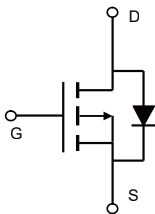


Description

Features ● -20V, -20A ● $R_{DS(ON)} < 16m\Omega$ @ $V_{GS} = -4.5V$ ● $R_{DS(ON)} < 24m\Omega$ @ $V_{GS} = -2.5V$ ● Advanced Trench Technology ● Provide Excellent $R_{DS(ON)}$ and Low Gate Charge ● Lead free product is acquired	Application ● Load Switch ● PWM Application ● Power management <i>100% UIS TESTED!</i> <i>100% ΔV_{ds} TESTED!</i>
 TO-251	 Schematic

Package Marking and Ordering Information

Device Marking	Device	OUTLINE	Device Package	TUBE (PCS)	Inner Box (PCS)	Per Carton (PCS)
VSM20P02	VSM20P02-T1	TUBE	TO-251	75	4,950	29,700

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	-20	A
	T _C = 25°C	-13	A
	T _C = 100°C	-13	A
I _{DM}	Pulsed Drain Current ^{note1}	-80	A
EAS	Single Pulsed Avalanche Energy ^{note2}	36	mJ
P _D	Power Dissipation	13	W
	T _C = 25°C	12	°C/W
R _{θJC}	Thermal Resistance, Junction to Ambient	12	°C/W
T _J , T _{STG}	Operating and Storage Temperature Range	-55 to +175	°C

Electrical Characteristics (T_J=25°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 _{DS} =0V, V _{GS} = ±12V	-	-	±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 Note3	V _{GS} = -4.5V, I _D = -10A	-	12	16	mΩ
		V _{GS} = -2.5V, I _D = -5A	-	17	24	
Dynamic Characteristics						
C _{iss}	Input Capacitance	V _{DS} = -10V, V _{GS} =0V, f=1.0MHz	-	2000	-	pF
C _{oss}	Output Capacitance		-	242	-	pF
C _{rss}	Reverse Transfer Capacitance		-	231	-	pF
Q _g	Total Gate Charge	V _{DS} = -10V, I _D = -6A, V _{GS} = -4.5V	-	16	-	nC
Q _{gs}	Gate-Source Charge		-	3	-	nC
Q _{gd}	Gate-Drain(“Miller”) Charge		-	4	-	nC
Switching Characteristics						
t _{d(on)}	Turn-on Delay Time	V _{DD} = -10V, I _D = -12A, V _{GS} = -4.5V, R _{GEN} =2.4Ω	-	14	-	ns
t _r	Turn-on Rise Time		-	79	-	ns
t _{d(off)}	Turn-off Delay Time		-	76	-	ns
t _f	Turn-off Fall Time		-	76	-	ns
Drain-Source Diode Characteristics and Maximum Ratings						
I _S	Maximum Continuous Drain to Source Diode Forward Current		-	-	-20	A
I _{SM}	Maximum Pulsed Drain to Source Diode Forward Current		-	-	-80	A
V _{SD}	Drain to Source Diode Forward Voltage	V _{GS} =0V, I _S = -20A	-	-0.8	-1.2	V
t _{rr}	Body Diode Reverse Recovery Time	IF=-2A, di/dt=-100A/μs	-	180	-	ns
Q _{rr}	Body Diode Reverse Recovery Charge		-	300	-	nC

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

2. EAS condition : T_J=25°C, V_{DD}=-10V, V_G=10V, L=0.5mH, R_g=25Ω, I_{AS}=-12A

3. Pulse Test: Pulse Width≤300μs, Duty Cycle≤2%

Typical Performance Characteristics

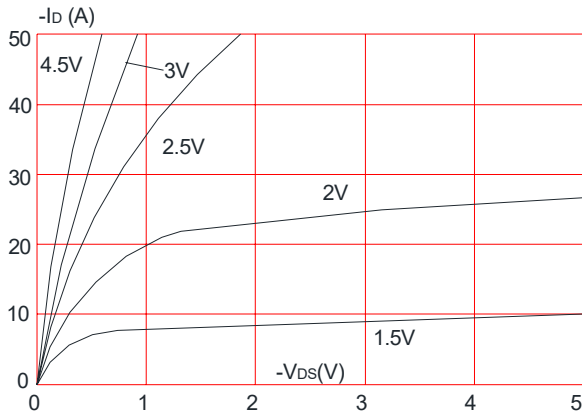
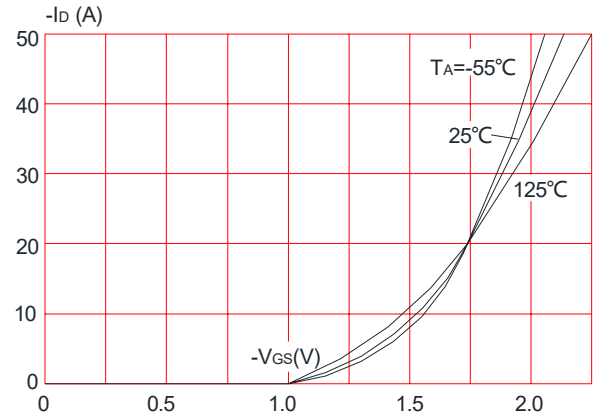
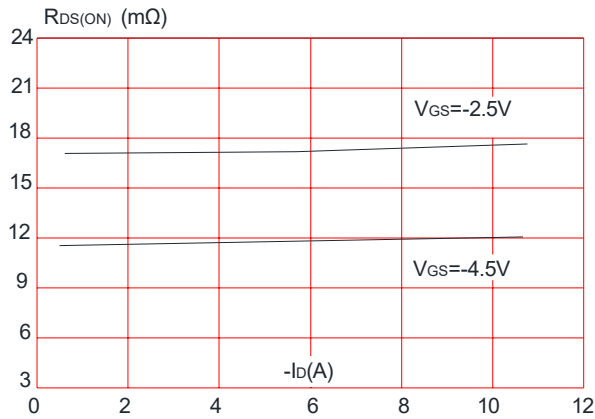
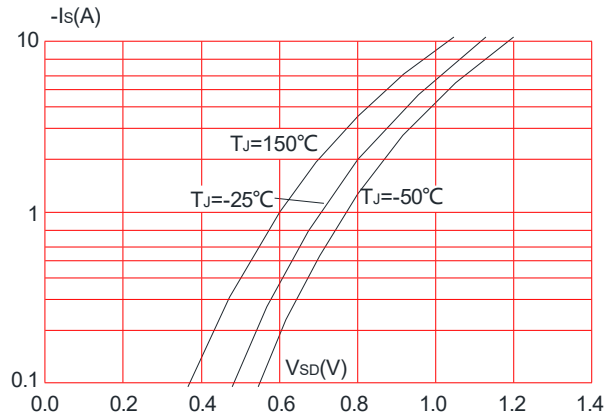
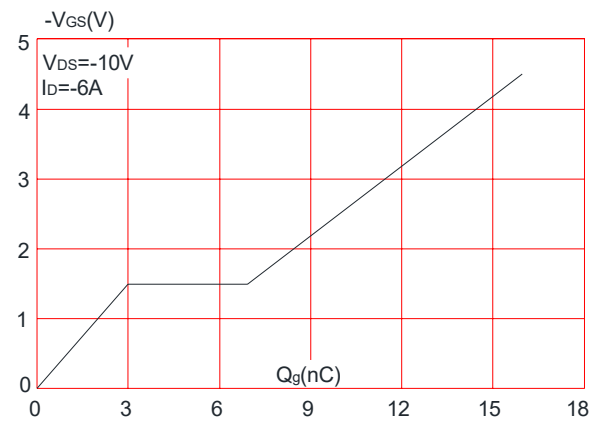
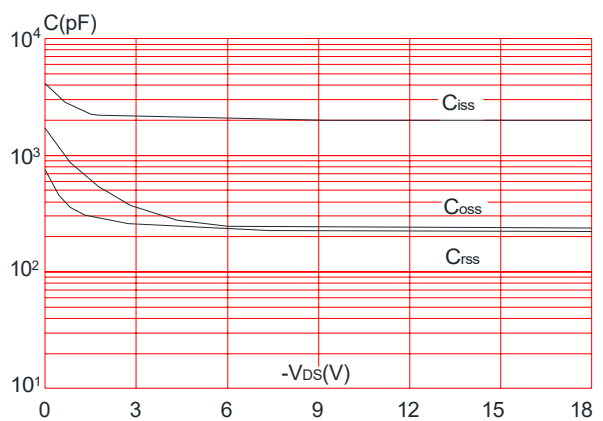
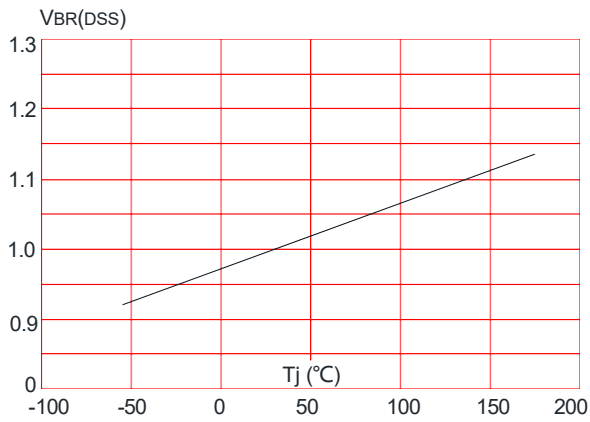
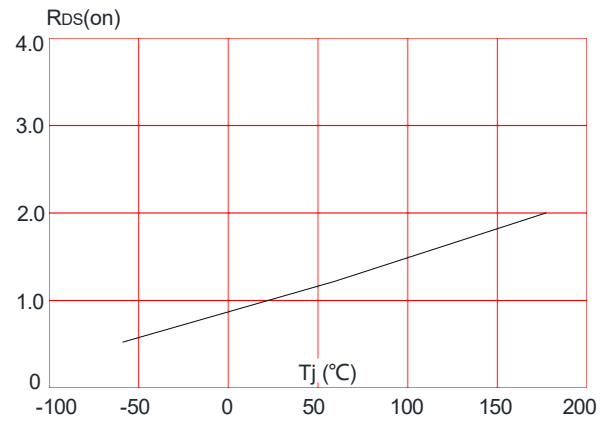
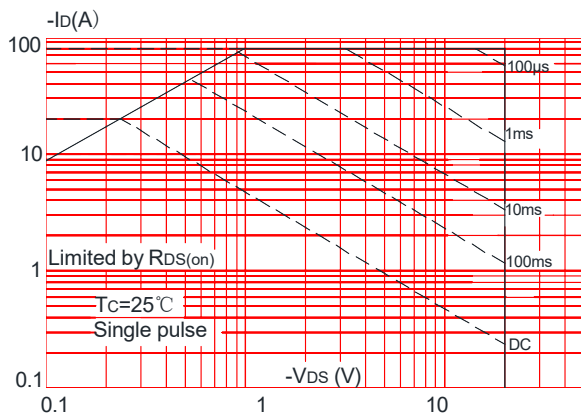
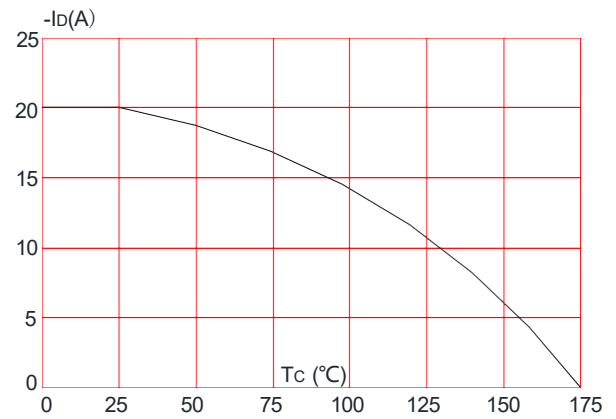
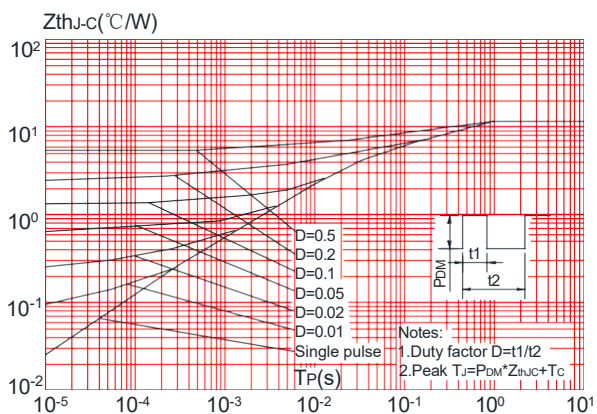
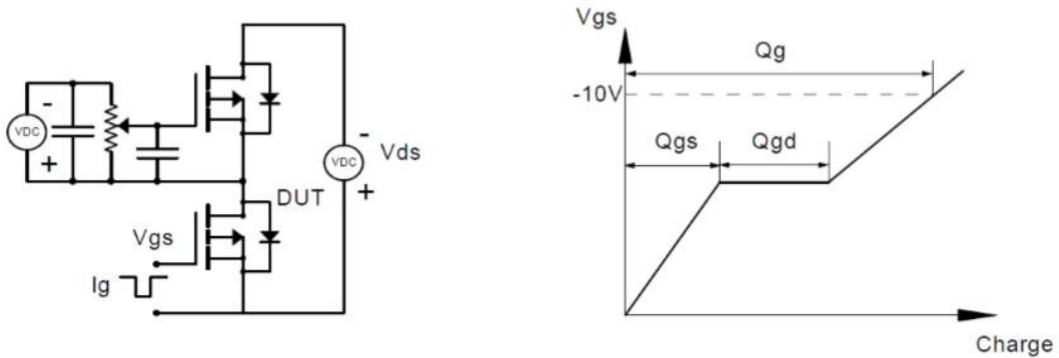
Figure1: Output Characteristics

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


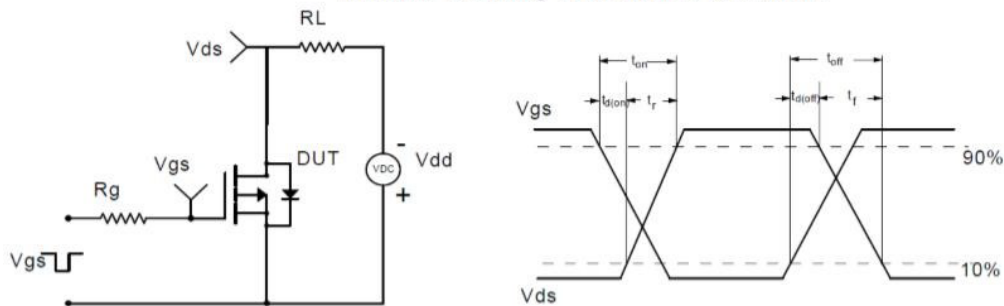
Figure 7: Normalized Breakdown Voltage vs. Junction Temperature

Figure 8: Normalized on Resistance vs. Junction Temperature

Figure 9: Maximum Safe Operating Area

Figure 10: Maximum Continuous Drain Current vs. Case Temperature

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


Test Circuit

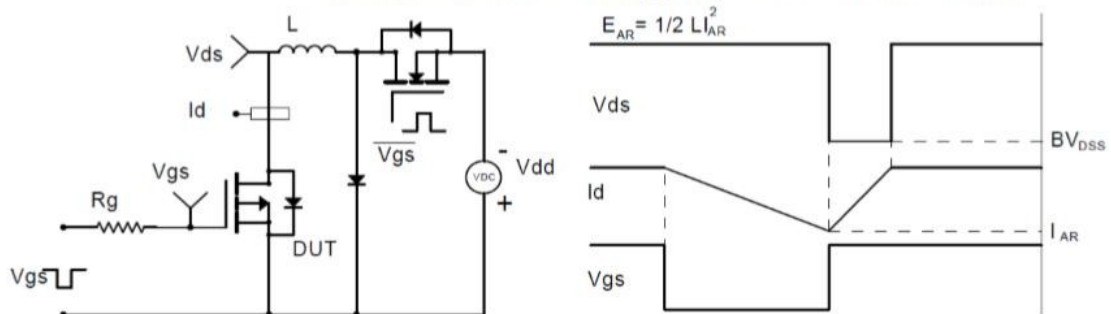
Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms

