

Description

The VSM15P04 uses advanced trench technology and design to provide excellent $R_{DS(ON)}$ with low gate charge. This device is well suited for use as a load switch or in PWM applications.

General Features

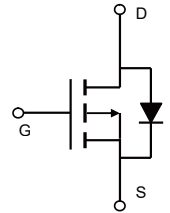
- $V_{DS} = -40V, I_D = -15A$
 $R_{DS(ON)} < 35m\Omega @ V_{GS} = -10V$
 $R_{DS(ON)} < 45m\Omega @ V_{GS} = -4.5V$
- High density cell design for ultra low $R_{DS(ON)}$
- Fully characterized avalanche voltage and current
- Excellent package for good heat dissipation

Application

- Load switch
- PWM application



TO-252



Schematic

Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
VSM15P04	VSM15P04-T2	TO-252	-	-	-

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	-15	A
Pulsed Drain Current	I_{DM}	-60	A
Maximum Power Dissipation	P_D	41.7	W
Single pulse avalanche energy (Note 5)	E_{AS}	77	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)	$R_{\theta JC}$	3.0	$^\circ C/W$
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Electrical Characteristics (T_c=25°C unless otherwise noted)

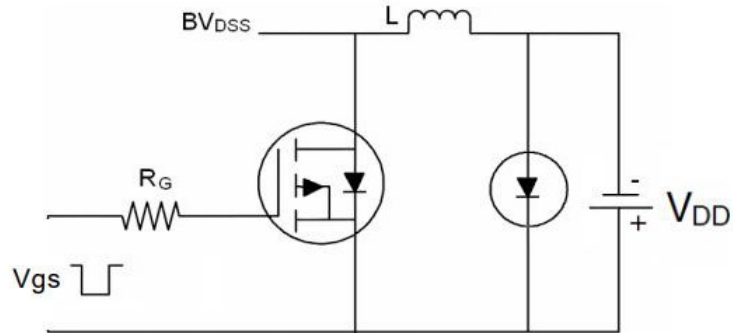
Parameter	Symbol	Condition	Min	Typ	Max	Unit
Off Characteristics						
Drain-Source Breakdown Voltage	BV _{DSS}	V _{GS} =0V I _D =-250μA	-40	-	-	V
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} =-40V, V _{GS} =0V	-	-	-1	μA
Gate-Body Leakage Current	I _{GSS}	V _{GS} =±20V, V _{DS} =0V	-	-	±100	nA
On Characteristics (Note 3)						
Gate Threshold Voltage	V _{GS(th)}	V _{DS} =V _{GS} , I _D =-250μA	-1.0	-1.5	-2.0	V
Drain-Source On-State Resistance	R _{DS(ON)}	V _{GS} =-10V, I _D =-15A	-	29	35	mΩ
		V _{GS} =-4.5V, I _D =-10A	-	34	45	mΩ
Forward Transconductance	g _{FS}	V _{DS} =-5V, I _D =-15A	-	10	-	S
Dynamic Characteristics (Note4)						
Input Capacitance	C _{iss}	V _{DS} =-20V, V _{GS} =0V, F=1.0MHz	-	1060	-	pF
Output Capacitance	C _{oss}		-	121	-	pF
Reverse Transfer Capacitance	C _{rss}		-	111	-	pF
Switching Characteristics (Note 4)						
Turn-on Delay Time	t _{d(on)}	V _{DD} =-20V, R _L =1Ω, V _{GS} =-10V, R _G =3Ω	-	8	-	nS
Turn-on Rise Time	t _r		-	4	-	nS
Turn-Off Delay Time	t _{d(off)}		-	32	-	nS
Turn-Off Fall Time	t _f		-	7	-	nS
Total Gate Charge	Q _g	V _{DS} =-20, I _D =-15A, V _{GS} =-10V	-	26	-	nC
Gate-Source Charge	Q _{gs}		-	3.7	-	nC
Gate-Drain Charge	Q _{gd}		-	6.0	-	nC
Drain-Source Diode Characteristics						
Diode Forward Voltage (Note 3)	V _{SD}	V _{GS} =0V, I _S =-15A	-	-	-1.2	V
Diode Forward Current (Note 2)	I _S		-	-	-15	A
Reverse Recovery Time	t _{rr}	T _J = 25°C, I _F =- 15A	-	25	-	nS
Reverse Recovery Charge	Q _{rr}	di/dt = -100A/μs ^(Note3)	-	31	-	nC

Notes:

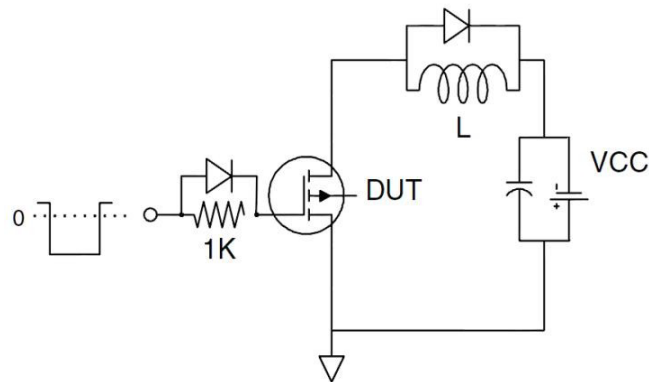
1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. Surface Mounted on FR4 Board, t ≤ 10 sec.
3. Pulse Test: Pulse Width ≤ 300μs, Duty Cycle ≤ 2%.
4. Guaranteed by design, not subject to production
5. EAS condition: T_J=25°C, V_{DD}=-20V, V_G=-10V, L=0.5mH, R_G=25Ω

Test Circuit

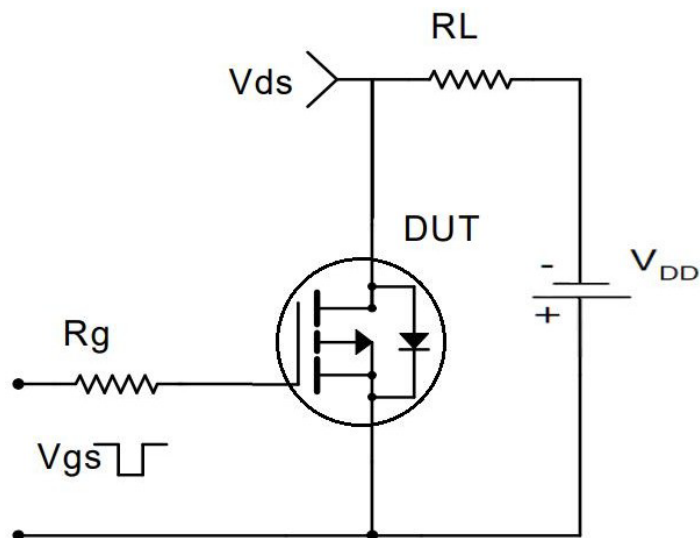
1) E_{AS} test Circuit



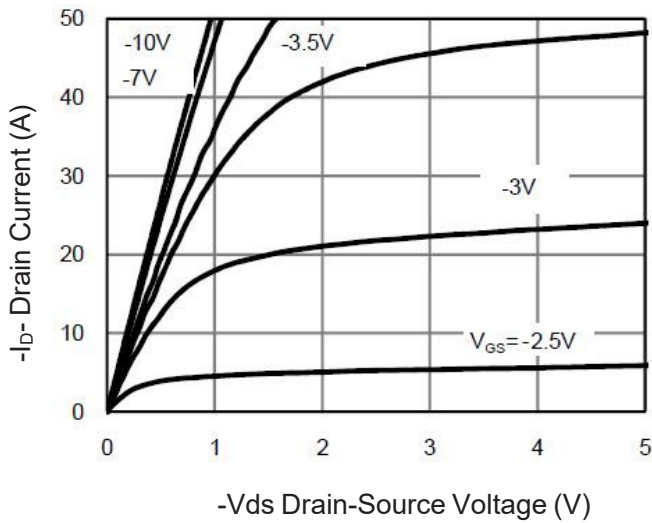
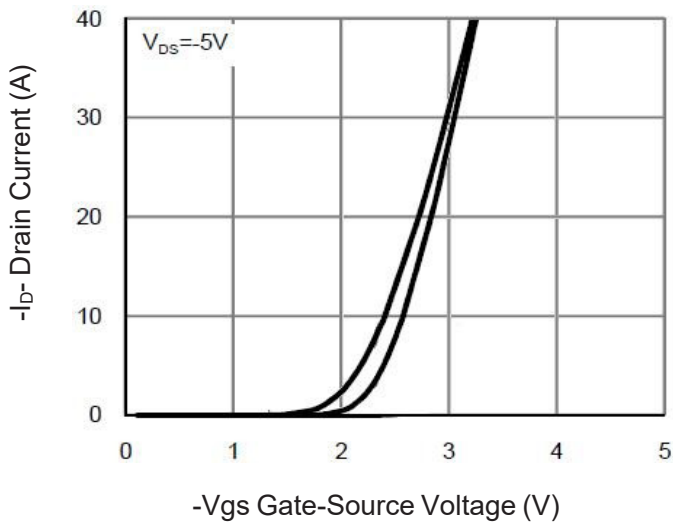
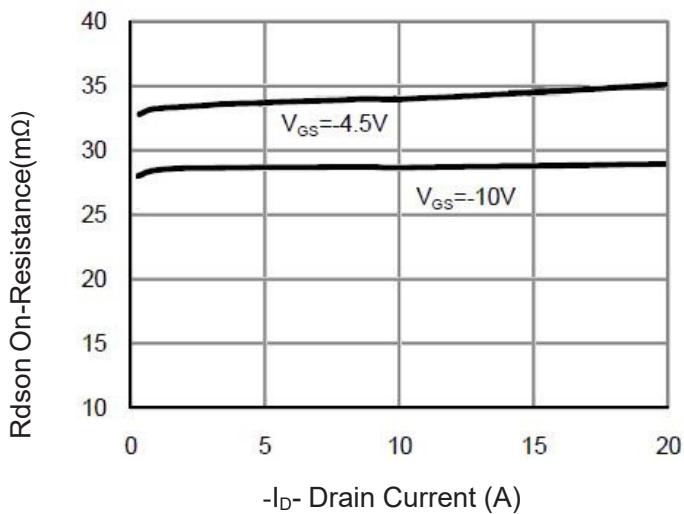
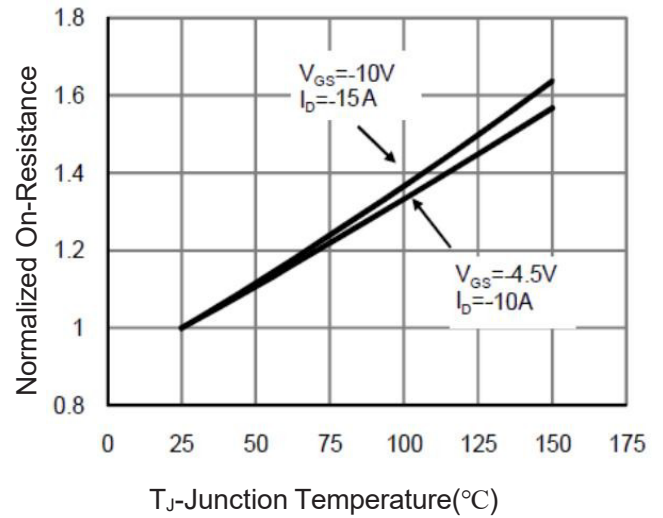
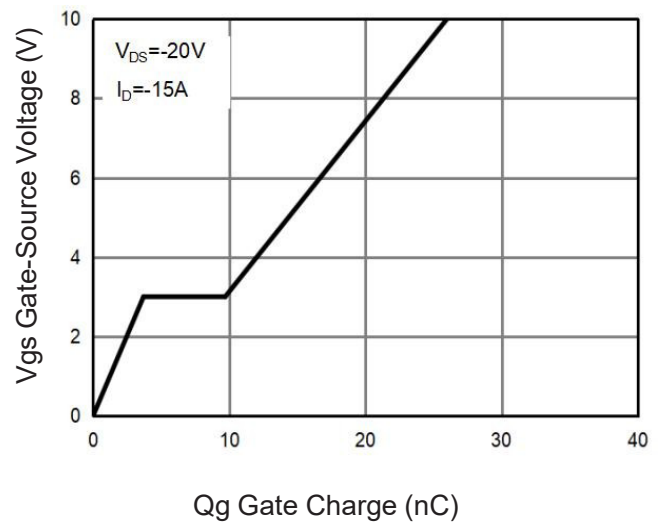
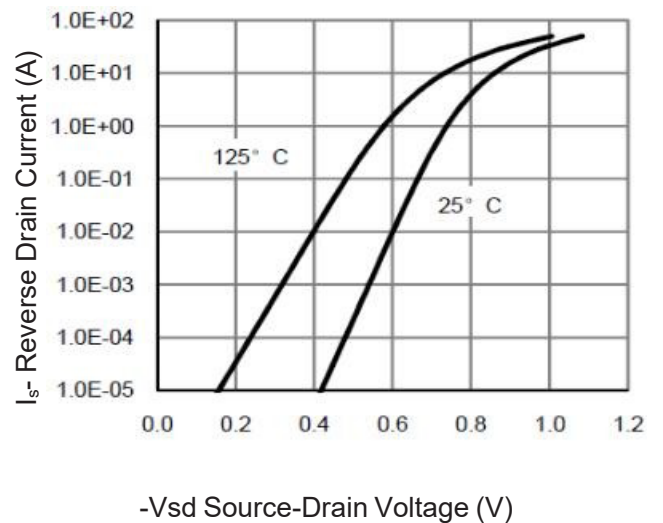
2) Gate charge test Circuit

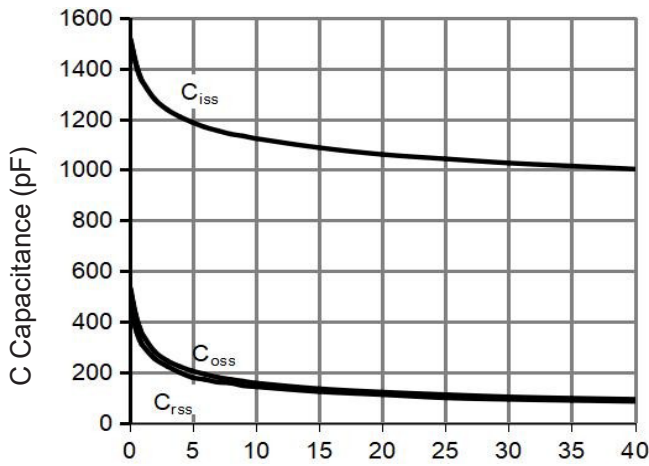


3) Switch Time Test Circuit

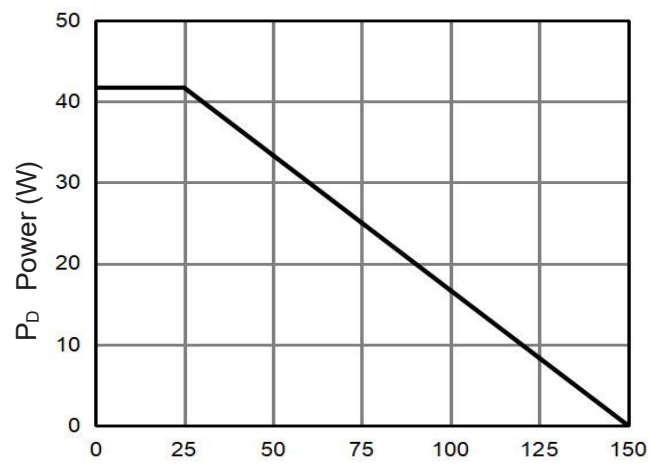


P- Channel Typical Electrical and Thermal Characteristics (Curves)

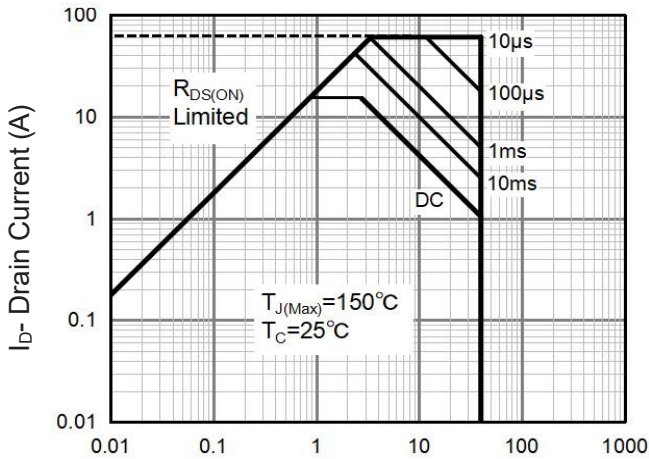

Figure 1 Output Characteristics

Figure 2 Transfer Characteristics

Figure 3 Rdson- Drain Current

Figure 4 Rdson-Junction Temperature

Figure 5 Gate Charge

Figure 6 Source- Drain Diode Forward



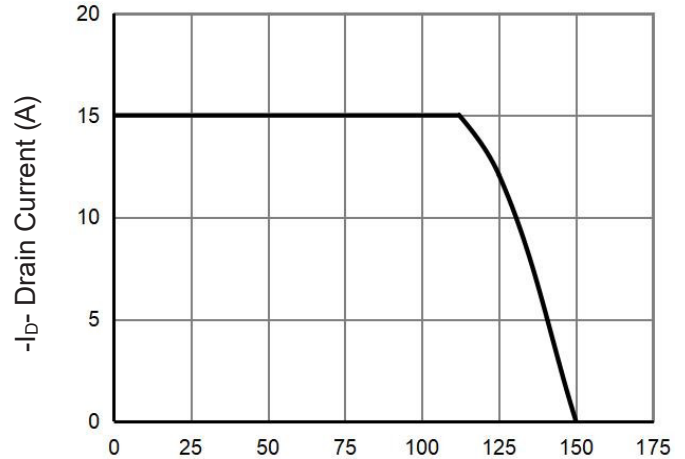
-Vds Drain-Source Voltage (V)
Figure 7 Capacitance vs Vds



T_C -Case Temperature(°C)
Figure 9 Power Dissipation



-Vds Drain-Source Voltage (V)
Figure 8 Safe Operation Area



T_C -Case Temperature(°C)
Figure 10 ID Current De-rating

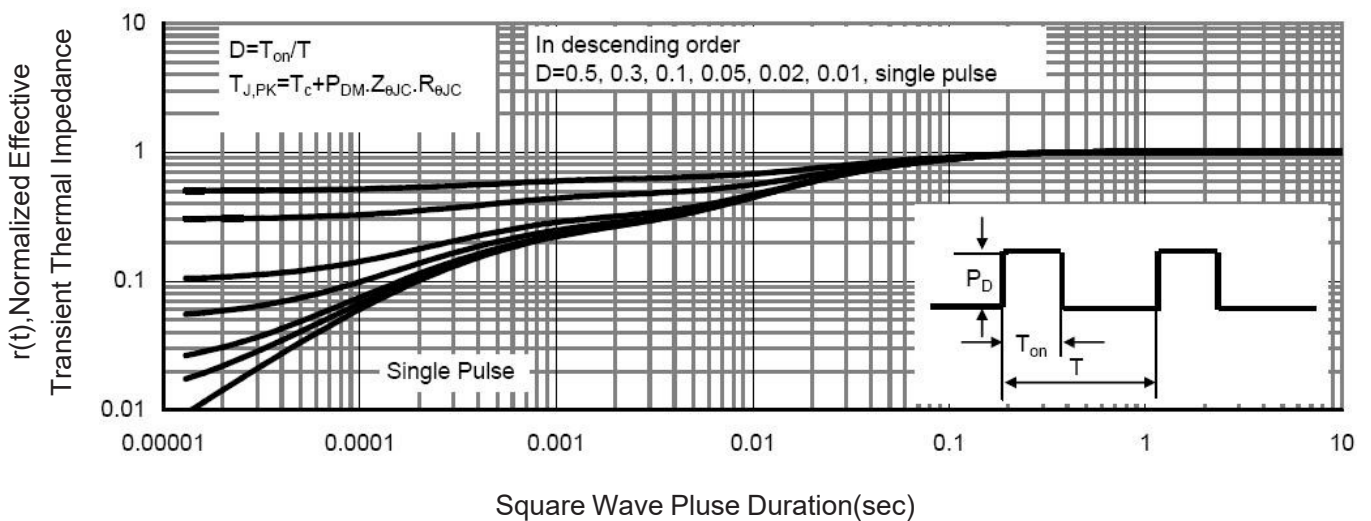


Figure 11 Normalized Maximum Transient Thermal Impedance