6.002 Demo# 10   (Load Set up demo#10PG.set) : (Load Set up Demo#10AA.set)
I$_{DS}$ vs. V$_{DS}$ Load Line   Agarwal/Fall 00
Lectures 10 and 11

Purpose: In this demo, a picture of the MOSFET amplifier behavior is presented by displaying a load line over a set of (premade) MOSFET i-v curves. The load line crosses the family of MOSFET curves in the saturation region, and ends in the ohmic region. By using music as the amplifier input, and by sending the output to a speaker, distortion can be heard when the signal is outside the saturation region. This is seen on the scope as the (partial) load line being in the saturation region (no distortion), in the ohmic region (distortion), or near the cutoff region (distortion/low volume). As a fun and interesting aside, we can show that classical music suffers much more perceptually than does, say, heavy metal.

Steps:
1. Having previously aligned the load line with the stored MOSFET curves, use the sinusoid input to show the entire load line.
2. With the input sinusoid set to a small value, turn on the speaker and adjust the bias of the input to show the amplifier behavior for the different MOSFET regions.
3. Repeat the previous step using a classical music signal from the CD player, noting the audio distortion.
4. Switch to heavy metal music, and point out this type of music does not perceptually distort much. (in showing this demo, we have observed that the output to the speaker system of the class loads the circuit and makes it behave strangely. Add a buffer to fix the problem).
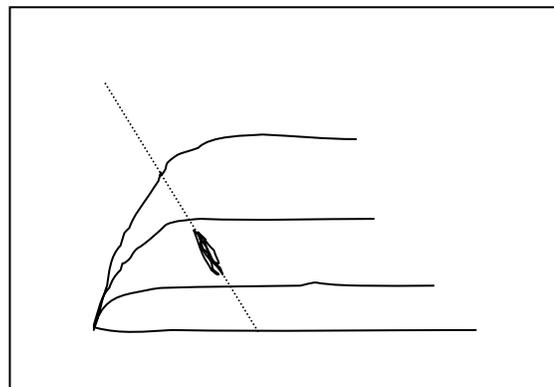
MOSFET curves, load line, small music signal

Description: Small signal circuit models and analysis

Load IVCURVE5.WFM from WAVEFORM MEMORY

Connect CD output to the input of to EXT2 (Red) cable.

Connect CH3 output of MOSFET Amplifier, using a   Tee BNC to Mac Amp/Speaker

******************Make sure the FG1 is OFF (Very important!)*************************

For music use CD1 #10 for the first music; later we play AC/DC (the razor edge) #1 to show that Doesn't matter where you have the load line it sounds the same!

Note: see Fg1 next page schematic diagram and pins being used

Note : For Prof. Agarwal load Demo#10AA.set he starting with ONLY a dot by pressing FG2 offset bottom to zero

Oscilloscope Setup

CH	V/DIV	OFFSET	MODE	FUNC	MATH	VERTICAL		HORIZONTAL	
1 off	1	3	DC	off	CH2 − CH3				
2 on	1	4.451	DC	off	F1 ÷ 1k				
3 on	2	-670 mV	DC	on	F2 vs CH3	2	-1.97	2.67	3.91
4 off	200 mV	611 mV	DC	off					

Horizontal: 1 m   Acquisition: Trigger: CH4

Waveform Generator Setup   **Power Supply Setup**

UNIT	WAVE	AMP	OFFSET	FREQ	+6	+25	-25	OUTPUT
FG2	SIN	50m ~ 100m	0	1 k	2.08	6		on
						Trigger:		INT

Note: We had to use our amplifier and speaker set up because the 10-250 system stop working and also caused our amplifier (MOSFET) on demo board to go bad.

Note: Use CD#1 Piano music instead violin for Prof. Lang

IDS vsVDS
Load Line

6 Vdc from +25
(1) *

2 K

(20) *

CH3
20

100 uF

7

(7) *

2N7000

1 K

22

(22) *

+6 Vdc

(2) *

(2)*

To Amp/
Speaker

(13) *

14

13

Note: We don't need pre-amp for this demo.

FG2

CD
Player

(2) *
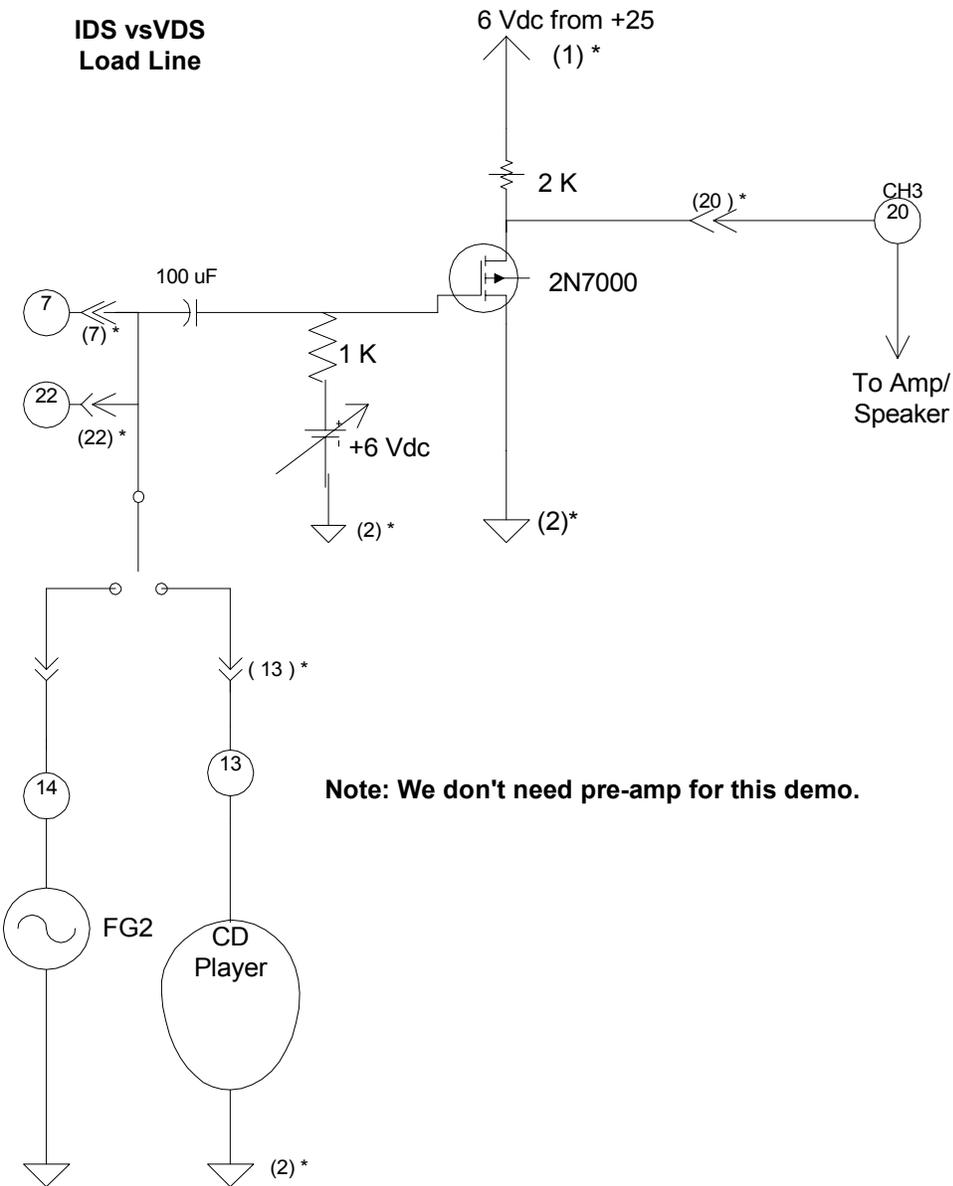
* Note: # of pins on the PC board and BNC connectors

Make sure FG1 is OFF!

BNC

( )   **Pins**