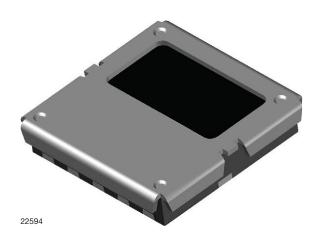


## **IR Receiver Modules for Remote Control Systems**



#### **DESIGN SUPPORT TOOLS**

click logo to get started



#### **ORDERING CODE**

#### Taping:

TSOP57...TT1 - top view taped TSOP57...TT2 - top view taped

#### **FEATURES**

- Improved immunity against HF and RF noise
- · Height of 0.8 mm
- ± 75° half angle sensitivity
- Low supply current
- Photo detector and preamplifier in one package
- 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 <a href="https://www.vishay.com/doc?99912"><u>www.vishay.com/doc?99912</u></a>





## RoHS

HALOGEN FREE

**GREEN** (5-2008)

#### **DESCRIPTION**

The TSOP573..H, TSOP575..H series are miniaturized receiver modules for infrared remote control systems. A PIN diode and a preamplifier are assembled on a lead frame, the epoxy lens cap contains an IR filter. The demodulated output signal can be directly connected to a microprocessor for decoding.

The TSOP573..H 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.

New designs should prefer the TSOP573..H series containing the newer AGC3. The TSOP575..H 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.

AGC		NOISY ENVIRONMENTS AND SHORT BURSTS (AGC3)	VERY NOISY ENVIRONMENTS AND SHORT BURSTS (AGC5)	
	36 kHz	TSOP57336H <sup>(1)</sup>	TSOP57536H <sup>(1)</sup>	
Carrier	38 kHz	TSOP57338H <sup>(2)(3)(4)(5)</sup>	TSOP57538H (2)(3)(4)	
frequency	40 kHz	TSOP57340H	TSOP57540H	
	56 kHz	TSOP57356H	TSOP57556H	
Package		Belobog shield		
Pinning		1= OUT, 2, 3, 6, 7, 8 = GND, 4, 5 = V <sub>S</sub>		
Dimensions	(mm)	4.3 W x 4.3 H x 1.0 D		
Mounting		SMD		
Application		Remote control		
Best choice	for	(1) MCIR (2) Mitsubishi (3) RECS-80 Code (4) r-map (5) XMP-1, XMP-2		

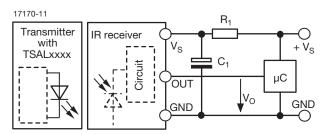


#### **BLOCK DIAGRAM**

# 4, 5 V<sub>S</sub> 33 kΩ Input AGC Band pass Demodulator dulator 2, 3, 6, 7, 8 GND

#### 20445-6

#### **APPLICATION CIRCUIT**



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

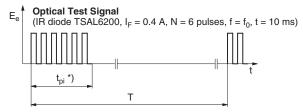
ABSOLUTE MAXIMUM RATINGS				
PARAMETER	TEST CONDITION	SYMBOL	VALUE	UNIT
Supply voltage		V <sub>S</sub>	-0.3 to +6	V
Supply current		I <sub>S</sub>	5	mA
Output voltage		Vo	-0.3 to (V <sub>S</sub> + 0.3)	V
Output current		I <sub>O</sub>	5	mA
Junction temperature		Tj	100	°C
Storage temperature range		T <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 OPTI	CAL CHARACTERISTICS	(T <sub>amb</sub> = 25 °	°C, unless o	otherwise s	pecified)	
PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT
Supply voltage		Vs	2.5	-	5.5	V
Supply ourrent	$V_{S} = 5 V, E_{V} = 0$	I <sub>SD</sub>	0.55	0.7	0.9	mA
Supply current	$E_v = 40$ klx, sunlight	I <sub>SH</sub>	-	0.8	-	mA
Transmission distance	$E_{\rm v}=0,$ IR diode TSAL6200, I <sub>F</sub> = 50 mA, test signal see Fig. 1	d	-	18	-	m
Output voltage low	$I_{OSL} = 0.5 \text{ mA}, E_e = 0.7 \text{ mW/m}^2,$ test signal see Fig. 1	V <sub>OSL</sub>	-	-	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 <sub>e min.</sub>	-	0.2	0.4	mW/m²
Maximum irradiance	$t_{pi}$ - 5/f <sub>o</sub> < $t_{po}$ < $t_{pi}$ + 6/f <sub>o</sub> , test signal see Fig. 1	E <sub>e max.</sub>	50	-	-	W/m <sup>2</sup>
Directivity	Angle of half transmission distance	Φ1/2	-	± 75	-	deg

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



\*)  $t_{\text{ni}} \ge 6/f_0$  is recommended for optimal function

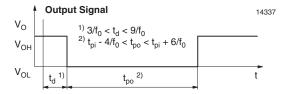


Fig. 1 - Output Active Low

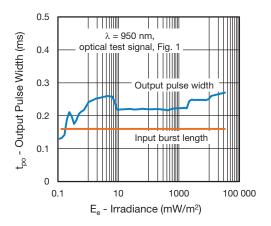


Fig. 2 - Pulse Length and Sensitivity in Dark Ambient

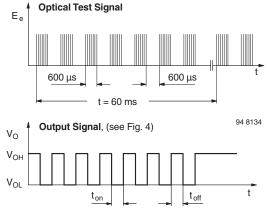


Fig. 3 - Output Function

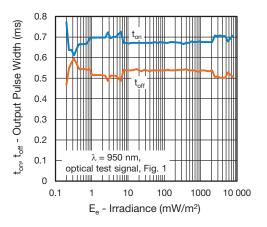


Fig. 4 - Output Pulse Diagram

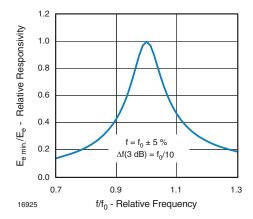


Fig. 5 - Frequency Dependance of Responsivity

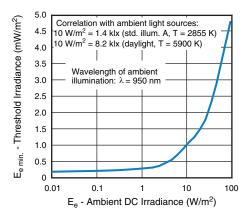


Fig. 6 - Sensitivity in Bright Ambient



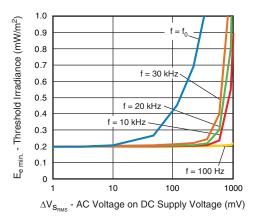


Fig. 7 - Sensitivity vs. Supply Voltage Disturbances

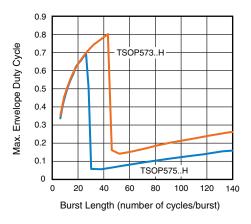


Fig. 8 - Max. Envelope Duty Cycle vs. Burst Length

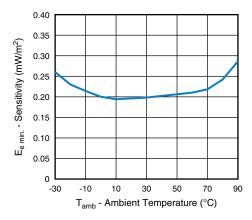


Fig. 9 - Sensitivity vs. Ambient Temperature

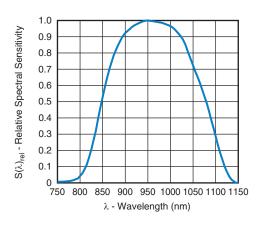


Fig. 10 - Relative Spectral Sensitivity vs. Wavelength

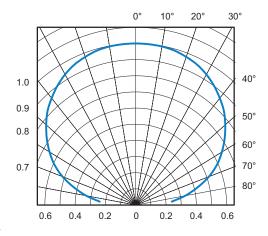


Fig. 11 - Horizontal Directivity

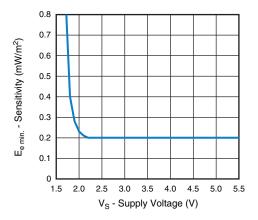


Fig. 12 - Sensitivity vs. Supply Voltage

21947

#### **SUITABLE DATA FORMAT**

The TSOP573..H, TSOP575..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 TSOP573..H, TSOP575..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)
- 2.4 GHz and 5 GHz Wi-Fi

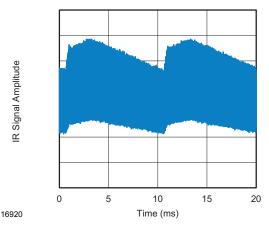


Fig. 13 - IR Signal from Fluorescent Lamp With Low Modulation

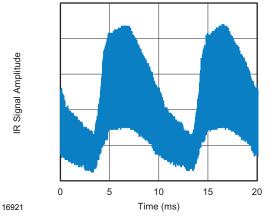


Fig. 14 - IR Signal from Fluorescent Lamp With High Modulation

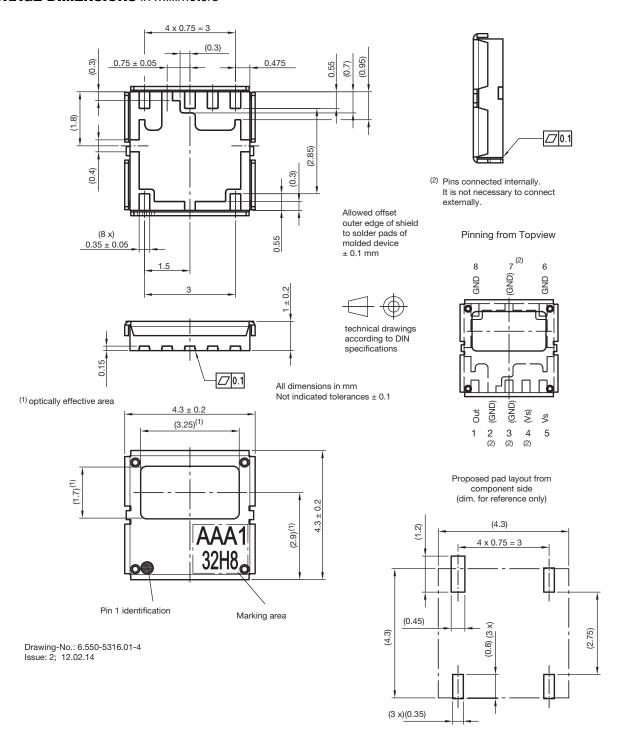
	TSOP573H	TSOP575H
Minimum burst length	6 cycles/burst	6 cycles/burst
After each burst of length a minimum gap time is required of	6 to 35 cycles ≥ 10 cycles	6 to 24 cycles ≥ 10 cycles
For bursts greater than a minimum gap time in the data stream is needed of	35 cycles > 6 x burst length	24 cycles > 25 ms
Maximum number of continuous short bursts/second	2000	2000
MCIR code	Preferred	Yes
XMP-1, XMP-2 code	Preferred	Yes
Suppression of interference from fluorescent lamps	Mild and complex disturbance patterns are suppressed (example: signal pattern of Fig. 13 and 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 TSOP572..H, TSOP574..H



#### **PACKAGE DIMENSIONS** in millimeters





#### **ASSEMBLY INSTRUCTIONS**

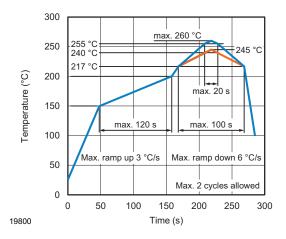
#### **Reflow Soldering**

- 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**



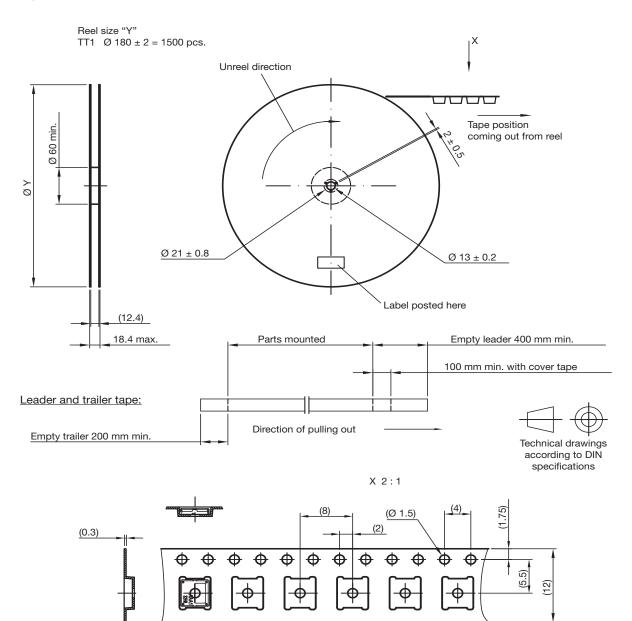
ORDERING INFORMATION			
ORDERING CODE	PACKAGING	VOLUME (1)	REMARKS
TSOP57HTT1	Tana and roal	MOQ: 1500 pcs	3.95 mm x 3.95 mm x 0.75 mm
TSOP57HTT2	Tape and reel	MOQ: 5000 pcs	3.93 11111 x 3.93 11111 x 0.73 11111

#### Note

(1) MOQ: minimum order quantity

#### TAPING VERSION TSOP57...H DIMENSIONS in millimeters

Tape and reel dimensions:



Drawing-No.: 9.700-5380.01-4

Issue: 3; 07.03.18

Not indicated tolerances ± 0.1



#### LABEL

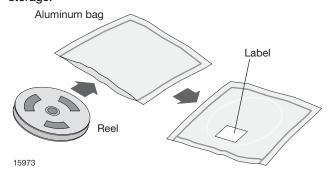
#### Standard bar code labels for finished goods

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.

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	xxxxxx+	Company logo	
Long bar code top	Туре	Length	
Item-number	N	8	
Plant-code	N	2	
Sequence-number	X	3	
Quantity	N	8	
Total length	-	21	
Short bar code bottom	Туре	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 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  $^{\tiny{(8)}}$  standard J-STD-020 level 3 label is included on all dry bags.

## TSOP573..H, TSOP575..H

# Vishay Semiconductors

#### www.vishay.com

6	Caution This bag contains MOISTURE-SENSITIVE DEVICES Thank, see adjacent the rook thick lift before the bar or be the rook the r
	lated shelf life in sealed bag: 12 months at $<\!\!40^{\circ}\mathrm{C}$ and $<\!\!90\%$ we humidity (RH)
2. Peak	package body temperature:
	bag is opened, devices that will be subjected to reflow solder or other high erature process must be
	ounted within: 168 hours of factory conditions lifblank, see adjacent bar code label C/60% RH, or
b) Sto	ored per J-STD-033
4. Devi	ces require bake, before mounting, if:
	midity Indicator Card reads > 10% for level 2a - 5a devices or >60% for 2 devices when read at 23±5°C
b) 3a	or 3b are not met
5. If bal	ring is required, refer to IPC/JEDEC J-STD-033 for bake procedure
Bag Sea	al Date:
	If blank, see adjacent bar code label
	Note: Level and body temperature defined by IPC/JEDEC J-STD-020
650	

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)

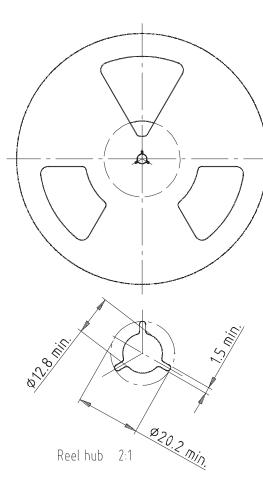
TSOP75338WTT (reel packing)

TSOP57438TT1 (reel packing)

TSOP57238HTT1 (reel packing)

TSOP39438TR1 (reel packing)

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



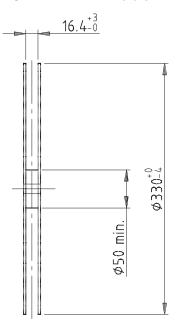
Drawing-No.: 9.800-5052.V2-4

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

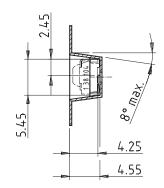


technical drawings according to DIN specifications

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

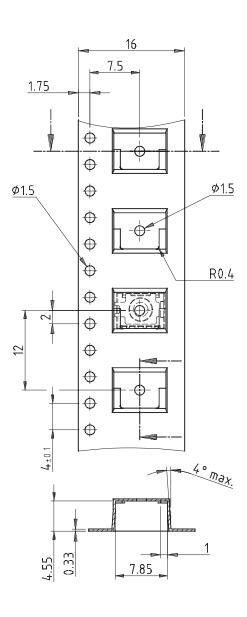
A. Panhead (TSOP36...TT, TSSP....TT, TSOP6...TT, TSOP16...TT, TSOP96...TT)





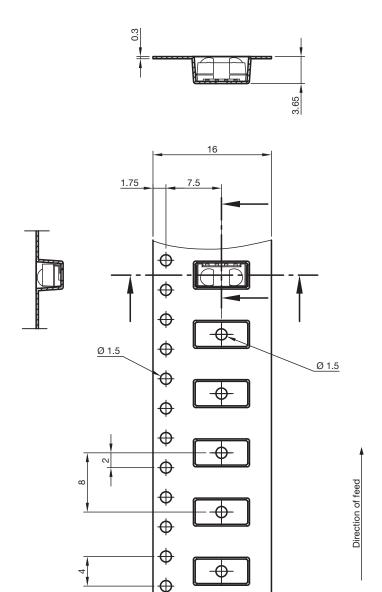
Drawing-No.: 9.700-5259.01-4 Issue: 1; 05.09.01

16584



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

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



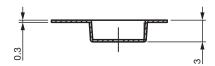
Drawing-No.: 9.700-5338.01-4

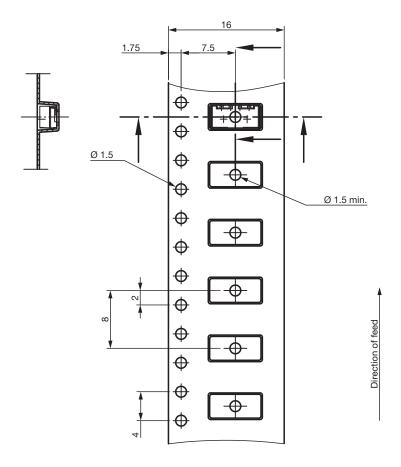
Issue: 4; 12.06.13

technical drawings according to DIN specifications

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

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





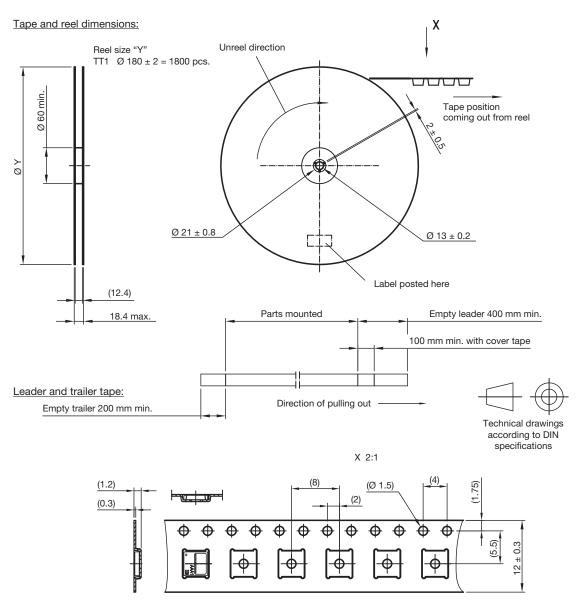
Drawing-No.: 9.700-5341.01-4

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)



Drawing-No.: 9.700-5347.01-4

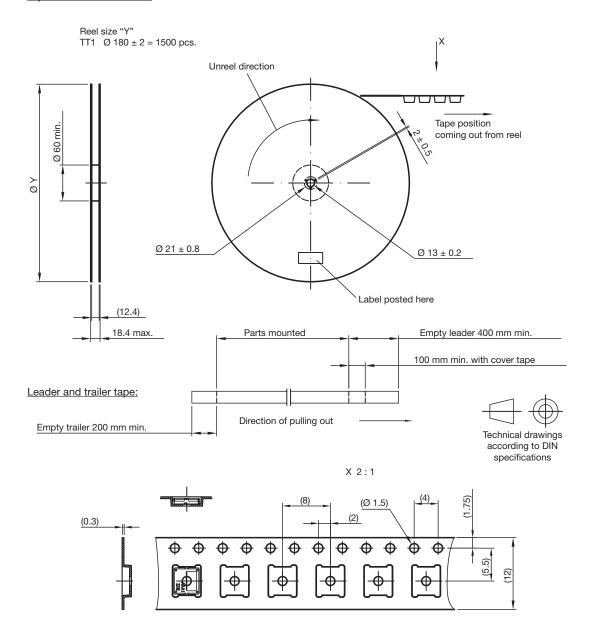
Issue: 2; 07.03.18

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:



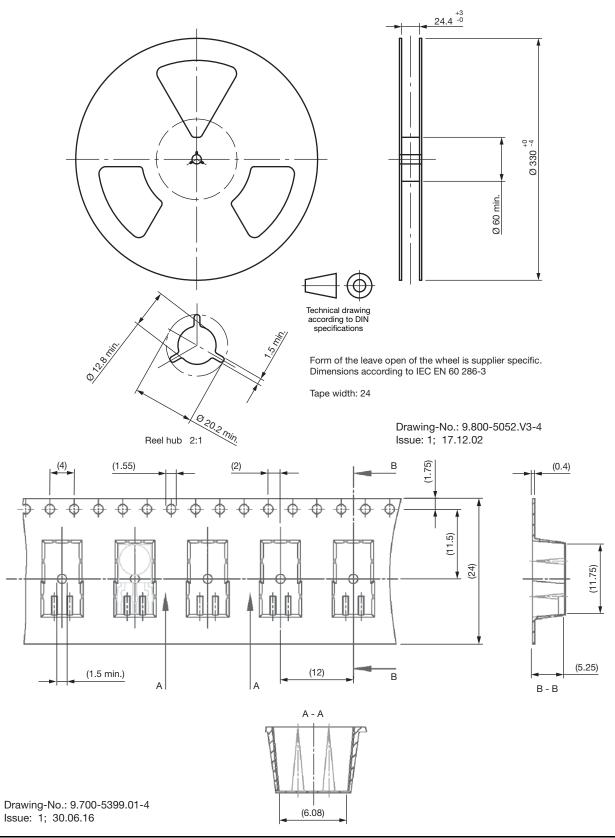
Drawing-No.: 9.700-5380.01-4

Issue: 3; 07.03.18

Not indicated tolerances ± 0.1

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

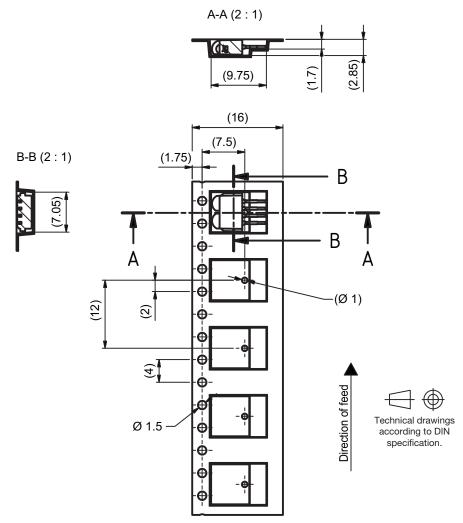
F. Minimold DF1P (TSOP33...DF1P, TSOP53...DF1P, TSOP13...DF1P, TSOP93...DF1P)





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

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

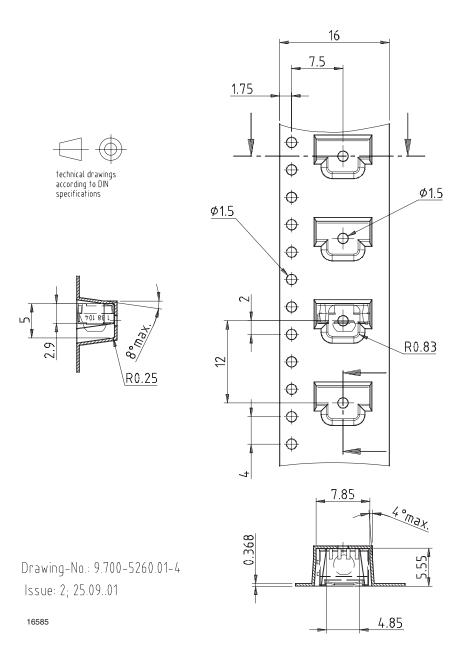


Drawing-No.: GO-100220.10\_Z

Issue B: 08.02.17

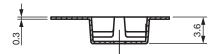
#### TAPING VERSION TSOP..TR (SIDE VIEW) DIMENSIONS in millimeters

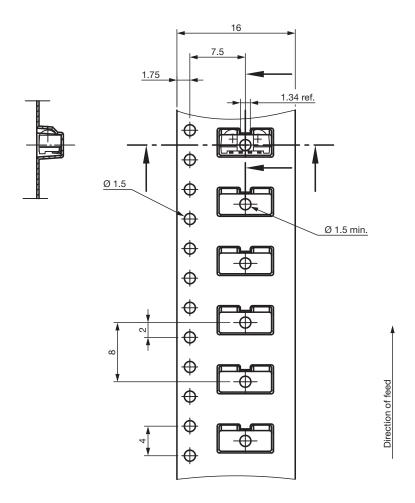
A. Panhead (TSOP36...TR, TSSP6...TR, TSOP6...TR, TSOP16...TR, TSOP96...TR)



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

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





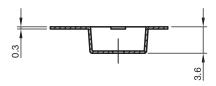
Drawing-No.: 9.700-5337.01-4

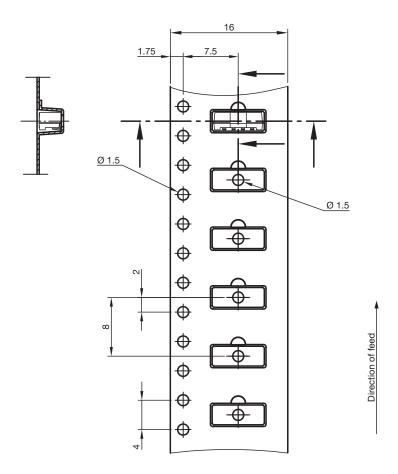
Issue: 2; 06.10.15

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)

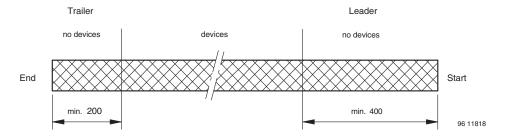




Drawing-No.: 9.700-5342.01-4 Issue: 2; 12.06.13 technical drawings according to DIN specifications



#### **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

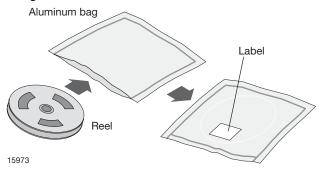
The standard bar code labels are product labels and used for identification of goods. The finished goods are packed in final packing area. The standard packing units are labeled with standard bar code labels before transported as finished goods to warehouses. The labels are on each packing unit and contain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

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.



#### 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.

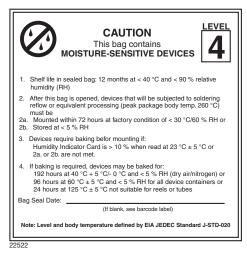
In case of moisture absorption, the devices will recover to the former condition by drying under the following condition:

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  $^{\!0}\!\!\!\!\!^{^{^{\phantom{0}}}}$  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.

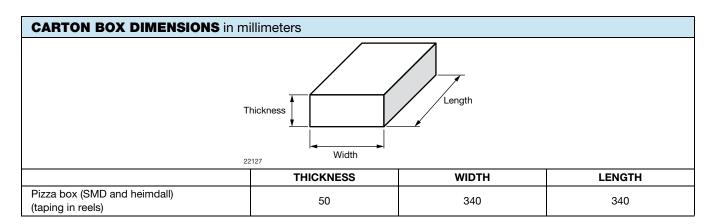
# VISHAY SEMICONDUCTORS STANDARD BAR CODE LABELS

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.



#### **OUTER PACKAGING**

The sealed reel is packed into a pizza box.





## **Legal Disclaimer Notice**

Vishay

### **Disclaimer**

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Компания «ЭлектроПласт» предлагает заключение долгосрочных отношений при поставках импортных электронных компонентов на взаимовыгодных условиях!

#### Наши преимущества:

- Оперативные поставки широкого спектра электронных компонентов отечественного и импортного производства напрямую от производителей и с крупнейших мировых складов:
- Поставка более 17-ти миллионов наименований электронных компонентов;
- Поставка сложных, дефицитных, либо снятых с производства позиций;
- Оперативные сроки поставки под заказ (от 5 рабочих дней);
- Экспресс доставка в любую точку России;
- Техническая поддержка проекта, помощь в подборе аналогов, поставка прототипов;
- Система менеджмента качества сертифицирована по Международному стандарту ISO 9001:
- Лицензия ФСБ на осуществление работ с использованием сведений, составляющих государственную тайну;
- Поставка специализированных компонентов (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Aeroflex, Peregrine, Syfer, Eurofarad, Texas Instrument, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits, General Dynamics и др.);

Помимо этого, одним из направлений компании «ЭлектроПласт» является направление «Источники питания». Мы предлагаем Вам помощь Конструкторского отдела:

- Подбор оптимального решения, техническое обоснование при выборе компонента;
- Подбор аналогов;
- Консультации по применению компонента;
- Поставка образцов и прототипов;
- Техническая поддержка проекта;
- Защита от снятия компонента с производства.



#### Как с нами связаться

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