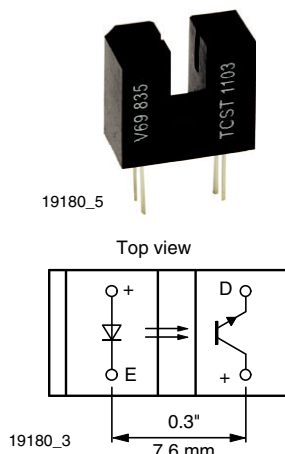


Transmissive Optical Sensor with Phototransistor Output



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 ⁽¹⁾ (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 ⁽¹⁾ | 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 |
|---------------------------|---|-----------|---------------|------|
| 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 ($T_{amb} = 25\text{ }^{\circ}\text{C}$, unless otherwise specified) | | | | |
|---|---|-----------|-------|--------------------|
| PARAMETER | TEST CONDITION | SYMBOL | VALUE | UNIT |
| INPUT (EMITTER) | | | | |
| Reverse voltage | | V_R | 6 | V |
| Forward current | | I_F | 60 | mA |
| Forward surge current | $t_p \leq 10\text{ }\mu\text{s}$ | I_{FSM} | 3 | A |
| Power dissipation | $T_{amb} \leq 25\text{ }^{\circ}\text{C}$ | P_V | 100 | mW |
| Junction temperature | | T_j | 100 | $^{\circ}\text{C}$ |
| 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 | $^{\circ}\text{C}$ |

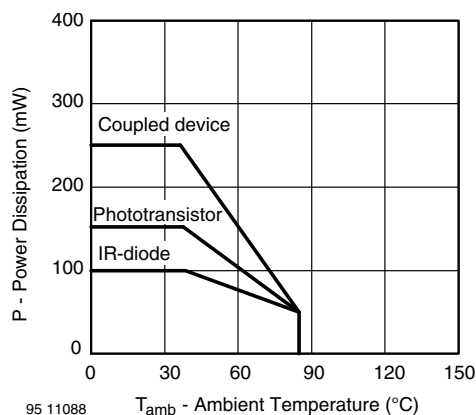
ABSOLUTE MAXIMUM RATINGS

Fig. 1 - Power Dissipation Limit vs. Ambient Temperature

| BASIC CHARACTERISTICS ($T_{amb} = 25\text{ }^{\circ}\text{C}$, unless otherwise specified) | | | | | | | |
|--|--|----------|-------------|------|------|------|------|
| PARAMETER | TEST CONDITION | PART | SYMBOL | MIN. | TYP. | MAX. | UNIT |
| COUPLER | | | | | | | |
| Current transfer ratio | $V_{CE} = 5\text{ V}$, $I_F = 20\text{ mA}$ | TCST1103 | CTR | 10 | 20 | | % |
| | | TCST1202 | CTR | 5 | 10 | | % |
| | | TCST1300 | CTR | 1.25 | 2.5 | | % |
| Collector current | $V_{CE} = 5\text{ V}$, $I_F = 20\text{ mA}$ | TCST1103 | I_C | 2 | 4 | | mA |
| | | TCST1202 | I_C | 1 | 2 | | mA |
| | | TCST1300 | I_C | 0.25 | 0.5 | | mA |
| Collector emitter saturation voltage | $I_F = 20\text{ mA}$, $I_C = 1\text{ mA}$ | TCST1103 | V_{CEsat} | | | 0.4 | V |
| | $I_F = 20\text{ mA}$, $I_C = 0.5\text{ mA}$ | TCST1202 | V_{CEsat} | | | 0.4 | V |
| | $I_F = 20\text{ mA}$, $I_C = 0.1\text{ mA}$ | TCST1300 | V_{CEsat} | | | 0.4 | V |
| Resolution, path of the shutter crossing the radiant sensitive zone | $I_{Crel} = 10\text{ % to }90\text{ %}$ | 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 |
| 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 |

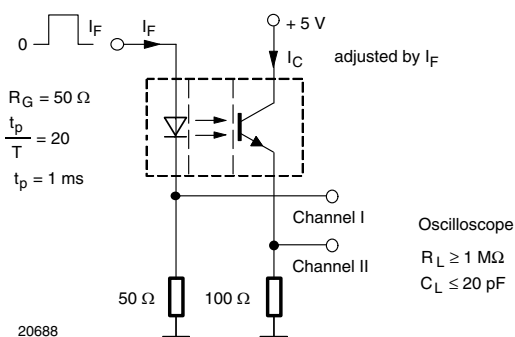
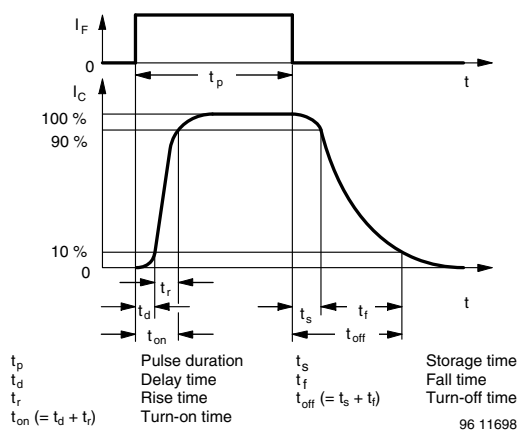

Fig. 2 - Test Circuit for t_{on} and t_{off}


Fig. 3 - Switching Times

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

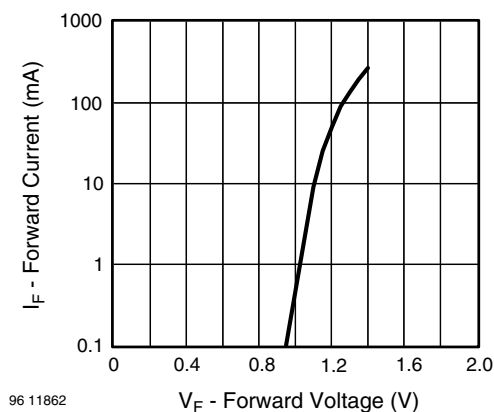


Fig. 4 - Forward Current vs. Forward Voltage

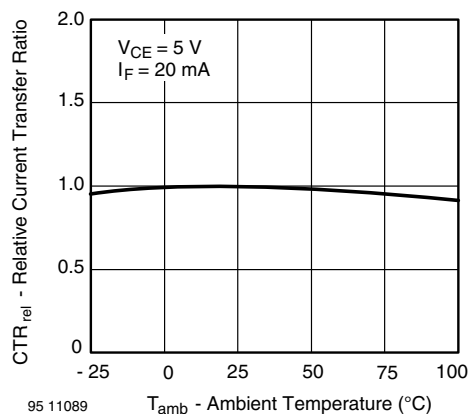


Fig. 5 - Relative Current Transfer Ratio vs. Ambient Temperature

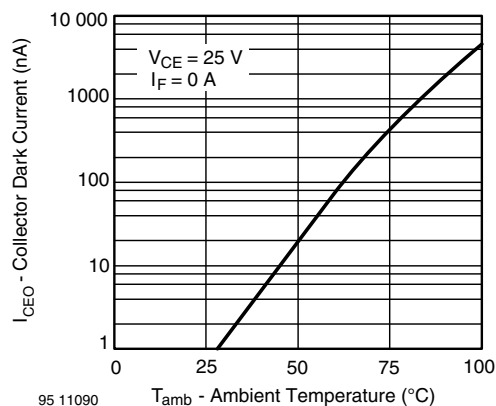


Fig. 6 - Collector Dark Current vs. Ambient Temperature

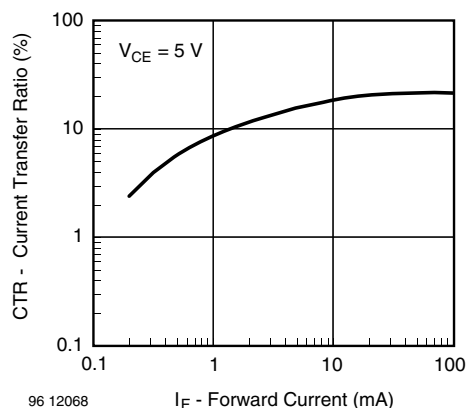


Fig. 9 - Current Transfer Ratio vs. Forward Current

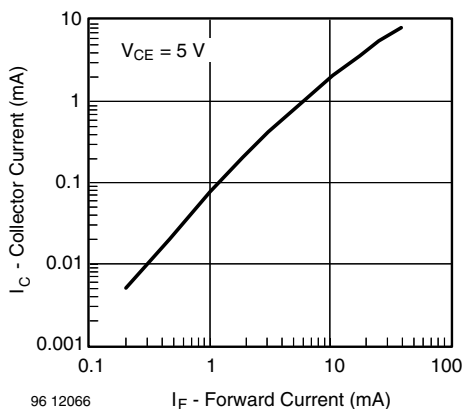


Fig. 7 - Collector Current vs. Forward Current

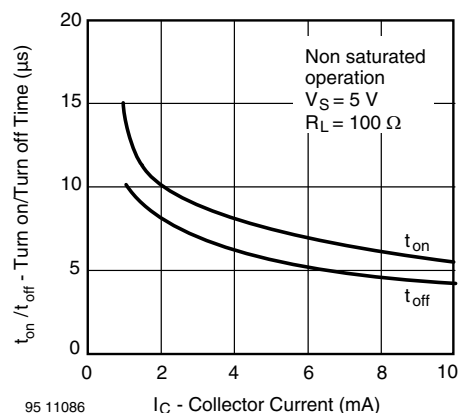


Fig. 10 - Turn-off/Turn-on Time vs. Collector Current

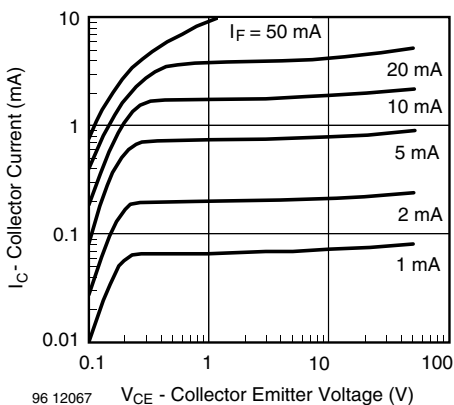


Fig. 8 - Collector Current vs. Collector Emitter Voltage

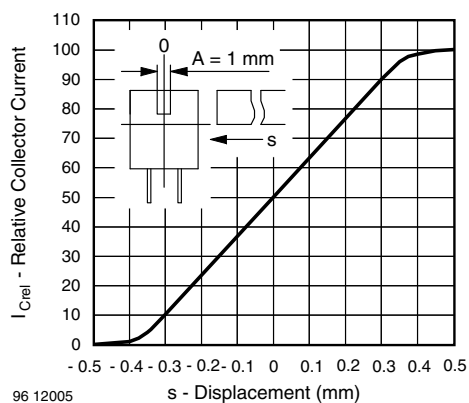


Fig. 11 - Relative Collector Current vs. Displacement

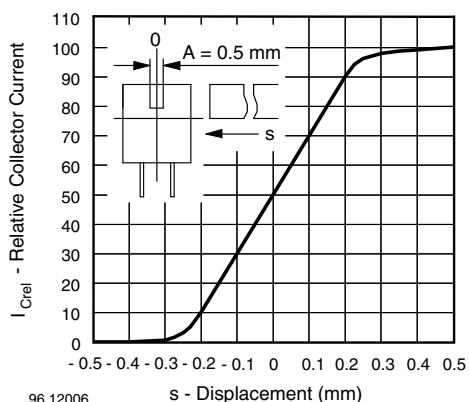


Fig. 12 - Relative Collector Current vs. Displacement

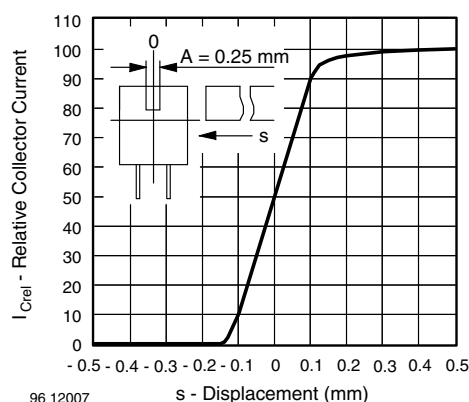

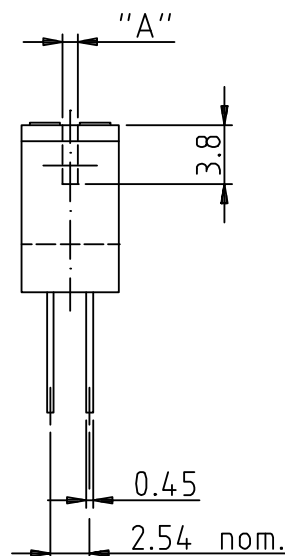
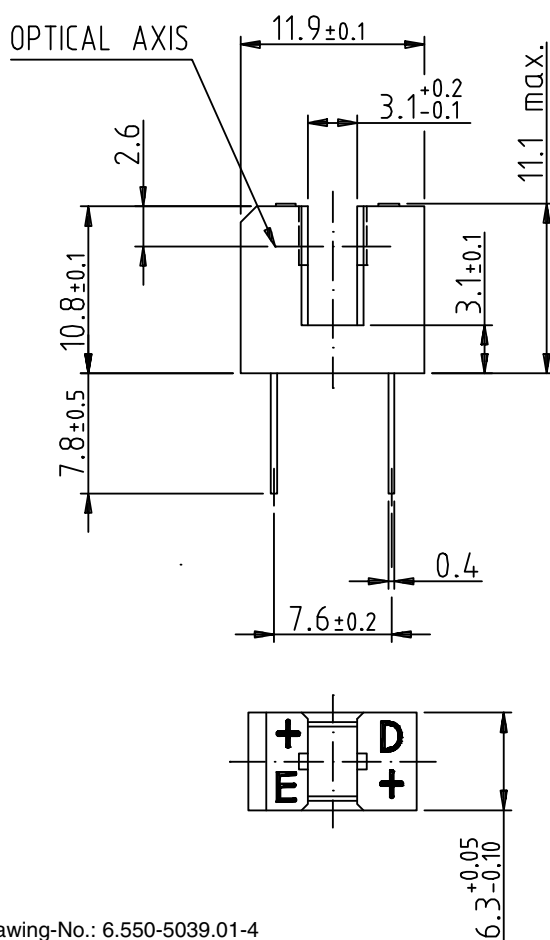


Fig. 13 - Relative Collector Current vs. Displacement

PACKAGE DIMENSIONS in millimeters

technical drawing
according to DIN
specifications

Drawing-No.: 6.550-5039.01-4

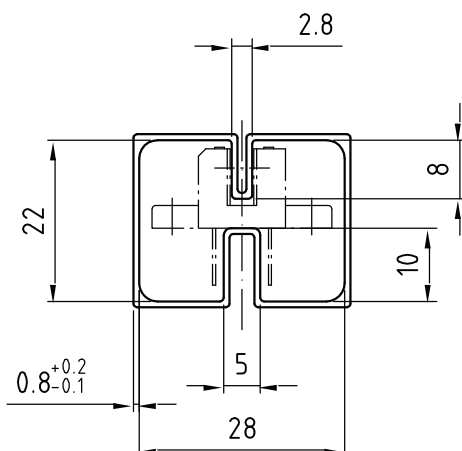
Issue: 2; 10.11.98

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



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