

## Description

The VSM2321 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

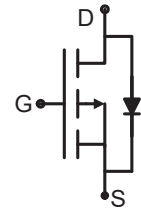
- $V_{DS} = -20V, I_D = -3.9A$   
 $R_{DS(ON)} < 70m\Omega @ V_{GS} = -2.5V$   
 $R_{DS(ON)} < 50m\Omega @ V_{GS} = -4.5V$
- High power and current handling capability
- Lead free product is acquired
- Surface mount package

## Application

- PA switch
- Load switch
- Power management



SOT-23-3



Schematic Diagram

## Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
VSM2321-S2	VSM2321	SOT-23-3	Ø180mm	8 mm	3000 units

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

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	$V_{DS}$	-20	V
Gate-Source Voltage	$V_{GS}$	$\pm 12$	V
Drain Current -Continuous	$I_D$	-3.9	A
Drain Current -Pulsed <sup>(Note 1)</sup>	$I_{DM}$	-12	A
Maximum Power Dissipation	$P_D$	1.4	W
Operating Junction and Storage Temperature Range	$T_J, T_{STG}$	-55 To 150	$^\circ C$

## Thermal Characteristic

Thermal Resistance, Junction-to-Ambient <sup>(Note 2)</sup>	$R_{\theta JA}$	89	$^\circ C/W$
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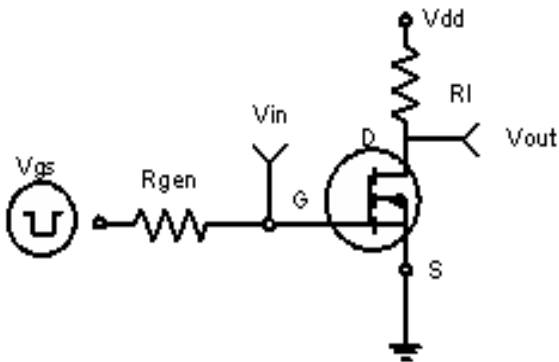
**Electrical Characteristics ( $T_A=25^{\circ}\text{C}$  unless otherwise noted)**

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Off Characteristics						
Drain-Source Breakdown Voltage	$BV_{DSS}$	$V_{GS}=0V, I_D=-250\mu A$	-20	-	-	V
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS}=-20V, V_{GS}=0V$	-	-	-1	$\mu A$
Gate-Body Leakage Current	$I_{GSS}$	$V_{GS}=\pm 12V, V_{DS}=0V$	-	-	$\pm 100$	nA
On Characteristics (Note 3)						
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=-250\mu A$	-0.45	-0.7	-1.0	V
Drain-Source On-State Resistance	$R_{DS(ON)}$	$V_{GS}=-4.5V, I_D=-3.3A$	-	37	50	m $\Omega$
		$V_{GS}=-2.5V, I_D=-3.0A$	-	48	70	
Forward Transconductance	$g_{FS}$	$V_{DS}=-5V, I_D=-3.0A$	5	-	-	S
Dynamic Characteristics (Note4)						
Input Capacitance	$C_{ISS}$	$V_{DS}=-10V, V_{GS}=0V,$ $F=1.0MHz$	-	560	-	PF
Output Capacitance	$C_{OSS}$		-	80	-	PF
Reverse Transfer Capacitance	$C_{RSS}$		-	70	-	PF
Switching Characteristics (Note 4)						
Turn-on Delay Time	$t_{d(on)}$	$V_{DD}=-10V, I_D=-3.3A,$ $R_L=2.2\Omega, V_{GS}=-4.5V, R_g=6\Omega$	-	12	-	nS
Turn-on Rise Time	$t_r$		-	35	-	nS
Turn-Off Delay Time	$t_{d(off)}$		-	55	-	nS
Turn-Off Fall Time	$t_f$		-	40	-	nS
Total Gate Charge	$Q_g$	$V_{DS}=-10V, I_D=-3.3A, V_{GS}=-4.5V$	-	8.5	-	nC
Gate-Source Charge	$Q_{gs}$		-	1.2	-	nC
Gate-Drain Charge	$Q_{gd}$		-	2.1	-	nC
Drain-Source Diode Characteristics						
Diode Forward Voltage (Note 3)	$V_{SD}$	$V_{GS}=0V, I_S=-3.9A$	-	-	-1.2	V
Diode Forward Current (Note 2)	$I_S$		-	-	-3.9	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

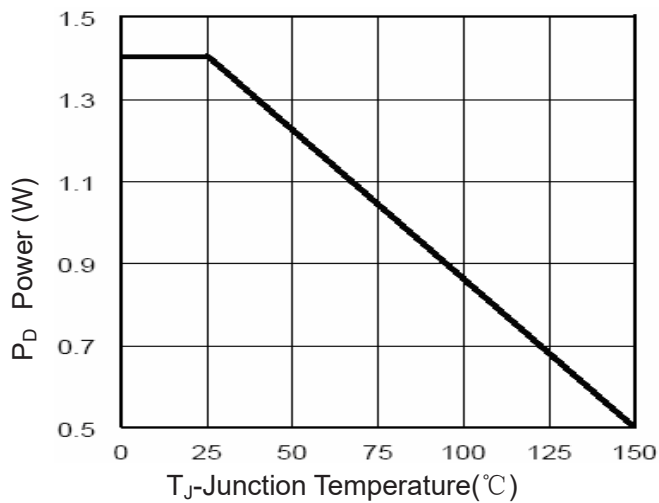
## Typical Electrical and Thermal Characteristics



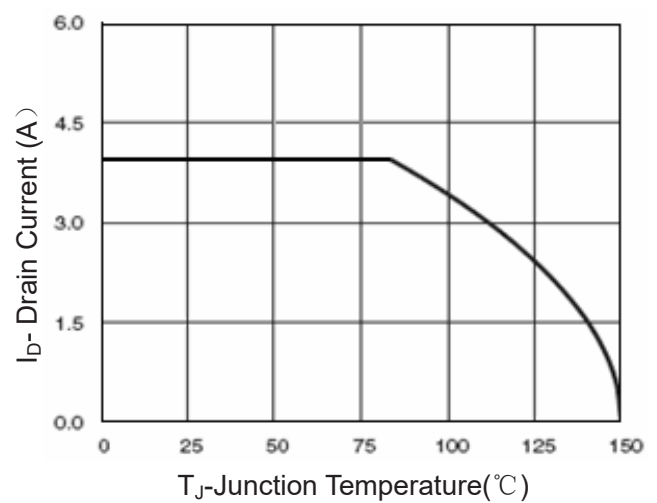
**Figure 1: Switching Test Circuit**



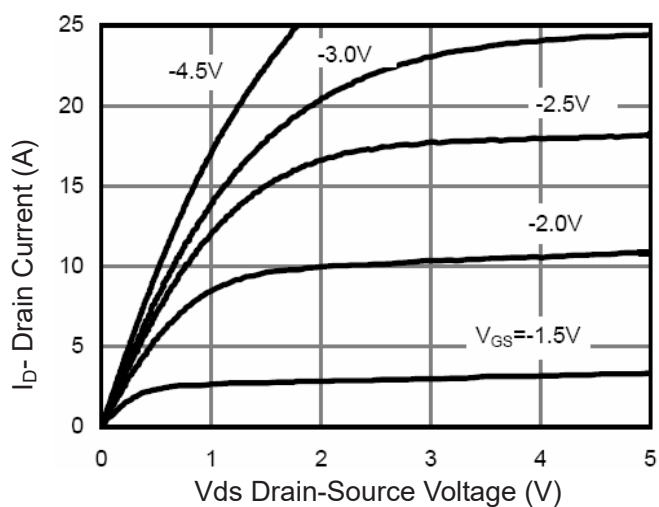
**Figure 2: Switching Waveforms**



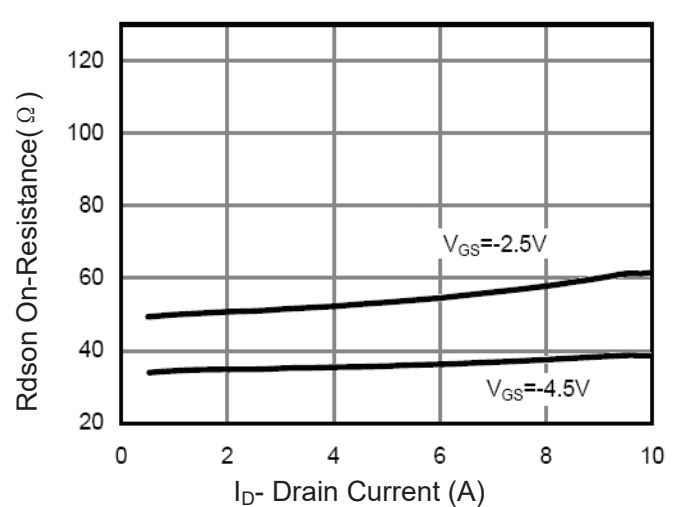
**Figure 3 Power Dissipation**



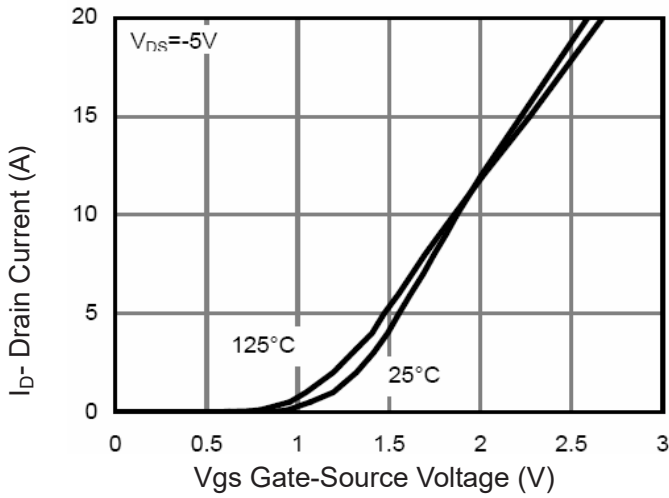
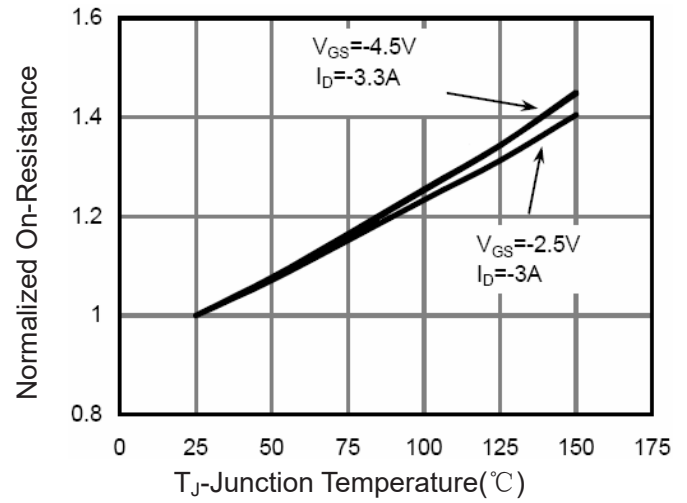
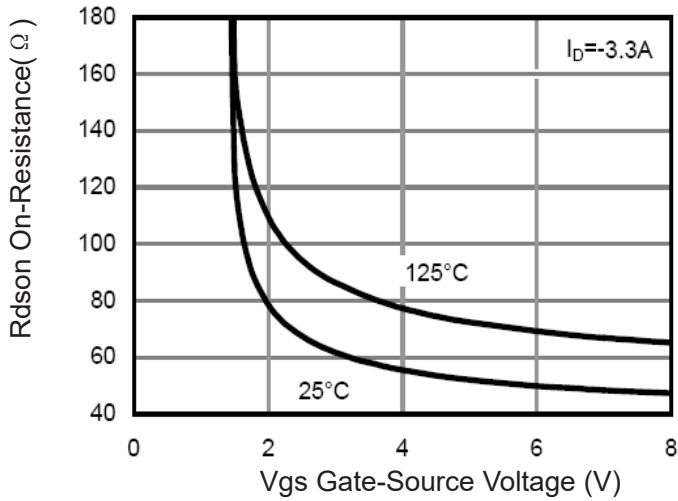
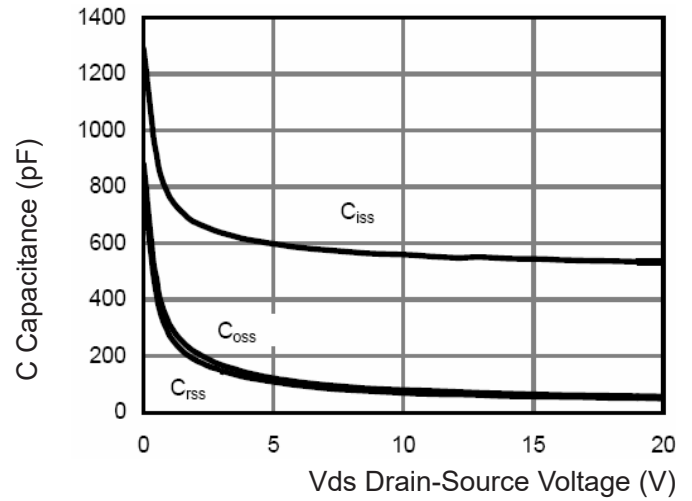
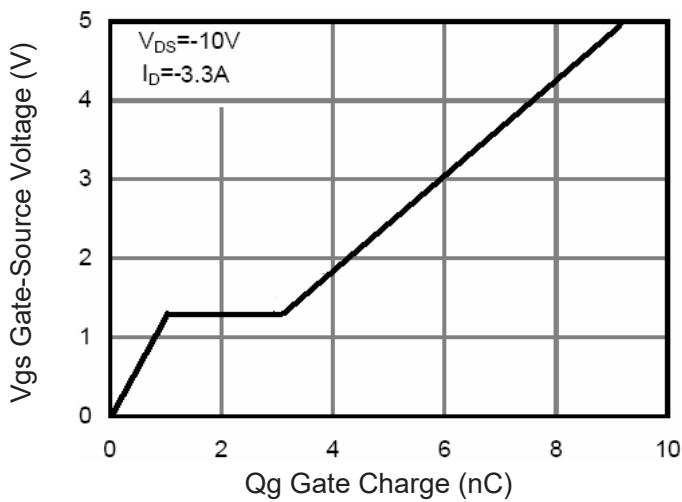
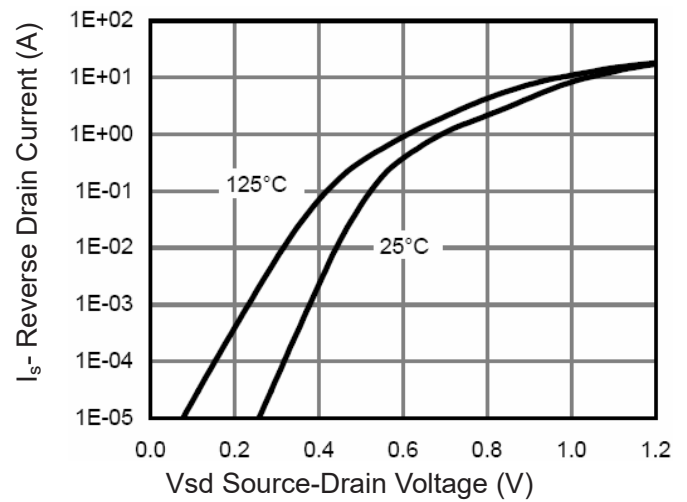
**Figure 4 Drain Current**

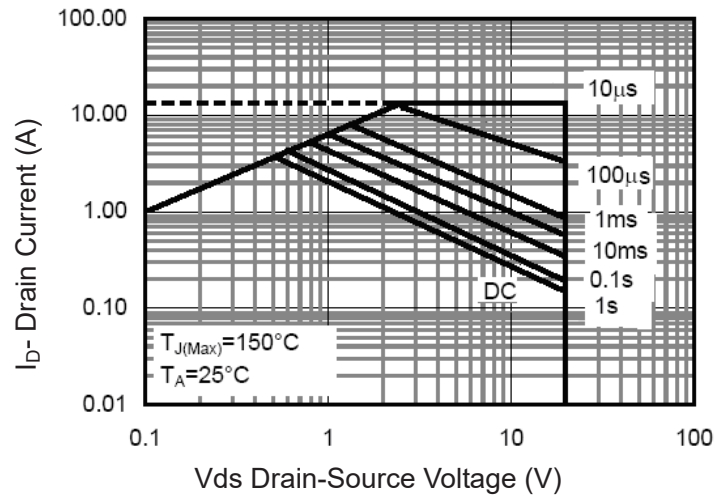
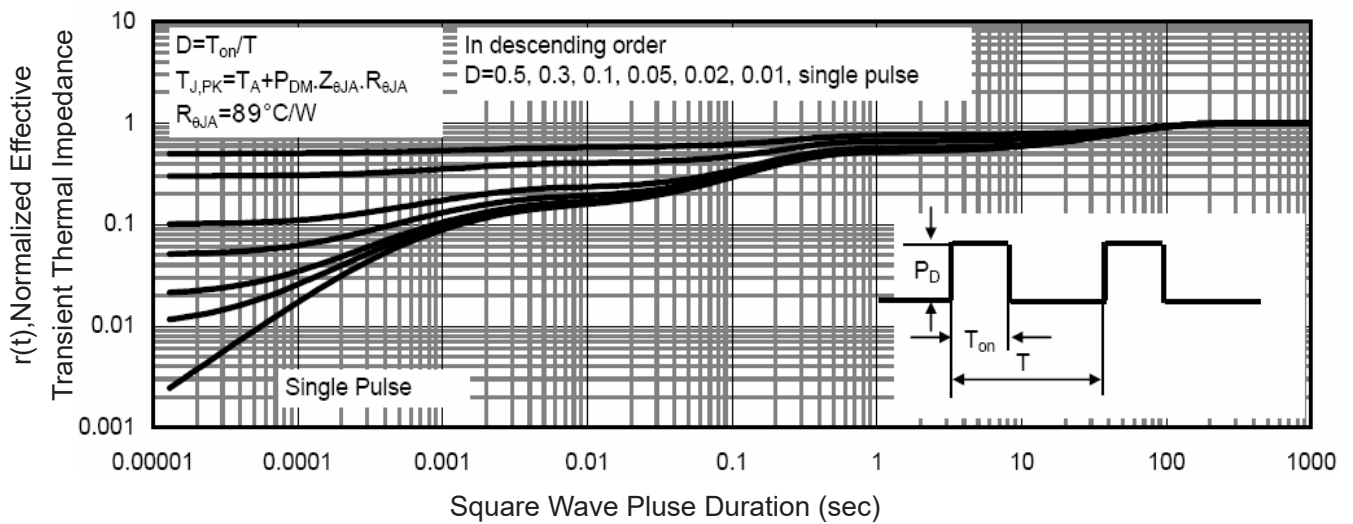


**Figure 5 Output Characteristics**



**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**


**Figure 13 Safe Operation Area**

**Figure 14 Normalized Maximum Transient Thermal Impedance**