

Reflective Optical Sensor With Transistor Output



LINKS TO ADDITIONAL RESOURCES



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



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 ($T_{amb} = 25\text{ }^{\circ}\text{C}$, unless otherwise specified)				
PARAMETER	TEST CONDITION	SYMBOL	VALUE	UNIT
INPUT (EMITTER)				
Reverse voltage		V_R	5	V
Forward current		I_F	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
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	$T_{amb} \leq 25\text{ }^{\circ}\text{C}$	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

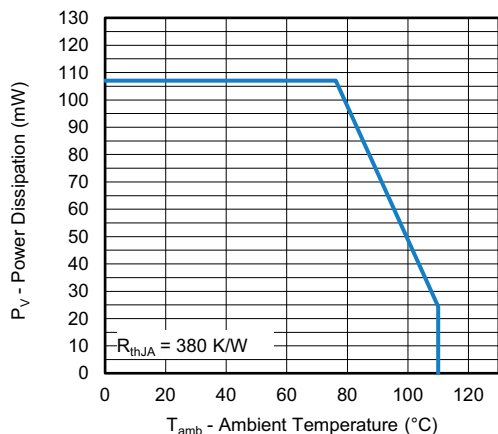


Fig. 1 - Power Dissipation vs. Ambient Temperature

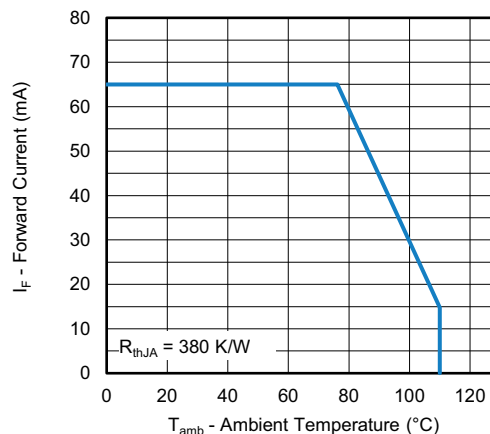


Fig. 2 - Forward Current vs. Ambient Temperature

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

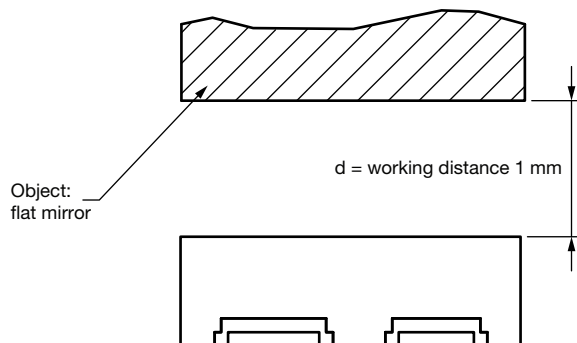


Fig. 3 - Test Setup

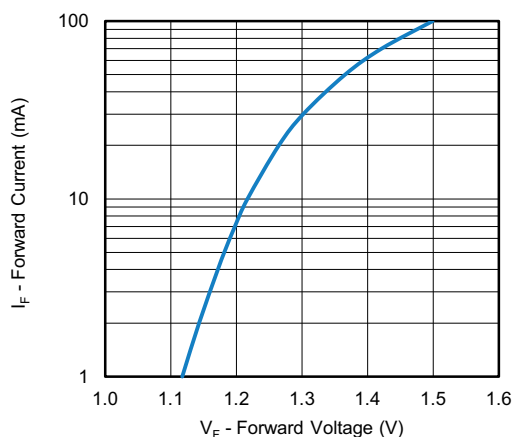
BASIC CHARACTERISTICS ($T_{amb} = 25\text{ }^{\circ}\text{C}$, unless otherwise specified)


Fig. 4 - Forward Current vs. Forward Voltage

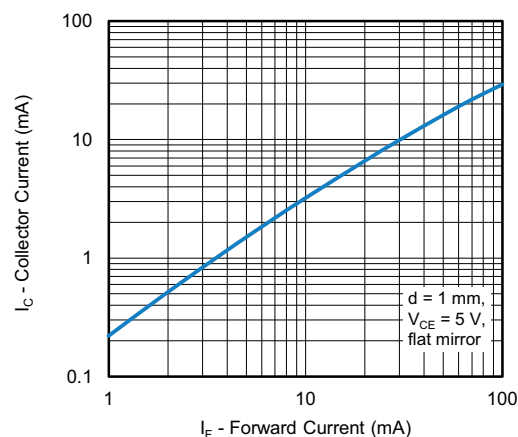


Fig. 7 - Collector Current vs. Forward Current

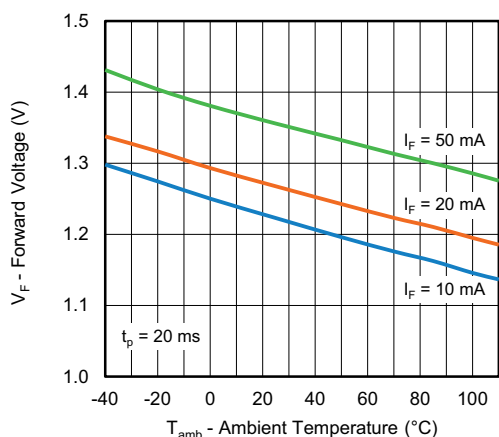


Fig. 5 - Forward Voltage vs. Ambient Temperature

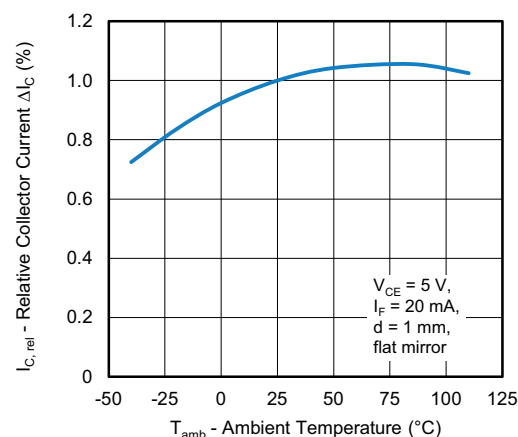


Fig. 8 - Relative Collector Current vs. Ambient Temperature

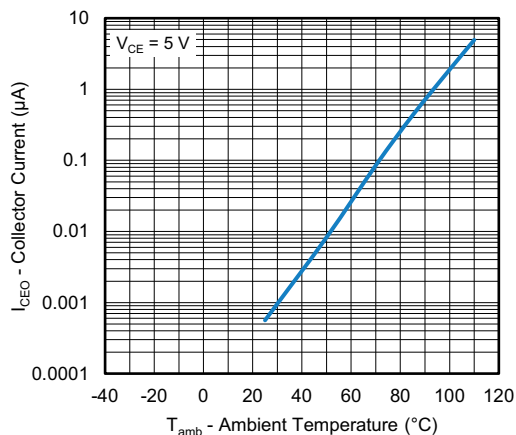


Fig. 6 - Collector Dark Current vs. Ambient Temperature

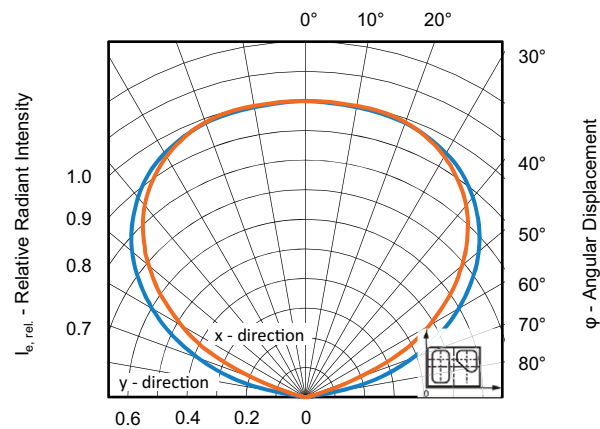


Fig. 9 - Relative Radiant Intensity vs. Angular Displacement

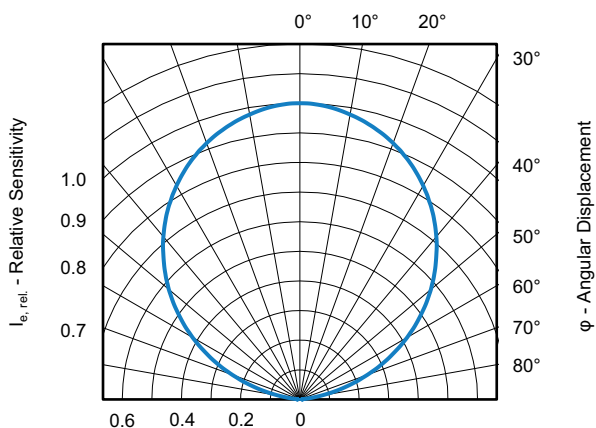


Fig. 10 - Relative Sensitivity vs. Angular Displacement

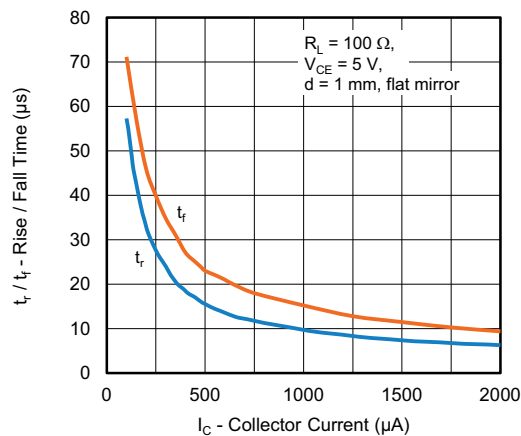


Fig. 13 - Rise / Fall Time vs. Collector Current

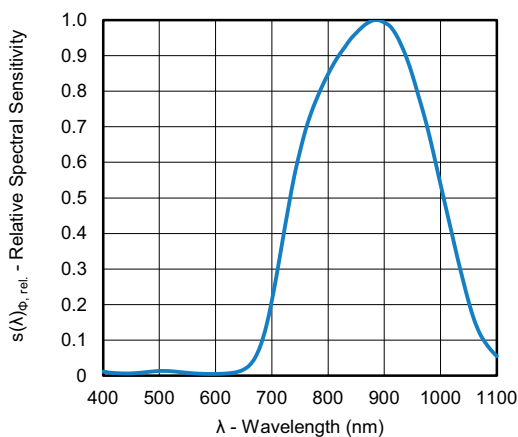


Fig. 11 - Relative Spectral Sensitivity vs. Wavelength

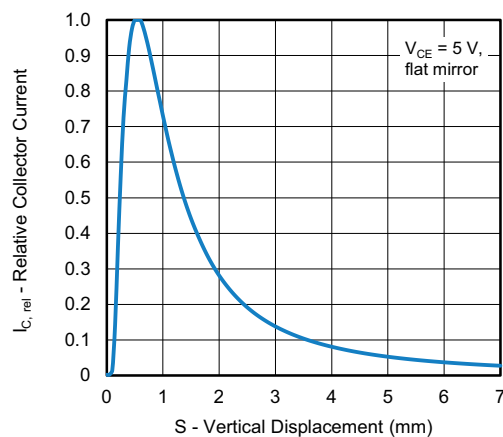


Fig. 14 - Relative Collector Current vs. Distance

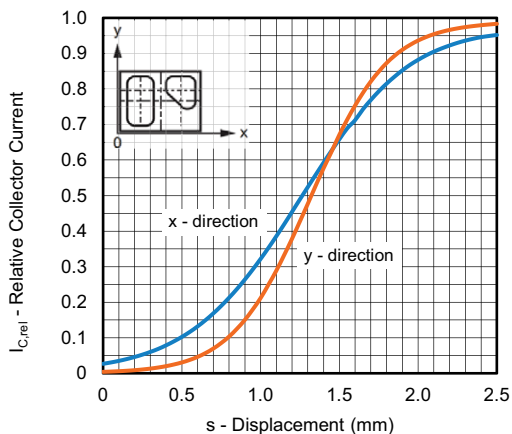
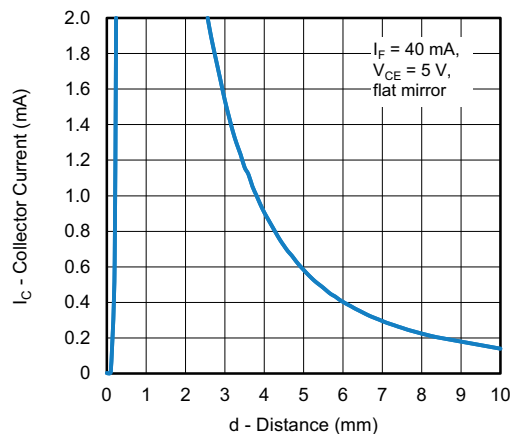


Fig. 12 - Relative Collector Current vs. Displacement


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



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: $T_{amb} < 30\text{ }^{\circ}\text{C}$, 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 $40\text{ }^{\circ}\text{C}$ (+ 5 $^{\circ}\text{C}$), RH < 5 %

or

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

REFLOW SOLDER PROFILE

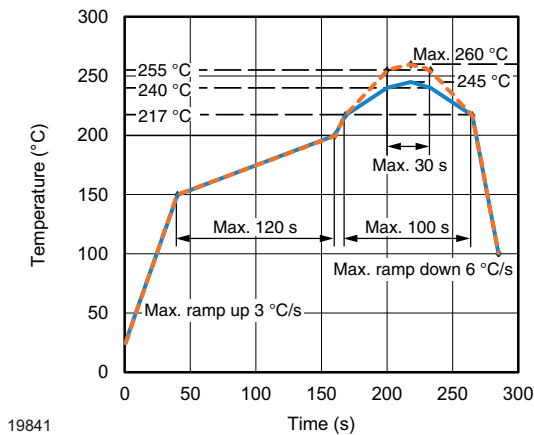
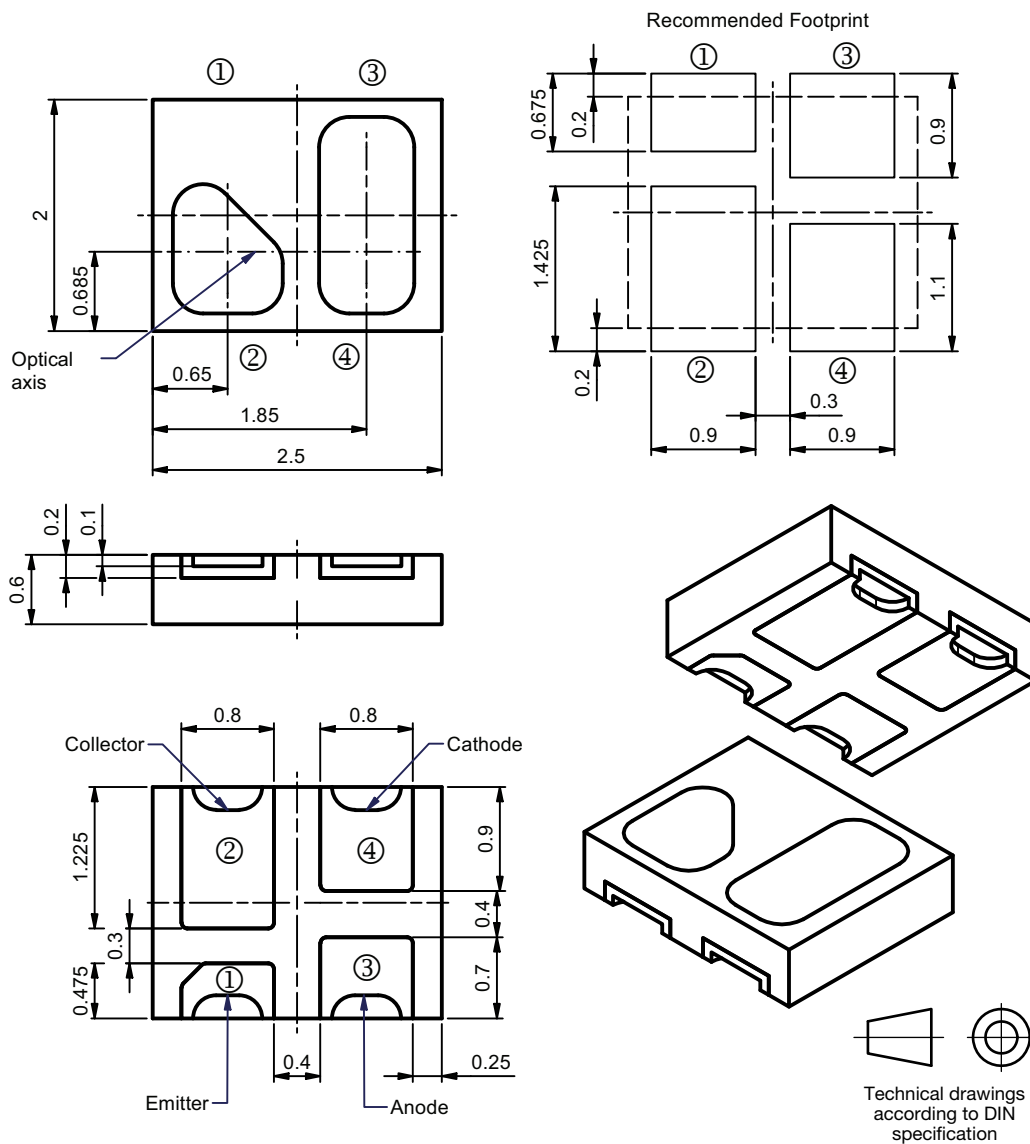


Fig. 16 - Lead (Pb)-free Reflow Solder Profile
According to J-STD-020

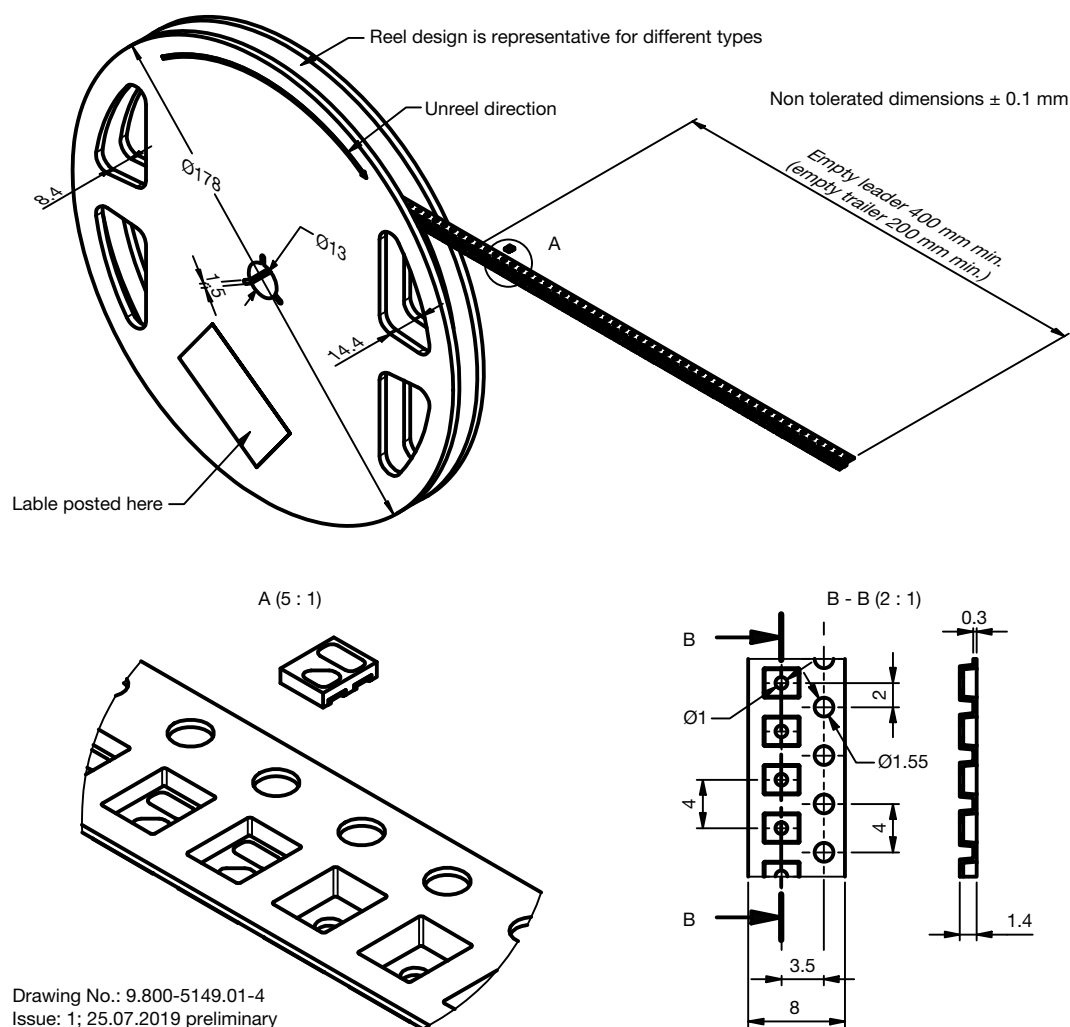
PACKAGE DIMENSIONS in millimeters


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





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