



Quad Channel Transmissive Optical Sensor With Phototransistor Outputs for Absolute and Incremental Encoding



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.

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: $I_C = 1.3 \text{ mA}$
- 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
- 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 ($T_{amb} = 25\text{ }^{\circ}\text{C}$, unless otherwise specified) | | | | |
|--|---|-----------|-------------|--------------------|
| PARAMETER | TEST CONDITION | SYMBOL | VALUE | UNIT |
| COUPLER | | | | |
| 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 |
| Total 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 |
| Total power dissipation | $T_{amb} \leq 95\text{ }^{\circ}\text{C}$ | P_V | 37.5 | mW |

ABSOLUTE MAXIMUM RATINGS

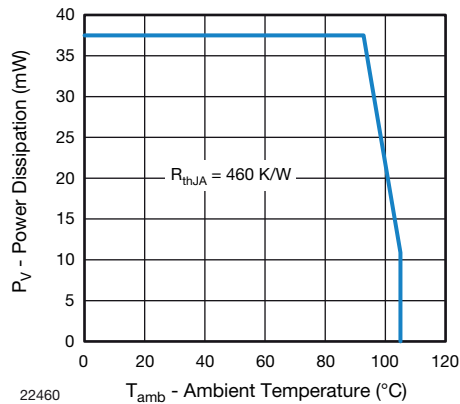


Fig. 1 - Power Dissipation Limit vs. Ambient Temperature

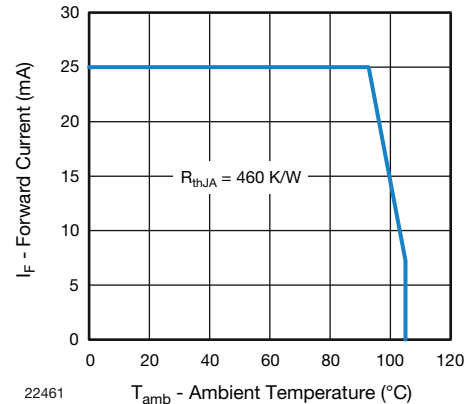


Fig. 2 - Forward Current Limit vs. Ambient Temperature

| ELECTRICAL CHARACTERISTICS ($T_{amb} = 25\text{ }^{\circ}\text{C}$, 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 | 0.45 | 1.3 | - | 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 |

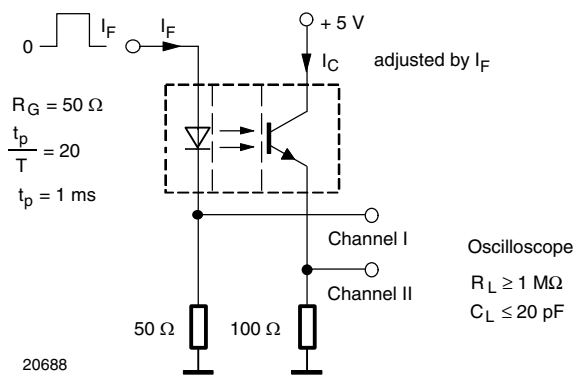
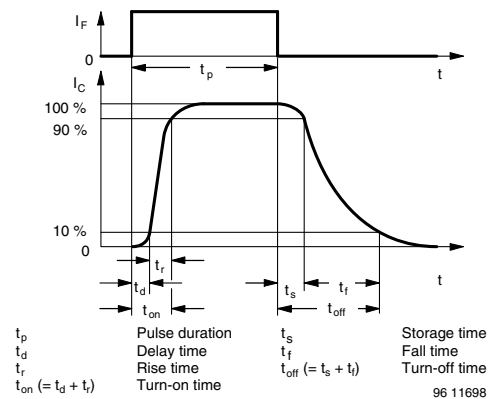

 Fig. 3 - Test Circuit for t_r and t_f


Fig. 4 - Switching Times

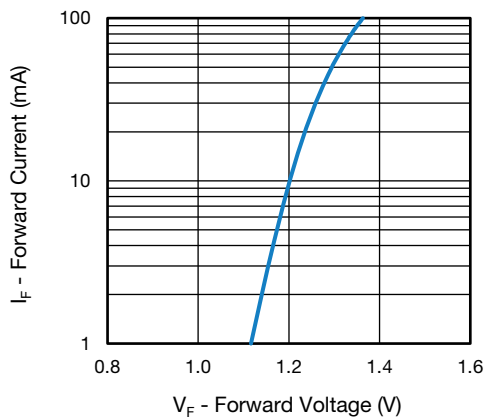
BASIC CHARACTERISTICS ($T_{amb} = 25\text{ }^{\circ}\text{C}$, unless otherwise specified)


Fig. 5 - Forward Current vs. Forward Voltage

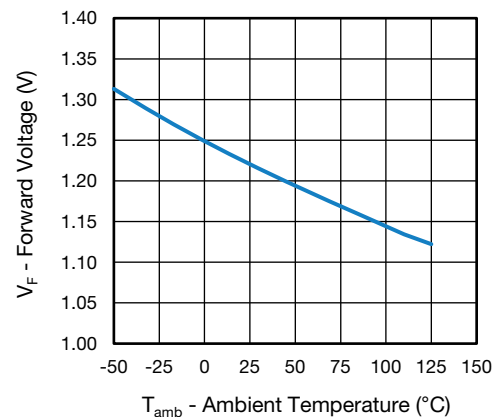


Fig. 6 - Forward Voltage vs. Ambient Temperature

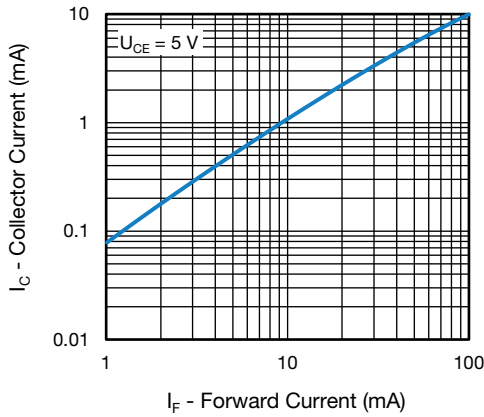


Fig. 7 - Collector Current vs. Forward Current

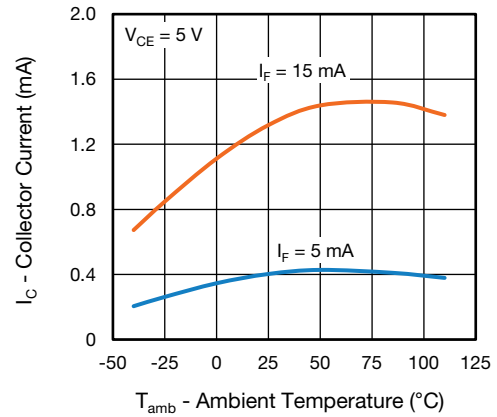


Fig. 10 - Collector Current vs. Ambient Temperature

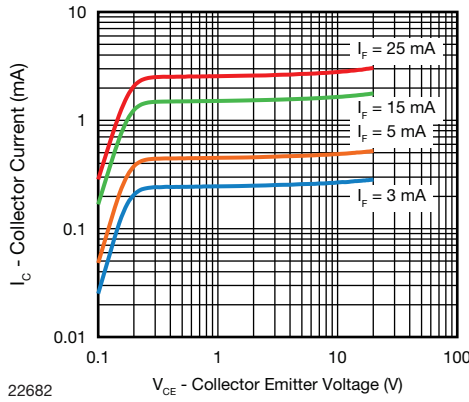


Fig. 8 - Collector Current vs. Collector Emitter Voltage

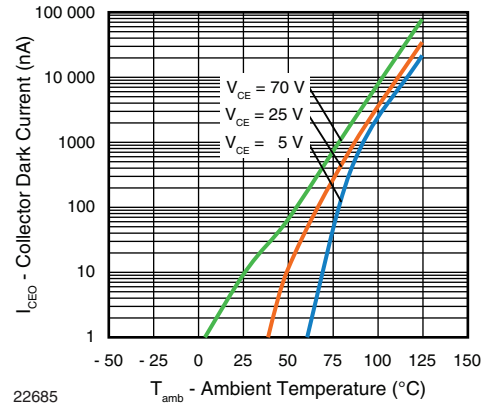


Fig. 11 - Collector Dark Current vs. Ambient Temperature

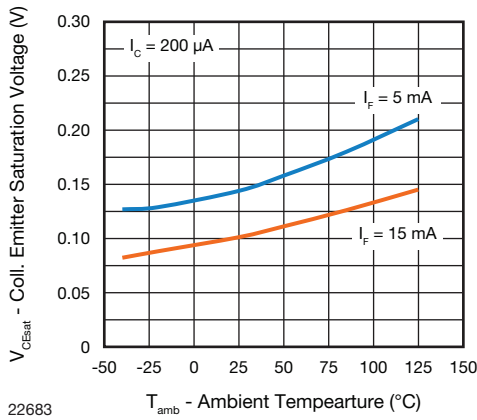


Fig. 9 - Collector Emitter Saturation Voltage vs. Ambient Temperature

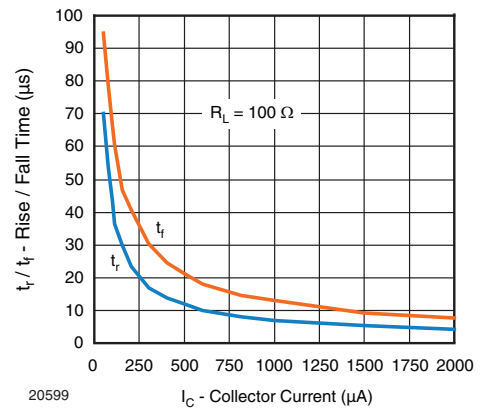


Fig. 12 - Rise / Fall Time vs. Collector Current

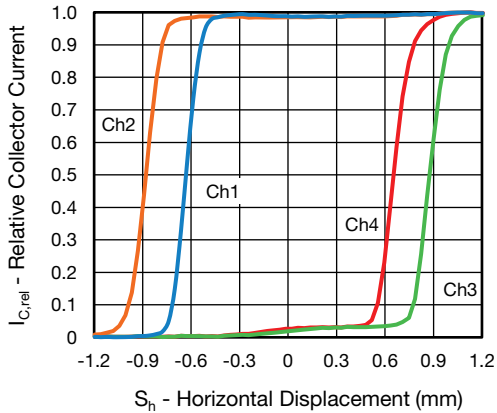


Fig. 13 - Relative Collector Current vs. Horizontal Displacement Horizontal Shutter (0.25 mm thickness), tolerances ± 0.2 mm

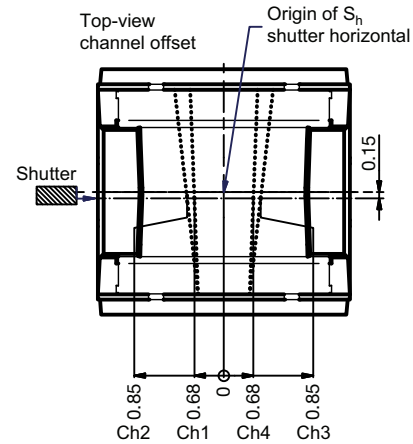


Fig. 16 - Top View Sensor, Channel Positions and Origin of Horizontal Shutter, tolerances ± 0.2 mm

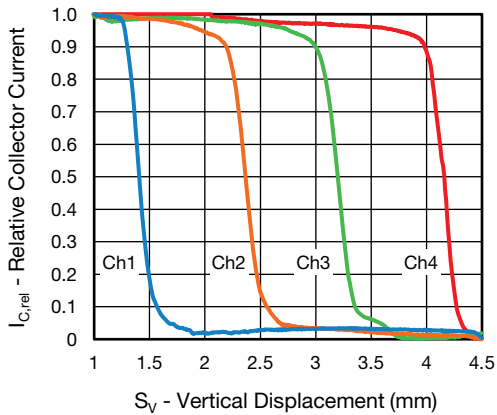


Fig. 14 - Relative Collector Current vs. Vertical Displacement Vertical Shutter (0.25 mm thickness), tolerances ± 0.2 mm

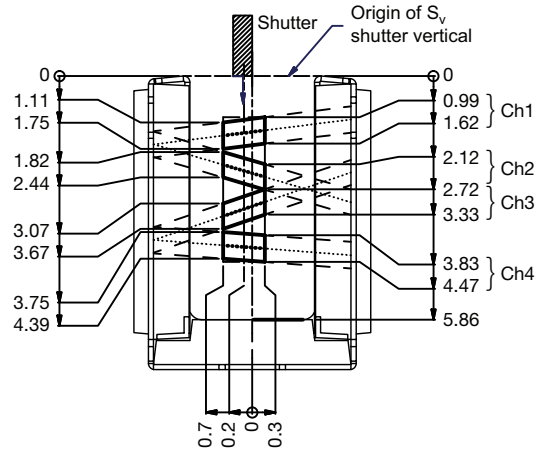


Fig. 17 - Top View Sensor, Channel Positions and Origin of Vertical Shutter, tolerances ± 0.2 mm

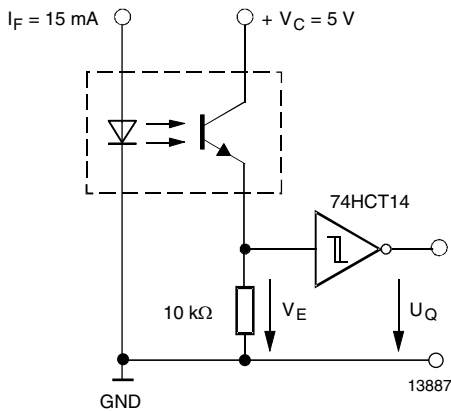
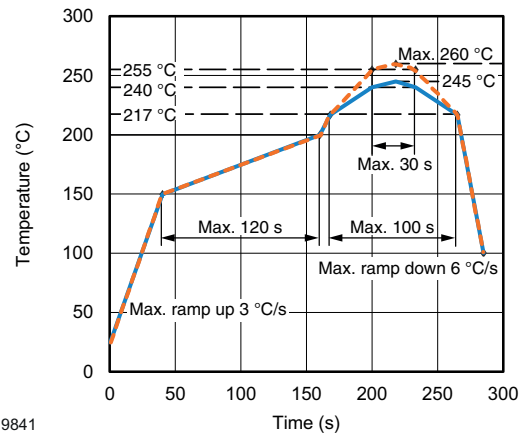


Fig. 15 - Application example

REFLOW SOLDER PROFILE



19841

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



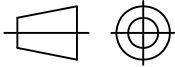


FLOOR LIFE

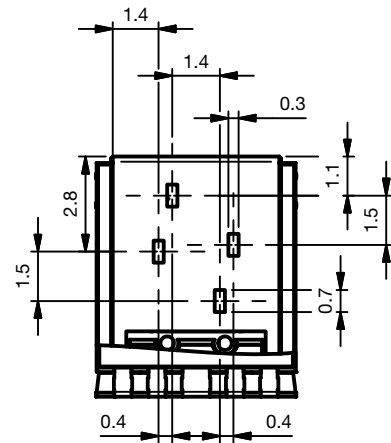
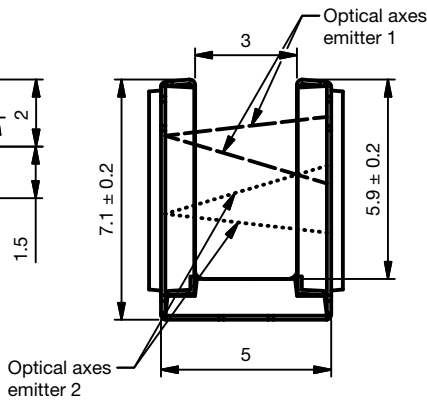
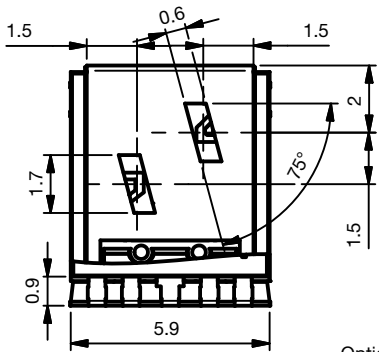
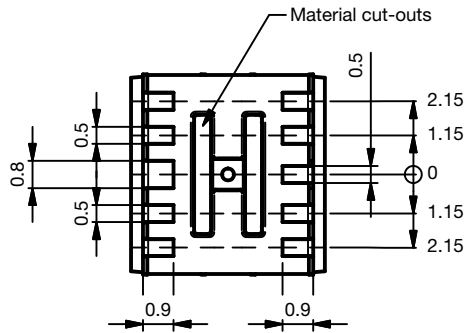
Level 1, according to JEDEC®, J-STD-020. No time limit.

PACKAGE DIMENSIONS in millimeters

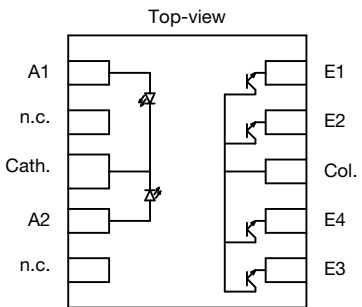
Not indicated tolerances ± 0.15 mm



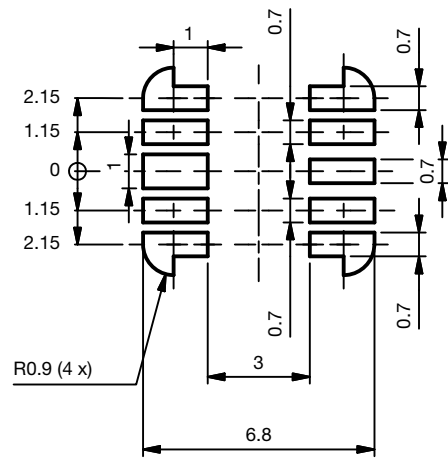
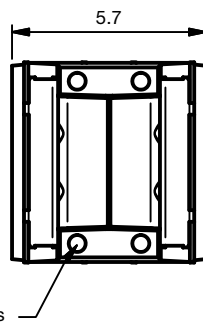
Technical drawings according to DIN specification.



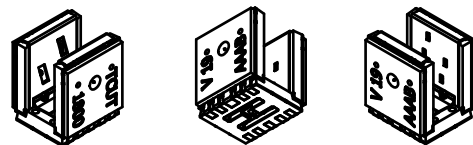
Recommended Footprint



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



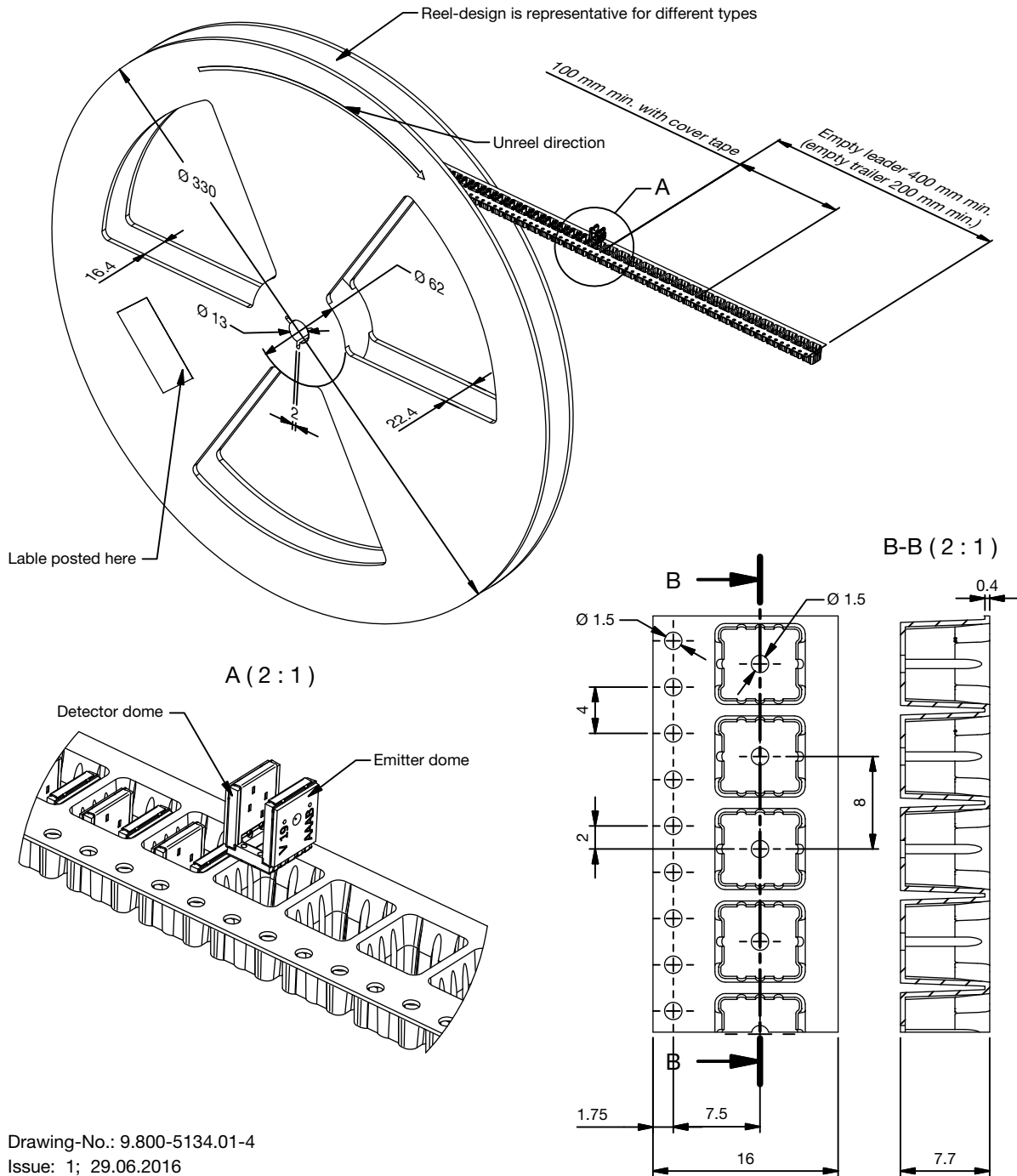
Drawing No.: 6.541-5105.01-4
Issue: 1; 20.06.2016





PACKAGE DIMENSIONS in millimeters

Volume/reel = 1100 pcs



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



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