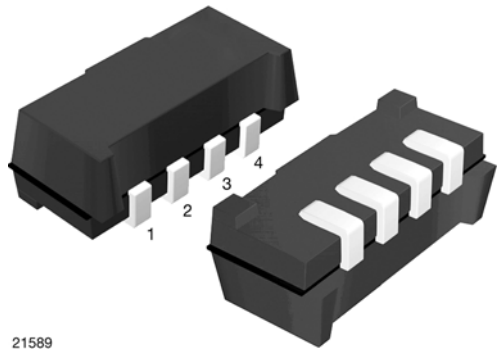
# IR Receiver Modules for Remote Control Systems




21589

## 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
- Capable of side or top view
- Low profile 2.35 mmfio
- Insensitive to supply voltage ripple and noise
- Narrow optical filter to reduce interference from plasma TV emissions
- 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, 4 = GND, 2 = $V_S$, 3 = OUT

## ORDERING CODE

**Taping:**

TSOP75...WTT - top view taped

TSOP75...WTR - side view taped

## DESCRIPTION

The TSOP75...W series are miniaturized SMD IR receiver modules for infrared remote control systems. Two PIN diodes 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 TSOP752...W and TSOP754..W are optimized to suppress almost all spurious pulses from energy saving lamps like CFLs. The AGC4 used in the TSOP754..W may suppress some data signals. The TSOP752..W is a legacy product for all common IR remote control data formats. Between these two receiver types, the TSOP754..W is preferred. Customers should initially try the TSOP754..W in their design.

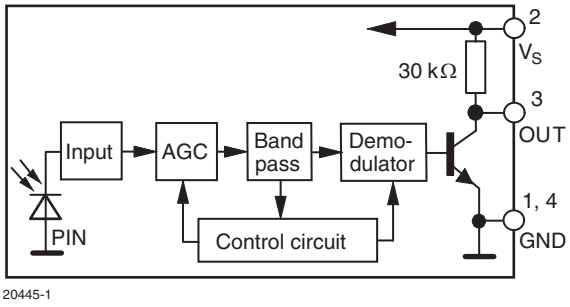
These components have not been qualified according to automotive specifications.

| PARTS TABLE | | | |
|---|---|---|---|
| **AGC** | | **LEGACY, FOR LONG BURST REMOTE CONTROLS (AGC2)** | **RECOMMENDED FOR LONG BURST CODES (AGC4) (1)** |
| **Carrier frequency** | 30 kHz | TSOP75230W | TSOP75430W |
| | 33 kHz | TSOP75233W | TSOP75433W |
| | 36 kHz | TSOP75236W | TSOP75436W (2)(3)(4) |
| | 38 kHz | TSOP75238W | TSOP75438W (5)(6) |
| | 40 kHz | TSOP75240W | TSOP75440W |
| | 56 kHz | TSOP75256W | TSOP75456W (7)(8) |
| **Package** | | Heimdall no lens | |
| **Pinning** | | 1, 4 = GND, 2 = $V_S$, 3 = OUT | |
| **Dimensions (mm)** | | 6.8 W x 3.0 H x 2.35 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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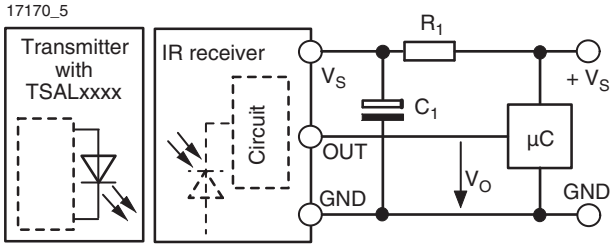
## APPLICATION CIRCUIT




$R_1$ and $C_1$ are recommended for protection against EOS. Components should be in the range of 33 Ω < $R_1$ < 1 kΩ, $C_1$ > 0.1 µF.

## ABSOLUTE MAXIMUM RATINGS

| PARAMETER | TEST CONDITION | SYMBOL | VALUE | UNIT |
|---|---|---|---|---|
| Supply voltage | | $V_S$ | -0.3 to +6 | V |
| Supply current | | $I_S$ | 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 | $T_{amb}$ ≤ 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 | $E_v$ = 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 |
| Transmission distance | $E_v$ = 0, test signal see fig. 1, IR diode TSAL6200, $I_F$ = 200 mA | d | | 30 | | 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 | $E_{e\ min.}$ | | 0.25 | 0.5 | mW/m² |
| Maximum irradiance | $t_{pi}$ - 5/$f_o$ < $t_{po}$ < $t_{pi}$ + 6/$f_o$, test signal see fig. 1 | $E_{e\ max.}$ | 30 | | | W/m² |
| Directivity | Angle of half transmission distance | $\varphi_{1/2}$ | | ± 75 | | deg |

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

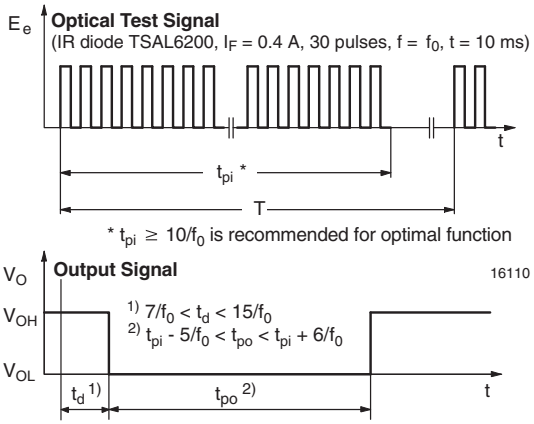



Fig. 1 - Output Active Low

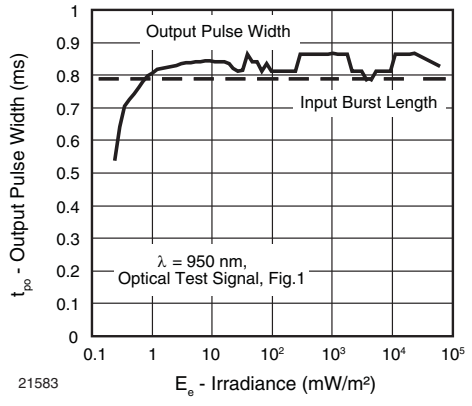



Fig. 2 - Pulse Length and Sensitivity in Dark Ambient

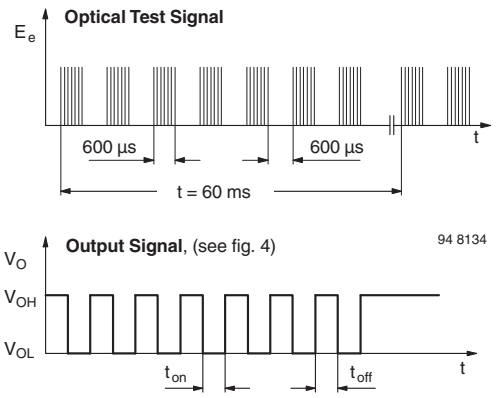



Fig. 3 - Output Function

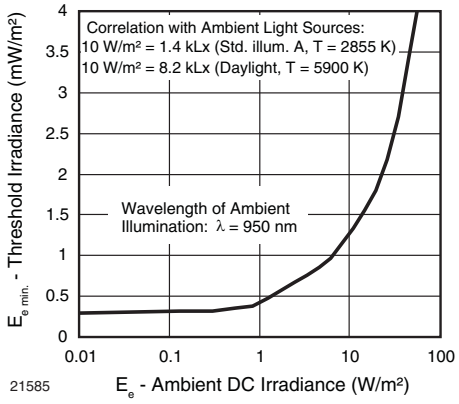



Fig. 6 - Sensitivity in Bright Ambient

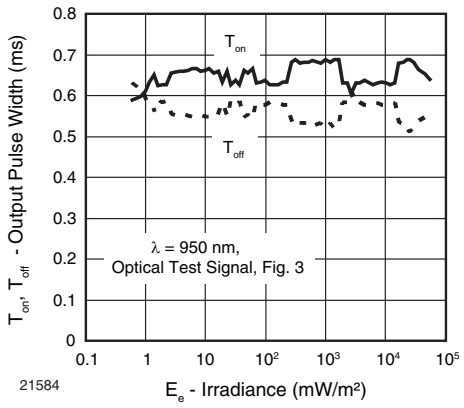



Fig. 4 - Output Pulse Diagram

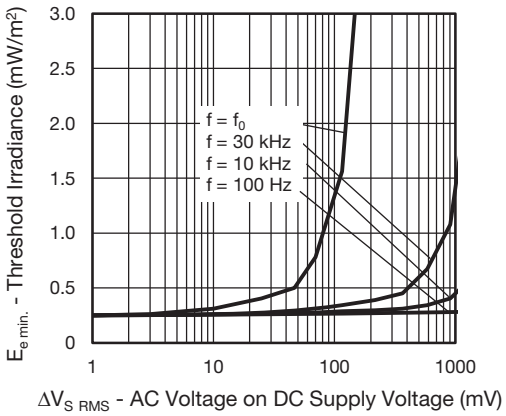



Fig. 7 - Sensitivity vs. Supply Voltage Disturbances

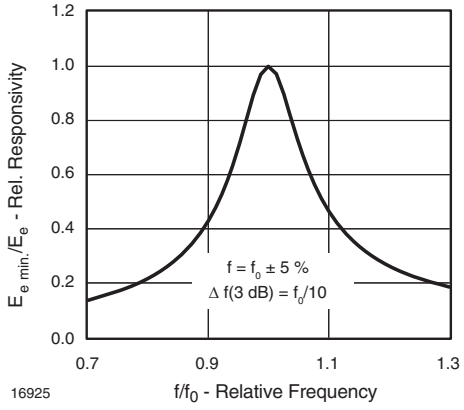



Fig. 5 - Frequency Dependence of Responsivity

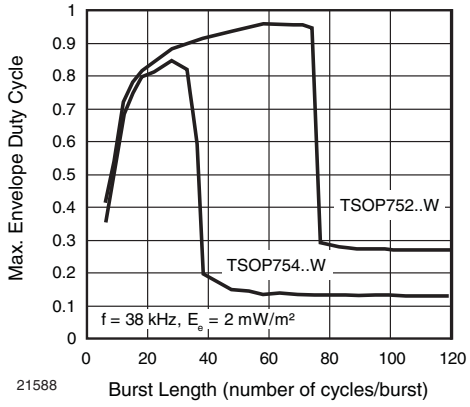



Fig. 8 - Max. Envelope Duty Cycle vs. Burst Length

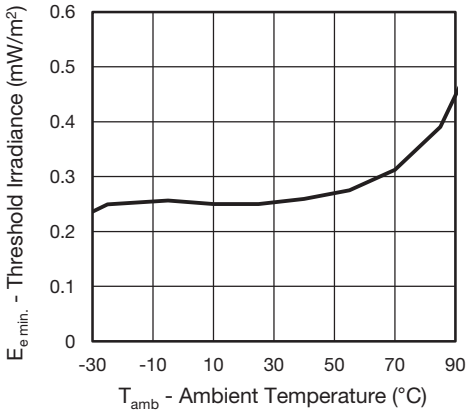



Fig. 9 - Sensitivity vs. Ambient Temperature

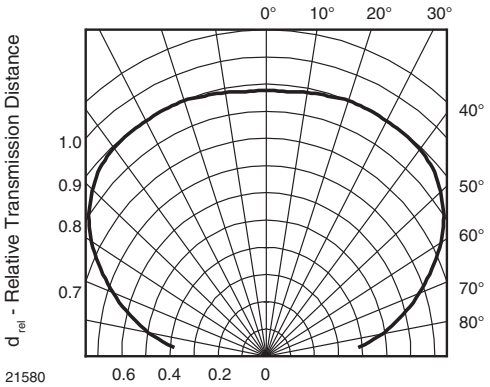



Fig. 12 - Vertical Directivity

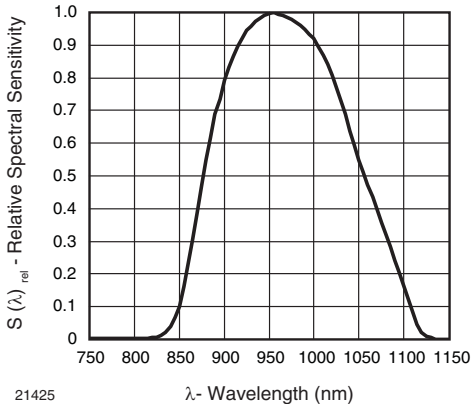



Fig. 10 - Relative Spectral Sensitivity vs. Wavelength

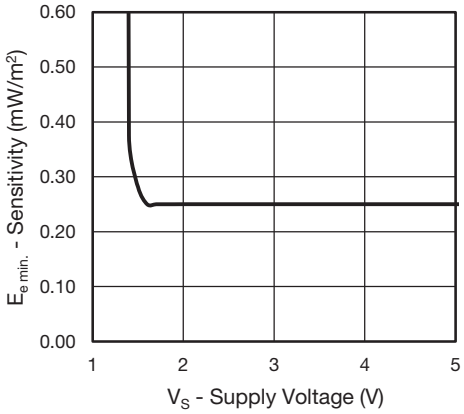



Fig. 13 - Sensitivity vs. Supply Voltage

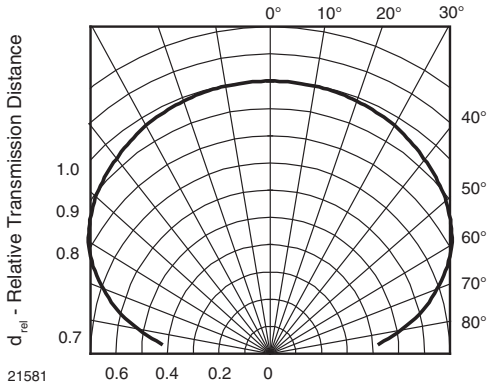



Fig. 11 - Horizontal Directivity

## 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 patterns from fluorescent lamps with electronic ballasts (see figure 14 or figure 15)

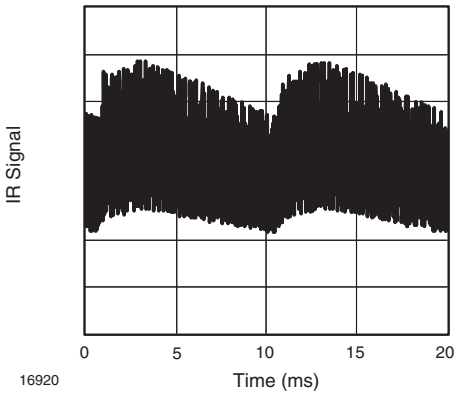



Fig. 14 - IR Disturbance from Fluorescent Lamp with Low Modulation

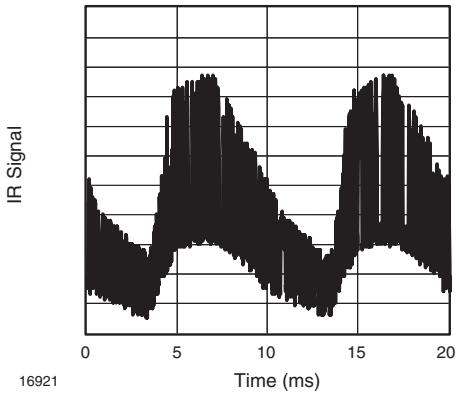


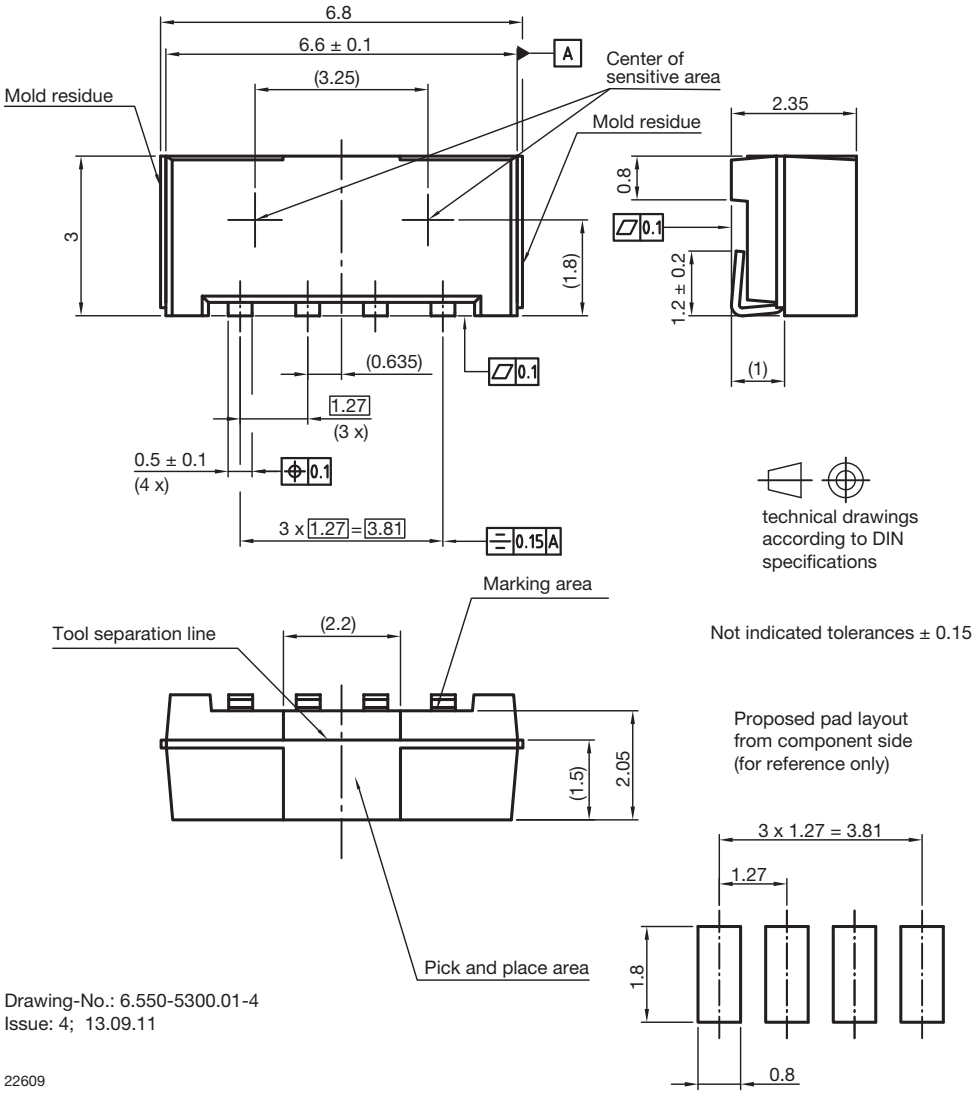

Fig. 15 - IR Disturbance from Fluorescent Lamp with High Modulation

| | TSOP752..W | TSOP754..W |
|---|---|---|
| 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>≥ 10 cycles | 10 to 35 cycles<br>≥ 10 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 | 1800 | 1500 |
| 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 for TSOP753..W
- Best choice of AGC for some popular IR-codes:
  - TSOP75436W: RC-5, RC-6, Panasonic
  - TSOP75438W: NEC, Sharp, r-map
  - TSOP75456W: r-step, Thomson RCA
- For Sony 12, 15, and 20 bit IR-codes please see the datasheet of TSOP75S40FW

**PACKAGE DIMENSIONS** in millimeters




## ASSEMBLY INSTRUCTIONS

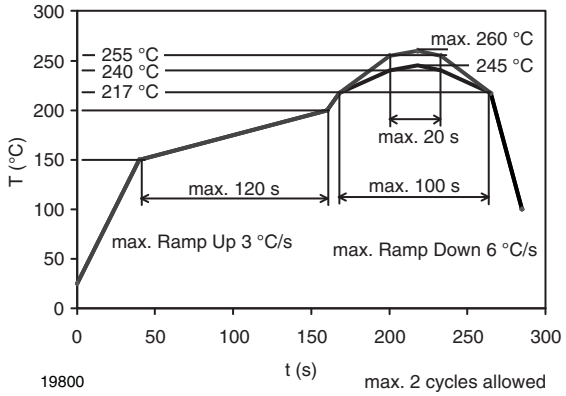
### Reflow Soldering

- 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

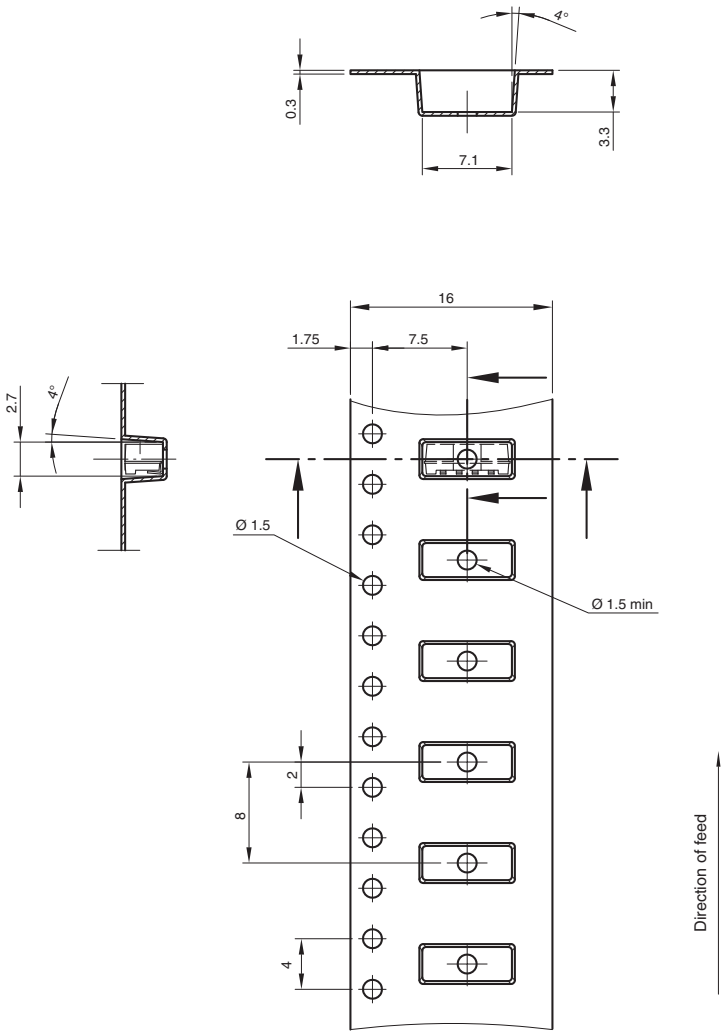
### Manual Soldering

- 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



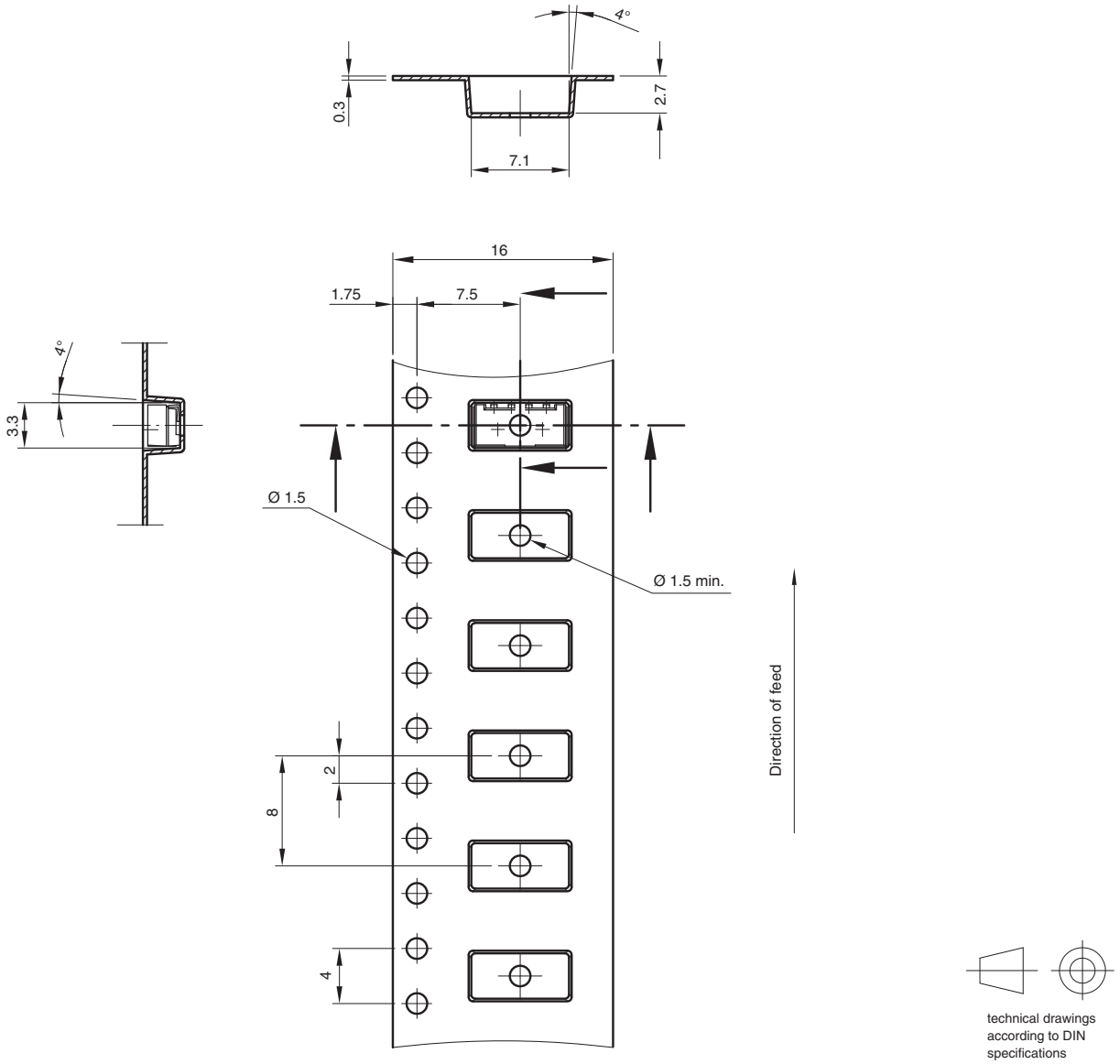

## TAPING VERSION TSOP..TR DIMENSIONS in millimeters




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

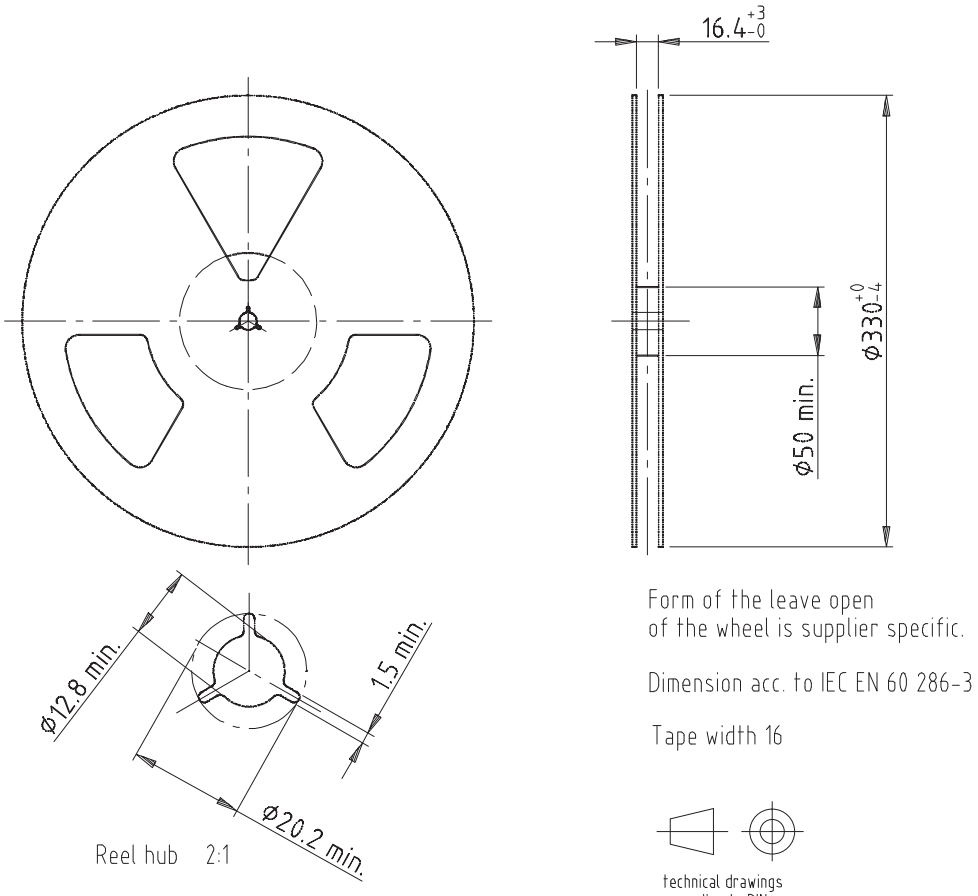
technical drawings
according to DIN
specifications

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

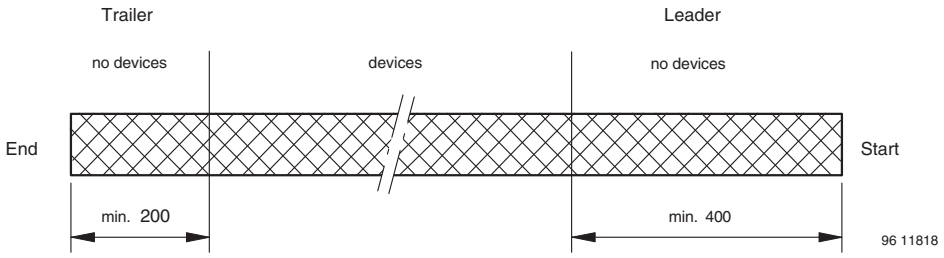



Drawing-No.: 9.700-5341.01-4
Issue: 2: 23.03.09
21666

## REEL DIMENSIONS in millimeters




## LEADER AND TRAILER DIMENSIONS in millimeters




## COVER TAPE PEEL STRENGTH

According to DIN EN 60286-3

0.1 N to 1.3 N

300 ± 10 mm/min.

165° to 180° peel angle

## LABEL

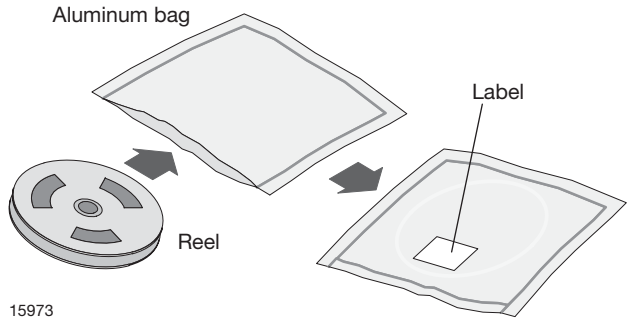
**Standard bar code labels for finished goods**

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.

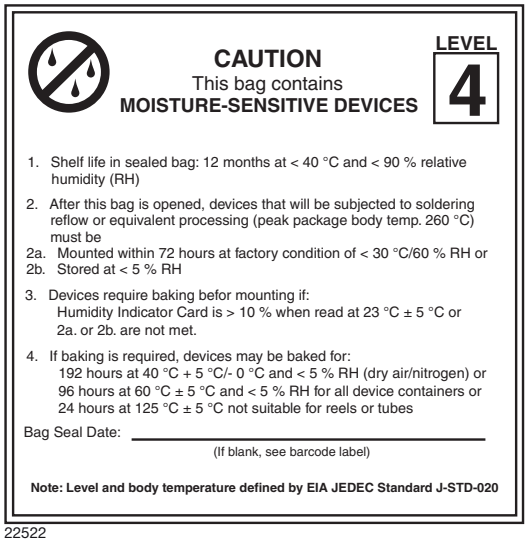
In case of moisture absorption, the devices will recover to the former condition by drying under the following condition:

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.


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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.**