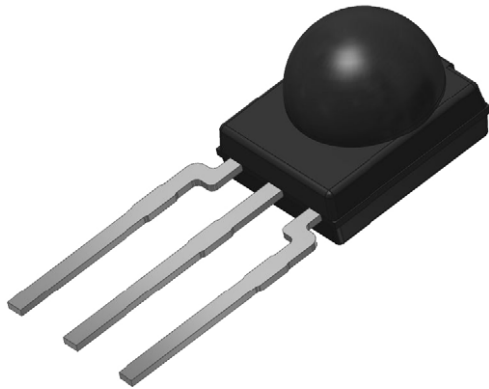




IR Receiver Modules for Remote Control Systems



MECHANICAL DATA

Pinning for TSOP33...:

1 = OUT, 2 = GND, 3 = V_S

FEATURES

- Very 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 ambient light
- 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



DESCRIPTION

The TSOP33... 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.

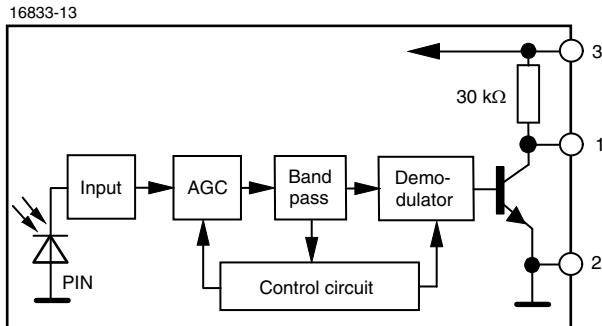
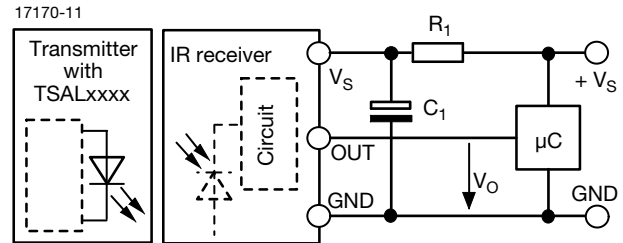
The demodulated output signal can be directly connected to a microprocessor for decoding.

The TSOP333.. series devices are optimized to suppress almost all spurious pulses from energy saving lamps like CFLs. AGC3 may also suppress some data signals if continuously transmitted.

The TSOP331.. series are provided primarily for compatibility with old AGC1 designs. New designs should prefer the TSOP333.. series containing the newer AGC3. The TSOP335.. series contain a very robust AGC5. This series should only be used for critically noisy environments.

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 | TSOP33130 | TSOP33330 | TSOP33530 |
| | 33 kHz | TSOP33133 | TSOP33333 | TSOP33533 |
| | 36 kHz | TSOP33136 | TSOP33336 ⁽¹⁾⁽²⁾⁽⁷⁾ | TSOP33536 |
| | 38 kHz | TSOP33138 | TSOP33338 ⁽³⁾⁽⁴⁾⁽⁵⁾⁽⁶⁾ | TSOP33538 |
| | 40 kHz | TSOP33140 | TSOP33340 | TSOP33540 |
| | 56 kHz | TSOP33156 | TSOP33356 | TSOP33556 |
| Package | Minimold | | | |
| Pinning | 1 = OUT, 2 = GND, 3 = V _S | | | |
| Dimensions (mm) | 5.4 W x 6.35 H x 4.9 D | | | |
| Mounting | Leaded | | | |
| Application | Remote control | | | |
| Best remote control code | ⁽¹⁾ MCIR ⁽²⁾ RCMM ⁽³⁾ Mitsubishi ⁽⁴⁾ RECS-80 Code ⁽⁵⁾ r-map ⁽⁶⁾ XMP-1, XMP-2 ⁽⁷⁾ RCMM | | | |

BLOCK DIAGRAM

APPLICATION CIRCUIT


R_1 and C_1 recommended to reduce supply ripple for $V_S < 2.8$ V

ABSOLUTE MAXIMUM RATINGS

| PARAMETER | TEST CONDITION | SYMBOL | VALUE | UNIT |
|-----------------------------|-------------------------------|-----------|-----------------------|------|
| Supply voltage | | V_S | -0.3 to +6 | V |
| Supply current | | I_S | 3 | mA |
| Output voltage | | 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 | $T_{amb} \leq 85$ °C | P_{tot} | 10 | mW |
| Soldering temperature | $t \leq 10$ s, 1 mm from case | T_{sd} | 260 | °C |

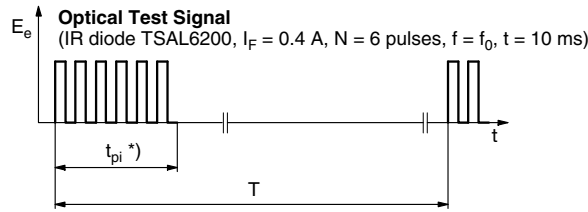
Note

- 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 ($T_{amb} = 25$ °C, unless otherwise specified)

| PARAMETER | TEST CONDITION | SYMBOL | MIN. | TYP. | MAX. | UNIT |
|-----------------------|--|--------------|------|----------|------|-------------------|
| Supply current | $E_v = 0, V_S = 3.3$ V | I_{SD} | 0.27 | 0.35 | 0.45 | mA |
| | $E_v = 40$ klx, sunlight | I_{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, $I_F = 150$ mA | d | - | 45 | - | m |
| Output voltage low | $I_{OSL} = 0.5$ mA, $E_e = 0.7$ mW/m ² , test signal see Fig. 1 | V_{OSL} | - | - | 100 | mV |
| Minimum irradiance | Pulse width tolerance: $t_{pi} - 5/f_0 < t_{po} < t_{pi} + 6/f_0$, test signal see Fig. 1 | E_e min. | - | 0.08 | 0.15 | mW/m ² |
| Maximum irradiance | $t_{pi} - 5/f_0 < t_{po} < t_{pi} + 6/f_0$, test signal see Fig. 1 | E_e max. | 30 | - | - | W/m ² |
| Directivity | Angle of half transmission distance | $\phi_{1/2}$ | - | ± 45 | - | deg |

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



*) $t_{pi} \geq 6/f_0$ is recommended for optimal function

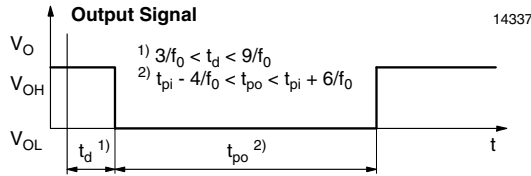


Fig. 1 - Output Active Low

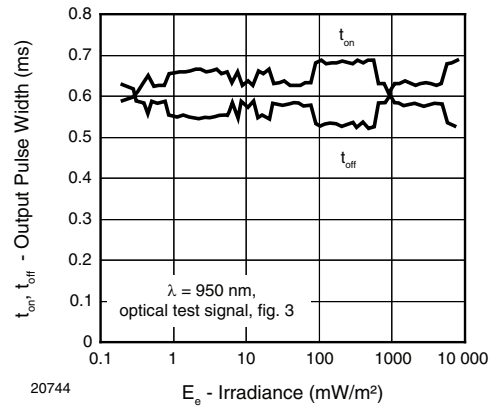


Fig. 4 - Output Pulse Diagram

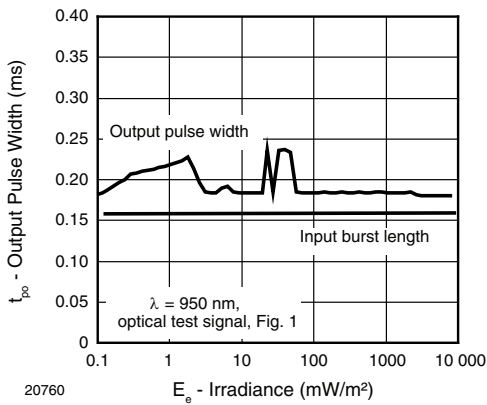


Fig. 2 - Pulse Length and Sensitivity in Dark Ambient

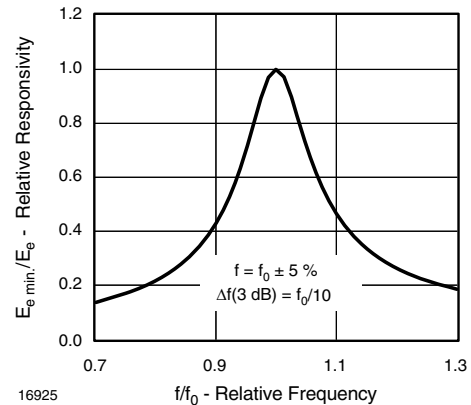


Fig. 5 - Frequency Dependence of Responsivity

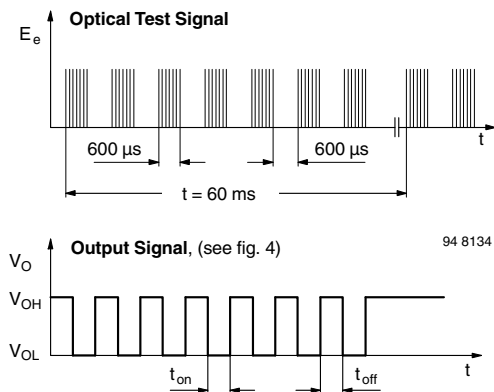


Fig. 3 - Output Function

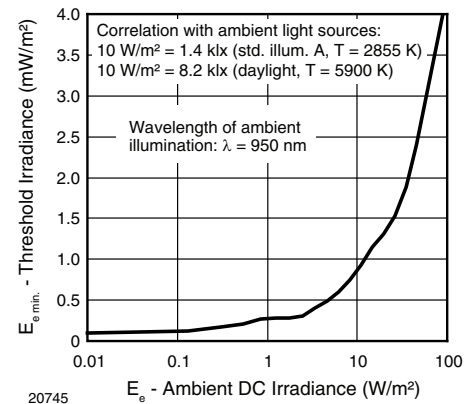


Fig. 6 - Sensitivity in Bright Ambient

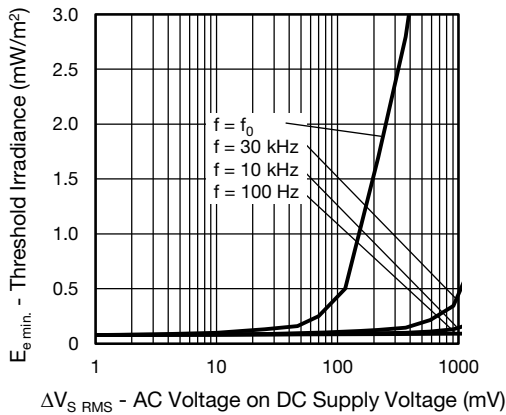


Fig. 7 - Sensitivity vs. Supply Voltage Disturbances

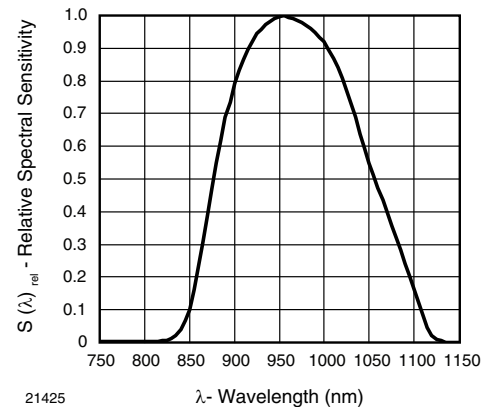


Fig. 10 - Relative Spectral Sensitivity vs. Wavelength

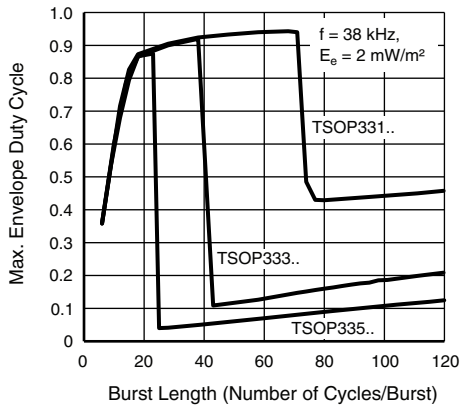


Fig. 8 - Max. Envelope Duty Cycle vs. Burst Length

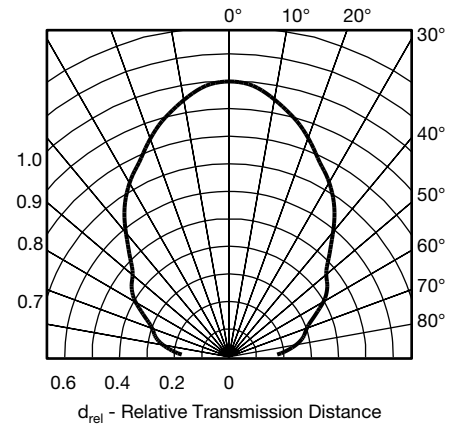


Fig. 11 - Horizontal Directivity

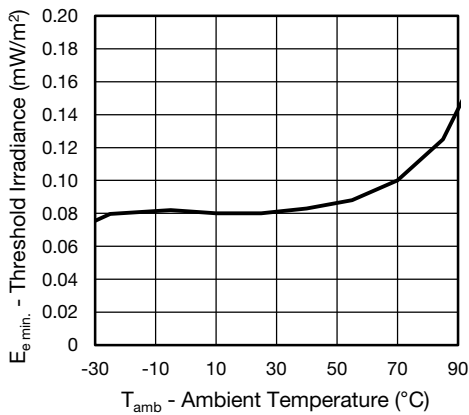


Fig. 9 - Sensitivity vs. Ambient Temperature

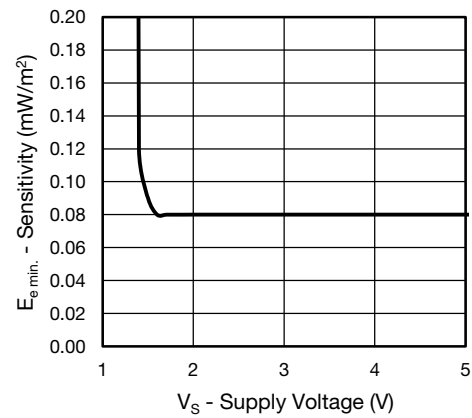


Fig. 12 - Sensitivity vs. Supply Voltage

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).

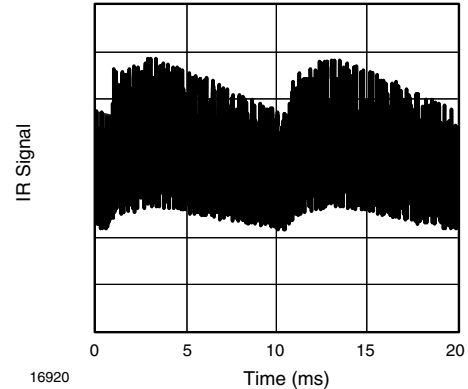


Fig. 13 - IR Disturbance from Fluorescent Lamp with Low Modulation

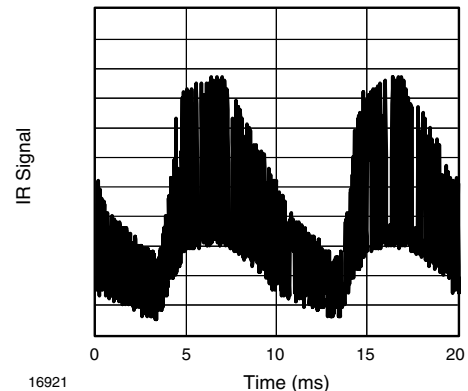


Fig. 14 - IR Disturbance from Fluorescent Lamp with High Modulation

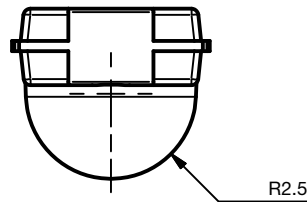
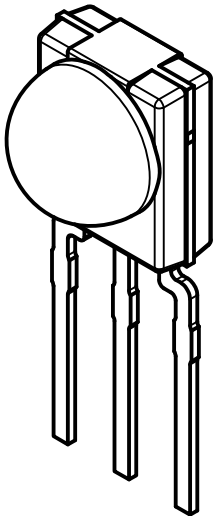
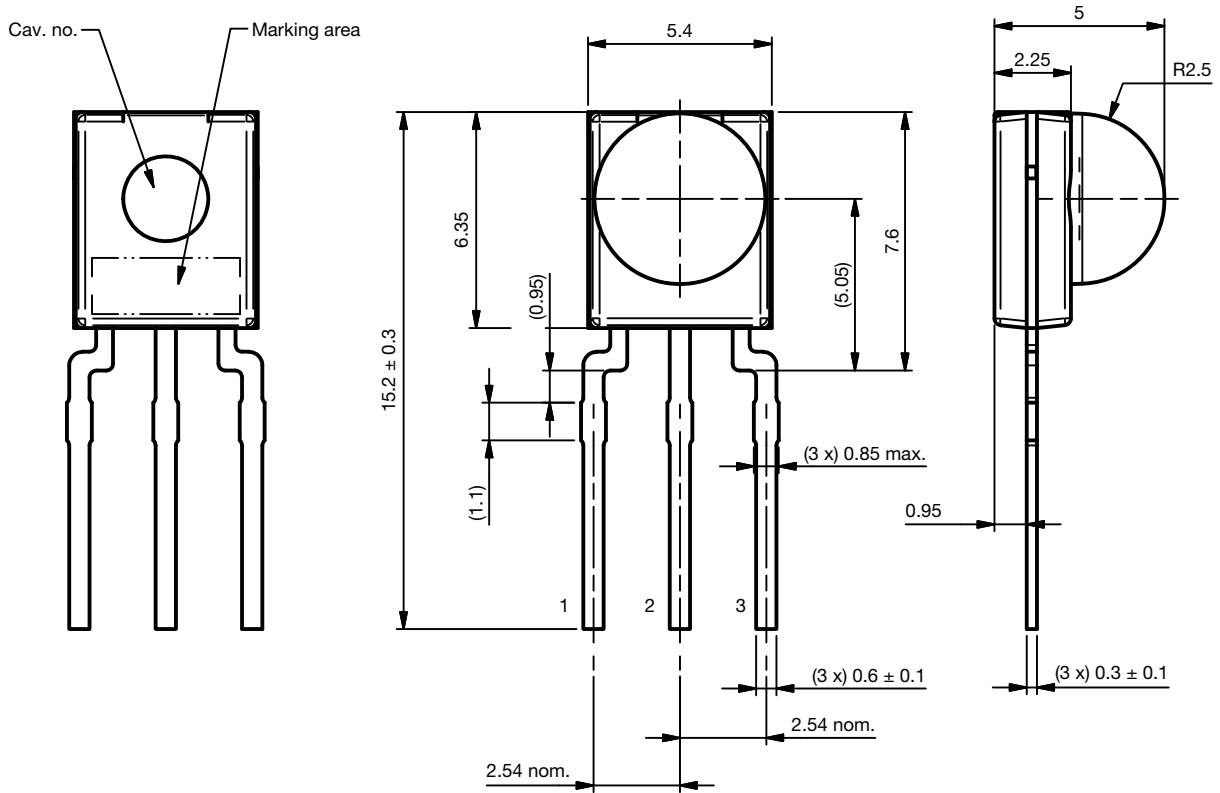
| | TSOP331.. | TSOP333.. | TSOP335.. |
|--|---|--|---|
| Minimum burst length | 6 cycles/burst | 6 cycles/burst | 6 cycles/burst |
| After each burst of length A gap time is required of | 6 to 70 cycles ≥ 10 cycles | 6 to 35 cycles ≥ 10 cycles | 6 to 24 cycles ≥ 10 cycles |
| For bursts greater than 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 |
| RCMM code | Yes | Preferred | Yes |
| XMP-1, XMP-2 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

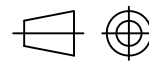
- For data formats with long bursts (more than 10 carrier cycles) please see the datasheet for TSOP332.., TSOP334..



PACKAGE DIMENSIONS in millimeters



Not indicated tolerances ± 0.2



Technical drawings according to DIN specification.

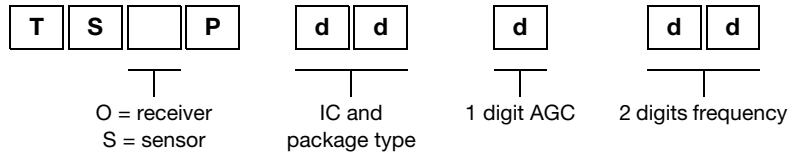
Drawing no.: 6.550-5335.01-4
Issue: 1; 16.09.15



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: **TSOP33338**

TSOP33356V11

TSOP33338SS1F

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

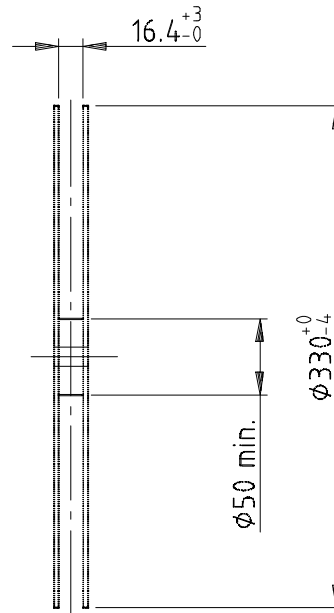
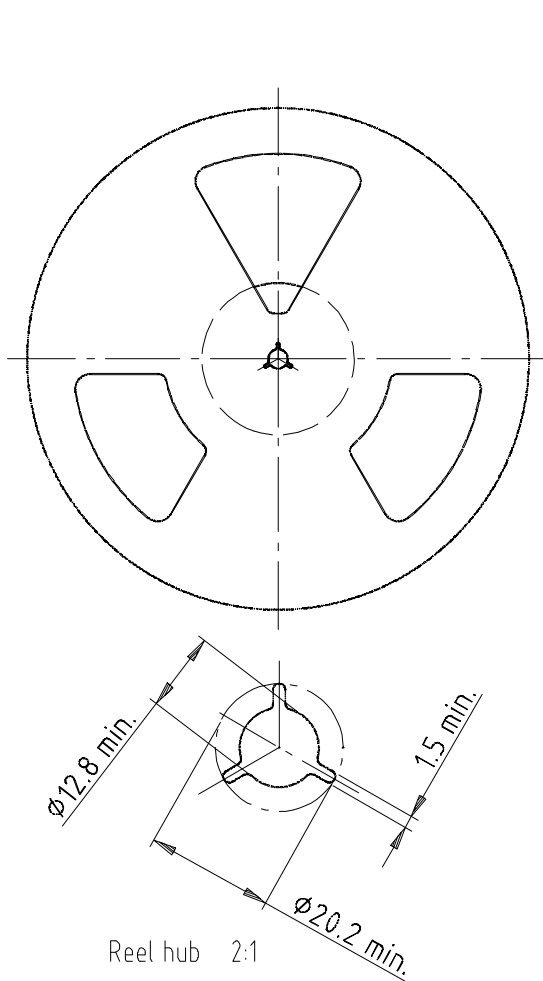
The type designation of the device is extended by TT or TT1 for top view or TR for side view.

Example:

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



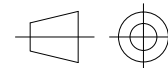
REEL DIMENSIONS FOR PANHEAD, HEIMDALL, AND TVCASTSMD TR in millimeters



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

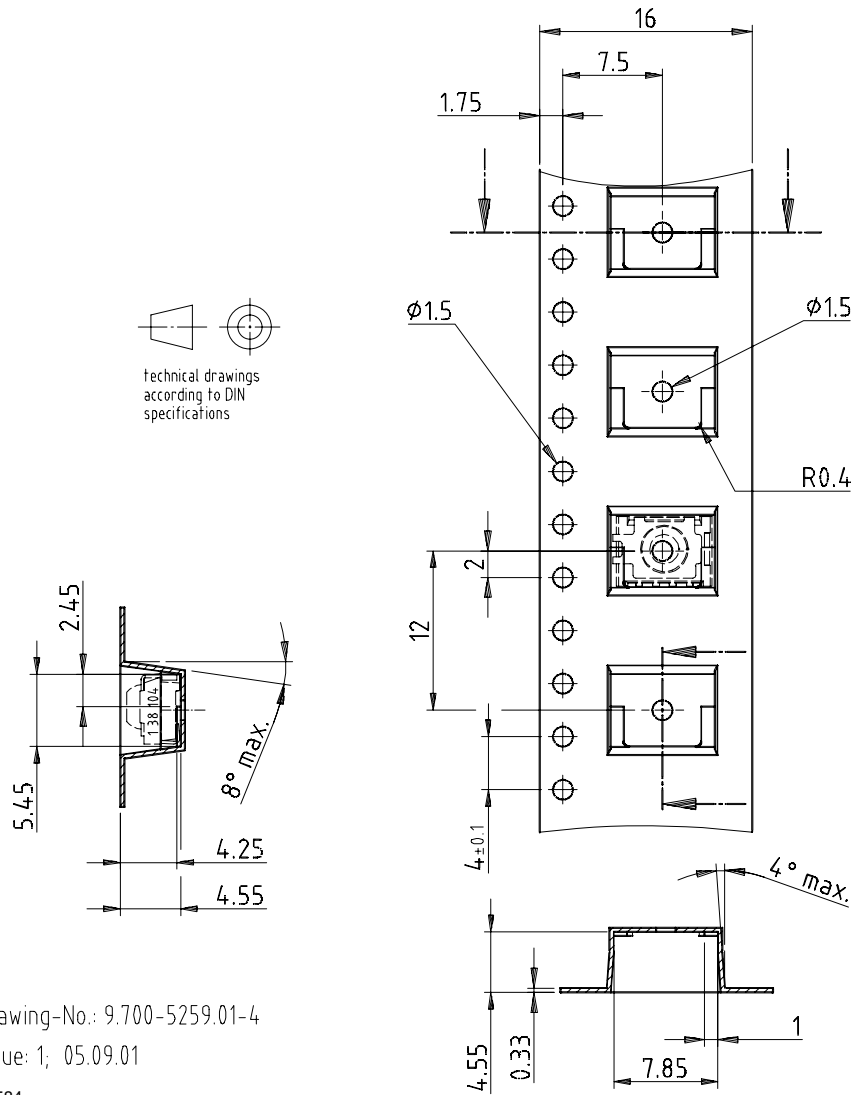
Note

- 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

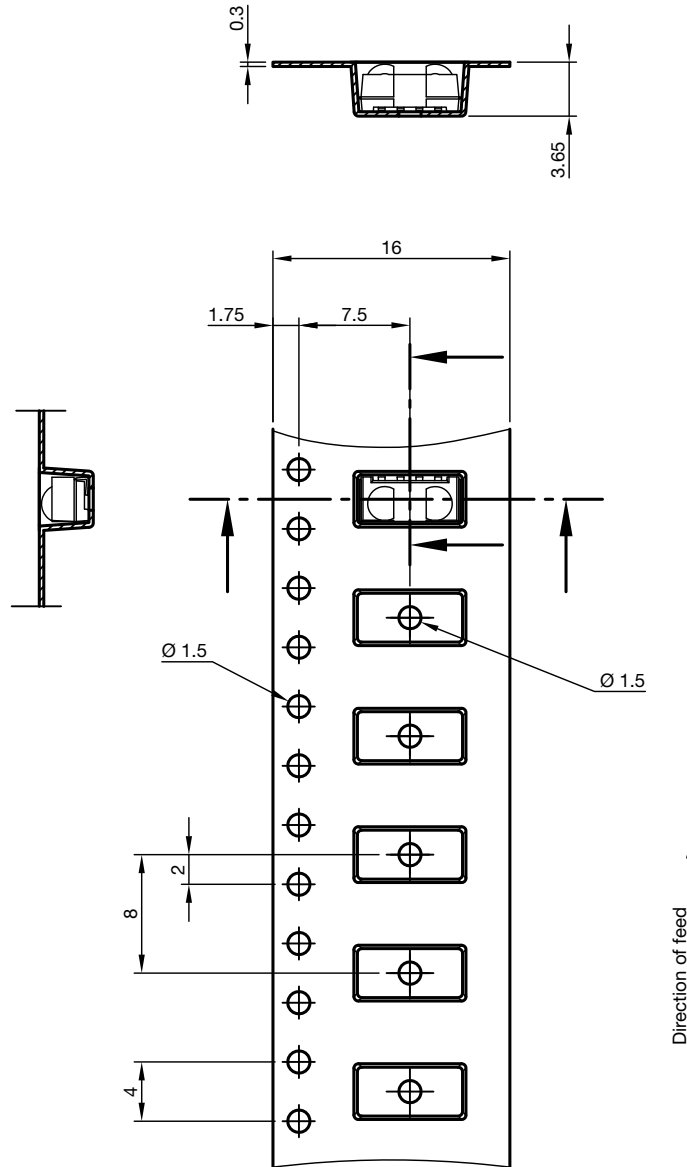
Issue: 1; 05.09.01

16584

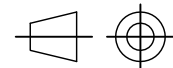


TAPING VERSION TSOP..TT (TOP VIEW) DIMENSIONS in millimeters

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



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



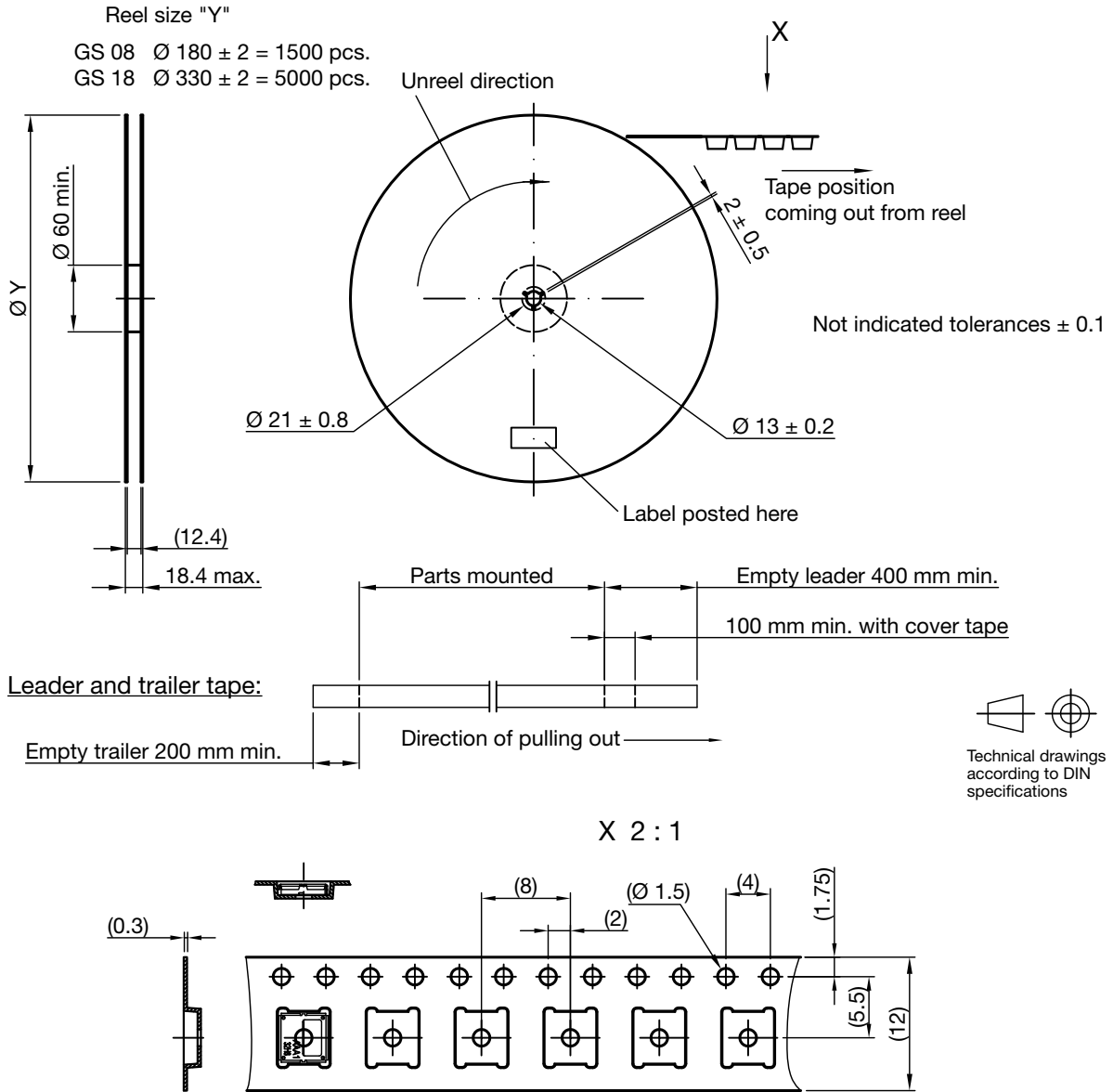
technical drawings
according to DIN
specifications



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

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

Tape and Reel dimensions:



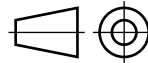
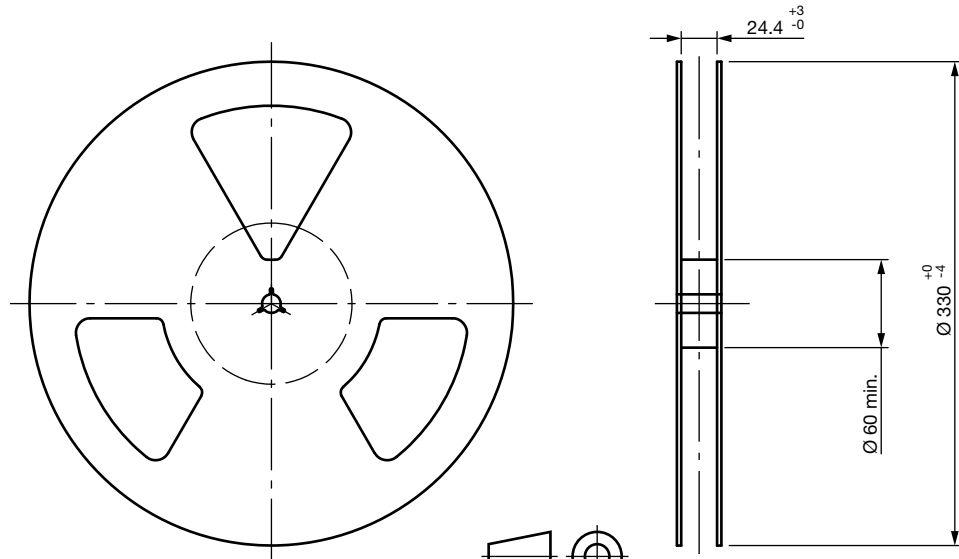
Reel dimensions and tape

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



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

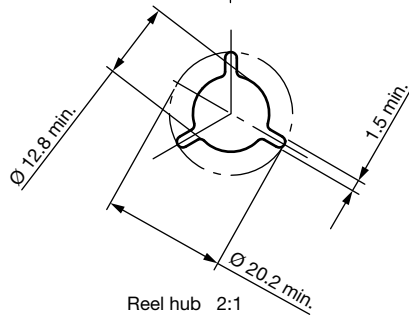
F. Minimold DF1P (TSOP33...DF1P, TSOP53...DF1P)



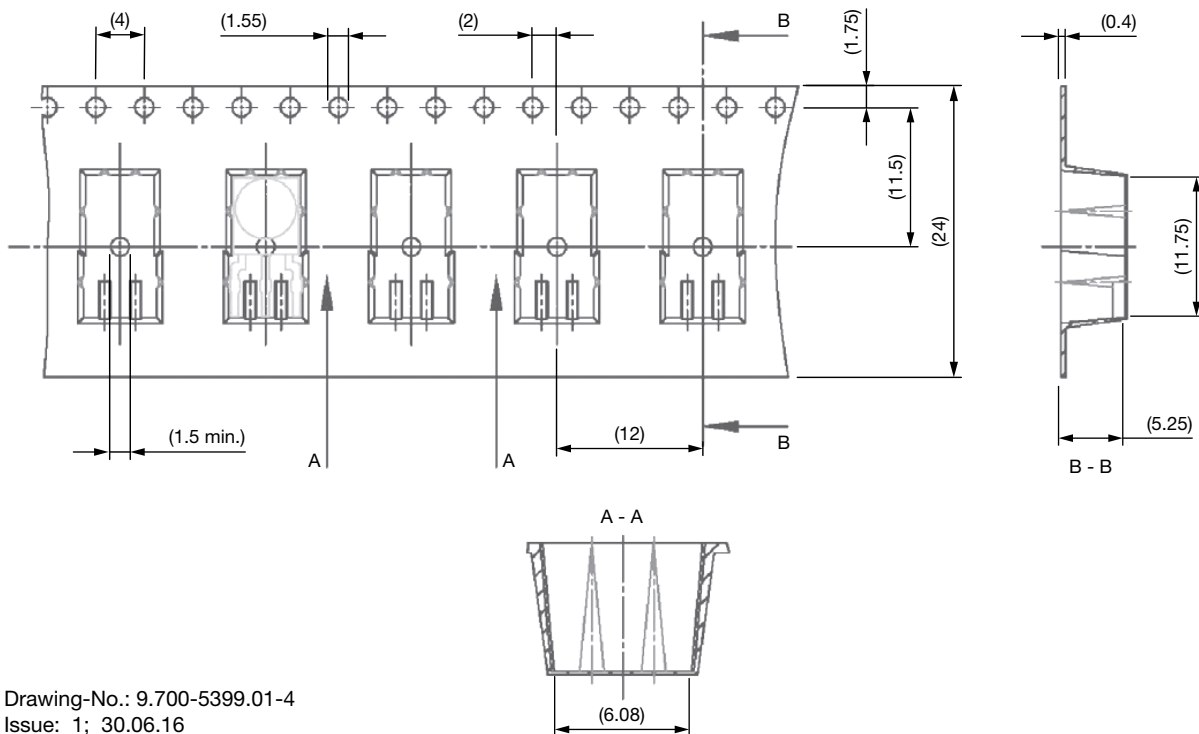
Technical drawing according to DIN specifications

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

Tape width: 24



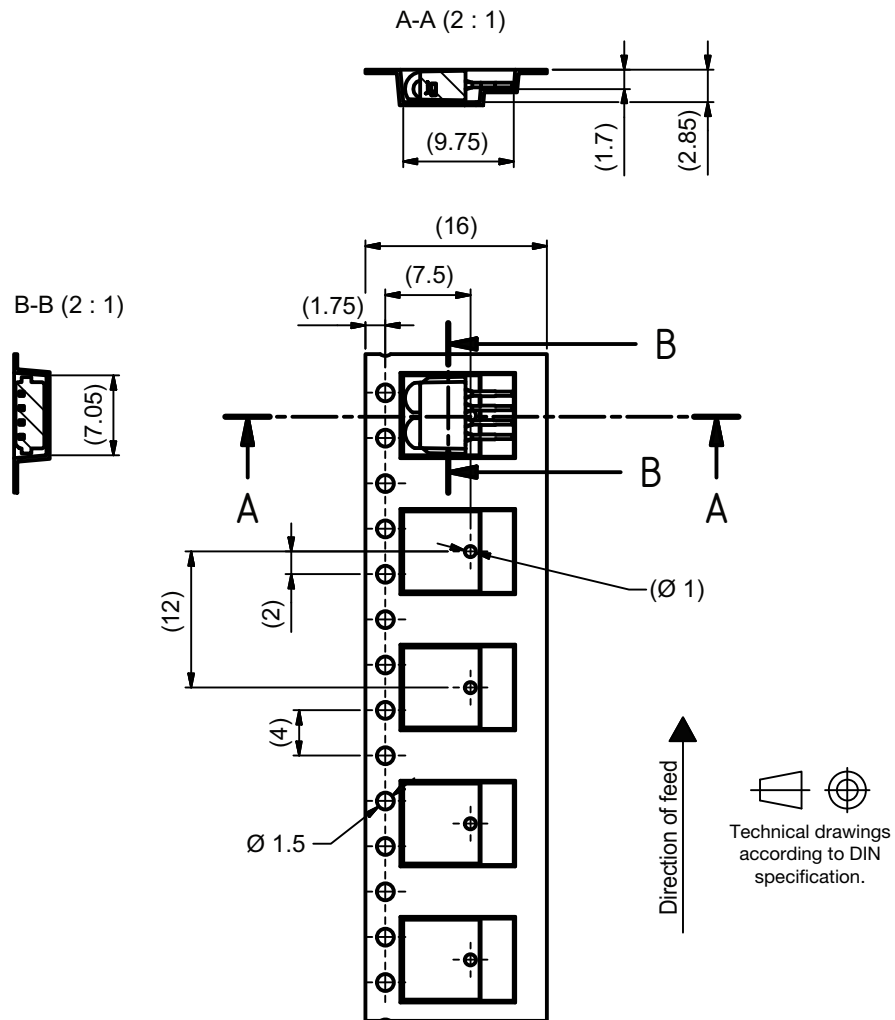
Drawing-No.: 9.800-5052.V3-4
Issue: 1; 17.12.02



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)

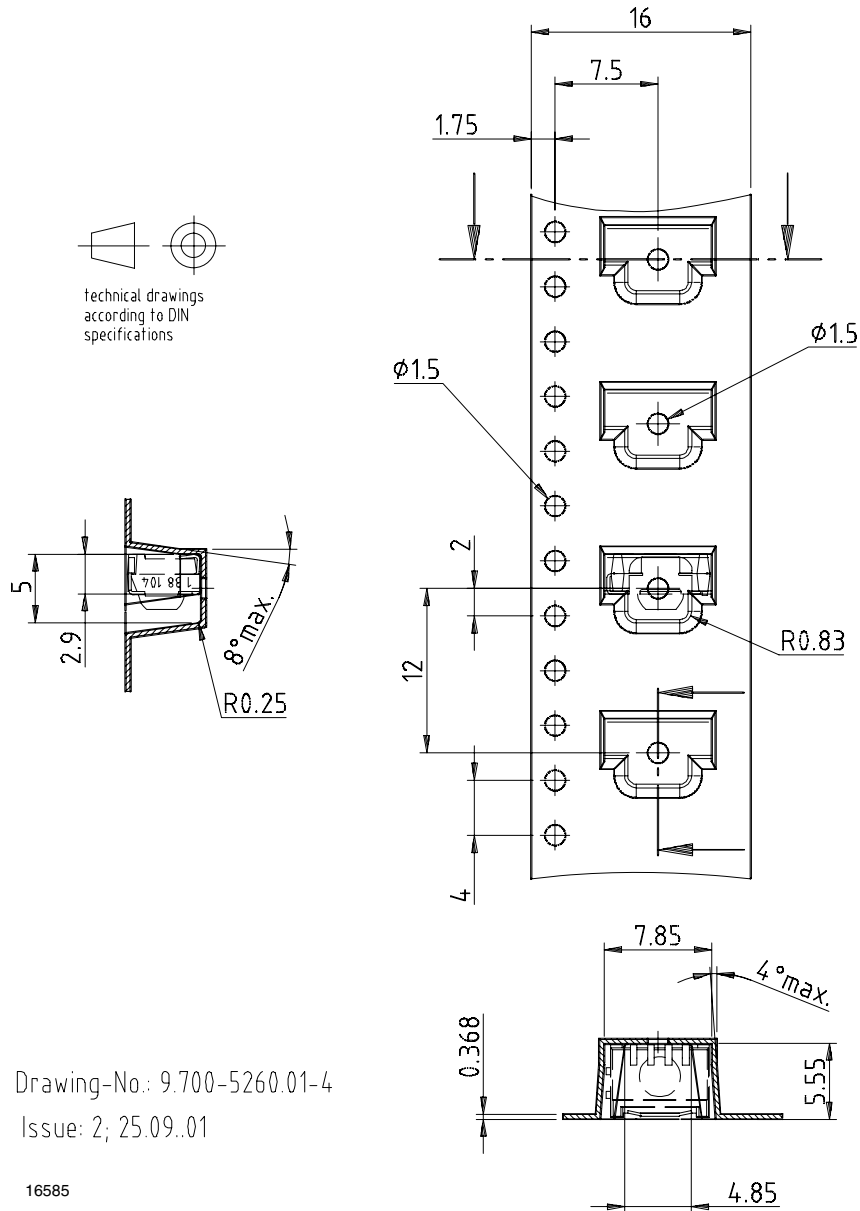


Drawing-No.: GO-100220.10_Z
Issue B: 08.02.17



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

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



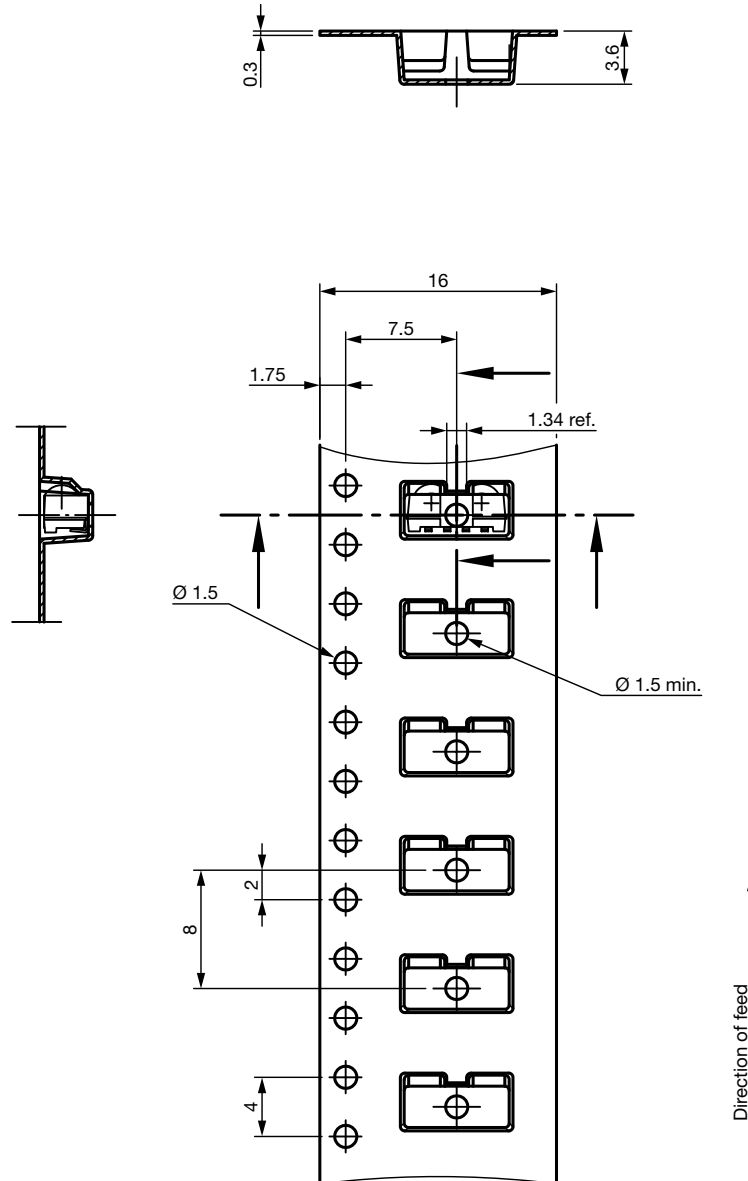
Drawing-No.: 9.700-5260.01-4

Issue: 2; 25.09..01

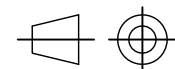
16585

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

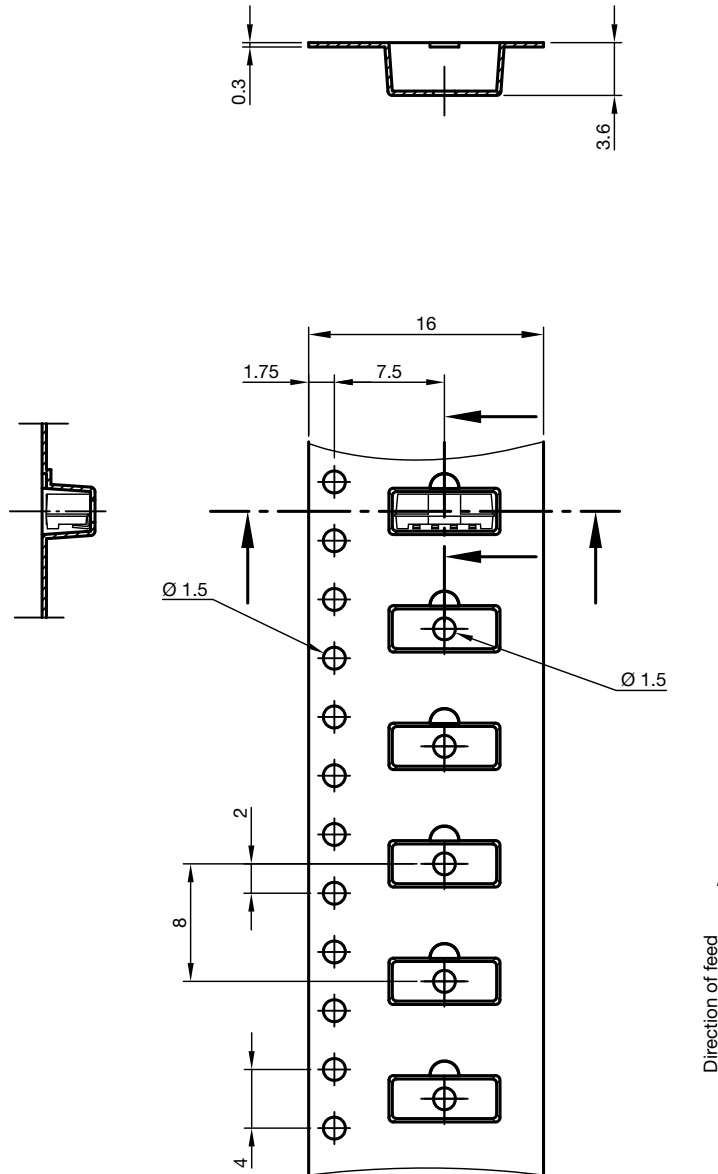


technical drawings
according to DIN
specifications



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

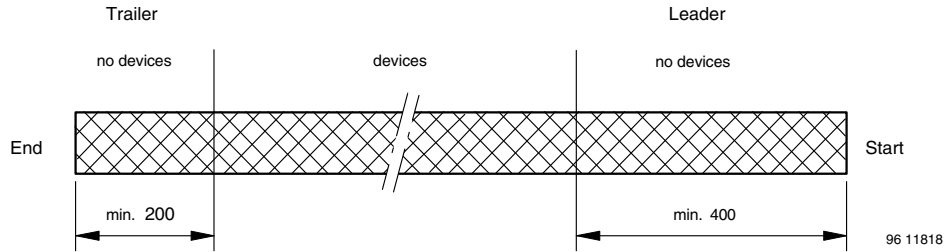
C. Heimdall without lens (TSOP75...WTR, TSOP77...WTR, TSSP...WTR)



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

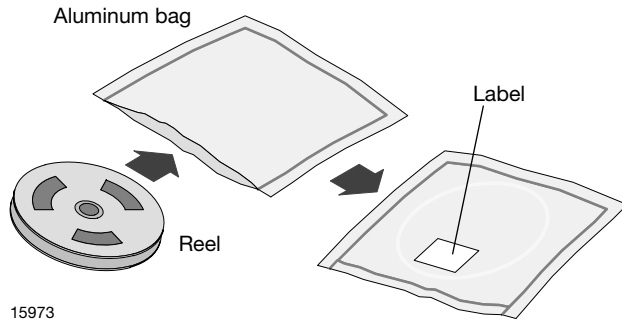
Standard bar code labels for finished goods

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.

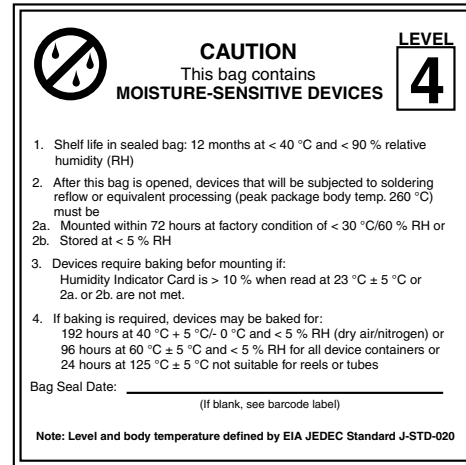
After more than 72 h under these conditions moisture content will be too high for reflow soldering.

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

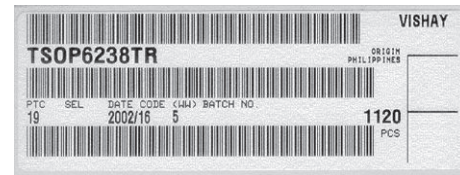
EIA JEDEC standard JSTD-020 level 4 label is included on all dry bags

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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