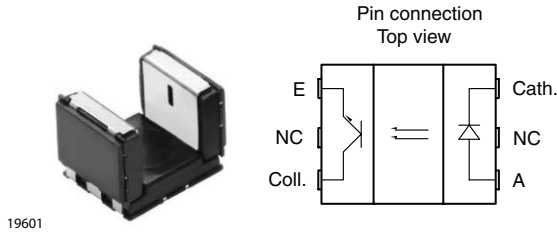


# Subminiature Transmissive Optical Sensor with Transistor Output



## DESCRIPTION

The TCPT1300X01 is a compact transmissive sensor that includes an infrared emitter and a phototransistor detector, located face-to-face in a surface mount package.

## FEATURES

- Package type: surface mount
- Detector type: phototransistor
- Dimensions (L x W x H in mm): 5.5 x 4 x 4
- AEC-Q101 qualified
- Gap (in mm): 3
- Aperture (in mm): 0.3
- Typical output current under test:  $I_C = 0.6 \text{ mA}$
- Emitter wavelength: 950 nm
- Moisture sensitivity level (MSL): 1
- Compliant to RoHS directive 2002/95/EC and in accordance to WEEE 2002/96/EC
- Halogen-free according to IEC 61249-2-21 definition



**RoHS**  
COMPLIANT  
HALOGEN  
**FREE**

## APPLICATIONS

- Automotive optical sensors
- Accurate position sensor for encoder
- Detection of motion speed

## PRODUCT SUMMARY

PART NUMBER	GAP WIDTH (mm)	APERTURE WIDTH (mm)	TYPICAL OUTPUT CURRENT UNDER TEST <sup>(1)</sup> (mA)	DAYLIGHT BLOCKING FILTER INTEGRATED
TCPT1300X01	3	0.3	0.6	No

### Note

<sup>(1)</sup> Conditions like in table basic characteristics/coupler

## ORDERING INFORMATION

ORDERING CODE	PACKAGING	VOLUME <sup>(1)</sup>	REMARKS
TCPT1300X01	Tape and reel	MOQ: 2000 pcs, 2000 pcs/reel	Drypack, MSL 1

### Note

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

## ABSOLUTE MAXIMUM RATINGS <sup>(1)</sup>

PARAMETER	TEST CONDITION	SYMBOL	VALUE	UNIT
<b>COUPLER</b>				
Total power dissipation	$T_{amb} \leq 25 \text{ }^\circ\text{C}$	$P_{tot}$	150	mW
Junction temperature		$T_j$	145	$^\circ\text{C}$
Ambient temperature range		$T_{amb}$	- 40 to + 125	$^\circ\text{C}$
Storage temperature range		$T_{stg}$	- 40 to + 125	$^\circ\text{C}$
Soldering temperature	In accordance with fig. 15	$T_{sd}$	260	$^\circ\text{C}$
<b>INPUT (EMITTER)</b>				
Reverse voltage		$V_R$	5	V
Forward current	$T_{amb} \leq 125 \text{ }^\circ\text{C}$	$I_F$	25	mA
Forward surge current	$t_p \leq 10 \text{ } \mu\text{s}$	$I_{FSM}$	200	mA
Power dissipation	$T_{amb} \leq 25 \text{ }^\circ\text{C}$	$P_V$	75	mW

ABSOLUTE MAXIMUM RATINGS (1)				
PARAMETER	TEST CONDITION	SYMBOL	VALUE	UNIT
<b>OUTPUT (DETECTOR)</b>				
Collector emitter voltage		$V_{CEO}$	20	V
Emitter collector voltage		$V_{ECO}$	7	V
Collector current		$I_C$	20	mA
Power dissipation	$T_{amb} \leq 25\text{ }^\circ\text{C}$	$P_V$	75	mW
Collector dark current	$T_{amb} = 85\text{ }^\circ\text{C}, V_{CE} = 5\text{ V}$	$I_{CEO}$	3.3	$\mu\text{A}$

**Note**

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

## ABSOLUTE MAXIMUM RATINGS

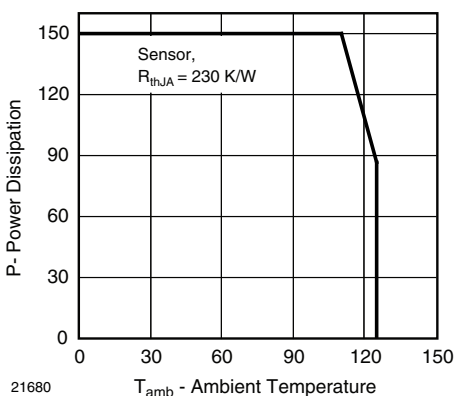


Fig. 1 - Power Dissipation Limit vs. Ambient Temperature

BASIC CHARACTERISTICS (1)						
PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT
<b>COUPLER</b>						
Collector current	$V_{CE} = 5\text{ V}, I_F = 15\text{ mA}$	$I_C$	300	600		$\mu\text{A}$
Collector emitter saturation voltage	$I_F = 15\text{ mA}, I_C = 0.05\text{ mA}$	$V_{CEsat}$			0.4	V
<b>INPUT (EMITTER)</b>						
Forward voltage	$I_F = 15\text{ mA}$	$V_F$		1.2	1.4	V
Reverse current	$V_R = 5\text{ V}$	$I_R$			10	$\mu\text{A}$
Junction capacitance	$V_R = 0\text{ V}, f = 1\text{ MHz}$	$C_j$		25		pF
<b>OUTPUT (DETECTOR)</b>						
Collector emitter voltage $I_C$	$I_C = 1\text{ mA}$	$V_{CEO}$	20			V
Emitter collector voltage	$I_E = 100\text{ }\mu\text{A}$	$V_{ECO}$	7			V
Collector dark current	$V_{CE} = 25\text{ V}, I_F = 0\text{ A}, E = 0\text{ lx}$	$I_{CEO}$		1	100	nA
<b>SWITCHING CHARACTERISTICS</b>						
Rise time	$I_C = 0.3\text{ mA}, V_{CE} = 5\text{ V}, R_L = 100\text{ }\Omega$ (see figure 3)	$t_r$		20	150	$\mu\text{s}$
Fall time	$I_C = 0.3\text{ mA}, V_{CE} = 5\text{ V}, R_L = 100\text{ }\Omega$ (see figure 3)	$t_f$		30	150	$\mu\text{s}$

**Note**

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

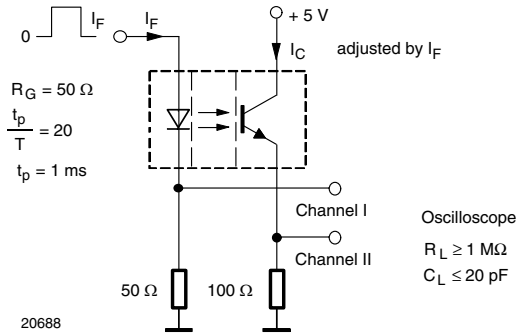


Fig. 2 - Test Circuit for  $t_r$  and  $t_f$

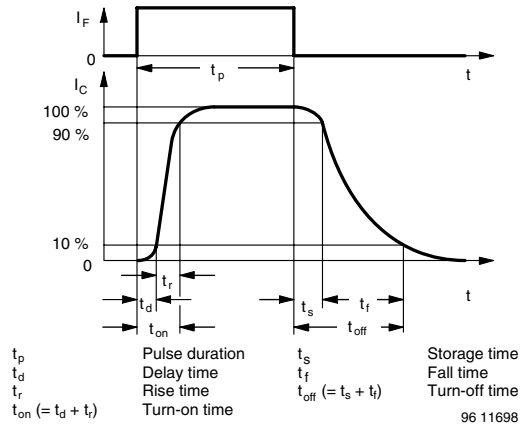


Fig. 3 - Switching Times

### BASIC CHARACTERISTICS

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

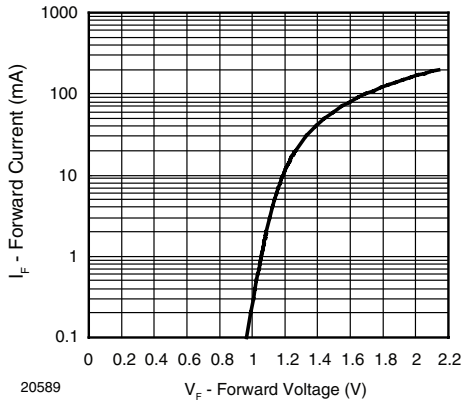


Fig. 4 - Forward Current vs. Forward Voltage

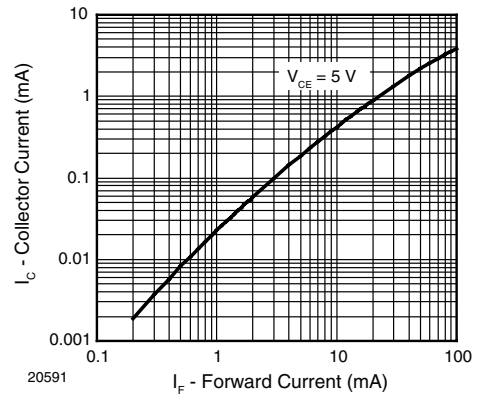


Fig. 6 - Collector Current vs. Forward Current

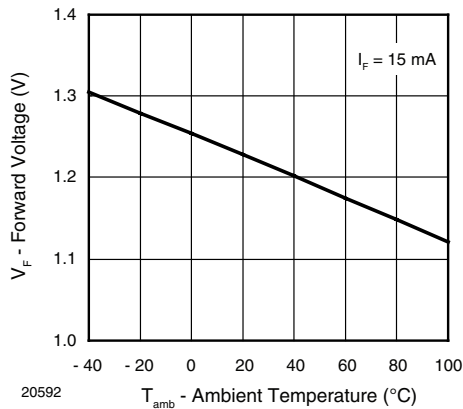


Fig. 5 - Forward Voltage vs. Ambient Temperature

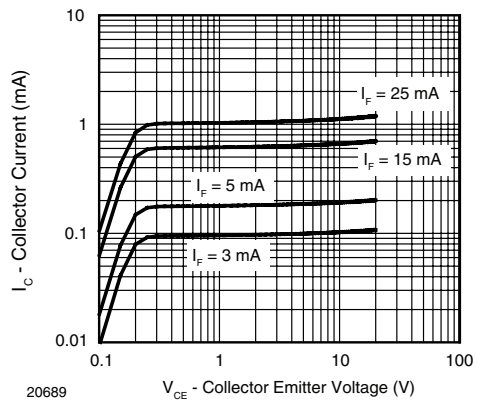


Fig. 7 - Collector Current vs. Collector Emitter Voltage

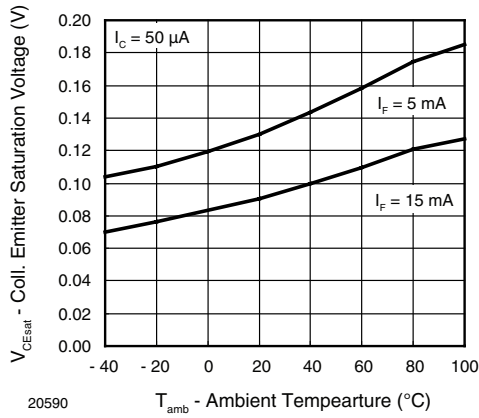


Fig. 8 - Collector-Emitter Saturation Voltage vs. Ambient Temperature

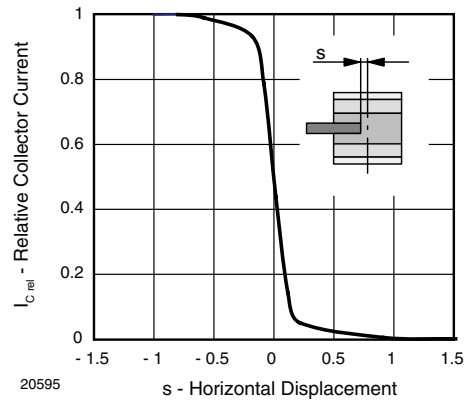


Fig. 11 - Relative Collector Current vs. Horizontal Displacement

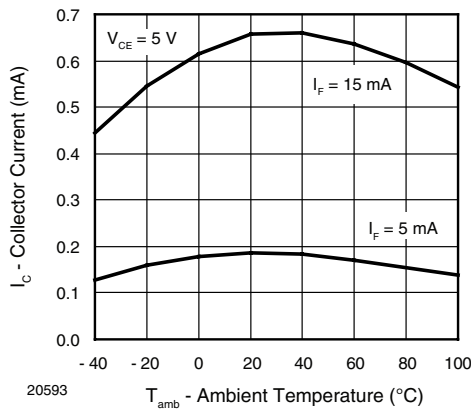


Fig. 9 - Collector Current vs. Ambient Temperature

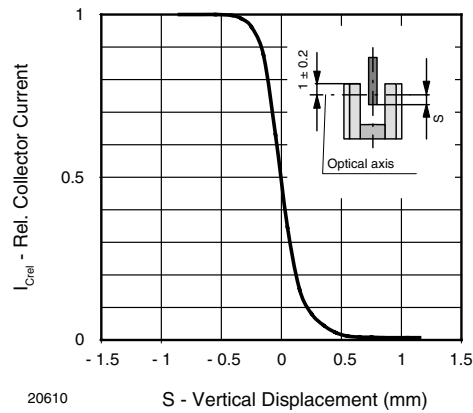


Fig. 12 - Relative Collector Current vs. Vertical Displacement

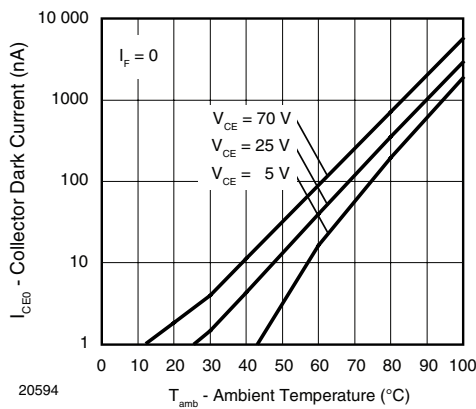


Fig. 10 - Collector Dark Current vs. Ambient Temperature

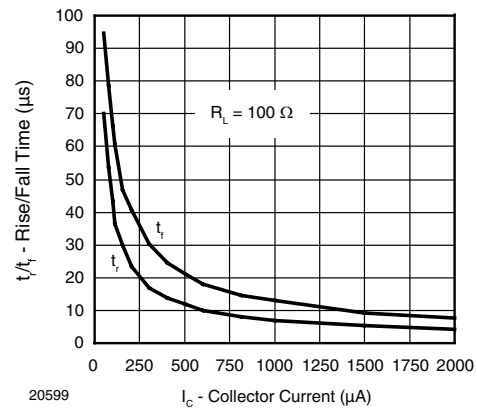


Fig. 13 - Rise/Fall Time vs. Collector Current

### REFLOW SOLDER PROFILE

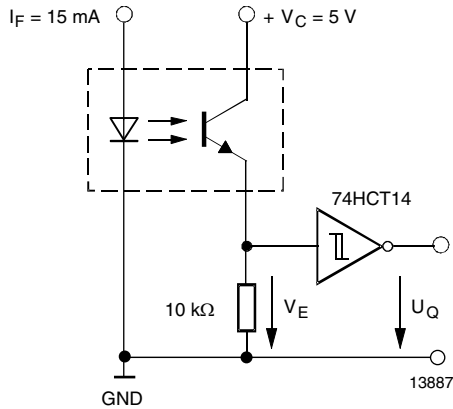


Fig. 14 - Application example

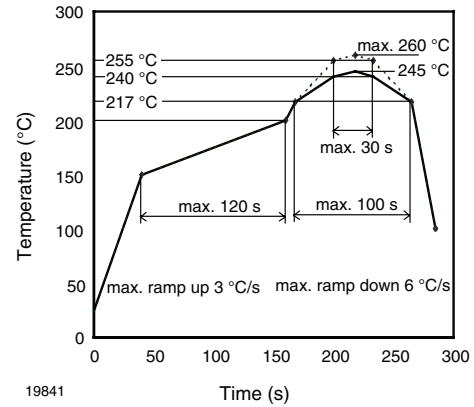


Fig. 15 - Lead (Pb)-free Reflow Solder Profile acc. J-STD-020

### FLOOR LIFE

No time limit.

Moisture sensitivity level (MSL) 1, acc. JEDEC, J-STD-020.

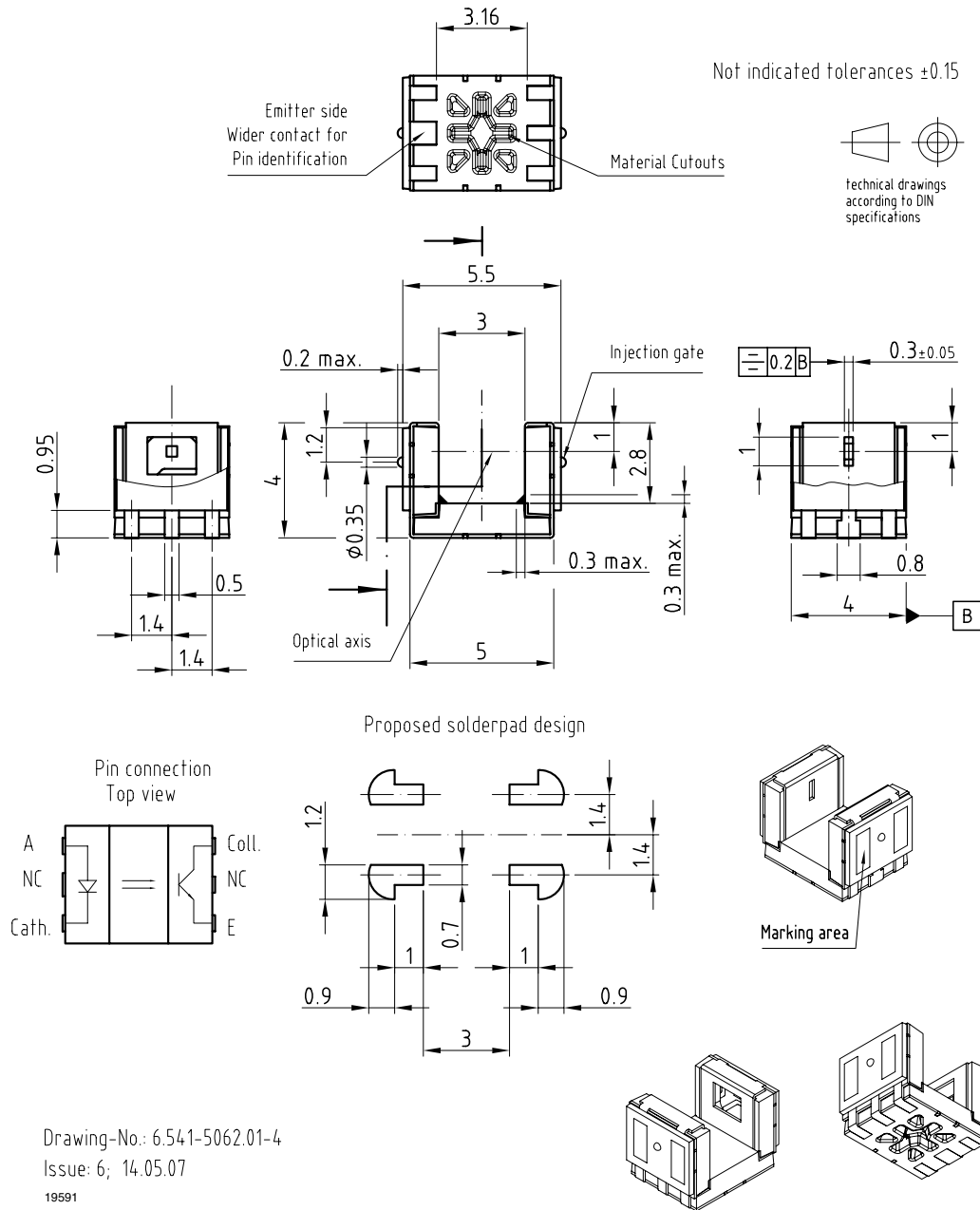
RELIABILITY TESTS IN REFERENCE TO AEC-Q101 RELEASE			
TEST	CONDITION	DURATION	LOT SIZE - REJECTS
High temperature storage	$T_{stg(max.)} = 100\text{ °C}$	1000 h	3 x 50 pcs - 0 pcs
Low temperature storage	$T_{stg(min.)} = -40\text{ °C}$	1000 h	3 x 50 pcs - 0 pcs
Temperature cycling	$-40\text{ °C}/+100\text{ °C}$	1000 x	3 x 77 pcs - 0 pcs
H3TRB	85 °C/85 % RH, emitters: $V_R = 4\text{ V}$ , detectors: $V_{CEO} = 5\text{ V}$	1000 h	3 x 77 pcs - 0 pcs
Intermittent operational life	Emitters: $I_F = 80\text{ mA DC}$ , detectors: $V_{CE} = 16\text{ V}$ , duty cycle: 2 min on, 2 min off, $T_{amb} = 25\text{ °C}$	1000 h (15 000 cycles)	3 x 77 pcs - 0 pcs

# TCPT1300X01



Vishay Semiconductors Subminiature Transmissive Optical Sensor with Transistor Output

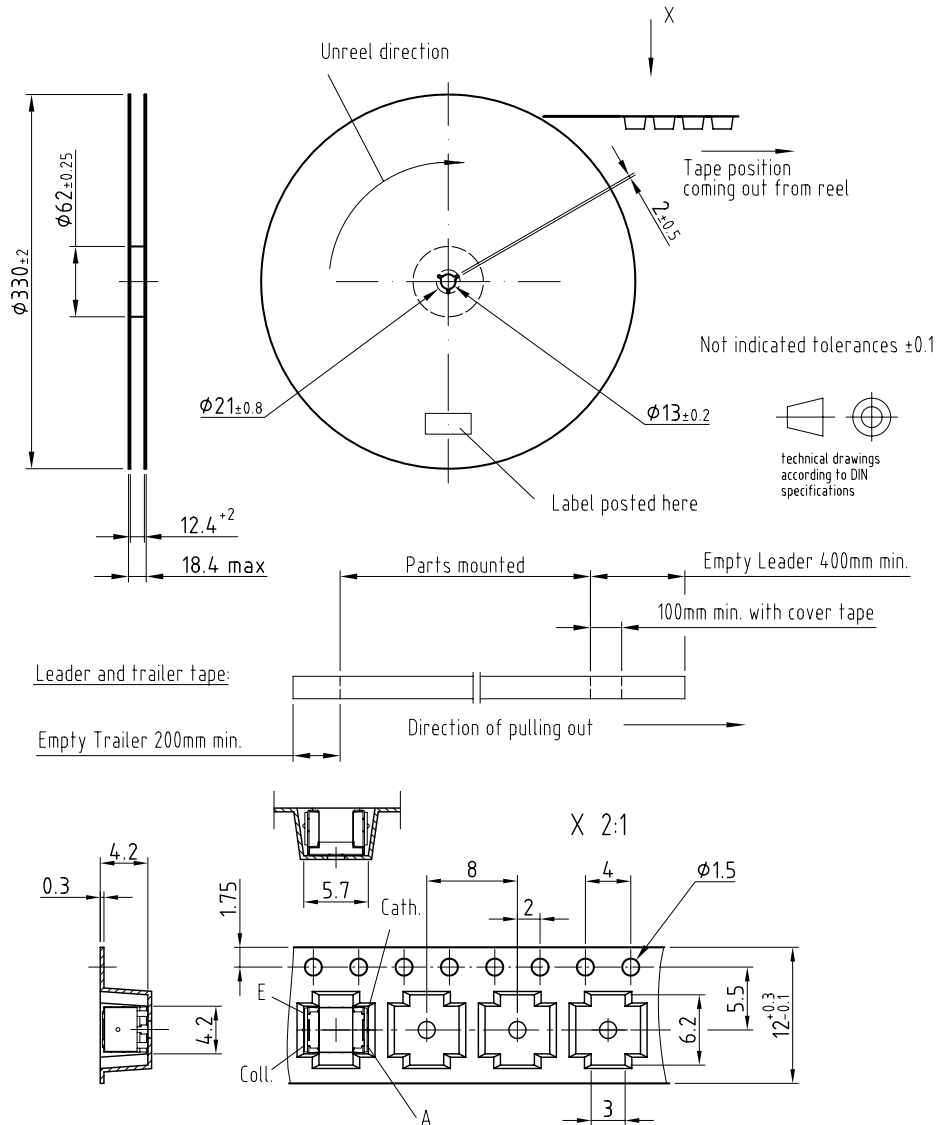
## PACKAGE DIMENSIONS in millimeters





**PACKAGE DIMENSIONS** in millimeters

Volume/reel = 2000 pcs



Drawing-No.: 9.800-5092.02-4  
Issue: 1; 14.05.07  
20601



## Disclaimer

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