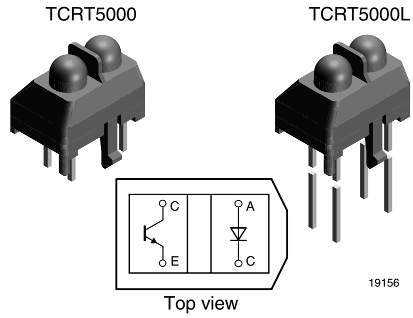
Reflective Optical Sensor with Transistor Output

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 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

Pb-free
e2

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 °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	$t_p \leq 10$ µs	I_{FSM}	3	A
Power dissipation	$T_{amb} \leq 25$ °C	P_V	100	mW
Junction temperature		T_j	100	°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	$T_{amb} \leq 55$ °C	P_V	100	mW
Junction temperature		T_j	100	°C

Sensor

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

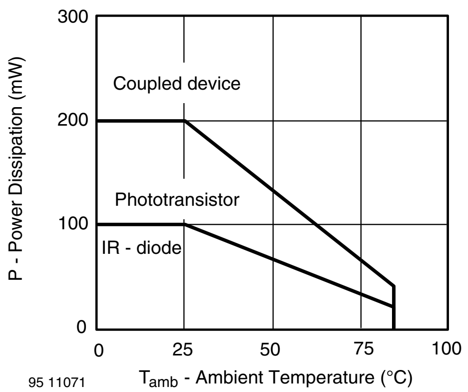


Figure 1. Power Dissipation Limit vs. Ambient Temperature

Electrical Characteristics

T_{amb} = 25 °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	λ_P	940			nm
Virtual source diameter	Method: 63 % encircled energy	Ø		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 µA	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 V, I_F = 10 mA, D = 12 mm	I_C [1,2]	0.5	1	2.1	mA
Collector emitter saturation voltage	I_F = 10 mA, I_C = 0.1 mA, D = 12 mm	V_{CEsat} [1,2]			0.4	V

[1] See figure 3

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

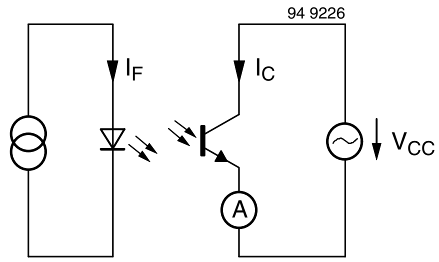


Figure 2. Test Circuit

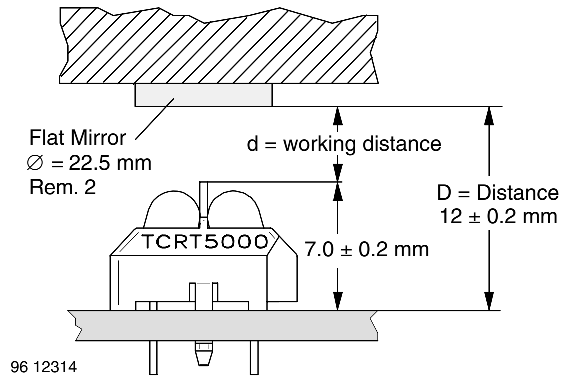


Figure 3. Test Circuit

Typical Characteristics

T_{amb} = 25 °C, unless otherwise specified

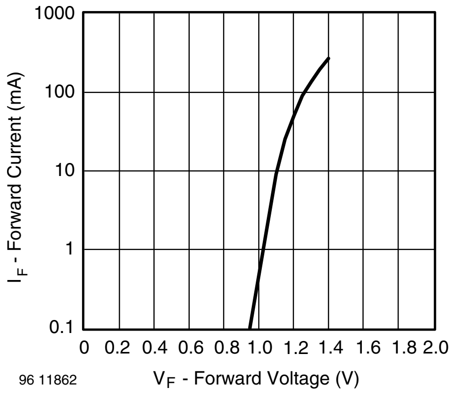


Figure 4. Forward Current vs. Forward Voltage

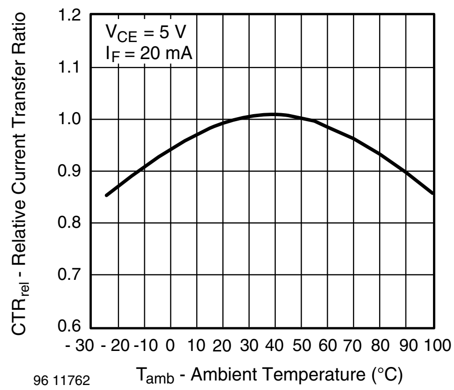


Figure 5. Relative Current Transfer Ratio vs. Ambient Temperature

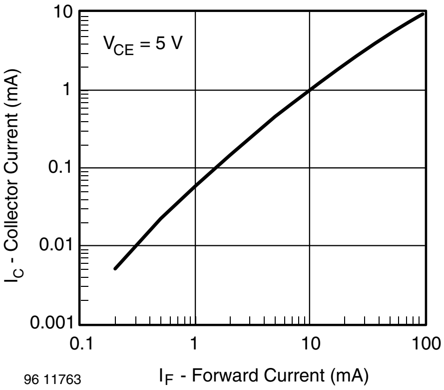


Figure 6. Collector Current vs. Forward Current

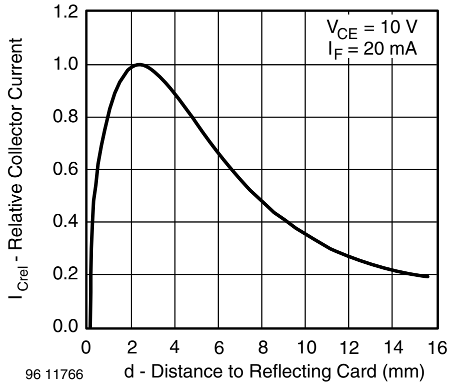


Figure 9. Relative Collector Current vs. Distance

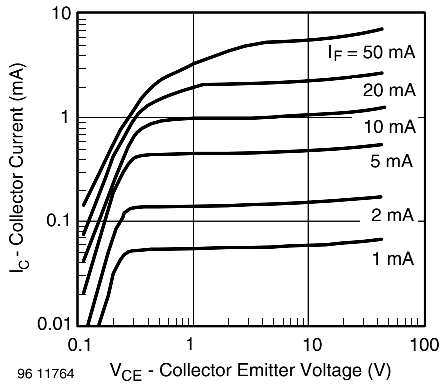


Figure 7. Collector Emitter Saturation Voltage vs. Collector Current

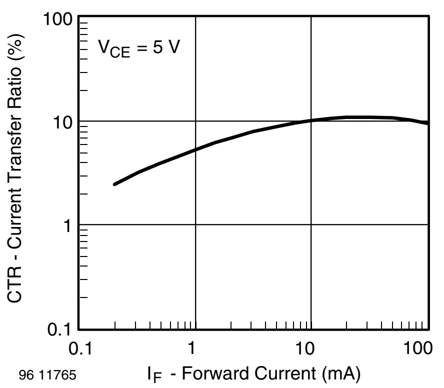
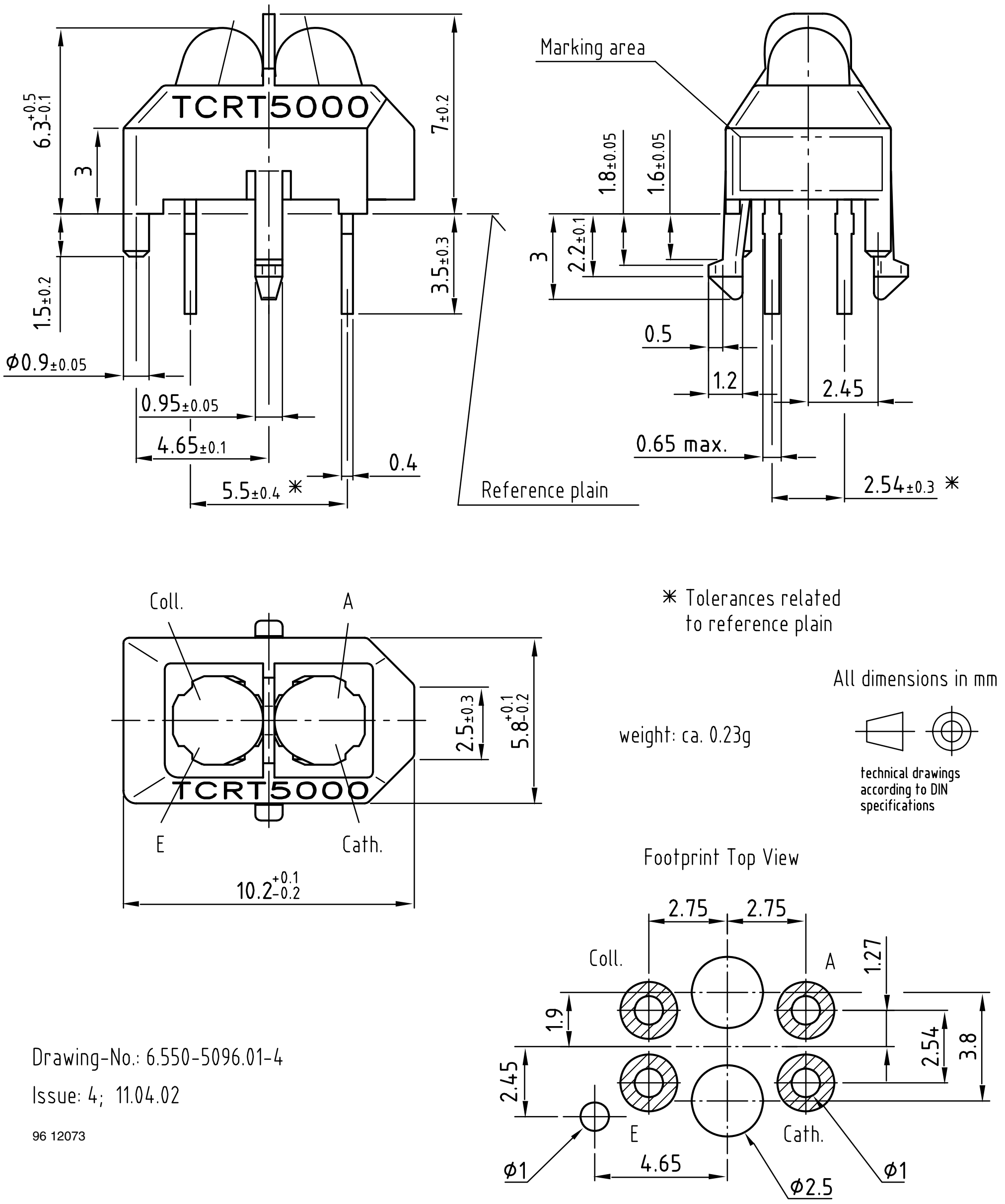
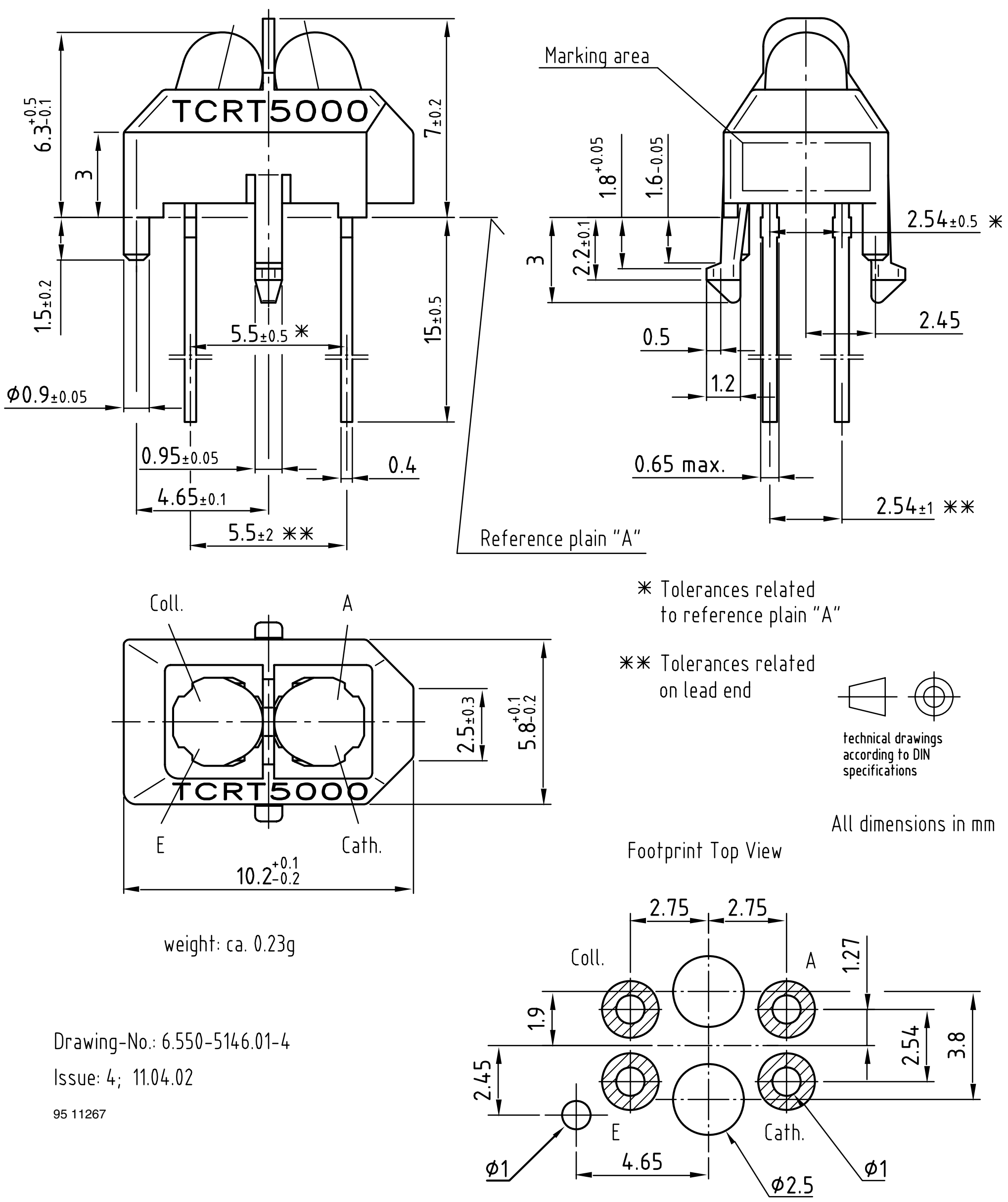


Figure 8. Current Transfer Ratio vs. Forward Current

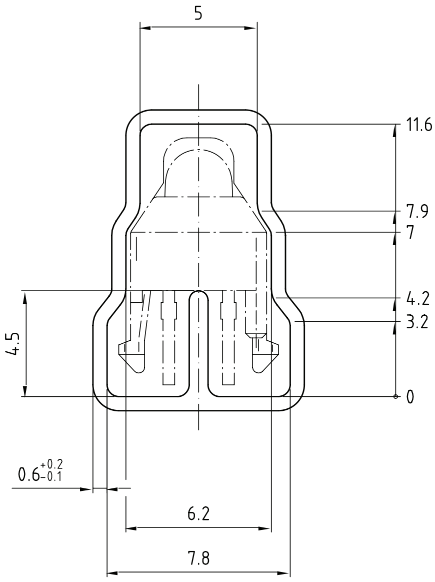
Package Dimensions in mm





Marking area
TCRT5000
Reference plain "A"
Coll.
A
E
Cath.
weight: ca. 0.23g
Drawing-No.: 6.550-5146.01-4
Issue: 4; 11.04.02
95 11267
* 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

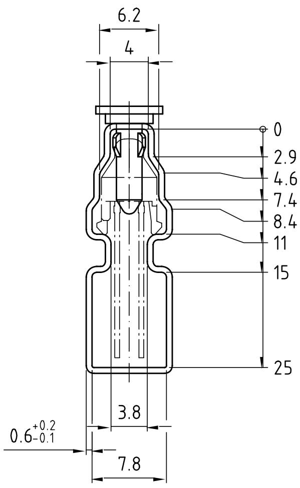


With rubber stopper
Tolerance: ±0.5mm
Length: 575±1mm

All dimensions in mm

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

TCRT5000L, Tube Dimensions



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

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.

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

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