## Description

The VSM3N18 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.
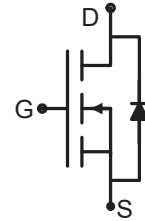
General Features

● V_{DS} = 185V, I_D =3A

   $R_{DS(ON)}$ < 450mΩ @ V_{GS}=10V   (Typ:390mΩ)

   $R_{DS(ON)}$ < 500mΩ @ V_{GS}=10V   (Typ:400mΩ)

● High density cell design for ultra low Rdson

● 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
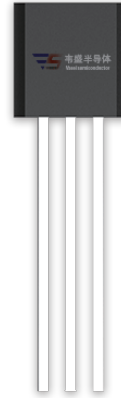
TO-92   Schematic Diagram

Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
VSM3N18-T9	VSM3N18	TO-92	-	-	-

Absolute Maximum Ratings (T_A=25℃ unless otherwise noted)

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	V_{DS}	185	V
Gate-Source Voltage	V_{GS}	±20	V
Drain Current-Continuous	I_D	3	A
Drain Current-Pulsed [Note 1]	I_{DM}	8	A
Maximum Power Dissipation	P_D	3	W
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-55 To 150	℃

Thermal Characteristic

Thermal Resistance,Junction-to-Ambient [Note 2]	$R_{\theta JA}$	41.7	℃/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	185	-	-	V
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS}=185V,V_{GS}=0V	-	-	1	μA

| Gate-Body Leakage Current	I_{GSS}	$V_{GS}=\pm20V, V_{DS}=0V$	-	-	±100	nA
On Characteristics [Note 3]						
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=250\mu A$	1.2	1.8	2.5	V
Drain-Source On-State Resistance	$R_{DS(ON)}$	$V_{GS}=10V,\ I_D=2A$	-	390	450	$m\Omega$
		$V_{GS}=4.5V,\ I_D=2A$	-	400	500	$m\Omega$
Forward Transconductance	g_{FS}	$V_{DS}=5V, I_D=2A$	-	8	-	S
Dynamic Characteristics [Note4]						
Input Capacitance	C_{Iss}	$V_{DS}=50V, V_{GS}=0V,$ F=1.0MHz	-	563	-	PF
Output Capacitance	C_{oss}		-	35	-	PF
Reverse Transfer Capacitance	C_{rss}		-	10	-	PF
Switching Characteristics [Note 4]						
Turn-on Delay Time	$t_{d(on)}$	$V_{DD}=100V,\ R_L=15\Omega$ $V_{GS}=10V, R_G=2.5\Omega$	-	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 [Note 3]	V_{SD}	$V_{GS}=0V, I_S=2A$	-	-	1.2	V
Diode Forward Current [Note 2]	I_S		-	-	3	A

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%.

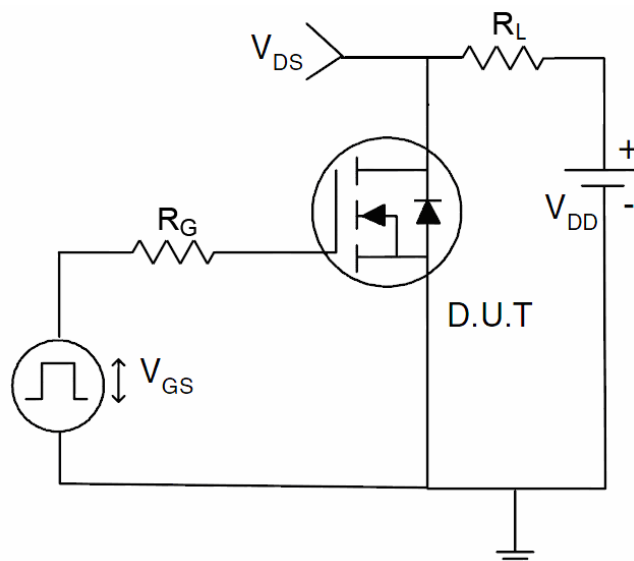**4.** Guaranteed by design, not subject to production
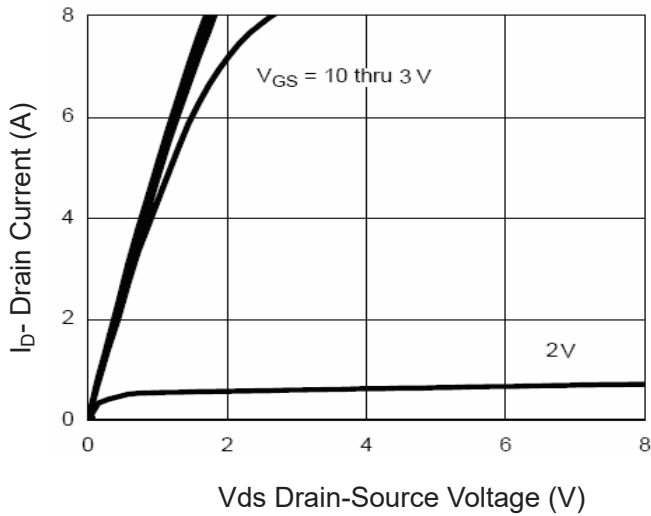
Test Circuit
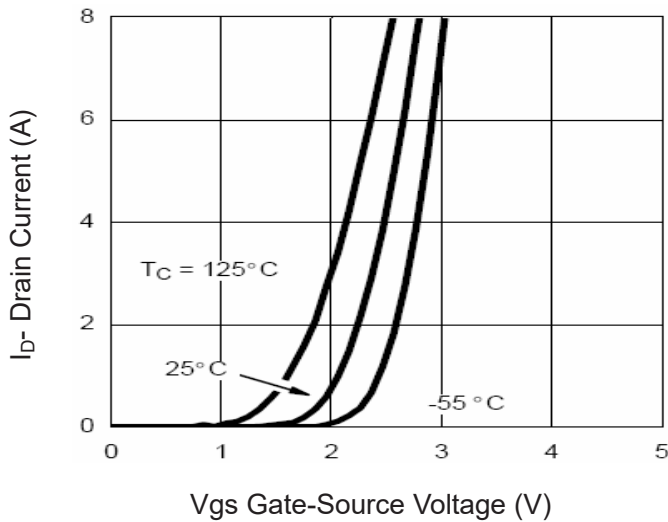
1）E$_{AS}$ test circuit
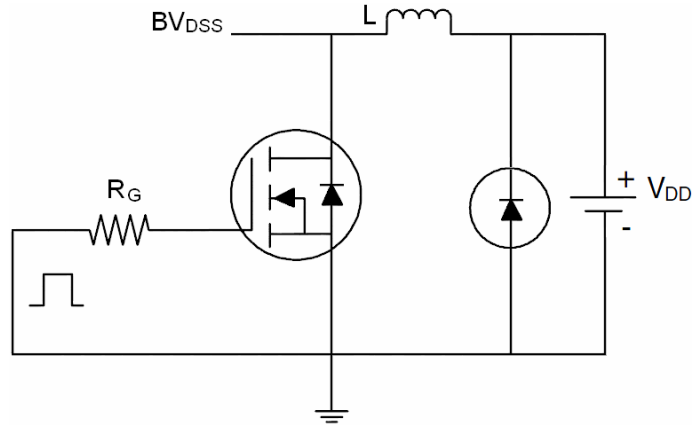
2）Gate charge test circuit
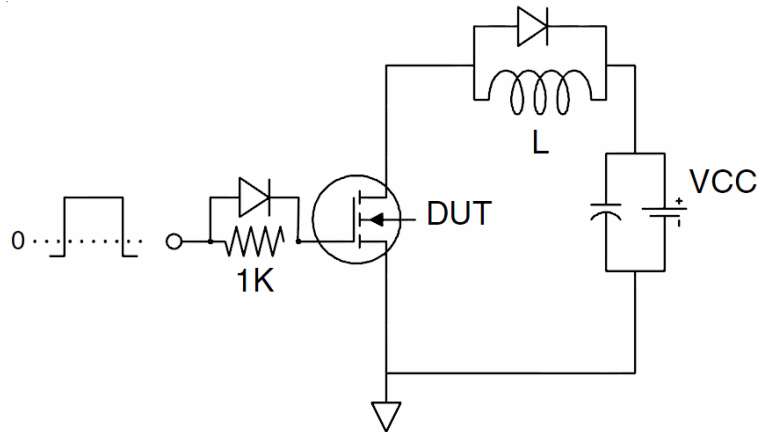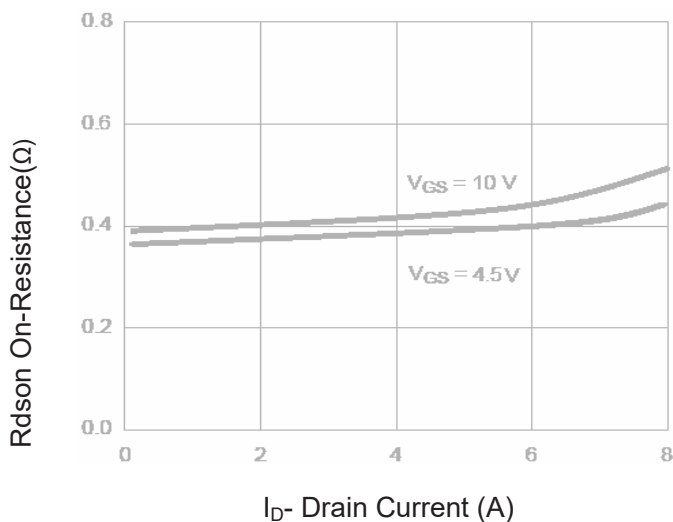

3）Switch Time Test Circuit

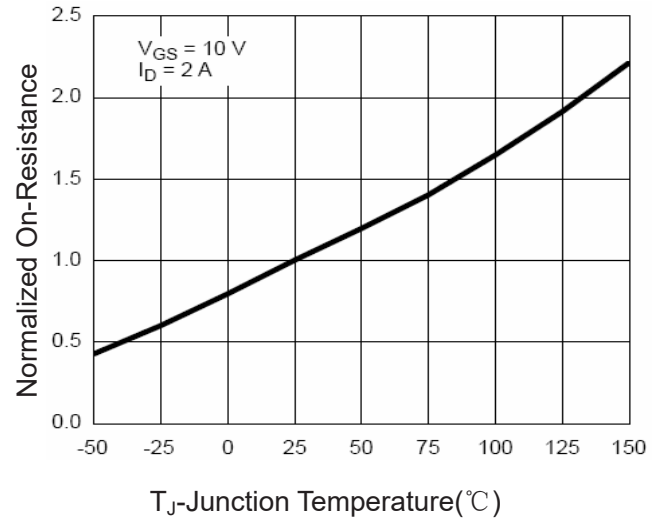## Typical Electrical and Thermal Characteristics (Curves)
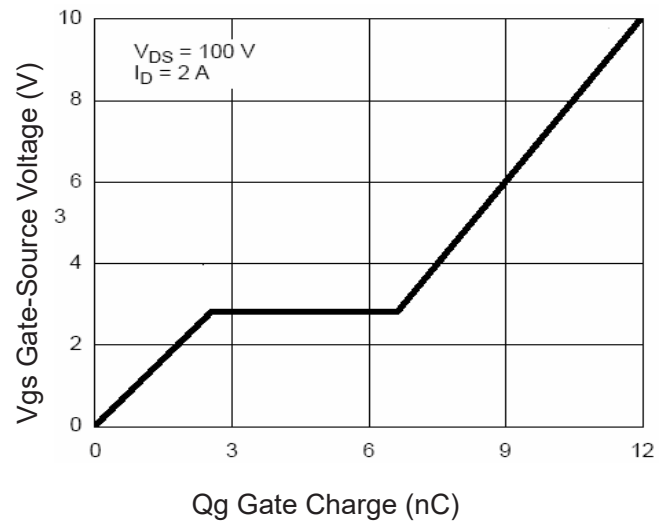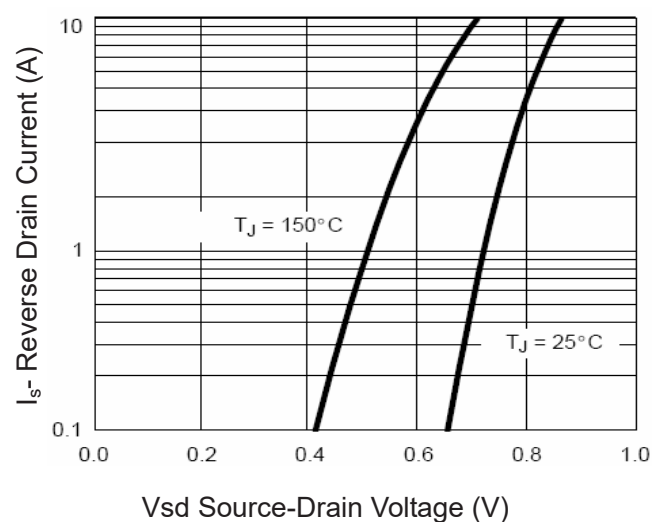
Figure 1 Output Characteristics

Figure 2 Transfer Characteristics

Figure 3 Rdson- Drain Current

Figure 4 Rdson-JunctionTemperature
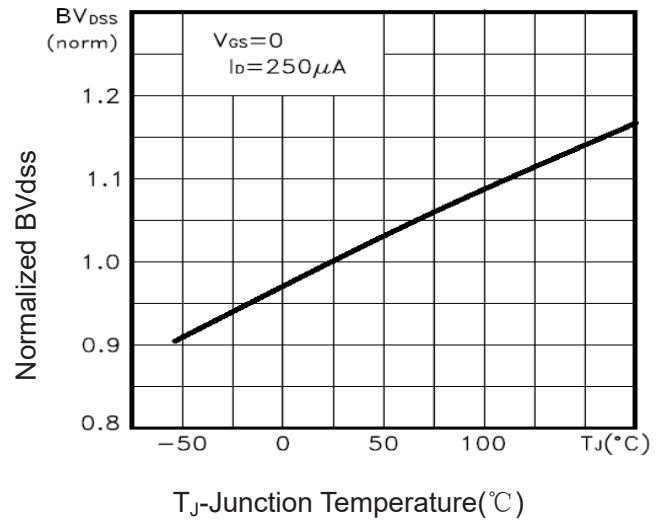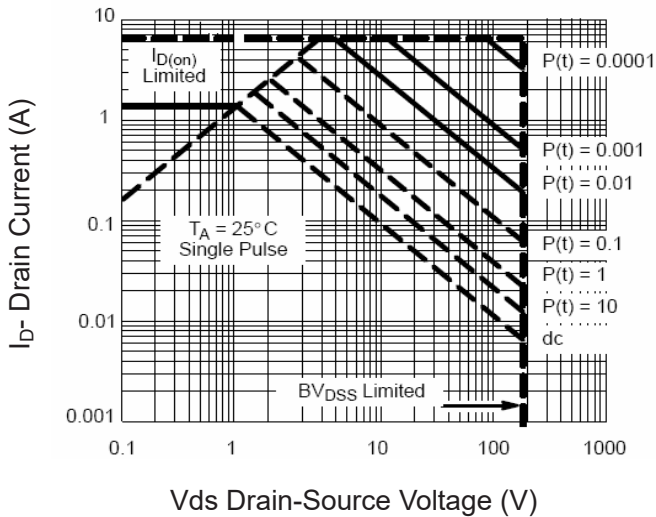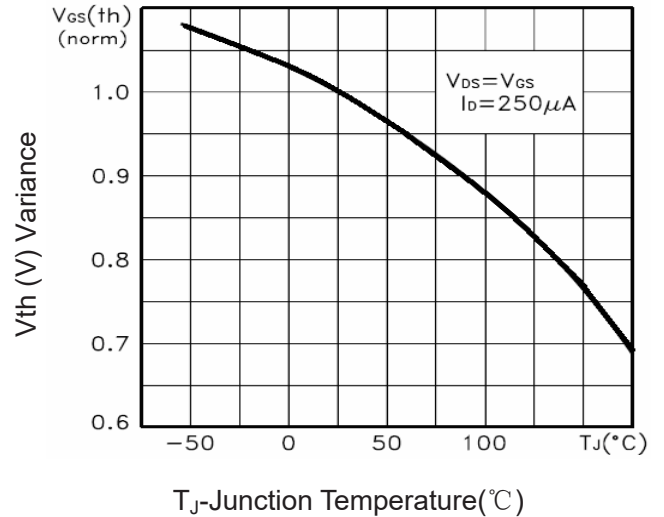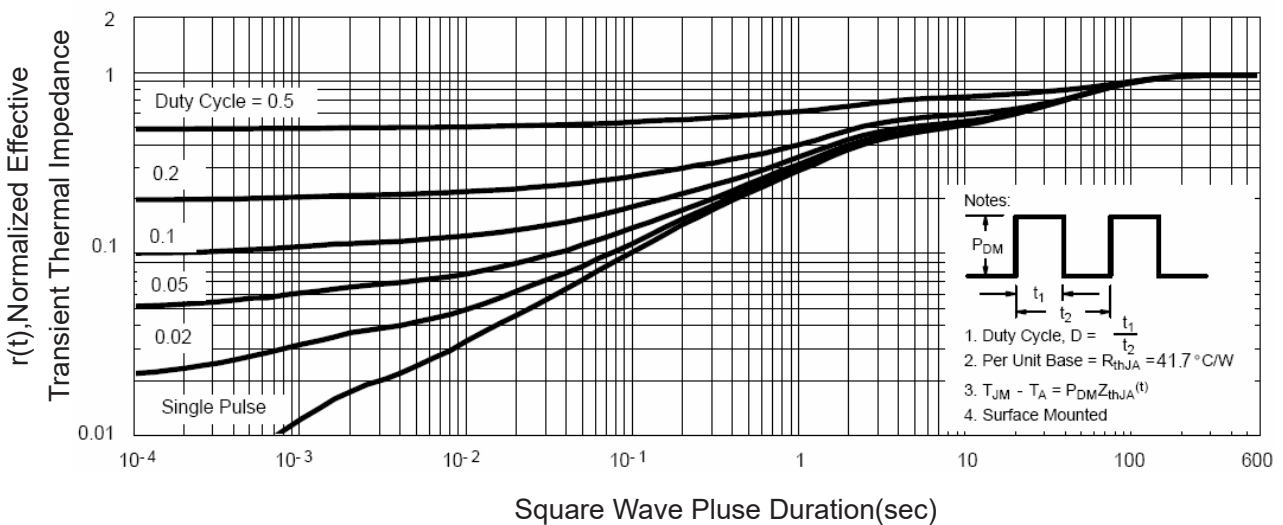
Figure 5 Gate Charge

Figure 6 Source- Drain Diode Forward
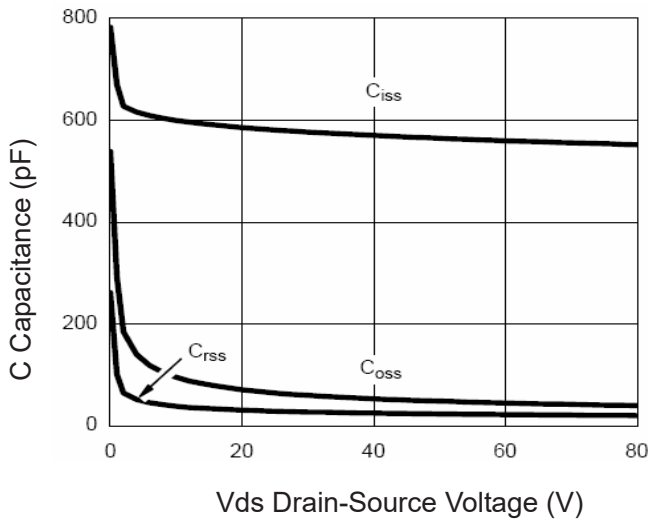
Figure 7 Capacitance vs Vds

Figure 9 BV$_{DSS}$ vs Junction Temperature

Figure 8 Safe Operation Area

Figure 10 V$_{GS(th)}$ vs Junction Temperature

Notes:

1. Duty Cycle, D = $\frac{t_1}{t_2}$
2. Per Unit Base = R$_{thJA}$ =41.7 °C/W
3. T$_{JM}$ - T$_A$ = P$_{DM}$Z$_{thJA}$$^{(t)}$
4. Surface Mounted

Figure 11 Normalized Maximum Transient Thermal Impedance