ScioSense

LTDC-X3-QF_DK

Development Kit User Guide

LTDC-X3-QF_DK User Guide

Revision: 1

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Document Status: Product Preview

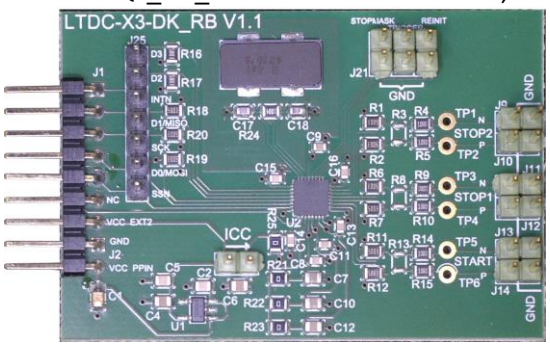
Content Guide

1 Introduction

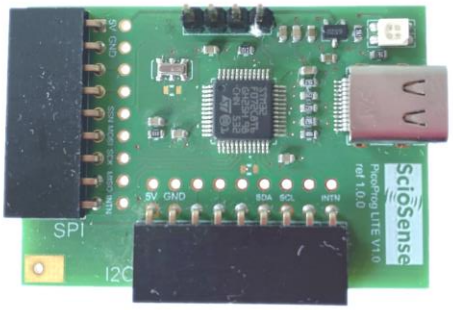
The LTDC-X3-DK development kit allows customers a quick and intuitive approach to work with the LTDC-X3 2-channel time-to-digital converter.

The kit includes of three elements:

LTDC-X3-QF_DK_RB reference board V1.1, based on LTDC-X3-FLQM in QFN32 package



PicoProg LiteV1.0 LTDC-X3 SPI-USB interface



USB-C data cable

Figure 1: Components

Please download the latest software for the kit from
https://downloads.sciosense.com/ltdc-x3-lidar-time-to-digital-converter/

1.1 Ordering Codes

Table 1: Ordering codes

Ordering code	Part Number	Description
LTDC-X3-QF_DK	221070003	LTDC-X3 Development kit including PicoProg Lite and cable
LTDC-X3-QF_DK_RB	221070002	LTDC-X3 reference board

2 Quick Start Guide

This section describes how to set up the LTDC-X3 development kit, establish basic operation and make measurements quickly.

2.1 Install the Software

Please download the latest software for the kit from:
https://downloads.sciosense.com/LTDC-X3

- Unzip the package to the desired directory.
- Open “LTDC-X3_Dashboard.exe” from the unzipped directory.

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 LTDC-X3 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 LTDC-X3 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 LTDC-X3-QF_DK_RB board, shown in Figure 2, is a basic board for the 2-channel time-to-digital converter LTDC-X3. The reference clock can be applied from external via pin or from the on-board 5 MHz quartz oscillator (X1).

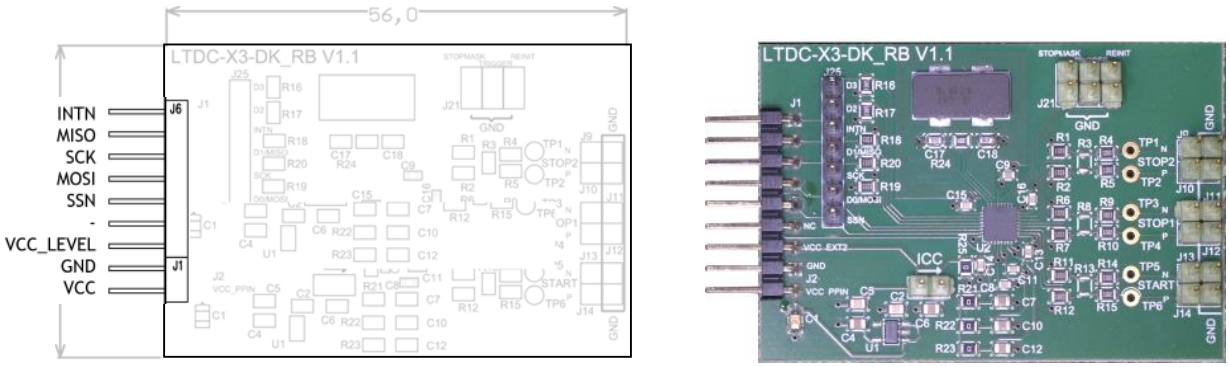


Figure 2: Reference board

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 LTDC-X3-QF_DK_RB includes the power lines and the SPI communication lines. VCC_LEVEL is the voltage feedback but not used with PicoProg Lite.

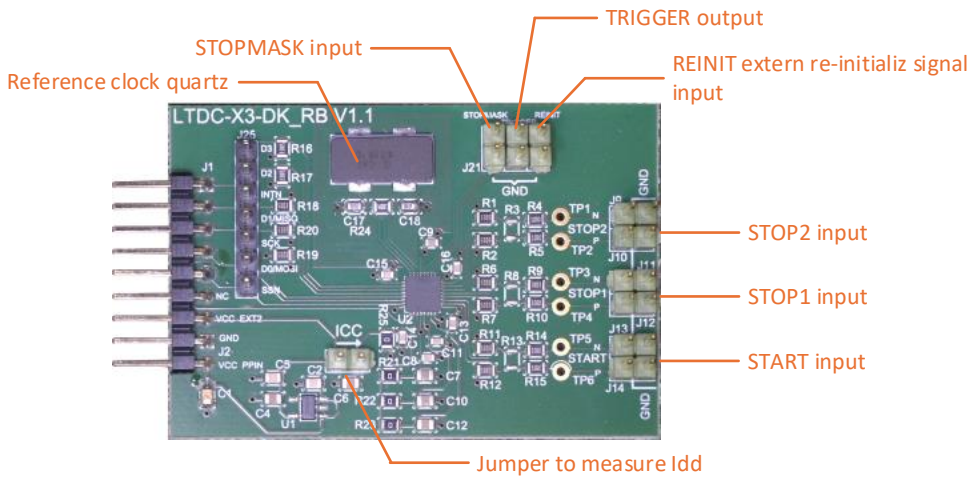


Figure 3: Reference board main points

4 LTDC-X3 Evaluation Software

The software opens with the dashboard window. It should detect the connected board automatically and indicate operability by green status information (1).

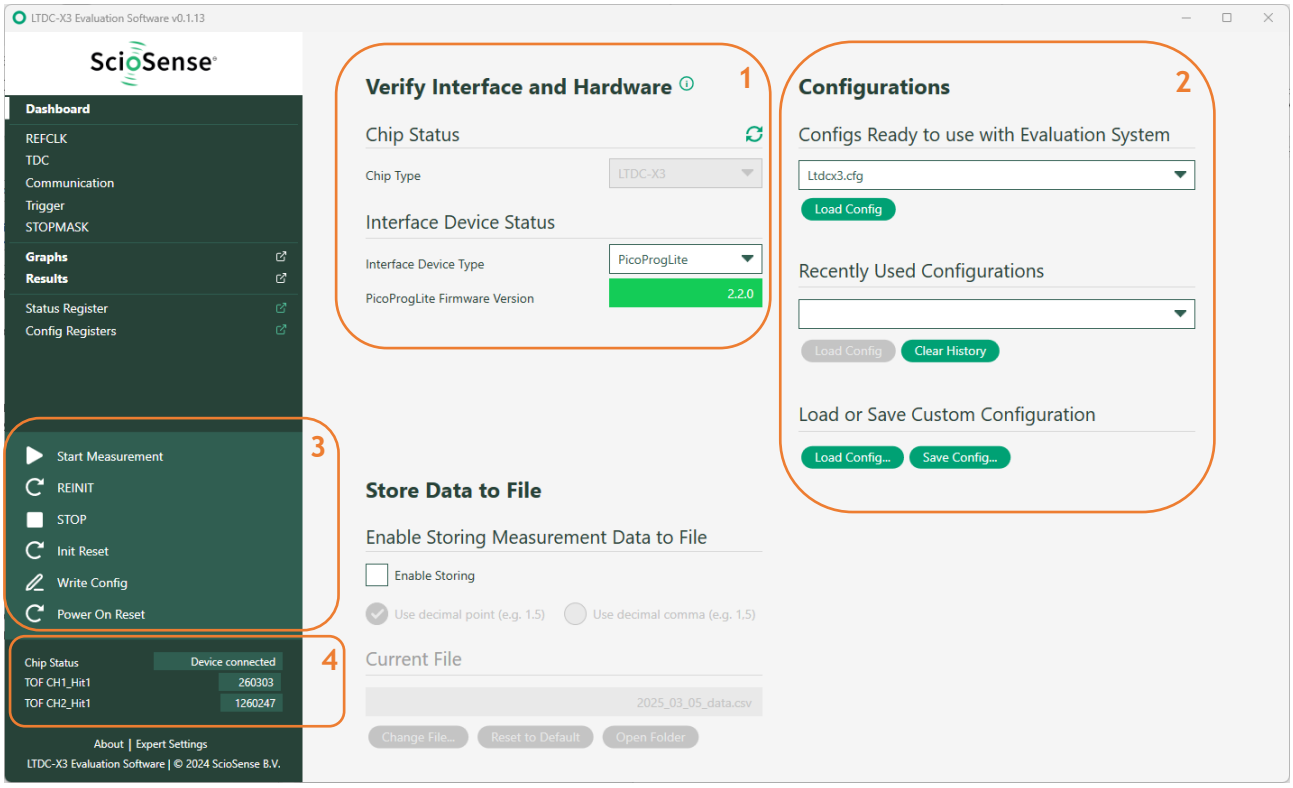


Figure 4: Dashboard page

The next steps could be to start with one of the default configurations or an existing configuration by loading it into the GUI (2). To write the Data to the Chip you need to click on “Write Config” and then you can start the measurement (3).

Note: when you change parameters in the GUI this is indicated by a star behind “Write Config” (3). Do the write to make sure the chip has the current configuration. The star will then disappear.

For further data analysis you can export the measured data into a csv file.

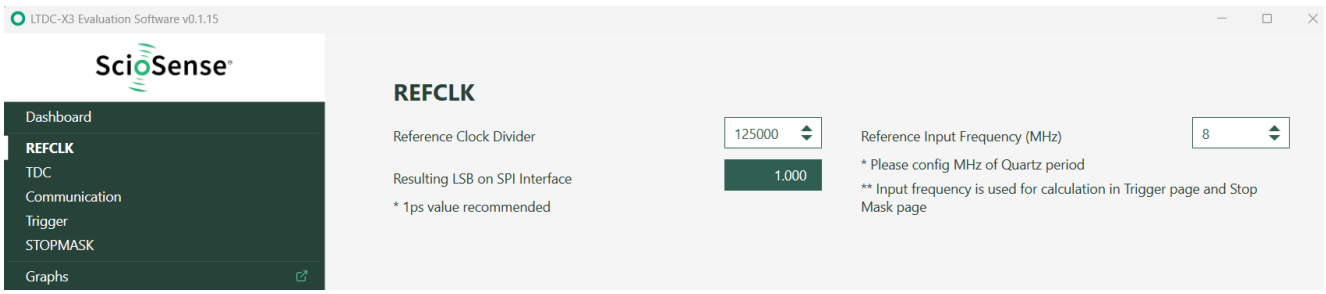


Figure 5: REFCLK page

On the reference clock you have to enter the frequency of the reference clock as it is used on your board. In the field “Reference clock divider” the period of the reference clock in picoseconds should be entered. That will set the LSB to 1 ps.

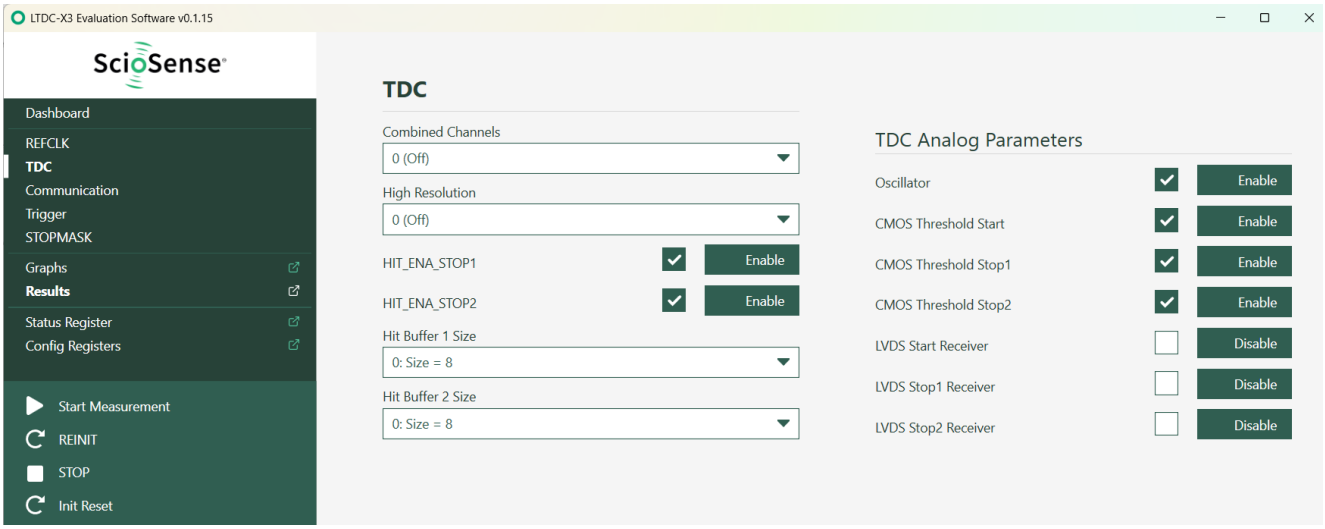


Figure 6: TDC page

With “Combined channels” the hits are distributed between the two channels when set to 2. The pulse-to-pulse spacing between two hits is improved then.

Setting “High Resolution” to 1 or 2 will reduce the standard deviation but at cost of worse pulse-pair resolution.

By setting the “Hit buffer size” you can set a limit for the number of hits that you expect.

With the “TDC Analog Parameters you mainly select between CMOS or LVDS inputs.

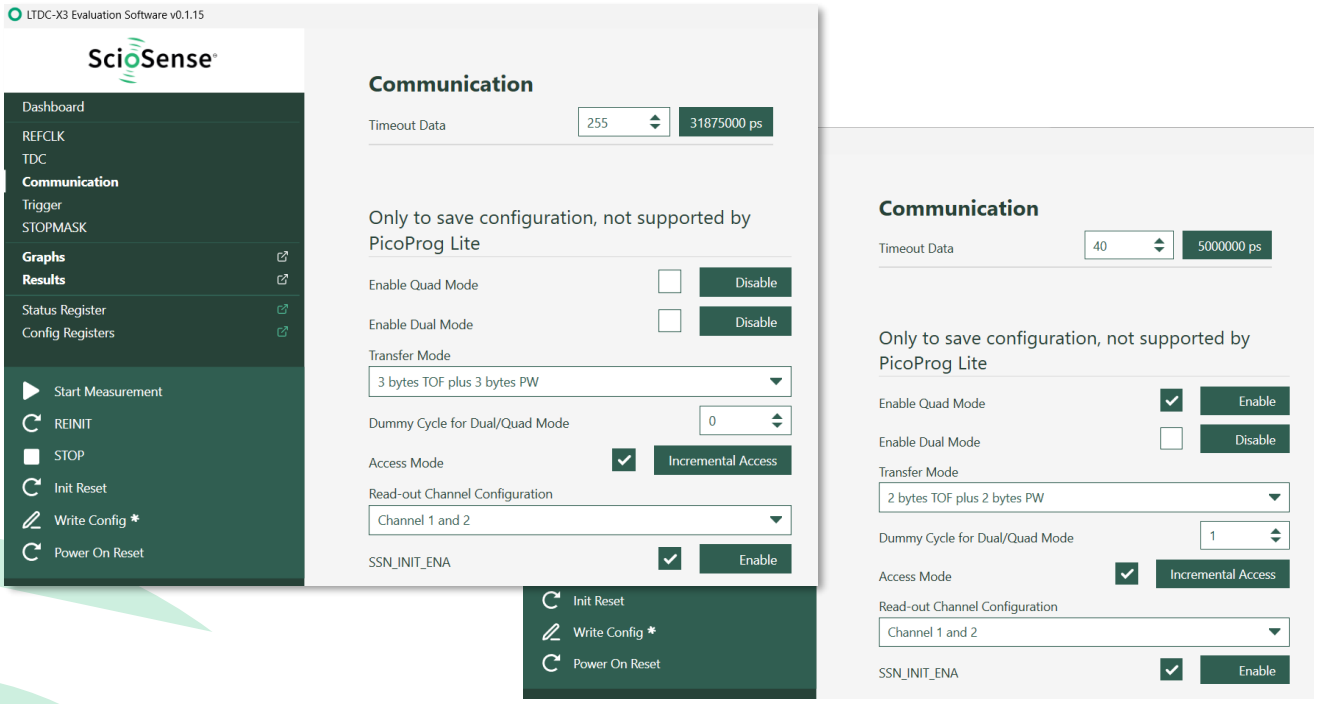


Figure 7: Communication page

On the “Communication” page you find the main settings for the quad SPI interface.

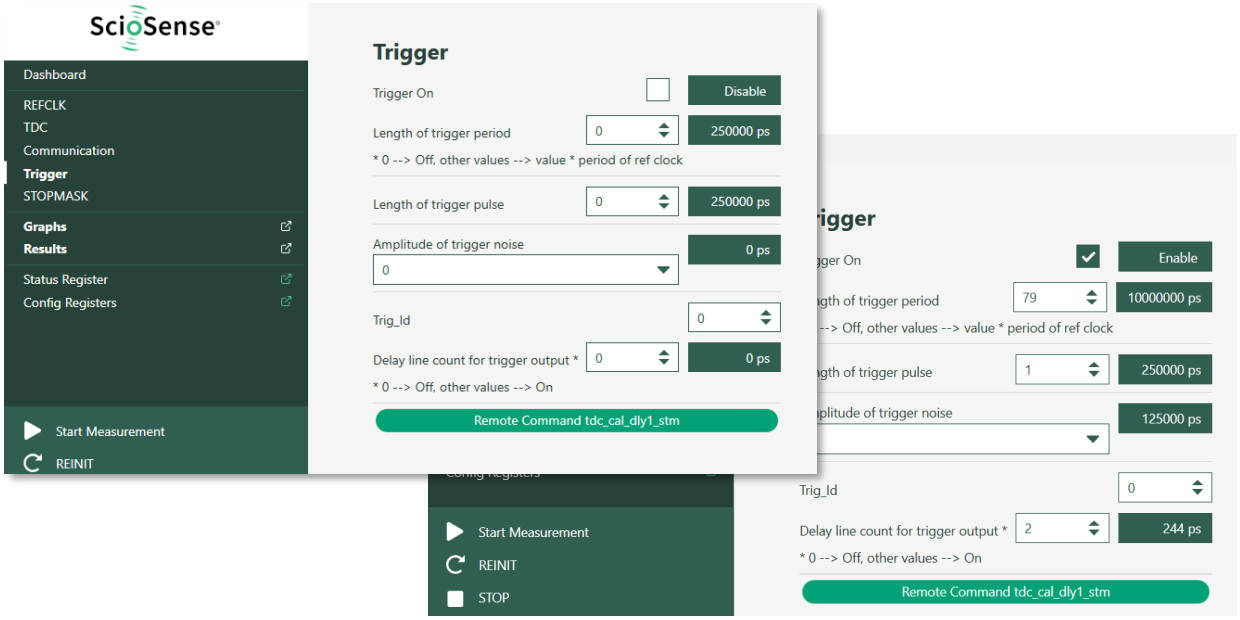


Figure 8: Trigger page

The “Trigger” page holds all settings to define the trigger output. This output of the LTDC-X3 may be used to trigger the laser driver circuit.

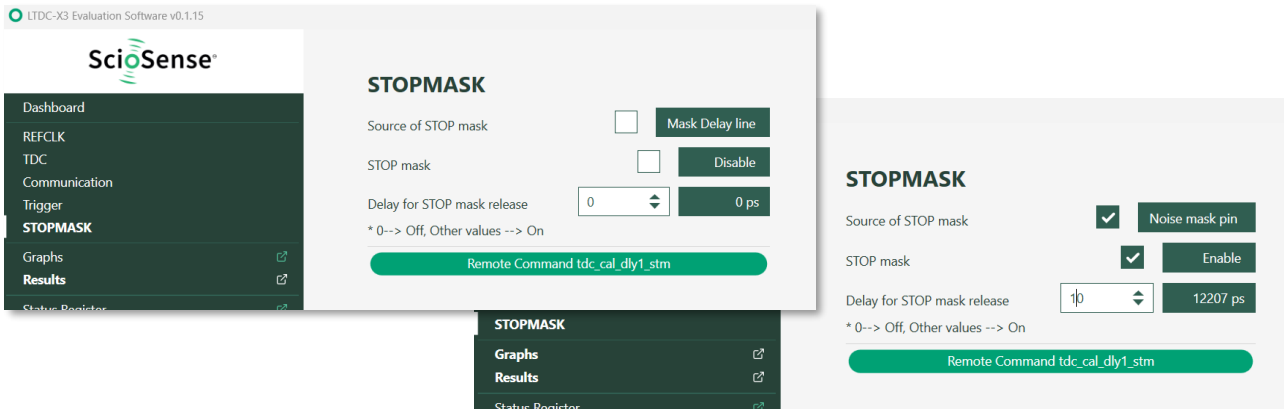


Figure 9: STOPMASK page

The “STOPMASK” page holds the settings for masking the stop inputs. The source can be selected between the pin or the internal timer.

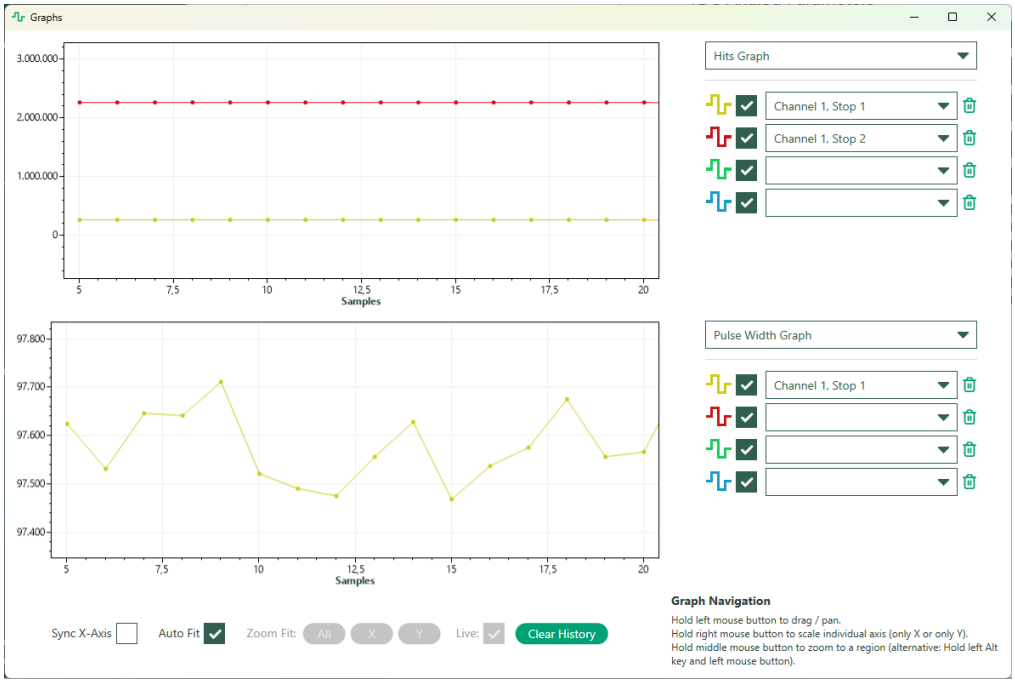


Figure 10: Graphs page

The “Graphs “ page allows to display data graphically. The sources can be selected independently for the two graphs. Typically, one is used for time-of-flight data and one for the pulse width.

Results

Average and Std. Deviation Reset | N for Averaging 50

#	Stop	Name	TOF	PW	Average_TOF	Std. Dev._TOF	Average_PW	Std. Dev._PW
0	STOP0_CH1	HIT 1	411490	122942	411591	110	122836	123
1	STOP0_CH2	HIT 1	411490	121990	411416	132	122137	145
2	STOP1_CH1	HIT 2	1661772	122785	1661732	112	122827	123
3	STOP1_CH2	HIT 2	1661614	122151	1661540	119	122124	114
4	STOP2_CH1	HIT 3	2911842	122952	2911893	117	122806	116
5	STOP2_CH2	HIT 3	2911524	122317	2911666	111	122148	100
6	STOP3_CH1	HIT 4	4161916	122937	4161992	99	122833	89
7	STOP3_CH2	HIT 4	4161758	122302	4161800	94	122148	110
0	STOP4_CH1	HIT 5	5412231	122776	5412135	116	122850	119
1	STOP4_CH2	HIT 5	5411914	122141	5411940	121	122161	131
2	STOP5_CH1	HIT 6	6662367	122776	6662316	148	122815	128
3	STOP5_CH2	HIT 6	6662129	122061	6662102	159	122143	139
4	STOP6_CH1	HIT 7	7912504	122776	7912462	180	122829	116
5	STOP6_CH2	HIT 7	7912345	121982	7912244	157	122140	113
6	STOP7_CH1	HIT 8	9162804	122617	9162603	144	122820	128
7	STOP7_CH2	HIT 8	9162486	16122333	9162408	171	7973587	4625909

Figure 11: Results page

The “Results” page shows the numerical results in the order of the RAM occupation. Time-of-Flight and pulse width are shown in separate columns. The software also calculates the averages and standard deviation based on the number N of samples which is set on the top right.

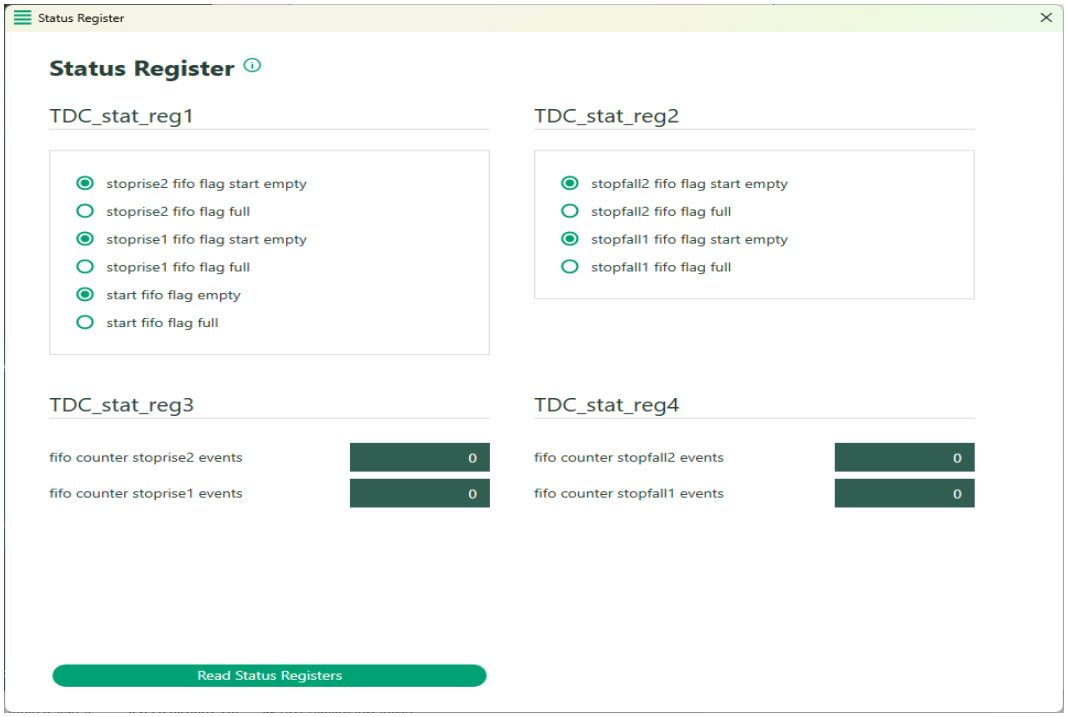


Figure 12: Status Register page

The “Status Register” page shows the flags and the hit counters.

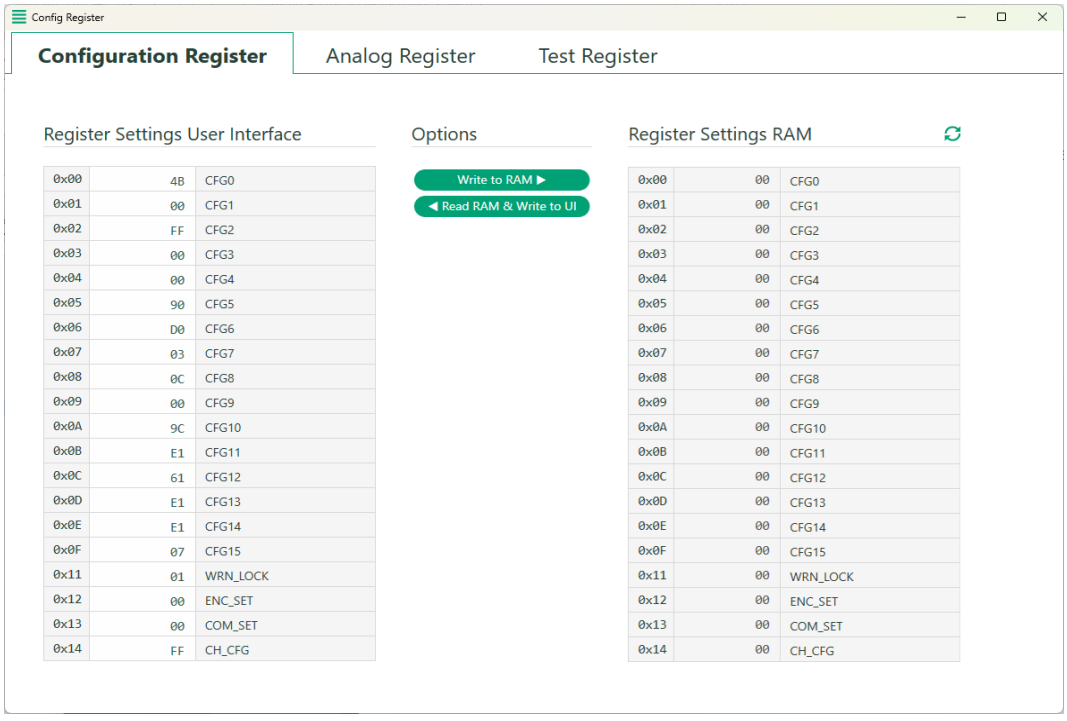


Figure 13: Configuration Register page

The « Config Register » page shows the configuration register, including the analog registers and the test registers. By means of the two green buttons in the center the data can be transferred from the GUI to the chip and vice versa.

5 Schematics, Layers & BOM

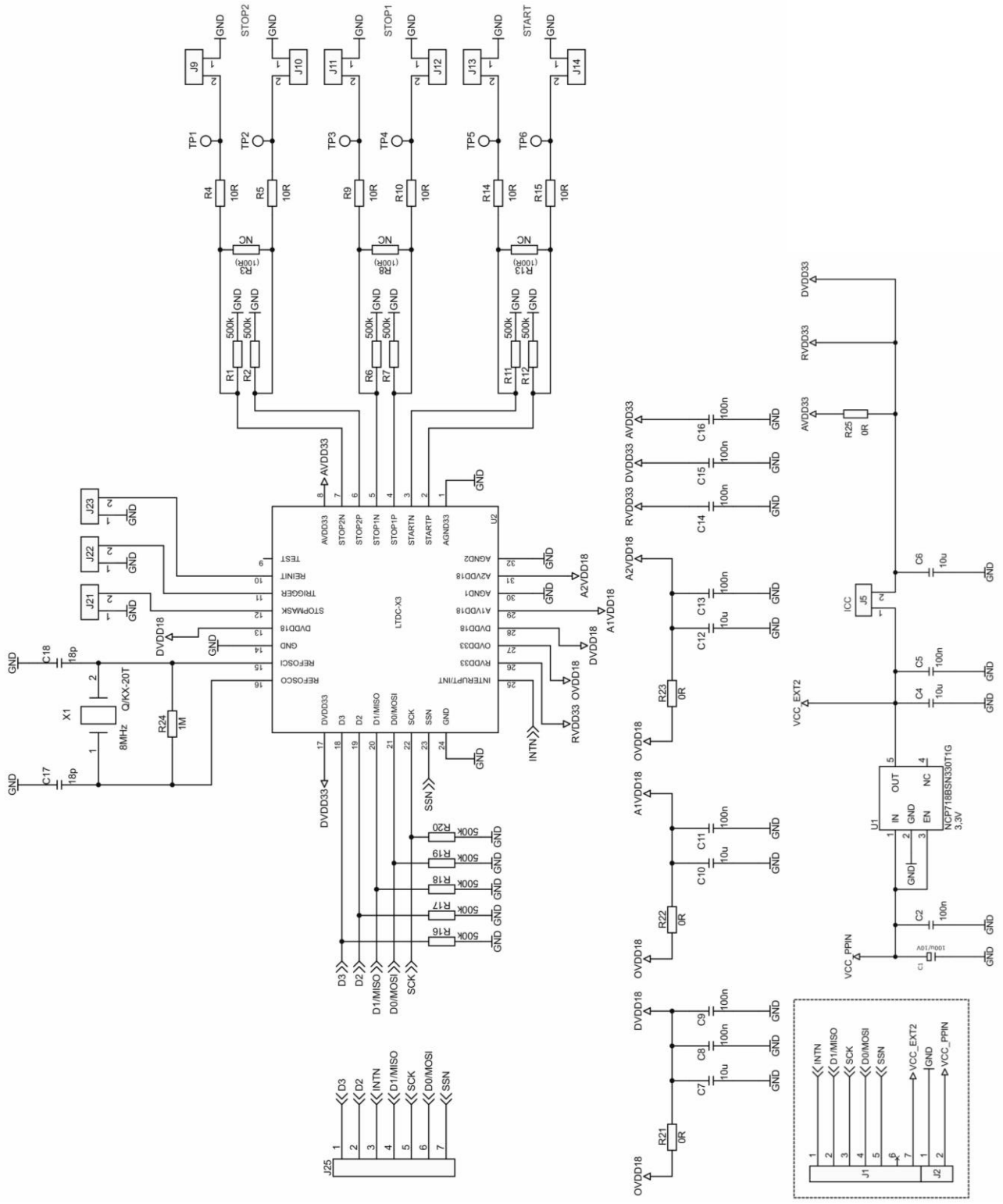


Figure 14: LTDC-X3-QF_DK_RB schematics, Version 1.1

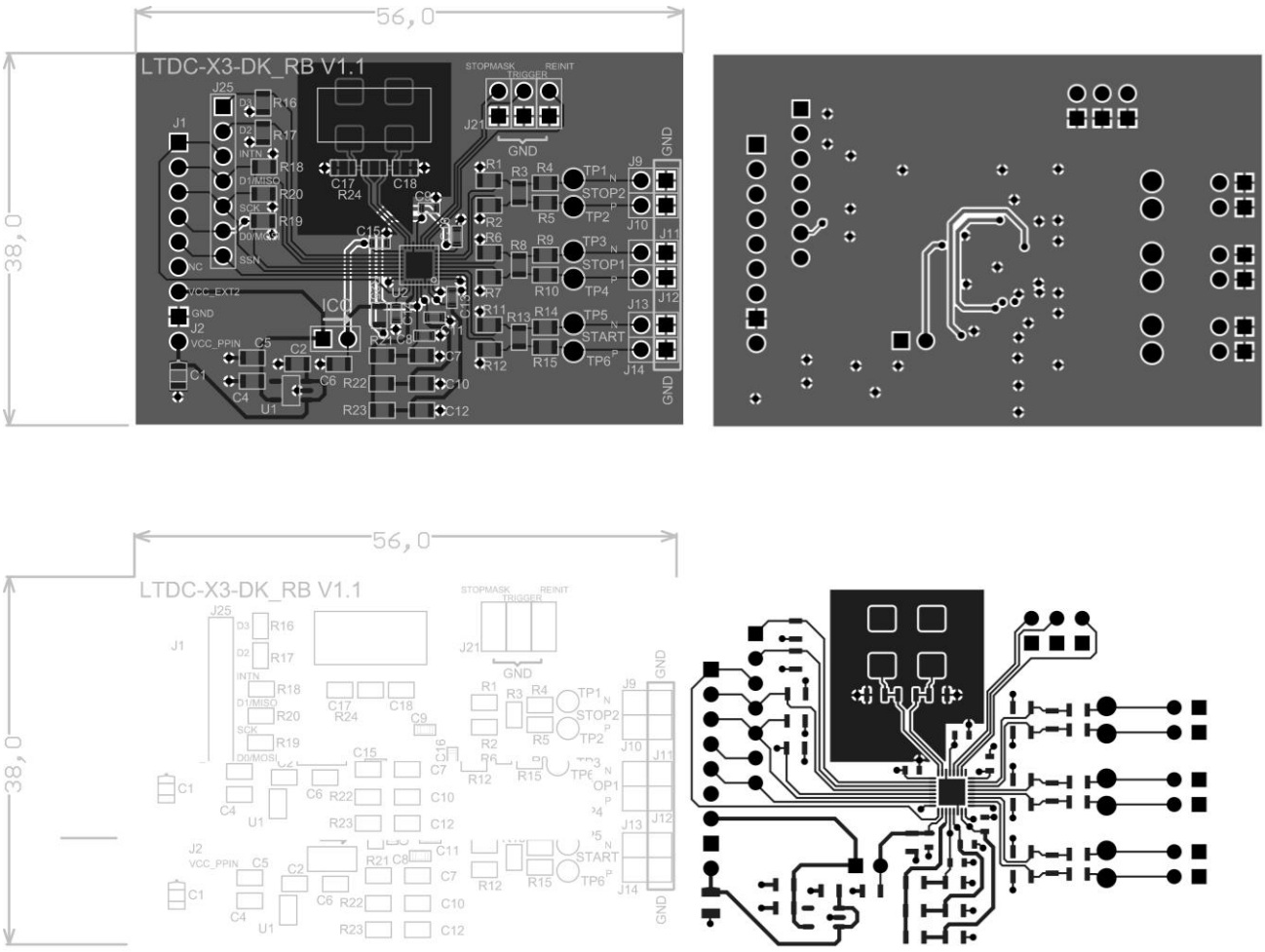


Figure 15: LTDC-X3-QF_DK_RB layout, version 1.1

Table 2: Bill of materials for LTDC-X3-QF_DK_RB

Quantity	Designator	Value	Comment	Footprint
1	C1	100µ/10V	F95-A	0805
2	C2, C5	100n	Chip capacitor	0805
5	C4, C6, C7, C10, C12	10µ	Chip capacitor	0805
7	C8, C9, C11, C13, C14, C15, C16	100n	Chip capacitor	0603
2	C17, C18	18p	Chip capacitor	0805
1	J1		ST/254_7_1R_90°	
1	J2		ST/254_2_90°	

10	J5, J9, J10, J11, J12, J13, J14, J21, J22, J23		ST/254_2	
1	J25		ST/254_7_1R	
11	R1, R2, R6, R7, R11, R12, R16, R17, R18, R19, R20	500k	Chip resistor	0805
3	R3, R8, R13	NC	Chip resistor	0805
6	R4, R5, R9, R10, R14, R15	10R	Chip resistor	0805
4	R21, R22, R23, R25	0R	Chip resistor	0805
1	R24	1M	Chip resistor	0805
6	TP1, TP2, TP3, TP4, TP5, TP6		Test point	
1	U1	3.3V	NCP718BSN330T1G voltage regulator	SOT23-5
1	U2		LTDC-X3	QFN32
1	X1	8 MHz	Q/KX-20T Geyer Electronics	

6 RoHS Compliance & ScioSense Green Statement

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8 Revision information

Table 3: Revision history

Revision	Date	Comment	Page
1	Jun 2025	First release	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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