

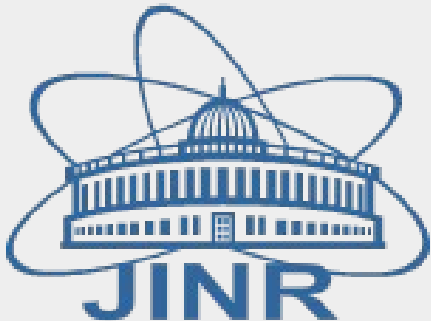
Multiplexer used for measuring temperatures in a TOF detector

Adam Kubiela

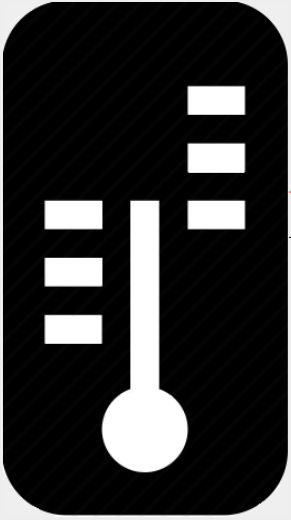
Faculty of Physics, University of Warsaw

Report on the project developed during International Student Practices
in Joint Institute for Nuclear Research in July 2017

Supervisor: Krystian Rośton, VBLHEP



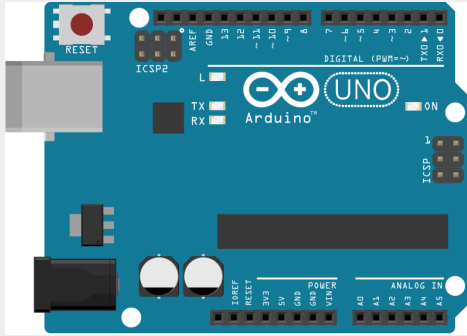
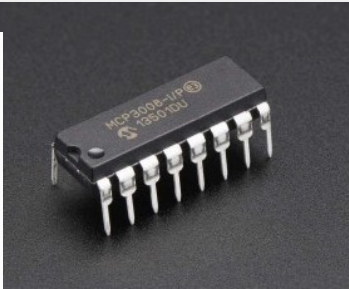
How to measure temperature?



Pt100

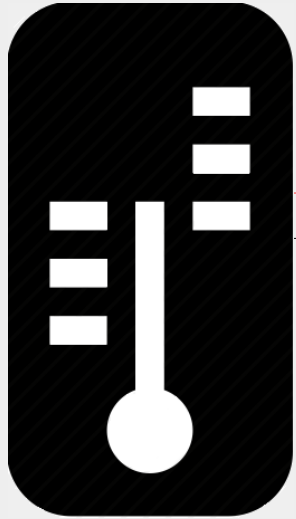


Source: www.pixsys.net

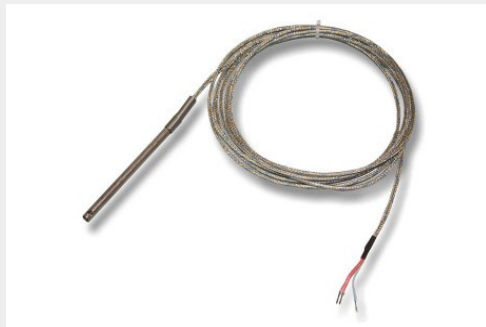


Sources: ni.com, lumel.com.pl

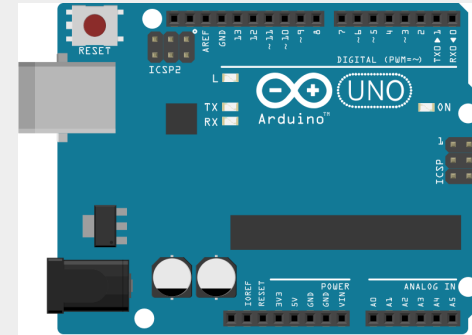
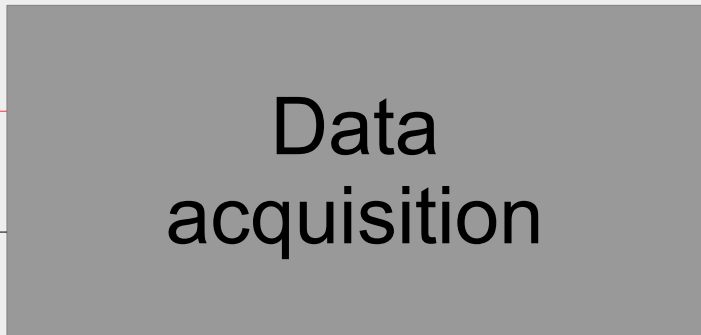
How to measure temperature?



Pt100



Source: www.pixsys.net

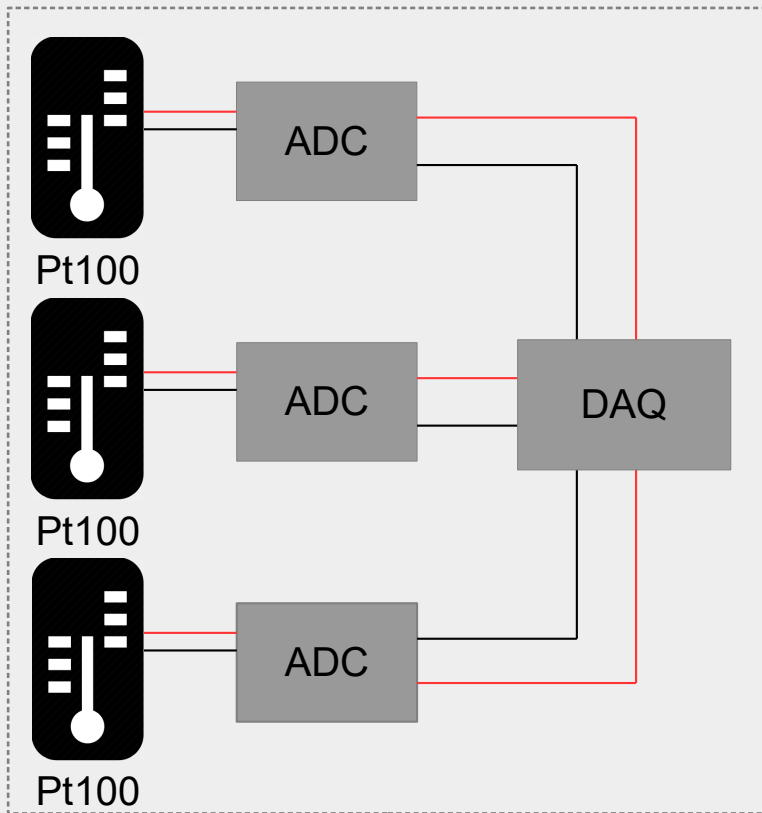


Sources: ni.com, lumel.com.pl

But what if we want to collect data from **multiple** thermometers?

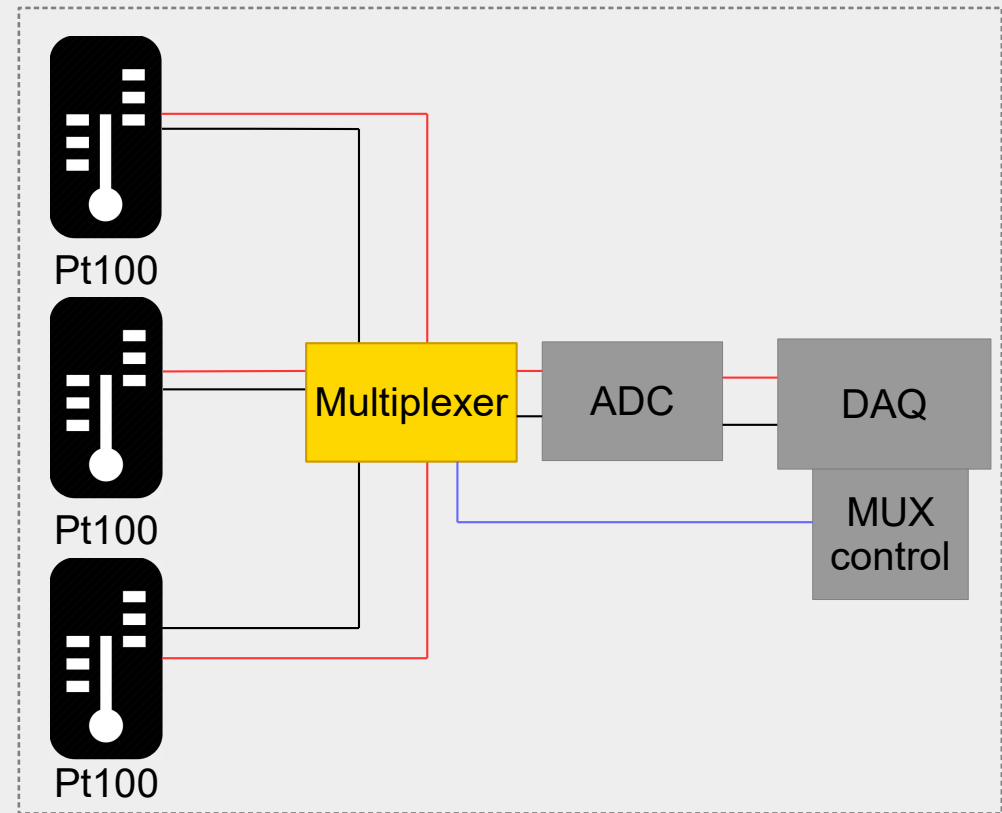
Multiple measurements setup

But what if we want to collect data from **multiple** thermometers?



One ADC reads one or few thermometers

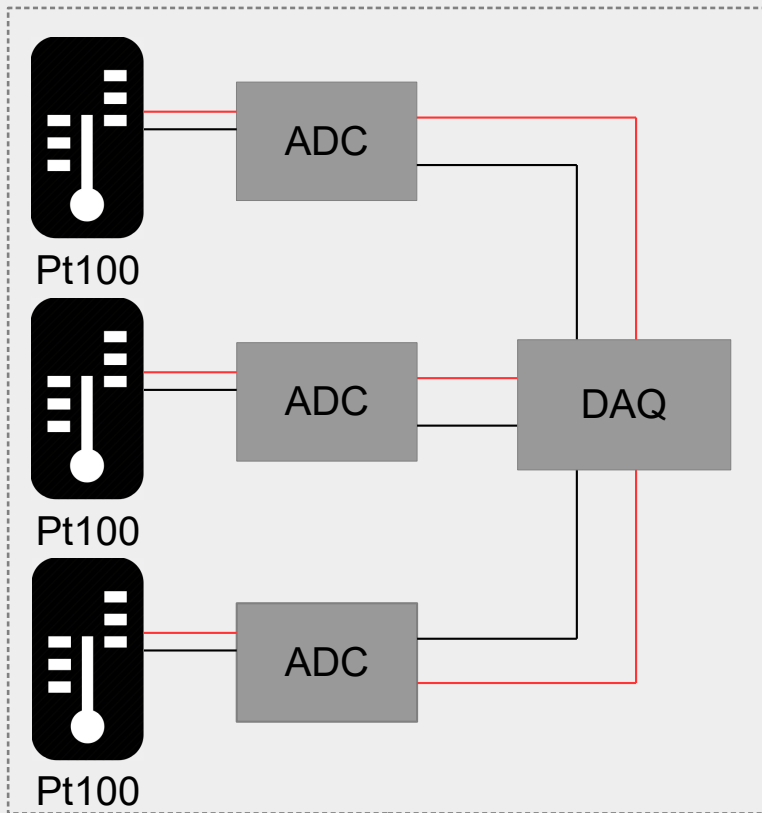
OR



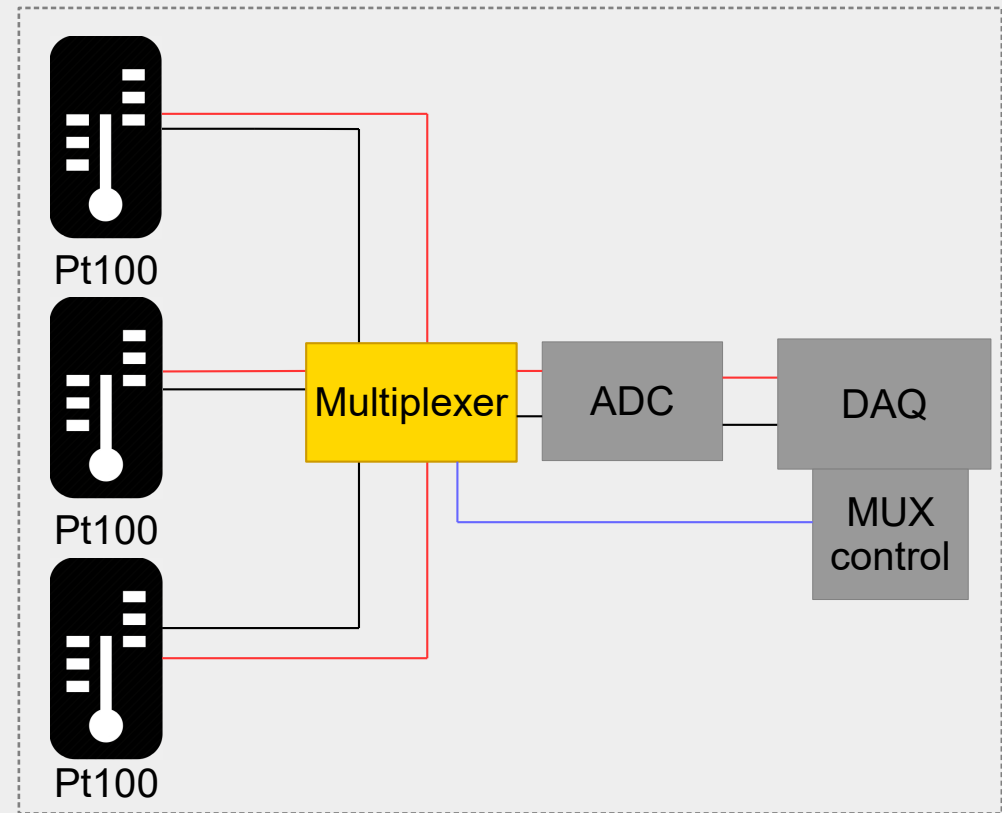
One ADC reads **all** thermometers

Multiple measurements setup

But what if we want to collect data from **multiple** thermometers?



OR



One ADC reads one or few thermometers

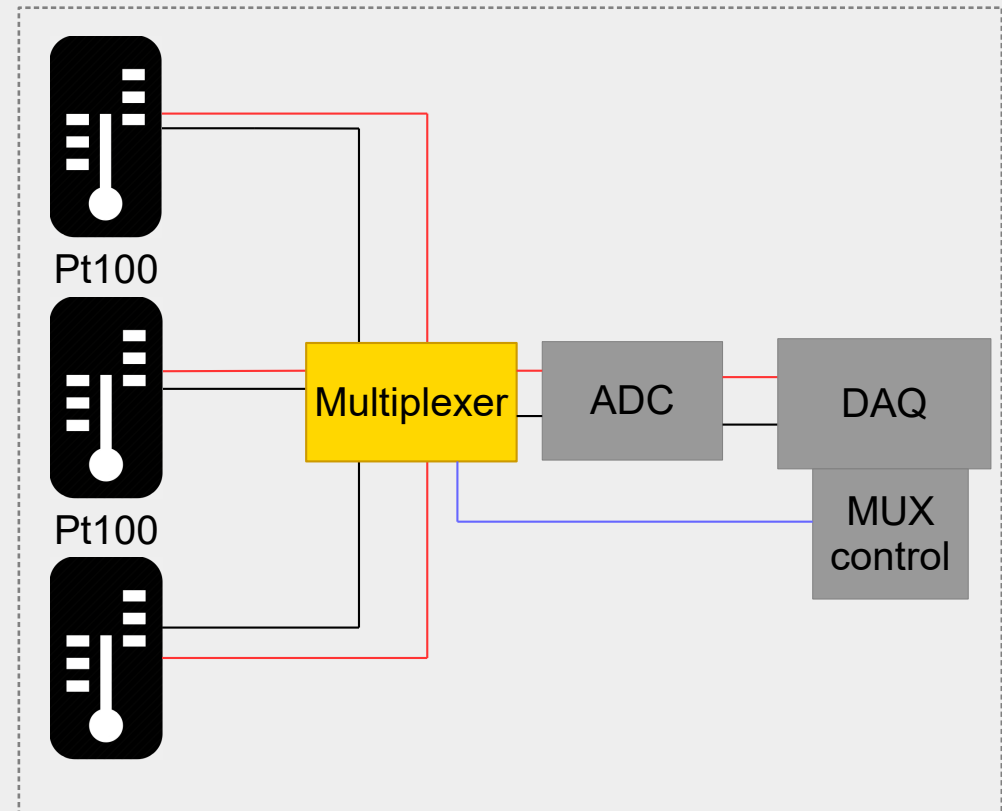
One ADC reads **all** thermometers

WHICH ONE IS BETTER AND WHEN?

Main goals

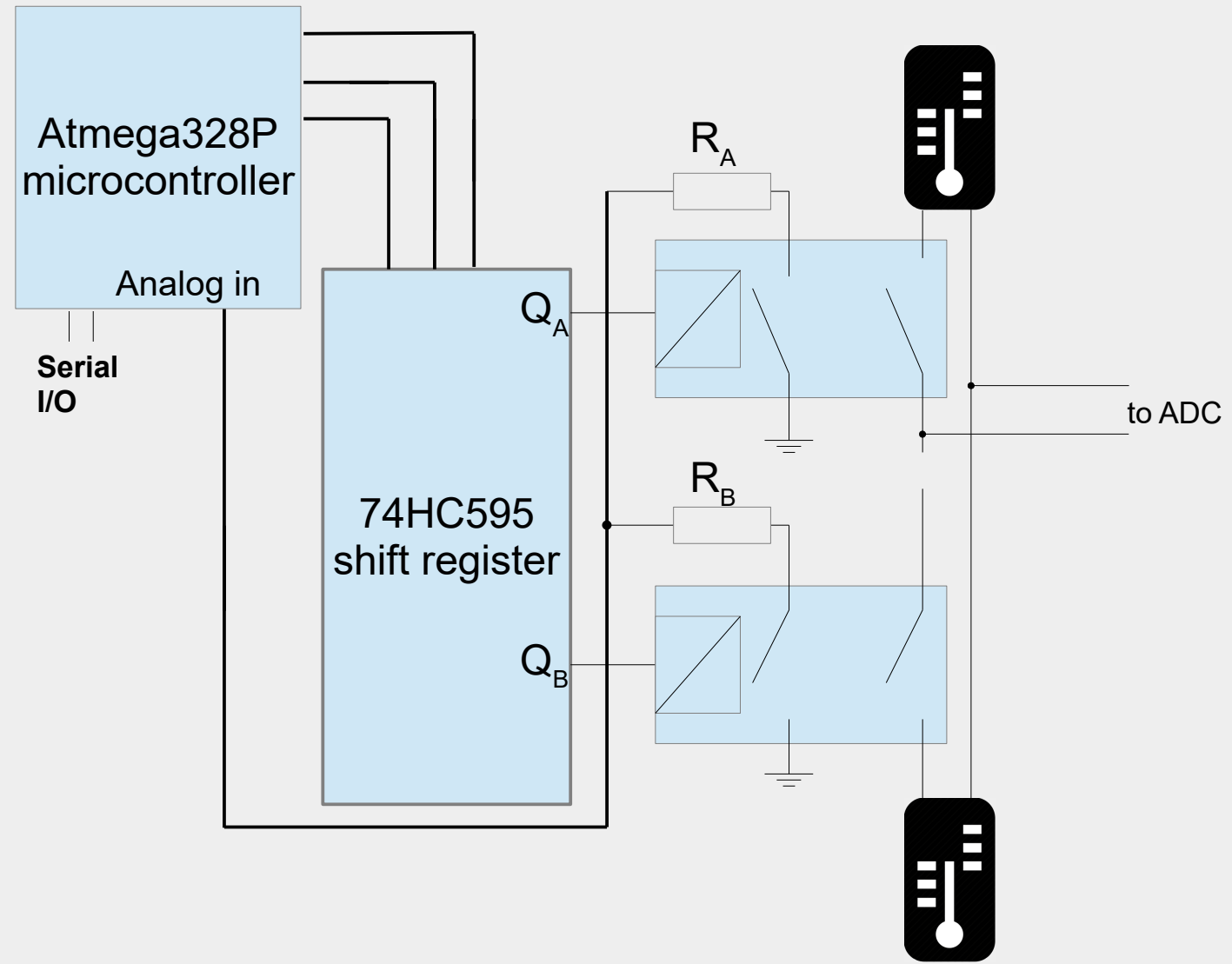
WHICH ONE IS BETTER AND WHEN?

- Design switching device for temperature measurement
- Design a printed circuit board
- Build a prototype
- Test a prototype

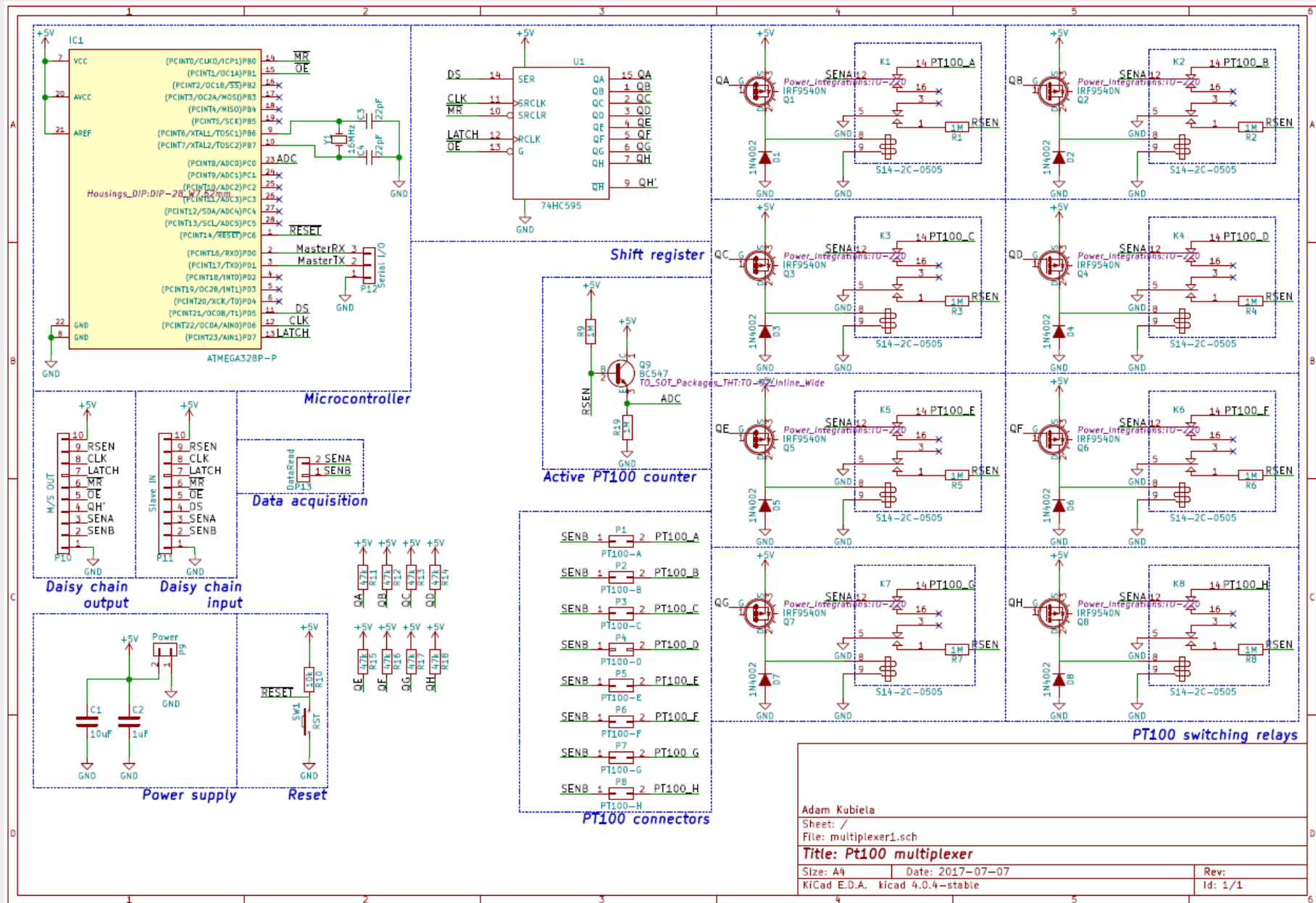


Multiplexer schematic

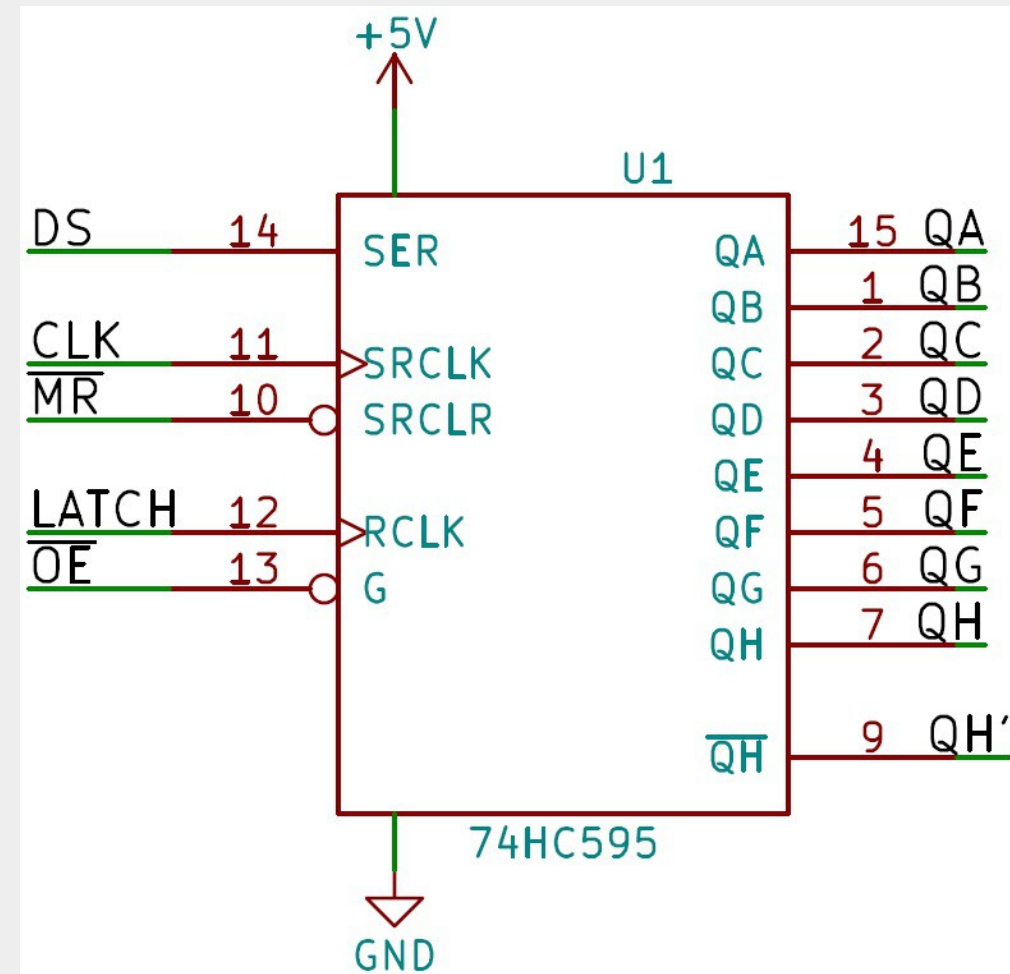
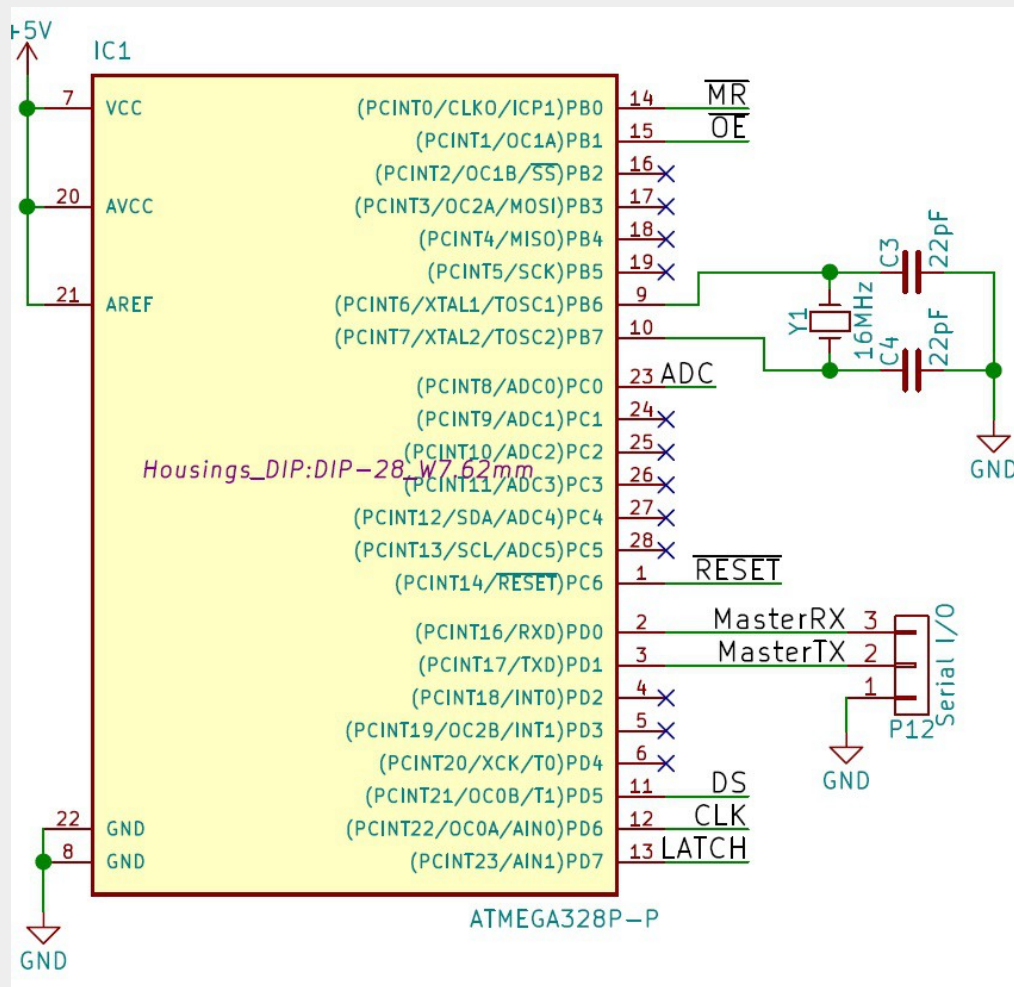
- 8 channels $Q_A - Q_H$
- Controlled via UART communication
- Allows daisy chaining (master/slave)
- Software protection against activating multiple relays
- Reprogrammable



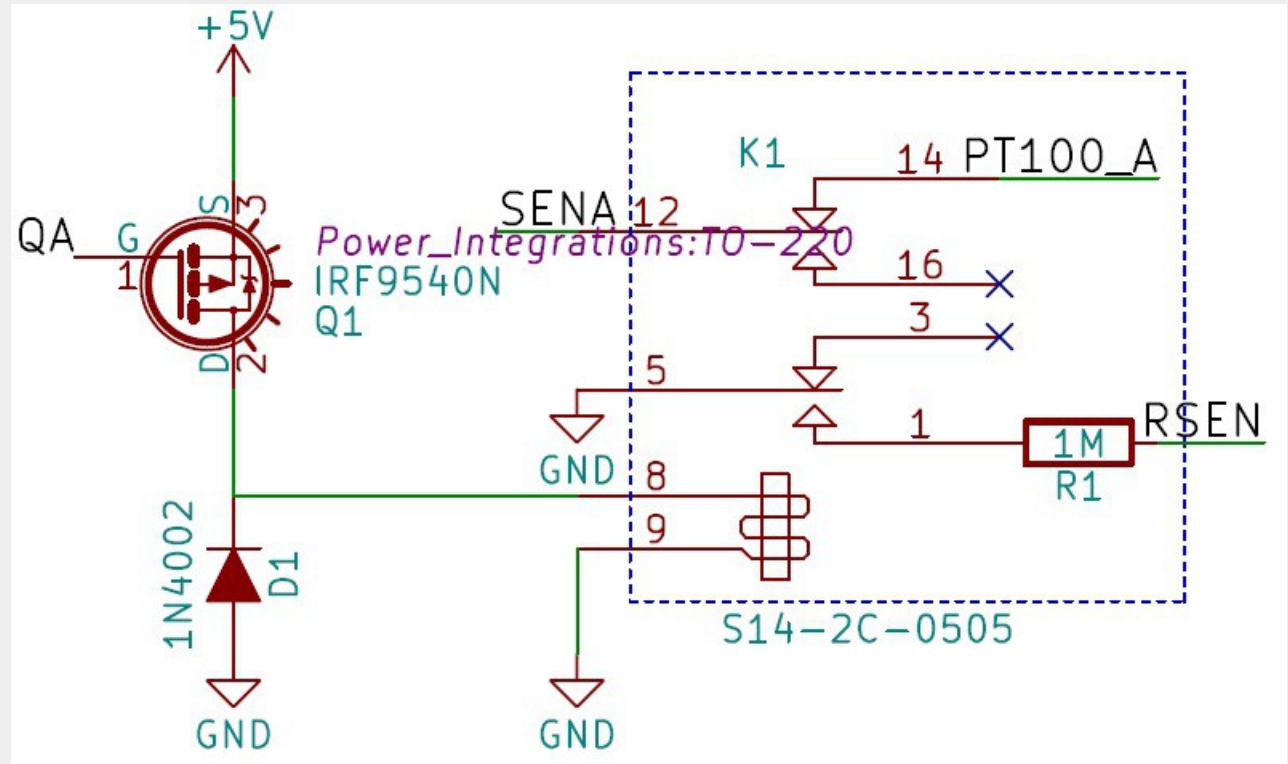
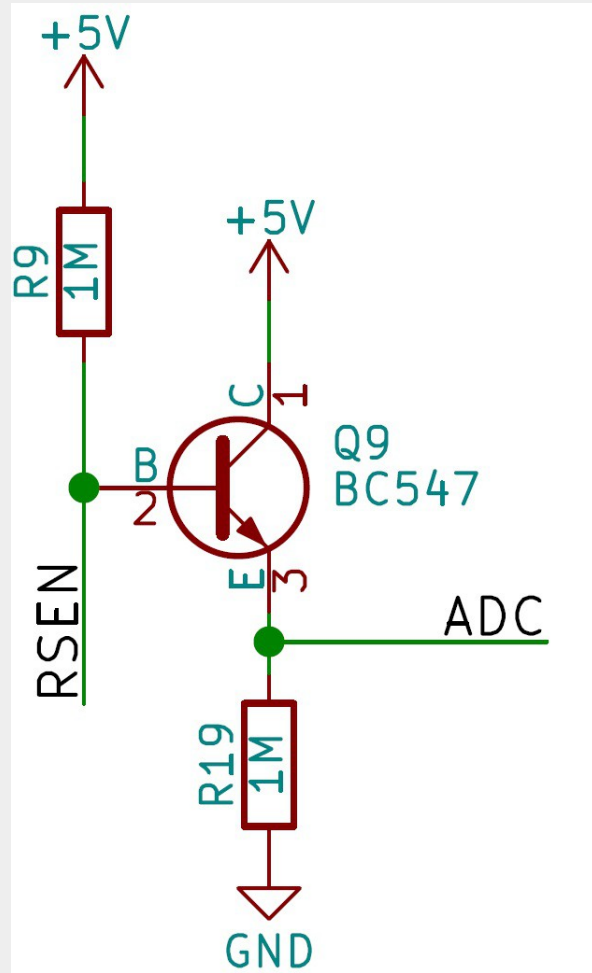
Multiplexer schematic



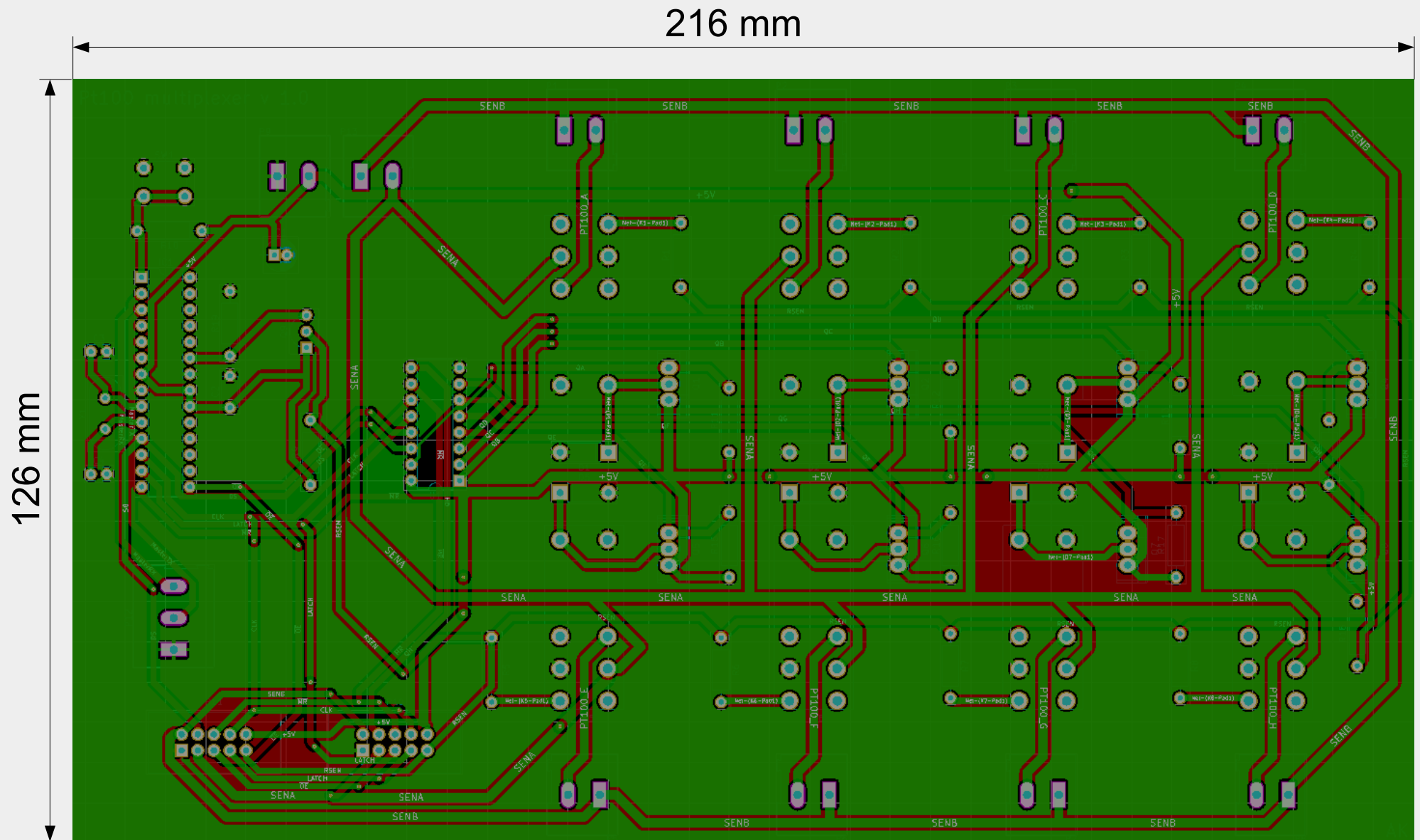
Multiplexer schematic



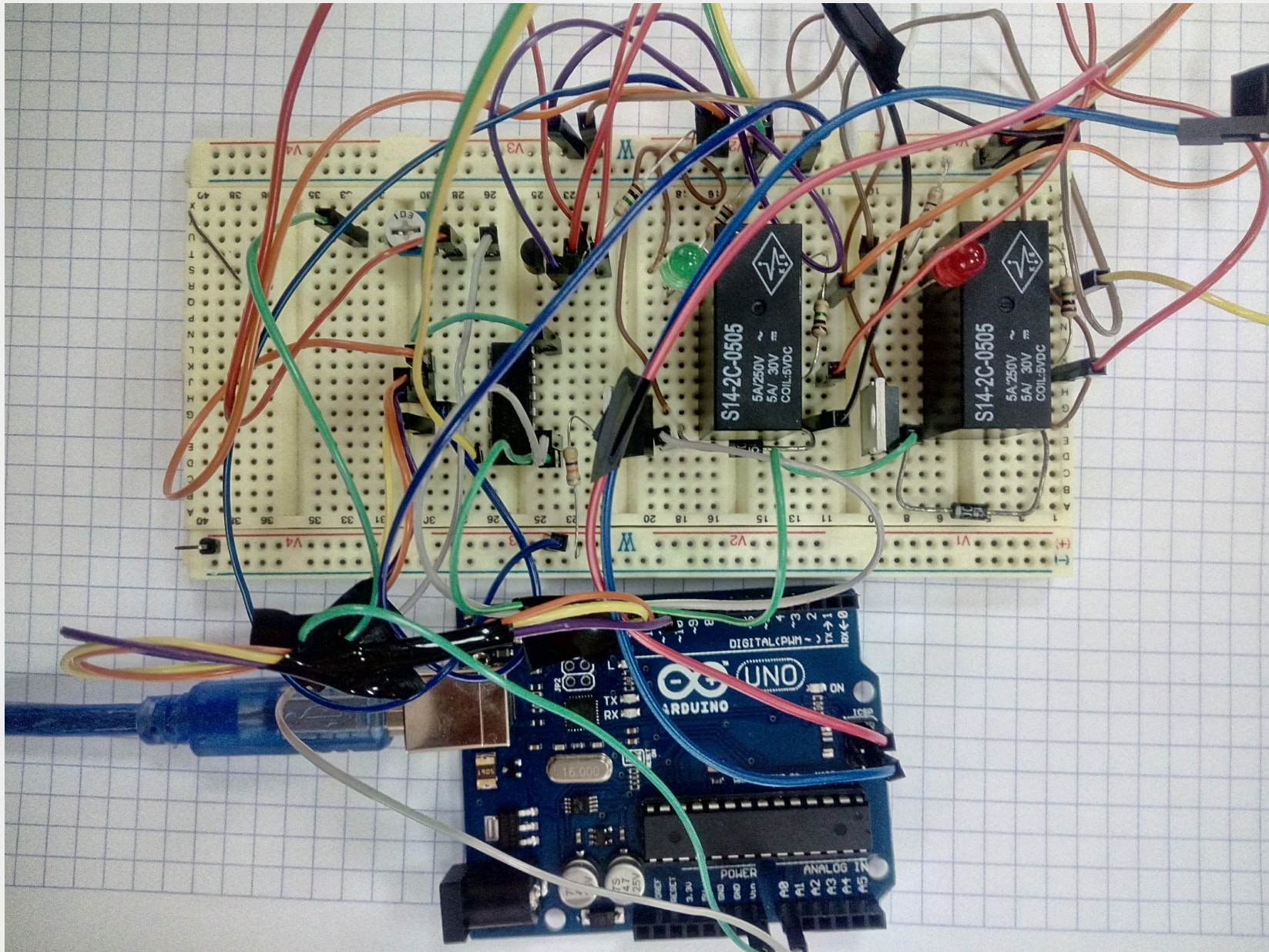
Multiplexer schematic



PCB



Prototype



Testing conclusions

Pros:

- Modular
- Scalable (daisy chaining)
- Better for great numbers of sensors
- Universal (not only for temperature measurements)
- Compatible with many communication protocols
- Cheap (comparing to SM1 solution)
- Firmware can be changed

Cons:

- Fail-safe software instead of hardware
- Scalability has limits (switching delay)
- Worse for only few sensors (< 4)

Possible applications

QUINTA experiment



ADS simulation; measurement of energy emitted in reactor core

Slow Control System



Temperature monitoring in a TOF detector, a part of MPD

Thank you.

