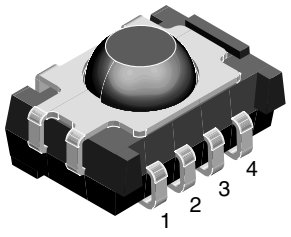
# IR Receiver Module for Light Barrier Systems




## FEATURES

- Low supply current
- Photo detector and preamplifier in one package
- Internal filter for 38 kHz IR signals
- Shielding against EMI
- Supply voltage: 2.7 V to 5.5 V
- Visible light is suppressed by IR filter
- Insensitive to supply voltage ripple and noise
- Compliant to RoHS directive 2002/95/EC and in accordance to WEEE 2002/96/EC

Pb-free

e3

RoHS COMPLIANT

## MECHANICAL DATA

**Pinning:**

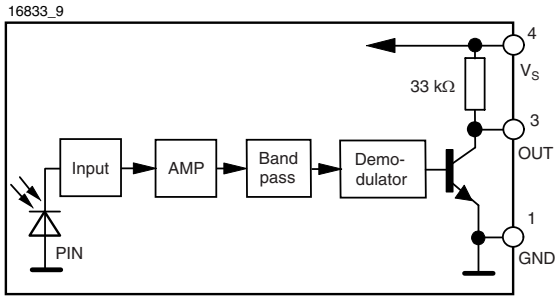
1 = GND, 2 = N.C., 3 = OUT, 4 = $V_S$

## DESCRIPTION

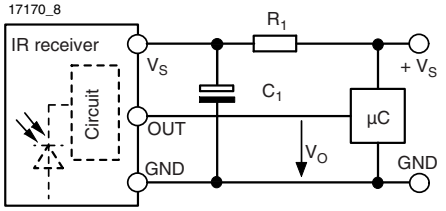
The TSOP5038 is a compact SMD IR receiver for sensor applications. It has a high gain for IR signals at 38 kHz. The detection level does not change when ambient light or strong IR signals are applied. It can receive continuous 38 kHz signals or 38 kHz bursts.

| PARTS TABLE | |
|---|---|
| **CARRIER FREQUENCY** | **SENSOR APPLICATIONS** |
| 38 kHz | TSOP5038 |

## BLOCK DIAGRAM




## APPLICATION CIRCUIT




The external components $R_1$ and $C_1$ are optional to improve the robustnes against electrical overstress (typical values are $R_1$ = 100 Ω, $C_1$ = 0.1 µF).
The output voltage $V_O$ should not be pulled down to a level below 1 V by the external circuit.
The capacitive load at the output should be less than 2 nF.

## ABSOLUTE MAXIMUM RATINGS (1)

| PARAMETER | TEST CONDITION | SYMBOL | VALUE | UNIT |
|---|---|---|---|---|
| Supply voltage (pin 4) | | $V_S$ | - 0.3 to + 6.0 | V |
| Supply current (pin 4) | | $I_S$ | 5 | mA |
| Output voltage (pin 3) | | $V_O$ | - 0.3 to 5.5 | V |
| Voltage at output to supply | | $V_S - V_O$ | - 0.3 to ($V_S$ + 0.3) | V |
| Output current (pin 3) | | $I_O$ | 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**

(1) 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 (1)

| PARAMETER | TEST CONDITION | SYMBOL | MIN. | TYP. | MAX. | UNIT |
|---|---|---|---|---|---|---|
| Supply current (pin 4) | $E_v$ = 0, $V_S$ = 5 V | $I_{SD}$ | 0.65 | 0.85 | 1.05 | mA |
| | $E_v$ = 40 klx, sunlight | $I_{SH}$ | | 0.95 | | mA |
| Supply voltage | | $V_S$ | 2.7 | | 5.5 | V |
| Transmission distance | $E_v$ = 0, test signal see fig. 1, IR diode TSAL6200, $I_F$ = 400 mA | d | | 30 | | m |
| Output voltage low (pin 3) | $I_{OSL}$ = 0.5 mA, $E_e$ = 2 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 | $E_{e\ min.}$ | | 0.5 | 1 | 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 | $\varphi_{1/2}$ | | ± 50 | | deg |

**Note**

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

## TYPICAL CHARACTERISTICS

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

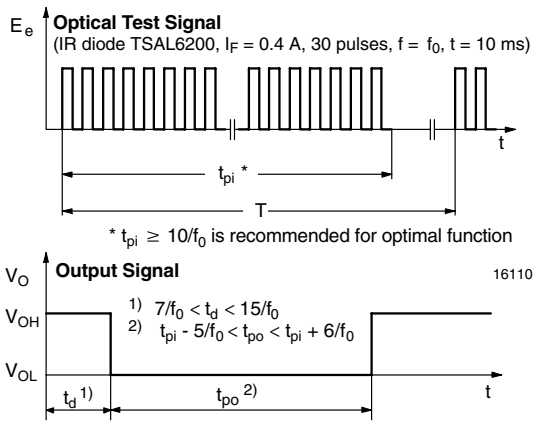



Fig. 1 - Output Active Low

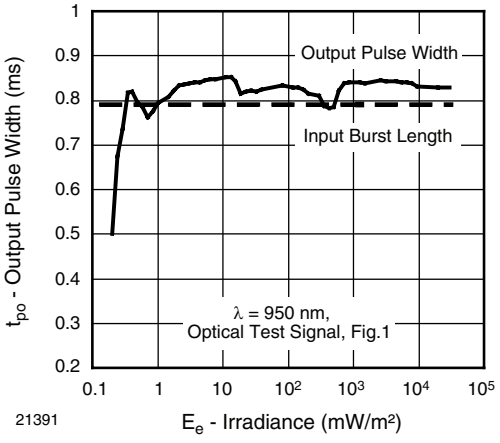



Fig. 2 - Pulse Length and Sensitivity in Dark Ambient

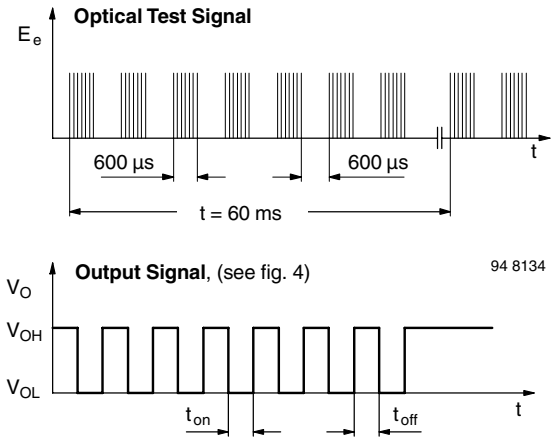



Fig. 3 - Output Function

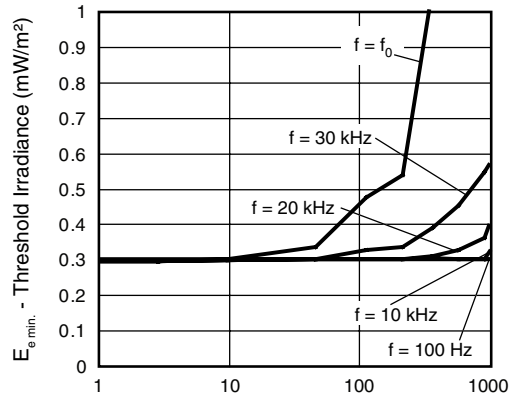



Fig. 6 - Sensitivity vs. Supply Voltage Disturbances

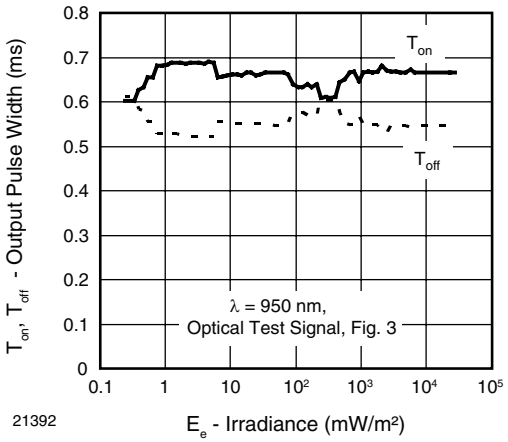



Fig. 4 - Output Pulse Diagram

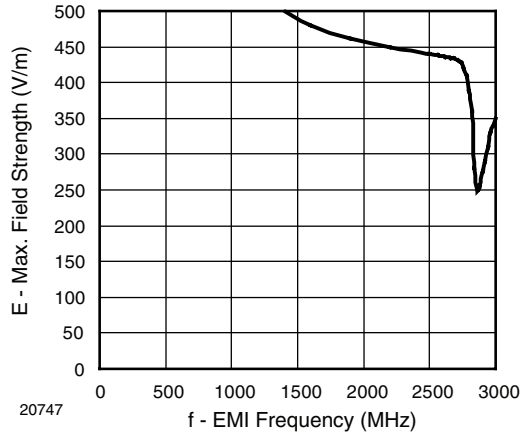



Fig. 7 - Sensitivity vs. Electric Field Disturbances

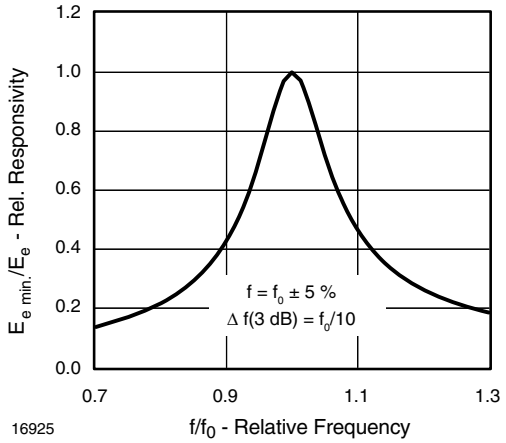



Fig. 5 - Frequency Dependence of Responsivity

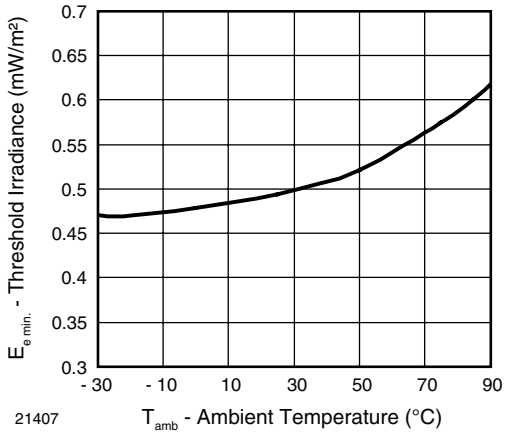



Fig. 8 - Sensitivity vs. Ambient Temperature

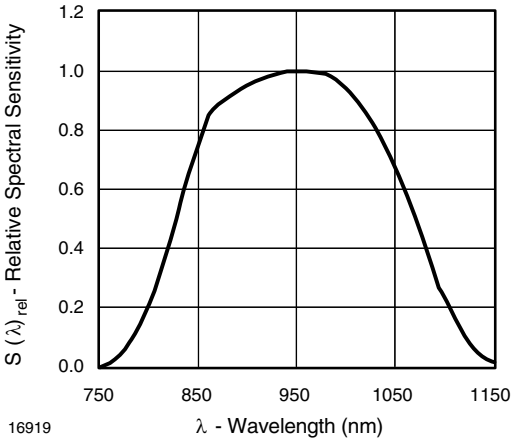



Fig. 9 - Relative Spectral Sensitivity vs. Wavelength

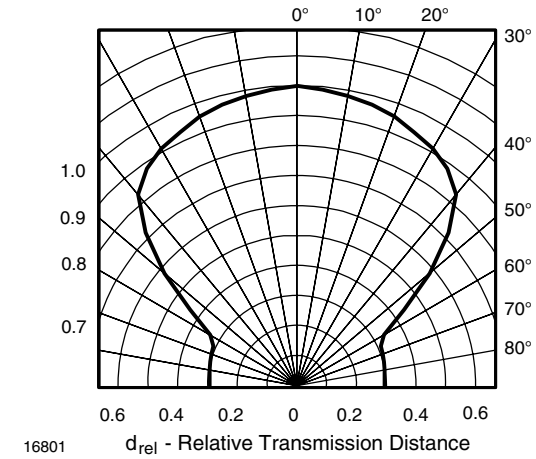



Fig. 10 - Horizontal Directivity

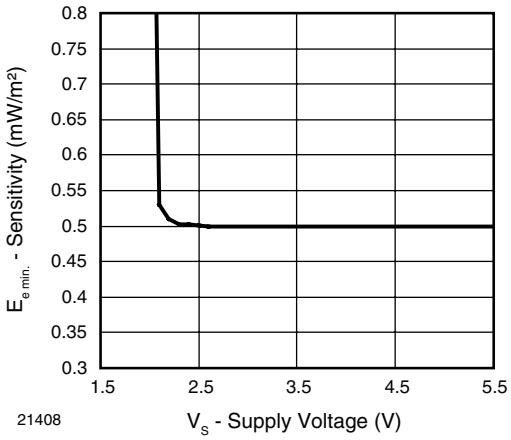
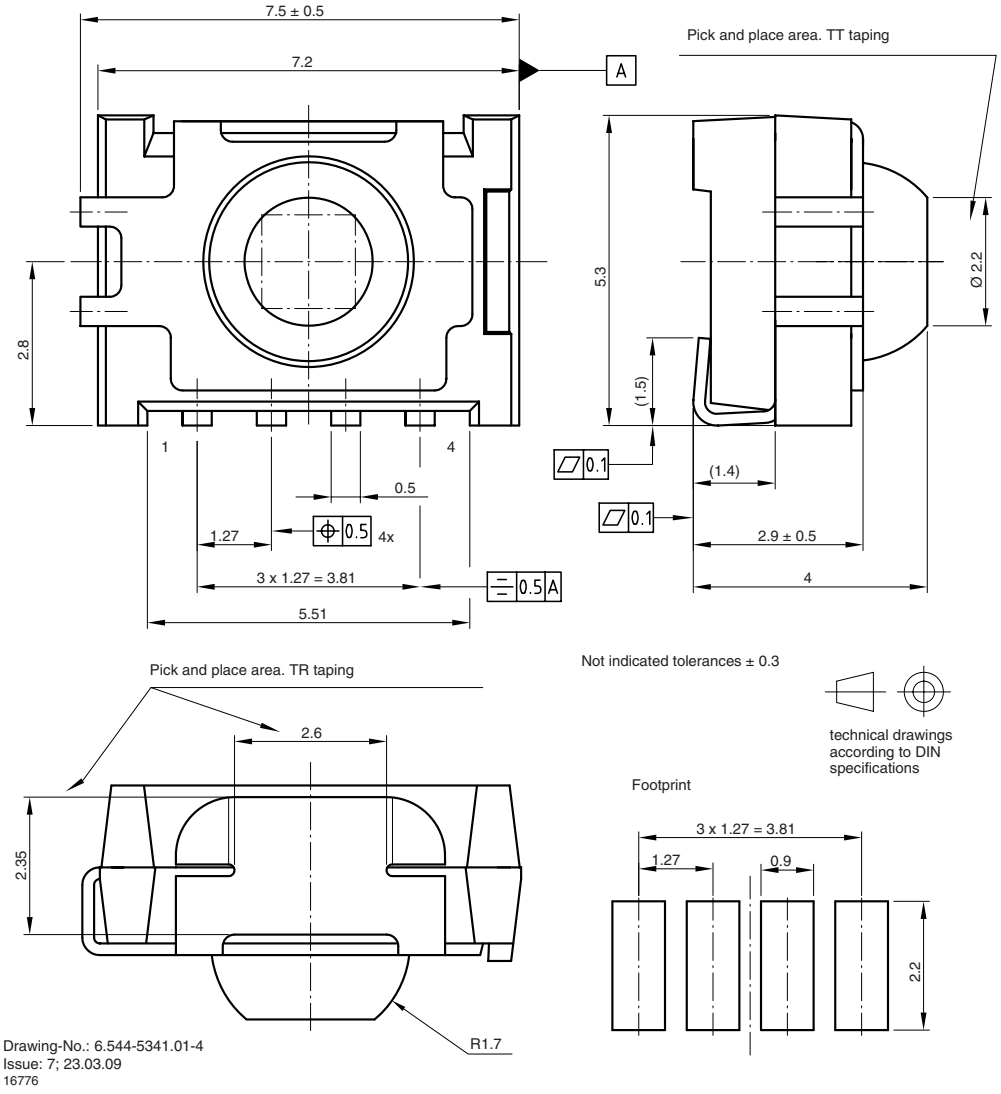



Fig. 11 - Sensitivity vs. Supply Voltage

## PACKAGE DIMENSIONS in millimeters




## ASSEMBLY INSTRUCTIONS

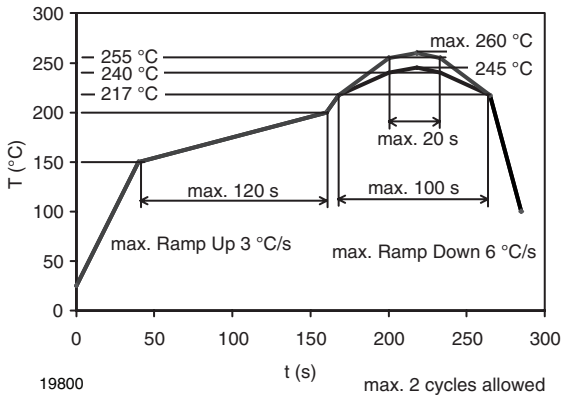
### Reflow Soldering

- 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. Excercise 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

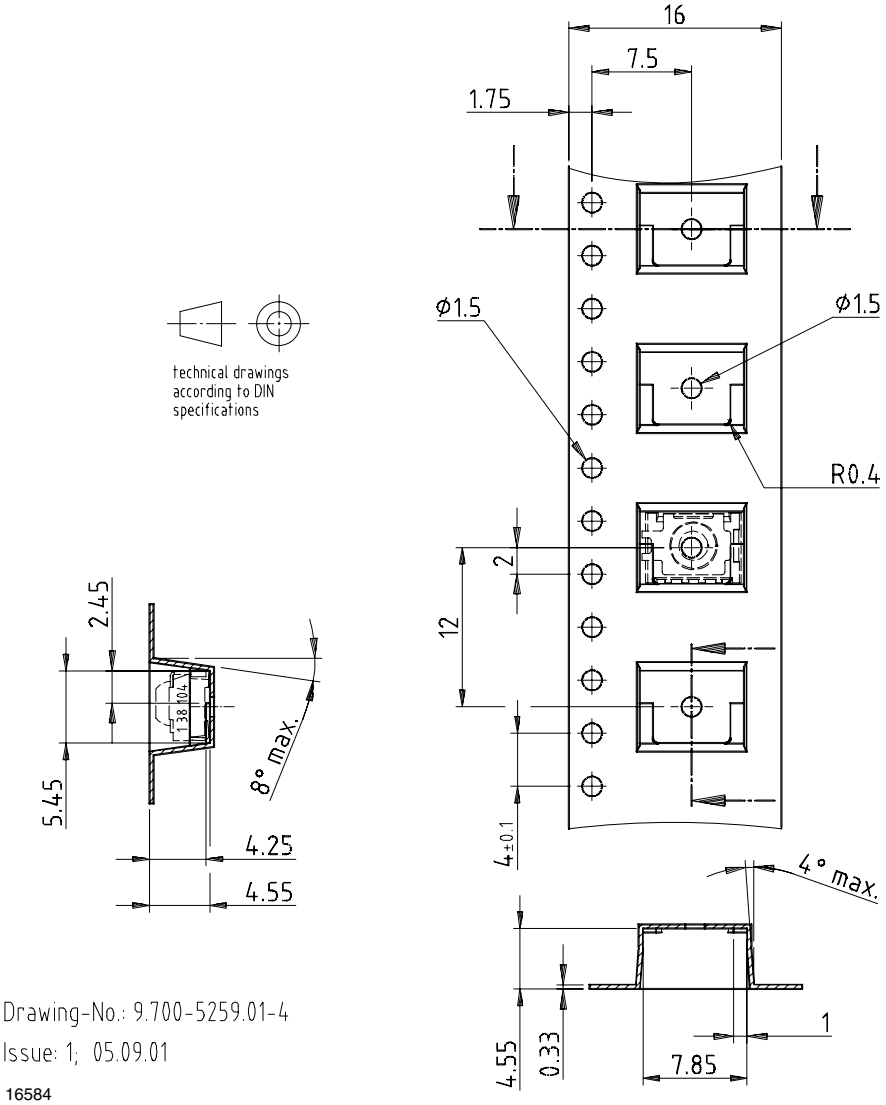
### Manual Soldering

- 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

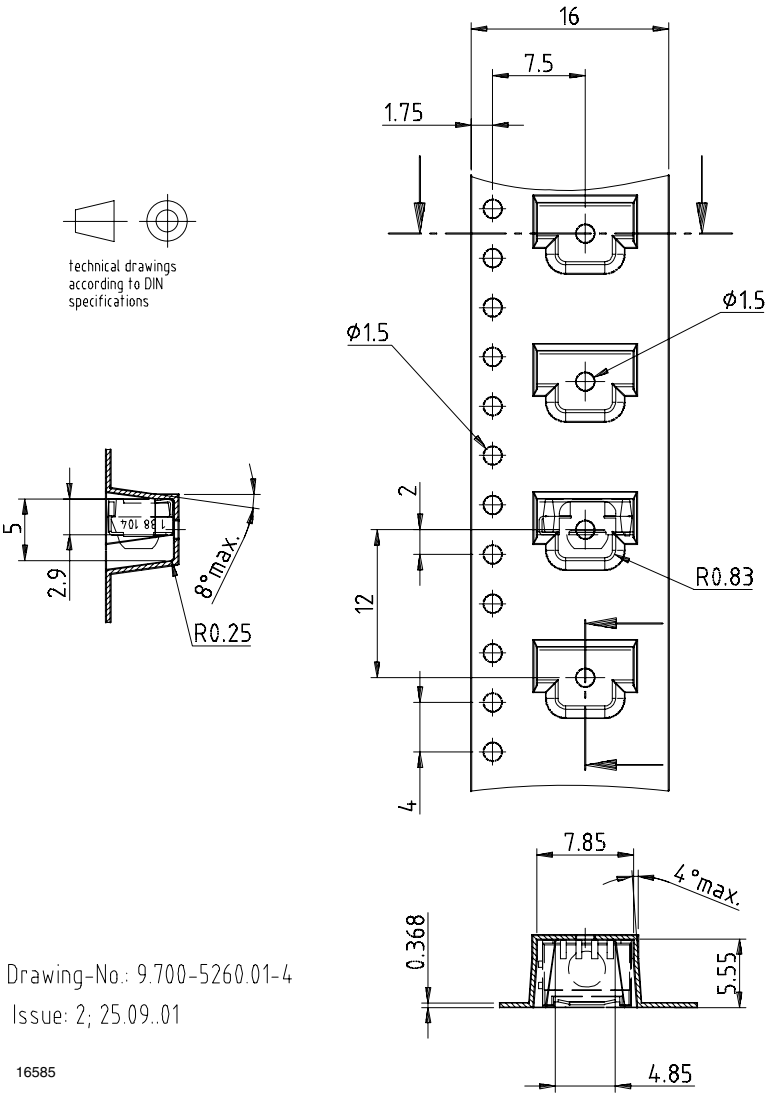
## VISHAY LEAD (Pb)-FREE REFLOW SOLDER PROFILE



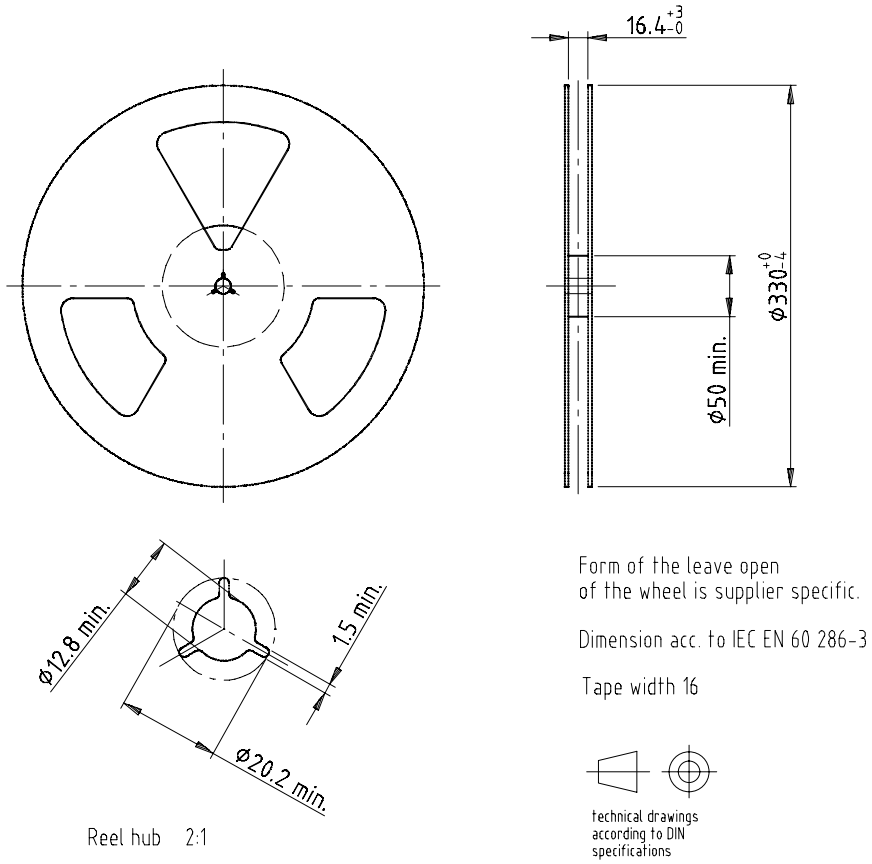

## TAPING VERSION TSOP..TT Dimensions in millimeters



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



## REEL DIMENSIONS in millimeters



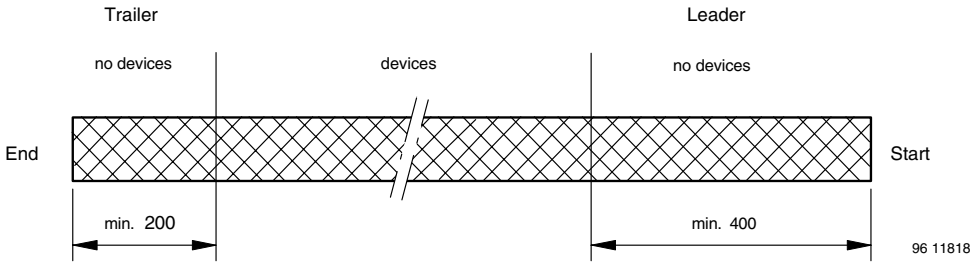

Drawing refers to following types: Reel for blister carrier tape Version B

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

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 ± 10 mm/min.
165° to 180° peel angle

## LABEL

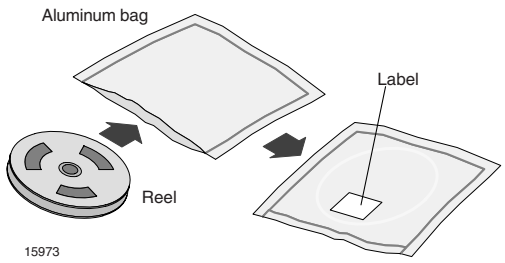
**Standard bar code labels for finished goods**

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 WRITTING** | **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

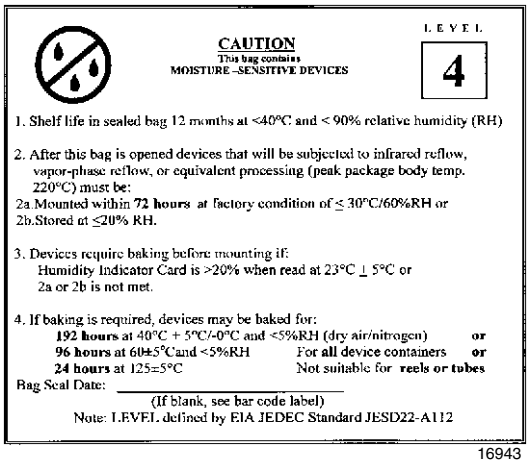
The sealed reel is packed into a cardboard box. A secondary cardboard box is used for shipping purposes.

## 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 JESD22-A112 level 4 label is included on all dry bags.



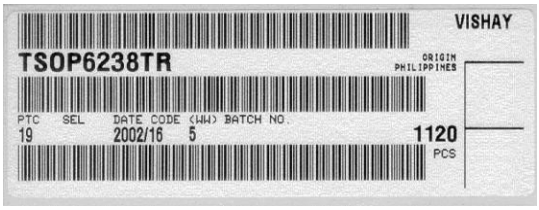

Example of JESD22-A112 level 4 label

## 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. Electro-static 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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