Complementary 20-V (D-S) Low Threshold MOSFET

CHARACTERISTICS

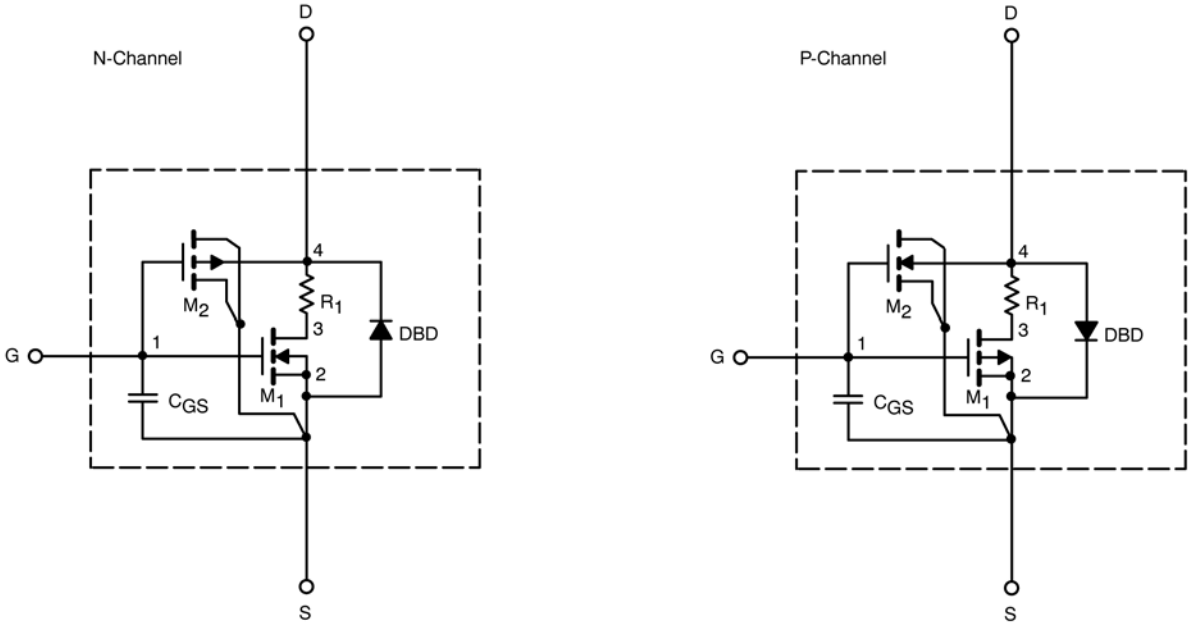
- N- and P-Channel Vertical DMOS
- Macro Model (Subcircuit Model)
- Level 3 MOS
- Apply for both Linear and Switching Application
- Accurate over the −55 to 125°C Temperature Range
- Model the Gate Charge, Transient, and Diode Reverse Recovery Characteristics

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



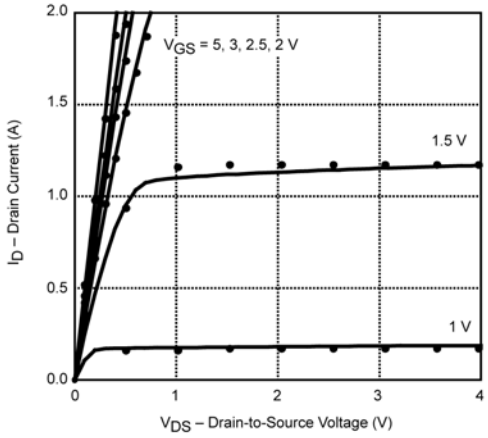
This document is intended as a SPICE modeling guideline and does not constitute a commercial product data sheet. Designers should refer to the appropriate data sheet of the same number for guaranteed specification limits.

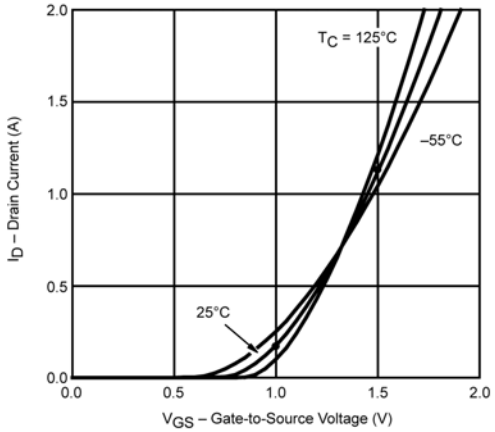
SPECIFICATIONS (T_J = 25°C UNLESS OTHERWISE NOTED)					
Parameter	**Symbol**	**Test Condition**		**Typical**	**Unit**
Static					
Gate Threshold Voltage	$V_{GS(th)}$	V_{DS} = V, V_{GS}, I_D = 100 μA	N-Ch	0.58	V
		V_{DS} = V, V_{GS}, I_D = –100 μA	P-Ch	0.79	
On-State Drain Current[a]	$I_{D(on)}$	$V_{DS} \geq$ 5 V, V_{GS} = 4.5 V	N-Ch	15	A
		$V_{DS} \leq$ 5– V, V_{GS} = –4.5 V	P-Ch	7.8	
Drain-Source On-State Resistance[a]	$r_{DS(on)}$	V_{GS} = 4.5 V, I_D = 1.13 A	N-Ch	0.213	Ω
		V_{GS} = –4.5 V, I_D = –0.88 A	P-Ch	0.41	
		V_{GS} = 2.5 V, I_D = 0.99 A	N-Ch	0.272	
		V_{GS} = –2.5 V, I_D = –0.71 A	P-Ch	0.64	
		V_{GS} = –1.8 V, I_D = –0.20 A		0.331	
		V_{GS} = –1.8 V, I_D = –0.20 A		0.89	
Forward Transconductance[a]	g_{fs}	V_{DS} = 10V, I_D = 1.13 A	N-Ch	2.6	S
		V_{DS} = –10 V, I_D = –0.88 A	P-Ch	1.5	
Diode Forward Voltage[a]	V_{SD}	I_S = 0.48 A, V_{GS} = 0 V	N-Ch	0.77	V
		I_S = –0.48 V, V_{GS} = 0 V	P-Ch	–0.78	
Dynamic[b]					
Total Gate Charge	Q_g	N-Channel V_{DS} = 10 V, V_{GS} = 4.5 V, I_D = 1.13 A P-Channel V_{DS} = –10 V, V_{GS} = –4.5 V, I_D = –0.88 A	N-Ch	1.2	nC
			P-Ch	1	
Gate-Source Charge	Q_{gs}		N-Ch	0.21	
			P-Ch	0.30	
Gate-Drain Charge	Q_{gd}		N-Ch	0.30	
			P-Ch	.0.21	
Turn-On Delay Time	$t_{d(on)}$	N-Channel V_{DD} =10 V, R_L = 20 Ω $I_D \cong$ 0.50 A, V_{GEN} = 4.5 V, R_G = 6 Ω P-Channel V_{DD} = –10 V, R_L = 20 Ω $I_D \cong$ –0.50 A, V_{GEN} = –4.5 V, R_G = 6 Ω	N-Ch	54	ns
			P-Ch	15	
Rise Time	t_r		N-Ch	60	
			P-Ch	48	
Turn-Off Delay Time	$t_{d(off)}$		N-Ch	102	
			P-Ch	84	
Fall Time	t_f		N-Ch	103	
			P-Ch	44	

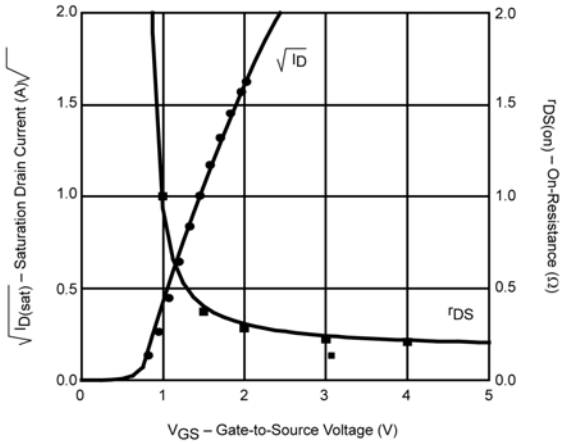
Notes
a. Guaranteed by design, not subject to production testing.
b. Pulse test; pulse width ≤ 300 μs, duty cycle ≤ 2%.

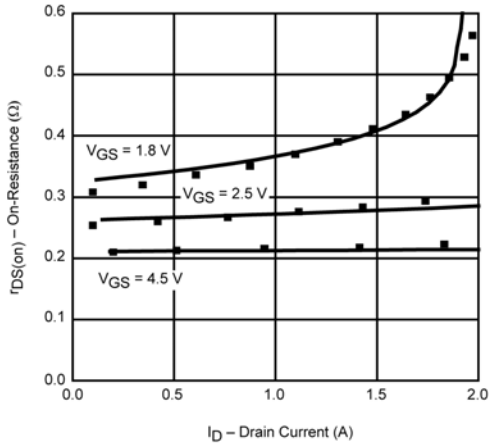
COMPARISON OF MODEL WITH MEASURED DATA (T_J=25°C UNLESS OTHERWISE NOTED)

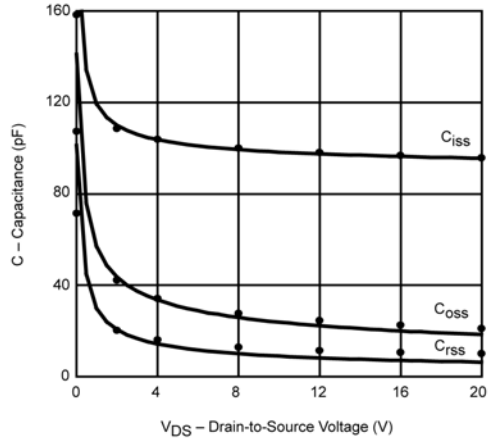
N-Channel MOSFET

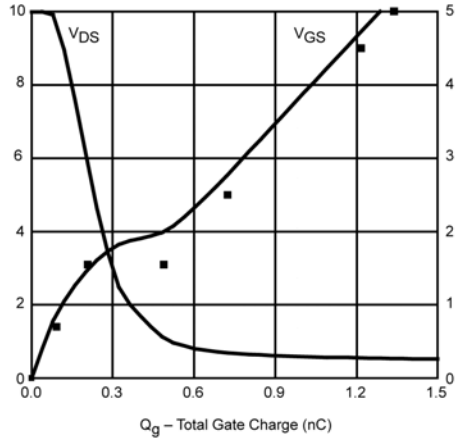






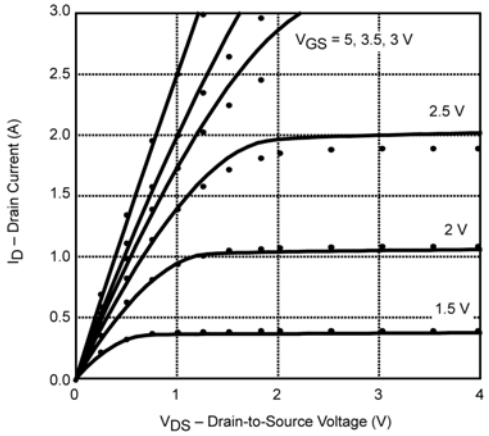


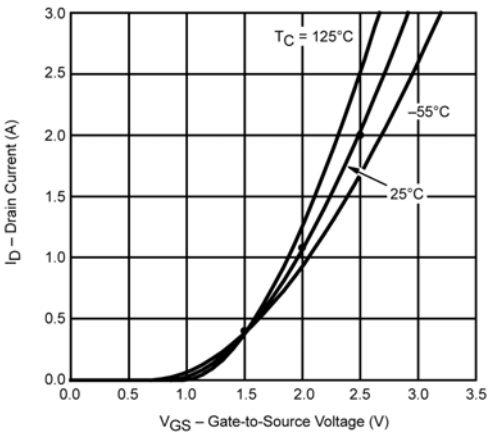


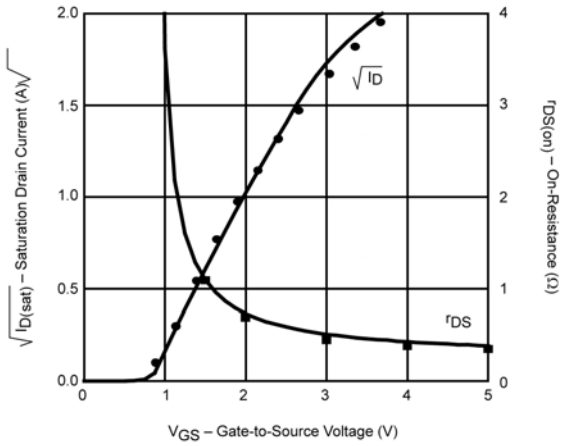


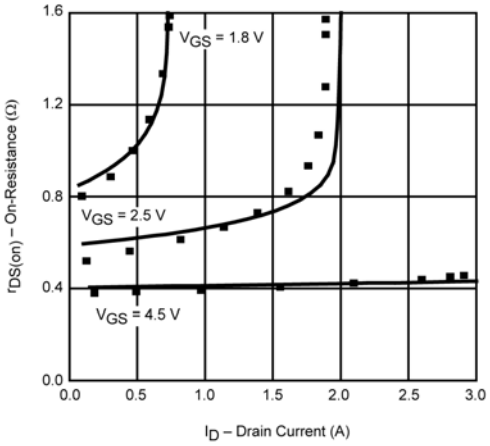
Note: Dots and squares represent measured data.

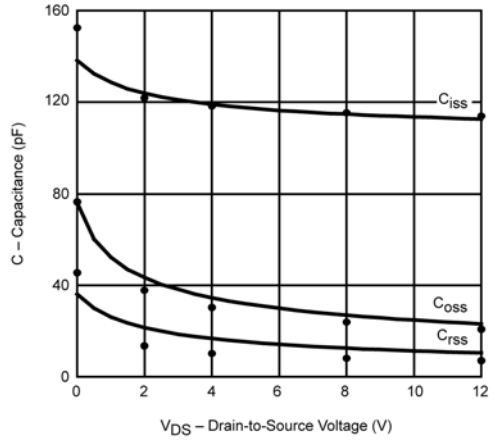
P-Channel MOSFET

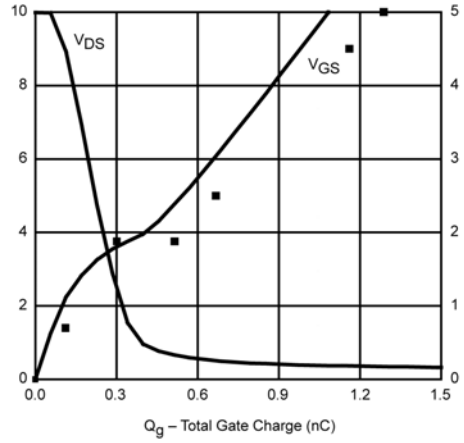












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