Quad Channel Transmissive Optical Sensor With Phototransistor Outputs for Absolute and Incremental 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 TCUT1800X01 is a compact transmissive sensor that includes two infrared emitters and four phototransistor detectors, located face-to-face in a surface mount package.

APPLICATIONS

- Automotive optical sensors
- Accurate position sensor for encoder
- Sensor for motion, speed, and direction
- 4 bit transmissive sensor, that can detect up to 16 positions

PRODUCT SUMMARY

PART NUMBER	GAP WIDTH (mm)	APERTURE WIDTH (mm)	TYPICAL OUTPUT CURRENT UNDER TEST (1) (mA)	DAYLIGHT BLOCKING FILTER INTEGRATED
TCUT1800X01	3	0.3	1.3	No

Note

(1) Conditions like in table basic characteristics / coupler

ORDERING INFORMATION

ORDERING CODE	PACKAGING	VOLUME (1)	REMARKS
TCUT1800X01	Tape and reel	MOQ: 1100 pcs, 1100 pcs/reel	Drypack, MSL 1

Note

(1) MOQ: minimum order quantity

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. 16	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

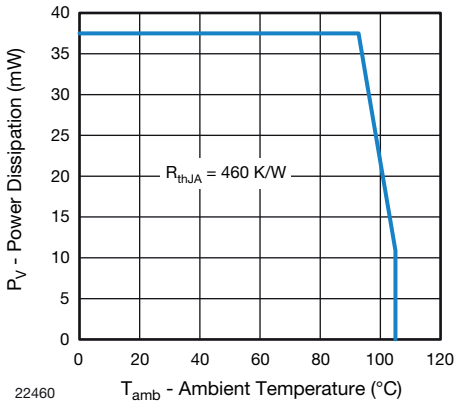


Fig. 1 - Power Dissipation Limit vs. Ambient Temperature

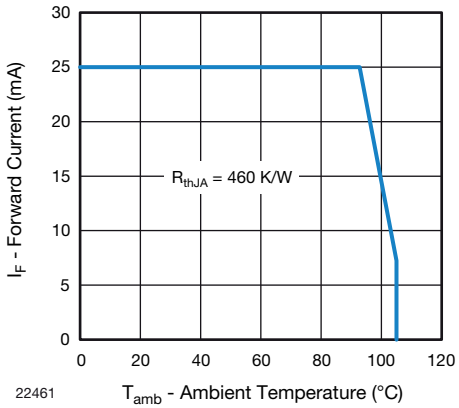


Fig. 2 - Forward Current Limit vs. Ambient Temperature

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

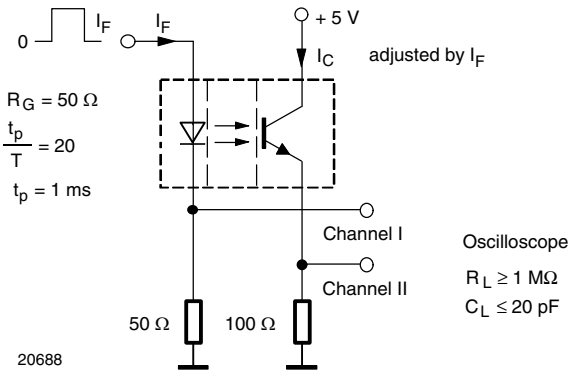


Fig. 3 - Test Circuit for t_r and t_f

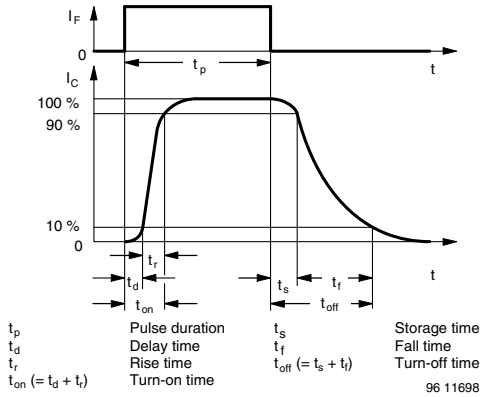


Fig. 4 - Switching Times

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

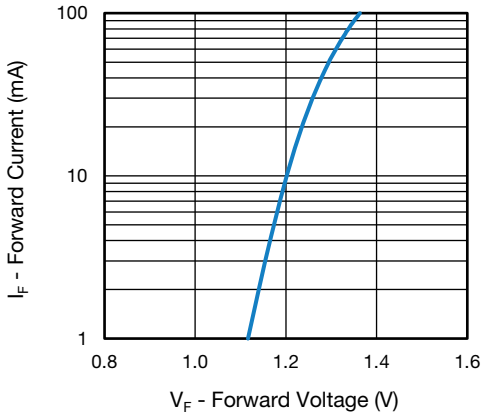


Fig. 5 - Forward Current vs. Forward Voltage

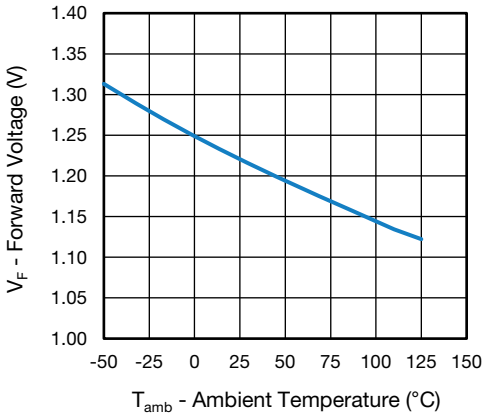


Fig. 6 - Forward Voltage vs. Ambient Temperature

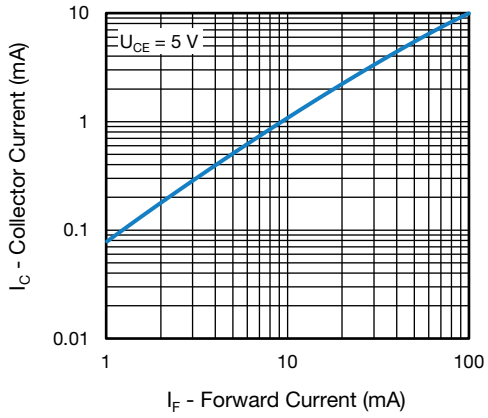


Fig. 7 - Collector Current vs. Forward Current

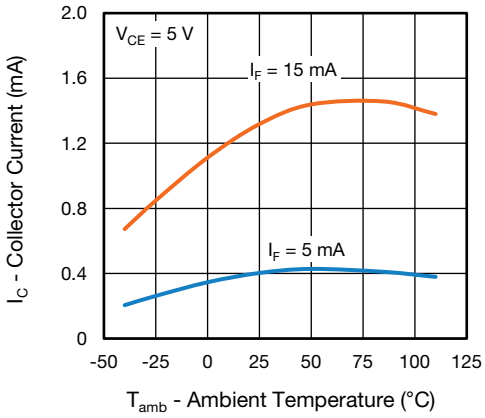


Fig. 10 - Collector Current vs. Ambient Temperature

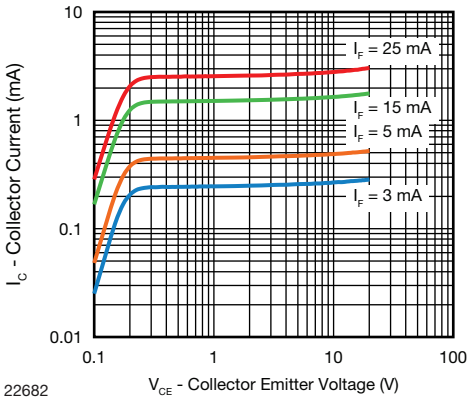


Fig. 8 - Collector Current vs. Collector Emitter Voltage

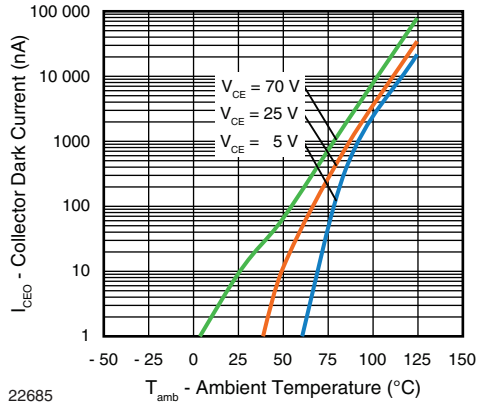


Fig. 11 - Collector Dark Current vs. Ambient Temperature

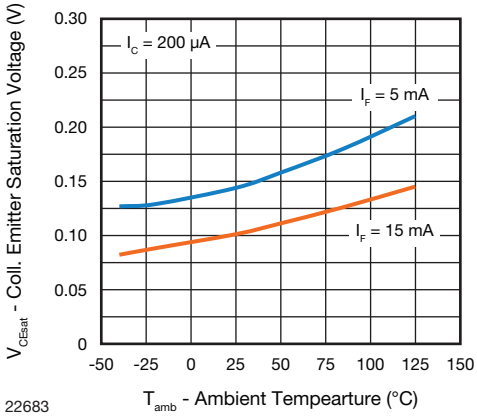


Fig. 9 - Collector Emitter Saturation Voltage vs. Ambient Temperature

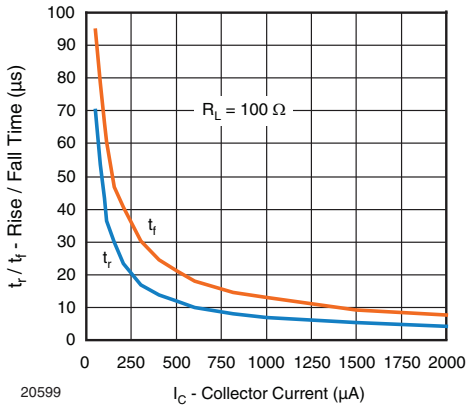


Fig. 12 - Rise / Fall Time vs. Collector Current

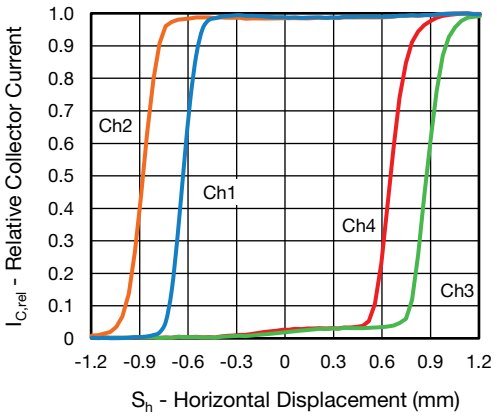


Fig. 13 - Relative Collector Current vs. Horizontal Displacement
Horizontal Shutter (0.25 mm thickness), tolerances ± 0.2 mm

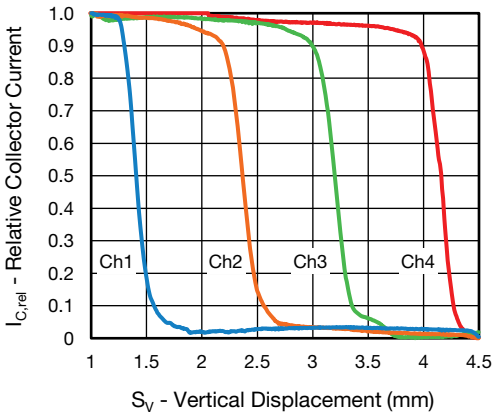


Fig. 14 - Relative Collector Current vs. Vertical Displacement
Vertical Shutter (0.25 mm thickness), tolerances ± 0.2 mm

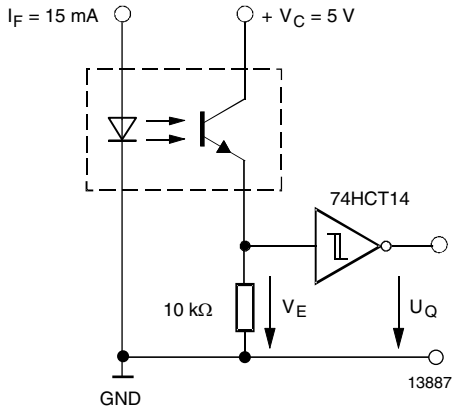


Fig. 15 - Application example

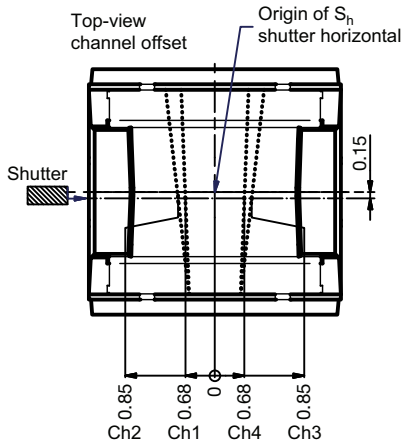


Fig. 16 - Top View Sensor, Channel Positions and
Origin of Horizontal Shutter, tolerances ± 0.2 mm

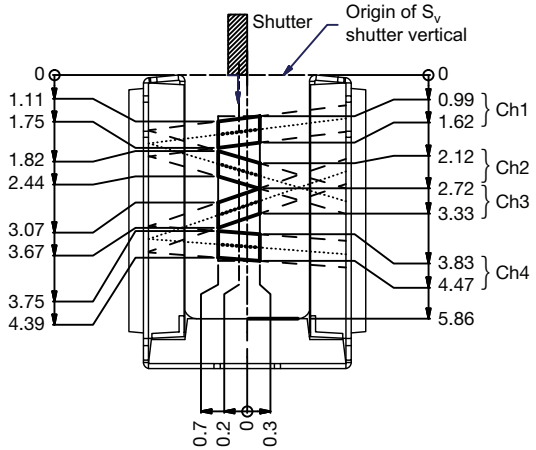


Fig. 17 - Top View Sensor, Channel Positions and
Origin of Vertical Shutter, tolerances ± 0.2 mm

REFLOW SOLDER PROFILE

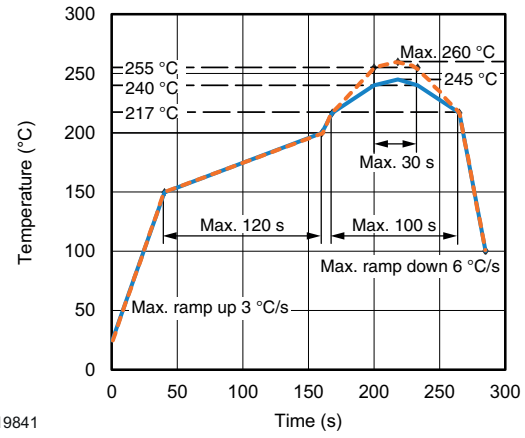
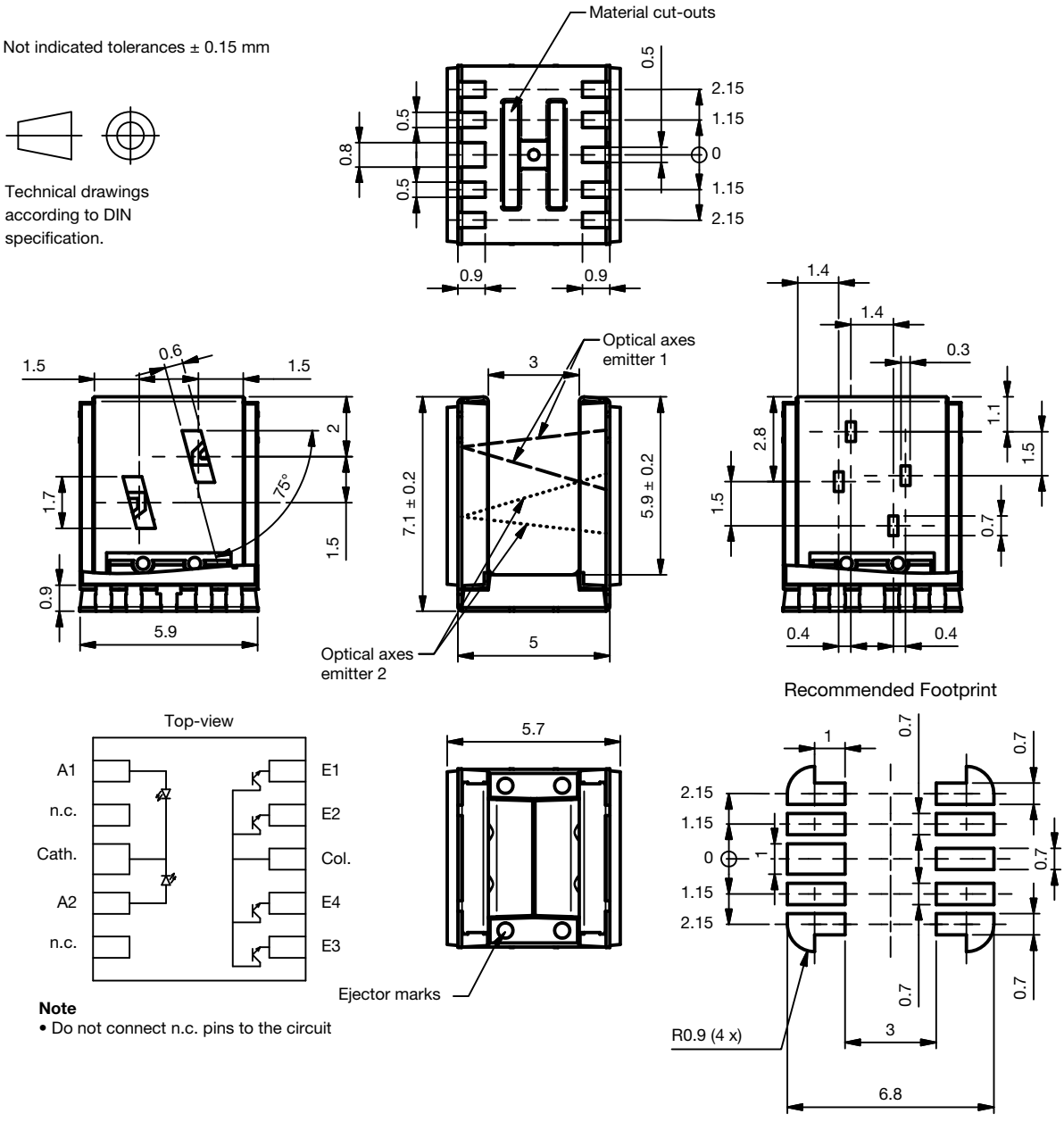


Fig. 18 - Lead (Pb)-free Reflow Solder Profile
According to J-STD-020

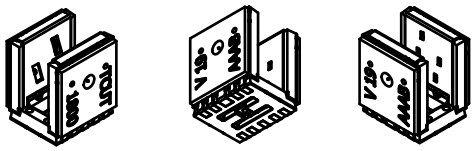
FLOOR LIFE

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

PACKAGE DIMENSIONS in millimeters



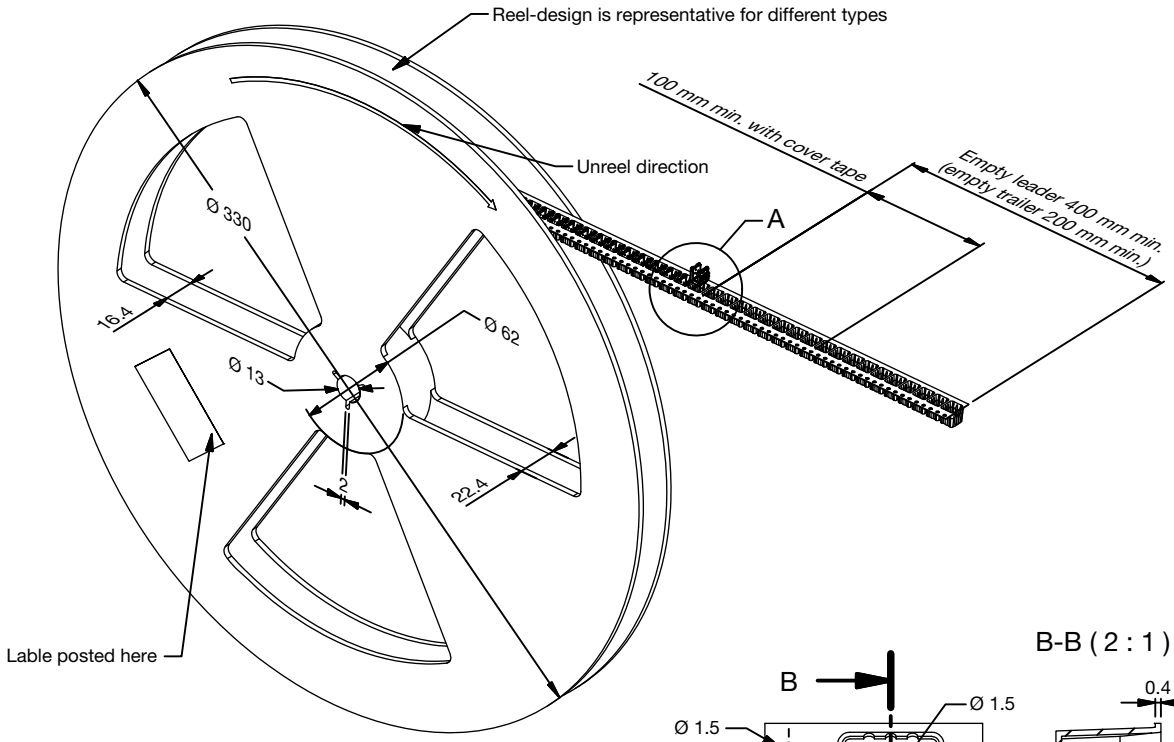
Note
• Do not connect n.c. pins to the circuit



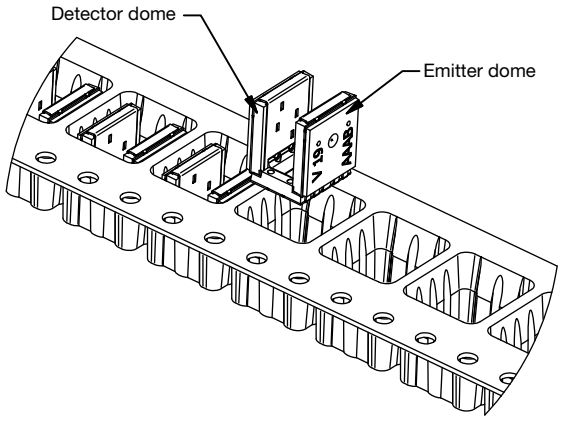
Drawing No.: 6.541-5105.01-4
Issue: 1; 20.06.2016

PACKAGE DIMENSIONS in millimeters

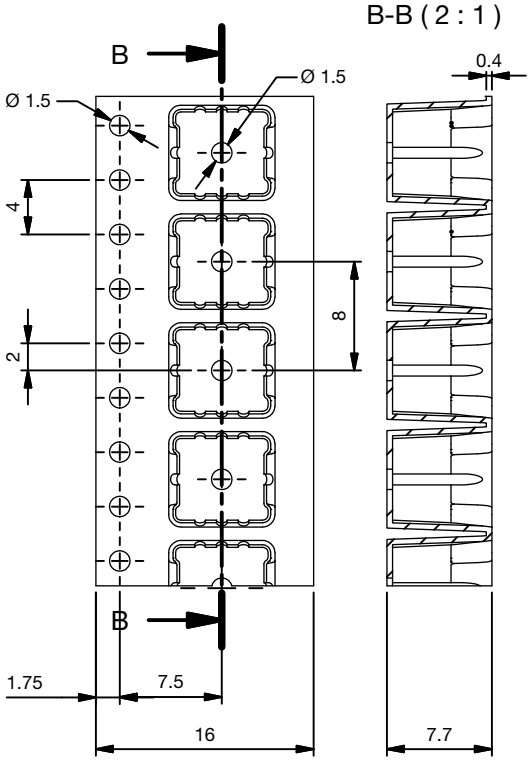
Volume/reel = 1100 pcs



A (2 : 1)



B-B (2 : 1)



Drawing-No.: 9.800-5134.01-4
Issue: 1; 29.06.2016

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