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

DESCRIPTION

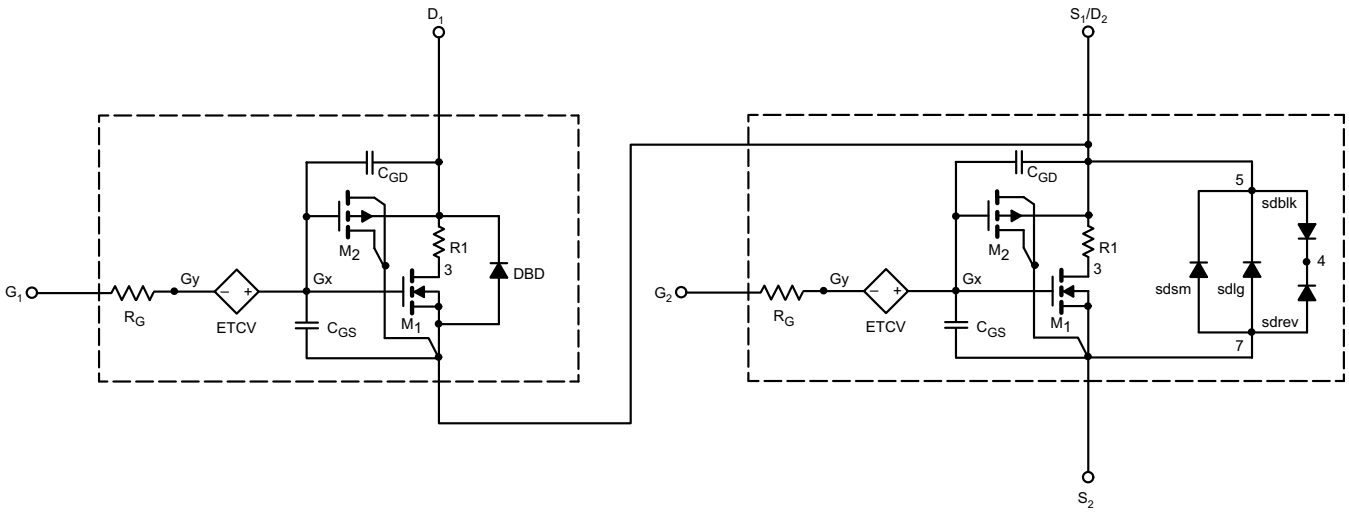
The attached SPICE model describes the typical electrical characteristics of the n-channel vertical DMOS. The sub-circuit model is extracted and optimized over the -55 °C to 125 °C temperature ranges under the pulsed 0 V to 10 V gate drive. The saturated output impedance is best fit at the gate bias 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.

CHARACTERISTICS

- N-Channel Vertical DMOS
- Macro Model (Sub-circuit Model)
- Level 3 MOS
- Apply for both Linear and Switching Application
- Accurate over the -55 °C to 125 °C Temperature Range
- Model the Gate Charge

SUBCIRCUIT MODEL SCHEMATIC



Note

- This document is intended as a SPICE modeling guideline and does not constitute a commercial product datasheet. Designers should refer to the appropriate datasheet 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-Source Threshold Voltage	$V_{GS(th)}$	V_{DS} = V_{GS}, I_D = 250 µA	Ch-1	1.6	-	V
			Ch-2	1.6	-	
Drain-Source On-State Resistance [a]	$R_{DS(on)}$	V_{GS} = 10 V, I_D = 19 A	Ch-1	0.0048	0.0047	Ω
			Ch-2	0.0011	0.0011	
		V_{GS} = 4.5 V, I_D = 15 A	Ch-1	0.0068	0.0065	
			Ch-2	0.0015	0.0016	
Forward Transconductance [a]	g_{fs}	V_{DS} = 10 V, I_D = 19 A	Ch-1	92	80	S
		V_{DS} = 10 V, I_D = 20 A	Ch-2	170	155	
Diode Forward Voltage [a]	V_{SD}	I_S = 10 A, V_{GS} = 0 V	Ch-1	0.80	0.80	V
			Ch-2	0.58	0.58	
Dynamic [b]						
Input Capacitance	C_{iss}	Channel 1 V_{DS} = 15 V, V_{GS} = 0 V, f = 1 MHz Channel 2 V_{DS} = 15 V, V_{GS} = 0 V, f = 1 MHz	Ch-1	929	930	pF
			Ch-2	4190	4600	
Output Capacitance	C_{oss}		Ch-1	340	325	
			Ch-2	1590	1700	
Reverse Transfer Capacitance	C_{rss}		Ch-1	23	21	
			Ch-2	102	115	
Total Gate Charge	Q_g	V_{DS} = 15 V, V_{GS} = 10 V, I_D = 19 A	Ch-1	12	12	nC
			Ch-2	53	51	
		Channel 1 V_{DS} = 15 V, V_{GS} = 4.5 V, I_D = 19 A Channel 2 V_{DS} = 15 V, V_{GS} = 4.5 V, I_D = 19 A	Ch-1	5.6	5.4	
			Ch-2	25	23	
Gate-Source Charge	Q_{gs}		Ch-1	3	3	
			Ch-2	12.2	12.2	
Gate-Drain Charge	Q_{gd}		Ch-1	0.75	0.75	
			Ch-2	2.2	2.2	

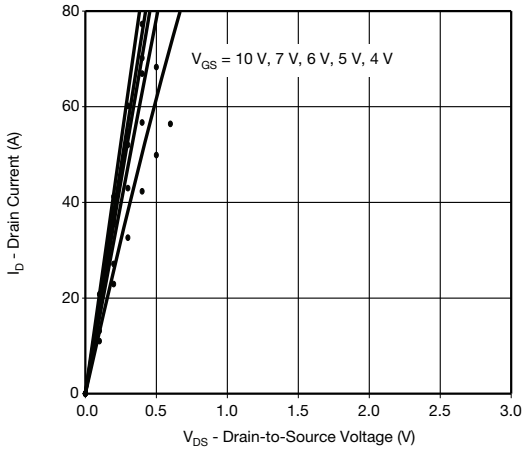
Notes

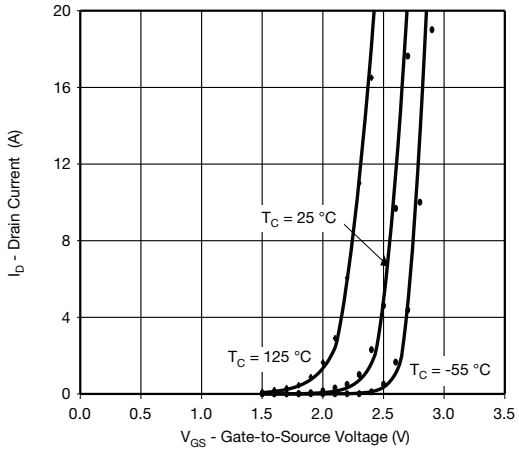
a. Pulse test; pulse width ≤ 300 µs, duty cycle ≤ 2 %.

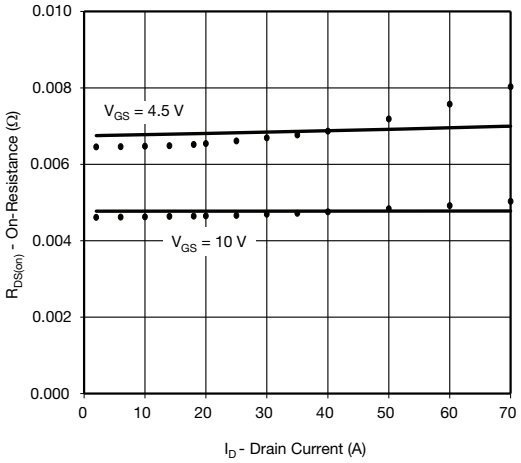
b. Guaranteed by design, not subject to production testing.

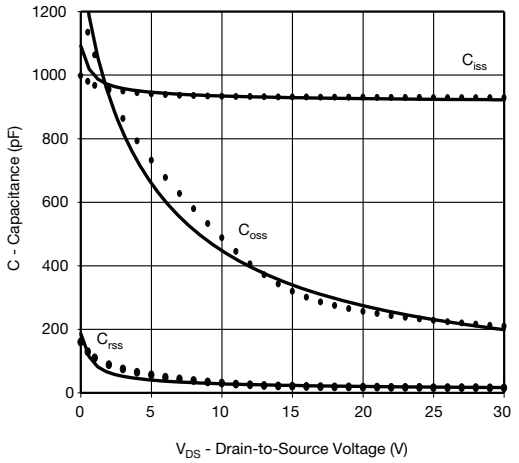
COMPARISON OF MODEL WITH MEASURED DATA T_J = 25 °C, unless otherwise noted

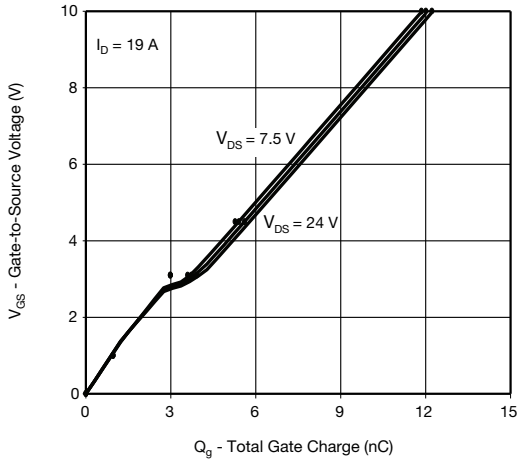
N-Channel 1 MOSFET

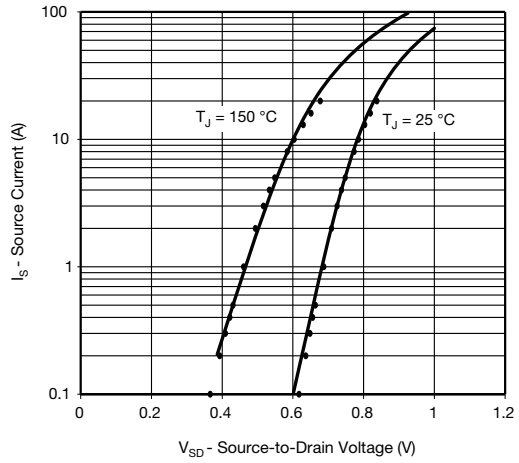










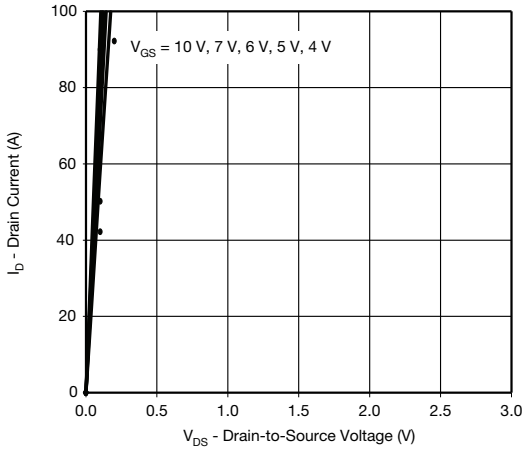


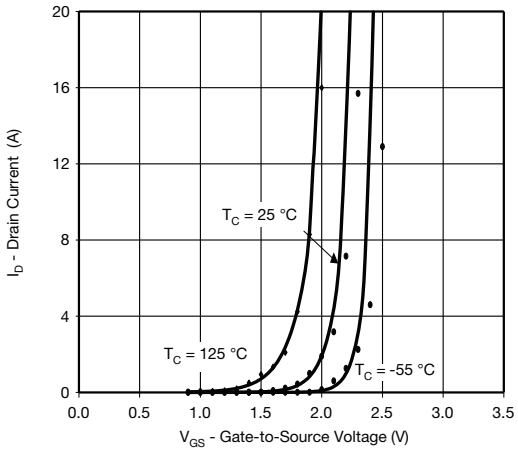
Note

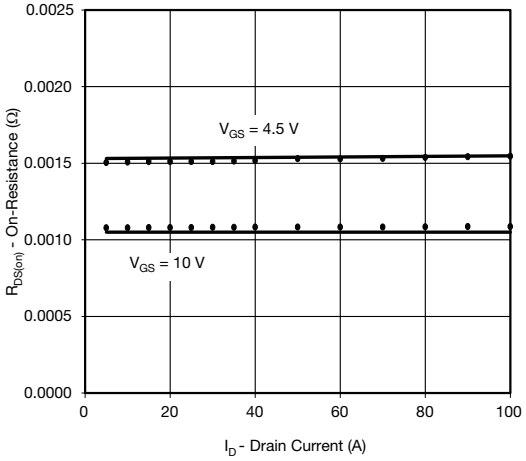
- Dots and squares represent measured data.

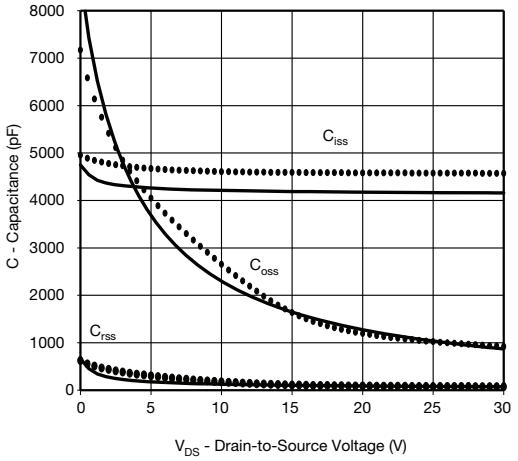
COMPARISON OF MODEL WITH MEASURED DATA T_J = 25 °C, unless otherwise noted

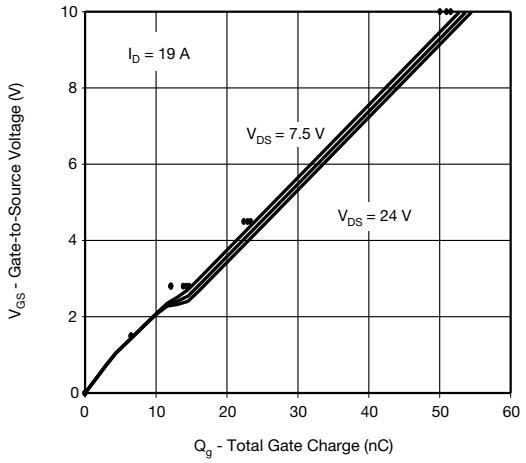
N-Channel 2 MOSFET

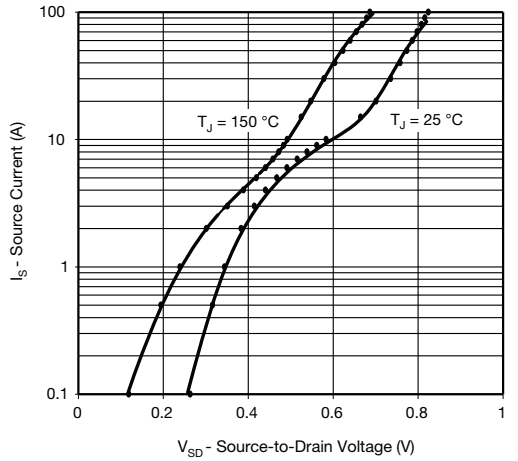












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