



IR Detector for Mid Range Proximity Sensor



20953

DESCRIPTION

The TSSP77P38 is a compact infrared detector module for proximity sensing application. It receives 38 kHz modulated signals and has a peak sensitivity of 940 nm.

The length of the detector's output pulse varies in proportion to the amount of light reflected from the object being detected.

FEATURES

- Up to 2 m for proximity sensing
- Very low supply current
- Photo detector and preamplifier in one package
- Shielding against EMI
- Supply voltage: 2.0 V to 5.5 V
- Visible light is suppressed by IR filter
- Capable of side or top view
- Insensitive to supply voltage ripple and noise
- Two lenses for high sensitivity and wide receiving angle
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912



RoHS
COMPLIANT
HALOGEN
FREE
GREEN
(5-2008)

LINKS TO ADDITIONAL RESOURCES



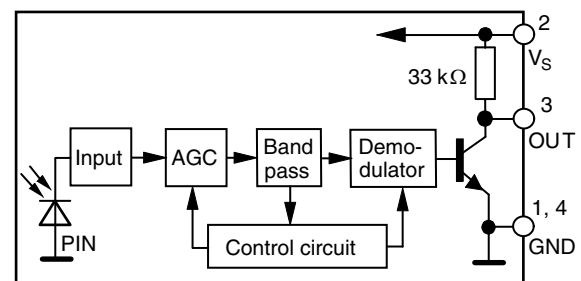
APPLICATIONS

- Object approach detection for activation of displays and user consoles, signaling of alarms, etc.
- Simple gesture controls
- Differentiation of car arrival, static, car departure in parking lots
- Reflective sensors for toilet flush
- Navigational sensor for robotics

DESIGN SUPPORT TOOLS

- [3D models](#)
- [Window size calculator](#)

BLOCK DIAGRAM



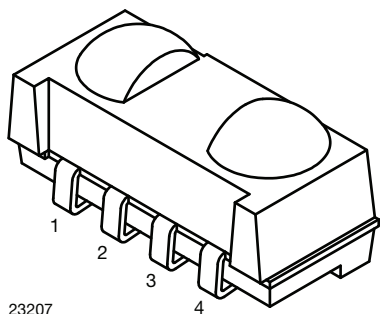
20445-8



MECHANICAL DATA

Pinning:

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

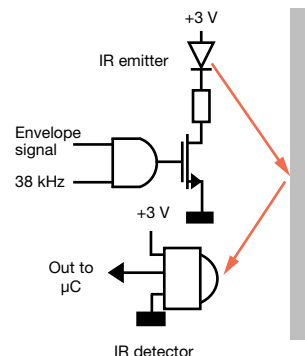


ORDERING CODE

Taping:

TSSP77P38TT - top view taped, 2200 pcs/reel
 TSSP77P38TR - side view taped, 2300 pcs/reel

PROXIMITY SENSING



| PARTS TABLE | |
|-------------------|--|
| Carrier frequency | 38 kHz |
| 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 | Proximity sensors |
| Special options | <ul style="list-style-type: none"> Extended temperature range: www.vishay.com/doc?82738 Narrow optical filter: www.vishay.com/doc?81590 Wide optical filter: www.vishay.com/doc?82726 |

| 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} ≤ 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 | 2.0 | - | 5.5 | V |
| Supply current | V _S = 3.3 V, E _e = 0 | I _{SD} | 0.25 | 0.35 | 0.45 | mA |
| | E _v = 40 klx, sunlight | I _{SH} | - | 0.45 | - | mA |
| Receiving distance | Direct line of sight, IR diode TSAL6200, I _F = 50 mA, test signal see Fig. 1 | d | - | 21 | - | m |
| Output voltage low | I _{OSL} = 0.5 mA, E _e = 0.7 mW/m ² , test signal see Fig. 1 | V _{OSL} | - | - | 100 | mV |
| Minimum irradiance | Pulse width tolerance: t _{pi} - 5/f ₀ < t _{po} < t _{pi} + 5/f ₀ , test signal see Fig. 1 | E _{e min.} | - | 0.15 | 0.3 | mW/m ² |
| Maximum irradiance | Pulse width tolerance: t _{pi} - 5/f ₀ < t _{po} < t _{pi} + 5/f ₀ , test signal see Fig. 1 | E _{e max.} | 30 | - | - | W/m ² |
| Directivity | Angle of half receiving distance | φ _{1/2} | - | ± 50 | - | ° |

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

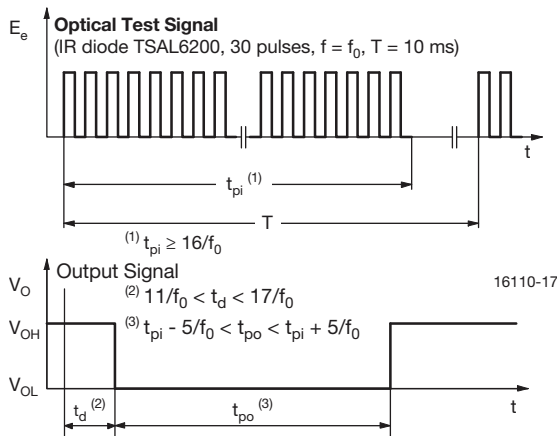


Fig. 1 - Output Active Low

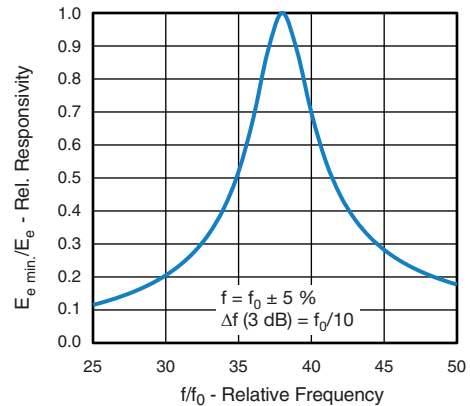


Fig. 3 - Frequency Dependence of Responsivity

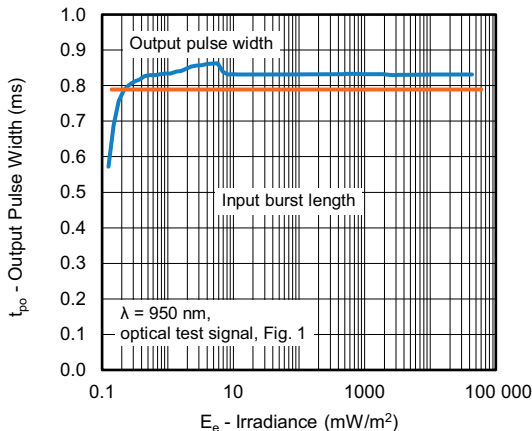


Fig. 2 - Pulse Length and Sensitivity in Dark Ambient

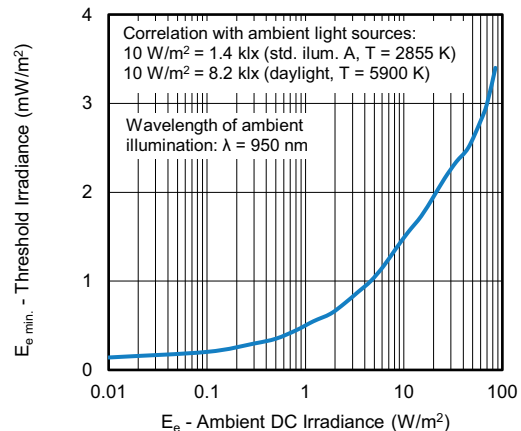


Fig. 4 - Sensitivity in Bright Ambient

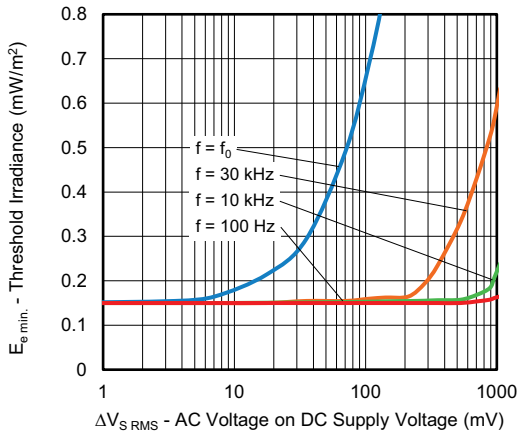


Fig. 5 - Sensitivity vs. Supply Voltage Disturbances

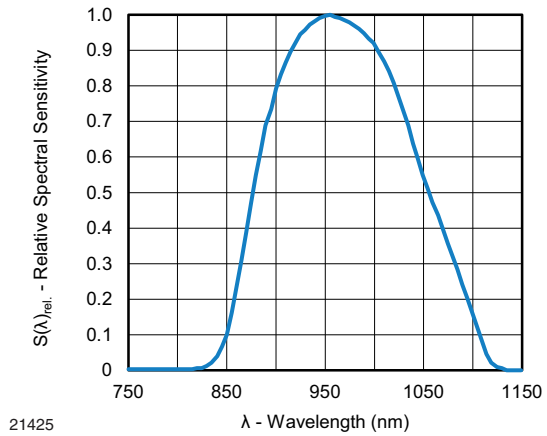


Fig. 8 - Relative Spectral Sensitivity vs. Wavelength

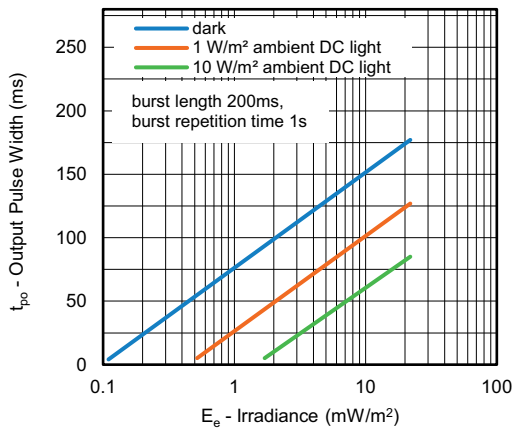


Fig. 6 - Output Pulse Width vs. Irradiance

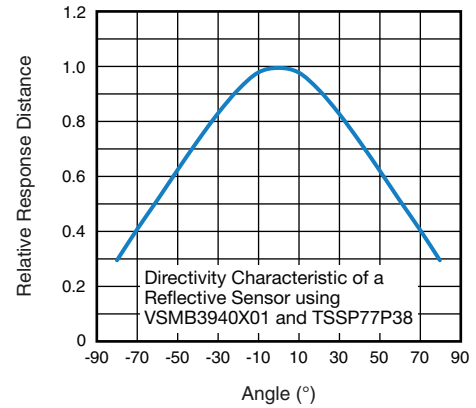


Fig. 9 - Angle Characteristic

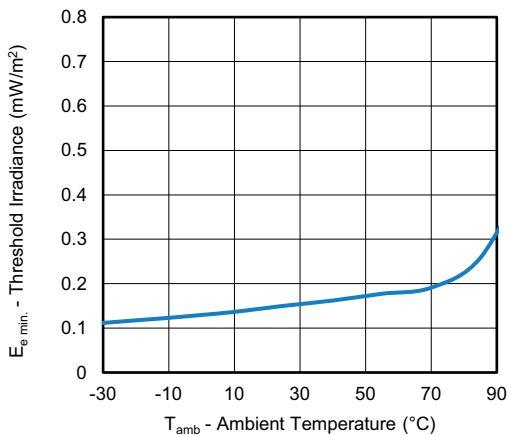


Fig. 7 - Sensitivity vs. Ambient Temperature

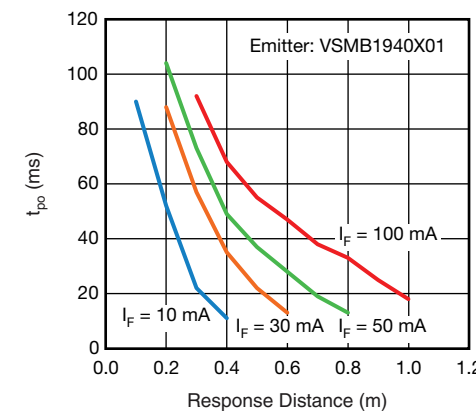


Fig. 10 - t_{po} vs. Distance Kodak Gray Card Plus 15 %

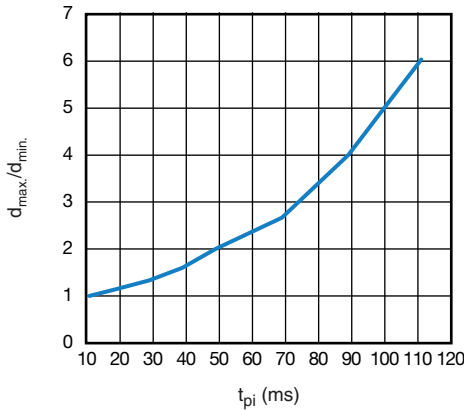


Fig. 11 - Dynamic Range of Sensor vs. t_{pi}

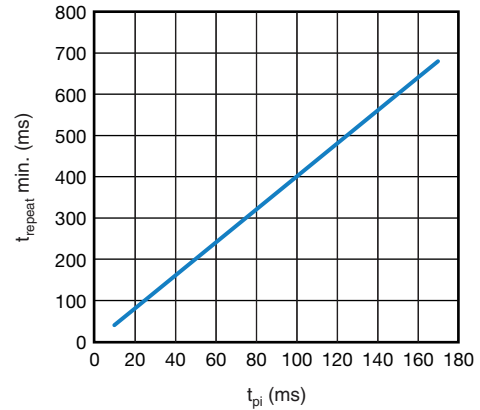
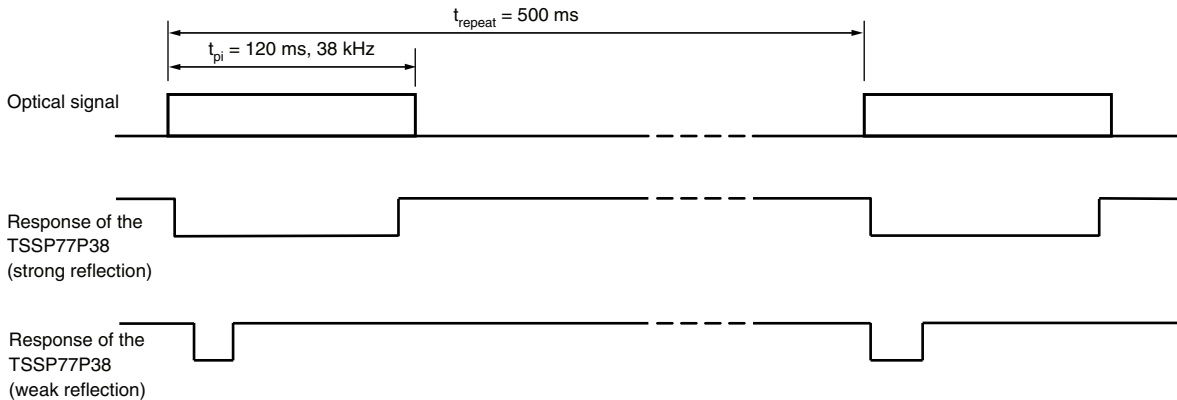


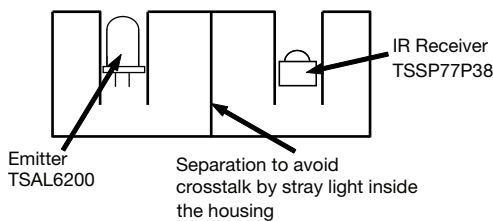
Fig. 12 - Max. Rate of Bursts

The typical application of the TSSP77P38 is a reflective sensor with analog information contained in its output. Such a sensor is evaluating the time required by the AGC to suppress a quasi continuous signal. The time required to suppress such a signal is longer when the signal is strong than when the signal is weak, resulting in a pulse length corresponding to the distance of an object from the sensor. This kind of analog information can be evaluated by a microcontroller. The absolute amount of reflected light depends much on the environment and is not evaluated. Only sudden changes of the amount of reflected light, and therefore changes in the pulse width, are evaluated using this application.

Example of a signal pattern:



Example for a sensor hardware:

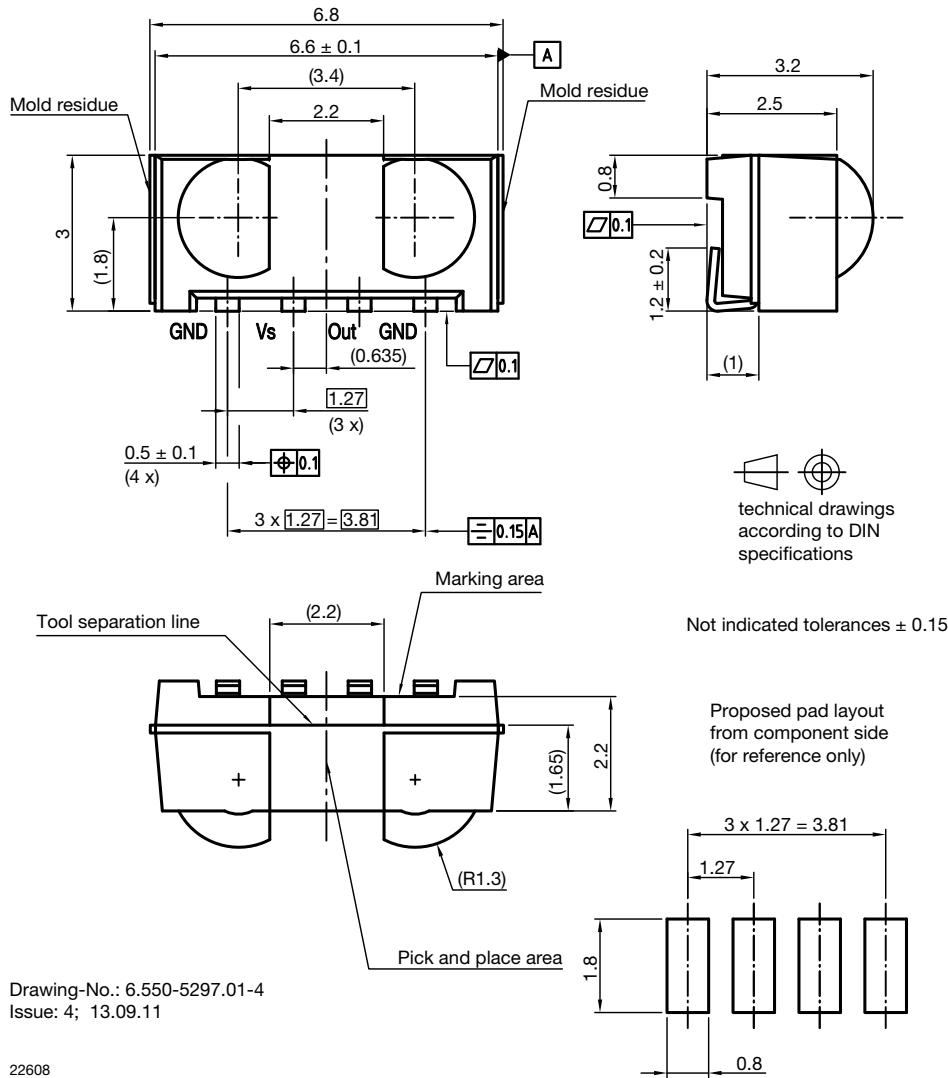


The logarithmic characteristic of the AGC in the TSSP77P38 results in an almost linear relationship between distance and pulse width. Ambient light has also some impact to the pulse width of this kind of sensor, making the pulse shorter.

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



PACKAGE DIMENSIONS in millimeters



Drawing-No.: 6.550-5297.01-4
Issue: 4; 13.09.11

22608



ASSEMBLY INSTRUCTIONS

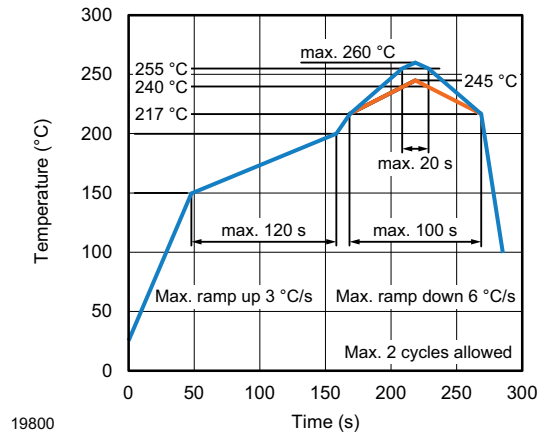
Reflow Soldering

- 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

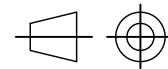
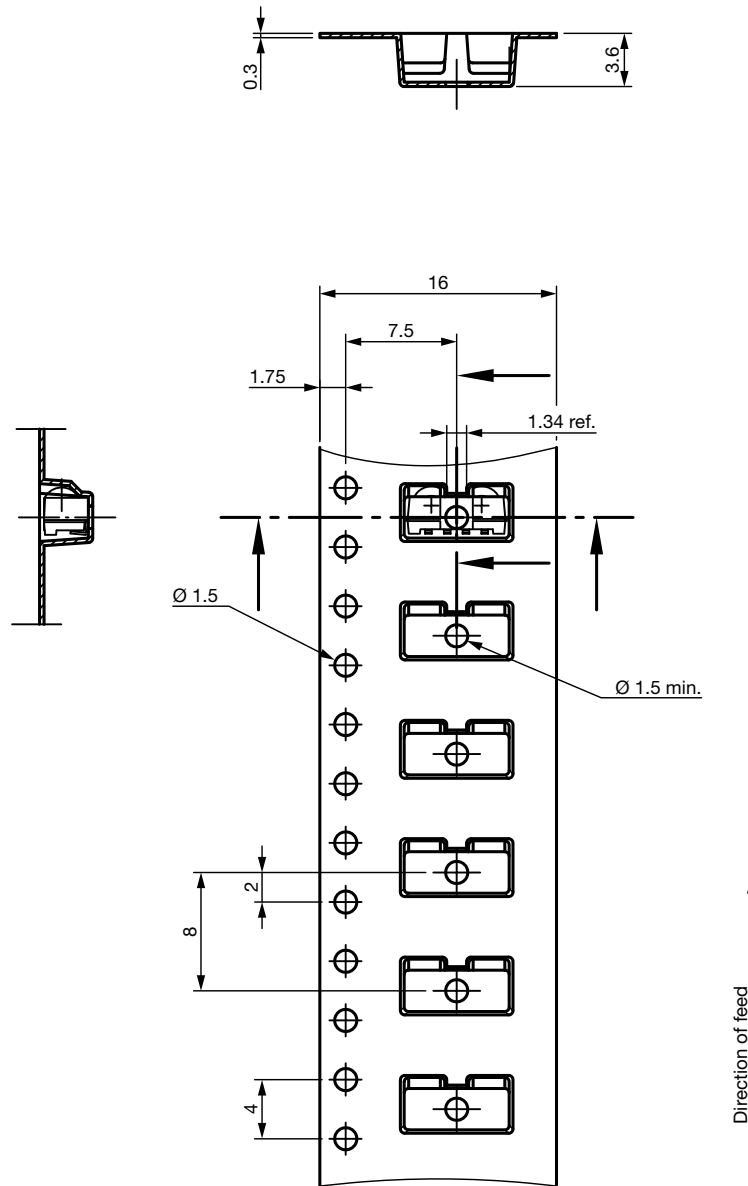
- Use a soldering iron of 25 W or less. Adjust the temperature of the soldering iron below 300 °C
- Finish soldering within 3 s
- Handle products only after the temperature has cooled off

VISHAY LEAD (Pb)-FREE REFLOW SOLDER PROFILE





TAPING VERSION TSSP77P38TR DIMENSIONS in millimeters

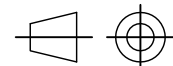
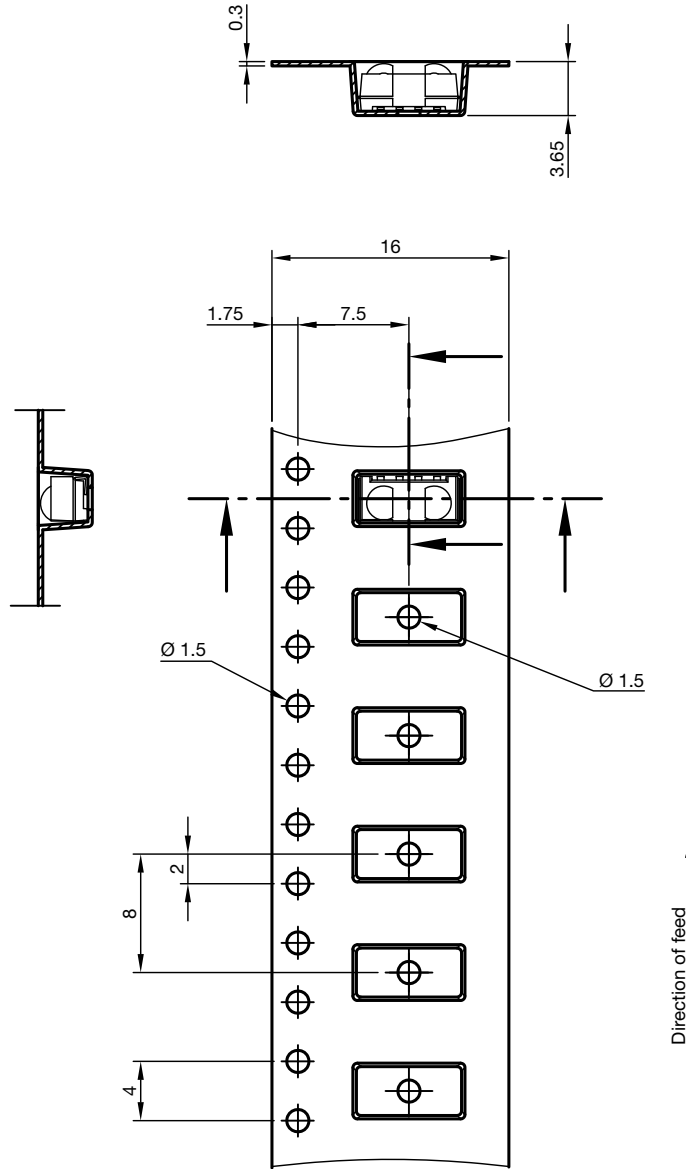


technical drawings according to DIN specifications

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



TAPING VERSION TSSP77P38TT DIMENSIONS in millimeters

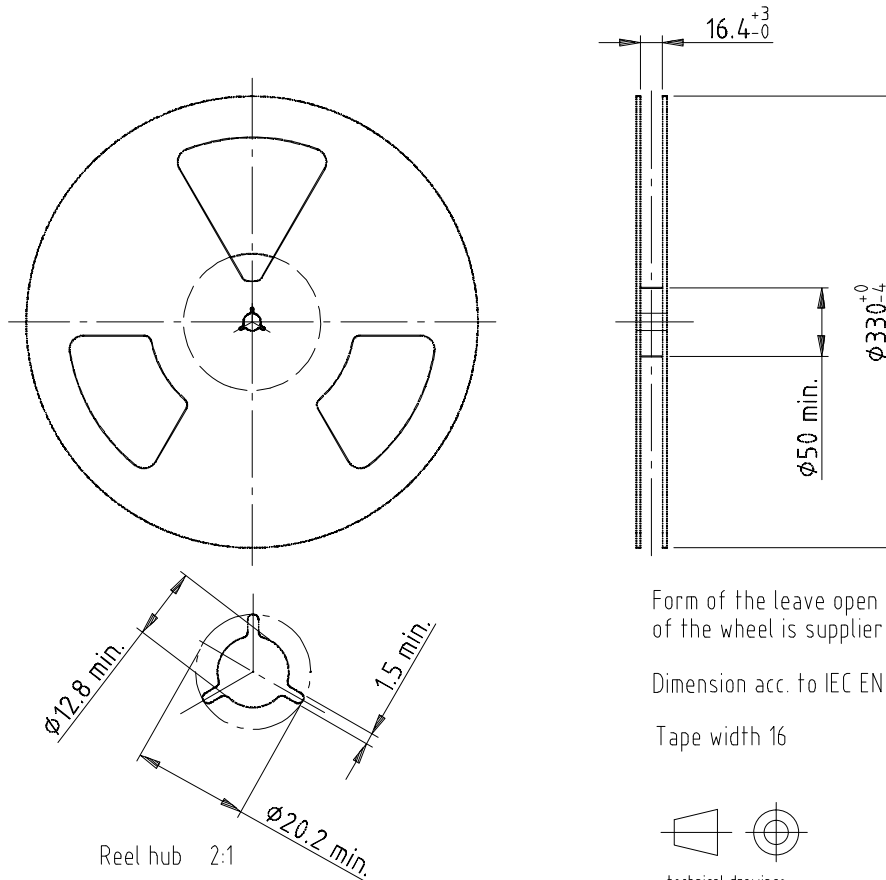


technical drawings according to DIN specifications

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



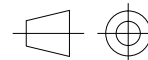
REEL DIMENSIONS in millimeters



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

Dimension acc. to IEC EN 60 286-3

Tape width 16



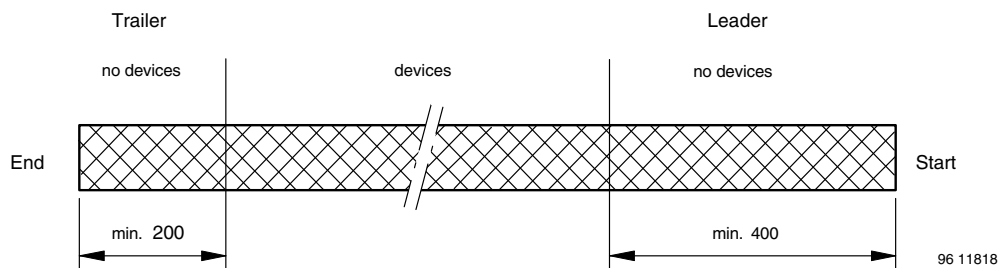
technical drawings according to DIN specifications

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 ± 10 mm/min.

165° to 180° peel angle



OUTER PACKAGING

The sealed reel is packed into a pizza box.

| CARTON BOX DIMENSIONS in millimeters | | | |
|---|------------------|--------------|---------------|
| | | | |
| | THICKNESS | WIDTH | LENGTH |
| Pizza box (SMD and heimdall) (taping in reels) | 50 | 340 | 340 |

LABEL

Standard bar code labels for finished goods

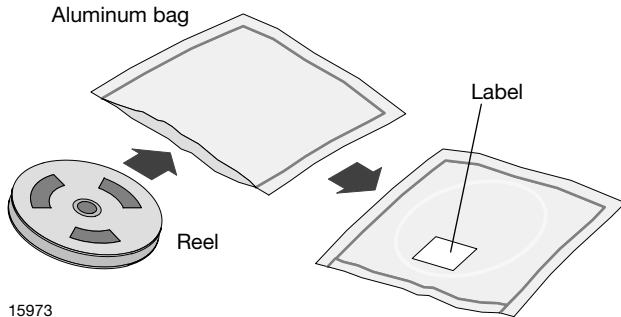
The standard bar code labels are product labels and used for identification of goods. The finished goods are packed in final packing area. The standard packing units are labeled with standard bar code labels before transported as finished goods to warehouses. The labels are on each packing unit and contain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



15973

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.

CAUTION
This bag contains
MOISTURE-SENSITIVE DEVICES

LEVEL
4

1. Shelf life in sealed bag: 12 months at < 40 °C and < 90 % relative humidity (RH)
2. After this bag is opened, devices that will be subjected to soldering reflow or equivalent processing (peak package body temp. 260 °C) must be
 - 2a. Mounted within 72 hours at factory condition of < 30 °C/60 % RH or
 - 2b. Stored at < 5 % RH
3. Devices require baking before mounting if:
Humidity Indicator Card is > 10 % when read at 23 °C ± 5 °C or 2a. or 2b. are not met.
4. If baking is required, devices may be baked for:
192 hours at 40 °C + 5 °C/- 0 °C and < 5 % RH (dry air/nitrogen) or
96 hours at 60 °C ± 5 °C and < 5 % RH for all device containers or
24 hours at 125 °C ± 5 °C not suitable for reels or tubes

Bag Seal Date: _____
(If blank, see barcode label)

Note: Level and body temperature defined by EIA JEDEC Standard J-STD-020

22522

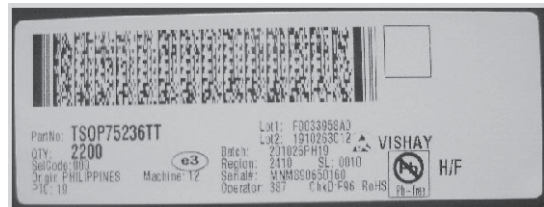
EIA JEDEC standard J-STD-020 level 4 label is included on all dry bags

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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