

## N-Channel 40 V (D-S) 175 °C MOSFET

### DESCRIPTION

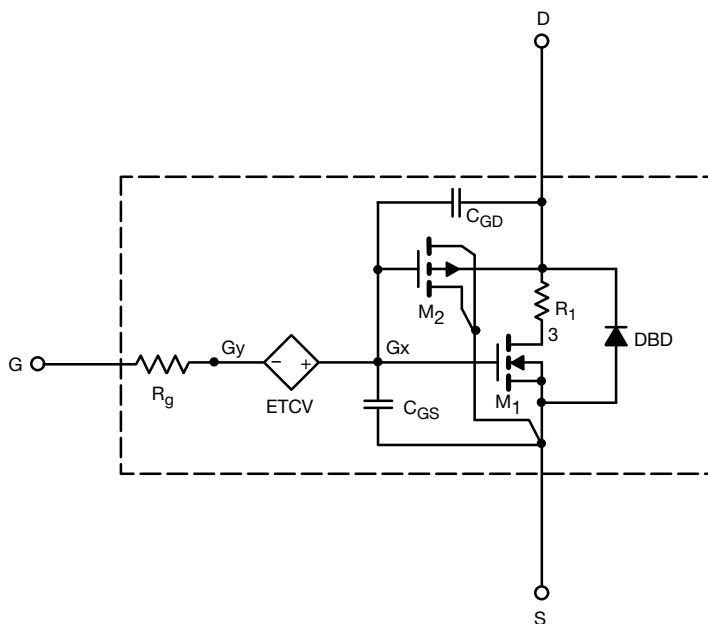
The attached SPICE model describes the typical electrical characteristics of the n-channel vertical DMOS. The subcircuit model is extracted and optimized over -55 °C to +125 °C temperature ranges under the pulsed 0 V to 10 V gate drive. The saturated output impedance is best fit at the gate bias near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



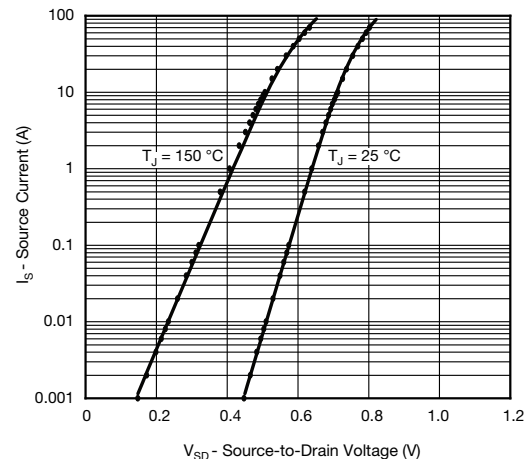
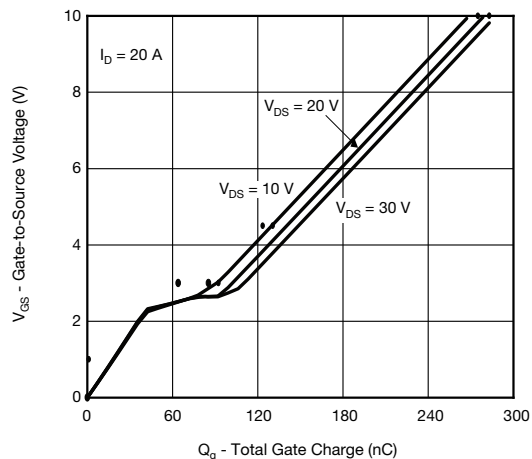
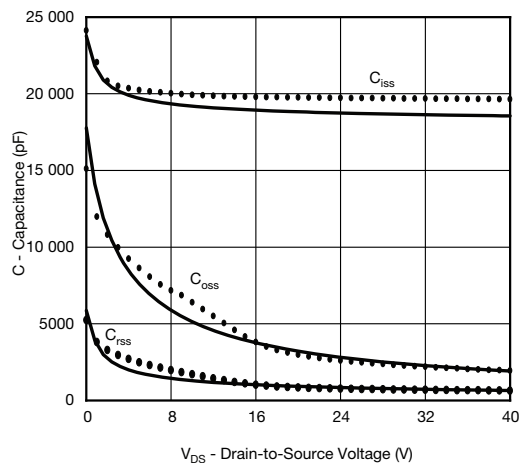
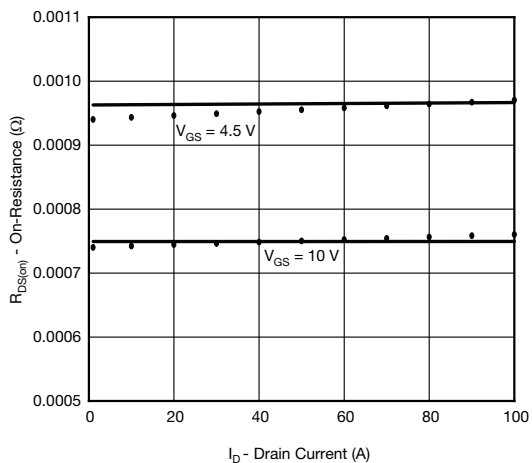
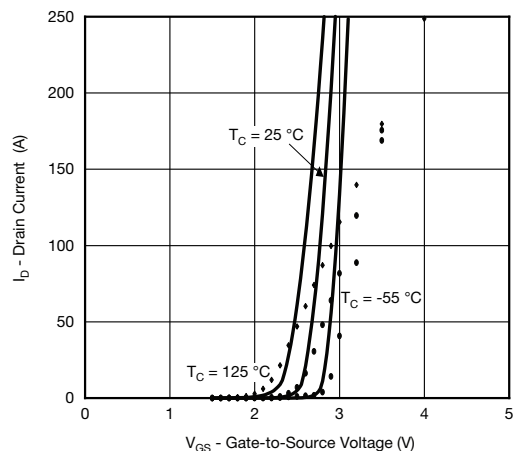
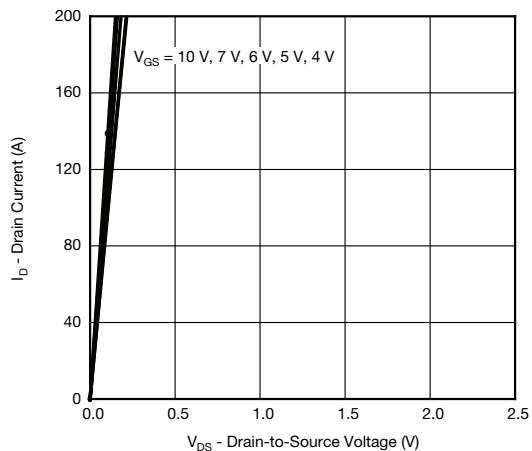
<b>SPECIFICATIONS</b> ( $T_J = 25\text{ }^{\circ}\text{C}$ , unless otherwise noted)					
PARAMETER	SYMBOL	TEST CONDITIONS	SIMULATED DATA	MEASURED DATA	UNIT
<b>Static</b>					
Gate-Source Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}$ , $I_D = 250\text{ }\mu\text{A}$	1.8	-	V
Drain-Source On-State Resistance <sup>a</sup>	$R_{DS(on)}$	$V_{GS} = 10\text{ V}$ , $I_D = 20\text{ A}$	0.00075	0.00080	$\Omega$
		$V_{GS} = 4.5\text{ V}$ , $I_D = 20\text{ A}$	0.00098	0.00096	
Forward Transconductance <sup>a</sup>	$g_{fs}$	$V_{DS} = 15\text{ V}$ , $I_D = 20\text{ A}$	155	140	S
Diode Forward Voltage <sup>a</sup>	$V_{SD}$	$I_S = 5\text{ A}$	0.68	0.68	V
<b>Dynamic <sup>b</sup></b>					
Input Capacitance	$C_{iss}$	$V_{DS} = 20\text{ V}$ , $V_{GS} = 0\text{ V}$ , $f = 1\text{ MHz}$	18 800	20 330	pF
Output Capacitance	$C_{oss}$		3220	2920	
Reverse Transfer Capacitance	$C_{rss}$		922	820	
Total Gate Charge <sup>c</sup>	$Q_g$	$V_{DS} = 20\text{ V}$ , $V_{GS} = 10\text{ V}$ , $I_D = 20\text{ A}$	281	279	nC
		$V_{DS} = 20\text{ V}$ , $V_{GS} = 4.5\text{ V}$ , $I_D = 20\text{ A}$	136	127	
Gate-Source Charge <sup>c</sup>	$Q_{gs}$		64	64	
Gate-Drain Charge <sup>c</sup>	$Q_{gd}$		24.5	24.5	

**Notes**

- a. Pulse test; pulse width  $\leq 300\text{ }\mu\text{s}$ , duty cycle  $\leq 2\text{ }\%$ .  
b. Guaranteed by design, not subject to production testing.  
c. Independent of operating temperature.



## COMPARISON OF MODEL WITH MEASURED DATA ( $T_J = 25^\circ\text{C}$ , unless otherwise noted)



### Note

- Dots and squares represent measured data.

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