

Description

The VSM6004 uses advanced trench technology to provide excellent $R_{DS(ON)}$, low gate charge. This device is suitable for use as a Battery protection or in other switching application.

General Features

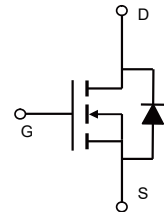
- $V_{DS} = 60V, I_D = 4A$
 $R_{DS(ON)} < 50m\Omega @ V_{GS}=10V$
 $R_{DS(ON)} < 80m\Omega @ V_{GS}=4.5V$
- High power and current handling capability
- Lead free product is acquired
- Surface mount package

Application

- Battery switch
- DC/DC converter



SOT-23



Schematic

Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
VSM6004	VSM6004-S2	SOT-23	Ø180mm	8 mm	3000 units

Absolute Maximum Ratings ($T_A=25^{\circ}C$ unless otherwise noted)

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	V_{DS}	60	V
Gate-Source Voltage	V_{GS}	± 20	V
Drain Current-Continuous	I_D	4	A
Drain Current-Pulsed (Note 1)	I_{DM}	16	A
Single pulse avalanche energy (Note 5)	E_{AS}	36	mJ
Maximum Power Dissipation	P_D	1.7	W
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-55 To 150	$^{\circ}C$

Thermal Characteristic

Thermal Resistance, Junction-to-Ambient (Note 2)	$R_{\theta JA}$	73.5	$^{\circ}C/W$
Thermal Resistance, Junction-to-Case (Note 2)	$R_{\theta JC}$	55	$^{\circ}C/W$

Electrical Characteristics (T_A=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	60	-	-	V
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} =60V, 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	1.2	1.8	2.5	V
Drain-Source On-State Resistance	R _{DS(ON)}	V _{GS} =10V, I _D =4A	-	38	50	mΩ
		V _{GS} =4.5V, I _D =4A	-	58	80	mΩ
Forward Transconductance	g _{FS}	V _{DS} =5V, I _D =4A	-	3	-	S
Dynamic Characteristics (Note4)						
Input Capacitance	C _{iss}	V _{DS} =30V, V _{GS} =0V, F=1.0MHz	-	553	-	pF
Output Capacitance	C _{oss}		-	43	-	pF
Reverse Transfer Capacitance	C _{rss}		-	37	-	pF
Switching Characteristics (Note 4)						
Turn-on Delay Time	t _{d(on)}	V _{DD} =30V, I _D =4A V _{GS} =10V, R _{GEN} =1Ω	-	6	-	nS
Turn-on Rise Time	t _r		-	11	-	nS
Turn-Off Delay Time	t _{d(off)}		-	18	-	nS
Turn-Off Fall Time	t _f		-	10	-	nS
Total Gate Charge	Q _g	V _{DS} =30V, I _D =4A, V _{GS} =10V	-	11.4	-	nC
Gate-Source Charge	Q _{gs}		-	1.7	-	nC
Gate-Drain Charge	Q _{gd}		-	2.6	-	nC
Drain-Source Diode Characteristics						
Diode Forward Voltage (Note 3)	V _{SD}	V _{GS} =0V, I _S =4A	-	-	1.2	V
Diode Forward Current (Note 2)	I _S		-	-	4	A

Notes:

1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. The value of R_{θJA} is measured with the device mounted on 1in 2 FR-4 board with 2oz. Copper, in a still air environment with T_A=25°C. The value in any given application depends on the user's specific board design.
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}=30V, V_G=10V, L=0.5mH, R_g=25Ω

Typical Electrical and Thermal Characteristics

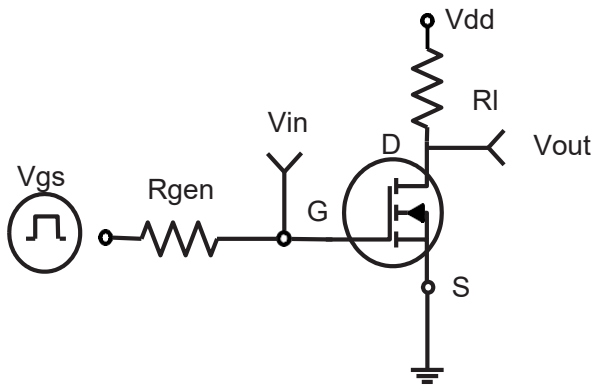


Figure 1: Switching Test Circuit

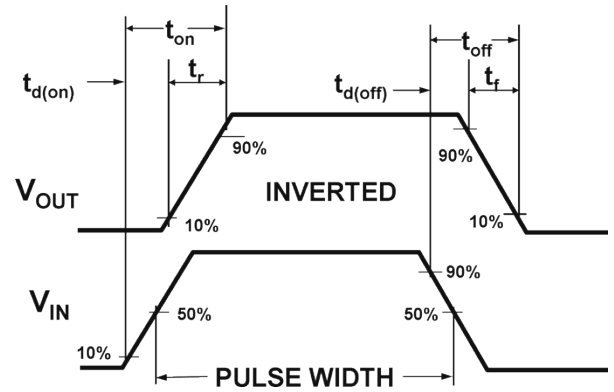


Figure 2: Switching Waveforms

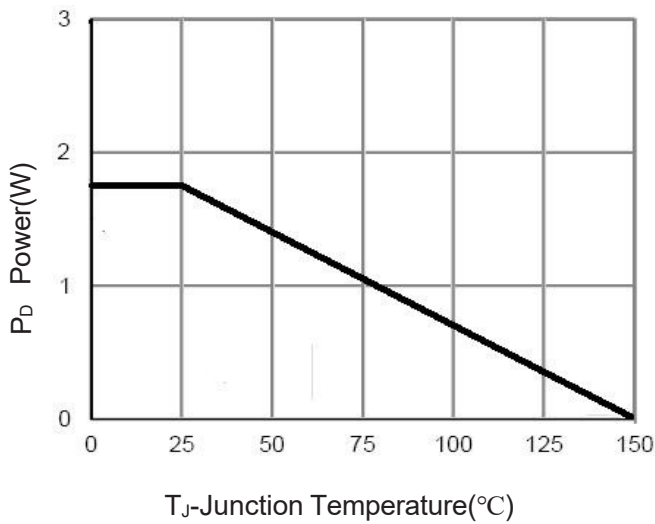


Figure 3 Power Dissipation

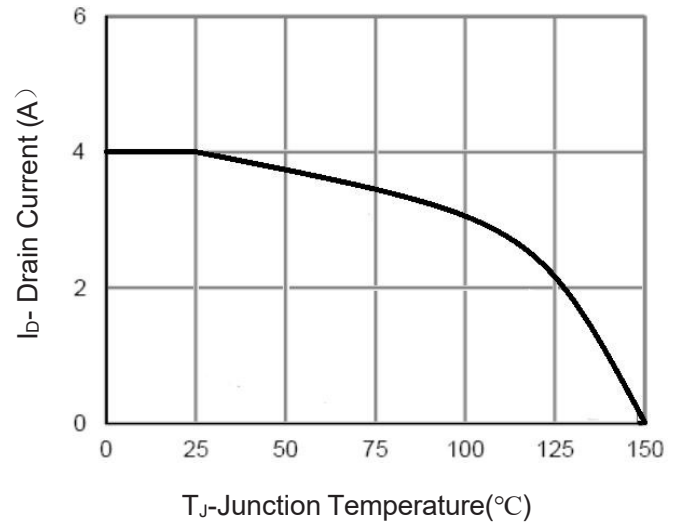


Figure 4 Drain Current

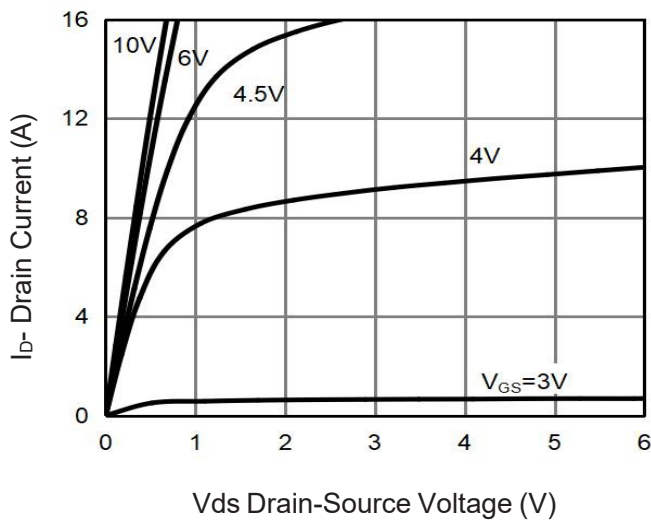


Figure 5 Output Characteristics

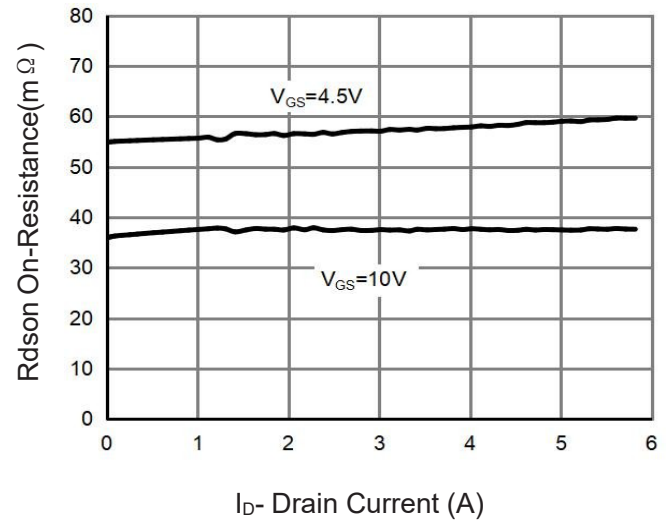
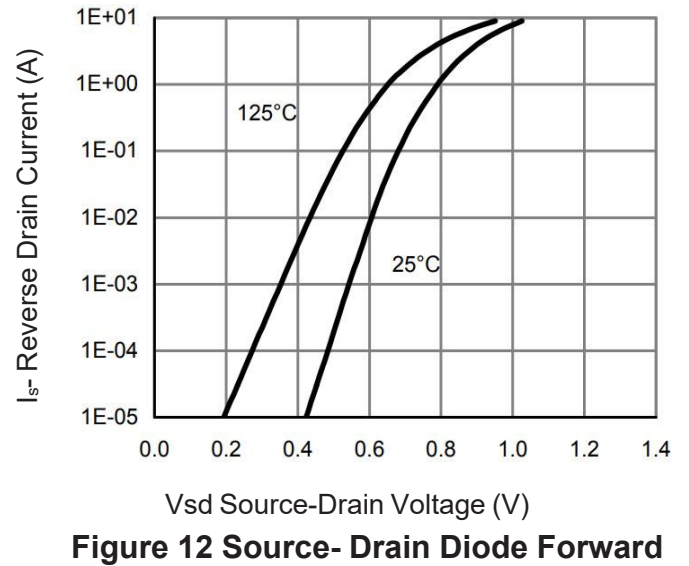
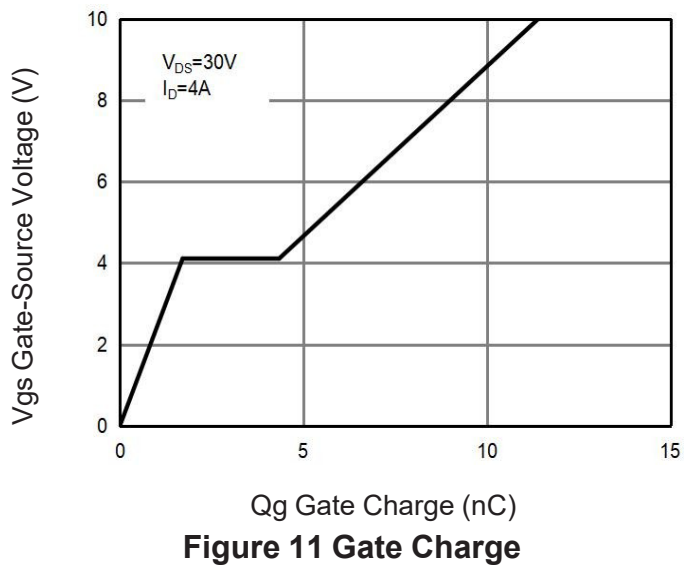
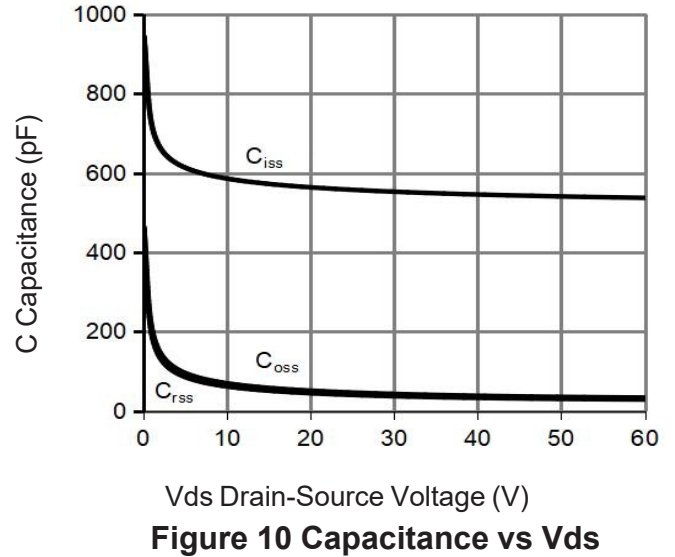
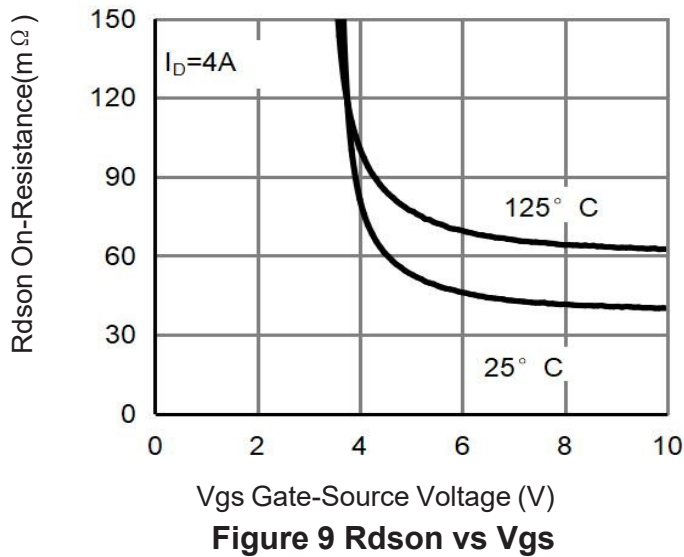
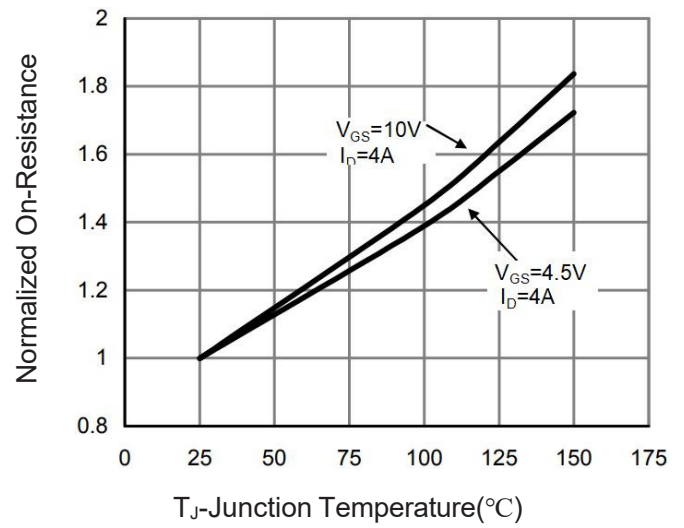
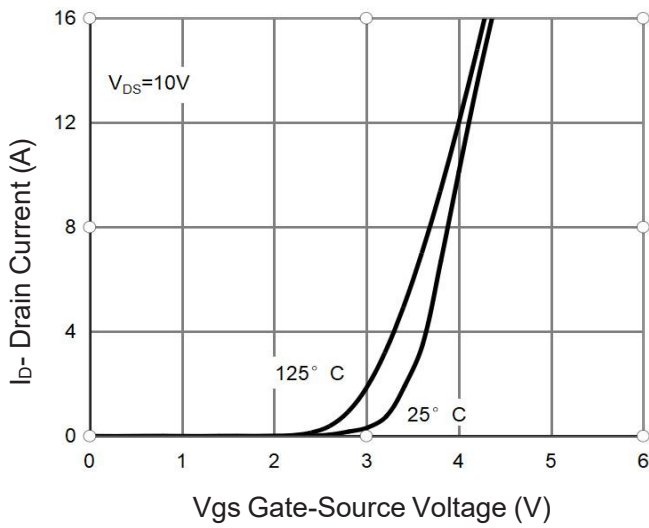


Figure 6 Drain-Source On-Resistance



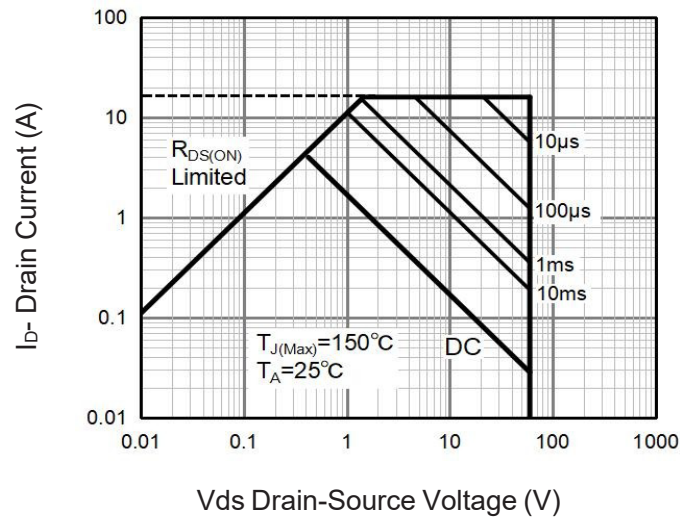


Figure 13 Safe Operation Area

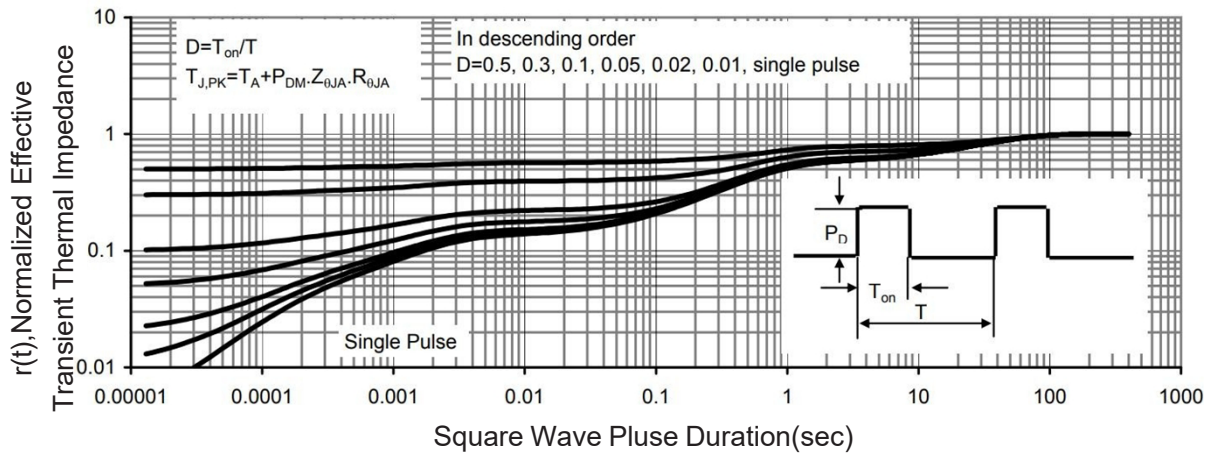


Figure 14 Normalized Maximum Transient Thermal Impedance