

## N-Channel 20 V (D-S) MOSFET

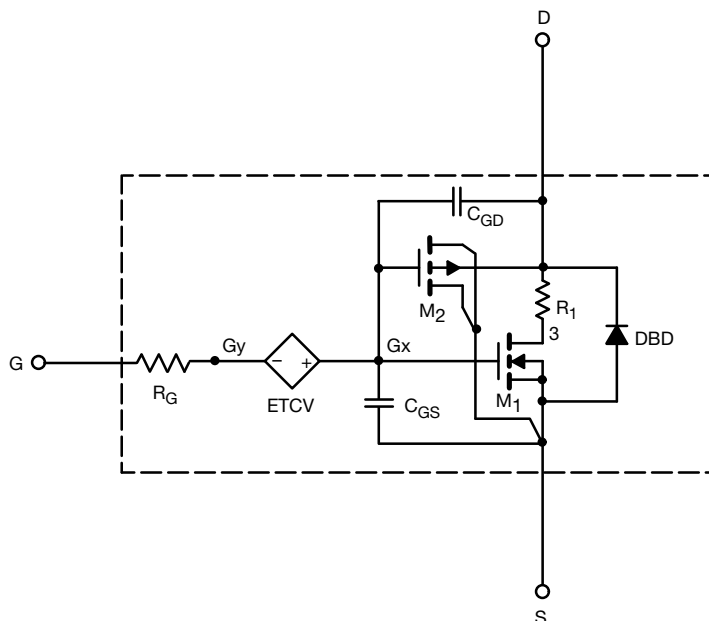
### DESCRIPTION

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, Transient, and Diode Reverse Recovery Characteristics

### 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.



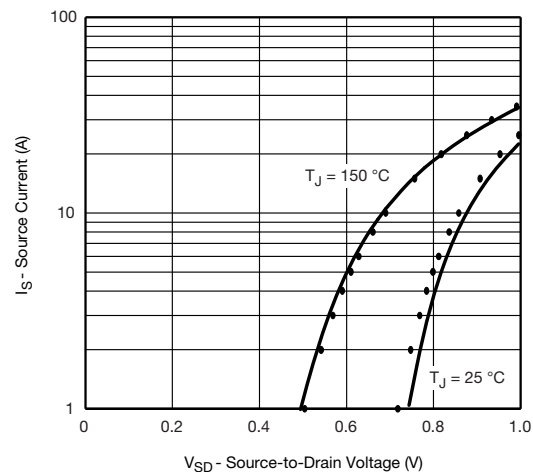
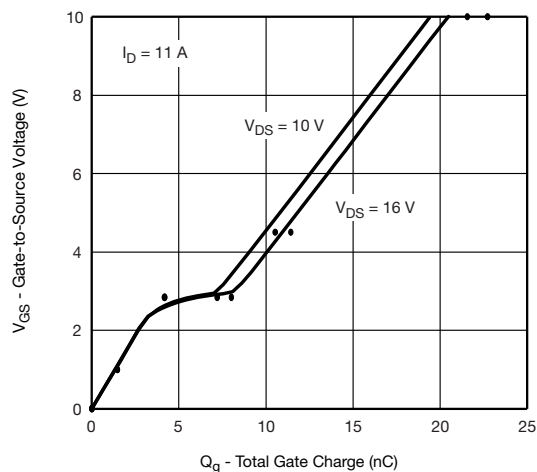
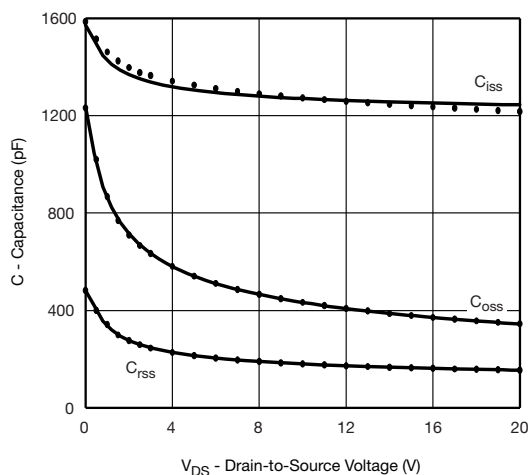
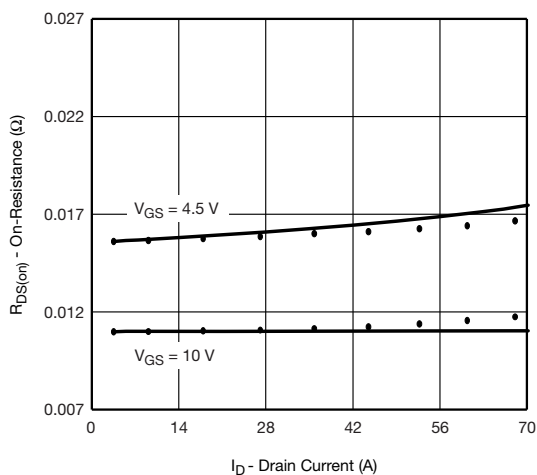
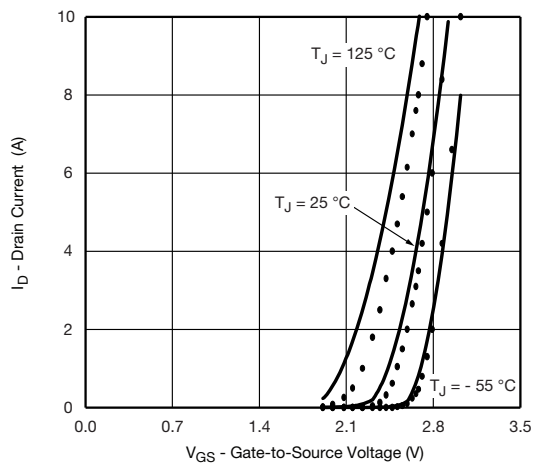
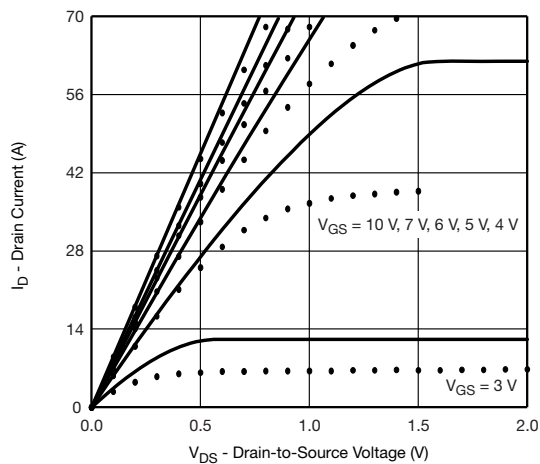
| SPECIFICATIONS ( $T_J = 25\text{ }^{\circ}\text{C}$ , unless otherwise noted) |              |  |                |               |          |
|---|--------------|--|----------------|---------------|----------|
| PARAMETER   | SYMBOL       | TEST CONDITIONS  | SIMULATED DATA | MEASURED DATA | UNIT     |
| <b>Static</b>   |              |  |                |               |          |
| Gate-Source Threshold Voltage   | $V_{GS(th)}$ | $V_{DS} = V_{GS}$ , $I_D = 250\text{ }\mu\text{A}$                     | 1.3            | -             | V        |
| Drain-Source On-State Resistance <sup>a</sup>                                 | $R_{DS(on)}$ | $V_{GS} = 10\text{ V}$ , $I_D = 11\text{ A}$                           | 0.011          | 0.0115        | $\Omega$ |
|   |              | $V_{GS} = 4.5\text{ V}$ , $I_D = 9.3\text{ A}$                         | 0.017          | 0.016         |          |
| Forward Transconductance <sup>a</sup>   | $g_{fs}$     | $V_{DS} = 10\text{ V}$ , $I_D = 11\text{ A}$                           | 23             | 25            | S        |
| Body Diode Voltage  | $V_{SD}$     | $I_S = 8.8\text{ A}$   | 0.80           | 0.84          | V        |
| <b>Dynamic<sup>b</sup></b>  |              |  |                |               |          |
| Input Capacitance   | $C_{iss}$    | $V_{DS} = 10\text{ V}$ , $V_{GS} = 0\text{ V}$ , $f = 1\text{ MHz}$    | 1270           | 1280          | pF       |
| Output Capacitance  | $C_{oss}$    |  | 433            | 440           |          |
| Reverse Transfer Capacitance  | $C_{rss}$    |  | 180            | 195           |          |
| Total Gate Charge   | $Q_g$        | $V_{DS} = 10\text{ V}$ , $V_{GS} = 10\text{ V}$ , $I_D = 11\text{ A}$  | 20             | 21.6          | nC       |
|   | $Q_g$        | $V_{DS} = 10\text{ V}$ , $V_{GS} = 4.5\text{ V}$ , $I_D = 11\text{ A}$ | 10             | 10.6          |          |
| Gate-Source Charge  | $Q_{gs}$     |  | 4.2            | 4.2           |          |
| Gate-Drain Charge   | $Q_{gd}$     |  | 3.1            | 3.1           |          |

**Notes**

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



## COMPARISON OF MODEL WITH MEASURED DATA ( $T_J = 25^\circ\text{C}$ , unless otherwise noted)



### Note

- Dots and squares represent measured data.