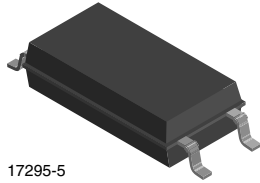
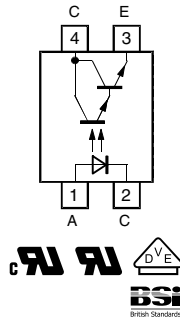


## Optocoupler, Photodarlington Output, SOP-4L, Long Mini-Flat Package



17295-5



### FEATURES

- Low profile package
- Darlington output
- Extra low coupling capacity - typical 0.2 pF
- High common mode rejection
- Creepage current resistance according to VDE 0303/IEC 60112 comparative tracking index: CTI ≥ 175
- Creepage distance > 8 mm
- Tested acc. 60950: AM4: 1997 clause 2.9.6.
- Material categorization: For definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)



### DESCRIPTION

The TCLD1000 consists of a darlington phototransistor optically coupled to a gallium arsenide infrared-emitting diode in a 4-lead SO6L package.

### AGENCY APPROVALS

- UL1577, file no. E76222
- CSA 22.2 bulletin 5A, double protection
- BSI IEC 60950; IEC 60065
- DIN EN 60747-5-2 (VDE 0884)/DIN EN 60747-5-5 pending

### APPLICATIONS

- Switch-mode power supplies
- Line receiver
- Computer peripheral interface
- Microprocessor system interface
- Reinforced isolation provides circuit protection against electrical shock (safety class II)
- Circuits for safe protective separation against electrical shock according to safety class II (reinforced isolation):
  - for appl. class I to IV at mains voltage ≤ 300 V
  - for appl. class I to III at mains voltage ≤ 600 V
 according to DIN EN 60747-5-2 (VDE 0884)

ORDERING INFORMATION	
<div style="display: flex; justify-content: space-around; align-items: center;"> <div style="border: 1px solid black; padding: 2px 5px;">T</div> <div style="border: 1px solid black; padding: 2px 5px;">C</div> <div style="border: 1px solid black; padding: 2px 5px;">L</div> <div style="border: 1px solid black; padding: 2px 5px;">D</div> <div style="border: 1px solid black; padding: 2px 5px;">1</div> <div style="border: 1px solid black; padding: 2px 5px;">0</div> <div style="border: 1px solid black; padding: 2px 5px;">0</div> <div style="border: 1px solid black; padding: 2px 5px;">0</div> </div> <p style="text-align: center;">PART NUMBER</p>	
<b>AGENCY CERTIFIED/PACKAGE</b>	<b>CTR (%)</b>
UL, cUL, VDE, BSI	<b>&gt; 600</b>
SOP-4L, mini-flat, long	TCLD1000

ABSOLUTE MAXIMUM RATINGS ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)				
PARAMETER	TEST CONDITION	SYMBOL	VALUE	UNIT
<b>INPUT</b>				
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	$^{\circ}\text{C}$



ABSOLUTE MAXIMUM RATINGS ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)				
PARAMETER	TEST CONDITION	SYMBOL	VALUE	UNIT
<b>OUTPUT</b>				
Collector emitter voltage		$V_{CEO}$	35	V
Emitter collector voltage		$V_{ECO}$	7	V
Collector current		$I_C$	80	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	$^{\circ}\text{C}$
<b>COUPLER</b>				
Isolation test voltage (RMS)		$V_{ISO}$	5000	$V_{RMS}$
Total power dissipation		$P_{tot}$	250	mW
Operating ambient temperature range		$T_{amb}$	-55 to +100	$^{\circ}\text{C}$
Storage temperature range		$T_{stg}$	-55 to +150	$^{\circ}\text{C}$
Soldering temperature <sup>(1)</sup>		$T_{sld}$	260	$^{\circ}\text{C}$

**Notes**

- 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 ratings for extended periods of the time can adversely affect reliability.
- <sup>(1)</sup> Wave soldering three cycles are allowed. Also refer to "Assembly Instructions" ([www.vishay.com/doc?80054](http://www.vishay.com/doc?80054)).

ELECTRICAL CHARACTERISTICS ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)						
PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT
<b>INPUT</b>						
Forward voltage	$I_F = 20\text{ mA}$	$V_F$		1.1	1.4	V
Junction capacitance	$V_R = 0\text{ V}, f = 1\text{ MHz}$	$C_j$		50		pF
<b>OUTPUT</b>						
Collector emitter voltage	$I_C = 1\text{ mA}$	$V_{CEO}$	32			V
Emitter collector voltage	$I_E = 100\text{ }\mu\text{A}$	$V_{ECO}$	7			V
Collector emitter leakage current	$V_{CE} = 10\text{ V}, I_F = 0\text{ A}$	$I_{CEO}$		15	100	nA
<b>COUPLER</b>						
Collector emitter saturation voltage	$I_F = 20\text{ mA}, I_C = 5\text{ mA}$	$V_{CEsat}$			1	V
Cut-off frequency	$V_{CE} = 5\text{ V}, I_F = 10\text{ mA}, R_L = 100\text{ }\Omega$	$f_c$		10		kHz
Coupling capacitance	$f = 1\text{ MHz}$	$C_k$		0.3		pF

**Note**

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

CURRENT TRANSFER RATIO ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)						
PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT
$I_C/I_F$	$V_{CE} = 2\text{ V}, I_F = 1\text{ mA}$	CTR	600	800		%

SAFETY AND INSULATION RATED PARAMETERS						
PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT
Partial discharge test voltage - routine test	100 %, $t_{\text{test}} = 1 \text{ s}$	$V_{\text{pd}}$	2			kV
Partial discharge test voltage - lot test (sample test)	$t_{\text{Tr}} = 60 \text{ s}$ , $t_{\text{test}} = 10 \text{ s}$ , (see figure 2)	$V_{\text{IOTM}}$	8			kV
		$V_{\text{pd}}$	1.68			kV
Insulation resistance	$V_{\text{IO}} = 500 \text{ V}$	$R_{\text{IO}}$	$10^{12}$			$\Omega$
	$V_{\text{IO}} = 500 \text{ V}$ , $T_{\text{amb}} = 100 \text{ }^\circ\text{C}$	$R_{\text{IO}}$	$10^{11}$			$\Omega$
	$V_{\text{IO}} = 500 \text{ V}$ , $T_{\text{amb}} = 150 \text{ }^\circ\text{C}$ (construction test only)	$R_{\text{IO}}$	$10^9$			$\Omega$
Forward current		$I_{\text{si}}$	130			mA
Power dissipation		$P_{\text{so}}$	265			mW
Rated impulse voltage		$V_{\text{IOTM}}$	8			kV
Safety temperature		$T_{\text{si}}$	150			$^\circ\text{C}$
Clearance distance			8.0			mm
Creepage distance			8.0			mm
Insulation distance (internal)			0.40			mm

**Note**

- According to DIN EN 60747-5-2 (VDE 0884) (see figure 2). 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.

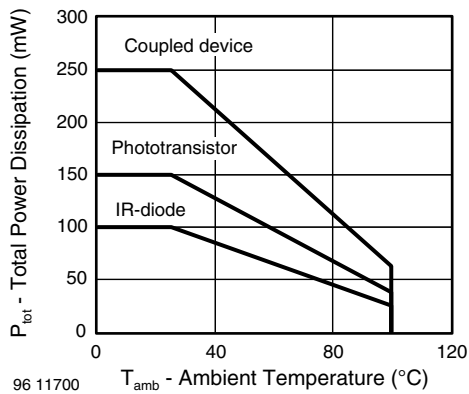


Fig. 1 - Derating Diagram

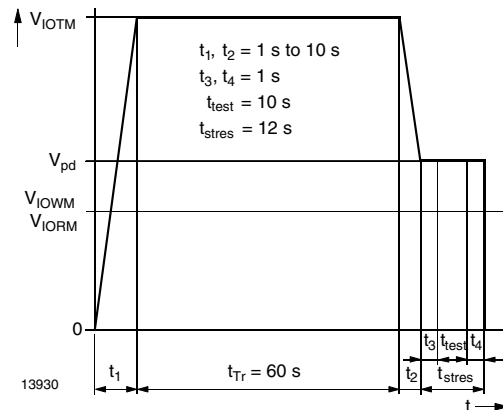


Fig. 2 - Test Pulse Diagram for Sample Test According to DIN EN 60747-5-2 (VDE 0884); IEC 60747-5-5

SWITCHING CHARACTERISTICS ( $T_{\text{amb}} = 25 \text{ }^\circ\text{C}$ , unless otherwise specified)						
PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT
Rise time	$V_{\text{CE}} = 2 \text{ V}$ , $I_{\text{C}} = 10 \text{ mA}$ , $R_{\text{L}} = 100 \text{ } \Omega$ , (see figure 3)	$t_{\text{r}}$		300		$\mu\text{s}$
Turn-off time	$V_{\text{CE}} = 2 \text{ V}$ , $I_{\text{C}} = 10 \text{ mA}$ , $R_{\text{L}} = 100 \text{ } \Omega$ , (see figure 3)	$t_{\text{off}}$		250		$\mu\text{s}$

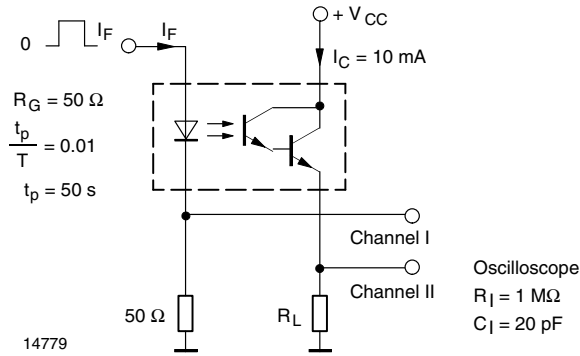


Fig. 3 - Test Circuit, Non-Saturated Operation

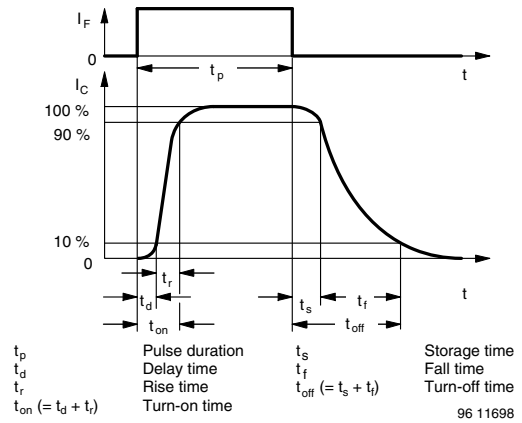


Fig. 4 - Switching Times

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

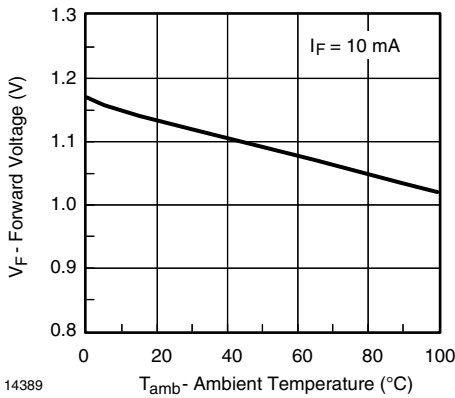


Fig. 5 - Forward Voltage vs. Ambient Temperature

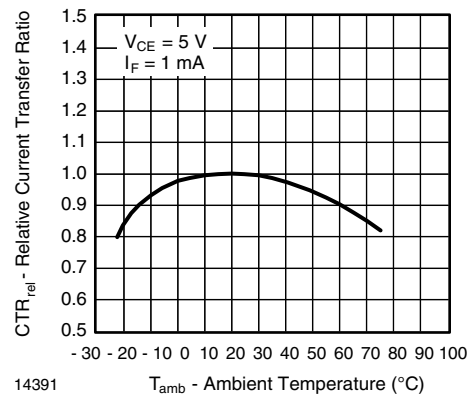


Fig. 7 - Relative Current Transfer Ratio vs. Ambient Temperature

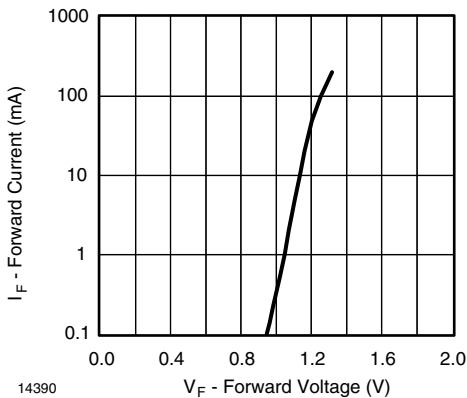


Fig. 6 - Forward Current vs. Forward Voltage

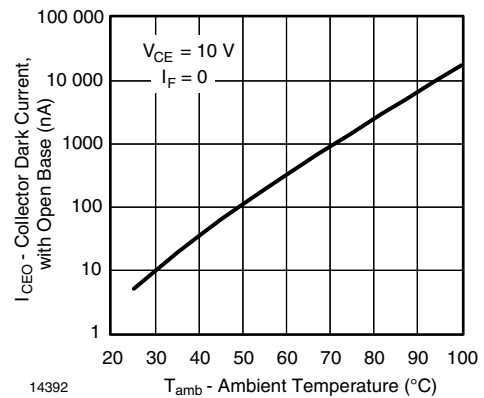


Fig. 8 - Collector Dark Current vs. Ambient Temperature

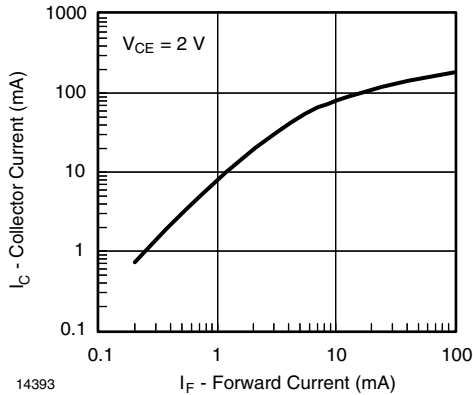


Fig. 9 - Collector Current vs. Forward Current

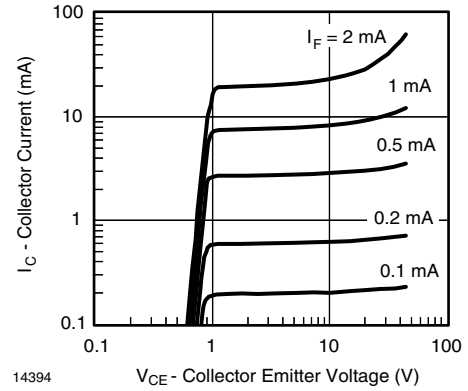
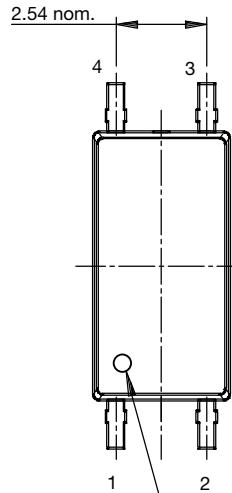
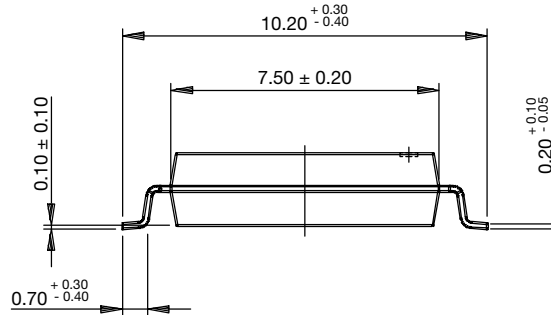
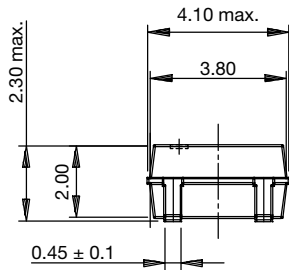


Fig. 10 - Collector Current vs. Collector Emitter Voltage

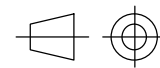
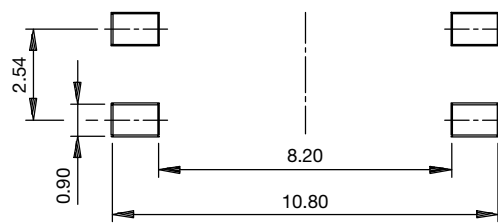
**PACKAGE DIMENSIONS** in millimeters



22533

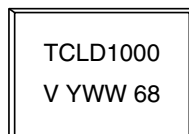
Pin no. 1 identification

Possible footprint



technical drawings according to DIN specifications

**PACKAGE MARKING**





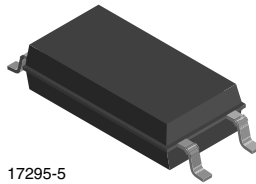
## Footprint and Schematic Information for TCLD1000

The footprint and schematic symbols for the following parts can be accessed using the associated links. They are available in Eagle, Altium, KiCad, OrCAD / Allegro, Pulsonix, and PADS.

Note that the 3D models for these parts can be found on the Vishay product page.

PART NUMBER	FOOTPRINT / SCHEMATIC
TCLD1000	<a href="http://www.snapeda.com/parts/TCLD1000/Vishay/view-part">www.snapeda.com/parts/TCLD1000/Vishay/view-part</a>

For technical issues and product support, please contact [optocoupleranswers@vishay.com](mailto:optocoupleranswers@vishay.com).





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