تطبيقات ميكاترونيك -1-

Lecture No. 1

General Introduction to the Course
SCH PCB By Eagle 1

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روبوت و أنظمة ذكية - سنة ثالثة

2022-2023

النظري: 50 العملي: 50

الاختبارات وتوزيع الدرجات وطريقة التقييم

اختبار تحريري 1 في الأسبوع السابع	%15
اختبار حاسوبي 2 في الأسبوع الثاني عشر	%15
مشروع تطبيقي بحثي يتضمن عرض تقديمي أمام لجنة حكم في الأسبوع الرابع عشر	%20
امتحان نهائي كتابي	%50

تحتاج للتجريب والتدريب والدراسة بشكل ذاتي منزلي وخلال الجلسات.

الموضوعات الرئيسة التي يغطيها المقرر

القسم الأول

مفردات التي سيعطيها الدكتور فادي

الموضوعات الرئيسة التي يغطيها المقرر

القسم الثاني

مفردات التي سيعطيها الدكتور عيسى

- برامج التصميم الإلكتروني Eagle and Altium Designer.
- المقاطعات والتحكم PID بمحرك تيار مستمر وبدرجة الحرارة
- التايمرات في المتحكمات وتوظيفها
- قيادة روبوت على عجلات تخطيط مسار وتحكم حركة
- ROS2

المشروع

- منافسة بين روبوتين للوصول إلى آخر المسار
- توزع النقاط عل التصميم وعلى التنفيذ والبرمجة وإنجاز المهام.
- استخدام تقنيات حساسات مركبة على روبوت تفاضلي بعجلات عادية للتعرف على بيئة مجهولة نسبيا.
- الروبوت مقيد بالمشي على مسار مرسوم (خط أسود)
- البيئة عبارة عن حلبة تحوي عوائق تكون موضوع بجانب أو على الخط الأسود بحيث تعيق حركة الروبوت
- العوائق عبارة عن علبة كرتونية لا يجب أن يصطدم الروبوت بها.
- عندما يصادف الروبوت عائق عليه العودة إلى تقاطع ليجرب مسار آخر حتى الوصول للأخير
- يجب على الروبوت تجاوز شرط فجائي معين.

الغاية من هذه المحاضرة:

تعليم استخدام برنامج EAGLE لتصميم دارة الكترونية مطبوعة.

- تعلم Schematic
- تعلم PCB
- قواعد التصميم الإلكتروني
- فحص الأخطاء

الغاية النهائية تصميم دارة المشروع لمادة تطبيقات 1 باستخدام هذا البرنامج.

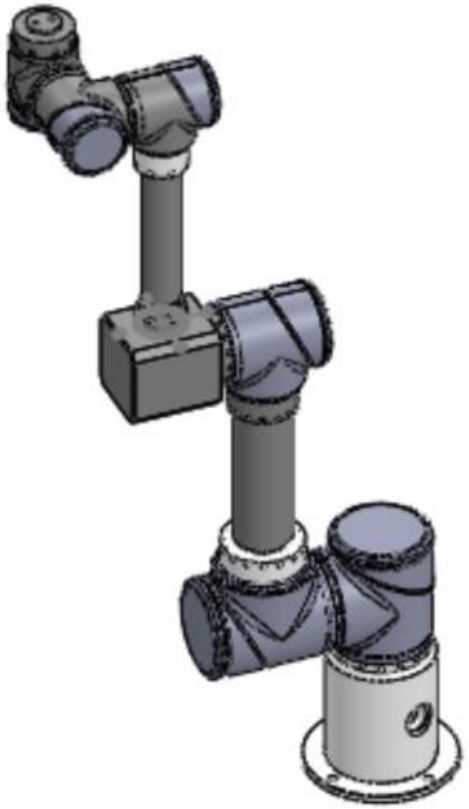
PCB Technology

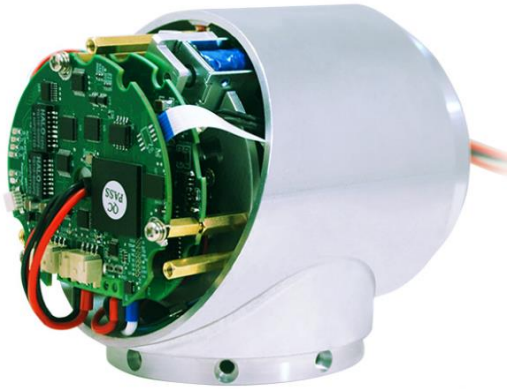
PCB Assembly services are a fundamental part of the manufacturing of electronic devices to ensure their utility and competence.

A PCB is an electronic part used to assemble electrical components into various machines and hardware.

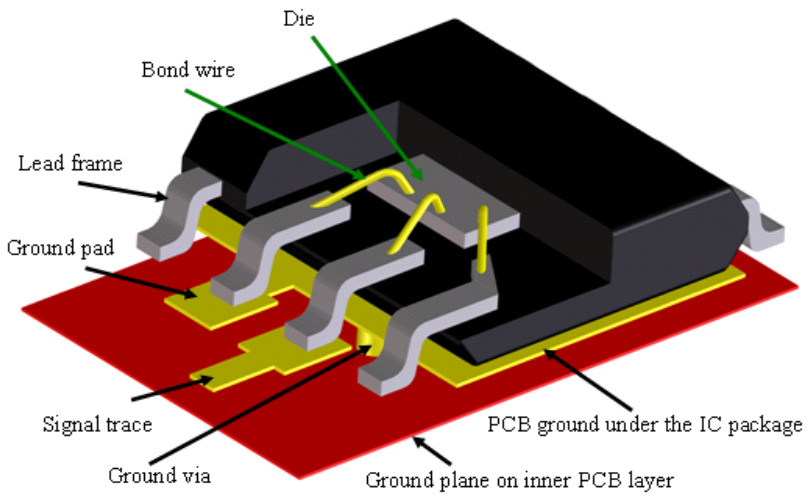
These machines are commonly found in the advanced gadgets on which we are vigorously reliant today, like Television, Drivers, motors, Games, PCs, phones, and laptops.

- **Low Cost Overall With PCB Assembly**
- **Human Error Is Reduced**
- **Product Development Cycle Has Been Reduced**
- **Reliable Quality**
- **Fit For Mass Production الانتاج الشامل**

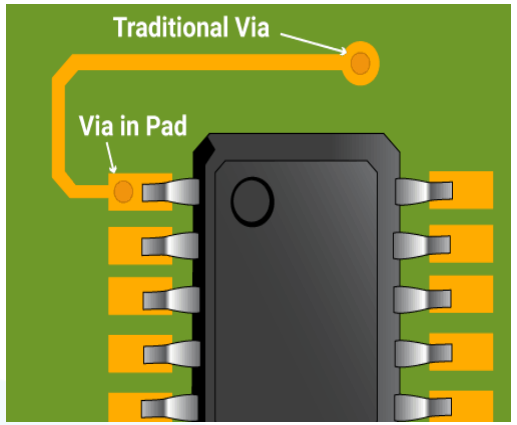




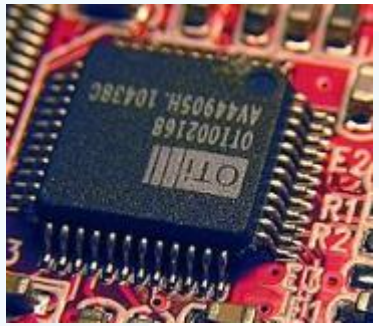
Methods Or Technologies of Mounting Electronic Components



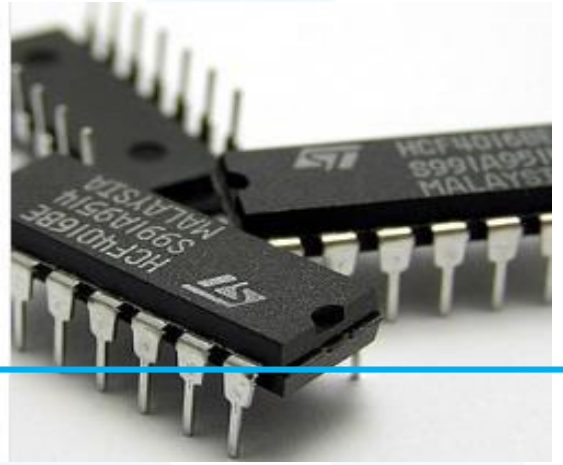
1. In electronics, a **lead** is an electrical connection consisting of a length of wire or a metal pad.
2. A die, in the context of integrated circuits, is a small block of semiconducting material on which a given functional circuit is fabricated.
3. Black plastic housing.



1. **Surface-mount technology** (**SMT**) is a method in which the electrical components are mounted directly onto the surface of a printed circuit board (PCB). An electrical component mounted in this manner is referred to as a **surface-mount device** (**SMD**). In industry, this approach has largely replaced the through-hole technology



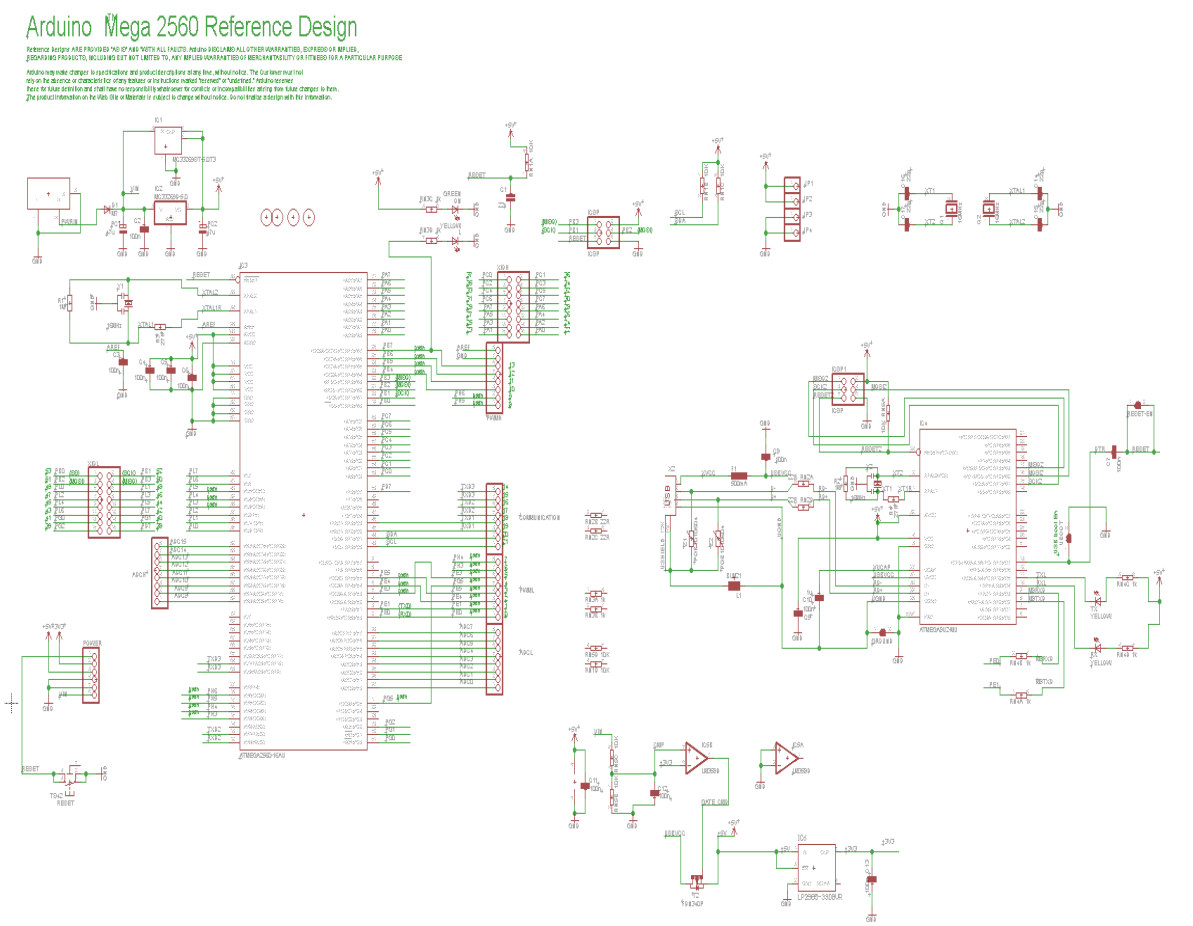
2. **Through-hole technology** (also spelled "**thru-hole**"), refers to the mounting scheme used for electronic components that involves the use of leads on the components that are inserted into holes drilled in printed circuit boards (PCB) and soldered to pads on the opposite side either by manual assembly (hand placement) or by the use of automated insertion mount machines.

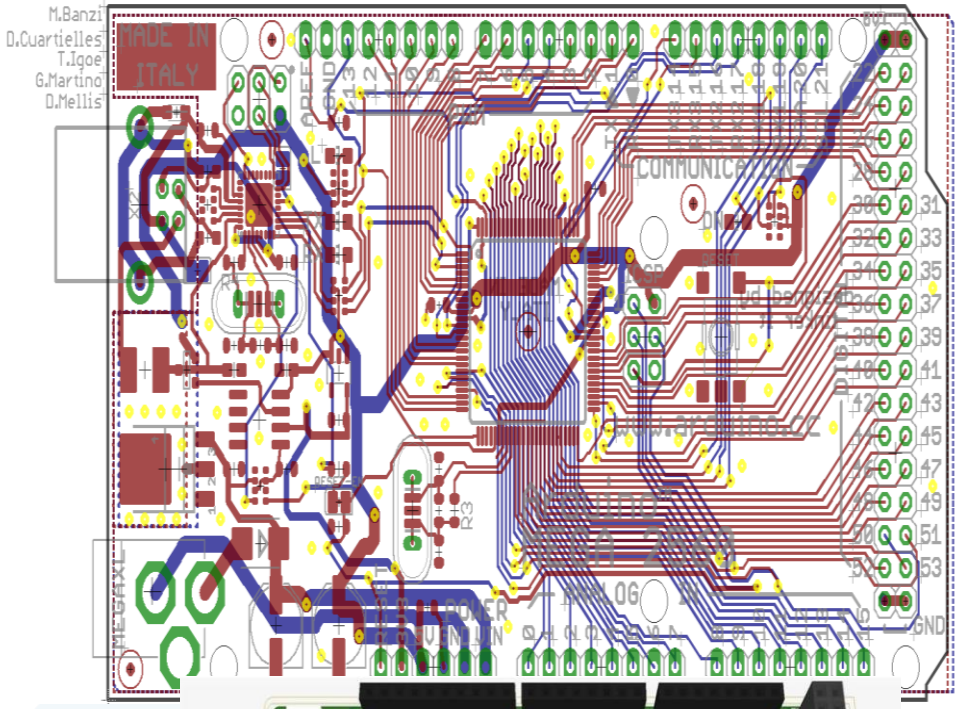


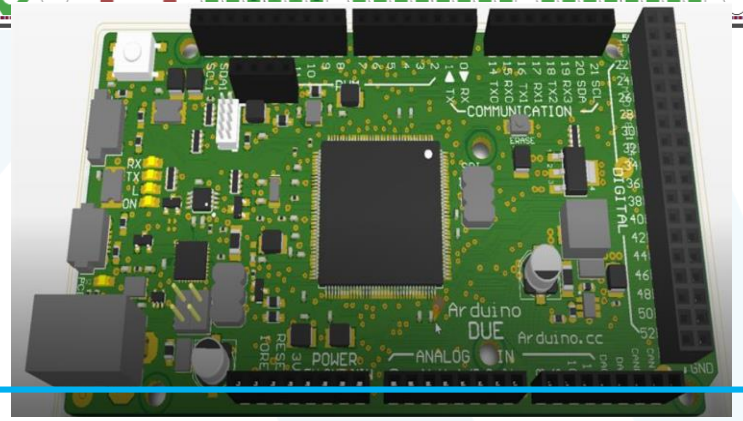
In microelectronics, a dual in-line package (DIP or DIL), is an **electronic component package** with a **rectangular housing** and **two parallel rows of electrical connecting pins**. The package may be **through-hole mounted** to a printed circuit board (PCB) or inserted in a socket.

What is SCH and PCB?

- **SCH file** is an electronic circuit's schematic created with electronics design/simulation programs.
- **PCB** (printed circuit board)







Different SCH-PCB CAD software

Altium

Circuitmaker

is a unique combination of the broad design community, a **free** PCB Design software

Altium Designer:

single, unified application that incorporates all the technologies and capabilities necessary for electronic product development.

Altium Designer integrates within a single design environment:

- board- and FPGA-level system design,
- embedded software development,
- PCB layout, editing and manufacturing

Autodesk

EAGLE

The name EAGLE is an acronym, which stands for: Easily Applicable Graphical Layout Editor. The program consists of three main modules: Layout Editor, Schematic Editor, and Autorouter, which are embedded in a single user interface.

Fusion 360

Fusion 360, in addition to EAGLE's capabilities within its Electronics Workspace, unifies tools for **MCAD mechanical computer aided design**, true 3D modelling, collaboration, documentation, simulation and manufacturing, all in one application built from the ground up.

Proteus

simulator Design Schematic printed circuit board (PCB) editor

Kicad

KiCad EDA

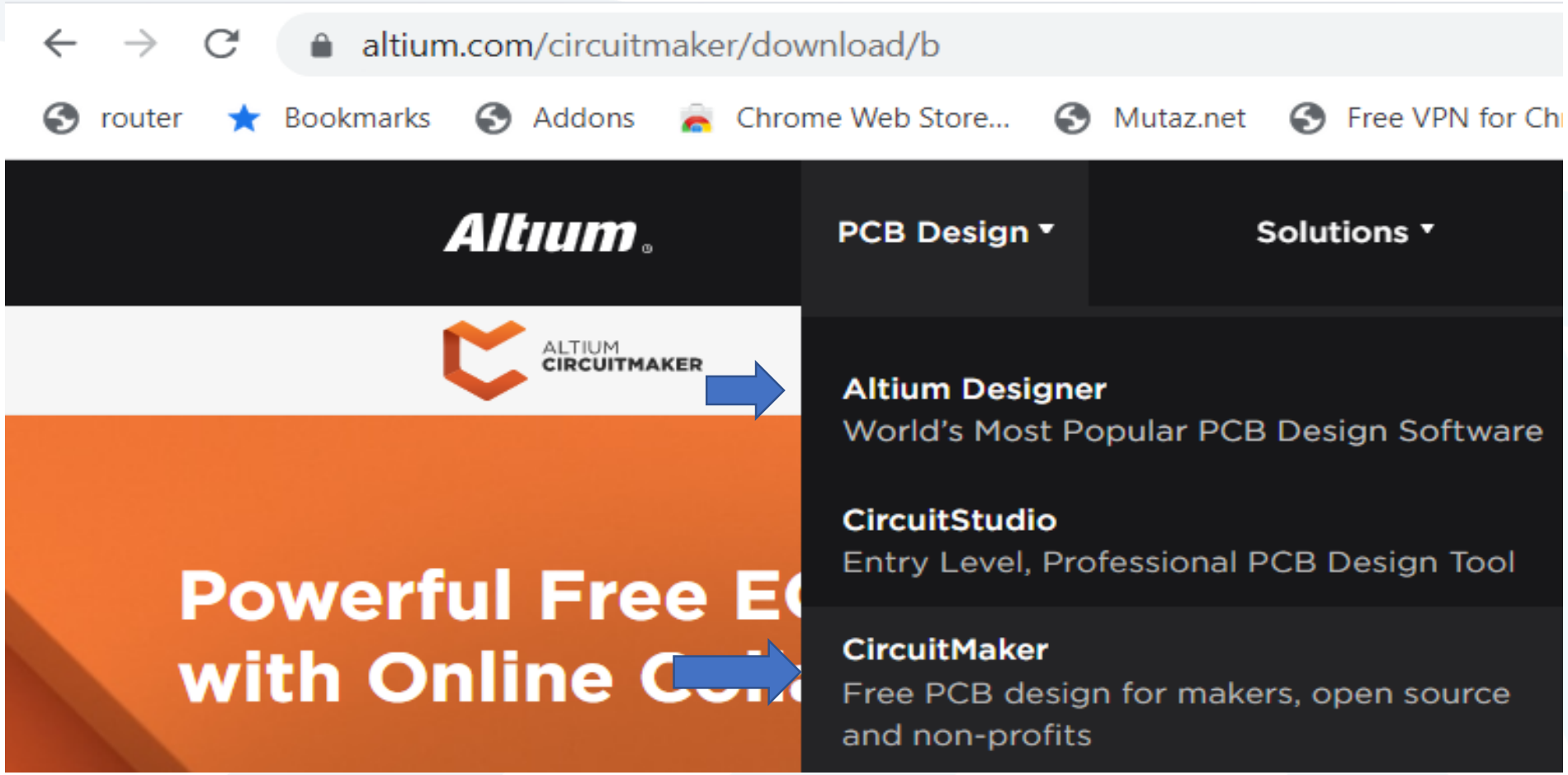
A Cross Platform and **Open Source** Electronics Design Automation Suite

OrCAD

mixed-signal simulator Design Schematic printed circuit board (PCB) editor.

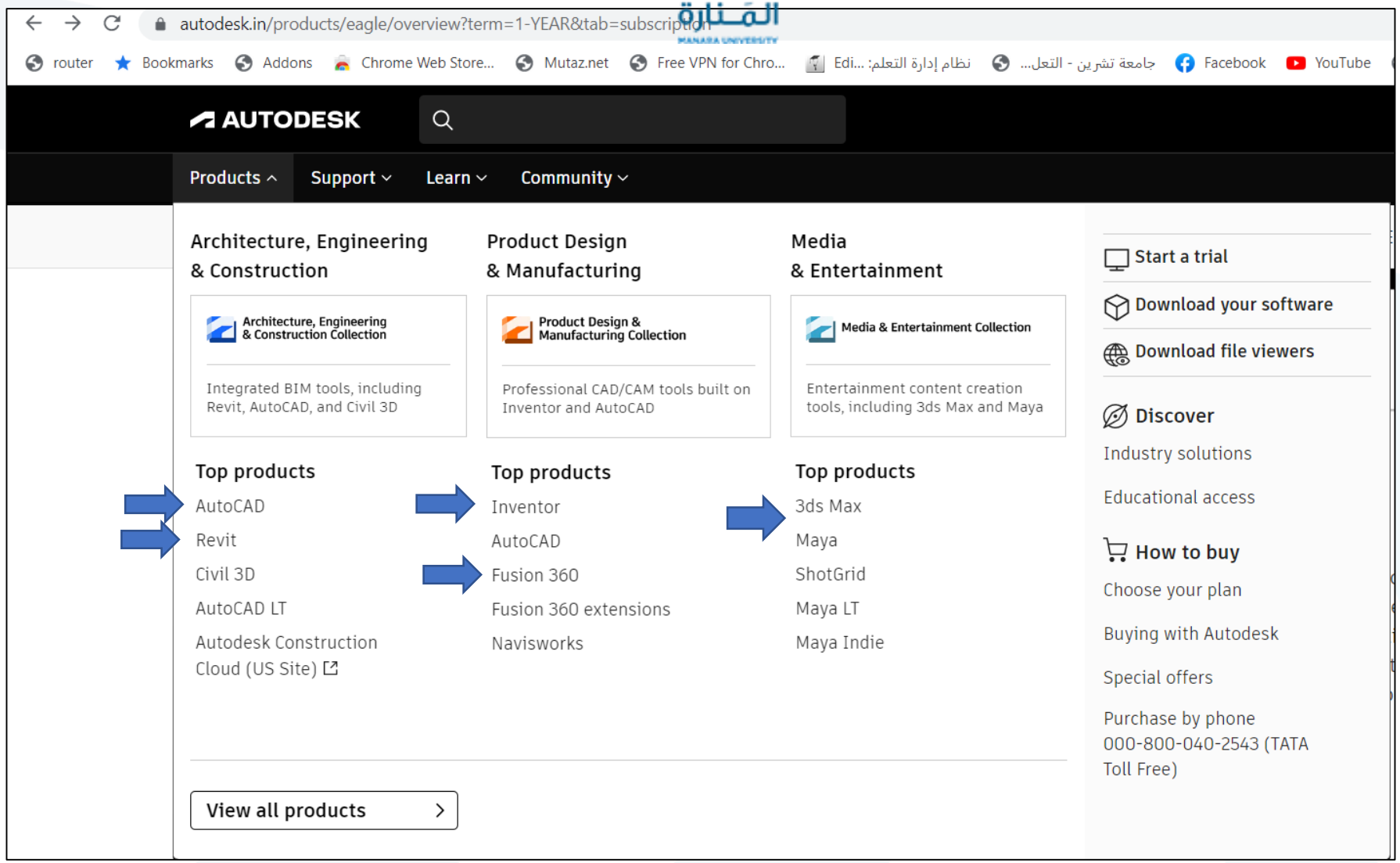
Altium

Australian multinational software company



Autodesk

Autodesk, Inc. is an American multinational software corporation

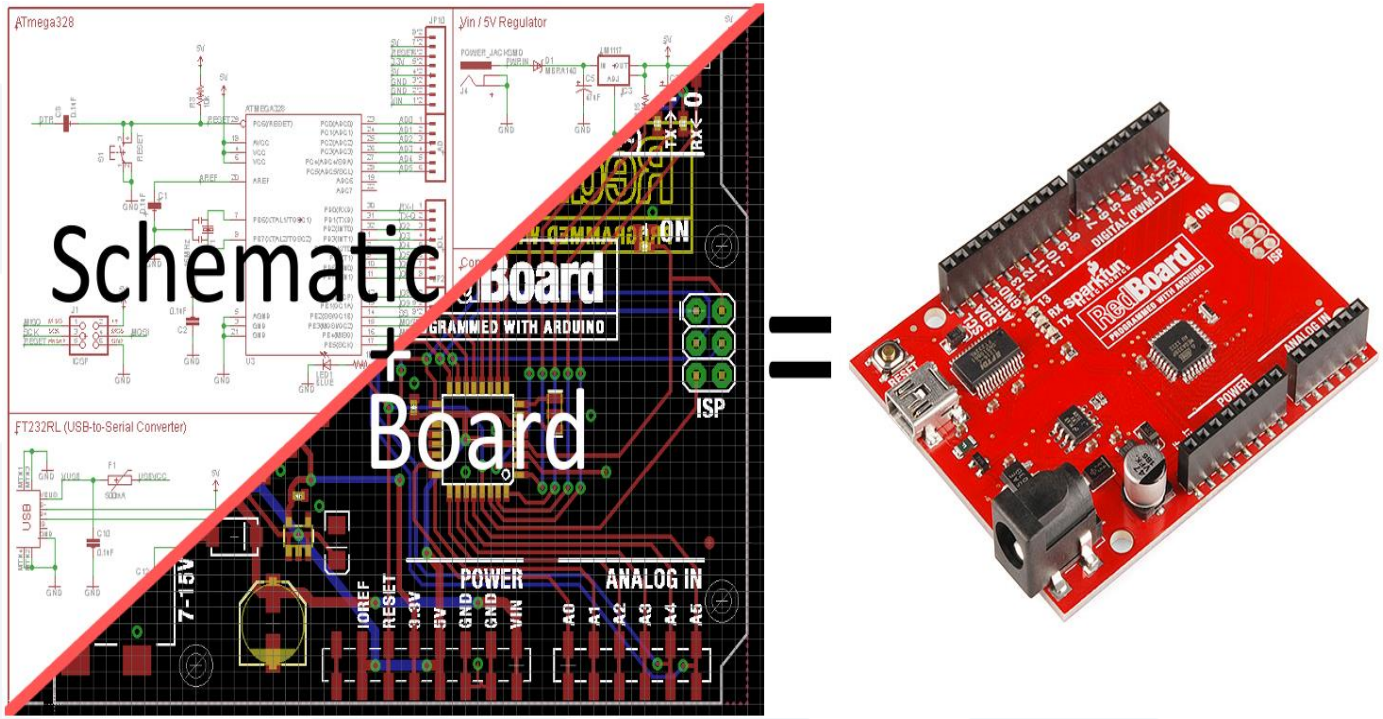


Why EAGLE?

EAGLE is one of many PCB CAD softwares out there.

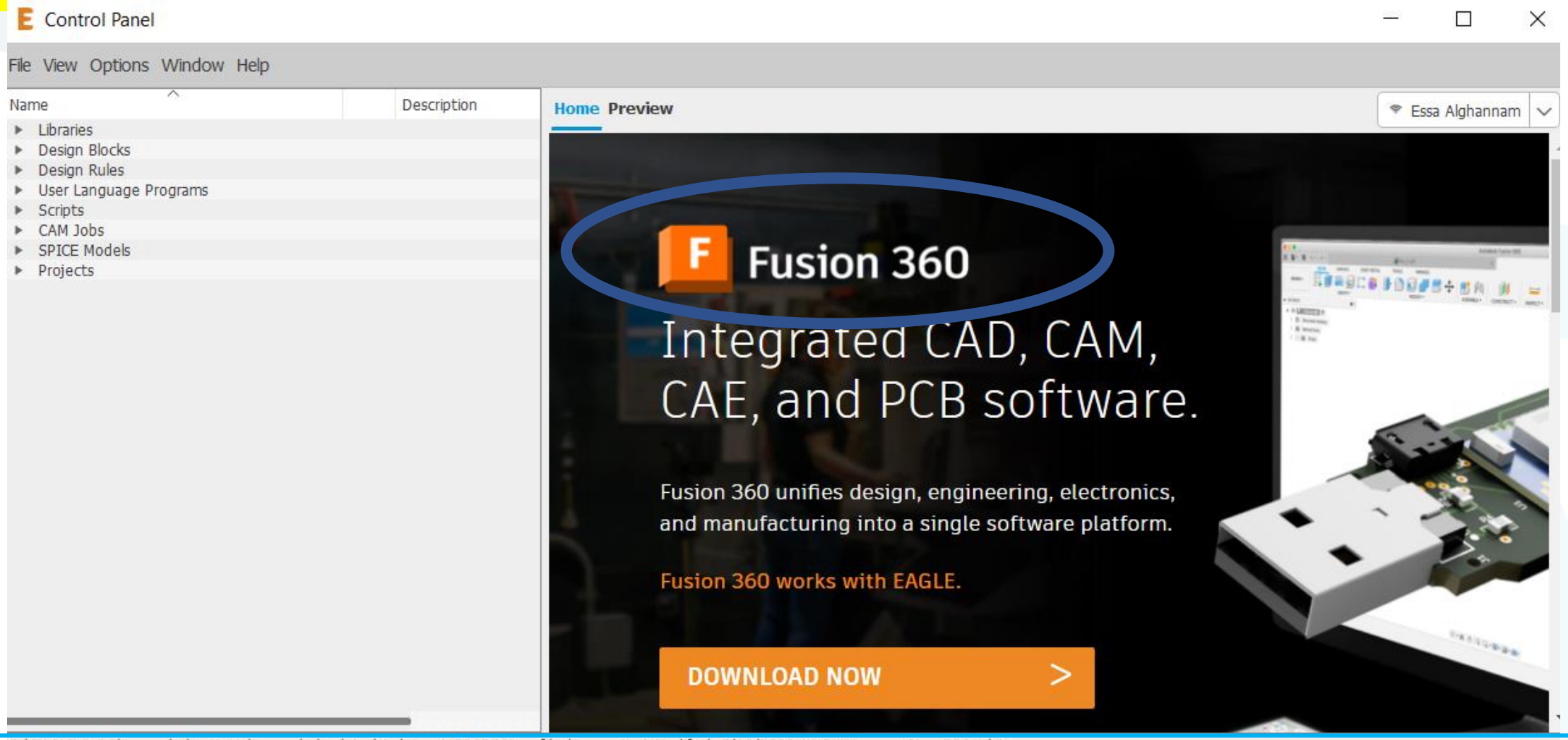
1. **Cross-platform** -- EAGLE can run on anything: Windows, Mac, even Linux.
2. **Lightweight** -- It requires anywhere from 50-200MB of disk space (compared to the 10+GB more advanced tools might require). The installer is about 25MB. So you can go from download to install to making a PCB in minutes.
3. **Free/Low-Cost** -- The freeware version of EAGLE provides enough utility to design almost any PCB in the SparkFun catalog.
4. **Community support**

Whether you want to study the design of an Arduino board or import a popular sensor into your design, somebody has probably already made it in EAGLE and shared it.



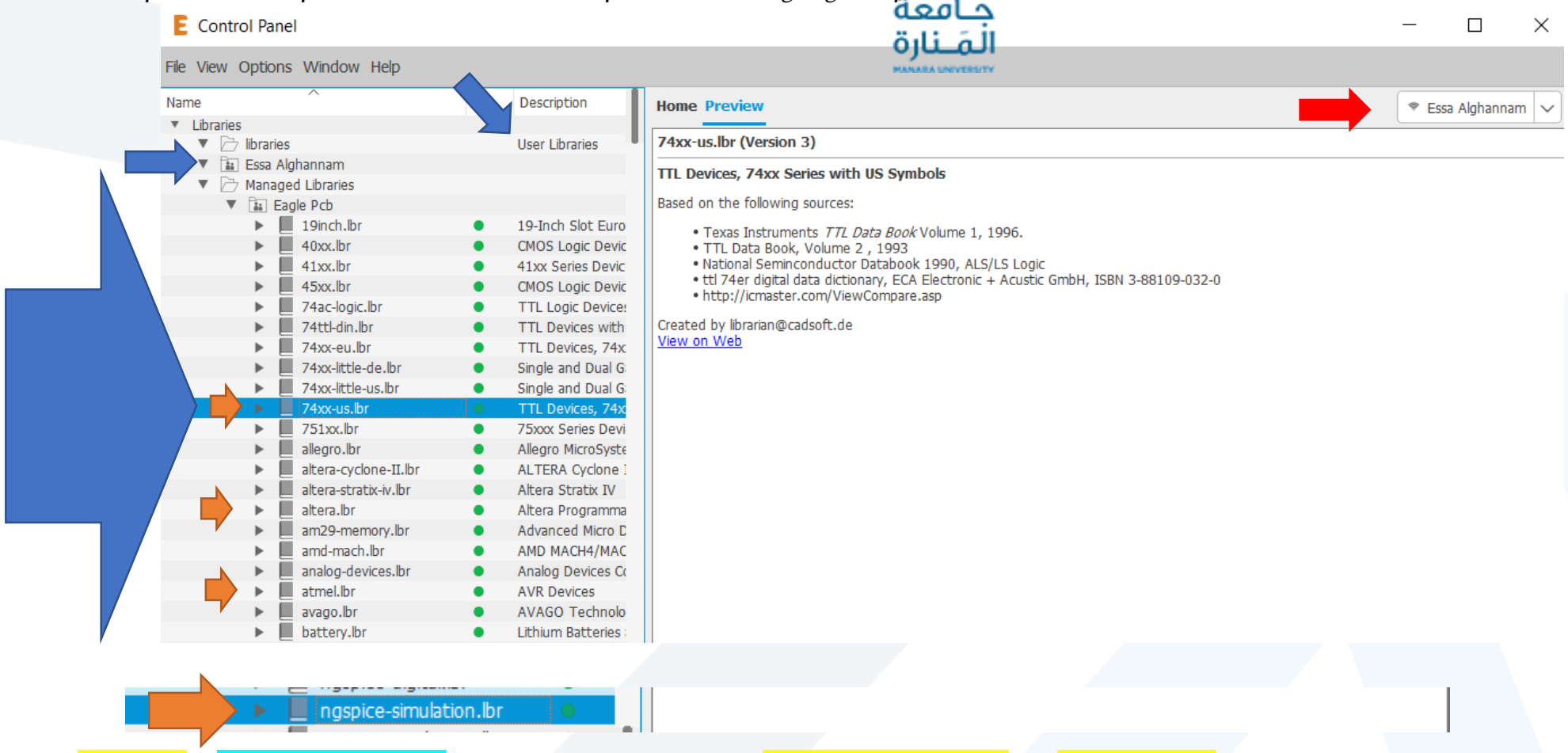
Exploring the Control Panel

The first time you open up EAGLE, you should be presented with the **Control Panel** view. The Control Panel is the "homebase" for Eagle, it links together all of the other modules in the software.



The control panel

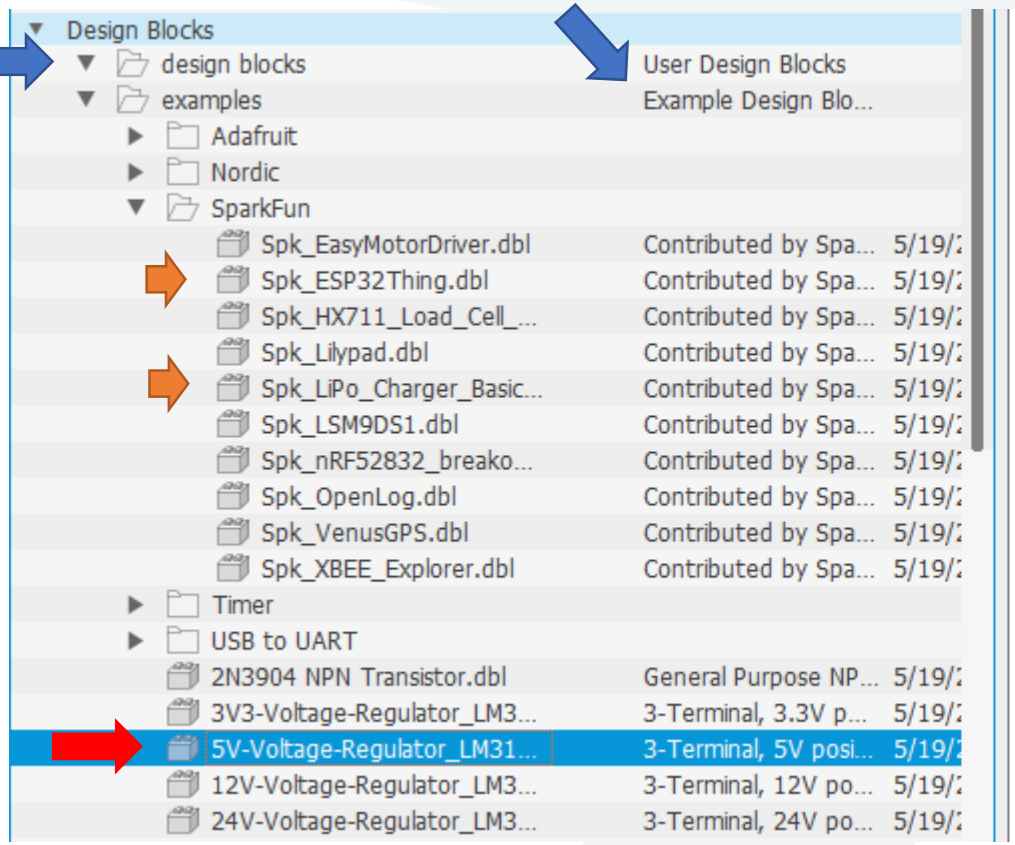
You can explore the 8 separate trees in the control panel, which highlight separate functions of the software:

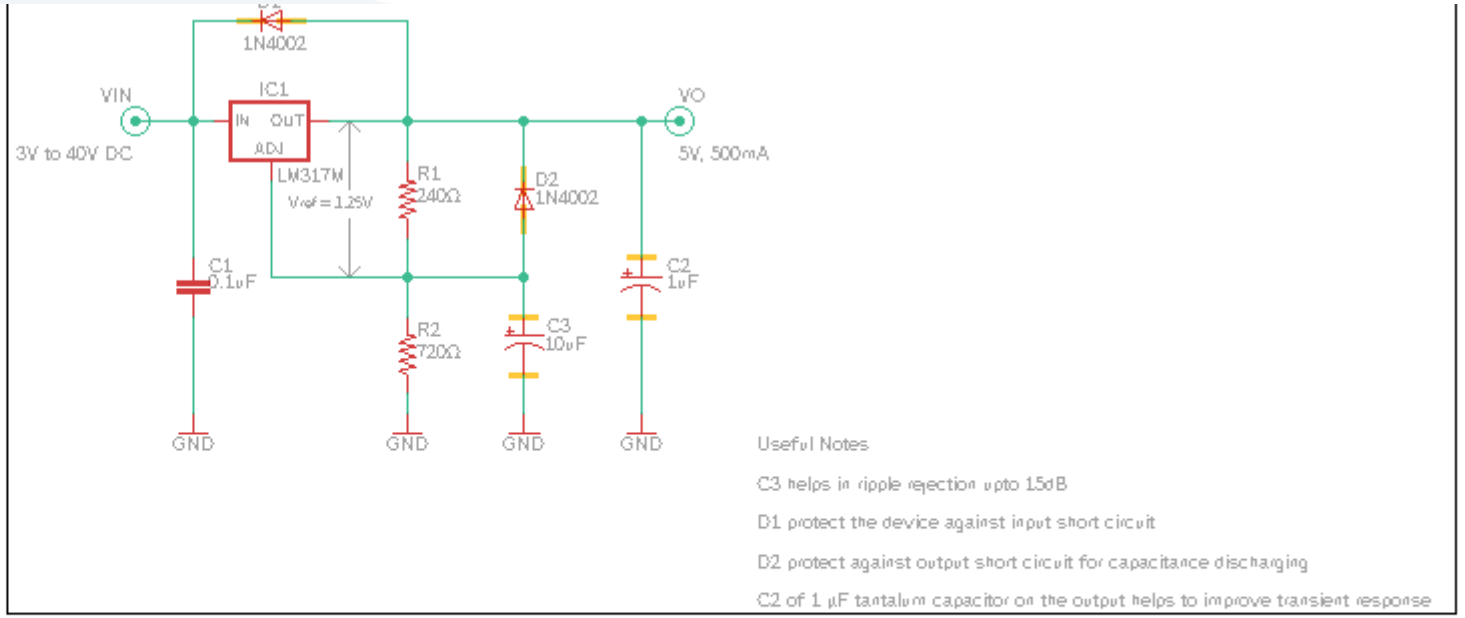


1. **Libraries** -- Libraries store parts, which are a **combination** of schematic symbol and PCB footprint.

- Libraries usually contain a group of related parts,
- e.g. the *atmel.lbr* stores a good amount of Atmel AVR devices,
- while the *74xx-us.lbr* library has just about every TTL 74xx series IC.

The control panel





Sheet	Size	Description
Sheet 1	7.407 x 3.389 inch	

2. **Design blocks**

The control panel

3. **Design Rules (DRU)** -- Design rules are a set of rules your board design must meet before you can send it off to the fab house. In this tree you'll find DRU files, which are a a pre-defined set of rules.

4. **User Language Programs (ULPs)** -- ULPs are scripts written in EAGLE's User Language. They can be used to automate processes like generating bill of materials (bom.ulp), or importing a graphic (import-bmp.ulp).

5. **Scripts (SCR)** -- Script files can be used to customize the EAGLE user interface. In one click you can set the color scheme and assign key bindings.

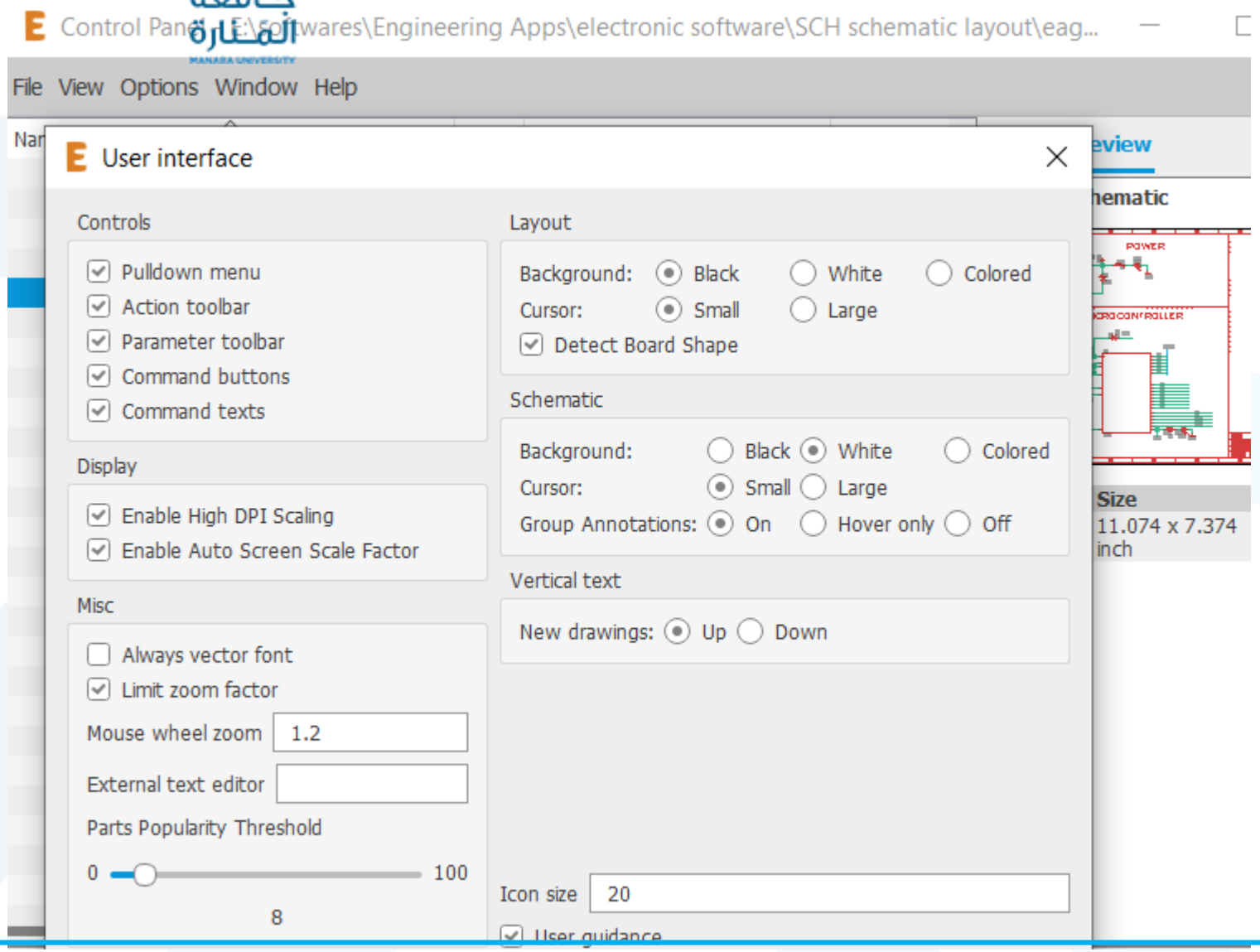
6. **CAM Jobs (CAM)** -- CAM jobs can be opened up by the CAM processor to aid in the creation of gerber files.

7. Spice models: programming components

8. **Projects** -- This is where each of your projects are organized into a single project folder. Projects will include schematic, board design, and possibly gerber files.

Setting the Background Color

- To change the background color, go up to the "Options" menu and select "User interface".
- Inside the "Layout" box you can set the background to black, white, or a specific color.

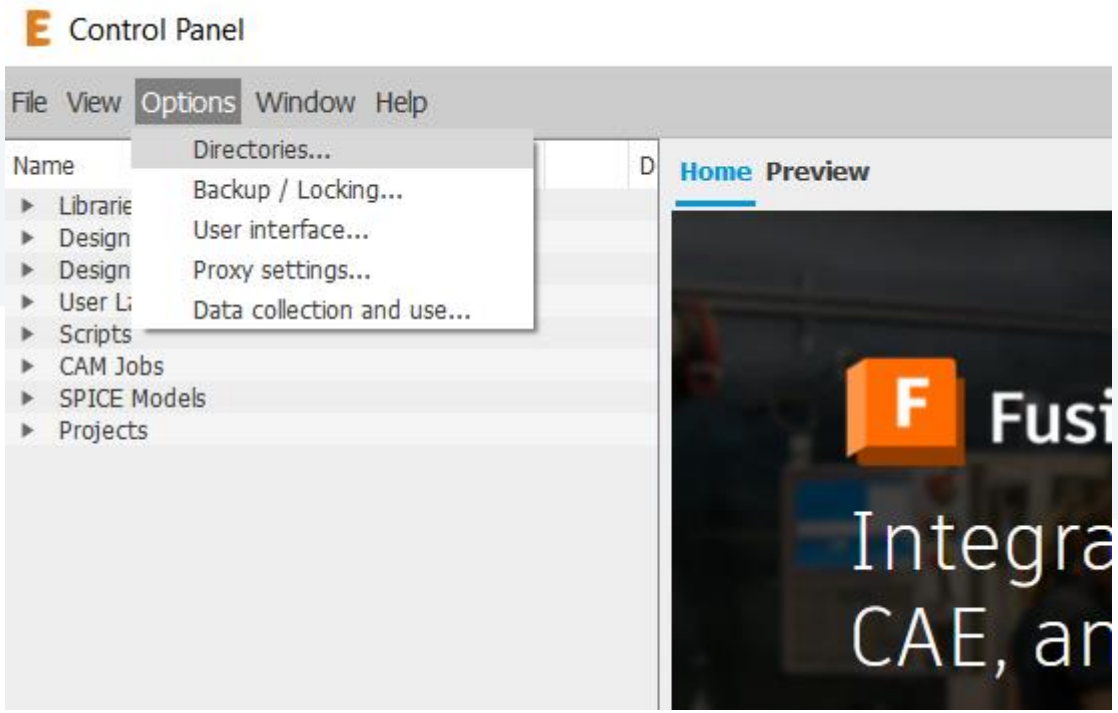


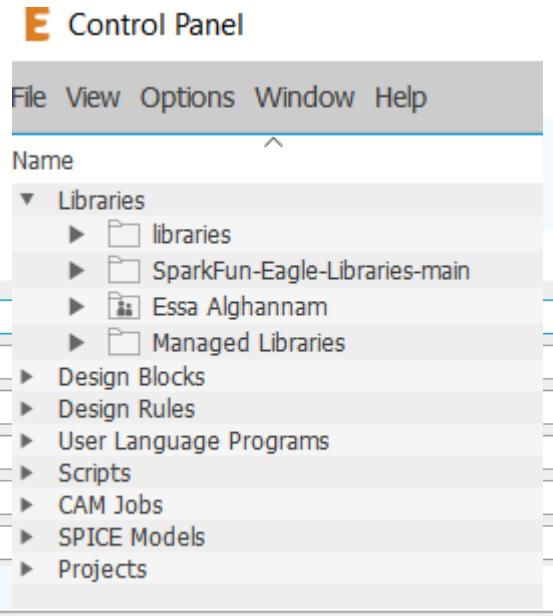
Add new library

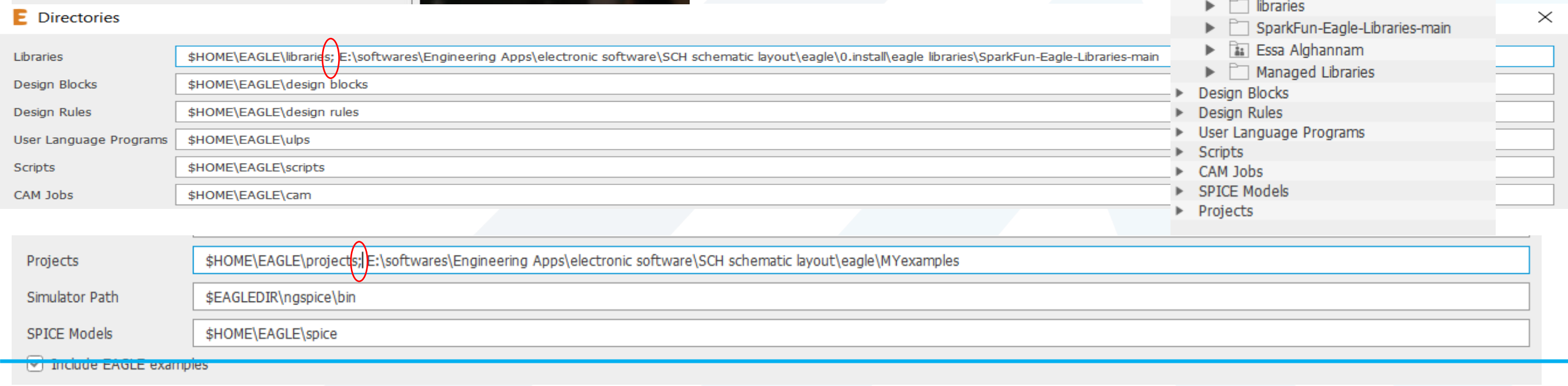
Project path

https://github.com/sparkfun/SparkFun-Eagle-Libraries

https://github.com/adafruit/Adafruit-Eagle-Library

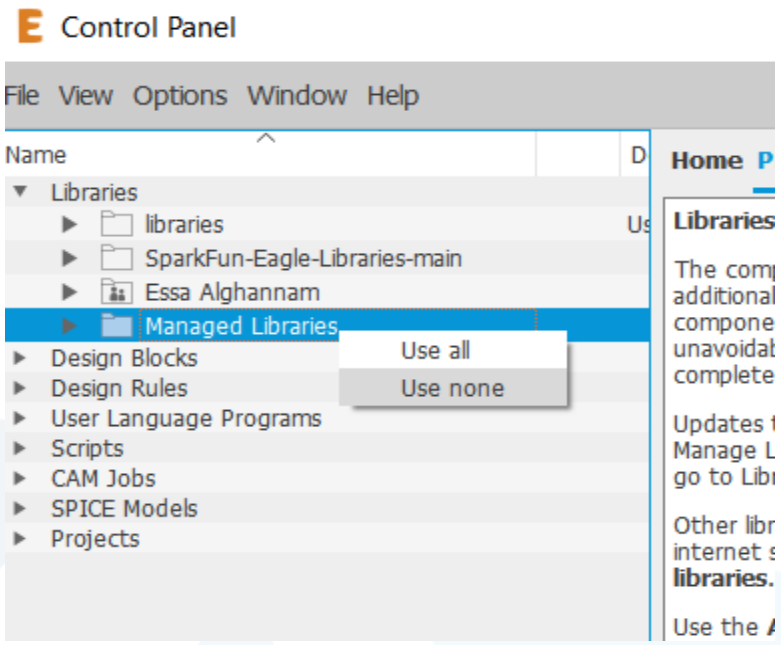




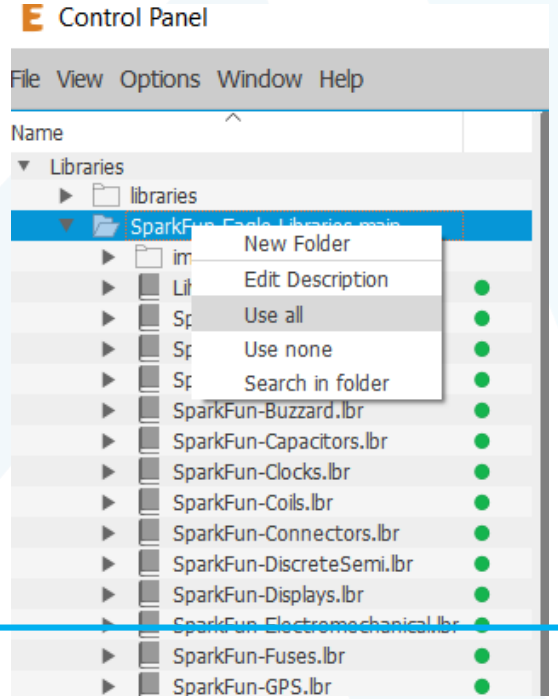


Using" Libraries

- Now, when you go back and look at the "Libraries" tree, there should be two folders included, one of which should be our SparkFun Eagle Libraries.
- The last step is to tell EAGLE that, for now at least, we don't want to use the default libraries. To do this, right click on the "lbr" folder, and select **"Use none"**.

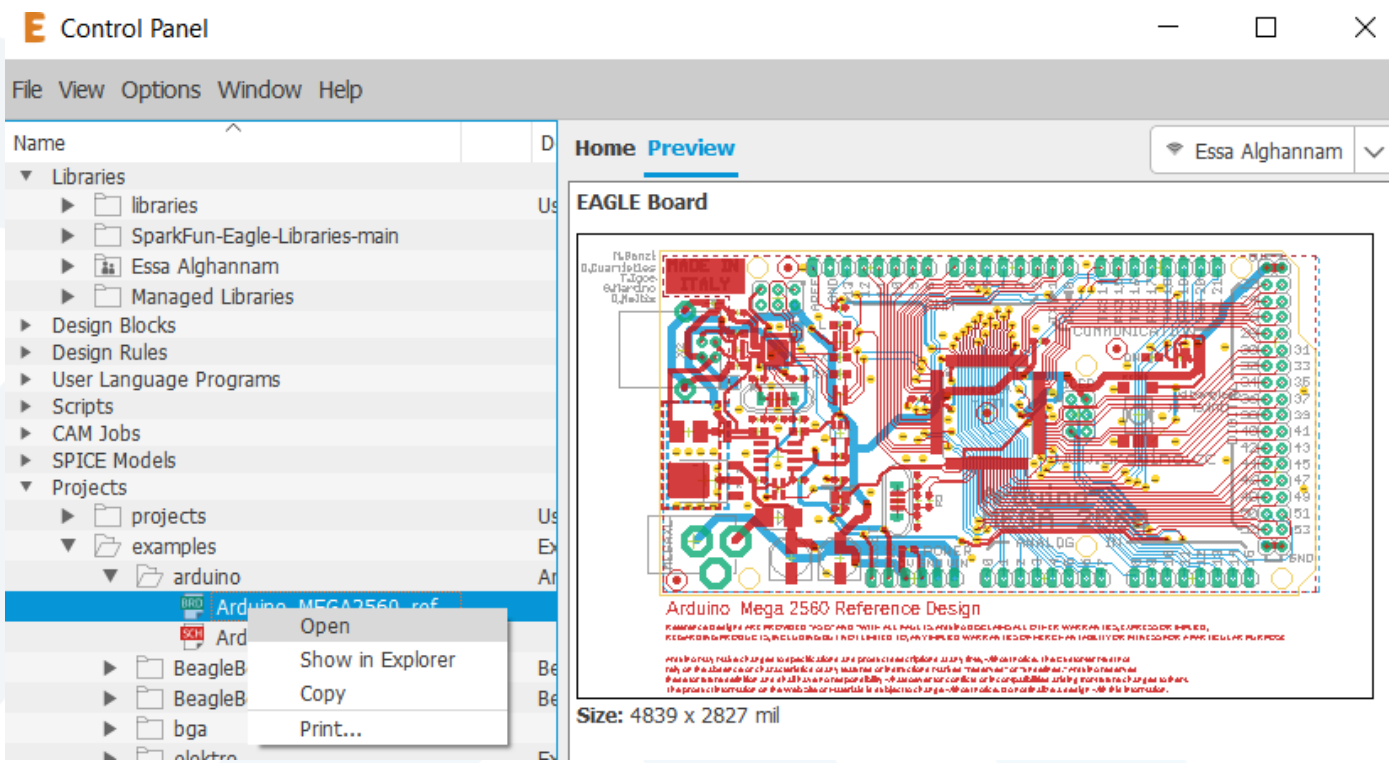


Then, right-click on the "SparkFun-Eagle-Libraries-master" folder, and select **"Use all"**. Then check the libraries in each of the two folders. Next to them should be either a grey or green dot. A green dot next to a library means it's in use, a grey dot means it's not. Your libraries tree should look a little something like this:



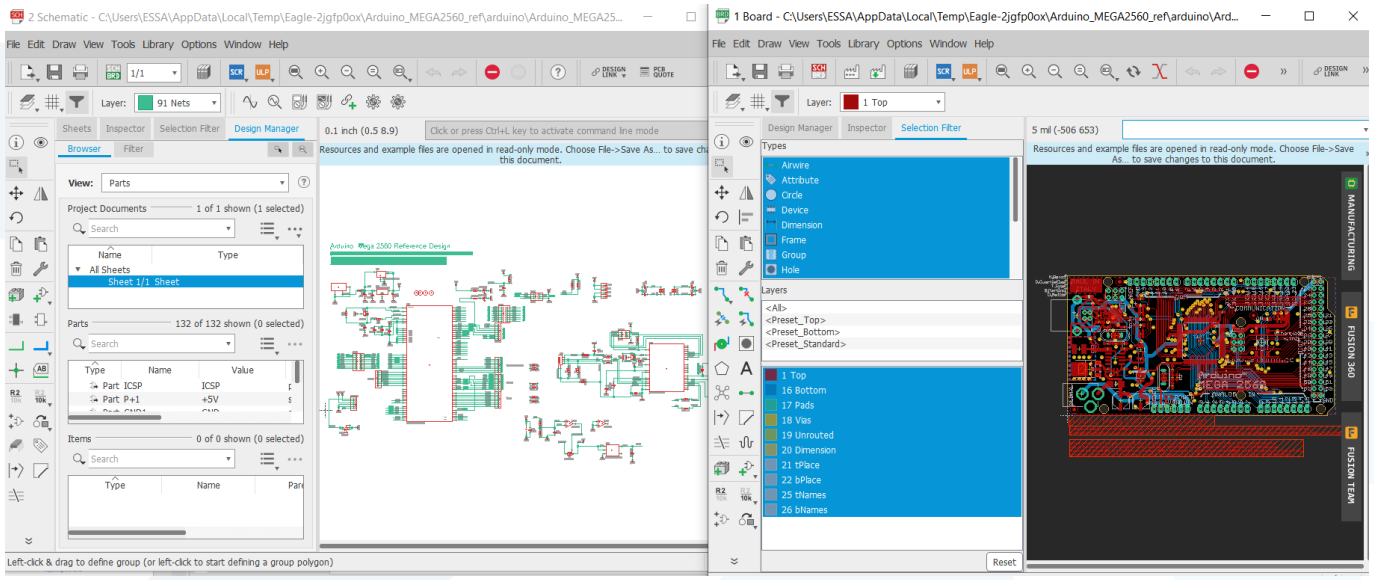
Opening a Project and Explore

EAGLE is packaged with a handful of nifty example PCB designs. Open one up by expanding the "Projects" tree. From there, under the "examples" folder open up the "arduino" project by double-clicking the red folder (or right-clicking and selecting "Open project"). Note that, in this view, project folders are red and regular folders are the standard yellow.



Opening a Project and Explore

Opening the project should cause two more EAGLE windows to spawn: the board and schematic editors. These are the yin and the yang of EAGLE. They should be used together to create the finished product that is a functional PCB design.



Keep Both
Windows Open!

- The **schematic editor** (on the left above) is
- a collection of red circuit symbols which are interconnected with green nets (or wires).
- A project's schematic is like the comments in a program's code.
- It helps tell the story of what the board design actually does, but it doesn't have much influence on the end product.
- Parts in a schematic aren't precisely measured, they're laid out and connected in a way that's easy to read, to help you and others understand what's going on with the board design.

The **board editor** is where the real magic happens. Here colorful layers overlap and intersect to create a precisely measured PCB design.

Two copper layers -- red on top, blue on the bottom -- are strategically routed to make sure different signals don't intersect and short out.

Yellow circles (on this design, but they're more often green) called "vias" pass a signal from one side to the other.

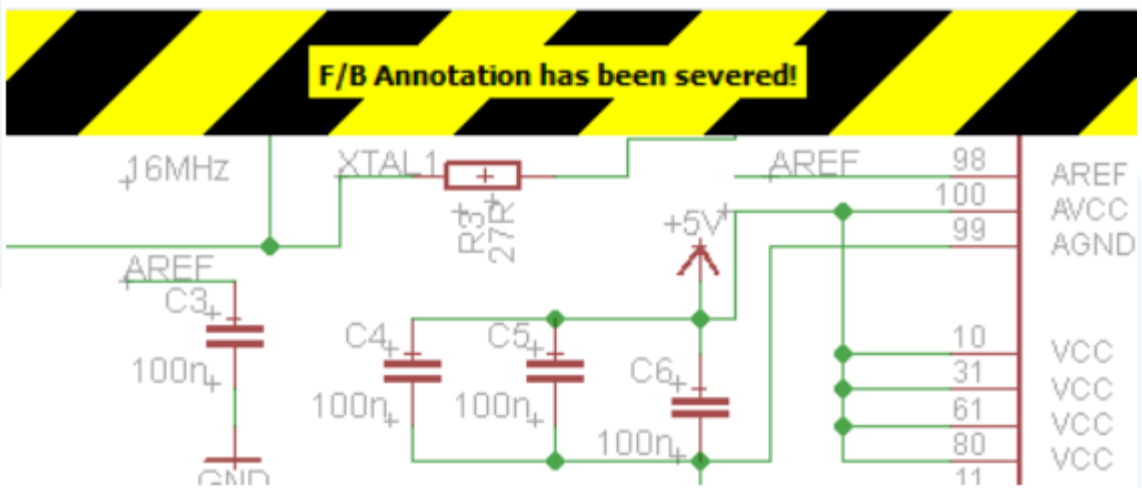
Bigger vias allow for through-hole parts to be inserted and soldered to the board.

Other, currently hidden, layers expose copper so components can be soldered to it.

Opening a Project and Explore

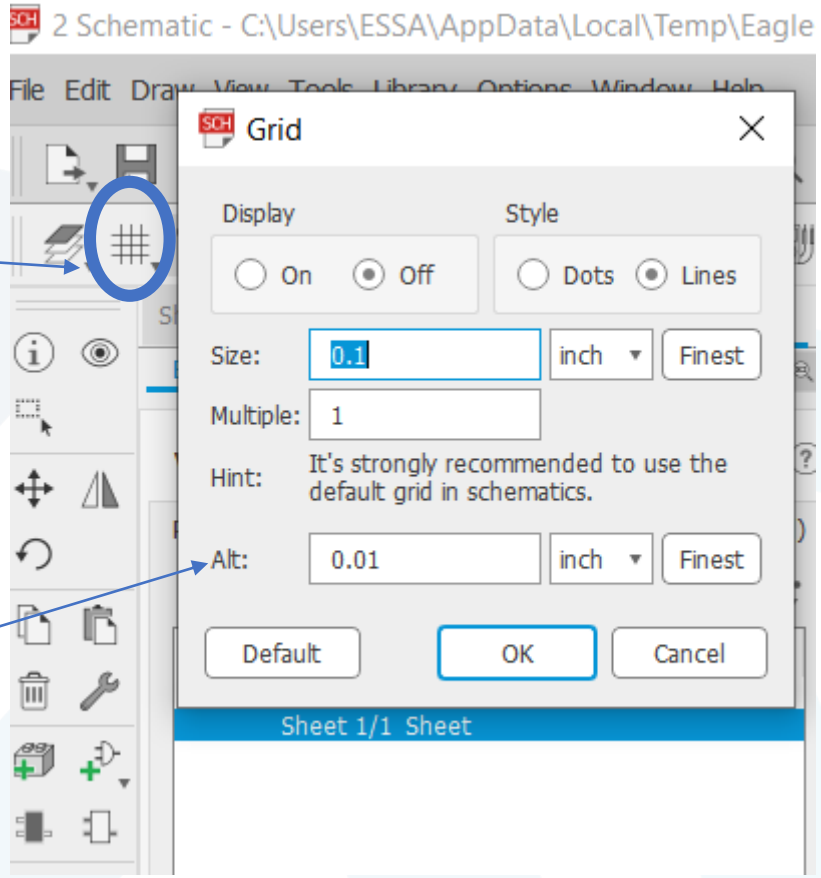
- If the dot is green, everything is groovy. If the dot is magenta, a window's probably closed that shouldn't be.
- Second, and more obvious, if you close either of the two windows a big, huge warning should pop up in the other:

"Switch to board/schematic" icon 



Adjusting the Grid

To turn the grid view on, click the icon near the top-left corner of the board window (or go to the "View" menu and select "Grid").



Switch the "Display" radio button over to "On".

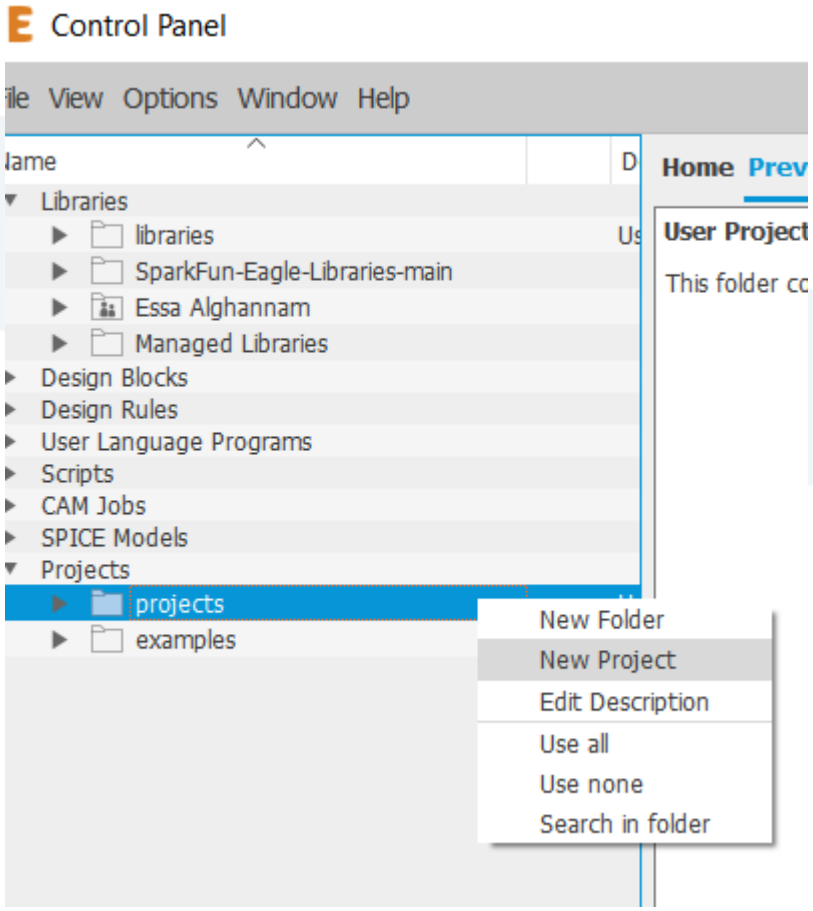
We'll also make the grid a bit less fine by setting the "Size" to 100 mil (0.1") and "Alt" to 50 mil (0.05").

Alternate grid أكثر دقة

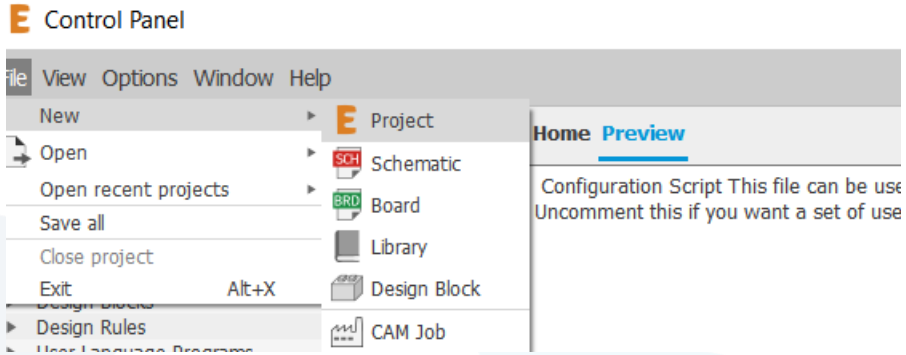
2.54 mm=0.1 inch=100 mil

Schematic

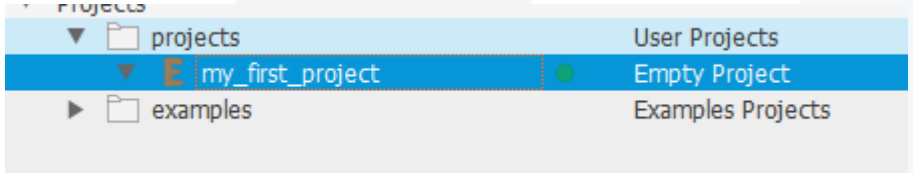
Create a Project



or

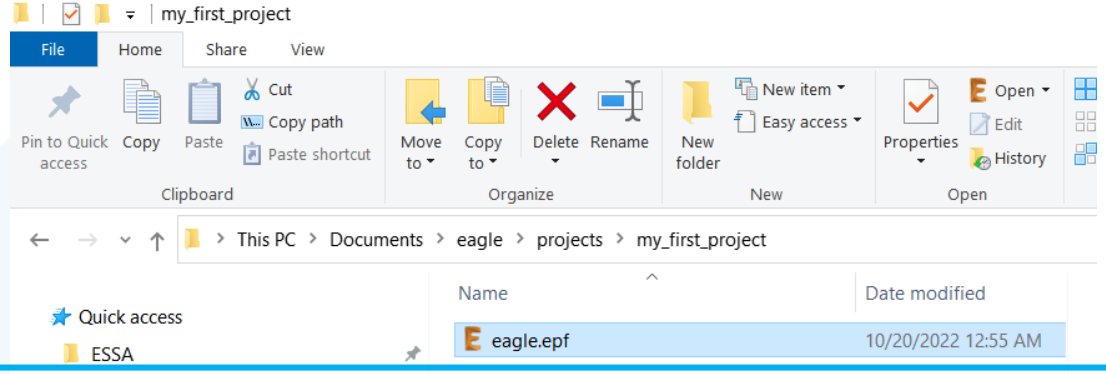


Give the newly created, red project folder a descriptive name.
How about “my_first_project".



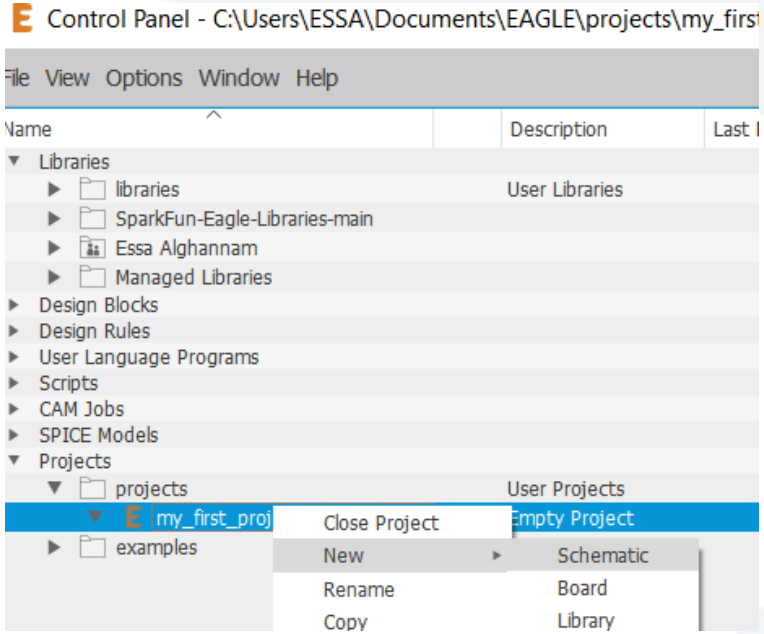
C:\Users\ESSA\Documents\eagle\projects\my_first_project

Project folders are like any regular file system folder, except they contain a file named "eagle.epf". The EPF file links your schematic and board design together, and also stores any settings you may have set especially for the project.



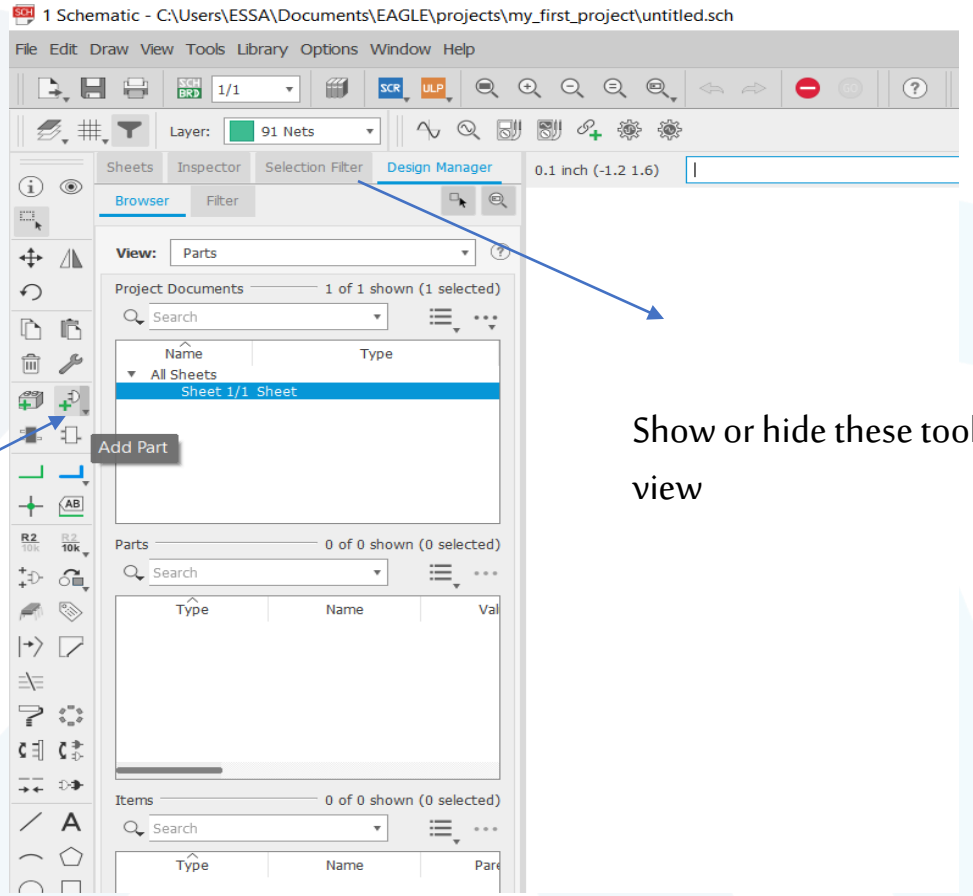
Create a Schematic

The project folder will house both our schematic and board design files (and eventually our gerber files too). To begin the design process, we need to lay out a schematic. To add a schematic to a project folder, right-click the folder, hover over **"New"** and select **"Schematic"**.



Adding Parts to a Schematic

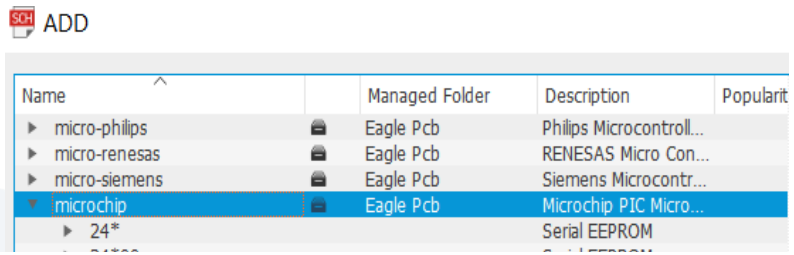
Using the ADD Tool

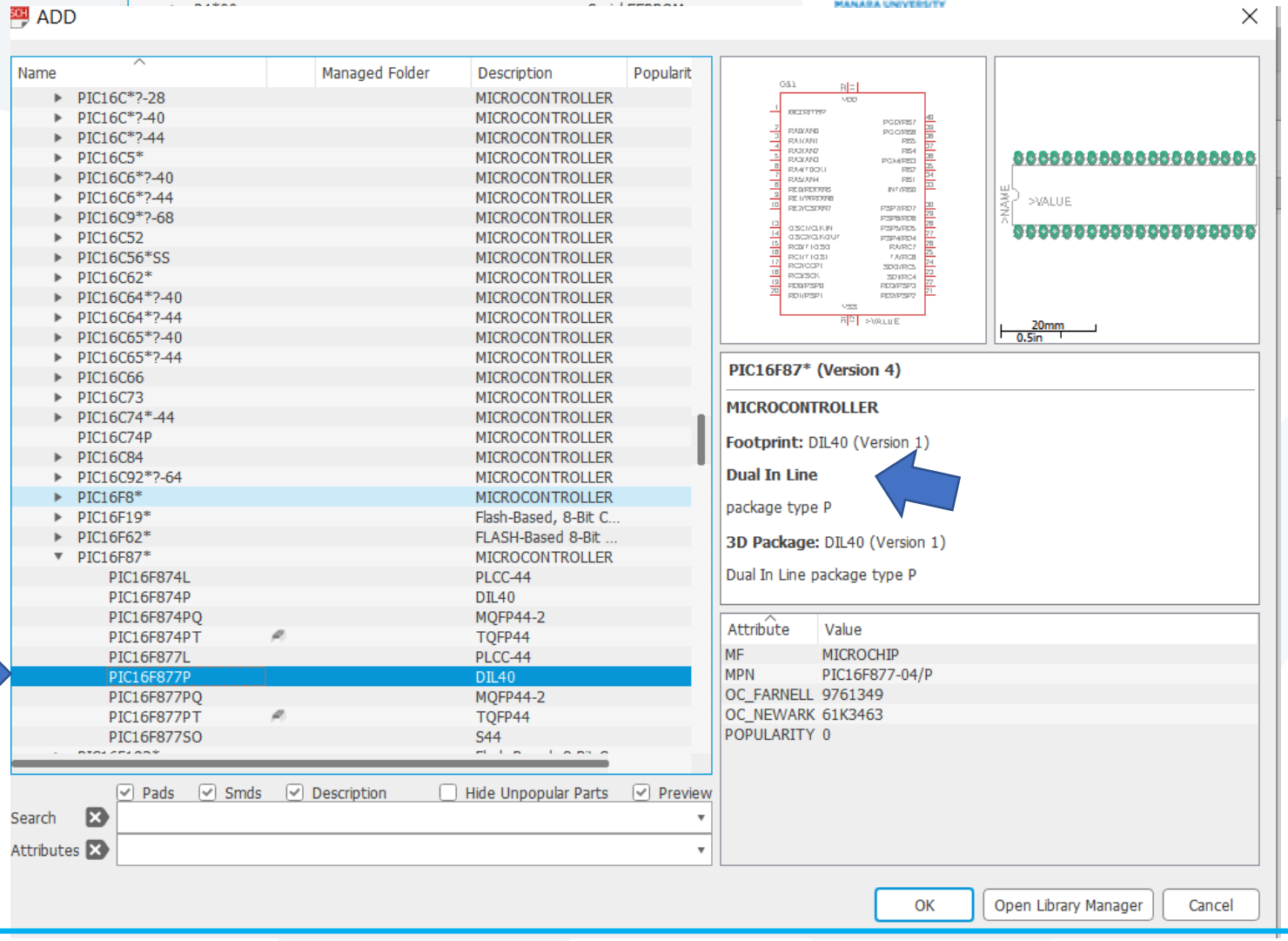


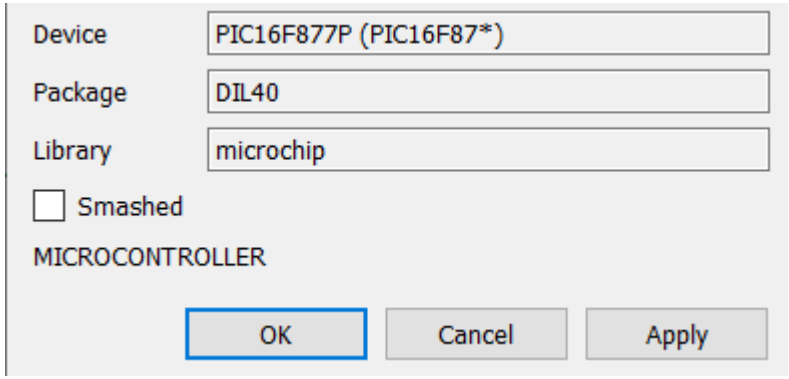
Show or hide these toolbars from view

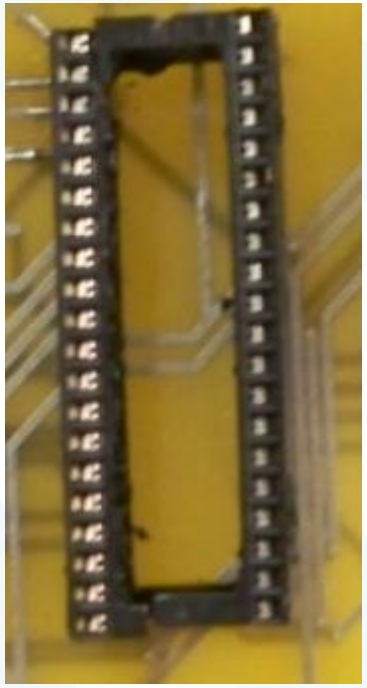
ADD

PIC16F877

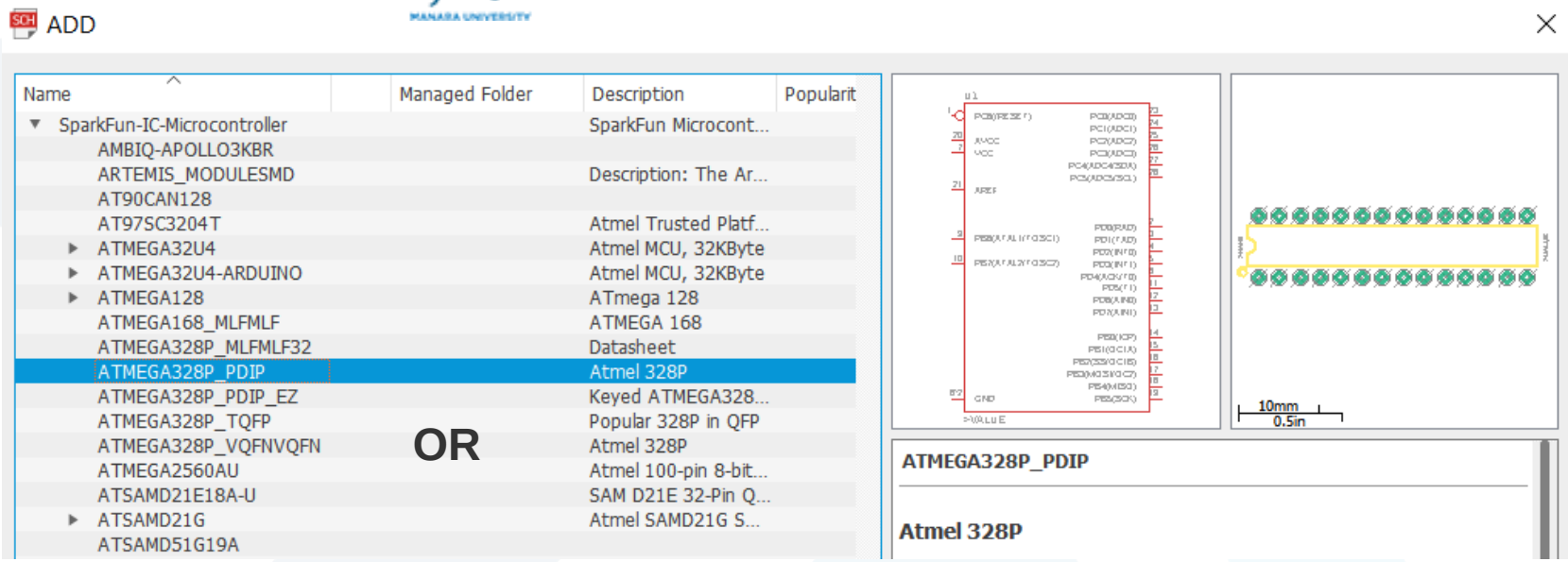






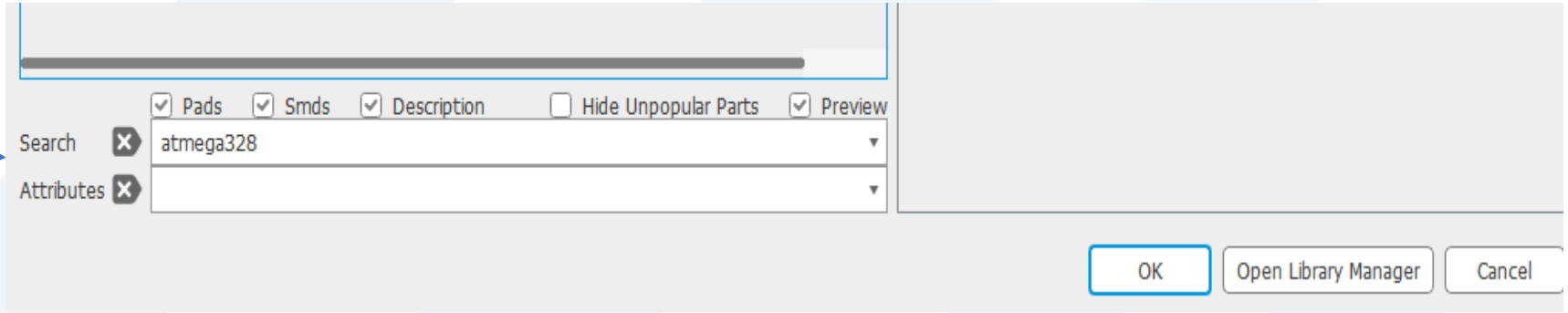


ADD atmega328

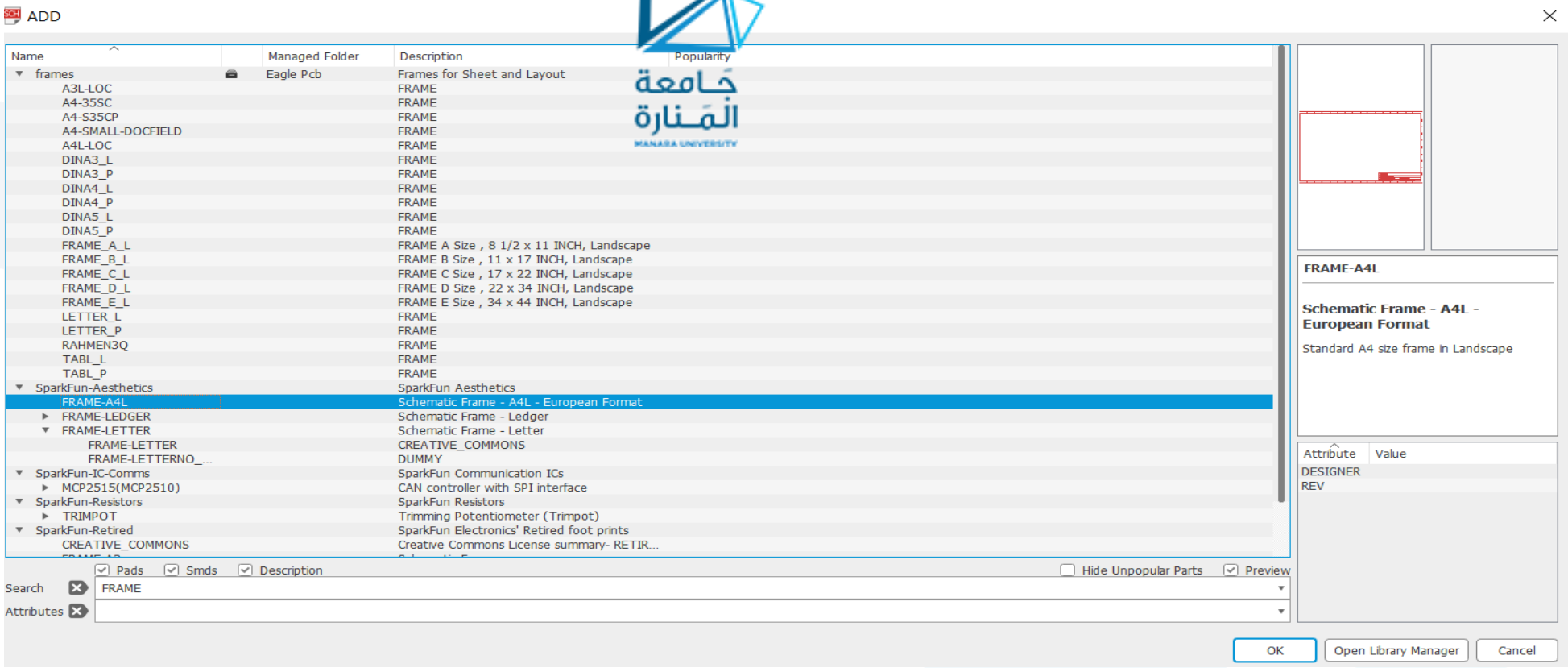


search functionality

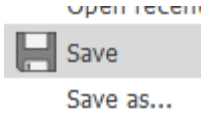
atmega328



Add a Frame:

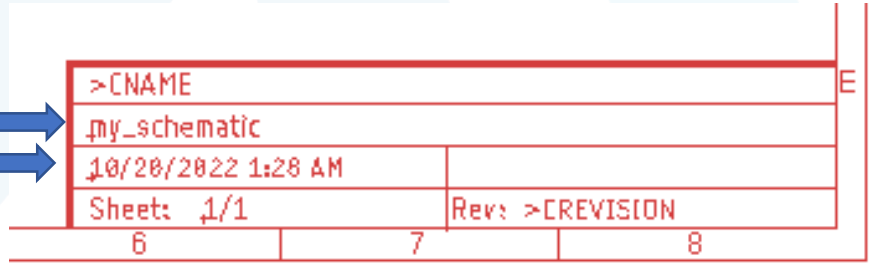


Save (And Save Often)

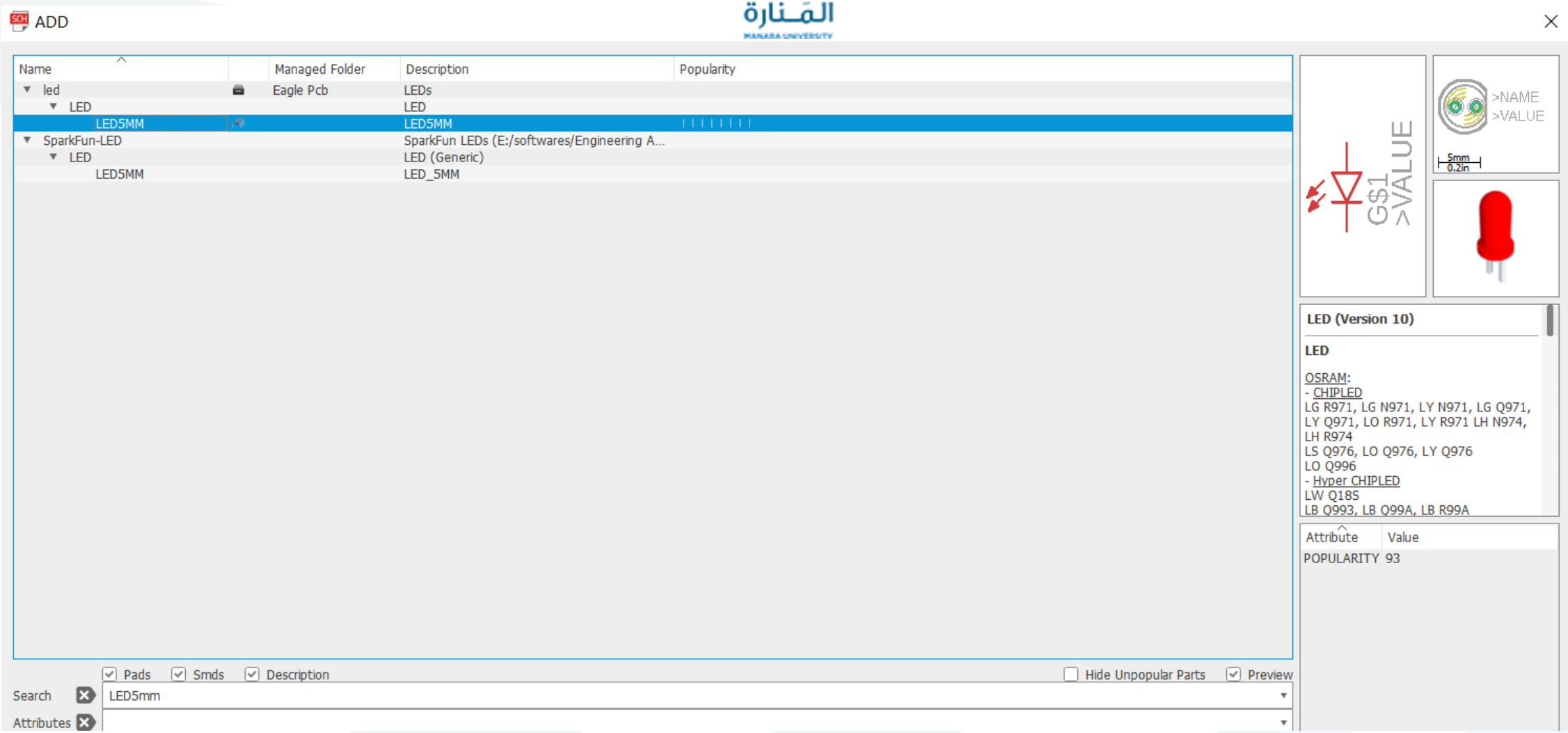


go to *File* > *Save*, or just click the blue floppy disk icon --Name your schematic something descriptive. "**my_schematic.sch**" (SCH is the file format for all EAGLE schematics).

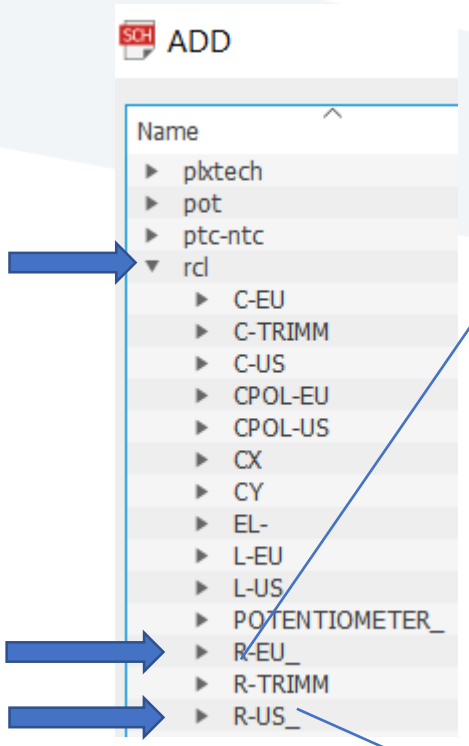
As a bonus, after saving, your frame's title should update accordingly (you may have to move around the screen, or go to ***View > Redraw***). Or click F2

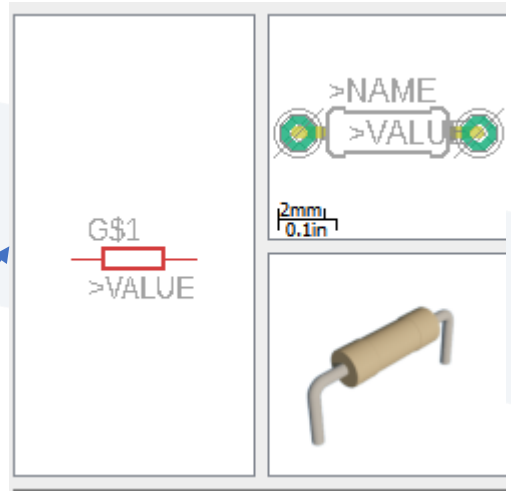


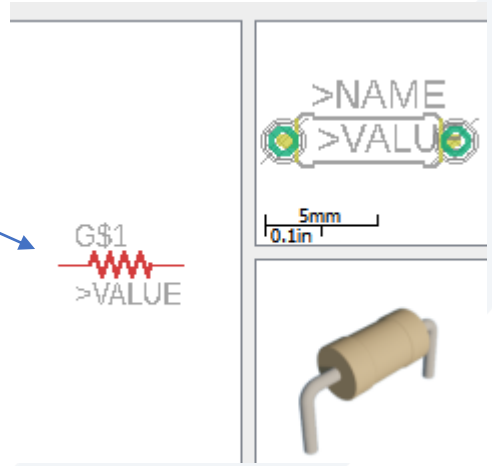
Add LED

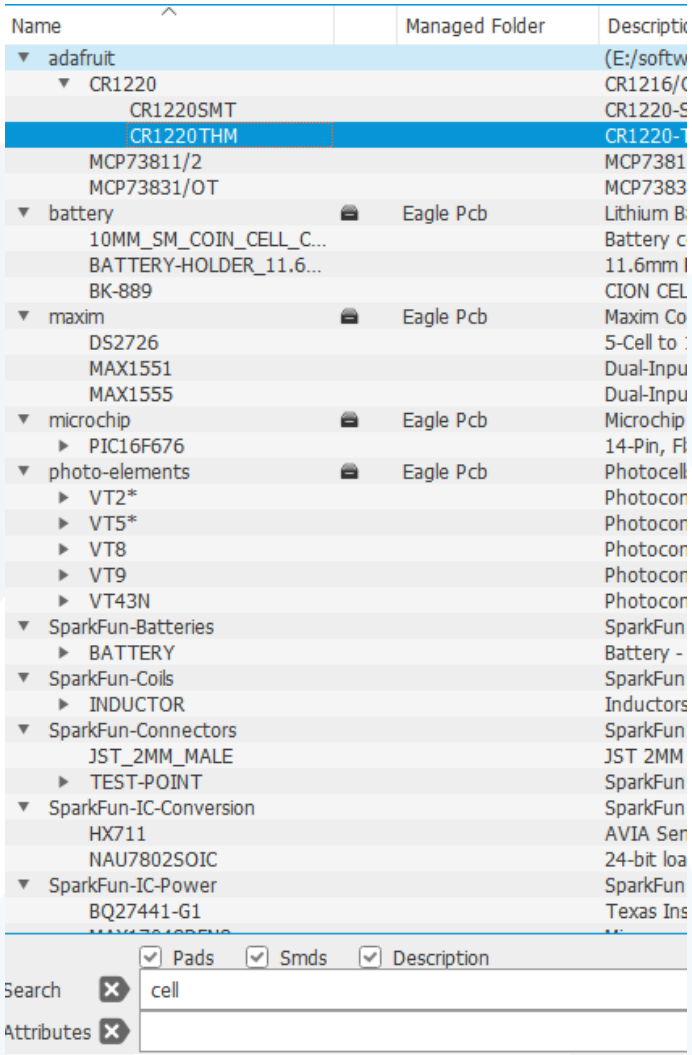

ADD
Name
Managed Folder
Description
Popularity
led
Eagle Pcb
LEDs
LED
LED
LED5MM
LED5MM
SparkFun-LED
SparkFun LEDs (E:/softwares/Engineering A...
LED
LED (Generic)
LED5MM
LED_5MM
G$1
>VALUE
>NAME
>VALUE
5mm
0.2in
LED (Version 10)
LED
OSRAM:
- CHIPLED
LG R971, LG N971, LY N971, LG Q971,
LY Q971, LO R971, LY R971 LH N974,
LH R974
LS Q976, LO Q976, LY Q976
LO Q996
- Hyper CHIPLED
LW Q18S
LB Q993, LB Q99A, LB R99A
Attribute
Value
POPULARITY
93
Pads
Smds
Description
Hide Unpopular Parts
Preview
Search
LED5mm
Attributes

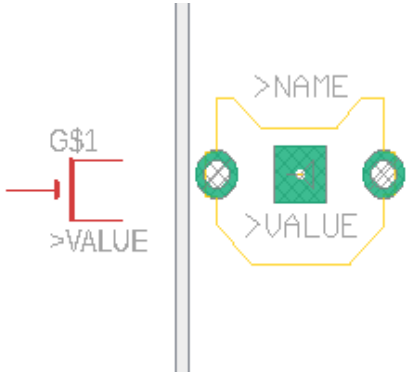
Add Resistor



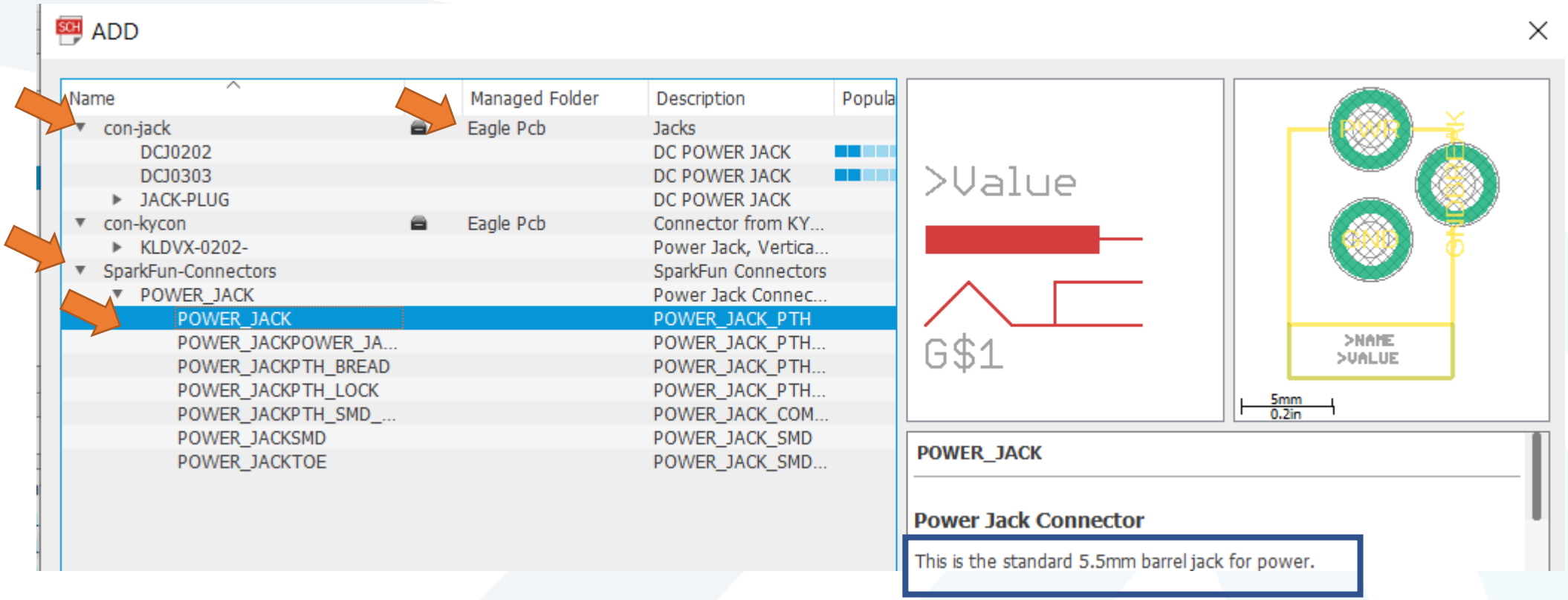






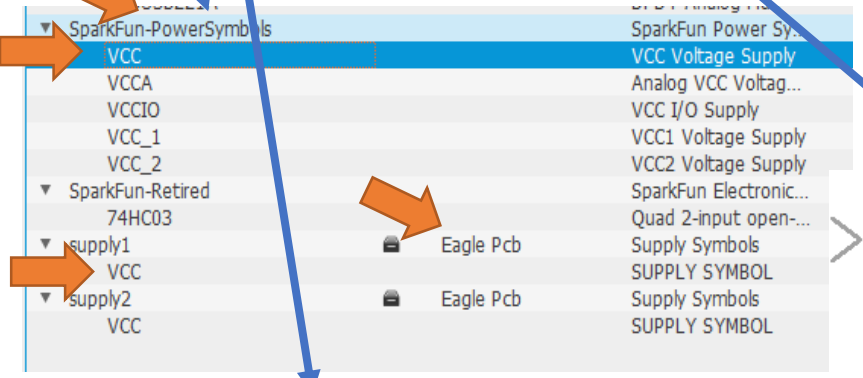


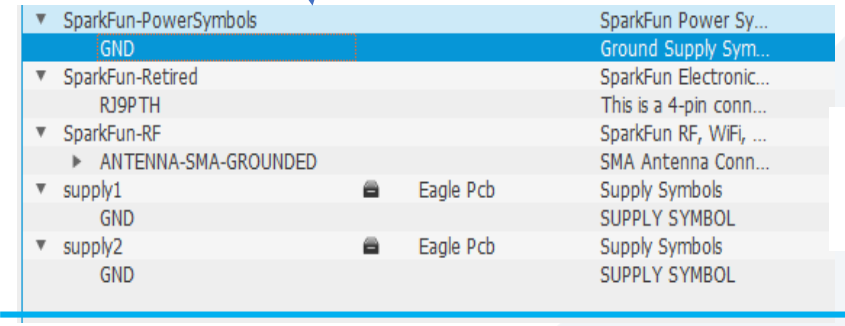
Add Power Jack

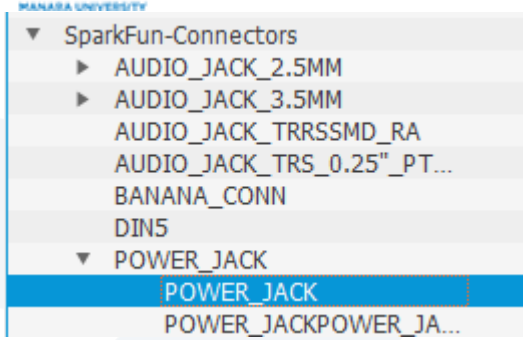


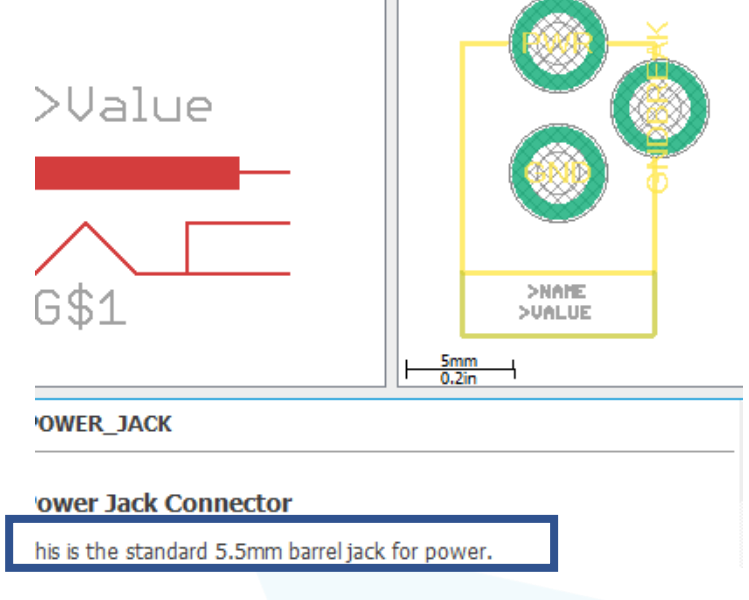
Add parts

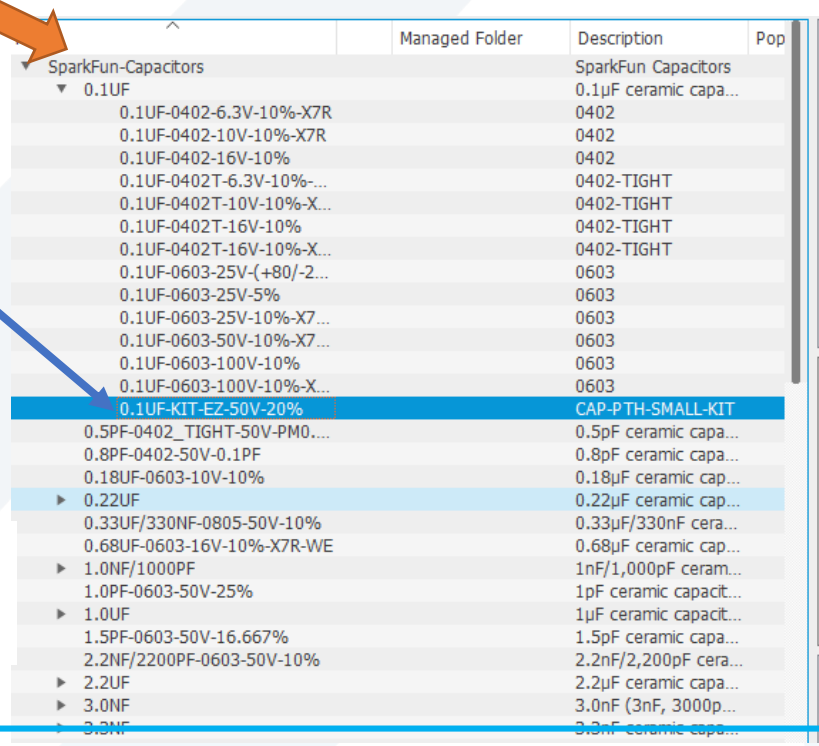
Part Description	Library	Part Name
5.5mm Barrel Jack (PTH)	SparkFun-Connectors	POWER_JACKPTH
0.1µF Ceramic Capacitor	SparkFun-Capacitors	CAPPTH
Voltage Supply Symbol	SparkFun-Aesthetics	VCC
Ground Symbol	SparkFun-Aesthetics	GND

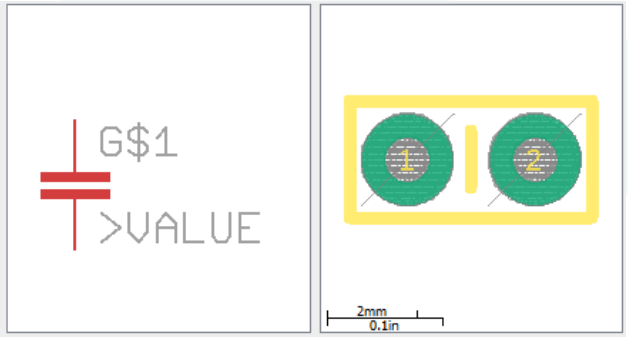


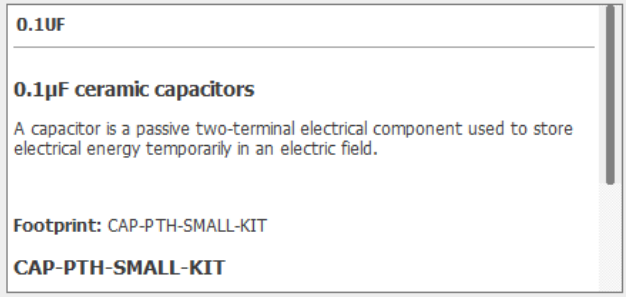








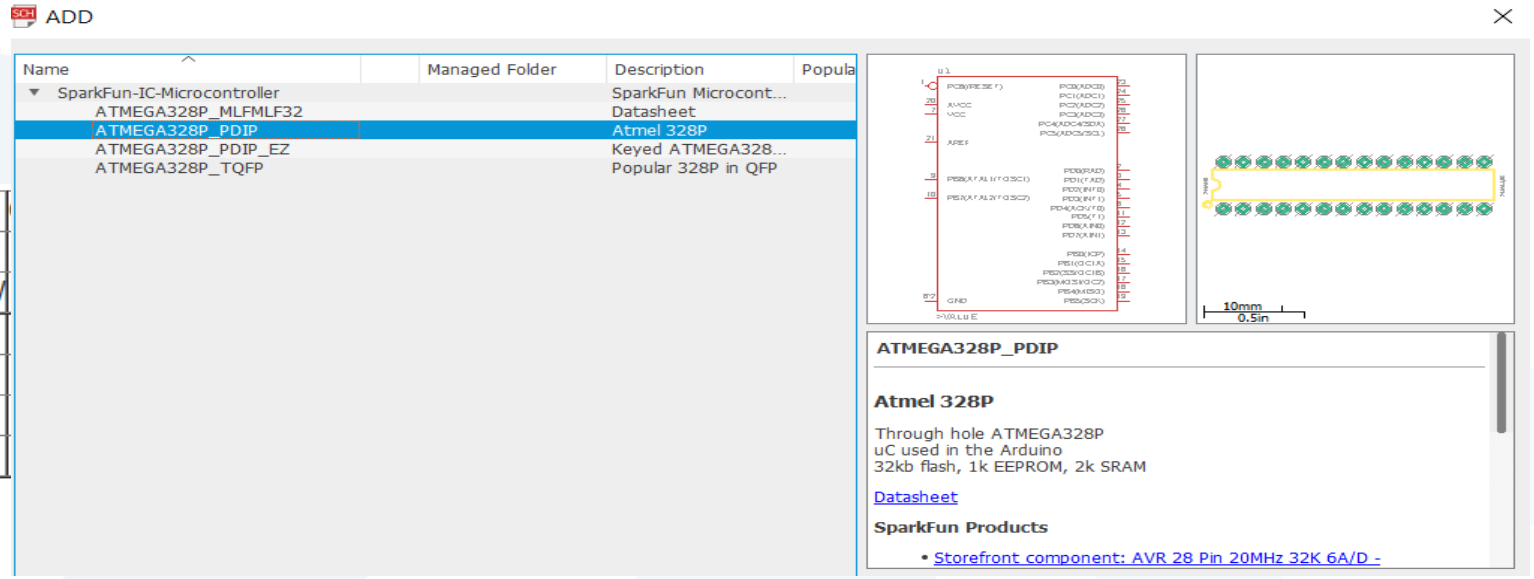


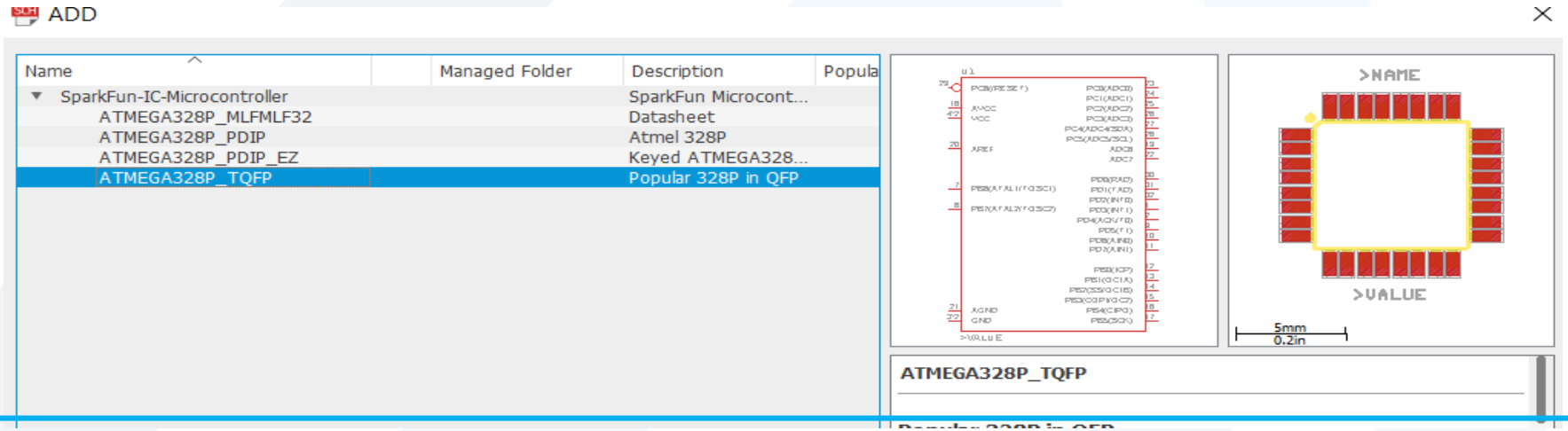


Attribute	Value
PROD_ID	CAP-08370
VALUE	0.1uF

Add Atmega 328p

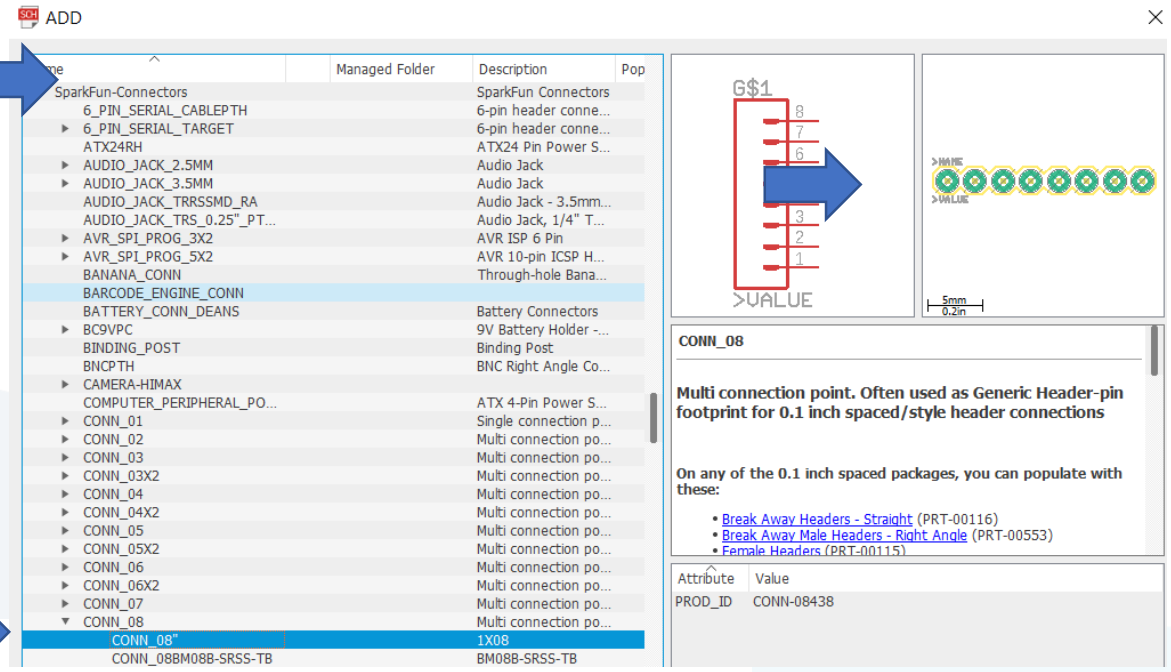
Part Description	Library	Exact Part Name
ATmega328P (PTH)	SparkFun-DigitalIC	ATMEGA328P_PDIP
¼W Resistors	SparkFun-Resistors	RESISTORPTH-1/4W
5mm LEDs	SparkFun-LED	LED5MM
0.1µF Ceramic Capacitor	SparkFun-Capacitors	CAPPTH
Voltage Supply Symbol	SparkFun-Aesthetics	VCC
Ground Symbol	SparkFun-Aesthetics	GND



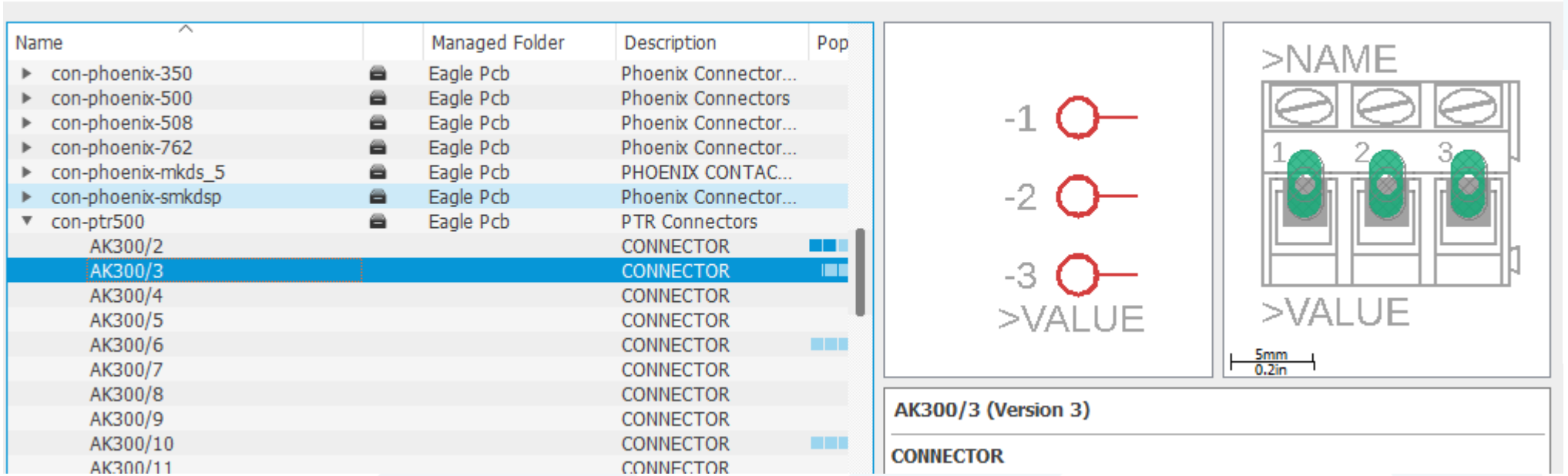


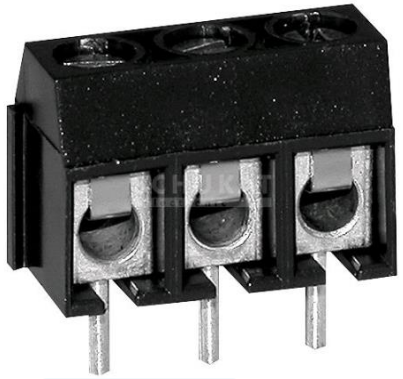
Add header

Part Description	Library	Exact Part Name
8-Pin 0.1" Header	SparkFun-Connectors	M081X08
2x3 AVR Programming Header	SparkFun-Connectors	AVR_SPI_PRG_6PTH
6-Pin Serial Programming Header	SparkFun-Connectors	ARDUINO_SERIAL_PROGRAMPTH
Voltage Supply Symbol	SparkFun-Aesthetics	VCC
Ground Symbol	SparkFun-Aesthetics	GND



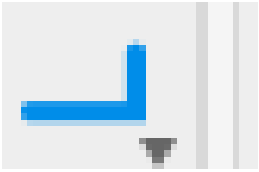
CON PTR 500



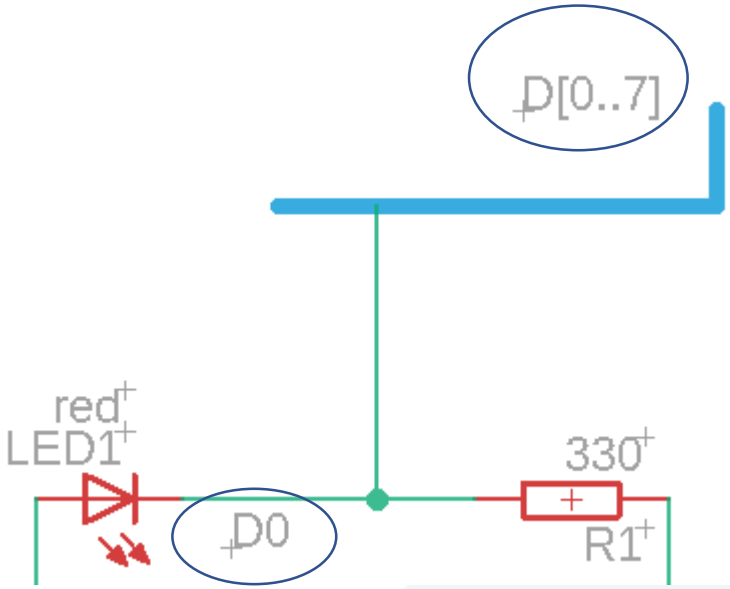


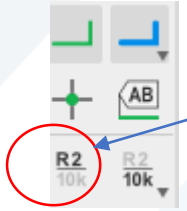
Wiring Up the Schematic

NET does a better job of connecting components.



Draw a bus

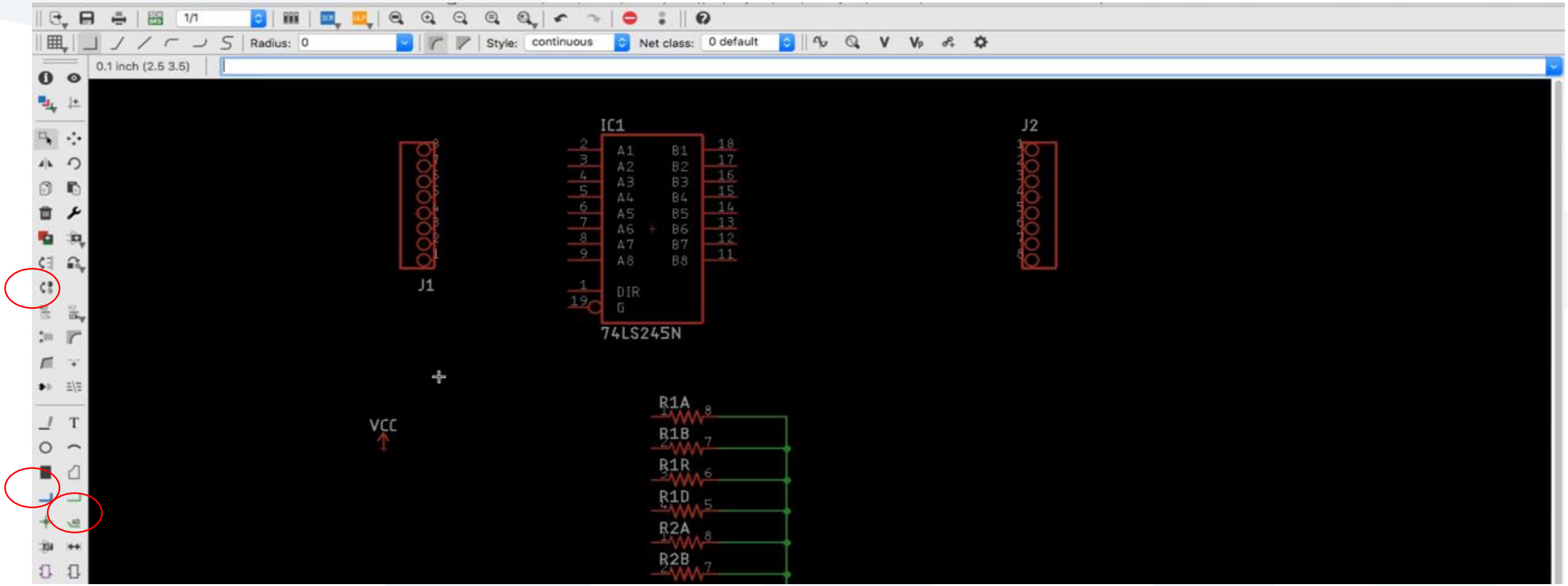




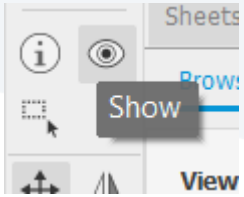
استخدام اختصار label و name لوصل نقطتين:

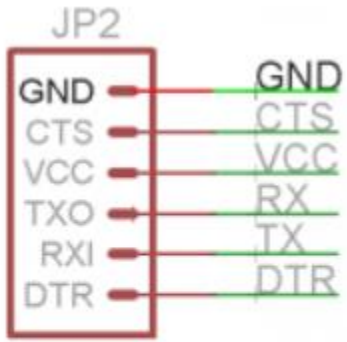
- نرسم خط اول
- نرسم خط ثاني
- نستخدم ايقونة لابل لاظهار اسم الاثنين
- نستخدم ايقونة الاسم لمنحهما و لجعل اسم احدهما مطابقا للثاني و نضغط اوكي على الرسالة الظاهرة

Using Bus Wires and Labels

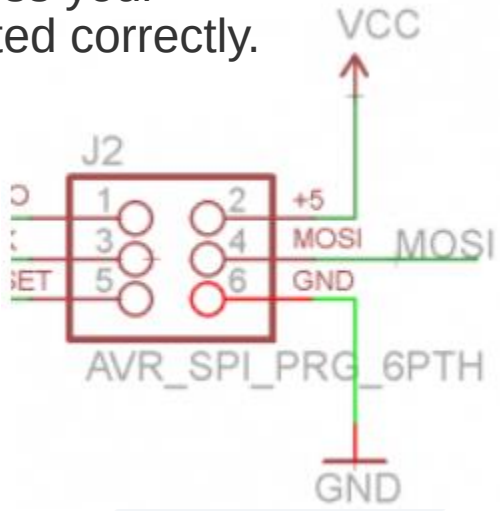


Show Function and Value Function



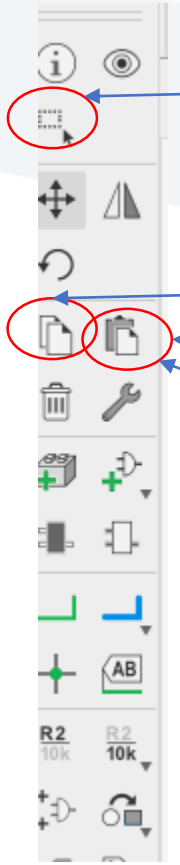


The SHOW tool is very useful for verifying that pins across your schematic are connected correctly.



A part's **value** allows you to define unique characteristics of that part. For example, you can set a resistor's resistance, or a capacitor's capacitance.

• GROUP COPY PASTE



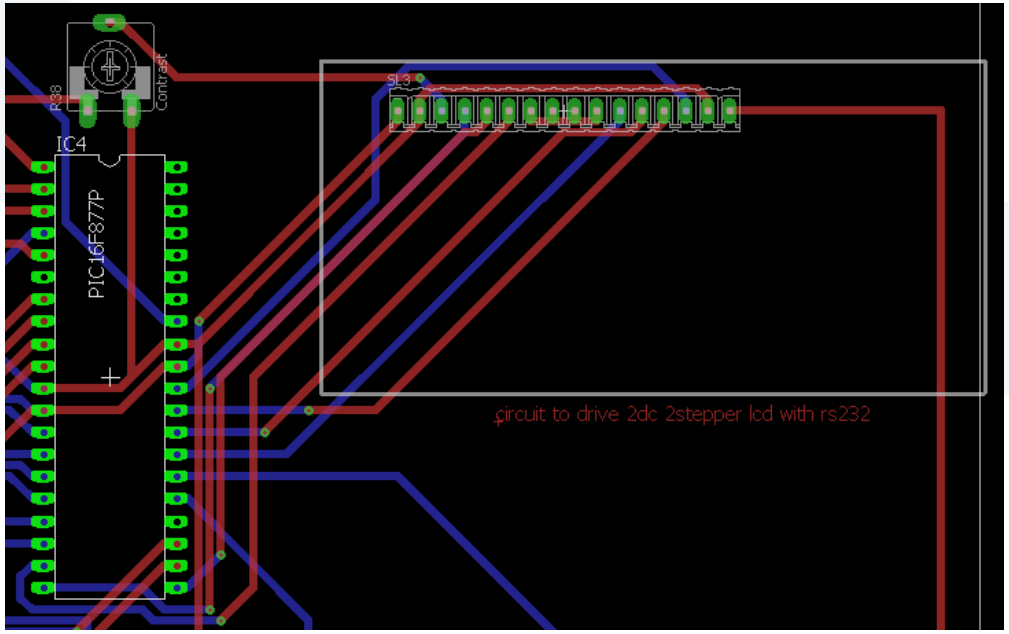
النسخ و اللصق لنفس الملف:

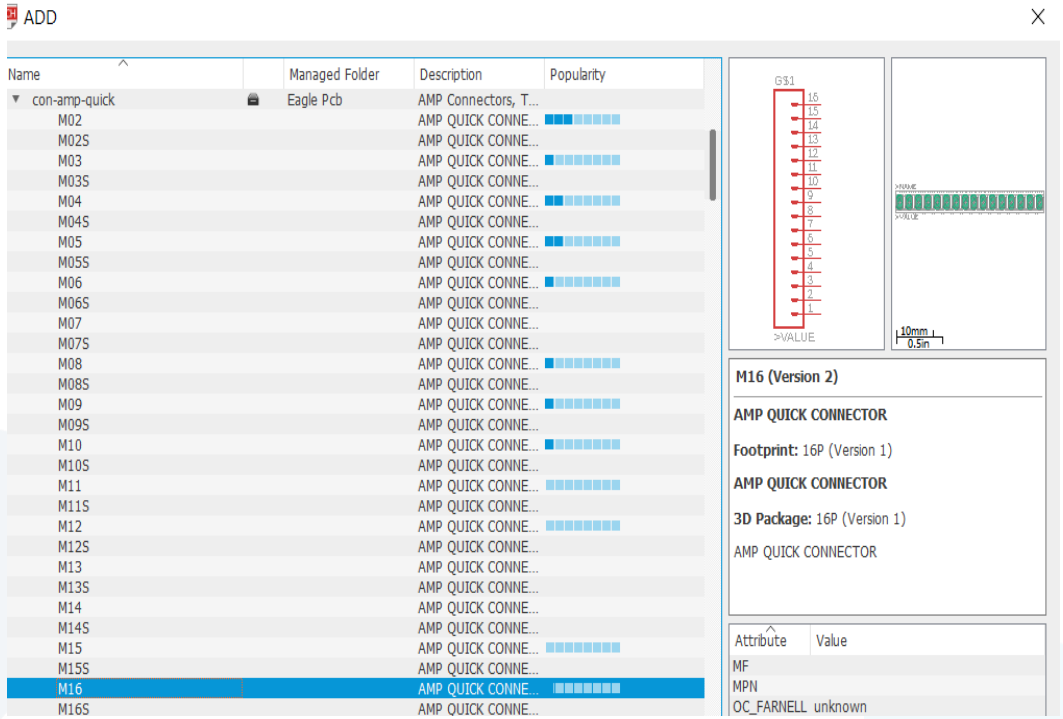
- باختيار ايقونة الغروب داخل الدائرة الحمراء
- ثم تحديد مجموعة من العناصر المطلوب نسخها
- اختيار ايقونة نسخ
- في اي منطقة بيضاء ضمن مساحة العمل كبس الزر اليميني للفارة و اختيار خيار نسخ مجموعة
- أو اختيار ايقونة لصق و من ثم بتحريك الفارة اختيار مكان اللصق و النقر لإنهاء المهمة

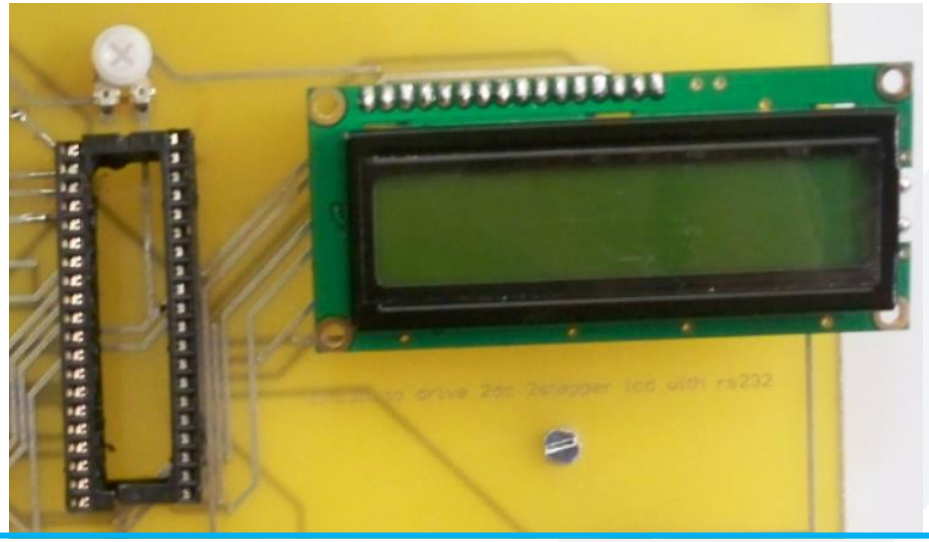
النسخ و اللصق من ملف لملف:

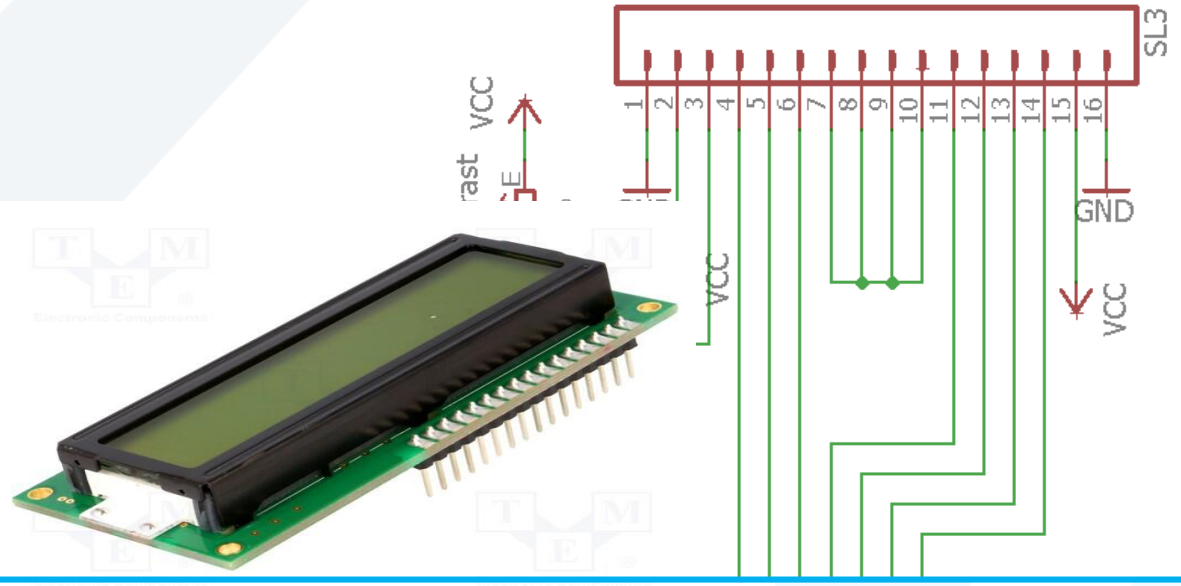
- باختيار ايقونة الغروب داخل الدائرة الحمراء
- ثم تحديد مجموعة من العناصر المطلوب نسخها
- اختيار ايقونة نسخ
- فتح الملف الجديد
- اختيار ايقونة لصق و من ثم بتحريك الفارة اختيار مكان اللصق و النقر لإنهاء المهمة

- CON AMP QUICK

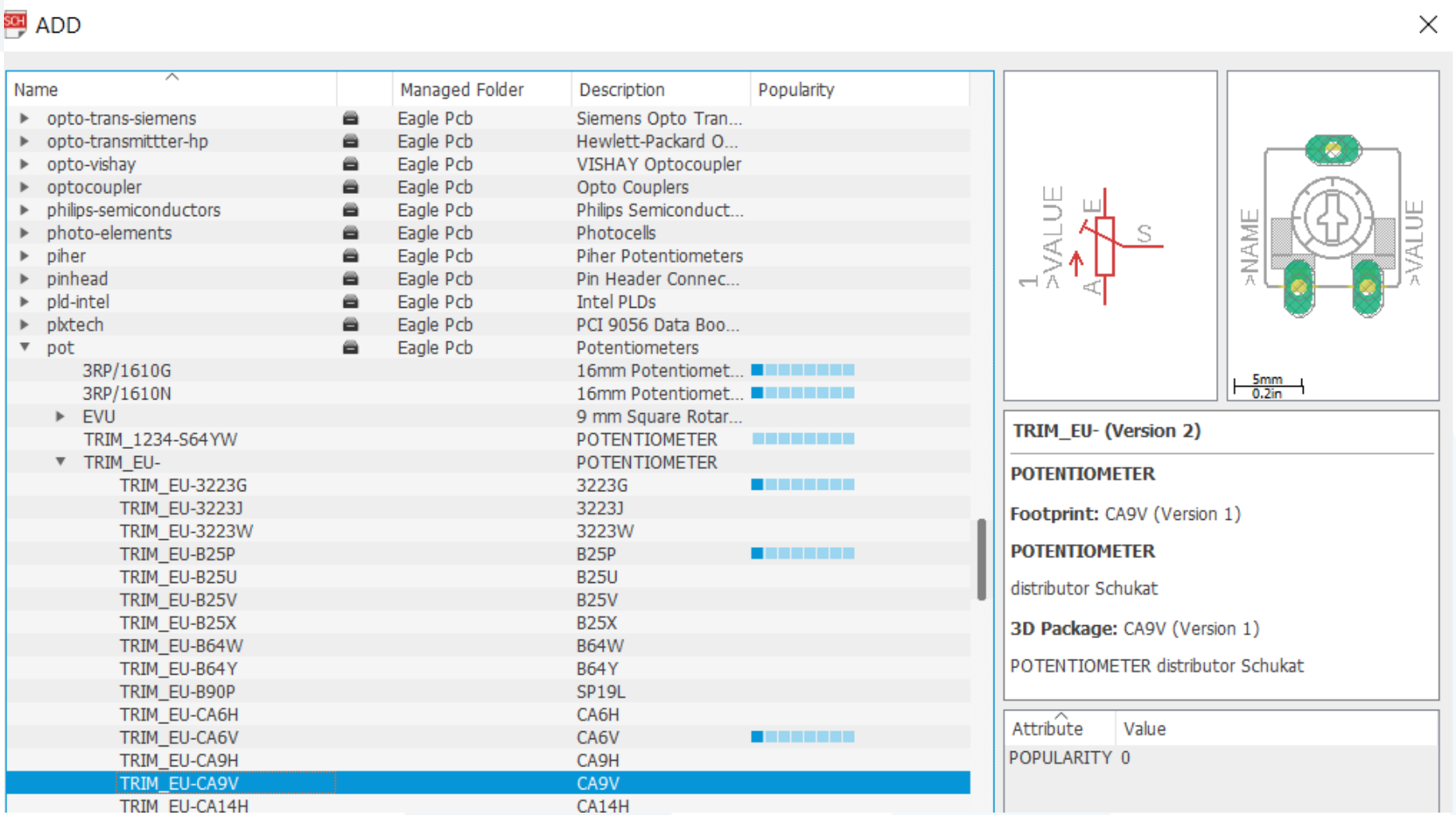








- POT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Managed Folder
Description
Popularity
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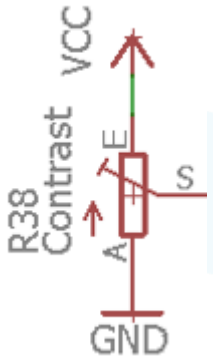
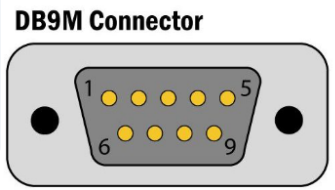
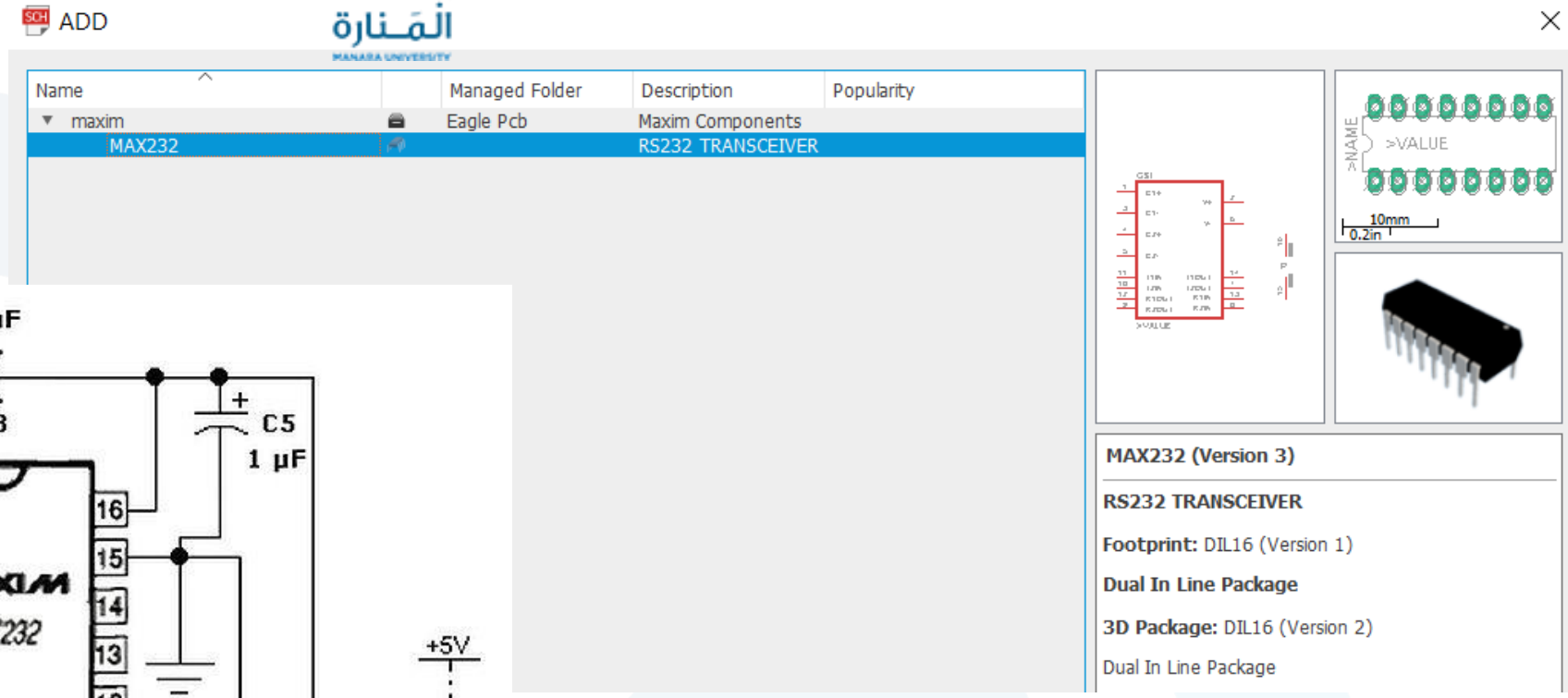
opto-transmittter-hp Eagle Pcb Hewlett-Packard O...
opto-vishay Eagle Pcb VISHAY Optocoupler
optocoupler Eagle Pcb Opto Couplers
philips-semiconductors Eagle Pcb Philips Semiconduct...
photo-elements Eagle Pcb Photocells
piher Eagle Pcb Piher Potentiometers
pinhead Eagle Pcb Pin Header Connec...
pld-intel Eagle Pcb Intel PLDs
plxtech Eagle Pcb PCI 9056 Data Boo...
pot Eagle Pcb Potentiometers
3RP/1610G 16mm Potentiomet...
3RP/1610N 16mm Potentiomet...
EVU 9 mm Square Rotar...
TRIM_1234-S64YW POTENTIOMETER
TRIM_EU- POTENTIOMETER
TRIM_EU-3223G 3223G
TRIM_EU-3223J 3223J
TRIM_EU-3223W 3223W
TRIM_EU-B25P B25P
TRIM_EU-B25U B25U
TRIM_EU-B25V B25V
TRIM_EU-B25X B25X
TRIM_EU-B64W B64W
TRIM_EU-B64Y B64Y
TRIM_EU-B90P SP19L
TRIM_EU-CA6H CA6H
TRIM_EU-CA6V CA6V
TRIM_EU-CA9H CA9H
TRIM_EU-CA9V CA9V
TRIM_EU-CA14H CA14H
1
>VALUE
A
E
S
>NAME
>VALUE
5mm
0.2in
TRIM_EU- (Version 2)
POTENTIOMETER
Footprint: CA9V (Version 1)
POTENTIOMETER
distributor Schukat
3D Package: CA9V (Version 1)
POTENTIOMETER distributor Schukat
Attribute
Value
POPULARITY 0

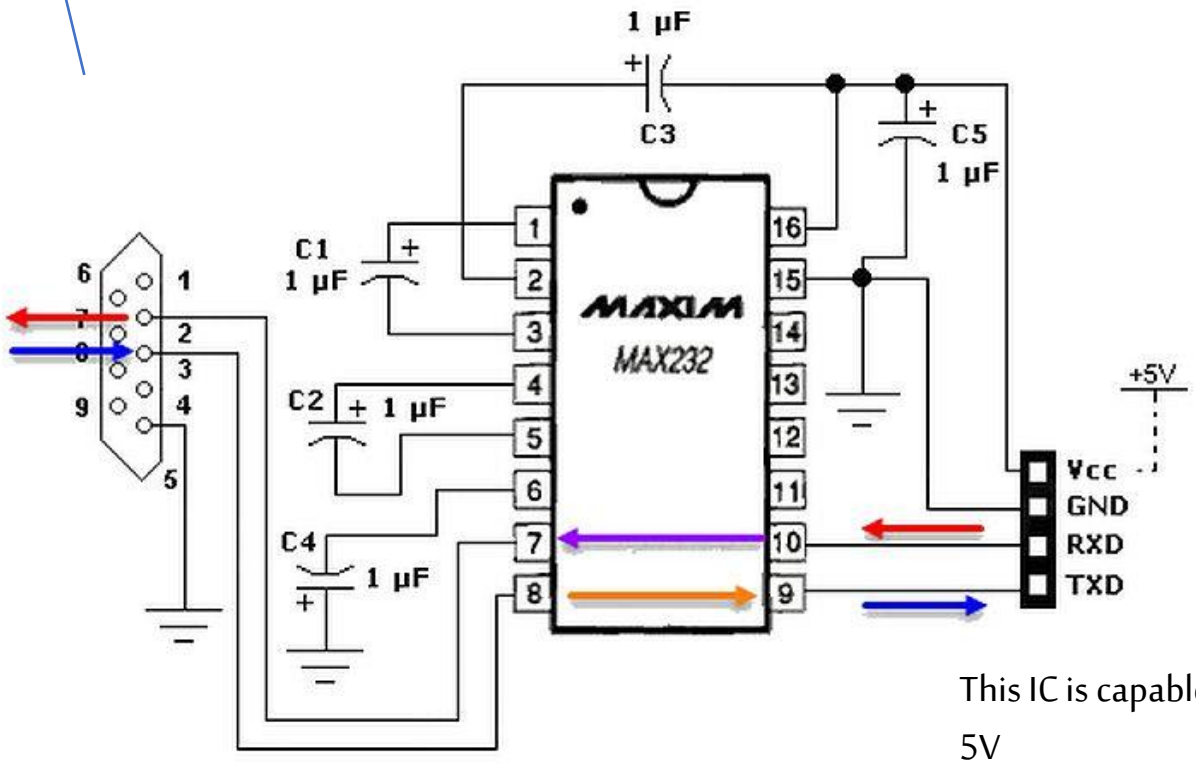

VCC
R38
Contrast
A
E
S
GND

- RS232-MAX232



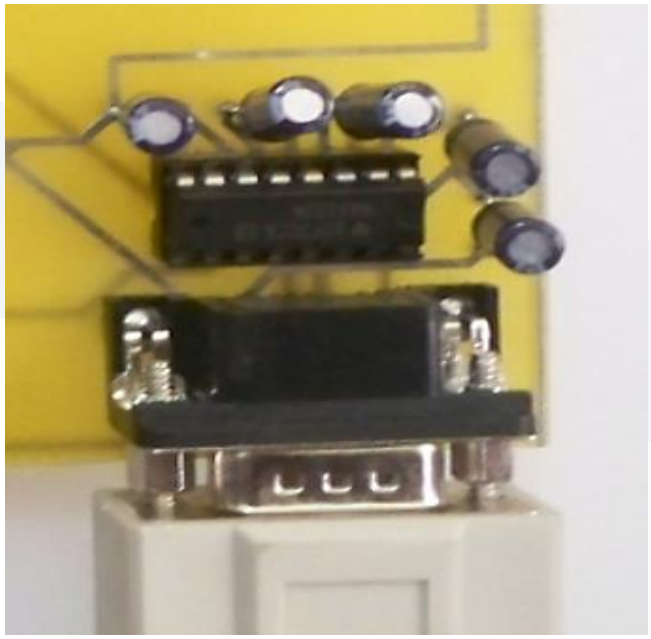
Pin #	Signal
1	DCD
2	RX
3	TX
4	DTR
5	GND
6	DSR
7	RTS
8	CTS
9	RI

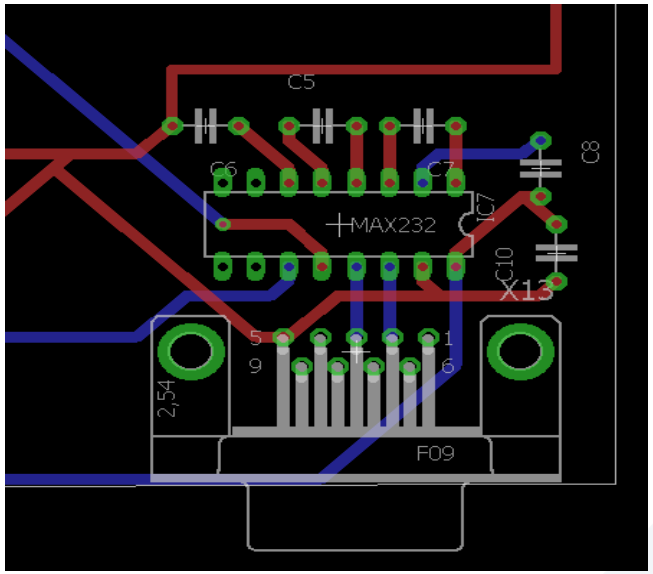




This IC is capable of +**30V to -30V from RS-232** and shifts the levels down to 0V to 5V

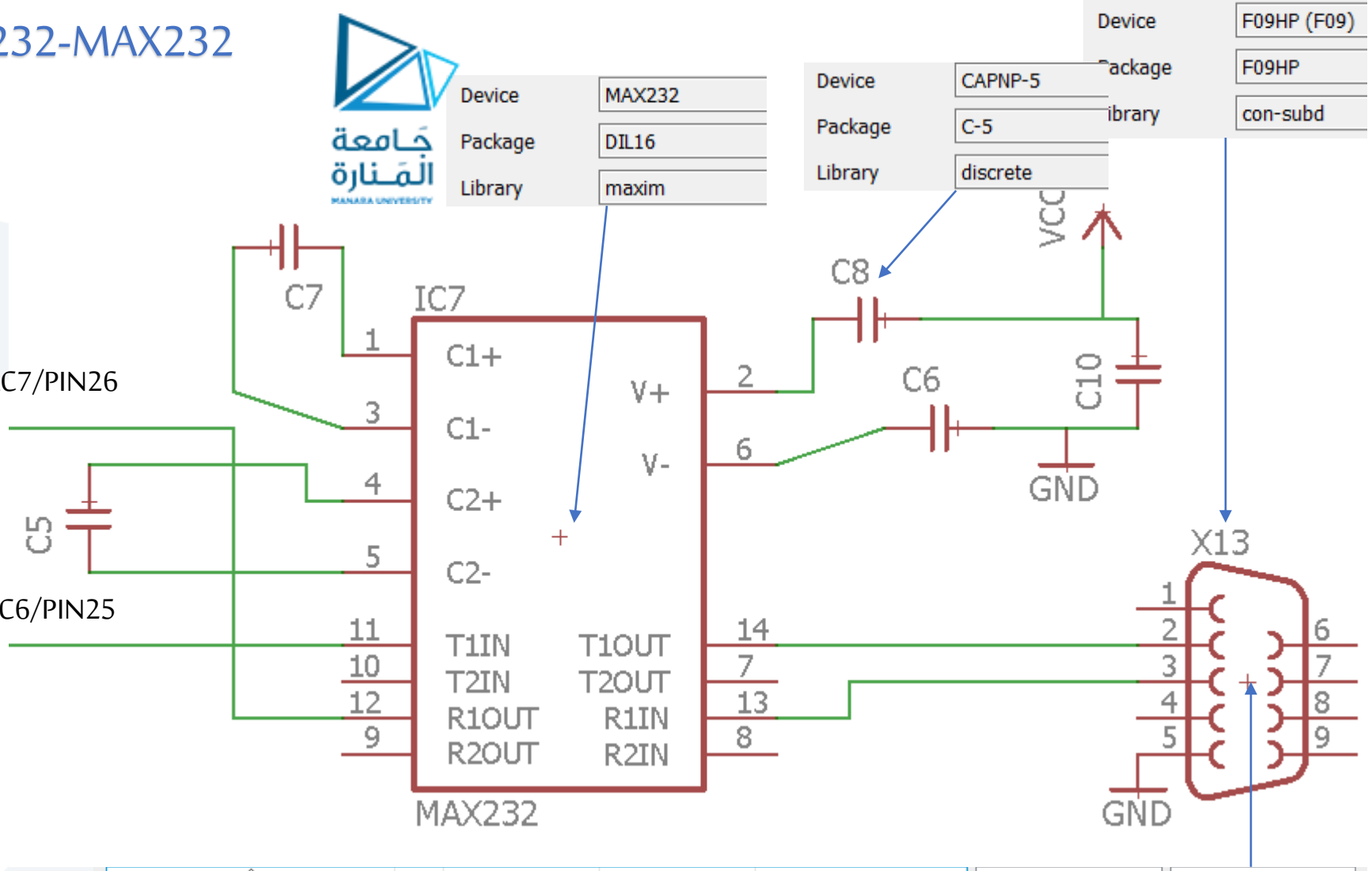
RS232-MAX232

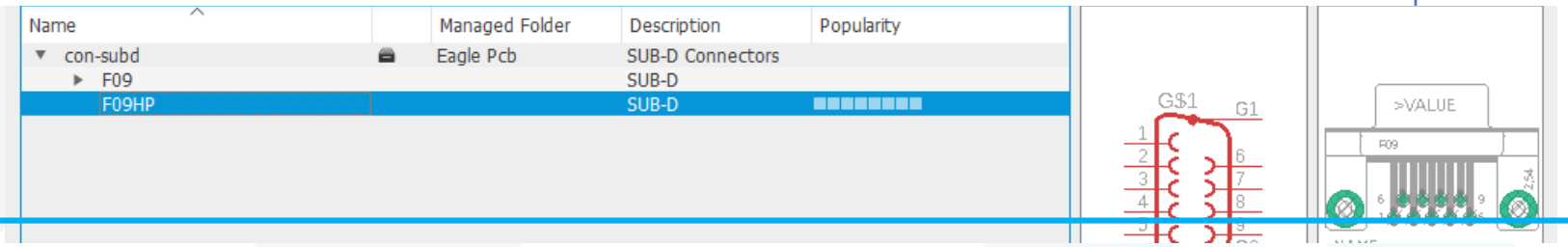




RX/RC7/PIN26

TX/RC6/PIN25



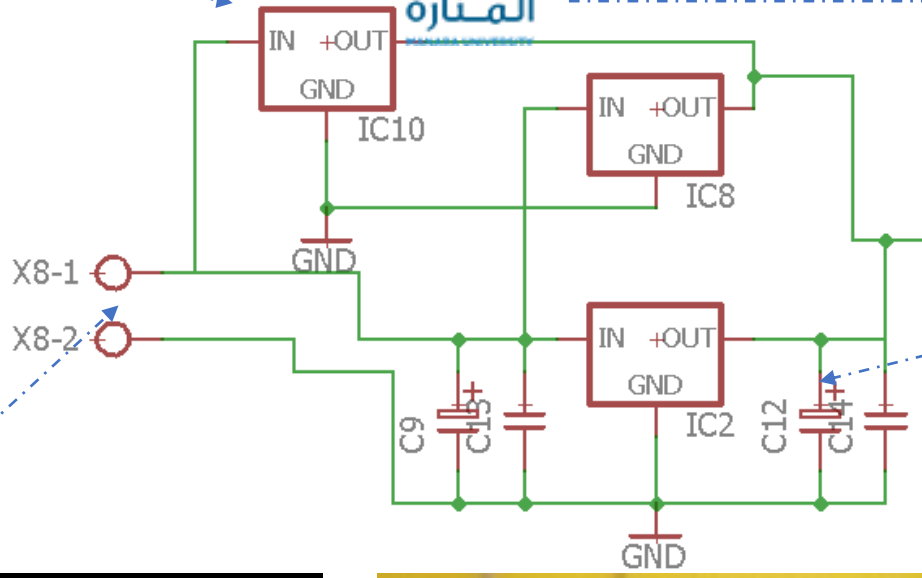


Voltage Regulator

Device	78XXS
Package	78XXS
Library	v-reg

Device	AK300/2
Package	AK300/2
Library	con-ptr500

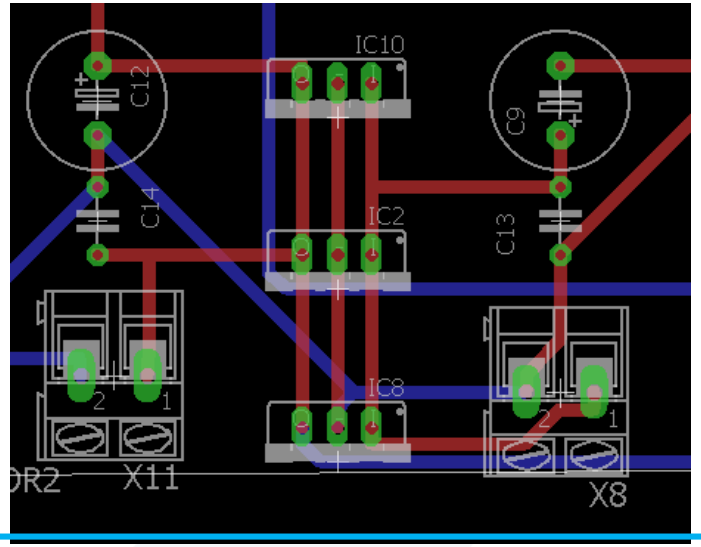
Device	ELC-5
Package	ES-5
Library	discrete



7805 IC Rating

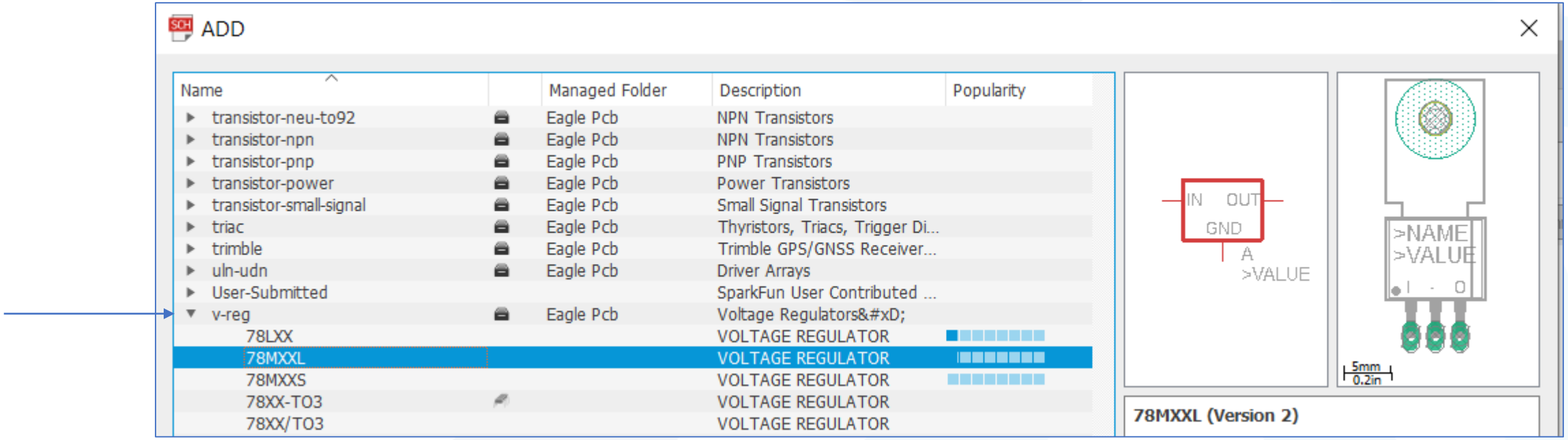
- Input voltage range 7V- 35V
- Current rating I_c = 1A
- Output voltage range $V_{Max=5.2V}$,$V_{Min=4.8V}$

Device	CAPNP-5
Package	C-5
Library	discrete

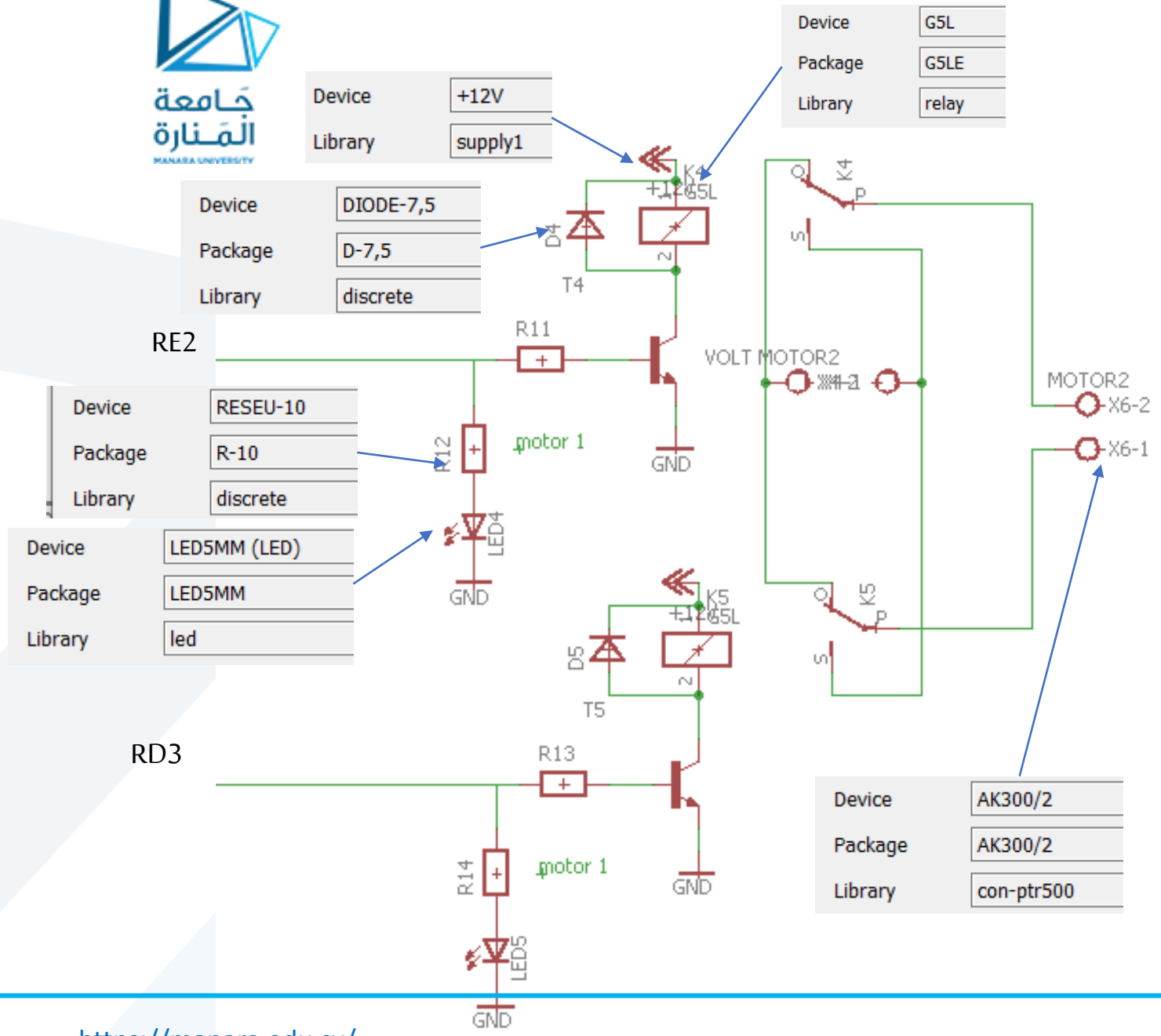


Device	AK300/2
Package	AK300/2
Library	con-ptr500

Add voltage regulator 78L05



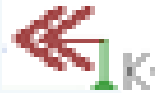
Add relay


Device | G5L
Package | G5LE
Library | relay
Device | +12V
Library | supply1
Device | DIODE-7,5
Package | D-7,5
Library | discrete
RE2
Device | RESEU-10
Package | R-10
Library | discrete
Device | LED5MM (LED)
Package | LED5MM
Library | led
RD3
Device | AK300/2
Package | AK300/2
Library | con-ptr500
K4
G5L
D4
T4
R11
VOLT MOTOR2
MOTOR2
X6-2
X6-1
R12
motor 1
GND
LED4
K5
D5
T5
R13
R14
LED5

Add ANOTHER VOLTAGE SOURCE 12V

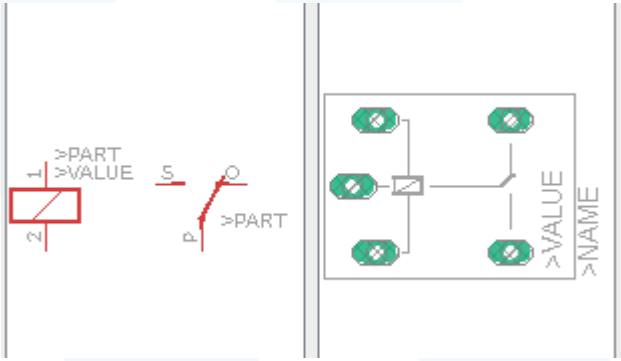
SparkFun-PowerSymbols	SparkFun Power Symbols
12V	12V Supply Symbol

supply1	Eagle Pcb	Supply Symbols
+3V3		SUPPLY SYMBOL
+5V		SUPPLY SYMBOL
+12V		SUPPLY SYMBOL
+15V		SUPPLY SYMBOL
+18V		SUPPLY SYMBOL
+24V		SUPPLY SYMBOL
-5V		SUPPLY SYMBOL
-12V		SUPPLY SYMBOL
-15V		SUPPLY SYMBOL
-18V		SUPPLY SYMBOL
-24V		SUPPLY SYMBOL

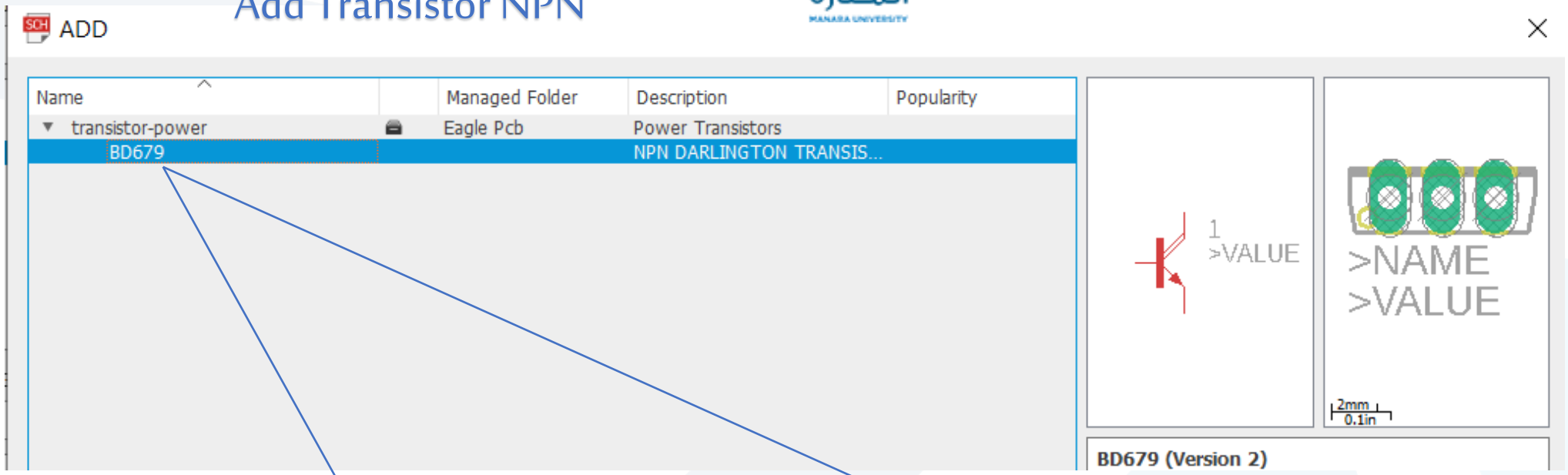


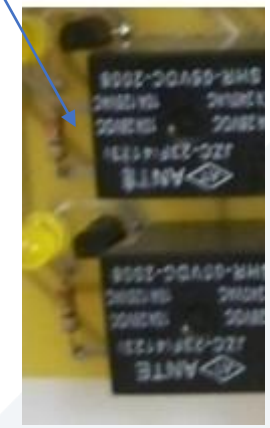
Add relay

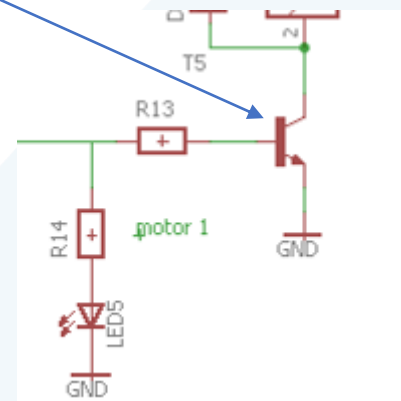
relay		Eagle Pcb	Relays
G5L			RELAY



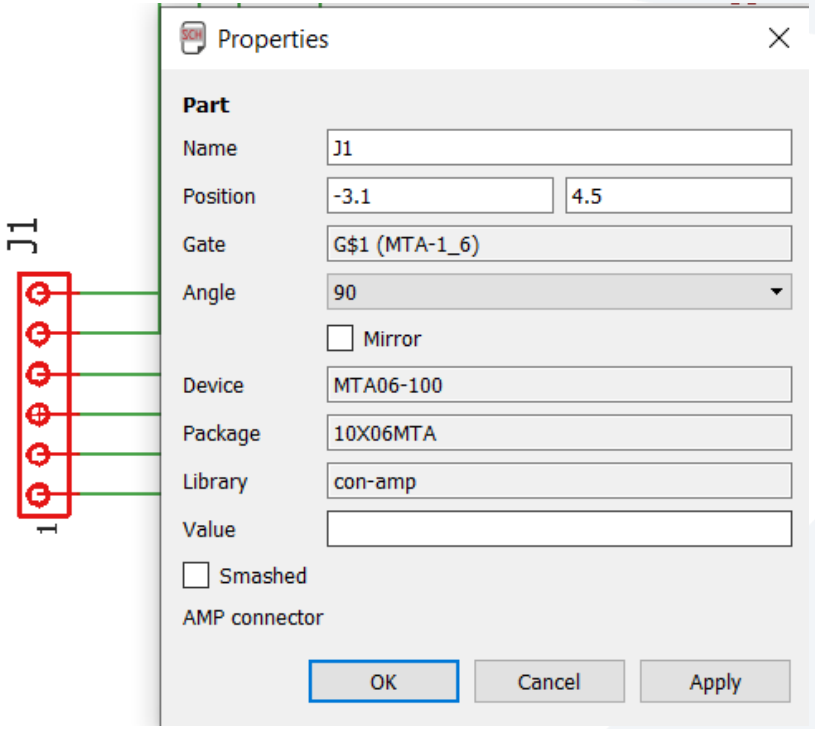
Add Transistor NPN



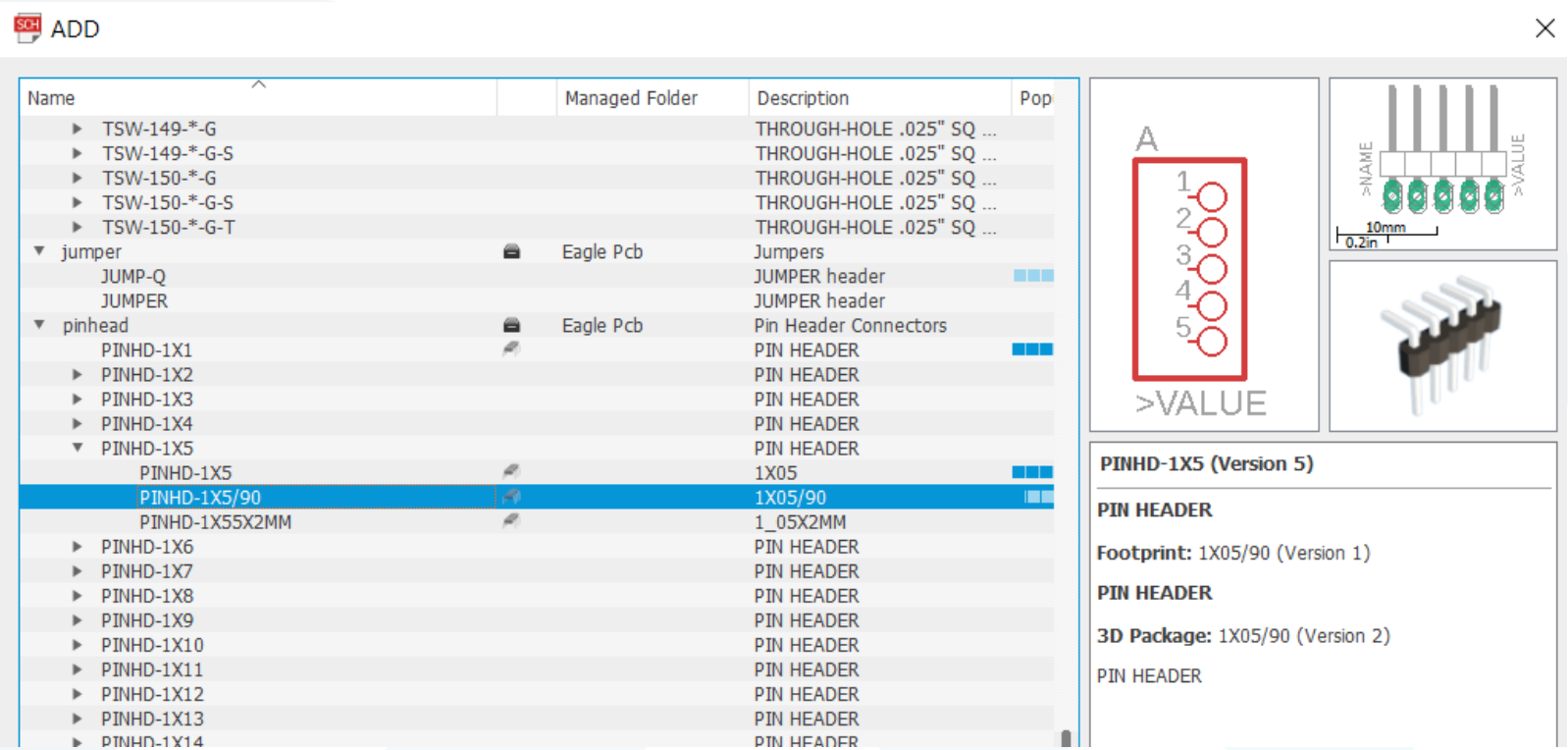




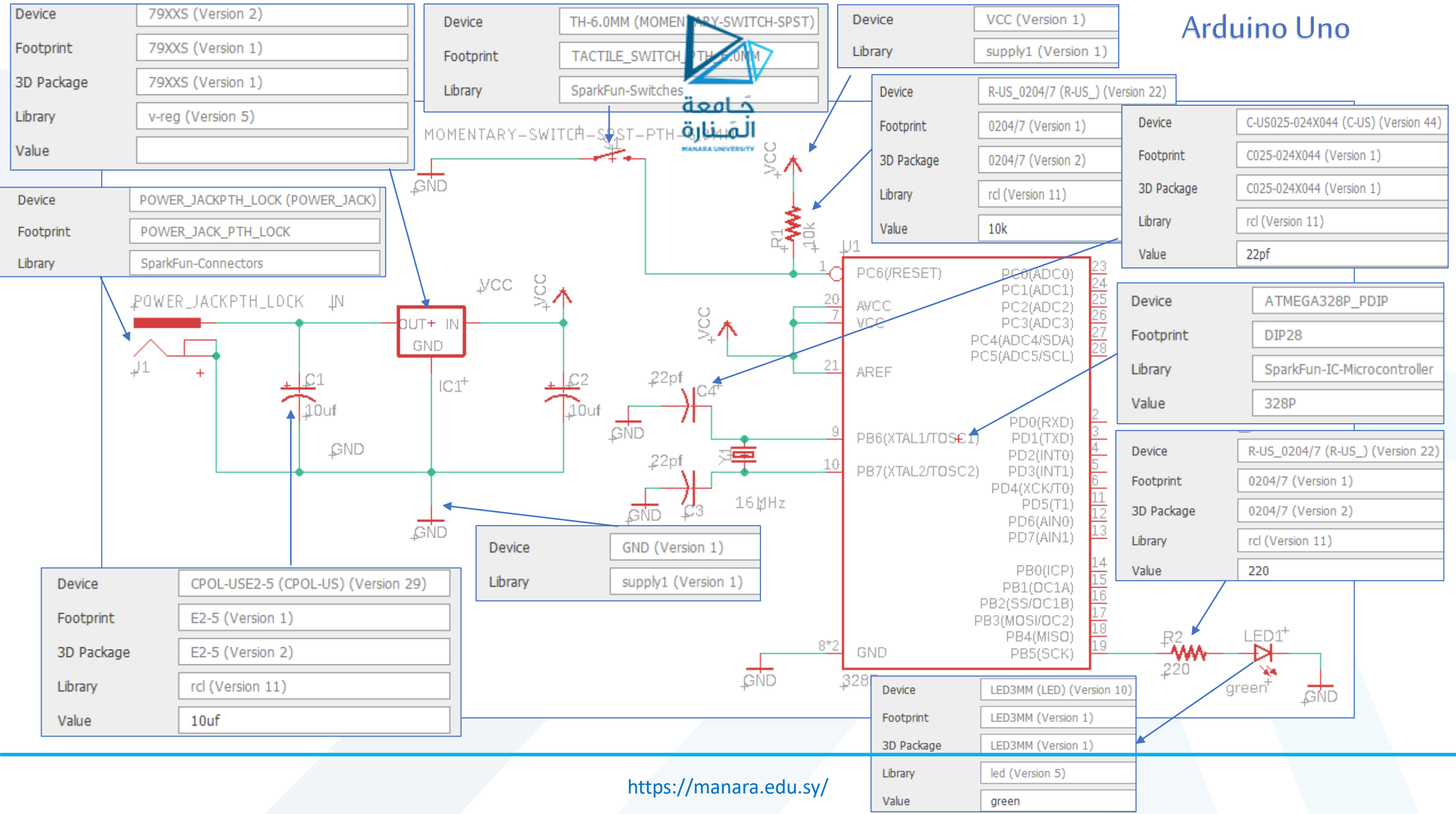
Con amp

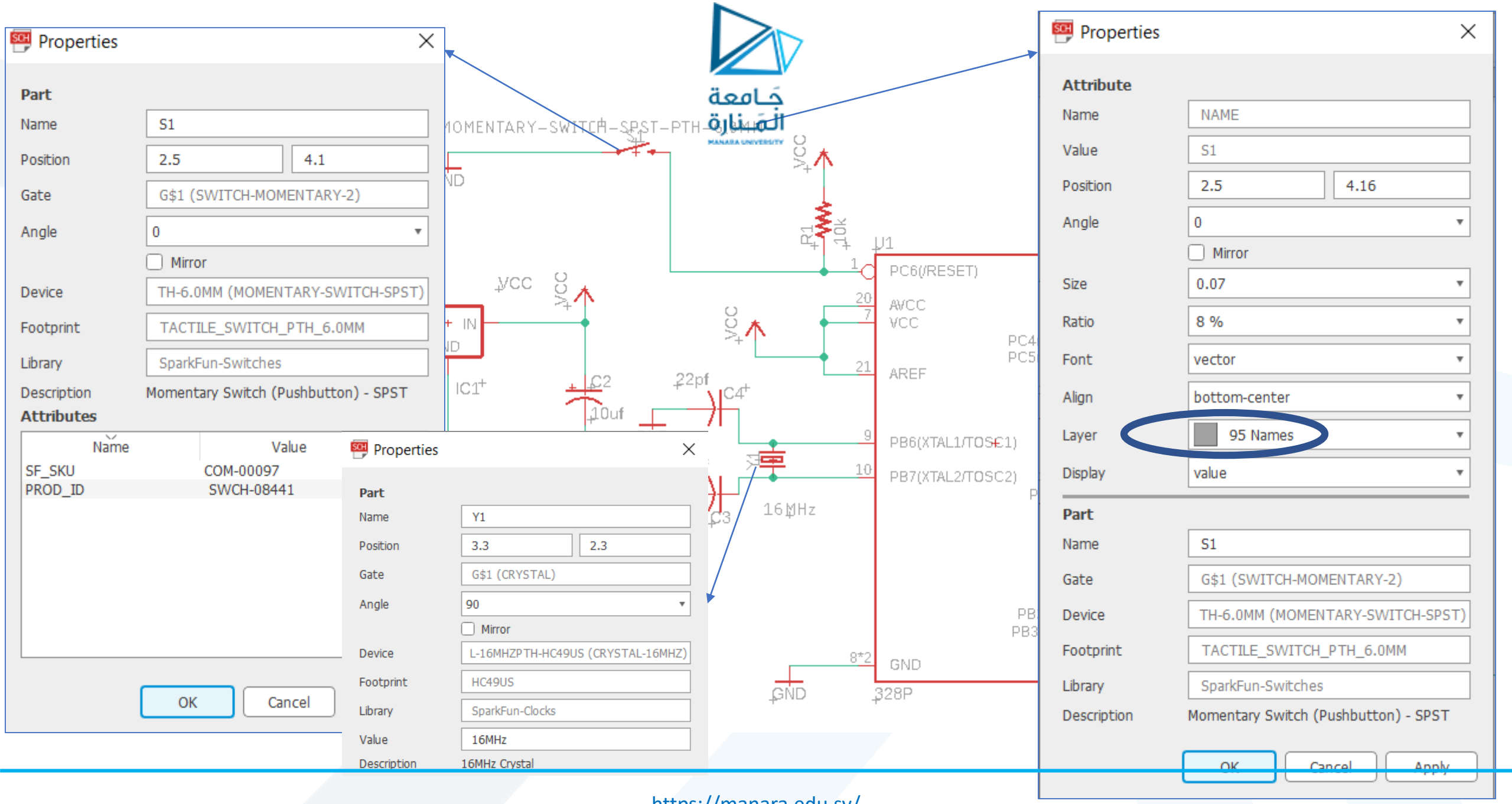


pinhead

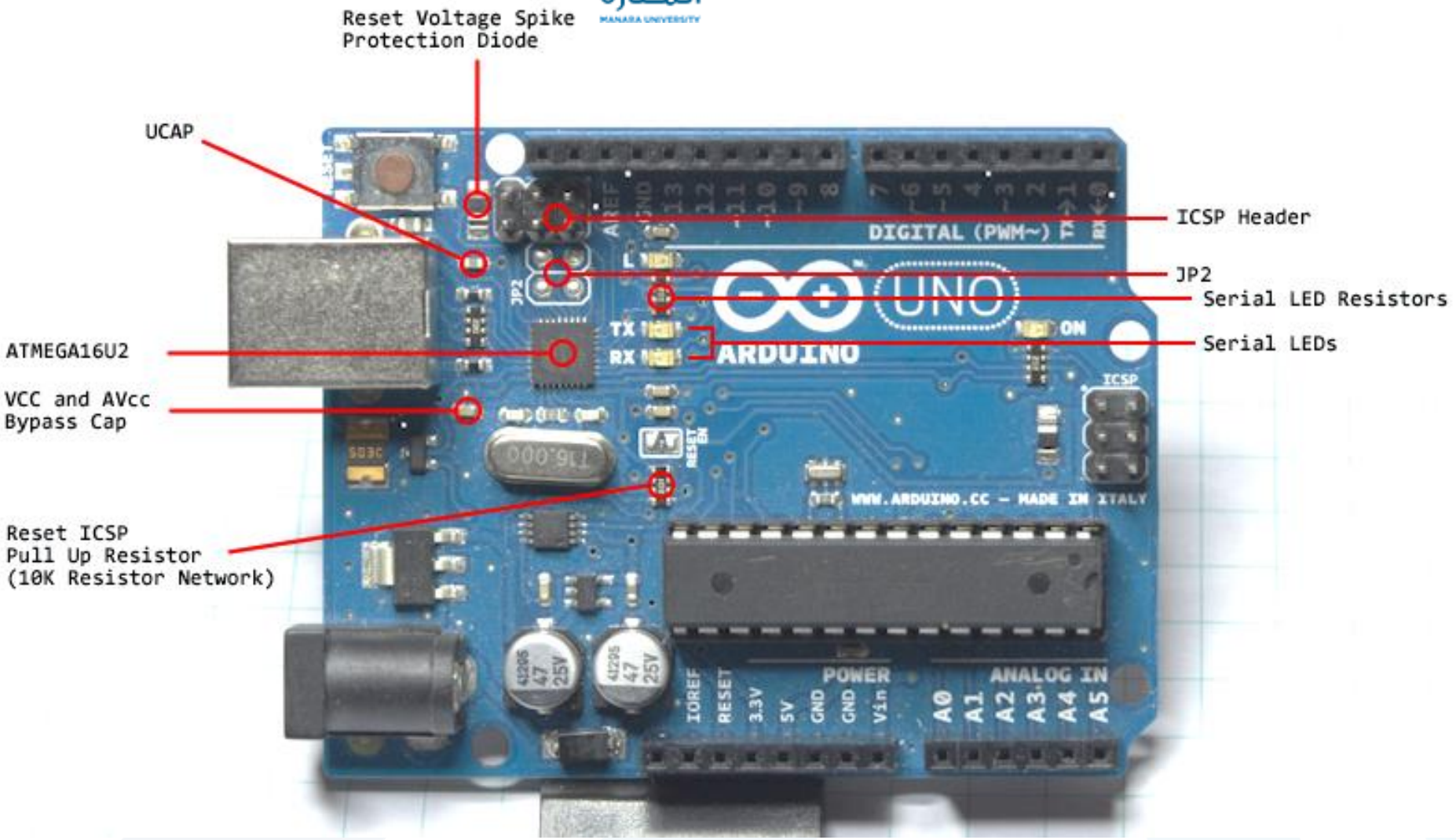


Arduino Uno


Device 79XXS (Version 2)
Footprint 79XXS (Version 1)
3D Package 79XXS (Version 1)
Library v-reg (Version 5)
Value
Device TH-6.0MM (MOMENTARY-SWITCH-SPST)
Footprint TACTILE_SWITCH_PTH_6.0MM
Library SparkFun-Switches
Device VCC (Version 1)
Library supply1 (Version 1)
Device R-US_0204/7 (R-US_) (Version 22)
Footprint 0204/7 (Version 1)
3D Package 0204/7 (Version 2)
Library rcl (Version 11)
Value 10k
Device C-US025-024X044 (C-US) (Version 44)
Footprint C025-024X044 (Version 1)
3D Package C025-024X044 (Version 1)
Library rcl (Version 11)
Value 22pf
Device POWER_JACKPTH_LOCK (POWER_JACK)
Footprint POWER_JACK_PTH_LOCK
Library SparkFun-Connectors
Device ATMEGA328P_PDIP
Footprint DIP28
Library SparkFun-IC-Microcontroller
Value 328P
Device R-US_0204/7 (R-US_) (Version 22)
Footprint 0204/7 (Version 1)
3D Package 0204/7 (Version 2)
Library rcl (Version 11)
Value 220
Device GND (Version 1)
Library supply1 (Version 1)
Device CPOL-USE2-5 (CPOL-US) (Version 29)
Footprint E2-5 (Version 1)
3D Package E2-5 (Version 2)
Library rcl (Version 11)
Value 10uf
Device LED3MM (LED) (Version 10)
Footprint LED3MM (Version 1)
3D Package LED3MM (Version 1)
Library led (Version 5)
Value green
MOMENTARY-SWITCH-SPST-PTH-6.0MM
POWER_JACKPTH_LOCK
J1
IN
OUT+
GND
IC1
C1
10uf
C2
10uf
VCC
R1
10k
U1
PC6(/RESET)
AVCC
VCC
AREF
PB6(XTAL1/TOSC1)
PB7(XTAL2/TOSC2)
GND
PC0(ADC0)
PC1(ADC1)
PC2(ADC2)
PC3(ADC3)
PC4(ADC4/SDA)
PC5(ADC5/SCL)
PD0(RXD)
PD1(TXD)
PD2(INT0)
PD3(INT1)
PD4(XCK/T0)
PD5(T1)
PD6(AIN0)
PD7(AIN1)
PB0(ICP)
PB1(OC1A)
PB2(SS/OC1B)
PB3(MOSI/OC2)
PB4(MISO)
PB5(SCK)
22pf
C4
22pf
C3
Y1
16MHz
R2
220
LED1
green
328P


Properties
Part
Name S1
Position 2.5 4.1
Gate G$1 (SWITCH-MOMENTARY-2)
Angle 0
Mirror
Device TH-6.0MM (MOMENTARY-SWITCH-SPST)
Footprint TACTILE_SWITCH_PTH_6.0MM
Library SparkFun-Switches
Description Momentary Switch (Pushbutton) - SPST
Attributes
Name Value
SF_SKU COM-00097
PROD_ID SWCH-08441
OK Cancel
Properties
Part
Name Y1
Position 3.3 2.3
Gate G$1 (CRYSTAL)
Angle 90
Mirror
Device L-16MHZPTH-HC49US (CRYSTAL-16MHZ)
Footprint HC49US
Library SparkFun-Clocks
Value 16MHz
Description 16MHz Crystal
Properties
Attribute
Name NAME
Value S1
Position 2.5 4.16
Angle 0
Mirror
Size 0.07
Ratio 8 %
Font vector
Align bottom-center
Layer 95 Names
Display value
Part
Name S1
Gate G$1 (SWITCH-MOMENTARY-2)
Device TH-6.0MM (MOMENTARY-SWITCH-SPST)
Footprint TACTILE_SWITCH_PTH_6.0MM
Library SparkFun-Switches
Description Momentary Switch (Pushbutton) - SPST
OK Cancel Apply
VCC
R1
10k
U1
PC6(/RESET)
AVCC
VCC
AREF
PB6(XTAL1/TOSC1)
PB7(XTAL2/TOSC2)
GND
328P
C2
10uf
22pf
C4
C3
16MHz
Y1
IC1
IN
GND

atmega8u2-mu



CP2102 USB TO TTL SERIAL ADAPTER

جامعة المنارة
MANARA UNIVERSITY

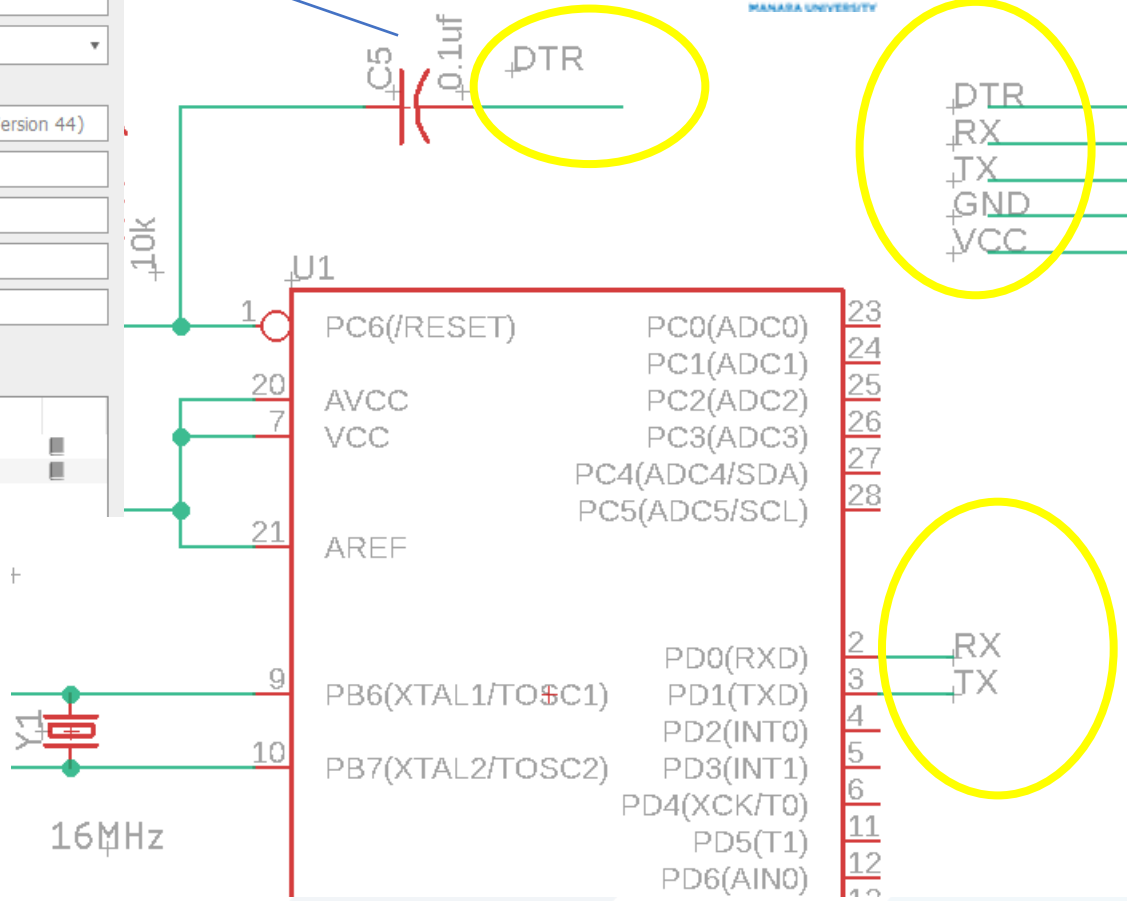
Properties

Part

Name	C5
Position	4.2 | 4
Gate	G$1 (C-US)
Angle	90
Mirror	☐
Device	C-US025-024X044 (C-US) (Version 44)
Footprint	C025-024X044 (Version 1)
3D Package	C025-024X044 (Version 1)
Library	rcl (Version 11)
Value	0.1uf
Description	CAPACITOR, American symbol

Attributes

Name	Value
SPICEPREFIX	C
POPULARITY	17



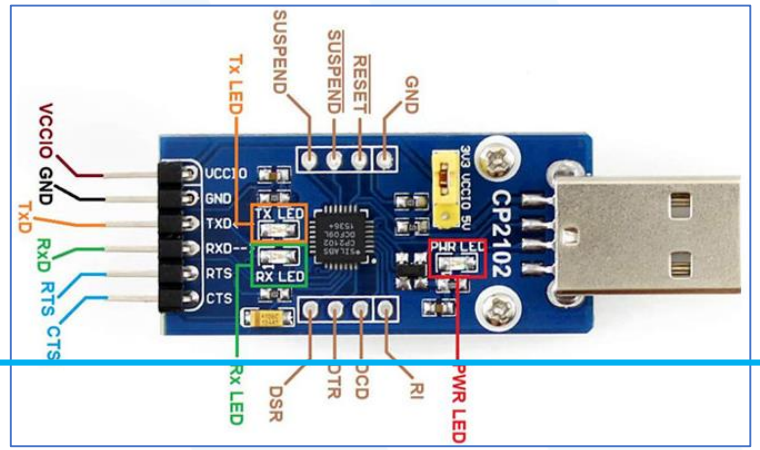
Properties

Part

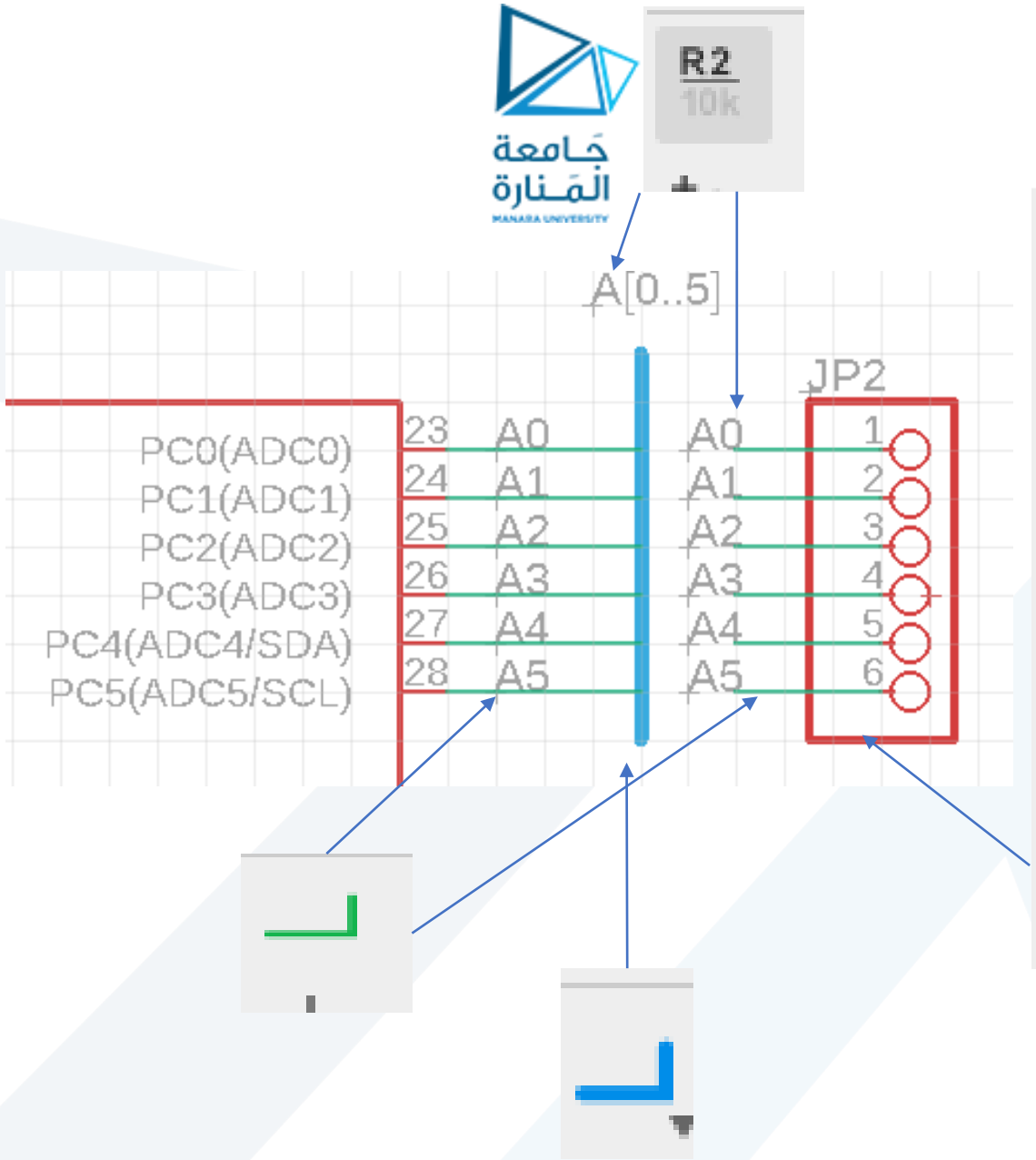
Name	JP1
Position	6.5 | 3.8
Gate	A (PINHD5)
Angle	0
Mirror	☐
Device	PINHD-1X5/90 (PINHD-1X5) (Version 5)
Footprint	1X05/90 (Version 1)
3D Package	1X05/90 (Version 2)
Library	pinhead (Version 4)
Value	
Description	PIN HEADER

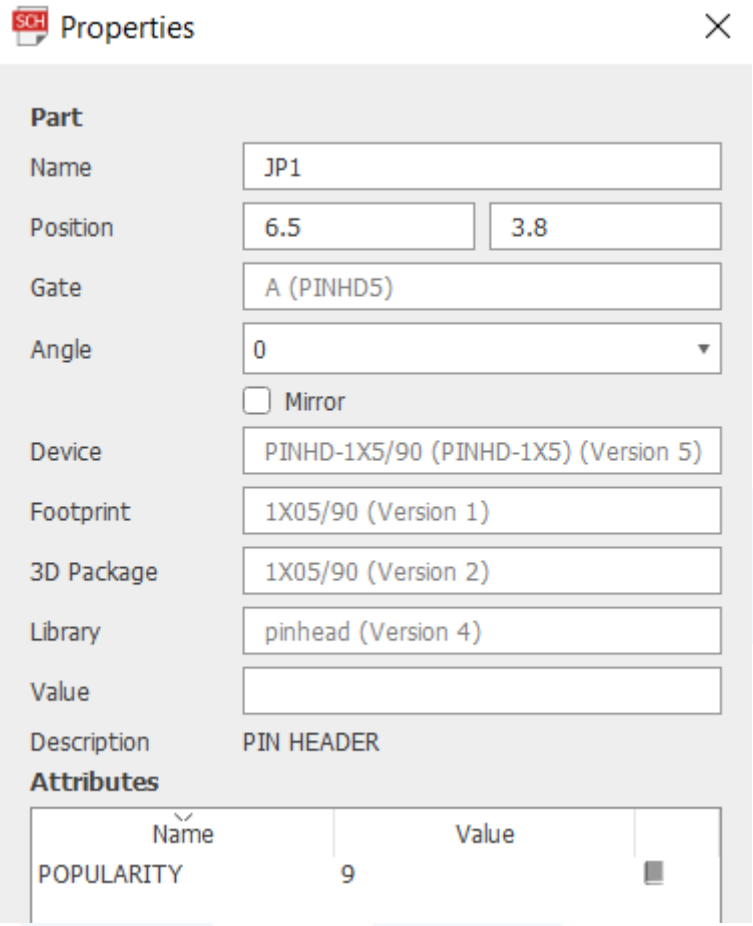
Attributes

Name	Value
POPULARITY	9

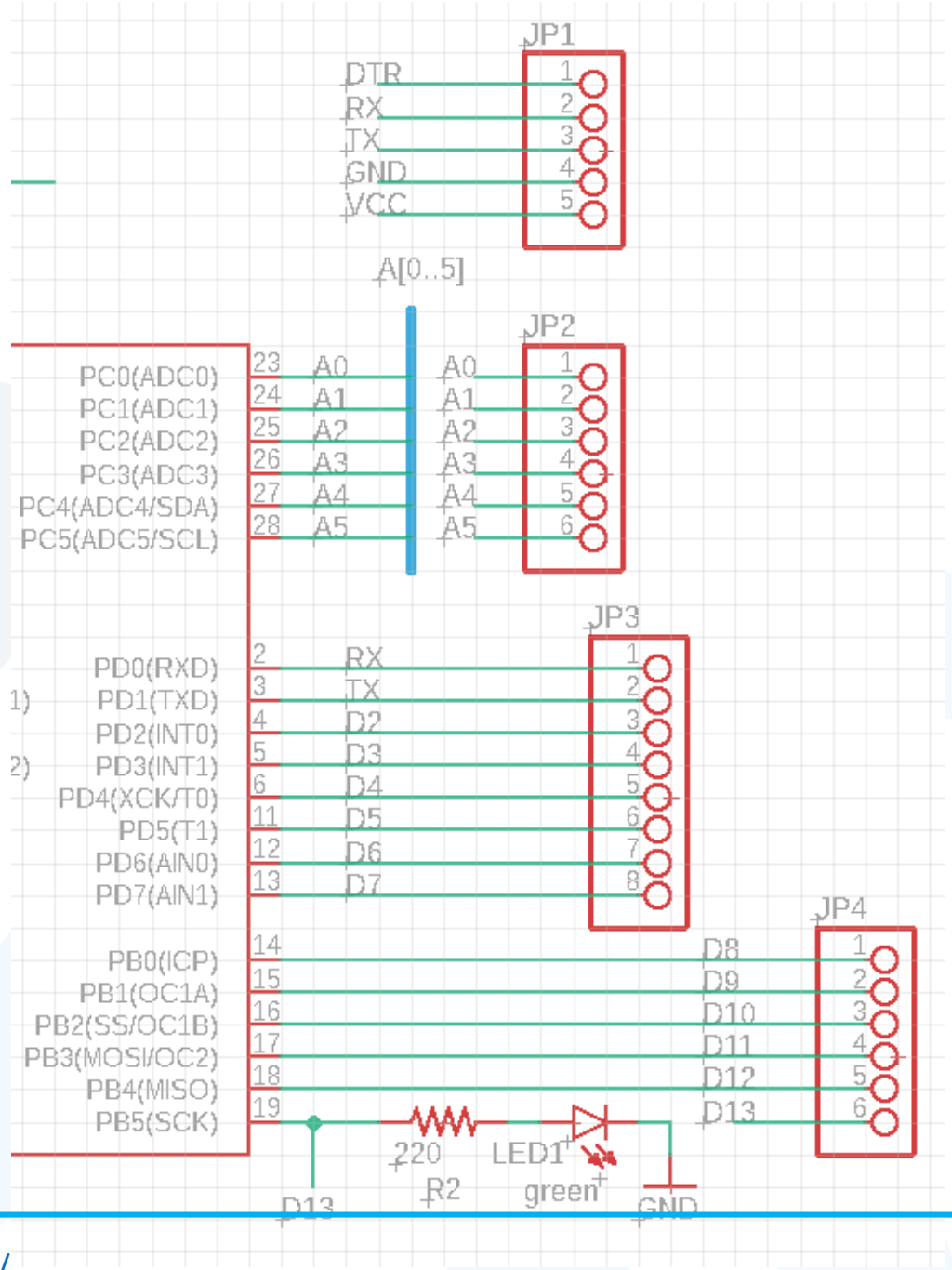


- Using Bus wire
- Label
- Name

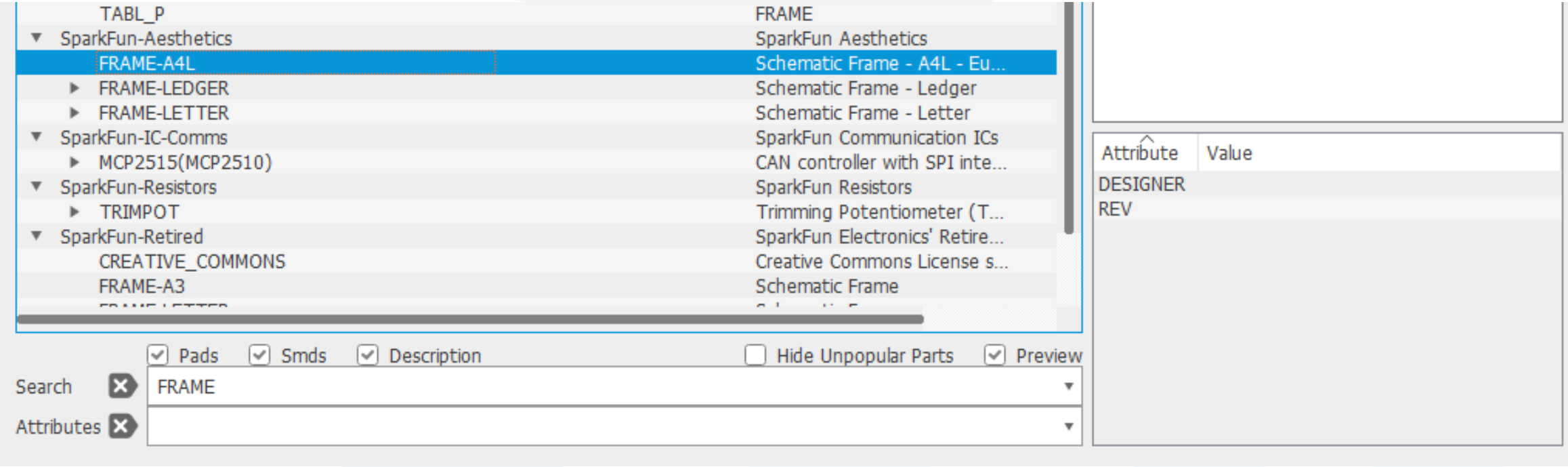




- Label
- Name


JP1
DTR
RX
TX
GND
VCC
A[0..5]
JP2
PC0(ADC0)
PC1(ADC1)
PC2(ADC2)
PC3(ADC3)
PC4(ADC4/SDA)
PC5(ADC5/SCL)
A0
A1
A2
A3
A4
A5
JP3
PD0(RXD)
PD1(TXD)
PD2(INT0)
PD3(INT1)
PD4(XCK/T0)
PD5(T1)
PD6(AIN0)
PD7(AIN1)
RX
TX
D2
D3
D4
D5
D6
D7
JP4
PB0(ICP)
PB1(OC1A)
PB2(SS/OC1B)
PB3(MOSI/OC2)
PB4(MISO)
PB5(SCK)
D8
D9
D10
D11
D12
D13
220
R2
LED1
green
GND

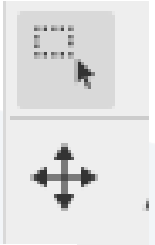
Add frame A4

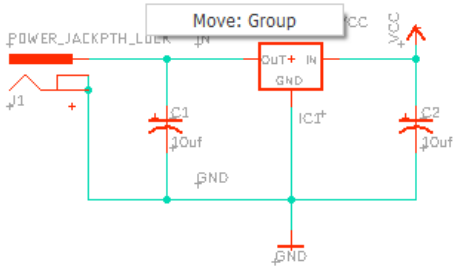

TABL_P
FRAME
SparkFun-Aesthetics
SparkFun Aesthetics
FRAME-A4L
Schematic Frame - A4L - Eu...
FRAME-LEDGER
Schematic Frame - Ledger
FRAME-LETTER
Schematic Frame - Letter
SparkFun-IC-Comms
SparkFun Communication ICs
MCP2515(MCP2510)
CAN controller with SPI inte...
SparkFun-Resistors
SparkFun Resistors
TRIMPOT
Trimming Potentiometer (T...
SparkFun-Retired
SparkFun Electronics' Retire...
CREATIVE_COMMONS
Creative Commons License s...
FRAME-A3
Schematic Frame
Pads
Smds
Description
Hide Unpopular Parts
Preview
Search
FRAME
Attributes
Attribute
Value
DESIGNER
REV

Add frame A4- global attributes

Group

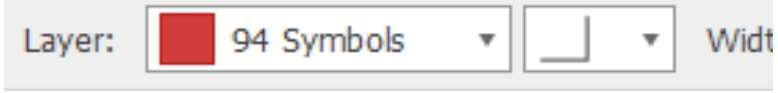
Then move each group (right click to move a group after selecting it)



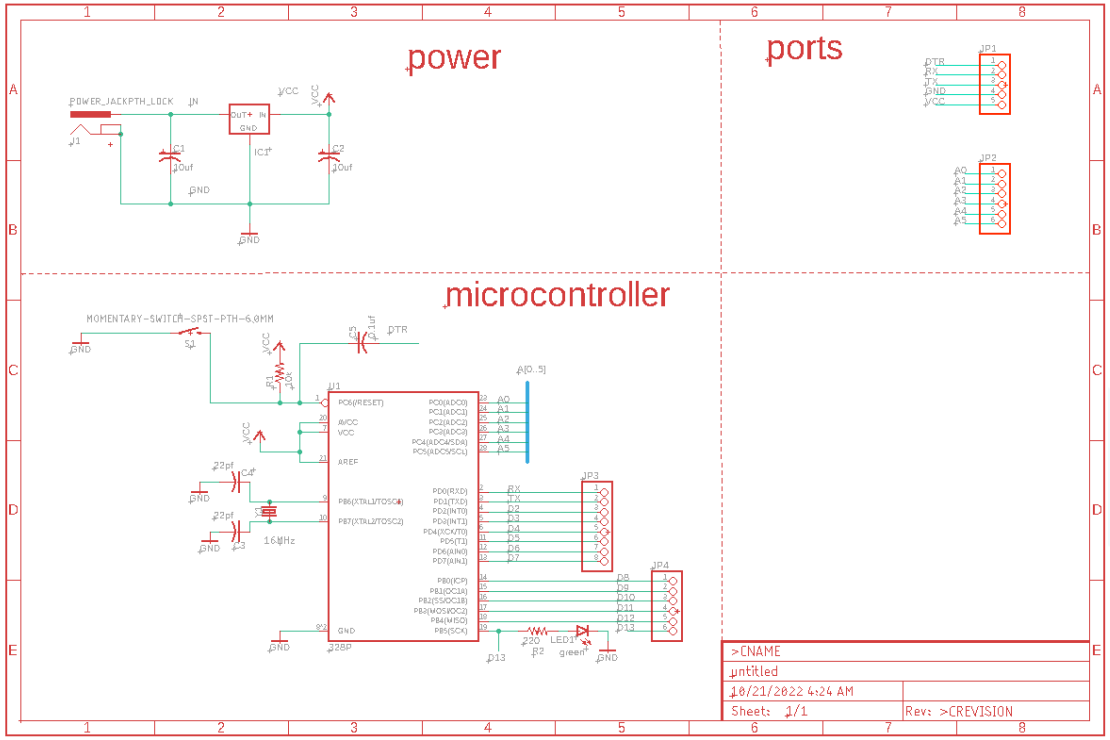


Draw lines

Add text



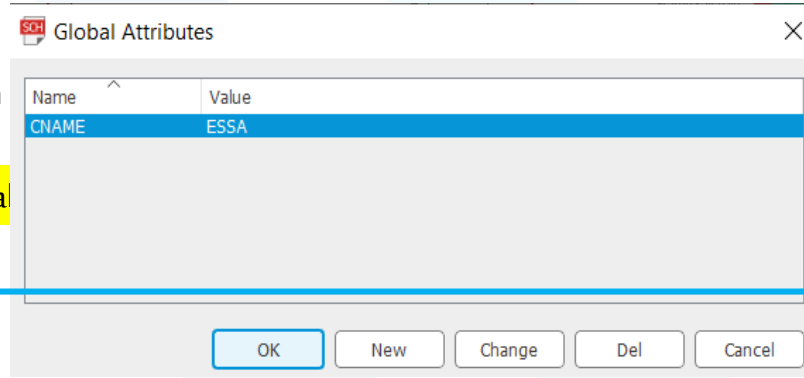
Modify the text by right click on it then properties



Press F2

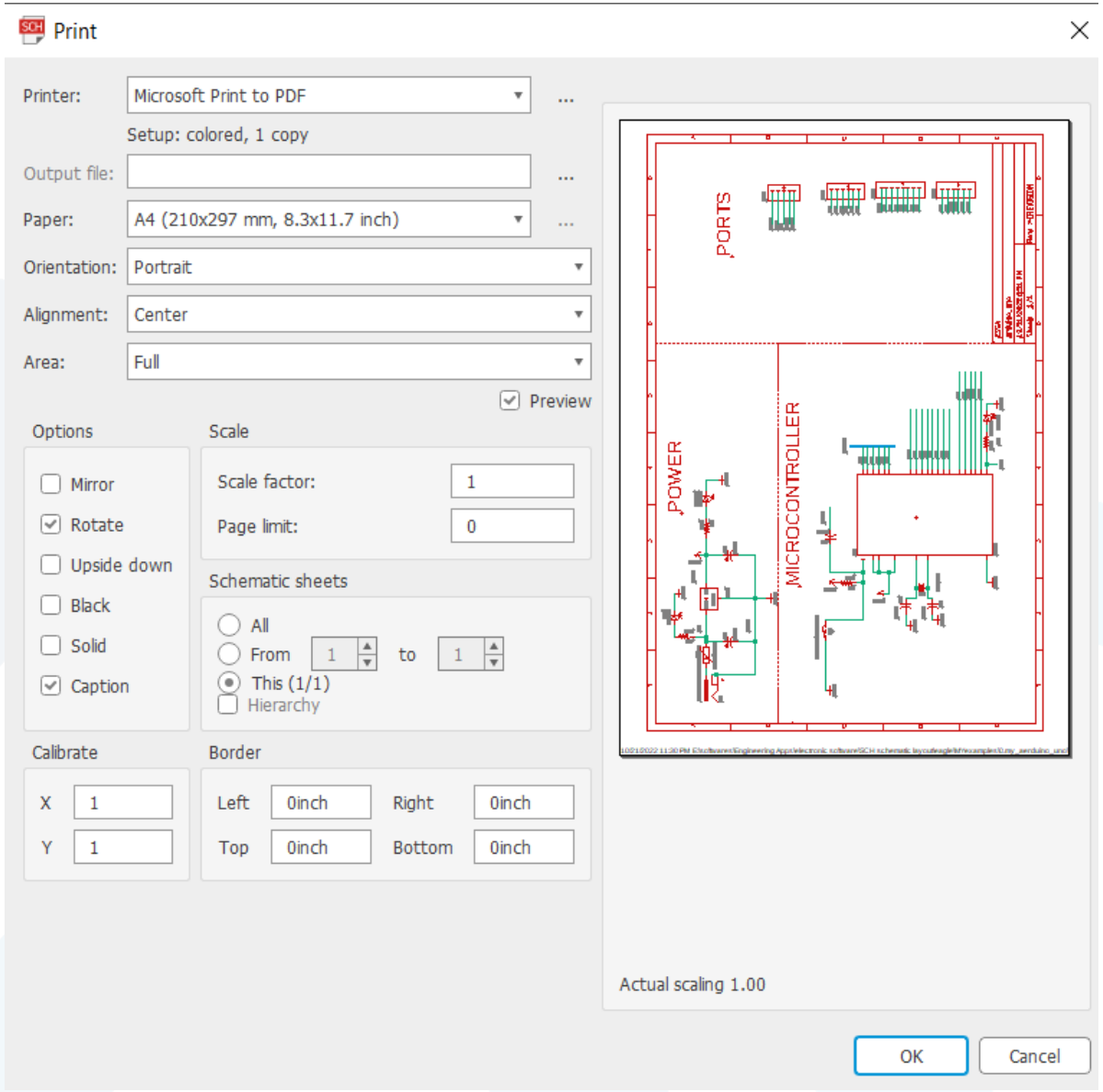
Or view-> redraw to update the name based on your file name "untitled"

Other like CNAME and rev from edit then global attributes

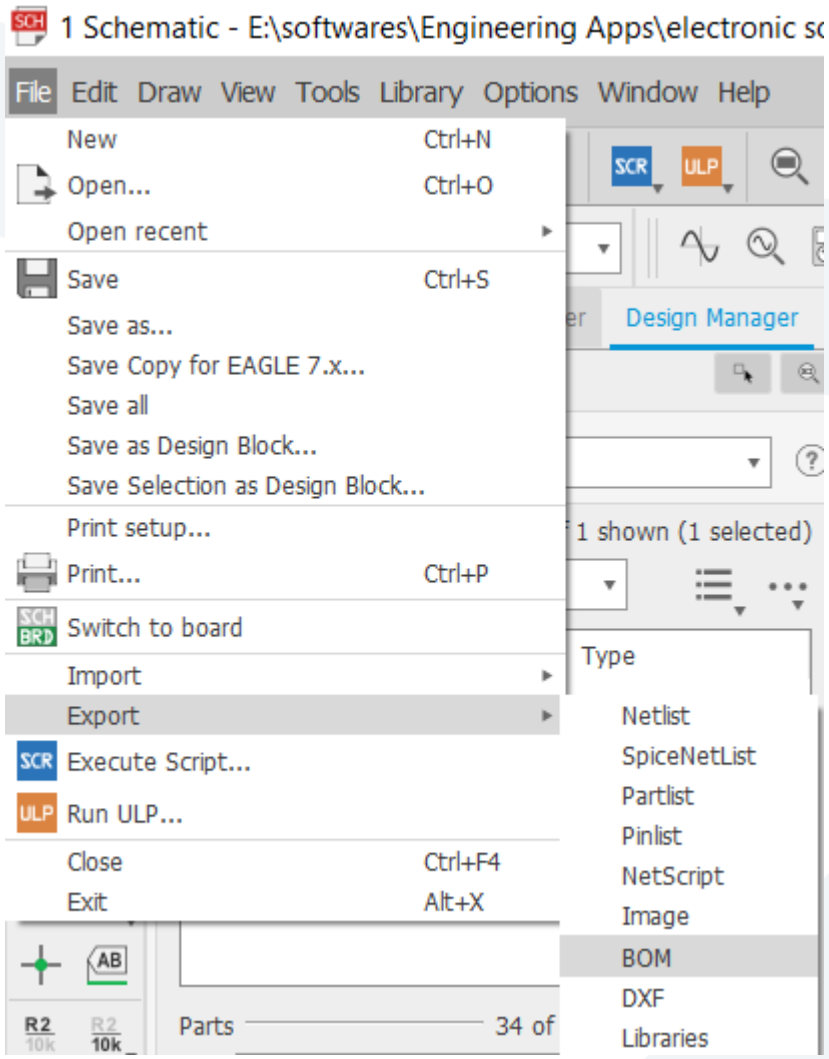


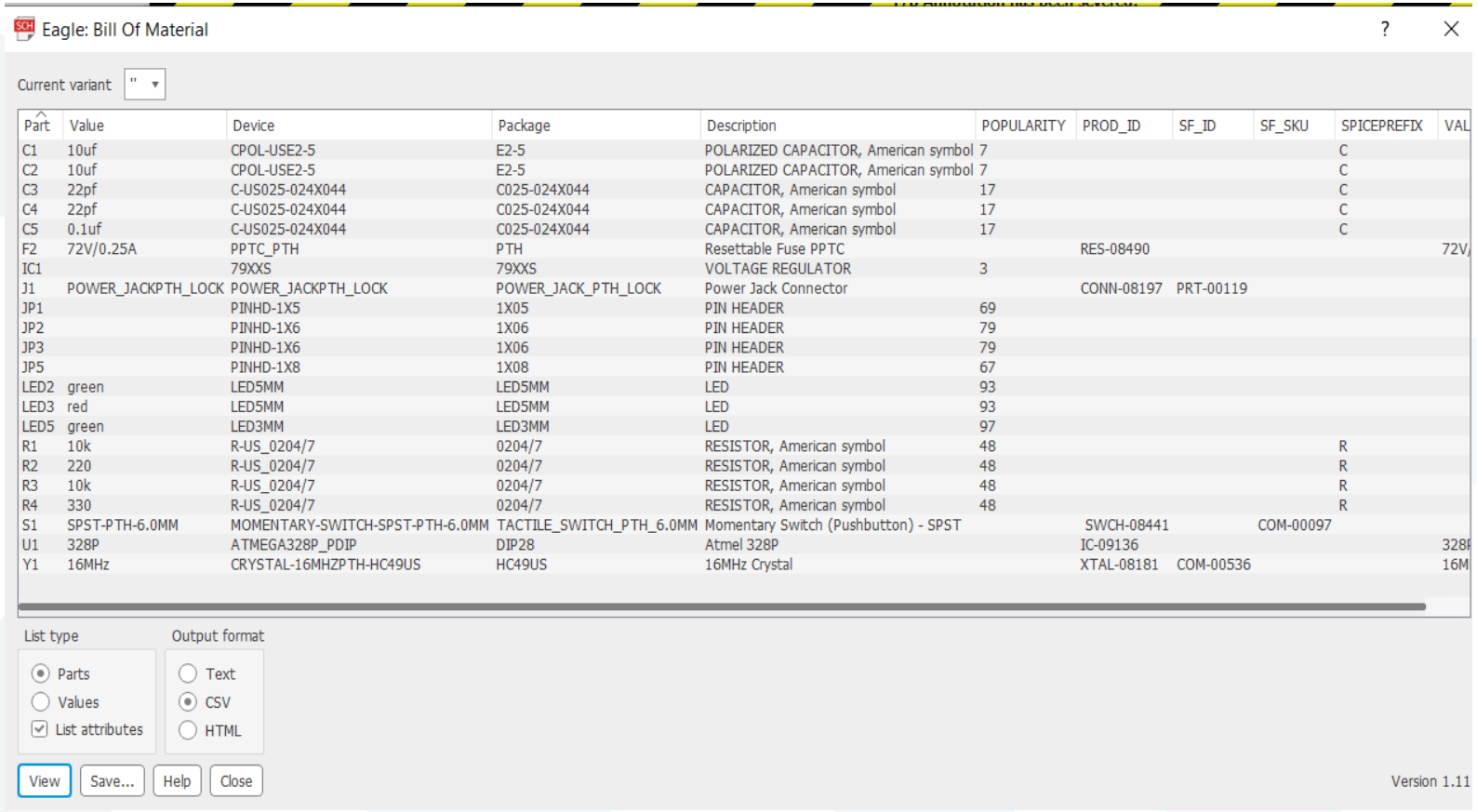
Save as pdf

From Print



EXPORT Bill of Material BOM





Part	Value	Device	Package	Description	POPULARITY	PROD_ID	SF_ID	SF_SKU	SPICEPREFIX	VAL
C1	10uf	CPOL-USE2-5	E2-5	POLARIZED CAPACITOR, American symbol	7				C	
C2	10uf	CPOL-USE2-5	E2-5	POLARIZED CAPACITOR, American symbol	7				C	
C3	22pf	C-US025-024X044	C025-024X044	CAPACITOR, American symbol	17				C	
C4	22pf	C-US025-024X044	C025-024X044	CAPACITOR, American symbol	17				C	
C5	0.1uf	C-US025-024X044	C025-024X044	CAPACITOR, American symbol	17				C	
F2	72V/0.25A	PPTC_PTH	PTH	Resettable Fuse PPTC		RES-08490				72V/
IC1		79XXS	79XXS	VOLTAGE REGULATOR	3					
J1	POWER_JACKPTH_LOCK	POWER_JACKPTH_LOCK	POWER_JACK_PTH_LOCK	Power Jack Connector		CONN-08197	PRT-00119			
JP1		PINHD-1X5	1X05	PIN HEADER	69					
JP2		PINHD-1X6	1X06	PIN HEADER	79					
JP3		PINHD-1X6	1X06	PIN HEADER	79					
JP5		PINHD-1X8	1X08	PIN HEADER	67					
LED2	green	LED5MM	LED5MM	LED	93					
LED3	red	LED5MM	LED5MM	LED	93					
LED5	green	LED3MM	LED3MM	LED	97					
R1	10k	R-US_0204/7	0204/7	RESISTOR, American symbol	48				R	
R2	220	R-US_0204/7	0204/7	RESISTOR, American symbol	48				R	
R3	10k	R-US_0204/7	0204/7	RESISTOR, American symbol	48				R	
R4	330	R-US_0204/7	0204/7	RESISTOR, American symbol	48				R	
S1	SPST-PTH-6.0MM	MOMENTARY-SWITCH-SPST-PTH-6.0MM	TACTILE_SWITCH_PTH_6.0MM	Momentary Switch (Pushbutton) - SPST		SWCH-08441		COM-00097		
U1	328P	ATMEGA328P_PDIP	DIP28	Atmel 328P		IC-09136				328P
Y1	16MHz	CRYSTAL-16MHZPTH-HC49US	HC49US	16MHz Crystal		XTAL-08181	COM-00536			16M

Click save

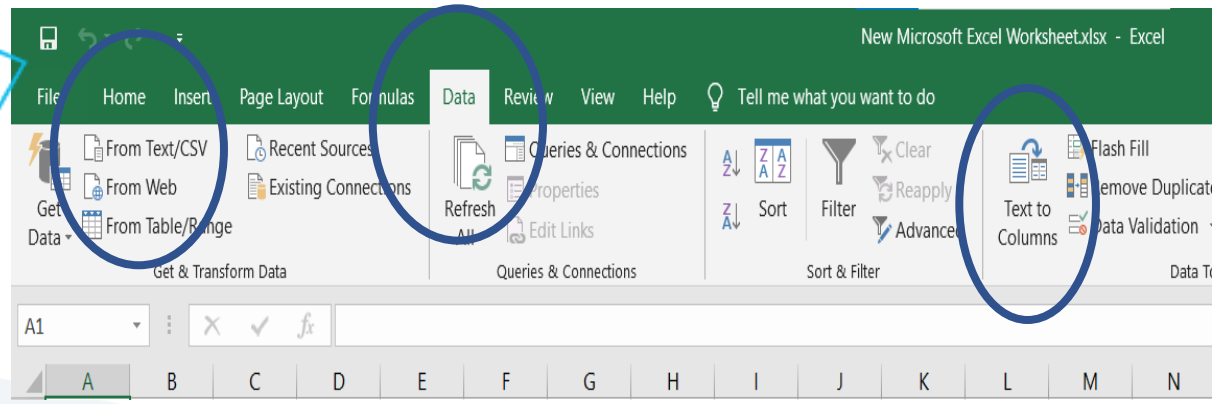
arduino_uno.csv

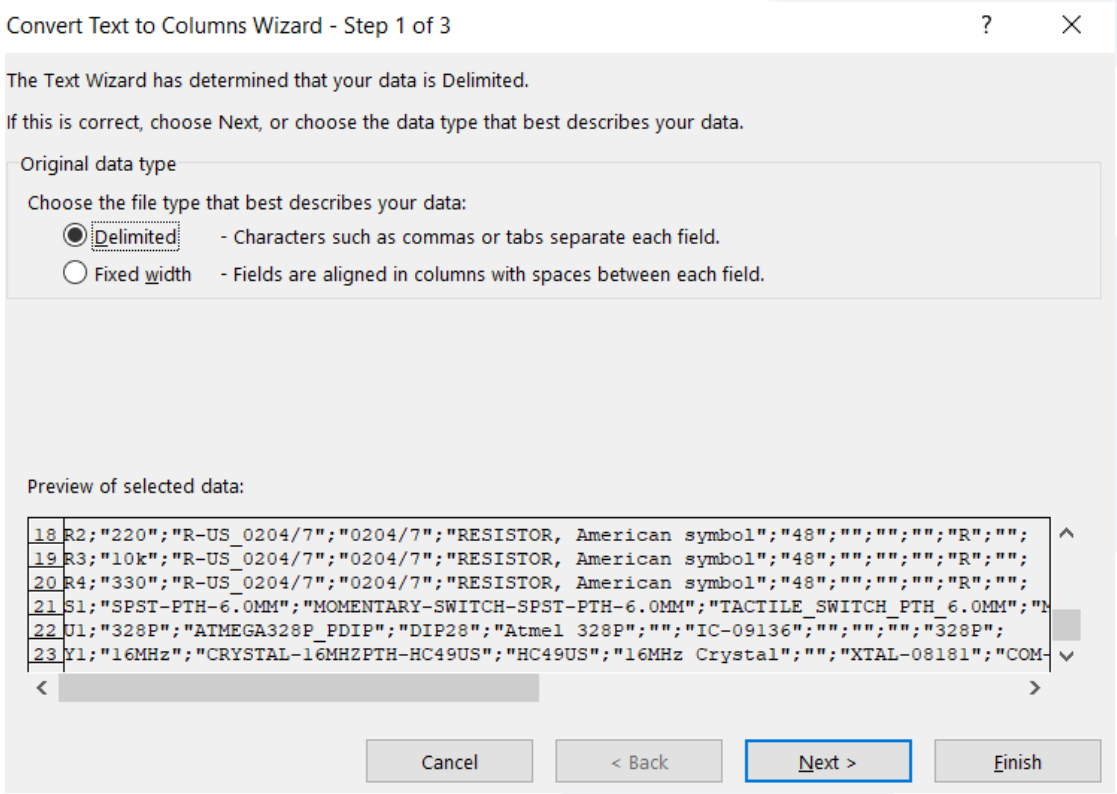
Converts Data csv to Excel

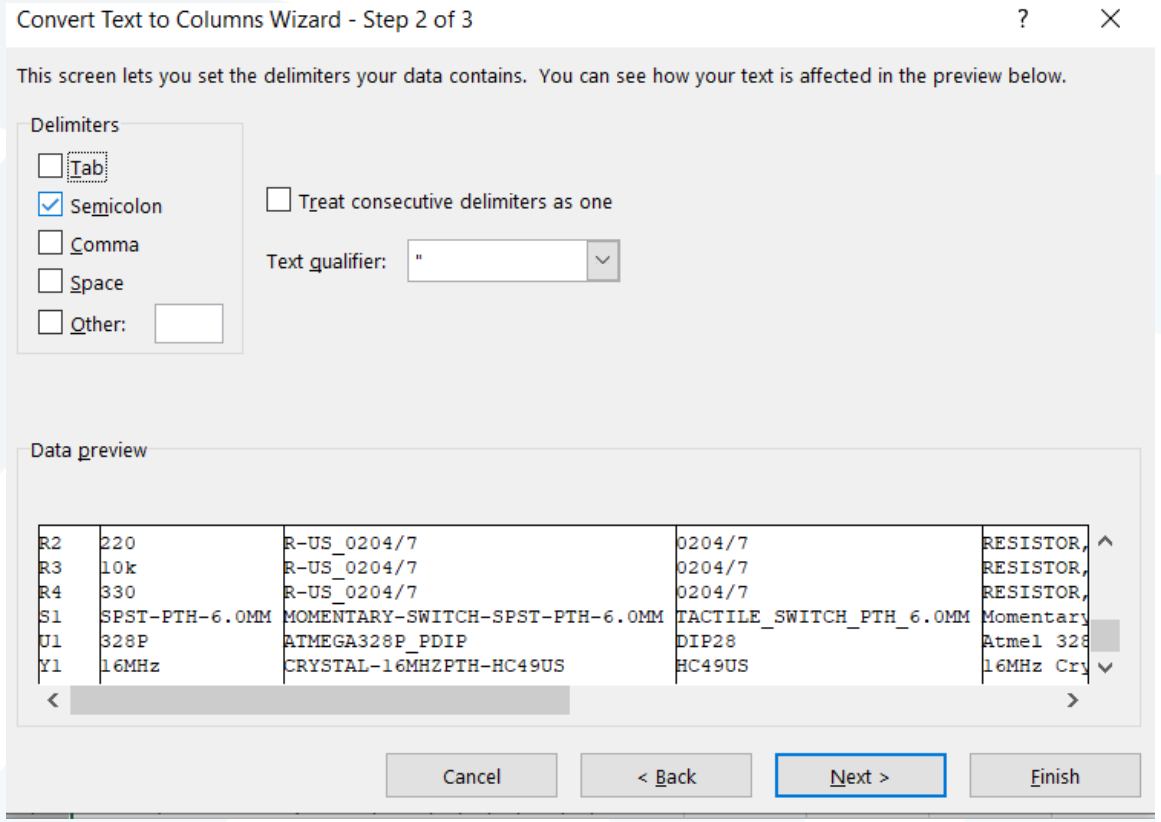
Open the file arduino_uno.csv with notepad++ and select all then copy

Open Excel and select the first column and paste

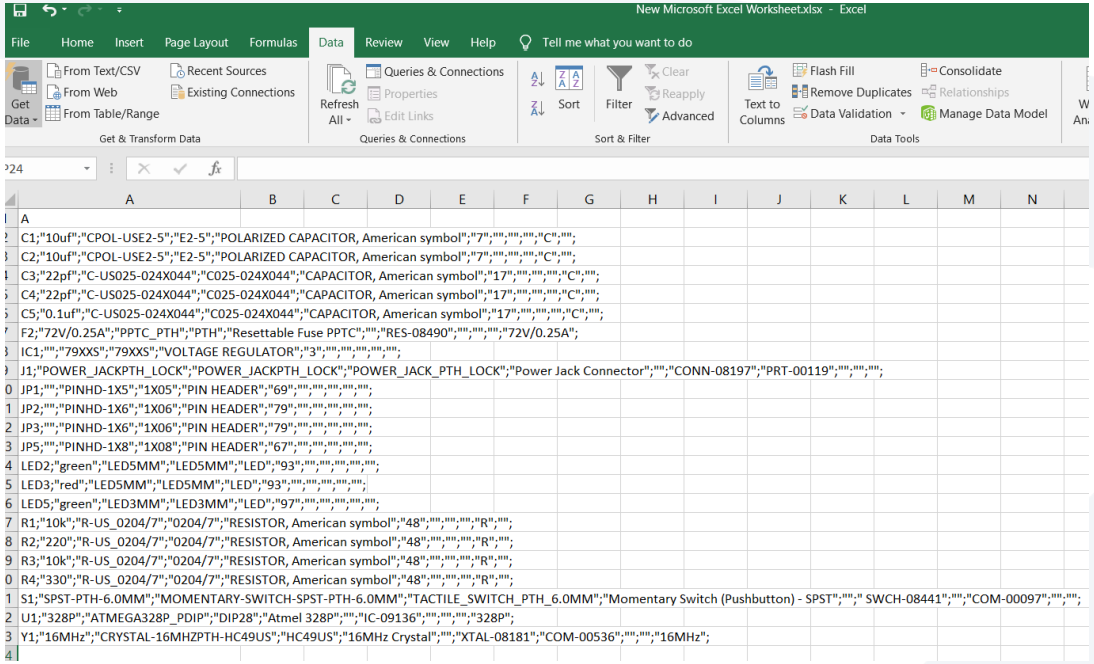
Select all then Open data then text to column







Converts Data csv to Excel



A

C1;"10uf";"CPOL-USE2-5";"E2-5";"POLARIZED CAPACITOR, American symbol";"7";"";"";"C";"";
C2;"10uf";"CPOL-USE2-5";"E2-5";"POLARIZED CAPACITOR, American symbol";"7";"";"";"C";"";
C3;"22pf";"C-US025-024X044";"C025-024X044";"CAPACITOR, American symbol";"17";"";"";"C";"";
C4;"22pf";"C-US025-024X044";"C025-024X044";"CAPACITOR, American symbol";"17";"";"";"C";"";
C5;"0.1uf";"C-US025-024X044";"C025-024X044";"CAPACITOR, American symbol";"17";"";"";"C";"";
F2;"72V/0.25A";"PPTC_PTH";"PTH";"Resettable Fuse PPTC";"";"RES-08490";"";"";"72V/0.25A";
IC1;"";"79XXS";"79XXS";"VOLTAGE REGULATOR";"3";"";"";"";"";
J1;"POWER_JACKPTH_LOCK";"POWER_JACKPTH_LOCK";"POWER_JACK_PTH_LOCK";"Power Jack Connector";"";"CONN-08197";"PRT-00119";"";"";
JP1;"";"PINHD-1X5";"1X05";"PIN HEADER";"69";"";"";"";"";
JP2;"";"PINHD-1X6";"1X06";"PIN HEADER";"79";"";"";"";"";
JP3;"";"PINHD-1X6";"1X06";"PIN HEADER";"79";"";"";"";"";
JP5;"";"PINHD-1X8";"1X08";"PIN HEADER";"67";"";"";"";"";
LED2;"green";"LED5MM";"LED5MM";"LED";"93";"";"";"";"";
LED3;"red";"LED5MM";"LED5MM";"LED";"93";"";"";"";"";
LED5;"green";"LED3MM";"LED3MM";"LED";"97";"";"";"";"";
R1;"10k";"R-US_0204/7";"0204/7";"RESISTOR, American symbol";"48";"";"";"R";"";
R2;"220";"R-US_0204/7";"0204/7";"RESISTOR, American symbol";"48";"";"";"R";"";
R3;"10k";"R-US_0204/7";"0204/7";"RESISTOR, American symbol";"48";"";"";"R";"";
R4;"330";"R-US_0204/7";"0204/7";"RESISTOR, American symbol";"48";"";"";"R";"";
S1;"SPST-PTH-6.0MM";"MOMENTARY-SWITCH-SPST-PTH-6.0MM";"TACTILE_SWITCH_PTH_6.0MM";"Momentary Switch (Pushbutton) - SPST";"";" SWCH-08441";"";"COM-00097";"";"";
U1;"328P";"ATMEGA328P_PDIP";"DIP28";"Atmel 328P";"";"IC-09136";"";"";"328P";
Y1;"16MHz";"CRYSTAL-16MHZPTH-HC49US";"HC49US";"16MHz Crystal";"";"XTAL-08181";"COM-00536";"";"";"16MHz";

	A	B	C	D	E	F	G	H	I	J	K	L
1	Qty	Value	Device	Package	Parts	Descriptio	POPULARI	PROD_ID	SF_ID	SF_SKU	SPICEPREF	VALUE
2	1		79XXS	79XXS	IC1	VOLTAGE I	3					
3	1		PINHD-1X5	1X05	JP1	PIN HEADE	69					
4	2		PINHD-1X6	1X06	JP2, JP3	PIN HEADE	79					
5	1		PINHD-1X8	1X08	JP5	PIN HEADE	67					
6	1	0.1uf	C-US025-0	C025-024X	C5	CAPACITO	17				C	
7	2	10k	R-US_020	0204/7	R1, R3	RESISTOR,	48				R	
8	2	10uf	CPOL-USE	E2-5	C1, C2	POLARIZED	7				C	
9	1	16MHz	CRYSTAL-1	HC49US	Y1	16MHz Crystal		XTAL-0818	COM-00536			16MHz
10	1	220	R-US_020	0204/7	R2	RESISTOR,	48				R	
11	2	22pf	C-US025-0	C025-024X	C3, C4	CAPACITO	17				C	
12	1	328P	ATMEGA3	DIP28	U1	Atmel 328P		IC-09136				328P
13	1	330	R-US_020	0204/7	R4	RESISTOR,	48				R	
14	1	72V/0.25A	PPTC_PTH	PTH	F2	Resettable Fuse PPTC		RES-08490				72V/0.25A
15	1	POWER_J	POWER_J	POWER_J	J1	Power Jack Connecto		CONN-081	PRT-00119			
16	1	SPST-PTH-	MOMENT	TACTILE_S	S1	Momentary Switch (P		SWCH-08441		COM-00097		
17	1	green	LED3MM	LED3MM	LED5	LED	97					
18	1	green	LED5MM	LED5MM	LED2	LED	93					
19	1	red	LED5MM	LED5MM	LED3	LED	93					
20												

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	1+ US$1.847 10+ US$1.5974	Add	0	ATMEGA8A-MN	Microchip Tech	4K@x16bit -40℃~+105℃ 2.7V~5.5V AVR	RoHS

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