



Dual P-Channel 30-V (D-S) MOSFET

CHARACTERISTICS

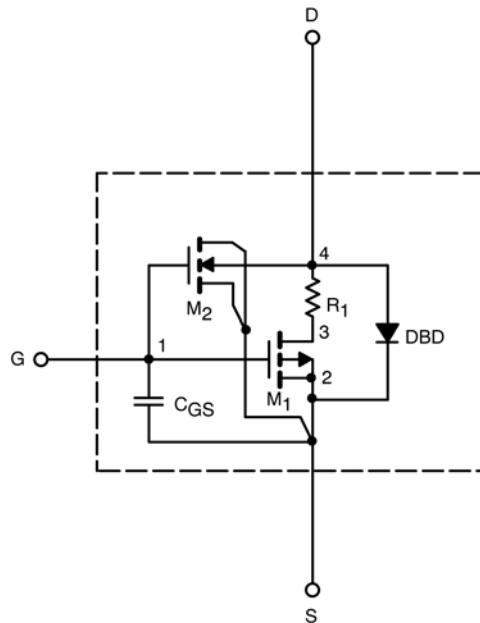
- P-Channel Vertical DMOS
- Macro Model (Subcircuit Model)
- Level 3 MOS
- Apply for both Linear and Switching Application
- Accurate over the -55 to 125°C Temperature Range
- Model the Gate Charge, Transient, and Diode Reverse Recovery Characteristics

DESCRIPTION

The attached spice model describes the typical electrical characteristics of the p-channel vertical DMOS. The subcircuit 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 ($T_J = 25^\circ\text{C}$ UNLESS OTHERWISE NOTED) | | | | | |
|---|--------------|---|----------------|---------------|----------|
| Parameter | Symbol | Test Conditions | Simulated Data | Measured Data | Unit |
| Static | | | | | |
| Gate Threshold Voltage | $V_{GS(th)}$ | $V_{DS} = V_{GS}, I_D = -250 \mu\text{A}$ | 2.3 | | V |
| On-State Drain Current ^a | $I_{D(on)}$ | $V_{DS} = -5 \text{ V}, V_{GS} = -10 \text{ V}$ | 10 | | A |
| Drain-Source On-State Resistance ^a | $r_{DS(on)}$ | $V_{GS} = -10 \text{ V}, I_D = -2.2 \text{ A}$ | 0.114 | 0.107 | Ω |
| | | $V_{GS} = -4.5 \text{ V}, I_D = -1.6 \text{ A}$ | 0.185 | 0.194 | |
| Forward Transconductance ^a | g_{fs} | $V_{DS} = -5 \text{ V}, I_D = -2.2 \text{ A}$ | 4.3 | 4 | S |
| Diode Forward Voltage ^a | V_{SD} | $I_S = -1.05 \text{ A}, V_{GS} = 0 \text{ V}$ | -0.78 | -0.82 | V |
| Dynamic^b | | | | | |
| Total Gate Charge | Q_g | $V_{DS} = -15 \text{ V}, V_{GS} = -4.5 \text{ V}, I_D = -2.2 \text{ A}$ | 2.3 | 3.1 | nC |
| Gate-Source Charge | Q_{gs} | | 1 | 1 | |
| Gate-Drain Charge | Q_{gd} | | 1.6 | 1.6 | |
| Turn-On Delay Time | $t_{d(on)}$ | $V_{DD} = -15 \text{ V}, R_L = 15 \Omega$ $I_D \cong -1 \text{ A}, V_{GEN} = -4.5 \text{ V}, R_G = 6 \Omega$ | 10 | 10 | ns |
| Rise Time | t_r | | 7 | 16 | |
| Turn-Off Delay Time | $t_{d(off)}$ | | 14 | 17 | |
| Fall Time | t_f | | 5 | 12 | |

Notes

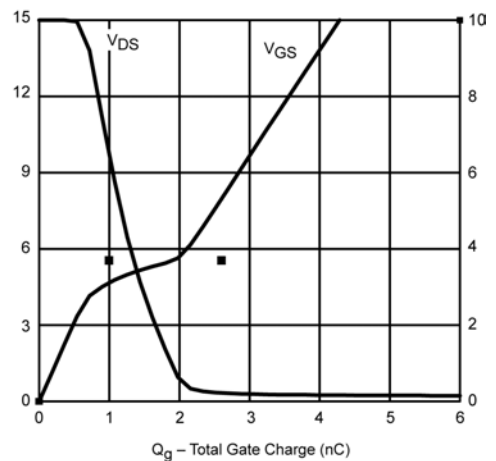
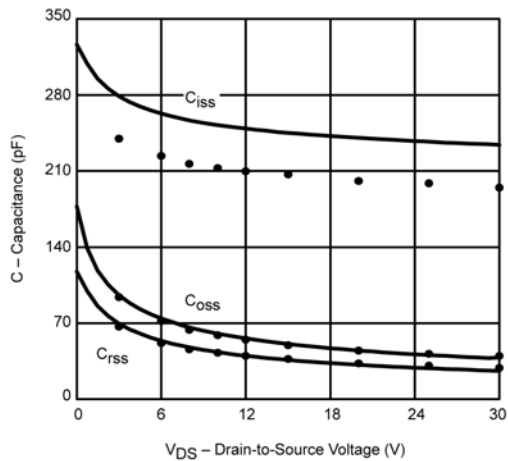
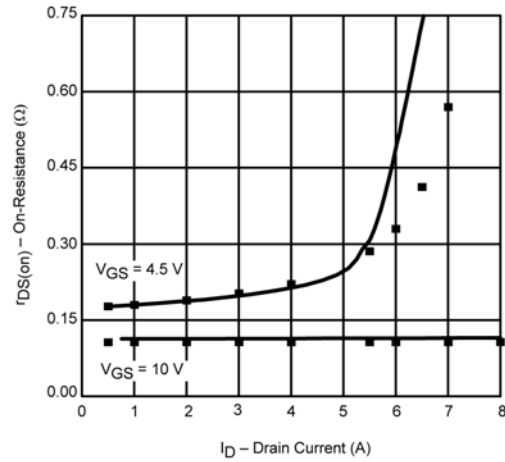
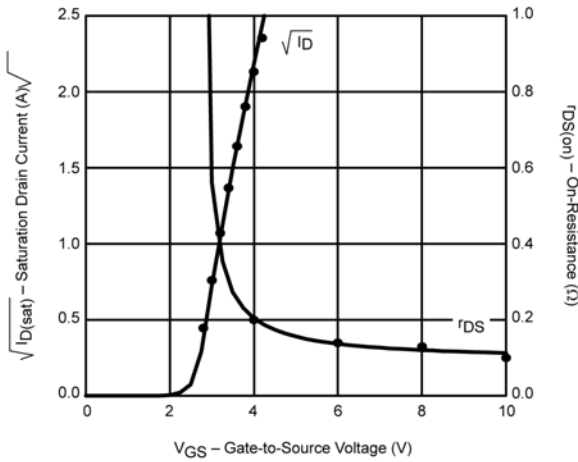
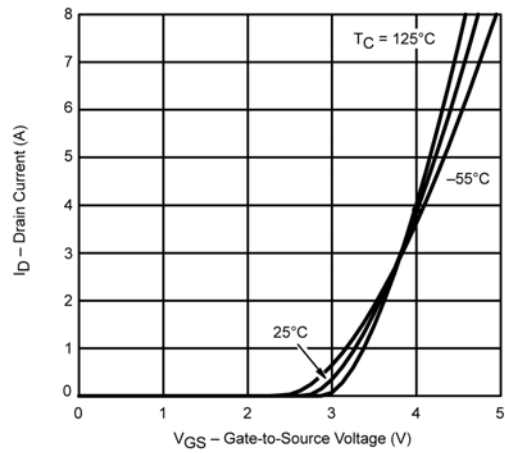
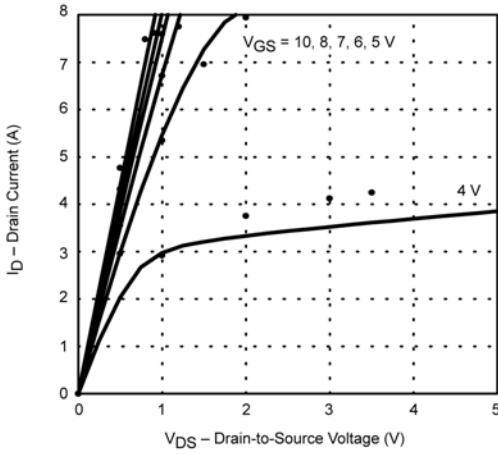
- a. Pulse test; pulse width $\leq 300 \mu\text{s}$, duty cycle $\leq 2\%$.
- b. Guaranteed by design, not subject to production testing.



SPICE Device Model Si3993DV

Vishay Siliconix

COMPARISON OF MODEL WITH MEASURED DATA ($T_J=25^\circ\text{C}$ UNLESS OTHERWISE NOTED)



Note: Dots and squares represent measured data.



Disclaimer

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