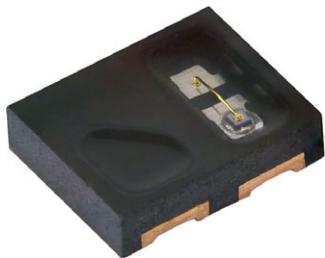


## Reflective Optical Sensor With Transistor Output



### LINKS TO ADDITIONAL RESOURCES


[Design Tools](#)

[Related Documents](#)

[3D Models](#)

[Application Notes](#)



**RoHS**  
COMPLIANT  
HALOGEN  
**FREE**  
**GREEN**  
(5-2008)

### FEATURES

- Package type: SMD
- Detector type: phototransistor
- Dimensions (L x W x H in mm): 2.5 x 2 x 0.6
- Emitter wavelength: 940 nm
- Moisture sensitivity level (MSL): 3
- AEC-Q101 qualified
- Material categorization:  
for definitions of compliance please see  
[www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)

### APPLICATIONS

- Position sensor
- Optical switch
- Optical encoder
- Object detection (e.g. paper presence in printer and copy machines)

### DESCRIPTION

The VCNT2025X01 is a reflective sensor in a miniature SMD package. It has a compact construction where the emitting light source and the detector are arranged in the same plane. The operating infrared wavelength is 940 nm. The detector consists of a silicon phototransistor. The sensor analog output signal (photo current) is triggered by detection of reflected infrared light from a close by object.

The sensor has a built in daylight blocking filter, which greatly suppresses disturbing ambient light and therefore increases signal to noise ratio.

PRODUCT SUMMARY					
PART NUMBER	TARGET MATERIAL	DISTANCE RANGE FOR RELATIVE $I_{out}$ > 0.5 mA WITH $I_{Fmax.}$ (mm)	TYPICAL CTR <sup>(1)</sup> (%)	DISTANCE OF PEAK SENSITIVITY (mm)	DAYLIGHT BLOCKING FILTER INTEGRATED
VCNT2025X01	Kodak Gray Card, gray side (18 %)	0 to 4	4.5	0.7	Yes
VCNT2025X01	Kodak Gray Card, white side (90 %)	0 to 15	39	0.7	Yes

#### Note

<sup>(1)</sup> CTR: current transfer ratio,  $I_{out}/I_{in}$

ORDERING INFORMATION			
ORDERING CODE	PACKAGING	VOLUME <sup>(1)</sup>	REMARKS
VCNT2025X01	Tape and reel	MOQ: 3000 pcs	Drypack, MSL 3

#### Note

<sup>(1)</sup> MOQ: minimum order quantity

<b>ABSOLUTE MAXIMUM RATINGS</b> ( $T_{amb} = 25 \text{ }^{\circ}\text{C}$ , unless otherwise specified)				
PARAMETER	TEST CONDITION	SYMBOL	VALUE	UNIT
<b>INPUT (EMITTER)</b>				
Reverse voltage		$V_R$	5	V
Forward current		$I_F$	65	mA
Forward surge current	$t_p \leq 100 \text{ }\mu\text{s}$	$I_{FSM}$	200	mA
Junction temperature		$T_J$	120	$^{\circ}\text{C}$
Thermal resistance junction to ambient	JESD 51	$R_{thJA}$	380	K/W
<b>OUTPUT (DETECTOR)</b>				
Collector emitter breakdown voltage		$V_{(BR)CEO}$	20	V
Emitter collector voltage		$V_{ECO}$	7	V
Collector current		$I_C$	50	mA
<b>SENSOR</b>				
Total power dissipation	$T_{amb} \leq 25 \text{ }^{\circ}\text{C}$	$P_{tot}$	107	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. 16	$T_{sd}$	260	$^{\circ}\text{C}$

### ABSOLUTE MAXIMUM RATINGS

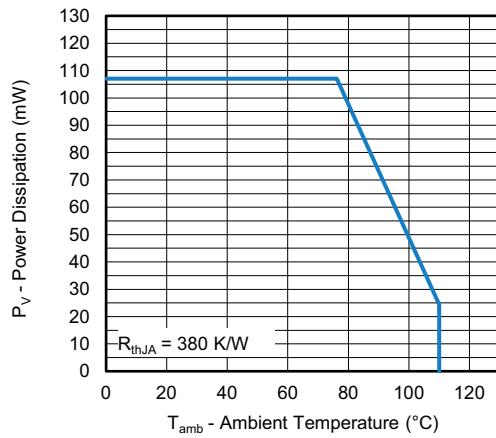


Fig. 1 - Power Dissipation vs. Ambient Temperature

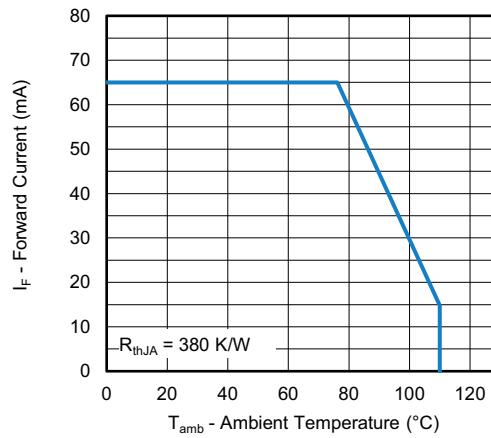


Fig. 2 - Forward Current vs. Ambient Temperature

<b>BASIC CHARACTERISTICS</b> ( $T_{amb} = 25^\circ\text{C}$ , unless otherwise specified)						
PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT
<b>INPUT (EMITTER)</b>						
Forward voltage	$I_F = 20 \text{ mA}$	$V_F$	1.0	1.25	1.4	V
	$I_F = 65 \text{ mA}$		-	1.47	-	
Temperature coefficient of $V_F$	$I_F = 20 \text{ mA}$	$\text{TKV}_F$	-	-1.0	-	mV/K
Peak wavelength	$I_F = 65 \text{ mA}$	$\lambda_P$	-	940	-	nm
Reverse current	$V_R = 5 \text{ V}$	$I_R$	-	-	10	$\mu\text{A}$
<b>OUTPUT (DETECTOR)</b>						
Collector emitter breakdown voltage	$I_C = 0.1 \text{ mA}, E = 0$	$V_{(\text{BR})\text{CEO}}$	20	-	-	V
Emitter collector voltage	$I_E = 100 \mu\text{A}, E = 0$	$V_{\text{ECO}}$	7	-	-	V
Collector emitter dark current	$V_{\text{CE}} = 5 \text{ V}, E = 0$	$I_{\text{CEO}}$	-	1	100	nA
<b>SENSOR</b>						
Collector current	$V_{\text{CE}} = 5 \text{ V}, I_F = 20 \text{ mA}, d = 1 \text{ mm}$ (flat mirror)	$I_C$	3.5	6.6	10.5	mA
	$V_{\text{CE}} = 5 \text{ V}, I_F = 20 \text{ mA}, d = 1 \text{ mm}$ (Kodak gray card, 18 %)	$I_C$	-	0.9	-	mA
Current transfer ratio	$I_C/I_F, V_{\text{CE}} = 5 \text{ V}, d = 1 \text{ mm}$ (Kodak gray card, 18 %)	CTR	-	4.6	-	%
Rise time	$I_C = 0.8 \text{ mA}, V_{\text{CE}} = 5 \text{ V}, R_L = 100 \Omega$	$t_r$	-	10	-	$\mu\text{s}$
Fall time	$I_C = 0.8 \text{ mA}, V_{\text{CE}} = 5 \text{ V}, R_L = 100 \Omega$	$t_f$	-	15	-	$\mu\text{s}$

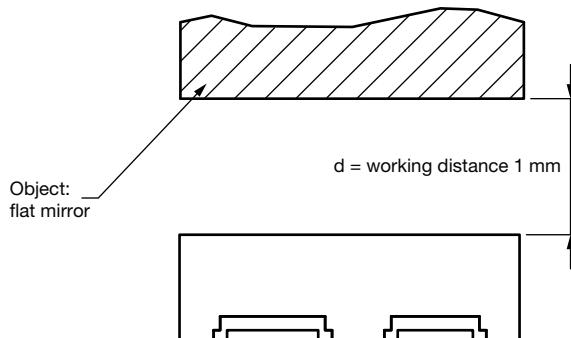


Fig. 3 - Test Setup

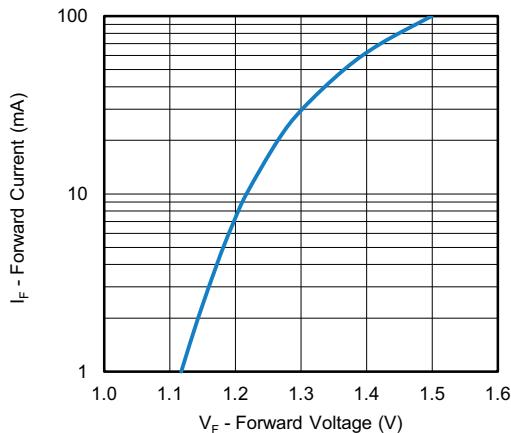
**BASIC CHARACTERISTICS** ( $T_{amb} = 25$  °C, unless otherwise specified)


Fig. 4 - Forward Current vs. Forward Voltage

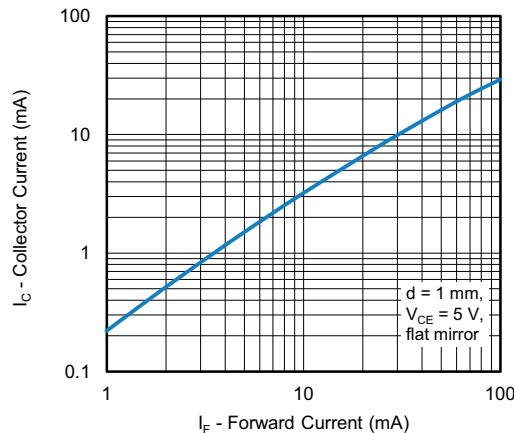


Fig. 7 - Collector Current vs. Forward Current

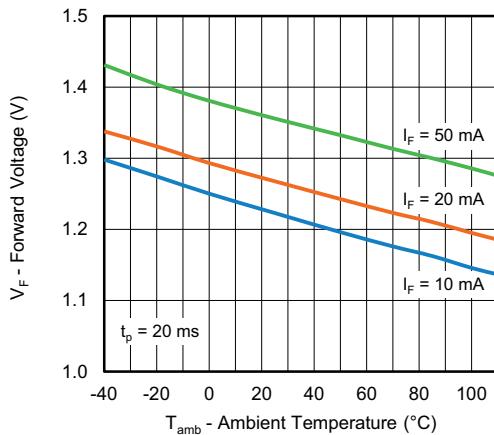


Fig. 5 - Forward Voltage vs. Ambient Temperature

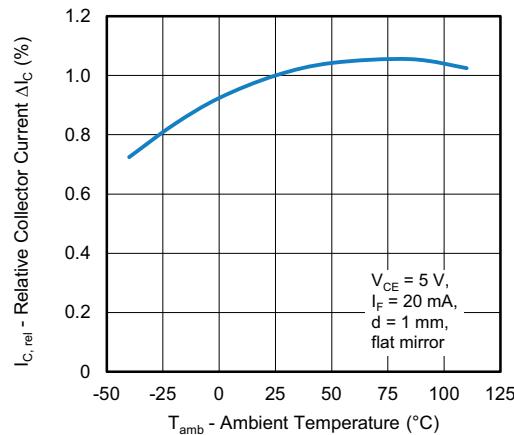


Fig. 8 - Relative Collector Current vs. Ambient Temperature

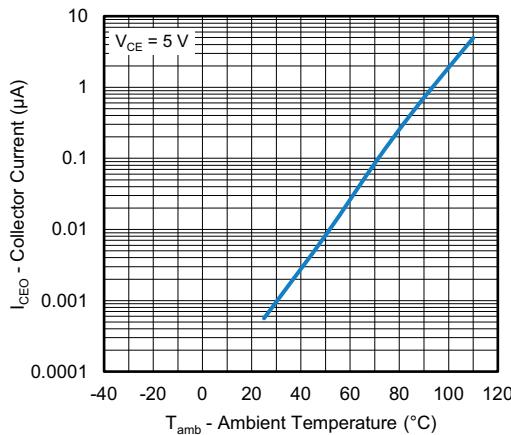


Fig. 6 - Collector Dark Current vs. Ambient Temperature

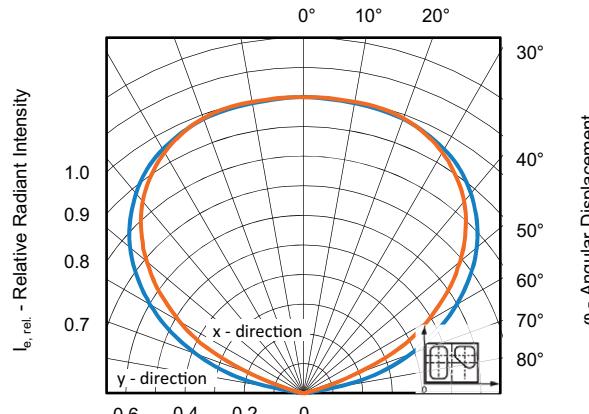


Fig. 9 - Relative Radiant Intensity vs. Angular Displacement

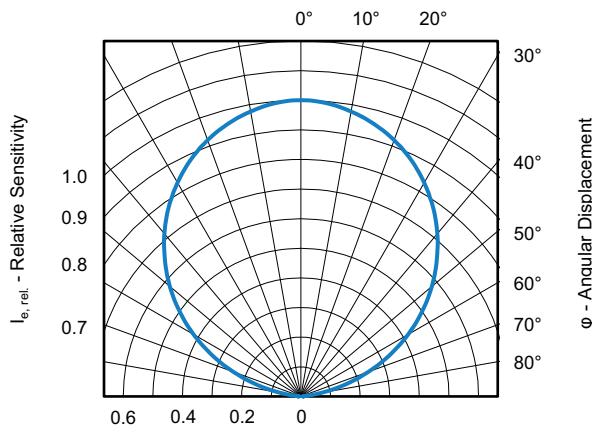


Fig. 10 - Relative Sensitivity vs. Angular Displacement

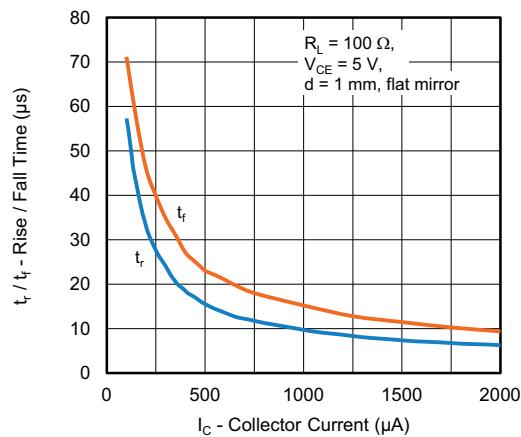


Fig. 13 - Rise / Fall Time vs. Collector Current

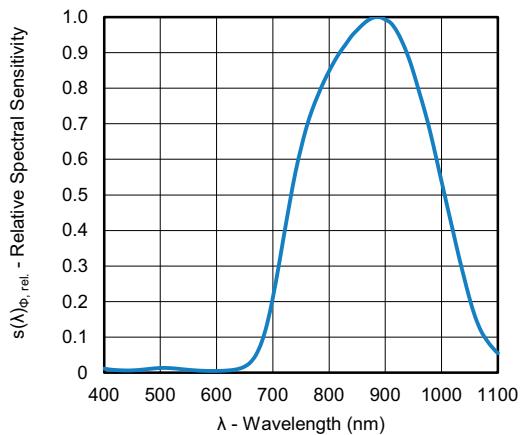


Fig. 11 - Relative Spectral Sensitivity vs. Wavelength

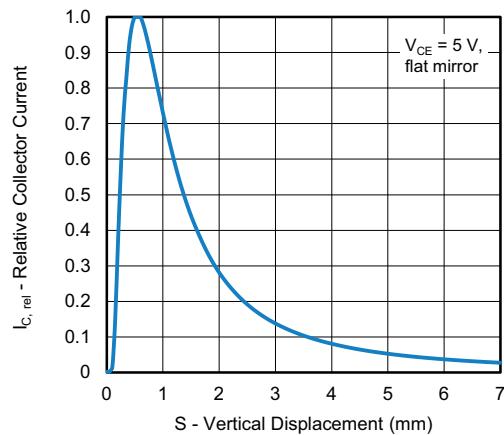


Fig. 14 - Relative Collector Current vs. Distance

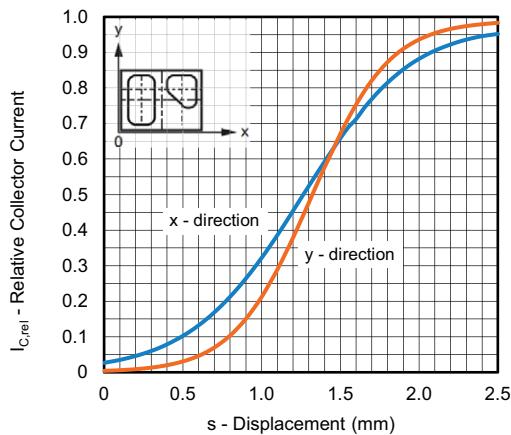


Fig. 12 - Relative Collector Current vs. Displacement

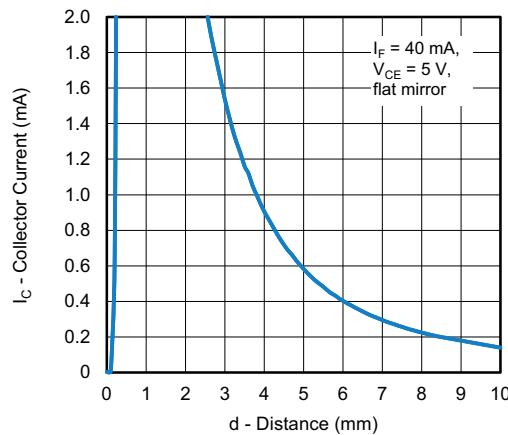


Fig. 15 - Collector Current vs. Distance, for  $I_C \leq 2$  mA

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

## DRYING

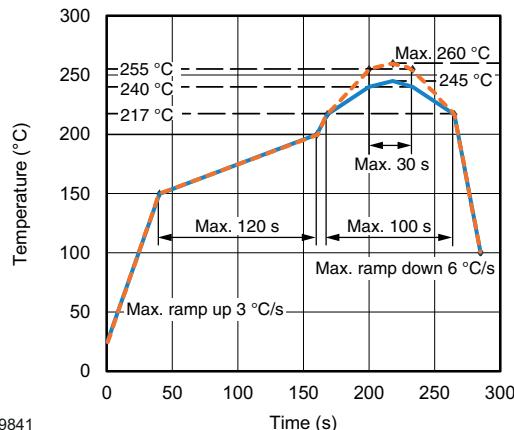
In case of moisture absorption devices should be baked before soldering. Conditions see J-STD-020 or recommended conditions:

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

or

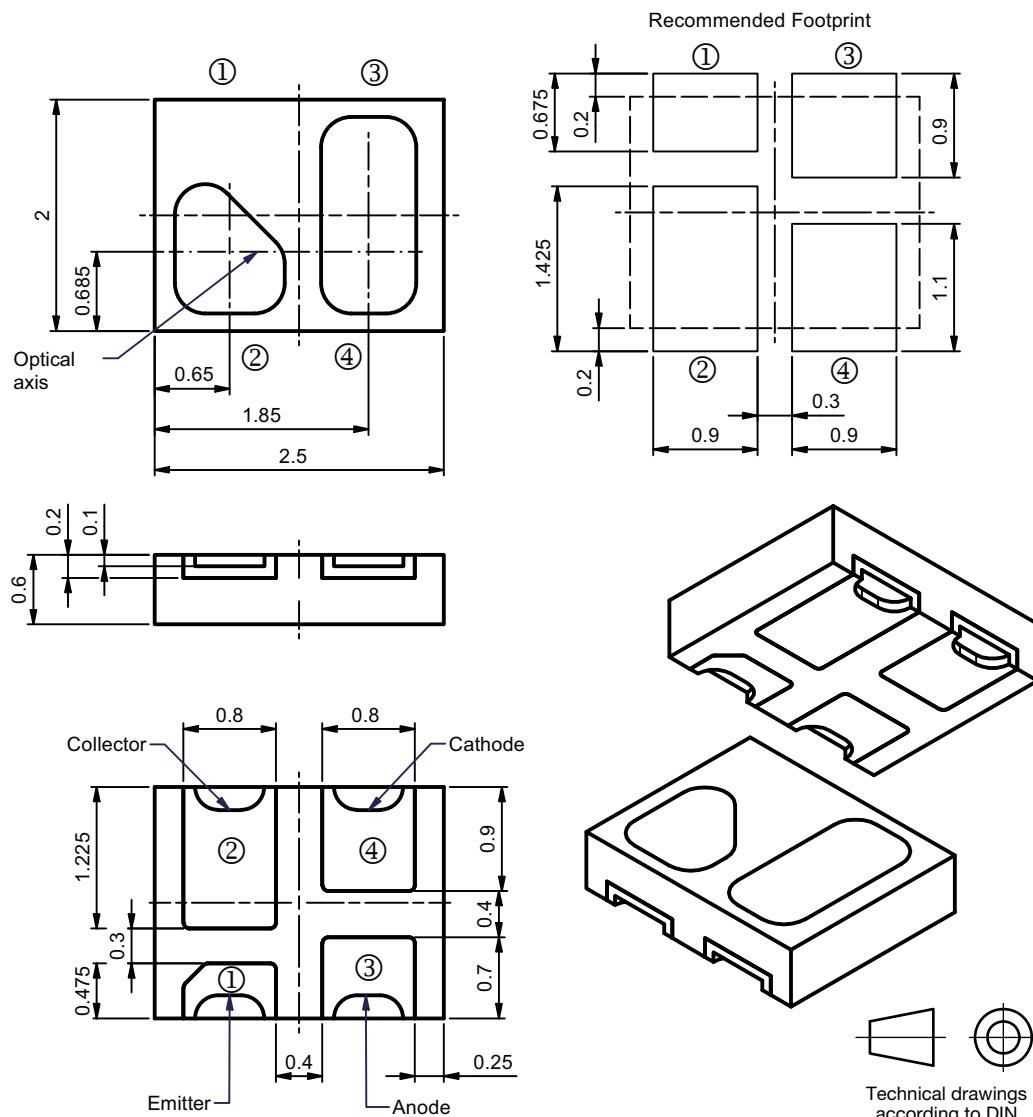
96 h at  $60^{\circ}\text{C}$  (+ 5 °C), RH < 5 %

## REFLOW SOLDER PROFILE



19841

Fig. 16 - Lead (Pb)-free Reflow Solder Profile  
According to J-STD-020

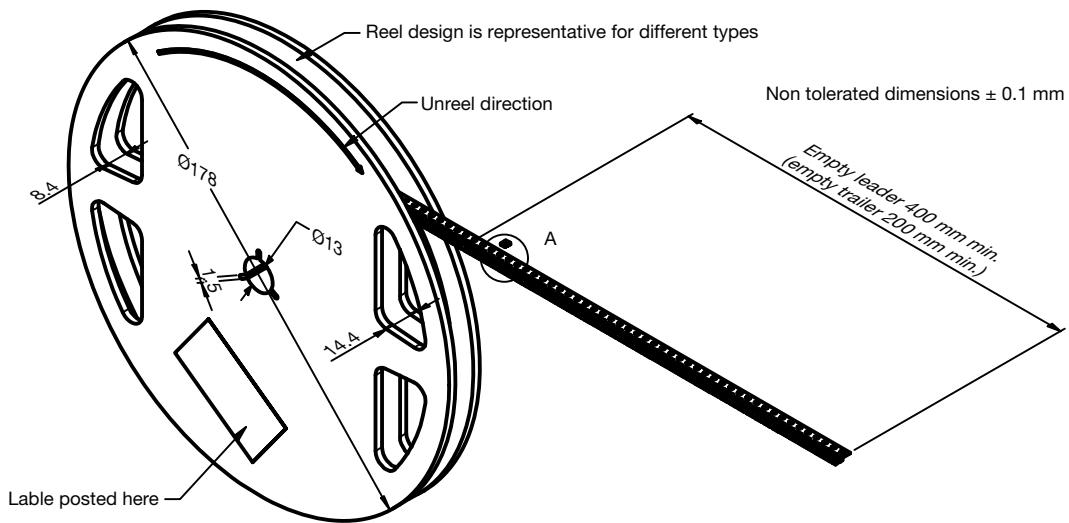
**PACKAGE DIMENSIONS** in millimeters


Drawing- No.: 6.550-5364.01-4  
Issue: 2; 11.01.2022

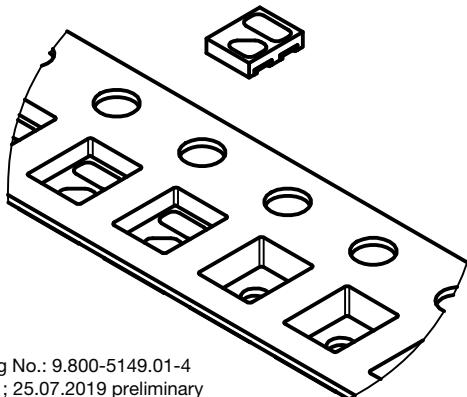
Not indicated tolerances  $\pm 0.1$

**TAPE AND REEL DIMENSIONS** in millimeters

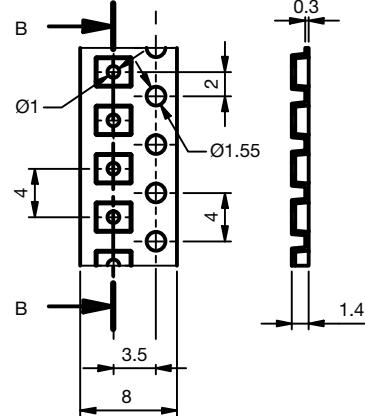
3000 pcs/reel



A (5 : 1)


 Drawing No.: 9.800-5149.01-4  
 Issue: 1; 25.07.2019 preliminary

B - B (2 : 1)



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