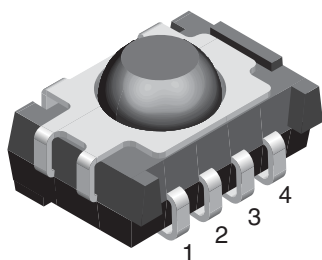


## IR Sensor Module for Remote Control Systems



16797

### DESIGN SUPPORT TOOLS

[click logo to get started](#)


### MECHANICAL DATA

#### Pinning:

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

### ORDERING CODE

#### Taping:

TSMP6000TT - top view taped

TSMP6000TR - side view taped

### FEATURES

- Photo detector and preamplifier in one package
- AC coupled response from 20 kHz to 60 kHz, all data formats
- Improved shielding against electrical field disturbance
- TTL and CMOS compatibility
- Output active low
- Supply voltage 2.5 V to 5.5 V, typically the device works in the range between 2.0 V and 5.5 V
- Carrier out signal for code learning functions
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)



### DESCRIPTION

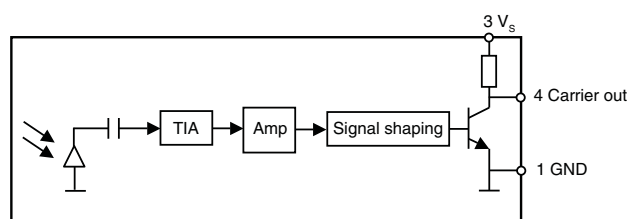
The TSMP6000 is a miniaturized sensor for receiving various kinds of modulated IR signals. A PIN diode and preamplifier are assembled on a lead frame, the epoxy package is designed as an IR filter. The modulated output signal, carrier out, can be used for code learning applications.

This component has not been qualified according to automotive specifications.

### PARTS TABLE

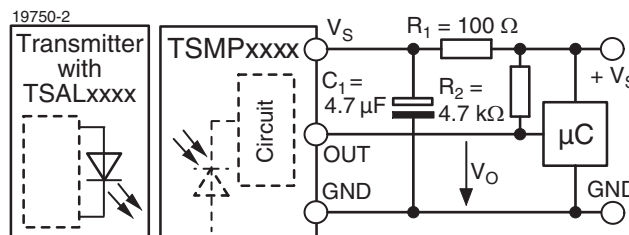
Carrier frequency	20 kHz to 60 kHz	TSMP6000
Package		Panhead
Pinning		1 = GND, 2 = N.C., 3 = $V_S$ , 4 = OUT
Dimensions (mm)		7.5 W x 5.3 H x 4.0 D
Mounting		SMD
Application		Code learning

### BLOCK DIAGRAM



19746-1

### APPLICATION CIRCUIT



$R_1 + C_1$  recommended to suppress power supply disturbances.  
 $R_2$  recommended to get faster slopes and a correct high level of the output pulses.

**ABSOLUTE MAXIMUM RATINGS** ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)

PARAMETER	TEST CONDITION	SYMBOL	VALUE	UNIT
Supply voltage (pin 3)		$V_S$	-0.3 to +6	V
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	$^{\circ}\text{C}$
Storage temperature range		$T_{stg}$	-25 to +85	$^{\circ}\text{C}$
Operating temperature range		$T_{amb}$	-25 to +85	$^{\circ}\text{C}$

**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 CARRIER OUT**

( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified,  $V_S = 3\text{ V}$ )

PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT
Supply current (pin 3)	$E_v = 0$	$I_{SD}$	0.55	0.7	0.9	mA
Supply voltage		$V_S$	2.5	-	5.5	V
Transmission distance	$E_v = 0$ , test signal see Fig. 1, IR diode TSAL6200, $I_F = 400\text{ mA}$	$d$	-	5	-	m
Output voltage low (pin 4)	$I_{OSL} = 0.5\text{ mA}$ , test signal see Fig. 1	$V_{OSL}$	-	-	250	mV
Minimum irradiance	$V_S = 3\text{ V}$ , (20 kHz to 60 kHz)	$E_e\text{ min.}$	-	12	25	$\text{mW}/\text{m}^2$
Maximum irradiance	Test signal see Fig. 1, (20 kHz to 60 kHz)	$E_e\text{ max.}$	50	80	-	$\text{W}/\text{m}^2$
Directivity	Angle of half transmission distance	$\phi_{1/2}$	-	$\pm 50$	-	deg
Output accuracy	$f_C = 20\text{ kHz to } 60\text{ kHz}$ , $E_e = 25\text{ mW}/\text{m}^2\text{ to } 50\text{ W}/\text{m}^2$ , test signal see Fig. 1, $\text{BER} \leq 2\%$	N carrier pulses	Input burst length -1 cycle	Input burst length	Input burst length +1 cycle	counts

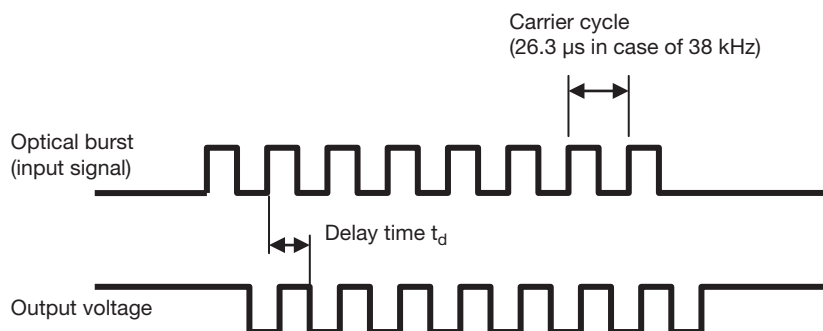
**TYPICAL CHARACTERISTICS** ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)


Fig. 1 - Testsignal

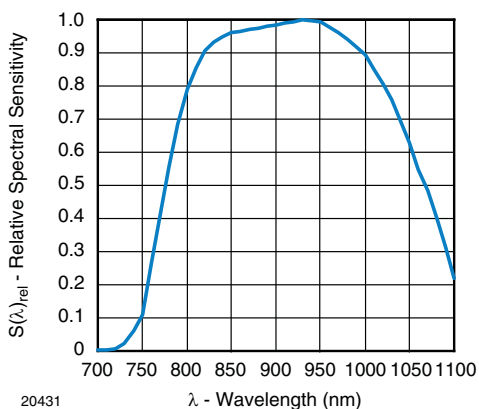


Fig. 2 - Relative Spectral Sensitivity vs. Wavelength

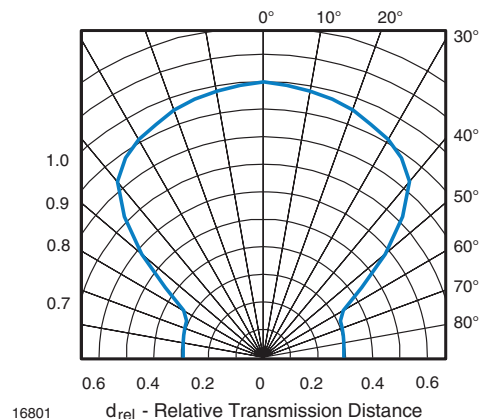
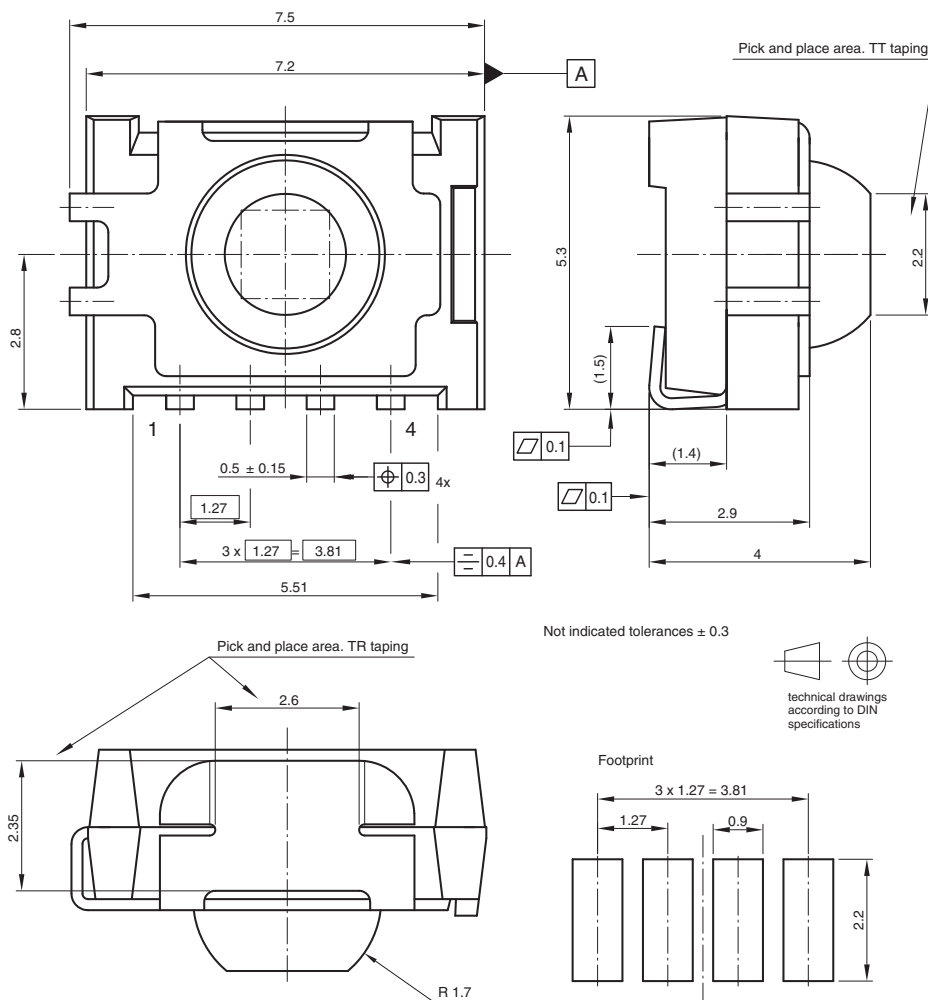


Fig. 3 - Horizontal Directivity

**PACKAGE DIMENSIONS** in millimeters


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



## ASSEMBLY INSTRUCTIONS

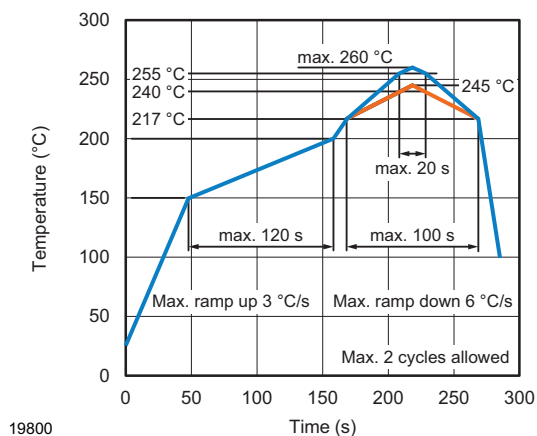
### Reflow Soldering

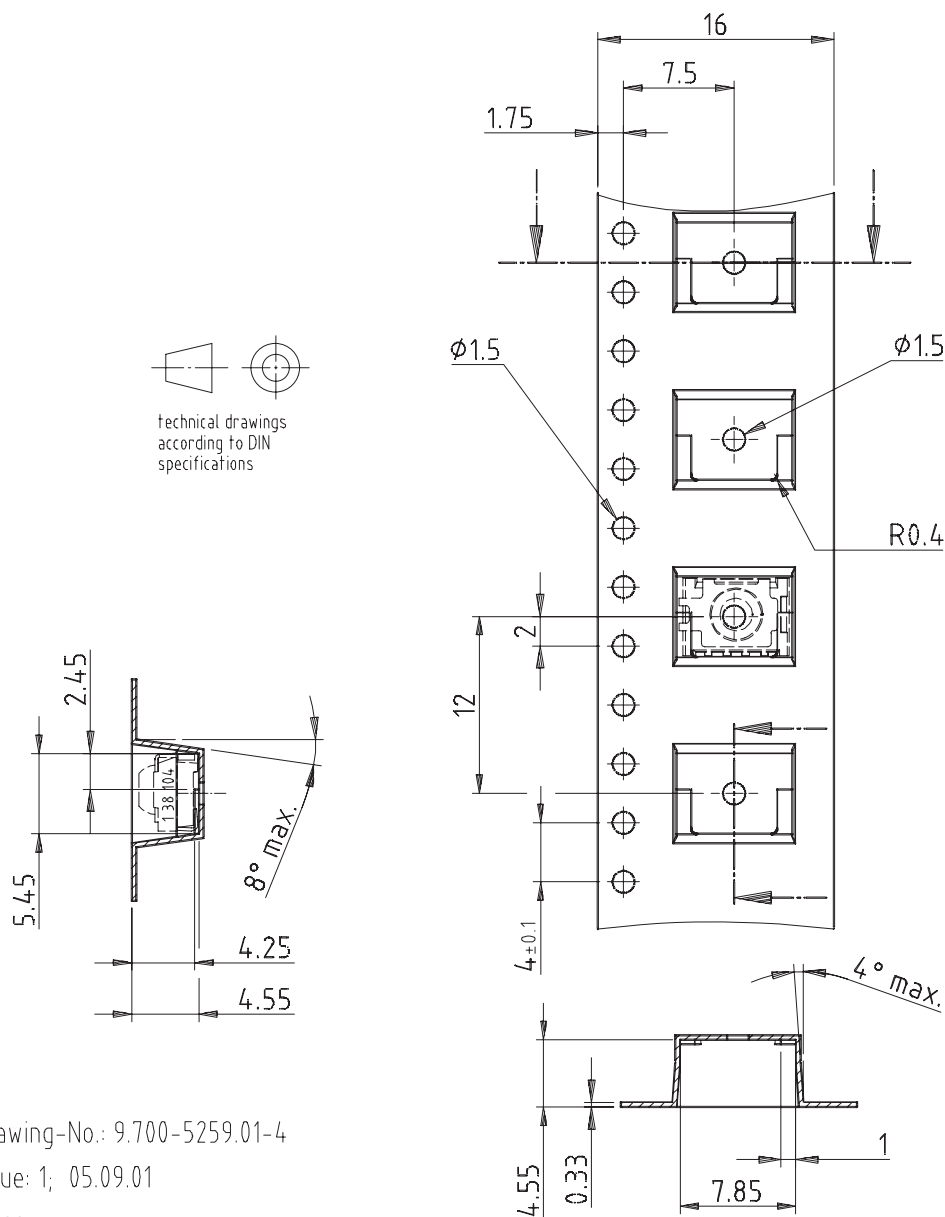
- Reflow soldering must be done within 72 h while stored under a max. temperature of 30 °C, 60 % RH after opening the dry pack envelope
- Set the furnace temperatures for pre-heating and heating in accordance with the reflow temperature profile as shown in the diagram. Exercise extreme care to keep the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



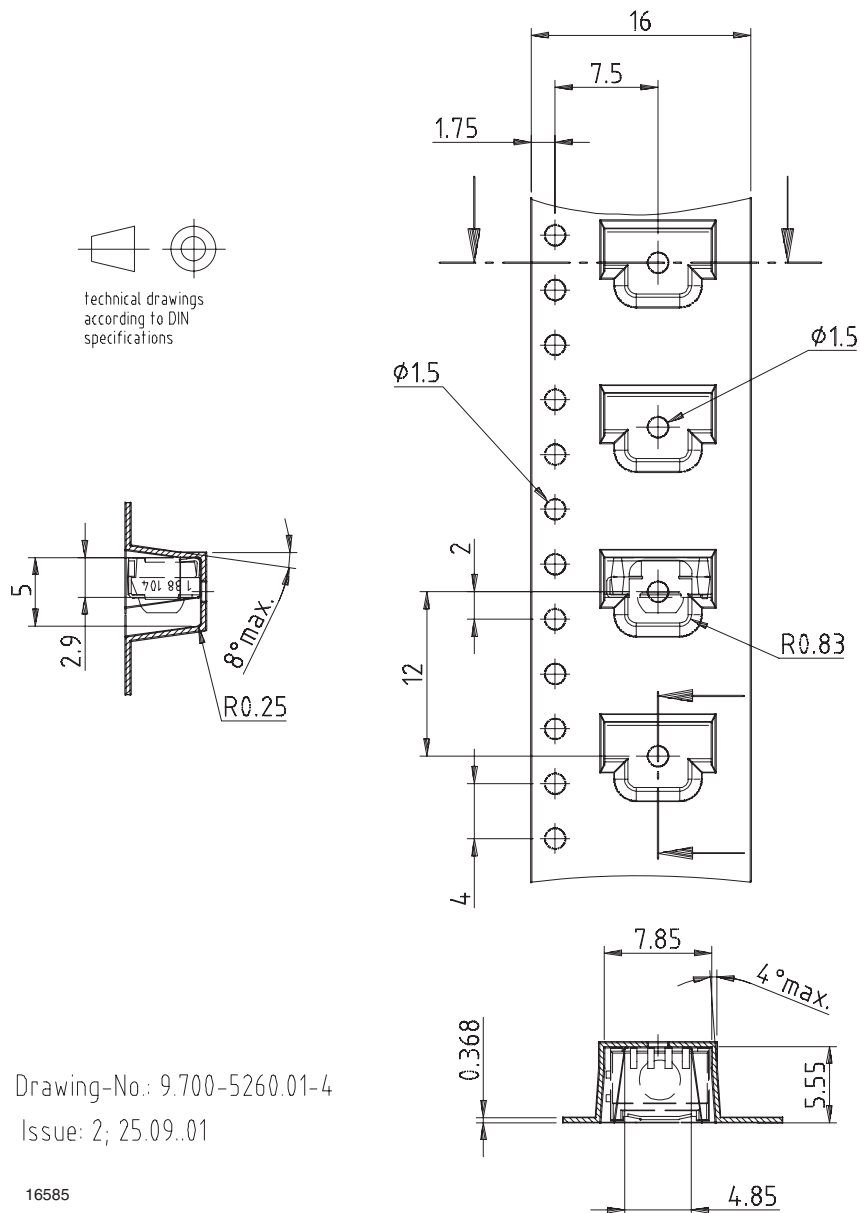
**TAPING VERSION TSMP..TT DIMENSIONS** in millimeters


Drawing-No.: 9.700-5259.01-4

Issue: 1; 05.09.01

16584

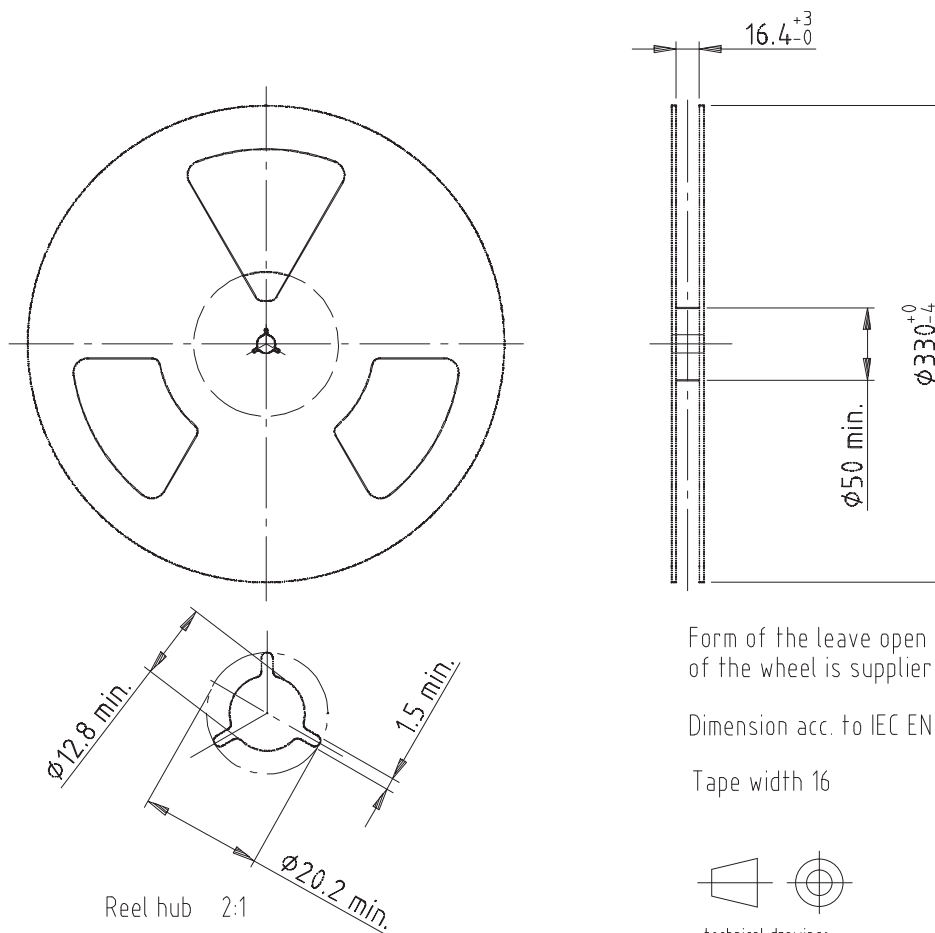
### TAPING VERSION TSMP..TR DIMENSIONS in millimeters



Drawing-No.: 9.700-5260.01-4

Issue: 2; 25.09..01

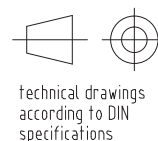
16585

**REEL DIMENSIONS** in millimeters


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

Dimension acc. to IEC EN 60 286-3

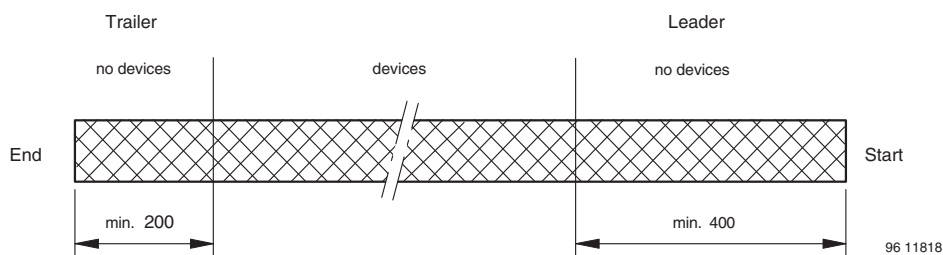
Tape width 16



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.  $\pm$  10 mm/min.

165° to 180° peel angle

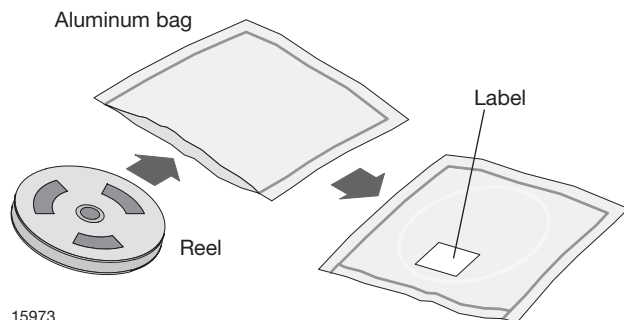
**LABEL**
**Standard bar code labels for finished goods**

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)		
PLAIN WRITTING	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 BOTTOM	TYPE	LENGTH
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.

## 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.

	<b>CAUTION</b> This bag contains <b>MOISTURE-SENSITIVE DEVICES</b>	<b>LEVEL</b> <b>4</b>
	<ol style="list-style-type: none"> <li>Shelf life in sealed bag: 12 months at &lt; 40 °C and &lt; 90 % relative humidity (RH)</li> <li>After this bag is opened, devices that will be subjected to soldering reflow or equivalent processing (peak package body temp. 260 °C) must be               <ol style="list-style-type: none"> <li>Mounted within 72 hours at factory condition of &lt; 30 °C/60 % RH or</li> <li>Stored at &lt; 5 % RH</li> </ol> </li> <li>Devices require baking before mounting if:               <ul style="list-style-type: none"> <li>Humidity Indicator Card is &gt; 10 % when read at 23 °C ± 5 °C or</li> <li>2a. or 2b. are not met.</li> </ul> </li> <li>If baking is required, devices may be baked for:               <ul style="list-style-type: none"> <li>192 hours at 40 °C + 5 °C/- 0 °C and &lt; 5 % RH (dry air/nitrogen) or</li> <li>96 hours at 60 °C ± 5 °C and &lt; 5 % RH for all device containers or</li> <li>24 hours at 125 °C ± 5 °C not suitable for reels or tubes</li> </ul> </li> </ol>	
Bag Seal Date: _____ (If blank, see barcode label)		
Note: Level and body temperature defined by EIA JEDEC Standard J-STD-020		

22522

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 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

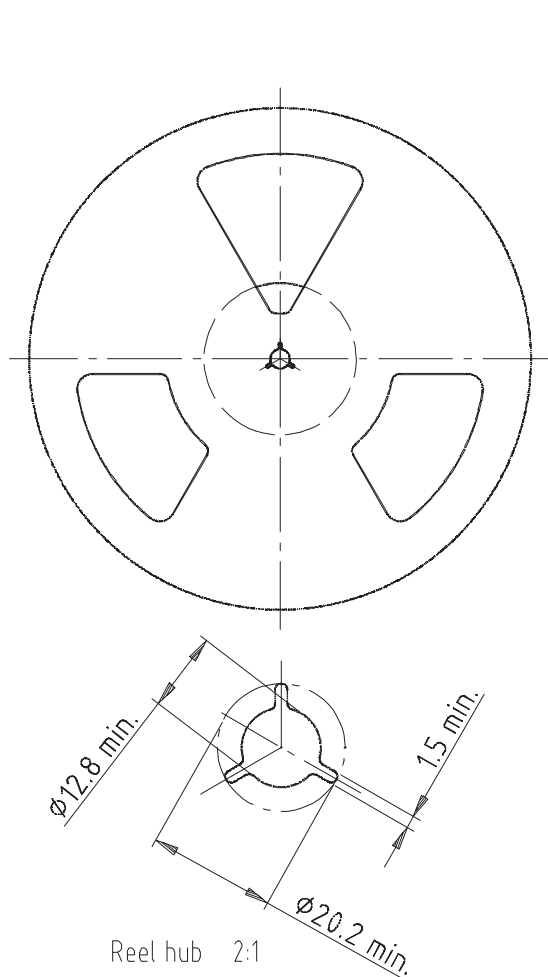
The type designation of the device is extended by TT or TT1 for top view or TR for side view.

#### 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



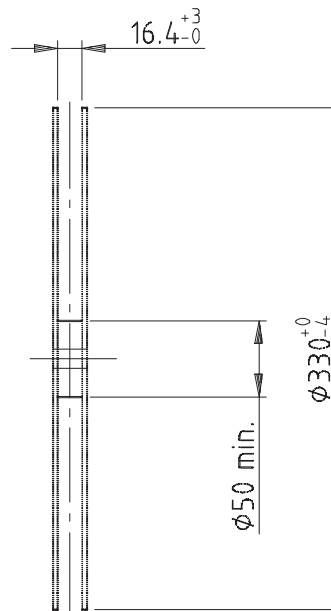
Drawing-No.: 9.800-5052.V2-4

Issue: 1; 07.05.02

16734

### Note

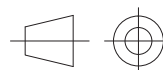
- The body structure of the reel can vary



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

Dimension acc. to IEC EN 60 286-3

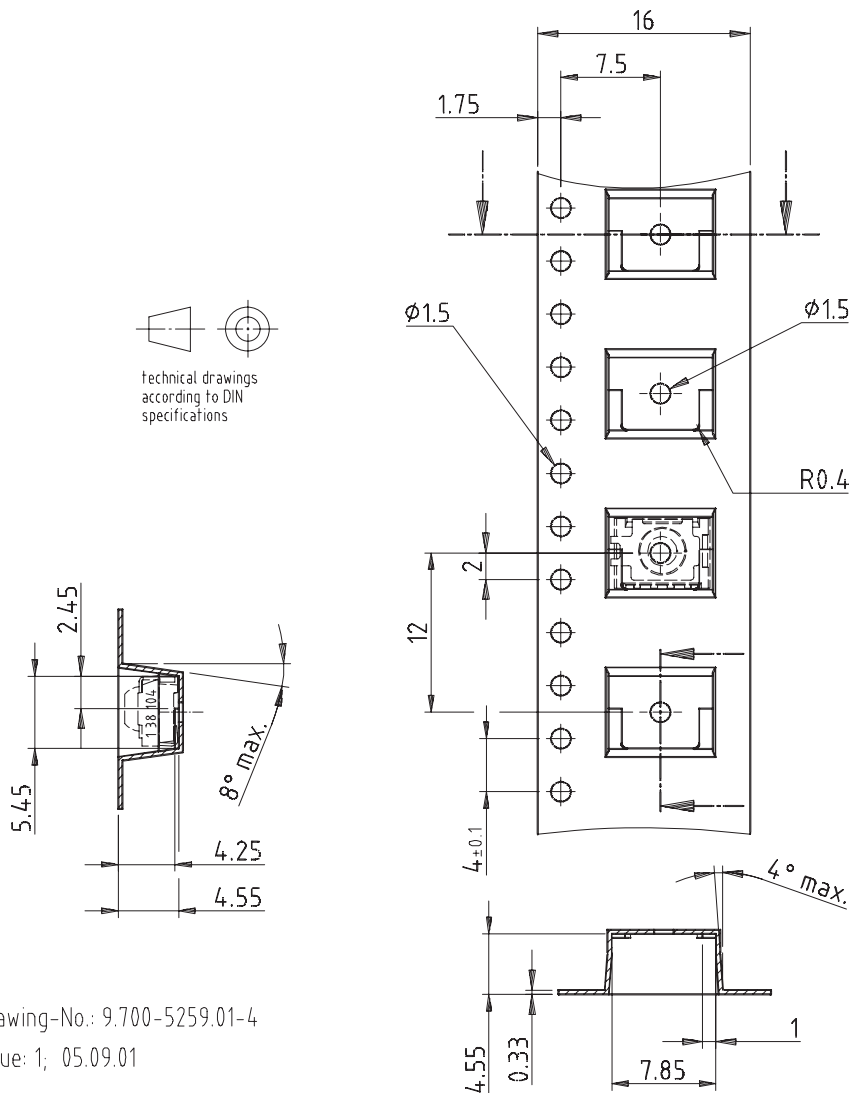
Tape width 16



technical drawings  
according to DIN  
specifications

## 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

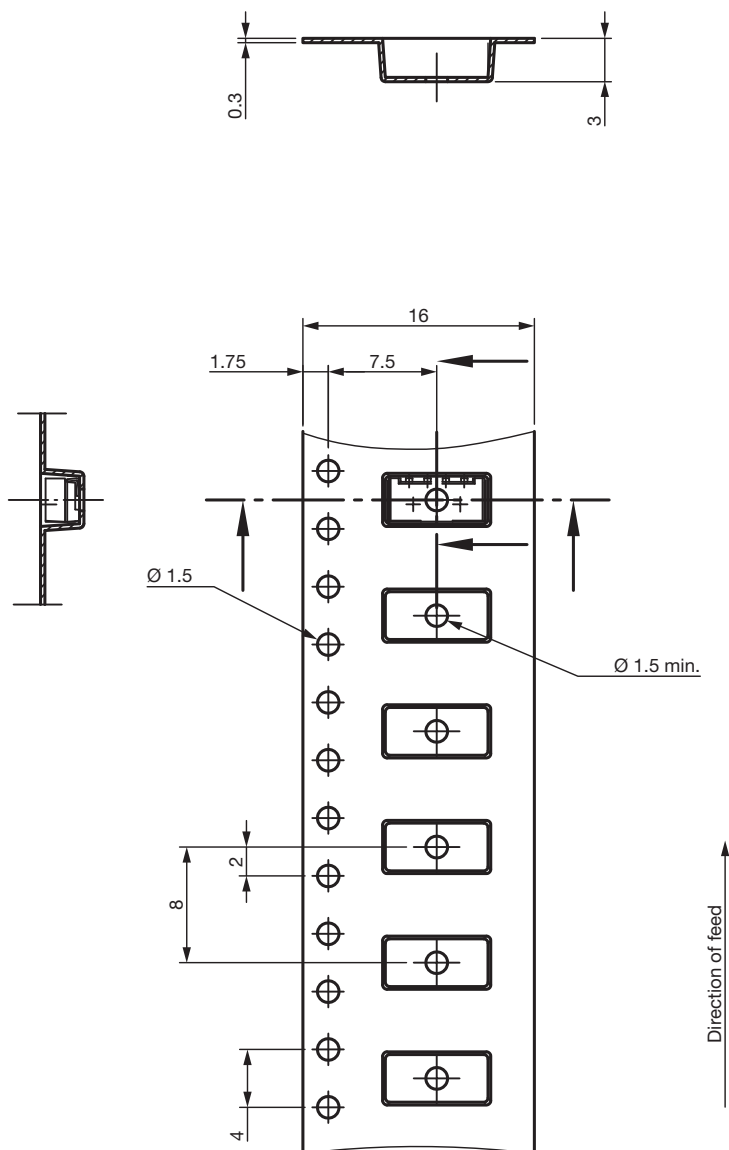
Issue: 1; 05.09.01

16584

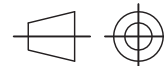


## TAPING VERSION TSOP..TT (TOP VIEW) DIMENSIONS in millimeters

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



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

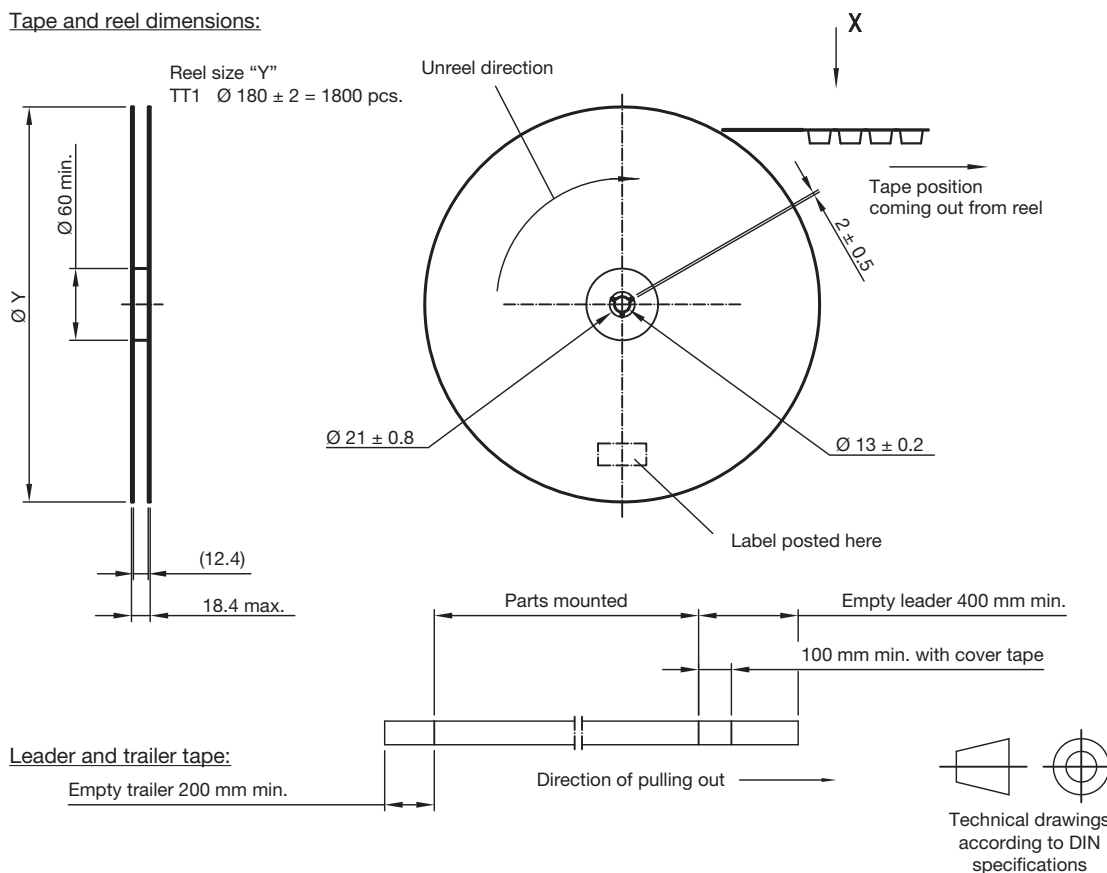


technical drawings  
according to DIN  
specifications

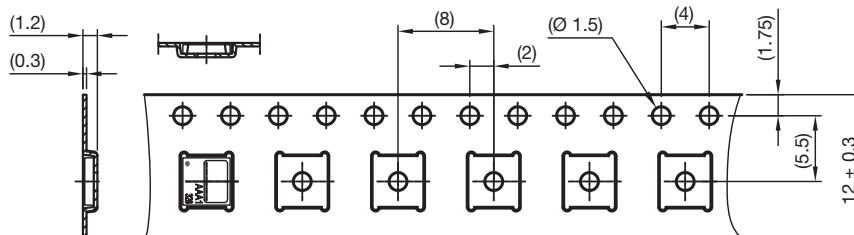
## TAPING VERSION TSOP..TT1 (TOP VIEW) DIMENSIONS in millimeters

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

Tape and reel dimensions:



X 2:1



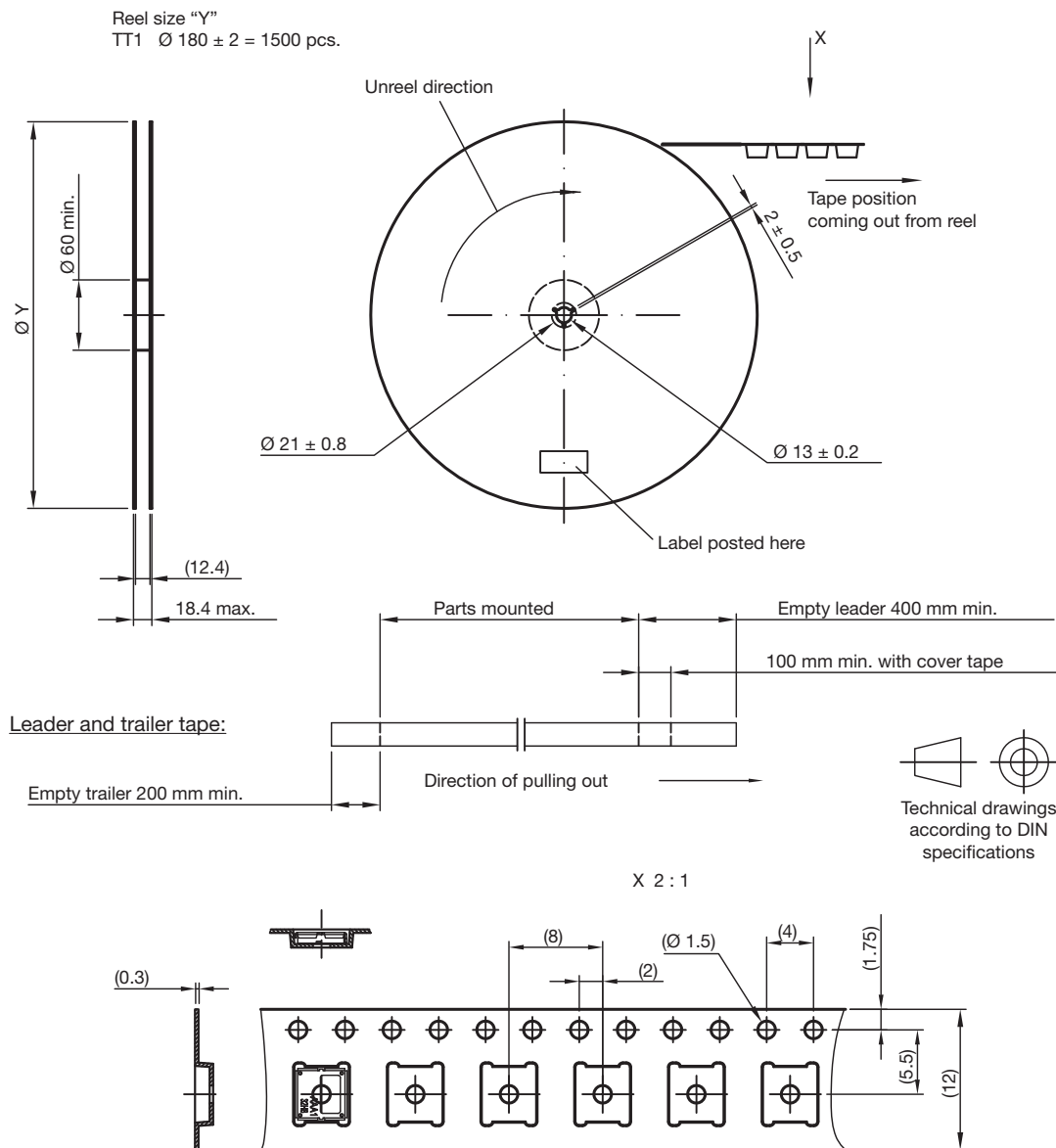
Drawing-No.: 9.700-5347.01-4  
Issue: 2; 07.03.18

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:



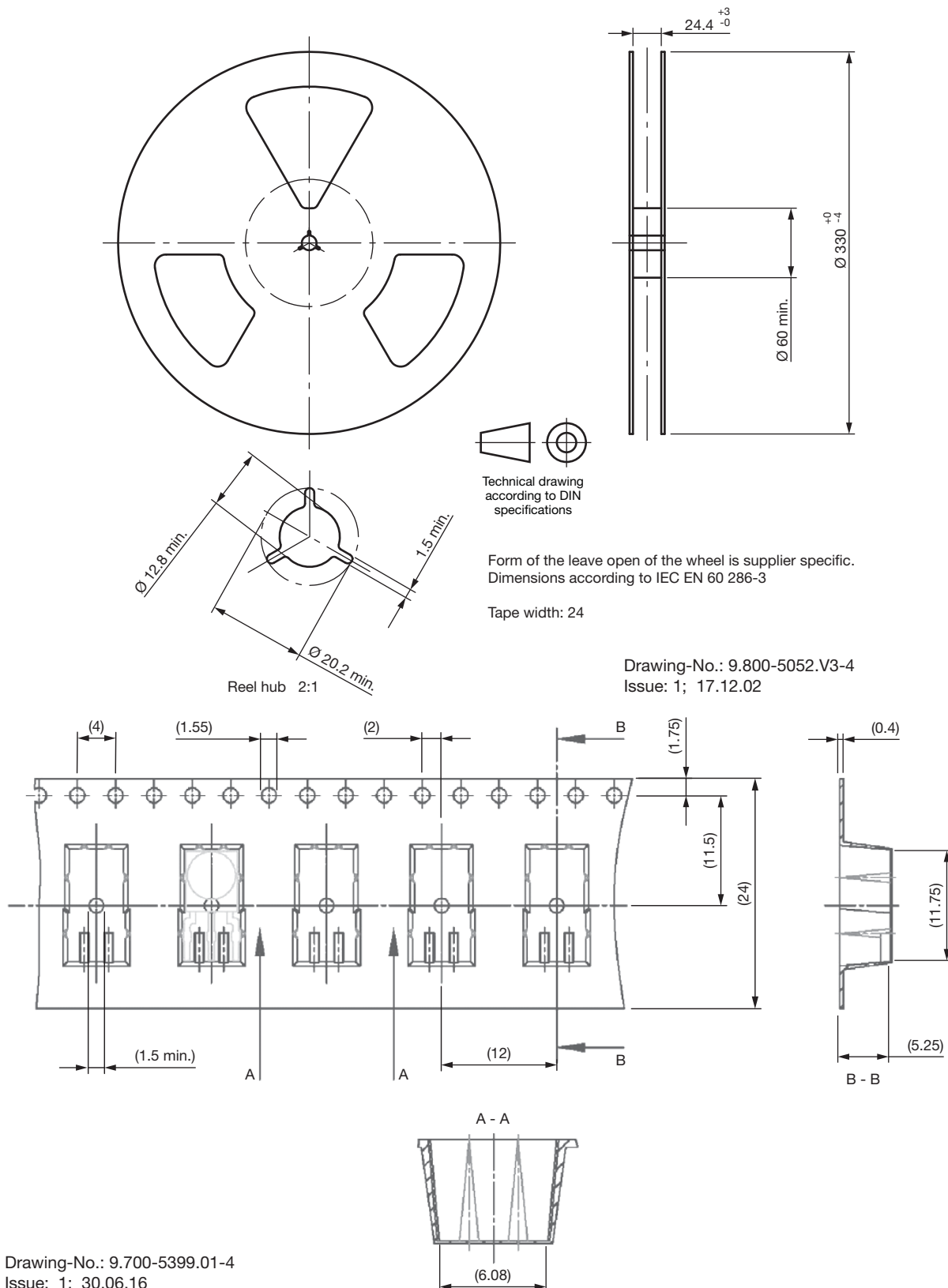
Drawing-No.: 9.700-5380.01-4  
Issue: 3; 07.03.18

Not indicated tolerances  $\pm 0.1$



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

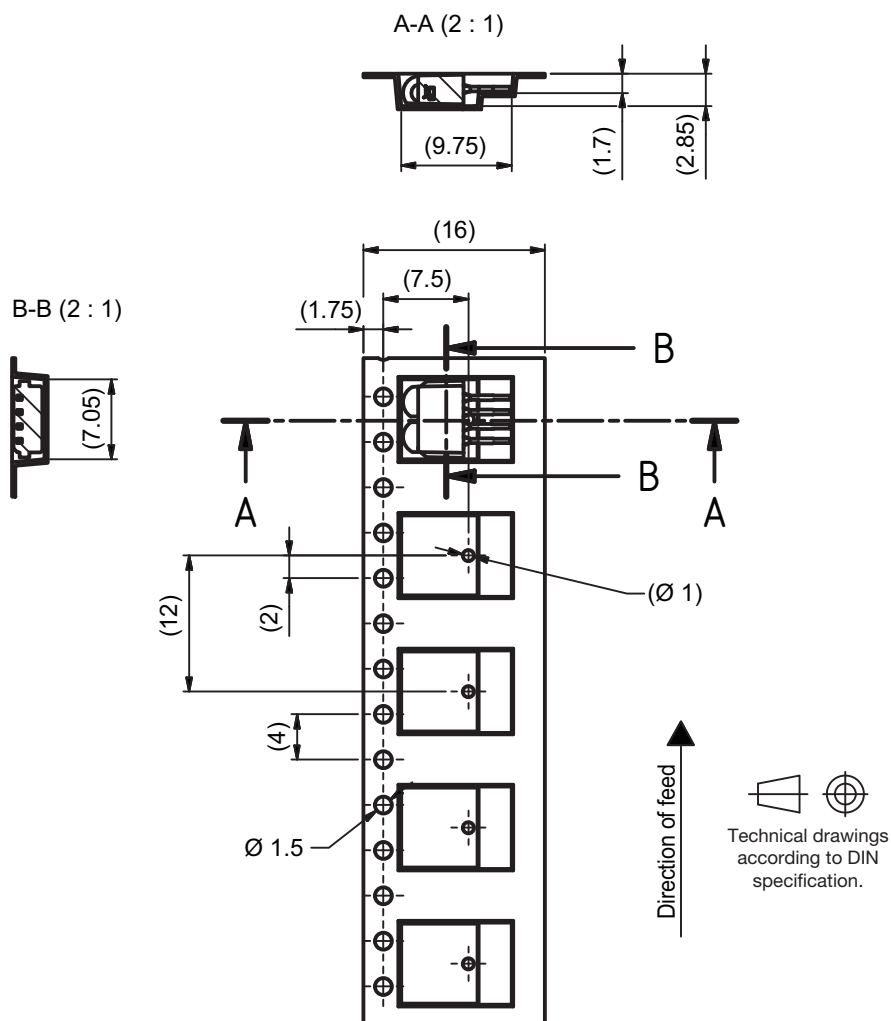
F. Minimold DF1P (TSOP33...DF1P, TSOP53...DF1P, TSOP13...DF1P, TSOP93...DF1P)



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

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

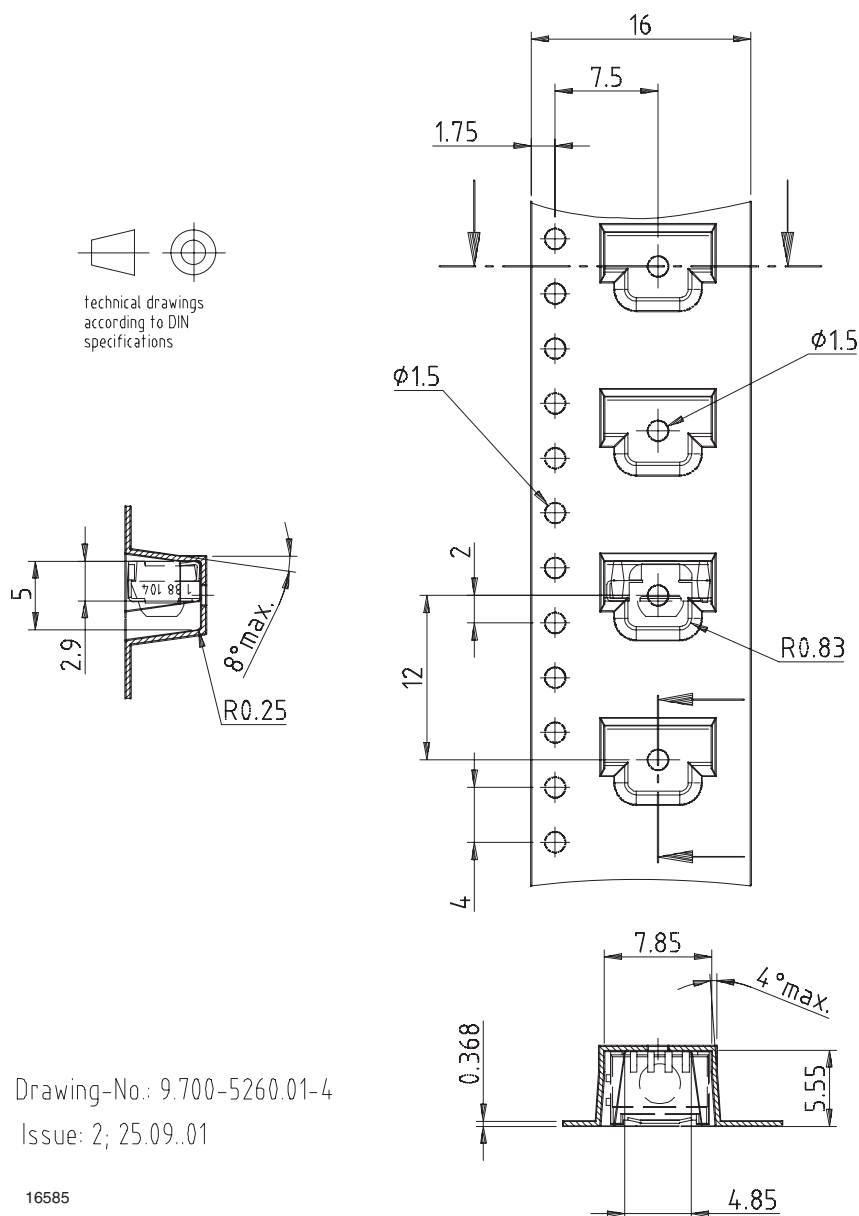
G. TVCastSMD TR1 (TSOP59...TR1, TSOP39...TR1, TSOP19...TR1, TSOP99...TR1)



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)



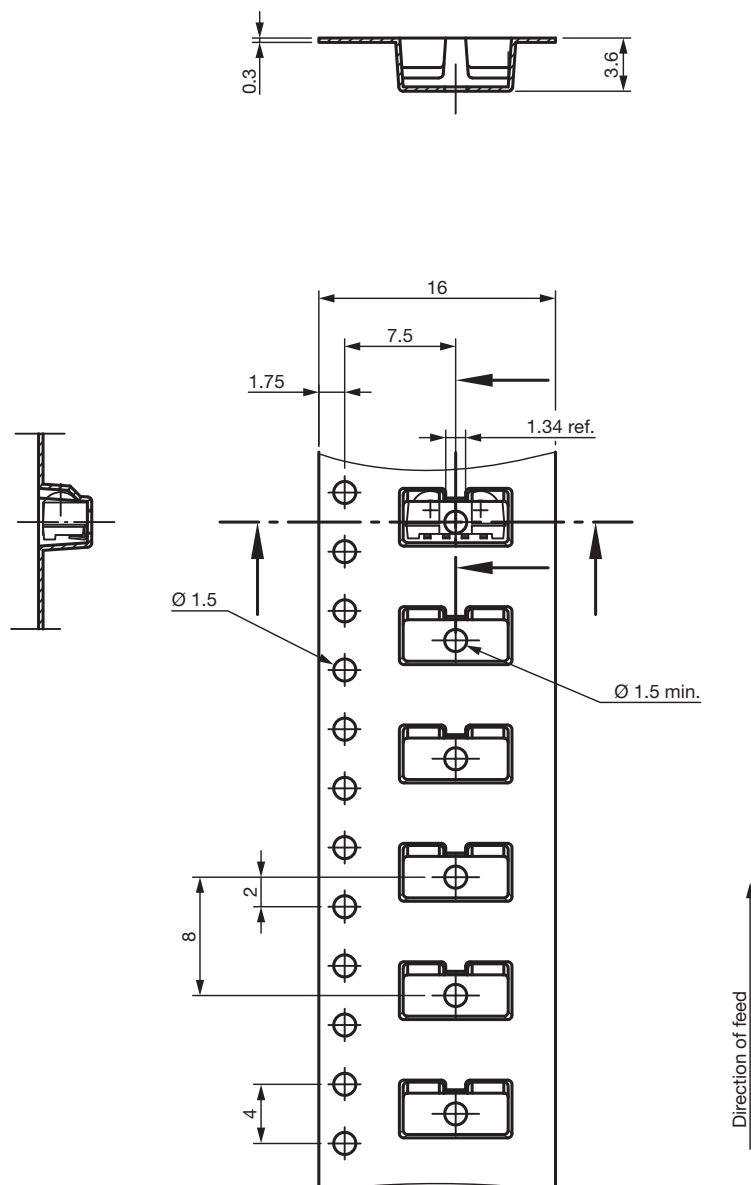
Drawing-No.: 9.700-5260.01-4

Issue: 2; 25.09..01

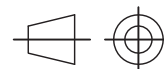
16585

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

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



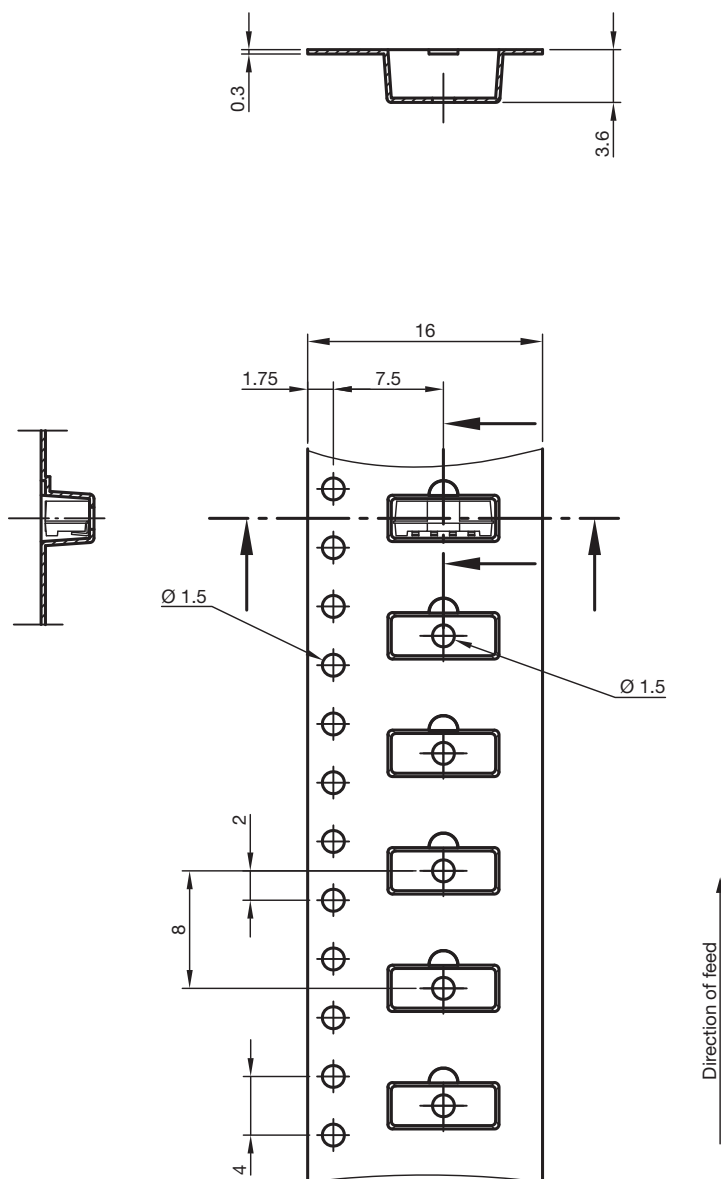
Drawing-No.: 9.700-5337.01-4  
Issue: 2; 06.10.15



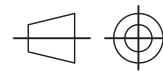
technical drawings  
according to DIN  
specifications

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

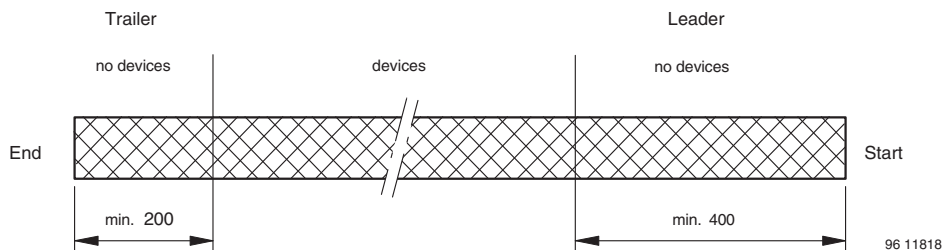
C. Heimdall without lens (TSOP75...WTR, TSOP77...WTR, TSSP...WTR, TSOP15...WTR, TSOP95...WTR)



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

  
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

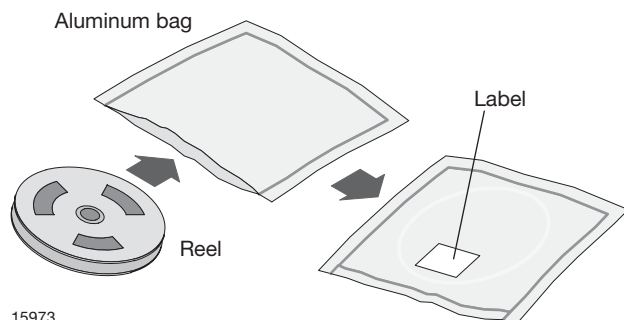
### Standard bar code labels for finished goods

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.

	<b>CAUTION</b> This bag contains <b>MOISTURE-SENSITIVE DEVICES</b>	<b>LEVEL</b> <b>4</b>
	1. Shelf life in sealed bag: 12 months at < 40 °C and < 90 % relative humidity (RH) 2. After this bag is opened, devices that will be subjected to soldering reflow or equivalent processing (peak package body temp. 260 °C) must be: 2a. Mounted within 72 hours at factory condition of < 30 °C/60 % RH or 2b. Stored at < 5 % RH 3. Devices require baking before mounting if: Humidity Indicator Card is > 10 % when read at 23 °C ± 5 °C or 2a. or 2b. are not met. 4. If baking is required, devices may be baked for: 192 hours at 40 °C + 5 °C/- 0 °C and < 5 % RH (dry air/nitrogen) or 96 hours at 60 °C ± 5 °C and < 5 % RH for all device containers or 24 hours at 125 °C ± 5 °C not suitable for reels or tubes Bag Seal Date: _____ (If blank, see barcode label) Note: Level and body temperature defined by EIA JEDEC Standard J-STD-020	

22522

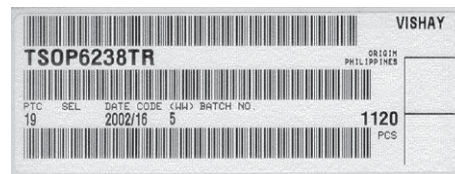
EIA JEDEC standard JSTD-020 level 4 label is included on all dry bags

**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**

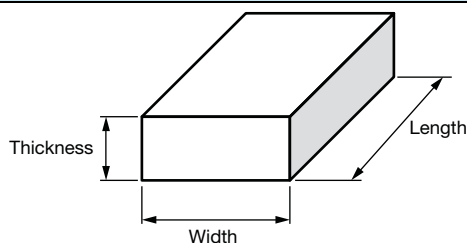
The Vishay Semiconductors standard bar code labels are printed at final packing areas. The labels are on each packing unit and contain Vishay Semiconductors specific data.



16962

**OUTER PACKAGING**

The sealed reel is packed into a pizza box.

**CARTON BOX DIMENSIONS** in millimeters

22127

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



## Disclaimer

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