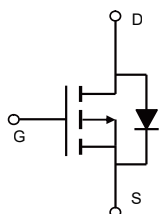


Description

Features ● $V_{DS} = -40V$, $I_D = -70A$ ● $R_{DS(ON)} < 10m\Omega$ @ $V_{GS} = -10V$ ● $R_{DS(ON)} < 15m\Omega$ @ $V_{GS} = -4.5V$ ● Advanced Trench Technology ● Excellent $R_{DS(ON)}$ and Low Gate Charge ● Lead free product is acquired	Application ● PWM Applications ● Load Switch ● Power Management <i>100% UIS TESTED!</i> <i>100% ΔV_{ds} TESTED!</i>
 TO-220	 Schematic

Package Marking and Ordering Information

Device Marking	Device	OUTLINE	Device Package	TUBE (PCS)	Inner Box (PCS)	Per Carton (PCS)
VSM70P04	VSM70P04-TC	TUBE	TO-220	50	1000	5000

Absolute Maximum Ratings ($T_C = 25^\circ C$ 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 _C = 25°C	-70	A
		T _C = 100°C	-46	A
I _{DM}	Pulsed Drain Current ^{note1}		-280	A
E _{AS}	Single Pulsed Avalanche Energy ^{note2}		324	mJ
P _D	Power Dissipation	T _C = 25°C	108	W
R _{θJC}	Thermal Resistance, Junction to Case		1.4	°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	-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	-1.5	-2.5	V
R _{DS(on)}	Static Drain-Source on-Resistance note3	V _{GS} = -10V, I _D = -30A	-	8	10	mΩ
		V _{GS} = -4.5V, I _D = -20A	-	11	15	
Dynamic Characteristics						
C _{iss}	Input Capacitance	V _{DS} = -20V, V _{GS} =0V, f=1.0MHz	-	7200	-	pF
C _{Oss}	Output Capacitance		-	625	-	pF
C _{rss}	Reverse Transfer Capacitance		-	437	-	pF
Q _g	Total Gate Charge	V _{DS} = -20V, I _D = -20A, V _{GS} = -10V	-	115	-	nC
Q _{gs}	Gate-Source Charge		-	23	-	nC
Q _{gd}	Gate-Drain(“Miller”) Charge		-	20	-	nC
Switching Characteristics						
t _{d(on)}	Turn-on Delay Time	V _{DD} = -20V, I _D = -20A, V _{GS} = -10V, R _{GEN} =3Ω	-	15	-	ns
t _r	Turn-on Rise Time		-	88	-	ns
t _{d(off)}	Turn-off Delay Time		-	122	-	ns
t _f	Turn-off Fall Time		-	101	-	ns
Drain-Source Diode Characteristics and Maximum Ratings						
I _S	Maximum Continuous Drain to Source Diode Forward Current		-	-	-70	A
I _{SM}	Maximum Pulsed Drain to Source Diode Forward Current		-	-	-280	A
V _{SD}	Drain to Source Diode Forward Voltage	V _{GS} =0V, I _S = -30A	-	-	-1.2	V
trr	Reverse Recovery Time	V _{GS} =0V, I _S = -20A, di/dt=100A/μs	-	25	-	ns
Qrr	Reverse Recovery Charge		-	17	-	nC

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

2. EAS condition: T_J= 25°C, V_{DD}= -20V, V_G= -10V, L= 0.5mH, R_G= 25Ω, I_{AS}= -36A

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

Typical Performance Characteristics

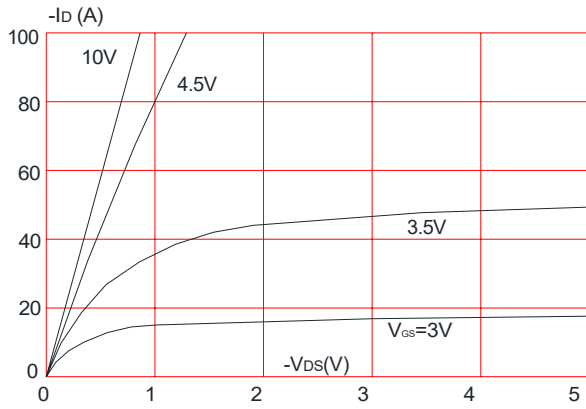
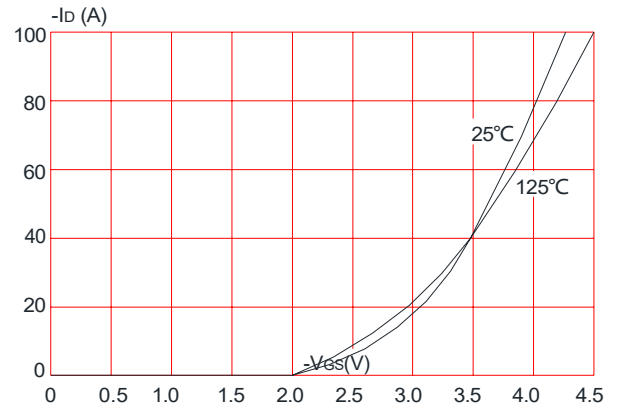
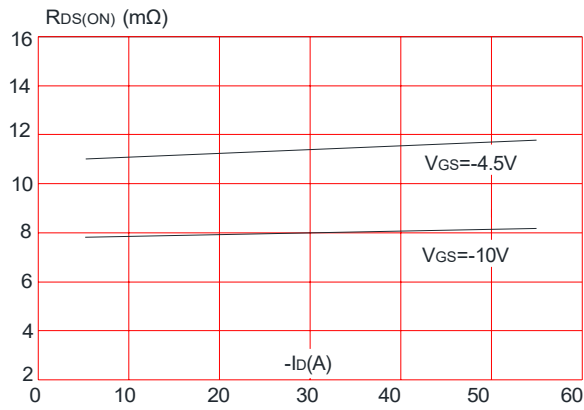
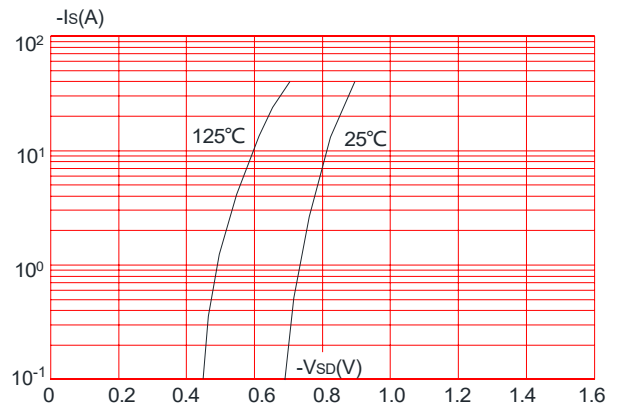
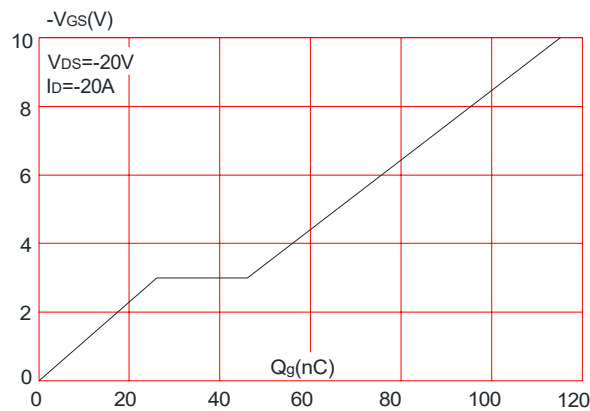
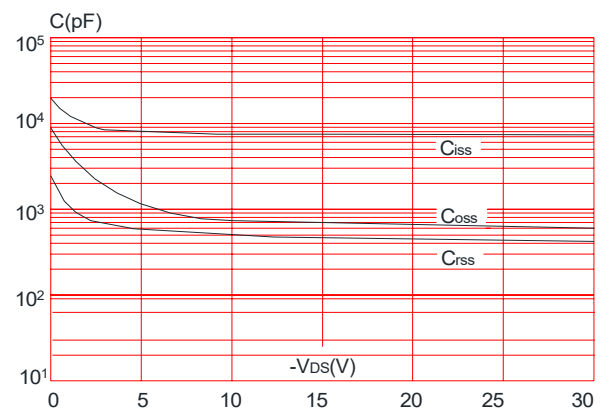
Figure1: Output Characteristics

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

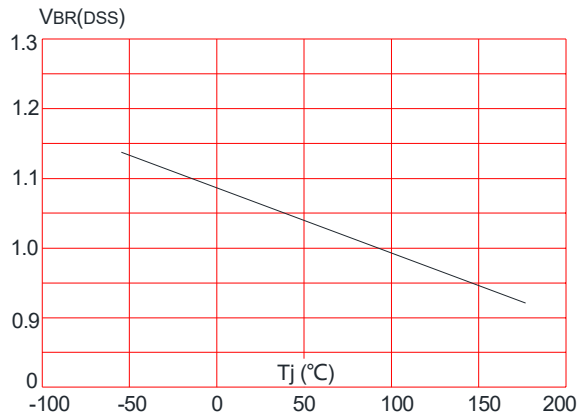


Figure 8: Normalized on Resistance vs. Junction Temperature

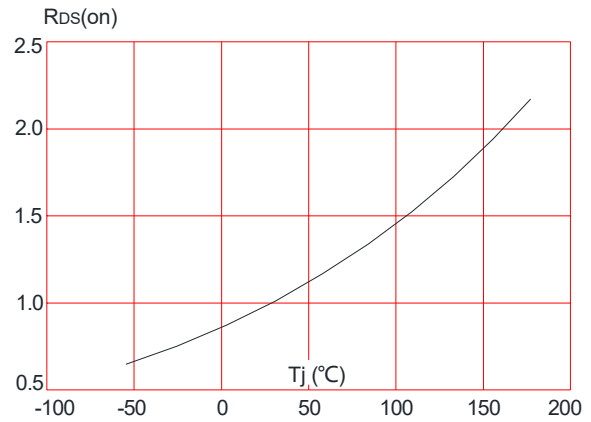


Figure 9: Maximum Safe Operating Area

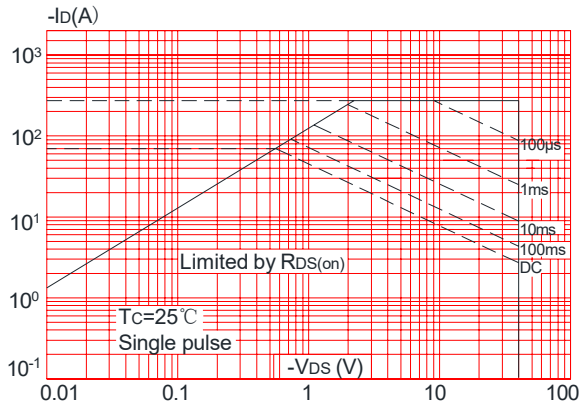


Figure 10: Maximum Continuous Drain Current vs. Case Temperature

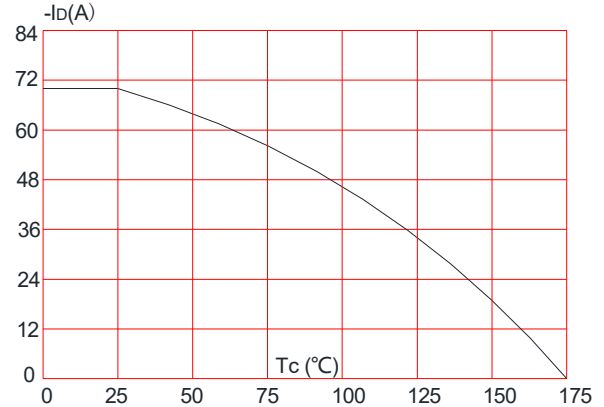
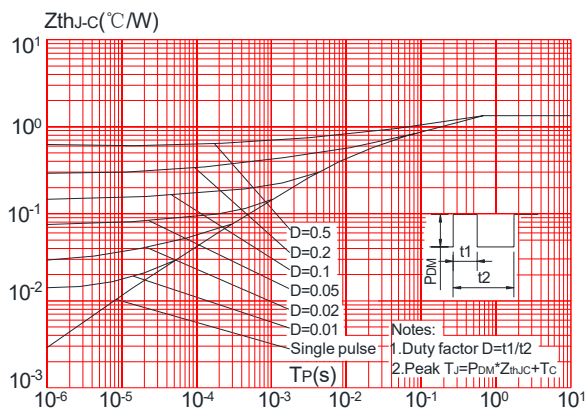
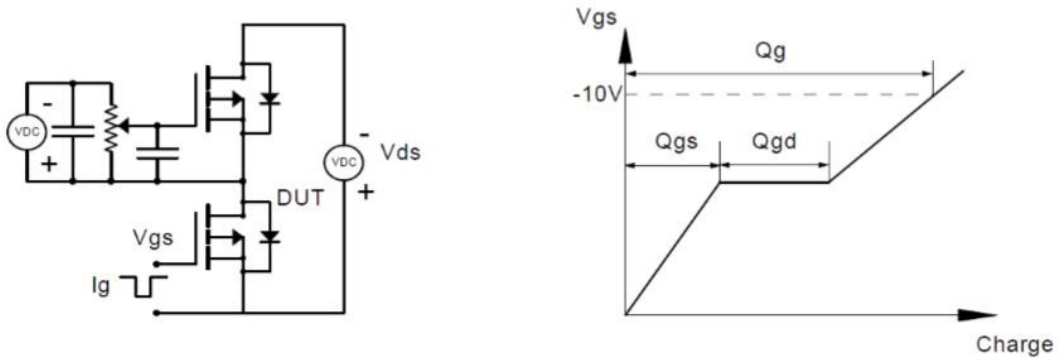


Figure.11: Maximum Effective Transient Thermal Impedance, Junction-to-Case

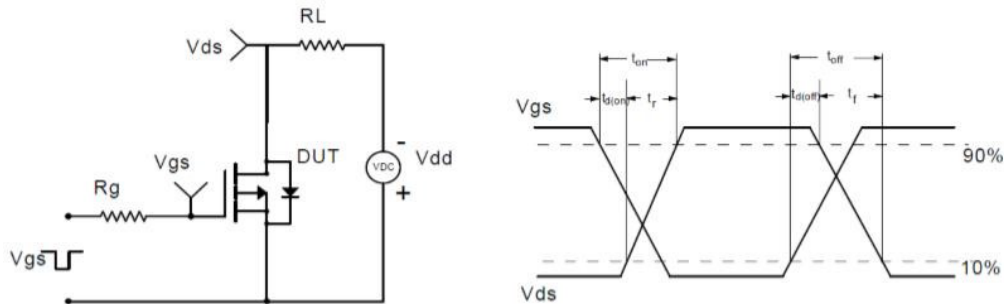


Test Circuit

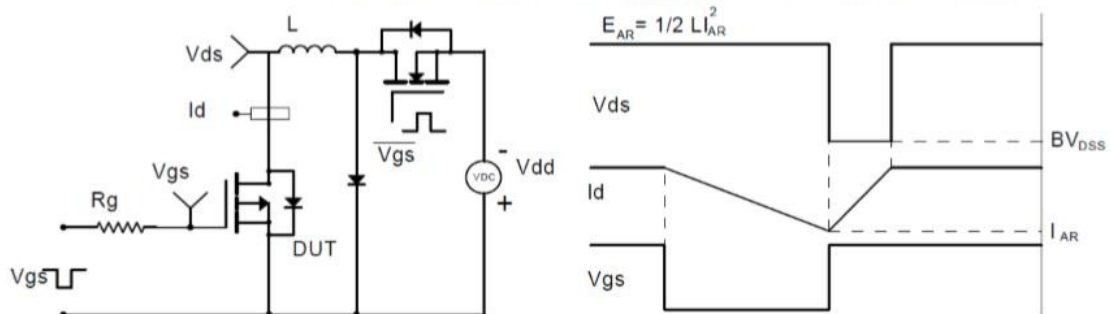
Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms

