

## Description

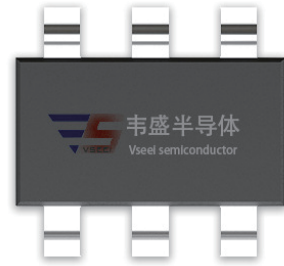
The VSM1608N uses advanced trench technology to provide excellent  $R_{DS(ON)}$ , low gate charge and operation with gate voltages as low as 2.5V. This device is suitable for use as a Battery protection or in other Switching application.

## General Features

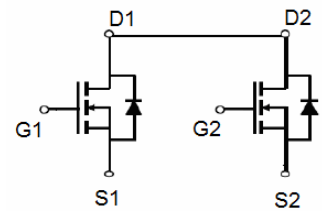
- $V_{DS} = 16V, I_D = 8A$   
 $R_{DS(ON)} < 16m\Omega @ V_{GS}=2.5V$   
 $R_{DS(ON)} < 12m\Omega @ V_{GS}=4.5V$
- High power and current handling capability
- Lead free product is acquired
- Surface mount package

## Application

- Battery protection
- Load switch
- Power management



SOT-23-6



Schematic Diagram

## Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
VSM1608N-S6	VSM1608N	SOT-23-6	Ø330mm	12mm	3000 units

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

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	$V_{DS}$	16	V
Gate-Source Voltage	$V_{GS}$	$\pm 12$	V
Drain Current-Continuous	$I_D$	8	A
Drain Current-Pulsed (Note 1)	$I_{DM}$	30	A
Maximum Power Dissipation	$P_D$	1.5	W
Operating Junction and Storage Temperature Range	$T_J, T_{STG}$	-55 To 150	$^{\circ}C$

## Thermal Characteristic

Thermal Resistance, Junction-to-Ambient (Note 2)	$R_{\theta JA}$	83.3	$^{\circ}C/W$
--	-----------------	------	---------------

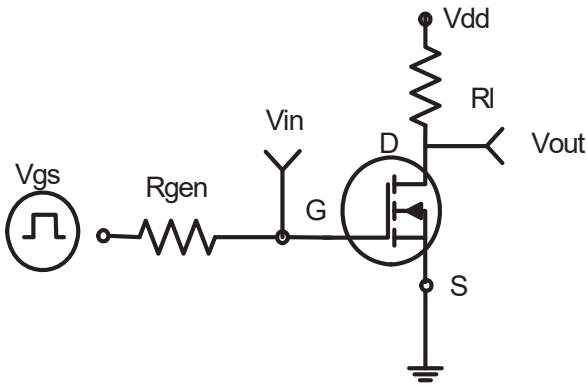
**Electrical Characteristics ( $T_A=25^{\circ}\text{C}$  unless otherwise noted)**

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Off Characteristics						
Drain-Source Breakdown Voltage	BV <sub>DSS</sub>	V <sub>GS</sub> =0V I <sub>D</sub> =250μA	20	-	-	V
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	V <sub>DS</sub> =16V, V <sub>GS</sub> =0V	-	-	1	μA
Gate-Body Leakage Current	I <sub>GSS</sub>	V <sub>GS</sub> =±12V, V <sub>DS</sub> =0V	-	-	±100	nA
On Characteristics <sup>(Note 3)</sup>						
Gate Threshold Voltage	V <sub>GS(th)</sub>	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250μA	0.5	0.7	1.2	V
Drain-Source On-State Resistance	R <sub>DS(ON)</sub>	V <sub>GS</sub> =4.5V, I <sub>D</sub> =6A	-	10	12	mΩ
		V <sub>GS</sub> =2.5V, I <sub>D</sub> =5.5A	-	12.9	16	mΩ
Forward Transconductance	g <sub>FS</sub>	V <sub>DS</sub> =5V, I <sub>D</sub> =6A	-	10	-	S
Dynamic Characteristics <sup>(Note4)</sup>						
Input Capacitance	C <sub>ISS</sub>	V <sub>DS</sub> =10V, V <sub>GS</sub> =0V, F=1.0MHz	-	1150	-	PF
Output Capacitance	C <sub>OSS</sub>		-	185	-	PF
Reverse Transfer Capacitance	C <sub>RSS</sub>		-	145	-	PF
Switching Characteristics <sup>(Note 4)</sup>						
Turn-on Delay Time	t <sub>d(on)</sub>	V <sub>DD</sub> =10V, I <sub>D</sub> =6A V <sub>GS</sub> =4.5V, R <sub>GEN</sub> =6Ω	-	6	-	nS
Turn-on Rise Time	t <sub>r</sub>		-	13	-	nS
Turn-Off Delay Time	t <sub>d(off)</sub>		-	52	-	nS
Turn-Off Fall Time	t <sub>f</sub>		-	16	-	nS
Total Gate Charge	Q <sub>g</sub>	V <sub>DS</sub> =10V, I <sub>D</sub> =6A, V <sub>GS</sub> =4.5V	-	15	-	nC
Gate-Source Charge	Q <sub>gs</sub>		-	0.8	-	nC
Gate-Drain Charge	Q <sub>gd</sub>		-	3.2	-	nC
Drain-Source Diode Characteristics						
Diode Forward Voltage <sup>(Note 3)</sup>	V <sub>SD</sub>	V <sub>GS</sub> =0V, I <sub>S</sub> =6A	-	-	1.2	V
Diode Forward Current <sup>(Note 2)</sup>	I <sub>S</sub>		-	-	8	A

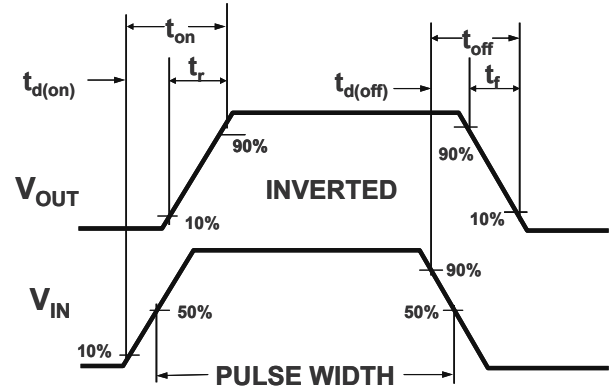
**Notes:**

1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. Surface Mounted on FR4 Board,  $t \leq 10$  sec.
3. Pulse Test: Pulse Width  $\leq 300\mu s$ , Duty Cycle  $\leq 2\%$ .
4. Guaranteed by design, not subject to production

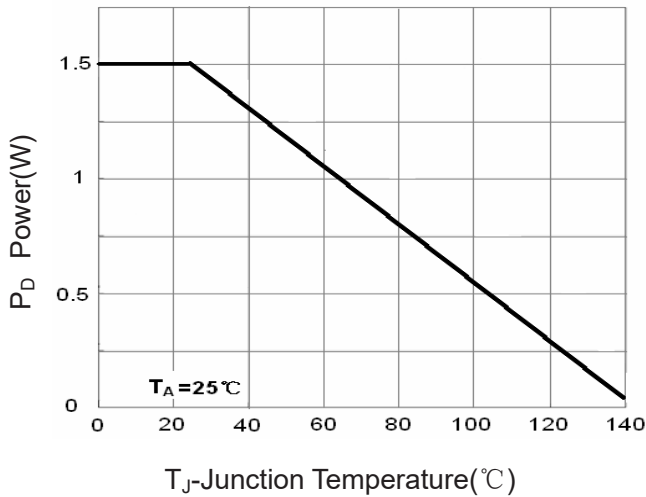
## Typical Electrical and Thermal Characteristics



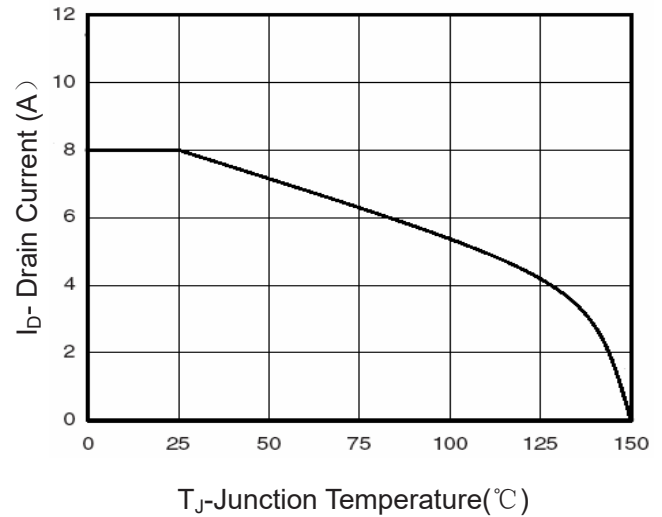
**Figure 1: Switching Test Circuit**



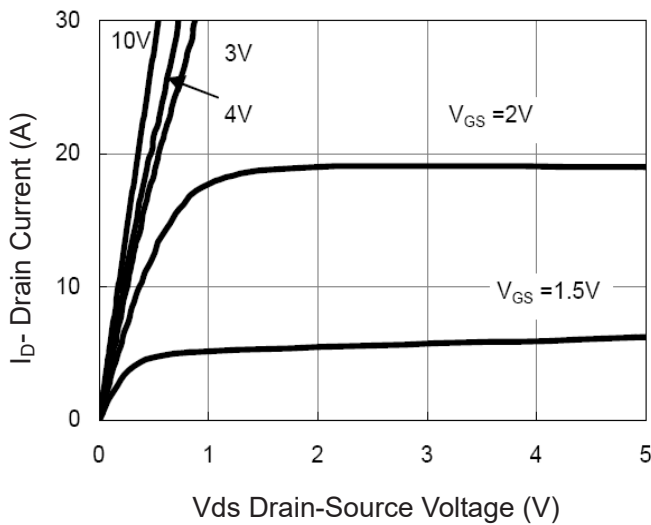
**Figure 2: Switching Waveforms**



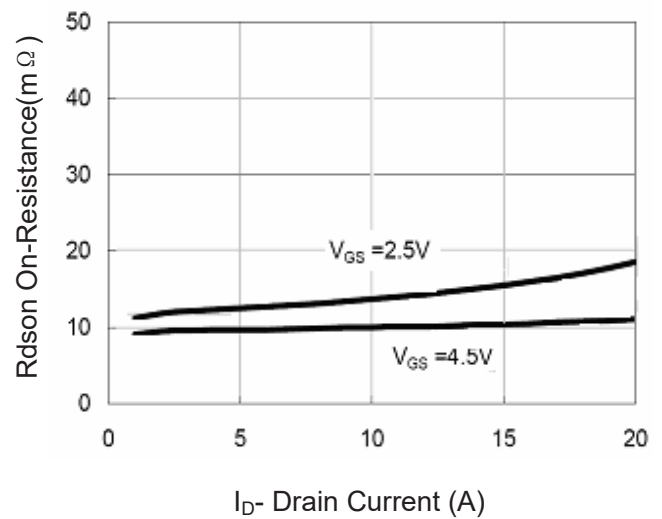
**Figure 3 Power Dissipation**



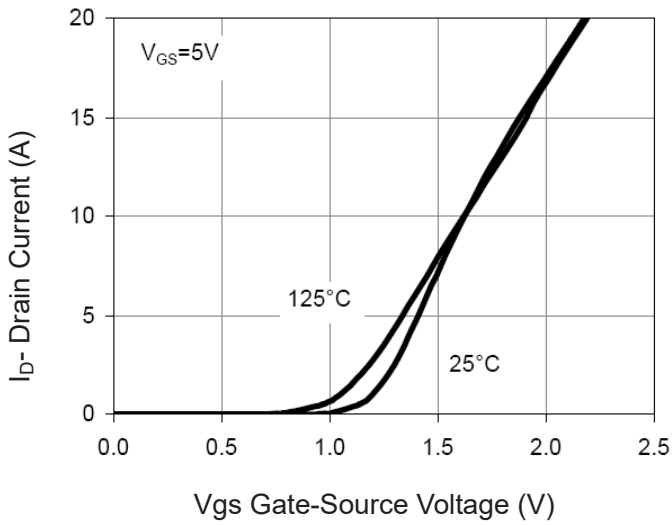
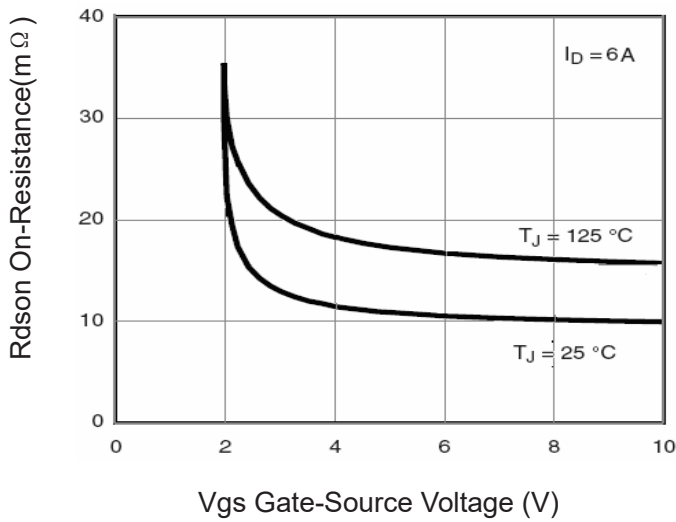
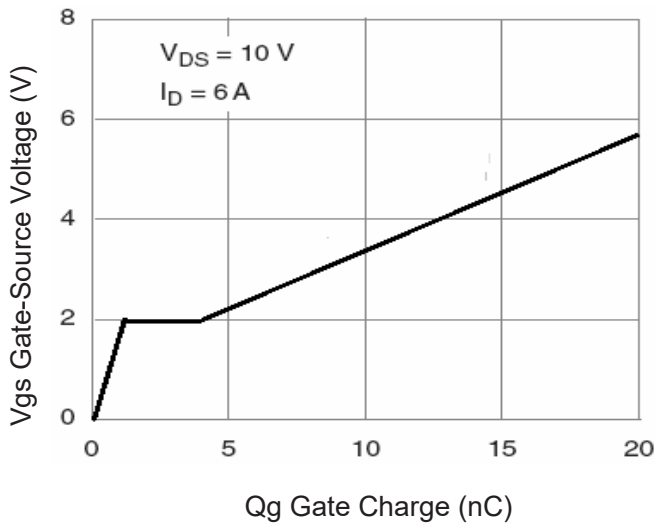
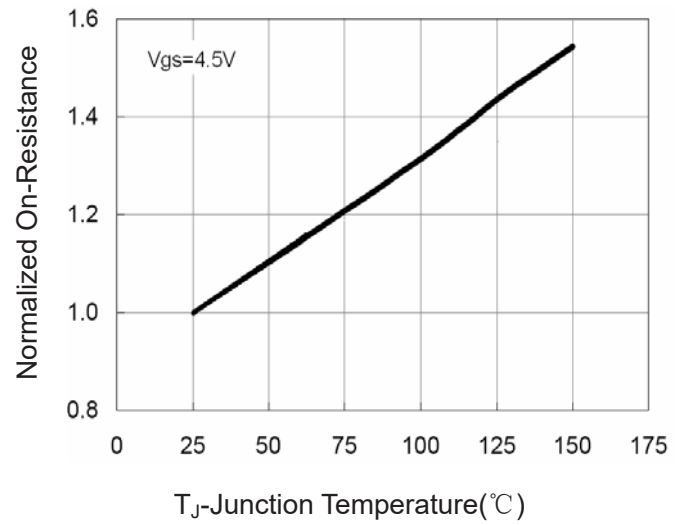
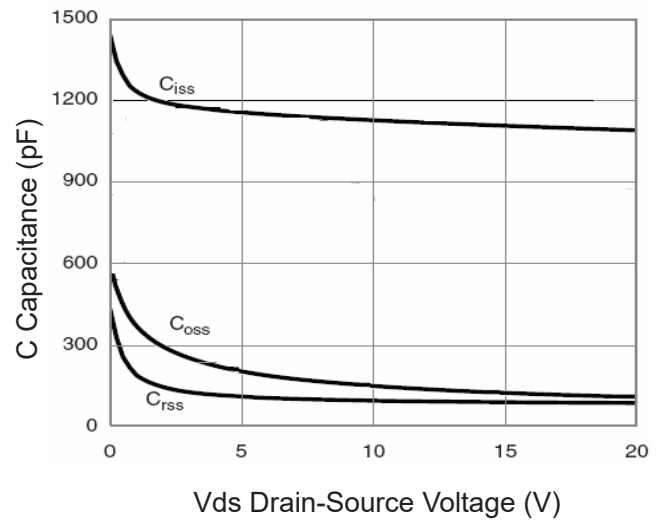
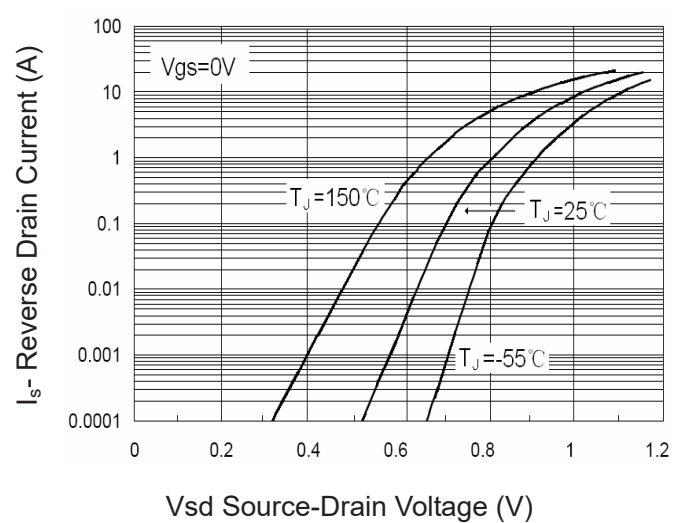
**Figure 4 Drain Current**

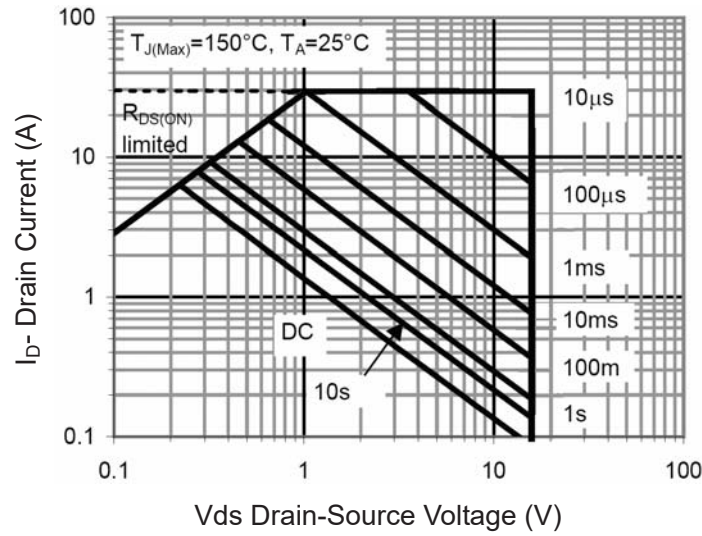


**Figure 5 Output Characteristics**

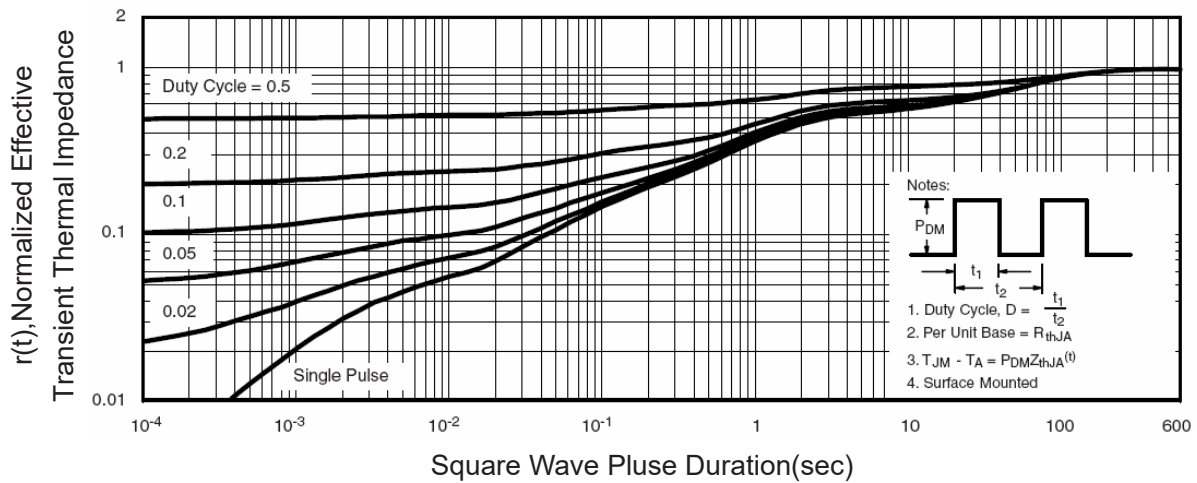


**Figure 6 Drain-Source On-Resistance**


**Figure 7 Transfer Characteristics**

**Figure 9 Rdson vs Vgs**

**Figure 11 Gate Charge**

**Figure 8 Drain-Source On-Resistance**

**Figure 10 Capacitance vs Vds**

**Figure 12 Source- Drain Diode Forward**



**Figure 13 Safe Operation Area**



**Figure 14 Normalized Maximum Transient Thermal Impedance**