

N-Channel 100 V (D-S) MOSFET

DESCRIPTION

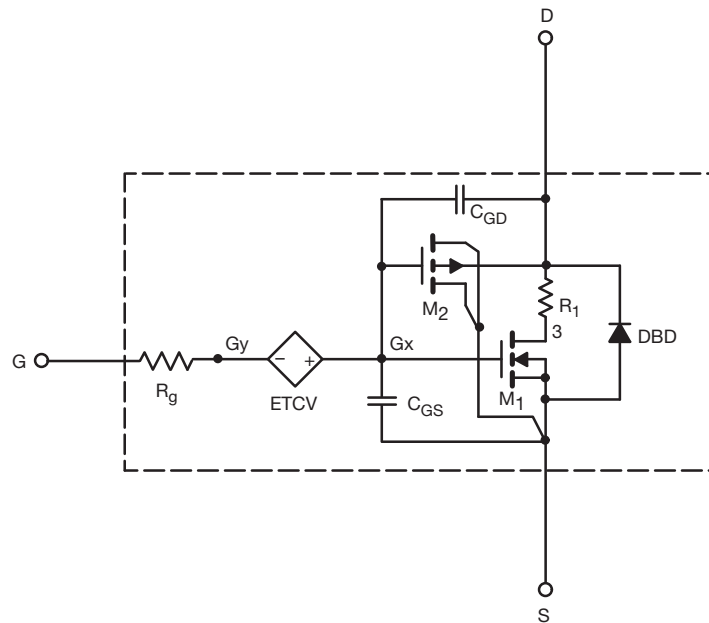
The attached SPICE model describes the typical electrical characteristics of the N-Channel vertical DMOS. The subcircuit model is extracted and optimized over the $-55\text{ }^{\circ}\text{C}$ to $+150\text{ }^{\circ}\text{C}$ temperature ranges under the pulsed -20 V to $+20\text{ V}$ gate drive. The 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 $-55\text{ }^{\circ}\text{C}$ to $+150\text{ }^{\circ}\text{C}$ 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



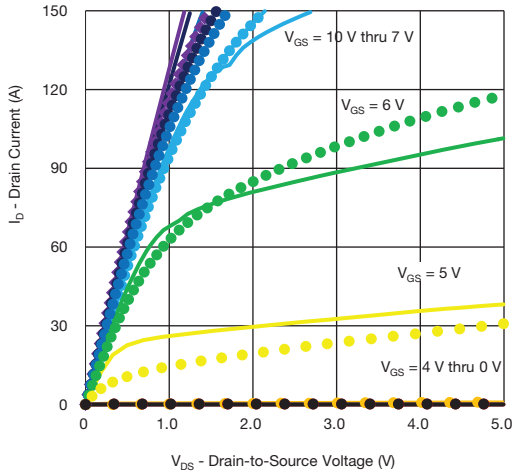
SPECIFICATIONS ($T_C = 25\text{ }^\circ\text{C}$, unless otherwise noted)					
PARAMETER	SYMBOL	TEST CONDITIONS	SIMULATED DATA	MEASURED DATA	UNIT
Static					
Gate-source threshold voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 250\text{ }\mu\text{A}$	2.9	-	V
Drain-source on-state resistance ^a	$R_{DS(on)}$	$V_{GS} = 10\text{ V}, I_D = 5\text{ A}$	0.0075	0.0075	Ω
		$V_{GS} = 4.5\text{ V}, I_D = 4\text{ A}$	0.0084	0.0085	
Forward transconductance ^a	g_{fs}	$V_{DS} = 10\text{ V}, I_D = 10\text{ A}$	52	70	S
Dynamic ^b					
Input capacitance	C_{iss}	$V_{DS} = 30\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$	2440	2440	pF
Output capacitance	C_{oss}		259	255	
Reverse transfer capacitance	C_{rss}		16.4	16.2	
Total gate charge	Q_g	$V_{DS} = 30\text{ V}, V_{GS} = 10\text{ V}, I_D = 5\text{ A}$	34.6	34.5	nC
		$V_{DS} = 30\text{ V}, V_{GS} = 4.5\text{ V}, I_D = 5\text{ A}$	26.1	26.5	
Gate-source charge	Q_{gs}		11	12	
Gate-drain charge	Q_{gd}		5.8	5.3	
Drain-source body diode characteristics					
Body diode voltage	V_{SD}	$I_S = 5\text{ A}$	0.74	0.75	V
Body diode reverse recovery time	t_{rr}	$I_F = 10\text{ A}$ $di/dt = 100\text{ A}/\mu\text{s}, T_J = 25\text{ }^\circ\text{C}$	40	42	ns
Body diode reverse recovery charge	Q_{rr}		51	55	nC
Reverse recovery fall time	t_a		25	26	ns
Reverse recovery rise time	t_b		15	16	

Notes

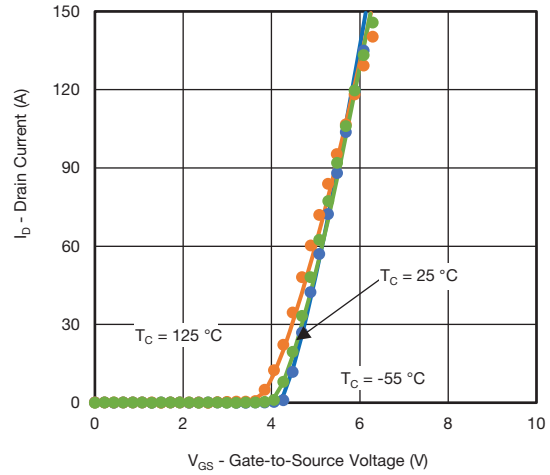
- a. Pulse test; pulse width $\leq 300\text{ }\mu\text{s}$, duty cycle $\leq 2\%$
b. Guaranteed by design, not subject to production testing



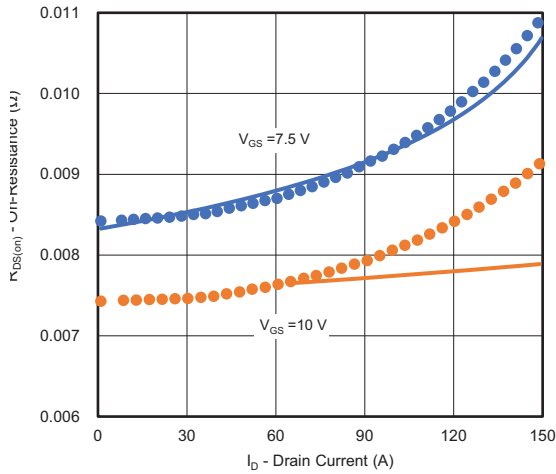
COMPARISON OF MODEL WITH MEASURED DATA ($T_C = 25\text{ }^\circ\text{C}$, unless otherwise noted)



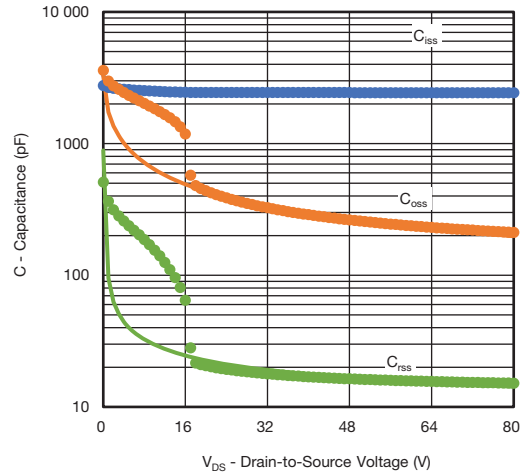
Output Characteristics



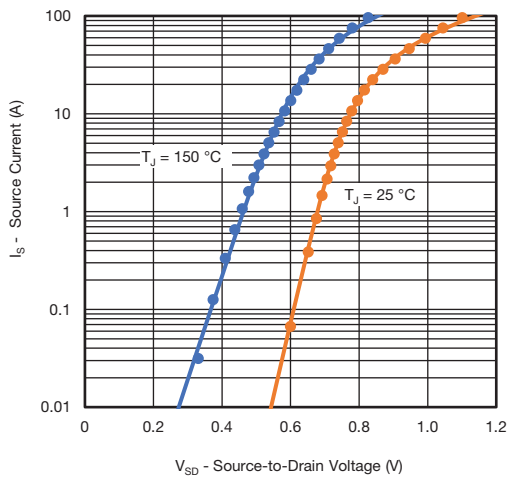
Transfer Characteristics



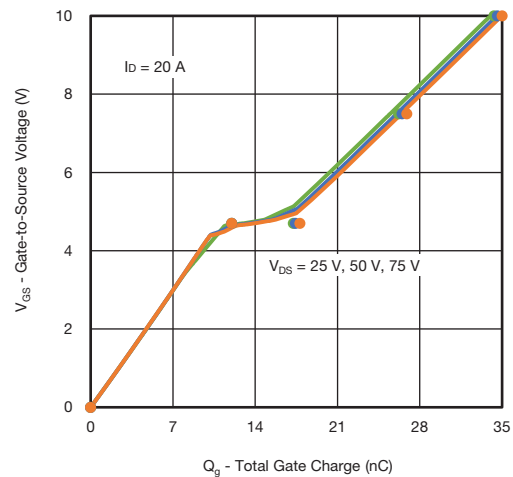
On-Resistance vs. Drain Current (A)



Capacitance



Source-Drain Diode Forward Voltage



Gate Charge

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