Description

The VSM24N20 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 =24A

   $R_{DS(ON)}$ < 80mΩ @ V_{GS}=10V   (Typ:62mΩ)

● 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

● Power switching application
● Hard switched and high frequency circuits
● Uninterruptible power supply

TO-220F
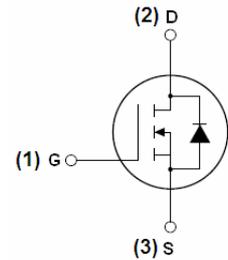
Schematic Diagram

(2) D

(1) G

(3) S

Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
VSM24N20-TF	VSM24N20	TO-220F	-	-	-

Absolute Maximum Ratings (T_A=25℃ 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	24	A
Drain Current-Continuous(T_C=100℃)	I_D (100℃)	16.5	A
Pulsed Drain Current	I_{DM}	100	A
Maximum Power Dissipation	P_D	45	W
Single pulse avalanche energy [Note 5]	E_{AS}	250	mJ
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-55 To 175	℃

Thermal Characteristic

Thermal Resistance,Junction-to-Ambient [Note 2]	$R_{θJA}$	3.33	℃/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	200	220	-	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 [Note 3]						
Gate Threshold Voltage	$V_{GS(th)}$	V_{DS}=V_{GS},I_D=250µA	1.0	1.5	2.5	V
Drain-Source On-State Resistance	$R_{DS(ON)}$	V_{GS}=10V, I_D=15A	-	62	80	mΩ
Forward Transconductance	g_{FS}	V_{DS}=10V,I_D=15A	30	-	-	S
Dynamic Characteristics [Note4]						
Input Capacitance	C_{Iss}	V_{DS}=25V,V_{GS}=0V, F=1.0MHz		4200		PF
Output Capacitance	C_{oss}			163		PF
Reverse Transfer Capacitance	C_{rss}			75		PF
Switching Characteristics [Note 4]						
Turn-on Delay Time	$t_{d(on)}$	V_{DD}=100V,I_D=15A V_{GS}=10V,R_{GEN}=2.5Ω	-	10	-	nS
Turn-on Rise Time	t_r		-	18	-	nS
Turn-Off Delay Time	$t_{d(off)}$		-	22	-	nS
Turn-Off Fall Time	t_f		-	5	-	nS
Total Gate Charge	Q_g	V_{DS}=100V,I_D=15A, V_{GS}=10V		60		nC
Gate-Source Charge	Q_{gs}			19		nC
Gate-Drain Charge	Q_{gd}			17		nC
Drain-Source Diode Characteristics						
Diode Forward Voltage [Note 3]	V_{SD}	V_{GS}=0V,I_S=15A	-	-	1.2	V
Diode Forward Current [Note 2]	I_S	-	-	-	24	A
Reverse Recovery Time	t_{rr}	TJ = 25°C, IF = 15A di/dt = 100A/µs [Note3]	-	90	-	nS
Reverse Recovery Charge	Qrr		-	300	-	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

5. EAS condition: Tj=25℃,V_{DD}=50V,V_G=10V,L=0.5mH,Rg=25Ω

Test Circuit

1) E_{AS} Test Circuits
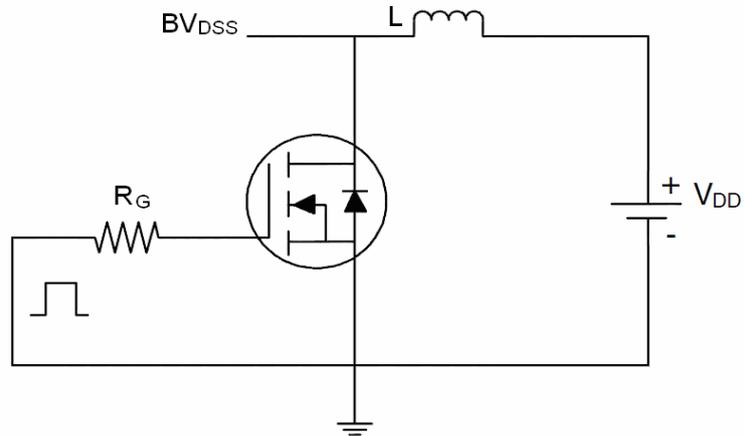
2) Gate Charge Test Circuit
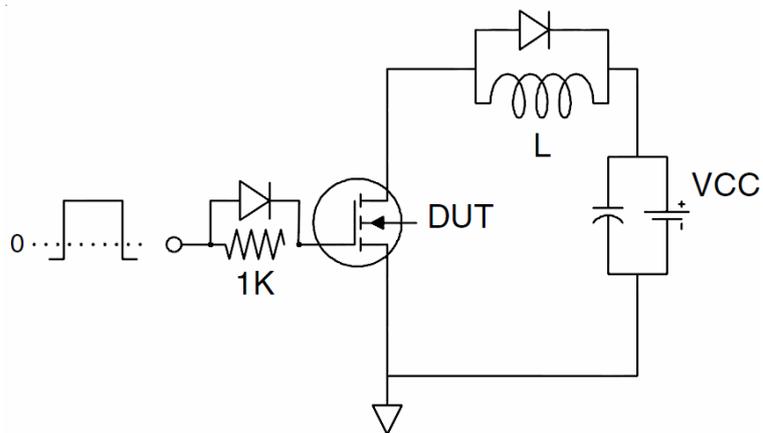
3) Switch Time Test Circuit
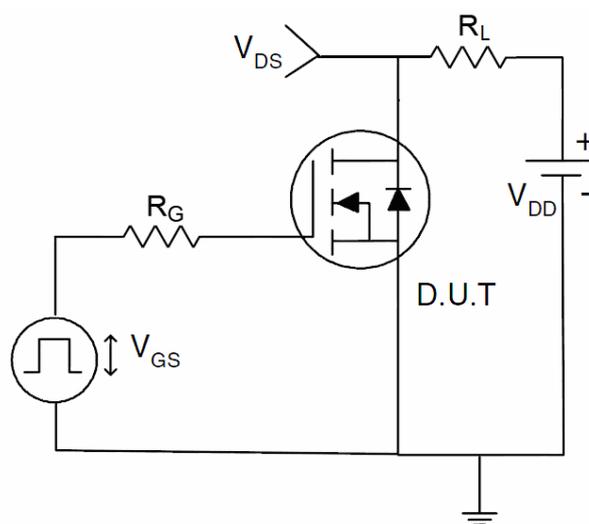
Typical Electrical and Thermal Characteristics (Curves)
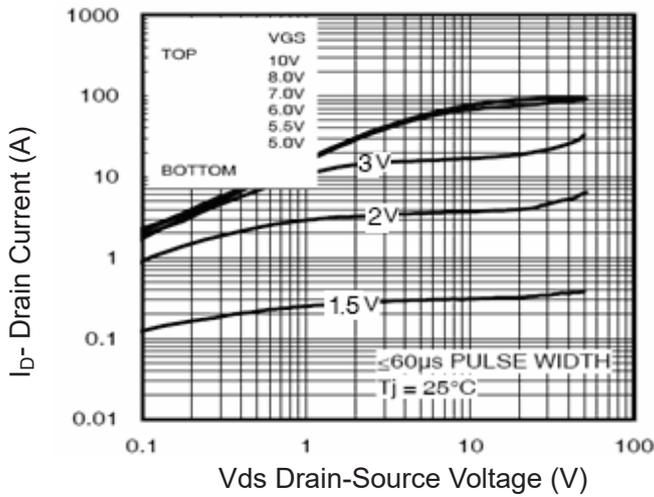
Figure 1 Output Characteristics

Figure 4 Rdson-Junction Temperature

Figure 2 Transfer Characteristics
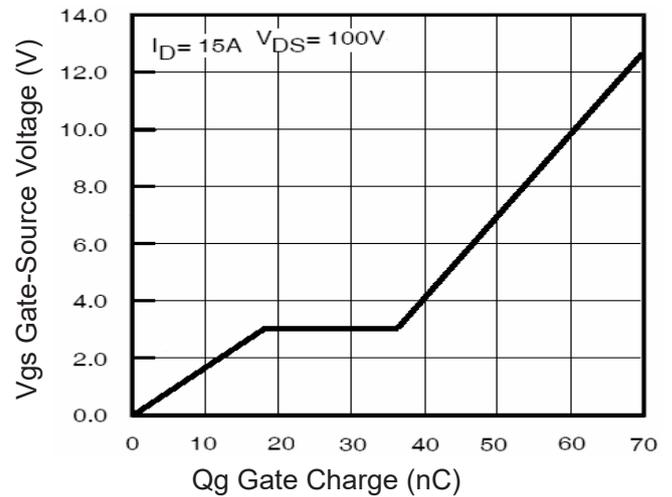
Figure 5 Gate Charge

Figure 3 Rdson- Drain Current
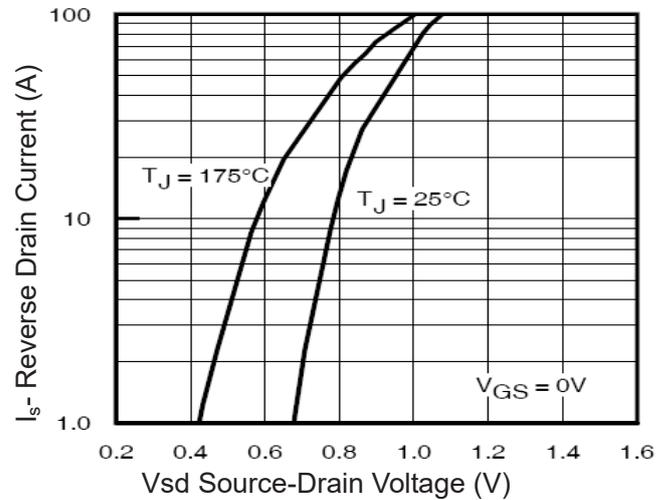
Figure 6 Source- Drain Diode Forward
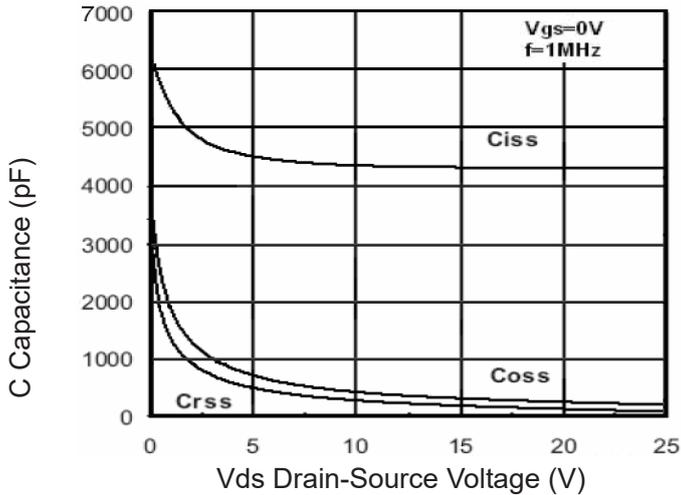
Figure 7 Capacitance vs Vds
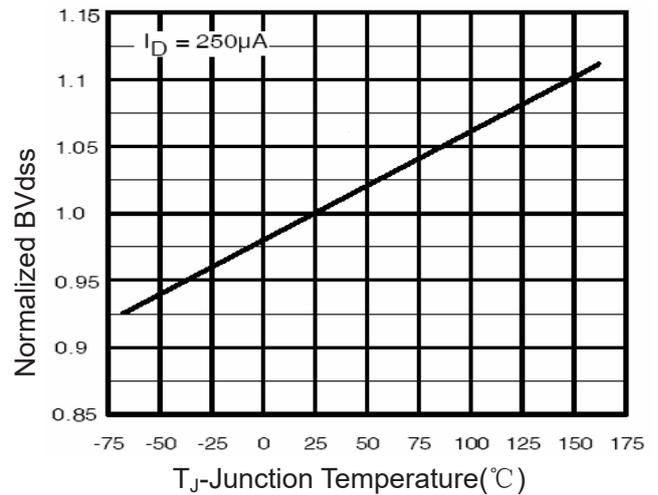
Figure 9 BV$_{DSS}$ vs Junction Temperature
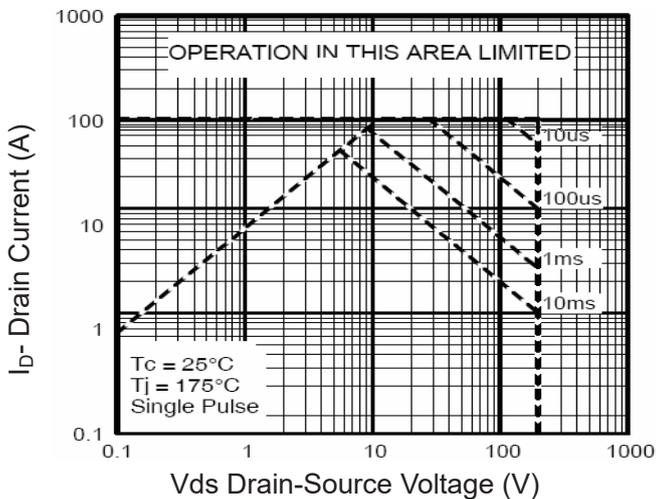
Figure 8 Safe Operation Area
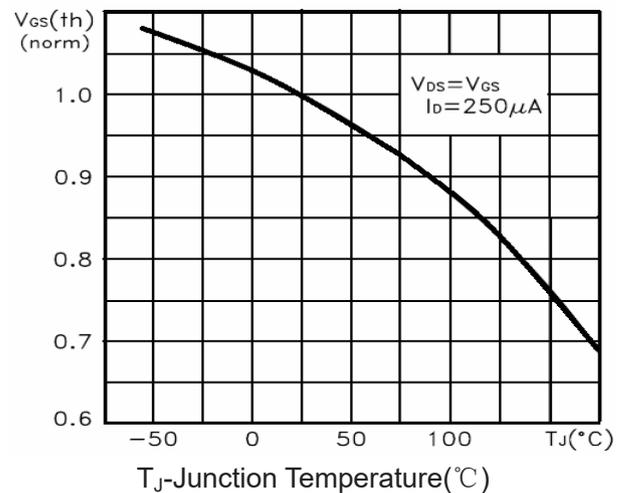
Figure 10 V$_{GS(th)}$ vs Junction Temperature
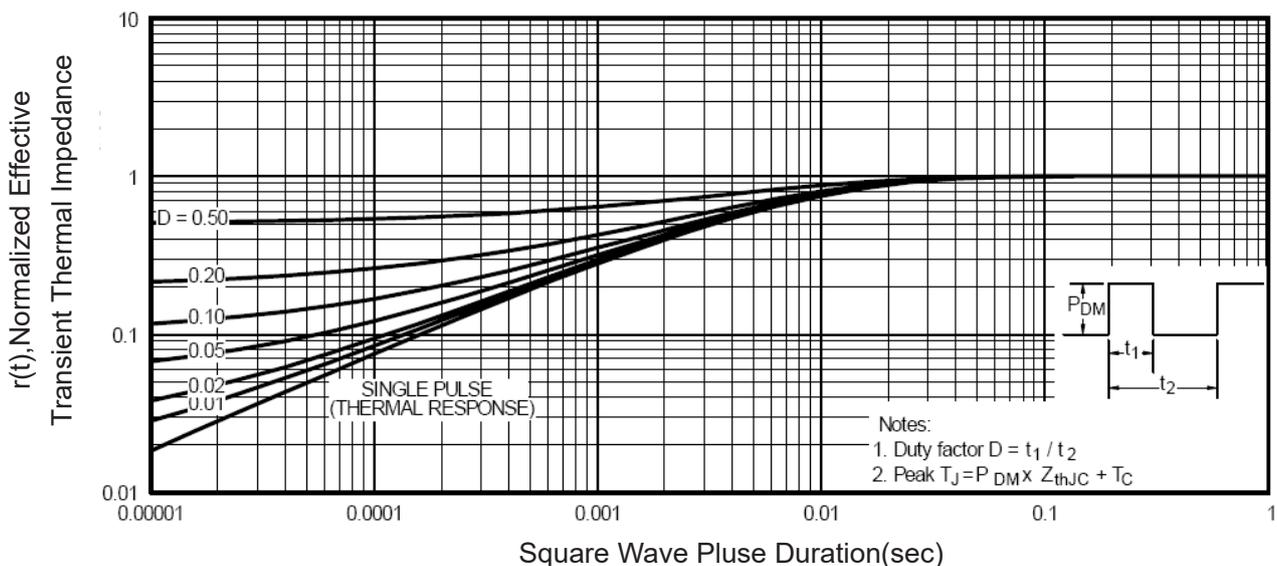
Figure 11 Normalized Maximum Transient Thermal Impedance