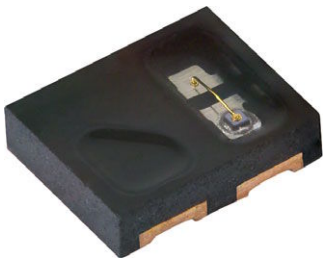
Reflective Optical Sensor With Transistor Output



LINKS TO ADDITIONAL RESOURCES

Design Tools | Related Documents | 3D Models | Application Notes

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.

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

AUTOMOTIVE GRADE

Pb-free

e4

RoHS COMPLIANT

HALOGEN FREE

GREEN (5-2008)

APPLICATIONS

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

PRODUCT SUMMARY

PART NUMBER	TARGET MATERIAL	DISTANCE RANGE FOR RELATIVE I_{OUT} > 0.5 mA WITH $I_{Fmax.}$ (mm)	TYPICAL CTR (1) (%)	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

(1) CTR: current transfer ratio, I_{out}/I_{in}

ORDERING INFORMATION

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

Note

(1) MOQ: minimum order quantity

ABSOLUTE MAXIMUM RATINGS (T_{amb} = 25 °C, unless otherwise specified)				
PARAMETER	**TEST CONDITION**	**SYMBOL**	**VALUE**	**UNIT**
INPUT (EMITTER)				
Reverse voltage		V_R	5	V
Forward current		I_F	65	mA
Forward surge current	$t_p \leq 100$ µs	I_{FSM}	200	mA
Junction temperature		T_J	120	°C
Thermal resistance junction to ambient	JESD 51	R_{thJA}	380	K/W
OUTPUT (DETECTOR)				
Collector emitter breakdown voltage		$V_{(BR)CEO}$	20	V
Emitter collector voltage		V_{ECO}	7	V
Collector current		I_C	50	mA
SENSOR				
Total power dissipation	$T_{amb} \leq 25$ °C	P_{tot}	107	mW
Ambient temperature range		T_{amb}	-40 to +110	°C
Storage temperature range		T_{stg}	-40 to +110	°C
Soldering temperature	In accordance with Fig. 16	T_{sd}	260	°C

ABSOLUTE MAXIMUM RATINGS

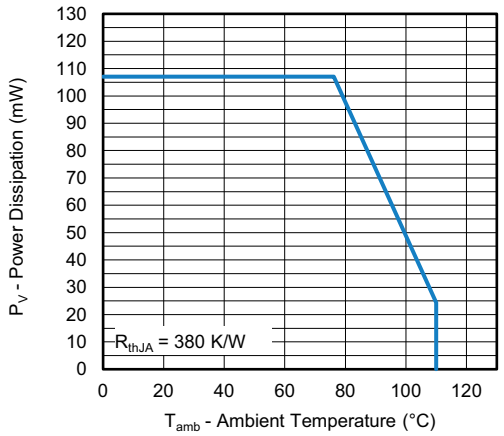


Fig. 1 - Power Dissipation vs. Ambient Temperature

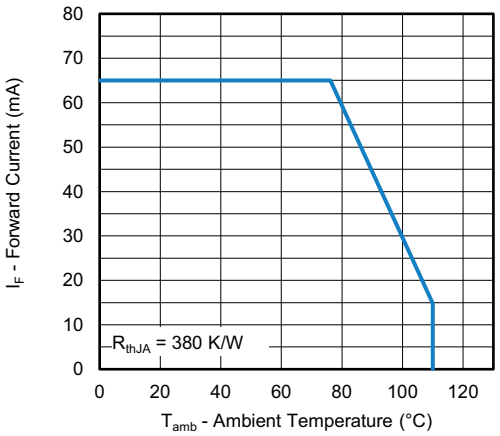


Fig. 2 - Forward Current vs. Ambient Temperature

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

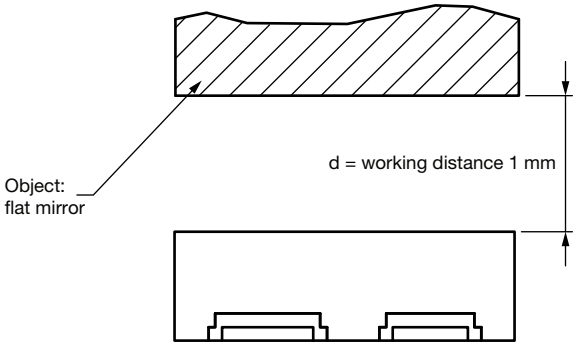


Fig. 3 - Test Setup

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

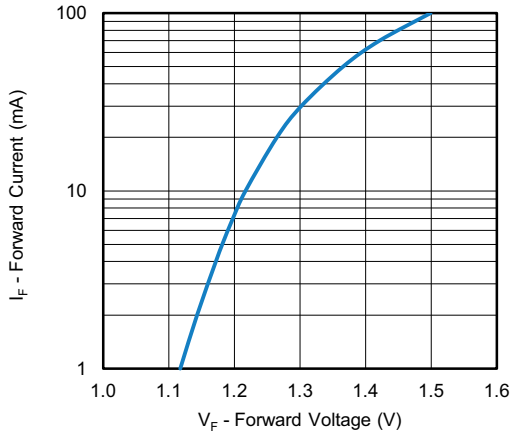


Fig. 4 - Forward Current vs. Forward Voltage

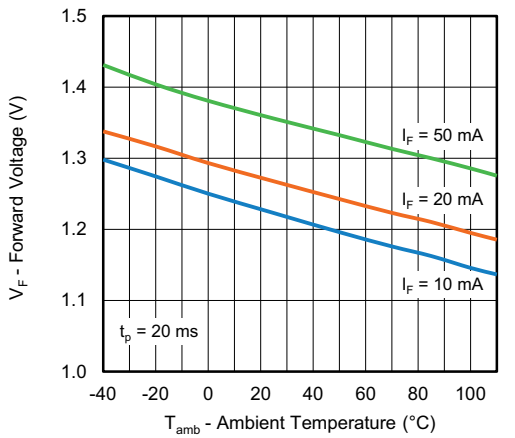


Fig. 5 - Forward Voltage vs. Ambient Temperature

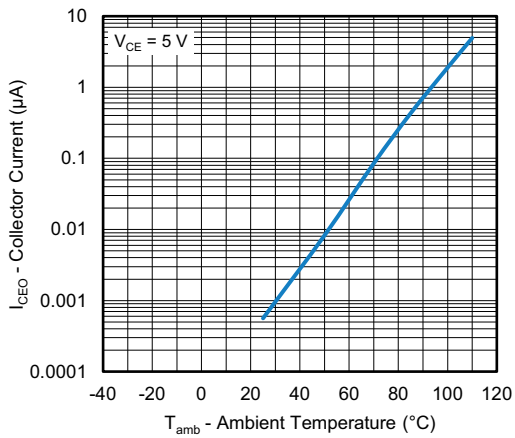


Fig. 6 - Collector Dark Current vs. Ambient Temperature

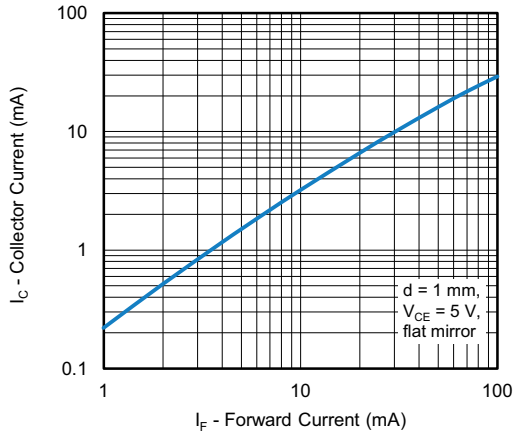


Fig. 7 - Collector Current vs. Forward Current

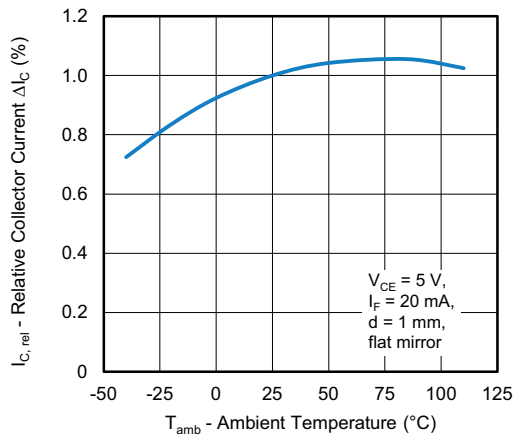


Fig. 8 - Relative Collector Current vs. Ambient Temperature

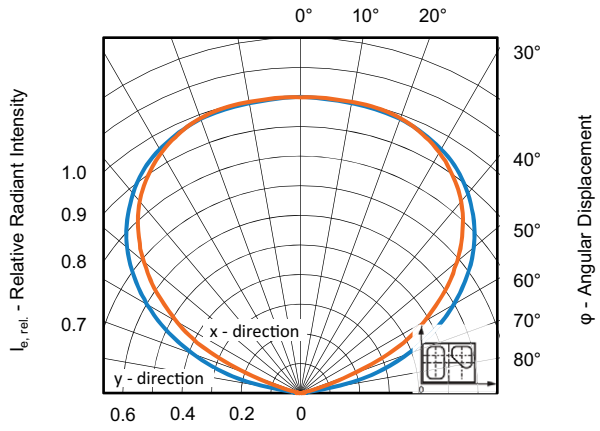


Fig. 9 - Relative Radiant Intensity vs. Angular Displacement

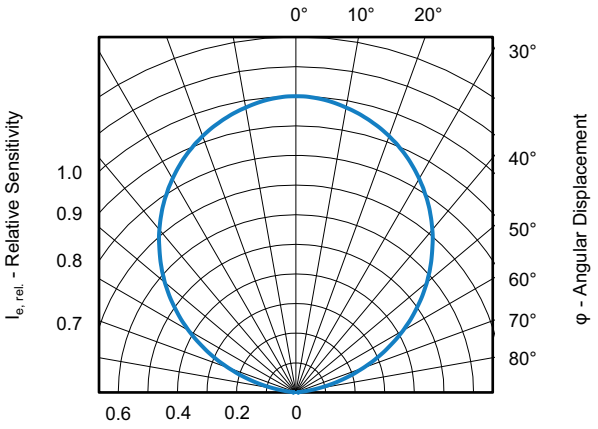


Fig. 10 - Relative Sensitivity vs. Angular Displacement

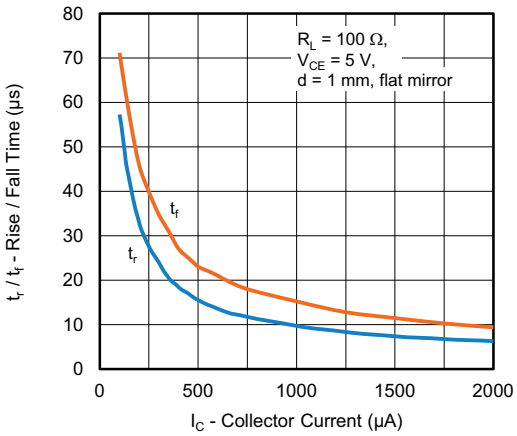


Fig. 13 - Rise / Fall Time vs. Collector Current

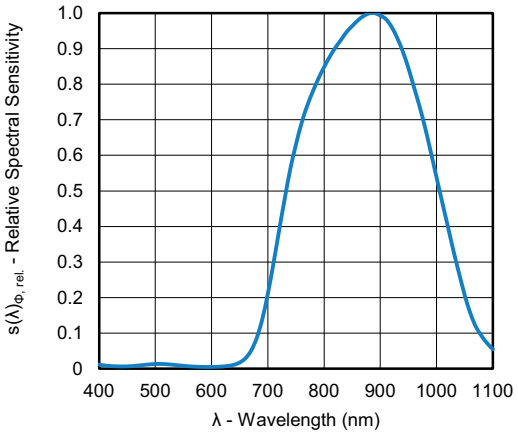


Fig. 11 - Relative Spectral Sensitivity vs. Wavelength

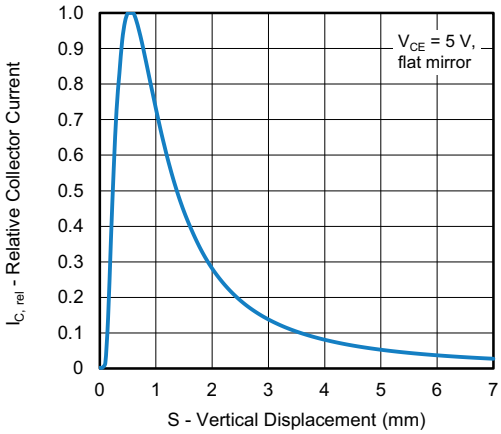


Fig. 14 - Relative Collector Current vs. Distance

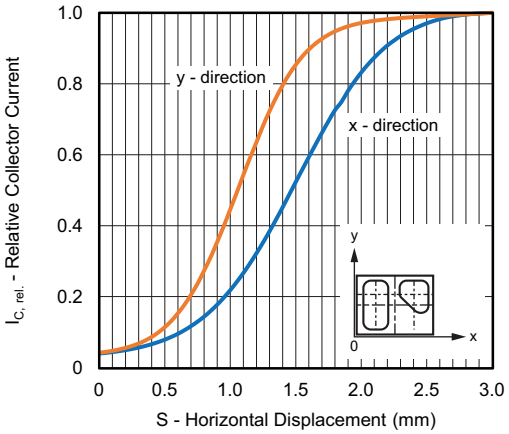


Fig. 12 - Relative Collector Current vs. Displacement

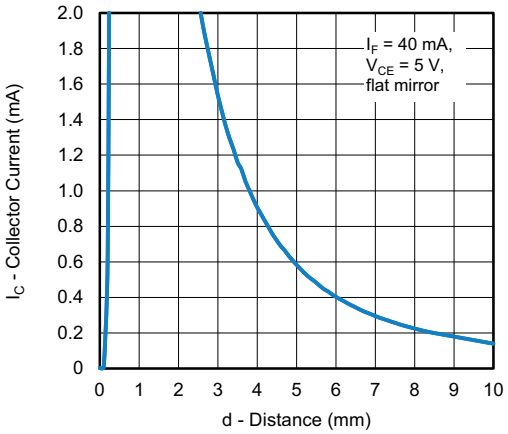


Fig. 15 - Collector Current vs. Distance, for $I_C \leq 2$ mA

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 °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 °C (+ 5 °C), RH < 5 %

or

96 h at 60 °C (+ 5 °C), RH < 5 %

REFLOW SOLDER PROFILE

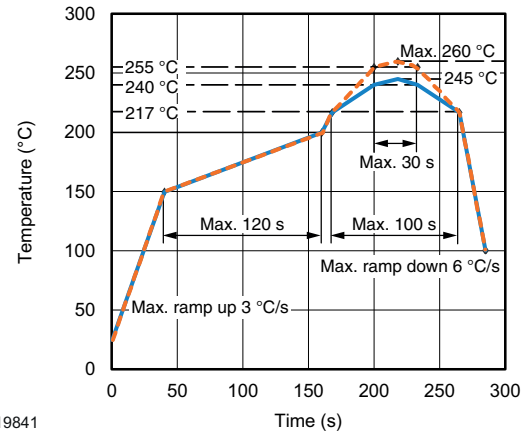
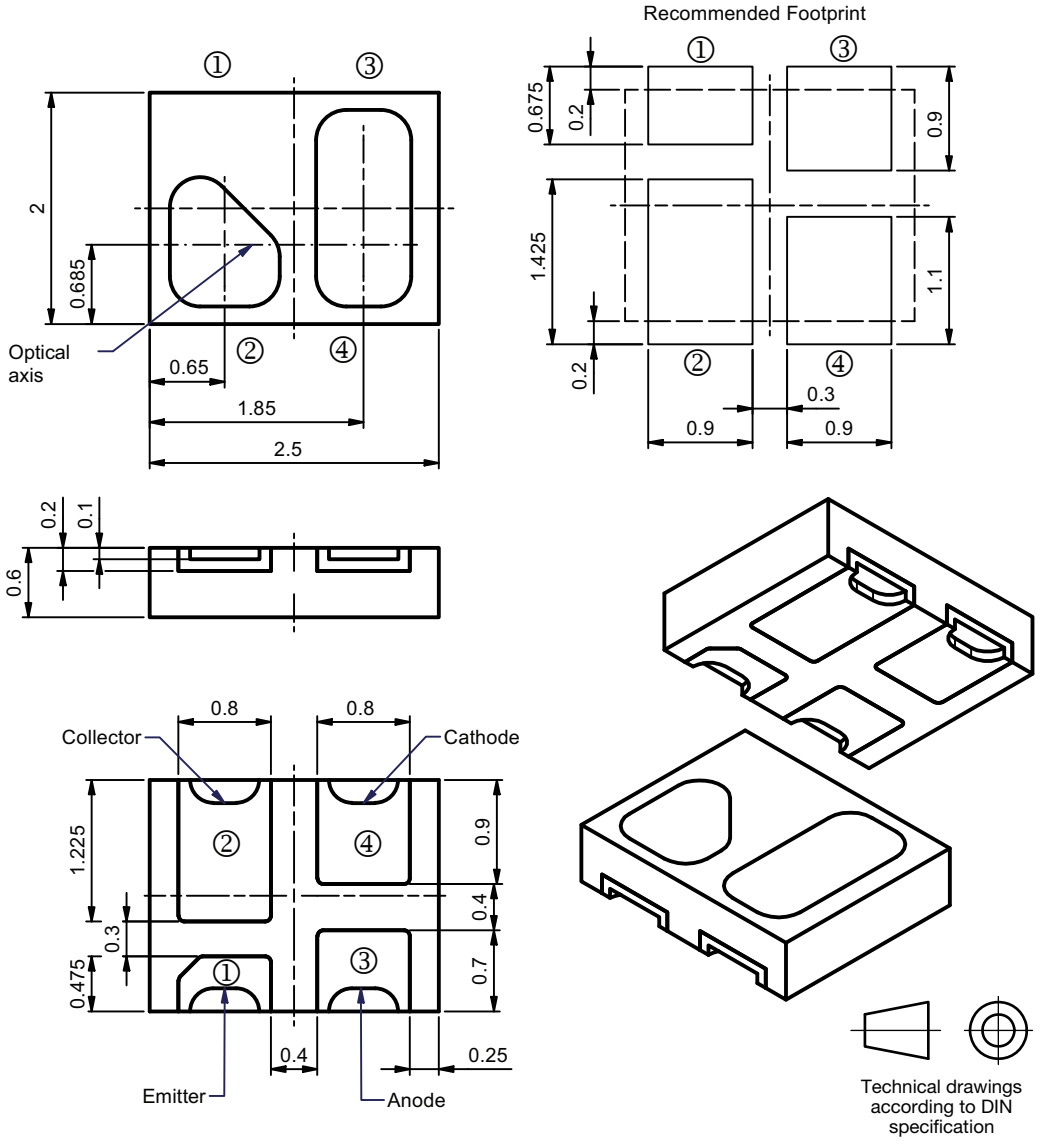


Fig. 16 - Lead (Pb)-free Reflow Solder Profile According to J-STD-020

PACKAGE DIMENSIONS in millimeters

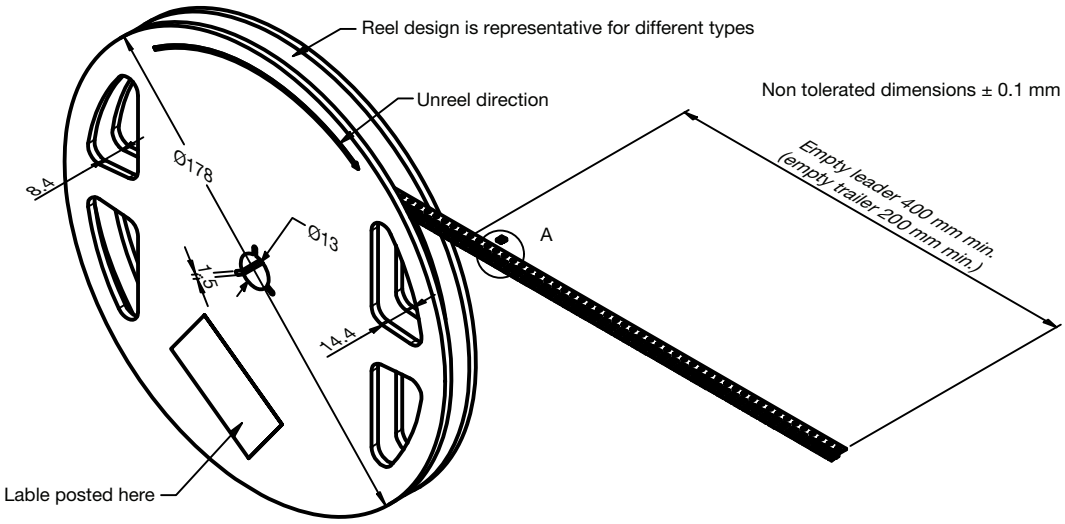


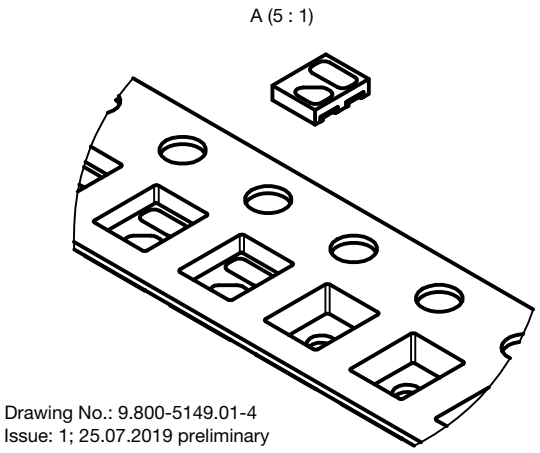
Drawing- No.: 6.550-5364.01-4
Issue: 2; 11.01.2022

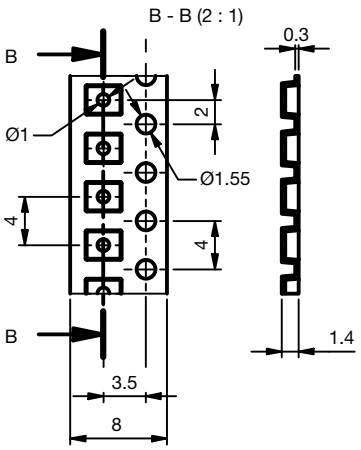
Not indicated tolerances ± 0.1

TAPE AND REEL DIMENSIONS in millimeters

3000 pcs/reel







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

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