Description

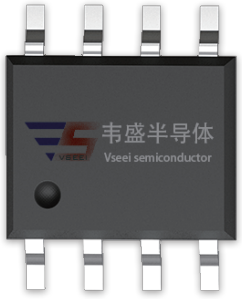
The VSM15N04 uses advanced trench technology and design to provide excellent $R_{DS(ON)}$ with low gate charge. It can be used in a wide variety of applications.

General Features

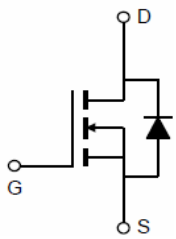
- V_{DS} =40V,I_D =15A
  $R_{DS(ON)}$ <8.2mΩ @ V_{GS}=10V (Typ. 6.1 mΩ)
  $R_{DS(ON)}$ <25mΩ @ V_{GS}=4.5V (Typ. 11.4 mΩ)
- High density cell design for ultra low Rdson
- Fully characterized avalanche voltage and current
- Good stability and uniformity with high E_{AS}
- Excellent package for good heat dissipation
- Special process technology for high ESD capability

Application

- Load switching
- Hard switched and high frequency circuits
- Uninterruptible power supply



SOP-8



Schematic Diagram

Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
VSM15N04-S8	VSM15N04	SOP-8	Ø330mm	12mm	2500 units

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

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	V_{DS}	40	V
Gate-Source Voltage	V_{GS}	±20	V
Drain Current-Continuous	I_D	15	A
Drain Current-Continuous(T_C=100℃)	I_D (100℃)	10.6	A
Pulsed Drain Current	I_{DM}	70	A
Maximum Power Dissipation	P_D	3.1	W
Operating Junction and Storage Temperature Range	T_J,T_{STG}	-55 To 150	℃

Thermal Characteristic

Thermal Resistance,Junction-to-Ambient(Note 2)	$R_{\theta JA}$	40	℃/W

Electrical Characteristics (T_A=25℃unless otherwise noted)

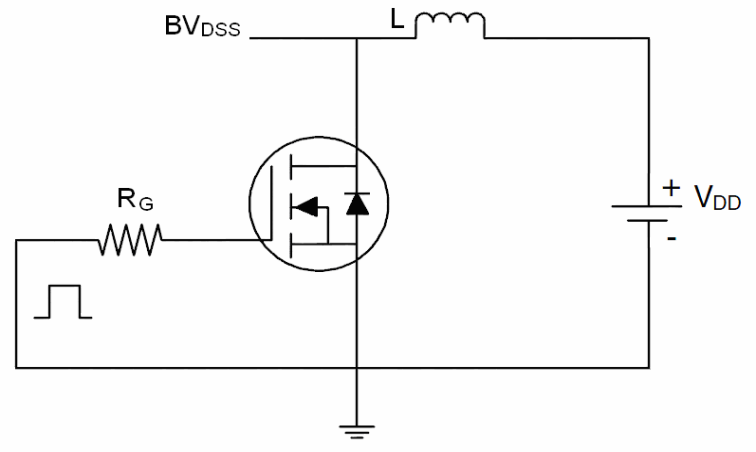
Parameter	Symbol	Condition	Min	Typ	Max	Unit
Off Characteristics						
Drain-Source Breakdown Voltage	BV_{DSS}	V_{GS}=0V I_D=250μA	40	45	-	V
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS}=40V,V_{GS}=0V	-	-	1	μA
Gate-Body Leakage Current	I_{GSS}	V_{GS}=±20V,V_{DS}=0V	-	-	±100	nA
On Characteristics (Note 3)						
Gate Threshold Voltage	$V_{GS(th)}$	V_{DS}=V_{GS},I_D=250μA	1.2	1.8	2.5	V
Drain-Source On-State Resistance	$R_{DS(ON)}$	V_{GS}=10V, I_D=10A	-	6.1	8.2	mΩ
		V_{GS}=4.5V, I_D=8A	-	11.4	25	mΩ
Forward Transconductance	g_{FS}	V_{DS}=5V,I_D=10A		80	-	S
Dynamic Characteristics (Note4)						
Input Capacitance	C_{lss}	V_{DS}=20V,V_{GS}=0V, F=1.0MHz	-	3090	-	PF
Output Capacitance	C_{oss}		-	328	-	PF
Reverse Transfer Capacitance	C_{rss}		-	273	-	PF
Switching Characteristics (Note 4)						
Turn-on Delay Time	$t_{d(on)}$	V_{DD}=20V, R_L=2Ω V_{GS}=10V,R_G=3Ω	-	7	-	nS
Turn-on Rise Time	t_r		-	20	-	nS
Turn-Off Delay Time	$t_{d(off)}$		-	34	-	nS
Turn-Off Fall Time	t_f		-	19	-	nS
Total Gate Charge	Q_g	V_{DS}=20V,I_D=10A, V_{GS}=10V	-	60		nC
Gate-Source Charge	Q_{gs}		-	8.1		nC
Gate-Drain Charge	Q_{gd}		-	16.9		nC
Drain-Source Diode Characteristics						
Diode Forward Voltage (Note 3)	V_{SD}	V_{GS}=0V,I_S=10A	-		1.2	V
Diode Forward Current (Note 2)	I_S		-	-	15	A
Reverse Recovery Time	t_{rr}	TJ = 25°C, IF = 10A di/dt = 100A/μs (Note3)	-	31	-	nS
Reverse Recovery Charge	Qrr		-	33	-	nC

Notes:

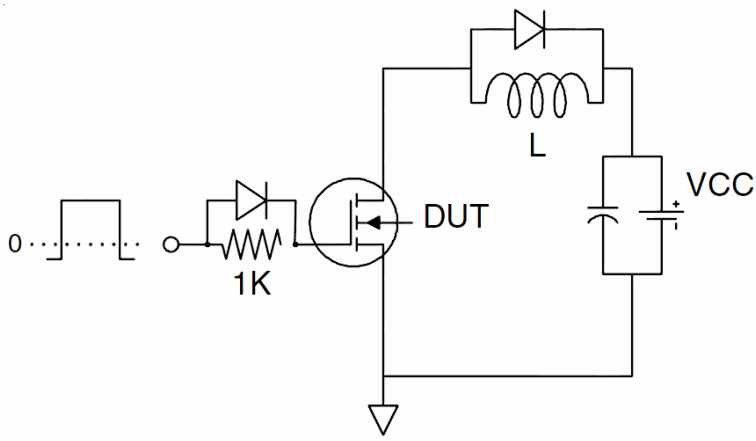
1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. Surface Mounted on FR4 Board, t ≤ 10 sec.
3. Pulse Test: Pulse Width ≤ 300μs, Duty Cycle ≤ 2%.
4. Guaranteed by design, not subject to production

Test circuit

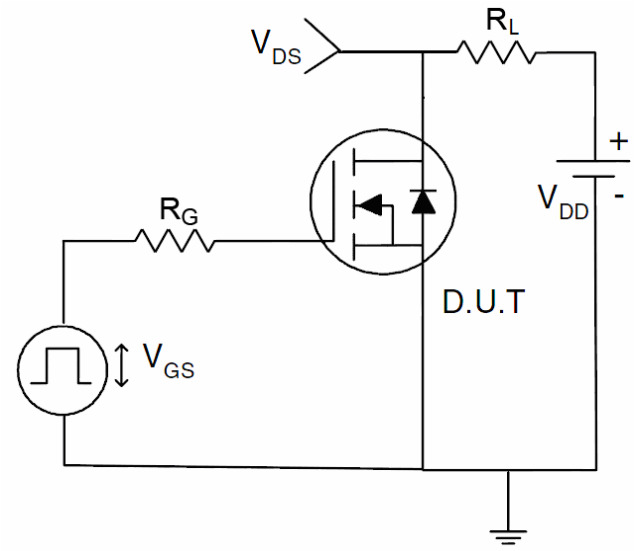
1) E_{AS} Test Circuit



2) Gate Charge Test Circuit



3) Switch Time Test Circuit



Typical Electrical and Thermal Characteristics (Curves)

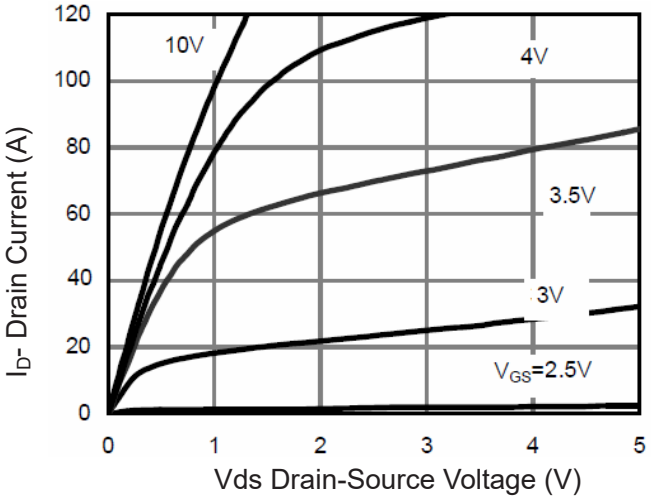


Figure 1 Output Characteristics

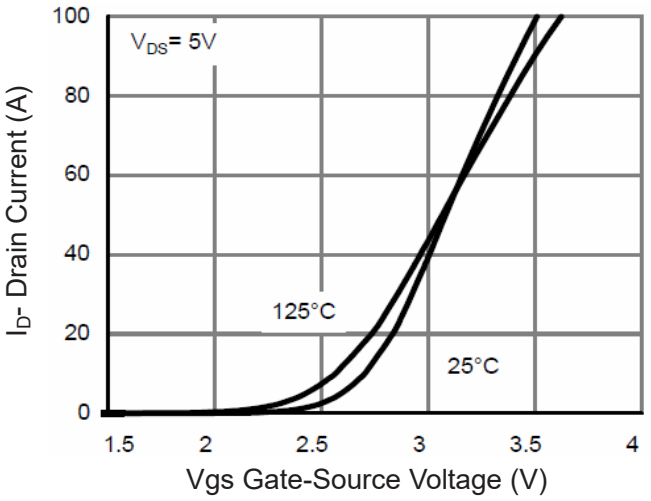


Figure 2 Transfer Characteristics

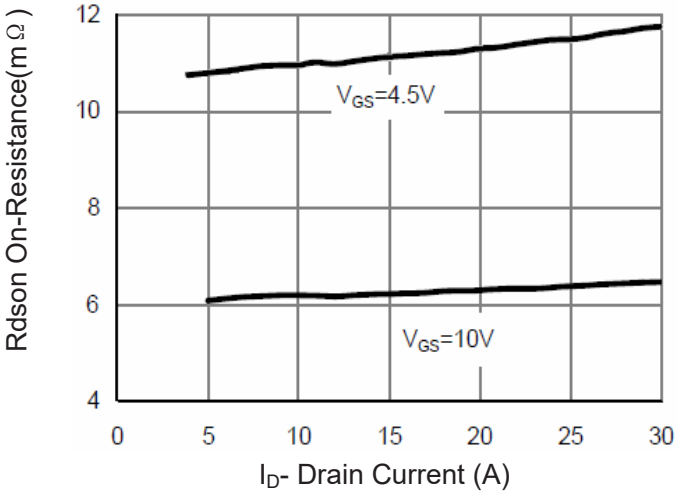


Figure 3 Rdson- Drain Current

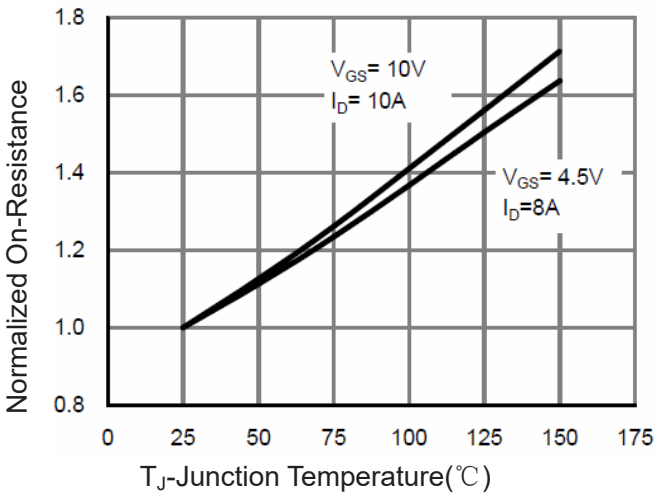


Figure 4 Rdson-JunctionTemperature

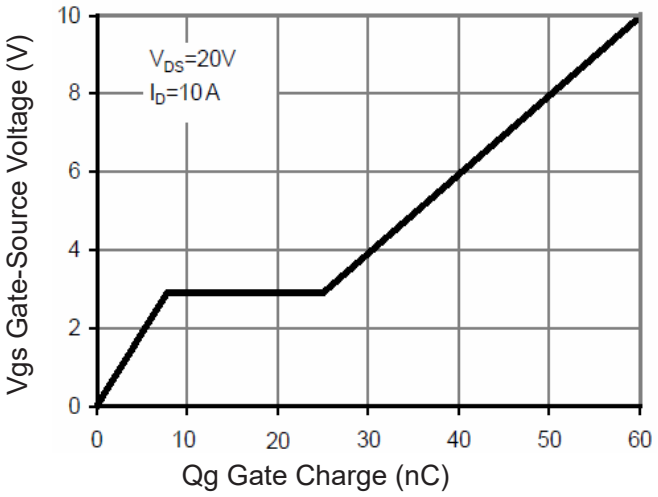


Figure 5 Gate Charge

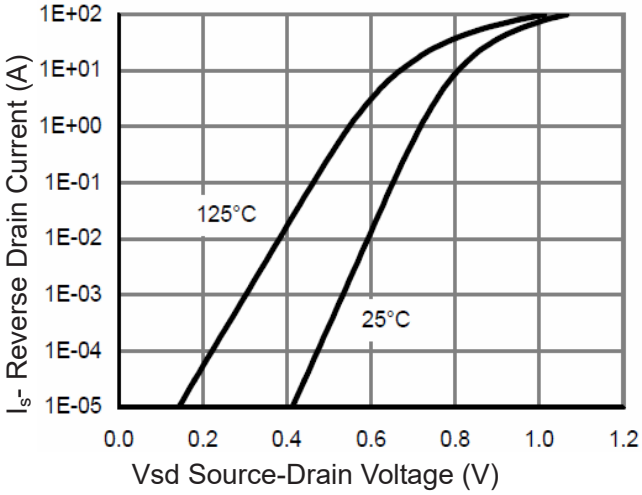


Figure 6 Source- Drain Diode Forward

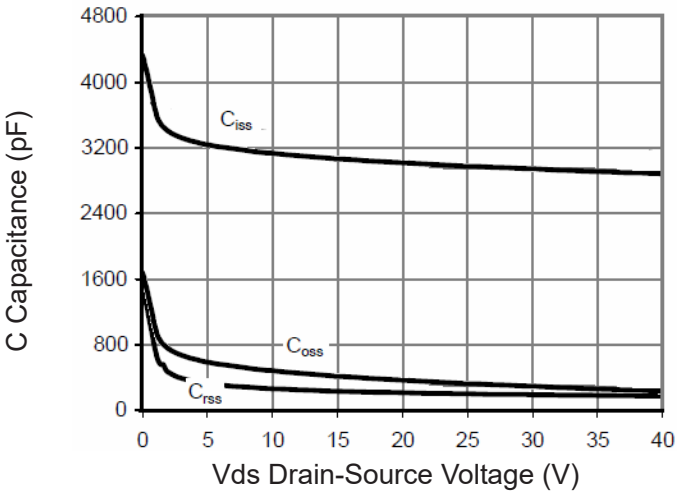


Figure 7 Capacitance vs Vds

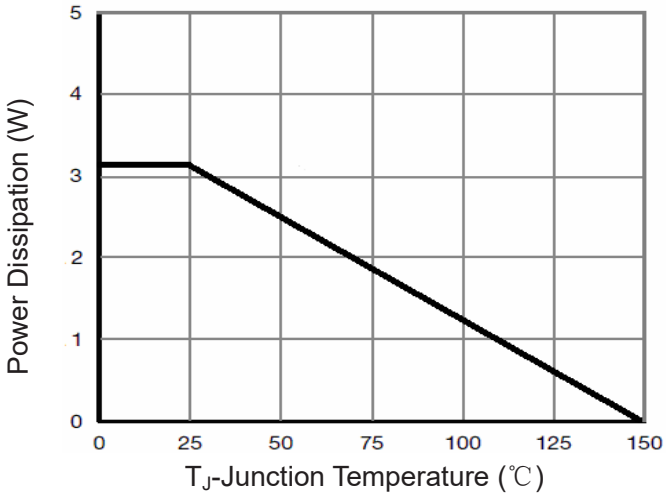


Figure 9 Power De-rating

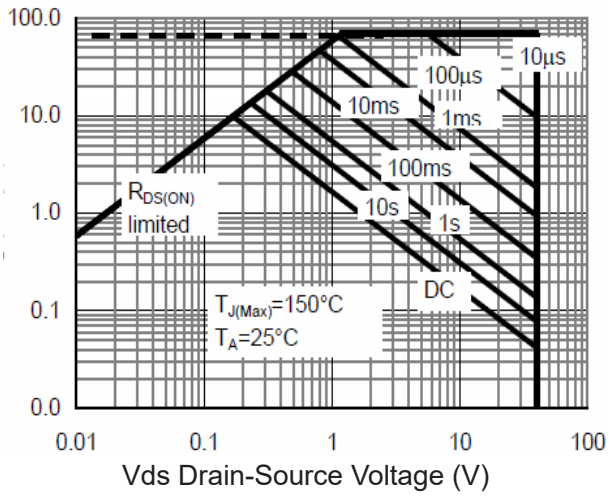


Figure 8 Safe Operation Area

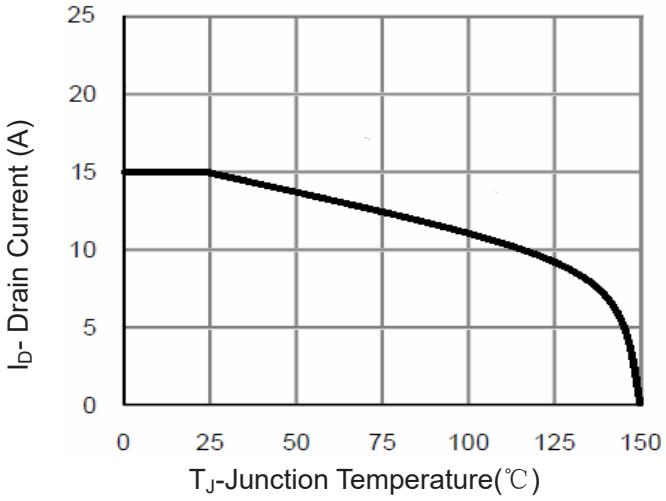


Figure 10 Current De-rating

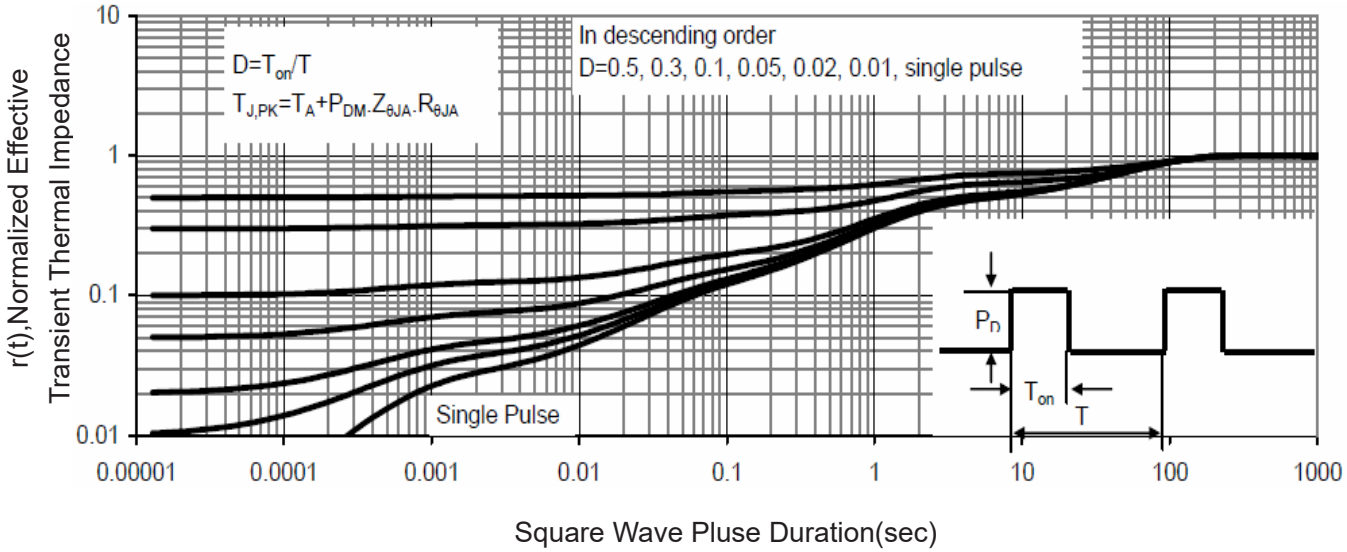


Figure 11 Normalized Maximum Transient Thermal Impedance