

UM10711

Slim proximity touch sensor demo board OM11052

Rev. 1 — 26 April 2013

User manual

Document information

Info	Content
Keywords	PCA8886, Touch, Proximity, Sensor
Abstract	User manual for the demo board OM11052 which contains the touch and proximity sensor PCA8886



Revision history

Rev	Date	Description
v.1	20130426	new user manual, first revision

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1. Introduction

1.1 General

The OM11052 is an application and demo board to evaluate the performance of the NXP capacitive touch and proximity switch PCA8886.

1.2 Capacitive sensing...

Capacitive sensing allows detecting the approach of an object getting towards the sensor plate. Two cases can be distinguished:

- proximity detection
- touch detection

The NXP circuits of the sensor family PCF8883, PCF8885 and PCA8886 are configurable to sense either proximity or touch.

A moving object represents in a general way a moving electrode. The interaction with a static electrode is a change of capacity. The proximity switch is now evaluating the change of capacity. Special methods are used to detect the changes in a large range. NXP's implementation includes auto-calibration. This compensates changes of the environment over time. There might be a change of humidity or contamination on the electrode.

The detected effect can now be used for sensing different behaviors:

- Proximity of a certain object
- Touch sensor for replacing a mechanical switch

1.3 Application board

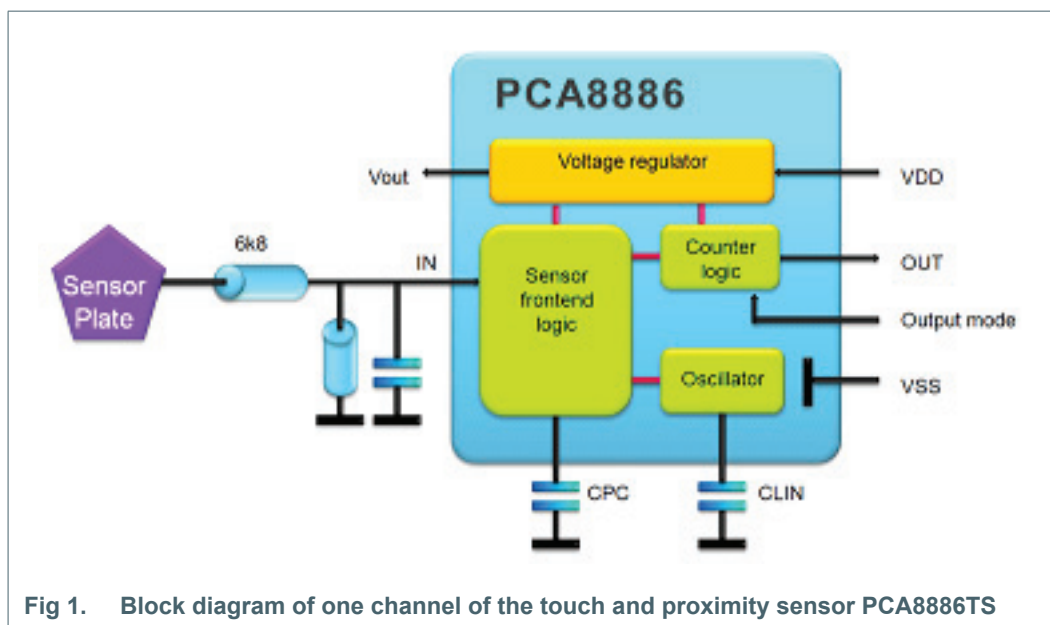
This OM11052 board demonstrates the high sensitivity and reliable functionality of the dual channel touch and proximity sensor PCA8886.

The mechanical shape of the board is optimized to fit in a door handle. One sensor is able to detect the approximation of the hand to trigger the unlocking of the door. A second sensor is foreseen to be touched to lock the door upon departure.

This unique shape allows using the board as a starting point in many different applications. The size of the sensors can be easily adapted to reflect your target application.

2. Key features of the PCA8886 dual channel sensor

- Dynamic proximity switch
- Digital processing method
- Automatic calibration
- Adjustable sensitivity, can be made very high
- Adjustable response time
- Wide input capacitance range (10 pF to 60 pF)
- A large distance (several 10 cm) between the sensing plate and the IC is possible
- Open-drain output (P-type MOSFET, external load between pin and ground)
- Output configurable as push-button, toggle, or pulse
- Wide voltage operating range ($V_{DD} = 3\text{ V to }9\text{ V}$)
- Designed for battery powered applications ($I_{DD} = 6\text{ }\mu\text{A}$, typical)
- Large temperature operating range ($T_{amb} = -40\text{ }^{\circ}\text{C to }+85\text{ }^{\circ}\text{C}$)
- Available in TSSOP16
- AEC-Q100 compliant for automotive applications.



3. Hardware set up

3.1 Getting started

The board can be powered from 5 V to 12 V. Two LEDs will show the status of the lock and unlock sensors. The output is configured in the pulse mode, when touched it gives a pulse of about 250 ms.

When the board is powered up, the following processes are started:

- The auto-calibration: The sensor will sense the input capacitance on each channel and adjust the voltage on the external reservoir capacitors C4 and C5. These capacitors are called CPC1 and CPC2 in the product data sheet. Auto-calibration is continuous
- The voltage over the CPC capacitors might fluctuate due to the so called dielectric absorption in the external capacitors during the first few seconds of the power-up process. After a few seconds the voltage over the capacitors will settle. In case the sensor pad is touched when these two processes are started, the output might switch but will recover for the next touch and release cycle.
- The approach speed sensitivity is optimized for a normally moving hand. For detection of faster approach the CLINx capacitors (C8 and C9) can be decreased or vice versa.
- The sensitivity is set with the CPC capacitors to sense at a distance of about 5 mm plastic and 10 mm air for the unlock sensor and 5 mm plastic for the lock sensor.
- The board is coated with a polishing for short term environmental testing. This coating is however not resistant to most of chemical solvents (such as acetone) and should be handled thereafter.

3.2 Circuit

The board is a standard double sided FR4-PC-Board, see [Figure 2](#). The schematic is illustrated in [Figure 3](#).

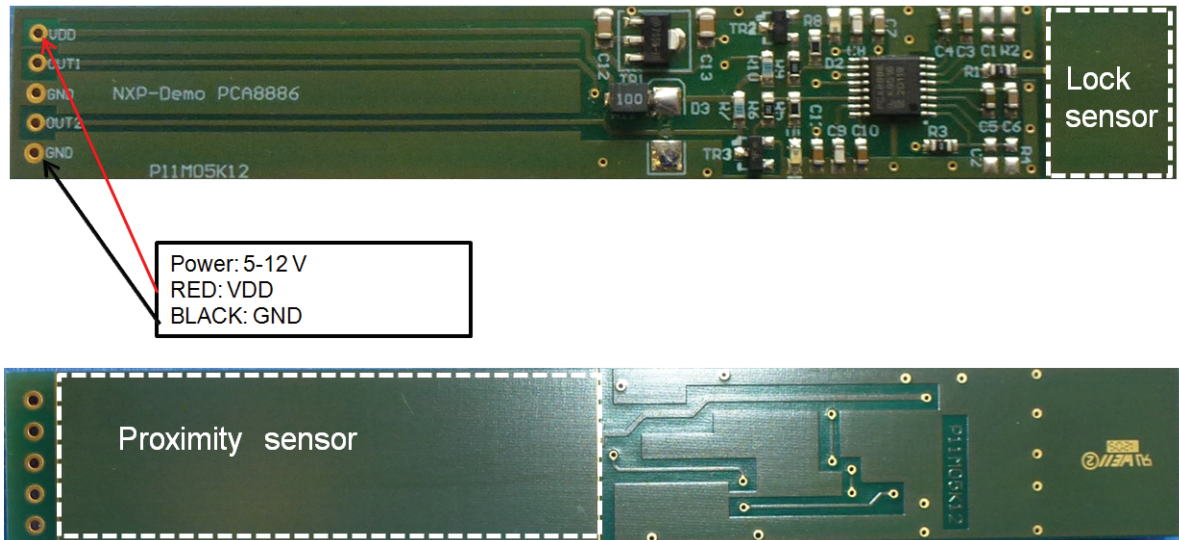


Fig 2. Demoboard top and bottom view

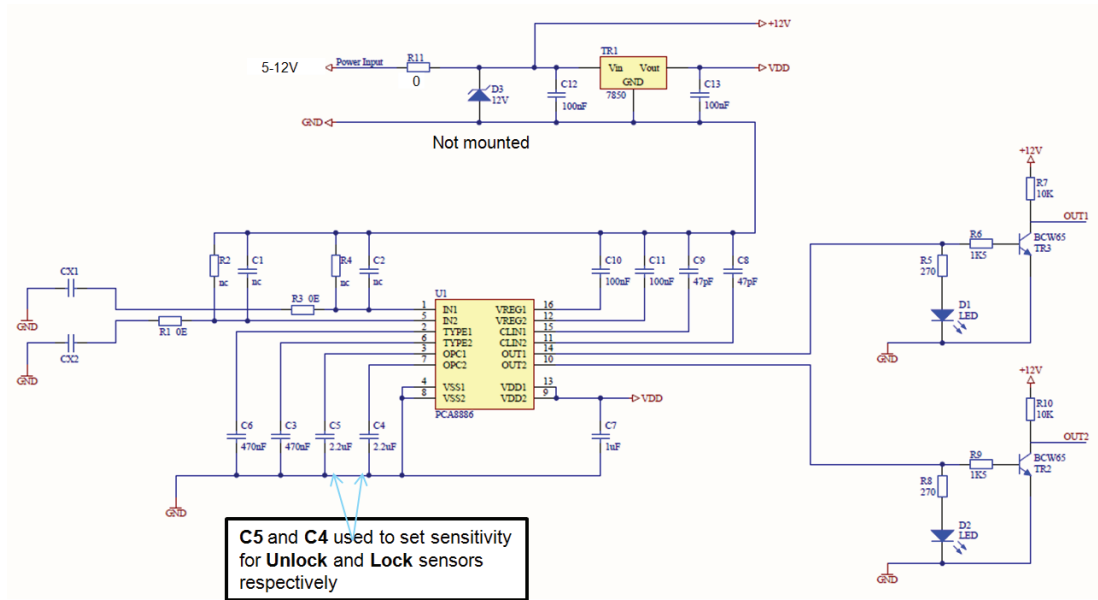


Fig 3. Schematic of the OM11052 demoboard

4. The physical properties of touch

The physical properties of any touch experiment are determined by different factors, which are:

- Size of touching entity (single finger, several fingers, palm ... hand)
- Speed of approaching object
- Environmental properties like humidity, contamination

The board is configured to detect a typical human touch. Movements which are too fast or too slow will be screened out (no fly or turtle will be detected).

If the touch is very hesitant, the finger just forms a very small area and therefore it will not be recognized as a touch.

5. References

- [1] **AN10832** — PCF8883 and PCA8886 - capacitive proximity switch with auto-calibration
- [2] **AN11157** — Dual channel capacitive proximity switch with auto-calibration and large voltage operating range
- [3] **AN11122** — Water and condensation safe touch sensing with the NXP capacitive touch sensors. (This application note explains the unique auto-calibration feature of the touch sensor family from NXP and provides guidelines for applications.)
- [4] **UM10505** — OM11057 quick start guide. (The OM11057 is an evaluation board which can be used to demonstrate and evaluate the PCA8886 and PCF8885 capacitive touch and proximity sensors.)

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7. Figures

Fig 1. Block diagram of one channel of the touch and proximity sensor PCA8886TS4

Fig 2. Demoboard top and bottom view.....6

Fig 3. Schematic of the OM11052 demoboard6

8. Contents

1	Introduction	3
1.1	General	3
1.2	Capacitive sensing... ..	3
1.3	Application board	3
2	Key features of the PCA8886 dual channel sensor	4
3	Hardware set up	5
3.1	Getting started	5
3.2	Circuit	5
4	The physical properties of touch	7
5	References	7
6	Legal information	8
6.1	Definitions	8
6.2	Disclaimers	8
6.3	Trademarks	8
7	Figures	9
8	Contents	10

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Date of release: 26 April 2013

Document identifier: UM10711