MS8883A Evaluation board

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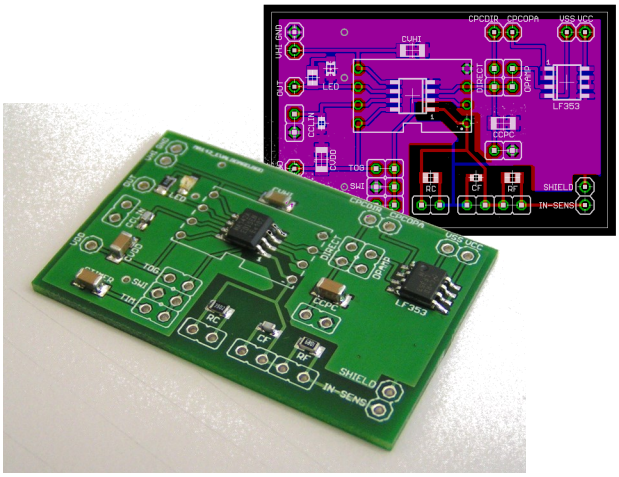
Capacitive proximity switch evaluation board



Description

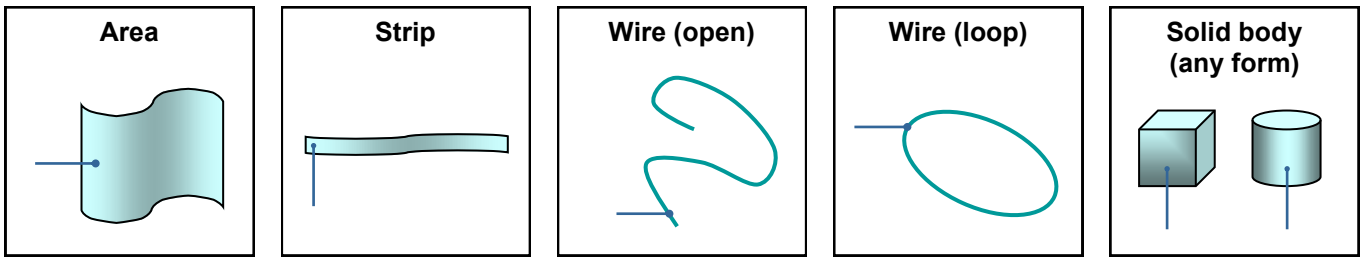
The evaluation board allows the user to investigate the operation of the MS8883A capacitive proximity switch. An LED displays the status of the switch and test points facilitate measurements of other important signals.

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 MS8883A capacitive switch can be used in a particular application.

Sensors

The following diagrams show some creative examples of how the switch can be used.



For questions or help with a particular application, contact Microdul AG at the address given below.

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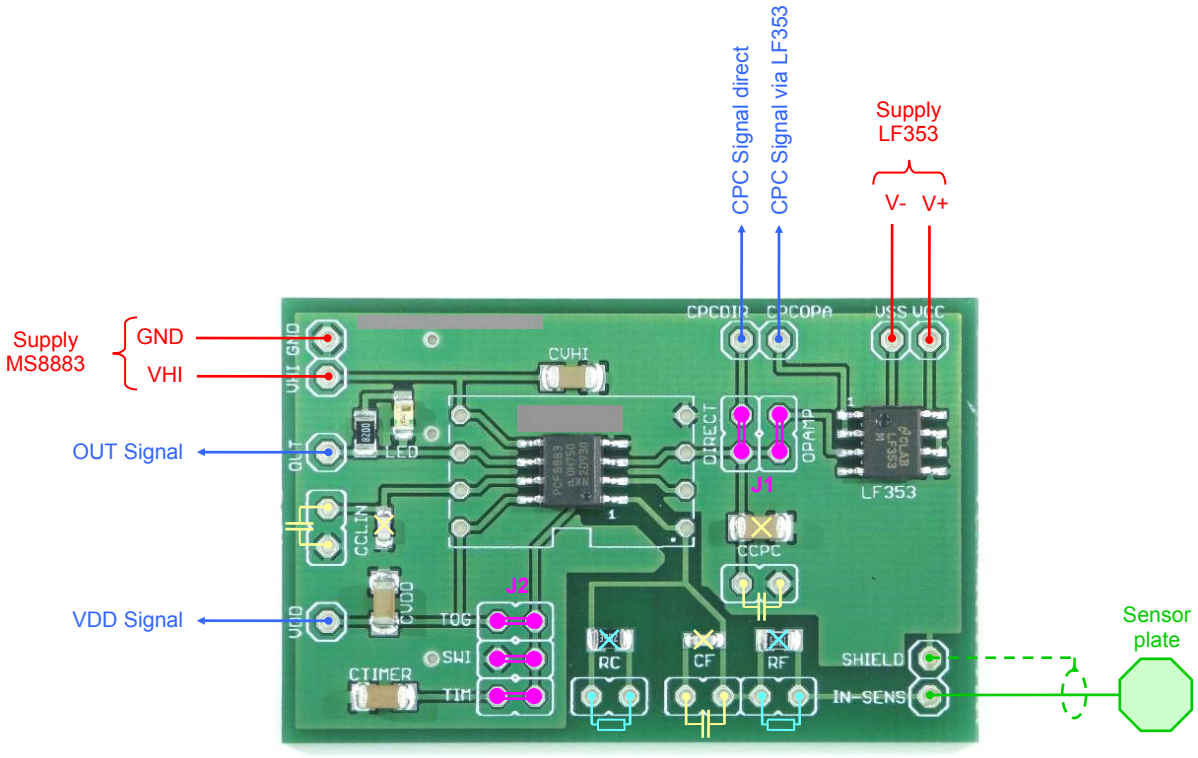
Evaluation board

The picture below shows the pre-assembled evaluation board.
The circuit set-up is described using the corresponding colours on the following page.



The pre-assembled SMD resistors and capacitors may be changed in order to experiment with the set-up. In addition, the SMD components may be removed and conventional components may be soldered on to the board in the positions that are marked in yellow and turquoise. The component labels are marked between the corresponding connections. The sensor compensation section covers the effects of changing the component values.

Note: The CPCC capacitor must be a good quality X7R type to minimise charge leakage.

Bill of material

The evaluation board is populated with the following components:

Item	Description	Value	Package
MS8883	MS8883 capacitive switch	-	SO-8
LF353	LF353 voltage follower	-	SO-8
CVDD	SMD capacitor	1µF	C1206
CTIMER	SMD capacitor	470nF	C1206
CCPC	SMD capacitor X7R	470nF	C1206
CVHI	SMD capacitor	100nF	C1206
CCLIN	SMD capacitor	22pF	C0603
CF	SMD capacitor	10pF	C0603
RC	SMD resistor	n.p.	R0805
RF	SMD resistor	6.8kΩ	R0805
RLED	SMD resistor	820Ω	R0805
LED	SMD LED	red	CHIPLED_0805

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Set-up

The board is delivered with all necessary SMD components soldered on to the board. Here are a few useful tips to help with the test set-up.

Note: If the voltage follower is used then two supply voltages are needed. The MS8883A is supplied from 3.0 to 9.0V as indicated in the specification and the LF353 voltage follower requires ±15VDC.

The sensor plate area does not need to be adjacent to the electronics. It is recommended to use coaxial cable to connect the sensor plate to the IN-SENS point. The coaxial shield must be connected to “Shield”. The size and form of the sensor plate can be varied to obtain optimal switching behaviour. The components already soldered on to the board are optimised for a sensor area of about $2cm^2$.

The signal OUT is connected to a test point and then via a resistor to an LED showing the switch state.
An active probe has to be used when probing CPCDIR due to its high impedance. It is recommended to probe this signal using the signal CPCOPA at the output of the voltage follower. The measured voltage has a linear relationship to the total input capacitance.

Jumper J1 is used to select direct connection of CPC at the test point or a buffered connection of CPC at the voltage follower output.
Jumper J2 selects the MS8883A switching mode:

- TOG (Toggle): OUT toggles high or low each time a switching event occurs
- SWI (Switch): OUT is active as long as the switch event is taking place
- TIM (Timer): OUT is active for a time interval of C_{TIMER} * 2ms/nF at each switching event.

Sensor compensation

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. The voltage measured on CPCOPA should ideally be approximately VDD/2 (Note VDD/2 not VHI/2). The bias point can be optimised by first changing CF (and possibly also RC) according to step 1 in the table below. Once the switch functions, further optimisation can be done in a second step by adjusting CCPC and CCLIN.

Details concerning optimisation of the biasing are contained in the application note AH_MS8883
(please download from https://www.microdul.com/en/standardprodukte/capacitive-switches/)

Step	Component	Description	min	typ	max
1	CIN (CF)	CIN is the **total input capacitance** (C_{Sensor} + C_{cable} + CF). CF should be chosen so that CIN is about 30pF. The voltage over CCPC should then be about VDD/2.	10pF	30pF	60pF
	RF	RF and CF form a low pass filter. The typical values are likely to be correct for most applications.		6.8kΩ	
	RC	This resistance compensates large input capacitances (long coaxial cable, larger sensor plate area). Smaller resistor values should be used with larger input capacitances.	10kΩ	39kΩ	
2	CCPC	CCPC determines the **sensitivity** of the sensor. If the sensitivity is increased, the likelihood of incorrect switching due to interfering electrical fields is also increased. This parameter has a strong influence on the switching characteristic.	90nF	470nF	2500nF
3	CCLIN	CCLIN determines the internal sampling frequency and therefore the switch **reaction time**. Smaller values of CCLIN correspond to shorter reaction times. Shorter reaction times lead to increased current consumption.	0pF	22pF	100pF

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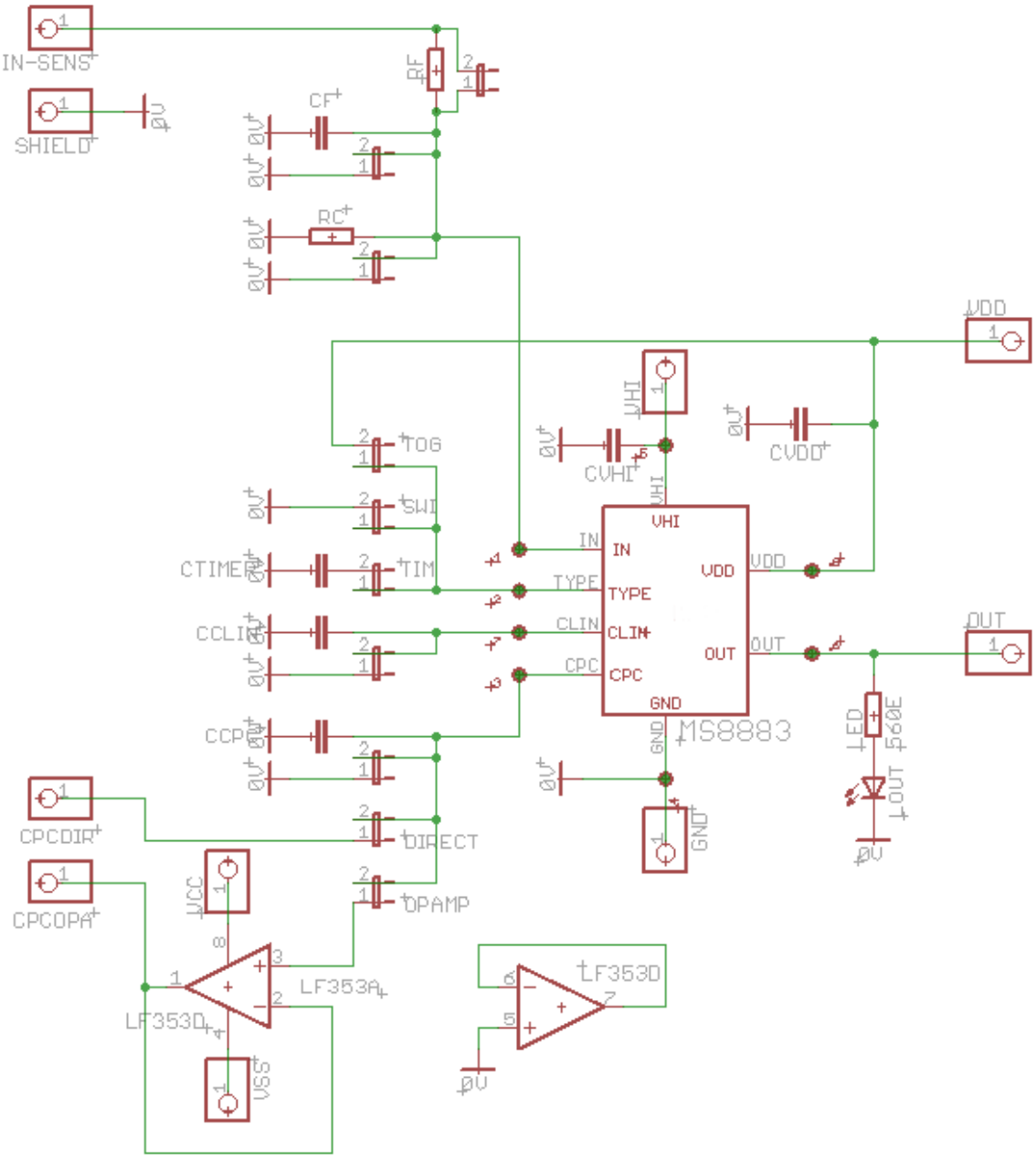
Circuit diagram

All important SMD component locations provide contacts to allow “wired” components to be soldered on to the board for experimentation (see page 2).



Data sheet, application note and further information:
https://www.microdul.com/en/standardprodukte/capacitive-switches/

Legal disclaimer

The product is not designed for use in life support appliances, devices, or systems where malfunction could reasonably be expected to result in personal injury. Microdul AG customers using or selling these products in such applications do so at their own risk and fully agree to indemnify Microdul AG for any damages resulting from such application.

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