

Description

The VSM5N20 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

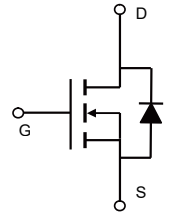
- $V_{DS} = 200V, I_D = 5A$
 $R_{DS(ON)} < 580m\Omega @ V_{GS}=10V$ (Typ:520m Ω)
- High density cell design for ultra low R_{dson}
- Fully characterized avalanche voltage and current
- Excellent package for good heat dissipation

Application

- Power switching application
- 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
VSM5N20	VSM5N20-T2	TO-252	-	-	-

Absolute Maximum Ratings ($T_A=25^{\circ}C$ unless otherwise noted)

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	V_{DS}	200	V
Gate-Source Voltage	V_{GS}	± 20	V
Drain Current-Continuous	I_D	5	A
Drain Current-Pulsed	I_{DM}	20	A
Single pulse avalanche energy (Note 1)	E_{AS}	6	mJ
Maximum Power Dissipation	P_D	39	W
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-55 To 175	$^{\circ}C$

Thermal Characteristic

Thermal Resistance,Junction-to-Case	$R_{\theta JA}$	3.85	$^{\circ}C/W$
Thermal Resistance,Junction-to-Ambient ^(Note4)	$R_{\theta JA}$	50	$^{\circ}C/W$

Electrical Characteristics (T_A=25°C unless otherwise noted)

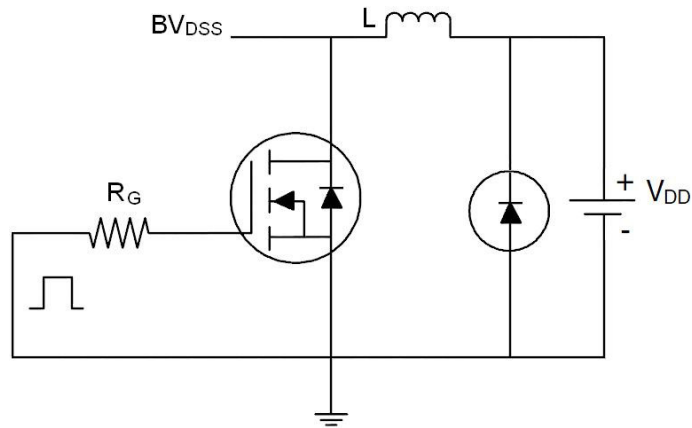
Parameter	Symbol	Condition	Min	Typ	Max	Unit
Off Characteristics						
Drain-Source Breakdown Voltage	BV _{DSS}	V _{GS} =0V I _D =250μA	200	-	-	V
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} =200V, V _{GS} =0V	-	-	1	μA
Gate-Body Leakage Current	I _{GSS}	V _{GS} =±20V, V _{DS} =0V	-	-	±100	nA
On Characteristics						
Gate Threshold Voltage	V _{GS(th)}	V _{DS} =V _{GS} , I _D =250μA	1.2	1.7	2.5	V
Drain-Source On-State Resistance	R _{DS(ON)}	V _{GS} =10V, I _D =2A	-	520	580	mΩ
Forward Transconductance	g _{FS}	V _{DS} =10V, I _D =2A	-	8	-	S
Dynamic Characteristics						
Input Capacitance	C _{iss}	V _{DS} =100V, V _{GS} =0V, F=1.0MHz	-	530	-	pF
Output Capacitance	C _{oss}		-	90	-	pF
Reverse Transfer Capacitance	C _{rss}		-	30	-	pF
Switching Characteristics (Note 2)						
Turn-on Delay Time	t _{d(on)}	V _{DD} =100V, R _L =20Ω V _{GS} =10V, R _G =2.5Ω	-	10	-	nS
Turn-on Rise Time	t _r		-	12	-	nS
Turn-Off Delay Time	t _{d(off)}		-	15	-	nS
Turn-Off Fall Time	t _f		-	15	-	nS
Total Gate Charge	Q _g	V _{DS} =100V, I _D =2A, V _{GS} =10V	-	12		nC
Gate-Source Charge	Q _{gs}		-	2.5	-	nC
Gate-Drain Charge	Q _{gd}		-	3.8	-	nC
Drain-Source Diode Characteristics						
Diode Forward Voltage	V _{SD}	V _{GS} =0V, I _S =2A	-	-	1.2	V
Diode Forward Current	I _S		-	-	5	A

Notes:

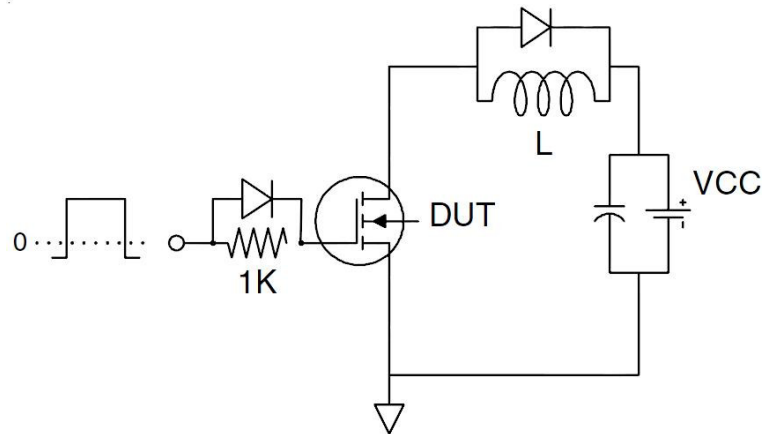
1. EAS condition : T_j=25°C, V_{DD}=50V, V_G=10V, L=0.5mH, R_G=25Ω
2. Guaranteed by design, not subject to production
3. These curves are based on the junction-to-case thermal impedance which is measured with the device mounted to a large heatsink, assuming a maximum junction temperature of T_{J(MAX)}=175°C. 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 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.

Test Circuit

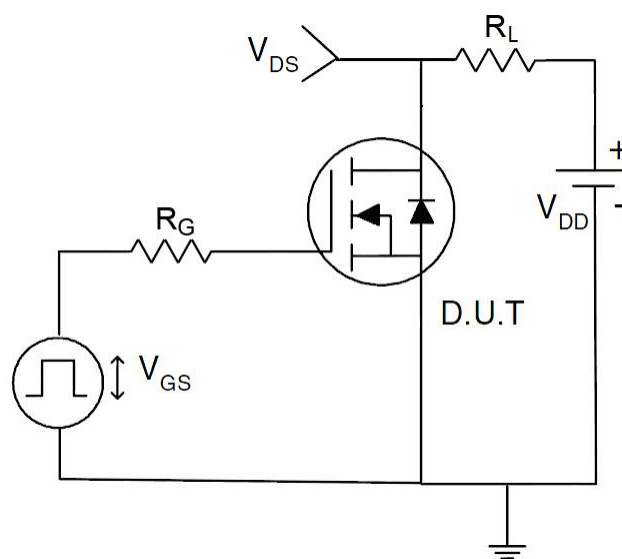
1) E_{AS} test circuit



2) Gate charge test circuit



3) Switch Time Test Circuit



Typical Electrical and Thermal Characteristics (Curves)

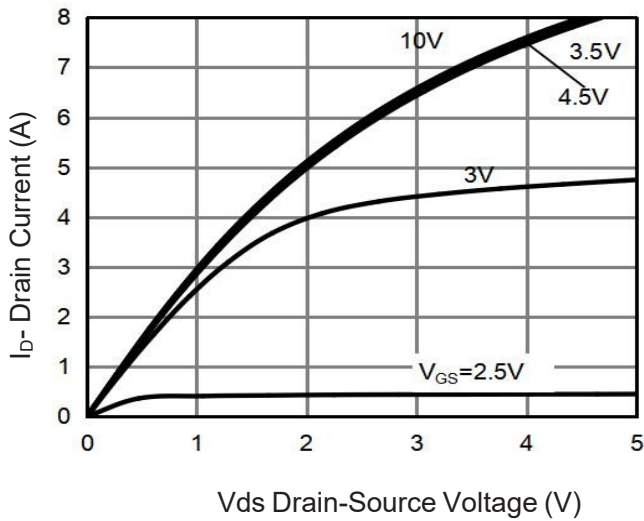


Figure 1 Output Characteristics

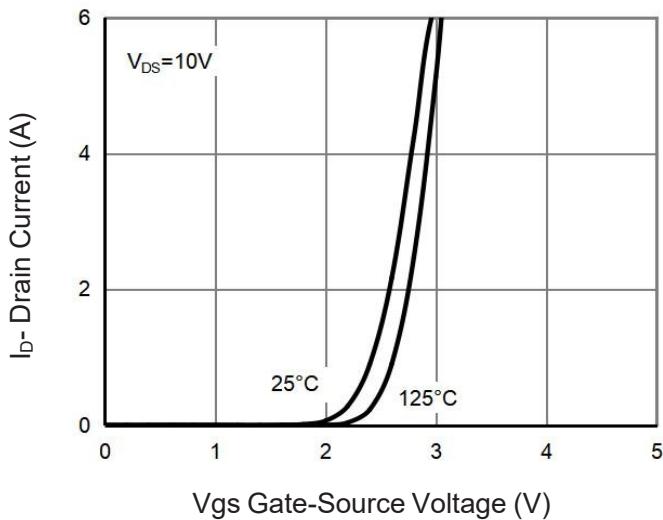


Figure 2 Transfer Characteristics

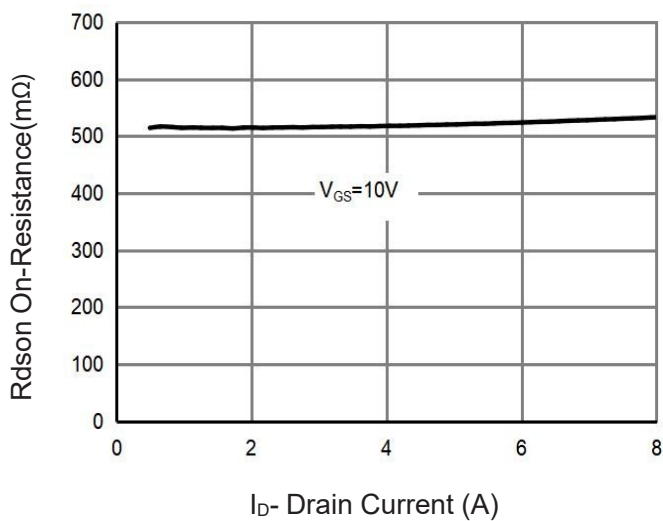


Figure 3 $R_{DS(on)}$ - Drain Current

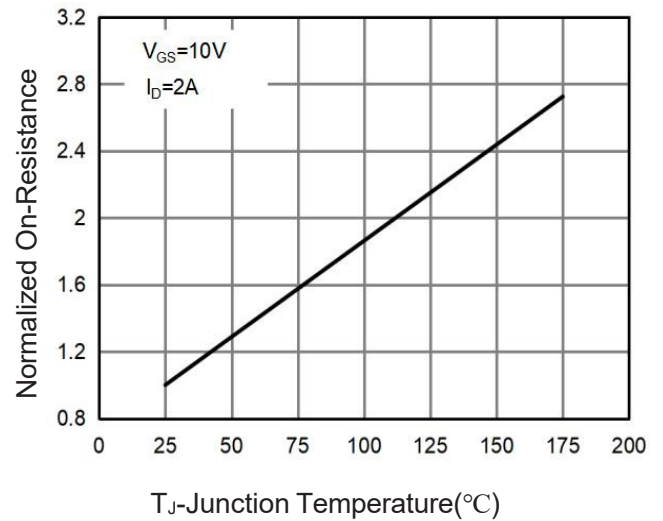


Figure 4 $R_{DS(on)}$ -Junction Temperature

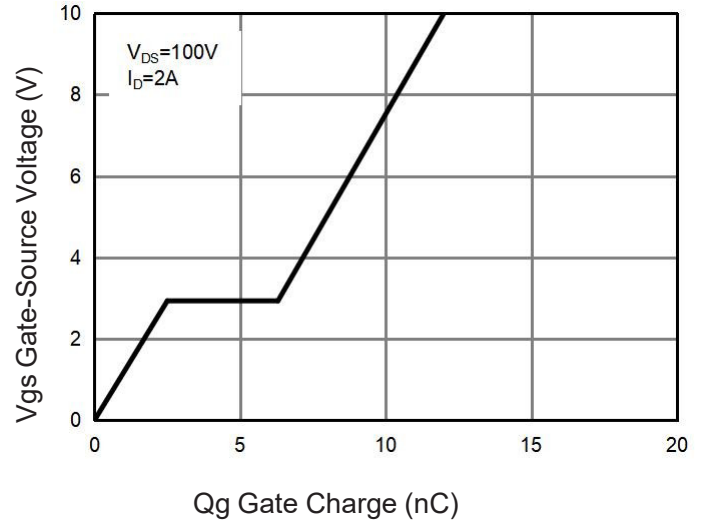


Figure 5 Gate Charge

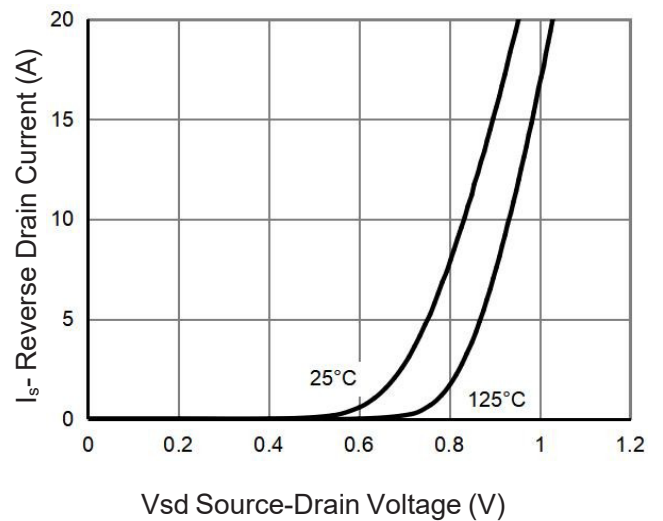
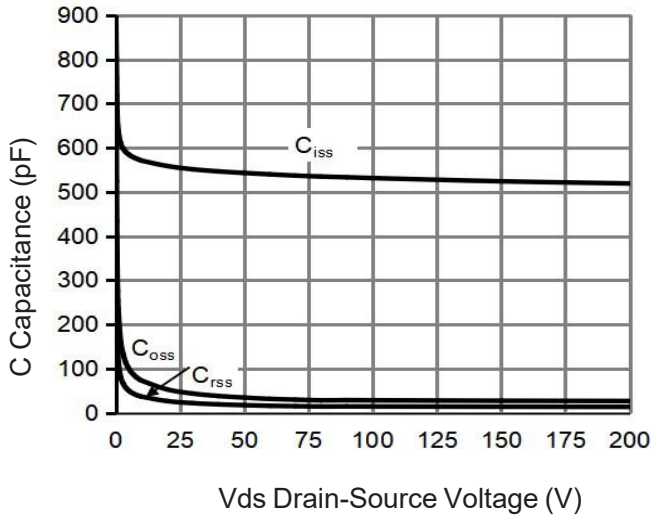
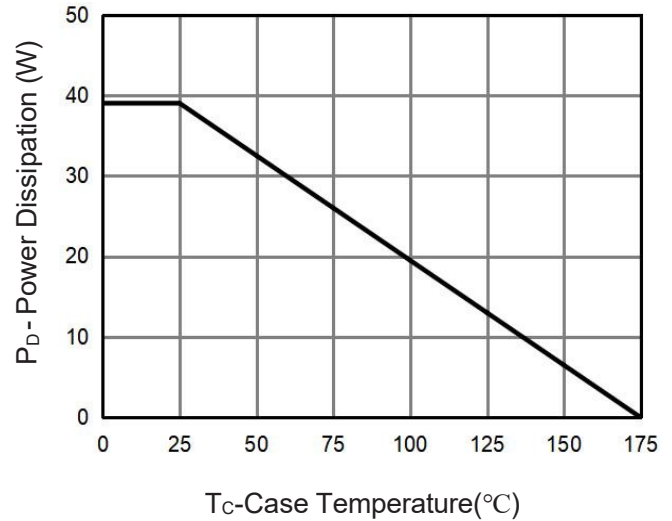
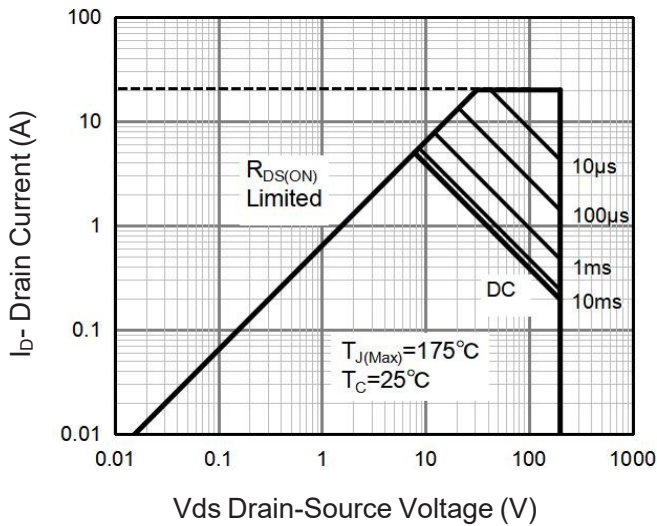
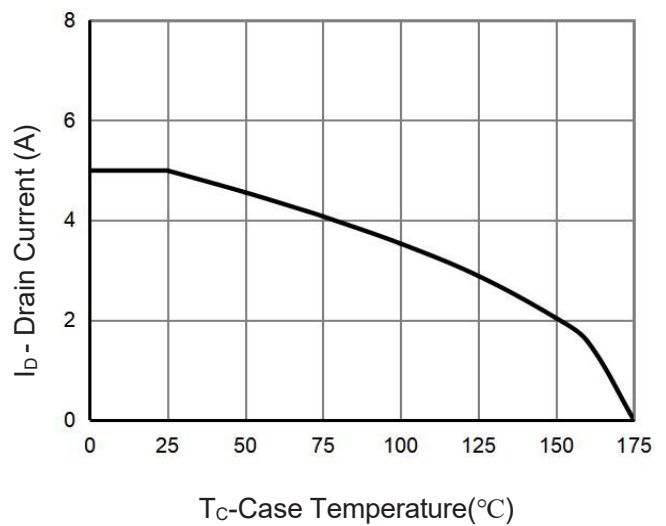
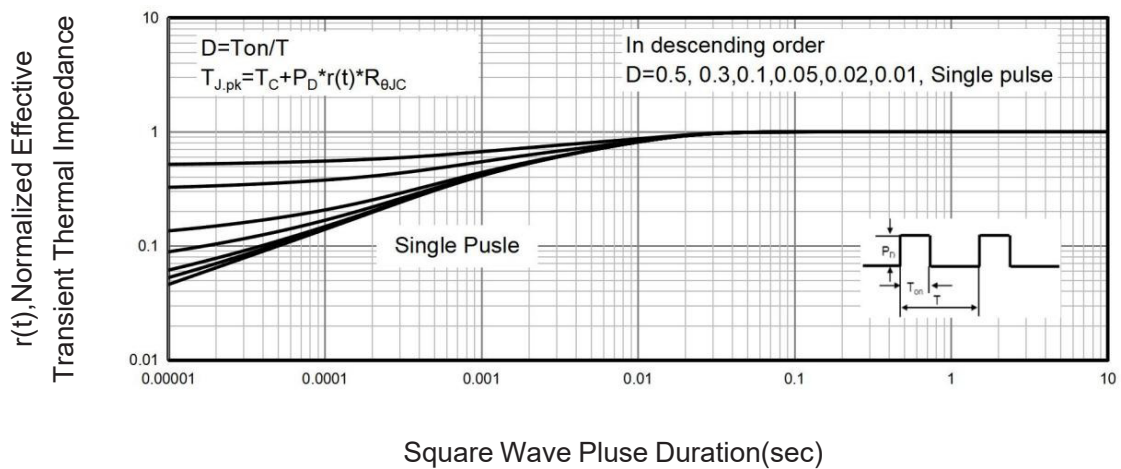


Figure 6 Source- Drain Diode Forward


Figure 7 Capacitance vs Vds

Figure 9 BV_{DSS} vs Junction Temperature

Figure 8 Safe Operation Area

Figure 10 Drain Current De-rating

Figure 11 Normalized Maximum Transient Thermal Impedance