

## N-Channel 200 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.



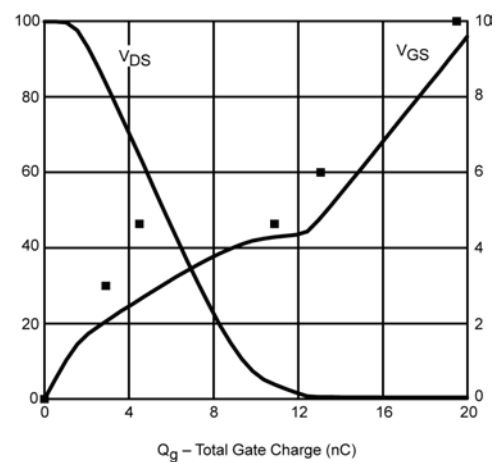
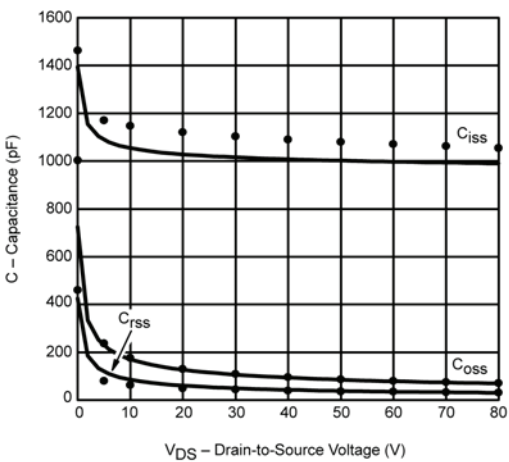
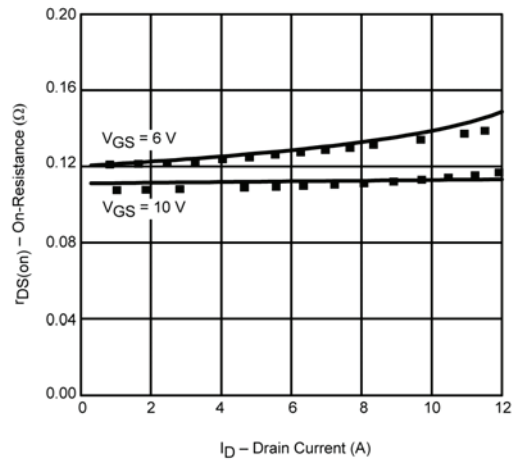
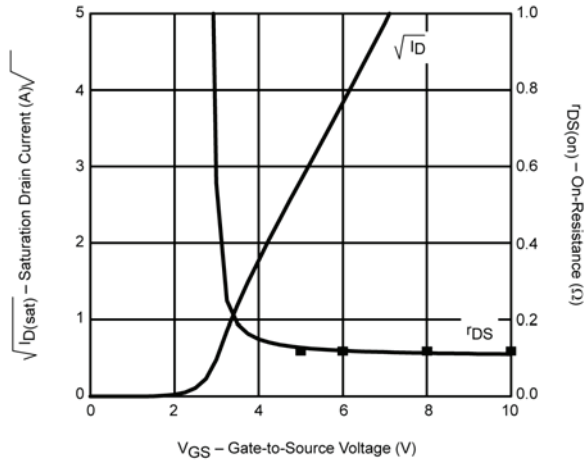
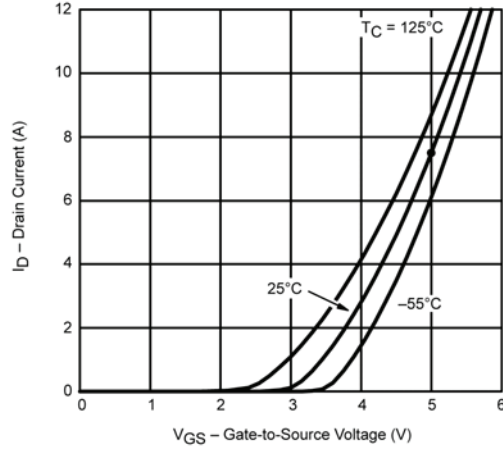
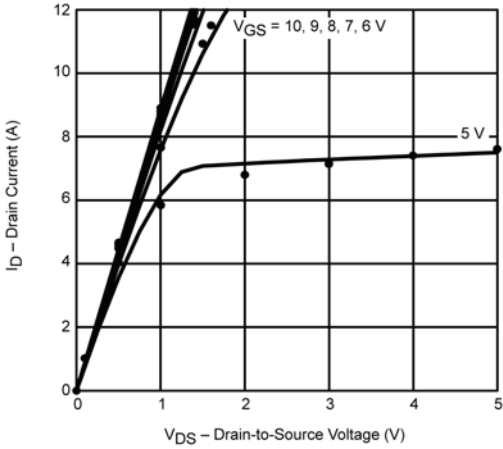
<b>SPECIFICATIONS</b> ( $T_J = 25\text{ }^\circ\text{C}$ , unless otherwise noted)					
PARAMETER	SYMBOL	TEST CONDITIONS	SIMULATED DATA	MEASURED DATA	UNIT
<b>Static</b>					
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}$ , $I_D = 250\text{ }\mu\text{A}$	1.9	-	V
On-State Drain Current <sup>a</sup>	$I_{D(on)}$	$V_{DS} \geq 5\text{ V}$ , $V_{GS} = 10\text{ V}$	42	-	A
Drain-Source On-State Resistance <sup>a</sup>	$R_{DS(on)}$	$V_{GS} = 10\text{ V}$ , $I_D = 4.1\text{ A}$	0.111	0.110	$\Omega$
		$V_{GS} = 6\text{ V}$ , $I_D = 3.9\text{ A}$	0.125	0.120	
Diode Forward Voltage	$V_{SD}$	$I_S = 4\text{ A}$ , $V_{GS} = 0\text{ V}$	0.83	0.80	V
<b>Dynamic<sup>b</sup></b>					
Total Gate Charge	$Q_g$	$V_{DS} = 100\text{ V}$ , $V_{GS} = 10\text{ V}$ , $I_D = 4.1\text{ A}$	21	20	nC
Gate-Source Charge	$Q_{gs}$		4.5	4.5	
Gate-Drain Charge	$Q_{gd}$		6.5	6.5	
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = 100\text{ V}$ , $R_L = 100\text{ }\Omega$ $I_D = 1\text{ A}$ , $V_{GEN} = 10\text{ V}$ , $R_g = 6\text{ }\Omega$	9	15	ns
Rise Time	$t_r$		16	15	
Turn-Off Delay Time	$t_{d(off)}$		22	40	
Fall Time	$t_f$		19	20	
Source-Drain Reverse Recovery Time	$t_{rr}$	$I_F = 4\text{ A}$ , $di/dt = 100\text{ A}/\mu\text{s}$	60	70	

**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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