



AS6500-QF_DK

Development Kit User Guide

AS6500-QF_DK User Guide

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1 Introduction

The AS6500-DK development kit allows customers a quick and intuitive approach to using the AS6500 TDC applications.

The kit includes of four elements:

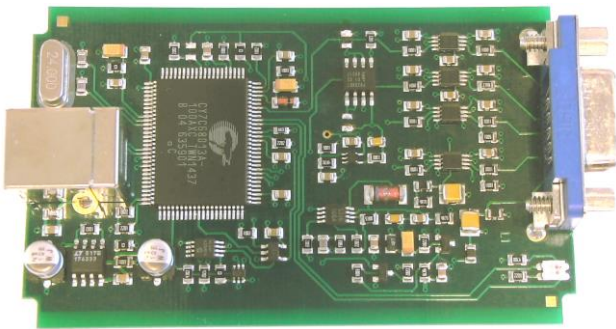
AS6500-QF_DK_RB reference board V2.0, based on AS6500-BQFM in QFN48 package



Cable to connect the PICOPROG USB-to-SPI interface with the reference board



PICOPROG V3.0 interface



USB cable to connect the PICOPROG with a PC



Figure 1: Functional Blocks

Please download the latest software for the kit from <https://www.downloads.sciosense.com/AS6500>

1.1 Ordering Codes

Table 1: Pin description

| Ordering code | Part Number | Description |
|----------------------|-------------|---|
| AS6500-QF_DK V1.0 | 221050003 | AS6500 Demo kit including PICOPROG and cables |
| AS6500-QF_DK_RB V2.0 | 221050003 | AS6500 reference board |

2 Quick Start Guide

This section describes how to set up the GPX2-EVA-KIT, establish basic operation and make measurements quickly.

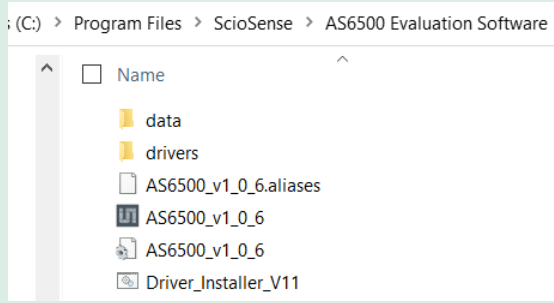
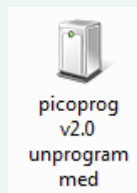
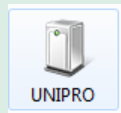
2.1 Install the Software

Please download the latest software for the kit from:

Link: <https://downloads.sciosense.com/as6500>

It is crucial to install the software before connecting the evaluation kit to your computer. A default driver loading of your OS may interfere with correct installation.

Table 2: Software installation

| Step | Screen |
|--|---|
| <p>Download the latest software installation package to the desired directory.</p> <p>Unzip the package to the desired directory.</p> <p>Open “setup.exe” from the unzipped directory.</p> <p>Follow the instructions on the screen. The the software will be available from the Program Files folder or the Start menu.</p> |  |
| <p>When connecting the PicoProg to the USB port it will be listed first as “picoprogram v2.0 unprogrammed” device. This is true also for PicoProg V3.0.</p> <p>In the drivers folder you find the driver for a manual installation.</p> |  |
| <p>Starting the software will download a special firmware into the PICOPROG, picoprogram_gp2_v005.hex or higher, and the device will now be listed as “UNIPRO”:</p> |  |

2.2 Install the Hardware:

- Make sure software is installed correctly before proceeding with this step!
- Connect your computer with the PicoProg V3.0 using USB cable.
- Connect PicoProg V3.0 and the evaluation board DB15 cable or directly. The board is supplied via the USB.
- The green LED on the evaluation kit should be on.
- Connect your signal source.

2.3 Start Software

- Execute the AS6500 front panel Software. The communication status should be green
- The software starts with an initial configuration, that can be opened the default configuration file config_default.cfg.
- Press “Power On Reset!” - “Write Config” - “Init Reset”
- Press “Start Measurement”

The measurement should run and results should be displayed now.

3 Hardware Description

The AS6500-QF_DK_RB board, shown in Figure 2, is a basic board for the 4-channel time-to-digital converter AS6500. The reference clock can be applied from external via pin or from the on-board 5 MHz quartz oscillator (X1).

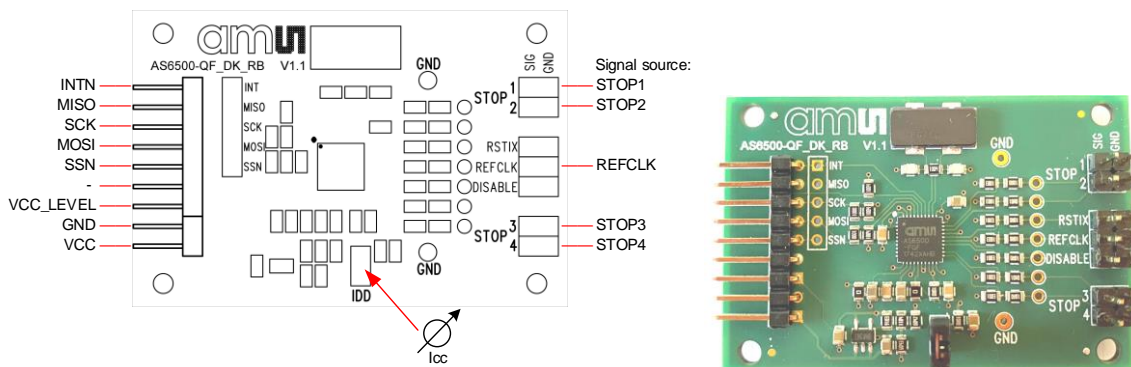


Figure 2: Reference board

The board is connected to the PC via the PICOPROG, a USB-to-SPI converter. The PICOPROG is registered by the operating system initially as “PICOPROG v2.0 unprogrammed”. As soon as the AS6500-QF_DK_RB evaluation software starts, a special firmware is written into the PICOPROG to handle the SPI communication with the AS6500-DK. The PICOPROG is now listed as “UNIPRO” in the device manager. For SPI communication only, PICOPROG version 2.0 is sufficient.

The flat connector connecting the PICOPROG and the AS6500-QF_DK_RB. includes the power lines and the SPI communication lines. VCC_LEVEL is the voltage feedback for the PICOPROG level shifters.

4 Software Description

This section describes how to quickly set up the AS6500-DK, establish basic operation and make measurements.

4.1 Main Window

The main windows shows two pages, one for configuration and one for results display:

4.1.1 Stop Page

On this window major settings are made:

- 1. Selects the input pins that are used in the application
- 2. Enable the internal measurement channels. Each pin refers to minimum one internal channel. Two will be needed in case of channel combination.
- 3. Select the resolution. High resolution achieves a better single-shot rms noise, but at the cost of pulse-pair resolution.
- 4. Selects optional channel combination
- This can be for better pulse-pair resolution or for pulse width measurement. Both options demand internally two channels per stop pin.
- 5. Having done the settings, download the configuration and initialize the chip.
- 6. Start the measurement.
- 7. At the bottom the results for the four stop channels are displayed.
- 8. In many cases the differences between the channels are of interest. This can be activated here.

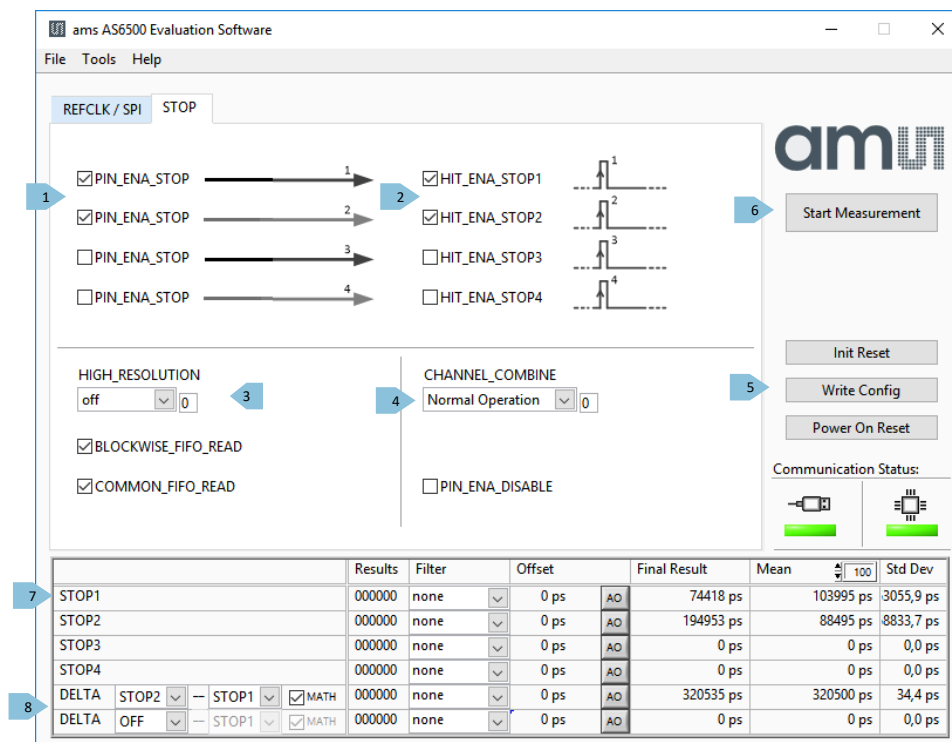


Figure 3: Stop page

4.1.2 REFCLK/SPI Page

At this point, after successful completion of the above steps, a basic operation of the kit should be possible.

Parameter REFCLK_DIVISIONS has to be set so that the frequency calculated is the same of the reference clock used (5 MHz for the on-board reference). Then the output data will come with 1 LSB = 1ps.

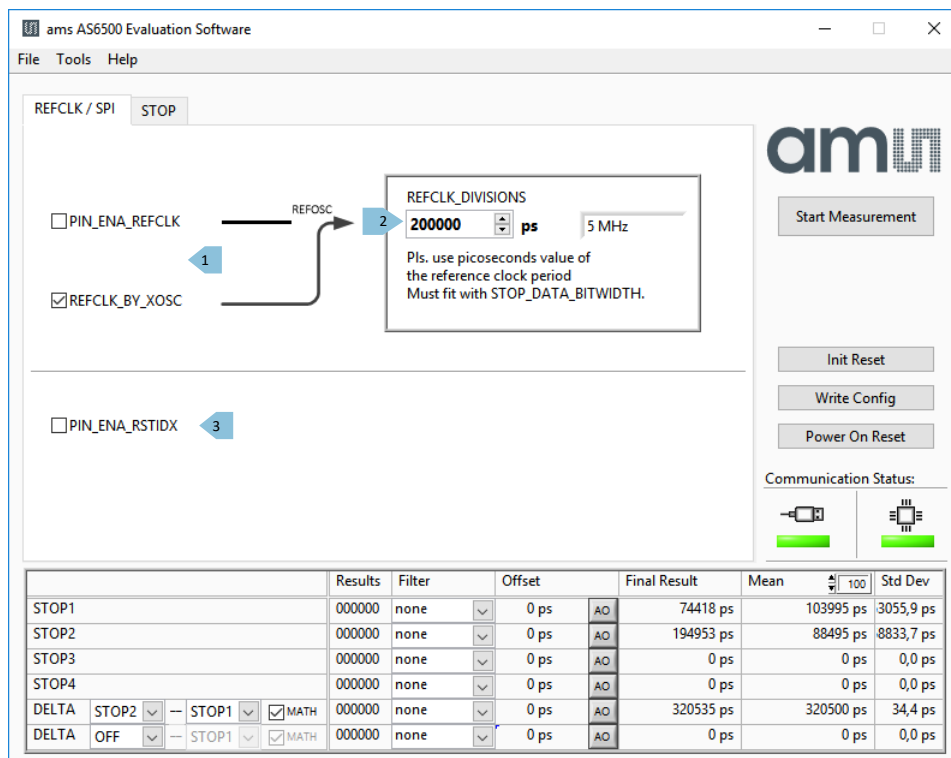


Figure 4: Setup page

4.2 Menu & Support Windows

Beside main window, the software menu allows the opening of other windows. There are some menu items which are redundant to available buttons of main window.

4.2.1 File

- **Load Config**
This dialog box allows the path selection of a configuration file, covering the register settings, necessary for a proper configuration of the AS6500. After opening this file, the control settings are updated in the GUI.
- **Save Config**
This menu item allows the saving of the current GUI control settings into a configuration file
- **Save Graph Data**
Allows to store the measurement data as they are stored in the data buffer for the graphical

display. It is possible to store the STOP data only or the STOP together with the reference numbers.

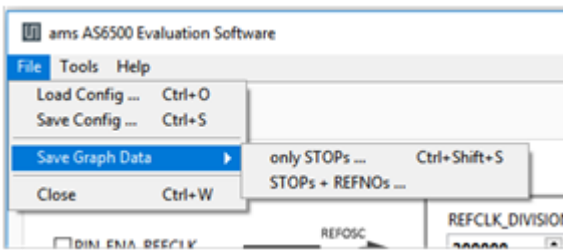


Figure 5: Menu

- Close
Close all open windows of the AS6500-QF_DK Evaluation software.

4.2.2 Tools

- Run Measurement
Same function as “Start/Stop Measurement” button in “Measurement” tab of main window.
- Graph
Opens the window for a graphical display of the measurement data

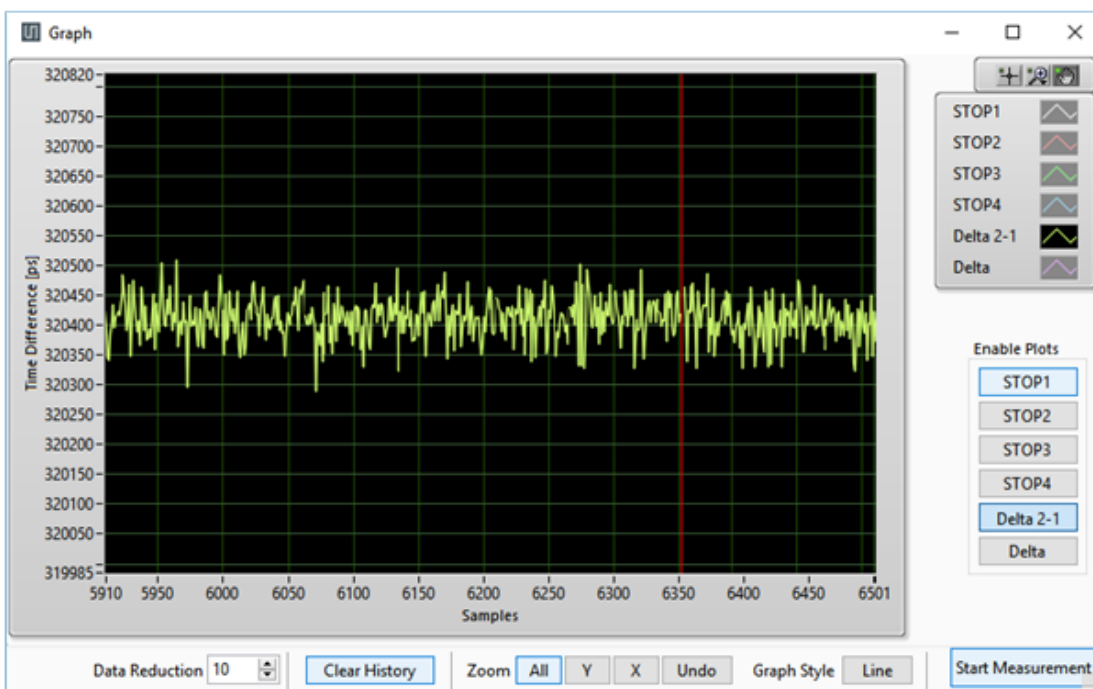


Figure 6: Menu

- Registers
Opens a separate window for the display and setting of the configuration registers and the display of the read registers.

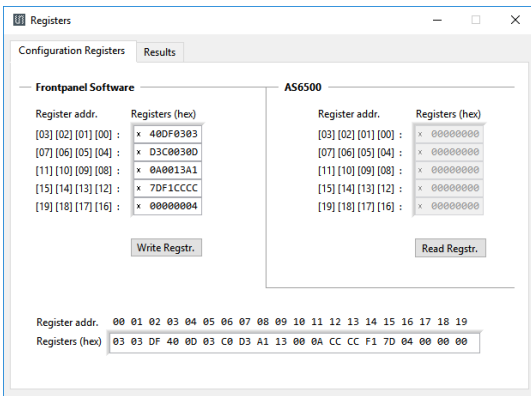


Figure 7: Configuration registers

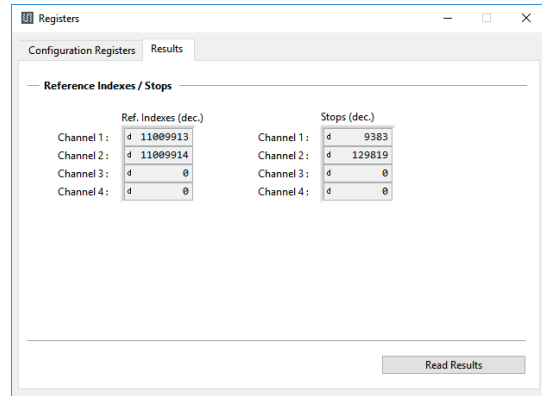


Figure 8: Result registers

5 Schematics, Layers & BOM

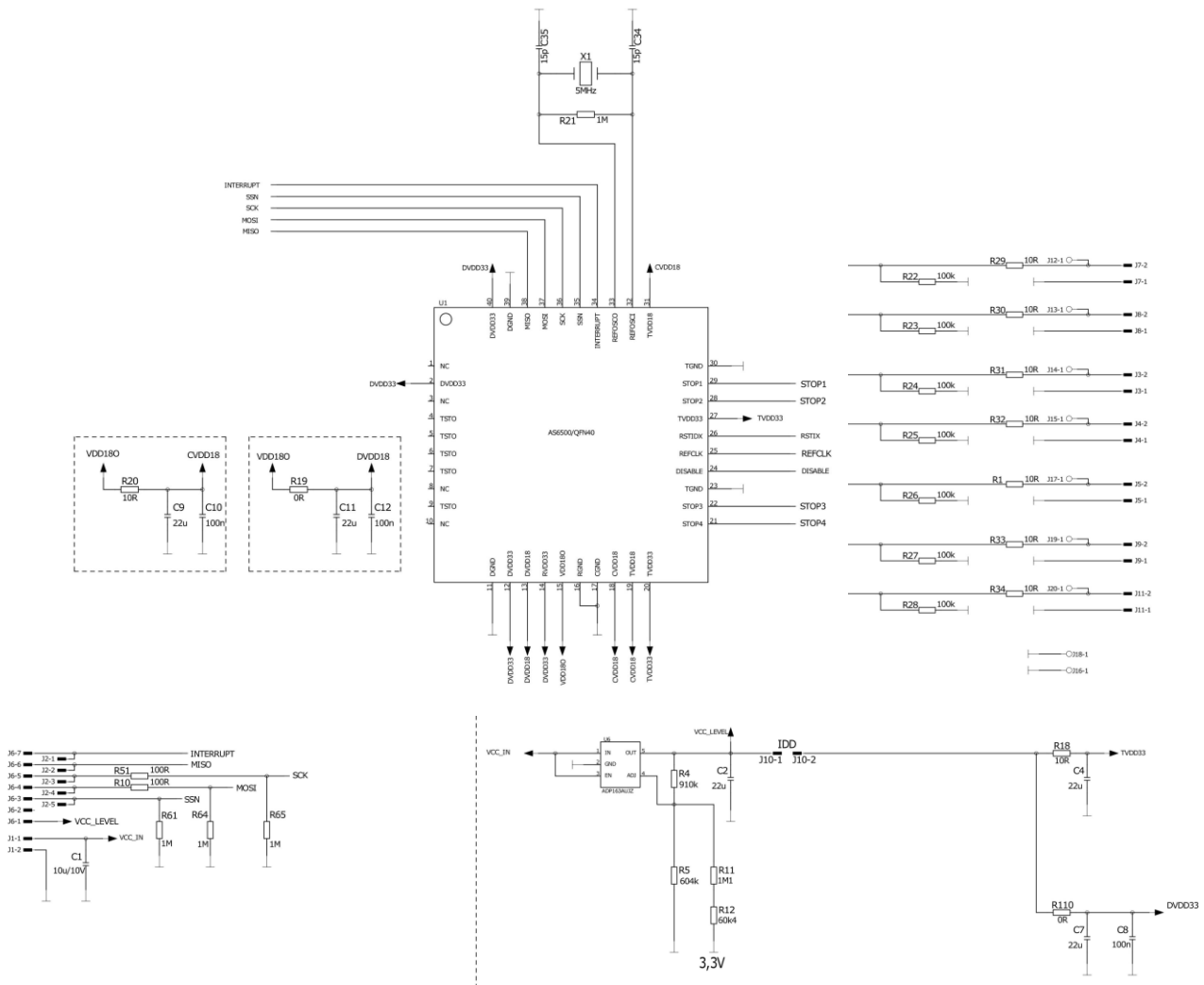
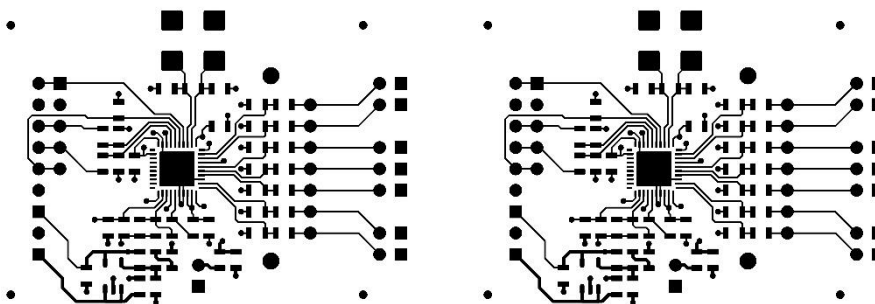


Figure 9: AS6500-QF_DK_RB schematics



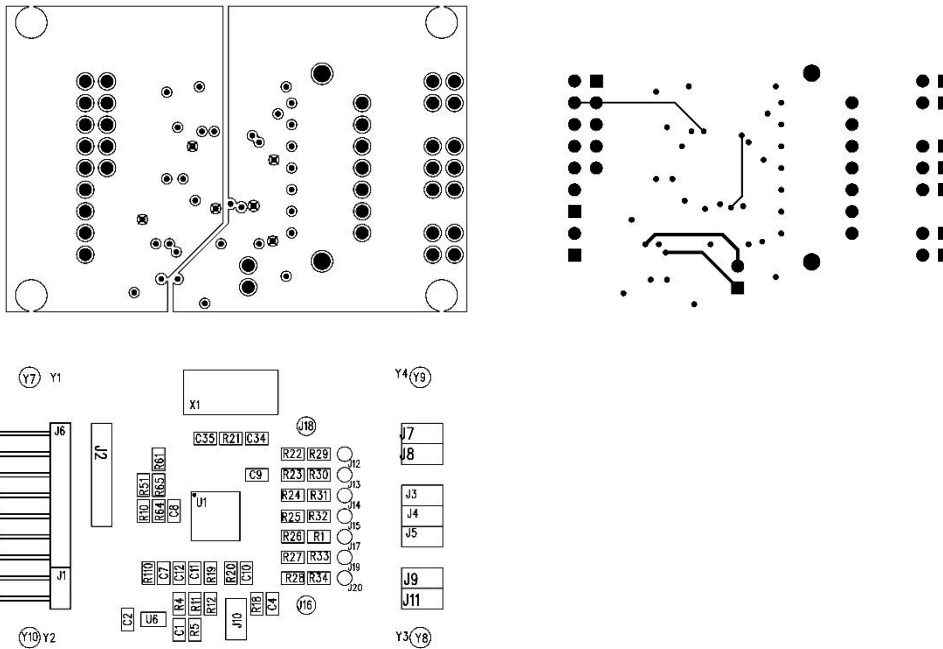


Figure 10: AS6500-QF_DK_RB layout

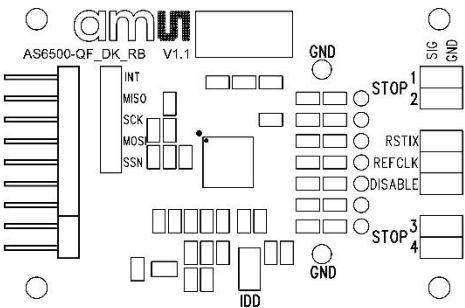


Figure 11: AS6500-QF_DK_RB assembly

Table 3: Bill of materials for AS6500-QF_DK_RB

| Quantity | Designator | Value | Comment | Footprint |
|----------|---------------------|------------|---------------------------|-----------|
| 1 | U1 | | AS6500 | QFN40 |
| 1 | U6 | 3.0 V | ADP163AUJZ Analog Devices | |
| 1 | X1 | 5 MHz | KX-20 Quartzs Geyer | |
| 3 | C8, C10, C12 | 100 nF | Chip capacitor | 0805 |
| 2 | C34, C35 | 15 pF | Chip capacitor | 0805 |
| 5 | C2, C4, C7, C9, C11 | 22 μ F | Chip capacitor | 0805 |
| 2 | R19, R110 | 0 Ω | Chip capacitor | 0805 |

| | | | | |
|---|------------------------------------|-----------------|---------------|------|
| 2 | R10,R51 | 100 Ω | Chip resistor | 0805 |
| 7 | R22,R23,R24,R25,R26, R27,R28 | 100 k Ω | Chip resistor | 0805 |
| 9 | R1,R18,R20,R29,R30, R31,R32,R33 | 1 M Ω | Chip resistor | 0805 |
| 4 | R21,R61,R64,R65 | 1.1 M Ω | Chip resistor | 0805 |
| 1 | R5 | 604 k Ω | Chip resistor | 0805 |
| 1 | R12 | 60.4 k Ω | Chip resistor | 0805 |
| 1 | R4 | 910 k Ω | Chip resistor | 0805 |
| 1 | R8 | 10 M Ω | Chip resistor | 0805 |
| 1 | J6 | 7 x 1 x 90° | Connector | 2.54 |
| 1 | J1 | 2 x 1 x 90° | Connector | 2.54 |
| 1 | J2 | 5 x 1 x 180° | Connector | 2.54 |

6 RoHS Compliance & ScioSense Green Statement

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8 Revision information

Table 4: Revision history

| Revision | Date | Comment | Page |
|----------|-------------|---|------|
| 1 | 2019 Mar 14 | Change of ownership from ams to SciSense, status to release | All |
| 2 | 2021 Oct 01 | Updated pictures, new SciSense layout | All |

Note(s) and/or Footnote(s):

1. Page and figure numbers for the previous version may differ from page and figure numbers in the current revision.
2. Correction of typographical errors is not explicitly mentioned.

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