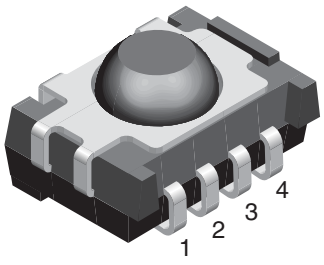
# IR Receiver Modules for Remote Control Systems

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## FEATURES

- Low supply current
- Photo detector and preamplifier in one package
- Internal filter for PCM frequency
- Improved shielding against EMI
- Supply voltage: 2.5 V to 5.5 V
- Improved immunity against ambient light
- Insensitive to supply voltage ripple and noise
- Taping available for top view and side view assembly
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

Pb-free

e3

RoHS COMPLIANT

HALOGEN FREE

GREEN (5-2008)

## MECHANICAL DATA

**Pinning**

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

## ORDERING CODE

**Taping:**

TSOP6...TT - top view taped

TSOP6...TR - side view taped

## DESCRIPTION

The TSOP6... series are miniaturized SMD IR receiver modules for infrared remote control systems. A PIN diode and a preamplifier are assembled on a leadframe, the epoxy package contains an IR filter.

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

The TSOP62.. and TSOP64.. are optimized to suppress almost all spurious pulses from energy saving lamps like CFLs. The AGC4 used in the TSOP64.. may suppress some data signals. The TSOP62.. is a legacy product for all common IR remote control data formats. Between these two receiver types, the TSOP64.. is preferred. Customers should initially try the TSOP64.. in their design.

These components have not been qualified according to automotive specifications.

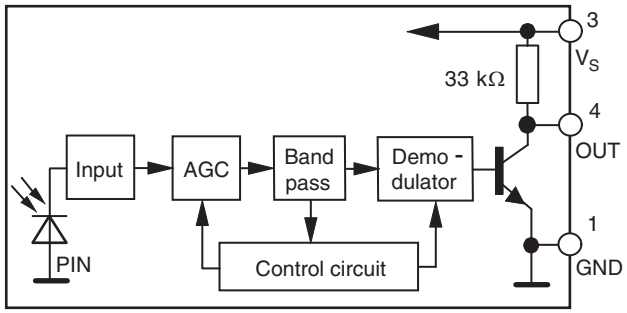
## PARTS TABLE

| AGC | | LEGACY, FOR LONG BURST REMOTE CONTROLS (AGC2) | RECOMMENDED FOR LONG BURST CODES (AGC4) [1] |
|---|---|---|---|
| Carrier frequency | 30 kHz | TSOP6230 | TSOP6430 |
| | 33 kHz | TSOP6233 | TSOP6433 |
| | 36 kHz | TSOP6236 | TSOP6436 [2][3][4] |
| | 38 kHz | TSOP6238 | TSOP6438 [5][6] |
| | 40 kHz | TSOP6240 | TSOP6440 |
| | 56 kHz | TSOP6256 | TSOP6456 [7][8] |
| Package | | Panhead | |
| Pinning | | 1 = GND, 2 = N.C., 3 = $V_S$, 4 = OUT | |
| Dimensions (mm) | | 7.5 W x 5.3 H x 4.0 D | |
| Mounting | | SMD | |
| Application | | Remote control | |
| Best remote control code | | [2] RC-5 [3] RC-6 [4] Panasonic [5] NEC [6] Sharp [7] r-step [8] Thomson RCA | |

**Note**

[1] We advise try AGC4 first if the burst length is unknown

## BLOCK DIAGRAM

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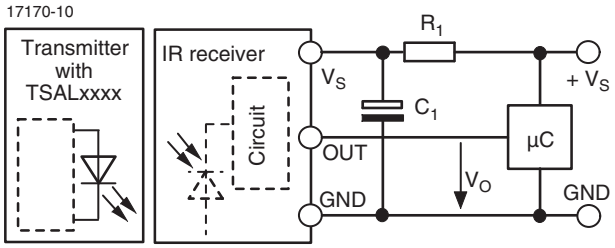
## APPLICATION CIRCUIT




The external components $R_1$ and $C_1$ are optional to improve the robustness against electrical overstress (typical values are $R_1$ = 100 Ω, $C_1$ = 0.1 µF).

## 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 ($V_S$ + 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 |

**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 voltage | | $V_S$ | 2.5 | | 5.5 | V |
| Supply current | $V_S$ = 5 V, $E_v$ = 0 | $I_{SD}$ | 0.55 | 0.7 | 0.9 | mA |
| | $E_v$ = 40 klx, sunlight | $I_{SH}$ | | 0.8 | | mA |
| Transmission distance | $E_v$ = 0, IR diode TSAL6200, $I_F$ = 250 mA, test signal see fig. 1 | d | | 40 | | m |
| Output voltage low | $I_{OSL}$ = 0.5 mA, $E_e$ = 0.7 mW/m², 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 | $E_{e\ min.}$ | | 0.2 | 0.4 | mW/m² |
| Maximum irradiance | $t_{pi} - 5/f_o < t_{po} < t_{pi} + 6/f_o$, test signal see fig. 1 | $E_{e\ max.}$ | 50 | | | W/m² |
| Directivity | Angle of half transmission distance | $\varphi_{1/2}$ | | ± 50 | | deg |

## TYPICAL CHARACTERISTICS ($T_{amb}$ = 25 °C, unless otherwise specified)

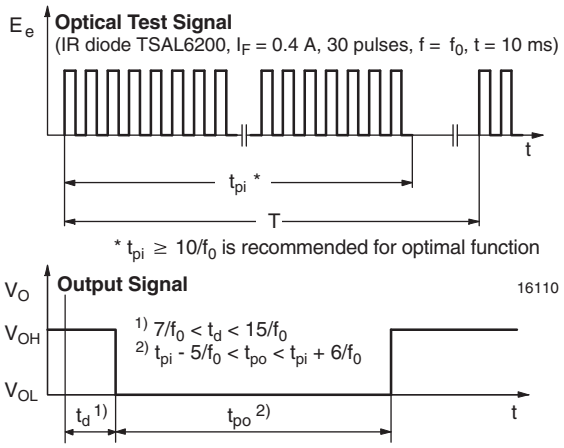



Fig. 1 - Output Active Low

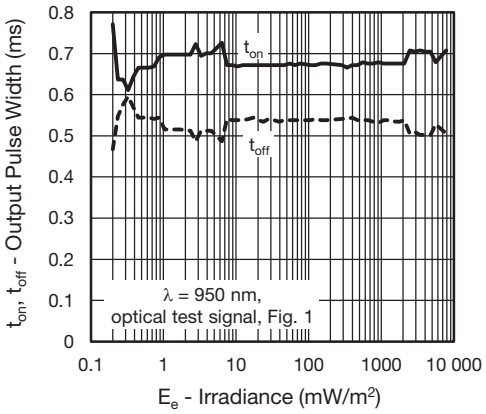



Fig. 4 - Output Pulse Diagram

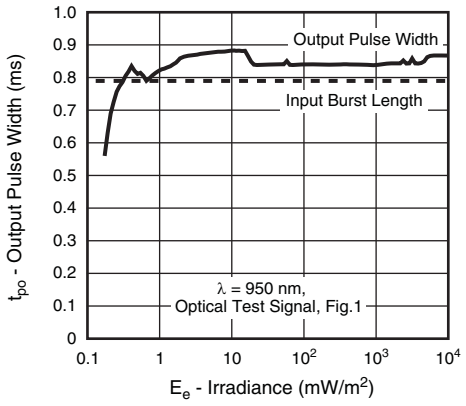



Fig. 2 - Pulse Length and Sensitivity in Dark Ambient

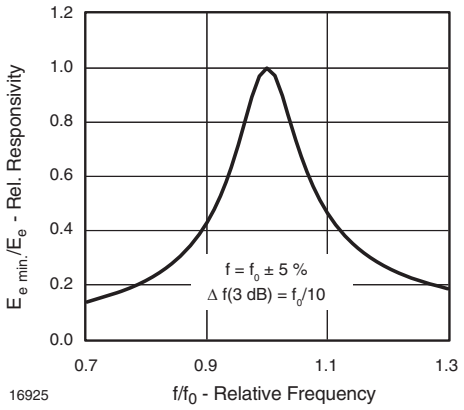



Fig. 5 - Frequency Dependence of Responsivity

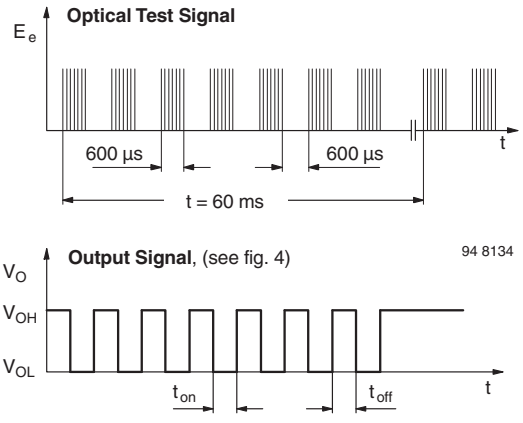



Fig. 3 - Output Function

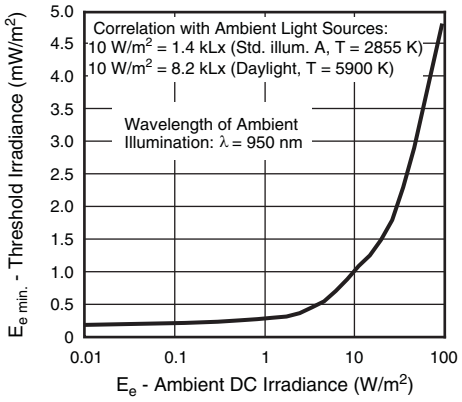



Fig. 6 - Sensitivity in Bright Ambient

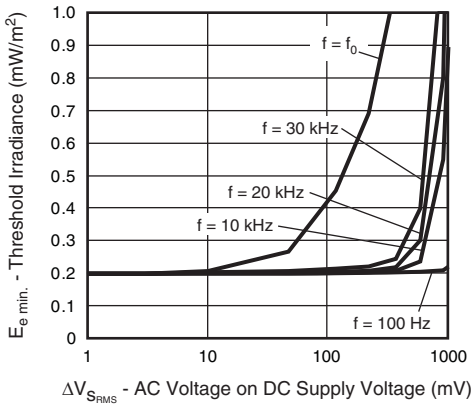



Fig. 7 - Sensitivity vs. Supply Voltage Disturbances

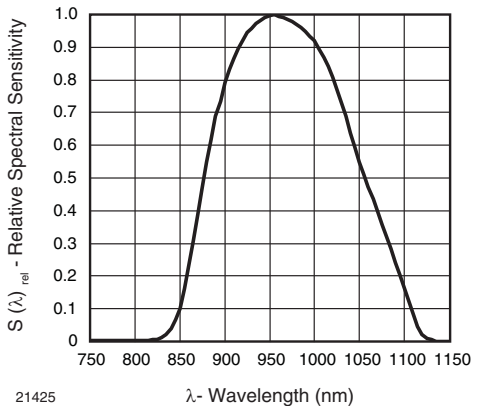



Fig. 10 - Relative Spectral Sensitivity vs. Wavelength

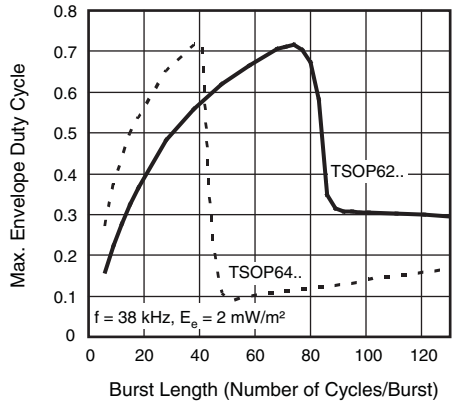



Fig. 8 - Max. Envelope Duty Cycle vs. Burst Length

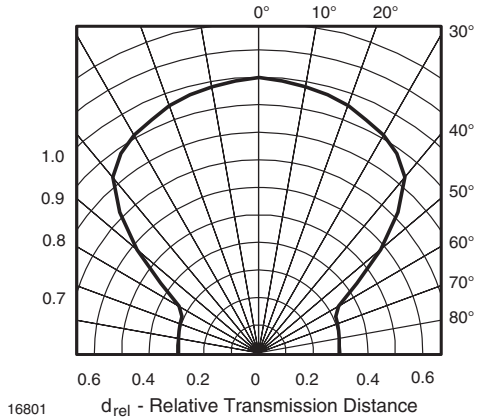



Fig. 11 - Horizontal Directivity

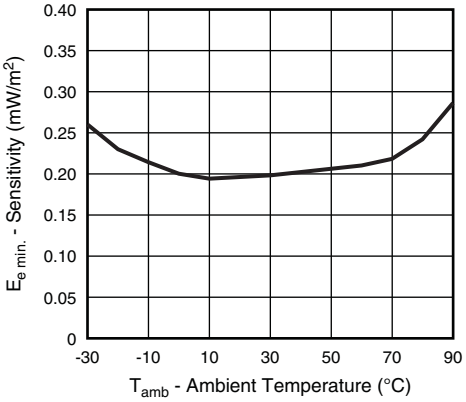



Fig. 9 - Sensitivity vs. Ambient Temperature

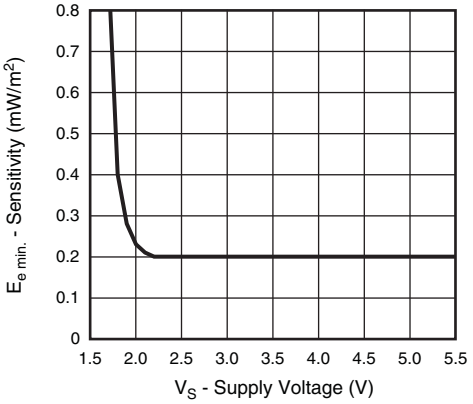



Fig. 12 - Sensitivity vs. Supply Voltage

## 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 is applied to the product in the presence of a disturbance, the sensitivity of the receiver is automatically reduced by the AGC to insure that no spurious pulses are present at the receiver's output.

Some examples which are suppressed are:

- DC light (e.g. from tungsten bulbs sunlight)
- Continuous signals at any frequency
- Strongly or weakly modulated noise from fluorescent lamps with electronic ballasts (see figure 13 or figure 14)

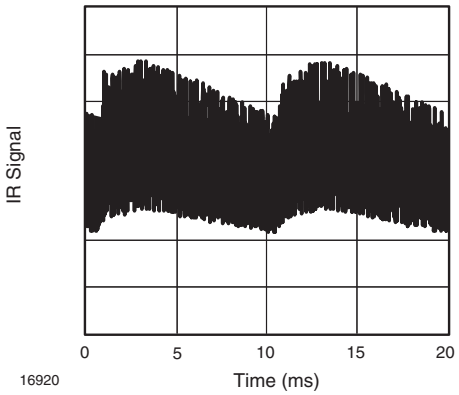



Fig. 13 - IR Disturbance from Fluorescent Lamp with Low Modulation

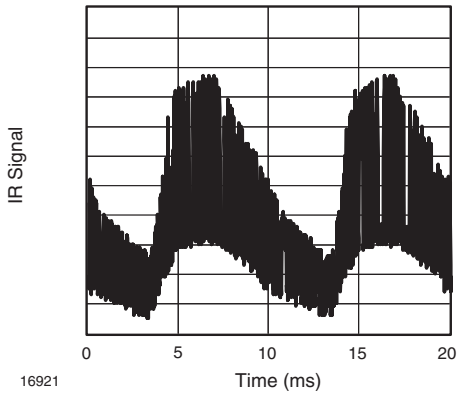


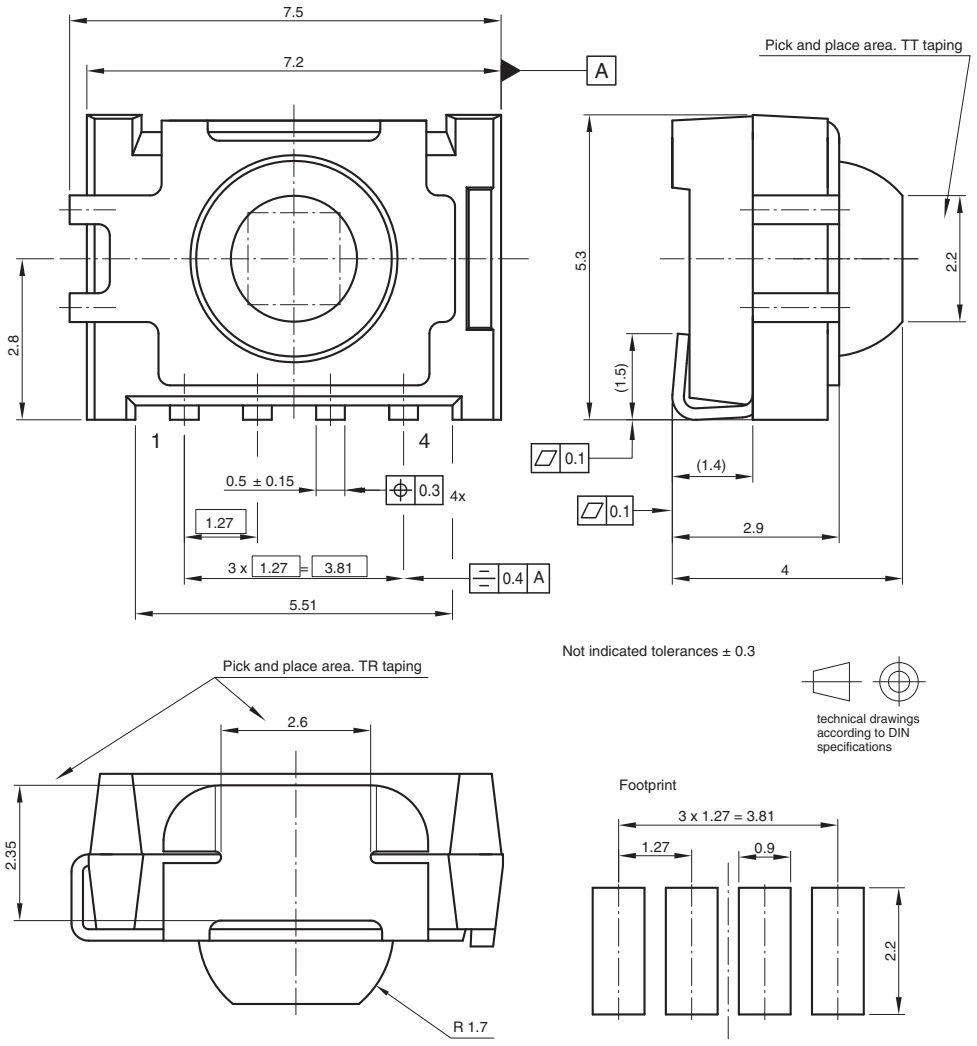

Fig. 14 - IR Disturbance from Fluorescent Lamp with High Modulation

| | TSOP62.. | TSOP64.. |
|---|---|---|
| Minimum burst length | 10 cycles/burst | 10 cycles/burst |
| After each burst of length<br>a minimum gap time is required of | 10 to 70 cycles<br>≥ 12 cycles | 10 to 35 cycles<br>≥ 12 cycles |
| For bursts greater than<br>a minimum gap time in the data stream is needed of | 70 cycles<br>> 4 x burst length | 35 cycles<br>> 10 x burst length |
| Maximum number of continuous short bursts/second | 800 | 1300 |
| NEC code | yes | preferred |
| RC5/RC6 code | yes | preferred |
| Thomson 56 kHz code | yes | preferred |
| Sharp code | yes | preferred |
| Suppression of interference from fluorescent lamps | Most common disturbance patterns are suppressed | Even extreme disturbance patterns are suppressed |

**Notes**

- For data formats with short bursts please see the datasheet of TSOP61.., TSOP63.., TSOP65..
- Best choice of AGC for some popular IR-codes:
  - TSOP6436: RC-5, RC-6, Panasonic
  - TSOP6438: NEC, Sharp, r-map
  - TSOP6456: r-step, Thomson RCA
- For SIRCS 15 and 20 bit, Sony 12 bit IR-codes, please see the datasheet for TSOP4S40, TSOP2S40

**PACKAGE DIMENSIONS** in millimeters

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Issue: 8; 02.09.09
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## ASSEMBLY INSTRUCTIONS

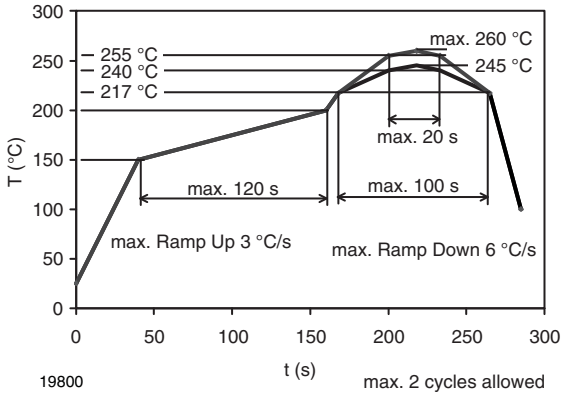
### Reflow Soldering

- Reflow soldering must be done within 72 h while stored under a max. temperature of 30 °C, 60 % RH after opening the dry pack envelope
- Set the furnace temperatures for pre-heating and heating in accordance with the reflow temperature profile as shown in the diagram. Exercise extreme care to keep the maximum temperature below 260 °C. The temperature shown in the profile means the temperature at the device surface. Since there is a temperature difference between the component and the circuit board, it should be verified that the temperature of the device is accurately being measured
- Handling after reflow should be done only after the work surface has been cooled off

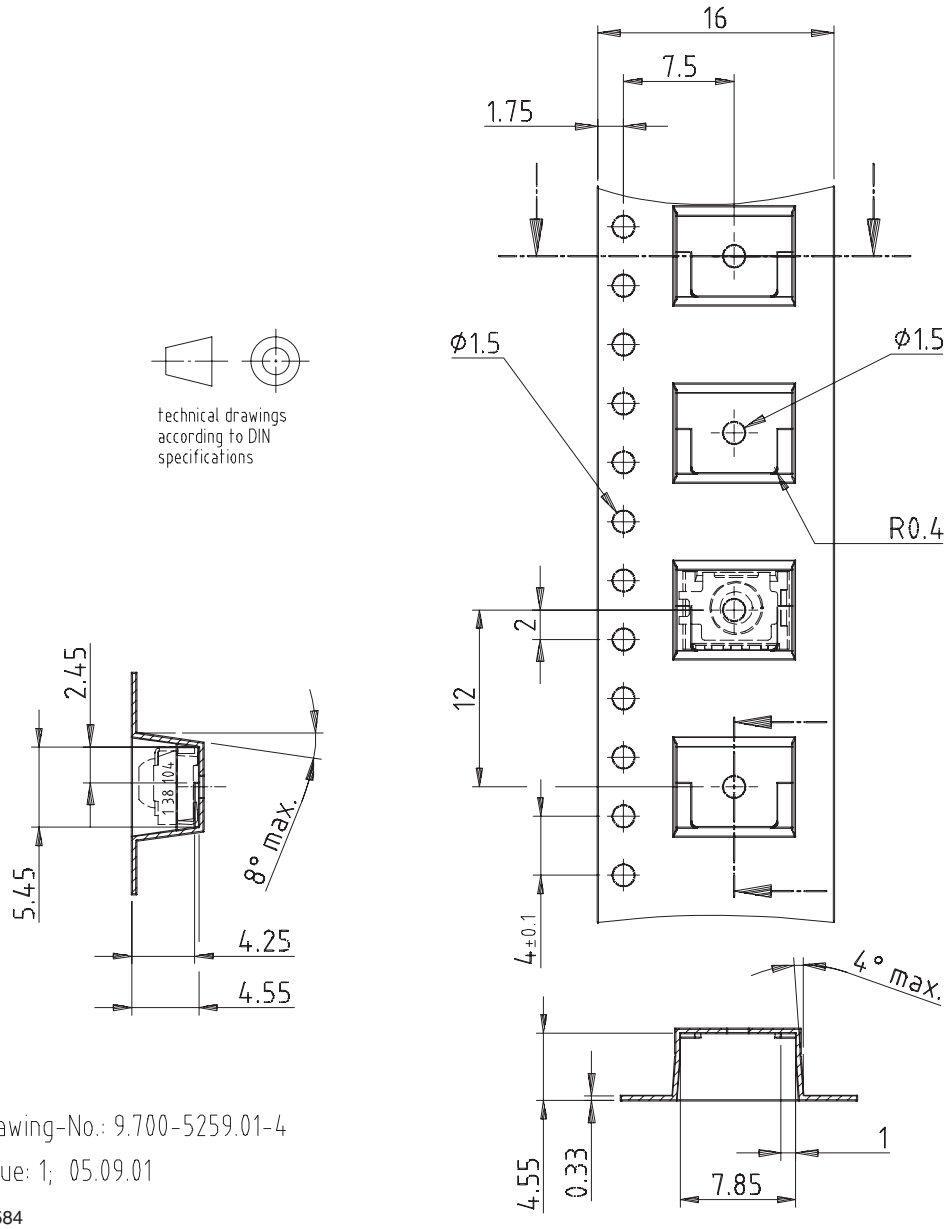
### Manual Soldering

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

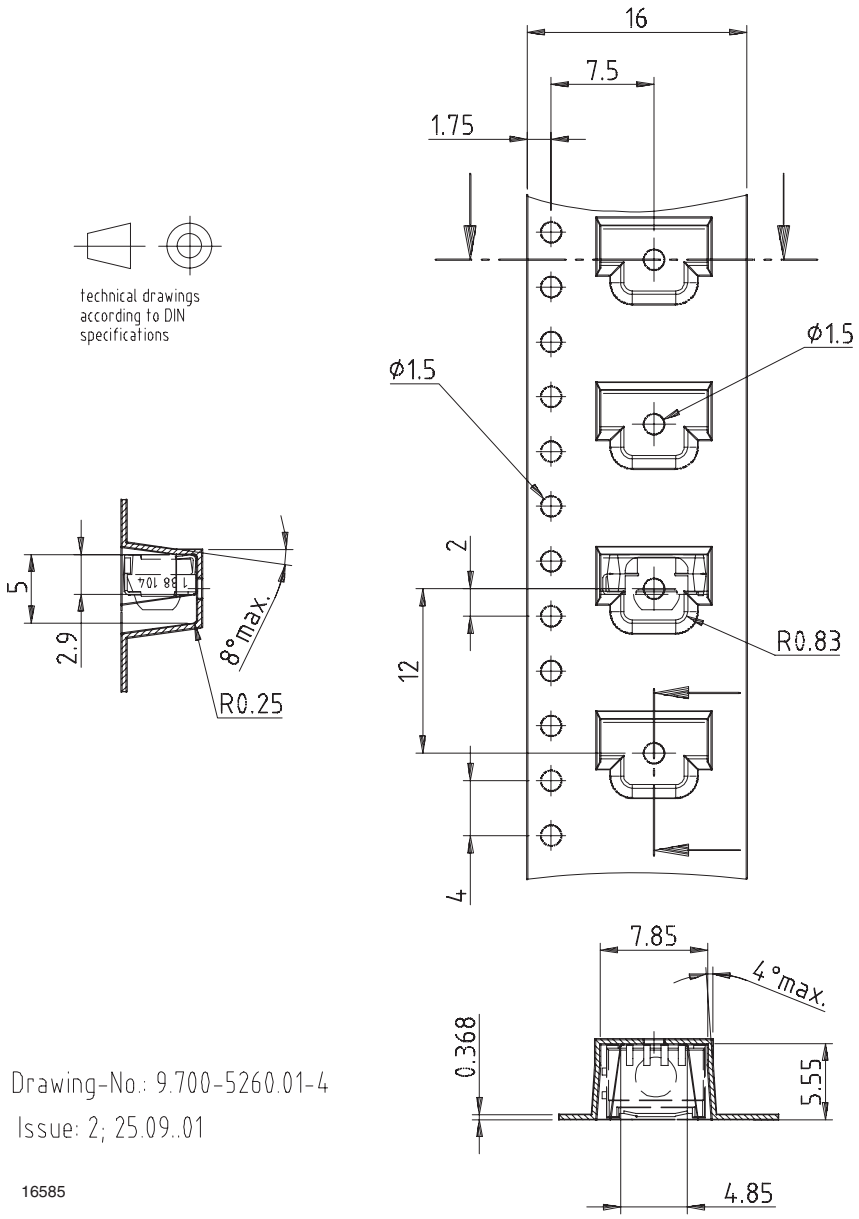
## VISHAY LEAD (Pb)-FREE REFLOW SOLDER PROFILE



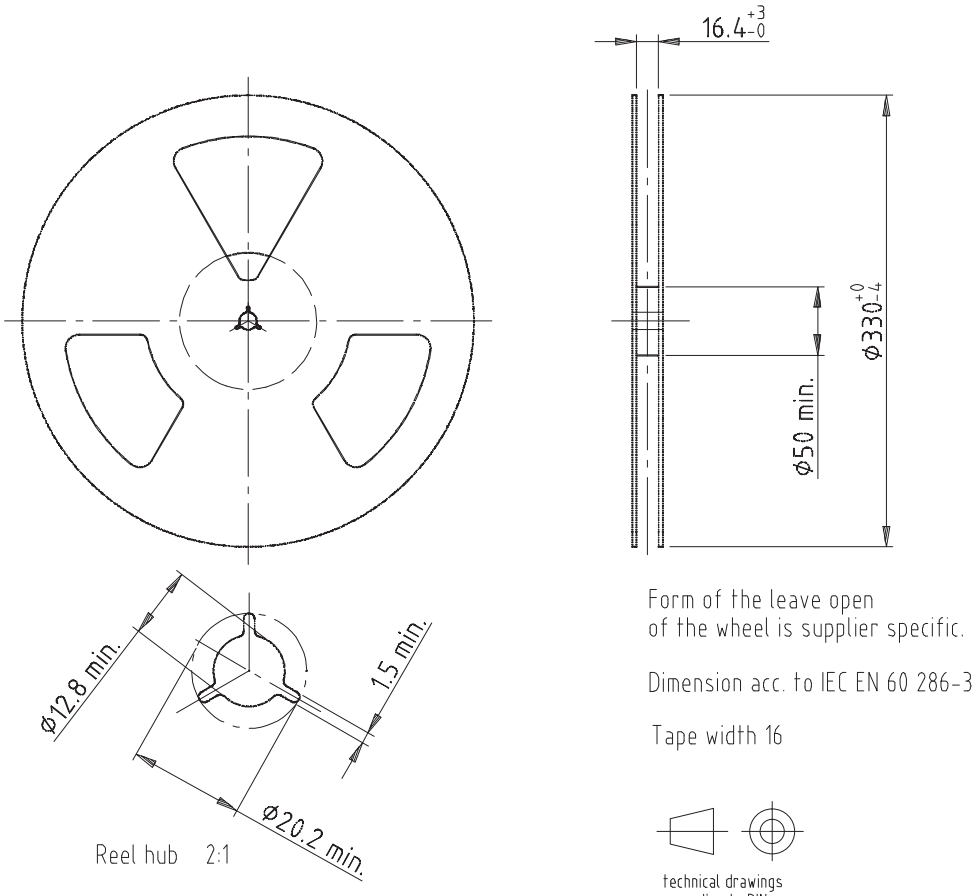

## TAPING VERSION TSOP..TT DIMENSIONS in millimeters



**TAPING VERSION TSOP..TR DIMENSIONS** in millimeters



## REEL DIMENSIONS in millimeters

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Issue: 1; 07.05.02
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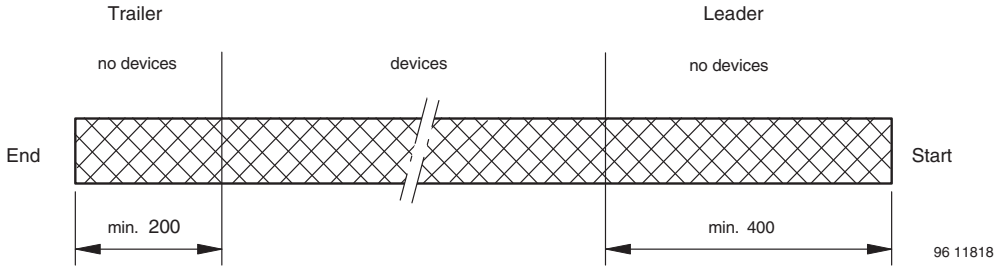
## LEADER AND TRAILER DIMENSIONS in millimeters




## COVER TAPE PEEL STRENGTH

According to DIN EN 60286-3

0.1 N to 1.3 N

300 mm/min. ± 10 mm/min.

165° to 180° peel angle

## LABEL

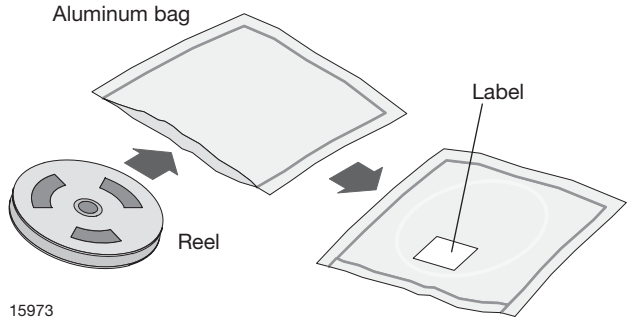
**Standard bar code labels for finished goods**

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

| 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 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.

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## FINAL PACKING

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

## RECOMMENDED METHOD OF STORAGE

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

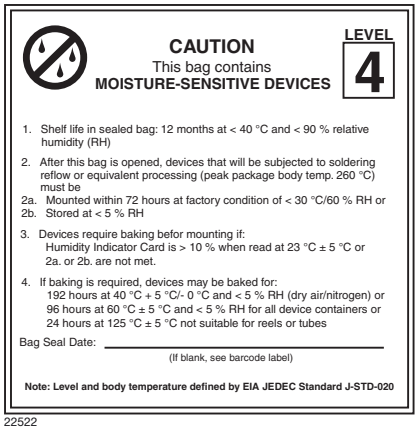
- Storage temperature 10 °C to 30 °C
- Storage humidity ≤ 60 % RH max.

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

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

192 h at 40 °C + 5 °C / - 0 °C and < 5 % RH (dry air / nitrogen) or
96 h at 60 °C + 5 °C and < 5 % RH for all device containers or
24 h at 125 °C + 5 °C not suitable for reel or tubes.

An EIA JEDEC® standard J-STD-020 level 4 label is included on all dry bags.

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

## ESD PRECAUTION

Proper storage and handling procedures should be followed to prevent ESD damage to the devices especially when they are removed from the antistatic shielding bag. Electrostatic sensitive devices warning labels are on the packaging.

## VISHAY SEMICONDUCTORS STANDARD BAR CODE LABELS

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


22645

# Tape and Reel Standards for SMD IR Receiver Modules

Vishay Semiconductor SMD IR Receivers are packaged on tape and reel. The following specification is based on IEC publication 286, which takes the industrial requirements for automatic insertion into account.

Absolute maximum ratings, mechanical dimensions, optical and electrical characteristics for taped devices are identical to the basic catalog types and can be found in the specifications for untaped devices.

## PACKAGING

The tapes of components are available on reels. Each reel is marked with labels which contain the following information:

- Vishay
- Type
- Group
- Tape code, normally part of type name
- Production code
- Quantity

## MISSING COMPONENTS

Up to 3 consecutive components may be missing if the gap is followed by at least 6 components. A maximum of 0.5 % of the components per reel quantity may be missing. At least 5 empty positions are present at the start and the end of the tape to enable tape insertion.

**Tensile strength** of the tape: > 15 N

## NUMBER OF COMPONENTS

A. Panhead SMD: quantity per reel:

TT, SMD top view package, 1190 pcs

TR, SMD side view package, 1120 pcs

B. Heimdall: quantity per reel:

TT, Heimdall top view package, 2200 pcs

TR, Heimdall side view package, 2300 pcs

C. Heimdall without lens: quantity per reel:

WTT, top view package, 2200 pcs

WTR, side view package, 2300 pcs

D. Bugeye: quantity per reel:

TT, 2500 pcs

TR, 2500 pcs

E. AP5: quantity per reel:

TT, 2500 pcs

TR, not available in side view

F. Belobog: quantity per reel:

TT1, 1800 pcs

TT2, 7000 pcs

TR, not available in side view

G. Belobog with shield: quantity per reel:

TT1, 1500 pcs

TT2, 5000 pcs

## ORDER DESIGNATION

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

**Example:**

TSOP6238TR (reel packing)

TSOP75238TR (reel packing)

TSOP75338WTT (reel packing)

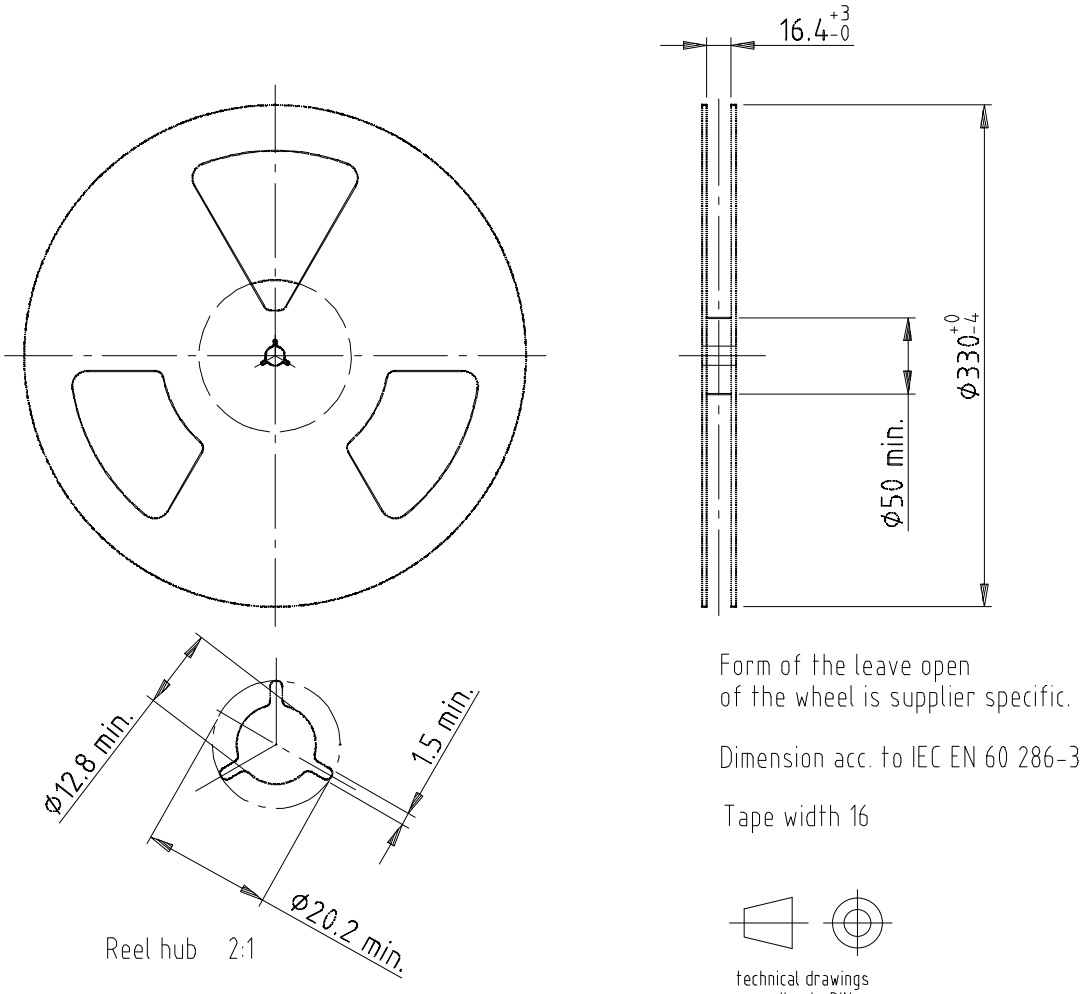
TSOP85438TT (reel packing)

TSOP85238AP5TR (reel packing)

TSOP57438TT1 (reel packing)

TSOP57238HTT1 (reel packing)

## REEL DIMENSIONS FOR PANHEAD SMD AND HEIMDALL in millimeters

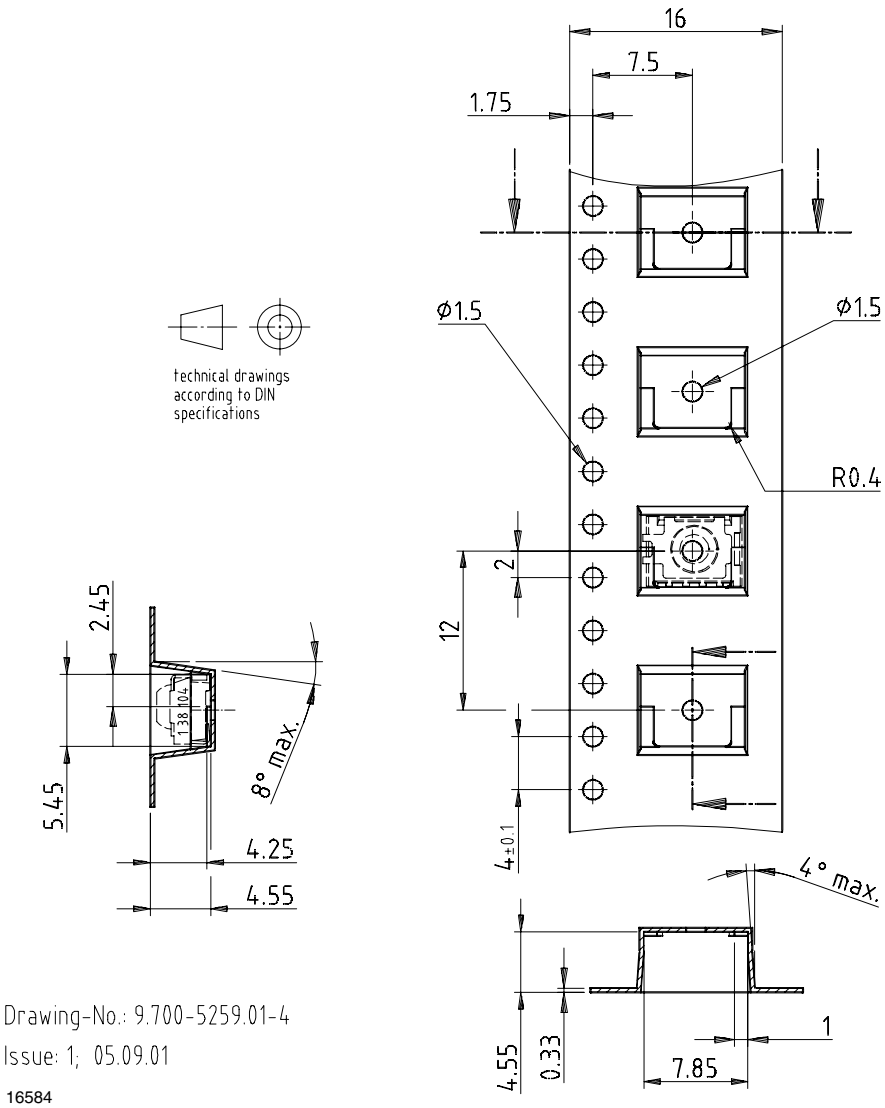



**Note**

- The body structure of the reel can vary

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

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

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Issue: 1; 05.09.01

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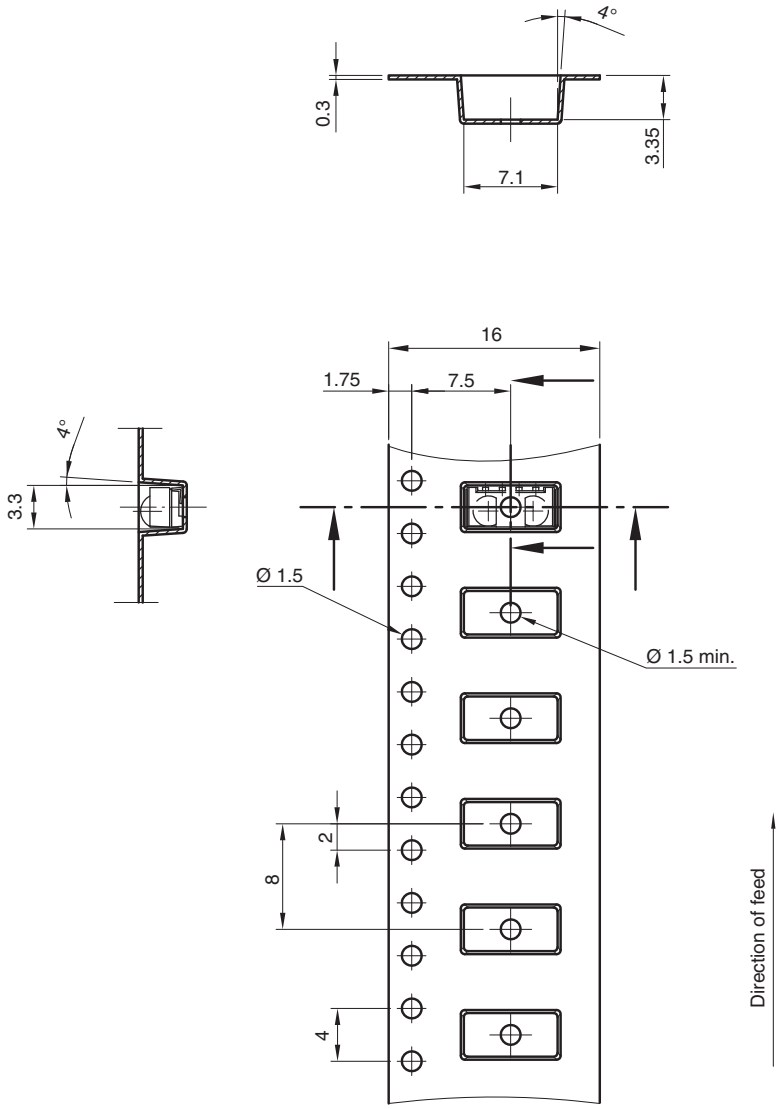
**TAPING VERSION TSOP..TT (TOP VIEW) DIMENSIONS** in millimeters

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

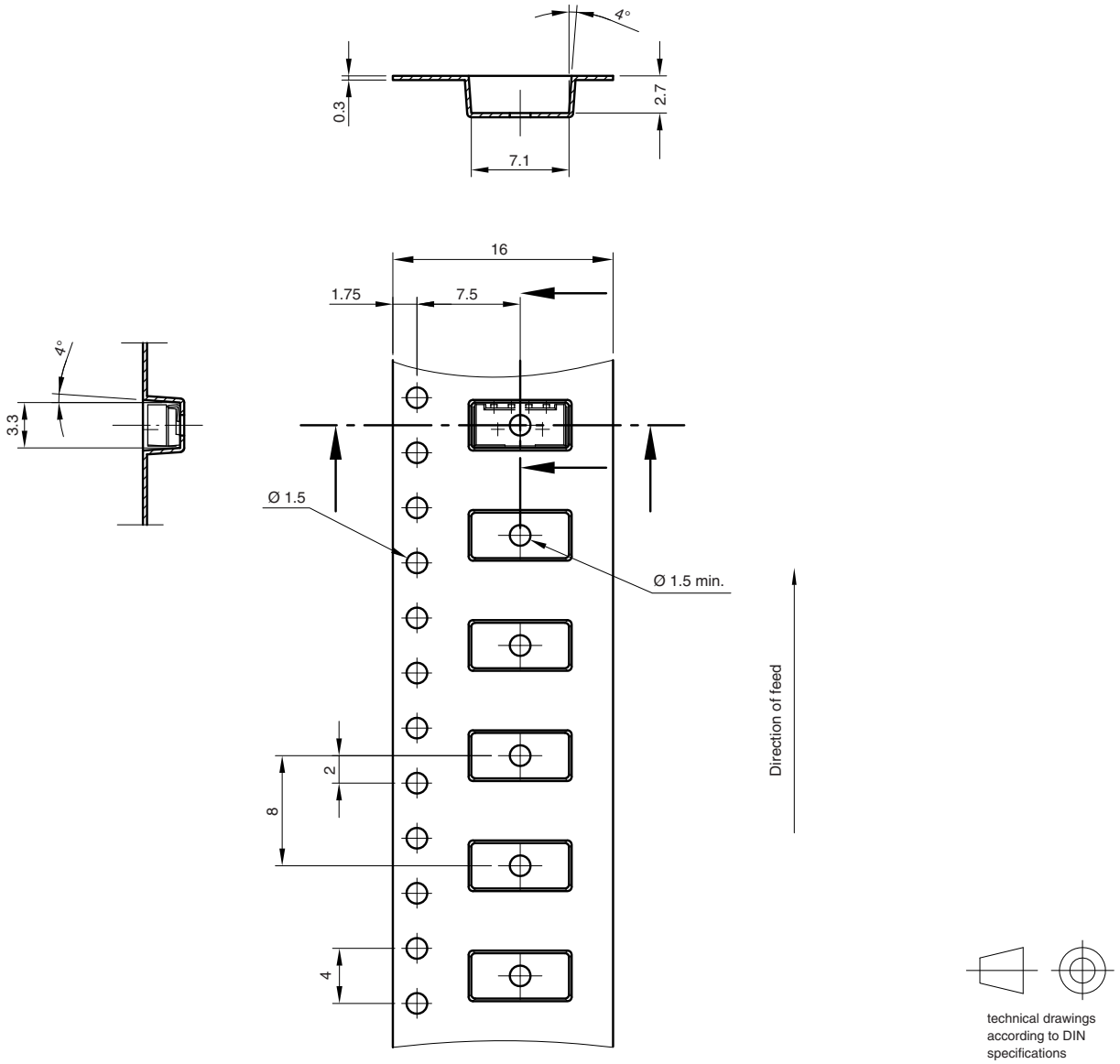



Drawing-No.: 9.700-5338.01-4
Issue: 3; 09.06.09
21578

technical drawings
according to DIN
specifications

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

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



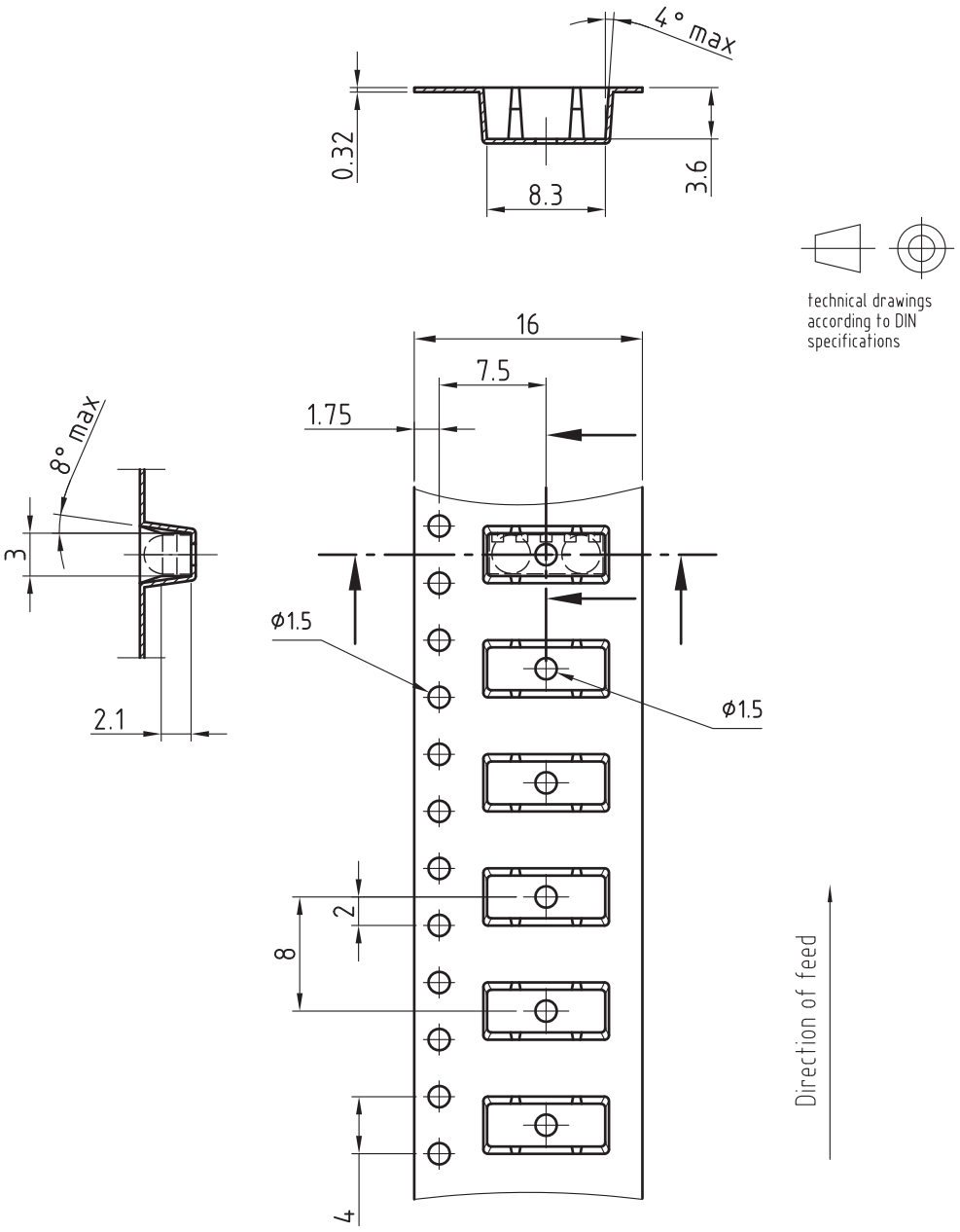

Drawing-No.: 9.700-5341.01-4

Issue: 2: 23.03.09

21666

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

D. Bugeye (TSOP85...TT)



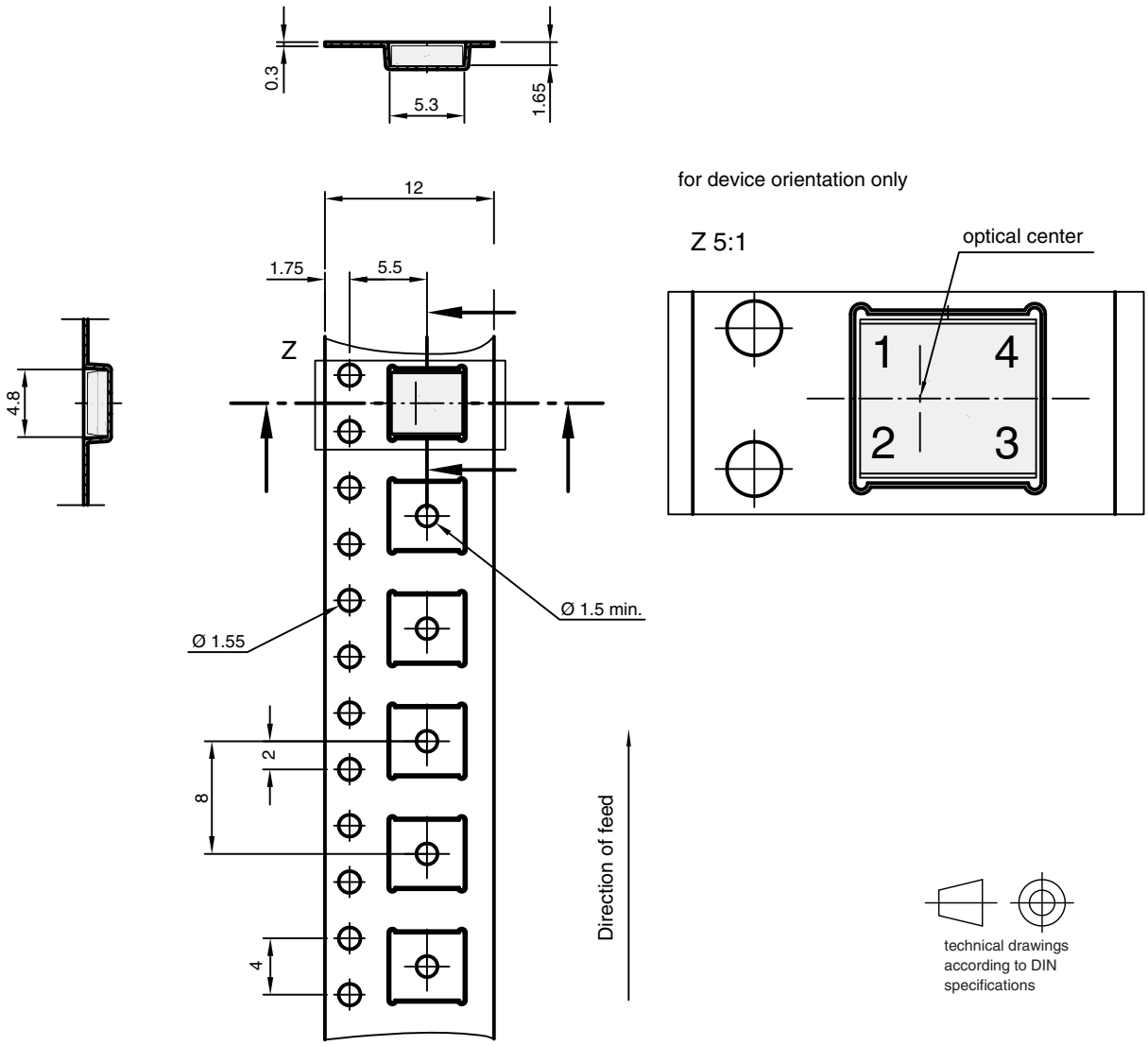

Drawing-No.: 9.700-5317.01-4

Issue: 2; 10.04.08

20629

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

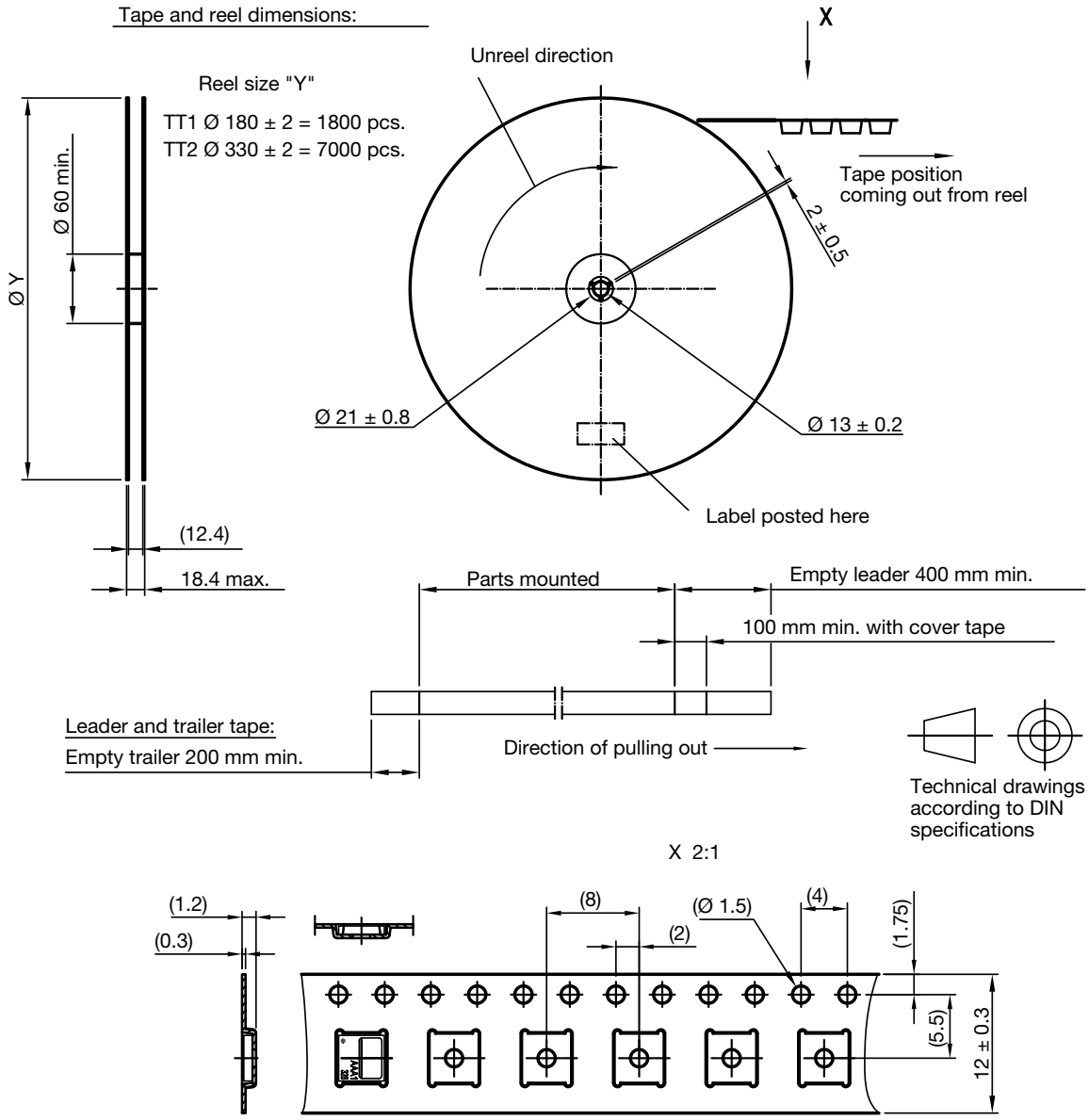
E. AP5 (TSOP85...AP5TT)




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

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

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



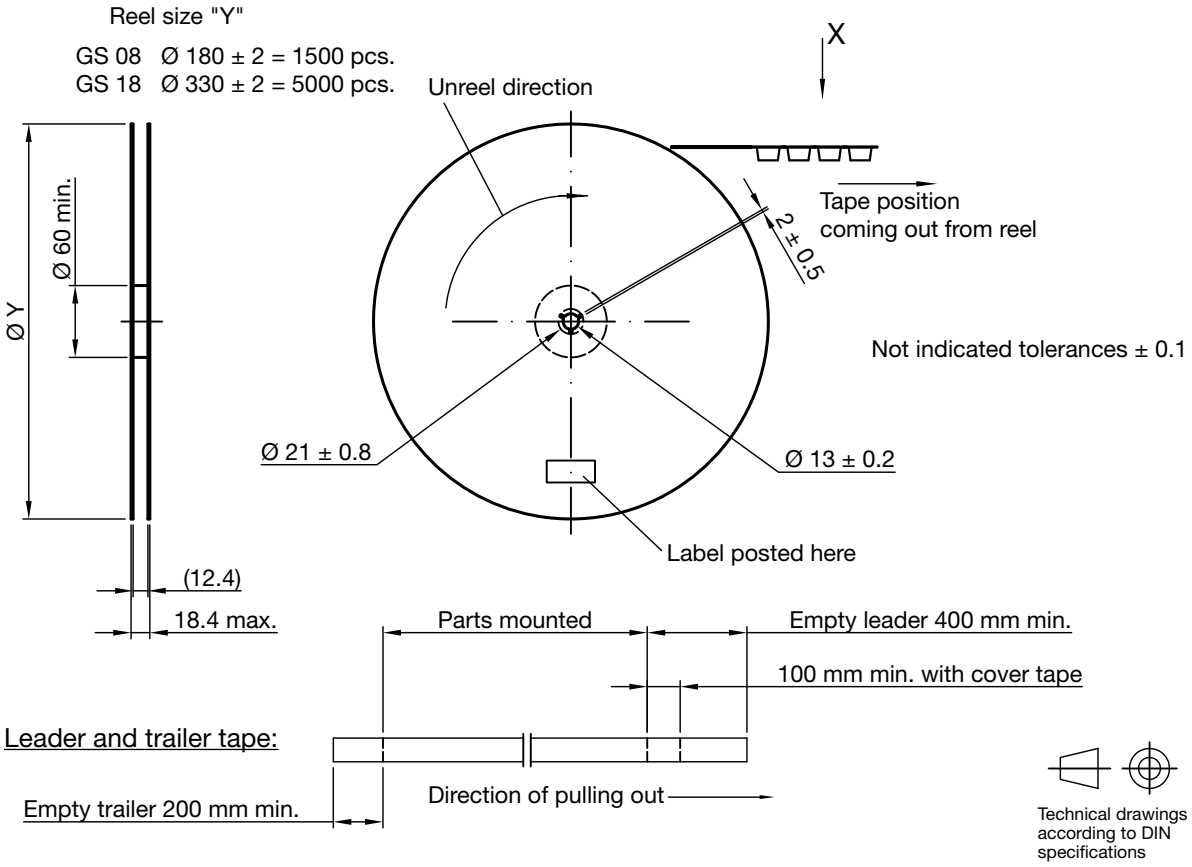

Drawing-No.: 9.700-5347.01-4
Issue: 1; 14.11.11

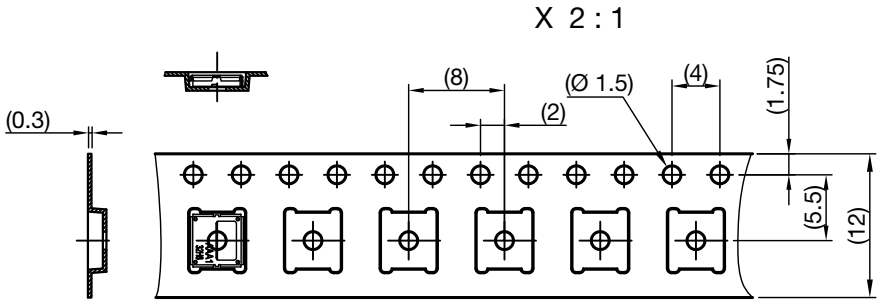
Not indicated tolerances ± 0.1

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

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

Tape and Reel dimensions:



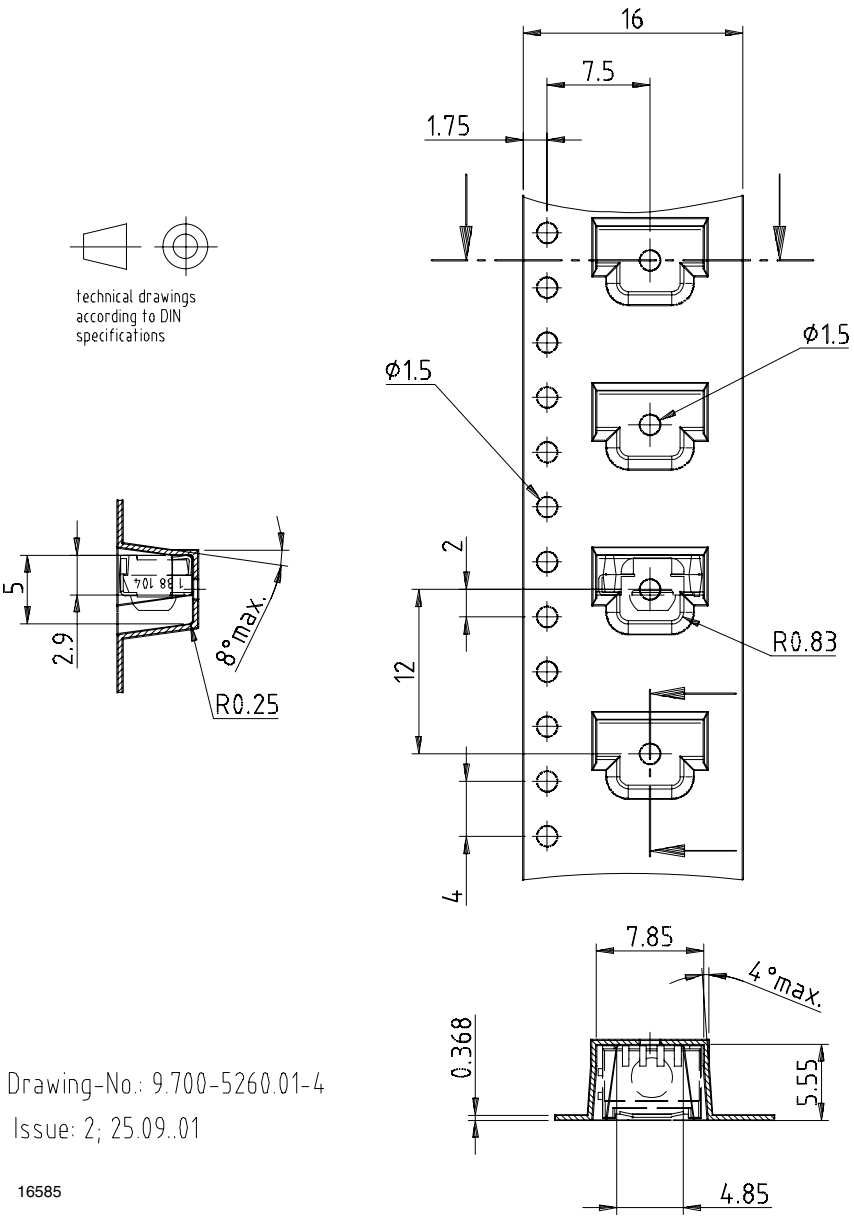




Reel dimensions and tape

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

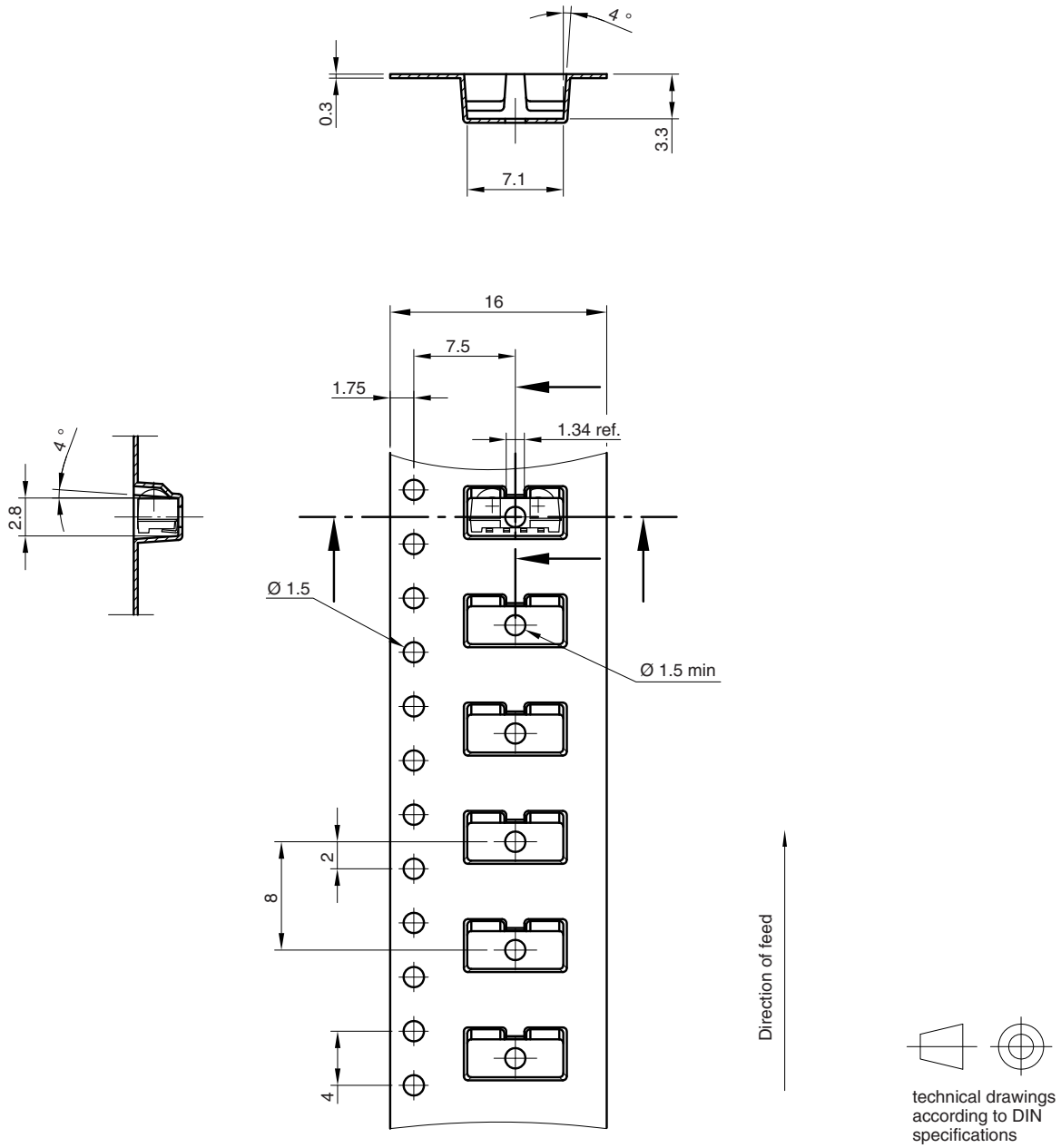
**TAPING VERSION TSOP..TR (SIDE VIEW) DIMENSIONS** in millimeters

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



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

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



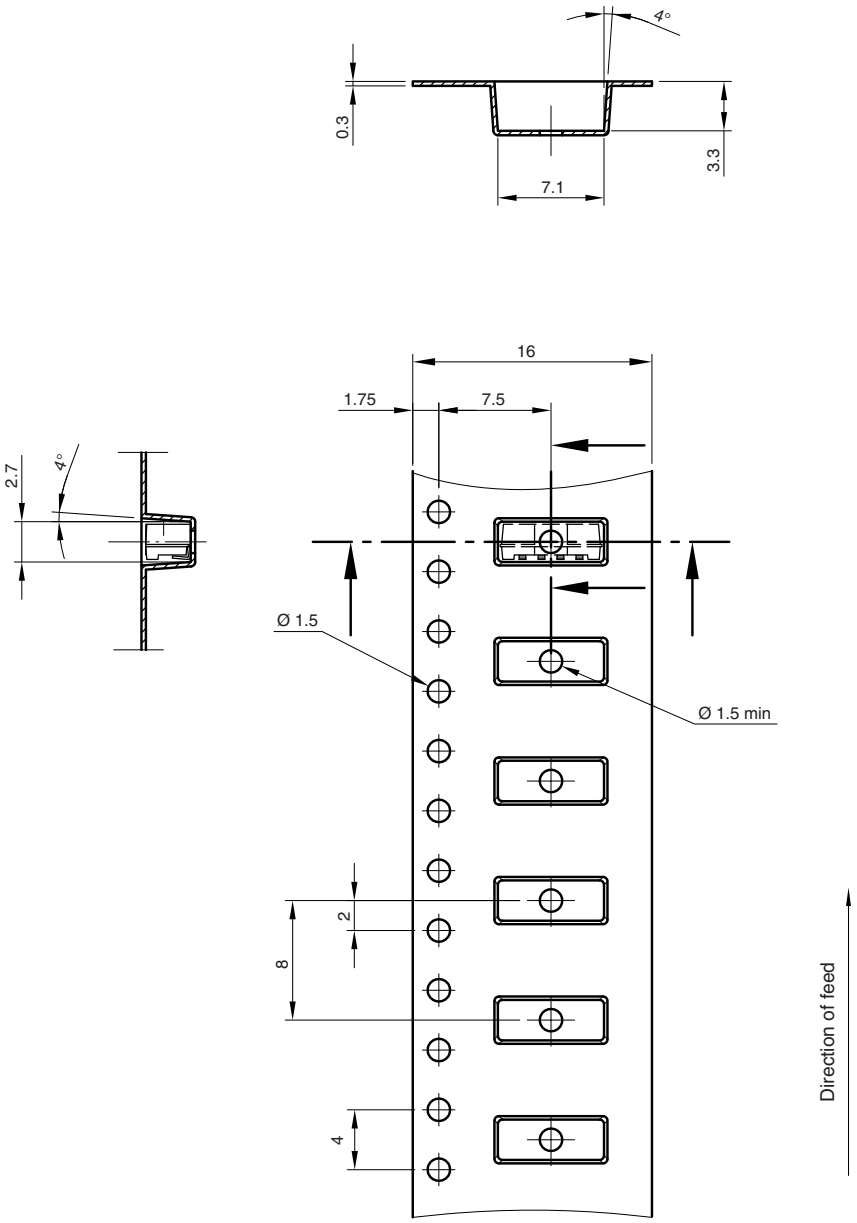

Drawing-No.: 9.700-5337.01-4

Issue: 1; 16.10.08

21577

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

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

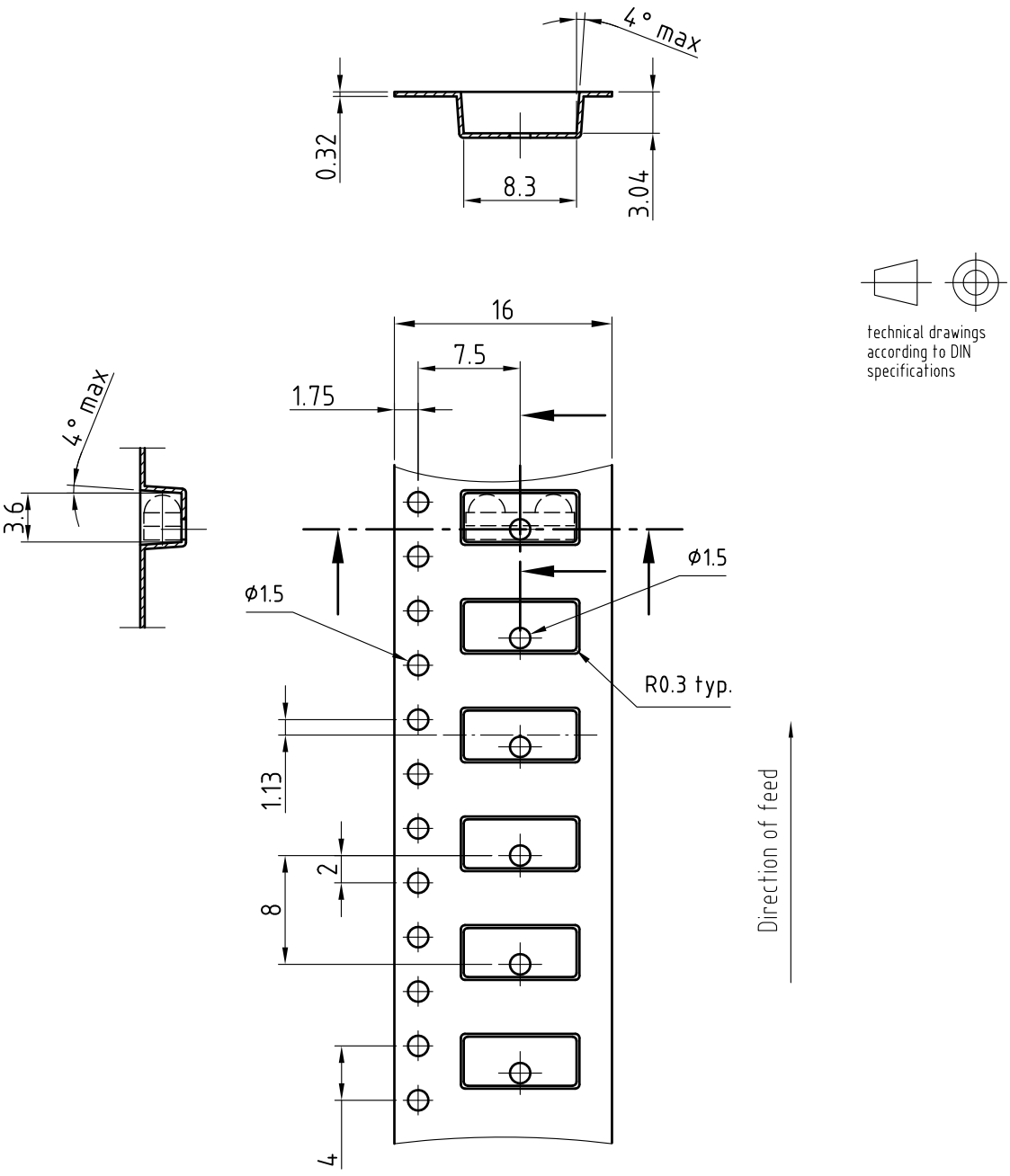



Drawing-No.: 9.700-5342.01-4
Issue: 1: 23.03.09
21785

technical drawings
according to DIN
specifications

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

D. Bugeye (TSOP85...TR)

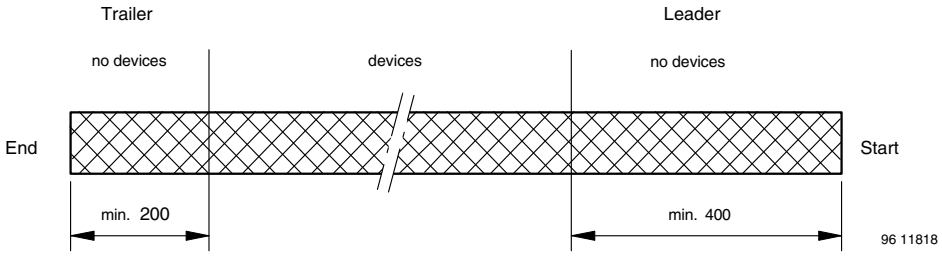



Drawing-No.: 9.700-5316.01-4

Issue: 1; 12.02.07

20628

## LEADER AND TRAILER DIMENSIONS in millimeters




## COVER TAPE REEL STRENGTH

According to DIN EN 60286-3

0.1 N to 1.3 N

300 mm/min. ± 10 mm/min.

165° to 180° peel angle

## LABEL

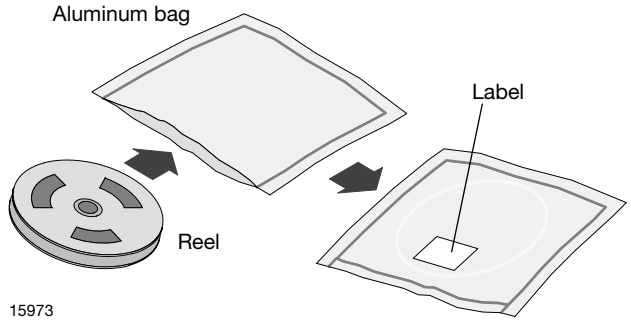
**Standard bar code labels for finished goods**

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:

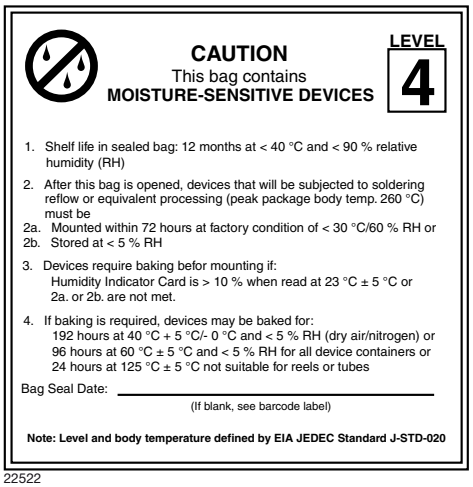
- Storage temperature 10 °C to 30 °C
- Storage humidity ≤ 60 % RH max.

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

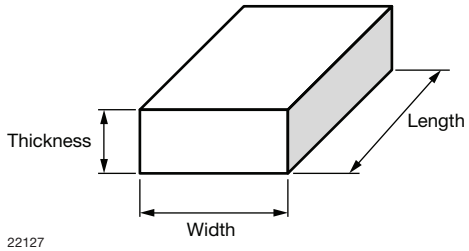
The Vishay Semiconductors standard bar code labels are printed at final packing areas. The labels are on each packing unit and contain Vishay Semiconductors specific data.


16962

## OUTER PACKAGING

The sealed reel is packed into a pizza box.

**CARTON BOX DIMENSIONS** in millimeters




22127

| | THICKNESS | WIDTH | LENGTH |
|---|---|---|---|
| **Pizza Box**<br>(SMD and Heimdall)<br>(Taping in Reels) | 50 | 340 | 340 |

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

**Vishay Intertechnology, Inc. hereby certifies that all its products that are identified as Halogen-Free follow Halogen-Free requirements as per JEDEC JS709A standards. Please note that some Vishay documentation may still make reference to the IEC 61249-2-21 definition. We confirm that all the products identified as being compliant to IEC 61249-2-21 conform to JEDEC JS709A standards.**

Общество с ограниченной ответственностью «МосЧип» ИНН 7719860671 / КПП 771901001
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