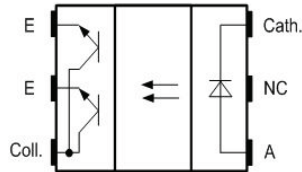


Tall Dome Dual Channel Transmissive Optical Sensor with Phototransistor Outputs



DESCRIPTION

The TCUT1600X01 is a compact transmissive sensor that includes an infrared emitter and two phototransistor detectors, 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
- Channel distance (center to center): 0.8 mm
- 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

 AUTOMOTIVE
GRADE

RoHS
COMPLIANT
HALOGEN
FREE
GREEN
(5-2008)

APPLICATIONS

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

PRODUCT SUMMARY				
PART NUMBER	GAP WIDTH (mm)	APERTURE WIDTH (mm)	TYPICAL OUTPUT CURRENT UNDER TEST ⁽¹⁾ (mA)	DAYLIGHT BLOCKING FILTER INTEGRATED
TCUT1600X01	3	0.3	1.6	No

Note

⁽¹⁾ Conditions like in table basic characteristics/coupler

ORDERING INFORMATION			
ORDERING CODE	PACKAGING	VOLUME ⁽¹⁾	REMARKS
TCUT1600X01	Tape and reel	MOQ: 1300 pcs, 1300 pcs/reel	Drypack, MSL 1

Note

⁽¹⁾ MOQ: minimum order quantity



ABSOLUTE MAXIMUM RATINGS ($T_{amb} = 25\text{ }^{\circ}\text{C}$, unless otherwise specified)				
PARAMETER	TEST CONDITION	SYMBOL	VALUE	UNIT
COUPLER				
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	$^{\circ}\text{C}$
INPUT (EMITTER)				
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
OUTPUT (DETECTOR)				
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	μA

ABSOLUTE MAXIMUM RATINGS

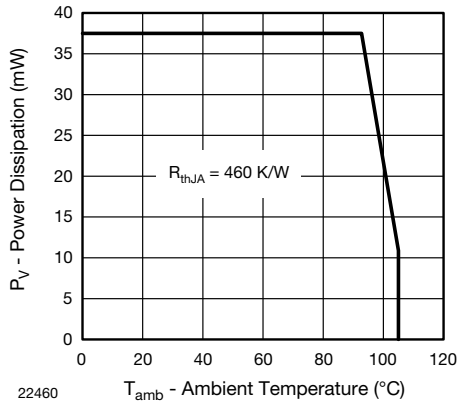


Fig. 1 - Power Dissipation Limit vs. Ambient Temperature

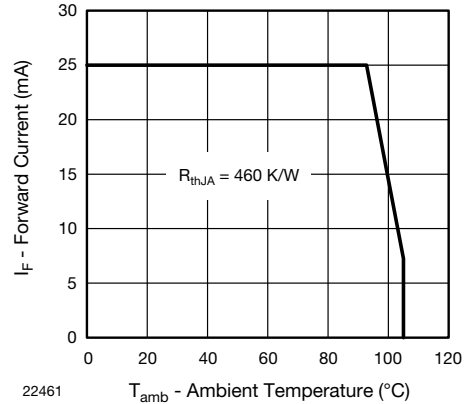


Fig. 2 - Forward Current Limit vs. Ambient Temperature

ELECTRICAL CHARACTERISTICS ($T_{amb} = 25\text{ }^{\circ}\text{C}$, unless otherwise specified)						
PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT
COUPLER						
Collector current per channel	$V_{CE} = 5\text{ V}$, $I_F = 15\text{ mA}$	I_C	0.7	1.6	-	mA
Collector emitter saturation voltage	$I_F = 15\text{ mA}$, $I_C = 0.2\text{ mA}$	V_{CEsat}	-	-	0.4	V
INPUT (EMITTER)						
Forward voltage	$I_F = 15\text{ mA}$	V_F	1	1.2	1.4	V
Reverse current	$V_R = 5\text{ V}$	I_R	-	-	10	μA
Junction capacitance	$V_R = 0\text{ V}$, $f = 1\text{ MHz}$	C_j	-	25	-	pF
OUTPUT (DETECTOR)						
Collector emitter voltage I_C	$I_C = 1\text{ mA}$	V_{CEO}	20	-	-	V
Emitter collector voltage	$I_E = 100\text{ }\mu\text{A}$	V_{ECO}	7	-	-	V
Collector dark current	$V_{CE} = 25\text{ V}$, $I_F = 0\text{ A}$, $E = 0\text{ lx}$	I_{CEO}	-	1	100	nA
SWITCHING CHARACTERISTICS						
Rise time	$I_C = 0.7\text{ mA}$, $V_{CE} = 5\text{ V}$, $R_L = 100\text{ }\Omega$ (see fig. 3)	t_r	-	9	150	μs
Fall time	$I_C = 0.7\text{ mA}$, $V_{CE} = 5\text{ V}$, $R_L = 100\text{ }\Omega$ (see fig. 3)	t_f	-	16	150	μs

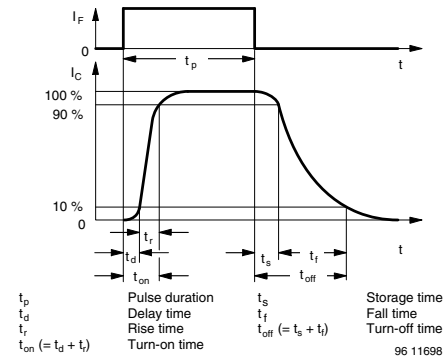

 Fig. 3 - Test Circuit for t_r and t_f


Fig. 4 - Switching Times

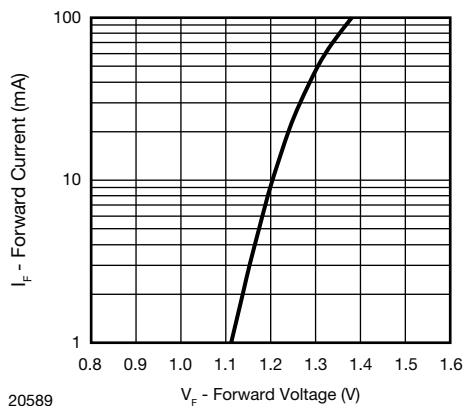
BASIC CHARACTERISTICS ($T_{amb} = 25\text{ }^{\circ}\text{C}$, unless otherwise specified)


Fig. 5 - Forward Current vs. Forward Voltage

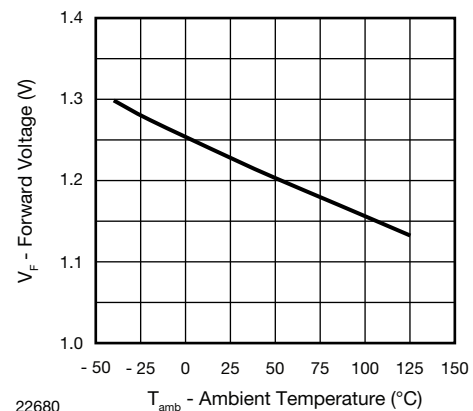


Fig. 6 - Forward Voltage vs. Ambient Temperature

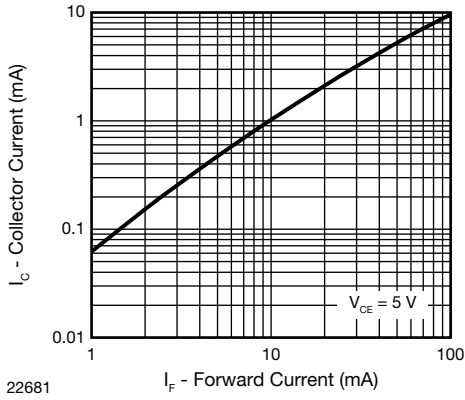


Fig. 7 - Collector Current vs. Forward Current



Fig. 10 - Collector Current vs. Ambient Temperature

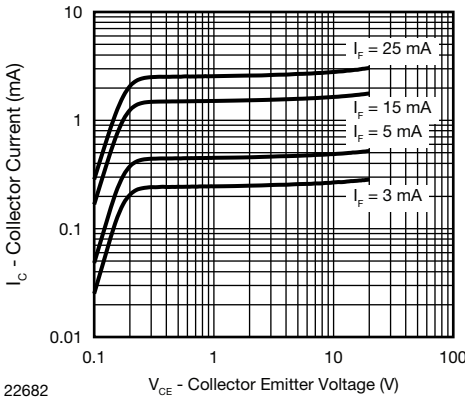


Fig. 8 - Collector Current vs. Collector Emitter Voltage

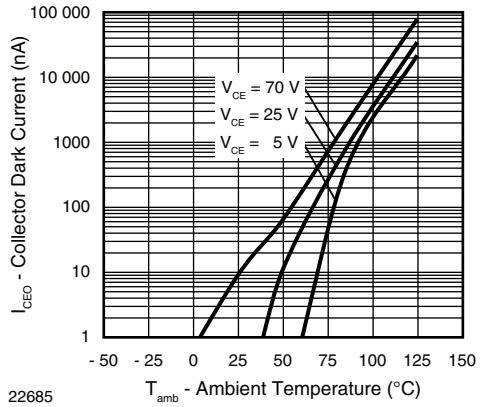


Fig. 11 - Collector Dark Current vs. Ambient Temperature

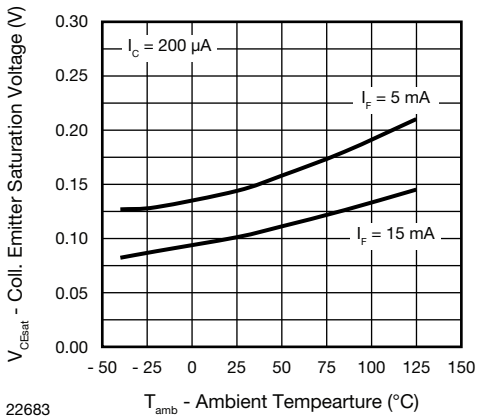


Fig. 9 - Collector Emitter Saturation Voltage vs. Ambient Temperature

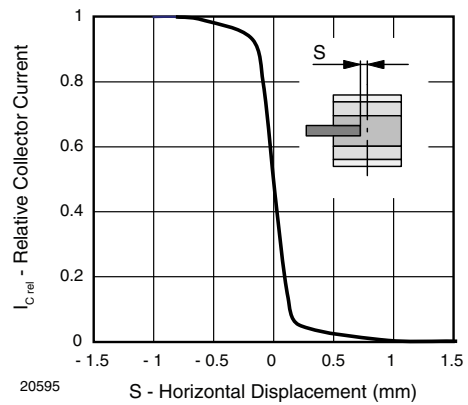


Fig. 12 - Relative Collector Current vs. Horizontal Displacement

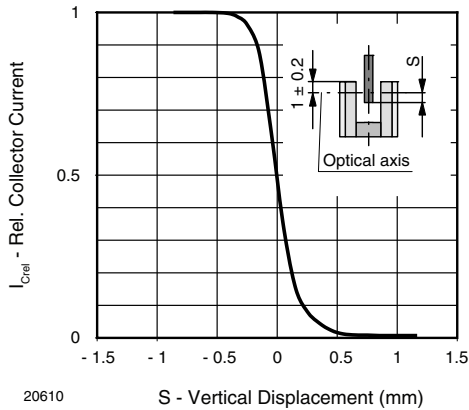


Fig. 13 - Relative Collector Current vs. Vertical Displacement

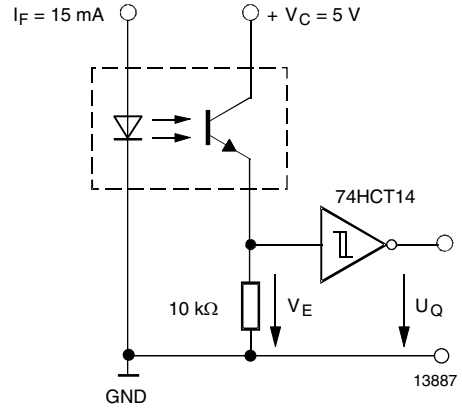


Fig. 15 - Application example

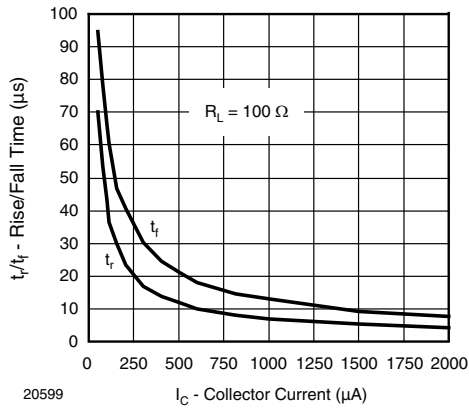


Fig. 14 - Rise/Fall Time vs. Collector Current

REFLOW SOLDER PROFILE

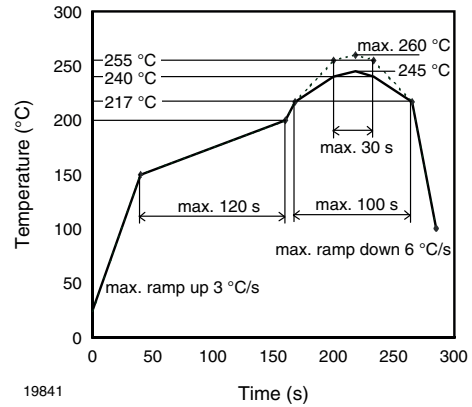


Fig. 16 - Lead (Pb)-free Reflow Solder Profile acc. J-STD-020

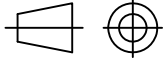
FLOOR LIFE

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

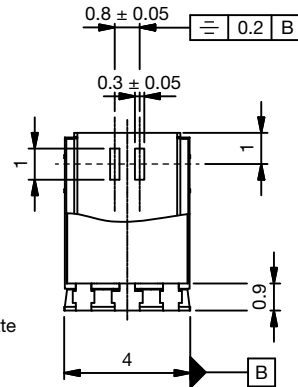
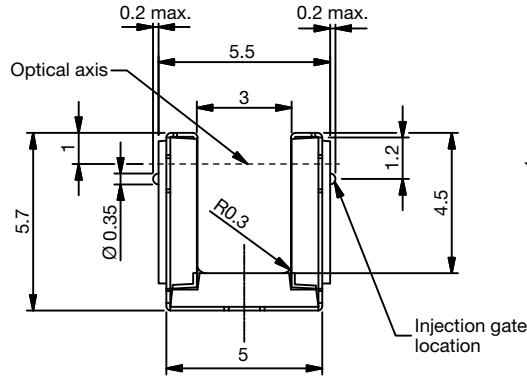
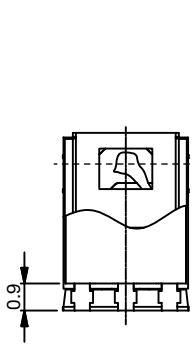
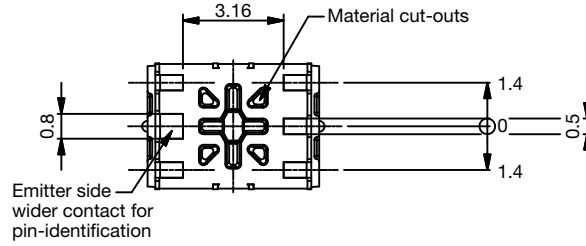


PACKAGE DIMENSIONS in millimeters

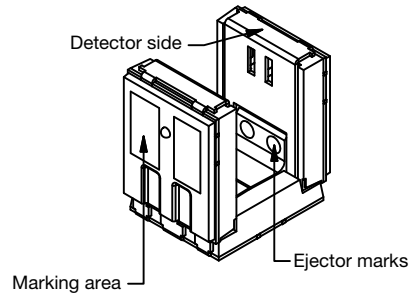
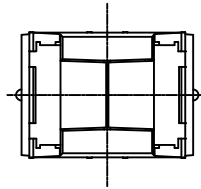
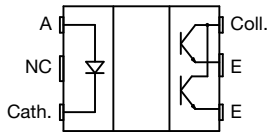
Not indicated tolerances ± 0.15



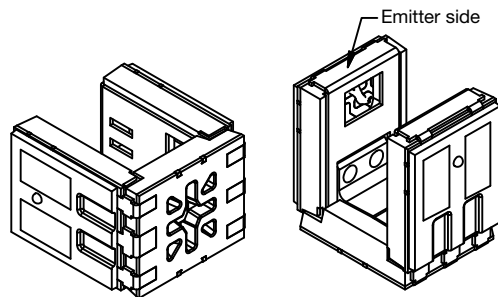
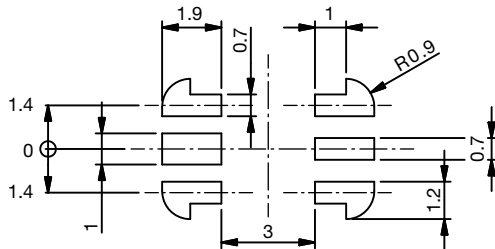
Technical drawings according to DIN specification.



Pin connection top view



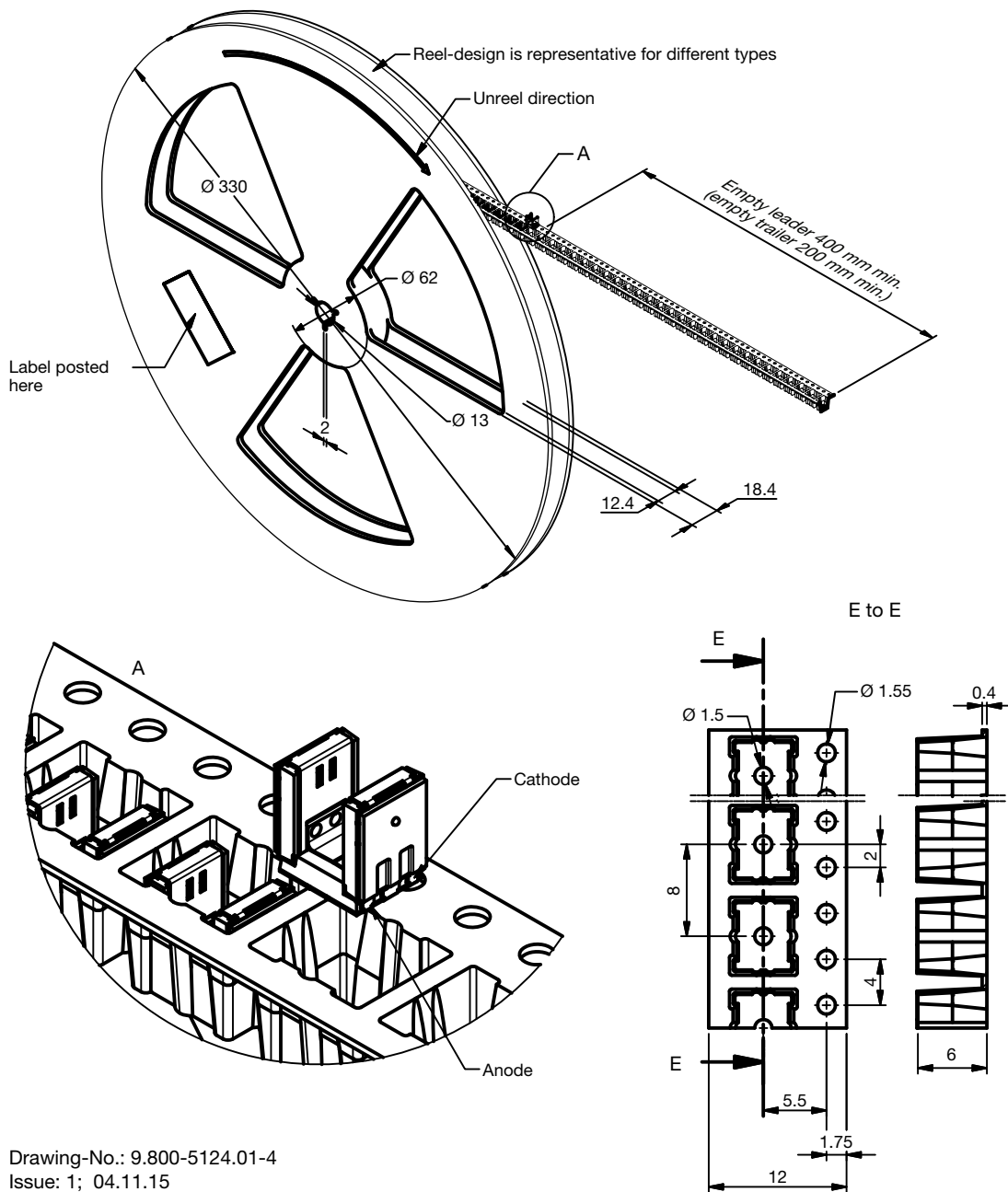
Proposed solderpad design



Drawing-No.: 6.541-5098.01-4
Issue: 1; 04.11.15



PACKAGE DIMENSIONS in millimeters





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