
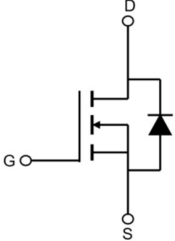


## Description

<b>Features</b> <ul style="list-style-type: none"> <li>● 30V, 40A</li> <li>● <math>R_{DS(ON)} &lt; 10m\Omega @ V_{GS} = 10V</math></li> <li>● <math>R_{DS(ON)} &lt; 17m\Omega @ V_{GS} = 4.5V</math></li> <li>● Advanced Trench Technology</li> <li>● Provide Excellent <math>R_{DS(ON)}</math> and Low Gate Charge</li> <li>● Lead free product is acquired</li> </ul>	<b>Application</b> <ul style="list-style-type: none"> <li>● Load Switch</li> <li>● PWM Application</li> <li>● Power management</li> </ul> <p style="text-align: center;">100% UIS 100% <math>\Delta Vds</math></p>
 <p>TO-252</p>	 <p>Schematic Diagram</p>

## Package Marking and Ordering Information

Device Marking	Device	OUTLINE	Device Package	Reel Size	Reel (PCS)	Per Carton (PCS)
VSM40N03-T2	VSM40N03	TAPING	TO-252	13inch	2500	25000

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

Symbol	Parameter	Max.	Units
V <sub>DSS</sub>	Drain-Source Voltage	30	V
V <sub>GSS</sub>	Gate-Source Voltage	±20	V
I <sub>D</sub>	Continuous Drain Current	T <sub>C</sub> = 25°C	40
		T <sub>C</sub> = 100°C	26
I <sub>DM</sub>	Pulsed Drain Current <sup>note1</sup>	160	A
E <sub>AS</sub>	Single Pulsed Avalanche Energy <sup>note2</sup>	29	mJ
P <sub>D</sub>	Power Dissipation	T <sub>C</sub> = 25°C	29
R <sub>θJC</sub>	Thermal Resistance, Junction to Case	5.2	°C/W
T <sub>J</sub> , T <sub>STG</sub>	Operating and Storage Temperature Range	-55 to +175	°C

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

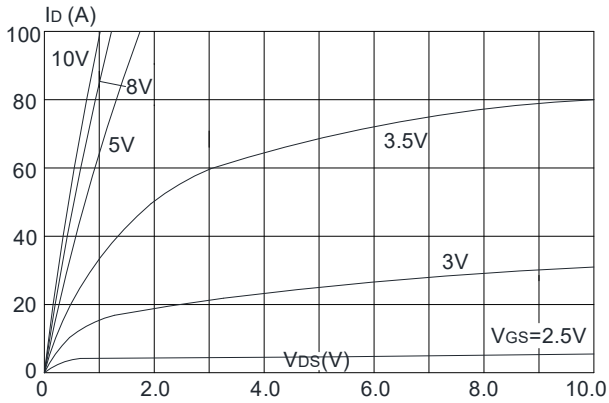
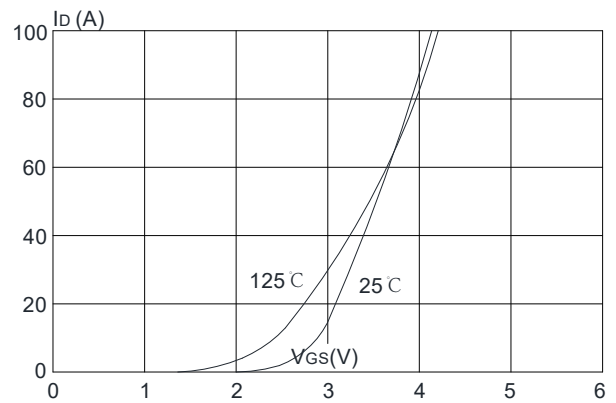
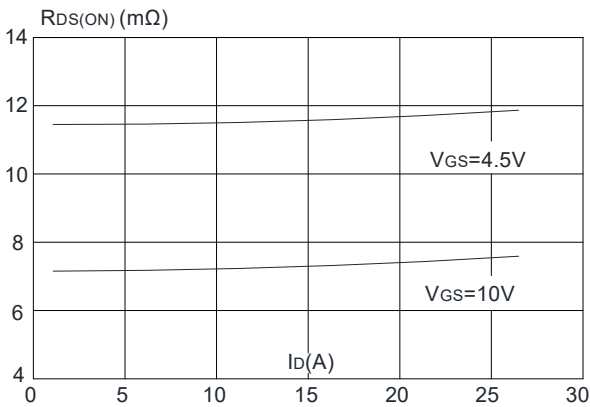
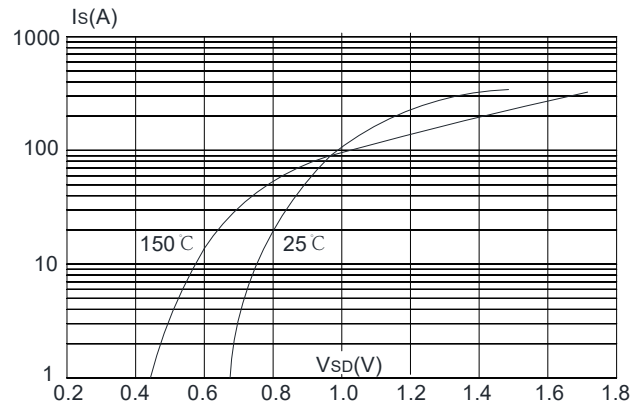
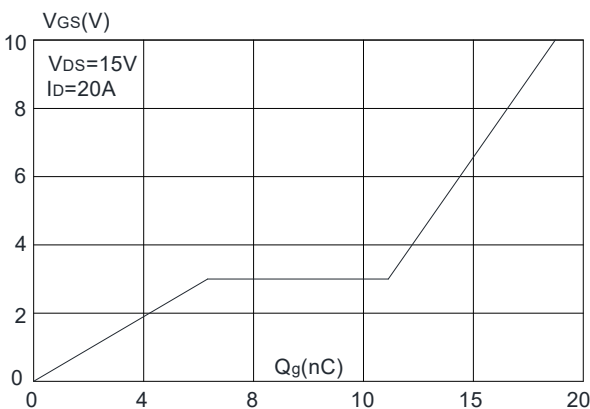
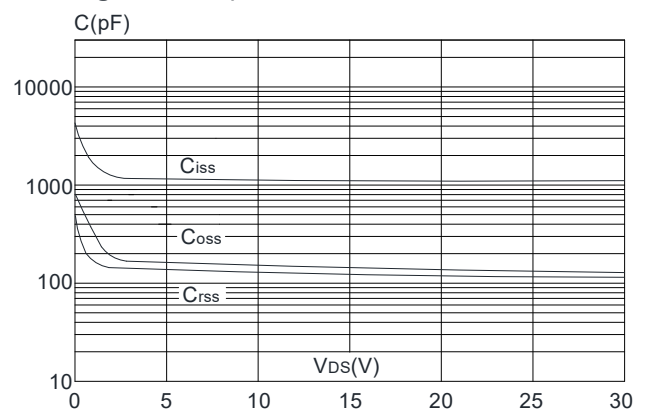
Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Units
<b>Off Characteristic</b>						
$V_{(BR)DSS}$	Drain-Source Breakdown Voltage	$V_{GS}=0V, I_D=250\mu A$	30	-	-	V
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS}=30V, V_{GS}=0V,$	-	-	1.0	$\mu A$
$I_{GSS}$	Gate to Body Leakage Current	$V_{DS}=0V, V_{GS}=\pm 20V$	-	-	$\pm 100$	nA
<b>On Characteristics</b>						
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}, I_D=250\mu A$	1.0	1.5	2.5	V
$R_{DS(on)}$	Static Drain-Source on-Resistance <small>note3</small>	$V_{GS}=10V, I_D=20A$	-	7.6	10	m $\Omega$
		$V_{GS}=4.5V, I_D=10A$	-	11.5	17	
<b>Dynamic Characteristics</b>						
$C_{iss}$	Input Capacitance	$V_{DS}=15V, V_{GS}=0V,$ $f=1.0MHz$	-	1011	-	pF
$C_{oss}$	Output Capacitance		-	142	-	pF
$C_{rss}$	Reverse Transfer Capacitance		-	119	-	pF
$Q_g$	Total Gate Charge	$V_{DS}=15V, I_D=20A,$ $V_{GS}=10V$	-	19	-	nC
$Q_{gs}$	Gate-Source Charge		-	6.3	-	nC
$Q_{gd}$	Gate-Drain("Miller") Charge		-	4.5	-	nC
<b>Switching Characteristics</b>						
$t_{d(on)}$	Turn-on Delay Time	$V_{DS}=30V,$ $I_D=2A, R_{GEN}=3\Omega,$ $V_{GS}=10V$	-	6	-	ns
$t_r$	Turn-on Rise Time		-	5	-	ns
$t_{d(off)}$	Turn-off Delay Time		-	25	-	ns
$t_f$	Turn-off Fall Time		-	7	-	ns
<b>Drain-Source Diode Characteristics and Maximum Ratings</b>						
$I_S$	Maximum Continuous Drain to Source Diode Forward Current		-	-	40	A
$I_{SM}$	Maximum Pulsed Drain to Source Diode Forward Current		-	-	160	A
$V_{SD}$	Drain to Source Diode Forward Voltage	$V_{GS}=0V, I_S=30A$	-	-	1.2	V
$t_{rr}$	Body Diode Reverse Recovery Time	$I_F=30A, di/dt=100A/\mu s$	-	7	-	ns
$Q_{rr}$	Body Diode Reverse Recovery Charge		-	6.3	-	nC

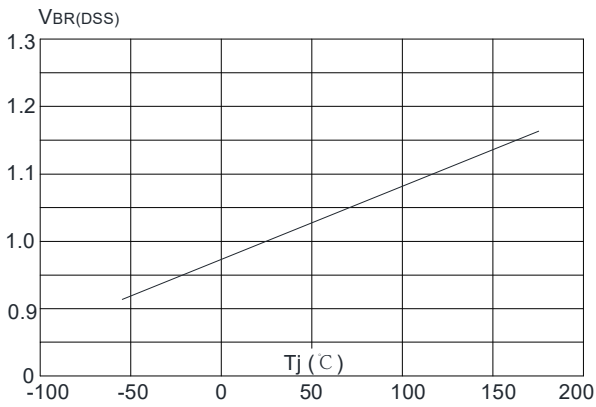
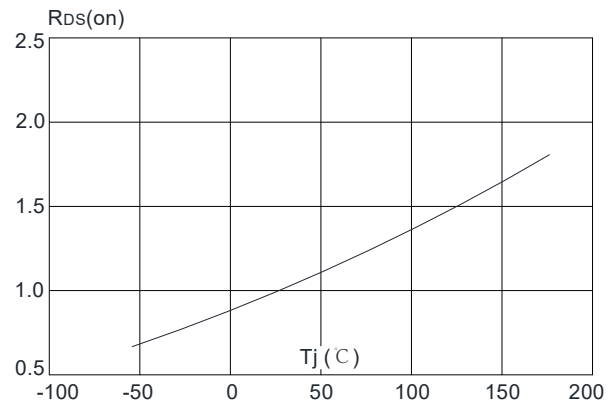
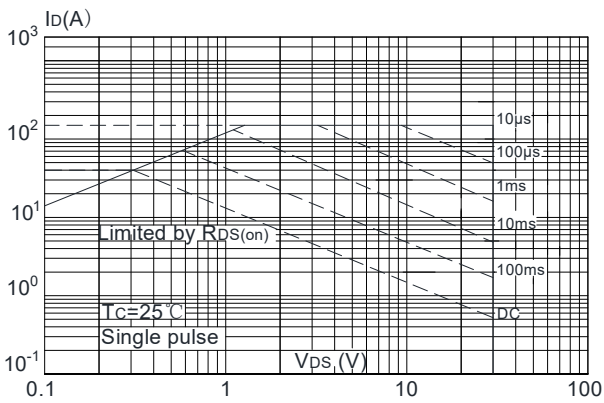
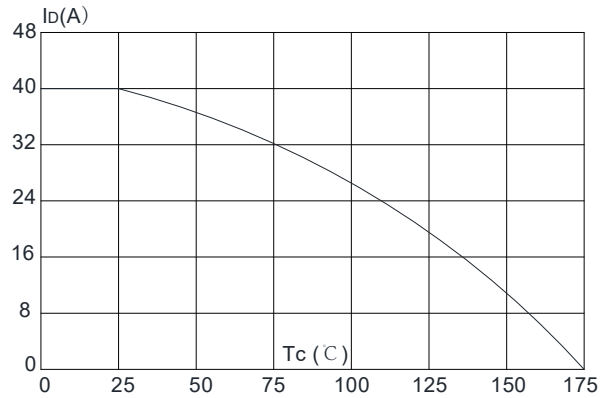
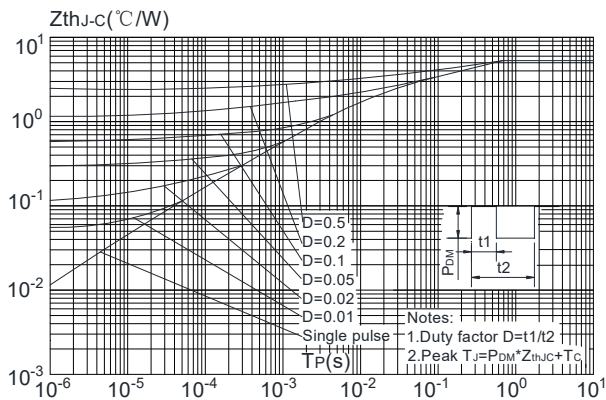
Notes:1. Repetitive Rating: Pulse Width Limited by Maximum Junction Temperature

 2. EAS condition:  $T_J=25^{\circ}\text{C}, V_{DD}=15V, V_G=10V, R_G=25\Omega, L=0.5mH, I_{AS}=10.8A$ 

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

## Typical Performance Characteristics

**Figure 1: 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. Case Temperature**

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


## Test Circuit

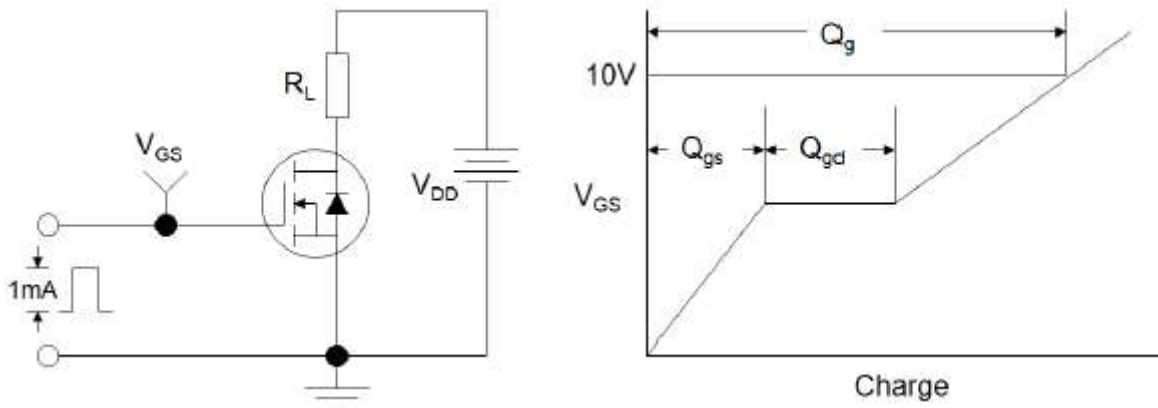


Figure1:Gate Charge Test Circuit & Waveform

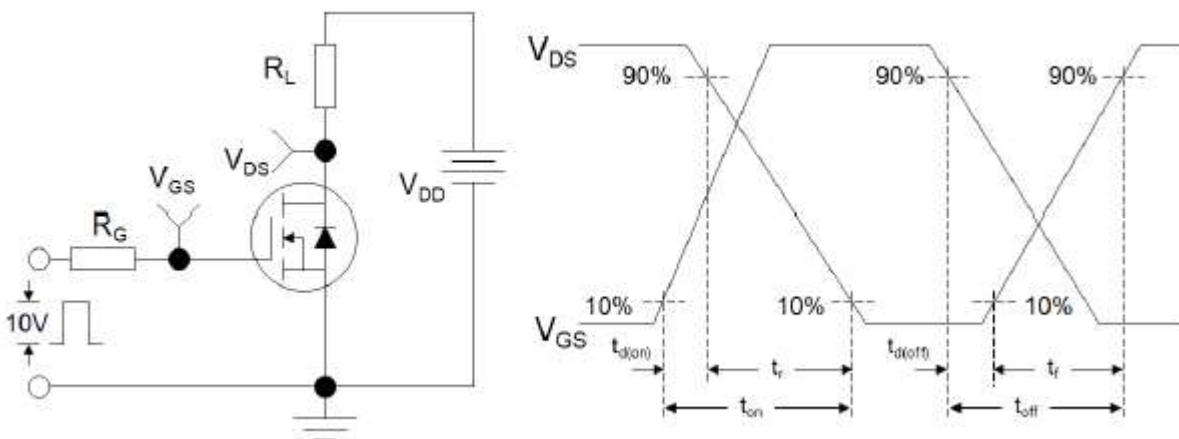


Figure 2: Resistive Switching Test Circuit & Waveforms

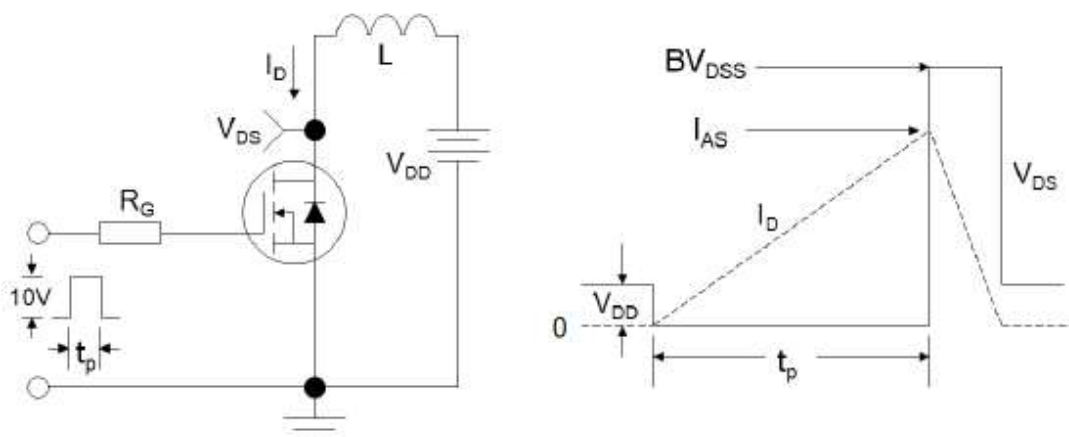


Figure 3:Unclamped Inductive Switching Test Circuit & Waveforms