## Description

The VSM12P03 uses advanced trench technology to provide excellent $R_{DS(ON)}$, low gate charge and operation with gate voltages as low as 4.5V. This device is suitable for use as a load switch or in PWM applications.
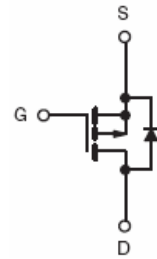
General Features

● V_{DS} = -30V, I_D = -12A

  $R_{DS(ON)}$ < 25mΩ @ V_{GS}=-4.5V

  $R_{DS(ON)}$ < 15mΩ @ V_{GS}=-10V

● High Power and current handing capability
● Lead free product is acquired
● Surface mount package

Application

● PWM applications
● Load switch
● Power management
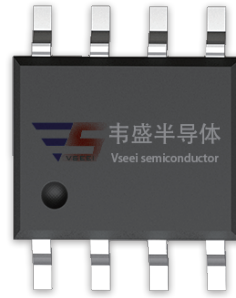
SOP-8   Schematic Diagram

Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
VSM12P03-S8	VSM12P03	SOP-8	Ø330mm	12mm	4000 units

Absolute Maximum Ratings (T$_A$=25℃ unless otherwise noted)

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	V_{DS}	-30	V
Gate-Source Voltage	V_{GS}	±20	V
Drain Current-Continuous (T$_C$=25℃)	I_D	-12	A
Drain Current-Continuous (T$_C$=100℃)		-8.4	
Drain Current-Pulsed (Note 1)	I_{DM}	-48	A
Maximum Power Dissipation (T$_C$=25℃)	P_D	3	W
Maximum Power Dissipation (T$_C$=100℃)		1.3	
Single pulse avalanche energy (Note 5)	E_{AS}	231	mJ
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-55 To 150	℃

Thermal Characteristic

Thermal Resistance,Junction-to-Ambient (Note 2)	$R_{θJA}$	41.67	℃/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	-30	-33	-	V
Zero Gate Voltage Drain Current	I$_{DSS}$	V$_{DS}$=-30V,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	-1.5	-3	V
Drain-Source On-State Resistance	R$_{DS(ON)}$	V$_{GS}$=-10V, I$_D$=-10A	-	11.5	15	mΩ
		V$_{GS}$=-4.5V, I$_D$=-7A	-	18	25	mΩ
Forward Transconductance	g$_{FS}$	V$_{DS}$=-10V,I$_D$=-10A	-	20	-	S
Dynamic Characteristics [Note4]						
Input Capacitance	C$_{Iss}$	V$_{DS}$=-15V,V$_{GS}$=0V, F=1.0MHz	-	1750	-	PF
Output Capacitance	C$_{oss}$		-	215	-	PF
Reverse Transfer Capacitance	C$_{rss}$		-	180	-	PF
Switching Characteristics [Note 4]						
Turn-on Delay Time	t$_{d(on)}$	V$_{DD}$=-15V, ID=-10A, V$_{GS}$=-10V,R$_{GEN}$=1Ω	-	9	-	nS
Turn-on Rise Time	t$_r$		-	8	-	nS
Turn-Off Delay Time	t$_{d(off)}$		-	28	-	nS
Turn-Off Fall Time	t$_f$		-	10	-	nS
Total Gate Charge	Q$_g$	V$_{DS}$=-15V,I$_D$=-10A,V$_{GS}$=-10V	-	24	-	nC
Gate-Source Charge	Q$_{gs}$		-	3.5	-	nC
Gate-Drain Charge	Q$_{gd}$		-	6	-	nC
Drain-Source Diode Characteristics						
Diode Forward Current [Note 2]	I$_S$		-	-	-12	A
Diode Forward Voltage [Note 3]	V$_{SD}$	V$_{GS}$=0V,I$_S$=-12A	-	-	-1.2	V

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. E$_{AS}$ condition: Tj=25℃,V$_{DD}$=-15V,V$_G$=10V,L=0.5mH,Rg=25Ω, I$_{AS}$=-34A

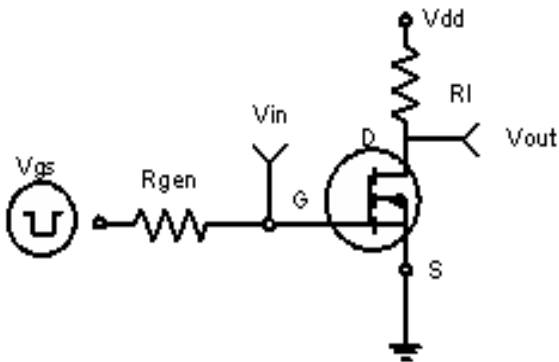## Typical Electrical and Thermal Characteristics
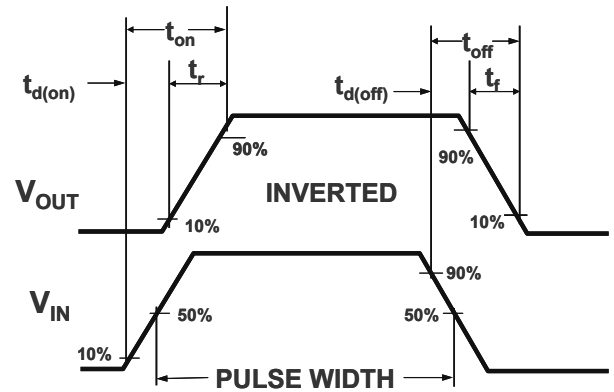
Figure 1:Switching Test Circuit
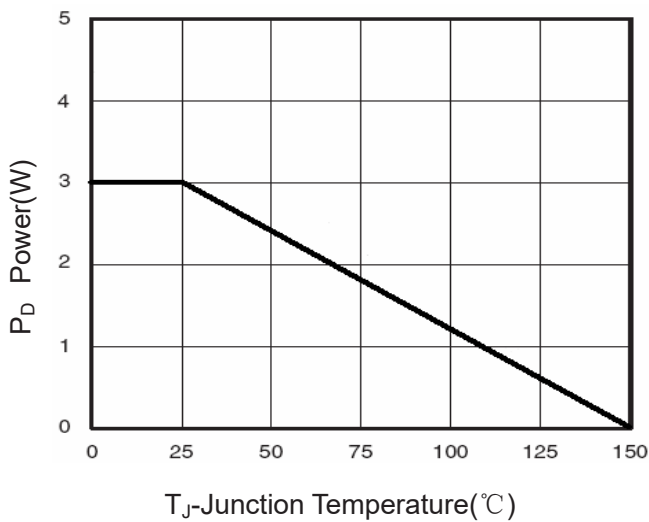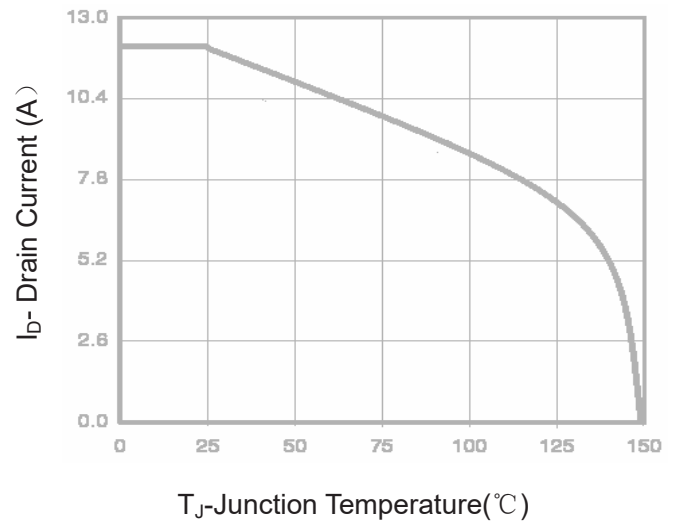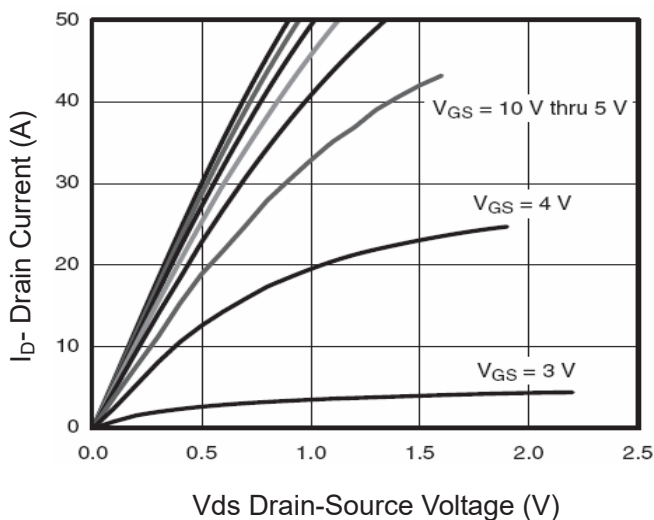
Figure 2:Switching Waveforms

Figure 3 Power Dissipation

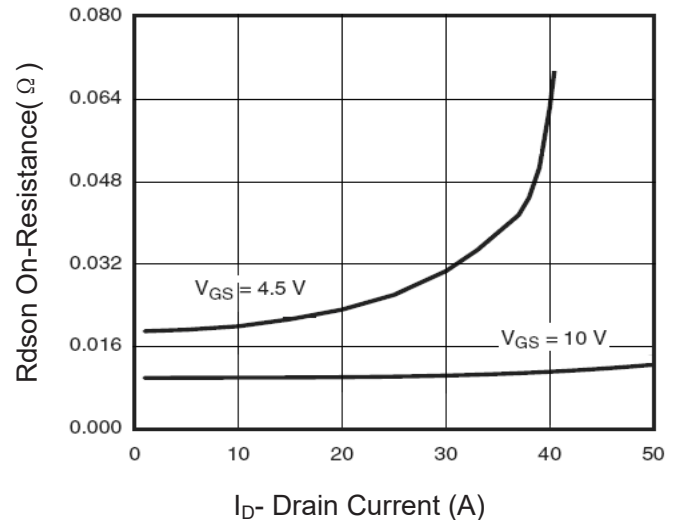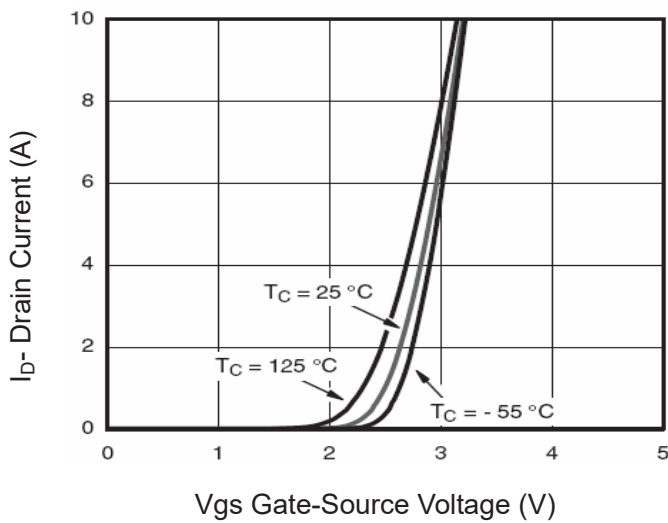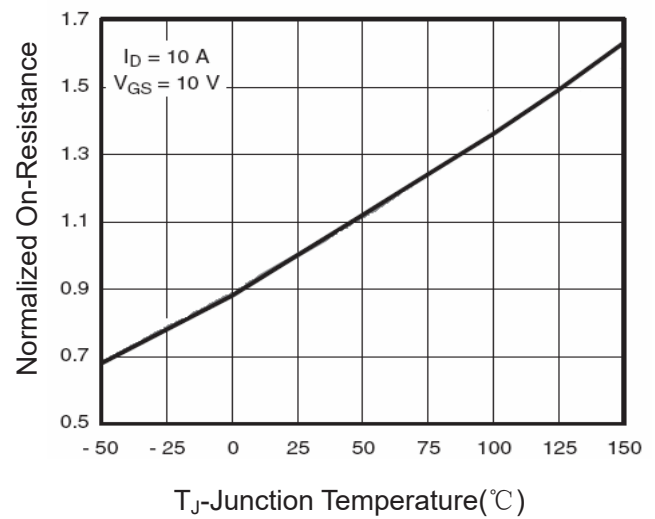**Figure 4 Drain Current**
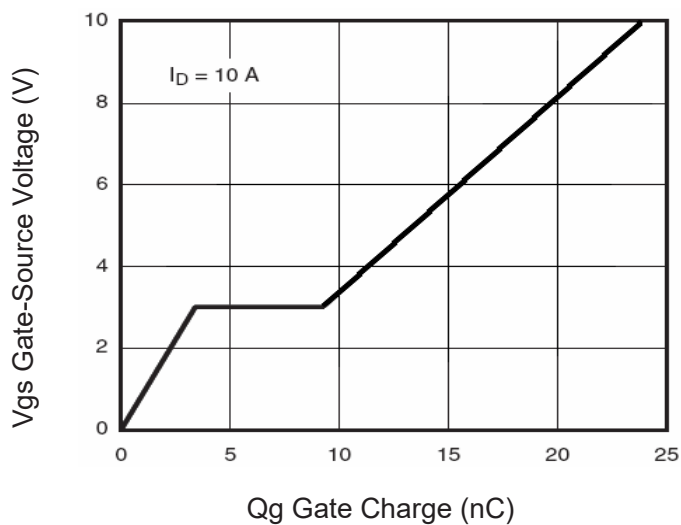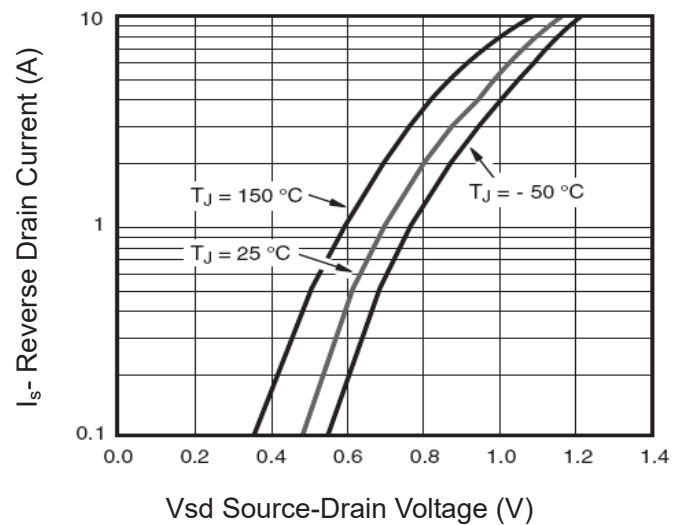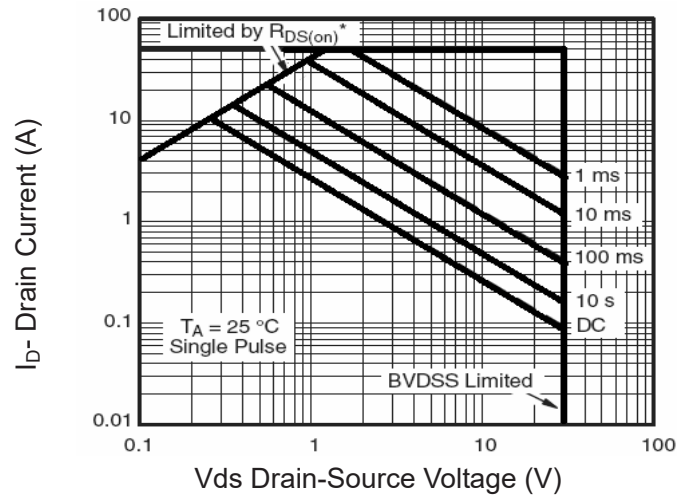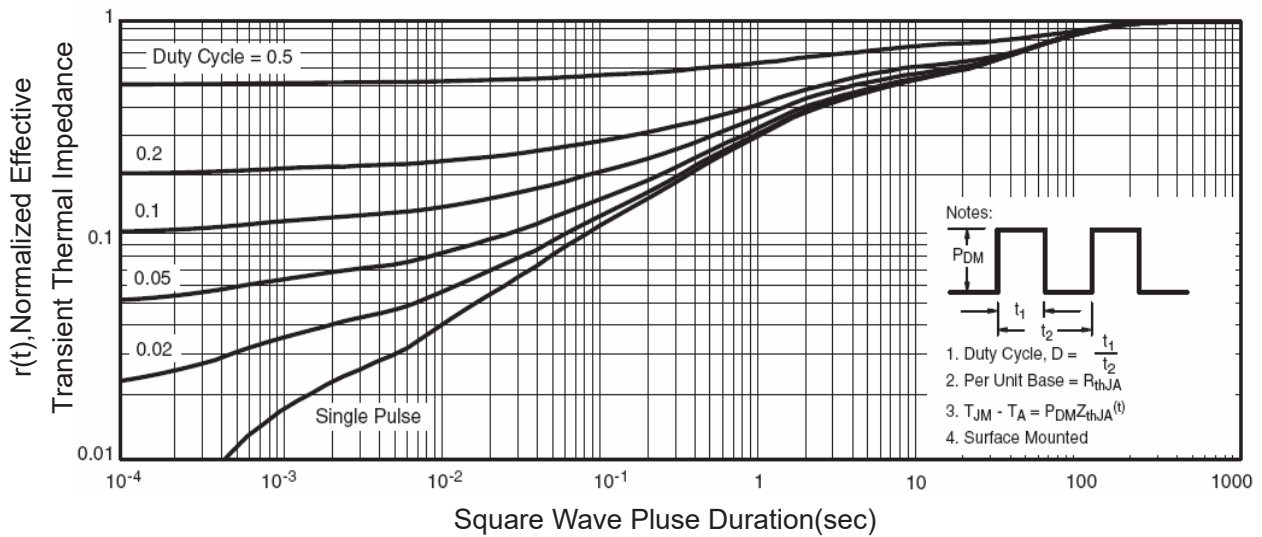
Figure 5 Output Characteristics

Figure 6 Drain-Source On-Resistance

Figure 7 Transfer Characteristics

Figure 8 Drain-Source On-Resistance
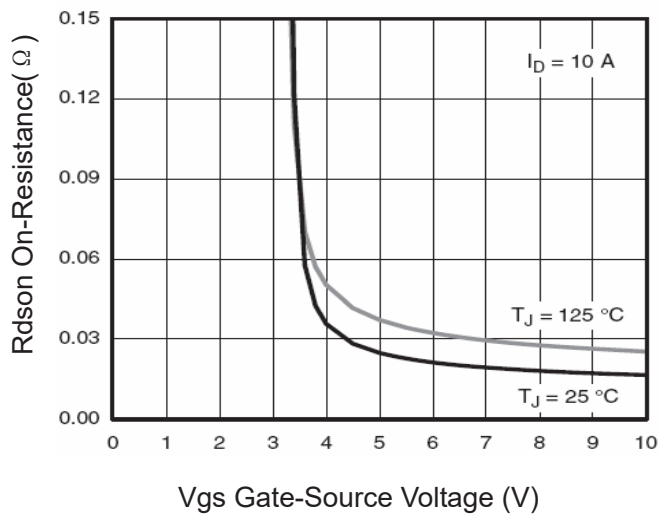
Figure 9 Rdson vs Vgs
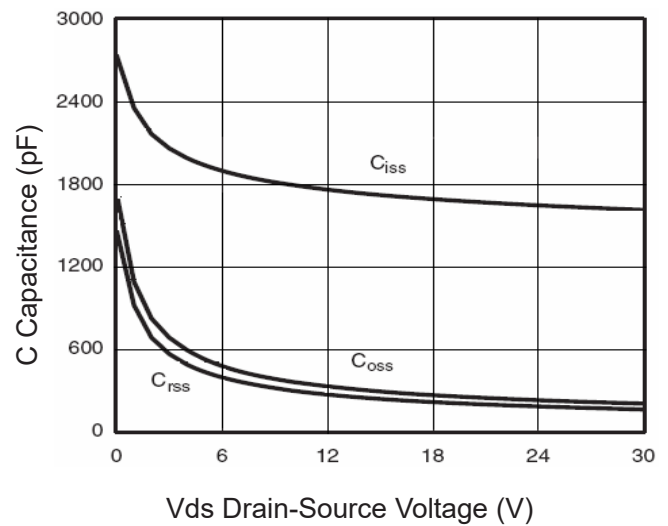
Figure 10 Capacitance vs Vds

Figure 11 Gate Charge

Figure 12 Source- Drain Diode Forward

Figure 13 Safe Operation Area

Figure 14 Normalized Maximum Transient Thermal Impedance