



Sensor Starter Kit User Guide

VCNL Sensor Board Layout

The VCNL sensor boards, figure 3 and 5, have test points to allow simple evaluation and / or connection to the customer's application board. The boards also include an external emitter (VSMF2890GX01) to increase the measurement range to 500 mm and supporting FETs to use the integrated emitter and external emitter in series.

For more information on extending the detection range, please read www.vishay.com/doc?84225

Sensor Board Description, Functions, and Features, as well as a Schematic of the Board

For the VCNL4020 gesture control sensor board, this information can be found at: www.vishay.com/doc?84218

Every new sensor board can be connected to the Sensor Starter Kit. Please see:

www.vishay.com/moreinfo/vcnldemokit/

and the last page of this document.

Other Useful Links

I²C specification version 3.0:

www.nxp.com/documents/user_manual/UM10204.pdf

Male pin connector 2199SB-XXG-301523

Female pin connector 2200SB-XXG-A1

www.almita-connectors.com/connector/pcb-connectors.html

VCNL40x0 Development Software

After installing the software, run the following command: Rapid_VCNL40x0.exe. When executing the program, the Proximity Function screen is displayed. There are four tabbed files: Proximity Function, Ambient Light Function, Setup, and Register.

PROXIMITY FUNCTION

Proximity Mode

- select a single measurement, periodic measurement, or self-timed measurement. The periodic measurement rates are set in the Measurement Speed window within Setup menu. The default setting is "periodic measurement (on demand)." Selecting periodic measurement sets the 'prox_od' bit 3 of the command register #0 (80h) to "1." See screen shot 1.
- When chosen "selftimed mode" one additional window will appear what allows then the to program the proximity rate between 1.95 and 250 measurements per second as specified within datasheet: proximity rate register #2 (82h) bits 0 to 2.

Proximity Settings

- sets the infrared emitter current. The infrared emitter current determines the effective range of the sensor; higher current will translate to longer sensing range. This feature can also be used to determine the impact of the cover or window on the sensing range. To compensate for the infrared light absorbed by the window, the current can be increased. The current can be set by either toggling up or down or by left clicking in the window and a current select bar will pop-up. The default setting is 100 mA.

Proximity Results

- shows the chosen measurement rate, which is dependent on the delay time selected in conjunction with the measurement speed. The default is 10 ms ("10"), which results in about 30 measurements per second. So the time needed for one measurement is $1/30 \text{ s} = 0.033 \text{ s}$, which is shown within the "Measurement Time / Sample" field. The next four items show the actual proximity counts, their max., min., and mean values as well as the averaged peak to peak noise value.

Clear Display

- clears the upper and lower window graphs and resets the 'Data#' to zero.

Proximity Value

Changes the unit of measure for the proximity value. Click on the small blue letter on its left side. This letter indicates the selected format: b = binary, d = decimal, x = hexadecimal, o = octal, and p stands for SI notation.

Infinite Impulse Response (IIR) Filter

This low pass filter is activated with the "active" button and shows an average of the measurement results. The average value can be changed from 1 to 20 by clicking on the toggle arrow where 1 corresponds to no averaging and 20 to strong averaging. When active the button will be red.

Upper Window

Displays the entire 16-bit measured signal from 0 to 65 535 counts.

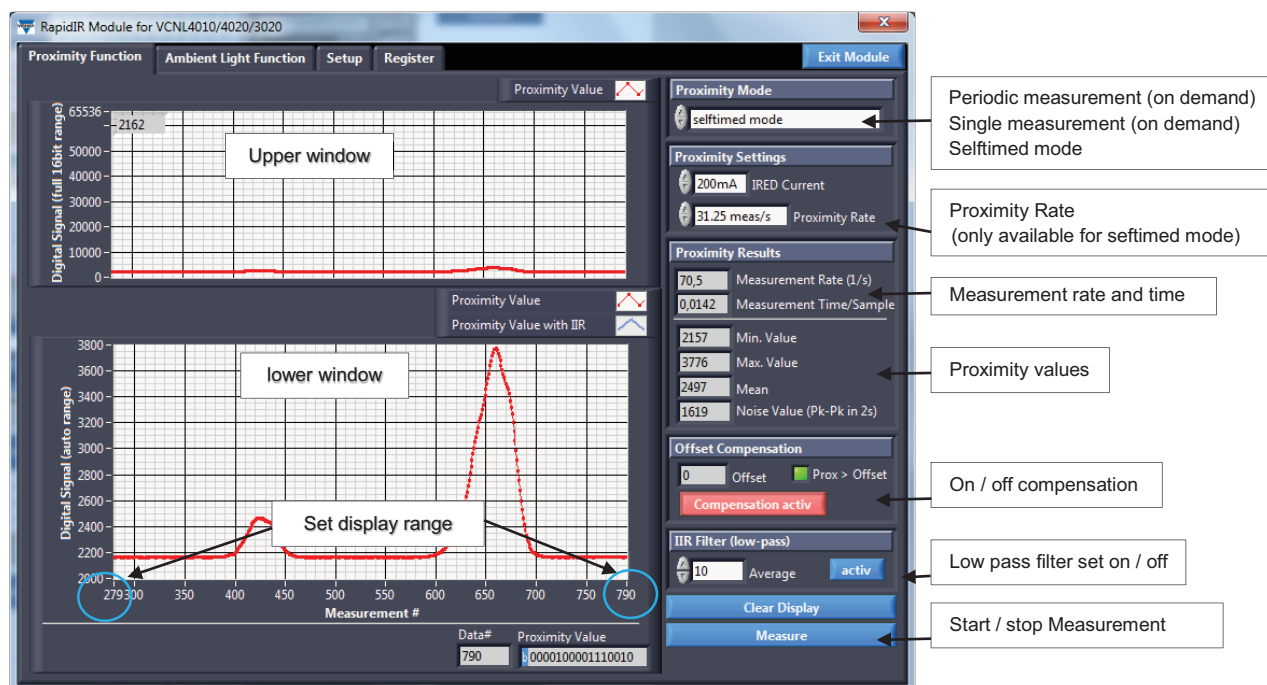
Lower Window

Displays only the active or dynamic range. The y-axis represents the number of counts and will change depending on the sensor reading.

Proximity Measurement

Click on the measure button to initiate a measurement.

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Screen Shot 1

Offset

Without an object in range, the upper window shows an offset of approximately 2000 counts. The lower windows shows the exact values. This offset is a result of optical crosstalk and digital noise. In an application where a window is placed over the top of the sensor, the offset value can be as high as 5000 to 20 000 counts.

For the kit, the offset value is calculated by averaging the last 2 seconds of counts. In a ready-made application the offset value should be subtracted from incoming proximity readings and the resultant used to determine object proximity.

Object with Range of 200 mm and 100 mm

Assuming the offset value is 2170 counts, at a range of 200 mm, the reflection from a hand results in an output count of 2190 counts. This is 20 counts higher than the offset or noise floor. At a range of 100 mm, the reflection of the object results in an output count of 2270 counts. This is 100 counts higher than the offset value. By clicking the "Compensate Offset" button, the software simulates this subtraction. When this function is active, the button will be red as in screen shot 1. With compensation offset active, the digital signal in the lower frame will display only the counts related to the reflected signal, effectively zeroing the offset. This is a feature of the kit only. In actual applications, the offset value should be subtracted to obtain actual proximity or ambient counts.

Object with Range of 10 mm and 5 mm

With compensation offset active, at a range of 10 mm, the reflection of the object (hand) results in an output count of approximately 8000 counts. At a range of 5 mm, the reflection results in an output count of approximately 30 000 counts. Again, with compensation offset active, the digital signal in the lower frame shows only the counts related to the reflected signal.

Display Range

Displays a specific range of readings by entering a minimum reading number on the right side of the x-axis and the maximum reading number on the left side of the x-axis. Type over the existing displayed value. This feature is only available when measurements have stopped.

Register Values

The actual proximity value is available by selecting the Register Value tab. The high 16-bit value is stored in register #7 and the low value is stored in register #8. Register #7 equals 8 (dec) [00001000] and register #8 equals 114 (dec) [01110010]. See screen shot 2.