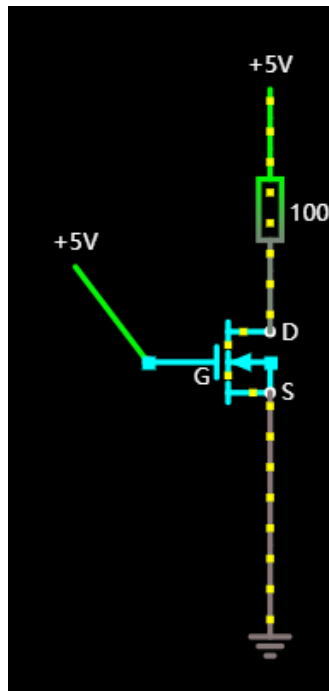
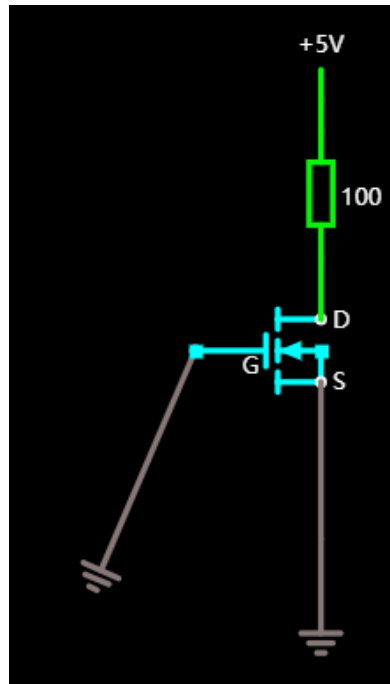


## How to CMOS

NMOS is a switch. Current **must** flow from drain to source. When the gate voltage is **high**, it turns on, otherwise it turns off.

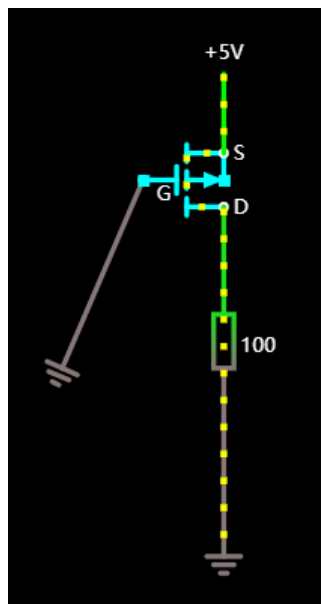


NMOS on

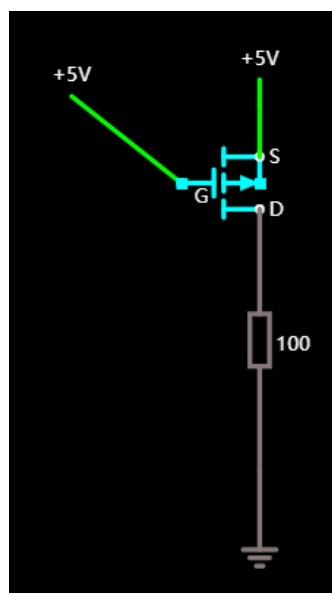


NMOS off

PMOS is also a switch. Current **must** flow from source to drain. When the gate voltage is **low**, it turns on, otherwise it turns off.

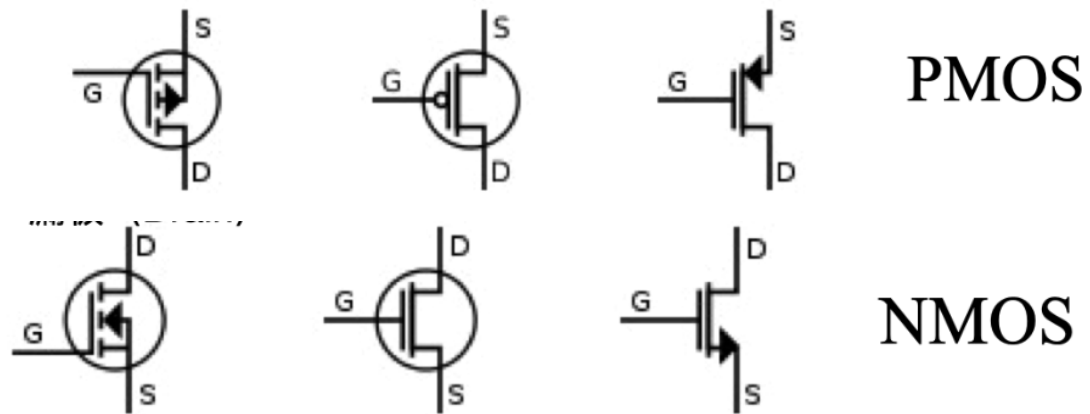


PMOS on



PMOS off

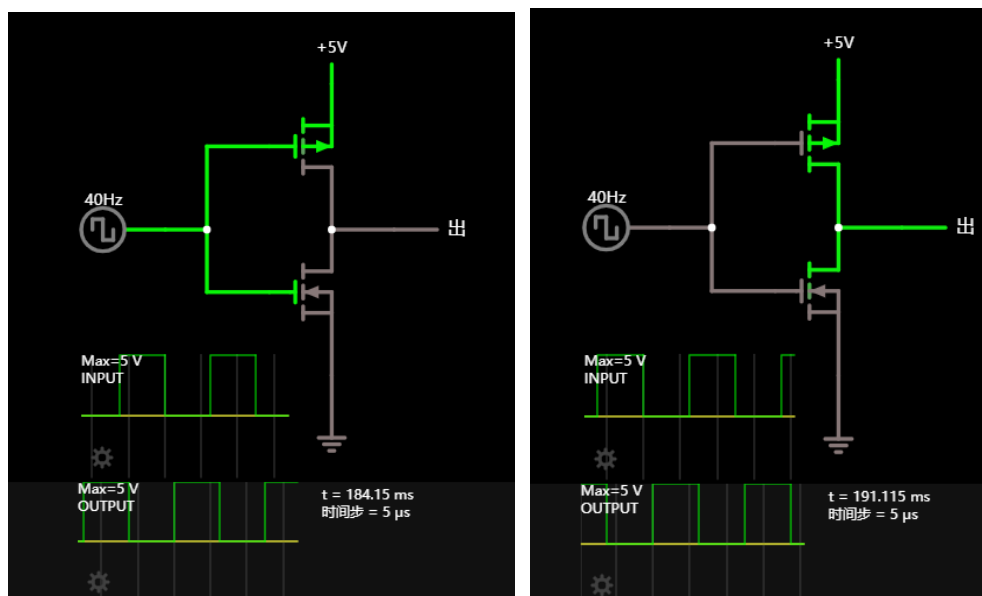
If MOSFET is connected reversely, it's just a diode. Don't do that.



There are different ways to draw a MOS in different situations, but for now you can regard them as the same. Pay attention to the direction of the arrows.

The C in CMOS stands for complementary. Use NMOS to pull down (connect to ground) the output and use PMOS to pull up (connect to VCC) the output.

NOT gate in CMOS looks something like this (Green stand of high voltage/1 and grey stand for low voltage/0) :

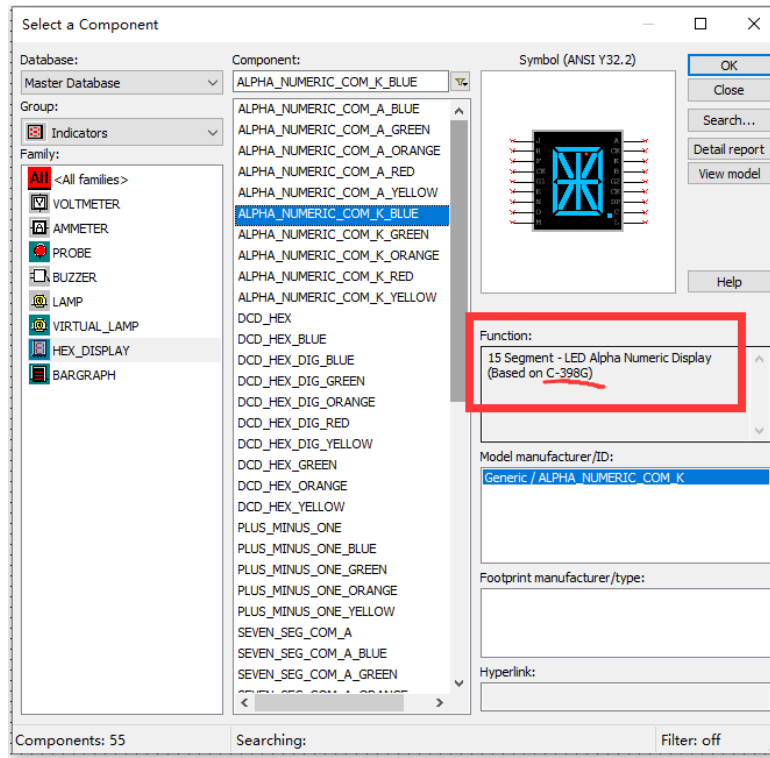


Recommended NMOS for hw2: ZVN4424G

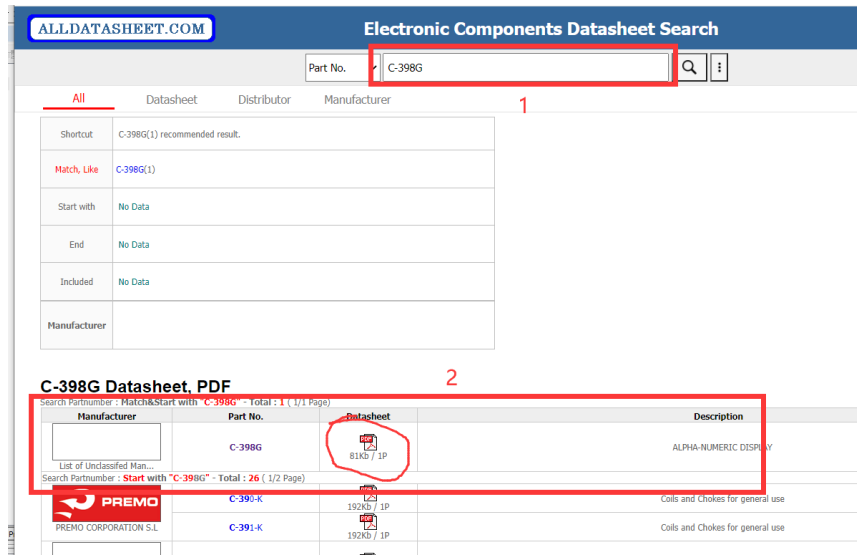
Recommended PMOS for hw2: ZVP4424G

# How to use HEX display in Multisim

Step1: Choose your hex display, read its function to find out what its part number.



Step2: Go to alldatasheet.com and search for that part number and read its datasheet



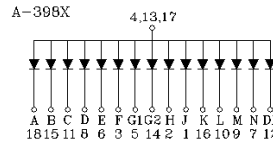
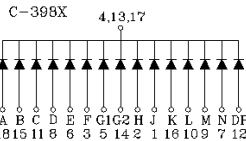
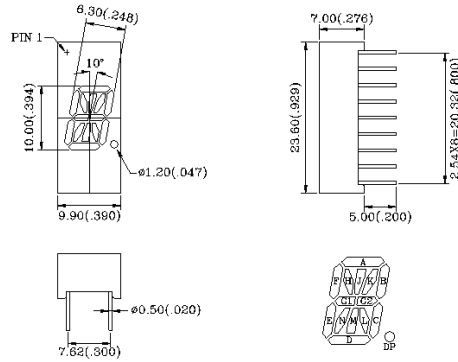
Step 3: HEX display is composed of many LEDs with common anode or cathode, you just need to light them up according to datasheet.

**PARA**  
LIGHT

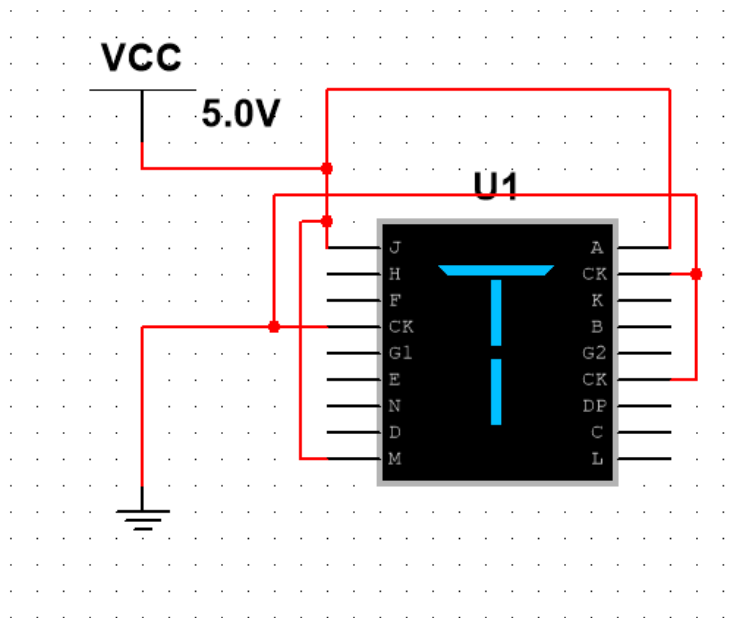
C/A-398X ALPHA-NUMERIC DISPLAY

Shape	Part No.		Chip		Wave Length $\lambda_p(\text{nm})$	Electro-Optical Characteristics			Fig. No.
	Common Cathode	Common Anode	Raw Material	Emitted Color		$V_f(V/20\text{mA})$	Max.	$I_v(\mu\text{cd}/10\text{mA})$	
	C-398H	A-398H	GaP	Red	700	2.1	2.8	550	D 5.5
	C-398E	A-398E	GaAsP/GaP	Effi Red	635	2.0	2.8	1800	
	C-398G	A-398G	GaP	Green	565	2.1	2.8	1600	
	C-398Y	A-398Y	GaAsP/GaP	Yellow	585	2.1	2.8	1500	
	C-398SR	A-398SR	GaAlAs	Super Red	660	1.8	2.4	10000	

Fig.D55



Looks like for this hex display, if we want it to display T, then we need A,J,M to be high. We can test it in Multisim



If next time you need to use other component, you can follow the same procedure.

**Reminder:** 第二次作业第一题只能用 NAND 和 NOT，别的逻辑门不能用。第一题第三小问是要 CMOS 级别的仿真，即让你用 NMOS 和 PMOS 在 Multisim 里搭建出你在第二问里得出的 CMOS 设计，并仿真。