

Description

The VSM25P04 uses advanced trench technology to provide excellent $R_{DS(ON)}$. This device is suitable for use as a load switch or power management.

Application

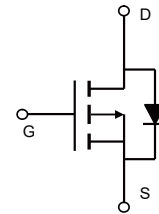
- DC/DC Converter
- Ideal for high-frequency switching and synchronous rectification

General Features

- $V_{DS} = -40V, I_D = -25A$
 $R_{DS(ON)} = 11.5m\Omega$ (typical) @ $V_{GS} = -10V$
 $R_{DS(ON)} = 18.5m\Omega$ (typical) @ $V_{GS} = -4.5V$
- High density cell design for ultra low $R_{DS(on)}$
- Good stability and uniformity with high E_{AS}
- 150 °C operating temperature
- Pb-free lead plating



DFN5x6



Schematic

Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
VSM25P04	VSM25P04-D56	DFN5x6	Ø330mm	12mm	5000units

Absolute Maximum Ratings ($T_c = 25^\circ C$ 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	-25	A
Drain Current-Pulsed	I_{DM}	-100	A
Maximum Power Dissipation	P_D	35	W
Single pulse avalanche energy ^(Note 1)	E_{AS}	353	mJ
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-55 To 150	$^\circ C$

Thermal Characteristic

Thermal Resistance, Junction-to-Case	$R_{\theta JC}$	3.6	$^\circ C/W$
Thermal Resistance, Junction-to-Ambient ^(Note 2)	$R_{\theta JA}$	50	$^\circ C/W$

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}	$V_{GS}=0V, I_D=-250\mu A$	-40	-	-	V
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS}=-40V, V_{GS}=0V$	-	-	-1	μA
Gate-Body Leakage Current	I_{GSS}	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	± 100	nA
On Characteristics						
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=-250\mu A$	-1.2	-1.8	-2.4	V
Drain-Source On-State Resistance	$R_{DS(ON)}$	$V_{GS}=-10V, I_D=-20A$	-	11.5	14	m Ω
	$R_{DS(ON)}$	$V_{GS}=-4.5V, I_D=-20A$	-	18.5	23	
Forward Transconductance	g_{FS}	$V_{DS}=-10V, I_D=-20A$	-	25	-	S
Dynamic Characteristics						
Input Capacitance	C_{iss}	$V_{DS}=-20V, V_{GS}=0V,$ $F=1.0MHz$	-	2960	-	pF
Output Capacitance	C_{oss}		-	370	-	pF
Reverse Transfer Capacitance	C_{rss}		-	310	-	pF
Switching Characteristics ^(Note 3)						
Turn-on Delay Time	$t_{d(on)}$	$V_{DD}=-20V, I_D=-20A,$ $V_{GS}=-10V, R_{GEN}=3\Omega$	-	10	-	nS
Turn-on Rise Time	t_r		-	18	-	nS
Turn-Off Delay Time	$t_{d(off)}$		-	38	-	nS
Turn-Off Fall Time	t_f		-	24	-	nS
Total Gate Charge	Q_g	$V_{DS}=-20V, I_D=-20A, V_{GS}=-10V$	-	42.2	-	nC
Gate-Source Charge	Q_{gs}		-	6.9	-	nC
Gate-Drain Charge	Q_{gd}		-	9.7	-	nC
Drain-Source Diode Characteristics						
Diode Forward Voltage	V_{SD}	$V_{GS}=0V, I_S=-20A$	-	-	-1.2	V

Notes:

1. EAS condition : $T_j=25^{\circ}\text{C}, V_{DD}=-25V, V_G=-10V, L=0.5mH, R_g=25\Omega$.
2. The value of $R_{\theta JA}$ is measured with the device mounted on 1in² FR-4 board with 2oz. Copper, in a still air environment with $T_A=25^{\circ}\text{C}$. The maximum allowed junction temperature of 150°C . The value in any given application depends on the user's specific board design, and the maximum temperature of 150°C may be used if the PCB allows it.
3. Guaranteed by design, not subject to production.
4. These curves are based on the junction-to-case thermal impedance which is measured with the device mounted to a large heatsink, assuming a maximum junction temperature of $T_{J(MAX)}=150^{\circ}\text{C}$. The SOA curve provides a single pulse rating.

Typical Electrical and Thermal Characteristics

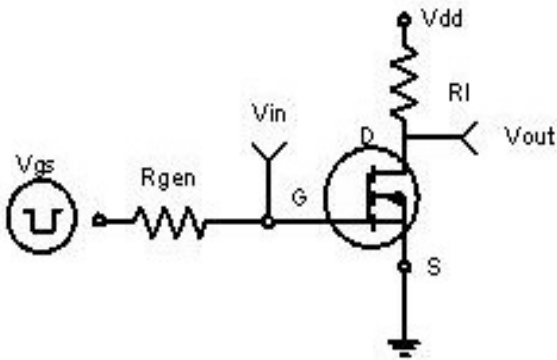


Figure 1 Switching Test Circuit

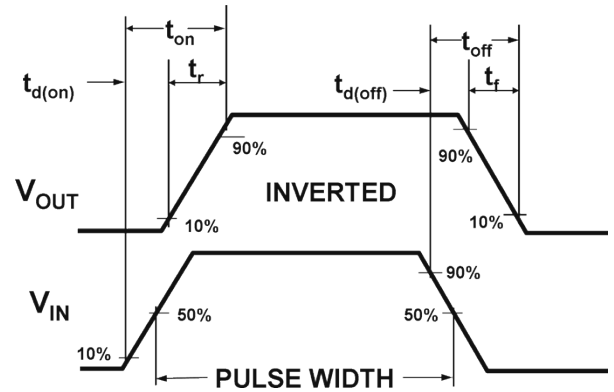


Figure 2 Switching Waveforms

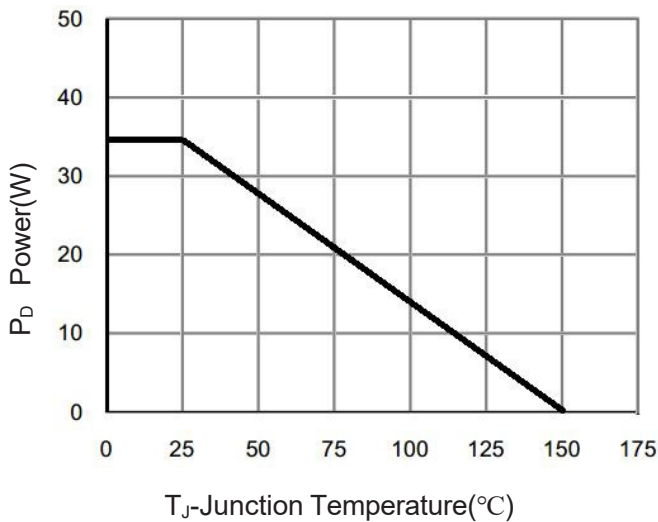


Figure 3 Power Dissipation

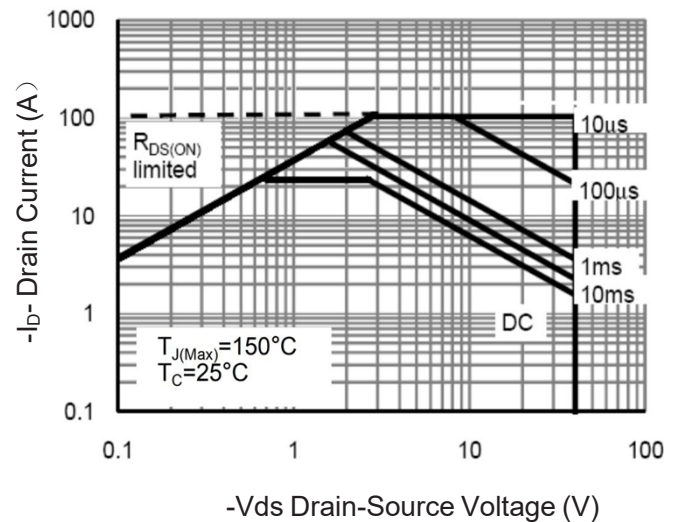


Figure 4 Safe Operation Area(Note 4)

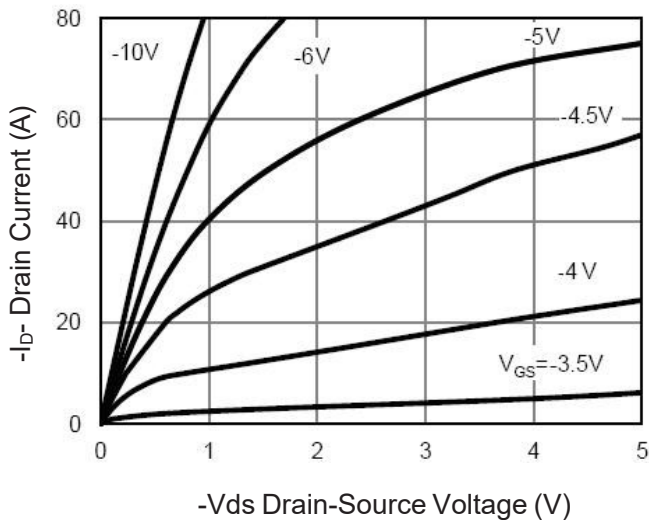


Figure 5 Output Characteristics

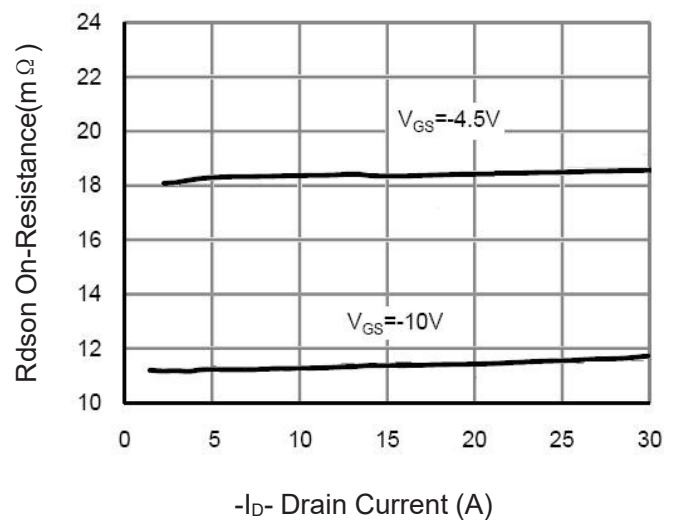
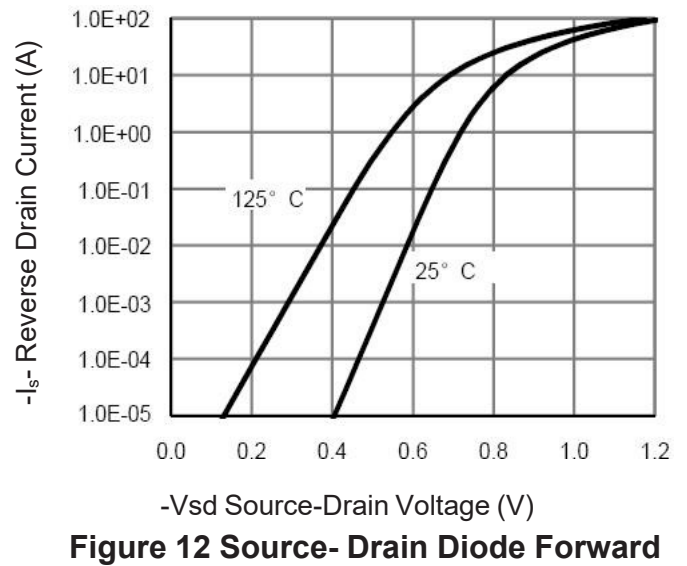
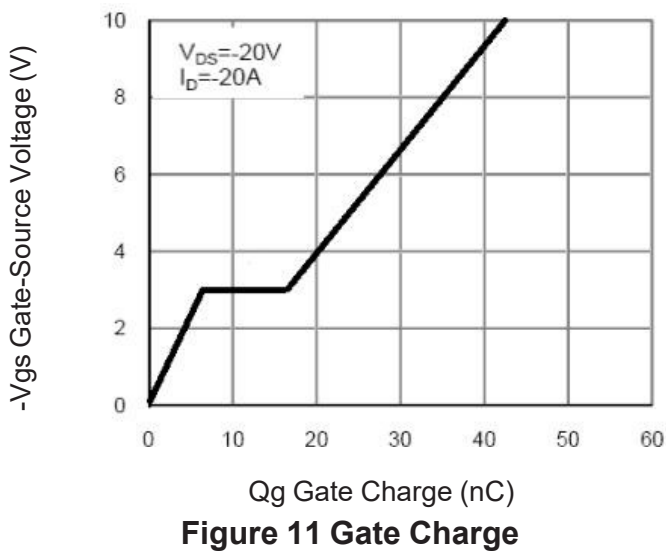
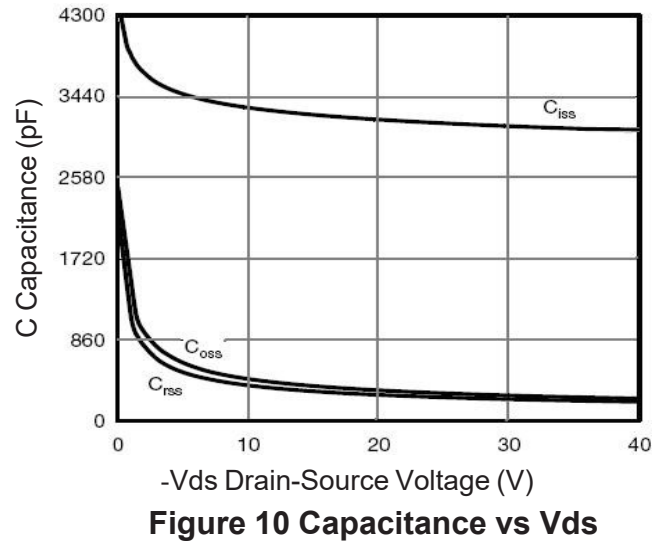
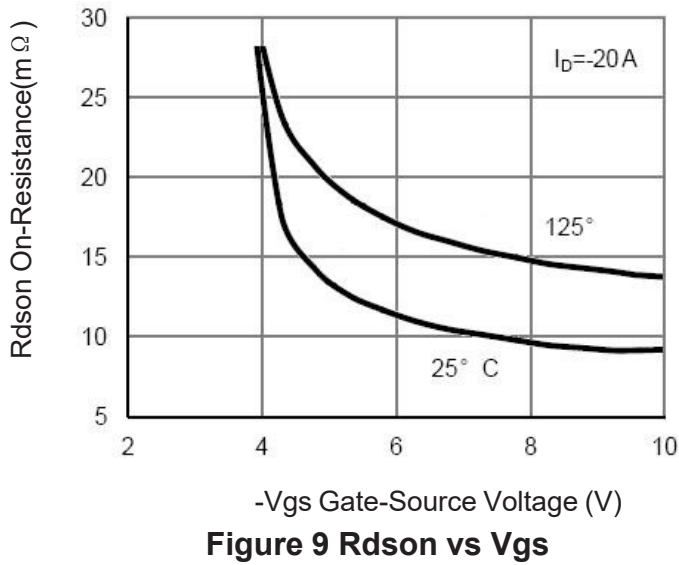
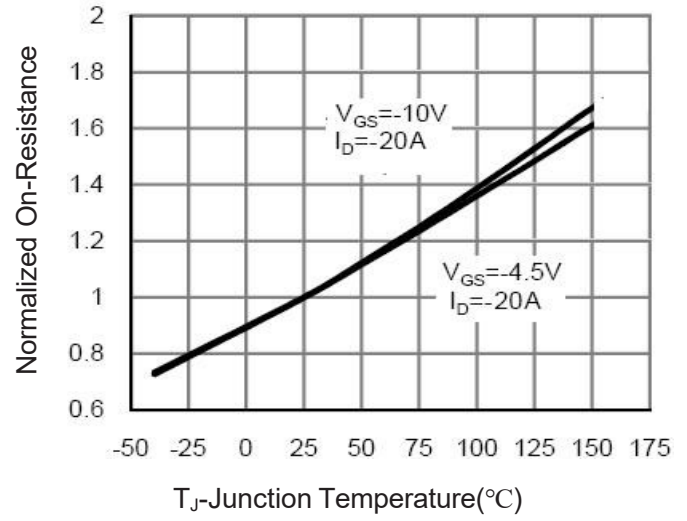
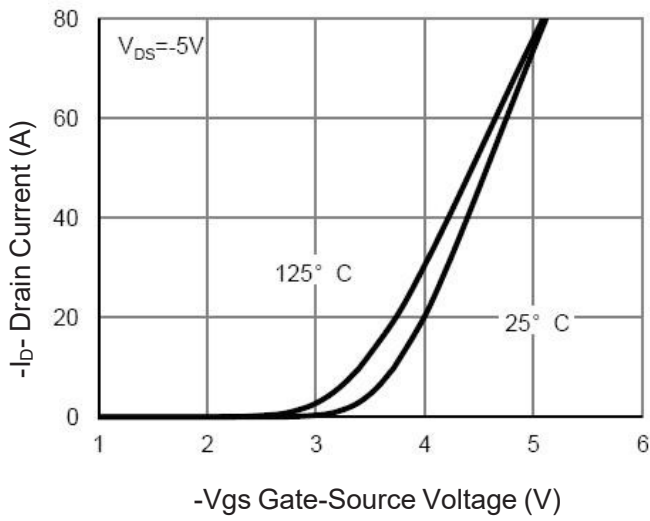


Figure 6 Drain-Source On-Resistance



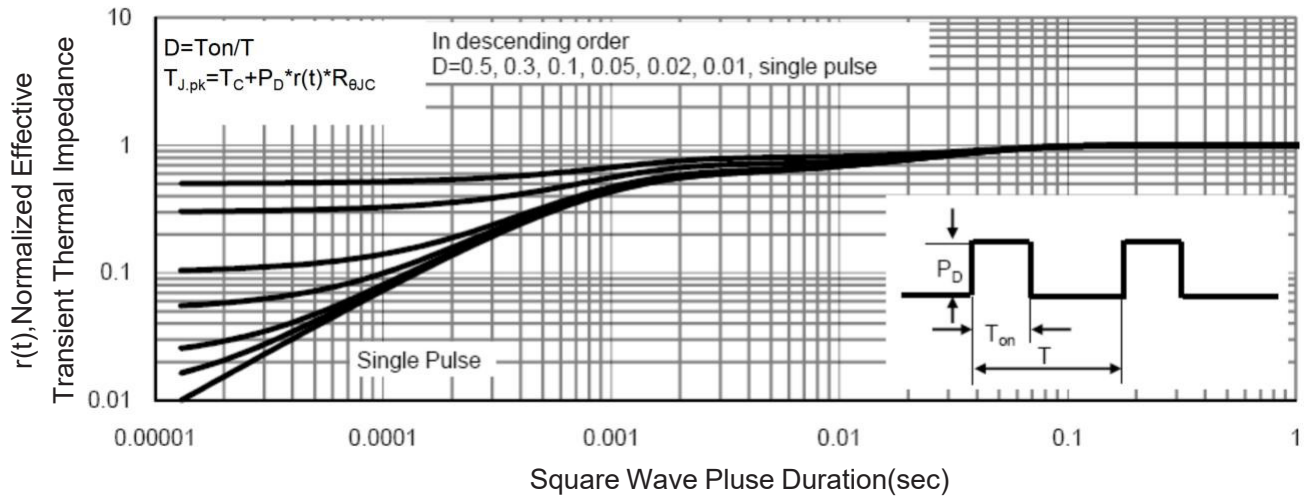


Figure 13 Normalized Maximum Transient Thermal Impedance