

## Dual N-Channel 2.5-V (G-S) MOSFET

### CHARACTERISTICS

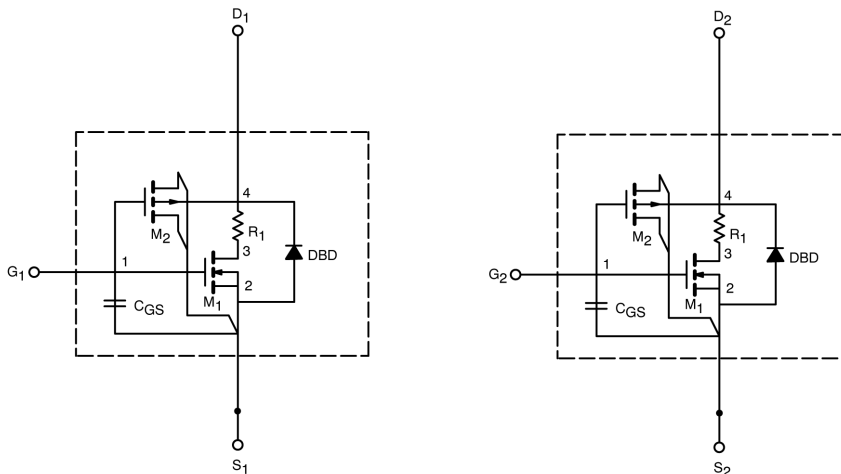
- N-Channel Vertical DMOS
- Macro Model (Subcircuit Model)
- Level 3 MOS
- Apply for both Linear and Switching Application
- Accurate over the  $-55$  to  $125^{\circ}\text{C}$  Temperature Range
- Model the Gate Charge, Transient, and Diode Reverse Recovery Characteristics

### DESCRIPTION

The attached spice model describes the typical electrical characteristics of the n-channel vertical DMOS. The subcircuit model schematic is extracted and optimized over the  $-55$  to  $125^{\circ}\text{C}$  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 Si5904DC

Vishay Siliconix



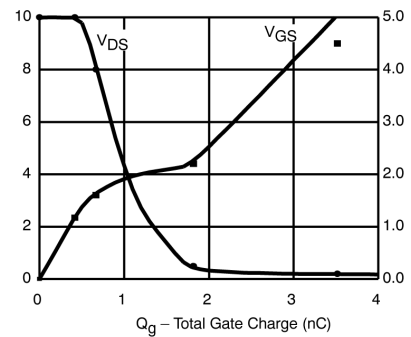
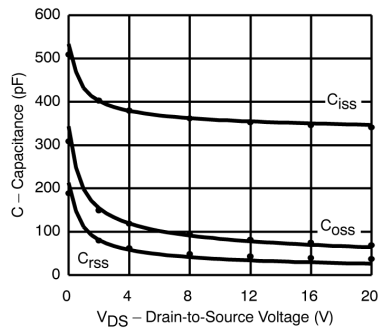
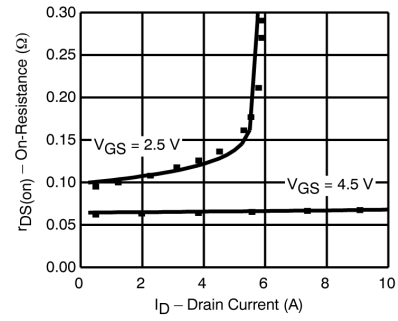
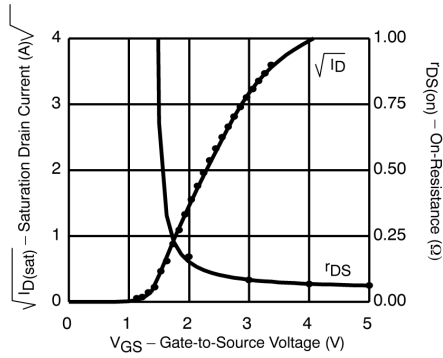
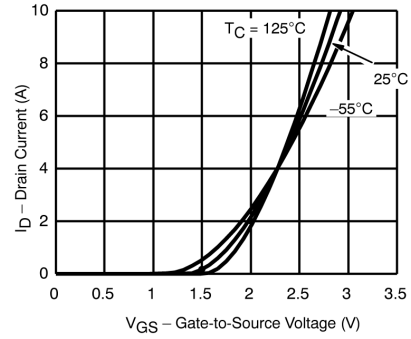
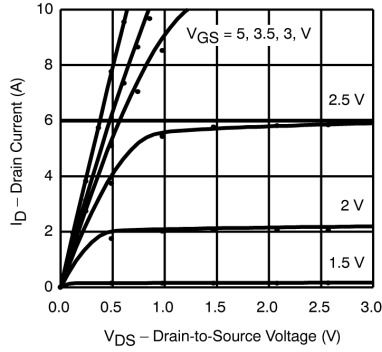
SPECIFICATIONS ( $T_J = 25^\circ\text{C}$ UNLESS OTHERWISE NOTED)				
Parameter	Symbol	Test Conditions	Typical	Unit
<b>Static</b>				
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 250 \mu\text{A}$	1.02	V
On-State Drain Current <sup>a</sup>	$I_{D(on)}$	$V_{DS} \geq 5 \text{ V}, V_{GS} = 4.5 \text{ V}$	32	A
		$V_{GS} = 4.5 \text{ V}, I_D = 3.1 \text{ A}$	0.065	
		$V_{GS} = 2.5 \text{ V}, I_D = 2.3 \text{ A}$	0.011	
Forward Transconductance <sup>a</sup>	$g_{fs}$	$V_{DS} = 10 \text{ V}, I_D = 3.1 \text{ A}$	7	S
Diode Forward Voltage <sup>a</sup>	$V_{SD}$	$I_S = 0.9 \text{ A}, V_{GS} = 0 \text{ V}$	0.8	V
<b>Dynamic<sup>b</sup></b>				
Total Gate Charge	$Q_g$	$V_{DS} = 10 \text{ V}, V_{GS} = 4.5 \text{ V}, I_D = 3.1 \text{ A}$	3.2	nC
Gate-Source Charge	$Q_{gs}$		0.6	
Gate-Drain Charge	$Q_{gd}$		1.3	
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = 10 \text{ V}, R_L = 10 \Omega$ $I_D \cong 1 \text{ A}, V_{GEN} = 4.5 \text{ V}, R_G = 6 \Omega$	11	ns
Rise Time	$t_r$		14	
Turn-Off Delay Time	$t_{d(off)}$		16	
Fall Time	$t_f$		20	
Source-Drain Reverse Recovery Time	$t_{rr}$	$I_F = 0.9 \text{ A}, di/dt = 100 \text{ A}/\mu\text{s}$	40	

**Notes**

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



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



Note: Dots and squares represent measured data.