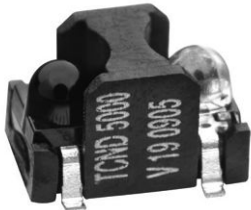
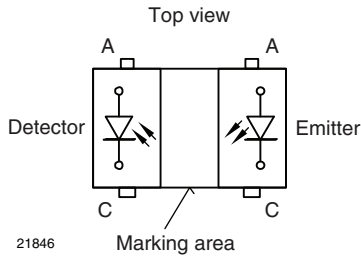


Reflective Optical Sensor with PIN Photodiode Output



19967



21846

DESCRIPTION

The TCND5000 is a reflective sensor that includes an infrared emitter and pin photodiode in a surface mount package which blocks visible light.

FEATURES

- Package type: surface mount
- Detector type: pin photodiode
- Dimensions (L x W x H in mm): 6 x 4.3 x 3.75
- Peak operating distance: 6 mm
- Operating range within > 20 % relative collector current: 2 mm to 25 mm
- Typical output current under test: $I_{ra} > 0.11 \mu A$
- Daylight blocking filter
- High linearity
- Emitter wavelength: 940 nm
- Lead (Pb)-free soldering released
- Moisture sensitivity level (MSL): 4
- Compliant to RoHS Directive 2002/95/EC and in accordance to WEEE 2002/96/EC


RoHS
COMPLIANT

APPLICATIONS

- Proximity sensor
- Object sensor
- Motion sensor
- Touch key

PRODUCT SUMMARY

| PART NUMBER | DISTANCE FOR MAXIMUM CTR _{rel} ⁽¹⁾ (mm) | DISTANCE RANGE FOR RELATIVE I _{out} > 20 % (mm) | TYPICAL OUTPUT CURRENT UNDER TEST ⁽²⁾ (mA) | DAYLIGHT BLOCKING FILTER INTEGRATED |
|-------------|---|--|---|-------------------------------------|
| TCND5000 | 6 | 2 to 25 | 0.15 | Yes |

Notes

- (1) CTR: current transference ratio, I_{out}/I_{in}
 (2) Conditions like in table basic characteristics/sensors

ORDERING INFORMATION

| ORDERING CODE | PACKAGING | VOLUME ⁽¹⁾ | REMARKS |
|---------------|---------------|------------------------------|---------|
| TCND5000 | Tape and reel | MOQ: 2000 pcs, 2000 pcs/reel | Drypack |

Note

- (1) MOQ: minimum order quantity

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

| PARAMETER | TEST CONDITION | SYMBOL | VALUE | UNIT |
|------------------------|--|-----------------|-------|------|
| INPUT (EMITTER) | | | | |
| Reverse voltage | | V _R | 5 | V |
| Forward current | | I _F | 100 | mA |
| Peak forward current | t _p = 50 μs, t = 2 ms, T _{amb} ≤ 25 °C | I _{FM} | 500 | mA |
| Power dissipation | | P _V | 190 | 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 |
| OUTPUT (DETECTOR) | | | | |
| Reverse voltage | | V_R | 60 | V |
| Power dissipation | | P_V | 75 | mW |
| Junction temperature | | T_j | 100 | $^{\circ}\text{C}$ |
| SENSOR | | | | |
| Ambient temperature range | | T_{amb} | - 40 to + 85 | $^{\circ}\text{C}$ |
| Storage temperature range | | T_{stg} | - 40 to + 100 | $^{\circ}\text{C}$ |
| Soldering temperature | acc. fig. 14 | T_{sd} | 260 | $^{\circ}\text{C}$ |

ABSOLUTE MAXIMUM RATINGS

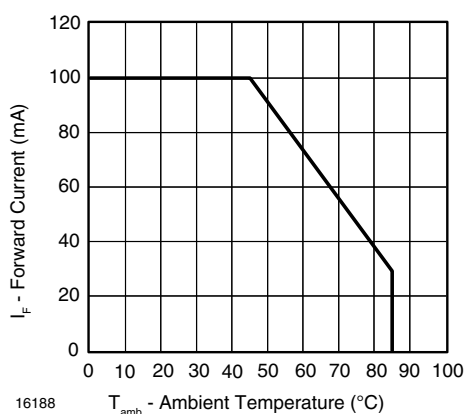


Fig. 1 - Forward Current Limit vs. Ambient Temperature

| BASIC CHARACTERISTICS ($T_{amb} = 25\text{ }^{\circ}\text{C}$, unless otherwise specified) | | | | | | |
|---|---|------------------|------|----------|------|---------------|
| PARAMETER | TEST CONDITION | SYMBOL | MIN. | TYP. | MAX. | UNIT |
| INPUT (EMITTER) ⁽¹⁾ | | | | | | |
| Forward voltage | $I_F = 50\text{ mA}$, $t_p = 20\text{ ms}$ | V_F | | 1.2 | 1.5 | V |
| Temperature coefficient of V_F | $I_F = 1\text{ mA}$ | TK_{V_F} | | - 1.3 | | mV/K |
| Reverse current | $V_R = 5\text{ V}$ | I_R | | | 10 | μA |
| Junction capacitance | $V_R = 0\text{ V}$, $f = 1\text{ MHz}$, $E = 0\text{ lx}$ | C_j | | 25 | | pF |
| Radiant intensity | $I_F = 20\text{ mA}$, $t_p = 20\text{ ms}$ | I_e | | 7 | 75 | mW/sr |
| Angle of half intensity | | ϕ | | ± 12 | | deg |
| Peak wavelength | $I_F = 100\text{ mA}$ | λ_p | 930 | 940 | | nm |
| Spectral bandwidth | $I_F = 100\text{ mA}$ | $\Delta\lambda$ | | 50 | | nm |
| Temperature coefficient of λ_p | $I_F = 100\text{ mA}$ | TK_{λ_p} | | 0.2 | | nm/K |
| Rise time | $I_F = 100\text{ mA}$ | t_r | | 800 | | ns |
| Fall time | $I_F = 100\text{ mA}$ | t_f | | 800 | | ns |
| Virtual source diameter | Method: 63 % encircled energy | d | | 1.2 | | mm |

| BASIC CHARACTERISTICS ($T_{amb} = 25\text{ }^{\circ}\text{C}$, unless otherwise specified) | | | | | | |
|---|---|-----------------|------|-------------|------|---------------|
| PARAMETER | TEST CONDITION | SYMBOL | MIN. | TYP. | MAX. | UNIT |
| OUTPUT (DETECTOR) ⁽²⁾ | | | | | | |
| Forward voltage | $I_F = 50\text{ mA}$ | V_F | | 1 | 1.3 | V |
| Breakdown voltage | $I_R = 100\text{ }\mu\text{A}$ | V_{BR} | 60 | | | V |
| Reverse dark current | $V_R = 10\text{ V}$, $E = 0\text{ lx}$ | I_{ro} | | 1 | 10 | nA |
| Diode capacitance | $V_R = 5\text{ V}$, $f = 1\text{ MHz}$, $E = 0\text{ lx}$ | C_D | | 1.8 | | pF |
| Reverse light current | $E_o = 1\text{ mW/cm}^2$, $\lambda = 950\text{ nm}$, $V_R = 5\text{ V}$ | I_{ra} | | 12 | | μA |
| Temperature coefficient of I_{ra} | $\lambda = 870\text{ nm}$, $V_R = 5\text{ V}$ | TK_{Ira} | | 0.2 | | %/K |
| Angle of half intensity | | ϕ | | ± 15 | | deg |
| Wavelength of peak sensitivity | | λ_P | | 930 | | nm |
| Range of spectral bandwidth | | $\lambda_{0.5}$ | | 840 to 1050 | | nm |
| SENSOR | | | | | | |
| Reverse Light Current | $V_R = 2.5\text{ V}$, $I_F = 20\text{ mA}$, $D = 30\text{ mm}$, reflective mode: see figure 2 | I_{ra} | 110 | | | nA |

Note

- (1) See figures 2 to 8 accordingly
 (2) See figures 9 to 12 accordingly

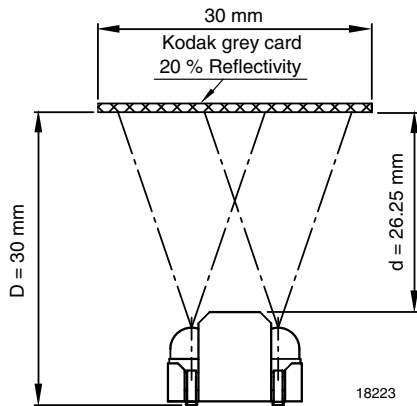


Fig. 2 - Test Circuit

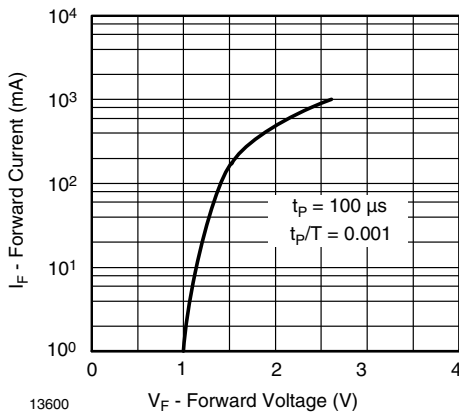
BASIC CHARACTERISTICS ($T_{amb} = 25\text{ }^{\circ}\text{C}$, unless otherwise specified)


Fig. 3 - Forward Current vs. Forward Voltage

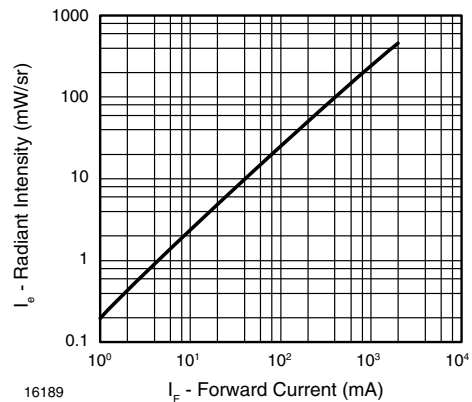


Fig. 4 - Radiant Intensity vs. Forward Current

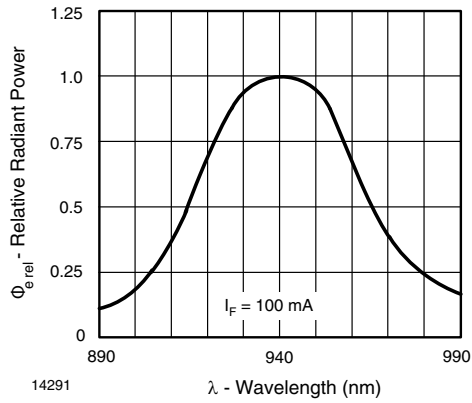


Fig. 5 - Relative Radiant Power vs. Wavelength

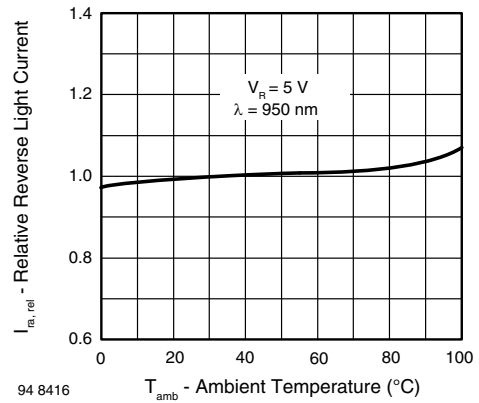


Fig. 8 - Relative Reverse Light Current vs. Ambient Temperature

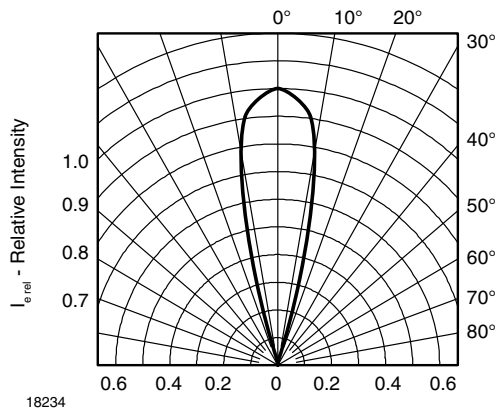


Fig. 6 - Relative Radiant Intensity vs. Angular Displacement

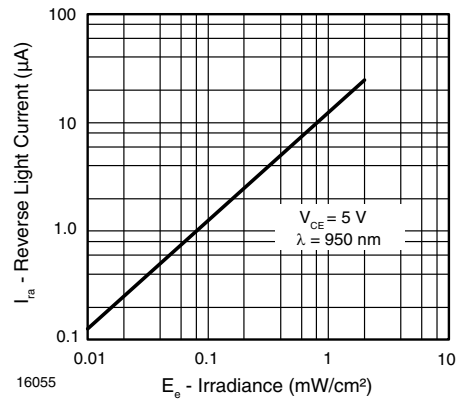


Fig. 9 - Reverse Light Current vs. Irradiance

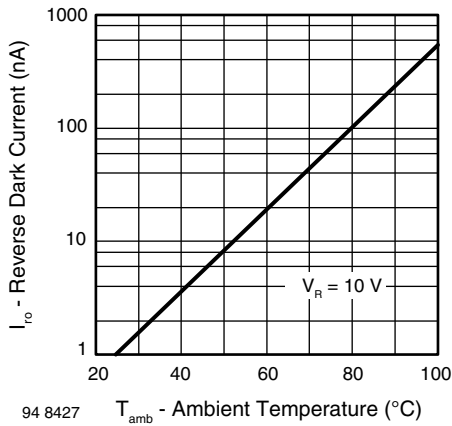


Fig. 7 - Reverse Dark Current vs. Ambient Temperature

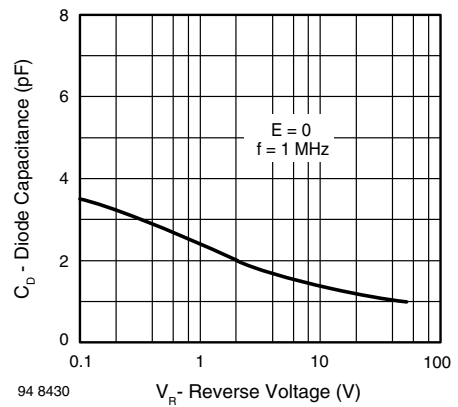


Fig. 10 - Diode Capacitance vs. Reverse Voltage

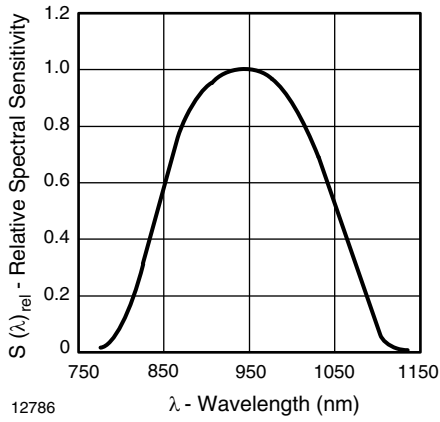


Fig. 11 - Relative Spectral Sensitivity vs. Wavelength

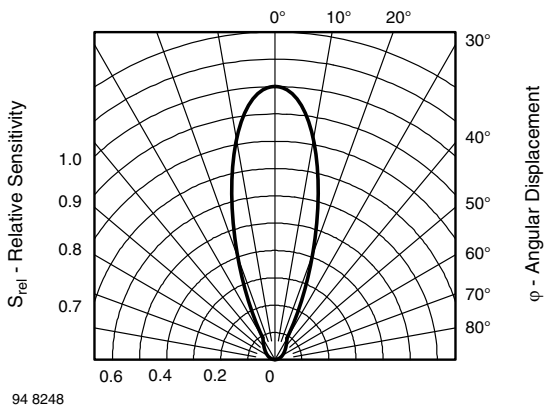


Fig. 12 - Relative Radiant Sensitivity vs. Angular Displacement

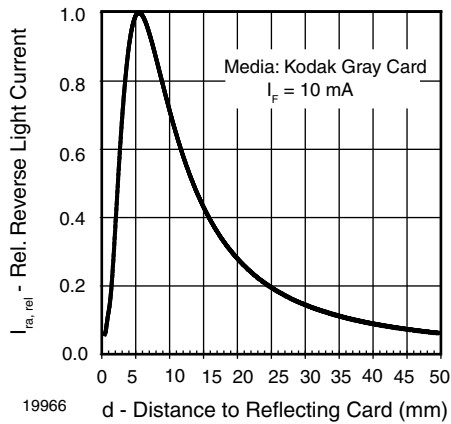
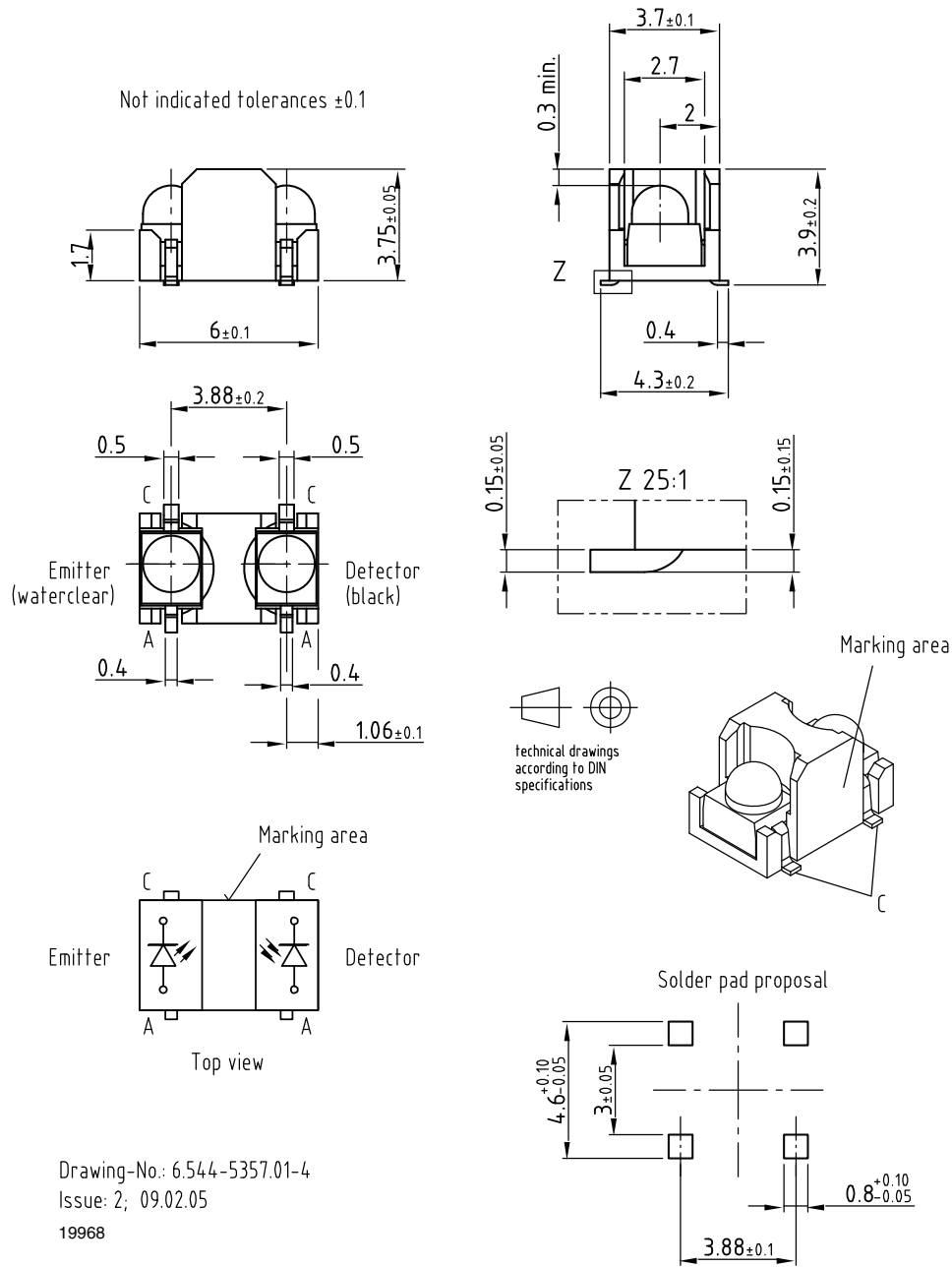


Fig. 13 - Relative Reverse Light Current vs. Distance

PACKAGE DIMENSIONS in millimeters


PRECAUTIONS FOR USE

1. Over-current-proof

Customer must apply resistors for protection, otherwise slight voltage shift will cause big current change (Burn out will happen).

2. Storage

2.1 Storage temperature and rel. humidity conditions are: 5 °C to 30 °C, RH 60 %

2.2 Floor life must not exceed 72 h, acc. to JEDEC level 4, J-STD-020.

Once the package is opened, the products should be used within 72 h. Otherwise, they should be kept in a damp proof box with desiccant.

Considering tape life, we suggest to use products within one year from production date.

2.3 If opened more than 72 h in an atmosphere 5 °C to 30 °C, RH 60 %, devices should be treated at 60 °C ± 5 °C for 15 h.

2.4 If humidity indicator in the package shows pink color (normal blue), then devices should be treated with the same conditions as 2.3

REFLOW SOLDER PROFILES

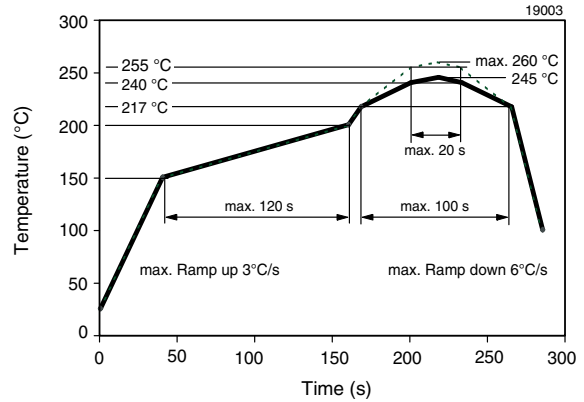


Fig. 14 - Lead (Pb)-Free Reflow Solder Profile

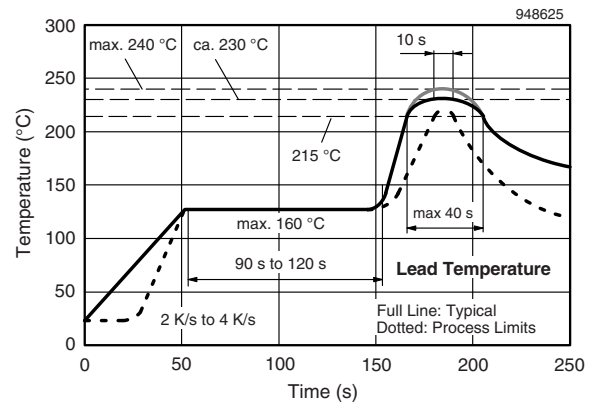


Fig. 15 - Lead Tin (SnPb) Reflow Solder Profile

Packaging and Ordering Information

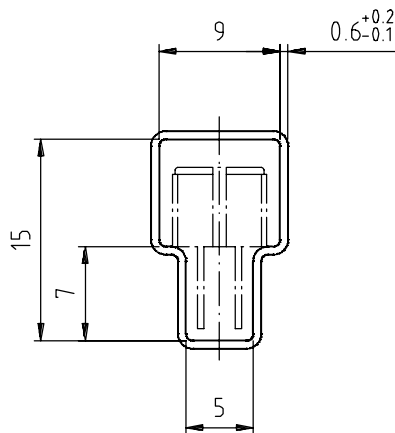
| PART NUMBER | MOQ ⁽¹⁾ | PCS PER TUBE | TUBE SPEC. (FIGURE) | CONSTITUENTS (FORMS) |
|---------------|--------------------|--------------|---------------------|----------------------|
| CNY70 | 4000 | 80 | 1 | 28 |
| TCPT1300X01 | 2000 | Reel | (2) | 29 |
| TCRT1000 | 1000 | Bulk | - | 26 |
| TCRT1010 | 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: ± 0.5 mm

Length: 575 ± 1 mm

Drawing-No.: 9.700-5097.01-4

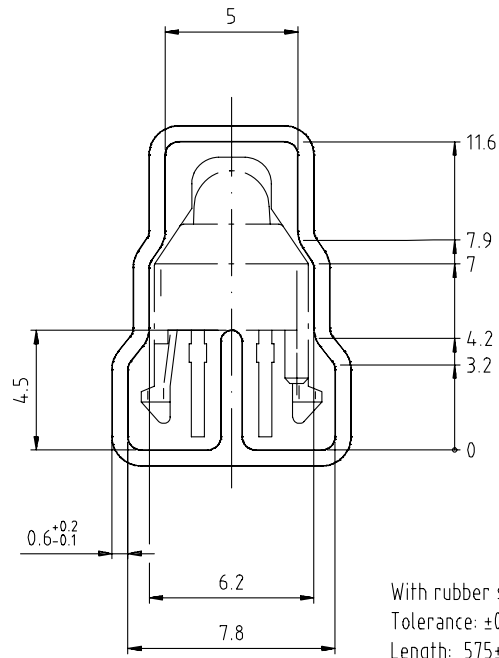
Issue: 1; 25.02.00

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

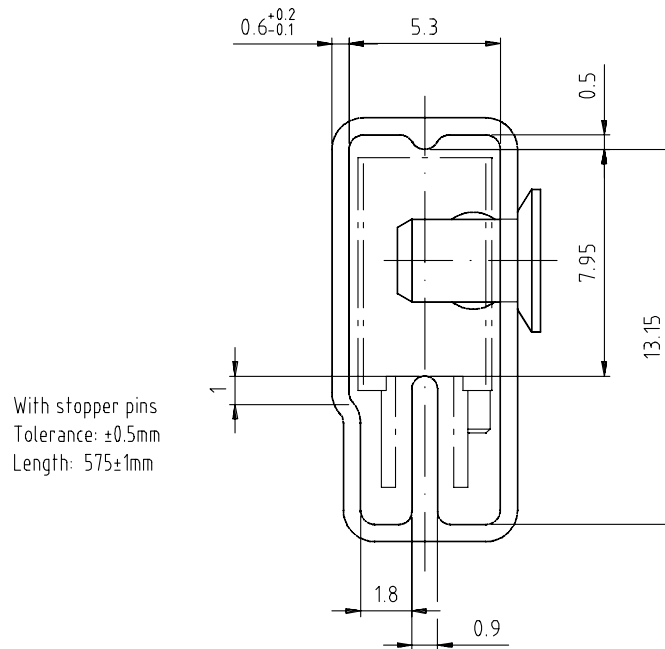


With rubber stopper
Tolerance: ±0.5mm
Length: 575±1mm

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

15199

Fig. 4

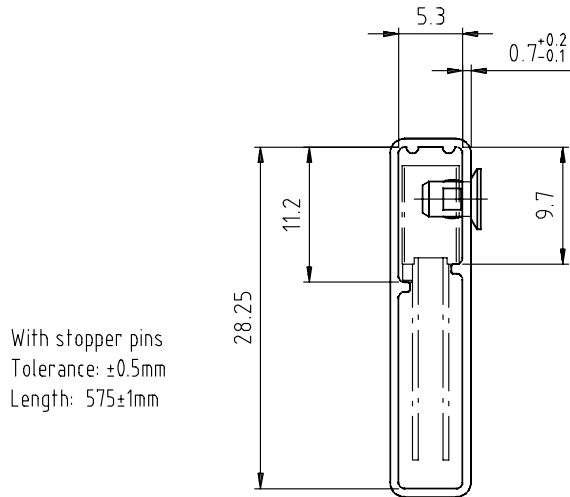


With stopper pins
Tolerance: ±0.5mm
Length: 575±1mm

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

15202

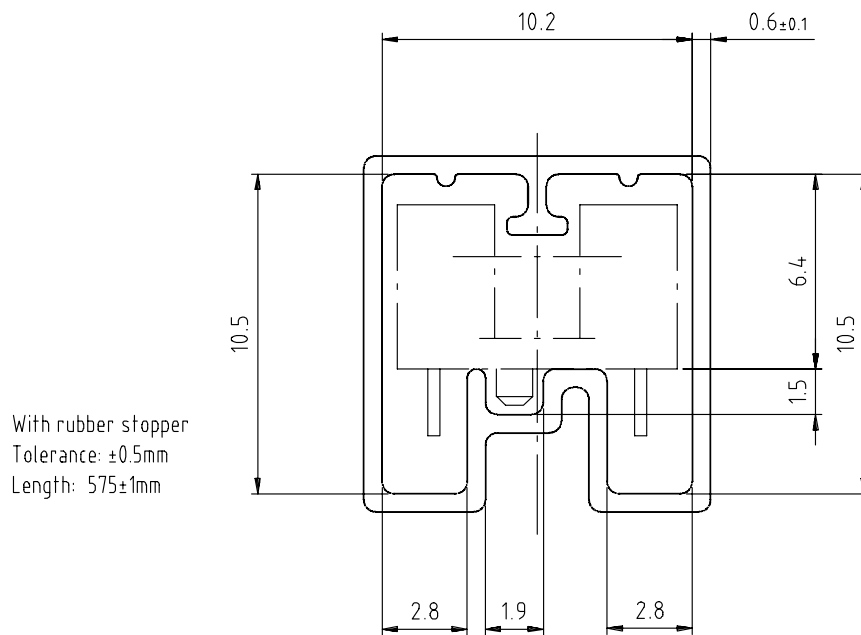
Fig. 5



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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