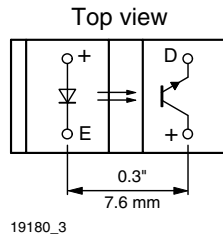
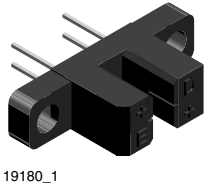


## Transmissive Optical Sensor with Phototransistor Output



### 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 <sup>(1)</sup> (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

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

# TCST2103, TCST2202, TCST2300

## Transmissive Optical Sensor with Phototransistor Output

<b>ABSOLUTE MAXIMUM RATINGS (1)</b>				
PARAMETER	TEST CONDITION	SYMBOL	VALUE	UNIT
<b>COUPLER</b>				
Total power dissipation	$T_{amb} \leq 25\text{ }^{\circ}\text{C}$	$P_{tot}$	250	mW
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	$t_p \leq 10\text{ }\mu\text{s}$	$I_{FSM}$	3	A
Power dissipation	$T_{amb} \leq 25\text{ }^{\circ}\text{C}$	$P_V$	100	mW
Junction temperature		$T_j$	100	$^{\circ}\text{C}$
<b>OUTPUT (DETECTOR)</b>				
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

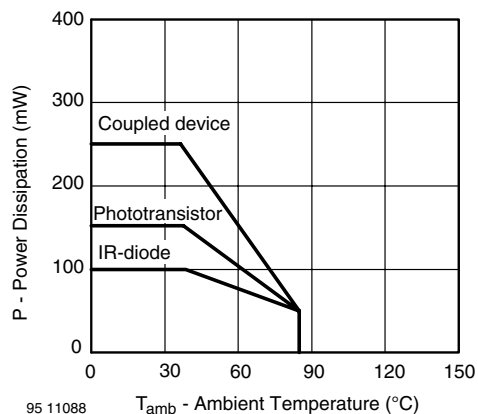


Fig. 1 - Power Dissipation Limit vs. Ambient Temperature

# TCST2103, TCST2202, TCST2300

## Transmissive Optical Sensor with Phototransistor Output

BASIC CHARACTERISTICS (1)							
PARAMETER	TEST CONDITION	PART	SYMBOL	MIN.	TYP.	MAX.	UNIT
<b>COUPLER</b>							
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	$I_{Crel} = 10\% \text{ to } 90\%$	TCST2103	s		0.6		mm
		TCST2202	s		0.4		mm
		TCST2300	s		0.2		mm
<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		$\mu\text{s}$

### Note

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

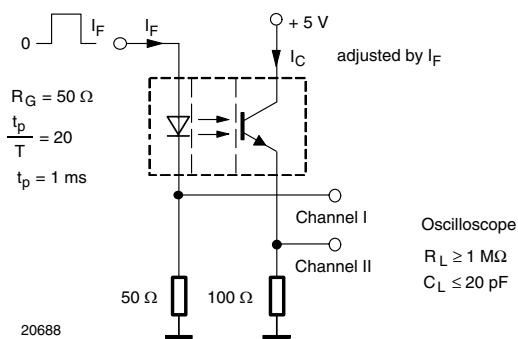


Fig. 2 - Test Circuit for  $t_{on}$  and  $t_{off}$

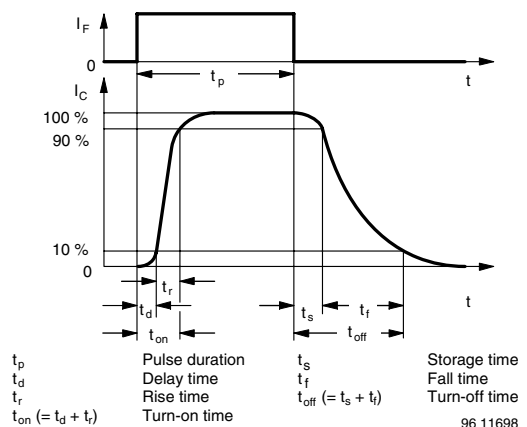


Fig. 3 - Switching Times

# TCST2103, TCST2202, TCST2300

## Transmissive Optical Sensor with Phototransistor Output

### BASIC CHARACTERISTICS

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

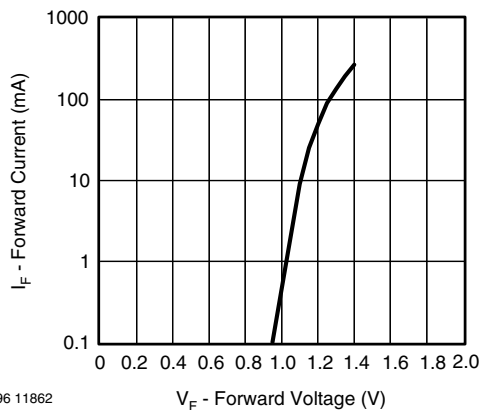


Fig. 4 - Forward Current vs. Forward Voltage

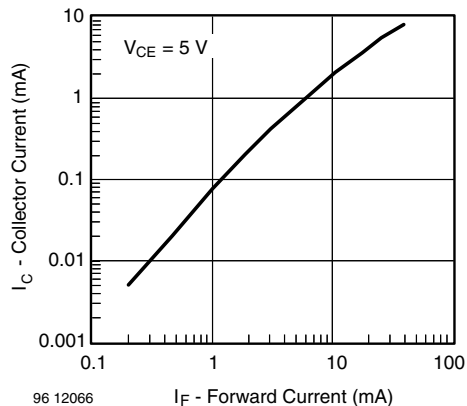


Fig. 7 - Collector Current vs. Forward Current

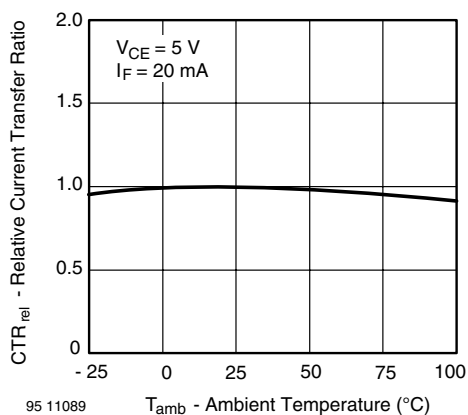


Fig. 5 - Relative Current Transfer Ratio vs. Ambient Temperature

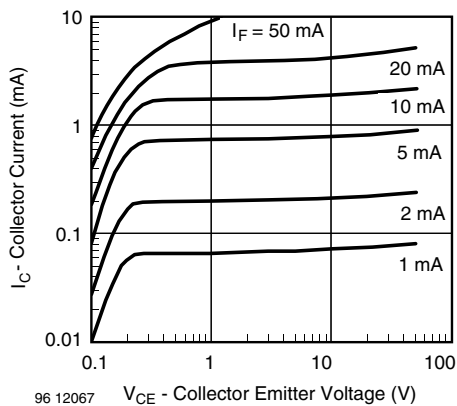


Fig. 8 - Collector Current vs. Collector Emitter Voltage

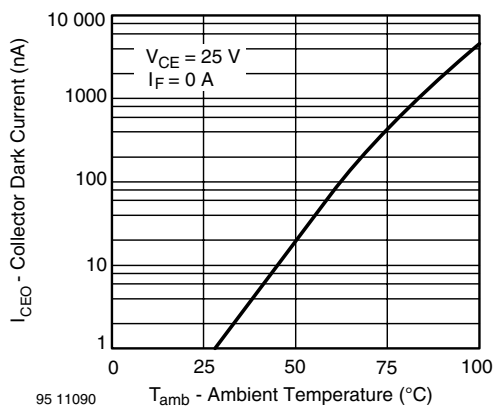


Fig. 6 - Collector Dark Current vs. Ambient Temperature

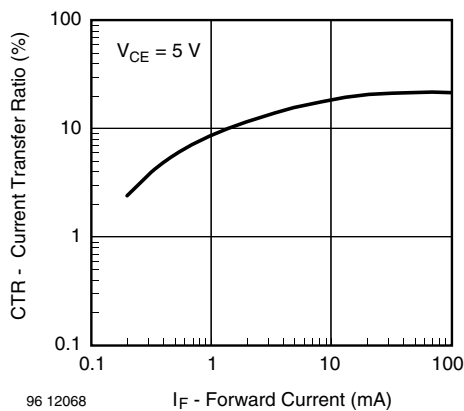


Fig. 9 - Current Transfer Ratio vs. Forward Current

## Transmissive Optical Sensor with Phototransistor Output

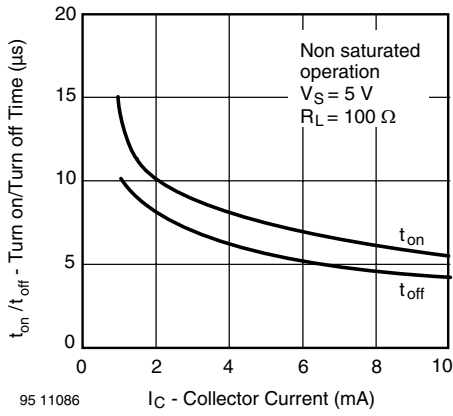


Fig. 10 - Turn-off/Turn-on Time vs. Collector Current

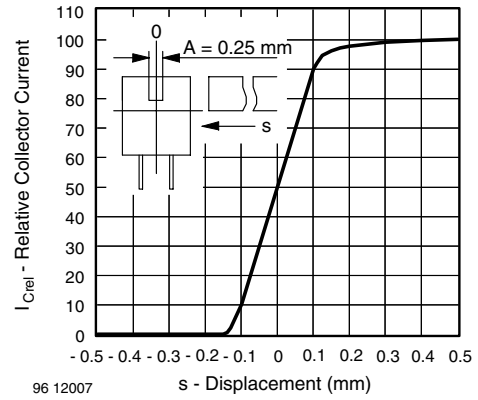


Fig. 13 - Relative Collector Current vs. Displacement

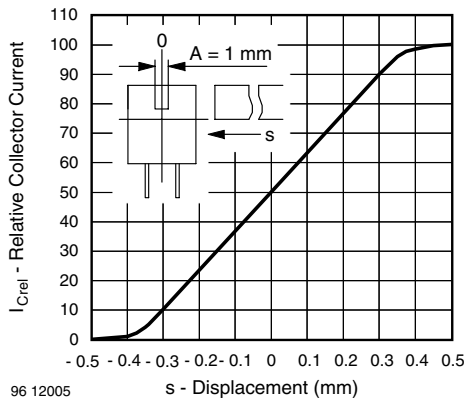


Fig. 11 - Relative Collector Current vs. Displacement

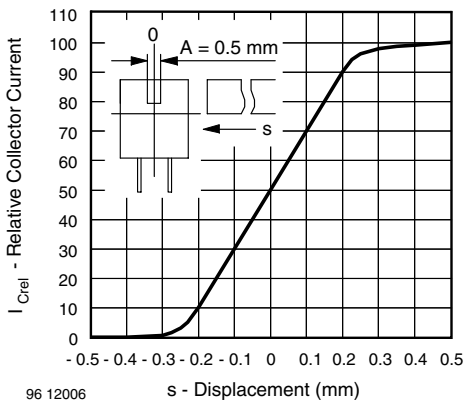
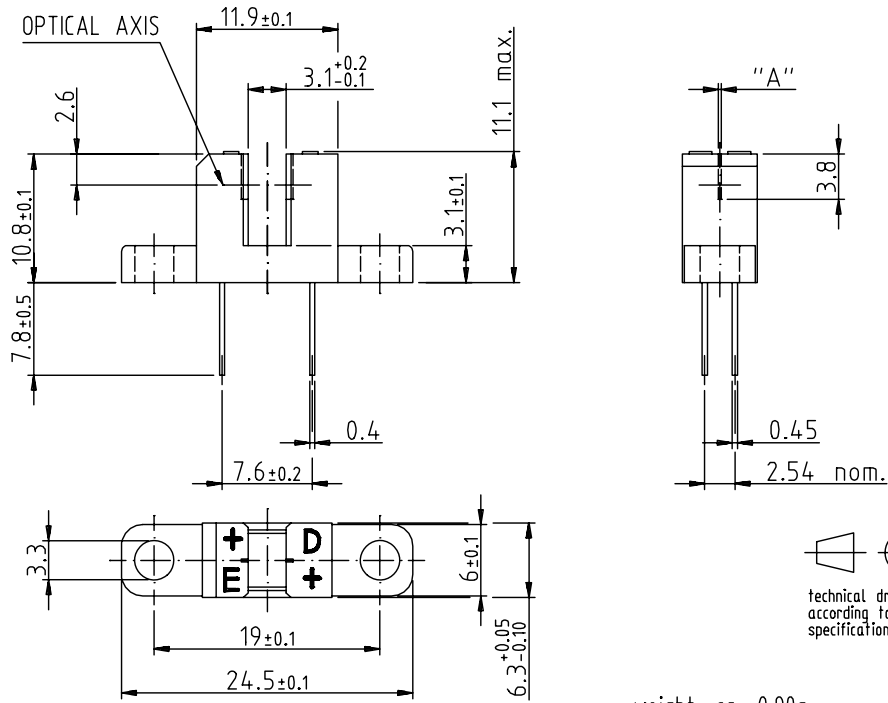


Fig. 12 - Relative Collector Current vs. Displacement

# TCST2103, TCST2202, TCST2300

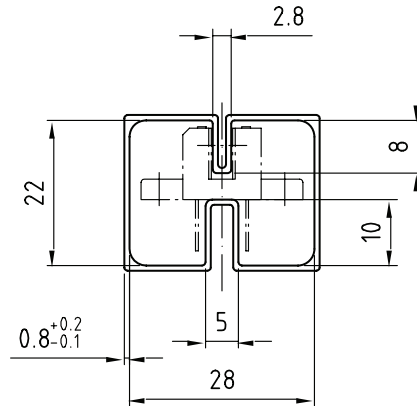
## Transmissive Optical Sensor with Phototransistor Output

### PACKAGE DIMENSIONS in millimeters



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

### TUBE DIMENSIONS in millimeters



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

Drawing-No.: 9.700-5100.01-4  
 Issue: 1; 25.02.00  
 20252