

## N-Channel 30 V (D-S) MOSFET

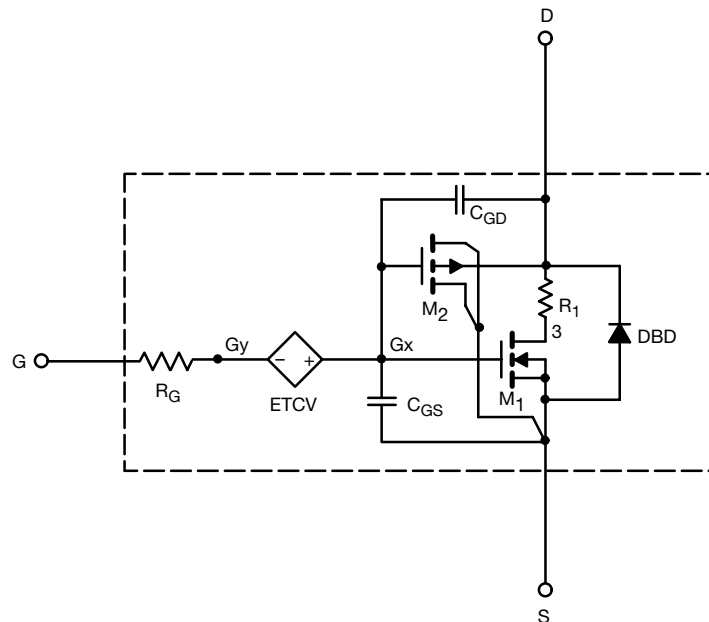
### DESCRIPTION

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.

# SPICE Device Model Si4178DY

Vishay Siliconix



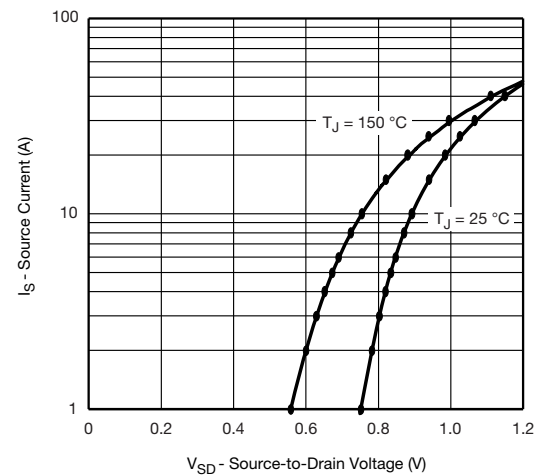
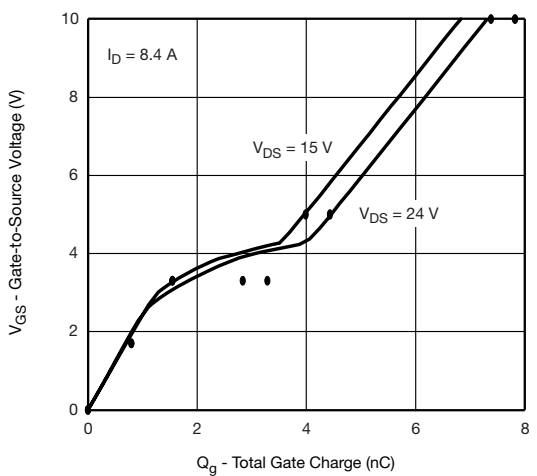
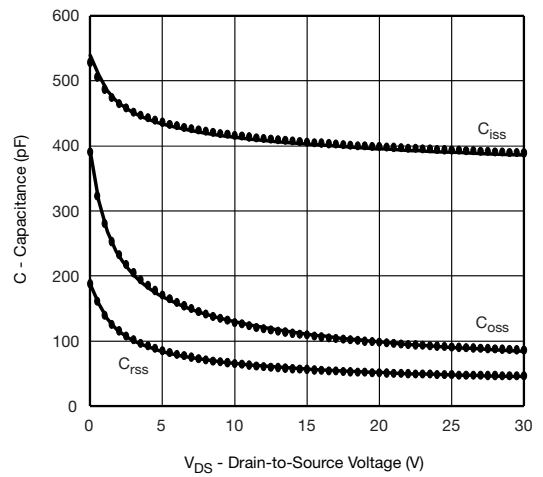
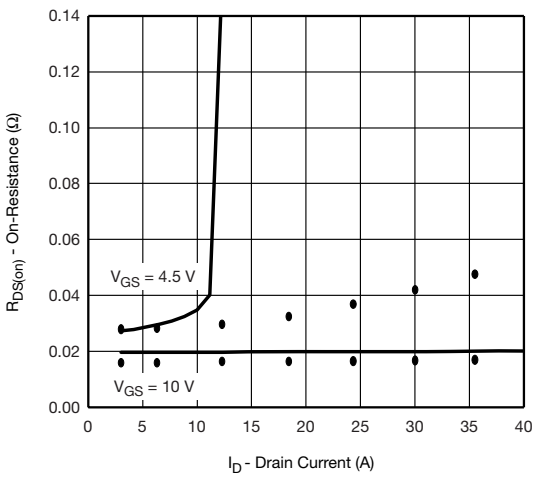
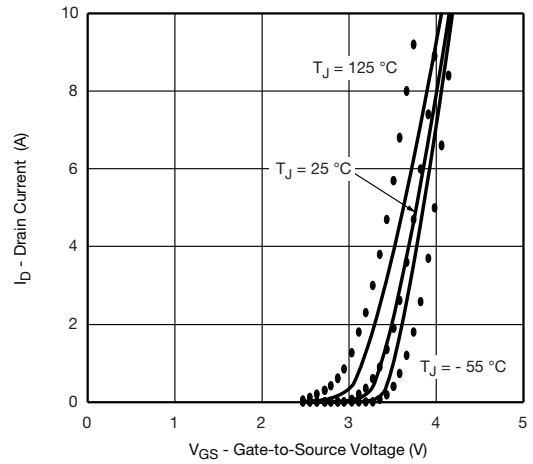
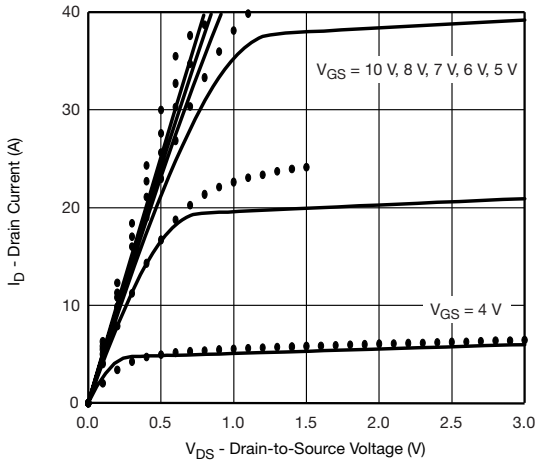
SPECIFICATIONS $T_J = 25\text{ }^\circ\text{C}$ , unless otherwise noted					
PARAMETER	SYMBOL	TEST CONDITIONS	SIMULATED DATA	MEASURED DATA	UNIT
<b>Static</b>					
Gate-Source Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 250\ \mu\text{A}$	2.6	-	V
Drain-Source On-State Resistance <sup>a</sup>	$R_{DS(on)}$	$V_{GS} = 10\ \text{V}, I_D = 8.4\ \text{A}$	0.019	0.017	$\Omega$
		$V_{GS} = 4.5\ \text{V}, I_D = 2\ \text{A}$	0.027	0.027	
Forward Transconductance <sup>a</sup>	$g_{fs}$	$V_{DS} = 15\ \text{V}, I_D = 8.4\ \text{A}$	15	22	S
Body Diode Voltage	$V_{SD}$	$I_S = 6.7\ \text{A}$	0.86	0.85	V
<b>Dynamic<sup>b</sup></b>					
Input Capacitance	$C_{iss}$	$V_{DS} = 15\ \text{V}, V_{GS} = 0\ \text{V}, f = 1\ \text{MHz}$	403	405	pF
Output Capacitance	$C_{oss}$		111	110	
Reverse Transfer Capacitance	$C_{rss}$		57	56	
Total Gate Charge	$Q_g$	$V_{DS} = 15\ \text{V}, V_{GS} = 10\ \text{V}, I_D = 8.4\ \text{A}$	6.9	7.5	nC
		$V_{DS} = 15\ \text{V}, V_{GS} = 4.5\ \text{V}, I_D = 8.4\ \text{A}$	3.7	3.7	
Gate-Source Charge	$Q_{gs}$	$V_{DS} = 15\ \text{V}, V_{GS} = 4.5\ \text{V}, I_D = 8.4\ \text{A}$	1.6	1.6	
Gate-Drain Charge	$Q_{gd}$		1.3	1.3	

## 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.



## Disclaimer

All product specifications and data are subject to change without notice.

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