

Description

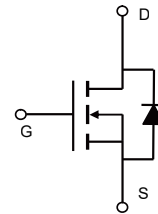
Features

- 40V,60A
 $R_{DS(ON)} < 7.7m\Omega @ V_{GS} = 10V$
 $R_{DS(ON)} < 14m\Omega @ V_{GS} = 4.5V$
- Advanced Trench Technology
- Provide Excellent $R_{DS(ON)}$ and Low Gate Charge
- Lead free product is acquired

Application

- Load Switch
- PWM Application
- Power management

100% UIS TESTED!
100% ΔV_{ds} TESTED!



Schematic

Package Marking and Ordering Information

Device Marking	Device	OUTLINE	Device Package	TUBE (PCS)	Inner Box (PCS)	Per Carton (PCS)
VSM60N04	VSM60N04-TC	TUBE	TO-220	50	1,000	8,000

Absolute Maximum Ratings (T_C=25°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	60	A
		T _C = 100°C	39	A
I _{DM}	Pulsed Drain Current ^{note1}		240	A
EAS	Single Pulsed Avalanche Energy ^{note2}		81	mJ
P _D	Power Dissipation	T _C = 25°C	47	W
R _{θJC}	Thermal Resistance, Junction to Case		3.2	°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,	-	-	1.0	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	1.1	1.7	2.4	V
R _{DS(on)}	Static Drain-Source on-Resistance note3	V _{GS} =10V, I _D =30A	-	5.9	7.7	mΩ
		V _{GS} =4.5V, I _D =20A	-	9.3	14	
Dynamic Characteristics						
C _{iss}	Input Capacitance	V _{DS} =20V, V _{GS} =0V, f=1.0MHz	-	2400	-	pF
C _{OSS}	Output Capacitance		-	192	-	pF
C _{rSS}	Reverse Transfer Capacitance		-	165	-	pF
Q _g	Total Gate Charge	V _{DS} =20V, I _D =30A, V _{GS} =10V	-	37	-	nC
Q _{gs}	Gate-Source Charge		-	6	-	nC
Q _{gd}	Gate-Drain(“Miller”) Charge		-	7	-	nC
Switching Characteristics						
t _{d(on)}	Turn-on Delay Time	V _{DD} =20V, I _D =30A, R _L =1Ω, R _{GEN} =3Ω, V _{GS} =10V	-	12	-	ns
t _r	Turn-on Rise Time		-	12	-	ns
t _{d(off)}	Turn-off Delay Time		-	38	-	ns
t _f	Turn-off Fall Time		-	9	-	ns
Drain-Source Diode Characteristics and Maximum Ratings						
I _S	Maximum Continuous Drain to Source Diode Forward Current		-	-	60	A
I _{SM}	Maximum Pulsed Drain to Source Diode Forward Current		-	-	240	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	T _J =25℃, I _F =20A,dI/dt=100A/μs	-	22	-	ns
Q _{rr}	Body Diode Reverse Recovery Charge		-	11	-	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}=18A

3. Pulse Test: Pulse Width≤300μs, Duty Cycle≤0.5%

Typical Performance Characteristics

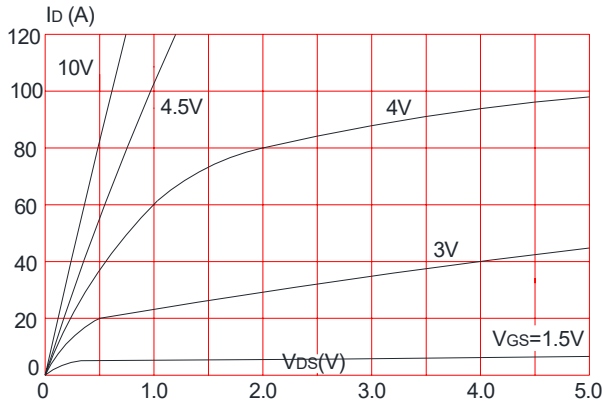
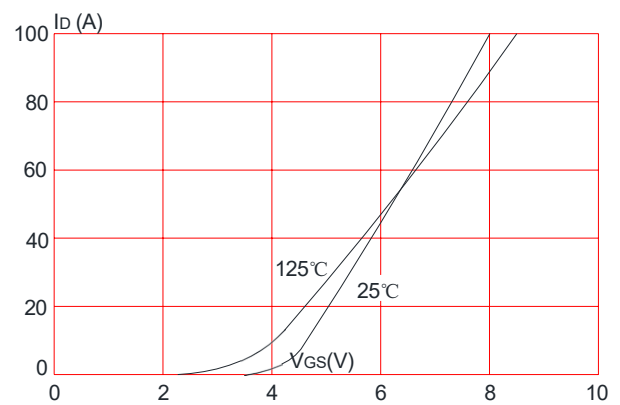
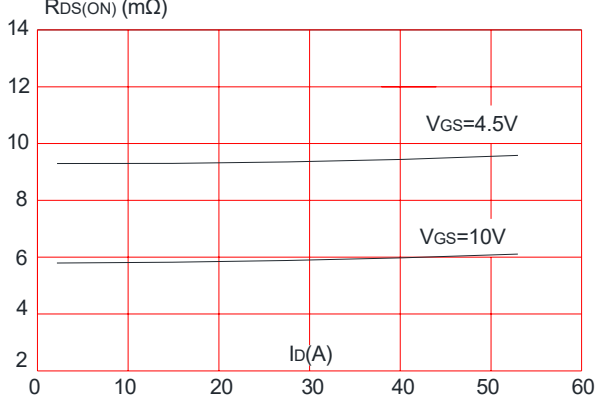
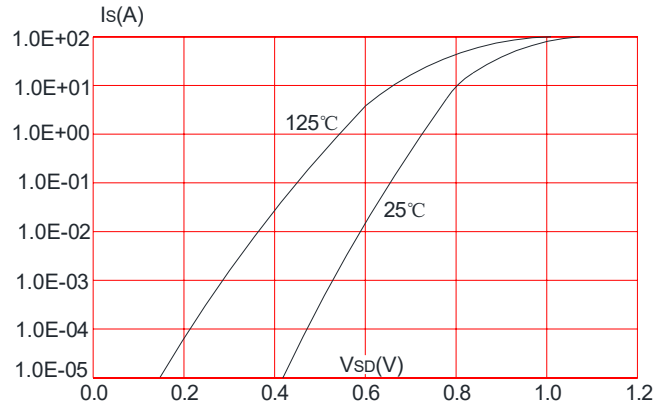
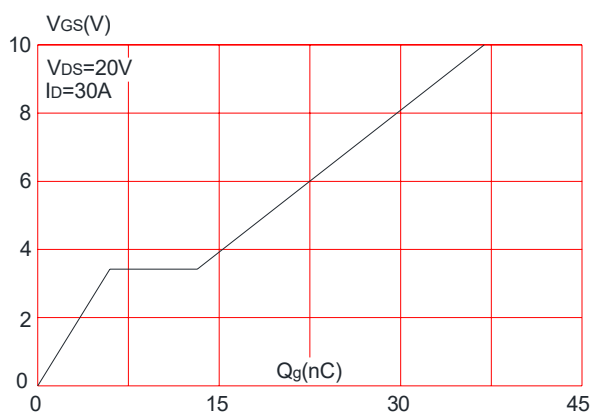
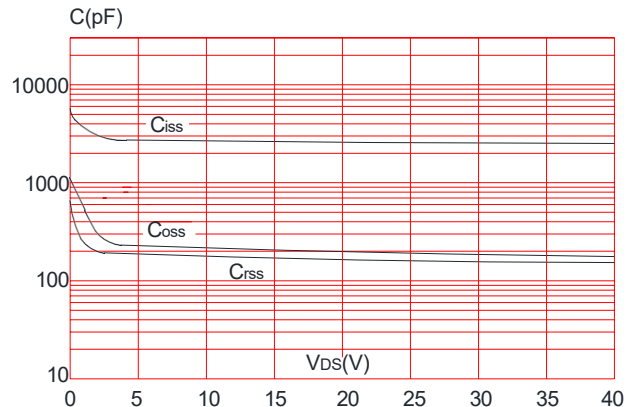
Figure1: Output Characteristics

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

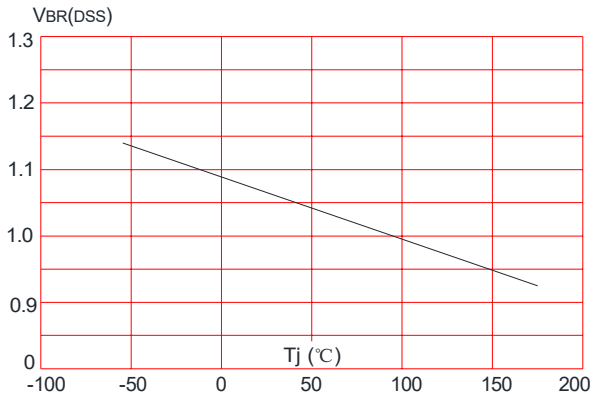


Figure 8: Normalized on Resistance vs. Junction Temperature

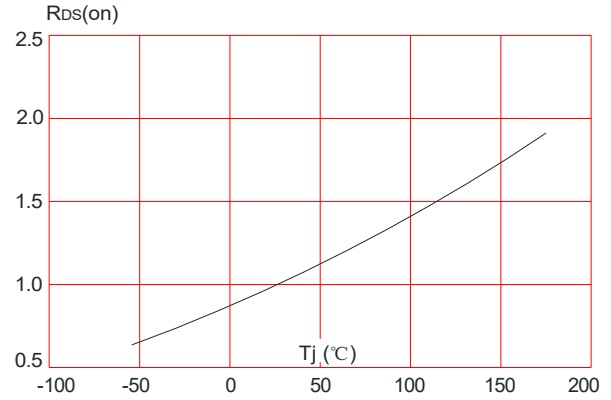


Figure 9: Maximum Safe Operating Area

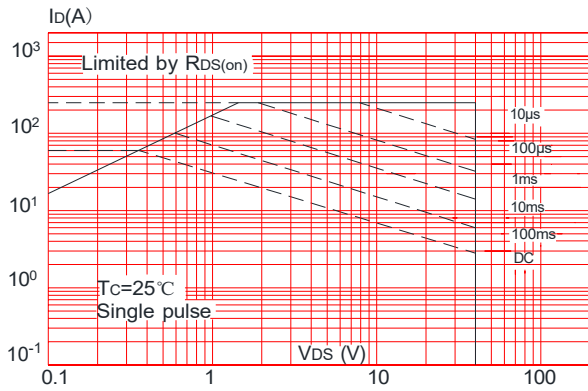


Figure 10: Maximum Continuous Drain Current vs. Case Temperature

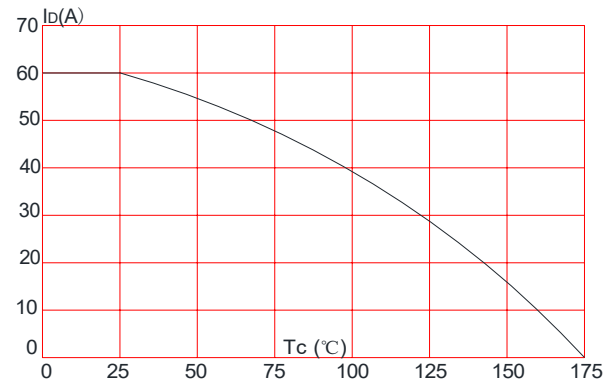
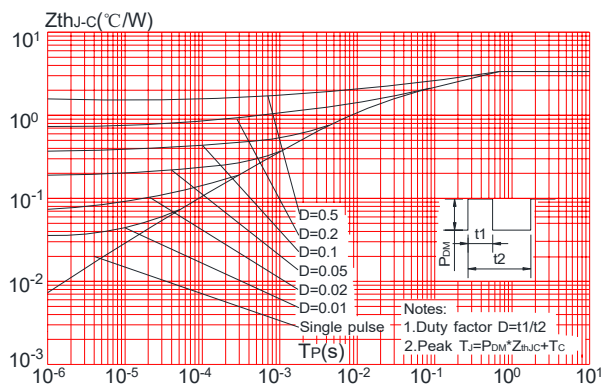


Figure.11: Maximum Effective Transient Thermal Impedance, Junction-to-Case



Test Circuit

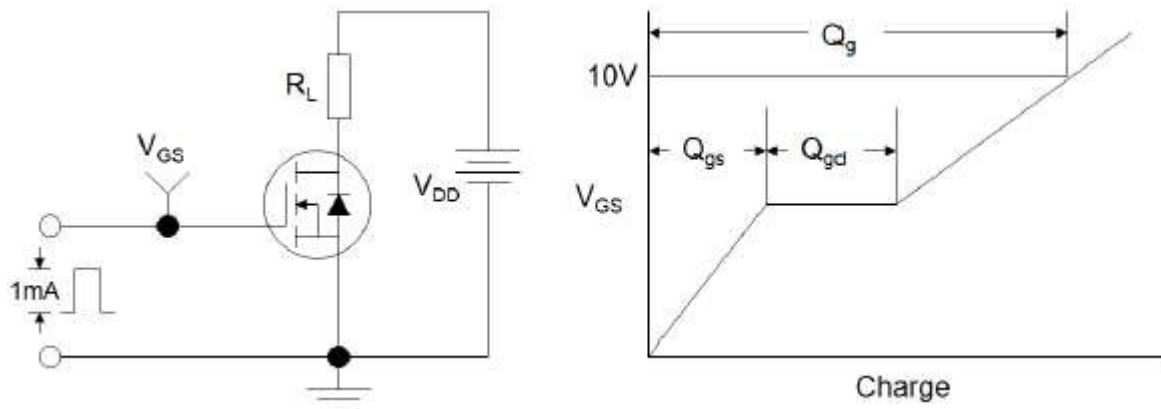


Figure1:Gate Charge Test Circuit & Waveform

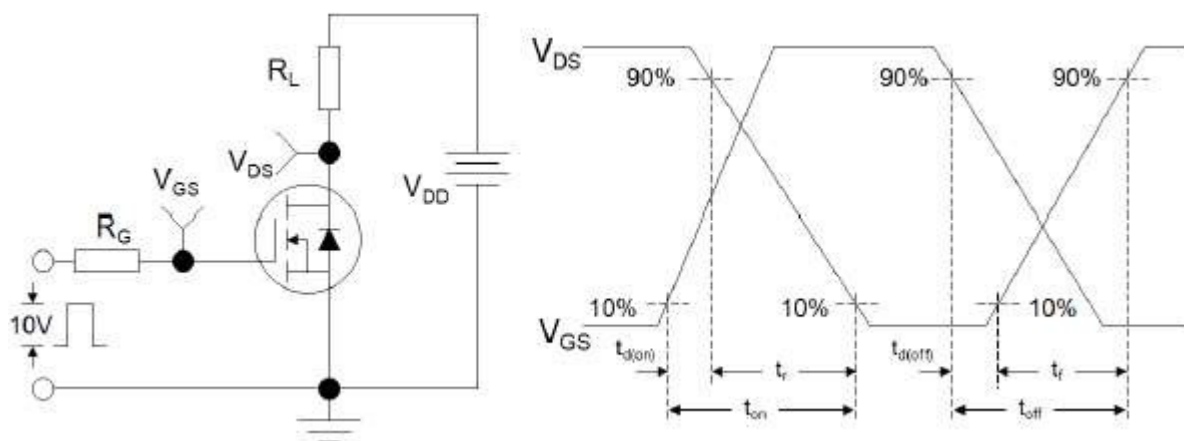


Figure 2: Resistive Switching Test Circuit & Waveforms

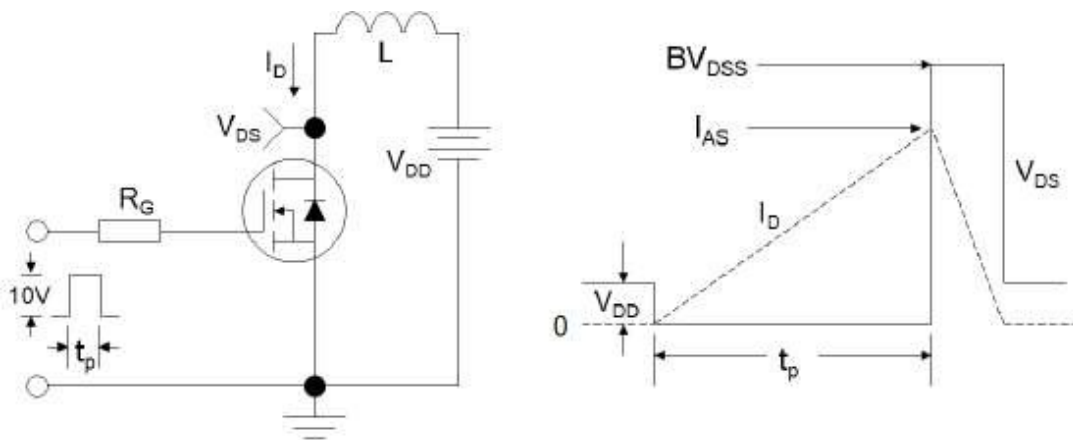


Figure 3:Unclamped Inductive Switching Test Circuit & Waveforms