



## Description

The SM3416SRL uses advanced trench technology to provide excellent  $R_{DS(ON)}$ , low gate charge and operation with gate voltages as low as 2.5V. This device is suitable for use as a Battery protection or in other Switching application.

## General Features

$V_{DS} = 20V$   $I_D = 6A$

$R_{DS(ON)} < 17m\Omega @ V_{GS}=4.5V$

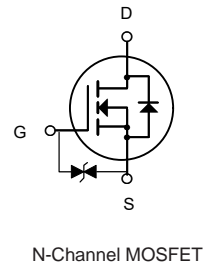
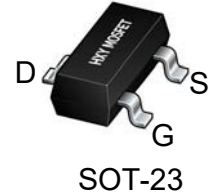
ESD=2500HBM

## Application

Battery protection

Load switch

Uninterruptible power supply



## Package Marking and Ordering Information

Product ID	Pack	Brand	Qty(PCS)
SM3416SRL	SOT-23	HXY MOSFET	3000

## Absolute Maximum Ratings ( $T_A=25^{\circ}C$ unless otherwise noted)

Symbol	Parameter	Limit	Unit
$V_{DS}$	Drain-Source Voltage	20	V
$V_{GS}$	Gate-Source Voltage	$\pm 12$	V
$I_D$	Drain Current-Continuous	6	A
$I_{DM}$	Drain Current-Pulsed (Note 1)	30	A
$P_D$	Maximum Power Dissipation	1.4	W
$T_J, T_{STG}$	Operating Junction and Storage Temperature Range	-55 To 150	$^{\circ}C$
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient (Note 2)	89	$^{\circ}C/W$



**Electrical Characteristics ( $T_A=25^{\circ}\text{C}$  unless otherwise noted)**

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Drain-Source Breakdown Voltage	$BV_{DSS}$	$V_{GS}=0V, I_D=250\mu A$	20		-	V
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS}=20V, V_{GS}=0V$	-	-	1	$\mu A$
Gate-Body Leakage Current	$I_{GSS}$	$V_{GS}=\pm 10V, V_{DS}=0V$	-	-	$\pm 10$	$\mu A$
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=250\mu A$	0.45	0.7	1.0	V
Drain-Source On-State Resistance	$R_{DS(on)}$	$V_{GS}=4.5V, I_D=6.5A$	-	14	17	m $\Omega$
		$V_{GS}=2.5V, I_D=5.5A$	-	18	23	m $\Omega$
		$V_{GS}=1.8V, I_D=5A$	-	28	40	m $\Omega$
Forward Transconductance	$g_{FS}$	$V_{DS}=5V, I_D=6.5A$	8	-	-	S
Input Capacitance	$C_{iss}$	$V_{DS}=10V, V_{GS}=0V,$ $F=1.0\text{MHz}$	-	660	-	PF
Output Capacitance	$C_{oss}$		-	160	-	PF
Reverse Transfer Capacitance	$C_{rss}$		-	87	-	PF
Turn-on Delay Time	$t_{d(on)}$	$V_{DD}=10V, R_L=1.5\Omega$ $V_{GS}=5V, R_{GEN}=3\Omega$	-	0.5		nS
Turn-on Rise Time	$t_r$		-	1		nS
Turn-Off Delay Time	$t_{d(off)}$		-	12		nS
Turn-Off Fall Time	$t_f$		-	4		nS
Total Gate Charge	$Q_g$	$V_{DS}=10V, I_D=6.5A,$ $V_{GS}=4.5V$	-	8		nC
Gate-Source Charge	$Q_{gs}$		-	2.5	-	nC
Gate-Drain Charge	$Q_{gd}$		-	3	-	nC
Diode Forward Voltage <sup>(Note 3)</sup>	$V_{SD}$	$V_{GS}=0V, I_S=6.5A$	-	-	1.2	V
Diode Forward Current <sup>(Note 2)</sup>	$I_S$		-	-	6.5	A

**Notes:**

Repetitive Rating: Pulse width limited by maximum junction temperature.

Surface Mounted on FR4 Board,  $t \leq 10$  sec.

Pulse Test: Pulse Width  $\leq 300\mu s$ , Duty Cycle  $\leq 2\%$ .

Guaranteed by design, not subject to production



### Typical Characteristics

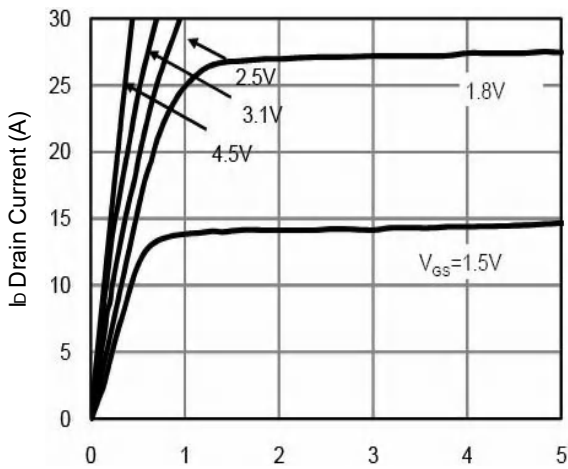


Fig.1 Typical Output Characteristics

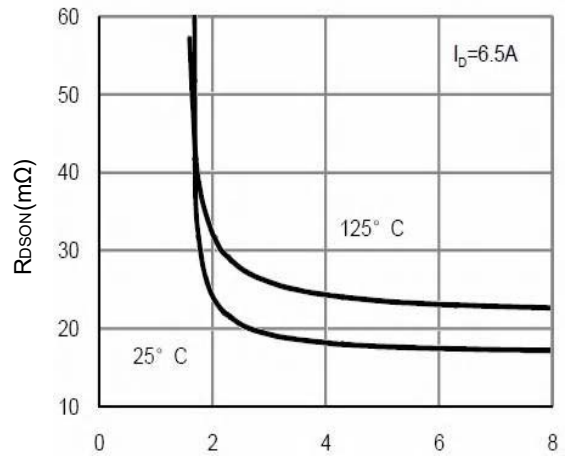


Fig.2 On-Resistance vs. Gate-Source

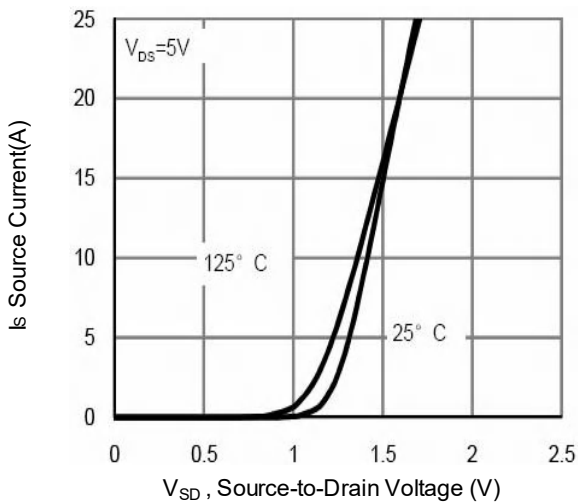


Fig.3 Forward Characteristics of Reverse

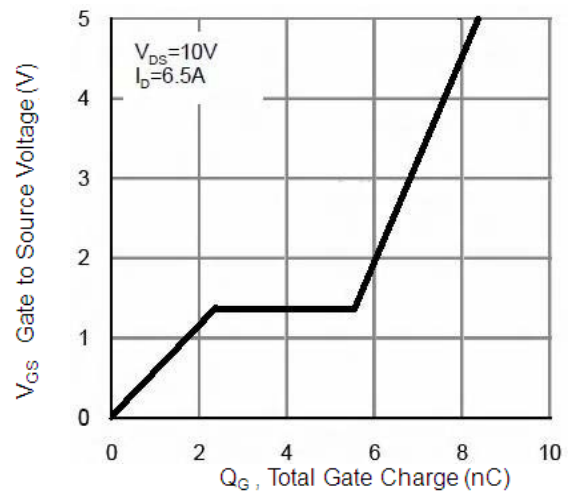


Fig.4 Gate-Charge Characteristics

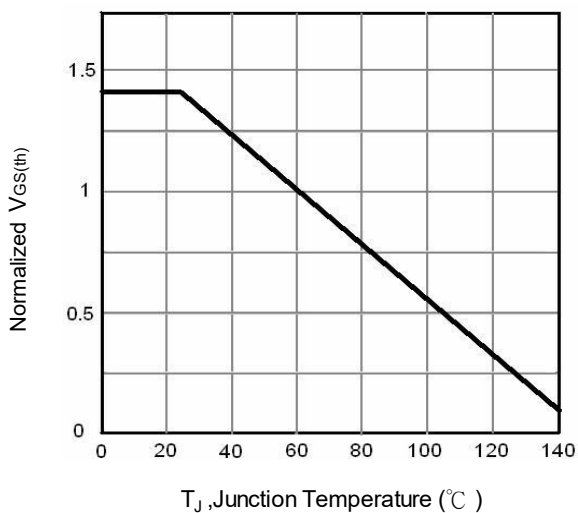


Fig.5 Normalized VGS(th) vs. Tj

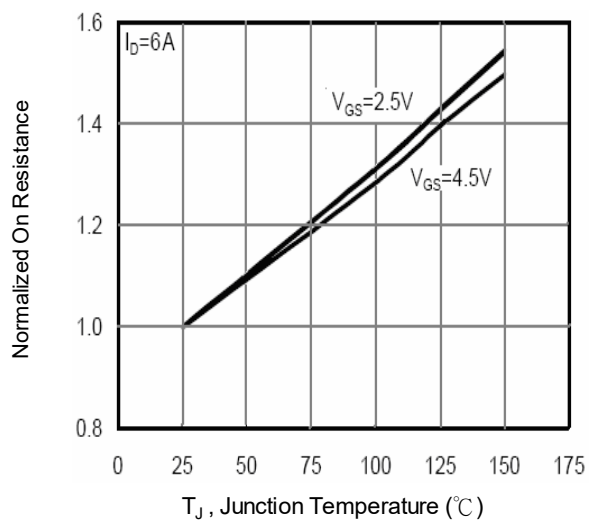


Fig.6 Normalized Rds(on) vs. Tj

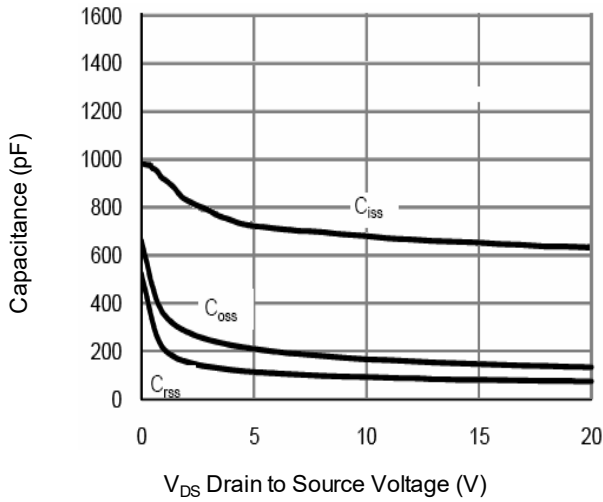


Fig.7 Capacitance

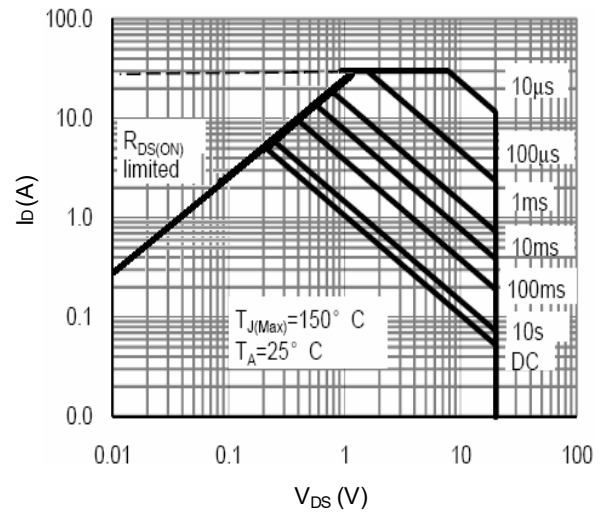


Fig.8 Safe Operating Area

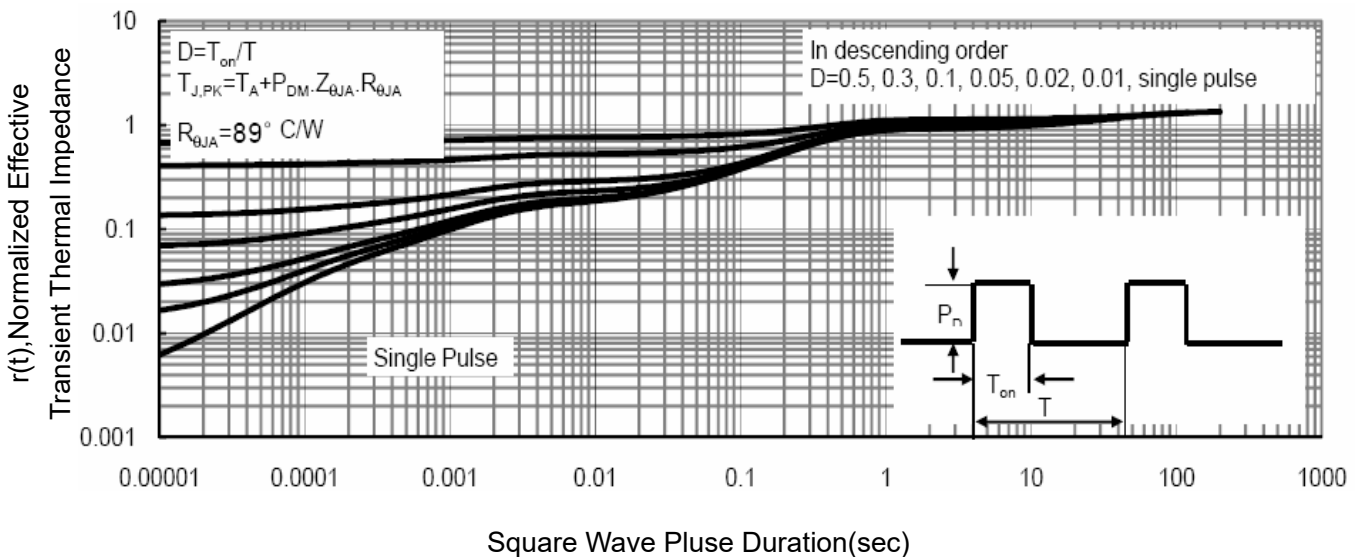


Fig.9 Normalized Maximum Transient Thermal Impedance

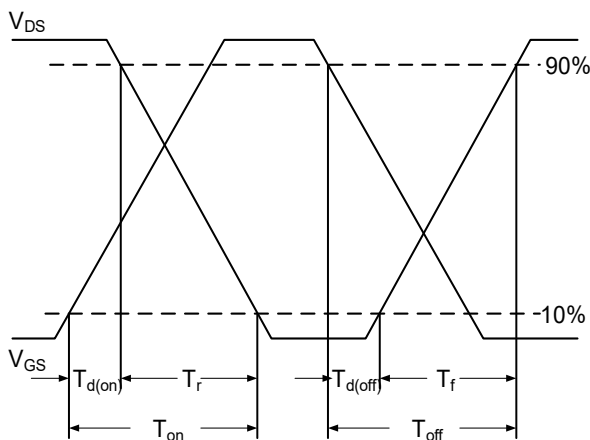


Fig.10 Switching Time Waveform

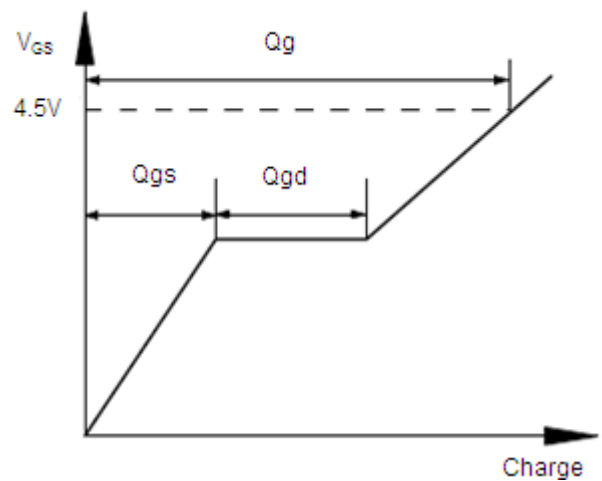
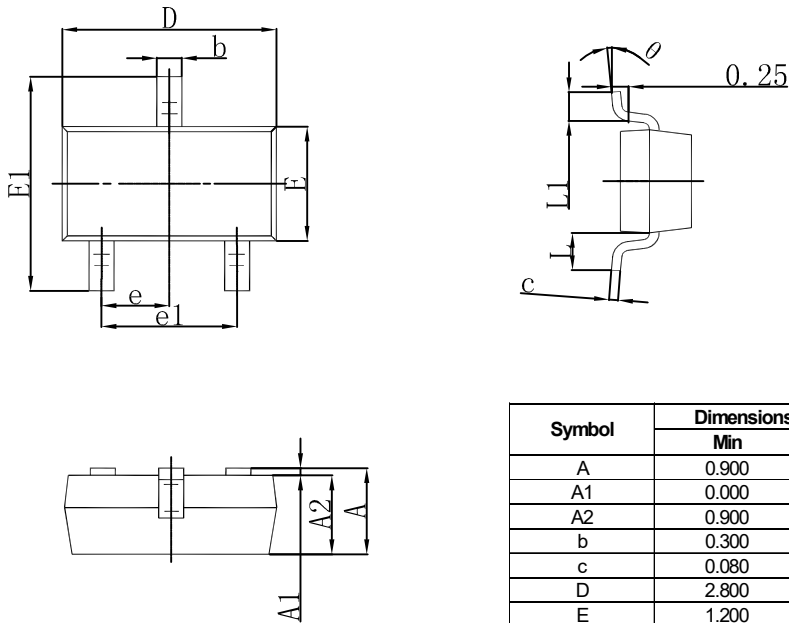


Fig.11 Gate Charge Waveform

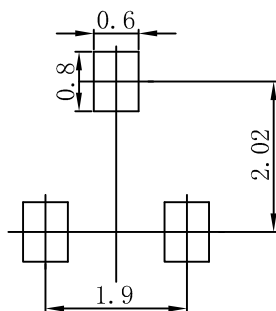


### SOT-23 Package Outline Dimensions



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	0.900	1.150	0.035	0.045
A1	0.000	0.100	0.000	0.004
A2	0.900	1.050	0.035	0.041
b	0.300	0.500	0.012	0.020
c	0.080	0.150	0.003	0.006
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 TYP		0.037 TYP	
e1	1.800	2.000	0.071	0.079
L	0.550 REF		0.022 REF	
L1	0.300	0.500	0.012	0.020
θ	0°	8°	0°	8°

### SOT-23 Suggested Pad Layout



- Note:
1. Controlling dimension: in millimeters.
  2. General tolerance:  $\pm 0.05\text{mm}$ .
  3. The pad layout is for reference purposes only.



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