N-Channel 20 V (D-S) 175 °C MOSFET

DESCRIPTION

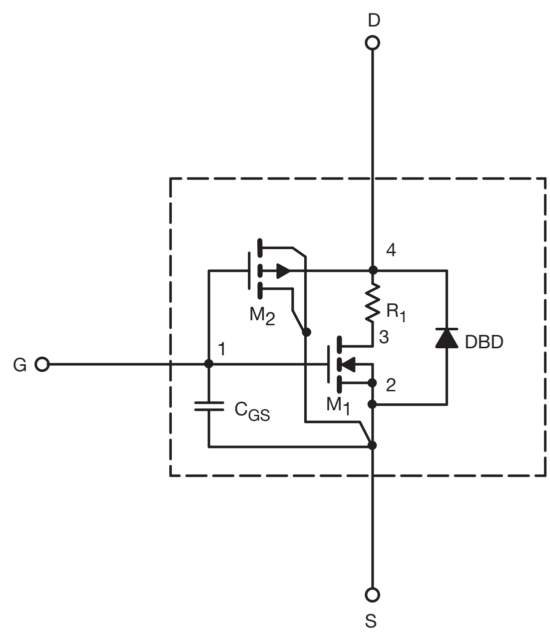
The attached SPICE model describes the typical electrical characteristics of the n-channel vertical DMOS. The subcircuit model is extracted and optimized over the - 55 °C to 125 °C temperature ranges under the pulsed 0 V to 10 V gate drive. The saturated output impedance is best fit at the gate bias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

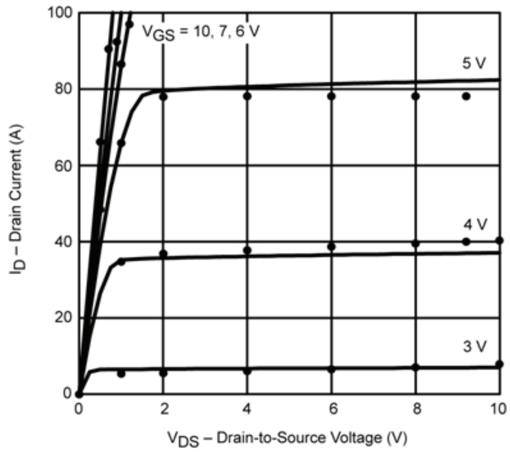
- This document is intended as a SPICE modeling guideline and does not constitute a commercial product datasheet. Designers should refer to the appropriate datasheet of the same number for guaranteed specification limits.

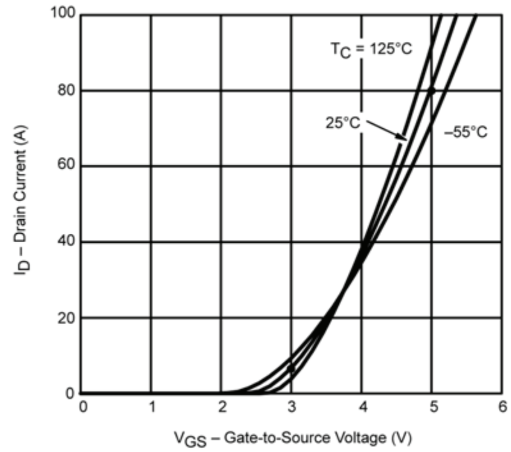
SPECIFICATIONS (T_J = 25 °C, unless otherwise noted)					
PARAMETER	**SYMBOL**	**TEST CONDITIONS**	**SIMULATED DATA**	**MEASURED DATA**	**UNIT**
Static					
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}$, I_D = 250 µA	1.7	-	V
On-State Drain Current[a]	$I_{D(on)}$	V_{DS} = 5 V, V_{GS} = 10 V	438	-	A
Drain-Source On-State Resistance[a]	$R_{DS(on)}$	V_{GS} = 10 V, I_D = 20 A	0.0078	0.0080	Ω
		V_{GS} = 10 V, I_D = 20 A, T_J = 125 °C	0.01	-	
		V_{GS} = 4.5 V, I_D = 20 A	0.0136	0.0135	
Diode Forward Voltage[a]	V_{SD}	I_F = 50 A, V_{GS} = 0 V	0.91	1.1	V
Dynamic[b]					
Input Capacitance	C_{iss}	V_{DS} = 10 V, V_{GS} = 0 V, f = 1 MHz	1212	1300	pF
Output Capacitance	C_{oss}		470	470	
Reverse Transfer Capacitance	C_{rss}		237	275	
Total Gate Charge[c]	Q_g	V_{DS} = 10 V, V_{GS} = 4.5 V, I_D = 50 A	10.6	10.5	nC
Gate-Source Charge[c]	Q_{gs}		4.2	4.2	
Gate-Drain Charge[c]	Q_{gd}		4	4	
Turn-On Delay Time[c]	$t_{d(on)}$	V_{DD} = 10 V, R_L = 0.2 Ω I_D = 50 A, V_{GEN} = 10 V, R_g = 2.5 Ω	9	8	ns
Rise Time[c]	t_r		9	10	
Turn-Off Delay Time[c]	$t_{d(off)}$		32	25	
Fall Time[c]	t_f		10	12	
Source-Drain Reverse Recovery Time	t_{rr}	I_F = 50 A, dI/dt = 100 A/µs	31	35	

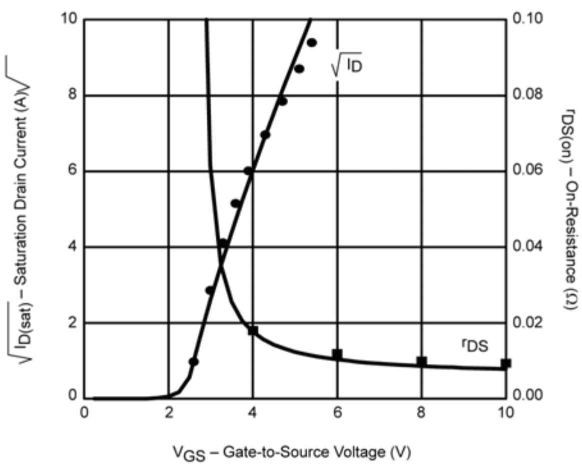
Notes

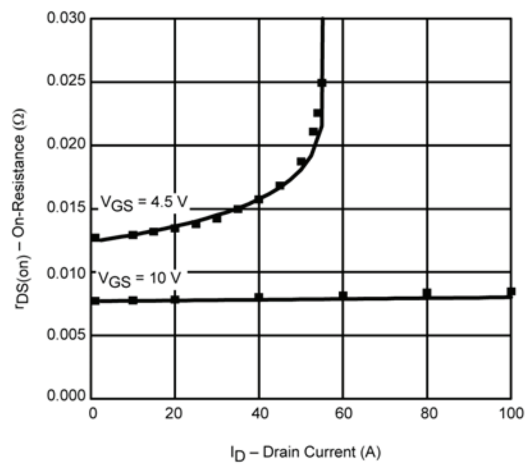
a. Pulse test; pulse width ≤ 300 µs, duty cycle ≤ 2 %.
b. Guaranteed by design, not subject to production testing.
c. Independent of operating temperature.

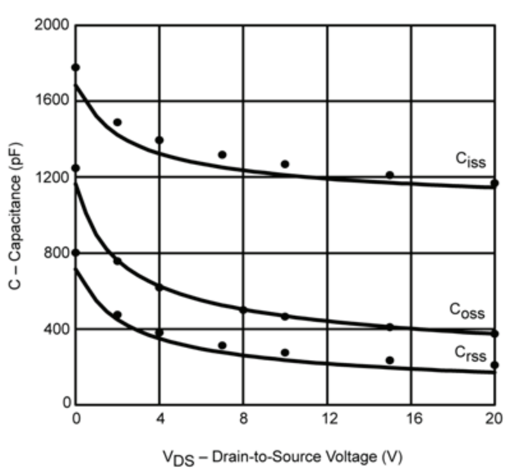
COMPARISON OF MODEL WITH MEASURED DATA (T_J = 25 °C, unless otherwise noted)

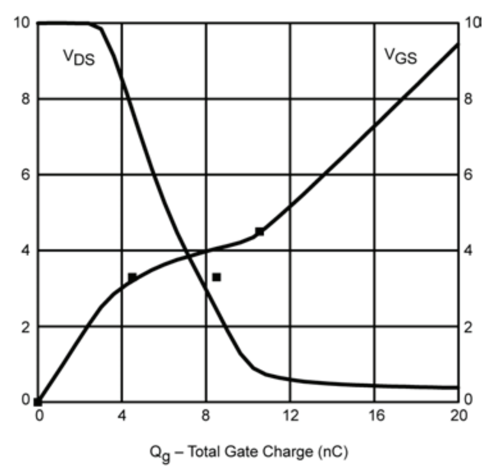












Note

- Dots and squares represent measured data.

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