

Description

The VSM3416 uses advanced trench technology to provide excellent $R_{DS(ON)}$, low gate charge and operation with gate voltages as low as 1.8V. This device is suitable for use as a load switch or in PWM applications. It is ESD protected.

General Features

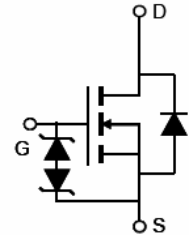
- $V_{DS} = 20V, I_D = 6.5A$
 $R_{DS(ON)} < 40m\Omega @ V_{GS}=1.8V$
 $R_{DS(ON)} < 33m\Omega @ V_{GS}=2.5V$
 $R_{DS(ON)} < 27m\Omega @ V_{GS}=4.5V$
ESD Rating: 2000V HBM
- High Power and current handing capability
- Lead free product is acquired
- Surface mount package

Application

- PWM application
- Load switch



SOT-23-3



Schematic Diagram

Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
VSM3416-S2	VSM3416	SOT-23-3	Ø180mm	8mm	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
Drain Current-Continuous	I_D	6.5	A
Drain Current-Pulsed ^(Note 1)	I_{DM}	30	A
Maximum Power Dissipation	P_D	1.4	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)	$R_{\theta JA}$	89	$^\circ\text{C/W}$
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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}	$V_{GS}=0V, I_D=250\mu A$	20		-	V

Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} =20V, V _{GS} =0V	-	-	1	μA
Gate-Body Leakage Current	I _{GSS}	V _{GS} =±10V, V _{DS} =0V	-	-	±10	μA
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 =6.5A	-	17	27	mΩ
		V _{GS} =2.5V, I _D =5.5A	-	21	33	mΩ
		V _{GS} =1.8V, I _D =5A	-	28	40	mΩ
Forward Transconductance	g _{FS}	V _{DS} =5V, I _D =6.5A	8	-	-	S
Dynamic Characteristics (Note4)						
Input Capacitance	C _{ISS}	V _{DS} =10V, V _{GS} =0V, F=1.0MHz	-	660	-	PF
Output Capacitance	C _{OSS}		-	160	-	PF
Reverse Transfer Capacitance	C _{RSS}		-	87	-	PF
Switching Characteristics (Note 4)						
Turn-on Delay Time	t _{d(on)}	V _{DD} =10V, R _L =1. 5Ω V _{GS} =5V, R _{GEN} =3Ω	-	0.5		nS
Turn-on Rise Time	t _r		-	1		nS
Turn-Off Delay Time	t _{d(off)}		-	12		nS
Turn-Off Fall Time	t _f		-	4		nS
Total Gate Charge	Q _g	V _{DS} =10V, I _D =6.5A, V _{GS} =4.5V	-	8		nC
Gate-Source Charge	Q _{gs}		-	2.5	-	nC
Gate-Drain Charge	Q _{gd}		-	3	-	nC
Drain-Source Diode Characteristics						
Diode Forward Voltage (Note 3)	V _{SD}	V _{GS} =0V, I _S =6.5A	-	-	1.2	V
Diode Forward Current (Note 2)	I _S		-	-	6.5	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

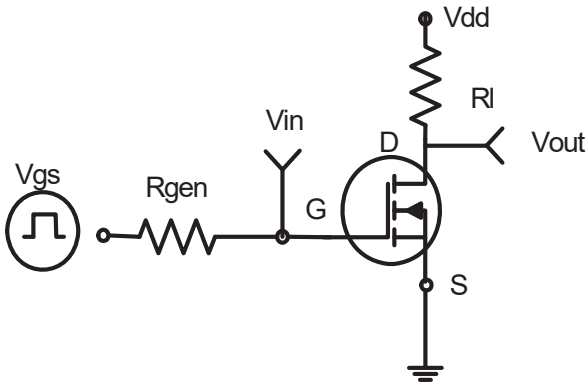


Figure 1: Switching Test Circuit

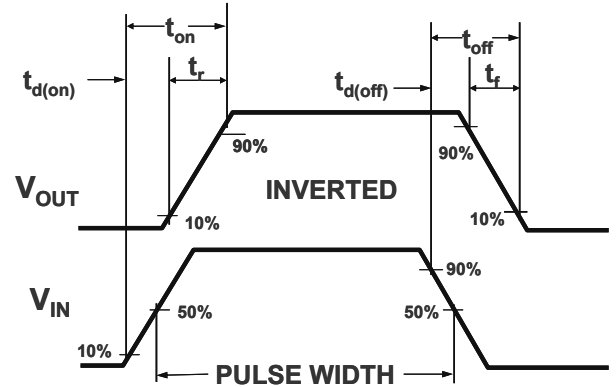


Figure 2: Switching Waveforms

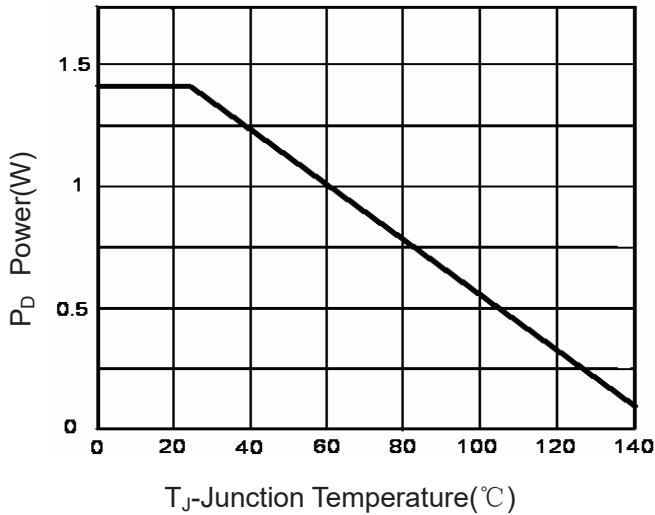


Figure 3 Power Dissipation

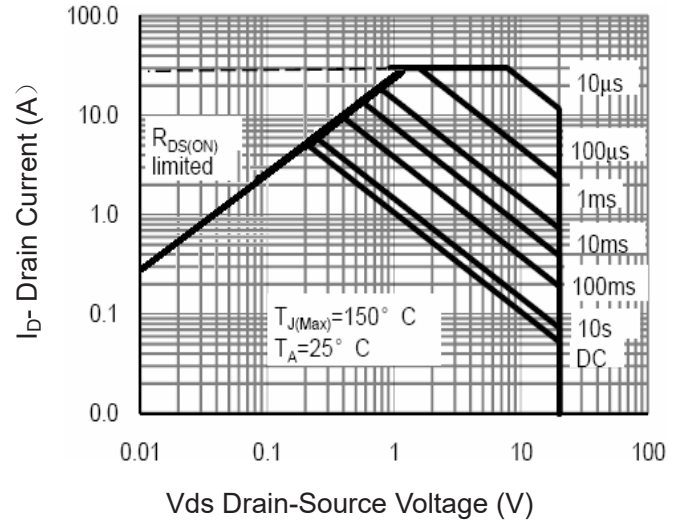


Figure 4 Safe Operation Area

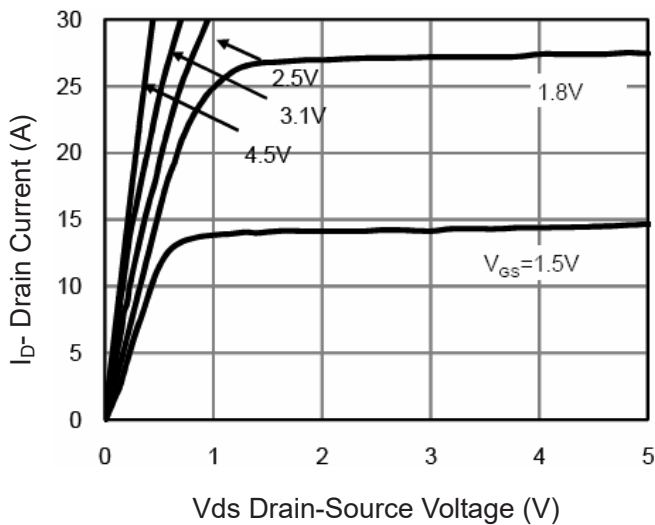


Figure 5 Output Characteristics

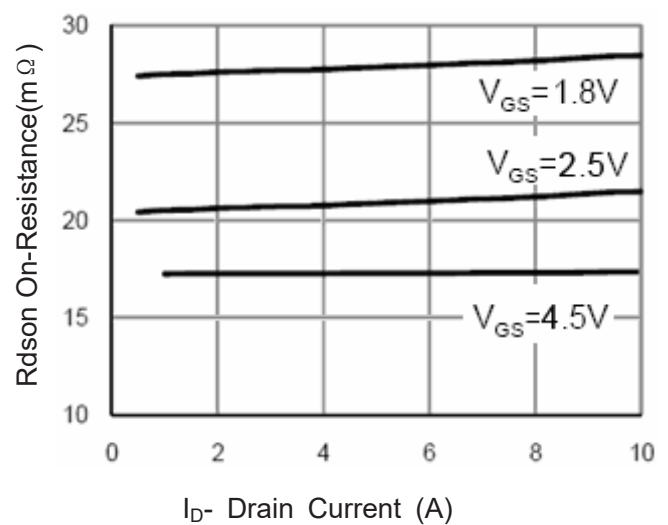
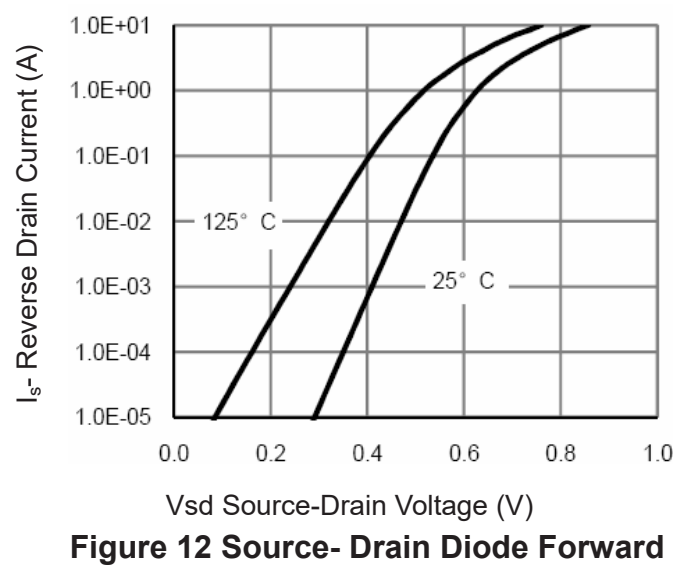
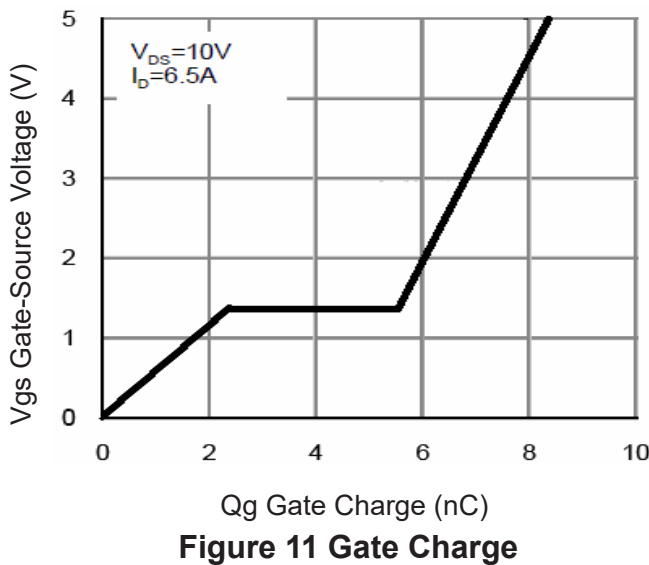
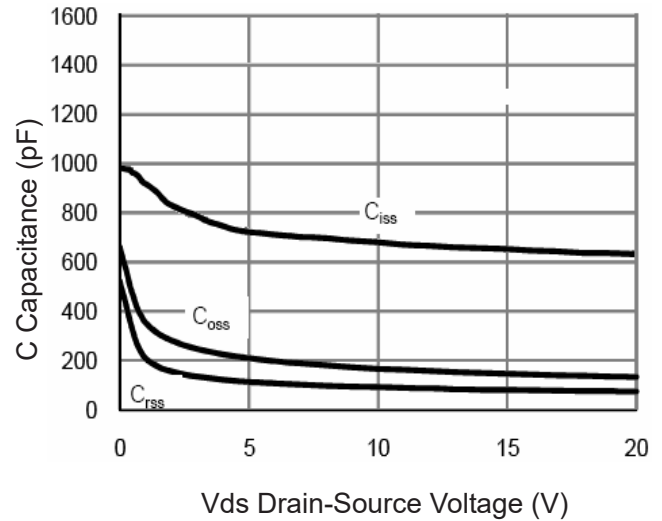
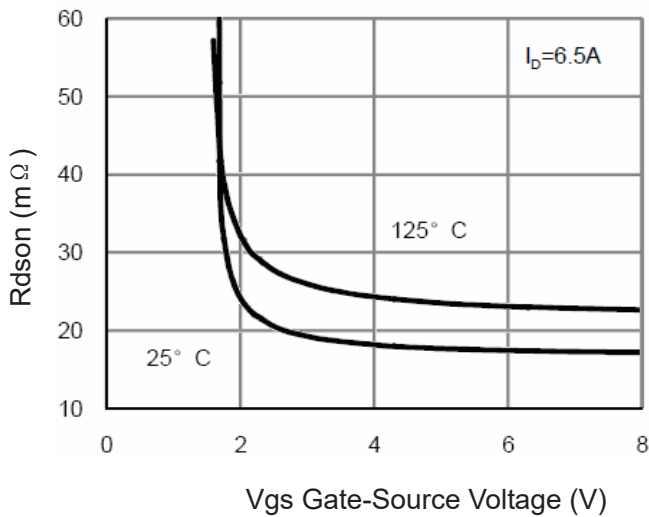
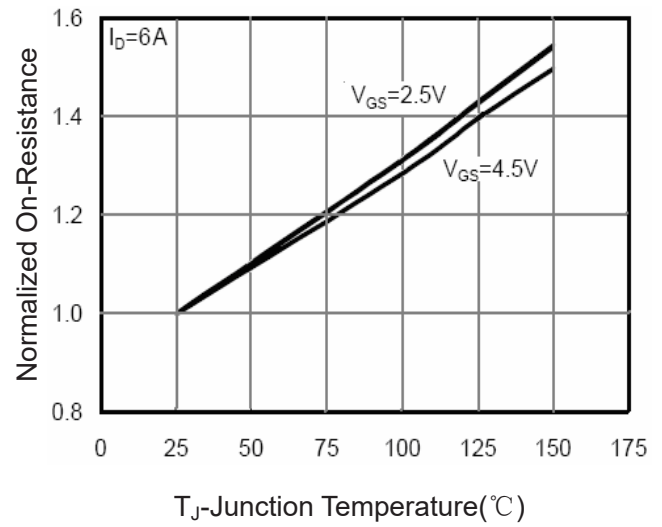
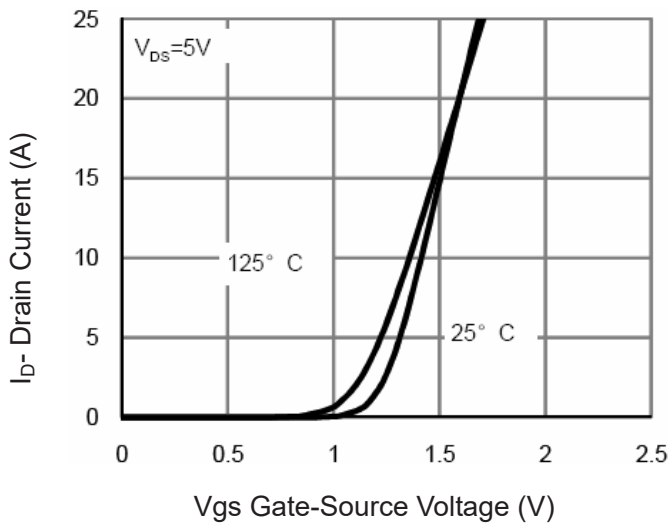


Figure 6 Drain-Source On-Resistance



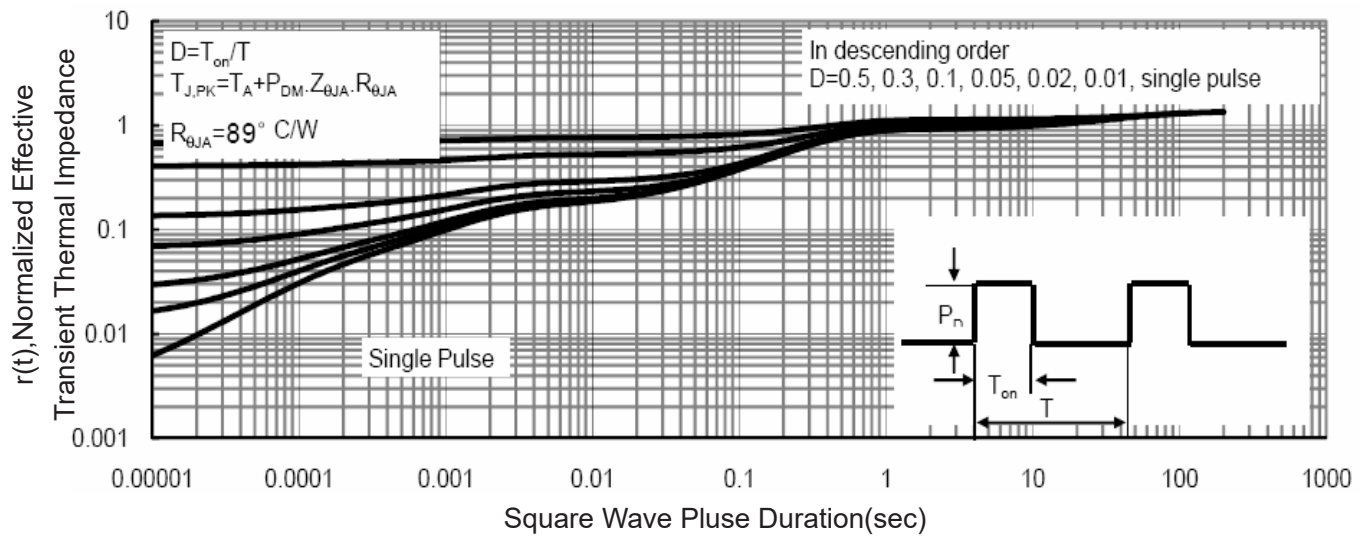


Figure 13 Normalized Maximum Transient Thermal Impedance