UM1796
User manual

VL6180X explorer kit (EVALKIT-VL6180X) software installation

Introduction

This document provides detailed firmware installation guidelines for a standalone demonstration, a PC graphical user interface (GUI) and an application programming interface (API) for the use of VL6180X explorer kit (EVALKIT-VL6180X). This explorer kit consists of the VL6180X plug-in board and the STM32 F401RE Nucleo board. This product is part of STMicroelectronics offering for demonstration and development tools designed around the VL6180X, 3-in-1 proximity, gesture and ALS sensor, based on ST patented FlightSense™ technology.

Figure 1. EVALKIT-VL6180X

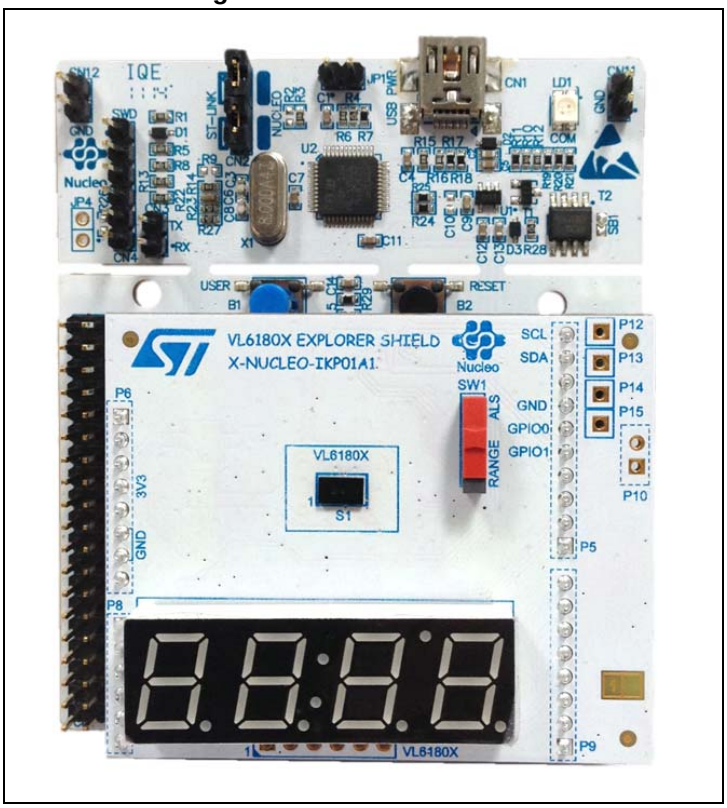

Table 1. Ordering information

Ordering code	Description
EVALKIT-VL6180X	VL6180X plug-in board and STM32 F401RE Nucleo board

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1 Getting started

1.1 Document references

Table 2. Document references

Description	DocID
Data brief - VL6180X plug-in and STM32F401 Nucleo board evaluation kit	DocID026599
Datasheet - VL6180X proximity and ambient light sensing (ALS) module	DocID026171
AN4545: application note: Getting started - VL6180X basic ranging	DocID026571
AN4466 application note: VL6180X cover glass selection	DocID026155
AN4478 application note: Using multiple VL6180Xs in a single design	DocID026250

1.2 Hardware description

The VL6180X plug-in is a board for use with most of the Arduino compatible connectors. With its companion software package, it is particularly well suited for STM32 Nucleo boards. To function in a nominal way, the VL6180X must be connected to the STM32 Nucleo board as shown in *Figure 2*. and *Figure 3*

Figure 2. VL6180X plug-in connected to STM32 Nucleo board

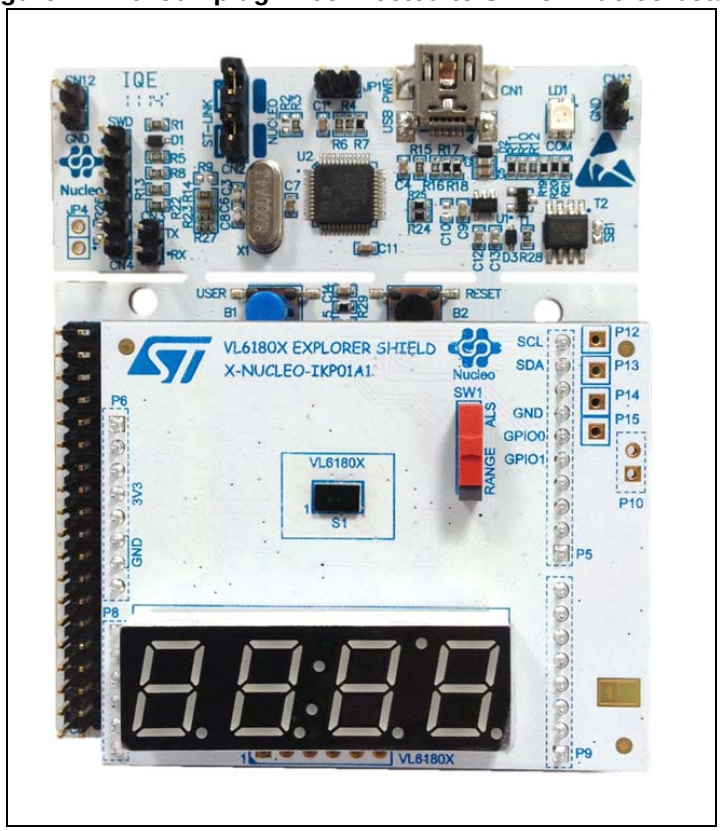
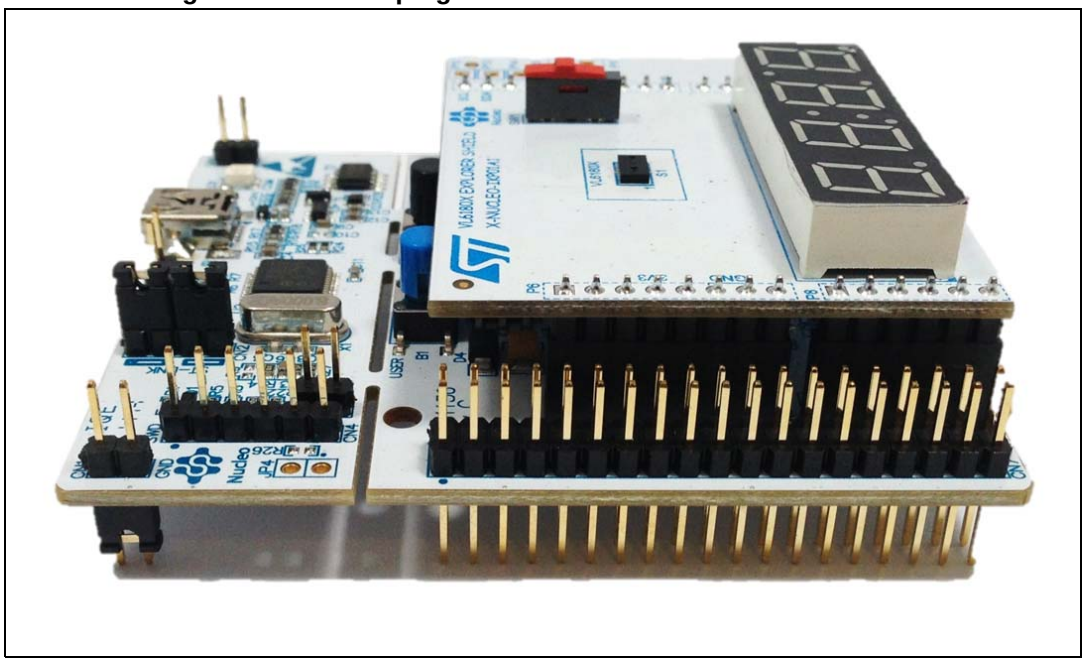


Figure 3. VL6180X plug-in connected to STM32 Nucleo board



The interconnection between STM32 Nucleo board and VL6180X plug-in is optimal with NUCLEO-F401RE.

The NUCLEO-F401RE is connected to the PC via a cable ended by a mini USB connector.

1.3 EVALKIT-VL6180X demonstration software installation

ST delivers a software suite allowing the user to discover, through a standalone demonstration and a PC graphical user interface (GUI), the VL6180X ranging and ambient light sensing (ALS) features.

1.3.1 Demonstration software suite

The demonstration software suite is available at the bottom of the page of the EVALKIT-VL6180X *http://www.st.com/web/en/catalog/tools/PF260896*. (see *Figure 4*).

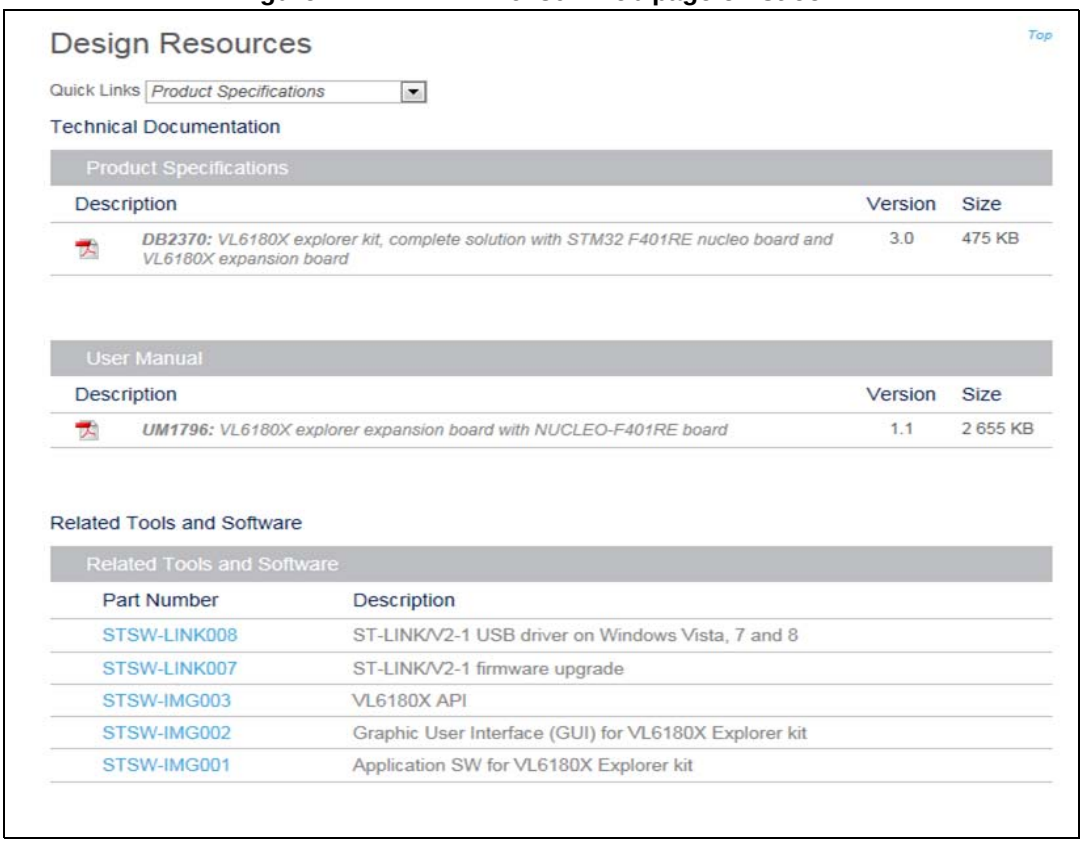
This software suite is consisting of:

- **STSW-LINK008**, Windows vista , 7 and 8 driver for STM32 F401RE Nucleo board. This driver must be first installed.
- **STSW-LINK007**, STM32 F401RE Nucleo board communication driver with PC. When STSW-LINK008 and STSW-LINK007 firmware's are installed the STM32 F401RE Nucleo board is configured and ready to use with a PC.
- **STSW-IMG-001**, binary code to be downloaded into STM32 F401RE microcontroller in order to enable the EVALKIT-VL6180X standalone demonstration, showing on the display the result of a range or an ALS measurement. This stand-alone demonstration will start each time the USB cable is plugged between the EVALKIT-VL6180X and the PC.
  In standalone demonstration mode, the USB cable is only used to supply the EVALKIT-VL6180X, no data are transferred on DP and DN.

- **STSW-IMG002**, this executable enables the graphical user interface (GUI) on the PC. The GUI shows, on the PC screen, the result of a range or an ALS measurement and allows the user to discover and test the different VL6180X settings.

Note: When the GUI is in use the display of the EVALKIT-VL6180X is disabled.

Figure 4. EVALKIT-VL6180X web page on st.com



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Product Specifications

Description	Version	Size
DB2370: *VL6180X explorer kit, complete solution with STM32 F401RE nucleo board and VL6180X expansion board*	3.0	475 KB

User Manual

Description	Version	Size
UM1796: *VL6180X explorer expansion board with NUCLEO-F401RE board*	1.1	2 655 KB

Related Tools and Software

Related Tools and Software

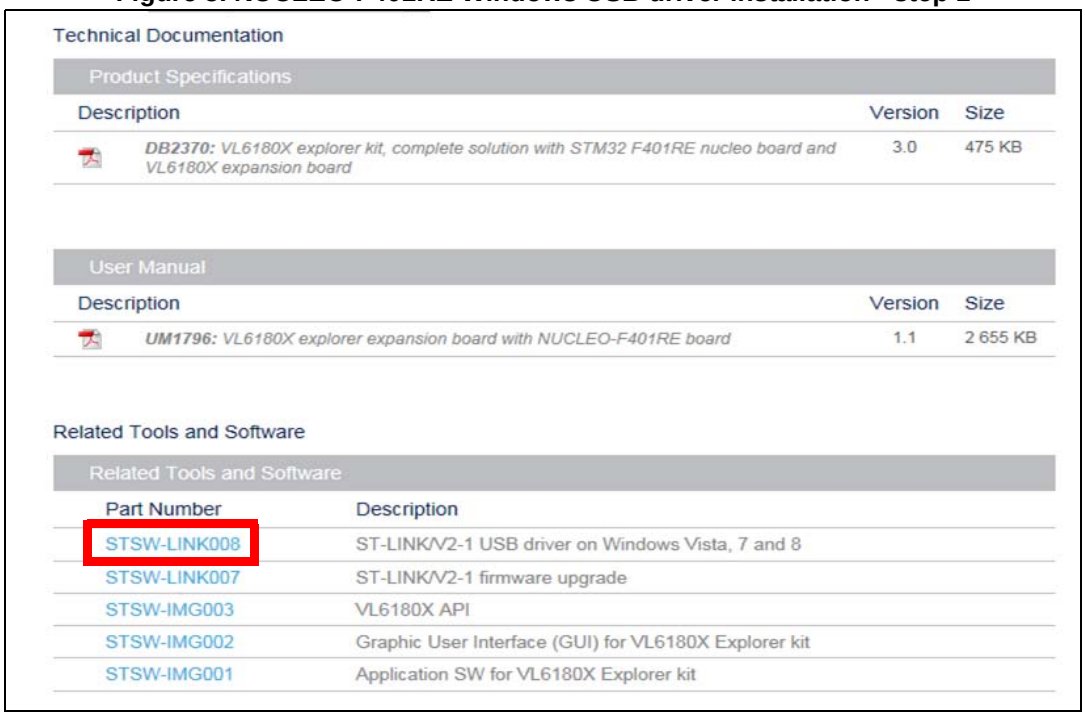
Part Number	Description
STSW-LINK008	ST-LINK/V2-1 USB driver on Windows Vista, 7 and 8
STSW-LINK007	ST-LINK/V2-1 firmware upgrade
STSW-IMG003	VL6180X API
STSW-IMG002	Graphic User Interface (GUI) for VL6180X Explorer kit
STSW-IMG001	Application SW for VL6180X Explorer kit

1.3.2 STM32 F401RE driver and upgrade firmware installation

STSW-LINK008: Windows USB driver installation

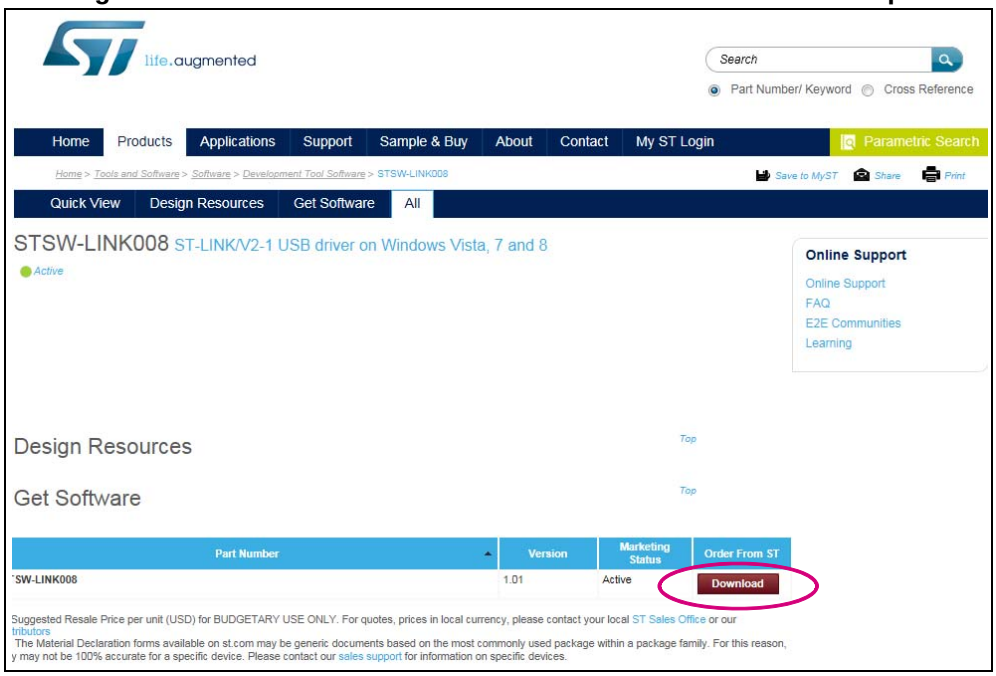
- In EVALKIT-VL6180X page select STSW-LINK008

Figure 5. NUCLEO-F401RE Windows USB driver installation - step 1



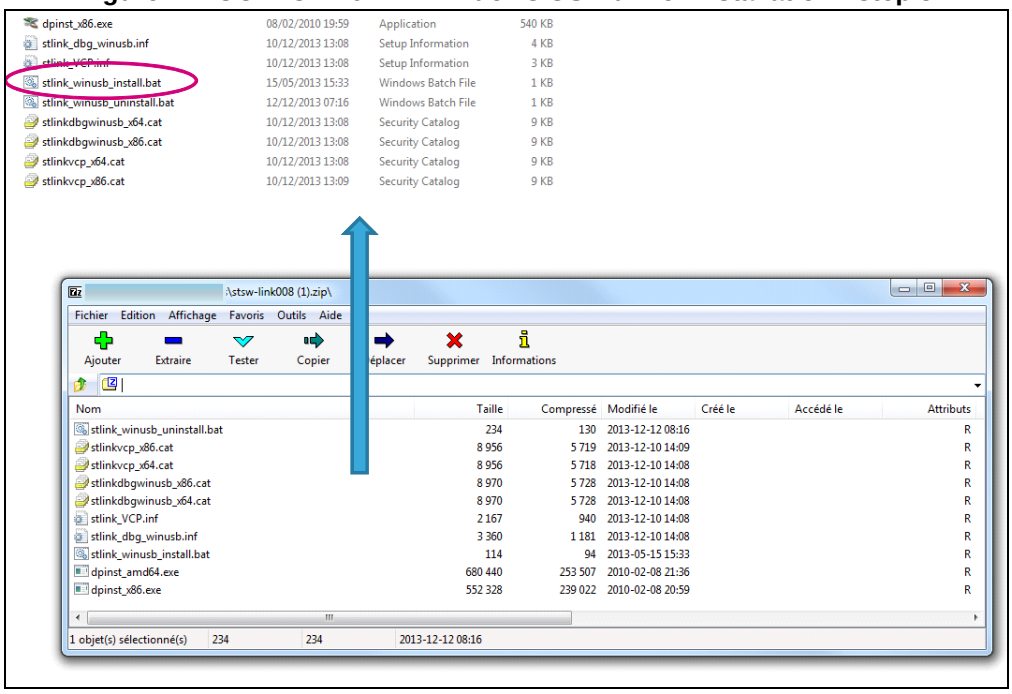
- Then Click on “Download”

Figure 6. NUCLEO-F401RE Windows USB driver installation - step 2



- Following windows: From stsw-link008.zip, by unpacking the .zip file and running stlink_winusb_install.bat. This will install the necessary USB drivers to allow communications between the Nucleo board and the PC.

Figure 7. NUCLEO-F401RE Windows USB driver installation - step 3

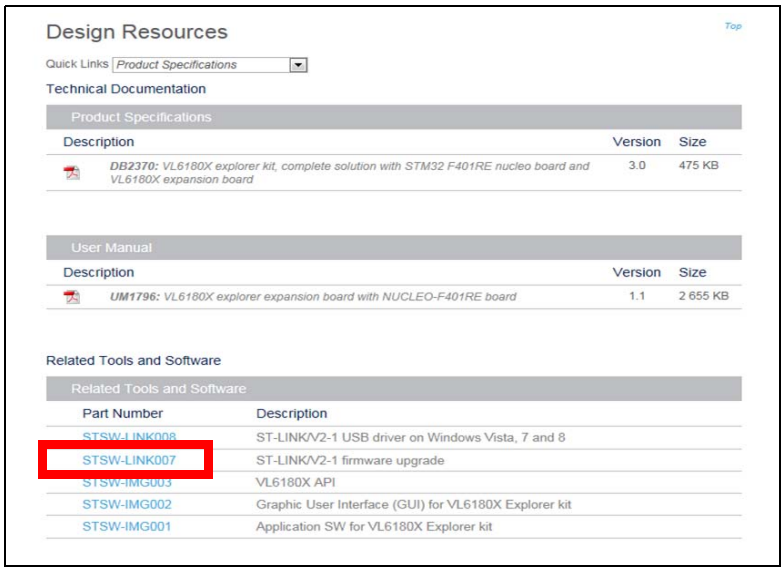


- Plug a USB cable between the PC and NUCLEO-F401RE board. Allow the board driver installations to complete before proceeding.

STSW-LINK007: NUCLEO-F401RE communication driver with the PC

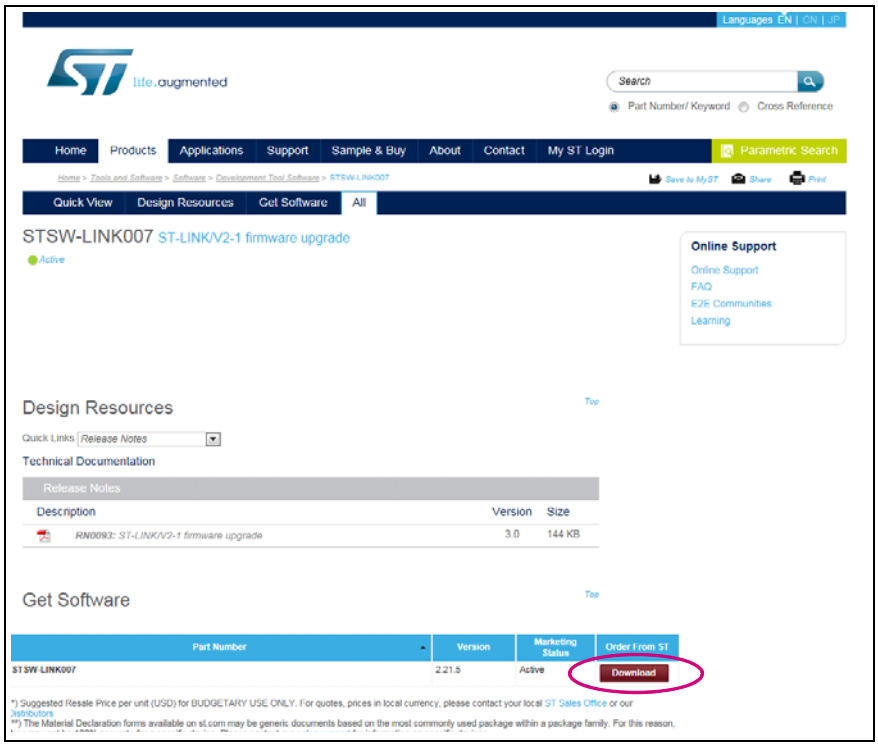
- In EVALKIT-VL6180X page select STSW-LINK007

Figure 8. Nucleo-F401RE communication driver with PC installation - step 1



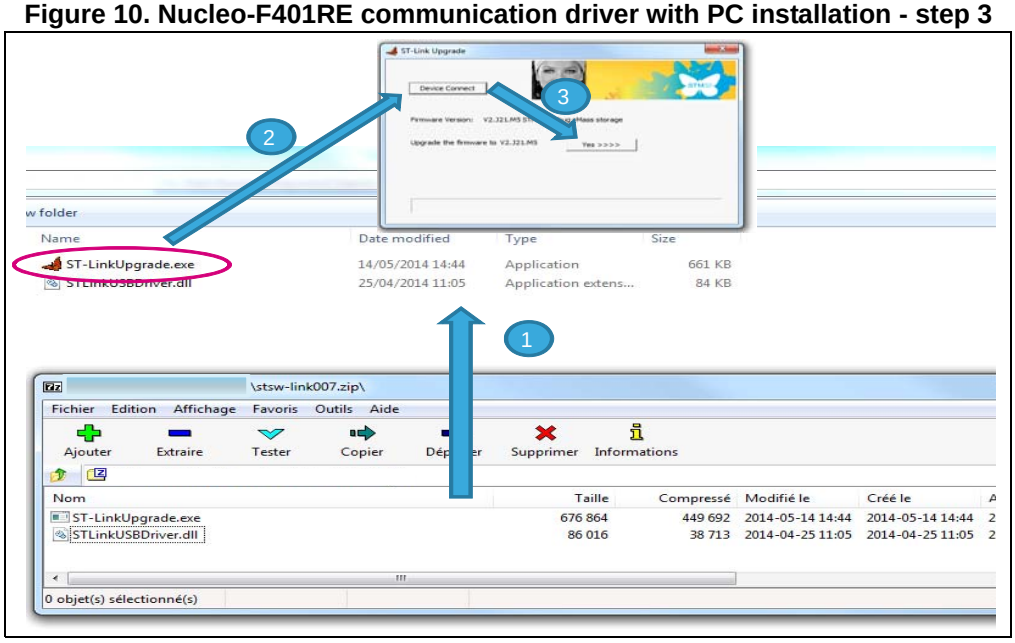
- Following windows: Click on “Download”

Figure 9. Nucleo-F401RE communication driver with PC installation - step 2



- Following windows: From stsw-link007.zip by unpacking .zip file and running ST-LinkUpgrade.exe. Press 'device connect' in the application. Then press 'YES' to upgrade the communication driver with the PC with the last version.

Figure 10. Nucleo-F401RE communication driver with PC installation - step 3



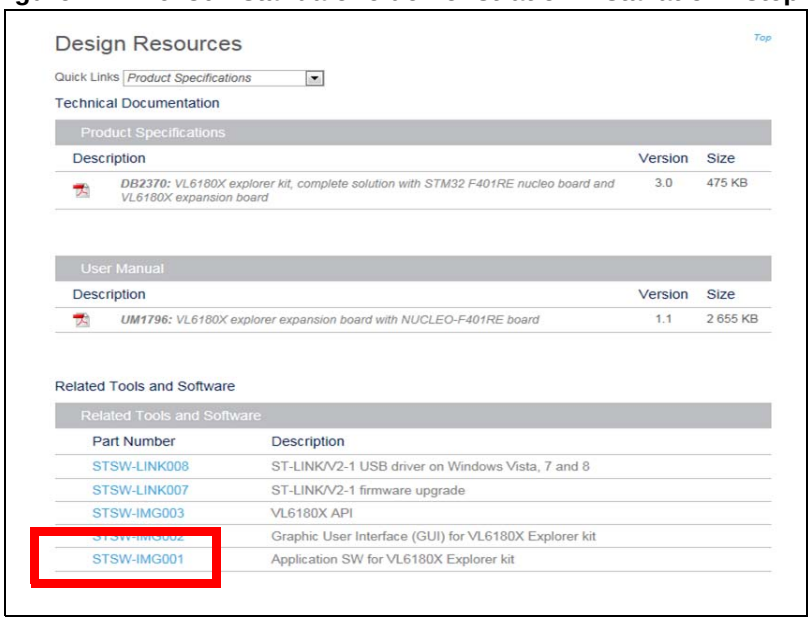
1.3.3 Installation of the VL6180X standalone demonstration

Note: If not already done, plug VL6180X plug-in on STM32 F401RE Nucleo board

To install VL6180X standalone demonstration

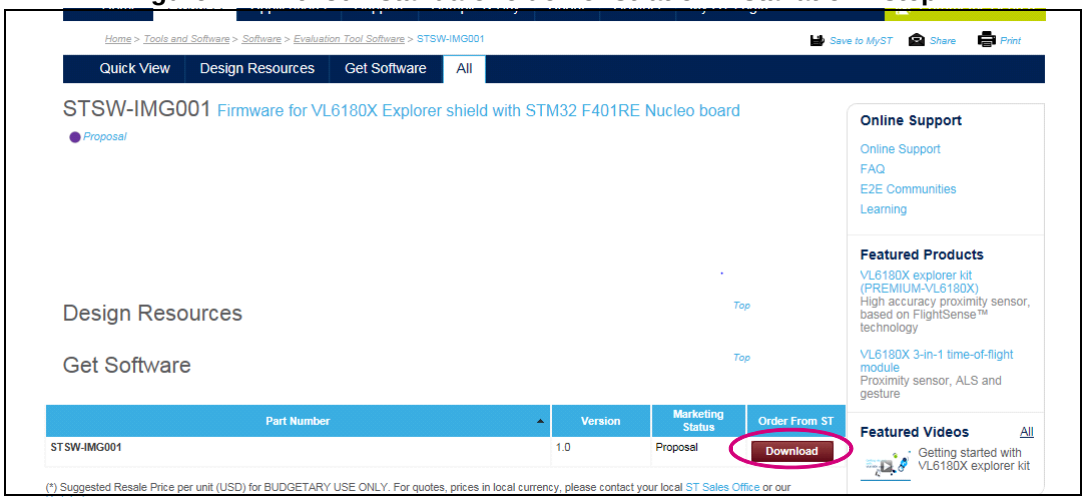
- In EVALKIT-VL6180X page select STSW-IMG001

Figure 11. VL6180X standalone demonstration installation - step 1



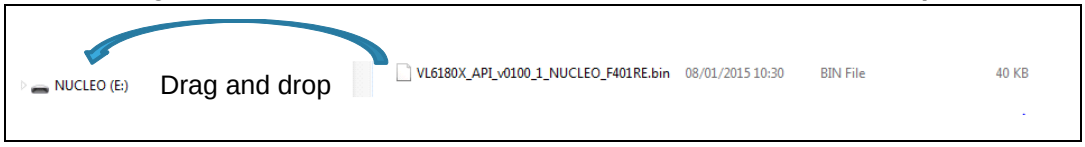
- Following windows click on “Download” then save it

Figure 12. VL6180X standalone demonstration installation - step 2



- then drag and drop the “.bin” file to Nucleo

Figure 13. VL6180X standalone demonstration installation - step 4

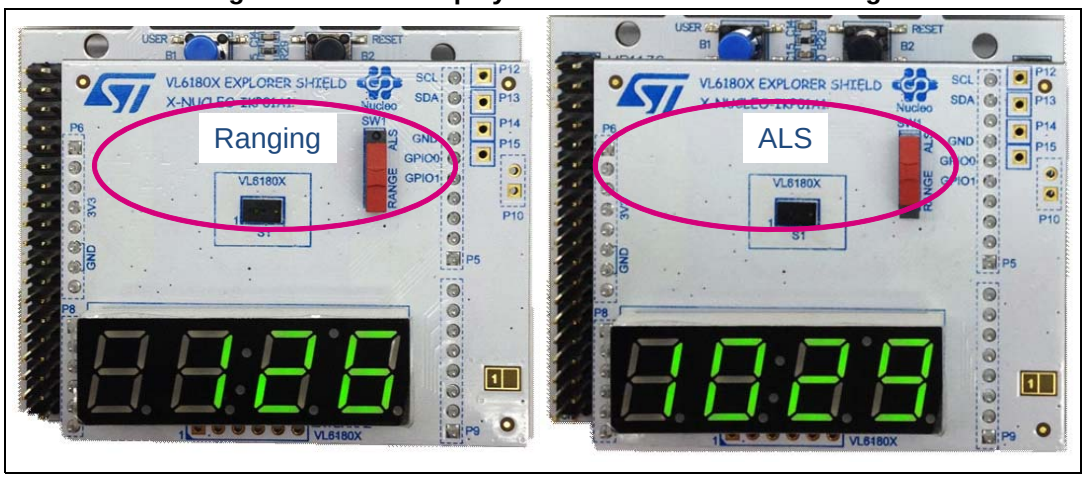


The explorer kit is now running in “standalone” mode, meaning no PC is required to control the explorer kit, USB connection is only used to power the explorer kit.

The switch SW1 can be changed on the fly.

- When running in Standalone mode, the SW1 switch on the VL6180X plug-in selects the value displayed on the 4-digit display, see *Figure 14*.
  - If switch is on “range”, the distance detected between VL6180X and the nearest object is displayed in mm.
  - If switch is on “ALS”, the ambient light level is displayed in Lux.

Figure 14. Value displayed versus SW1 switch setting



- Move your hand or any object in front of VL6180X and read the value displayed on the 4-digit display.

1.3.4 Installation of the VL6180X PC software graphical user interface (GUI)

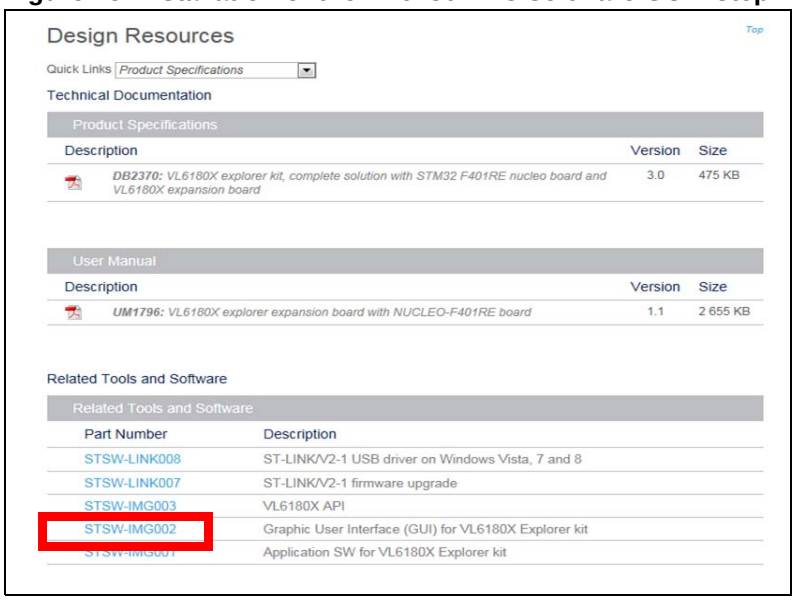
The GUI shows, on the PC screen, the result of a range or an ALS measurement and allows the user to discover and test the different VL6180X settings.

Caution: As soon as the PC software runs, the VL6180X plug-in display is Off and values are only visible on the PC screen.

To install the PC graphical user interface

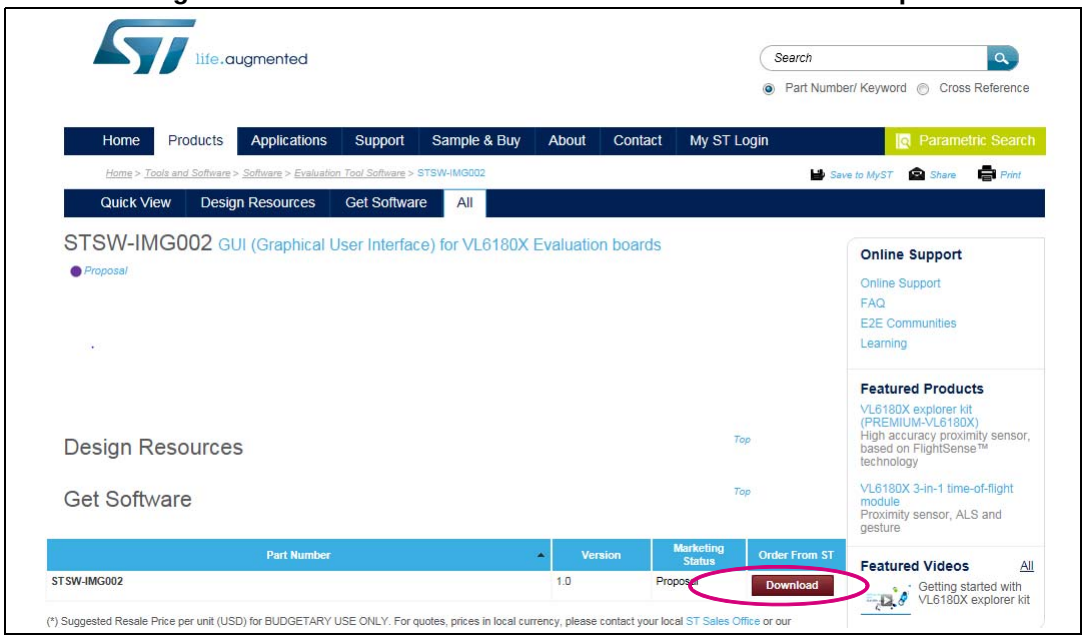
- In EVALKIT-VL6180X page select STSW-IMG002

Figure 15. Installation of the VL6180X PC software GUI - step 1



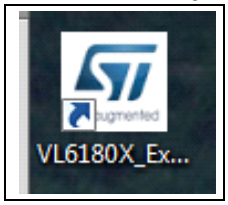
- Following windows click on “Download”

Figure 16. Installation of the VL6180X PC software GUI - step 2



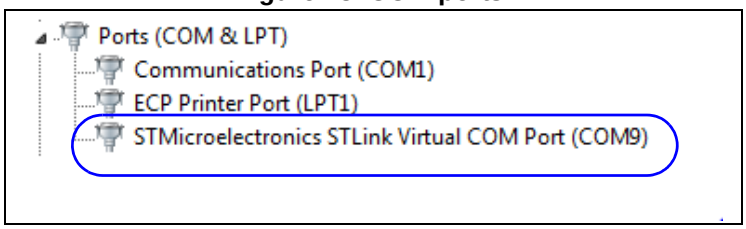
- Then “Save” and “Run” VL6180X_ExplorerSetup.exe, icon “VL6180X_Explorer” is installed on the user desktop space.

Figure 17. VL6180X_Explorer icon



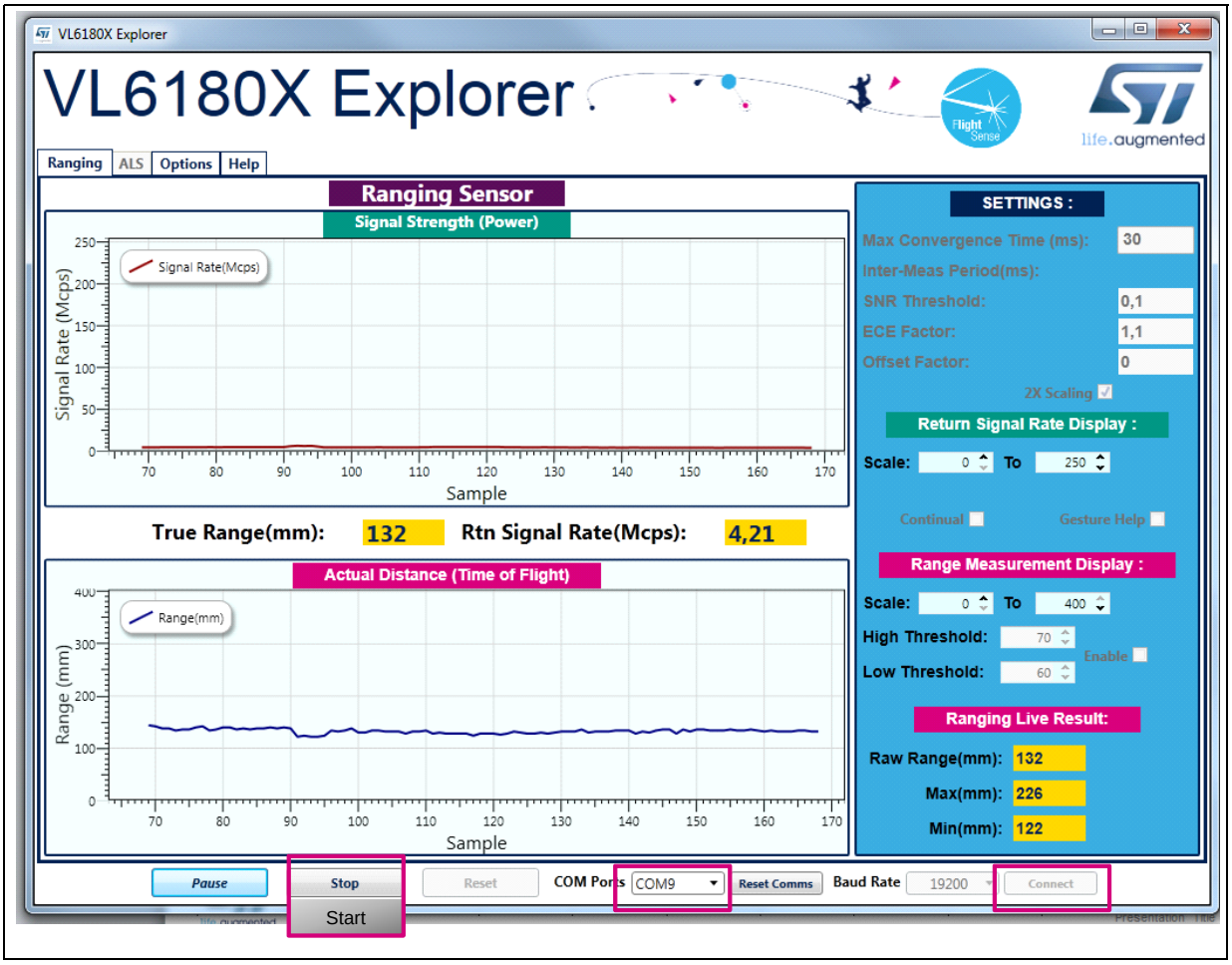
- The explorer software needs to know which COM Port the Nucleo is connected to the PC on. This can be found under Device Manager (Mouse right button on “Computer” icon, select “property” then click on “Device manager” and expand “Ports (COM & LPT) section”)

Figure 18. COM ports.



- Read the COM Port listed against “STMicroelectronics STLink Virtual COM Port” in the drop-down list of COM Ports.
- Start PC graphic user interface by clicking “VL6180X_Explorer” icon
- In the port list select the port com previously listed against “STMicroelectronics STLink Virtual COM Port” in the drop-down list of COM Ports
- Press the Connect button to establish communications between the software and the board.
- Press the Start/Stop button to start the device (Start then when running “stop”)

Figure 19. Starting the device



- Values are now displayed on the PC screen and no more on the VL6180X plug-in display.

2 VL6180X software GUI description

The VL6180X software GUI contains several tabs that can be used to display, calibrate and configure various features of the VL6180X. The available tabs are:

- **Ranging**, see *Section 2.1*
- **ALS**, see *Section 2.2*
- **Options**, see *Section 2.3*
- **Help**, see *Section 2.4*

2.1 Ranging

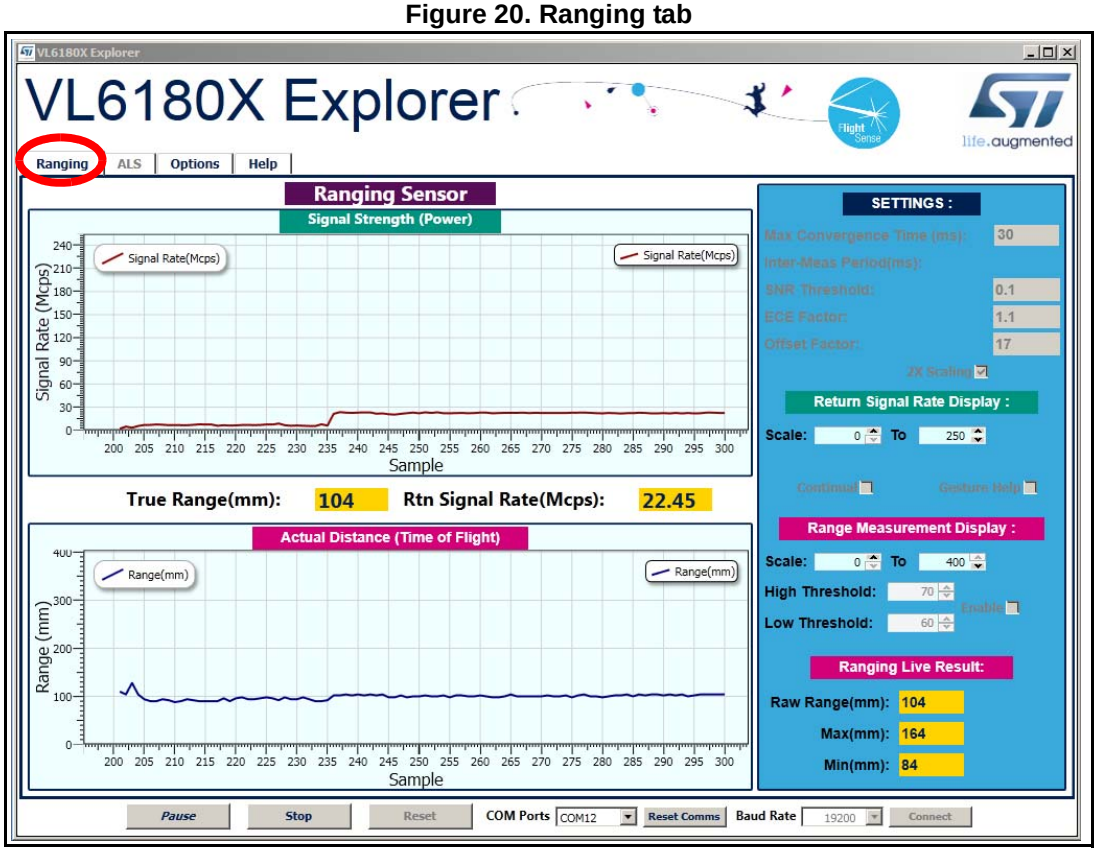
When the VL6180X explorer software is launched, the **Ranging** tab is displayed containing the ranging sensor interface as shown in *Figure 20*.

In ranging mode, the VL6180X explorer measures absolute range from the sensor to a target. This is shown in graphical form in the two graphs displayed:

- **Signal Strength (Power)**, see *Section 2.1.1*
- **Actual Distance (Time of Flight - TOF)**, see *Section 2.1.2*

To use the software, place a target above the VL6180X device and click on **Start**. The device begins ranging and the **Signal Strength (Power)** and **Actual Distance (ToF)** graphs will display data in real-time and numerically in the settings and display boxes to the right.

Figure 20. Ranging tab



The buttons listed in *Table 3* are available at the bottom of the **Ranging** tab.

Table 3. Buttons in the ranging tab

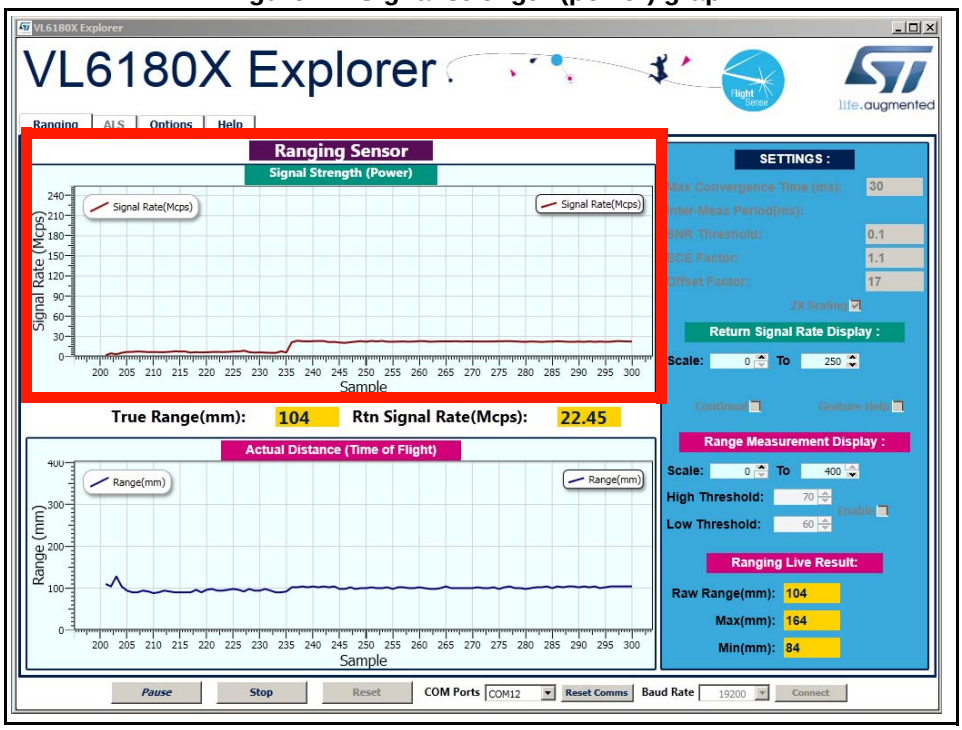
Button	Description
Start (**Pause/Resume**)	Click on **Start** to begin ranging. The **Start** button changes to **Pause/Resume** while the device is ranging.
Stop	Click on **Stop** to stop ranging.
Reset	The **Reset** button resets the I^2C communications interface between the application and the VL6180X.
COM Ports	The **COM Ports** box display a list of available connection ports to connect the VL6180X to the PC.
Reset Comms	Resets the COM Port connection to the VL6180X software.
Baud Rate	Port COM speed (bits per second). Default is 19200.
Connect	Connects the chosen COM Port to the VL6180X explorer software.

2.1.1 Signal strength (power) graph

The **Signal strength (power)** graph plots, in real time, the Signal Rate (Mega Counts per Second) returned from the target, as shown in *Figure 21*.

The Signal Rate can be viewed as a measure of the reflectance of the target, with high reflectance targets producing stronger signal rates.

Figure 21. Signal strength (power) graph



To the right of the **Signal strength (power)** graph the settings and display information described in *Table 4* is shown.

Table 4. Signal strength (power) information

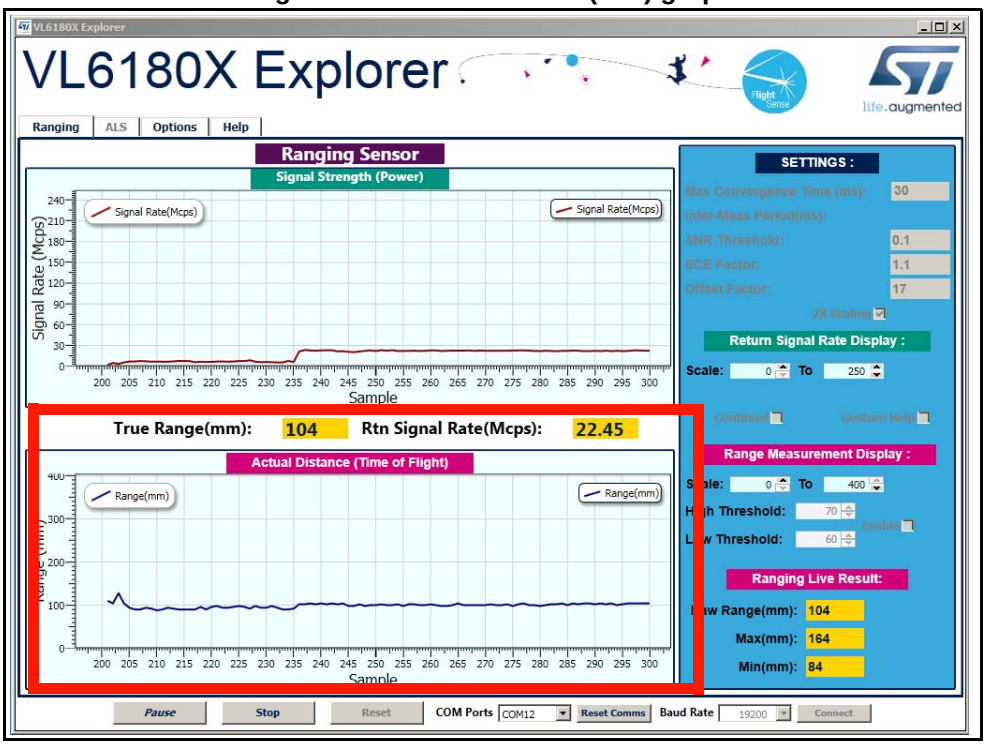
Field	Description
Max Convergence time (ms)	This is the maximum time allowed for a range measurement to be made. No range output is given if the system has not converged within the specified time (that is, no target or target out of range). Maximum convergence time default = 30ms.
Inter Meas period (ms)	Inter measurement period is the time delay between measurements in continuous range mode. Range = 10ms to 2.55 seconds (default = 50ms).
SNR threshold	The minimum SNR threshold below which a range measurement is rejected. The default value is 0.1.
ECE factor	The VL6180X has a built in Early Convergence Estimate feature. When enabled, the rate of convergence is automatically calculated 0.5ms after the start of each measurement. If the return count is below the ECE threshold the measurement is aborted. This minimizes power consumption and reduces red glow when there is no target. The ECE threshold is calculated as follows (example with ECE factor = 80%): ECE threshold = (80% x 0.5 x 15360) /SYSRANGE__MAX_CONVERGENCE_TIME (in ms)
Offset factor (mm)	This is fixed range offset parameter, which can be manually applied by the user to introduce a range adjustment.
2X Scaling	Default setting: maximum range measurement up to 400mm (if box not ticked, maximum range can be approximatively 200 or 400mm)(1)
Return Signal Rate Display	Manual adjustment of the Signal Rate vertical axis permissible range. Scale can be adjusted from 0...240 at the lower limit to 10...300 at the upper limit.
Continual	Changes ranging mode from single-shot to continuous mode.
Gesture Help	Provides some examples of gesture hand movements and signal comparison from a classical IR sensor with the VL6180X.

1. Under certain conditions, the VL6180X will detect targets above the specified 100mm. With the “2x Scaler” default setting, the maximum distance measurement can be up to 400 mm with a reported granularity of 2mm. For applications requiring a granularity of 1mm, scaling factor must be set to 1 and maximum distance measurement will be reported up to 200mm.

2.1.2 Actual distance (ToF) graph

The **Actual distance (ToF)** graph plots, in real time, range measurements (see *Figure 22*). The vertical axis can be changed using the **Range Measurement display** Scale. If a target is not detected, the maximum range is displayed.

Figure 22. Actual distance (ToF) graph



The VL6180X explorer can be run in single-shot ranging mode (default) or continuous ranging mode (by ticking the **Continual** check box to the right of the **Signal Strength (Power)** graph, see *Figure 21*). If in Continual ranging mode the time between measurements can be changed by adjusting the **Inter-Meas Period (ms)**.

The **Actual Distance (ToF)** graph can be changed to show threshold information, see *Section 2.1.3*.

To the right of and above the **Actual Distance (ToF)** graph, the information described in *Table 5* is displayed.

Table 5. Actual distance (ToF) information

Field	Description
Actual Distance (ToF) Display	Manual adjustment of the Range vertical axis permissable range. Scale can be adjusted from 0...110 at the lower limit to 10...255 at the upper limit.
Enable	Check the **Enable** box to allow thresholding to be enabled.
Low Threshold	Manual adjustment of the lower threshold limit (default is 60mm). When enabled, this threshold line is shown in the **Actual Distance (ToF)** graph. See *Actual distance (ToF) graph showing thresholds*.
High Threshold	Manual adjustment of the upper threshold limit (default is 70mm). When enabled, this threshold line is shown in the **Actual Distance (ToF)** graph. See *Actual distance (ToF) graph showing thresholds*.
Raw Range (mm)	This is the range measurement including the Offset Factor.
Max & Min (mm)	These are post-processed measurement statistics to make noise evaluation easier to characterize. The max and min are the range data measured by the sensor over 100 measured sample points.

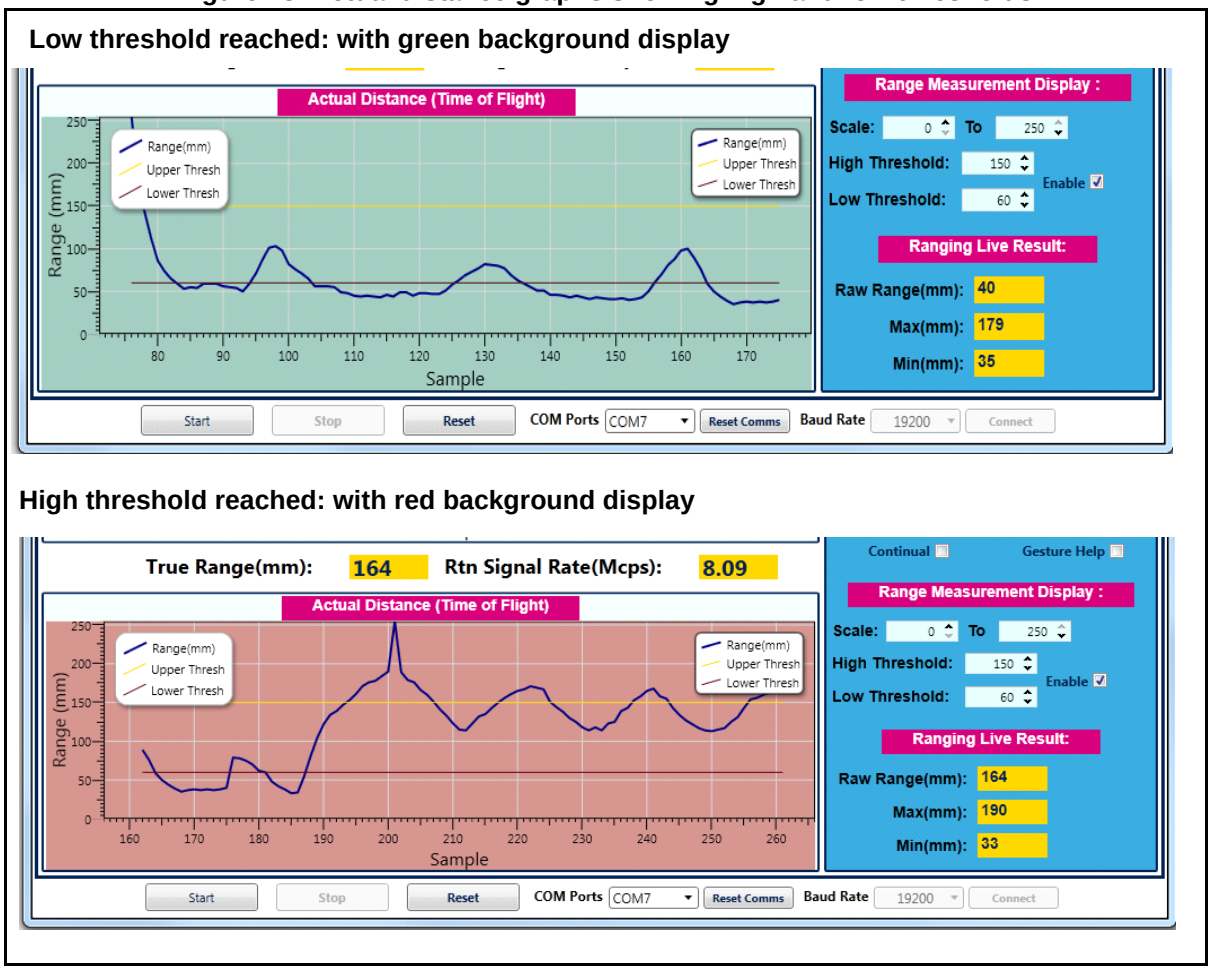
2.1.3 Actual distance (ToF) graph showing thresholds

The thresholding feature allows the user to define upper and lower limits and be alerted as the range measurements transition across these limits by the display changing color. *Figure 23* shows examples of the **Actual Distance (ToF)** graph with high and low thresholding enabled. It shows a minimum threshold of 60 mm, a maximum threshold of 150 mm and range measurements above and below the thresholds.

If the range measurement goes below the lower threshold the graph turns green as shown in the top graph. If it goes above the upper threshold the graph turns pink as shown in the lower graph. The graph will stay pink/green, till the lower/upper threshold is crossed.

Thresholding is enabled by checking the **Enable** check box (see *Table 5*) and the upper and lower threshold settings can be modified in the **High & Low Threshold** settings.

Figure 23. Actual distance graphs showing high and low thresholds



2.2 Ambient light sensor (ALS)

The ambient light sensor can be activated in the **ALS** tab. This tab displays the **ALS Count** graph showing ALS Lux/count versus Samples, as shown in *Figure 24*. *Table 6* lists the buttons available in the ALS tab.

Figure 24. ALS tab

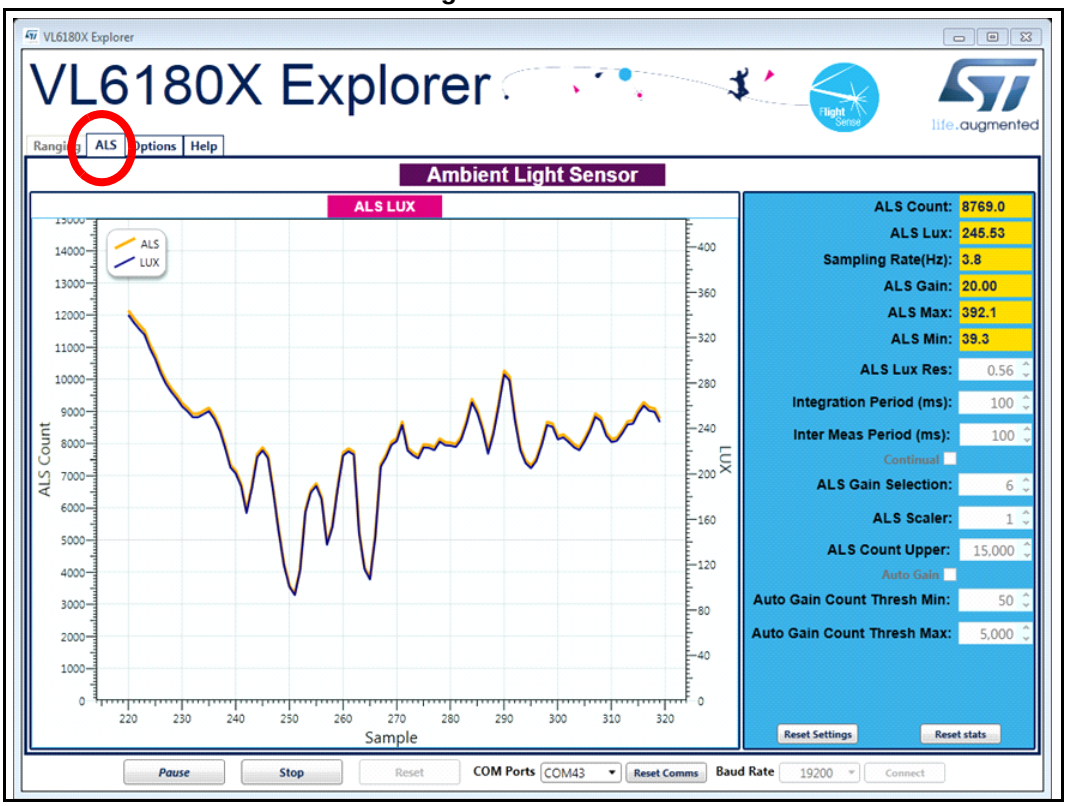


Table 6. Buttons in the ALS tab

Button	Description
Start (**Pause/Resume**)	Click on **Start** to begin measuring the ALS count. The **Start** button then changes to **Pause/Resume**.
Stop	Click on **Stop** to stop measuring the ALS count.
Reset	The **Reset** button resets the I^2C communications interface between the application and the VL6180X.
COM Ports	The **COM Ports** list shows available device ports.
Reset Comms	The **Reset Comms** button resets the comms between the device and the software.
Baud Rate	Port COM speed (bits per second). Default is 19200.

To the right of the **ALS** graph the information described in *Table 7* is displayed.

Table 7. ALS information

Field	Description
ALS Count	This is the raw output from the ambient light sensor. The count is proportional to the light level. The count output is a 16-bit binary value.
ALS Lux	The **ALS Count** value is converted automatically to a Lux value depending on the **ALS Lux Res**, **ALS Gain**, **Integration Period** and **ALS Scaler** settings.

Table 7. ALS information (continued)

Field	Description
Sampling Rate (Hz)	The number of ALS samples measured per second (PC dependent).
ALS Gain	Displays the actual gain value applied corresponding to the **ALS Gain Selection** setting.
ALS Max &Min	These are post-processed measurement statistics to make noise evaluation easier to characterize. The max, min and mean are the ALS data measured by the sensor over 100 sample points.
ALS Lux Res	This calibrates the ALS Lux/count conversion. The characterized **ALS Lux Res** is 0.32 (default).
Integration Period (ms)	The integration period is the time range, during a single ALS measurement, over which Lux data is captured and averaged. The default integration period is 100 ms.
Inter Meas Period (ms)	The inter-measurement period is the time between each ALS measurement in continuous ALS mode. The default inter-measurement period is 10 ms.
Continual	Changes ALS mode from single-shot to continuous mode.
ALS Gain Selection	This is the device register setting 0 to 7. The corresponding gain value is displayed in the **ALS Gain** box. Gain settings are as follows: 0: ALS Gain = 1 1: ALS Gain = 1.25 2: ALS Gain = 1.67 3: ALS Gain = 2.5 4: ALS Gain = 5 5: ALS Gain = 10 6: ALS Gain = 20 7: ALS Gain = 40
ALS Scaler	The count output is a 16-bit value. Internally, the device uses a 20-bit counter. Gain and integration time are normally used to increase sensitivity. However, if this is not sufficient and more resolution is required in low light, the ALS scaler can be used to access the 4 LSBs of the internal counter. Apply a value in the range 2 to 15 to apply additional gain.
ALS Count Upper	This is the maximum scale value for the vertical axis. The default value is 15000. The user can input a new value to scale the **ALS Count** graph up or down as required for measurements, up to a maximum value of 65,000.
Auto Gain	Enables and disables the auto-gain feature. Auto-gain automatically adjusts the gain selection in response to the current ALS Count value in order to provide and effective dynamic range for the current lighting conditions.
Auto Gain Count Thresh Min	The manual Auto Gain ALS count threshold minimum value in Auto Gain mode.
Auto Gain Count Thresh Max	The manual Auto Gain ALS count threshold maximum value in Auto Gain mode.

2.3 Options

The **Options** tab is used to enable I2C logging or data logging during ranging and ALS modes.

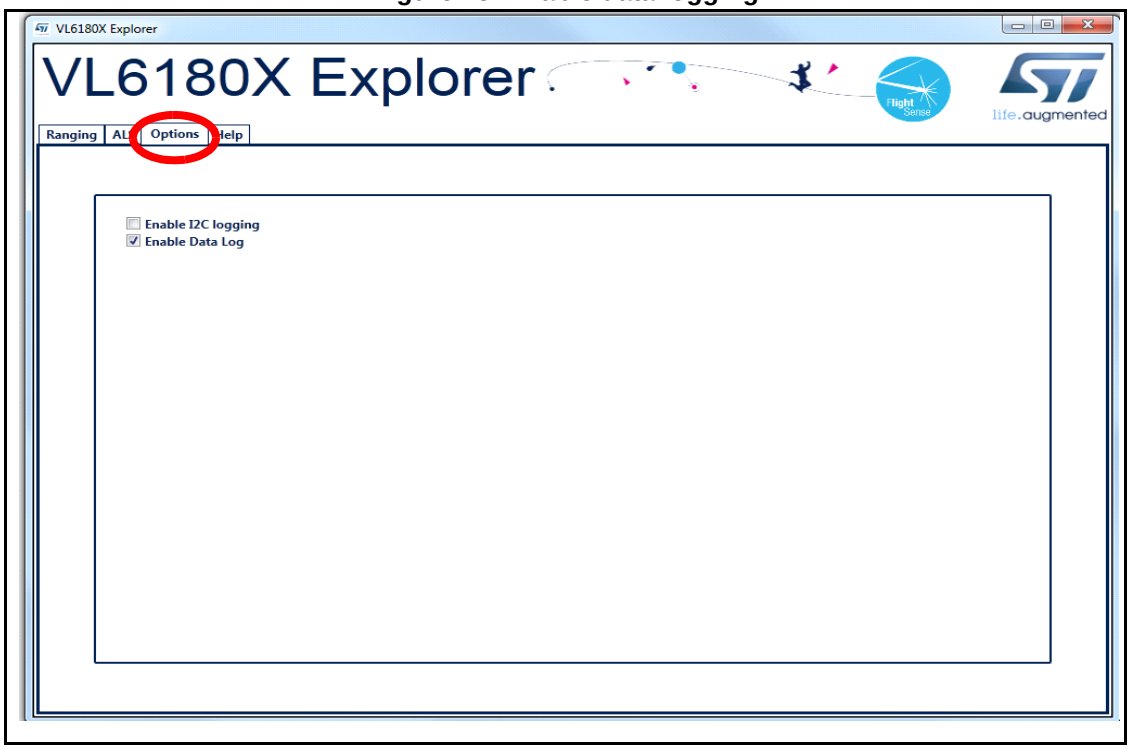
2.3.1 Recording Data Logs

For every measurement, relevant system data is stored in a comma separated value file (.csv) identified by date and time.

To enable data logging, in the **Options** tab, check the **Enable Data Log** box, see *Figure 25*.

Data logging should be selected either prior to starting measurements or during the paused state.

Figure 25. Enable data logging



Data log files are created with unique filenames and stored in:
C...\Users\username\AppData\Local\STMicroElectronics\VL6180XEVK\DataLog\.
See *2.5: Data log file* for an example.

Before you can switch off data logging, the device must first stop ranging or ALS measurements. To do this, click on the **Stop** button in the **Ranging** tab, see *Section 2.1: Ranging*.

2.3.2 Recording I^{2}C transactions

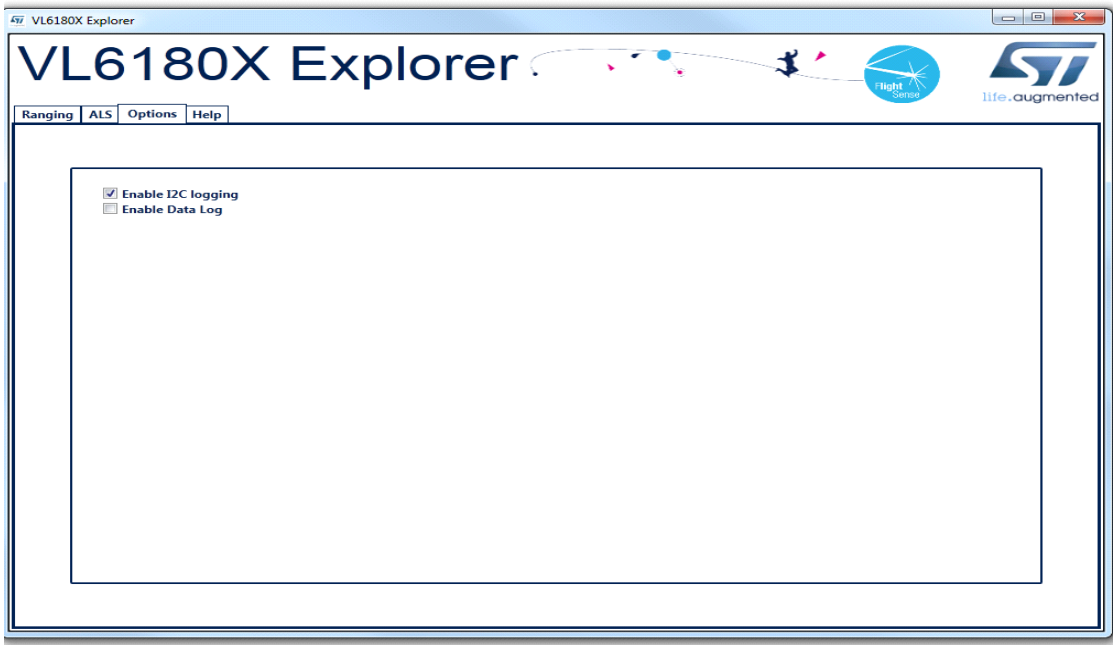
The **Enable I2C Logging** option is used to record I^{2}C transactions during ranging or ALS mode. The I^{2}C transactions are stored in a unique file (`.txt`) identified by date and time.

To enable I^{2}C logging, in the **Options** tab, check the **Enable I2C Logging** box, see *Figure 25*.

I^{2}C log files are stored in:
C...\Users\username\AppData\Local\STMicroElectronics\VL6180XEVK\I2C\.
See *2.6: I^{2}C log file* for an example.

Before you can switch off I^{2}C logging, the device must first stop ranging or ALS measurements. To do this, click on the **Stop** button in the **Ranging** tab, see *Section 2.1*.

Figure 26. Enable I2C logging



2.4 Help

The **Help** tab provides links to documents and on line resources which provide details on the setup and functionalities of the VL6180X explorer and also details on the software version:

- HELP: To access help index
- HW User Manual: To access hardware user manual
- SW User Manual: To access software user manual
- *www.ST.com/VL6180X*: To access ST VL6180X product and support page
- About GUI Version: Provides the GUI version installed

2.5 Data log file

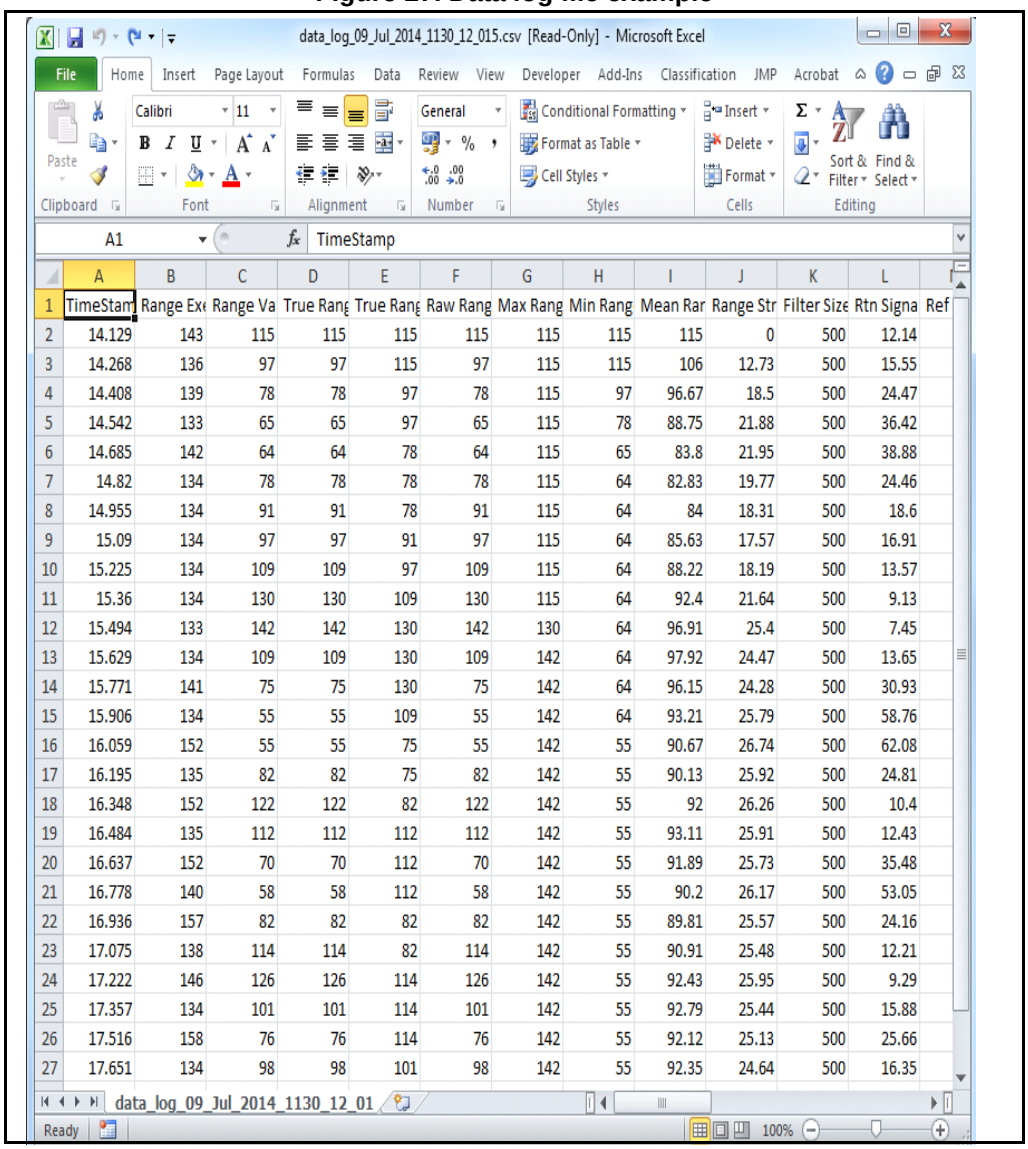
Each data log is stored in a uniquely named .csv file. The data log filename configuration is data_log_*DD_MMM_YYYY_HHMM_SS_sss*.csv.

Where:

- *DD_MMM_YYYY* is the date the log file was created, for example 17_Apr_2014
- *HHMM* is the time (hours, minutes) the log file was created, for example 1025
- *SS_sss* is the time (seconds, milliseconds) the log file was created, for example 17_367.

An example of a ranging data log is shown in *Figure 27*

Figure 27. Data log file example



	A	B	C	D	E	F	G	H	I	J	K	L
1	TimeStam	Range Exe	Range Va	True Rang	True Rang	Raw Rang	Max Rang	Min Rang	Mean Rar	Range Str	Filter Size	Rtn Signa
2	14.129	143	115	115	115	115	115	115	115	0	500	12.14
3	14.268	136	97	97	115	97	115	115	106	12.73	500	15.55
4	14.408	139	78	78	97	78	115	97	96.67	18.5	500	24.47
5	14.542	133	65	65	97	65	115	78	88.75	21.88	500	36.42
6	14.685	142	64	64	78	64	115	65	83.8	21.95	500	38.88
7	14.82	134	78	78	78	78	115	64	82.83	19.77	500	24.46
8	14.955	134	91	91	78	91	115	64	84	18.31	500	18.6
9	15.09	134	97	97	91	97	115	64	85.63	17.57	500	16.91
10	15.225	134	109	109	97	109	115	64	88.22	18.19	500	13.57
11	15.36	134	130	130	109	130	115	64	92.4	21.64	500	9.13
12	15.494	133	142	142	130	142	130	64	96.91	25.4	500	7.45
13	15.629	134	109	109	130	109	142	64	97.92	24.47	500	13.65
14	15.771	141	75	75	130	75	142	64	96.15	24.28	500	30.93
15	15.906	134	55	55	109	55	142	64	93.21	25.79	500	58.76
16	16.059	152	55	55	75	55	142	55	90.67	26.74	500	62.08
17	16.195	135	82	82	75	82	142	55	90.13	25.92	500	24.81
18	16.348	152	122	122	82	122	142	55	92	26.26	500	10.4
19	16.484	135	112	112	112	112	142	55	93.11	25.91	500	12.43
20	16.637	152	70	70	112	70	142	55	91.89	25.73	500	35.48
21	16.778	140	58	58	112	58	142	55	90.2	26.17	500	53.05
22	16.936	157	82	82	82	82	142	55	89.81	25.57	500	24.16
23	17.075	138	114	114	82	114	142	55	90.91	25.48	500	12.21
24	17.222	146	126	126	114	126	142	55	92.43	25.95	500	9.29
25	17.357	134	101	101	114	101	142	55	92.79	25.44	500	15.88
26	17.516	158	76	76	114	76	142	55	92.12	25.13	500	25.66
27	17.651	134	98	98	101	98	142	55	92.35	24.64	500	16.35

Range output column data definitions

A: TimeStamp: The time stamp is generated by the EVK software so the data can easily be plotted on a graph, and it represents the time of start of the test. There is latency, due to the USB interface, to send and receive data to the sensor.

B: Range Execution Time (ms): The range execution time is measured by the software for the amount of time that the test was executed to the time the data was received over the USB interface to display the data.

C: Range Val: The range value read directly from RESULT__RANGE_VAL (0x0062) in the VL6180X part on the EVK. This value includes the crosstalk compensation.

D: True Range: The range value read directly from the VL6180X part on the EVK. There is no difference between this value and the Range Value.

E: True Range Smoothed: The Raw Range value read from RESULT__RANGE_RAW (0x0064) on the VL6180X that would show a range measured without any stray light compensation.

F to I: Max, Min, Mean, Standard Deviation: Statistical data on the range data in mm gathered since the EVK software was started or the statistics were reset. Stopping and starting the capture will create a new file, but not reset the statistics.

J: Rtn Signal Rate: The actual count rate of signal returns of light measured by the return sensor when the laser is active on the return array. This is calculated by the formula:

$$\frac{\text{RESULT__RANGE_RETURN_SIGNAL_COUNT (0x006C)}}{\text{RESULT__RANGE_RETURN_CONV_TIME (0x007C)}}$$

This data is read directly from the VL6180X. Note: There are two photon triggering arrays. The first reference array is the reference array to measure the time photons have left the laser and the second return array is the array used to measure the time that the photons traveled to the target and back to the sensor.

K: Ref Signal Rate: The actual count rate of signal returns of light measured by the reference sensor when the laser is active. This is calculated by the formula:

$$\frac{\text{RESULT__RANGE_REFERENCE_SIGNAL_COUNT (0x0070)}}{\text{RESULT__RANGE_REFERENCE_CONV_TIME (0x0080)}}$$

L: Rtn Signal Count: This is the amount of sensor counts triggered by the return array on the VL6180X when the laser is active. This data is read directly from the VL6180X.

2.6 I²C log file

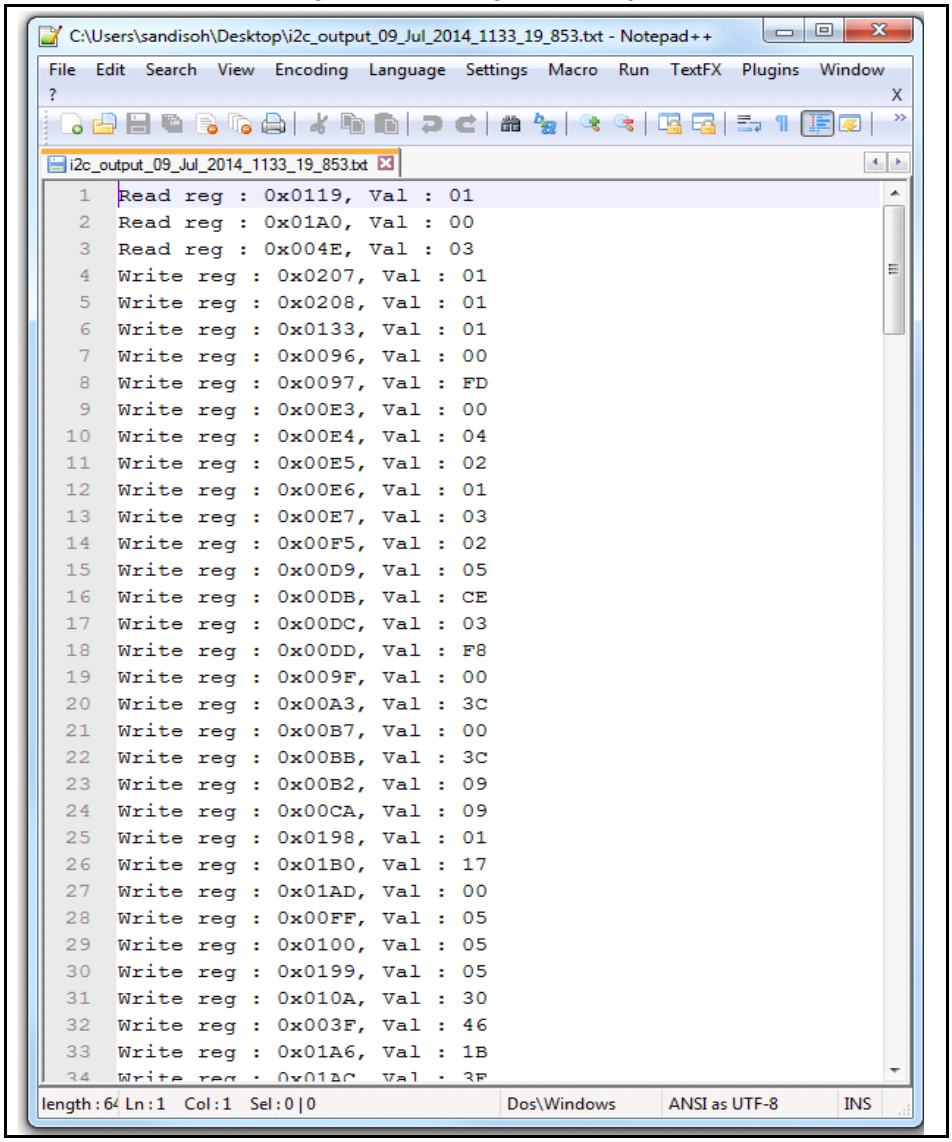
Each I²C log is stored in a uniquely named .txt file. The I²C log filename configuration is i2c_output_*DD_MMM_YYYY*_HHMM_SS_sss.txt.

Where:

- *DD_MMM_YYYY* is the date the log file was created, for example 07_May_2013
- *HHMM* is the time the log file was created, for example 1553
- *SS_sss* is the time (seconds, milliseconds) the log file was created, for example 17_367.

An example of a I²C log is shown in *Figure 28*.

Figure 28. I²C log file example



2.7 Range offset calibration procedure

Note: If a measurement with an accuracy below 10 mm is required, offset calibration must be done.

An offset calibration is performed for each VL6180X module during the final test of the manufacturing process, and stored into the NVM. So, the ranging measurement reported by the product should be very close to the actual distance between a target and the VL6180X module. Despite this offset calibration, you may notice eventually a significant offset due to the soldering of the VL6180X module on the plug-in. In this case, the VL6180X evaluation kit provides you with the possibility to make a manual offset calibration

The calibration procedure described below is efficient but will not deliver the highest precision.
For precise offset calibration refer to: AN4545 VL6180X basic ranging application note - section 4.1.1

- Put the jacket delivered with the VL6180X explorer board, or a grey paper, horizontally on the 4 digit display and above the VL6180X: this corresponds to the distance of 8 mm between the target and the VL6180X.
- To have a precise measurement, set the max value of the “range measurement display” to 30. (see *Figure 29*)
- Check the value of “Raw Range”, if the “Raw range” does not equal to 8 then the “offset factor” value must be modified.
- in the following example, before manual offset calibration, the “Raw range” reports a value of 22 mm (see *Figure 29)*, while the actual distance of the target is 8mm. The “offset factor” must be adjusted from 30 to 15, reducing the raw range from 22mm before offset calibration back to the true value of 8mm after offset calibration (see *Figure 30*).

Note: Each time you modify the “offset factor” you have to do a “stop” “start” bottom sequence.

Each time the EVALKIT-VL6180X is switched-off, the “offset factor” value is cleared back to the factory calibration, so, if previously manually modified, the “offset factor” must be reloaded at the next switch-on of the EVALKIT-VL6180X.

Figure 29. Before offset calibration procedure

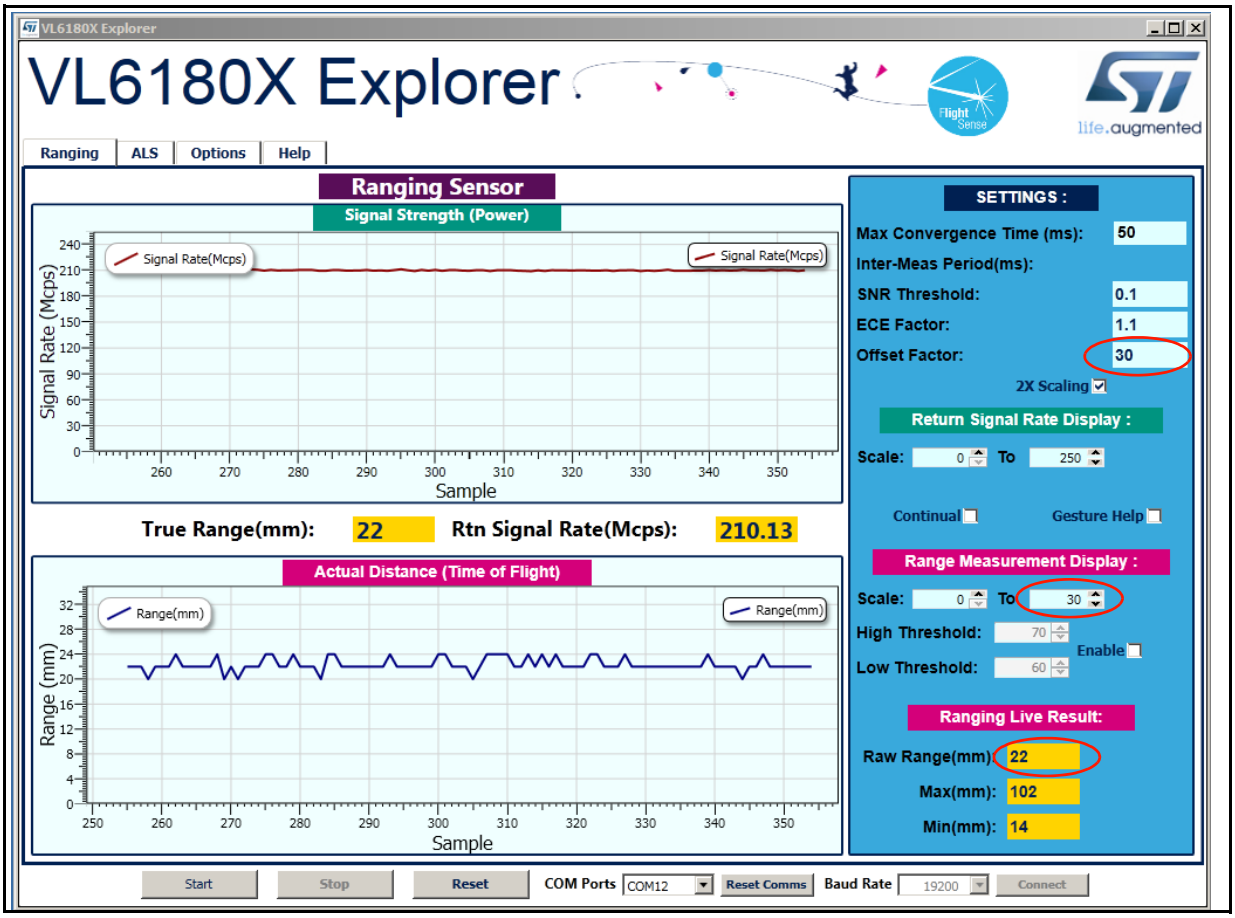
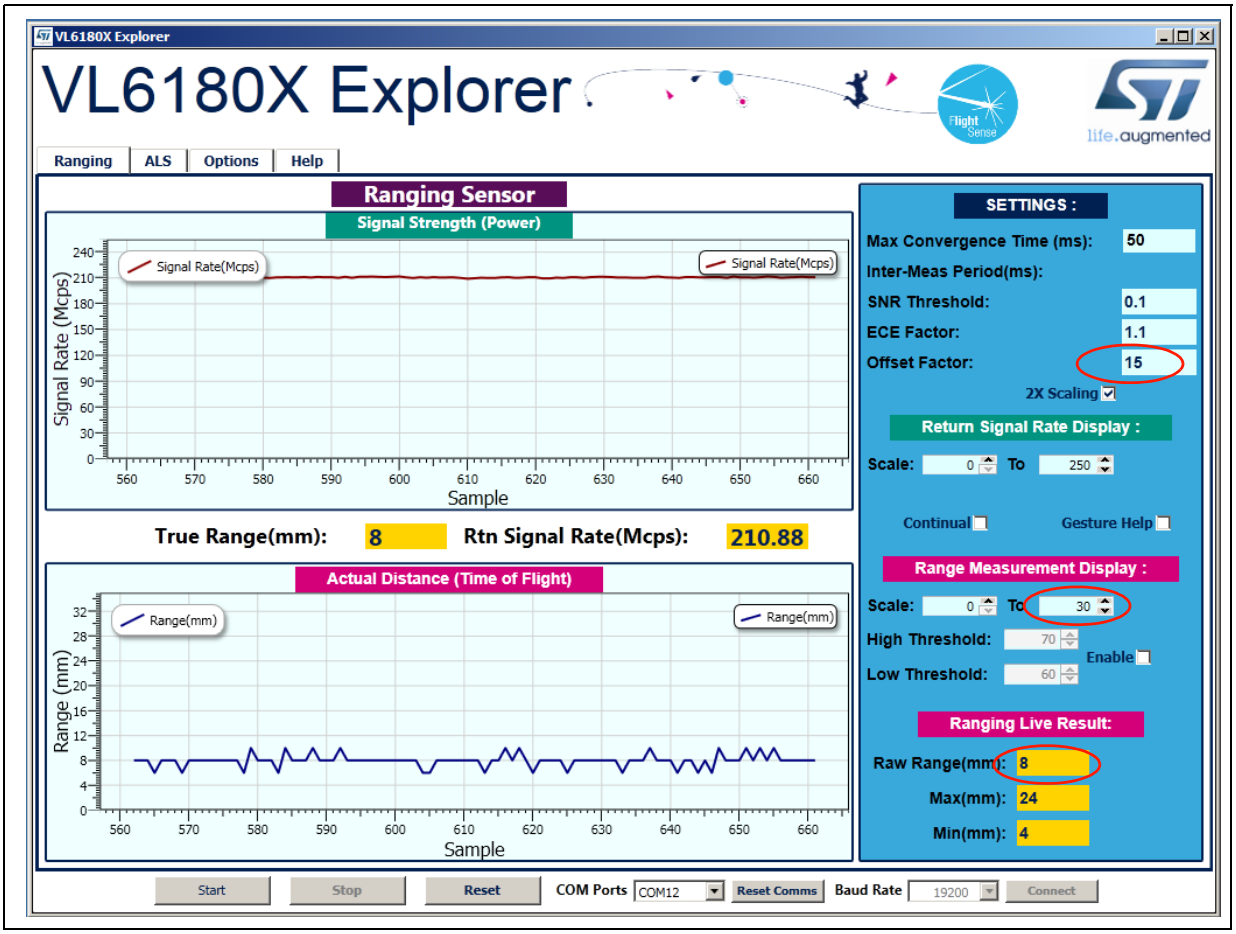


Figure 30. After Offset calibration procedure



3 VL6180X application programming interface (API)

Previous chapters described how to use EVALKIT-VL6180X in demonstration mode, this chapter gives information to use EVALKIT-VL6180X as a development tool.

STSW-IMG003 contains VL6180X API

API features

- VL6180X application programming interface (API) source code (C language)
- Full ranging and ALS features control
- API structured in a way it can be easily ported/compiled on any microcontroller platforms
- Several examples showing how to use API to perform ranging and ALS measurements
- Complete Nucleo STM32 F401 project (source code + binary) working with VL6180X explorer expansion board (under Keil IDE)
- API documentation (.csh and .html)

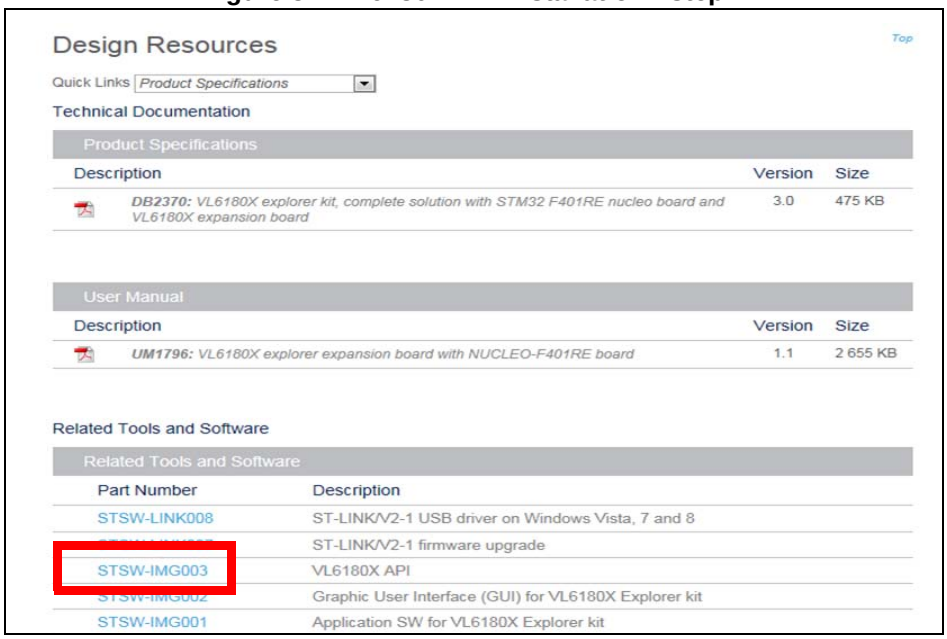
Description

The VL6180X API is a set of C functions controlling the VL6180X (init, ranging, ALS,…) to enable the development of end-user applications. This API is structured in a way it can be compiled on any kind of platforms through a well isolated platform layer (mainly for low level I2C access). Several code examples are provided to show how to use API and perform ranging and ALS measures. A complete Nucleo F401 + VL6180X expansion board project is also provided (Keil IDE required to compile the project) as well as the pre-compiled binary that can be directly used.

STSW-IMG003 installation

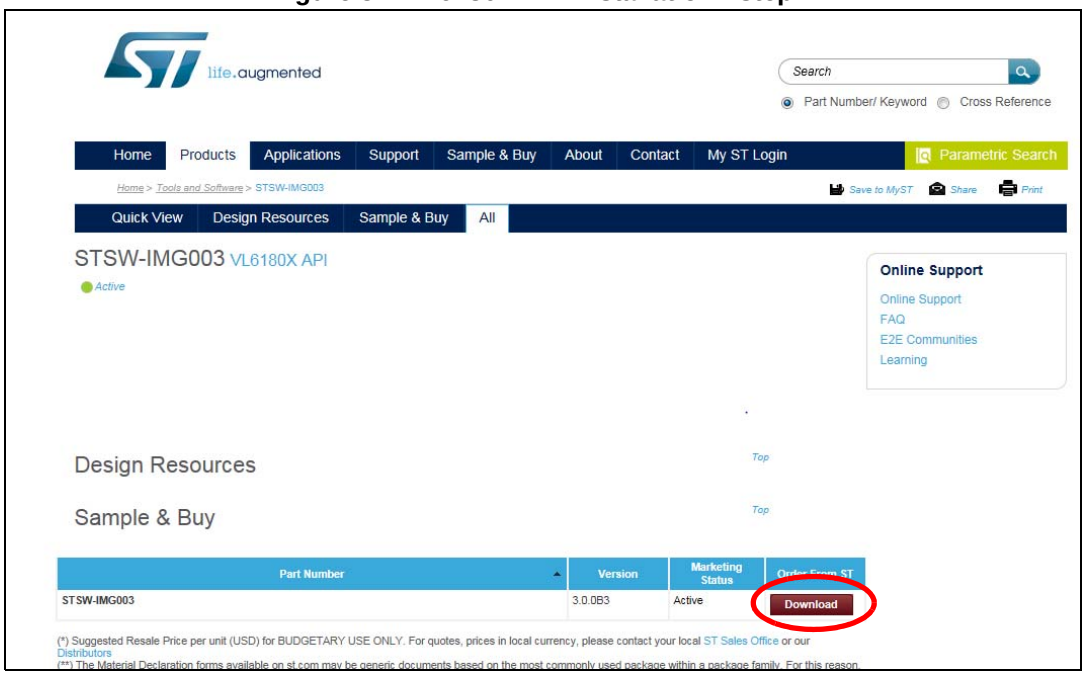
- In EVALKIT-VL6180X page select STSW-IMG003

Figure 31. VL6180X API installation - step 1



- Following windows click on “Download”

Figure 32. VL6180X API installation - step 2



- Save and unzip STSW-IMG003.zip
- User has now all information to develop its own application with VL6180X
- The best way to discover VL6180X API features is to open API_Documentation-proximity.chm file in the DOCS folder.

4 Revision history

Table 8. Document revision history

Date	Revision	Changes
12-Aug-2014	1	Initial release.
03-Feb-2015	2	Remove VL6180X plug-in hardware information Update *Section 1.3.1: Demonstration software suite*

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