

The steps towards a basic CanSat

Going through all this is necessary.

Determine what to measure

	Altitude	Temperature	Pressure
expected	Max 1 km Min 0 km	-6.5 K/km starting temp 0°C to 40°C	0.86*P(0) at 1km P(0) around 1bar
Required precision	10 m	65 mK	8 mbar
Expected rate of change (up)	150 m/s	0.97 K/s	120 mbar/s
Expected rate of change (down)	10 m/s	65 mK/s	8mbar/s

MPX4115A

	Required	MPX4115
Range	0.8 to 1.1 bar	15 to 115 kPa
Accuracy	8 mbar	46mV/kPa
		1.5 % V Full scale span
Response time	120 mbar/s	1 ms (for step)
Supply voltage		4.85 to 5.35 V
Current use		Max 10 mA

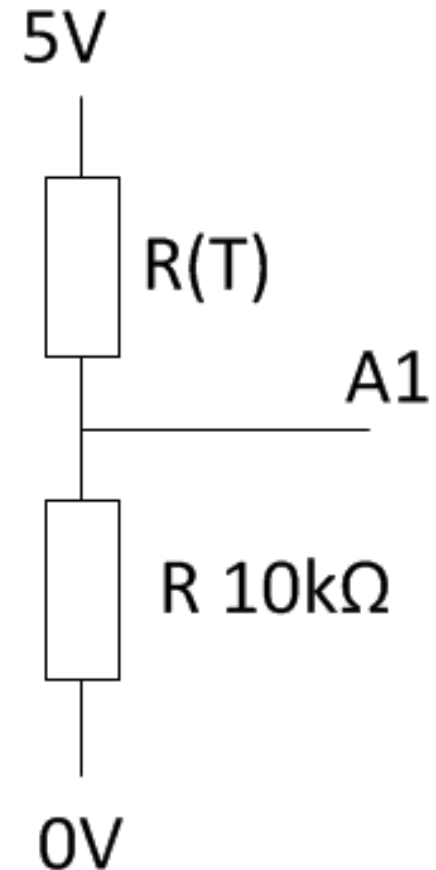
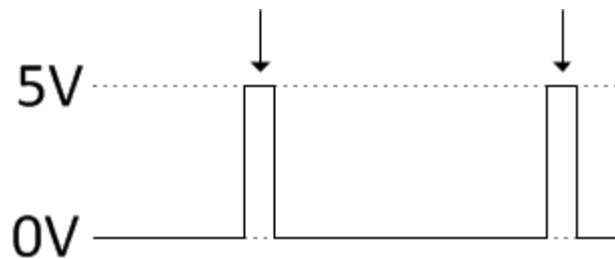
Operational Characteristics on page 3 of the MPX4115 data sheet

Temperature

	Required	NTC	LM35
Range	-10 to 40 °C	-40 to 150 °C	2 to 150 °C Or negative supply voltage
Accuracy	65 mK	0.5 °C	0.5 °C
		Resistance change is non linear	10 mV/°C
Response time	0.97 K/s	1.2 s For temp step in oil	3 minutes For temp step in still air
Supply voltage		Dependant on measurement	4 to 30 V
Current use		Dependant on supply voltage	Less the 60 uA

NTC self heating

- Measuring resistance requires current
- Turning the 5V on and off



From digital value back to altitude

$$V_{in} = V_{LSB} * N_{ADC}$$
$$V_{in} = 4.88 \text{ mV} * N_{ADC}$$

- Calculating the measured voltage is only the first step

$$P_{in} = \dots * V_{in} + \dots$$
$$P_{in} = \dots * (4.88 \text{ mV} * N_{ADC}) + \dots$$

- The second is going back to pressure

Calibration

Measurement deviation sources

- Static
 - Sensor
 - Power supply
 - ADC offset
- Dynamic
 - Weather (high or low pressure area)

DATA processing

- Sending Altitude
 - Altitude measurement is indirect
- Pressure is dependent on altitude and weather



Altitude is 0 meter



Altitude is 40 meter

DATA processing

- Sending pressure
- Weather impact can be removed later



Pressure is 1050 mbar
Altitude is 0 meter



Pressure is 950 mbar
Altitude is 0 meter

DATA analysis

- Determining what the data means
 - Plotting the data vs. time
- Compare to the expected
 - To determine if the data is correct

DATA analysis

