

元器件库的构建及 如何使用KiCad构建原理图符号

FastBond之KiCad设计PCB (4)

库 - library

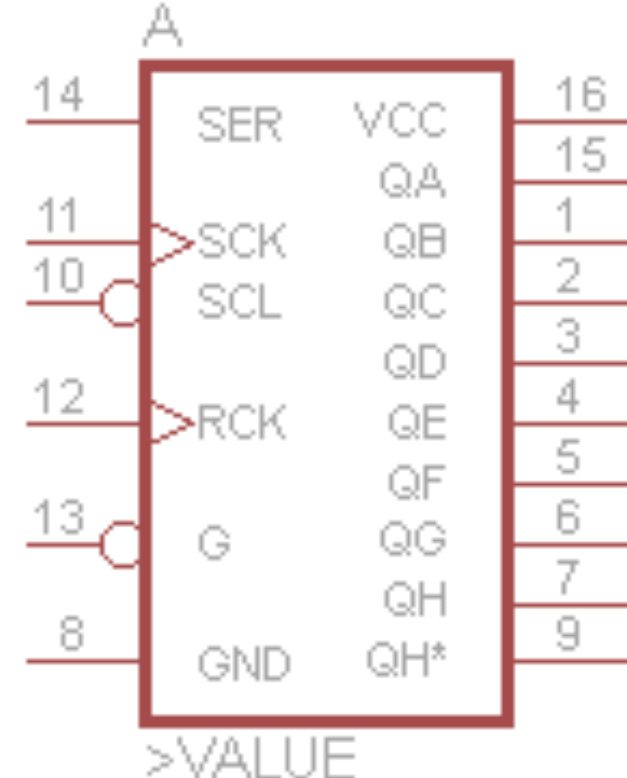
ADD

Name	Description
▶ SparkFun-Boards	SparkFun Electronics' preferred foot prints
▶ SparkFun-Capacitors	SparkFun Electronics' preferred foot prints
▶ SparkFun-Connectors	SparkFun Electronics' preferred foot prints
▲ SparkFun-DigitalIC	SparkFun Electronics' preferred foot prints
▶ 74*157	Quadruple 2-line to 1-line data SELECTOR/...
▲ 74*595	8-bit SHIFT REGISTER, output latch
74LS595D	SO16
74LS595FK	LCC20
74LS595N	DIL16
74595	TSSOP16
74ACT125D	Quad Buffer with 3-State Outputs-
74AHC1G08	Single 2-input AND gate
74HC04_HEX_INVERTER	74HC04 Hex Inverter
74LVC138AD	3-to-8 decoder
7408SE	Single 2-input AND gate
7432SE	Single 2-input OR gate
74165D	

Pads Smds Description Preview

Search

Attributes



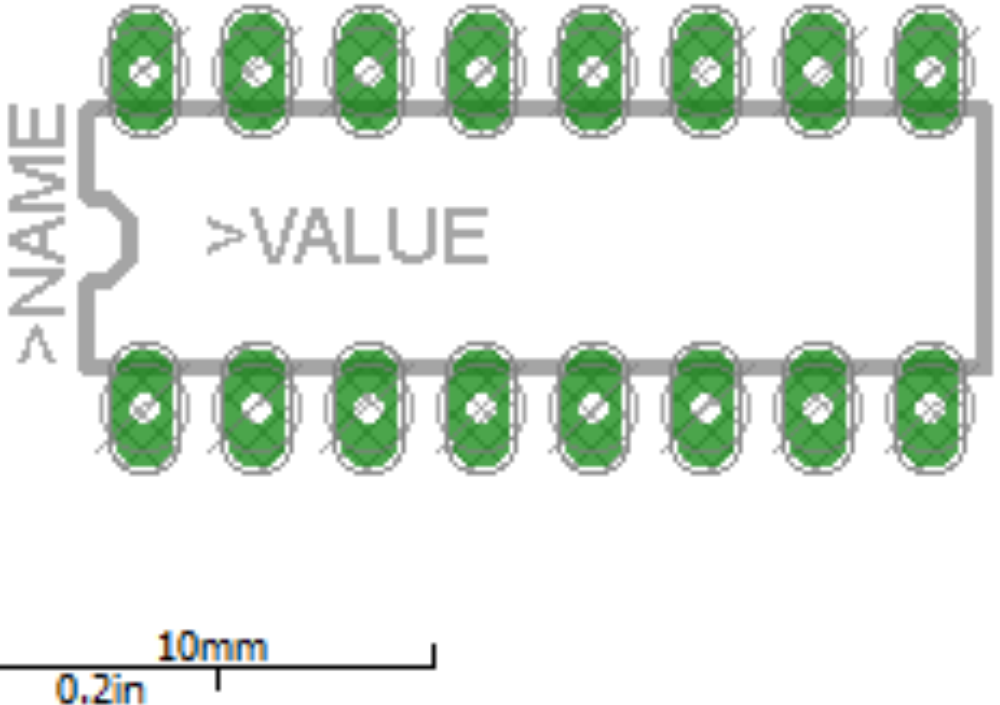
8-bit **SHIFT REGISTER**, output latch

Package: DIL16

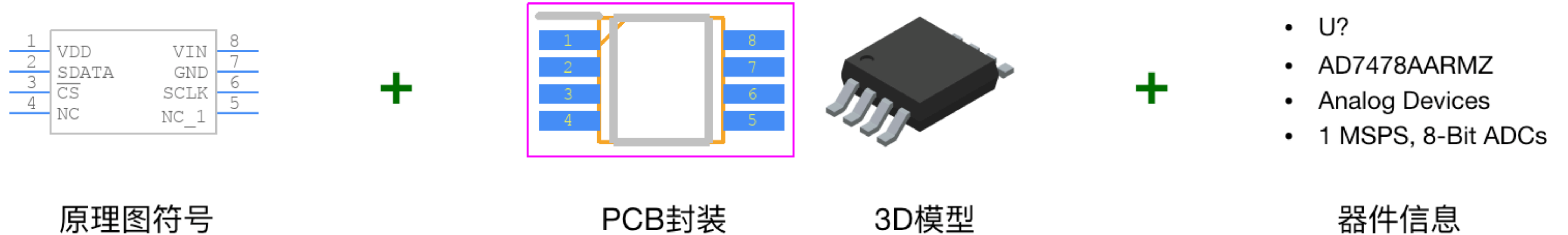
Dual In Line Package

Attribute	Value
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OK Drop Cancel



基本单元 - 元器件的构成



- **Symbol**: 原理图的基本构成单元，是代表元器件功能的抽象符号；
- **Footprint**: PCB布局、布线中元器件的封装，它类似元器件在PCB上站立同PCB接触的脚印，准确来讲像“鞋”，能够通过焊接来稳定安放元器件的管脚（Pin）；
- **STEP**: Standard for the Exchange of Product model data，是3D模型的一种文件格式；
- **SPICE**: Simulation Program with Integrated Circuit Emphasis，用于电路仿真分析；
- **IBIS**: Input/output Buffer Information Specification，用于信号完整性分析等；

两种管理方式

集成化库



分立库



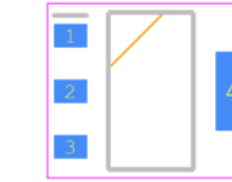
阅读元器件数据手册 - Datasheet



创建原理图符号
Symbol

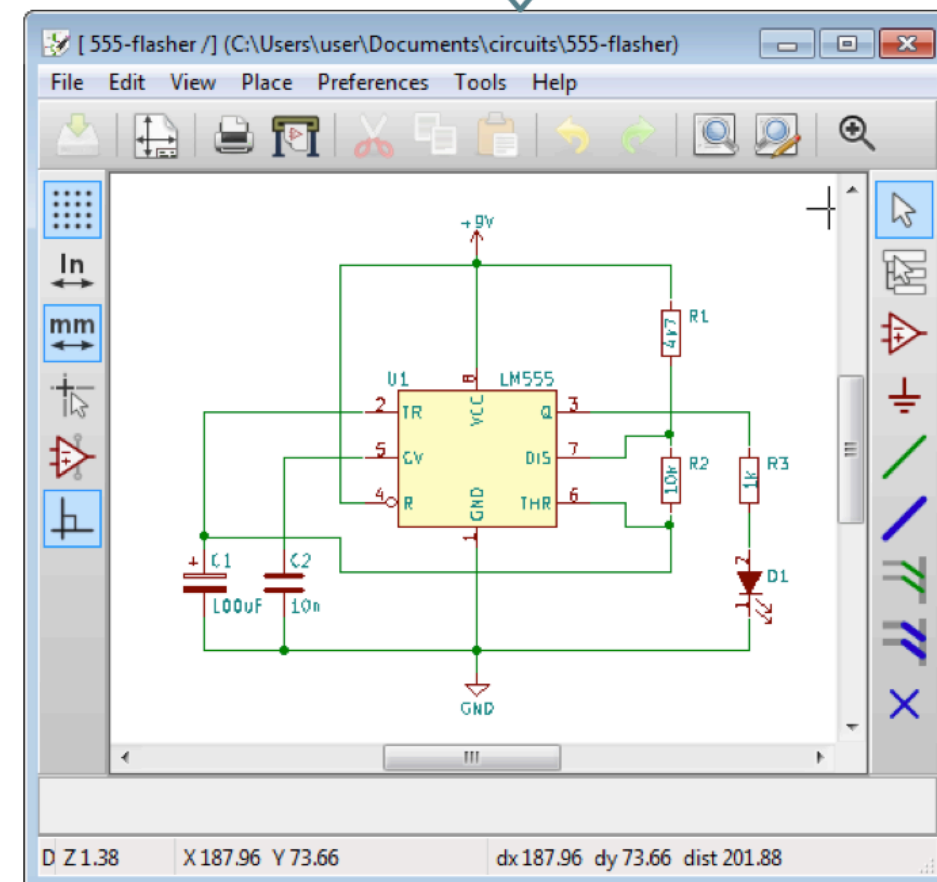
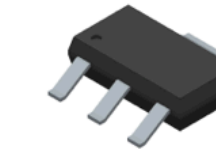


创建PCB封装
Footprint

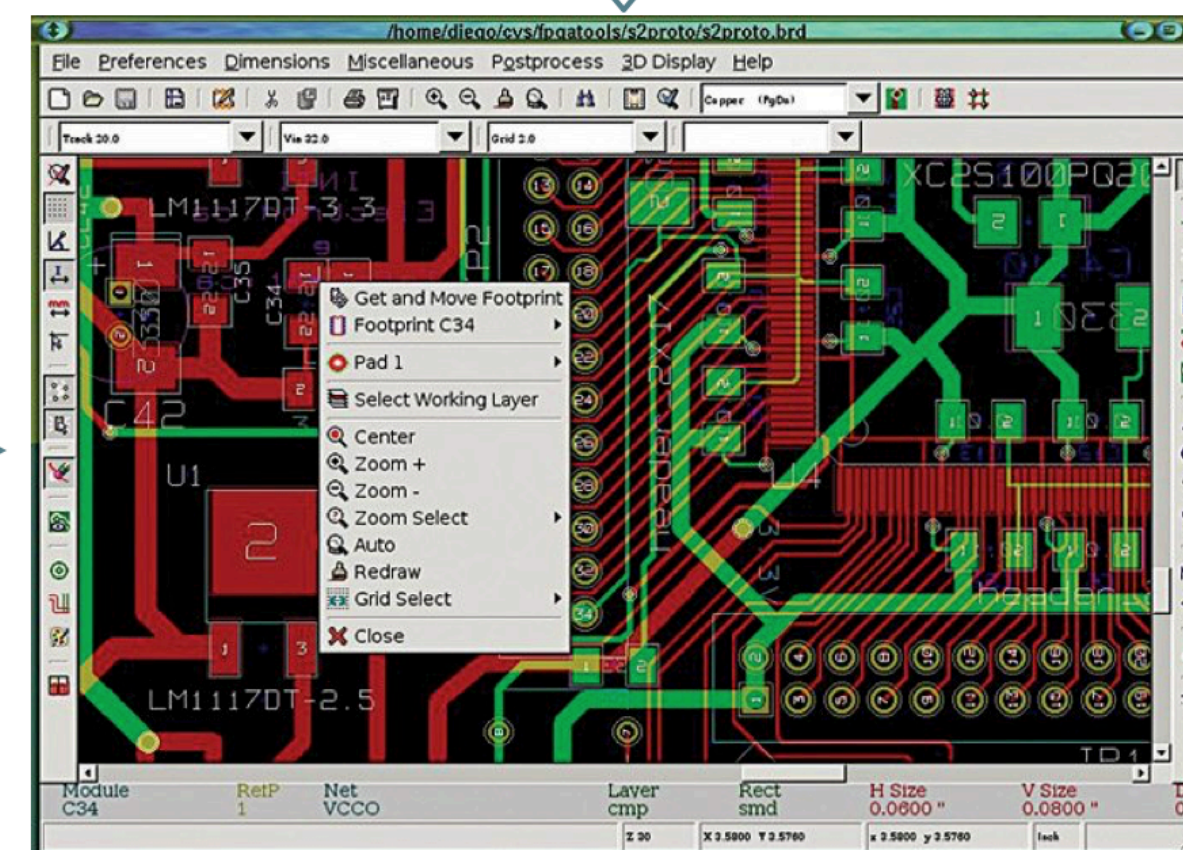


添加元器件
参数信息

导入3D模型
或构建3D模型

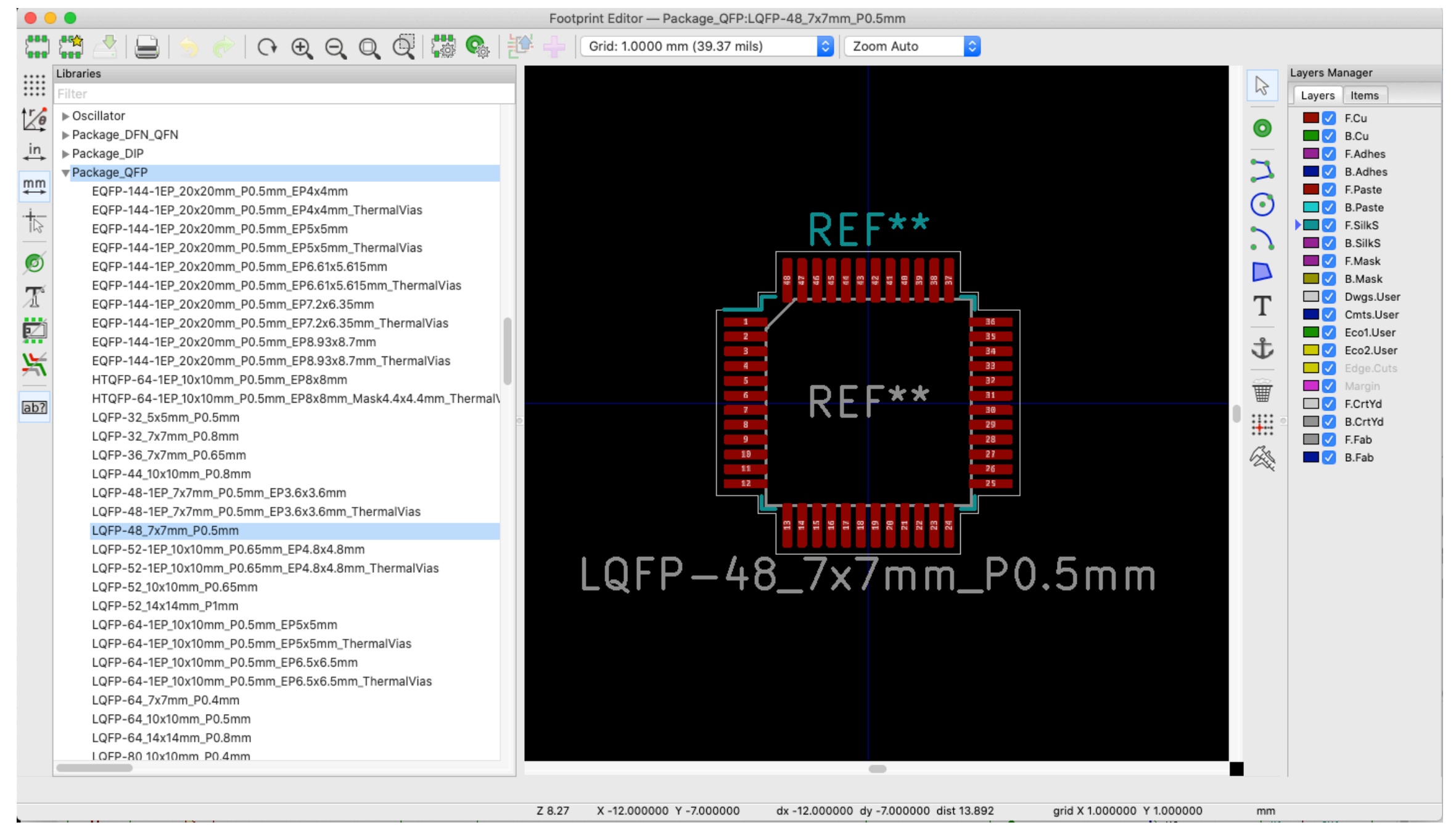
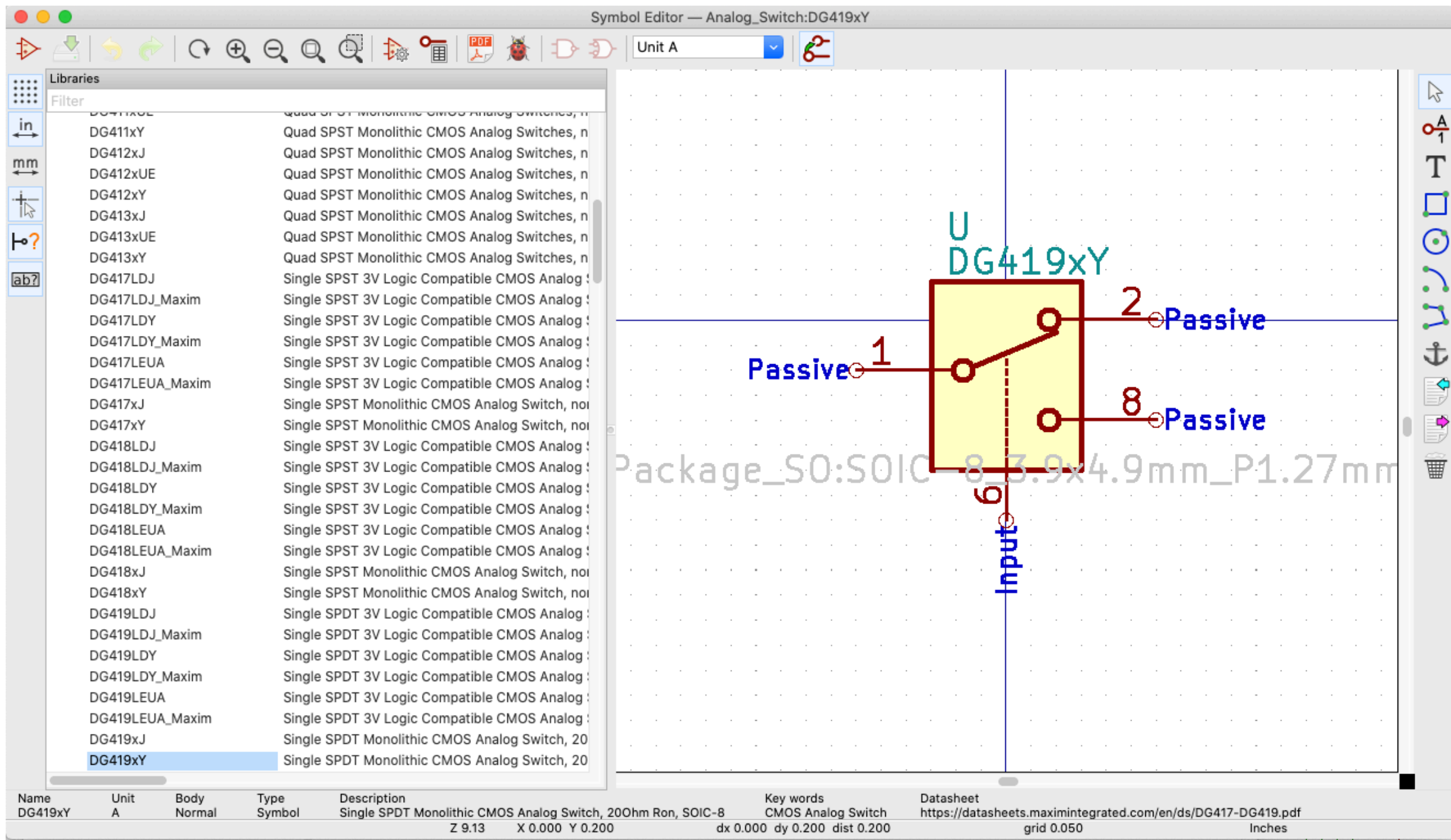


netlist



构建元器件库的几种方式

- ① 使用PCB设计工具自带的库，有时候需要做修改
- ② 从现有参考设计原理图中提取，有时需要做格式转换
- ③ 从专业的库资源网站下载
- ④ 从原厂的官网下载
- ⑤ 自己基于器件的数据手册自己创建

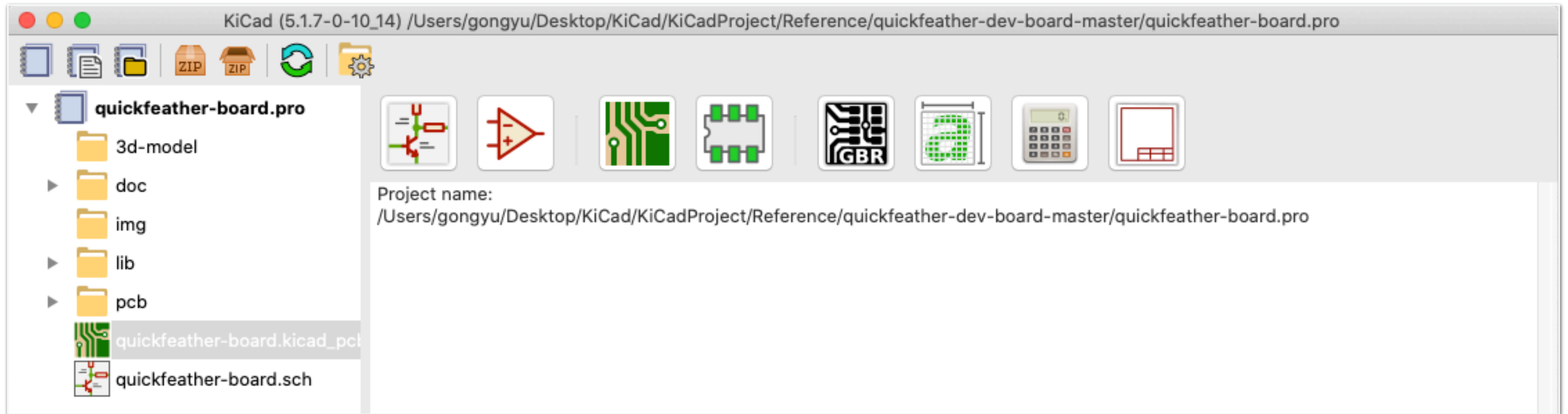


- 每种EDA工具都有自带的原理图库，一般是通用的器件，可以根据需要选装
- 自带的原理图库不一定适合自己的风格需要，有时可以根据自己的需要进行修改
- 专用元器件需要自建，最好形成统一的风格

调用PCB工具自带的元器件库

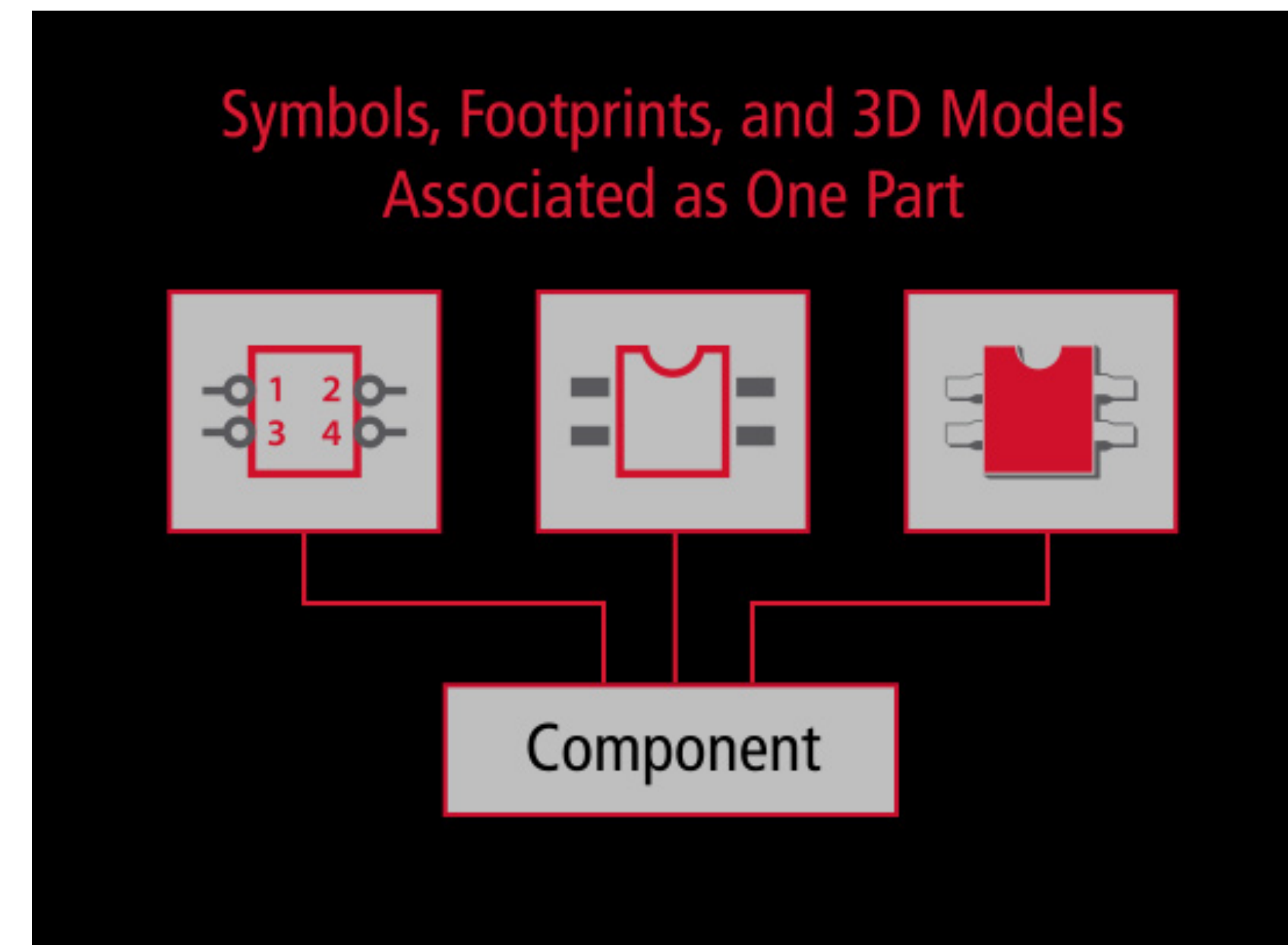
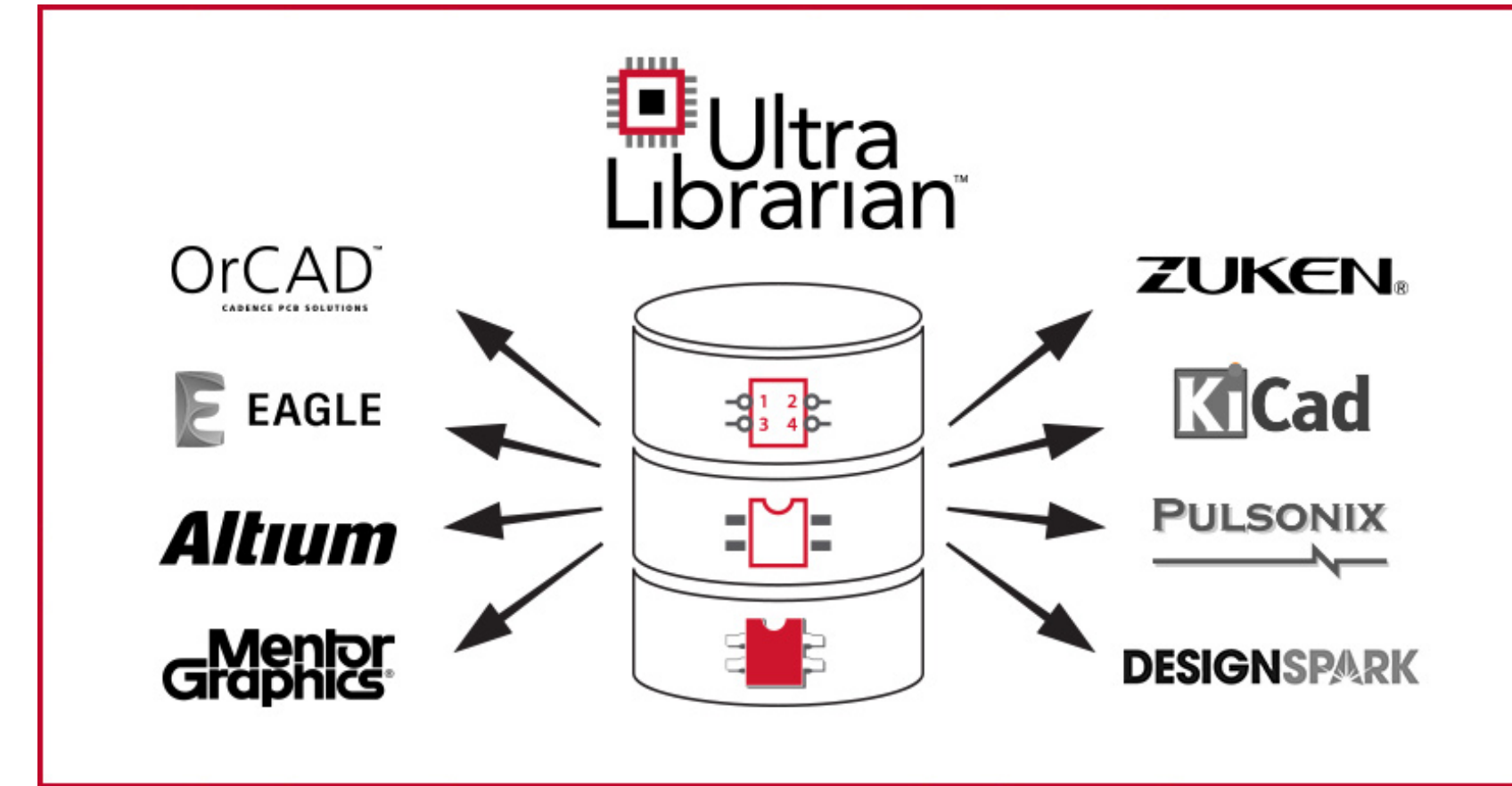
从现有可靠的参考设计中提取

- 能够加速设计，至少可以提供参考，在此基础上进行调整
- 厂商提供的参考设计
- 其他人分享的设计源图
- 需要认真验证



器件原厂提供的元器件库

- BXL = Binary eXchange Language
- TI、ADI、Maxim、Microchip、Silicon Labs、NXP、TE
- 包含了原理图符号、PCB封装、3D模型
- IPC7351-B



Symbols For ADM3053

Parts Offered	Symbols File
ADM3053BRWZ	BXL

专业库资源下载网站



Pricing

Models

max232



Displaying 1 - 50 of 216 Results

Manufacturer Name	Manufacturer Part Number	Formats Available	Previews	Choose Part
Maxim Integrated Products	MAX232ACPE		Preview	Download
Maxim Integrated Products	MAX232ACPE+		Preview	Download
Maxim Integrated Products	MAX232ACPE+WCC1		Preview	Download
Maxim Integrated Products	MAX232ACPE16		Preview	Download
Maxim Integrated Products	MAX232ACPE16_2		Preview	Download
Maxim Integrated Products	max232acse		Preview	Download
Maxim Integrated Products	MAX232ACSE+		Preview	Download
Maxim Integrated Products	MAX232ACSE+T		Preview	Download
Maxim Integrated Products	MAX232ACSE+TWCC1		Preview	Download
Maxim Integrated Products	MAX232ACSE+WCC1		Preview	Download
Maxim Integrated Products	MAX232ACSE-T		Preview	Download
Maxim Integrated Products	MAX232ACSE16		Preview	Download

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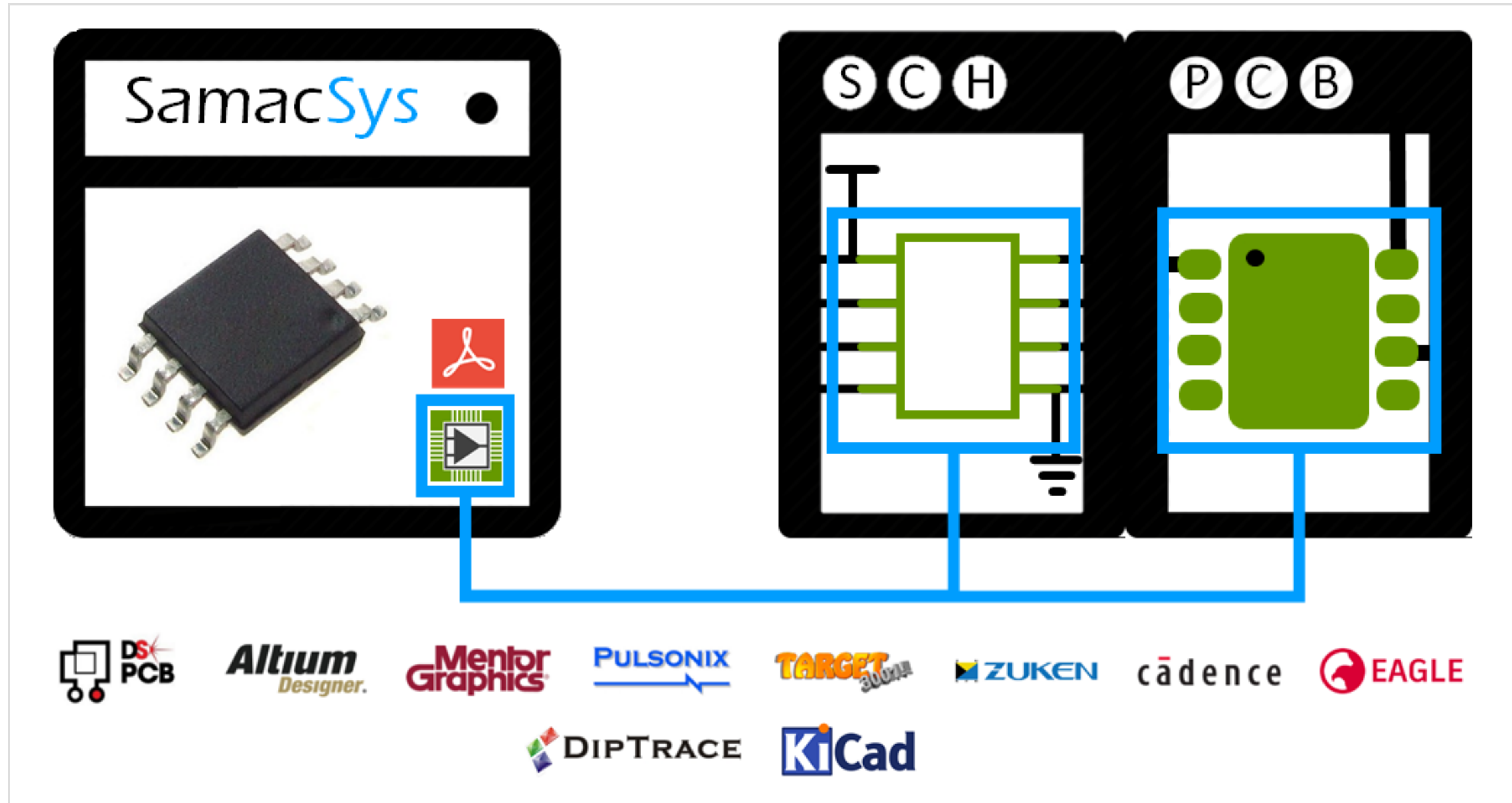
Choose between 20+ different CAD tool formats including Altium and Cadence Allegro

Download

Download symbols, footprints and 3D models

www.datasheet5.com

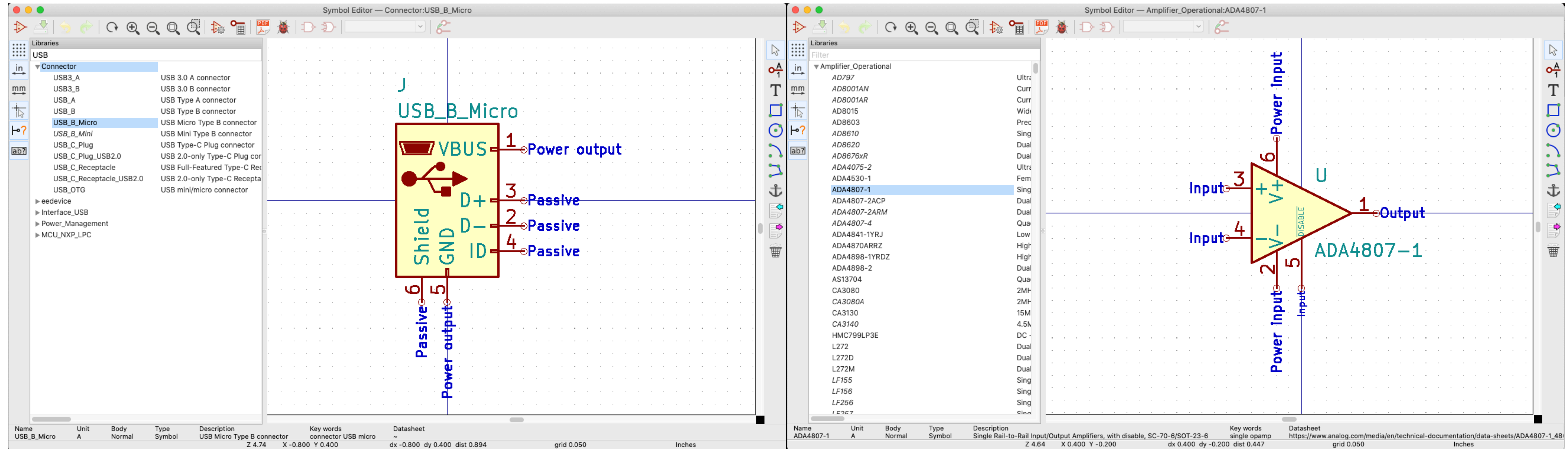
- (www.samacsys.com)





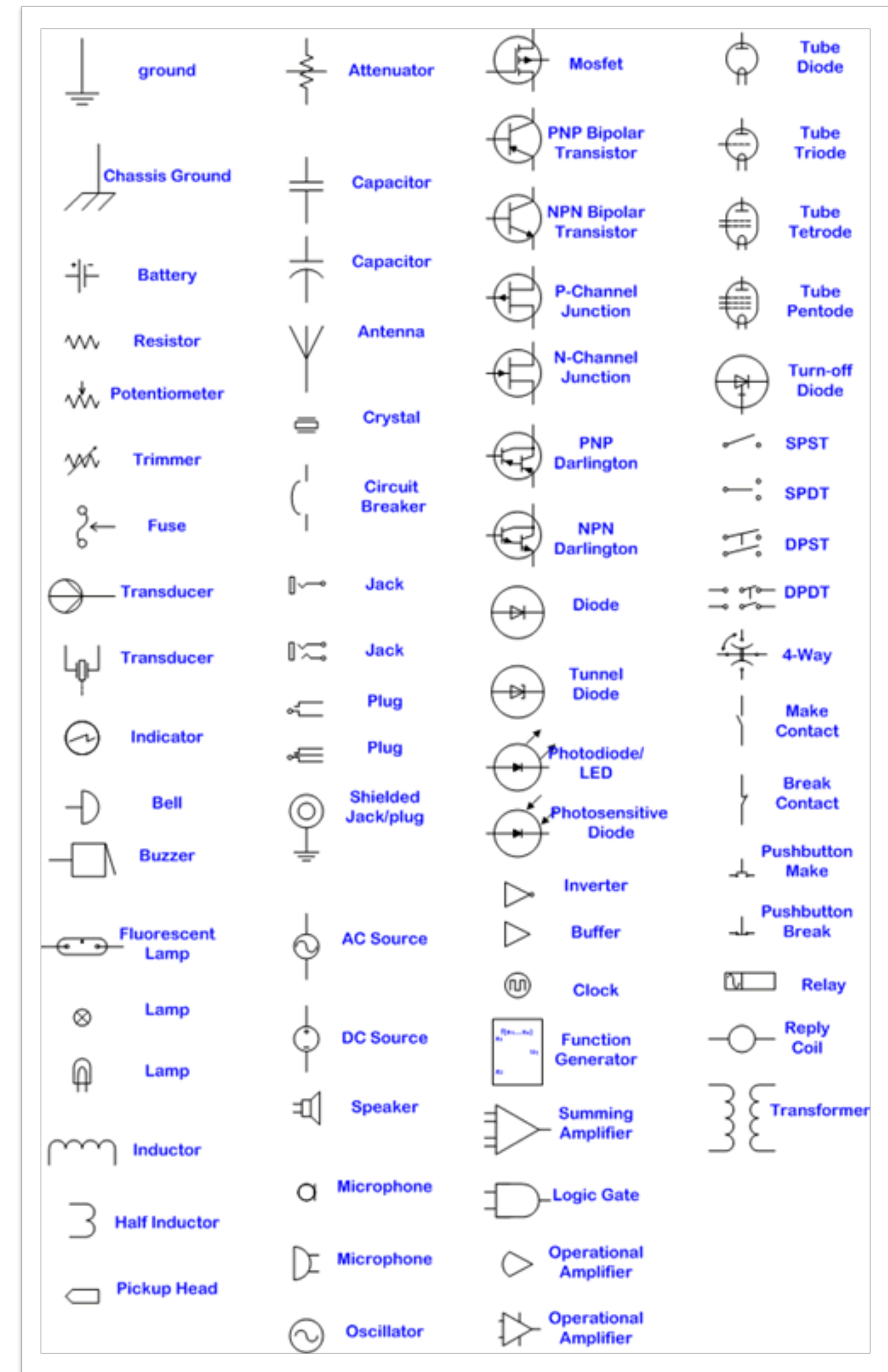
原理图库 (symbol) 的构建

原理图符号 - 对器件功能的图形化表示



常用器件的原理图符号

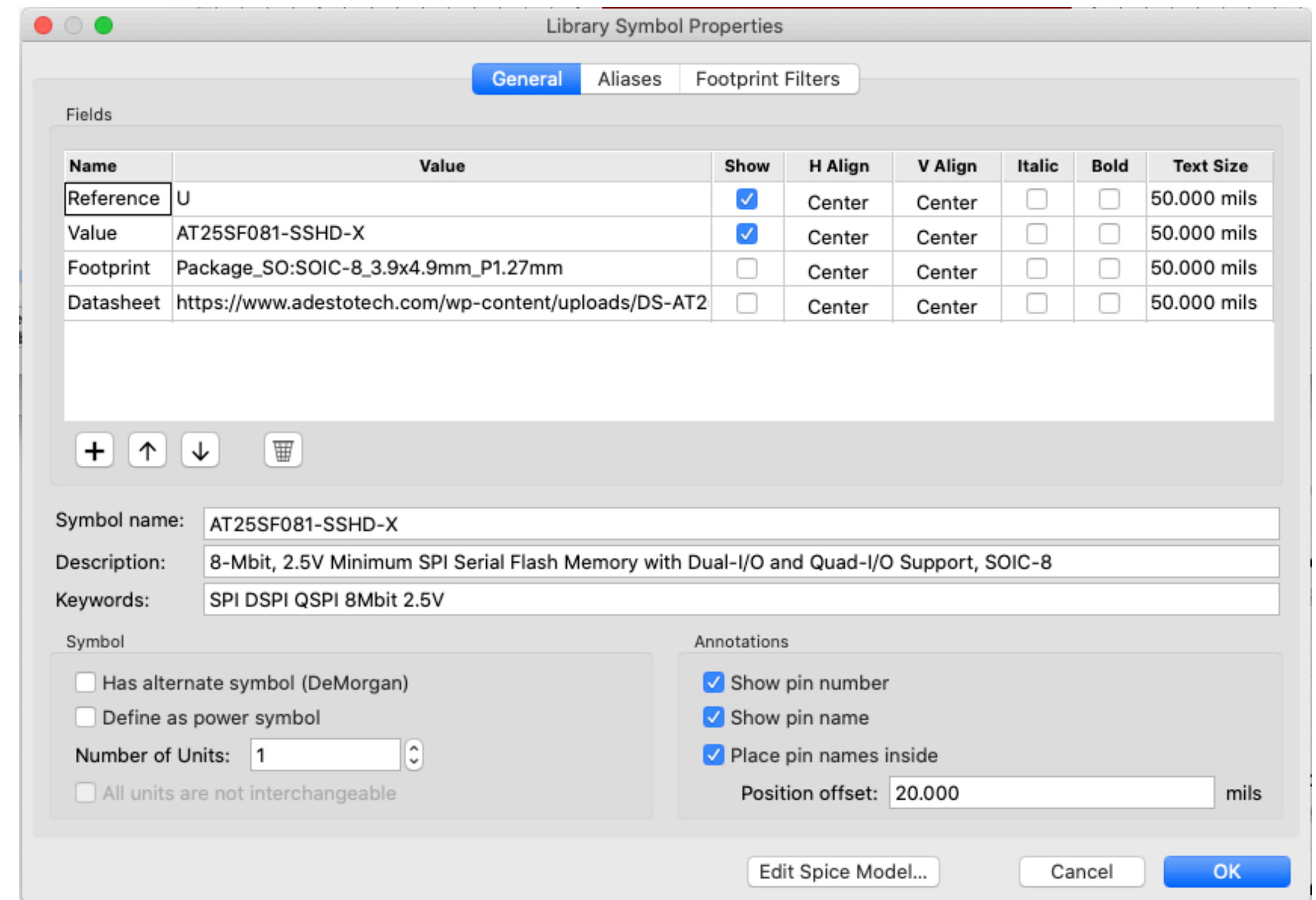
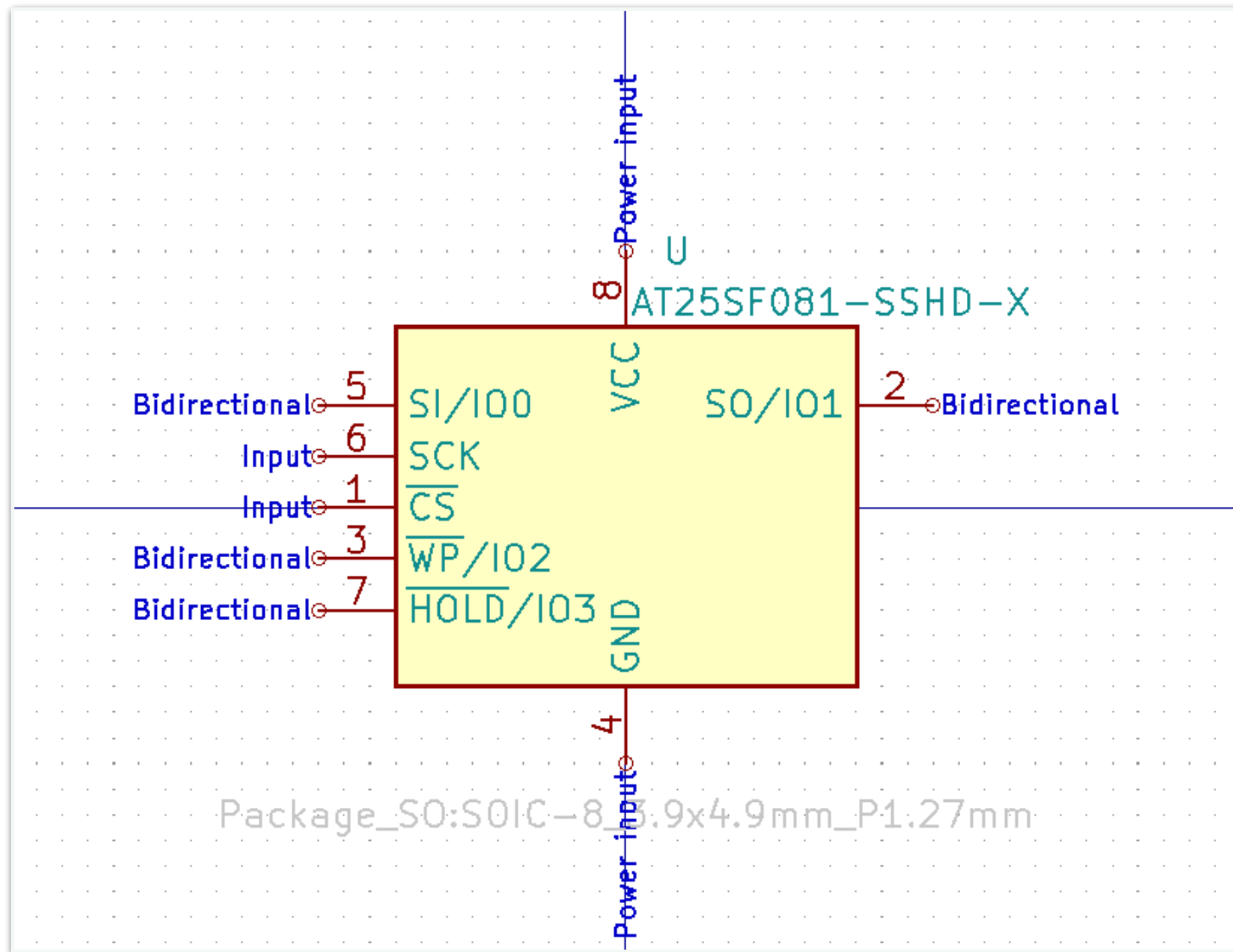
- 常用的器件有约定俗成的符号，便于阅读
- 在设计中可以做大小的调整，但不建议做样式的修改
- 多数EDA工具自带标准的原理图符号库，但一定要确保自己所使用的器件与其对应 - 管脚的命名和排序
- 确保原理图符号的管脚命名与封装库的管脚命名一致



U STM32G491CCU6			
Bidirectional	9 PA1/ADC12/OP6_M/OP1_P/OP3_P	VDDA	21 Power input
Bidirectional	15 PA7/ADC2/OP1_P/OP2_P	Vref+	20 Power input
Bidirectional	12 PA4/DAC1_1/ADC2		
Bidirectional	44 PB6/UART1_TX	VBAT	1 Power input
Bidirectional	45 PB7/UART1_RX	VDD	48 Power input
		VDD	35 Power input
Bidirectional	8 PA0/ADC12	VDD	23 Power input
Bidirectional	10 PA2/ADC1/OP1_O		
Bidirectional	11 PA3/ADC1/OP1_M/OP1_P	VSS	49 Power input
Bidirectional	13 PA5/DAC1/ADC2/OP2_M		
Bidirectional	14 PA6/ADC2/OP2_O	USB_DM	33 Bidirectional
Bidirectional	16 PC4/ADC2	USB_DP	34 Bidirectional
Bidirectional	17 PB0/ADC1/ADC3/OP2_P/OP3_P		
Bidirectional	18 PB1/ADC1/ADC3/OP3_O/OP6_M	PF0-OSC_IN	5 Bidirectional
Bidirectional	19 PB2/ADC2/OP3_M	PF1-OSC_OUT	6 Bidirectional
Bidirectional	22 PB10/OP3_MQFP48-7x7mm		
Bidirectional	24 PB11/ADC12/OP6_O		
Bidirectional	25 PB12/ADC1/OP6_P	PG10-NRST	7 Bidirectional
Bidirectional	2 PC13/RTC_O		
Bidirectional	3 PC14-OSC32_IN		
Bidirectional	4 PC15-OSC32_OUT		
Bidirectional	46 PB8-BOOT0		
Bidirectional	47 PB9/IR_OUT	SWDIO_JTMS	36 Bidirectional
		SWCLK_JTCK	37 Bidirectional
Bidirectional	28 PB15/SPI2_MOSI/ADC2_15		
Bidirectional	38 PA15/SPI3_NSS	PC10/SPI3_SCK	39 Bidirectional
Bidirectional	41 PB3/SPI3_SCK	PC11/SPI3_MISO	40 Bidirectional
Bidirectional	42 PB4/SPI3_MISO		
Bidirectional	43 PB5/SPI3_MOSI		
Bidirectional	30 PA8/I2C2_SDA	PB13/SPI2_SCK/OP3_P/OP6_P	26 Bidirectional
Bidirectional	31 PA9/I2C2_SCL	PB14/SPI2_MISO/ADC1/OP2_P	27 Bidirectional
Bidirectional	32 PA10/I2C2_SMBA	PC6	29 Bidirectional

- 准确 - 每一个管脚的属性
- 直观 - 功能、信号流程
- 大小 - 方便连接
- 位置 - 基准点

原理图符号的基本要素

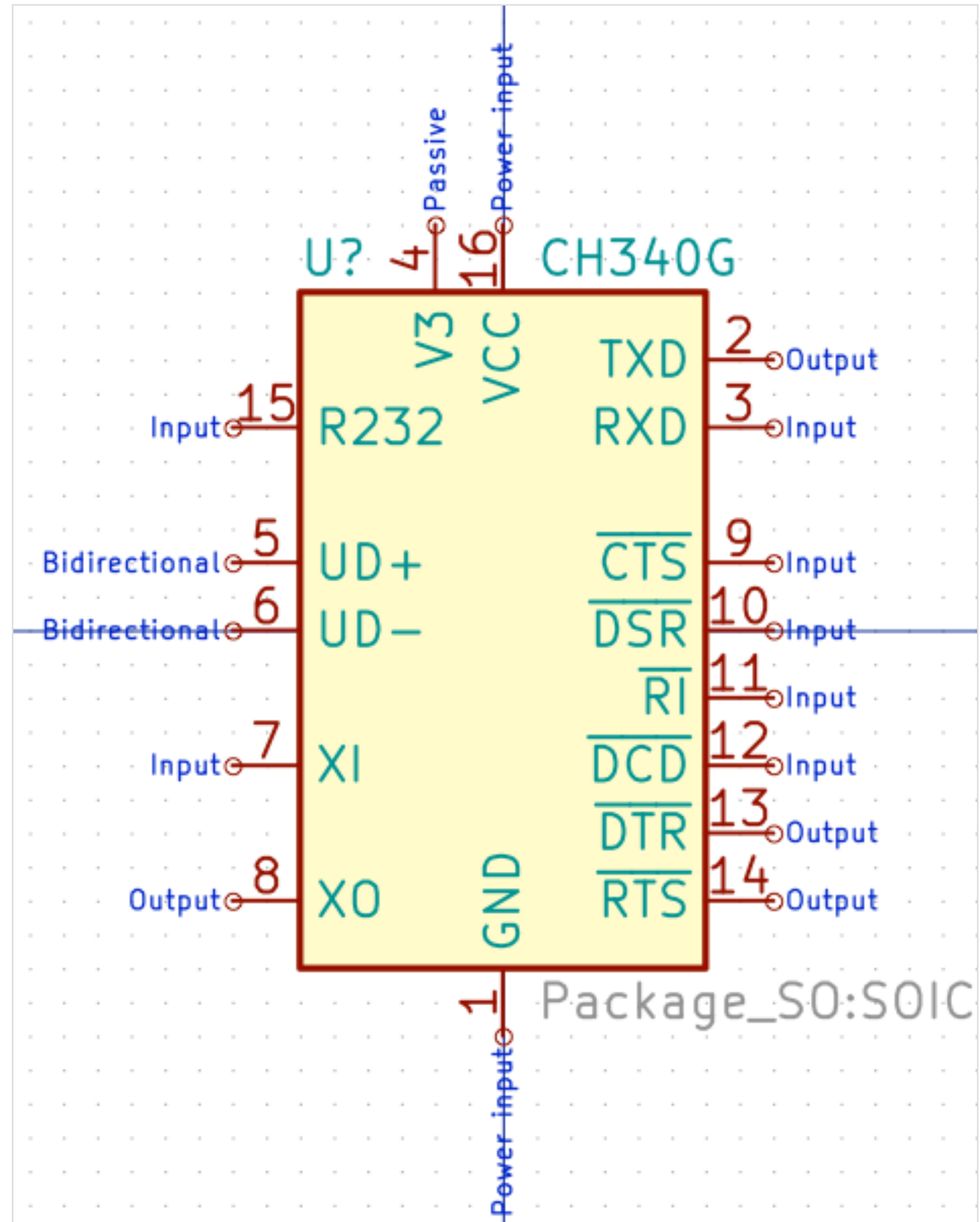


- 轮廓形状 - 便于辨识
- 管脚 - 命名、输入/输出、属性、时钟、电源/地（有时隐藏）
- Grid - 固定清晰的间距，保证原理图的连接不出问题
- 设定原点坐标

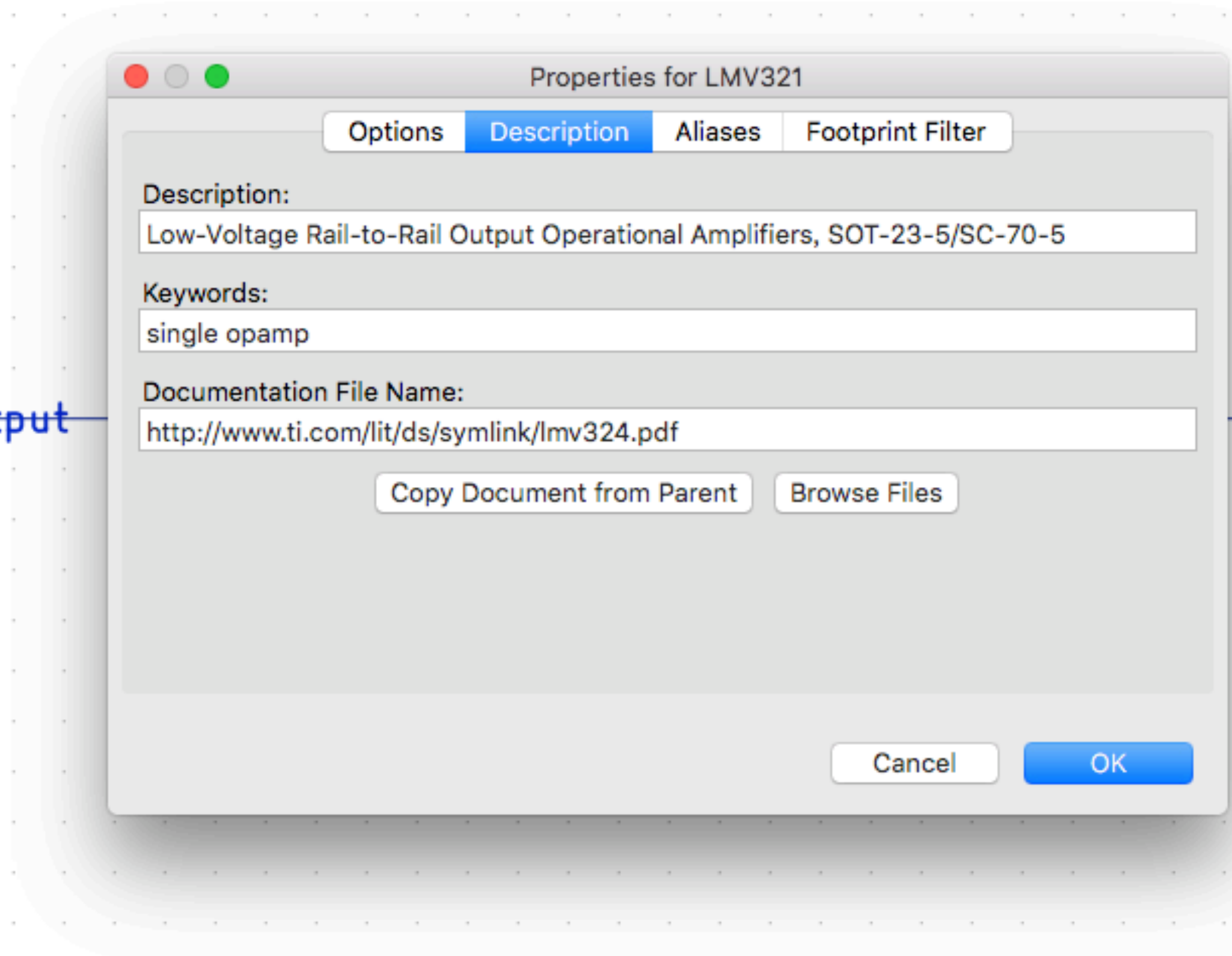
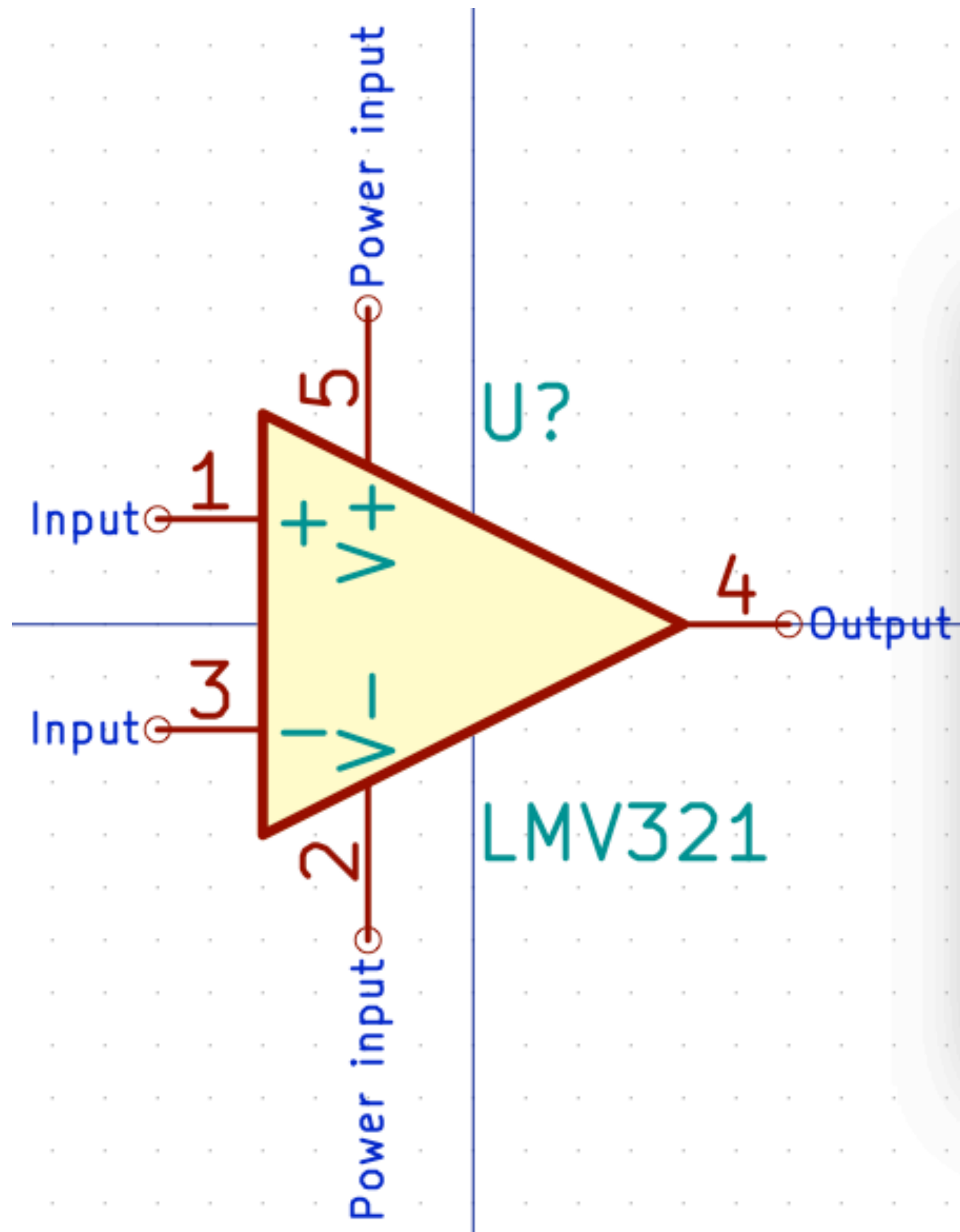
标注信息：

- Designator - U?
- Comment - 型号 (TCN75) 或值 (0.1uF)
- Description - Serial temperature sensor

原理图符号上的管脚



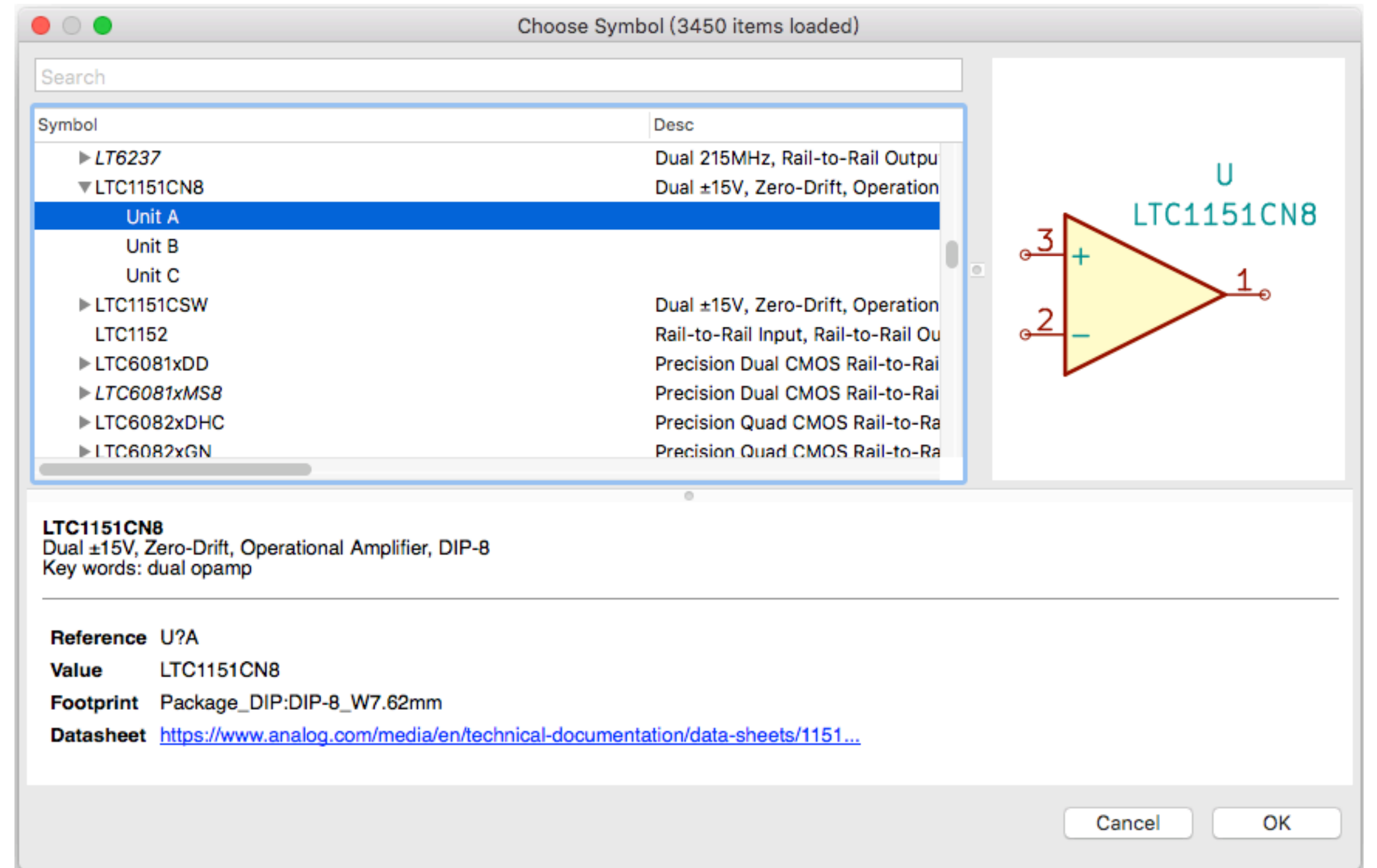
- 尺寸 / 管脚间距：适合在电路图上摆放
- IC的管脚排列：注意电路图上信号流走向：电源（多路） / 地 / 输入（左） / 输出（右） / 时钟 / 参考源
- 注意隐藏管脚的统一命名，最好不要隐藏



描述：对于有型号的专用器件需要对其型号、描述、封装、厂商等进行详细定义

一个器件多个部分组成

- 一个器件 (Component) 可以由多个部分 (Part) 组成
- 一般用于内部多个相同的功能或者管脚比较多的器件
- 同一个器件的多个部分共享同一个器件编号, 比如U1
- 注意公共管脚 (电源、地、时钟等)
- 同一个bank的相关信号管脚以及电源信号最好画在一个Part里



原理图符号的检查

- 管脚数量
- 管脚方向
- 管脚的特性
- ERC
- 打印出来对照数据手册进行校对