COMPLIANT

HALOGEN

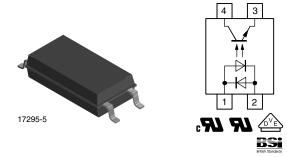
FREE GREEN



www.vishay.com

Vishay Semiconductors

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



DESCRIPTION

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

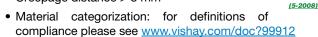
AGENCY APPROVALS

- 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

FEATURTES

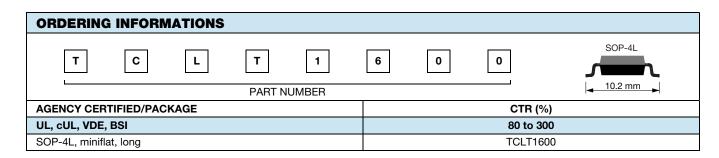
- Low profile package
- Extra low coupling capacity typical 0.2 pF
- High common mode rejection
- AC input
- Creepage current resistance according to VDE 0303/IEC 60112 comparative tracking index: CTI ≥ 175





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)





ABSOLUTE MAXIMUM RATINGS (T _{amb} = 25 °C, unless otherwise specified)								
PARAMETER	TEST CONDITION	SYMBOL	VALUE	UNIT				
INPUT								
Forward current		I _F	± 60	mA				
Forward surge current	t _p ≤ 10 μs	I _{FSM}	± 1.5	Α				
Power dissipation		P _{diss}	100	mW				
Junction temperature		Tj	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	$t_p/T = 0.5, t_p \le 10 \text{ ms}$	I _{CM}	100	mA				
Power dissipation		P _{diss}	150	mW				
Junction temperature		Tj	125	°C				
COUPLER								
Total power dissipation		P _{tot}	250	mW				
Operating ambient temperature range		T _{amb}	-55 to +100	°C				
Storage temperature range		T _{stg}	-55 to +125	°C				
Soldering temperature (1)		T _{sld}	260	°C				

Notes

⁽¹⁾ Wave soldering three cycles are allowed. Also refer to "Assembly Instruction" (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	$I_F = \pm 50 \text{ mA}$	V_{F}	-	1.25	1.6	V		
Junction capacitance	$V_R = 0 V, f = 1 MHz$	C _j	-	50	-	pF		
OUTPUT	OUTPUT							
Collector emitter voltage	I _C = 1 mA	V_{CEO}	70	-	-	V		
Emitter collector voltage	I _E = 100 μA	V_{ECO}	7	-	-	V		
Collector ermitter 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 V, I_F = ± 10 mA, R_L = 100 Ω	f _c	-	110	-	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	$V_{CE} = 5 \text{ V}, I_F = \pm 5 \text{ mA}$	CTR	80	-	300	%

[•] 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.

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 -	$t_{Tr} = 60 \text{ s}, t_{test} = 10 \text{ s},$	V _{IOTM}	8	kV
lot test (sample test)	(see figure 2)	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
	$V_{IO} = 500 \text{ V}, T_{amb} = 100 \text{ °C}$	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.

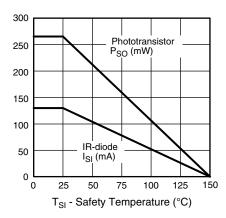


Fig. 1 - Derating Diagram

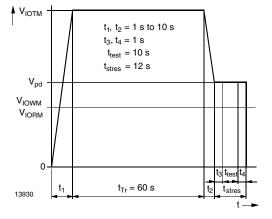


Fig. 2 - Test Pulse Diagram for Sample Test according to DIN EN 60747-5-2; IEC60747-5-5

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	-	μs
Rise time	V_S = 5 V, I_C = 2 mA, R_L = 100 Ω , (see figure 3)	t _r	-	3	-	μs
Turn-on time	V_S = 5 V, I_C = 2 mA, R_L = 100 Ω , (see figure 3)	t _{on}	-	6	-	μs
Storage time	V_S = 5 V, I_C = 2 mA, R_L = 100 Ω , (see figure 3)	t _s	-	0.3	-	μs
Fall time	V_S = 5 V, I_C = 2 mA, R_L = 100 Ω , (see figure 3)	t _f	-	4.7	-	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 k Ω , (see figure 4)	t _{on}	-	9	-	μs
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	-	μs



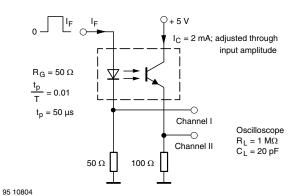


Fig. 3 - Test Circuit, Non-Saturated Operation

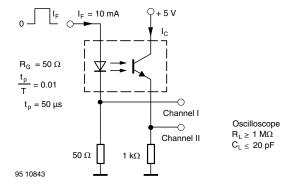


Fig. 4 - Test Circuit, Saturated Operation

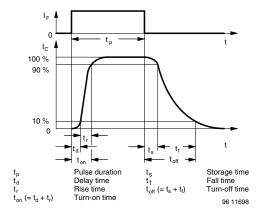
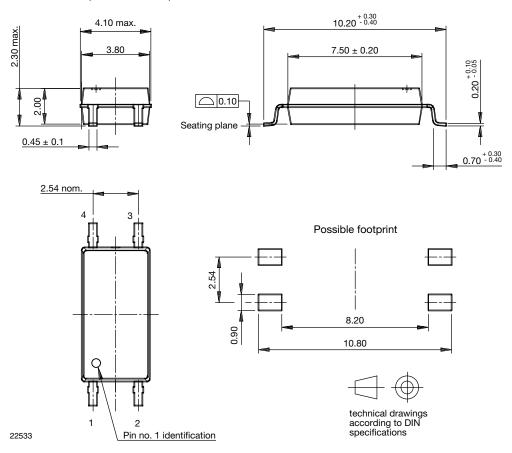


Fig. 5 - Switching Times

PACKAGE DIMENSIONS (in millimeters)



PACKAGE MARKING



TAPE AND REEL DIMENSIONS (in millimeters)

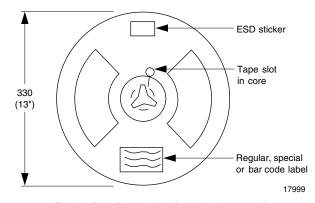


Fig. 6 - Reel Dimensions (3000 units per reel)

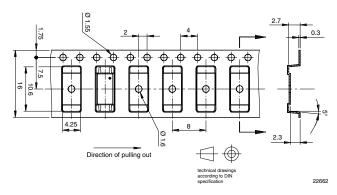


Fig. 7 - Tape Dimensions



SOLDER PROFILE

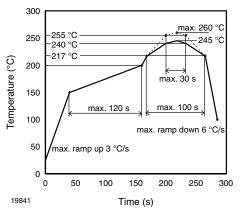


Fig. 8 - Lead (Pb)-free Reflow Solder Profile according to J-STD-020

HANDLING AND STORAGE CONDITIONS

ESD level: HBM class 2 Floor life: unlimited

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

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



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