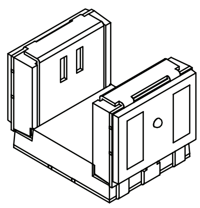
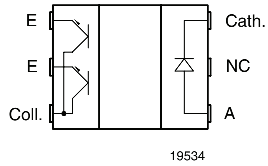
Subminiature Dual Channel Transmissive Optical Sensor with Phototransistor Outputs, RoHS Compliant, Released for Lead (Pb)-free Solder Process, AEC-Q101 Released

Description

The TCUT1300X01 is a compact transmissive sensor that includes an infrared emitter and two phototransistor detectors, located face-to-face in a surface mount package.





Pin connection
Top view

Features

- Product designed and qualified acc. AEC-Q101 for the automotive market
- Package type: Surface mount
- Detector type: Phototransistor
- Dimensions:
  L 5.5 mm x W 4 mm x H 4 mm
- Gap: 3 mm
- Aperture: 0.3 mm
- Channel distance (center to center): 0.8 mm
- Typical output current under test: I_C = 0.6 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

Applications

- Automotive optical sensors
- Accurate position sensor for encoder
- Sensor for motion, speed and direction

Absolute Maximum Ratings

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

Coupler

Parameter	Test condition	Symbol	Value	Unit
Power dissipation	$T_{amb} \le 25$ °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. 15	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	$t_p \le 10$ µs	I_{FSM}	200	mA
Power dissipation	$T_{amb} \le 25$ °C	P_V	75	mW

Output (Detector)

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

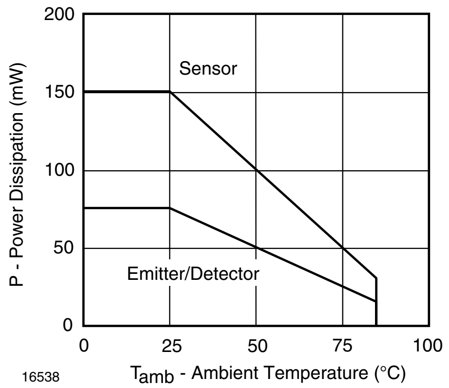


Figure 1. Power Dissipation Limit vs. Ambient Temperature

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	600		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	1.4	V
Reverse current	V_R = 5 V	I_R			10	µA
Junction capacitance	V_R = 0 V, f = 1 MHz	C_j		25		pF

Output (Detector)

Parameter	Test condition	Symbol	Min	Typ.	Max	Unit
Collector emitter voltage I_C	I_C = 1 mA	V_{CEO}	20			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}		1	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 = 100 Ω (see figure 2)	t_r		20.0	150	µs
Fall time	I_C = 0.3 mA, V_{CE} = 5 V, R_L = 100 Ω (see figure 2)	t_f		30.0	150	µs

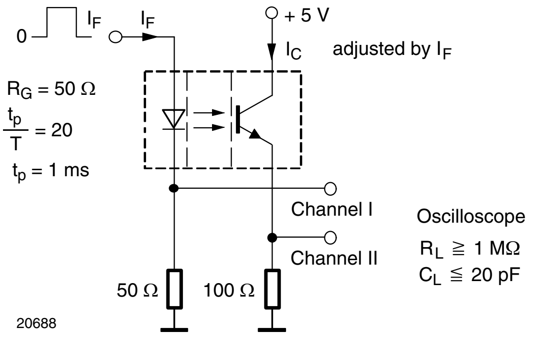


Figure 2. Test Circuit for t_r and t_f

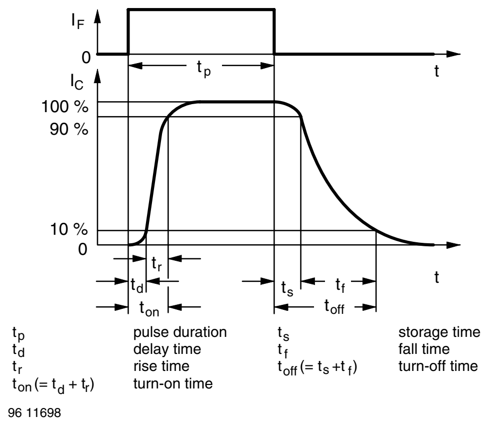


Figure 3. Switching Times

Typical Characteristics

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

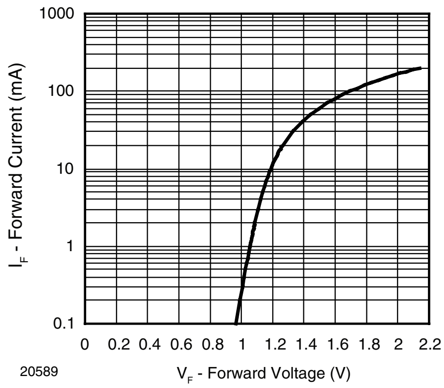


Figure 4. Forward Current vs. Forward Voltage

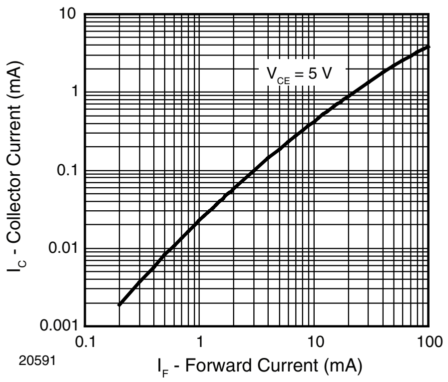


Figure 6. Collector Current vs. Forward Current

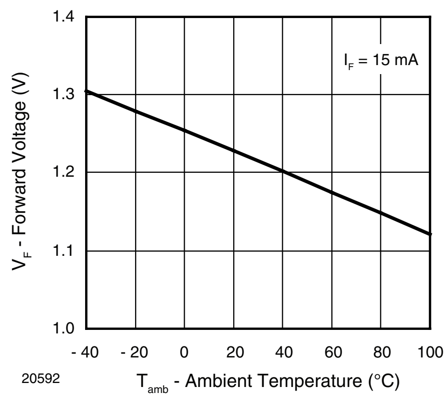


Figure 5. Forward Voltage vs. Ambient Temperature

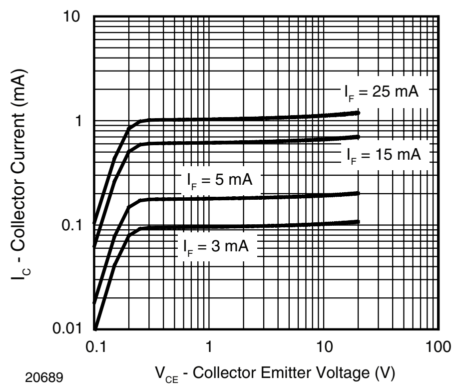


Figure 7. Collector Current vs. Collector Emitter Voltage

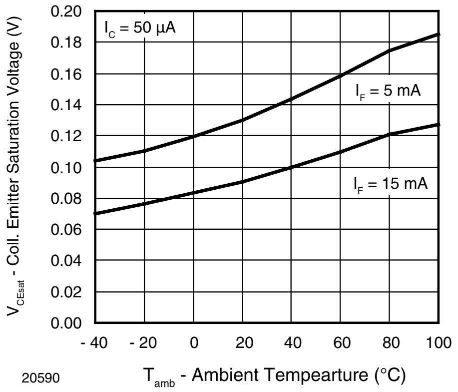


Figure 8. Collector Emitter Saturation Voltage vs. Ambient Temperature

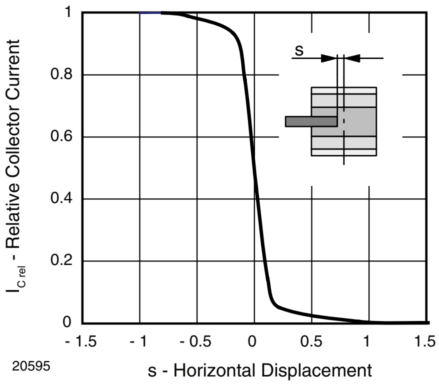


Figure 11. Relative Collector Current vs. Horizontal Displacement

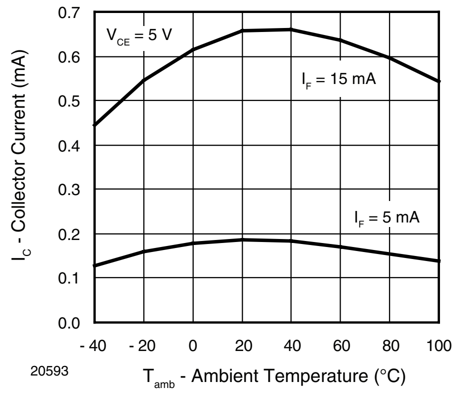


Figure 9. Collector Current vs. Ambient Temperature

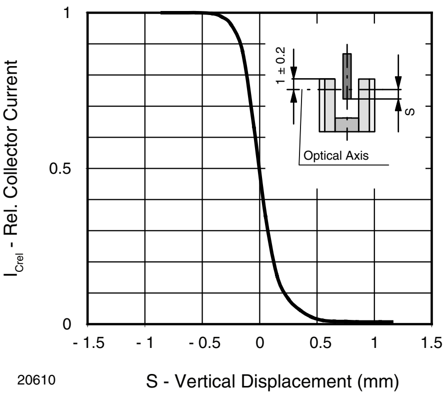


Figure 12. Relative Collector Current vs. Vertical Displacement

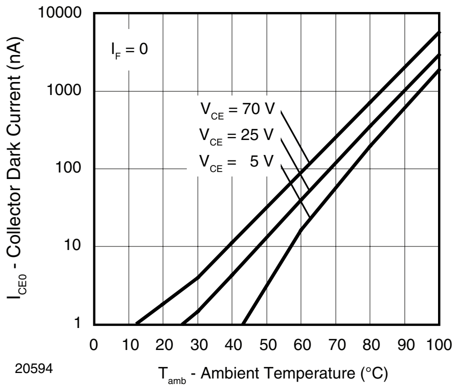


Figure 10. Collector Dark Current vs. Ambient Temperature

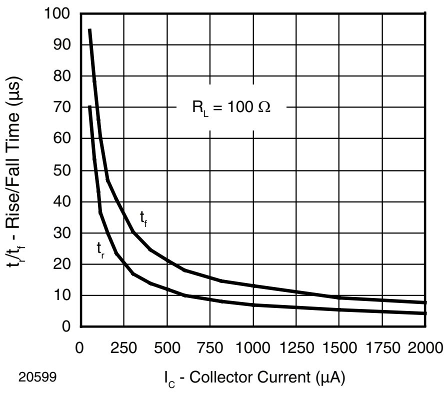


Figure 13. Rise/Fall Time vs. Collector Current

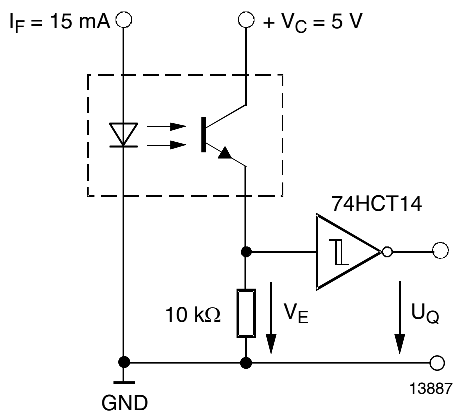


Figure 14. Application example

Floor Life

Level 1, acc. JEDEC, J-STD-020. No time limit.

Reflow Solder Profile

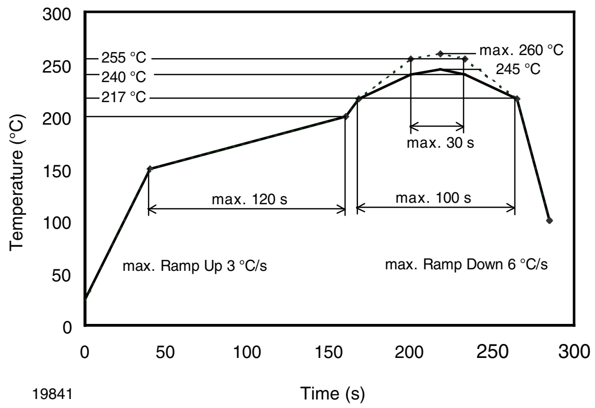
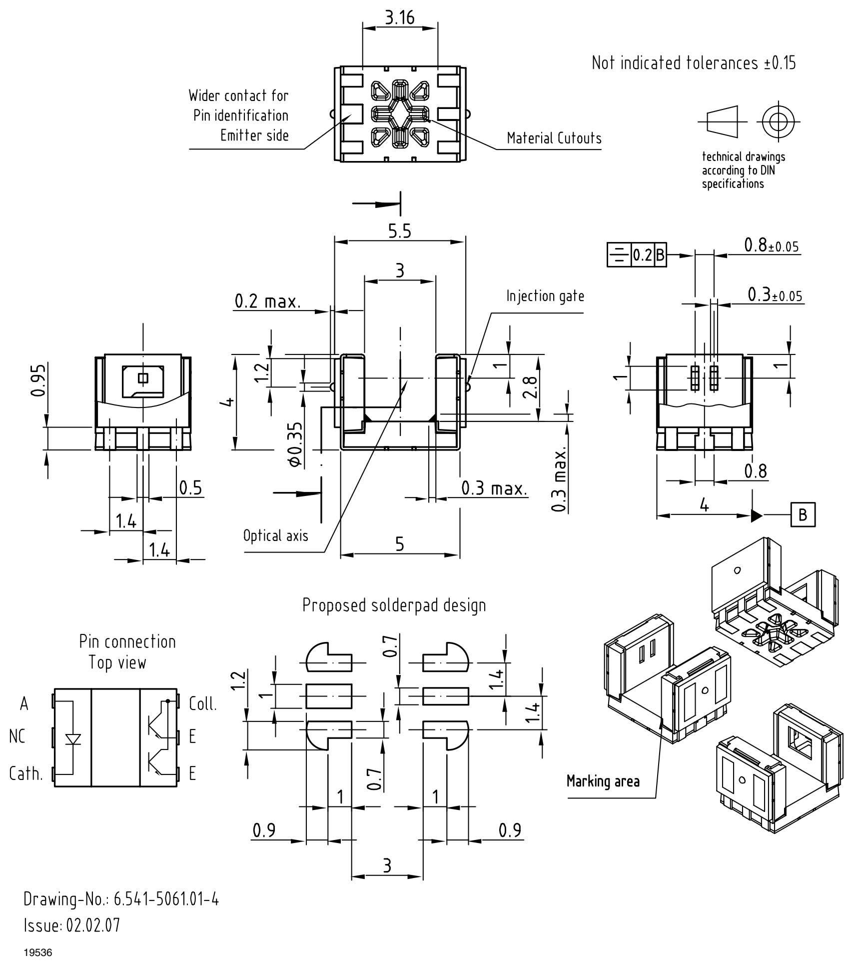
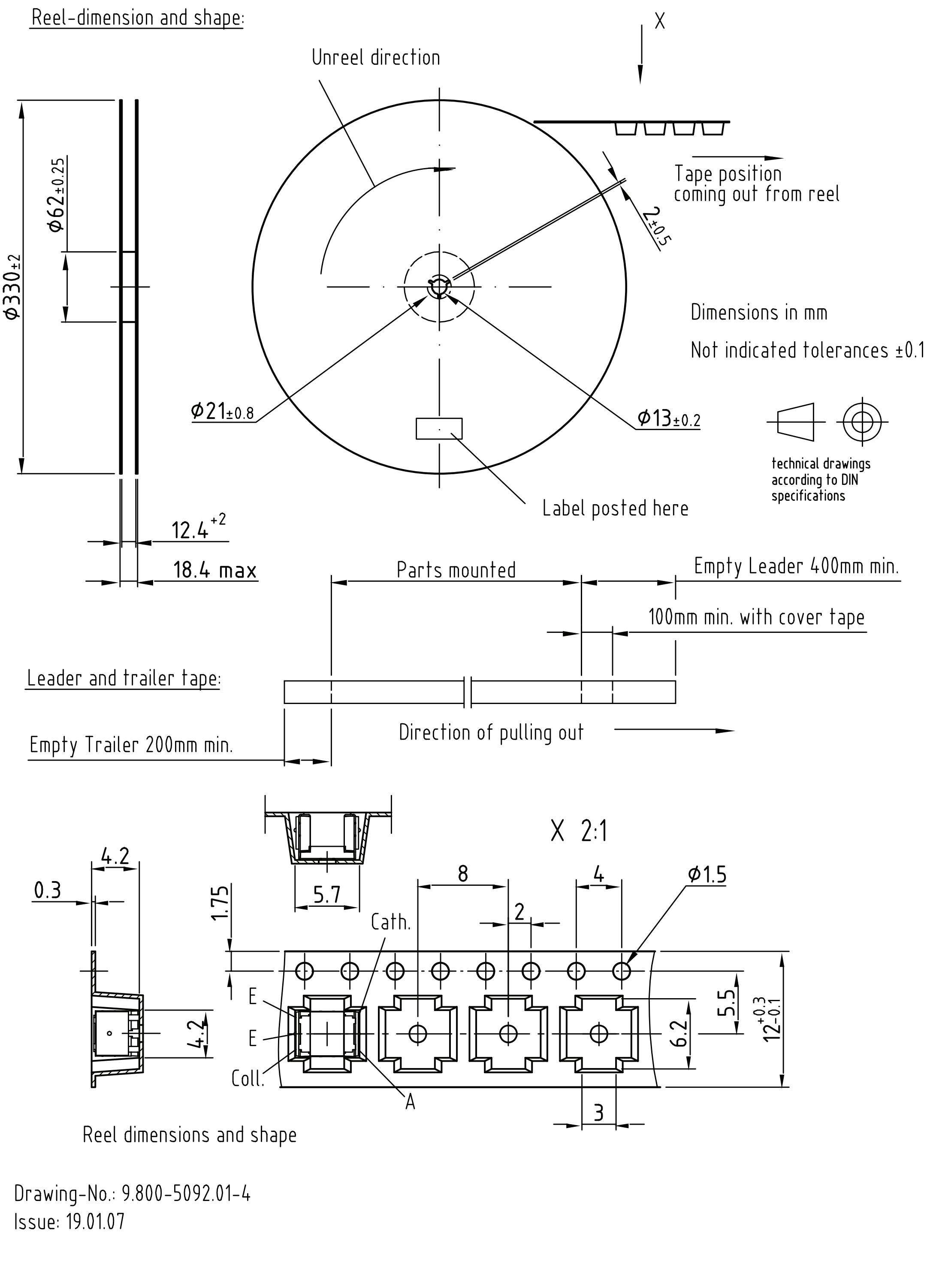


Figure 15. Lead (Pb)-free Reflow Solder Profile acc. J-STD-020C

Package Dimensions in millimeters



Package Dimensions in millimeters



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.

We reserve the right to make changes to improve technical design
and may do so without further notice.
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