

## Description

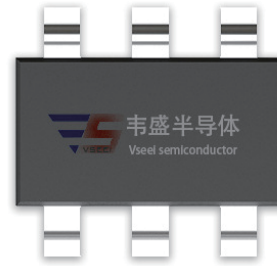
The VSM0104AN uses advanced trench technology and design to provide excellent  $R_{DS(ON)}$  with low gate charge. It can be used in a wide variety of applications.

## General Features

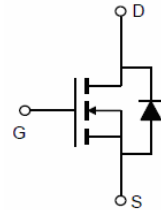
- $V_{DS}=100V, I_D=4A$   
 $R_{DS(ON)} < 100m\Omega @ V_{GS}=10V$  (Typ.84m $\Omega$ )  
 $R_{DS(ON)} < 118m\Omega @ V_{GS}=4.5V$  (Typ.94m $\Omega$ )
- High density cell design for ultra low  $R_{dson}$
- Fully characterized avalanche voltage and current
- Good stability and uniformity with high  $E_{AS}$
- Excellent package for good heat dissipation
- Special process technology for high ESD capability

## Application

- Power switching application
- Hard switched and high frequency circuits
- Uninterruptible power supply



SOT-23-6



Schematic Diagram

## Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
VSM0104AN-S6	VSM0104AN	SOT-23-6	Ø180mm	8 mm	3000 units

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

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	$V_{DS}$	100	V
Gate-Source Voltage	$V_{GS}$	$\pm 20$	V
Drain Current-Continuous	$I_D$	4	A
Drain Current-Continuous( $T_C=100^{\circ}C$ )	$I_D(100^{\circ}C)$	2.8	A
Pulsed Drain Current	$I_{DM}$	20	A
Maximum Power Dissipation	$P_D$	2	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)	$R_{\theta JA}$	62.5	$^{\circ}C/W$
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**Electrical Characteristics (T<sub>A</sub>=25°C unless otherwise noted)**

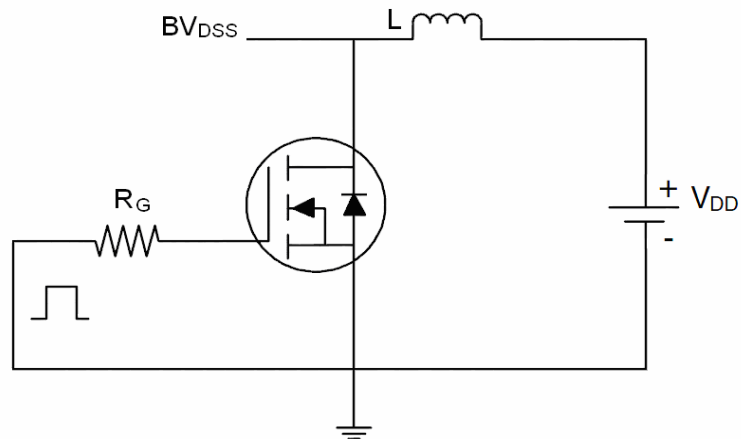
Parameter	Symbol	Condition	Min	Typ	Max	Unit
Off Characteristics						
Drain-Source Breakdown Voltage	BV <sub>DSS</sub>	V <sub>GS</sub> =0V I <sub>D</sub> =250μA	100	-	-	V
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	V <sub>DS</sub> =100V, V <sub>GS</sub> =0V	-	-	1	μA
Gate-Body Leakage Current	I <sub>GSS</sub>	V <sub>GS</sub> =±20V, V <sub>DS</sub> =0V	-	-	±100	nA
On Characteristics (Note 3)						
Gate Threshold Voltage	V <sub>GS(th)</sub>	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250μA	1.2	1.5	2.0	V
Drain-Source On-State Resistance	R <sub>DS(ON)</sub>	V <sub>GS</sub> =10V, I <sub>D</sub> =2A	-	84	100	mΩ
	R <sub>DS(ON)</sub>	V <sub>GS</sub> =4.5V, I <sub>D</sub> =2A	-	94	118	mΩ
Forward Transconductance	g <sub>FS</sub>	V <sub>DS</sub> =5V, I <sub>D</sub> =2A	11	-	-	S
Dynamic Characteristics (Note4)						
Input Capacitance	C <sub>ISS</sub>	V <sub>DS</sub> =50V, V <sub>GS</sub> =0V, F=1.0MHz	-	882	-	PF
Output Capacitance	C <sub>OSS</sub>		-	54.6	-	PF
Reverse Transfer Capacitance	C <sub>RSS</sub>		-	36.1	-	PF
Switching Characteristics (Note 4)						
Turn-on Delay Time	t <sub>d(on)</sub>	V <sub>DD</sub> =50V, R <sub>L</sub> =25Ω V <sub>GS</sub> =10V, R <sub>G</sub> =3Ω	-	8	-	nS
Turn-on Rise Time	t <sub>r</sub>		-	3	-	nS
Turn-Off Delay Time	t <sub>d(off)</sub>		-	24	-	nS
Turn-Off Fall Time	t <sub>f</sub>		-	5	-	nS
Total Gate Charge	Q <sub>g</sub>	V <sub>DS</sub> =50V, I <sub>D</sub> =2A, V <sub>GS</sub> =10V	-	24.1		nC
Gate-Source Charge	Q <sub>gs</sub>		-	3.1		nC
Gate-Drain Charge	Q <sub>gd</sub>		-	5.5		nC
Drain-Source Diode Characteristics						
Diode Forward Voltage (Note 3)	V <sub>SD</sub>	V <sub>GS</sub> =0V, I <sub>S</sub> =2A	-		1.2	V
Diode Forward Current (Note 2)	I <sub>S</sub>		-	-	4	A

**Notes:**

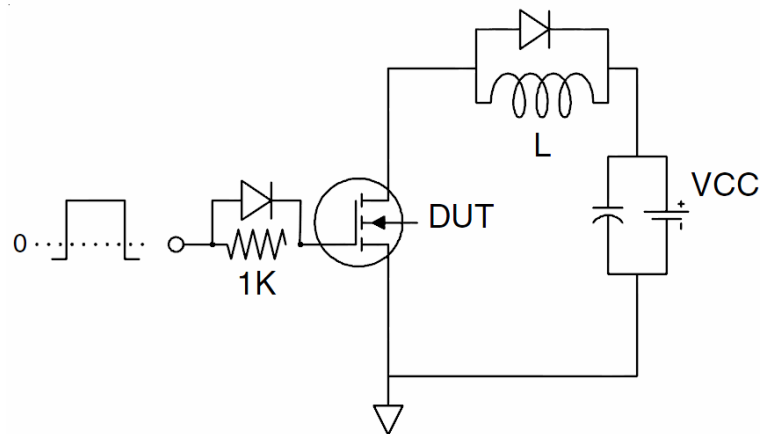
1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. Surface Mounted on FR4 Board, t ≤ 10 sec.
3. Pulse Test: Pulse Width ≤ 300μs, Duty Cycle ≤ 2%.
4. Guaranteed by design, not subject to production

## Test Circuit

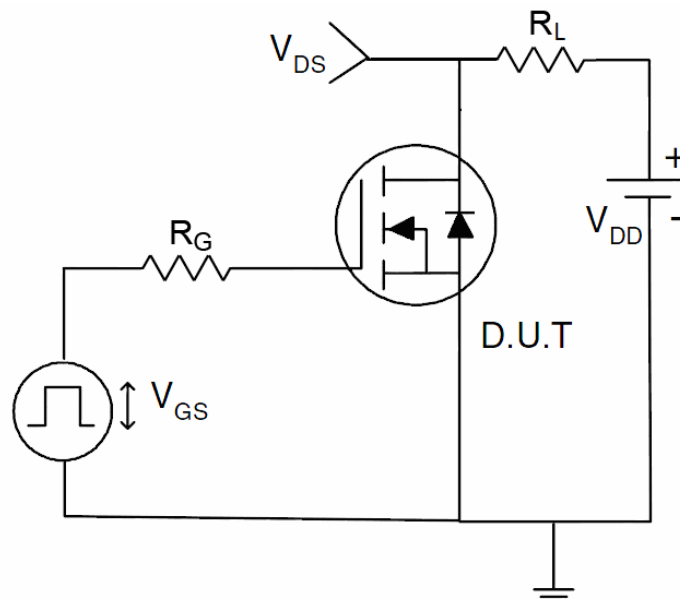
### 1) $E_{AS}$ test Circuit



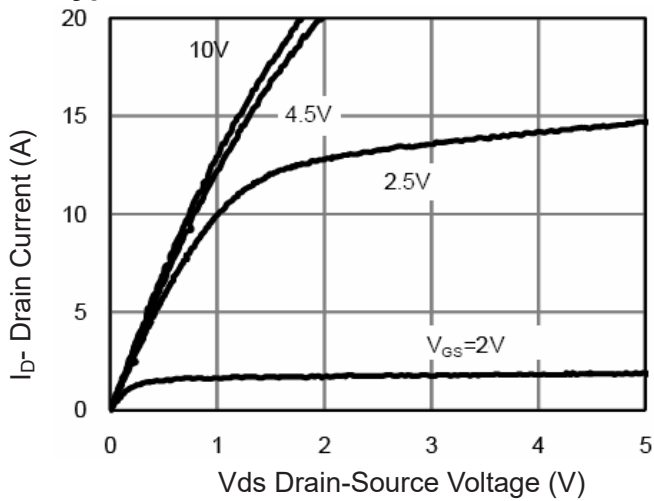
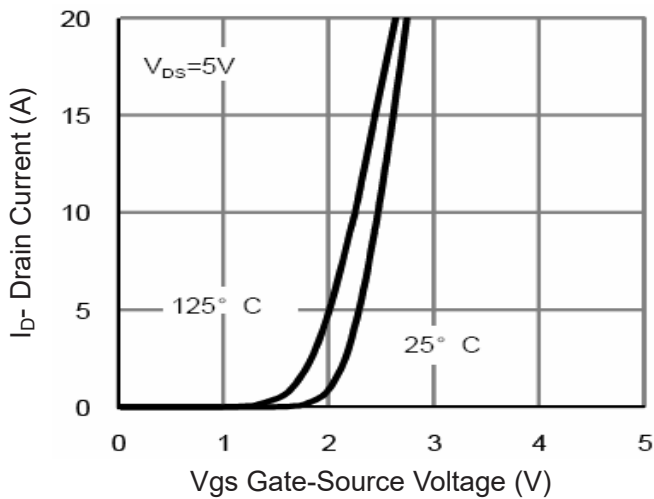
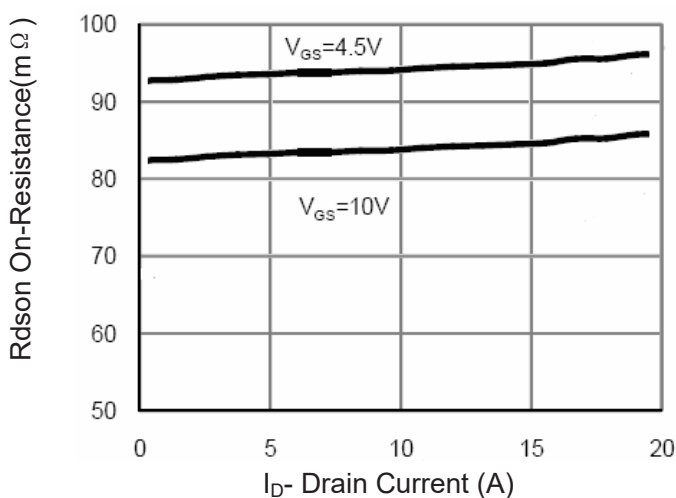
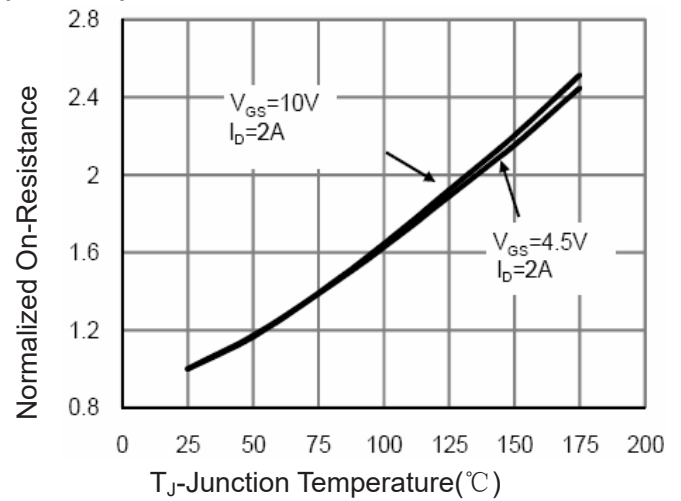
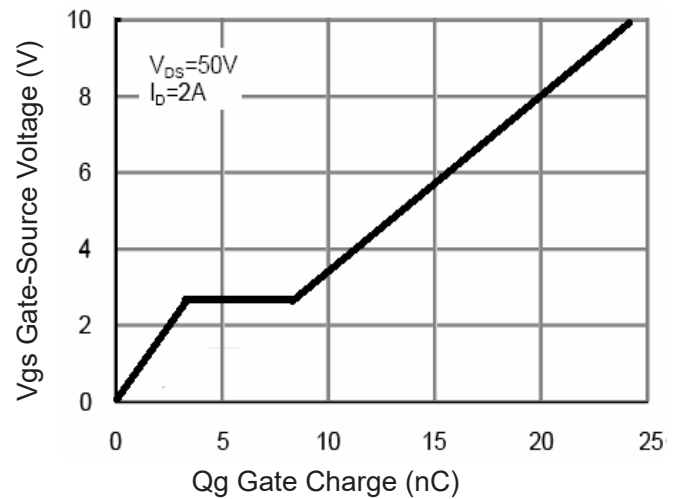
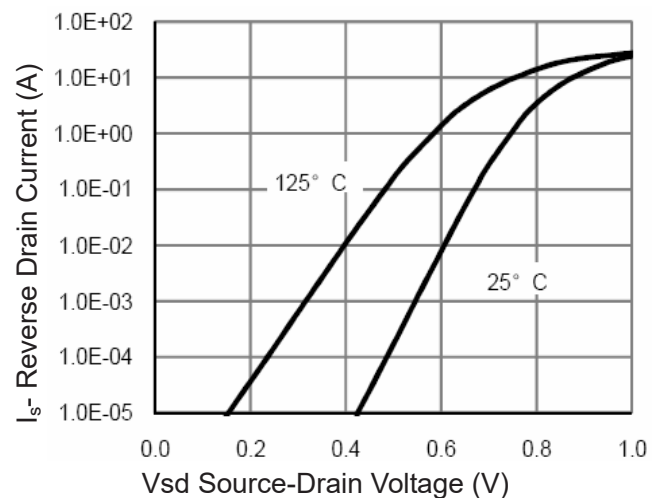
### 2) Gate charge test Circuit

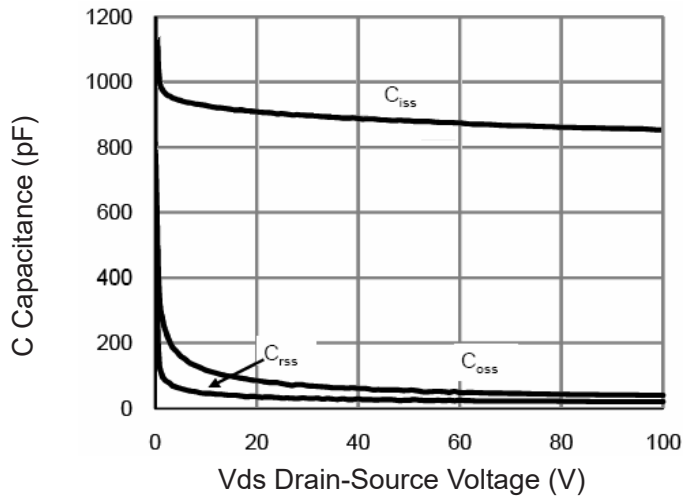
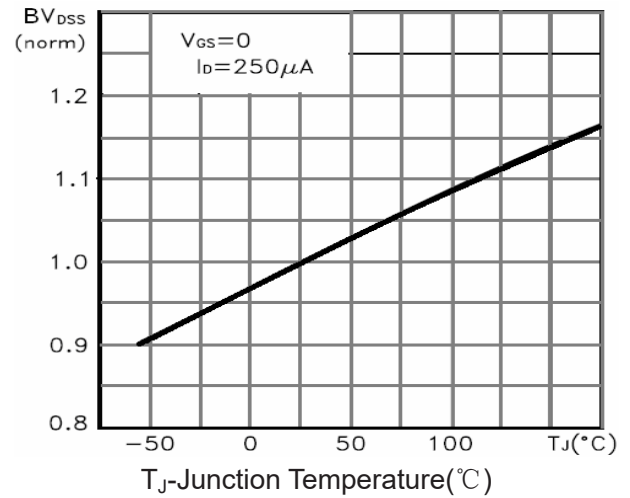
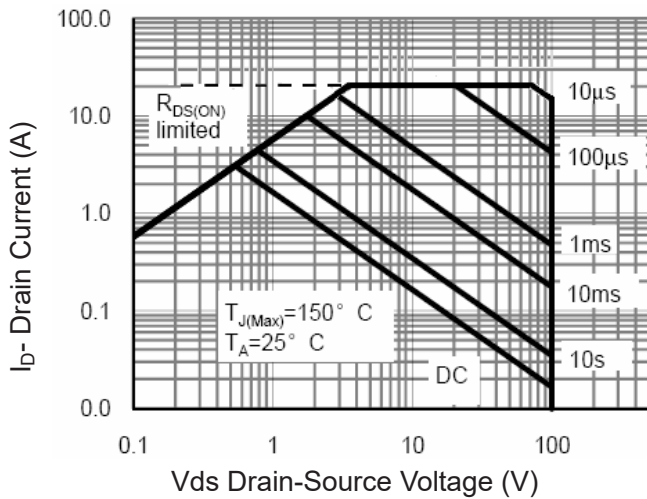
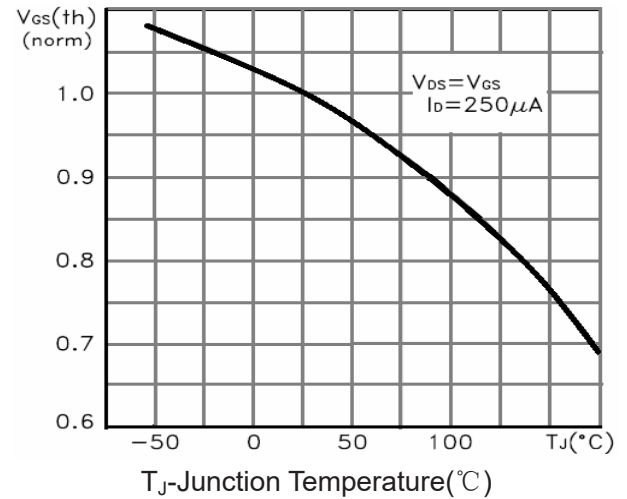
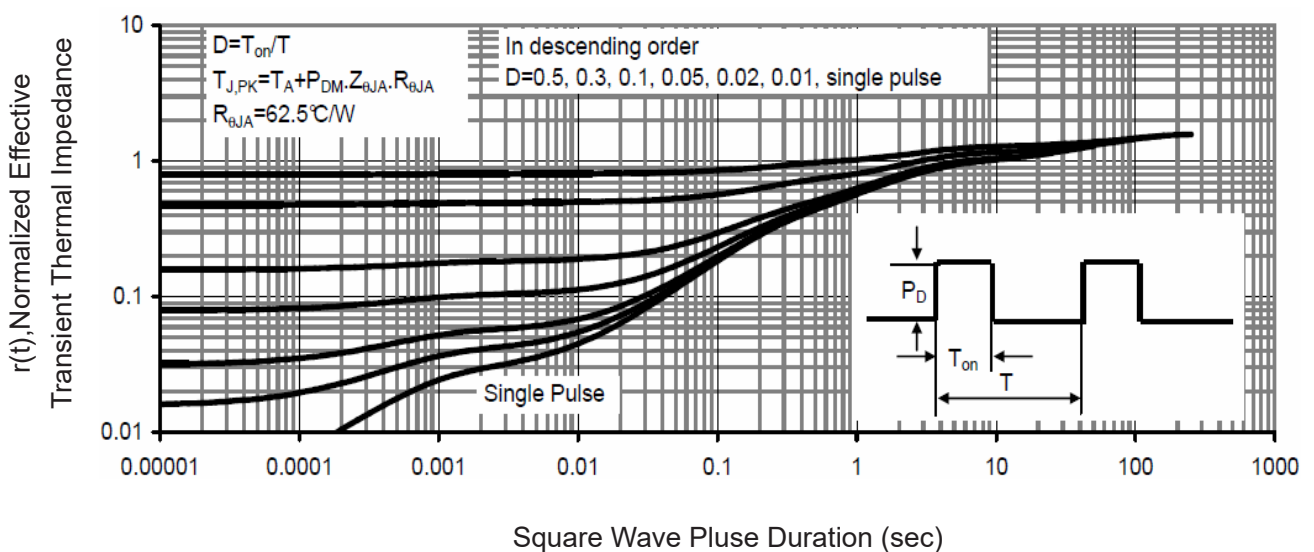


### 3) Switch Time Test Circuit



## Typical Electrical and Thermal Characteristics (Curves)


**Figure 1 Output Characteristics**

**Figure 2 Transfer Characteristics**

**Figure 3 Rdson- Drain Current**

**Figure 4 Rdson-Junction Temperature**

**Figure 5 Gate Charge**

**Figure 6 Source- Drain Diode Forward**


**Figure 7 Capacitance vs Vds**

**Figure 9 BV<sub>DSS</sub> vs Junction Temperature**

**Figure 8 Safe Operation Area**

**Figure 10 V<sub>GS(th)</sub> vs Junction Temperature**

**Figure 11 Normalized Maximum Transient Thermal Impedance**