

Description

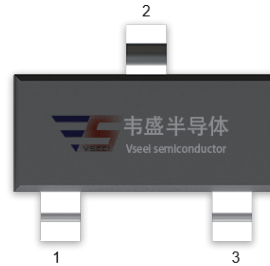
The VSM2304 uses advanced trench technology to provide excellent $R_{DS(ON)}$ and low gate charge. This device is suitable for use as a load switch or in PWM applications.

General Features

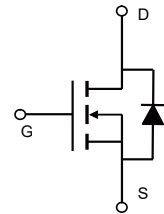
- $V_{DS} = 30V, I_D = 3.6A$
 $R_{DS(ON)} < 73m\Omega @ V_{GS}=4.5V$
 $R_{DS(ON)} < 46m\Omega @ V_{GS}=10V$
- High power and current handling capability
- Lead free product is acquired
- Surface mount package
- Pb free terminal plating
- RoHS compliant
- Halogen free

Application

- Battery protection
- Load switch
- Power management



SOT-23



Schematic

Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
VSM2304	VSM2304-S2	SOT-23	Ø180mm	8 mm	3000 units

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

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	V_{DS}	30	V
Gate-Source Voltage	V_{GS}	± 20	V
Drain Current-Continuous	I_D	3.6	A
Drain Current-Pulsed (Note 1)	I_{DM}	15	A
Maximum Power Dissipation	P_D	1.7	W
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-55 To 150	$^\circ\text{C}$

Thermal Characteristic

Thermal Resistance, Junction-to-Ambient (Note 2)	$R_{\theta JA}$	73.5	$^\circ\text{C/W}$
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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}	$V_{GS}=0V, I_D=250\mu A$	30	33	-	V
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS}=30V, V_{GS}=0V$	-	-	1	μA

Parameter	Symbol	Condition	Min	Typ	Max	Unit
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	1.05	1.5	2.1	V
Drain-Source On-State Resistance	R _{DS(ON)}	V _{GS} =4.5V, I _D =3.1A	-	61	73	mΩ
		V _{GS} =10V, I _D =3.6A	-	39	46	mΩ
Forward Transconductance	g _{FS}	V _{DS} =5V, I _D =3.6A	-	11	-	S
Dynamic Characteristics (Note4)						
Input Capacitance	C _{iss}	V _{DS} =15V, V _{GS} =0V, F=1.0MHz	-	230	-	PF
Output Capacitance	C _{oss}		-	40	-	PF
Reverse Transfer Capacitance	C _{rss}		-	17	-	PF
Switching Characteristics (Note 4)						
Turn-on Delay Time	t _{d(on)}	V _{DD} =10V, I _b =3.6A V _{GS} =4.5V, R _{GEN} =6Ω	-	10	-	nS
Turn-on Rise Time	t _r		-	50	-	nS
Turn-Off Delay Time	t _{d(off)}		-	10	-	nS
Turn-Off Fall Time	t _f		-	20	-	nS
Total Gate Charge	Q _g	V _{DS} =15V, I _D =3.6A, V _{GS} =10V	-	4.0	-	nC
Gate-Source Charge	Q _{gs}		-	0.75	-	nC
Gate-Drain Charge	Q _{gd}		-	0.65	-	nC
Drain-Source Diode Characteristics						
Diode Forward Voltage (Note 3)	V _{SD}	V _{GS} =0V, I _s =3.6A	-	0.8	1.2	V
Diode Forward Current (Note 2)	I _s		-	-	3.6	A

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

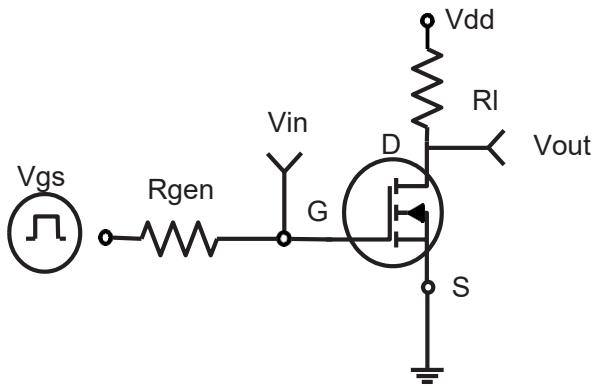


Figure 1: Switching Test Circuit

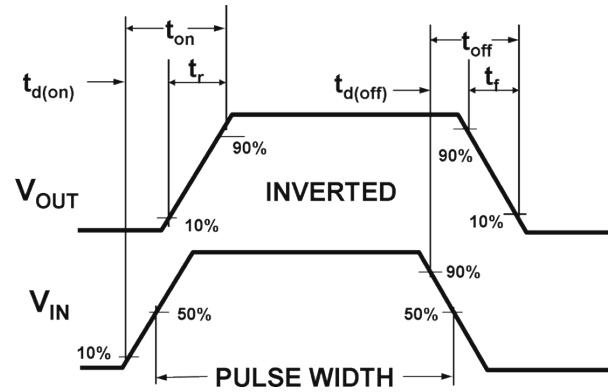


Figure 2: Switching Waveforms

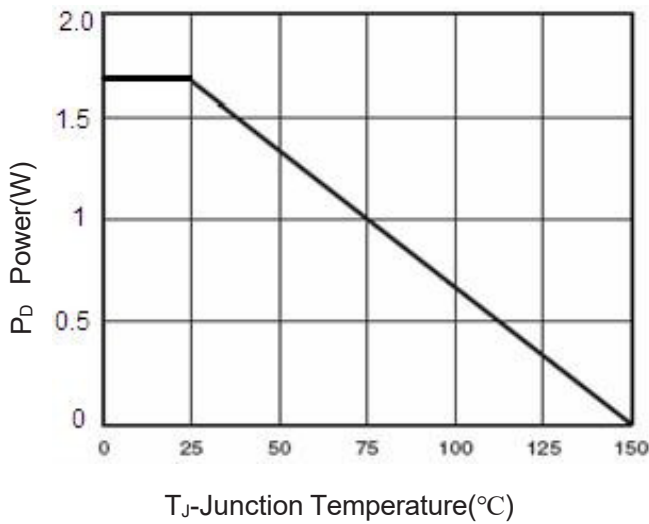


Figure 3 Power Dissipation

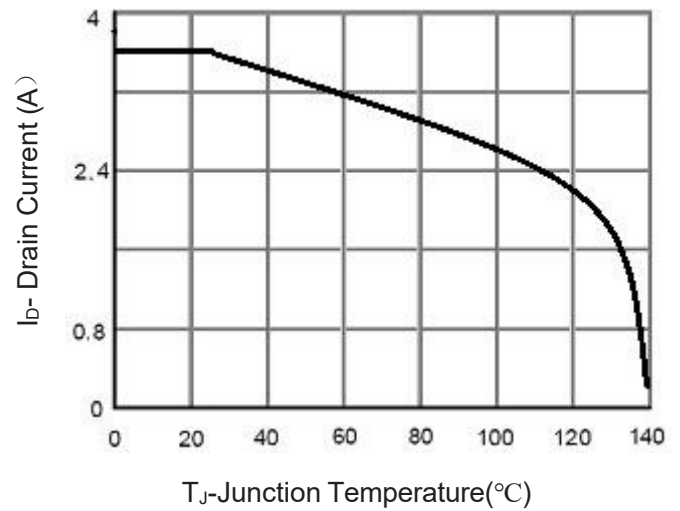


Figure 4 Drain Current

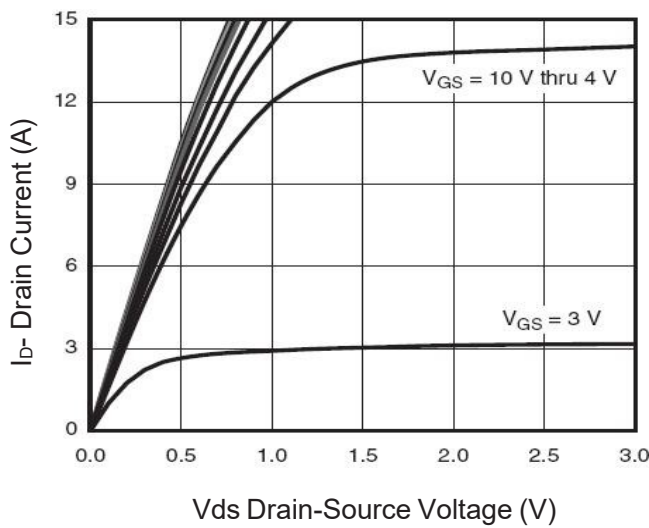


Figure 5 Output Characteristics

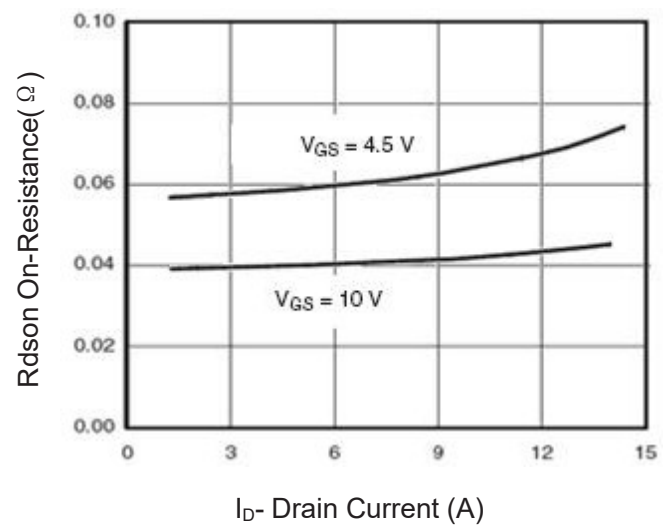
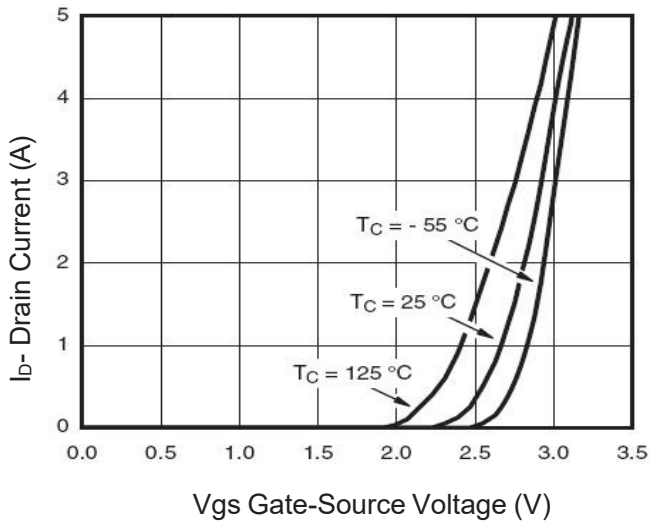
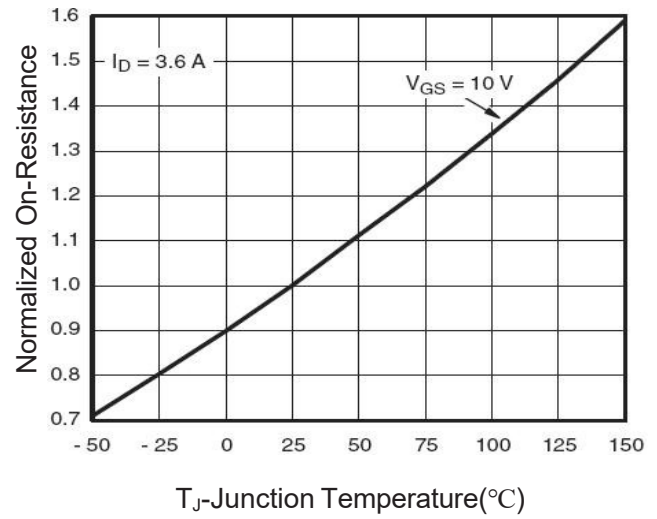
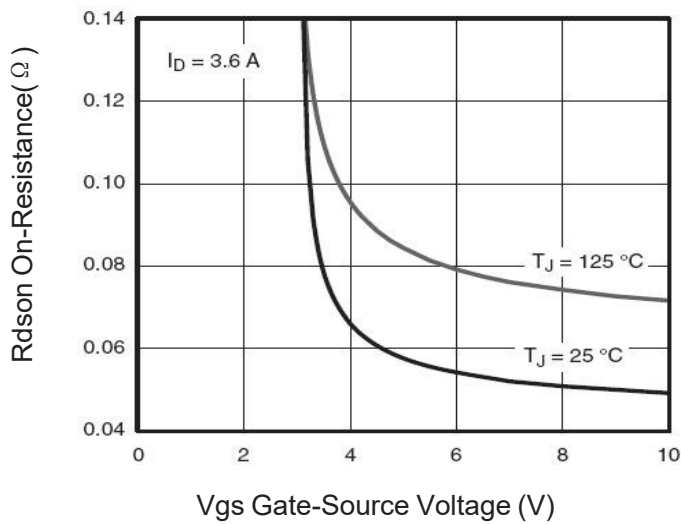
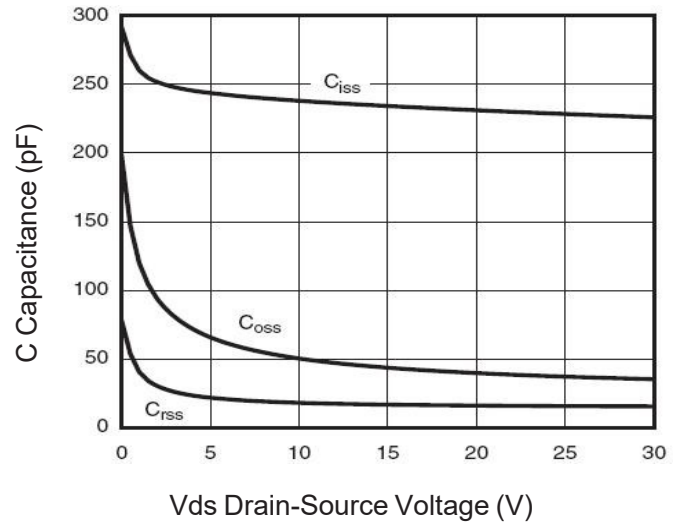
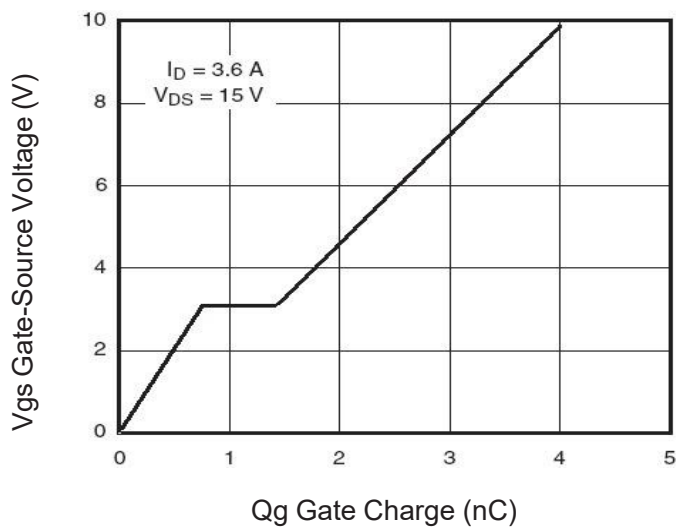
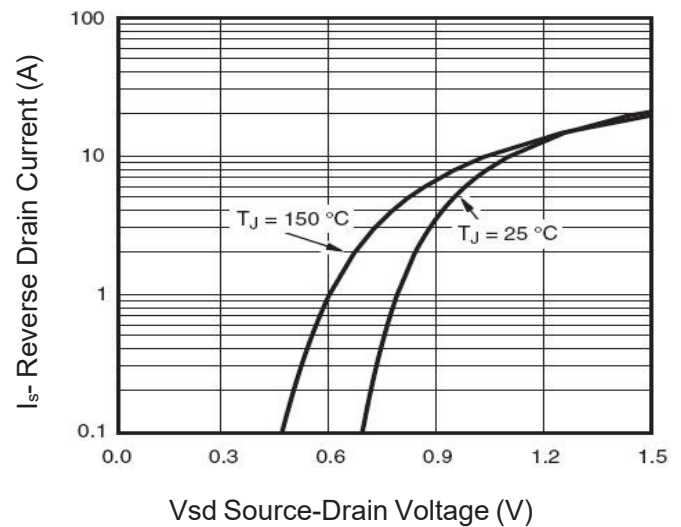
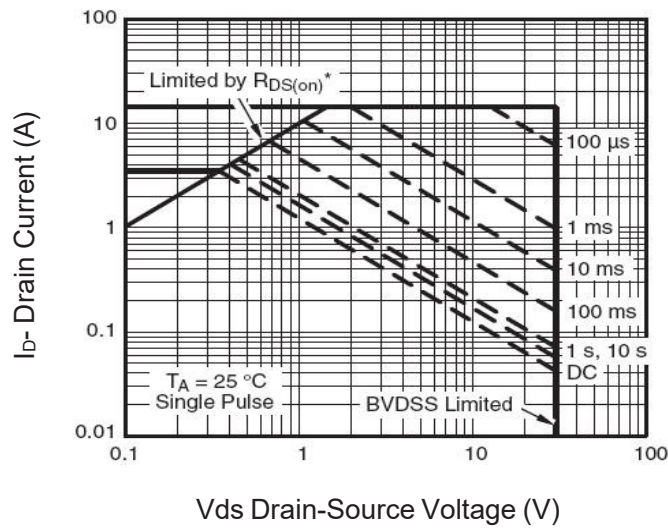
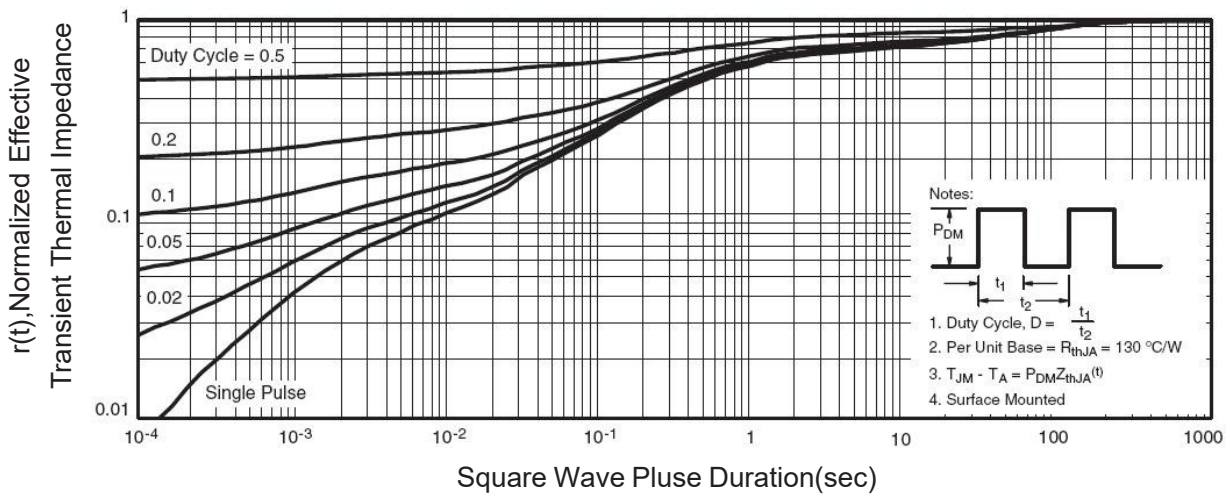


Figure 6 Drain-Source On-Resistance


Figure 7 Transfer Characteristics

Figure 8 Drain-Source On-Resistance

Figure 9 $R_{DS(on)}$ vs V_{GS}

Figure 10 Capacitance vs V_{DS}

Figure 11 Gate Charge

Figure 12 Source- Drain Diode Forward


Figure 13 Safe Operation Area

Figure 14 Normalized Maximum Transient Thermal Impedance