

Description

The VSM2305 uses advanced trench technology to provide excellent $R_{DS(ON)}$, low gate charge and operation with gate voltages as low as 2.5V. This device is suitable for use as a load switch or in PWM applications.

General Features

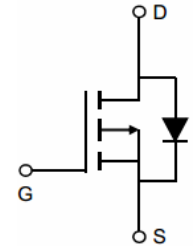
- $V_{DS} = -20V, I_D = -4.1A$
 $R_{DS(ON)} < 60m\Omega @ V_{GS} = -2.5V$
 $R_{DS(ON)} < 45m\Omega @ V_{GS} = -4.5V$
- High power and current handling capability
- Surface mount package
- Pb free terminal plating
- RoHS compliant
- Halogen free

Application

- PWM applications
- Load switch
- Power management



SOT-23-3



Schematic Diagram

Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
VSM2305-S2	VSM2305	SOT-23-3	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}	-20	V
Gate-Source Voltage		V_{GS}	± 12	V
Continuous Drain Current	$T_C = 25^\circ\text{C}$	I_D	-5.4	A
	$T_C = 70^\circ\text{C}$		-4.3	
	$T_A = 25^\circ\text{C}$		-4.1	
	$T_A = 70^\circ\text{C}$		-3.2	
Drain Current -Pulsed (Note 1)		I_{DM}	-20	A
Maximum Power Dissipation	$T_C = 25^\circ\text{C}$	P_D	1.7	W
	$T_C = 70^\circ\text{C}$		1.1	
	$T_A = 25^\circ\text{C}$		1.0	
	$T_A = 70^\circ\text{C}$		0.65	
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)	$R_{\theta JA}$	125	$^\circ\text{C/W}$
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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 =-250μA	-20	-	-	V
Parameter	Symbol	Condition	Min	Typ	Max	Unit
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} =-20V, V _{GS} =0V	-	-	-1	μA
Gate-Body Leakage Current	I _{GSS}	V _{GS} =±12V, V _{DS} =0V	-	-	±100	nA
On Characteristics ^(Note 3)						
Gate Threshold Voltage	V _{GS(th)}	V _{DS} =V _{GS} , I _D =-250μA	-0.45	-0.7	-1.0	V
Drain-Source On-State Resistance	R _{DS(ON)}	V _{GS} =-4.5V, I _D =-4.1A	-	34	45	mΩ
		V _{GS} =-2.5V, I _D =-3A	-	44	60	
Forward Transconductance	g _{FS}	V _{DS} =-5V, I _D =-4.1A	-	6	-	S
Dynamic Characteristics ^(Note4)						
Input Capacitance	C _{iss}	V _{DS} =-4V, V _{GS} =0V, F=1.0MHz	-	740	-	PF
Output Capacitance	C _{oss}		-	290	-	PF
Reverse Transfer Capacitance	C _{rss}		-	190	-	PF
Switching Characteristics ^(Note 4)						
Turn-on Delay Time	t _{d(on)}	V _{DD} =-4V, ,R _L =-1.2Ω, V _{GEN} =-4.5V, R _g =1Ω	-	12	-	nS
Turn-on Rise Time	t _r		-	35	-	nS
Turn-Off Delay Time	t _{d(off)}		-	30	-	nS
Turn-Off Fall Time	t _f		-	10	-	nS
Total Gate Charge	Q _g	V _{DS} =-4V, I _D =-4.1A, V _{GS} =-4.5V	-	7.8	-	nC
Gate-Source Charge	Q _{gs}		-	1.2	-	nC
Gate-Drain Charge	Q _{gd}		-	1.6	-	nC
Drain-Source Diode Characteristics						
Diode Forward Voltage ^(Note 3)	V _{SD}	V _{GS} =0V, I _S =-4.1A	-	-	-1.2	V
Diode Forward Current ^(Note 2)	I _S		-	-	-4.1	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

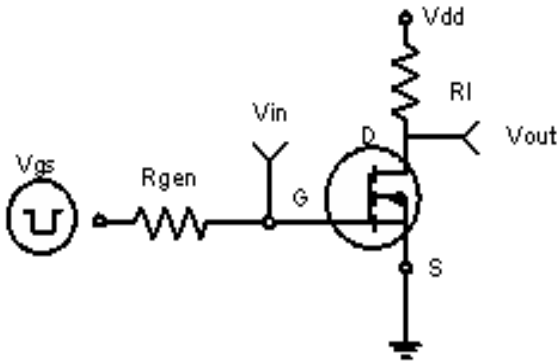


Figure 1: Switching Test Circuit

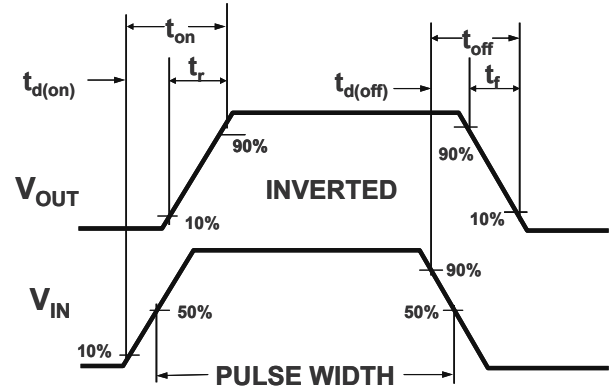


Figure 2: Switching Waveforms

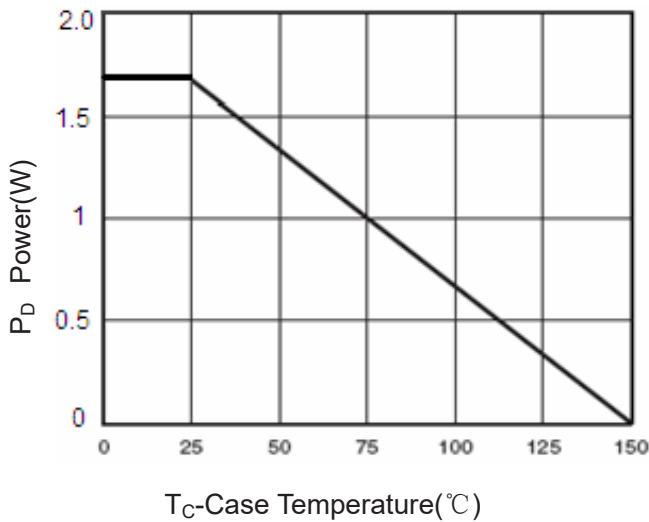


Figure 3 Power Dissipation

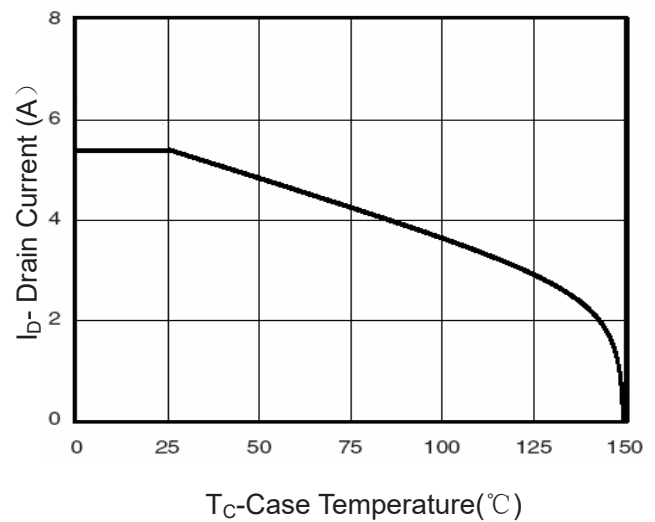


Figure 4 Drain Current

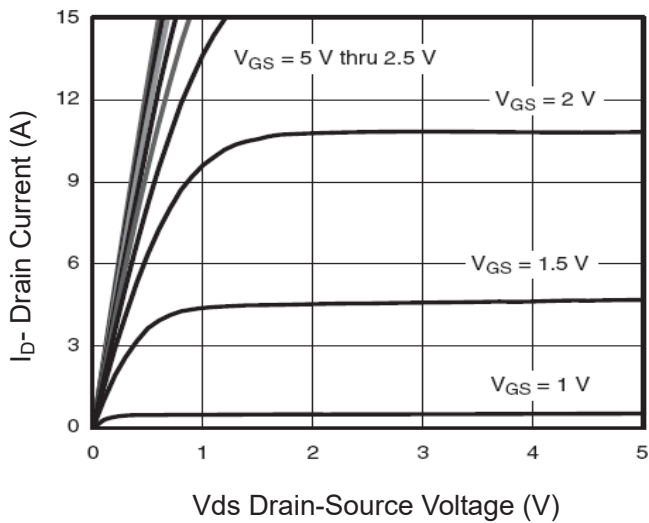


Figure 5 Output Characteristics

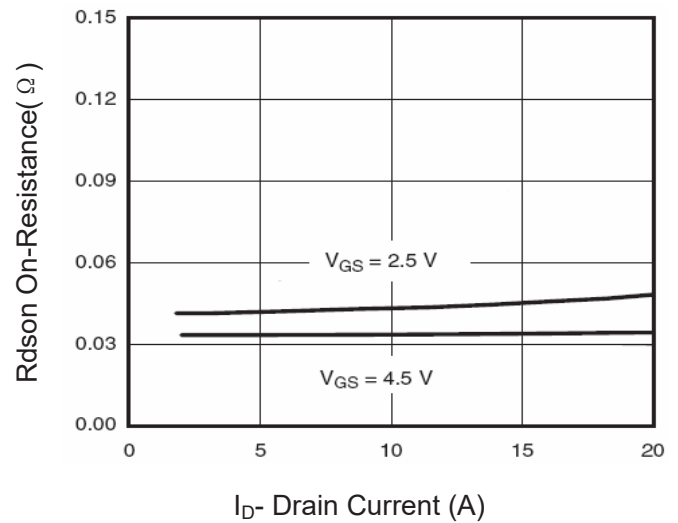
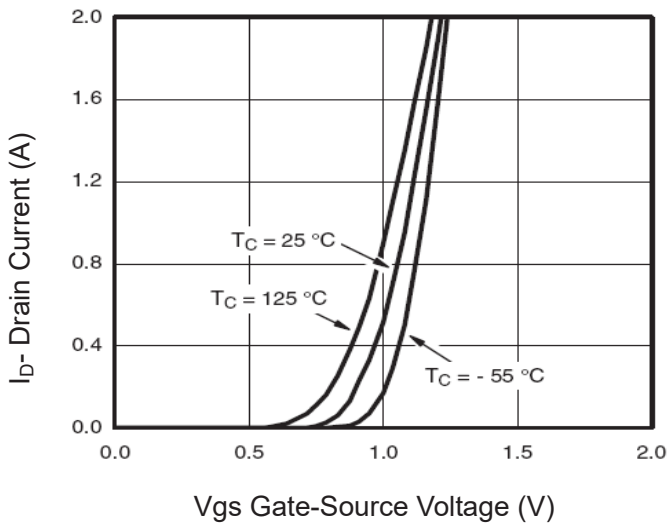
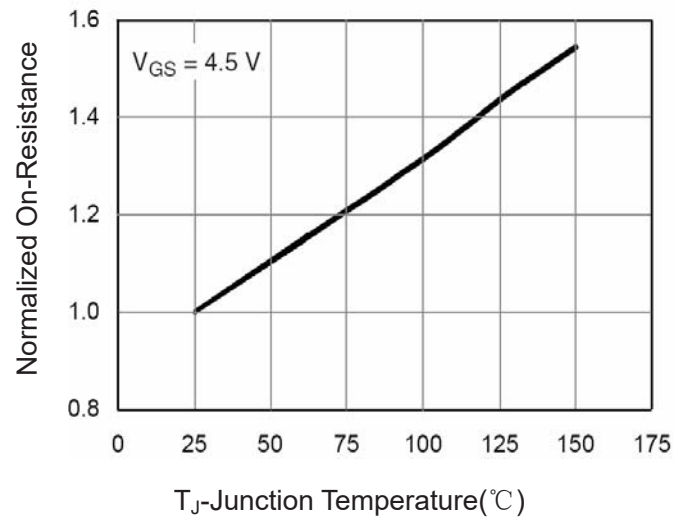
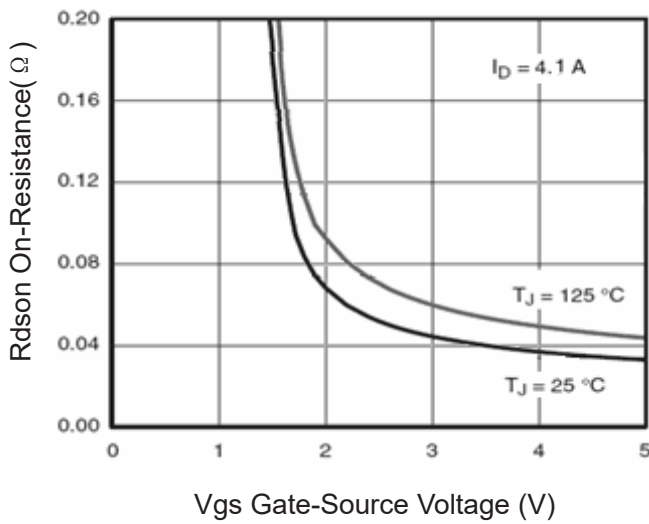
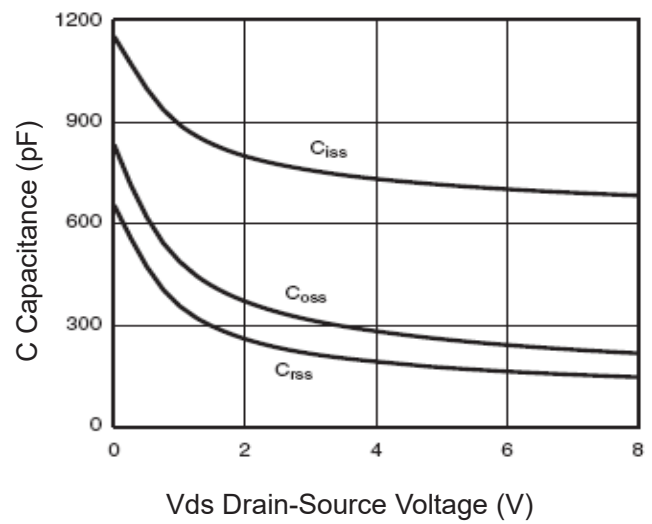
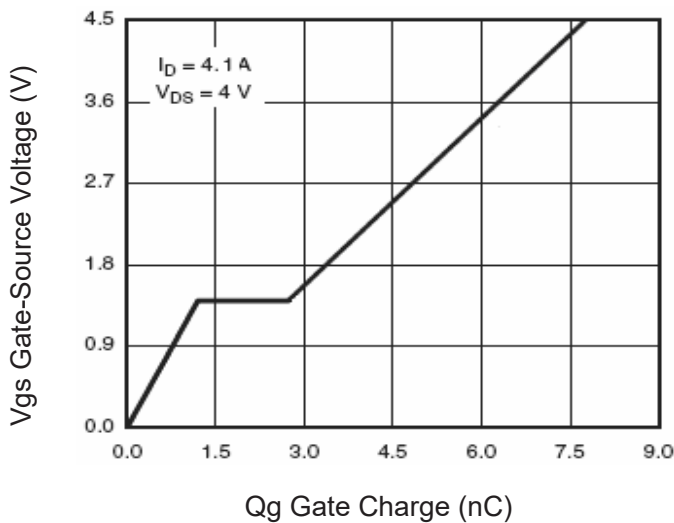
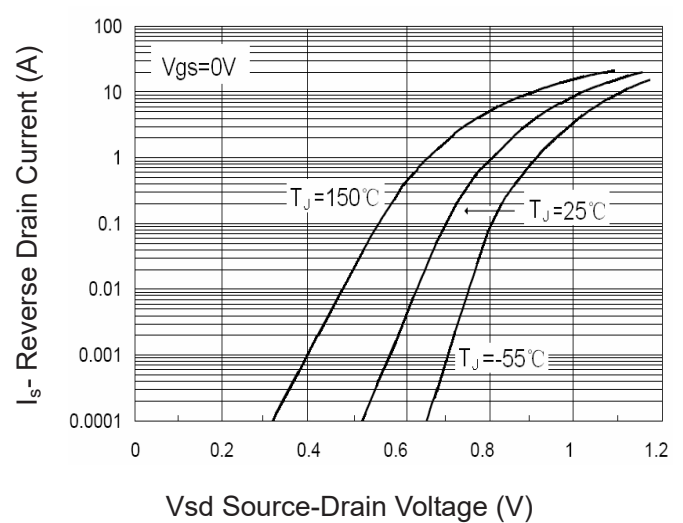


Figure 6 Drain-Source On-Resistance


Figure 7 Transfer Characteristics

Figure 8 Drain-Source On-Resistance

Figure 9 Rdson vs Vgs

Figure 10 Capacitance vs Vds

Figure 11 Gate Charge

Figure 12 Source- Drain Diode Forward

