Designing the VEML6031X00 Into an Application

By Reinhard Schaar

HIGH ACCURACY AMBIENT LIGHT SENSOR: VEML6031X00

The VEML6031X00 is a high accuracy digital ambient light sensor with 16-bit resolution in a miniature opaque 2.67 mm x 2.45 mm package. It includes a high sensitivity photodiode, low noise amplifier, and 16-bit A/D converter, and supports an easy to use I²C bus communication interface and additional interrupt feature.

The ambient light read-out is available as a digital value, and the built-in photodiode response is near that of the human eye. The 16-bit dynamic range offers ambient light detection up to about 228 klx, with a resolution down to 0.0034 lx/counts.

Beside100 Hz and 120 Hz flicker noise rejection and a low temperature coefficient, the device consumes just 0.5 μA in shutdown mode. The sensor is AEC-Q100 qualified and has a operating range from -40 °C to +110 °C.

The high senstivity of 0.0034 lx/counts allows the sensor to be placed behind very dark cover glasses that will dramatically reduce the total light reaching it. The sensor will also work behind clear cover glass, because even high illumination - such as daylight and all indoor lights - will not saturate the device and read-outs up to 228 klx are possible.

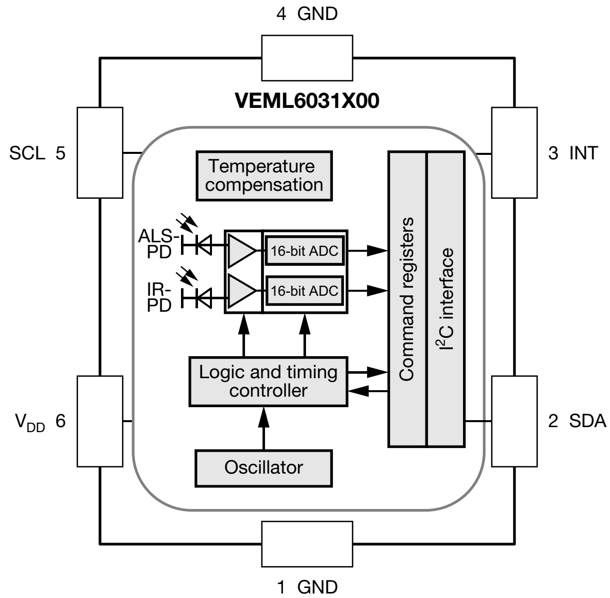

Fig. 1 - VEML6031X00 Block Diagram

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APPLICATION CIRCUITRY FOR THE VEML6031X00

The power supply for the sensor has a defined range from 2.5 V to 3.6 V. The SCL and SDA, as well as the interrupt line, need pull-up resistors. The resistor values depend on the application and on the I²C bus speed. Common values are about 2.2 kΩ to 4.7 kΩ for the SDA and SCL, and about 8.2 kΩ to 22 kΩ for the interrupt line. The interrupt pin is an open drain output.

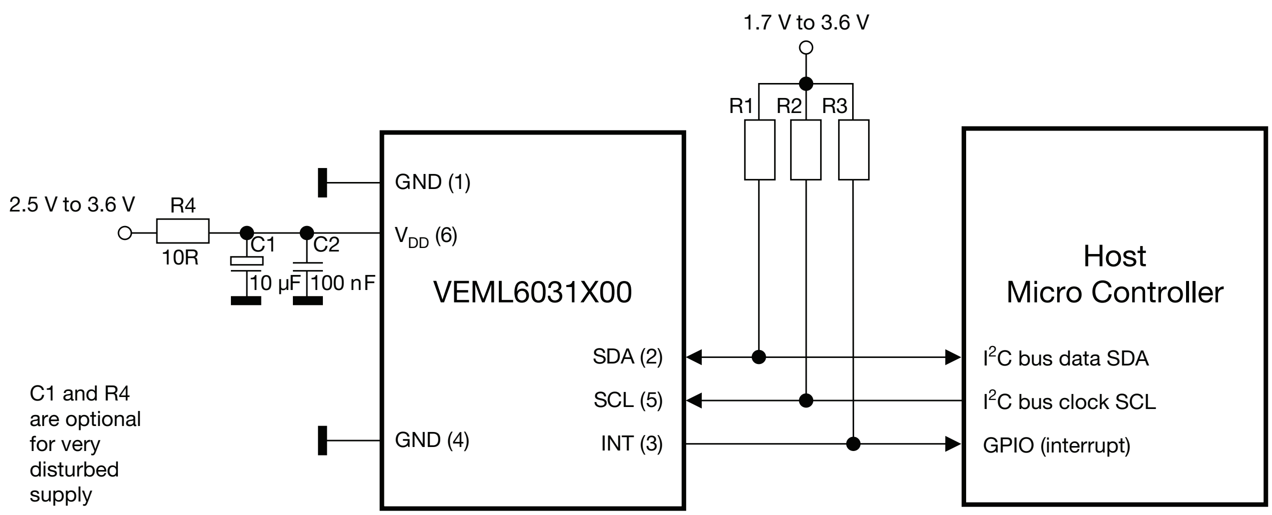

Fig. 2 - VEML6031X00 Application Circuit
(x) = Pin Number

For decoupling purposes, a 100 nF ceramic capacitor (C2) should be placed close to the V_{DD} (pin 4).

If the supply voltage contains a lot of noise and the supply voltage range is close to the low limit of 2.5 V, an RC (R4 and C1) decoupling should be used, as depicted in Fig. 2.

APPLICATION NOTE

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MECHANICAL CONSIDERATIONS AND WINDOW CALCULATION FOR THE VEML6031X00

The ambient light sensor will be placed behind a window or cover. The window material should be completely transmissive to visible light (400 nm to 700 nm). For optimal performance the window size should be large enough to maximize the light irradiating the sensor. In calculating the window size, the only dimensions that the design engineer needs to consider are the distance from the top surface of the sensor to the outside surface of the window and the size of the window. These dimensions will determine the size of the detection zone.

First, the center of the sensor and center of the window should be aligned. The VEML6031X00 has an angle of half sensitivity of about ± 55°, as shown in the figure below.

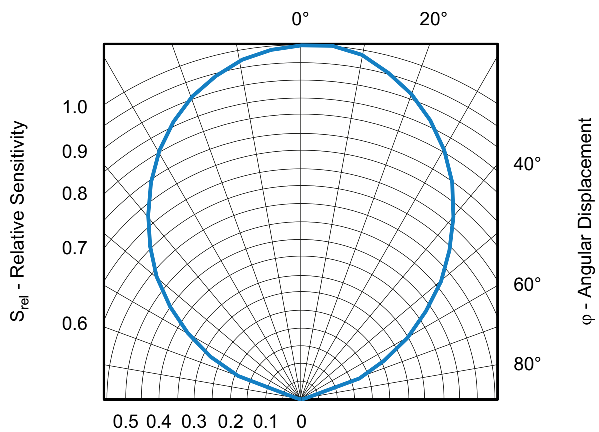

Fig. 3 - Relative Sensitivity vs. Angular Displacement

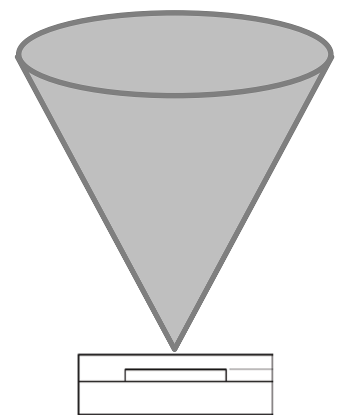

Fig. 4 - Angle of Half Sensitivity: Cone

Remark:

This wide angle and the placement of the sensor as close as possible to the cover is needed if it should show comparable results to an optometer, which also detects light reflections from the complete surroundings.

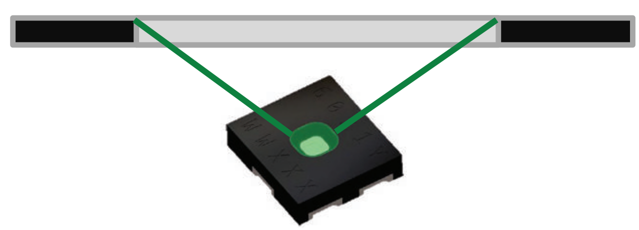

Fig. 5 - Windows Above Sensitive Area

The size of the window is simply calculated according to triangular rules. The dimensions of the device are shown within the datasheet, and with the known distance below the window's upper surface and the specified angle below the given window diameter (w), the best results are achieved.

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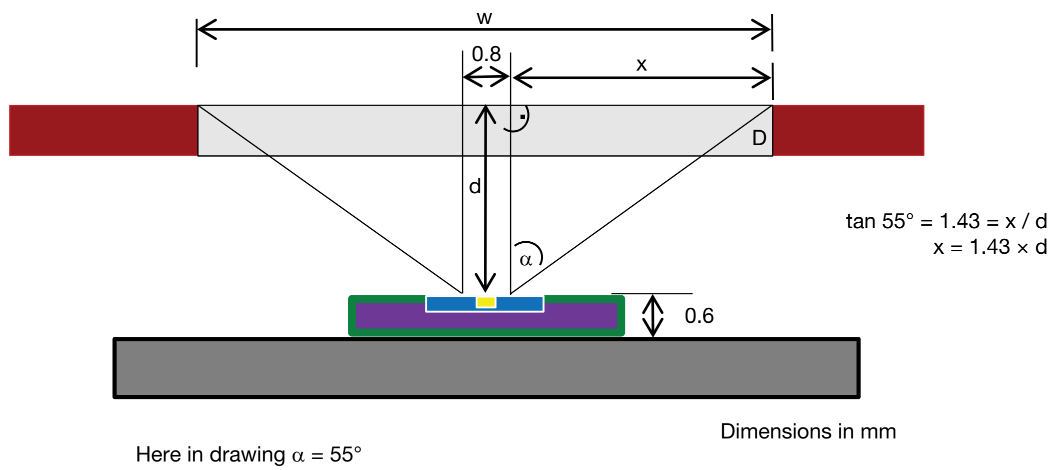

Fig. 6 - Window Area for an Opening Angle of ± 55°

The calculation is then: tan α = x / d $\rightarrow$ with α = 55° and tan 55° 1.43 = x / d $\rightarrow$ x = 1.43 × d

Then the total width is w = 0.5 mm + 2 × x.

d = 0.5 mm	→	x = 0.72 mm	→	w = 0.8 mm + 1.44 mm	=	2.24 mm
d = 1.0 mm	→	x = 1.43 mm	→	w = 0.8 mm + 2.86 mm	=	3.66 mm
d = 1.5 mm	→	x = 2.15 mm	→	w = 0.8 mm + 4.30 mm	=	5.10 mm
d = 2.0 mm	→	x = 2.86 mm	→	w = 0.8 mm + 5.72 mm	=	6.52 mm
d = 2.5 mm	→	x = 3.58 mm	→	w = 0.8 mm + 7.16 mm	=	7.96 mm
d = 3.0 mm	→	x = 4.29 mm	→	w = 0.8 mm + 8.58 mm	=	9.38 mm

A smaller window is also sufficient if reference measurements can be done and / or if the output result does not need to be as exact as an optometer.

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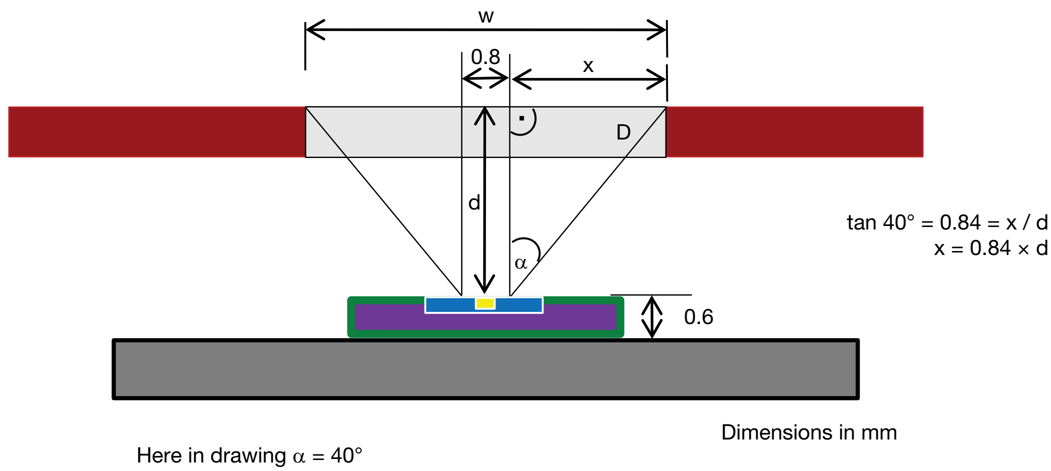

Fig. 7 - Window Area for an Opening Angle of ± 40°

The calculation is then: tan α = x / d $\rightarrow$ with α = 40° and tan 40° 0.84 = x / d $\rightarrow$ x = 0.84 × d
Then the total width is w = 0.5 mm + 2 × x.

d = 0.5 mm	→	x = 0.42 mm	→	w = 0.8 mm + 0.84 mm	=	1.64 mm
d = 1.0 mm	→	x = 0.84 mm	→	w = 0.8 mm + 1.68 mm	=	2.48 mm
d = 1.5 mm	→	x = 1.28 mm	→	w = 0.8 mm + 2.56 mm	=	3.36 mm
d = 2.0 mm	→	x = 1.68 mm	→	w = 0.8 mm + 3.36 mm	=	4.16 mm
d = 2.5 mm	→	x = 2.10 mm	→	w = 0.8 mm + 4.20 mm	=	5.00 mm
d = 3.0 mm	→	x = 2.52 mm	→	w = 0.8 mm + 5.04 mm	=	5.84 mm

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Designing the VEML6031X00 Into an Application

DEVICE ADDRESS

The VEML6031X00 is available in two different pre-configured slave addresses. For one version the predefined 7-bit I^2C bus address is set to 0101001 = 0x29. The least significant bit (LSB) defines read or write mode. Accordingly, the bus address is set to 0101 0010 = 0x52 for write and 0101 0011 = 0x53 for read. The second version comes with a predefined 7-bit I^2C bus address of 0010000 = 0x10. So, here the write address is 0010 0000 = 0x20 for write and 0010 0001 = 0x21 for read.

SLAVE ADDRESS OPTIONS	
ORDERING CODE	SLAVE ADDRESS (7 bit)
VEML6031X00	0x29
VEML60311X00	0x10

REGISTERS OF THE VEML6031X00

The sensor has thirteen user-accessible registers from 0x00 to 0x17 (0x02 and 0x03, 0x08 to 0x0F, and 0x16 are not defined / reserved) with different functionalities. Note that due to the location of the two shutdown bits (SD and ALS_IR_SD), one in register 0x00 and the other in 0x01, it is necessary to always write to both registers at once when configuring the device.

COMMAND REGISTER FORMAT					
COMMAND CODE	REGISTER NAME	BIT	DEFAULT VALUE	FUNCTION / DESCRIPTION	R / W
0x00	ALS_CONF 0	0 : 7	0x01	ALS integration time, measurement mode, shutdown	R / W
0x01	ALS_CONF 1	0 : 7	0x00	ALS and IR shutdown, ALS gain, interrupt persistance	R / W
0x04	ALS_WH_L	0 : 7	0x00	ALS high threshold window setting (LSB)	R / W
0x05	ALS_WH_H	0 : 7	0x00	ALS high threshold window setting (MSB)	R / W
0x06	ALS_WL_L	0 : 7	0x00	ALS low threshold window setting (LSB)	R / W
0x07	ALS_WL_H	0 : 7	0x00	ALS low threshold window setting (MSB)	R / W
0x10	ALS_DATA_L	0 : 7	0x00	Low byte of 16-bit ALS result DATA	R
0x11	ALS_DATA_H	0 : 7	0x00	High byte of 16-bit ALS result DATA	R
0x12	IR_DATA_L	0 : 7	0x00	Low byte of 16-bit IR result DATA	R
0x13	IR_DATA_H	0 : 7	0x00	High byte of 16-bit IR result DATA	R
0x14	ID_L	0 : 7	0x01	ID code	R
0x15	ID_H	0 : 7	0x00	Package and version code	R
0x17	ALS_INT	0 : 7	0x00	ALS INT trigger event	R

Notes

- Command code 0x00 default value is 0x01 = device is shutdown
- Command 0x00 and command 0x01 must be executed together, they cannot be executed independently

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INTEGRATION TIME AND GAIN SETTING OF THE ALS AND IR CHANNEL

The resolution of the ALS and IR channel can be determined by the setting of the integration time, the gain factor, and the PD size. The IT, GAIN factor, and PD size cannot be determined individually for each channel.

To achieve the highest resolution of 0.0034 lx/counts for the ALS channel, the max. integration time (400 ms), max. GAIN (ALS gain x 2), and the complete photodiode size (PD_ DIV4 = 0, 4/4 PD used) need to be applied. Accordingly, with the lowest resolution of 3.48 lx/counts for the ALS channel, at the min. integration time (6.25 ms), min. GAIN (ALS gain x 0.5), and one quarter of the photodiode size (PD_ DIV4 = 1, 1/4 PD), the max. illumination level of 228 klx is achievable.

Integration Time Setting

Within the command register 0x00 (ALS_CONF_0) bit 4 to 6 determine the applied integration time for the ALS and the IR channel.

TABLE 1 - REGISTER: ALS_CONF_0 - 0x00

REGISTER NAME	BIT	FUNCTION / DESCRIPTION	R / W
ALS_IT	6 : 4	ALS integration time setting 000 = 3.125 ms 001 = 6.25 ms 010 = 12.5 ms 011 = 25 ms 100 = 50 ms 101 = 100 ms 110 = 200 ms 111 = 400 ms	R / W

Remark: The default integration time is 3.125 ms.
For the integration time of 3.125 ms, the max. available resolution of the output channel is around 15 bit, which accordingly no longer leads to a doubling of the achieveable illumination level.
The integration time mainly determines the sampling time of the data from the sensor.
If you would like to increase your sampling rate, you have to decrease your integration time.

GAIN and PD Size Setting

Within the command register 0x01 (ALS_CONF_1), bit 4 and 5 determine the applied ALS_GAIN for the ALS and IR channel, whereby bit 6 determines the used size of the photodiode for the ALS and IR measurement.

TABLE 2 - REGISTER: ALS_CONF_1 - 0x01

REGISTER NAME	BIT	FUNCTION / DESCRIPTION	R / W
PD_DIV4	6	Effective photodiode size ALS and IR 0 = 4/4 PD used 1 = 1/4 PD used	R / W
ALS_GAIN	4 : 3	Gain selection 00 = ALS gain x1 01 = ALS gain x2 10 = ALS gain x 0.66 11 = ALS gain x 0.5	R / W

Remark: Possible saturation effects during the measurement start can be avoided if the application starts with the lowest gain setting: ALS_GAIN x 0.5, PD_DIV4 = 1 (1/4 PD used).
The setting ALS_GAIN x2 and PD_DIV4 = 0 (4/4 PD used) should only be used if a high resolution is necessary. For example, if the sensor is placed under a dark cover glass where the illumination level is reduced to a low level.
Please refer to Table 9 and Table 10 from the datasheet to get the best settings for the expected illumination level.

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READ OUT THE MEASUREMENT RESULTS

The ambient light measurement results are stored in the register ALS_DATA, which can be accessed over the command codes 0x10 and 0x11.

The infrared measurement results are stored in the IR_DATA register, which can be accessed over the command codes 0x12 and 0x13.

The VEML6031X00 stores the last measured ambient as well as infrared data before the device is shut down, keeping the data accessible. When the VEML6031X00 is in shutdown mode, the host can freely read this data via the read command directly.

ALS MEASUREMENT RESULTS

The command codes 0x10 and 0x11 (ALS_DATA) contain the ambient light measurement results. The low byte is stored in the command code 0x10 (ALS_DATA_L) while the command code 0x11 (ALS_DATA_H) accesses the ALS results from the high byte.

TABLE 3 - REGISTER: ALS_DATA - 0x10, 0x11

COMMAND CODE	REGISTER NAME	BIT	FUNCTION / DESCRIPTION	R / W
0x10	ALS_DATA_L	7 : 0	ALS result channel (data byte low)	R
0x11	ALS_DATA_H	7 : 0	ALS result channel (data byte high)	R

IR MEASUREMENT RESULTS

The command codes 0x12 and 0x13 (IR_DATA) contain the ambient light measurement results. The low byte is stored in the command code 0x12 (IR_DATA_L) while the command code 0x13 (IR_DATA_L) accesses the high byte of the infrared measurement results.

The measurement results are stored in the register IR_DATA, which can be accessed over the command codes 0x12 and 0x13.

TABLE 4 - REGISTER: IR_DATA - 0x12, 0x13

COMMAND CODE	REGISTER NAME	BIT	FUNCTION / DESCRIPTION	R / W
0x12	IR_DATA_L	7 : 0	IR result channel (data byte low)	R
0x13	IR_DATA_H	7 : 0	IR result channel (data byte high)	R

INTERRUPT HANDLING

To avoid too many interactions with the microcontroller, the interrupt feature may be used. The interupt mode can be enabled with the ALS_INT_EN bit in register ALS_CONF_0 - 0x00.

TABLE 7 - REGISTER: ALS_CONF_0 - 0x00

REGISTER NAME	BIT	FUNCTION / DESCRIPTION	R / W
Reserved	7	Must be set to “0”	R / W
ALS_INT_EN	1	ALS interrupt setting 0 = interrupt disable 1 = interrupt enable	R / W

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Persistence Settings

The persistence function ALS_PERS determines the number of measurements that have to remain above or below the chosen threshold level to activate the interrupt pin.

TABLE 8 - REGISTER: ALS_CONF_1 - 0x01			
REGISTER NAME	**BIT**	**FUNCTION / DESCRIPTION**	**R / W**
ALS_PERS	2 : 1	ALS persistence protect number setting Number of persistent measurements above the threshold to trigger the interrupt 00 = 1 01 = 2 10 = 4 11 = 8	R / W

Interrupt Thresholds

The high and low threshold levels for the interupt level can be determined individually.

In register ALS_WH - 0x04, the 0x05 high threshold window can be determined.

TABLE 9 - REGISTER: ALS_WH - 0x04, 0x05				
COMMAND CODE	**REGISTER NAME**	**BIT**	**FUNCTION / DESCRIPTION**	**R / W**
0x04	ALS_WH_L	7 : 0	ALS high threshold window setting (data byte low)	R / W
0x05	ALS_WH_H	7 : 0	ALS high threshold window setting (data byte high)	R / W

In register ALS_WL - 0x06, the 0x07 low threshold window can be determined.

TABLE 10 - REGISTER: ALS_WL - 0x06, 0x07				
COMMAND CODE	**REGISTER NAME**	**BIT**	**FUNCTION / DESCRIPTION**	**R / W**
0x06	ALS_WL_L	7 : 0	ALS low threshold window setting (data byte low)	R / W
0x07	ALS_WL_H	7 : 0	ALS low threshold window setting (data byte high)	R / W

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Interrupt Results

With bit 1 and 2 in register ALS_INT - 0x17, the interrupt flags for the high and low thresholds can be checked.

The interrupt flag is triggered as soon as the threshold level is exceeded. Reading the interrupt flag bit automatically resets it. To trigger the interrupt again, the applied threshold value must be exceeded again.

TABLE 11 - REGISTER: ALS_INT - 0x17

REGISTER NAME	BIT	FUNCTION / DESCRIPTION	R / W
Reserved	7 : 4	Reserved	R
ALS_AF_DATA_READY	3	ALS active force mode data ready flag	R
ALS_IF_L	2	ALS low threshold INT flag	R
ALS_IF_H	1	ALS high threshold INT flag	R
Reserved	0	Reserved	R

ALS CHANNEL

The responsivity of the ALS channel is close to the human eye curve, also called V(λ).

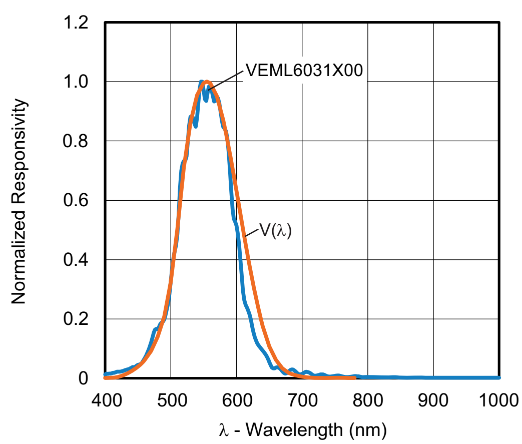

Fig. 8 - Spectral Response

Command codes 0x10 and 0x11 contain the results of the ALS measurement. This 16-bit code needs to be converted to a decimal value to determine the corresponding lux value. The calculation of the corresponding lux level is dependent on the applied resolution (lx/counts), which is determined by the programmed gain setting and the chosen integration time.

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CALCULATING THE LUX LEVEL

Command codes 0x10 and 0x11 contain the results of the ALS measurement. This 16-bit code needs to be converted to a decimal value to determine the corresponding lux value. The calculation of the corresponding lux level is dependent on the programmed gain setting and the chosen integration time.

The component is most sensitive with ALS_GAIN = x2, PD_DIV4 = 4/4, and an integration time of 400 ms, specified to a resolution of 0.0034 lx/step.

Every time the integration time is halved, the resolution is doubled, but the possible detection range is also doubled.

The same principle is valid for the gain setting. For ALS_GAIN = x1, it is doubled. For PD_DIV4 = 1/4, the size of the photodiode is just 1/4, the sensitivity is also just 1/4, and the resolution and max. possible detection range is x 4 to allow for higher illuminations up to about 228 klx.

TABLE 5 - RESOLUTION AND MAXIMUM DETECTION RANGE AT PD_DIV4 = 0 (= x 4/4)

	GAIN x 2	GAIN x 1	GAIN x 0.66	GAIN x 0.5		GAIN x 2	GAIN x 1	GAIN x 0.66	GAIN x 0.5
IT (ms)	TYPICAL RESOLUTION (lx/count)					MAXIMUM POSSIBLE ILLUMINATION (lx)			
400	0.0034	0.0068	0.0103	0.0136		223	446	675	891
200	0.0068	0.0136	0.0206	0.0272		446	891	1350	1783
100	0.0136	0.0272	0.0412	0.0544		891	1783	2701	3565
50	0.0272	0.0544	0.0824	0.1088		1783	3565	5402	7130
25	0.0544	0.1088	0.1648	0.2176		3565	7130	10 803	14 260
12.5	0.1088	0.2176	0.3297	0.4352		7130	14 260	21 607	28 521
6.25	0.2176	0.4352	0.6594	0.8704		14 260	28 521	43 213	57 042
3.125	0.4352	0.8704	1.3188	1.7408		(-) (1)	(-) (1)	(-) (1)	(-) (1)

TABLE 6 - RESOLUTION AND MAXIMUM DETECTION RANGE AT PD_DIV4 = 1 (= x 1/4)

	GAIN x 2	GAIN x 1	GAIN x 0.66	GAIN x 0.5		GAIN x 2	GAIN x 1	GAIN x 0.66	GAIN x 0.5
IT (ms)	TYPICAL RESOLUTION (lx/count)					MAXIMUM POSSIBLE ILLUMINATION (lx)			
400	0.0136	0.0272	0.0412	0.0544		891	1783	2701	3565
200	0.0272	0.0544	0.0824	0.1088		1783	3565	5402	7130
100	0.0544	0.1088	0.1648	0.2176		3565	7130	10 803	14 260
50	0.1088	0.2176	0.3297	0.4352		7130	14 260	21 607	28 521
25	0.2176	0.4352	0.6594	0.8704		14 260	28 521	43 213	57 042
12.5	0.4352	0.8704	1.3188	1.7408		28 521	57 042	86 427	114 083
6.25	0.8704	1.7408	2.6376	3.4816		57 042	114 083	172 854	228 167
3.125	1.7408	3.4816	5.2752	6.9632		(-) (1)	(-) (1)	(-) (1)	(-) (1)

Note

(1) For an integration time of 3.125 ms, the maximum count level is no longer 16 bit, so, half the integration time no longer leads to double the max. lux level

Example

If the 16-bit word of the ALS data shows: 0000 0101 1100 1000 = 1480 (dec.), the programmed ALS_GAIN = x 1, PD_DIV4 = 4/4 (= x 1) and ALS_IT = 100 ms, the corresponding lux level is: light level (lx) = 1480 x 0.0272 = 40.256 lx.

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IT, GAIN, and PD Size Settings

The output value of the sensor is linear across the integration (ALS_IT), gain (ALS_GAIN), or photodiode size (PD_DIV4) settings, respectively.

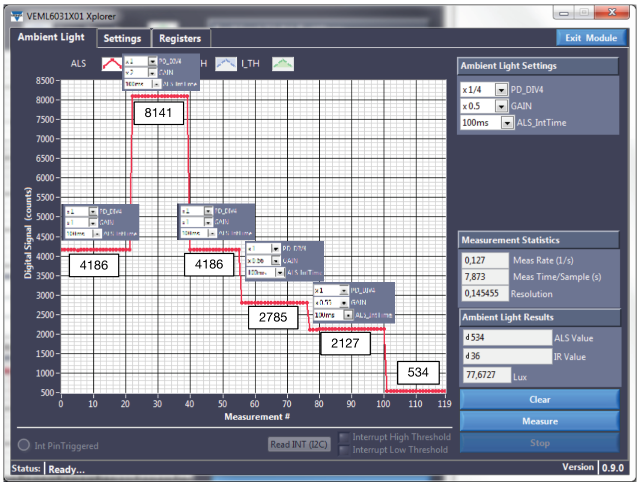

Fig. 9 - Linearity of Gain Steps

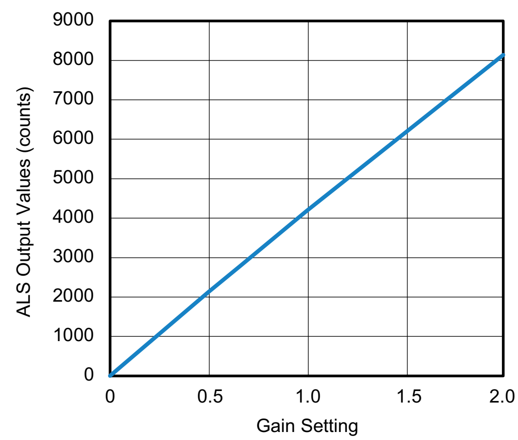

Fig. 10 - Linearity of the Gain

The integration time has a linear relationship to the output value in counts. A doubling in the integration time leads to a doubling in counts.

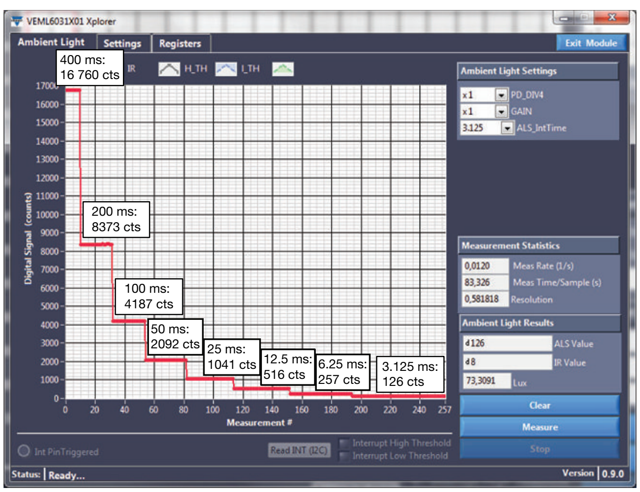

Fig. 11 - Linearity of Integration Times

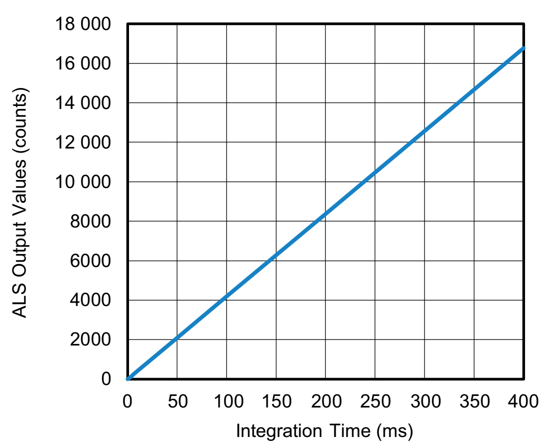

Fig. 12 - Linearity of the Integration Time

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LUX LEVEL MATCHING FOR DIFFERENT LIGHT SOURCES

The VEML6031X00 shows very good matching for all kinds of light sources.

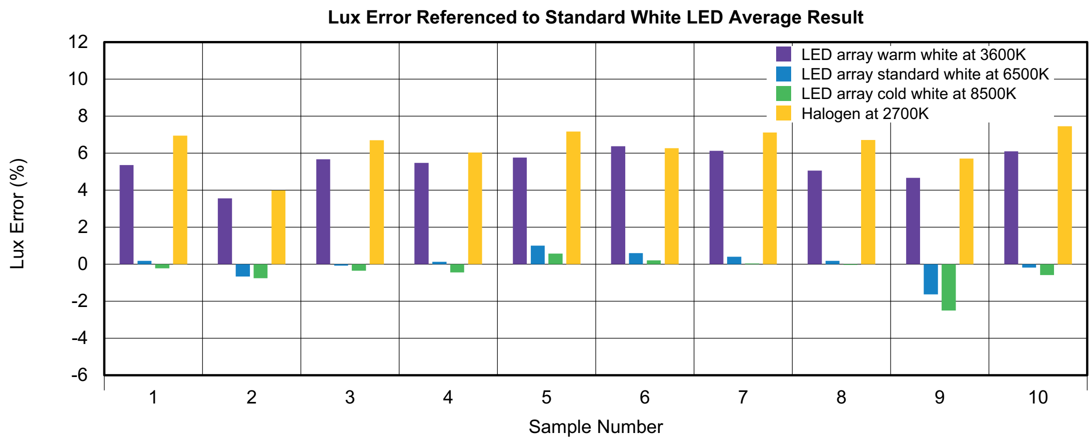

Fig. 13 - Tolerances for Different Light Sources

APPLICATION-DEPENDENT LUX CALCULATION

If the application uses a darkened / tinted cover glass, just 10 % - or even just 1 % - of the ambient light will reach the sensor. For a tinted cover glass where there is 1 lx up to 100 klx of light outside, just 0.01 lx to 1 klx is reaching the sensor, and the application software may always stay with ALS_GAIN x2 and full PD size (PD_DIV4 = 0).

If the application uses a clear cover glass, nearly all ambient light will reach the sensor. This means up to about 228 klx may be possible. For this clear cover where < 1 lx to ≥ 100 klx is possible, the application software will need to adapt the gain steps, and for very high illumination, also reduce the size of the photodiode to just 1/4.

For unknown brightness conditions, the application should always start with the lowest gain: ALS_GAIN x 0.5 and PD_DIV4 = 1 (1/4 PD size). This avoids possible overload / saturation if, for example, direct sunlight suddenly reaches the sensor.

The VEML6031X00 shows very good linear behavior for all levels from 0.0034 lx to about 228 klx.

A software flow may look like the flow chart diagram at the end of this note:

- Starting with the lowest sensitivity (ALS_GAIN = 0.5 and PD_DIV4 = 1), check the ALS counts. If ≤ 100 counts, increase sensitivity with PD_DIV4 = 0, full PD size
- Check the ALS counts again. If they are still ≤ 100 counts, increase up to 2
- Check the ALS counts again. If they are still ≤ 100 counts, increase the integration time from 100 ms to 200 ms, and continue the procedure up to the longest integration time of 400 ms. If a very dark cover glass is used and one knows that just few percent of outside light is reaching the sensor, one may directly start with higher gain

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Designing the VEML6031X00 Into an Application

IR CHANNEL

In addition to the ALS channel that follows the so-called human eye curve very well, there is also an IR channel available, which offers a much higher responsivity for light with wavelengths > 800 nm.

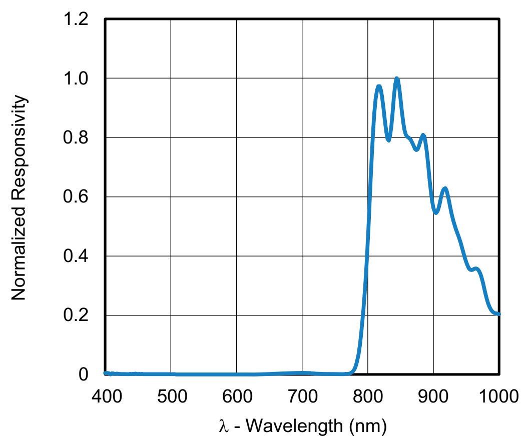

Fig. 14 - IR Channel Response

Since the light sources the sensor is exposed to can have different spectrums, it can be helpful for an application to be able to differentiate between light sources and react accordingly. The additional IR channel offers the possibilities to do a light source differentiation based on the IR content measured with the IR channel. A ratio between the IR and ALS channel can be calculated to determine the amount of IR light within the light source's spectrum. This easily allows, for example halogen bulb to be kept apart from an LED light.

Example

The below measurement result shows the sensor output values under several different light sources at 1000 lx. Based on the IR / ALS channel ratio, a clear differentiation between the three light sources is possible, even though the detected illuminance is the same.

The measurements were done with the evaluation tool as shown below:

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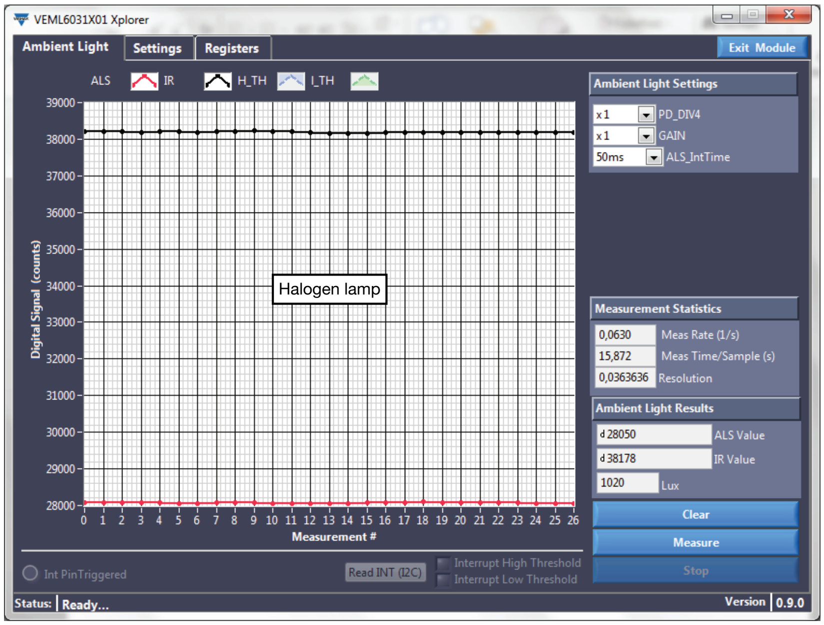

Fig. 15 - Measurement Results With a Halogen Lamp at About 1000 lx

The following results were measured with a fluorescent, sunlight, and halogen light source:

SETTINGS: PD_DIV 4/4 USED, ALS_GAIN x 1, ALS IT = 50 ms			
LIGHT SOURCE	**ALS**	**IR**	**RATIO IR-CHANNEL / ALS-CHANNEL (%)**
Fluorescent	27 490	2652	10
Daylight	28 299	9765	35
Halogen	28 050	38 178	136

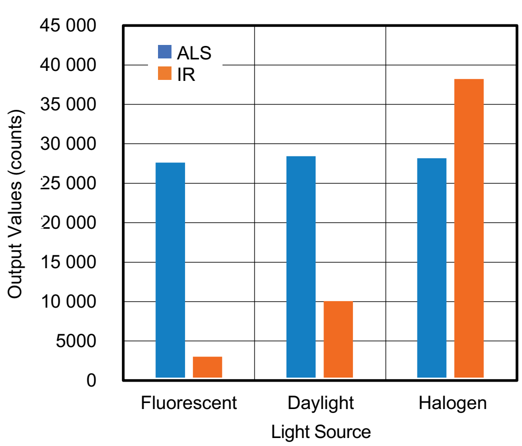

Fig. 16 - ALS and IR Channel - Absolute

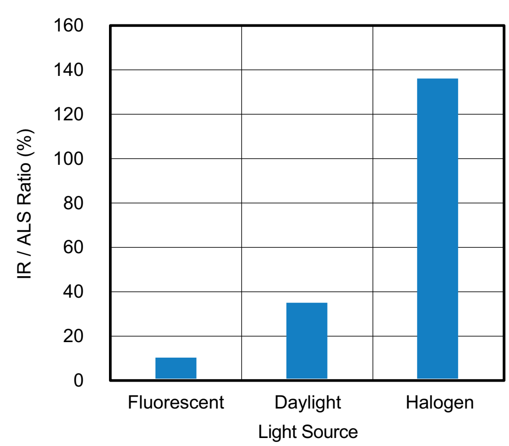

Fig. 17 - Ratio IR / ALS Channel

The IR / ALS channel ratios show that a clear differentiation of light sources can be made.

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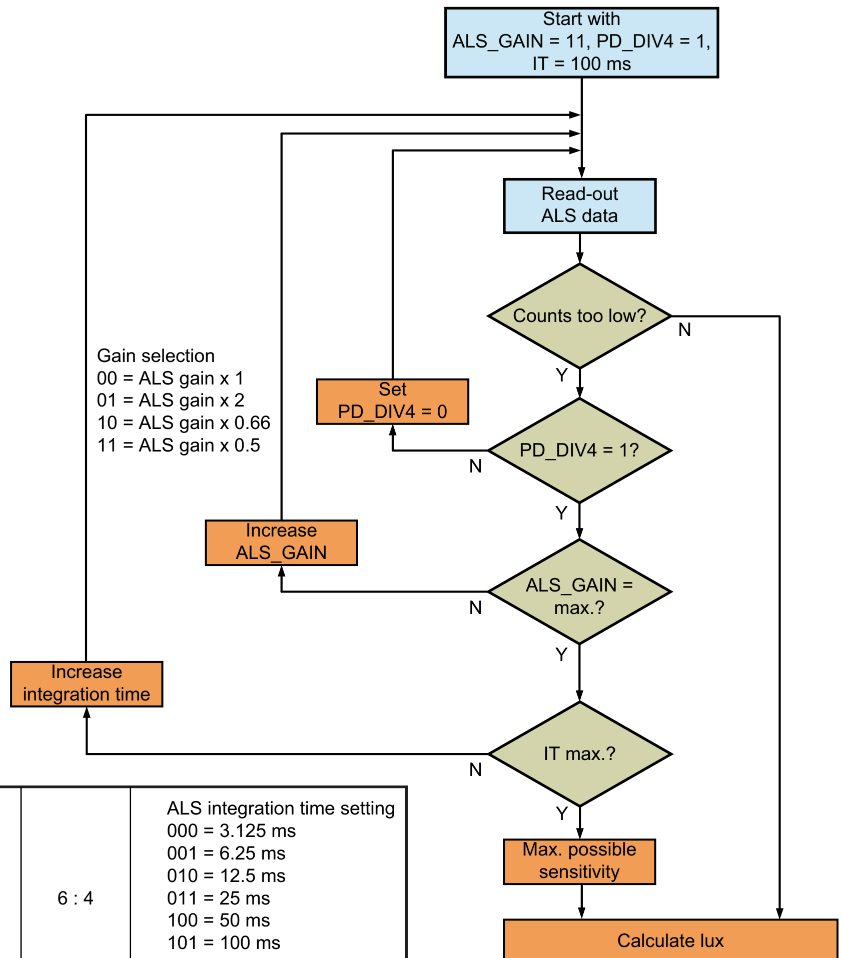
TYPICAL SOFTWARE FLOW CHART

For a wide light detection range of more than seven decades (from 0.0034 lx to 52 klx), it is necessary to adjust the sensor. This is done with the help of the gain steps, the sensitivity, and the steps for the integration time.

Whereas the programmed gain begins with the lowest possible value (ALS_GAIN x 0.5 and 1/4 PD size), in order to avoid any saturation effect, the integration time starts with 100 ms: IT = 0.

With this about 10 klx is possible. To determine the optimal gain and sensitivity settings for an application, it is advisable to first increase the sensitivity via the PD_DIV4 bit (PD_DIV4 = 0), followed by the ALS_GAIN bits.



ALS_IT	6 : 4	ALS integration time setting 000 = 3.125 ms 001 = 6.25 ms 010 = 12.5 ms 011 = 25 ms 100 = 50 ms 101 = 100 ms 110 = 200 ms 111 = 400 ms

Fig. 18 - Simple Flow Chart View

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Designing the VEML6031X00 Into an Application

HOW TO USE THE DEMO SOFTWARE

The small blue VEML6031X00 sensor board is compatible with the SensorXplorer. The software module and further information for the demo board can be found here: www.vishay.com/optoelectronics/SensorXplorer.

When evaluating the sensor, please connect the SensorXplorer and the VEML6031X00 sensor board and then open the software.

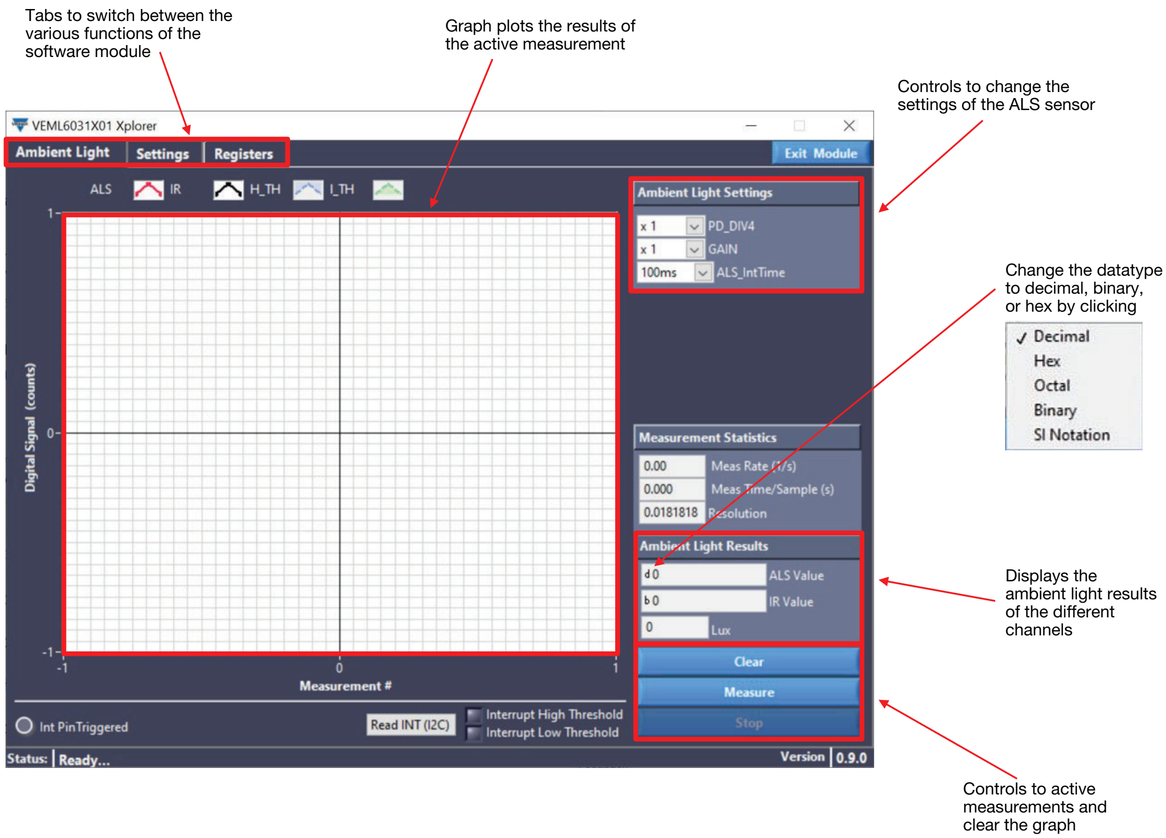

Fig. 19 - Demo Software GUI

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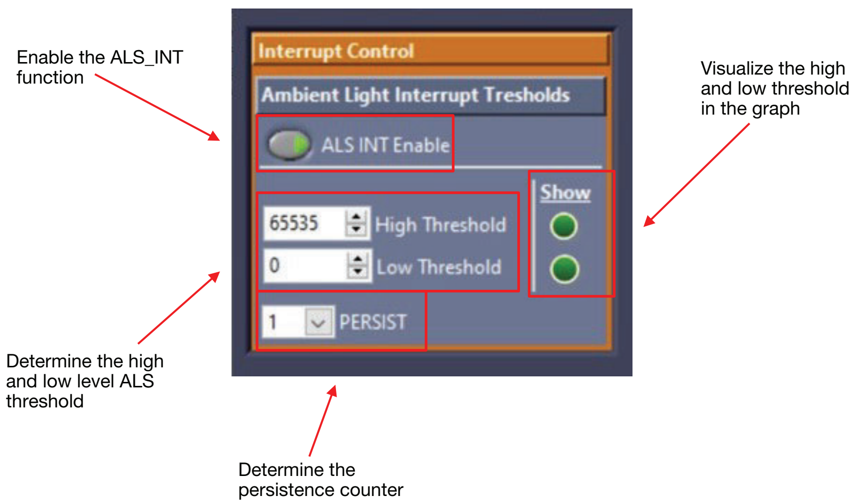

Fig. 20 Interrupt Control in the Demo Software GUI

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TYPICAL ILLUMINANCE VALUES

Illuminance	Example
10^{-5} lx	Light from Sirius, the brightest star in the night sky
10^{-4} lx	Total starlight, overcast sky
0.002 lx	Moonless clear night sky with airglow
0.01 lx	Quarter moon, 0.27 lx; full moon on a clear night
1 lx	Full moon overhead at tropical latitudes
3.4 lx	Dark limit of civil twilight under a clear sky
50 lx	Family living room
80 lx	Hallway / bathroom
100 lx	Very dark overcast day
320 lx to 500 lx	Office lighting
400 lx	Sunrise or sunset on a clear day
1000 lx	Overcast day; typical TV studio lighting
10 000 lx to 25 000 lx	Full daylight (not direct sun)
32 000 lx to 130 000 lx	Direct sunlight

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