

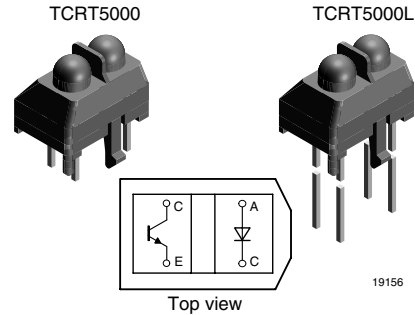
## Reflective Optical Sensor with Transistor Output

### Description

The TCRT5000 and TCRT500L are reflective sensors which include an infrared emitter and phototransistor in a leaded package which blocks visible light. The package includes two mounting clips. TCRT5000L is the long lead version.

### Features

- Package type: Leaded
- Detector type: Phototransistor
- Dimensions:  
L 10.2 mm x W 5.8 mm x H 7.0 mm
- Peak operating distance: 2.5 mm
- Operating range: 0.2 mm to 15 mm
- Typical output current under test:  $I_C = 1 \text{ mA}$
- Daylight blocking filter
- Emitter wavelength 950 nm
- Lead (Pb)-free soldering released
- Lead (Pb)-free component in accordance to RoHS 2002/95/EC and WEEE 2002/96/EC



### Applications

- Position sensor for shaft encoder
- Detection of reflective material such as paper, IBM cards, magnetic tapes etc.
- Limit switch for mechanical motions in VCR
- General purpose - wherever the space is limited

### Order Instructions

Part Number	Remarks	Minimum Order Quantity
TCRT5000	3.5 mm lead length	4500 pcs, 50 pcs/tube
TCRT5000L	15 mm lead length	2400 pcs, 48 pcs/tube

### Absolute Maximum Ratings

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

### Input (Emitter)

Parameter	Test condition	Symbol	Value	Unit
Reverse voltage		$V_R$	5	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)

Parameter	Test condition	Symbol	Value	Unit
Collector emitter voltage		$V_{CEO}$	70	V
Emitter collector voltage		$V_{ECO}$	5	V
Collector current		$I_C$	100	mA
Power dissipation	$T_{amb} \leq 55^\circ\text{C}$	$P_V$	100	mW
Junction temperature		$T_j$	100	$^\circ\text{C}$

## Sensor

Parameter	Test condition	Symbol	Value	Unit
Total power dissipation	$T_{amb} \leq 25^\circ\text{C}$	$P_{tot}$	200	mW
Operation temperature range		$T_{amb}$	- 25 to + 85	$^\circ\text{C}$
Storage temperature range		$T_{stg}$	- 25 to + 100	$^\circ\text{C}$
Soldering temperature	2 mm from case, $t \leq 10$ s	$T_{sd}$	260	$^\circ\text{C}$

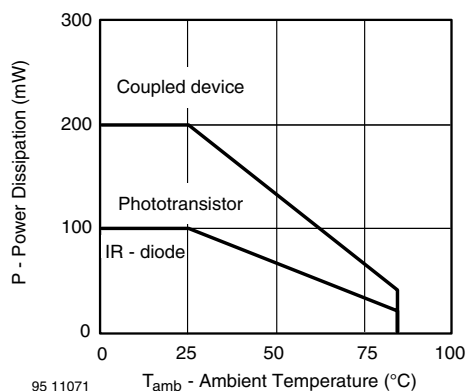


Figure 1. Power Dissipation Limit vs. Ambient Temperature

## Electrical Characteristics

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

### Input (Emitter)

Parameter	Test condition	Symbol	Min	Typ.	Max	Unit
Forward voltage	$I_F = 60$ mA	$V_F$		1.25	1.5	V
Junction capacitance	$V_R = 0$ V, $f = 1$ MHz	$C_j$		17		pF
Radiant intensity	$I_F = 60$ mA, $t_p = 20$ ms	$I_E$			21	mW/sr
Peak wavelength	$I_F = 100$ mA	$\lambda_p$	940			nm
Virtual source diameter	Method: 63 % encircled energy	$\emptyset$		2.1		mm

### Output (Detector)

Parameter	Test condition	Symbol	Min	Typ.	Max	Unit
Collector emitter voltage	$I_C = 1$ mA	$V_{CEO}$	70			V
Emitter collector voltage	$I_E = 100$ $\mu\text{A}$	$V_{ECO}$	7			V
Collector dark current	$V_{CE} = 20$ V, $I_F = 0$ , $E = 0$	$I_{CEO}$		10	200	nA

## Sensor

Parameter	Test condition	Symbol	Min	Typ.	Max	Unit
Collector current	$V_{CE} = 5\text{ V}$ , $I_F = 10\text{ mA}$ , $D = 12\text{ mm}$	$I_C$ <sup>1,2)</sup>	0.5	1	2.1	mA
Collector emitter saturation voltage	$I_F = 10\text{ mA}$ , $I_C = 0.1\text{ mA}$ , $D = 12\text{ mm}$	$V_{CEsat}$ <sup>1,2)</sup>			0.4	V

1) See figure 3

2) Test surface: Mirror (Mfr. Spindler a. Hoyer, Part No 340005)

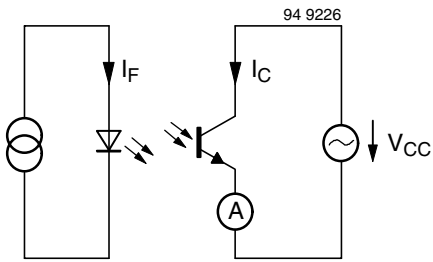


Figure 2. Test Circuit

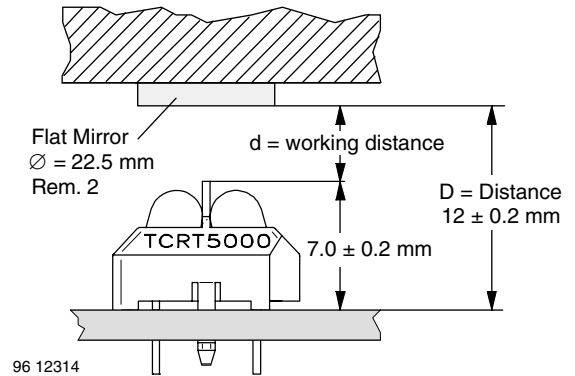


Figure 3. Test Circuit

## Typical Characteristics

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

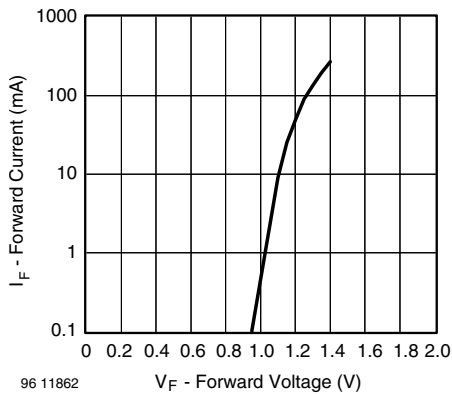


Figure 4. Forward Current vs. Forward Voltage

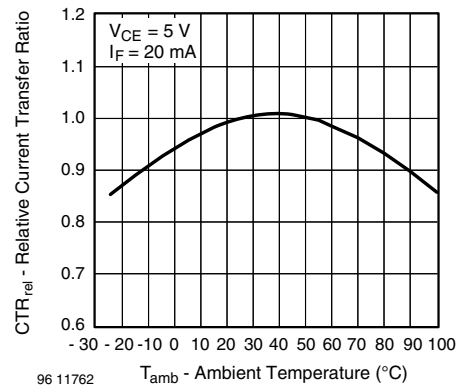


Figure 5. Relative Current Transfer Ratio vs. Ambient Temperature

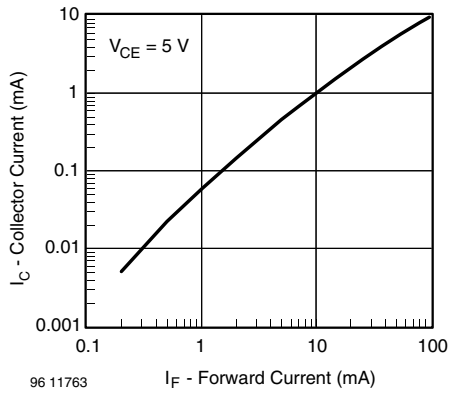


Figure 6. Collector Current vs. Forward Current

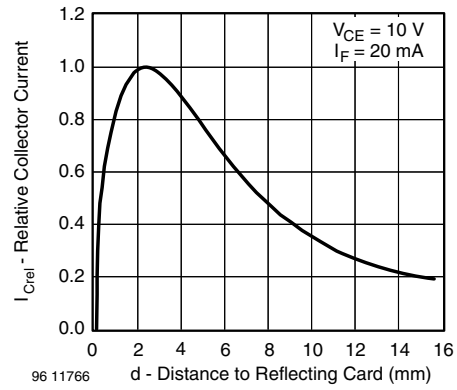


Figure 9. Relative Collector Current vs. Distance

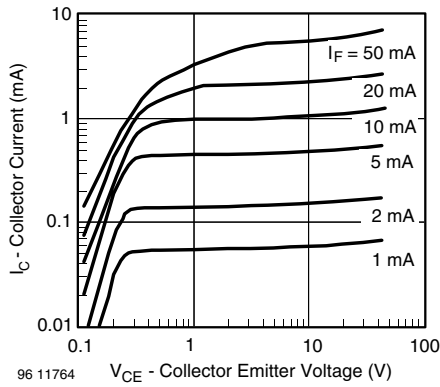


Figure 7. Collector Emitter Saturation Voltage vs. Collector Current

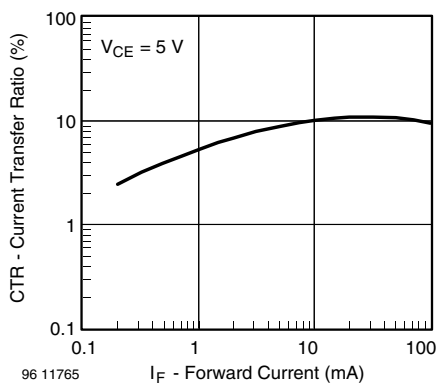
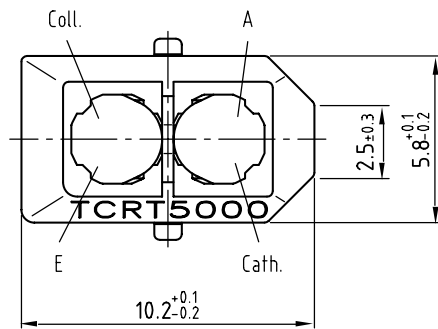
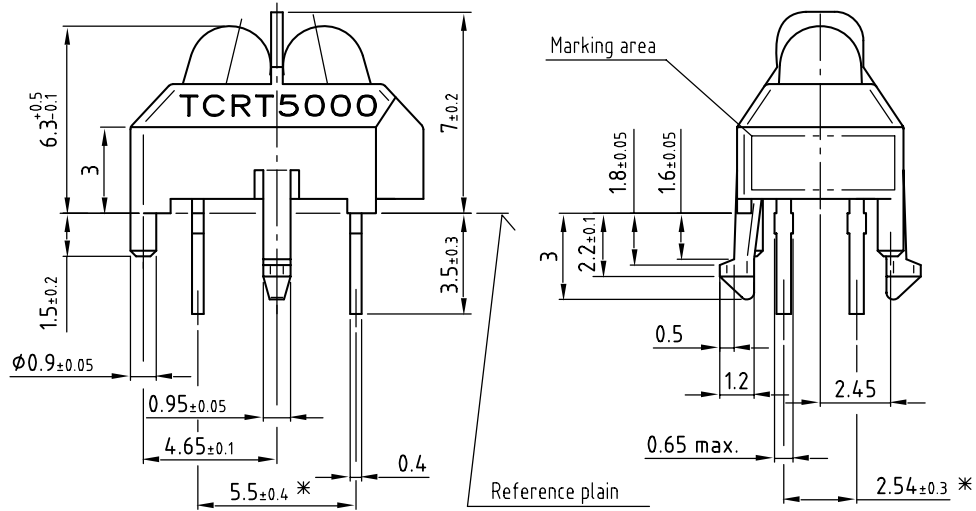


Figure 8. Current Transfer Ratio vs. Forward Current

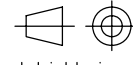
## Package Dimensions in mm



\* Tolerances related to reference plain

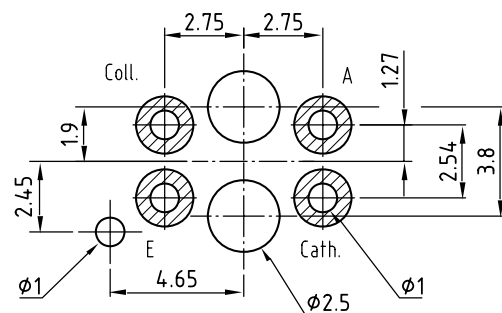
weight: ca. 0.23g

All dimensions in mm



technical drawings according to DIN specifications

### Footprint Top View



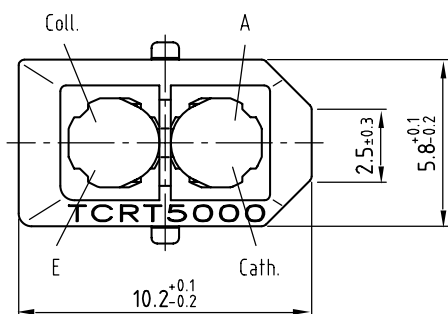
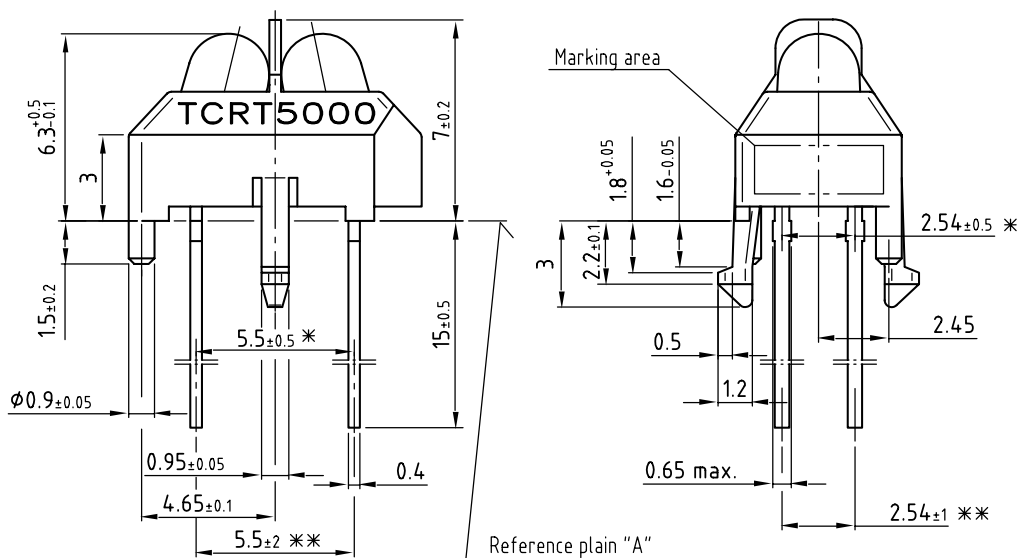
Drawing-No.: 6.550-5096.01-4

Issue: 4; 11.04.02

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# TCRT5000(L)

Vishay Semiconductors



weight: ca. 0.23g

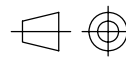
Drawing-No.: 6.550-5146.01-4

Issue: 4; 11.04.02

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\* Tolerances related to reference plain "A"

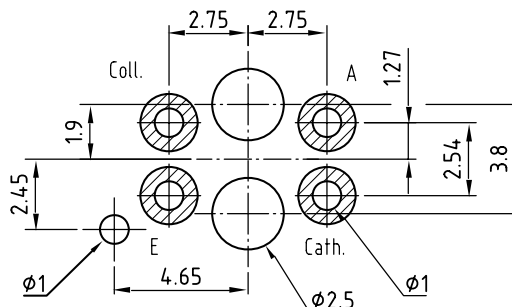
\*\* Tolerances related on lead end



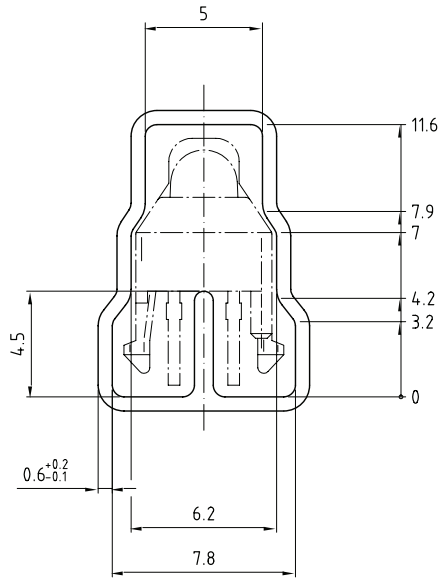
technical drawings according to DIN specifications

All dimensions in mm

Footprint Top View



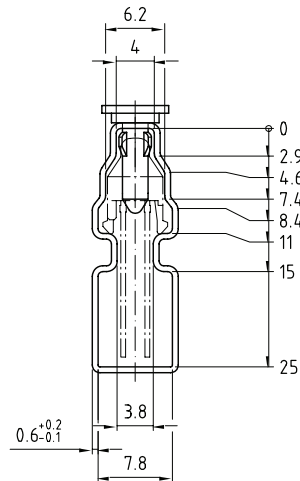
## TCRT5000, Tube Dimensions



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

Drawing-No.: 9.700-5139.01-4  
 Issue: 1; 10.05.00  
 20298

## TCRT5000L, Tube Dimensions



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

Drawing-No.: 9.700-5178.01-4  
 Issue: 1; 25.02.00  
 20299

### Ozone Depleting Substances Policy Statement

It is the policy of Vishay Semiconductor GmbH to

1. Meet all present and future national and international statutory requirements.
2. Regularly and continuously improve the performance of our products, processes, distribution and operating systems with respect to their impact on the health and safety of our employees and the public, as well as their impact on the environment.

It is particular concern to control or eliminate releases of those substances into the atmosphere which are known as ozone depleting substances (ODSs).

The Montreal Protocol (1987) and its London Amendments (1990) intend to severely restrict the use of ODSs and forbid their use within the next ten years. Various national and international initiatives are pressing for an earlier ban on these substances.

Vishay Semiconductor GmbH has been able to use its policy of continuous improvements to eliminate the use of ODSs listed in the following documents.

1. Annex A, B and list of transitional substances of the Montreal Protocol and the London Amendments respectively
2. Class I and II ozone depleting substances in the Clean Air Act Amendments of 1990 by the Environmental Protection Agency (EPA) in the USA
3. Council Decision 88/540/EEC and 91/690/EEC Annex A, B and C (transitional substances) respectively.

Vishay Semiconductor GmbH can certify that our semiconductors are not manufactured with ozone depleting substances and do not contain such substances.

We reserve the right to make changes to improve technical design  
and may do so without further notice.

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Vishay Semiconductor GmbH, P.O.B. 3535, D-74025 Heilbronn, Germany





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