Interlock PCB (for PB mass test system)

Timon Heim, Karol Krizka, Zhicai Zhang, Noah Zisser

LBNL

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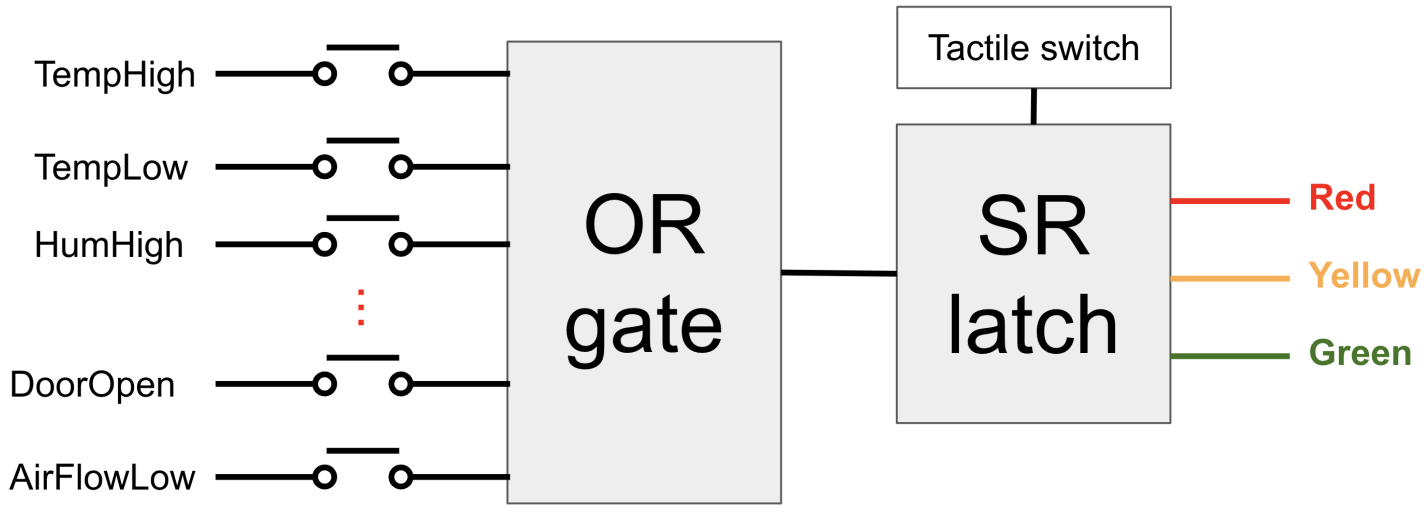
Introduction

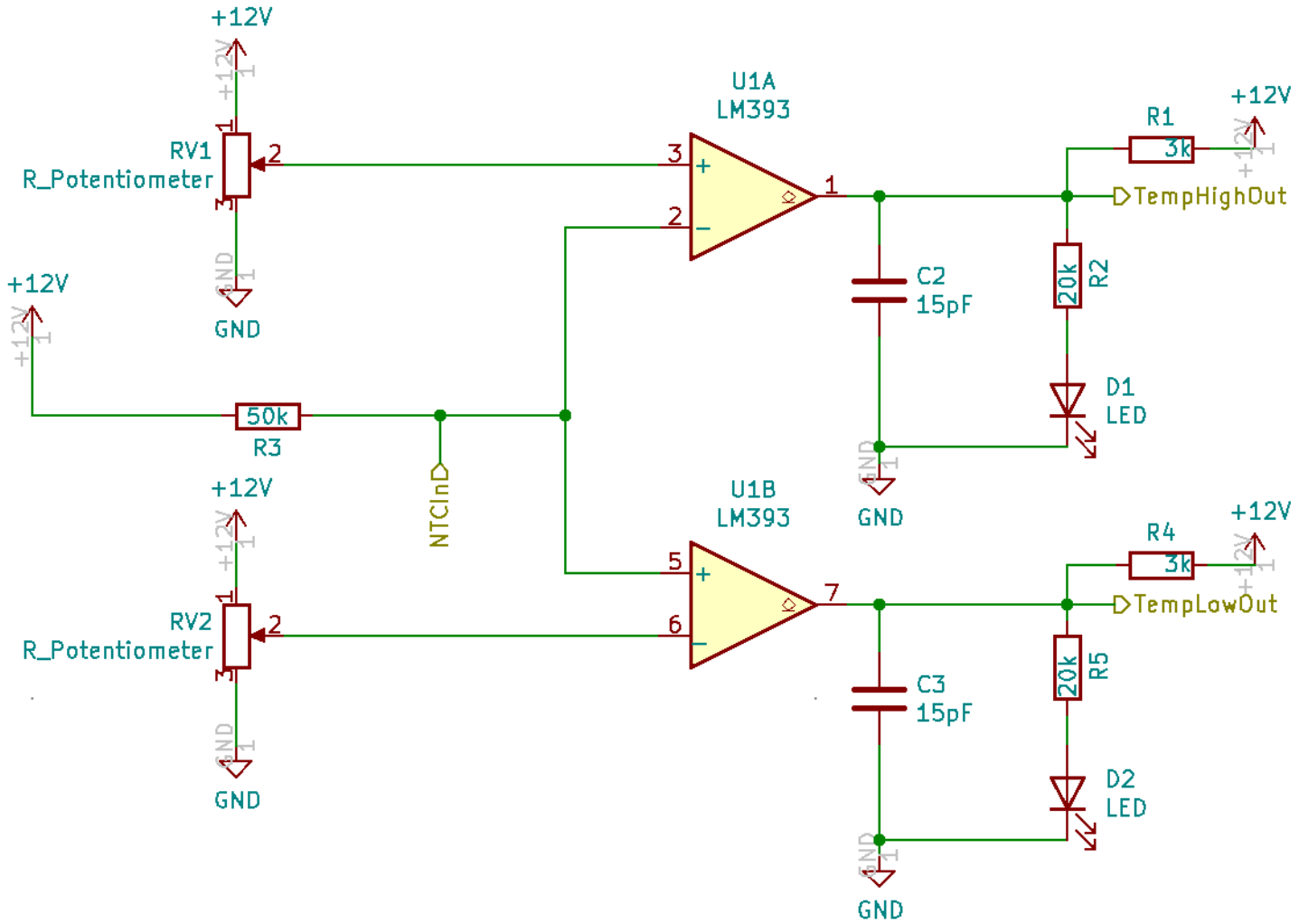
- We want to design an interlock PCB for the powerboard mass test system to shutdown all devices in case of any failure:
  - Temperature in the crate is too high
  - Humidity is too high
  - Door of the crate is open
  - Air flow from the chiller is too low
  - ...
- Some requirements:
  - The board needs to be robust, purely analog signal based (no need for microcontrol, software, etc.)
  - The board needs to be generic: can accept different input mopnitoring signal types with adjustable thresholds and output different interlock signal types

Input and output



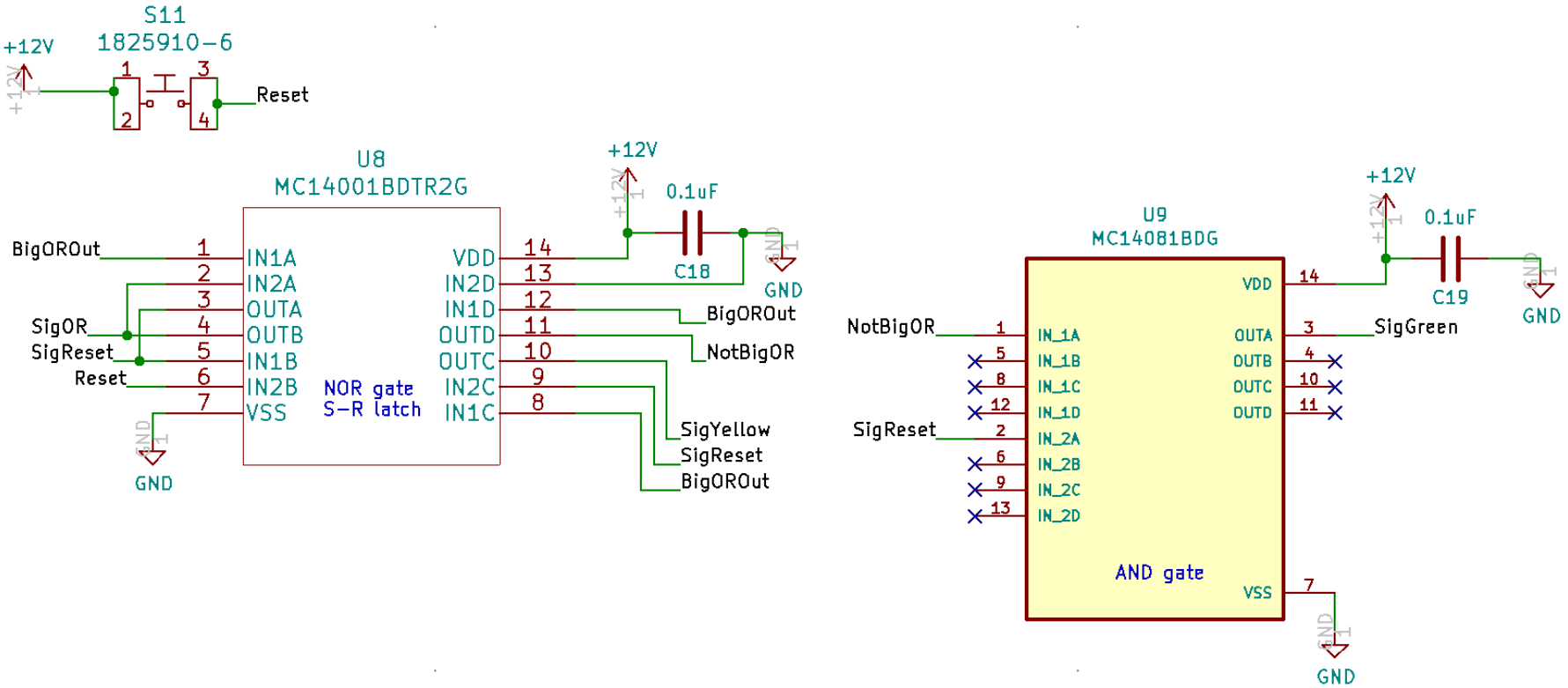
- Red signal: when any of the input signal is triggered (high)
- Yellow signal: after all the input signals turn low (system ready to be restarted)
- Green: after the reset button (tactile switch) is pressed
- Interlock signal sent to devices when red OR yellow
- Each input line can be disabled with the slide switch if not in use

Input example



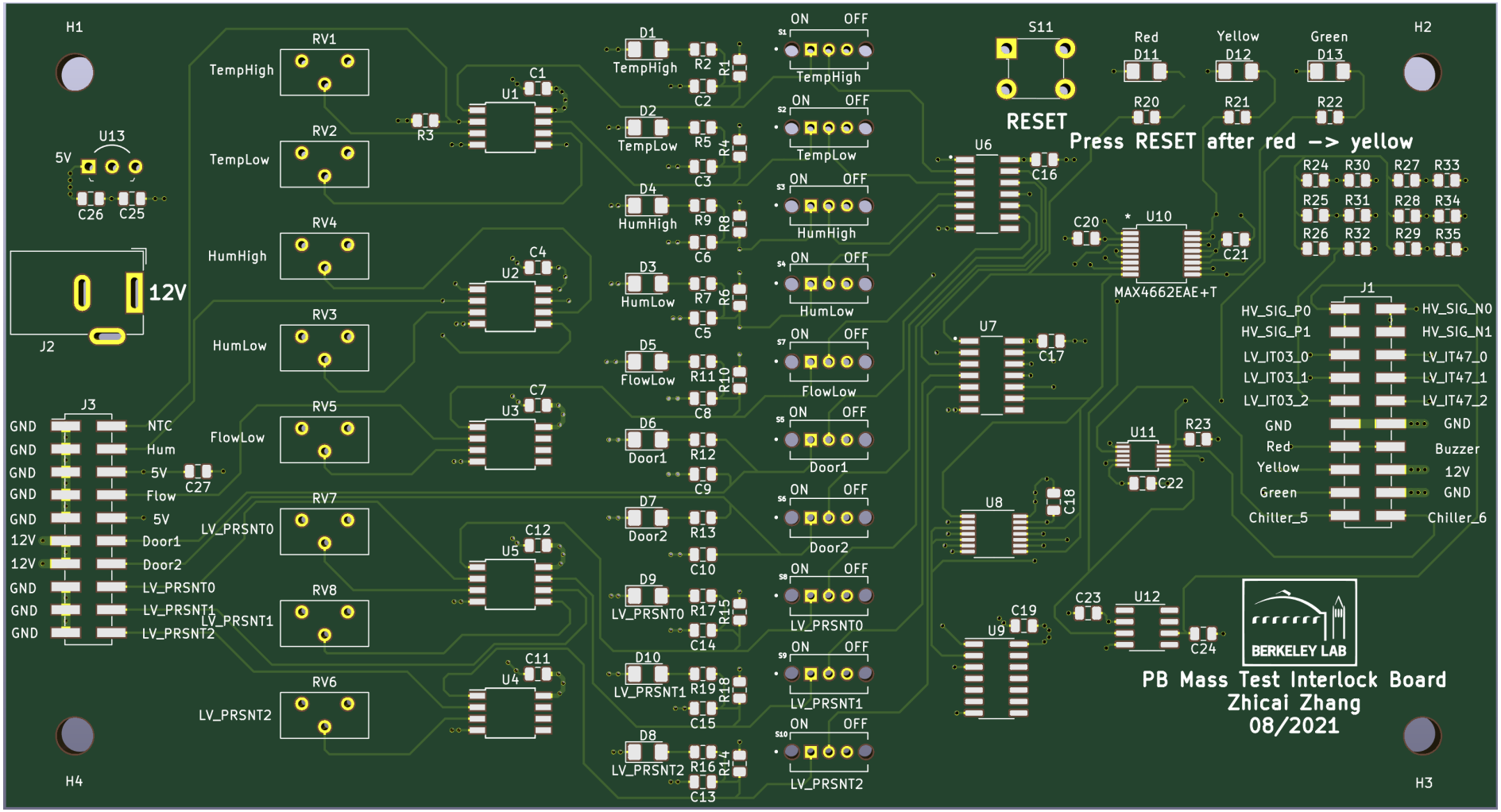
- High temperature → small NTC resistance → pin 1 high, pin 7 low

The latch: red, yellow, green



- Red: BigOROut is high
- Yellow: BigOROut is low, reset button not pressed
- Green: BitOROut is low, reset button pressed

The board



- Output (normal): HV_SIG 5V, LV_IT 0V, Chiller_5-6 shorted
- Output (interlock): HV_SIG 0V, LV_IT 12V, Chiller_5-6 disconnected

Alert light and buzzer

adafruit 2993 tower light with buzzer

Summary

- The board should be generic enough for other use cases:
  - Input signals that can be monitored: resistance high/low, voltage high/low, switch ON/OFF
  - Output interlock signals that can be sent to devices: high voltage (value adjustable), low voltage, short two pins
- KiCad files:
  https://gitlab.cern.ch/zhicaiz/pb_crate_interlock