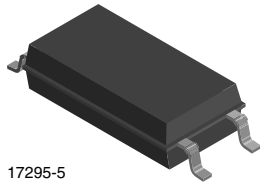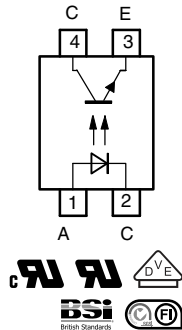# Optocoupler, Phototransistor Output, SOP-4L, Long Mini-Flat Package

17295-5

C   E

4   3

1   2

A   C

FEATURES

- SMD low profile 4 lead package
- V_{IORM} = 1050 V
- CTR flexibility available see order information
- Special construction
- Extra low coupling capacitance
- DC input with transistor output
- Creepage distance > 8 mm
- Material categorization:
  For definitions of compliance please see
  www.vishay.com/doc?99912

Pb-free

e3

RoHS
COMPLIANT
HALOGEN
FREE
GREEN
(5-2008)

AGENCY APPROVALS

- UL1577, file no. E76222
- CSA (cUL) 22.2 bulletin 5A recognized file no. E-76222
- BSI: BS EN 41003, BS EN 60065 (BS 415), BS EN 60950 (BS 7002), certificate number 7081 and 7402
- DIN EN 60747-5-5 (VDE 0884), available with option 1
- FIMKO: EN 60950
- CQC

Note
- See the safety standard approval list "Agency Table" for more detailed information.

DESCRIPTION

The TCLT100. series consists of a phototransistor optically coupled to a gallium arsenide infrared-emitting diode in a 4-lead SOP4L package.

APPLICATIONS

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

ORDERING INFORMATION

T	C	L	T	1	0	0	#

PART NUMBER

SOP-4L

10.2 mm

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-4L	TCLT1000	TCLT1002	TCLT1003	TCLT1004	TCLT1005	TCLT1006	TCLT1007	TCLT1008	TCLT1009

Note
- Available only on tape and reel.

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	$t_p \leq 10$ 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	$t_p/T = 0.5$, $t_p \leq 10$ 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}	- 55 to + 100	°C
Storage temperature range		T_{stg}	- 55 to + 125	°C
Soldering temperature		T_{sld}	260	°C

Note
- 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.

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

PARAMETER	TEST CONDITION	PART	SYMBOL	MIN.	TYP.	MAX.	UNIT
I_C/I_F	V_{CE} = 5 V, I_F = 5 mA	TCLT1000	CTR	50		600	%
	V_{CE} = 5 V, I_F = 10 mA	TCLT1002	CTR	63		125	%
		TCLT1003	CTR	100		200	%
		TCLT1004	CTR	160		320	%
	V_{CE} = 5 V, I_F = 1 mA	TCLT1002	CTR	22	45		%
		TCLT1003	CTR	34	70		%
		TCLT1004	CTR	56	100		%
	V_{CE} = 5 V, I_F = 5 mA	TCLT1005	CTR	50		150	%
		TCLT1006	CTR	100		300	%
		TCLT1007	CTR	80		160	%
		TCLT1008	CTR	130		260	%
		TCLT1009	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 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_{peak}
		V_{pd}			1.68	kV_{peak}
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
Comparative tracking index		CTI		175		
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.
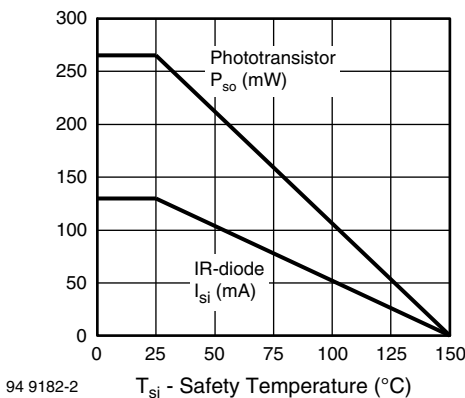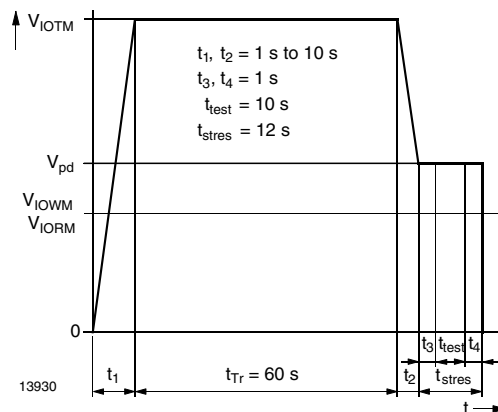

Fig. 1 - Derating Diagram

Fig. 2 - Test Pulse Diagram for Sample Test according to DIN EN 60747-5-2 (VDE 0884); 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
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
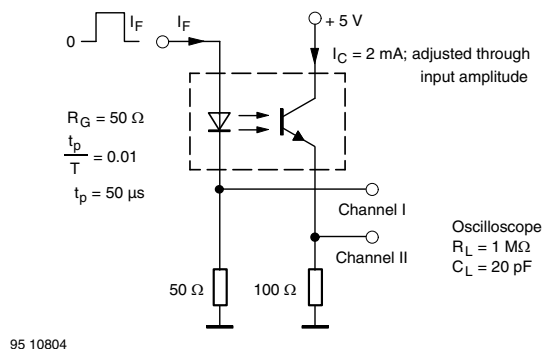
Fig. 3 - Test Circuit, Non-Saturated Operation
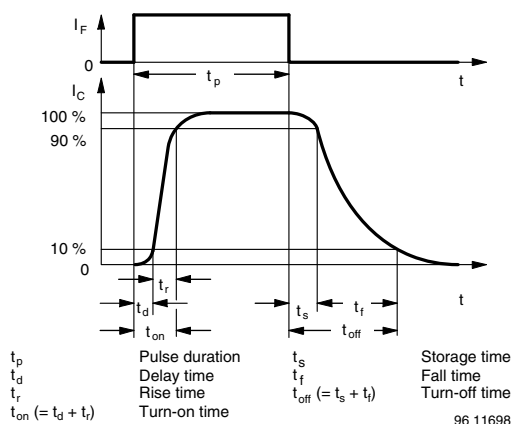

Fig. 5 - Switching Times
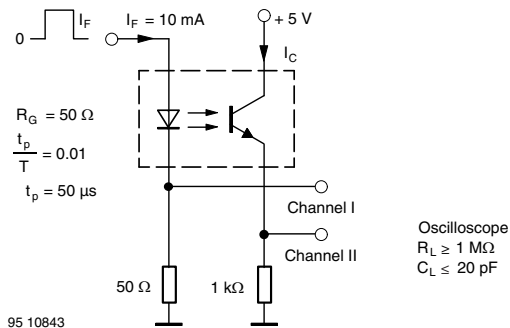

Fig. 4 - Test Circuit, Saturated Operation

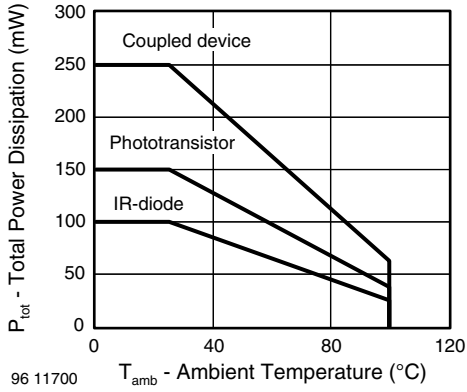**TYPICAL CHARACTERISTICS** (T_{amb} = 25 °C, unless otherwise specified)

96 11700

Fig. 6 - Total Power Dissipation vs. Ambient Temperature
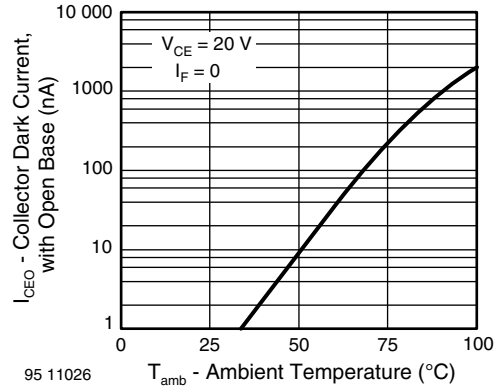

95 11026

Fig. 9 - Collector Dark Current vs. Ambient Temperature
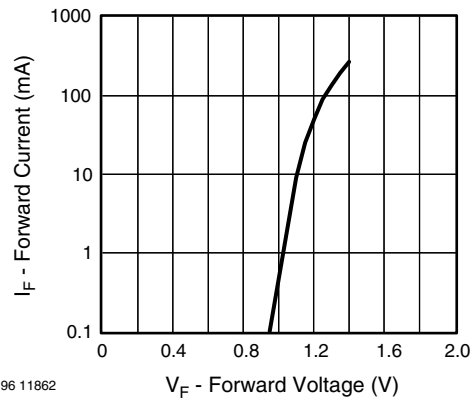

96 11862

Fig. 7 - Forward Current vs. Forward Voltage
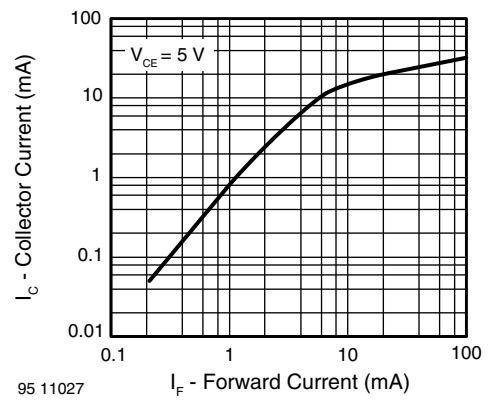

95 11027

Fig. 10 - Collector Current vs. Forward Current
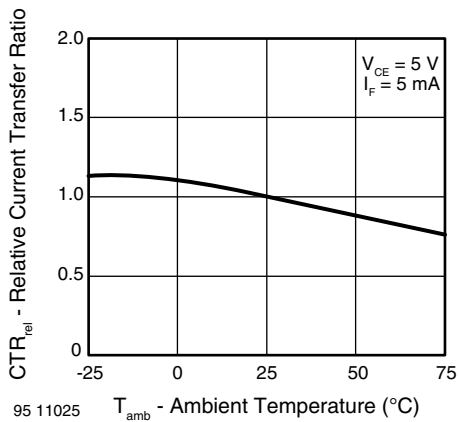

95 11025

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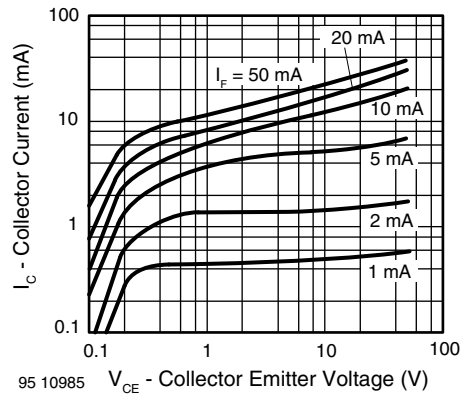

95 10985

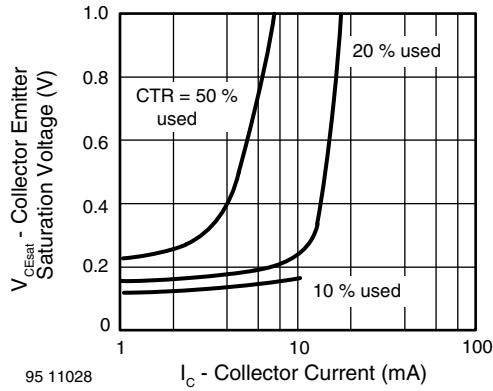Fig. 11 - Collector Current vs. Collector Emitter Voltage

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Fig. 12 - Collector Emitter Saturation Voltage vs. Collector Current
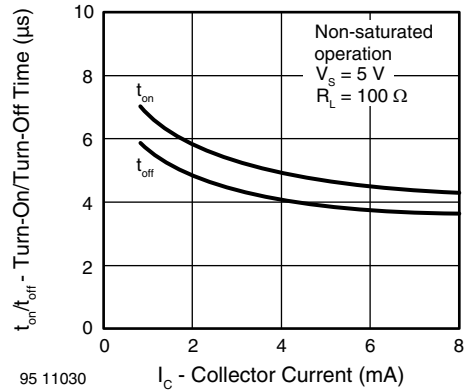

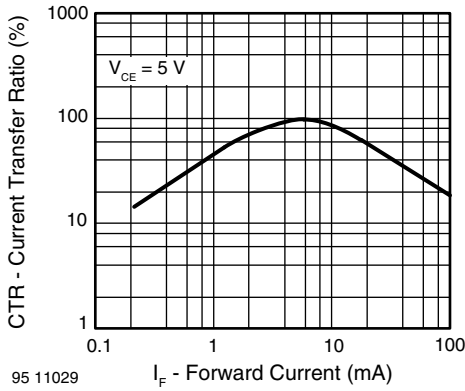Fig. 14 - Turn-on/off Time vs. Collector Current

Fig. 13 - Current Transfer Ratio vs. Forward Current
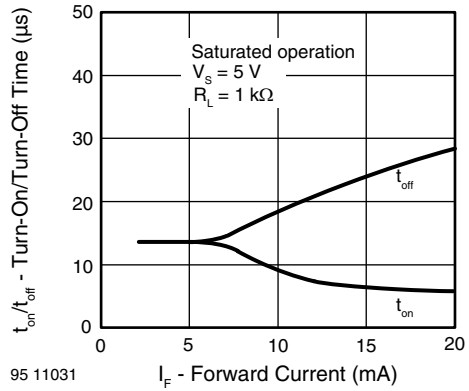
Fig. 15 - Turn-on/off Time vs. Forward Current

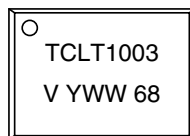For technical questions, contact: optocoupleranswers@vishay.com

PACKAGE DIMENSIONS in millimeters

22533

Pin no. 1 identification

Possible footprint

technical drawings according to DIN specifications
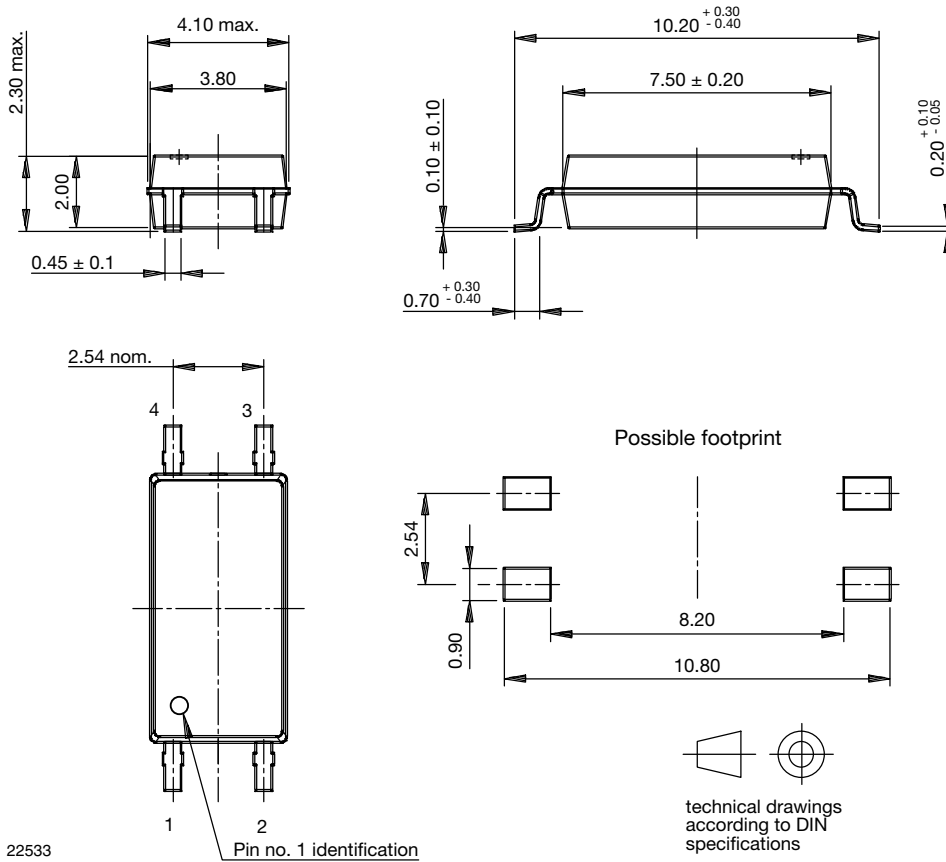
PACKAGE MARKING (Example)

TCLT1003

V YWW 68

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