

## Single N-Channel MOSFET

### DESCRIPTION

SMC6216SN is the N-Channel enhancement mode power field effect transistors, this advanced technology has been especially tailored to minimize on-state resistance, provide superior switching performance. These devices are well suited for high efficiency fast switching applications.

### PART NUMBER INFORMATION

**SMC 6216 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

**$V_{DS}=60V, I_D=3.8A$**

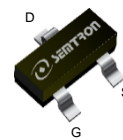
$R_{DS(ON)}=58m\Omega(Typ.)@V_{GS}=10V$

$R_{DS(ON)}=66m\Omega(Typ.)@V_{GS}=4.5V$

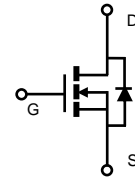
- ◆ Fast switching

### APPLICATIONS

- ◆ Motor drive
- ◆ Power Management
- ◆ LED Lighting



SOT-23



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

Symbol	Parameter	Rating	Units	
$V_{DSS}$	Drain-Source Voltage	60	V	
$V_{GSS}$	Gate-Source Voltage	$\pm 20$	V	
$I_D$	Continuous Drain Current	$T_A=25^\circ C$	3.8	A
		$T_A=70^\circ C$	3	A
$I_{DM}$	Pulsed Drain Current <sup>B</sup>	15.2	A	
$I_{AS}$	Avalanche Current <sup>B</sup>	5	A	
$E_{AS}$	Single Pulse Avalanche energy $L=0.3mH$ <sup>B</sup>	3.75	mJ	
$P_D$	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	130	

## ELECTRICAL CHARACTERISTICS (T<sub>A</sub>=25°C Unless otherwise noted )

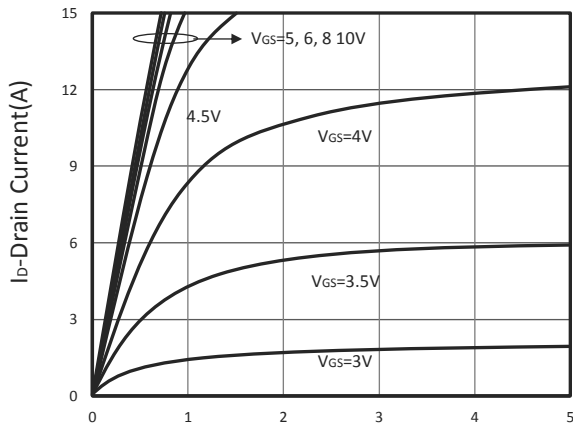
Symbol	Parameter	Condition	Min	Typ	Max	Unit
<b>Static Parameters</b>						
BV <sub>DSS</sub>	Drain-Source Breakdown Voltage	V <sub>GS</sub> =0V, I <sub>D</sub> =250μA	60			V
V <sub>GS(th)</sub>	Gate Threshold Voltage	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250μA	1.2	1.8	2.5	V
I <sub>GSS</sub>	Gate Leakage Current	V <sub>DS</sub> =0V, V <sub>GS</sub> =±20V			±100	nA
I <sub>DSS</sub>	Zero Gate Voltage Drain Current	V <sub>DS</sub> =60V, V <sub>GS</sub> =0V, T <sub>J</sub> =25°C			1	μA
		V <sub>DS</sub> =48V, 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> =3.8A V <sub>GS</sub> =4.5V, I <sub>D</sub> =3.1A		58 66	64 76	mΩ
G <sub>fs</sub>	Forward Transconductance	V <sub>DS</sub> =10V, I <sub>D</sub> =3.5A		6.8		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				1.9	A
t <sub>rr</sub>	Reverse Recovery Time	I <sub>S</sub> =1A, di/dt=100A/μs		22.8		ns
Q <sub>rr</sub>	Reverse Recovery Charge	T <sub>J</sub> =25°C		13.6		nC
<b>Dynamic and Switching Parameters<sup>E</sup></b>						
Q <sub>g</sub>	Total Gate Charge	V <sub>DS</sub> =30V, V <sub>GS</sub> =10V, I <sub>D</sub> =3.5A		9.2	13.8	nC
Q <sub>g</sub>	Total Gate Charge (4.5V)			4.5	6.8	
Q <sub>gs</sub>	Gate-Source Charge			2.3	3.5	
Q <sub>gd</sub>	Gate-Drain Charge			1.8	2.7	
C <sub>iss</sub>	Input Capacitance	V <sub>DS</sub> =30V, V <sub>GS</sub> =0V, f=1MHz		495		pF
C <sub>oss</sub>	Output Capacitance			43		
C <sub>rss</sub>	Reverse Transfer Capacitance			15		
R <sub>g</sub>	Gate Resistance	V <sub>GS</sub> =0V, V <sub>DS</sub> =0V, f=1MHz		2		Ω
t <sub>d(on)</sub>	Turn-On Time	V <sub>DD</sub> =30V, V <sub>GEN</sub> =10V R <sub>G</sub> =3.3Ω, I <sub>D</sub> =1A		3.1	9	nS
t <sub>r</sub>				9.2	18	
t <sub>d(off)</sub>	Turn-Off Time			17.5	35	
t <sub>f</sub>				5.5	10	

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

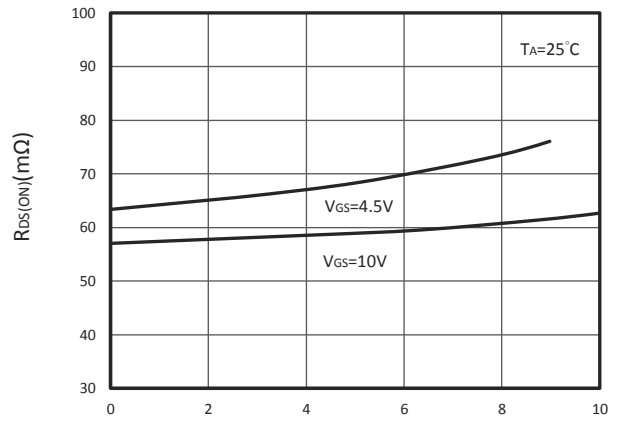
- A. Surface mounted on FR4 board using 1 in<sup>2</sup> pad size.
- B. Pulsed width limited by maximum junction temperature, T<sub>J(MAX)</sub>=150°C (initial temperature T<sub>J</sub>=25°C).
- C. Using ≤ 10s junction-to-ambient thermal resistance is base on T<sub>J(MAX)</sub>=150°C.
- D. Pulse test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

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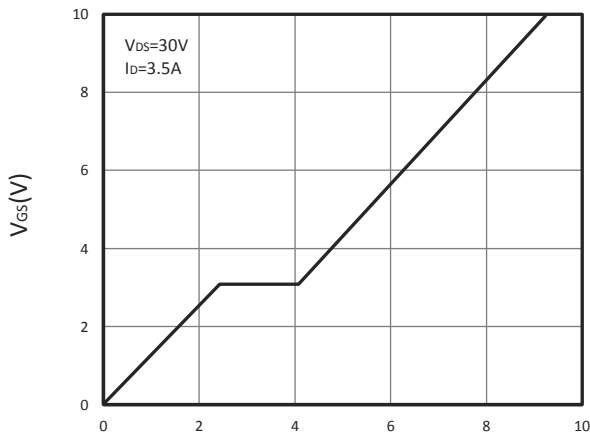
## TYPICAL CHARACTERISTICS



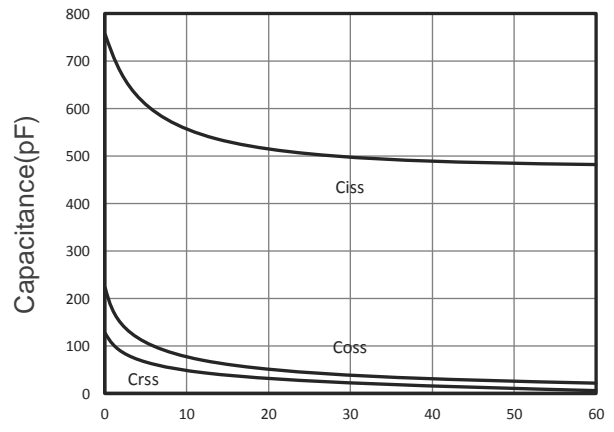
**Output Characteristics**



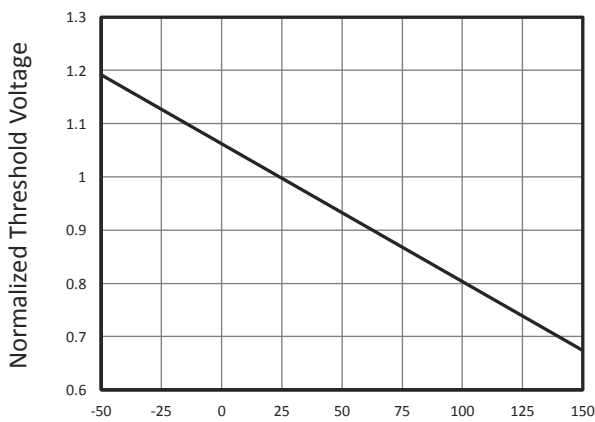
**Drain-Source On Resistance**



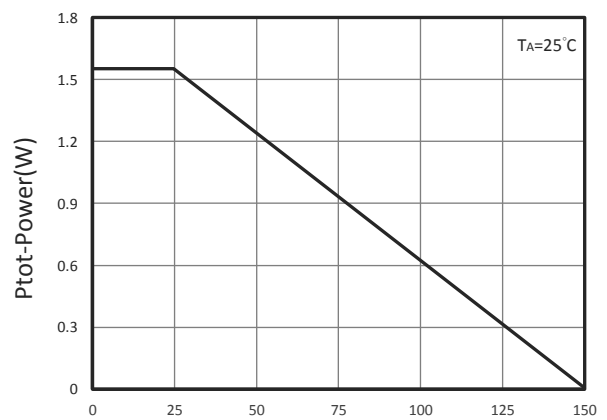
**Gate Charge**



**Capacitance**

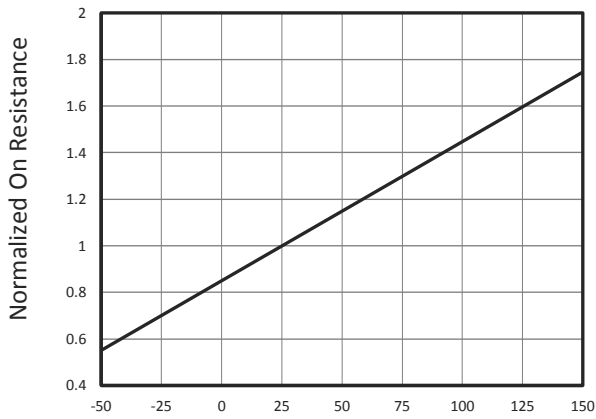


**Gate Threshold Voltage**

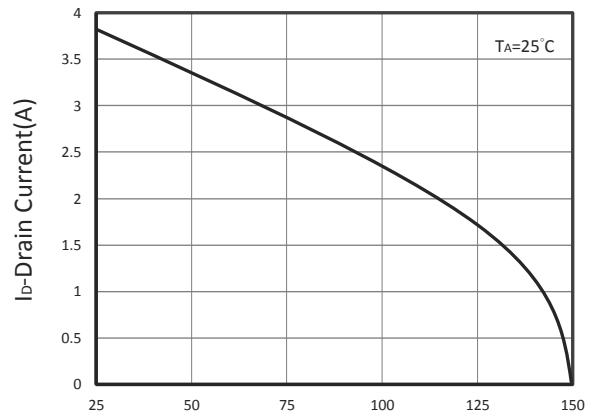


**Power Dissipation**

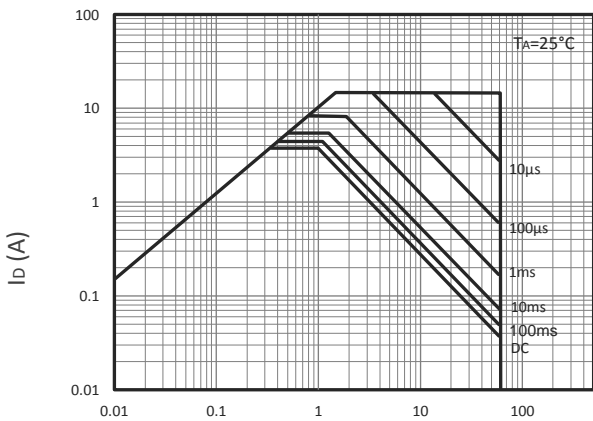
## TYPICAL CHARACTERISTICS



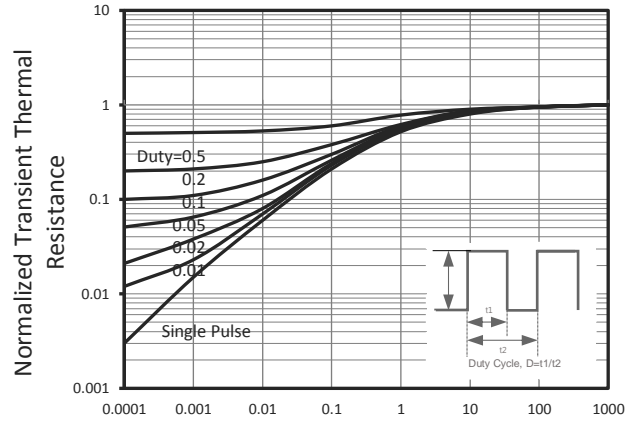
T<sub>J</sub>-Junction Temperature(°C)  
Drain-Source On Resistance



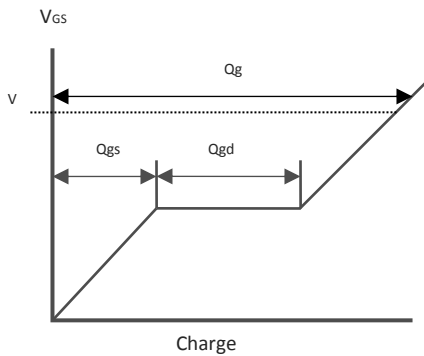
T<sub>J</sub>-Junction Temperature(°C)  
Drain Current vs T<sub>J</sub>



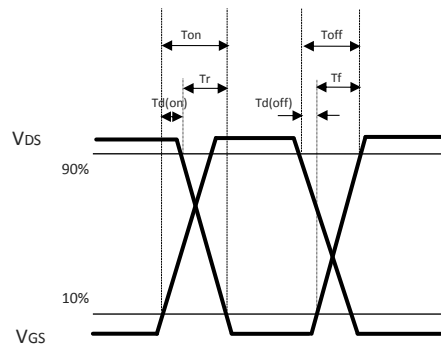
V<sub>DS</sub> Voltage (V)  
Maximum Safe Operation Area



Square Wave Pulse Duration(Sec)  
Thermal Transient Impedance

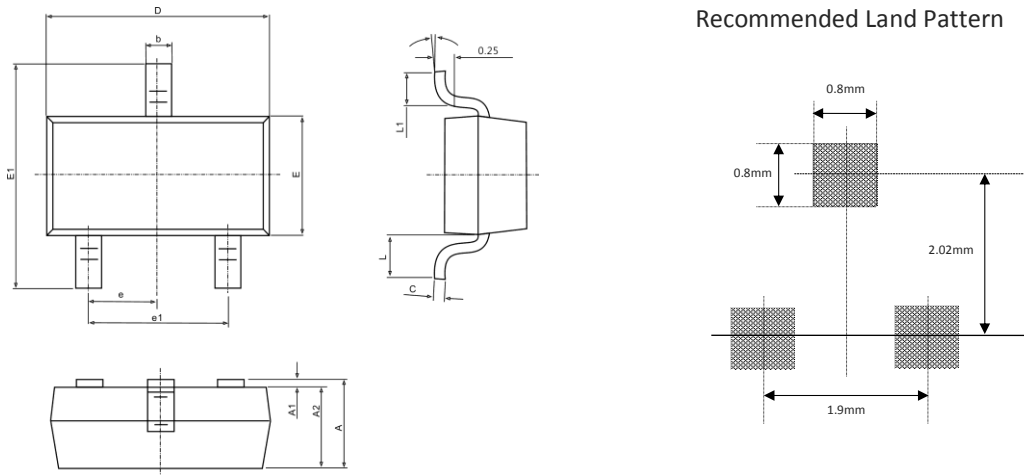


Gate Chrg Waveform



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°