# N-Channel 30 V (D-S) MOSFET

## DESCRIPTION

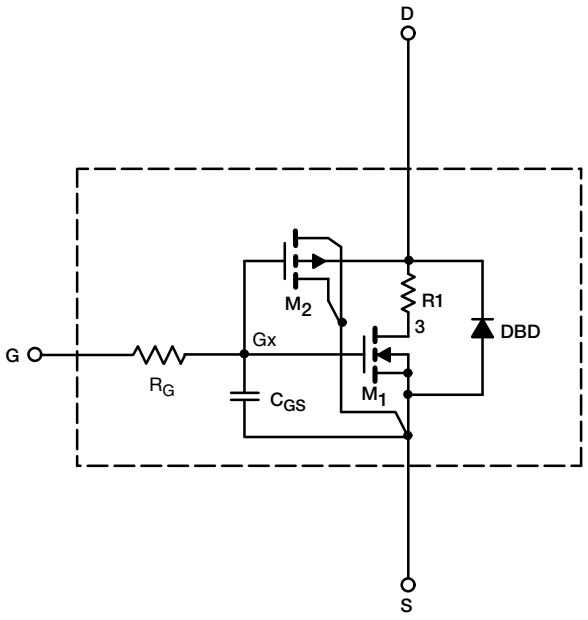
The attached SPICE model describes the typical electrical characteristics of the n-channel vertical DMOS. The subcircuit model is extracted and optimized over the - 55 °C to 125 °C temperature ranges under the pulsed 0 V to 10 V gate drive. The saturated output impedance is best fit at the gate bias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

## 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.

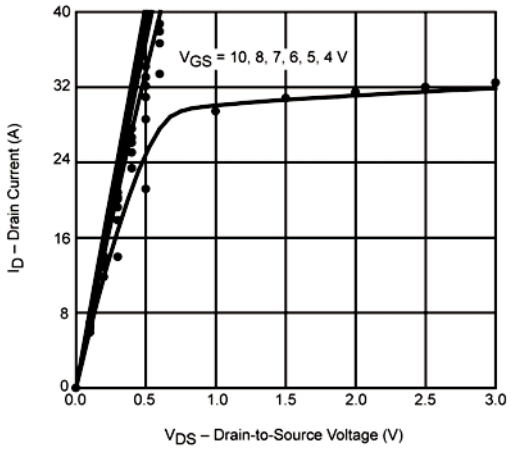
| **SPECIFICATIONS** ($T_J$ = 25 °C, unless otherwise noted) | | | | | |
|---|---|---|---|---|---|
| **PARAMETER** | **SYMBOL** | **TEST CONDITIONS** | **SIMULATED DATA** | **MEASURED DATA** | **UNIT** |
| **Static** | | | | | |
| Gate Threshold Voltage | $V_{GS(th)}$ | $V_{DS}$ = $V_{GS}$, $I_D$ = 250 µA | 2 | - | V |
| Drain-Source On-State Resistance[a] | $R_{DS(on)}$ | $V_{GS}$ = 10 V, $I_D$ = 7.7 A | 0.012 | 0.012 | Ω |
| | | $V_{GS}$ = 4.5 V, $I_D$ = 6.9 A | 0.015 | 0.015 | |
| Forward Transconductance[a] | $g_{fs}$ | $V_{DS}$ = 15 V, $I_D$ = 7.7 A | 28 | 31 | S |
| Diode Forward Voltage | $V_{SD}$ | $I_F$ = 9.3 A | 0.95 | 0.80 | V |
| **Dynamic[b]** | | | | | |
| Input Capacitance | $C_{iss}$ | $V_{DS}$ = 15 V, $V_{GS}$ = 0 V, f = 1 MHz | 1306 | 1350 | pF |
| Output Capacitance | $C_{oss}$ | | 177 | 190 | |
| Reverse Transfer Capacitance | $C_{rss}$ | | 64 | 80 | |
| Total Gate Charge | $Q_g$ | $V_{DS}$ = 15 V, $V_{GS}$ = 10 V, $I_D$ = 11.6 A | 18 | 20 | nC |
| | | $V_{DS}$ = 15 V, $V_{GS}$ = 4.5 V, $I_D$ = 11.6 A | 9 | 9.5 | |
| Gate-Source Charge | $Q_{gs}$ | | 4.5 | 4.5 | |
| Gate-Drain Charge | $Q_{gd}$ | | 2.7 | 2.7 | |

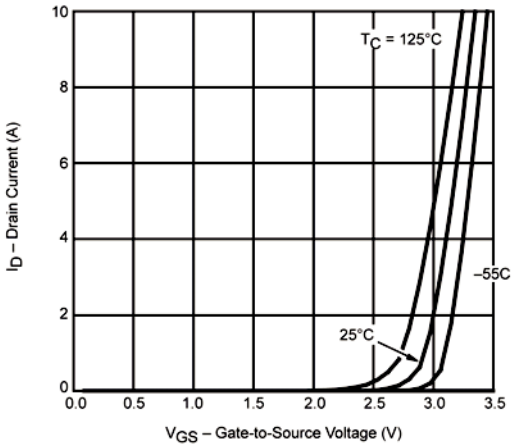
**Notes**

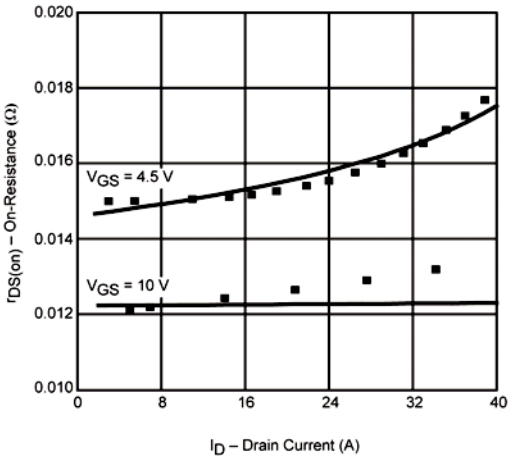
a. Pulse test; pulse width ≤ 300 µs, duty cycle ≤ 2 %.

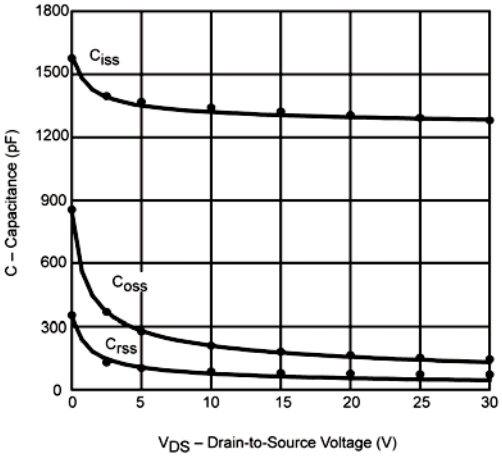
b. Guaranteed by design, not subject to production testing.

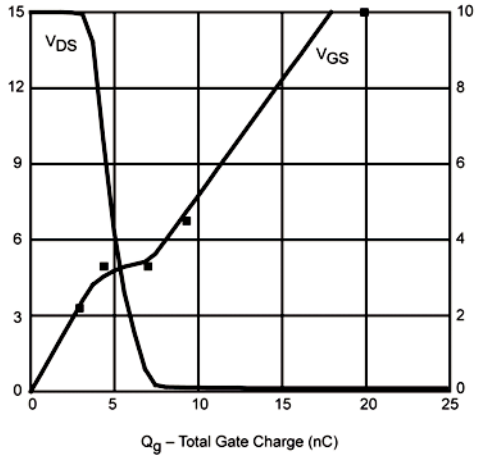
**COMPARISON OF MODEL WITH MEASURED DATA** ($T_J$ = 25 °C, unless otherwise noted)

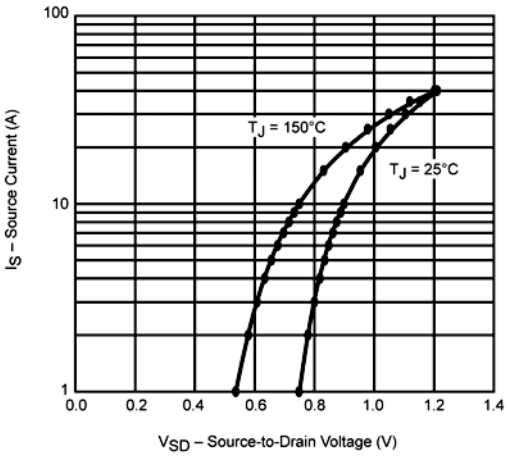



**Note**

- Dots and squares represent measured data.

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