



N-Channel 20-V (D-S) MOSFET

CHARACTERISTICS

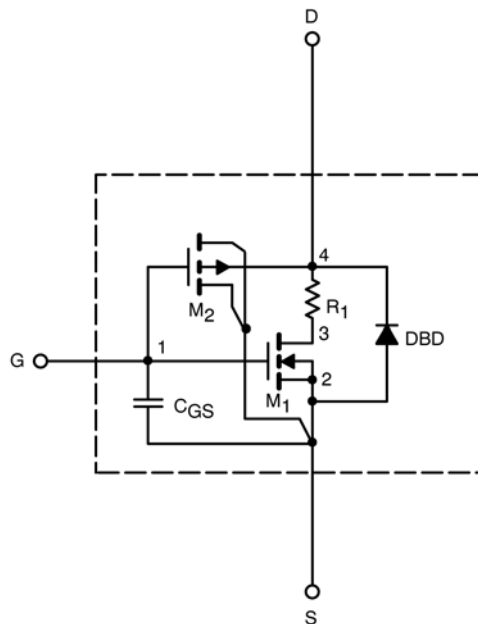
- N-Channel Vertical DMOS
- Macro Model (Subcircuit Model)
- Level 3 MOS
- Apply for both Linear and Switching Application
- Accurate over the -55 to 125°C Temperature Range
- Model the Gate Charge, Transient, and Diode Reverse Recovery Characteristics

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-V to 5-V 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 Si4378DY

Vishay Siliconix



SPECIFICATIONS ($T_J = 25^\circ\text{C}$ UNLESS OTHERWISE NOTED)

Parameter	Symbol	Test Condition	Simulated Data	Measured Data	Unit
Static					
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}$, $I_D = 250\ \mu\text{A}$	1.1		V
On-State Drain Current ^a	$I_{D(on)}$	$V_{DS} \geq 5\ \text{V}$, $V_{GS} = 4.5\ \text{V}$	907		A
Drain-Source On-State Resistance ^a	$r_{DS(on)}$	$V_{GS} = 4.5\ \text{V}$, $I_D = 25\ \text{A}$	0.0023	0.0022	Ω
		$V_{GS} = 2.5\ \text{V}$, $I_D = 22\ \text{A}$	0.0034	0.0034	
Forward Transconductance ^a	g_{fs}	$V_{DS} = 10\ \text{V}$, $I_D = 25\ \text{A}$	146	150	S
Forward Voltage ^a	V_{SD}	$I_S = 2.9\ \text{A}$, $V_{GS} = 0\ \text{V}$	0.83	0.72	V
Dynamic^b					
Total Gate Charge	Q_g	$V_{DS} = 10\ \text{V}$, $V_{GS} = 4.5\ \text{V}$, $I_D = 25\ \text{A}$	58	55	nC
Gate-Source Charge	Q_{gs}		16	16	
Gate-Drain Charge	Q_{gd}		10	10	
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = 10\ \text{V}$, $R_L = 10\ \Omega$ $I_D \cong 1\ \text{A}$, $V_{GEN} = 4.5\ \text{V}$, $R_G = 6\ \Omega$	64	85	ns
Rise Time	t_r		87	65	
Turn-Off Delay Time	$t_{d(off)}$		68	140	
Fall Time	t_f		56	50	

Notes

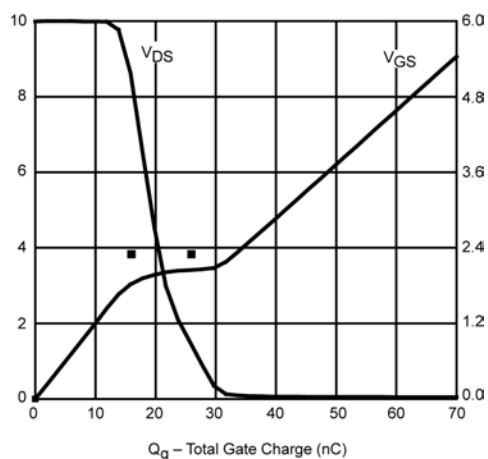
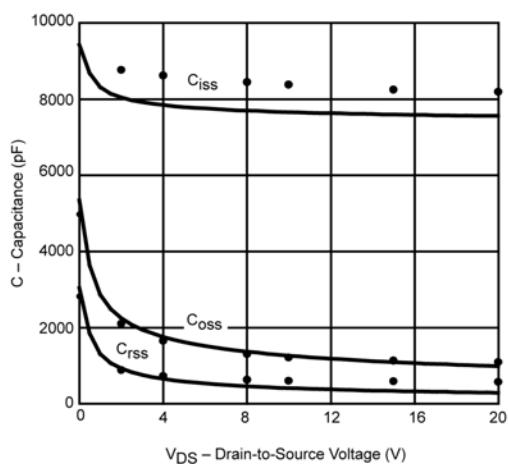
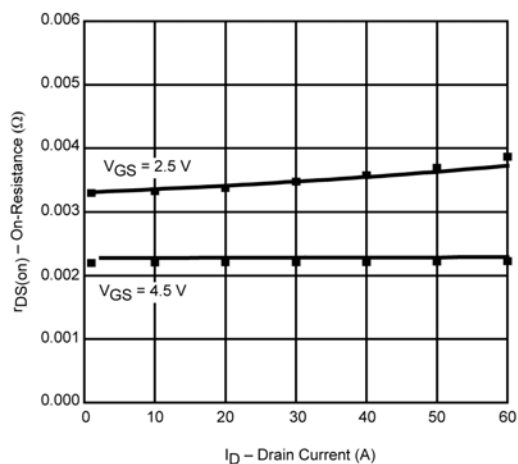
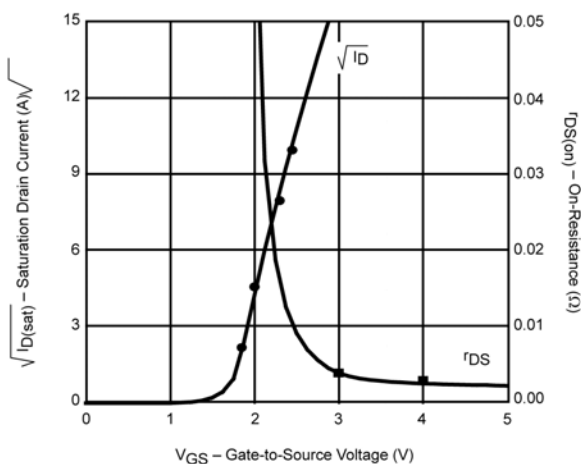
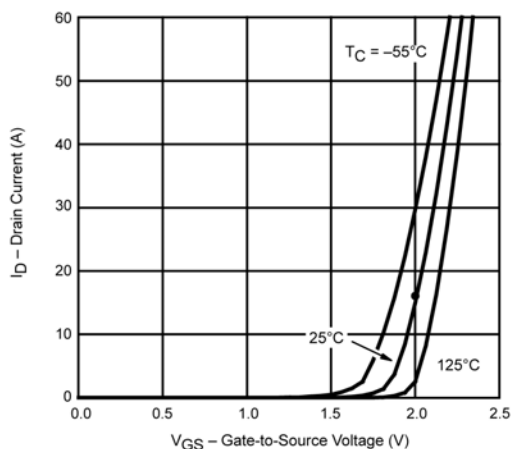
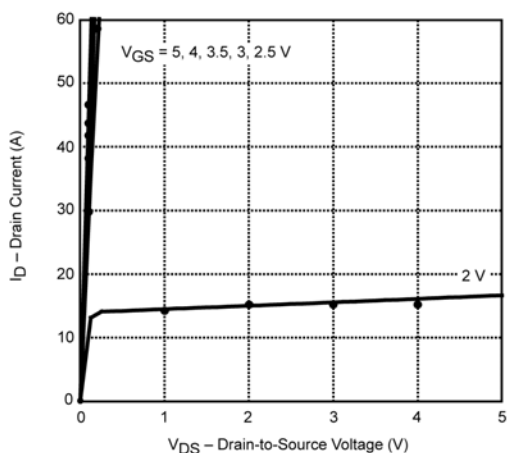
- a. Pulse test; pulse width $\leq 300\ \mu\text{s}$, duty cycle $\leq 2\%$.
b. Guaranteed by design, not subject to production testing.



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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.



Disclaimer

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