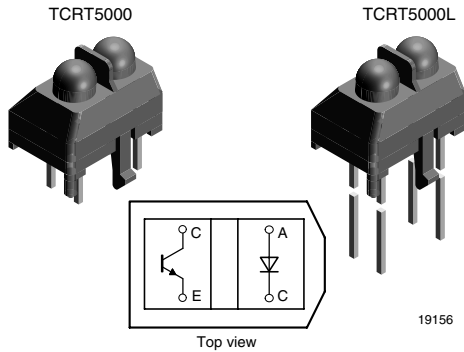


Reflective Optical Sensor with Transistor Output



DESCRIPTION

The TCRT5000 and TCRT5000L 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 x W x H in mm): 10.2 x 5.8 x 7
- Peak operating distance: 2.5 mm
- Operating range within > 20 % relative collector current: 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
- Compliant to RoHS directive 2002/95/EC and in accordance to WEEE 2002/96/EC



RoHS
COMPLIANT

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

PRODUCT SUMMARY

PART NUMBER	DISTANCE FOR MAXIMUM CTR _{rel} ⁽¹⁾ (mm)	DISTANCE RANGE FOR RELATIVE $I_{out} > 20\%$ (mm)	TYPICAL OUTPUT CURRENT UNDER TEST ⁽²⁾ (mA)	DAYLIGHT BLOCKING FILTER INTEGRATED
TCRT5000	2.5	0.2 to 15	1	Yes
TCRT5000L	2.5	0.2 to 15	1	Yes

Notes

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

ORDERING INFORMATION

ORDERING CODE	PACKAGING	VOLUME ⁽¹⁾	REMARKS
TCRT5000	Tube	MOQ: 4500 pcs, 50 pcs/tube	3.5 mm lead length
TCRT5000L	Tube	MOQ: 2400 pcs, 48 pcs/tube	15 mm lead length

Note

- ⁽¹⁾ MOQ: minimum order quantity

ABSOLUTE MAXIMUM RATINGS ⁽¹⁾

PARAMETER	TEST CONDITION	SYMBOL	VALUE	UNIT
INPUT (EMITTER)				
Reverse voltage		V_R	5	V
Forward current		I_F	60	mA
Forward surge current	$t_p \leq 10 \mu s$	I_{FSM}	3	A
Power dissipation	$T_{amb} \leq 25^\circ C$	P_V	100	mW
Junction temperature		T_j	100	$^\circ C$

ABSOLUTE MAXIMUM RATINGS (1)				
PARAMETER	TEST CONDITION	SYMBOL	VALUE	UNIT
OUTPUT (DETECTOR)				
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				
Total power dissipation	$T_{amb} \leq 25\text{ }^\circ\text{C}$	P_{tot}	200	mW
Ambient 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	$^\circ\text{C}$

Note

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

ABSOLUTE MAXIMUM RATINGS

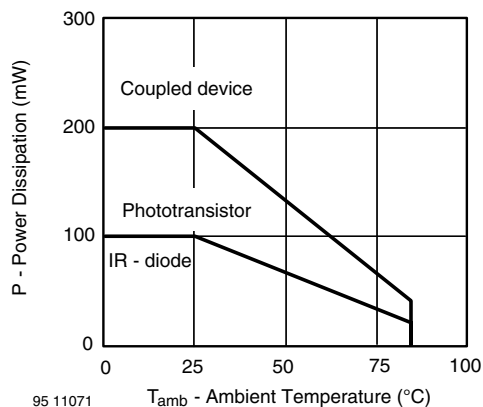


Fig. 1 - Power Dissipation Limit vs. Ambient Temperature

BASIC CHARACTERISTICS (1)						
PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT
INPUT (EMITTER)						
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	d		2.1		mm
OUTPUT (DETECTOR)						
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						
Collector current	$V_{CE} = 5\text{ V}$, $I_F = 10\text{ mA}$, $D = 12\text{ mm}$	$I_C^{(2)(3)}$	0.5	1	2.1	mA
Collector emitter saturation voltage	$I_F = 10\text{ mA}$, $I_C = 0.1\text{ mA}$, $D = 12\text{ mm}$	$V_{CEsat}^{(2)(3)}$			0.4	V

Note

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

(2) See figure 3

(3) Test surface: mirror (Mfr. Spindler a. Hoyer, Part No. 340005)

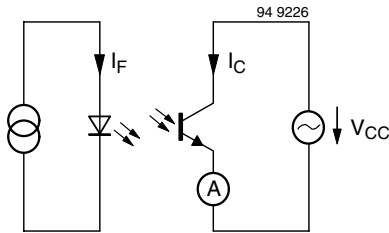


Fig. 2 - Test Circuit

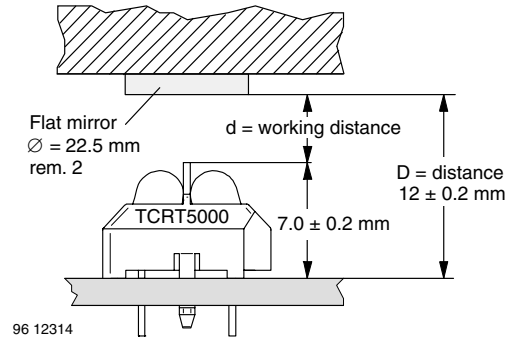
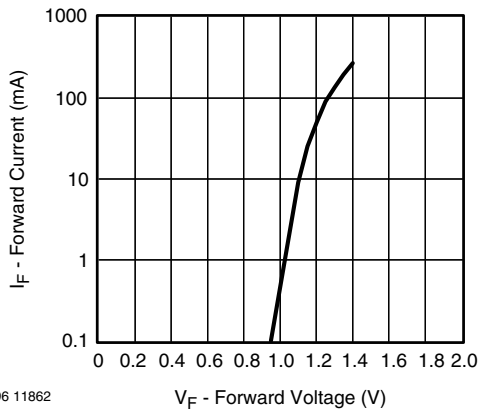


Fig. 3 - Test Circuit

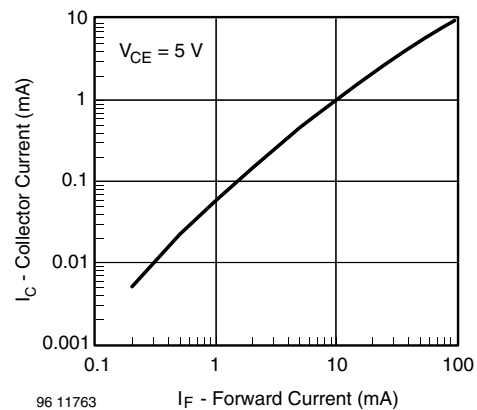
BASIC CHARACTERISTICS

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



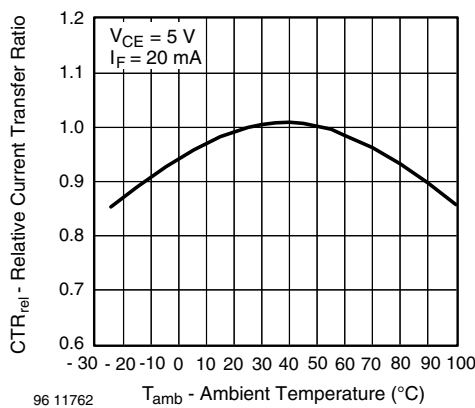
96 11862

Fig. 4 - Forward Current vs. Forward Voltage



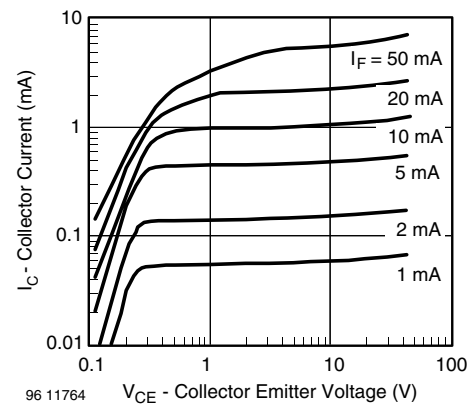
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Fig. 6 - Collector Current vs. Forward Current



96 11762

Fig. 5 - Relative Current Transfer Ratio vs. Ambient Temperature



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Fig. 7 - Collector Emitter Saturation Voltage vs. Collector Current

TCRT5000, TCRT5000L



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Reflective Optical Sensor with Transistor Output

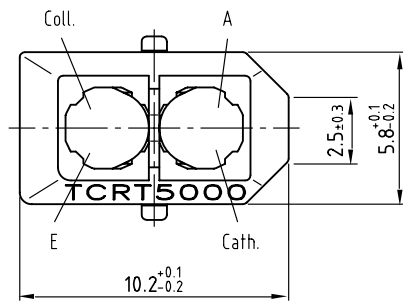


Fig. 8 - Current Transfer Ratio vs. Forward Current



Fig. 9 - Relative Collector Current vs. Distance

PACKAGE DIMENSIONS in millimeters, TCRT5000

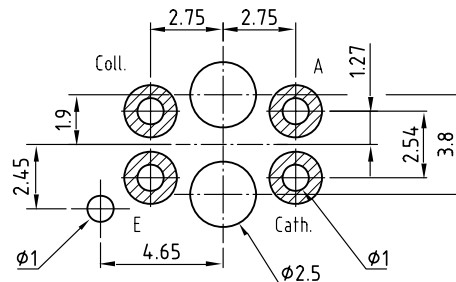


* Tolerances related to reference plain

weight: ca. 0.23g



Footprint Top View



Drawing-No.: 6.550-5096.01-4

Issue: 4; 11.04.02

96 12073



TCRT5000, TCRT5000L

Reflective Optical Sensor with Transistor Output

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PACKAGE DIMENSIONS in millimeters, TCRT5000L

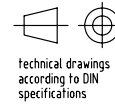


weight: ca. 0.23g

Drawing-No.: 6.550-5146.01-4
Issue: 4; 11.04.02
95 11267

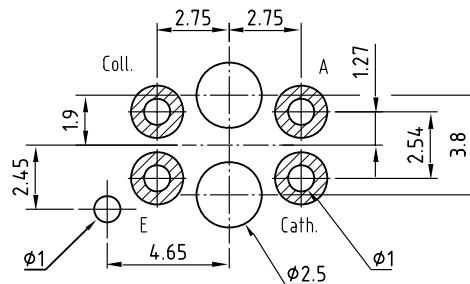
* Tolerances related to reference plain "A"

** Tolerances related on lead end



technical drawings according to DIN specifications

Footprint Top View



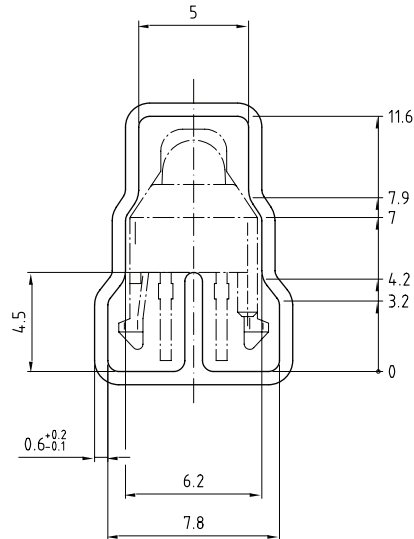
TCRT5000, TCRT5000L



Vishay Semiconductors

Reflective Optical Sensor with Transistor Output

TUBE DIMENSIONS in millimeters, TCRT5000



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

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

TUBE DIMENSIONS in millimeters, TCRT5000L



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
20298



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