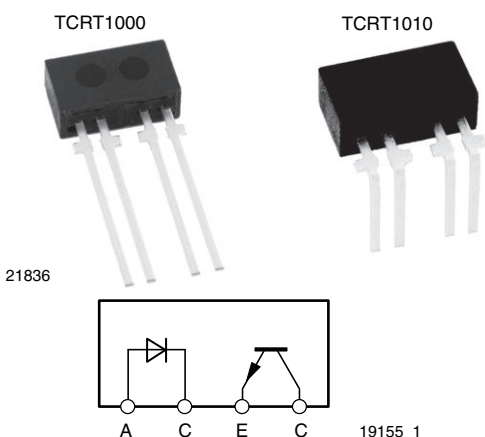


# **Reflective Optical Sensor With Transistor Output**



## **FEATURES**

- Package type: leaded
- Detector type: phototransistor
- Dimensions (L x W x H in mm): 7 x 4 x 2.5
- Peak operating distance: 1 mm
- Operating range within > 20 % relative collector current: 0.2 mm to 4 mm
- Typical output current under test:  $I_C = 0.7 \text{ mA}$
- Daylight blocking filter
- Emitter wavelength: 950 nm
- 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

## **DESCRIPTION**

The TCRT1000 and TCRT1010 are reflective sensors which include an infrared emitter and phototransistor in a leaded package which blocks visible light.

## **APPLICATIONS**

- Optoelectronic scanning and switching devices i.e., index sensing, coded disk scanning etc. (optoelectronic encoder assemblies for transmissive sensing).

## **PRODUCT SUMMARY**

| PART NUMBER | DISTANCE FOR MAXIMUM CTR <sub>REL</sub> <sup>(1)</sup> (mm) | DISTANCE RANGE FOR RELATIVE $I_{out} > 20 \%$ (mm) | TYPICAL OUTPUT CURRENT UNDER TEST <sup>(2)</sup> (mA) | DAYLIGHT BLOCKING FILTER INTEGRATED |
|-------------|-------------------------------------------------------------|----------------------------------------------------|-------------------------------------------------------|-------------------------------------|
| TCRT1000    | 1                                                           | 0.2 to 4                                           | 0.7                                                   | Yes                                 |
| TCRT1010    | 1                                                           | 0.2 to 4                                           | 0.7                                                   | Yes                                 |

### **Notes**

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

<sup>(2)</sup> Conditions like in table basic characteristics/sensor

## **ORDERING INFORMATION**

| ORDERING CODE | PACKAGING | VOLUME <sup>(1)</sup>        | REMARKS        |
|---------------|-----------|------------------------------|----------------|
| TCRT1000      | Bulk      | MOQ: 1000 pcs, 1000 pcs/bulk | Straight leads |
| TCRT1010      | Bulk      | MOQ: 1000 pcs, 1000 pcs/bulk | Bent leads     |

### **Note**

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

## **ABSOLUTE MAXIMUM RATINGS** ( $T_{amb} = 25 \text{ }^{\circ}\text{C}$ , unless otherwise specified)

| PARAMETER                 | TEST CONDITION                                 | SYMBOL    | VALUE       | UNIT               |
|---------------------------|------------------------------------------------|-----------|-------------|--------------------|
| <b>SENSOR</b>             |                                                |           |             |                    |
| Total power dissipation   | $T_{amb} \leq 25 \text{ }^{\circ}\text{C}$     | $P_{tot}$ | 270         | mW                 |
| Ambient temperature range |                                                | $T_{amb}$ | -40 to +85  | $^{\circ}\text{C}$ |
| Storage temperature range |                                                | $T_{stg}$ | -40 to +100 | $^{\circ}\text{C}$ |
| Soldering temperature     | 2 mm distance to package, $t \leq 5 \text{ s}$ | $T_{sd}$  | 260         | $^{\circ}\text{C}$ |
| <b>INPUT (EMITTER)</b>    |                                                |           |             |                    |
| Reverse voltage           |                                                | $V_R$     | 5           | V                  |
| Forward current           |                                                | $I_F$     | 100         | mA                 |
| Forward surge current     | $t_p \leq 100 \text{ } \mu\text{s}$            | $I_{FSM}$ | 1.5         | A                  |
| Power dissipation         | $T_{amb} \leq 25 \text{ }^{\circ}\text{C}$     | $P_V$     | 170         | mW                 |
| Junction temperature      |                                                | $T_j$     | 100         | $^{\circ}\text{C}$ |

**ABSOLUTE MAXIMUM RATINGS** ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)

| PARAMETER                 | TEST CONDITION                            | SYMBOL    | VALUE | UNIT               |
|---------------------------|-------------------------------------------|-----------|-------|--------------------|
| <b>OUTPUT (DETECTOR)</b>  |                                           |           |       |                    |
| Collector emitter voltage |                                           | $V_{CEO}$ | 32    | V                  |
| Emitter collector voltage |                                           | $V_{ECO}$ | 5     | V                  |
| Collector current         |                                           | $I_C$     | 50    | mA                 |
| Power dissipation         | $T_{amb} \leq 25\text{ }^{\circ}\text{C}$ | $P_V$     | 100   | mW                 |
| Junction temperature      |                                           | $T_j$     | 100   | $^{\circ}\text{C}$ |

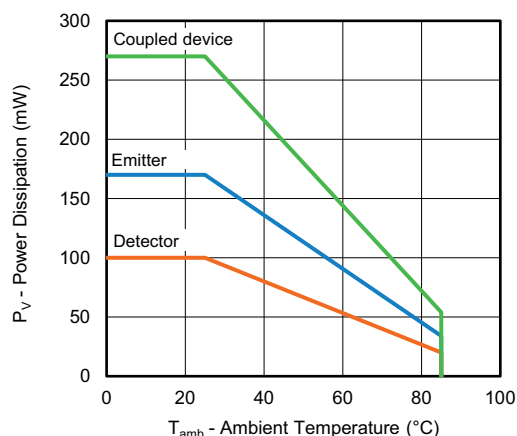
**ABSOLUTE MAXIMUM RATINGS** ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)

Fig. 1 - Power Dissipation Limit vs. Ambient Temperature

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

| PARAMETER                            | TEST CONDITION                                                            | SYMBOL            | MIN. | TYP. | MAX. | UNIT          |
|--------------------------------------|---------------------------------------------------------------------------|-------------------|------|------|------|---------------|
| <b>SENSOR</b>                        |                                                                           |                   |      |      |      |               |
| Collector current                    | $V_{CE} = 5\text{ V}$ , $I_F = 20\text{ mA}$ , $d = 1\text{ mm}$ (Fig. 2) | $I_C^{(1)}$       | 0.6  | 0.7  | -    | mA            |
| Cross talk current                   | $V_{CE} = 5\text{ V}$ , $I_F = 20\text{ mA}$                              | $I_{CX}^{(2)}$    | -    | -    | 1    | $\mu\text{A}$ |
| Collector emitter saturation voltage | $I_F = 20\text{ mA}$ , $I_C = 0.1\text{ mA}$ , $d = 1\text{ mm}$ (Fig. 2) | $V_{CEsat}^{(1)}$ | -    | -    | 0.3  | V             |
| <b>INPUT (EMITTER)</b>               |                                                                           |                   |      |      |      |               |
| Forward voltage                      | $I_F = 100\text{ mA}$                                                     | $V_F$             | -    | 1.6  | 1.7  | V             |
| Peak wavelength                      | $I_F = 100\text{ mA}$                                                     | $\lambda_P$       | 950  | -    | -    | nm            |
| <b>OUTPUT (DETECTOR)</b>             |                                                                           |                   |      |      |      |               |
| Collector emitter voltage            | $I_C = 1\text{ mA}$                                                       | $V_{CEO}$         | 32   | -    | -    | V             |
| Emitter collector voltage            | $I_E = 100\text{ }\mu\text{A}$                                            | $V_{ECO}$         | 5    | -    | -    | V             |
| Collector dark current               | $V_{CE} = 10\text{ V}$ , $I_F = 0\text{ A}$ , $E = 0\text{ lx}$           | $I_{CEO}$         | -    | -    | 200  | nA            |

**Notes**

- (1) Measured with the "Kodak neutral test card", white side with 90 % diffuse reflectance  
 (2) Measured without reflecting medium

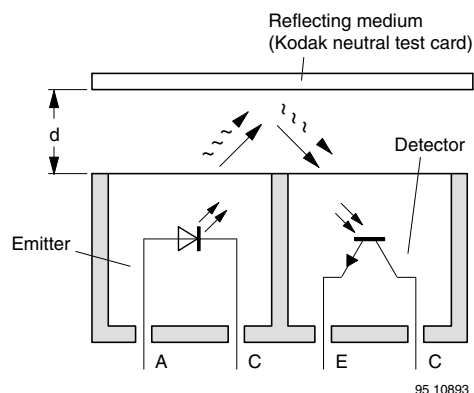


Fig. 2 - Test Condition

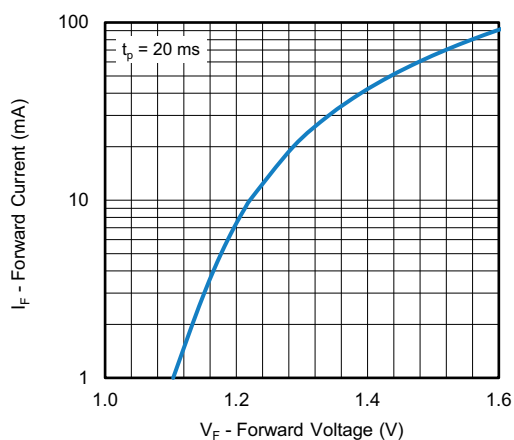
**BASIC CHARACTERISTICS** ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)


Fig. 3 - Forward Current vs. Forward Voltage

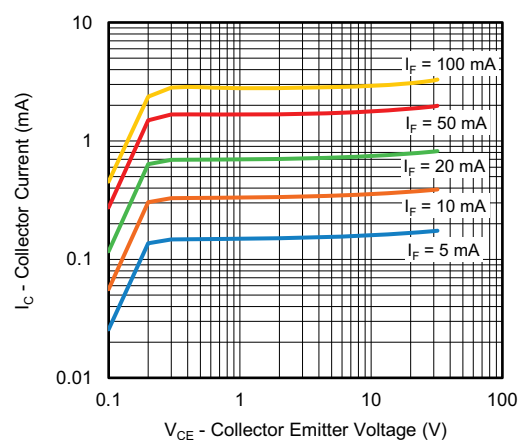


Fig. 5 - Collector Current vs. Collector Emitter Voltage

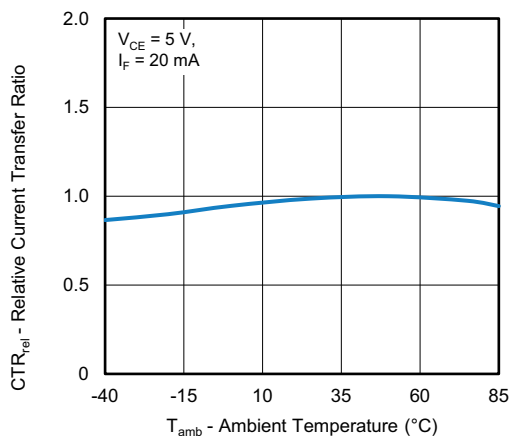


Fig. 4 - Relative Current Transfer Ratio vs. Ambient Temperature

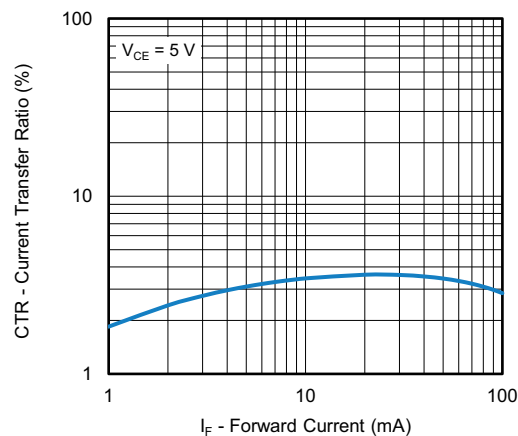


Fig. 6 - Current Transfer Ratio vs. Forward Current

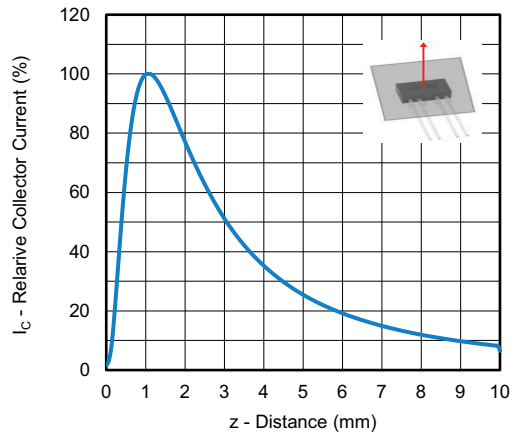


Fig. 7 - Collector Current vs. Distance

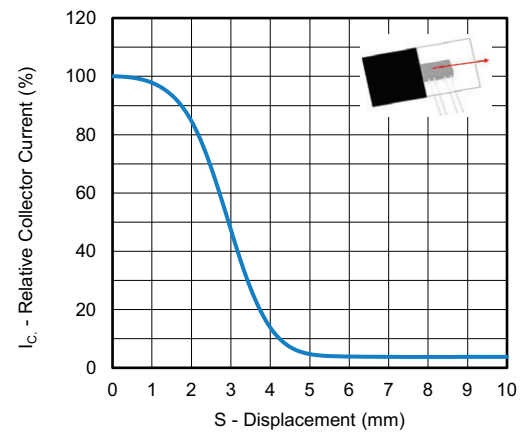
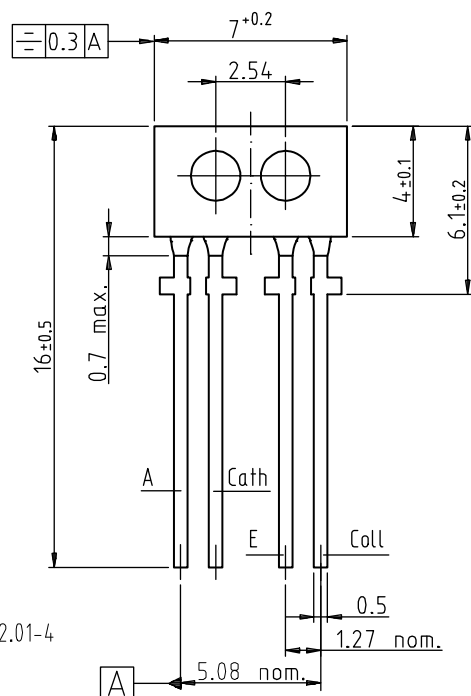
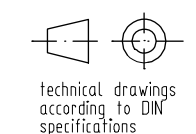


Fig. 8 - Relative Collector Current vs. Displacement

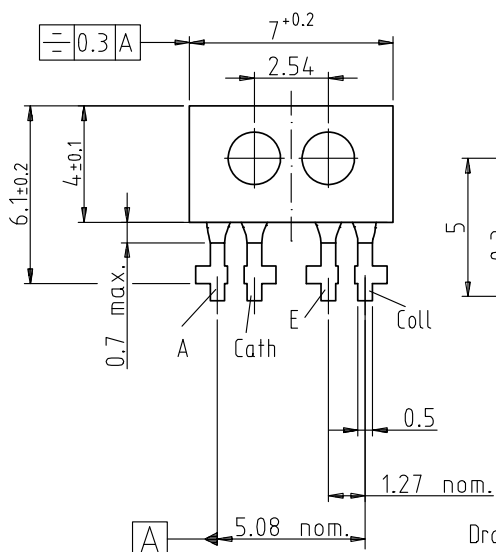
**PACKAGE DIMENSIONS** in millimeters


Drawing-No.: 6.544-5162.01-4  
 Issue: 2; 10.11.98

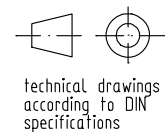


weight: ca. 0.15g

14768



Drawing-No.: 6.544-5174.01-4  
 Issue: 2; 10.11.98



weight: ca. 0.15g

14769

## Packaging and Ordering Information

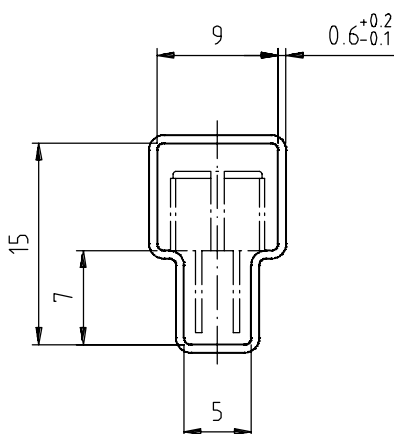
| PART NUMBER   | MOQ <sup>(1)</sup> | PCS PER TUBE | TUBE SPEC. (FIGURE) | CONSTITUENTS (FORMS) |
|---------------|--------------------|--------------|---------------------|----------------------|
| CNY70         | 4000               | 80           | 1                   | 28                   |
| TCPT1300X01   | 2000               | Reel         | <sup>(2)</sup>      | 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         | <sup>(2)</sup>      | 29                   |
| TCZT8020-PAER | 2500               | Bulk         | -                   | 22                   |

### Notes

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

<sup>(2)</sup> Please refer to datasheets

### TUBE SPECIFICATION FIGURES



With rubber stopper

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

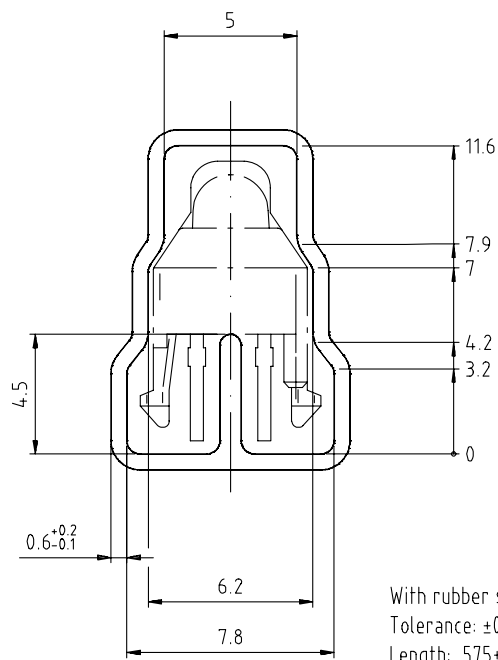
Length:  $575 \pm 1\text{mm}$

Drawing-No.: 9.700-5097.01-4

Issue: 1; 25.02.00

15198

Fig. 1

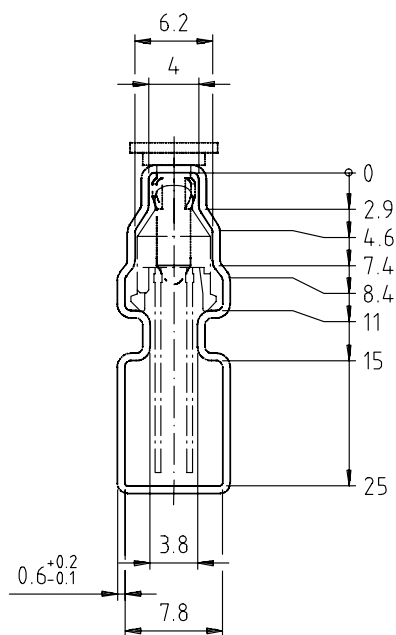


Drawing-No.: 9.700-5139.01-4  
Issue: 1; 10.05.00

Drawing refers to following types: TCRT 5000

15210

Fig. 2

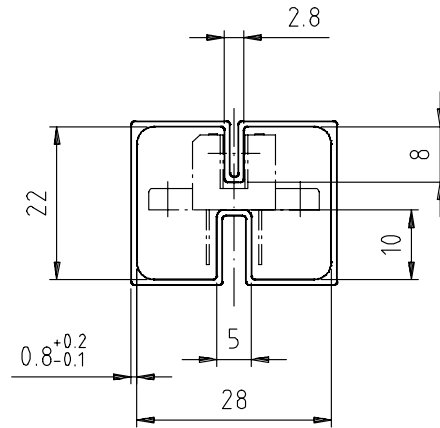


With stopper pins  
Tolerance:  $\pm 0.5\text{mm}$   
Length:  $575 \pm 1\text{mm}$

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

15201

Fig. 3

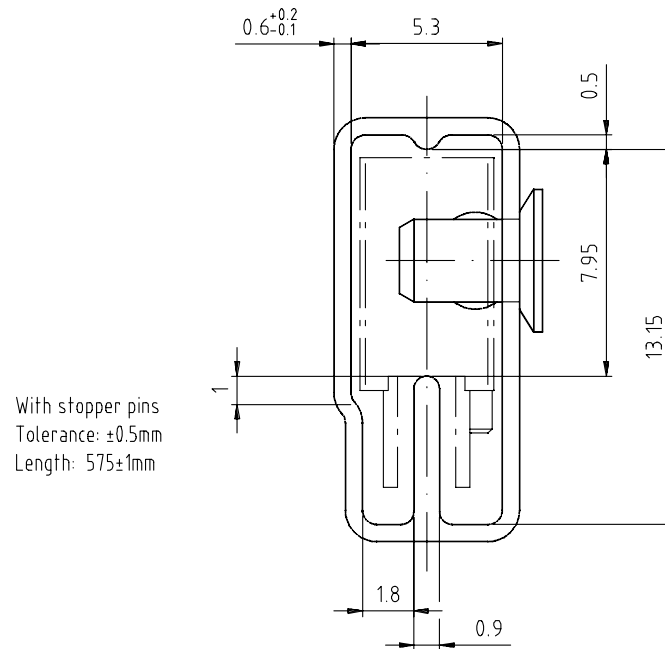


With rubber stopper  
Tolerance:  $\pm 0.5\text{mm}$   
Length:  $575 \pm 1\text{mm}$

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

15199

Fig. 4



With stopper pins  
Tolerance:  $\pm 0.5\text{mm}$   
Length:  $575 \pm 1\text{mm}$

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

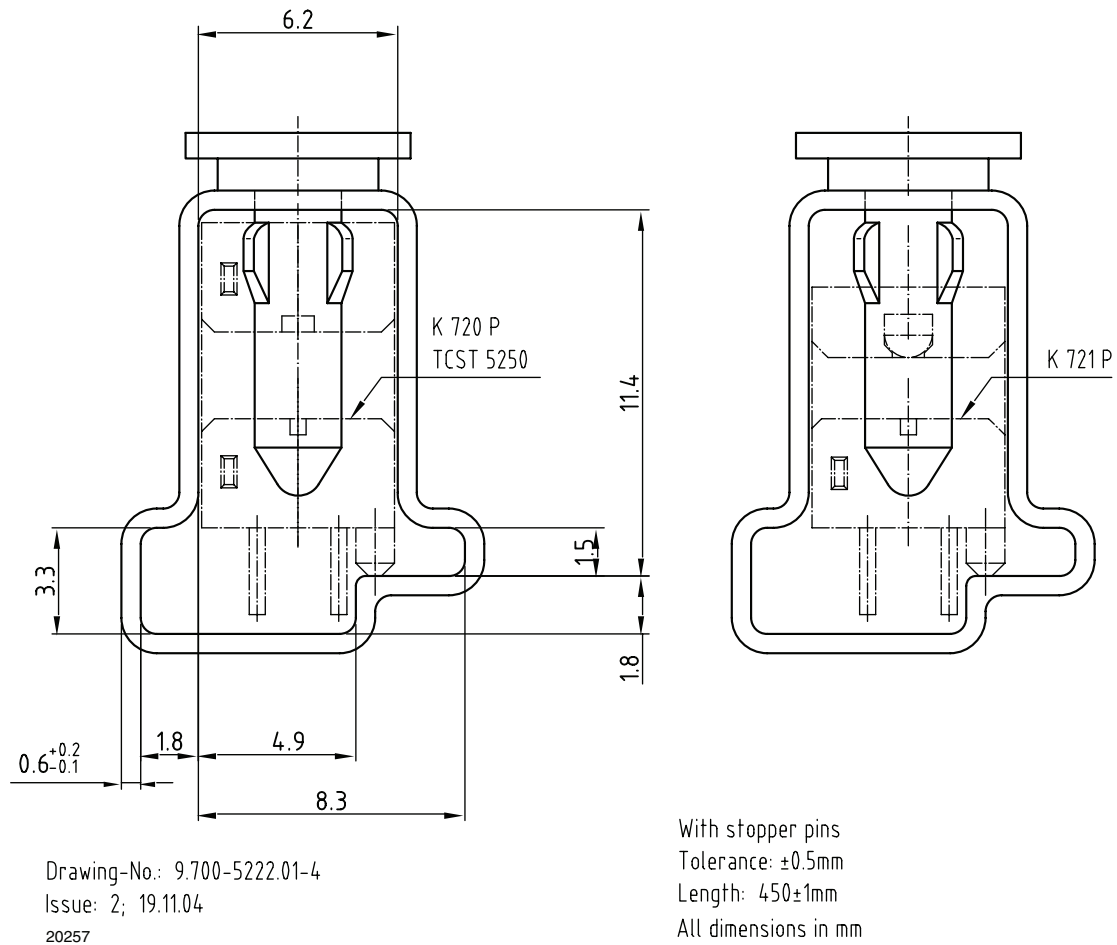


Fig. 8



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