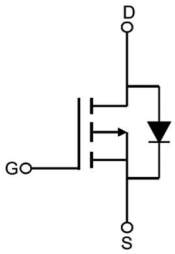
Description

Features	Application
● V_{DS}= -40V, I_D= -12A $R_{DS(ON)}$ < 14.3mΩ @ V_{GS} = -10V $R_{DS(ON)}$ < 22mΩ @ V_{GS} = -4.5V ● Advanced Trench Technology ● Excellent $R_{DS(ON)}$ and Low Gate Charge ● Lead free product is acquired	● PWM Applications ● Load Switch ● Power Management 100% UIS 100% ΔVds

SOP-8



Schematic Diagram

Package Marking and Ordering Information

Device Marking	Device	OUTLINE	Device Package	Reel Size	Reel (PCS)	Per Carton (PCS)
VSM12P04-S8	VSM12P04	TAPING	SOP-8	13inch	4000	48000

Absolute Maximum Ratings (T_A=25℃ unless otherwise specified)

Symbol	Parameter		Max.	Units
V_{DSS}	Drain-Source Voltage		-40	V
V_{GSS}	Gate-Source Voltage		±20	V
I_D	Continuous Drain Current	T_A = 25℃	-12	A
		T_A = 100℃	-7.8	A
I_{DM}	Pulsed Drain Current note1		-48	A
E_{AS}	Single Pulsed Avalanche Energy note2		27.6	mJ
P_D	Power Dissipation	T_A = 25℃	3.7	W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient		33.8	℃/W
T_J, T_{STG}	Operating and Storage Temperature Range		-55 to +150	℃

Electrical Characteristics (T_J=25℃ 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	-40	-	-	V
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS}= -40V, V_{GS}=0V	-	-	-1	μA
I_{GSS}	Gate to Body Leakage Current	V_{DS}=0V, V_{GS}= ±20V	-	-	±100	nA
On Characteristics						
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS}=V_{GS}, I_D= -250μA	-1.0	-1.7	-2.5	V
$R_{DS(on)}$	Static Drain-Source on-Resistance note3	V_{GS}= -10V, I_D= -12A	-	11	14.3	mΩ
		V_{GS}= -4.5V, I_D= -5A	-	15.5	22	
Dynamic Characteristics						
C_{iss}	Input Capacitance	V_{DS}= -20V, V_{GS}=0V, f=1.0MHz	-	3800	-	pF
C_{oss}	Output Capacitance		-	329	-	pF
C_{rss}	Reverse Transfer Capacitance		-	289	-	pF
Q_g	Total Gate Charge	V_{DS}= -20V, I_D= -12A, V_{GS}= -10V	-	42	-	nC
Q_{gs}	Gate-Source Charge		-	7.3	-	nC
Q_{gd}	Gate-Drain(“Miller”) Charge		-	8.5	-	nC
Switching Characteristics						
$t_{d(on)}$	Turn-on Delay Time	V_{DD}= -20V, I_D= -12A, V_{GS}= -10V, R_{GEN}=2.5Ω	-	10	-	ns
t_r	Turn-on Rise Time		-	21	-	ns
$t_{d(off)}$	Turn-off Delay Time		-	53	-	ns
t_f	Turn-off Fall Time		-	29	-	ns
Drain-Source Diode Characteristics and Maximum Ratings						
I_S	Maximum Continuous Drain to Source Diode Forward Current		-	-	-12	A
I_{SM}	Maximum Pulsed Drain to Source Diode Forward Current		-	-	-48	A
V_{SD}	Drain to Source Diode Forward Voltage	V_{GS}=0V, I_S= -12A	-	-0.8	-1.2	V
trr	Reverse Recovery Time	V_{GS}=0V, I_S= -12A, di/dt=100A/μs	-	39	-	ns
Qrr	Reverse Recovery Charge		-	42	-	nC

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

2. EAS condition: T_J= 25℃, V_{DD}= -20V, V_G= -10V, L= 0.5mH, R_G= 25Ω, I_{AS}= -10.5A

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

Typical Performance Characteristics

Figure1: Output Characteristics

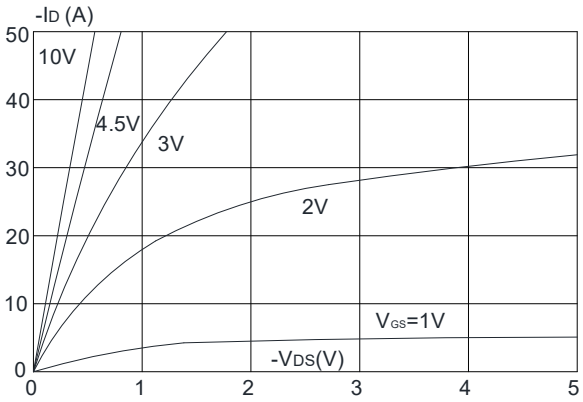


Figure 2: Typical Transfer Characteristics

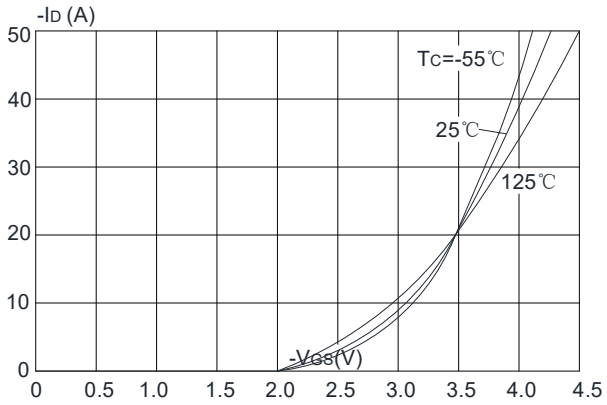


Figure 3: On-resistance vs. Drain Current

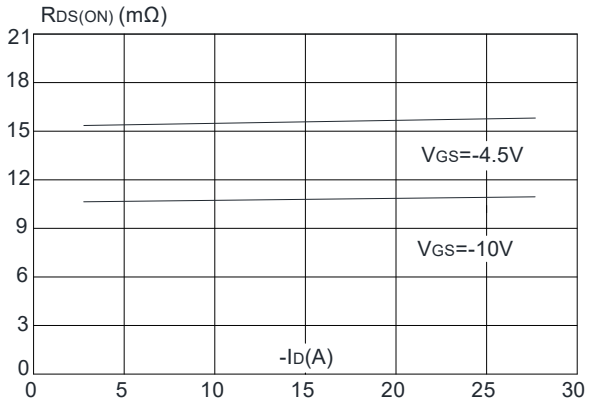


Figure 4: Body Diode Characteristics

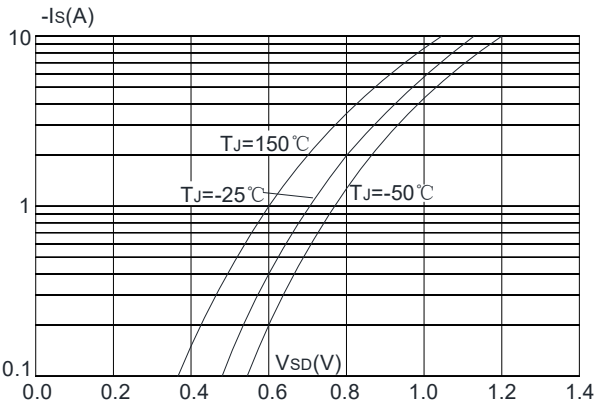


Figure 5: Gate Charge Characteristics

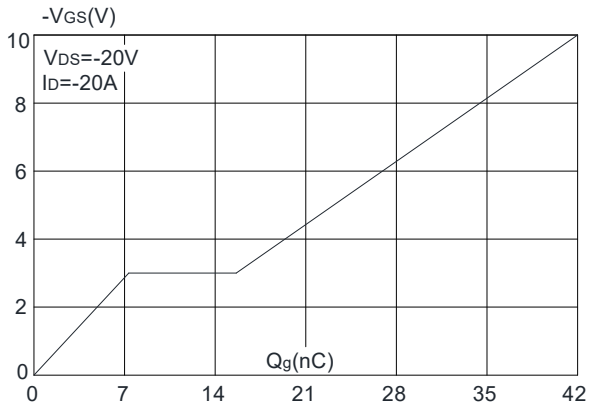


Figure 6: Capacitance Characteristics

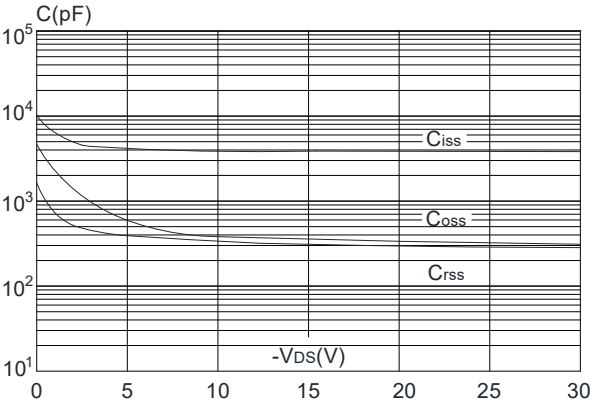


Figure 7: Normalized Breakdown Voltage vs. Junction Temperature

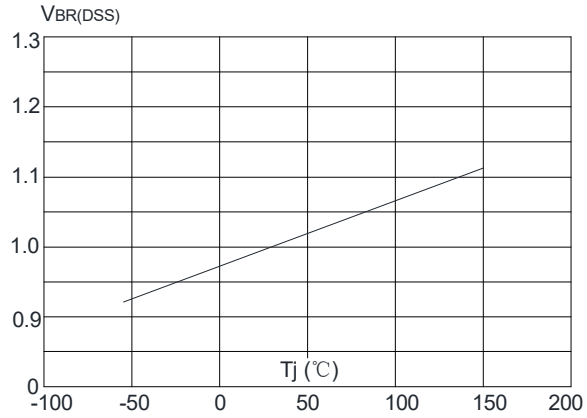


Figure 8: Normalized on Resistance vs. Junction Temperature

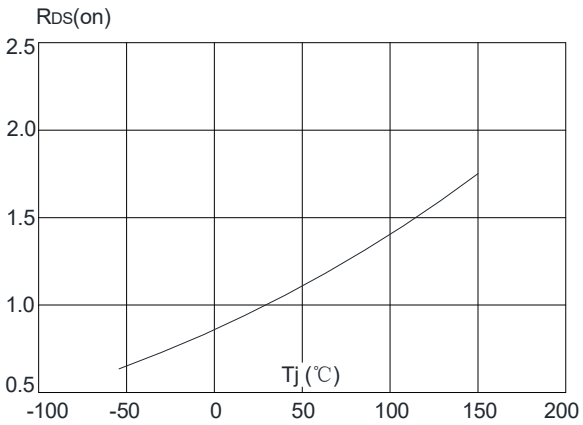


Figure 9: Maximum Safe Operating Area

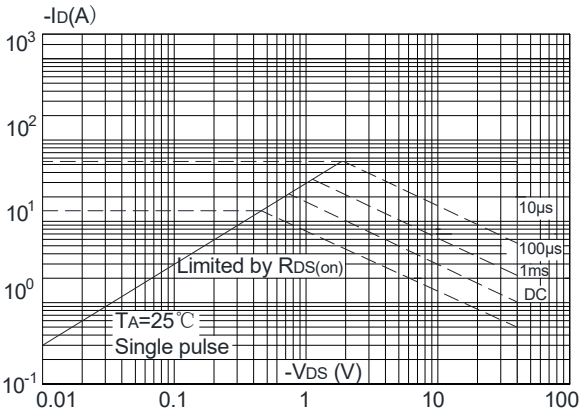


Figure 10: Maximum Continuous Drain Current vs. Ambient Temperature

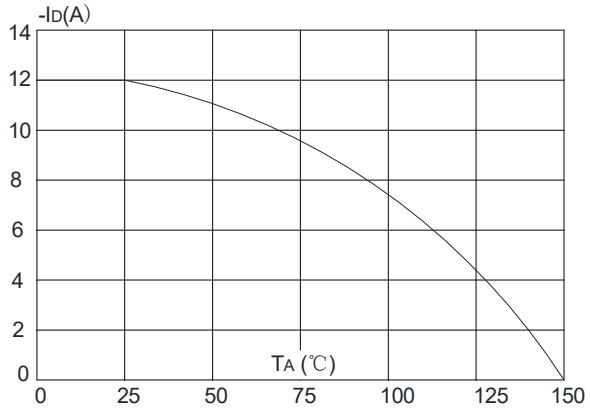
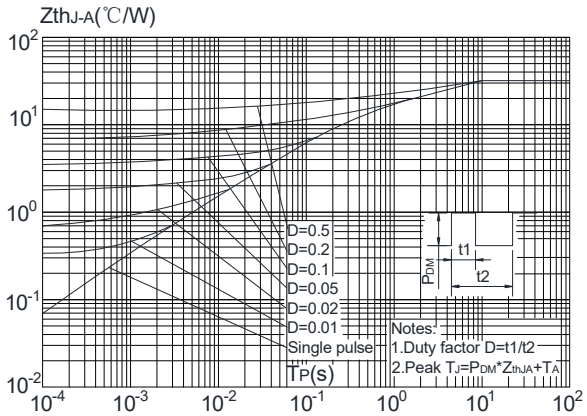
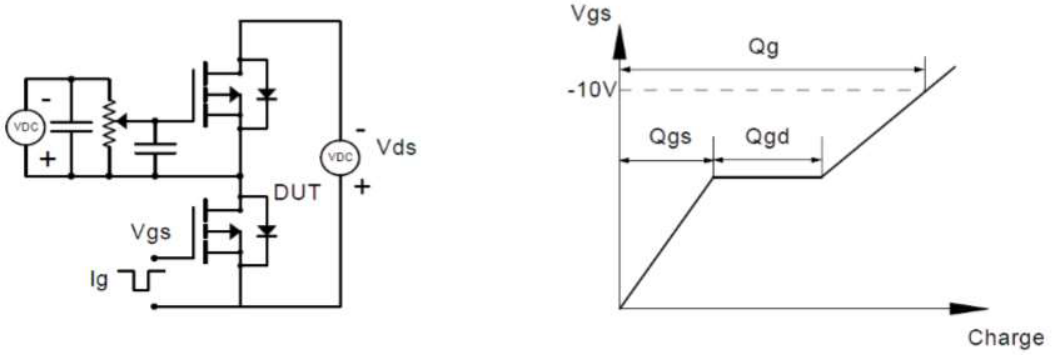


Figure.11: Maximum Effective Transient Thermal Impedance, Junction-to-Ambient

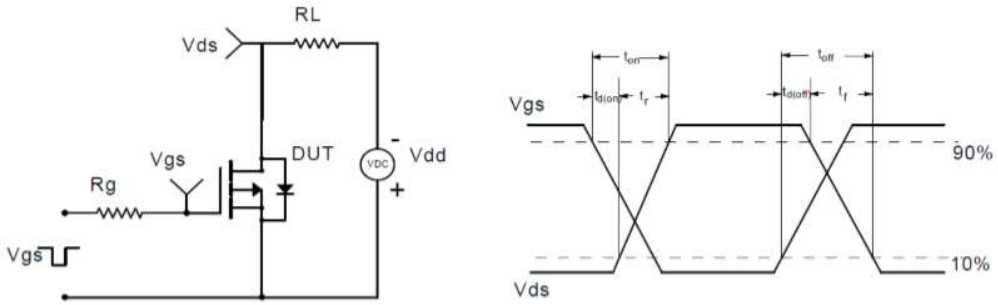


Test Circuit

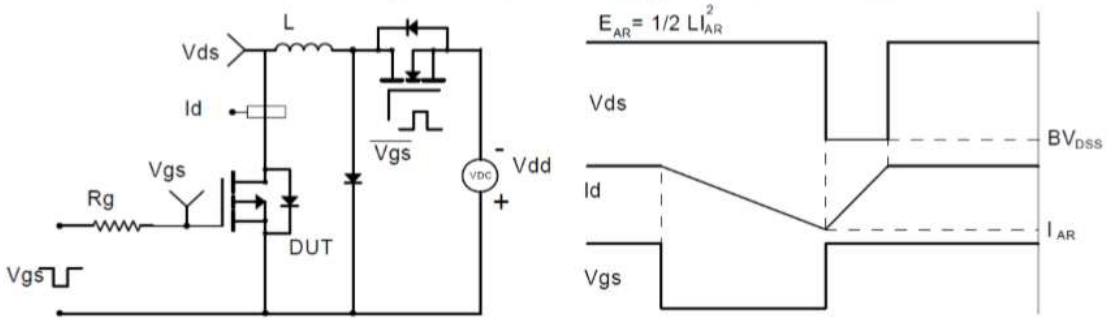
Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms