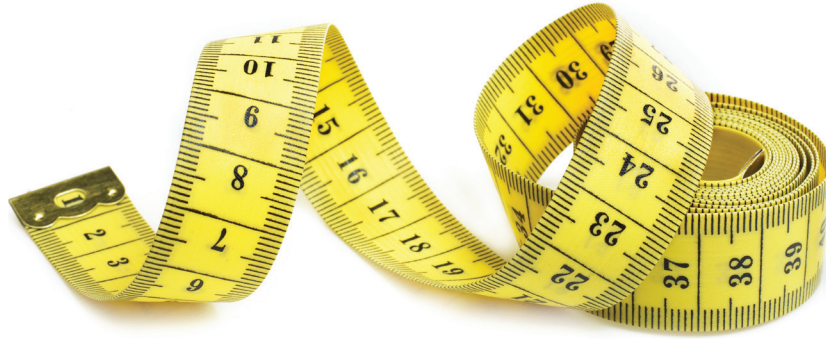


**OPTOELECTRONICS****Proximity Sensors****Proximity Sensing
from 2 mm to 2 m**

Many applications require a sensor that detects not only the presence of an object, but also its relative proximity. Vishay's proximity sensors emit pulses of infrared light which reflect off an object back to the sensor. The strength of that reflected signal is used to determine the proximity of the object. A change in the reflected signal strength can be used to determine if an object is moving toward or away from the sensor.

APPLICATIONS

- Smart phone display control
- Digital camera display control
- Monitor sleep / wake function
- Touchless light switch
- Refrigerator water / ice dispenser
- Paper towel dispenser
- Soap dispenser
- Automatic toilet flushing
- Automatic water faucet
- Industrial door or latch switch

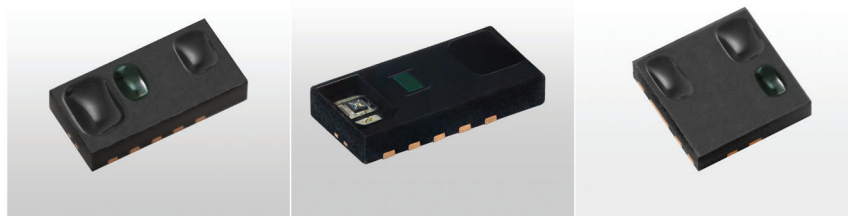
RESOURCES

- VCNL3020 datasheet: <http://www.vishay.com/doc?84150>
- VCNL4020 datasheet: <http://www.vishay.com/doc?83476>
- VCNL4020X01 datasheet: <http://www.vishay.com/doc?84177>
- Proximity receivers: <http://www.vishay.com/ir-receiver-modules/proximity-sensor/>
- VCNL3020 application note: <http://www.vishay.com/docs/84139/designingvcnl3020.pdf>
- VCNL4020 application note: <http://www.vishay.com/docs/84136/designingvcnl4020.pdf>
- Current calculator: <http://www.vishay.com/optoelectronics/opto-sensors-calculator/>
- Extended detection range: http://www.vishay.com/docs/84225/extended_detection_range.pdf
- Window design: <http://www.vishay.com/docs/82506/windowsi.pdf>

One of the World's Largest Manufacturers of
Discrete Semiconductors and Passive Components



INTEGRATED PROXIMITY AND AMBIENT LIGHT SENSORS



VCNL3020, VCNL4020

VCNL4020X01

VCNL4010

The VCNL4010, VCNL4020, and VCNL4020X01 are fully integrated proximity and ambient light sensors. Fully integrated means they contain the infrared emitter and photo detector for proximity, an ambient light sensor, a signal processing IC, and I²C communication interface. VCNL4020X01 is qualified for automotive applications. It has a maximum operating temperature of 105 °C. The VCNL3020 supports only proximity sensing; it does not contain an ambient light sensor. With full 16-bit resolution for both the proximity and ambient features, user-defined interrupt levels, and multiple packaging options, the VCNL portfolio will fulfill your requirements.

FEATURES

- Proximity function
 - 16-bit resolution
 - Excellent crosstalk immunity
 - Programmable LED drive current from 10 mA to 200 mA in 10 mA steps
 - Programmable measurement rate from 1 Hz to 250 Hz
 - Proximity distance up to 20 cm (8 in.)
 - Includes driver for an external emitter for increased range
- Ambient light function
 - Built-in ambient light PIN photodiode with close to human eye sensitivity characteristic
 - 16-bit dynamic range for ambient light detection from 0.25 lx to 16 klx
 - 100 Hz and 120 Hz flicker noise rejection

APPLICATIONS



SMARTPHONES



REARVIEW MIRROR



LCD DISPLAY



SOAP DISPENSER



TOWEL DISPENSER



TOUCHLESS LIGHT SWITCH



OPTOELECTRONICS

Proximity Sensors

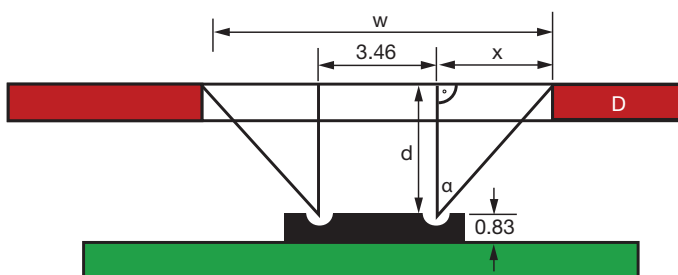
VCNL PRODUCT FAMILY

PART NUMBER	PACKAGE		INTEGRATED COMPONENTS			OPERATING TEMP RANGE (°C)	AEC-Q101
	L X W (mm)	HEIGHT (mm)	INFRARED EMITTER	PROXIMITY DETECTOR	AMBIENT LIGHT SENSOR		
VCNL4020X01	4.90 x 2.40	0.83	•	•	•	-40 to 105	•
VCNL3020	4.90 x 2.40	0.83	•	•	x	-25 to 85	x
VCNL4010	3.95 x 3.95	0.75	•	•	•	-25 to 85	x
VCNL4020	4.90 x 2.40	0.83	•	•	•	-25 to 85	x

WINDOW SIZE

The ideal window sizes for the VCNL4020X01/VCNL4020/VCNL3020 based on the depth of the sensor are shown in the table below. Different shapes and smaller sizes are possible but performance may be impacted.

d (mm)	x (0.84 d)	w (3.46 + 2x)
0.5	0.42	4.30
1.0	0.84	5.14
1.5	1.26	6.02
2.0	1.68	6.82
2.5	2.10	7.66
3.0	2.52	8.50



CURRENT CONSUMPTION

When only the I²C interface is active, the current consumption is only 1.5 μ A. When proximity is active, the current consumption is a function of the emitter current and the measurements per second. A current calculator is available at <http://www.vishay.com/optoelectronics/opto-sensors-calculator/>.

Proximity Sensor

Select Proximity Sensor Parameters

Measurements per Second

Emitter Current

Light Sensor

Select Light Sensor Parameters On Off

Measurements per Second

Averaging

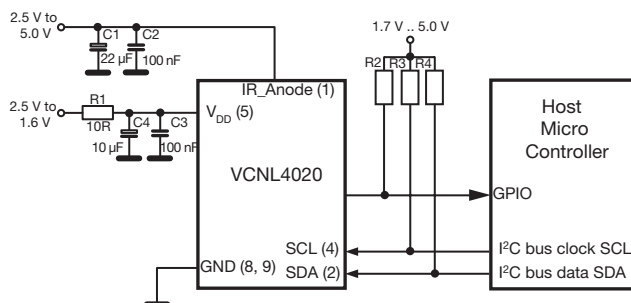
Estimated Current Consumption

μ A

Reset

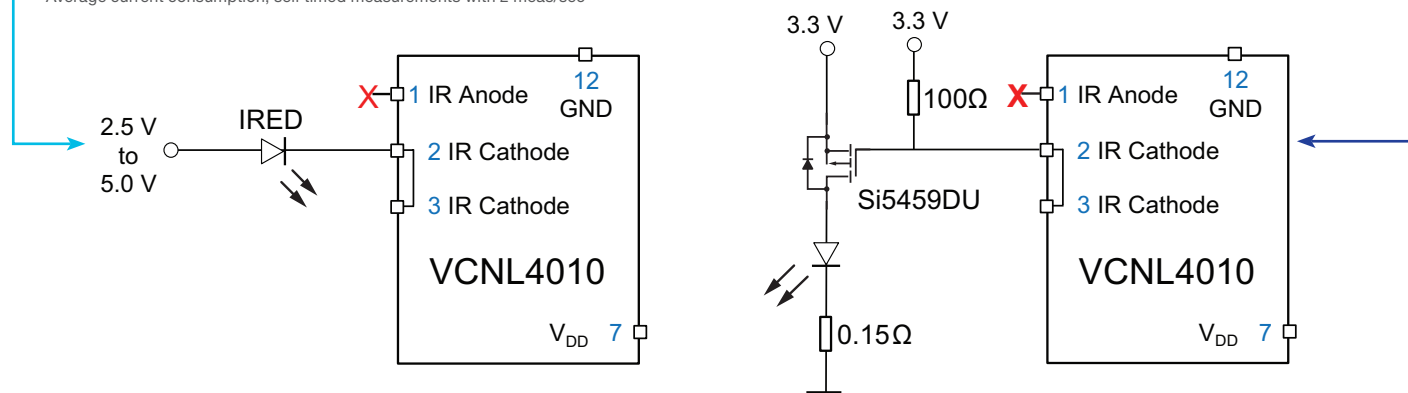
More Information

Vishay's VCNL portfolio sense proximity ranges from 2 mm to 1 m. The VCNL3020, VCNL4020, and VCNL4010 by themselves feature a sensing range up to 20 cm. Add an external emitter and the range increases to up to 50 cm. Add an external driver and the range again increases to up to 1 m.



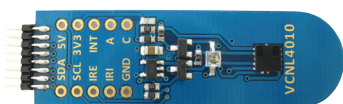
PARTS	IR EMITTER	OBJECT REFLECTIVITY (%)	RANGE	IRED CURRENT (mA)	CURRENT CONSUMPTION (mA) *	RANGE RESOLUTION (%)
VCNLx	Integrated	100 %	3 mm - 13 mm	40 mA	0.007 mA	< 1 %
	Integrated	18 %	2 mm - 15 cm	200 mA	0.031 mA	± 5.0 %
VCNLx with External Emitter	VSMF2890X01	18 %	2 mm - 20 cm	200 mA	0.031 mA	± 5.0 %
	VSMF2890X01	18 %	20 cm - 50 cm	200 mA	0.031 mA	± 10.0 %
VCNLx with External Emitter and Driver	VSMY2850	18 %	1 cm - 100 cm	1 A	0.16 mA	± 10.0 %
	VSMY98545	18 %	10 cm - 100 cm	4 A	0.6 mA	± 10.0 %

* Average current consumption, self timed measurements with 2 meas/sec



EVALUATION KITS

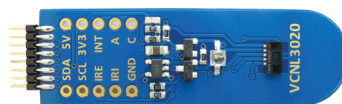
An evaluation kit is available, along with an add-on demo board for each of the sensors. Contact any catalog distributor or a local Vishay sales representative to purchase the Sensor Starter Kit. Please contact sensorstechsupport@vishay.com in order to receive the VCNL4010, VCNL4020X01, or VCNL3020 add-on boards.



VCNL4010



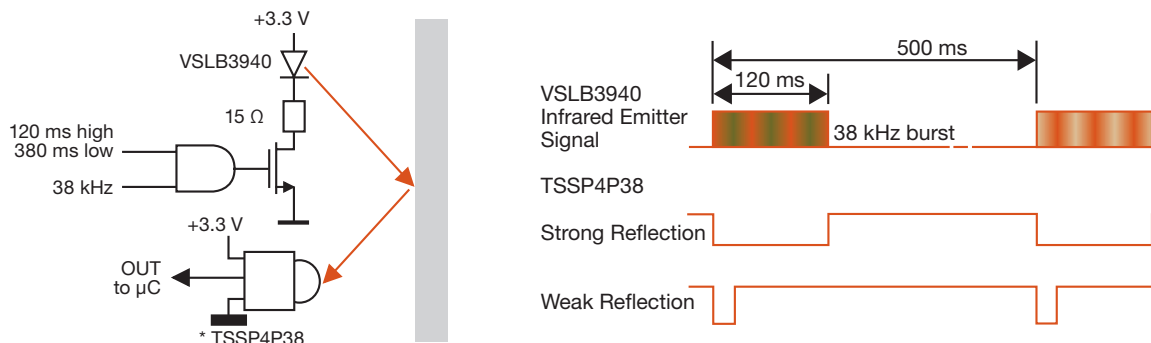
VCNL4020



VCNL3020

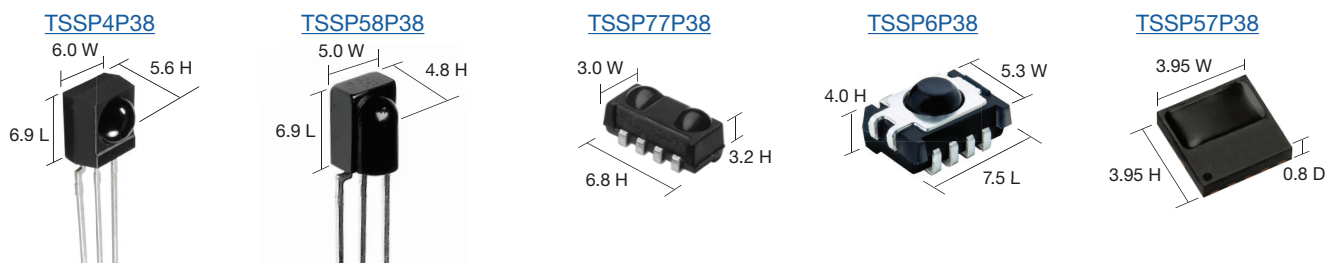
IR RECEIVERS

The IR receiver-based sensors sense proximity using an onboard AGC circuit that reduces the gain in response to a reflected long burst signal from an IR emitter. The amount of time required to completely suppress the signal, and correspondingly the output pulse width, is proportional to the strength of the signal, which in turn is inversely proportional to the distance to the object. A near object reflects more light, resulting in a longer pulse width. A longer pulse width takes more time to suppress. Based on this time, the relative proximity of the object can be determined. Depending on the IR Emitter and Sensor package (see table below), ranges from 5 cm to 2 meters can be sensed.



IR EMITTER	OBJECT REFLECTIVITY (%)	RANGE (cm)	RESISTOR VALUE	IRE D CURRENT (mA)	CURRENT CONSUMPTION (mA)	RANGE RESOLUTION (%)
V SMB3940	60 %	5 to 20	2.2 kΩ	5	0.67	± 2.5
V SLB3940	15 %	8 to 50	2.2 kΩ	5	0.67	± 5.0
		20 to 100	390 Ω	15	0.96	
		40 to 200	15 Ω	50	2.81	

PROXIMITY SENSORS



PROXIMITY (PWM Out)	REFLECTIVE RANGE (m)	SUPPLY VOLTAGE (V)	RESPONSE TIME (μs)	CURRENT CONSUMPTION (mA)
TSSP4P38	0.2 to 2	2.5 to 5.5	300	0.7
TSSP58P38				
TSSP6P38				
TSSP77P38				
TSSP57P38				

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