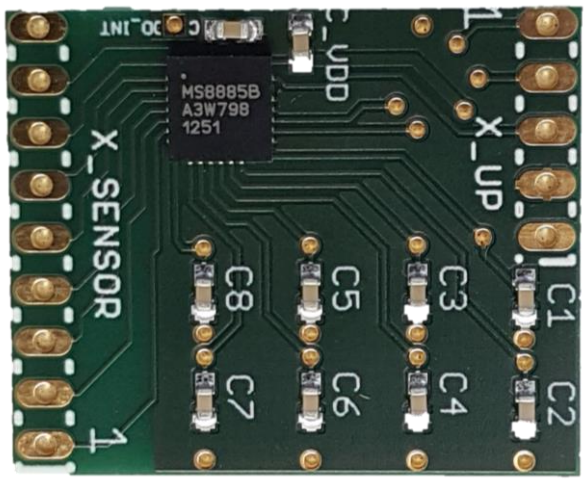
MS8885B Evaluation Board

User guide for the MS8885B evaluation board



Description

The evaluation board allows the user to investigate the operation of the MS8885B capacitive proximity switch.

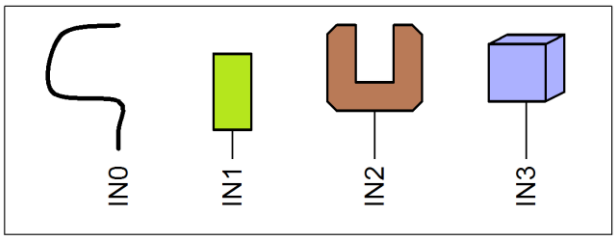
The MS8885B is a capacitive switch with eight sensor channels that can operate independently. There is also a built in option for a matrix arrangement of the sensors.

The desired capacitive sensor areas can vary in terms of material, form, size and switching distance.

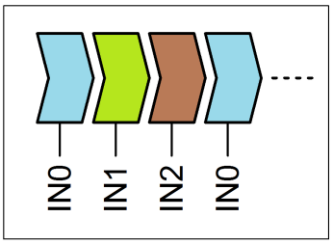
The board allows the user to quickly determine whether the MS8885B capacitive switch can be used in a particular customer application.

Sensors

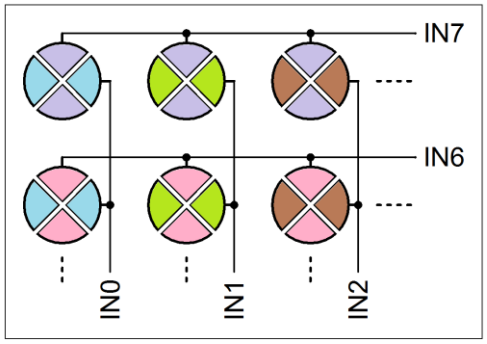
The following diagrams show some example sensor arrangements of how the switch can be used.



Arbitrary sensor shapes



Slider arrangement



Matrix arrangement (each ‘key’ activates two different channels)

References

Data sheet and further information:

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

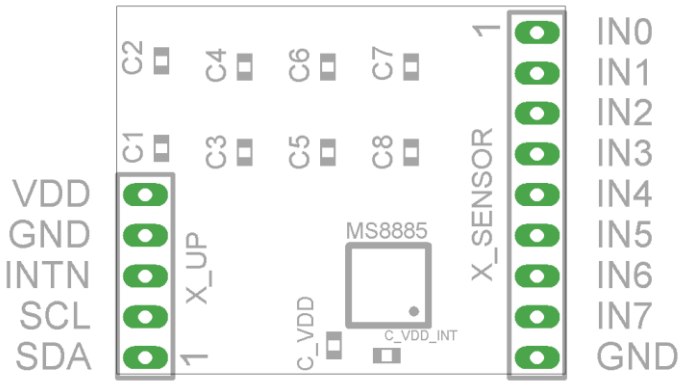
Ordering information

Article Number	Description	Contact
9160308	MS8885B Evaluation board	info@microdul.com

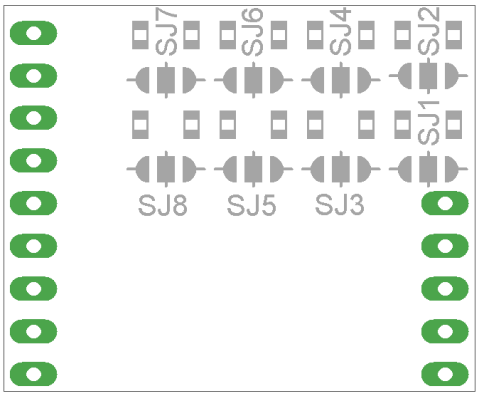
Tel. +41 44 455 35 11, Fax +41 44 455 35 95
http://www.microdul.com/
semiconductors@microdul.com

Evaluation board

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



(top view)

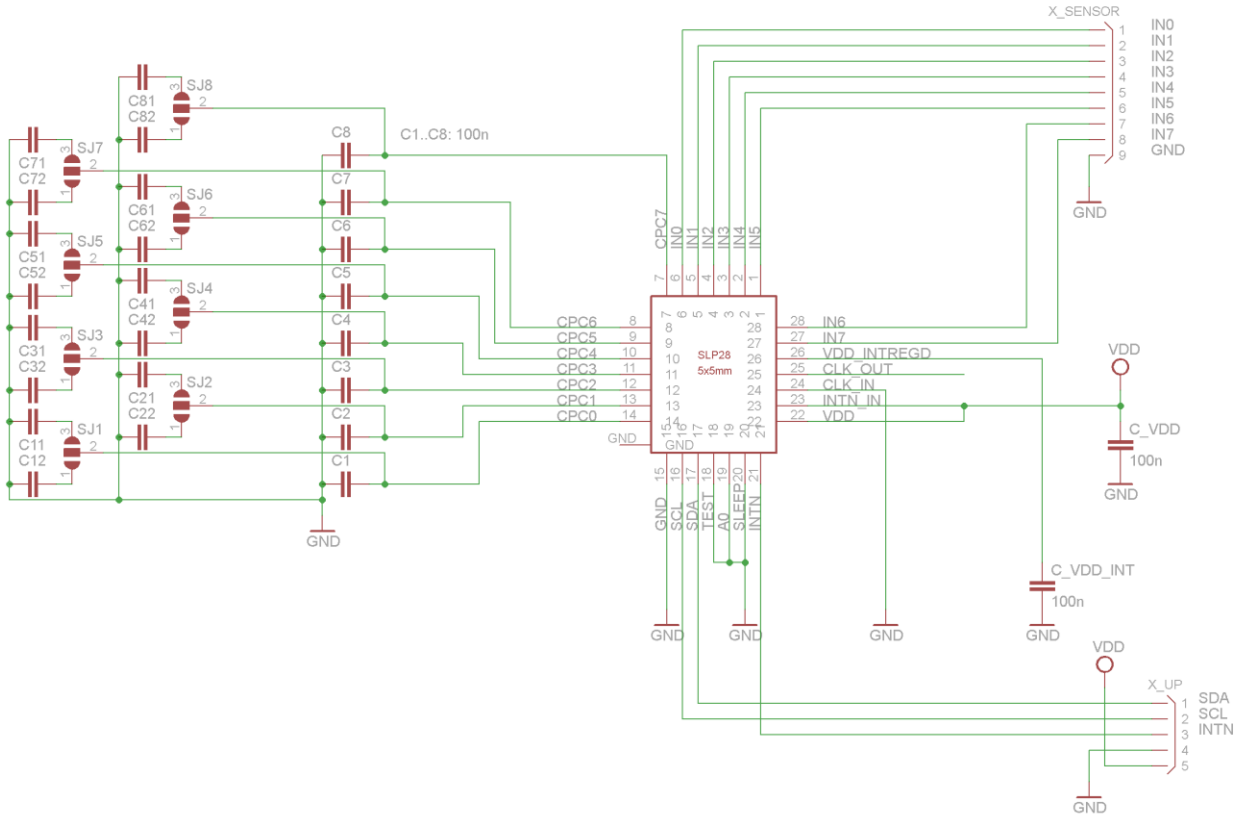


(bottom view)

The pre-assembled SMD capacitors may be changed in order to experiment with the set-up. Additional sensitivity setting capacitors can be added to the bottom side of the PCB.

The sensor compensation section below covers the effects of changing the component values.

Circuit diagram



Bill of material

The evaluation board is populated with the following components:

Item	Description	Value	Package
IC1	MS8885B 8-channel capacitive switch		QFN28 5x5 mm
C1 to C8	SMD capacitors, sensor sensitivity setting	100 nF X7R	C0603
C_VDD, C_VDD_INT	SMD capacitor, supply decoupling	100 nF	C0603
C11, C12, C21 … C82	Optional additional SMD capacitors for individual sensor sensitivity tuning, to be mounted on the bottom side	X7R type, not placed	C0603

Set-up

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

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

- The MS8885B has a serial I2C interface, used to configure operating parameters and to read out sensor states. A controller has to be attached to connector X_UP.

  In its power-up configuration the MS8885B is actively monitoring all sensor inputs. For the complete configuration options refer to the MS8885B datasheet.

- Pull-up resistors are required on the I2C bus lines SCL and SDA for proper operation. The pull-up resistors have to be attached externally, on the controller board, or on the X_UP connector. The MS8885B contains no internal pull-up resistors.

- The CPC capacitors C1 to C8 (and also the optional capacitors C11 to C82 on the bottom side) must be good quality X7R type to minimise charge leakage.

- The sensor plate areas do not need to be adjacent to the electronics. It is recommended to use coaxial cable or a flat ribbon cable with a shielding GND lines to connect the sensor plates to the IN0..7 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. The CPC voltages are best accessed on the solder jumpers SJ1 to SJ8 on the bottom side of the board.

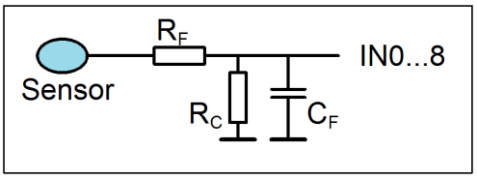
  These nodes are susceptible to leakage currents, which may hamper the switching performance. The measured voltage has a linear relationship to the total input capacitance and can be used to optimise the operating point of each channel of the MS8888B.

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.

The voltage measured on the CPC lines should ideally be approximately VDD/2, which corresponds to a total capacitance of the sensor and connection lines of 20 – 30 pF. The bias point can be optimised by adding capacitance to the IN lines or by adding a pull-down resistor to the IN lines, according to step 1 in the table below. Once the switch functions properly, further optimisation can be done in a second step by adjusting C1 to C8 and the internal configuration registers of the MS8885B.

Tel. +41 44 455 35 11, Fax +41 44 455 35 95
http://www.microdul.com/
semiconductors@microdul.com

Step	Component	Description	min	typ	max
1	optional external components				
	CF	The **total input capacitance** (CSensor + Ccable) is ideally about 20 - 30pF. The voltage at C1…C8 should then be about VDD/2. If the input capacitance is too small, an additional capacitor CF should be added between the sensor inputs IN1…8 and GND.	10pF	30pF	50pF
	RF	RF and CF form a low pass filter. The typical value is likely to be correct for most applications.		4.7kΩ	
	RC	A discharge resistor RC may be added, if the input capacitance (CSensor + Ccable) is too large (large sensor, long coax connection). Smaller resistor values should be used for larger input capacitances. In this case CF should not be applied. Again the criteria is to reduce the voltage over CCPC to approximately VDD/2.	5kΩ		50kΩ
2	CPC capacitors	C1 to C8 determine the **sensitivity** of the sensors. The sensitivity can be increased by adding C11, C12 to C82. This capacitance has a strong influence on the switching characteristic. The maximum value of 470 nF is no strict limit, but larger values increase the likelihood of incorrect switching due to interfering electrical fields. The sensitivity of each channel can be set individually by choosing the optimal capacitance value. The initially placed C1 to C8 have a value of 100 nF. If the sensitivity has to be reduced, these capacitors must be replaced with smaller values.	22nF	100nF	470nF
3	CLKREG register	The internal CLKREG register determines the sensor sampling frequency and therefore the switch **reaction time**. Please refer to the datasheet for details about the CLKREG register. 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.			
4	CONFIG register	Additional settings can be configured in the CONFIG register. Please refer to the datasheet for details about the CONFIG register.			

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.

Tel. +41 44 455 35 11, Fax +41 44 455 35 95
http://www.microdul.com/
semiconductors@microdul.com