

Description

The VSM3P06 uses advanced trench technology and design to provide excellent $R_{DS(ON)}$ with low gate charge. This device is well suited for use as a load switch or in PWM applications.

Application

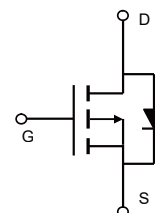
- Load switch
- PWM application

General Features

- $V_{DS} = -60V, I_D = -3A$
- $R_{DS(ON)} < 170m\Omega @ V_{GS} = -10V$
- $R_{DS(ON)} < 220m\Omega @ V_{GS} = -4.5V$
- High density cell design for ultra low $R_{DS(on)}$
- Fully characterized avalanche voltage and current
- Excellent package for good heat dissipation
- 150 °C operating temperature
- Pb-free lead plating



SOT-223



Schematic

Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
VSM3P06	VSM3P06-S23	SOT-223	Ø330mm	16mm	2500 units

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

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	V_{DS}	-60	V
Gate-Source Voltage	V_{GS}	± 20	V
Drain Current-Continuous ($T_A=25^{\circ}C$)	I_D	-3	A
Drain Current-Continuous ($T_A=70^{\circ}C$)	I_D	-2.4	A
Pulsed Drain Current (Note 1)	I_{DM}	-12	A
Maximum Power Dissipation	P_D	2.75	W
Single pulse avalanche energy (Note 5)	E_{AS}	24	mJ
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-55 To 150	$^{\circ}C$

Thermal Characteristic

Thermal Resistance, Junction-to-Ambient (Note 2)	$R_{\theta JA}$	45.5	$^{\circ}C/W$
Thermal Resistance, Junction-to-Case	$R_{\theta JC}$	35	$^{\circ}C/W$

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

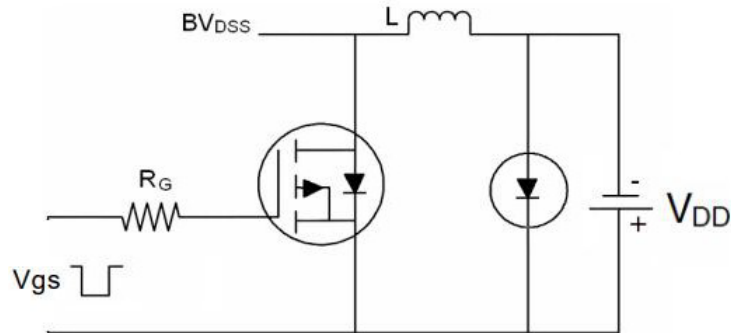
Parameter	Symbol	Condition	Min	Typ	Max	Unit
Off Characteristics						
Drain-Source Breakdown Voltage	BV _{DSS}	V _{GS} =0V I _D =-250μA	-60	-	-	V
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} =-60V, V _{GS} =0V	-	-	-1	μA
Gate-Body Leakage Current	I _{GSS}	V _{GS} =±20V, V _{DS} =0V	-	-	±100	nA
On Characteristics (Note 3)						
Gate Threshold Voltage	V _{GS(th)}	V _{DS} =V _{GS} , I _D =-250μA	-1.4	-2.0	-2.6	V
Drain-Source On-State Resistance	R _{DS(ON)}	V _{GS} =-10V, I _D =-3A	-	148	170	mΩ
		V _{GS} =-4.5V, I _D =-3A	-	185	220	mΩ
Forward Transconductance	g _{FS}	V _{DS} =-5V, I _D =-3A	-	3	-	S
Dynamic Characteristics (Note4)						
Input Capacitance	C _{iss}	V _{DS} =-30V, V _{GS} =0V, F=1.0MHz	-	444.2	-	PF
Output Capacitance	C _{oss}		-	19.6	-	PF
Reverse Transfer Capacitance	C _{rss}		-	17.9	-	PF
Switching Characteristics (Note 4)						
Turn-on Delay Time	t _{d(on)}	V _{DD} =-30V, I _D =-3A, V _{GS} =-10V, R _G =3Ω	-	40	-	nS
Turn-on Rise Time	t _r		-	35	-	nS
Turn-Off Delay Time	t _{d(off)}		-	15	-	nS
Turn-Off Fall Time	t _f		-	10	-	nS
Total Gate Charge	Q _g	V _{DS} =-30, I _D =-3A, V _{GS} =-10V	-	11.3	-	nC
Gate-Source Charge	Q _{gs}		-	2.7	-	nC
Gate-Drain Charge	Q _{gd}		-	1.6	-	nC
Drain-Source Diode Characteristics						
Diode Forward Voltage (Note 3)	V _{SD}	V _{GS} =0V, I _S =-3A	-		-1.2	V
Diode Forward Current (Note 2)	I _S		-	-	-3	A
Reverse Recovery Time	t _{rr}	T _J = 25°C, I _F =- 3A	-	25		nS
Reverse Recovery Charge	Q _{rr}	di/dt = -100A/μs (Note3)	-	31		nC

Notes:

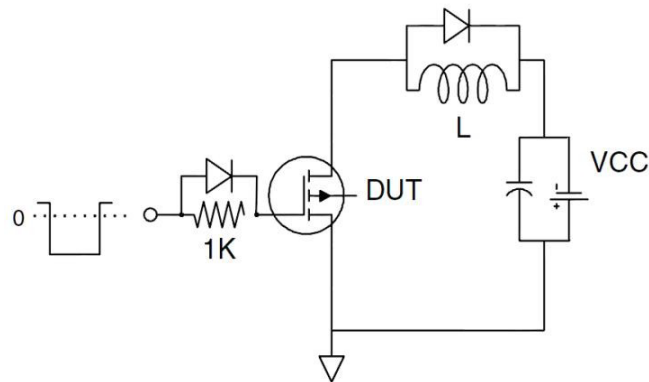
1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. Surface Mounted on FR4 Board, $t \leq 10$ sec.
3. Pulse Test: Pulse Width $\leq 300\mu s$, Duty Cycle $\leq 2\%$.
4. Guaranteed by design, not subject to production
5. EAS condition : $T_J=25^{\circ}\text{C}, V_{DD}=-30V, V_G=-10V, L=0.5mH, R_G=25\Omega$

Test Circuit

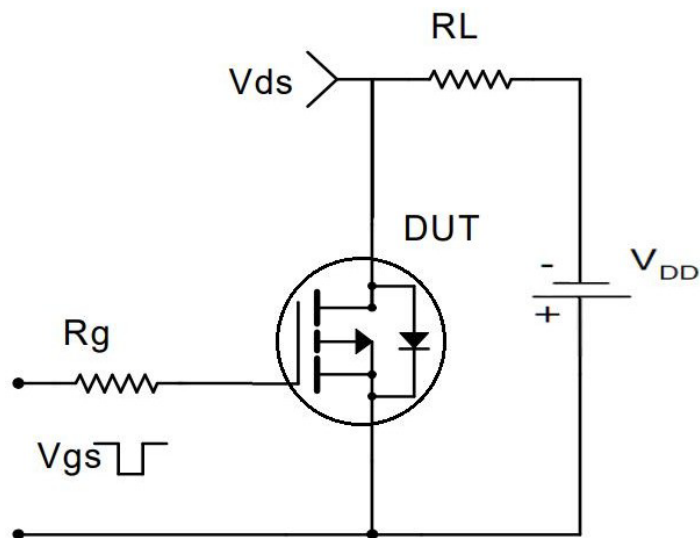
1) E_{AS} test Circuit



2) Gate charge test Circuit



3) Switch Time Test Circuit



Typical Electrical and Thermal Characteristics (Curves)

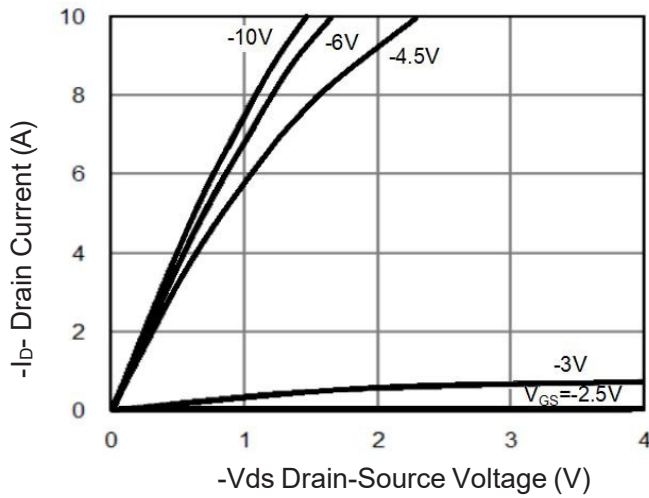


Figure 1 Output Characteristics

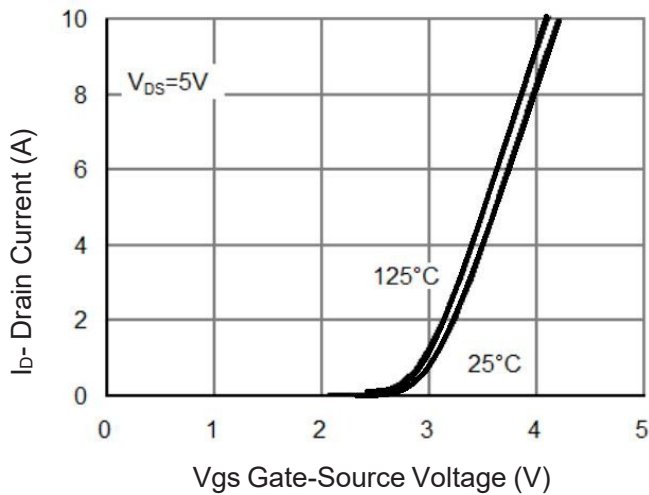


Figure 2 Transfer Characteristics

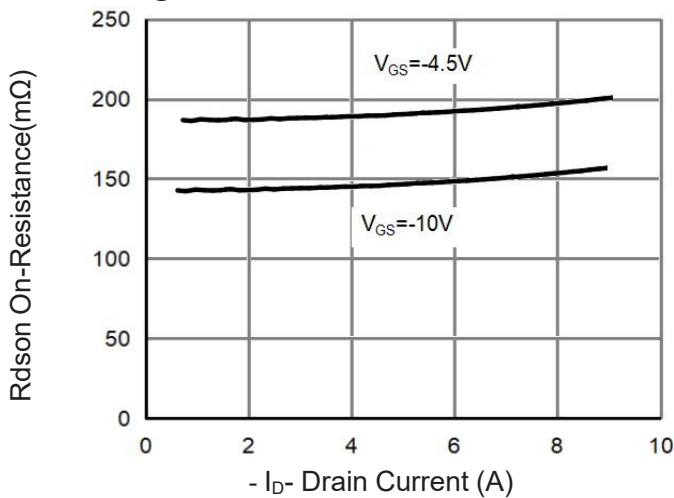


Figure 3 Rdson- Drain Current

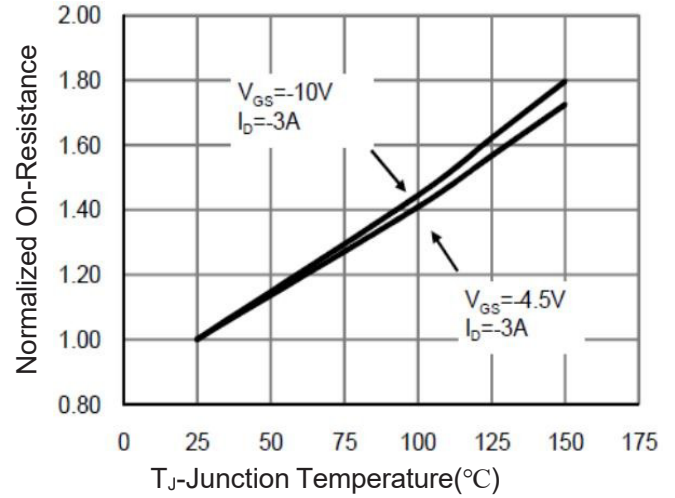


Figure 4 Rdson-Junction Temperature

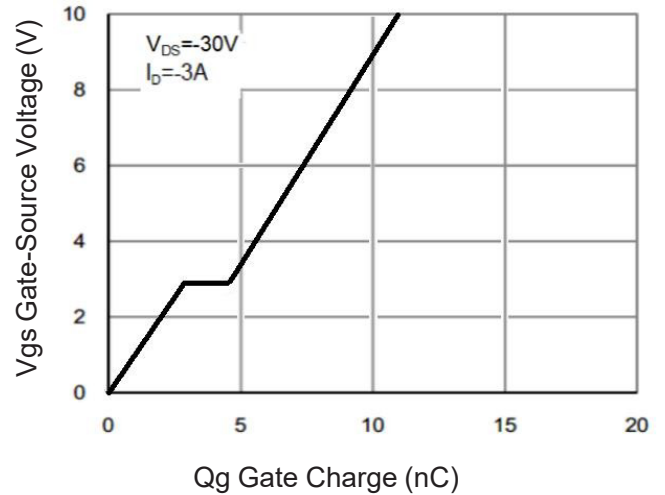


Figure 5 Gate Charge

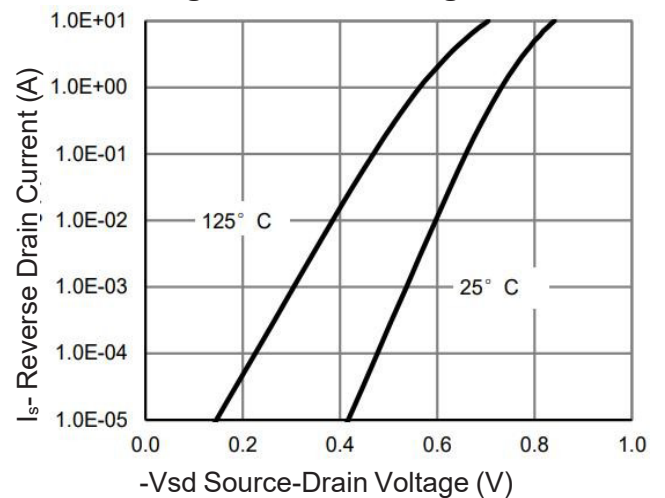
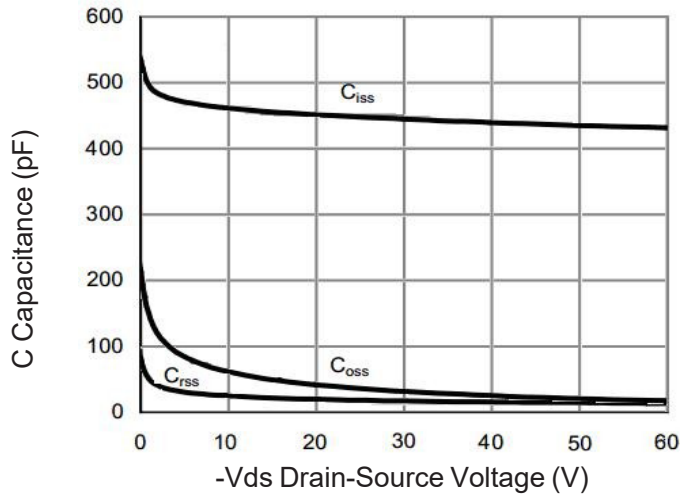
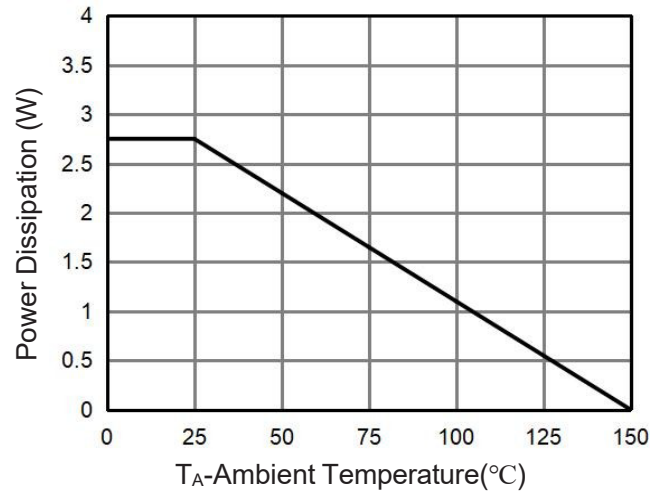
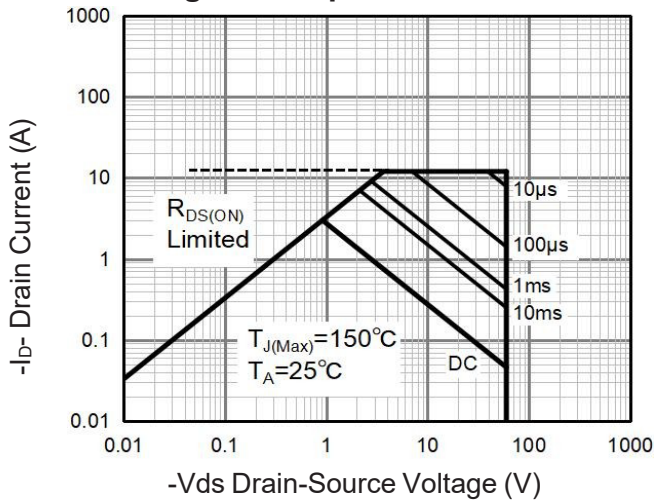
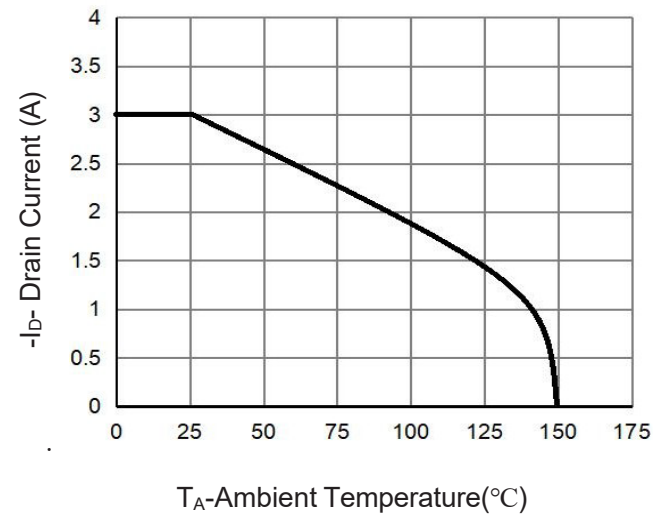
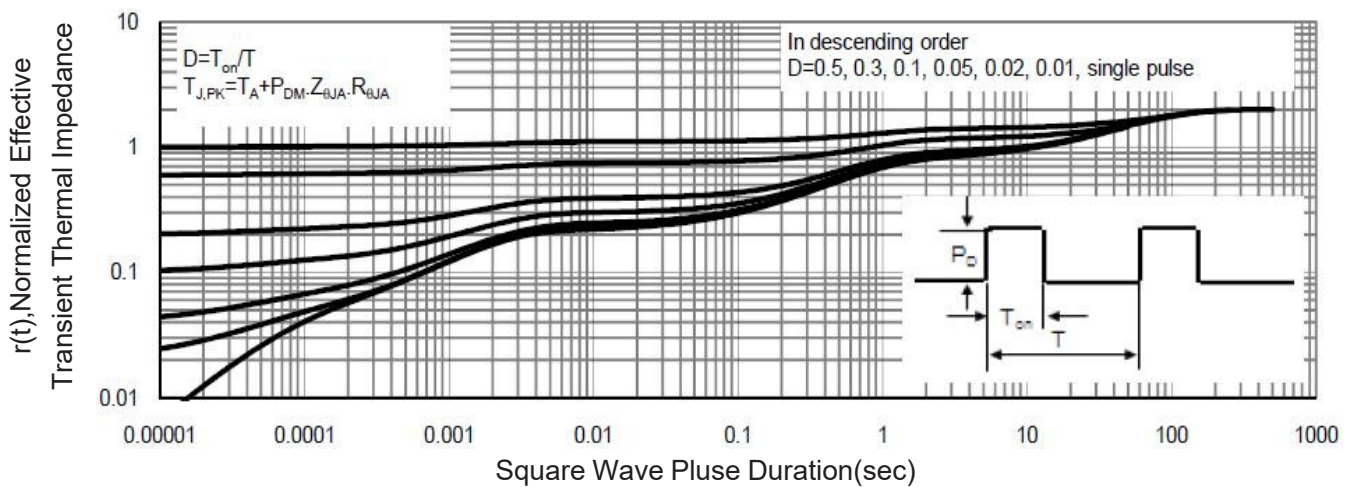


Figure 6 Source- Drain Diode Forward


Figure 7 Capacitance vs Vds

Figure 9 Power De-rating

Figure 8 Safe Operation Area

Figure 10 ID Current De-rating

Figure 11 Normalized Maximum Transient Thermal Impedance