

6.002 Demo# 06 (Load set up Demo#06.set)
S/SR/SCS models
Lecture 6 (and 8)

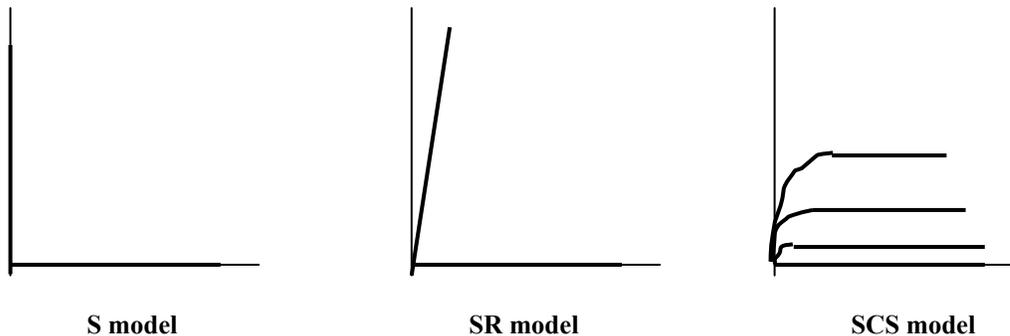
Agarwal Fall 00

Purpose:

This demo illustrates the various models of the MOSFET, namely the S, SR, and SCS models. The models are displayed on the scope by plotting the current i_D (taken as a voltage across a load resistor) versus the voltage v_{DS} , with a sinusoidal drive on V_S to display a line rather than simply a point. The S and SR models are shown by switching v_{GS} between voltages above (ON state) and below (OFF state) the MOSFET threshold voltage. The SCS model is shown in a similar manner, by incrementally increasing v_{GS} from just below v_T to some amount above it. This shows the saturation (current source) region of the MOSFET not visible when larger values of v_{GS} are used.

Steps:

1. To show the switch model, v_{IN} is set to a large value, and switched on and off. The i - v characteristic as seen from the drain to the source is shown on the scope. The curve looks like an open circuit (horizontal line) and a short circuit (vertical line) accordingly.
2. To show the switch-resistor model, v_{IN} is set to a slightly smaller value, and switched on and off. The i - v characteristic as seen from the drain to the source is shown on the scope. The curve looks like an open circuit (horizontal line) and a resistor (sloped line) accordingly.
3. To show the switch-current source model, v_{IN} is set just below v_T and increased incrementally, to show a family of curves.



Description: MOSFET Switch (S) ; switch resistor (SR) ; Switch Current Source (SCS) ; models

- 1) Set FG2 @ High Z mode, frequency @ 500 HZ Sine, Amp @ 3 v p-p, Offset @ 1.5 v p-p
- 2) Set FG1 @ High Z mode (DC offset only) press DC offset button and hold it until you hear the click!
 - a) To show S model, set FG1 dc offset to 5 v, (NOT MORE THAN 5 V IT WILL DAMAGE THE FET) turn the switch (S1) on the pc board to FG1 to show $V_{GS} > V_T$ and off to show $V_{GS} < V_T$. See Fg1 pictorial graph!
 - b) To show SR model, set FG1 dc offset to 2.6 v, turn the switch on the pc board to FG1 to show $V_{GS} > V_T$ and off to show $V_{GS} < V_T$. See Fg1 pictorial graph!
 - c) To show SCS model, making various curves, do the following: The switch on the pc board should be set on FG1 ON, roll FG1 dc offset voltage between 2 & 2.4 v by tenths (i.e. 2.0, 2.1,2.4). See Fg1 pictorial graph!

***Note: See below the sequence of button to change from 50 Ohm termination to High Z mode!**

Oscilloscope Setup

CH	V/DIV	OFFSET	MODE	FUNC	MATH	VERTICAL		HORIZONTAL	
1	off	1	0	DC	off	CH1- CH2			
2	off	1	0	DC	off	F1 ÷ 500 m			
3	off	1	-1.0	DC	on	F2 vs CH2	1	2	500mv 999 mv
4	off	2	6.0	DC	off	CH2-CH3			
Horizontal:		2 m	Acquisition: AUTO		AUTO	4	Trigger: CH1		

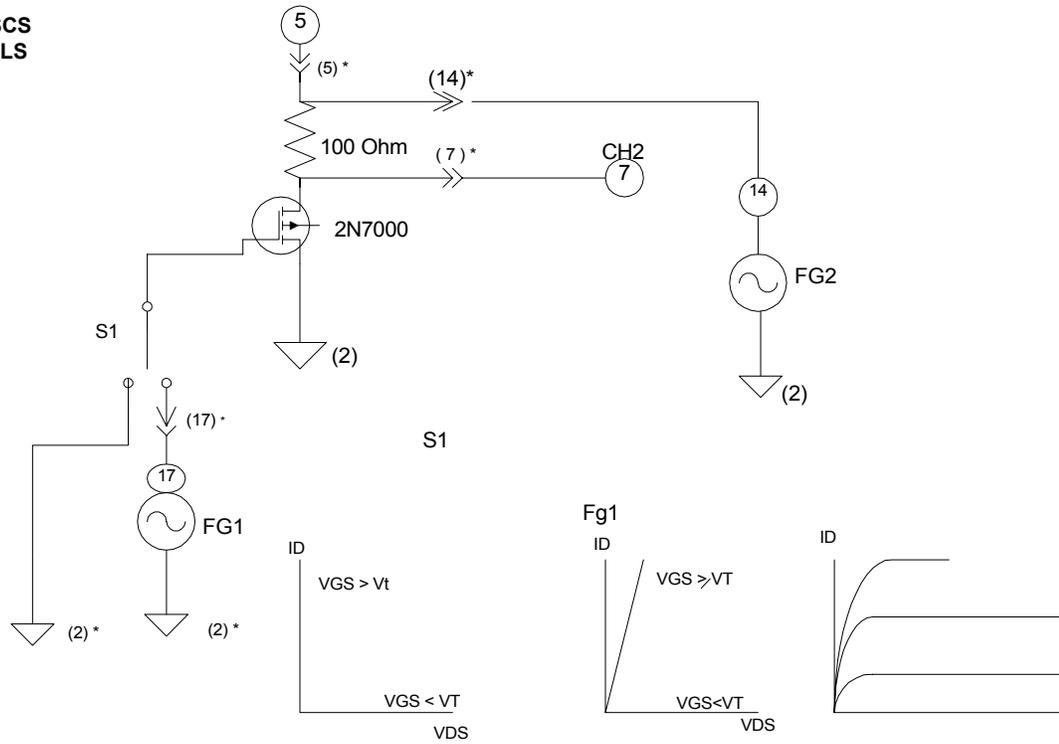
Waveform Generator Setup

Power Supply Setup

UNIT	WAVE	AMP	OFFSET	FREQ	+6	+25	-25	OUTPUT
FG1	DCV	0	2 & 5 V	1 k	Hi Z			OFF
FG2	SIN	3	1.5	500 HZ	Hi Z	Trigger: INT, INT		

- See the sequence of buttons to be pressed
 - >
 - >0
 - >
 - 0.4v
 - v
 - < High
 - > 50 Ohm

**S/SR/SCS
MODELS**



*Note # of pins
on the PC
board and BNC
connectors

○ BNC

() Pins