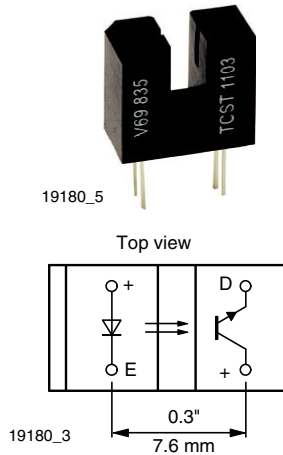


## Transmissive Optical Sensor with Phototransistor Output



### FEATURES

- Package type: leaded
- Detector type: phototransistor
- Dimensions (L x W x H in mm): 11.9 x 6.3 x 10.8
- Gap (in mm): 3.1
- Typical output current under test:  $I_C = 4$  mA (TCST1103)
- Typical output current under test:  $I_C = 2$  mA (TCST1202)
- Typical output current under test:  $I_C = 0.5$  mA (TCST1300)
- 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

### DESCRIPTION

The TCST1103, TCST1202, and TCST1300 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.

### APPLICATIONS

- Optical switch
- Photo interrupter
- Counter
- Encoder

PRODUCT SUMMARY				
PART NUMBER	GAP WIDTH (mm)	APERTURE WIDTH (mm)	TYPICAL OUTPUT CURRENT UNDER TEST <sup>(1)</sup> (mA)	DAYLIGHT BLOCKING FILTER INTEGRATED
TCST1103	3.1	1	4	Yes
TCST1202	3.1	0.5	2	Yes
TCST1300	3.1	0.25	0.5	Yes

#### Note

- Conditions like in table basic characteristics/coupler

ORDERING INFORMATION			
ORDERING CODE	PACKAGING	VOLUME <sup>(1)</sup>	REMARKS
TCST1103	Tube	MOQ: 1020 pcs, 85 pcs/tube	Without mounting flange
TCST1202	Tube	MOQ: 1020 pcs, 85 pcs/tube	Without mounting flange
TCST1300	Tube	MOQ: 1020 pcs, 85 pcs/tube	Without mounting flange

#### Note

- MOQ: minimum order quantity

ABSOLUTE MAXIMUM RATINGS ( $T_{amb} = 25$ °C, unless otherwise specified)				
PARAMETER	TEST CONDITION	SYMBOL	VALUE	UNIT
<b>COUPLER</b>				
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 (T <sub>amb</sub> = 25 °C, unless otherwise specified)				
PARAMETER	TEST CONDITION	SYMBOL	VALUE	UNIT
<b>INPUT (EMITTER)</b>				
Reverse voltage		V <sub>R</sub>	6	V
Forward current		I <sub>F</sub>	60	mA
Forward surge current	t <sub>p</sub> ≤ 10 μs	I <sub>FSM</sub>	3	A
Power dissipation	T <sub>amb</sub> ≤ 25 °C	P <sub>V</sub>	100	mW
Junction temperature		T <sub>j</sub>	100	°C
<b>OUTPUT (DETECTOR)</b>				
Collector emitter voltage		V <sub>CEO</sub>	70	V
Emitter collector voltage		V <sub>ECO</sub>	7	V
Collector peak current	t <sub>p</sub> /T = 0.5, t <sub>p</sub> ≤ 10 ms	I <sub>CM</sub>	200	mA
Power dissipation	T <sub>amb</sub> ≤ 25 °C	P <sub>V</sub>	150	mW
Junction temperature		T <sub>j</sub>	100	°C

**ABSOLUTE MAXIMUM RATINGS**

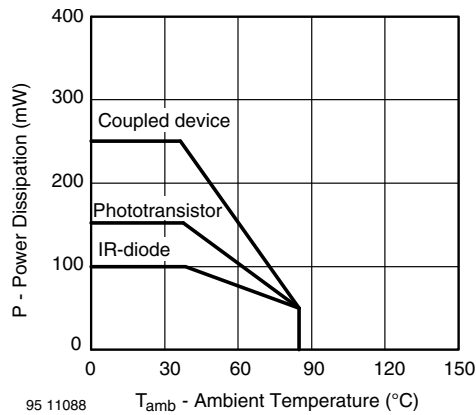


Fig. 1 - Power Dissipation Limit vs. Ambient Temperature

BASIC CHARACTERISTICS (T <sub>amb</sub> = 25 °C, unless otherwise specified)							
PARAMETER	TEST CONDITION	PART	SYMBOL	MIN.	TYP.	MAX.	UNIT
<b>COUPLER</b>							
Current transfer ratio	V <sub>CE</sub> = 5 V, I <sub>F</sub> = 20 mA	TCST1103	CTR	10	20		%
		TCST1202	CTR	5	10		%
		TCST1300	CTR	1.25	2.5		%
Collector current	V <sub>CE</sub> = 5 V, I <sub>F</sub> = 20 mA	TCST1103	I <sub>C</sub>	2	4		mA
		TCST1202	I <sub>C</sub>	1	2		mA
		TCST1300	I <sub>C</sub>	0.25	0.5		mA
Collector emitter saturation voltage	I <sub>F</sub> = 20 mA, I <sub>C</sub> = 1 mA	TCST1103	V <sub>CEsat</sub>			0.4	V
	I <sub>F</sub> = 20 mA, I <sub>C</sub> = 0.5 mA	TCST1202	V <sub>CEsat</sub>			0.4	V
	I <sub>F</sub> = 20 mA, I <sub>C</sub> = 0.1 mA	TCST1300	V <sub>CEsat</sub>			0.4	V
Resolution, path of the shutter crossing the radiant sensitive zone	I <sub>Crel</sub> = 10 % to 90 %	TCST1103	s		0.6		mm
		TCST1202	s		0.4		mm
		TCST1300	s		0.2		mm

BASIC CHARACTERISTICS ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)							
PARAMETER	TEST CONDITION	PART	SYMBOL	MIN.	TYP.	MAX.	UNIT
<b>INPUT (EMITTER)</b>							
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
<b>OUTPUT (DETECTOR)</b>							
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
<b>SWITCHING CHARACTERISTICS</b>							
Turn-on time	$I_C = 2\text{ mA}$ , $V_S = 5\text{ V}$ , $R_L = 100\text{ }\Omega$ (see figure 2)		$t_{on}$		10		$\mu\text{s}$
Turn-off time	$I_C = 2\text{ mA}$ , $V_S = 5\text{ V}$ , $R_L = 100\text{ }\Omega$ (see figure 2)		$t_{off}$		8		$\mu\text{s}$

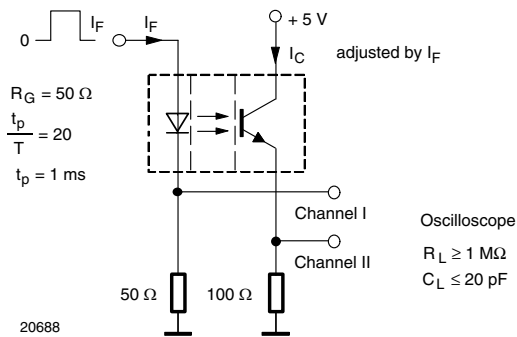
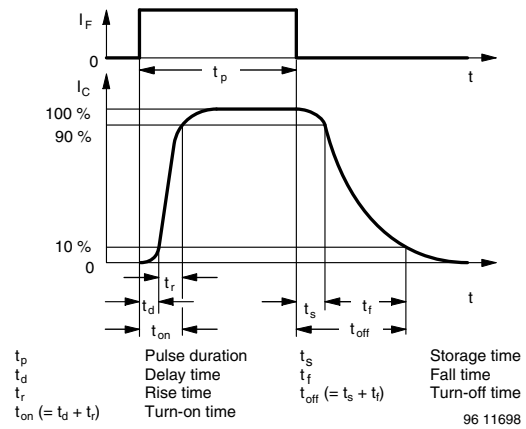

 Fig. 2 - Test Circuit for  $t_{on}$  and  $t_{off}$ 


Fig. 3 - Switching Times

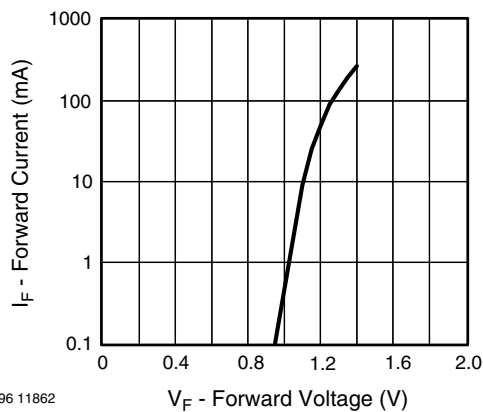
**BASIC CHARACTERISTICS** ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)


Fig. 4 - Forward Current vs. Forward Voltage

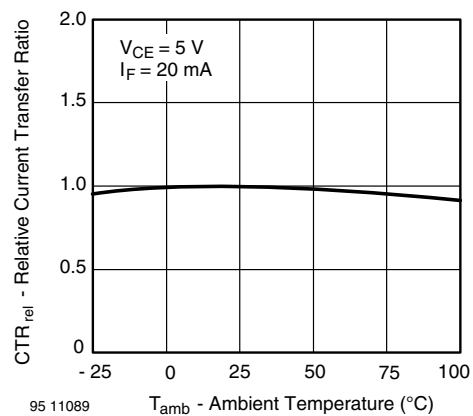


Fig. 5 - Relative Current Transfer Ratio vs. Ambient Temperature

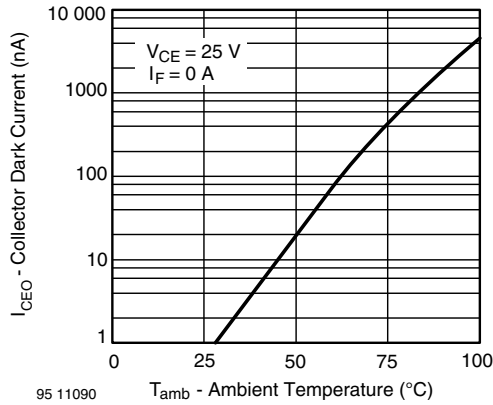


Fig. 6 - Collector Dark Current vs. Ambient Temperature

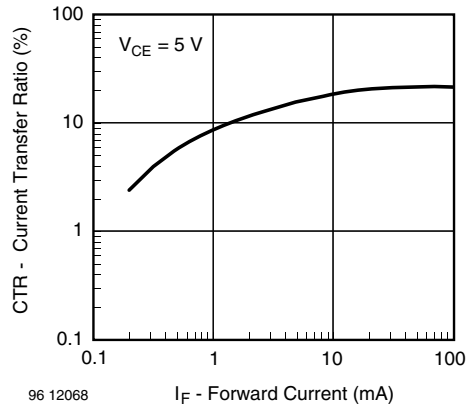


Fig. 9 - Current Transfer Ratio vs. Forward Current

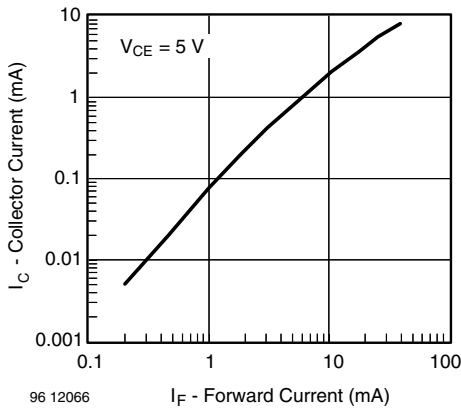


Fig. 7 - Collector Current vs. Forward Current

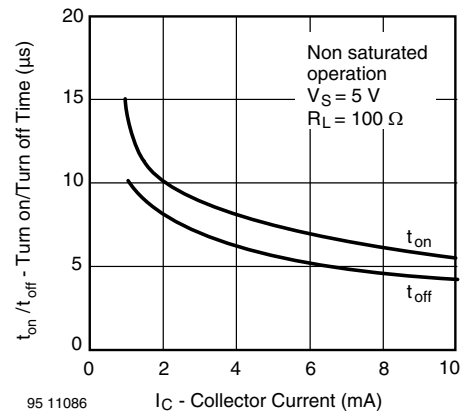


Fig. 10 - Turn-off/Turn-on Time vs. Collector Current

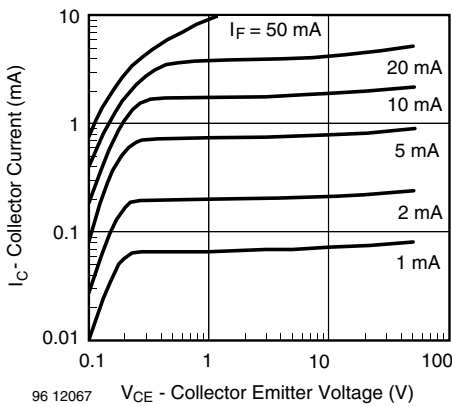


Fig. 8 - Collector Current vs. Collector Emitter Voltage

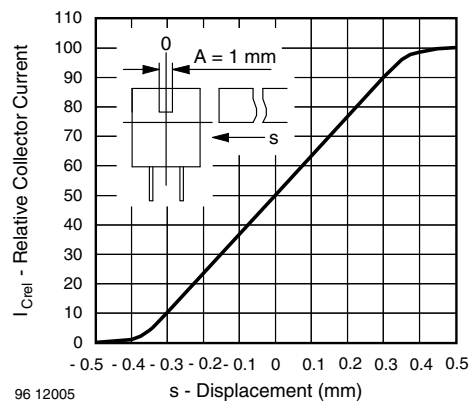


Fig. 11 - Relative Collector Current vs. Displacement

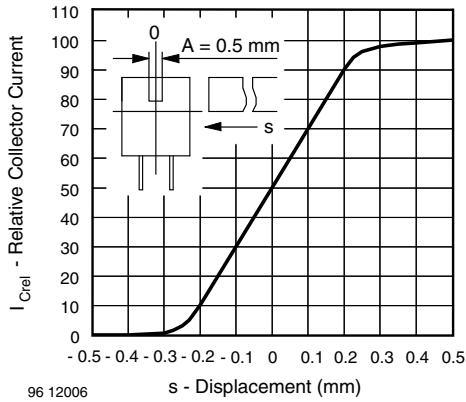


Fig. 12 - Relative Collector Current vs. Displacement

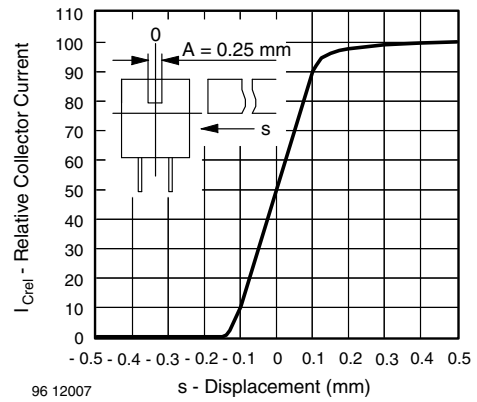
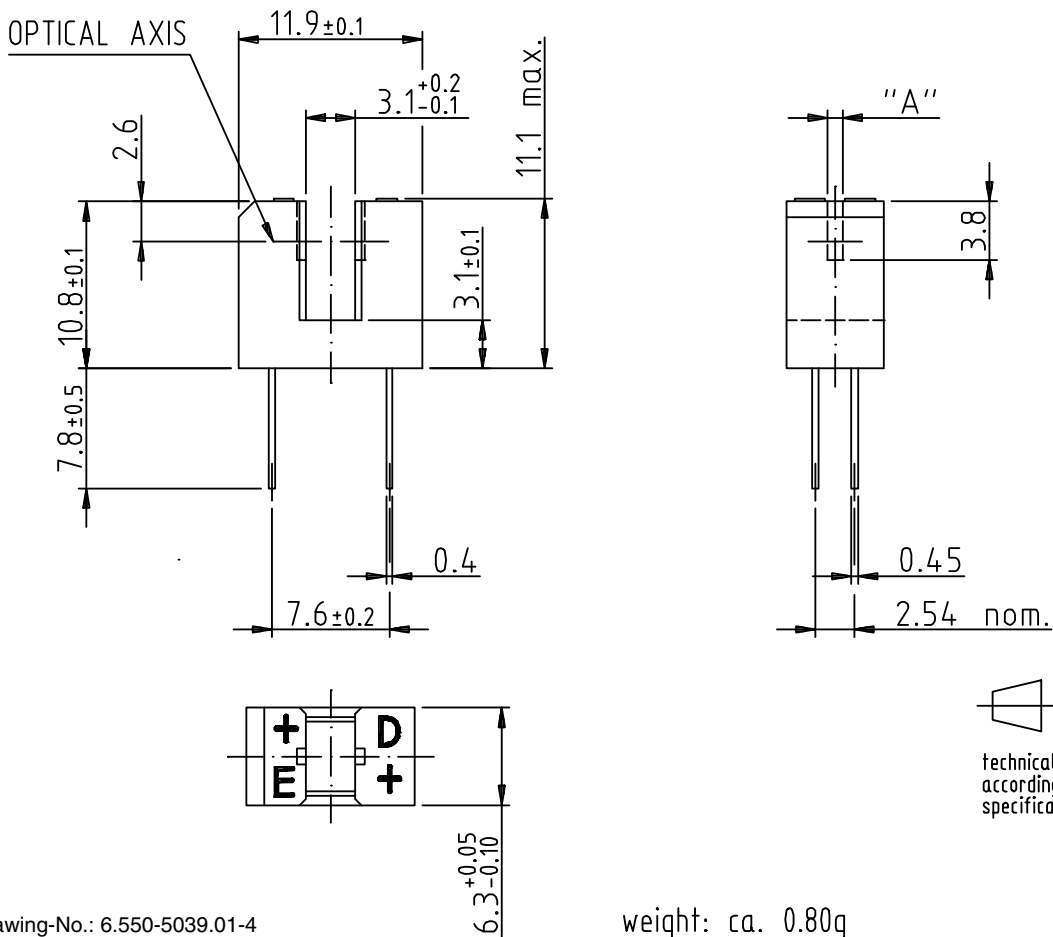


Fig. 13 - Relative Collector Current vs. Displacement

**PACKAGE DIMENSIONS** in millimeters



Drawing-No.: 6.550-5039.01-4

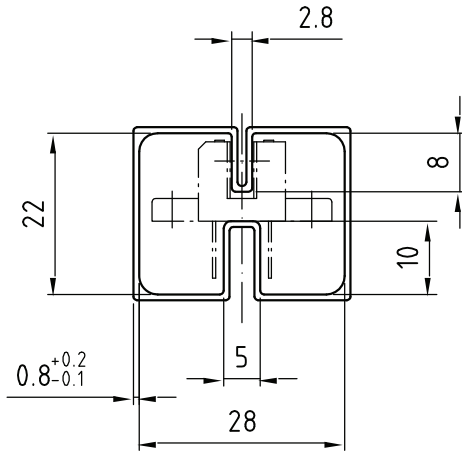
Issue: 2; 10.11.98

96 12094

weight: ca. 0.80g



**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

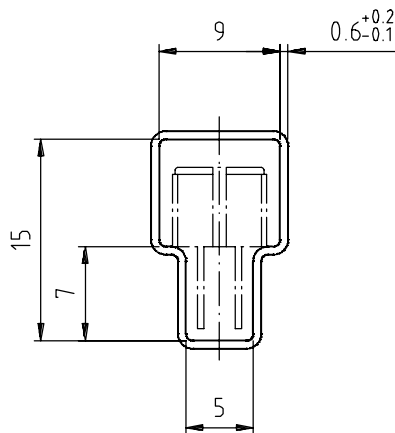
PART NUMBER	MOQ <sup>(1)</sup>	PCS PER TUBE	TUBE SPEC. (FIGURE)	CONSTITUENTS (FORMS)
CNY70	4000	80	1	28
TCPT1300X01	2000	Reel	(2)	29
TCRT1000	1000	Bulk	-	26
TCRT1010	1000	Bulk	-	26
TCRT5000	4500	50	2	27
TCRT5000L	2400	48	3	27
TCST1030	5200	65	5	24
TCST1030L	2600	65	6	24
TCST1103	1020	85	4	24
TCST1202	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: ±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



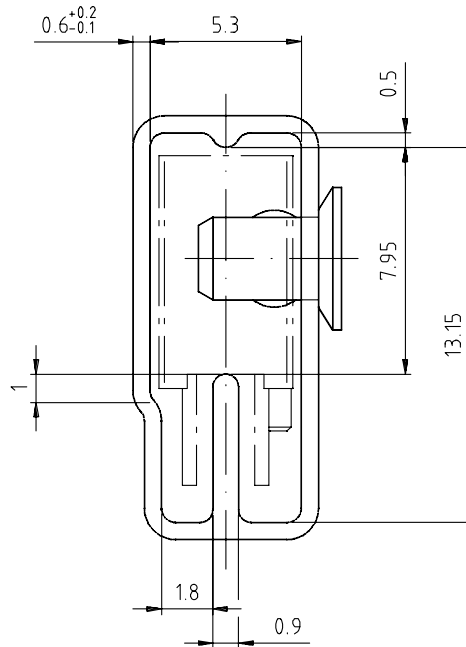


With rubber stopper  
Tolerance: ±0.5mm  
Length: 575±1mm

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

15199

Fig. 4

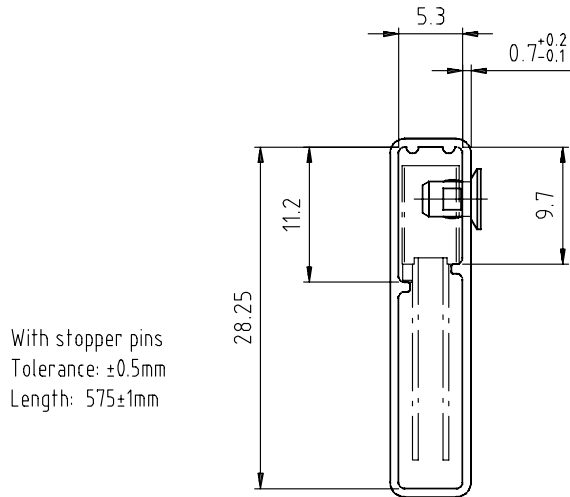


With stopper pins  
Tolerance: ±0.5mm  
Length: 575±1mm

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

15202

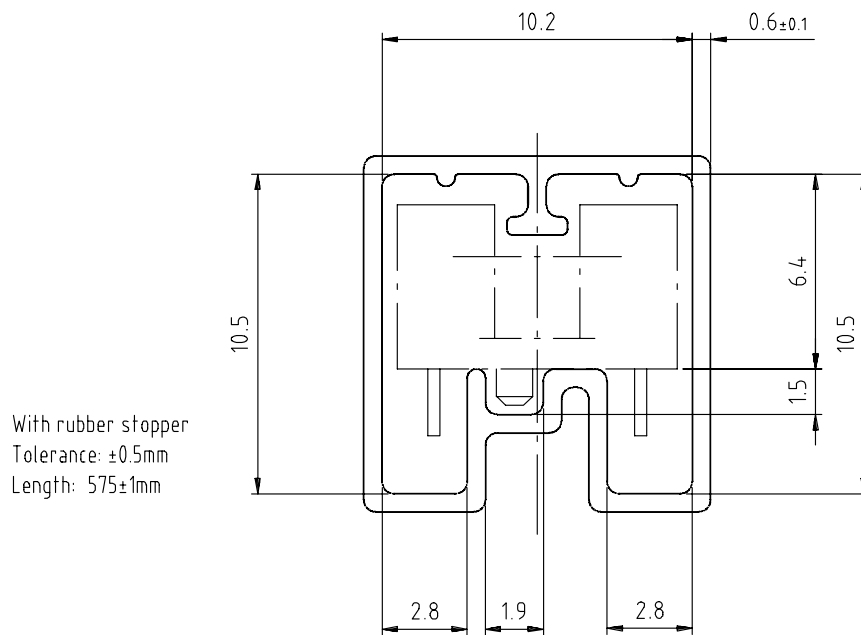
Fig. 5



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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