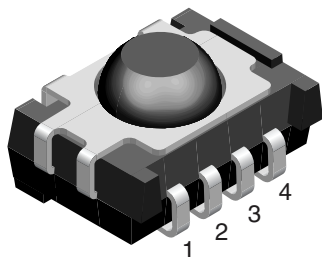


## IR Receiver Modules for Remote Control Systems



16797

### 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

### 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](http://www.vishay.com/doc?99912)


**RoHS**  
COMPLIANT  
HALOGEN  
**FREE**  
**GREEN**  
(5-2008)

### 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.

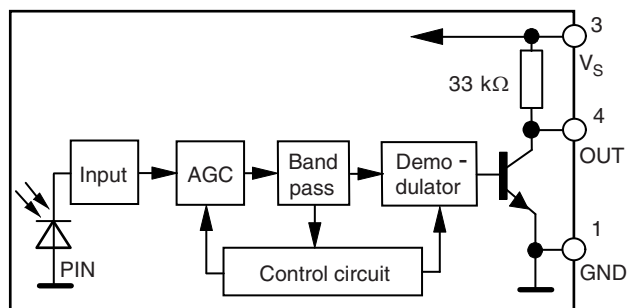
The TSOP62.. and TSOP64.. are optimized to suppress almost all spurious pulses from energy saving lamps like CFLs. The AGC4 used in the TSOP64.. may suppress some data signals. The TSOP62.. is a legacy product for all common IR remote control data formats. Between these two receiver types, the TSOP64..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

These components have not been qualified according to automotive specifications.

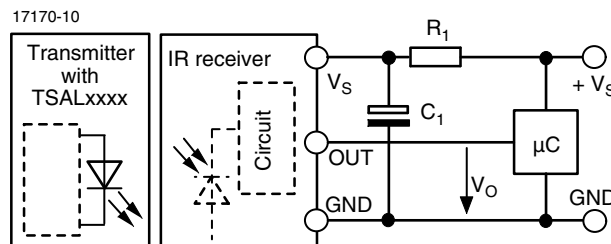
| PARTS TABLE              |        |                                                                                                                                                           |                                                           |
|--------------------------|--------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------|
| AGC                      |        | LEGACY, FOR<br>LONG BURST REMOTE CONTROLS (AGC2)                                                                                                          | RECOMMENDED FOR<br>LONG BURST CODES (AGC4) <sup>(1)</sup> |
| Carrier<br>frequency     | 30 kHz | TSOP6230                                                                                                                                                  | TSOP6430                                                  |
|                          | 33 kHz | TSOP6233                                                                                                                                                  | TSOP6433                                                  |
|                          | 36 kHz | TSOP6236                                                                                                                                                  | TSOP6436 <sup>(2)(3)(4)</sup>                             |
|                          | 38 kHz | TSOP6238                                                                                                                                                  | TSOP6438 <sup>(5)(6)</sup>                                |
|                          | 40 kHz | TSOP6240                                                                                                                                                  | TSOP6440                                                  |
|                          | 56 kHz | TSOP6256                                                                                                                                                  | TSOP6456 <sup>(7)(8)</sup>                                |
| 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 |        | <sup>(2)</sup> RC-5 <sup>(3)</sup> RC-6 <sup>(4)</sup> Panasonic <sup>(5)</sup> NEC <sup>(6)</sup> Sharp <sup>(7)</sup> r-step <sup>(8)</sup> Thomson RCA |                                                           |

#### Note

<sup>(1)</sup> We advise try AGC4 first if the burst length is unknown

**BLOCK DIAGRAM**


16839-1

**APPLICATION CIRCUIT**


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

**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           | $T_{amb} \leq 85 \text{ °C}$ | $P_{tot}$ | 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** ( $T_{amb} = 25 \text{ °C}$ , unless otherwise specified)

| PARAMETER             | TEST CONDITION                                                                                   | SYMBOL             | MIN. | TYP.     | MAX. | UNIT            |
|-----------------------|--------------------------------------------------------------------------------------------------|--------------------|------|----------|------|-----------------|
| Supply voltage        |                                                                                                  | $V_S$              | 2.5  |          | 5.5  | V               |
| Supply current        | $V_S = 5 \text{ V}$ , $E_v = 0$                                                                  | $I_{SD}$           | 0.55 | 0.7      | 0.9  | mA              |
|                       | $E_v = 40 \text{ klx}$ , sunlight                                                                | $I_{SH}$           |      | 0.8      |      | mA              |
| Transmission distance | $E_v = 0$ ,<br>IR diode TSAL6200,<br>$I_F = 250 \text{ mA}$ ,<br>test signal see fig. 1          | $d$                |      | 40       |      | m               |
| Output voltage low    | $I_{OSL} = 0.5 \text{ mA}$ , $E_e = 0.7 \text{ mW/m}^2$ ,<br>test signal see fig. 1              | $V_{OSL}$          |      |          | 100  | mV              |
| Minimum irradiance    | Pulse width tolerance:<br>$t_{pi} - 5/f_o < t_{po} < t_{pi} + 6/f_o$ ,<br>test signal see fig. 1 | $E_e \text{ min.}$ |      | 0.2      | 0.4  | $\text{mW/m}^2$ |
| Maximum irradiance    | $t_{pi} - 5/f_o < t_{po} < t_{pi} + 6/f_o$ ,<br>test signal see fig. 1                           | $E_e \text{ max.}$ | 50   |          |      | $\text{W/m}^2$  |
| Directivity           | Angle of half transmission distance                                                              | $\phi_{1/2}$       |      | $\pm 50$ |      | deg             |

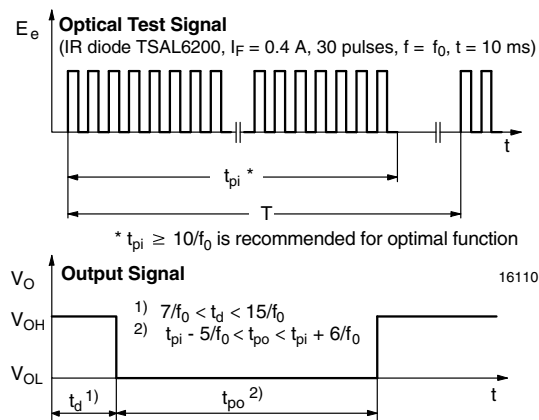
**TYPICAL CHARACTERISTICS** ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)


Fig. 1 - Output Active Low

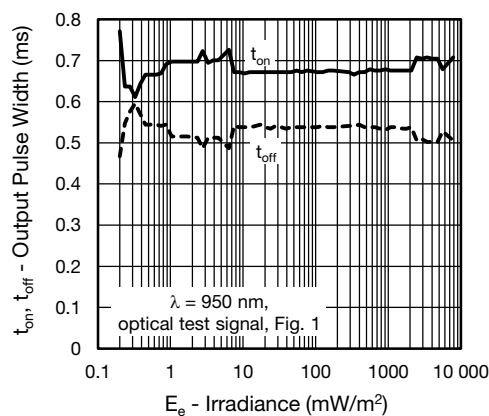


Fig. 4 - Output Pulse Diagram

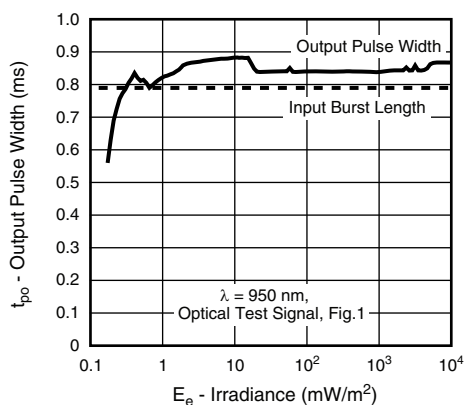


Fig. 2 - Pulse Length and Sensitivity in Dark Ambient

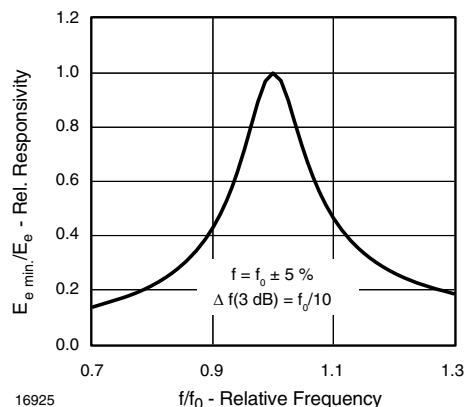


Fig. 5 - Frequency Dependence of Responsivity

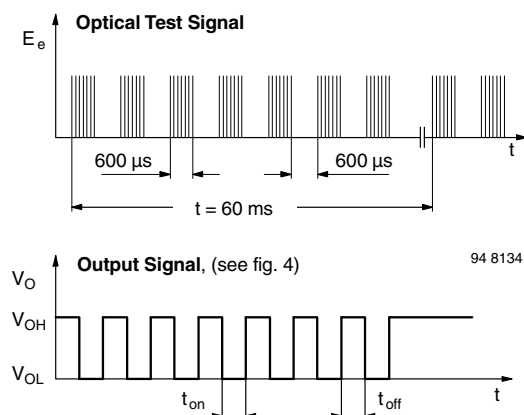


Fig. 3 - Output Function

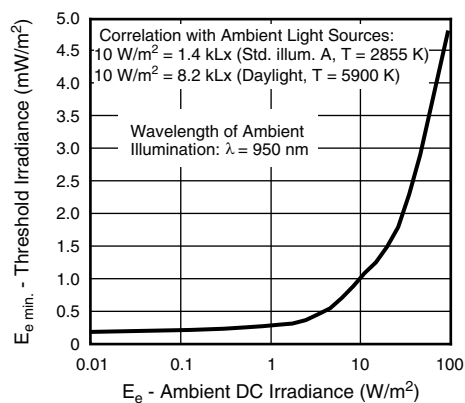


Fig. 6 - Sensitivity in Bright Ambient

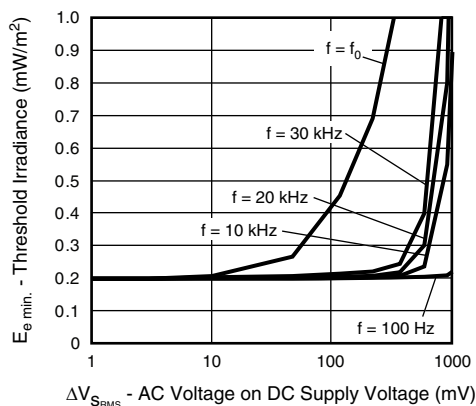


Fig. 7 - Sensitivity vs. Supply Voltage Disturbances

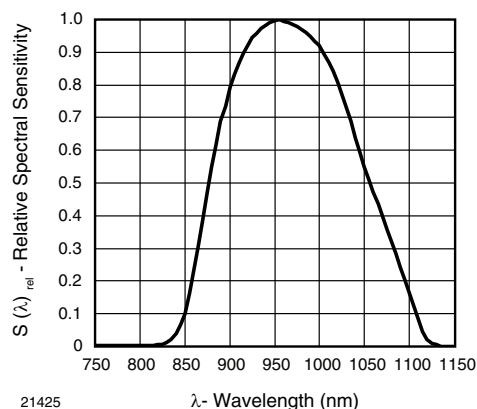


Fig. 10 - Relative Spectral Sensitivity vs. Wavelength

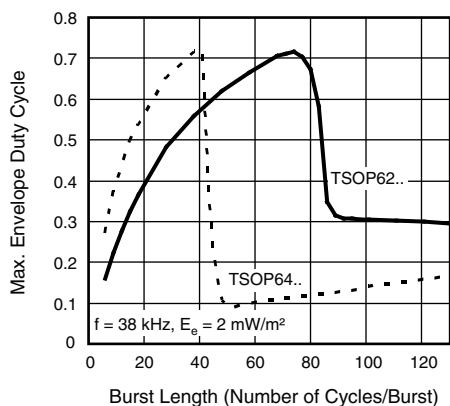


Fig. 8 - Max. Envelope Duty Cycle vs. Burst Length

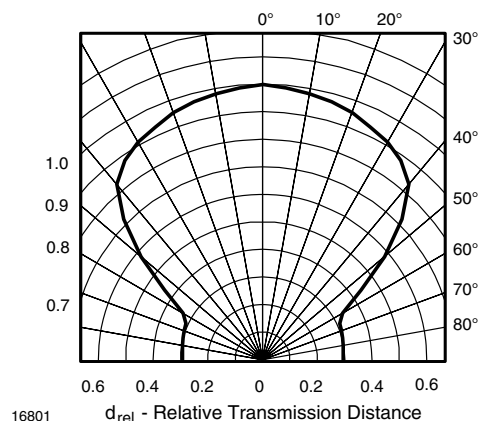


Fig. 11 - Horizontal Directivity

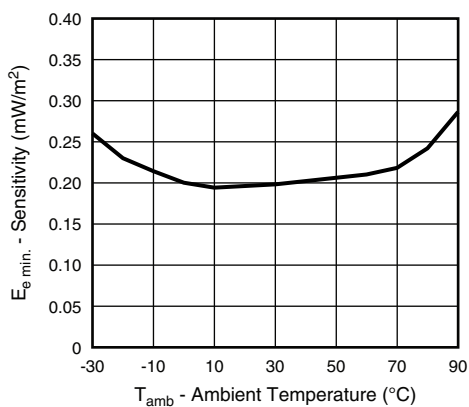


Fig. 9 - Sensitivity vs. Ambient Temperature

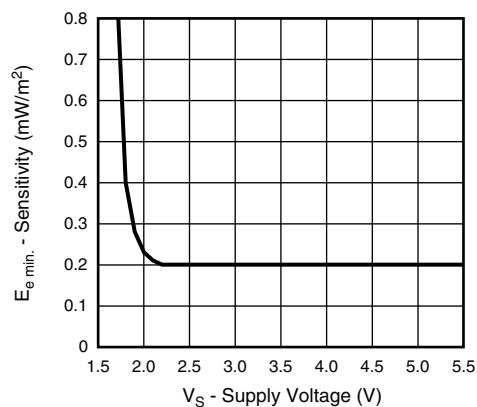


Fig. 12 - Sensitivity vs. Supply Voltage

## 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)

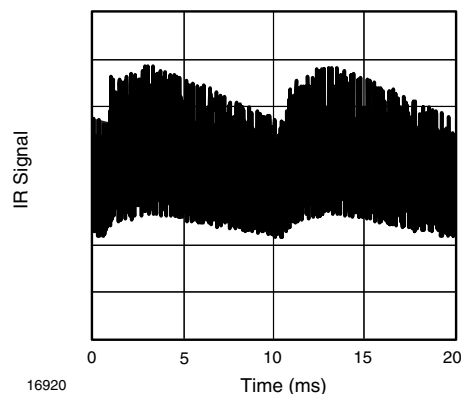


Fig. 13 - IR Disturbance from Fluorescent Lamp with Low Modulation

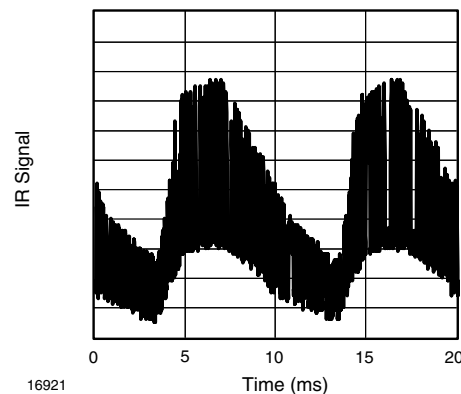


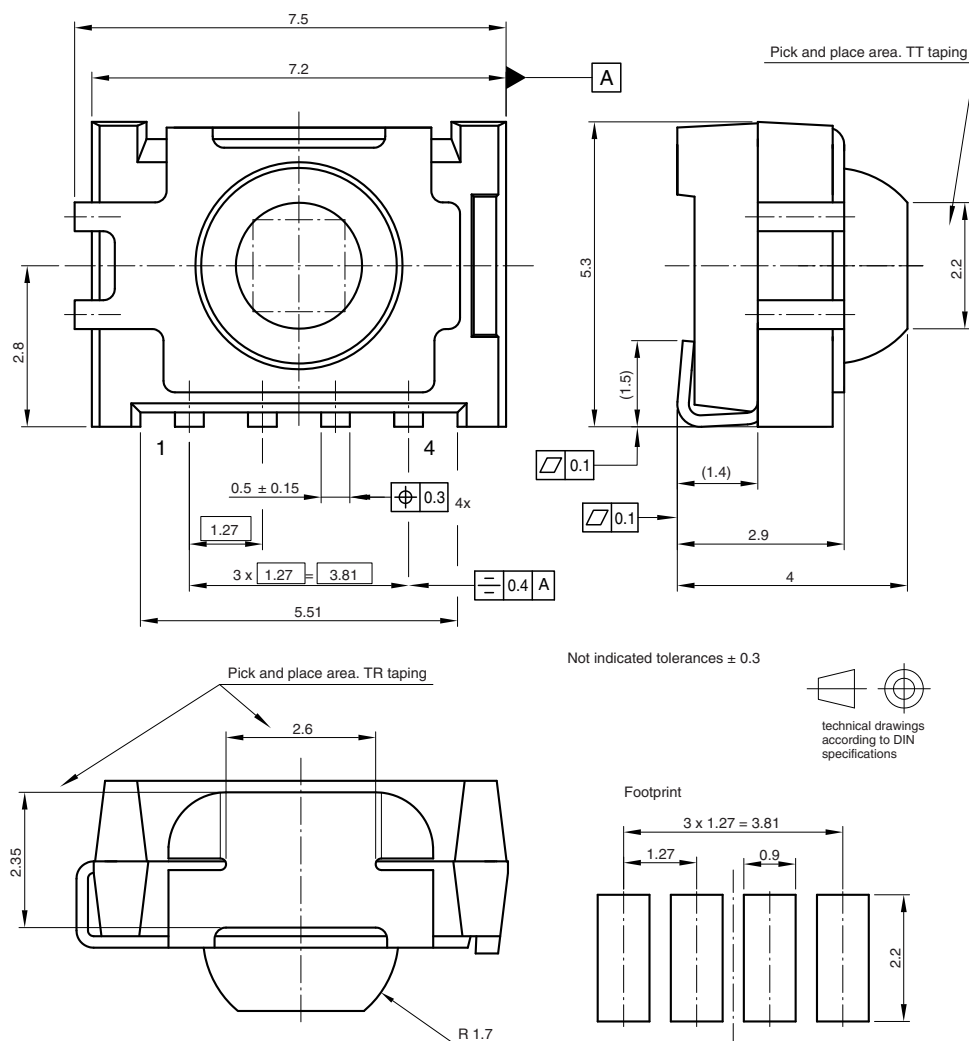
Fig. 14 - IR Disturbance from Fluorescent Lamp with High Modulation

|                                                                            | TSOP62..                                        | TSOP64..                                         |
|----------------------------------------------------------------------------|-------------------------------------------------|--------------------------------------------------|
| Minimum burst length                                                       | 10 cycles/burst                                 | 10 cycles/burst                                  |
| After each burst of length 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 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



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

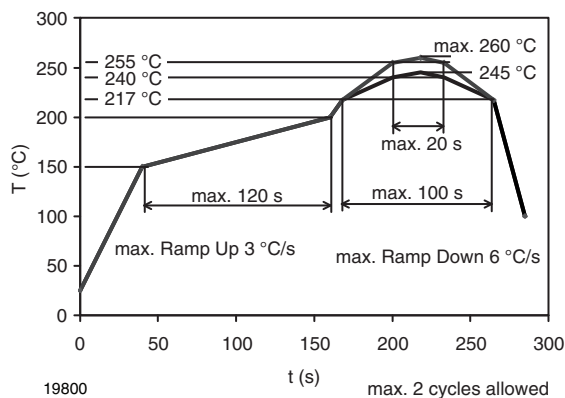
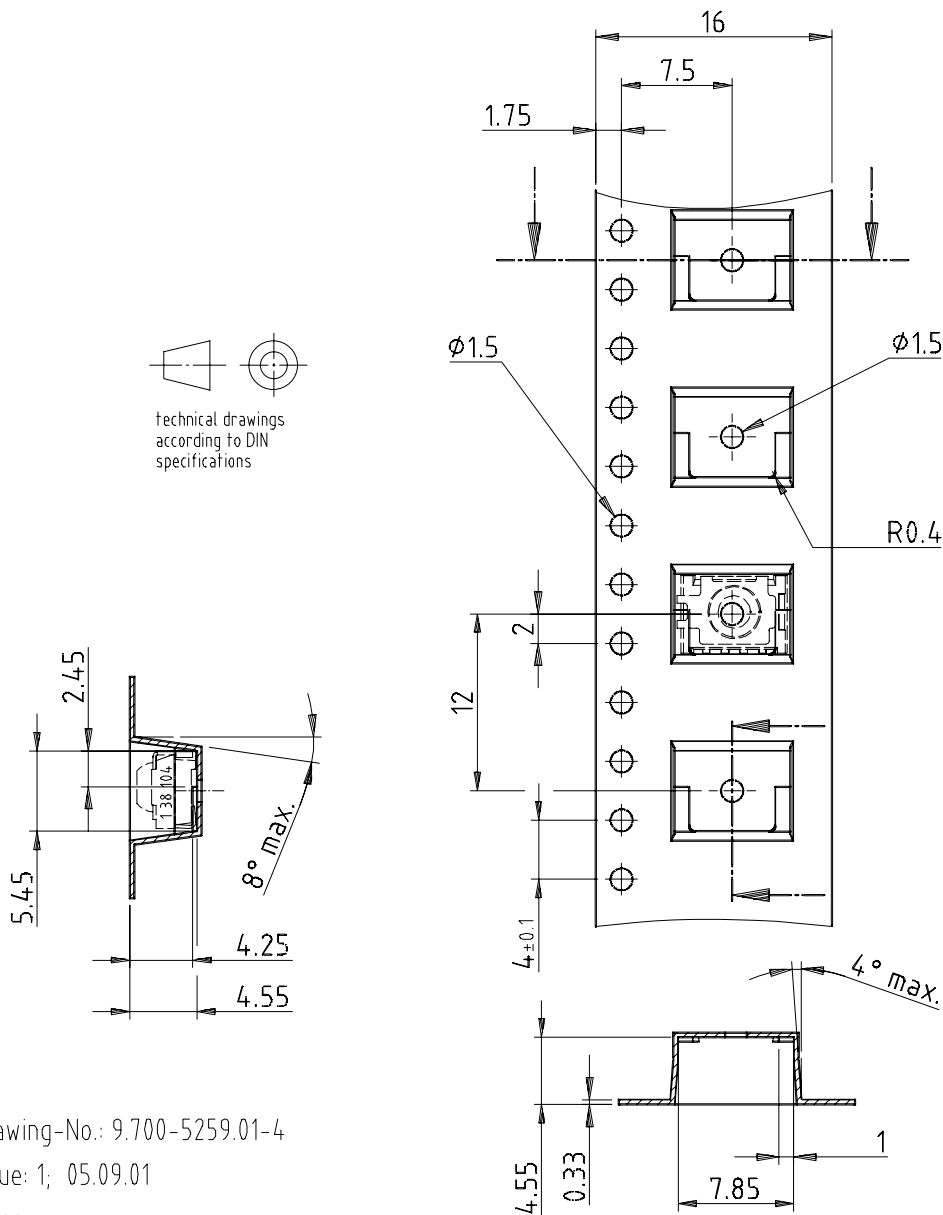
## ASSEMBLY INSTRUCTIONS

## 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 TSOP..TT DIMENSIONS in millimeters**


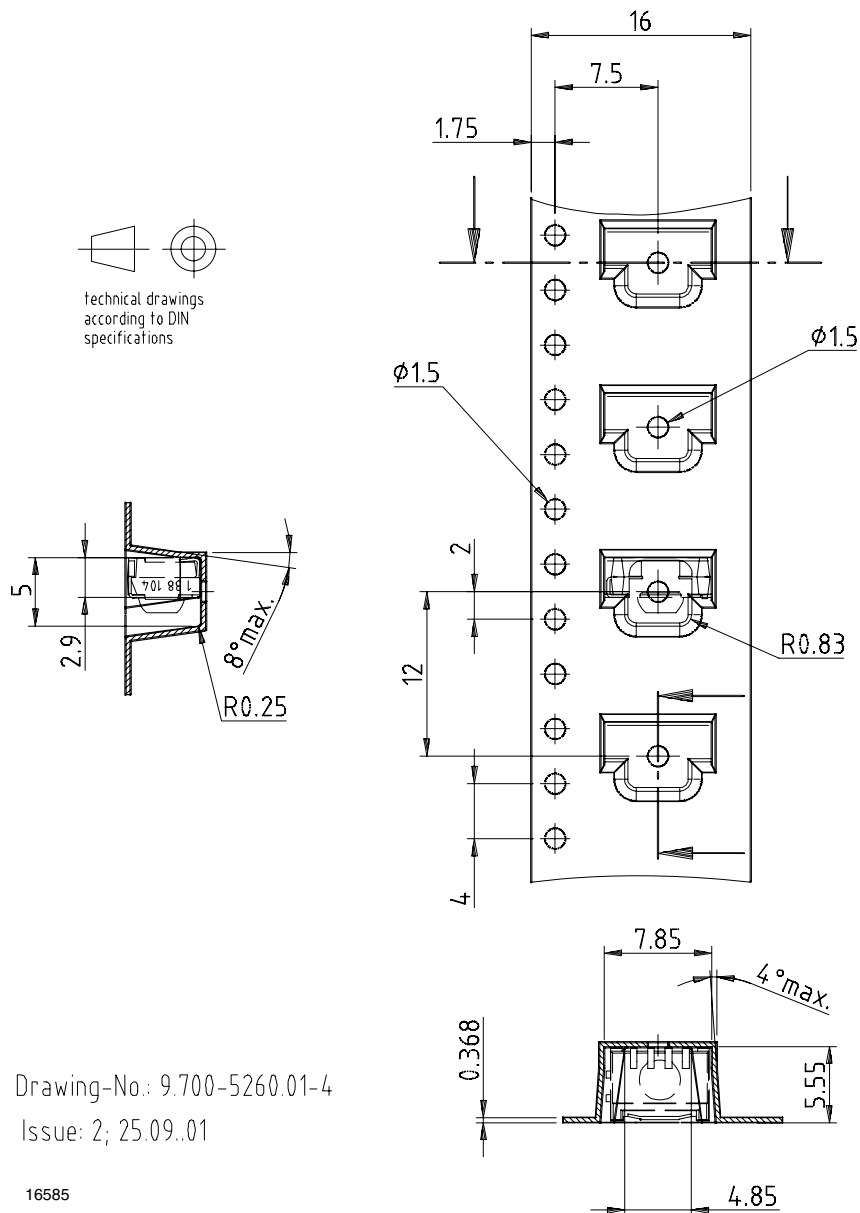
Drawing-No.: 9.700-5259.01-4

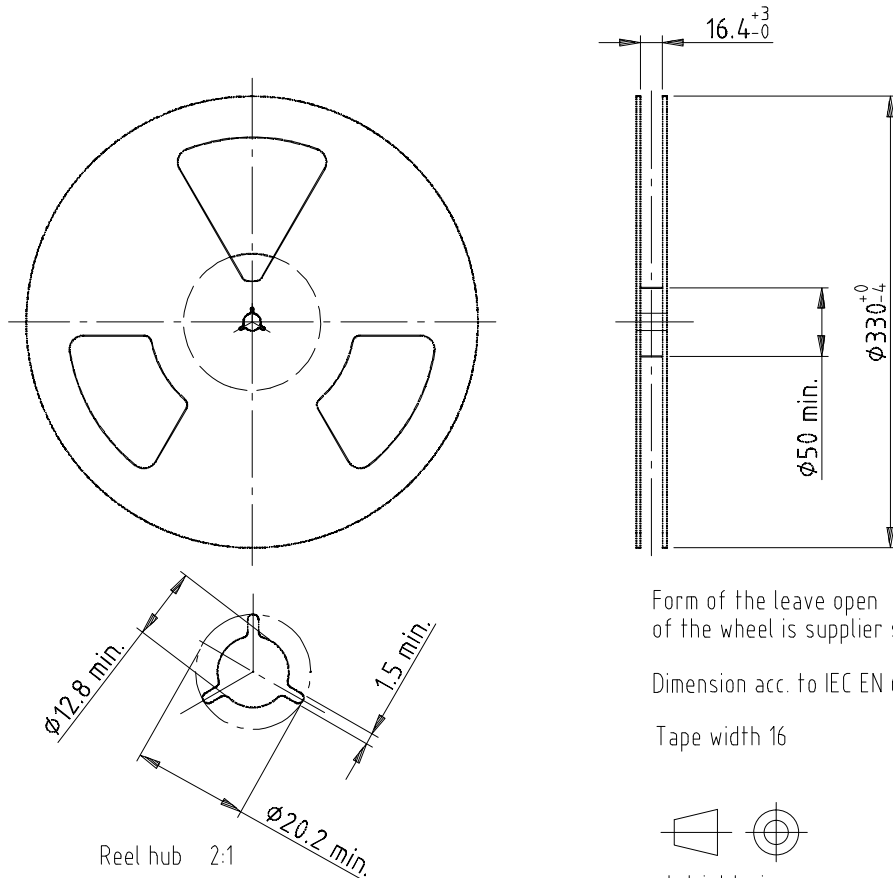
Issue: 1; 05.09.01

16584



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

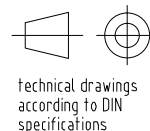


**REEL DIMENSIONS** in millimeters


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

Dimension acc. to IEC EN 60 286-3

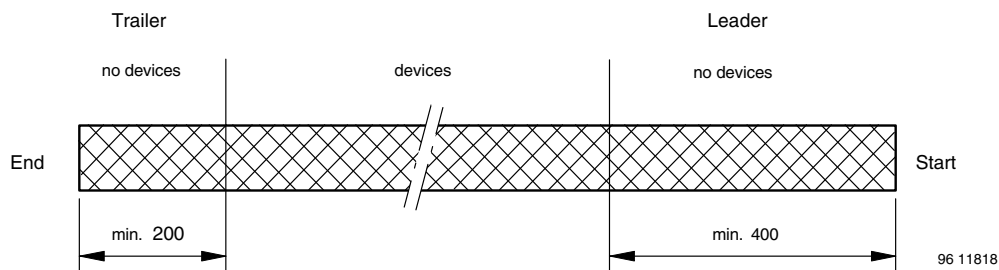
Tape width 16



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

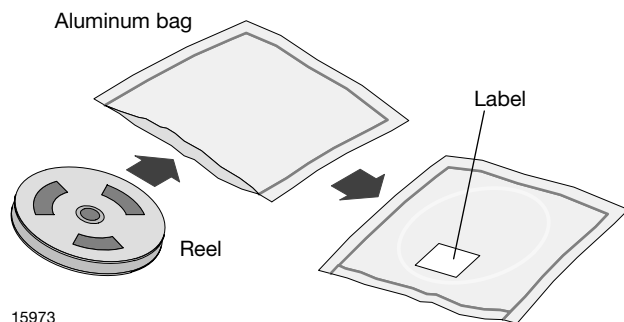
**LABEL**
**Standard bar code labels for finished goods**

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 (Finished goods)</b> |              |              |
|-----------------------------------------------------------------------------------|--------------|--------------|
| 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.



## 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:

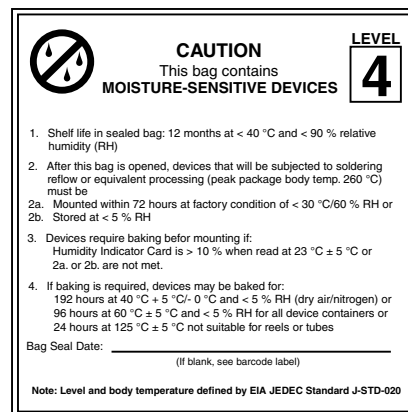
- Storage temperature 10 °C to 30 °C
- Storage humidity ≤ 60 % RH max.

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.



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



## Disclaimer

ALL PRODUCT, PRODUCT SPECIFICATIONS AND DATA ARE SUBJECT TO CHANGE WITHOUT NOTICE TO IMPROVE RELIABILITY, FUNCTION OR DESIGN OR OTHERWISE.

Vishay Intertechnology, Inc., its affiliates, agents, and employees, and all persons acting on its or their behalf (collectively, "Vishay"), disclaim any and all liability for any errors, inaccuracies or incompleteness contained in any datasheet or in any other disclosure relating to any product.

Vishay makes no warranty, representation or guarantee regarding the suitability of the products for any particular purpose or the continuing production of any product. To the maximum extent permitted by applicable law, Vishay disclaims (i) any and all liability arising out of the application or use of any product, (ii) any and all liability, including without limitation special, consequential or incidental damages, and (iii) any and all implied warranties, including warranties of fitness for particular purpose, non-infringement and merchantability.

Statements regarding the suitability of products for certain types of applications are based on Vishay's knowledge of typical requirements that are often placed on Vishay products in generic applications. Such statements are not binding statements about the suitability of products for a particular application. It is the customer's responsibility to validate that a particular product with the properties described in the product specification is suitable for use in a particular application. Parameters provided in datasheets and/or specifications may vary in different applications and performance may vary over time. All operating parameters, including typical parameters, must be validated for each customer application by the customer's technical experts. Product specifications do not expand or otherwise modify Vishay's terms and conditions of purchase, including but not limited to the warranty expressed therein.

Except as expressly indicated in writing, Vishay products are not designed for use in medical, life-saving, or life-sustaining applications or for any other application in which the failure of the Vishay product could result in personal injury or death. Customers using or selling Vishay products not expressly indicated for use in such applications do so at their own risk. Please contact authorized Vishay personnel to obtain written terms and conditions regarding products designed for such applications.

No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted by this document or by any conduct of Vishay. Product names and markings noted herein may be trademarks of their respective owners.

## Material Category Policy

**Vishay Intertechnology, Inc. hereby certifies that all its products that are identified as RoHS-Compliant fulfill the definitions and restrictions defined under Directive 2011/65/EU of The European Parliament and of the Council of June 8, 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment (EEE) - recast, unless otherwise specified as non-compliant.**

**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.**