

Description

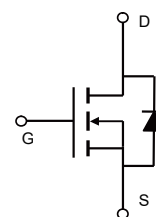
The VSM20N15 uses advanced trench technology and design to provide excellent $R_{DS(ON)}$ with low gate charge. It can be used in a wide variety of applications.

General Features

- $V_{DS}=150V, I_D=20A$
 $R_{DS(ON)} < 35m\Omega @ V_{GS}=10V$ (Typ:30m Ω)
- High density cell design for ultra low R_{dson}
- 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



Schematic

Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
VSM20N15	VSM20N15-TF	TO-220F	-	-	-

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

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	V_{DS}	150	V
Gate-Source Voltage	V_{GS}	± 12	V
Drain Current-Continuous	I_D	20	A
Drain Current-Continuous($T_c=100^{\circ}C$)	$I_D(100^{\circ}C)$	14	A
Pulsed Drain Current	I_{DM}	60	A
Maximum Power Dissipation	P_D	37	W
Derating factor		0.3	W/ $^{\circ}C$
Single pulse avalanche energy (Note 5)	E_{AS}	320	mJ
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-55 To 150	$^{\circ}C$

Thermal Characteristic

Thermal Resistance,Junction-to-Case	$R_{\theta JC}$	3.38	$^{\circ}\text{C/W}$
Thermal Resistance,Junction-to-Ambient ^(Note 2)	$R_{\theta JA}$	20	$^{\circ}\text{C/W}$

Electrical Characteristics ($T_c=25^{\circ}\text{C}$ unless otherwise noted)

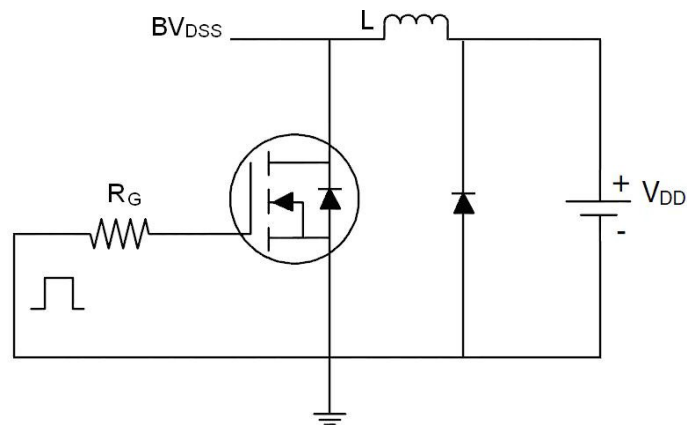
Parameter	Symbol	Condition	Min	Typ	Max	Unit
Off Characteristics						
Drain-Source Breakdown Voltage	BV _{DSS}	V _{GS} =0V I _D =250μA	150	-	-	V
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} =150V, V _{GS} =0V	-	-	1	μA
Gate-Body Leakage Current	I _{GSS}	V _{GS} =±12V, V _{DS} =0V	-	-	±100	nA
On Characteristics (Note 3)						
Gate Threshold Voltage	V _{GS(th)}	V _{DS} =V _{GS} , I _D =250μA	0.7	1.05	1.4	V
Drain-Source On-State Resistance	R _{DS(ON)}	V _{GS} =10V, I _D =18A	-	30	35	mΩ
Forward Transconductance	g _{FS}	V _{DS} =20V, I _D =18A	-	110	-	S
Dynamic Characteristics (Note4)						
Input Capacitance	C _{iss}	V _{DS} =75V, V _{GS} =0V, F=1.0MHz	-	5941	-	PF
Output Capacitance	C _{oss}		-	117	-	PF
Reverse Transfer Capacitance	C _{rss}		-	85.5	-	PF
Switching Characteristics (Note 4)						
Turn-on Delay Time	t _{d(on)}	V _{DD} =30V, R _L =15Ω V _{GS} =10V, R _G =2.5Ω	-	14	-	nS
Turn-on Rise Time	t _r		-	12	-	nS
Turn-Off Delay Time	t _{d(off)}		-	45	-	nS
Turn-Off Fall Time	t _f		-	11	-	nS
Total Gate Charge	Q _g	V _{DS} =75V, I _D =18A, V _{GS} =10V		183	-	nC
Gate-Source Charge	Q _{gs}			12	-	nC
Gate-Drain Charge	Q _{gd}			27.5	-	nC
Drain-Source Diode Characteristics						
Diode Forward Voltage (Note 3)	V _{SD}	V _{GS} =0V, I _S =18A	-	-	1.2	V
Diode Forward Current (Note 2)	I _S		-	-	40	A
Reverse Recovery Time	t _{rr}	TJ = 25°C, IF = 18A	-	42	-	nS
Reverse Recovery Charge	Q _{rr}	di/dt = 100A/μs (Note3)	-	75	-	nC

Notes:

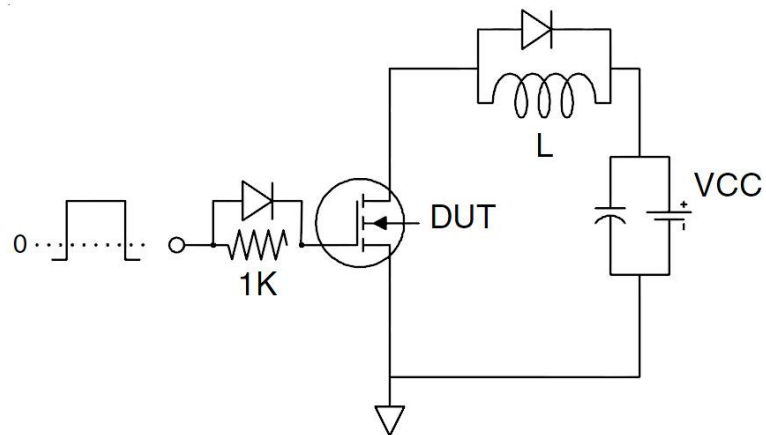
1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. The value of $R_{\theta JA}$ is measured with the device mounted on 1in 2 FR-4 board with 2oz. Copper, in a still air environment with $T_A = 25^{\circ}\text{C}$. The value in any given application depends on the user's specific board design, and the maximum temperature of 175°C may be used if the PCB allows it. The $R_{\theta JA}$ is the sum of the thermal impedance from junction to case $R_{\theta JC}$ and case to ambient.
3. Pulse Test: Pulse Width $\leq 300\mu s$, Duty Cycle $\leq 2\%$.
4. Guaranteed by design, not subject to production
5. EAS condition: $T_J=25^{\circ}\text{C}, V_{DD}=50V, V_G=10V, L=0.5mH, R_G=25\Omega$

Test Circuit

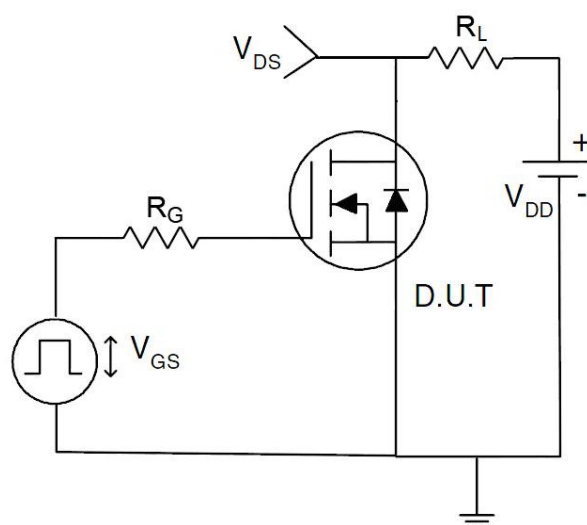
1) E_{AS} test Circuit



2) Gate charge test Circuit



3) Switch Time Test Circuit:



Typical Electrical and Thermal Characteristics (Curves)

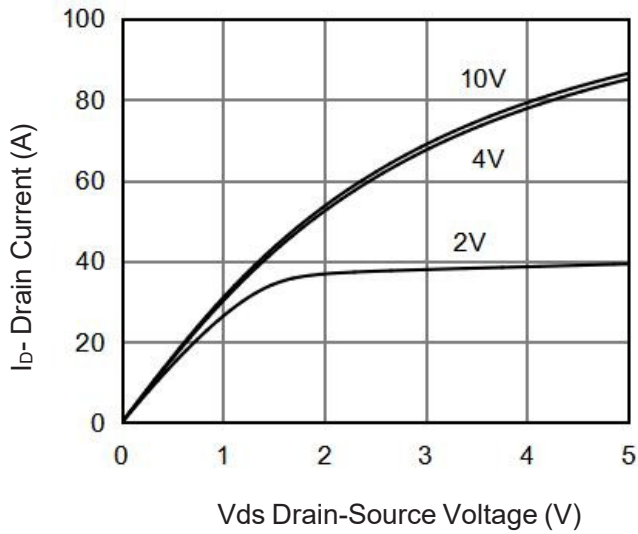


Figure 1 Output Characteristics

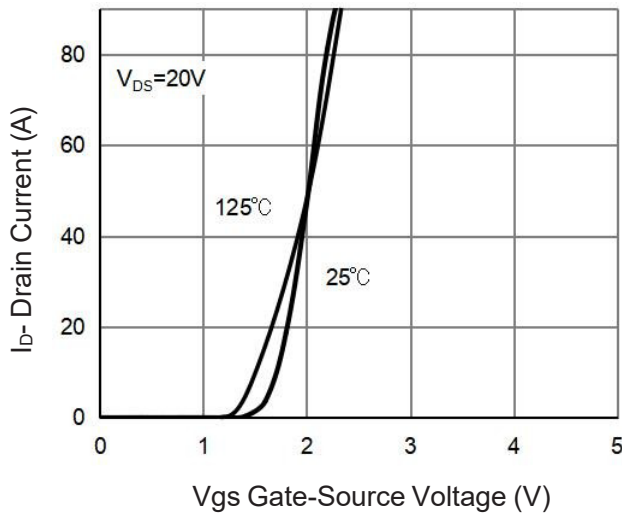


Figure 2 Transfer Characteristics

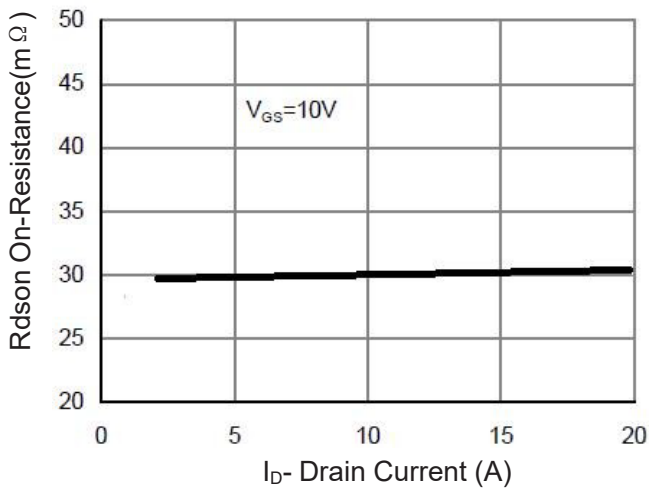


Figure 3 Rdson- Drain Current

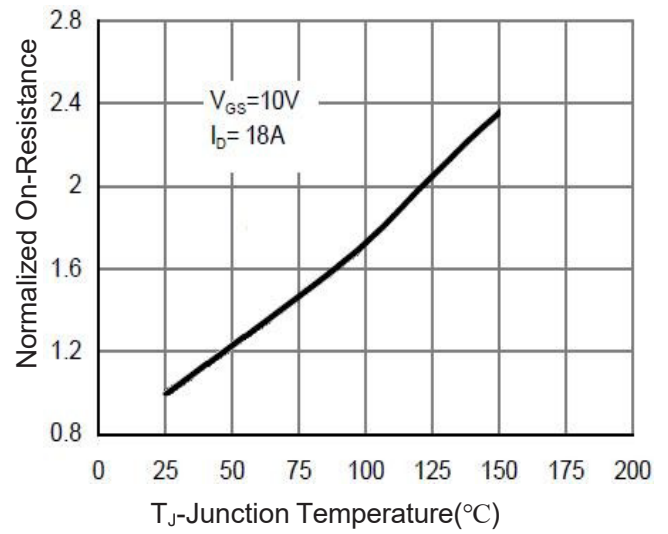


Figure 4 Rdson-Junction Temperature

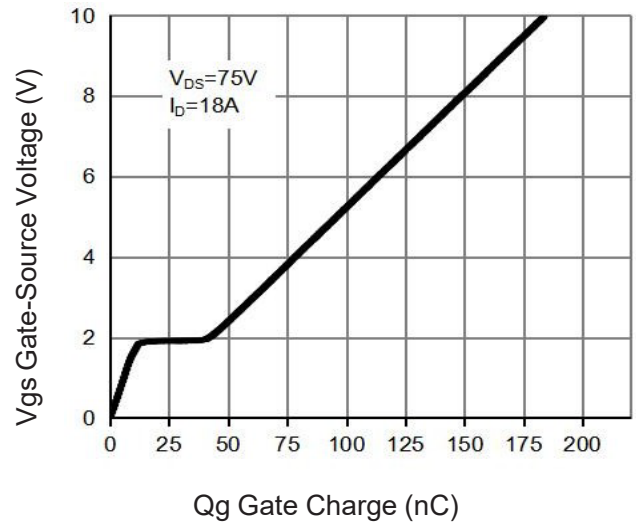


Figure 5 Gate Charge

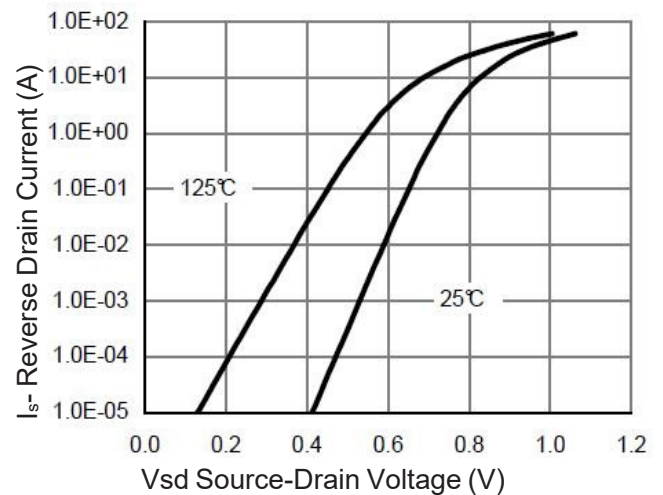
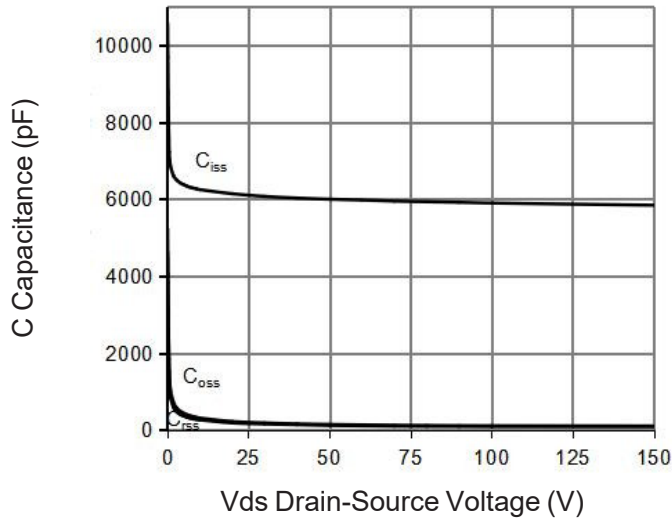
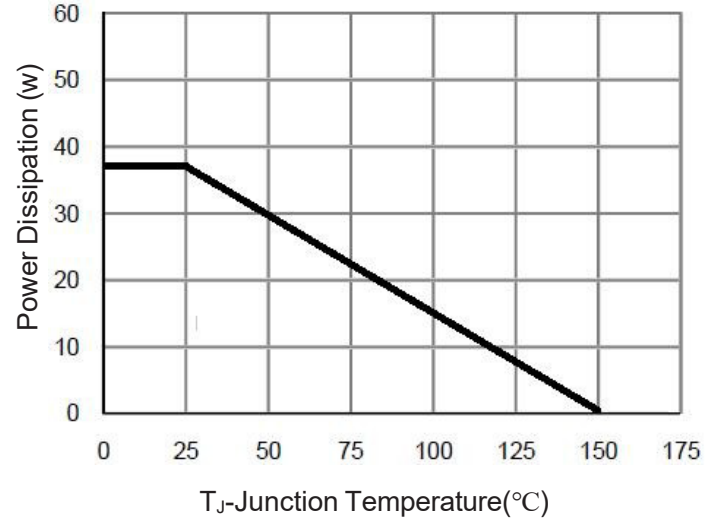
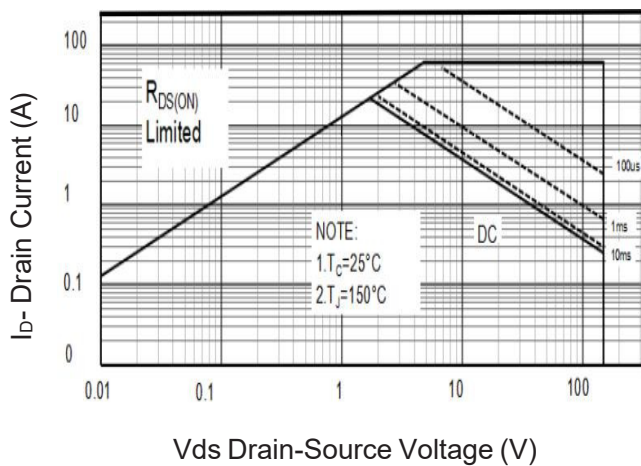
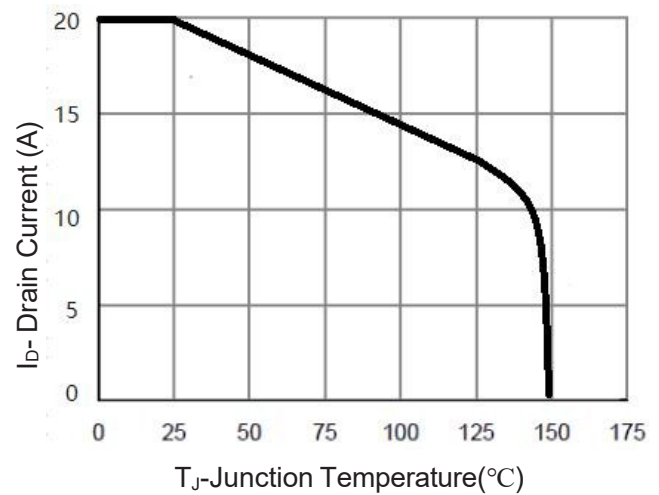
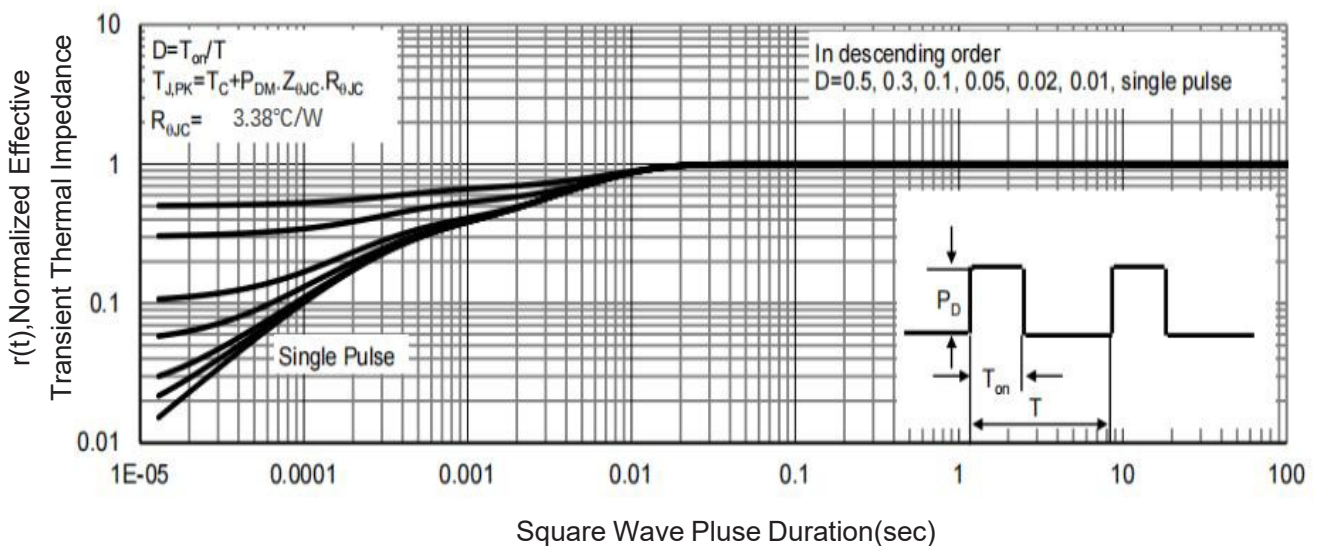


Figure 6 Source- Drain Diode Forward


Figure 7 Capacitance vs Vds

Figure 9 Power De-rating

Figure 8 Safe Operation Area

Figure 10 Current De-rating

Figure 11 Normalized Maximum Transient Thermal Impedance