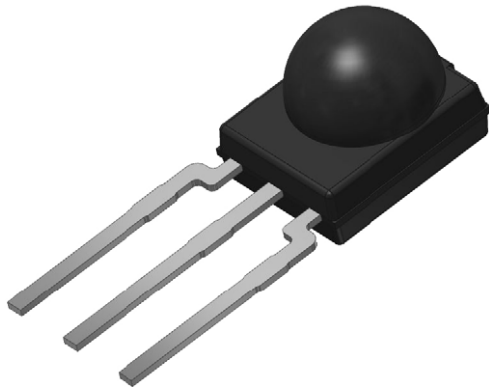




# IR Receiver Modules for Remote Control Systems



### MECHANICAL DATA

#### Pinning for TSOP53...:

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

### FEATURES

- Improved immunity against HF and RF noise
- 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 optical noise
- Insensitive to supply voltage ripple and noise
- Compatible with wave or reflow soldering (see "P" version of Minimold option datasheets)
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)



### DESCRIPTION

The TSOP531.., TSOP533.., and TSOP535.. series are miniaturized IR receiver modules for infrared remote control systems. A PIN diode and a preamplifier are assembled on lead frame, the epoxy package contains an IR filter. The demodulated output signal can be directly connected to a microprocessor for decoding.

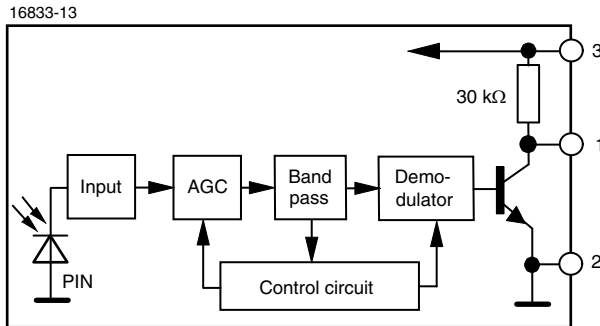
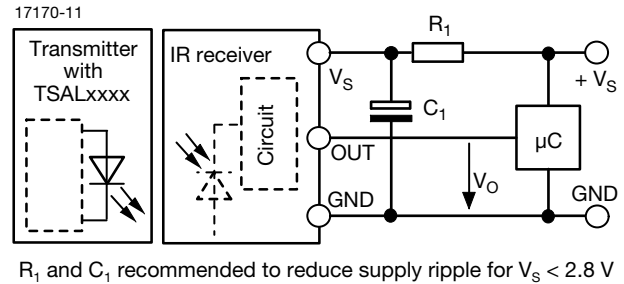
The TSOP533.. series devices are optimized to suppress almost all spurious pulses from Wi-Fi and CFL sources. They may suppress some data signals if continuously transmitted.

The TSOP531.. series devices are provided primarily for compatibility with old AGC1 designs. New designs should prefer the TSOP533.. series containing the newer AGC3.

The TSOP535.. series are useful to suppress even extreme levels of optical noise, but may also suppress some data signals. Please check compatibility with your codes.

These components have not been qualified according to automotive specifications.

PARTS TABLE					
AGC		LEGACY, FOR SHORT BURSTS (AGC1)	FOR SHORT BURSTS, NOISY ENVIRONMENTS (AGC3)	FOR SHORT BURSTS, VERY NOISY ENVIRONMENTS (AGC5)	
Carrier frequency	30 kHz	TSOP53130	TSOP53330	TSOP53530	
	33 kHz	TSOP53133	TSOP53333	TSOP53533	
	36 kHz	TSOP53136	TSOP53336 <sup>(1)</sup>	TSOP53536	
	38 kHz	TSOP53138	TSOP53338 <sup>(2)(3)(4)(5)</sup>	TSOP53538	
	40 kHz	TSOP53140	TSOP53340	TSOP53540	
	56 kHz	TSOP53156	TSOP53356	TSOP53556	
Package		Minimold			
Pinning		1 = OUT, 2 = GND, 3 = V <sub>S</sub>			
Dimensions (mm)		5.4 W x 6.35 H x 4.9 D			
Mounting		Leaded			
Application		Remote control			
Best remote control code		<sup>(1)</sup> MCIR <sup>(2)</sup> Mitsubishi <sup>(3)</sup> RECS-80 Code <sup>(4)</sup> r-map <sup>(5)</sup> XMP-1			

**BLOCK DIAGRAM**

**APPLICATION CIRCUIT**

**ABSOLUTE MAXIMUM RATINGS**

PARAMETER	TEST CONDITION	SYMBOL	VALUE	UNIT
Supply voltage		$V_S$	-0.3 to +6	V
Supply current		$I_S$	5	mA
Output voltage		$V_O$	-0.3 to 5.5	V
Voltage at output to supply		$V_S - V_O$	-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

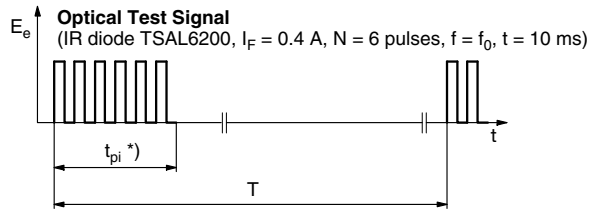
**Note**

- 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 current	$E_v = 0$ , $V_S = 5\text{ V}$	$I_{SD}$	0.55	0.7	0.9	mA
	$E_v = 40\text{ klx}$ , sunlight	$I_{SH}$	-	0.8	-	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	$I_{OSL} = 0.5\text{ mA}$ , $E_e = 0.7\text{ mW/m}^2$ , test signal see Fig. 1	$V_{OSL}$	-	-	100	mV
Minimum irradiance	Pulse width tolerance: $t_{pi} - 5/f_o < t_{po} < t_{pi} + 6/f_o$ , test signal see Fig. 1	$E_e\text{ min.}$	-	0.12	0.25	$\text{mW/m}^2$
Maximum irradiance	$t_{pi} - 5/f_o < t_{po} < t_{pi} + 6/f_o$ , test signal see Fig. 1	$E_e\text{ max.}$	50	-	-	$\text{W/m}^2$
Directivity	Angle of half transmission distance	$\phi_{1/2}$	-	$\pm 45$	-	deg

## TYPICAL CHARACTERISTICS (T<sub>amb</sub> = 25 °C, unless otherwise specified)



\*) t<sub>pi</sub> ≥ 6/f<sub>0</sub> is recommended for optimal function

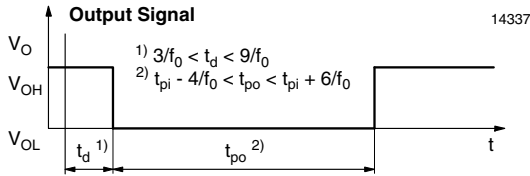


Fig. 1 - Output Active Low

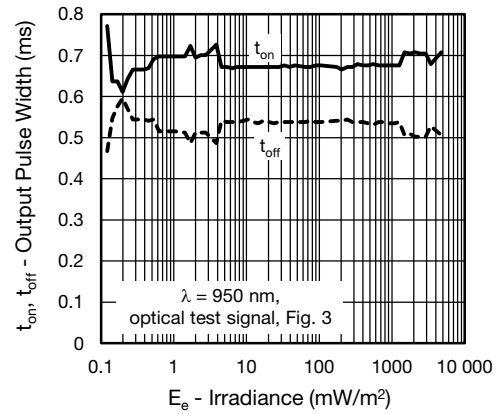


Fig. 4 - Output Pulse Diagram

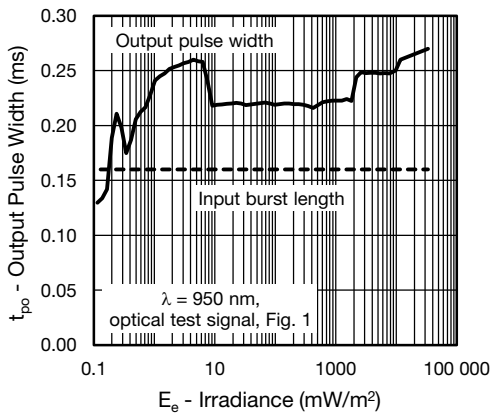


Fig. 2 - Pulse Length and Sensitivity in Dark Ambient

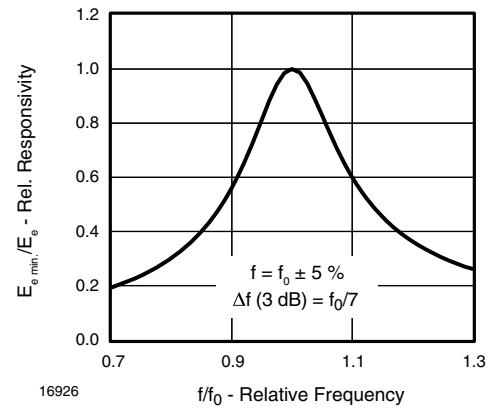


Fig. 5 - Frequency Dependence of Responsivity

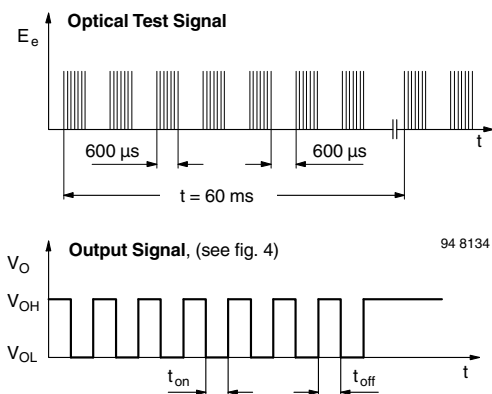


Fig. 3 - Output Function

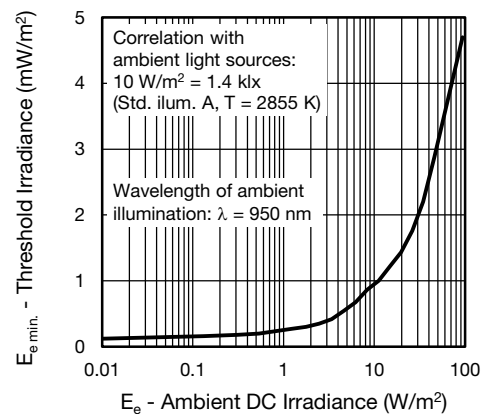


Fig. 6 - Sensitivity in Bright Ambient

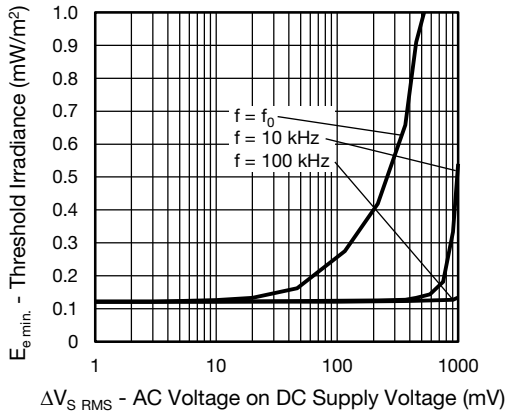


Fig. 7 - Sensitivity vs. Supply Voltage Disturbances

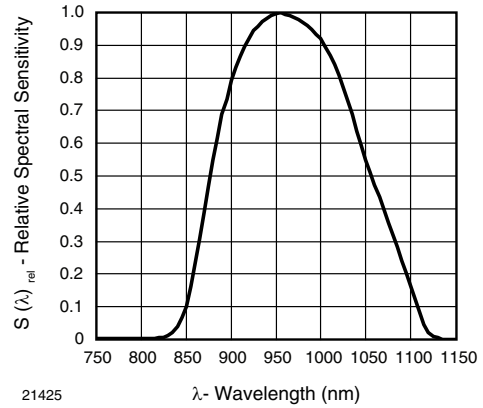


Fig. 10 - Relative Spectral Sensitivity vs. Wavelength

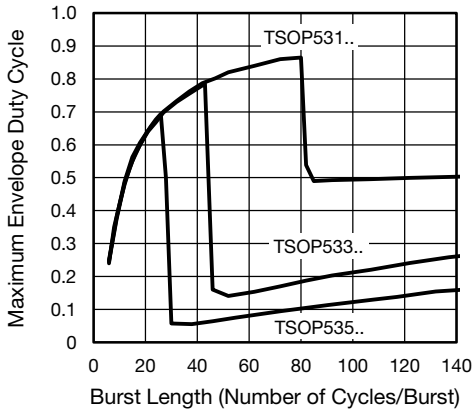


Fig. 8 - Max. Envelope Duty Cycle vs. Burst Length

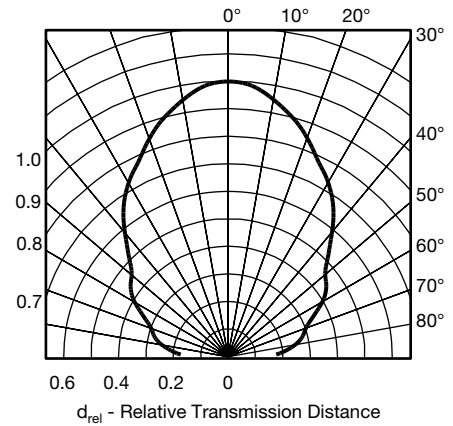


Fig. 11 - Horizontal Directivity

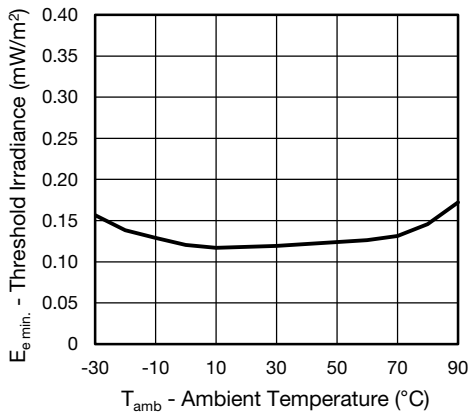


Fig. 9 - Sensitivity vs. Ambient Temperature

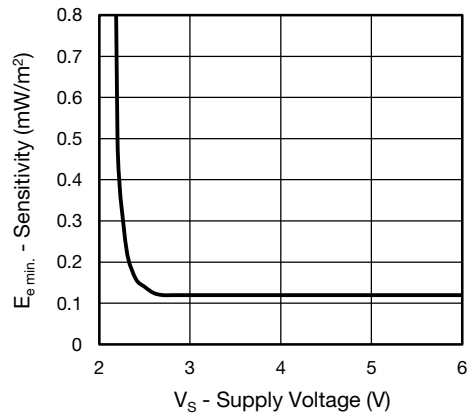


Fig. 12 - Sensitivity vs. Supply Voltage

**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 presented to the device 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).
- 2.4 GHz and 5 GHz Wi-Fi

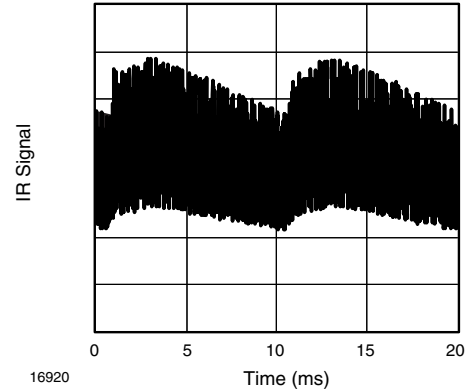


Fig. 13 - IR Disturbance from Fluorescent Lamp with Low Modulation

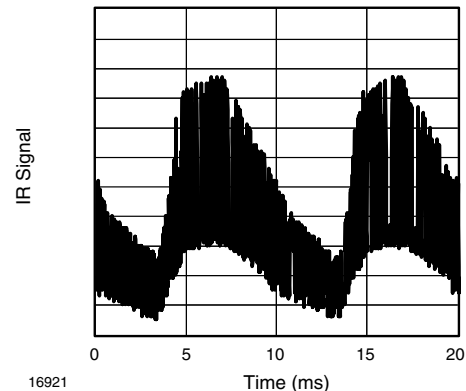


Fig. 14 - IR Disturbance from Fluorescent Lamp with High Modulation

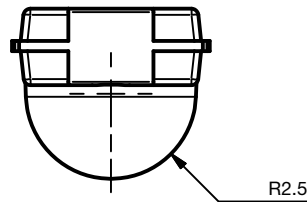
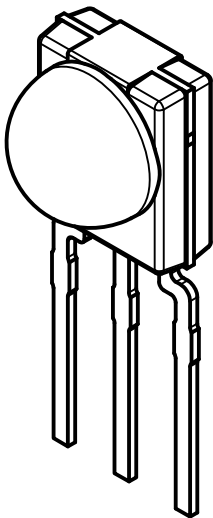
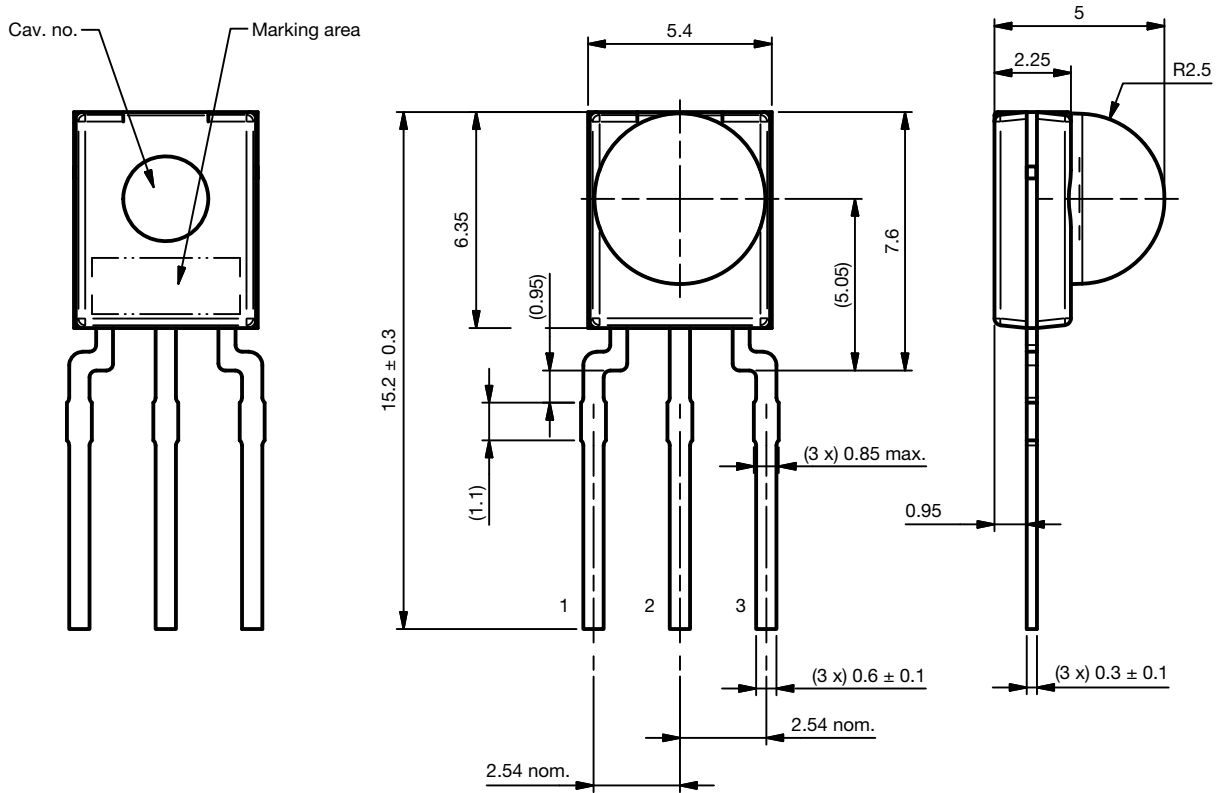
	<b>TSOP531..</b>	<b>TSOP533..</b>	<b>TSOP535..</b>
Minimum burst length	6 cycles/burst	6 cycles/burst	6 cycles/burst
After each burst of length A gap time is required of	6 to 70 cycles ≥ 10 cycles	6 to 35 cycles ≥ 10 cycles	6 to 24 cycles ≥ 10 cycles
For bursts greater than a minimum gap time in the data stream is needed of	70 cycles > 1.2 x burst length	35 cycles > 6 x burst length	24 cycles > 25 ms
Maximum number of continuous short bursts/second	2000	2000	2000
MCIR code	Yes	Preferred	Yes
XMP-1 code	Yes	Preferred	Yes
Suppression of interference from fluorescent lamps	Mild disturbance patterns are suppressed (example: signal pattern of Fig. 13)	Complex disturbance patterns are suppressed (example: signal pattern of Fig. 14)	Critical disturbance patterns are suppressed, e.g. highly dimmed LCDs

**Note**

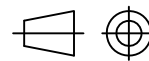
- For data formats with long bursts (more than 10 carrier cycles) please see the datasheet for TSOP532.., TSOP534..



## PACKAGE DIMENSIONS in millimeters



Not indicated tolerances  $\pm 0.2$



Technical drawings according to DIN specification.

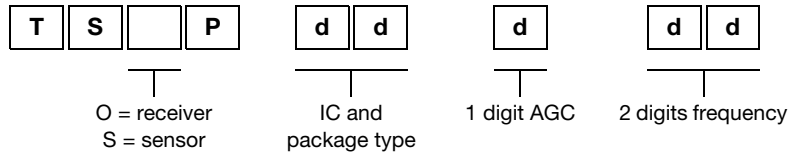
Drawing no.: 6.550-5335.01-4  
Issue: 1; 16.09.15



## BULK PACKAGING

Standard shipping for minimold is in conductive plastic bags. The packing quantity is determined by weight and a maximum of 0.3 % of the components per carton may be missing.

## ORDERING INFORMATION



### Note

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

**Examples:** TSOP53338  
 TSOP53356V11  
 TSOP53338SS1F

## PACKAGING QUANTITY

- 300 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
  - TT2, top view package, 7000 pcs
- E. Belobog with shield: quantity per reel:
  - TT1, top view package, 1500 pcs
  - TT2, top view package, 5000 pcs
- F. Minimold DF1P: quantity per reel:
  - DF1P, 1100 pcs
- G. TVCastSMD TR: quantity per reel:
  - TR, side view package, 2200 pcs

### ORDER DESIGNATION

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

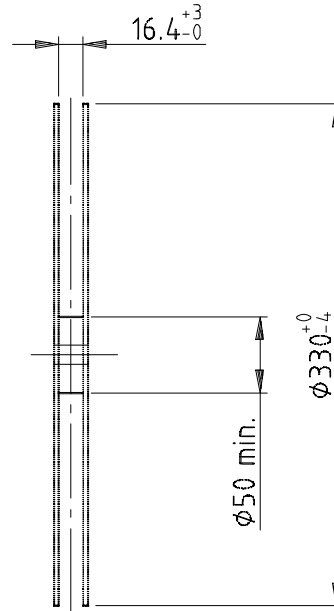
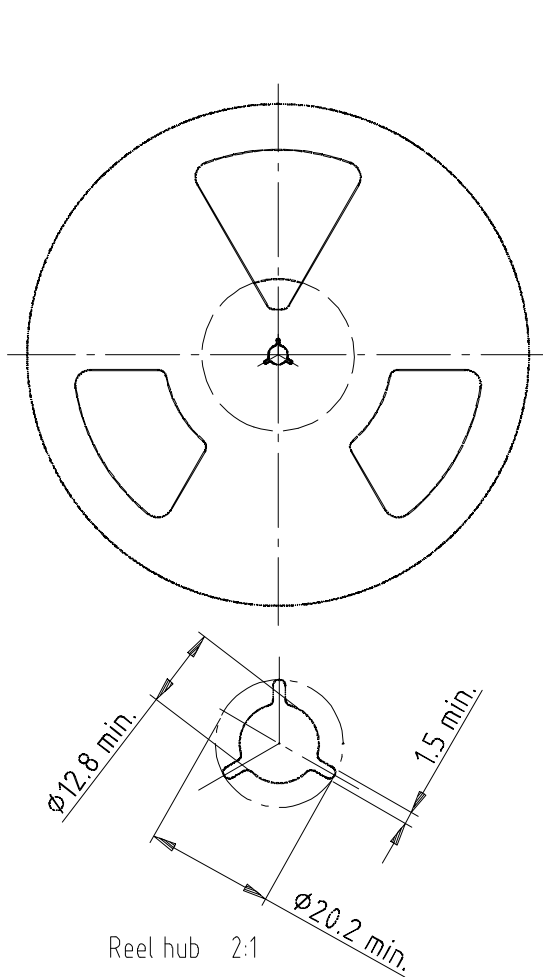
#### Example:

- TSOP6238TR (reel packing)
- TSOP75238TR (reel packing)
- TSOP75338WTT (reel packing)
- TSOP57438TT1 (reel packing)
- TSOP57238HTT1 (reel packing)
- TSOP39438TR (reel packing)





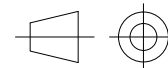
## REEL DIMENSIONS FOR PANHEAD, HEIMDALL, AND TVCASTSMD TR in millimeters



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

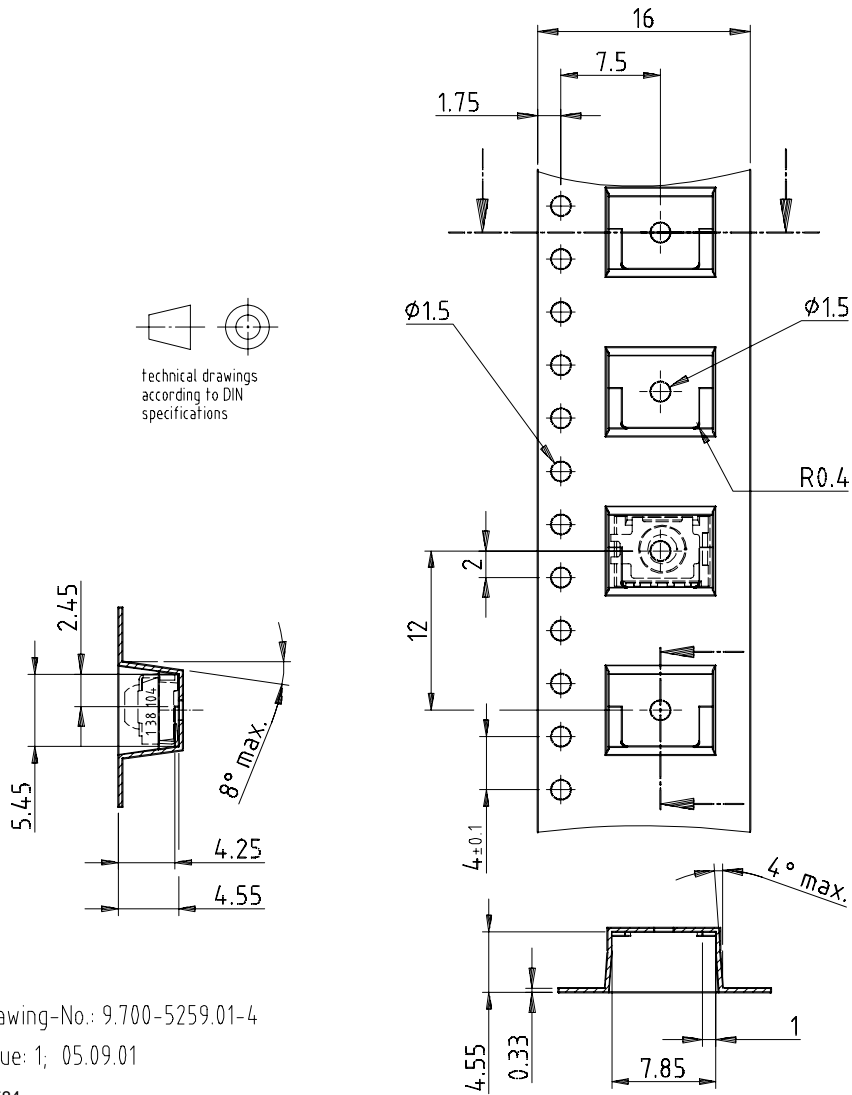
### Note

- 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)



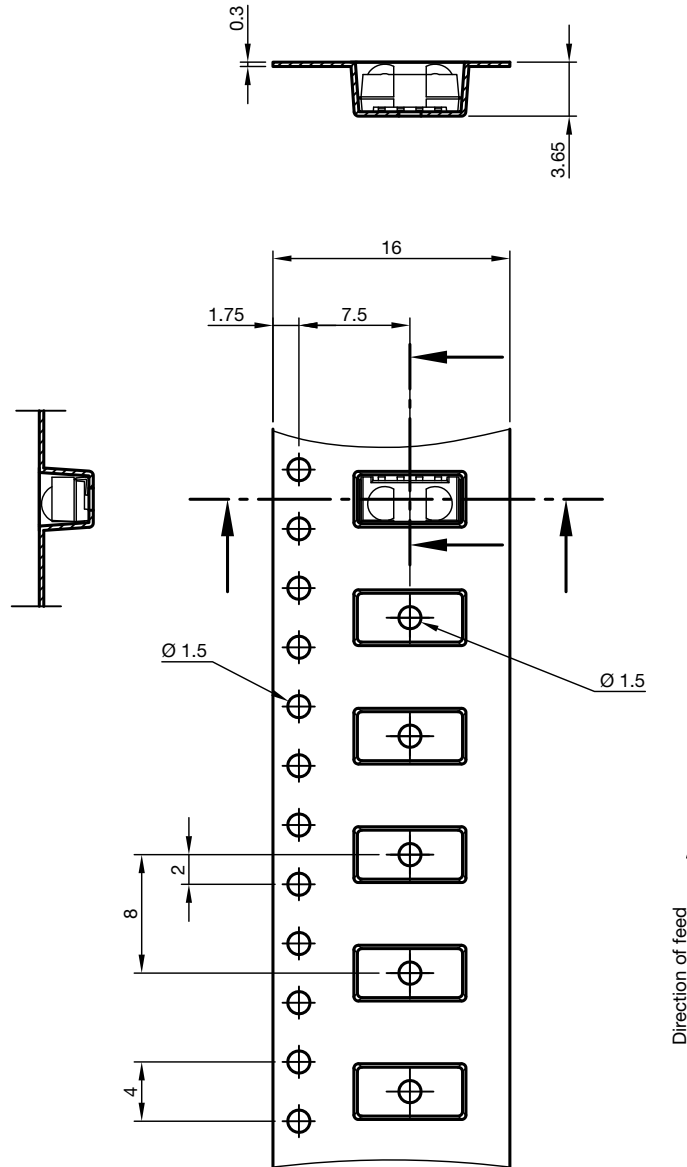
Drawing-No.: 9.700-5259.01-4

Issue: 1; 05.09.01

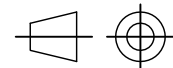
16584

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

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



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

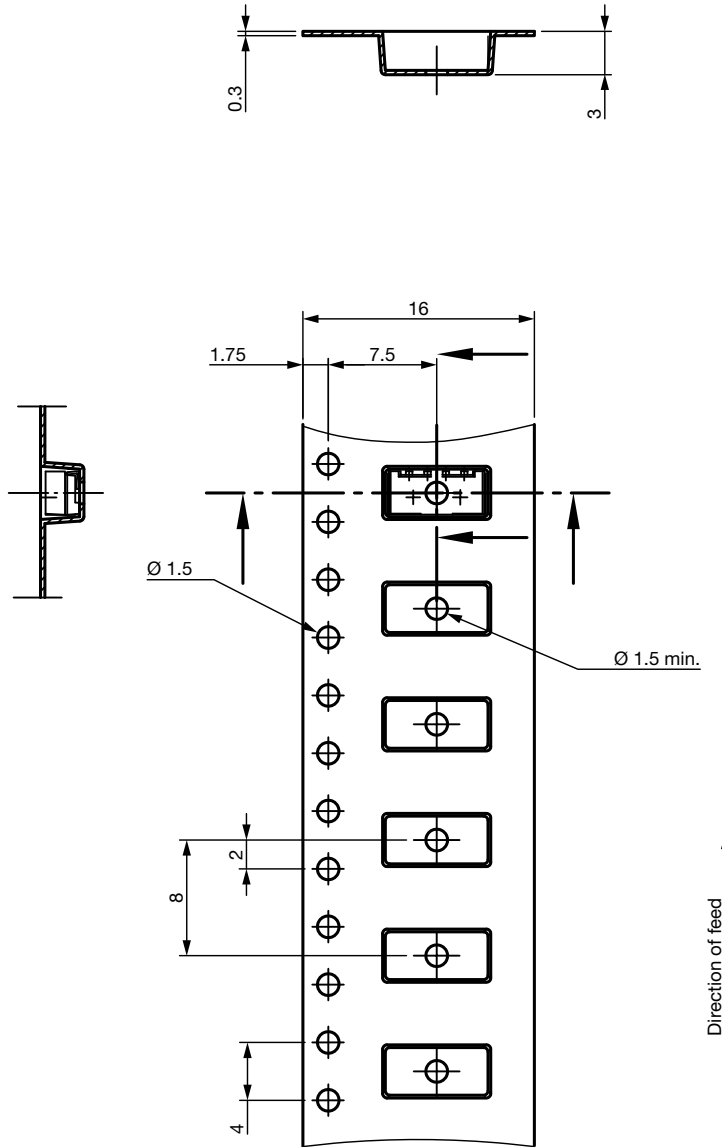


technical drawings  
according to DIN  
specifications

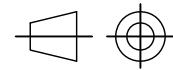


## TAPING VERSION TSOP..TT (TOP VIEW) DIMENSIONS in millimeters

C. Heimdall without lens (TSOP75...WTT, TSOP77...WTT, TSSP77...WTT)



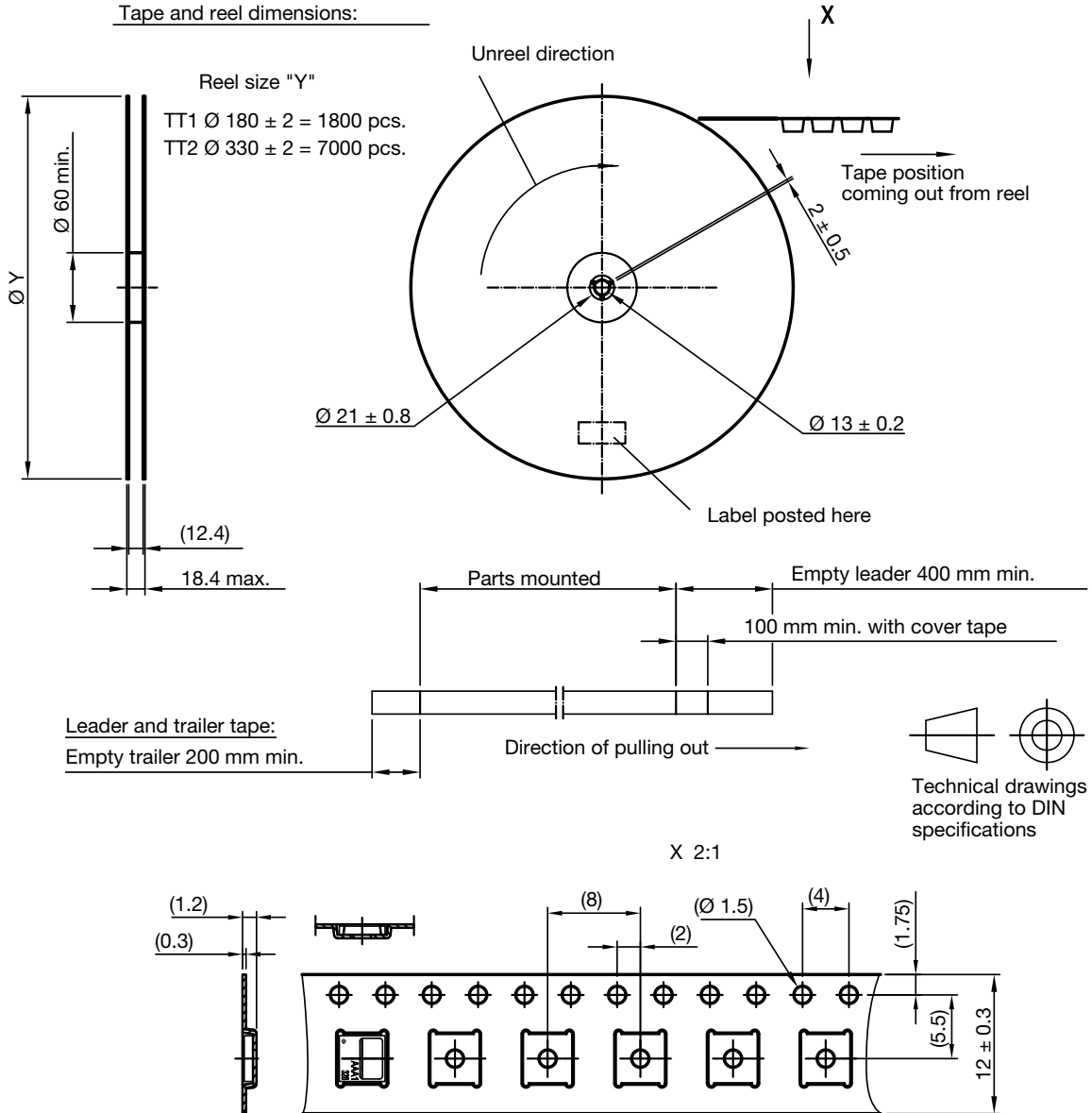
Drawing-No.: 9.700-5341.01-4  
Issue: 3; 06.10.15



technical drawings  
according to DIN  
specifications

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

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



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

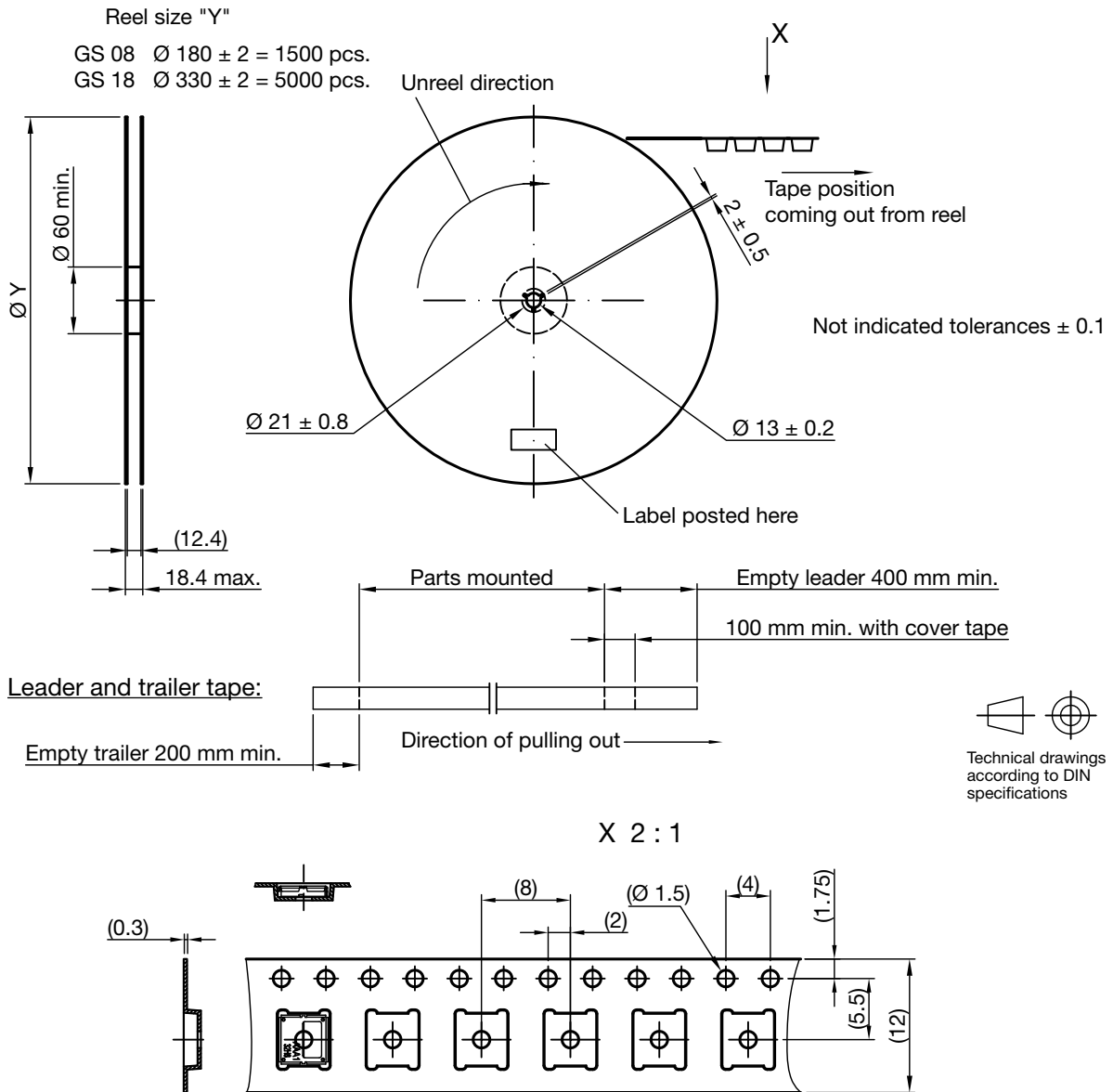
Not indicated tolerances  $\pm 0.1$



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

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

### Tape and Reel dimensions:



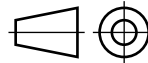
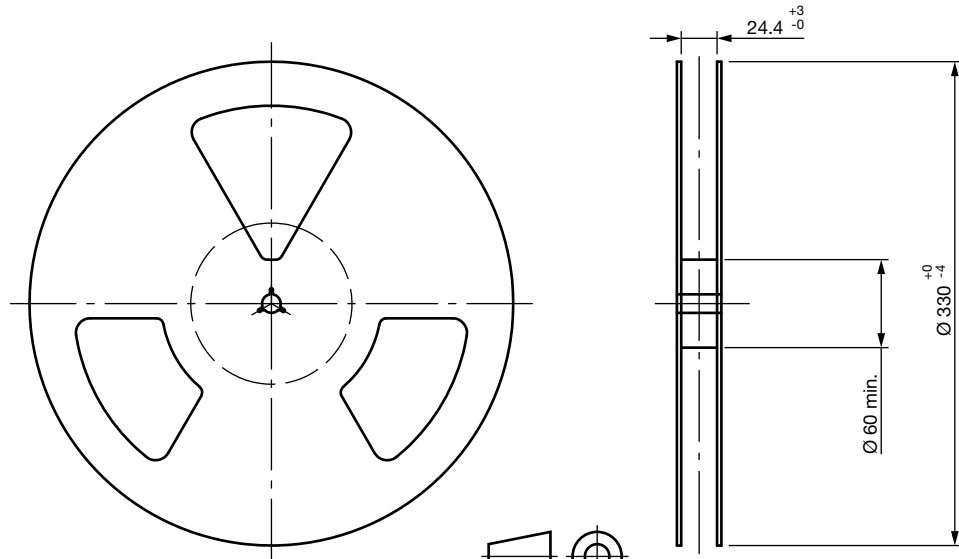
Reel dimensions and tape

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



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

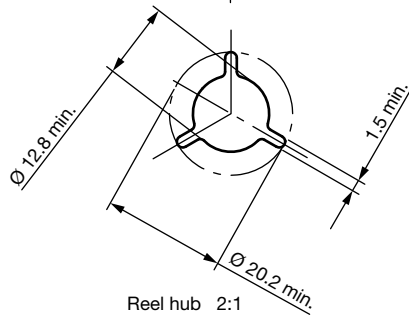
F. Minimold DF1P (TSOP33...DF1P, TSOP53...DF1P)



Technical drawing according to DIN specifications

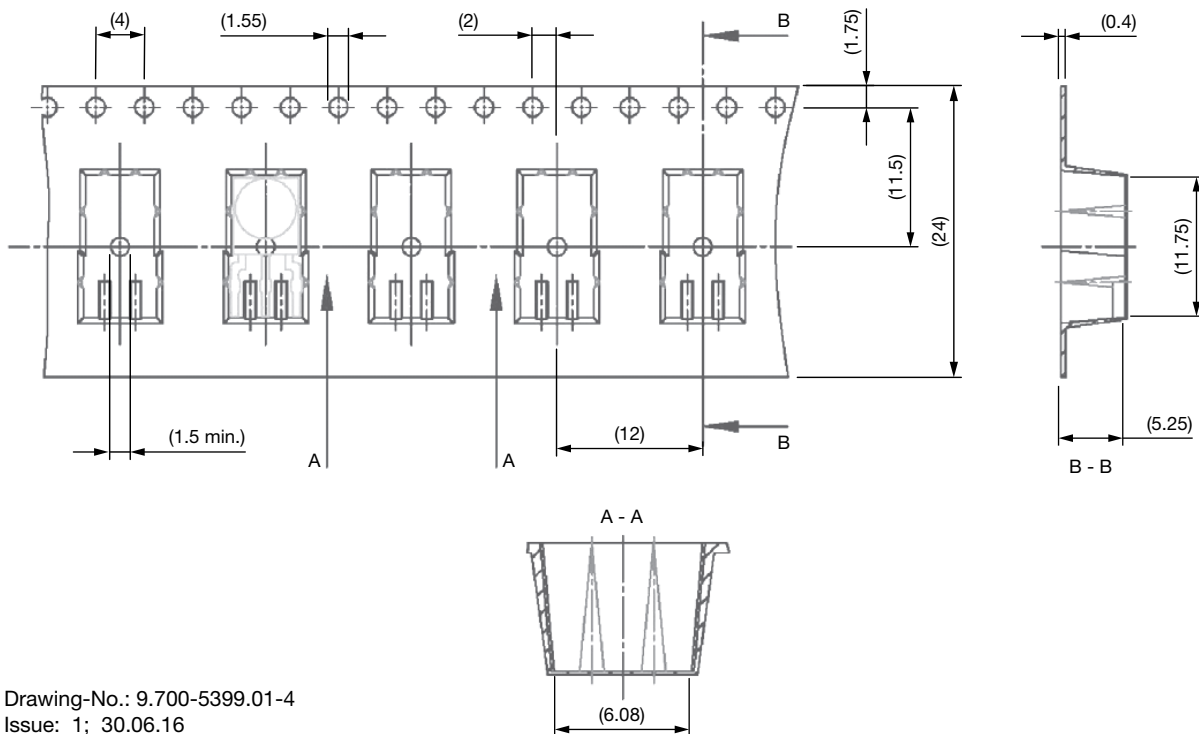
Form of the leave open of the wheel is supplier specific. Dimensions according to IEC EN 60 286-3

Tape width: 24



Reel hub 2:1

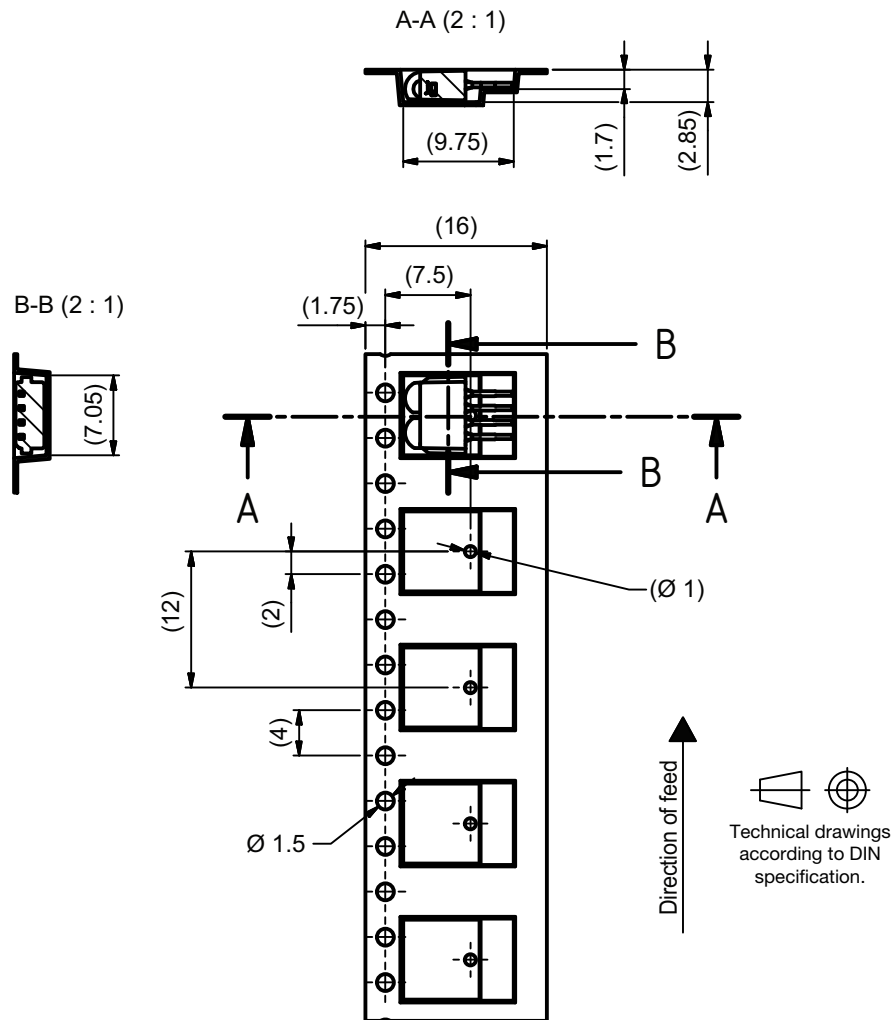
Drawing-No.: 9.800-5052.V3-4  
Issue: 1; 17.12.02



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

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

G. TVCastSMD TR (TSOP59...TR, TSOP39...TR)



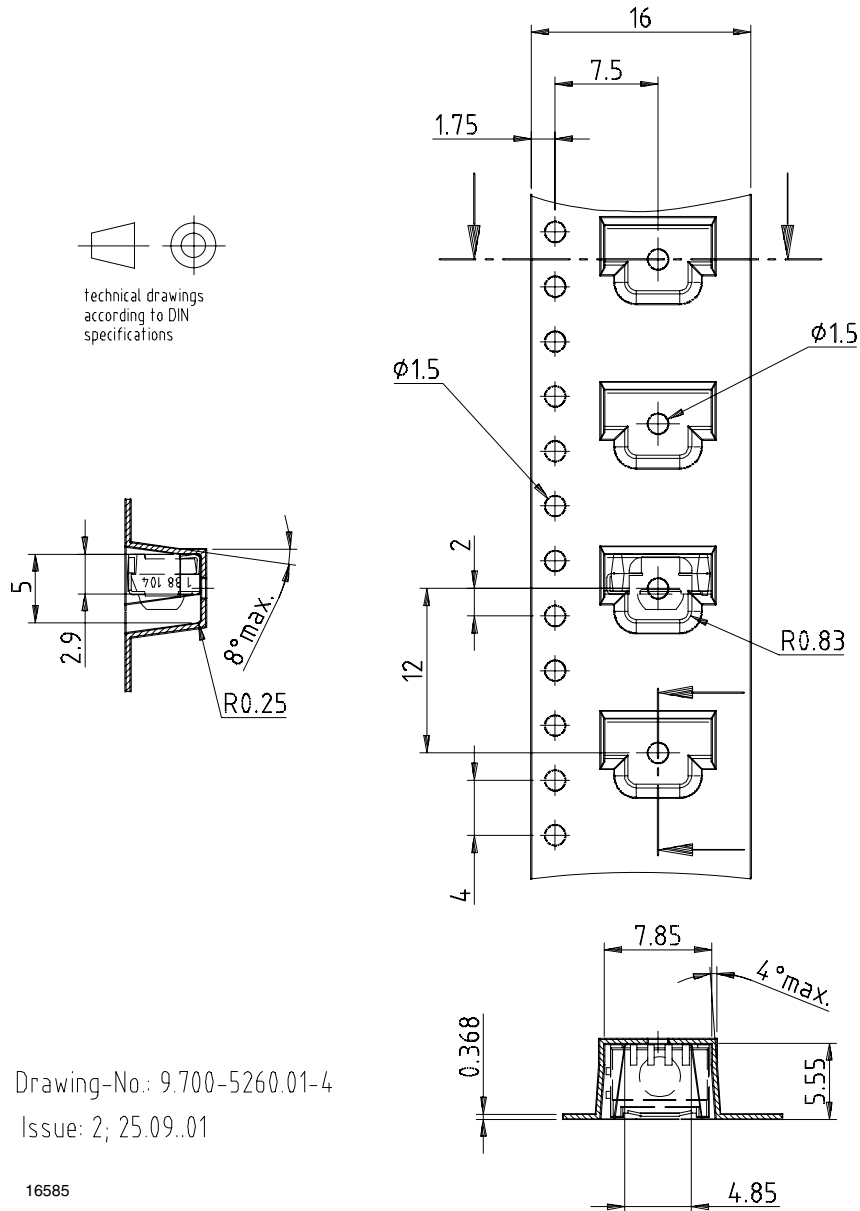
Drawing-No.: GO-100220.10\_Z  
Issue B: 08.02.17





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

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



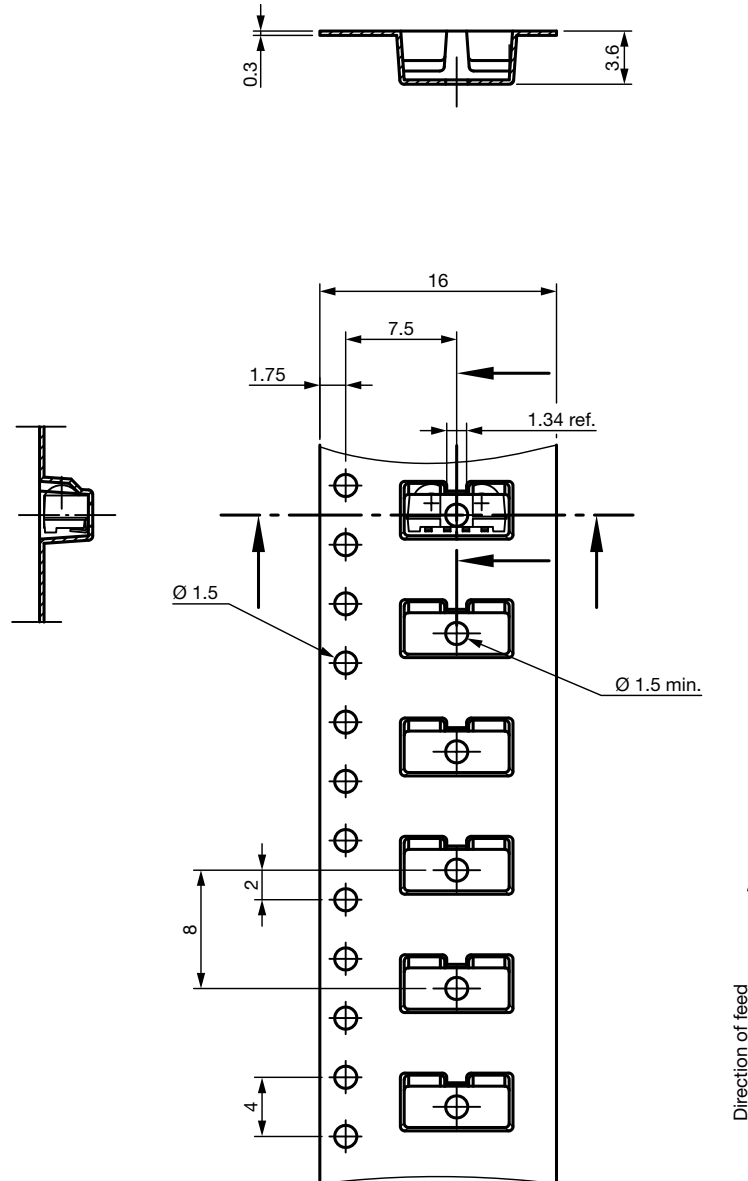
Drawing-No.: 9.700-5260.01-4

Issue: 2; 25.09..01

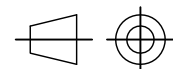
16585

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

B. Heimdall (TSOP75..., TSOP77..., TSSP7....)



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

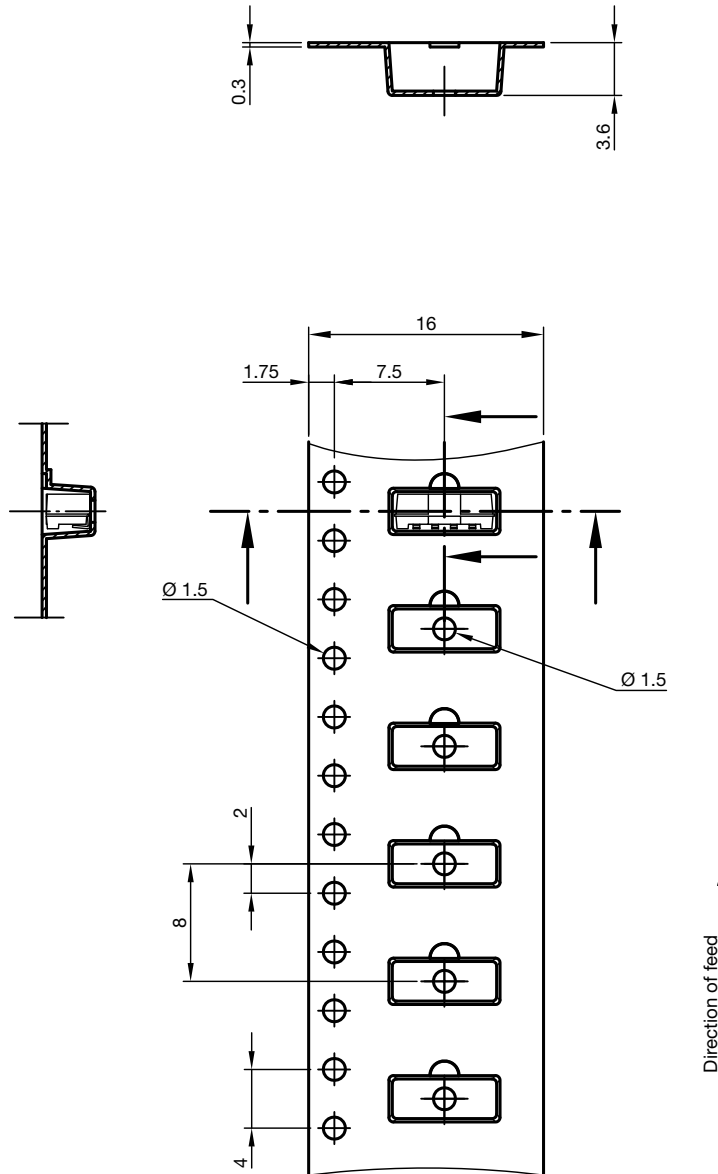


technical drawings  
according to DIN  
specifications

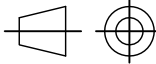


## TAPING VERSION TSOP..TR (SIDE VIEW) DIMENSIONS in millimeters

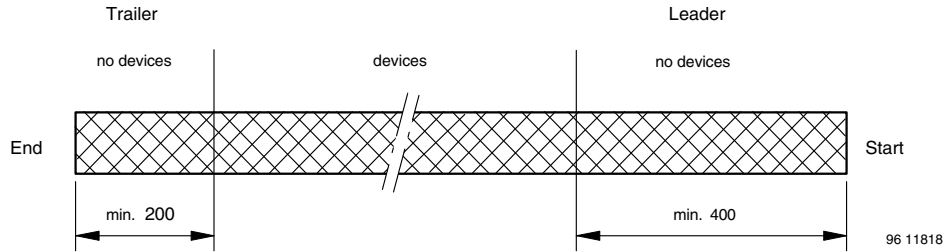
C. Heimdall without lens (TSOP75...WTR, TSOP77...WTR, TSSP...WTR)



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

  
technical drawings  
according to DIN  
specifications

### 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

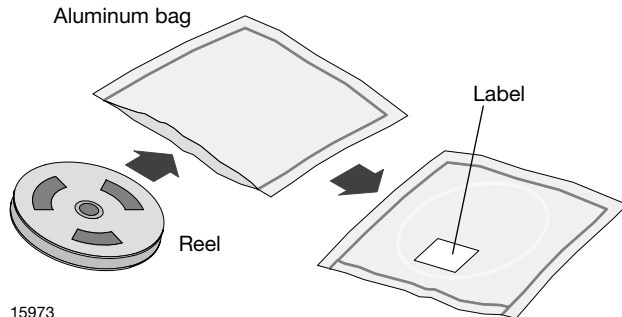
#### Standard bar code labels for finished goods

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.

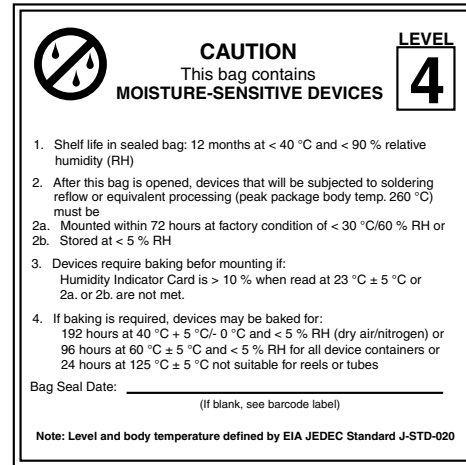
After more than 72 h under these conditions moisture content will be too high for reflow soldering.

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

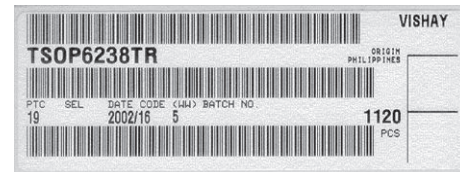
EIA JEDEC standard JSTD-020 level 4 label is included on all dry bags

## 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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