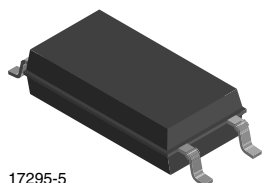
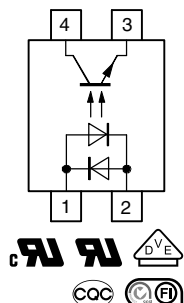


Optocoupler, Phototransistor Output, AC Input, SOP-4L, Long Mini-Flat Package



17295-5



FEATURES

- Low profile package
- Extra low coupling capacity - typical 0.2 pF
- High common mode rejection
- AC input
- Creepage current resistance according to VDE 0303 / IEC 60112 comparative tracking index: CTI \geq 175
- Creepage distance $>$ 8 mm
- Material categorization:
for definitions of compliance please see www.vishay.com/doc?99912



RoHS
COMPLIANT
HALOGEN
FREE
GREEN
(5-2008)

LINKS TO ADDITIONAL RESOURCES



Product Page



Design Tools

SPICE

Models



Related Documents

DESCRIPTION

The TCLT1600 consists of a phototransistor optically coupled to 2 gallium arsenide infrared-emitting diodes in an SOP 4-pin wide body package.

AGENCY APPROVALS

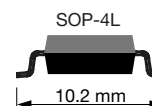
- [UL](#)
- [cUL](#)
- [DIN EN 60747-5-5 \(VDE 0884-5\)](#)
- [BSI](#)
- [FIMKO](#)
- [CQC GB4943.1](#)
- [CQC GB8898](#)

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 \leq 300 V
- for appl. class I to III at mains voltage \leq 600 V according to DIN EN 60747-5-2 (VDE 0884)

ORDERING INFORMATION

| | | | | | | | |
|-------------|---|---|---|---|---|---|---|
| T | C | L | T | 1 | 6 | 0 | 0 |
| PART NUMBER | | | | | | | |



| AGENCY CERTIFIED / PACKAGE | CTR (%) |
|----------------------------|-----------|
| UL, cUL, VDE, BSI | 80 to 300 |
| SOP-4L, miniflat, long | TCLT1600 |



| ABSOLUTE MAXIMUM RATINGS ($T_{amb} = 25\text{ }^{\circ}\text{C}$, unless otherwise specified) | | | | |
|--|--------------------------------------|------------|-------------|--------------------|
| PARAMETER | TEST CONDITION | SYMBOL | VALUE | UNIT |
| INPUT | | | | |
| 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 | | | | |
| 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 | | | | |
| 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 ⁽¹⁾ | | 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.

⁽¹⁾ Wave soldering three cycles are allowed. Also refer to "Assembly Instruction" (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 |
| INPUT | | | | | | |
| 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 | | | | | | |
| 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 |
| COUPLER | | | | | | |
| Collector emitter saturation voltage | $I_F = \pm 10\text{ mA}, I_C = 1\text{ mA}$ | V_{CEsat} | - | - | 0.3 | V |
| Cut-off frequency | $V_{CE} = 5\text{ V}, I_F = \pm 10\text{ mA}, R_L = 100\text{ }\Omega$ | f_c | - | 110 | - | kHz |
| Coupling capacitance | $f = 1\text{ MHz}$ | C_k | - | 0.3 | - | pF |

Note

- Minimum and maximum values are 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 | $V_{CE} = 5\text{ V}, I_F = \pm 5\text{ mA}$ | CTR | 80 | - | 300 | % |

| SAFETY AND INSULATION RATINGS | | | | |
|---|---|------------|-----------|------------------|
| PARAMETER | TEST CONDITION | SYMBOL | VALUE | 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 Fig. 2) | V_{IOTM} | 8 | kV |
| | | V_{pd} | 1.68 | kV |
| Isolation test voltage (RMS) | | V_{ISO} | 5000 | V _{RMS} |
| 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 | | | 8.00 | mm |
| Creepage distance | | | 8.00 | mm |
| Insulation distance (internal) | | | 0.40 | mm |

Note

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

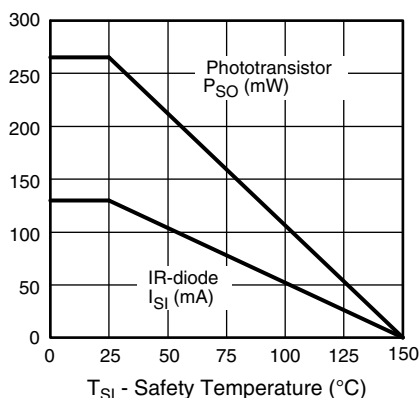


Fig. 1 - Derating Diagram

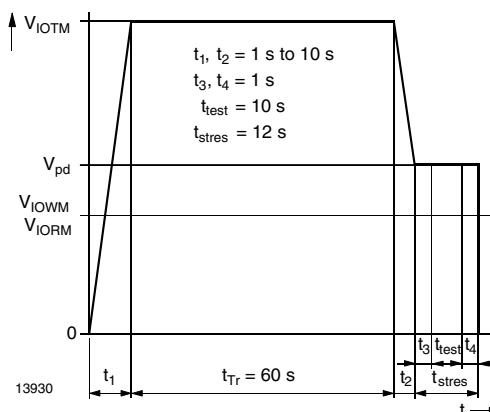


Fig. 2 - Test Pulse Diagram for Sample Test according to DIN EN 60747-5-2; IEC60747-5-5

| SWITCHING CHARACTERISTICS ($T_{amb} = 25$ °C, unless otherwise specified) | | | | | | |
|--|---|-----------|------|------|------|---------|
| PARAMETER | TEST CONDITION | SYMBOL | MIN. | TYP. | MAX. | UNIT |
| Delay time | $V_S = 5$ V, $I_C = 2$ mA, $R_L = 100$ Ω , (see Fig. 3) | t_d | - | 3 | - | μ s |
| Rise time | $V_S = 5$ V, $I_C = 2$ mA, $R_L = 100$ Ω , (see Fig. 3) | t_r | - | 3 | - | μ s |
| Turn-on time | $V_S = 5$ V, $I_C = 2$ mA, $R_L = 100$ Ω , (see Fig. 3) | t_{on} | - | 6 | - | μ s |
| Storage time | $V_S = 5$ V, $I_C = 2$ mA, $R_L = 100$ Ω , (see Fig. 3) | t_s | - | 0.3 | - | μ s |
| Fall time | $V_S = 5$ V, $I_C = 2$ mA, $R_L = 100$ Ω , (see Fig. 3) | t_f | - | 4.7 | - | μ s |
| Turn-off time | $V_S = 5$ V, $I_C = 2$ mA, $R_L = 100$ Ω , (see Fig. 3) | t_{off} | - | 5 | - | μ s |
| Turn-on time | $V_S = 5$ V, $I_F = 10$ mA, $R_L = 1$ k Ω , (see Fig. 4) | t_{on} | - | 9 | - | μ s |
| Turn-off time | $V_S = 5$ V, $I_F = 10$ mA, $R_L = 1$ k Ω , (see Fig. 4) | t_{off} | - | 10 | - | μ s |

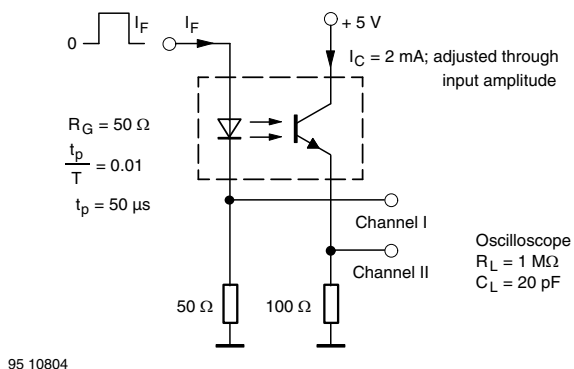


Fig. 3 - Test Circuit, Non-Saturated Operation

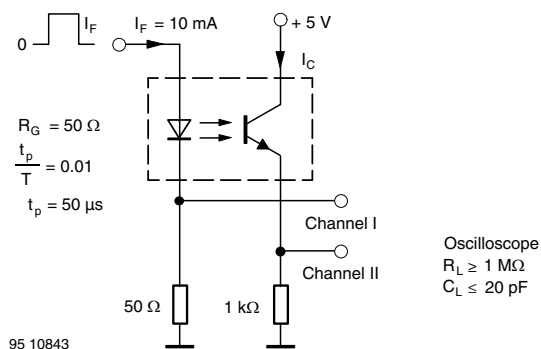


Fig. 4 - Test Circuit, Saturated Operation

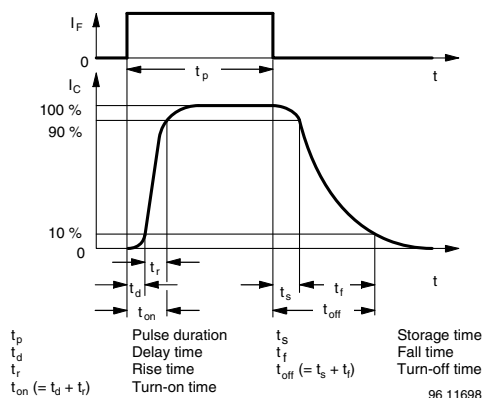
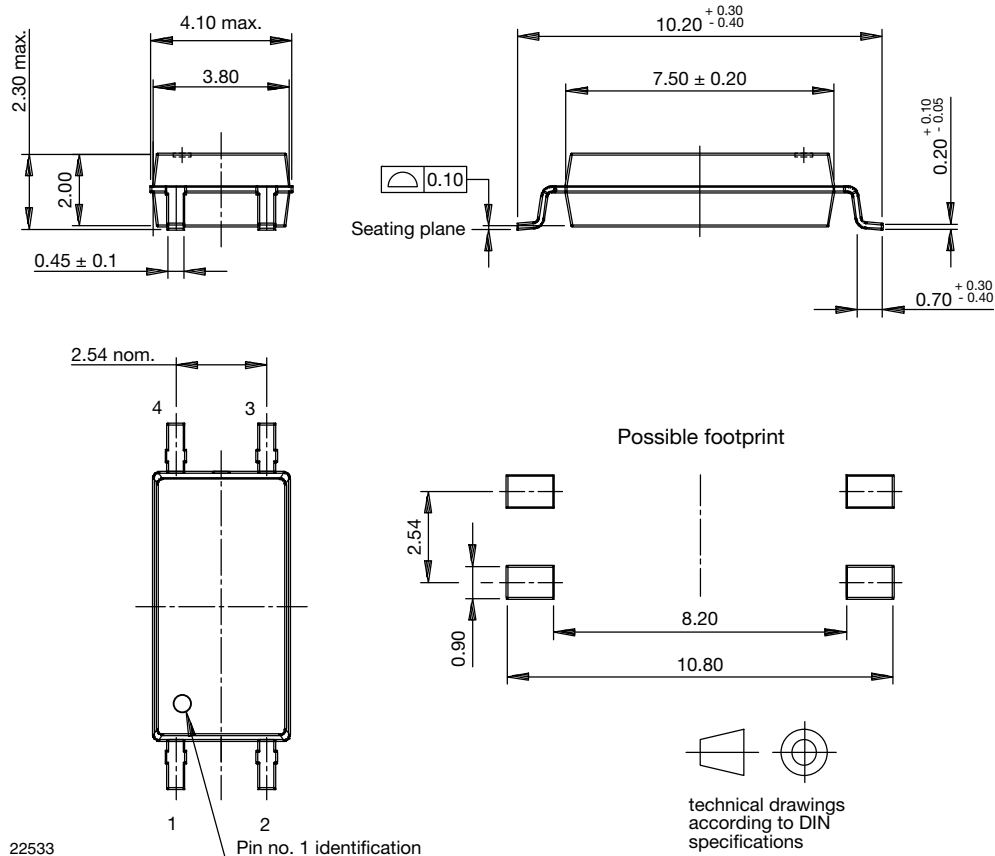
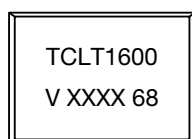


Fig. 5 - Switching Times

PACKAGE DIMENSIONS (in millimeters)

PACKAGE MARKING

Note

- XXXX = LMC (lot marking code)

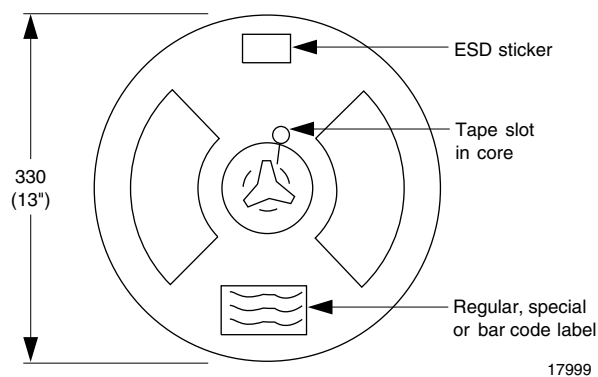
TAPE AND REEL DIMENSIONS (in millimeters)


Fig. 6 - Reel Dimensions (3000 units per reel)

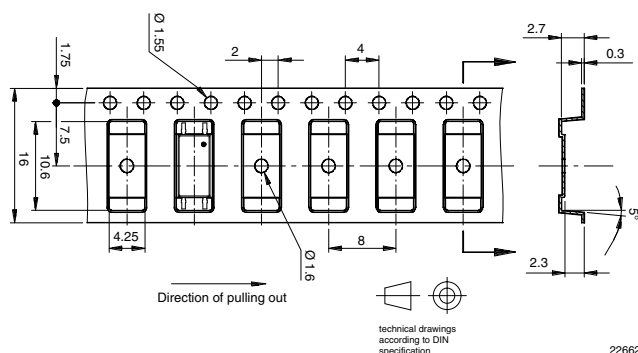
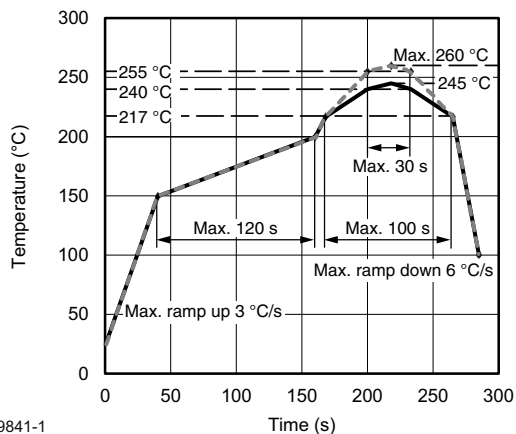


Fig. 7 - Tape Dimensions



SOLDER PROFILE



19841-1

Fig. 8 - Lead (Pb)-free Reflow Solder Profile according to J-STD-020

HANDLING AND STORAGE CONDITIONS

ESD level: HBM class 2

Floor life: unlimited

Conditions: $T_{amb} < 30\text{ °C}$, RH < 85 %

Moisture sensitivity level 1, according to J-STD-020



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