

## IR Receiver Modules for Remote Control Systems



16797

### MECHANICAL DATA

#### Pinning:

 1 = GND, 2 = N.C., 3 =  $V_S$ , 4 = OUT

### ORDERING CODE

#### Taping:

TSOP36...TT - top view taped

TSOP36...TR - side view taped

### FEATURES

- Very low supply current
- Photo detector and preamplifier in one package
- Internal filter for PCM frequency
- Supply voltage range: 2.5 V to 5.5 V
- Improved immunity against modulated light sources
- Insensitive to supply voltage ripple and noise
- Capable of side or top view
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)



### DESCRIPTION

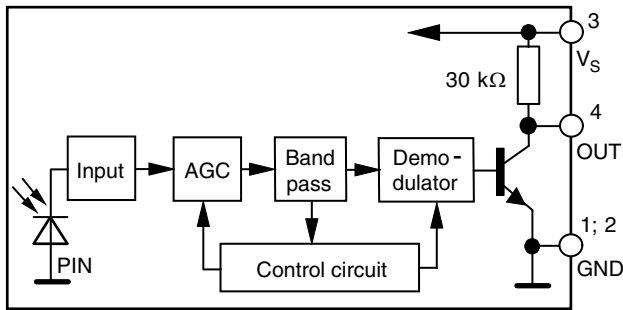
The TSOP36... series are miniaturized SMD IR receiver modules for infrared remote control systems. A PIN diode and a preamplifier are assembled on a leadframe, the epoxy package contains an IR filter.

The demodulated output signal can be directly connected to a microprocessor for decoding.

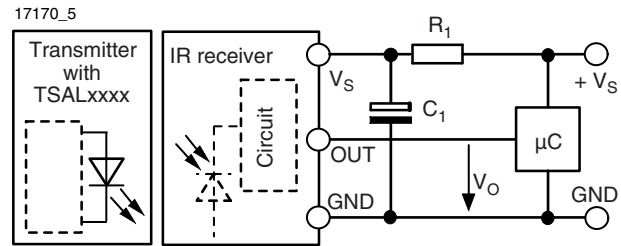
The TSOP364.. series devices are optimized to suppress almost all spurious pulses from energy saving lamps like CFLs. The AGC4 used in the TSOP364.. may suppress some data signals. The TSOP362.. series are provided primarily for compatibility with old AGC2 designs. New designs should prefer the TSOP364.. 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	30 kHz	TSOP36230	TSOP36430
	33 kHz	TSOP36233	TSOP36433
	36 kHz	TSOP36236	TSOP36436 <sup>(1)(2)(3)</sup>
	38 kHz	TSOP36238	TSOP36438 <sup>(4)(5)</sup>
	40 kHz	TSOP36240	TSOP36440
	56 kHz	TSOP36256	TSOP36456 <sup>(6)(7)</sup>
Package	Panhead		
Pinning	1 = GND, 2 = N.C., 3 = $V_S$ , 4 = OUT		
Dimensions (mm)	7.5 W x 5.3 H x 4.0 D		
Mounting	SMD		
Application	Remote control		
Best remote control code	<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**


16839

**APPLICATION CIRCUIT**


17170\_5

$R_1$  and  $C_1$  are recommended for protection against EOS. Components should be in the range of  $33 \Omega < R_1 < 1 \text{ k}\Omega$ ,  $C_1 > 0.1 \mu\text{F}$ .

**ABSOLUTE MAXIMUM RATINGS**

PARAMETER	TEST CONDITION	SYMBOL	VALUE	UNIT
Supply voltage (pin 3)		$V_S$	-0.3 to +6	V
Supply current (pin 3)		$I_S$	3	mA
Output voltage (pin 4)		$V_O$	-0.3 to $(V_S + 0.3)$	V
Output current (pin 4)		$I_O$	5	mA
Junction temperature		$T_j$	100	°C
Storage temperature range		$T_{\text{stg}}$	-25 to +85	°C
Operating temperature range		$T_{\text{amb}}$	-25 to +85	°C
Power consumption	$T_{\text{amb}} \leq 85 \text{ } ^\circ\text{C}$	$P_{\text{tot}}$	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** ( $T_{\text{amb}} = 25 \text{ } ^\circ\text{C}$ , unless otherwise specified)

PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT
Supply current	$E_v = 0, V_S = 3.3 \text{ V}$	$I_{\text{SD}}$	0.27	0.35	0.45	mA
	$E_v = 40 \text{ klx, sunlight}$	$I_{\text{SH}}$	-	0.45	-	mA
Supply voltage		$V_S$	2.5	-	5.5	V
Transmission distance	$E_v = 0$ , test signal see fig. 1, IR diode TSAL6200, $I_F = 200 \text{ mA}$	$d$	-	45	-	m
Output voltage low	$I_{\text{OSL}} = 0.5 \text{ mA}, E_e = 0.7 \text{ mW/m}^2$ , test signal see fig. 1	$V_{\text{OSL}}$	-	-	100	mV
Minimum irradiance	Pulse width tolerance: $t_{\text{pi}} - 5/f_o < t_{\text{po}} < t_{\text{pi}} + 6/f_o$ , test signal see fig. 1	$E_e \text{ min.}$	-	0.12	0.25	$\text{mW/m}^2$
Maximum irradiance	$t_{\text{pi}} - 5/f_o < t_{\text{po}} < t_{\text{pi}} + 6/f_o$ , test signal see fig. 1	$E_e \text{ max.}$	30	-	-	$\text{W/m}^2$
Directivity	Angle of half transmission distance	$\phi_{1/2}$	-	$\pm 50$	-	deg

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



Fig. 1 - Output Active Low

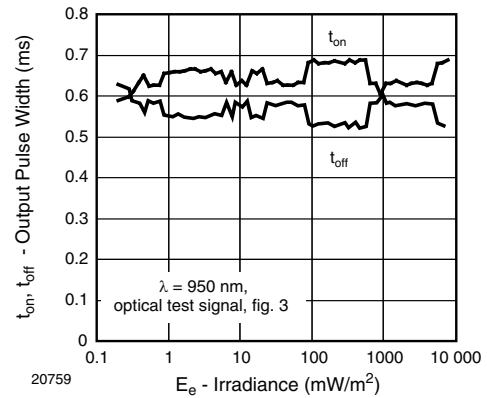


Fig. 4 - Output Pulse Diagram

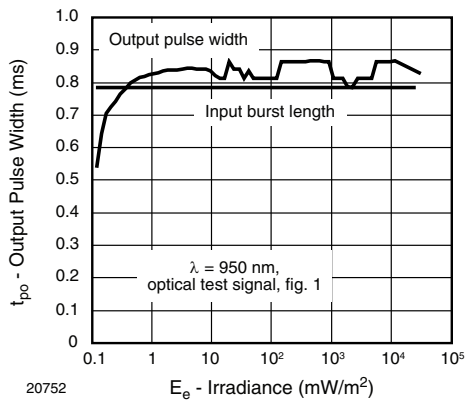


Fig. 2 - Pulse Length and Sensitivity in Dark Ambient

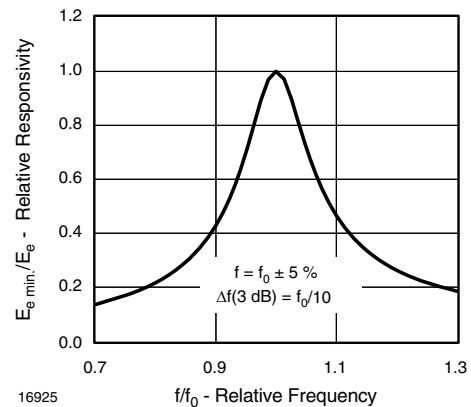


Fig. 5 - Frequency Dependence of Responsivity

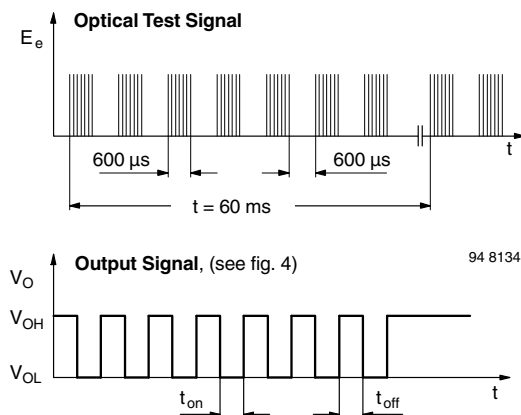


Fig. 3 - Output Function

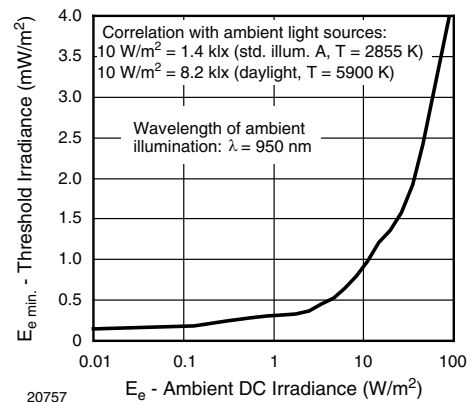


Fig. 6 - Sensitivity in Bright Ambient



Fig. 7 - Sensitivity vs. Supply Voltage Disturbances



Fig. 10 - Relative Spectral Sensitivity vs. Wavelength

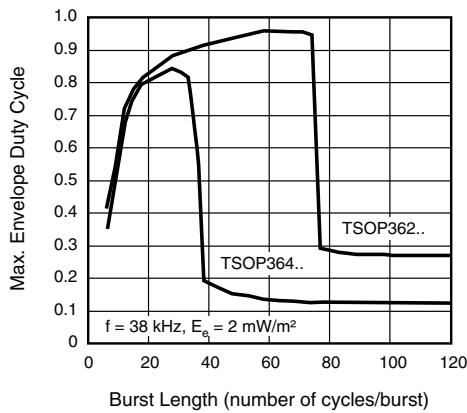


Fig. 8 - Maximum Envelope Duty Cycle vs. Burst Length

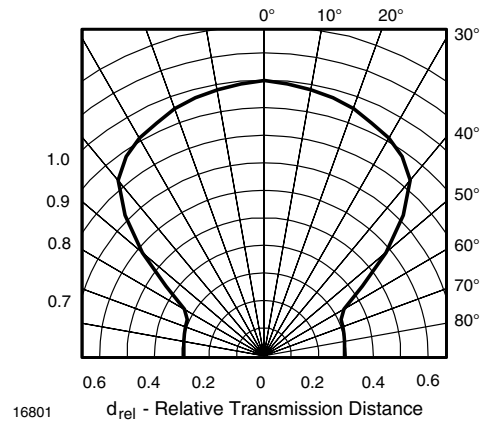


Fig. 11 - Horizontal Directivity

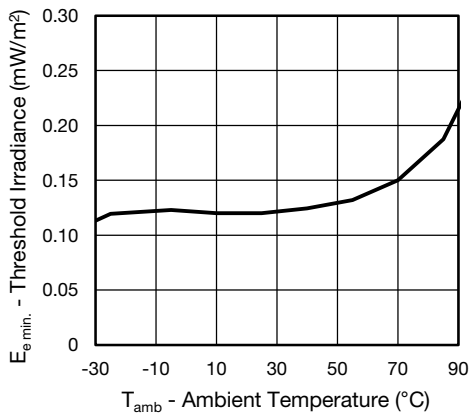


Fig. 9 - Sensitivity vs. Ambient Temperature

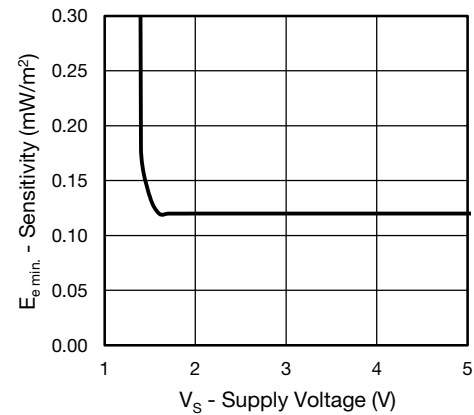


Fig. 12 - Sensitivity vs. Supply Voltage

## 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 noise from fluorescent lamps with electronic ballasts (see fig. 13 or fig. 14)

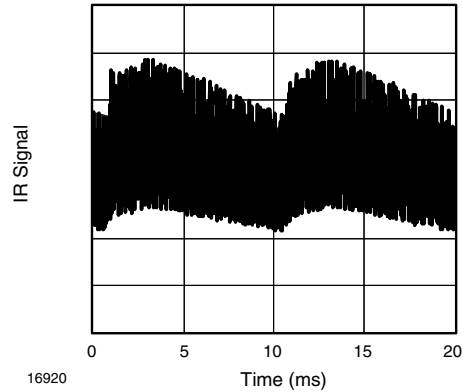


Fig. 13 - IR Disturbance from Fluorescent Lamp with Low Modulation

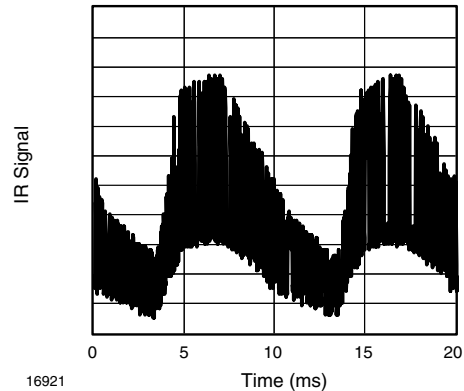


Fig. 14 - IR Disturbance from Fluorescent Lamp with High Modulation

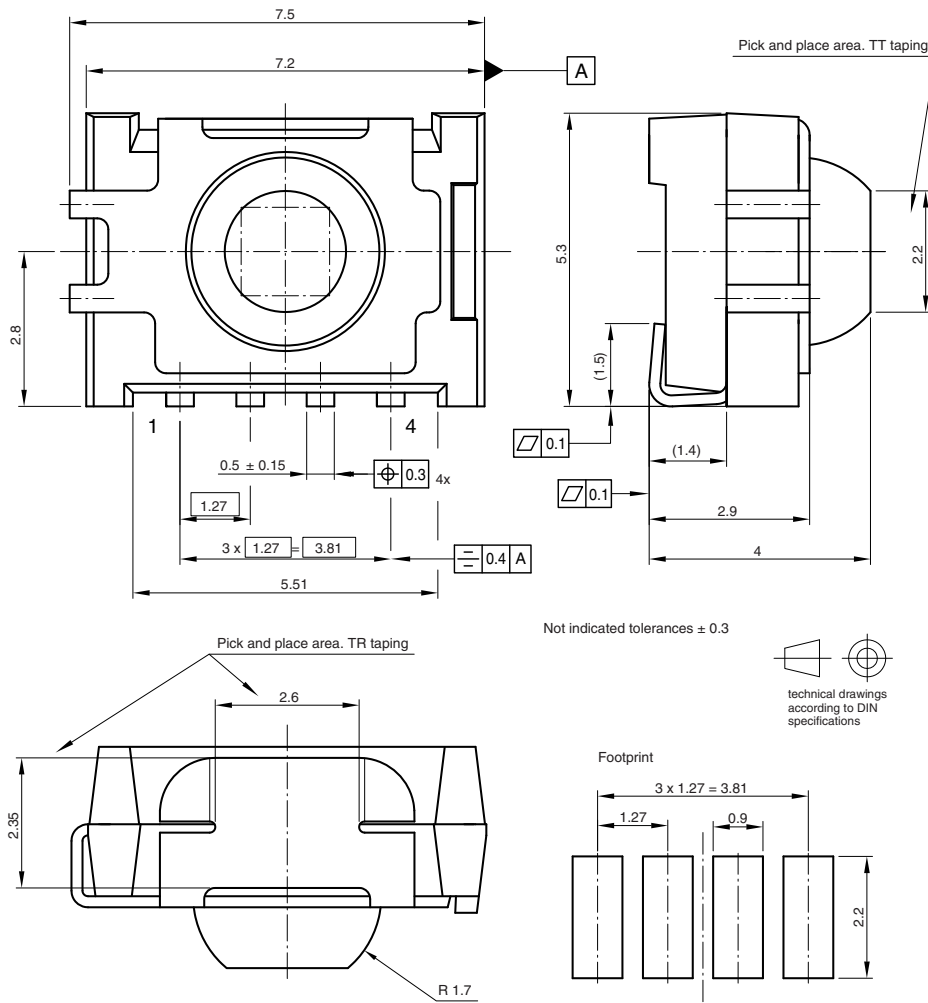
	TSOP362..	TSOP364..
Minimum burst length	10 cycles/burst	10 cycles/burst
After each burst of length a minimum gap time is required of	10 to 70 cycles ≥ 10 cycles	10 to 35 cycles ≥ 10 cycles
For bursts greater than a minimum gap time in the data stream is needed of	70 cycles > 4 x burst length	35 cycles > 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 please see the datasheet for TSOP361.., TSOP363.., TSOP365..
- For Sony 12, 15, and 20 bit IR codes please see the datasheet of TSOP36S40F



## PACKAGE DIMENSIONS in millimeters



Drawing-No.: 6.544-5341.01-4  
 Issue: 8; 02.09.09  
 16776

## ASSEMBLY INSTRUCTIONS

### Reflow Soldering

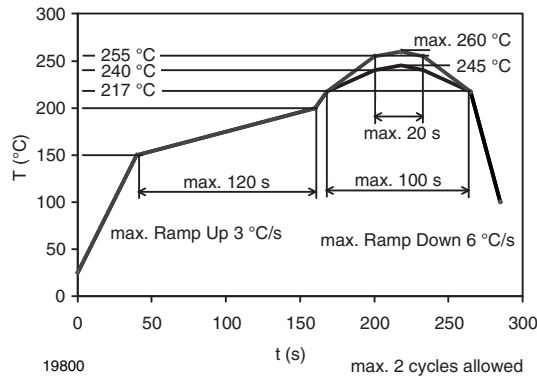
- Reflow soldering must be done within 72 h while stored under a max. temperature of 30 °C, 60 % RH after opening the dry pack envelope
- Set the furnace temperatures for pre-heating and heating in accordance with the reflow temperature profile as shown in the diagram. Exercise extreme care to keep the 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

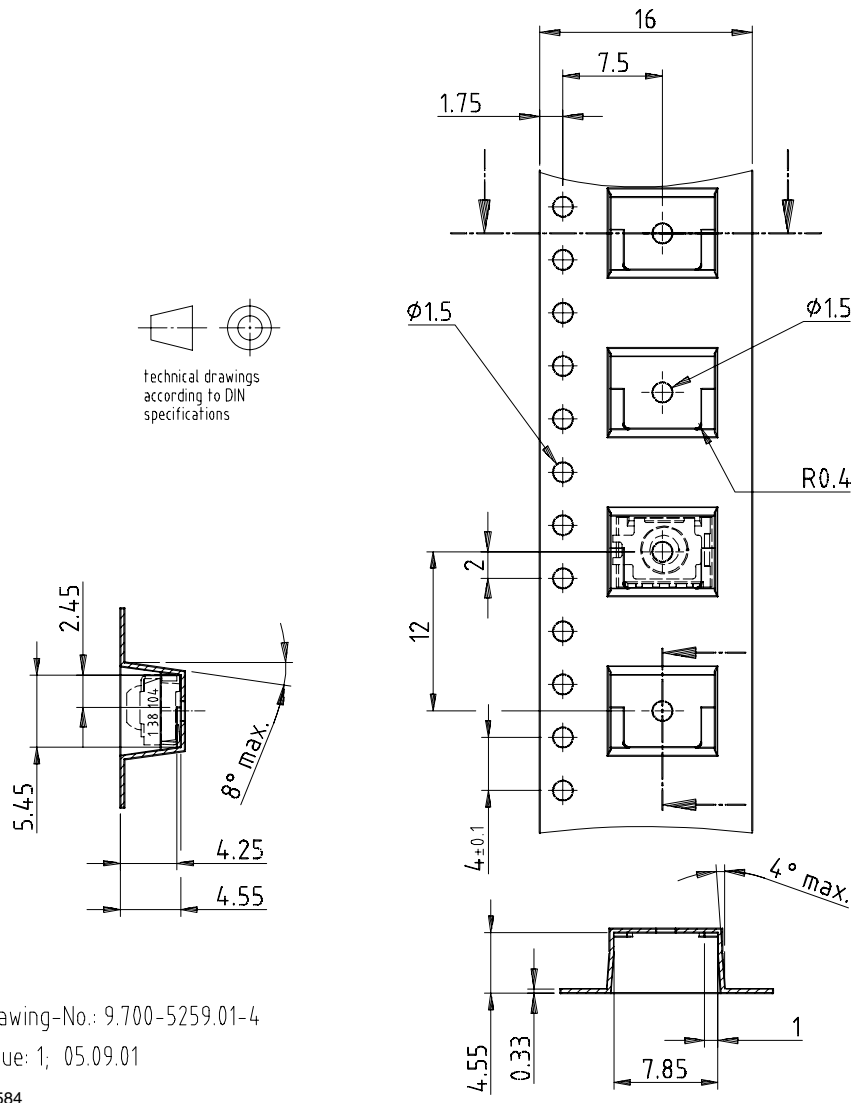
- Use a soldering iron of 25 W or less. Adjust the temperature of the soldering iron below 300 °C
- Finish soldering within 3 s
- Handle products only after the temperature has cooled off



VISHAY LEAD (Pb)-FREE REFLOW SOLDER PROFILE



TAPING VERSION TSOP..TT DIMENSIONS in millimeters



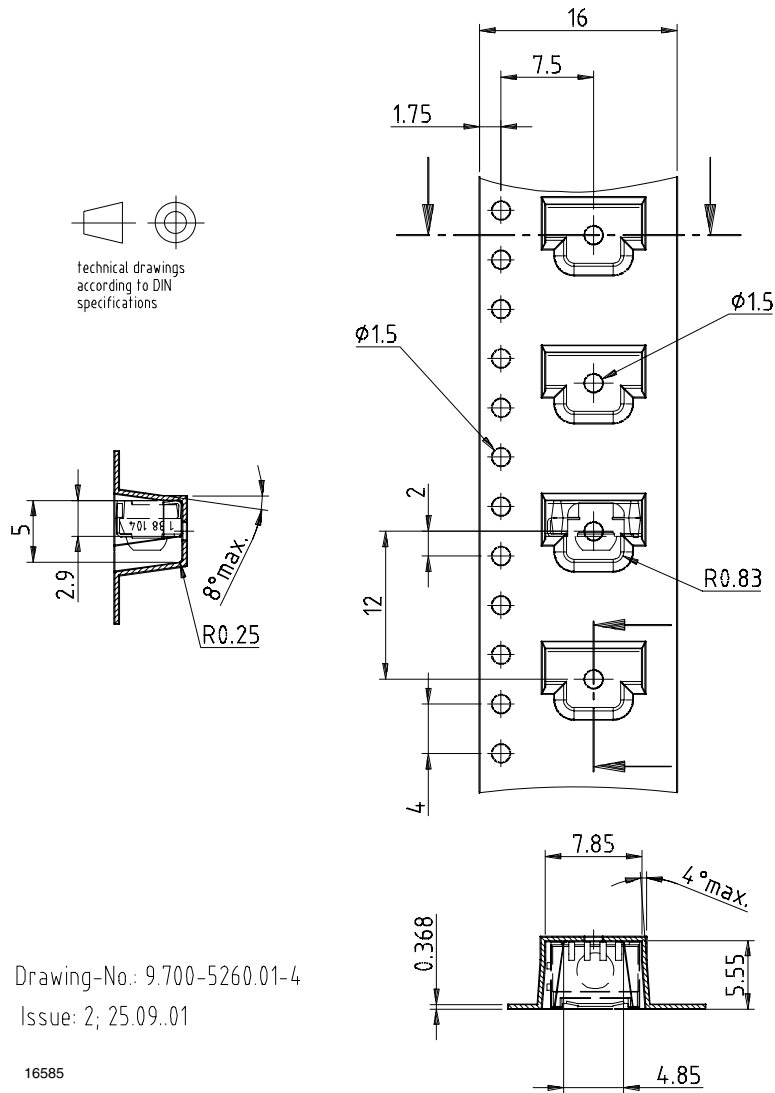
Drawing-No.: 9.700-5259.01-4

Issue: 1; 05.09.01

16584



TAPING VERSION TSOP..TR DIMENSIONS in millimeters



Drawing-No.: 9.700-5260.01-4  
Issue: 2; 25.09..01

16585



**REEL DIMENSIONS** in millimeters



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

Dimension acc. to IEC EN 60 286-3

Tape width 16



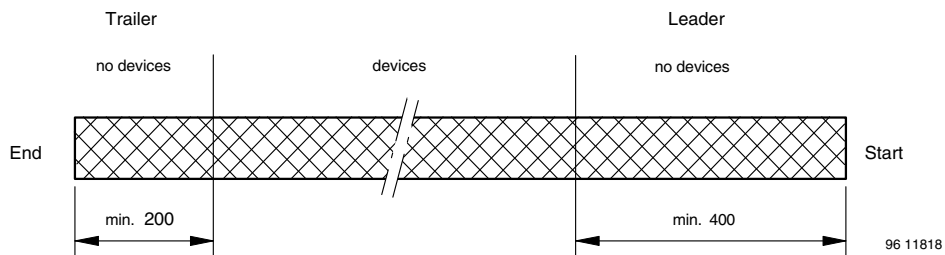
technical drawings according to DIN specifications

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

Issue: 1; 07.05.02

16734

**LEADER AND TRAILER DIMENSIONS** in millimeters



**COVER TAPE PEEL STRENGTH**

According to DIN EN 60286-3

0.1 N to 1.3 N

300 mm/min. ± 10 mm/min.

165° to 180° peel angle

**LABEL**

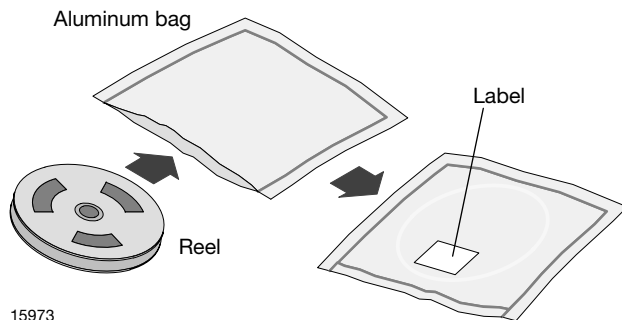
**Standard bar code labels for finished goods**

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 (finished goods)</b>		
<b>PLAIN WRITTING</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	xxxxxxx+	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.



### FINAL PACKING

The sealed reel is packed into a cardboard box. A secondary cardboard box is used for shipping purposes.

### RECOMMENDED METHOD OF STORAGE

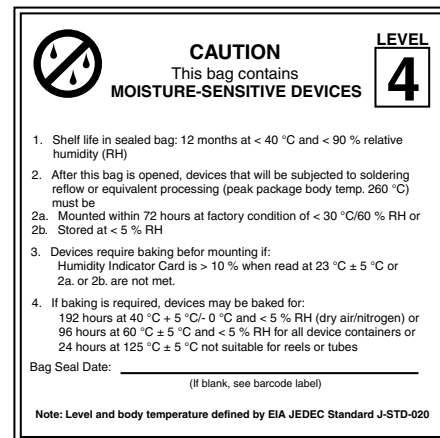
Dry box storage is recommended as soon as the aluminum bag has been opened to prevent moisture absorption. The following conditions should be observed, if dry boxes are not available:

- 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 J-STD-020 level 4 label is included on all dry bags.



EIA JEDEC standard J-STD-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.



22645



## Tape and Reel Standards for SMD IR Receiver Modules

Vishay Semiconductor SMD 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 SMD: quantity per reel:
  - TT, SMD top view package, 1190 pcs
  - TR, SMD side view package, 1120 pcs
- B. Heimdall: quantity per reel:
  - TT, Heimdall top view package, 2200 pcs
  - TR, Heimdall 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. Bugeye: quantity per reel:
  - TT, 2500 pcs
  - TR, 2500 pcs
- E. AP5: quantity per reel:
  - TT, 2500 pcs
  - TR, not available in side view
- F. Belobog: quantity per reel:
  - TT1, 1800 pcs
  - TT2, 7000 pcs
  - TR, not available in side view
- G. Belobog with shield: quantity per reel:
  - TT1, 1500 pcs
  - TT2, 5000 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)
- TSOP85438TT (reel packing)
- TSOP85238AP5TR (reel packing)
- TSOP57438TT1 (reel packing)
- TSOP57238HTT1 (reel packing)



## REEL DIMENSIONS FOR PANHEAD SMD AND HEIMDALL 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

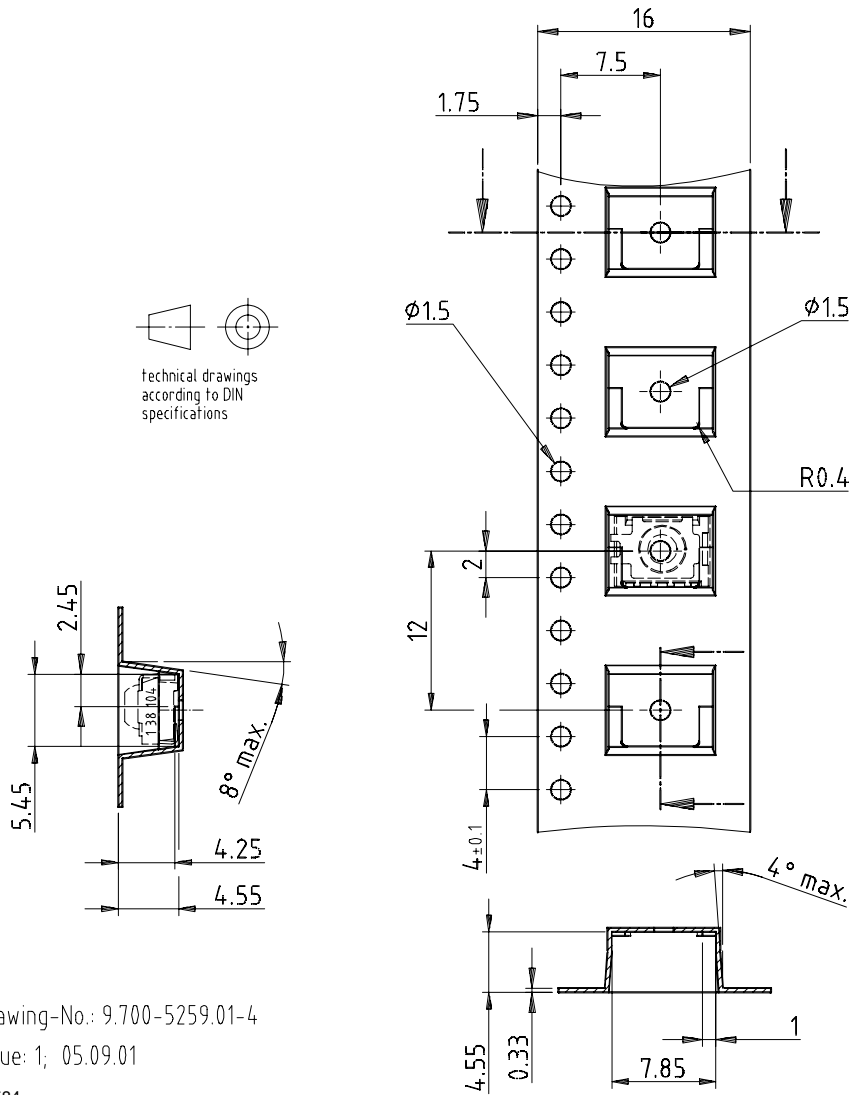
### Note

- The body structure of the reel can vary



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

A. Panhead SMD (TSOP36...TT, TSOP35...TT, TSOP6...TT)



Drawing-No.: 9.700-5259.01-4

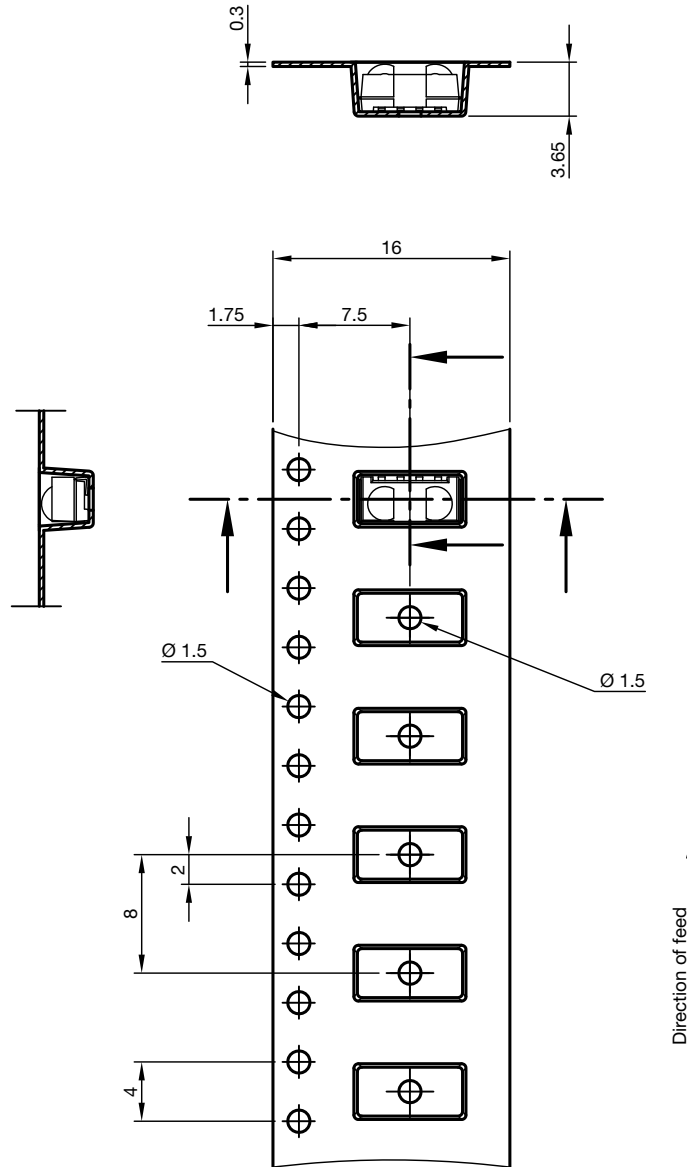
Issue: 1; 05.09.01

16584

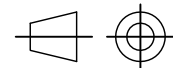


## TAPING VERSION TSOP..TT (TOP VIEW) DIMENSIONS in millimeters

B. Heimdall SMD (TSOP75...TT, TSOP77...TT)



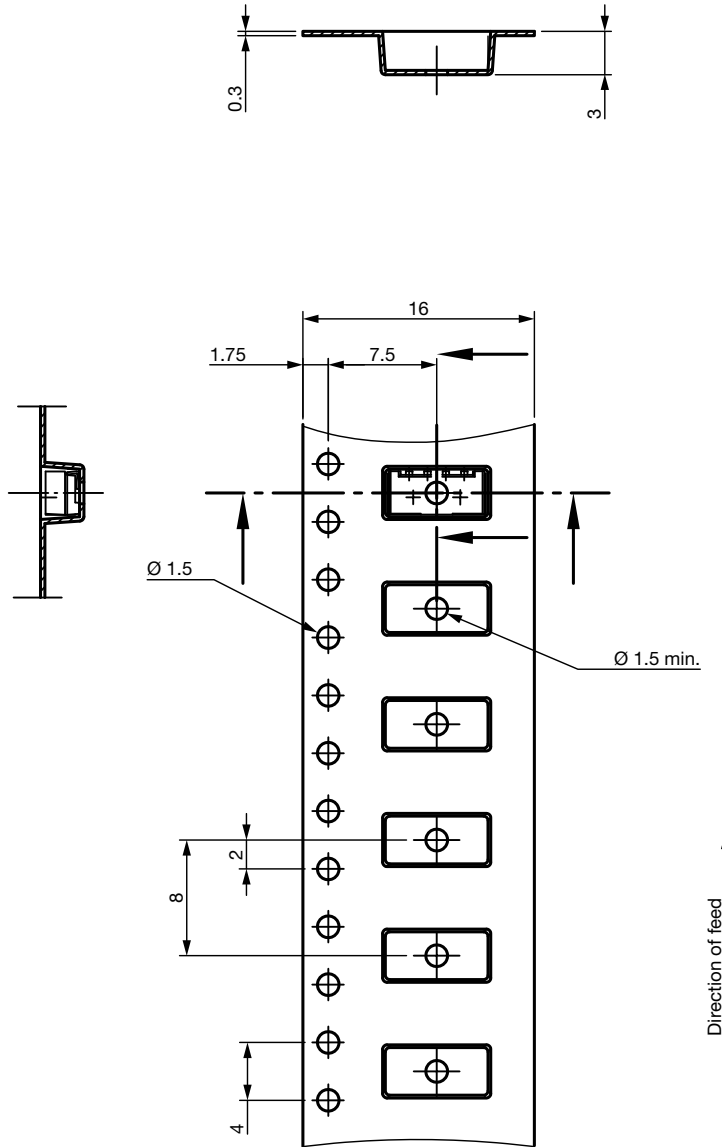
Drawing-No.: 9.700-5338.01-4  
Issue: 4; 12.06.13



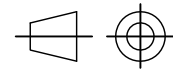
technical drawings  
according to DIN  
specifications

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

C. Heimdall SMD without lens (TSOP75...WTT, TSOP77...WTT)



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



technical drawings according to DIN specifications







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

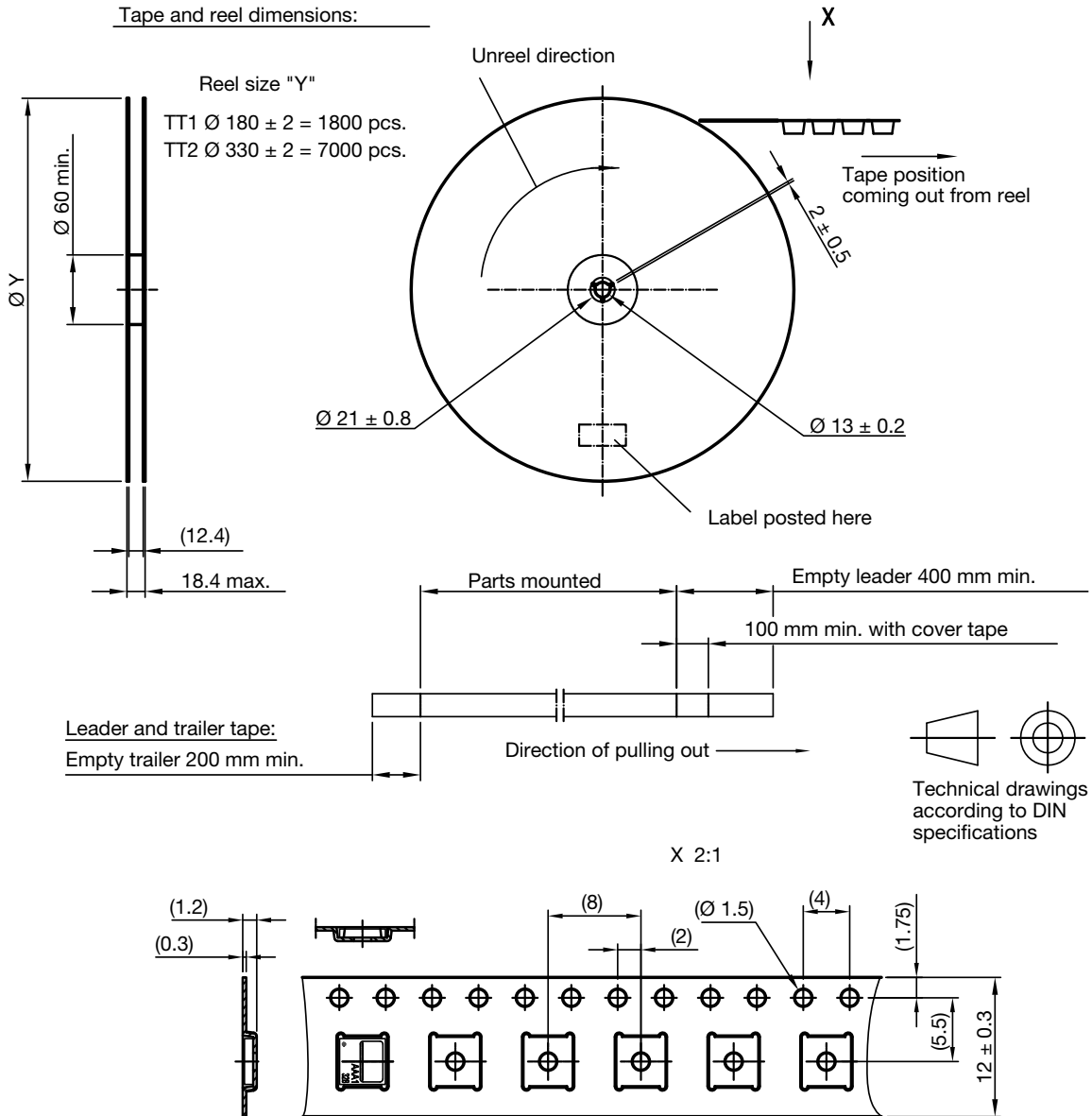
E. AP5 (TSOP85...AP5TT)



Drawing-No.: 9.700-5346.01-4  
Issue: 2, 24.11.09  
21945

## TAPING VERSION TSOP..TT1, TSOP..TT2 (TOP VIEW) DIMENSIONS in millimeters

F. Belobog (TSOP37...TT1, TSOP37...TT2, TSOP57...TT1, TSOP57...TT2)



Drawing-No.: 9.700-5347.01-4  
 Issue: 1; 14.11.11

Not indicated tolerances  $\pm 0.1$



### TAPING VERSION TSOP..TT1, TSOP..TT2 (TOP VIEW) DIMENSIONS in millimeters

G. Belobog with shield (TSOP37...HTT1, TSOP37...HTT2, TSOP57...HTT1, TSOP57...HTT2)

#### Tape and Reel dimensions:



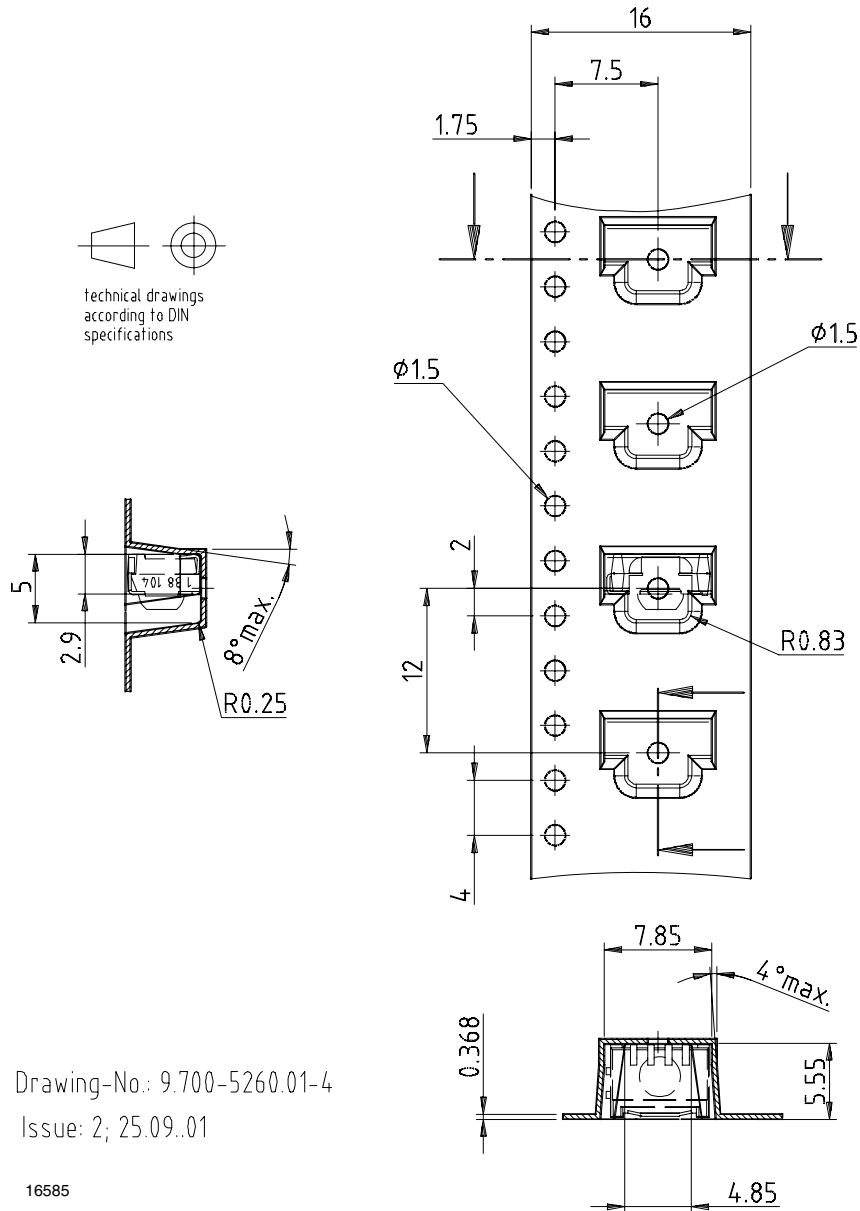
Reel dimensions and tape

Drawing-No.: 9.700-5380.01-4  
Issue: 1; 28.10.13



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

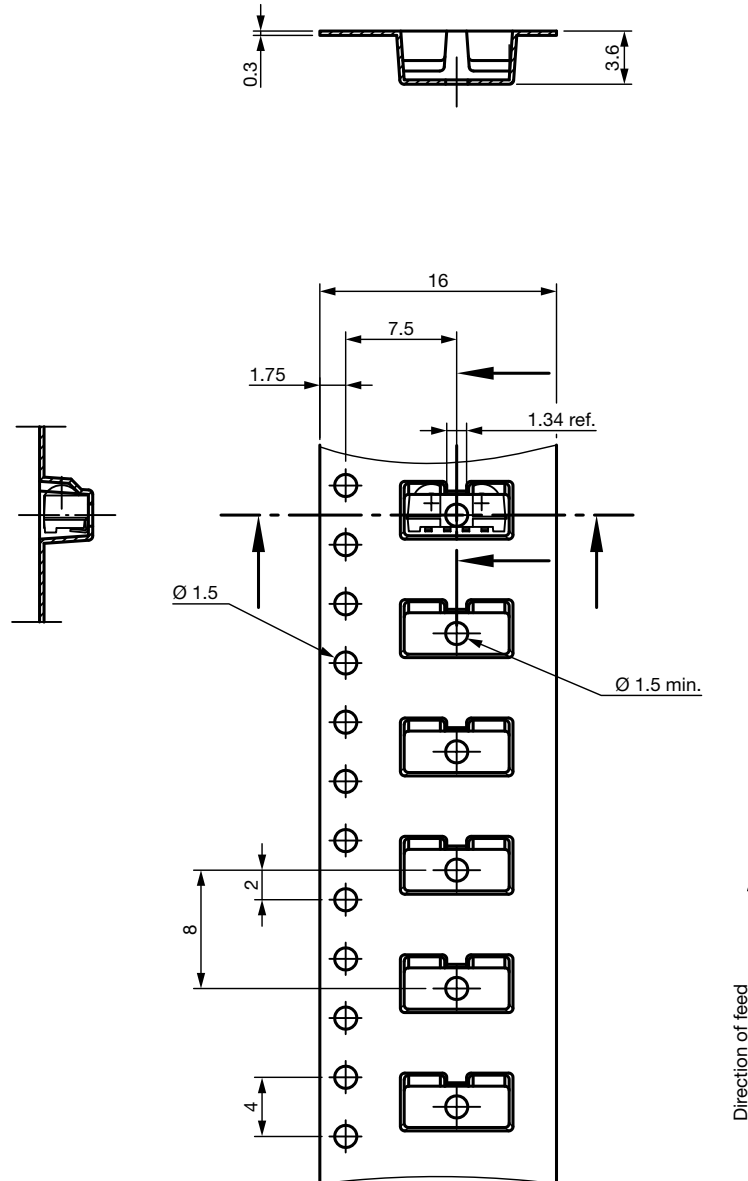
A. Panhead SMD (TSOP36...TR, TSOP35...TR, TSOP6...TR)



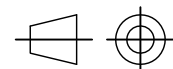


## TAPING VERSION TSOP..TR (SIDE VIEW) DIMENSIONS in millimeters

B. Heimdall SMD (TSOP75..., TSOP77...)



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

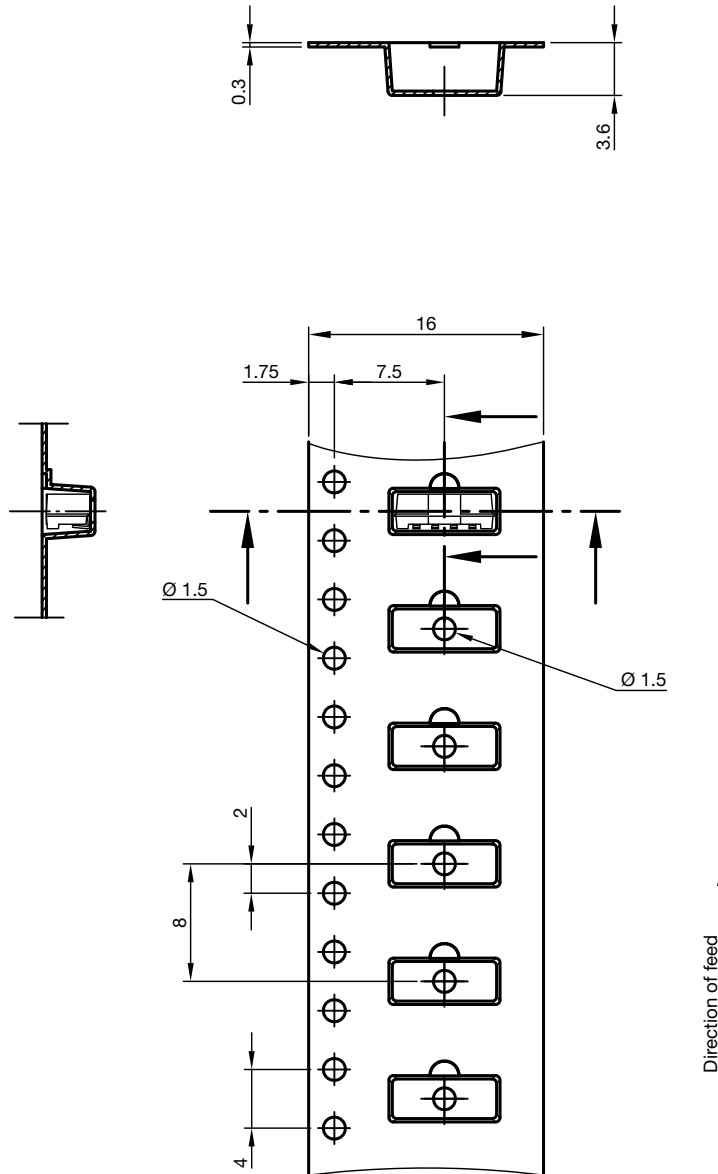


technical drawings  
according to DIN  
specifications

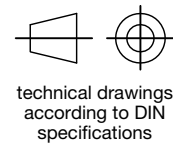


## TAPING VERSION TSOP..TR (SIDE VIEW) DIMENSIONS in millimeters

C. Heimdall SMD without lens (TSOP75...WTR, TSOP77...WTR)



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



technical drawings  
according to DIN  
specifications



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

D. Bugeye (TSOP85...TR)



Drawing-No.: 9.700-5316.01-4

Issue: 1; 12.02.07

20628



### 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

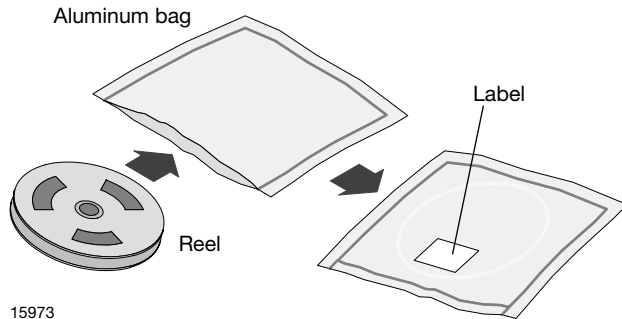
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VISHAY SEMICONDUCTOR GmbH STANDARD BAR CODE PRODUCT LABEL (finished goods)		
PLAIN WRITING	ABBREVIATION	LENGTH
Item-description	-	18
Item-number	INO	8
Selection-code	SEL	3
LOT-/serial-number	BATCH	10
Data-code	COD	3 (YWW)
Plant-code	PTC	2
Quantity	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			
<p>Thickness</p> <p>Width</p> <p>Length</p>			
	<b>THICKNESS</b>	<b>WIDTH</b>	<b>LENGTH</b>
<b>Pizza Box</b> (SMD and Heimdall) (Taping in Reels)	50	340	340

22127



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## Material Category Policy

**Vishay Intertechnology, Inc. hereby certifies that all its products that are identified as RoHS-Compliant fulfill the definitions and restrictions defined under Directive 2011/65/EU of The European Parliament and of the Council of June 8, 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment (EEE) - recast, unless otherwise specified as non-compliant.**

**Please note that some Vishay documentation may still make reference to RoHS Directive 2002/95/EC. We confirm that all the products identified as being compliant to Directive 2002/95/EC conform to Directive 2011/65/EU.**

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