# E Series Power MOSFET

## DESCRIPTION

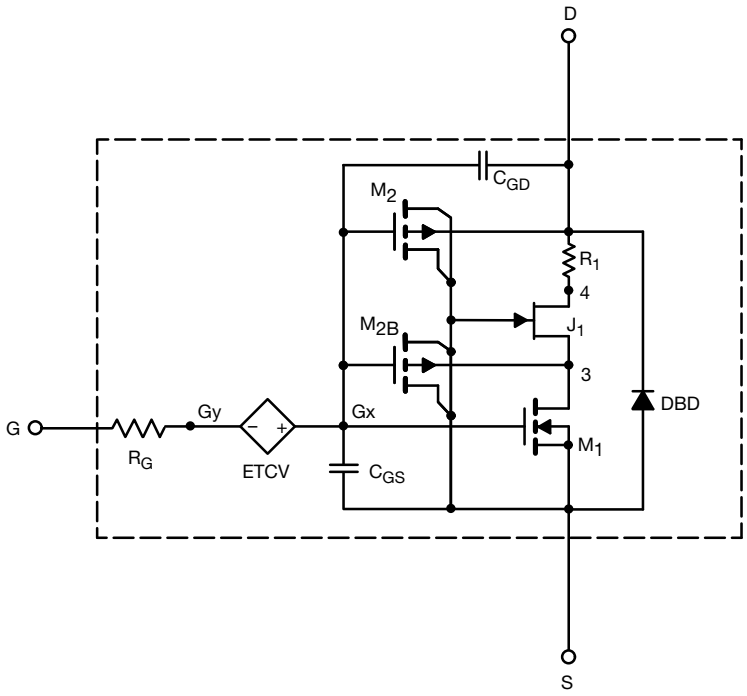
The attached SPICE model describes the typical electrical characteristics of the n-channel vertical DMOS. The sub-circuit model is extracted and optimized over the -55 °C to 150 °C temperature ranges under the pulsed 0 V to 15 V gate drive. The saturated output impedance is best fit at the gate bias 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

## SUB-CIRCUIT 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.

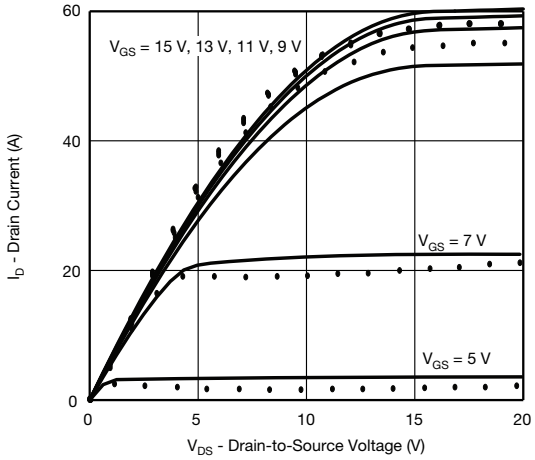
| **SPECIFICATIONS** ($T_J$ = 25 °C, unless otherwise noted) | | | | | |
|---|---|---|---|---|---|
| **PARAMETER** | **SYMBOL** | **TEST CONDITIONS** | **SIMULATED DATA** | **MEASURED DATA** | **UNIT** |
| **Static** | | | | | |
| Gate Threshold Voltage | $V_{GS(th)}$ | $V_{DS}$ = $V_{GS}$, $I_D$ = 250 µA | 3 | - | V |
| Drain-Source On-State Resistance [a] | $R_{DS(on)}$ | $V_{GS}$ = 10 V, $I_D$ = 12 A | 0.159 | 0.130 | Ω |
| Forward Transconductance [a] | $g_{fs}$ | $V_{DS}$ = 30 V, $I_D$ = 12 A | 9.7 | 8.2 | S |
| Diode Forward Voltage | $V_{SD}$ | $I_S$ = 12 A, $V_{GS}$ = 0 V | 0.90 | 0.90 | V |
| **Dynamic [b]** | | | | | |
| Input Capacitance | $C_{iss}$ | $V_{DS}$ = 100 V, $V_{GS}$ = 0 V, f = 1 MHz | 2920 | 2814 | pF |
| Output Capacitance | $C_{oss}$ | | 190 | 121 | |
| Reverse Transfer Capacitance | $C_{rss}$ | | 4.3 | 5 | |
| Total Gate Charge | $Q_g$ | $V_{DS}$ = 520 V, $V_{GS}$ = 10 V, $I_D$ = 12 A | 77 | 77 | nC |
| Gate-Source Charge | $Q_{gs}$ | | 19 | 19 | |
| Gate-Drain Charge | $Q_{gd}$ | | 33 | 33 | |

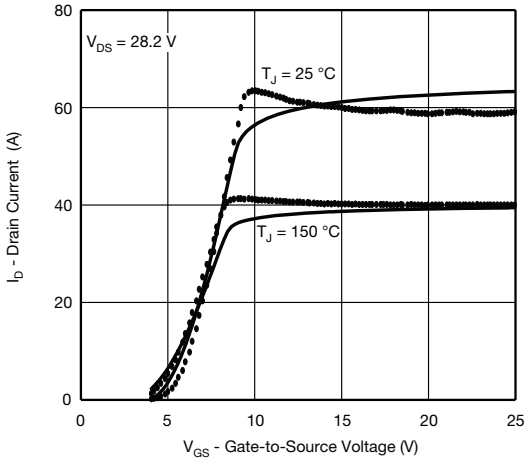
**Notes**

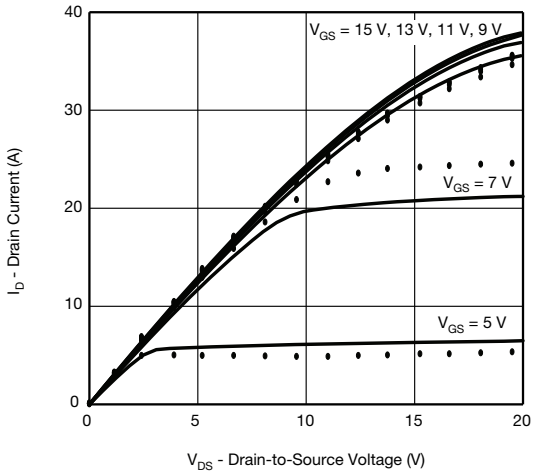
a. Pulse test; pulse width ≤ 300 µs, duty cycle ≤ 2 %.

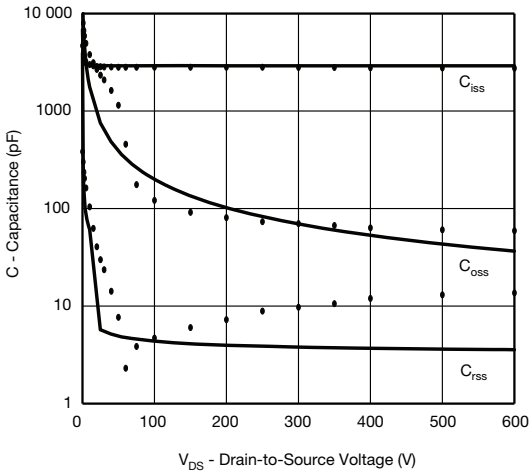
b. Guaranteed by design, not subject to production testing.

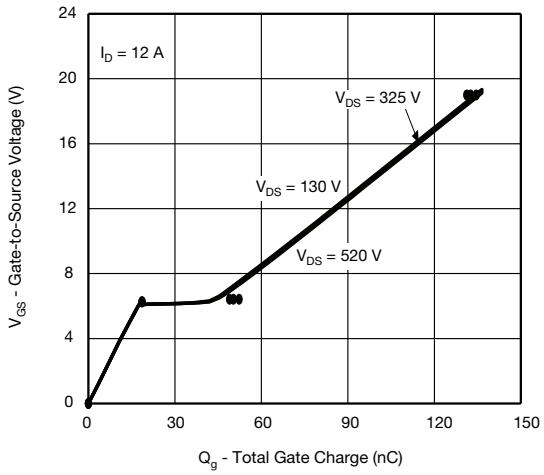
## COMPARISON OF MODEL WITH MEASURED DATA ($T_J$ = 25 °C, unless otherwise noted)

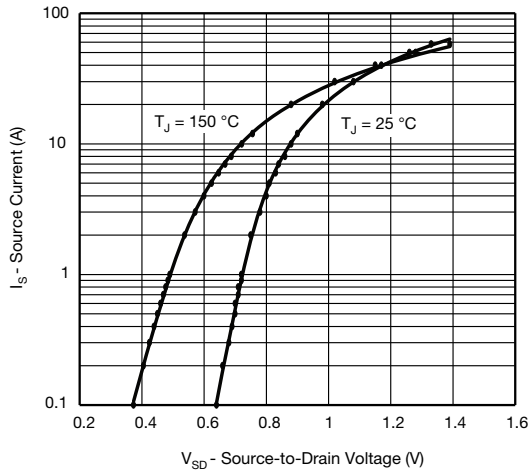



**Note**

- Dots and squares represent measured data.

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