Triple Channel Transmissive Optical Sensor With Phototransistor Outputs for “Turn and Push” Encoding

FEATURES

- Package type: surface-mount
- Detector type: phototransistor
- Dimensions (L x W x H in mm): 5.7 x 5.9 x 7.1
- AEC-Q101 qualified
- Gap (in mm): 3
- Aperture (in mm): 0.3
- Typical output current under test: I_C = 1.3 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

Pb-free

e4

RoHS COMPLIANT

HALOGEN FREE GREEN (5-2008)

DESCRIPTION

The TCUT1630X01 is a compact transmissive sensor that includes an infrared emitter and three phototransistor detectors, located face-to-face in a surface-mount package. The tall dome design supports an additional transistor and additional mechanical room for vertical signal encoding.

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
TCUT1630X01	3	0.3	1.3	No

Note

(1) Conditions like in table basic characteristics / coupler

ORDERING INFORMATION

ORDERING CODE	PACKAGING	VOLUME (1)	REMARKS
TCUT1630X01 (2)	Tape and reel	MOQ: 1100 pcs, 1100 pcs/reel	Drypack, MSL 1
TCUT1630X01_A (3)	Tape and reel	MOQ: 1100 pcs, 1100 pcs/reel	Drypack, MSL 1 PCN-OPT-1311-2024

Notes

(1) MOQ: minimum order quantity

(2) Starting from the date stated in PCN, the updated ordering code TCUT1630X01_A to guarantee availability of the product

(3) TCUT1630X01_A represents the post PCN parts; for more details: PCN-OPT-1311-2024

ABSOLUTE MAXIMUM RATINGS (T_{amb} = 25 °C, unless otherwise specified)				
PARAMETER	**TEST CONDITION**	**SYMBOL**	**VALUE**	**UNIT**
COUPLER				
Junction temperature		T_j	110	°C
Ambient temperature range		T_{amb}	-40 to +105	°C
Storage temperature range		T_{stg}	-40 to +125	°C
Soldering temperature	In accordance with Fig. 17	T_{sd}	260	°C
INPUT (EMITTER)				
Reverse voltage		V_R	5	V
Forward current	$T_{amb} \leq 95$ °C	I_F	25	mA
Forward surge current	$t_p \leq 10$ µs	I_{FSM}	200	mA
Total power dissipation	$T_{amb} \leq 95$ °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 °C, V_{CE} = 5 V	I_{CEO}	3.3	µA
Total power dissipation	$T_{amb} \leq 95$ °C	P_V	37.5	mW

ABSOLUTE MAXIMUM RATINGS

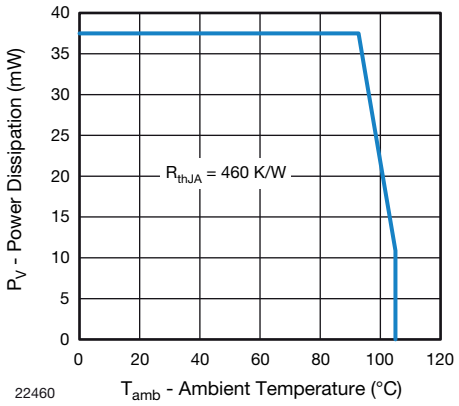


Fig. 1 - Power Dissipation Limit vs. Ambient Temperature

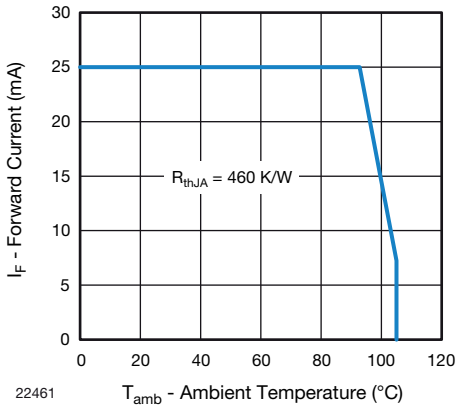


Fig. 2 - Forward Current Limit vs. Ambient Temperature

ELECTRICAL CHARACTERISTICS (T_{amb} = 25 °C, unless otherwise specified)						
PARAMETER	**TEST CONDITION**	**SYMBOL**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
COUPLER						
Collector current per channel	V_{CE} = 5 V, I_F = 15 mA	I_C	0.45	1.3	-	mA
Collector emitter saturation voltage	I_F = 15 mA, I_C = 0.2 mA	V_{CEsat}	-	-	0.4	V
INPUT (EMITTER)						
Forward voltage	I_F = 15 mA	V_F	1	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)						
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 A, E = 0 lx	I_{CEO}	-	1	100	nA
SWITCHING CHARACTERISTICS						
Rise time	I_C = 0.7 mA, V_{CE} = 5 V, R_L = 100 Ω (see Fig. 3)	t_r	-	9	150	µs
Fall time	I_C = 0.7 mA, V_{CE} = 5 V, R_L = 100 Ω (see Fig. 3)	t_f	-	16	150	µs

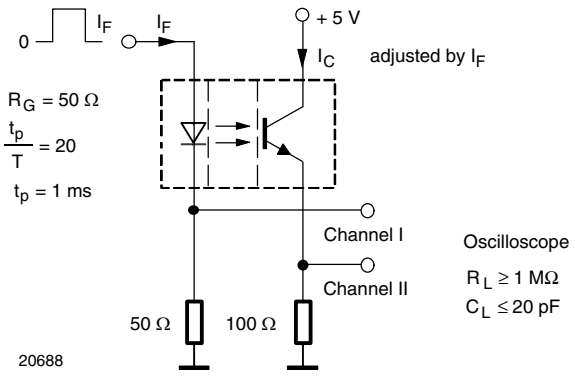


Fig. 3 - Test Circuit for t_r and t_f

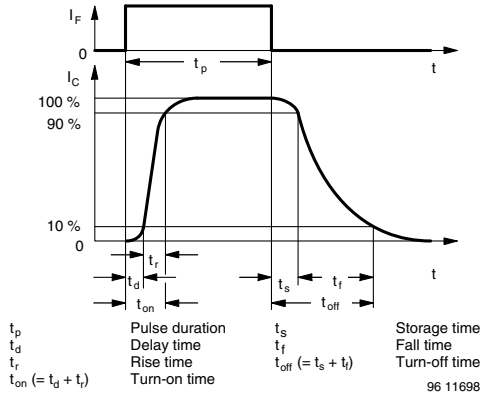


Fig. 4 - Switching Times

BASIC CHARACTERISTICS (T_{amb} = 25 °C, unless otherwise specified)

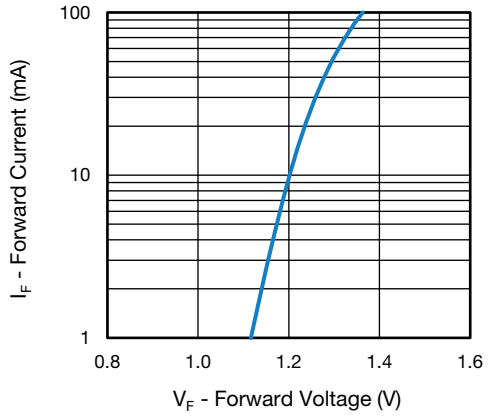


Fig. 5 - Forward Current vs. Forward Voltage

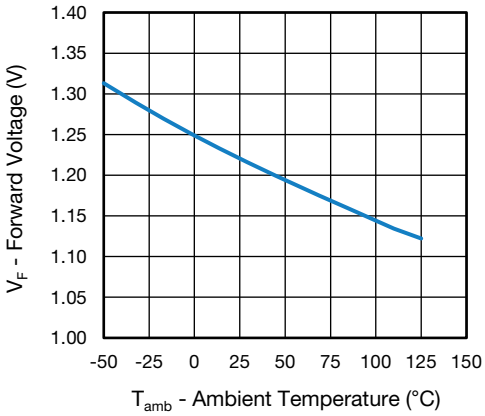


Fig. 6 - Forward Voltage vs. Ambient Temperature

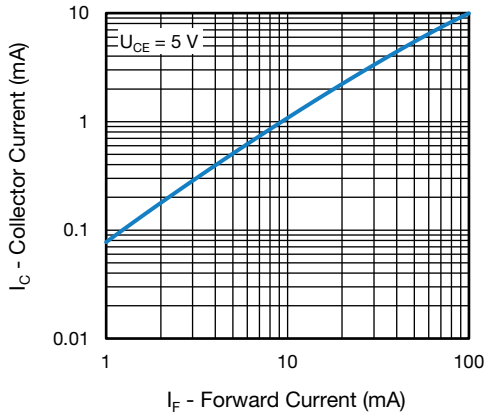


Fig. 7 - Collector Current vs. Forward Current

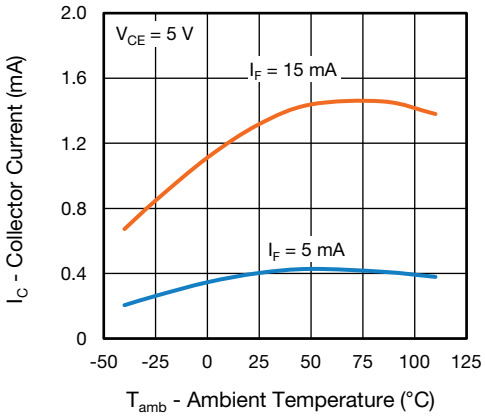


Fig. 10 - Collector Current vs. Ambient Temperature

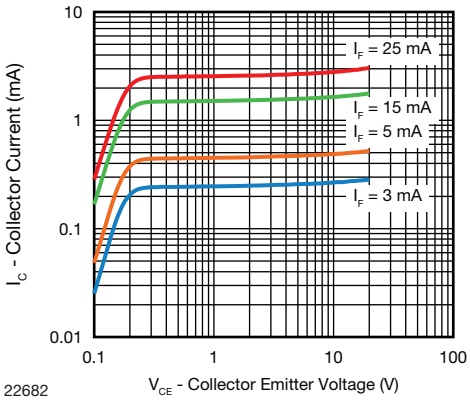


Fig. 8 - Collector Current vs. Collector Emitter Voltage

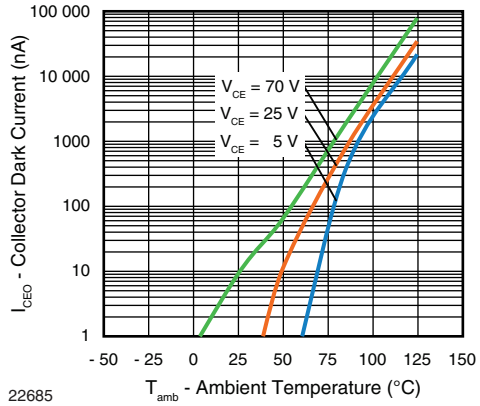


Fig. 11 - Collector Dark Current vs. Ambient Temperature

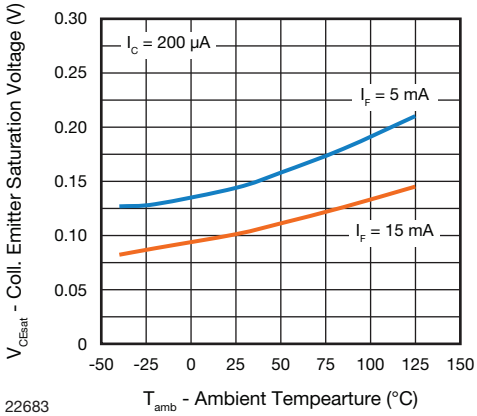


Fig. 9 - Collector Emitter Saturation Voltage vs. Ambient Temperature

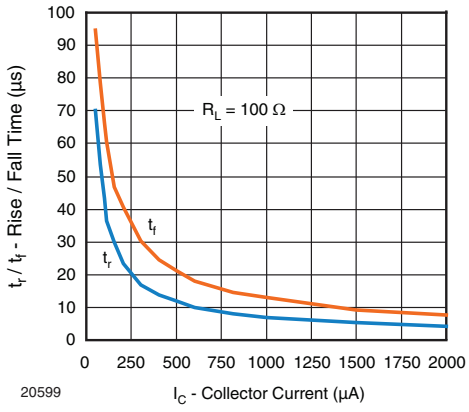


Fig. 12 - Rise / Fall Time vs. Collector Current

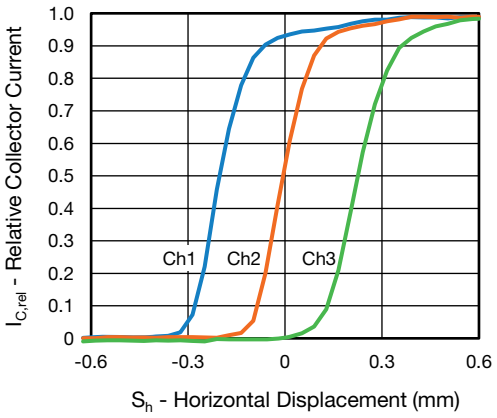


Fig. 13 - Relative Collector Current vs. Horizontal Displacement
Horizontal Shutter (0.25 mm thickness)

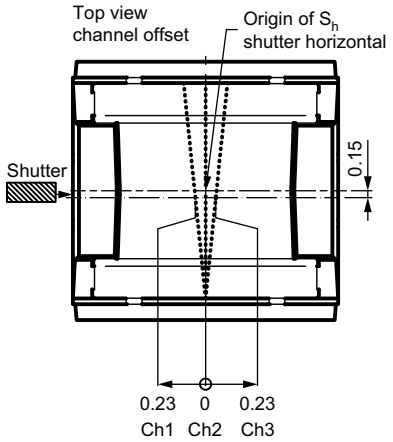


Fig. 16 - Top View Sensor
Channel Positions and Origin of Horizontal Shutter

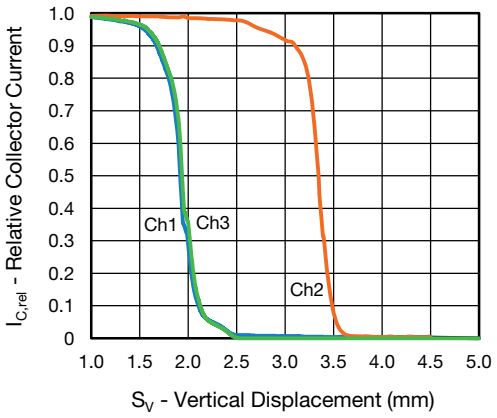


Fig. 14 - Relative Collector Current vs. Vertical Displacement
Vertical Shutter (0.25 mm thickness)

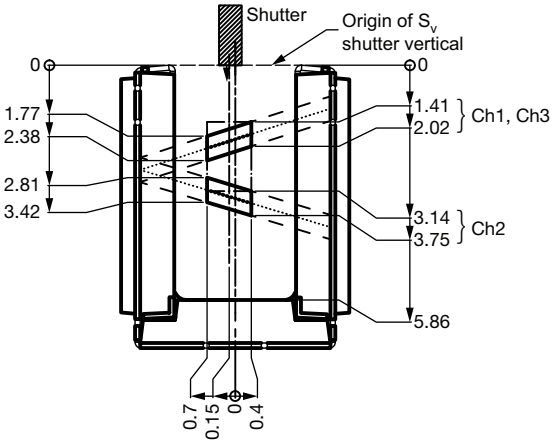


Fig. 17 - Top View Sensor
Channel Positions and Origin of Vertical Shutter

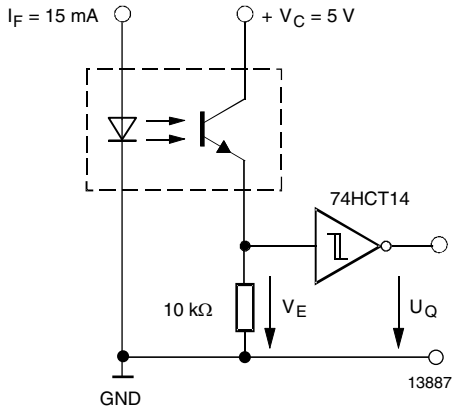


Fig. 15 - Application example

REFLOW SOLDER PROFILE

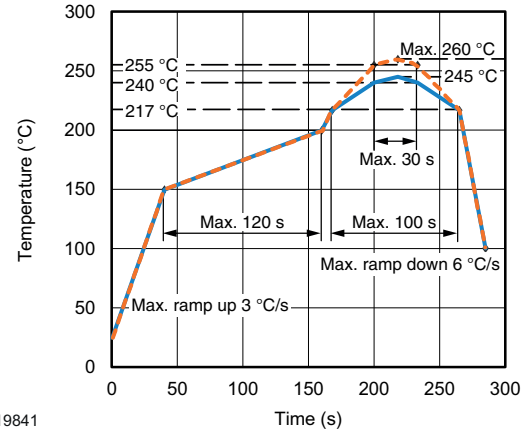
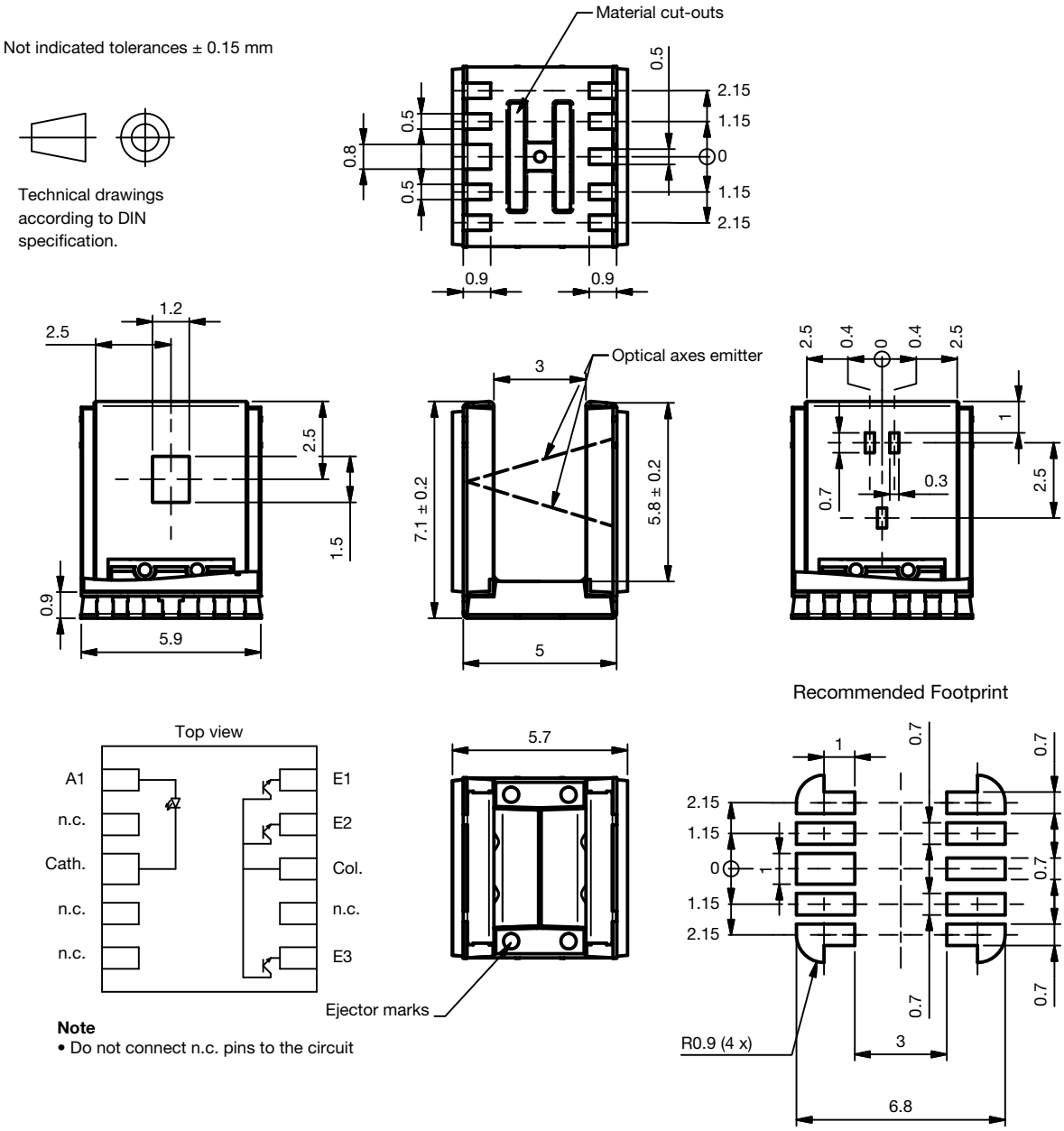


Fig. 18 - Lead (Pb)-free Reflow Solder Profile
According to J-STD-020

FLOOR LIFE

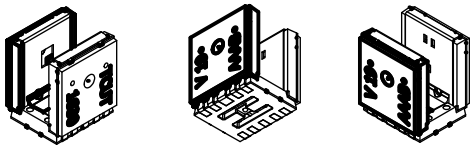
Level 1, according to JEDEC®, J-STD-020. No time limit.

PACKAGE DIMENSIONS in millimeters



Note

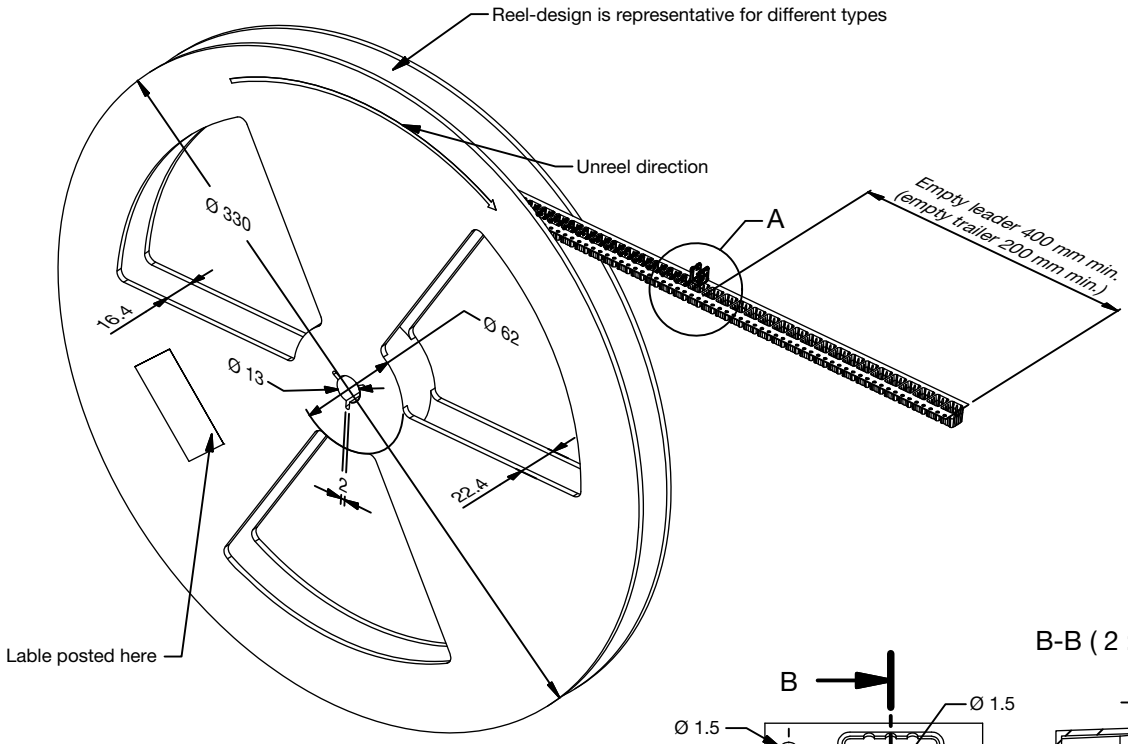
- Do not connect n.c. pins to the circuit



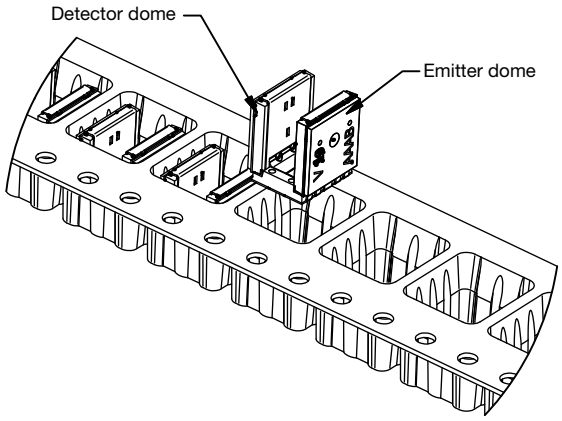
Drawing No.: 6.541-5106.01-4
Issue: 1; 20.06.2016

PACKAGE DIMENSIONS in millimeters

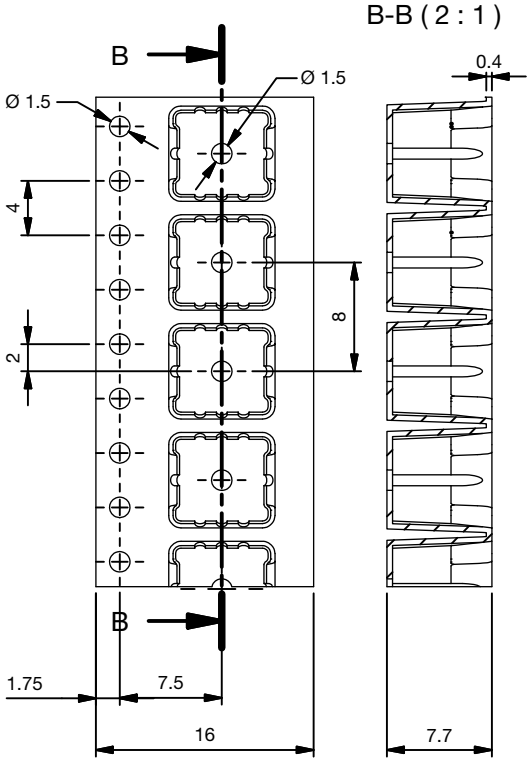
Volume/reel = 1100 pcs



A (2 : 1)



B-B (2 : 1)



Drawing-No.: 9.800-5133.01-4
Issue: 1; 29.06.2016

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