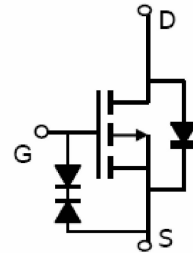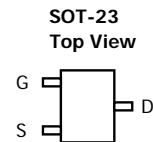## P-Channel Enhancement Mode Power MOSFET

Description

The SM3415 uses advanced trench technology to provide excellent $R_{DS(ON)}$, low gate charge and operation with gate voltages as low as 1.8V. This device is suitable for use as a load switch or in PWM applic

Schematic diagram

SOT-23 Top View

PRODUCT SUMMARY		
V_{DSS}	I_D	$R_{DS(on)}$ (m-ohm) Max
-20V	-4A	60 @ VGS = -4.5V
		45 @ VGS = -2.5V

ESD Rating: 2500V HBM

◆ Ordering Information

Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
SM3415SR L	SM3415SR G	SOT-23	G	S	D	Tape Reel

SM3415 X X X

(1) Package Type

(2) Packing Type

(3) Lead Free

(1) S：SOT-23；

(2) R：Tape Reel

(3) G：Halogen Free；L：Lead Free

◆ Absolute Maximum Ratings (T$_A$=25°C, unless otherwise noted)

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	V$_{DS}$	-20	V
Gate-Source Voltage	V$_{GS}$	±10	V
Drain Current-Continuous	I$_D$	-4	A
Drain Current-Pulsed (Note 1)	I$_{DM}$	-30	A
Maximum Power Dissipation	P$_D$	1.4	W
Operating Junction and Storage Temperature Range	T$_J$,T$_{STG}$	-55 To 150	℃

a:Fused current that based on wire numbers and diameter

b:Repetitive Rating: Pulse width limited by the maximum junction temperature

c:1-in^2 2oz Cu PCB board

◆ Electrical Characteristics (T$_A$=25°C, unless otherwise noted)

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Off Characteristics						
Drain-Source Breakdown Voltage	BV$_{DSS}$	V$_{GS}$=0V I$_D$=-250µA	-20		-	V
Zero Gate Voltage Drain Current	I$_{DSS}$	V$_{DS}$=-20V,V$_{GS}$=0V	-	-	1	µA
Gate-Body Leakage Current	I$_{GSS}$	V$_{GS}$=±10V,V$_{DS}$=0V	-	-	±10	µA
On Characteristics (Note 3)						
Gate Threshold Voltage	V$_{GS(th)}$	V$_{DS}$=V$_{GS}$,I$_D$=-250µA	-0.35	-0.55	-0.9	V
Drain-Source On-State Resistance	R$_{DS(ON)}$	V$_{GS}$=-4.5V, I$_D$=-4A	-	34	45	mΩ
		V$_{GS}$=-2.5V, I$_D$=-4A	-	44	60	mΩ
Forward Transconductance	g$_{FS}$	V$_{DS}$=-5V,I$_D$=-4A	8	-	-	S
Dynamic Characteristics (Note4)						
Input Capacitance	C$_{Iss}$	V$_{DS}$=-10V,V$_{GS}$=0V, F=1.0MHz	-	950	-	PF
Output Capacitance	C$_{oss}$		-	165	-	PF
Reverse Transfer Capacitance	C$_{rss}$		-	120	-	PF
Switching Characteristics (Note 4)						
Turn-on Delay Time	t$_{d(on)}$	V$_{DD}$=-10V,R$_L$=2. 5Ω V$_{GS}$=-4.5V,R$_{GEN}$=3Ω	-	12		nS
Turn-on Rise Time	t$_r$		-	10		nS
Turn-Off Delay Time	t$_{d(off)}$		-	19		nS
Turn-Off Fall Time	t$_f$		-	25		nS
Total Gate Charge	Q$_g$	V$_{DS}$=-10V,I$_D$=-4A, V$_{GS}$=-4.5V	-	12		nC
Gate-Source Charge	Q$_{gs}$		-	1.4	-	nC
Gate-Drain Charge	Q$_{gd}$		-	3.6	-	nC
Drain-Source Diode Characteristics						
Diode Forward Voltage (Note 3)	V$_{SD}$	V$_{GS}$=0V,I$_S$=-4A	-	-	-1.2	V
Diode Forward Current (Note 2)	I$_S$		-	-	-4	A

Note: Pulse Test: Pulse Width ≤300us, Duty Cycle≤2%

d: Guaranteed by design: not subject to production testing
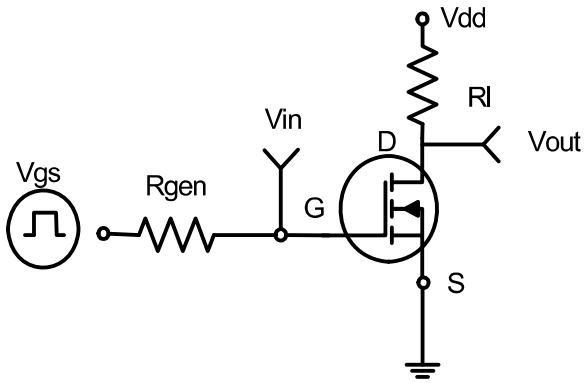
Typical Electrical and Thermal Characteristics
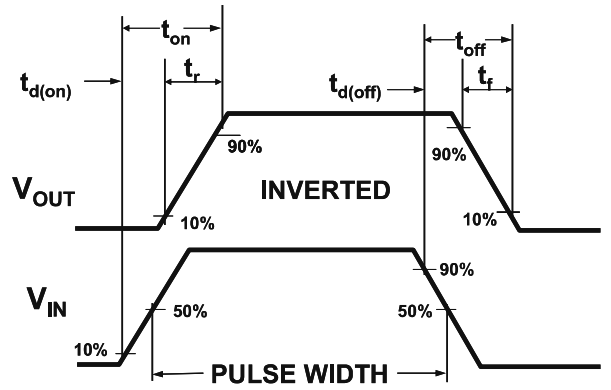
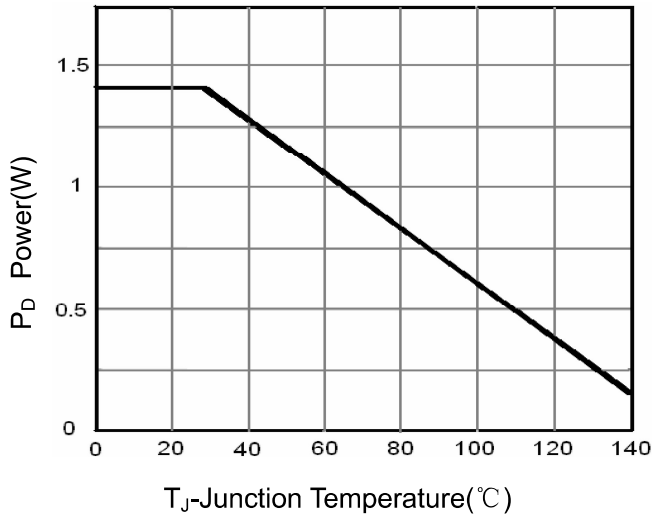**Figure 1:Switching Test Circuit**
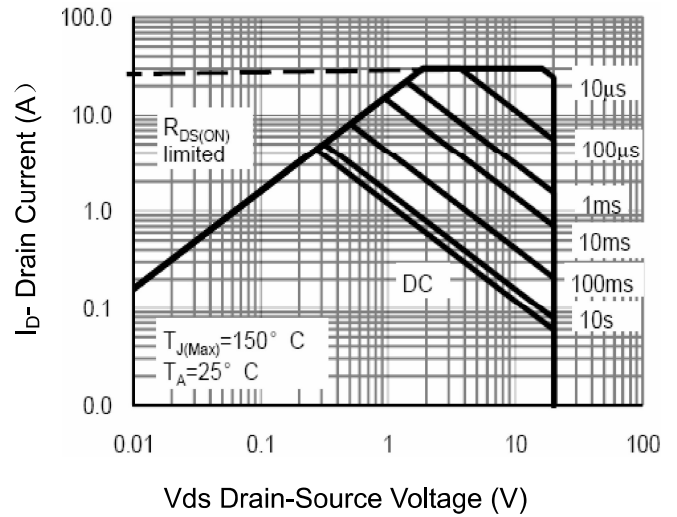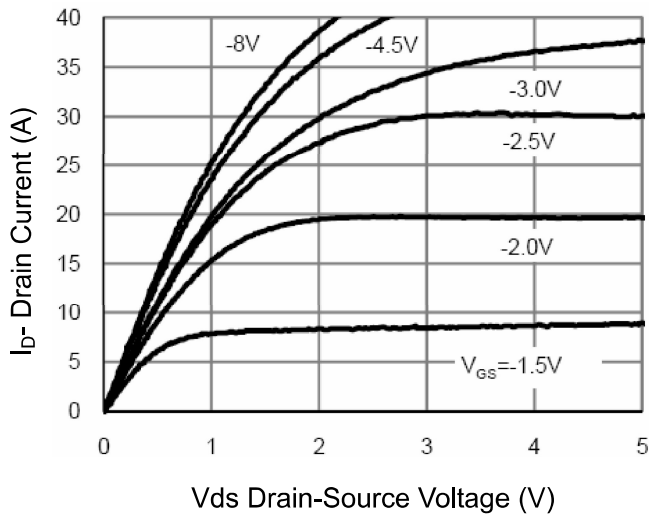
Figure 2:Switching Waveforms

Figure 3 Power Dissipation
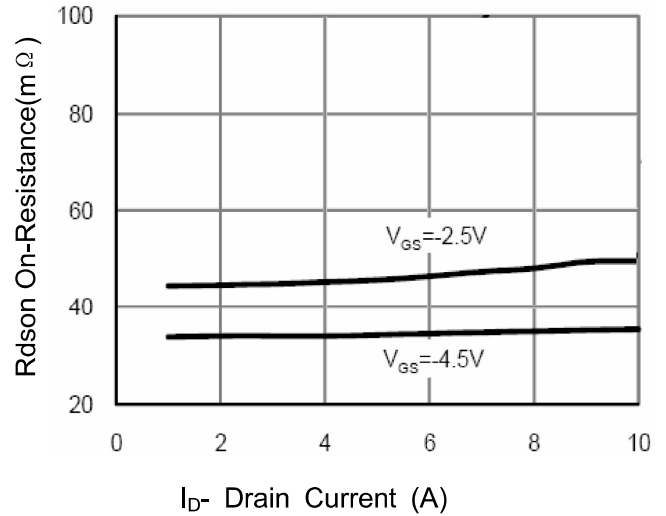
Figure 4 Safe Operation Area
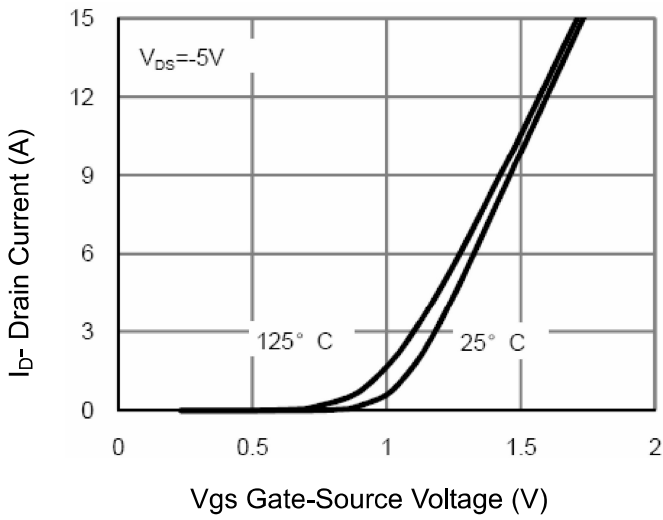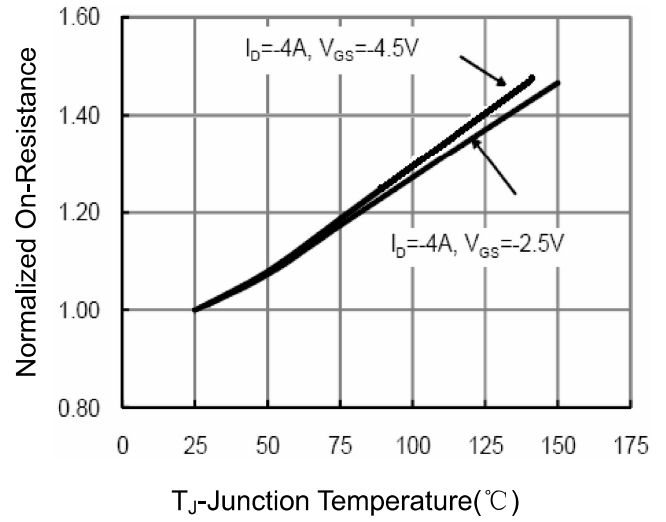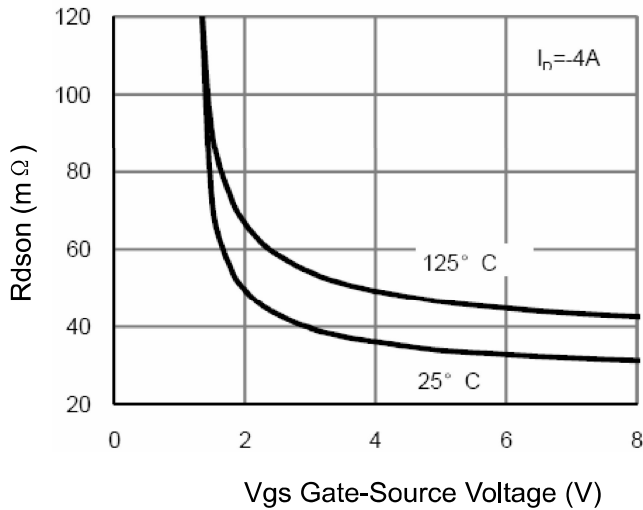
Figure 5 Output Characteristics
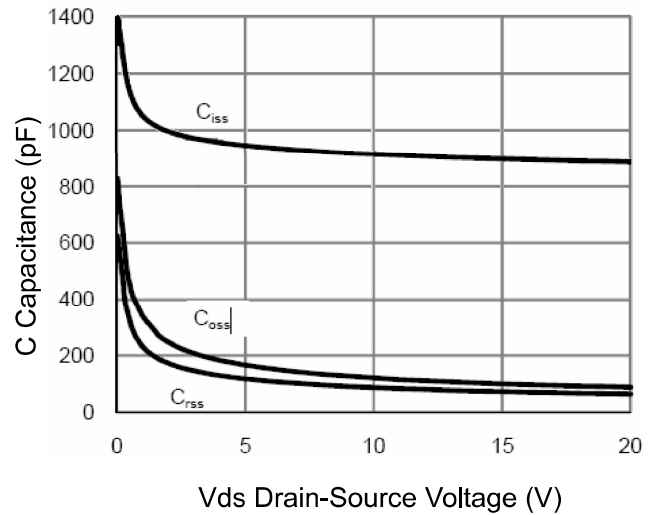
Figure 6 Drain-Source On-Resistance
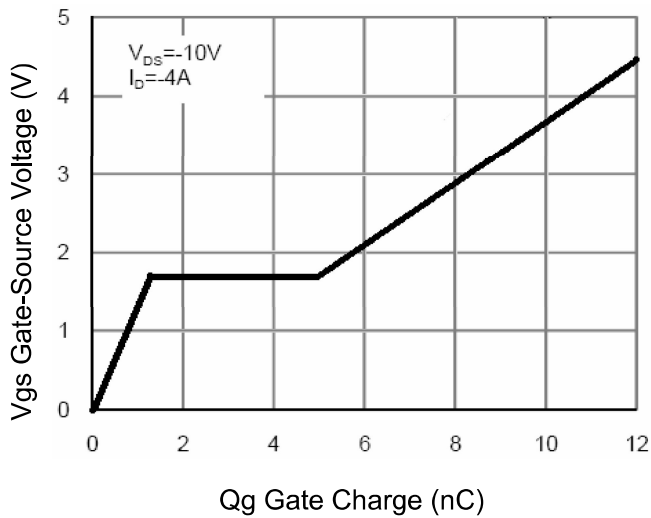
Figure 7 Transfer Characteristics

Figure 8 Drain-Source On-Resistance

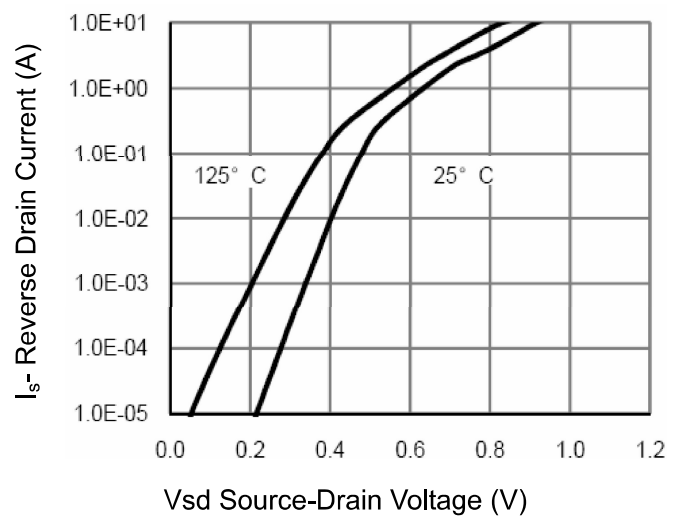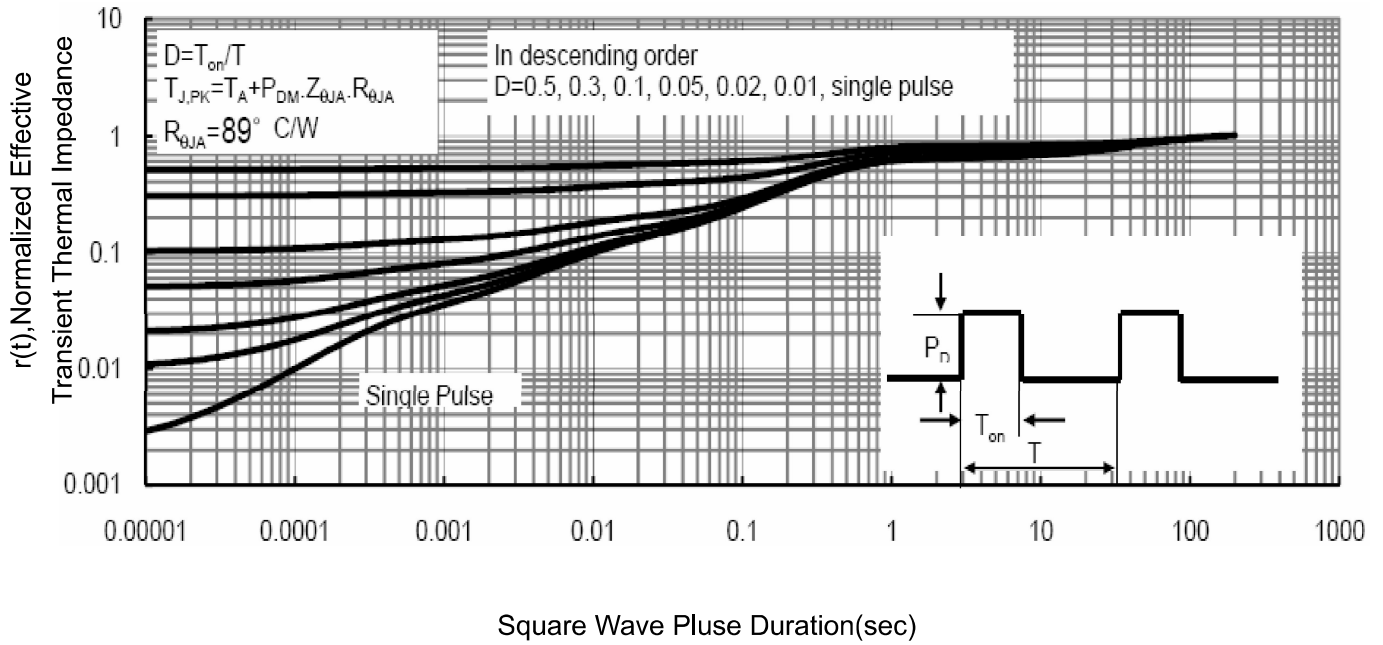**Figure 9 Rdson vs Vgs**

Figure 10 Capacitance vs Vds
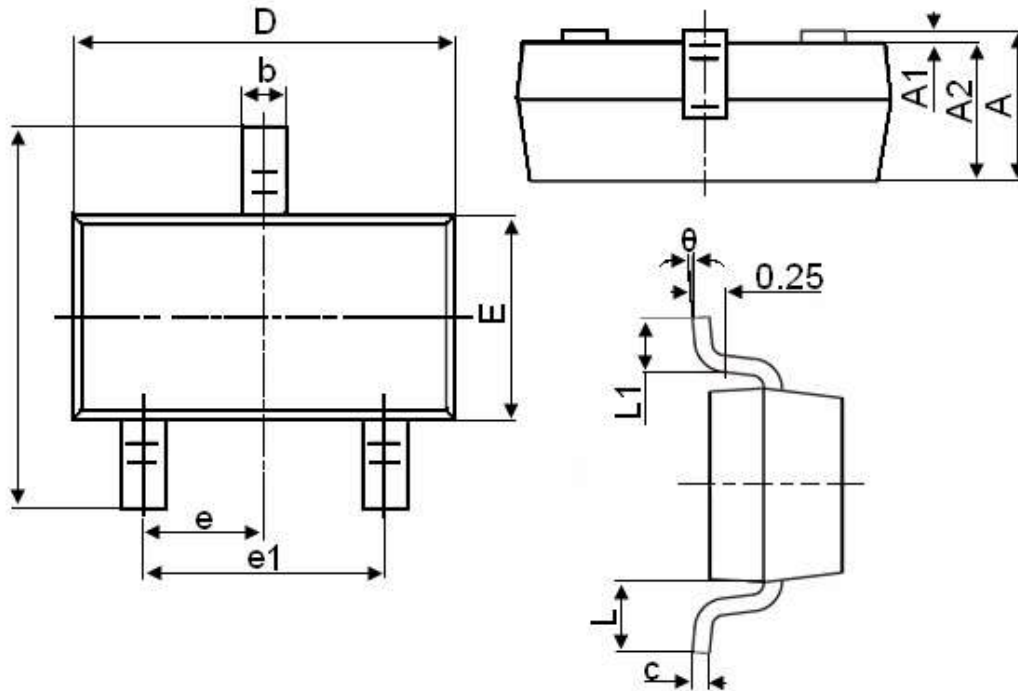
Figure 11 Gate Charge

Figure 12 Source- Drain Diode Forward

Figure 13 Normalized Maximum Transient Thermal Impedance

SOT-23 Package Information

Symbol	Dimensions in Millimeters	
	MIN.	MAX.
A	0.900	1.150
A1	0.000	0.100
A2	0.900	1.050
b	0.300	0.500
c	0.080	0.150
D	2.800	3.000
E	1.200	1.400
E1	2.250	2.550
e	0.950TYP	
e1	1.800	2.000
L	0.550REF	
L1	0.300	0.500
θ	0°	8°

Notes

1. All dimensions are in millimeters.

2. Tolerance ±0.10mm (4 mil) unless otherwise specified

3. Package body sizes exclude mold flash and gate burrs. Mold flash at the non-lead sides should be less than 5 mils.

4. Dimension L is measured in gauge plane.

5. Controlling dimension is millimeter, converted inch dimensions are not necessarily exact.

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