# IR Receiver Modules for Remote Control Systems

## LINKS TO ADDITIONAL RESOURCES

Product Page  Marking

## DESCRIPTION

This IR receiver series is optimized for short burst remote control systems in different environments. The customer can chose 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

Pb-free

e4

RoHS COMPLIANT

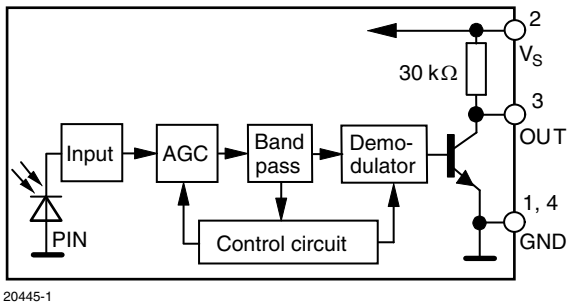
HALOGEN FREE

GREEN (5-2008)

## DESIGN SUPPORT TOOLS

- 3D models
- Window size calculator
- PCB layout guidelines

## BLOCK DIAGRAM

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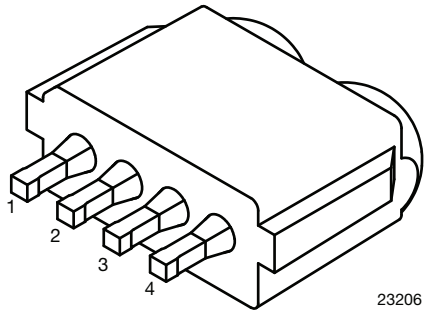
## MECHANICAL DATA

**Pinning:**

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

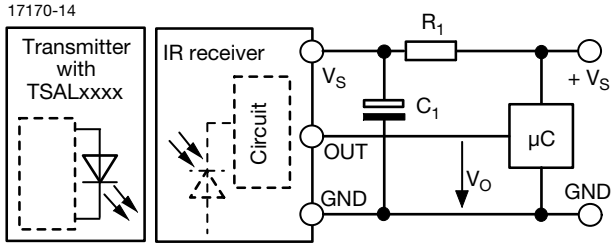



## ORDERING CODE

**Taping:**

TSOP39...TR1 - top view taped, 2000 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** | | **NOISY ENVIRONMENTS AND SHORT BURSTS (AGC3)** | **VERY NOISY ENVIRONMENTS AND SHORT BURSTS (AGC5)** |
| **Carrier frequency** | 30 kHz | TSOP39330TR1 | TSOP39530TR1 |
| | 33 kHz | TSOP39333TR1 | TSOP39533TR1 |
| | 36 kHz | TSOP39336TR1 (1)(2) | TSOP39536TR1 |
| | 38 kHz | TSOP39338TR1 (3)(4)(5) | TSOP39538TR1 |
| | 40 kHz | TSOP39340TR1 | TSOP39540TR1 |
| | 56 kHz | TSOP39356TR1 | TSOP39556TR1 |
| **Package** | | TVCastSMD | |
| **Pinning** | | 1, 4 = GND, 2 = $V_S$, 3 = OUT | |
| **Dimensions (mm)** | | 6.8 W x 2.6 H x 5.3 D | |
| **Mounting** | | SMD | |
| **Application** | | Remote control | |
| **Best choice for** | | (1) MCIR (2) RCMM (3) RECS-80 Code (4) r-map (5) XMP | |

| 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 | $T_{amb} \leq 85$ °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 | $E_v$ = 0, $V_S$ = 3.3 V | $I_{SD}$ | 0.25 | 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, $I_F$ = 50 mA | d | - | 26 | - | 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 | Test signal: RC-5 code | $E_{e\ min.}$ | - | 0.1 | 0.2 | mW/m² |
| | Test signal: XMP code | $E_{e\ min.}$ | - | 0.12 | 0.25 | mW/m² |
| Maximum irradiance | $t_{pi}$ - 3/$f_0$ < $t_{po}$ < $t_{pi}$ + 3.5/$f_0$, test signal see Fig. 1 | $E_{e\ max.}$ | 30 | - | - | W/m² |
| Directivity | Angle of half transmission distance | $\varphi_{1/2}$ | - | ± 50 | - | ° |

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

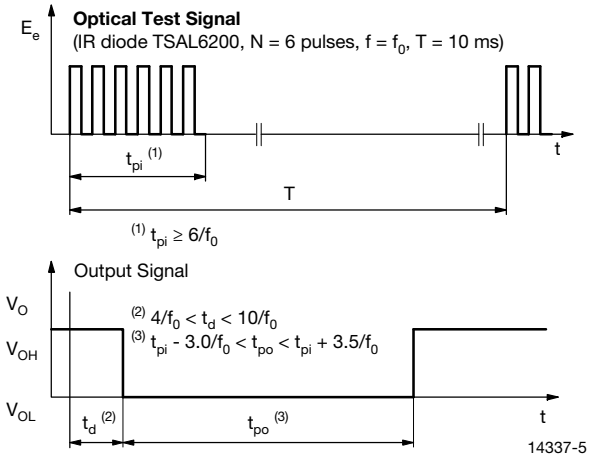



Fig. 1 - Output Active Low

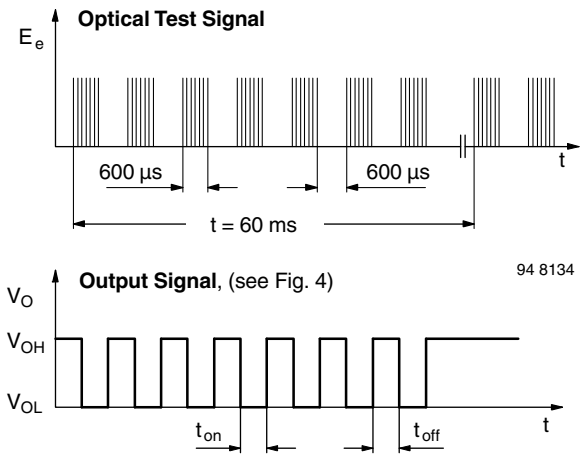



Fig. 3 - Output Function

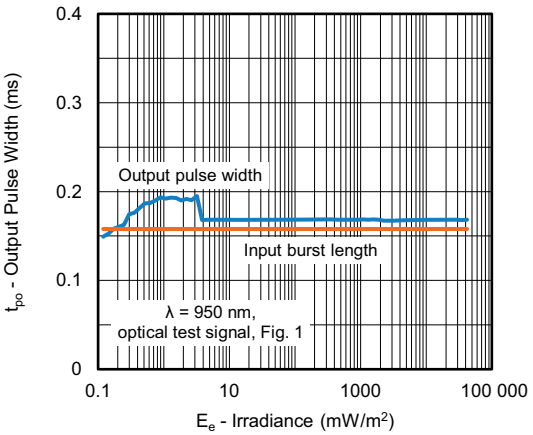



Fig. 2 - Pulse Length and Sensitivity in Dark Ambient

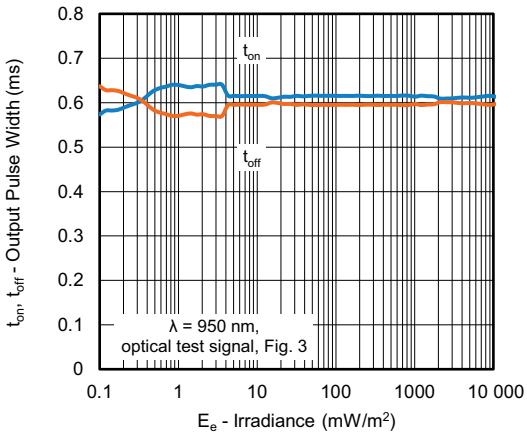



Fig. 4 - Output Pulse Diagram

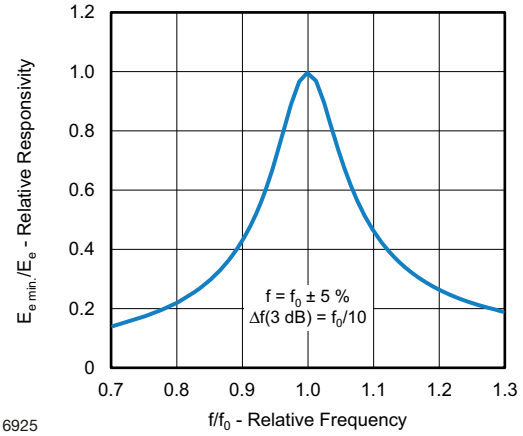



Fig. 5 - Frequency Dependence of Responsivity

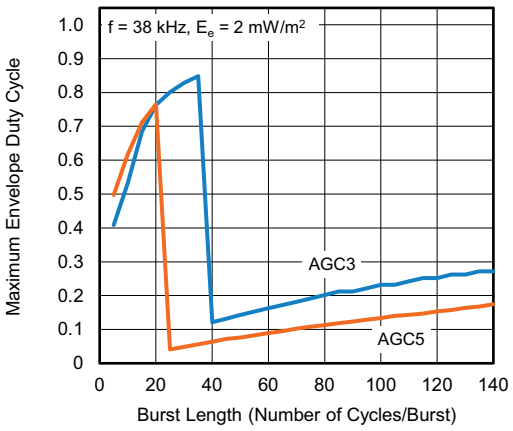



Fig. 8 - Max. Envelope Duty Cycle vs. Burst Length

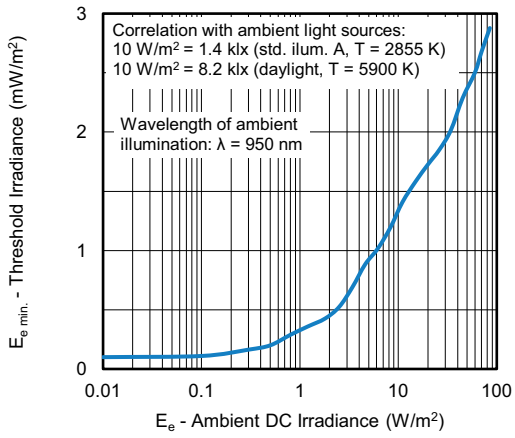



Fig. 6 - Sensitivity in Bright Ambient

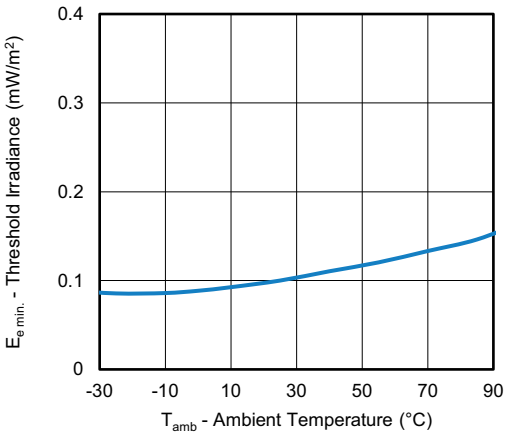



Fig. 9 - Sensitivity vs. Ambient Temperature

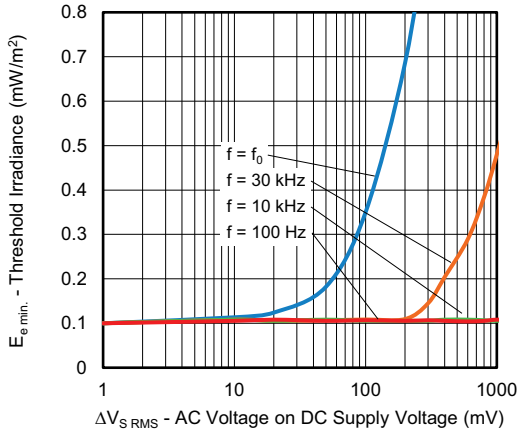



Fig. 7 - Sensitivity vs. Supply Voltage Disturbances

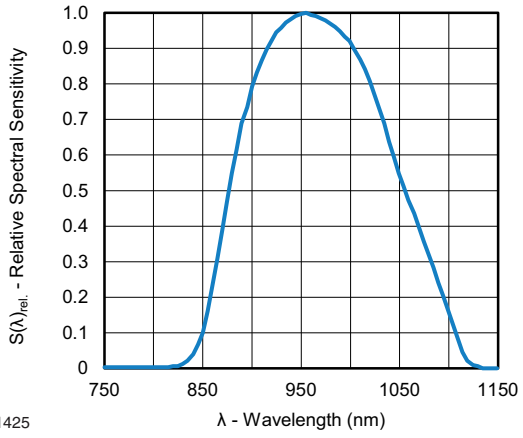



Fig. 10 - Relative Spectral Sensitivity vs. Wavelength

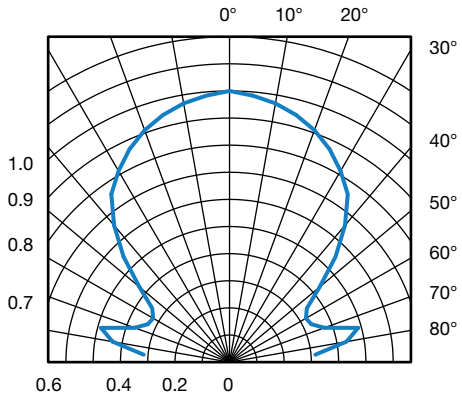



Fig. 11 - Horizontal Directivity

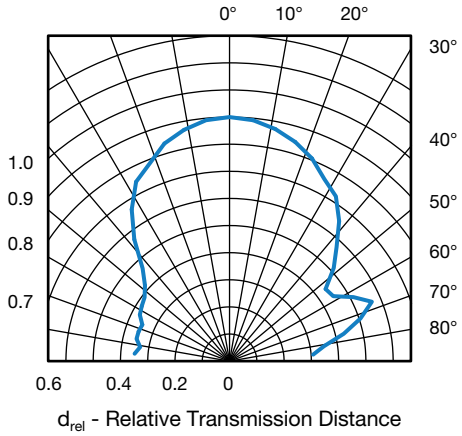



Fig. 12 - Vertical Directivity

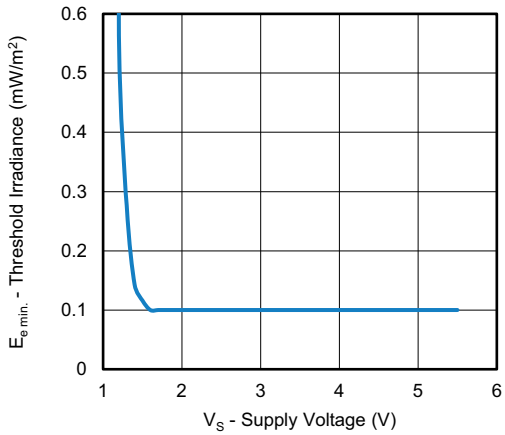



Fig. 13 - Sensitivity vs. Supply Voltage

## 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 pattern from fluorescent lamps with electronic ballasts (see Fig. 14 or Fig. 15)

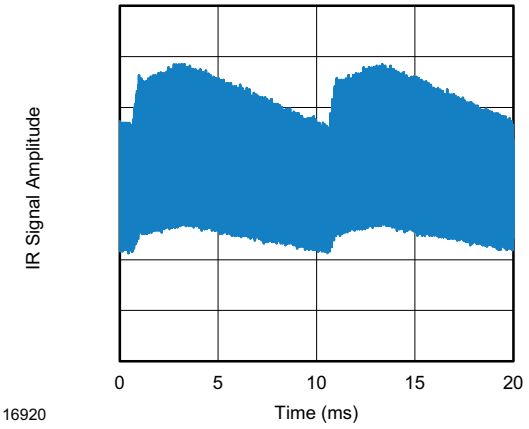



Fig. 14 - IR Disturbance from Fluorescent Lamp With Low Modulation

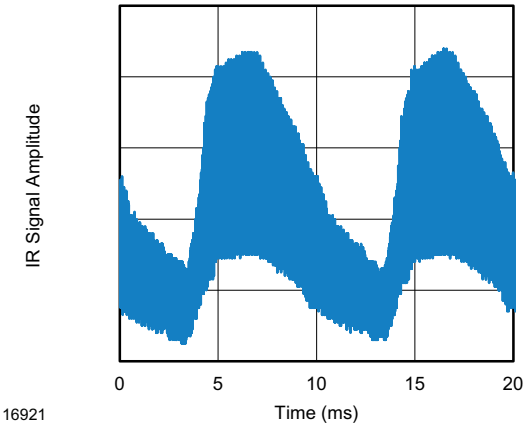


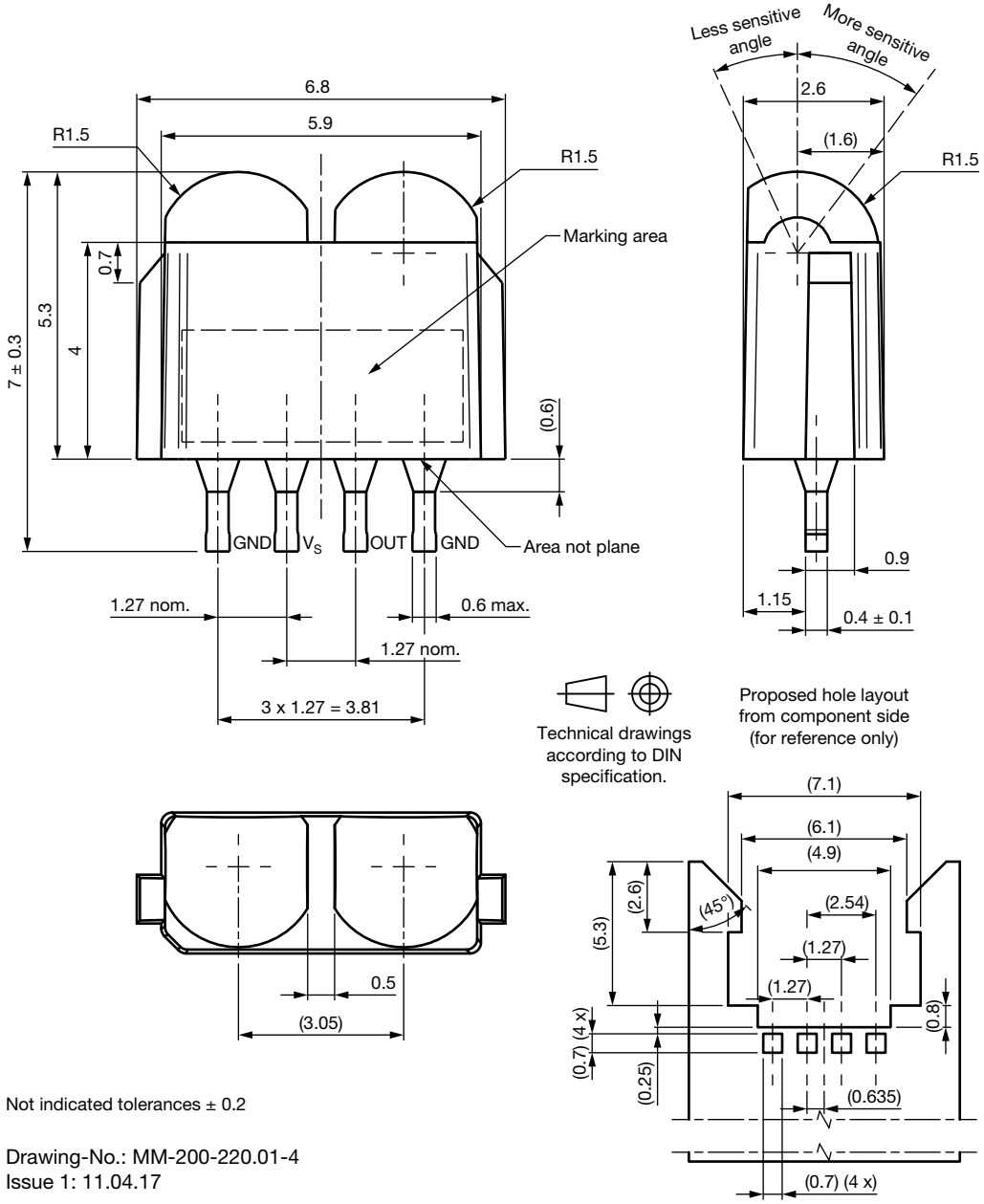

Fig. 15 - IR Disturbance from Fluorescent Lamp With High Modulation

| | TSOP393..TR1 | TSOP395..TR1 |
|---|---|---|
| Minimum burst length | 6 cycles/burst | 6 cycles/burst |
| After each burst of length<br>a minimum gap time is required of | 6 to 35 cycles<br>≥ 10 cycles | 6 to 20 cycles<br>≥ 10 cycles |
| For bursts greater than<br>a minimum gap time in the data stream is needed of | 35 cycles<br><br>> 9 x burst length | 20 cycles<br><br>> 25 x burst length |
| Maximum number of continuous short bursts/second | 2000 | 2000 |
| MCIR code | Preferred | No |
| XMP code | Preferred | Yes |
| RCMM code | Preferred | Yes |
| RECS-80 code | Preferred | Yes |
| r-map code | Preferred | Yes |
| Suppression of interference from fluorescent lamps | Fig. 14 and Fig. 15 | Fig. 14 and Fig. 15 |

**Note**

- For data formats with long bursts please see the datasheet for TSOP392..TR1, TSOP394..TR1

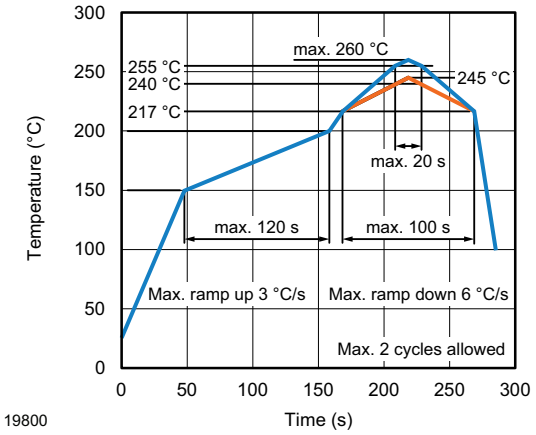
**PACKAGE DIMENSIONS** in millimeters



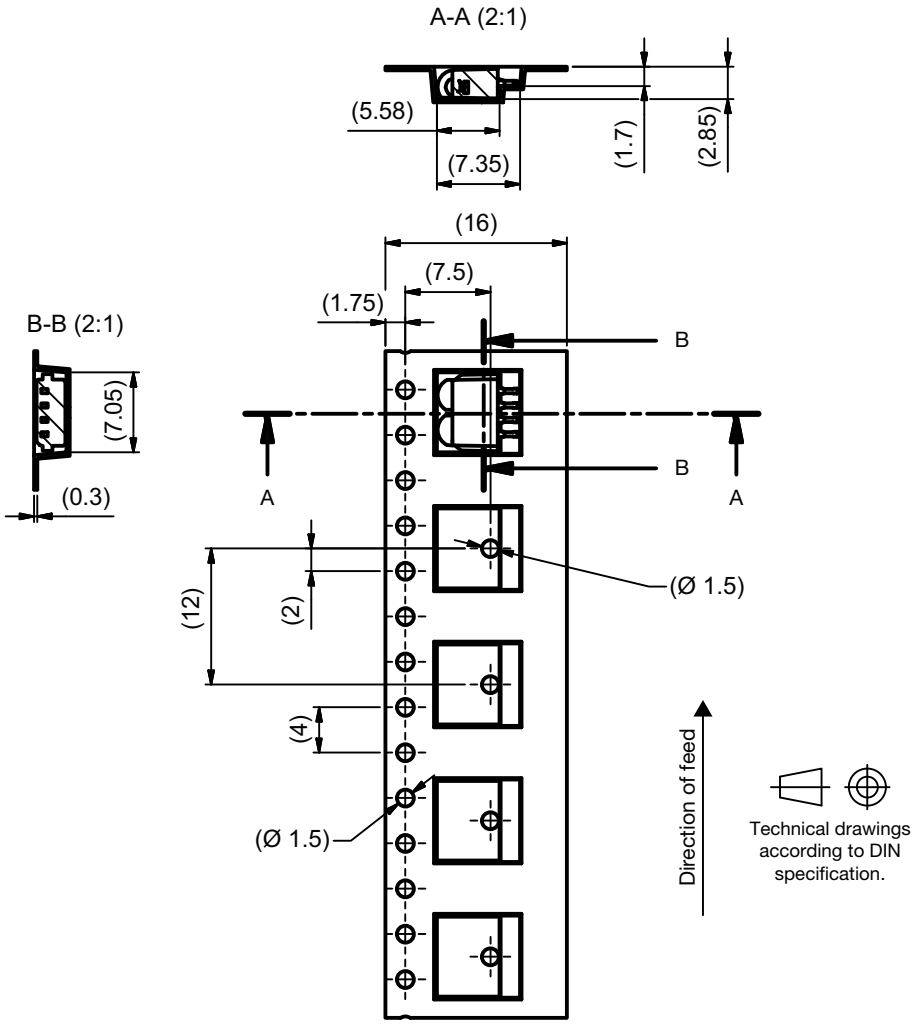

Not indicated tolerances ± 0.2

Drawing-No.: MM-200-220.01-4
Issue 1: 11.04.17

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



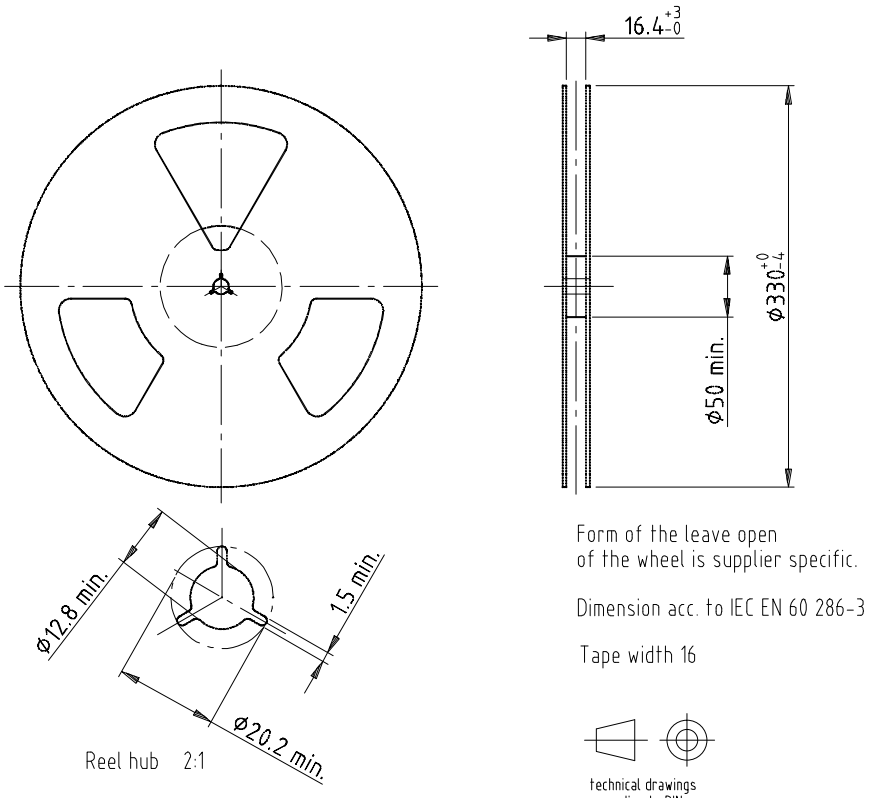

## TAPING VERSION TSOP..TR1 DIMENSIONS in millimeters



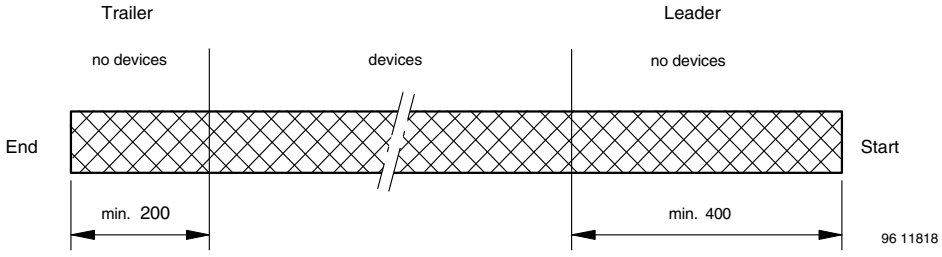

Drawing-No.: MM-200-229.01-4_Z
Issue A: 24.04.17

## **REEL DIMENSIONS** in millimeters

Packing quantity - 2000 pieces per reel



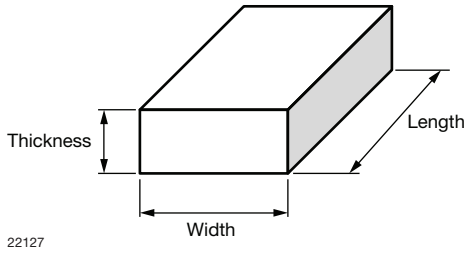

## **LEADER AND TRAILER DIMENSIONS** in millimeters



## OUTER PACKAGING

The sealed reel is packed into a pizza box.

**CARTON BOX DIMENSIONS** in millimeters




| | THICKNESS | WIDTH | LENGTH |
|---|---|---|---|
| Pizza box<br>(Belobog, Panhead, Heimdall, TVCast SMD, and Minimold DF1P)<br>(taping in reels) | 50 | 340 | 340 |

## 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**

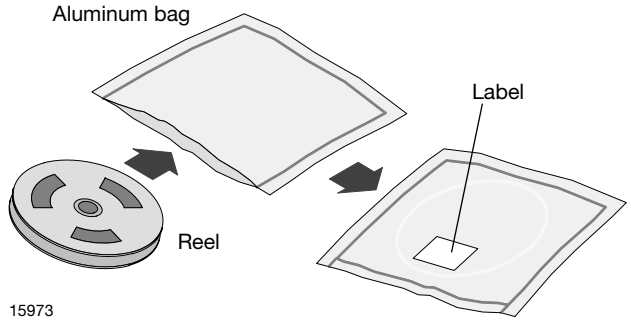
The standard bar code labels are product labels and used for identification of goods. The finished goods are packed in final packing area. The standard packing units are labeled with standard bar code labels before transported as finished goods to warehouses. The labels are on each packing unit and contain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

## 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.

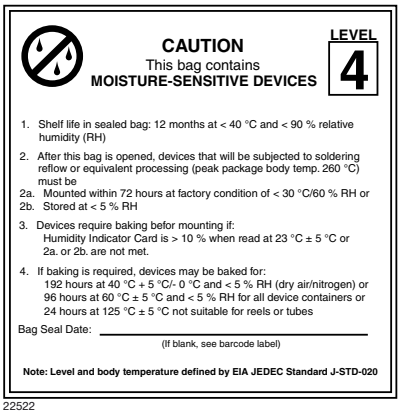
In case of moisture absorption, the devices will recover to the former condition by drying under the following condition:

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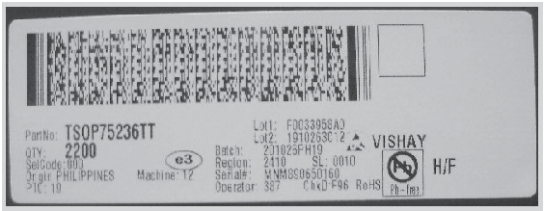
EIA JEDEC standard J-STD-020 level 4 label is included on all dry bags

## 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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