

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

### DESCRIPTION

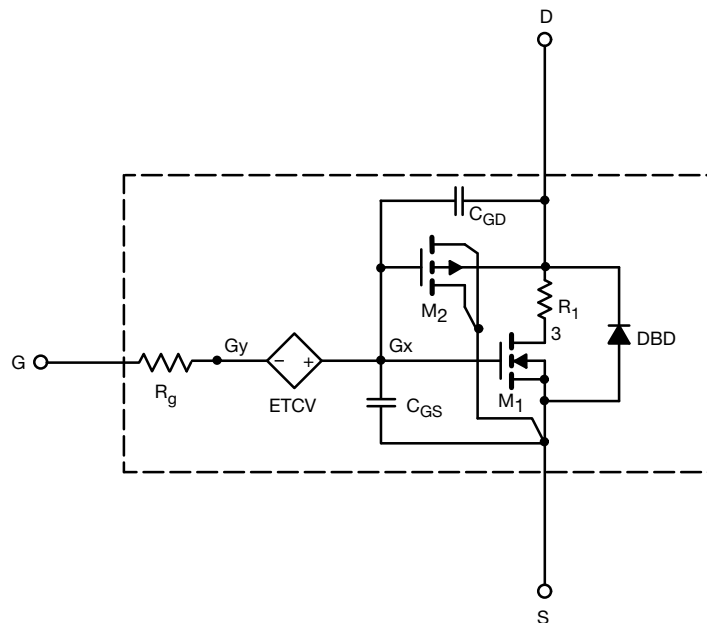
The attached SPICE model describes the typical electrical characteristics of the n-channel vertical DMOS. The sub-circuit model is extracted and optimized over the  $-55\text{ }^{\circ}\text{C}$  to  $+125\text{ }^{\circ}\text{C}$  temperature ranges under the pulsed 0 V to 10 V gate drive. The saturated 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  $-55\text{ }^{\circ}\text{C}$  to  $+125\text{ }^{\circ}\text{C}$  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.



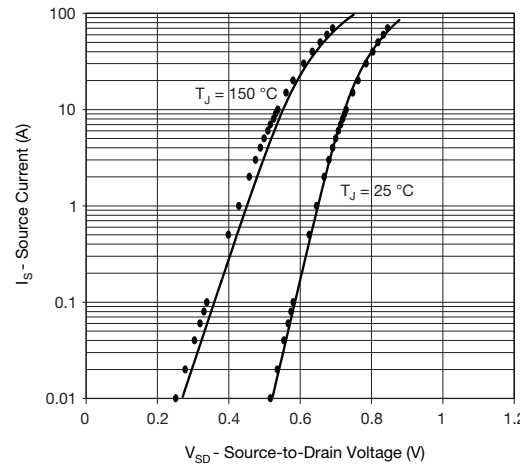
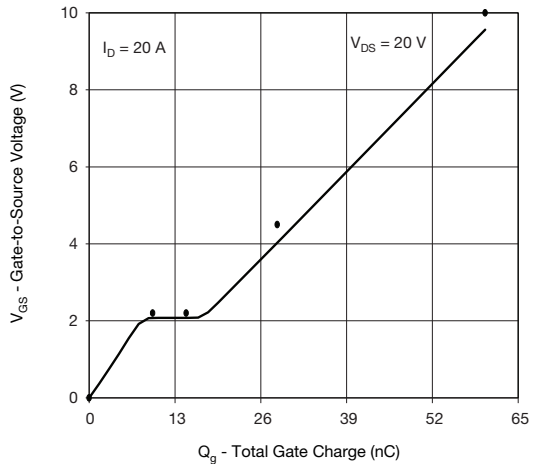
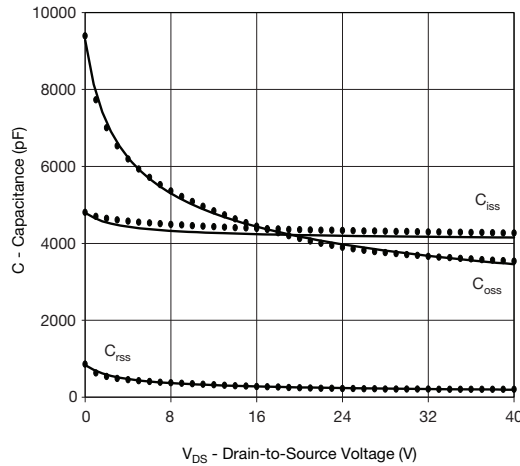
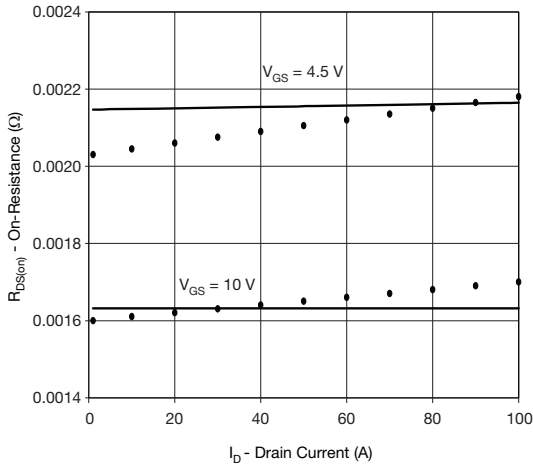
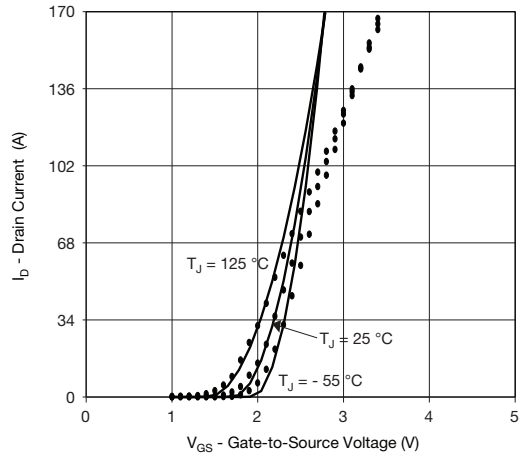
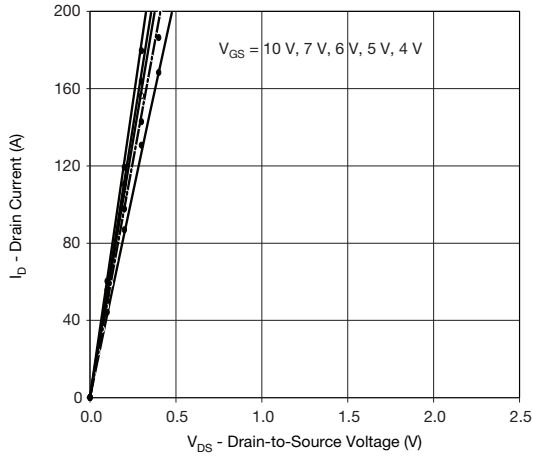
<b>SPECIFICATIONS</b> ( $T_J = 25\text{ }^\circ\text{C}$ , unless otherwise noted)					
PARAMETER	SYMBOL	TEST CONDITIONS	SIMULATED DATA	MEASURED DATA	UNIT
<b>Static</b>					
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 250\text{ }\mu\text{A}$	1.3	-	V
Drain-Source On-State Resistance <sup>a</sup>	$R_{DS(on)}$	$V_{GS} = 10\text{ V}, I_D = 20\text{ A}$	0.0016	0.0016	$\Omega$
		$V_{GS} = 4.5\text{ V}, I_D = 20\text{ A}$	0.0021	0.0021	
Forward Transconductance <sup>a</sup>	$g_{fs}$	$V_{DS} = 15\text{ V}, I_D = 20\text{ A}$	52	82	S
Diode Forward Voltage	$V_{SD}$	$I_S = 5\text{ A}$	0.7	0.7	V
<b>Dynamic <sup>b</sup></b>					
Input Capacitance	$C_{iss}$	$V_{DS} = 20\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$	4210	4240	pF
Output Capacitance	$C_{oss}$		4180	3930	
Reverse Transfer Capacitance	$C_{rss}$		257	230	
Total Gate Charge	$Q_g$	$V_{DS} = 20\text{ V}, V_{GS} = 10\text{ V}, I_D = 20\text{ A}$	61	60	nC
Gate-Source Charge	$Q_{gs}$	$V_{DS} = 20\text{ V}, V_{GS} = 4.5\text{ V}, I_D = 20\text{ A}$	30	28.5	
Gate-Source Charge	$Q_{gs}$		9.6	9.6	
Gate-Drain Charge	$Q_{gd}$		5.1	5.1	

**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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