ESR MĚŘIČ

Atmega 8 @ 7,3728

FUSED brownout OFF!

reset — 330K — +5

150nF

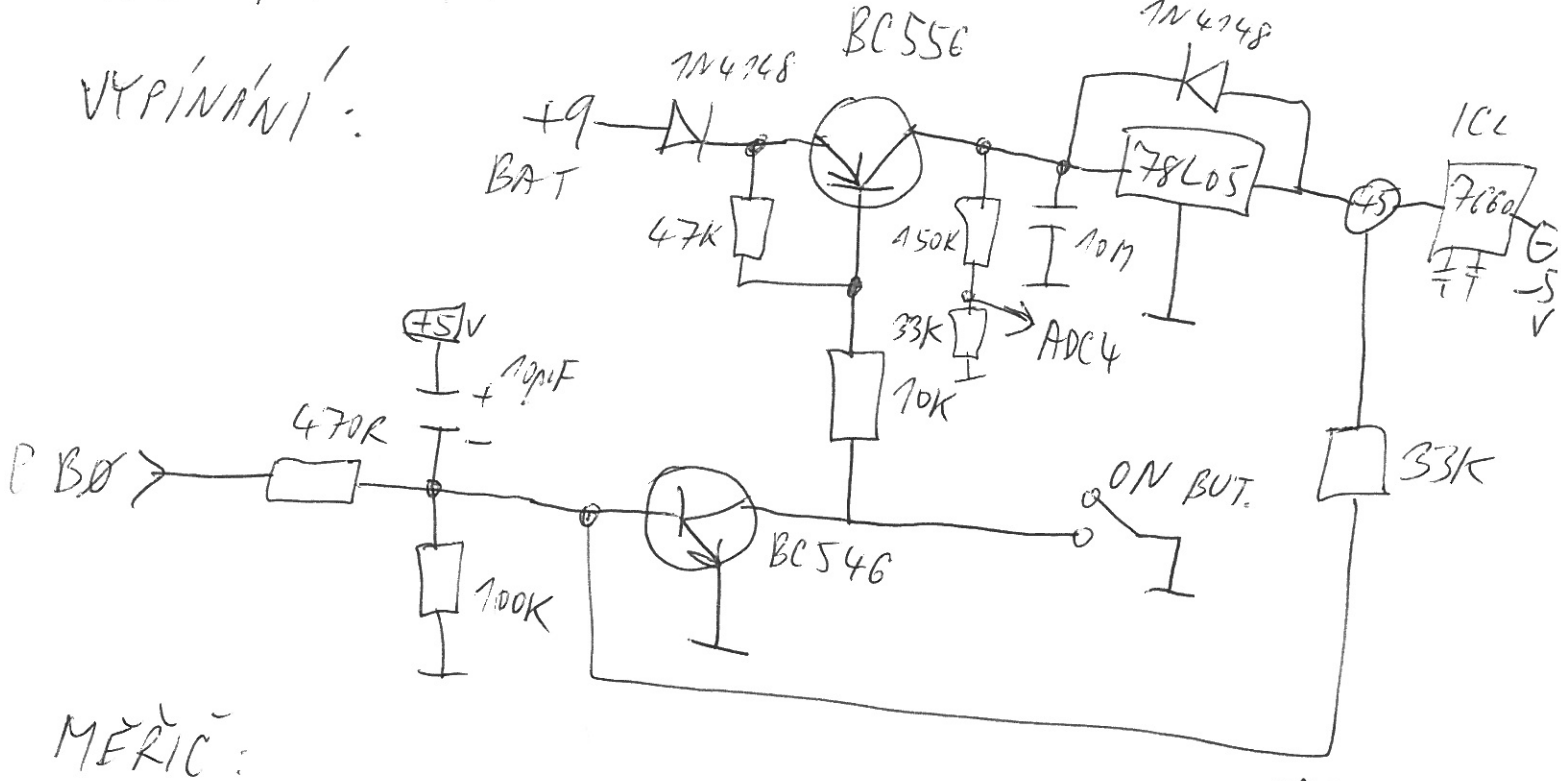
PB0 – vypínání

PC0-3, PD 5&7 DISPLAY

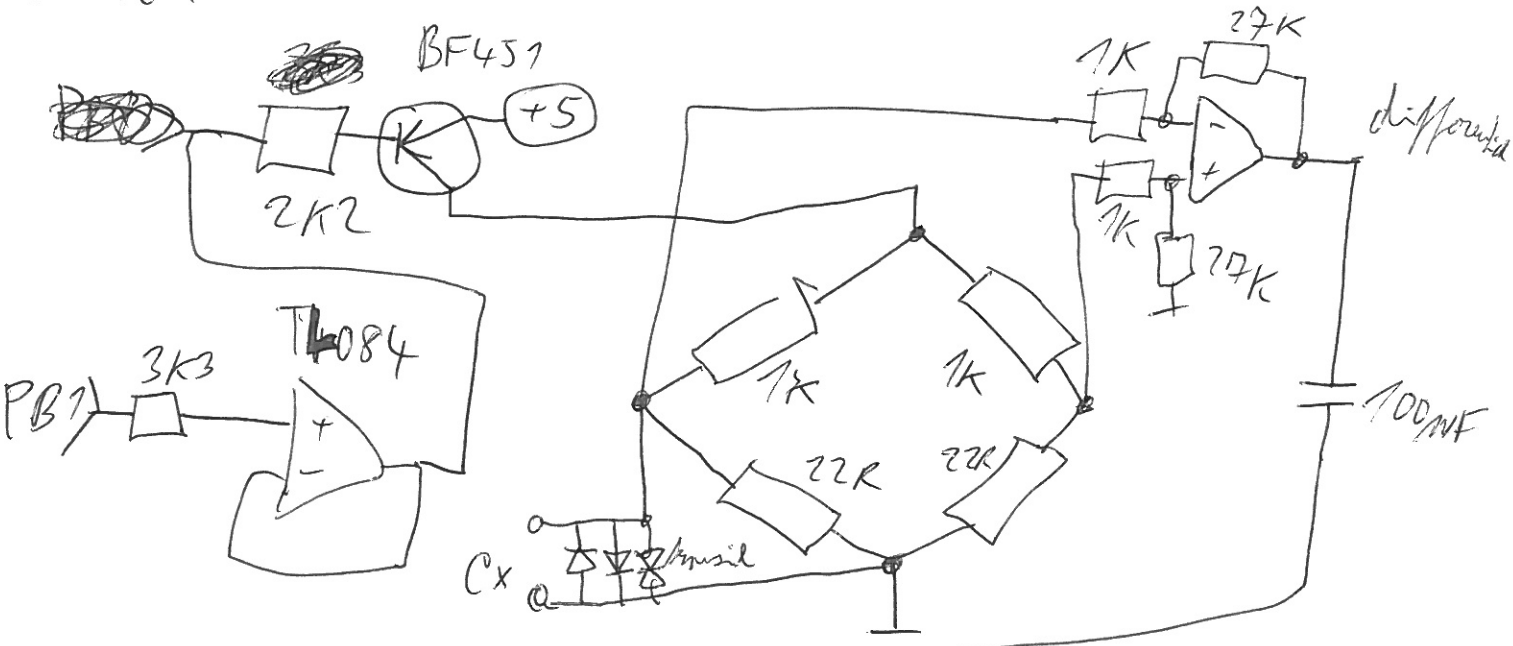
PB1 = OC1A generátor

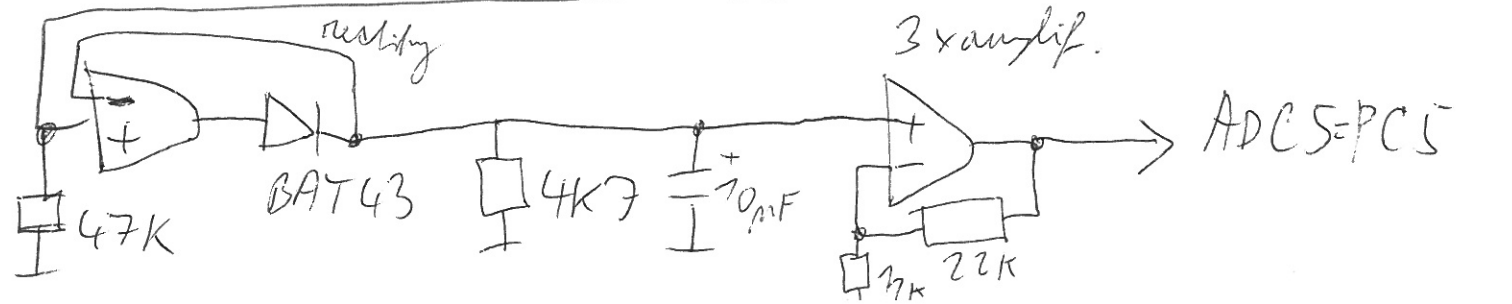
PD2 = INT0 – tlačítka

VYPÍNÁNÍ:

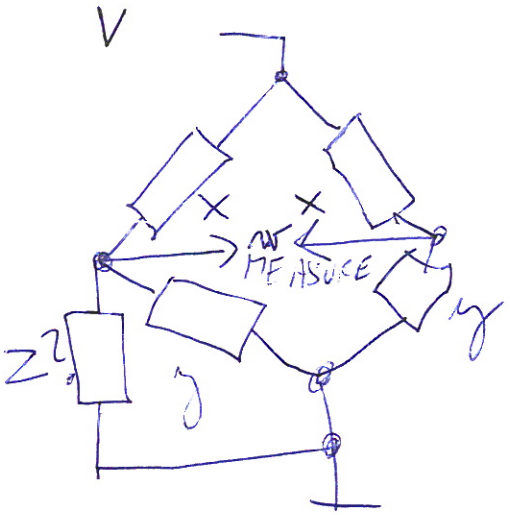


MĚŘIČ:





ESR BRIDGE



MEASUREMENT

1) DIFF. AMPLIF. W. GAIN
2) AC COUPLING
3) RECTIFIER W. OPAMP
4) FINAL GAIN
5) ADC

$$V_{RIGHT} = \frac{y}{x+y} V$$

$$V_{LEFT} = V \frac{\frac{zy}{z+y}}{x + \frac{zy}{z+y}} = V \frac{zy}{xz + xy + zy}$$

$$W = V_R - V_L = Vy\left(\frac{1}{x+y} - \frac{1}{x+y+\frac{xy}{z}}\right) =$$

$$= \frac{Vy\left(x+y+\frac{xy}{z} - x - y\right)}{(x+y)\left(x+y+\frac{xy}{z}\right)} =$$

$$= \frac{V x y^2}{(x+y)(xz + yz + xy)}$$

$$(x+y)z + xy = \frac{V x y^2}{W(x+y)} - xy = xy\left(\frac{Vy}{W(x+y)} - 1\right)$$

$$z = \frac{xy}{x+y}\left[\frac{xy}{x+y}\left(\frac{V}{Wx} - 1\right)\right] = R\left(\frac{R \cdot V}{W \cdot x} - 1\right) = R\left(\frac{1}{ax} - 1\right)$$

FIT:

$z = B \cdot \frac{1}{a} + A$

A ↑ ABSORBS TEST LEADS RESIST. a ↑ ADC READOUT

IF BRIDGE IS NOT IDEALLY BALLANCED:

$V_R = R \cdot v$

$\Delta v = vR - v \frac{y}{x + y + \frac{xy}{R}}$

$\frac{y}{x + y + \frac{xy}{R}} = R - \frac{\Delta v}{v} = R - K \cdot \frac{ADC}{a}$

$\frac{xy}{Z} = \frac{y}{x(R - K \cdot a)} - \frac{1}{y} - \frac{1}{x}$

$\frac{1}{R_{leads} + Z} = \frac{1}{x(R - K \cdot a)} - \frac{1}{x} - \frac{1}{y} =$

$= \frac{1}{A - B \cdot a} - C$

$a = ADC$ readout

→ 3-param nonlinear fit

+ 1 param for test leads resistance

$Z = \frac{1}{\frac{1}{A - B \cdot a} - C} = \frac{A - B \cdot a}{-CA + BCa}$