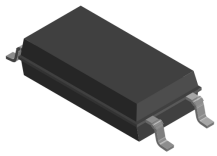

VISHAY TCLT1000 Optocoupler Phototransistor Output SOP 4L Long Mini Flat Package User Guide

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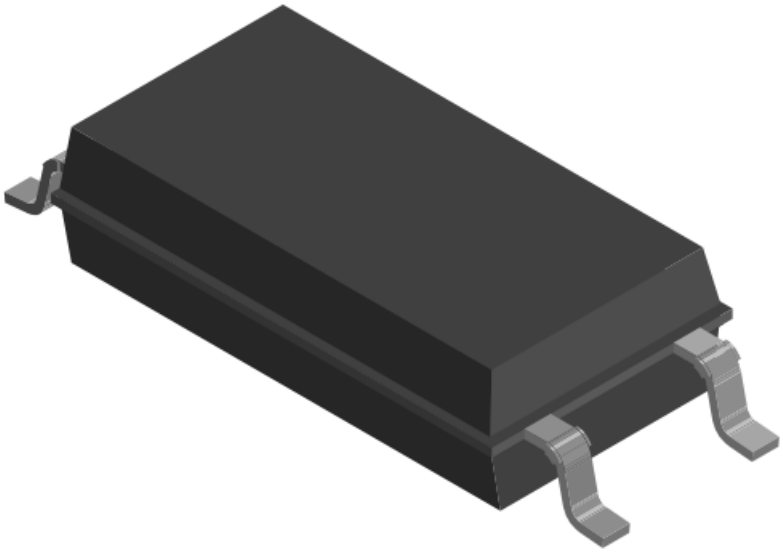
VISHAY TCLT1000 Optocoupler Phototransistor Output SOP 4L Long Mini Flat Package



Product Information

Specifications

- **Product Name:** TCLT100. Series
- **Manufacturer:** Vishay Semiconductors
- **Package Type:** SOP-4L (Long Mini-Flat Package)
- **Description:** Phototransistor optically coupled to a gallium arsenide infrared-emitting diode
- **Input Parameters:**
  - **Reverse Voltage:** 6V
  - **Forward Current:** 60mA
  - **Forward Surge Current:** 1.5A
  - **Power Dissipation:** 100mW
  - **Junction Temperature:** 125°C
- **Output Parameters:**
  - **Collector-Emitter Voltage:** 70V
  - **Emitter Collector Voltage:** 7V
  - **Collector Current:** 50mA
  - **Collector Peak Current:** 100mA
  - **Power Dissipation:** 150mW
  - **Junction Temperature:** 125°C
- **Coupler Parameters:**
  - **Total Power Dissipation:** 250mW
  - **Operating Ambient Temperature Range:** -55°C to +100°C
  - **Storage Temperature Range:** -55°C to +125°C
  - **Soldering Temperature:** 260°C

Features

- Optocoupler with phototransistor output
- 4-lead SOP-4L package

Agency Approvals
UL, cUL, VDE, BSI, FIMKO

Ordering Information

- **Part Number:** TCLT100#
- **Package:** SOP-4L

Product Usage Instructions

Installation

1. Ensure the power is disconnected before installation.
2. Identify the input and output terminals of the optocoupler.
3. Connect the input terminals to the appropriate power source.
4. Connect the output terminals to the desired load or circuit.
5. Securely mount the optocoupler in its intended location.

Operation

1. Apply power to the input terminals within the specified parameters.
2. The optocoupler will detect and transmit the input signal to the output terminals.
3. The output terminals can be connected to other components or circuits for further processing or control.
4. Monitor the optocoupler and ensure it is functioning as expected.

Maintenance
There is no specific maintenance required for the optocoupler. However, regular inspection and cleaning of the terminals and surrounding area are recommended to ensure proper operation.

Safety Precautions

- Do not exceed the specified input and output parameters to prevent damage to the optocoupler.
- Ensure proper insulation and grounding to prevent electric shock.
- Avoid exposure to extreme temperatures or moisture.
- Follow all applicable safety guidelines and regulations when installing or operating the optocoupler.

FAQ

- **Q: What are the agency approvals for this product?**
  A: The product has UL, cUL, VDE, BSI, and FIMKO approvals.
- **Q: What is the operating temperature range for the optocoupler?**
  A: The optocoupler can operate within a temperature range of -55°C to +100°C.
- **Q: Can I use the optocoupler with higher input currents?**
  A: No, the maximum forward current for the optocoupler is 60mA. Exceeding this limit may cause damage to the device.

- **Q: What is the package type for this optocoupler?**

  A: The optocoupler comes in a 4-lead SOP-4L (Long Mini-Flat Package).

DESCRIPTION

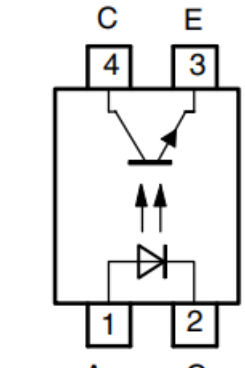
The TCLT100. series consists of a phototransistor optically coupled to a gallium arsenide infrared-emitting diode in a 4-lead SOP4L package.

APPLICATIONS

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

FEATURES

- SMD low profile 4 lead package
- VIORM = 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



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)
- FIMKO: EN 60950

- CQC

Note

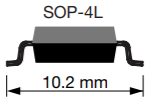
- See the safety standard approval list “Agency Table” for more detailed information.

ORDERING INFORMATION

ORDERING INFORMATION

T	C	L	T	1	0	0	#

PART NUMBER



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

ABSOLUTE MAXIMUM RATINGS (T_{amb} = 25 °C, unless otherwise specified)				
PARAMETER	**CONDITION**	**SYMBOL**	**VALUE**	**UNIT**
INPUT				
Reverse voltage		V_R	6	V
Forward current		I_F	60	mA
Forward surge current	t_p £ 10 µs	IFSM	1.5	A
Power dissipation		Pdiss	100	mW
Junction temperature		T_j	125	°C
OUTPUT				
Collector emitter voltage		VCEO	70	V
Emitter collector voltage		VECO	7	V
Collector current		I_C	50	mA
Collector peak current	t_p/T = 0.5, t_p £ 10 ms	ICM	100	mA
Power dissipation		Pdiss	150	mW
Junction temperature		T_j	125	°C
COUPLER				
Total power dissipation		Ptot	250	mW
Operating ambient temperature range		Tamb	-55 to +100	°C
Storage temperature range		Tstg	-55 to +125	°C
Soldering temperature		Tsld	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

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	VCEO	70	–	–	V
Emitter collector voltage	I_E = 100 µA	VECO	7	–	–	V
Collector emitter cut-off current	V_{CE} = 20 V, I_F = 0 A	ICEO	–	10	100	nA
COUPLER						
Collector emitter saturation voltage	I_F = 10 mA, I_C = 1 mA	VCEsat	–	–	0.3	V
Cut-off frequency	V_{CE} = 5 V, I_F = 10 mA, R_L = 100 W	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 RATINGS				
PARAMETER	**CONDITION**	**SYMBOL**	**VALUE**	**UNIT**
Partial discharge test voltage – routine test	100 %, t_{test} = 1 s	Vpd	2	kV
Partial discharge test voltage – lot test (sample test)	t_{Tr} = 60 s, t_{test} = 10 s, (see figure 2)	VIOTM	8	kVpeak
		Vpd	1.68	kVpeak
Isolation test voltage (RMS)		VISO	5000	VRMS
Insulation resistance	V_{IO} = 500 V	RIO	1012	W
	V_{IO} = 500 V, T_{amb} = 100 °C	RIO	1011	W
	V_{IO} = 500 V, T_{amb} = 150 °C (construction test only)	RIO	109	W
Forward current		Isi	130	mA
Power dissipation		Pso	265	mW
Rated impulse voltage		VIOTM	8	kV
Safety temperature		Tsi	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.

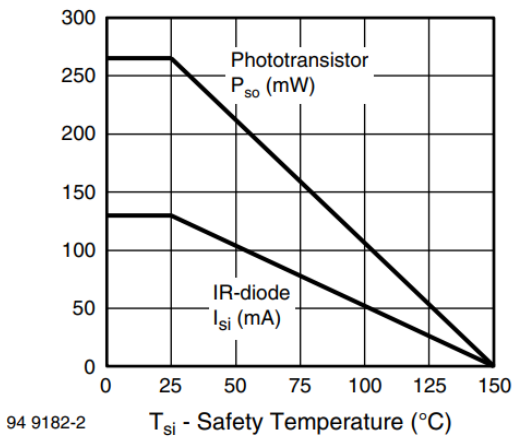


Fig. 1 - Derating Diagram

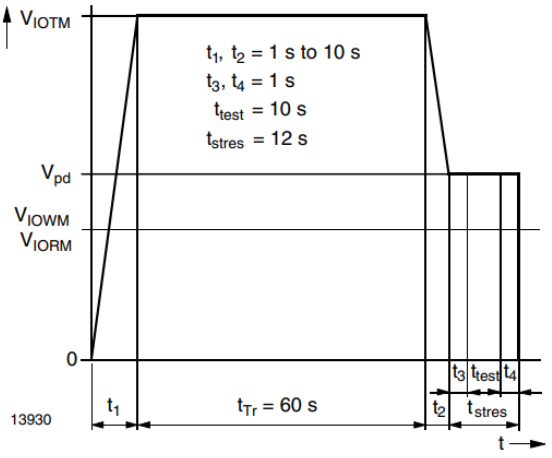


Fig. 2 - Test Pulse Diagram for Sample Test according to DIN EN 60747-5-2 (VDE 0884); IEC60747-5-5

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 W, (see figure 3)	t_d	–	3	–	µs
Rise time	V_S = 5 V, I_C = 2 mA, R_L = 100 W, (see figure 3)	t_r	–	3	–	µs
Fall time	V_S = 5 V, I_C = 2 mA, R_L = 100 W, (see figure 3)	t_f	–	4.7	–	µs
Storage time	V_S = 5 V, I_C = 2 mA, R_L = 100 W, (see figure 3)	t_s	–	0.3	–	µs
Turn-on time	V_S = 5 V, I_C = 2 mA, R_L = 100 W, (see figure 3)	ton	–	6	–	µs
Turn-off time	V_S = 5 V, I_C = 2 mA, R_L = 100 W, (see figure 3)	toff	–	5	–	µs
Turn-on time	V_S = 5 V, I_F = 10 mA, R_L = 1 kW, (see figure 4)	ton	–	9	–	µs
Turn-off time	V_S = 5 V, I_F = 10 mA, R_L = 1 kW, (see figure 4)	toff	–	10	–	µs

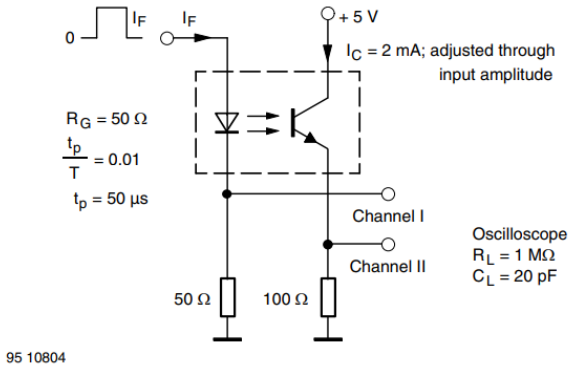


Fig. 3 - Test Circuit, Non-Saturated Operation

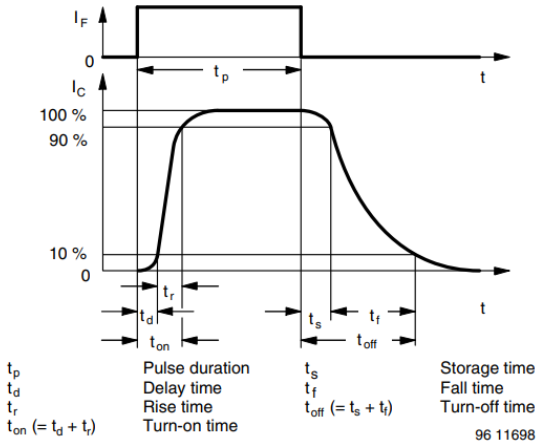


Fig. 5 - Switching Times

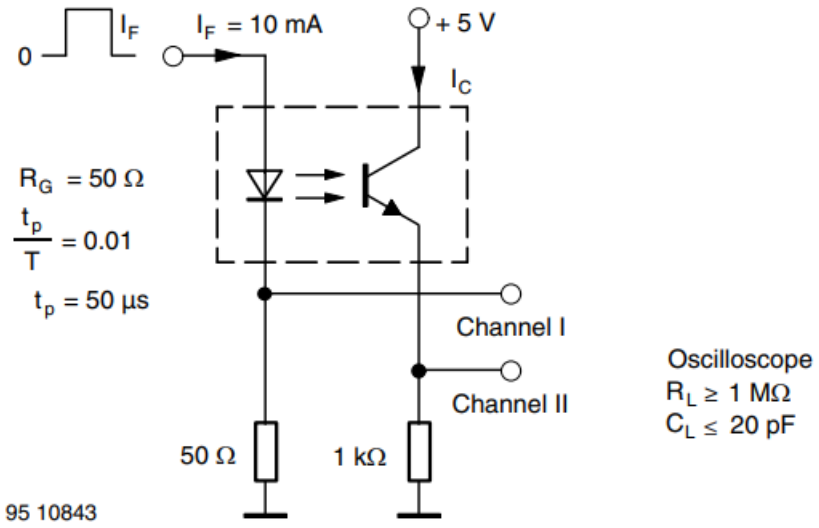


Fig. 4 - Test Circuit, Saturated Operation

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

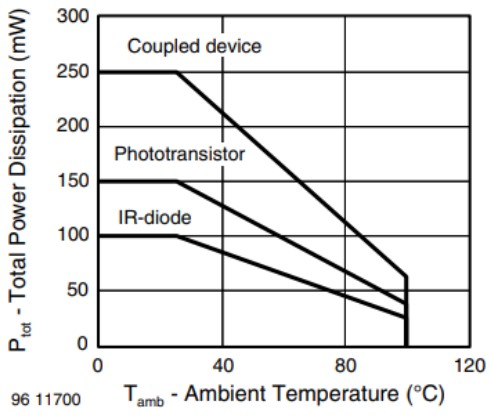


Fig. 6 - Total Power Dissipation vs. Ambient Temperature

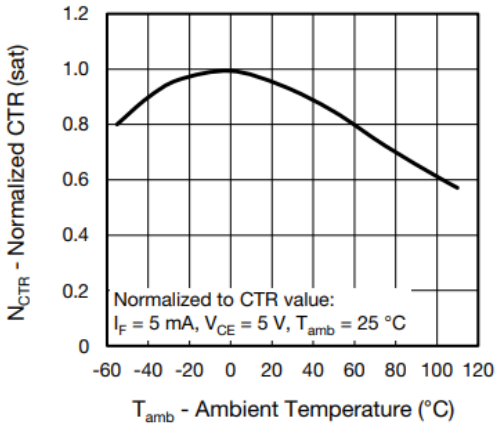


Fig. 9 - Normalized Current Transfer Ratio (saturated) vs. Ambient Temperature

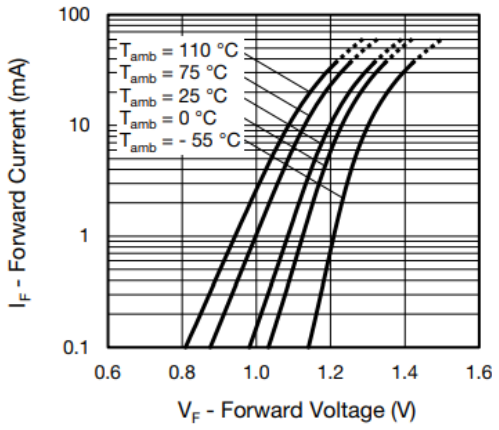


Fig. 7 - Forward Current vs. Forward Voltage

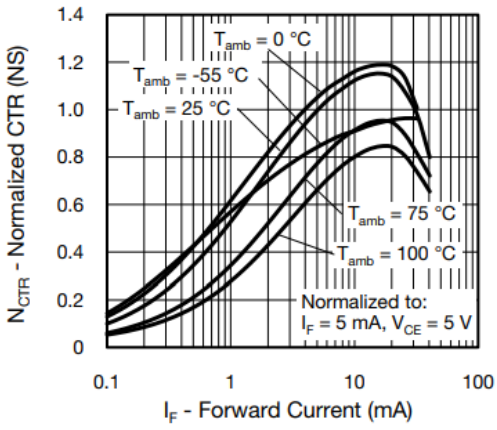


Fig. 10 - Normalized Current Transfer Ratio (non-saturated) vs. Forward Current

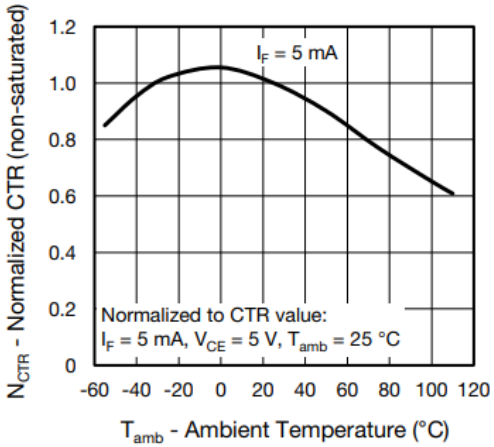


Fig. 8 - Normalized Current Transfer Ratio (non-saturated) vs. Ambient Temperature

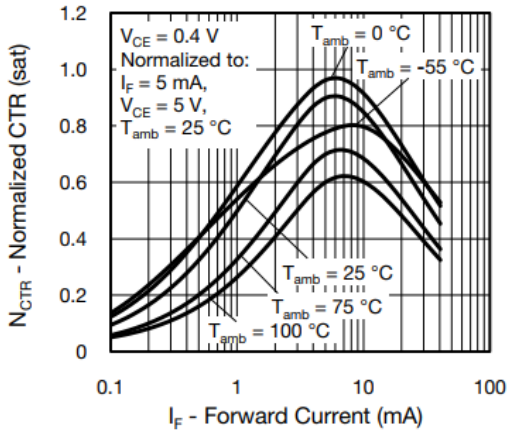


Fig. 11 - Normalized Current Transfer Ratio (saturated) vs. Forward Current

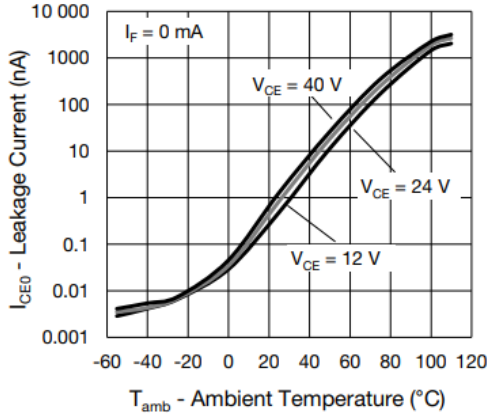


Fig. 12 - Collector Dark Current vs. Ambient Temperature

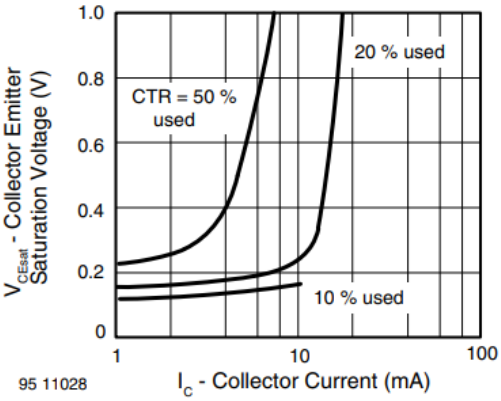


Fig. 15 - Collector Emitter Saturation Voltage vs. Collector Current

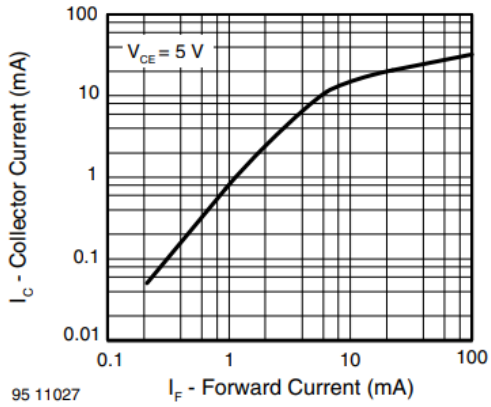


Fig. 13 - Collector Current vs. Forward Current

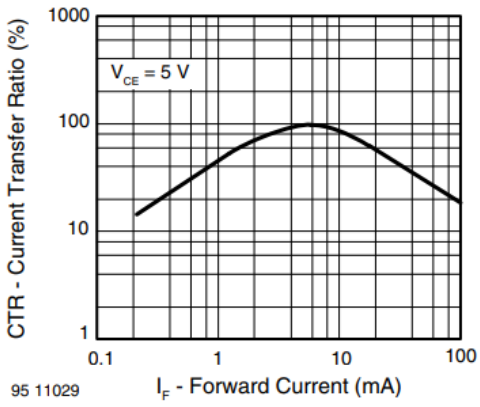


Fig. 16 - Current Transfer Ratio vs. Forward Current

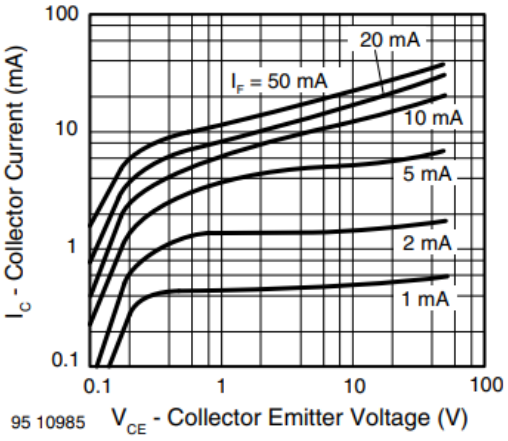


Fig. 14 - Collector Current vs. Collector Emitter Voltage

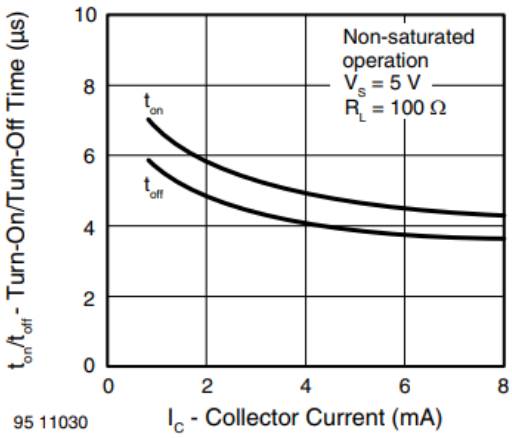


Fig. 17 - Turn-on/off Time vs. Collector Current

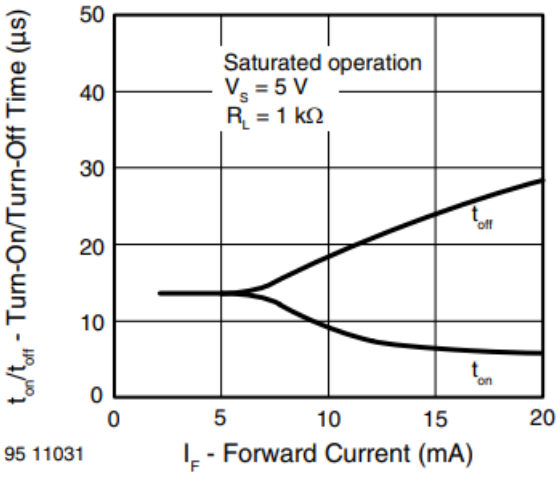
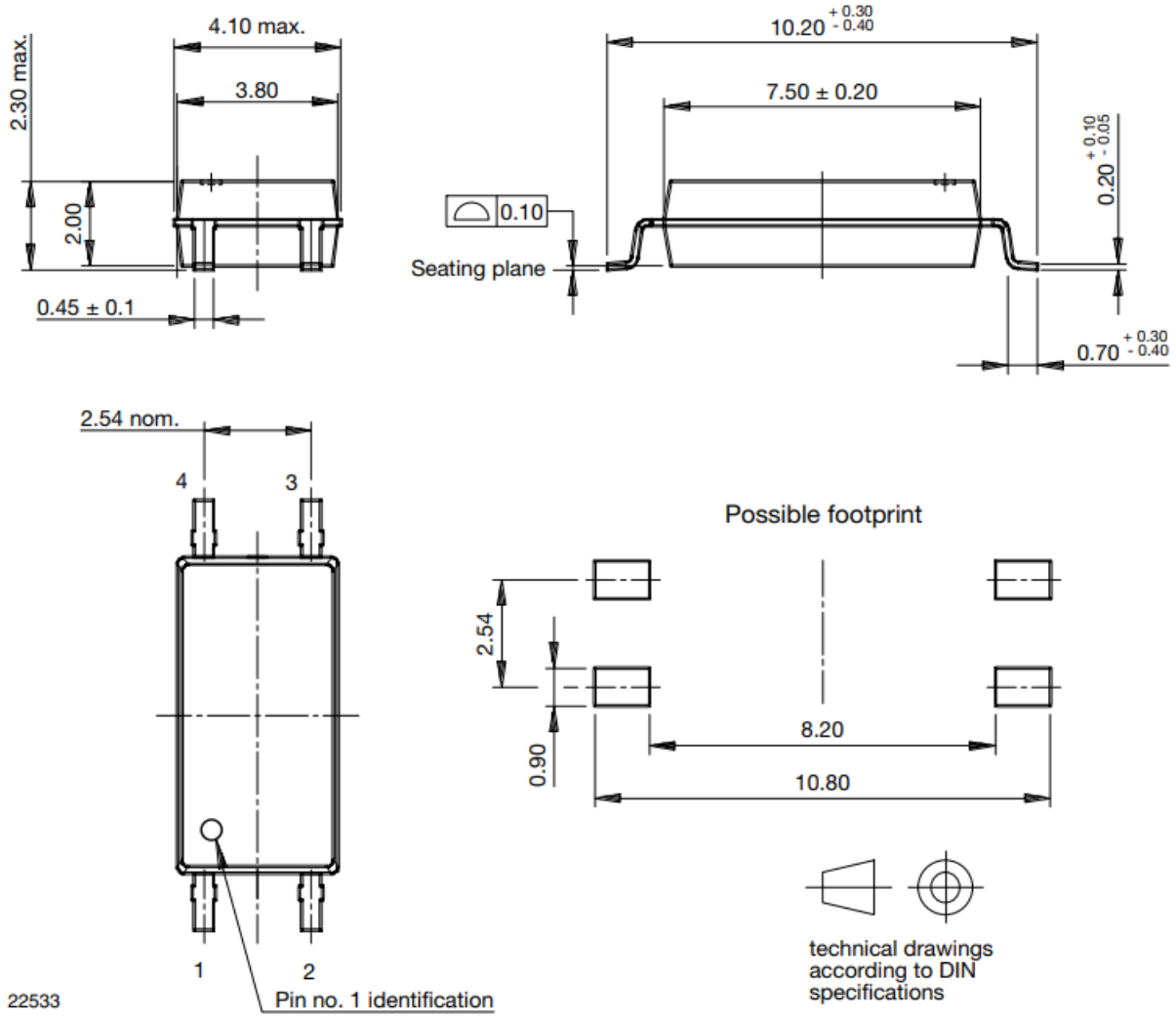
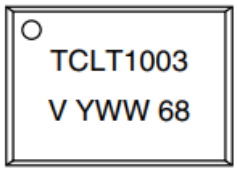


Fig. 18 - Turn-on/off Time vs. Forward Current

PACKAGE DIMENSIONS



PACKAGE MARKING (example)



TAPE AND REEL DIMENSIONS (in millimeters)

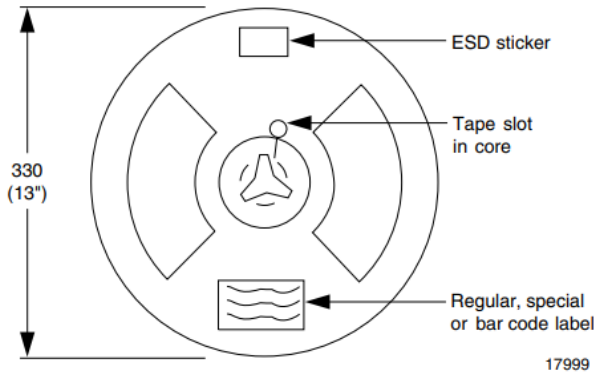


Fig. 19 - Reel Dimensions (3000 units per reel)

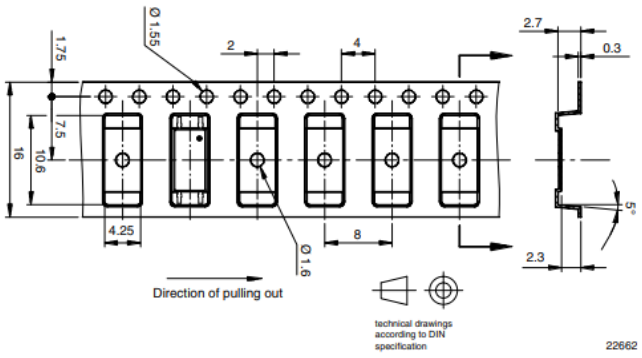


Fig. 20 - Tape Dimensions

SOLDER PROFILE

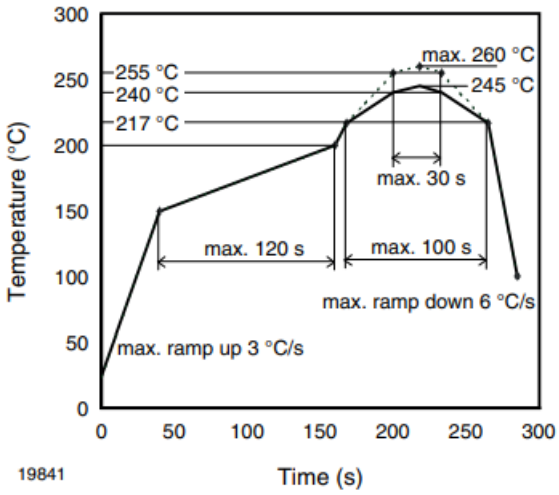


Fig. 21 - Lead (Pb)-free Reflow Solder Profile according to J-STD-020

HANDLING AND STORAGE CONDITIONS

- **ESD level:** HBM class 2
- **Floor life:** unlimited
- **Conditions:** Tamb < 30 °C, RH < 85 %
- Moisture sensitivity level 1, according to J-STD-020

Disclaimer

Except as expressly indicated in writing, Vishay products are not designed for use in medical, life-saving, or life-sustaining applications or for any other application in which the failure of the Vishay product could result in personal injury or death. Customers using or selling Vishay products not expressly indicated for use in such applications do so at their own risk. Please contact authorized Vishay personnel to obtain written terms and conditions regarding products designed for such applications. No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted by this document or by any conduct of Vishay. Product names and markings noted herein may be trademarks of their respective owners.

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Documents / Resources

	**VISHAY TCLT1000 Optocoupler Phototransistor Output SOP 4L Long Mini Flat Package** [pdf] User Guide TCLT1000 Optocoupler Phototransistor Output SOP-4L Long Mini Flat Package, TCLT1000, Optocoupler Phototransistor Output SOP 4L Long Mini Flat Package, Phototransistor Output SOP 4L Long Mini Flat Package, Output SOP 4L Long Mini Flat Package, 4L Long Mini Flat Package, Mini Flat Package, Flat Package, Package

References

- **Vishay Intertechnology: Passives & Discrete Semiconductors**
- **vishay.com/doc?91000**
- **vishay.com/doc?99912**
- **User Manual**