

## N-Channel 200 V (D-S) 175 °C MOSFET

### DESCRIPTION

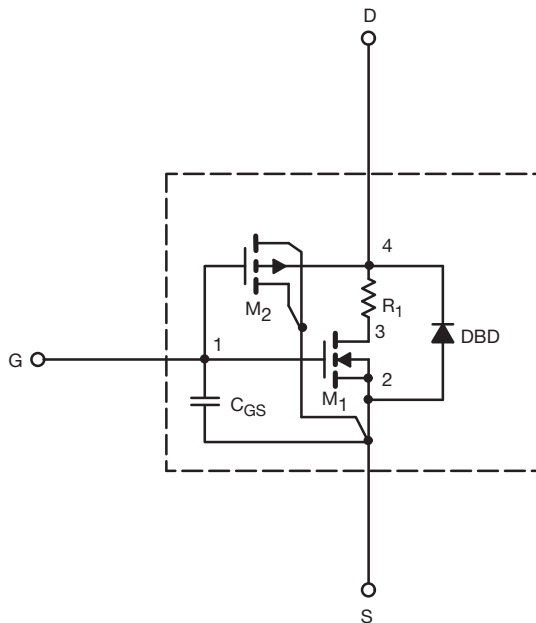
The attached SPICE model describes the typical electrical characteristics of the n-channel vertical DMOS. The subcircuit model is extracted and optimized over the - 55 °C to 125 °C temperature ranges under the pulsed 0 V to 10 V gate drive. The saturated output impedance is best fit at the gate bias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

### 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.



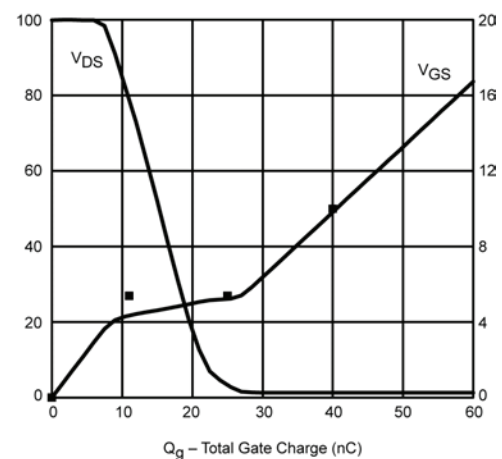
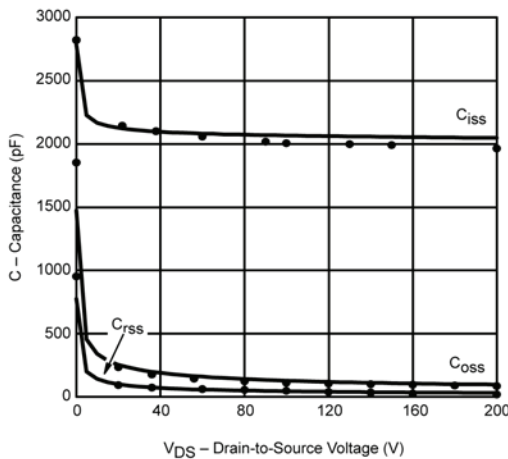
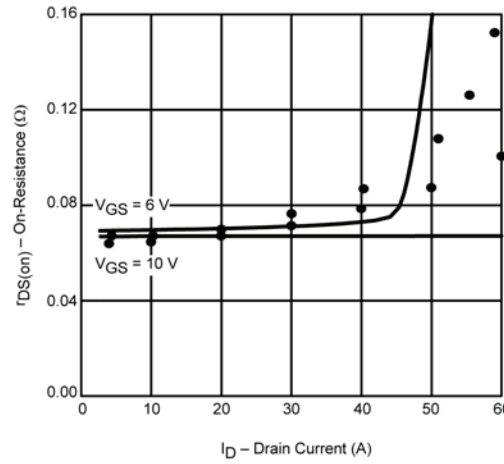
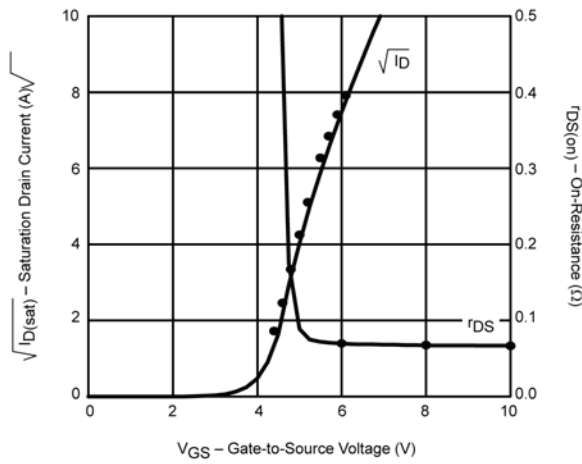
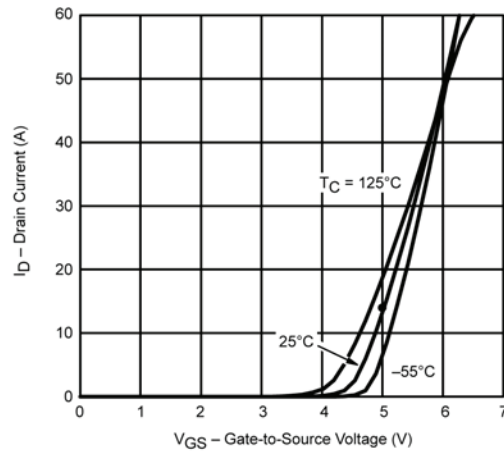
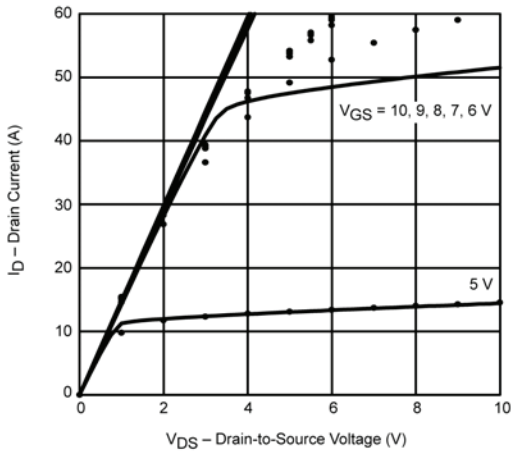
| SPECIFICATIONS ( $T_J = 25\text{ }^\circ\text{C}$ , unless otherwise noted) |              |  |  |               |          |
|---|--------------|--|--|---------------|----------|
| PARAMETER   | SYMBOL       | TEST CONDITIONS  | SIMULATED DATA   | MEASURED DATA | UNIT     |
| <b>Static</b>   |              |  |  |               |          |
| Gate Threshold Voltage  | $V_{GS(th)}$ | $V_{DS} = V_{GS}$ , $I_D = 250\text{ }\mu\text{A}$   | 2.8  | -             | V        |
| On-State Drain Current <sup>a</sup>   | $I_{D(on)}$  | $V_{DS} \geq 5\text{ V}$ , $V_{GS} = 10\text{ V}$  | 74   | -             | A        |
| Drain-Source On-State Resistance <sup>a</sup>                               | $R_{DS(on)}$ | $V_{GS} = 10\text{ V}$ , $I_D = 20\text{ A}$   | 0.067  | 0.064         | $\Omega$ |
|   |              | $V_{GS} = 10\text{ V}$ , $I_D = 20\text{ A}$ , $T_J = 125\text{ }^\circ\text{C}$   | 0.126  | -             |          |
|   |              | $V_{GS} = 10\text{ V}$ , $I_D = 20\text{ A}$ , $T_J = 175\text{ }^\circ\text{C}$   | 0.162  | -             |          |
|   |              | $V_{GS} = 6\text{ V}$ , $I_D = 20\text{ A}$  | 0.069  | 0.068         |          |
| Diode Forward Voltage   | $V_{SD}$     | $I_F = 20\text{ A}$ , $V_{GS} = 0\text{ V}$  | 0.89   | 1             | V        |
| <b>Dynamic<sup>b</sup></b>  |              |  |  |               |          |
| Input Capacitance   | $C_{iss}$    | $V_{DS} = 25\text{ V}$ , $V_{GS} = 0\text{ V}$ , $f = 1\text{ MHz}$  | 2117   | 2150          | pF       |
| Output Capacitance  | $C_{oss}$    |  | 233  | 215           |          |
| Reverse Transfer Capacitance  | $C_{rss}$    |  | 91   | 90            |          |
| Total Gate Charge   | $Q_g$        | $V_{DS} = 100\text{ V}$ , $V_{GS} = 10\text{ V}$ , $I_D = 20\text{ A}$   | 40.5   | 40            | nC       |
| Gate-Source Charge  | $Q_{gs}$     |  | 11   | 11            |          |
| Gate-Drain Charge   | $Q_{gd}$     |  | 14   | 14            |          |
| Turn-On Delay Time  | $t_{d(on)}$  | $V_{DD} = 100\text{ V}$ , $R_L = 5\text{ }\Omega$<br>$I_D = 20\text{ A}$ , $V_{GEN} = 10\text{ V}$ , $R_g = 2.5\text{ }\Omega$ | 32   | 15            | ns       |
| Rise Time   | $t_r$        |  | 21   | 35            |          |
| Turn-Off Delay Time   | $t_{d(off)}$ |  | 39   | 40            |          |
| Fall Time   | $t_f$        |  | 16   | 30            |          |
| Source-Drain Reverse Recovery Time  | $t_{rr}$     |  | $I_F = 50\text{ A}$ , $di/dt = 100\text{ A}/\mu\text{s}$ | 89            |          |

**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 ( $T_J = 25\text{ }^\circ\text{C}$ , unless otherwise noted)



### Note

- Dots and squares represent measured data.



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