DT0017
Design tip

VL6180X interleaved mode explanation

By Colin Ramrattan

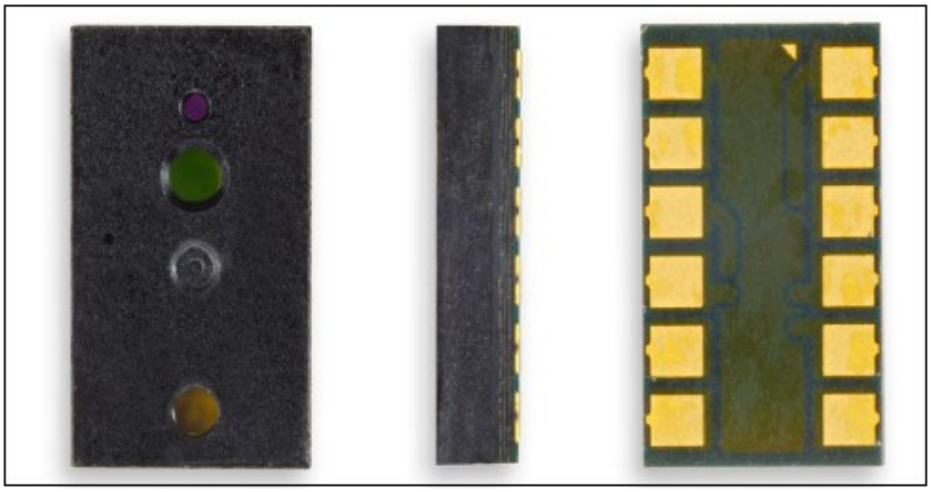
Main components	
VL6180X	Proximity and ambient light sensing (ALS) module

Purpose and benefits

The purpose of this document is to explain in further detail the interleaved feature of the VL6180X.

It is assumed that customers who use this document can communicate with the VL6180X through I^2C and are now looking for more information on the interleaved operation mode.

Figure 1. VL6180X device

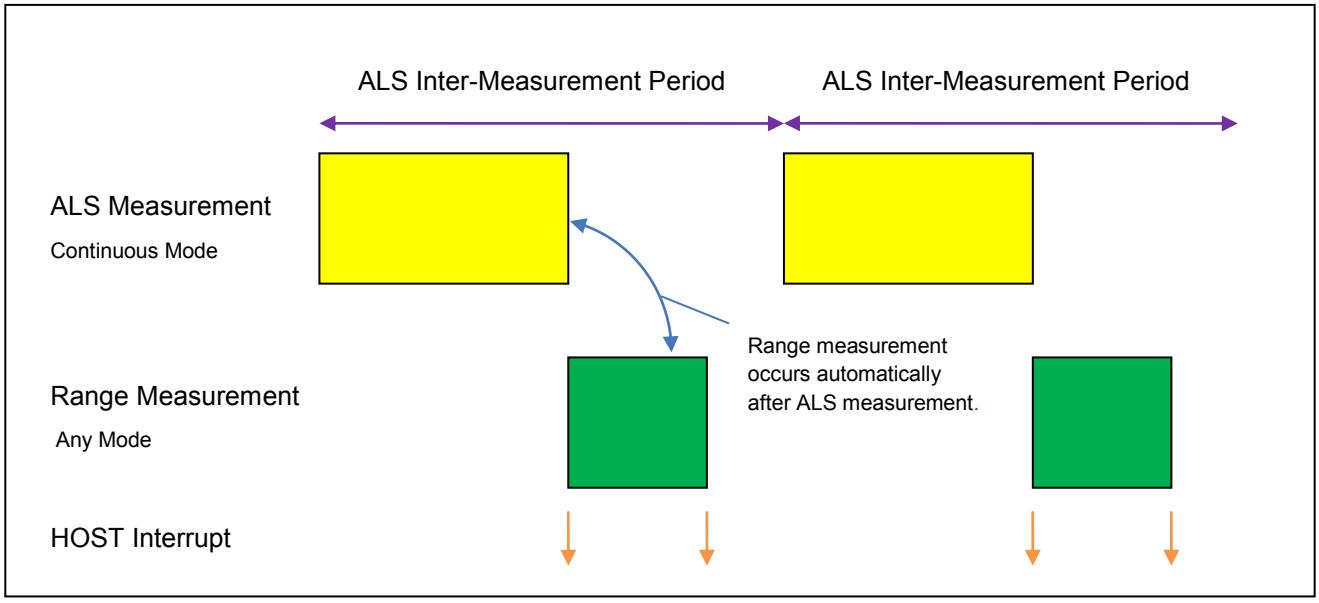


Description

Interleaved mode is a term used to describe a continuous mode of operation in the VL6180X where the Ambient Light Sensor (ALS) and Ranging functions continuously perform measurements over a user specified period. This operation is beneficial to users that would like to have continuous measurements from both the ALS and range functions of the VL6180X.

Figure 2 below shows a timeline of how the ALS and ranging are executed when interleaved mode is enabled.

Figure 2. ALS and ranging timeline



Enabling Interleaved Mode:

The following registers in Table 1 are used in interleaved operation.

Table 1. Overview of registers to set using interleaved operation

Register Name	Register Address	Description
SYSALS_ INTERMEASUREMENT_PERIOD	0x03E	This will define the time between the ALS measurements. Note: The host must ensure that the inter-measurement time is not exceeded See Table XXX.
SYSALS_INTEGRATION_PERIOD	0x040	The integration period is the time the ALS will integrate based on the current light conditions. This is chosen by the user.
SYSALS_START	0x038	This register is used to select continuous mode operation for the ALS measurements. If the interleaved mode enable bit is set, a range measurement will be performed after each ALS measurement
SYSRANGE_MAX_ CONVERGENCE_TIME	0x01C	This will define the maximum time allowed for a range measurement to complete. Note: The maximum time set cannot be more than the ALS inter-measurement period.
SYSRANGE_START	0x018	This register is used to select either continuous or single shot range measurements. Note: in interleaved mode, this register is ignored.
INTERLEAVED_MODE_ENABLED	0x2A3	To enable interleaved mode, this register must be set to 0x01.

The following registers shown in Table 1 are a subset of what is used in normal operation of the VL6180X. The user is advised to refer to the datasheet for further information on how to set-up GPIO modes, interrupt conditions and other functions of the VL6180X.

To set-up interleaved mode, the user should decide the rate at which the device will report ALS and range measurements. Once the time is chosen, the user must ensure this time does not violate the following equations for proper operation.

ALS_Inter-Measurement period (ALS_IMP)

ALS_IMP > [(1.1 * ALS_INTEGRATION_PERIOD) +
(RANGE_MAX_CONVERGENCE_TIME + 5ms)] / 0.9

The equation above will ensure the system will have enough time to process each measurement while continuing to report the appropriate measurements for ranging and ALS.

Table 2 below shows an example of 10Hz operation along with the maximum permissible settings for 10Hz operation. The ALS Integration period and max convergence time should not be increased further but can be reduced from the example below.

Table 2. 10Hz interleaved operation example

Parameter Name	Time Required	Register address and value to write.
Inter-measurement period	100ms	Address (0x03E), write value 0x0A
ALS Integration period	50ms	Address (0x040), write value 0x32
Range Max convergence time	30ms	Address (0x01C), write value 0x1E

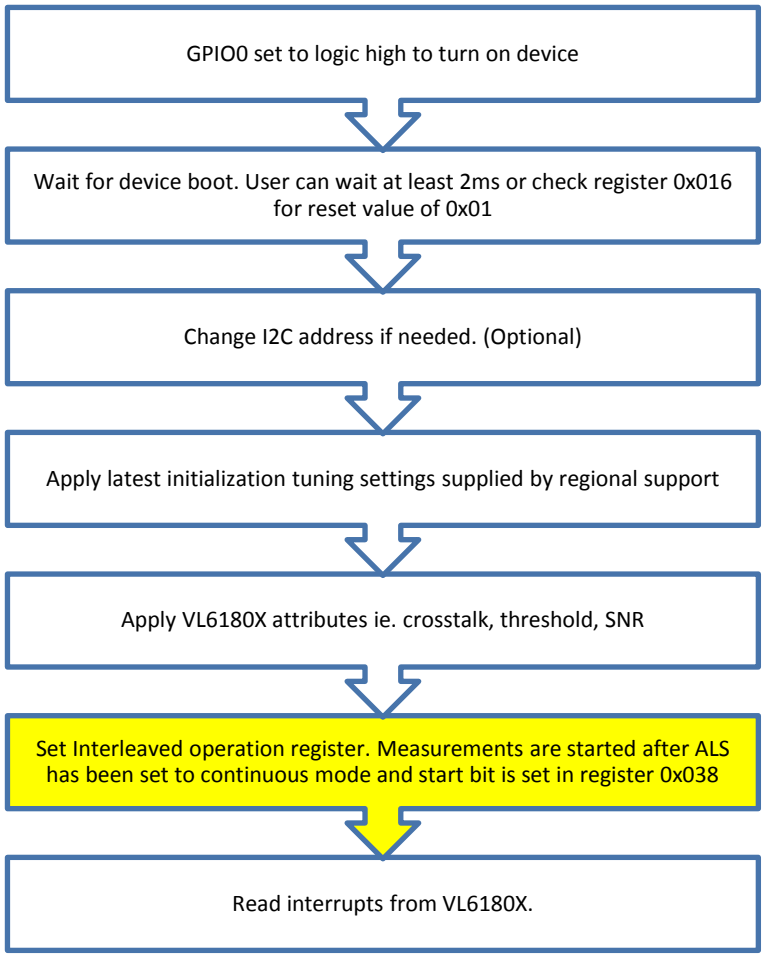
Table 3 below shows an example of 20Hz operation along with the maximum permissible settings for 10Hz operation. The ALS Integration period and max convergence time should not be increased further but can be reduced from the example below.

Table 3. 20Hz interleaved operation example

Parameter Name	Time Required	Register address and value to write.
Inter-measurement period	50ms	Address (0x03E), write value 0x05
ALS Integration period	20ms	Address (0x040), write value 0x14
Range Max convergence time	18ms	Address (0x01C), write value 0x12

For completeness, Table 3 below shows the user where the settings for interleaved operation should be applied. Note that this is just a subset of what is required for normal operation and the user is advised to refer to the datasheet for additional functions with the VL6180X.

Figure 3. Interleaved operation register writes flow



Support material

Related design support material	
MOB-EK2-180-01/1	Product/ system evaluation board
Documentation	
Datasheet: VL6180X - Proximity and ambient light sensing (ALS) module	

Revision history

Date	Version	Changes
27-MAY-2014	1	Initial release

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