



## IR Receiver Modules for Remote Control Systems



### DESCRIPTION

This IR receiver series is optimized for long burst remote control systems in different environments. The customer can choose between different IC settings (AGC variants), to find the optimum solution for his application. The higher the AGC, the better noise is suppressed, but the lower the code compatibility.

The devices contain a PIN diode and a preamplifier assembled on a lead frame. The epoxy package contains an IR filter. The demodulated output signal can be directly connected to a microprocessor for decoding. These components have not been qualified to automotive specifications.

### FEATURES

- Individual IC settings to reach maximum performance
- Immunity against noise (lamps, LCD TV, Wi-Fi)
- Low supply current
- Photo detector and preamplifier in one package
- Supply voltage: 2.0 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)

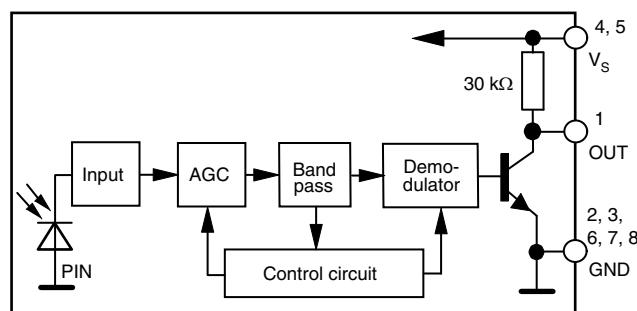
### LINKS TO ADDITIONAL RESOURCES



### DESIGN SUPPORT TOOLS

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

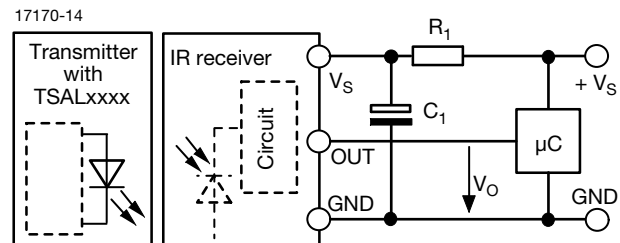
### BLOCK DIAGRAM



20445-5

**ORDERING CODE****Taping:**

TSOP37...TT1 - top view taped, 1800 pcs/reel

**APPLICATION CIRCUIT**

$R_1$  and  $C_1$  recommended in case there are strong ripple or spikes on the supply line.

**PARTS TABLE**

| AGC               |        | LEGACY, FOR<br>LONG BURST REMOTE CONTROLS (AGC2)                                                                                                              | RECOMMENDED FOR<br>LONG BURST CODES (AGC4) |
|-------------------|--------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------|
| Carrier frequency | 36 kHz | TSOP37236                                                                                                                                                     | TSOP37436 <sup>(1)(2)(3)</sup>             |
|                   | 38 kHz | TSOP37238                                                                                                                                                     | TSOP37438 <sup>(4)(5)(6)</sup>             |
|                   | 40 kHz | TSOP37240                                                                                                                                                     | TSOP37440                                  |
|                   | 56 kHz | TSOP37256                                                                                                                                                     | TSOP37456 <sup>(7)</sup>                   |
| Package           |        | Belobog                                                                                                                                                       |                                            |
| Pinning           |        | 1 = OUT, 2, 3, 6, 7, 8 = GND, 4, 5 = $V_S$                                                                                                                    |                                            |
| Dimensions (mm)   |        | 3.95 W x 3.95 H x 0.8 D                                                                                                                                       |                                            |
| Mounting          |        | SMD                                                                                                                                                           |                                            |
| Application       |        | Remote control                                                                                                                                                |                                            |
| Best choice for   |        | <sup>(1)</sup> RC-5 <sup>(2)</sup> RC-6 <sup>(3)</sup> Panasonic <sup>(4)</sup> NEC <sup>(5)</sup> Sharp <sup>(6)</sup> Mitsubishi <sup>(7)</sup> Thomson RCA |                                            |
| Special options   |        | <ul style="list-style-type: none"> <li>Extended temperature range: <a href="http://www.vishay.com/doc?82738">www.vishay.com/doc?82738</a></li> </ul>          |                                            |

**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           | $T_{amb} \leq 85^\circ\text{C}$ | $P_{tot}$ | 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 ( $T_{amb} = 25^{\circ}\text{C}$ , unless otherwise specified) |                                                                                |                     |      |          |      |                 |
|-------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------|---------------------|------|----------|------|-----------------|
| PARAMETER                                                                                             | TEST CONDITION                                                                 | SYMBOL              | MIN. | TYP.     | MAX. | UNIT            |
| Supply voltage                                                                                        |                                                                                | $V_S$               | 2.0  | -        | 5.5  | V               |
| Supply current                                                                                        | $V_S = 3.3\text{ V}$ , $E_v = 0$                                               | $I_{SD}$            | 0.25 | 0.35     | 0.45 | mA              |
|                                                                                                       | $E_v = 40\text{ klx}$ , sunlight                                               | $I_{SH}$            | -    | 0.45     | -    | mA              |
| Transmission distance                                                                                 | $E_v = 0$ , IR diode TSAL6200, $I_F = 50\text{ mA}$ , test signal see Fig. 1   | $d$                 | -    | 18       | -    | m               |
| Output voltage low                                                                                    | $I_{OSL} = 0.5\text{ mA}$ , $E_e = 0.7\text{ mW/m}^2$ , test signal see Fig. 1 | $V_{OSL}$           | -    | -        | 100  | mV              |
| Minimum irradiance                                                                                    | Test signal: RC5 code                                                          | $E_{e\text{ min.}}$ | -    | 0.2      | 0.4  | $\text{mW/m}^2$ |
|                                                                                                       | Test signal: NEC code                                                          | $E_{e\text{ min.}}$ | -    | 0.25     | 0.5  | $\text{mW/m}^2$ |
| Maximum irradiance                                                                                    | $t_{pi} - 5/f_0 < t_{po} < t_{pi} + 5/f_0$ , test signal see Fig. 1            | $E_{e\text{ max.}}$ | 30   | -        | -    | $\text{W/m}^2$  |
| Directivity                                                                                           | Angle of half transmission distance                                            | $\Phi_{1/2}$        | -    | $\pm 75$ | -    | $^{\circ}$      |

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

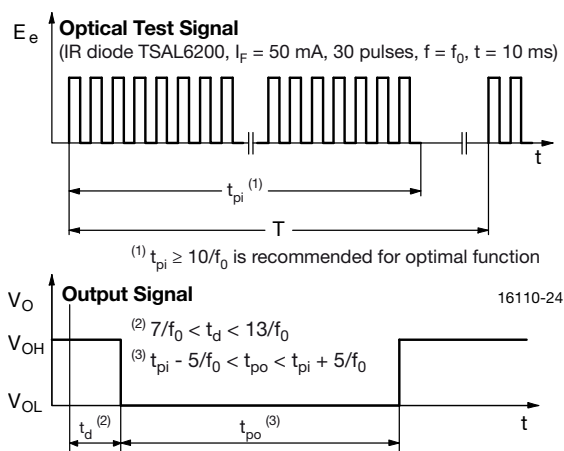


Fig. 1 - Output Function

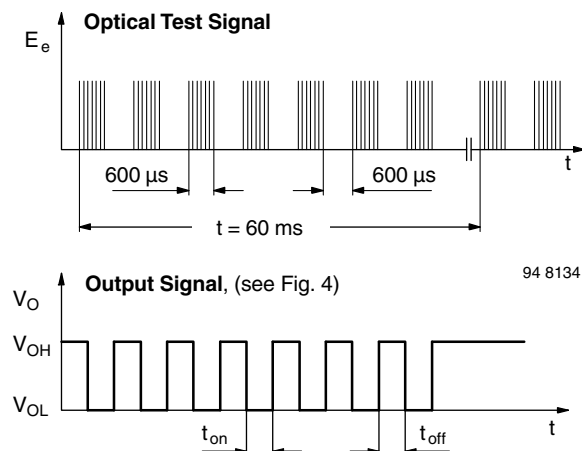


Fig. 3 - Output Function

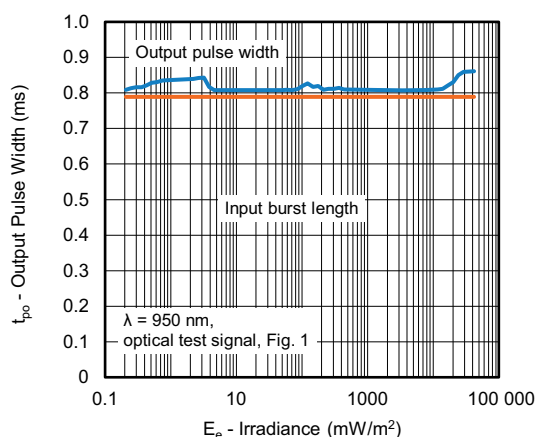


Fig. 2 - Output Pulse Width vs. Irradiance

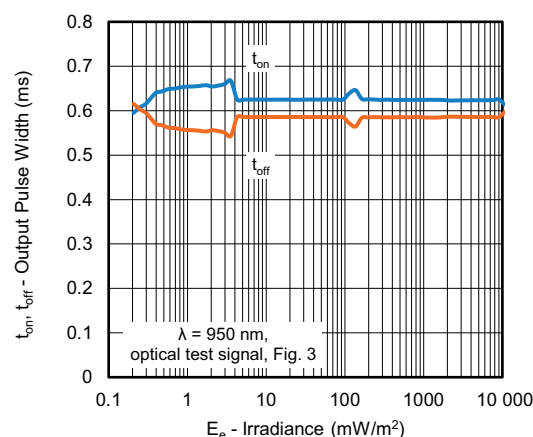


Fig. 4 - Output Pulse Diagram

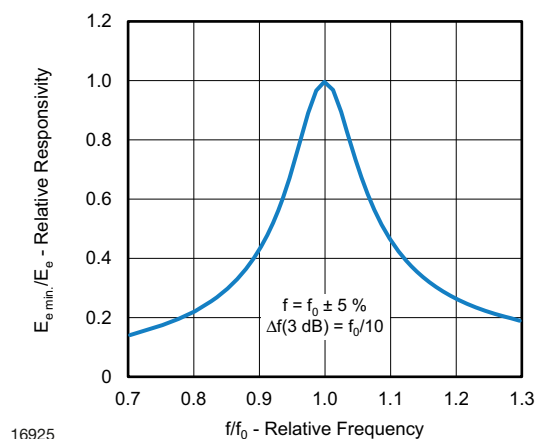


Fig. 5 - Frequency Dependence of Responsivity

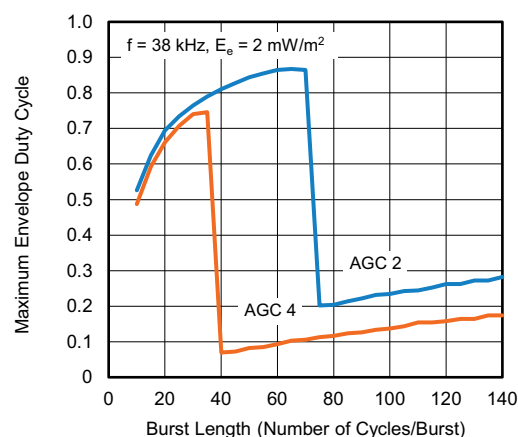


Fig. 8 - Max. Envelope Duty Cycle vs. Burst Length

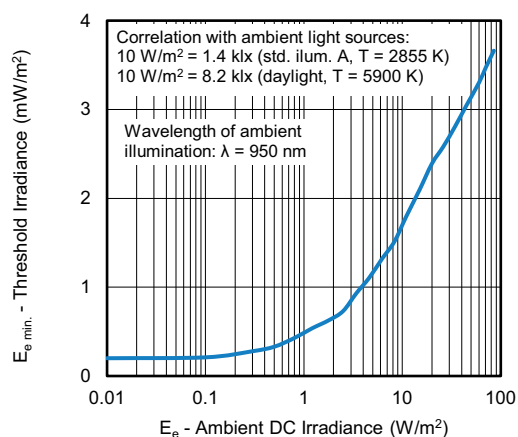


Fig. 6 - Sensitivity in Bright Ambient

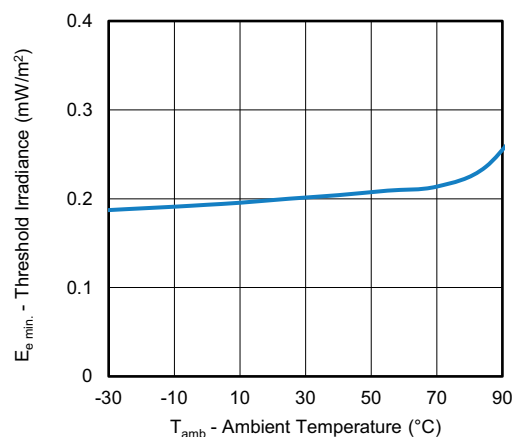


Fig. 9 - Sensitivity vs. Ambient Temperature

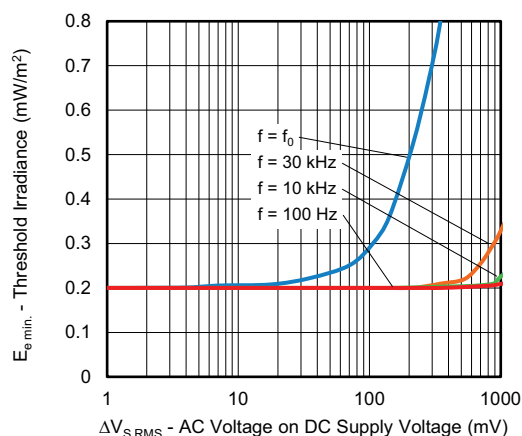


Fig. 7 - Sensitivity vs. Supply Voltage Disturbances

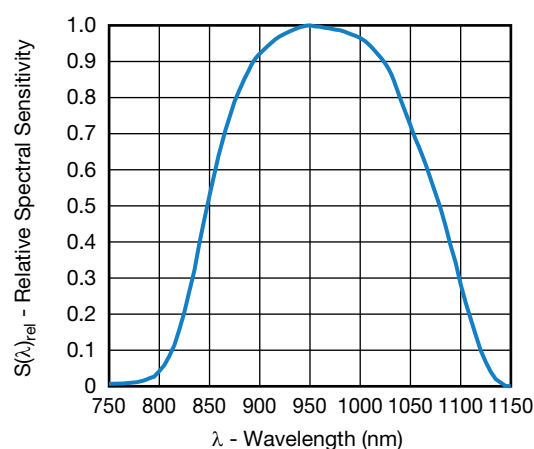


Fig. 10 - Relative Spectral Sensitivity vs. Wavelength

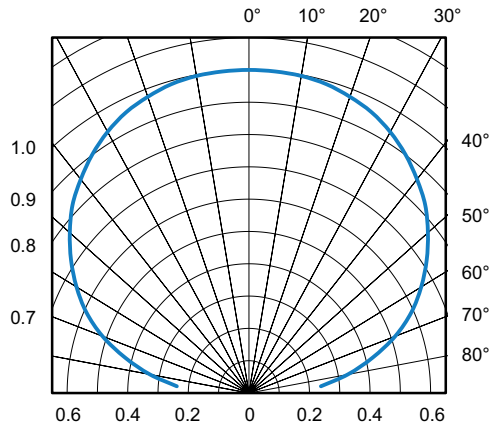


Fig. 11 - Directivity

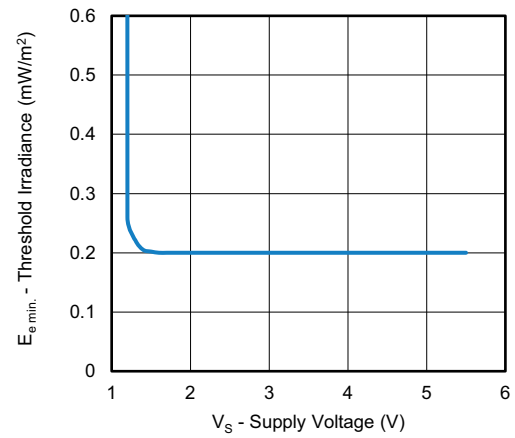


Fig. 12 - Sensitivity vs. Supply Voltage

21947

**SUITABLE DATA FORMAT**

The TSOP372.., TSOP374.. 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 TSOP372.., TSOP374.. 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 Fig. 13 or Fig. 14)

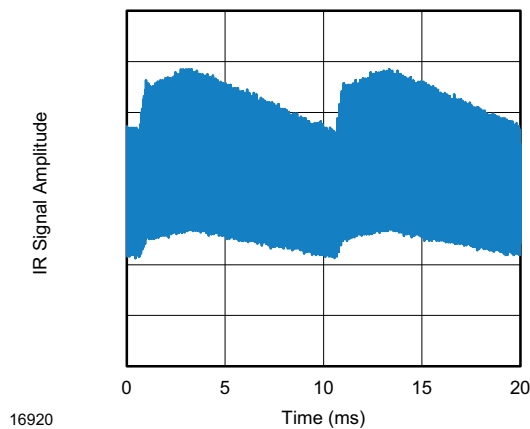


Fig. 13 - IR Signal from Fluorescent Lamp With Low Modulation

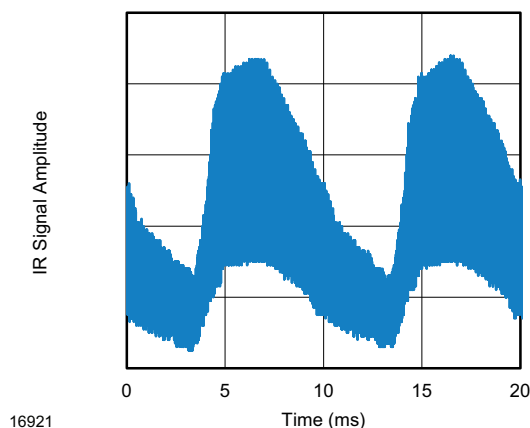


Fig. 14 - IR Signal from Fluorescent Lamp With High Modulation

|                                                                               | <b>TSOP372..</b>                | <b>TSOP374..</b>                 |
|-------------------------------------------------------------------------------|---------------------------------|----------------------------------|
| 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>≥ 12 cycles  | 10 to 35 cycles<br>≥ 12 cycles   |
| For bursts greater than<br>a minimum gap time in the data stream is needed of | 70 cycles<br>> 5 x burst length | 35 cycles<br>> 15 x burst length |
| Maximum number of continuous short bursts/second                              | 1700                            | 1700                             |
| NEC code                                                                      | Yes                             | Preferred                        |
| RC5 / RC6 code                                                                | Yes                             | Preferred                        |
| Thomson RCA 56kHz code                                                        | Yes                             | Preferred                        |
| Sharp code                                                                    | Yes                             | Preferred                        |
| Sony code                                                                     | Yes                             | No                               |
| Mitsubishi code                                                               | Yes                             | Preferred                        |
| Suppression of interference from fluorescent lamps                            | Fig. 13                         | Fig. 13 and Fig. 14              |

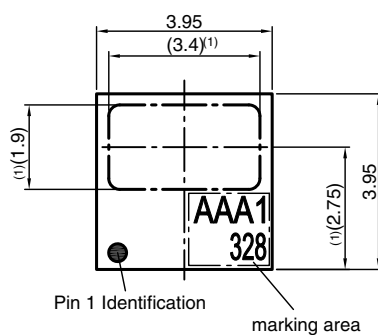
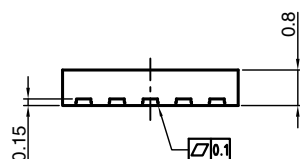
**Notes**

- For data formats with short bursts (less than 10 carrier cycles) please see the datasheet for TSOP373.., TSOP375..
- For Sony 12, 15, and 20 bit IR codes please see the datasheet of TSOP37S40

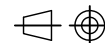
Technical drawing of a mechanical part with dimensions in mm. The part is a rectangular plate with a central rectangular hole and four circular holes. Dimensions include overall width 3, overall height 1.8, central hole width 1.5, and various hole diameters and positions.

Dimensions (mm):

- Overall width: 3
- Overall height: 1.8
- Central hole width: 1.5
- Central hole height: 0.55
- Four circular holes: diameter  $\varnothing 0.35 \pm 0.05$
- Four rectangular holes: width  $4 \times 0.75 = 3$ , height 0.55
- Distance from top edge to center of rectangular holes: 0.475
- Distance from bottom edge to center of rectangular holes: 0.55
- Distance from left edge to center of rectangular holes: 0.75  $\pm 0.05$
- Distance from right edge to center of rectangular holes: 0.75
- Distance from top edge to center of circular holes: 0.3
- Distance from bottom edge to center of circular holes: 0.3
- Distance from left edge to center of circular holes: 0.3
- Distance from right edge to center of circular holes: 0.3

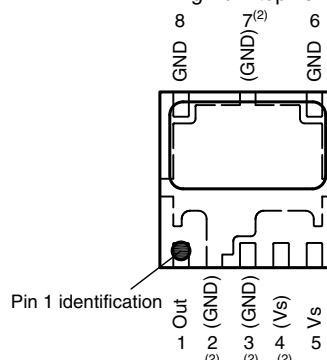


Not indicated tolerances  $\pm 0.1$

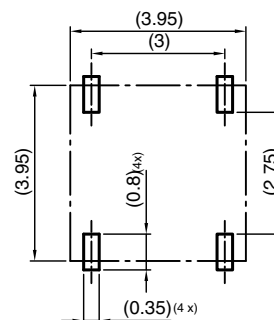


technical drawings  
according to DIN  
specifications

### Pinning from topview



Proposed pad layout from  
component side  
(dim. for reference only)



## Notes

(1) Optically effective area

(2) Pins connected internally. It is not necessary to connect externally



## ASSEMBLY INSTRUCTIONS

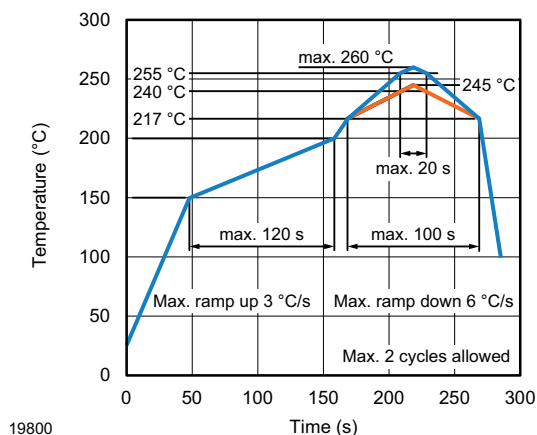
### Reflow Soldering

- Reflow soldering must be done within 168 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







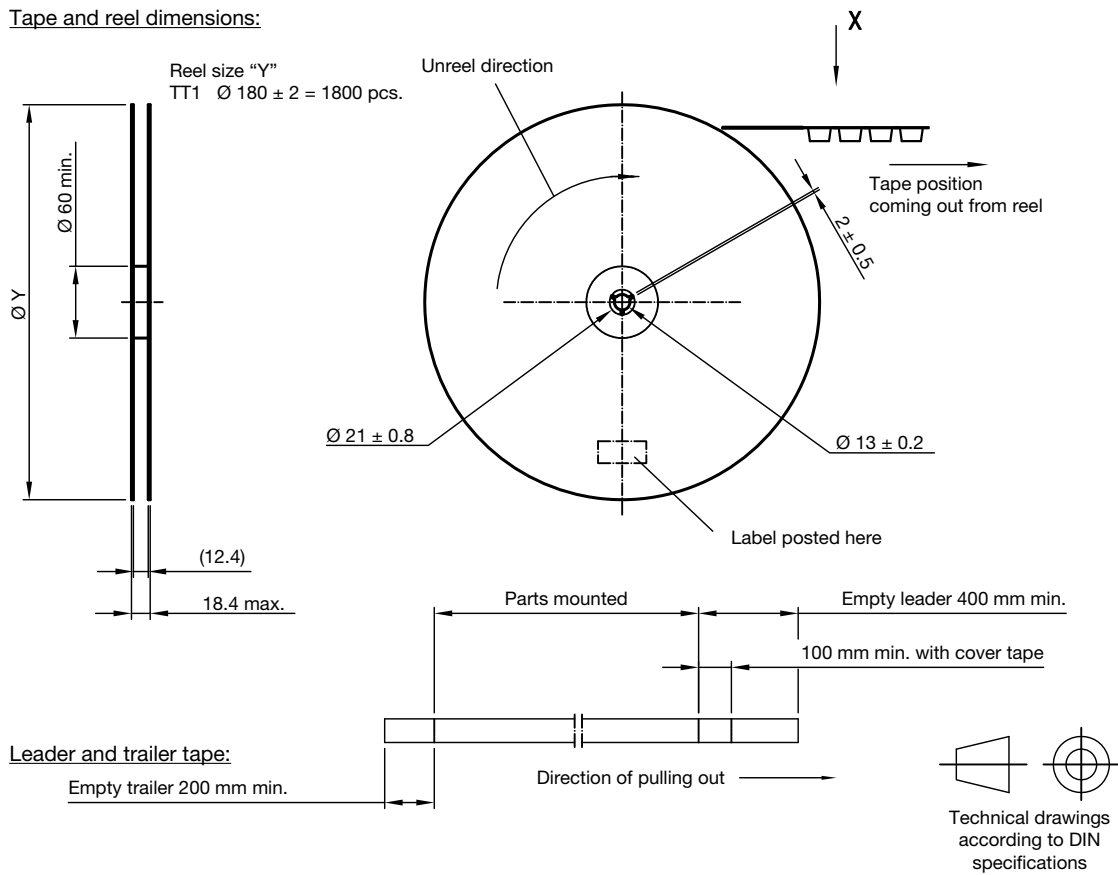
[www.vishay.com](http://www.vishay.com)

**TSOP372.., TSOP374..**

Vishay Semiconductors

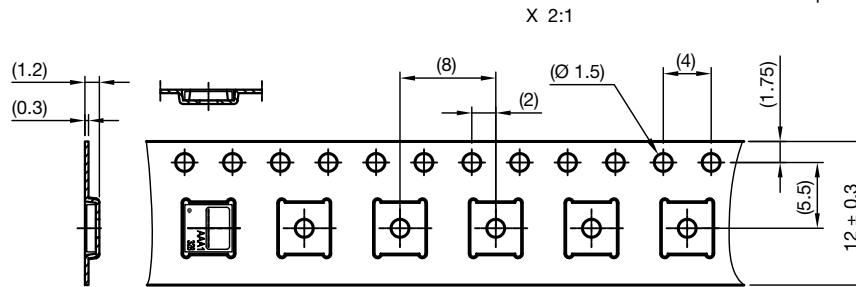
**TAPING VERSION TSOP37... DIMENSIONS** in millimeters

Tape and reel dimensions:



Leader and trailer tape:

Empty trailer 200 mm min.

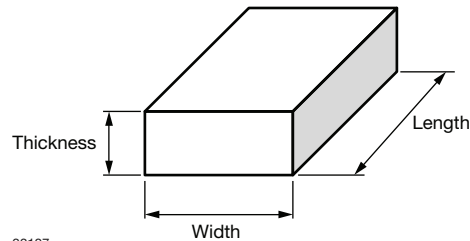


Drawing-No.: 9.700-5347.01-4  
Issue: 2; 07.03.18

Not indicated tolerances ± 0.1

**OUTER PACKAGING**

The sealed reel is packed into a pizza box.

**CARTON BOX DIMENSIONS** in millimeters

|                                                              | THICKNESS | WIDTH | LENGTH |
|--------------------------------------------------------------|-----------|-------|--------|
| Pizza box (Panhead, Heimdall, and Belobog) (taping in reels) | 50        | 340   | 340    |

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

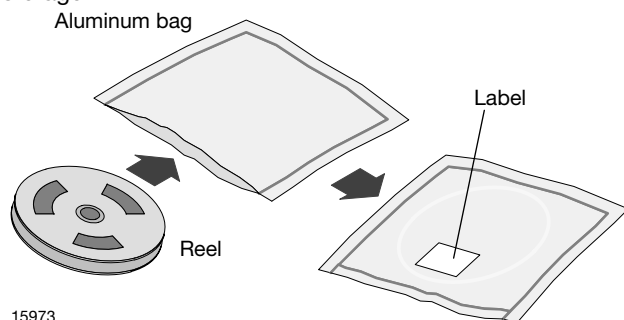
The standard bar code labels are product labels and used for identification of goods. The finished goods are packed in final packing area. The standard packing units are labeled with standard bar code labels before transported as finished goods to warehouses. The labels are on each packing unit and contain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

**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 168 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.

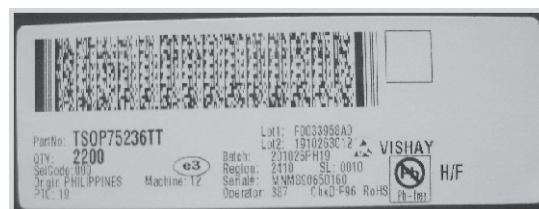
An EIA JEDEC® standard J-STD-020 level 3 label is included on all dry bags.

**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.

**BAR CODE PRODUCT LABEL (example)**

22178

|                                                                                                                   |                                                        |                                                                        |
|-------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------|------------------------------------------------------------------------|
|                                                                                                                   | <b>Caution</b>                                         | <b>LEVEL 3</b><br><small>If blank, see adjacent bar code label</small> |
|                                                                                                                   | This bag contains<br><b>MOISTURE-SENSITIVE DEVICES</b> |                                                                        |
| 1. Calculated shelf life in sealed bag: 12 months at <40°C and <90% relative humidity (RH)                        |                                                        |                                                                        |
| 2. Peak package body temperature: <u>260</u> °C<br><small>If blank, see adjacent bar code label</small>           |                                                        |                                                                        |
| 3. After bag is opened, devices that will be subjected to reflow solder or other high temperature process must be |                                                        |                                                                        |
| a) Mounted within: <u>168</u> hours of factory conditions<br><small>If blank, see adjacent bar code label</small> |                                                        |                                                                        |
| ≤30°C/60% RH, or<br>b) Stored per J-STD-033                                                                       |                                                        |                                                                        |
| 4. Devices require bake, before mounting, if:                                                                     |                                                        |                                                                        |
| a) Humidity Indicator Card reads > 10% for level 2a - 5a devices or >60% for level 2 devices when read at 23±5°C  |                                                        |                                                                        |
| b) 3a or 3b are not met                                                                                           |                                                        |                                                                        |
| 5. If baking is required, refer to IPC/JEDEC J-STD-033 for bake procedure                                         |                                                        |                                                                        |
| Bag Seal Date: _____<br><small>If blank, see adjacent bar code label</small>                                      |                                                        |                                                                        |
| <small>Note: Level and body temperature defined by IPC/JEDEC J-STD-020</small>                                    |                                                        |                                                                        |

22650

EIA JEDEC standard J-STD-020 level 3 label is included on all dry bags



## Disclaimer

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