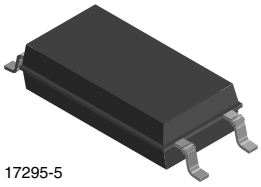
# Optocoupler, Photodarlington Output, SOP-4L, Long Mini-Flat Package



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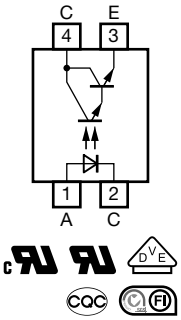



## FEATURES

- 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

Pb-free

e3

RoHS COMPLIANT

HALOGEN FREE

GREEN (5-2008)

## LINKS TO ADDITIONAL RESOURCES

Product Page | Design Tools | SPICE Models | Related Documents

## 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

- UL
- cUL
- DIN EN 60747-5-2 (VDE 0884)
- BSI
- FIMKO
- CQC GB4943.1
- CQC GB8898

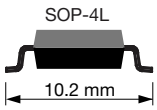
## APPLICATIONS

- 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

| T | C | L | D | 1 | 0 | 0 | 0 |
|---|---|---|---|---|---|---|---|

PART NUMBER




| AGENCY CERTIFIED / PACKAGE | CTR (%) |
|---|---|
| **UL, cUL, VDE, BSI** | **> 600** |
| SOP-4L, mini-flat, long | TCLD1000 |

| ABSOLUTE MAXIMUM RATINGS ($T_{amb}$ = 25 °C, unless otherwise specified) | | | | |
|---|---|---|---|---|
| **PARAMETER** | **TEST CONDITION** | **SYMBOL** | **VALUE** | **UNIT** |
| **INPUT** | | | | |
| Reverse voltage | | $V_R$ | 6 | V |
| Forward current | | $I_F$ | 60 | mA |
| Forward surge current | $t_p \leq 10$ µs | $I_{FSM}$ | 1.5 | A |
| Power dissipation | | $P_{diss}$ | 100 | mW |
| Junction temperature | | $T_j$ | 125 | °C |
| **OUTPUT** | | | | |
| Collector emitter voltage | | $V_{CEO}$ | 35 | V |
| Emitter collector voltage | | $V_{ECO}$ | 7 | V |
| Collector current | | $I_C$ | 80 | mA |
| Collector peak current | $t_p/T = 0.5$, $t_p \leq 10$ ms | $I_{CM}$ | 100 | mA |
| Power dissipation | | $P_{diss}$ | 150 | mW |
| Junction temperature | | $T_j$ | 125 | °C |
| **COUPLER** | | | | |
| 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 | °C |
| Storage temperature range | | $T_{stg}$ | -55 to +150 | °C |
| Soldering temperature [1] | | $T_{sld}$ | 260 | °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.

(1) Wave soldering three cycles are allowed. Also refer to “Assembly Instructions” (www.vishay.com/doc?80054).

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

**Note**

- Minimum and maximum values are tested requierements. 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 °C, unless otherwise specified) | | | | | | |
|---|---|---|---|---|---|---|
| **PARAMETER** | **TEST CONDITION** | **SYMBOL** | **MIN.** | **TYP.** | **MAX.** | **UNIT** |
| $I_C/I_F$ | $V_{CE}$ = 2 V, $I_F$ = 1 mA | CTR | 600 | 800 | - | % |

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

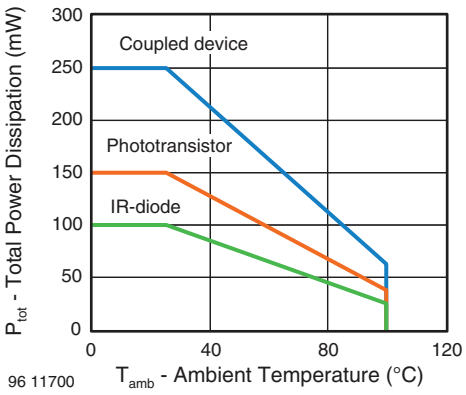



Fig. 1 - Derating Diagram

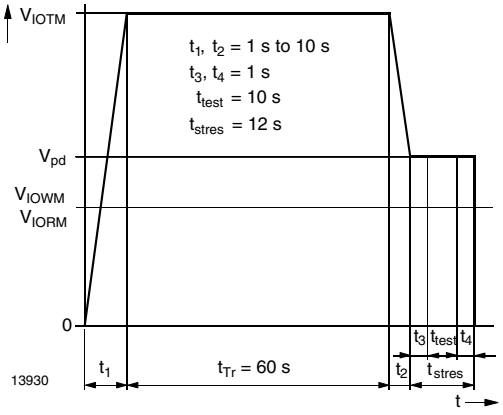



Fig. 2 - Test Pulse Diagram for Sample Test According to DIN EN 60747-5-2 (VDE 0884); IEC 60747-5-5

| SWITCHING CHARACTERISTICS ($T_{amb}$ = 25 °C, unless otherwise specified) | | | | | | |
|---|---|---|---|---|---|---|
| **PARAMETER** | **TEST CONDITION** | **SYMBOL** | **MIN.** | **TYP.** | **MAX.** | **UNIT** |
| Rise time | $V_{CE}$ = 2 V, $I_C$ = 10 mA, $R_L$ = 100 Ω (see Fig. 3) | $t_r$ | - | 300 | - | µs |
| Turn-off time | $V_{CE}$ = 2 V, $I_C$ = 10 mA, $R_L$ = 100 Ω (see Fig. 3) | $t_{off}$ | - | 250 | - | µs |

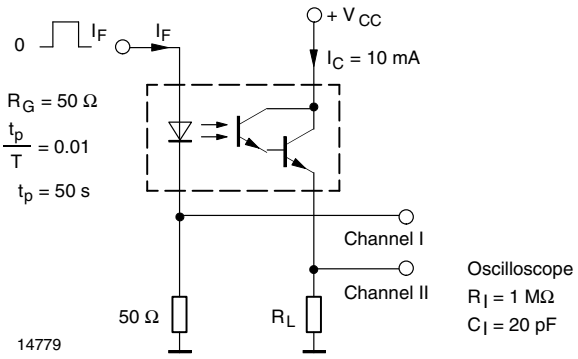



Fig. 3 - Test Circuit, Non-Saturated Operation

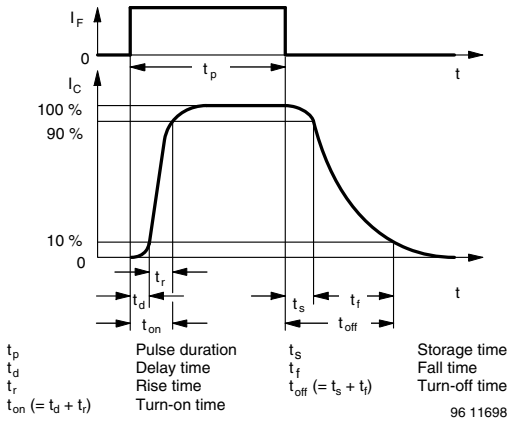



Fig. 4 - Switching Times

## TYPICAL CHARACTERISTICS ($T_{amb}$ = 25 °C, unless otherwise specified)

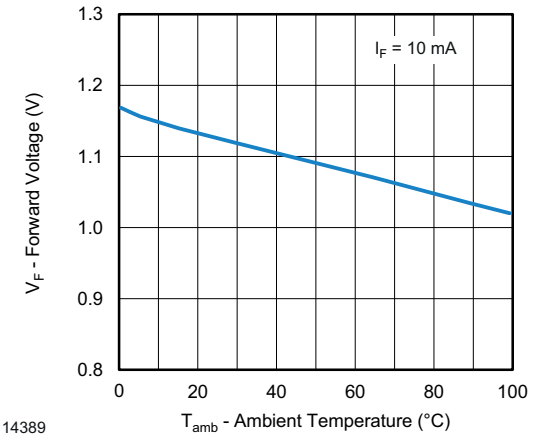



Fig. 5 - Forward Voltage vs. Ambient Temperature

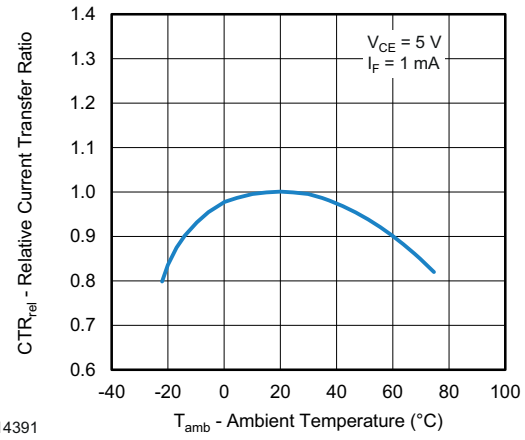



Fig. 7 - Relative Current Transfer Ratio vs. Ambient Temperature

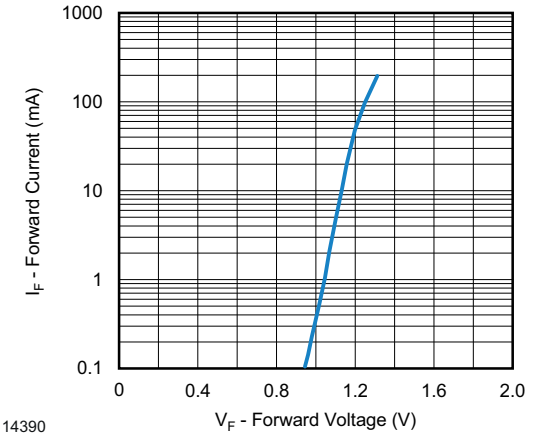



Fig. 6 - Forward Current vs. Forward Voltage

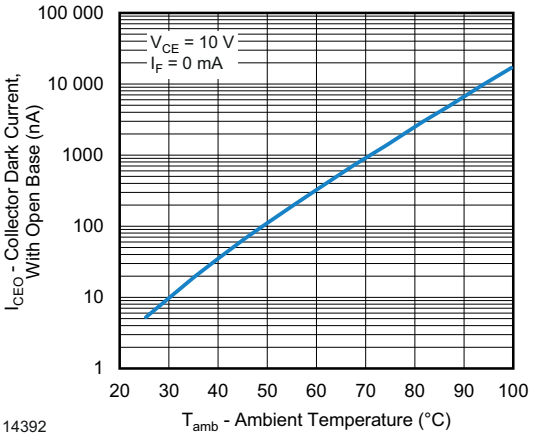



Fig. 8 - Collector Dark Current vs. Ambient Temperature

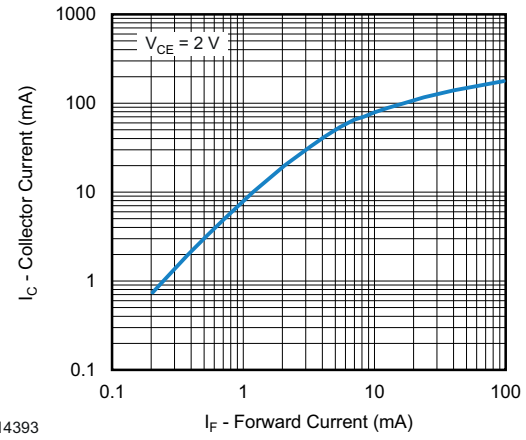



Fig. 9 - Collector Current vs. Forward Current

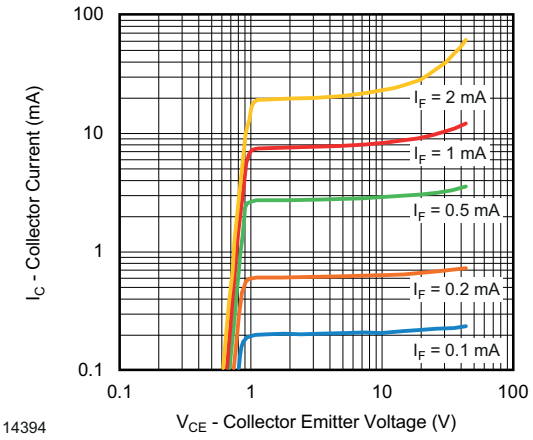
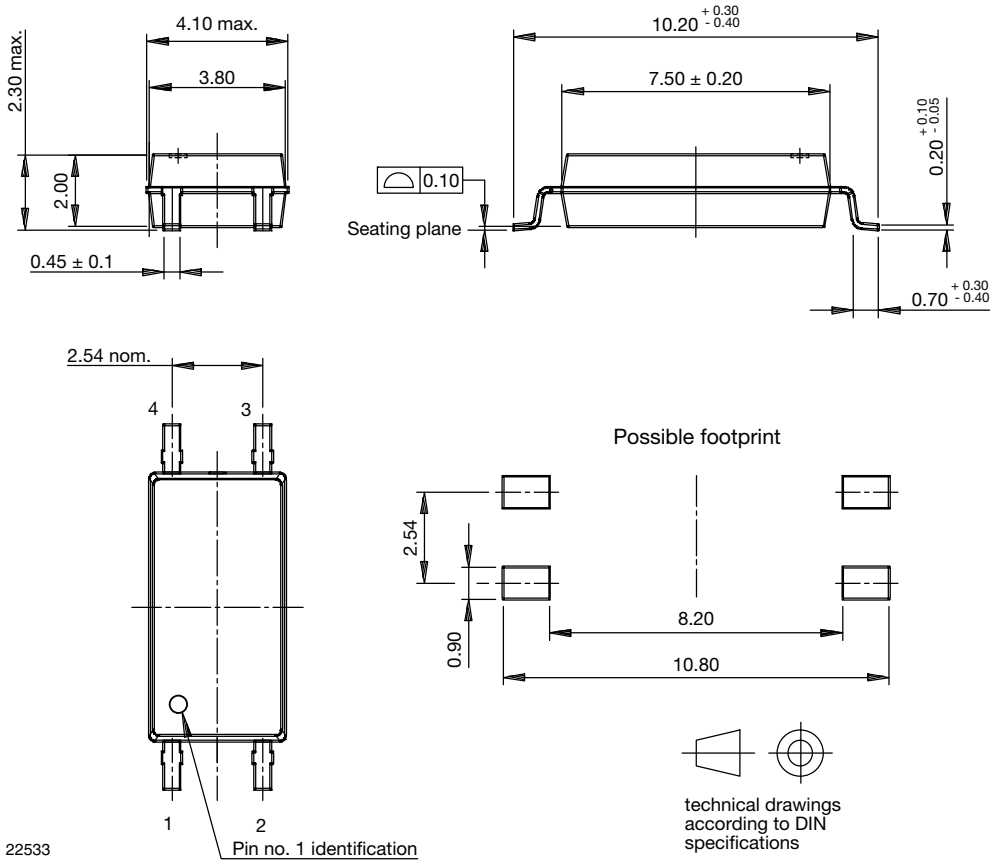
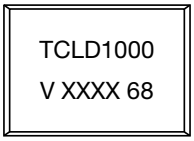



Fig. 10 - Collector Current vs. Collector Emitter Voltage

## **PACKAGE DIMENSIONS** in millimeters



## PACKAGE MARKING




**Note**

- XXXX = LMC (lot marking code)

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