
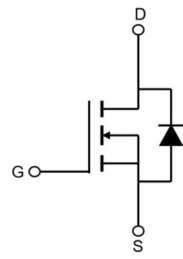


Description

Features <ul style="list-style-type: none"> ● 20V, 90A ● $R_{DS(ON)} < 4.0m\Omega @ V_{GS} = 4.5V$ ● $R_{DS(ON)} < 6.0m\Omega @ V_{GS} = 2.5V$ ● Lead free and Green Device Available ● Excellent $R_{DS(ON)}$ and Low Gate Charge ● Lead free product is acquired 	Application <ul style="list-style-type: none"> ● Load Switch ● PWM Application ● Power management <p>100% UIS 100% ΔV_ds</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)
VSM90N02-T2	VSM90N02	TAPING	TO-252	13inch	2500	25000

Absolute Maximum Ratings (T_C=25°C unless otherwise specified)

Symbol	Parameter		Max.	Units
V _{DSS}	Drain-Source Voltage		20	V
V _{GSS}	Gate-Source Voltage		±12	V
I _D	Continuous Drain Current	T _C = 25°C	90	A
		T _C = 100°C	59	A
I _{DM}	Pulsed Drain Current ^{note1}		360	A
E _{AS}	Single Pulsed Avalanche Energy ^{note2}		110	mJ
P _D	Power Dissipation	T _C = 25°C	81	W
R _{θJC}	Thermal Resistance, Junction to Case		1.85	°C/W
T _J , T _{STG}	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
Off Characteristic						
V _{(BR)DSS}	Drain-Source Breakdown Voltage	V _{GS} =0V, I _D =250μA	20	-	-	V
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} =20V, V _{GS} =0V	-	-	1	μA
I _{GSS}	Gate to Body Leakage Current	V _{GS} = ±12V, V _{DS} =0V	-	-	±100	nA
On Characteristics						
V _{GS(th)}	Gate Threshold Voltage	V _{DS} =V _{GS} , I _D =250μA	0.4	0.7	1.0	V
R _{DS(on)}	Static Drain-Source On-Resistance <small>note3</small>	V _{GS} =4.5V, I _D =30A	-	2.8	4	mΩ
		V _{GS} =2.5V, I _D =20A		4	6	
Dynamic Characteristics						
C _{iss}	Input Capacitance	V _{DS} =10V, V _{GS} =0V, f=1.0MHz	-	3200	-	pF
C _{oss}	Output Capacitance		-	460	-	pF
C _{rss}	Reverse Transfer Capacitance		-	445	-	pF
Q _g	Total Gate Charge	V _{DS} =10V, I _D =30A, V _{GS} =4.5V	-	48	-	nC
Q _{gs}	Gate-Source Charge		-	3.6	-	nC
Q _{gd}	Gate-Drain(“Miller”) Charge		-	19	-	nC
Switching Characteristics						
t _{d(on)}	Turn-On Delay Time	V _{DS} =10V, I _D =30A, R _G =1.8Ω, V _{GS} =4.5V	-	9.7	-	ns
t _r	Turn-On Rise Time		-	37	-	ns
t _{d(off)}	Turn-Off Delay Time		-	63	-	ns
t _f	Turn-Off Fall Time		-	52	-	ns
Drain-Source Diode Characteristics and Maximum Ratings						
I _S	Maximum Continuous Drain to Source Diode Forward Current		-	-	90	A
I _{SM}	Maximum Pulsed Drain to Source Diode Forward Current		-	-	360	A
V _{SD}	Drain to Source Diode Forward Voltage	V _{GS} =0V, I _{SD} =30A, T _J =25℃	-	-	1.2	V
t _{rr}	Reverse Recovery Time	T _J =25℃, I _F =30A,	-	23	-	ns
Q _{rr}	Reverse Recovery Charge	di/dt =100A/μs	-	10	-	nC

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

2. EAS condition: $T_J=25^{\circ}\text{C}$, $V_{DD}=15V$, $V_G=4.5V$, $R_G=25\Omega$, $L=0.5mH$, $I_{AS}=21A$

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

Typical Performance Characteristics

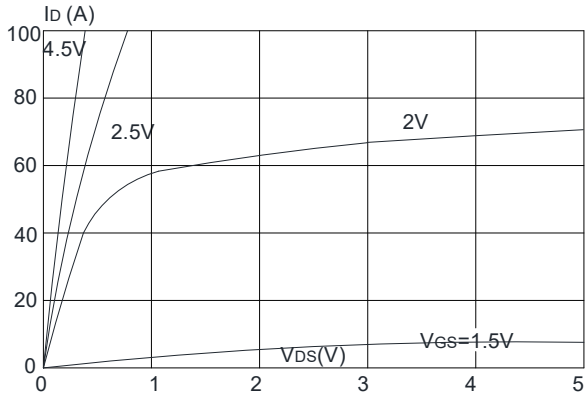
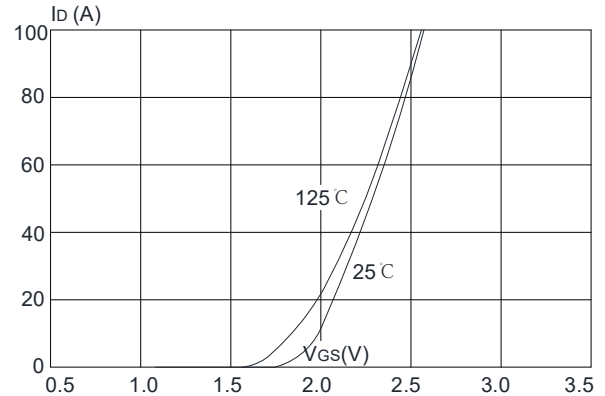
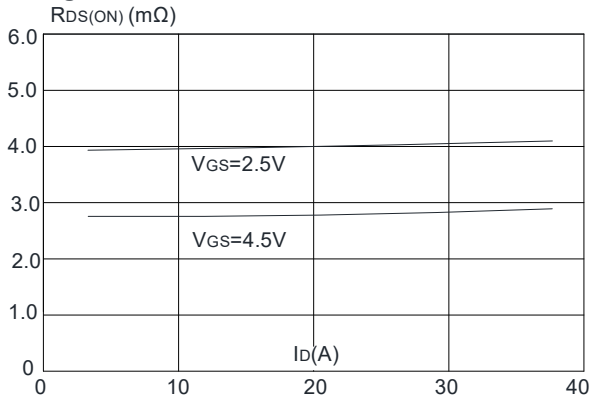
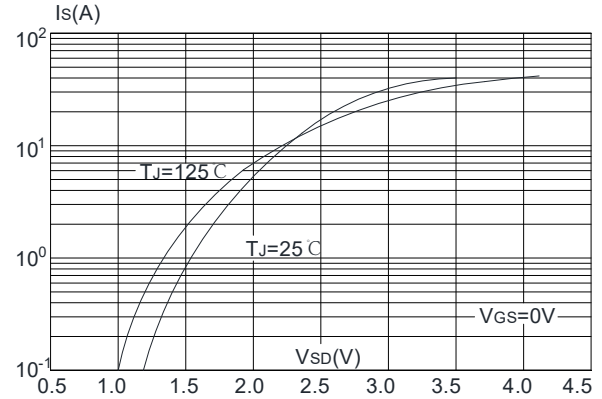
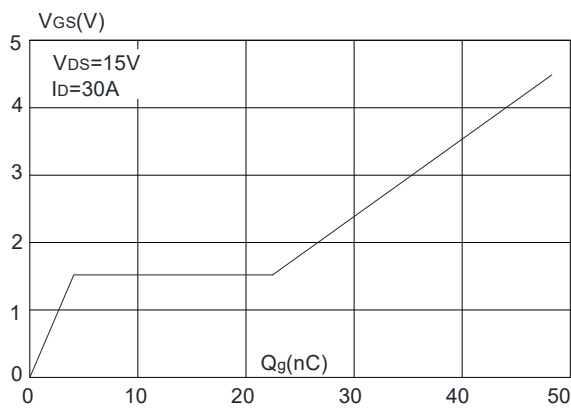
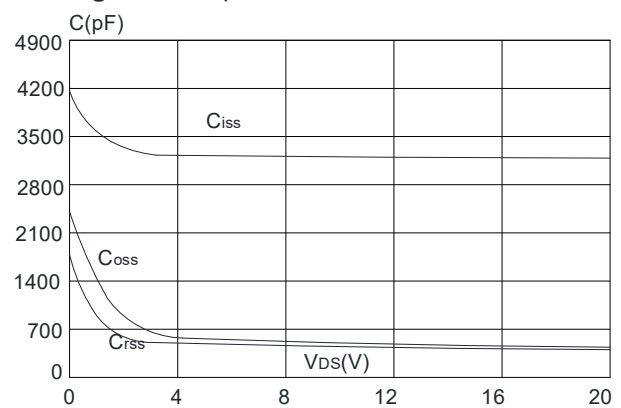
Figure1: Output Characteristics

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

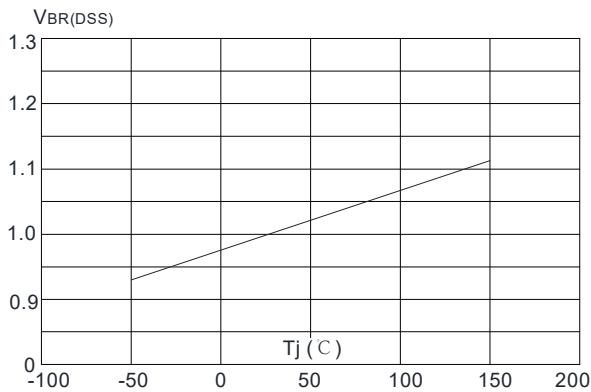


Figure 8: Normalized on Resistance vs. Junction Temperature

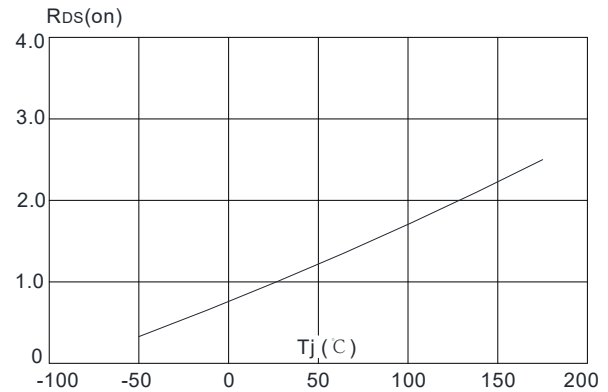


Figure 9: Maximum Safe Operating Area

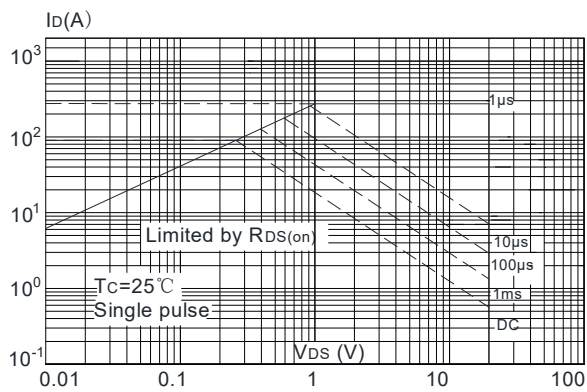


Figure 10: Maximum Continuous Drain Current vs. Case Temperature

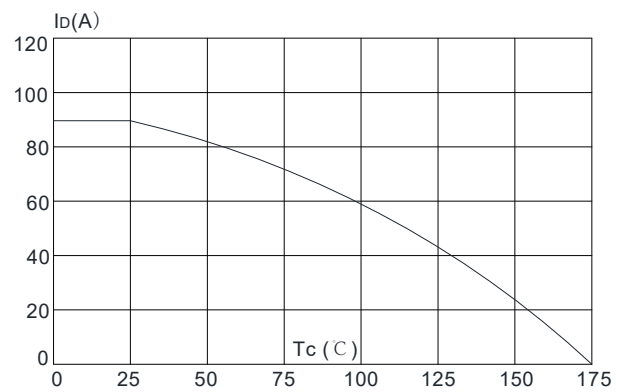
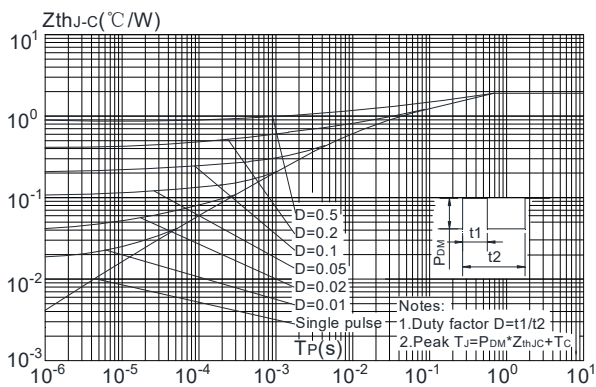


Figure.11: Maximum Effective Transient Thermal Impedance, Junction-to-Case



Test Circuit

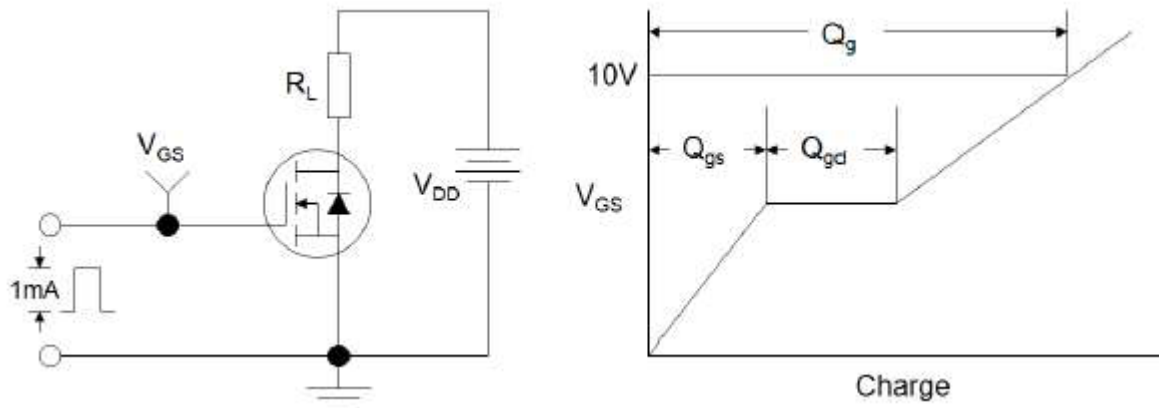


Figure1:Gate Charge Test Circuit & Waveform

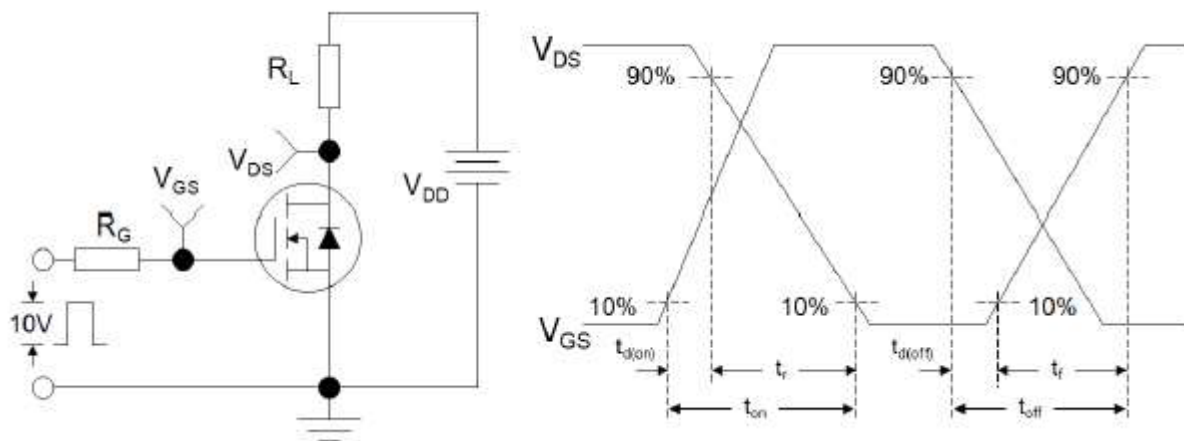


Figure 2: Resistive Switching Test Circuit & Waveforms

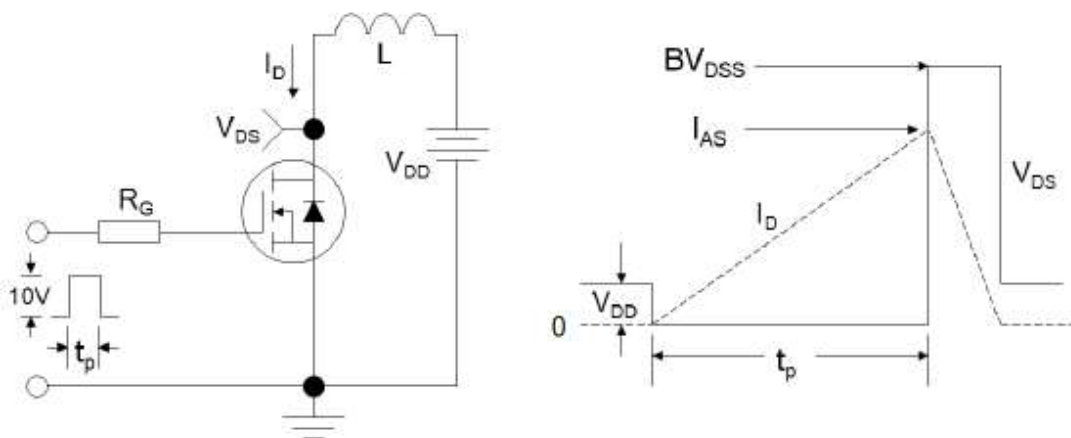


Figure 3:Unclamped Inductive Switching Test Circuit & Waveforms