

## Description

### Features

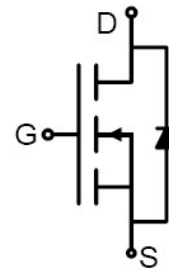
- 20V, 4A  
 $R_{DS(ON)} < 27m\Omega @ V_{GS} = 4.5V$   
 $R_{DS(ON)} < 44m\Omega @ V_{GS} = 2.5V$
- Advanced Trench Technology
- Excellent  $R_{DS(ON)}$  and Low Gate Charge
- Lead free product is acquired

### Application

- Load Switch
- PWM Application
- Power management



SOT-23-3



Schematic Diagram

## Package Marking and Ordering Information

Device Marking	Device	OUTLINE	Device Package	Reel Size	Reel (PCS)	Per Carton (PCS)
VSM2302A-S2	VSM2302A	TAPING	SOT-23-3	7inch	3000	180000

## Absolute Maximum Ratings (T<sub>A</sub>=25°C unless otherwise specified)

Symbol	Parameter		Max.	Units
V <sub>DSS</sub>	Drain-Source Voltage		20	V
V <sub>GSS</sub>	Gate-Source Voltage		±12	V
I <sub>D</sub>	Continuous Drain Current	T <sub>A</sub> = 25°C	4	A
		T <sub>A</sub> = 100°C	2.6	A
I <sub>DM</sub>	Pulsed Drain Current <sup>note1</sup>		16	A
P <sub>D</sub>	Power Dissipation	T <sub>A</sub> = 25°C	0.7	W
R <sub>θJA</sub>	Thermal Resistance, Junction to Case		179	°C/W
T <sub>J</sub> , T <sub>STG</sub>	Operating and Storage Temperature Range		-55 to +150	°C

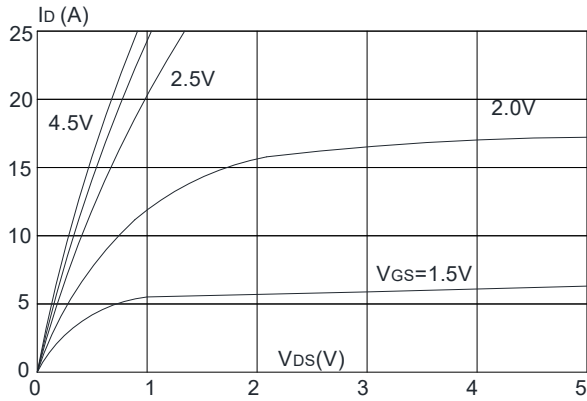
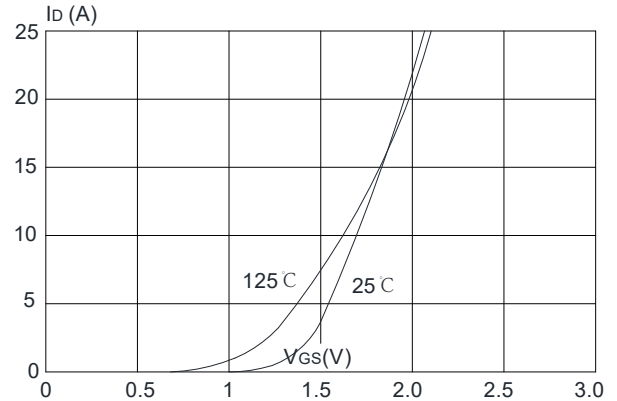
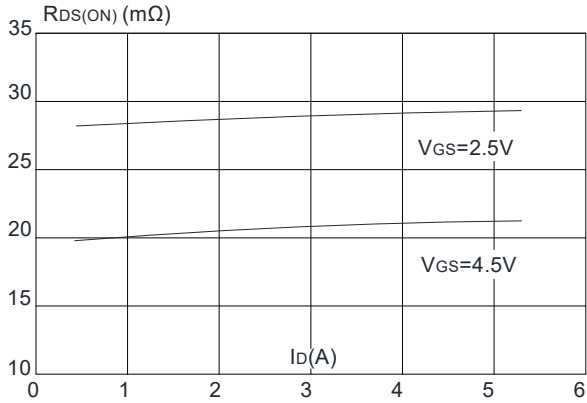
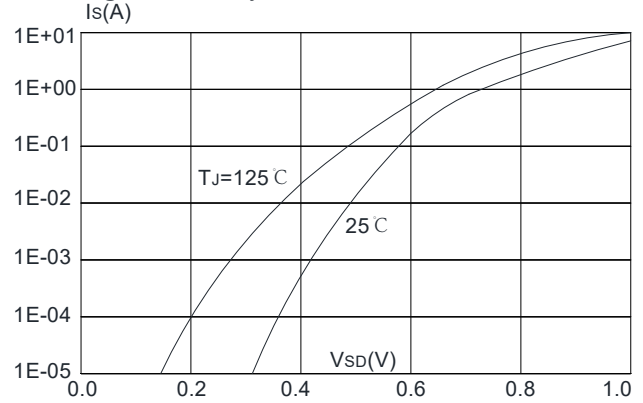
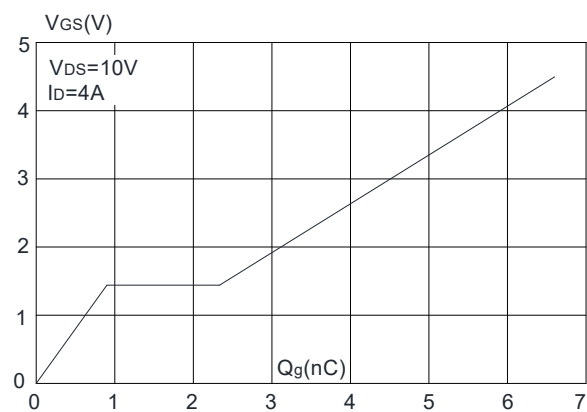
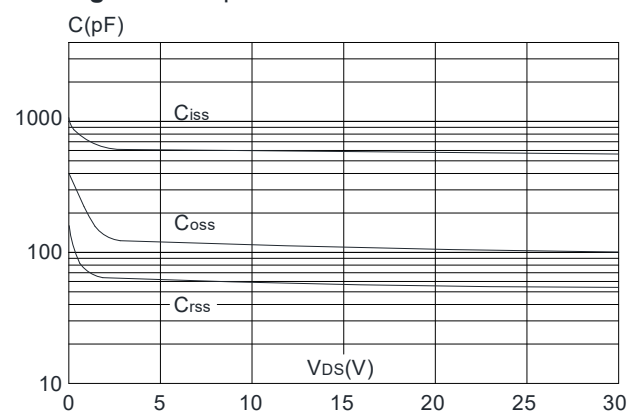
**Electrical Characteristics** ( $T_J=25^{\circ}\text{C}$  unless otherwise specified)

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Units
Off Characteristic						
V <sub>(BR)DSS</sub>	Drain-Source Breakdown Voltage	V <sub>GS</sub> =0V, I <sub>D</sub> =250μA	20	-	-	V
I <sub>DSS</sub>	Zero Gate Voltage Drain Current	V <sub>DS</sub> =20V, V <sub>GS</sub> =0V,	-	-	1.0	μA
I <sub>GSS</sub>	Gate to Body Leakage Current	V <sub>DS</sub> =0V, V <sub>GS</sub> =±12V	-	-	±100	nA
On Characteristics						
V <sub>GS(th)</sub>	Gate Threshold Voltage	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250μA	0.5	0.85	1.2	V
R <sub>DS(on)</sub>	Static Drain-Source on-Resistance <small>note2</small>	V <sub>GS</sub> =4.5V, I <sub>D</sub> =4A	-	21	27	mΩ
		V <sub>GS</sub> =2.5V, I <sub>D</sub> =3A	-	29	44	
Dynamic Characteristics						
C <sub>iss</sub>	Input Capacitance	V <sub>DS</sub> =10V, V <sub>GS</sub> =0V, f=1.0MHz	-	595	-	pF
C <sub>oss</sub>	Output Capacitance		-	106	-	pF
C <sub>rss</sub>	Reverse Transfer Capacitance		-	59	-	pF
Q <sub>g</sub>	Total Gate Charge	V <sub>DS</sub> =10V, I <sub>D</sub> =4A, V <sub>GS</sub> =4.5V	-	6.6	-	nC
Q <sub>gs</sub>	Gate-Source Charge		-	0.9	-	nC
Q <sub>gd</sub>	Gate-Drain(“Miller”) Charge		-	1.4	-	nC
Switching Characteristics						
t <sub>d(on)</sub>	Turn-on Delay Time	V <sub>DS</sub> =10V, I <sub>D</sub> =4A, R <sub>GEN</sub> =3Ω, V <sub>GS</sub> =4.5V	-	13	-	ns
t <sub>r</sub>	Turn-on Rise Time		-	55	-	ns
t <sub>d(off)</sub>	Turn-off Delay Time		-	18	-	ns
t <sub>f</sub>	Turn-off Fall Time		-	10	-	ns
Drain-Source Diode Characteristics and Maximum Ratings						
I <sub>S</sub>	Maximum Continuous Drain to Source Diode Forward Current		-	-	4	A
I <sub>SM</sub>	Maximum Pulsed Drain to Source Diode Forward Current		-	-	16	A
V <sub>SD</sub>	Drain to Source Diode Forward Voltage	V <sub>GS</sub> =0V, I <sub>S</sub> =4A	-	-	1.2	V

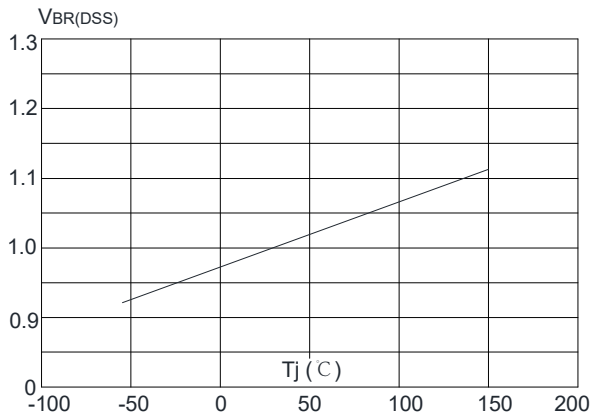
Notes:1. Repetitive Rating: Pulse Width Limited by Maximum Junction Temperature

2. Pulse Test: Pulse Width $\leq 300\mu s$ , Duty Cycle $\leq 0.5\%$

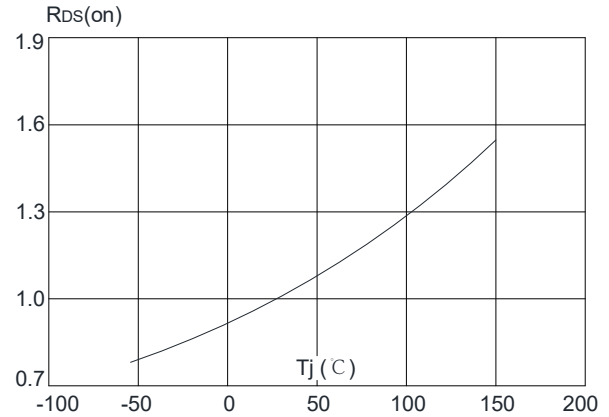
## Typical Performance Characteristics

**Figure1: Output Characteristics**

**Figure 2: Typical Transfer Characteristics**

**Figure 3: On-resistance vs. Drain Current**

**Figure 4: Body Diode Characteristics**

**Figure 5: Gate Charge Characteristics**

**Figure 6: Capacitance Characteristics**


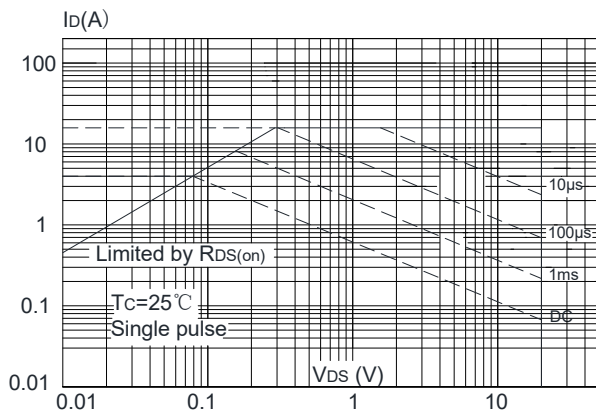
**Figure 7: Normalized Breakdown Voltage vs. Junction Temperature**



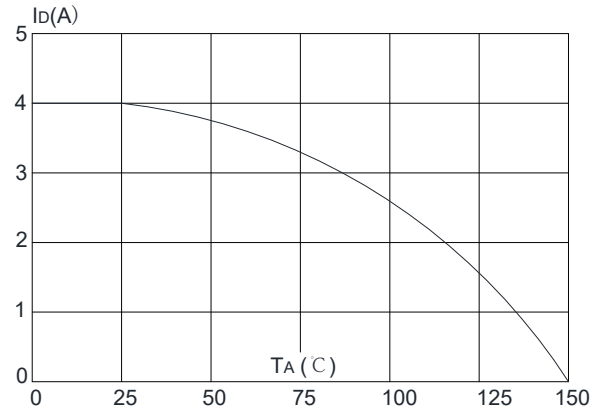
**Figure 8: Normalized on Resistance vs. Junction Temperature**



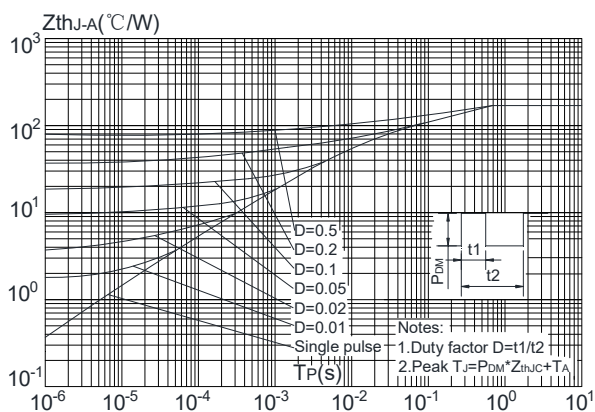
**Figure 9: Maximum Safe Operating Area**



**Figure 10: Maximum Continuous Drain Current vs. Ambient Temperature**



**Figure.11: Maximum Effective Transient Thermal Impedance, Junction-to-Ambient**



## Test Circuit

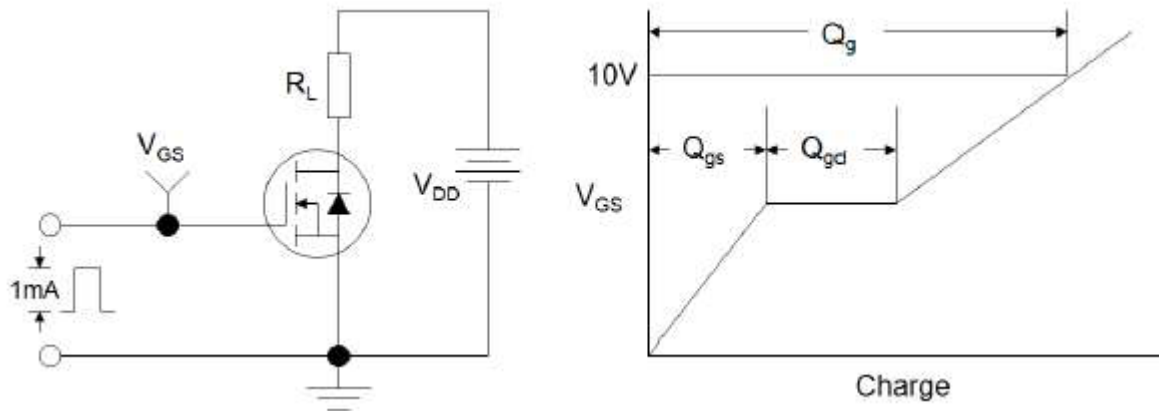


Figure1:Gate Charge Test Circuit & Waveform

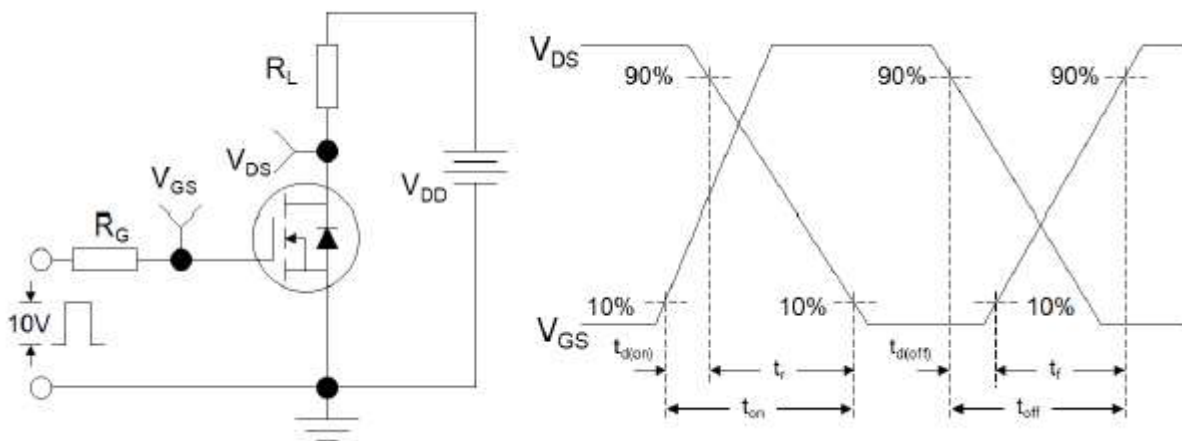


Figure 2: Resistive Switching Test Circuit & Waveforms

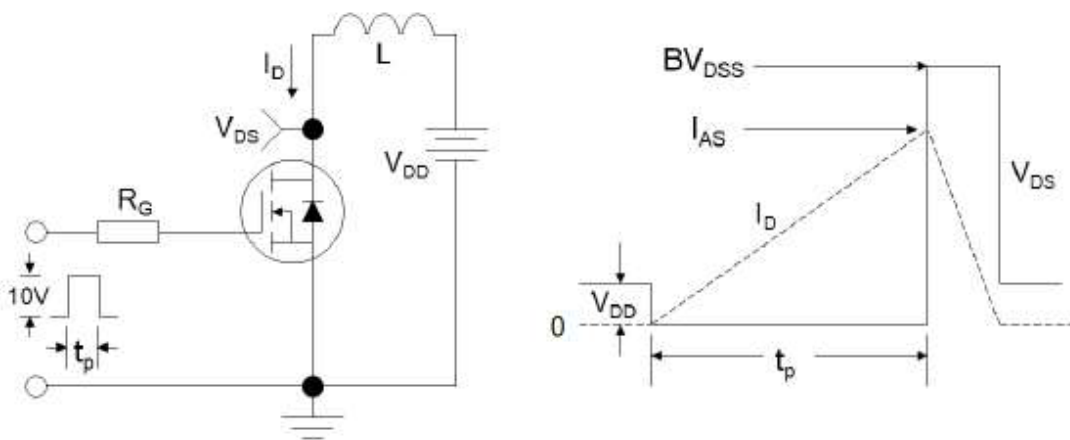


Figure 3:Unclamped Inductive Switching Test Circuit & Waveforms