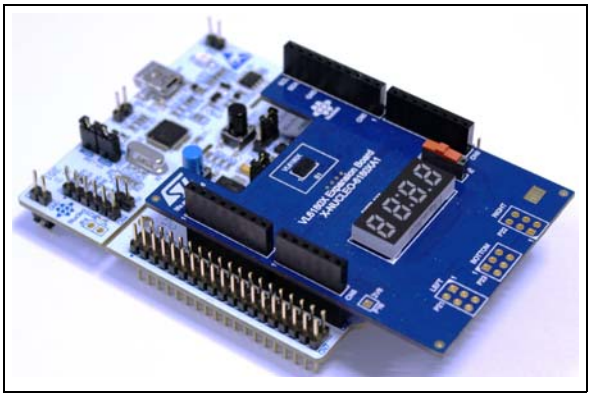
P-NUCLEO-6180X1

Proximity, gesture, ambient light sensor expansion board based on VL6180X for STM32F401RE

Data brief



Features

- 1x VL6180X (proximity, gesture and ambient light sensing module) expansion board.
  - Slider switch controlling 2 functions:
    - Ranging measurement.
    - Ambient light sensing, up to 100KLux.(a)
  - 4-digit display, displaying either the distance of a target from the proximity sensor or the lux value from the ambient light sensing (ALS).
  - Excellent ranging accuracy, independent of the reflectance of the target.
- 1x NUCLEO-F401RE board
- Power management access point
- Equipped with Arduino UNO R3 connector.
- RoHS compliant.
- Full system SW supplied, download from *www.st.com/vl6180x* in the folder “Design resources”.
- 3x VL6180X satellite boards can be connected on the VL6180X expansion board, in order to integrate the VL6180X in customer’s application.
- Basic gesture recognition application can be developed using the VL6180X sensor on the expansion board and/or up to three sensors on the satellite boards.

Description

The P-NUCLEO-6180X1 is an evaluation pack that provides an introduction to the proximity, ranging and light sensing capabilities of the VL6180X sensor, combined with the powerful STM32F401RE microcontroller.

The VL6180X is the latest product based on ST’s patented FlightSense™ technology. This is a ground-breaking technology allowing absolute distance to be measured independent of target reflectance. Instead of estimating the distance by measuring the amount of light reflected back from the object (which is significantly influenced by color and surface), the VL6180X precisely measures the time the light takes to travel to the nearest object and reflect back to the sensor (Time-of-Flight).

The STM32 Nucleo board, NUCLEO-F401RE, provides an affordable and flexible way for users to try out new ideas and build prototypes with any STM32 microcontroller line, choosing from the various combinations of performance, power consumption and features.

a. VL6180X detects up to 100KLux but since the display is 4 digits only, maximum displayed value is limited to 9999 Lux

Ordering information

Table 1. Ordering code

Order code	Description
P-NUCLEO-6180X1	VL6180X expansion board and NUCLEO-F401RE board
VL6180X-SATEL	Optional board: VL6180X satellite board

NUCLEO-F401RE board

Information about NUCLEO-F401RE board can be found at http://www.st.com/stm32nucleo.

VL6180X expansion board

The board allows the user to test the VL6180X functionality, to program it and to help understanding how to develop an application using VL6180X. It integrates:

- a 4-Digit display to render either the range value in mm or the ambient light value in Lux.
- a switch to select the value type to be displayed.
- a 2.8V regulator to supply the VL6180X.
- two level shifters to adapt the I/O level to the micro controller main board.
- the necessary connectivity for the application.

It is required to program the NUCLEO-F401RE board in order to control the VL6180X expansion board. For the NUCLEO-F401RE board, the required software suite is available on *www.st.com,* on the P-NUCLEO-6180X1 page, and is composed of STSW-LINK008, STSW-LINK7 and the X-CUBE-6180XA1.

The VL6180X expansion board and the NUCLEO-F401RE board are connected through Arduino compatible connectors CN5, CN6, CN8 and CN9 as shown in *Figure 1* and described in *Table 2* and *Table 3*.

The Arduino connectors on NUCLEO-F401RE board support Arduino Uno Revision 3.

Figure 1. Arduino Uno connector layout

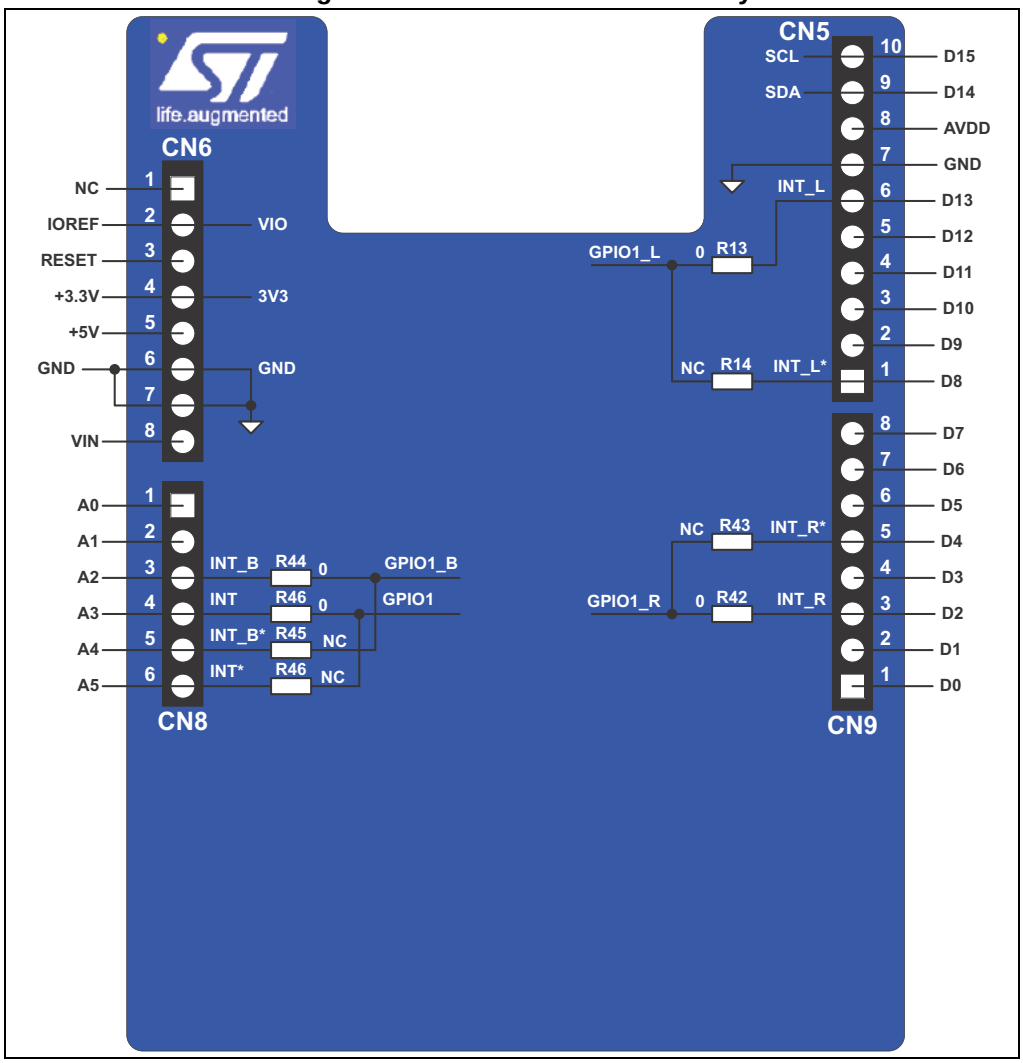


Table 2. Arduino Uno left connector on NUCLEO-F401RE board

CN Nb	VL6180X board	Pin Nb	Pin name	MCU pin	VL6180X expansion board function
CN6 Power		1	NC		
	VIO	2	VIO		Level shifter reference (3.3V)
		3	NC		
	Power	4	+3V3		3.3V supply
		5	NC		
	Gnd	6	Gnd	Gnd	Gnd
	Gnd	7	Gnd	Gnd	Gnd
		8	NC		-

Table 2. Arduino Uno left connector on NUCLEO-F401RE board (continued)

CN Nb	VL6180X board	Pin Nb	Pin name	MCU pin	VL6180X expansion board function
CN8 Analog		1	NC		
		2	NC		
	GPIO1_B	3	INT_B	PA4	Interrupt signal from VL6180X bottom satellite plug-in
	GPIO1	4	INT	PB0	Interrupt signal from VL6180X on board soldered device
	GPIO1_B	5	INT_B*	PC1 or PB9(1)	Interrupt signal from VL6180X bottom satellite plug-in
	GPIO1	6	INT*	PC1 or PB8(1)	Interrupt signal from VL6180X on board soldered device

1. Depending on Nucleo board solder bridges, see details on Nucleo documentation. These interrupt signals are duplicated, but not used, this offers hardware connection flexibility in case of conflict on MCU interface management when expansion board is used superposed with other expansion boards, in this case remove 0 ohm resistor from interrupt used and connect 0 ohm resistor in place of “do not mount” one.

Table 3. Arduino Uno right connector on NUCLEO-F401RE board

CN Nb	VL6180X expansion board	Pin Nb	Pin name	MCU pin	VL6180X expansion board function
CN5 Digital	SCL	10	D15	PB8	I2C1_SCL
	SDA	9	D14	PB9	I2C1_SDA
		8	NC		
	Gnd	7	Gnd	Gnd	Gnd
	GPIO1_L	6	INT_L	PA5	Interrupt signal from VL6180X left satellite plug-in
		5	NC		
		4	NC		
		3	NC		
		2	NC		
	GPIO1_L	1	INT_L*	PA9	Interrupt signal from VL6180X left satellite plug-in(1)

Table 3. Arduino Uno right connector on NUCLEO-F401RE board (continued)

CN Nb	VL6180X expansion board	Pin Nb	Pin name	MCU pin	VL6180X expansion board function
CN9 Digital		8	NC		
		7	NC		
		6	NC		
	GPIO1_R	5	INT_R*	PB5	Interrupt signal from VL6180X right satellite plug-in(1)
		4	NC		
	GPIO1_R	3	INT_R	PA10	Interrupt signal from VL6180X right satellite plug-in
		2	NC		
		1	NC		

1. These interrupt signals are duplicated, but not used, this offers hardware connection flexibility in case of conflict on MCU interface management when expansion board is used superposed with other expansion boards, in this case remove 0 ohm resistor from interrupt used and connect 0 ohm resistor in place of “do not mount” one.

Optional VL6180X satellite board

The VL6180X expansion board allows connecting up to 3x VL6180X satellite boards (see *Figure 2*). This allows to develop applications controlling up to 4x VL6180X.

- I2C bus is common with the VL6180X on-board: I2C bus,
- each satellite can be connected through a dedicated connector to be soldered on the expansion board and has its own:
  - interrupt (GPIO1-x) pin, routed from each satellite connector to the Arduino Uno connectors.
  - reset (GPIO0-y) pin, routed from each satellite connector to the GPIO expander device.

Figure 2. Connections of VL6180X satellite boards

Note: VL6180X satellite boards can be ordered under the reference: VL6180X-SATEL.

Figure 3. VL6180X-SATEL

Laser consideration

The VL6180X contains a laser emitter and corresponding drive circuitry. The laser output is designed to remain within Class 1 laser safety limits under all reasonably foreseeable conditions including single faults in compliance with IEC 60825-1:2007. The laser output will remain within Class 1 limits as long as the STMicroelectronics recommended device settings are used and the operating conditions specified in the datasheet are respected. The laser output power must not be increased by any means and no optics should be used with the intention of focusing the laser beam.

Figure 4. Class 1 laser product label

Compliance

Complies with 21 CFR 1040.10 and 1040.11 except for deviations pursuant to Laser Notice No.50, dated June 24, 2007.

ECOPACK®

In order to meet environmental requirements, ST offers these devices in different grades of ECOPACK® packages, depending on their level of environmental compliance. ECOPACK® specifications, grade definitions and product status are available at: *www.st.com*. ECOPACK® is an ST trademark.

Revision history

Table 4. Document revision history

Date	Revision	Changes
19-Mar-2015	1	Initial release.
05-May-2015	2	Add ST cube logo on first page
02-Jun-2015	3	Update Description section

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- Система менеджмента качества сертифицирована по Международному стандарту ISO 9001;
- Лицензия ФСБ на осуществление работ с использованием сведений, составляющих государственную тайну;
- Поставка специализированных компонентов (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Aeroflex, Peregrine, Syfer, Eurofarad, Texas Instrument, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits,General Dynamics и др.);

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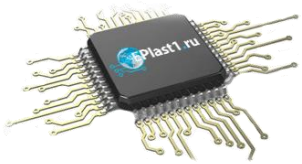
- Поставка образцов и прототипов;
- Техническая поддержка проекта;
- Защита от снятия компонента с производства.



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