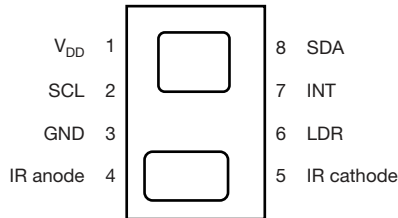
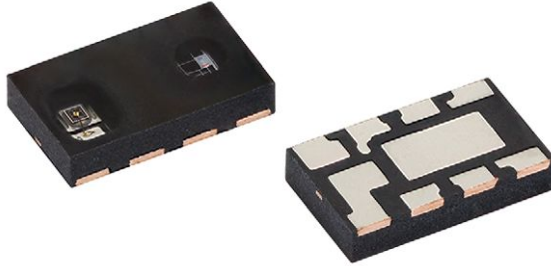


Fully Integrated Proximity Sensor With Infrared Emitter, I²C Interface, and Interrupt Function



LINKS TO ADDITIONAL RESOURCES


[3D Models](#)

[Design Tools](#)

[Application Notes](#)

[Technical Notes](#)

DESCRIPTION

VCNL3030X01 integrates a proximity sensor (PS) and a high power IRED into one small package. It incorporates photodiodes, amplifiers, and analog to digital converting circuits into a single chip by CMOS process. The PS offers a programmable interrupt with individual high and low thresholds offers the power savings on the microcontroller.

FEATURES

- Package type: surface-mount
- Dimensions (L x W x H in mm): 4.0 x 2.36 x 0.75
- AEC-Q101 qualified
- Integrated modules: infrared emitter (IRED), proximity sensor (PS), and signal conditioning IC
- Low power consumption I²C (SMBus compatible) interface
- Output type: I²C bus (PS)
- Operation voltage: 2.5 V to 3.6 V
- Floor life: 168 h, MSL 3, according to J-STD-020
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

 AUTOMOTIVE
GRADE

RoHS
COMPLIANT
HALOGEN
FREE
GREEN
(5-2008)

PROXIMITY FUNCTION

- Immunity to red glow (940 nm IRED)
- Programmable IRED sink current
- Intelligent cancellation to reduce cross talk phenomenon
- Smart persistence scheme to reduce PS response time
- Selectable for 12- / 16-bit PS output data

INTERRUPT

- Programmable interrupt function for PS with upper and lower thresholds
- Adjustable persistence to prevent false triggers for PS

APPLICATIONS

- Force feedback applications
- Proximity / optical switch for consumer, computing, automotive and industrial devices

PRODUCT SUMMARY						
PART NUMBER	OPERATING RANGE ⁽¹⁾ (mm)	OPERATING VOLTAGE RANGE (V)	I ² C BUS VOLTAGE RANGE (V)	IRED PULSE CURRENT ⁽²⁾ (mA)	OUTPUT CODE	ADC RESOLUTION PROXIMITY / AMBIENT LIGHT
VCNL3030X01	0 to 300	2.5 to 3.6	1.8 to 5.5	200	16 bit, I ² C	16 bit / -

Notes

- ⁽¹⁾ Part should be operated in dark condition (not in direct sunlight)
⁽²⁾ Adjustable through I²C interface



ORDERING INFORMATION			
ORDERING CODE	PACKAGING	VOLUME ⁽¹⁾	REMARKS
VCNL3030X01-GS08	Tape and reel	MOQ: 3300 pcs	4.0 mm x 2.36 mm x 0.75 mm
VCNL3030X01-GS18		MOQ: 13 000 pcs	

Note

(1) MOQ: minimum order quantity

SLAVE ADDRESS OPTIONS	
ORDERING CODE	SLAVE ADDRESS (7 bit)
VCNL3030X01-GS08	0x41
VCNL3030X01-GS18	

ABSOLUTE MAXIMUM RATINGS ($T_{amb} = 25\text{ }^{\circ}\text{C}$, unless otherwise specified)					
PARAMETER	TEST CONDITION	SYMBOL	MIN.	MAX.	UNIT
Supply voltage		V_{DD}	2.5	3.6	V
Operation temperature range		T_{amb}	-40	+105	$^{\circ}\text{C}$
Storage temperature range		T_{stg}	-40	+110	$^{\circ}\text{C}$

RECOMMENDED OPERATING CONDITIONS ($T_{amb} = 25\text{ }^{\circ}\text{C}$, unless otherwise specified)					
PARAMETER	TEST CONDITION	SYMBOL	MIN.	MAX.	UNIT
Supply voltage		V_{DD}	2.5	3.6	V
Operation temperature range		T_{amb}	-40	+105	$^{\circ}\text{C}$
I ² C bus operating frequency		$f_{(I2CCLK)}$	10	400	kHz

PIN DESCRIPTIONS			
PIN ASSIGNMENT	SYMBOL	TYPE	FUNCTION
1	V_{DD}	-	Power supply input
2	SCL	I	I ² C digital bus clock input
3	GND	-	Ground
4	IR ANODE	I	Anode for IRED
5	IR CATHODE	I	Cathode (IRED) connection
6	LDR	I	IRED driver input
7	INT	O	Interrupt pin
8	SDA	I / O (open drain)	I ² C data bus data input / output

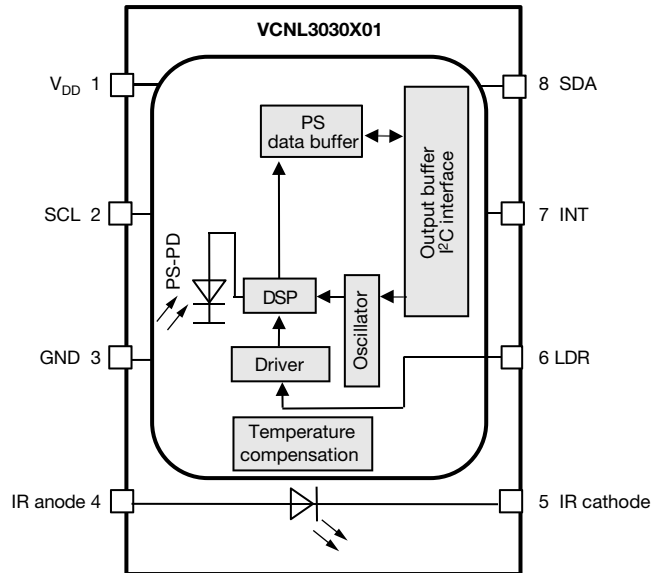
BLOCK DIAGRAM


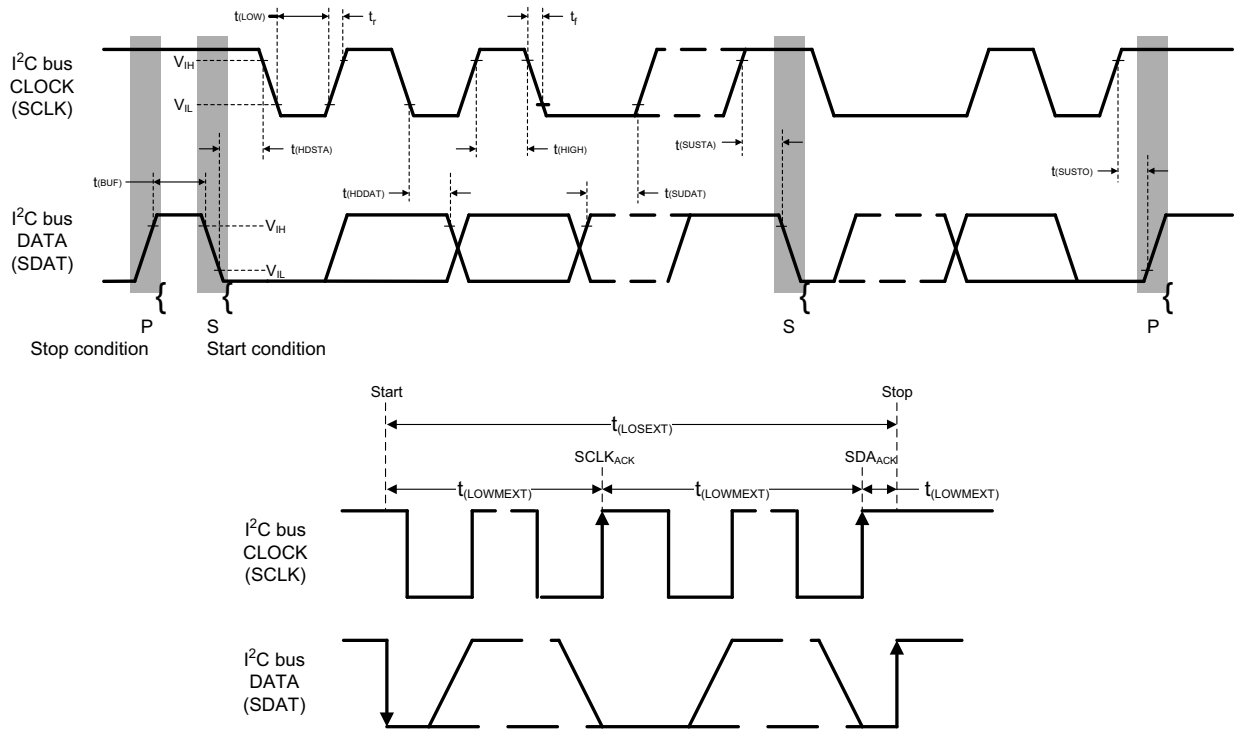
Fig. 1 - Detailed Block Diagram

BASIC CHARACTERISTICS ($T_{amb} = 25\text{ }^{\circ}\text{C}$, unless otherwise specified)						
PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT
Supply voltage		V_{DD}	2.5	-	3.6	V
Supply current	Excluded LED driving	I_{DD}	-	200	-	μA
	Light condition = dark, $V_{DD} = 3.3\text{ V}$	$I_{DD}(\text{SD})$	-	0.2	-	μA
I ² C supply voltage		$V_{PULL\ UP}$	1.8	-	5.5	V
I ² C signal input	Logic high	$V_{DD} = 3.3\text{ V}$	V_{IH}	-	-	V
	Logic low		V_{IL}	-	0.4	
	Logic high	$V_{DD} = 2.6\text{ V}$	V_{IH}	1.4	-	V
	Logic low		V_{IL}	-	0.4	
Peak sensitivity wavelength of PS		λ_p	-	720	-	nm
Full PS counts	12-bit / 16-bit resolution		-	-	4096 / 65 535	steps
PS detection range	Kodak gray card ⁽¹⁾		0	-	300	mm
Operating temperature range		T_{amb}	-40	-	+105	$^{\circ}\text{C}$
LED_Anode voltage			-	-	5.5	V
IRED driving current	⁽²⁾		-	200	-	mA

Notes

- Test condition: $V_{DD} = 3.3\text{ V}$, temperature: $25\text{ }^{\circ}\text{C}$
- ⁽¹⁾ Part should be operated in dark condition (not in direct sunlight)
- ⁽²⁾ Programmable between 50 mA and 200 mA; based on IRED on / off duty ratio = 1/40, 1/80, 1/160, and 1/320

I²C BUS TIMING CHARACTERISTICS ($T_{amb} = 25\text{ }^{\circ}\text{C}$, unless otherwise specified)						
PARAMETER	SYMBOL	STANDARD MODE		FAST MODE		UNIT
		MIN.	MAX.	MIN.	MAX.	
Clock frequency	$f_{(I2CCLK)}$	10	100	10	400	kHz
Bus free time between start and stop condition	$t_{(BUF)}$	4.7	-	1.3	-	μs
Hold time after (repeated) start condition; after this period, the first clock is generated	$t_{(HDSTA)}$	4.0	-	0.6	-	μs
Repeated start condition setup time	$t_{(SUSTA)}$	4.7	-	0.6	-	μs
Stop condition setup time	$t_{(SUSTO)}$	4.0	-	0.6	-	μs
Data hold time	$t_{(HDDAT)}$	-	3450	-	900	ns
Data setup time	$t_{(SUDAT)}$	250	-	100	-	ns
I ² C clock (SCK) low period	$t_{(LOW)}$	4.7	-	1.3	-	μs
I ² C clock (SCK) high period	$t_{(HIGH)}$	4.0	-	0.6	-	μs
Clock / data fall time	t_f	-	300	-	300	ns
Clock / data rise time	t_r	-	1000	-	300	ns


 Fig. 2 - I²C Bus Timing Diagram

PARAMETER TIMING INFORMATION

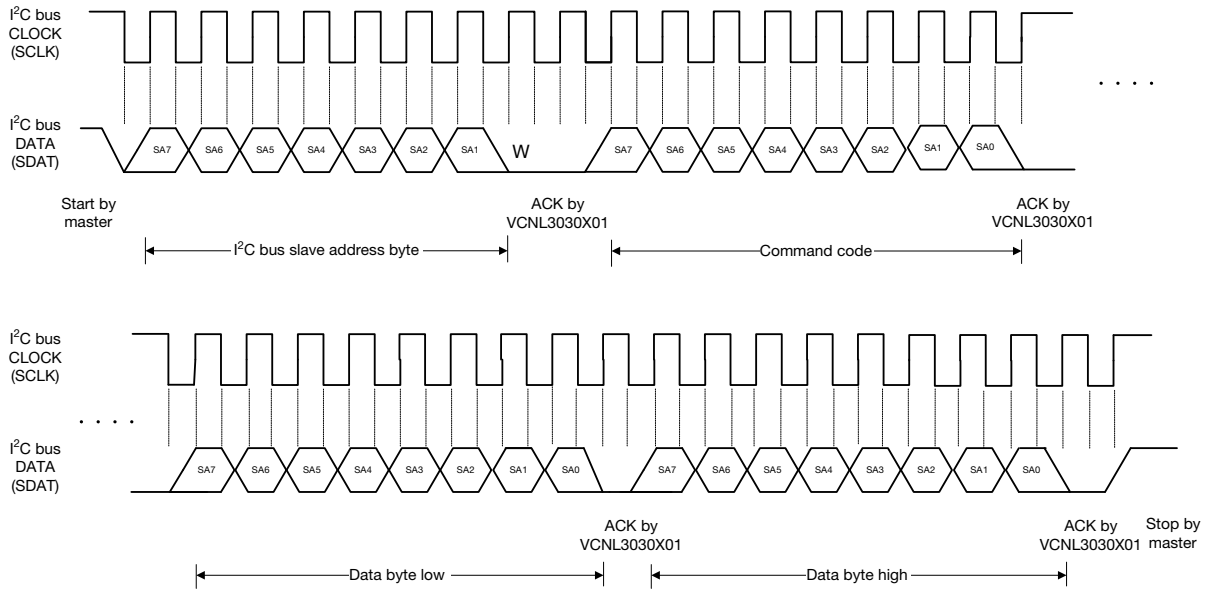


Fig. 3 - I²C Bus Timing for Sending Word Command Format

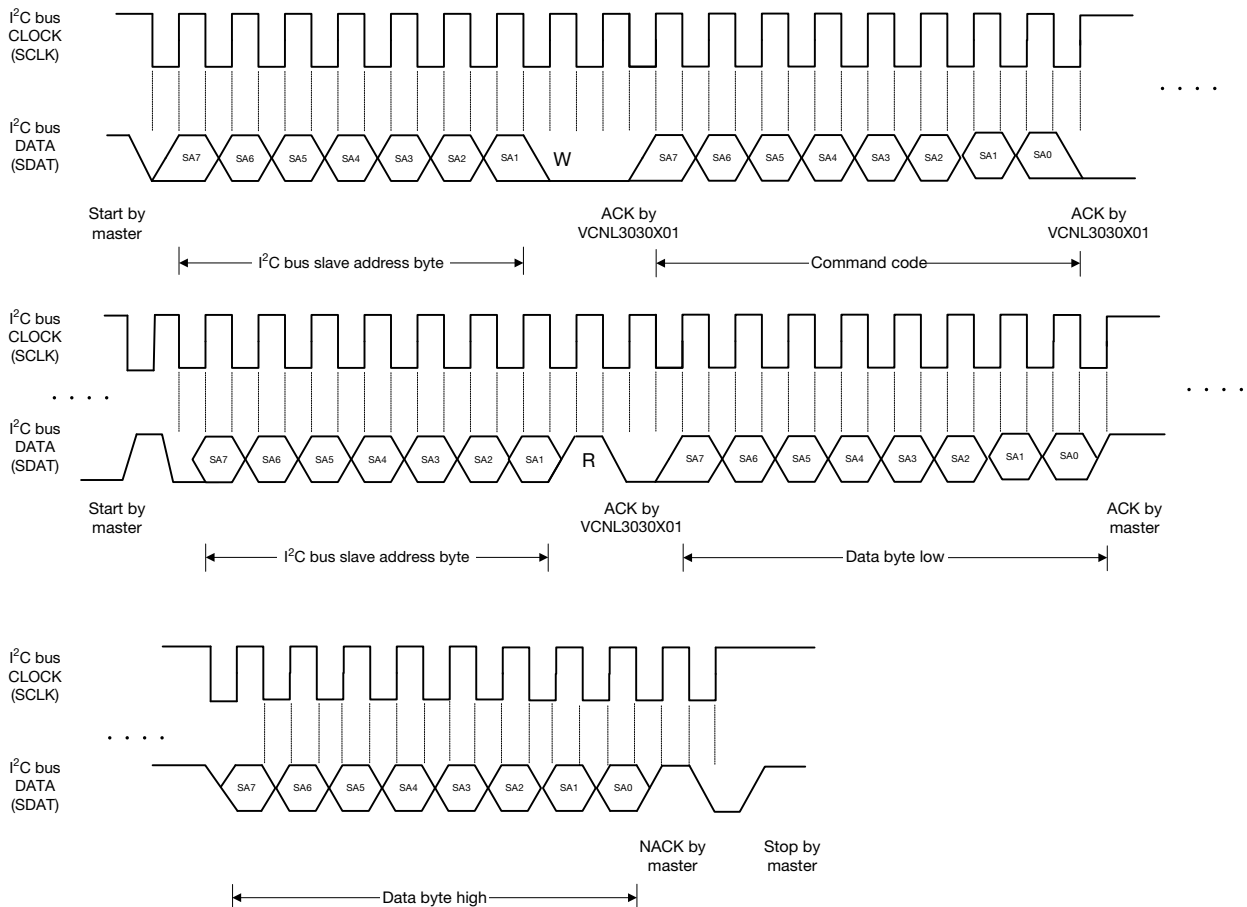


Fig. 4 - I²C Bus Timing for Receiving Word Command Format

TYPICAL PERFORMANCE CHARACTERISTICS ($T_{amb} = 25\text{ }^{\circ}\text{C}$, unless otherwise specified)

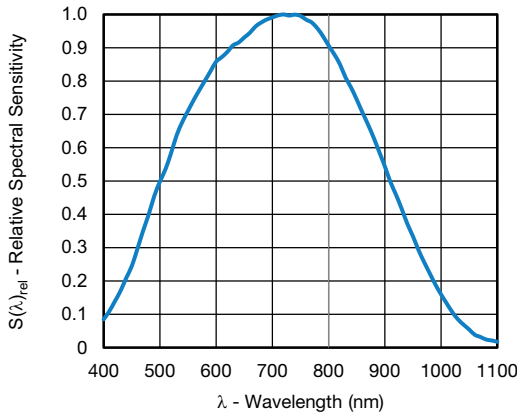


Fig. 5 - Normalized Spectral Response (PS channel)

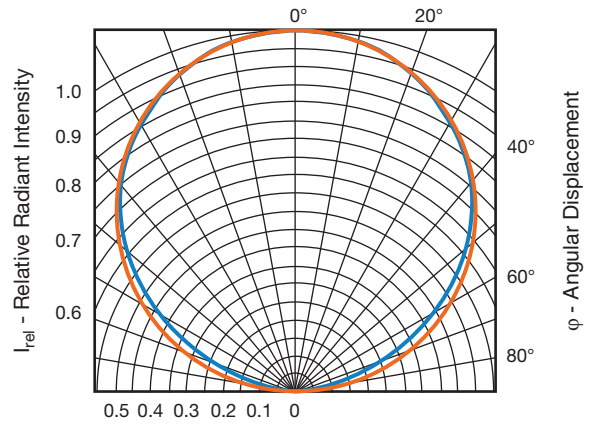


Fig. 8 - Relative Radiant Intensity Emitter vs. Angular Displacement

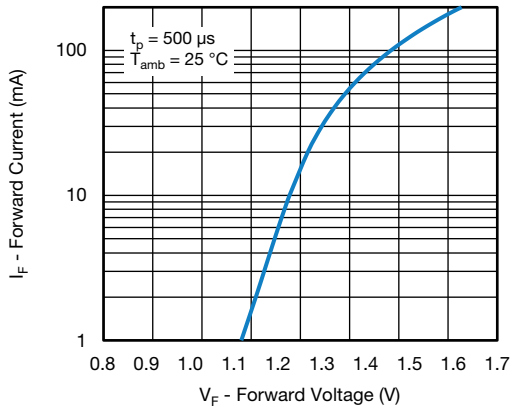


Fig. 6 - Forward Current $I_F = f(V_F)$ for LED

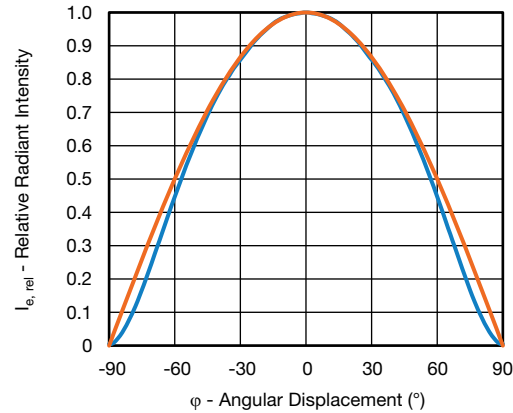


Fig. 9 - Relative Radiant Intensity Emitter vs. Angular Displacement

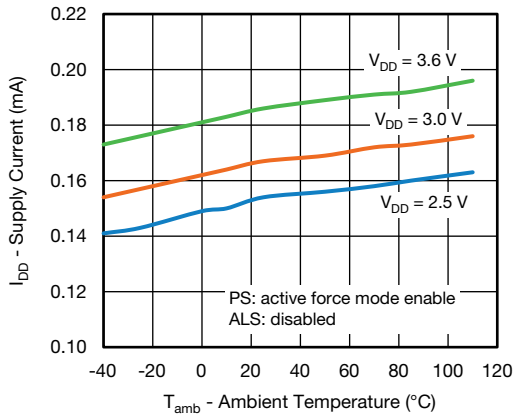


Fig. 7 - Supply Current vs. Ambient Temperature With PS = Active

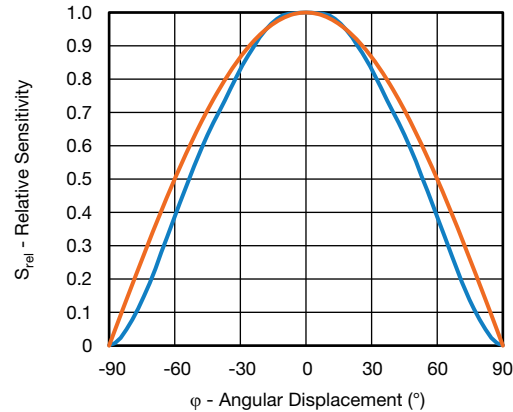


Fig. 10 - Relative Sensitivity vs. Angular Displacement

APPLICATION INFORMATION
Pin Connection with the Host

VCNL3030X01 integrates proximity sensor and IRED all together with I²C interface. It is very easy for the baseband (CPU) to access PS data via I²C interface without extra software algorithms. The hardware schematic is shown in the following diagram.

Two additional capacitors in the circuit can be used for the following purposes: (1) the 0.1 μ F capacitor near the V_{DD} pin is used for power supply noise rejection, (2) the 2.2 μ F capacitor - connected to the anode - is used to prevent the IRED voltage from instantly dropping when the IRED is turned on, and (3) 2.2 k Ω is suitable for the pull up resistor of I²C except for the 8.2 k Ω applied on the INT pin.

Note

- IR cathode and LDR: pins need to be connected together externally

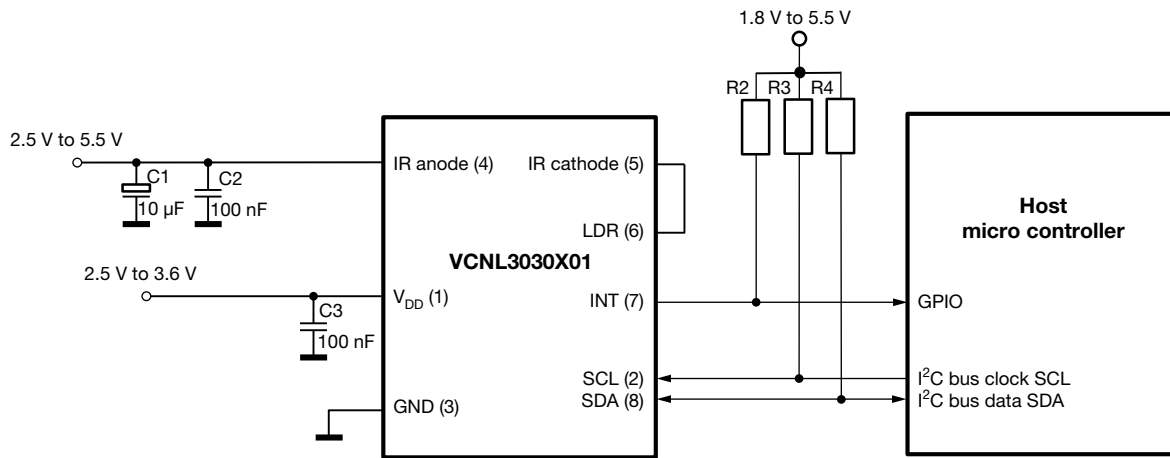


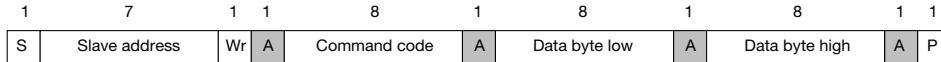
Fig. 11 - Circuitry with Two Separate Power Supply Sources



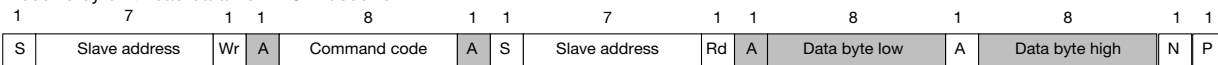
Digital Interface

VCNL3030X01 applies single slave address 0x41 (HEX) of 7-bit addressing following I2C protocol. All operations can be controlled by the command register. The simple command structure helps users easily program the operation setting and latch the light data from VCNL3030X01. As Fig. 17 shows, VCNL3030X01's I2C command format is simple for read and write operations between VCNL3030X01 and the host. The white sections indicate host activity and the gray sections indicate VCNL3030X01's acknowledgement of the host access activity. Write word and read word protocol is suitable for accessing registers for 12-bit / 16-bit PS data. Interrupt can be cleared by reading data out from register: INT_Flag. All command codes should follow read word and write word protocols.

Send byte → write command to VCNL3030X01



Receive byte → read data from VCNL3030X01



S = start condition
P = stop condition
A = acknowledge
N = no acknowledge
Shaded area = VCNL3030X01 acknowledge

Fig. 12 - Write Word and Read Word Protocol

Function Description

For proximity sensor function, VCNL3030X01 supports different kinds of mechanical designs to achieve the best proximity detection performance for any color of object with more flexibility. The basic PS function settings, such as duty ratio, integration time, interrupt, and PS enable / disable, and persistence, are handled by the register: PS_CONF1. Duty ratio controls the PS response time. Integration time represents the duration of the energy being received. The interrupt is asserted when the PS detection levels over the high threshold level setting (register: PS_THDH) or lower than low threshold (register: PS_THDL). If the interrupt function is enabled, the host reads the PS output data from VCNL3030X01 that saves host loading from periodically reading PS data. More than that, INT flag (register: INT_Flag) indicates the behavior of INT triggered under different conditions. PS persistence (PS_PERS) sets up the PS INT asserted conditions as long as the PS output value continually exceeds the threshold level. The intelligent cancellation level can be set on register: PS_CANC to reduce the cross talk phenomenon.

VCNL3030X01 also supports an easy use of proximity detection logic output mode that outputs just high / low levels saving loading from the host. Normal operation mode or proximity detection logic output mode can be selected on the register: PS_MS. A smart persistence is provided to get faster PS response time and prevent false trigger for PS. Descriptions of each slave address operation are shown in table 1.

**TABLE 1 - COMMAND CODE AND REGISTER DESCRIPTION**

COMMAND CODE	DATE BYTE LOW / HIGH	REGISTER NAME	R / W	DEFAULT VALUE	FUNCTION DESCRIPTION
0x00	L	Reserved	R / W	0x01	Reserved
	H	Reserved	R / W	0x01	Reserved
0x01	L	Reserved	R / W	0x00	Reserved
	H	Reserved	R / W	0x00	Reserved
0x02	L	Reserved	R / W	0x00	Reserved
	H	Reserved	R / W	0x00	Reserved
0x03	L	PS_CONF1	R / W	0x01	PS duty ratio, integration time, persistence, and PS enable / disable
	H	PS_CONF2	R / W	0x00	PS gain, PS output resolution, PS interrupt trigger
0x04	L	PS_CONF3	R / W	0x00	PS smart persistence, active force mode
	H	PS_MS	R / W	0x00	LED current selection
0x05	L	PS_CANC_L	R / W	0x00	PS cancellation level setting
	H	PS_CANC_M	R / W	0x00	PS cancellation level setting
0x06	L	PS_THDL_L	R / W	0x00	PS low interrupt threshold setting LSB byte
	H	PS_THDL_M	R / W	0x00	PS low interrupt threshold setting MSB byte
0x07	L	PS_THDH_L	R / W	0x00	PS high interrupt threshold setting LSB byte
	H	PS_THDH_M	R / W	0x00	PS high interrupt threshold setting MSB byte
0x08	L	PS_Data_L	R	0x00	PS LSB output data
	H	PS_Data_M	R	0x00	PS MSB output data
0x09	L	Reserved	R	0x00	Reserved
	H	Reserved	R	0x00	Reserved
0x0A	L	Reserved	R	0x00	Reserved
	H	Reserved	R	0x00	Reserved
0x0B	L	Reserved	R	0x00	Reserved
	H	Reserved	R	0x00	Reserved
0x0C	L	Reserved	R	0x00	Reserved
	H	Reserved	R	0x00	Reserved
0x0D	L	Reserved	R	0x00	Reserved
	H	INT_Flag	R	0x00	PS interrupt flags, PS sunlight protection mode flag
0x0E	L	ID_L	R	0x80	Device ID LSB
	H	ID_M	R	0x00	For version with 0x41 as device address; 0x10 for version with 0x51, 0x20 for version with 0x40 and 0x30 for version with 0x60 as device address

Note

- All of reserved register are used for internal test. Please keep as default setting

Command Register Format

VCNL3030X01 provides an 8-bit command register for PS controlling. The description of each command format is shown in following tables.

TABLE 2 - REGISTER: PS_CONF1 DESCRIPTION

REGISTER: PS_CONF1		COMMAND CODE: 0x03_L (0x03 DATA BYTE LOW)
Command	Bit	Description
PS_Duty	7 : 6	(0 : 0) = 1/40, (0 : 1) = 1/80, (1 : 0) = 1/160, (1 : 1) = 1/320 PS IRED on / off duty ratio setting
PS_PERS	5 : 4	(0 : 0) = 1, (0 : 1) = 2, (1 : 0) = 3, (1 : 1) = 4 PS interrupt persistence setting
PS_IT	3 : 1	(0 : 0 : 0) = 1T, (0 : 0 : 1) = 1.5T, (0 : 1 : 0) = 2T, (0 : 1 : 1) = 2.5T, (1 : 0 : 0) = 3T, (1 : 0 : 1) = 3.5T, (1 : 1 : 0) = 4T, (1 : 1 : 1) = 8T, PS integration time setting
PS_SD	0	0 = PS power on, 1 = PS shut down, default = 1

**TABLE 3 - REGISTER: PS_CONF2 DESCRIPTION**

REGISTER: PS_CONF2		COMMAND CODE: 0x03_H (0x03 DATA BYTE HIGH)
Command	Bit	Description
Reserved	7 : 6	(0 : 0), reserved
PS_Gain	5 : 4	(0 : 0) and (0 : 1) = two step mode, (1 : 0) = single mode x 8, (1 : 1) = single mode x 1
PS_HD	3	0 = PS output is 12 bits, 1 = PS output is 16 bits
PS_NS	2	0 = typical sensitivity (two step mode x 4), 1 = typical sensitivity mode (two step mode)
PS_INT	1 : 0	(0 : 0) = interrupt disable, (0 : 1) = trigger by closing, (1 : 0) = trigger by away, (1 : 1) = trigger by closing and away

TABLE 4 - REGISTER: PS_CONF3 DESCRIPTION

REGISTER: PS_CONF3		COMMAND CODE: 0x04_L (0x04 DATA BYTE LOW)
Command	Bit	Description
LED_I_LOW	7	0 = disabled = normal current, 1 = enabled = 1/10 of normal current, with that the current is accordingly: 5 mA, 7.5 mA, 10 mA, 12 mA, 14 mA, 16 mA, 18 mA, 20 mA
Reserved	6 : 5	(0 : 0)
PS_SMART_PERS	4	0 = disable; 1 = enable PS smart persistence
PS_AF	3	0 = active force mode disable (normal mode), 1 = active force mode enable
PS_TRIG	2	0 = no PS active force mode trigger, 1 = trigger one time cycle VCNL3030X01 output one cycle data every time host writes in '1' to sensor. The state returns to '0' automatically.
PS_MS	1	0 = proximity normal operation with interrupt function, 1 = proximity detection logic output mode enable
PS_SC_EN	0	0 = turn off sunlight cancel; 1 = turn on sunlight cancel PS sunlight cancel function enable setting

TABLE 5 - REGISTER: PS_MS DESCRIPTION

REGISTER: PS_MS		COMMAND CODE: 0x04_H (0x04 DATA BYTE HIGH)
Command	Bit	Description
Reserved	7	0
PS_SC_CUR	6 : 5	(0 : 0) = 1 x typical sunlight cancel current, (0 : 1) = 2 x typical sunlight cancel current, (1 : 0) = 4 x typical sunlight cancel current, (1 : 1) = 8 x typical sunlight cancel current
PS_SP	4	0 = typical sunlight capability, 1 = 1.5 x typical sunlight capability
PS_SPO	3	0 = output is 00h in sunlight protect mode, 1 = output is FFh in sunlight protect mode,
LED_I	2 : 0	(0 : 0 : 0) = 50 mA; (0 : 0 : 1) = 75 mA; (0 : 1 : 0) = 100 mA; (0 : 1 : 1) = 120 mA (1 : 0 : 0) = 140 mA; (1 : 0 : 1) = 160 mA; (1 : 1 : 0) = 180 mA; (1 : 1 : 1) = 200 mA LED current selection setting

TABLE 6 - REGISTER PS_CANC_L AND PS_CANC_M DESCRIPTION

		COMMAND CODE: 0x05_L (0x05 DATA BYTE LOW) AND 0x05_H (0x05 DATA BYTE HIGH)
Register	Bit	Description
PS_CANC_L	7 : 0	0x00 to 0xFF, PS cancellation level setting_LSB byte
PS_CANC_M	7 : 0	0x00 to 0xFF, PS cancellation level setting_MSB byte

TABLE 7 - REGISTER: PS_THDL_L AND PS_THDL_M DESCRIPTION

		COMMAND CODE: 0x06_L (0x06 DATA BYTE LOW) AND 0x06_H (0x06 DATA BYTE HIGH)
Register	Bit	Description
PS_THDL_L	7 : 0	0x00 to 0xFF, PS interrupt low threshold setting_LSB byte
PS_THDL_M	7 : 0	0x00 to 0xFF, PS interrupt low threshold setting_MSB byte

TABLE 8 - REGISTER: PS_THDH_L AND PS_THDH_M DESCRIPTION

		COMMAND CODE: 0x07_L (0x07 DATA BYTE LOW) AND 0x07_H (0x07 DATA BYTE HIGH)
Register	Bit	Description
PS_THDH_L	7 : 0	0x00 to 0xFF, PS interrupt high threshold setting_LSB byte
PS_THDH_M	7 : 0	0x00 to 0xFF, PS interrupt high threshold setting_MSB byte

**TABLE 9 - READ OUT REGISTER DESCRIPTION**

Register	Command Code	Bit	Description
PS_Data_L	0x08_L (0x08 data byte low)	7 : 0	0x00 to 0xFF, PS1 LSB output data
PS_Data_M	0x08_H (0x08 data byte high)	7 : 0	0x00 to 0xFF, PS1 MSB output data
Reserved	0x09_L (0x09 data byte low)	7 : 0	Reserved
Reserved	0x09_H (0x09 data byte high)	7 : 0	Reserved
Reserved	0x0A_L (0x0A data byte low)	7 : 0	Reserved
Reserved	0x0A_H (0x0A data byte high)	7 : 0	Reserved
Reserved	0x0B_L (0x0B data byte low)	7 : 0	Reserved
Reserved	0x0B_H (0x0B data byte high)	7 : 0	Reserved
Reserved	0x0C_L (0x0C data byte low)	7 : 0	Reserved
Reserved	0x0C_H (0x0C data byte high)	7 : 0	Reserved
Reserved	0x0D_L (0x0D data byte low)	7 : 0	Default = 0x00
INT_Flag	0x0D_H (0x0D data byte high)	7 6 5 4 3 2 1 0	Reserved Reserved Reserved Reserved Reserved PS_SPFLAG, PS entering sunlight protection mode PS_IF_CLOSE, PS rises above PS_THDH INT trigger event PS_IF_AWAY, PS drops below PS_THDL INT trigger event
ID_L	0x0E_L (0x0E data byte low)	7 : 0	0x80
ID_M	0x0E_H (0x0E data byte high)	7 : 6 5 : 4 3 : 0	(0 : 0) (0 : 0) = slave address = 0x41 (7-bit) Version code (0 : 0 : 0 : 0)

Adjustable Sampling Time

VCNL3030X01's embedded LED driver drives the internal IRED with the "LDR" pin by a pulsed duty cycle. The IRED on / off duty ratio is programmable by I²C command at register: PS_Duty which is related to the current consumption and PS response time. The higher the duty ratio adopted, the faster response time achieved with higher power consumption. For example, PS_Duty = 1/320, peak IRED current = 100 mA, averaged current consumption is 100 mA/320 = 0.3125 mA.

Initialization

VCNL3030X01 includes default values for each register. As long as power is on, it is ready to be controlled by host via I²C bus.

Threshold Window Setting

- Programmable PS Threshold

VCNL3030X01 provides both high and low thresholds for PS (register: PS_THDL, PS_THDH)

- PS Persistence

The PS persistence function (PS_PERS, 1, 2, 3, 4) helps to avoid false trigger of the PS INT. For example, if PS_PERS = 3 times, the PS INT will not be asserted unless the PS value is greater than the PS threshold (PS_THDH) value for three periods of time continuously

- PS Active Force mode

An extreme power saving way to use PS is to apply PS active force (register: PS_CONF3 command: PS_FOR = 1) mode. Anytime host would like to read out just one of PS data, write in '1' at register: PS_CONF3 command: PS_FOR_Trig. Without commands placed, there is no PS data output. VCNL3030X01 stays in standby mode constantly

- PS detection object

Any color of object is detectable by VCNL3030X01

Intelligent Cancellation

VCNL3030X01 provides an intelligent cancellation method to reduce cross talk phenomenon for the proximity sensor. The output data will be subtracted by the input value on register: PS_CANC.

Interruption (INT)

VCNL3030X01 has PS interrupt feature operated by a single pin “INT”. The purpose of the interrupt feature is to actively inform the host once INT has been asserted. With the interrupt function applied, the host does not need to be constantly pulling data from the sensor, but to read data from the sensor while receiving interrupt request from the sensor. As long as the host enables PS interrupt (register: PS_INT) function, the level of INT pin (pin 7) is pulled low once INT asserted. All registers are accessible even if INT is asserted.

To effectively adopt PS INT function, it is recommended to use PS detection mechanism at register: PS_INTT = 1 for the best PS detection performance which can be adjusted by high / low THD level of PS. PS INT trigger way is defined by register: PS_INT.

Interruption Flag

Register: INT_Flag represents all of interrupt trigger status for PS. Any flag value changes from ‘0’ to ‘1’ state, the level of INT pin will be pulled low. As long as host reads INT_Flag data, the bit will change from ‘1’ state to ‘0’ state after reading out, the INT level will be returned to high afterwards.

PROXIMITY DETECTION LOGIC OUTPUT MODE

VCNL3030X01 provides a proximity detection logic output mode that uses INT pin (pin 7) as a proximity detection logic high / low output (register: PS_MS). When this mode is selected, the PS output (pin 7; INT/P_{out}) is pulled low when an object is closing to be detected and returned to level high when the object moves away. Register: PS_THDH / PS_THDL defines how sensitive PS detection is.

PROXIMITY DETECTION HYSTERESIS

A PS detection hysteresis is important that keeps PS state in a certain range of detection distance. For example, PS INT asserts when PS value over PS_THDH. Host switches off panel backlight and then clears INT. When PS value is less than PS_THDL, host switches on panel backlight. Any PS value lower than PS_THDH or higher than PS_THDL, PS INT will not be asserted. Host does keep the same state.

APPLICATION CIRCUIT BLOCK REFERENCE

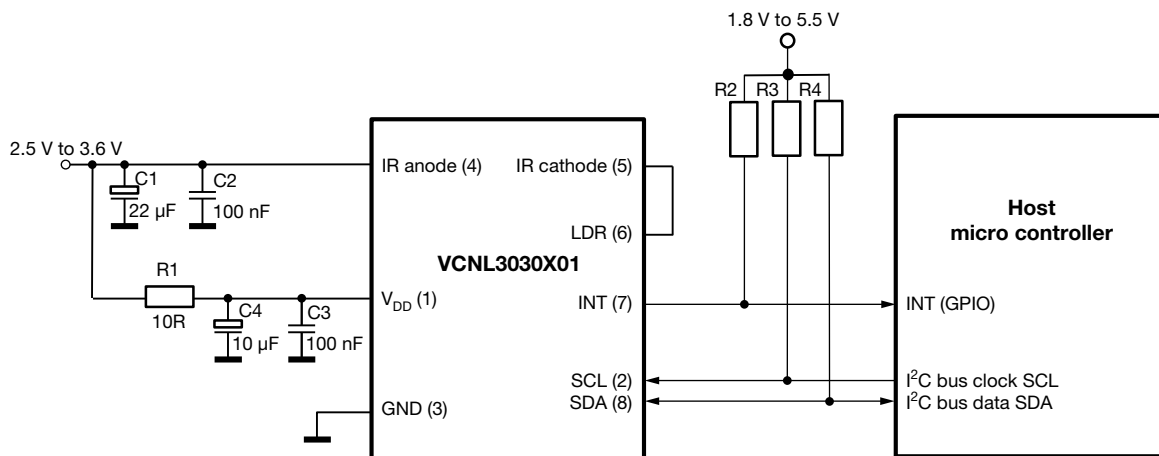
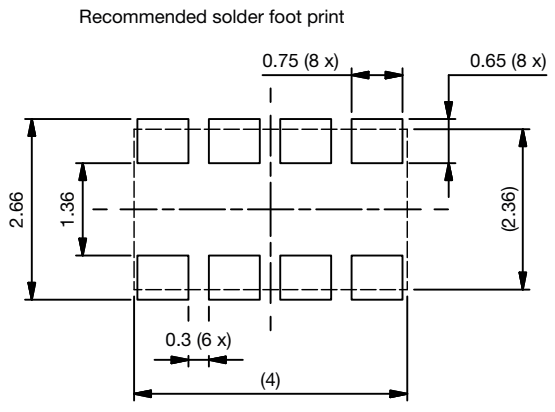
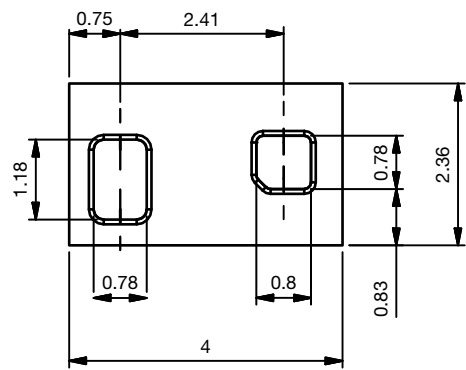
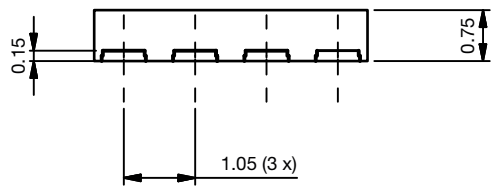
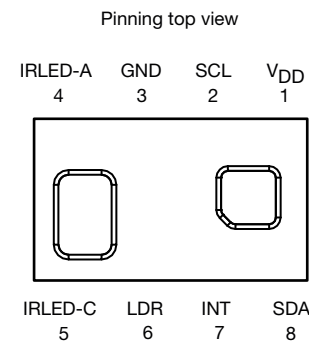
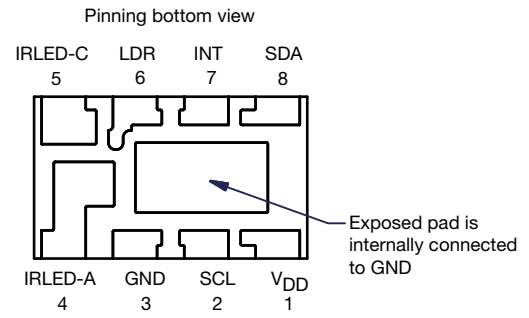
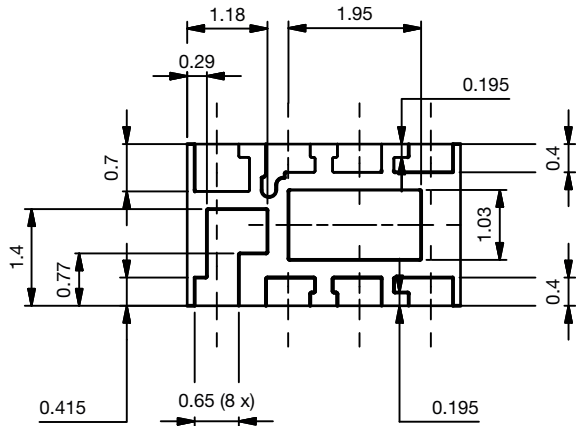


Fig. 13 - Circuitry with Just One Common Power Supply Source

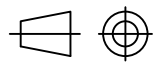
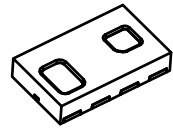


PACKAGE DIMENSIONS in millimeters



Drawing No.: 6.550-5326.01-4
Issue: 2, 27.07.2020

Not indicated tolerances ± 0.1 mm



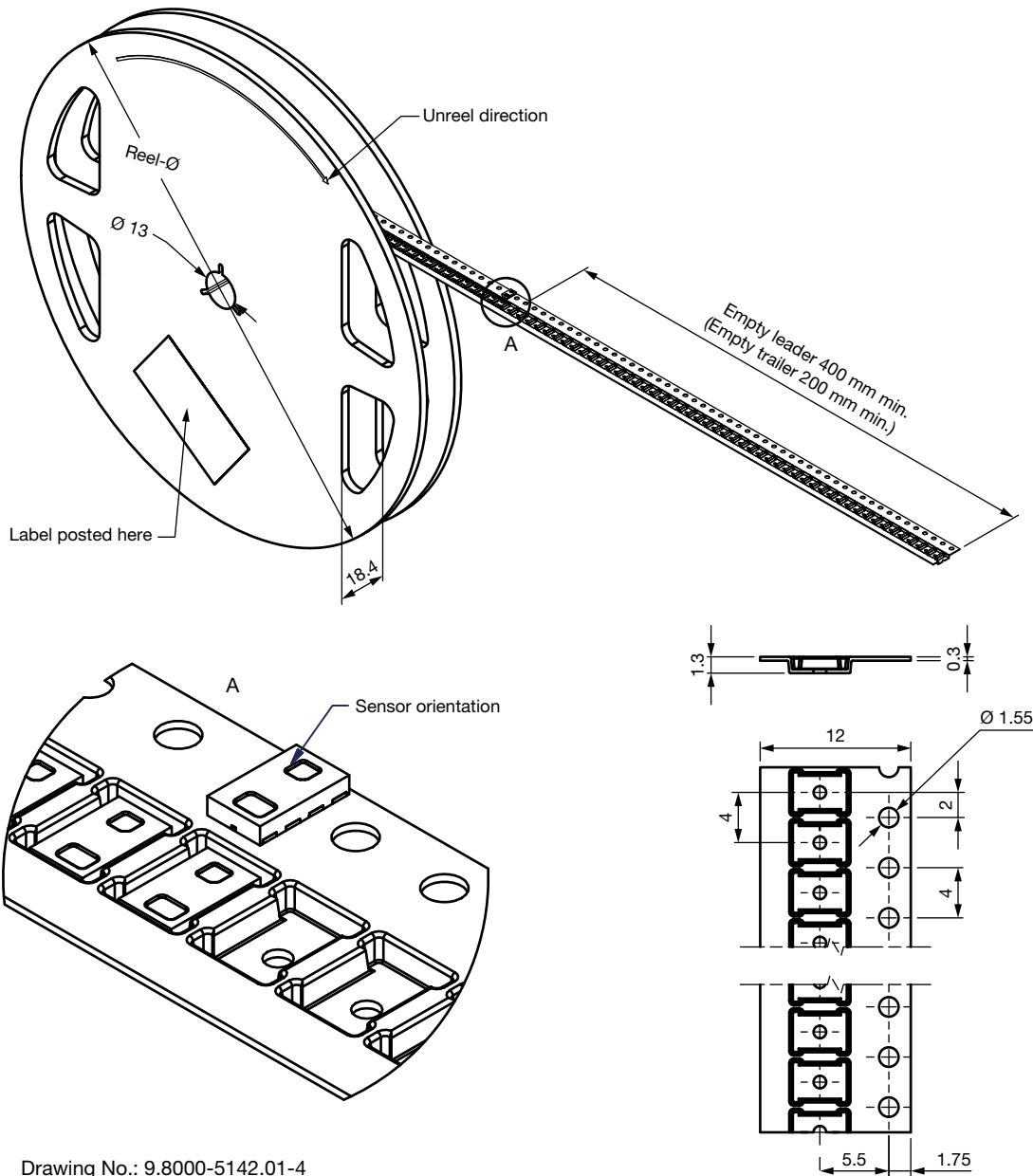
Technical drawings according to DIN specification.



TAPE AND REEL DIMENSIONS in millimeters

Reel-Size:
GS 08: Ø 180 mm ± 2 mm = 3300 pcs.
GS 18: Ø 330 mm ± 2 mm = 13 000 pcs.
Reel-design is representative for different types

Non tolerated dimensions ± 0.1 mm



Drawing No.: 9.8000-5142.01-4
Issue: 1, 07.06.2017



SOLDER PROFILE

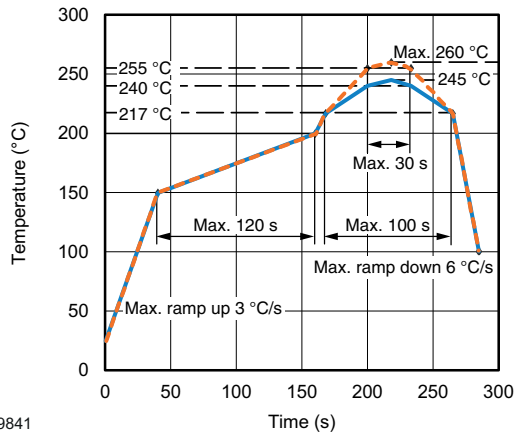


Fig. 14 - Lead (Pb)-free Reflow Solder Profile According to J-STD-020

DRYPACK

Devices are packed in moisture barrier bags (MBB) to prevent the products from moisture absorption during transportation and storage. Each bag contains a desiccant.

FLOOR LIFE

Floor life (time between soldering and removing from MBB) must not exceed the time indicated on MBB label:

Floor life: 168 h

Conditions: $T_{amb} < 30\text{ °C}$, $RH < 60\%$

Moisture sensitivity level 3, according to J-STD-020.

DRYING

In case of moisture absorption devices should be baked before soldering. Conditions see J-STD-020 or label. Devices taped on reel dry using recommended conditions 192 h at 40 °C (+ 5 °C), $RH < 5\%$.

19841



Disclaimer

ALL PRODUCT, PRODUCT SPECIFICATIONS AND DATA ARE SUBJECT TO CHANGE WITHOUT NOTICE TO IMPROVE RELIABILITY, FUNCTION OR DESIGN OR OTHERWISE.

Vishay Intertechnology, Inc., its affiliates, agents, and employees, and all persons acting on its or their behalf (collectively, "Vishay"), disclaim any and all liability for any errors, inaccuracies or incompleteness contained in any datasheet or in any other disclosure relating to any product.

Vishay makes no warranty, representation or guarantee regarding the suitability of the products for any particular purpose or the continuing production of any product. To the maximum extent permitted by applicable law, Vishay disclaims (i) any and all liability arising out of the application or use of any product, (ii) any and all liability, including without limitation special, consequential or incidental damages, and (iii) any and all implied warranties, including warranties of fitness for particular purpose, non-infringement and merchantability.

Statements regarding the suitability of products for certain types of applications are based on Vishay's knowledge of typical requirements that are often placed on Vishay products in generic applications. Such statements are not binding statements about the suitability of products for a particular application. It is the customer's responsibility to validate that a particular product with the properties described in the product specification is suitable for use in a particular application. Parameters provided in datasheets and / or specifications may vary in different applications and performance may vary over time. All operating parameters, including typical parameters, must be validated for each customer application by the customer's technical experts. Product specifications do not expand or otherwise modify Vishay's terms and conditions of purchase, including but not limited to the warranty expressed therein.

Hyperlinks included in this datasheet may direct users to third-party websites. These links are provided as a convenience and for informational purposes only. Inclusion of these hyperlinks does not constitute an endorsement or an approval by Vishay of any of the products, services or opinions of the corporation, organization or individual associated with the third-party website. Vishay disclaims any and all liability and bears no responsibility for the accuracy, legality or content of the third-party website or for that of subsequent links.

Except as expressly indicated in writing, Vishay products are not designed for use in medical, life-saving, or life-sustaining applications or for any other application in which the failure of the Vishay product could result in personal injury or death. Customers using or selling Vishay products not expressly indicated for use in such applications do so at their own risk. Please contact authorized Vishay personnel to obtain written terms and conditions regarding products designed for such applications.

No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted by this document or by any conduct of Vishay. Product names and markings noted herein may be trademarks of their respective owners.