

Description

The VSM20P04 uses advanced trench technology to provide excellent $R_{DS(ON)}$. This device is suitable for use as a load switch or power management.

Application

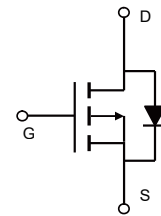
- Power management
- Load switch

General Features

- $V_{DS} = -40V, I_D = -20A$
 $R_{DS(ON)} < 18m\Omega @ V_{GS} = -10V$
 $R_{DS(ON)} < 28m\Omega @ V_{GS} = -4.5V$
- High power and current handling capability
- Lead free product is acquired
- Surface mount package



DFN3x3



Schematic

Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
VSM20P04	VSM20P04-D33	DFN3x3			

Absolute Maximum Ratings ($T_A = 25^\circ C$ 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	-20	A
Drain Current-Pulsed (Note 1)	I_{DM}	-80	A
Maximum Power Dissipation	P_D	30	W
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-55 To 150	$^\circ C$

Thermal Characteristic

Thermal Resistance, Junction-to-Case (Note 2)	$R_{\theta JC}$	4.17	$^\circ C/W$
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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}	$V_{GS}=0V, I_D=-250\mu A$	-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 (Note 3)						
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	$R_{DS(ON)}$	$V_{GS}=-10V, I_D=-20A$	-	14	18	m Ω
	$R_{DS(ON)}$	$V_{GS}=-4.5V, I_D=-20A$	-	21.5	28	
Forward Transconductance	g_{FS}	$V_{DS}=-10V, I_D=-20A$	-	25	-	S
Dynamic Characteristics (Note4)						
Input Capacitance	C_{iss}	$V_{DS}=-20V, V_{GS}=0V,$ $F=1.0MHz$	-	2800	-	PF
Output Capacitance	C_{oss}		-	300	-	PF
Reverse Transfer Capacitance	C_{rss}		-	275	-	PF
Switching Characteristics (Note 4)						
Turn-on Delay Time	$t_{d(on)}$	$V_{DD}=-20V, I_D=-20A,$ $V_{GS}=-10V, R_{GEN}=3\Omega$	-	11	-	nS
Turn-on Rise Time	t_r		-	9.4	-	nS
Turn-Off Delay Time	$t_{d(off)}$		-	24	-	nS
Turn-Off Fall Time	t_f		-	12	-	nS
Total Gate Charge	Q_g	$V_{DS}=-20V, I_D=-20A, V_{GS}=-10V$	-	54	-	nC
Gate-Source Charge	Q_{gs}		-	8	-	nC
Gate-Drain Charge	Q_{gd}		-	11	-	nC
Drain-Source Diode Characteristics						
Diode Forward Voltage (Note 3)	V_{SD}	$V_{GS}=0V, I_S=-20A$	-	-	-1.2	V

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

Typical Electrical and Thermal Characteristics

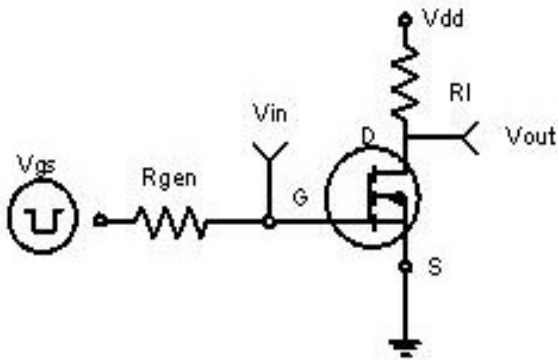


Figure 1 Switching Test Circuit

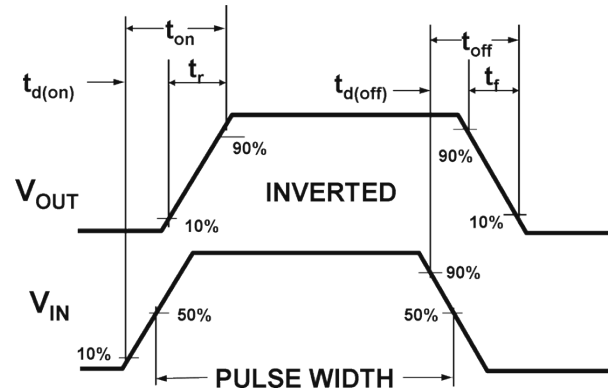


Figure 2 Switching Waveforms

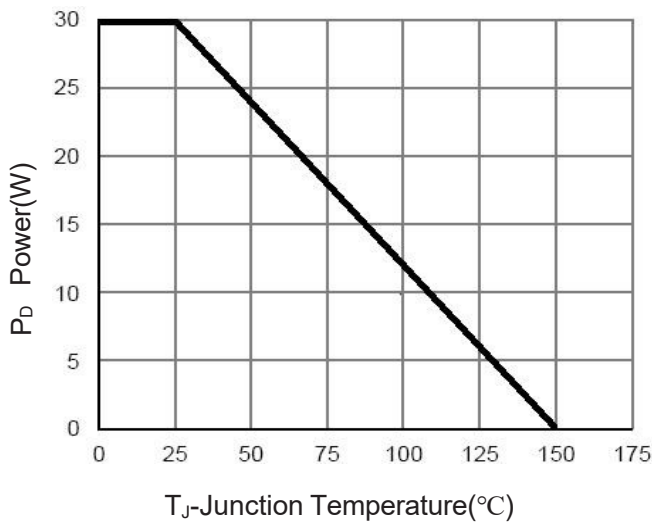


Figure 3 Power Dissipation

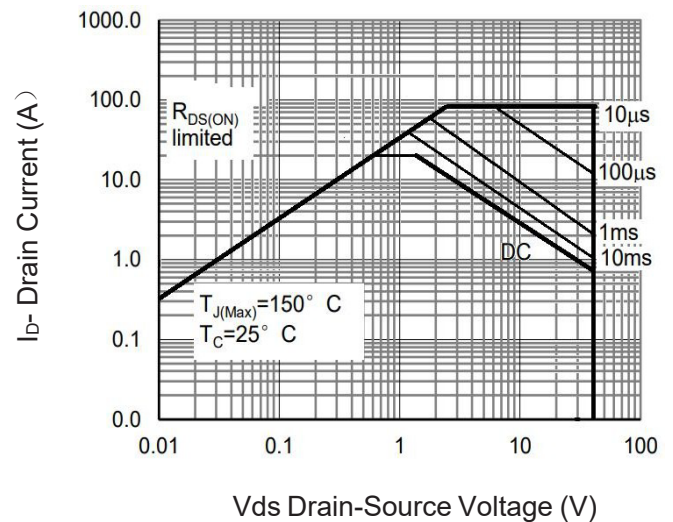


Figure 4 Safe Operation Area

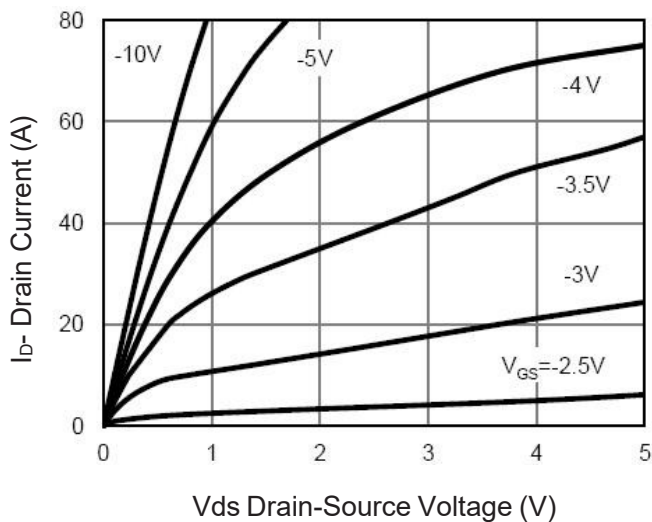


Figure 5 Output Characteristics

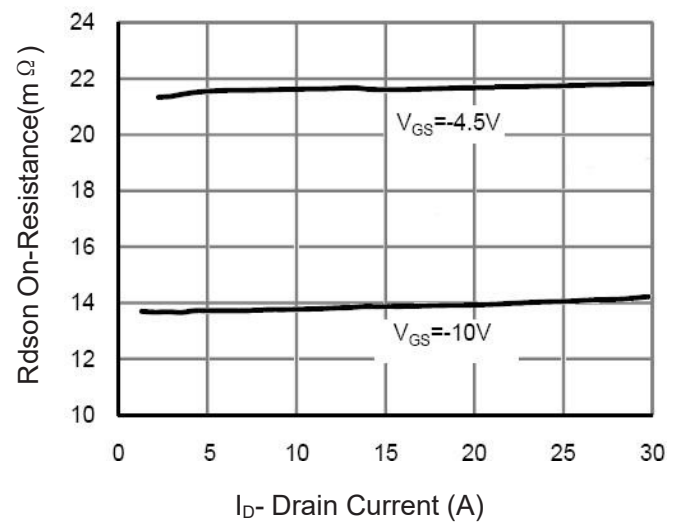
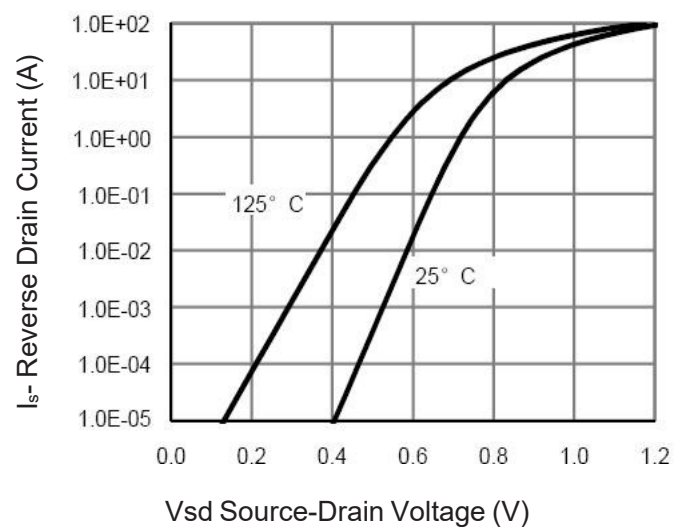
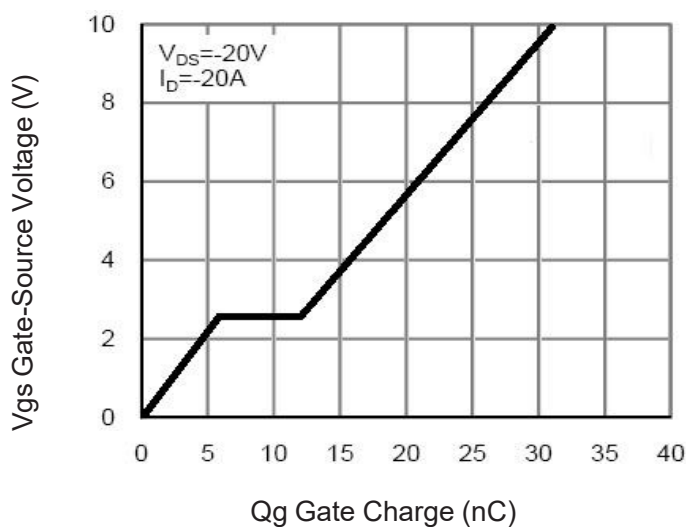
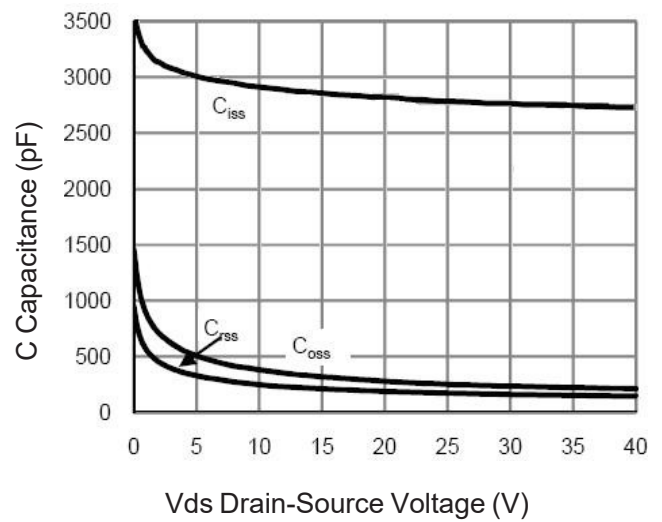
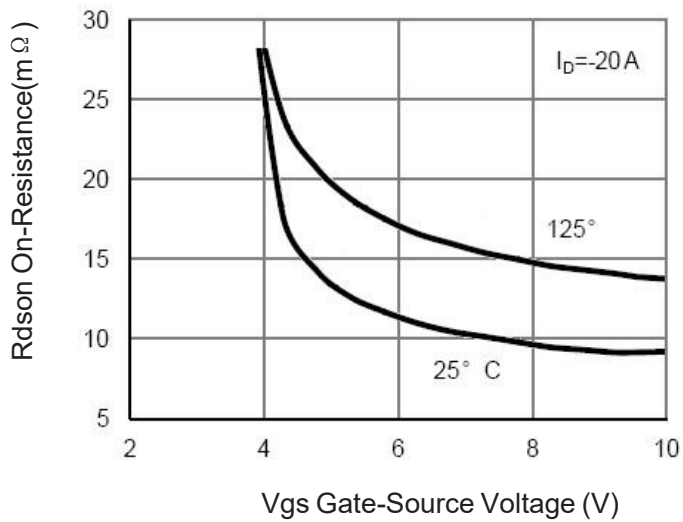
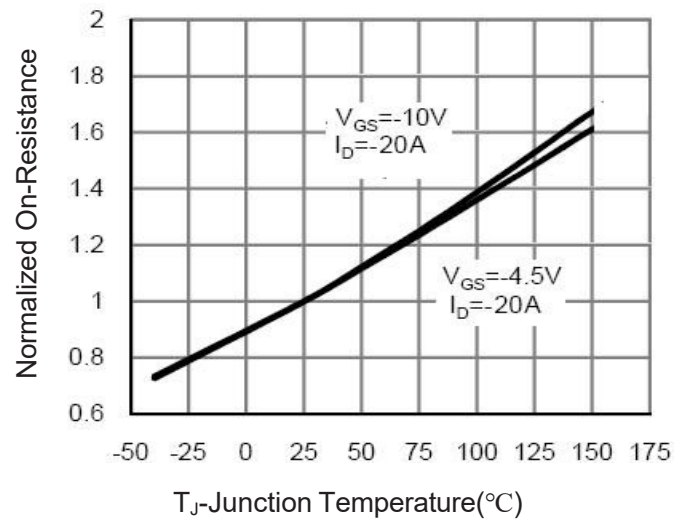
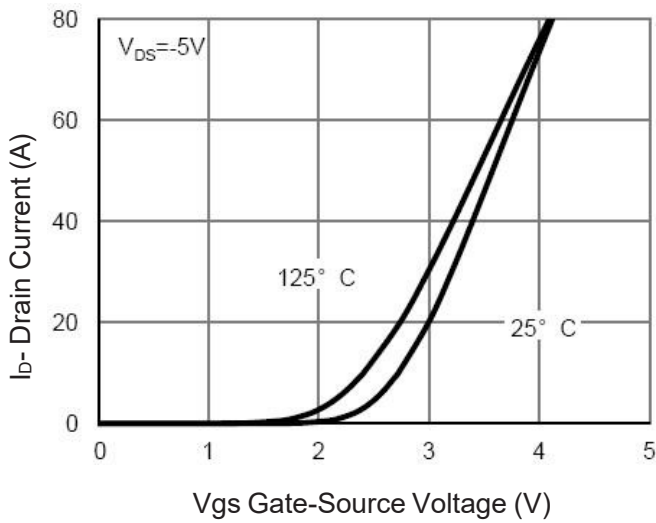


Figure 6 Drain-Source On-Resistance



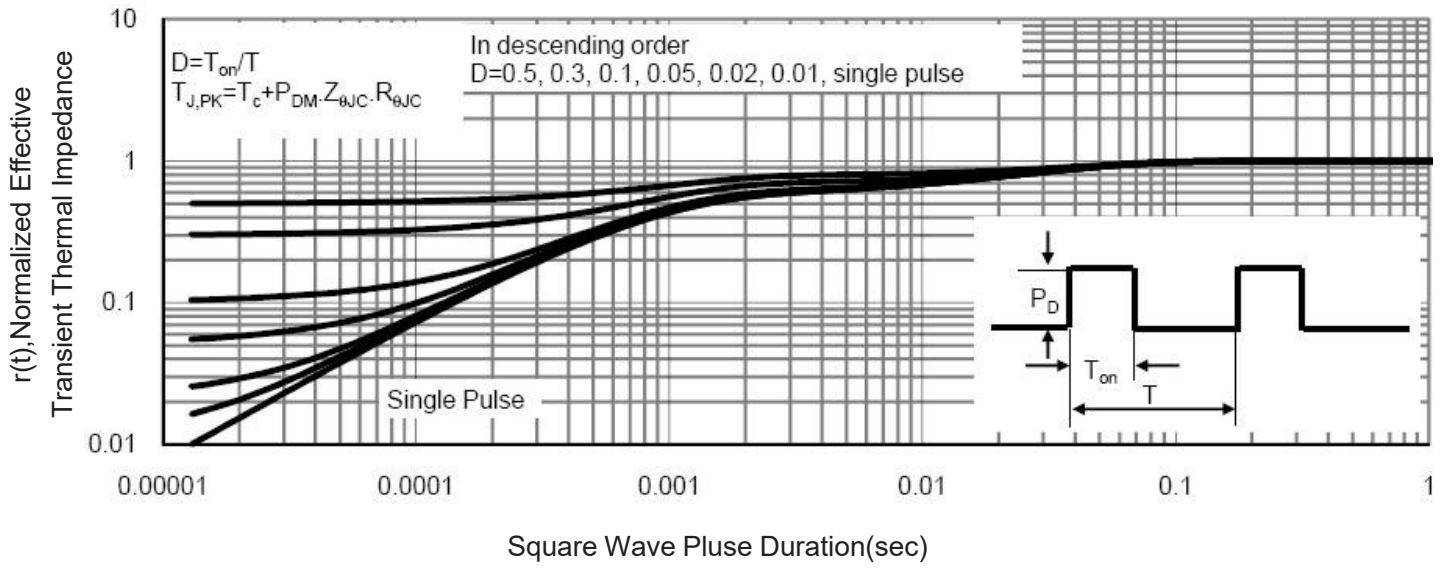


Figure 13 Normalized Maximum Transient Thermal Impedance