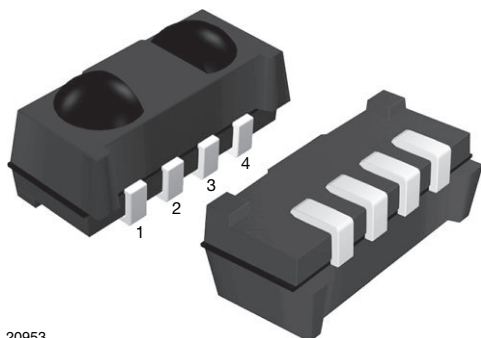


# IR Sensor Module for Reflective Sensor, Light Barrier, and Fast Proximity Applications



20953

## DESIGN SUPPORT TOOLS AVAILABLE



3D Models

## MECHANICAL DATA

### Pinning:

1, 4 = GND, 2 =  $V_S$ , 3 = OUT

## ORDERING CODE

### Taping:

TSSP770..TT - top view taped

TSSP770..TR - side view taped

## FEATURES

- Up to 2 m for presence and proximity sensing
- Uses modulated bursts of infrared light
- PIN diode and sensor IC in one package
- Low supply current
- Shielding against EMI
- Visible light is suppressed by IR filter
- Insensitive to supply voltage ripple and noise
- Supply voltage: 2.5 V to 5.5 V
- 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 TSSP770.. series are compact infrared detector modules for presence and fast proximity sensing applications. They provide an active low output in response to infrared bursts at 940 nm. The frequency of the burst should correspond to the carrier frequency shown in the parts table.

This component has not been qualified according to automotive specifications.

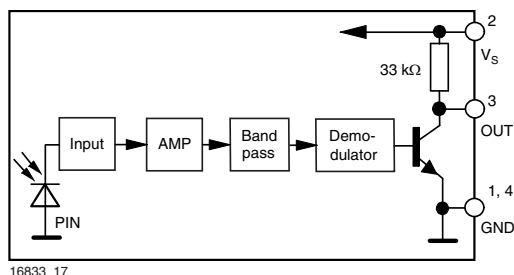
## APPLICATIONS

- Reflective sensors for hand dryers, towel or soap dispensers, water faucets, toilet flush
- Vending machine fall detection
- Security and pet gates
- Person or object vicinity activation
- Fast proximity sensors for toys, robotics, drones, and other consumer and industrial uses

## PARTS TABLE

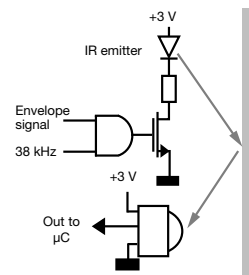
|                   |                                          |           |
|-------------------|------------------------------------------|-----------|
| Carrier frequency | 38 kHz                                   | TSSP77038 |
|                   | 56 kHz                                   | TSSP77056 |
| Package           | Heimdall                                 |           |
| Pinning           | 1, 4 = GND, 2 = $V_S$ , 3 = OUT          |           |
| Dimensions (mm)   | 6.8 W x 3.0 H x 3.2 D                    |           |
| Mounting          | SMD                                      |           |
| Application       | Presence sensors, fast proximity sensors |           |

## BLOCK DIAGRAM



16833\_17

## PRESENCE SENSING



**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>$I_F = 50\text{ mA}$ ,<br>test signal see Fig. 1            | $d$               | -    | 8        | -    | 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 | $E_e\text{ min.}$ | -    | 0.7      | 1.2  | mW/m <sup>2</sup> |
| 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   | -        | -    | W/m <sup>2</sup>  |
| Directivity           | Angle of half<br>transmission distance                                                           | $\Phi_{1/2}$      | -    | $\pm 50$ | -    | deg               |

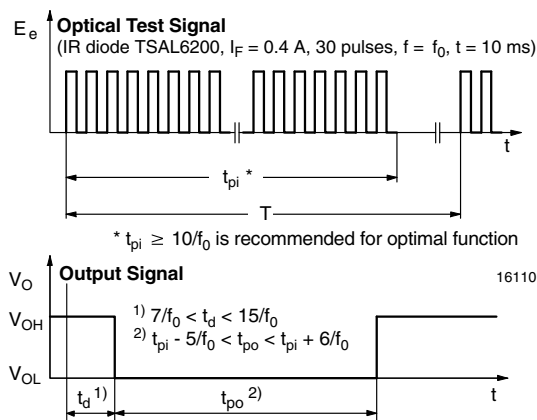
**TYPICAL CHARACTERISTICS** ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)


Fig. 1 - Output Active Low

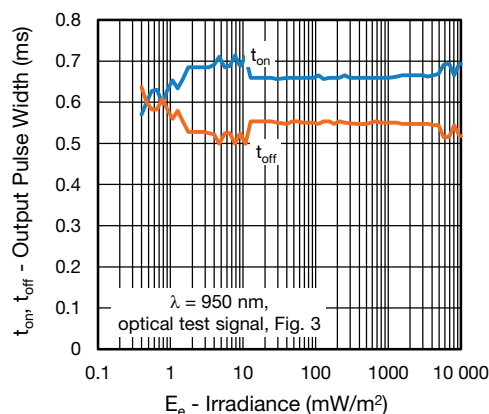


Fig. 4 - Output Pulse Diagram

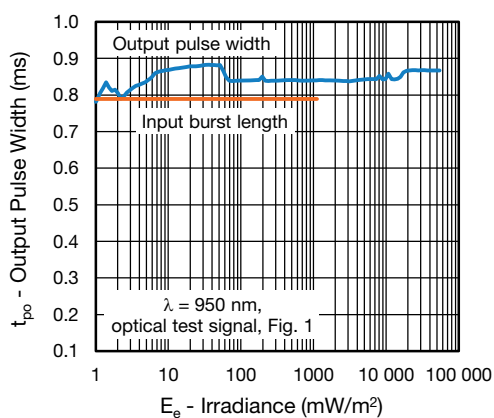


Fig. 2 - Pulse Length and Sensitivity in Dark Ambient

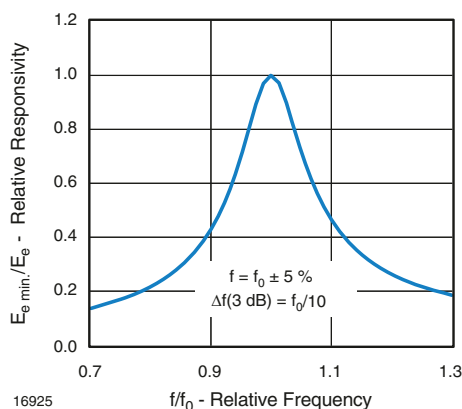


Fig. 5 - Frequency Dependence of Responsivity

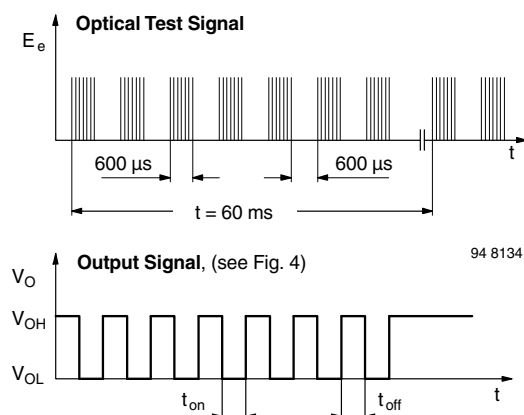


Fig. 3 - Output Function

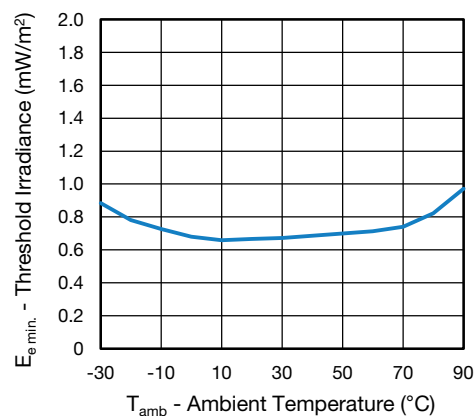


Fig. 6 - Sensitivity vs. Ambient Temperature

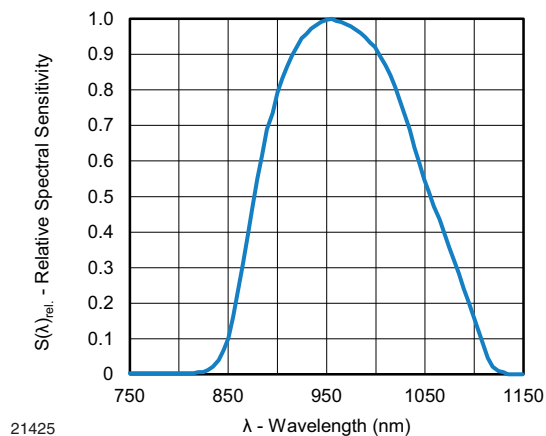


Fig. 7 - Relative Spectral Sensitivity vs. Wavelength

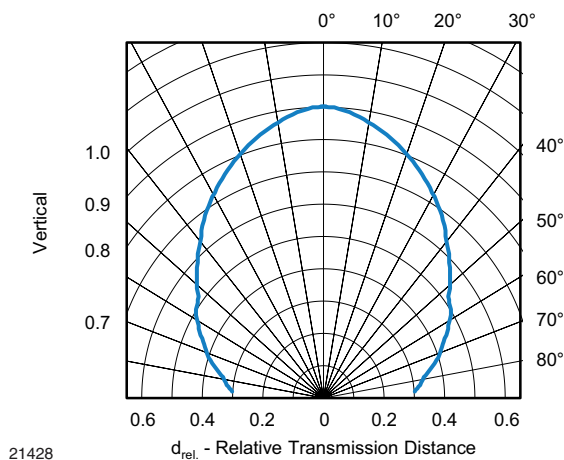


Fig. 9 - Vertical Directivity

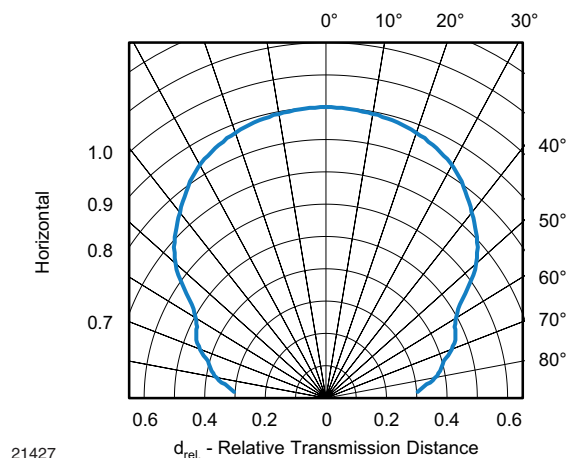


Fig. 8 - Horizontal Directivity

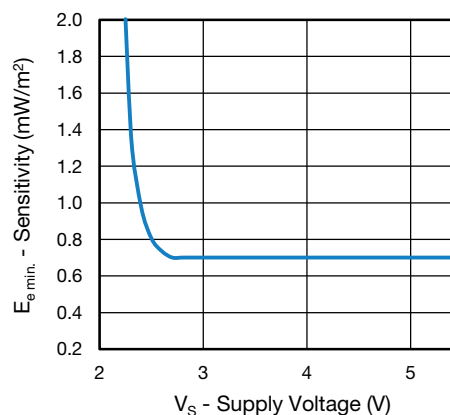
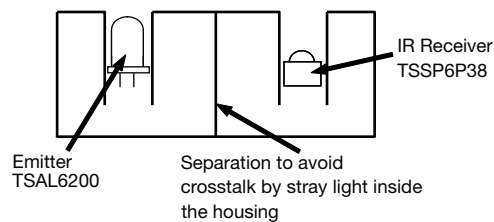


Fig. 10 - Sensitivity vs. Supply Voltage

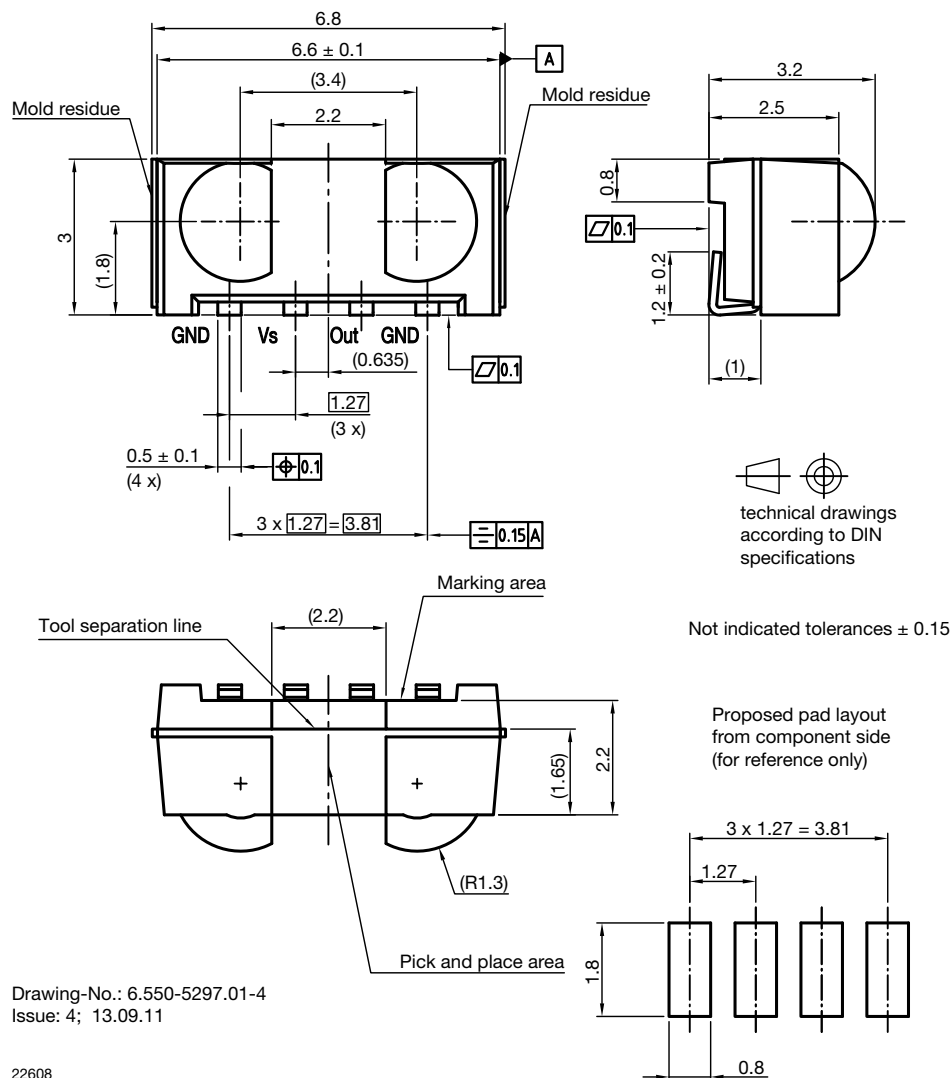
The typical application of these devices is a reflective or beam break sensor with active low “detect” or “no detect” information contained in its output. The TSSP77056 is also suitable for fast (~ 5 ms) proximity sensor applications for ranges between 10 cm and 2 m. Please see application note “Vishay’s TSSP4056 Sensor for Fast Proximity Sensing” ([www.vishay.com/doc?82741](http://www.vishay.com/doc?82741)).

Example for a sensor hardware:



There should be no common window in front of the emitter and detector in order to avoid crosstalk via guided light through the window.

### PACKAGE DIMENSIONS in millimeters



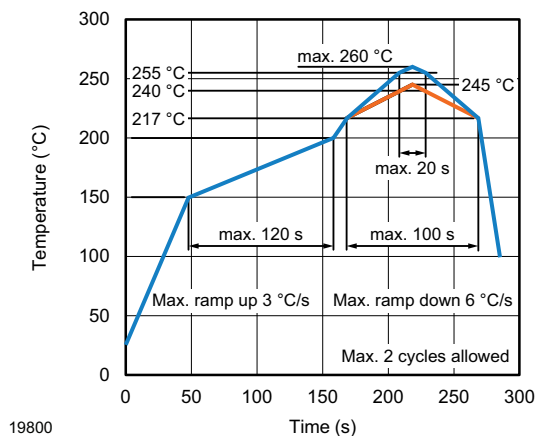
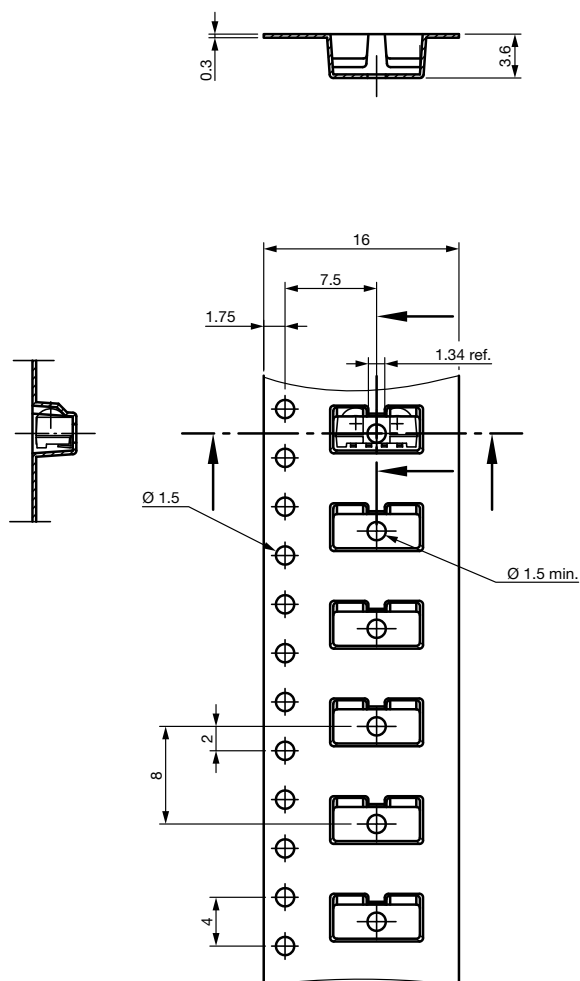
## ASSEMBLY INSTRUCTIONS

## 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

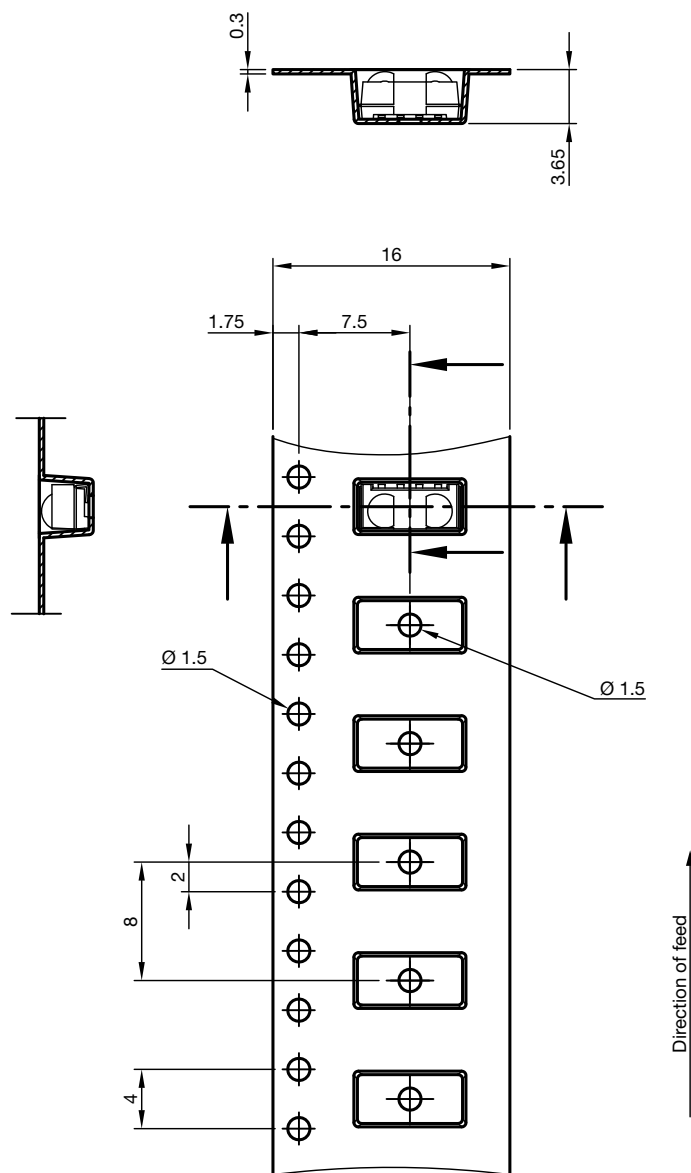
## Manual Soldering

- 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

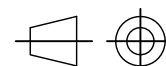
**VISHAY LEAD (Pb)-FREE REFLOW SOLDER PROFILE**

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


Drawing-No.: 9.700-5337.01-4  
Issue: 2; 06.10.15

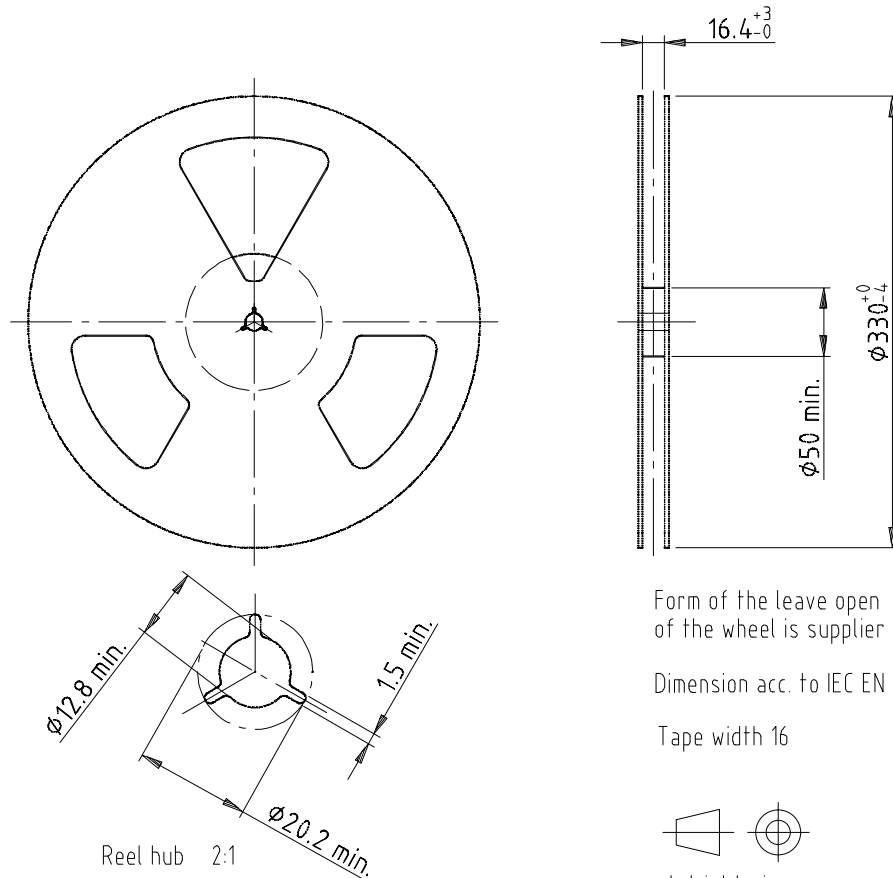
technical drawings  
according to DIN  
specifications

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


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



technical drawings  
according to DIN  
specifications

**REEL DIMENSIONS** in millimeters


Reel hub 2:1

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

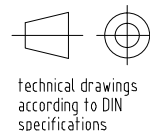
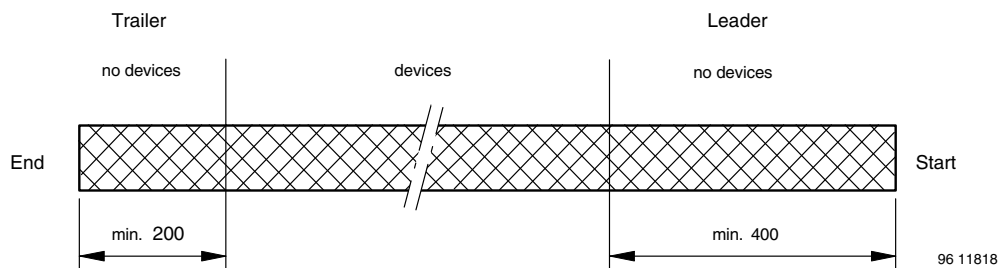
Issue: 1; 07.05.02

16734

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

Dimension acc. to IEC EN 60 286-3

Tape width 16


**LEADER AND TRAILER DIMENSIONS** in millimeters


96 11818

**COVER TAPE REEL STRENGTH**

According to DIN EN 60286-3

0.1 N to 1.3 N

 $300 \pm 10 \text{ mm/min.}$ 
 $165^\circ$  to  $180^\circ$  peel angle

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

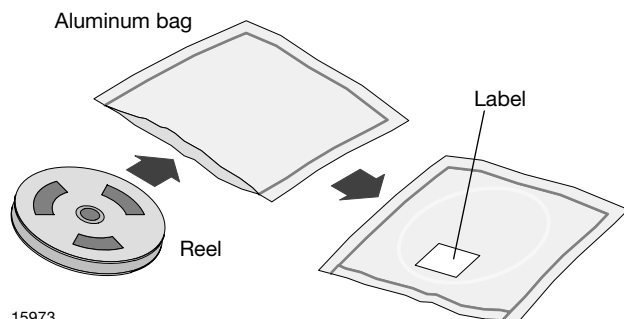
The standard bar code labels are product labels and used for identification of goods. The finished goods are packed in final packing area. The standard packing units are labeled with standard bar code labels before transported as finished goods to warehouses. The labels are on each packing unit and contain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



| VISHAY SEMICONDUCTORS 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.



## FINAL PACKING

The sealed reel is packed into a cardboard box.

## RECOMMENDED METHOD OF STORAGE

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

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

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

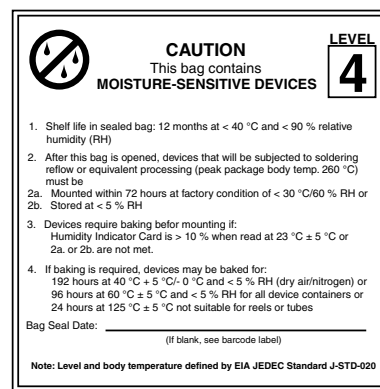
In case of moisture absorption, the devices will recover to the former condition by drying under the following condition:

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

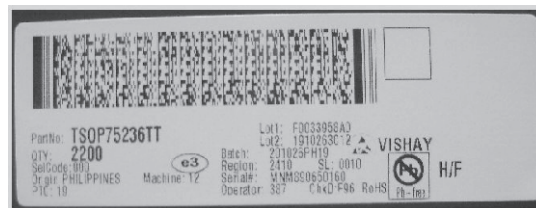


### ESD PRECAUTION

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 (example)

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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