

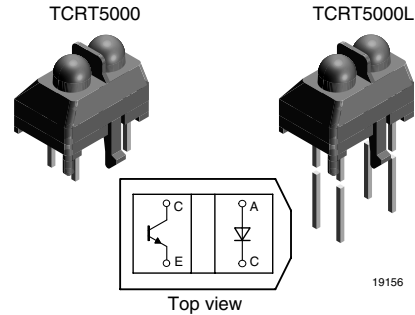
Reflective Optical Sensor with Transistor Output

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	$^\circ\text{C}$

TCRT5000(L)

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	$T_{amb} \leq 55\text{ }^\circ\text{C}$	P_V	100	mW
Junction temperature		T_j	100	$^\circ\text{C}$

Sensor

Parameter	Test condition	Symbol	Value	Unit
Total power dissipation	$T_{amb} \leq 25\text{ }^\circ\text{C}$	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, $t \leq 10\text{ s}$	T_{sd}	260	$^\circ\text{C}$

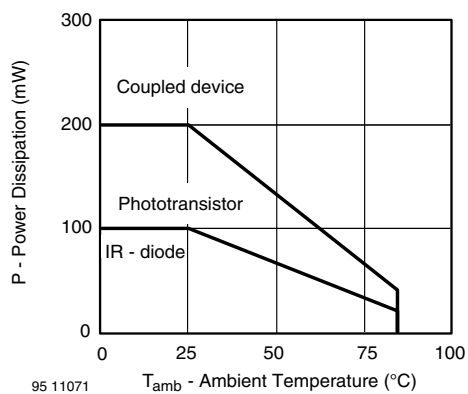


Figure 1. Power Dissipation Limit vs. Ambient Temperature

Electrical Characteristics

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

Input (Emitter)

Parameter	Test condition	Symbol	Min	Typ.	Max	Unit
Forward voltage	$I_F = 60\text{ mA}$	V_F		1.25	1.5	V
Junction capacitance	$V_R = 0\text{ V}$, $f = 1\text{ MHz}$	C_j		17		pF
Radiant intensity	$I_F = 60\text{ mA}$, $t_p = 20\text{ ms}$	I_E			21	mW/sr
Peak wavelength	$I_F = 100\text{ mA}$	λ_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	$I_C = 1\text{ mA}$	V_{CEO}	70			V
Emitter collector voltage	$I_E = 100\text{ }\mu\text{A}$	V_{ECO}	7			V
Collector dark current	$V_{CE} = 20\text{ V}$, $I_F = 0$, $E = 0$	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 ^{1,2)}	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} ^{1,2)}			0.4	V

1) See figure 3

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

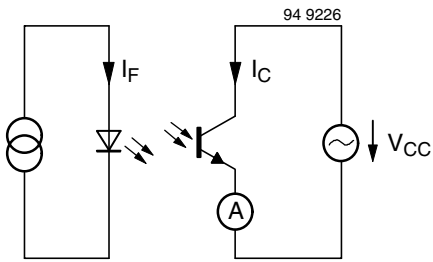


Figure 2. Test Circuit

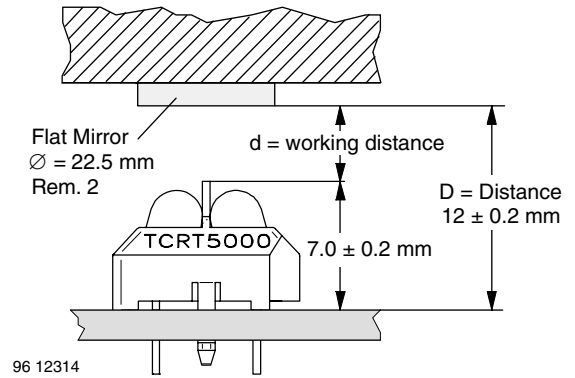


Figure 3. Test Circuit

Typical Characteristics

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

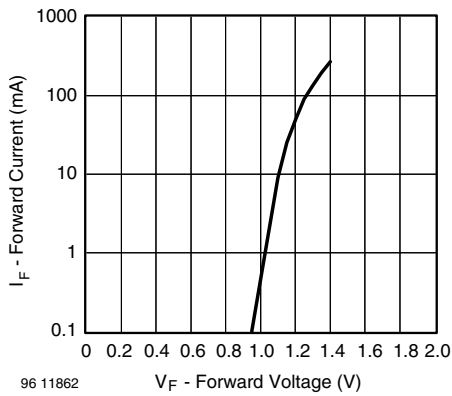


Figure 4. Forward Current vs. Forward Voltage

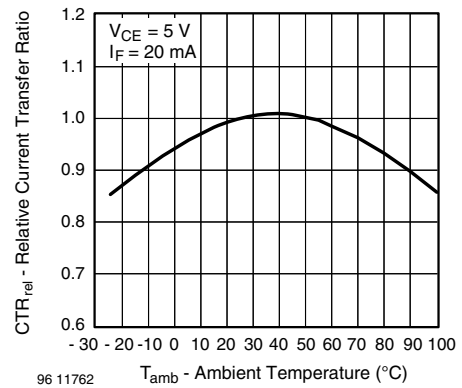


Figure 5. Relative Current Transfer Ratio vs. Ambient Temperature

TCRT5000(L)

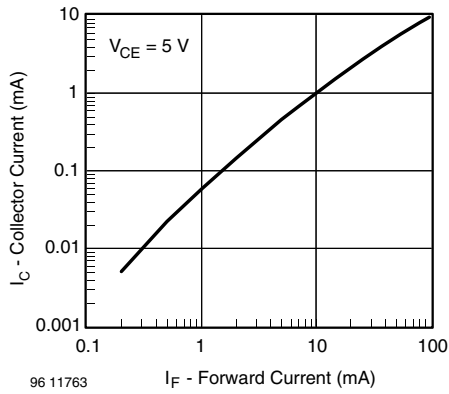


Figure 6. Collector Current vs. Forward Current

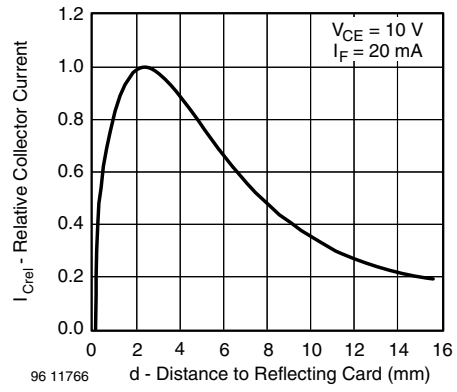


Figure 9. Relative Collector Current vs. Distance

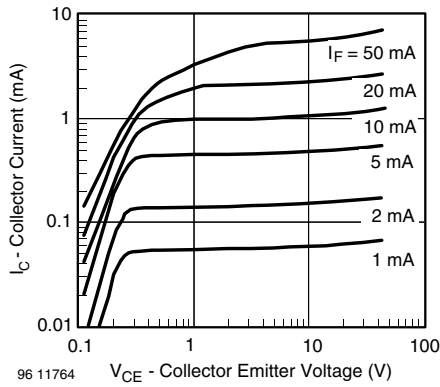


Figure 7. Collector Emitter Saturation Voltage vs. Collector Current

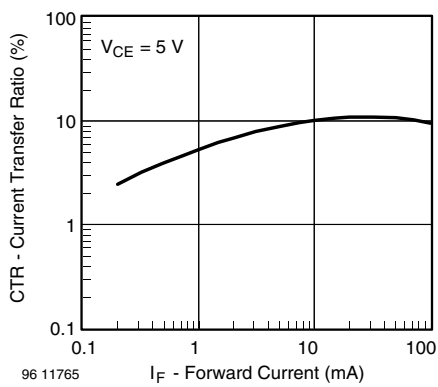
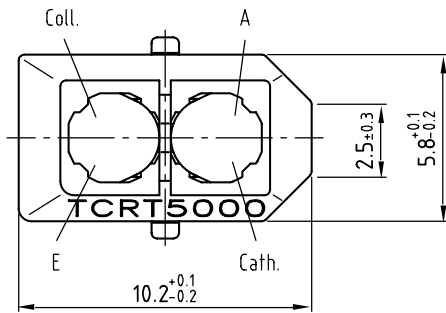
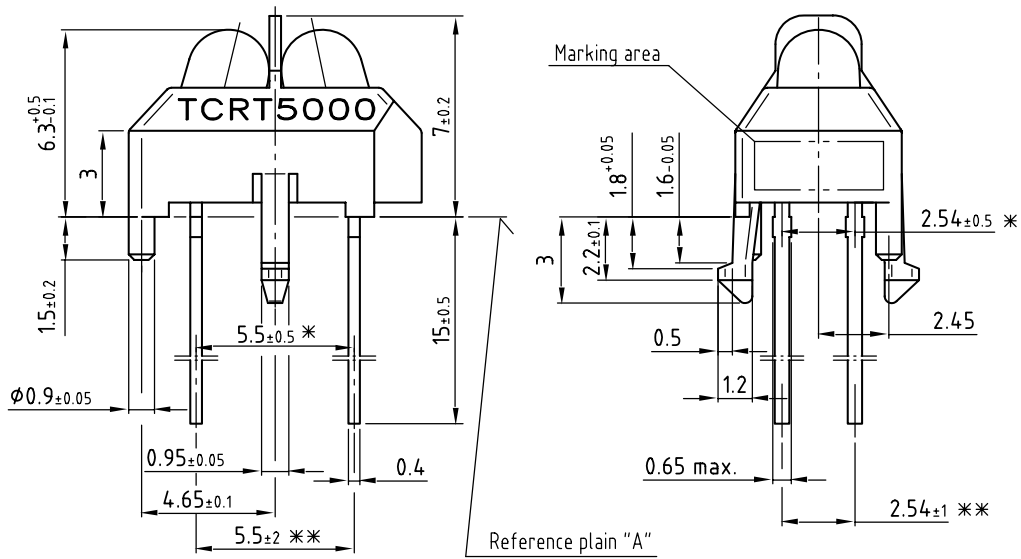


Figure 8. Current Transfer Ratio vs. Forward Current

TCRT5000(L)



weight: ca. 0.23g

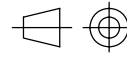
Drawing-No.: 6.550-5146.01-4

Issue: 4; 11.04.02

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* Tolerances related to reference plain "A"

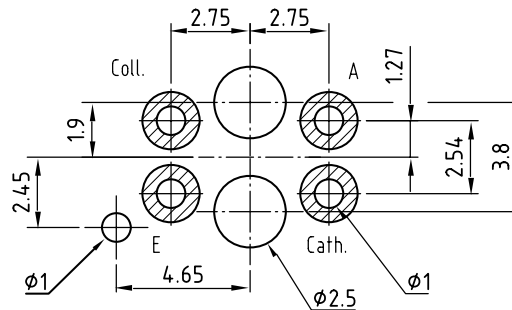
** Tolerances related on lead end



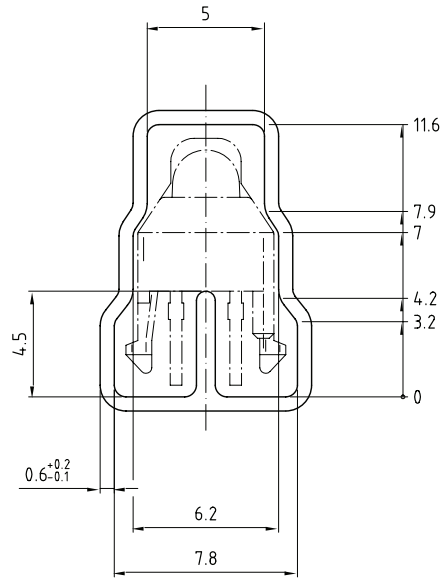
technical drawings according to DIN specifications

All dimensions in mm

Footprint Top View



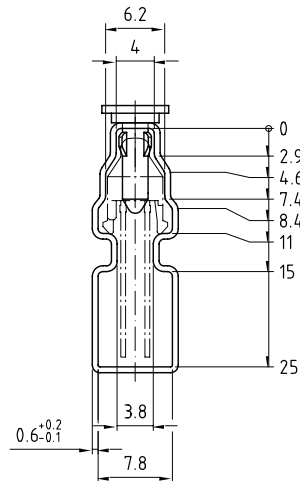
TCRT5000, Tube Dimensions



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

