

Description

The VSM40P04 uses advanced trench technology to provide excellent $R_{DS(ON)}$. This device is suitable for use as a load switch or power management.

Application

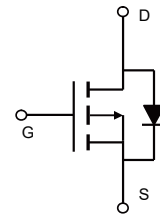
- Power management
- Load switch

General Features

- $V_{DS} = -40V, I_D = -40A$
 $R_{DS(ON)} = 8.0m\Omega @ V_{GS} = -10V$ (Typ)
 $R_{DS(ON)} = 12.2m\Omega @ V_{GS} = -4.5V$ (Typ)
- 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
VSM40P04	VSM40P04-D33	DFN3x3	-	-	-

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	-40	A
Drain Current-Continuous($T_c=100^{\circ}C$)	$I_D(100^{\circ}C)$	-25	A
Pulsed Drain Current	I_{DM}	-160	A
Maximum Power Dissipation	P_D	28	W
Single pulse avalanche energy (Note 5)	E_{AS}	184	mJ
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-55 To 150	$^{\circ}C$

Thermal Characteristic

Thermal Resistance, Junction-to-Case (Note 2)	$R_{\theta JC}$	4.5	$^{\circ}C/W$
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Electrical Characteristics (T_c=25°C unless otherwise noted)

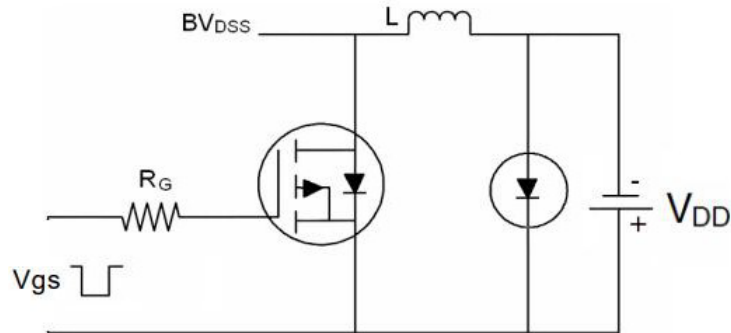
Parameter	Symbol	Condition	Min	Typ	Max	Unit
Off Characteristics						
Drain-Source Breakdown Voltage	BV _{DSS}	V _{GS} =0V I _D = -250μA	-40	-	-	V
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} = -40V,V _{GS} =0V	-	-	-1	μA
Gate-Body Leakage Current	I _{GSS}	V _{GS} =±20V,V _{DS} =0V	-	-	±100	nA
On Characteristics (Note 3)						
Gate Threshold Voltage	V _{GS(th)}	V _{DS} =V _{GS} ,I _D =-250μA	-1.3	-1.9	-2.5	V
Drain-Source On-State Resistance	R _{DS(ON)}	V _{GS} = -10V, I _D =-20A	-	8.0	10	mΩ
		V _{GS} = -4.5V, I _D =-20A	-	12.2	16	mΩ
Forward Transconductance	g _{FS}	V _{DS} = -5V,I _D =-20A	-	20	-	S
Dynamic Characteristics (Note4)						
Input Capacitance	C _{iss}	V _{DS} =-20V,V _{GS} =0V, F=1.0MHz	-	2214	-	pF
Output Capacitance	C _{oss}		-	242	-	pF
Reverse Transfer Capacitance	C _{rss}		-	235	-	pF
Switching Characteristics (Note 4)						
Turn-on Delay Time	t _{d(on)}	V _{DD} =-20V,I _D =-20A V _{GS} =-10V,R _G =3Ω	-	10	-	nS
Turn-on Rise Time	t _r		-	18	-	nS
Turn-Off Delay Time	t _{d(off)}		-	45	-	nS
Turn-Off Fall Time	t _f		-	26	-	nS
Total Gate Charge	Q _g	V _{DS} =-20V,I _D =-20A, V _{GS} =-10V	-	52.4	-	nC
Gate-Source Charge	Q _{gs}		-	6.0	-	nC
Gate-Drain Charge	Q _{gd}		-	14.7	-	nC
Drain-Source Diode Characteristics						
Diode Forward Voltage (Note 3)	V _{SD}	V _{GS} =0V,I _S =-20A	-	-	-1.2	V
Diode Forward Current (Note 2)	I _S		-	-	-40	A
Reverse Recovery Time	t _{rr}	T _J = 25°C, I _F =- 20A di/dt = -100A/μs ^(Note3)	-	38	-	nS
Reverse Recovery Charge	Q _{rr}		-	40	-	nC
Forward Turn-On Time	t _{on}	Intrinsic turn-on time is negligible (turn-on is dominated by LS+LD)				

Notes:

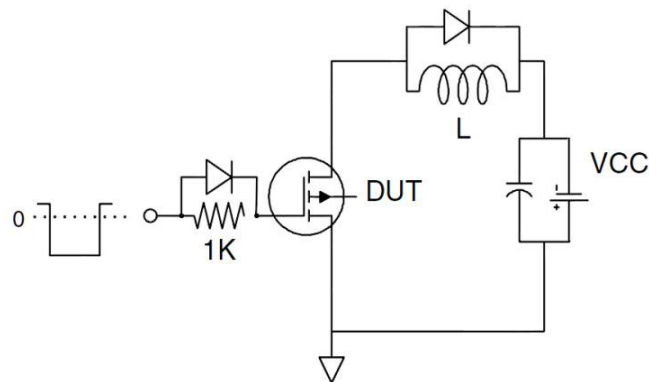
1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. Surface Mounted on FR4 Board with 2oz. Copper, in a still air environment with T_A=25°C., t ≤ 10 sec.
3. Pulse Test: Pulse Width ≤ 300μs, Duty Cycle ≤ 2%.
4. Guaranteed by design, not subject to production
5. E_{AS} condition: T_J=25°C, V_{DD}=-20V, V_G=-10V, L=0.5mH, R_G=25Ω

Test Circuit

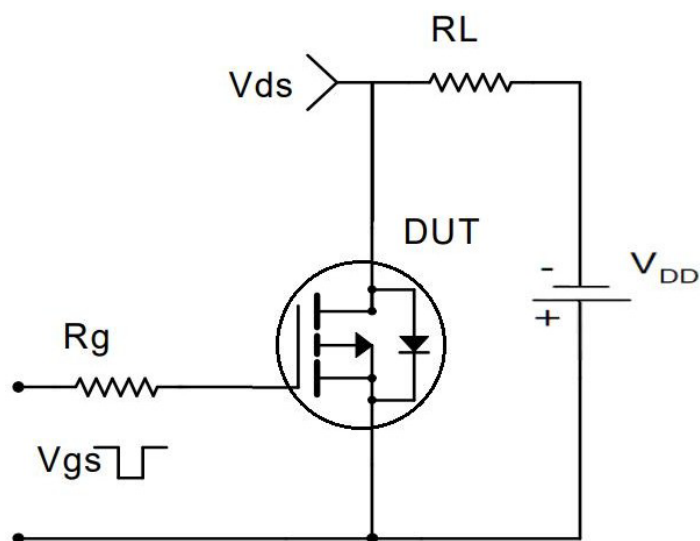
1) E_{AS} test Circuit



2) Gate charge test Circuit



3) Switch Time Test Circuit



Typical Electrical and Thermal Characteristics (Curves)

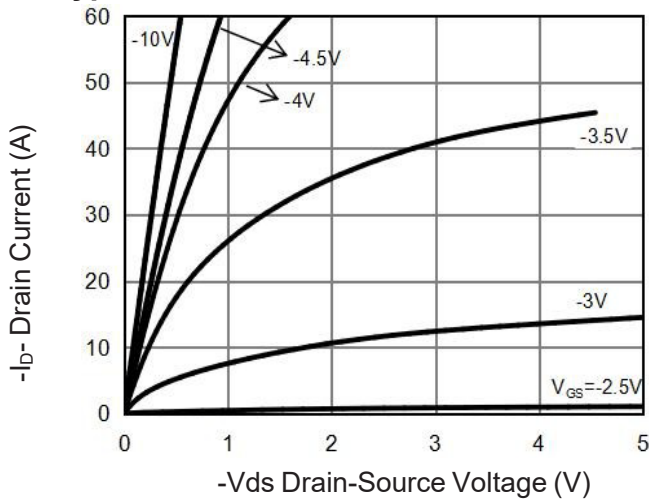


Figure 1 Output Characteristics

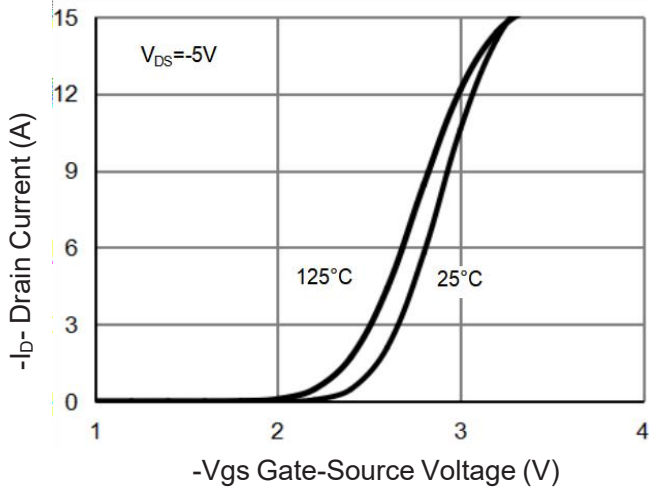


Figure 2 Transfer Characteristics

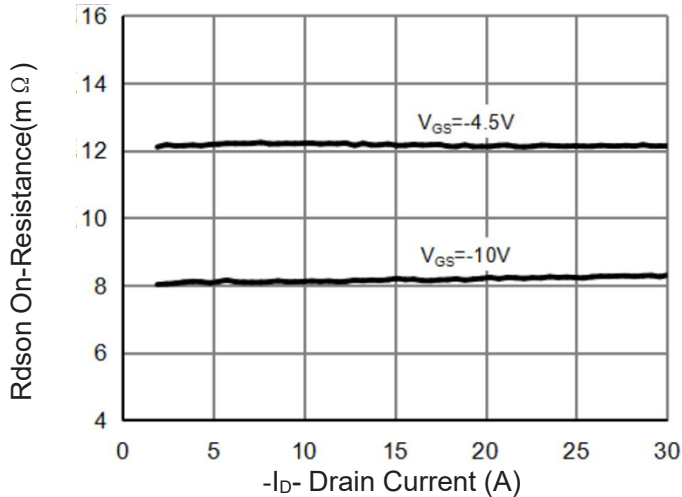


Figure 3 Rdson- Drain Current

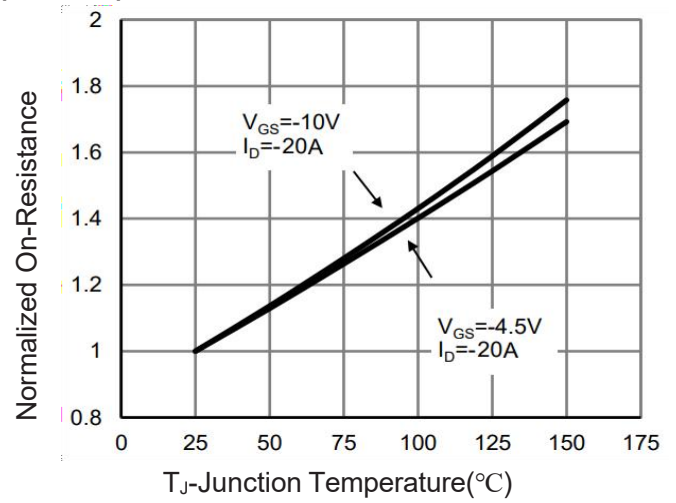


Figure 4 Rdson-Junction Temperature

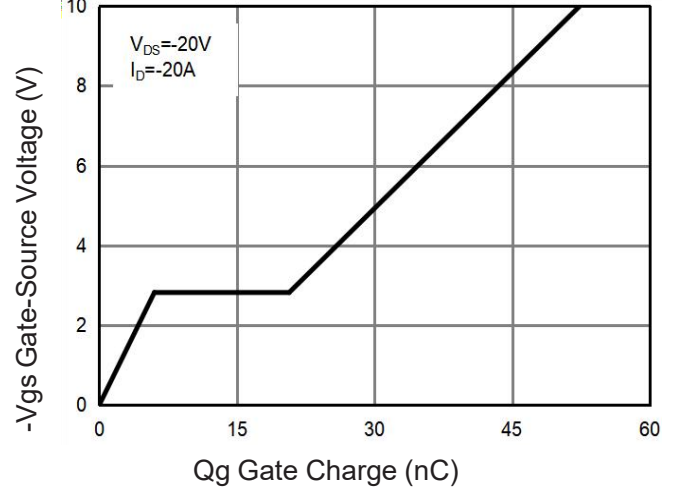


Figure 5 Gate Charge

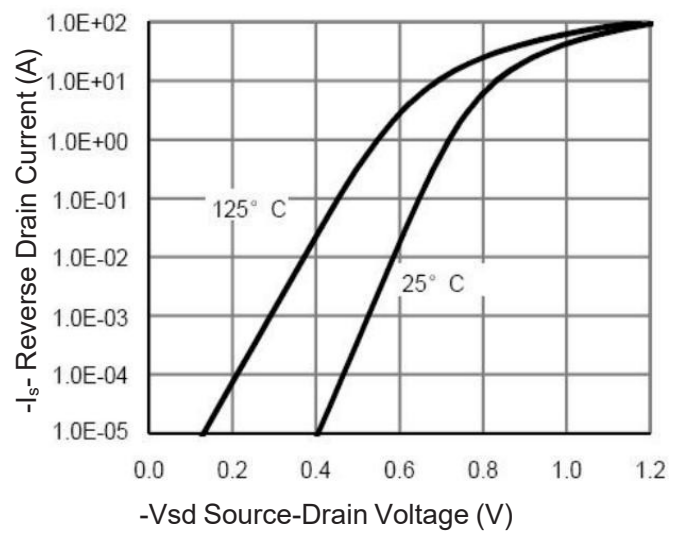
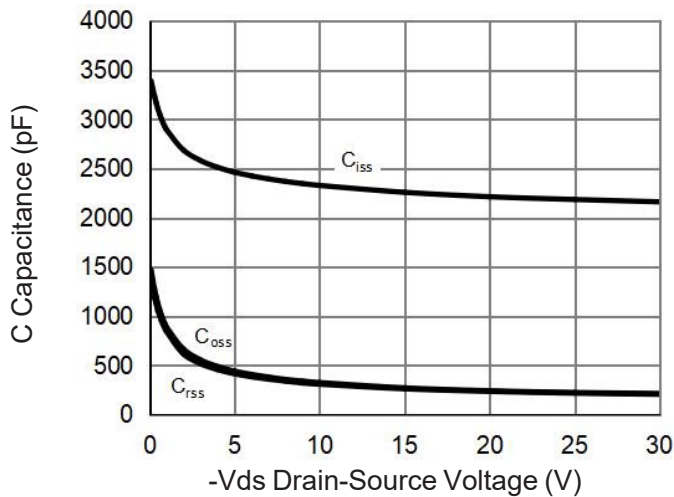
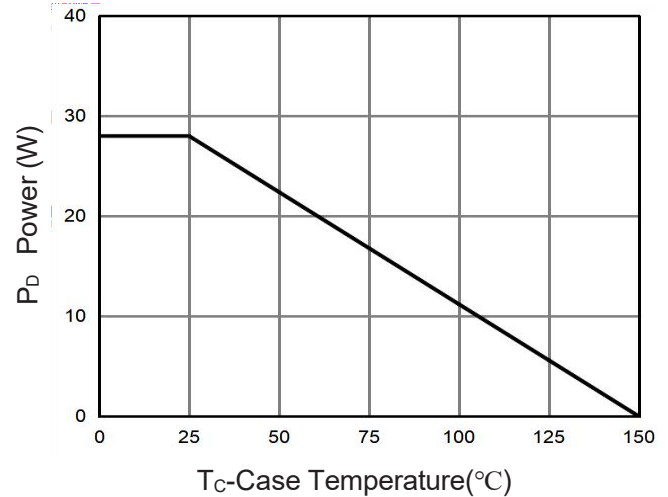
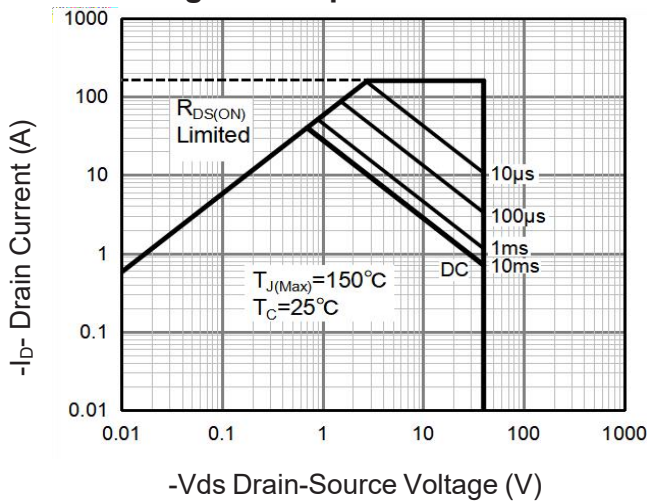
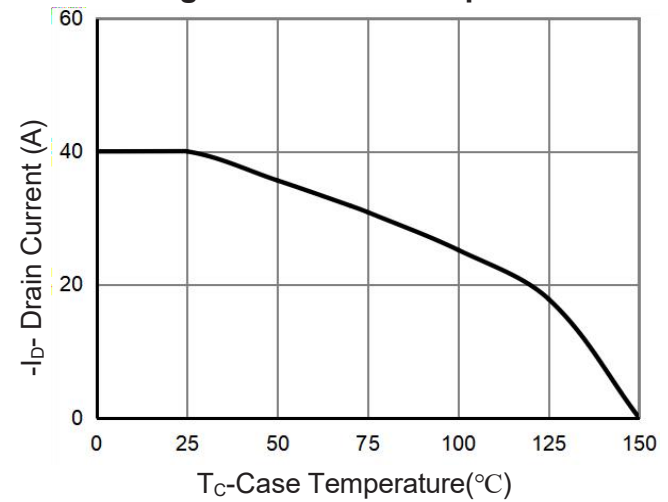
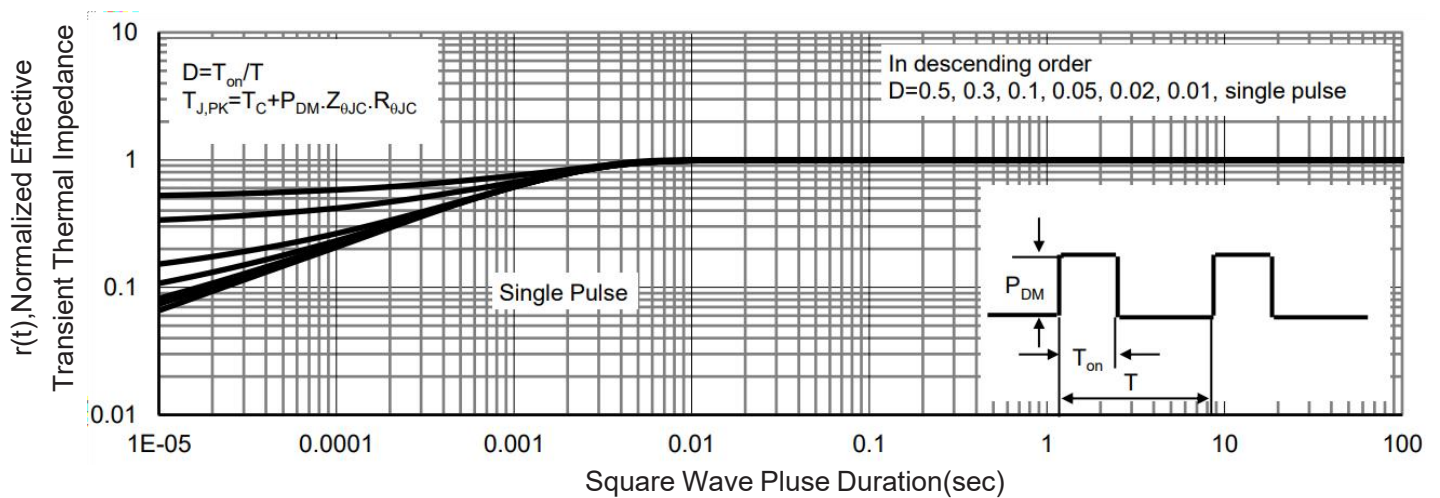


Figure 6 Source- Drain Diode Forward


Figure 7 Capacitance vs Vds

Figure 9 Power Dissipation

Figure 8 Safe Operation Area

Figure 10 ID Current Derating

Figure 11 Normalized Maximum Transient Thermal Impedance