

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

### DESCRIPTION

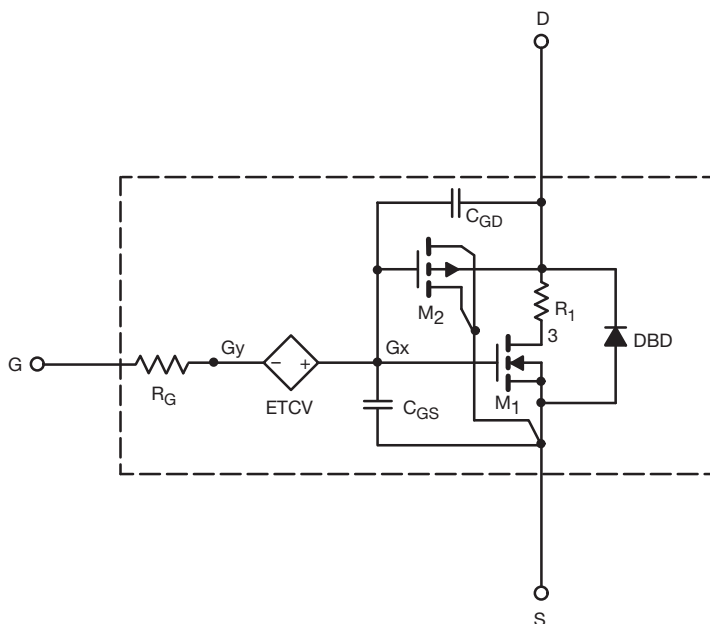
The attached SPICE model describes the typical electrical characteristics of the n-channel vertical DMOS. The subcircuit model is extracted and optimized over the - 55 °C to 125 °C temperature ranges under the pulsed 0 V to 10 V gate drive. The saturated output impedance is best fit at the gate bias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



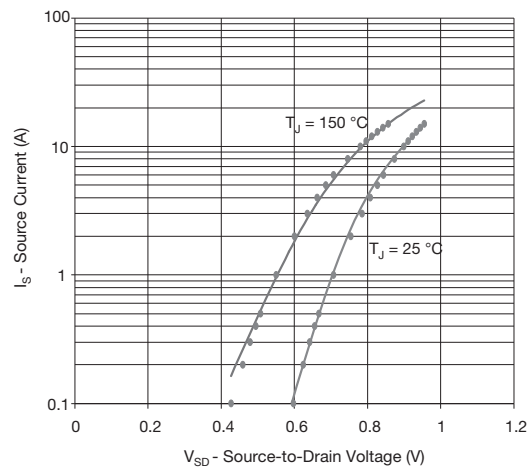
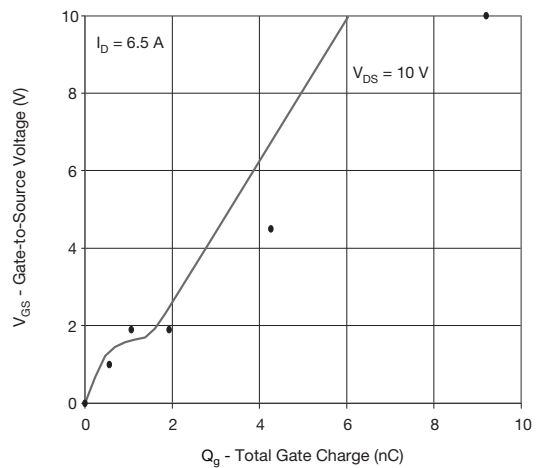
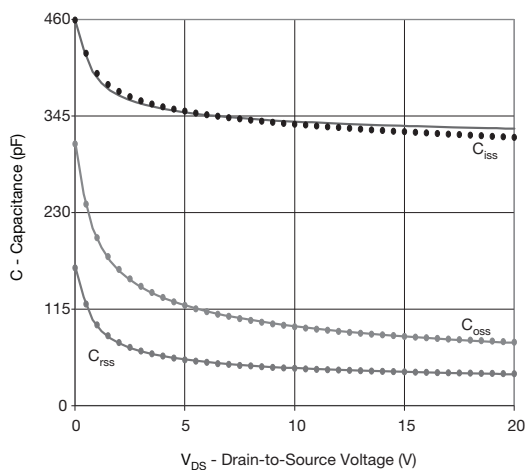
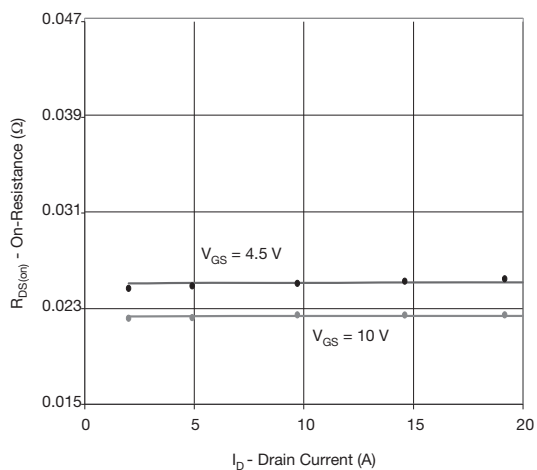
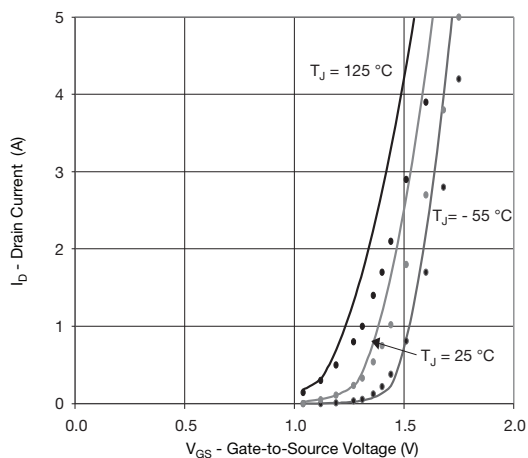
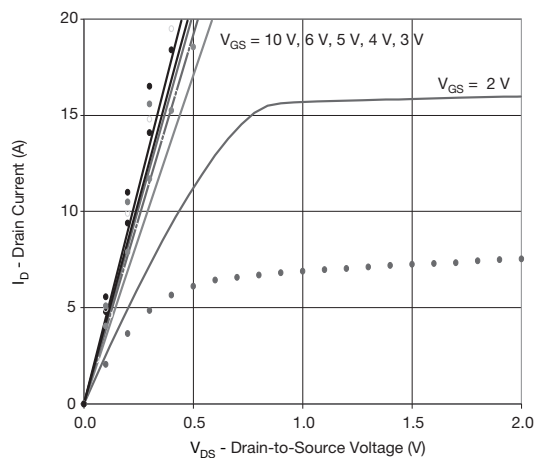
| <b>SPECIFICATIONS</b> ( $T_J = 25\text{ }^{\circ}\text{C}$ , unless otherwise noted) |              |   |                |               |          |
|--|--------------|---|----------------|---------------|----------|
| PARAMETER  | SYMBOL       | TEST CONDITIONS   | SIMULATED DATA | MEASURED DATA | UNIT     |
| <b>Static</b>  |              |   |                |               |          |
| Gate Threshold Voltage   | $V_{GS(th)}$ | $V_{DS} = V_{GS}$ , $I_D = 250\text{ }\mu\text{A}$                    | 0.7            |               | V        |
| Drain-Source On-State Resistance <sup>a</sup>  | $R_{DS(on)}$ | $V_{GS} = 10\text{ V}$ , $I_D = 6.5\text{ A}$                         | 0.0224         | 0.0225        | $\Omega$ |
|  |              | $V_{GS} = 4.5\text{ V}$ , $I_D = 5.9\text{ A}$                        | 0.0251         | 0.0250        |          |
| Forward Transconductance <sup>a</sup>  | $g_{fs}$     | $V_{DS} = 10\text{ V}$ , $I_D = 6.5\text{ A}$                         | 24             | 22            | S        |
| Diode Forward Voltage  | $V_{SD}$     | $I_S = 5.2\text{ A}$  | 0.82           | 0.80          | V        |
| <b>Dynamic<sup>b</sup></b>   |              |   |                |               |          |
| Input Capacitance  | $C_{iss}$    | $V_{DS} = 10\text{ V}$ , $V_{GS} = 0\text{ V}$ , $f = 1\text{ MHz}$   | 339            | 335           | pF       |
| Output Capacitance   | $C_{oss}$    |   | 95             | 94            |          |
| Reverse Transfer Capacitance   | $C_{rss}$    |   | 45             | 45            |          |
| Total Gate Charge  | $Q_g$        | $V_{DS} = 10\text{ V}$ , $V_{GS} = 10\text{ V}$ , $I_D = 5\text{ A}$  | 6.2            | 9.2           | nC       |
|  |              | $V_{DS} = 10\text{ V}$ , $V_{GS} = 4.5\text{ V}$ , $I_D = 5\text{ A}$ | 3.2            | 4.3           |          |
| Gate-Source Charge   | $Q_{gs}$     |   | 1.1            | 1.1           |          |
| Gate-Drain Charge  | $Q_{gd}$     |   | 0.9            | 0.9           |          |

**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.