

N-Channel 30-V (D-S) MOSFET

CHARACTERISTICS

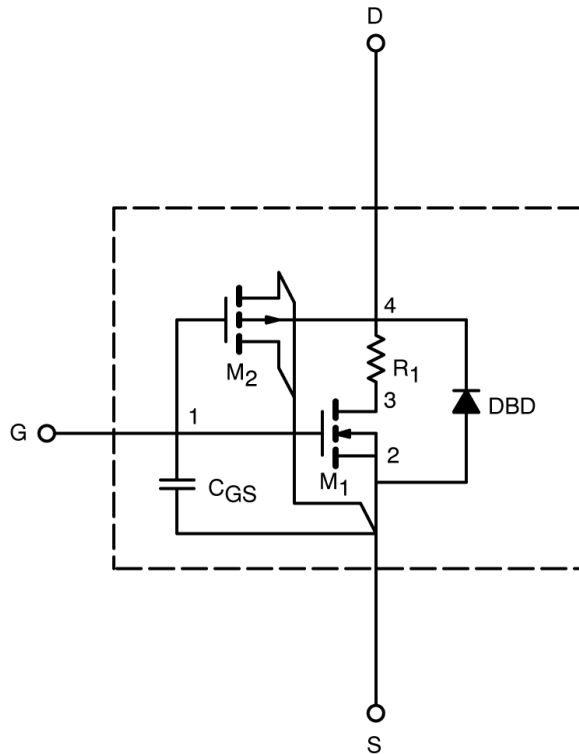
- N-Channel Vertical DMOS
- Macro Model (Subcircuit Model)
- Level 3 MOS
- Apply for both Linear and Switching Application
- Accurate over the -55 to 125°C Temperature Range
- Model the Gate Charge, Transient, and Diode Reverse Recovery Characteristics

DESCRIPTION

The attached spice model describes the typical electrical characteristics of the n-channel vertical DMOS. The subcircuit model is extracted and optimized over the -55 to 125°C temperature ranges under the pulsed 0-to-5V gate drive. The saturated output impedance is best fit at the gate bias near the threshold voltage.

A novel gate-to-drain feedback capacitance network is used to model the gate charge characteristics while avoiding convergence difficulties of the switched C_{gd} model. All model parameter values are optimized to provide a best fit to the measured electrical data and are not intended as an exact physical interpretation of the device.

SUBCIRCUIT MODEL SCHEMATIC



This document is intended as a SPICE modeling guideline and does not constitute a commercial product data sheet. Designers should refer to the appropriate data sheet of the same number for guaranteed specification limits.

SPICE Device Model Si4416DY

Vishay Siliconix



SPECIFICATIONS ($T_J = 25^\circ\text{C}$ UNLESS OTHERWISE NOTED)				
Parameter	Symbol	Test Conditions	Typical	Unit
Static				
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 250 \mu\text{A}$	1.83	V
On-State Drain Current ^a	$I_{D(on)}$	$V_{DS} \geq 5 \text{ V}, V_{GS} = 10 \text{ V}$	361	A
Drain-Source On-State Resistance ^a	$r_{DS(on)}$	$V_{GS} = 10 \text{ V}, I_D = 9 \text{ A}$	0.013	Ω
		$V_{GS} = 4.5 \text{ V}, I_D = 7.3 \text{ A}$	0.021	
Forward Transconductance ^a	g_{fs}	$V_{DS} = 15 \text{ V}, I_D = 9 \text{ A}$	22	S
Diode Forward Voltage ^a	V_{SD}	$I_S = 2.1 \text{ A}, V_{GS} = 0 \text{ V}$	0.8	V
Dynamic				
Total Gate Charge ^b	Q_g	$V_{DS} = 15 \text{ V}, V_{GS} = 10 \text{ V}, I_D = 9 \text{ A}$	24	nC
Gate-Source Charge ^b	Q_{gs}		6	
Gate-Drain Charge ^b	Q_{gd}		4	
Turn-On Delay Time ^{b, c}	$t_{d(on)}$	$V_{DD} = 15 \text{ V}, R_L = 15 \Omega$ $I_D \cong 1 \text{ A}, V_{GEN} = 10 \text{ V}, R_G = 6 \Omega$	18	ns
Rise Time ^{b, c}	t_r		10	
Turn-Off Delay Time ^{b, c}	$t_{d(off)}$		32	
Fall Time ^{b, c}	t_f		20	
Source-Drain Reverse Recovery Time	t_{rr}	$I_F = 2.1 \text{ A}, di/dt = 100 \text{ A}/\mu\text{s}$	49	

Notes

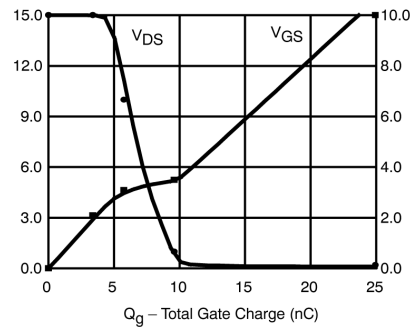
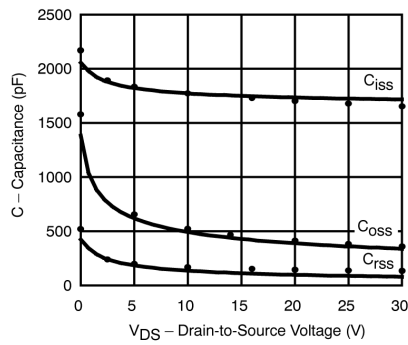
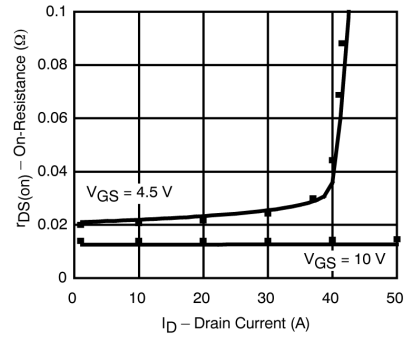
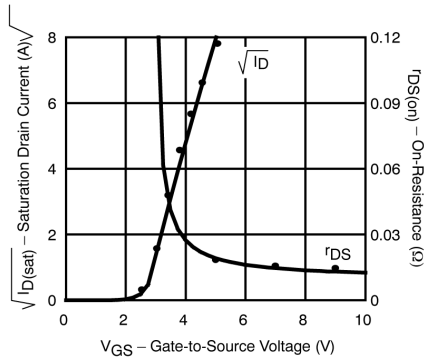
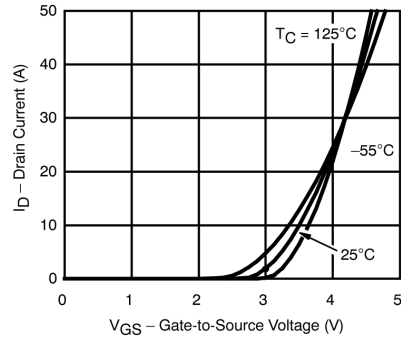
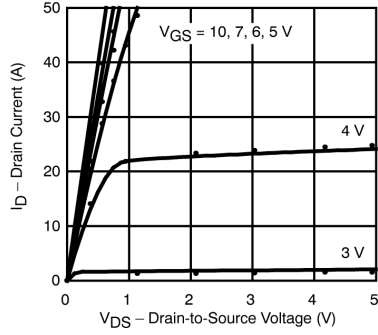
- a. Pulse test; pulse width $\leq 300 \mu\text{s}$, duty cycle $\leq 2\%$
- b. Independent of operating temperature
- c. Include only parasitic components presented in the model circuit



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COMPARISON OF MODEL WITH MEASURED DATA ($T_J=25^\circ\text{C}$ UNLESS OTHERWISE NOTED)



Note: Dots and squares represent measured data.