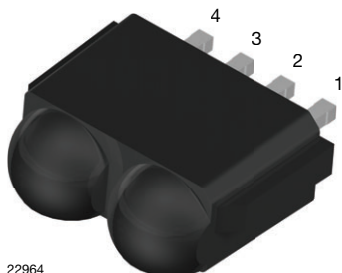


IR Receiver Modules for Remote Control Systems



22964

FEATURES

- Improved dark sensitivity
- Improved immunity against optical noise
- Very low supply current
- Photo detector and preamplifier in one package
- Internal filter for PCM frequency
- Supply voltage: 2.0 V to 3.6 V
- Insensitive to supply voltage ripple and noise
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912



RoHS
COMPLIANT
HALOGEN
FREE
GREEN
(5-2008)

MECHANICAL DATA

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

LINKS TO ADDITIONAL RESOURCES



DESCRIPTION

The TSOP99...TR1 series devices are the latest generation miniaturized IR receiver modules for infrared remote control systems. These series provide improvements in sensitivity to remote control signals in dark ambient as well as in sensitivity in the presence of optical disturbances e.g. from CFLs.

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.

The TSOP996..TR1 series devices are designed to receive long burst codes (10 or more carrier cycles per burst). The third digit designates the AGC level (AGC6) and the last two digits designate the band-pass frequency (see table below). The higher the AGC, the better noise is suppressed, but the lower the code compatibility. AGC6 provides maximized noise suppression. Generally, we advise to select the highest AGC that satisfactorily receives the desired remote code.

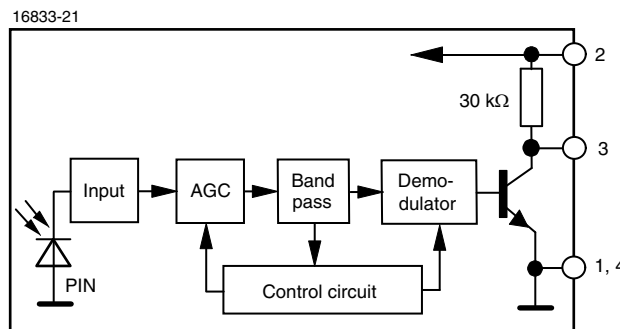
These components have not been qualified to automotive specifications.

ORDERING CODE

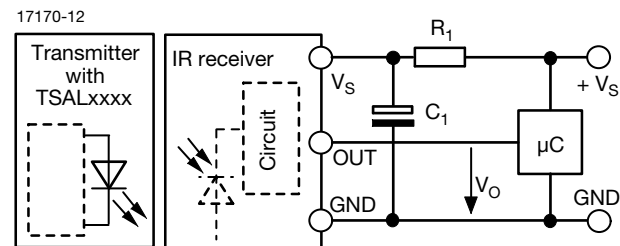
Taping:

TSOP99...TR1 - top view taped, 2000 pcs/reel

BLOCK DIAGRAM



APPLICATION CIRCUIT



R₁ and C₁ recommended to reduce supply ripple for V_S < 2.2 V



| PARTS TABLE | | |
|-------------------|---|------------------------------------|
| AGC | MAXIMIZED NOISE SUPPRESSION (AGC6) | |
| Carrier frequency | 30 kHz | TSOP99630TR1 |
| | 33 kHz | TSOP99633TR1 |
| | 36 kHz | TSOP99636TR1 ⁽⁵⁾⁽⁶⁾ |
| | 38 kHz | TSOP99638TR1 ⁽³⁾⁽⁴⁾⁽¹¹⁾ |
| | 40 kHz | TSOP99640TR1 |
| | 56 kHz | TSOP99656TR1 |
| 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⁾ Cisco ⁽²⁾ MCIR ⁽³⁾ Mitsubishi ⁽⁴⁾ NEC ⁽⁵⁾ Panasonic ⁽⁶⁾ RC-5 ⁽⁷⁾ RC-6 ⁽⁸⁾ RCA ⁽⁹⁾ r-step ⁽¹⁰⁾ Sejin 4PPM ⁽¹¹⁾ Sharp ⁽¹²⁾ Sony | |

Notes

- 30 kHz and 33 kHz only available on written request
- See datasheet for TSOP992..TR1, TSOP994..TR1 for preferred devices for ⁽¹⁾⁽²⁾⁽⁷⁾⁽⁸⁾⁽⁹⁾⁽¹⁰⁾⁽¹²⁾

| ABSOLUTE MAXIMUM RATINGS | | | | |
|-----------------------------|--------------------------|------------------|--------------------------------|------|
| PARAMETER | TEST CONDITION | SYMBOL | VALUE | UNIT |
| Supply voltage | | V _S | -0.3 to +3.6 | 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} ≤ 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 current | E _v = 0, V _S = 3.3 V | I _{SD} | 0.25 | 0.37 | 0.45 | mA |
| | E _v = 40 klx, sunlight | I _{SH} | - | 0.50 | - | mA |
| Supply voltage | | V _S | 2.0 | - | 3.6 | V |
| Transmission distance | E _v = 0, test signal see Fig. 1, IR diode TSAL6200, I _F = 50 mA | d | - | 30 | - | 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 | Test signal: NEC code | E _{e min.} | - | 0.08 | 0.15 | mW/m ² |
| Maximum irradiance | t _{pi} - 5/f ₀ < t _{po} < t _{pi} + 6/f ₀ , test signal see Fig. 1 | E _{e max.} | 30 | - | - | W/m ² |
| Directivity | Angle of half transmission distance | φ _{1/2} | - | ± 45 | - | ° |

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

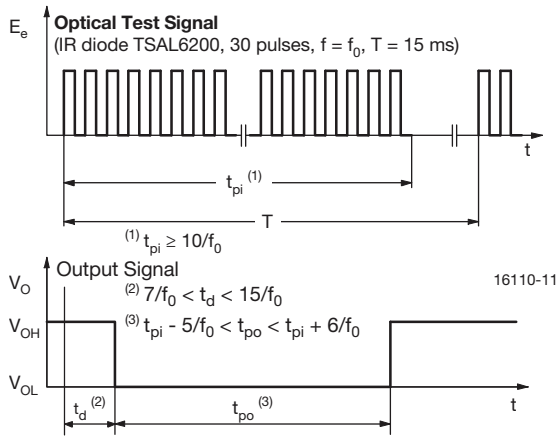


Fig. 1 - Output Delay and Pulse-Width

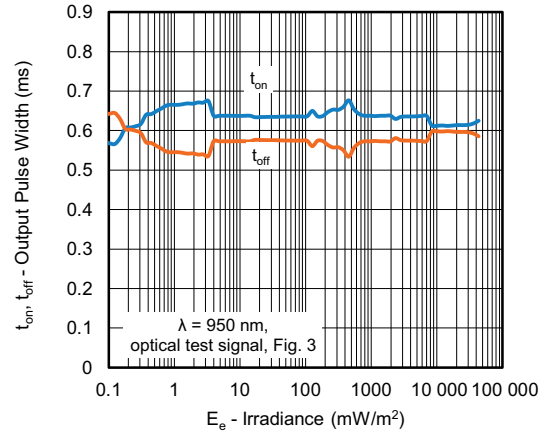


Fig. 4 - Pulse-Width vs. Irradiance in Dark Ambient

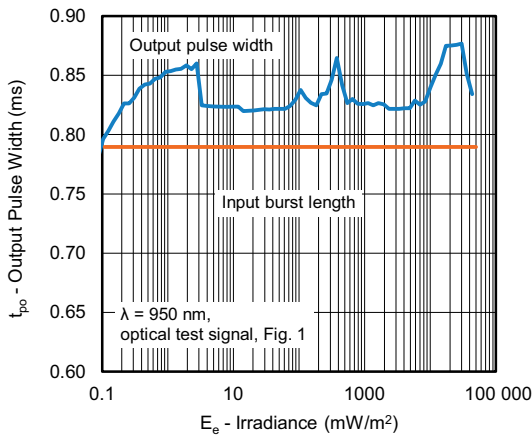


Fig. 2 - Pulse-Width vs. Irradiance in Dark Ambient

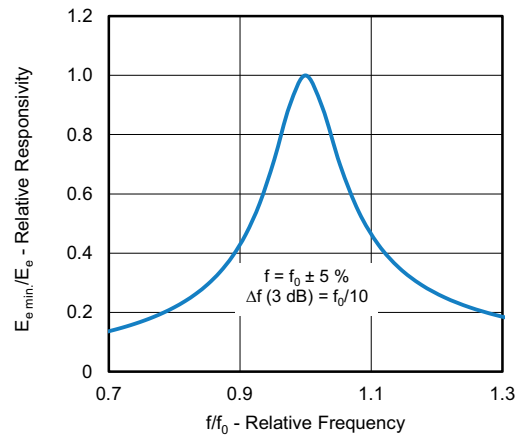


Fig. 5 - Frequency Dependence of Responsivity

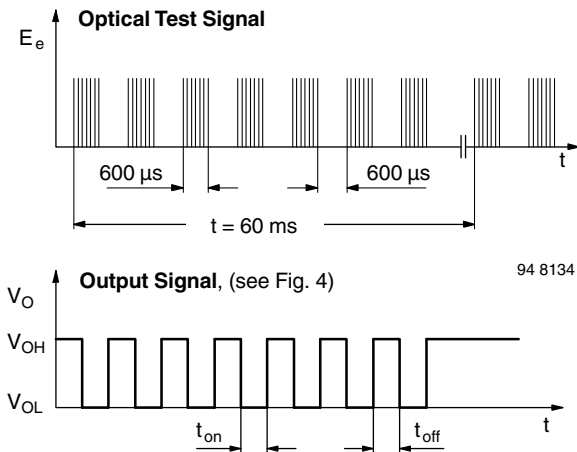


Fig. 3 - Test Signal

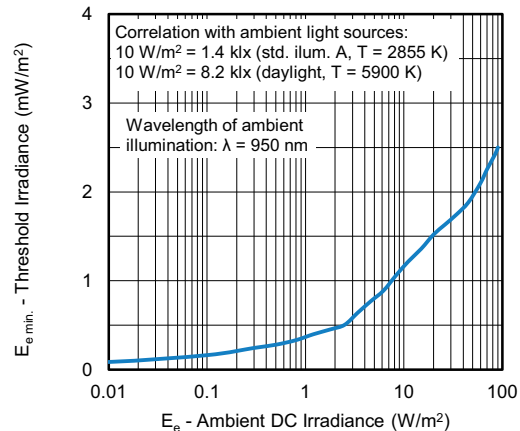


Fig. 6 - Sensitivity in Bright Ambient

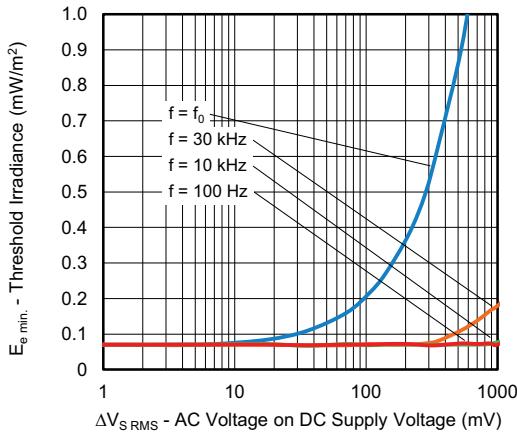


Fig. 7 - Sensitivity vs. Supply Voltage Disturbances

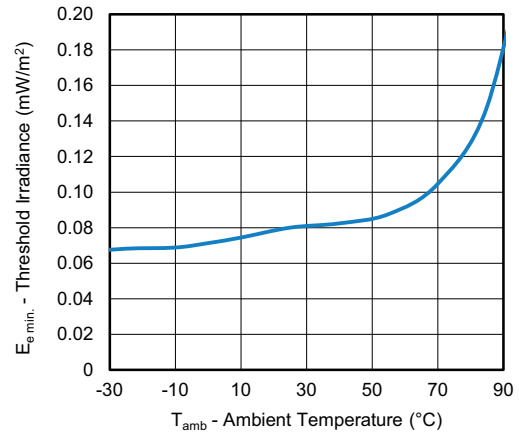


Fig. 9 - Sensitivity vs. Ambient Temperature

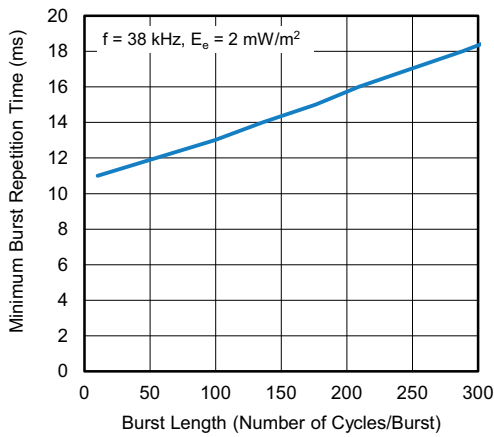


Fig. 8 - Minimum Burst Repetition Time vs. Burst Length

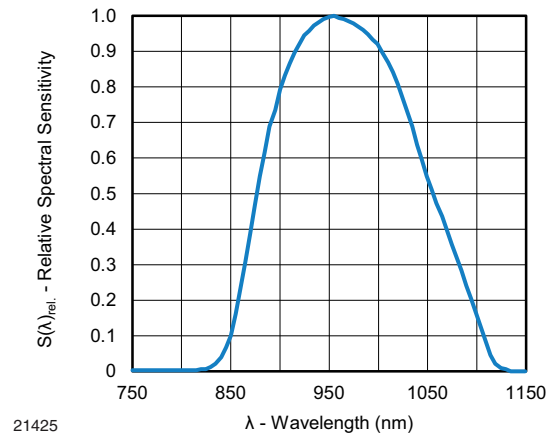


Fig. 10 - Relative Spectral Sensitivity vs. Wavelength

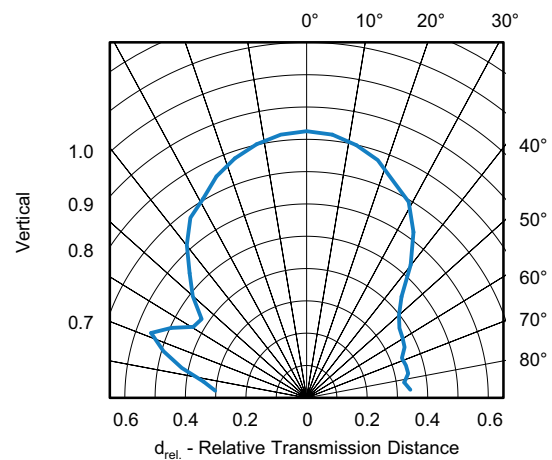
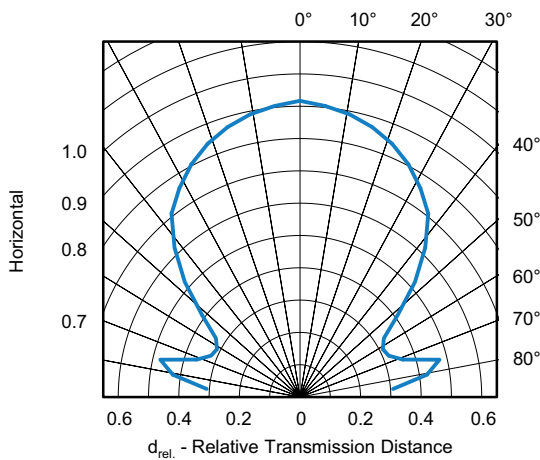


Fig. 11 - Horizontal and Vertical Directivity

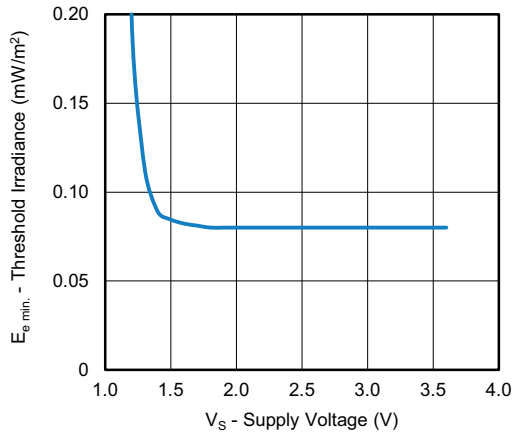


Fig. 12 - Sensitivity vs. Supply Voltage

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 patterns from fluorescent lamps with electronic ballasts (see Fig. 13 or Fig. 14)

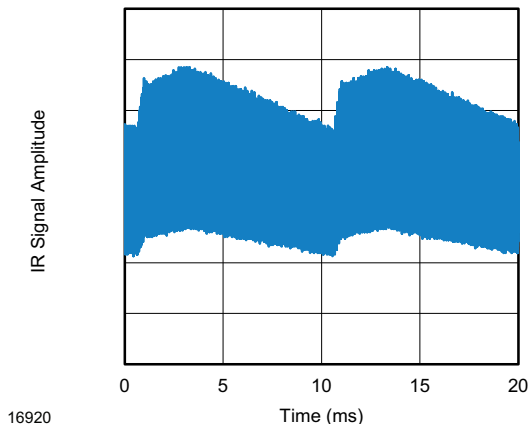


Fig. 13 - IR Emission from Fluorescent Lamp With Low Modulation

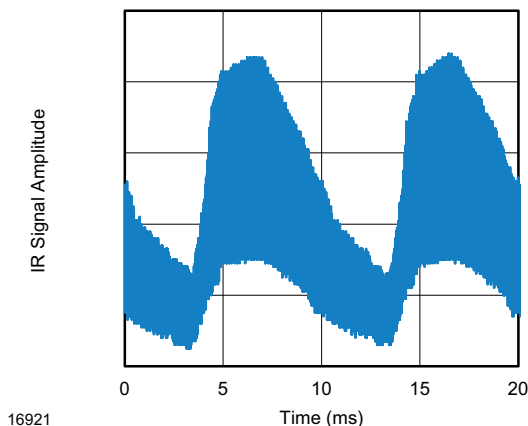


Fig. 14 - IR Emission from Fluorescent Lamp With High Modulation

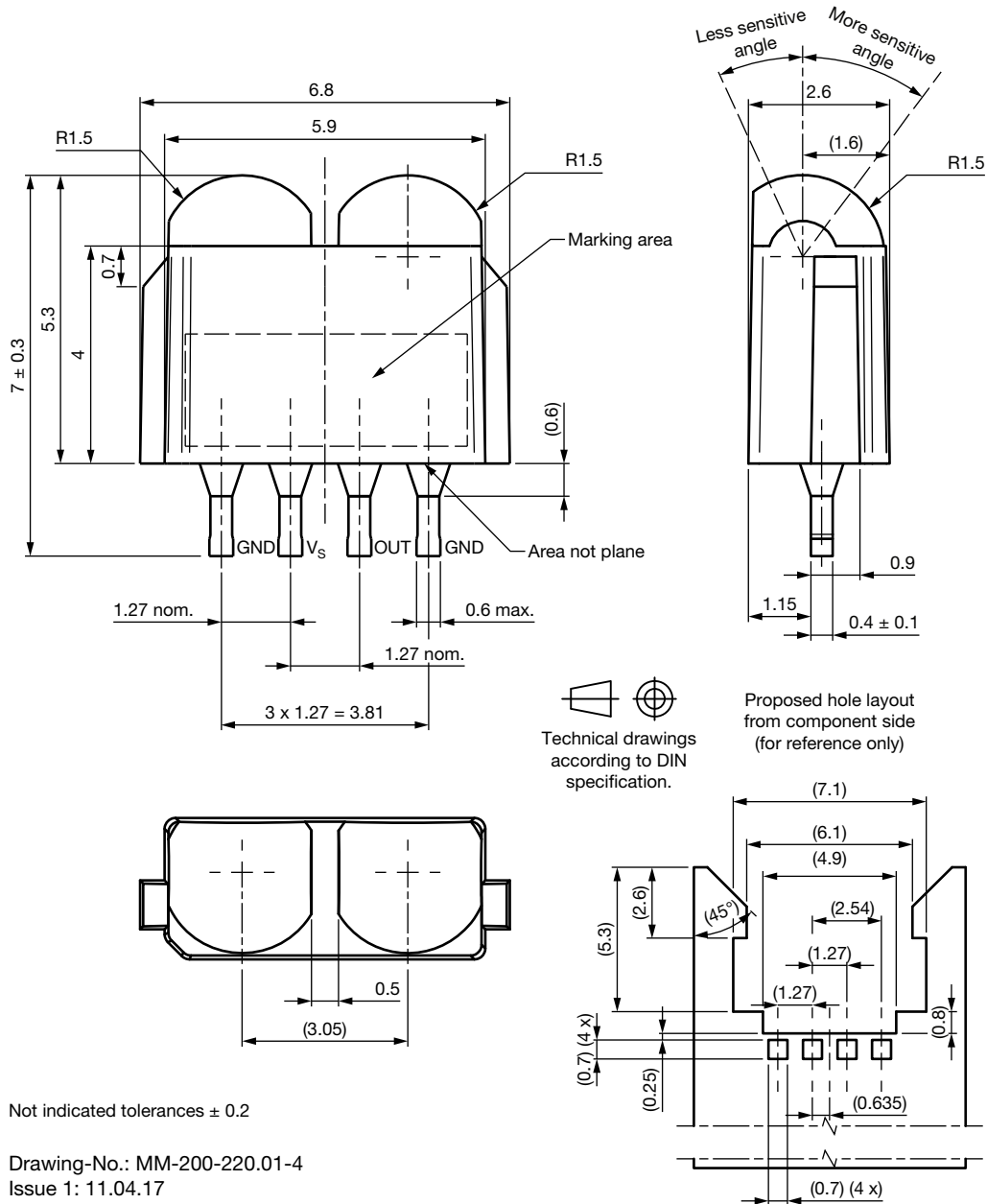
| | TSOP996..TR1 |
|--|---------------------|
| Minimum burst length | 10 cycles/burst |
| Minimum gap time between bursts | ≥ 13 cycles |
| Minimum idle period between data frames | 12 ms |
| RC-5 code | Preferred |
| RC-6 code | Yes |
| NEC code | Preferred |
| r-step code 56 kHz | Yes |
| Sony code | No |
| RCA 56 kHz code | Yes |
| Mitsubishi code 38 kHz | Preferred |
| Suppression of interference from fluorescent lamps | Fig. 13 and Fig. 14 |

Note

- For data formats with short bursts please see the datasheet for TSOP993..TR1, TSOP995..TR1



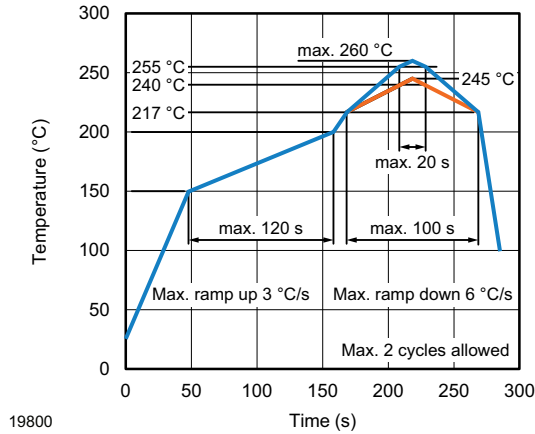
PACKAGE DIMENSIONS in millimeters



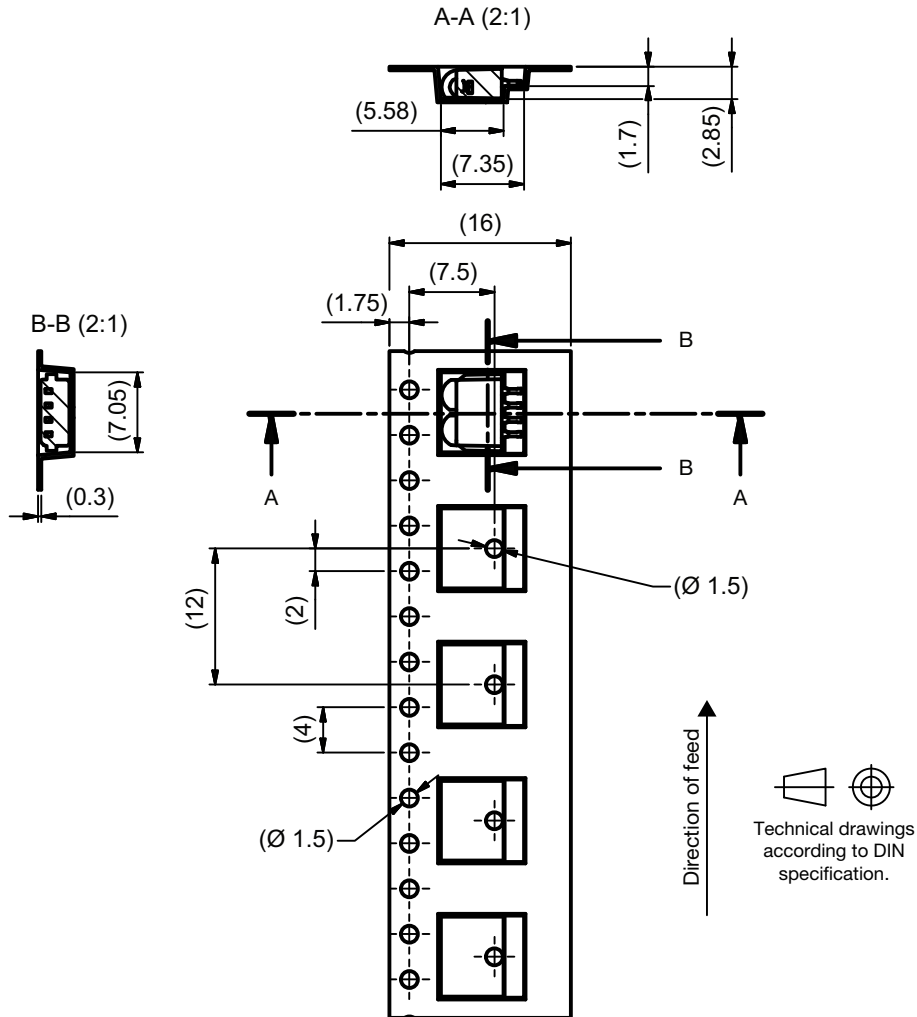
Not indicated tolerances ± 0.2

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

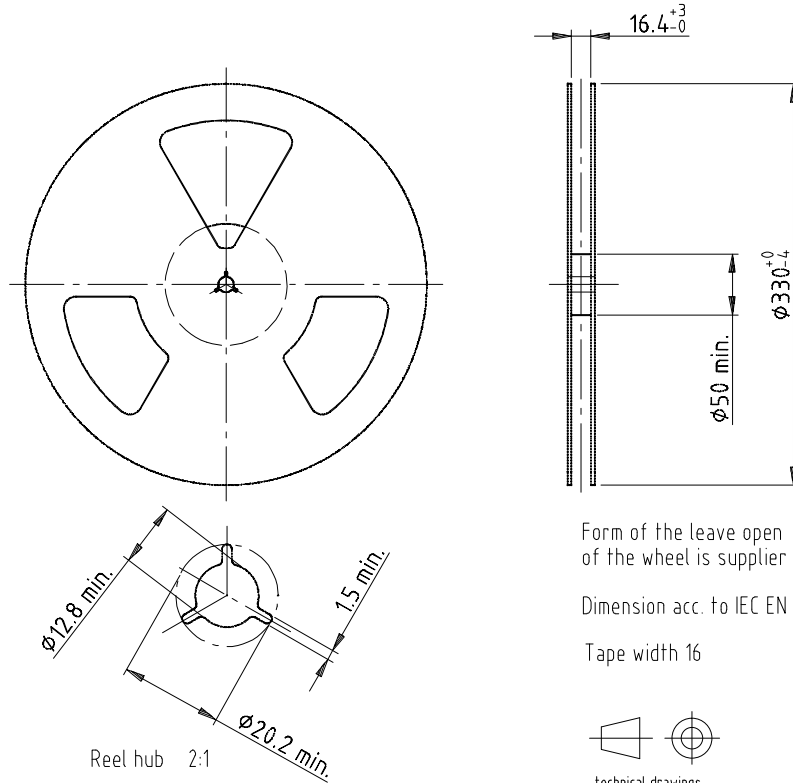


Drawing-No.: MM-200-229.01-4_Z
Issue A: 24.04.17



REEL DIMENSIONS in millimeters

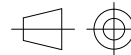
Packing quantity - 2000 pieces per reel



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

Dimension acc. to IEC EN 60 286-3

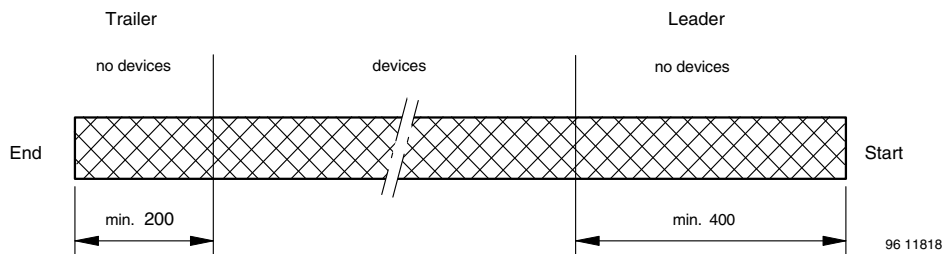
Tape width 16



Technical drawings according to DIN specifications

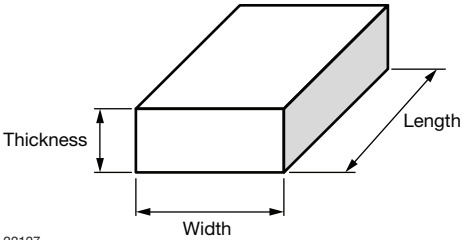
Drawing-No.: 9.800-5052.V2-4
Issue: 1; 07.05.02
16734

LEADER AND TRAILER DIMENSIONS in millimeters



OUTER PACKAGING

The sealed reel is packed into a pizza box.

| CARTON BOX DIMENSIONS in millimeters | | | |
|--|------------------|--------------|---------------|
|  <small>22127</small> | | | |
| | THICKNESS | WIDTH | LENGTH |
| Pizza box (Belobog, Panhead, Heimdall, TVCast SMD, and Minimold DF1P) (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

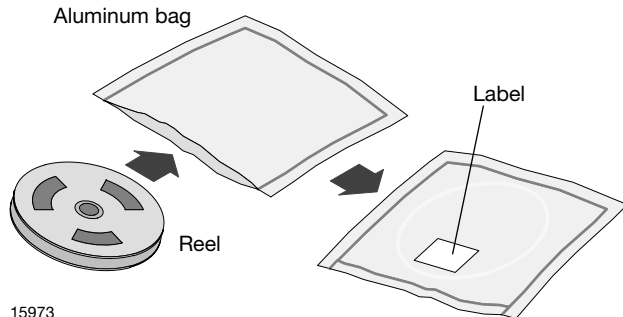
LABEL
Standard bar code labels for finished goods

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.



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.

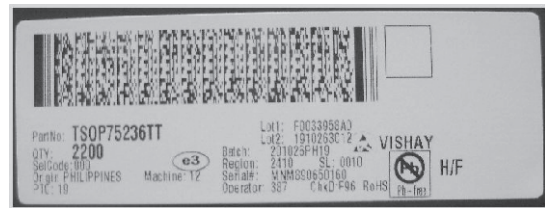
An EIA JEDEC® standard J-STD-020 level 4 label is included on all dry bags.

ESD PRECAUTION

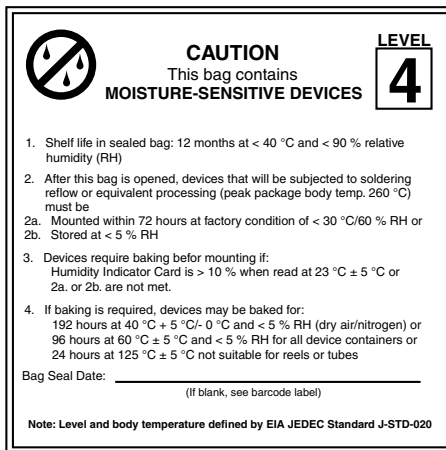
Proper storage and handling procedures should be followed to prevent ESD damage to the devices especially when they are removed from the antistatic shielding bag. Electrostatic sensitive devices warning labels are on the packaging.

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.



22178



22522

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



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