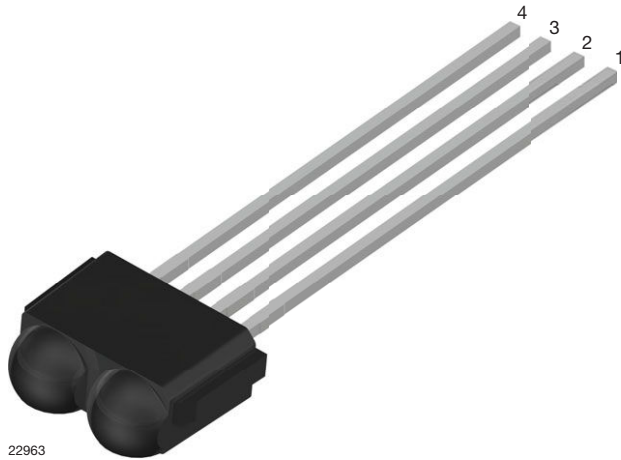




## IR Receiver Modules for Remote Control Systems



22963

### DESIGN SUPPORT TOOLS

[click logo to get started](#)



### MECHANICAL DATA

#### Pinning:

1, 4 = GND, 2 = V<sub>S</sub>, 3 = OUT

### FEATURES

- Very low supply current
- Photo detector and preamplifier in one package
- Internal filter for PCM frequency
- Supply voltage: 2.5 V to 5.5 V
- Improved immunity against ambient light
- Two lenses for high sensitivity
- Insensitive to supply voltage ripple and noise
- Ultra small top-view PCB footprint
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)



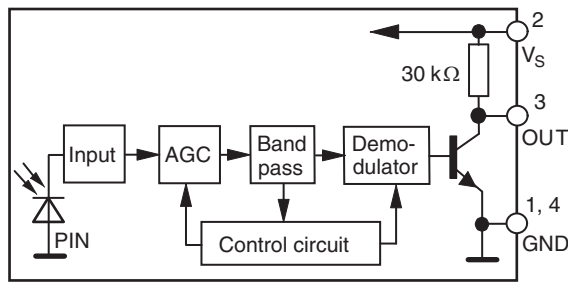
### DESCRIPTION

The TSOP39... series are miniaturized receiver modules for infrared remote control systems. Two PIN diodes and a preamplifier are assembled on a leadframe, the epoxy package contains an IR filter. The demodulated output signal can be directly connected to digital circuitry for decoding.

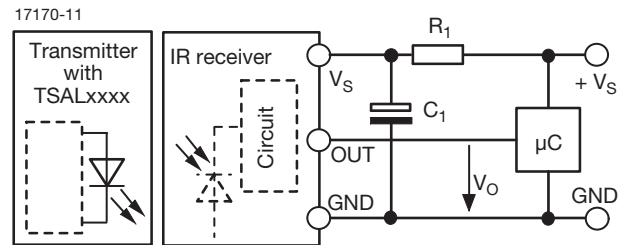
The TSOP394.. series devices are optimized to suppress almost all spurious pulses from energy saving lamps like CFLs. The AGC4 used in the TSOP394.. may suppress some data signals. The TSOP392.. series are provided primarily for compatibility with old AGC2 designs. New designs should prefer the TSOP394.. series containing the newer AGC4.

These components have not been qualified according to automotive specifications.

| PARTS TABLE       |        |   |  |
|-------------------|--------|---|--|
| AGC               |        | NOISY ENVIRONMENTS AND LONG BURSTS (AGC2)   | VERY NOISY ENVIRONMENTS AND LONG BURSTS (AGC4) |
| Carrier frequency | 30 kHz | TSOP39230   | TSOP39430                                      |
|                   | 33 kHz | TSOP39233   | TSOP39433                                      |
|                   | 36 kHz | TSOP39236   | TSOP39436 <sup>(1)(2)(3)</sup>                 |
|                   | 38 kHz | TSOP39238   | TSOP39438 <sup>(4)(5)</sup>                    |
|                   | 40 kHz | TSOP39240   | TSOP39440                                      |
|                   | 56 kHz | TSOP39256   | TSOP39456 <sup>(6)(7)</sup>                    |
| Package           |        | TVCast  |  |
| Pinning           |        | 1, 4 = GND, 2 = V <sub>S</sub> , 3 = OUT  |  |
| Dimensions (mm)   |        | 6.8 W x 2.6 H x 5.3 D   |  |
| Mounting          |        | Leaded  |  |
| Application       |        | Remote control  |  |
| Best choice for   |        | <sup>(1)</sup> RC-5 <sup>(2)</sup> RC-6 <sup>(3)</sup> Panasonic <sup>(4)</sup> NEC <sup>(5)</sup> Sharp <sup>(6)</sup> r-step <sup>(7)</sup> Thomson RCA |  |

**BLOCK DIAGRAM**


20445-1

**APPLICATION CIRCUIT**

 $R_1$  and  $C_1$  recommended to reduce supply ripple for  $V_S < 2.8\text{ V}$ 
**ABSOLUTE MAXIMUM RATINGS**

| PARAMETER                   | TEST CONDITION                        | SYMBOL    | VALUE                 | UNIT |
|-----------------------------|---------------------------------------|-----------|-----------------------|------|
| Supply voltage              |                                       | $V_S$     | -0.3 to +6            | V    |
| Supply current              |                                       | $I_S$     | 3                     | mA   |
| Output voltage              |                                       | $V_O$     | -0.3 to $(V_S + 0.3)$ | V    |
| Output current              |                                       | $I_O$     | 5                     | mA   |
| Junction temperature        |                                       | $T_j$     | 100                   | °C   |
| Storage temperature range   |                                       | $T_{stg}$ | -25 to +85            | °C   |
| Operating temperature range |                                       | $T_{amb}$ | -25 to +85            | °C   |
| Power consumption           | $T_{amb} \leq 85\text{ °C}$           | $P_{tot}$ | 10                    | mW   |
| Soldering temperature       | $t \leq 10\text{ s}$ , 1 mm from case | $T_{sd}$  | 260                   | °C   |

**Note**

- Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect the device reliability

**ELECTRICAL AND OPTICAL CHARACTERISTICS** ( $T_{amb} = 25\text{ °C}$ , unless otherwise specified)

| PARAMETER             | TEST CONDITION  | SYMBOL            | MIN. | TYP.     | MAX. | UNIT            |
|-----------------------|---|-------------------|------|----------|------|-----------------|
| Supply voltage        |   | $V_S$             | 2.5  | -        | 5.5  | V               |
| Supply current        | $E_v = 0$ , $V_S = 3.3\text{ V}$  | $I_{SD}$          | 0.27 | 0.35     | 0.45 | mA              |
|                       | $E_v = 40\text{ klx}$ , sunlight  | $I_{SH}$          | -    | 0.45     | -    | mA              |
| Transmission distance | $E_v = 0$ , test signal see Fig. 1, IR diode TSAL6200, $I_F = 150\text{ mA}$                  | $d$               | -    | 45       | -    | m               |
| Output voltage low    | $I_{OSL} = 0.5\text{ mA}$ , $E_e = 0.7\text{ mW/m}^2$ , test signal see Fig. 1                | $V_{OSL}$         | -    | -        | 100  | mV              |
| Minimum irradiance    | Pulse width tolerance:<br>$t_{pi} - 5/f_0 < t_{po} < t_{pi} + 6/f_0$ , test signal see Fig. 1 | $E_e\text{ min.}$ | -    | 0.08     | 0.12 | $\text{mW/m}^2$ |
| Maximum irradiance    | $t_{pi} - 5/f_0 < t_{po} < t_{pi} + 6/f_0$ , test signal see Fig. 1                           | $E_e\text{ max.}$ | 30   | -        | -    | $\text{W/m}^2$  |
| Directivity           | Angle of half transmission distance   | $\phi_{1/2}$      | -    | $\pm 45$ | -    | deg             |

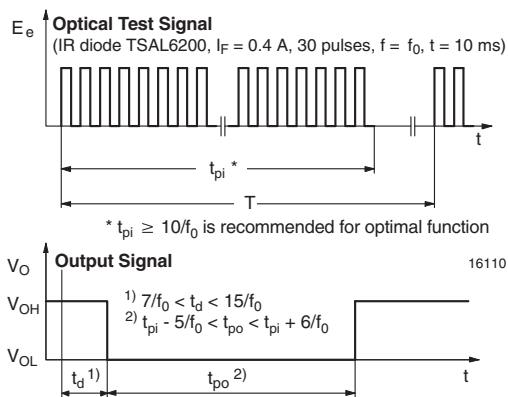
**TYPICAL CHARACTERISTICS** ( $T_{amb} = 25\text{ °C}$ , unless otherwise specified)


Fig. 1 - Output Active Low

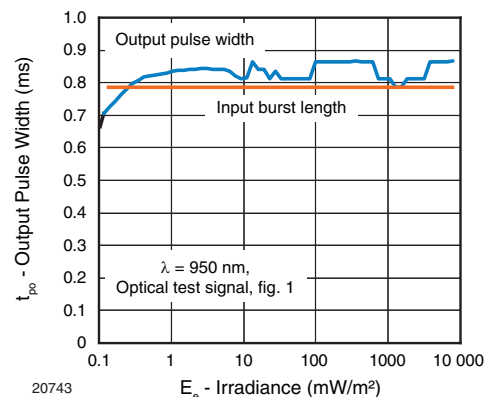


Fig. 2 - Pulse Length and Sensitivity in Dark Ambient



Fig. 3 - Output Function

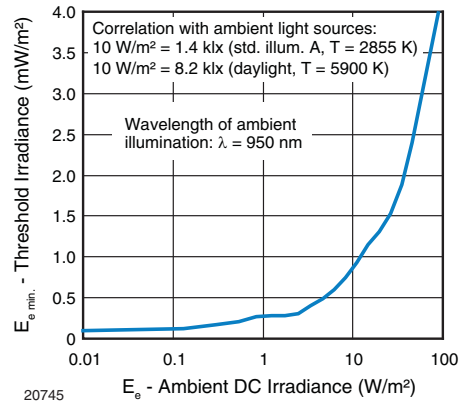


Fig. 6 - Sensitivity in Bright Ambient



Fig. 4 - Output Pulse Diagram

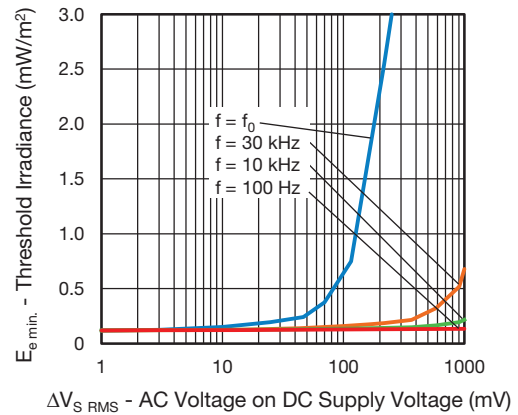


Fig. 7 - Sensitivity vs. Supply Voltage Disturbances



Fig. 5 - Frequency Dependence of Responsivity

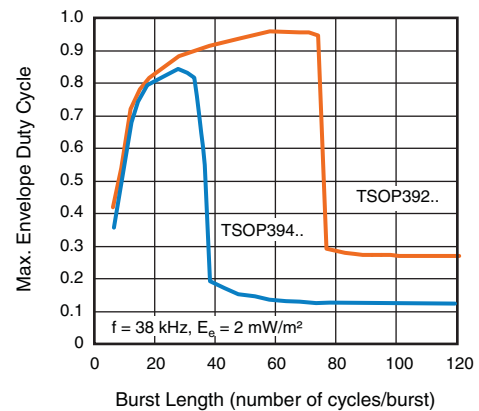


Fig. 8 - Max. Envelope Duty Cycle vs. Burst Length

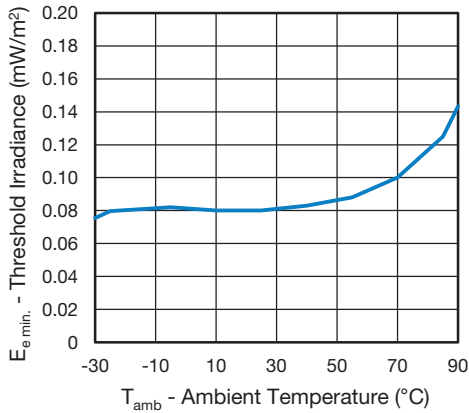


Fig. 9 - Sensitivity vs. Ambient Temperature

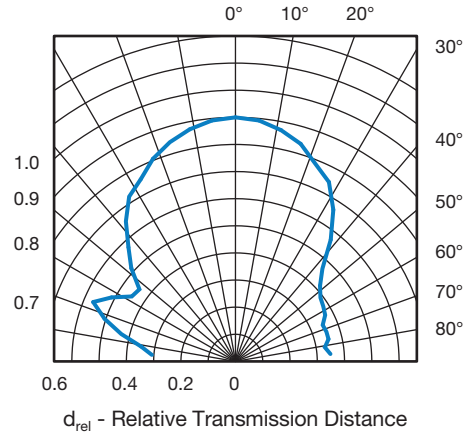


Fig. 12 - Vertical Directivity

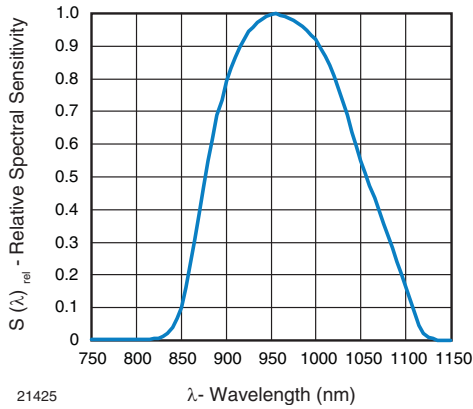


Fig. 10 - Relative Spectral Sensitivity vs. Wavelength

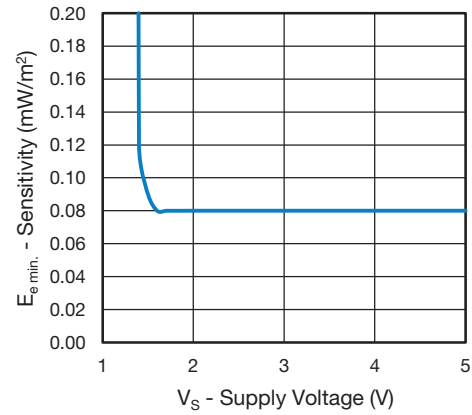


Fig. 13 - Sensitivity vs. Supply Voltage

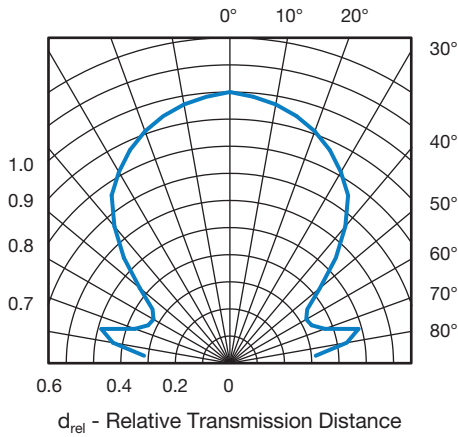


Fig. 11 - Horizontal Directivity

**SUITABLE DATA FORMAT**

This series is designed to suppress spurious output pulses due to noise or disturbance signals. The devices can distinguish data signals from noise due to differences in frequency, burst length, and envelope duty cycle. The data signal should be close to the device's band-pass center frequency (e.g. 38 kHz) and fulfill the conditions in the table below

When a data signal is applied to the product in the presence of a disturbance, the sensitivity of the receiver is automatically reduced by the AGC to insure that no spurious pulses are present at the receiver's output.

Some examples which are suppressed are:

- DC light (e.g. from tungsten bulbs sunlight)
- Continuous signals at any frequency
- Strongly or weakly modulated pattern from fluorescent lamps with electronic ballasts (see Fig. 14 or Fig. 15)

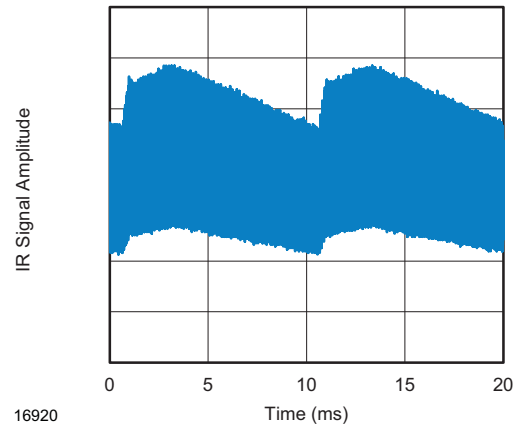


Fig. 14 - IR Disturbance from Fluorescent Lamp With Low Modulation

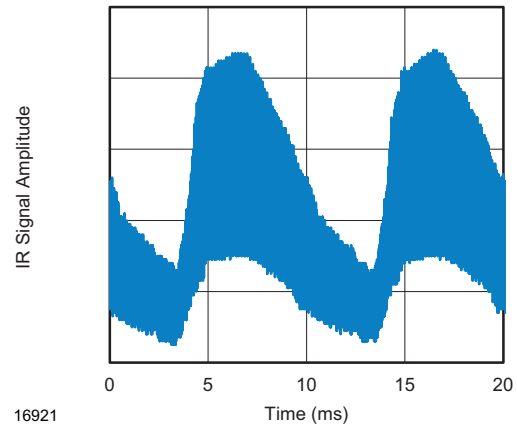


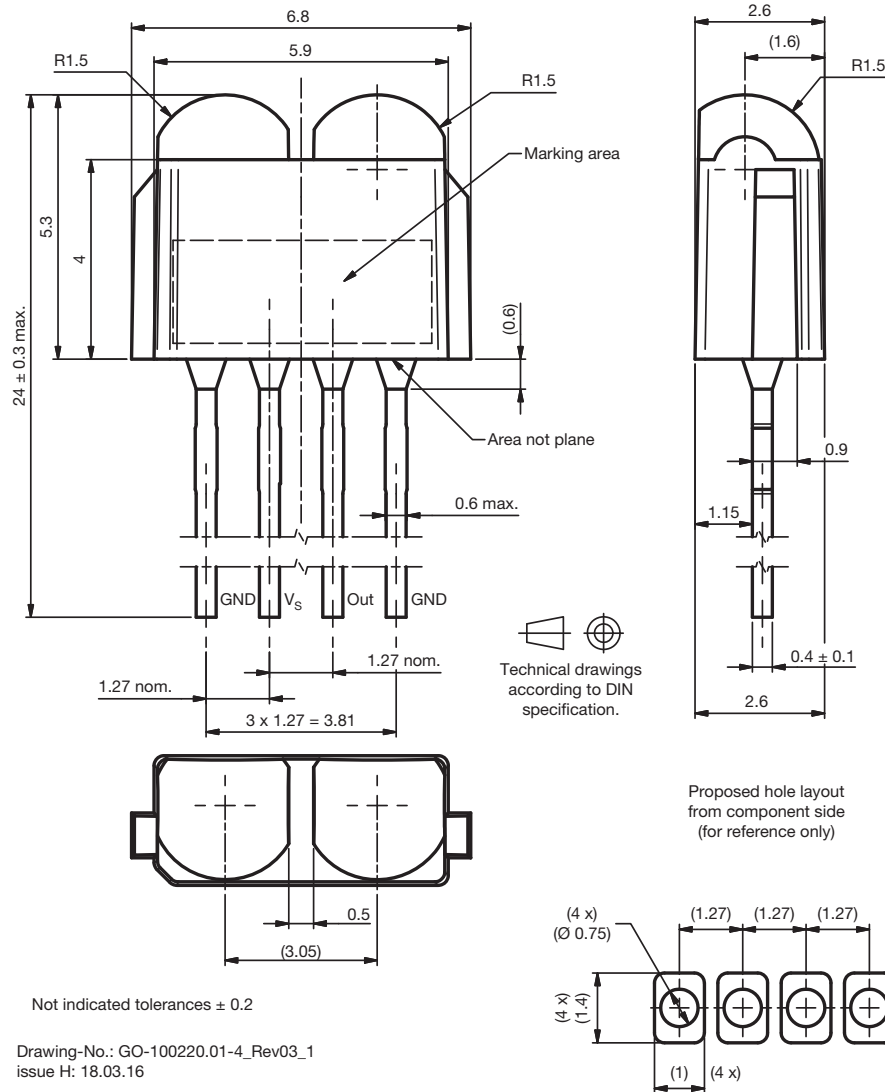
Fig. 15 - IR Disturbance from Fluorescent Lamp With High Modulation

|  | <b>TSOP392..</b>  | <b>TSOP394..</b>  |
|--|---|---|
| Minimum burst length   | 10 cycles/burst   | 10 cycles/burst   |
| After each burst of length a minimum gap time is required of               | 10 to 70 cycles<br>≥ 10 cycles  | 10 to 35 cycles<br>≥ 10 cycles  |
| For bursts greater than a minimum gap time in the data stream is needed of | 70 cycles<br>> 4 x burst length   | 35 cycles<br>> 10 x burst length  |
| Maximum number of continuous short bursts/second                           | 1800  | 1500  |
| NEC code   | Yes   | Preferred   |
| RC5 / RC6 code   | Yes   | Preferred   |
| Thomson 56 kHz code  | Yes   | Preferred   |
| Sharp code   | Yes   | Preferred   |
| Suppression of interference from fluorescent lamps                         | Mild disturbance patterns are suppressed (example: signal pattern of Fig. 13) | Complex and critical disturbance patterns are suppressed (example: signal pattern of Fig. 14 or highly dimmed LCDs) |

**Note**

- For data formats with short bursts please see the datasheet for TSOP393.., TSOP395..

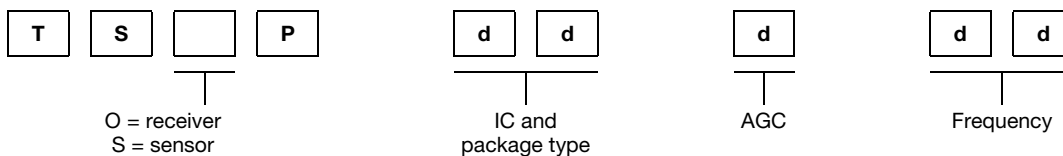
## PACKAGE DIMENSIONS in millimeters



## BULK PACKAGING

Standard shipping for TVCast is in conductive plastic bags. The packing quantity is determined by weight and the number of components per carton may vary by a maximum of ± 0.3 %.

## ORDERING INFORMATION



### Note

- d = "digit", please consult the list of available devices create a valid part number

Example: TSOP39438

## PACKAGING QUANTITY

- 400 pieces per bag (each bag is individually boxed)
- 6 bags per carton



## Tape and Reel Standards for Surface-Mount IR Receiver Modules

Vishay Semiconductor surface-mount IR receivers are packaged on tape and reel. The following specification is based on IEC publication 286, which takes the industrial requirements for automatic insertion into account.

Absolute maximum ratings, mechanical dimensions, optical and electrical characteristics for taped devices are identical to the basic catalog types and can be found in the specifications for untaped devices.

### PACKAGING

The tapes of components are available on reels. Each reel is marked with labels which contain the following information:

- Vishay
- Type
- Group
- Tape code, normally part of type name
- Production code
- Quantity

### MISSING COMPONENTS

Up to 3 consecutive components may be missing if the gap is followed by at least 6 components. A maximum of 0.5 % of the components per reel quantity may be missing. At least 5 empty positions are present at the start and the end of the tape to enable tape insertion.

**Tensile strength** of the tape: > 15 N

### NUMBER OF COMPONENTS

- A. Panhead: quantity per reel:
  - TT, top view package, 1190 pcs
  - TR, side view package, 1120 pcs
- B. Heimdall: quantity per reel:
  - TT, top view package, 2200 pcs
  - TR, side view package, 2300 pcs
- C. Heimdall without lens: quantity per reel:
  - WTT, top view package, 2200 pcs
  - WTR, side view package, 2300 pcs
- D. Belobog: quantity per reel:
  - TT1, top view package, 1800 pcs
- E. Belobog with shield: quantity per reel:
  - TT1, top view package, 1500 pcs
- F. Minimold DF1P: quantity per reel:
  - DF1P, 1100 pcs
- G. TVCastSMD TR1: quantity per reel:
  - TR1, side view package, 2000 pcs

### ORDER DESIGNATION

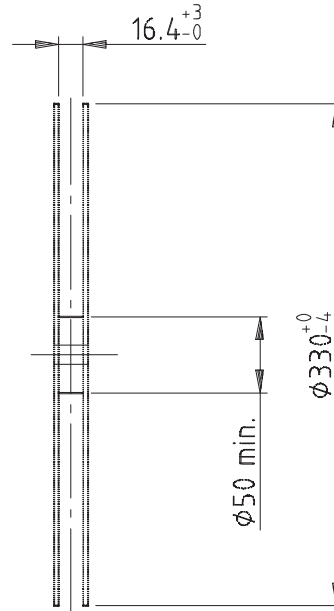
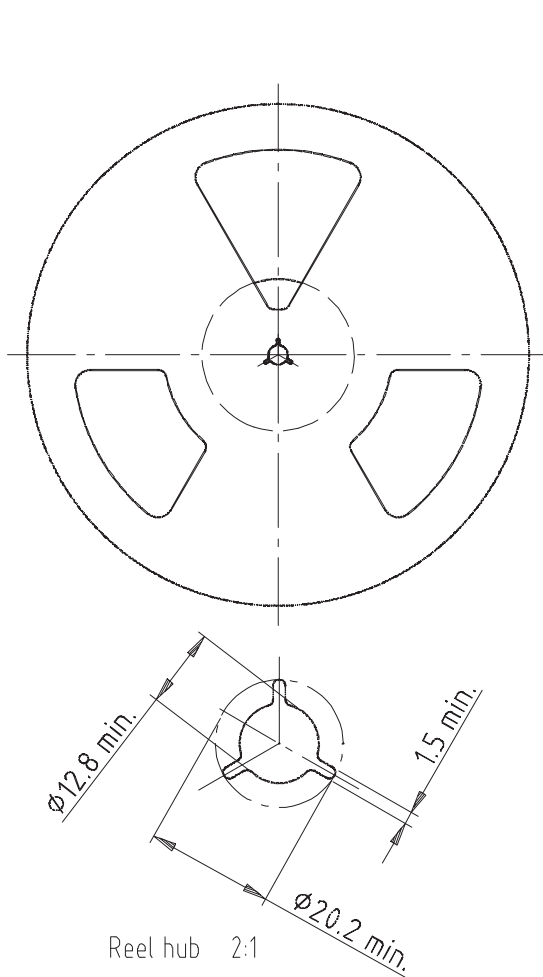
The type designation of the device is extended by TT or TT1 for top view or TR for side view.

#### Example:

- TSOP6238TR (reel packing)
- TSOP75238TR (reel packing)
- TSOP75338WTT (reel packing)
- TSOP57438TT1 (reel packing)
- TSOP57238HTT1 (reel packing)
- TSOP39438TR1 (reel packing)



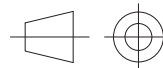
## REEL DIMENSIONS FOR PANHEAD, HEIMDALL, AND TVCASTSMD TR in millimeters



Form of the leave open of the wheel is supplier specific.

Dimension acc. to IEC EN 60 286-3

Tape width 16



technical drawings according to DIN specifications

Drawing-No.: 9.800-5052.V2-4

Issue: 1; 07.05.02

16734

### Note

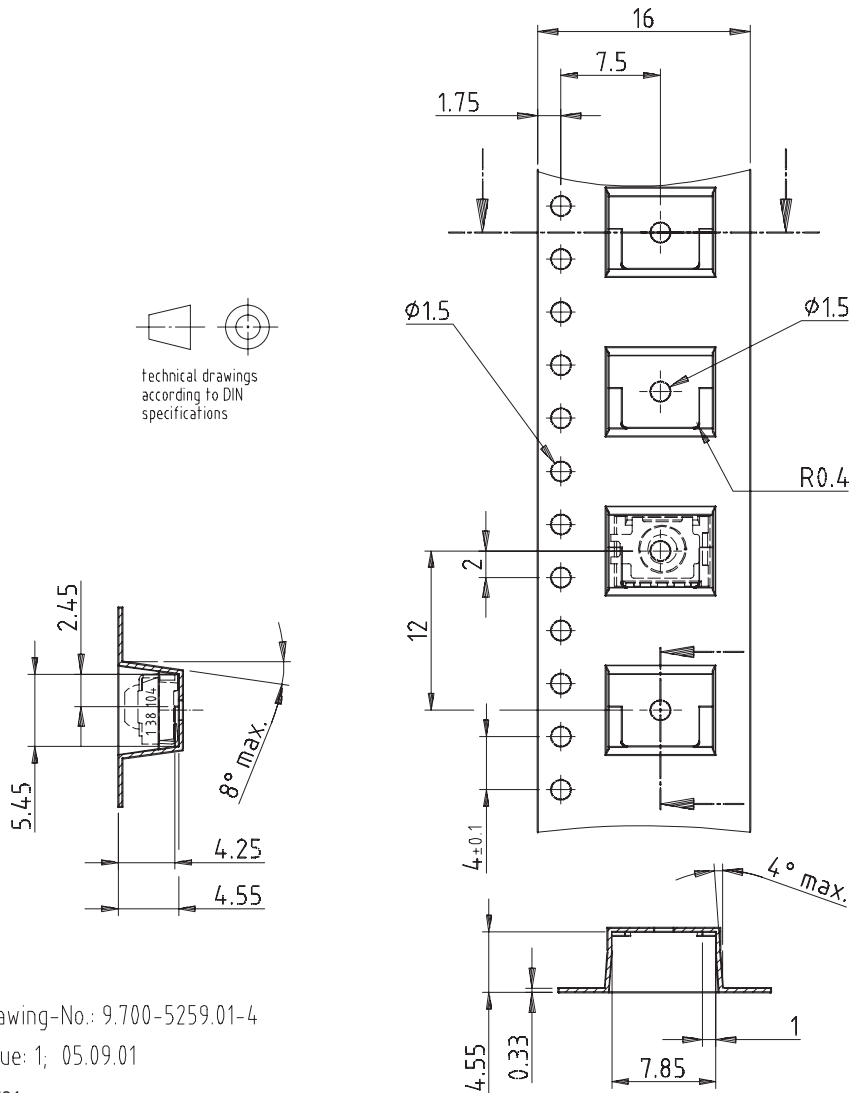
- The body structure of the reel can vary





## TAPING VERSION TSOP..TT (TOP VIEW) DIMENSIONS in millimeters

A. Panhead (TSOP36...TT, TSSP...TT, TSOP6...TT, TSOP16...TT, TSOP96...TT)



Drawing-No.: 9.700-5259.01-4

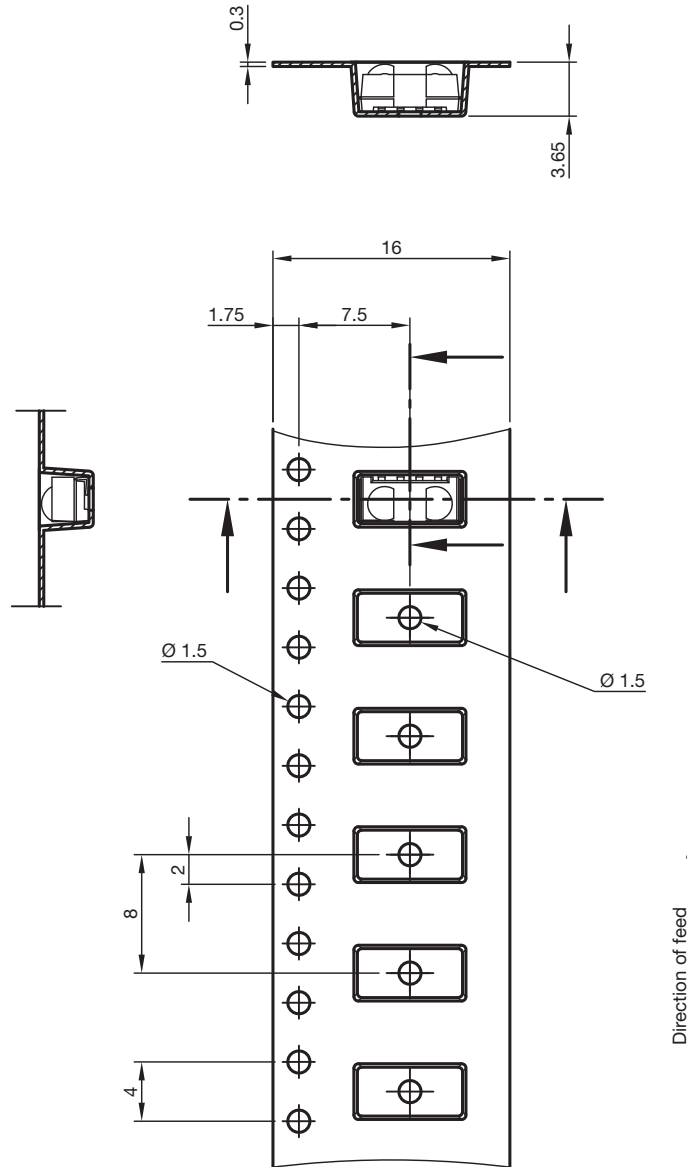
Issue: 1; 05.09.01

16584

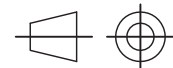


## TAPING VERSION TSOP..TT (TOP VIEW) DIMENSIONS in millimeters

B. Heimdall (TSOP75...TT, TSOP77...TT, TSSP77...TT, TSOP15...TT, TSOP95...TT)



Drawing-No.: 9.700-5338.01-4  
Issue: 4; 12.06.13



technical drawings  
according to DIN  
specifications

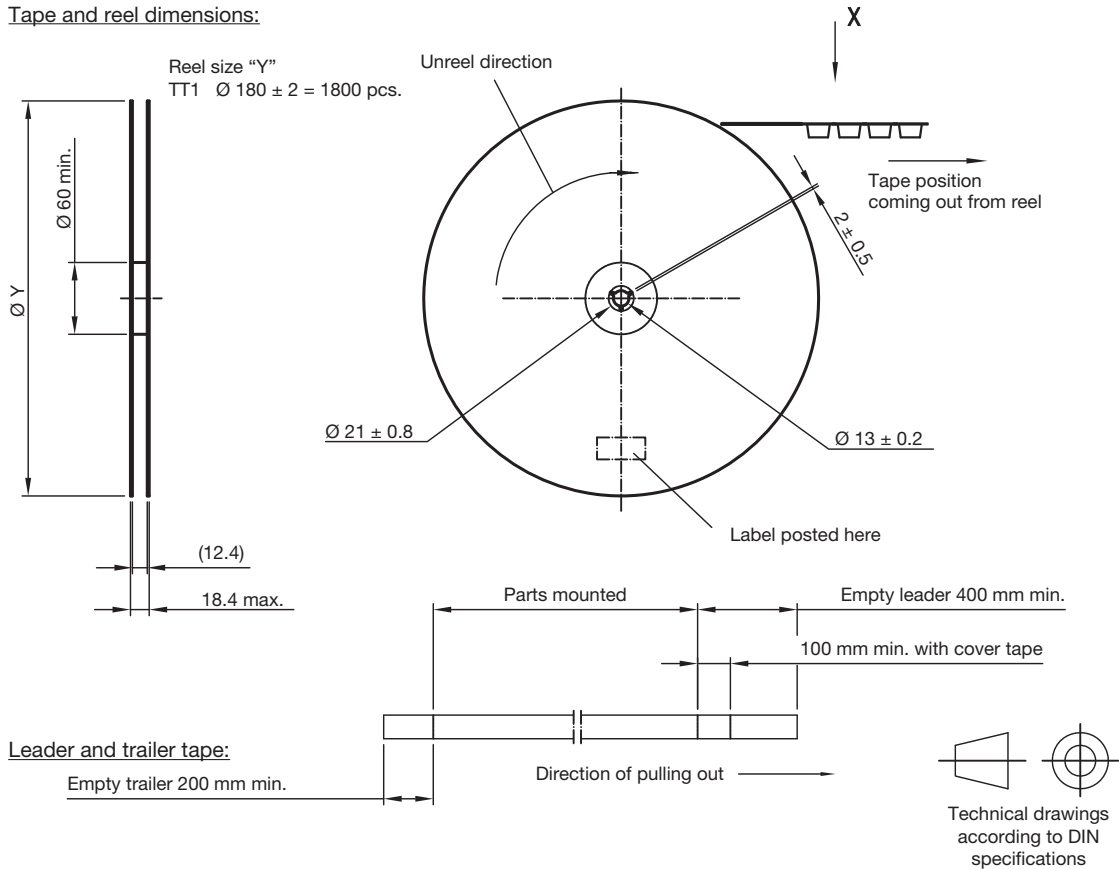




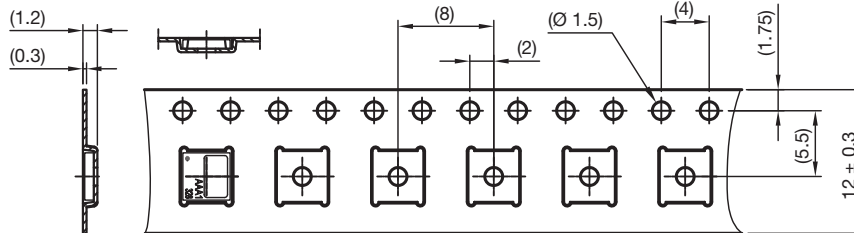
### TAPING VERSION TSOP..TT1 (TOP VIEW) DIMENSIONS in millimeters

D. Belobog (TSOP37...TT1, TSOP57...TT1, TSOP17...TT1, TSOP97...TT1)

Tape and reel dimensions:



X 2:1



Drawing-No.: 9.700-5347.01-4  
Issue: 2; 07.03.18

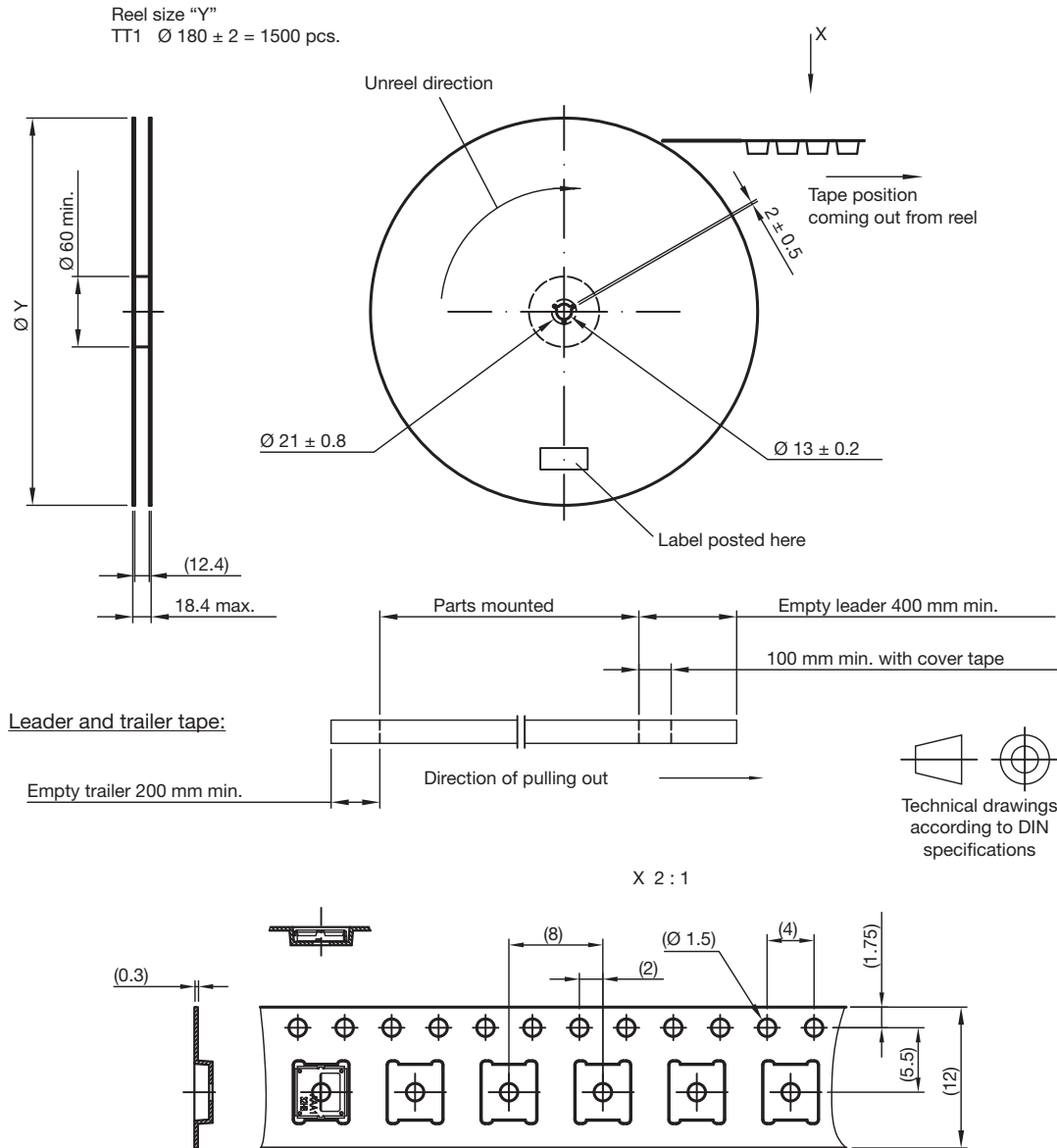
Not indicated tolerances  $\pm 0.1$



### TAPING VERSION TSOP..TT1 (TOP VIEW) DIMENSIONS in millimeters

E. Belobog with shield (TSOP37...HTT1, TSOP57...HTT1, TSOP17...HTT1, TSOP97...HTT1)

Tape and reel dimensions:



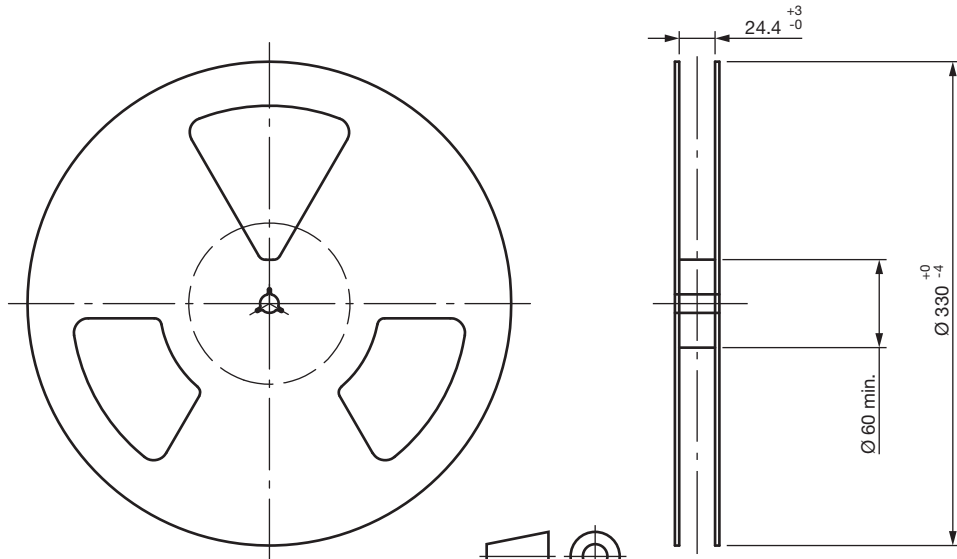
Drawing-No.: 9.700-5380.01-4  
Issue: 3; 07.03.18

Not indicated tolerances  $\pm 0.1$



### TAPING VERSION TSOP..DF1P (SIDE VIEW) DIMENSIONS in millimeters

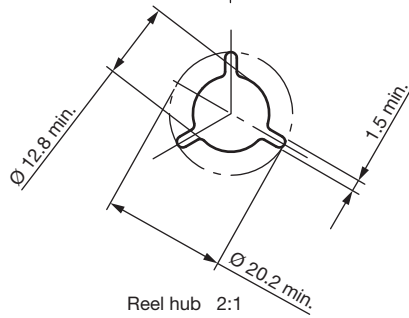
F. Minimold DF1P (TSOP33...DF1P, TSOP53...DF1P, TSOP13...DF1P, TSOP93...DF1P)



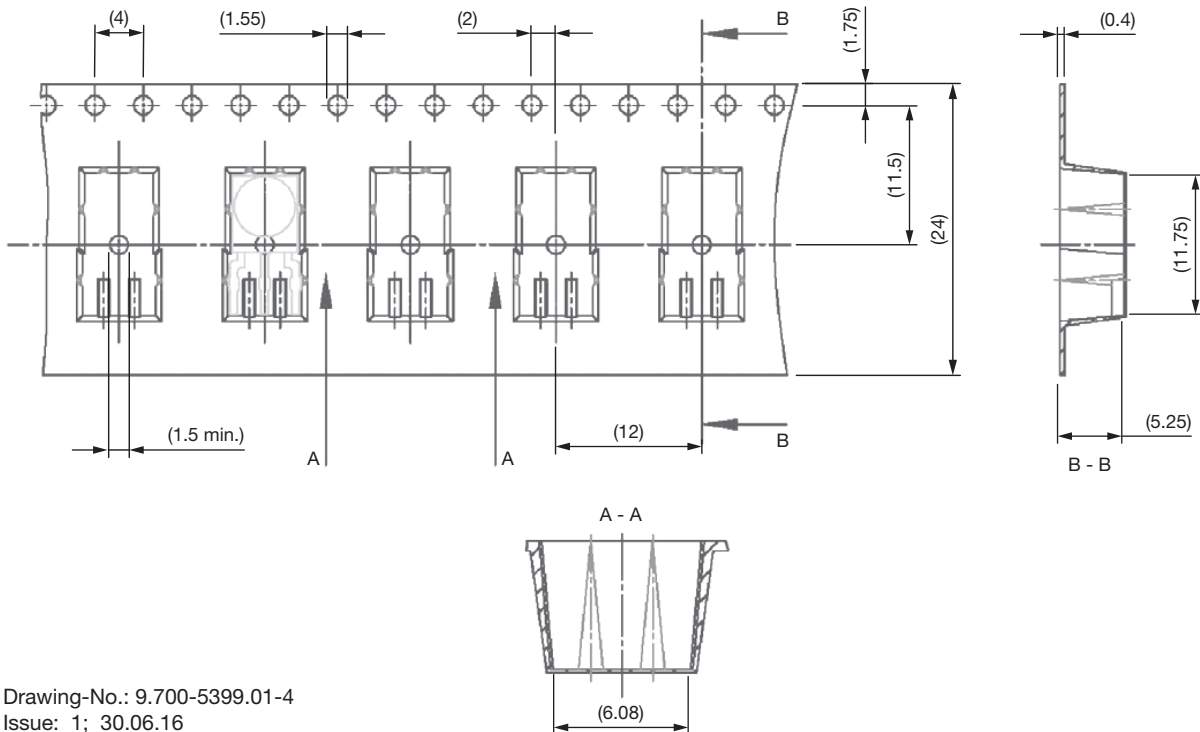
Technical drawing according to DIN specifications

Form of the leave open of the wheel is supplier specific. Dimensions according to IEC EN 60 286-3

Tape width: 24



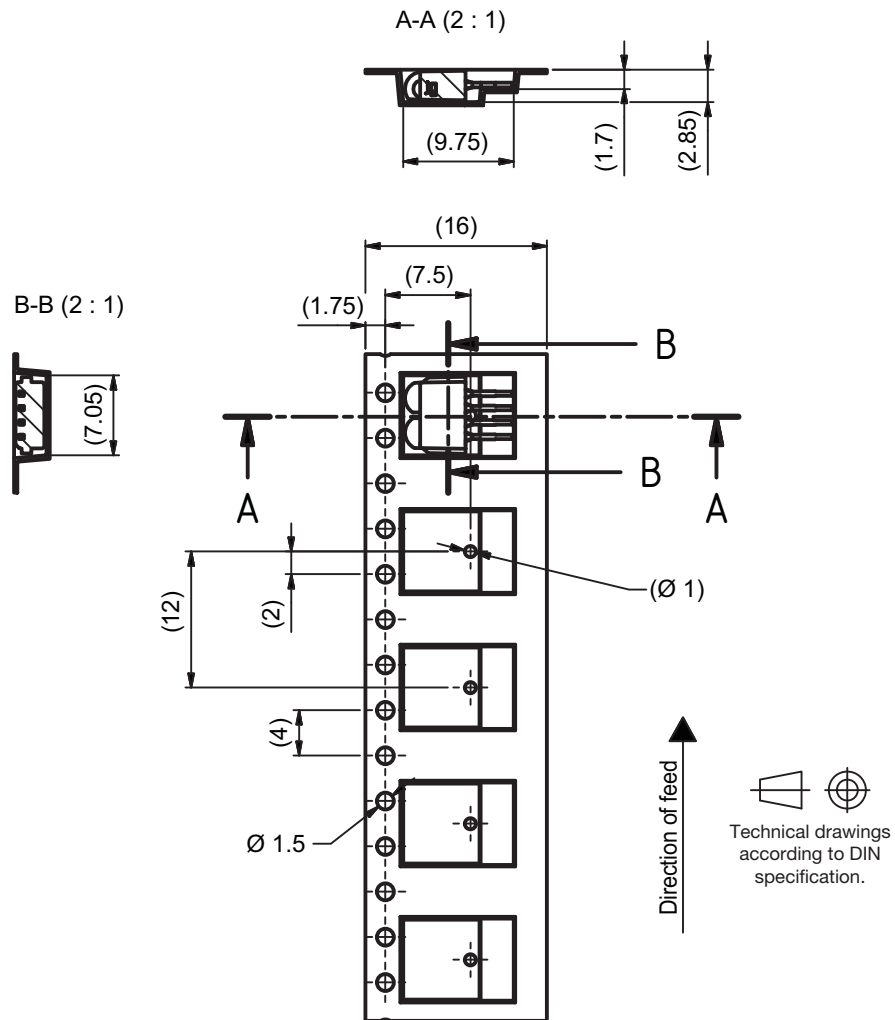
Drawing-No.: 9.800-5052.V3-4  
Issue: 1; 17.12.02



Drawing-No.: 9.700-5399.01-4  
Issue: 1; 30.06.16

## TAPING VERSION TSOP..TR (SIDE VIEW) DIMENSIONS in millimeters

G. TVCastSMD TR1 (TSOP59...TR1, TSOP39...TR1, TSOP19...TR1, TSOP99...TR1)

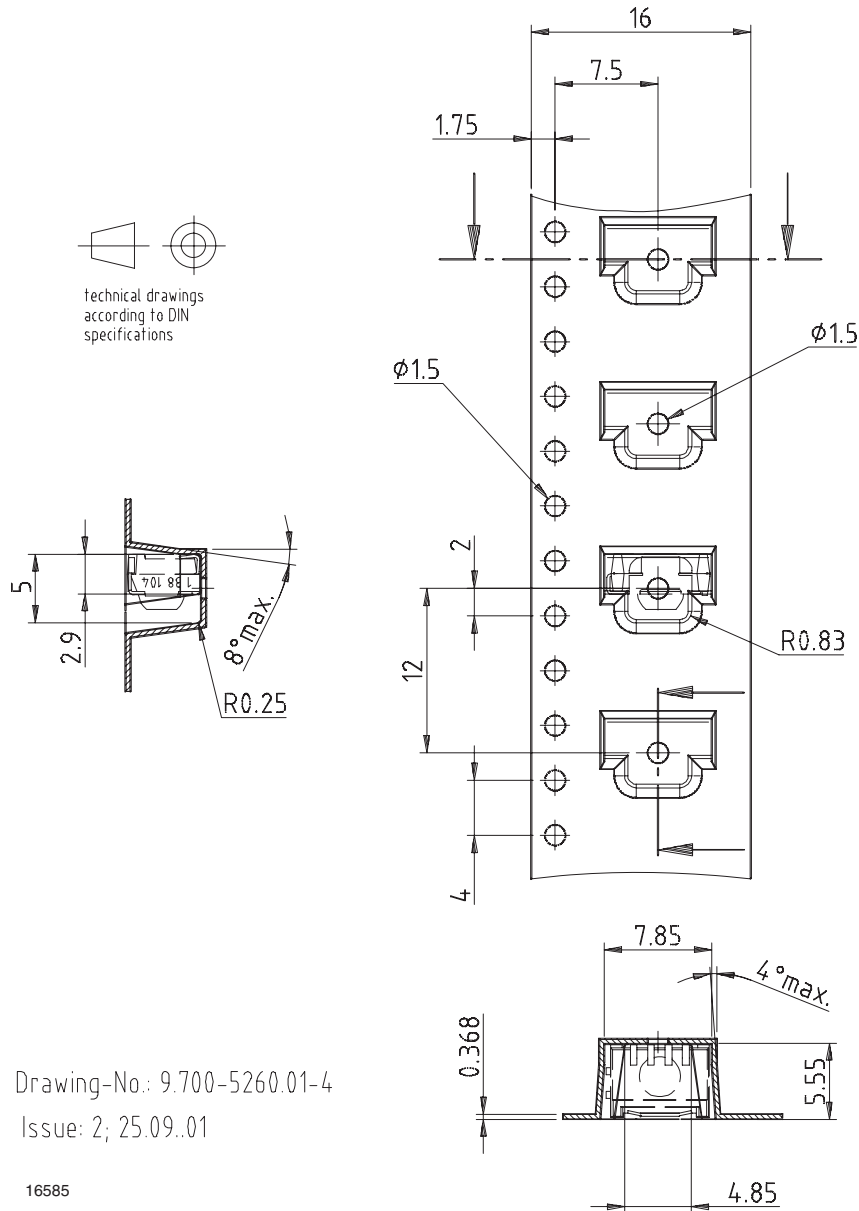


Drawing-No.: GO-100220.10\_Z  
Issue B: 08.02.17



### TAPING VERSION TSOP..TR (SIDE VIEW) DIMENSIONS in millimeters

A. Panhead (TSOP36...TR, TSSP6...TR, TSOP6...TR, TSOP16...TR, TSOP96...TR)



Drawing-No.: 9.700-5260.01-4

Issue: 2; 25.09..01

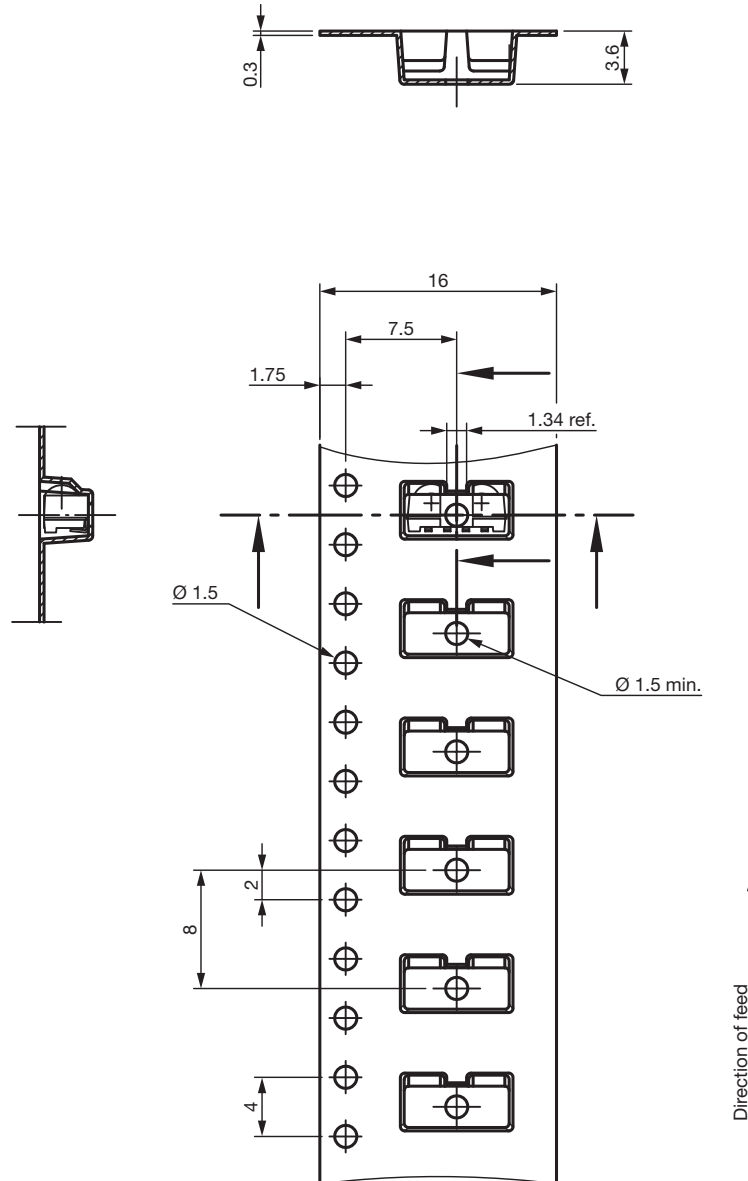
16585



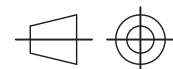


## TAPING VERSION TSOP..TR (SIDE VIEW) DIMENSIONS in millimeters

B. Heimdall (TSSP7...., TSOP75...TR, TSOP77...TR, TSSP7....TR, TSOP15...TR, TSOP95...TR)



Drawing-No.: 9.700-5337.01-4  
Issue: 2; 06.10.15

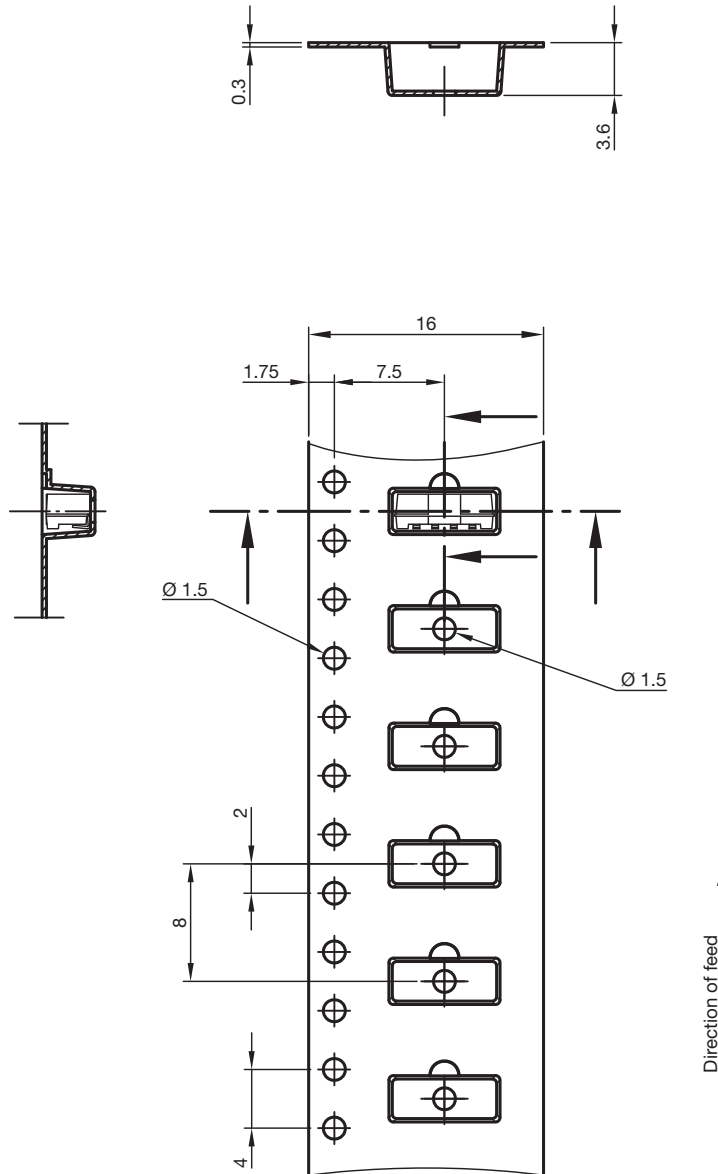


technical drawings  
according to DIN  
specifications

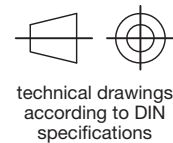


## TAPING VERSION TSOP..TR (SIDE VIEW) DIMENSIONS in millimeters

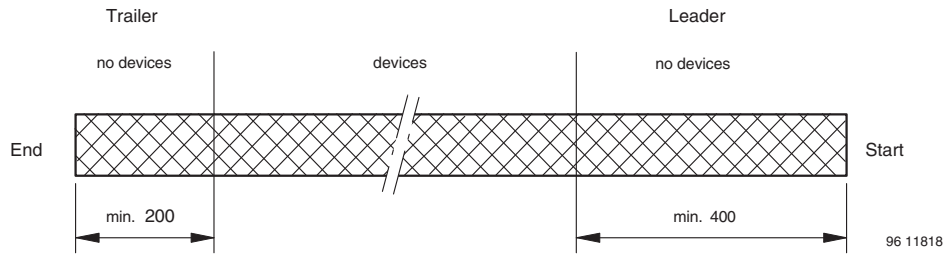
C. Heimdall without lens (TSOP75...WTR, TSOP77...WTR, TSSP...WTR, TSOP15...WTR, TSOP95...WTR)



Drawing-No.: 9.700-5342.01-4  
Issue: 2; 12.06.13



### LEADER AND TRAILER DIMENSIONS in millimeters



### COVER TAPE REEL STRENGTH

According to DIN EN 60286-3

0.1 N to 1.3 N

300 mm/min.  $\pm$  10 mm/min.

165° to 180° peel angle

### LABEL

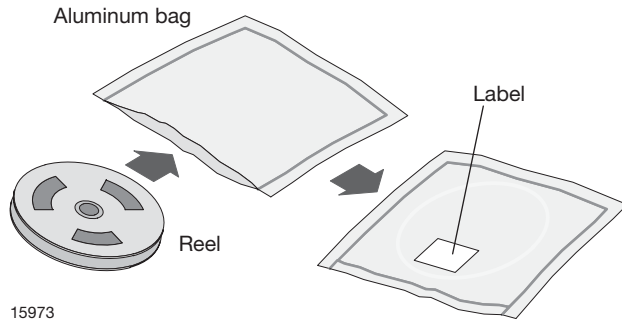
#### Standard bar code labels for finished goods

The standard bar code labels are product labels and used for identification of goods. The finished goods are packed in final packing area. The standard packing units are labeled with standard bar code labels before transported as finished goods to warehouses. The labels are on each packing unit and contain Vishay Semiconductor GmbH specific data.

| VISHAY SEMICONDUCTOR GmbH STANDARD BAR CODE PRODUCT LABEL (finished goods) |              |              |
|--|--------------|--------------|
| PLAIN WRITING  | ABBREVIATION | LENGTH       |
| Item-description   | -            | 18           |
| Item-number  | INO          | 8            |
| Selection-code   | SEL          | 3            |
| LOT-/serial-number   | BATCH        | 10           |
| Data-code  | COD          | 3 (YWW)      |
| Plant-code   | PTC          | 2            |
| Quantity   | QTY          | 8            |
| Accepted by  | ACC          | -            |
| Packed by  | PCK          | -            |
| Mixed code indicator   | MIXED CODE   | -            |
| Origin   | xxxxxxx+     | Company logo |
| LONG BAR CODE TOP  | TYPE         | LENGTH       |
| Item-number  | N            | 8            |
| Plant-code   | N            | 2            |
| Sequence-number  | X            | 3            |
| Quantity   | N            | 8            |
| Total length   | -            | 21           |
| SHORT BAR CODE TOP   | TYPE         | LENGTH       |
| Selection-code   | X            | 3            |
| Data-code  | N            | 3            |
| Batch-number   | X            | 10           |
| Filter   | -            | 1            |
| Total length   | -            | 17           |

## DRY PACKAGING

The reel is packed in an anti-humidity bag to protect the devices from absorbing moisture during transportation and storage.



15973

## RECOMMENDED METHOD OF STORAGE

Dry box storage is recommended as soon as the aluminum bag has been opened to prevent moisture absorption. The following conditions should be observed, if dry boxes are not available:

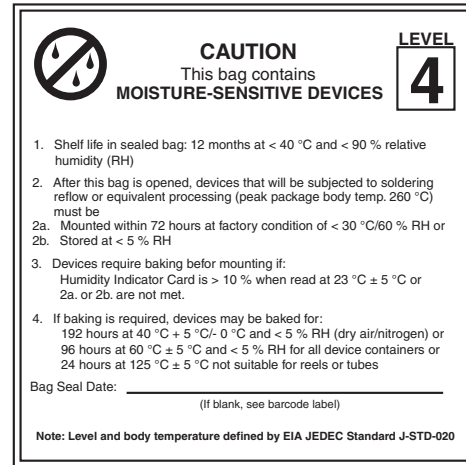
- Storage temperature 10 °C to 30 °C
- Storage humidity ≤ 60 % RH max.

After more than 72 h under these conditions moisture content will be too high for reflow soldering.

In case of moisture absorption, the devices will recover to the former condition by drying under the following condition:

- 192 h at 40 °C + 5 °C / - 0 °C and < 5 % RH (dry air / nitrogen) or
- 96 h at 60 °C + 5 °C and < 5 % RH for all device containers or
- 24 h at 125 °C + 5 °C not suitable for reel or tubes.

An EIA JEDEC® standard JSTD-020 level 4 label is included on all dry bags.



22522

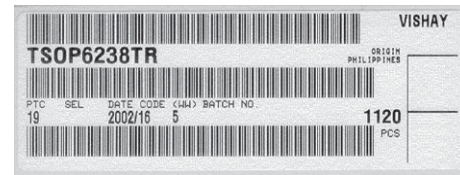
EIA JEDEC standard JSTD-020 level 4 label is included on all dry bags

## ESD PRECAUTION

Proper storage and handling procedures should be followed to prevent ESD damage to the devices especially when they are removed from the antistatic shielding bag. Electrostatic sensitive devices warning labels are on the packaging.

## VISHAY SEMICONDUCTORS STANDARD BAR CODE LABELS

The Vishay Semiconductors standard bar code labels are printed at final packing areas. The labels are on each packing unit and contain Vishay Semiconductors specific data.



16962

## OUTER PACKAGING

The sealed reel is packed into a pizza box.

| CARTON BOX DIMENSIONS in millimeters           |           |       |        |
|--|-----------|-------|--------|
|  |           |       |        |
|  | THICKNESS | WIDTH | LENGTH |
| Pizza box (SMD and heimdall) (taping in reels) | 50        | 340   | 340    |

22127



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