



Optical Sensor With Photodiode Output for Optical Communication



DESCRIPTION

The VCND2045X02, VCND2045SLX02 are an optical sensor in a miniature SMD package used for optical data communication and reflective encoding. It has a compact construction where the emitting light source and the detector are arranged in the same plane. The operating infrared wavelength is 860 nm. The detector consists of a silicon photodiode. The sensor analog output signal (photo current) is triggered by light from other device for optical data transmission.

FEATURES

- Package type: SMD
- Package form: top view, side view
- Detector type: photodiode
- Dimensions (L x W x H in mm): 4.4 x 2.25 x 1.9
- Emitter wavelength: 860 nm
- Moisture sensitivity level (MSL): 3
- AEC-Q102 qualified
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

AUTOMOTIVE GRADE



RoHS COMPLIANT
HALOGEN FREE
GREEN (5-2008)

APPLICATIONS

- Wireless optical communication
- Position sensor
- Optical switch
- Optical encoder

PRODUCT SUMMARY - EMITTER				
PART NUMBER	I_e (mW/sr) at $I_F = 24$ mA	ϕ (°)	λ_p (nm)	t_r (ns) ⁽¹⁾
VCND2045X02	65	± 10	860	9
VCND2045SLX02	65	± 10	860	9

Note

⁽¹⁾ Conditions as in "Basic Characteristics"

PRODUCT SUMMARY - PHOTODIODE				
PART NUMBER	I_{Fa} (µA) at $E_e = 1$ mW/cm ² , $\lambda = 850$ nm, $V_R = 2$ V	ϕ (°)	λ_p (nm)	DAYLIGHT BLOCKING FILTER INTEGRATED
VCND2045X02	7.8	± 29	820	No
VCND2045SLX02	7.8	± 29	820	No

ORDERING INFORMATION			
ORDERING CODE	PACKAGING	VOLUME ⁽¹⁾	REMARKS
VCND2045X02	Tape and reel	MOQ: 1000 pcs	Top looker variant
VCND2045SLX02	Tape and reel	MOQ: 1500 pcs	Side looker variant

Note

⁽¹⁾ MOQ: minimum order quantity



ABSOLUTE MAXIMUM RATINGS ($T_{amb} = 25\text{ }^{\circ}\text{C}$, unless otherwise specified)				
PARAMETER	TEST CONDITION	SYMBOL	VALUE	UNIT
INPUT (EMITTER)				
Reverse voltage		V_R	5	V
Forward current		I_F	45	mA
Junction temperature		T_J	125	$^{\circ}\text{C}$
Thermal resistance junction to ambient	Top looker, JESD 51	R_{thJA}	200	K/W
	Side looker, JESD 51	R_{thJA}	250	K/W
OUTPUT (DETECTOR)				
Reverse voltage		V_R	5	V
SENSOR				
Total power dissipation	$T_{amb} \leq 25\text{ }^{\circ}\text{C}$	P_{tot}	120	mW
Ambient temperature range		T_{amb}	-40 to +110	$^{\circ}\text{C}$
Storage temperature range		T_{stg}	-40 to +110	$^{\circ}\text{C}$
Soldering temperature	In accordance with Fig. 15	T_{sd}	260	$^{\circ}\text{C}$

ABSOLUTE MAXIMUM RATINGS

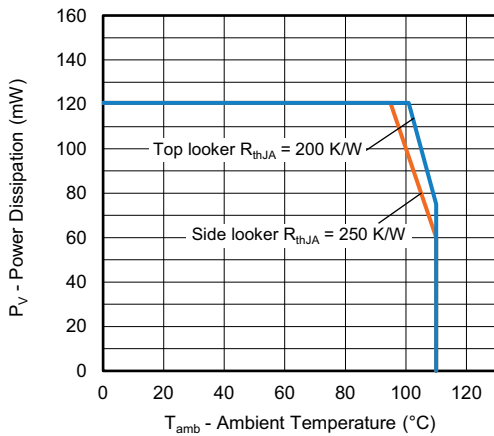


Fig. 1 - Power Dissipation vs. Ambient Temperature

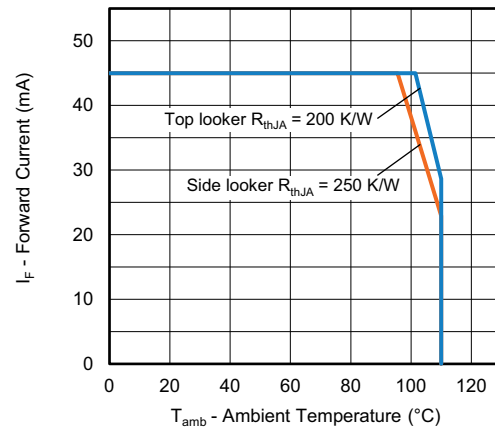


Fig. 2 - Forward Current vs. Ambient Temperature

BASIC CHARACTERISTICS ($T_{amb} = 25\text{ }^{\circ}\text{C}$, unless otherwise specified)							
PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT	
INPUT (EMITTER)							
Forward voltage	$I_F = 24\text{ mA}$	V_F	-	2.5	3.3	V	
Temperature coefficient of V_F	$I_F = 24\text{ mA}$	TKV_F	-	-1.8	-	mV/K	
Reverse current		I_R	Not designed for reverse operation			μA	
Junction capacitance	$V_R = 0\text{ V}$, $f = 1\text{ MHz}$, $E = 0$	C_j	-	19.5	-	pF	
Radiant intensity	$I_F = 24\text{ mA}$, $t_p = 20\text{ ms}$	I_e	35	65	100	mW/sr	
Radiant power	$I_F = 24\text{ mA}$, $t_p = 20\text{ ms}$	ϕ_e	-	12	-	mW	
Angle of half intensity		ϕ	-	± 10	-	$^{\circ}$	
Peak wavelength	$I_F = 24\text{ mA}$	λ_p	-	860	-	nm	
Spectral bandwidth	$I_F = 24\text{ mA}$	$\Delta\lambda_{P, 0.5}$	-	37	-	nm	



BASIC CHARACTERISTICS (T _{amb} = 25 °C, unless otherwise specified)						
PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT
OUTPUT (DETECTOR)						
Forward voltage	I _F = 50 mA	V _F	-	0.9	1.1	V
Reverse dark current	V _R = 10 V, E = 0	I _{ro}	-	0.01	10	nA
Diode capacitance	V _R = 0 V, f = 1 MHz, E = 0	C _D	-	5.8	-	pF
Open circuit voltage	E _e = 1 mW/cm ² , λ = 850 nm	V _O	-	429	-	mV
Temperature coefficient of V _O	E _e = 1 mW/cm ² , λ = 850 nm	TKV _O	-	-2.6	-	mV/K
Short circuit current	E _e = 1 mW/cm ² , λ = 850 nm	I _k	-	7.8	-	μA
Temperature coefficient of I _k	E _e = 1 mW/cm ² , λ = 850 nm	TKI _k	-	0.1	-	%/K
Reverse light current	E _e = 1 mW/cm ² , λ = 850 nm, V _R = 2 V	I _{ra}	4	7.8	10	μA
Wavelength of peak sensitivity		λ _p	-	820	-	nm
Angle of half sensitivity		φ	-	± 29	-	°
SENSOR						
Reverse light current	V _R = 2 V, I _F = 24 mA, d = 4 mm, mirror, reflective setup ⁽¹⁾	I _{ra}	-	166	-	μA
	V _R = 2 V, I _F = 24 mA, d = 4 mm, KODAK Gray Card, gray side, reflective setup ⁽¹⁾		-	8	-	
	V _R = 2 V, I _F = 24 mA, d = 4 mm, KODAK Gray Card, white side, reflective setup ⁽¹⁾		-	42	-	
	V _R = 2 V, I _F = 24 mA, d = 10 mm, communication setup ⁽²⁾		-	274	-	
Output rise time (20 % to 80 %)	Push-pull driver with I _F = 24 mA, I _{ra} = 5 μA, V _R = 2 V, communication setup ⁽²⁾	t _r	-	9	-	ns
Output fall time (80 % to 20 %)		t _f	-	9	-	ns

Notes

- (1) Reflective test setup as described in Fig. 4
- (2) Communication test setup as described in Fig. 5

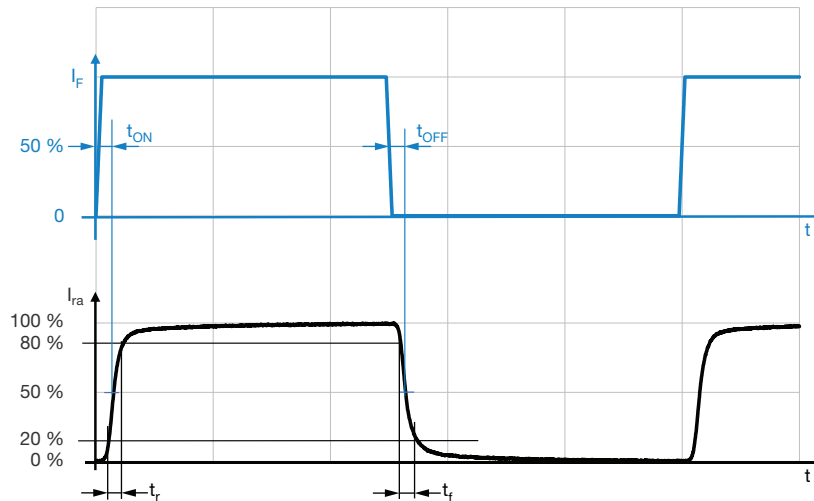


Fig. 3 - Switching Times

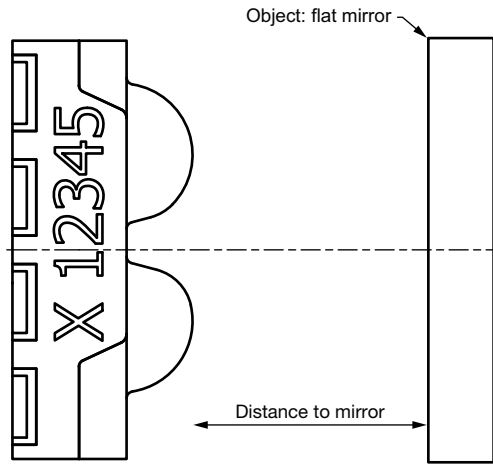


Fig. 4 - Test Setup - Reflective

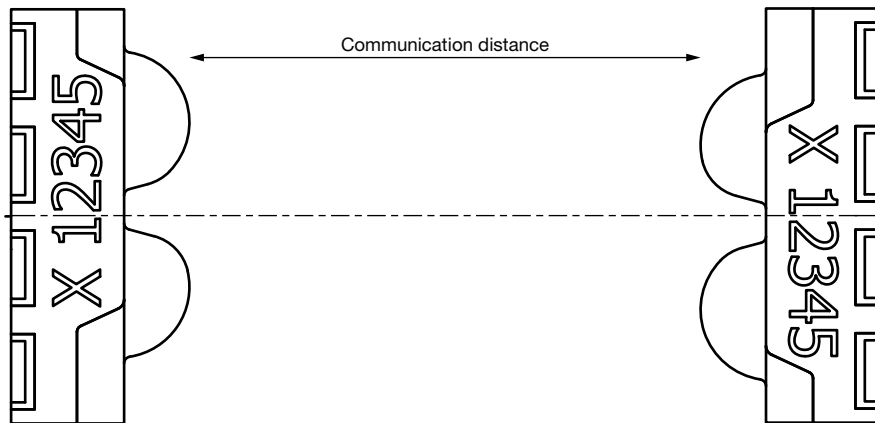


Fig. 5 - Test Setup - Communication

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

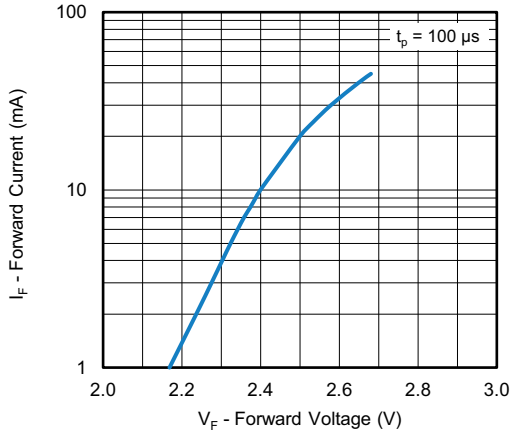


Fig. 6 - Forward Current vs. Forward Voltage

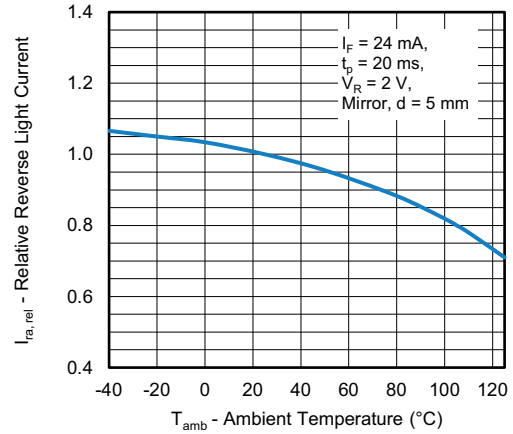


Fig. 9 - Relative Reverse Light Current vs. Ambient Temperature

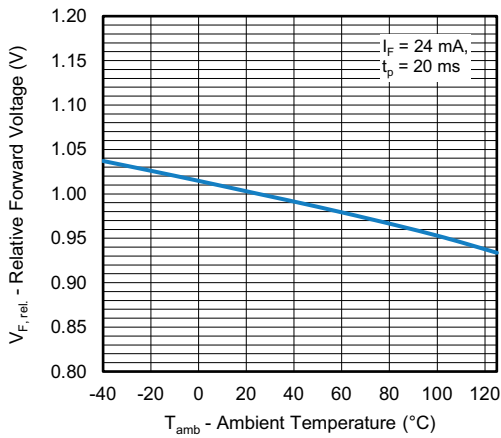


Fig. 7 - Relative Forward Voltage vs. Ambient Temperature

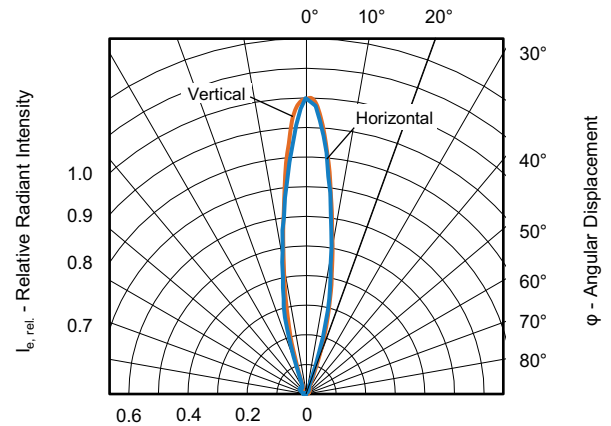


Fig. 10 - Relative Radiant Intensity vs. Angular Displacement

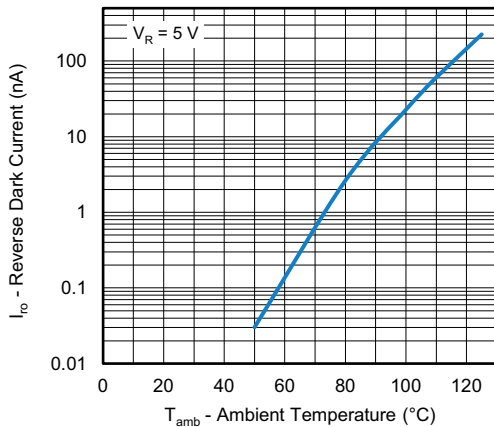


Fig. 8 - Reverse Dark Current vs. Ambient Temperature

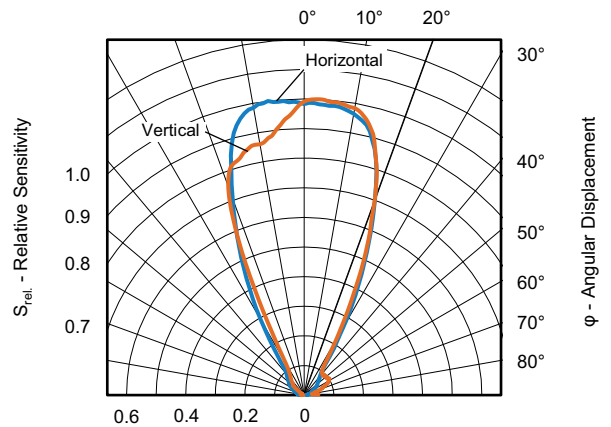


Fig. 11 - Relative Sensitivity vs. Angular Displacement

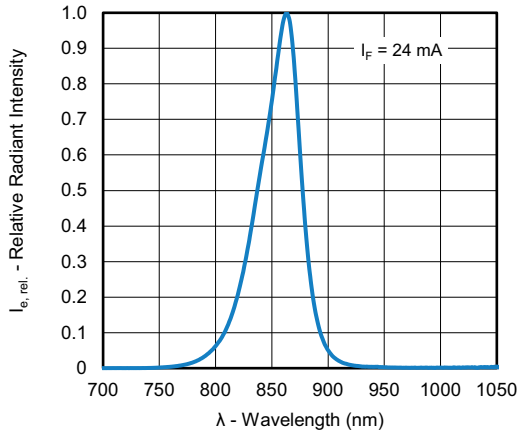


Fig. 12 - Relative Radiant Intensity vs. Wavelength

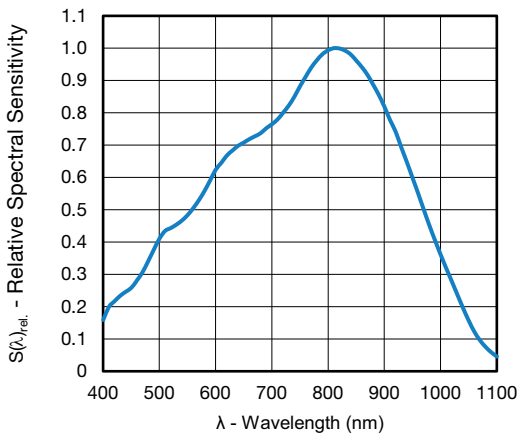


Fig. 13 - Relative Spectral Sensitivity vs. Wavelength

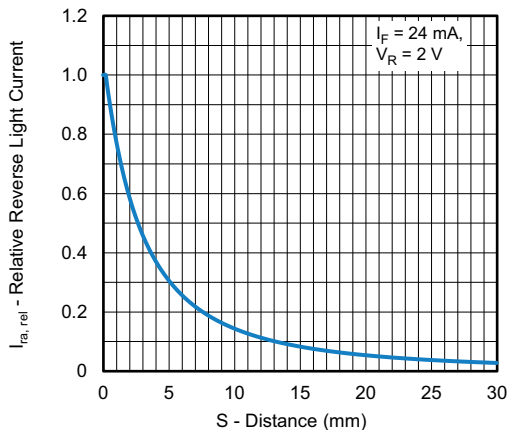


Fig. 14 - Relative Reverse Light Current vs. Distance (communication setup)

FLOOR LIFE

Time between soldering and removing from MBB must not exceed the time indicated in J-STD-020:

Moisture sensitivity: level 3

Floor life: 168 h

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

DRYING

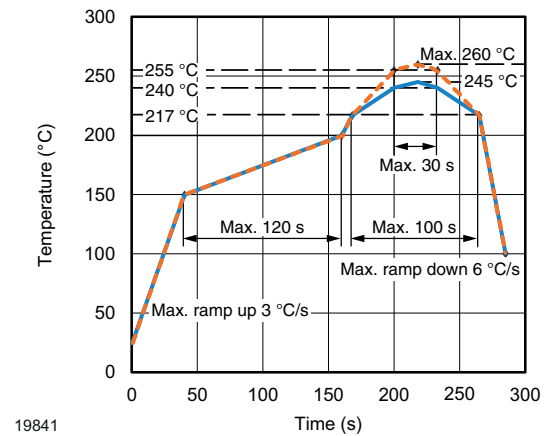
In case of moisture absorption devices should be baked before soldering. Conditions see J-STD-020 or recommended conditions:

192 h at $40\text{ }^{\circ}\text{C}$ (+ $5\text{ }^{\circ}\text{C}$), $\text{RH} < 5\%$

or

96 h at $60\text{ }^{\circ}\text{C}$ (+ $5\text{ }^{\circ}\text{C}$), $\text{RH} < 5\%$

REFLOW SOLDER PROFILE

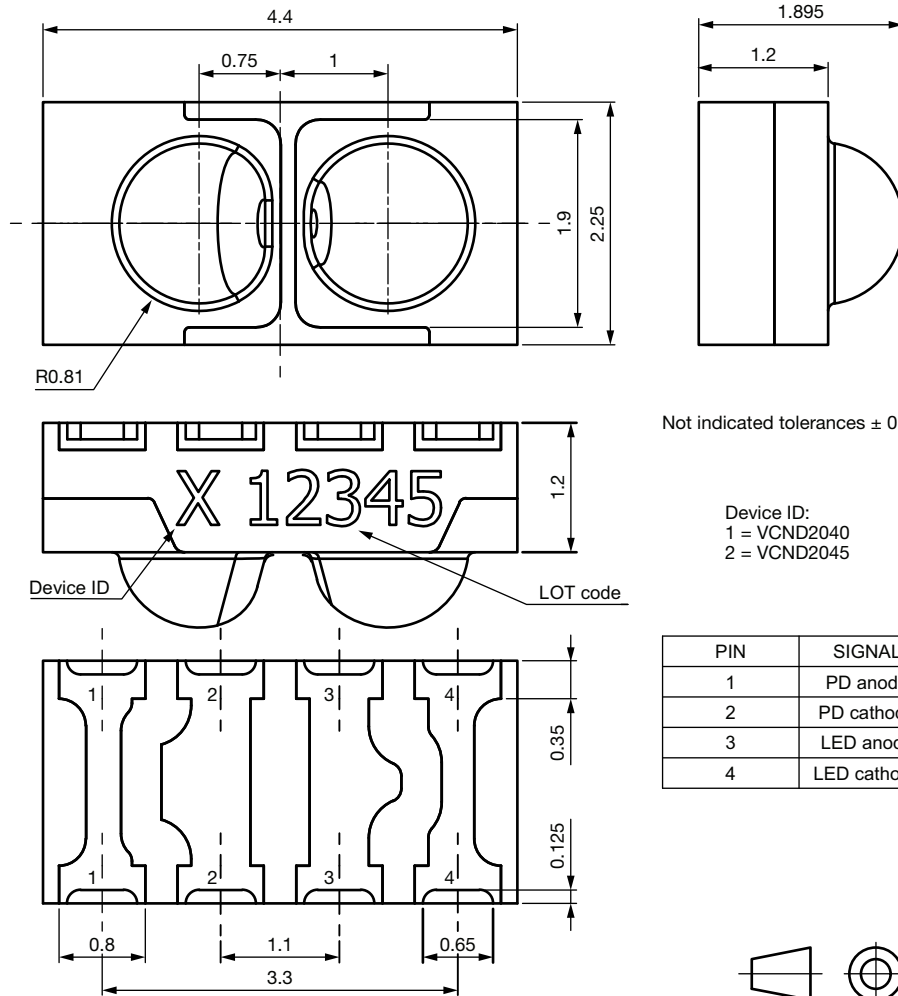


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Fig. 15 - Lead (Pb)-free Reflow Solder Profile According to J-STD-020



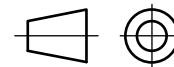
PACKAGE DIMENSIONS in millimeters



Not indicated tolerances ± 0.1

Device ID:
1 = VCND2040
2 = VCND2045

PIN	SIGNAL
1	PD anode
2	PD cathode
3	LED anode
4	LED cathode

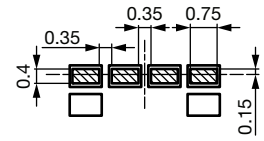
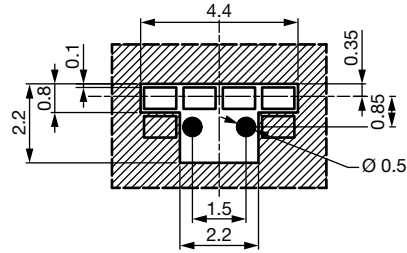
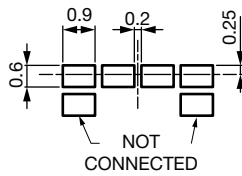
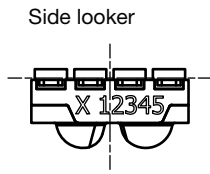


Technical drawings according to DIN specification

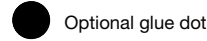
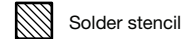
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Issue: 1_A; 27.08.2025



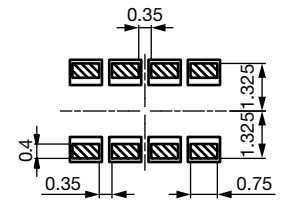
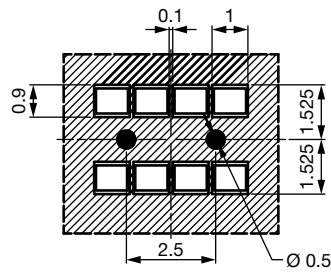
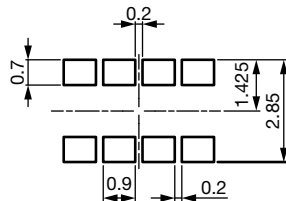
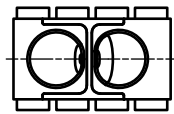
RECOMMENDED SOLDER PAD in millimeters



Component location on pad

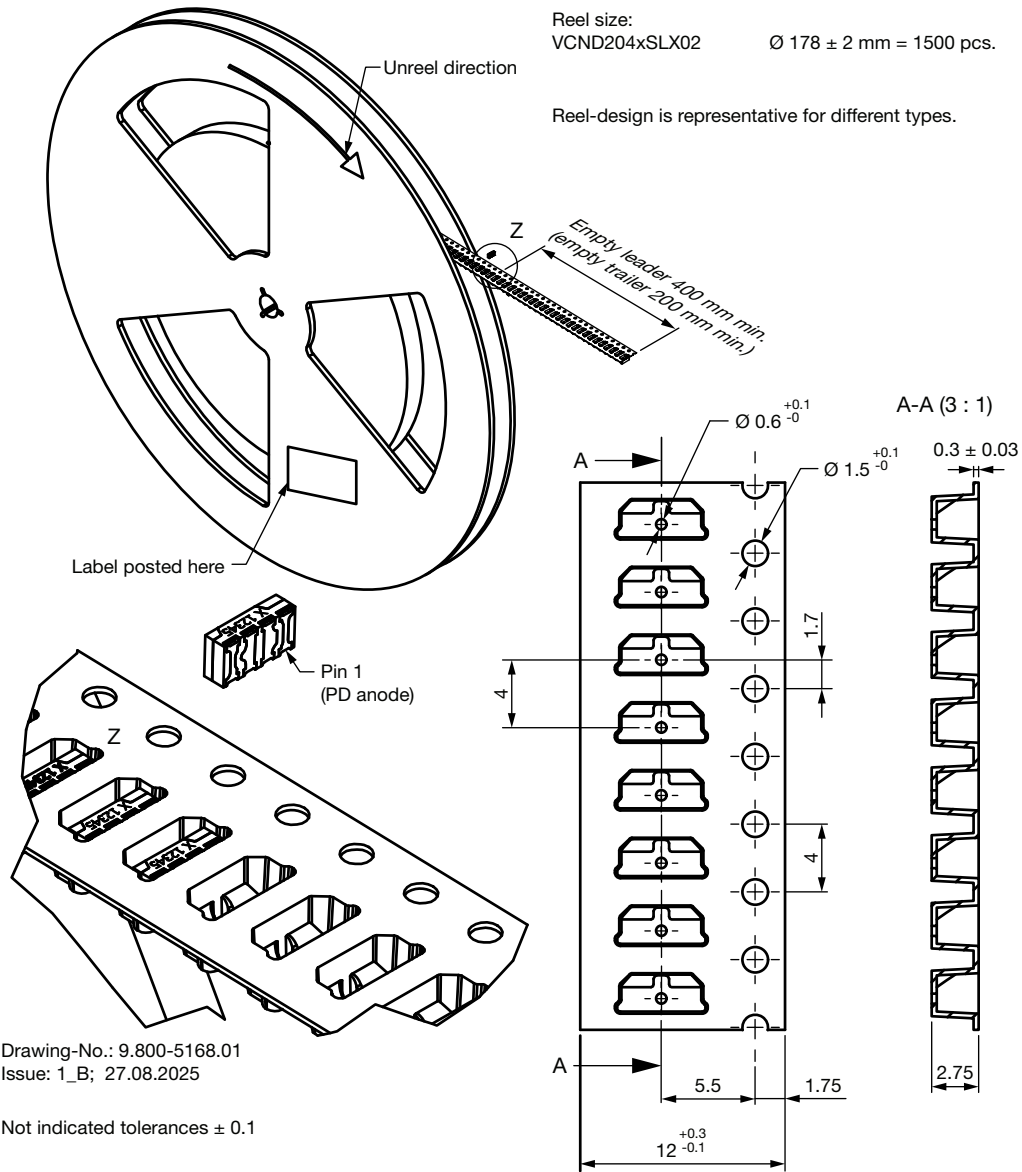


Top looker



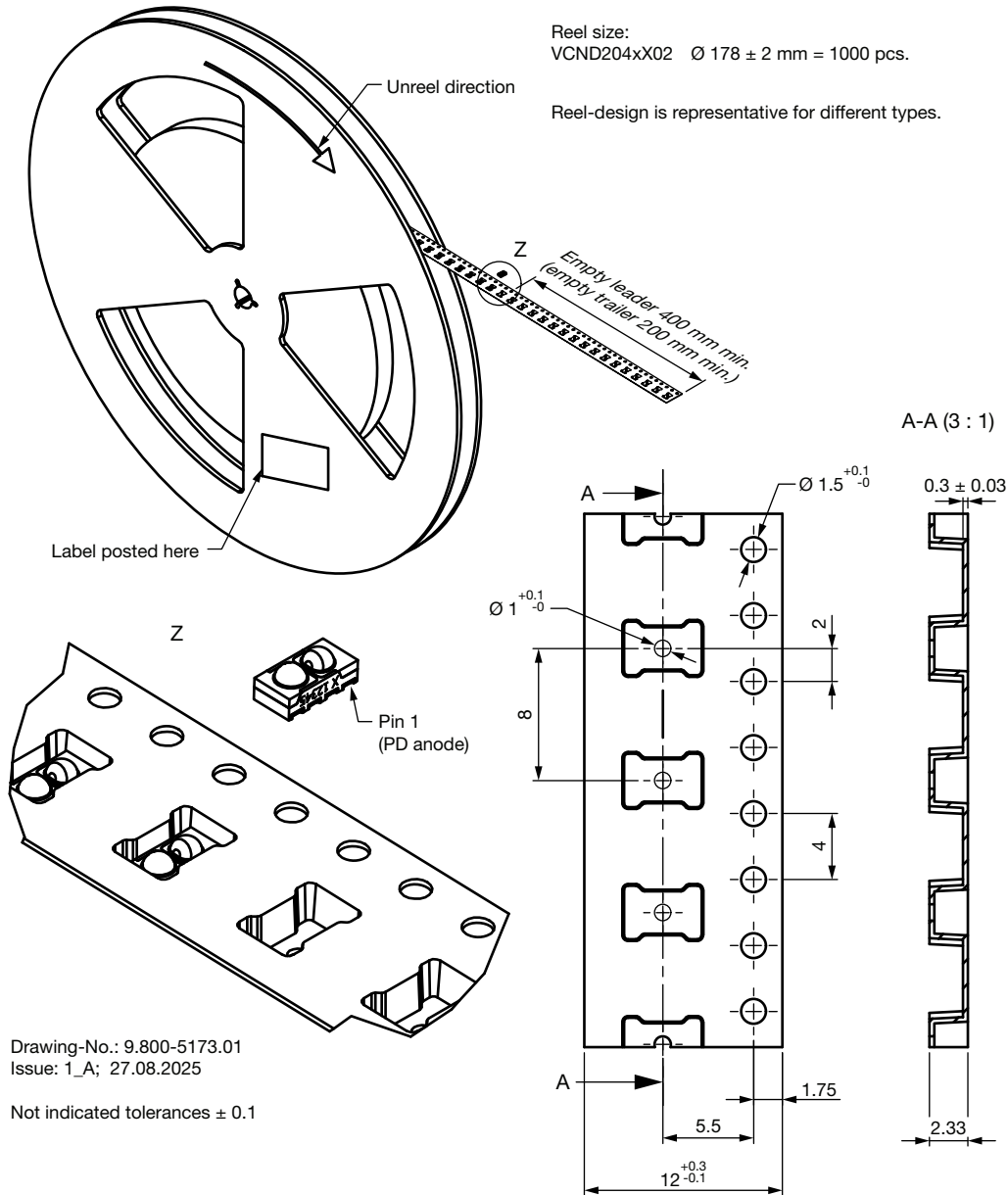


TAPE AND REEL DIMENSIONS (SIDE LOOK) in millimeters





TAPE AND REEL DIMENSIONS (TOP LOOK) in millimeters



Drawing-No.: 9.800-5173.01
Issue: 1_A; 27.08.2025

Not indicated tolerances ± 0.1



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