



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

CHARACTERISTICS

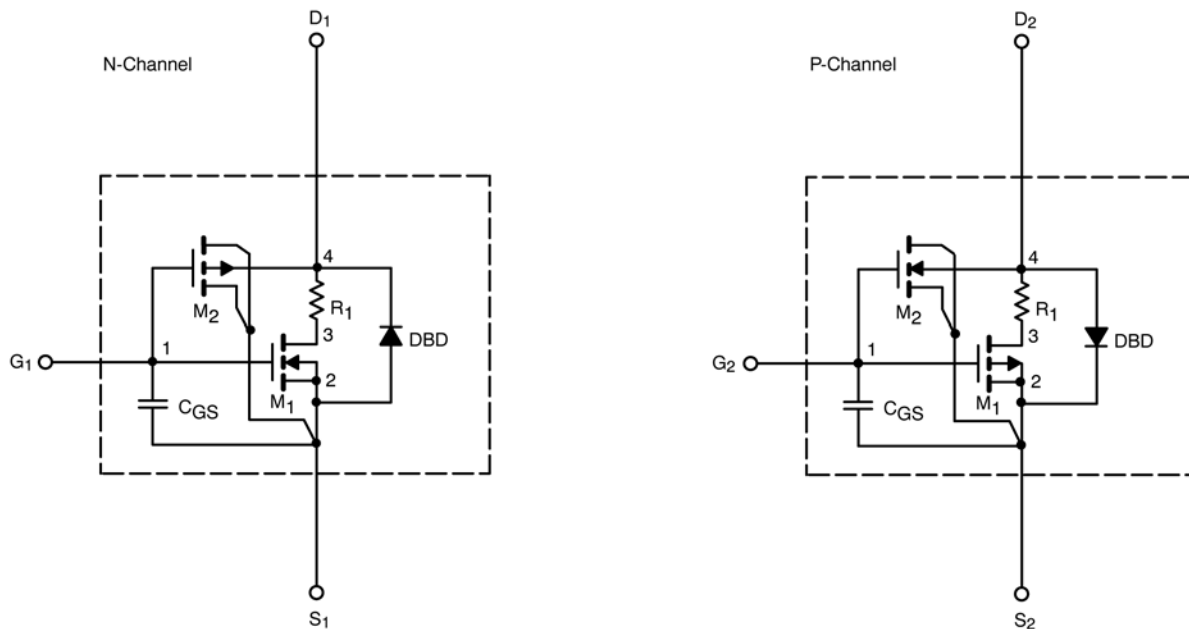
- N- and P-Channel Vertical DMOS
- Macro Model (Subcircuit Model)
- Level 3 MOS
- Apply for both Linear and Switching Application
- Accurate over the -55 to 125°C Temperature Range
- Model the Gate Charge, Transient, and Diode Reverse Recovery Characteristics

DESCRIPTION

The attached spice model describes the typical electrical characteristics of the n- and p-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.



SPECIFICATIONS (T _J = 25°C UNLESS OTHERWISE NOTED)						
Parameter	Symbol	Test Conditions		Simulated Data	Measured Data	Unit
Static						
Gate Threshold Voltage	V _{GS(th)}	V _{DS} = V _{GS} , I _D = 250 μA	N-Ch	1.2		V
		V _{DS} = V _{GS} , I _D = -250 μA	P-Ch	1.2		
On-State Drain Current ^a	I _{D(on)}	V _{DS} ≥ 5 V, V _{GS} = 4.5 V	N-Ch	51		A
		V _{DS} ≤ -5 V, V _{GS} = -4.5 V	P-Ch	18		
Drain-Source On-State Resistance ^a	r _{DS(on)}	V _{GS} = 4.5 V, I _D = 3 A	N-Ch	0.062	0.062	Ω
		V _{GS} = -4.5 V, I _D = -2 A	P-Ch	0.134	0.135	
		V _{GS} = 2.5 V, I _D = 2 A	N-Ch	0.082	0.095	
		V _{GS} = -2.5 V, I _D = -1.2 A	P-Ch	0.197	0.235	
Forward Transconductance ^a	g _{fs}	V _{DS} = 5 V, I _D = 3 A	N-Ch	10	10	S
		V _{DS} = -5 V, I _D = -2 A	P-Ch	4.5	5	
Diode Forward Voltage ^a	V _{SD}	I _S = 1.05 A, V _{GS} = 0 V	N-Ch	0.78	0.80	V
		I _S = -1.05 A, V _{GS} = 0 V	P-Ch	-0.78	-0.83	
Dynamic^b						
Total Gate Charge	Q _g	N-Channel V _{DS} = 15 V, V _{GS} = 4.5 V, I _D = 2 A P-Channel V _{DS} = -15 V, V _{GS} = -4.5 V, I _D = -2 A	N-Ch	2.9	3	Nc
Gate-Source Charge	Q _{gs}		P-Ch	3.2	3.8	
			N-Ch	0.60	0.60	
Gate-Drain Charge	Q _{gd}		P-Ch	0.60	0.60	
			N-Ch	1	1	
			P-Ch	1.5	1.5	
Turn-On Delay Time	t _{d(on)}	N-Channel V _{DD} = 15 V, R _L = 15 Ω I _D ≅ 1 A, V _{GEN} = 10 V, R _G = 6 Ω P-Channel V _{DD} = -15 V, R _L = 15 Ω I _D ≅ -1 A, V _{GEN} = -10 V, R _G = 6 Ω	N-Ch	5	5	Ns
			P-Ch	6	5	
Rise Time	t _r		N-Ch	5	12	
			P-Ch	8	15	
Turn-Off Delay Time	t _{d(off)}		N-Ch	11	13	
			P-Ch	18	20	
Fall Time	t _f		N-Ch	4	7	
			P-Ch	5	20	

Notes

- a. Pulse test; pulse width ≤ 300 μs, duty cycle ≤ 2.
- b. Guaranteed by design, not subject to production testing.

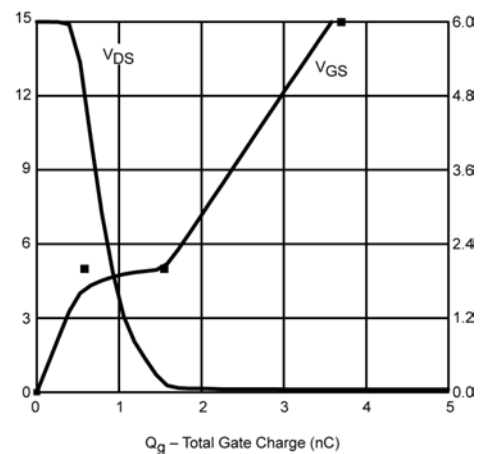
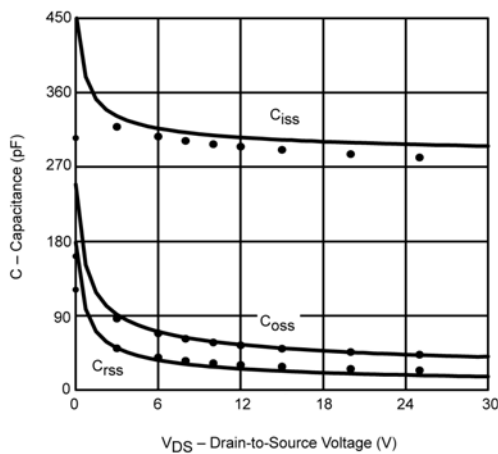
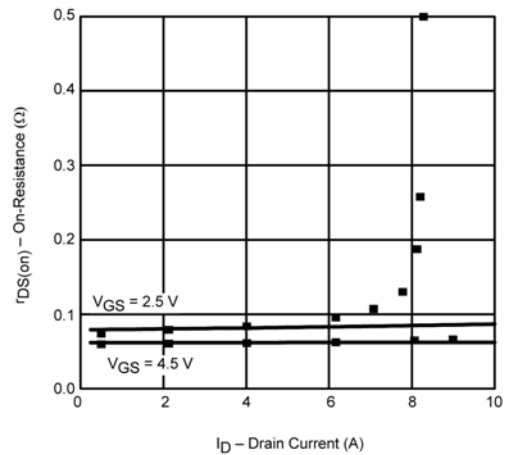
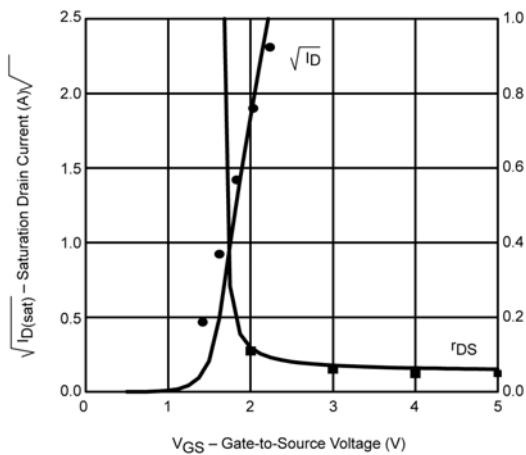
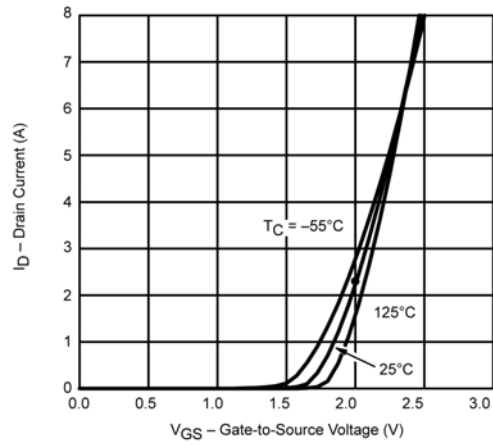
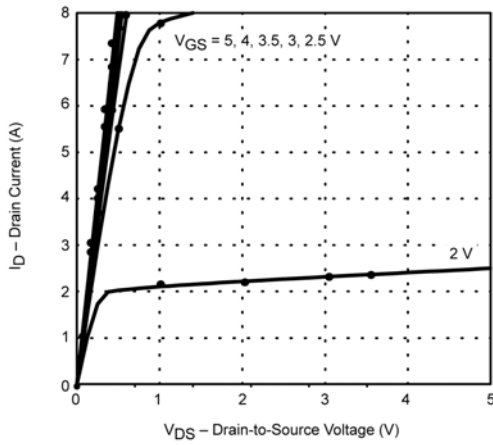


SPICE Device Model Si3590DV

Vishay Siliconix

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

N-Channel MOSFET



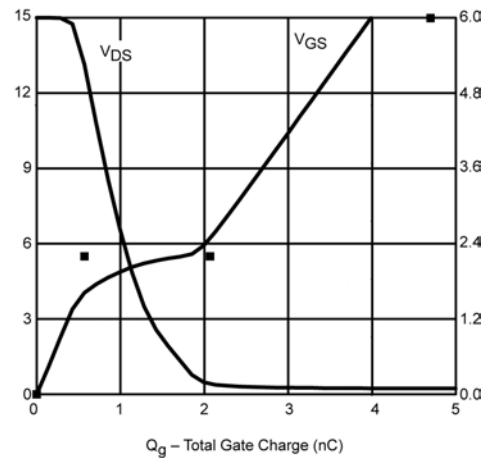
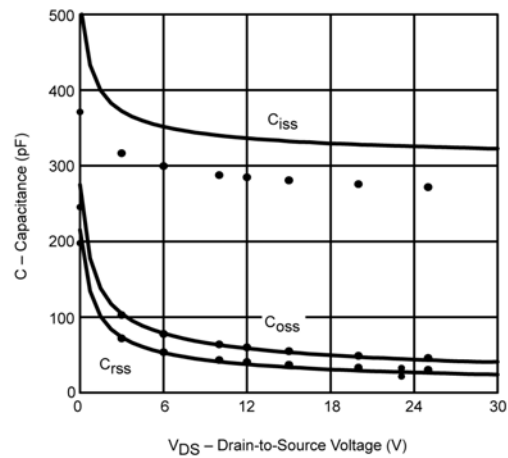
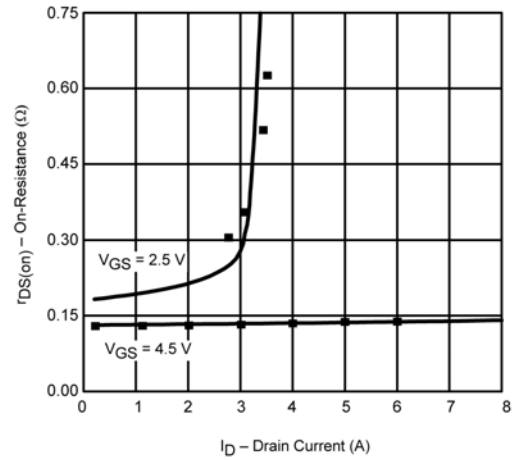
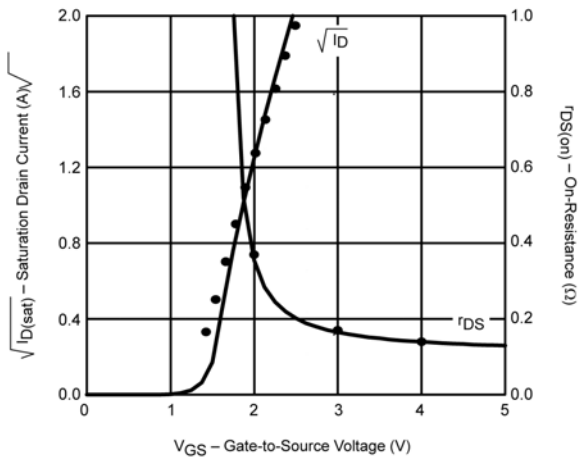
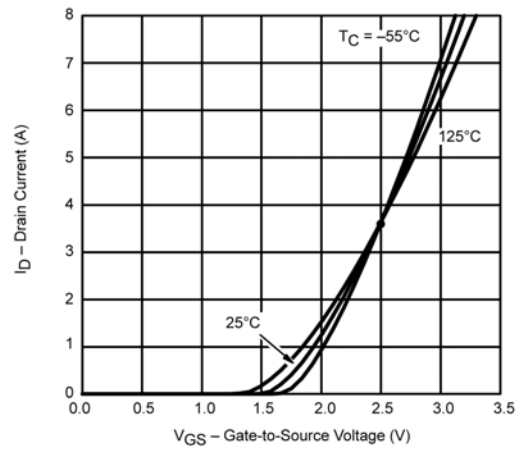
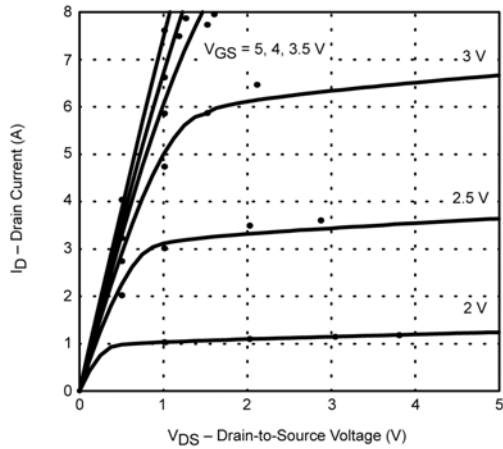
Note: Dots and squares represent measured data.

SPICE Device Model Si3590DV

Vishay Siliconix



P-Channel MOSFET



Note: Dots and squares represent measured data.



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