

Description

The VSM80N04 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

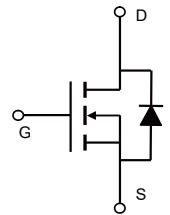
- $V_{DS} = 40V, I_D = 80A$
 $R_{DS(on)} < 4.8m\Omega @ V_{GS}=10V$
 $R_{DS(on)} < 9.5m\Omega @ V_{GS}=4.5V$
- High density cell design for ultra low $R_{DS(on)}$
- Fully characterized avalanche voltage and current
- Good stability and uniformity with high E_{AS}
- Excellent package for good heat dissipation

Application

- Power switching applications
- Hard switched and high frequency circuits
- Uninterruptible power supply



TO-252



Schematic

Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
VSM80N04	VSM80N04-T2	TO-252	-	-	-

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	80	A
Drain Current-Continuous(100°C)	$I_D(100^\circ\text{C})$	70	A
Pulsed Drain Current ($T_c=25^\circ\text{C}$)	I_{DM}	320	A
Maximum Power Dissipation	P_D	85	W
Derating factor		0.568	W/ $^\circ\text{C}$
Single pulse avalanche energy ^(Note 1)	E_{AS}	384	mJ
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-55 To 175	$^\circ\text{C}$

Thermal Characteristic

Thermal Resistance, Junction-to-Case	$R_{\theta JC}$	1.76	$^\circ\text{C/W}$
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Thermal Resistance, Junction-to-Ambient (Note 2)	$R_{\theta JA}$	50	$^{\circ}\text{C/W}$
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Electrical Characteristics ($T_c=25^{\circ}\text{C}$ unless otherwise noted)

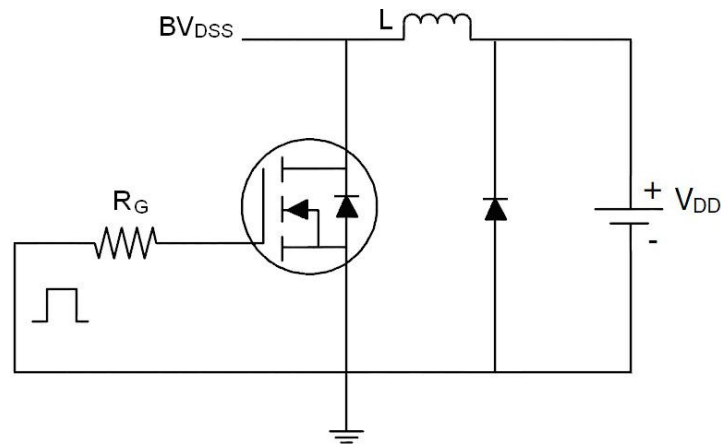
Parameter	Symbol	Condition	Min	Typ	Max	Unit
Off Characteristics						
Drain-Source Breakdown Voltage	BV_{DSS}	$V_{GS}=0V, I_D=250\mu A$	40	-	-	V
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS}=40V, V_{GS}=0V$	-	-	1	μA
Gate-Body Leakage Current	I_{GSS}	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	± 100	nA
On Characteristics						
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=250\mu A$	1.0	1.7	2.5	V
Drain-Source On-State Resistance	$R_{DS(on)}$	$V_{GS}=10V, I_D=20A$	-	4.2	4.8	m Ω
		$V_{GS}=4.5V, I_D=20A$	-	7.2	9.5	
Forward Transconductance	g_{FS}	$V_{DS}=10V, I_D=20A$	-	42	-	S
Dynamic Characteristics						
Input Capacitance	C_{iss}	$V_{DS}=20V, V_{GS}=0V,$ $F=1.0MHz$	-	2692	-	pF
Output Capacitance	C_{oss}		-	296	-	pF
Reverse Transfer Capacitance	C_{rss}		-	247	-	pF
Switching Characteristics ^(Note 3)						
Turn-on Delay Time	$t_{d(on)}$	$V_{DD}=20V, R_L=1\Omega,$ $V_{GS}=10V, R_{GEN}=3\Omega$	-	12	-	nS
Turn-on Rise Time	t_r		-	10	-	nS
Turn-off Delay Time	$t_{d(off)}$		-	37	-	nS
Turn-off Fall Time	t_f		-	12	-	nS
Total Gate Charge	Q_g	$V_{DS}=20V, I_D=20A,$ $V_{GS}=10V$	-	59	-	nC
Gate-Source Charge	Q_{gs}		-	7.5	-	nC
Gate-Drain Charge	Q_{gd}		-	16.5	-	nC
Drain-Source Diode Characteristics						
Diode Forward Voltage	V_{SD}	$V_{GS}=0V, I_S=20A$	-	-	1.2	V
Diode Forward Current	I_S		-	-	80	A
Reverse Recovery Time	t_{rr}	$T_J = 25^{\circ}C, I_F = 20A$ $di/dt = -100A/\mu s$	-	34	-	nS
Reverse Recovery Charge	Q_{rr}		-	45	-	nC
Forward Turn-On Time	t_{on}	Intrinsic turn-on time is negligible (turn-on is dominated by LS+LD)				

Notes:

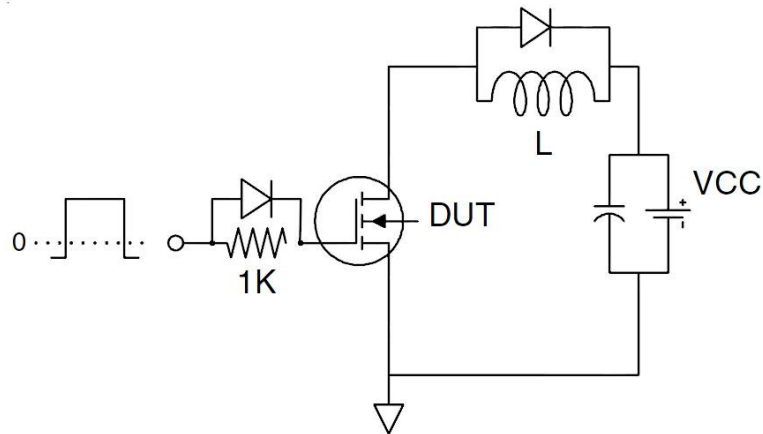
1. EAS condition : $T_J=25^{\circ}\text{C}, V_{DD}=40V, V_G=15V, L=0.5\text{mH}, R_g=25\Omega$.
2. The value of $R_{\theta JA}$ is measured with the device mounted on 1in2 FR-4 board with 2oz. Copper, in a still air environment with $T_A=25^{\circ}\text{C}$. The maximum allowed junction temperature of 175°C . The value in any given application depends on the user's specific board design, and the maximum temperature of 175°C may be used if the PCB allows it.
3. Guaranteed by design, not subject to production.
4. 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 $T_{J(MAX)}=175^{\circ}\text{C}$. The SOA curve provides a single pulse rating.

Test Circuit

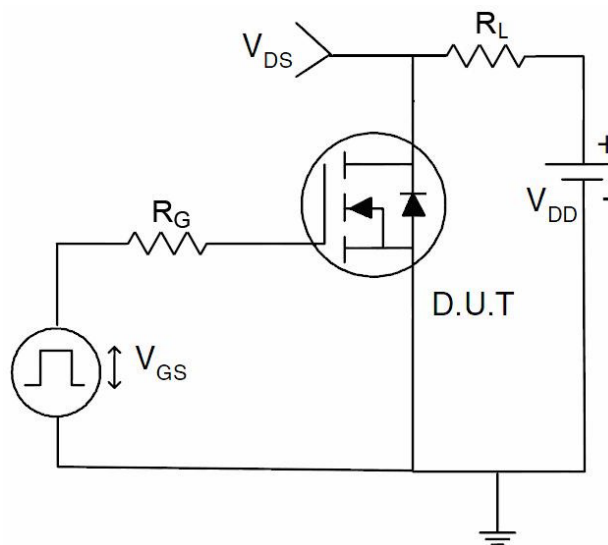
1) E_{AS} Test Circuit



2) Gate Charge Test Circuit



3) Switch Time Test Circuit



Typical Electrical and Thermal Characteristics (Curves)

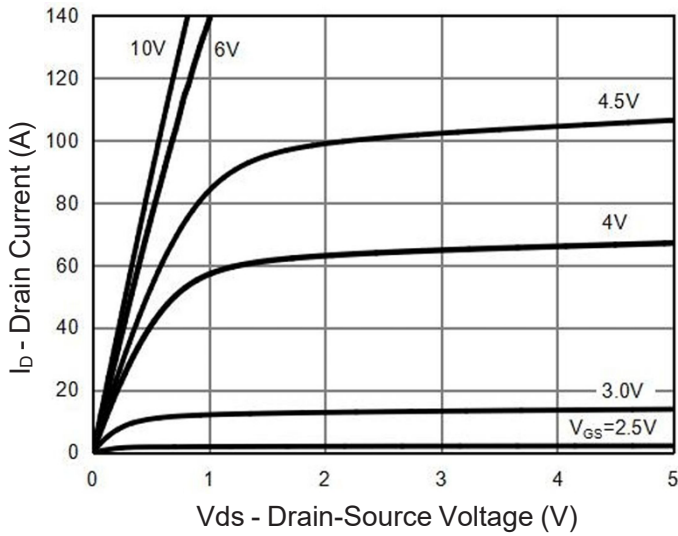


Figure 1 Output Characteristics

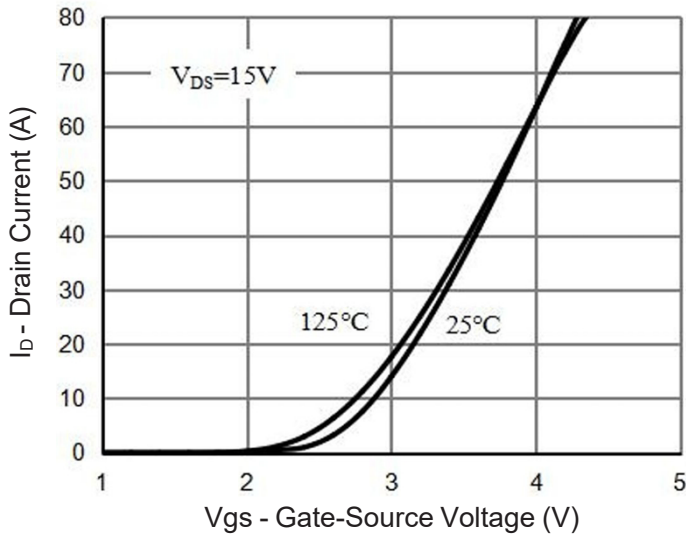


Figure 2 Transfer Characteristics

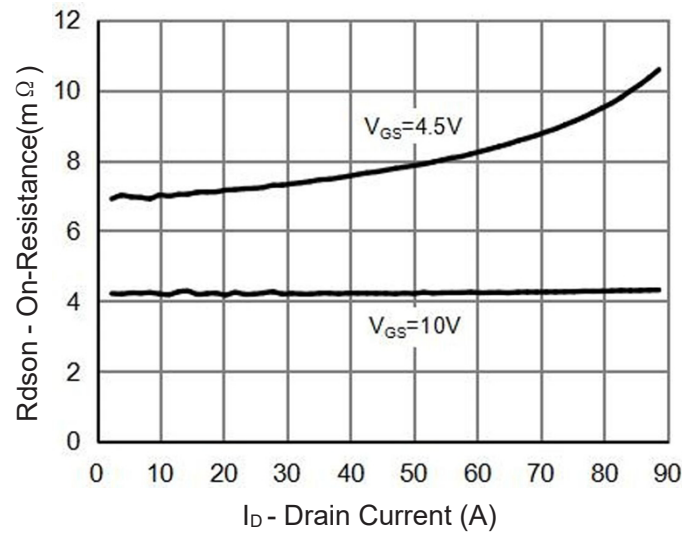


Figure 3 Rdson vs Drain Current

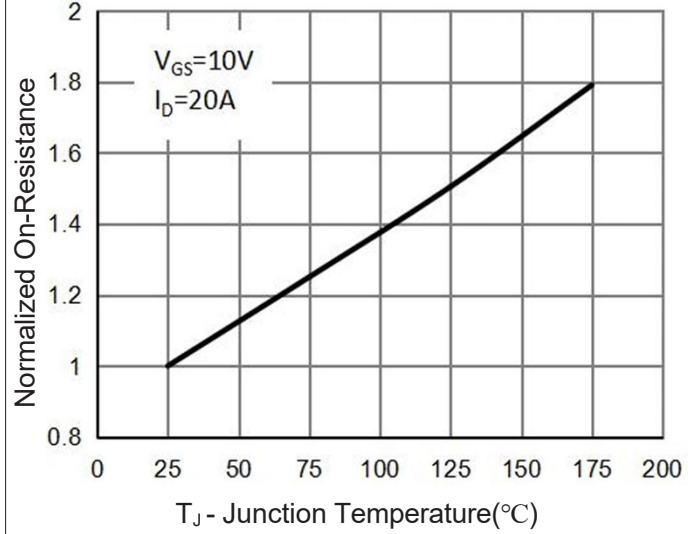


Figure 4 Rdson vs Junction Temperature

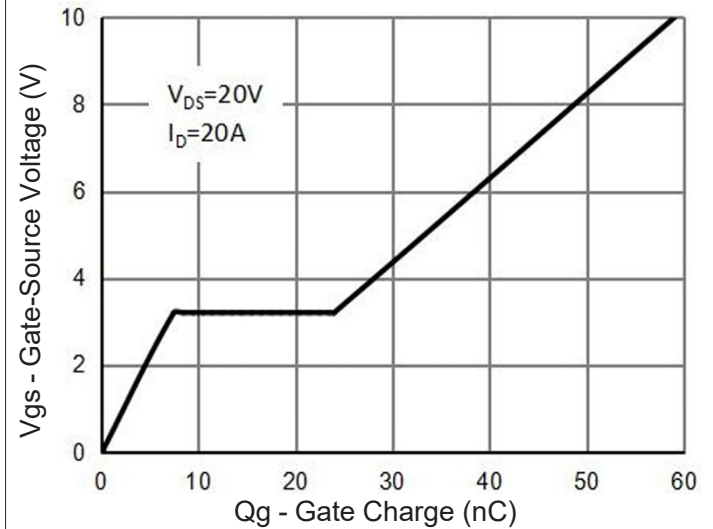


Figure 5 Gate Charge

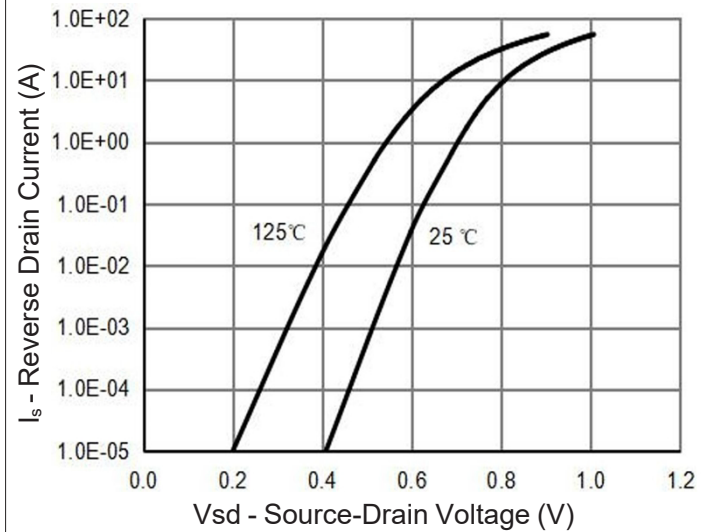
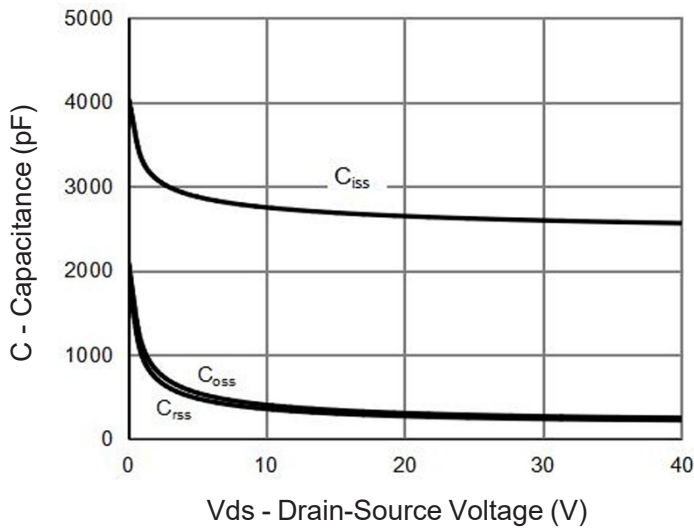
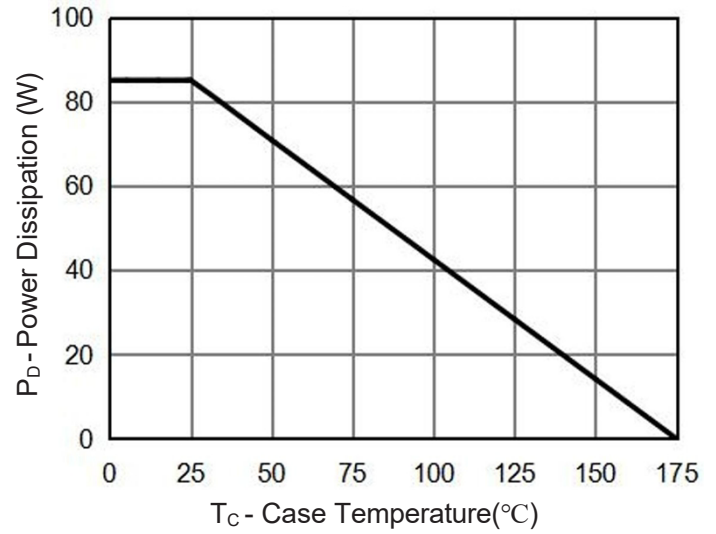
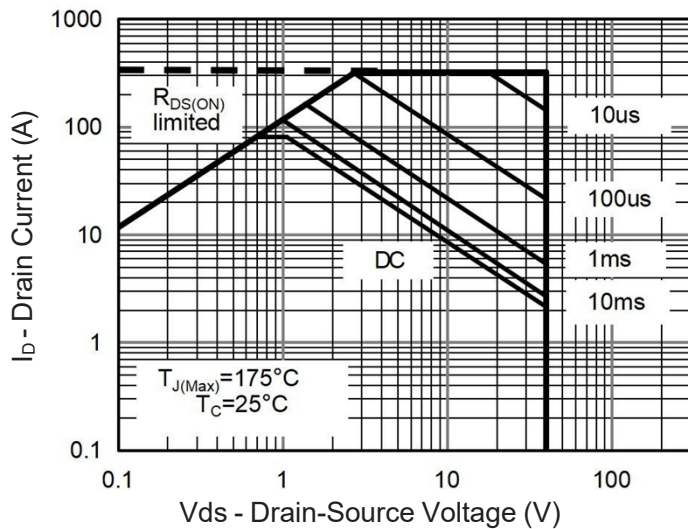
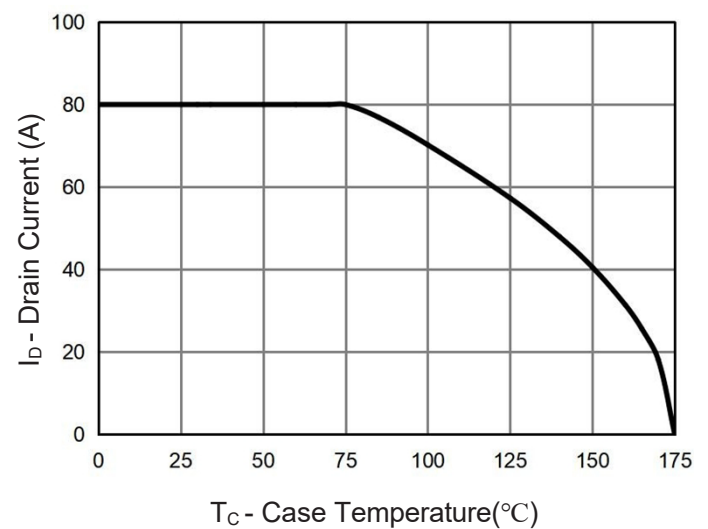
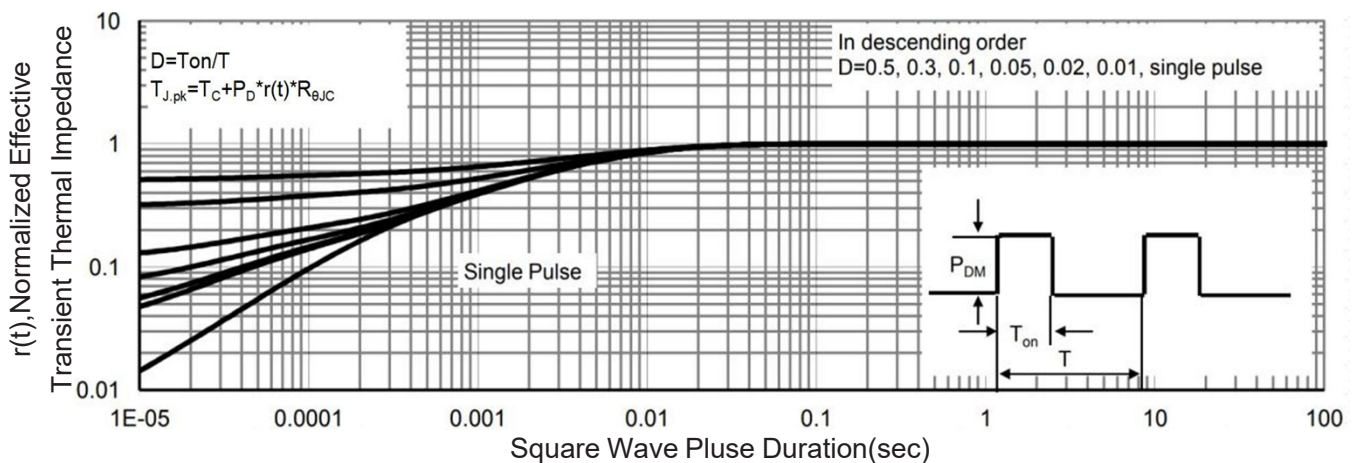


Figure 6 Source-Drain Diode Forward


Figure 7 Capacitance vs Vds

Figure 9 Power De-rating

Figure 8 Safe Operation Area (Note 4)

Figure 10 Drain Current De-rating

Figure 11 Normalized Maximum Transient Thermal Impedance