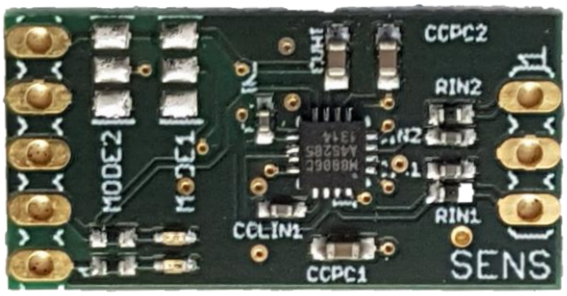
MS8886C Evaluation Board

User guide for the MS8886C evaluation board



Description

The evaluation board allows the user to investigate the operation of the MS8883C and MS8886C capacitive proximity switches.

The MS8886C contains two identical instances of the MS8883C capacitive switch. Therefore the MS8886C evaluation board can also be used to evaluate the usability of the MS8883C for single channel applications.

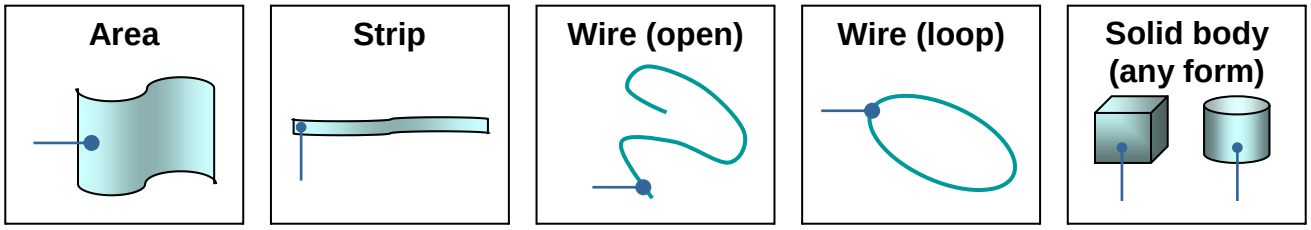
LEDs displays the status of the switches and test points facilitate measurements of other important signals.

The desired capacitive sensor area can vary in terms of material, form, size and switching distance. Each particular switch configuration demands a suitable electrical circuit for the input signal. The board allows the input circuit to be changed easily to check a particular switching configuration.

The board allows the user to quickly determine whether the MS8883C / MS8886C capacitive switches can be used in a particular customer application.

Sensors

The following diagrams show some example sensors of how the switch can be used.



References

Data sheet and further information:

https://www.microdul.com/en/standardprodukte/capacitive-switches/

Ordering information

Article Number	Description	Contact
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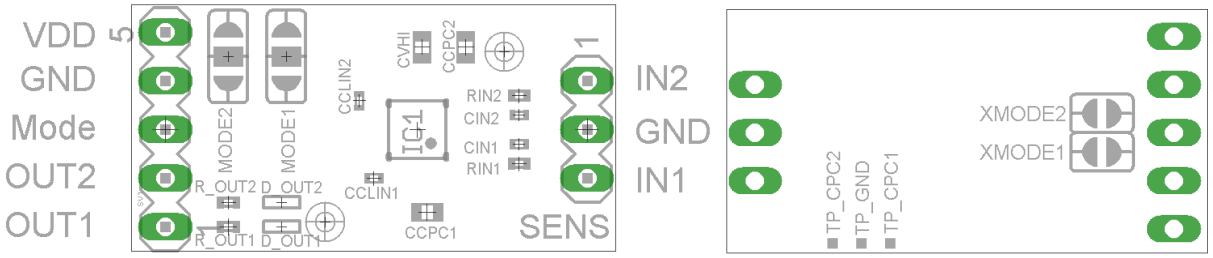
Evaluation board

The picture below shows the assembly drawing of the evaluation board.



(top view) (bottom view)

The pre-assembled SMD resistors and capacitors may be changed in order to experiment with the set-up. The sensor compensation section below explains the effects of changing the component values.

Note: The CCPC1,2 capacitors must be good quality X7R type to minimise charge leakage.

Bill of material

The evaluation board is populated with the following components:

Item	Description	Value	Package
IC1	MS8886C capacitive switch		QFN16 3x3 mm
RIN1, RIN2	SMD resistor, input filter	4.7 kΩ	R0402
CIN1, CIN2	SMD capacitor, input filter	22 pF	C0402
CCLIN1, CCLIN2	SMD capacitor, oscillator frequency setting	22 pF	C0402
CCPC1, CCPC2	SMD capacitor, sensor sensitivity setting	470 nF X7R	C0603
CVHI	SMD capacitor, supply decoupling	220 nF	C0603
R_OUT1, R_OUT2	SMD resistor, LED current limiting	330 Ω	R0402
D_OUT1, D_OUT2	SMD LEDs	red	LED 0402

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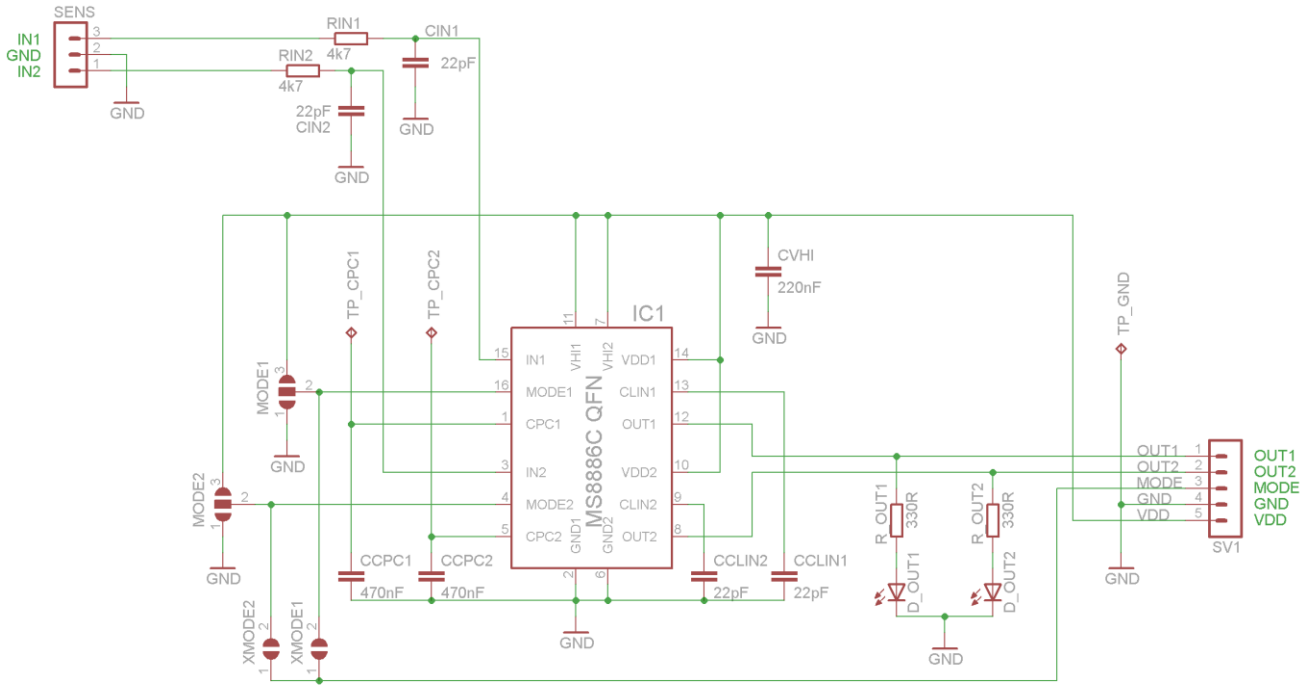
Circuit diagram



Set-up

The board is delivered with all necessary SMD components soldered on to the board. The components have default values. The solder jumpers are initially not connected.

Here are a few useful tips to help with the test set-up:

- Power supply: the VHI1,2 and VDD1,2 pins are connected on the evaluation board. Therefore the internal regulator of the MS8886C is not active, and the VDD supply voltage is restricted to a range of 2.7 - 4.6 V.
- The sensor plate area does not need to be adjacent to the electronics. It is recommended to use coaxial cable or a flat ribbon cable with a shielding GND line to connect the sensor plate to the IN1,2 points. The coaxial shield must be connected to “GND”. The size and form of the sensor plate can be varied to obtain optimal switching behaviour.
- A high-impedance voltage meter, an active probe or a high-impedance buffer amplifier must be used to measure the CPC voltages at the test points TP_CPC1 & TP_CPC2. These nodes are susceptible to leakage currents, which may hamper the switching performance.

  The measured voltage has a linear relationship to the total input capacitance and can be used to optimise the operating point of the MS8886C.
- Solder jumpers MODE1 & MODE2 allow to select the switching behaviour of the MS8886C (see datasheet for details). Additionally the switching behaviour can be dynamically set from the application host using the pin MODE of the connector SV1. For this the solder jumpers MODE1,2 must be open and the solder jumpers XMODE1,2 must be closed. As the MS8886C contains two independent capacitive switches, the switching mode selection can be individually chosen for the two channels.

Sensor compensation & tuning

It is recommended to start the evaluation of the application using the pre-assembled components on the board since these have typical values and should give an adequate response in many cases. In cases where the switch does not respond or responds unreliably, it is likely that the input capacitance exceeds the specified input range.

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The voltage measured on TP_CPC1,2 should ideally be approximately VDD/2. The bias point can be optimised by first changing CIN1,2 (and possibly replacing CIN1,2 by a resistor) according to step 1 in the table below. Once the switch functions properly, further optimisation can be done in a second step by adjusting CCPC1,2 and CCLIN1,2.

Step	Component	Description	min	typ	max
1	CS	CS is the **total input capacitance** (CSensor + Ccable + CIN). CIN should be chosen so that CS is about 30pF. The voltage over CCPC should then be about VDD/2.	10pF	30pF	60pF
	RIN	RIN and CIN form a low pass filter. The typical values are likely to be correct for most applications.		4.7kΩ	
	RC	CIN can be replaced with a discharge resistor if the input capacitance is too large (large sensor, long coax connection). Smaller resistor values should be used with larger input capacitances. Again the criteria is to reduce the voltage over CCPC to approximately VDD/2.	5kΩ		50kΩ
2	CCPC	CCPC determines the **sensitivity** of the sensor. If the sensitivity is increased by increasing CCPC, the likelihood of incorrect switching due to interfering electrical fields is also increased. This parameter has a strong influence on the switching characteristic. The CCPC capacitors must be good quality X7R type to minimise charge leakage.	90nF	470nF	2.5µF
3	CCLIN	CCLIN determines the internal sampling frequency and therefore the switch **reaction time**. Smaller values of CCLIN correspond to faster sampling and therefore shorter reaction times. Shorter reaction times lead to increased current consumption. A faster sampling frequency also increases the auto-calibration speed. Slow capacitance changes, caused for instance by very slowly approaching fingers, may be neutralised by the auto-calibration.	0pF	22pF	100pF

Legal disclaimer

This product is not designed for use in life support appliances or systems where malfunction of these parts can reasonably be expected to result in personal injury. Customers using or selling this product for use in such appliances do so at their own risk and agree to fully indemnify Microdul AG for any damages resulting from such applications.

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