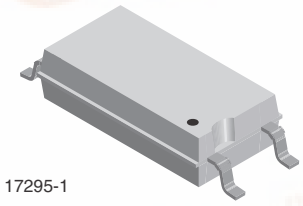
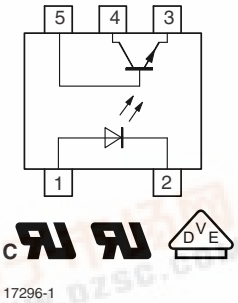
Optocoupler, Phototransistor Output, SOP-6L5, 110 °C Rated, Half Pitch, Long Mini-Flat Package





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 - 40 °C to 110 °C
- Thickness through insulation ≥ 0.75 mm
- Creepage distance > 8 mm
- Compliant to RoHS Directive 2002/95/EC and in accordance to WEEE 2002/96/EC

Pb-free
e3
RoHS COMPLIANT

DESCRIPTION

The TCLT1110 series consists of a phototransistor optically coupled to a gallium arsenide infrared-emitting diode in a 5-lead SOP-6L package.
The elements are mounted on one leadframe providing a fixed distance between input and output for highest safety requirements.

AGENCY APPROVALS

- UL1577, file no. E76222 system code W, double protection
- cUL - file no. E52744, equivalent to CSA 22.2 bulletin 5A
- DIN EN 60747-5-2 (VDE 0884)

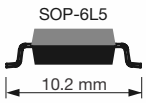
APPLICATIONS

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

ORDERING INFORMATION

T	C	L	T	1	1	1	#

PART NUMBER



AGENCY CERTIFIED/ PACKAGE	CTR (%)									
UL, cUL, VDE	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 (1) (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	$t_p \leq 10$ µs	I_{FSM}	1.5	A
Power dissipation		P_{diss}	100	mW
Junction temperature		T_j	125	°C

ABSOLUTE MAXIMUM RATINGS (1) (T_{amb} = 25 °C, unless otherwise specified)				
PARAMETER	**TEST CONDITION**	**SYMBOL**	**VALUE**	**UNIT**
OUTPUT				
Collector emitter voltage		V_{CEO}	70	V
Emitter collector voltage		V_{ECO}	7	V
Collector current		I_C	50	mA
Collector peak current	$t_p/T = 0.5$, $t_p \leq 10$ ms	I_{CM}	100	mA
Power dissipation		P_{diss}	150	mW
Junction temperature		T_j	125	°C
COUPLER				
Isolation test voltage (RMS)		V_{ISO}	5000	V_{RMS}
Total power dissipation		P_{tot}	250	mW
Operating ambient temperature range		T_{amb}	- 40 to + 110	°C
Storage temperature range		T_{stg}	- 40 to + 110	°C
Soldering temperature (2)		T_{sld}	260	°C

Notes

(1) 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.

(2) Refer to reflow profile for soldering conditions for surface mounted devices.

ELECTRICAL CHARACTERISTICS (T_{amb} = 25 °C, unless otherwise specified)						
PARAMETER	**TEST CONDITION**	**SYMBOL**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
INPUT						
Forward voltage	I_F = 50 mA	V_F		1.25	1.6	V
Junction capacitance	V_R = 0 V, f = 1 MHz	C_j		50		pF
OUTPUT						
Collector emitter voltage	I_C = 1 mA	V_{CEO}	70			V
Emitter collector voltage	I_E = 100 µA	V_{ECO}	7			V
Collector emitter cut-off current	V_{CE} = 20 V, I_F = 0 A, E = 0	I_{CEO}		10	100	nA
COUPLER						
Collector emitter saturation voltage	I_F = 10 mA, I_C = 1 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 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							
PARAMETER	**TEST CONDITION**	**PART**	**SYMBOL**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
I_C/I_F	V_{CE} = 5 V, I_F = 5 mA	TCLT1110	CTR	50		600	%
	V_{CE} = 5 V, I_F = 10 mA	TCLT1111	CTR	40		80	%
		TCLT1112	CTR	63		125	%
		TCLT1113	CTR	100		200	%
		TCLT1114	CTR	160		320	%
	V_{CE} = 5 V, I_F = 1 mA	TCLT1111	CTR	13	30		%
		TCLT1112	CTR	22	45		%
		TCLT1113	CTR	34	70		%
		TCLT1114	CTR	56	100		%
	V_{CE} = 5 V, I_F = 5 mA	TCLT1115	CTR	50		150	%
		TCLT1116	CTR	100		300	%
		TCLT1117	CTR	80		160	%
		TCLT1118	CTR	130		260	%
		TCLT1119	CTR	200		400	%

MAXIMUM SAFETY RATINGS						
PARAMETER	**TEST CONDITION**	**SYMBOL**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
INPUT						
Forward current		I_F			130	mA
OUTPUT						
Power dissipation		P_{diss}			265	mW
COUPLER						
Rated impulse voltage		V_{IOTM}			8	kV
Safety temperature		T_{si}			150	°C

Note

- According to DIN EN 60747-5-5 (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.

INSULATION RATED PARAMETERS						
PARAMETER	**TEST CONDITION**	**SYMBOL**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
Partial discharge test voltage - routine test	100 %, t_{test} = 1 s	V_{pd}	1.6			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}	1.3			kV
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

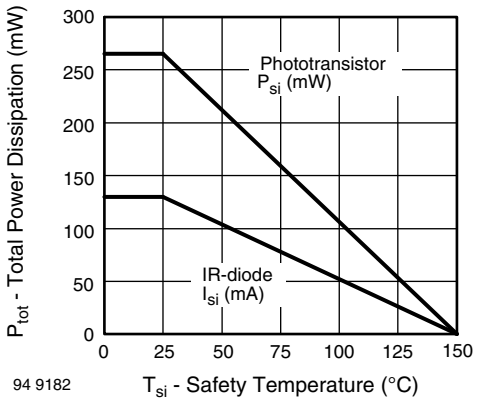


Fig. 1 - Derating Diagram

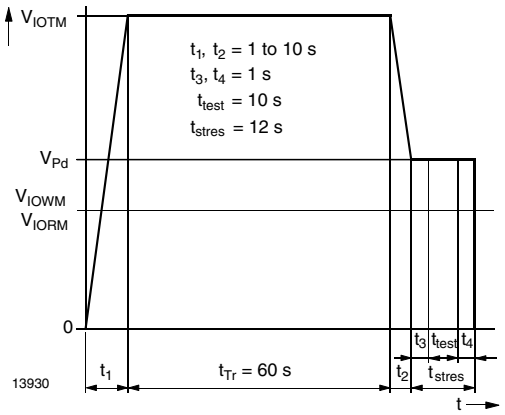


Fig. 2 - Test Pulse Diagram for Sample Test According to DIN EN 60747-5-5/DIN EN 60747-; IEC60747

SWITCHING CHARACTERISTICS						
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

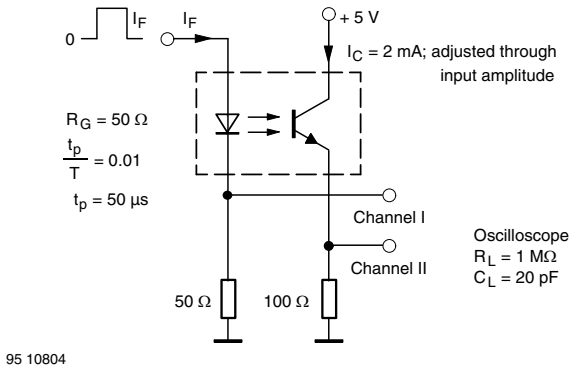


Fig. 3 - Test Circuit, Non-Saturated Operation

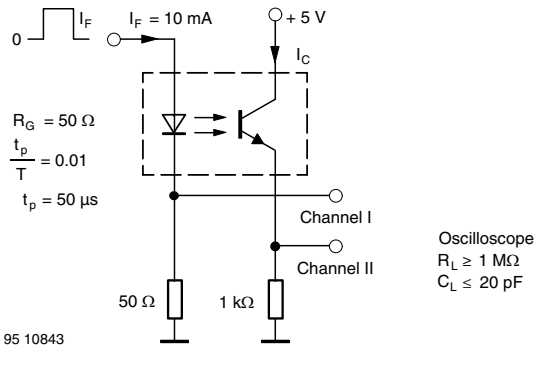


Fig. 4 - Test Circuit, Saturated Operation

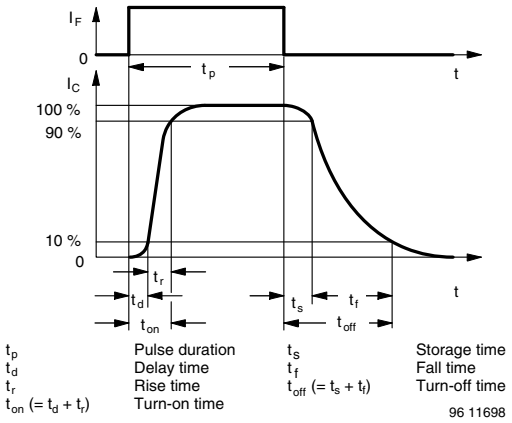


Fig. 5 - Switching Times

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

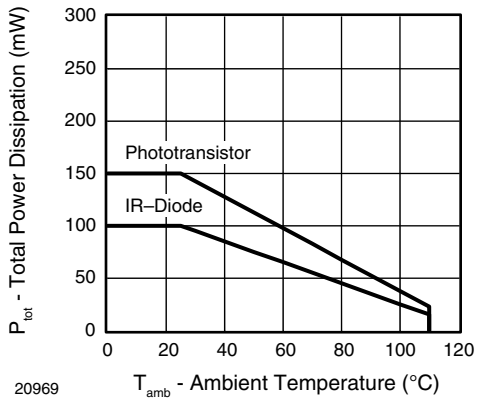


Fig. 6 - Total Power Dissipation vs. Ambient Temperature

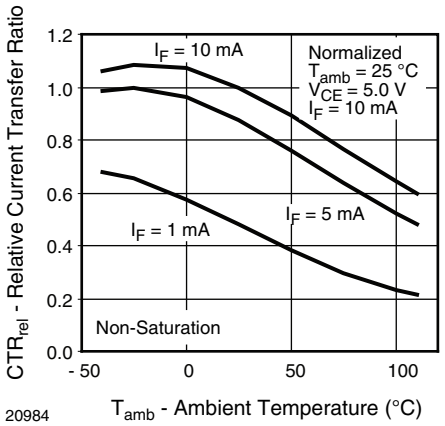


Fig. 8 - Relative Current Transfer Ratio vs. Ambient Temperature

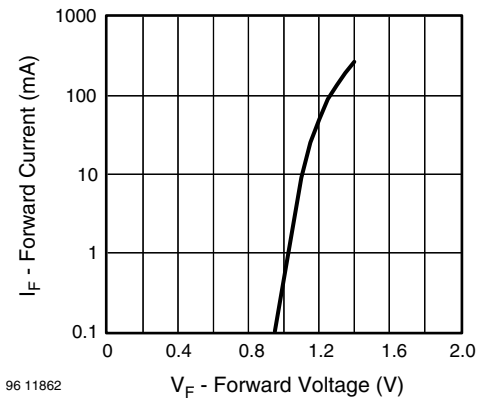


Fig. 7 - Forward Current vs. Forward Voltage

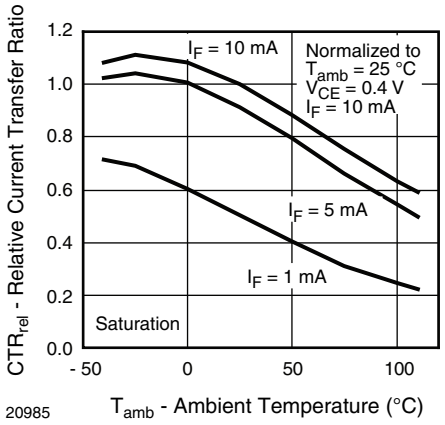


Fig. 9 - Relative Current Transfer Ratio vs. Ambient Temperature

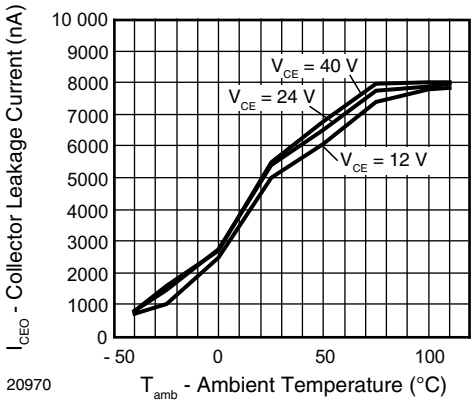


Fig. 10 - Collector Leakage Current vs. Ambient Temperature

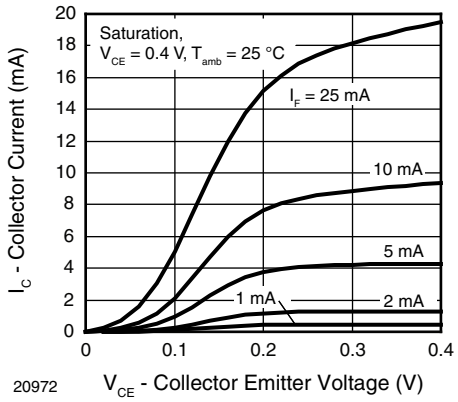


Fig. 13 - Collector Current vs. Collector Emitter Voltage

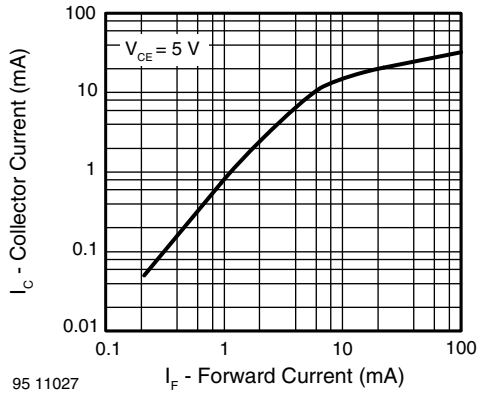


Fig. 11 - Collector Current vs. Forward Current

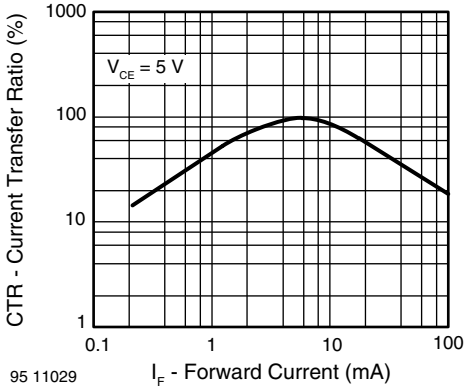


Fig. 14 - Current Transfer Ratio vs. Forward Current

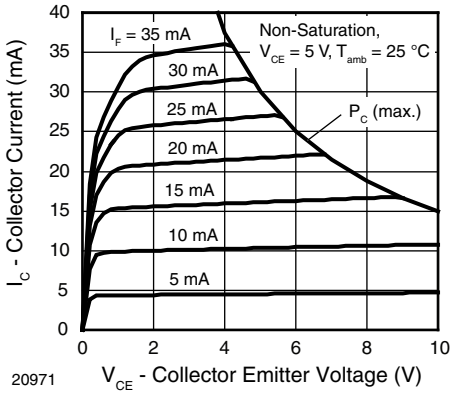


Fig. 12 - Collector Current vs. Collector Emitter Voltage

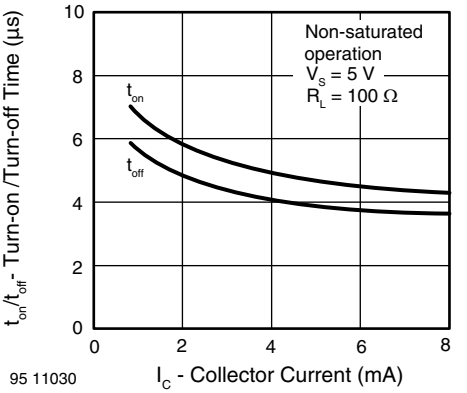


Fig. 15 - Turn-on/off Time vs. Collector Current

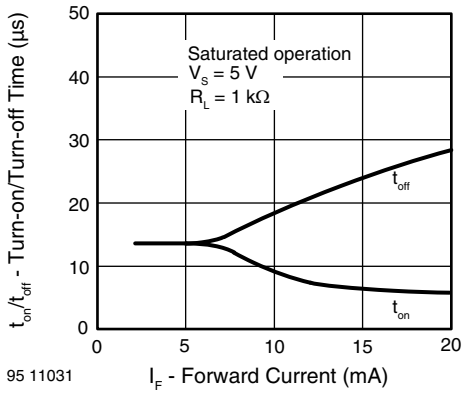
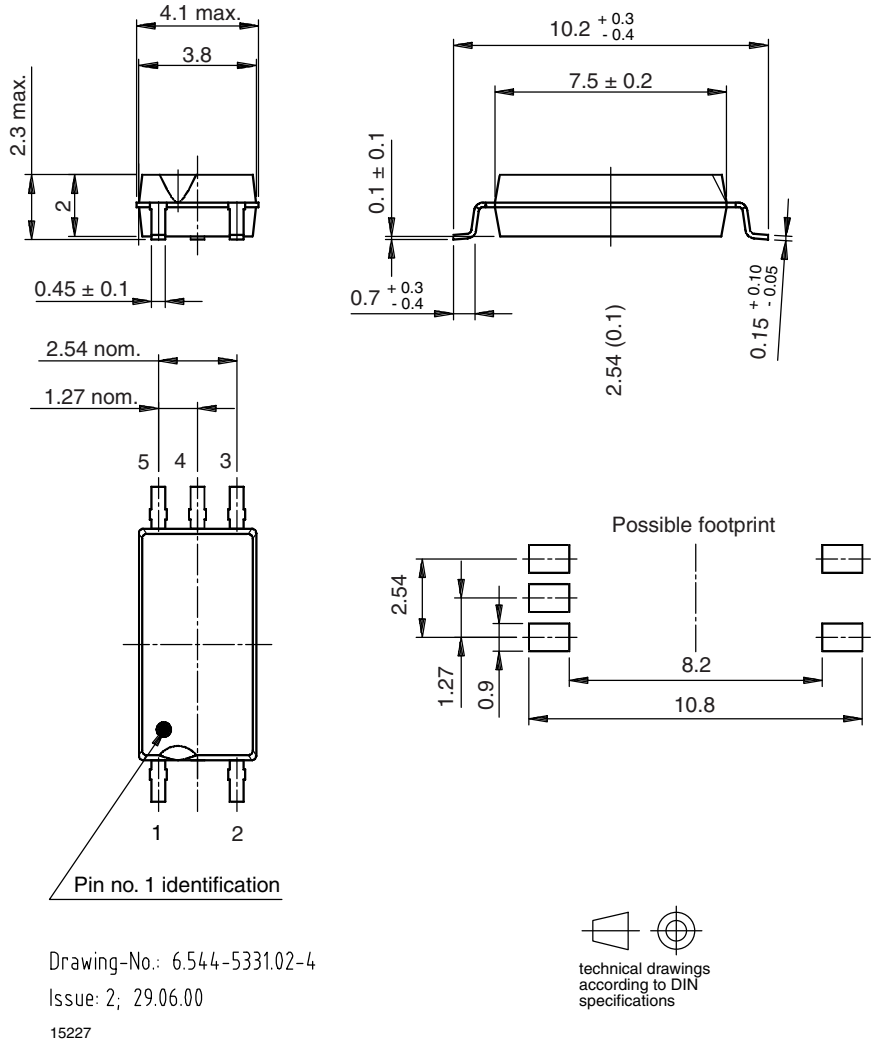


Fig. 16 - Turn-on/off Time vs. Forward Current

PACKAGE DIMENSIONS in millimeters



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