

Description

The VSM9N04 uses advanced trench technology to provide excellent $R_{DS(ON)}$ and low gate charge. The complementary MOSFETs may be used to form a level shifted high side switch, and for a host of other applications.

General Features

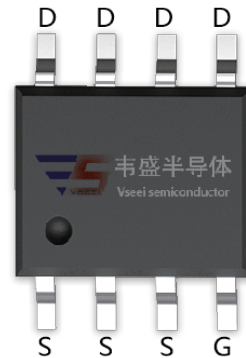
● N-Channel

$$V_{DS} = 40V, I_D = 9A$$

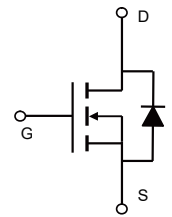
$$R_{DS(ON)} < 16m\Omega @ V_{GS}=10V$$

$$R_{DS(ON)} < 24m\Omega @ V_{GS}=4.5V$$

- High power and current handing capability
- Lead free product is acquired
- Surface mount package



SOP-8



Schematic

Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
VSM9N04	VSM9N04-S8	SOP-8	Ø330mm	12mm	2500 units

Absolute Maximum Ratings ($T_c=25^{\circ}C$ 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	9	A
Drain Current-Continuous($T_c=100^{\circ}C$)	$I_D(100^{\circ}C)$	6.4	A
Pulsed Drain Current	I_{DM}	40	A
Maximum Power Dissipation	P_D	2	W
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-55 To 150	$^{\circ}C$

Thermal Characteristic

Thermal Resistance, Junction-to-Ambient (Note 2)	$R_{\theta JA}$	62.5	$^{\circ}C/W$
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N-CH Electrical Characteristics ($T_A=25^{\circ}\text{C}$ unless otherwise noted)

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Off Characteristics						
Drain-Source Breakdown Voltage	BV_{DSS}	$V_{GS}=0V, I_D=250\mu A$	40	-	-	V
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS}=40V, V_{GS}=0V$	-	-	1	μA
Gate-Body Leakage Current	I_{GSS}	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	± 100	nA
On Characteristics (Note 3)						
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=250\mu A$	1	1.5	2.0	V
Drain-Source On-State Resistance	$R_{DS(ON)}$	$V_{GS}=10V, I_D=8A$	-	12.9	16	m Ω
		$V_{GS}=4.5V, I_D=4A$	-	18.9	24	m Ω
Forward Transconductance	g_{FS}	$V_{DS}=5V, I_D=8A$	33	-	-	S
Dynamic Characteristics (Note4)						
Input Capacitance	C_{iss}	$V_{DS}=20V, V_{GS}=0V,$ $F=1.0MHz$	-	1060	-	PF
Output Capacitance	C_{oss}		-	121	-	PF
Reverse Transfer Capacitance	C_{rss}		-	111	-	PF
Switching Characteristics (Note 4)						
Turn-on Delay Time	$t_{d(on)}$	$V_{DD}=20V, R_L=2.5\Omega$ $V_{GS}=10V, R_{GEN}=3\Omega$	-	5.5	-	nS
Turn-on Rise Time	t_r		-	14	-	nS
Turn-Off Delay Time	$t_{d(off)}$		-	24	-	nS
Turn-Off Fall Time	t_f		-	12	-	nS
Total Gate Charge	Q_g	$V_{DS}=20V, I_D=8A,$ $V_{GS}=10V$	-	26	-	nC
Gate-Source Charge	Q_{gs}		-	3.7	-	nC
Gate-Drain Charge	Q_{gd}		-	6.0	-	nC
Drain-Source Diode Characteristics						
Diode Forward Voltage (Note 3)	V_{SD}	$V_{GS}=0V, I_S=9A$	-	0.8	1.2	V

N- Channel Typical Electrical and Thermal Characteristics (Curves)

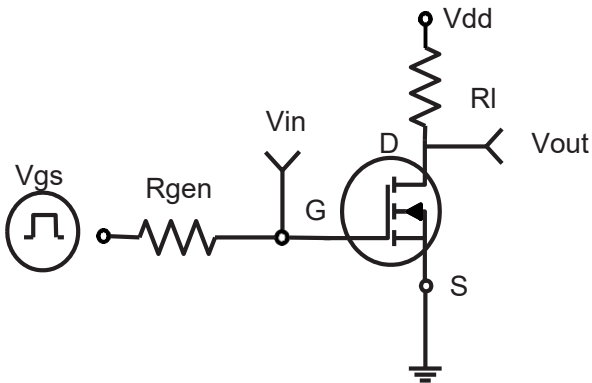


Figure 1: Switching Test Circuit

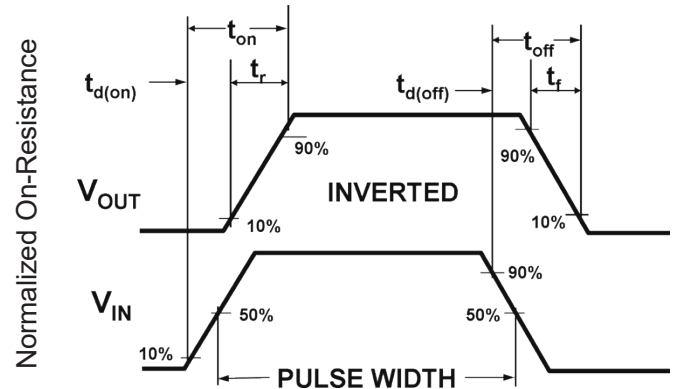


Figure 2: Switching Waveforms

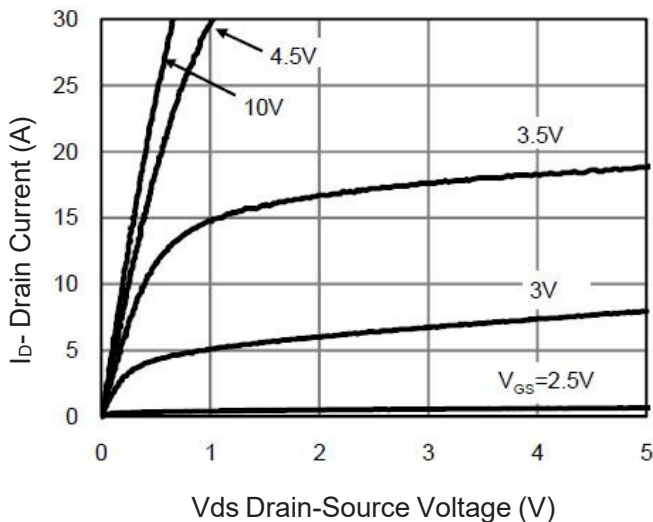


Figure 3 Output Characteristics

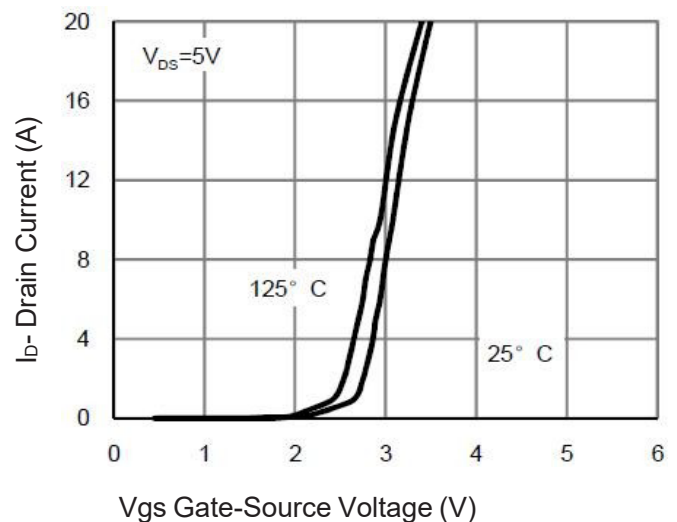


Figure 4 Transfer Characteristics

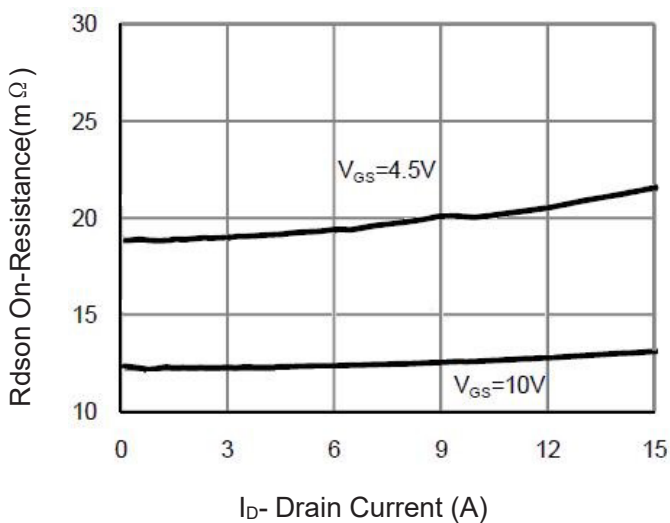


Figure 5 Drain-Source On-Resistance

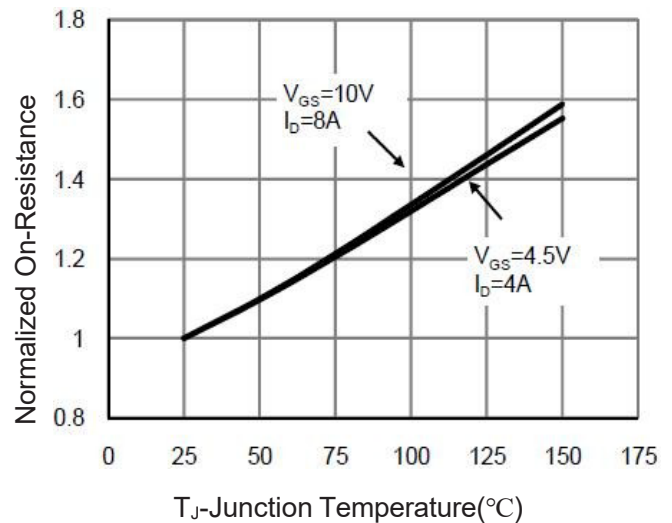
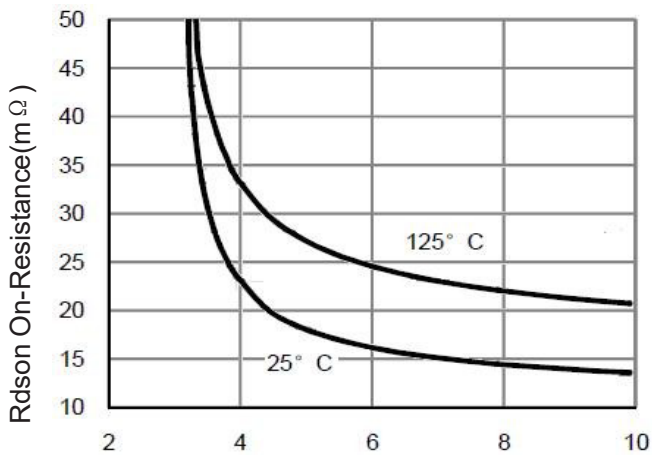
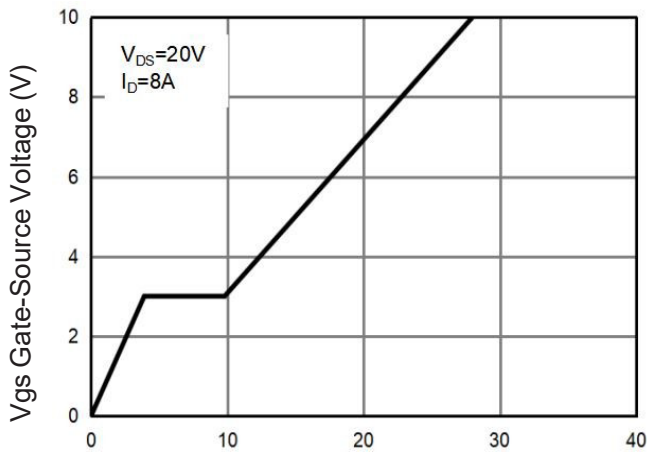


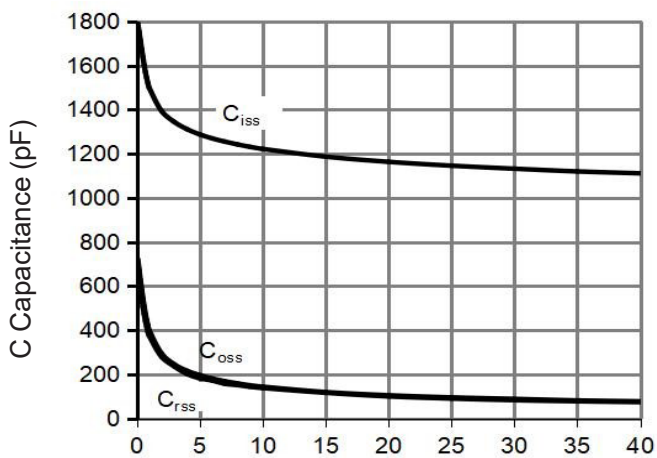
Figure 6 Drain-Source On-Resistance



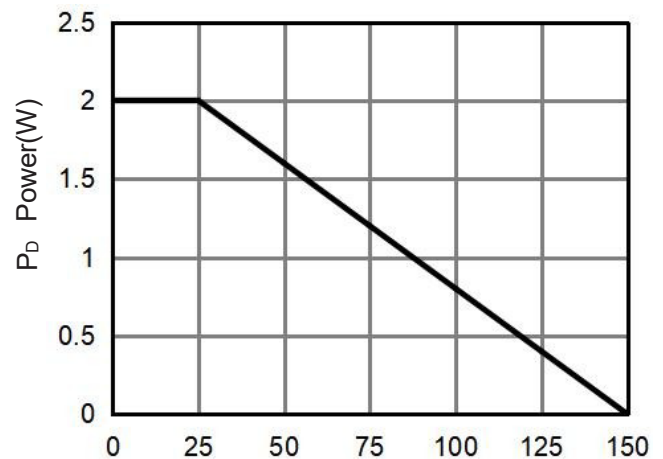
Vgs Gate-Source Voltage (V)

Figure7 Rdson vs Vgs


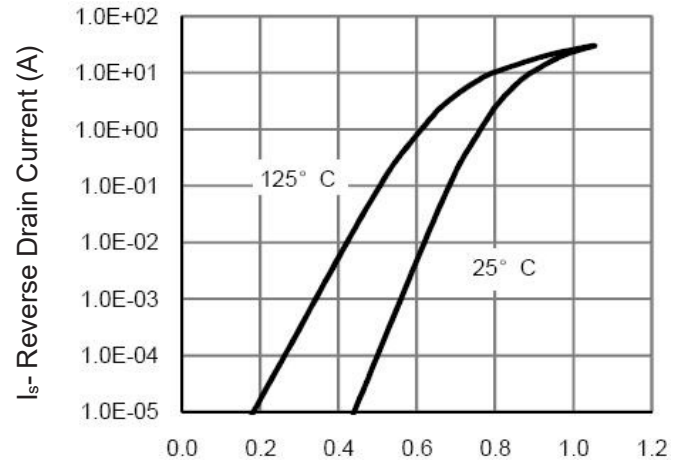
Qg Gate Charge (nC)

Figure 9 Gate Charge


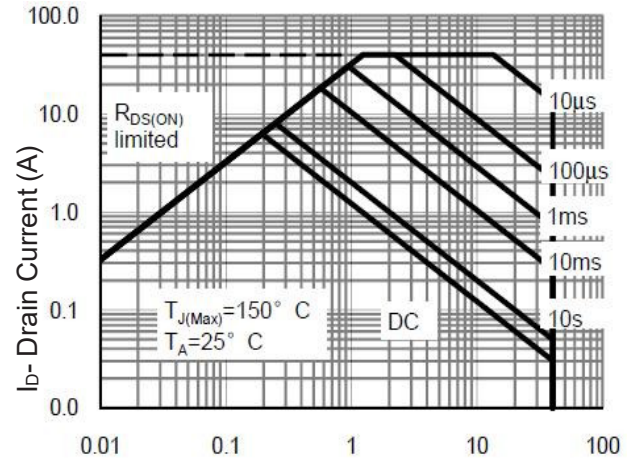
Vds Drain-Source Voltage (V)

Figure 11 Capacitance vs Vds


Tj-Junction Temperature(°C)

Figure 8 Power Dissipation


Vds Drain-Source Voltage (V)

Figure 10 Source- Drain Diode Forward


Vds Drain-Source Voltage (V)

Figure 12 Safe Operation Area

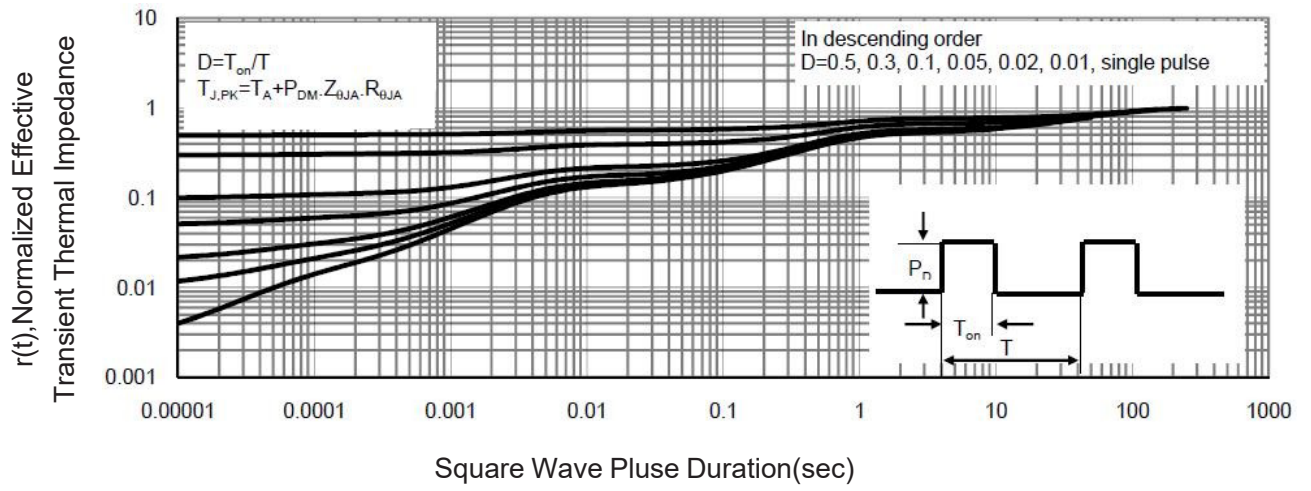


Figure 13 Normalized Maximum Transient Thermal Impedance