Project presentation

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Project assumptions

Main project assumptions

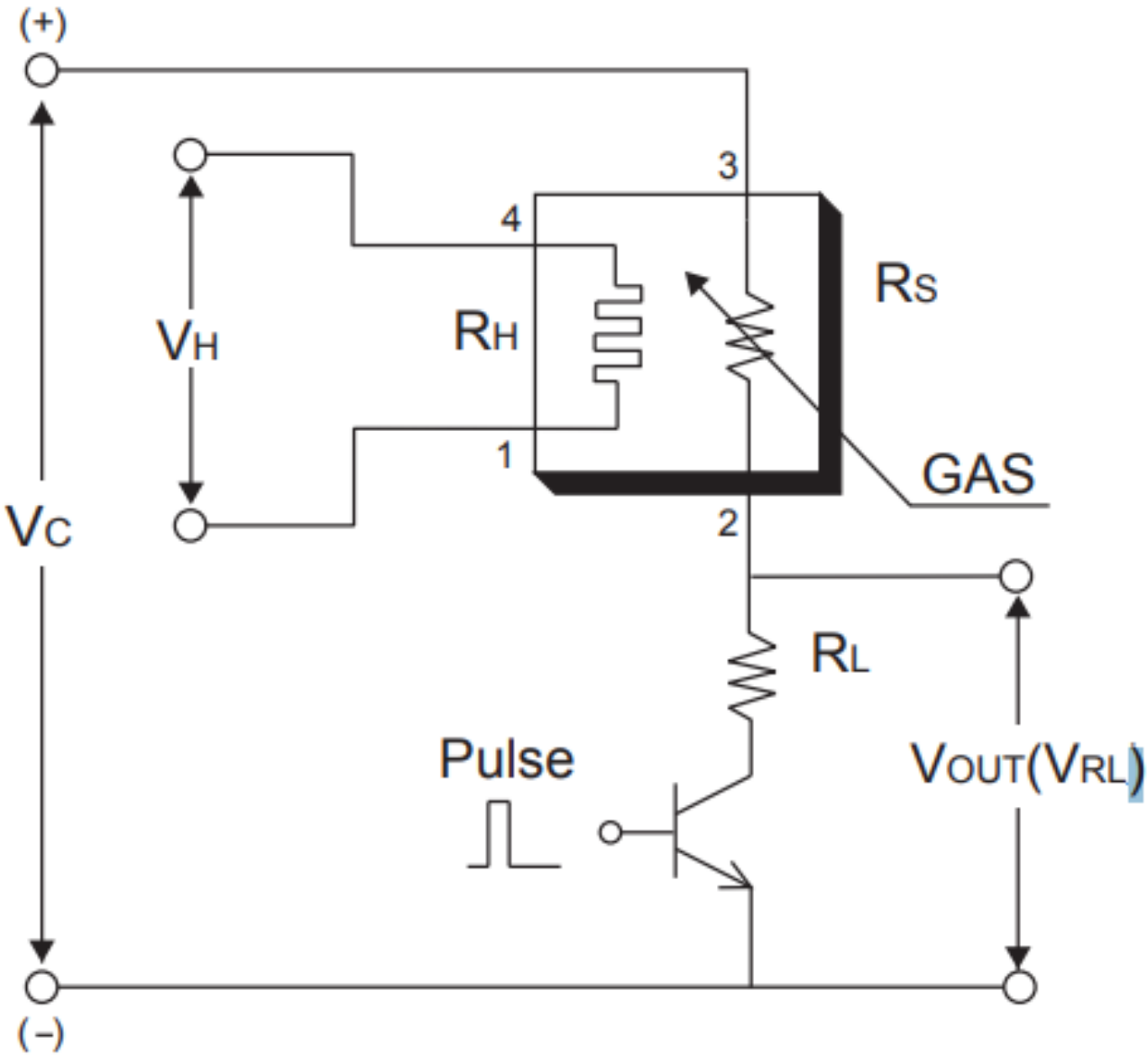
- Microprocessor system
- Gas sensor TGS8100
- LCD Display

Gas sensor TGS8100

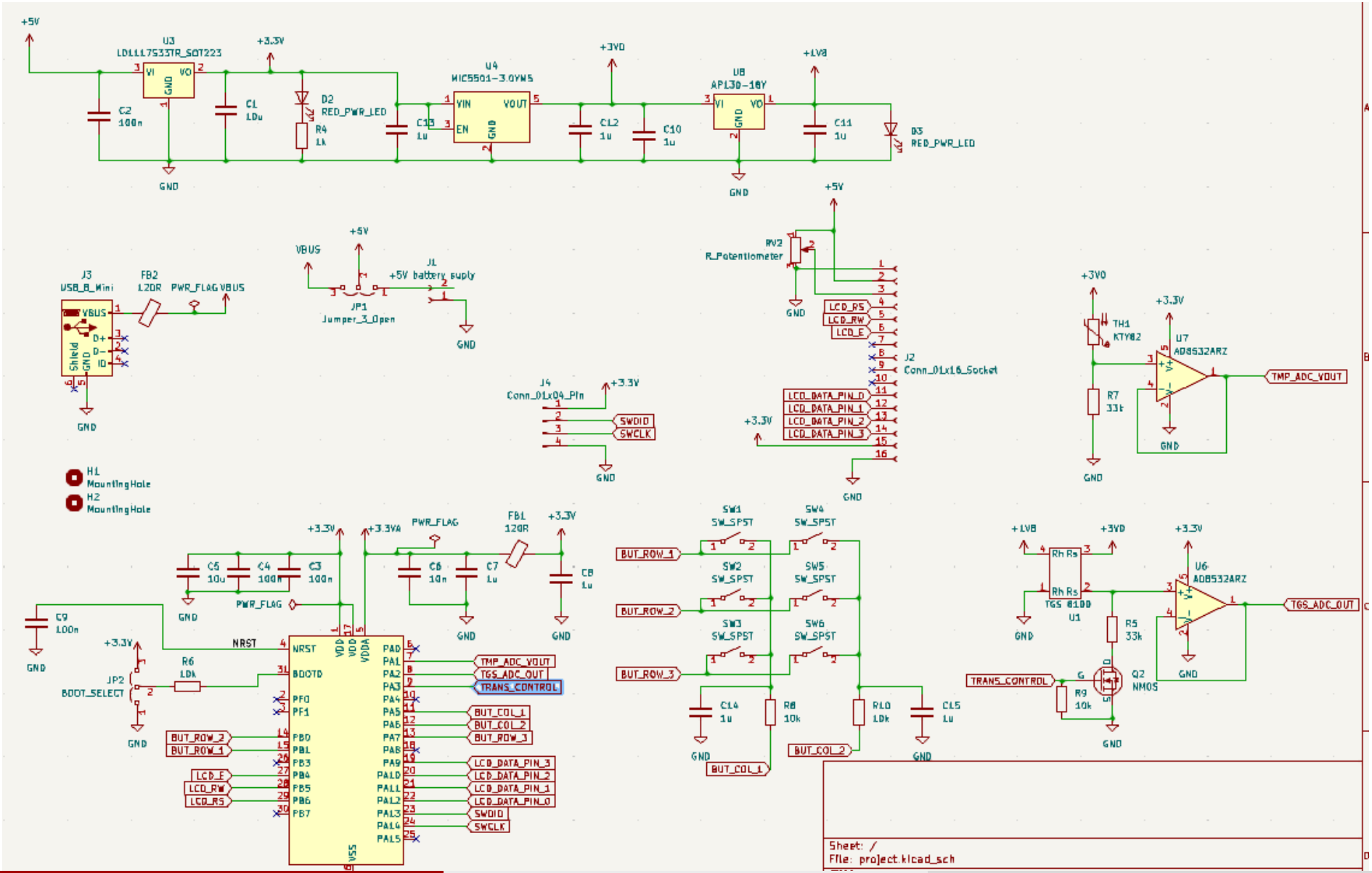
Sensor characteristics

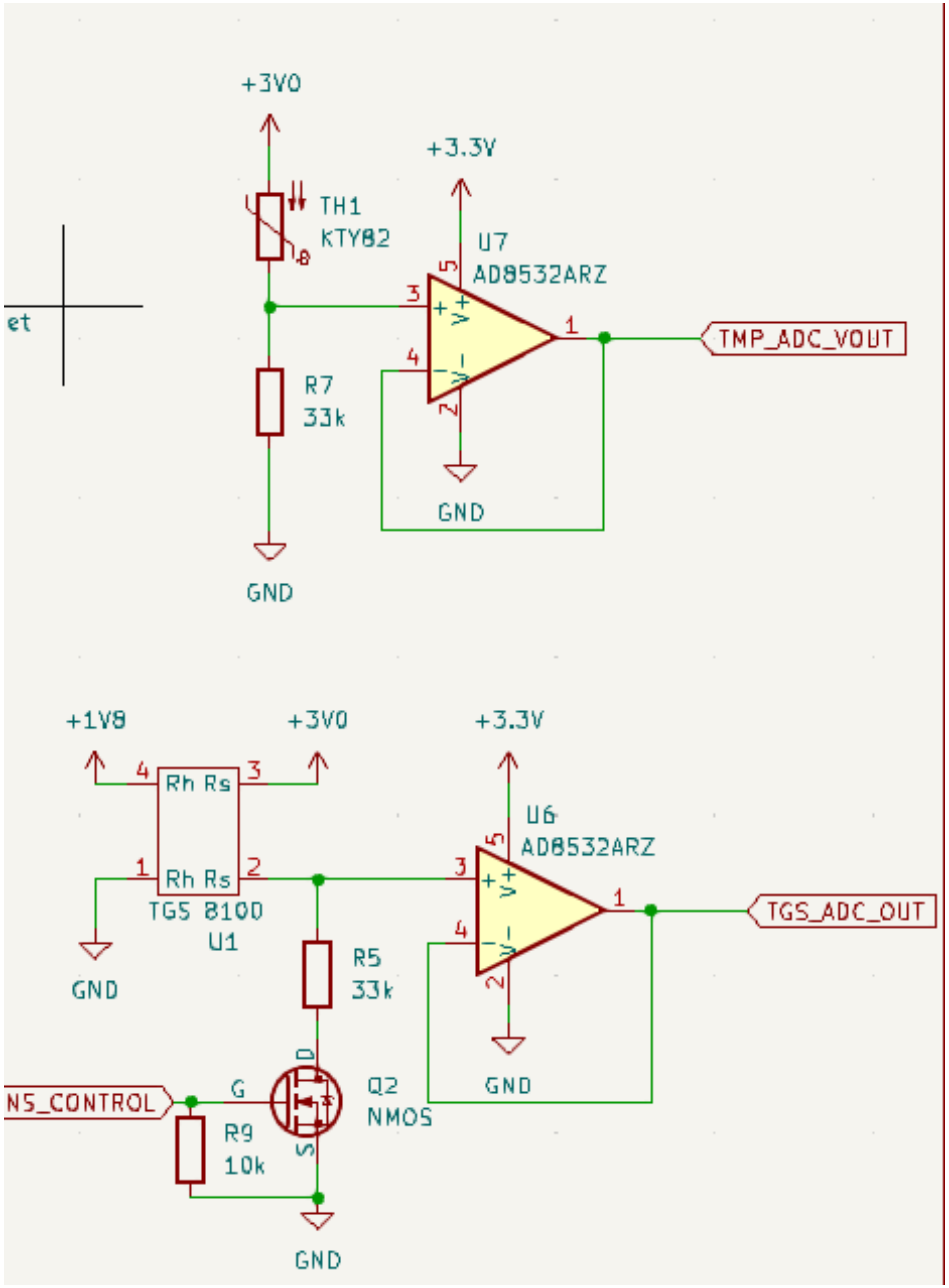
- Low power consumption (heater power consumption 15mW)
- Long life
- Highly sensitivity to cigarette smoko, cooking odors and gaseous air contaminants
- Applications: air cleaners, air quality monitors, ventilation control

How it works?

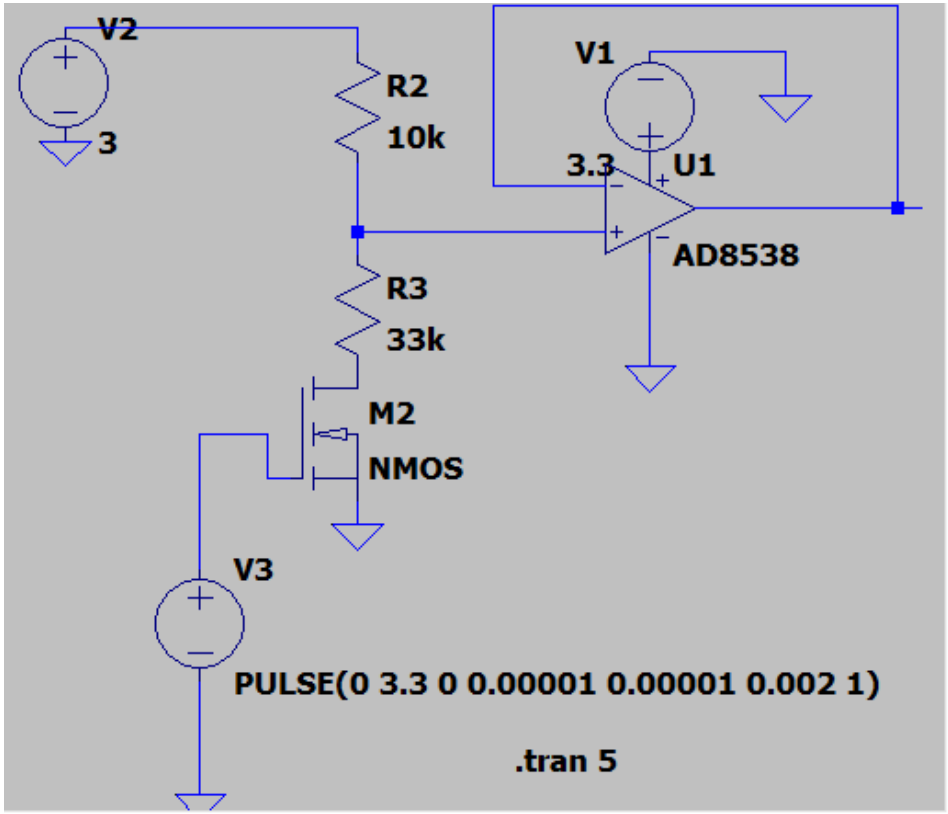


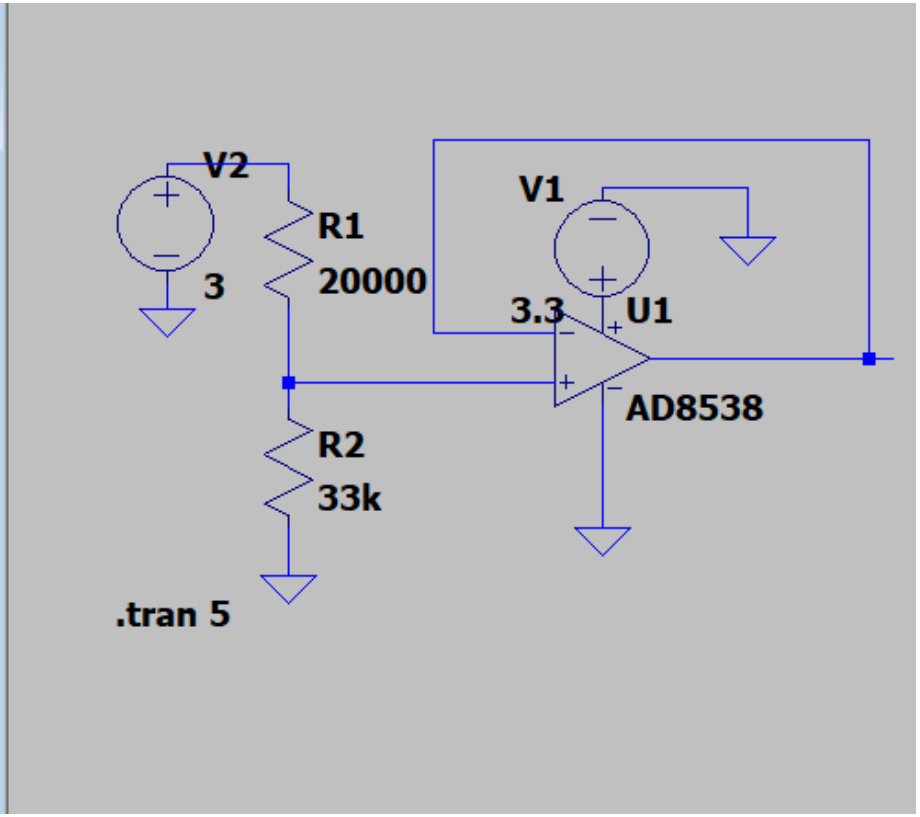
Schematic


+5V
U3
LD1117S33TR_SOT223
VI
VO
GND
+3.3V
C2
100n
C1
10u
D2
RED_PWR_LED
R4
1k
U4
MIC5501-3.0YM5
VIN
VOUT
EN
GND
C13
1u
+3V0
C12
1u
C10
1u
U8
AP130-18Y
+1V8
C11
1u
D3
RED_PWR_LED
J3
USB_B_Mini
VBUS
D+
D-
ID
Shield
FB2
120R
PWR_FLAG
VBUS
JP1
Jumper_3_Open
J1
+5V battery supply
RV2
R_Potentiometer
LCD_RS
LCD_RW
LCD_E
J2
Conn_01x16_Socket
LCD_DATA_PIN_0
LCD_DATA_PIN_1
LCD_DATA_PIN_2
LCD_DATA_PIN_3
J4
Conn_01x04_Pin
SWDIO
SWCLK
TH1
KTY82
U7
AD8532ARZ
R7
33k
TMP_ADC_VOUT
H1
MountingHole
H2
MountingHole
C5
10u
C4
100n
C3
100n
PWR_FLAG
C6
10n
C7
1u
FB1
120R
C8
1u
C9
100n
JP2
BOOT_SELECT
R6
10k
NRST
BOOT0
PF0
PF1
PB0
PB1
PB3
PB4
PB5
PB6
PB7
VDD
VDDA
VSS
PA0
PA1
PA2
PA3
PA4
PA5
PA6
PA7
PA8
PA9
PA10
PA11
PA12
PA13
PA14
PA15
TRANS_CONTROL
TGS_ADC_OUT
BUT_COL_1
BUT_COL_2
BUT_ROW_3
BUT_ROW_2
BUT_ROW_1
LCD_DATA_PIN_3
LCD_DATA_PIN_2
LCD_DATA_PIN_1
LCD_DATA_PIN_0
LCD_E
LCD_RW
LCD_RS
SWDIO
SWCLK
SW1
SW2
SW3
SW4
SW5
SW6
SW_SPST
C14
1u
R8
10k
R10
10k
C15
1u
TGS 6100
U1
R5
33k
Q2
NMOS
R9
10k
U6
AD8532ARZ
Sheet: /
File: project.kicad_sch

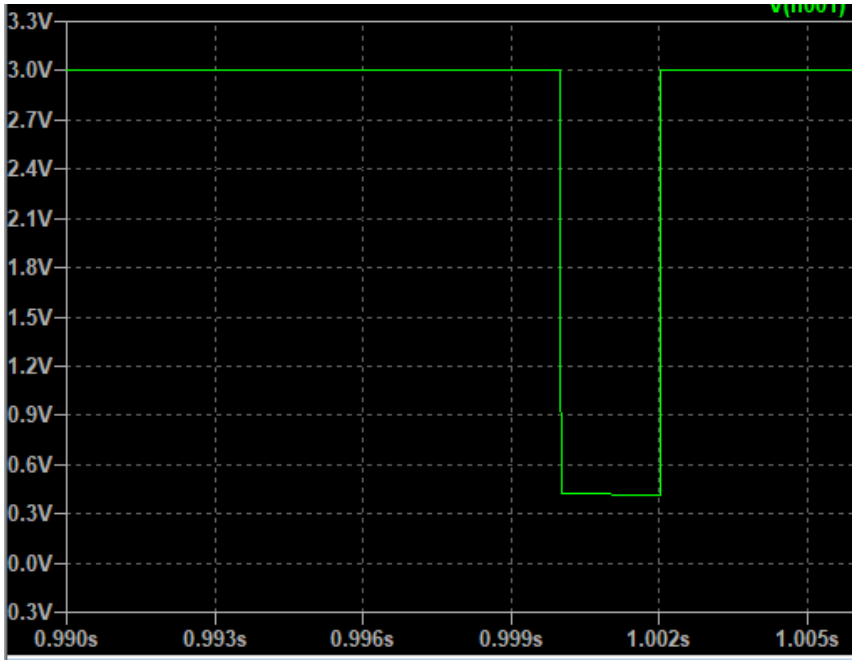

+3V0
+3.3V
TH1
KTY82
U7
AD8532ARZ
et
R7
33k
TMP_ADC_VOUT
GND
GND
+1V8
+3V0
+3.3V
Rh Rs
Rh Rs
U6
AD8532ARZ
TGS 8100
U1
TGS_ADC_OUT
GND
R5
33k
GND
N5_CONTROL
R9
10k
Q2
NMOS
GND

LTSpice simulations

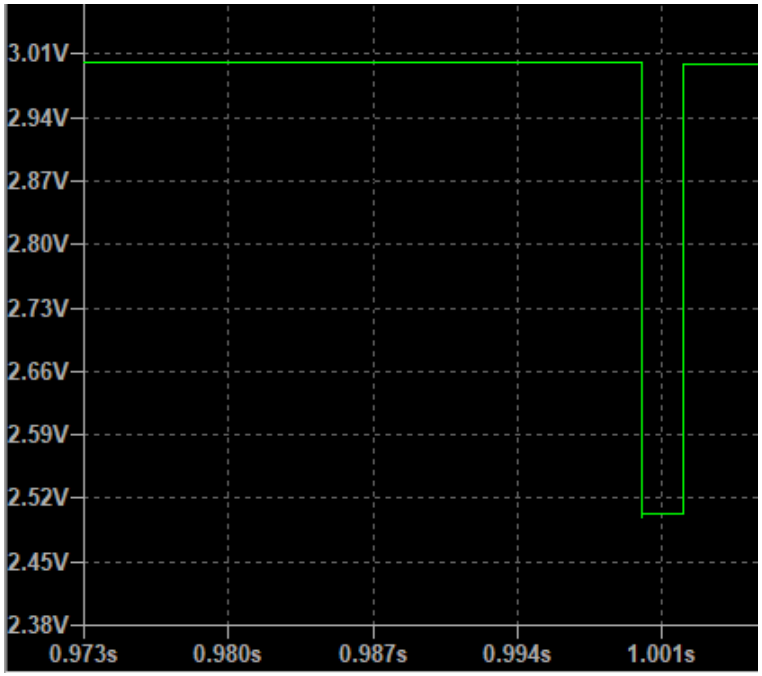




TGS8100 simulations



R = 10kΩ



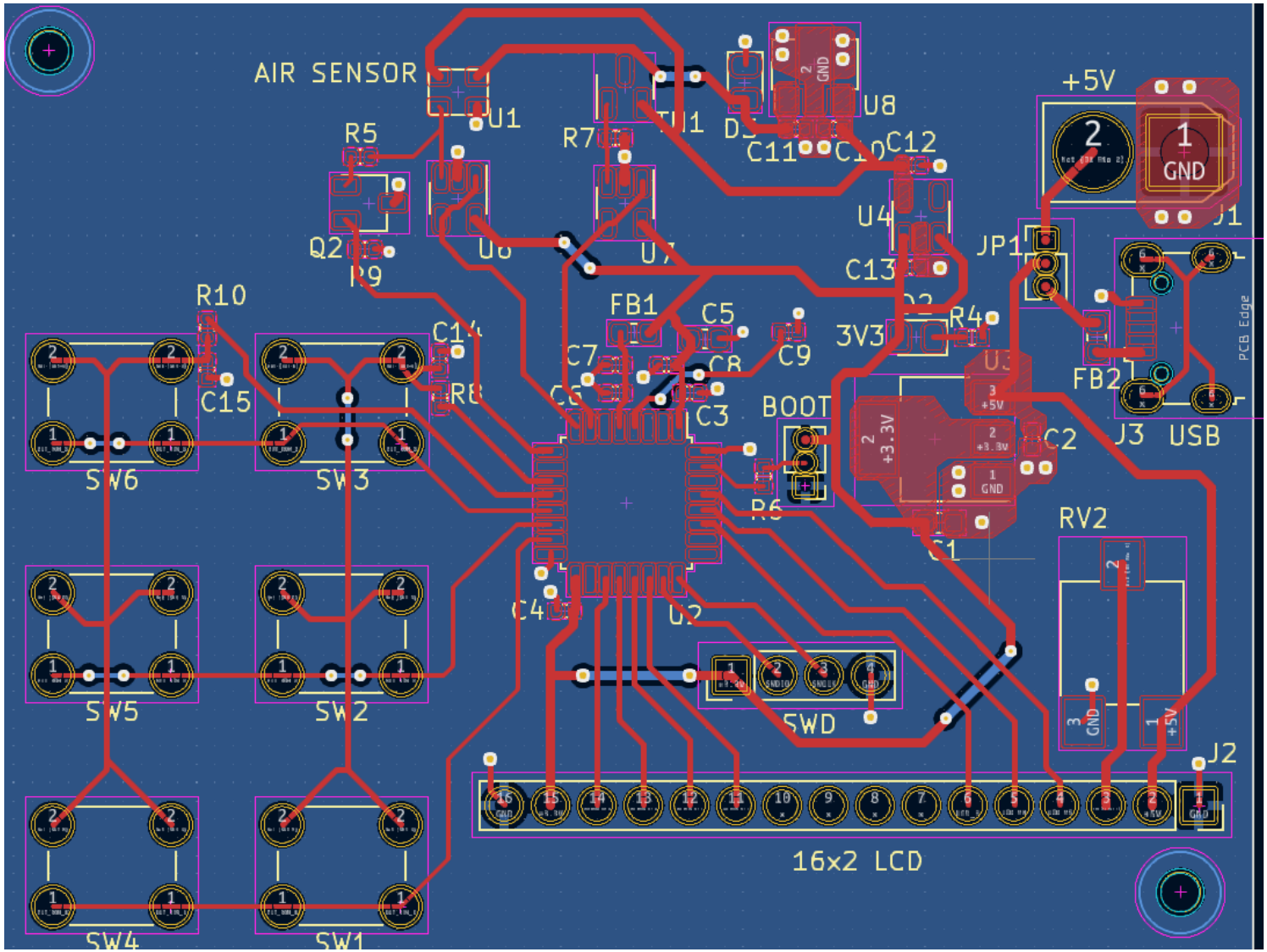
R = 300kΩ

Temperature sensor simulations

R = 2kΩ (25 °C)

R = 1922Ω (20 °C)

PCB


AIR SENSOR
U1
R5
Q2
R9
R10
C15
C14
R8
SW6
SW3
SW5
SW2
SW4
SW1
R7
U7
U8
C11
C12
U4
C13
JP1
+5V
GND
J1
FB1
C5
C7
C8
C9
C6
C3
3V3
R4
FB2
J3 USB
BOOT
R6
C2
C1
RV2
C4
U2
SWD
J2
16x2 LCD
PCB Edge

Measurements

The following measurements are done:

- Internal VRef channel measurement to calculate ADC VRef
- Temperature measurements
- Voltage measurement (without tgs8100 sensor)

temp_sensor	TEMP_SENSOR	{...}
(x)= adc_channel	uint16_t	1
(x)= raw_val	uint16_t	3143
(x)= updated	uint8_t	1 '\001'
(x)= temp	double	22.517666539559158

Problems

During measurements the following problems were discovered

- Wrong footprints of elements
- Wrongly selected temperature sensor (measure range -55 to 150)

Conclusions

- Temperature sensor is measuring quite correctly
- Pay attention to simulations
- Pay attention to properly choose footprints

Thank you for attention