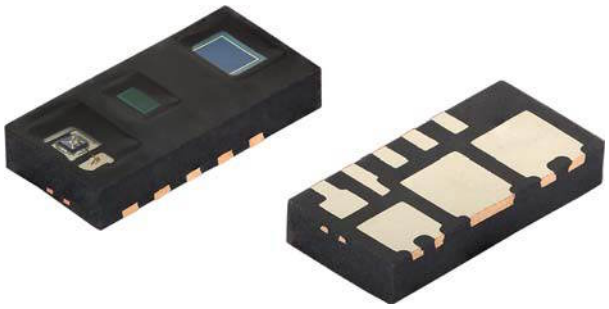
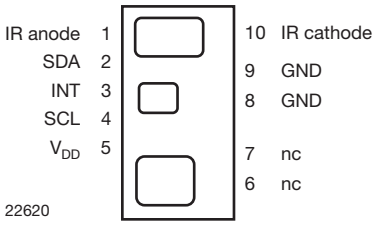
High Resolution Digital Biosensor for Wearable Applications With I²C Interface





FEATURES

- Package type: surface-mount
- Package form: SMD
- Dimensions (L x W x H in mm): 4.90 x 2.40 x 0.83
- Integrated modules: infrared emitter (IRED), ambient light sensor (ALS), photo diode (PD), and signal conditioning IC
- Interrupt function
- Supply voltage range V_{DD}: 2.5 V to 3.6 V
- Supply voltage range IR anode: 2.5 V to 5 V
- Communication via I²C interface
- I²C bus H-level range: 1.7 V to 5 V
- Floor life: 72 h, MSL 4, according to J-STD-020
- Low stand by current consumption: 1.5 µA
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

Pb-free

e4

RoHS COMPLIANT

HALOGEN FREE GREEN (5-2008)

DESCRIPTION

The VCNL4020C is a fully integrated biosensor and ambient light sensor. Fully integrated means that the infrared emitter is included in the package. It has 16 bit resolution. It includes a signal processing IC and features standard I²C communication interface. It features an interrupt function.

APPLICATIONS

- Wearables
- Health monitoring
- Pulse oximetry

OPTICAL BIOSENSORS FUNCTION

- Built-in infrared emitter and broader sensitivity photodiode allows to also work with green and red LEDs
- 16 bit effective resolution ensures excellent cross talk immunity
- Programmable LED drive current from 10 mA to 200 mA in 10 mA steps
- Excellent ambient light suppression through signal modulation

AMBIENT LIGHT FUNCTION

- Built-in ambient light photo-pin-diode with close-to-human-eye sensitivity
- 16 bit dynamic range from 0.25 lx to 16 klx
- 100 Hz and 120 Hz flicker noise rejection

PRODUCT SUMMARY

PART NUMBER	OPERATING VOLTAGE RANGE (V)	I²C BUS VOLTAGE RANGE (V)	LED PULSE CURRENT (1) (mA)	AMBIENT LIGHT RANGE (lx)	SPECTRAL BANDWIDTH RANGE $\lambda_{0.5}$ (nm)	OUTPUT CODE	ADC RESOLUTION BIOSENSOR / AMBIENT LIGHT SENSOR
VCNL4020C	2.5 to 3.6	1.7 to 5	10 to 200	0.25 to 16 383	550 to 970	16 bit, I²C	16 bit / 16 bit

Note

(1) Adjustable through I²C interface

ORDERING INFORMATION			
ORDERING CODE	**PACKAGING**	**VOLUME (1)**	**REMARKS**
VCNL4020C-GS08	Tape and reel	MOQ: 3300 pcs	4.90 mm x 2.40 mm x 0.83 mm
VCNL4020C-GS18		MOQ: 13 000 pcs	

Note

(1) MOQ: minimum order quantity

ABSOLUTE MAXIMUM RATINGS (T_{amb} = 25 °C, unless otherwise specified)					
PARAMETER	**TEST CONDITION**	**SYMBOL**	**MIN.**	**MAX.**	**UNIT**
Supply voltage		V_{DD}	-0.3	5.5	V
Operation temperature range		T_{amb}	-25	+85	°C
Storage temperature range		T_{stg}	-25	+85	°C
Total power dissipation	$T_{amb} \leq 25$ °C	P_{tot}	-	50	mW
Junction temperature		T_j	-	100	°C

BASIC CHARACTERISTICS (T_{amb} = 25 °C, unless otherwise specified)						
PARAMETER	**TEST CONDITION**	**SYMBOL**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
Supply voltage V_{DD}			2.5	-	3.6	V
Supply voltage IR anode			2.5	-	5	V
I^2C bus H-level range			1.7	-	5	V
INT H-level range			1.7	-	5	V
INT low voltage	3 mA sink current		-	-	0.4	V
Current consumption	Standby current, no LED-operation		-	1.5	2	µA
Current consumption pulse mode incl. LED (averaged)	2 measurements per second, LED current 20 mA		-	5	-	µA
	250 measurements per second, LED current 20 mA		-	520	-	µA
	2 measurements per second, LED current 200 mA		-	35	-	µA
	250 measurements per second, LED current 200 mA		-	4	-	mA
Current consumption ambient light mode	2 measurements per second averaging = 1		-	2.5	-	µA
	8 measurements per second averaging = 1		-	10	-	µA
	2 measurements per second averaging = 64		-	160	-	µA
	8 measurements per second averaging = 64		-	640	-	µA
Ambient light resolution	Digital resolution (LSB count)		-	0.25	-	lx
Ambient light output	E_V = 100 lx averaging = 64		-	400	-	counts
I^2C clock rate range		f_{SCL}	-	-	3400	kHz