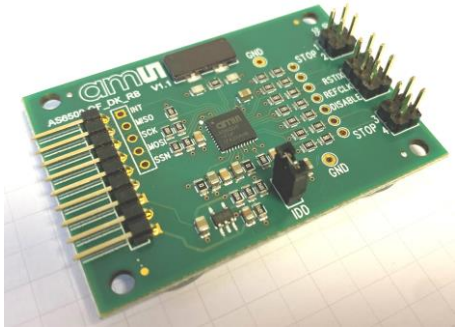

# AS6500-QF_DK

## Development Kit User Guide

**AS6500-QF_DK User Guide**

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Document Status: Production

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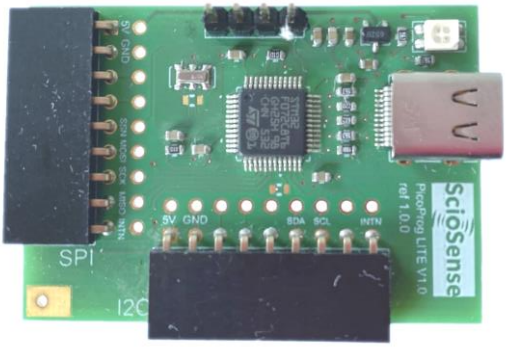
# 1 Introduction

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

PicoProg Lite interface



USB-C – USB cable

*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 Development kit including PicoProg Lite and cable |
| AS6500-QF_DK_RB V2.0 | 221050002 | AS6500 reference board |

# 2 Quick Start Guide

This section describes how to set up the AS6500 development kit, establish basic operation and make first measurements quickly.

## 2.1 Install the Software

Please download the latest software for the kit from: Link: https://downloads.sciosense.com/as6500

- Unzip the package to the desired directory.
- Open “setup.exe” from the unzipped directory.
- Follow the instructions on the screen.

## 2.2 Install the Hardware

- Connect the PicoProg Lite PCB to the computer by means of the USB cable. The green LED should be on.
- Connect the AS6500 reference board to the PicoProg Lite. Select the connector for SPI communication and one for I2C communication. They are marked accordingly.

## 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).

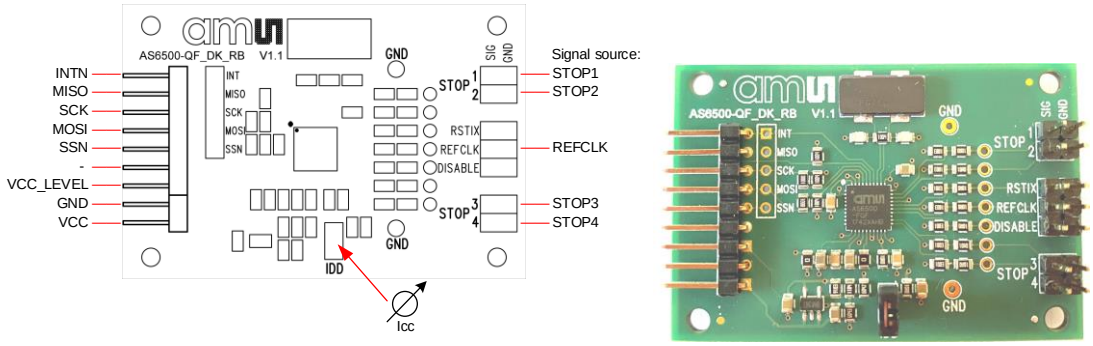



*Figure 2: Reference board*

The board is connected to the PC via the PicoProg Lite, a USB-to-SPI converter. The PicoProg Lite is registered by the operating system under “Other devices” as “PicoProg LITE V1.0”. It comes with the appropriate firmware for each board on chip by default.

The flat connector connecting the PicoProg Lite and the AS6500-QF_DK_RB includes the power lines and the SPI communication lines. VCC_LEVEL is the voltage feedback but not used with PicoProg Lite.

# 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 show 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 betters 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.

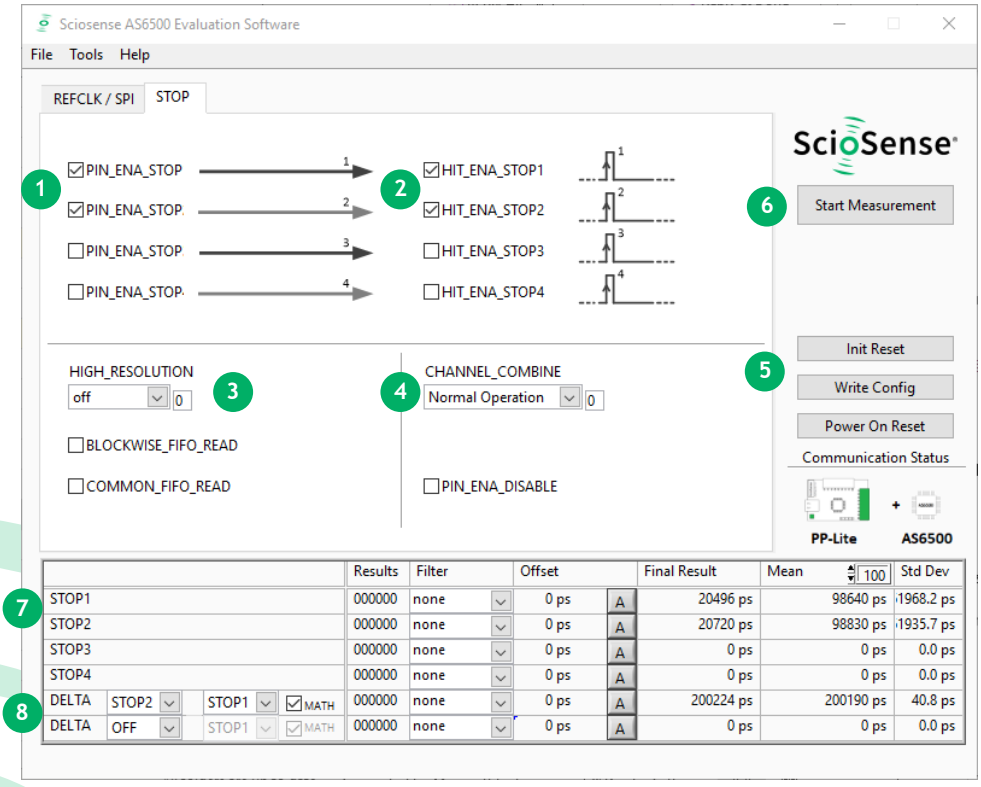



*Figure 3: Stop page*

### 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 = 1 ps.

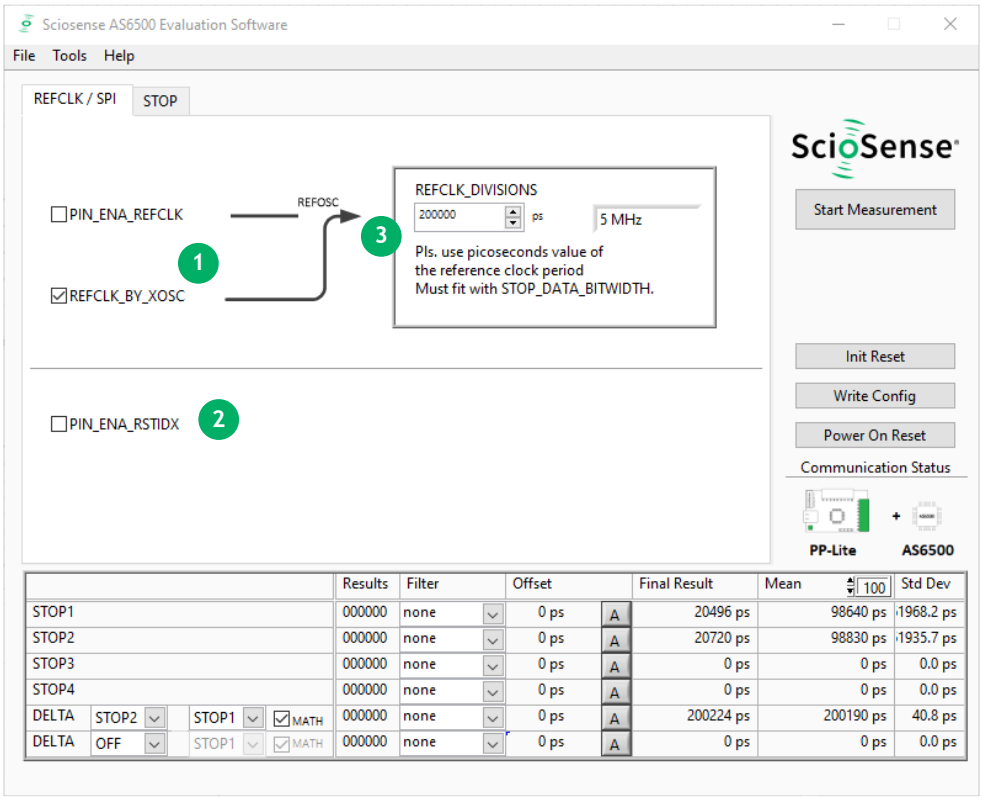



*Figure 4: Setup page*

## 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.

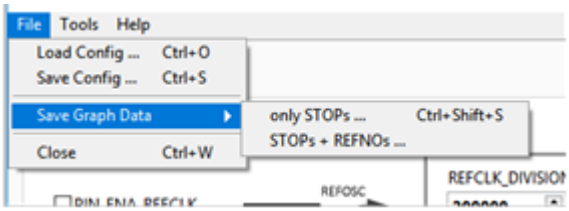



*Figure 5: Menu*

- 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

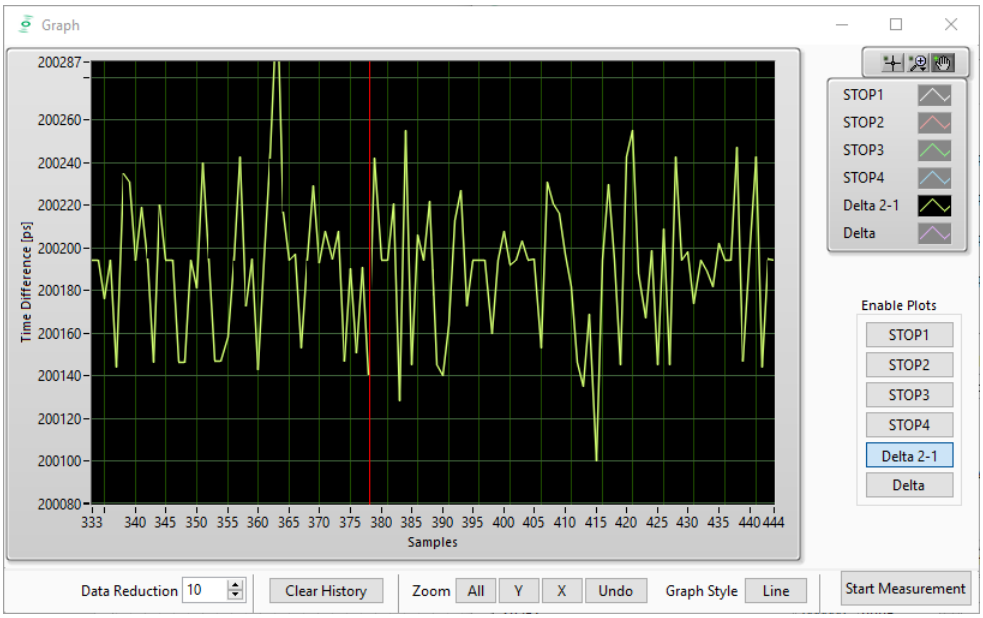



*Figure 6: Menu*

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

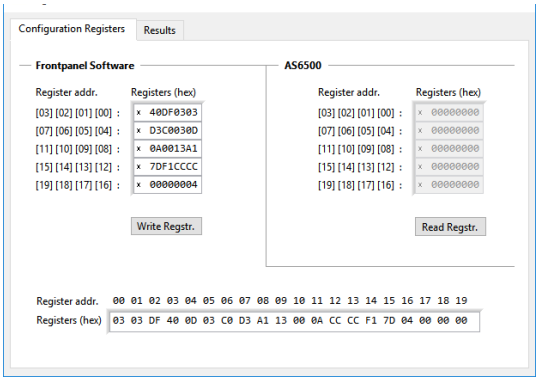



*Figure 7: Configuration registers*

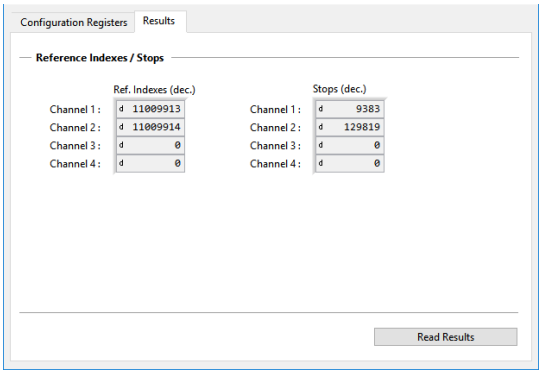



*Figure 8: Result registers*

# 5 Schematics, Layers & BOM

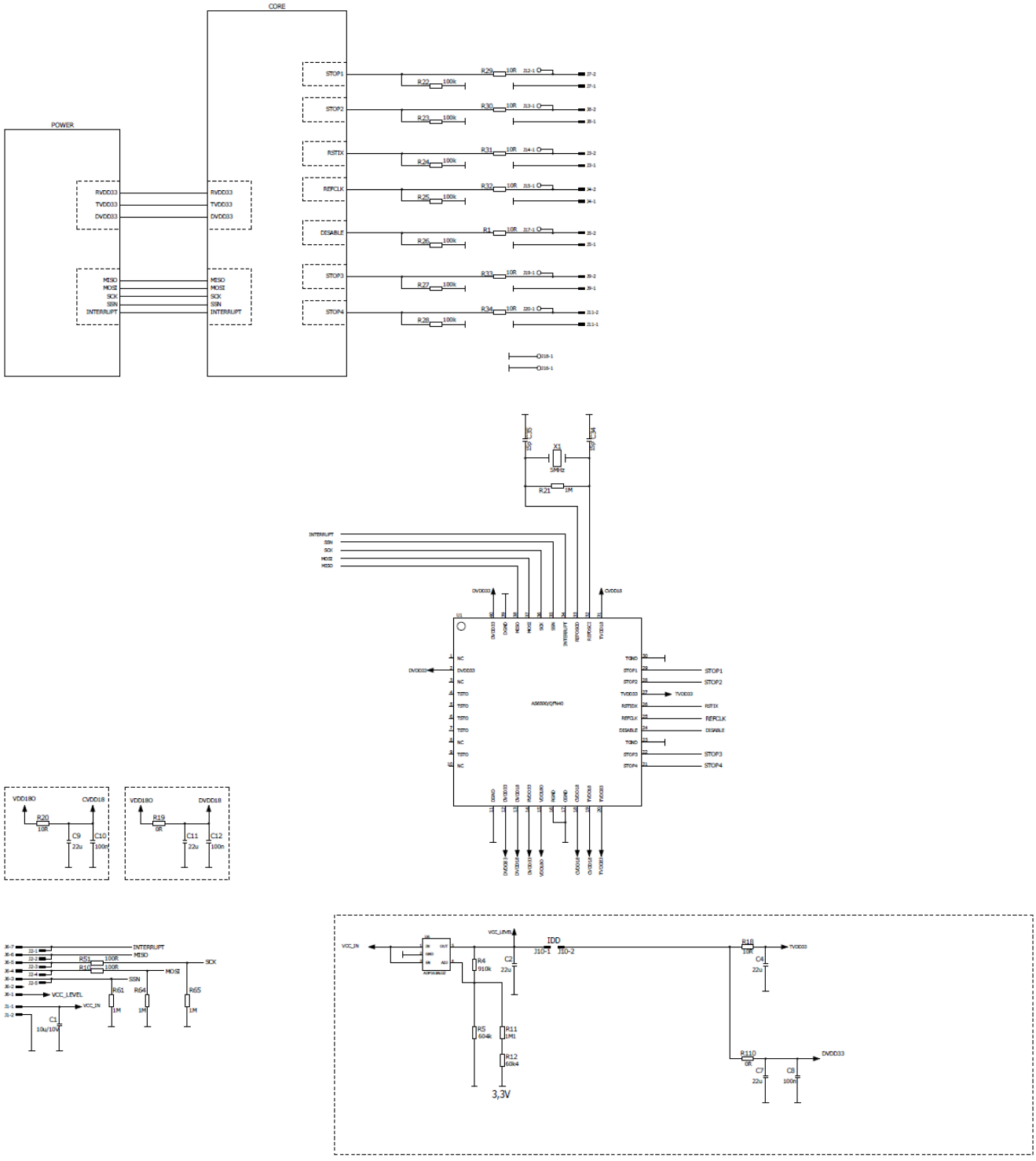
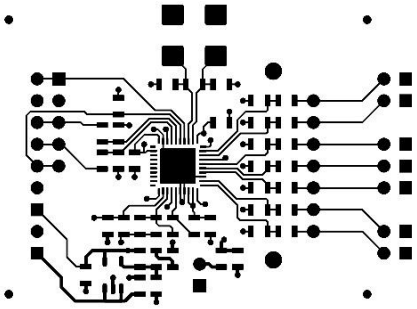
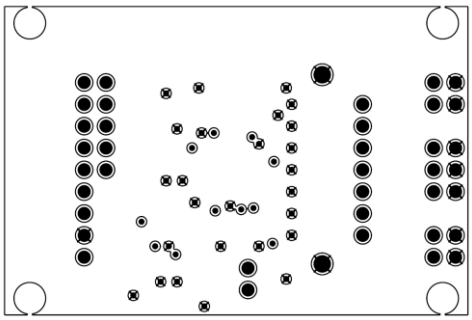



*Figure 9: AS6500-QF_DK_RB schematics, version 1.1*

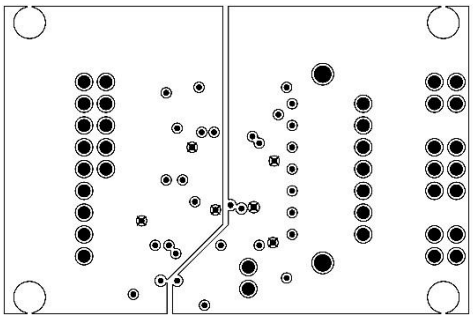
Top



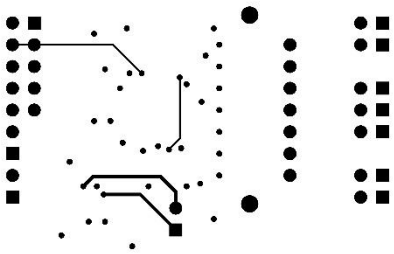
Inner Layer 2



Inner Layer 3



Bottom



Assembly Top

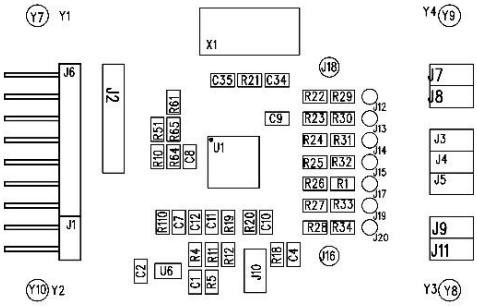



*Figure 10: AS6500-QF_DK_RB layout, version 1.1*

*Table 2: 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 Quarts 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 µF | 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 kΩ | Chip resistor | 0805 |
| 9 | R1,R18,R20,R29,R30, R31,R32,R33 | 1 MΩ | Chip resistor | 0805 |
| 4 | R21,R61,R64,R65 | 1.1 MΩ | Chip resistor | 0805 |
| 1 | R5 | 604 kΩ | Chip resistor | 0805 |
| 1 | R12 | 60.4 kΩ | Chip resistor | 0805 |
| 1 | R4 | 910 kΩ | Chip resistor | 0805 |
| 1 | R8 | 10 MΩ | 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 3: Revision history*

| Revision | Date | Comment | Page |
|---|---|---|---|
| 1 | 2019 Mar 14 | Change of ownership from ams to ScioSense, status to release | All |
| 2 | 2021 Oct 01 | Updated pictures, new ScioSense layout | All |
| 3 | 2023 May | PICOPROG replaced by PicoProg Lite | 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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