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

CHARACTERISTICS

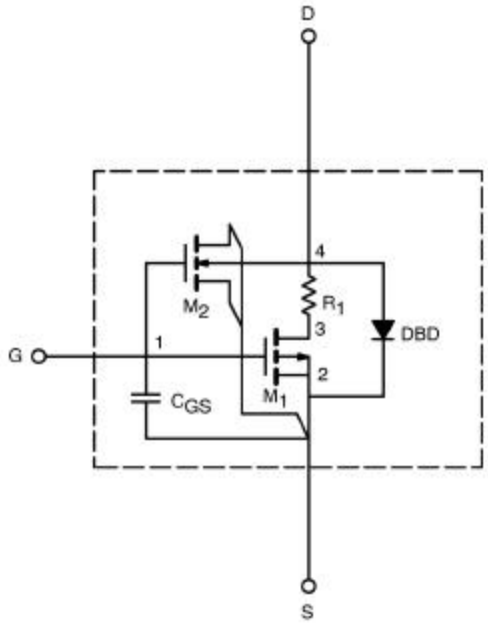
- P-Channel Vertical DMOS
- Macro Model (Subcircuit Model)
- Level 3 MOS
- Apply for both Linear and Switching Application
- Accurate over the –55 to 125°C Temperature Range
- Model the Gate Charge, Transient, and Diode Reverse Recovery Characteristics

DESCRIPTION

The attached spice model describes the typical electrical characteristics of the p-channel vertical DMOS. The subcircuit mode is extracted and optimized over the –55 to 125°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



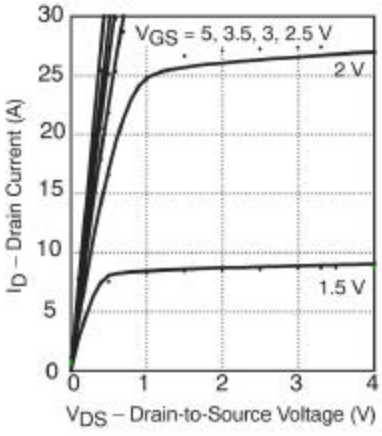
This document is intended as a SPICE modeling guideline and does not constitute a commercial product data sheet. Designers should refer to the appropriate data sheet of the same number for guaranteed specification limits.

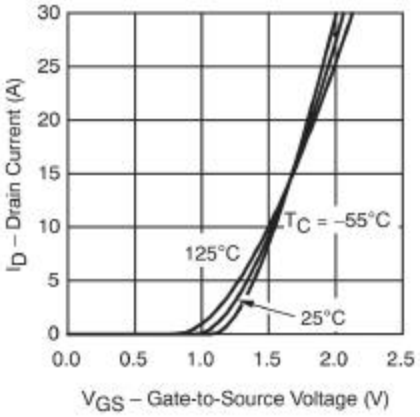
SPECIFICATIONS (T_J = 25°C UNLESS OTHERWISE NOTED)					
Parameter	**Symbol**	**Test Condition**	**Simulated Data**	**Measured Data**	**Unit**
Static					
Gate Threshold Voltage	$V_{GS(th)}$	V_{DS} = – 5V, I_D = – 2mA	0.73		V
On-State Drain Current[a]	$I_{D(on)}$	V_{DS} = – 5V, V_{GS} = – 4.5 V	171		A
Drain-Source On-State Resistance[a]	$r_{DS(on)}$	V_{GS} = – 4.5V, I_D = – 11A	0.015	0.017	Ω
		V_{GS} = – 2.5V, I_D = – 9.8A	0.021	0.022	
		V_{GS} = – 1.8V, I_D = – 2A	0.027	0.027	
Forward Transconductance[a]	g_{fs}	V_{DS} = – 15V, I_D = – 11A	33	31	S
Diode Forward Voltage[a]	V_{SD}	I_S = – 3.2A, V_{GS} = 0V	- 0.83	- 0.8	V
Dynamic[b]					
Total Gate Charge	Q_g	V_{DS} = – 10V, V_{GS} = – 4.5V, I_D = – 11A	33	29	nC
Gate-Source Charge	Q_{gs}		5.9	5.9	
Gate-Drain Charge	Q_{gd}		5.2	5.2	
Turn-On Delay Time	$t_{d(on)}$	V_{DD} = – 10V, R_L = 10Ω $I_D \cong$ – 1A, V_{GEN} = – 4.5V, R_G = 6Ω	34	23	ns
Rise Time	t_r		42	45	
Turn-Off Delay Time	$t_{d(off)}$		52	130	
Fall Time	t_f		78	95	
Source-Drain Reverse Recovery Time	t_{rr}	I_F = – 3.2A, di/dt = 100 A/µs	30	30	

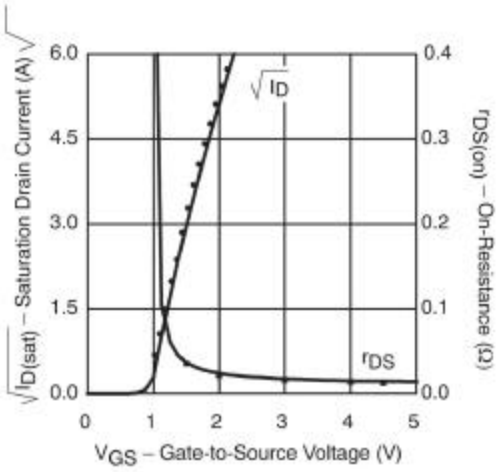
Notes

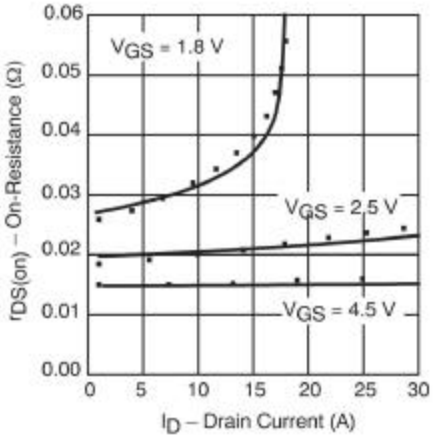
a. Pulse test; pulse width ≤ 300 µs, duty cycle ≤ 2%.
b. Guaranteed by design, not subject to production testing.

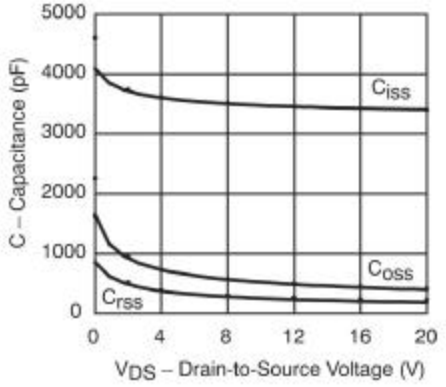
COMPARISON OF MODEL WITH MEASURED DATA (T_J=25°C UNLESS OTHERWISE NOTED)

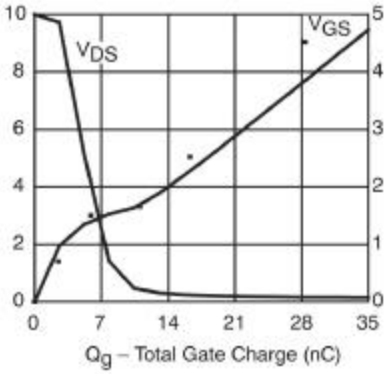












Note: Dots and squares represent measured data.