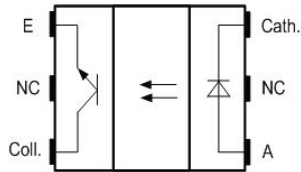


## Tall Dome Transmissive Optical Sensor with Phototransistor Output



### DESCRIPTION

The TCPT1600X01 is a compact transmissive sensor that includes an infrared emitter and a phototransistor detector, located face-to-face in a surface mount package. The tall dome design supports additional mechanical room for vertical signal encoding.

### FEATURES

- Package type: surface mount
- Detector type: phototransistor
- Dimensions (L x W x H in mm): 5.5 x 4 x 5.7
- AEC-Q101 qualified
- Gap (in mm): 3
- Aperture (in mm): 0.3
- Typical output current under test:  $I_C = 1.6$  mA
- Emitter wavelength: 950 nm
- Lead (Pb)-free soldering released
- Moisture sensitivity level (MSL): 1
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)

 AUTOMOTIVE  
GRADE

**RoHS**  
COMPLIANT  
HALOGEN  
**FREE**  
**GREEN**  
(5-2008)

### APPLICATIONS

- Automotive optical sensors
- Accurate position sensor for encoder
- Sensor for motion and speed
- Sensor for “turn and push” encoding

PRODUCT SUMMARY				
PART NUMBER	GAP WIDTH (mm)	APERTURE WIDTH (mm)	TYPICAL OUTPUT CURRENT UNDER TEST <sup>(1)</sup> (mA)	DAYLIGHT BLOCKING FILTER INTEGRATED
TCPT1600X01	3	0.3	1.6	No

#### Note

<sup>(1)</sup> Conditions like in table basic characteristics/coupler

ORDERING INFORMATION			
ORDERING CODE	PACKAGING	VOLUME <sup>(1)</sup>	REMARKS
TCPT1600X01	Tape and reel	MOQ: 1300 pcs, 1300 pcs/reel	Drypack, MSL 1

#### Note

<sup>(1)</sup> MOQ: minimum order quantity



<b>ABSOLUTE MAXIMUM RATINGS</b> ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)				
PARAMETER	TEST CONDITION	SYMBOL	VALUE	UNIT
<b>COUPLER</b>				
Total power dissipation	$T_{amb} \leq 95\text{ }^{\circ}\text{C}$	$P_{tot}$	37.5	mW
Junction temperature		$T_j$	110	$^{\circ}\text{C}$
Ambient temperature range		$T_{amb}$	-40 to +105	$^{\circ}\text{C}$
Storage temperature range		$T_{stg}$	-40 to +125	$^{\circ}\text{C}$
Soldering temperature	In accordance with fig. 16	$T_{sd}$	260	$^{\circ}\text{C}$
<b>INPUT (EMITTER)</b>				
Reverse voltage		$V_R$	5	V
Forward current	$T_{amb} \leq 95\text{ }^{\circ}\text{C}$	$I_F$	25	mA
Forward surge current	$t_p \leq 10\text{ }\mu\text{s}$	$I_{FSM}$	200	mA
Power dissipation	$T_{amb} \leq 95\text{ }^{\circ}\text{C}$	$P_V$	37.5	mW
<b>OUTPUT (DETECTOR)</b>				
Collector emitter voltage		$V_{CEO}$	20	V
Emitter collector voltage		$V_{ECO}$	7	V
Collector current		$I_C$	20	mA
Collector dark current	$T_{amb} = 85\text{ }^{\circ}\text{C}$ , $V_{CE} = 5\text{ V}$	$I_{CEO}$	3.3	$\mu\text{A}$

**ABSOLUTE MAXIMUM RATINGS**

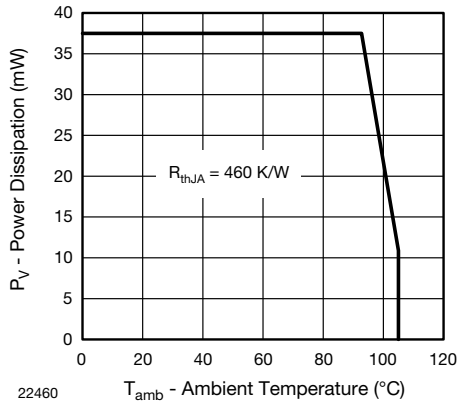


Fig. 1 - Power Dissipation Limit vs. Ambient Temperature

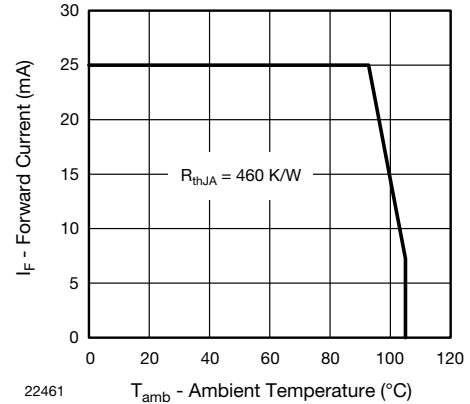


Fig. 2 - Forward Current Limit vs. Ambient Temperature

ELECTRICAL CHARACTERISTICS (T <sub>amb</sub> = 25 °C, unless otherwise specified)						
PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT
<b>COUPLER</b>						
Collector current	V <sub>CE</sub> = 5 V, I <sub>F</sub> = 15 mA	I <sub>C</sub>	0.7	1.6	-	mA
Collector emitter saturation voltage	I <sub>F</sub> = 15 mA, I <sub>C</sub> = 0.2 mA	V <sub>CEsat</sub>	-	-	0.4	V
<b>INPUT (EMITTER)</b>						
Forward voltage	I <sub>F</sub> = 15 mA	V <sub>F</sub>	1	1.2	1.4	V
Reverse current	V <sub>R</sub> = 5 V	I <sub>R</sub>	-	-	10	μA
Junction capacitance	V <sub>R</sub> = 0 V, f = 1 MHz	C <sub>j</sub>	-	25	-	pF
<b>OUTPUT (DETECTOR)</b>						
Collector emitter voltage I <sub>C</sub>	I <sub>C</sub> = 1 mA	V <sub>CEO</sub>	20	-	-	V
Emitter collector voltage	I <sub>E</sub> = 100 μA	V <sub>ECO</sub>	7	-	-	V
Collector dark current	V <sub>CE</sub> = 25 V, I <sub>F</sub> = 0 A, E = 0 lx	I <sub>CEO</sub>	-	1	100	nA
<b>SWITCHING CHARACTERISTICS</b>						
Rise time	I <sub>C</sub> = 0.7 mA, V <sub>CE</sub> = 5 V, R <sub>L</sub> = 100 Ω (see fig. 3)	t <sub>r</sub>	-	9	150	μs
Fall time	I <sub>C</sub> = 0.7 mA, V <sub>CE</sub> = 5 V, R <sub>L</sub> = 100 Ω (see fig. 3)	t <sub>f</sub>	-	16	150	μs



Fig. 3 - Test Circuit for t<sub>r</sub> and t<sub>f</sub>

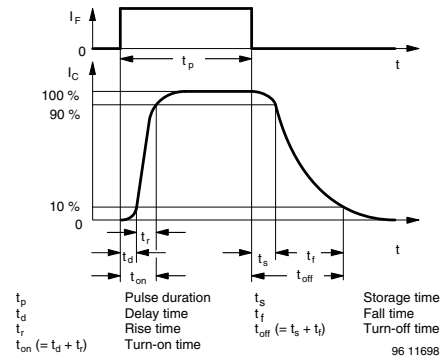


Fig. 4 - Switching Times

**BASIC CHARACTERISTICS** (T<sub>amb</sub> = 25 °C, unless otherwise specified)

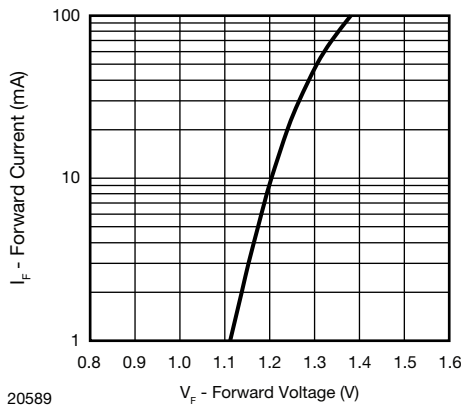


Fig. 5 - Forward Current vs. Forward Voltage

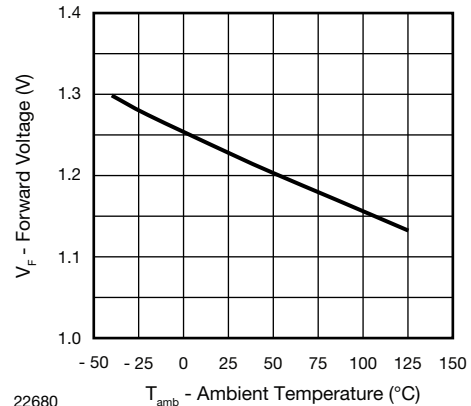


Fig. 6 - Forward Voltage vs. Ambient Temperature

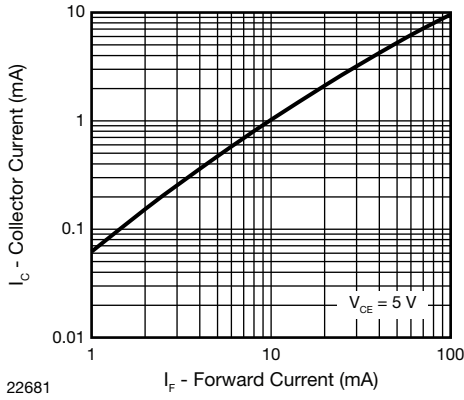


Fig. 7 - Collector Current vs. Forward Current



Fig. 10 - Collector Current vs. Ambient Temperature

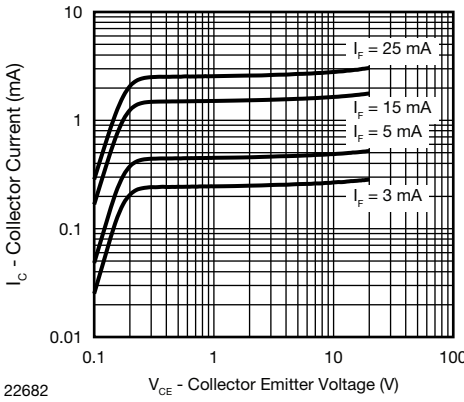


Fig. 8 - Collector Current vs. Collector Emitter Voltage

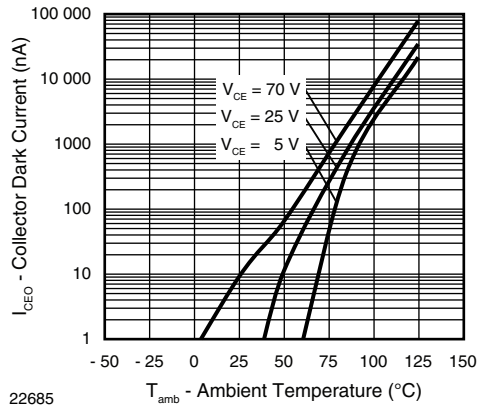


Fig. 11 - Collector Dark Current vs. Ambient Temperature

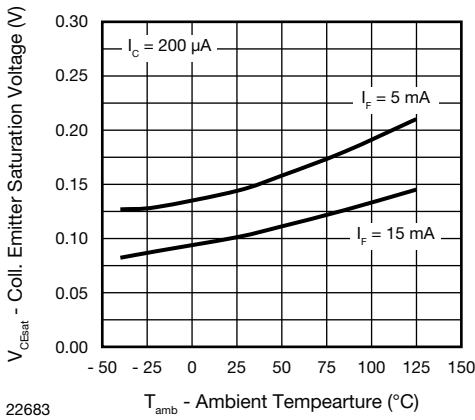


Fig. 9 - Collector Emitter Saturation Voltage vs. Ambient Temperature

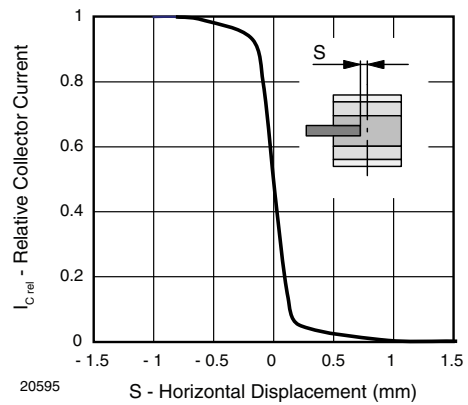


Fig. 12 - Relative Collector Current vs. Horizontal Displacement

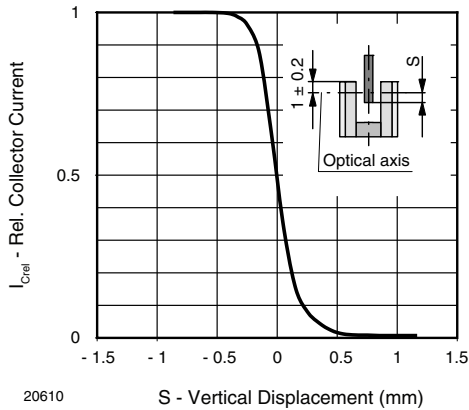


Fig. 13 - Relative Collector Current vs. Vertical Displacement



Fig. 15 - Application example

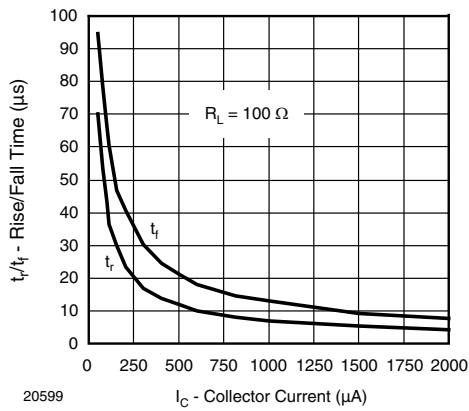


Fig. 14 - Rise/Fall Time vs. Collector Current

**REFLOW SOLDER PROFILE**



Fig. 16 - Lead (Pb)-free Reflow Solder Profile acc. J-STD-020

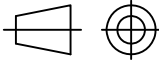
**FLOOR LIFE**

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

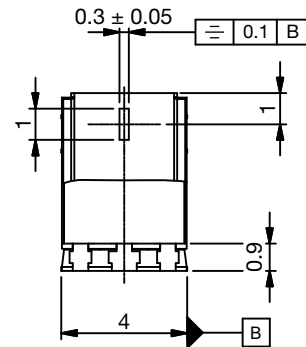
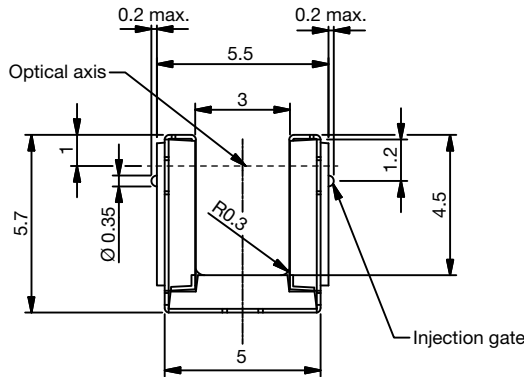
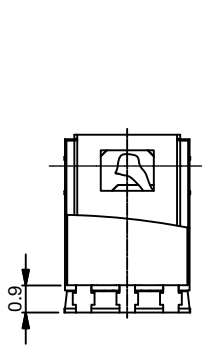
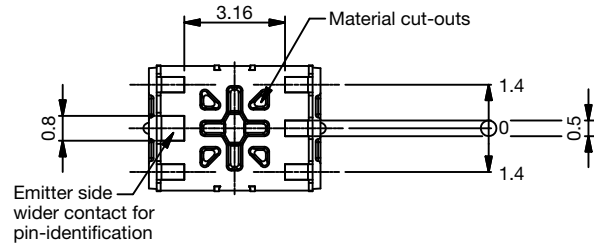


PACKAGE DIMENSIONS in millimeters

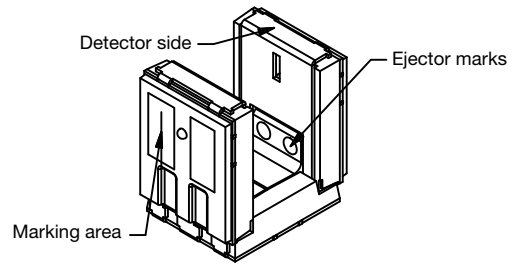
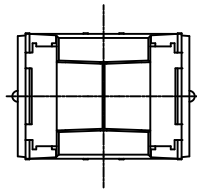
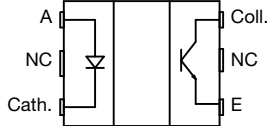
Not indicated tolerances ± 0.15



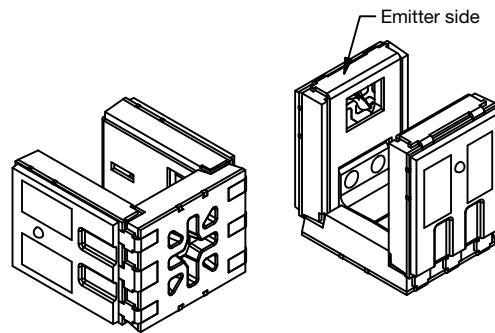
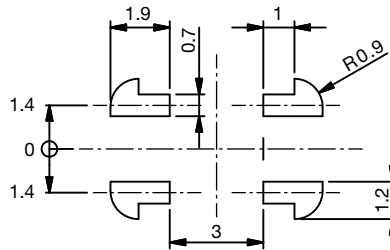
Technical drawings according to DIN specification.



Pin connection top view



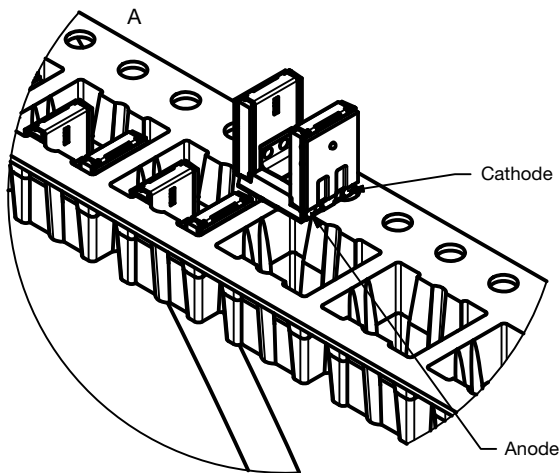
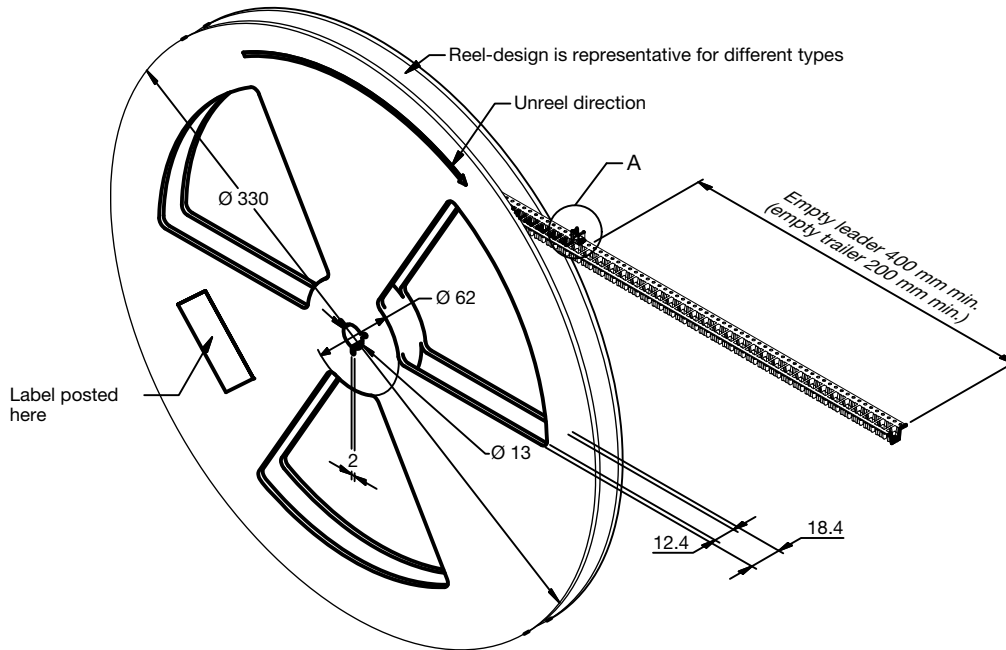
Proposed solderpad design



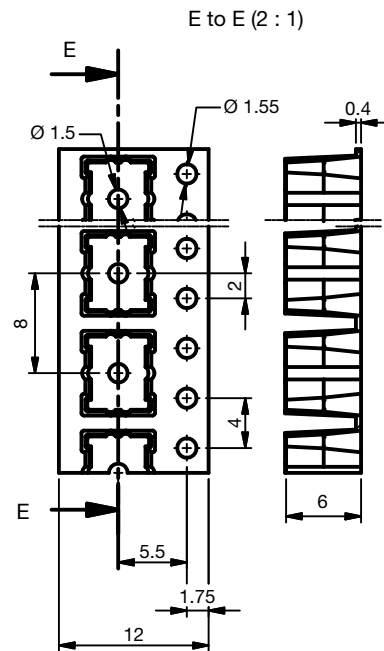
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Issue: 1; 04.11.15



PACKAGE DIMENSIONS in millimeters



Drawing-No.: 9.800-5124.02-4  
Issue: 1; 04.11.15





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