



# 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

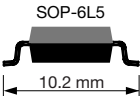
- Switchmode power supplies
- Computer peripheral interface
- Microprocessor system interface

### 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									
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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>		$T_{slid}$	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)	$t_{Tr} = 60\text{ s}, t_{test} = 10\text{ s}$ , (see figure 2)	$V_{IOTM}$	8			kV
		$V_{pd}$	1.68			kV
Insulation resistance	$V_{IO} = 500\text{ V}$	$R_{IO}$	$10^{12}$			$\Omega$
	$V_{IO} = 500\text{ V}, T_{amb} = 100\text{ }^{\circ}\text{C}$	$R_{IO}$	$10^{11}$			$\Omega$
	$V_{IO} = 500\text{ V}, T_{amb} = 150\text{ }^{\circ}\text{C}$ (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	$V_S = 5\text{ V}$ , $I_C = 2\text{ mA}$ , $R_L = 100\ \Omega$ , (see figure 3)	$t_d$		3.0		$\mu\text{s}$
Rise time	$V_S = 5\text{ V}$ , $I_C = 2\text{ mA}$ , $R_L = 100\ \Omega$ , (see figure 3)	$t_r$		3.0		$\mu\text{s}$
Turn-on time	$V_S = 5\text{ V}$ , $I_C = 2\text{ mA}$ , $R_L = 100\ \Omega$ , (see figure 3)	$t_{on}$		6.0		$\mu\text{s}$
Storage time	$V_S = 5\text{ V}$ , $I_C = 2\text{ mA}$ , $R_L = 100\ \Omega$ , (see figure 3)	$t_s$		0.3		$\mu\text{s}$
Fall time	$V_S = 5\text{ V}$ , $I_C = 2\text{ mA}$ , $R_L = 100\ \Omega$ , (see figure 3)	$t_f$		4.7		$\mu\text{s}$
Turn-off time	$V_S = 5\text{ V}$ , $I_C = 2\text{ mA}$ , $R_L = 100\ \Omega$ , (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		$\mu\text{s}$



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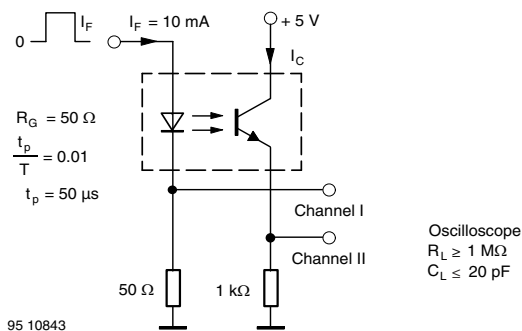
Fig. 3 - Test Circuit, Non-Saturated Operation



$t_p$  Pulse duration  
 $t_d$  Delay time  
 $t_r$  Rise time  
 $t_{on} (= t_d + t_r)$  Turn-on time  
 $t_s$  Storage time  
 $t_f$  Fall time  
 $t_{off} (= t_s + t_f)$  Turn-off time

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Fig. 5 - Switching Times

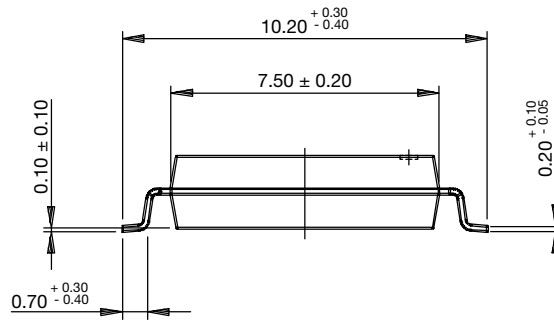


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Fig. 4 - Test Circuit, Saturated Operation



## PACKAGE DIMENSIONS in millimeters



22534

Pin no. 1 identification

### Possible footprint



technical drawings according to DIN specifications

## PACKAGE MARKING





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