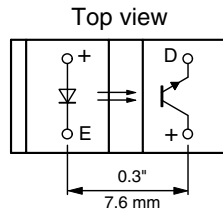


Transmissive Optical Sensor with Phototransistor Output



19180_4



19180_3

DESCRIPTION

The TCST2103, TCST2202, and TCST2300 are transmissive sensors that include an infrared emitter and phototransistor, located face-to-face on the optical axes in a leaded package which blocks visible light. These part numbers include options for aperture width.

FEATURES

- Package type: leaded
- Detector type: phototransistor
- Dimensions (L x W x H in mm): 24.5 x 6.3 x 10.8
- Gap (in mm): 3.1
- Typical output current under test: $I_C = 4$ mA (TCST2103)
- Typical output current under test: $I_C = 2$ mA (TCST2202)
- Typical output current under test: $I_C = 0.5$ mA (TCST2300)
- Daylight blocking filter
- Emitter wavelength: 950 nm
- Lead (Pb)-free soldering released
- Compliant to RoHS directive 2002/95/EC and in accordance to WEEE 2002/96/EC



RoHS
COMPLIANT

APPLICATIONS

- Optical switch
- Photo interrupter
- Counter
- Encoder

PRODUCT SUMMARY

| PART NUMBER | GAP WIDTH (mm) | APERTURE WIDTH (mm) | TYPICAL OUTPUT CURRENT UNDER TEST ⁽¹⁾ (mA) | DAYLIGHT BLOCKING FILTER INTEGRATED |
|-------------|----------------|---------------------|---|-------------------------------------|
| TCST2103 | 3.1 | 1 | 4 | Yes |
| TCST2202 | 3.1 | 0.5 | 2 | Yes |
| TCST2300 | 3.1 | 0.25 | 0.5 | Yes |

Note

⁽¹⁾ Conditions like in table basic characteristics/coupler

ORDERING INFORMATION

| ORDERING CODE | PACKAGING | VOLUME ⁽¹⁾ | REMARKS |
|---------------|-----------|----------------------------|----------------------|
| TCST2103 | Tube | MOQ: 1020 pcs, 85 pcs/tube | With mounting flange |
| TCST2202 | Tube | MOQ: 1020 pcs, 85 pcs/tube | With mounting flange |
| TCST2300 | Tube | MOQ: 1020 pcs, 85 pcs/tube | With mounting flange |

Note

⁽¹⁾ MOQ: minimum order quantity

ABSOLUTE MAXIMUM RATINGS ⁽¹⁾

| PARAMETER | TEST CONDITION | SYMBOL | VALUE | UNIT |
|---------------------------|---|-----------|---------------|------|
| COUPLER | | | | |
| Total power dissipation | $T_{amb} \leq 25$ °C | P_{tot} | 250 | mW |
| Ambient temperature range | | T_{amb} | - 55 to + 85 | °C |
| Storage temperature range | | T_{stg} | - 55 to + 100 | °C |
| Soldering temperature | Distance to package: 2 mm; $t \leq 5$ s | T_{sd} | 260 | °C |

| ABSOLUTE MAXIMUM RATINGS (1) | | | | |
|------------------------------|--|-----------|-------|------------------|
| PARAMETER | TEST CONDITION | SYMBOL | VALUE | UNIT |
| INPUT (EMITTER) | | | | |
| Reverse voltage | | V_R | 6 | V |
| Forward current | | I_F | 60 | mA |
| Forward surge current | $t_p \leq 10 \mu s$ | I_{FSM} | 3 | A |
| Power dissipation | $T_{amb} \leq 25 \text{ }^\circ\text{C}$ | P_V | 100 | mW |
| Junction temperature | | T_j | 100 | $^\circ\text{C}$ |
| OUTPUT (DETECTOR) | | | | |
| Collector emitter voltage | | V_{CEO} | 70 | V |
| Emitter collector voltage | | V_{ECO} | 7 | V |
| Collector peak current | $t_p/T = 0.5, t_p \leq 10 \text{ ms}$ | I_{CM} | 200 | mA |
| Power dissipation | $T_{amb} \leq 25 \text{ }^\circ\text{C}$ | P_V | 150 | mW |
| Junction temperature | | T_j | 100 | $^\circ\text{C}$ |

Note

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

ABSOLUTE MAXIMUM RATINGS

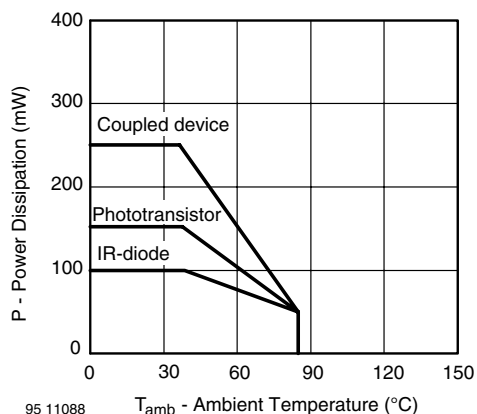


Fig. 1 - Power Dissipation Limit vs. Ambient Temperature

| BASIC CHARACTERISTICS (1) | | | | | | | |
|---|--|----------|-------------|------|------|------|------|
| PARAMETER | TEST CONDITION | PART | SYMBOL | MIN. | TYP. | MAX. | UNIT |
| COUPLER | | | | | | | |
| Current transfer ratio | $V_{CE} = 5 \text{ V}, I_F = 20 \text{ mA}$ | TCST2103 | CTR | 10 | 20 | | % |
| | | TCST2202 | CTR | 5 | 10 | | % |
| | | TCST2300 | CTR | 1.25 | 2.5 | | % |
| Collector current | $V_{CE} = 5 \text{ V}, I_F = 20 \text{ mA}$ | TCST2103 | I_C | 2 | 4 | | mA |
| | | TCST2202 | I_C | 1 | 2 | | mA |
| | | TCST2300 | I_C | 0.25 | 0.5 | | mA |
| Collector emitter saturation voltage | $I_F = 20 \text{ mA}, I_C = 1 \text{ mA}$ | TCST2103 | V_{CEsat} | | | 0.4 | V |
| | $I_F = 20 \text{ mA}, I_C = 0.5 \text{ mA}$ | TCST2202 | V_{CEsat} | | | 0.4 | V |
| | $I_F = 20 \text{ mA}, I_C = 0.1 \text{ mA}$ | TCST2300 | V_{CEsat} | | | 0.4 | V |
| Resolution, path of the shutter crossing the radiant sensitive zone | $I_{Crel} = 10 \text{ } \% \text{ to } 90 \text{ } \%$ | TCST2103 | s | | 0.6 | | mm |
| | | TCST2202 | s | | 0.4 | | mm |
| | | TCST2300 | s | | 0.2 | | mm |

| BASIC CHARACTERISTICS (1) | | | | | | | |
|----------------------------------|--|------|-----------|------|------|------|---------------|
| PARAMETER | TEST CONDITION | PART | SYMBOL | MIN. | TYP. | MAX. | UNIT |
| INPUT (EMITTER) | | | | | | | |
| Forward voltage | $I_F = 60 \text{ mA}$ | | V_F | | 1.25 | 1.6 | V |
| Junction capacitance | $V_R = 0 \text{ V}, f = 1 \text{ MHz}$ | | C_j | | 50 | | pF |
| OUTPUT (DETECTOR) | | | | | | | |
| Collector emitter voltage | $I_C = 1 \text{ mA}$ | | V_{CEO} | 70 | | | V |
| Emitter collector voltage | $I_E = 10 \text{ }\mu\text{A}$ | | 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 |
| SWITCHING CHARACTERISTICS | | | | | | | |
| Turn-on time | $I_C = 2 \text{ mA}, V_S = 5 \text{ V}, R_L = 100 \text{ }\Omega$ (see figure 2) | | t_{on} | | 10 | | μs |
| Turn-off time | $I_C = 2 \text{ mA}, V_S = 5 \text{ V}, R_L = 100 \text{ }\Omega$ (see figure 2) | | t_{off} | | 8 | | μs |

Note

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

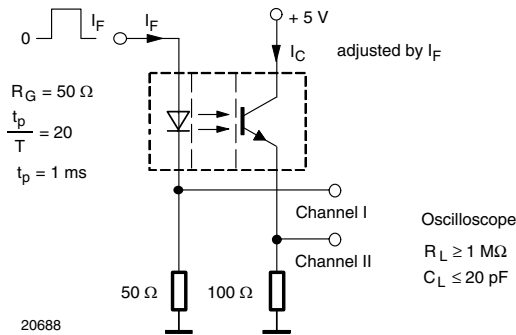


Fig. 2 - Test Circuit for t_{on} and t_{off}

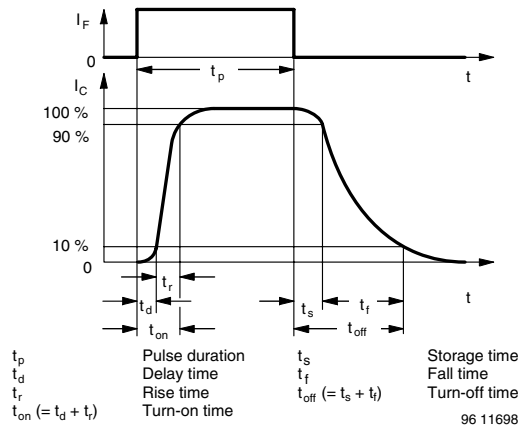


Fig. 3 - Switching Times

BASIC CHARACTERISTICS

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

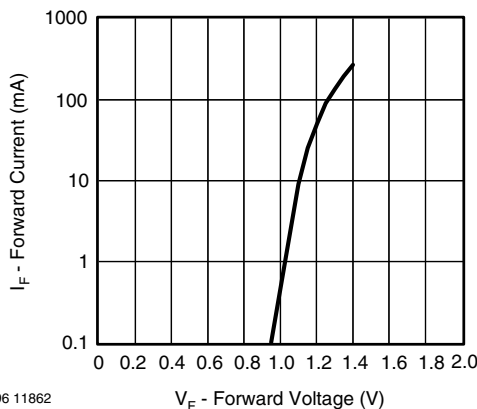


Fig. 4 - Forward Current vs. Forward Voltage

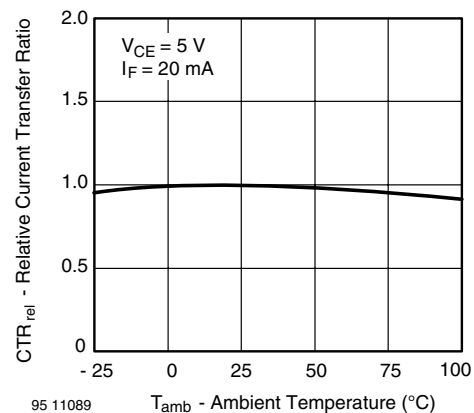


Fig. 5 - Relative Current Transfer Ratio vs. Ambient Temperature

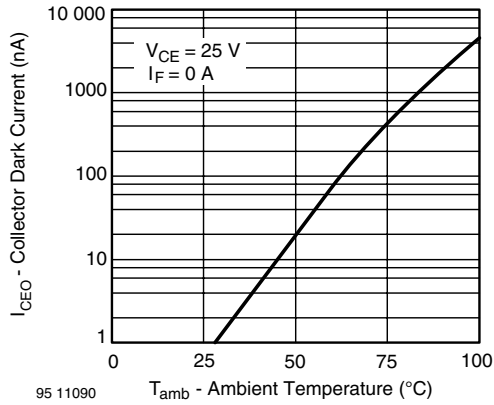


Fig. 6 - Collector Dark Current vs. Ambient Temperature

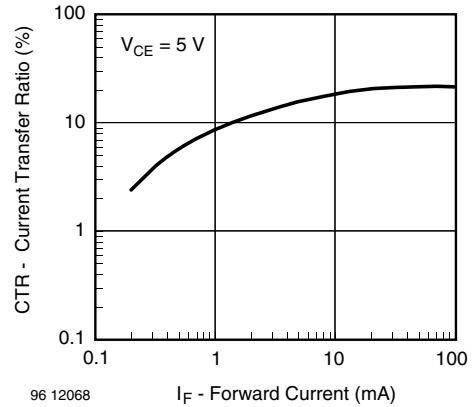


Fig. 9 - Current Transfer Ratio vs. Forward Current

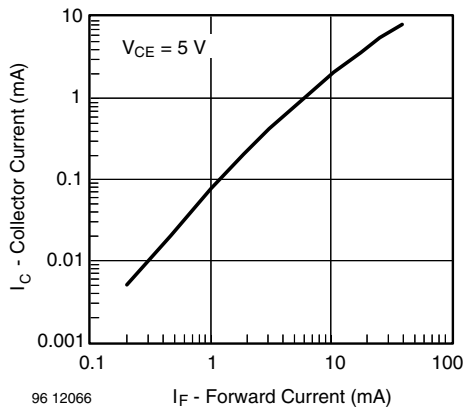


Fig. 7 - Collector Current vs. Forward Current

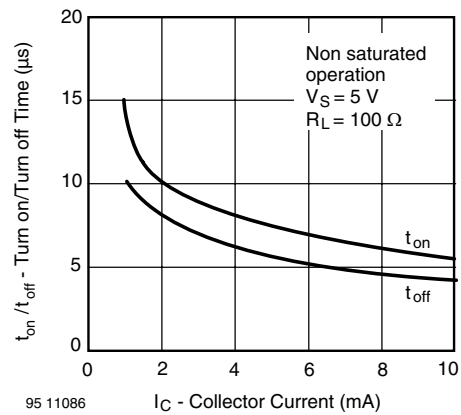


Fig. 10 - Turn-off/Turn-on Time vs. Collector Current

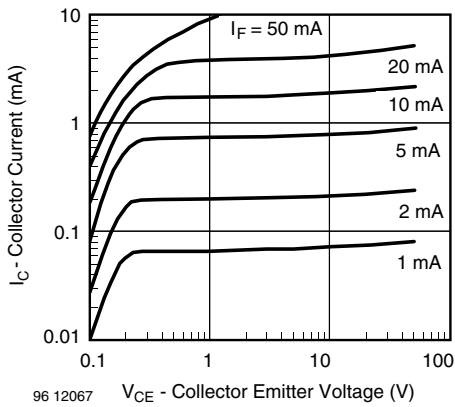


Fig. 8 - Collector Current vs. Collector Emitter Voltage

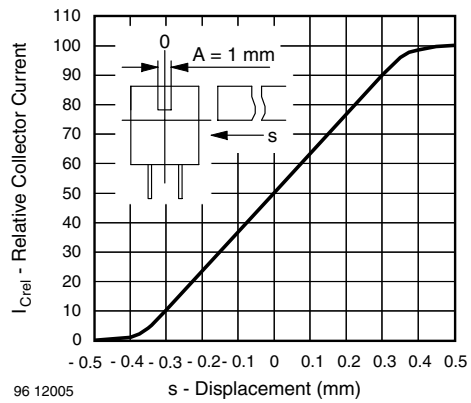


Fig. 11 - Relative Collector Current vs. Displacement

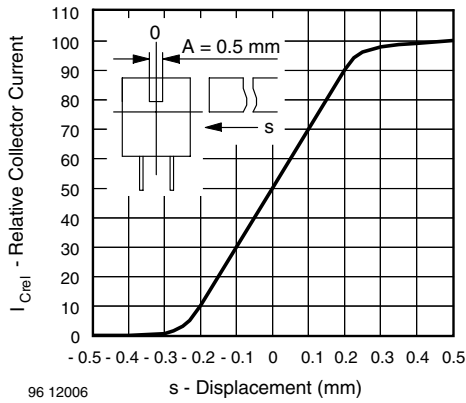


Fig. 12 - Relative Collector Current vs. Displacement

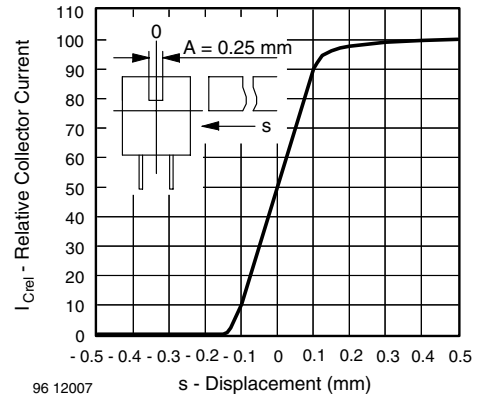
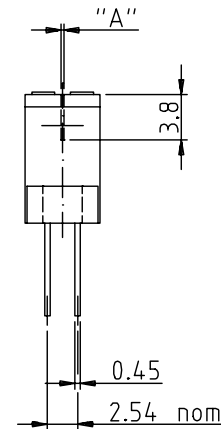
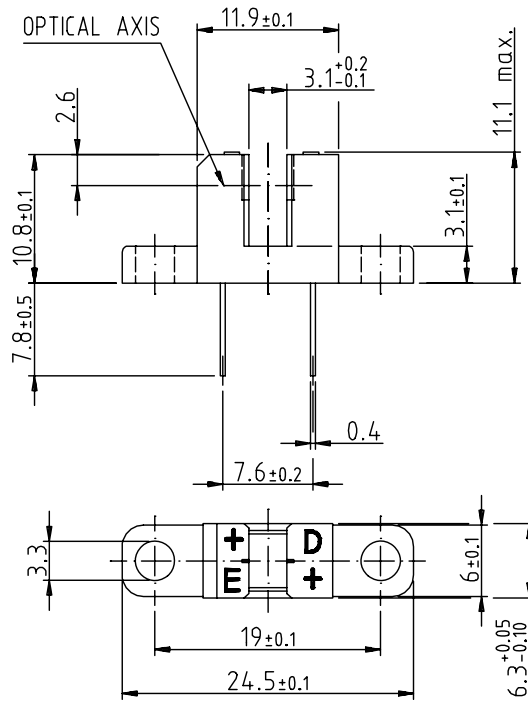


Fig. 13 - Relative Collector Current vs. Displacement

PACKAGE DIMENSIONS in millimeters



technical drawings according to DIN specifications

weight: ca. 0.90g

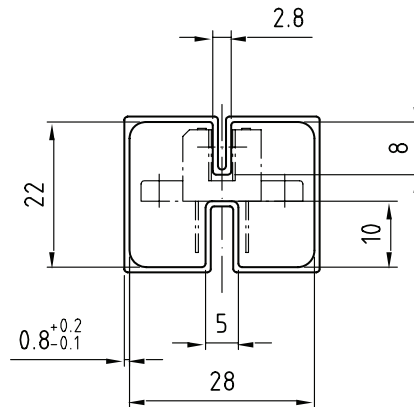
Drawing-No.: 6.550-5040.01-4
 Issue: 2; 10.11.98
 96 12095

TCST2103, TCST2202, TCST2300



Vishay Semiconductors Transmissive Optical Sensor with Phototransistor Output

TUBE DIMENSIONS in millimeters



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
20252

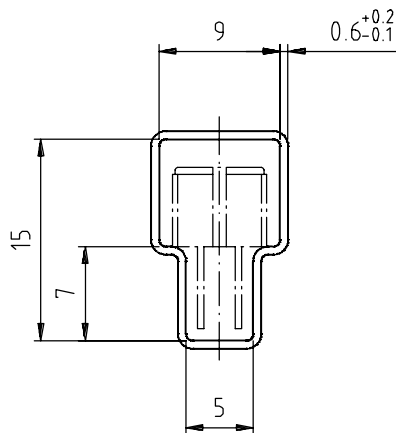
Packaging and Ordering Information

| PART NUMBER | MOQ ⁽¹⁾ | 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: ±0.5mm

Length: 575±1mm

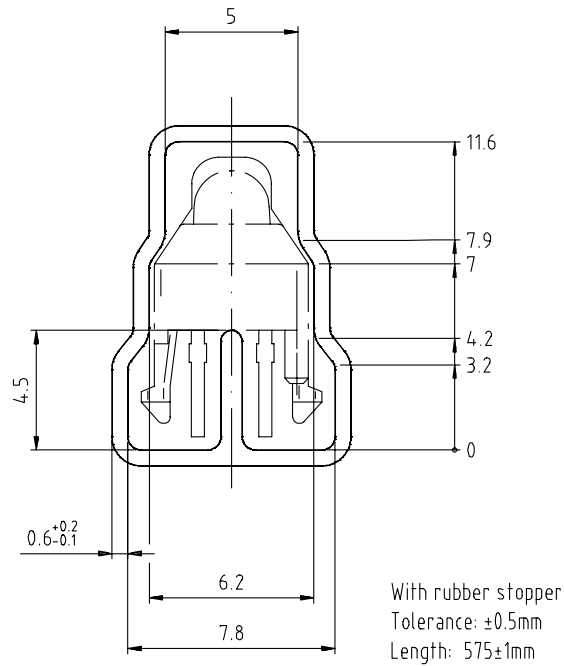
Drawing-No.: 9.700-5097.01-4
 Issue: 1; 25.02.00

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



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

15201

Fig. 3

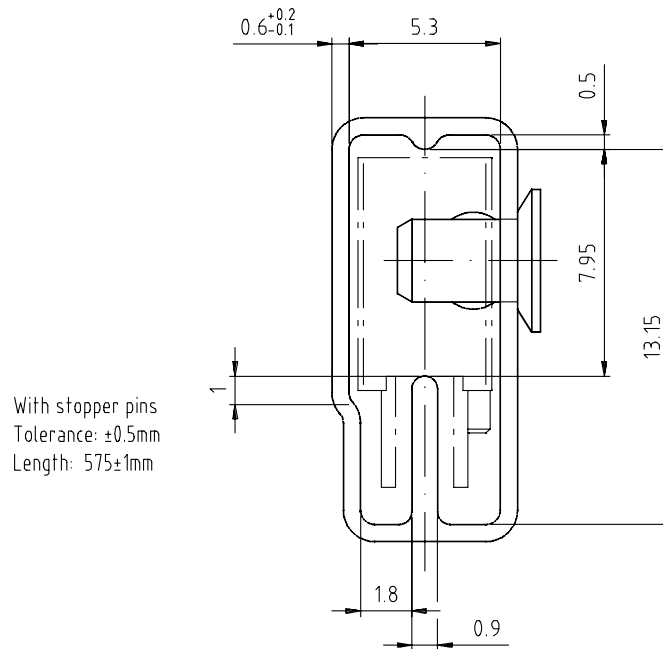


With rubber stopper
Tolerance: ±0.5mm
Length: 575±1mm

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

15199

Fig. 4

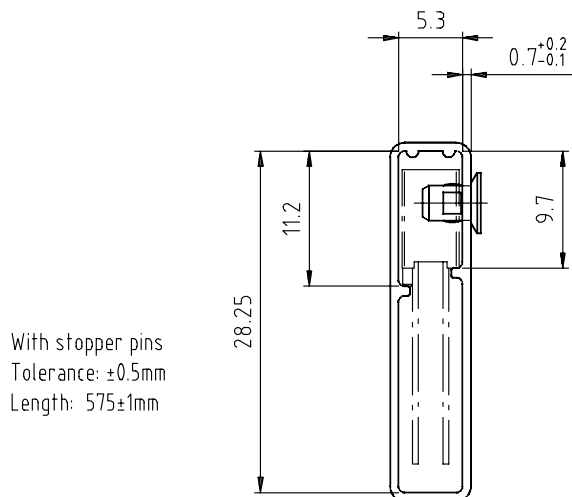


With stopper pins
Tolerance: ±0.5mm
Length: 575±1mm

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

15202

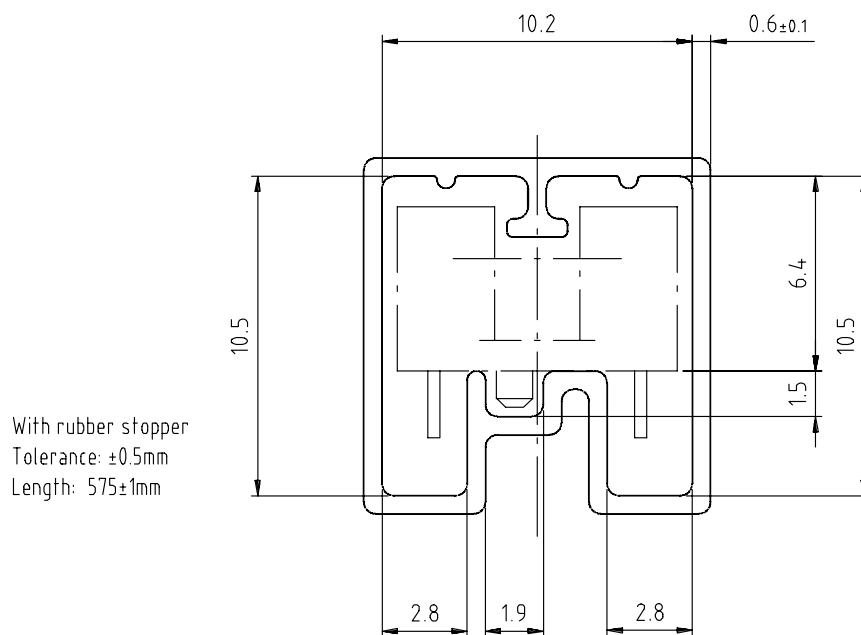
Fig. 5



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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