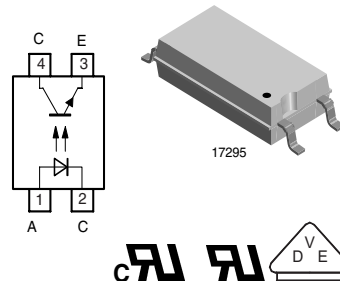


## Optocoupler, Phototransistor Output, SOP-4L, Long Mini-Flat Package

### Features

- SMD Low profile 4 lead package
- High Isolation 5000 V<sub>RMS</sub>
- CTR flexibility available see order information
- Special construction
- Extra low coupling capacitance
- Connected base
- DC input with transistor output



### Agency Approvals

- UL 1577 Recognized, File No. E76222 - Double Protection
- CSA (C-UL) 1577 Recognized File No. E- 76222 - Double Protection
- BSI: BS EN 41003, BS EN 60095 (BS 415), BS EN 60950 (BS 7002), Certificate number 7081 and 7402
- DIN EN 60747-5-2(VDE0884)  
DIN EN 60747-5-5 pending
- FIMKO (SETI): EN 60950, Certificate No. 11027
- NOTE:  
See the Safety Standard Approval List "Agency Table" for more detailed information.

### Applications

- Switchmode power supplies
- Computer peripheral interface
- Microprocessor system interface

### Description

The TCLT10.. Series consists of a phototransistor optically coupled to a gallium arsenide infrared-emitting diode in a 4-lead SOP4L package.

The elements are mounted on one leadframe providing a fixed distance between input and output for highest safety requirements.

### Order Information

Part	Remarks
TCLT1000	CTR 50 - 600 %, SMD-4
TCLT1002	CTR 63 - 125 %, SMD-4
TCLT1003	CTR 100 - 200 %, SMD-4
TCLT1005	CTR 50 - 150 %, SMD-4
TCLT1006	CTR 100 - 300 %, SMD-4
TCLT1007	CTR 80 - 160 %, SMD-4
TCLT1008	CTR 130 - 260 %, SMD-4
TCLT1009	CTR 200 - 400 %, SMD-4

NOTE: Available only on tape and reel.

### Absolute Maximum Ratings

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

Stresses in excess of the absolute Maximum Ratings can cause permanent damage to the device. Functional operation of the device is not implied at these or any other conditions in excess of those given in the operational sections of this document. Exposure to absolute Maximum Rating for extended periods of the time can adversely affect reliability.

### Input

Parameter	Test condition	Symbol	Value	Unit
Reverse voltage		$V_R$	6	V
Forward current		$I_F$	60	mA
Forward surge current	$t_p \leq 10\text{ }\mu\text{s}$	$I_{FSM}$	1.5	A
Power dissipation		$P_{diss}$	100	mW
Junction temperature		$T_j$	125	$^{\circ}\text{C}$

### Output

Parameter	Test condition	Symbol	Value	Unit
Collector emitter voltage		$V_{CEO}$	70	V
Emitter collector voltage		$V_{ECO}$	7	V
Collector current		$I_C$	50	mA
Collector peak current	$t_p/T = 0.5, t_p \leq 10\text{ ms}$	$I_{CM}$	100	mA
Power dissipation		$P_{diss}$	150	mW
Junction temperature		$T_j$	125	$^{\circ}\text{C}$

### Coupler

Parameter	Test condition	Symbol	Value	Unit
Isolation test voltage (RMS)		$V_{ISO}$	5000	$V_{RMS}$
Total power dissipation		$P_{tot}$	250	mW
Operating ambient temperature range		$T_{amb}$	- 40 to + 100	$^{\circ}\text{C}$
Storage temperature range		$T_{stg}$	- 40 to + 100	$^{\circ}\text{C}$
Soldering temperature		$T_{sld}$	240	$^{\circ}\text{C}$

### Electrical Characteristics

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

Minimum and maximum values are testing requirements. Typical values are characteristics of the device and are the result of engineering evaluation. Typical values are for information only and are not part of the testing requirements.

### Input

Parameter	Test condition	Symbol	Min	Typ.	Max	Unit
Forward voltage	$I_F = \pm 50\text{ mA}$	$V_F$		1.25	1.6	V
Junction capacitance	$V_R = 0\text{ V}, f = 1\text{ MHz}$	$C_j$		50		pF

### Output

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-emitter cut-off current	$V_{CE} = 20\text{ V}, I_f = 0, E = 0$	$I_{CEO}$		10	100	nA



## Coupler

Parameter	Test condition	Symbol	Min	Typ.	Max	Unit
Collector emitter saturation voltage	$I_F = 10 \text{ mA}$ , $I_C = 1 \text{ mA}$	$V_{CEsat}$			0.3	V
Cut-off frequency	$V_{CE} = 5 \text{ V}$ , $I_F = 10 \text{ mA}$ , $R_L = 100 \Omega$	$f_c$		110		kHz
Coupling capacitance	$f = 1 \text{ MHz}$	$C_k$		0.3		pF

## Current Transfer Ratio

Parameter	Test condition	Part	Symbol	Min	Typ.	Max	Unit
$I_C/I_F$	$V_{CE} = 5 \text{ V}$ , $I_F = 5 \text{ mA}$	TCLT1000	CTR	50		600	%
		TCLT1002	CTR	63		125	%
	TCLT1003	CTR	100		200	%	
	$V_{CE} = 5 \text{ V}$ , $I_F = 1 \text{ mA}$	TCLT1002	CTR	22	45		%
		TCLT1003	CTR	34	70		%
	$V_{CE} = 5 \text{ V}$ , $I_F = 5 \text{ mA}$	TCLT1005	CTR	50		150	%
		TCLT1006	CTR	100		300	%
		TCLT1007	CTR	80		160	%
		TCLT1008	CTR	130		260	%
TCLT1009	CTR	200		400	%		

## Maximum Safety Ratings

(according to DIN EN 60747-5-2(VDE0884)/ DIN EN 60747-5-5 pending) see figure 1

This optocoupler is suitable for safe electrical isolation only within the safety ratings.

Compliance with the safety ratings shall be ensured by means of suitable protective circuits.

## Input

Parameter	Test condition	Symbol	Min	Typ.	Max	Unit
Forward current		$I_F$			130	mA

## Output

Parameter	Test condition	Symbol	Min	Typ.	Max	Unit
Power dissipation		$P_{diss}$			265	mW

## Coupler

Parameter	Test condition	Symbol	Min	Typ.	Max	Unit
Rated impulse voltage		$V_{IOTM}$			8	kV
Safety temperature		$T_{si}$			150	°C

### Insulation Rated Parameters

Parameter	Test condition	Symbol	Min	Typ.	Max	Unit
Partial discharge test voltage - Routine test	100 %, $t_{test} = 1$ s	$V_{pd}$	1.6			kV
Partial discharge test voltage - Lot test (sample test)	$t_{Tr} = 60$ s, $t_{test} = 10$ s, (see figure 2)	$V_{IOTM}$	8			kV
		$V_{pd}$	1.3			kV
Insulation resistance	$V_{IO} = 500$ V	$R_{IO}$	$10^{12}$			$\Omega$
	$V_{IO} = 500$ V, $T_{amb} = 100$ °C	$R_{IO}$	$10^{11}$			$\Omega$
	$V_{IO} = 500$ V, $T_{amb} = 150$ °C (construction test only)	$R_{IO}$	$10^9$			$\Omega$

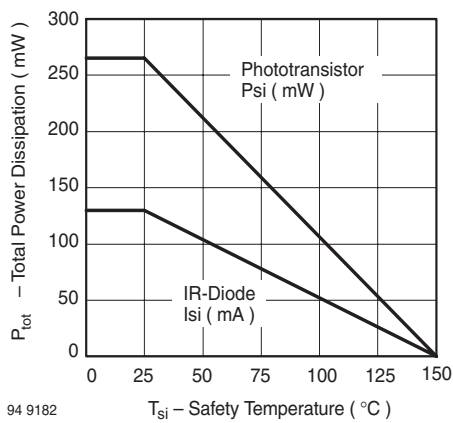


Fig. 1 Derating diagram

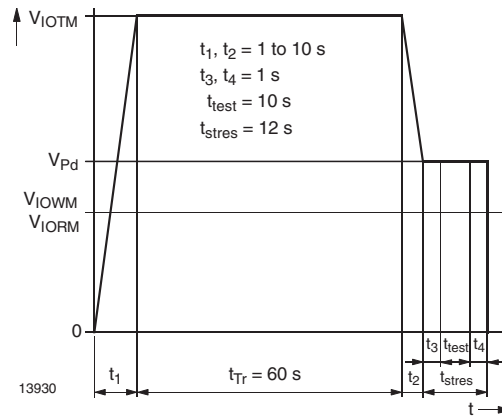


Fig. 2 Test pulse diagram for sample test according to DIN EN 60747-5-2(VDE0884)/ DIN EN 60747-; IEC60747

## Switching Characteristics

Parameter	Test condition	Symbol	Min	Typ.	Max	Unit
Delay time	$V_S = 5\text{ V}$ , $I_C = 2\text{ mA}$ , $R_L = 100\ \Omega$ (see figure 3)	$t_d$		3.0		$\mu\text{s}$
Rise time	$V_S = 5\text{ V}$ , $I_C = 2\text{ mA}$ , $R_L = 100\ \Omega$ (see figure 3)	$t_r$		3.0		$\mu\text{s}$
Turn-on time	$V_S = 5\text{ V}$ , $I_C = 2\text{ mA}$ , $R_L = 100\ \Omega$ (see figure 3)	$t_{on}$		6.0		$\mu\text{s}$
Storage time	$V_S = 5\text{ V}$ , $I_C = 2\text{ mA}$ , $R_L = 100\ \Omega$ (see figure 3)	$t_s$		0.3		$\mu\text{s}$
Fall time	$V_S = 5\text{ V}$ , $I_C = 2\text{ mA}$ , $R_L = 100\ \Omega$ (see figure 3)	$t_f$		4.7		$\mu\text{s}$
Turn-off time	$V_S = 5\text{ V}$ , $I_C = 2\text{ mA}$ , $R_L = 100\ \Omega$ (see figure 3)	$t_{off}$		5.0		$\mu\text{s}$
Turn-on time	$V_S = 5\text{ V}$ , $I_F = 10\text{ mA}$ , $R_L = 1\text{ k}\Omega$ (see figure 4)	$t_{on}$		9.0		$\mu\text{s}$
Turn-off time	$V_S = 5\text{ V}$ , $I_F = 10\text{ mA}$ , $R_L = 1\text{ k}\Omega$ (see figure 4)	$t_{off}$		10.0		$\mu\text{s}$

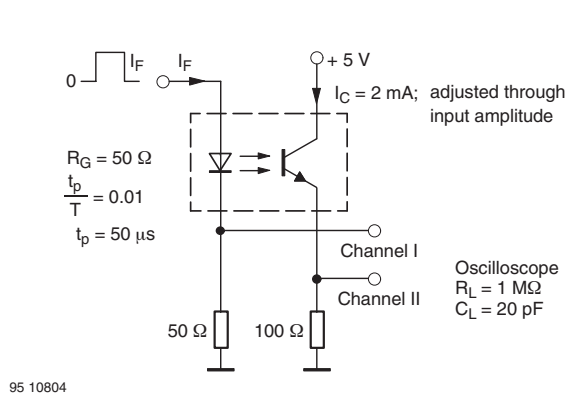


Fig. 3 Test circuit, non-saturated operation

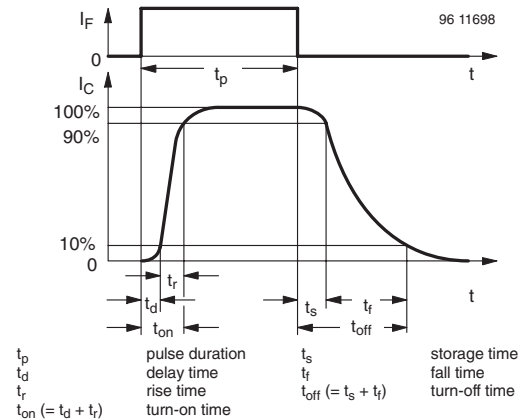


Fig. 5 Switching Times

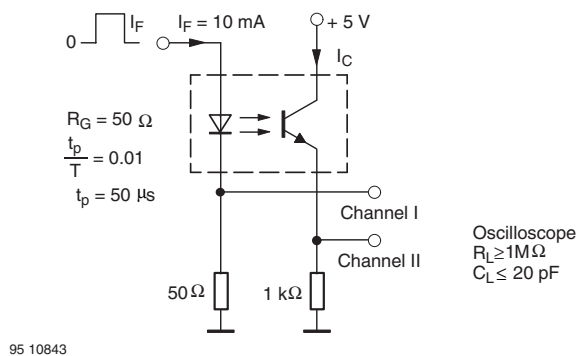


Fig. 4 Test circuit, saturated operation

## Typical Characteristics ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ unless otherwise specified)

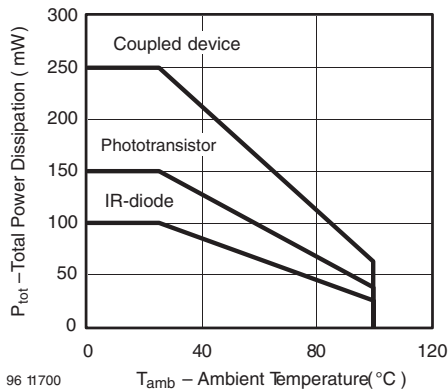


Fig. 6 Total Power Dissipation vs. Ambient Temperature

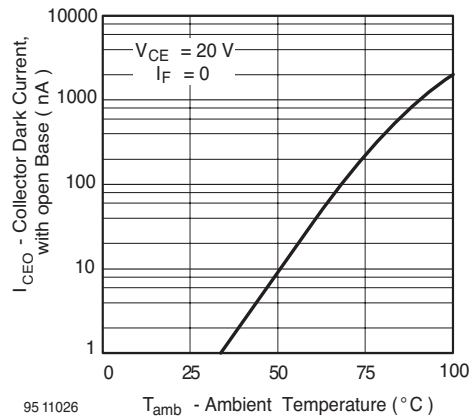


Fig. 9 Collector Dark Current vs. Ambient Temperature

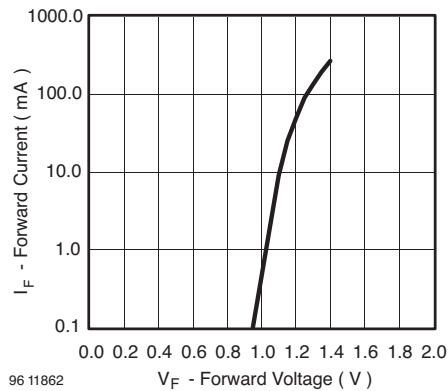


Fig. 7 Forward Current vs. Forward Voltage

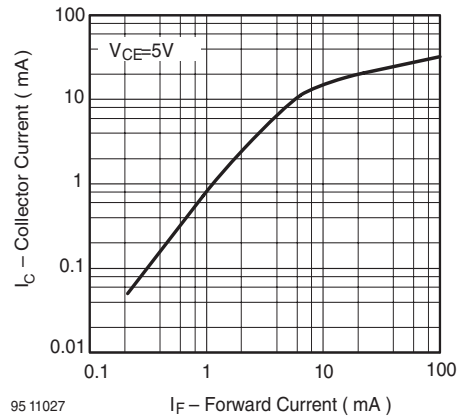


Fig. 10 Collector Current vs. Forward Current

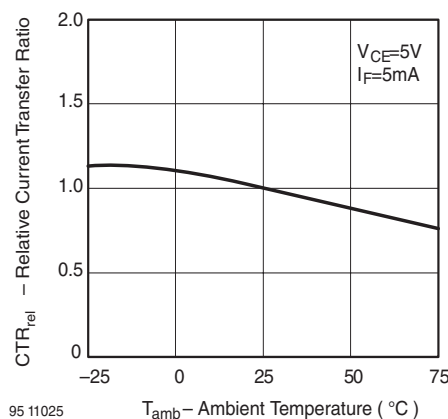


Fig. 8 Relative Current Transfer Ratio vs. Ambient Temperature

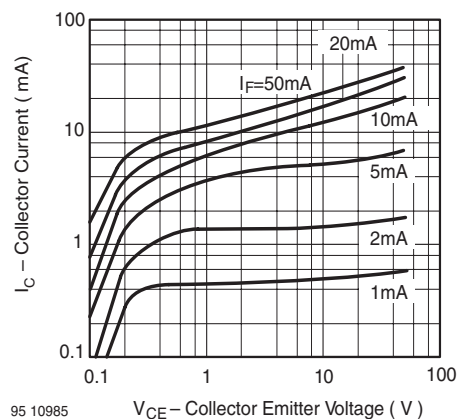


Fig. 11 Collector Current vs. Collector Emitter Voltage

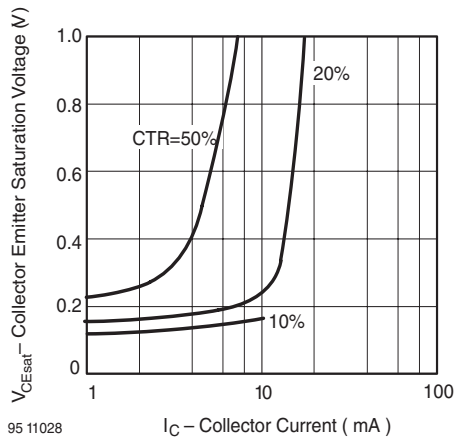


Fig. 12 Collector Emitter Saturation Voltage vs. Collector Current

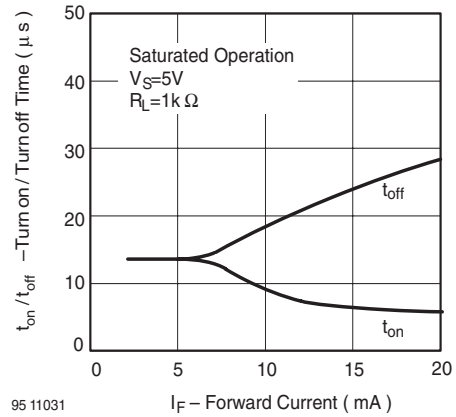


Fig. 15 Turn on / off Time vs. Forward Current

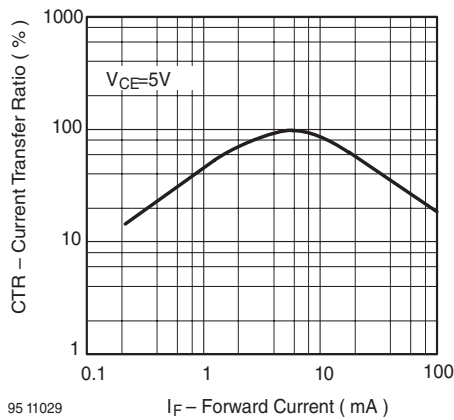


Fig. 13 Current Transfer Ratio vs. Forward Current

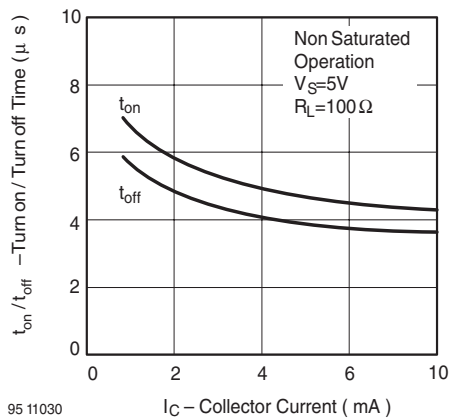


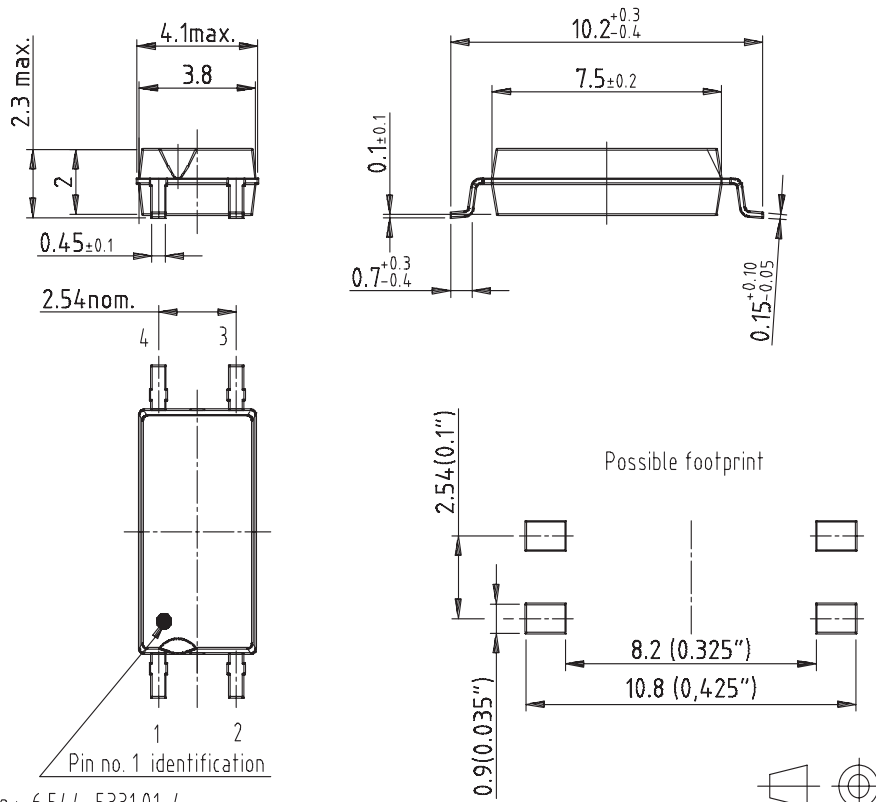
Fig. 14 Turn on / off Time vs. Collector Current

# TCLT10.. Series

Vishay Semiconductors



## Package Dimensions in mm



Drawing-No.: 6.544-5331.01-4

Issue: 1; 04.04.00

technical drawings  
according to DIN  
specifications

15243





## 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.**

Parameters can vary in different applications. All operating parameters must be validated for each customer application by the customer. Should the buyer use Vishay Semiconductors products for any unintended or unauthorized application, the buyer shall indemnify Vishay Semiconductors against all claims, costs, damages, and expenses, arising out of, directly or indirectly, any claim of personal damage, injury or death associated with such unintended or unauthorized use.

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