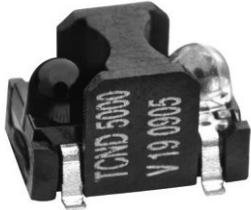
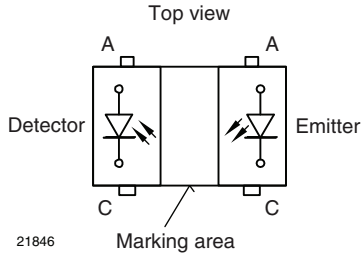


## Reflective Optical Sensor with PIN Photodiode Output



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 <sub>rel</sub> <sup>(1)</sup> (mm) | DISTANCE RANGE FOR RELATIVE I <sub>out</sub> > 20 % (mm) | TYPICAL OUTPUT CURRENT UNDER TEST <sup>(2)</sup> (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 <sup>(1)</sup>        | REMARKS |
|---------------|---------------|------------------------------|---------|
| TCND5000      | Tape and reel | MOQ: 2000 pcs, 2000 pcs/reel | Drypack |

#### Note

- (1) MOQ: minimum order quantity

### 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>  | 5     | V    |
| Forward current        |  | I <sub>F</sub>  | 100   | mA   |
| Peak forward current   | t <sub>p</sub> = 50 μs, t = 2 ms, T <sub>amb</sub> ≤ 25 °C | I <sub>FM</sub> | 500   | mA   |
| Power dissipation      |  | P <sub>V</sub>  | 190   | mW   |
| Junction temperature   |  | T <sub>J</sub>  | 100   | °C   |

| <b>ABSOLUTE MAXIMUM RATINGS</b> ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified) |                |           |               |                    |
|--|----------------|-----------|---------------|--------------------|
| PARAMETER  | TEST CONDITION | SYMBOL    | VALUE         | UNIT               |
| <b>OUTPUT (DETECTOR)</b>   |                |           |               |                    |
| Reverse voltage  |                | $V_R$     | 60            | V                  |
| Power dissipation  |                | $P_V$     | 75            | mW                 |
| Junction temperature   |                | $T_j$     | 100           | $^{\circ}\text{C}$ |
| <b>SENSOR</b>  |                |           |               |                    |
| 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

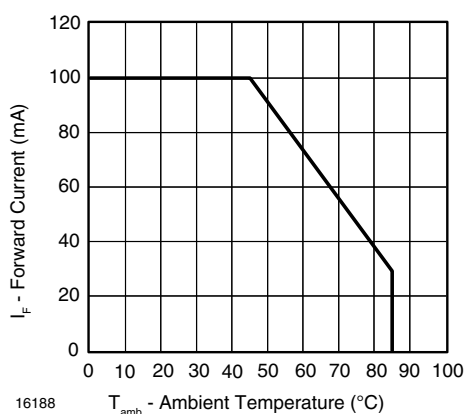


Fig. 1 - Forward Current Limit vs. Ambient Temperature

| <b>BASIC CHARACTERISTICS</b> ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified) |   |                  |      |          |      |               |
|---|---|------------------|------|----------|------|---------------|
| PARAMETER   | TEST CONDITION  | SYMBOL           | MIN. | TYP.     | MAX. | UNIT          |
| <b>INPUT (EMITTER) <sup>(1)</sup></b>   |   |                  |      |          |      |               |
| 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   | $\mu\text{A}$ |
| 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   |   | $\phi$           |      | $\pm 12$ |      | deg           |
| Peak wavelength   | $I_F = 100\text{ mA}$                                       | $\lambda_p$      | 930  | 940      |      | nm            |
| Spectral bandwidth  | $I_F = 100\text{ mA}$                                       | $\Delta\lambda$  |      | 50       |      | nm            |
| Temperature coefficient of $\lambda_p$  | $I_F = 100\text{ mA}$                                       | $TK_{\lambda_p}$ |      | 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            |

| <b>BASIC CHARACTERISTICS</b> ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified) |   |                 |      |             |      |               |
|---|---|-----------------|------|-------------|------|---------------|
| PARAMETER   | TEST CONDITION  | SYMBOL          | MIN. | TYP.        | MAX. | UNIT          |
| <b>OUTPUT (DETECTOR) <sup>(2)</sup></b>   |   |                 |      |             |      |               |
| 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   | $E_o = 1\text{ mW/cm}^2$ ,<br>$\lambda = 950\text{ nm}$ , $V_R = 5\text{ V}$                        | $I_{ra}$        |      | 12          |      | $\mu\text{A}$ |
| Temperature coefficient of $I_{ra}$   | $\lambda = 870\text{ nm}$ , $V_R = 5\text{ V}$  | $TK_{Ira}$      |      | 0.2         |      | %/K           |
| Angle of half intensity   |   | $\phi$          |      | $\pm 15$    |      | deg           |
| Wavelength of peak sensitivity  |   | $\lambda_P$     |      | 930         |      | nm            |
| Range of spectral bandwidth   |   | $\lambda_{0.5}$ |      | 840 to 1050 |      | nm            |
| <b>SENSOR</b>   |   |                 |      |             |      |               |
| Reverse Light Current   | $V_R = 2.5\text{ V}$ , $I_F = 20\text{ mA}$ , $D = 30\text{ mm}$ ,<br>reflective mode: see figure 2 | $I_{ra}$        | 110  |             |      | nA            |

**Note**

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

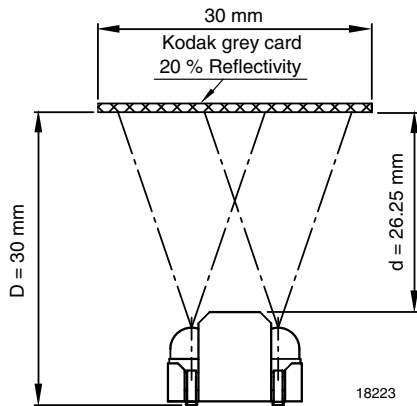


Fig. 2 - Test Circuit

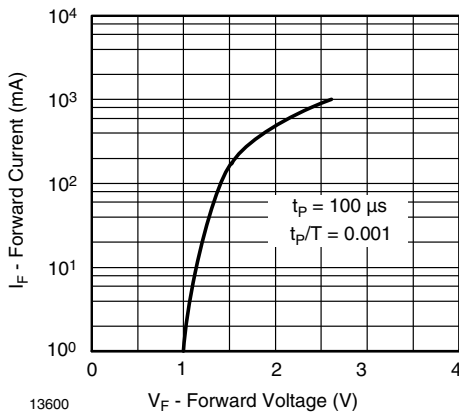
**BASIC CHARACTERISTICS** ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)


Fig. 3 - Forward Current vs. Forward Voltage

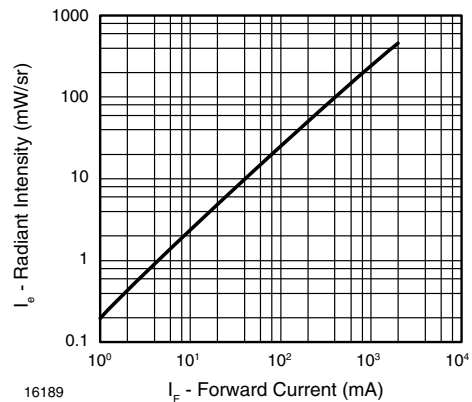


Fig. 4 - Radiant Intensity vs. Forward Current

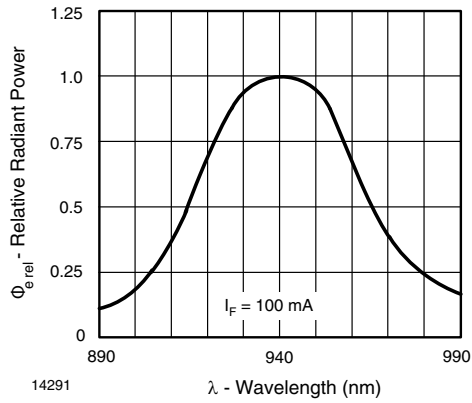


Fig. 5 - Relative Radiant Power vs. Wavelength

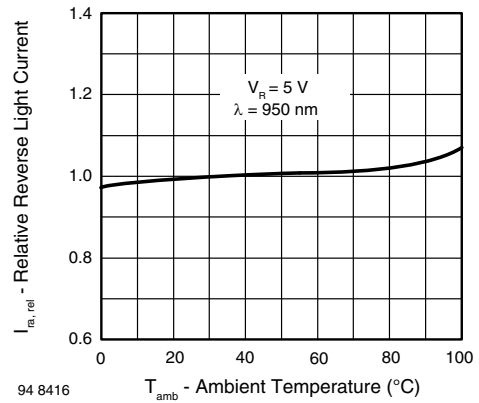


Fig. 8 - Relative Reverse Light Current vs. Ambient Temperature

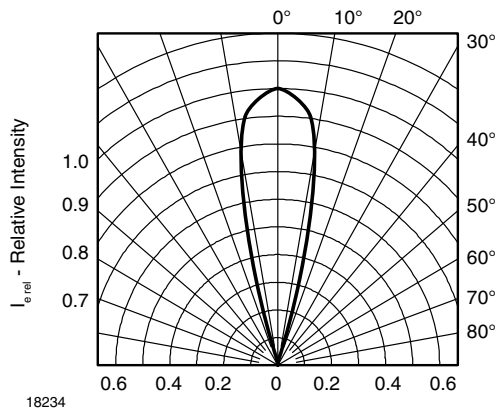


Fig. 6 - Relative Radiant Intensity vs. Angular Displacement

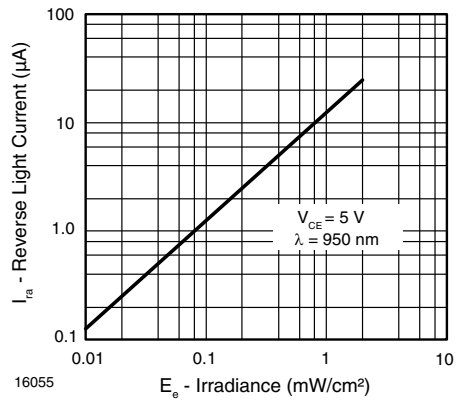


Fig. 9 - Reverse Light Current vs. Irradiance

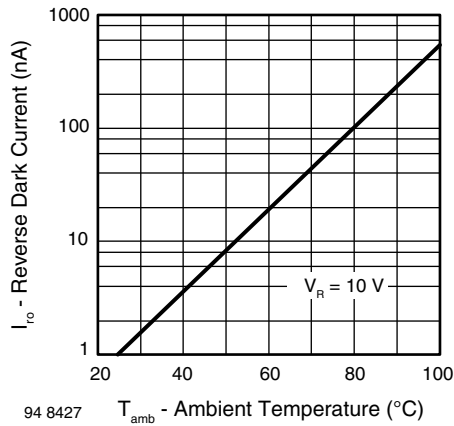


Fig. 7 - Reverse Dark Current vs. Ambient Temperature

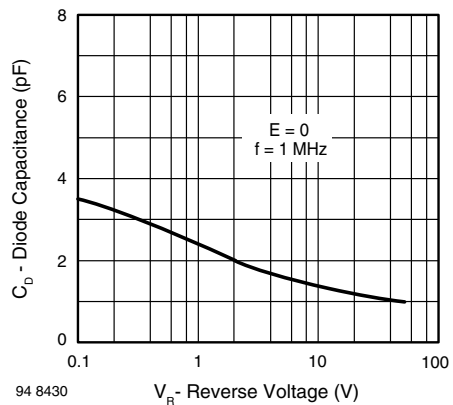


Fig. 10 - Diode Capacitance vs. Reverse Voltage

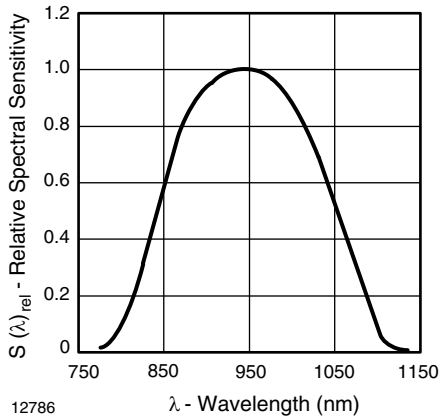


Fig. 11 - Relative Spectral Sensitivity vs. Wavelength

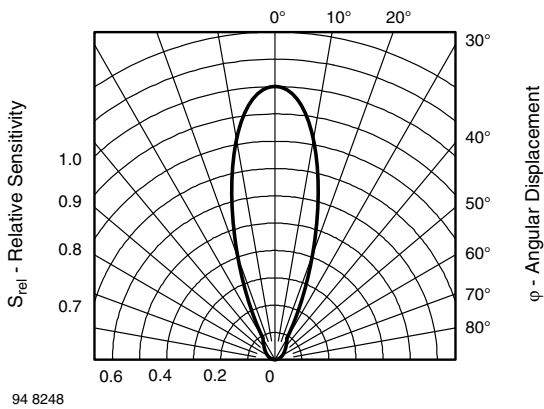


Fig. 12 - Relative Radiant Sensitivity vs. Angular Displacement

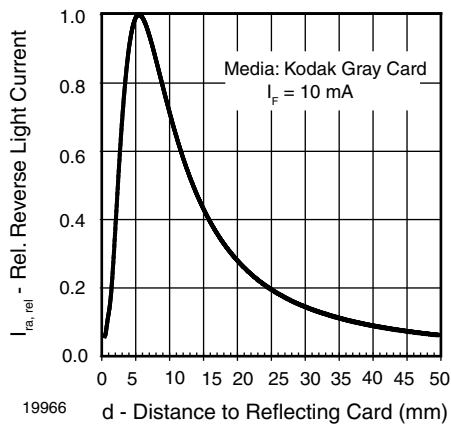


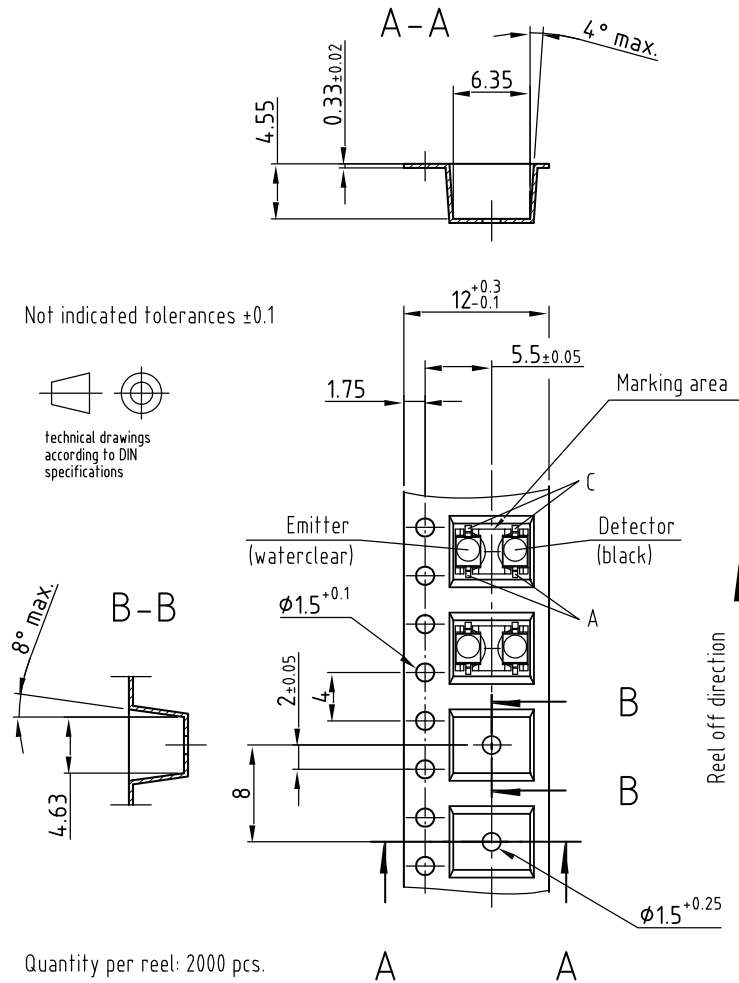
Fig. 13 - Relative Reverse Light Current vs. Distance

# TCND5000

Vishay Semiconductors Reflective Optical Sensor with PIN  
Photodiode Output



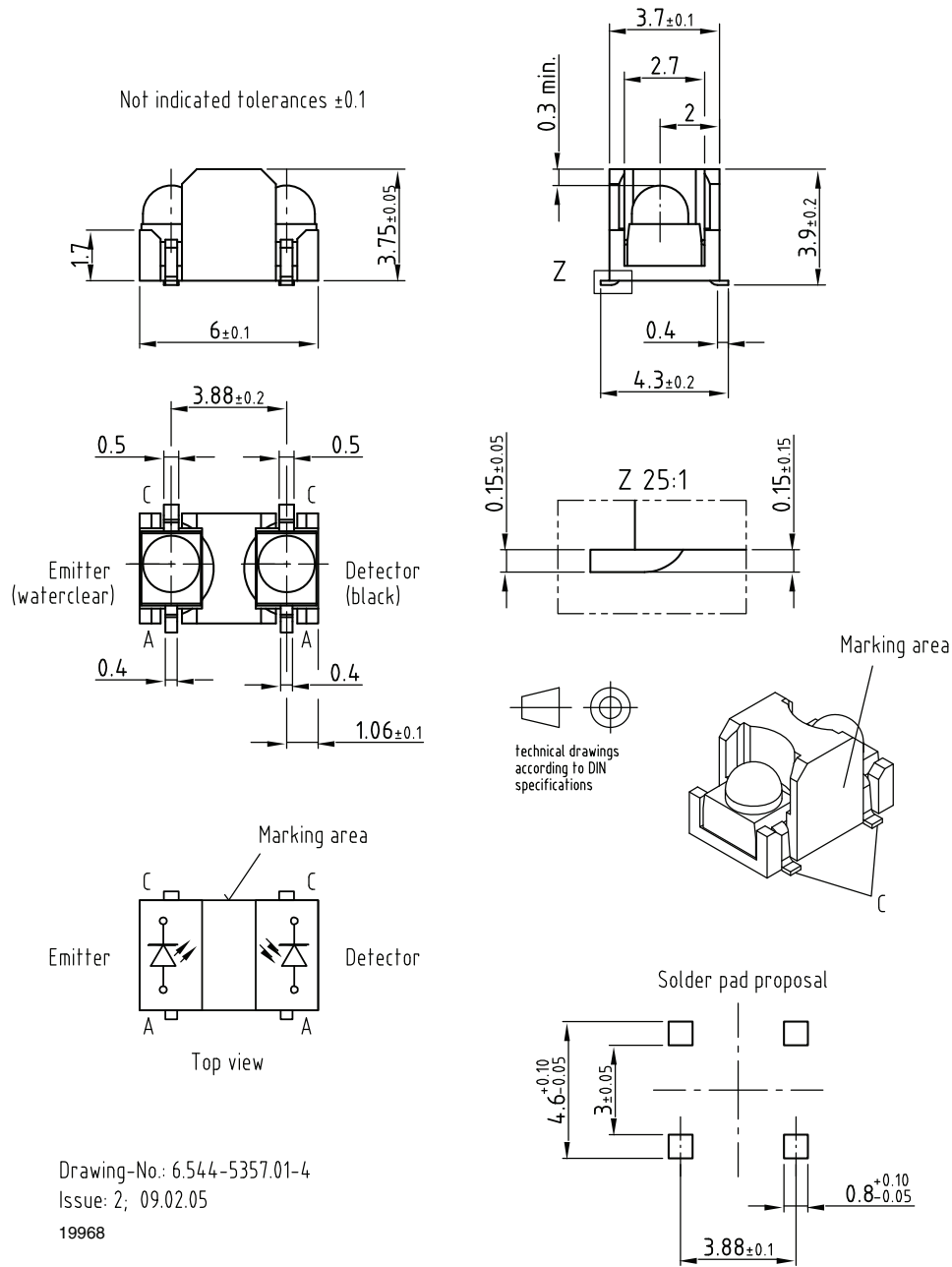
## TAPING Dimensions in millimeters



Material of Blister tape: PC black  
Sealing of cavities with hot sealing cover tape,  
C-Pak Type CP - 2010 AS ( Thickness: 0.055 - 0.075mm; Base Material: Polyester )

Drawing-No.: 9.700-5281.01-4  
Issue: 4; 10.02.05  
18222

**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**

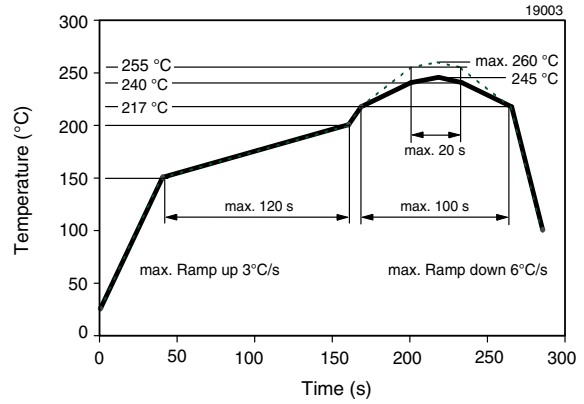


Fig. 14 - Lead (Pb)-Free Reflow Solder Profile

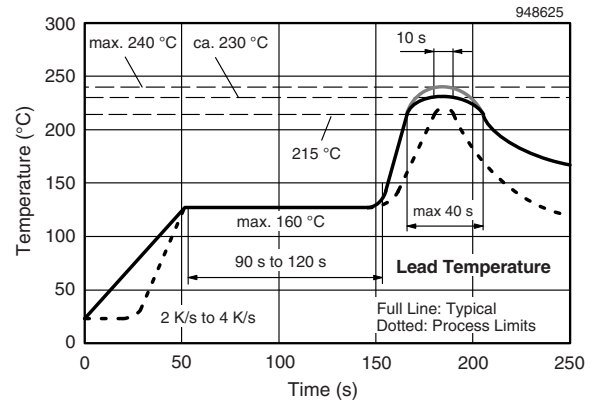


Fig. 15 - Lead Tin (SnPb) Reflow Solder Profile



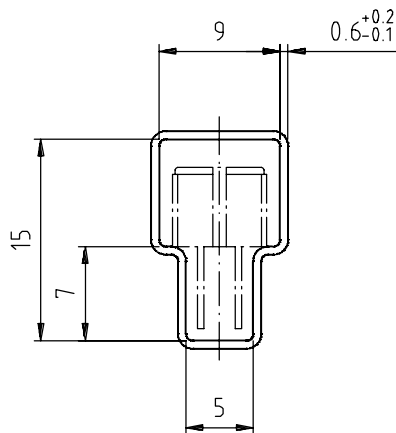
## Packaging and Ordering Information

| PART NUMBER   | MOQ <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

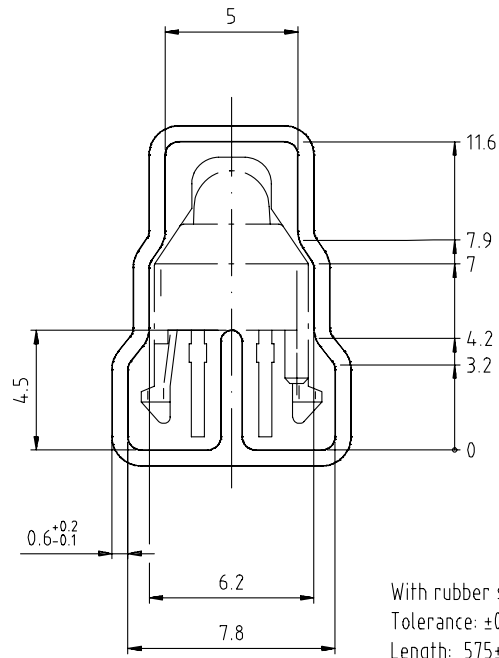
Drawing-No.: 9.700-5097.01-4  
 Issue: 1; 25.02.00

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:  $\pm 0.5\text{mm}$   
Length:  $575 \pm 1\text{mm}$

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

15201

Fig. 3

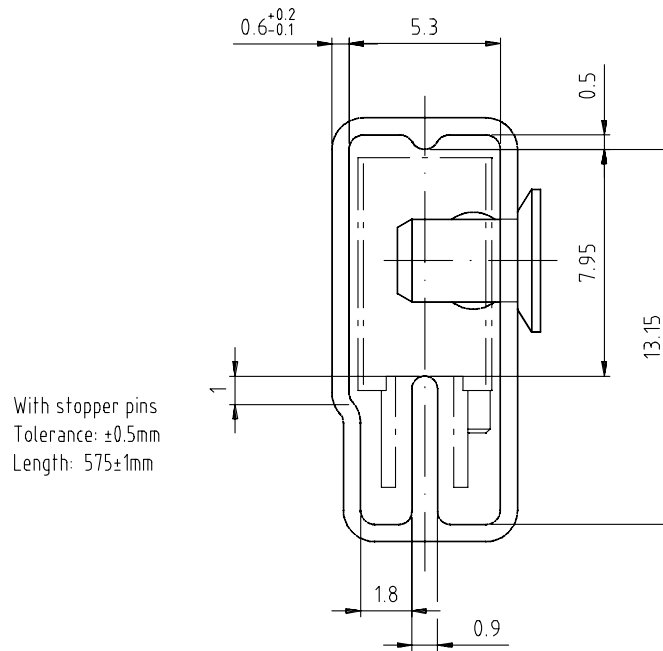


With rubber stopper  
Tolerance: ±0.5mm  
Length: 575±1mm

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

15199

Fig. 4

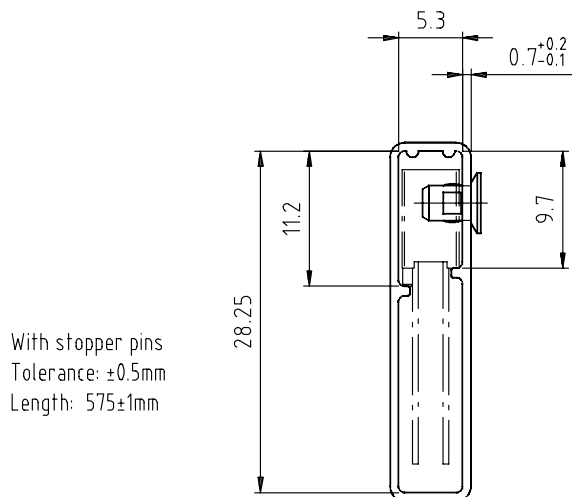


With stopper pins  
Tolerance: ±0.5mm  
Length: 575±1mm

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

15202

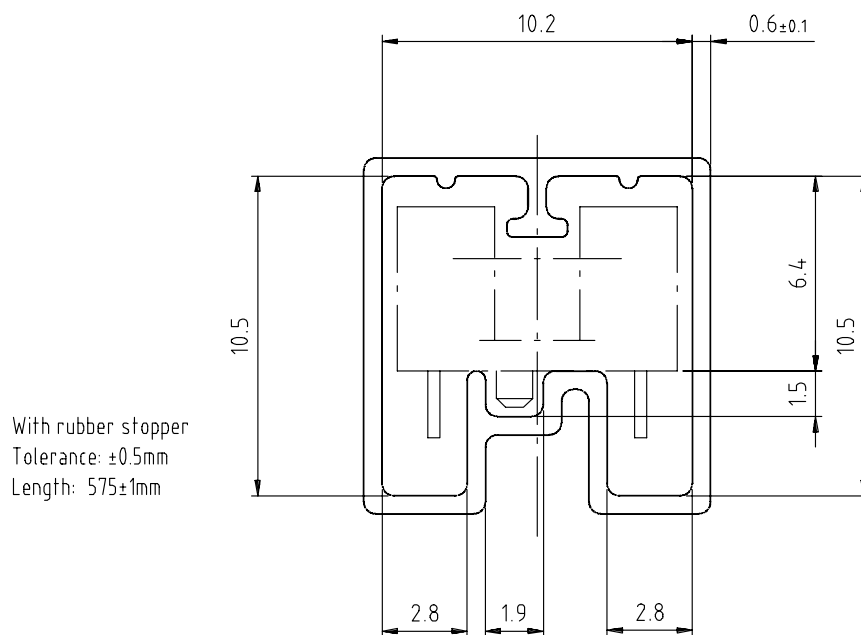
Fig. 5



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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**Please note that some Vishay documentation may still make reference to RoHS Directive 2002/95/EC. We confirm that all the products identified as being compliant to Directive 2002/95/EC conform to Directive 2011/65/EU.**

**Vishay Intertechnology, Inc. hereby certifies that all its products that are identified as Halogen-Free follow Halogen-Free requirements as per JEDEC JS709A standards. Please note that some Vishay documentation may still make reference to the IEC 61249-2-21 definition. We confirm that all the products identified as being compliant to IEC 61249-2-21 conform to JEDEC JS709A standards.**

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Наши преимущества:

- Поставка оригинальных импортных электронных компонентов напрямую с производств Америки, Европы и Азии, а так же с крупнейших складов мира;
- Широкая линейка поставок активных и пассивных импортных электронных компонентов (более 30 млн. наименований);
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- Оперативные сроки поставки под заказ (от 5 рабочих дней);
- Экспресс доставка в любую точку России;
- Помощь Конструкторского Отдела и консультации квалифицированных инженеров;
- Техническая поддержка проекта, помощь в подборе аналогов, поставка прототипов;
- Поставка электронных компонентов под контролем ВП;
- Система менеджмента качества сертифицирована по Международному стандарту ISO 9001;
- При необходимости вся продукция военного и аэрокосмического назначения проходит испытания и сертификацию в лаборатории (по согласованию с заказчиком);
- Поставка специализированных компонентов военного и аэрокосмического уровня качества (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Actel, Aeroflex, Peregrine, VPT, Syfer, Eurofarad, Texas Instruments, MS Kennedy, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits, General Dynamics и др.);

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«JONHON» (основан в 1970 г.)

Разъемы специального, военного и аэрокосмического назначения:

(Применяются в военной, авиационной, аэрокосмической, морской, железнодорожной, горно- и нефтедобывающей отраслях промышленности)

«FORSTAR» (основан в 1998 г.)

ВЧ соединители, коаксиальные кабели,  
кабельные сборки и микроволновые компоненты:

(Применяются в телекоммуникациях гражданского и специального назначения, в средствах связи, РЛС, а так же военной, авиационной и аэрокосмической отраслях промышленности).



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