



# Optocoupler, Phototransistor Output, SOP-6L5, Half Pitch, Long Mini-Flat Package



17295-1



### FEATURES

- SMD low profile 5 pin package
- Isolation test voltage 5000 V<sub>RMS</sub>
- CTR flexibility available see order information
- Special construction
- Extra low coupling capacitance
- Connected base
- DC input with transistor output
- Creepage distance > 8 mm
- Compliant to RoHS Directive 2002/95/EC and in accordance to WEEE 2002/96/EC



RoHS COMPLIANT

### DESCRIPTION

The TCLT110. series consists of a phototransistor optically coupled to a gallium arsenide infrared-emitting diode in a 5-lead SOP-6L package.

### APPLICATIONS

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

### AGENCY APPROVALS

- UL1577, file no. E76222
- CSA E76222 22.2 bulletin 5A
- BSI IEC 60950 IEC 60065
- DIN EN 60747-5-2 (VDE 0884)/DIN EN 60747-5-5 (pending), available with option 1
- FIMKO

### Note

- See the safety standard approval list "Agency Table" for more detailed information.

| 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;">T</div> <div style="border: 1px solid black; padding: 2px 5px;">1</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;">#</div> </div> <p style="text-align: center; margin-top: 5px;">PART NUMBER</p> |           |           |            |            |           |            |  |            |            |
| AGENCY CERTIFIED/PACKAGE  | CTR (%)   |           |            |            |           |            |   |            |            |
|   | 5 mA      |           |            | 10 mA      |           |            | 5 mA  |            |            |
| UL, cUL, VDE, BSI, FIMKO  | 50 to 600 | 63 to 125 | 100 to 200 | 160 to 320 | 50 to 150 | 100 to 300 | 80 to 160   | 130 to 260 | 200 to 400 |
| SOP-6L5   | TCLT1100  | TCLT1102  | TCLT1103   | TCLT1104   | TCLT1105  | TCLT1106   | TCLT1107  | TCLT1108   | TCLT1109   |



| <b>ABSOLUTE MAXIMUM RATINGS</b> ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , 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           | $^{\circ}\text{C}$ |
| <b>OUTPUT</b>  |                                      |            |               |                    |
| 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           | $^{\circ}\text{C}$ |
| <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 + 125 | $^{\circ}\text{C}$ |
| 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 Instruction" ([www.vishay.com/doc?80054](http://www.vishay.com/doc?80054)).

| <b>ELECTRICAL CHARACTERISTICS</b> ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified) |  |             |      |      |      |      |
|--|--|-------------|------|------|------|------|
| PARAMETER  | TEST CONDITION   | SYMBOL      | MIN. | TYP. | MAX. | UNIT |
| <b>INPUT</b>   |  |             |      |      |      |      |
| Forward voltage  | $I_F = \pm 50\text{ mA}$   | $V_F$       |      | 1.25 | 1.6  | V    |
| Junction capacitance   | $V_R = 0\text{ V}, f = 1\text{ MHz}$                               | $C_j$       |      | 50   |      | pF   |
| <b>OUTPUT</b>  |  |             |      |      |      |      |
| 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 leakage current  | $V_{CE} = 20\text{ V}, I_F = 0\text{ A}$                           | $I_{CEO}$   |      | 10   | 100  | nA   |
| <b>COUPLER</b>   |  |             |      |      |      |      |
| Collector emitter saturation voltage   | $I_F = 10\text{ mA}, I_C = 1\text{ mA}$                            | $V_{CEsat}$ |      |      | 0.3  | V    |
| Cut-off frequency  | $V_{CE} = 5\text{ V}, I_F = 10\text{ mA}, R_L = 100\text{ }\Omega$ | $f_c$       |      | 110  |      | kHz  |
| Coupling capacitance   | $f = 1\text{ MHz}$   | $C_k$       |      | 0.3  |      | pF   |

**Note**

- 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.

| CURRENT TRANSFER RATIO ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified) |   |          |        |      |      |      |      |
|---|---|----------|--------|------|------|------|------|
| PARAMETER   | TEST CONDITION                            | PART     | SYMBOL | MIN. | TYP. | MAX. | UNIT |
| $I_C/I_F$   | $V_{CE} = 5\text{ V}, I_F = 5\text{ mA}$  | TCLT1100 | CTR    | 50   |      | 600  | %    |
|   |   | TCLT1102 | CTR    | 63   |      | 125  | %    |
|   | $V_{CE} = 5\text{ V}, I_F = 10\text{ mA}$ | TCLT1103 | CTR    | 100  |      | 200  | %    |
|   |   | TCLT1104 | CTR    | 160  |      | 320  | %    |
|   | $V_{CE} = 5\text{ V}, I_F = 1\text{ mA}$  | TCLT1102 | CTR    | 22   | 45   |      | %    |
|   |   | TCLT1103 | CTR    | 34   | 70   |      | %    |
|   |   | TCLT1104 | CTR    | 56   | 100  |      | %    |
|   | $V_{CE} = 5\text{ V}, I_F = 5\text{ mA}$  | TCLT1105 | CTR    | 50   |      | 150  | %    |
|   |   | TCLT1106 | CTR    | 100  |      | 300  | %    |
|   |   | TCLT1107 | CTR    | 80   |      | 160  | %    |
| TCLT1108  |   | CTR      | 130    |      | 260  | %    |      |
| TCLT1109  |   | CTR      | 200    |      | 400  | %    |      |

| SAFETY AND INSULATION RATED PARAMETERS                  |  |            |           |      |      |                    |
|---|--|------------|-----------|------|------|--------------------|
| PARAMETER   | TEST CONDITION   | SYMBOL     | MIN.      | TYP. | MAX. | UNIT               |
| Partial discharge test voltage - routine test           | 100 %, $t_{test} = 1\text{ s}$   | $V_{pd}$   | 2.0       |      |      | kV                 |
| Partial discharge test voltage - lot test (sample test) | $t_{Tr} = 60\text{ s}, t_{test} = 10\text{ s}$ ,<br>(see figure 2)                         | $V_{IOTM}$ | 8         |      |      | kV                 |
|   |  | $V_{pd}$   | 1.68      |      |      | kV                 |
| Insulation resistance                                   | $V_{IO} = 500\text{ V}$  | $R_{IO}$   | $10^{12}$ |      |      | $\Omega$           |
|   | $V_{IO} = 500\text{ V}, T_{amb} = 100\text{ }^{\circ}\text{C}$                             | $R_{IO}$   | $10^{11}$ |      |      | $\Omega$           |
|   | $V_{IO} = 500\text{ V}, T_{amb} = 150\text{ }^{\circ}\text{C}$<br>(construction test only) | $R_{IO}$   | $10^9$    |      |      | $\Omega$           |
| Forward current   |  | $I_{si}$   | 130       |      |      | mA                 |
| Power dissipation                                       |  | $P_{so}$   | 265       |      |      | mW                 |
| Rated impulse voltage                                   |  | $V_{IOTM}$ | 8         |      |      | kV                 |
| Safety temperature                                      |  | $T_{si}$   | 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 ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified) |   |           |      |      |      |               |
|--|---|-----------|------|------|------|---------------|
| PARAMETER  | TEST CONDITION  | SYMBOL    | MIN. | TYP. | MAX. | UNIT          |
| Delay time   | $V_S = 5\text{ V}$ , $I_C = 2\text{ mA}$ , $R_L = 100\text{ }\Omega$ , (see figure 3) | $t_d$     |      | 3.0  |      | $\mu\text{s}$ |
| Rise time  | $V_S = 5\text{ V}$ , $I_C = 2\text{ mA}$ , $R_L = 100\text{ }\Omega$ , (see figure 3) | $t_r$     |      | 3.0  |      | $\mu\text{s}$ |
| Turn-on time   | $V_S = 5\text{ V}$ , $I_C = 2\text{ mA}$ , $R_L = 100\text{ }\Omega$ , (see figure 3) | $t_{on}$  |      | 6.0  |      | $\mu\text{s}$ |
| Storage time   | $V_S = 5\text{ V}$ , $I_C = 2\text{ mA}$ , $R_L = 100\text{ }\Omega$ , (see figure 3) | $t_s$     |      | 0.3  |      | $\mu\text{s}$ |
| Fall time  | $V_S = 5\text{ V}$ , $I_C = 2\text{ mA}$ , $R_L = 100\text{ }\Omega$ , (see figure 3) | $t_f$     |      | 4.7  |      | $\mu\text{s}$ |
| Turn-off time  | $V_S = 5\text{ V}$ , $I_C = 2\text{ mA}$ , $R_L = 100\text{ }\Omega$ , (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

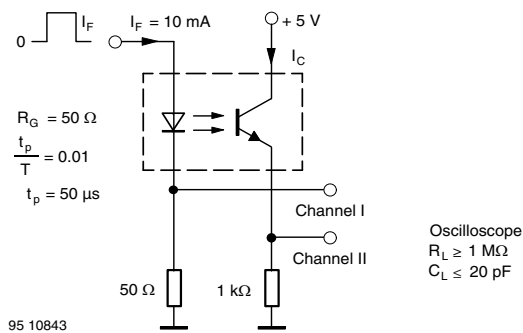
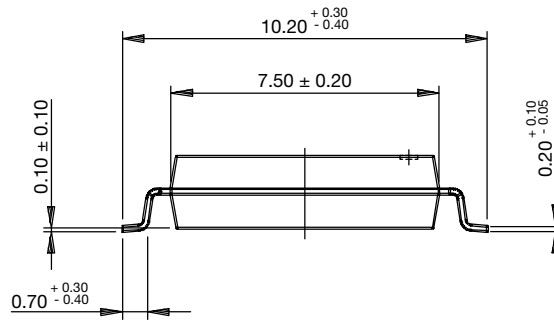


Fig. 4 - Test Circuit, Saturated Operation



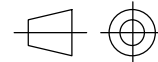
**PACKAGE DIMENSIONS** in millimeters



22534

Pin no. 1 identification

Possible footprint



technical drawings  
according to DIN  
specifications

**PACKAGE MARKING**





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