Dual N-Channel 30-V (D-S) MOSFET with Schottky Diode

CHARACTERISTICS

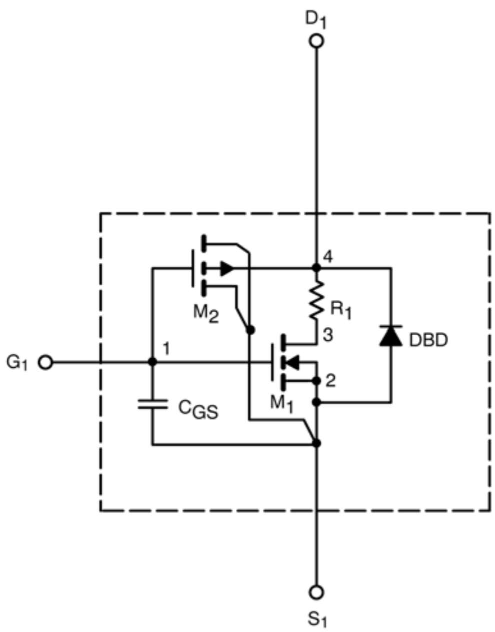
- N-Channel Vertical DMOS
- Macro Model (Subcircuit Model)
- Level 3 MOS
- Apply for both Linear and Switching Application
- Accurate over the −55 to 125°C Temperature Range
- Model the Gate Charge, Transient, and Diode Reverse Recovery Characteristics

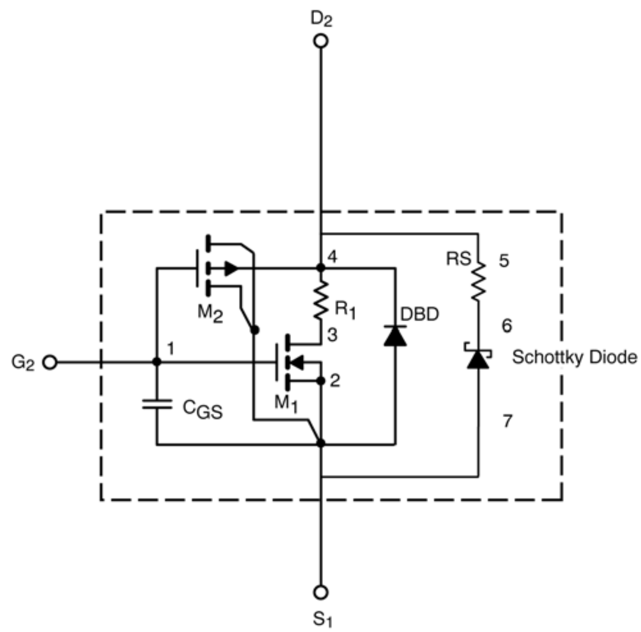
DESCRIPTION

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





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.

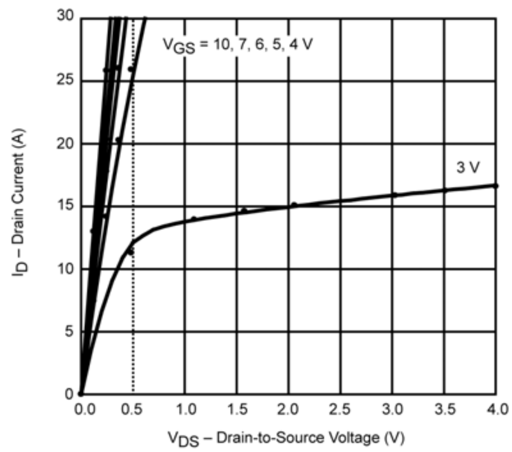
SPECIFICATIONS (T_J = 25°C UNLESS OTHERWISE NOTED)						
Parameter	**Symbol**	**Test Conditions**		**Simulated Data**	**Measured Data**	**Unit**
Static						
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}$, I_D = 250 µA	Ch-1	1.25	1.4	V
			Ch-2	0.95	1.35	
On-State Drain Current[a]	$I_{D(on)}$	V_{DS} = 5 V, V_{GS} = 10 V	Ch-1	398		A
			Ch-2	622		
Drain-Source On-State Resistance[a]	$r_{DS(on)}$	V_{GS} = 10 V, I_D = 9.6 A	Ch-1	0.010	0.010	Ω
		V_{GS} = 10 V, I_D = 13.5 A	Ch-2	0.0078	0.0070	
		V_{GS} = 4.5 V, I_D = 7.8 A	Ch-1	0.015	0.015	
		V_{GS} = 4.5 V, I_D = 12.5 A	Ch-2	.0092	0.0085	
Forward Transconductance[a]	g_{fs}	V_{DS} = 15 V, I_D = 9.6 A	Ch-1	31	25	S
		V_{DS} = 15 V, I_D = 13.5 A	Ch-2	51	56	
Diode Forward Voltage[a]	V_{SD}	I_S = 1.8 A, V_{GS} = 0 V	Ch-1	0.70	0.70	V
		I_S = 2.7 A, V_{GS} = 0 V	Ch-2	0.470	0.485	
Dynamic[b]						
Total Gate Charge	Q_g	Channel-1 V_{DS} = 15 V, V_{GS} = 5 V, I_D = 9.6 A Channel-2 V_{DS} = 15 V, V_{GS} = 5 V, I_D = 13.5 A	Ch-1	11	11.5	nC
			Ch-2	35	40	
Gate-Source Charge	Q_{gs}		Ch-1	3	3	
			Ch-2	10	10	
Gate-Drain Charge	Q_{gd}		Ch-1	4.5	4.5	
			Ch-2	8.8	8.8	
Turn-On Delay Time	$t_{d(on)}$	Channel-1 V_{DD} = 15 V, R_L = 15 Ω I_D ≅ 1 A, V_{GEN} = 10 V, R_G = 6 Ω Channel-2 V_{DD} = 15 V, R_L = 15 Ω I_D ≅ 1 A, V_{GEN} = 10 V, R_G = 6 Ω	Ch-1	10	10	ns
			Ch-2	19	17	
Turn-Off Delay Time	$t_{d(off)}$		Ch-1	15	5	
			Ch-2	23	14	
			Ch-1	22	30	
Fall Time	t_f		Ch-2	48	102	
			Ch-1	40	10	
			Ch-2	61	26	
Source-Drain Reverse Recovery Time	t_{rr}	I_F = 1.8 A, di/dt = 100 A/µs	Ch-1	30	30	
		I_F = 2.7 A, di/dt = 100 A/µs	Ch-2	37	40	

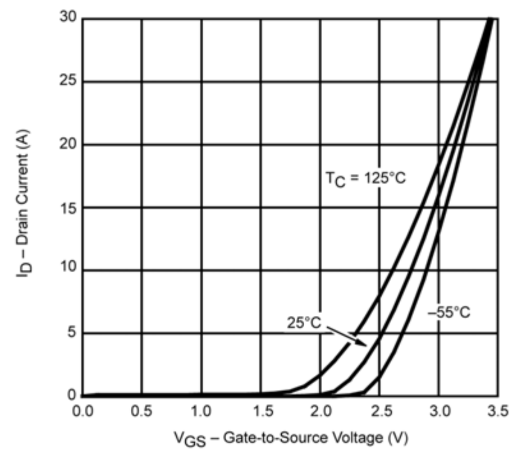
Notes

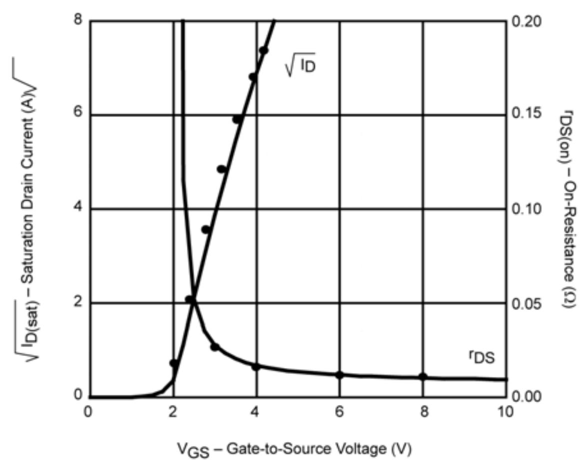
a. Guaranteed by design, not subject to production testing.
b. Pulse test; pulse width ≤ 300 µs, duty cycle ≤ 2%.

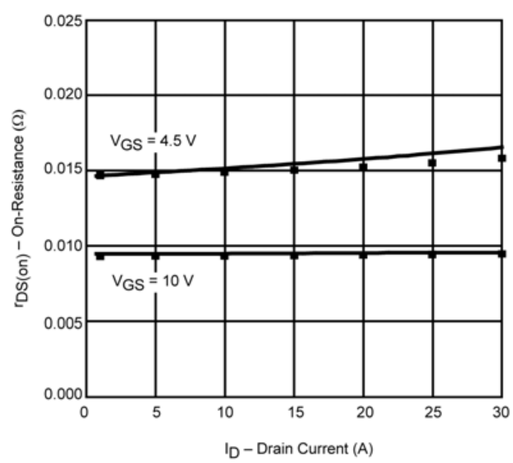
COMPARISON OF MODEL WITH MEASURED DATA (T_J=25°C UNLESS OTHERWISE NOTED)

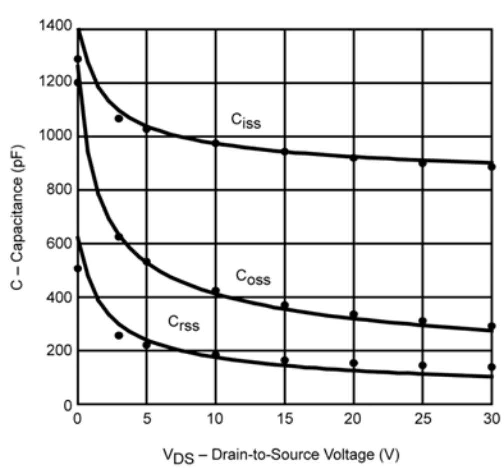
Channel 1

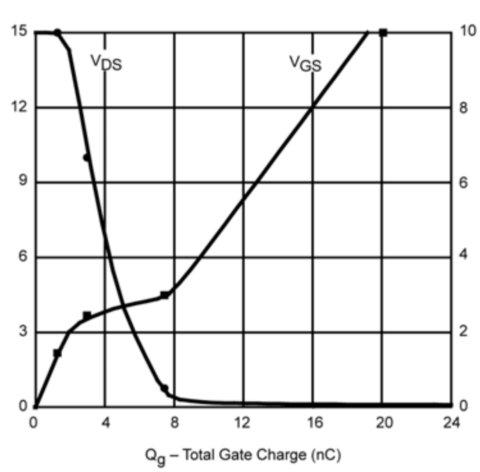






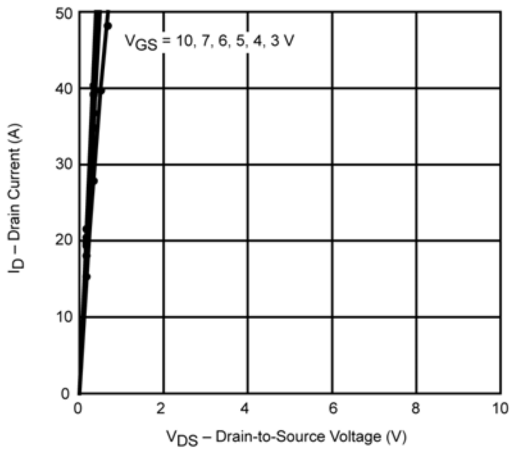


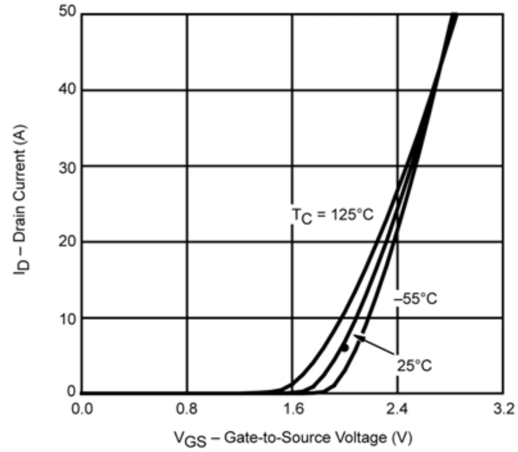


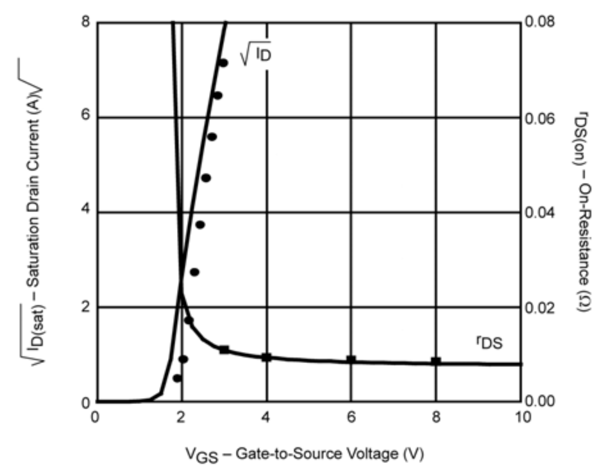


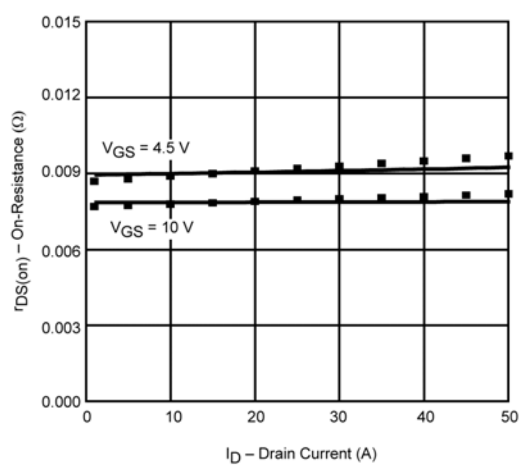
Note: Dots and squares represent measured data.

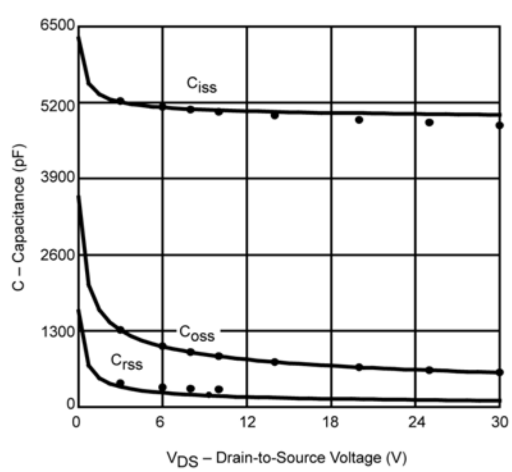
Channel 2

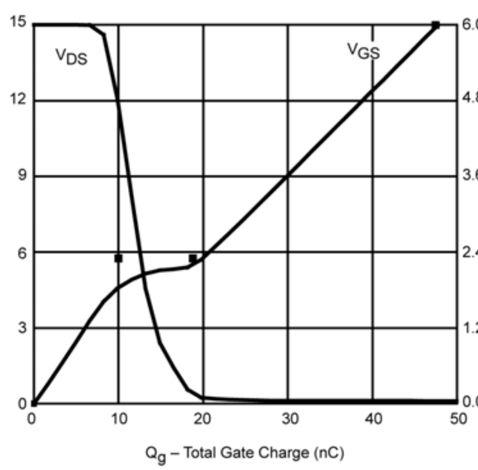












Note: Dots and squares represent measured data.

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