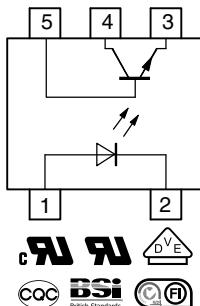
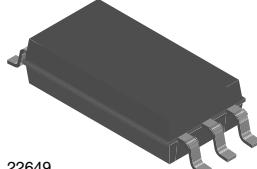


Optocoupler, Phototransistor Output, SOP-6L5, 110 °C Rated, Half Pitch, Long Mini-Flat Package



RoHS
COMPLIANT
HALOGEN
FREE
GREEN
(5-2008)

DESCRIPTION

The TCLT111. 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

FEATURES

- SMD low profile 5 pin package
- Isolation test voltage 5000 V_{RMS}
- CTR flexibility available see order information
- Special construction
- Extra low coupling capacitance
- Connected base
- DC input with transistor output
- Temperature range -55 °C to 110 °C
- Creepage distance > 8 mm
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

AGENCY APPROVALS

- UL1577, file no. E76222
- cUL - file no. E76222, equivalent to CSA 22.2 bulletin 5A
- DIN EN 60747-5-5 (VDE 0884-5)
- FIMKO
- BSI
- CQC

ORDERING INFORMATION

| | | | | | | | | | | |
|---------------------------------|-----------|----------|-----------|------------|------------|-----------|------------|--------------------|------------|------------|
| T | C | L | T | 1 | 1 | 1 | # | SOP-6L5 10.2 mm | | |
| PART NUMBER | | | | | | | | | | |
| AGENCY CERTIFIED/ PACKAGE | CTR (%) | | | | | | | | | |
| 5 mA | 10 mA | | | 5 mA | | | | | | |
| UL, cUL, VDE, FIMKO, CQC | 50 to 600 | 40 to 80 | 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 | TCLT1110 | TCLT1111 | TCLT1112 | TCLT1113 | TCLT1114 | TCLT1115 | TCLT1116 | TCLT1117 | TCLT1118 | TCLT1119 |

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 ≤ 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} | 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 ≤ 10 ms | I _{CM} | 100 | mA |
| Power dissipation | | P _{diss} | 150 | mW |
| Junction temperature | | T _j | 125 | °C |

| ABSOLUTE MAXIMUM RATINGS ($T_{amb} = 25^\circ C$, unless otherwise specified) | | | | |
|--|----------------|-----------|-------------|------|
| PARAMETER | TEST CONDITION | SYMBOL | VALUE | UNIT |
| COUPLER | | | | |
| Total power dissipation | | P_{tot} | 250 | mW |
| Operating ambient temperature range | | T_{amb} | -55 to +110 | °C |
| Storage temperature range | | T_{stg} | -55 to +125 | °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 Rating 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 ($T_{amb} = 25^\circ C$, unless otherwise specified) | | | | | | |
|--|---|-------------|------|------|------|------|
| PARAMETER | TEST CONDITION | SYMBOL | MIN. | TYP. | MAX. | UNIT |
| input | | | | | | |
| Forward voltage | $I_F = 50 \text{ mA}$ | 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} | 80 | - | - | V |
| Emitter collector voltage | $I_E = 100 \mu\text{A}$ | 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 | $I_F = 10 \text{ mA}, I_C = 1 \text{ mA}$ | 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 |

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 ($T_{amb} = 25^\circ C$, unless otherwise specified) | | | | | | | |
|--|---|----------|--------|------|------|------|------|
| PARAMETER | TEST CONDITION | PART | SYMBOL | MIN. | TYP. | MAX. | UNIT |
| I_C/I_F | $V_{CE} = 5 \text{ V}, I_F = 5 \text{ mA}$ | TCLT1110 | CTR | 50 | - | 600 | % |
| | | TCLT1111 | CTR | 40 | - | 80 | % |
| | | TCLT1112 | CTR | 63 | - | 125 | % |
| | | TCLT1113 | CTR | 100 | - | 200 | % |
| | | TCLT1114 | CTR | 160 | - | 320 | % |
| | $V_{CE} = 5 \text{ V}, I_F = 10 \text{ mA}$ | TCLT1111 | CTR | 13 | 30 | - | % |
| | | TCLT1112 | CTR | 22 | 45 | - | % |
| | | TCLT1113 | CTR | 34 | 70 | - | % |
| | | TCLT1114 | CTR | 56 | 100 | - | % |
| | $V_{CE} = 5 \text{ V}, I_F = 1 \text{ mA}$ | TCLT1115 | CTR | 50 | - | 150 | % |
| | | TCLT1116 | CTR | 100 | - | 300 | % |
| | | TCLT1117 | CTR | 80 | - | 160 | % |
| | | TCLT1118 | CTR | 130 | - | 260 | % |
| | | TCLT1119 | CTR | 200 | - | 400 | % |

SAFETY AND INSULATION RATINGS

| PARAMETER | TEST CONDITION | SYMBOL | VALUE | UNIT |
|---|--|------------|----------------|------------|
| Tested withstanding isolation voltage | According to UL1577, $t = 1$ s | V_{ISO} | 5000 | V_{RMS} |
| Maximum transient isolation voltage | According to DIN EN 60747-5-5 | V_{IOTM} | 8000 | V_{peak} |
| Maximum repetitive peak isolation voltage | According to DIN EN 60747-5-5 | V_{IORM} | 890 | V_{peak} |
| Partial discharge test voltage - lot test (sample test) | $t_{Tr} = 60$ s, $t_{test} = 10$ s, (see figure 2) | V_{pd} | 13 000 | V |
| Isolation resistance | $T_{amb} = 25$ °C, $V_{IO} = 500$ V | R_{IO} | $\geq 10^{12}$ | Ω |
| | $T_{amb} = 100$ °C, $V_{IO} = 500$ V | R_{IO} | $\geq 10^{11}$ | Ω |
| | $T_{amb} = 150$ °C, $V_{IO} = 500$ V (construction test only) | R_{IO} | $\geq 10^9$ | Ω |
| Output safety power | | P_{SO} | 265 | mW |
| Input safety current | | I_{SI} | 130 | mA |
| Input safety temperature | | T_S | 150 | °C |
| Creepage distance | DIP-6, option 6 | | ≥ 8 | mm |
| Clearance distance | DIP-6, option 6 | | ≥ 8 | mm |
| Insulation distance (internal) | | | 0.75 | mm |

Note

- As per IEC 60747-5-5, § 7.4.3.8.2, this optocoupler is suitable for “safe electrical insulation” only within the safety ratings. Compliance with the safety ratings shall be ensured by means of protective circuits.

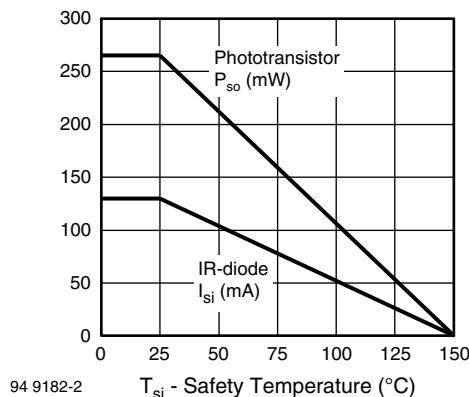


Fig. 1 - Derating Diagram

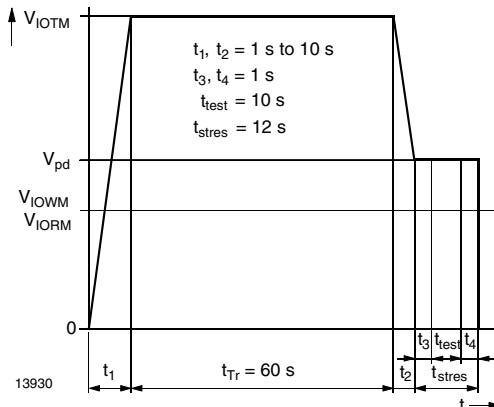
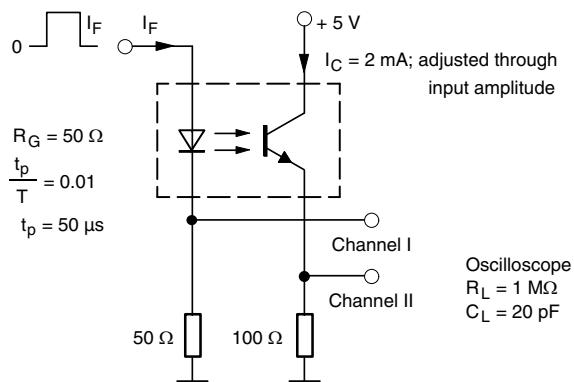


Fig. 2 - Test Pulse Diagram for Sample Test According to DIN EN 60747-5-5 (VDE 0884-5); IEC 60747-5-5

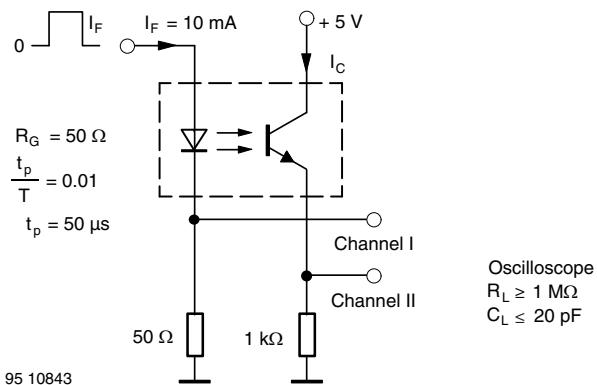
SWITCHING CHARACTERISTICS ($T_{amb} = 25$ °C, unless otherwise specified)

| PARAMETER | TEST CONDITION | SYMBOL | MIN. | TYP. | MAX. | UNIT |
|---------------|--|-----------|------|------|------|------|
| Delay time | $V_S = 5$ V, $I_C = 2$ mA, $R_L = 100$ Ω, (see figure 3) | t_d | - | 3 | - | μs |
| Rise time | $V_S = 5$ V, $I_C = 2$ mA, $R_L = 100$ Ω, (see figure 3) | t_r | - | 3 | - | μs |
| Fall time | $V_S = 5$ V, $I_C = 2$ mA, $R_L = 100$ Ω, (see figure 3) | t_f | - | 4.7 | - | μs |
| Storage time | $V_S = 5$ V, $I_C = 2$ mA, $R_L = 100$ Ω, (see figure 3) | t_s | - | 0.3 | - | μs |
| Turn-on time | $V_S = 5$ V, $I_C = 2$ mA, $R_L = 100$ Ω, (see figure 3) | t_{on} | - | 6 | - | μs |
| Turn-off time | $V_S = 5$ V, $I_C = 2$ mA, $R_L = 100$ Ω, (see figure 3) | t_{off} | - | 5 | - | μs |
| Turn-on time | $V_S = 5$ V, $I_F = 10$ mA, $R_L = 1$ kΩ, (see figure 4) | t_{on} | - | 9 | - | μs |
| Turn-off time | $V_S = 5$ V, $I_F = 10$ mA, $R_L = 1$ kΩ, (see figure 4) | t_{off} | - | 10 | - | μs |



95 10804

Fig. 3 - Test Circuit, Non-Saturated Operation



95 10843

Fig. 4 - Test Circuit, Saturated Operation

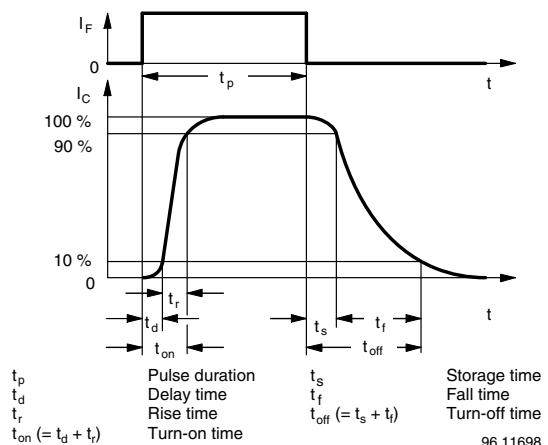


Fig. 5 - Switching Times

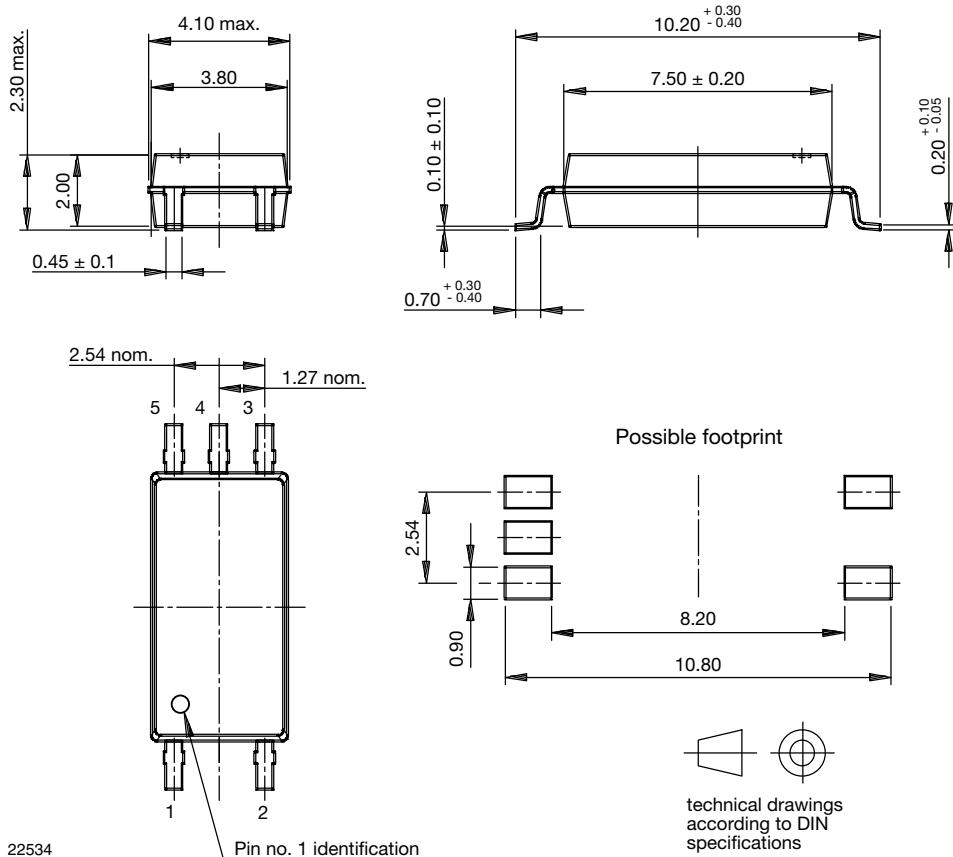
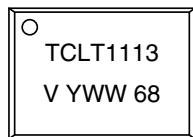
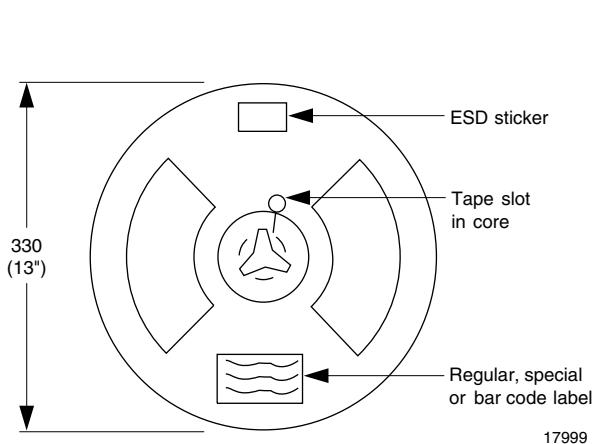
PACKAGE DIMENSIONS in millimeters

PACKAGE MARKING

TAPE AND REEL DIMENSIONS (in millimeters)


Fig. 6 - Reel Dimensions

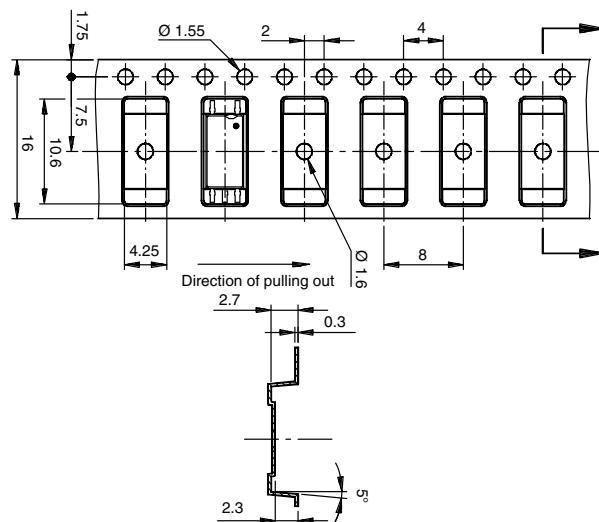


Fig. 7 - Tape Packing

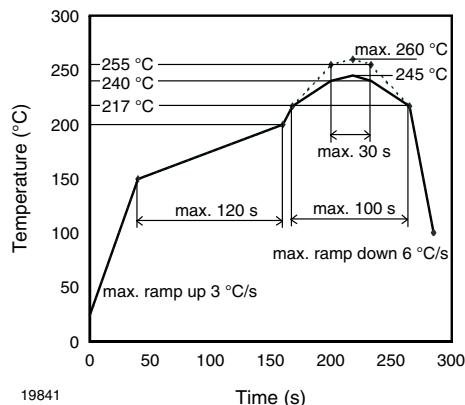
SOLDER PROFILE


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: $T_{amb} < 30^{\circ}\text{C}$, RH < 85 %

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

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