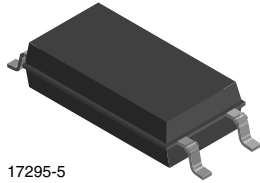
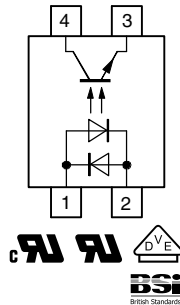


Optocoupler, Phototransistor Output, AC Input, SOP-4L, Long Mini-Flat Package



17295-5



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

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

FEATURES

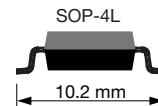
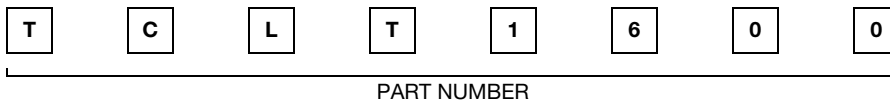
- Low profile package
- Extra low coupling capacity - typical 0.2 pF
- High common mode rejection
- AC input
- Creepage current resistance according to VDE 0303/IEC 60112 comparative tracking index: CTI \geq 175
- Creepage distance $>$ 8 mm
- Material categorization: for definitions of compliance please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



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



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 figure 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 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.

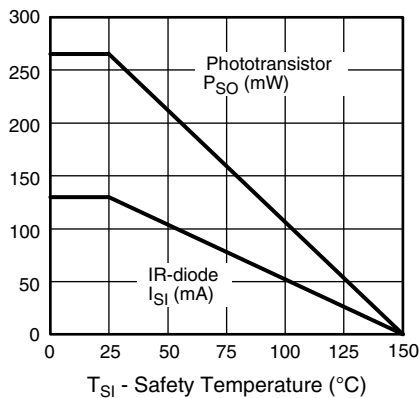


Fig. 1 - Derating Diagram

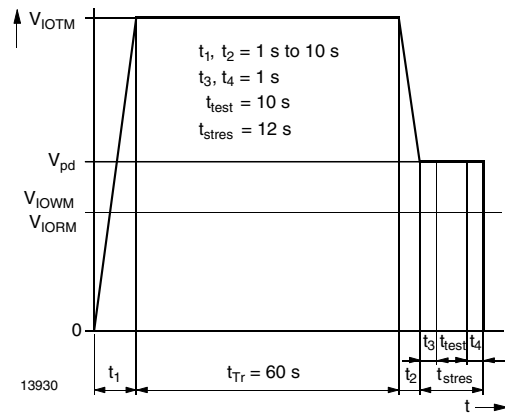
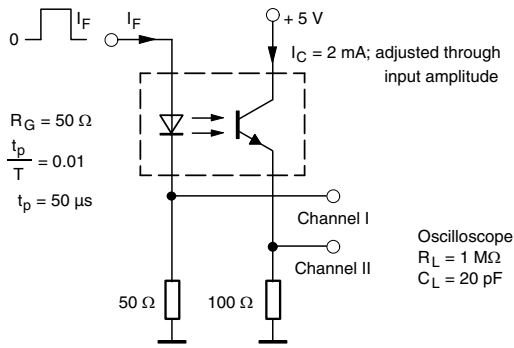


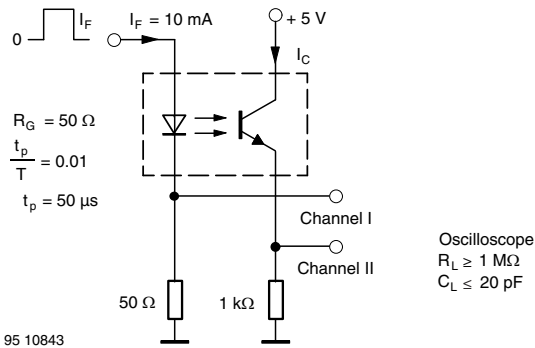
Fig. 2 - Test Pulse Diagram for Sample Test according to DIN EN 60747-5-2; IEC60747-5-5

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 figure 3)	t_d	-	3	-	μ s
Rise time	$V_S = 5$ V, $I_C = 2$ mA, $R_L = 100$ Ω , (see figure 3)	t_r	-	3	-	μ s
Turn-on time	$V_S = 5$ V, $I_C = 2$ mA, $R_L = 100$ Ω , (see figure 3)	t_{on}	-	6	-	μ s
Storage time	$V_S = 5$ V, $I_C = 2$ mA, $R_L = 100$ Ω , (see figure 3)	t_s	-	0.3	-	μ s
Fall time	$V_S = 5$ V, $I_C = 2$ mA, $R_L = 100$ Ω , (see figure 3)	t_f	-	4.7	-	μ s
Turn-off time	$V_S = 5$ V, $I_C = 2$ mA, $R_L = 100$ Ω , (see figure 3)	t_{off}	-	5	-	μ s
Turn-on time	$V_S = 5$ V, $I_F = 10$ mA, $R_L = 1$ k Ω , (see figure 4)	t_{on}	-	9	-	μ s
Turn-off time	$V_S = 5$ V, $I_F = 10$ mA, $R_L = 1$ k Ω , (see figure 4)	t_{off}	-	10	-	μ s



95 10804

Fig. 3 - Test Circuit, Non-Saturated Operation



95 10843

Fig. 4 - Test Circuit, Saturated Operation

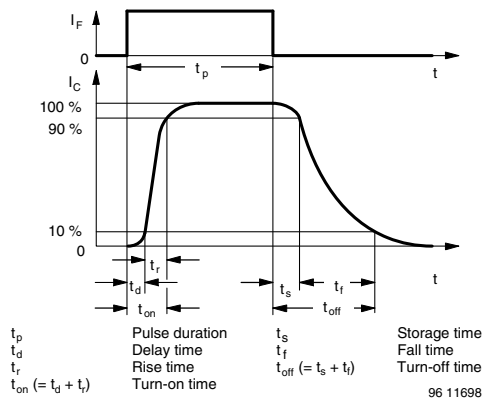
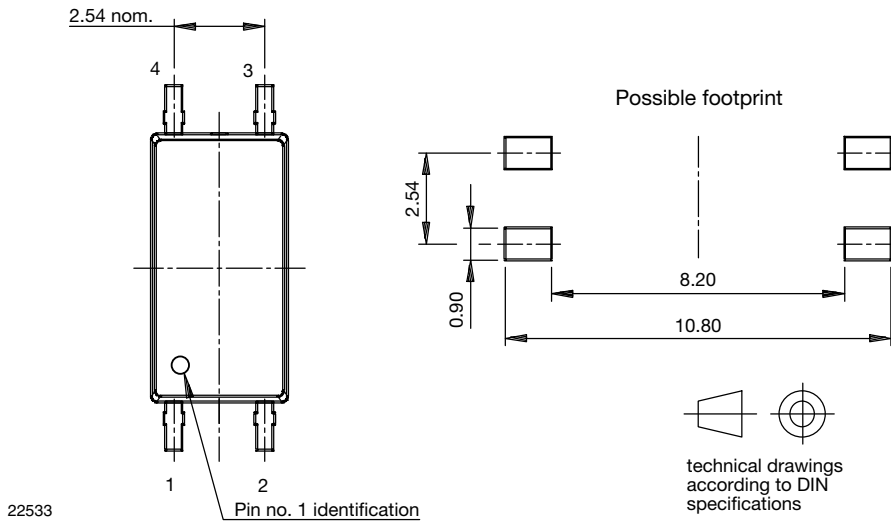
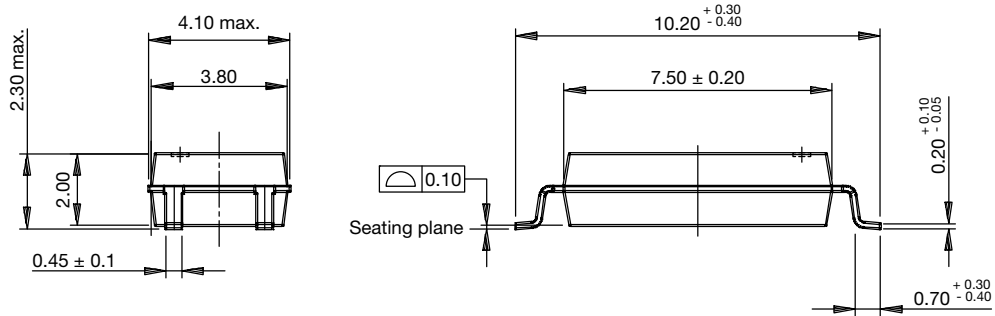
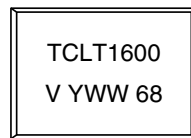


Fig. 5 - Switching Times

PACKAGE DIMENSIONS (in millimeters)



PACKAGE MARKING



TAPE AND REEL DIMENSIONS (in millimeters)

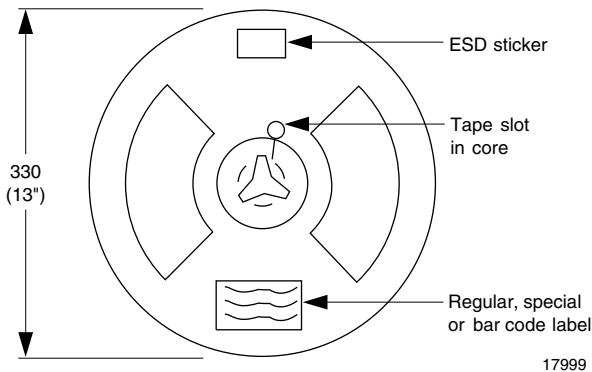


Fig. 6 - Reel Dimensions (3000 units per reel)

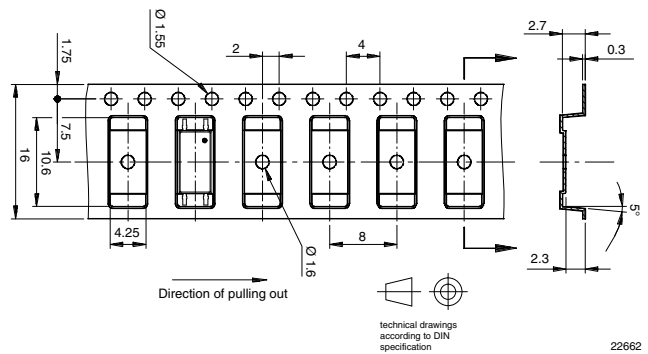
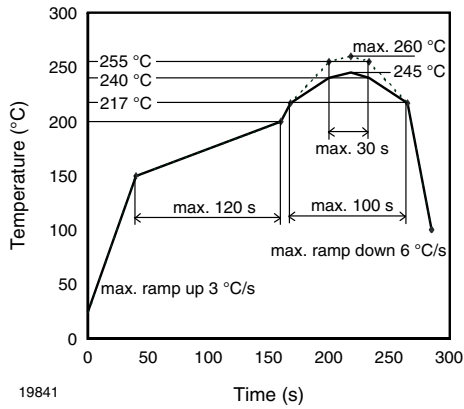


Fig. 7 - Tape Dimensions

SOLDER PROFILE



19841

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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