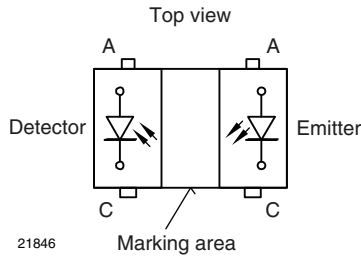


Reflective Optical Sensor with PIN Photodiode Output



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: $I_{ra} > 0.11 \mu\text{A}$
- Daylight blocking filter
- High linearity
- Emitter wavelength: 940 nm
- Lead (Pb)-free soldering released
- Moisture sensitivity level (MSL): 4
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912


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 $I_{\text{out}} > 20\%$ (mm)	TYPICAL OUTPUT CURRENT UNDER TEST ⁽²⁾ (mA)	DAYLIGHT BLOCKING FILTER INTEGRATED
TCND5000	6	2 to 25	0.0015	Yes

Notes

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

ORDERING INFORMATION			
ORDERING CODE	PACKAGING	VOLUME	REMARKS
TCND5000	Tape and reel	MOQ: 2000 pcs, 2000 pcs/reel	Drypack

Note

- MOQ: minimum order quantity

ABSOLUTE MAXIMUM RATINGS ($T_{\text{amb}} = 25\text{ }^{\circ}\text{C}$, 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	$t_p = 50 \mu\text{s}$, $t = 2 \text{ms}$, $T_{\text{amb}} \leq 25\text{ }^{\circ}\text{C}$	I_{FM}	500	mA
Power dissipation		P_V	190	mW
Junction temperature		T_j	100	$^{\circ}\text{C}$



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	$^{\circ}\text{C}$

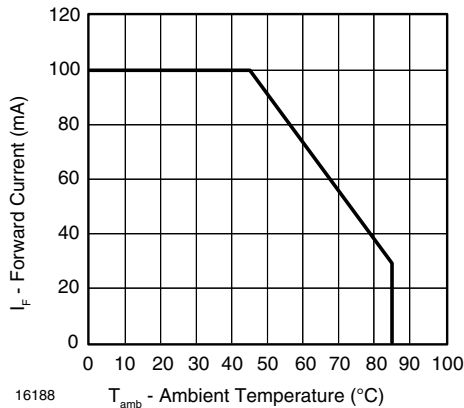


Fig. 1 - Forward Current Limit vs. Ambient Temperature

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		40		pF
Radiant intensity	$I_F = 20\text{ mA}$, $t_p = 20\text{ ms}$	I_e		11	15	mW/sr
Angle of half intensity		ϕ		± 12		deg
Peak wavelength	$I_F = 100\text{ mA}$	λ_p	930	940		nm
Spectral bandwidth	$I_F = 100\text{ mA}$	$\Delta\lambda$		30		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		15		ns
Fall time	$I_F = 100\text{ mA}$	t_f		15		ns

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	$E_e = 1\text{ mW/cm}^2$, $\lambda = 950\text{ nm}$, $V_R = 5\text{ V}$	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	260		nA

Notes

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

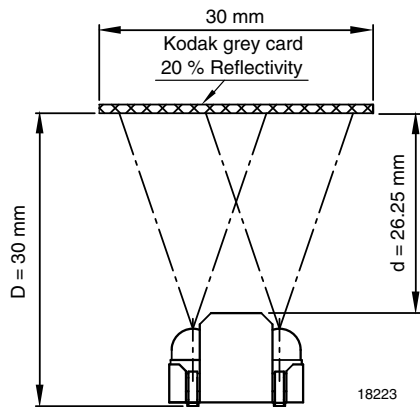


Fig. 2 - Test Circuit

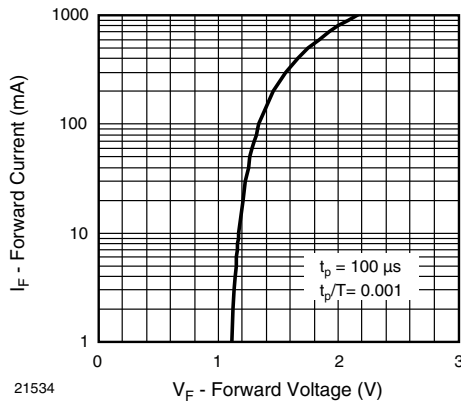
BASIC CHARACTERISTICS ($T_{amb} = 25\text{ }^{\circ}\text{C}$, unless otherwise specified)


Fig. 3 - Forward Current vs. Forward Voltage

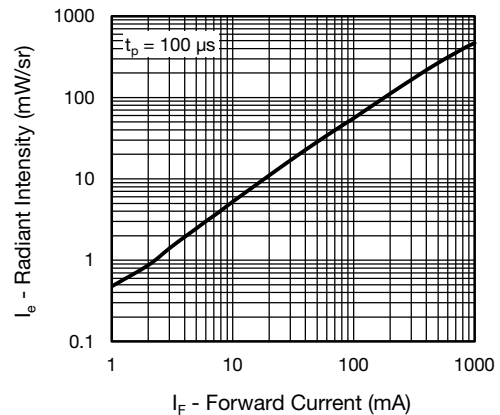


Fig. 4 - Radiant Intensity vs. Forward Current

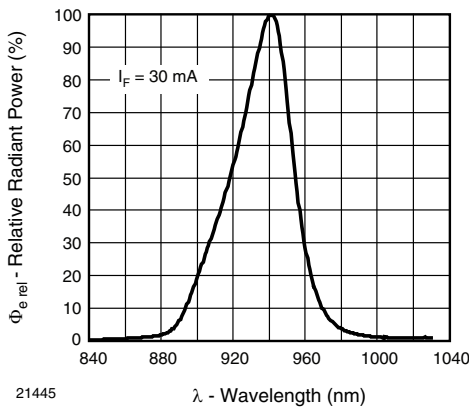


Fig. 5 - Relative Radiant Power vs. Wavelength

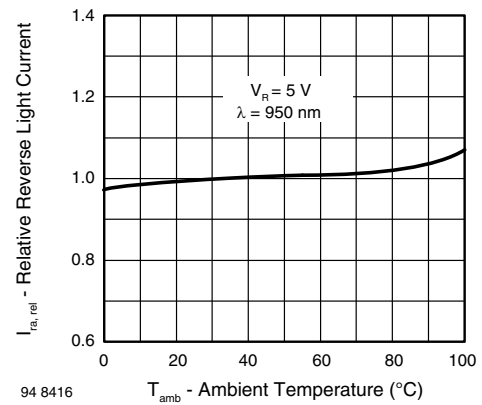


Fig. 8 - Relative Reverse Light Current vs. Ambient Temperature

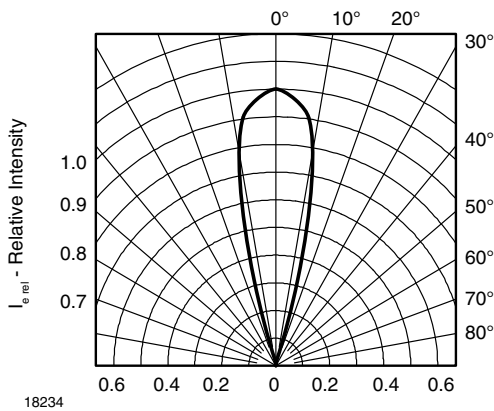


Fig. 6 - Relative Radiant Intensity vs. Angular Displacement

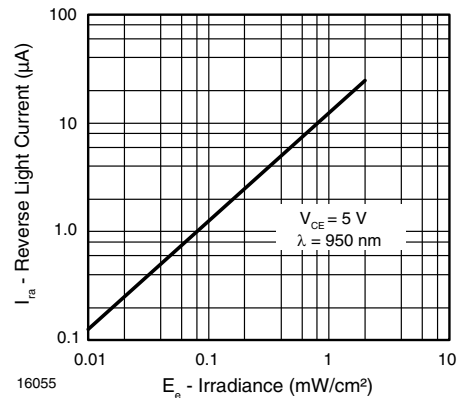


Fig. 9 - Reverse Light Current vs. Irradiance

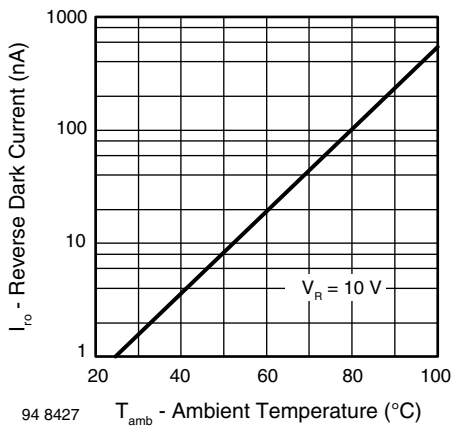


Fig. 7 - Reverse Dark Current vs. Ambient Temperature

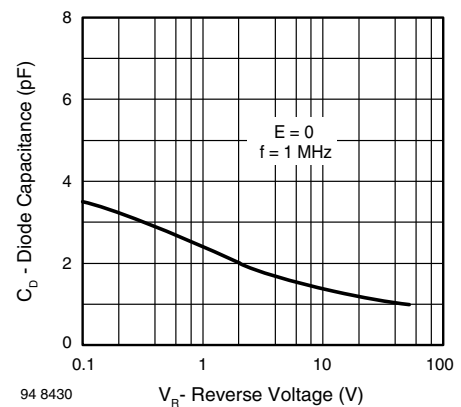


Fig. 10 - Diode Capacitance vs. Reverse Voltage

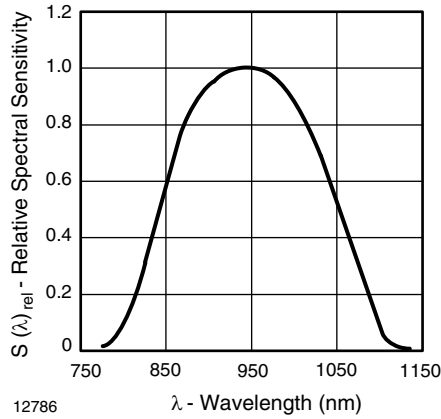


Fig. 11 - Relative Spectral Sensitivity vs. Wavelength

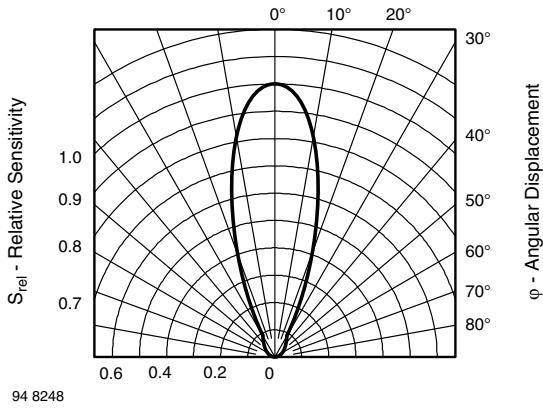


Fig. 12 - Relative Radiant Sensitivity vs. Angular Displacement

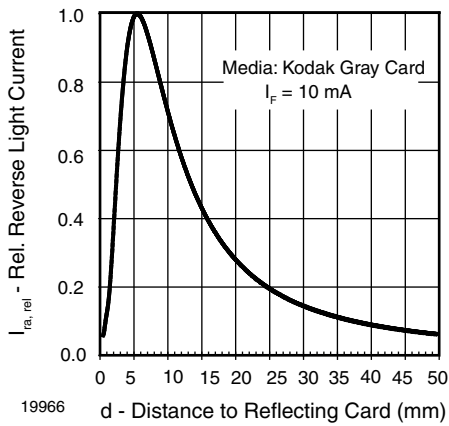
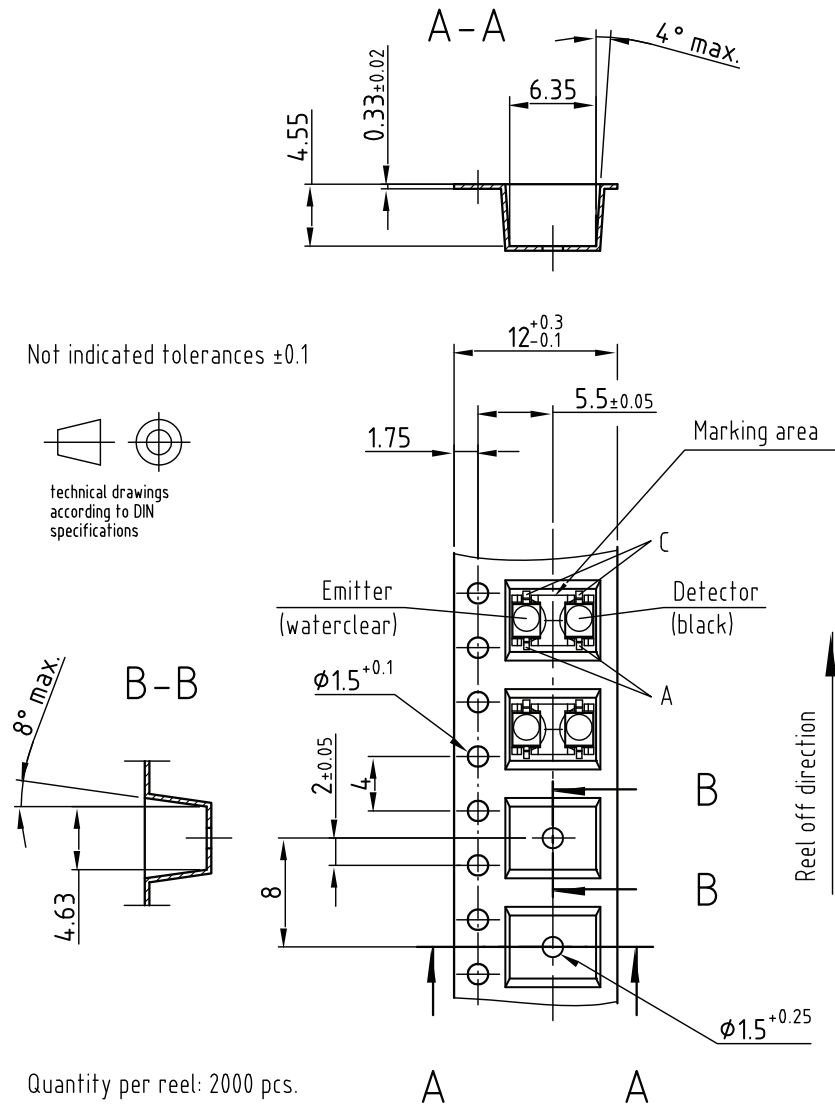


Fig. 13 - Relative Reverse Light Current vs. Distance



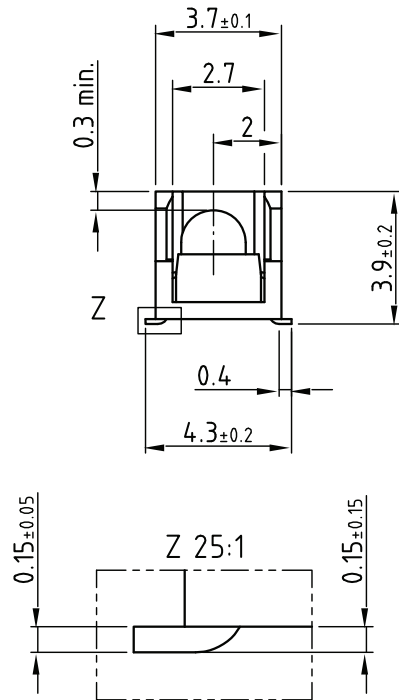
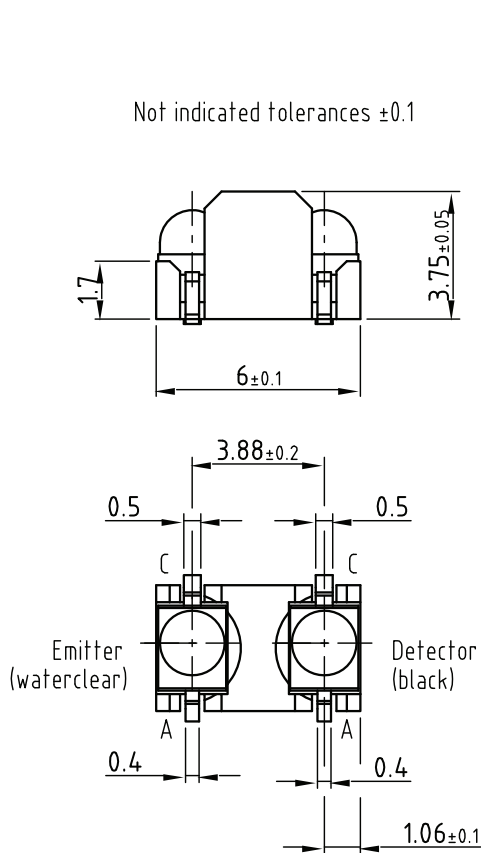
TAPING DIMENSIONS in millimeters



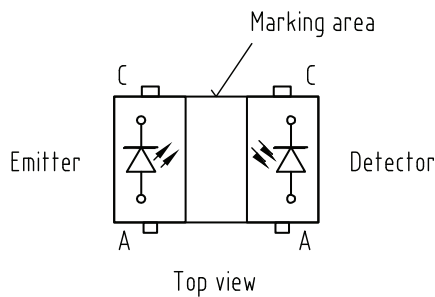
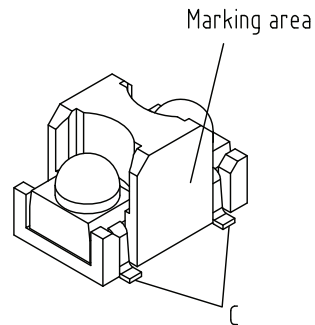


PACKAGE DIMENSIONS in millimeters

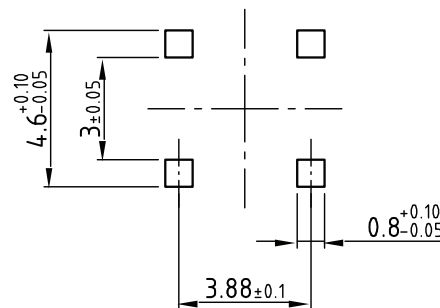
Not indicated tolerances ±0.1



technical drawings according to DIN specifications



Solder pad proposal



Drawing-No.: 6.544-5357.01-4
Issue: 2; 09.02.05
19968

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

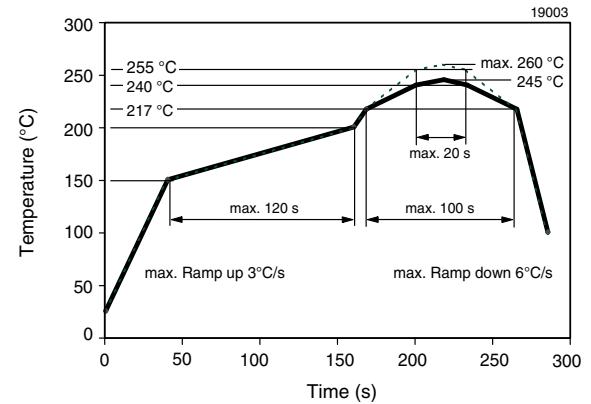


Fig. 14 - Lead (Pb)-Free Reflow Solder Profile

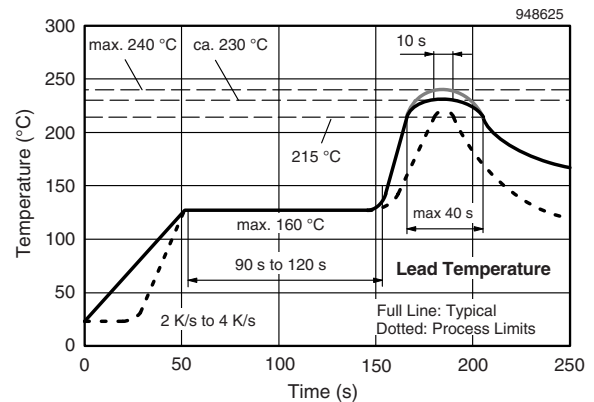


Fig. 15 - Lead Tin (SnPb) Reflow Solder Profile

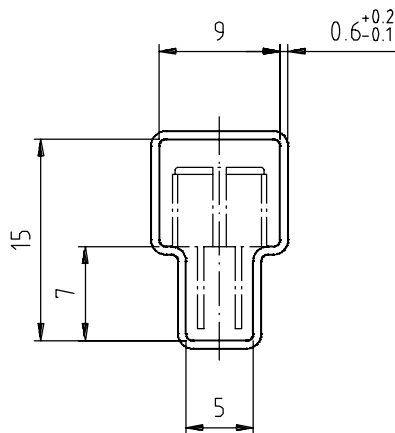
Packaging and Ordering Information

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: ±0.5mm

Length: 575±1mm

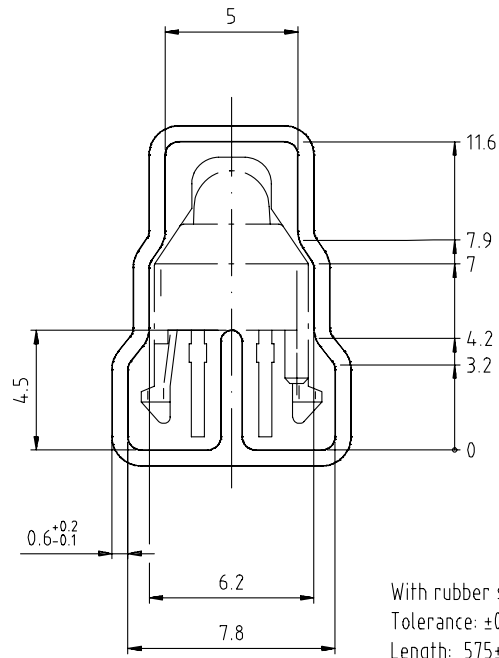
Drawing-No.: 9.700-5097.01-4
 Issue: 1; 25.02.00

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

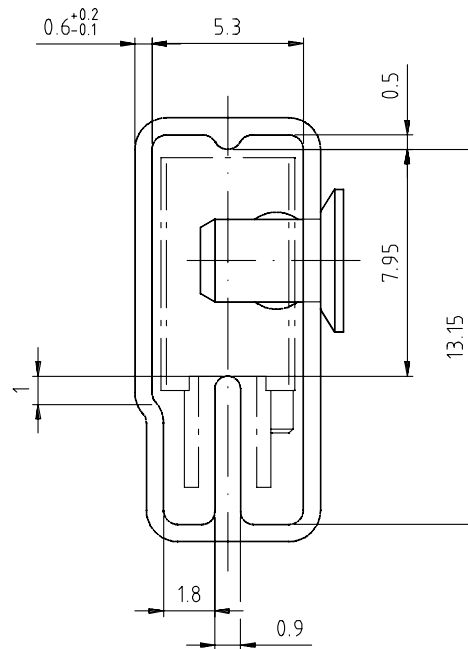


With rubber stopper
Tolerance: $\pm 0.5\text{mm}$
Length: $575 \pm 1\text{mm}$

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

15199

Fig. 4

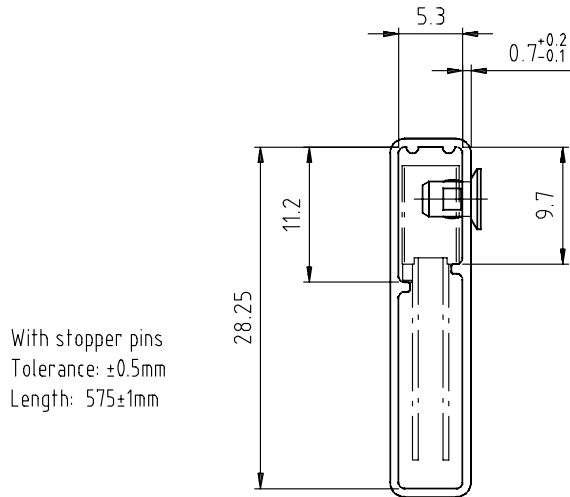


With stopper pins
Tolerance: $\pm 0.5\text{mm}$
Length: $575 \pm 1\text{mm}$

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

15202

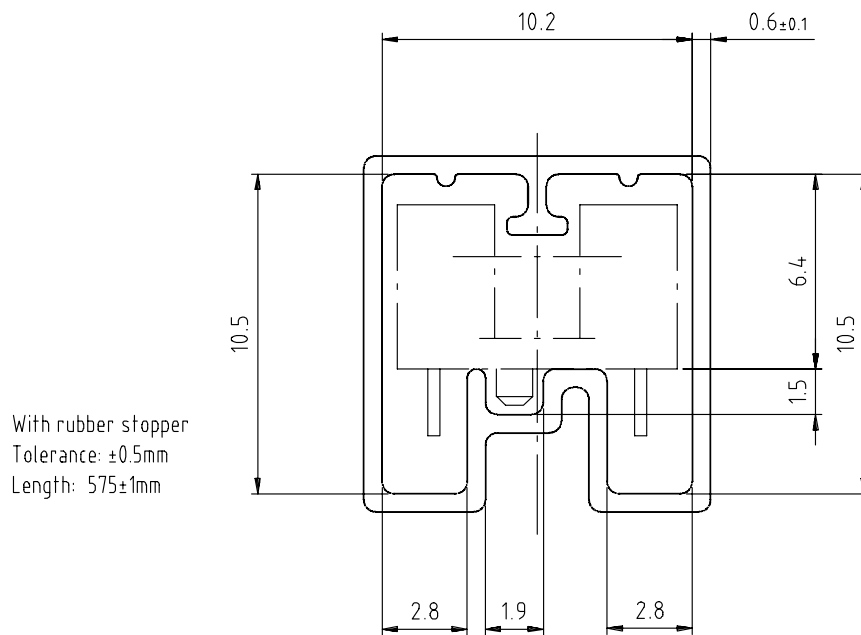
Fig. 5



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: ± 0.5 mm
 Length: 450 ± 1 mm
 All dimensions in mm

Fig. 8



Disclaimer

ALL PRODUCT, PRODUCT SPECIFICATIONS AND DATA ARE SUBJECT TO CHANGE WITHOUT NOTICE TO IMPROVE RELIABILITY, FUNCTION OR DESIGN OR OTHERWISE.

Vishay Intertechnology, Inc., its affiliates, agents, and employees, and all persons acting on its or their behalf (collectively, "Vishay"), disclaim any and all liability for any errors, inaccuracies or incompleteness contained in any datasheet or in any other disclosure relating to any product.

Vishay makes no warranty, representation or guarantee regarding the suitability of the products for any particular purpose or the continuing production of any product. To the maximum extent permitted by applicable law, Vishay disclaims (i) any and all liability arising out of the application or use of any product, (ii) any and all liability, including without limitation special, consequential or incidental damages, and (iii) any and all implied warranties, including warranties of fitness for particular purpose, non-infringement and merchantability.

Statements regarding the suitability of products for certain types of applications are based on Vishay's knowledge of typical requirements that are often placed on Vishay products in generic applications. Such statements are not binding statements about the suitability of products for a particular application. It is the customer's responsibility to validate that a particular product with the properties described in the product specification is suitable for use in a particular application. Parameters provided in datasheets and / or specifications may vary in different applications and performance may vary over time. All operating parameters, including typical parameters, must be validated for each customer application by the customer's technical experts. Product specifications do not expand or otherwise modify Vishay's terms and conditions of purchase, including but not limited to the warranty expressed therein.

Except as expressly indicated in writing, Vishay products are not designed for use in medical, life-saving, or life-sustaining applications or for any other application in which the failure of the Vishay product could result in personal injury or death. Customers using or selling Vishay products not expressly indicated for use in such applications do so at their own risk. Please contact authorized Vishay personnel to obtain written terms and conditions regarding products designed for such applications.

No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted by this document or by any conduct of Vishay. Product names and markings noted herein may be trademarks of their respective owners.