



Politechnika
Wrocławska

Elektronika w automatyce

Schematy elektroniczne - podstawy

Wojciech Tarnawski

wojciech.tarnawski@pwr.edu.pl

www.w-tarnawski.pl



- Wstęp
- Schemat blokowy
- Schemat elektroniczny
- Elementy schematu

Schemat blokowy

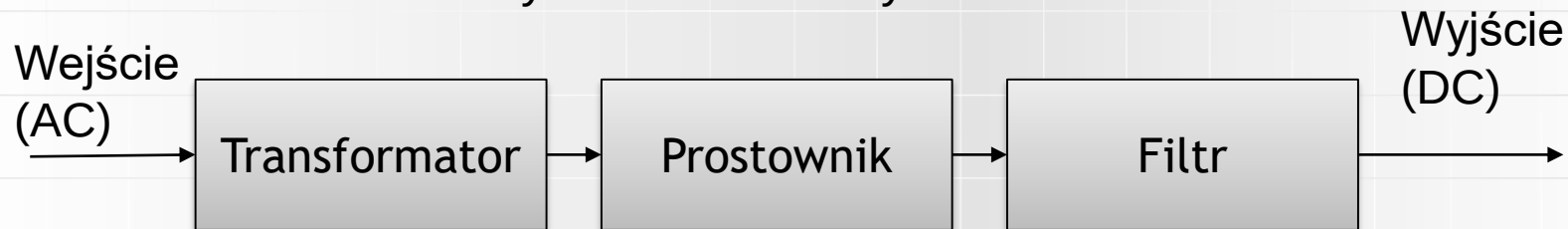
Schemat blokowy opisuje ogólną budowę urządzenia lub systemu elektronicznego.

Schemat taki może posłużyć do uproszczonej prezentacji obwodu, skupiającej się na niezbędnych funkcjach układu.

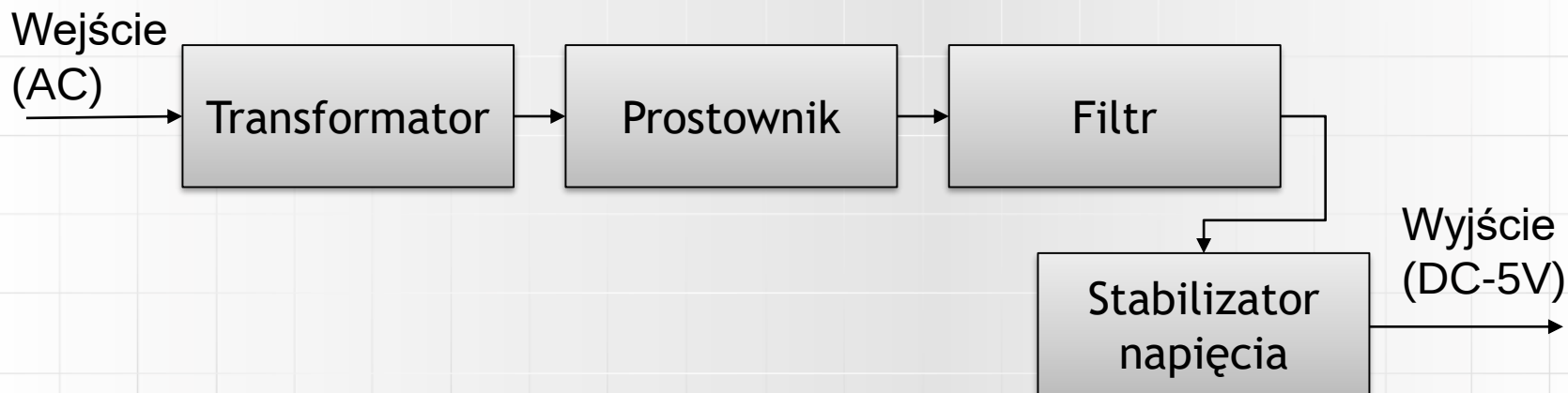
Schematy blokowe przydaje się w sytuacji, gdy nie musimy znać szczegółów pojedynczych komponentów, a chcemy tylko wiedzieć, jak ogólnie dany system działa.

Schemat blokowy

Zasilacz transformatorowy niestabilizowany



Zasilacz transformatorowy stabilizowany



Schemat elektroniczny, ideowy

- Schemat ideowy jest wizualną prezentacją połączeń między elementami
- Podczas jego tworzenia dobiera się również ostateczne wartości/modele elementów
- Błąd na tym etapie zwykle uniemożliwia uruchomienie urządzenia lub powoduje nieprawidłową jego pracę
- Tworzenie schematu wymaga dużej wiedzy od twórcy o elementach elektronicznych, zapoznania się z ich dokumentacją techniczną

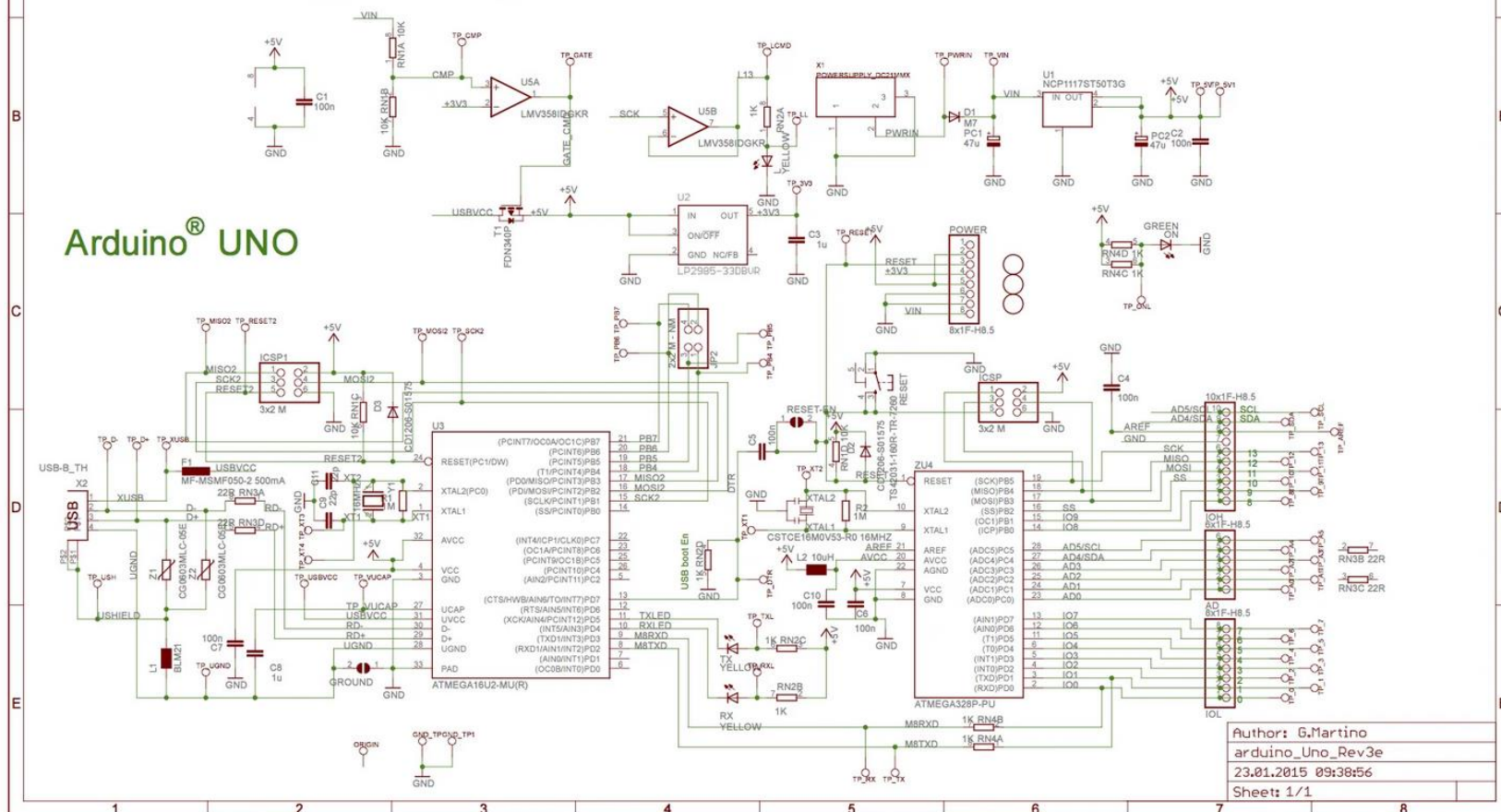


Schemat elektroniczny, ideowy

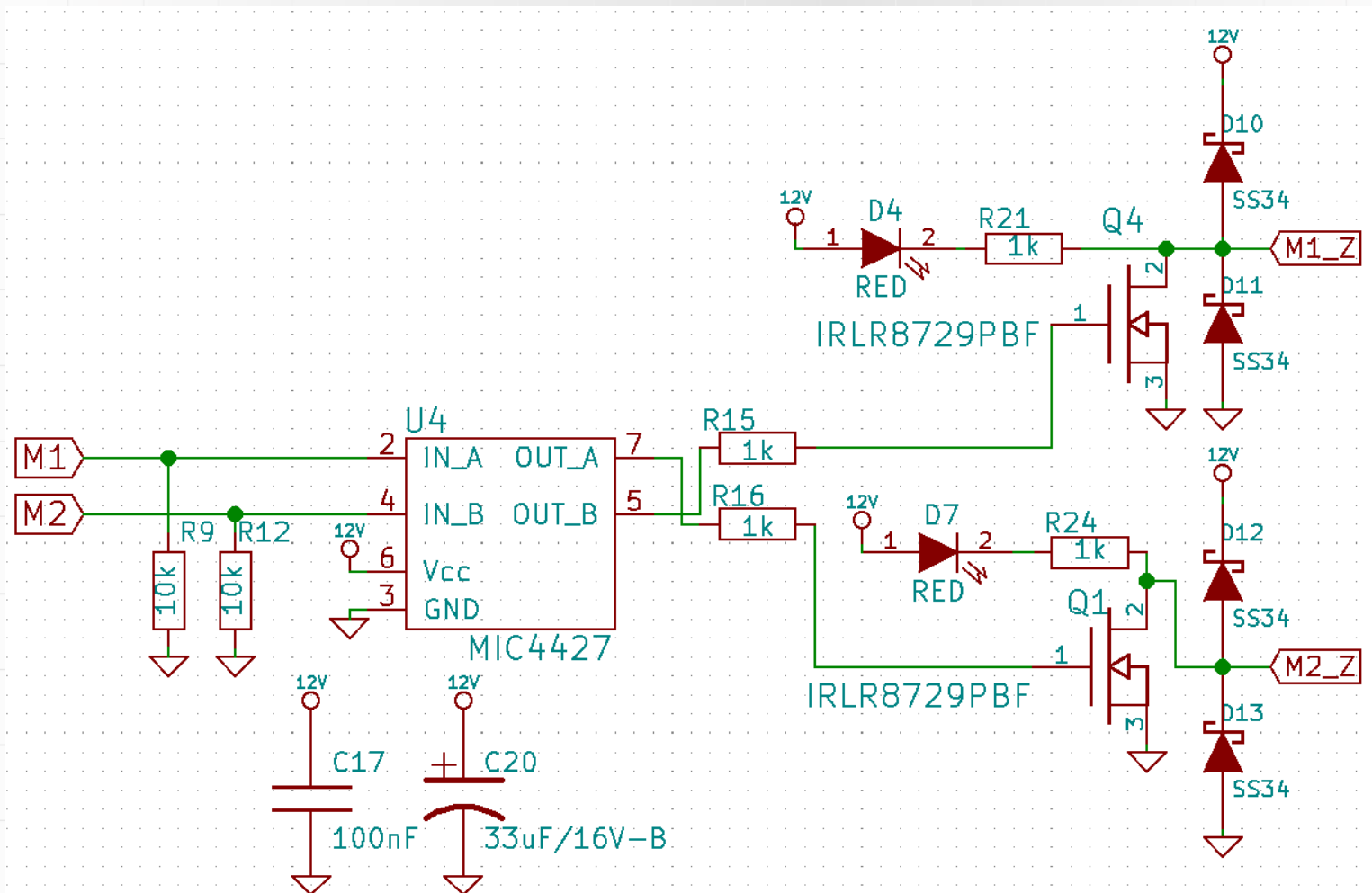
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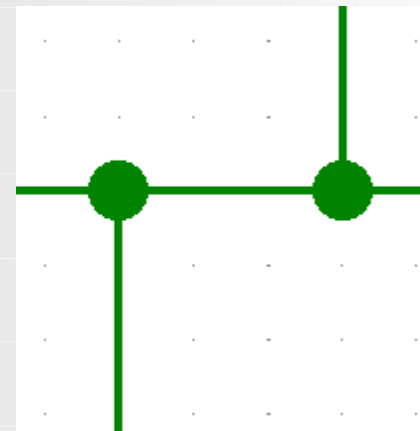
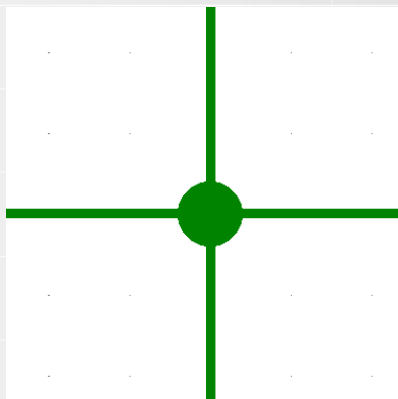
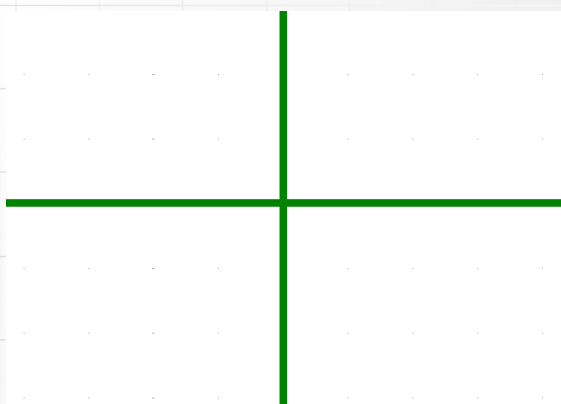
Arduino® UNO



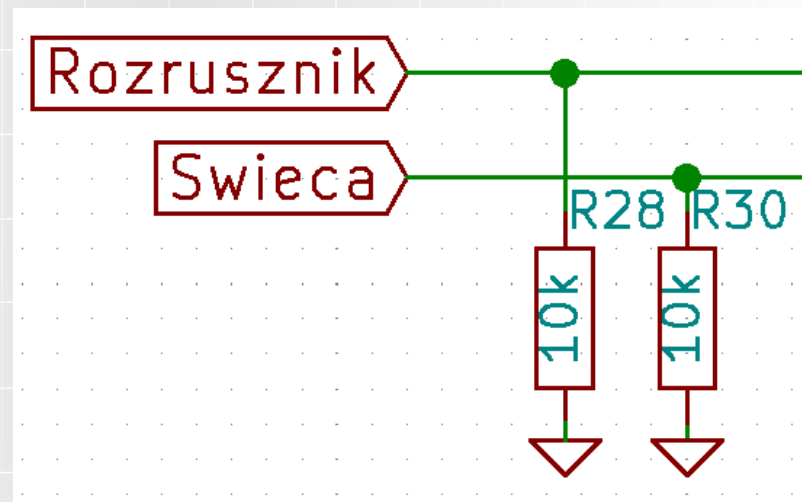
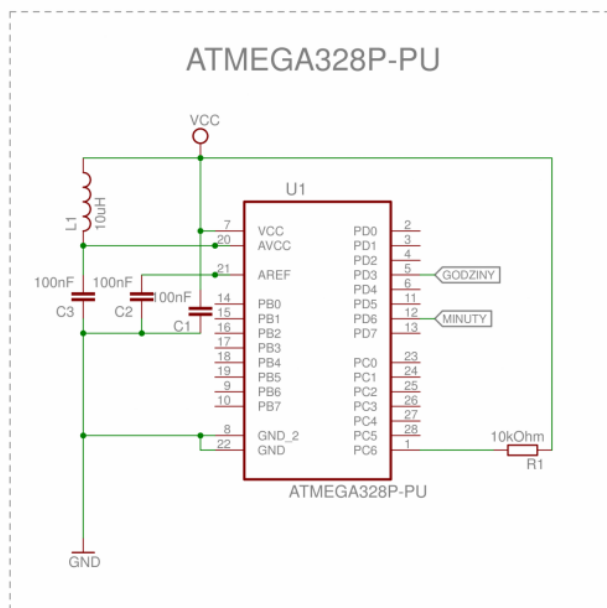
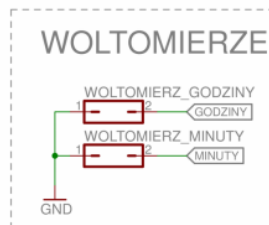
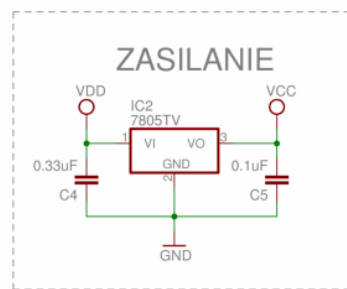
Schemat elektroniczny, ideowy



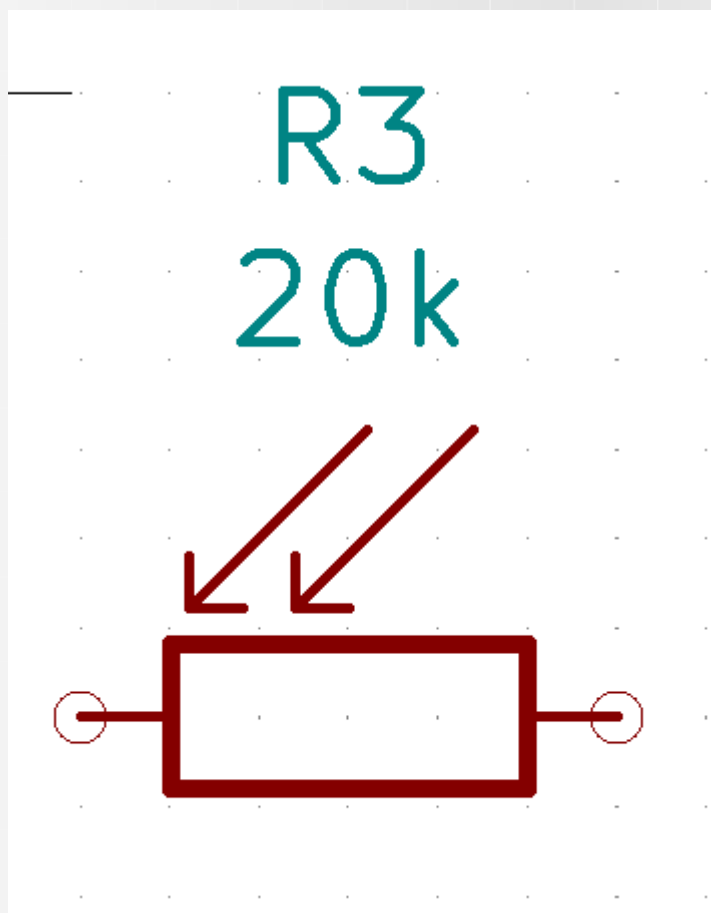
Przewody i ścieżki



Etykiety ścieżek, opisy



Etykiety, oznaczenia elementów



Tabliczka

Wersja dla studentów

Politechnika Wrocławska

Sheet: /

File: projekt.sch

Title: Układ zasilacza stabilizowanego

Size: A4

Date: 2021-10-06

Rev: V1.0

KiCad E.D.A. kicad (5.1.9)-1

Id: 1/1

4

5

6

D

Napięcie

+5V



VCC



+24V



BT1

CR2032



BT2

3xCR2032

Masa



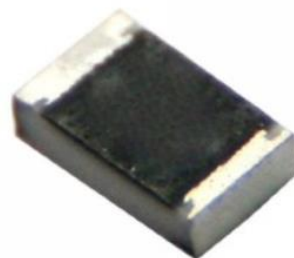
R L C

Rezystory

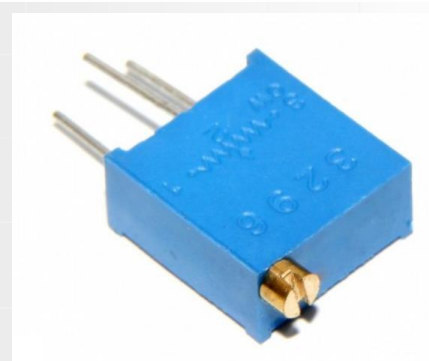
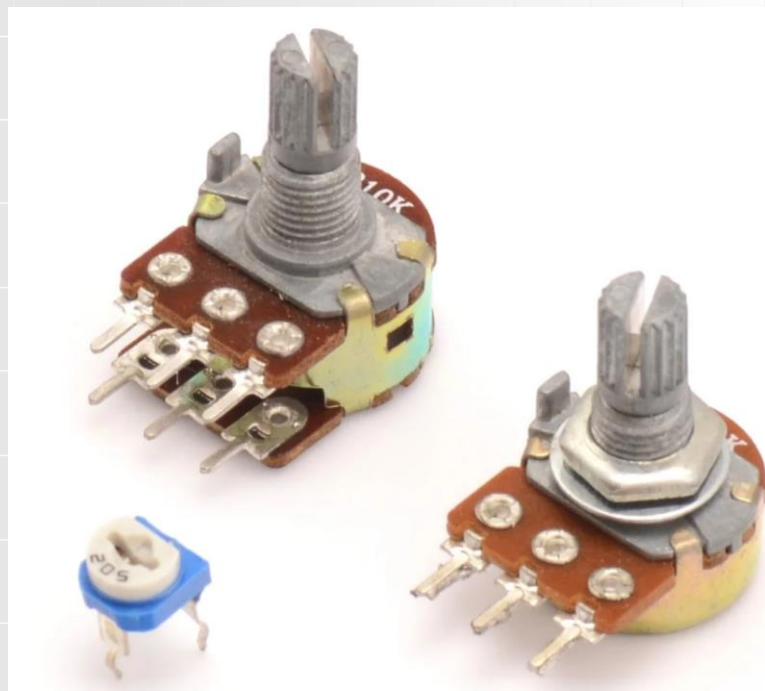
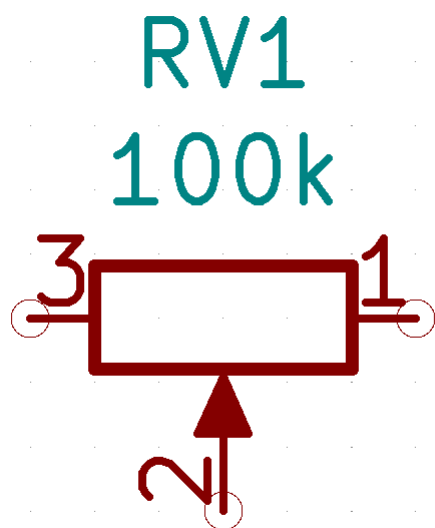
R1
100k



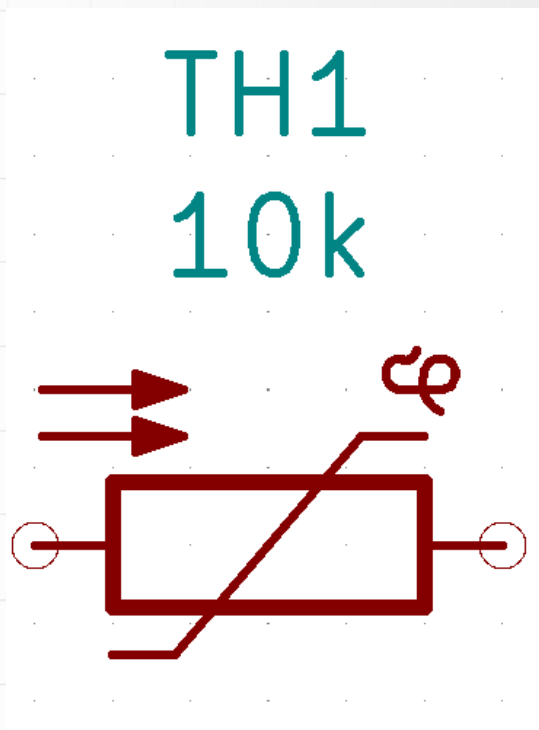
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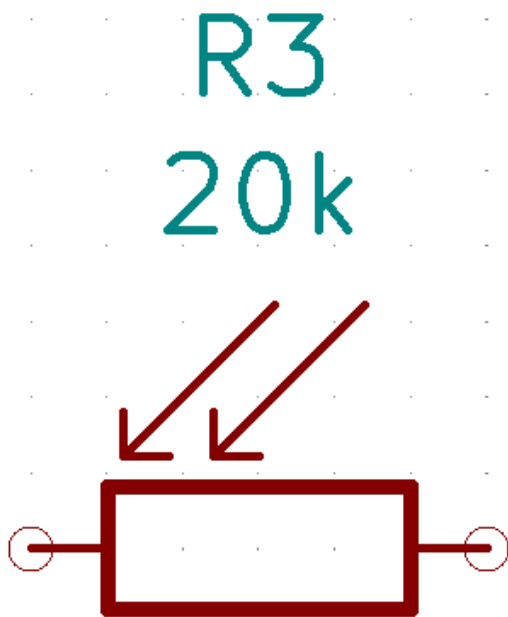
Potencjometry



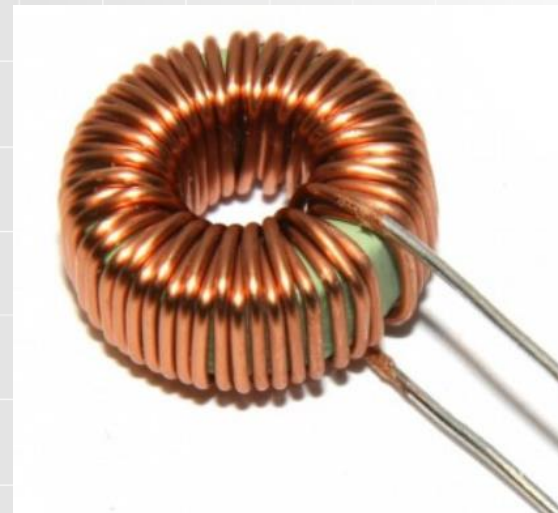
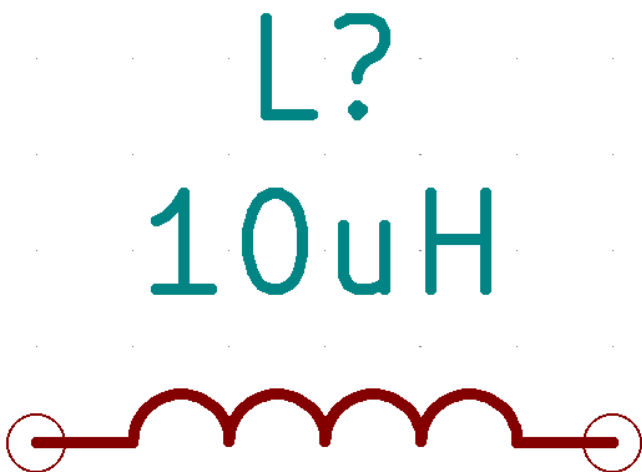
Termistory



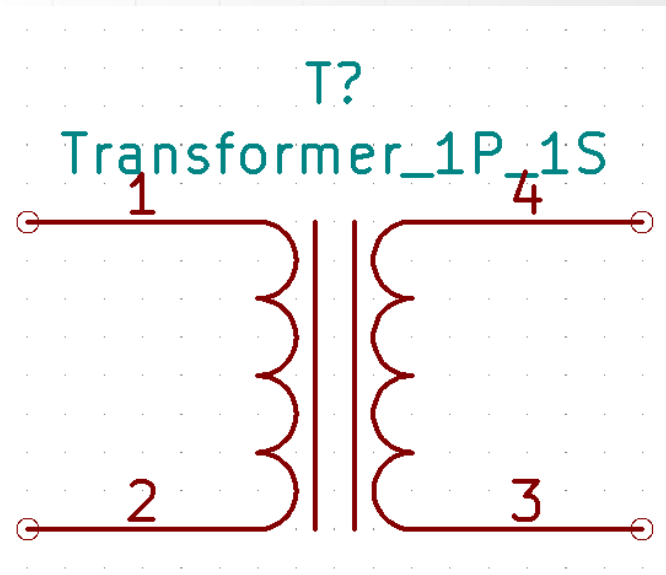
Fotorezystory



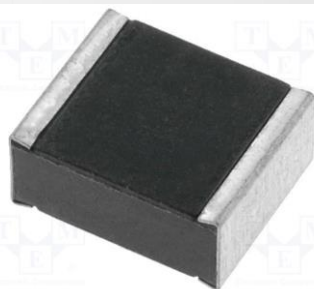
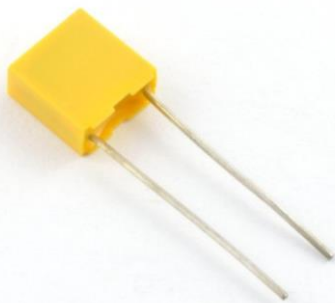
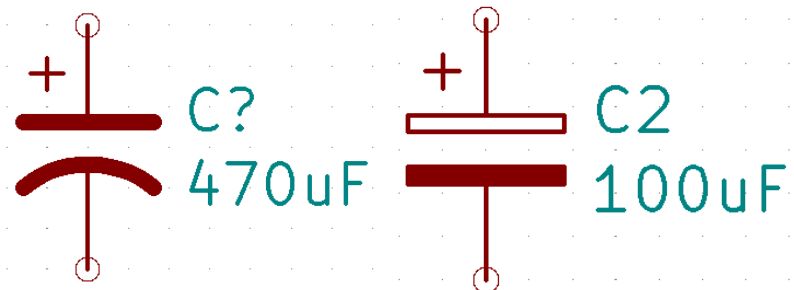
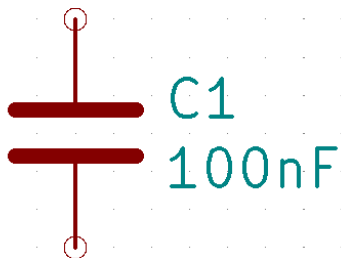
Cewki, dławiki



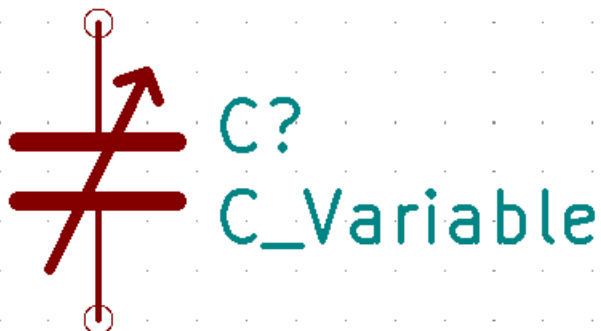
Transformator



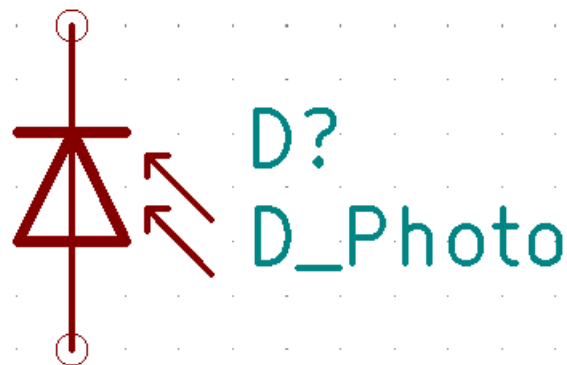
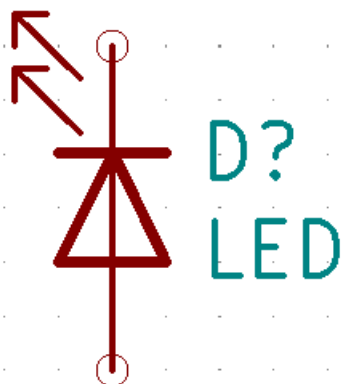
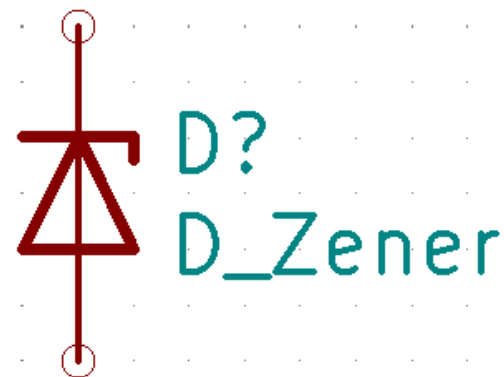
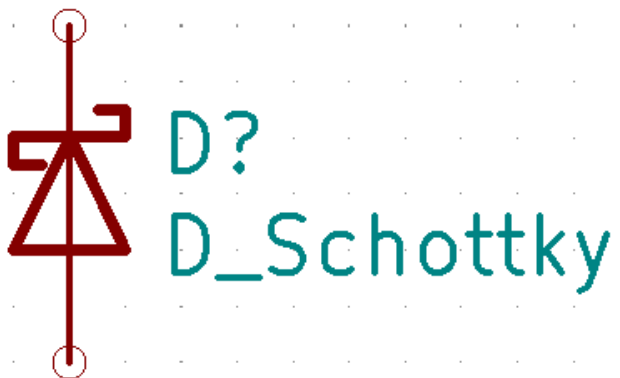
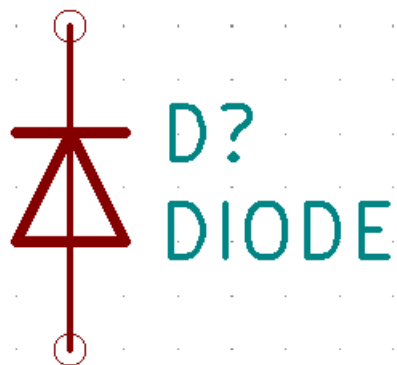
Kondensatory



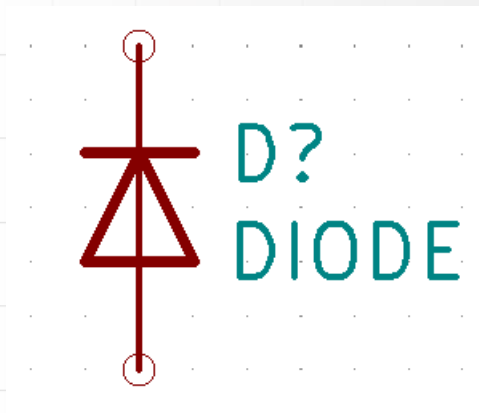
Kondensatory zmienne, trymery



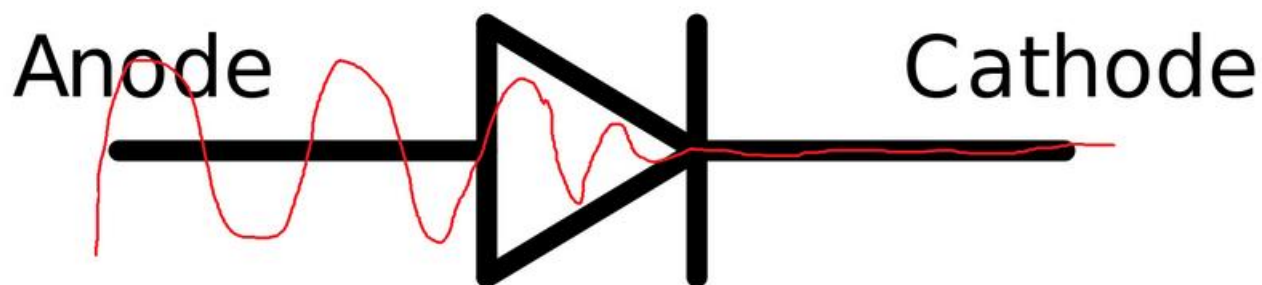
Szczegóły są najważniejsze



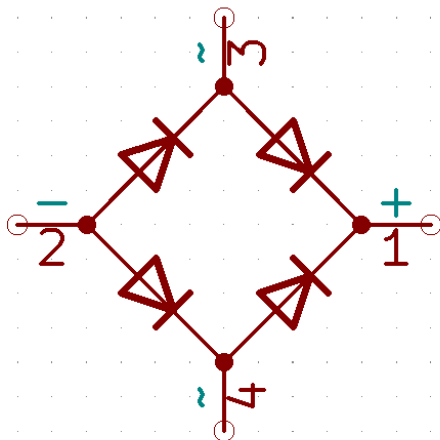
Diody prostownicze



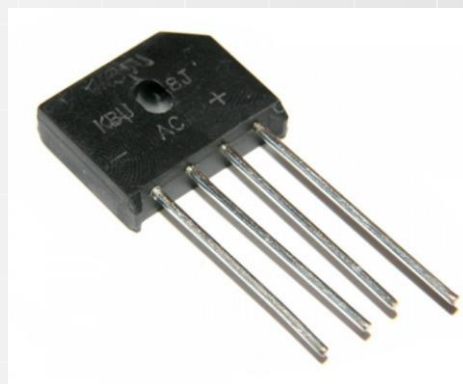
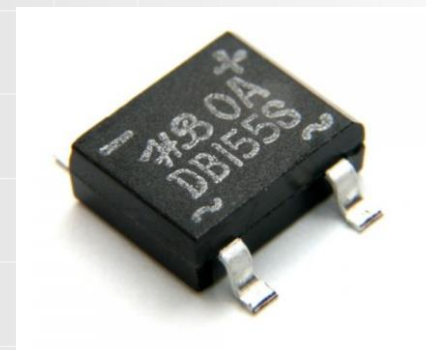
Dioda prostownicza-prostuje?



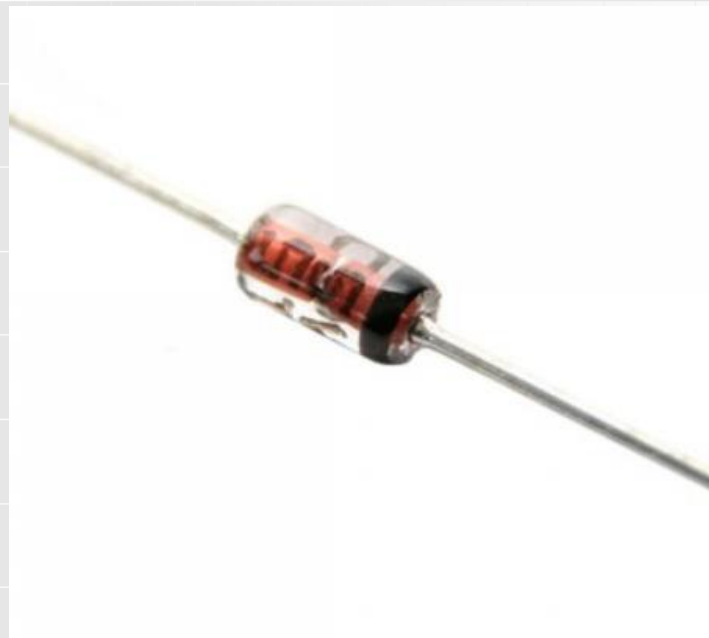
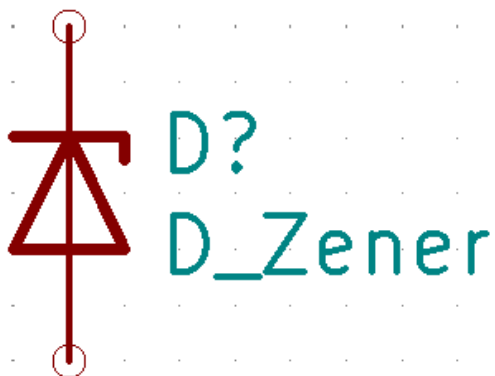
Mostki prostownicze



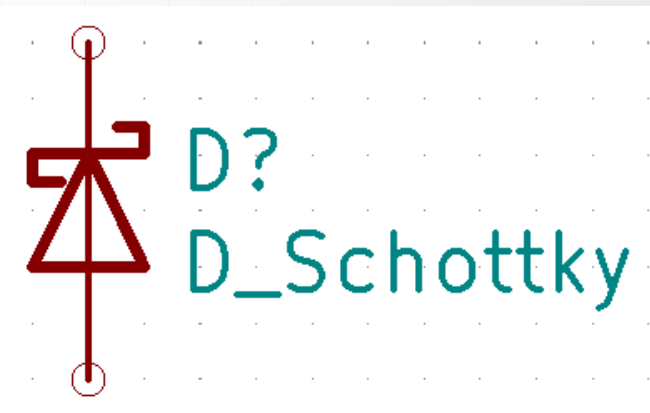
D?
D_Bridge_+ - AA



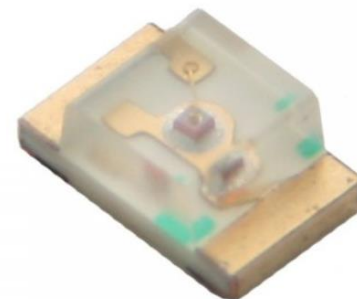
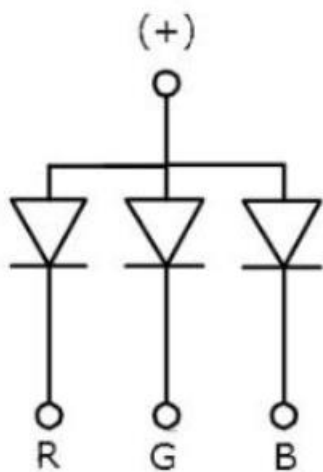
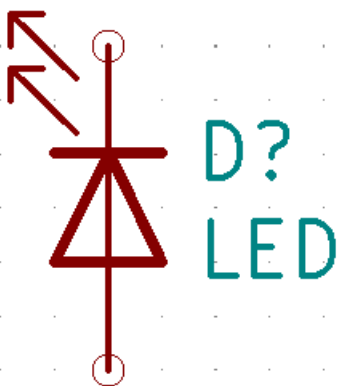
Diody Zenera



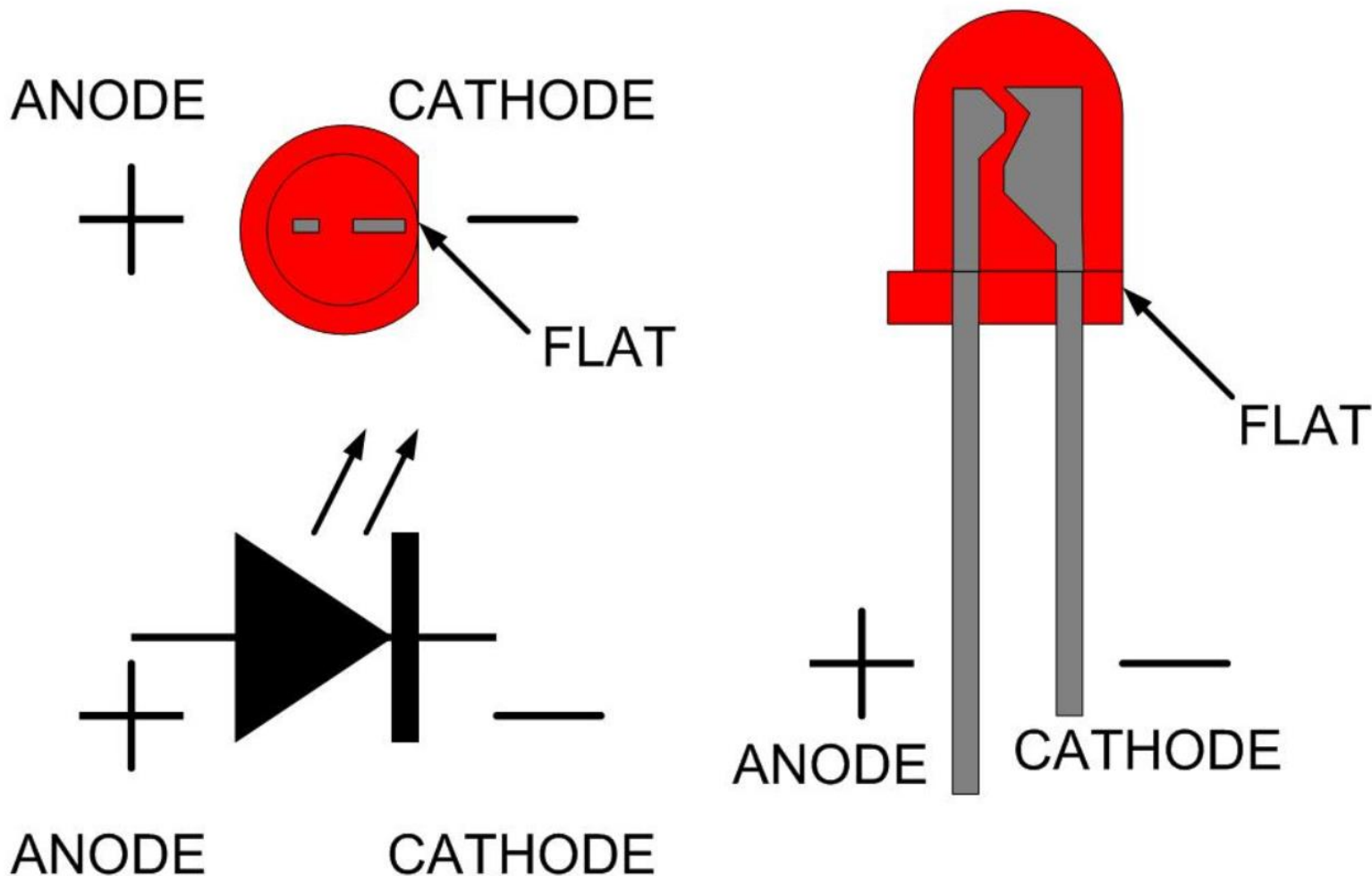
Diody Schottky, impulsowe



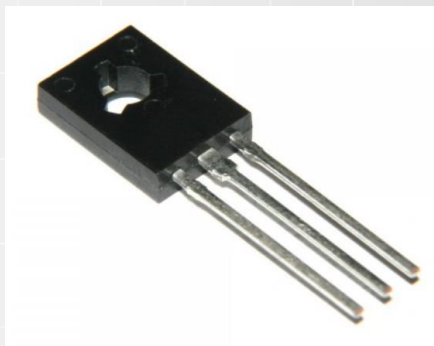
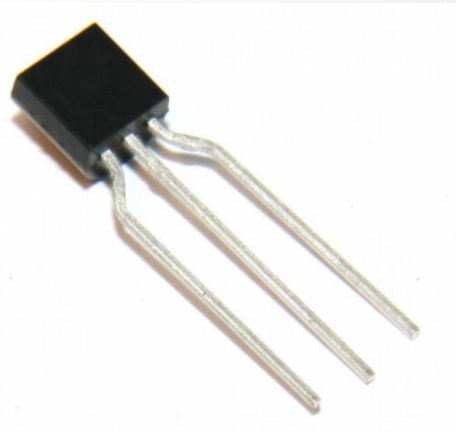
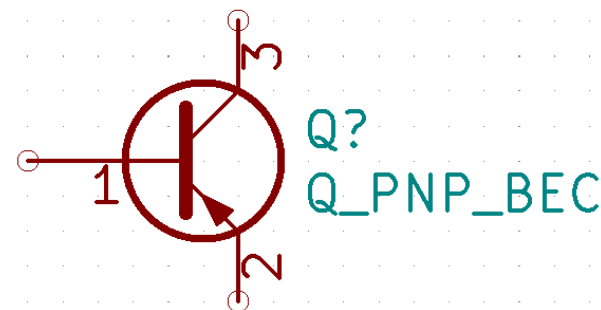
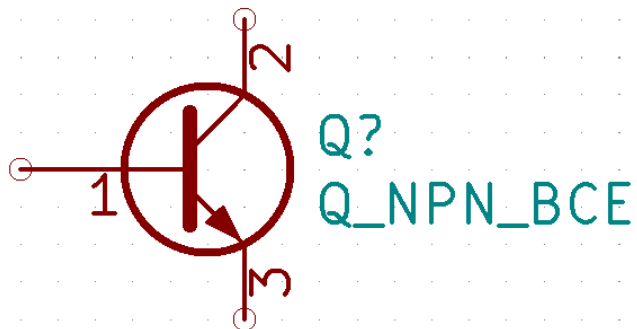
Diody LED



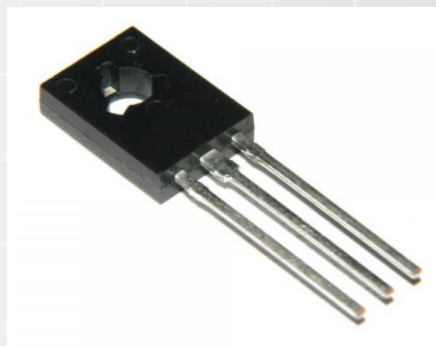
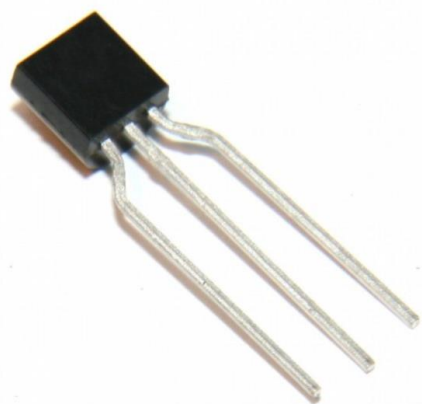
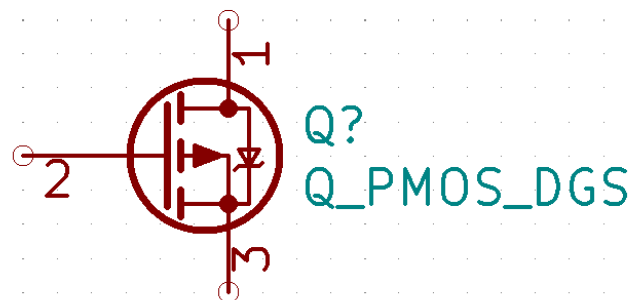
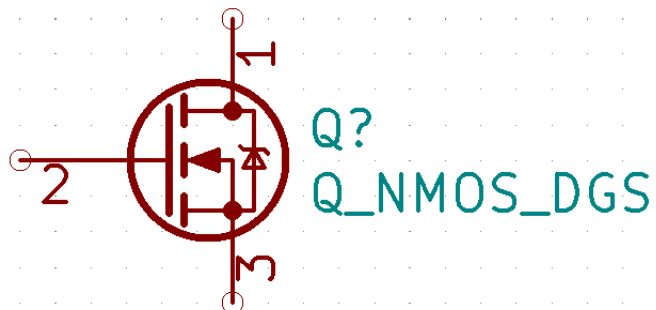
Anoda, katoda / kierunek przewodzenia???



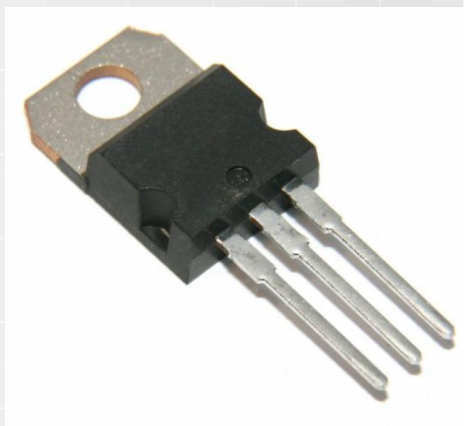
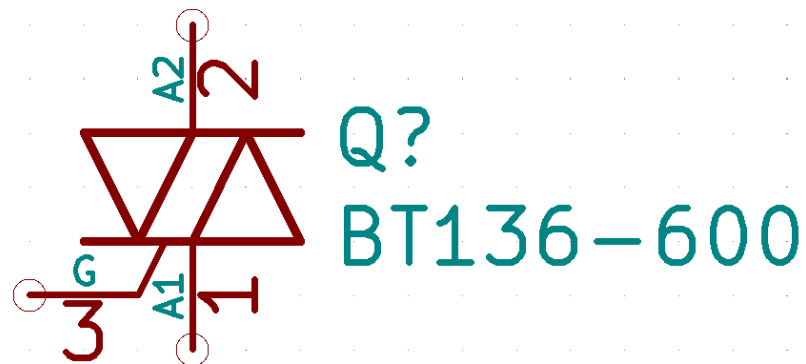
Tranzystory bipolarne



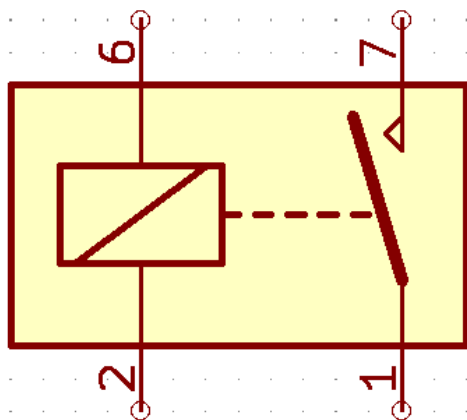
Tranzystory polowe



Tyrystory, triaki



Przełączniki

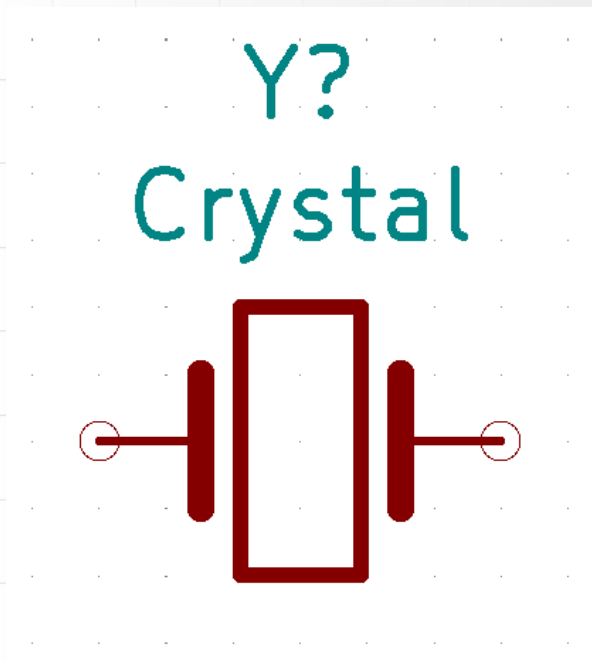


K?

DIPxx-1Axx-11x



Rezonatory kwarcowe



Bezpieczniki, bezpieczniki polimerowe

F?

Fuse

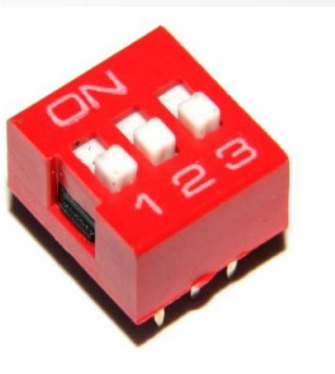
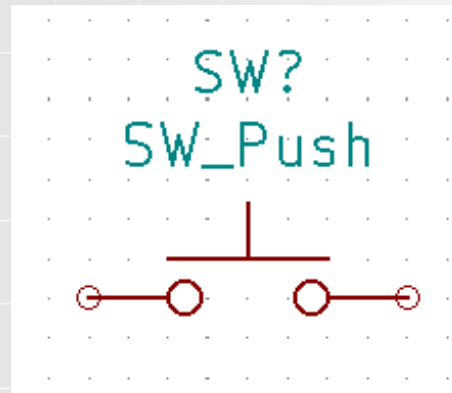
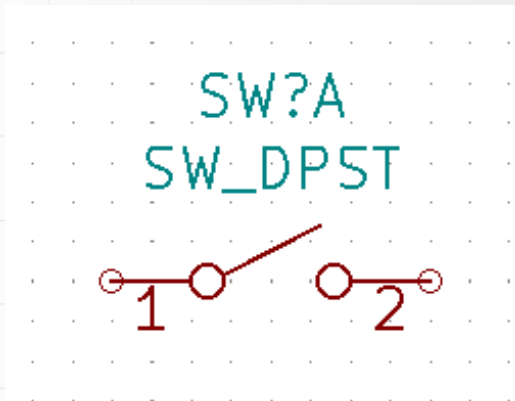


F?

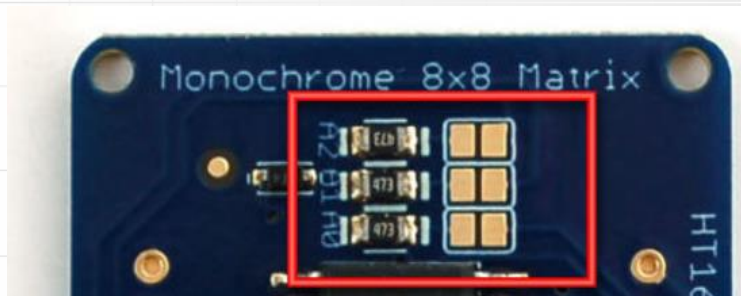
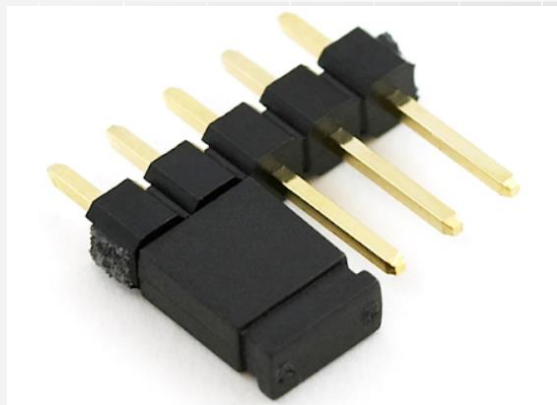
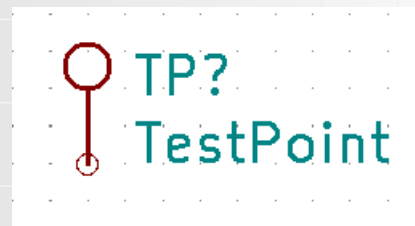
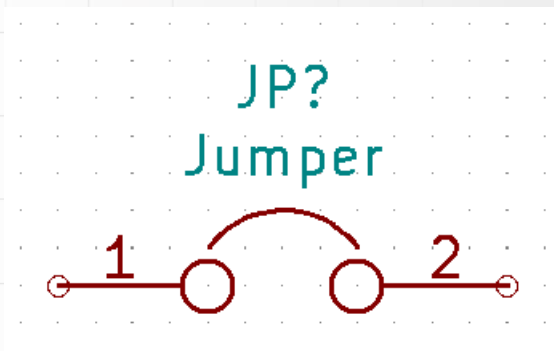
Polyfuse



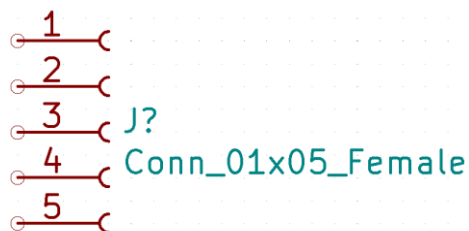
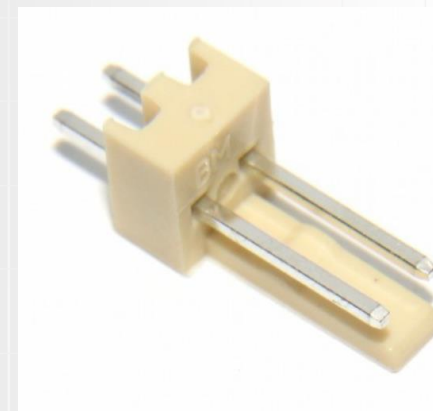
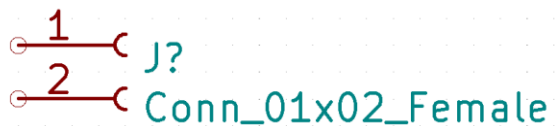
Przyciski



Zworki, pola testowe

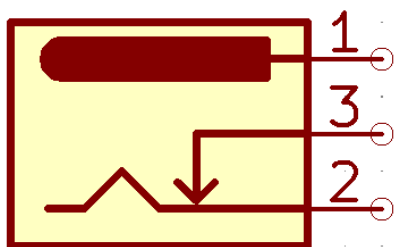


Złącza

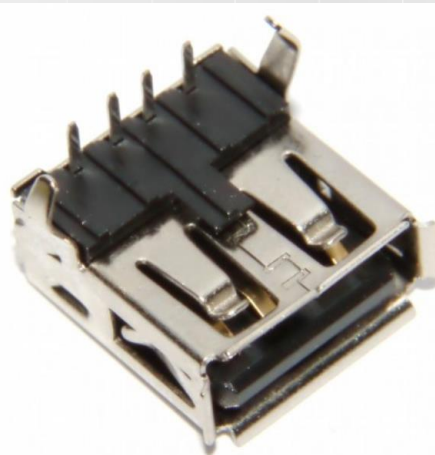
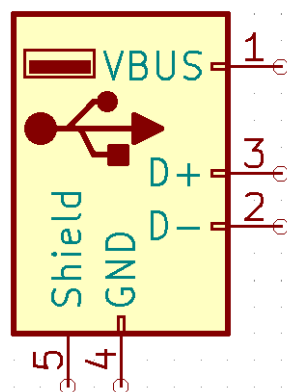


Złącza

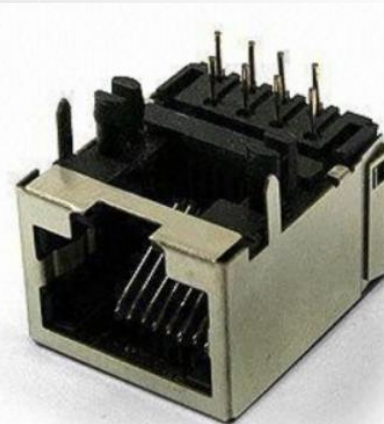
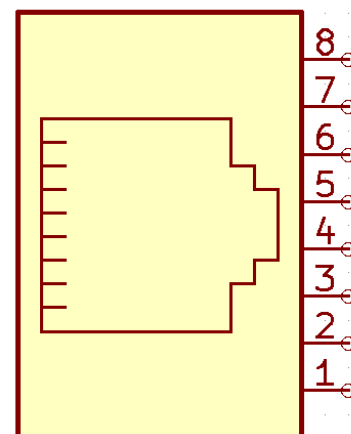
J?
Barrel_Jack_Switch



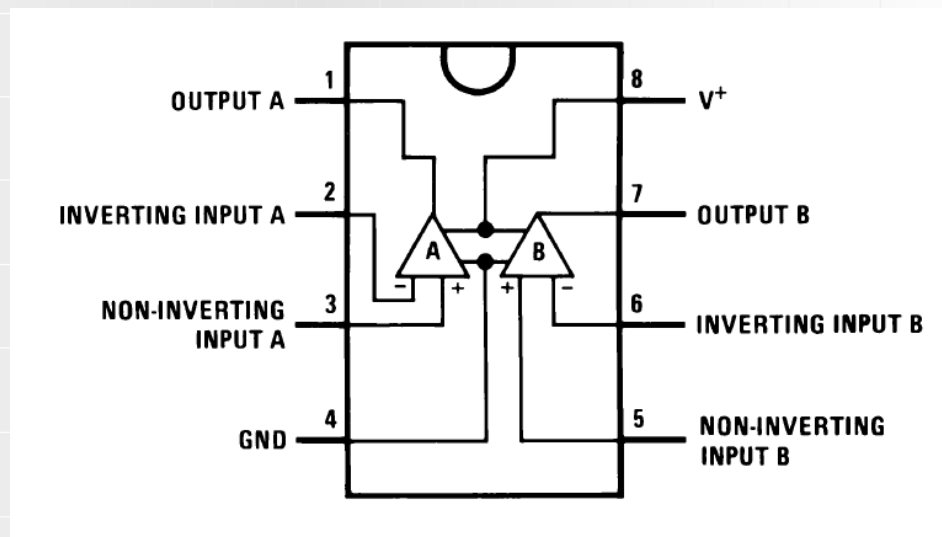
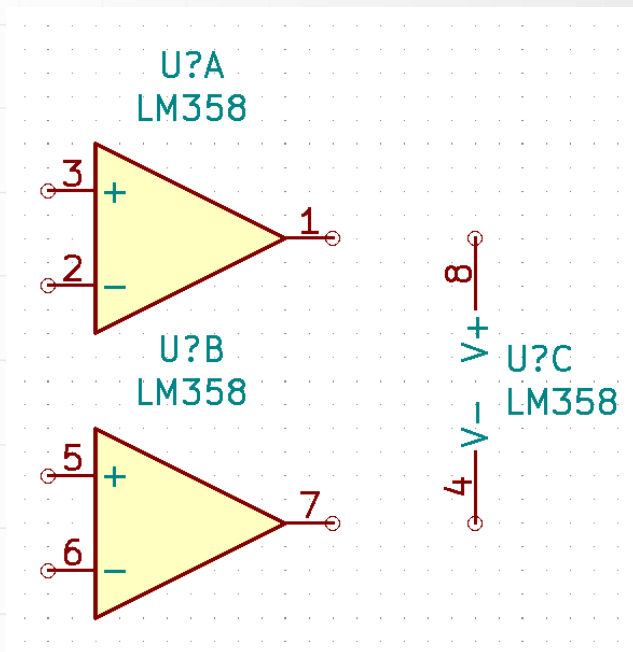
J?
USB_A



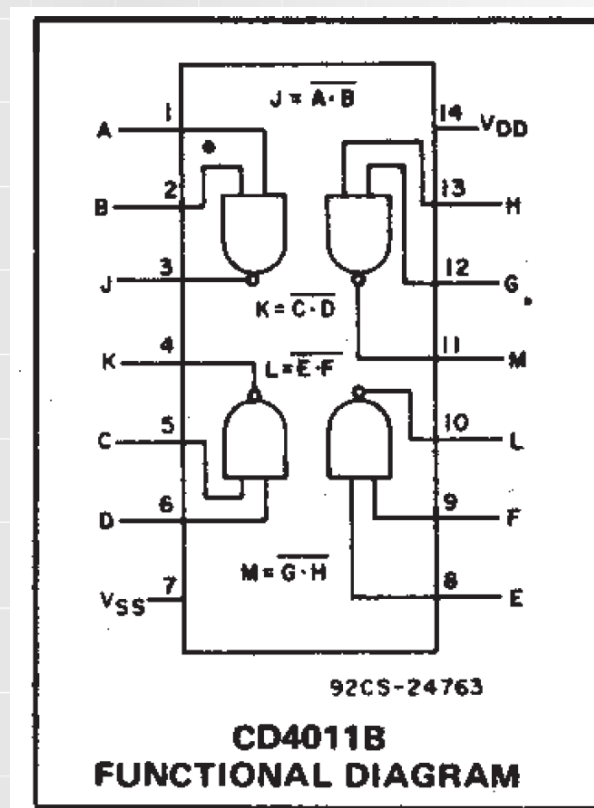
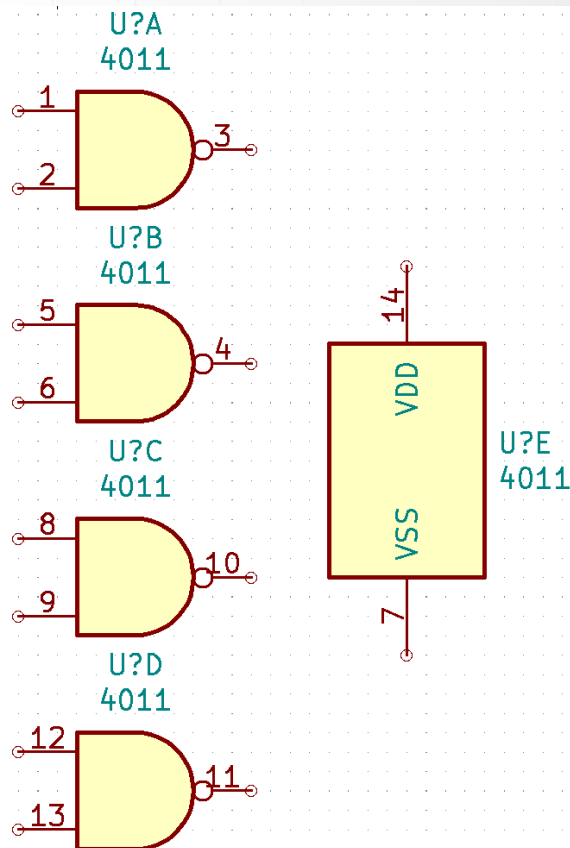
J?
8P8C



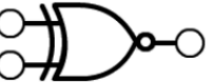
Wzmacniacze operacyjne



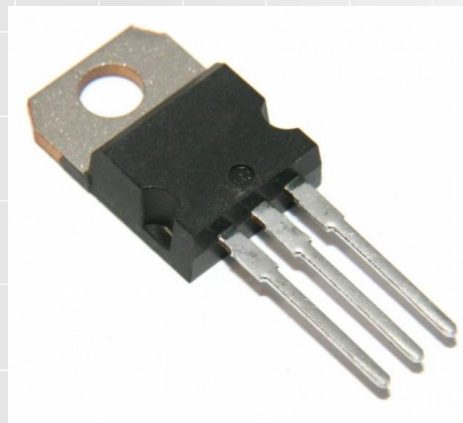
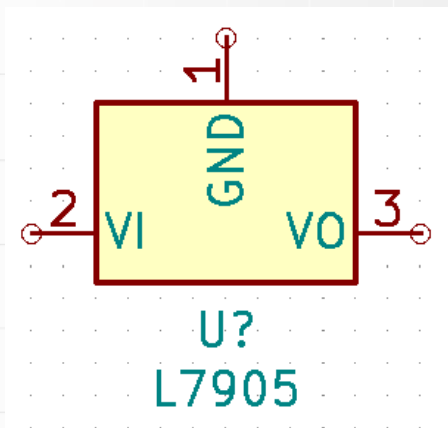
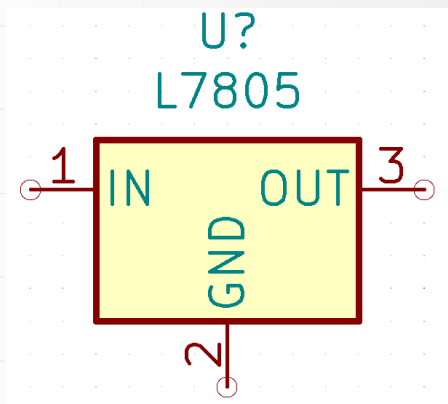
Bramki logiczne



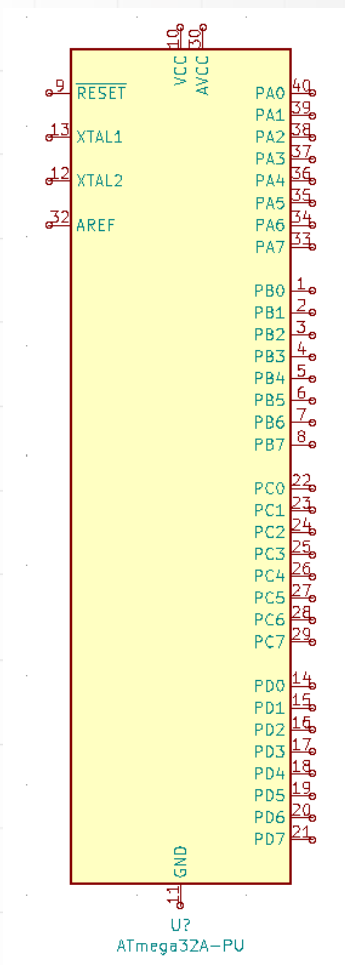
Bramki logiczne

Funkcja logiczna	Symbol	Zapis	Tabela		
			Wejście		Wyjście
			p	q	s
AND		$p \wedge q$	0	0	0
			0	1	0
			1	0	0
			1	1	1
OR		$p \vee q$	0	0	0
			0	1	1
			1	0	1
			1	1	1
NOT		$\neg p$	0		1
			1		0
NAND		p / q	0	0	1
			0	1	1
			1	0	1
			1	1	0
NOR		$p \downarrow q$	0	0	1
			0	1	0
			1	0	0
			1	1	0
XOR		$p \perp q$	0	0	0
			0	1	1
			1	0	1
			1	1	0
XNOR		$p \Leftrightarrow q$	0	0	1
			0	1	0
			1	0	0
			1	1	1

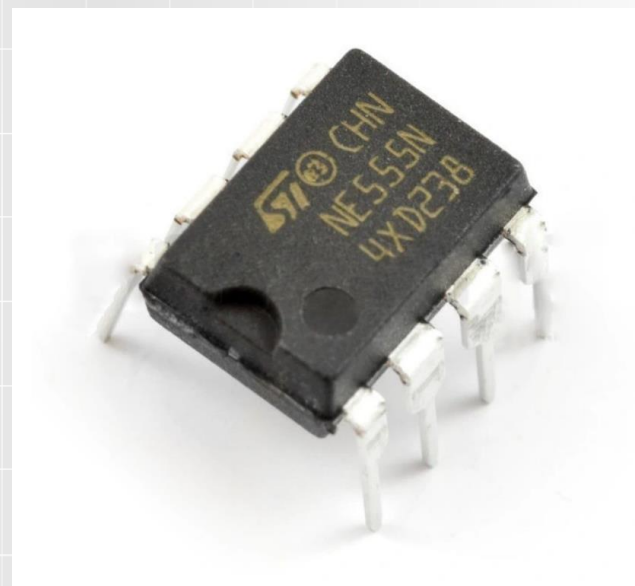
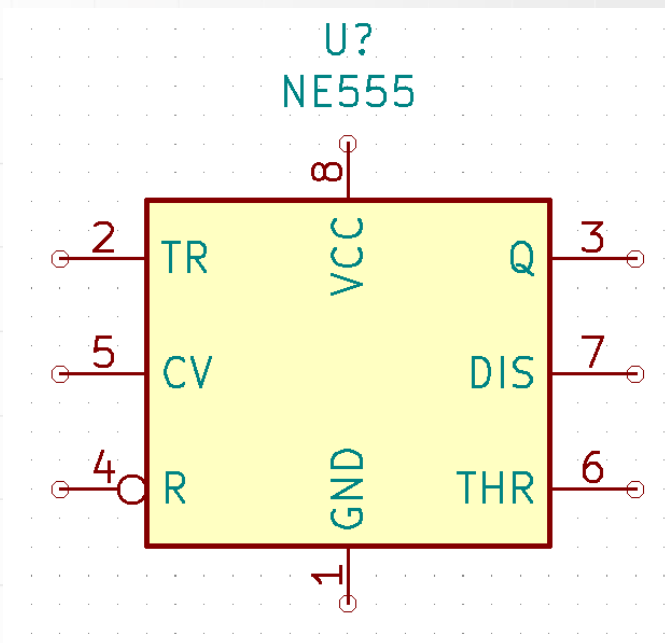
Stabilizatory napięcia



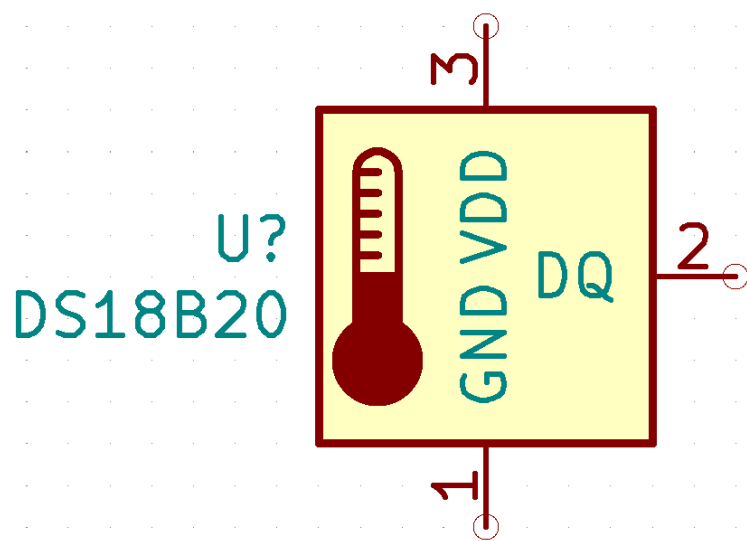
Układy scalone – Atmega32a

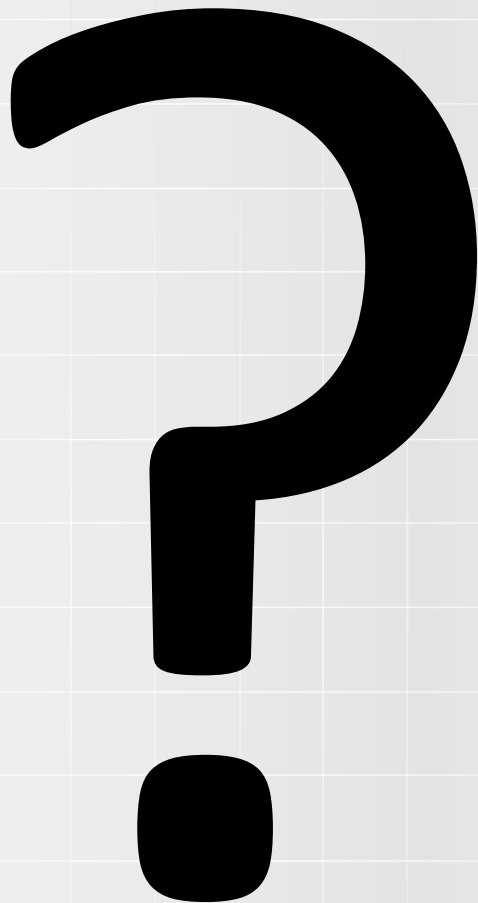


Układy scalone – NE555



Układy scalone - DS18B20





- <https://forbot.pl/blog/czytaj-schematy-doswiadczony-elektronik-id1890>
- „Schematy elektroniczne i elektryczne. Przewodnik dla początkujących”, Stan Gibilisco
- „Elektronika bez oporu. Schematy elektroniczne od podstaw”, Witold Wrotek
- „Sztuka elektroniki cz. 1 i 2,, Horowitz Paul , Hill Winfield
- Dokumentacje techniczne układów elektronicznych