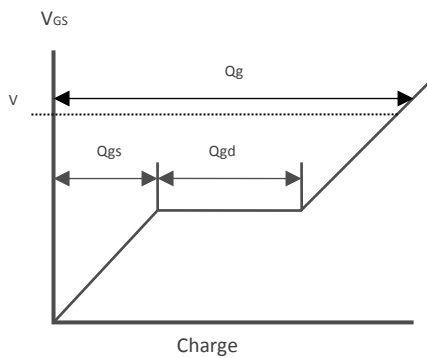
T<sub>J</sub>-Junction Temperature(°C)  
Drain Current vs T<sub>J</sub>



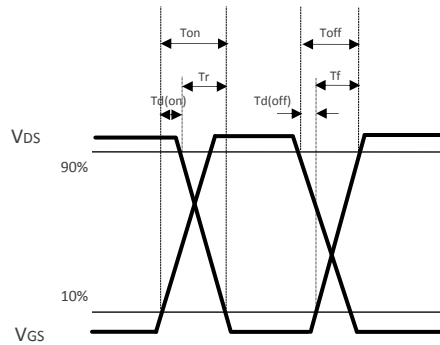
V<sub>DS</sub> Voltage (V)  
Maximum Safe Operation Area



Square Wave Pulse Duration(Sec)  
Thermal Transient Impedance

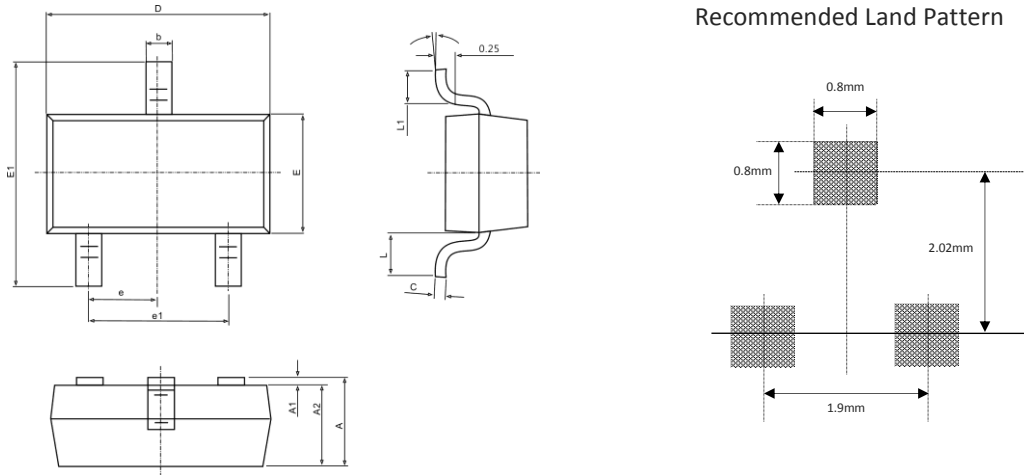


Gate Chrg Waveform



Switching Time Waveform

## ■ SOT-23 PACKAGE DIMENSIONS



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	0.940	1.120	0.037	0.044
A1	0.040	0.120	0.002	0.005
A2	0.900	1.000	0.035	0.039
b	0.300	0.500	0.012	0.020
c	0.090	0.110	0.004	0.004
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 BSC		0.037 BSC	
e1	1.800	2.000	0.071	0.079
L	0.500	0.600	0.020	0.024
L	0.550 BSC		0.022 BSC.	
L1	0.300	0.500	0.012	0.020
θ	1°	7°	1°	7°