

TSL2585 EVM

User Guide

Miniature ambient light sensor with UV and light flicker detection

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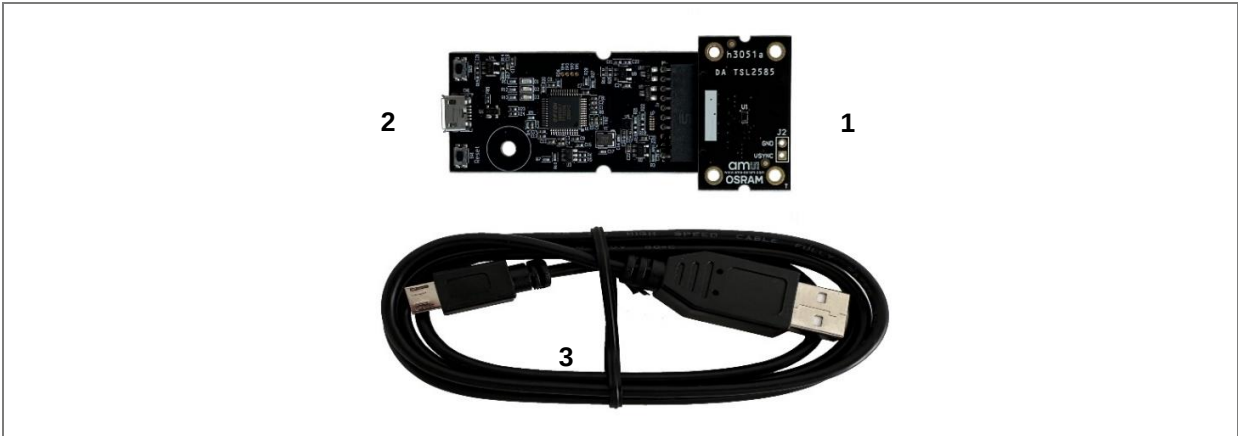
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1 Introduction

The TSL2585 incorporates Photopic, IR, and UV photodiodes that are connected to three modulators, and provide concurrent ambient light sensing, UV sensing and light flicker detection. The device comes in a low-profile and small footprint, L2.0mm x W1.0mm x H0.35mm OLGA package.

1.1 Kit content

Figure 1: Evaluation kit contents



No.	Item	Description
1	TSL2585 daughter board	PCB with TSL2585 sensor installed
2	EVM controller board	Used to communicate USB to I ² C
3	USB cable (A to Micro-B)	Connects EVM controller to PC

1.2 Ordering information

Ordering code	Description
TSL2585_EVM_KT	TSL2585 Evaluation Kit

2 Getting started

The software should be installed before connecting any hardware to the computer. Follow the instructions found in the TSL2585 EVM Quick Start Guide (QSG). This loads the required driver for the USB interface and the device's graphical user interface (GUI).

This document describes the controls available on the GUI. Combined with the TSL2585 datasheet, the QSG, and application notes available on the ams OSRAM website (ams-osram.com), there should be enough information to evaluate the TSL2585 device.

3 Hardware description

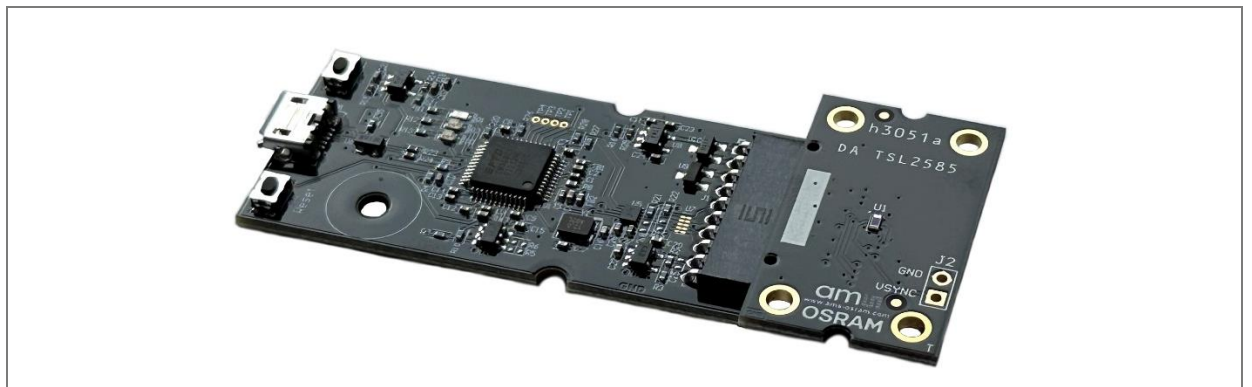
The hardware includes the EVM Controller, the TSL2585 EVM daughter board, and a USB interface cable. The EVM controller board provides power and I²C communication to the daughter board through a ten-pin connector. When the EVM controller is connected to the PC through USB, a green LED on the board lights up to indicate the system is getting power.

Please note that there are older versions of the TSL2585 kit with 7-pin-connectors and a sample diffuser mounted above the TSL2585. These versions must be used with a dedicated Software installer.

Mobile applications using the TSL2585 will most likely need a diffuser above it to avoid major result changes when the device changes angles in relation to the light source. Please refer to the Optical Design Guide provided by ams OSRAM.

Please refer to the ams OSRAM website for additional technical documents on the TSL2585 sensor, including the schematics and layout.

Figure 2: Evaluation kit hardware

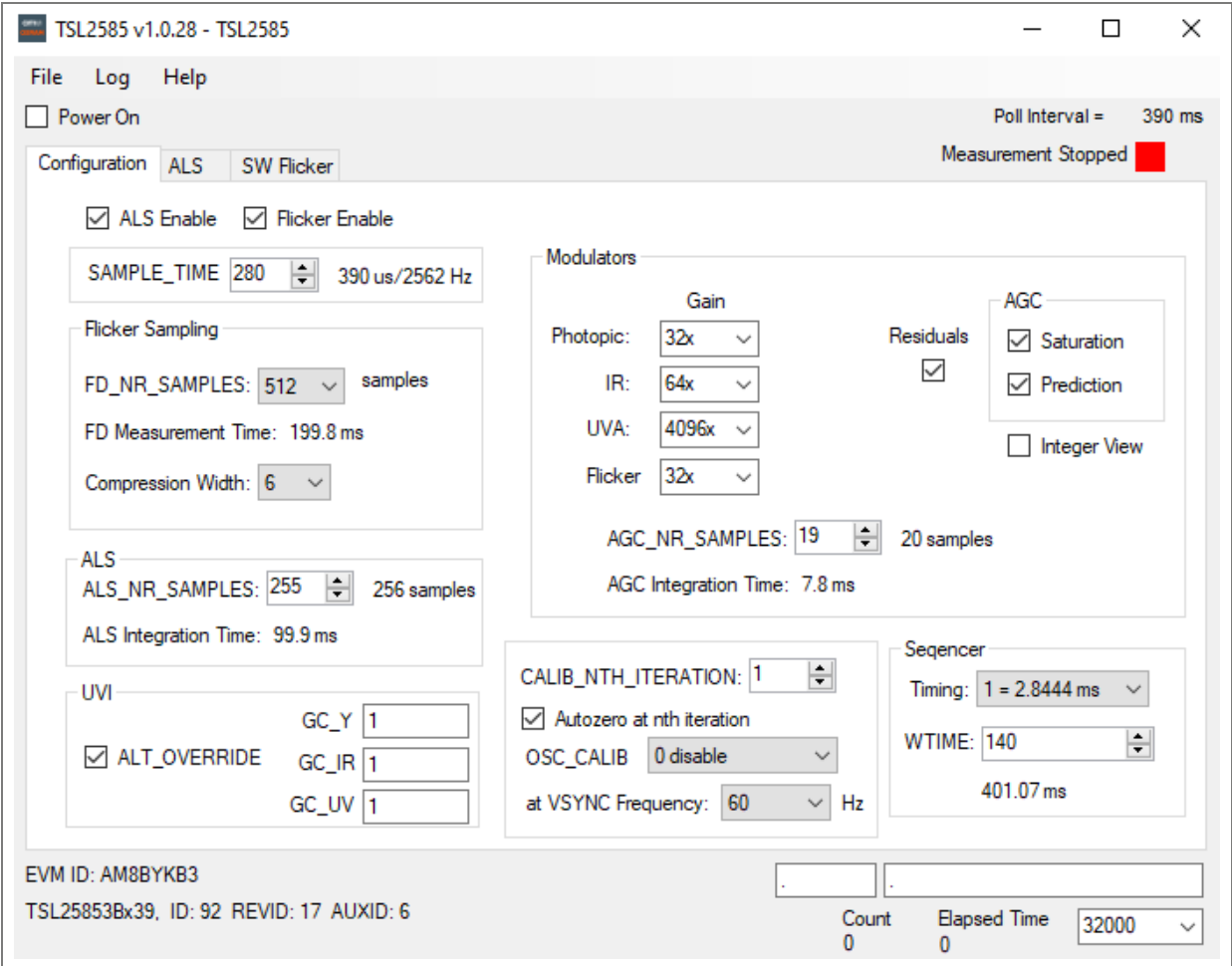


4 Software description

The main window (Figure 3) contains the system menus, system-level controls, device information, and logging status. The configuration tab contains controls to set up both ALS and Flicker detection parameters. The configuration controls can only be changed when “Power on”, which controls the *pon* bit in register **ENABLE**, is unchecked.

Both the ALS tab and SW Flicker tab display ALS and Flicker data. The ALS tab contains a plotting area in which raw ALS data is drawn. The SW Flicker tab contains a plotting area in which the flicker raw data and flicker frequency after FFT calculation are drawn. The application polls the ALS and flicker raw data continuously, and calculates flicker frequency values.

Figure 3: GUI main window



4.1 Software to hardware connection

On startup, the software automatically connects to the hardware. On successful initialization, the software displays a main window containing controls pertinent to the connected device. If the software detects an error, an error window appears. If “Device not found or is unsupported” appears, verify the correct daughterboard is properly connected to the EVM controller board. If “Cannot connect to EVM board” appears, verify the USB cable is connected. When the EVM controller board is connected to the USB, a green LED on the board lights on power up, indicating the USB cable is connected and supplying power to the system. The LED remains lit until a software application opens the controller. The light then switches off so as not to interfere with any light measurements.

If the EVM board disconnects from the USB bus while the program is running, the program displays an error message and then terminates. Reconnect the EVM board and restart the program.

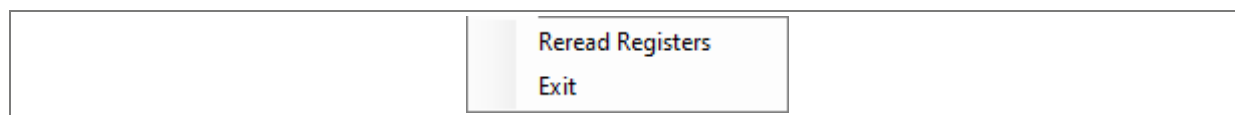
4.2 System menus

At the top of the window there are pull-down menus labeled “File”, “Log”, and “Help”. The **File** menu provides basic application-level control. The **Log** menu controls the logging function, and the **Help** menu provides version and copyright information for the application.

4.2.1 File menu

The File menu contains the following functions:

Figure 4: File menu



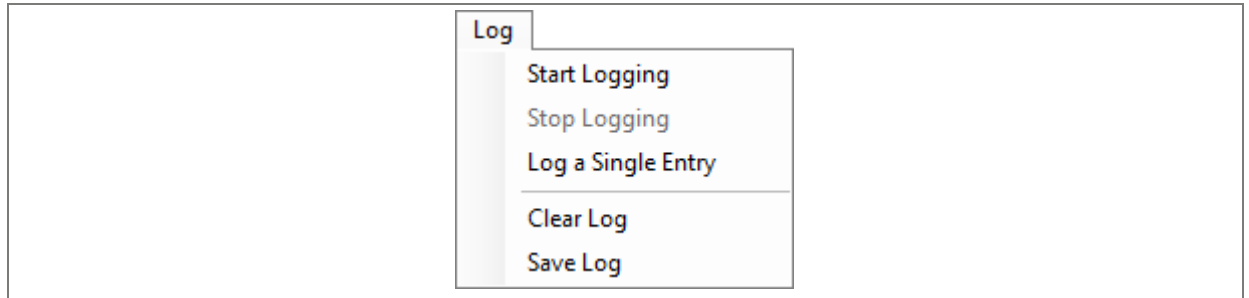
The **Reread Registers** function forces the program to re-read all the control registers from the device and display them on the screen. This does not read the output data because the program reads those registers continually while it is running.

Click on the **Exit** command to close the main window and terminate the application. This clears any unsaved log data from memory. The application can also be closed by clicking the red “X” in the upper right-hand corner.

4.2.2 Log menu

The Log menu controls the logging function and saves the log data to a file. Log data accumulates in memory until discarded or written to a data file.

Figure 5: Log menu



Click **Start Logging** to start the logging function. Each time the program polls the output information from the device, it creates a new log entry showing the raw data values, the values of various control registers, and the values entered by the user into the text fields near the bottom right-hand corner of the window.

Click **Stop Logging** to stop the logging function. Once logging stops, the user may store the data in a file or continue collecting additional data by clicking **Start Logging** again.

The **Log a Single Entry** command causes logging to start, collect one single entry, and immediately stop again. This function is not available when logging is already running.

Click **Clear Log** to discard any previously collected data. If there is data in memory, that has not been saved to disk, this function displays a prompt asking for verification to discard the data. If the log is active when this function executes, the log continues running after the existing data is discarded.

Click **Save Log** to save the collected log data to a CSV file. This stops the logging function if it is active and displays a file dialog box to specify where to store the logged data. The Log status and control information chapter below describes the default file name, but you may change the file name if desired.

4.2.3 Help menu

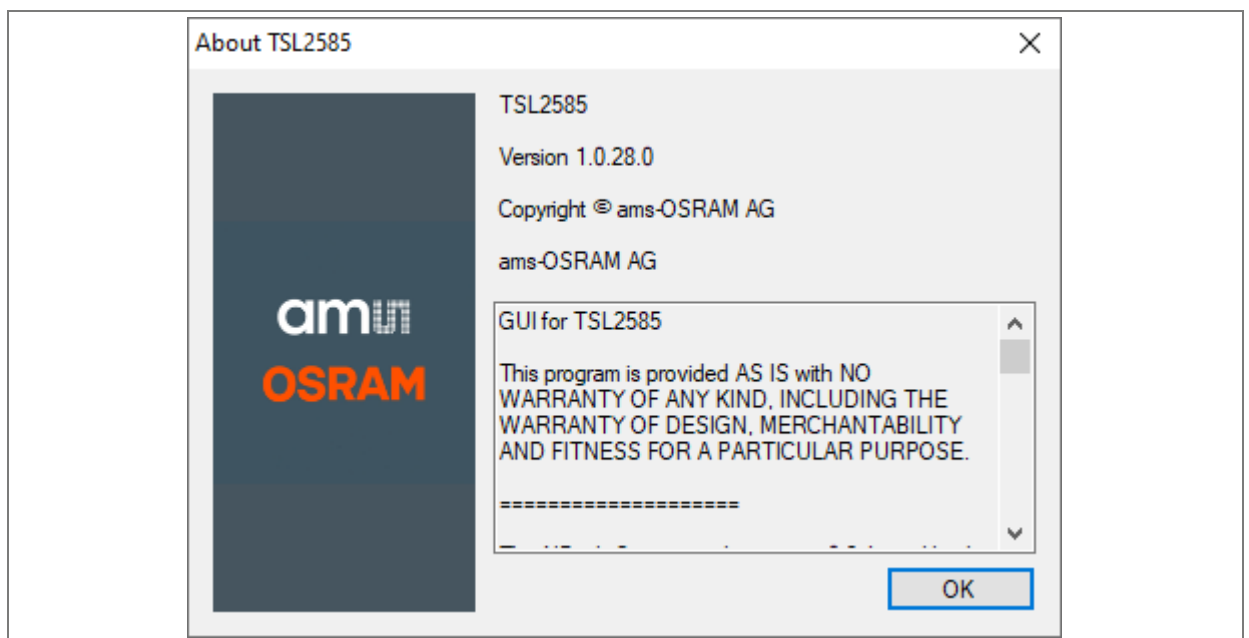
The Help menu contains a single function: About.

Figure 6: Help menu



The **About** function displays a dialog box (Figure 7) showing the version and copyright information for the application and library. Click the **OK** button to close this window and continue.

Figure 7: About window



4.3 System level controls

Immediately below the top menu bar are checkboxes used to control the system-level functions of the TSL2585 device.

The **Power On** checkbox controls the PON function of the TSL2585. When this box is checked, the power is on, and the device runs measurements according to the settings in the Configuration tab. Currently, the Configuration tab is disabled to prevent users from changing the settings while the measurement is ongoing. When this **Power On** checkbox is unchecked,

the power is off, and the device does not operate. The Configuration tab is then enabled, and the user can change the controls to set up the parameters for the next run.

4.4 Auto polling

The application automatically polls the TSL2585 raw data of ALS and Flicker if enabled. The **Poll Interval** at the upper right-hand corner of the form displays the actual time between the device reads.

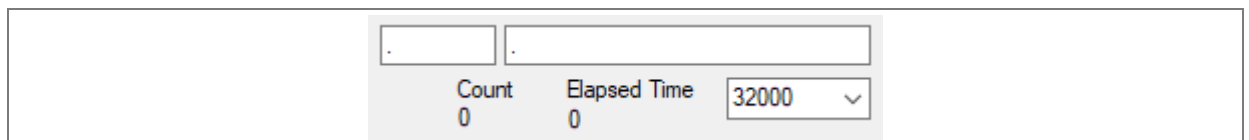
4.5 Device ID information

The lower right-hand corner of the window contains status information and controls for the logging function.

4.6 Log status and control information

The lower right-hand corner of the window contains status information and controls for the logging function:

Figure 8: Logging status



The screenshot shows a control panel with two text input fields at the top, each containing a period (.). Below these fields, the text 'Count' is followed by the value '0'. To the right, the text 'Elapsed Time' is followed by the value '0'. Further right is a dropdown menu showing the value '32000' with a downward arrow.

This section contains text boxes that are stored in the log file data and used to build the file name for the log file. If the data in these fields are changed, the new values are stored with any new data logged. The default file name is based on these values at the time the log file is written. If nothing is entered in these boxes, they default to a period (".").

Sample default file name:

TSL2585 EVM 1-2-3 Log HH MM SS.csv

From Application

From User Input

The **Count** value displayed is a count of the number of samples currently in the log buffer.

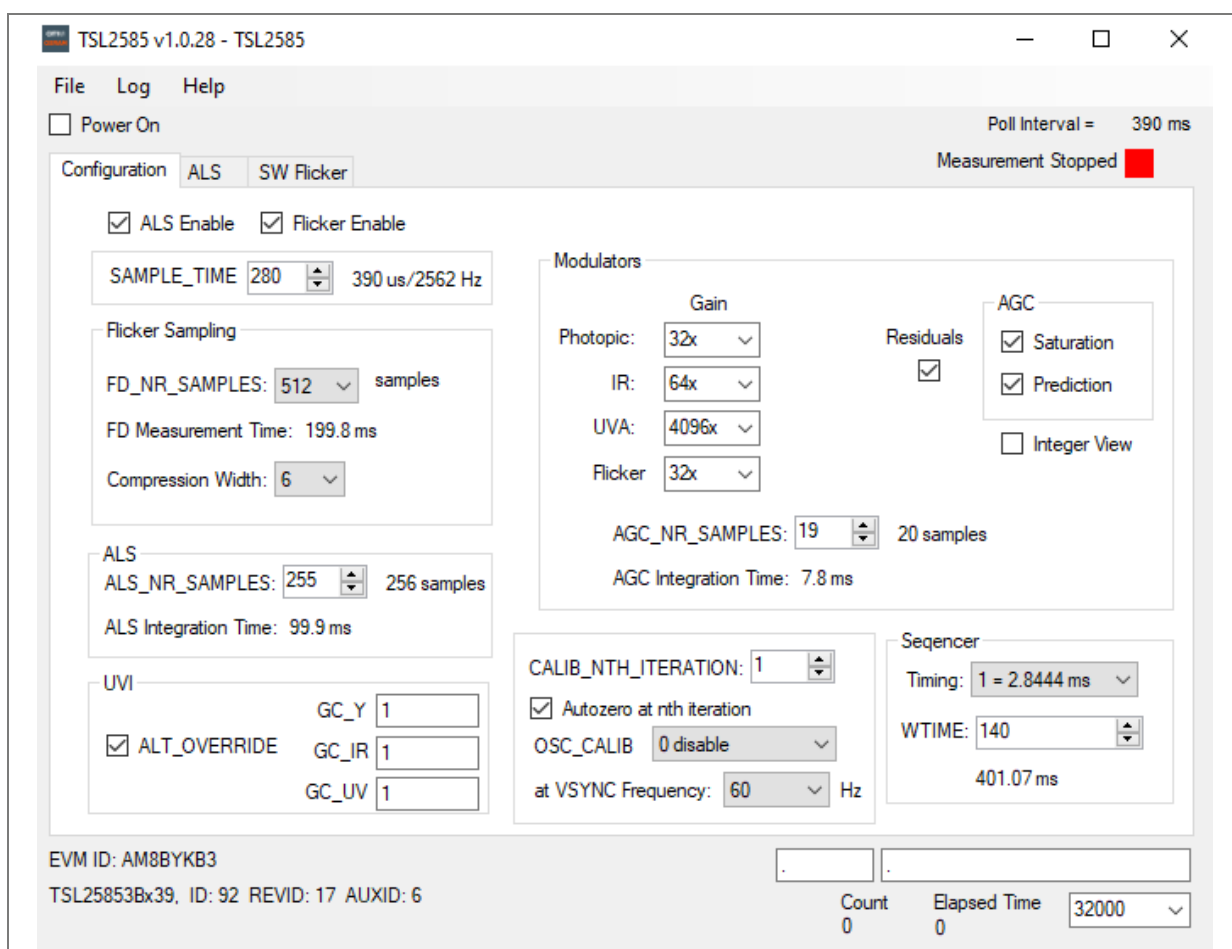
The **Elapsed Time** value indicates the elapsed time since data logging started.

The numeric box in the bottom right-hand corner sets a limit to the size of the collected dataset. You may select a value from the pull-down list or enter a value manually. When the number of entries in the log reaches this value, the program will automatically stop logging and display a file dialog box to specify where to store the logged data. You may change the file name if desired. The maximum value that can be entered in this field is 32000.

4.7 “Configuration” tab

The main portion of the screen contains a tab labeled Configuration.

Figure 9: Configuration tab



4.7.1 Configuration controls

ALS Enable control enables the ALS detection if checked.

Flicker Enable control enables the Flicker detection if checked.

The **SAMPLE TIME** control sets the time of one flicker measurement. It also defines the measurement time of the step for ALS measurements.

The **Flicker** group box contains controls relating to flicker detection:

- **FD_NR_SAMPLES** control defines the number of samples for one flicker measurement.
- **FD Measurement Time** control displays the integration time for one flicker measurement.
- **Compression Width** control defines the compressed flicker data width in the FIFO. The choice is from **1** to **15**.

The **ALS** group box contains controls relating to ALS detection:

- **ALS_NR_SAMPLES** control defines the number of samples for one ALS measurement.
- **ALS Integration Time** control displays the integration time for one ALS measurement.

The **Calibration** group box contains the following controls:

- **CALIB_NTH_ITERATION** control sets the repeated rate of the calibration execution in measurement sequencer rounds. The values are from 0 to 255.
- **Autozero at nth iteration** checkbox enables auto zero calibration during nth iteration calibration if checked.
- **OSC_CALIB** control defines the calibration mode. The available options are “0 disabled”, “1 after pon”, and “2 always on”.
- **At VSYNC Frequency** sets the VSYNC frequency. The available values are 60Hz, 90Hz, and 120Hz.

The **Modulators** group box contains controls to setup all gains:

- **Gain Photopic** dropdown combination box sets the gain for step 0 or modulator 0 (Photopic ALS). The choices are 1/2x, 1x, 2x, 4x, 8x, 16x, 32x, 64x, 128x, 256x, 512x, 1024x, 2048x, and 4096x.
- **Gain IR** dropdown combination box sets the gain for step 0 or modulator 1 (IR ALS). The choices are 1/2x, 1x, 2x, 4x, 8x, 16x, 32x, 64x, 128x, 256x, 512x, 1024x, 2048x, and 4096x.
- **UVA** dropdown combination box sets the gain for step 0 or modulator 2 (UV ALS). The choices are 1/2x, 1x, 2x, 4x, 8x, 16x, 32x, 64x, 128x, 256x, 512x, 1024x, 2048x, and 4096x.

- **AGC** group box has two checkboxes. One is the **Prediction** checkbox for enabling the prediction of the AGC function for all steps of the sequence if checked. The second is the **Saturation** checkbox which enables AGC analog saturation if checked.
- **Residual** checkbox enables a residual measurement on all modulators if checked.
- **AGC_NR_SAMPLES** defines the number of samples for every AGC measurement. The values are from 0 to 2047.
- **AGC Integration Time** displays the AGC integration time.

The **Sequencer** group box contains controls relating to the wait function:

- **Timing** defines the repeated rate of the modulator/sequencer measurements. The available selections are “0 = off”, “1 = 2.8444 ms”, “2 = 45.51 ms”, “3 = 88.89 μ s”, “4 = 1.42 ms”, “5 = vsync”.
- **WTIME** specifies the time to wait between measurement steps. The values are from 0 to 255.

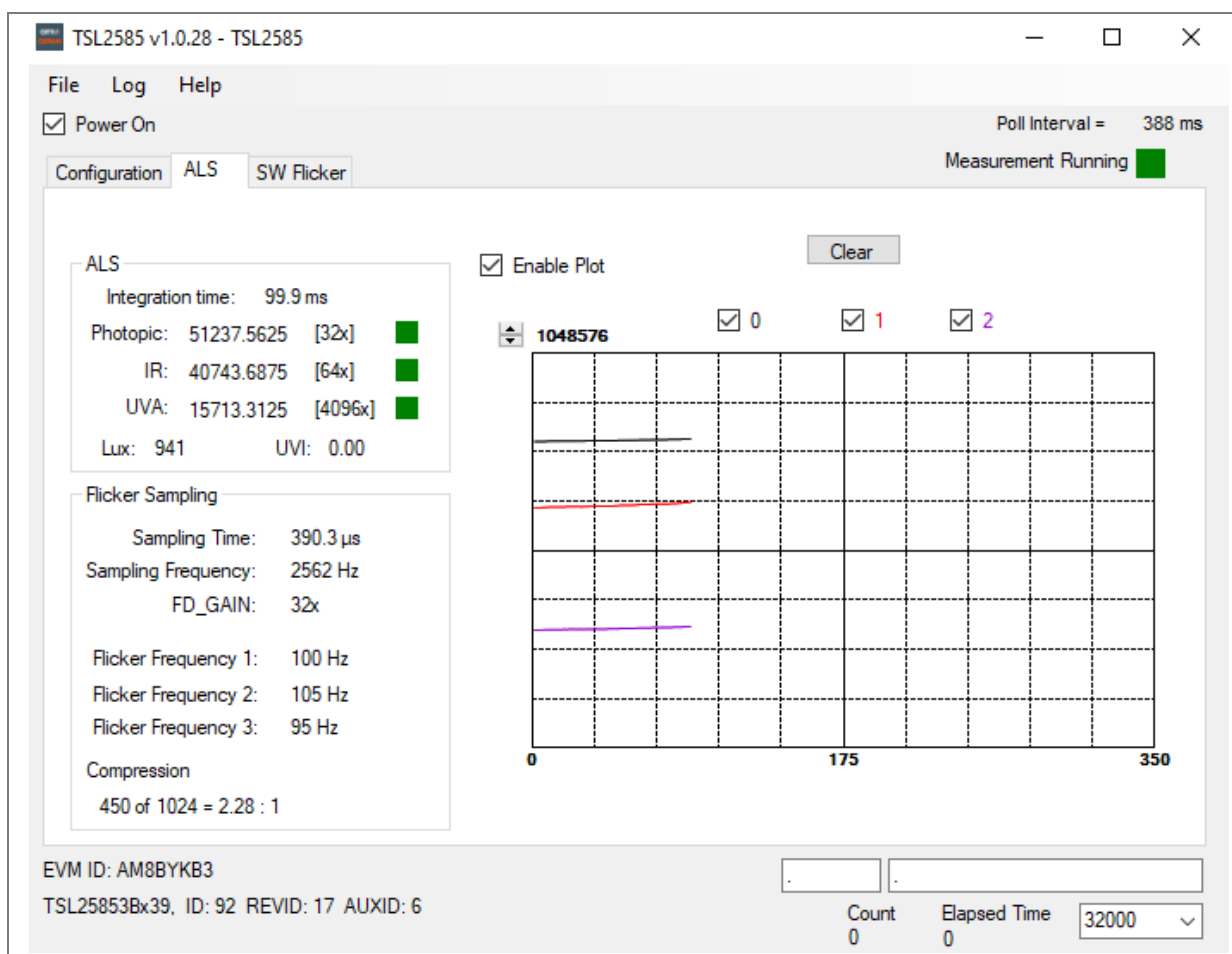
The **UVI** group box contains controls relating the UVI calculation:

- **ALT_OVERRIDE** checkbox uses the typical equation to calculate the UVI if checked. This works for typical indoor and outdoor conditions. When it is unchecked, the UVI calculation uses another set of constants in the equation, and it usually works better when testing indoors with special UV bulbs.
- **GC_Y, GC_IR, and GC_UV** are the golden calibration factors for Y, IR, and UV. These can also be entered through the GUI as an adjustment factor. Any other device will need its own.

4.8 “ALS” tab

The main portion of the screen contains a tab labeled ALS. It displays measurement data.

Figure 10: ALS tab



4.8.1 ALS group box

The left-hand side of the ALS tab displays the ALS measurement data with the following items:

- The ALS **Integration Time**.
- **Photopic** data counts.
- **IR** data counts.
- **UVA** data counts.

- **Photopic** gain value.
- **IR** gain value.
- **UVA** gain value.
- **Photopic Saturation Status:** A green color means no saturation happened. A red color otherwise.
- **IR Saturation Status:** A green color means no saturation happened. A red color means otherwise.
- **UVA Saturation Status:** A green color means no saturation happened. A red color means otherwise.
- **Lux:** Calculated Lux value.
- **UVI:** Calculated UVI value

4.8.2 Flicker sampling group box

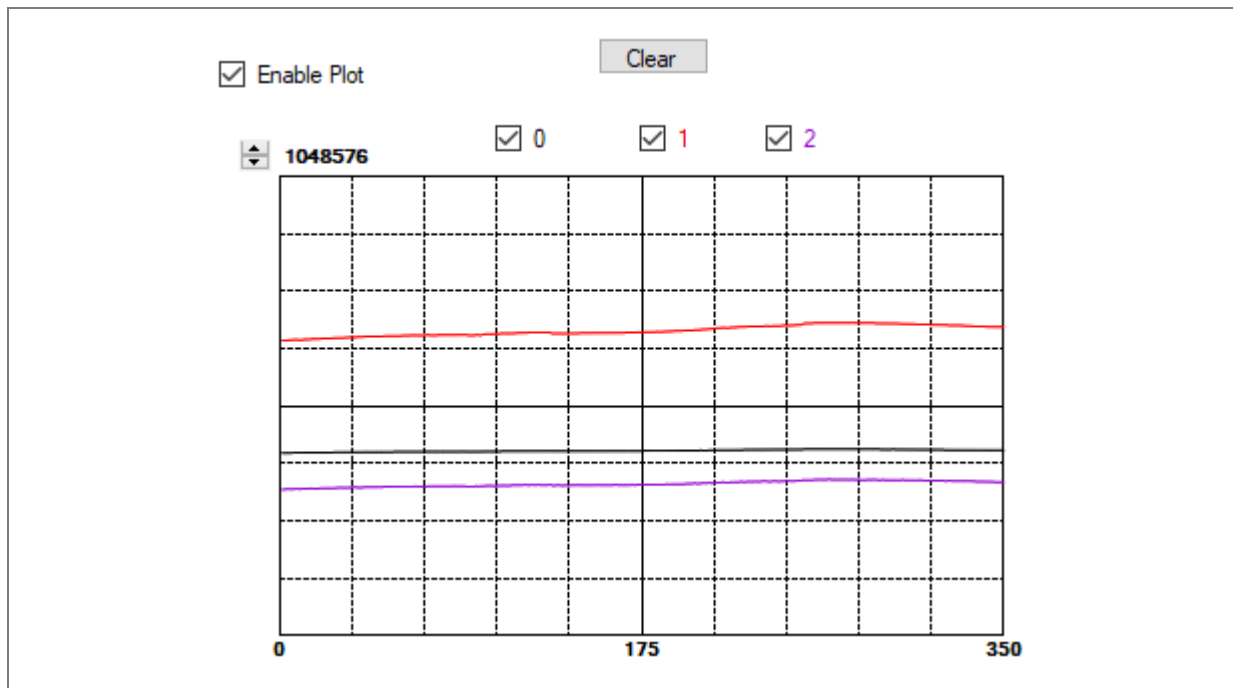
The following items are displayed in the Flicker Sampling group box:

- **Sampling Time**
- **Sampling Frequency**
- **FD_GAIN**
- **Flicker Frequency1**, which has the biggest FFT value.
- **Flicker Frequency2**, which has the second biggest FFT value.
- **Flicker Frequency3**, which has the third biggest FFT value.
- **Compression** rate of the Flicker data.

4.8.3 ALS data plot

The remaining portion of the ALS tab displays a running plot of the collected ALS values and calculated Lux. The last 350 values are collected and plotted on the graph. As additional values are added, the old values will be deleted from the left side of the graph. To start the plotting function, check the **Enable Plot** checkbox and select the **0**, **1** and/or **2** checkboxes. The **Clear** button clears the plot on the screen and restarts a new plot.

Figure 11: ALS data plot

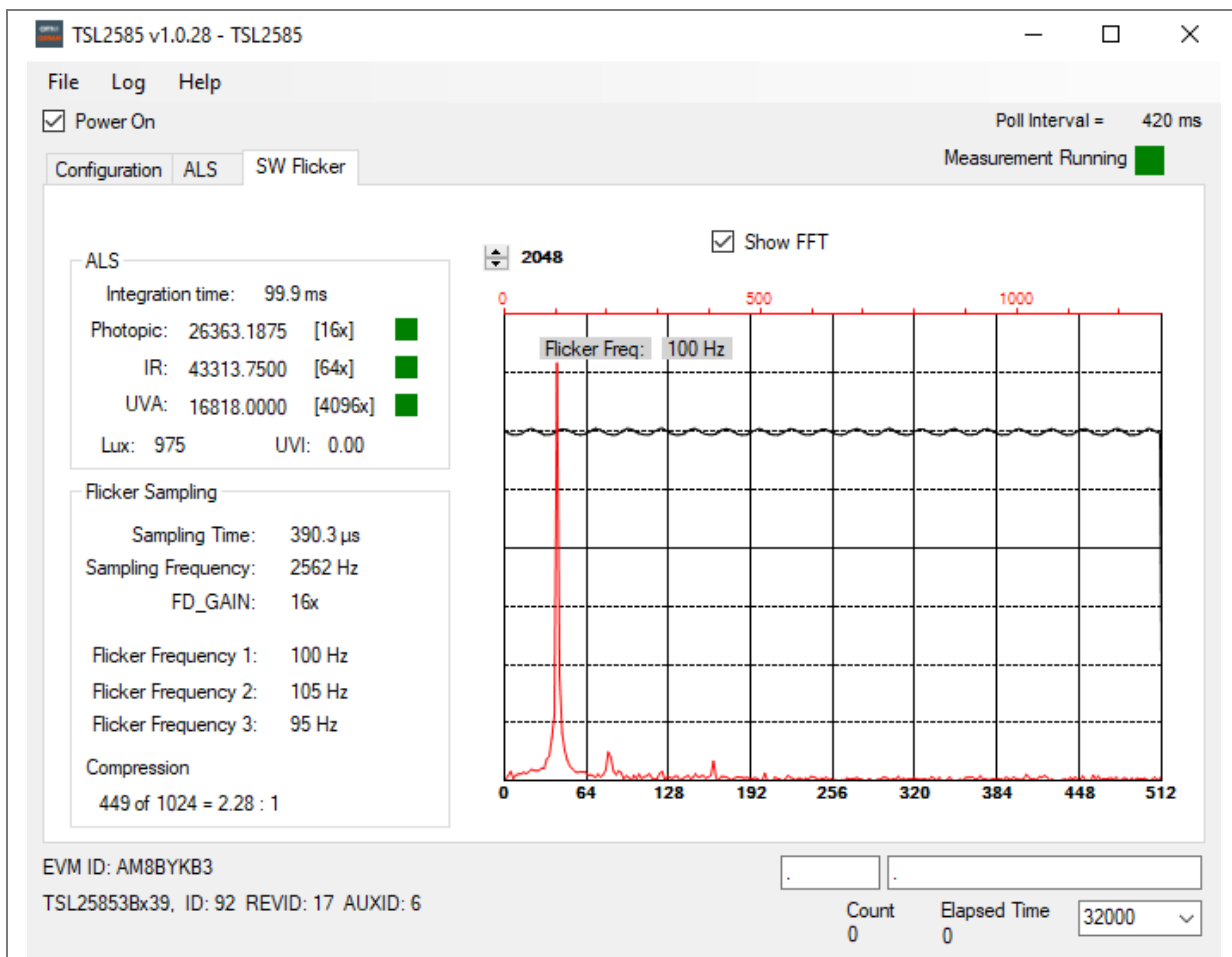


The scale of the plot's Y-axis can be adjusted by clicking on the small up and down arrows at the top left-hand corner of the plot. The scale can be set to any power of 2 from 64 through 1048576.

4.9 “SW flicker” tab

The main portion of the screen contains a tab labeled SW Flicker.

Figure 12: SW flicker tab



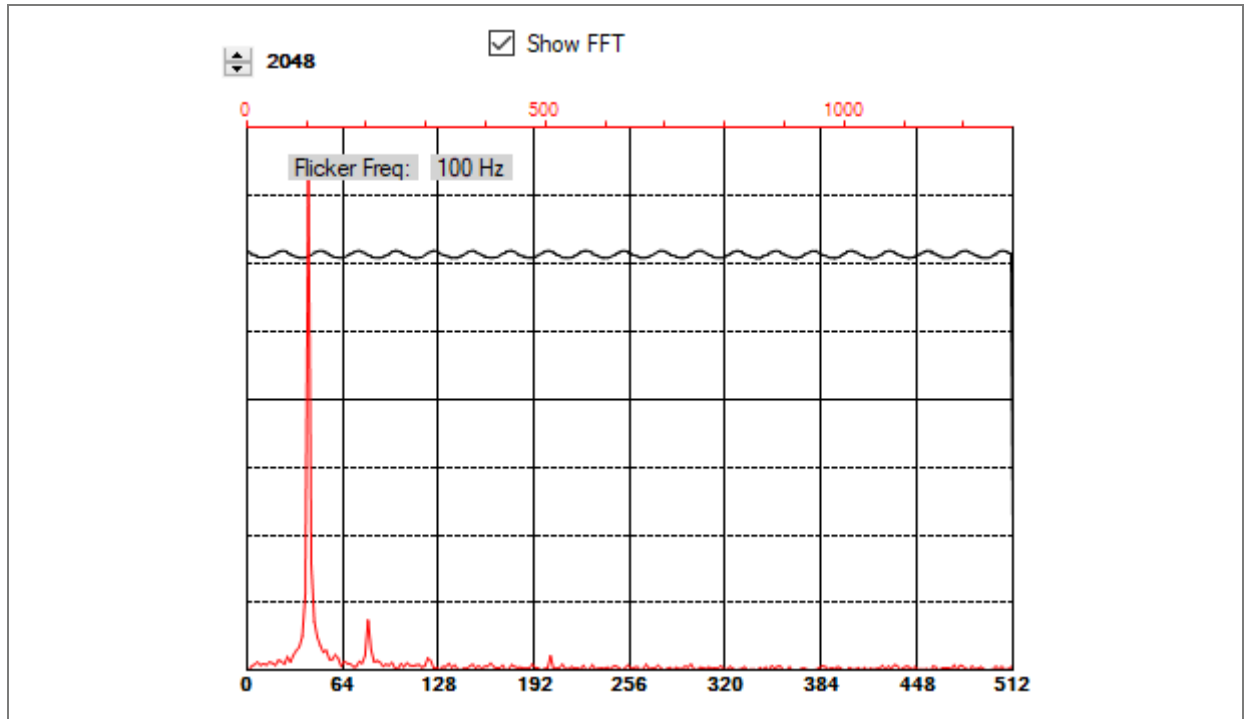
4.9.1 Flicker information

The left-hand side of the SW Flicker tab displays the ALS and Flicker information as in the ALS tab. See Chapter 4.8 for more information.

4.9.2 Flicker output data

The top right-hand section of the SW Flicker tab displays a plot of the original flicker data and the data after FFT. The peak Flicker Frequency is also displayed there.

Figure 13: SW flicker data plot



The scale of the plot's Y-axis can be adjusted by clicking on the small up and down arrows at the top left-hand corner of the plot. The scale can be set to any power of 2 from 16 to 65536.

5 Resources

For additional information regarding the TSL2585, please refer to the datasheet. For information regarding the installation of the TSL2585 EVM host application software please refer to the TSL2585 EVM Quick Start Guide.

Designer's Notebooks dealing with various aspects of optical measurement and optical measurement applications are available. All content is available on the ams OSRAM website ams-osram.com.



For further information, please refer to the following documents:

- TSL2585 Datasheet, DS001025
 - TSL2585 EVM Quick Start Guide (QSG), QG001010
 - TSL2585 EVM User's Guide (this document), UG001017
 - TSL2585 EVM Schematic Layout
-

6 Revision information

Definitions

Draft / Preliminary:
The draft / preliminary status of a document indicates that the content is still under internal review and subject to change without notice. ams-OSRAM AG does not give any warranties as to the accuracy or completeness of information included in a draft / preliminary version of a document and shall have no liability for the consequences of use of such information.

Changes from previous released version to current revision v3-00	Page
Document contents transferred to new ams OSRAM template	
Updated pictures and text to 10-pin daughter board revision without diffusor	
Updated ordering code	3

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

7 Legal information

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