Description

The VSM300N04 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.

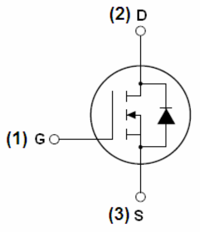
General Features

- V_{DS} =40V ,I_D =300A
  $R_{DS(ON)}$ < 1.8mΩ @ V_{GS}=10V
- 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-263



Schematic Diagram

Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
VSM300N04-T3	VSM300N04	TO-263	-	-	-

Absolute Maximum Ratings (T_A=25℃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	300	A
Drain Current-Continuous(T_C=100℃)	I_D (100℃)	212	A
Pulsed Drain Current	I_{DM}	840	A
Maximum Power Dissipation	P_D	350	W
Derating factor		2.33	W/℃
Single pulse avalanche energy (Note 5)	E_{AS}	2500	mJ
Operating Junction and Storage Temperature Range	T_J,T_{STG}	-55 To 175	℃

Thermal Characteristic

Thermal Resistance,Junction-to-Case(Note 2)	$R_{\theta JC}$	0.43	℃/W

Electrical Characteristics (T_A=25℃unless otherwise noted)

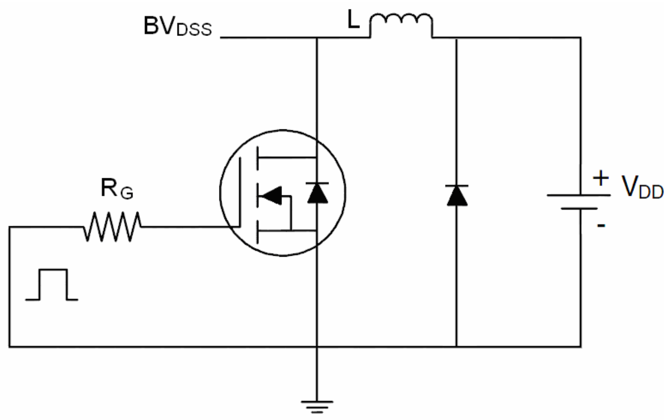
Parameter	Symbol	Condition	Min	Typ	Max	Unit
Off Characteristics						
Drain-Source Breakdown Voltage	BV_{DSS}	V_{GS}=0V I_D=250μA	40		-	V
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS}=40V,V_{GS}=0V	-	-	1	μA
Gate-Body Leakage Current	I_{GSS}	V_{GS}=±20V,V_{DS}=0V	-	-	±100	nA
On Characteristics (Note 3)						
Gate Threshold Voltage	$V_{GS(th)}$	V_{DS}=V_{GS},I_D=250μA	1.3	1.8	2.5	V
Drain-Source On-State Resistance	$R_{DS(ON)}$	V_{GS}=10V, I_D=150A	-	1.4	1.8	mΩ
Forward Transconductance	g_{FS}	V_{DS}=5V,I_D=150A	-	100	-	S
Dynamic Characteristics (Note4)						
Input Capacitance	C_{lss}	V_{DS}=25V,V_{GS}=0V, F=1.0MHz	-	11635	-	PF
Output Capacitance	C_{oss}		-	1360	-	PF
Reverse Transfer Capacitance	C_{rss}		-	1229	-	PF
Switching Characteristics (Note 4)						
Turn-on Delay Time	$t_{d(on)}$	V_{DD}=20V,R_L=15Ω, R_G=2.5Ω,V_{GS}=10V	-	42	-	nS
Turn-on Rise Time	t_r		-	41	-	nS
Turn-Off Delay Time	$t_{d(off)}$		-	150	-	nS
Turn-Off Fall Time	t_f		-	70	-	nS
Total Gate Charge	Q_g	I_D=150A,V_{DD}=20V,V_{GS}=10V	-	249	-	nC
Gate-Source Charge	Q_{gs}		-	40	-	nC
Gate-Drain Charge	Q_{gd}		-	80	-	nC
Drain-Source Diode Characteristics						
Diode Forward Voltage (Note 3)	V_{SD}	V_{GS}=0V,I_S=150A	-	0.85	1.2	V
Diode Forward Current (Note 2)	I_S		-	-	300	A
Reverse Recovery Time	t_{rr}	T_J = 25°C, I_F = 300A di/dt = 100A/μs(Note3)	-	55		nS
Reverse Recovery Charge	Qrr		-	180		nC

Notes:

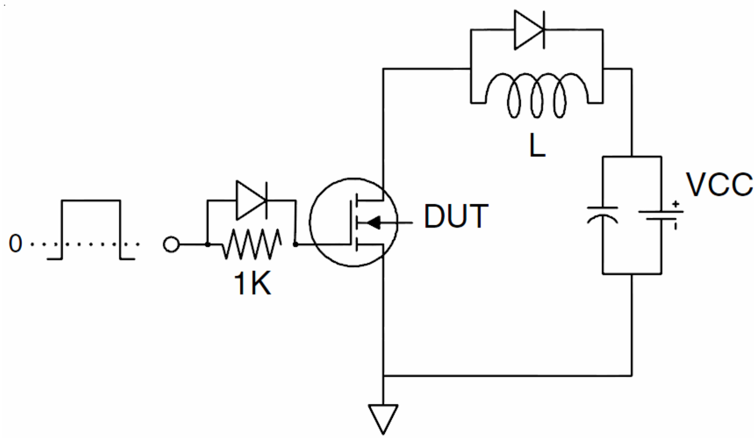
1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. Surface Mounted on FR4 Board, t ≤ 10 sec.
3. Pulse Test: Pulse Width ≤ 300μs, Duty Cycle ≤ 2%.
4. Guaranteed by design, not subject to production
5. EAS condition：Tj=25℃,V_{DD}=20V,V_G=10V,L=0.5mH,Rg=25Ω

Test circuit

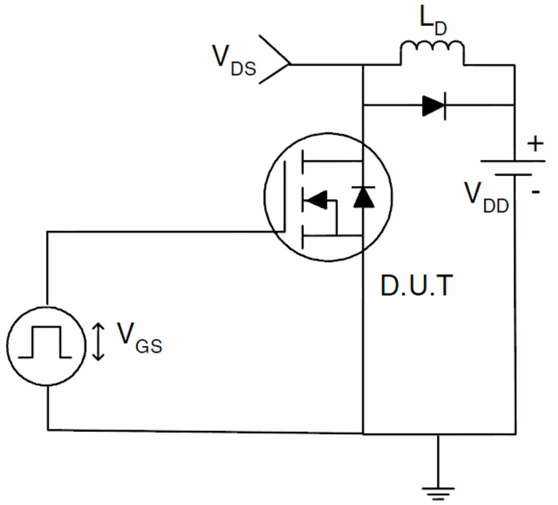
1） E_{AS} test Circuits



2） Gate charge test Circuit:



3） Switch Time Test Circuit:



Typical Electrical and Thermal Characteristics (Curves)

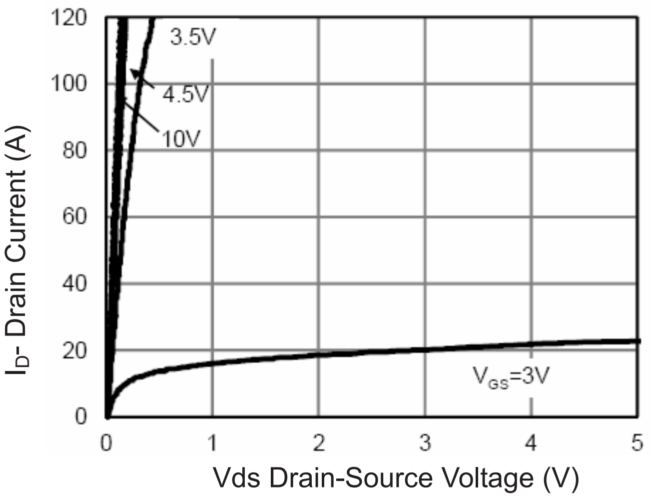


Figure 1 Output Characteristics

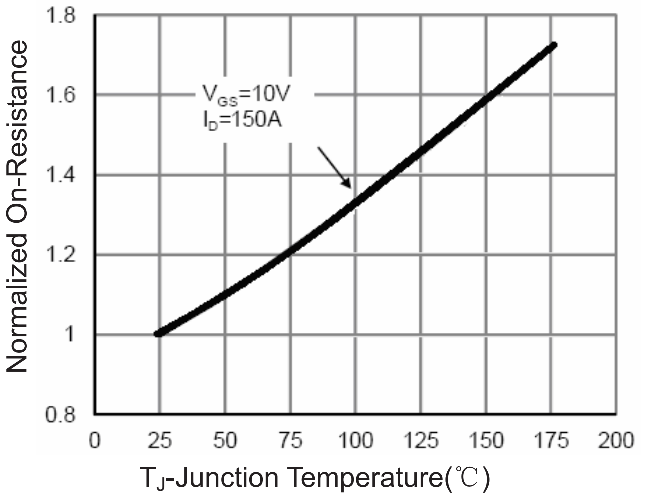


Figure 4 Rdson-JunctionTemperature

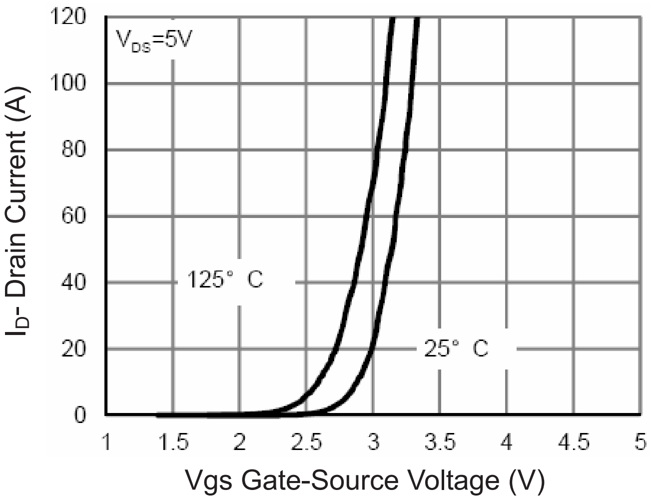


Figure 2 Transfer Characteristics

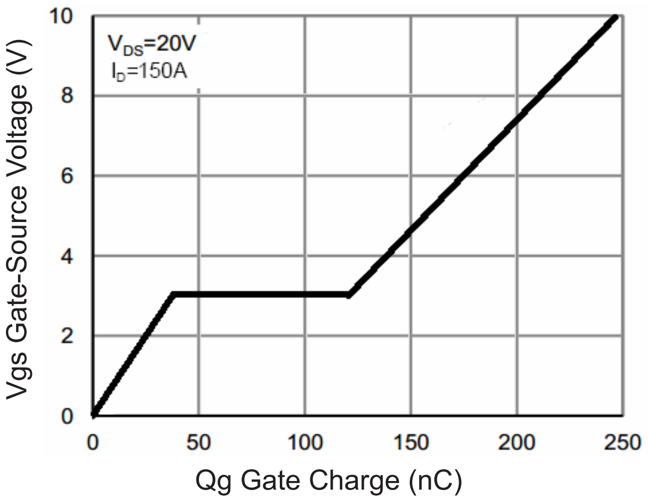


Figure 5 Gate Charge

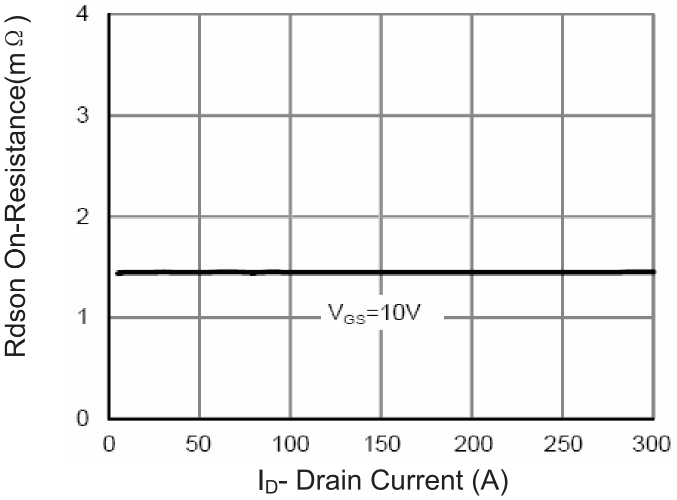


Figure 3 Rdson- Drain Current

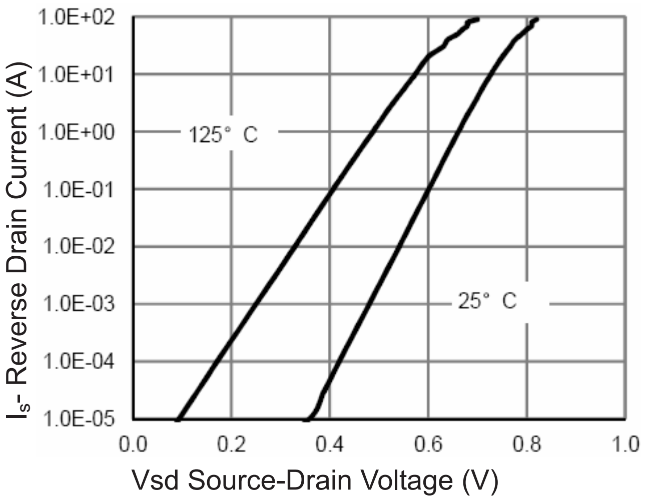


Figure 6 Source- Drain Diode Forward

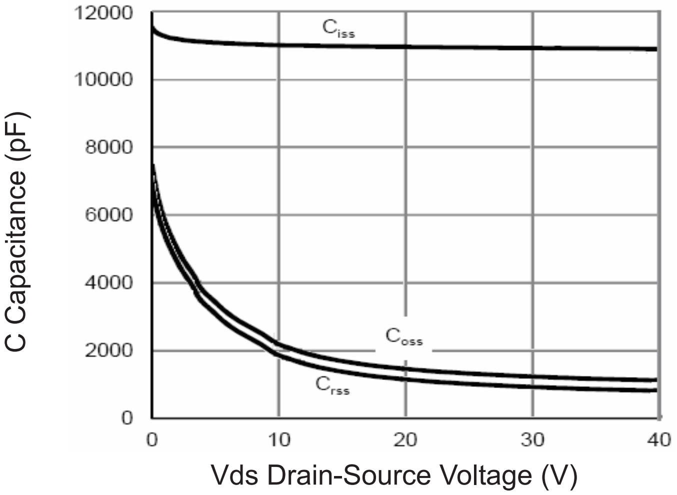


Figure 7 Capacitance vs Vds

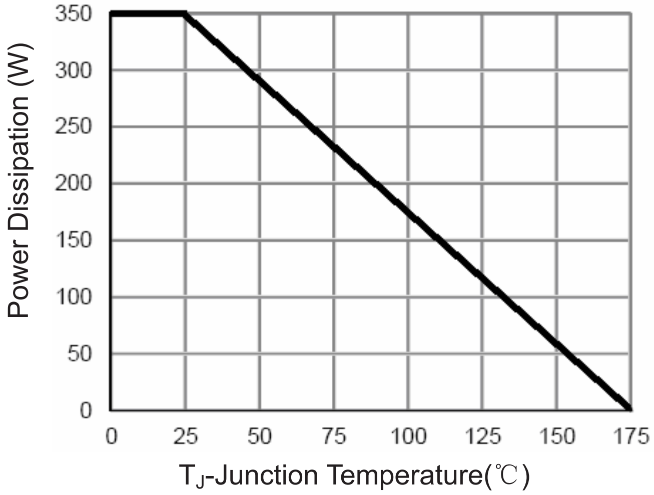


Figure 9 Power De-rating

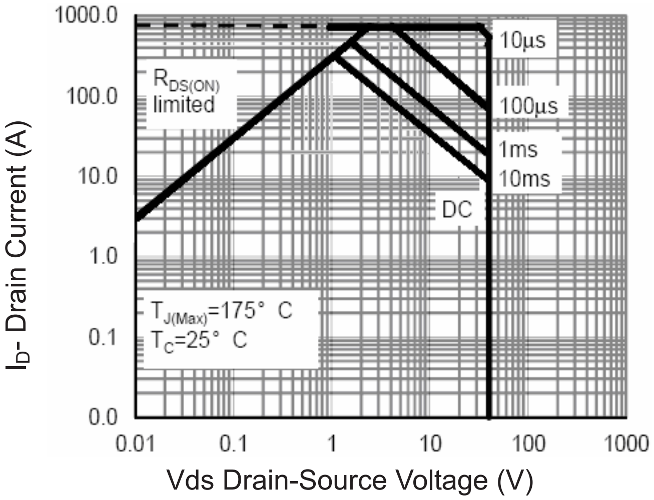


Figure 8 Safe Operation Area

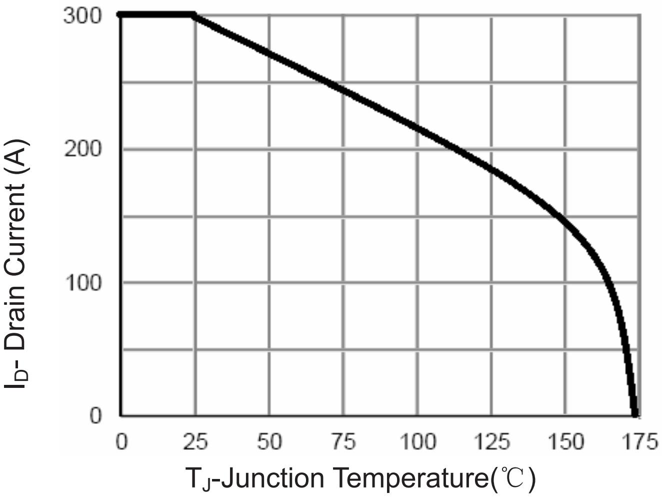


Figure 10 Current De-rating

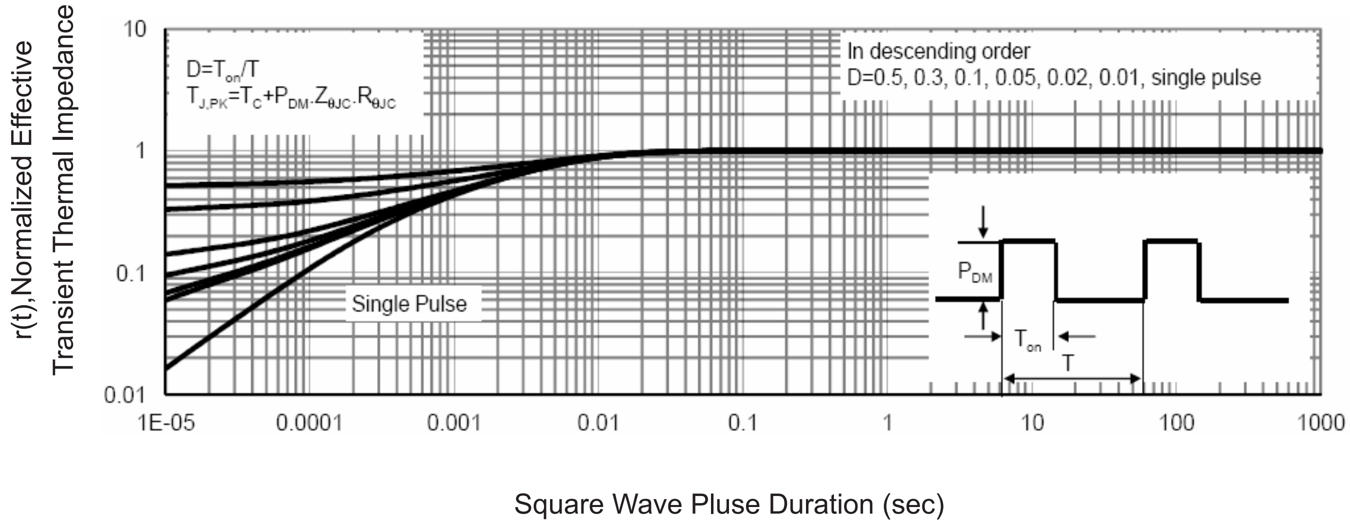


Figure 11 Normalized Maximum Transient Thermal Impedance