

## 2.5 The Humidity Sensor

For the measurement of the humidity I use a capacitor, which is open, and the air is able to flow through. The dielectric is therefore the surrounding air. With this alone it is of course not possible to measure the humidity. Thus I decided to generate a frequency, which would change with the changing  $C$  of the sensor. Since the microprocessor needs a digital frequency with proper positive and negative edges it is not possible to use an RC oscillator. In the database for electronic devices I found a timer LM555 that is also able to run as an oscillator. If we connect the circuit like shown in the figure we receive an astable operation. The circuit will trigger itself and free run as a multivibrator. The sensor charges trough  $R_A + R_B$  and discharges through  $R_B$ . Consequently the duty cycle can be set by the ratio of the two resistors. The generated frequency can be calculated by the formula:

$$f = \frac{1.44}{(R_A + 2R_B) \cdot C}$$

$R_A + 2R_B$  is put together of both charge time ( $R_A + R_B$ ) and discharge time  $R_B$ . Before I did the calculation I determined the range for the frequency at 1kHz. Afterwards I measured the capacitance of the sensor under normal conditions. I received the value 480nF. As a result of the calculation I received a value of  $3M\Omega$   $R_A$  and  $2R_B$ .

In the figure below is the complete circuit shown how it is built on the board.

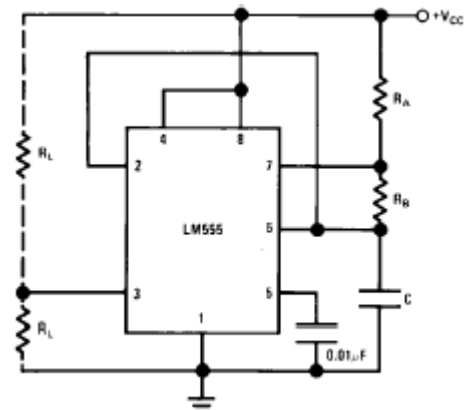


Figure 7: LM555 as an oscillator

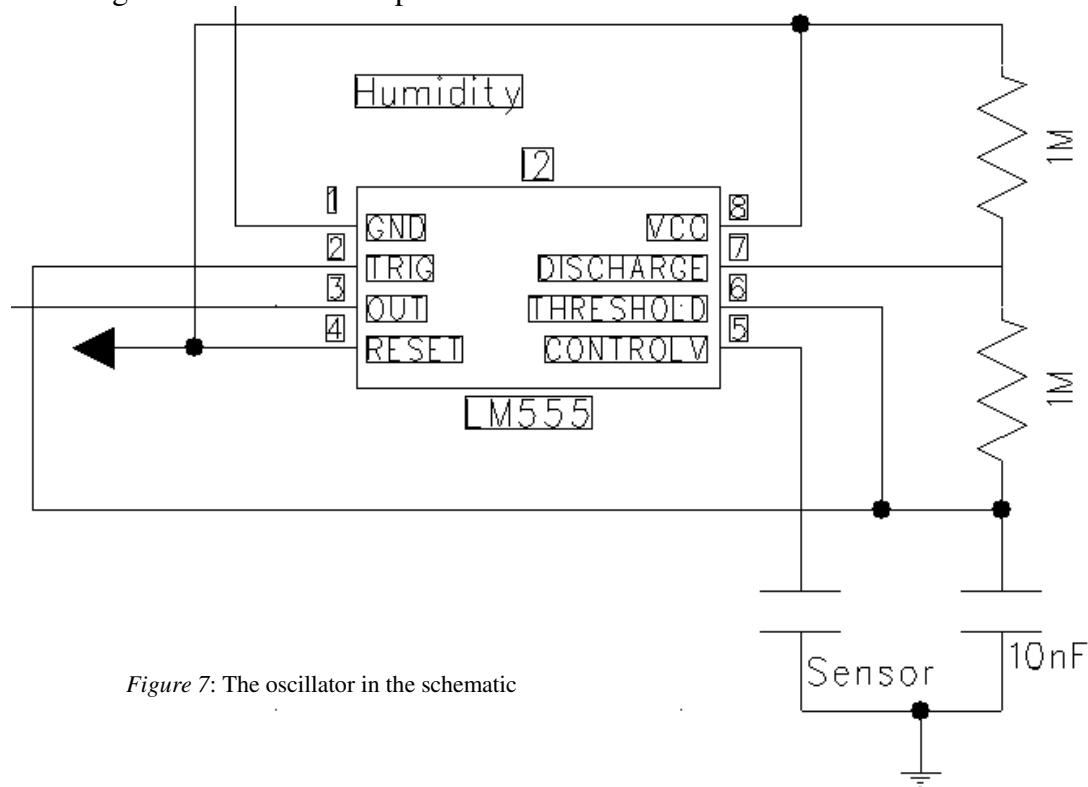


Figure 7: The oscillator in the schematic