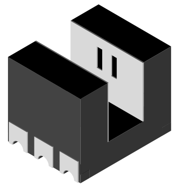
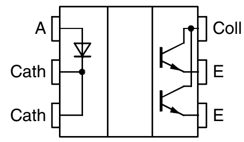
Subminiature Dual-Channel Transmissive Optical Sensor with Phototransistor Outputs, RoHS Compliant, Released for Lead (Pb)-free Solder Process

Description

The TCUT1200 is a compact transmissive sensor that includes an infrared emitter and two phototransistor detectors, located face-to-face in a surface-mount package.





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Features

- Package type: Surface-mount
- Detector type: Phototransistor
- Dimensions: L 5 mm x W 4 mm x H 4 mm
- Gap: 2 mm
- Aperture: 0.3 mm
- Channel distance (center to center): 0.8 mm
- Typical output current under test: I_C = 0.5 mA
- Emitter wavelength: 950 nm
- Lead (Pb)-free soldering released
- Lead (Pb)-free component in accordance with RoHS 2002/95/EC and WEEE 2002/96/EC
- Minimum order quantity: 2000 pcs, 2000 pcs/reel

Pb Pb-free

e4

Applications

- Accurate position sensor for encoder
- Detection of motion direction
- Computer mouse and trackballs

Absolute Maximum Ratings

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

Coupler

Parameter	Test condition	Symbol	Value	Unit
Power dissipation	$T_{amb} \leq 25$ °C	P	150	mW
Ambient temperature range		T_{amb}	- 40 to + 85	°C
Storage temperature range		T_{stg}	- 40 to + 100	°C
Soldering temperature	in accordance with fig. 13	T_{sd}	260	°C

Input (Emitter)

Parameter	Test condition	Symbol	Value	Unit
Reverse voltage		V_R	5	V
Forward current		I_F	25	mA
Forward surge current	$t_p \leq 10$ µs	I_{FSM}	100	mA
Power dissipation	$T_{amb} \leq 25$ °C	P_V	75	mW

Output (Detector)

Parameter	Test condition	Symbol	Value	Unit
Collector emitter voltage		V_{CEO}	70	V
Emitter collector voltage		V_{ECO}	7	V
Collector current		I_C	20	mA
Power dissipation	$T_{amb} \leq 25$ °C	P_V	75	mW

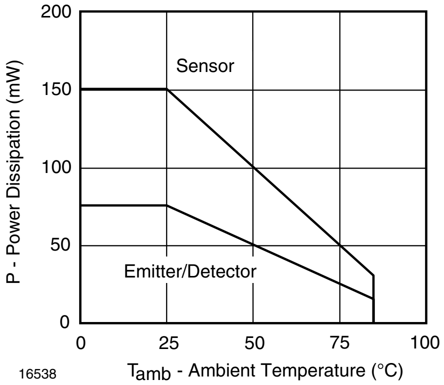


Figure 1. Power Dissipation Limit vs. Ambient Temperature

Electrical Characteristics

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

Coupler

Parameter	Test condition	Symbol	Min	Typ.	Max	Unit
Collector current per channel	V_{CE} = 5 V, I_F = 15 mA	I_C	300	500		µA
Collector emitter saturation voltage	I_F = 15 mA, I_C = 0.05 mA	V_{CEsat}			0.4	V

Input (Emitter)

Parameter	Test condition	Symbol	Min	Typ.	Max	Unit
Forward voltage	I_F = 15 mA	V_F		1.2	1.5	V
Reverse current	V_R = 5 V	I_R			10	µA
Junction capacitance	V_R = 0 V, f = 1 MHz	C_j		50		pF

Output (Detector)

Parameter	Test condition	Symbol	Min	Typ.	Max	Unit
Collector emitter voltage	I_C = 1 mA	V_{CEO}	70			V
Emitter collector voltage	I_E = 100 µA	V_{ECO}	7			V
Collector dark current	V_{CE} = 25 V, I_F = 0, E = 0	I_{CEO}		10	100	nA

Switching Characteristics

Parameter	Test condition	Symbol	Min	Typ.	Max	Unit
Rise time	I_C = 0.3 mA, V_{CE} = 5 V, R_L = 1000 Ω (see figure 3)	t_r		20.0	150	µs
Fall time	I_C = 0.3 mA, V_{CE} = 5 V, R_L = 1000 Ω (see figure 3)	t_f		30.0	150	µs

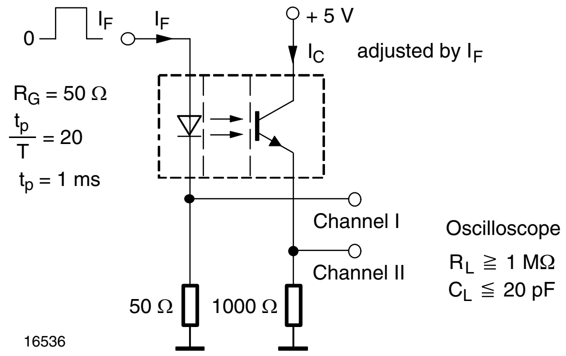


Figure 2. Test Circuit for t_r and t_f

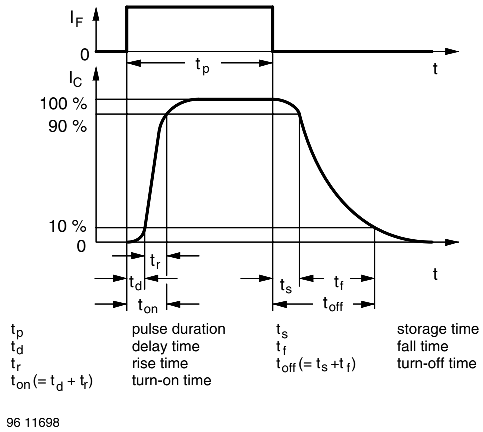


Figure 3. Switching Times

Typical Characteristics

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

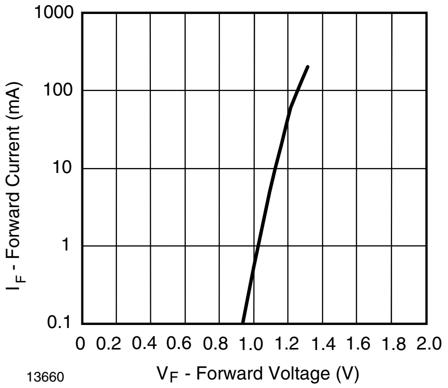


Figure 4. Forward Current vs. Forward Voltage

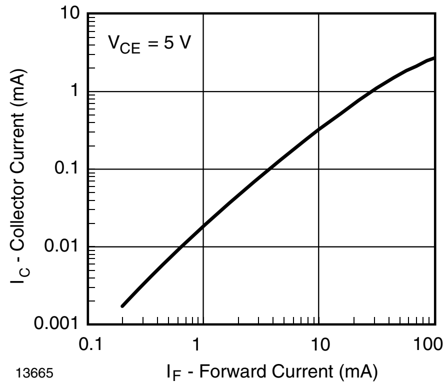


Figure 6. Collector Current vs. Forward Current

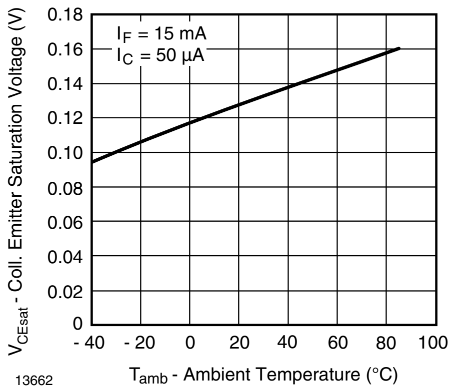


Figure 5. Collector Emitter Saturation Voltage vs. Ambient Temperature

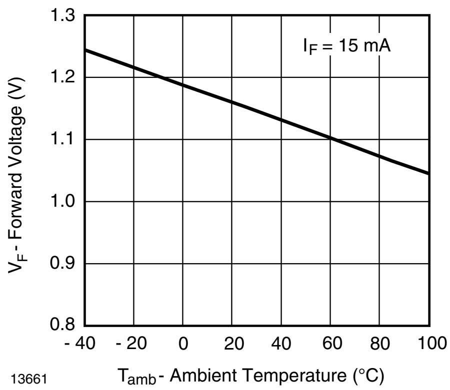


Figure 7. Forward Voltage vs. Ambient Temperature

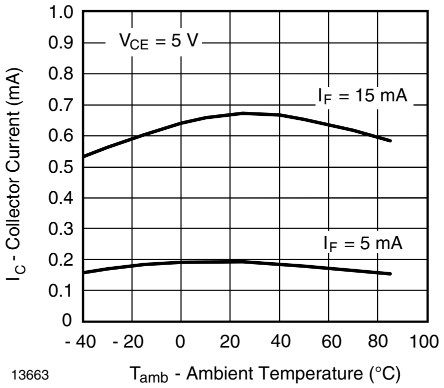


Figure 8. Collector Current vs. Ambient Temperature

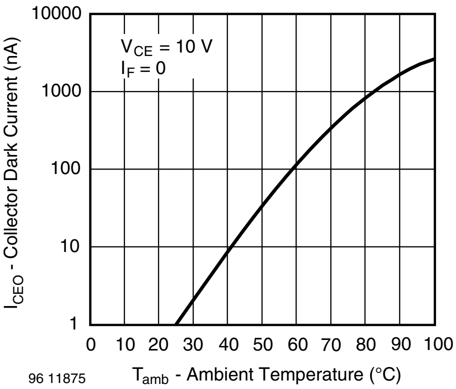


Figure 9. Collector Dark Current vs. Ambient Temperature

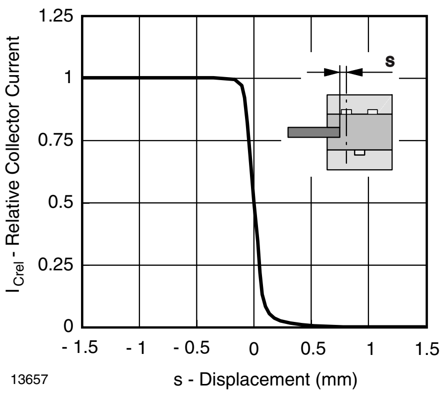


Figure 10. Relative Collector Current vs. Displacement

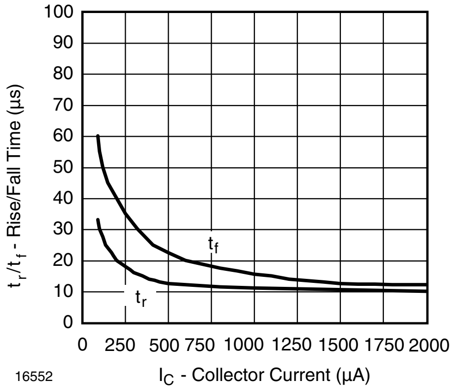


Figure 11. Rise/Fall Time vs. Collector Current

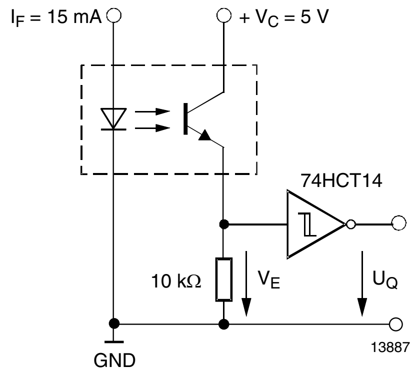


Figure 12. Application example

Reflow Solder Profiles

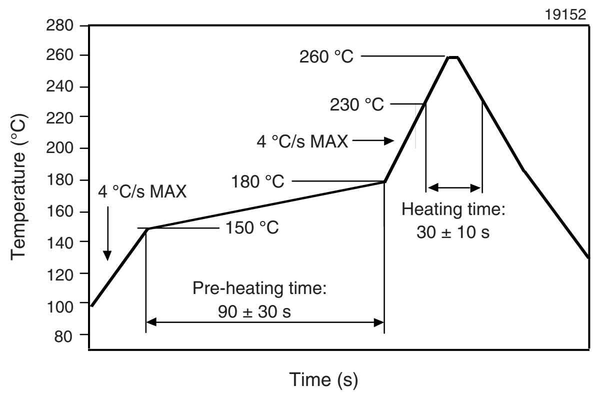


Figure 13. Lead (Pb)-free (Sn) Reflow Solder Profile

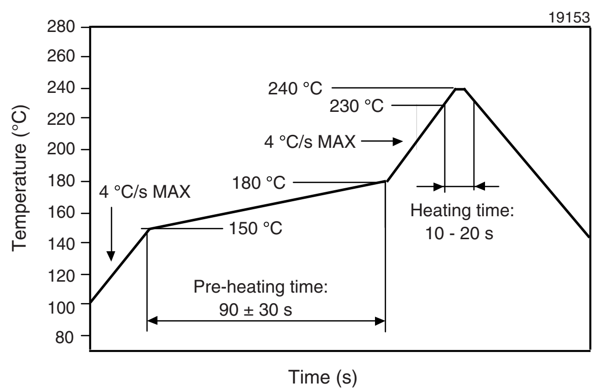


Figure 14. Lead Tin (SnPb) Reflow Solder Profile

Drypack

Devices are packed in moisture barrier bags (MBB) to prevent the products from absorbing moisture during transportation and storage. Each bag contains a desiccant.

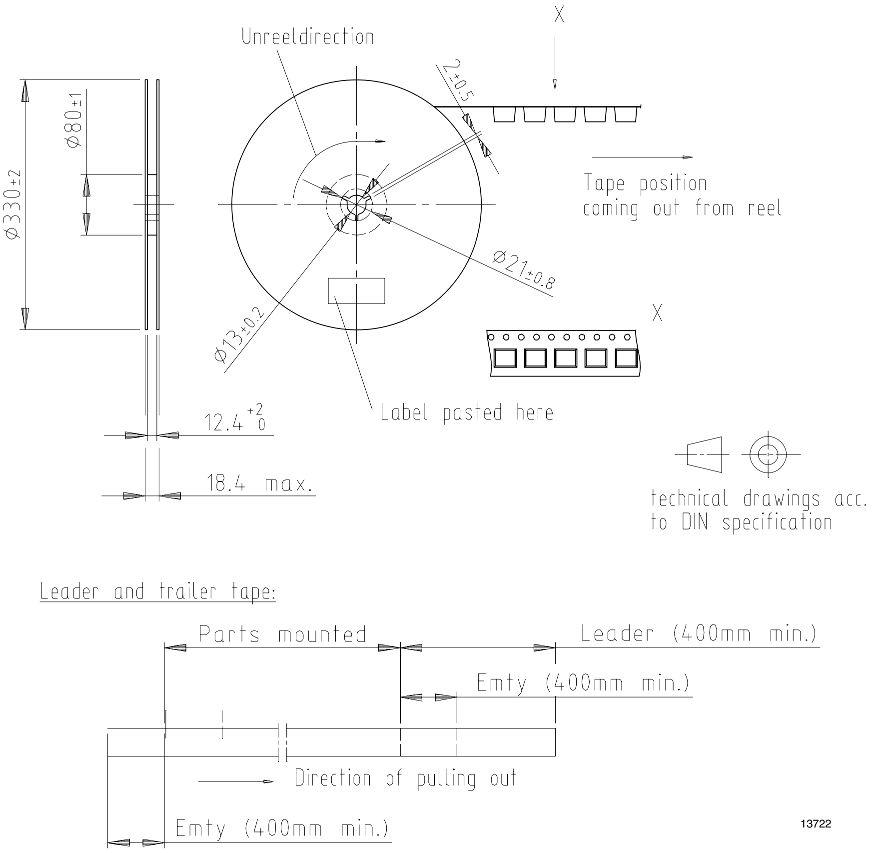
Floor Life

Floor life (time between soldering and removing from MBB) must not exceed the time indicated in J-STD-020. According JEDEC, J-STD-020, this component is released to Moisture Sensitivity Level 2, for use of Lead Tin (SnPb) Reflow Solder Profile (Figure 14) or Level 3, for use of Lead (Pb)-free (Sn) Reflow Solder Profile (Figure 13).
Floor Life: 12 month (Level 2) or 168 hours (Level 3)
Floor Conditions: T_{amb} < 30 °C, RH < 60 %

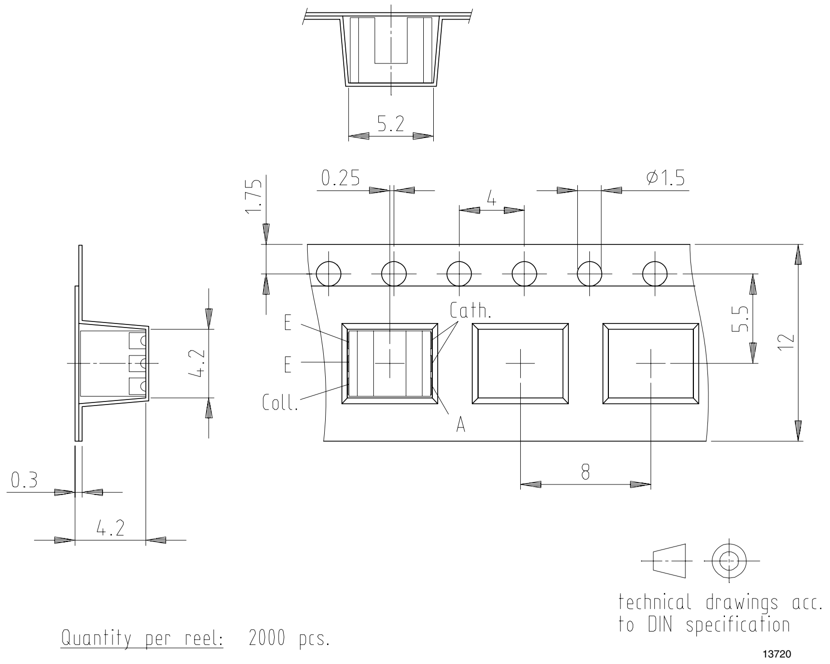
Drying

In case of moisture absorption, devices should be baked before soldering. Conditions see J-STD-020 or Label. Devices taped on reel dry using recommended conditions 192 h at 40 °C (± 5 °C), RH < 5 % or 96 h at 60 °C (± 5 °C), RH < 5 %.

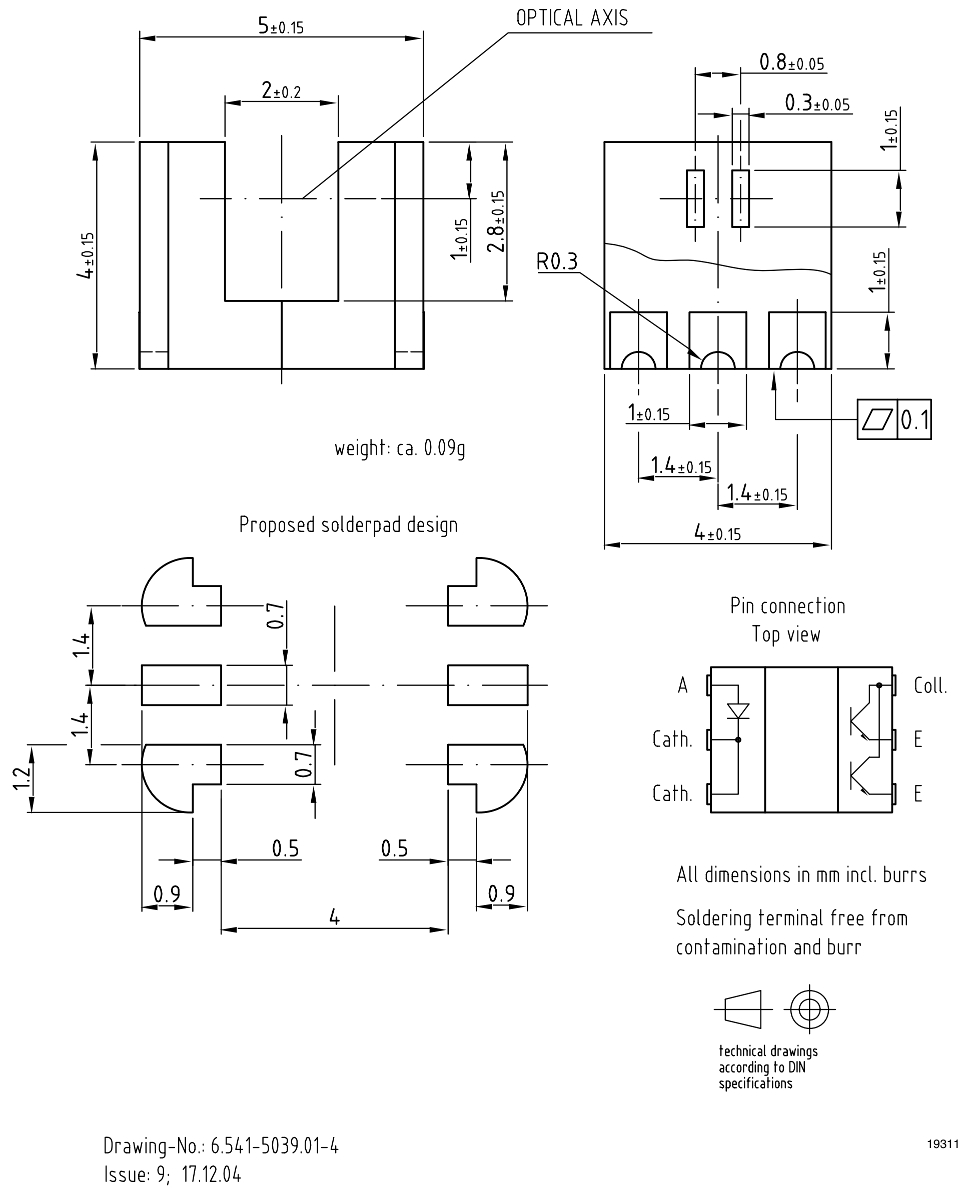
Dimensions of Reel and Tape in millimeters



Dimensions of Tape in millimeters



Package Dimensions



Ozone Depleting Substances Policy Statement

It is the policy of Vishay Semiconductor GmbH to

1. Meet all present and future national and international statutory requirements.
2. Regularly and continuously improve the performance of our products, processes, distribution and operating systems with respect to their impact on the health and safety of our employees and the public, as well as their impact on the environment.

It is particular concern to control or eliminate releases of those substances into the atmosphere which are known as ozone depleting substances (ODSs).

The Montreal Protocol (1987) and its London Amendments (1990) intend to severely restrict the use of ODSs and forbid their use within the next ten years. Various national and international initiatives are pressing for an earlier ban on these substances.

Vishay Semiconductor GmbH has been able to use its policy of continuous improvements to eliminate the use of ODSs listed in the following documents.

1. Annex A, B and list of transitional substances of the Montreal Protocol and the London Amendments respectively
2. Class I and II ozone depleting substances in the Clean Air Act Amendments of 1990 by the Environmental Protection Agency (EPA) in the USA
3. Council Decision 88/540/EEC and 91/690/EEC Annex A, B and C (transitional substances) respectively.

Vishay Semiconductor GmbH can certify that our semiconductors are not manufactured with ozone depleting substances and do not contain such substances.

Vishay Semiconductor GmbH, P.O.B. 3535, D-74025 Heilbronn, Germany

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