

## Single P-Channel MOSFET

### DESCRIPTION

SMC3415ES 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 needed in small outline surface mount package.

### PART NUMBER INFORMATION

**SMC 3415 ES - TR G**  
 a      b      c d      e f

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

### FEATURES

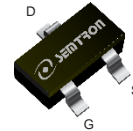
**$V_{DS} = -20V$ ,  $I_D = -5.3A$**

- $R_{DS(ON)}=31m\Omega(Typ.)@V_{GS}=-4.5V$
- $R_{DS(ON)}=40m\Omega(Typ.)@V_{GS}=-2.5V$
- $R_{DS(ON)}=50m\Omega(Typ.)@V_{GS}=-1.8V$
- $R_{DS(ON)}=60m\Omega(Typ.)@V_{GS}=-1.5V$

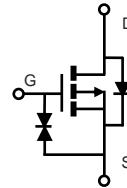
- ◆ ESD protected
- ◆ 1.5V Low gate drive applications

### APPLICATIONS

- ◆ Portable Equipment
- ◆ Power Management



SOT-23L



### 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	$T_A=25^\circ C$	-5.3	A
		$T_A=70^\circ C$	-4.2	A
$I_{DM}$	Pulsed Drain Current <sup>A</sup>	-21.2	A	
$P_D$	Power Dissipation <sup>B</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>B</sup>	$t \leq 10s$	80	$^\circ C/W$
	Thermal Resistance Junction to Ambient <sup>BC</sup>	Steady-State	120	

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

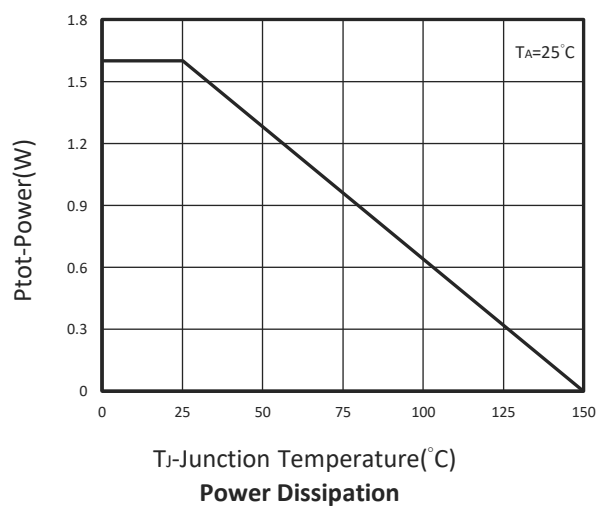
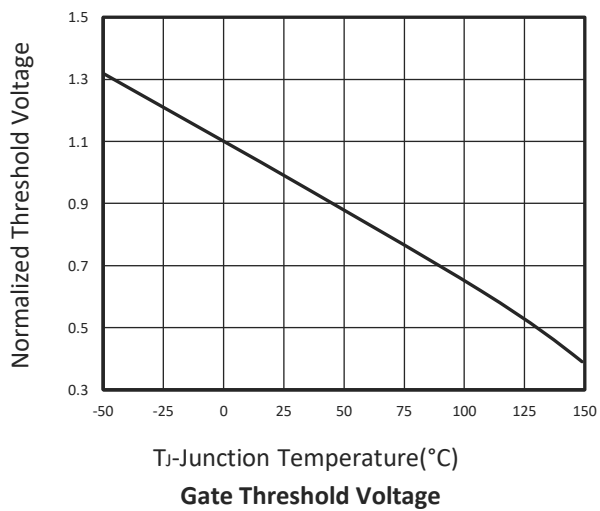
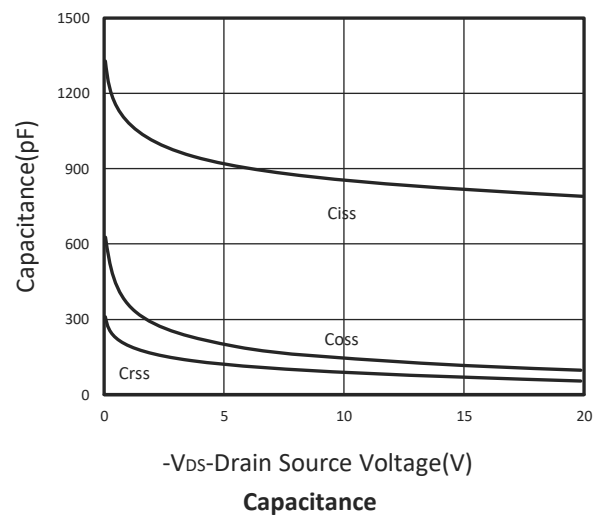
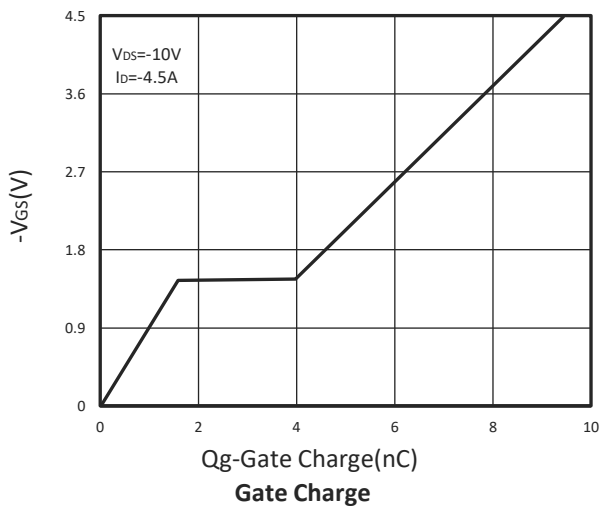
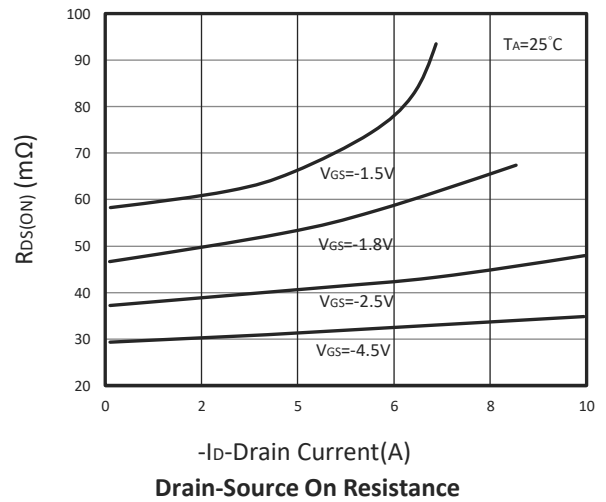
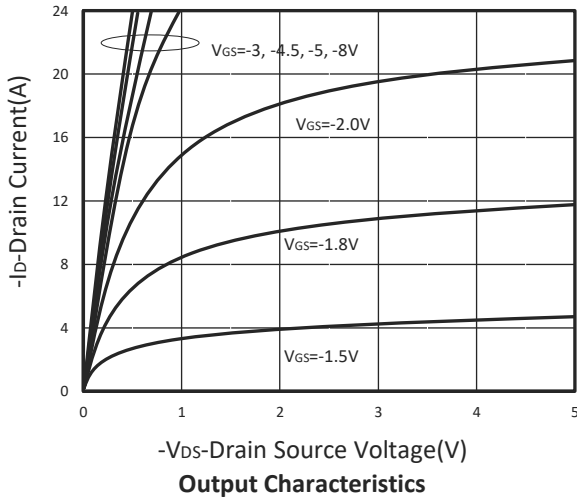
Symbol	Parameter	Condition	Min	Typ	Max	Unit
<b>Static Parameters</b>						
BV <sub>DSS</sub>	Drain-Source Breakdown Voltage	V <sub>GS</sub> =0V, I <sub>D</sub> =-250 $\mu$ A	-20			V
V <sub>GS(th)</sub>	Gate Threshold Voltage	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =-250 $\mu$ A	-0.3	-0.5	-1	V
I <sub>GSS</sub>	Gate Leakage Current	V <sub>DS</sub> =0V, V <sub>GS</sub> = $\pm$ 8V			$\pm$ 10	$\mu$ A
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	V <sub>GS</sub> =-4.5V, I <sub>D</sub> =-5.3A		31	35	m $\Omega$
		V <sub>GS</sub> =-2.5V, I <sub>D</sub> =-4A		40	45	
		V <sub>GS</sub> =-1.8V, I <sub>D</sub> =-2A		50	57	
		V <sub>GS</sub> =-1.5V, I <sub>D</sub> =-1.2A		60	70	
G <sub>fs</sub>	Forward Transconductance	V <sub>DS</sub> =-10V, I <sub>D</sub> =-4.5A		16		S
<b>Diode Characteristics</b>						
V <sub>SD</sub>	Diode Forward Voltage	I <sub>S</sub> =-1A, V <sub>GS</sub> =0V		-0.7	-1	V
I <sub>S</sub>	Diode Continuous Current				-2.7	A
<b>Dynamic and Switching Parameters</b>						
Q <sub>g</sub>	Total Gate Charge	V <sub>DS</sub> =-10V, V <sub>GS</sub> =-4.5V, I <sub>D</sub> =-4.5A		9.3	13	nC
Q <sub>gs</sub>	Gate-Source Charge			1.5	2.1	
Q <sub>gd</sub>	Gate-Drain Charge			2.5	3.5	
C <sub>iss</sub>	Input Capacitance	V <sub>DS</sub> =-10V, V <sub>GS</sub> =0V, f=1MHz		825		pF
C <sub>oss</sub>	Output Capacitance			120		
C <sub>rss</sub>	Reverse Transfer Capacitance			82		
t <sub>d(on)</sub>	Turn-On Time	V <sub>DD</sub> =-10V, V <sub>GEN</sub> =-4.5V R <sub>G</sub> =3.3 $\Omega$ , I <sub>D</sub> =-1A		10.2	19	nS
t <sub>r</sub>				18	34	
t <sub>d(off)</sub>	Turn-Off Time			46	87	
t <sub>f</sub>				14	27	

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

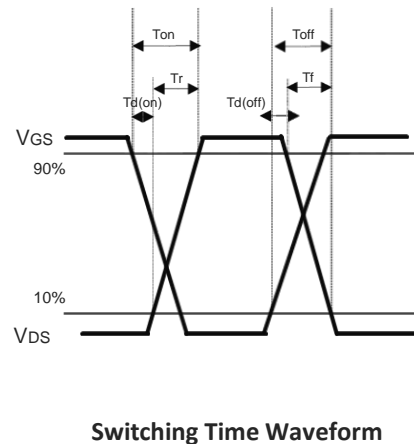
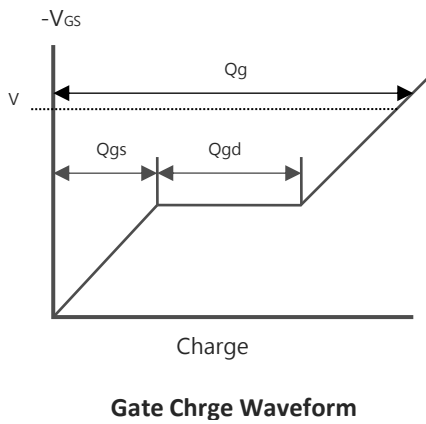
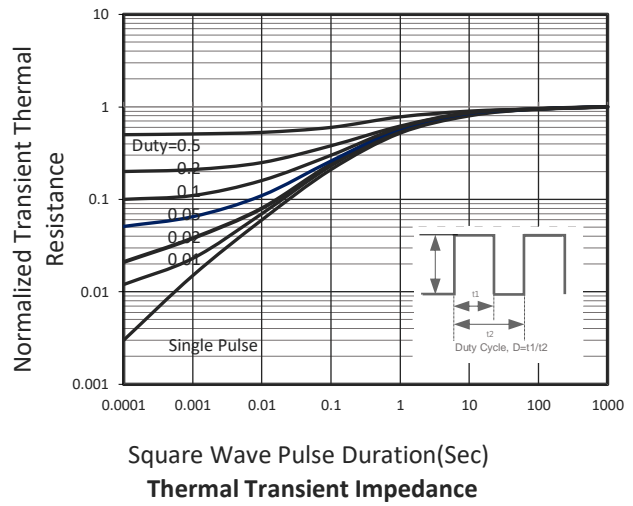
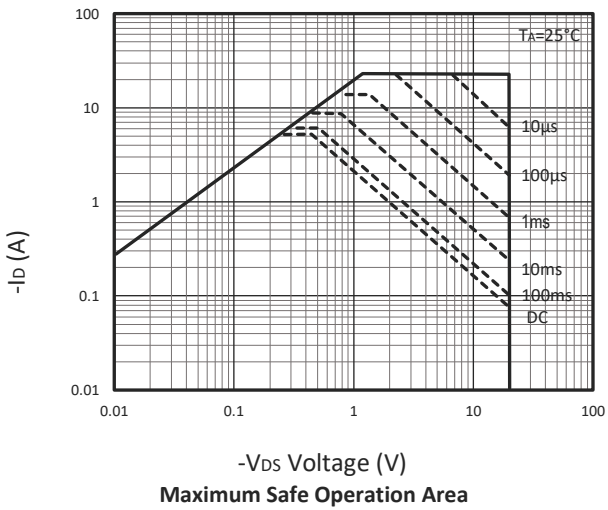
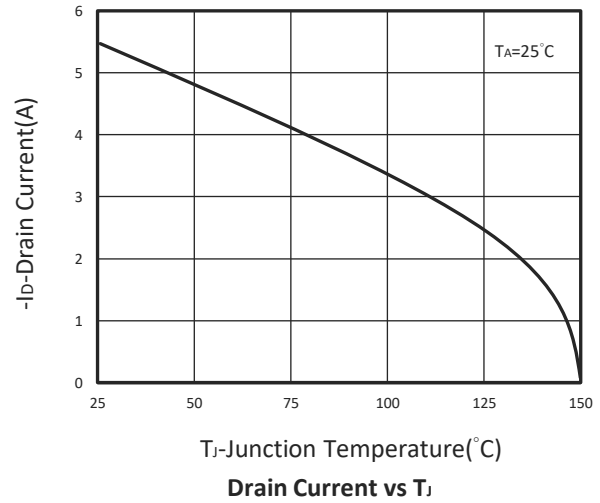
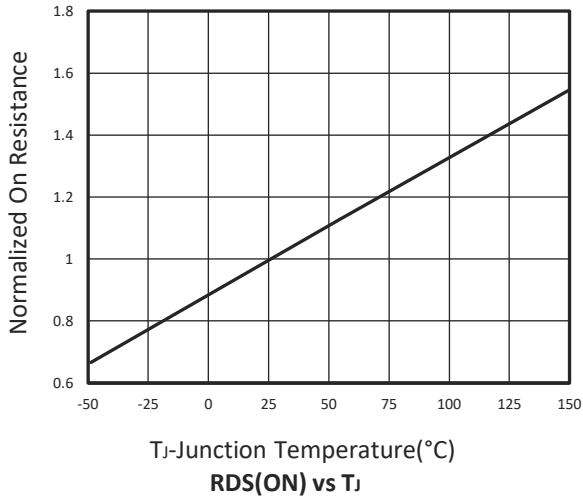
- A. Pulsed width limited by maximum junction temperature, T<sub>J(MAX)</sub>=150 $^\circ$ C.
- B. The value of R $\theta$ JA is measured with the device mounted on 1in2 FR-4 board in a still air environment with maximum junction temperature T<sub>J(MAX)</sub>=150 $^\circ$ C (initial temperature T<sub>A</sub>=25 $^\circ$ C).
- C. T<sub>J(MAX)</sub>=150 $^\circ$ C, using junction-to-case thermal resistance (R $\theta$ JC) is more useful in additional heat sinking is used.

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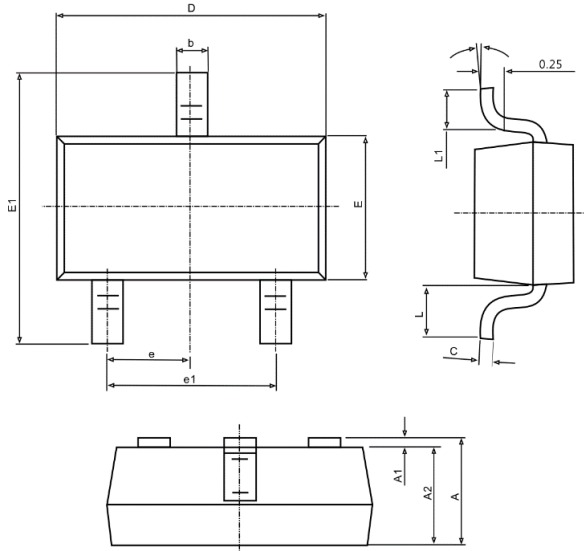
**TYPICAL CHARACTERISTICS**



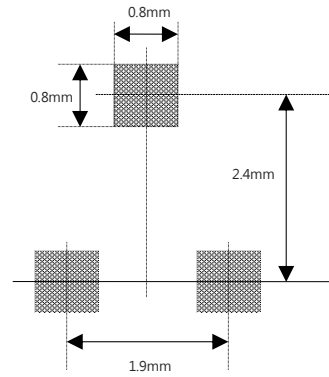
## TYPICAL CHARACTERISTICS



## ■ 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°