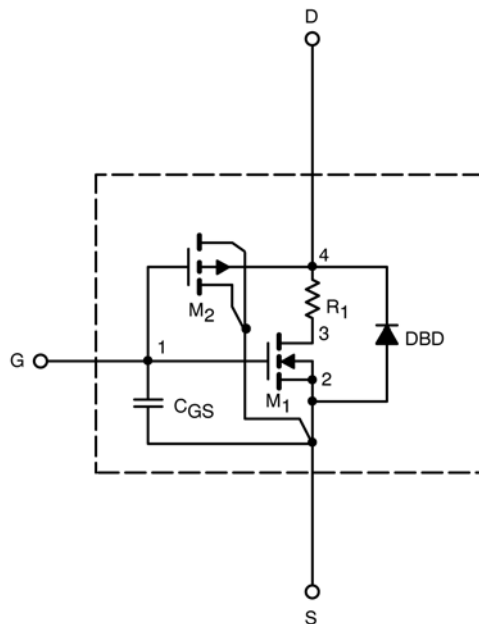# N-Channel 30-V (D-S) MOSFET

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

SPICE Device Model Si7636DP
Vishay Siliconix

| Parameter	Symbol	Test Condition	Simulated Data	Measured Data	Unit
SPECIFICATIONS (T_J = 25°C UNLESS OTHERWISE NOTED)					
Static					
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}$, I_D = 250 μA	1.9		V
On-State Drain Current[a]	$I_{D(on)}$	$V_{DS} \geq$ 5 V, V_{GS} = 10 V	1882		A
Drain-Source On-State Resistance[a]	$r_{DS(on)}$	V_{GS} = 10 V, I_D = 25 A	0.0033	0.0033	Ω
		V_{GS} = 4.5 V, I_D = 19 A	0.0040	0.0040	
Forward Transconductance[a]	g_{fs}	V_{DS} = 15 V, I_D = 25 A	95	110	S
Forward Voltage[a]	V_{SD}	I_S = 2.9 A, V_{GS} = 0 V	0.83	0.72	V
Dynamic[b]					
Total Gate Charge	Q_g	V_{DS} = 15 V, V_{GS} = 4.5 V, I_D = 20 A	37	32	nC
Gate-Source Charge	Q_{gs}		16.5	16.5	
Gate-Drain Charge	Q_{gd}		8.5	8.5	
Turn-On Delay Time	$t_{d(on)}$	V_{DD} = 15 V, R_L = 15 Ω, $I_D \cong$ 1 A, V_{GEN} = 10 V, R_G = 6 Ω	22	24	ns
Rise Time	t_r		13	16	
Turn-Off Delay Time	$t_{d(off)}$		70	90	
Fall Time	t_f		55	32	

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)
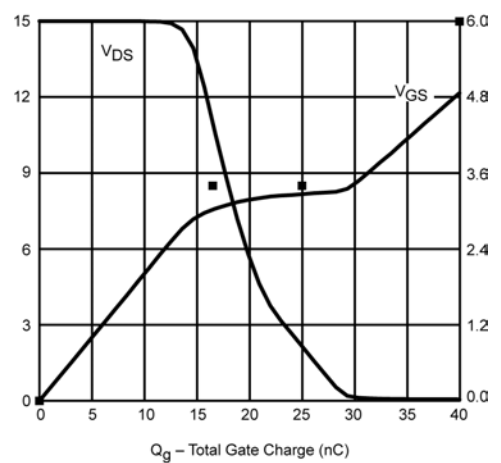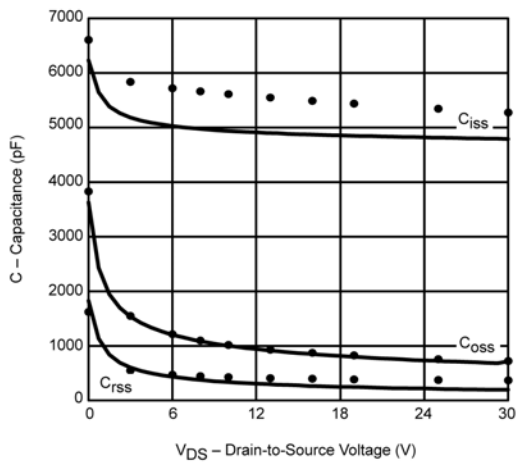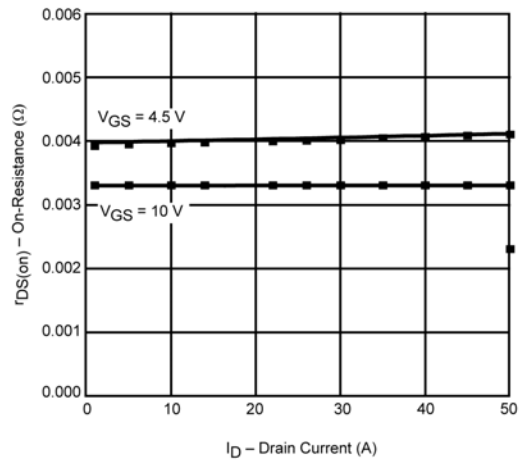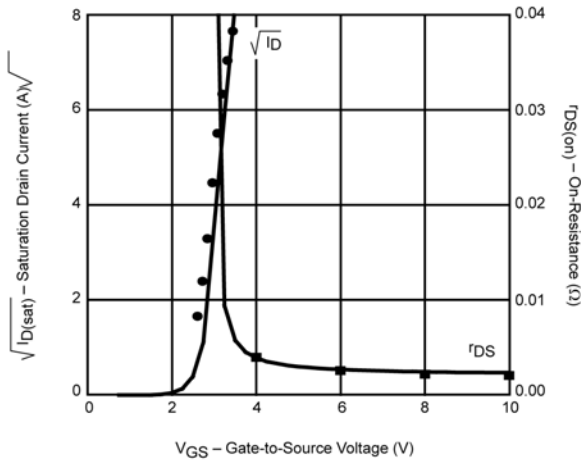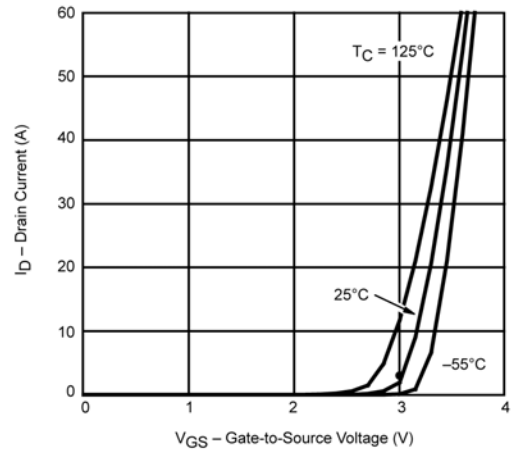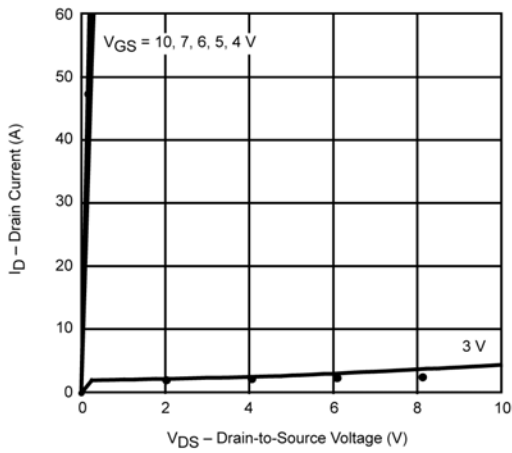
Note: Dots and squares represent measured data.