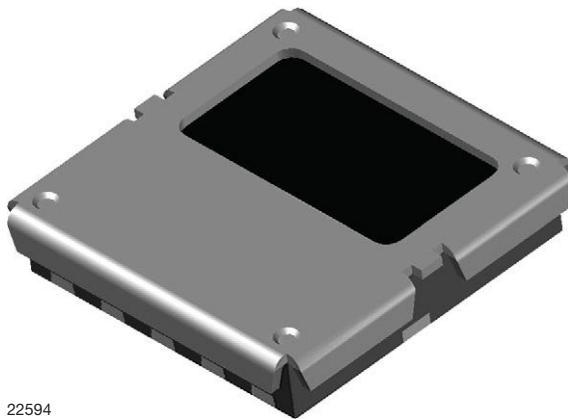


## IR Receiver Modules for Remote Control Systems



22594

### DESIGN SUPPORT TOOLS


[click logo to get started](#)

### ORDERING CODE

#### Taping:

TSOP37...TT1 - top view taped

TSOP37...TT2 - top view taped

### FEATURES

- Very low supply current
- Photo detectors and preamplifier in one package
- Internal filter for PCM frequency
- Supply voltage: 2.5 V to 5.5 V
- Improved immunity against ambient light
- Insensitive to supply voltage ripple and noise
- External metal shield
- Material categorization:  
for definitions of compliance please see  
[www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)



**RoHS**  
COMPLIANT  
**HALOGEN FREE**  
**GREEN**  
(5-2008)

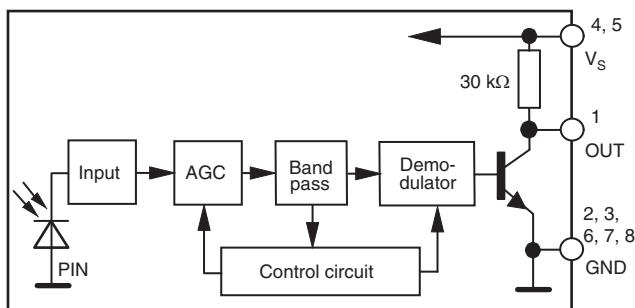
### DESCRIPTION

The TSOP372..H, TSOP374..H series are miniaturized receiver modules for infrared remote control systems. A PIN diode and a preamplifier are assembled on a PCB, the epoxy lens cap contains an IR filter.

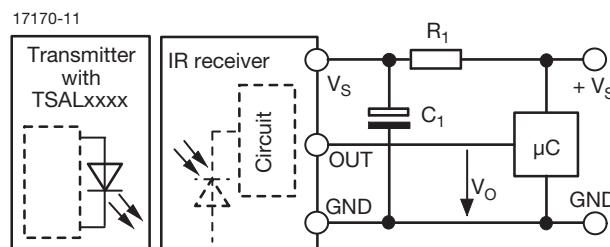
The TSOP374..H series devices are optimized to suppress almost all spurious pulses from energy saving lamps like CFLs. The AGC4 used in the TSOP374..H may suppress some data signals. The TSOP372..H series are provided primarily for compatibility with old AGC2 designs. New designs should prefer the TSOP374..H series containing the newer AGC4.

These components have not been qualified according to automotive specifications.

PARTS TABLE			
AGC		LEGACY, FOR LONG BURST REMOTE CONTROLS (AGC2)	RECOMMENDED FOR LONG BURST CODES (AGC4)
Carrier frequency	36 kHz	TSOP37236H	TSOP37436H <sup>(1)(2)(3)</sup>
	38 kHz	TSOP37238H	TSOP37438H <sup>(4)(5)(8)</sup>
	40 kHz	TSOP37240H	TSOP37440H
	56 kHz	TSOP37256H	TSOP37456 <sup>H(6)(7)</sup>
Package		Belobog shield	
Pinning		1 = OUT, 2, 3, 6, 7, 8 = GND, 4, 5 = Vs	
Dimensions (mm)		4.3 W x 4.3 H x 1.0 D	
Mounting		SMD	
Application		Remote control	
Best choice for		(1) RC-5 (2) RC-6 (3) Panasonic (4) NEC (5) Sharp (6) r-step (7) Thomson RCA (8) r-map	

**BLOCK DIAGRAM**


20445-5

**APPLICATION CIRCUIT**

R<sub>1</sub> and C<sub>1</sub> recommended to reduce supply ripple for V<sub>S</sub> < 2.8 V

**ABSOLUTE MAXIMUM RATINGS**

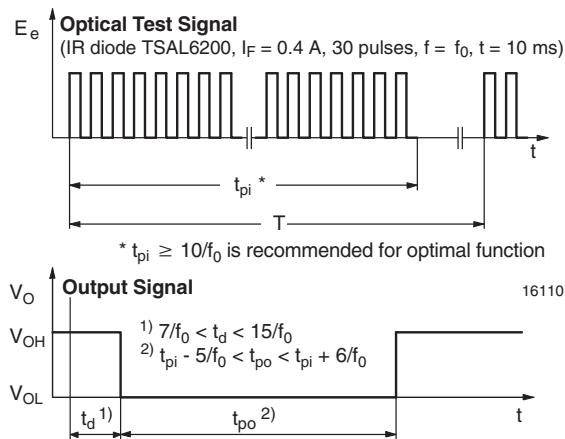
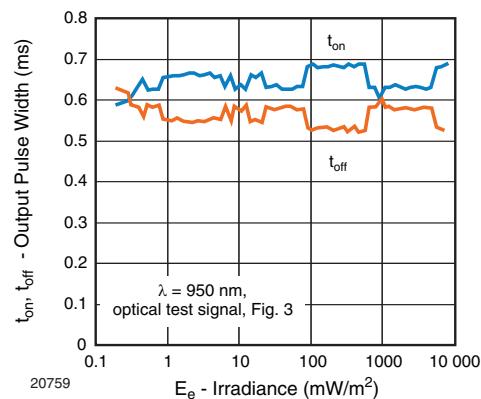
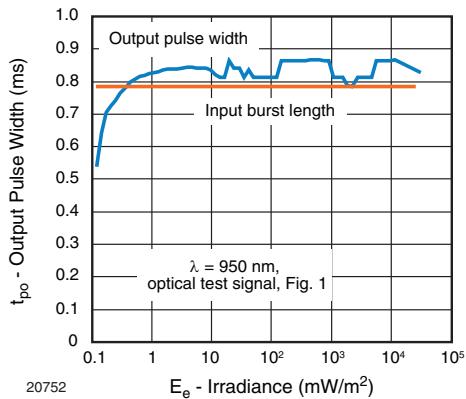
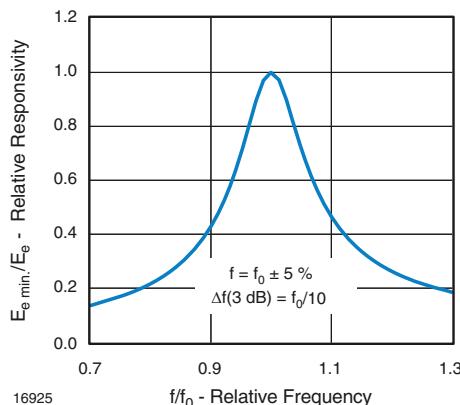
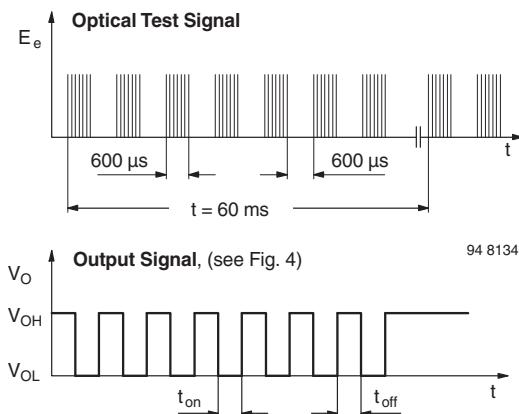
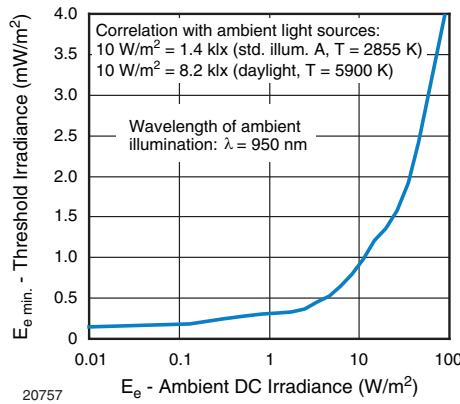
PARAMETER	TEST CONDITION	SYMBOL	VALUE	UNIT
Supply voltage		V <sub>S</sub>	-0.3 to +6	V
Supply current		I <sub>S</sub>	3	mA
Output voltage		V <sub>O</sub>	-0.3 to (V <sub>S</sub> + 0.3)	V
Output current		I <sub>O</sub>	5	mA
Junction temperature		T <sub>j</sub>	100	°C
Storage temperature range		T <sub>stg</sub>	-25 to +85	°C
Operating temperature range		T <sub>amb</sub>	-25 to +85	°C
Power consumption	T <sub>amb</sub> ≤ 85 °C	P <sub>tot</sub>	10	mW

**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<sub>amb</sub> = 25 °C, unless otherwise specified)**

PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT
Supply voltage		V <sub>S</sub>	2.5	-	5.5	V
Supply current	V <sub>S</sub> = 3.3 V, E <sub>v</sub> = 0	I <sub>SD</sub>	0.27	0.35	0.45	mA
	E <sub>v</sub> = 40 klx, sunlight	I <sub>SH</sub>	-	0.45	-	mA
Transmission distance	E <sub>v</sub> = 0, IR diode TSAL6200, I <sub>F</sub> = 50 mA, test signal see Fig. 1	d	-	24	-	m
Output voltage low	I <sub>OSL</sub> = 0.5 mA, E <sub>e</sub> = 0.7 mW/m <sup>2</sup> , test signal see Fig. 1	V <sub>OSL</sub>	-	-	100	mV
Minimum irradiance	Pulse width tolerance: t <sub>pi</sub> - 5/f <sub>0</sub> < t <sub>po</sub> < t <sub>pi</sub> + 6/f <sub>0</sub> , test signal see Fig. 1	E <sub>e</sub> min.	-	0.12	0.25	mW/m <sup>2</sup>
Maximum irradiance	t <sub>pi</sub> - 5/f <sub>0</sub> < t <sub>po</sub> < t <sub>pi</sub> + 6/f <sub>0</sub> , test signal see Fig. 1	E <sub>e</sub> max.	30	-	-	W/m <sup>2</sup>
Directivity	Angle of half transmission distance	Φ <sub>1/2</sub>	-	± 75	-	°

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

**Fig. 1 - Output Function**

**Fig. 4 - Output Pulse Diagram**

**Fig. 2 - Output Pulse Width vs. Irradiance**

**Fig. 5 - Frequency Dependence of Responsivity**

**Fig. 3 - Output Function**

**Fig. 6 - Sensitivity in Bright Ambient**

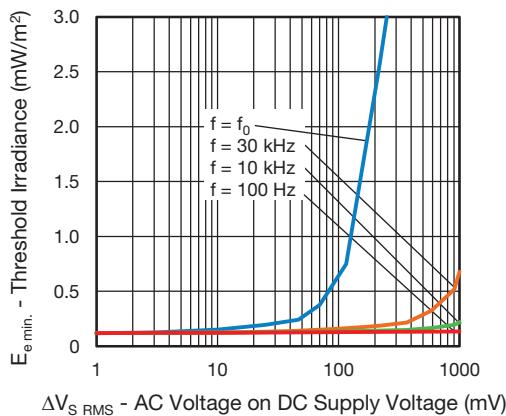


Fig. 7 - Sensitivity vs. Supply Voltage Disturbances

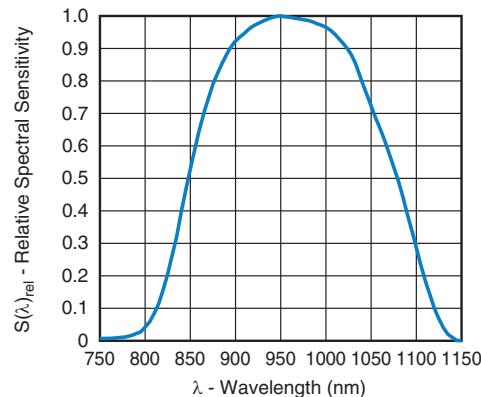


Fig. 10 - Relative Spectral Sensitivity vs. Wavelength

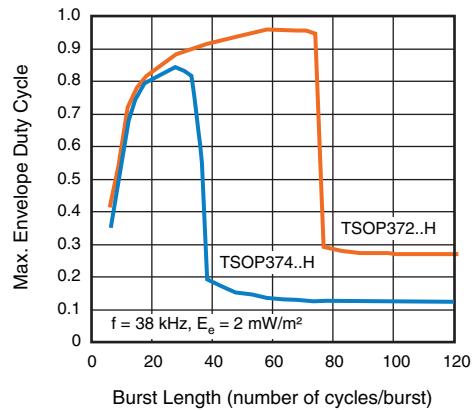


Fig. 8 - Max. Envelope Duty Cycle vs. Burst Length

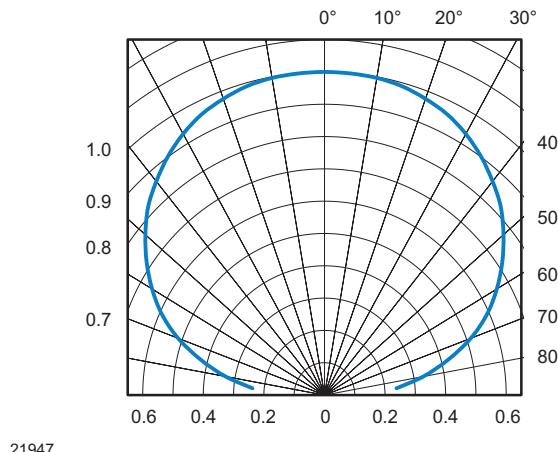


Fig. 11 - Directivity

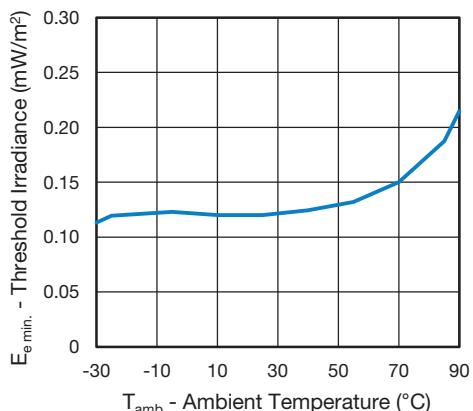


Fig. 9 - Sensitivity vs. Ambient Temperature

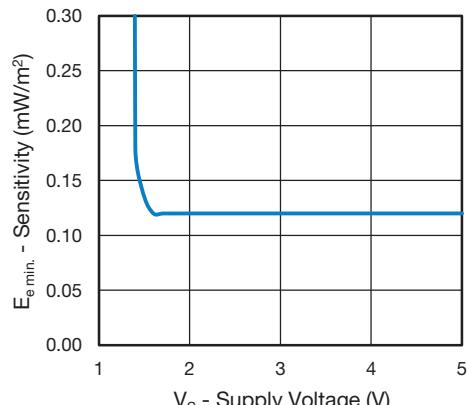


Fig. 12 - Sensitivity vs. Supply Voltage

## SUITABLE DATA FORMAT

The TSOP372..H, TSOP374..H 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 TSOP372..H, TSOP374..H 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 patterns from fluorescent lamps with electronic ballasts (see Fig. 13 or Fig. 14)

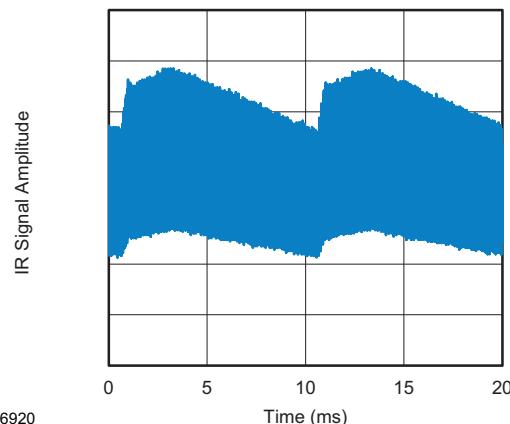


Fig. 13 - IR Signal from Fluorescent Lamp With Low Modulation

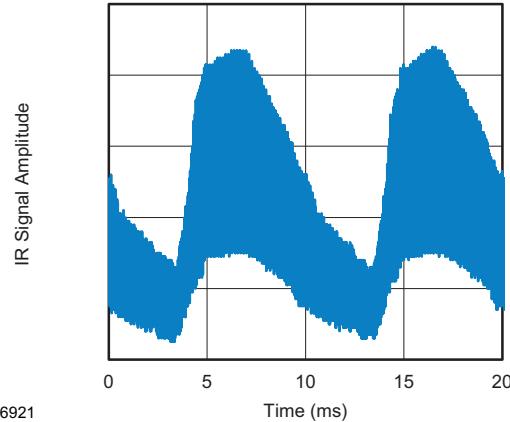
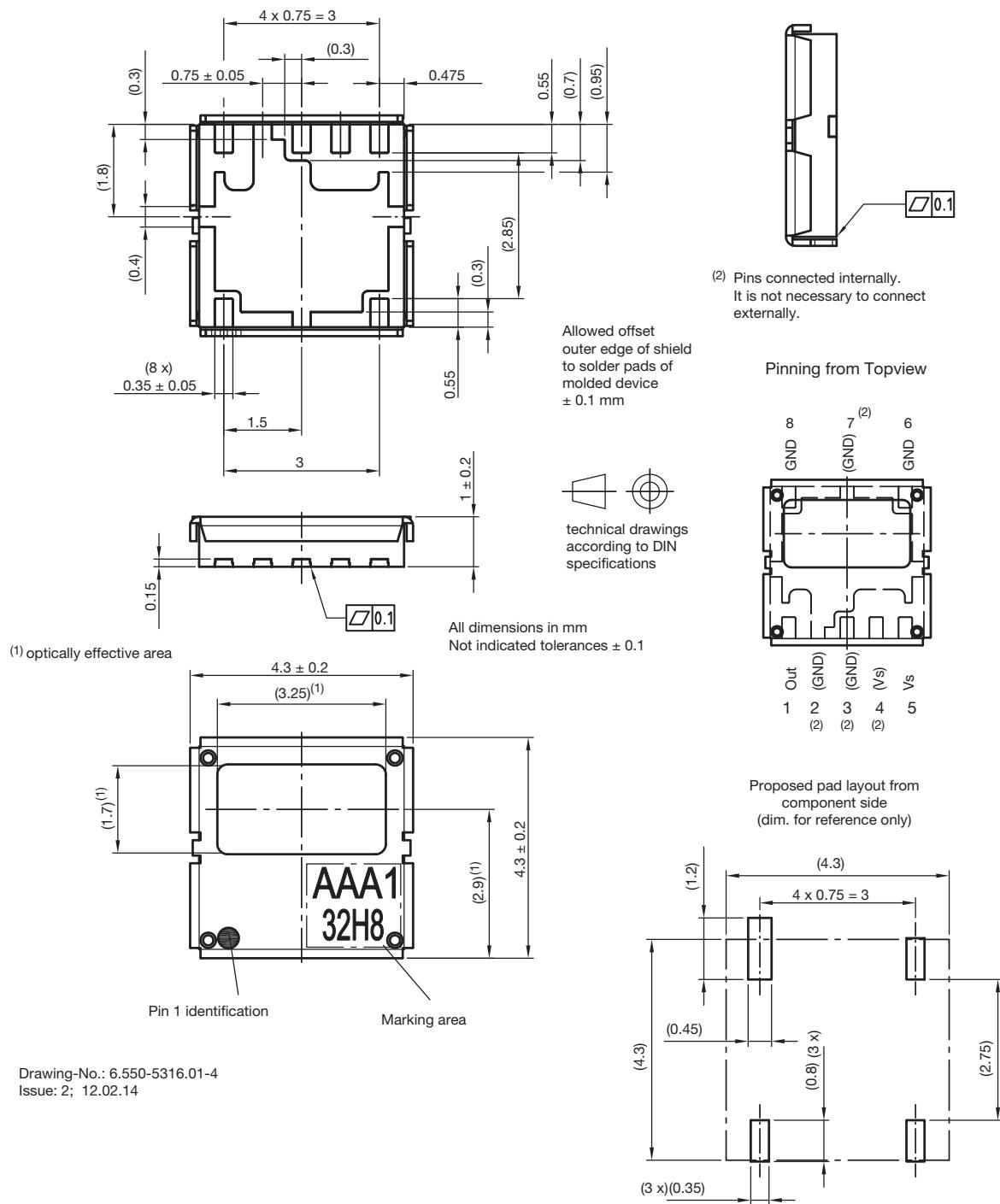


Fig. 14 - IR Signal from Fluorescent Lamp With High Modulation

	<b>TSOP372..H</b>	<b>TSOP374..H</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 ≥ 10 cycles	10 to 35 cycles ≥ 10 cycles
For bursts greater than a minimum gap time in the data stream is needed of	70 cycles > 4 x burst length	35 cycles > 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)

### Notes

- For data formats with short bursts (less than 10 carrier cycles) please see the datasheet for TSOP373..H, TSOP375..H
- For Sony 12, 15, and 20 bit IR codes please see the datasheet of TSOP37S40H

**PACKAGE DIMENSIONS** in millimeters


## ASSEMBLY INSTRUCTIONS

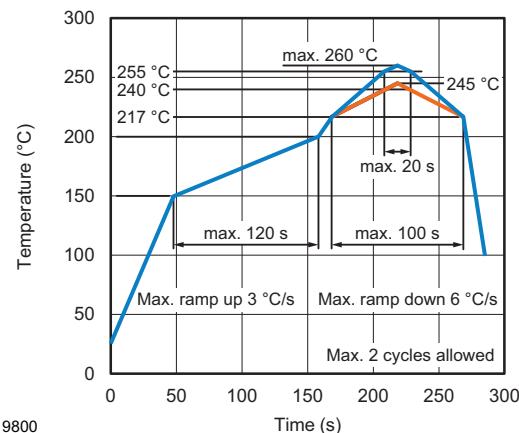
### Reflow Soldering

- Reflow soldering must be done within 168 h while stored under a max. temperature of 30 °C, 60 % RH after opening the dry pack envelope
- Set the furnace temperatures for pre-heating and heating in accordance with the reflow temperature profile as shown in the diagram. Exercise extreme care to keep the maximum temperature below 260 °C. The temperature shown in the profile means the temperature at the device surface. Since there is a temperature difference between the component and the circuit board, it should be verified that the temperature of the device is accurately being measured
- Handling after reflow should be done only after the work surface has been cooled off

### Manual Soldering

- Use a soldering iron of 25 W or less. Adjust the temperature of the soldering iron below 300 °C
- Finish soldering within 3 s
- Handle products only after the temperature has cooled off

## VISHAY LEAD (Pb)-FREE REFLOW SOLDER PROFILE



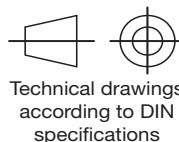
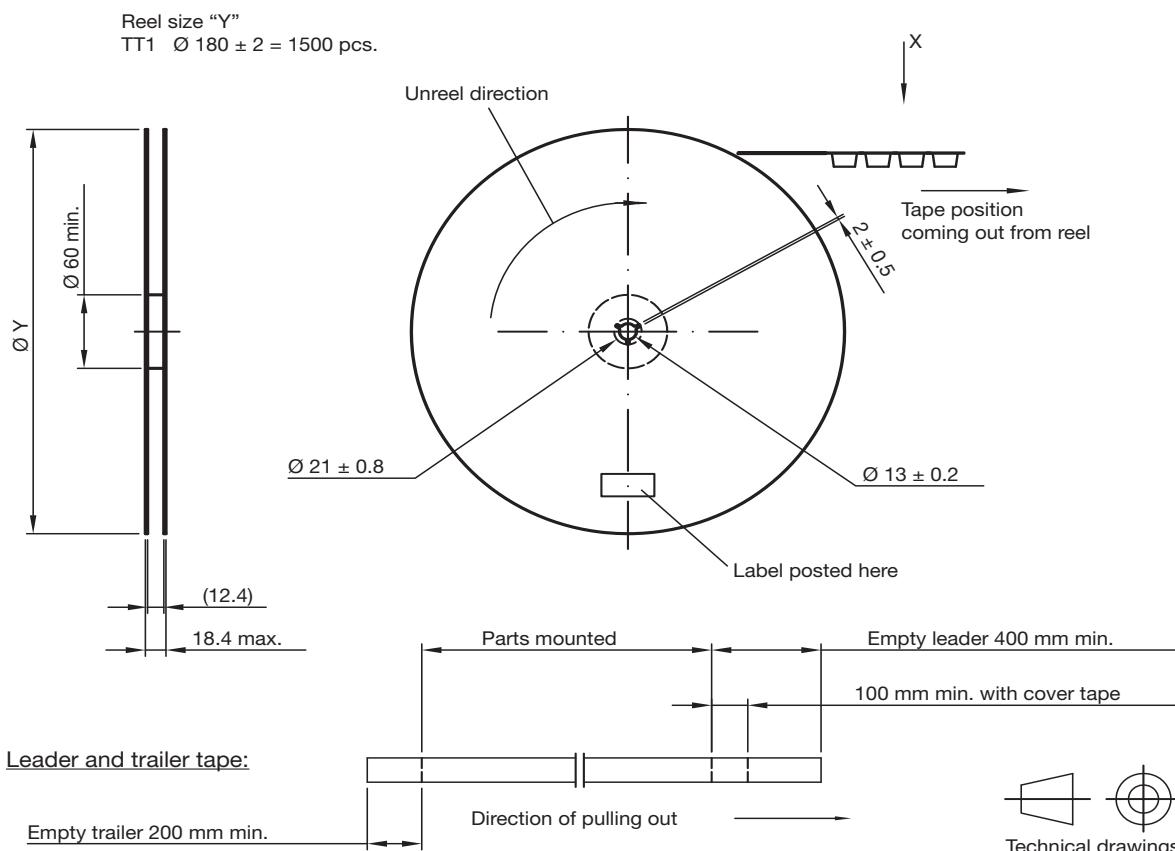
## ORDERING INFORMATION

ORDERING CODE	PACKAGING	VOLUME <sup>(1)</sup>	REMARKS
TSOP37..HTT1	Tape and reel	MOQ: 1500 pcs	3.95 mm x 3.95 mm x 0.75 mm
TSOP37..HTT2		MOQ: 5000 pcs	

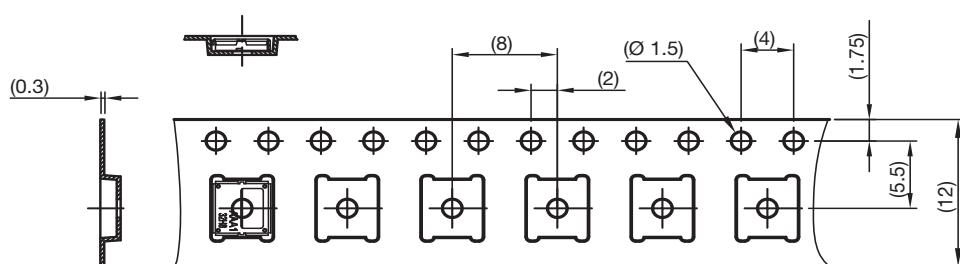
### Note

<sup>(1)</sup> MOQ: minimum order quantity

**TAPING VERSION TSOP37..H DIMENSIONS** in millimeters

Tape and reel dimensions:


X 2 : 1



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

Not indicated tolerances  $\pm 0.1$

**LABEL**
**Standard bar code labels for finished goods**

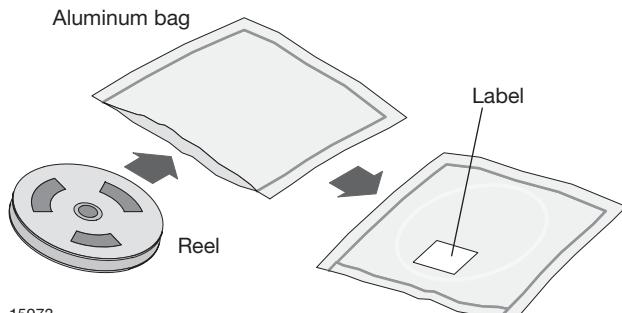
The standard bar code labels are product labels and used for identification of goods. The finished goods are packed in final packing area. The standard packing units are labeled

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.

<b>VISHAY SEMICONDUCTOR GmbH STANDARD BAR CODE PRODUCT LABEL</b> (finished goods)		
<b>PLAIN WRITING</b>	<b>ABBREVIATION</b>	<b>LENGTH</b>
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	xxxxxxxx+	Company logo
<b>LONG BAR CODE TOP</b>		
	<b>TYPE</b>	<b>LENGTH</b>
Item-number	N	8
Plant-code	N	2
Sequence-number	X	3
Quantity	N	8
Total length	-	21
<b>SHORT BAR CODE BOTTOM</b>		
	<b>TYPE</b>	<b>LENGTH</b>
Selection-code	X	3
Data-code	N	3
Batch-number	X	10
Filter	-	1
Total length	-	17

**DRY PACKING**

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



15973

**FINAL PACKING**

The sealed reel is packed into a cardboard box.

## 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 168 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 J-STD-020 level 3 label is included on all dry bags.



22650

EIA JEDEC standard J-STD-020 level 3 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.

## BAR CODE PRODUCT LABEL (example)



22178

# 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

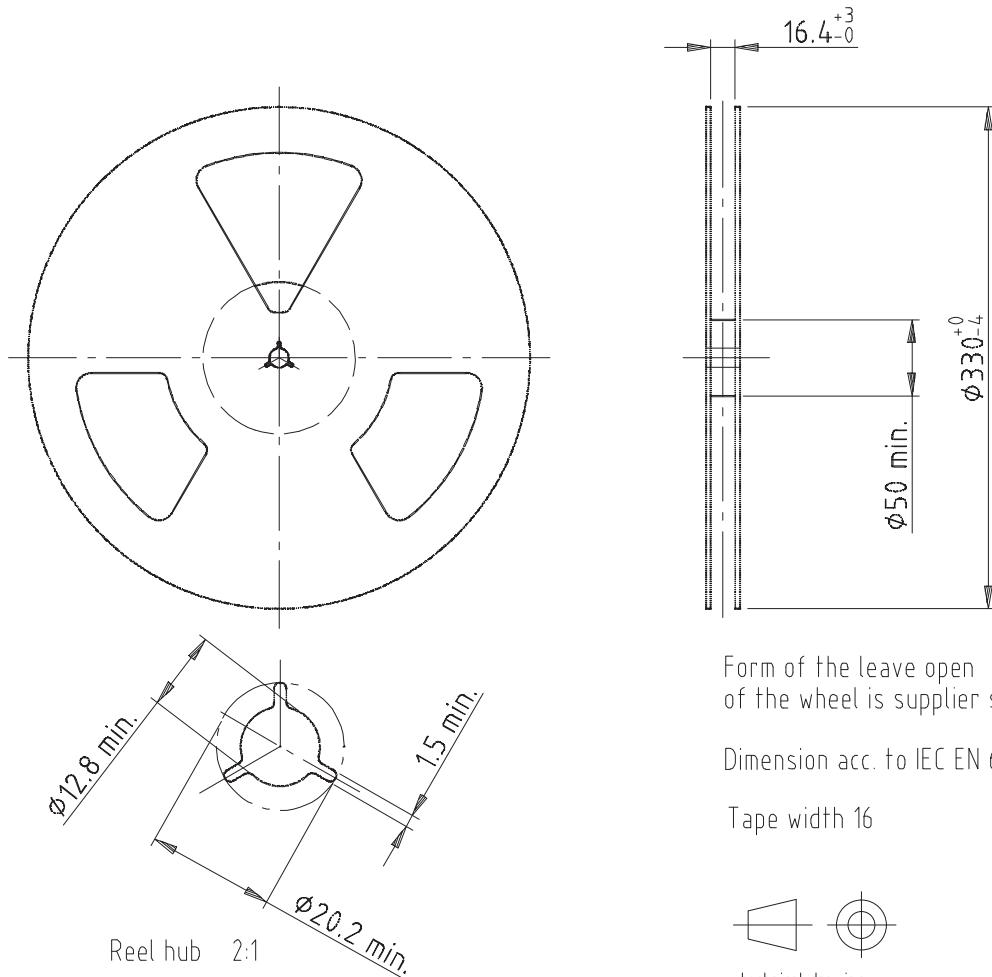
- A. Panhead: quantity per reel:
  - TT, top view package, 1190 pcs
  - TR, side view package, 1120 pcs
- B. Heimdall: quantity per reel:
  - TT, top view package, 2200 pcs
  - TR, side view package, 2300 pcs
- C. Heimdall without lens: quantity per reel:
  - WTT, top view package, 2200 pcs
  - WTR, 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:

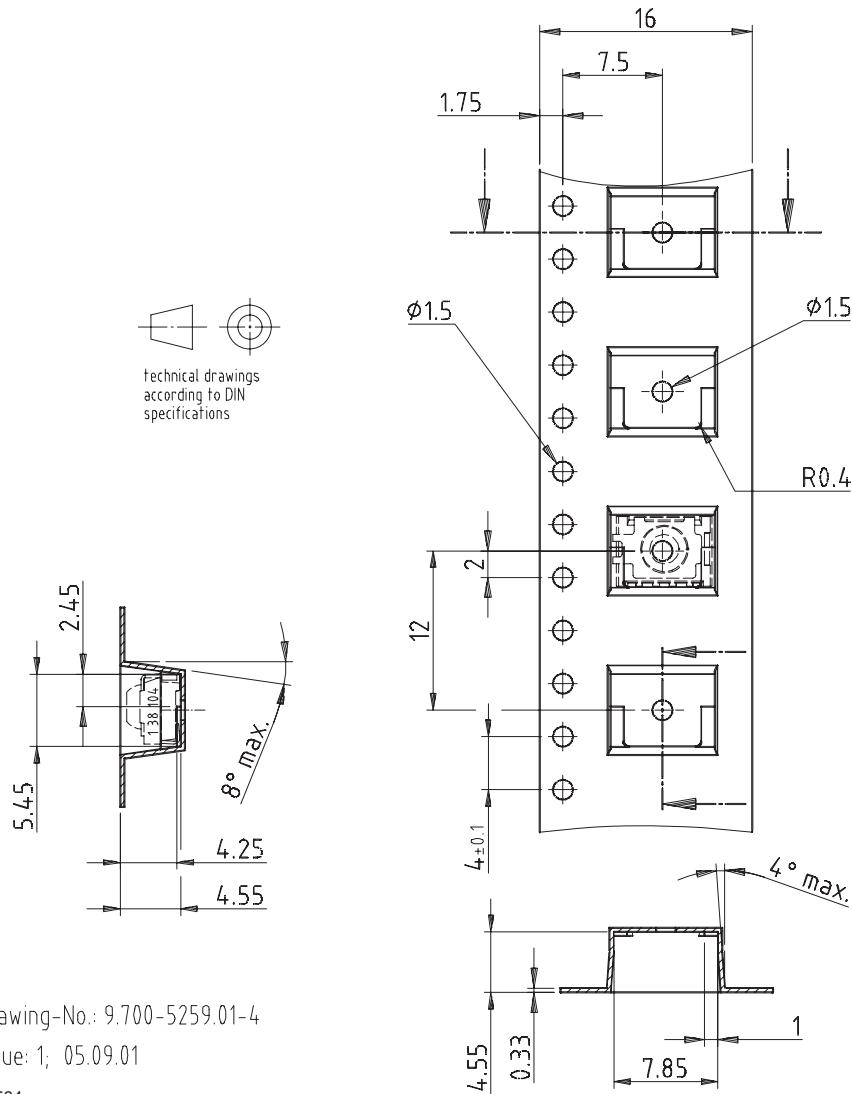
- TSOP6238TR (reel packing)
- TSOP75238TR (reel packing)
- TSOP75338WTT (reel packing)
- TSOP57438TT1 (reel packing)
- TSOP57238HTT1 (reel packing)
- TSOP39438TR1 (reel packing)

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

**Note**

- The body structure of the reel can vary

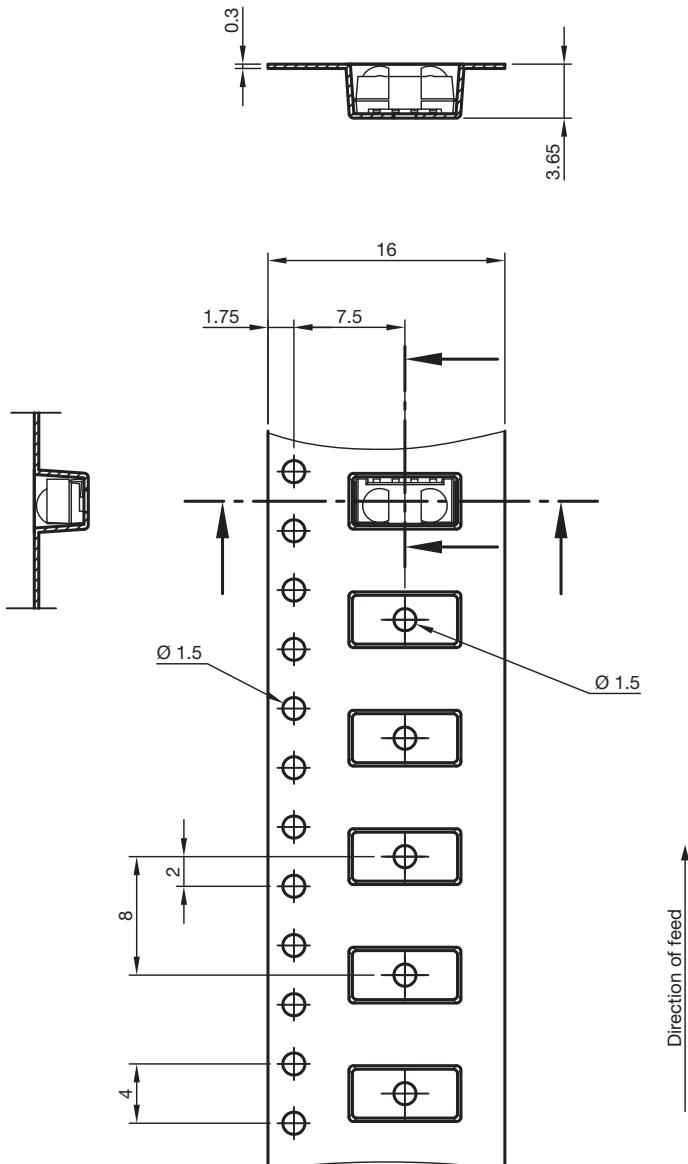
**TAPING VERSION TSOP..TT (TOP VIEW) DIMENSIONS** in millimeters

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

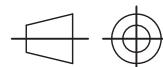


**TAPING VERSION TSOP..TT (TOP VIEW) DIMENSIONS** in millimeters

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



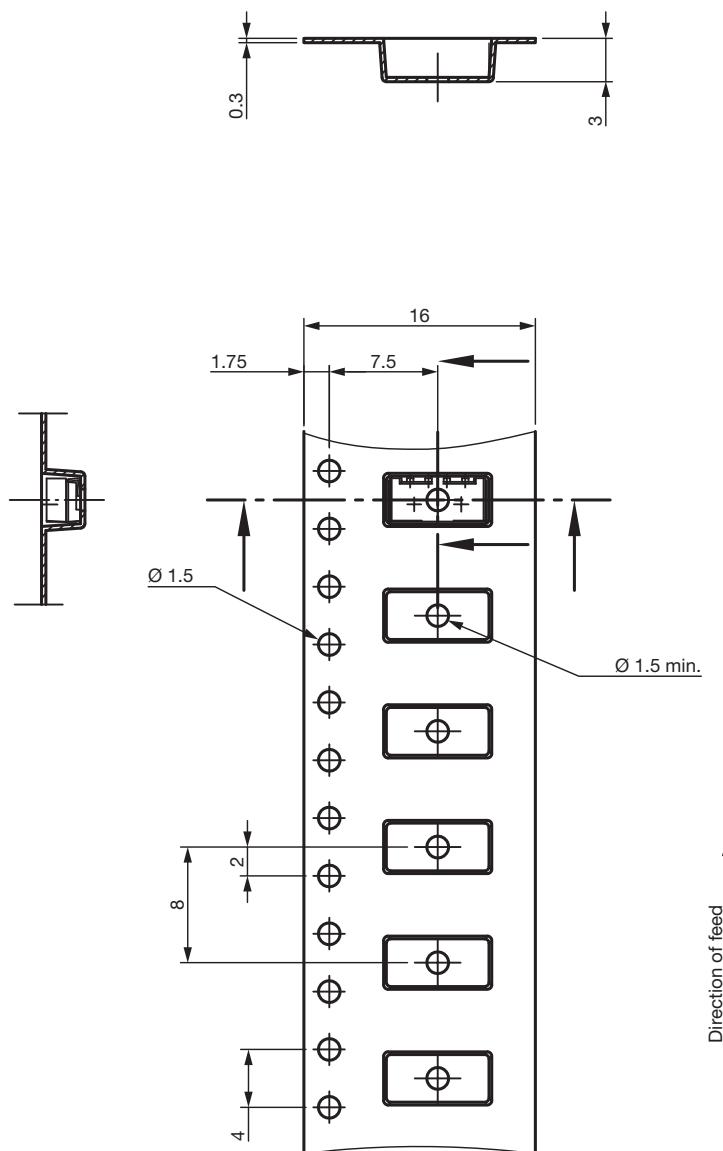
Drawing-No.: 9.700-5338.01-4  
Issue: 4; 12.06.13



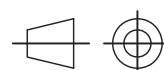
technical drawings  
according to DIN  
specifications

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

C. Heimdall without lens (TSOP75...WT, TSOP77...WT, TSSP77...WT, TSOP15...WT, TSOP95...WT)



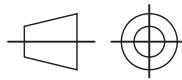
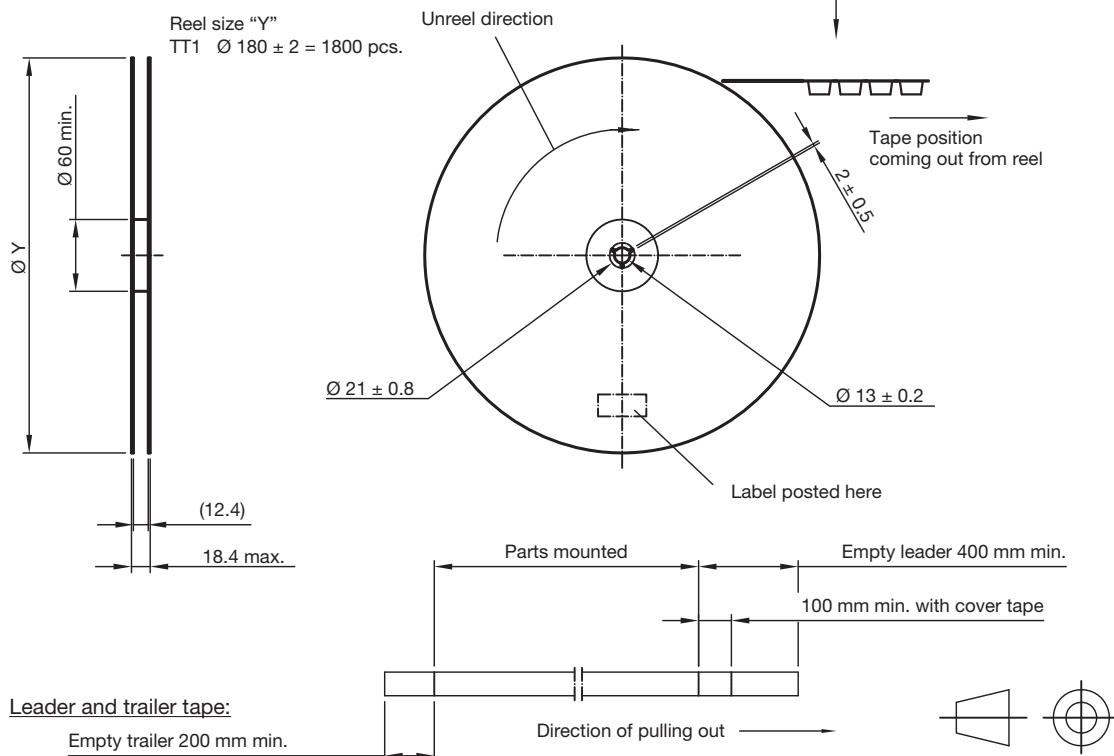
Drawing-No.: 9.700-5341.01-4  
Issue: 3; 06.10.15



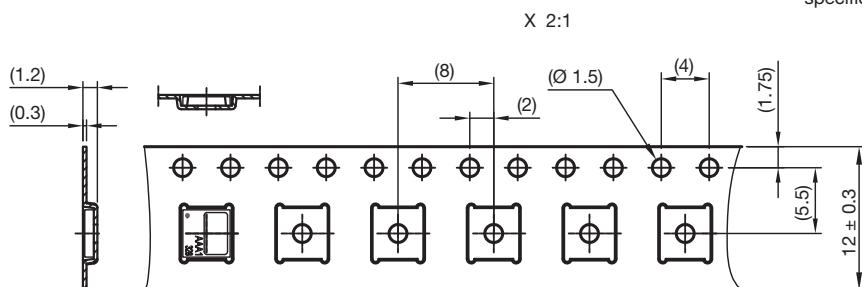
technical drawings  
according to DIN  
specifications

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

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

Tape and reel dimensions:


Technical drawings  
according to DIN  
specifications

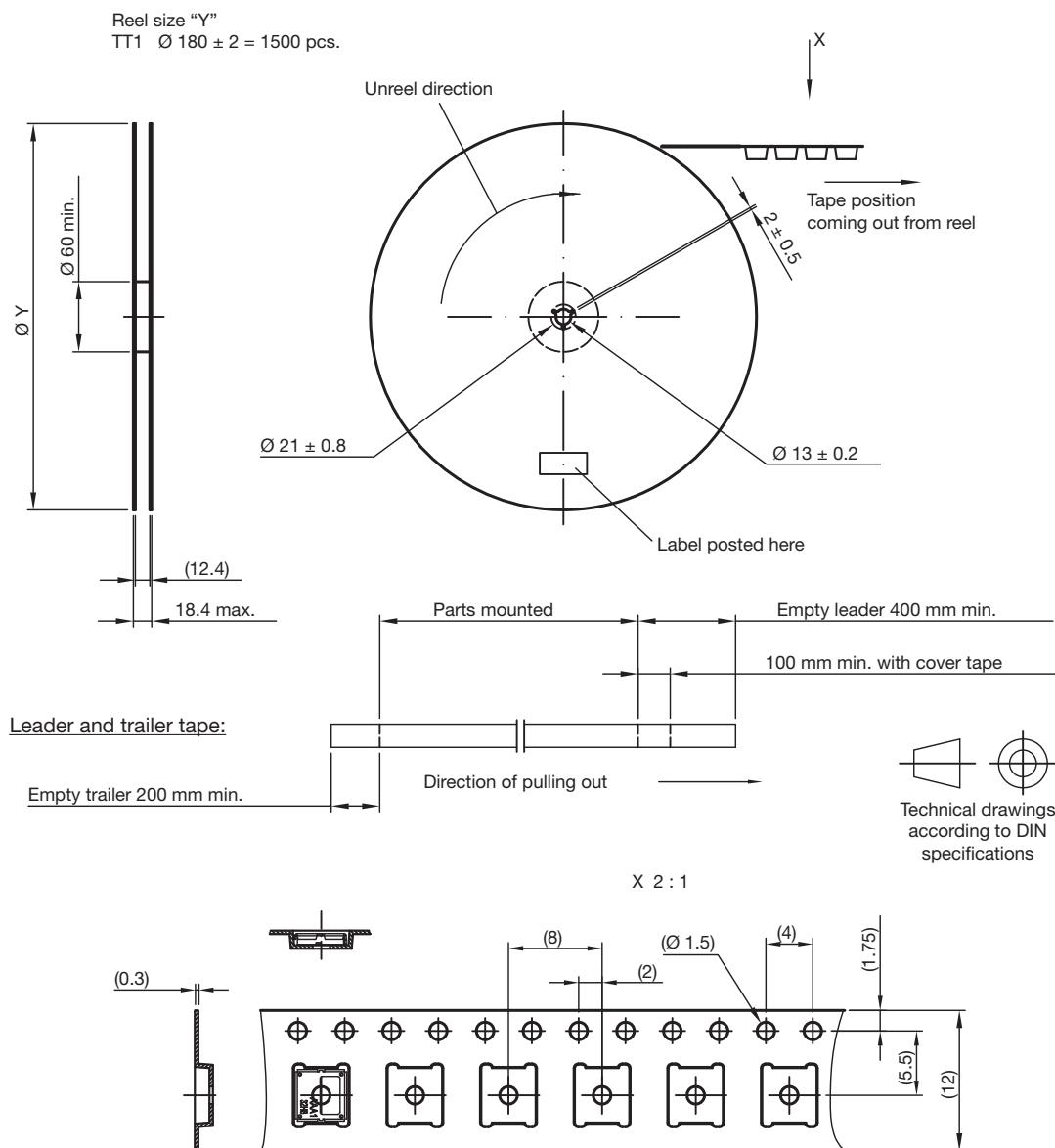


Drawing-No.: 9.700-5347.01-4  
Issue: 2; 07.03.18

Not indicated tolerances ± 0.1

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

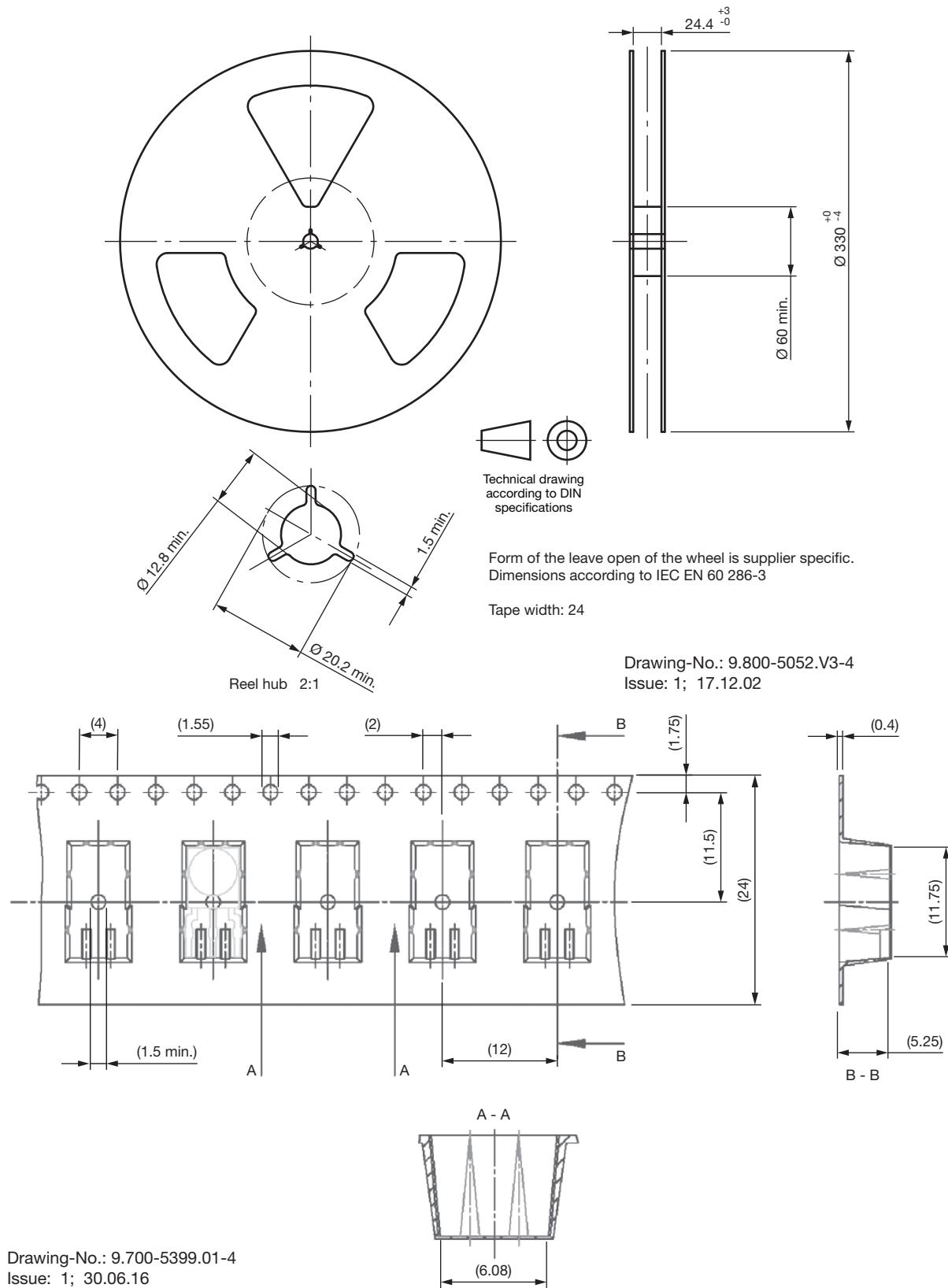
E. Belobog with shield (TSOP37...HTT1, TSOP57...HTT1, TSOP17...HTT1, TSOP97...HTT1)

Tape and reel dimensions:

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

Not indicated tolerances  $\pm 0.1$

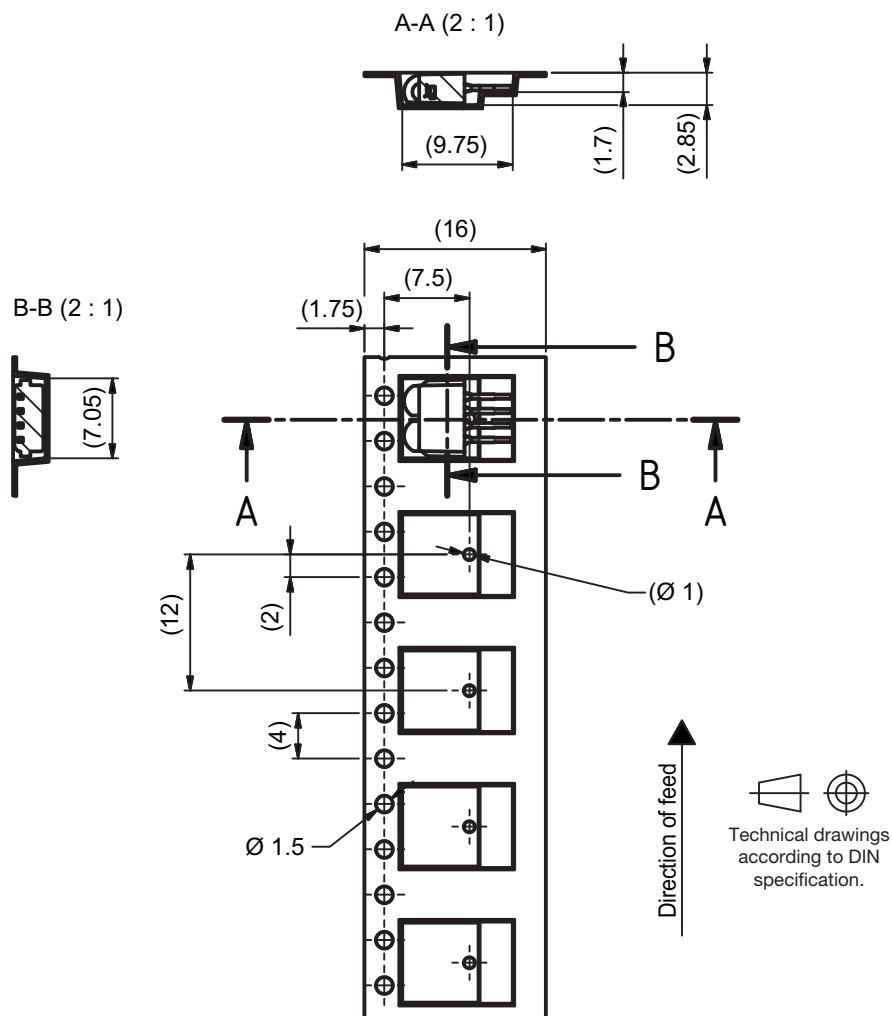
**TAPING VERSION TSOP..DF1P (SIDE VIEW) DIMENSIONS** in millimeters

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



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

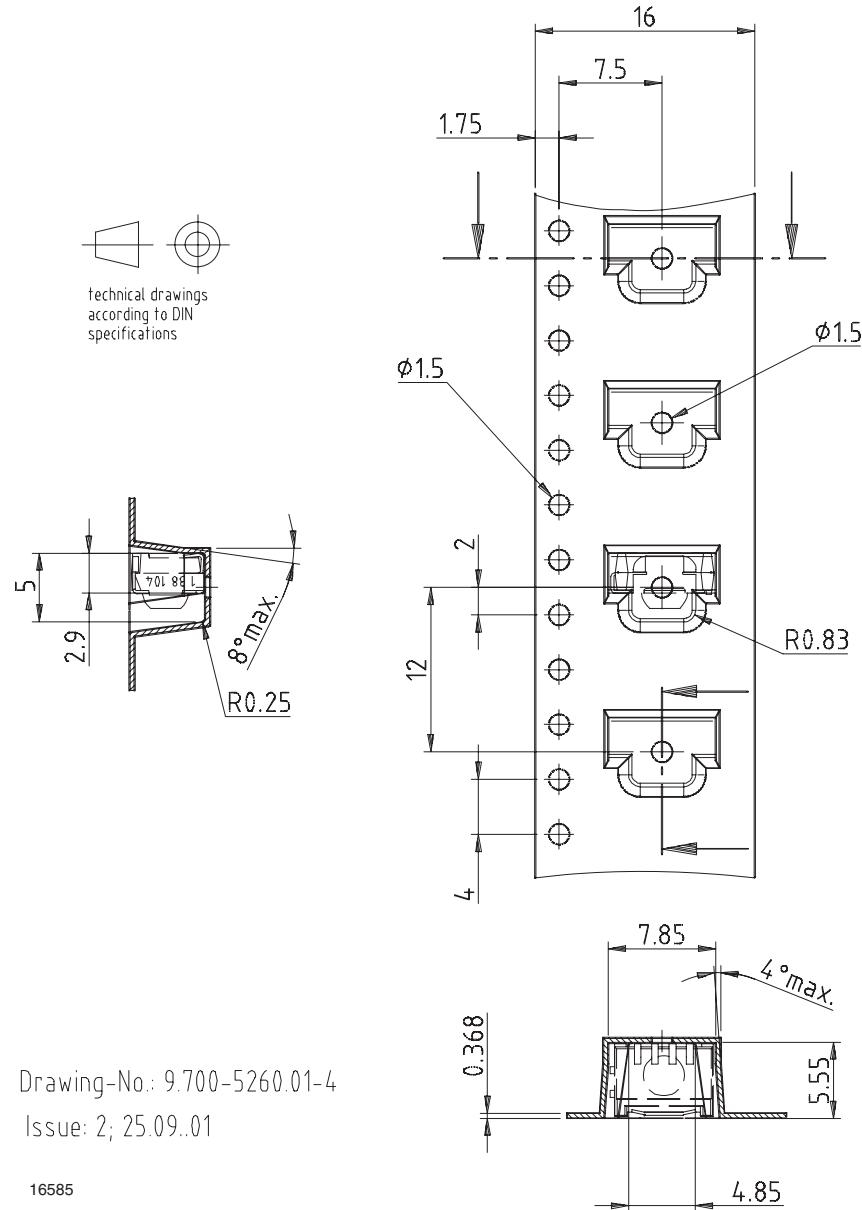
G. TVCastSMD TR1 (TSOP59...TR1, TSOP39...TR1, TSOP19...TR1, TSOP99...TR1)



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)



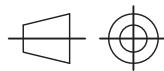
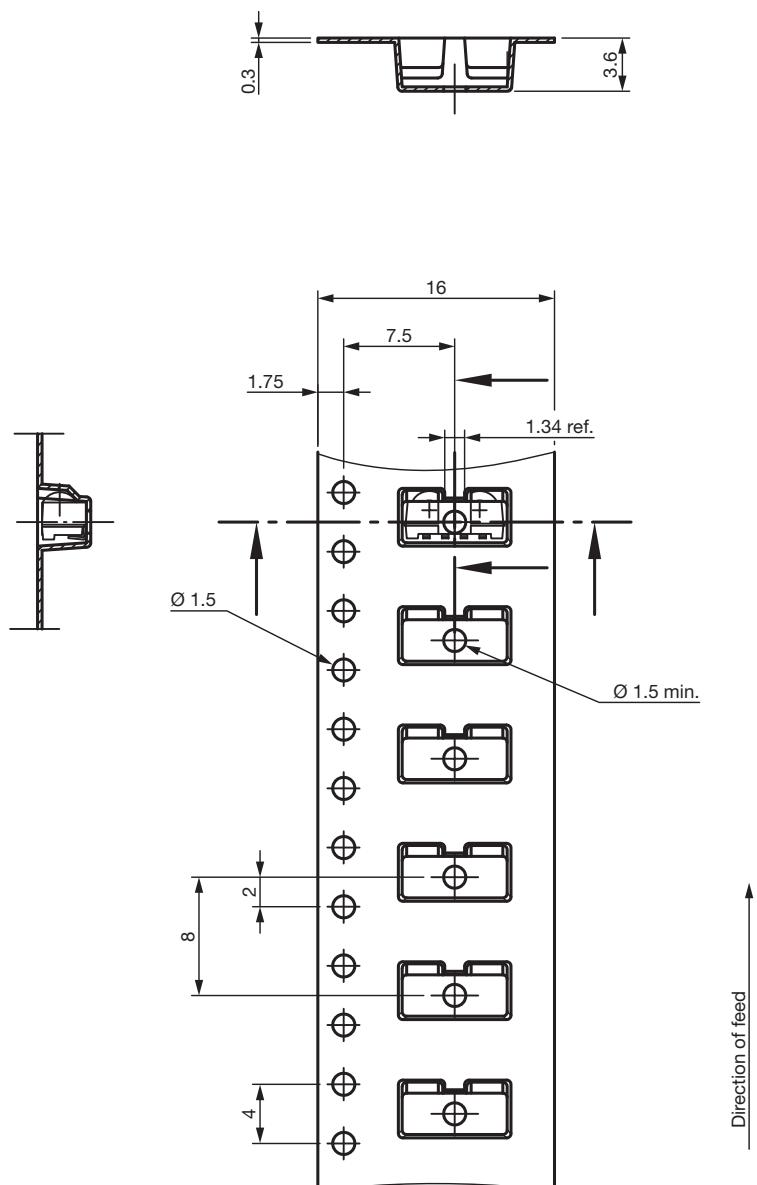
Drawing-No.: 9.700-5260.01-4

Issue: 2: 25.09.01

16585

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

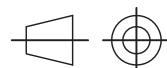
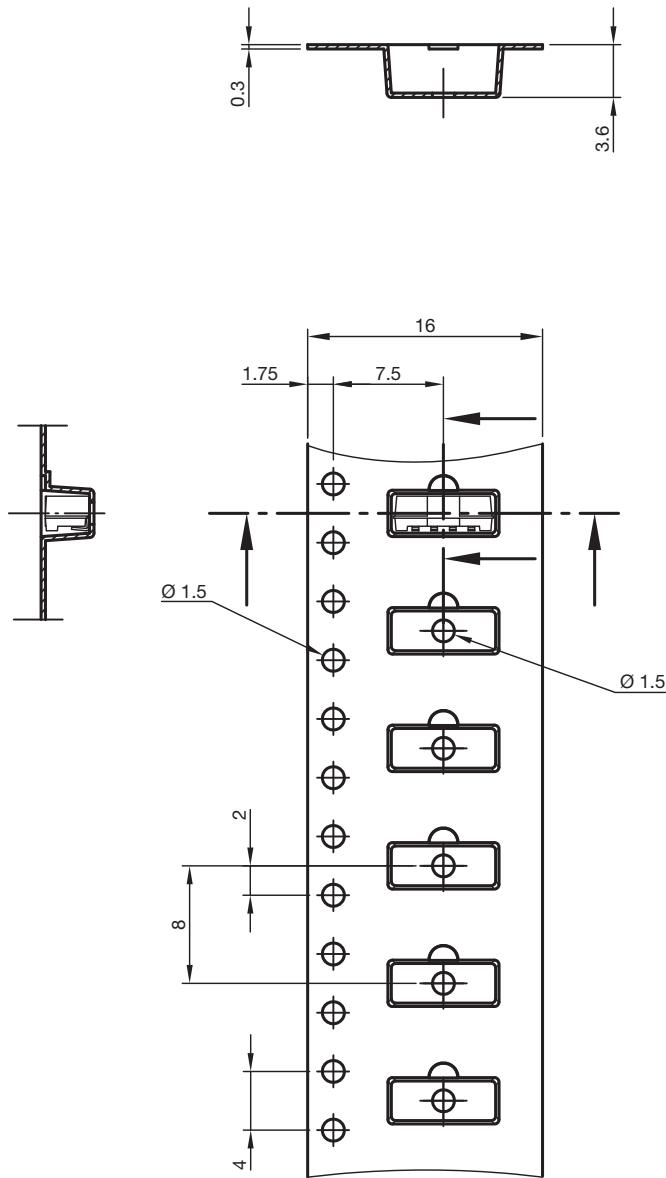
B. Heimdall (TSSP7...., TSOP75...TR, TSOP77...TR, TSSP7....TR, TSOP15...TR, TSOP95...TR)


 technical drawings  
according to DIN  
specifications

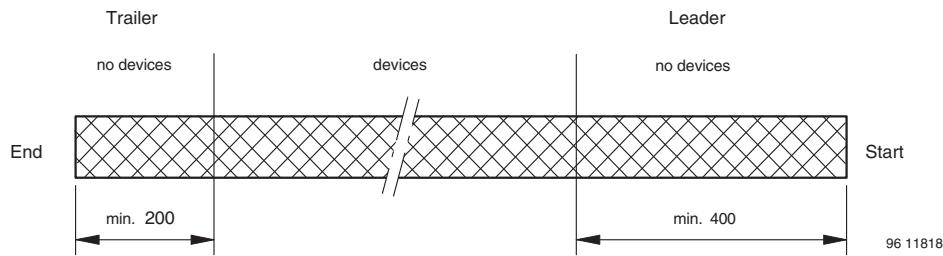
 Drawing-No.: 9.700-5337.01-4  
Issue: 2; 06.10.15

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

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


technical drawings  
according to DIN  
specifications

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

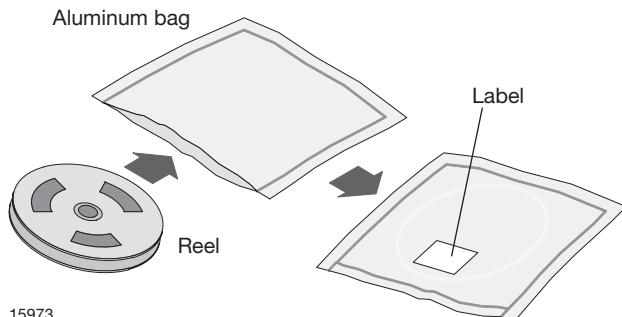
**LABEL**
**Standard bar code labels for finished goods**

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.

<b>VISHAY SEMICONDUCTOR GmbH STANDARD BAR CODE PRODUCT LABEL</b> (finished goods)		
<b>PLAIN WRITING</b>	<b>ABBREVIATION</b>	<b>LENGTH</b>
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	xxxxxxxx+	Company logo
<b>LONG BAR CODE TOP</b>		
<b>TYPE</b>		
Item-number	N	8
Plant-code	N	2
Sequence-number	X	3
Quantity	N	8
Total length	-	21
<b>SHORT BAR CODE TOP</b>		
<b>TYPE</b>		
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.

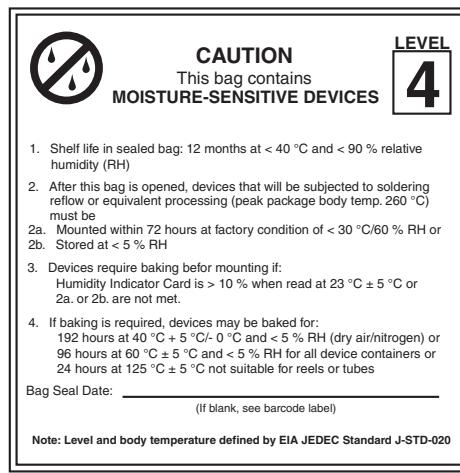
In case of moisture absorption, the devices will recover to the former condition by drying under the following condition:

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.



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.

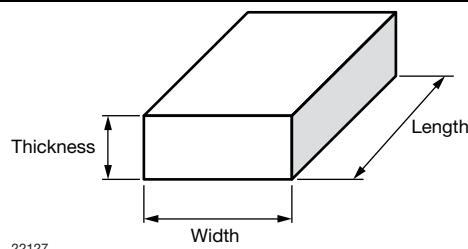


16962

## OUTER PACKAGING

The sealed reel is packed into a pizza box.

### CARTON BOX DIMENSIONS in millimeters



22127

	THICKNESS	WIDTH	LENGTH
Pizza box (SMD and heimdall) (taping in reels)	50	340	340

## **Disclaimer**

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