N-Channel Reduced Q_g, Fast Switching WFET

CHARACTERISTICS

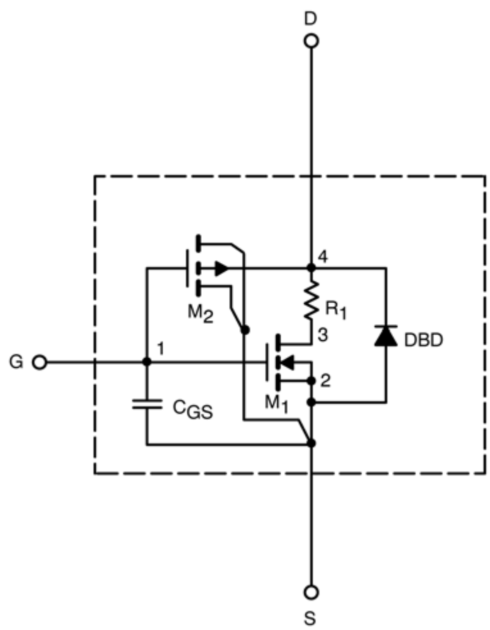
- N-Channel Vertical DMOS
- Macro Model (Subcircuit Model)
- Level 3 MOS
- Apply for both Linear and Switching Application
- Accurate over the −55 to 125°C Temperature Range
- Model the Gate Charge, Transient, and Diode Reverse Recovery Characteristics

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 10-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



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	1.3		V
On-State Drain Current[a]	$I_{D(on)}$	$V_{DS} \geq 5$ V, V_{GS} = 10 V	548		A
Drain-Source On-State Resistance[a]	$r_{DS(on)}$	V_{GS} = 10 V, I_D = 12.5 A	0.0085	0.0075	Ω
		V_{GS} = 4.5 V, I_D = 10.5 A	0.0118	0.0105	
Forward Transconductance[a]	g_{fs}	V_{DS} = 15 V, I_D = 12.5 A	33	38	S
Forward Voltage[a]	V_{SD}	I_S = 2.7 A, V_{GS} = 0 V	0.82	0.70	V
Dynamic[b]					
Total Gate Charge	Q_g	V_{DS} = 15 V, V_{GS} = 4.5 V, I_D = 12.5 A	11	10	nC
Gate-Source Charge	Q_{gs}		3.5	3.5	
Gate-Drain Charge	Q_{gd}		2.1	2.1	
Turn-On Delay Time	$t_{d(on)}$	V_{DD} = 15 V, R_L = 15 Ω $I_D \cong$ 1 A, V_{GEN} = 10 V, R_G = 6 Ω	14	16	ns
Rise Time	t_r		8	6	
Turn-Off Delay Time	$t_{d(off)}$		39	43	
Fall Time	t_f		24	14	
Source-Drain Reverse Recovery Time	t_{rr}	I_F = 2.7A, di/dt = 100 A/µs	22	35	

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

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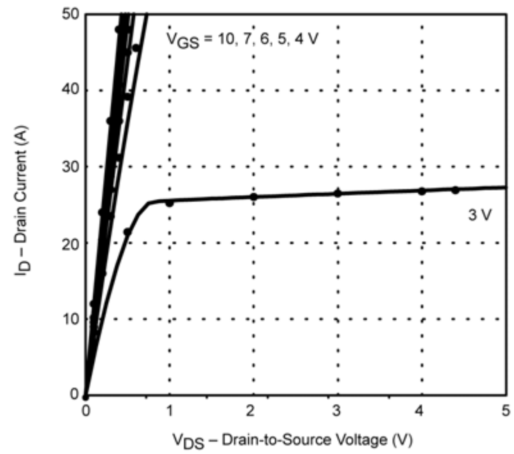
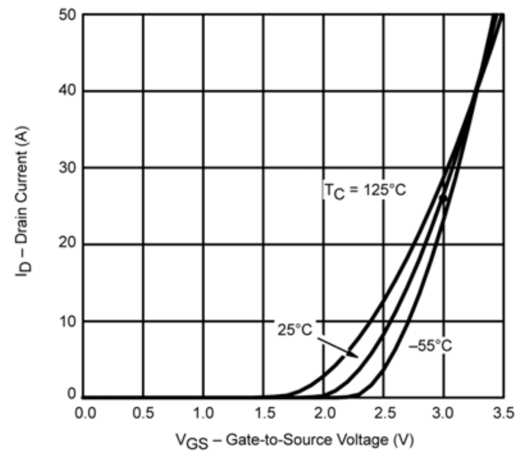
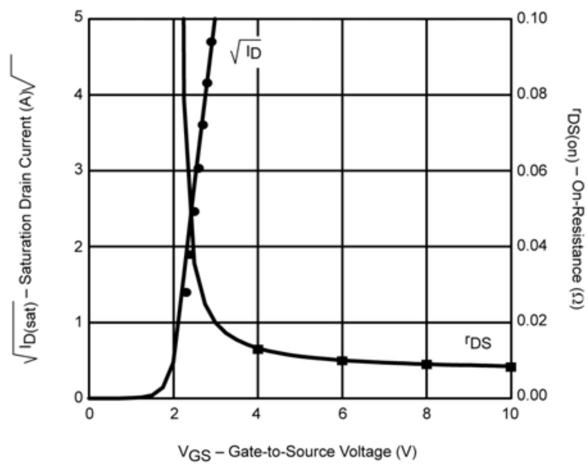
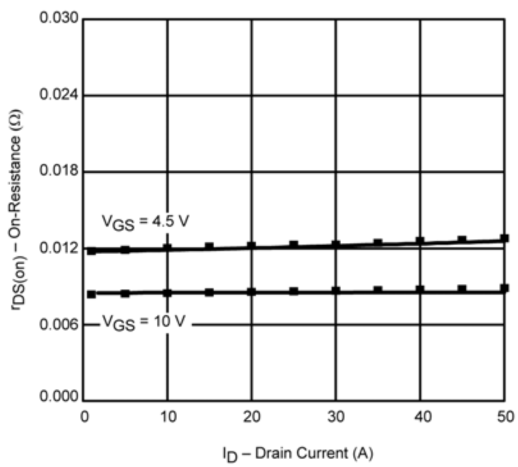
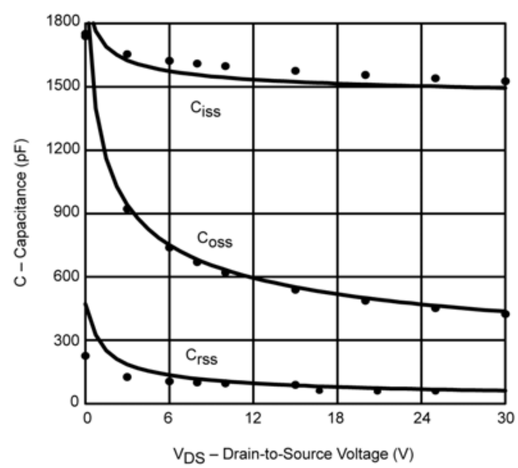
COMPARISON OF MODEL WITH MEASURED DATA (T_J=25°C UNLESS OTHERWISE NOTED)

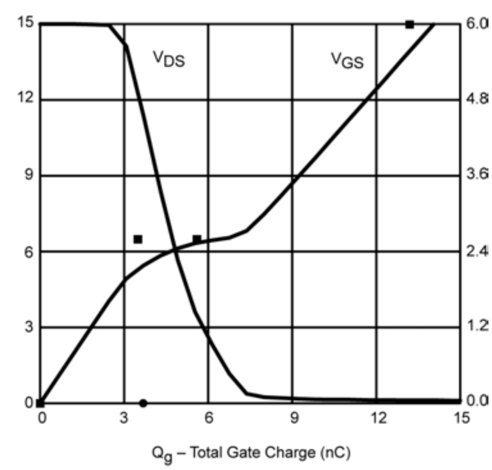












Note: Dots and squares represent measured data.

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