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Data Sheet

PCapØ2-EVA-Kit

Evaluation System for PCapØ2

January 16th, 2013
Document-No.: DB_PCapØ2-EVA-Kit_en V0.0

Published by acam-messelectronic gmbh
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Content

1 Introduction 1-2
1.1 General 1-2
1.2 Component List 1-2
2 Connecting Capacitors and Resistors 2-4
2.1 Capacitance Measurement 2-4
2.2 Temperature Measurement 2-5
2.3 Pulse Code Generation 2-6
2.4 Motherboard 2-6
3 Miscellaneous 3-1
3.1 Literature Guide 3-1
3.2 Document History 3-2
4 Appendix 4-1
4.1 Schematics 4-1
4.2 Layout 4-3

1 Introduction

1.1 General

The PCapØ2-EVA-KIT evaluation system provides a complete system for generally evaluating the PCapØ2 chip. It comprises of a main board, a plug-in module, a Windows based evaluation software, assembler software and the PicoProg V2.0 programming device. The PCapØ2 evaluation board is connected to the PC's USB interface through the PicoProg V2.0 programming device.

The evaluation kit offers user friendly configurations for evaluating the PCapØ2 single-chip solution for capacitance measurement. This kit can be used to evaluate the capacitance measurement, temperature measurement and the pulse generation capabilities of the PCapØ2 chip.

For a proper use of the evaluation system it is strongly recommended to refer to the current data sheet of the PCapØ2 device. You can download these data sheets from www.acam.de/download-center/picocap .

1.2 Component List

▪ PCapØ1-MB	Motherboard
▪ PCapØ2-AD Plug-in module	Based on PCapØ2-AD in QFN32 package
▪ PicoProg V2.0	Programmer
▪ High density DSUB15 cable	Connecting the Evaluation board to the programmer
▪ USB cable	Connects PicoProg V2.0 to the PC
▪ Wall power supply unit	9 V
▪ CD-ROM	Includes software and data sheets

Figure 1-1: Components of the evaluation kit

2 Connecting Capacitors and Resistors

This evaluation kit can be used for evaluating capacitance measurement by connecting capacitive sensors. Further, it can be used for evaluating temperature measurement by connecting external temperature sensitive resistors or for generating quasi analog voltage (pulse width/density modulated) that is dependent on the sensor connected to the system.

Depending on the purpose of evaluation, a modification has to be made to the same plug-in module. Following is a picture of the Mother board with the plug-in module.

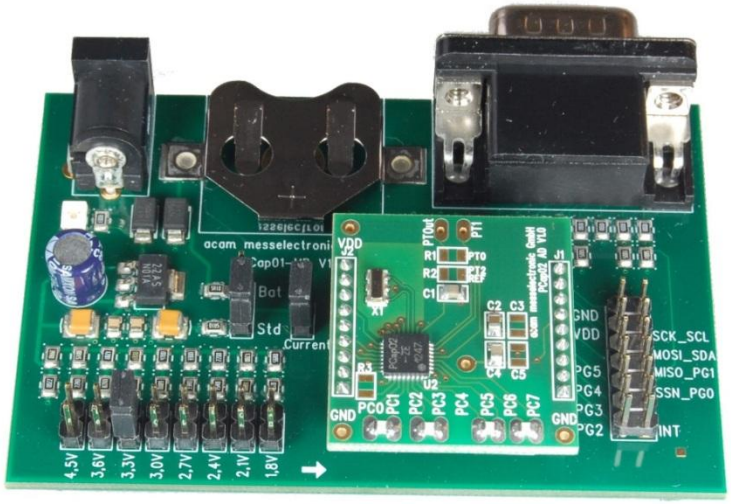

Figure 2-1: The evaluation kit's motherboard and plug-in module

The following sections describe the modifications for each application in detail.

2.1 Capacitance Measurement

For the purpose of evaluating the capacitance measurement using PCapØ2, the plug-in module is pre-assembled with ceramic capacitors to emulate capacitive sensors. These capacitors, each 47pF in value, are connected to the 8 ports PC0 to PC7. They are connected as single sensors in floating mode, i.e. each capacitor is connected between 2 ports, and hence there are 4 x 47pF on-board capacitors. Please refer to section 3 of the PCapØ2 data sheet for more information on how to connect capacitors to the chip. The capacitor connected between ports PC0 and PC1 is taken as the reference capacitor.

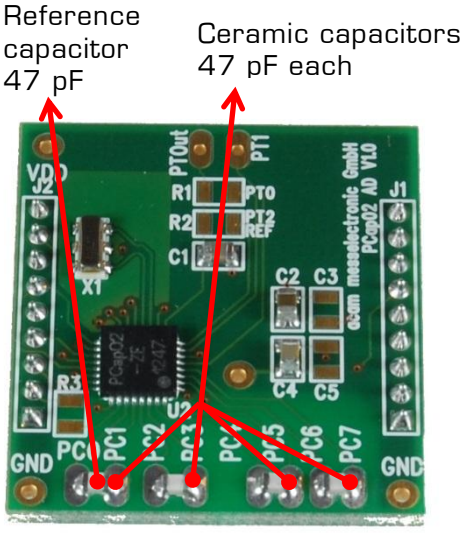

Figure 2-2: Details of the plug-in module

In the process of evaluation, when you are comfortable with interpreting the measurement results from the chip, these fixed capacitors can be replaced with the actual capacitive sensors of your application.

If you want to connect your capacitive sensors in grounded mode, then GND points are provided at the two ends of the module, where the sensor ground connections ought to be soldered.

The typical value of the capacitive sensors that can be connected to the evaluation kit lies in the range of 30pF to 3.5nF. The reference capacitor should be in the same order of magnitude as the sensor. Depending on the value of the sensor, the value of the internal resistor for performing the measurement has to be selected. For the pre-assembled 47pF capacitors, an internal discharge resistor of 180kOhm works well. See section 3 of the PCapØ2 data sheet on how to select the value of the internal discharge resistor.

2.2 Temperature Measurement

Temperature measurement or other resistive tasks may also be of interest for the user of this kit. The evaluation kit offers this possibility through the RDC (resistive-to-digital converter) ports. An on-chip thermistor coupled with an on-chip temperature-stable reference resistor made of polysilicon is sufficient for observing the temperature measurement capability of the PCapØ2 chip.

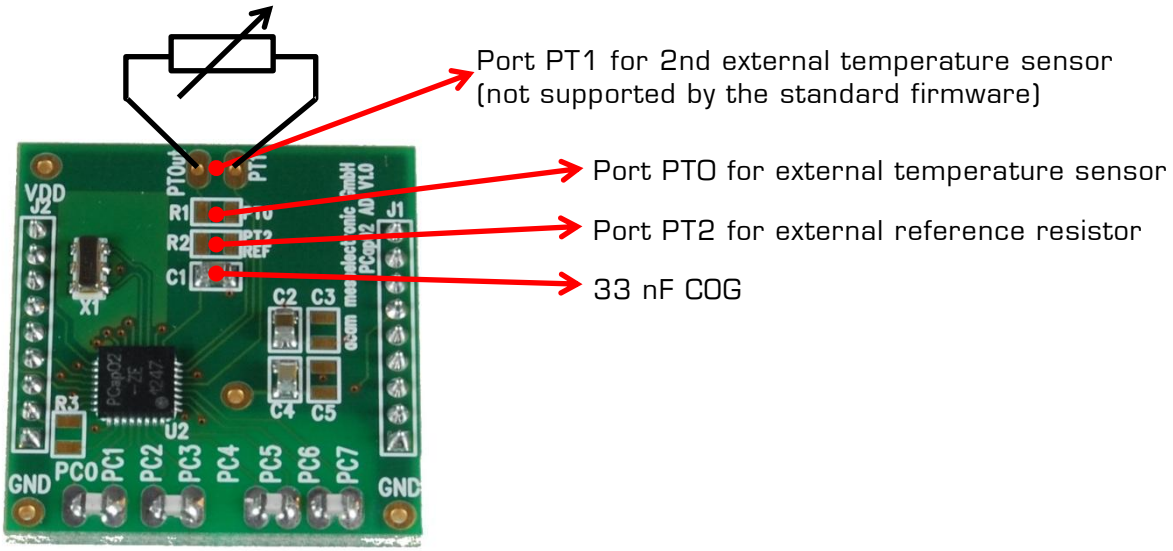

Figure 2-3: Temperature sensor connection pads

However, there is a possibility to connect the reference resistor and the thermistor externally to the chip, too. In case of external resistors, the temperature-stable reference resistor ought to be connected at port PT2REF on the plug-in module. The module allows you to connect the external

thermistor, e.g. a PT1000 sensor at port PT0 (or PT1, not supported yet by the standard firmware).

In any case, for the temperature measurement, an external capacitor 33 nF COG has to be connected to the chip; it is already pre-assembled on board.

2.3 Pulse Code Generation

Any of the capacitance or temperature measurement results from the PCapØ2 chip can be given out as a pulse width modulated or pulse density modulated signal. This output can be filtered to generate an analog output signal that can be used for further controlling.

These pulse width or pulse density codes can be generated at Ports PG0, PG1, PG2 or PG3. Since ports PG0 and PG1 are used for the SPI Interface in the module, the hardware allows to get a valid pulse width/density modulated signal on PG2 or PG3. However, when I2C communication mode is used the pulsed signals can be optionally obtained on the ports PG0 and PG1.

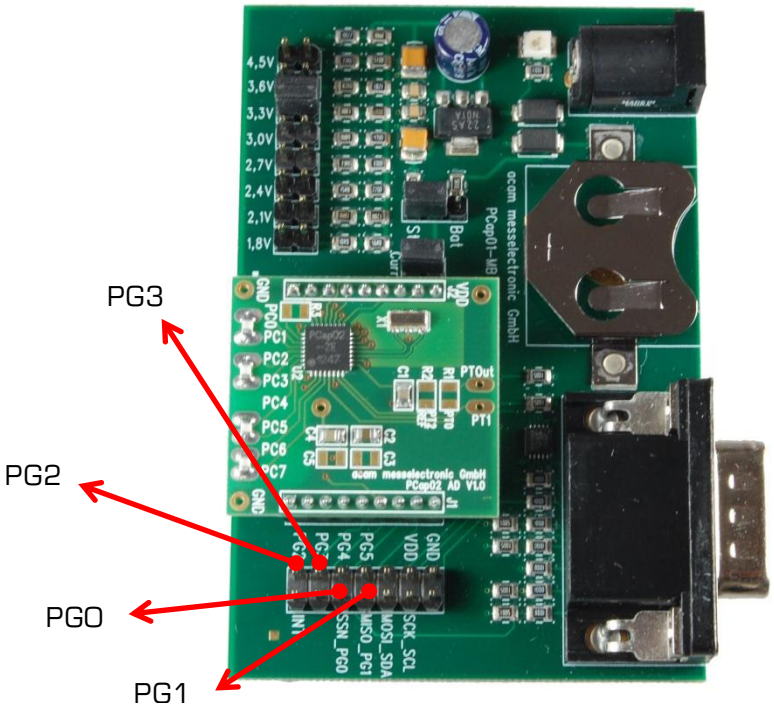

Figure 2-4: General purpose interface ports PG0 to PG3

2.4 Motherboard

The motherboard connects to the PicoProg V2.0 programmer. It serves the various power options. It can be powered via wall plug supply, the voltage being set from 1.8V to 4.5V by jumpers. Further, it supports a battery power option. Power present is indicated by a green LED.

There is a jumper 'Current' on the mother board. The current consumption of the PCapØ2 chip during operation can be directly measured from these jumper terminals.

All interface signals and general purpose I/O signals can be monitored by means of a separate jumper.

3 Miscellaneous

3.1 Literature Guide

Data Sheets

Title	Document-No
PCapØ2A Single-chip Solution for Capacitance Measurement Volume 1: General data and front-end description	DB_PCapØ2A_Vol1_en.pdf
PCapØ2Ax-DSP Single-chip Solution for Capacitance Measurement Volume 2: Digital Signal Processor	DB_PCapØ2A_Vol2_en.pdf
PCapØ2-EVA-Kit Evaluation System for PCapØ2	DB_PCapØ2-EVA-Kit_en.pdf
PCapØ2plus Evaluation Software for PICOCAP Devices	DB_PCapØ2plus_en.pdf
PCap Assembler Assembler Software for PICOCAP Devices	DB_PCap-Assembler_en.pdf

White Papers

Title	Document-No

Application Notes

Title	Document-No

The latest versions of the available documents can be downloaded from the acam website at:

http://www.acam.de/download-center/picocap

3.2 Document History

16.01.2013 First release

4 Appendix

4.1 Schematics

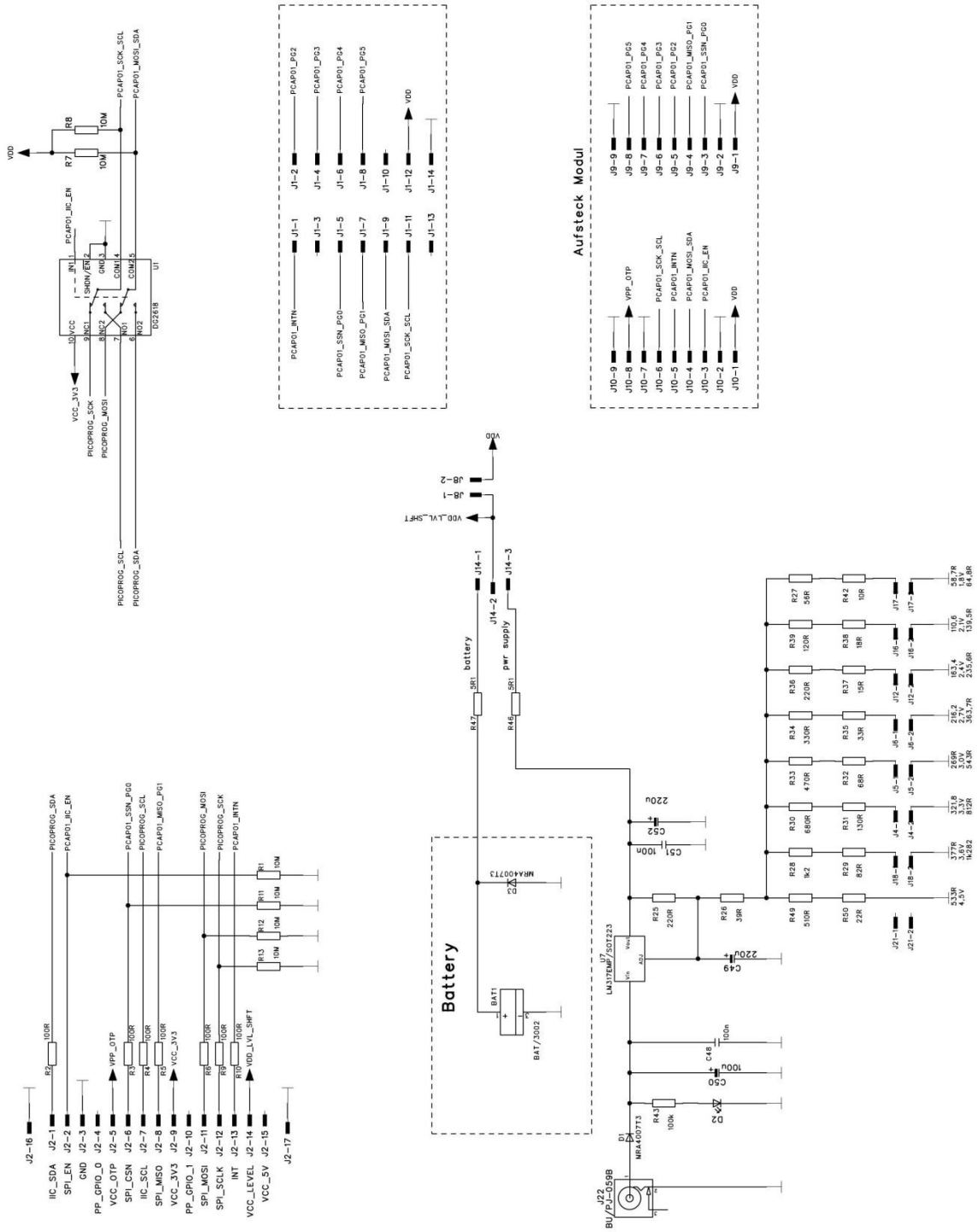

Figure 4-1: Motherboard schematics

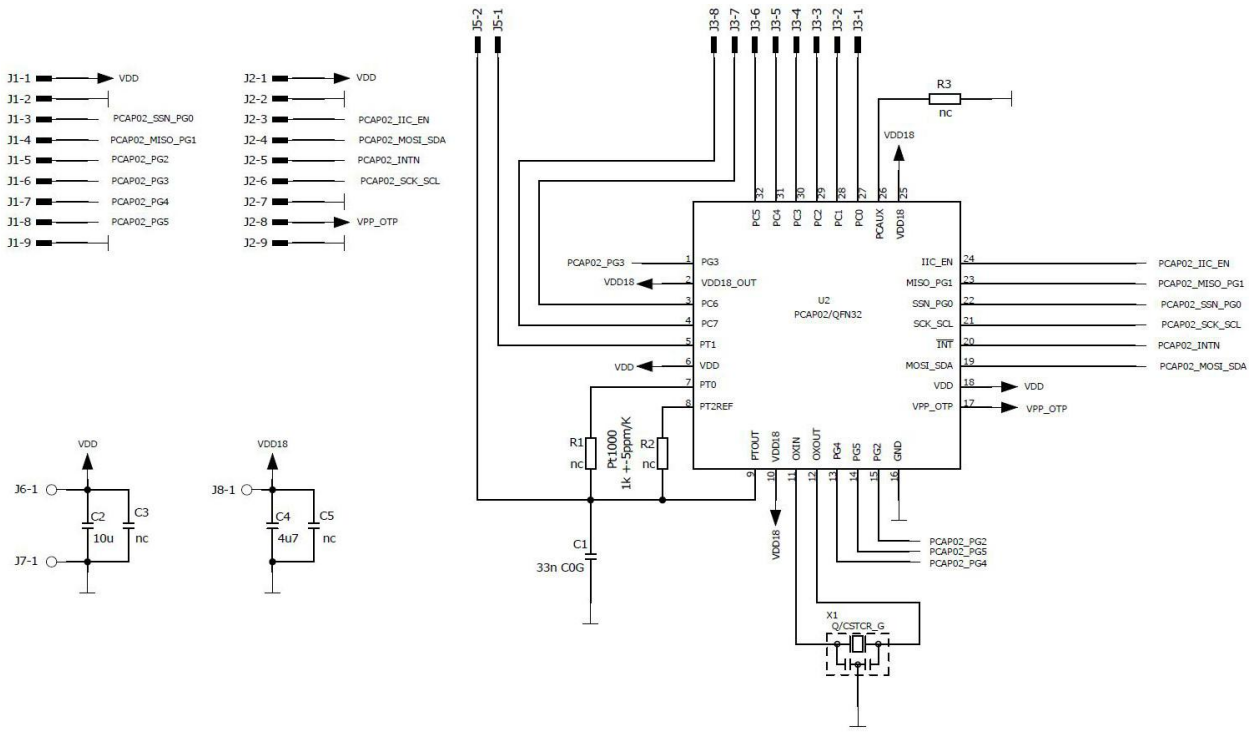

Figure 4-2: PCaØ2 AD module schematics

4.2 Layout

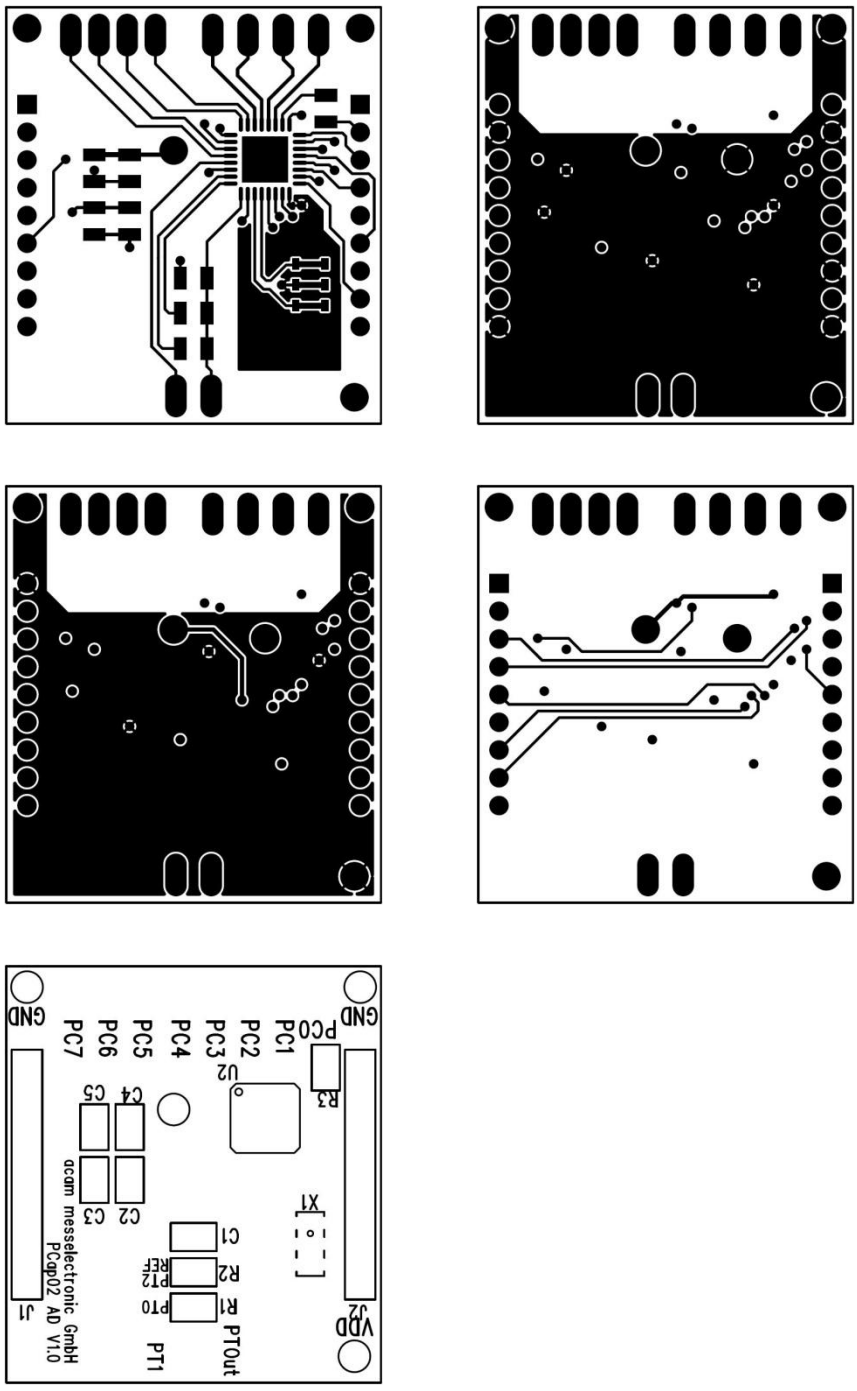

Figure 4-3: PCa02 AD module layout

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