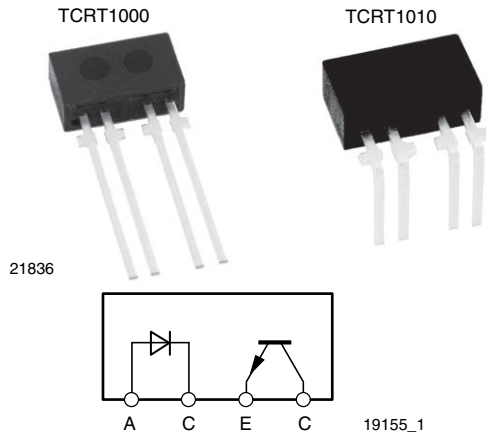


## Reflective Optical Sensor with Transistor Output



### 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:  $I_C = 0.5$  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> (1) (mm) | DISTANCE RANGE FOR RELATIVE $I_{out} > 20\%$ (mm) | TYPICAL OUTPUT CURRENT UNDER TEST (2) (mA) | DAYLIGHT BLOCKING FILTER INTEGRATED |
|-------------|--|---|--|-------------------------------------|
| TCRT1000    | 1  | 0.2 to 4  | 0.5  | Yes                                 |
| TCRT1010    | 1  | 0.2 to 4  | 0.5  | Yes                                 |

#### Notes

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

(2) Conditions like in table basic characteristics/sensor

### ORDERING INFORMATION

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

#### Note

(1) MOQ: minimum order quantity

### ABSOLUTE MAXIMUM RATINGS ( $T_{amb} = 25$ °C, unless otherwise specified)

| PARAMETER                 | TEST CONDITION                         | SYMBOL    | VALUE         | UNIT |
|---------------------------|--|-----------|---------------|------|
| <b>SENSOR</b>             |  |           |               |      |
| Total power dissipation   | $T_{amb} \leq 25$ °C                   | $P_{tot}$ | 200           | mW   |
| Ambient temperature range |  | $T_{amb}$ | - 40 to + 85  | °C   |
| Storage temperature range |  | $T_{stg}$ | - 40 to + 100 | °C   |
| Soldering temperature     | 2 mm distance to package, $t \leq 5$ s | $T_{sd}$  | 260           | °C   |
| <b>INPUT (EMITTER)</b>    |  |           |               |      |
| Reverse voltage           |  | $V_R$     | 5             | V    |
| Forward current           |  | $I_F$     | 50            | mA   |
| Forward surge current     | $t_p \leq 10$ $\mu$ s                  | $I_{FSM}$ | 3             | A    |
| Power dissipation         | $T_{amb} \leq 25$ °C                   | $P_V$     | 100           | mW   |
| Junction temperature      |  | $T_J$     | 100           | °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)

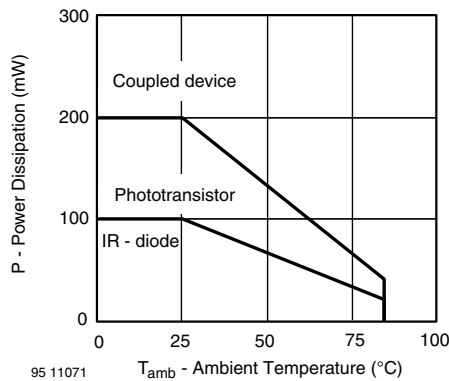


Fig. 1 - Power Dissipation Limit vs. Ambient Temperature

| 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  | $V_{CE} = 5\text{ V}$ , $I_F = 20\text{ mA}$ , $d = 1\text{ mm}$ (figure 2) | $I_C^{(1)}$       | 0.3  | 0.5  |      | mA            |
| Cross talk current   | $V_{CE} = 5\text{ V}$ , $I_F = 20\text{ mA}$ , (figure 1)                   | $I_{CX}^{(2)}$    |      |      | 1    | $\mu\text{A}$ |
| Collector emitter saturation voltage   | $I_F = 20\text{ mA}$ , $I_C = 0.1\text{ mA}$ , $d = 1\text{ mm}$ (figure 2) | $V_{CEsat}^{(1)}$ |      |      | 0.3  | V             |
| <b>INPUT (EMITTER)</b>   |   |                   |      |      |      |               |
| Forward voltage  | $I_F = 50\text{ mA}$  | $V_F$             |      | 1.25 | 1.6  | V             |
| Radiant intensity  | $I_F = 50\text{ mA}$ , $t_p = 20\text{ ms}$                                 | $I_e$             |      |      | 7.5  | mW/sr         |
| Peak wavelength  | $I_F = 100\text{ mA}$   | $\lambda_P$       | 940  |      |      | nm            |
| Virtual source diameter  | Method: 63 % encircled energy   | $d$               |      | 1.2  |      | mm            |
| <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   | $V_{CE} = 20\text{ V}$ , $I_F = 0\text{ A}$ , $E = 0\text{ lx}$             | $I_{CEO}$         |      |      | 200  | nA            |

**Notes**

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

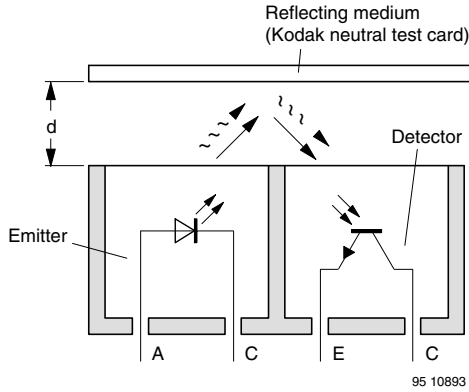


Fig. 2 - Test Condition

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

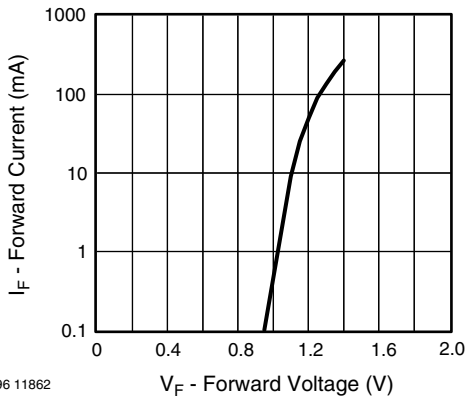


Fig. 3 - Forward Current vs. Forward Voltage

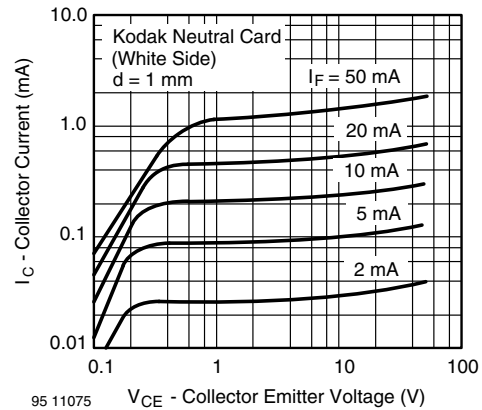


Fig. 5 - Collector Current vs. Collector Emitter Voltage

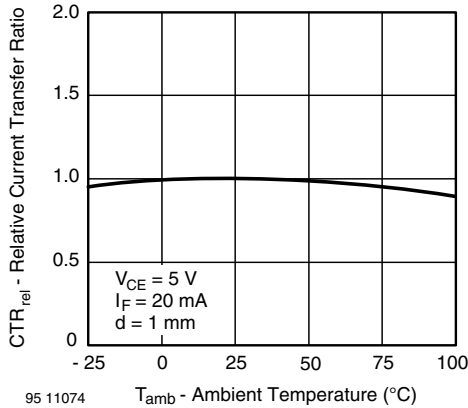


Fig. 4 - Relative Current Transfer Ratio vs. Ambient Temperature

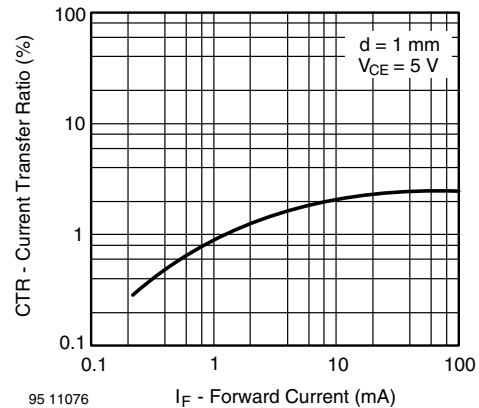


Fig. 6 - Current Transfer Ratio vs. Forward Current

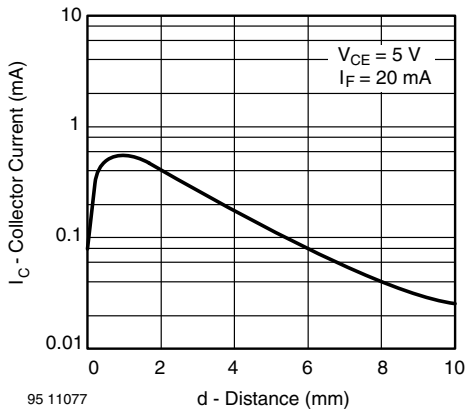


Fig. 7 - Collector Current vs. Distance

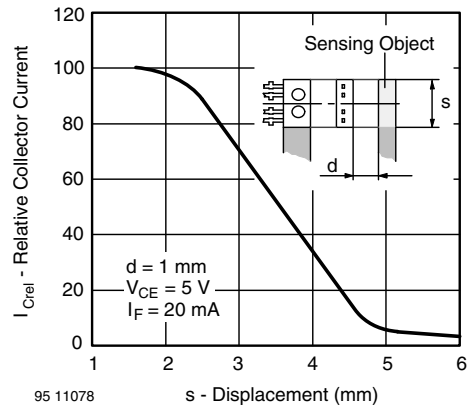
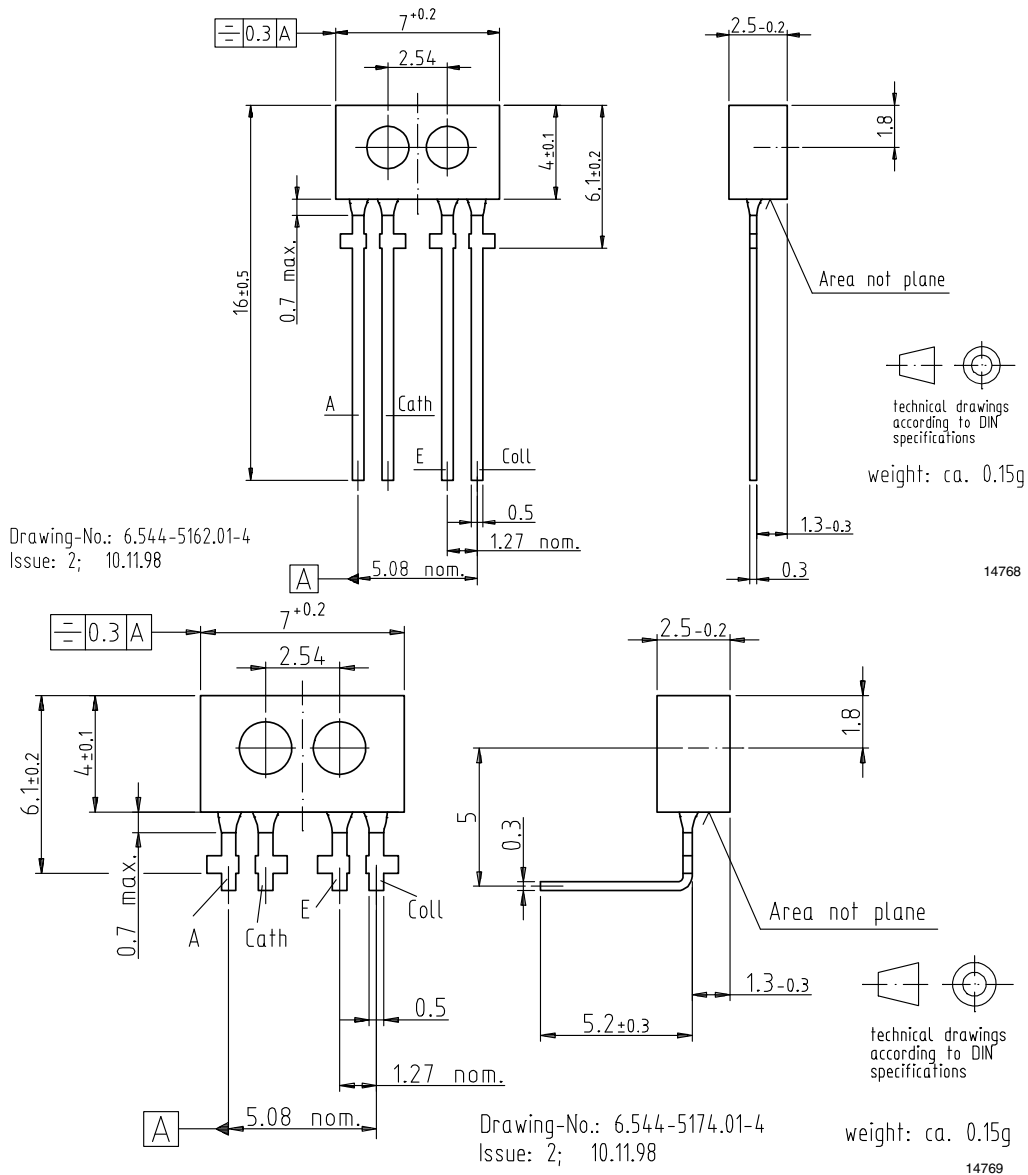


Fig. 8 - Relative Collector Current vs. Displacement

### PACKAGE DIMENSIONS in millimeters



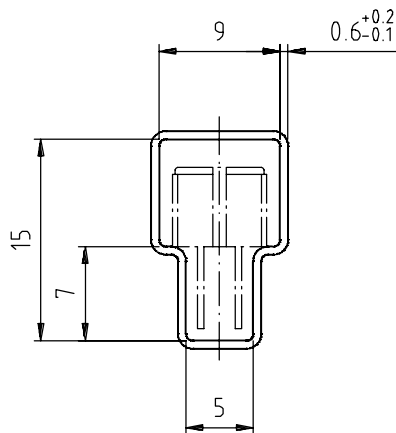
## Packaging and Ordering Information

| 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: ±0.5mm

Length: 575±1mm

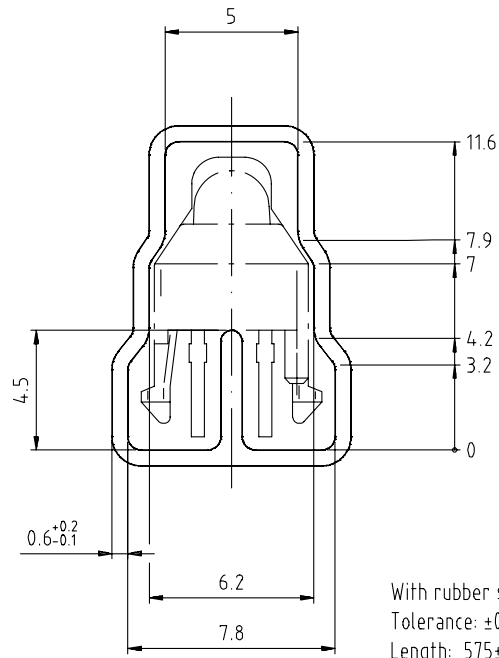
Drawing-No.: 9.700-5097.01-4  
Issue: 1; 25.02.00

15198

Fig. 1

# Packaging and Ordering Information

Vishay Semiconductors Packaging and Ordering Information

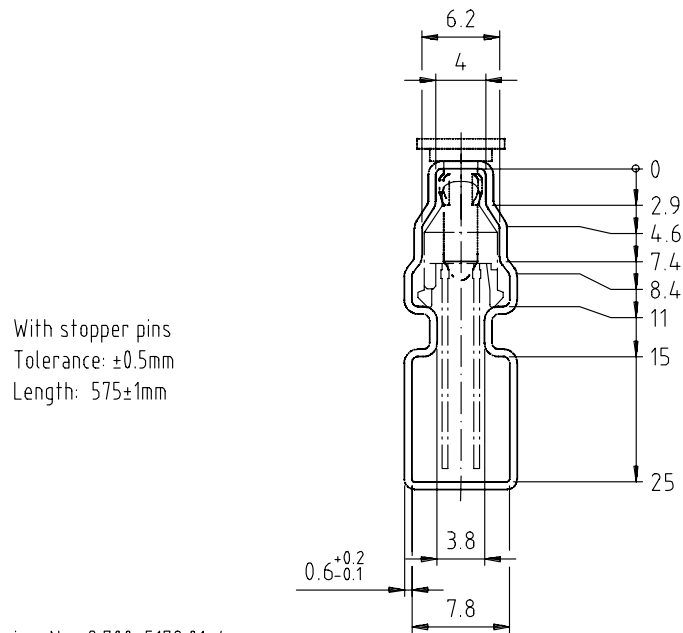


Drawing-No.: 9.700-5139.01-4  
Issue: 1; 10.05.00

Drawing refers to following types: TCRT 5000

15210

Fig. 2

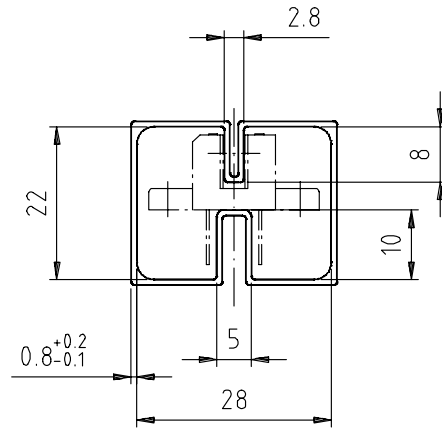


With stopper pins  
Tolerance: ±0.5mm  
Length: 575±1mm

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

15201

Fig. 3

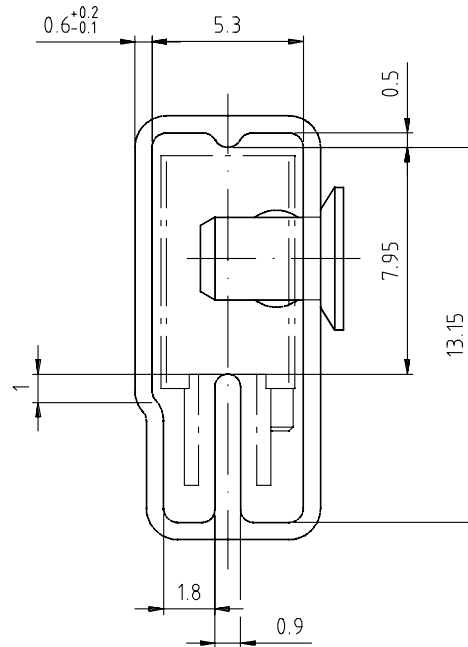


With rubber stopper  
Tolerance: ±0.5mm  
Length: 575±1mm

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

15199

Fig. 4



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

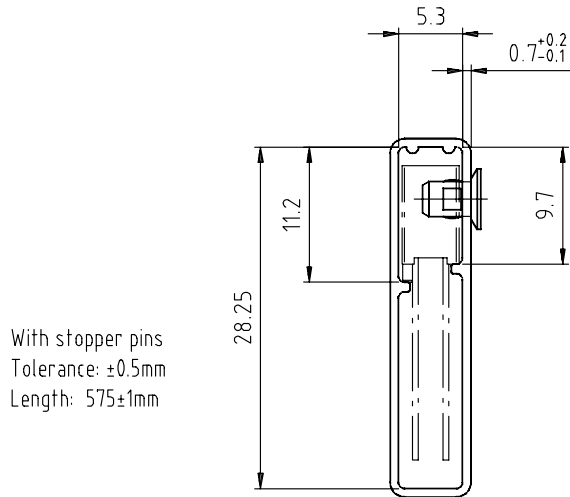
Drawing-No.: 9.700-5140.01-4  
Issue: 1; 25.02.00

15202

Fig. 5

# Packaging and Ordering Information

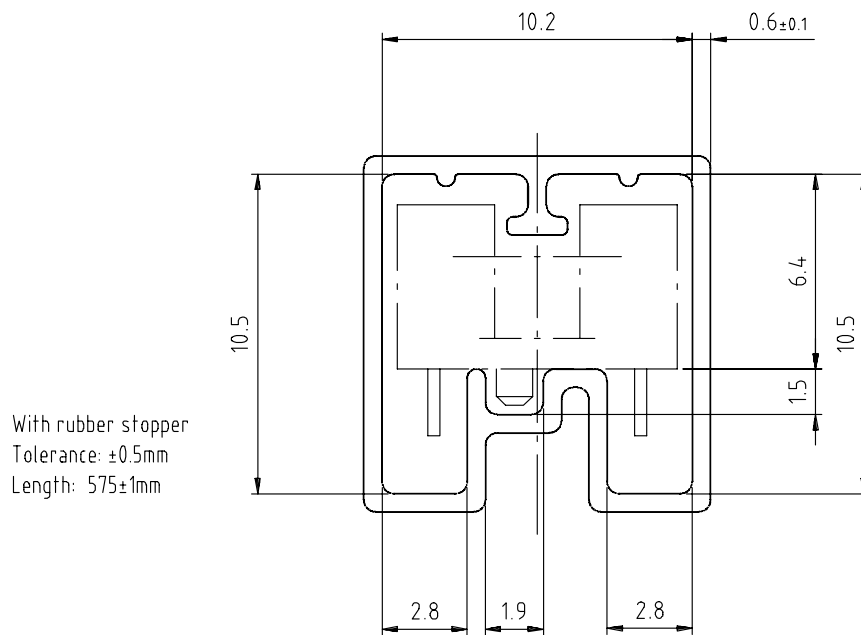
Vishay Semiconductors Packaging and Ordering Information



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

15196

Fig. 6

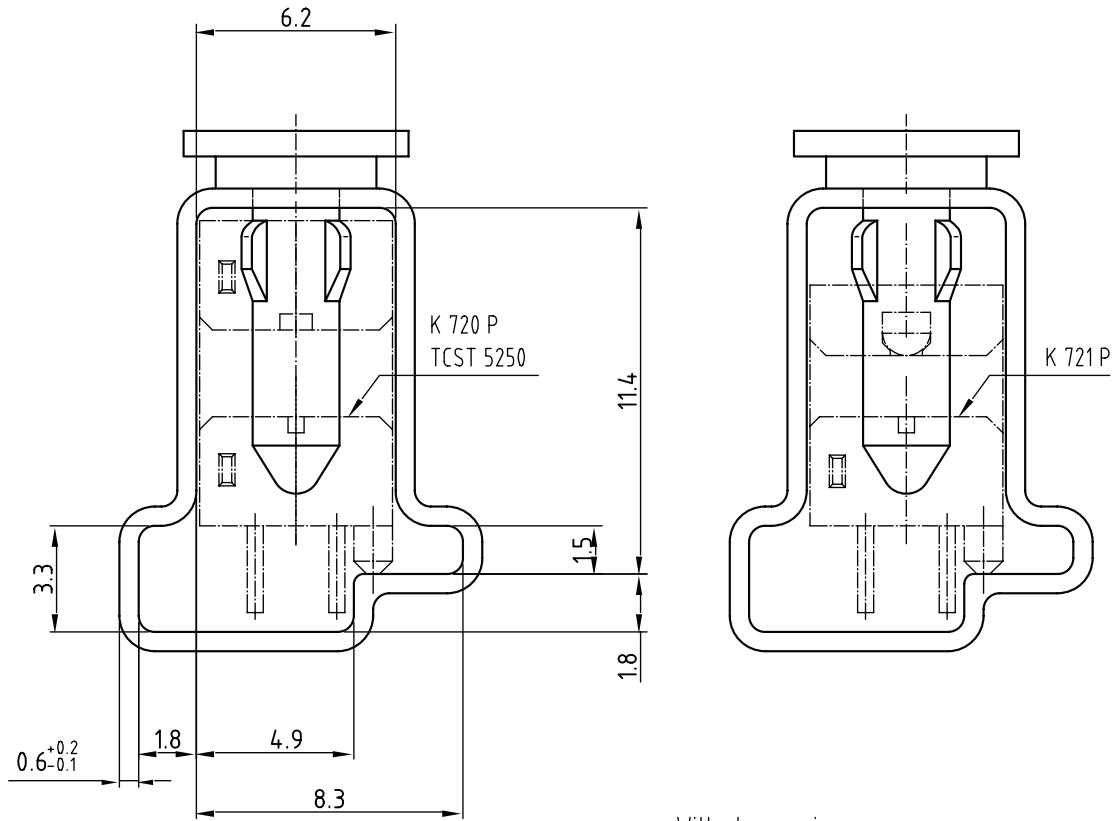


Drawing-No.: 9.700-5245.01-4  
Issue: 1; 25.02.00

15195

Fig. 7





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

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

Fig. 8



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