# P-Channel 60-V (D-S) MOSFET

## CHARACTERISTICS

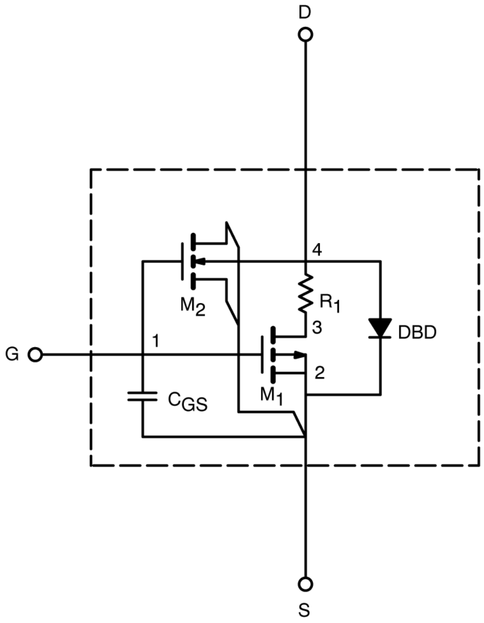
- P-Channel Vertical DMOS
- Macro Model (Subcircuit Model)
- Level 3 MOS
- Apply for both Linear and Switching Application
- Accurate over the −55 to 125°C Temperature Range
- Model the Gate Charge, Transient, and Diode Reverse Recovery Characteristics

## DESCRIPTION

The attached spice model describes the typical electrical characteristics of the p-channel vertical DMOS. The subcircuit mode is extracted and optimized over the −55 to 125°C temperature ranges under the pulsed 0-to-10V 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



SPECIFICATIONS ($T_J$ = 25°C UNLESS OTHERWISE NOTED)

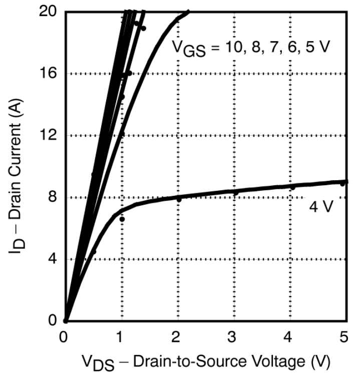
| Parameter | Symbol | Test Conditions | Simulated Data | Measured Data | Unit |
|---|---|---|---|---|---|
| **Static** | | | | | |
| Gate Threshold Voltage | $V_{GS(th)}$ | $V_{DS} = V_{GS}$, $I_D = -250\mu A$ | 2.1 | | V |
| On-State Drain Current[a] | $I_{D(on)}$ | $V_{DS} < -5V$, $V_{GS} = -10V$ | 88 | | A |
| Drain-Source On-State Resistance[a] | $r_{DS(on)}$ | $V_{GS} = -10V$, $I_D = -5.7A$ | 0.053 | 0.054 | Ω |
| | | $V_{GS} = -4.5V$, $I_D = -4.4A$ | 0.084 | 0.090 | |
| Forward Transconductance[a] | $g_{fs}$ | $V_{DS} = -15V$, $I_D = -5.7A$ | 11 | 11 | S |
| Diode Forward Voltage[a] | $V_{SD}$ | $I_S = -3.2A$, $V_{GS} = 0V$ | - 0.82 | - 0.80 | V |
| **Dynamic[b]** | | | | | |
| Total Gate Charge | $Q_g$ | $V_{DS} = -30V$, $V_{GS} = -10V$, $I_D = -5.7A$ | 15.4 | 15 | nC |
| Gate-Source Charge | $Q_{gs}$ | | 4 | 4 | |
| Gate-Drain Charge | $Q_{gd}$ | | 3.2 | 3.2 | |
| Turn-On Delay Time | $t_{d(on)}$ | $V_{DD} = -30V$, $R_L = 30\Omega$<br>$I_D \cong -1A$, $V_{GEN} = -10V$, $R_G = 6\Omega$ | 9 | 12 | ns |
| Rise Time | $t_r$ | | 12 | 12 | |
| Turn-Off Delay Time | $t_{d(off)}$ | | 19 | 22 | |
| Fall Time | $t_f$ | | 32 | 16 | |
| Source-Drain Reverse Recovery Time | $t_{rr}$ | $I_F = -3.2A$, di/dt = 100A/µs | 31 | 45 | |

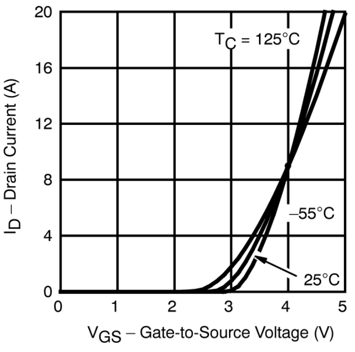
Notes

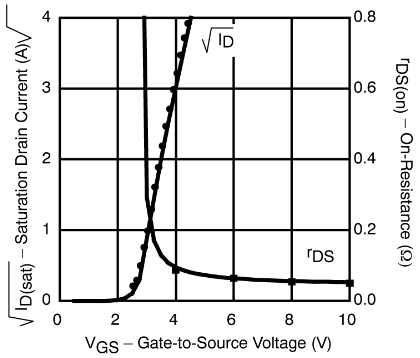
a. Pulse test; pulse width ≤ 300 µs, duty cycle ≤ 2%.

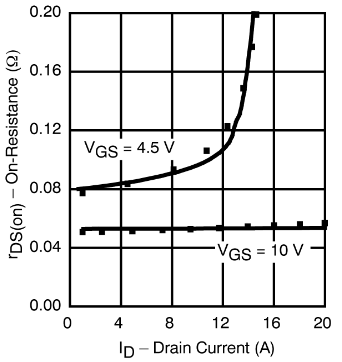
b. Guaranteed by design, not subject to production testing.

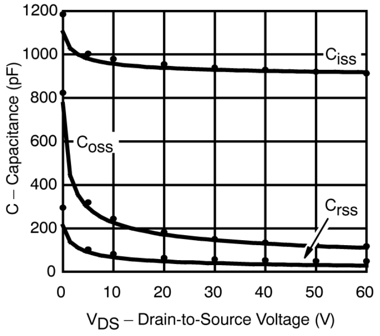
## COMPARISON OF MODEL WITH MEASURED DATA ($T_J$=25°C UNLESS OTHERWISE NOTED)

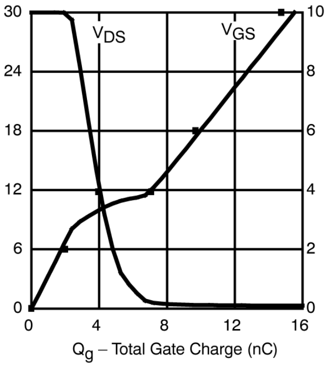












Note: Dots and squares represent measured data.