

## Automotive P-Channel 40 V (D-S) 175 °C MOSFET

### DESCRIPTION

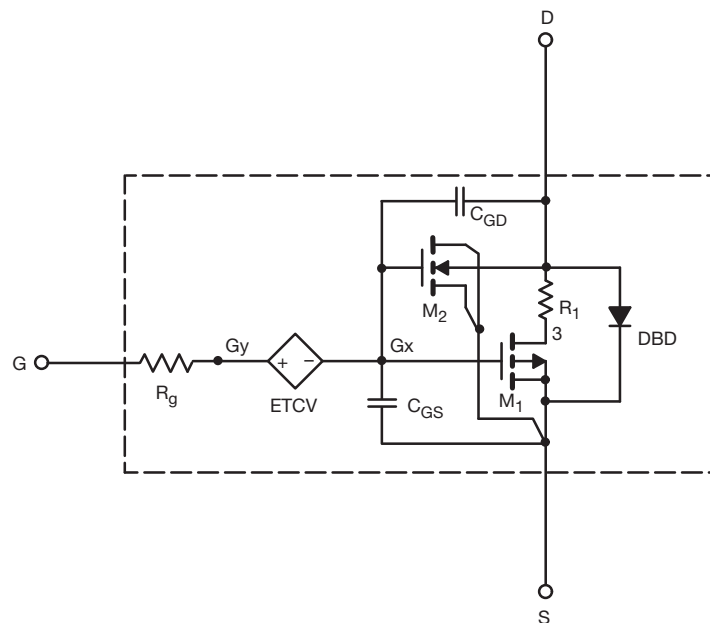
The attached SPICE model describes the typical electrical characteristics of the p-channel vertical DMOS. The sub-circuit model is extracted and optimized over the -55 °C to +125 °C temperature ranges under the pulsed 0 V to 10 V gate drive. The saturated output impedance is best fit at the gate bias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

- P-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



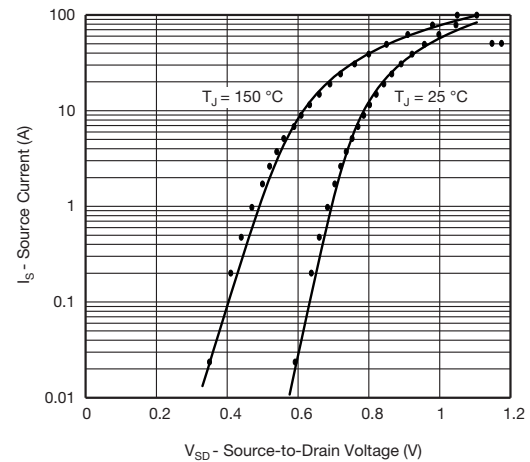
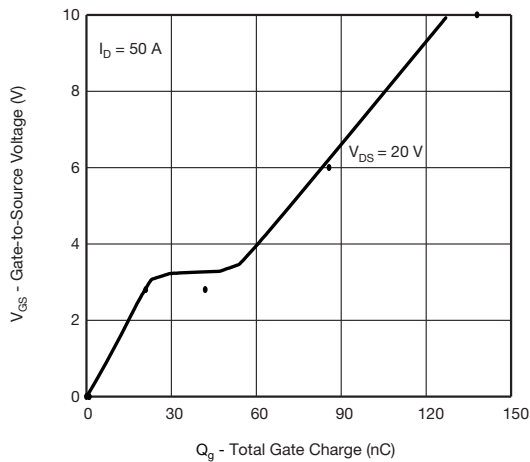
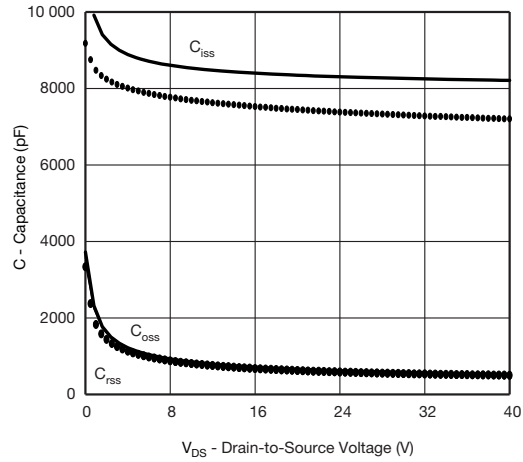
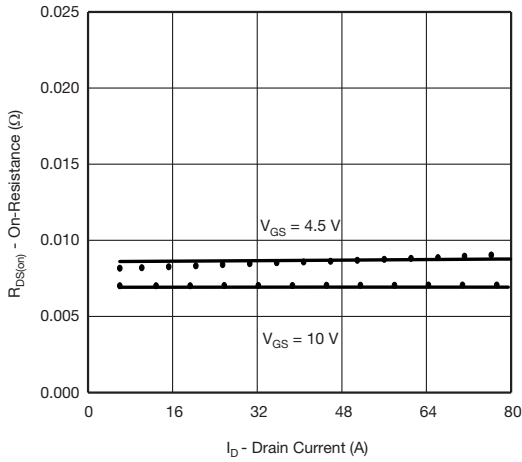
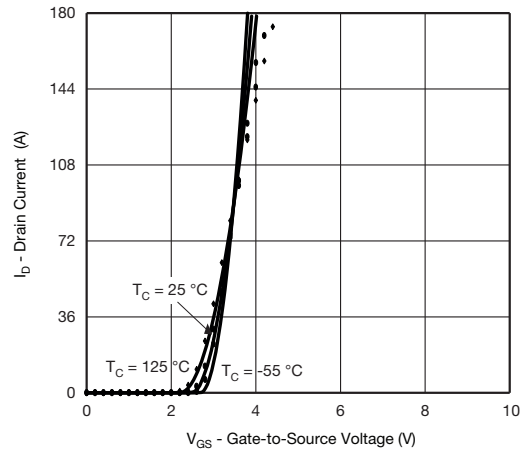
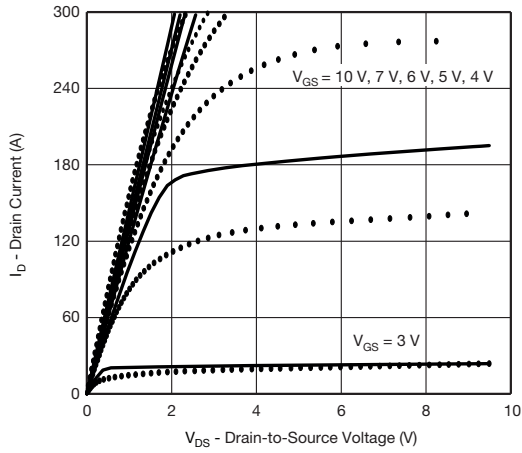
<b>SPECIFICATIONS</b> ( $T_J = 25\text{ }^\circ\text{C}$ , unless otherwise noted)					
PARAMETER	SYMBOL	TEST CONDITIONS	SIMULATED DATA	MEASURED DATA	UNIT
<b>Static</b>					
Gate threshold voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = -250\ \mu\text{A}$	2.1	-	V
Drain-source on-state resistance <sup>a</sup>	$R_{DS(on)}$	$V_{GS} = -10\ \text{V}, I_D = -25\ \text{A}$	0.0069	0.0070	$\Omega$
		$V_{GS} = -4.5\ \text{V}, I_D = -20\ \text{A}$	0.0086	0.0086	
Forward transconductance <sup>a</sup>	$g_{fs}$	$V_{DS} = -15\ \text{V}, I_D = -25\ \text{A}$	94	92	S
Diode forward voltage	$V_{SD}$	$I_S = -50\ \text{A}$	-0.97	-0.96	V
<b>Dynamic <sup>b</sup></b>					
Input capacitance	$C_{iss}$	$V_{DS} = -25\ \text{V}, V_{GS} = 0\ \text{V}, f = 1\ \text{MHz}$	8300	7365	pF
Output capacitance	$C_{oss}$		610	576	
Reverse transfer capacitance	$C_{rss}$		605	548	
Total gate charge	$Q_g$	$V_{DS} = -20\ \text{V}, V_{GS} = -10\ \text{V}, I_D = -50\ \text{A}$	131	138	nC
Gate-source charge	$Q_{gs}$		22	21	
Gate-drain charge	$Q_{gd}$		27	21	

**Notes**

- a. Pulse test; pulse width  $\leq 300\ \mu\text{s}$ , 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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