

## N-Channel 40 V (D-S) MOSFET

### DESCRIPTION

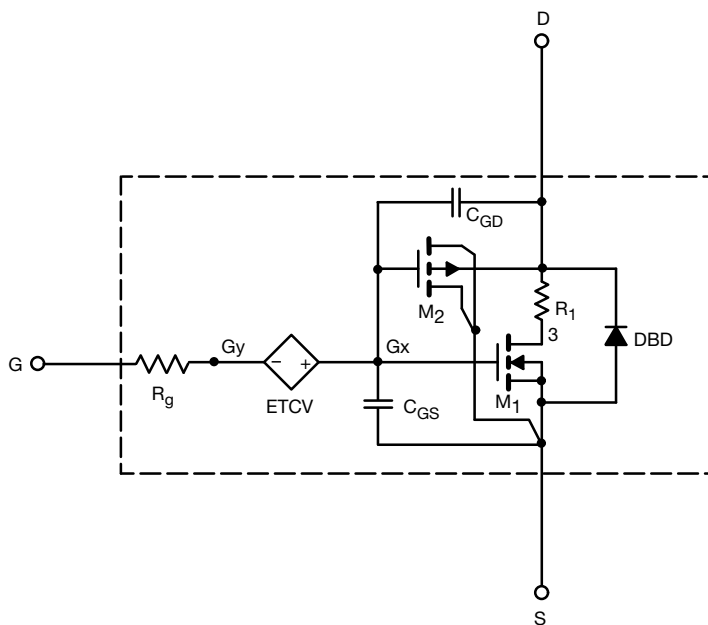
The attached SPICE model describes the typical electrical characteristics of the n-channel vertical DMOS. The sub-circuit model is extracted and optimized over the -55 °C to +125 °C temperature ranges under the pulsed 0 V to 10 V gate drive. The saturated output impedance is best fit at the gate bias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

### 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.



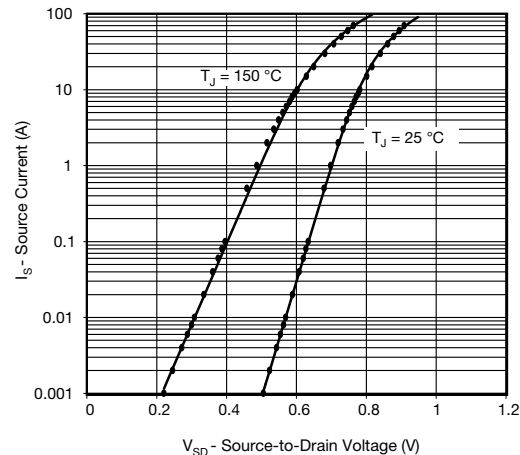
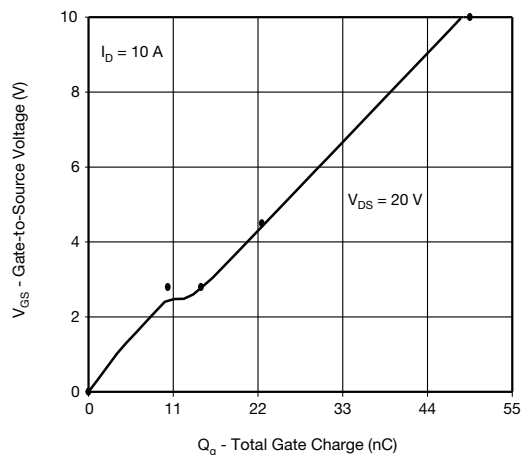
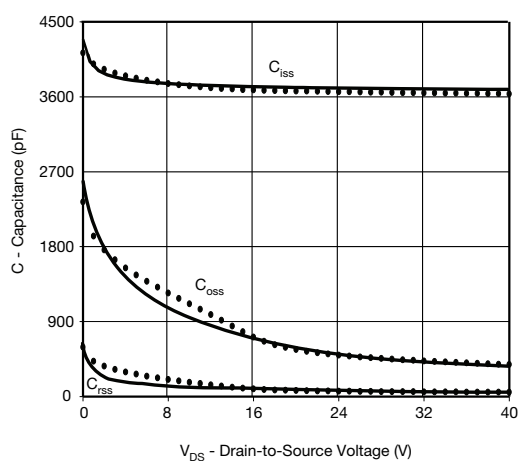
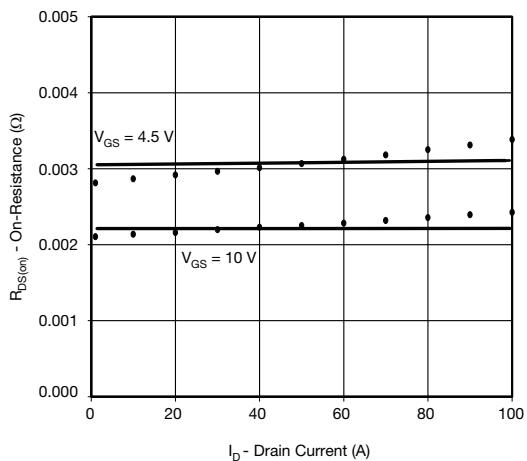
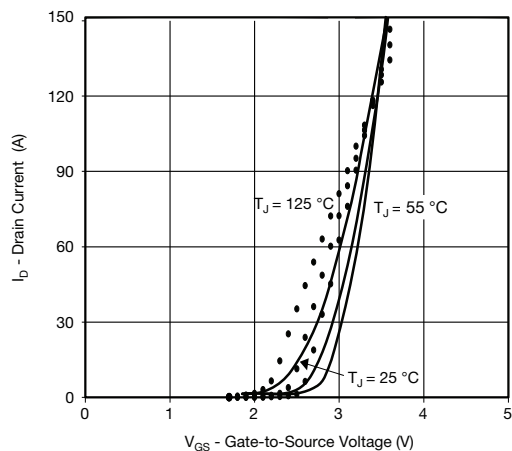
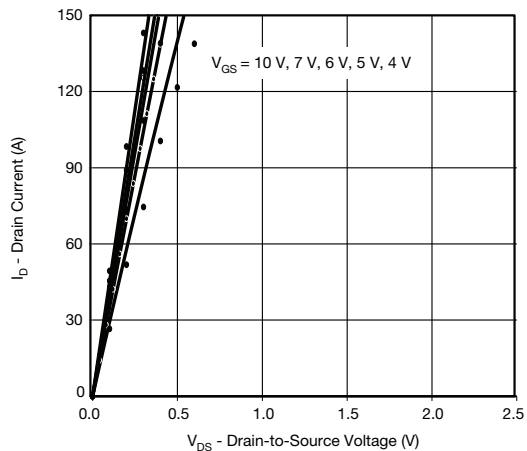
| <b>SPECIFICATIONS</b> ( $T_J = 25\text{ }^{\circ}\text{C}$ , unless otherwise noted) |              |  |                |               |          |
|--|--------------|--|----------------|---------------|----------|
| PARAMETER  | SYMBOL       | TEST CONDITIONS  | SIMULATED DATA | MEASURED DATA | UNIT     |
| <b>Static</b>  |              |  |                |               |          |
| Gate Threshold Voltage   | $V_{GS(th)}$ | $V_{DS} = V_{GS}$ , $I_D = 250\text{ }\mu\text{A}$                     | 2              | -             | V        |
| Drain-Source On-State Resistance <sup>a</sup>  | $R_{DS(on)}$ | $V_{GS} = 10\text{ V}$ , $I_D = 15\text{ A}$                           | 0.0022         | 0.0022        | $\Omega$ |
|  |              | $V_{GS} = 4.5\text{ V}$ , $I_D = 10\text{ A}$                          | 0.0030         | 0.0030        |          |
| Forward Transconductance <sup>a</sup>  | $g_{fs}$     | $V_{DS} = 10\text{ V}$ , $I_D = 15\text{ A}$                           | 88             | 70            | S        |
| Diode Forward Voltage  | $V_{SD}$     | $I_S = 5\text{ A}$   | 0.75           | 0.73          | V        |
| <b>Dynamic <sup>b</sup></b>  |              |  |                |               |          |
| Input Capacitance  | $C_{iss}$    | $V_{DS} = 20\text{ V}$ , $V_{GS} = 0\text{ V}$ , $f = 1\text{ MHz}$    | 3710           | 3750          | pF       |
| Output Capacitance   | $C_{oss}$    |  | 615            | 560           |          |
| Reverse Transfer Capacitance   | $C_{rss}$    |  | 82             | 72            |          |
| Total Gate Charge  | $Q_g$        | $V_{DS} = 20\text{ V}$ , $V_{GS} = 10\text{ V}$ , $I_D = 10\text{ A}$  | 50             | 50            | nC       |
| Gate-Source Charge   | $Q_{gs}$     | $V_{DS} = 20\text{ V}$ , $V_{GS} = 4.5\text{ V}$ , $I_D = 10\text{ A}$ | 23             | 23            |          |
| Gate-Source Charge   | $Q_{gs}$     |  | 10.3           | 10.3          |          |
| Gate-Drain Charge  | $Q_{gd}$     |  | 4.3            | 4.3           |          |

**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.

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