

Description

The VSM28P06 uses advanced trench technology and design to provide excellent $R_{DS(ON)}$ with low gate charge. This device is well suited for high current load applications.

General Features

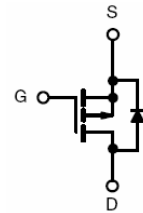
- $V_{DS} = -60V, I_D = -28A$
 $R_{DS(ON)} < 48m\Omega @ V_{GS} = -10V$
 $R_{DS(ON)} < 55m\Omega @ V_{GS} = -4.5V$
- High density cell design for ultra low R_{dson}
- Fully characterized avalanche voltage and current
- Good stability and uniformity with high E_{AS}
- Excellent package for good heat dissipation

Application

- High side switch for full bridge converter
- DC/DC converter for LCD display



TO-252



Schematic Diagram

Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
VSM28P06-T2	VSM28P06	TO-252	-	-	-

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	I_D	-28	A
Drain Current-Continuous($T_C = 100^\circ C$)	$I_D(100^\circ C)$	-19.8	A
Pulsed Drain Current	I_{DM}	-112	A
Maximum Power Dissipation	P_D	80	W
Derating factor		0.53	W/ $^\circ C$
Single pulse avalanche energy ^(Note 5)	E_{AS}	55	mJ
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-55 To 175	$^\circ C$

Thermal Characteristic

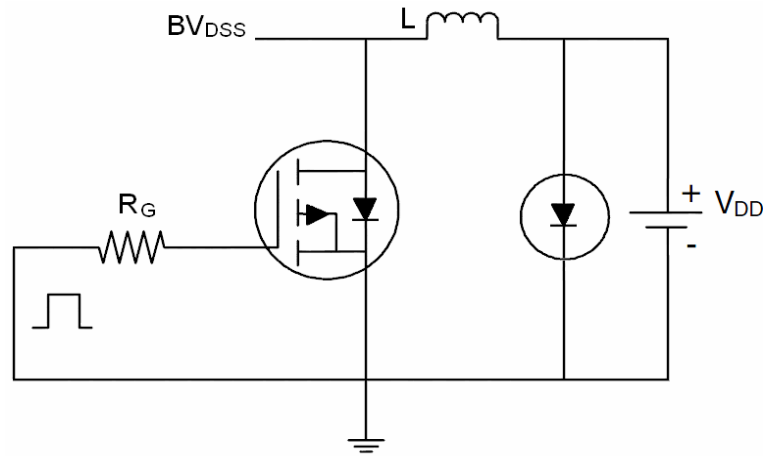
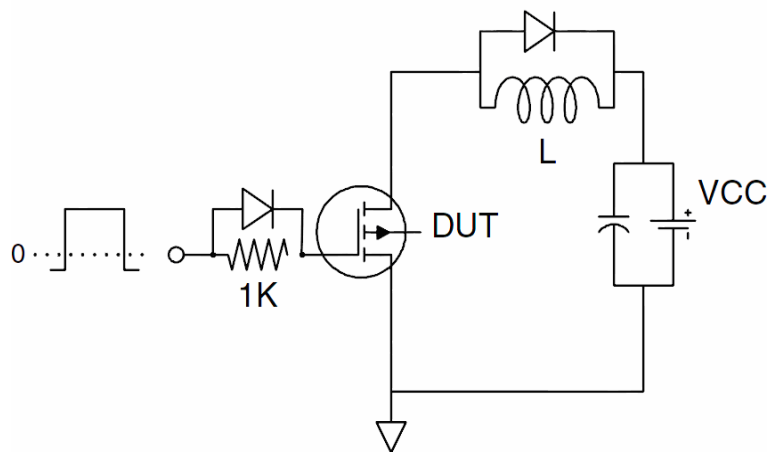
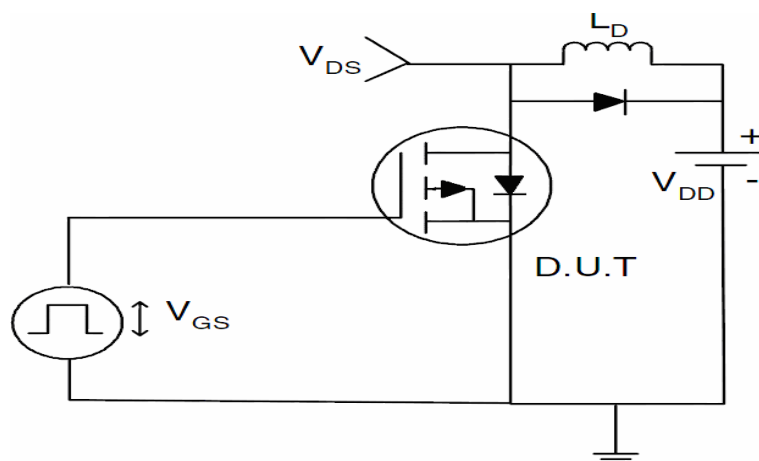
Thermal Resistance, Junction-to-Case ^(Note 2)	$R_{\theta JC}$	1.88	$^\circ C/W$
--	-----------------	------	--------------

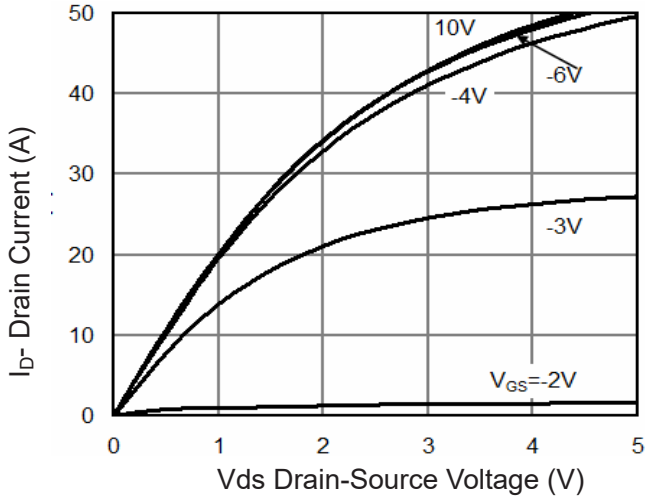
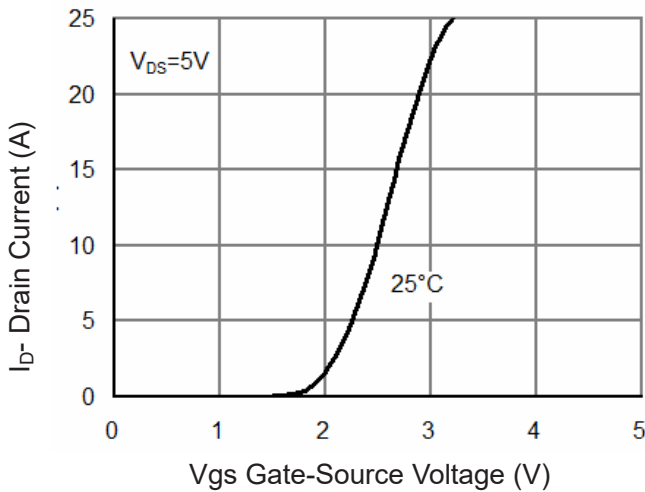
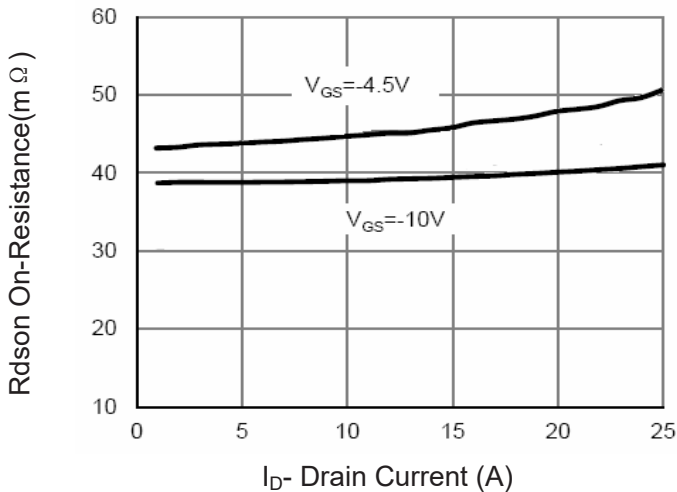
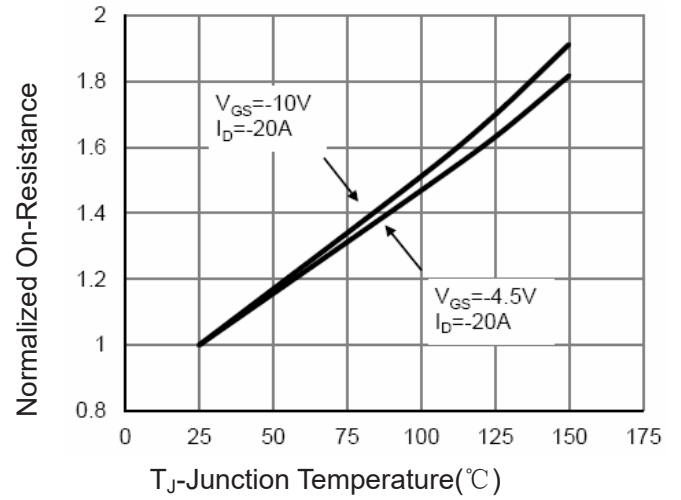
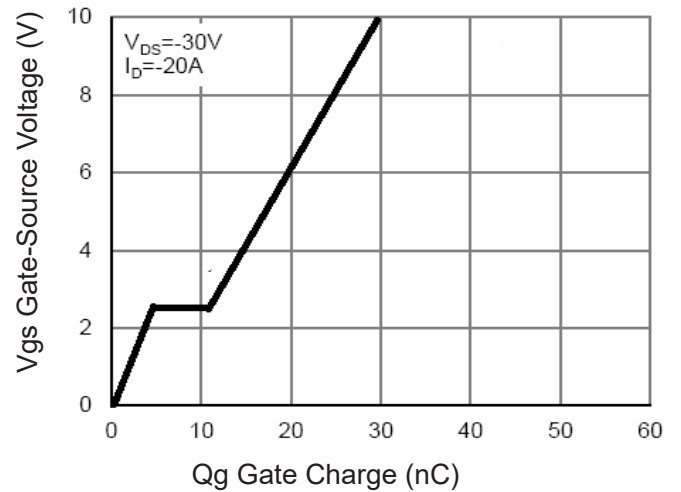
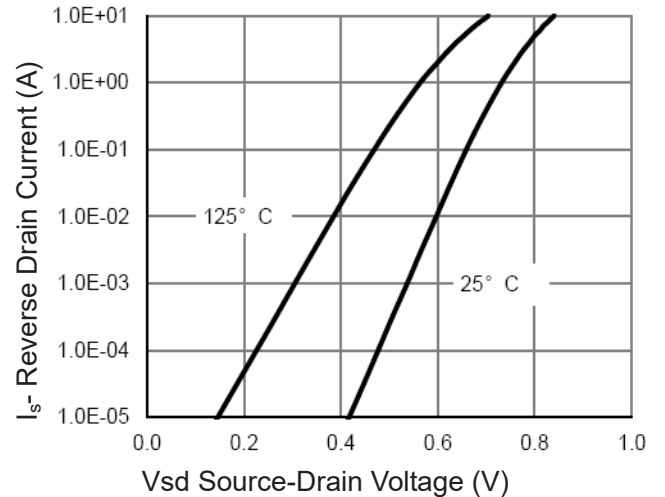
Electrical Characteristics ($T_C=25^\circ\text{C}$ unless otherwise noted)

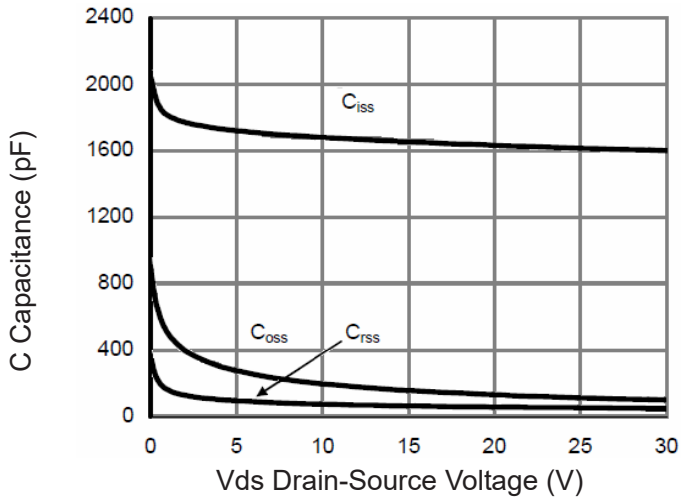
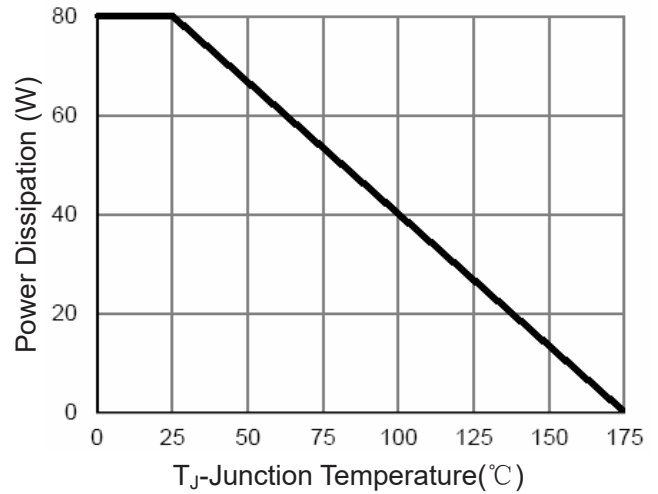
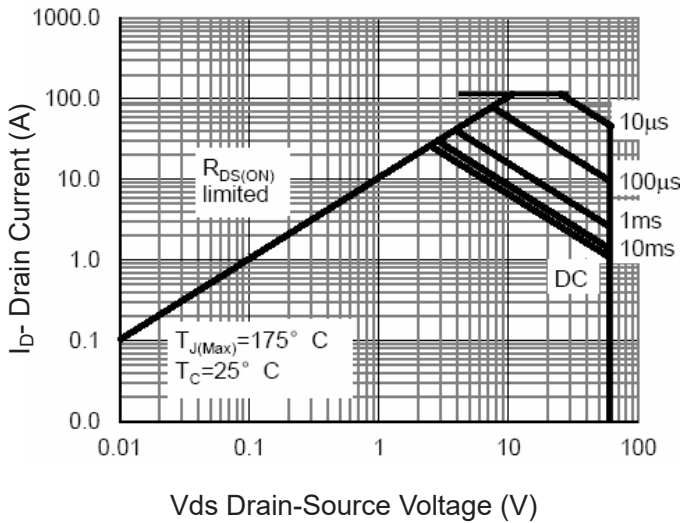
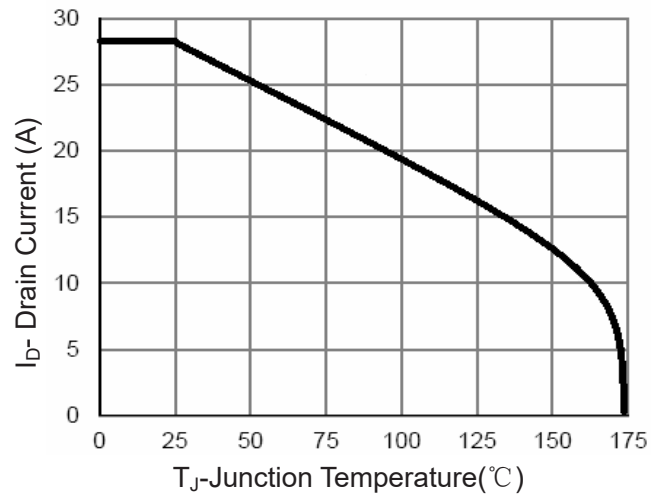
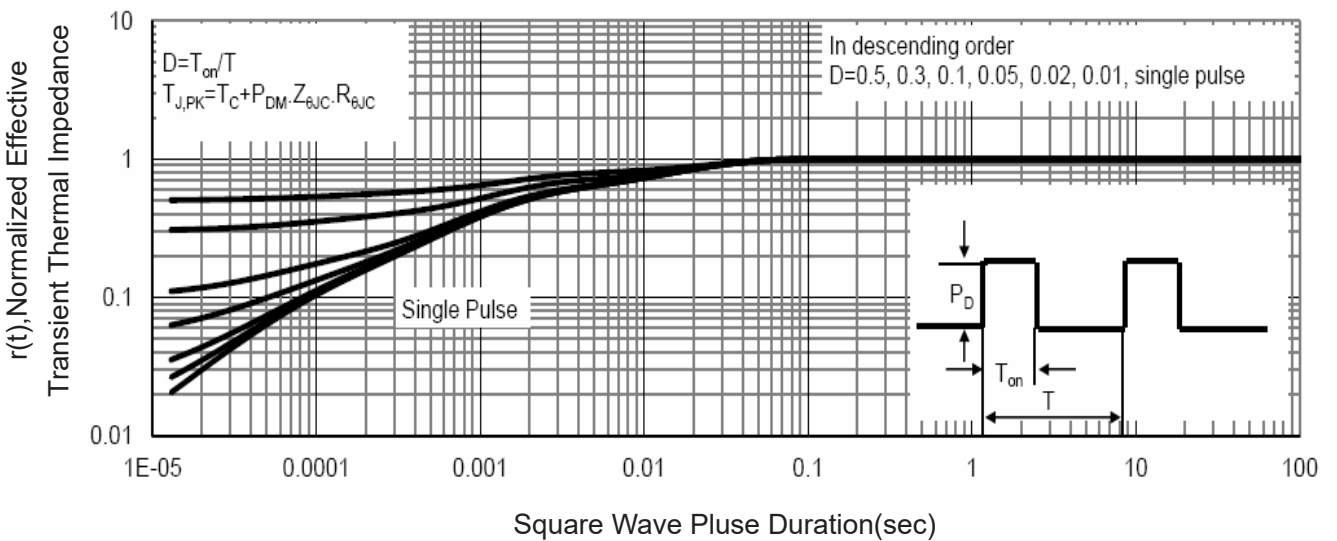
Parameter	Symbol	Condition	Min	Typ	Max	Unit
Off Characteristics						
Drain-Source Breakdown Voltage	BV_{DSS}	$V_{GS}=0V, I_D=-250\mu A$	-60	-	-	V
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS}=-60V, V_{GS}=0V$	-	-	-1	μA
Gate-Body Leakage Current	I_{GSS}	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	± 100	nA
On Characteristics (Note 3)						
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=-250\mu A$	-1	-1.5	-2.0	V
Drain-Source On-State Resistance	$R_{DS(ON)}$	$V_{GS}=-10V, I_D=-20A$	-	40	48	m Ω
		$V_{GS}=-4.5V, I_D=-20A$	-	48	55	m Ω
Forward Transconductance	g_{FS}	$V_{DS}=-5V, I_D=-20A$	-	10	-	S
Dynamic Characteristics (Note 4)						
Input Capacitance	C_{ISS}	$V_{DS}=-30V, V_{GS}=0V,$ $F=1.0\text{MHz}$	-	1630.7	-	PF
Output Capacitance	C_{OSS}		-	90.6	-	PF
Reverse Transfer Capacitance	C_{RSS}		-	77.3	-	PF
Switching Characteristics (Note 4)						
Turn-on Delay Time	$t_{d(on)}$	$V_{DD}=-30V, R_L=1.5\Omega,$ $V_{GS}=-10V, R_G=3\Omega$	-	11	-	nS
Turn-on Rise Time	t_r		-	14	-	nS
Turn-Off Delay Time	$t_{d(off)}$		-	33	-	nS
Turn-Off Fall Time	t_f		-	13	-	nS
Total Gate Charge	Q_g	$V_{DS}=-30, I_D=-20A,$ $V_{GS}=-10V$	-	30	-	nC
Gate-Source Charge	Q_{gs}		-	3.4	-	nC
Gate-Drain Charge	Q_{gd}		-	6.7	-	nC
Drain-Source Diode Characteristics						
Diode Forward Voltage	V_{SD}	$V_{GS}=0V, I_S=-20A$	-	-	-1.2	V
Diode Forward Current	I_S		-	-	-18	A
Reverse Recovery Time	t_{rr}	$T_J = 25^\circ\text{C}, I_F = -20A$ $di/dt = -100A/\mu s$ (Note 3)	-	34	-	nS
Reverse Recovery Charge	Q_{rr}		-	37	-	nC
Forward Turn-On Time	t_{on}	Intrinsic turn-on time is negligible (turn-on is dominated by LS+LD)				

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. E_{AS} condition: $T_J=25^\circ\text{C}, V_{DD}=-30V, V_G=-10V, L=0.5\text{mH}, R_G=25\Omega$

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