

Description

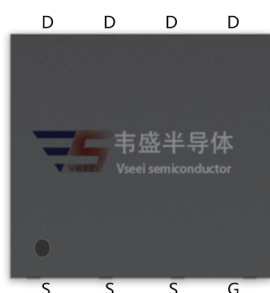
The VSM25N04 uses advanced trench technology to provide excellent $R_{DS(ON)}$ and low gate charge. The complementary MOSFETs may be used to form a level shifted high side switch, and for a host of other applications.

Application

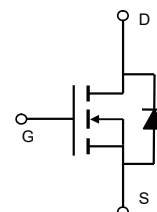
- DC/DC Converter
- Ideal for high-frequency switching and synchronous rectification

General Features

- $V_{DS}=40V, I_D=25A$
 $R_{DS(ON)}=11.5m\Omega$ (typical) @ $V_{GS}=10V$
 $R_{DS(ON)}=17m\Omega$ (typical) @ $V_{GS}=4.5V$
- Excellent gate charge x $R_{DS(on)}$ product(FOM)
- Very low on-resistance $R_{DS(on)}$
- 150°C operating temperature
- 100% UIS tested
- 100% ΔV_{ds} tested



DFN3x3



Schematic

Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
VSM25N04	VSM25N04-D33	DFN3x3	-	-	-

Absolute Maximum Ratings ($T_c=25^\circ\text{C}$ 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	25	A
Drain Current-Continuous($T_c=100^\circ\text{C}$)	$I_D(100^\circ\text{C})$	21.2	A
Pulsed Drain Current	I_{DM}	100	A
Maximum Power Dissipation	P_D	25	W
Single pulse avalanche energy (Note 1)	E_{AS}	70	mJ
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-55 To 150	$^\circ\text{C}$

Thermal Characteristic

Thermal Resistance, Junction-to-Case	$R_{\theta JC}$	5	$^\circ\text{C/W}$
Thermal Resistance, Junction-to-Ambient (Note 4)	$R_{\theta JA}$	60	$^\circ\text{C/W}$

Electrical Characteristics (T_c=25°C 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	-	-	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						
Gate Threshold Voltage	V _{GS(th)}	V _{DS} =V _{GS} , I _D =250μA	1.0	1.5	2.0	V
Drain-Source On-State Resistance	R _{DS(ON)}	V _{GS} =10V, I _D =20A	-	11.5	13.5	mΩ
		V _{GS} =4.5V, I _D =15A	-	17	22	mΩ
Forward Transconductance	g _{FS}	V _{DS} =5V, I _D =20A	-	30	-	S
Dynamic Characteristics						
Input Capacitance	C _{iss}	V _{DS} =20V, V _{GS} =0V, F=1.0MHz	-	964	-	pF
Output Capacitance	C _{oss}		-	98	-	pF
Reverse Transfer Capacitance	C _{rss}		-	91	-	pF
Switching Characteristics (Note 2)						
Turn-on Delay Time	t _{d(on)}	V _{DD} =20V, R _L =1Ω V _{GS} =10V, R _{GEN} =3Ω	-	5.5	-	nS
Turn-on Rise Time	t _r		-	25	-	nS
Turn-Off Delay Time	t _{d(off)}		-	15	-	nS
Turn-Off Fall Time	t _f		-	8	-	nS
Total Gate Charge	Q _g	V _{DS} =20V, I _D =20A, V _{GS} =10V	-	24.4	-	nC
Gate-Source Charge	Q _{gs}		-	4.1	-	nC
Gate-Drain Charge	Q _{gd}		-	6.1	-	nC
Drain-Source Diode Characteristics						
Diode Forward Voltage	V _{SD}	V _{GS} =0V, I _S =20A	-	-	1.2	V
Diode Forward Current	I _S		-	-	25	A
Reverse Recovery Time	t _{rr}	T _J = 25°C, I _F = 20A	-	34	-	nS
Reverse Recovery Charge	Q _{rr}	di/dt = 100A/μs	-	31	-	nC

Notes:

1. EAS condition : T_J=25°C, V_{DD}=20V, V_G=-10V, L=0.5mH, R_g=25Ω
2. Guaranteed by design, not subject to production
3. These curves are based on the junction-to-case thermal impedance which is measured with the device mounted to a large heatsink, assuming a maximum junction temperature of T_{J(MAX)}=150°C. The SOA curve provides a single pulse rating.
4. The value of R_{θJA} is measured with the device mounted on 1in2 FR-4 board with 2oz. Copper, in a still air environment with T_A=25°C. The maximum allowed junction temperature of 150°C. The value in any given application depends on the user's specific board design, and the maximum temperature of 150°C may be used if the PCB allows it.

N-Channel Typical Electrical and Thermal Characteristics (Curves)

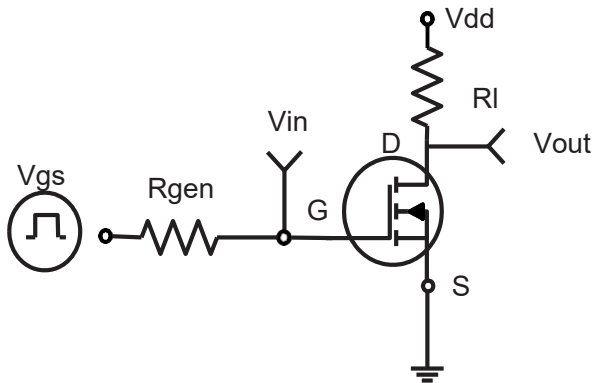


Figure 1: Switching Test Circuit

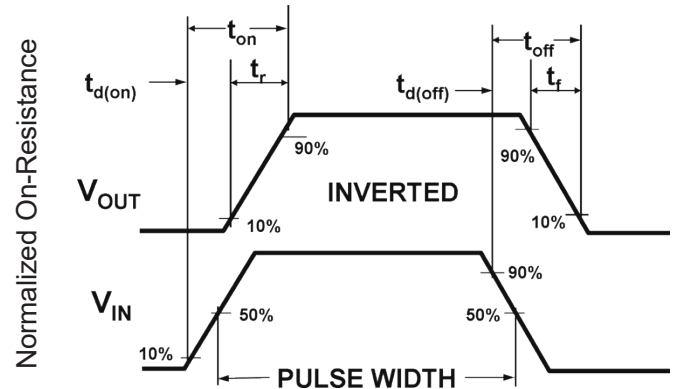
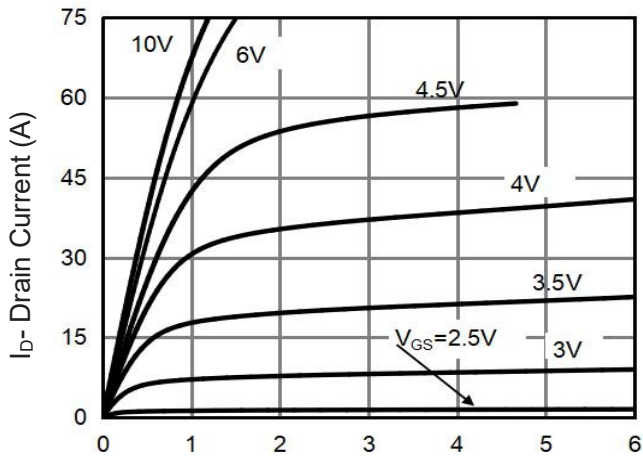
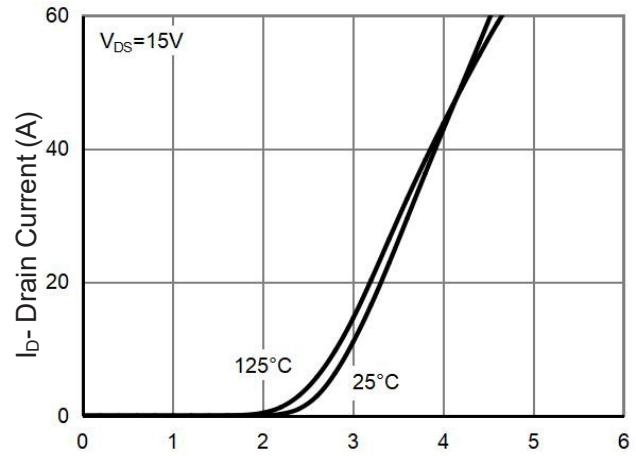


Figure 2: Switching Waveforms



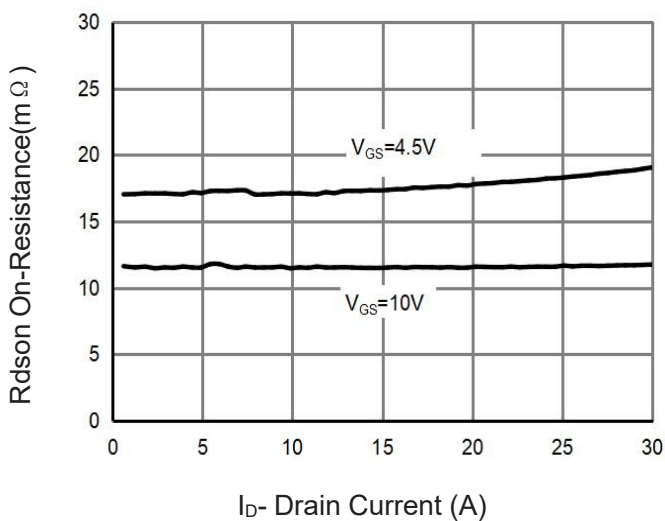
Vds Drain-Source Voltage (V)

Figure 3 Output Characteristics



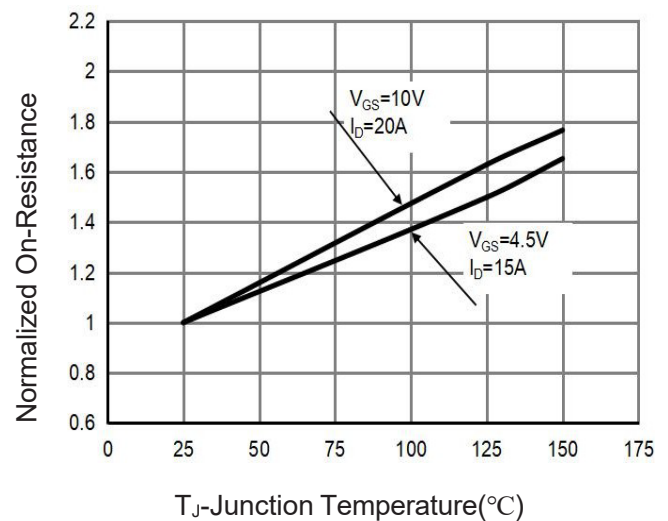
Vgs Gate-Source Voltage (V)

Figure 4 Transfer Characteristics



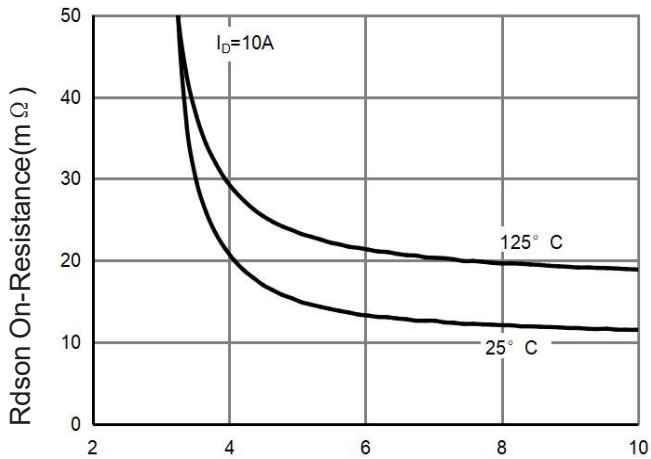
ID- Drain Current (A)

Figure 5 Drain-Source On-Resistance

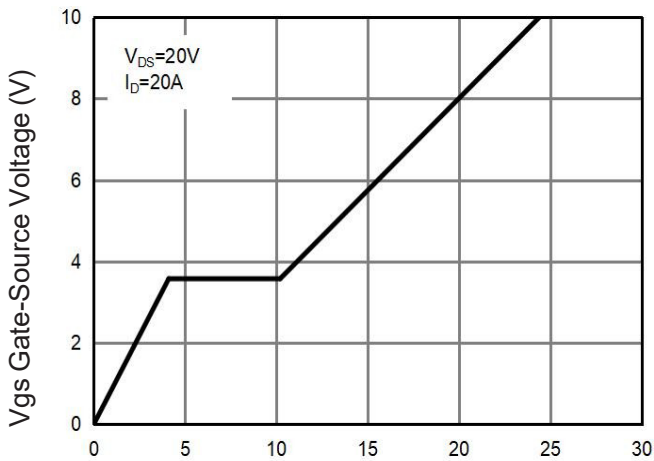


TJ-Junction Temperature(°C)

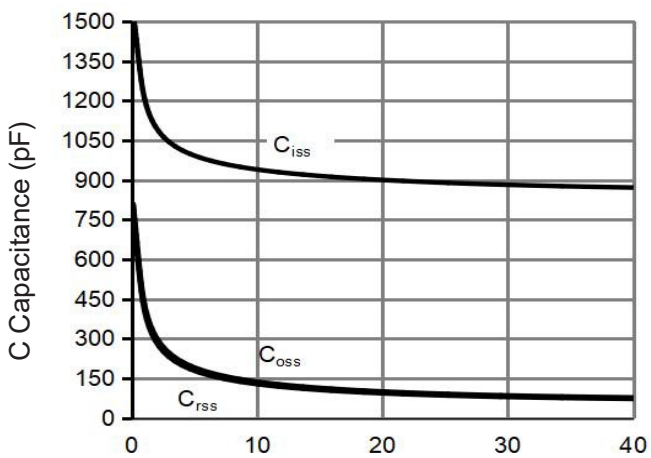
Figure 6 Drain-Source On-Resistance



Vgs Gate-Source Voltage (V)

Figure7 Rdson vs Vgs


Qg Gate Charge (nC)

Figure 9 Gate Charge


Vds Drain-Source Voltage (V)

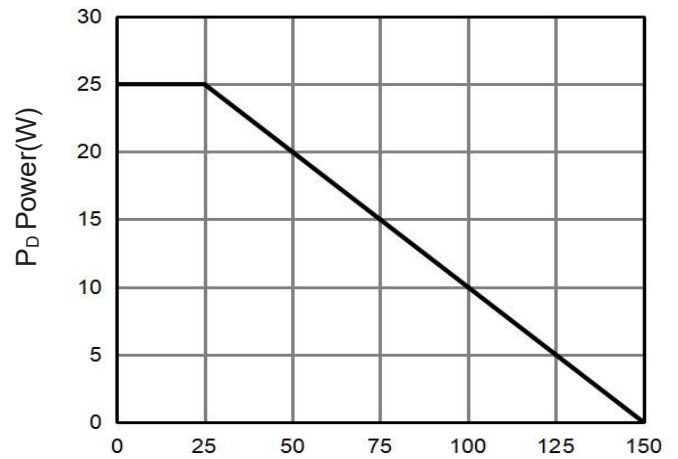
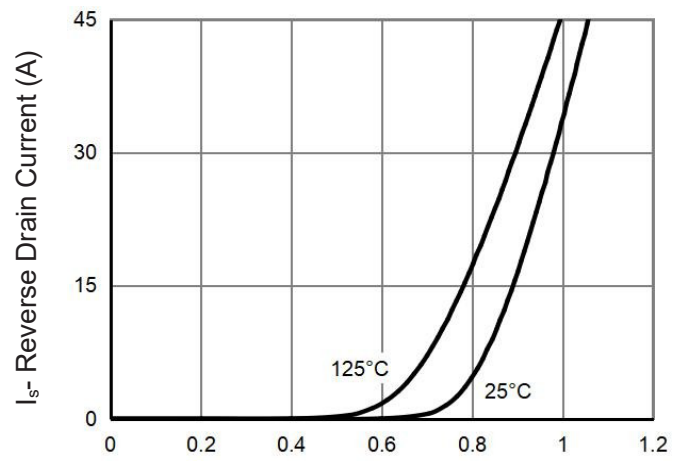
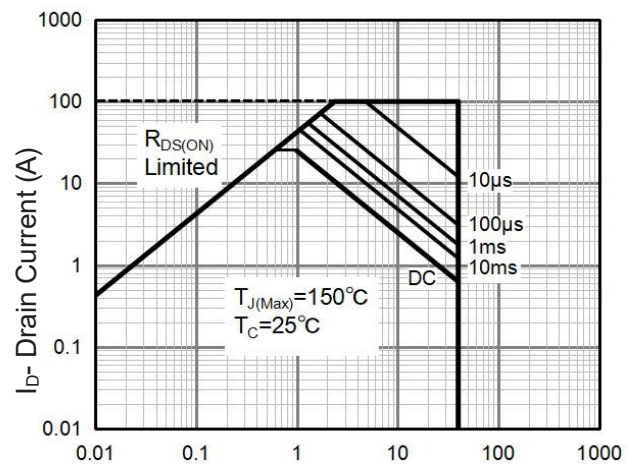
Figure 11 Capacitance vs Vds

T_C-Case 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(Note3)

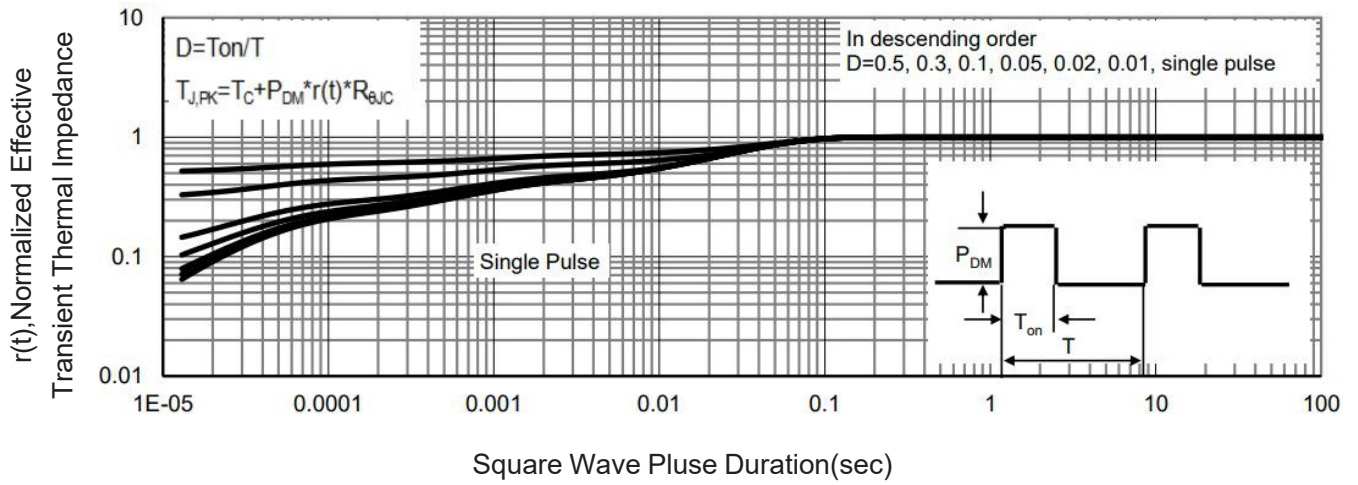


Figure 13 Normalized Maximum Transient Thermal Impedance