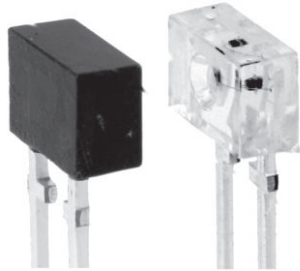




## Matched Pairs of Emitters and Detectors



96 12317\_1

### DESCRIPTION

The TCZT8020 include matched infrared emitters and phototransistors in leaded packages, used to assemble custom-designed transmissive sensors or reflective sensors. The phototransistor package blocks visible light.

### FEATURES

- Package type: leaded
- Detector type: phototransistor
- Dimensions (L x W x H in mm): 4.4 x 2 x 3
- Typical output current under test:  $I_C = 0.5 \text{ mA}$
- Daylight blocking filter
- Emitter wavelength: 950 nm
- Angle of half intensity:  $\phi = \pm 25^\circ$
- S420P: single detector component (dark epoxy)
- V420P: single emitter component (clear epoxy)
- Lead (Pb)-free soldering released
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)



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

### APPLICATIONS

- Custom-design sensors for various distances
- Reflective sensors
- Transmissive sensors

| PRODUCT SUMMARY |                |   |                                     |
|-----------------|----------------|---|-------------------------------------|
| PART NUMBER     | GAP WIDTH (mm) | TYPICAL OUTPUT CURRENT UNDER TEST <sup>(1)</sup> (mA) | DAYLIGHT BLOCKING FILTER INTEGRATED |
| TCZT8020        | Variable       | 0.5   | Yes                                 |

#### Note

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

| ORDERING INFORMATION |           |                                   |   |
|----------------------|-----------|-----------------------------------|---|
| ORDERING CODE        | PACKAGING | VOLUME <sup>(1)</sup>             | REMARKS                                 |
| TCZT8020             | Bulk      | MOQ: 2000 pairs,<br>1000 pcs/bulk | Detectors and emitters in separate bulk |

#### 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>COUPLER</b>   |   |           |             |                    |
| Ambient temperature range  |   | $T_{amb}$ | -55 to +85  | $^{\circ}\text{C}$ |
| Storage temperature range  |   | $T_{stg}$ | -55 to +100 | $^{\circ}\text{C}$ |
| Soldering temperature  | Distance to package 2 mm, $t \leq 5\text{ s}$ | $T_{sd}$  | 260         | $^{\circ}\text{C}$ |
| <b>INPUT (EMITTER)</b>   |   |           |             |                    |
| Reverse voltage  |   | $V_R$     | 6           | V                  |
| Forward current  |   | $I_F$     | 60          | mA                 |
| Forward surge current  | $t \leq 10\text{ }\mu\text{s}$                | $I_{FSM}$ | 1           | A                  |
| Power dissipation  | $T_{amb} \leq 25\text{ }^{\circ}\text{C}$     | $P_V$     | 100         | mW                 |
| Junction temperature   |   | $T_j$     | 100         | $^{\circ}\text{C}$ |
| <b>OUTPUT (DETECTOR)</b>   |   |           |             |                    |
| Collector emitter voltage  |   | $V_{CEO}$ | 70          | V                  |
| Emitter collector voltage  |   | $V_{ECO}$ | 7           | V                  |
| <b>OUTPUT (DETECTOR)</b>   |   |           |             |                    |
| Collector current  |   | $I_C$     | 50          | mA                 |
| Collector peak current   | $t_p/T = 0.5$ , $t \leq 10\text{ ms}$         | $I_{CM}$  | 100         | mA                 |
| Power dissipation  | $T_{amb} \leq 25\text{ }^{\circ}\text{C}$     | $P_V$     | 150         | mW                 |
| Junction temperature   |   | $T_j$     | 100         | $^{\circ}\text{C}$ |

## ABSOLUTE MAXIMUM RATINGS

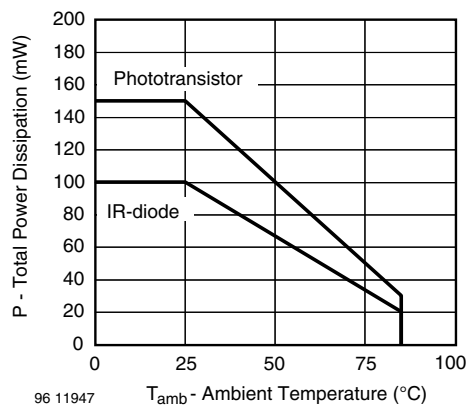


Fig. 1 - Power Dissipation Limit vs. Ambient Temperature



| <b>BASIC CHARACTERISTICS</b> ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified) |   |             |      |      |      |               |
|---|---|-------------|------|------|------|---------------|
| PARAMETER   | TEST CONDITION  | SYMBOL      | MIN. | TYP. | MAX. | UNIT          |
| <b>COUPLER</b>  |   |             |      |      |      |               |
| Collector current   | $V_{CE} = 5\text{ V}$ , $I_F = 20\text{ mA}$ , $d = 4\text{ mm}$ <sup>(1)</sup>       | $I_C$       | 0.25 | 0.5  | -    | mA            |
| $I_C/I_F$   | $V_{CE} = 5\text{ V}$ , $I_F = 20\text{ mA}$ , $d = 4\text{ mm}$                      | CTR         | 1.25 | 2.5  | -    | %             |
| Collector emitter saturation voltage  | $I_F = 20\text{ mA}$ , $I_C = 25\text{ }\mu\text{A}$                                  | $V_{CEsat}$ | -    | -    | 0.4  | V             |
| Cut-off frequency   | $I_F = 10\text{ mA}$ , $V_{CE} = 5\text{ V}$ ,<br>$R_L = 100\text{ }\Omega$           | $f_C$       | -    | 110  | -    | kHz           |
| <b>INPUT (EMITTER)</b>  |   |             |      |      |      |               |
| Forward voltage   | $I_F = 50\text{ mA}$  | $V_F$       | -    | 1.25 | 1.6  | V             |
| Radiant intensity   | $I_F = 60\text{ mA}$ , $t_P = 20\text{ ms}$   | $I_e$       | -    | -    | 7.8  | mW/sr         |
| Peak wavelength   | $I_F = 100\text{ mA}$   | $\lambda_P$ | 940  | -    | -    | nm            |
| Virtual source diameter   | DIN EN ISO 1146/1:2005  | $d$         | -    | 1.1  | -    | mm            |
| <b>OUTPUT (DETECTOR)</b>  |   |             |      |      |      |               |
| Collector emitter voltage   | $I_C = 1\text{ mA}$   | $V_{CEO}$   | 70   | -    | -    | V             |
| Emitter collector voltage   | $I_E = 100\text{ }\mu\text{A}$  | $V_{ECO}$   | 7    | -    | -    | V             |
| Collector dark current  | $V_{CE} = 25\text{ V}$ , $I_F = 0\text{ A}$ , $E = 0\text{ lx}$                       | $I_{CEO}$   | -    | -    | 100  | nA            |
| <b>SWITCHING CHARACTERISTICS</b>  |   |             |      |      |      |               |
| Turn-on time  | $V_S = 5\text{ V}$ , $I_C = 1\text{ mA}$ , $R_L = 100\text{ }\Omega$<br>(see Fig. 10) | $t_{on}$    | -    | 15   | -    | $\mu\text{s}$ |
| Turn-off time   | $V_S = 5\text{ V}$ , $I_C = 1\text{ mA}$ , $R_L = 100\text{ }\Omega$<br>(see Fig. 10) | $t_{off}$   | -    | 10   | -    | $\mu\text{s}$ |

**Note**

(1) Characteristics are measurement with  $d = 4\text{ mm}$  (0.55") distance between emitter and detector, within a common axis of  $0.5\text{ mm}$  (0.02") and with parallel alignment within  $5^{\circ}$

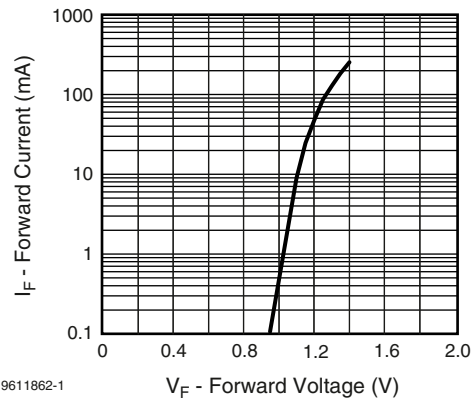
**BASIC CHARACTERISTICS** ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)

Fig. 2 - Forward Current vs. Forward Voltage

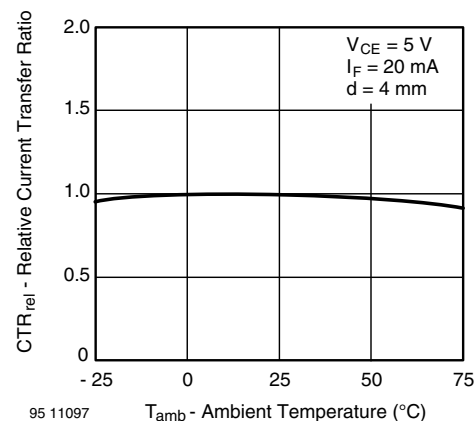


Fig. 3 - Relative Current Transfer Ratio vs. Ambient Temperature

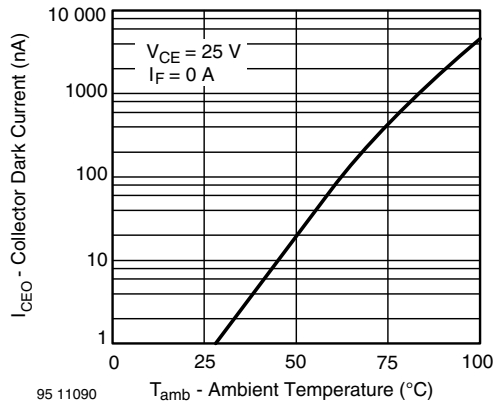


Fig. 4 - Collector Dark Current vs. Ambient Temperature

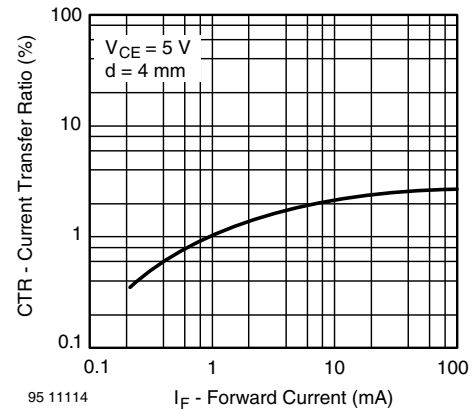


Fig. 7 - Current Transfer Ratio vs. Forward Current

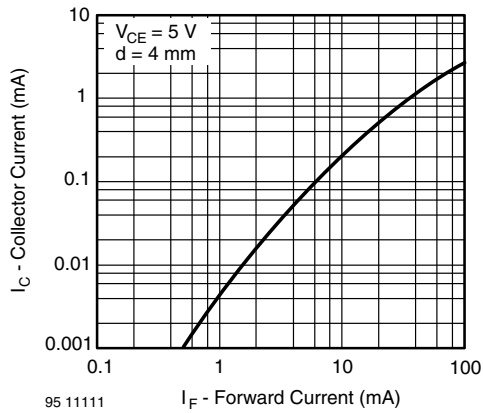


Fig. 5 - Collector Current vs. Forward Current

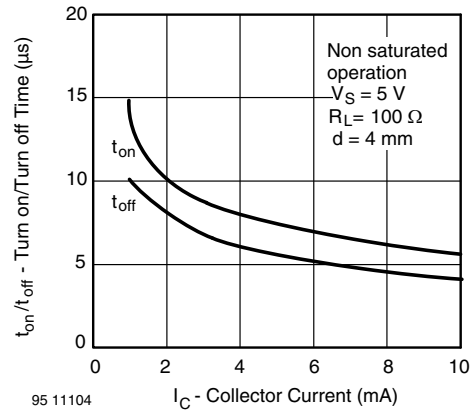


Fig. 8 - Turn on/off Time vs. Forward Current

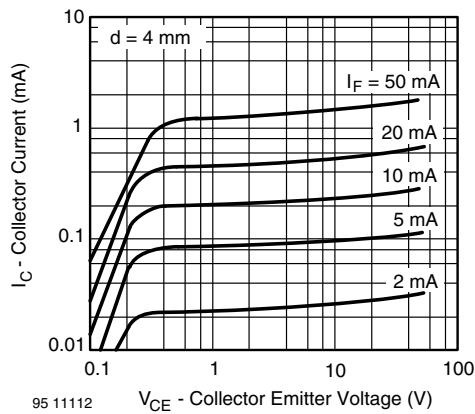


Fig. 6 - Collector Current vs. Collector Emitter Voltage

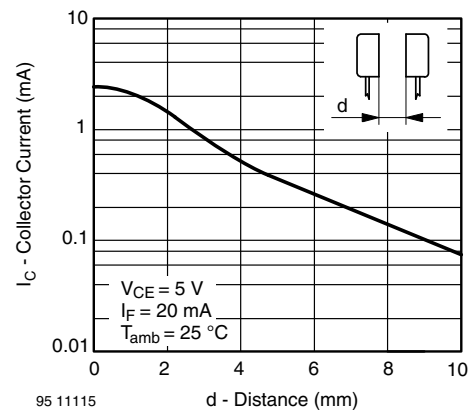


Fig. 9 - Collector Current vs. Distance

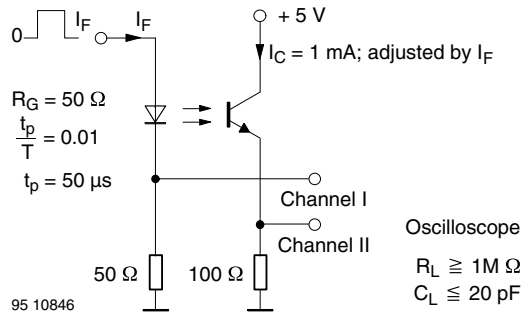


Fig. 10 - Pulse Diagram

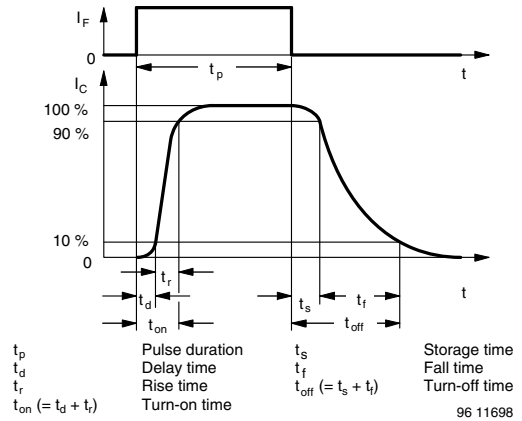
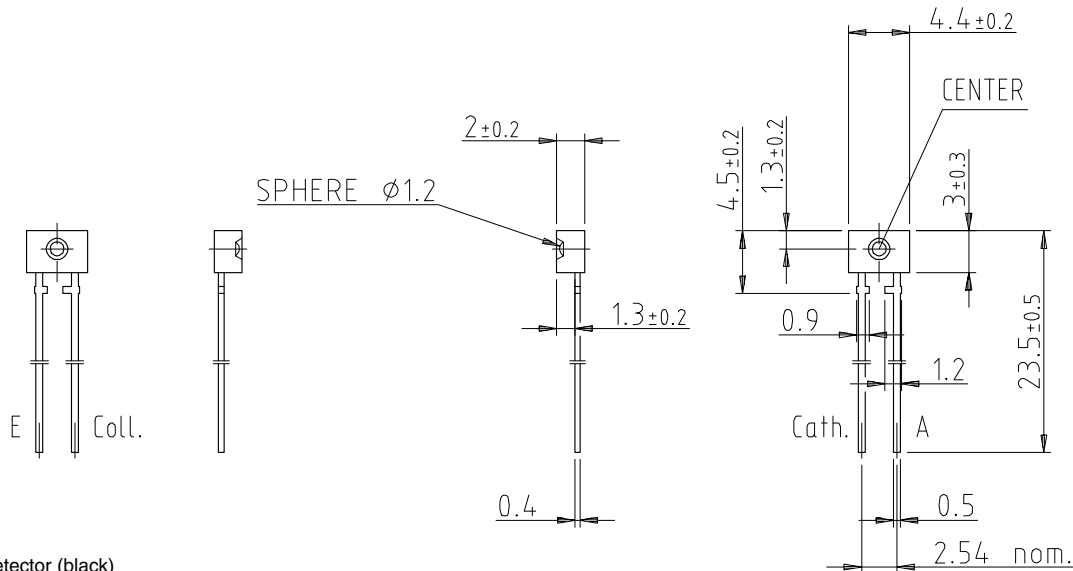


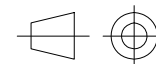
Fig. 11 - Switching Times

**PACKAGE DIMENSIONS** in millimeters



Detector (black)  
 Dimensions like emitter package

EMITTER (CLEAR)



technical drawings  
 according to DIN  
 specifications

Drawing-No.: 6.544-5284.01-4  
 Issue: 2; 10.11.98  
 96 12106

weight: ca. 0.23g

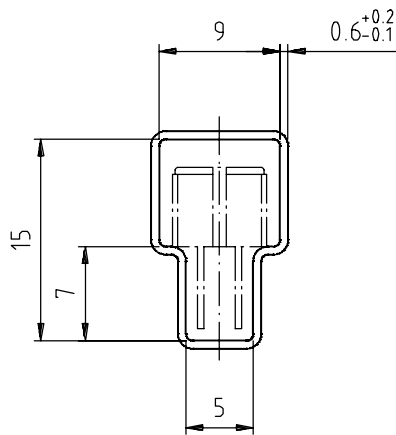
## Packaging and Ordering Information

| PART NUMBER   | MOQ <sup>(1)</sup> | PCS PER TUBE | TUBE SPEC. (FIGURE) | CONSTITUENTS (FORMS) |
|---------------|--------------------|--------------|---------------------|----------------------|
| CNY70         | 4000               | 80           | 1                   | 28                   |
| TCPT1300X01   | 2000               | Reel         | (2)                 | 29                   |
| TCRT1000      | 1000               | Bulk         | -                   | 26                   |
| TCRT1010      | 1000               | Bulk         | -                   | 26                   |
| TCRT5000      | 4500               | 50           | 2                   | 27                   |
| TCRT5000L     | 2400               | 48           | 3                   | 27                   |
| TCST1030      | 5200               | 65           | 5                   | 24                   |
| TCST1030L     | 2600               | 65           | 6                   | 24                   |
| TCST1103      | 1020               | 85           | 4                   | 24                   |
| TCST1202      | 1020               | 85           | 4                   | 24                   |
| TCST1230      | 4800               | 60           | 7                   | 24                   |
| TCST1300      | 1020               | 85           | 4                   | 24                   |
| TCST2103      | 1020               | 85           | 4                   | 24                   |
| TCST2202      | 1020               | 85           | 4                   | 24                   |
| TCST2300      | 1020               | 85           | 4                   | 24                   |
| TCST5250      | 4860               | 30           | 8                   | 24                   |
| TCUT1300X01   | 2000               | Reel         | (2)                 | 29                   |
| TCZT8020-PAER | 2500               | Bulk         | -                   | 22                   |

### Notes

- (1) MOQ: minimum order quantity
- (2) Please refer to datasheets

### TUBE SPECIFICATION FIGURES



With rubber stopper

Tolerance:  $\pm 0.5\text{mm}$

Length:  $575 \pm 1\text{mm}$

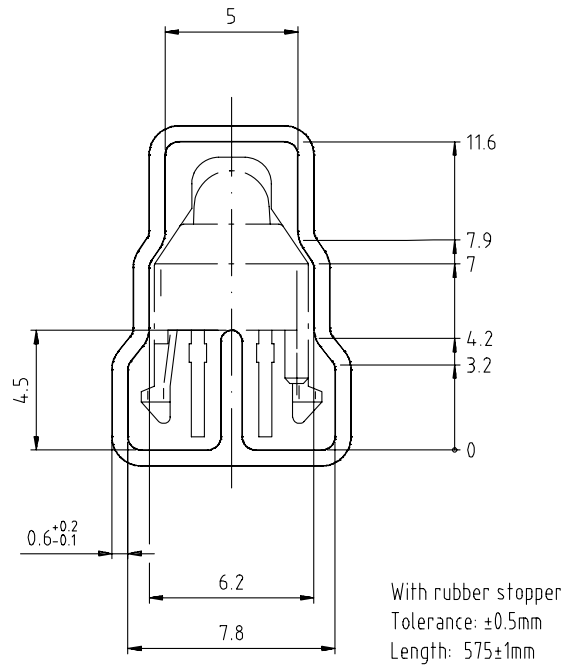
Drawing-No.: 9.700-5097.01-4  
Issue: 1; 25.02.00

15198

Fig. 1

# Packaging and Ordering Information

Vishay Semiconductors Packaging and Ordering Information

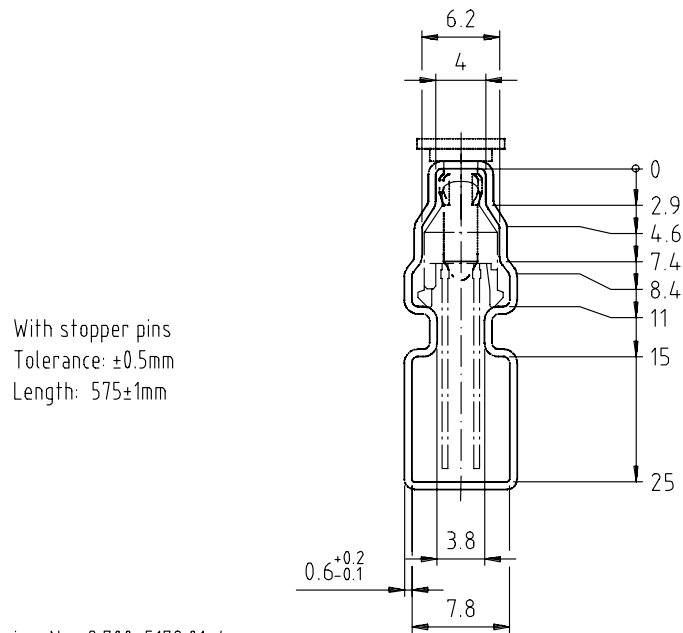


Drawing-No.: 9.700-5139.01-4  
Issue: 1; 10.05.00

Drawing refers to following types: TCRT 5000

15210

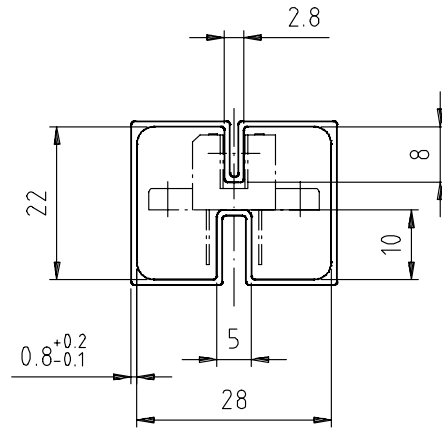
Fig. 2



Drawing-No.: 9.700-5178.01-4  
Issue: 1; 25.02.00

15201

Fig. 3

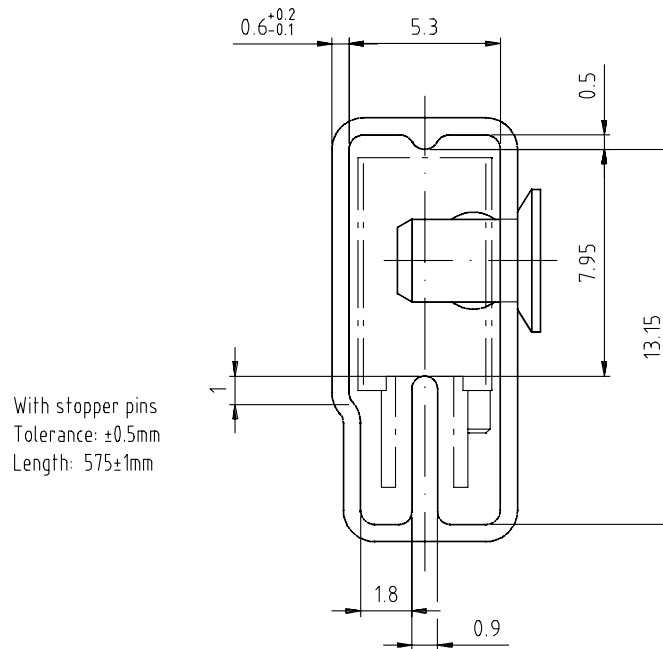


With rubber stopper  
Tolerance: ±0.5mm  
Length: 575±1mm

Drawing-No.: 9.700-5100.01-4  
Issue: 1; 25.02.00

15199

Fig. 4



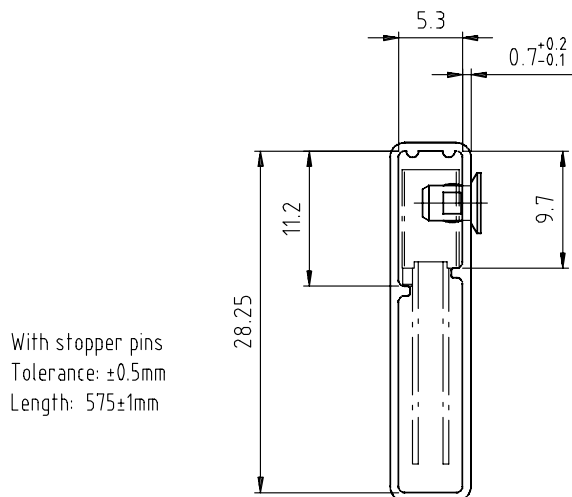
With stopper pins  
Tolerance: ±0.5mm  
Length: 575±1mm

Drawing-No.: 9.700-5140.01-4  
Issue: 1; 25.02.00

15202

Fig. 5

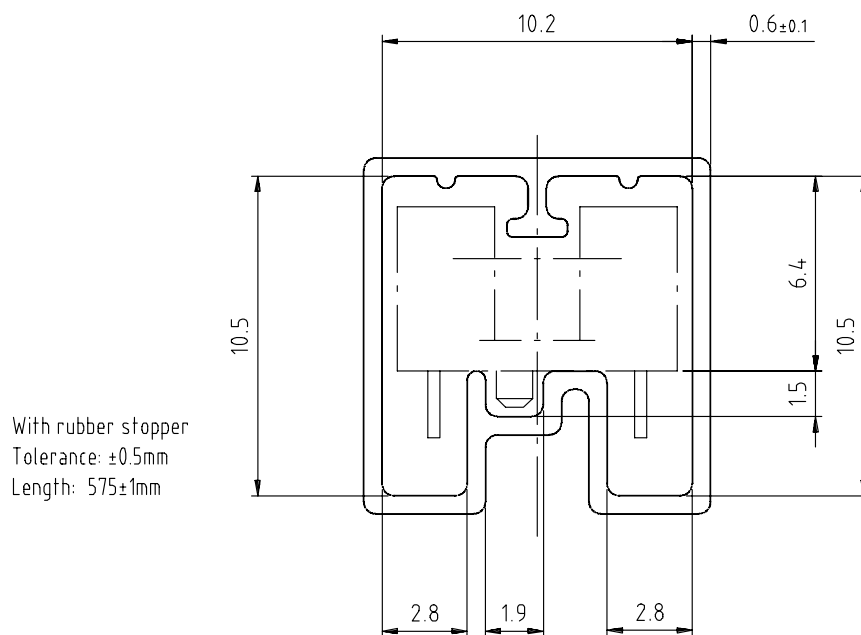




Drawing-No.: 9.700-5205.01-4  
Issue: 1; 25.02.00

15196

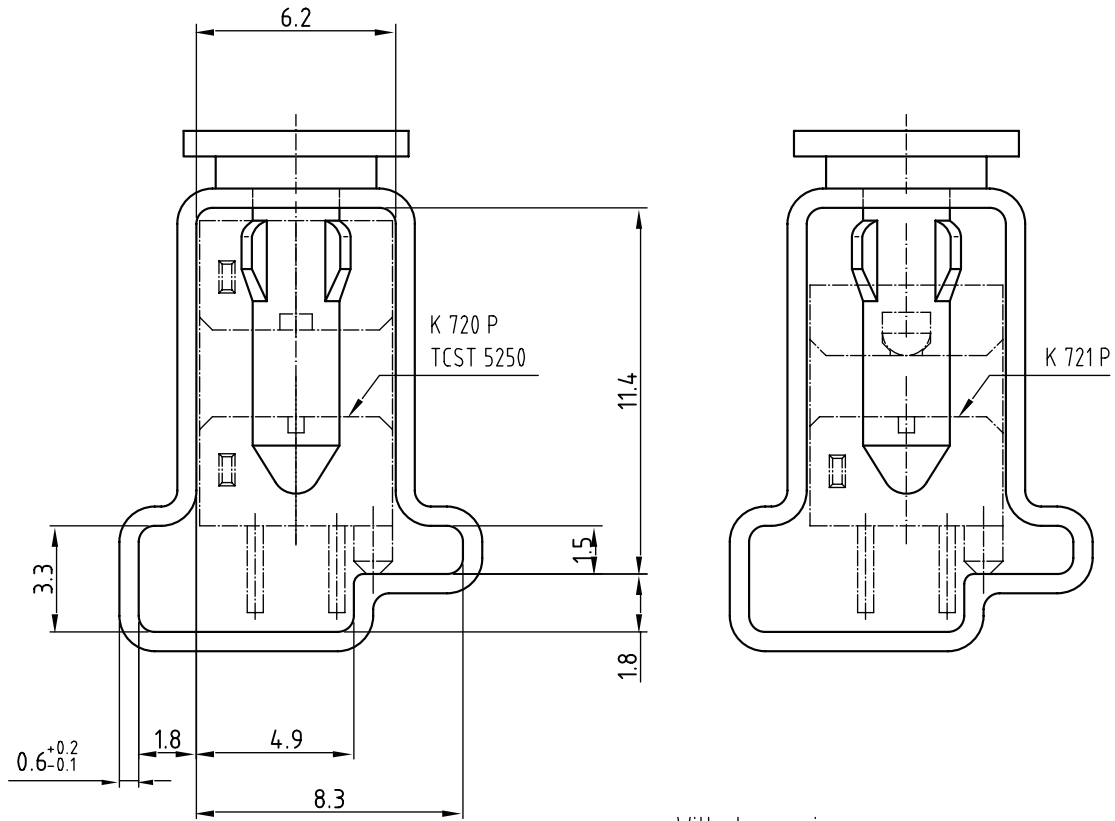
Fig. 6



Drawing-No.: 9.700-5245.01-4  
Issue: 1; 25.02.00

15195

Fig. 7



Drawing-No.: 9.700-5222.01-4  
 Issue: 2; 19.11.04  
 20257

With stopper pins  
 Tolerance:  $\pm 0.5\text{mm}$   
 Length:  $450 \pm 1\text{mm}$   
 All dimensions in mm

Fig. 8



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