

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

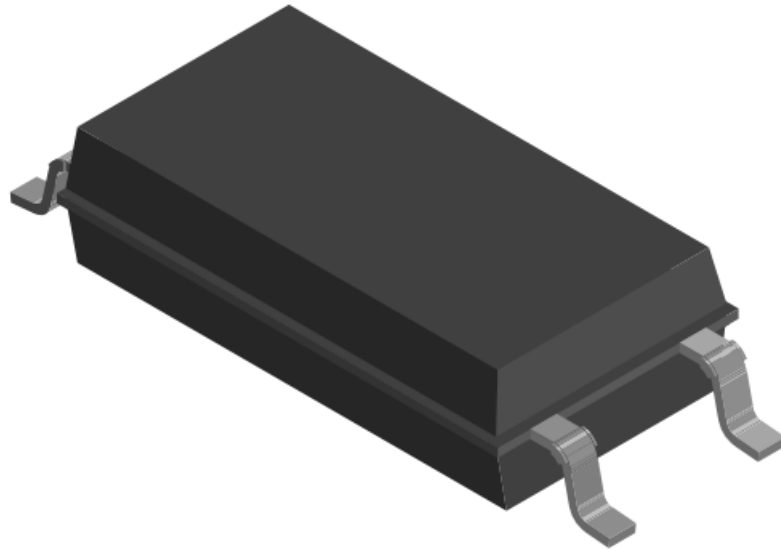
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VISHAY TCLT1000 Optocoupler Phototransistor Output SOP 4L Long Mini Flat Package



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

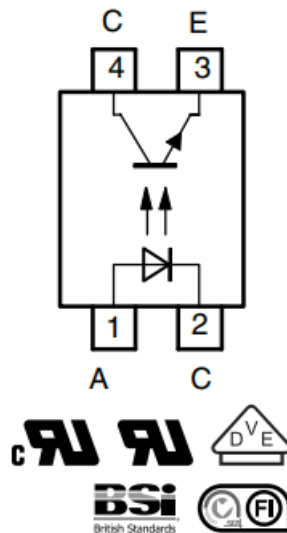
The TCLT100. series consists of a phototransistor optically coupled to a gallium arsenide infrared-emitting diode in a 4-lead SOP4L package.

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

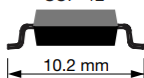
- UL1577, file no. E76222
- CSA (cUL) 22.2 bulletin 5A recognized file no. E-76222
- BSI: BS EN 41003, BS EN 60065 (BS 415), BS EN 60950 (BS 7002), certificate number 7081 and 7402
- DIN EN 60747-5-5 (VDE 0884)
- FIMKO: EN 60950

- CQC

Note

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

ORDERING INFORMATION

ORDERING INFORMATION									
<div><div>T</div><div>C</div><div>L</div><div>T</div><div>1</div><div>0</div><div>0</div><div>#</div></div> <div>PART NUMBER</div>								<div>SOP-4L</div> <div></div>	
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 ($T_{amb} = 25\text{ }^{\circ}\text{C}$, unless otherwise specified)				
PARAMETER	CONDITION	SYMBOL	VALUE	UNIT
INPUT				
Reverse voltage		V_R	6	V
Forward current		I_F	60	mA
Forward surge current	$t_p \leq 10\text{ }\mu\text{s}$	IFSM	1.5	A
Power dissipation		P_{diss}	100	mW
Junction temperature		T_j	125	$^{\circ}\text{C}$
OUTPUT				
Collector emitter voltage		V_{CEO}	70	V
Emitter collector voltage		V_{ECO}	7	V
Collector current		I_C	50	mA
Collector peak current	$t_p/T = 0.5$, $t_p \leq 10\text{ ms}$	ICM	100	mA
Power dissipation		P_{diss}	150	mW
Junction temperature		T_j	125	$^{\circ}\text{C}$
COUPLER				
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		T_{sld}	260	$^{\circ}\text{C}$

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 ($T_{amb} = 25\text{ }^{\circ}\text{C}$, unless otherwise specified)						
PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT
INPUT						
Forward voltage	$I_F = 50\text{ mA}$	V_F	–	1.25	1.6	V
Junction capacitance	$V_R = 0\text{ V}$, $f = 1\text{ MHz}$ z	C_j	–	50	–	pF
OUTPUT						
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 cut-off current	$V_{CE} = 20\text{ V}$, $I_F = 0\text{ A}$	I_{CEO}	–	10	100	nA
COUPLER						
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 ($T_{\text{amb}} = 25\text{ }^{\circ}\text{C}$, unless otherwise specified)

PARAMETER	TEST CONDITION	PART	SYMB OL	MIN.	TYP.	MAX.	UNIT
I_C/I_F	$V_{CE} = 5\text{ V}$, $I_F = 5\text{ mA}$	TCLT1000	CTR	50	–	600	%
	$V_{CE} = 5\text{ V}$, $I_F = 10\text{ mA}$	TCLT1002	CTR	63	–	125	%
		TCLT1003	CTR	100	–	200	%
		TCLT1004	CTR	160	–	320	%
	$V_{CE} = 5\text{ V}$, $I_F = 1\text{ mA}$	TCLT1002	CTR	22	45	–	%
		TCLT1003	CTR	34	70	–	%
		TCLT1004	CTR	56	100	–	%
	$V_{CE} = 5\text{ V}$, $I_F = 5\text{ mA}$	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 %, $t_{\text{test}} = 1 \text{ s}$	V_{pd}	2	kV
Partial discharge test voltage – lot test (sample test)	$t_{\text{Tr}} = 60 \text{ s}$, $t_{\text{test}} = 10 \text{ s}$, (see figure 2)	V_{IOTM}	8	kVpeak
		V_{pd}	1.68	kVpeak
Isolation test voltage (RMS)		V_{ISO}	5000	VRMS
Insulation resistance	$V_{\text{IO}} = 500 \text{ V}$	R_{IO}	1012	W
	$V_{\text{IO}} = 500 \text{ V}$, $T_{\text{amb}} = 100^\circ \text{C}$	R_{IO}	1011	W
	$V_{\text{IO}} = 500 \text{ V}$, $T_{\text{amb}} = 150^\circ \text{C}$ (construction test only)	R_{IO}	109	W
Forward current		I_{si}	130	mA
Power dissipation		P_{so}	265	mW
Rated impulse voltage		V_{IOTM}	8	kV
Safety temperature		T_{si}	150	$^\circ \text{C}$
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.

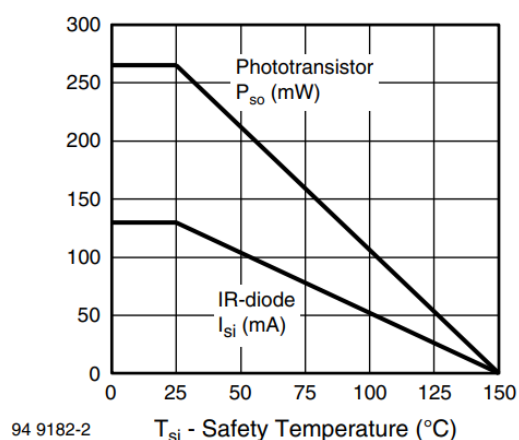


Fig. 1 - Derating Diagram

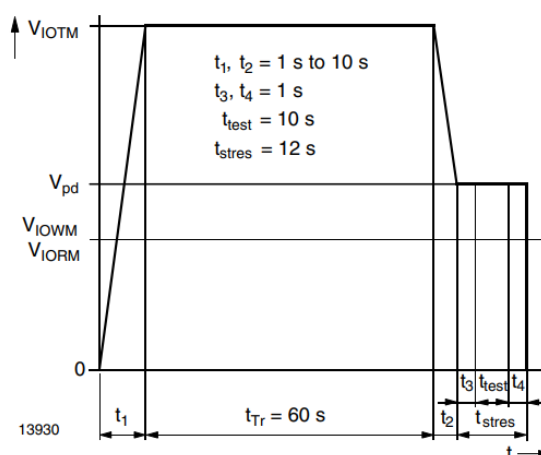


Fig. 2 - Test Pulse Diagram for Sample Test according to DIN EN 60747-5-2 (VDE 0884); IEC60747-5-5

SWITCHING CHARACTERISTICS ($T_{amb} = 25\text{ }^{\circ}\text{C}$, unless otherwise specified)						
PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT
Delay time	$V_S = 5\text{ V}$, $I_C = 2\text{ mA}$, $R_L = 100\text{ }\Omega$, (see figure 3)	t_d	—	3	—	μs
Rise time	$V_S = 5\text{ V}$, $I_C = 2\text{ mA}$, $R_L = 100\text{ }\Omega$, (see figure 3)	t_r	—	3	—	μs
Fall time	$V_S = 5\text{ V}$, $I_C = 2\text{ mA}$, $R_L = 100\text{ }\Omega$, (see figure 3)	t_f	—	4.7	—	μs
Storage time	$V_S = 5\text{ V}$, $I_C = 2\text{ mA}$, $R_L = 100\text{ }\Omega$, (see figure 3)	t_s	—	0.3	—	μs
Turn-on time	$V_S = 5\text{ V}$, $I_C = 2\text{ mA}$, $R_L = 100\text{ }\Omega$, (see figure 3)	t_{on}	—	6	—	μs
Turn-off time	$V_S = 5\text{ V}$, $I_C = 2\text{ mA}$, $R_L = 100\text{ }\Omega$, (see figure 3)	t_{off}	—	5	—	μs
Turn-on time	$V_S = 5\text{ V}$, $I_F = 10\text{ mA}$, $R_L = 1\text{ kW}$, (see figure 4)	t_{on}	—	9	—	μs
Turn-off time	$V_S = 5\text{ V}$, $I_F = 10\text{ mA}$, $R_L = 1\text{ kW}$, (see figure 4)	t_{off}	—	10	—	μs

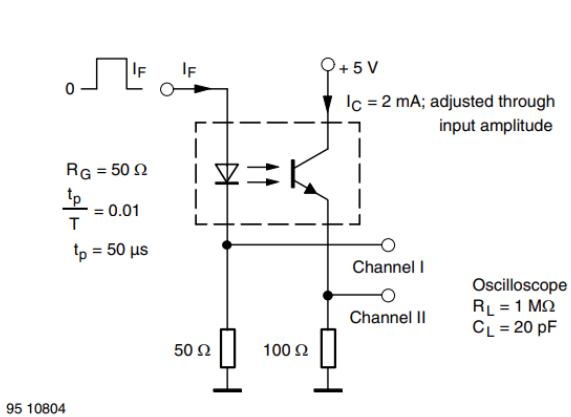


Fig. 3 - Test Circuit, Non-Saturated Operation

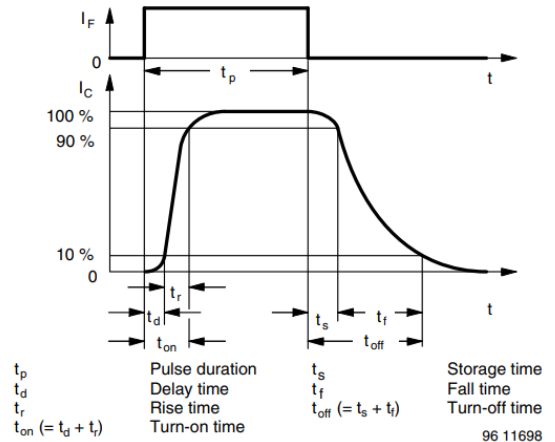


Fig. 5 - Switching Times

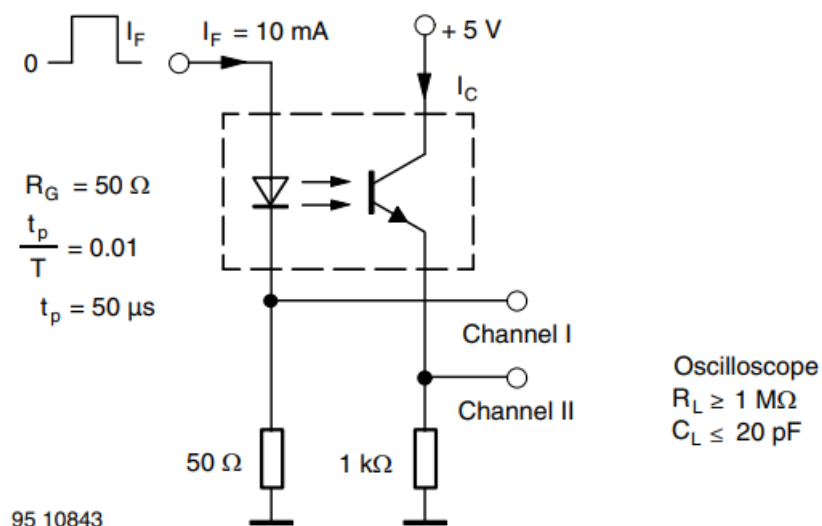


Fig. 4 - Test Circuit, Saturated Operation

TYPICAL CHARACTERISTICS ($T_{\text{amb}} = 25^\circ\text{C}$, unless otherwise specified)

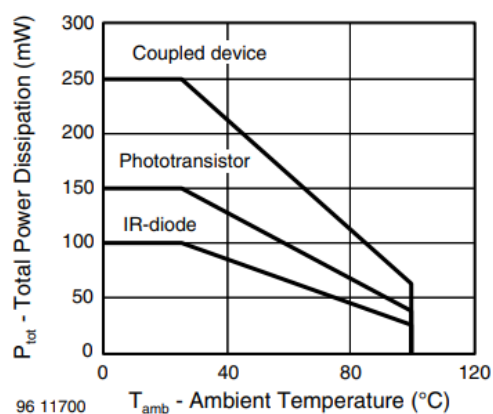


Fig. 6 - Total Power Dissipation vs. Ambient Temperature

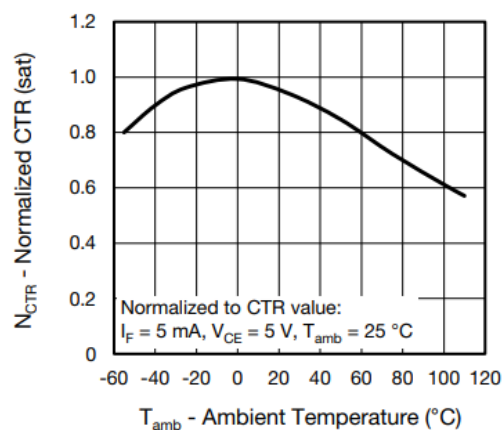


Fig. 9 - Normalized Current Transfer Ratio (saturated) vs. Ambient Temperature

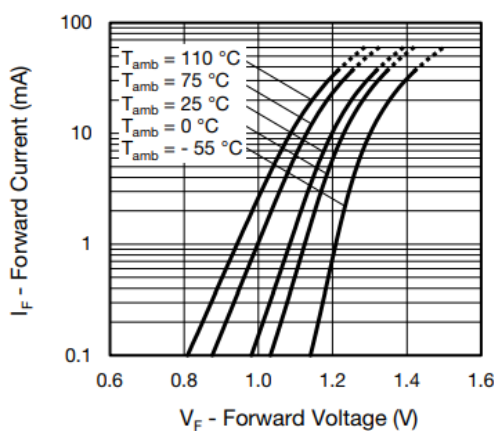


Fig. 7 - Forward Current vs. Forward Voltage

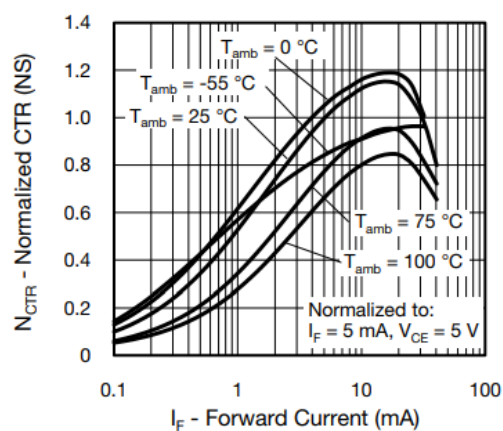


Fig. 10 - Normalized Current Transfer Ratio (non-saturated) vs. Forward Current

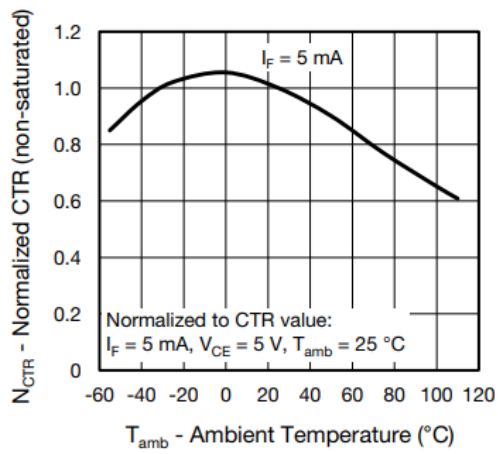


Fig. 8 - Normalized Current Transfer Ratio (non-saturated) vs. Ambient Temperature

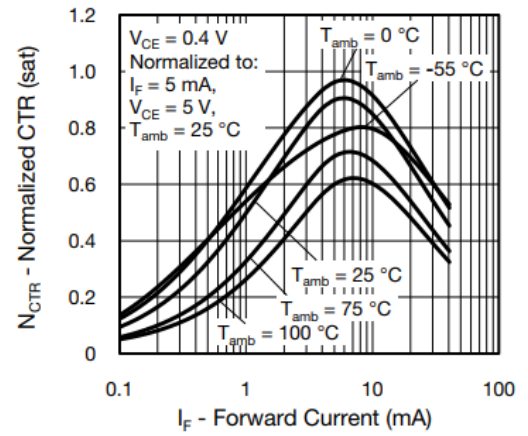


Fig. 11 - Normalized Current Transfer Ratio (saturated) vs. Forward Current

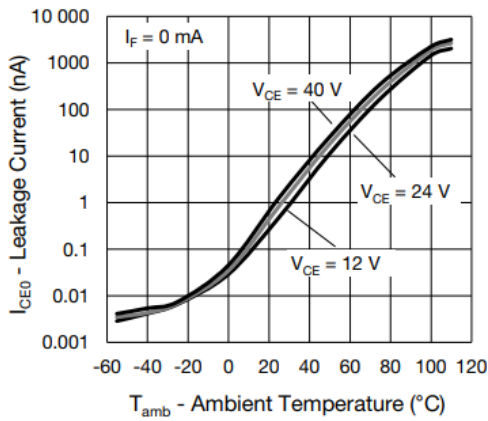


Fig. 12 - Collector Dark Current vs. Ambient Temperature

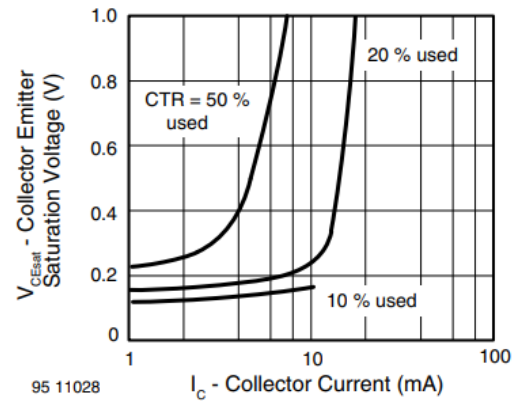


Fig. 15 - Collector Emitter Saturation Voltage vs. Collector Current

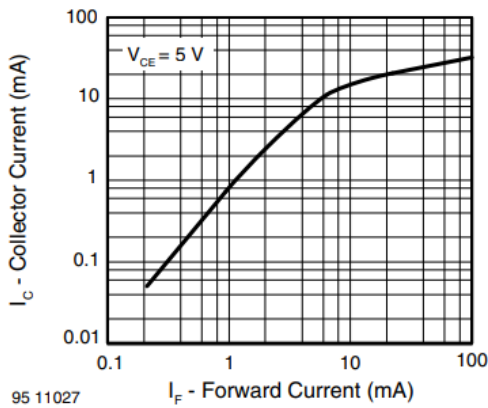


Fig. 13 - Collector Current vs. Forward Current

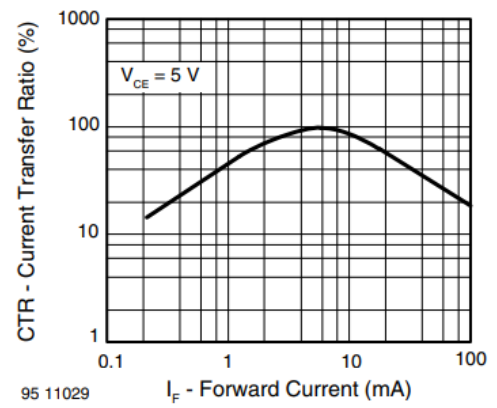


Fig. 16 - Current Transfer Ratio vs. Forward Current

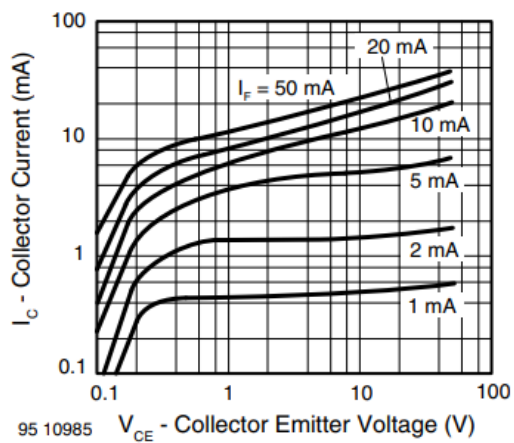


Fig. 14 - Collector Current vs. Collector Emitter Voltage

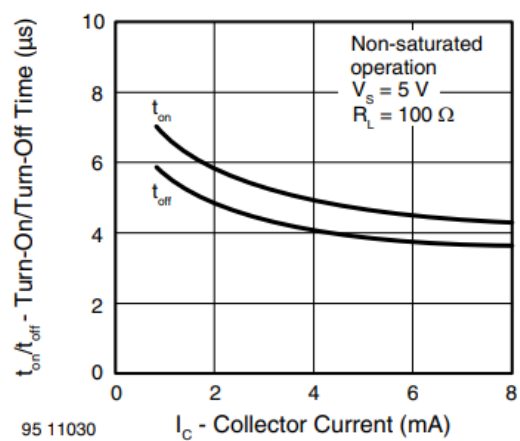


Fig. 17 - Turn-on/off Time vs. Collector Current

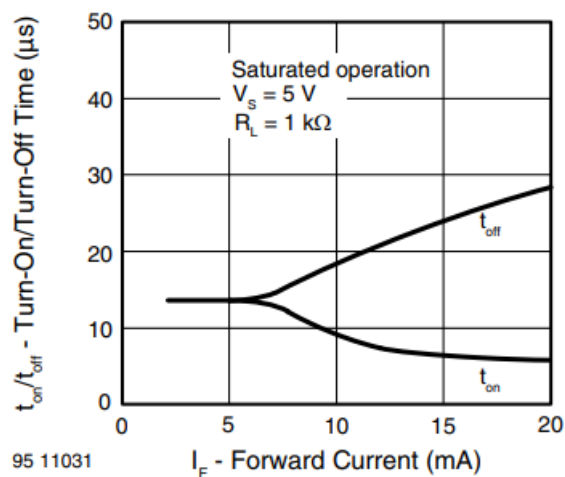
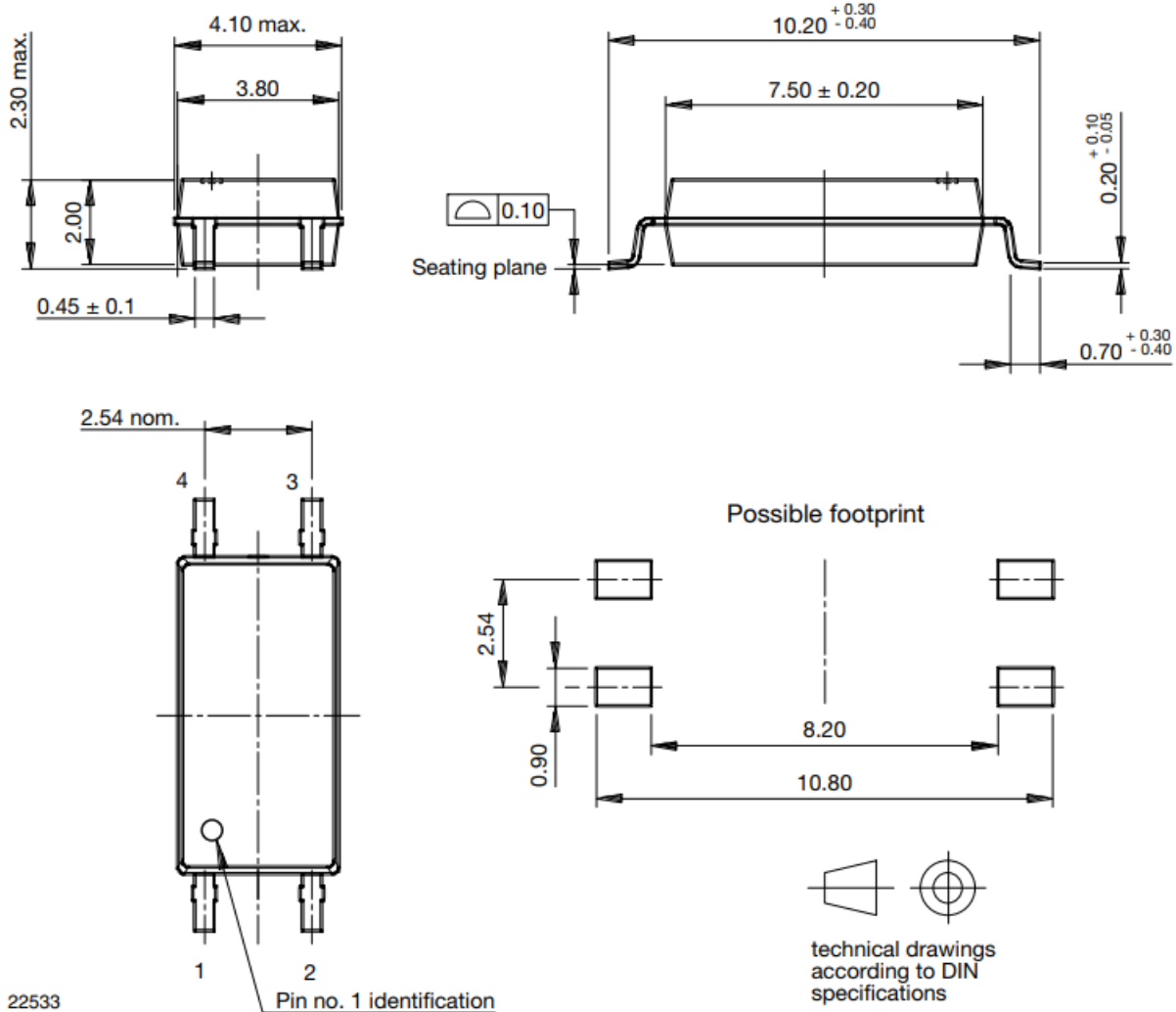
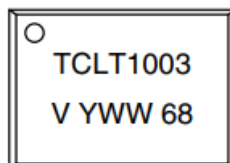


Fig. 18 - Turn-on/off Time vs. Forward Current

PACKAGE DIMENSIONS



PACKAGE MARKING (example)



TAPE AND REEL DIMENSIONS (in millimeters)

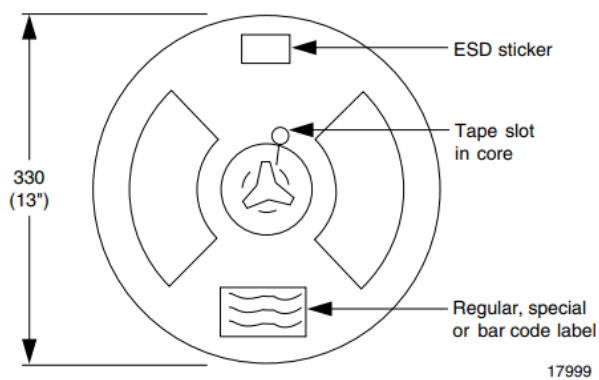


Fig. 19 - Reel Dimensions (3000 units per reel)

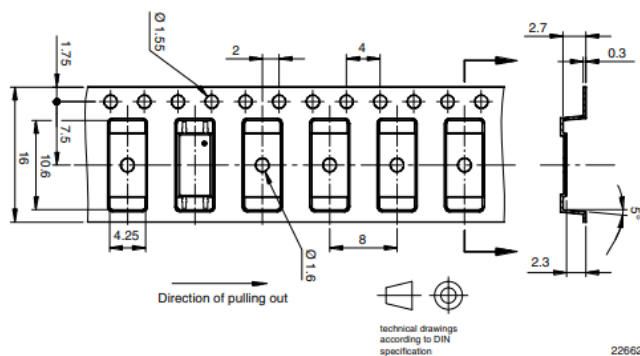


Fig. 20 - Tape Dimensions

SOLDER PROFILE

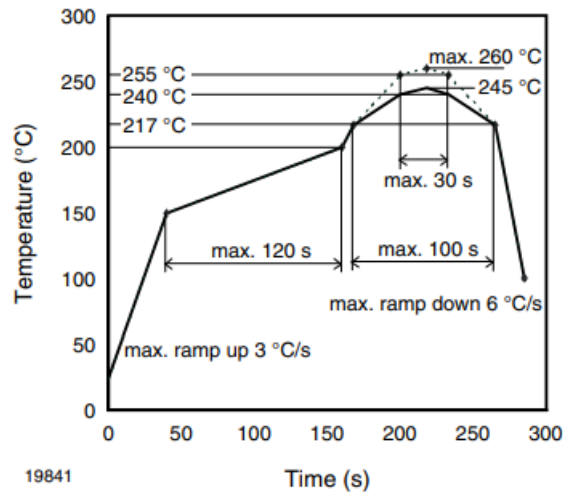


Fig. 21 - Lead (Pb)-free Reflow Solder Profile according to J-STD-020

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

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Documents / Resources

	<p>VISHAY TCLT1000 Optocoupler Phototransistor Output SOP 4L Long Mini Flat Package [pdf] User Guide</p> <p>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</p>
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References

- [Vishay Intertechnology: Passives & Discrete Semiconductors](#)
- [vishay.com/doc?91000](http://www.vishay.com/doc?91000)
- [vishay.com/doc?99912](http://www.vishay.com/doc?99912)
- [User Manual](#)