

ECE445 Soldering Workshop

Introduction

The purpose of this workshop is to give everybody some experience soldering. In particular, students should take away what types of parts are easy or more difficult to solder. The course staff has created a custom printed circuit board (PCB) to allow students to practice on many different types of packages. There is a required circuit all students must solder. All other parts are optional, but students are highly encouraged to use them as practice.

Required Linear Voltage Regulator, LED, and Logic Gate Circuits

You are required to solder parts for the linear voltage regulator circuit. The circuit takes a range of DC input voltages, and outputs a constant 5V. The range of input voltages in linear voltage regulators is required to be greater than the output voltage, plus some margin. If the input voltage is too low, the output voltage will drop below 5V. The diode in the circuit is used to prevent damage in case the polarity of the input voltage is reversed. The capacitors are used to filter out AC noise into the input and at the output. Sometimes the capacitors may be required for stability of the output, so always check the data sheet. The complete list of parts in this circuit that you must solder is as follows:

- 5V linear regulator (TI part number UA78M05CDCYR)
- 2x decoupling caps (Digikey part number 1276-1246-1-ND)
- Diode (Digikey part number)

You are required to solder parts for the LED circuit. The LED takes as an input from the output of the voltage regulator. The resistor is to limit the current across the LED. The complete list of parts in this circuit that you must solder is as follows:

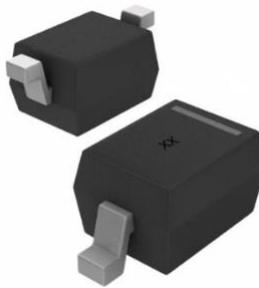
- LED (Digikey part number 160-1189-1-ND)
- Resistor (Digikey part number 311-150ARCT-ND)

You are required to solder a quad NAND gate. The chip is powered by the 5V output from the linear voltage regulator circuit.

- Quad NAND gate (TI part number SN7400D)

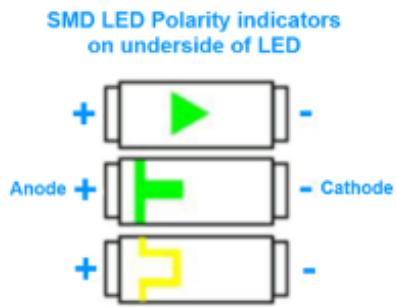
Diode and LED Polarity

Note Diodes only allow current to flow in one direction. A diode has two terminals. The positive side is called the anode, and the negative one is called the cathode. Current through a diode can only flow from the anode to cathode. It is important to distinguish the cathode and anode before you solder diode on to the PCBs. Physically, every diode should have some sort of indication for either the anode or cathode pin. Normally, the diode will have **a line near the cathode pin**, which matches the vertical line in the diode circuit symbol.



Notice the line on device denoting the Cathode side.

Like diodes, LEDs are polarized as well. There are a handful of identifiers for finding the positive and negative pins on an LED. Particularly in this assignment, we are using surface mount LEDs. The pin nearest the flat edge will be positive, Anode pin.



Notice the flat edge will be the positive

Other Optional parts

On the back, there are many surface mount parts of various packages you may want to try soldering. A table of all the parts and their packages can be found below.

package	description	digikey part number	coilcraft part number
0402	2.2k ohm resistor	RMCF0402JT2K20CT-ND	
0603	10k ohm resistor	RHM10KCGCT-ND	
0805	1k ohm resistor	1276-5531-1-ND	
1206	10k ohm resistor	1276-5930-1-ND	
1812	1.5k ohm resistor	P15968CT-ND	
2220	3.3 nF ceramic cap	490-3481-1-ND	
2512	1.2k ohm resistor	1276-6015-1-ND	
SOT23-6	MOSFET	DMG6602SVT-7DICT-ND	
SOT23-5	LDO REG	863-1491-1-ND	
MSOP .65mm	EEPROM	11LC010-I/MS-ND	
MSOP .5mm	BUCK REG	AP3201AMHTR-G1DICT-ND	
SOIC 1.27mm	EEPROM	11LC010-I/SN-ND	
LPS3015	10uH inductor		LPS3015-103MRB
LPS6235	22uH inductor		LPS6235-223MRB

Grading

After soldering wires through the Vin, GND, and 5V vias, connect Vin and GND to a DC power supply and measure the output voltage on an oscilloscope.

- Output is 5V when the input voltage is 10V (**2 points**)
- Output is 5V when the input voltage is swept above the regulator dropout voltage (**2 points**)
- LED lights up (**2 points**)
- Show four logic gates works (**4 points**)
 - LL pin shows High
 - LH pin shows High
 - HL pin shows High
 - HH pin shows Low

