

## Description

### Features

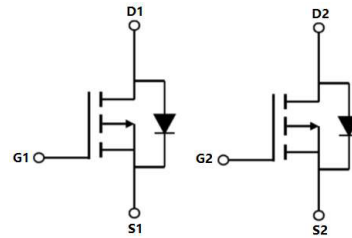
- $V_{DS} = -30V$ ,  $I_D = -5.1A$   
 $R_{DS(ON)} < 55m\Omega$  @  $V_{GS} = -10V$   
 $R_{DS(ON)} < 90m\Omega$  @  $V_{GS} = -4.5V$
- Advanced Trench Technology
- Excellent  $R_{DS(ON)}$  and Low Gate Charge
- Lead free product is acquired

### Application

- PWM Applications
- Load Switch
- Power Management



SOP-8



Schematic Diagram

## Package Marking and Ordering Information

Device Marking	Device	OUTLINE	Device Package	Reel Size	Reel (PCS)	Per Carton (PCS)
VSM5DP03-S8	VSM5DP03	TAPING	SOP-8	13inch	4000	48000

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

Symbol	Parameter		Max.	Units
$V_{DSS}$	Drain-Source Voltage		-30	V
$V_{GSS}$	Gate-Source Voltage		±20	V
$I_D$	Continuous Drain Current	$T_A = 25^\circ C$	-5.1	A
		$T_A = 100^\circ C$	-3.3	A
$I_{DM}$	Pulsed Drain Current <sup>note1</sup>		-20.4	A
$P_D$	Power Dissipation	$T_A = 25^\circ C$	2.15	W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient		58	°C/W
$T_J, T_{STG}$	Operating and Storage Temperature Range		-55 to +150	°C

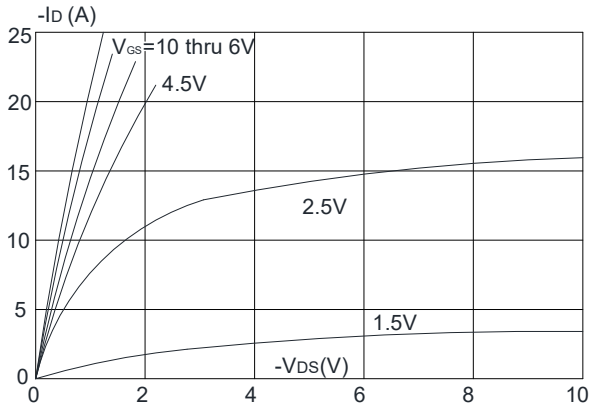
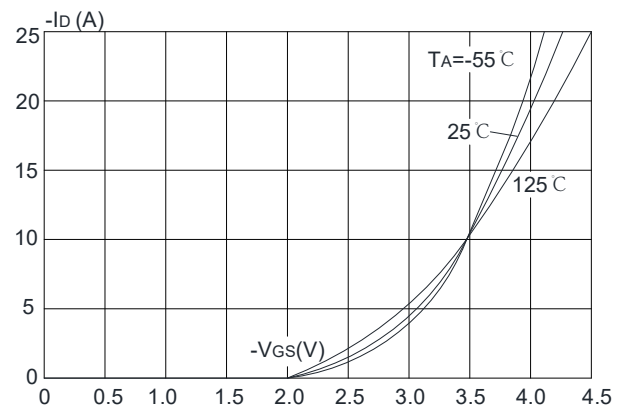
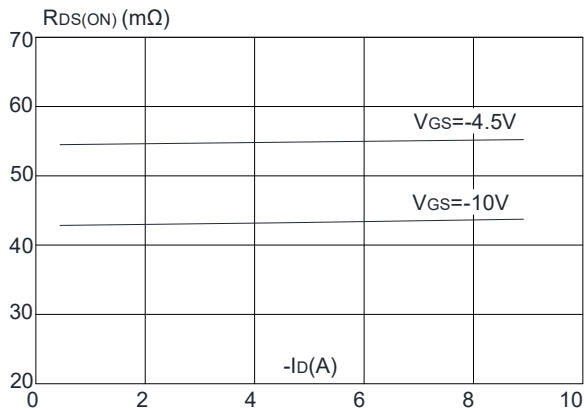
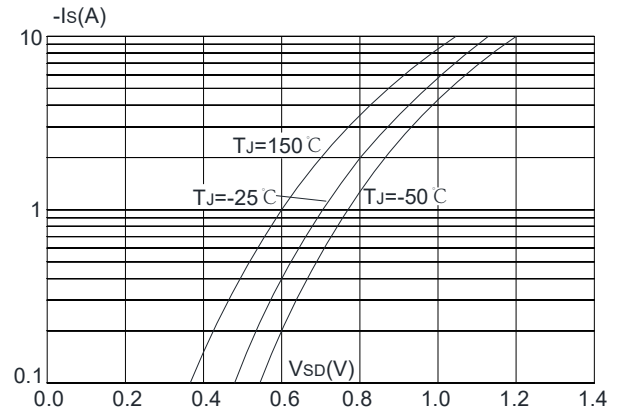
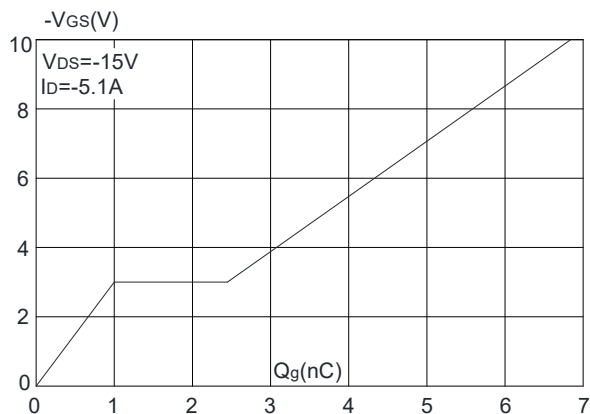
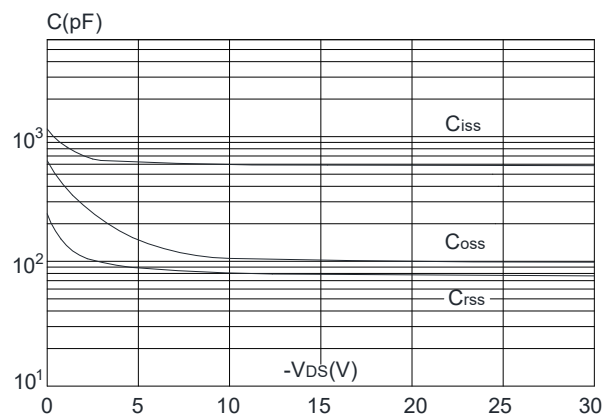
**Electrical Characteristics** ( $T_J=25^{\circ}\text{C}$  unless otherwise specified)

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	-30	-	-	V
I <sub>DSS</sub>	Zero Gate Voltage Drain Current	V <sub>DS</sub> = -30V, V <sub>GS</sub> =0V,	-	-	-1	μA
I <sub>GSS</sub>	Gate to Body Leakage Current	V <sub>DS</sub> =0V, V <sub>GS</sub> = ±20V	-	-	±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	-1.0	-1.6	-2.5	V
R <sub>DS(on)</sub>	Static Drain-Source on-Resistance <small>note2</small>	V <sub>GS</sub> = -10V, I <sub>D</sub> = -5A	-	43	55	mΩ
		V <sub>GS</sub> = -4.5V, I <sub>D</sub> = -4A	-	66	90	
Dynamic Characteristics						
C <sub>iss</sub>	Input Capacitance	V <sub>DS</sub> = -15V, V <sub>GS</sub> =0V, f=1.0MHz	-	580	-	pF
C <sub>oss</sub>	Output Capacitance		-	98	-	pF
C <sub>rss</sub>	Reverse Transfer Capacitance		-	74	-	pF
Q <sub>g</sub>	Total Gate Charge	V <sub>DS</sub> = -15V, I <sub>D</sub> = -5.1A, V <sub>GS</sub> = -10V	-	6.8	-	nC
Q <sub>gs</sub>	Gate-Source Charge		-	1	-	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>DD</sub> = -15V, I <sub>D</sub> = -1A, V <sub>GS</sub> = -10V, R <sub>GEN</sub> =2.5Ω	-	14	-	ns
t <sub>r</sub>	Turn-on Rise Time		-	61	-	ns
t <sub>d(off)</sub>	Turn-off Delay Time		-	19	-	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		-	-	-5.1	A
I <sub>SM</sub>	Maximum Pulsed Drain to Source Diode Forward Current		-	-	-20.4	A
V <sub>SD</sub>	Drain to Source Diode Forward Voltage	V <sub>GS</sub> =0V, I <sub>S</sub> = -5.1A	-	-0.8	-1.2	V

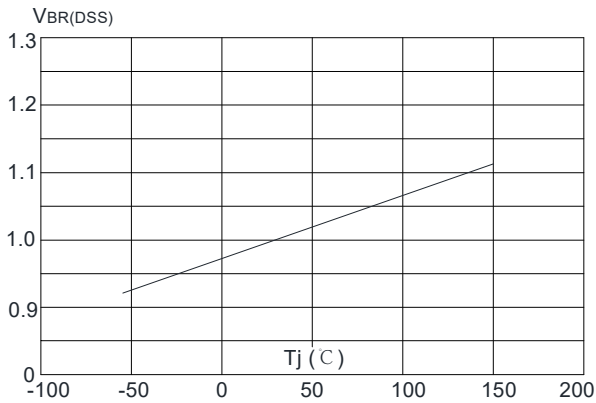
Notes:1. Repetitive Rating: Pulse Width Limited by Maximum Junction Temperature

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

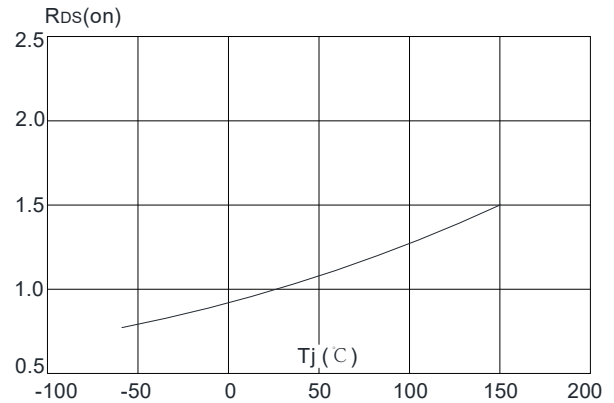
## Typical Performance Characteristics

**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**


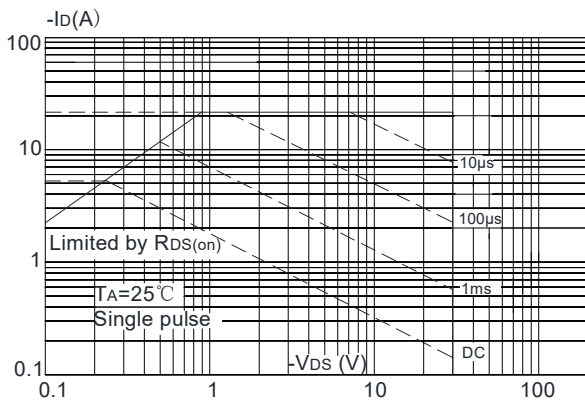
**Figure 7:** Normalized Breakdown Voltage vs. Junction Temperature



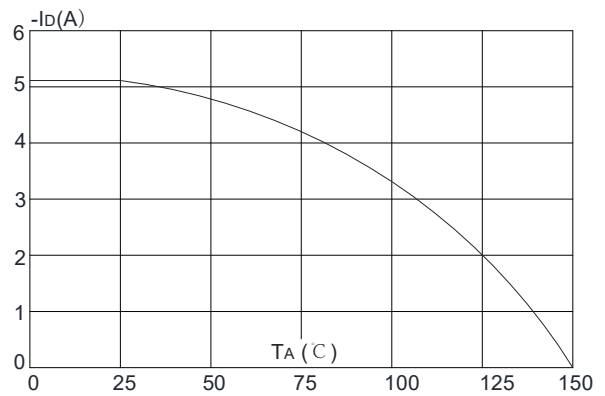
**Figure 8:** Normalized on Resistance vs. Junction Temperature



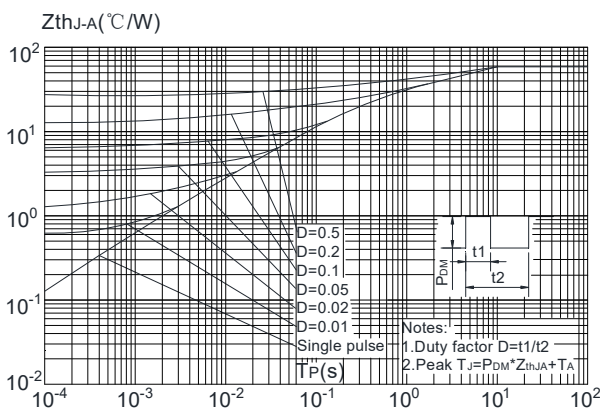
**Figure 9:** Maximum Safe Operating Area



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

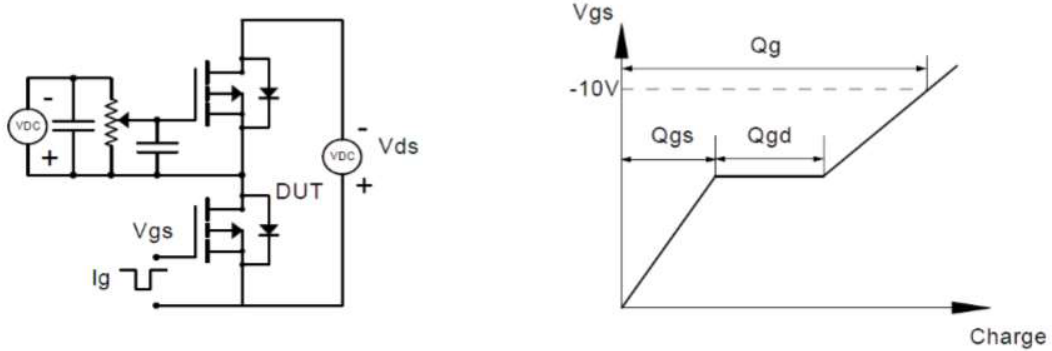


**Figure.11:** Maximum Effective Transient Thermal Impedance, Junction-to-Ambient

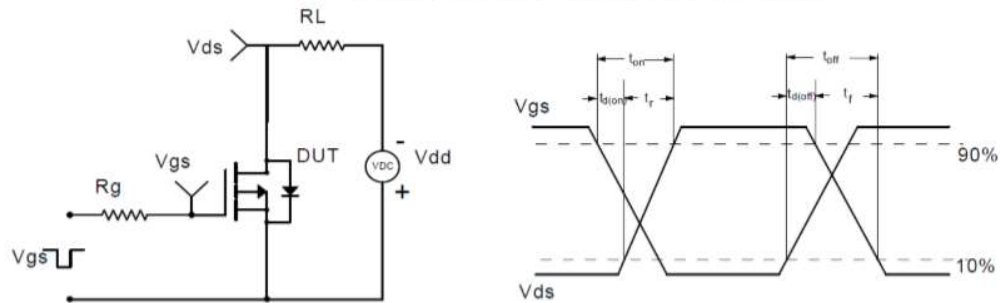


## Test Circuit

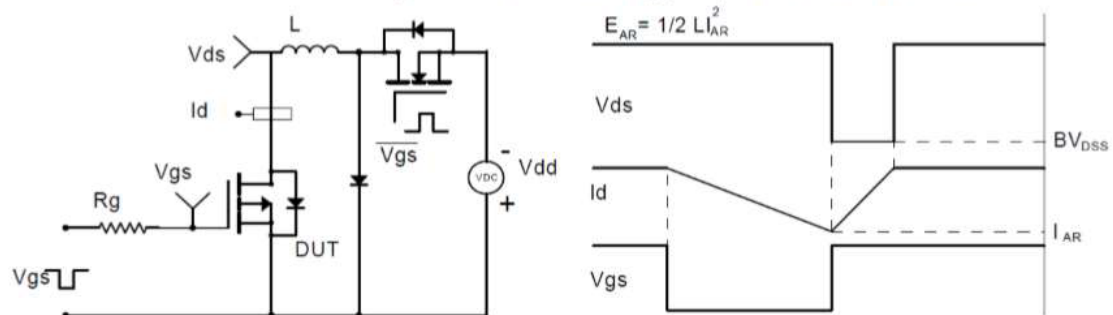
Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms

