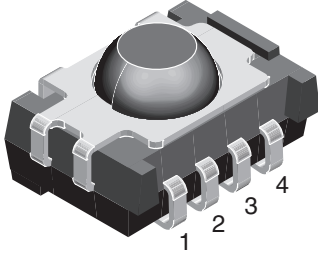


IR Receiver Modules for Remote Control Systems



16797

MECHANICAL DATA

Pinning:

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

FEATURES

- Very low supply current
- Photo detector and preamplifier in one package
- Internal filter for PCM frequency
- Continuous data transmission possible
- Supply voltage: 2.5 V to 5.5 V
- Insensitive to supply voltage ripple and noise
- Compliant to RoHS directive 2002/95/EC and in accordance to WEEE 2002/96/EC
- Taping available for topview and sideview assembly



RoHS
COMPLIANT

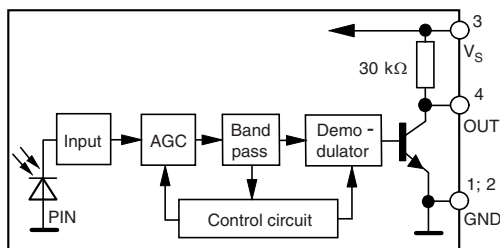
DESCRIPTION

The TSOP351.., TSOP353.. and TSOP355.. series are miniaturized SMD IR receiver modules for infrared remote control systems. PIN diode and preamplifier are assembled on a lead frame, the epoxy package is designed as IR filter. The demodulated output signal can directly be decoded by a microprocessor. The TSOP351.. is compatible with all common IR remote control data formats. The TSOP353.. is optimized to better suppress spurious pulses from energy saving lamps. The TSOP355.. has an excellent noise suppression. It is immune to dimmed LCD backlighting and any fluorescent lamps. AGC3 and AGC5 may also suppress some data signals in case of continuous transmission. This component has not been qualified according to automotive specifications.

PARTS TABLE

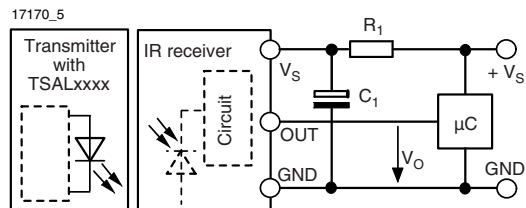
| CARRIER FREQUENCY | SHORT BURSTS AND HIGH DATA RATES (AGC1) | NOISY ENVIRONMENTS AND SHORT BURSTS (AGC3) | VERY NOISY ENVIRONMENTS AND SHORT BURSTS (AGC5) |
|-------------------|---|--|---|
| 30 kHz | TSOP35130 | TSOP35330 | TSOP35530 |
| 33 kHz | TSOP35133 | TSOP35333 | TSOP35533 |
| 36 kHz | TSOP35136 | TSOP35336 | TSOP35536 |
| 38 kHz | TSOP35138 | TSOP35338 | TSOP35538 |
| 40 kHz | TSOP35140 | TSOP35340 | TSOP35540 |
| 56 kHz | TSOP35156 | TSOP35356 | TSOP35556 |

BLOCK DIAGRAM



16839

APPLICATION CIRCUIT



R_1 and C_1 are recommended for protection against EOS. Components should be in the range of $33 \Omega < R_1 < 1 \text{ k}\Omega$, $C_1 > 0.1 \mu\text{F}$.

| ABSOLUTE MAXIMUM RATINGS | | | | |
|-----------------------------|----------------------|-----------|--------------------------|------|
| PARAMETER | TEST CONDITION | SYMBOL | VALUE | UNIT |
| Supply voltage (pin 3) | | V_S | - 0.3 to + 6 | V |
| Supply current (pin 3) | | I_S | 3 | mA |
| Output voltage (pin 4) | | V_O | - 0.3 to ($V_S + 0.3$) | V |
| Output current (pin 4) | | I_O | 5 | mA |
| Junction temperature | | T_j | 100 | °C |
| Storage temperature range | | T_{stg} | - 40 to + 100 | °C |
| Operating temperature range | | T_{amb} | - 30 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 current (pin 3) | $E_v = 0, V_S = 3.3$ V | I_{SD} | 0.27 | 0.35 | 0.45 | mA |
| | $E_v = 40$ klx, sunlight | I_{SH} | | 0.45 | | mA |
| Supply voltage | | V_S | 2.5 | | 5.5 | V |
| Transmission distance | $E_v = 0$, test signal see fig. 1, IR diode TSAL6200, $I_F = 250$ mA | d | | 45 | | m |
| Output voltage low (pin 4) | $I_{OSL} = 0.5$ mA, $E_e = 0.7$ mW/m ² , test signal see fig. 1 | V_{OSL} | | | 100 | mV |
| Minimum irradiance | Pulse width tolerance: $t_{pi} - 5/f_o < t_{po} < t_{pi} + 6/f_o$, test signal see fig. 1 | E_e min. | | 0.15 | 0.35 | mW/m ² |
| Maximum irradiance | $t_{pi} - 5/f_o < t_{po} < t_{pi} + 6/f_o$, test signal see fig. 1 | E_e max. | 30 | | | W/m ² |
| Directivity | Angle of half transmission distance | $\phi_{1/2}$ | | ± 50 | | deg |

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

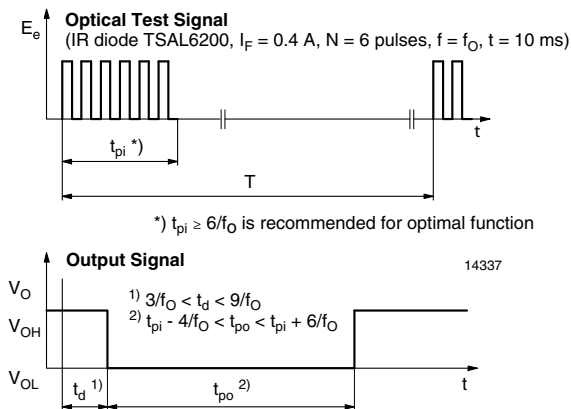


Fig. 1 - Output Function

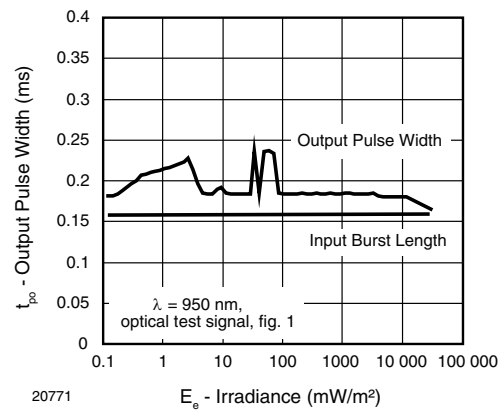


Fig. 2 - Pulse Length and Sensitivity in Dark Ambient



TSOP351.., TSOP353.., TSOP355..

IR Receiver Modules for Remote Control Systems Vishay Semiconductors

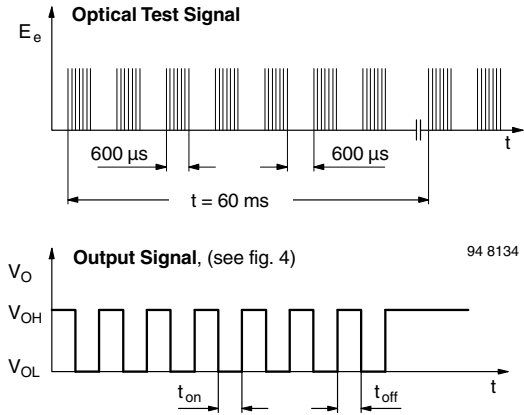


Fig. 3 - Output Function

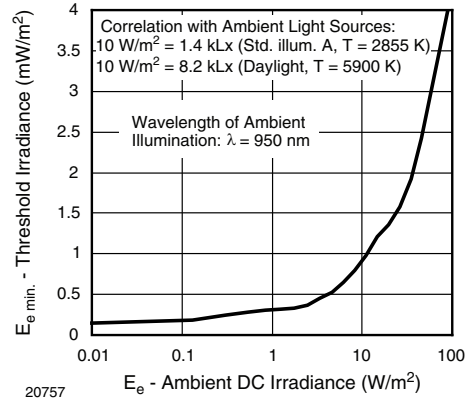


Fig. 6 - Sensitivity in Bright Ambient

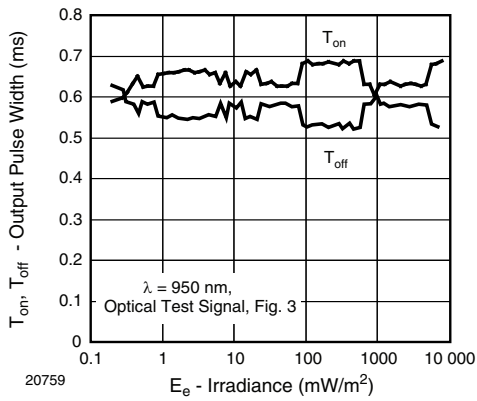


Fig. 4 - Output Pulse Diagram

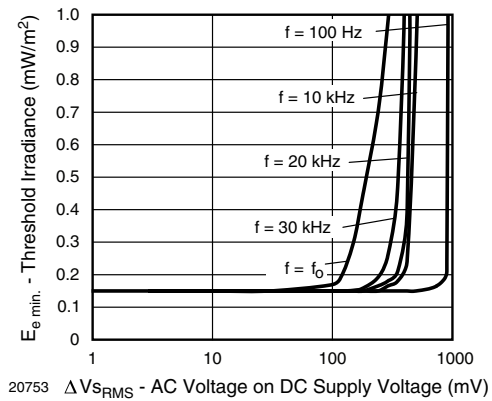


Fig. 7 - Sensitivity vs. Supply Voltage Disturbances

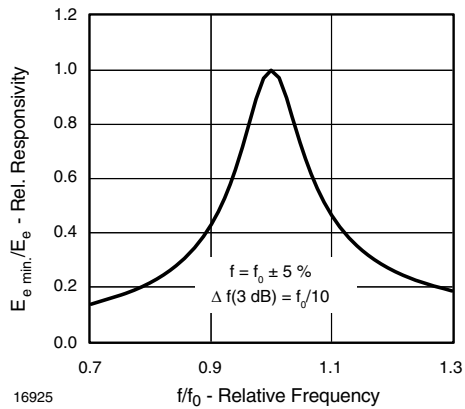


Fig. 5 - Frequency Dependence of Responsivity

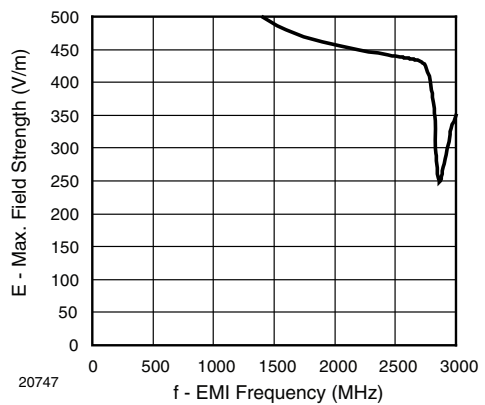


Fig. 8 - Sensitivity vs. Electric Field Disturbances

TSOP351..., TSOP353..., TSOP355..



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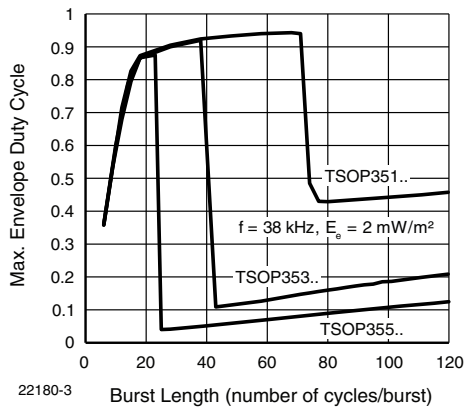


Fig. 9 - Max. Envelope Duty Cycle vs. Burstlength

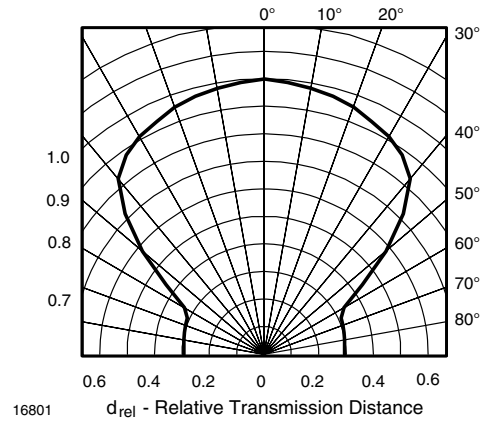


Fig. 12 - Directivity

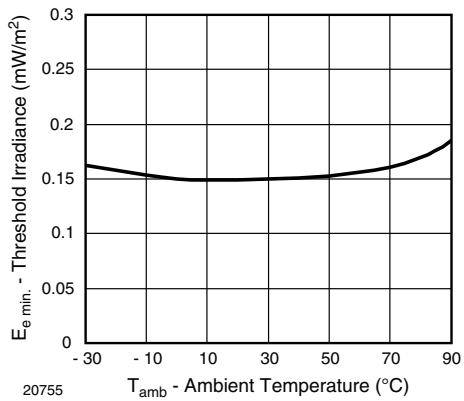


Fig. 10 - Sensitivity vs. Ambient Temperature

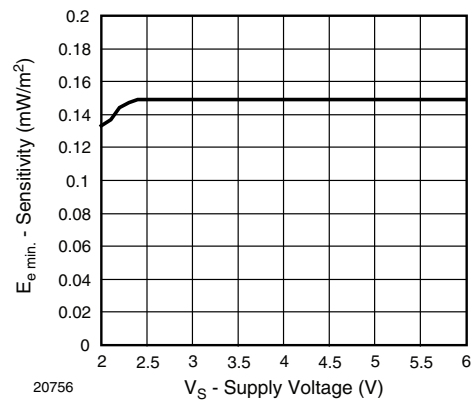


Fig. 13 - Sensitivity vs. Supply Voltage

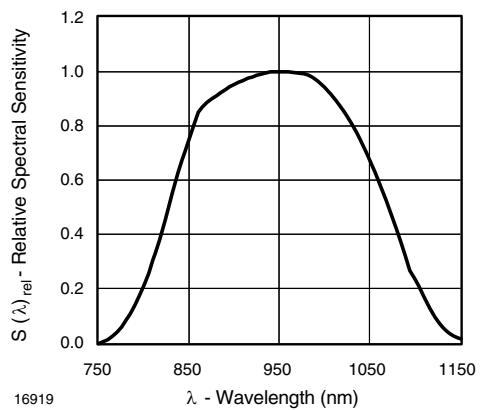


Fig. 11 - Relative Spectral Sensitivity vs. Wavelength

SUITABLE DATA FORMAT

The TSOP351.., TSOP353.. and TSOP355.. series is designed to suppress spurious output pulses due to noise or disturbance signals. Data and disturbance signals can be distinguished by the devices according to carrier frequency, burst length and envelope duty cycle. The data signal should be close to the band-pass center frequency (e.g. 38 kHz) and fulfill the conditions in the table below.

When a data signal is applied to the TSOP351.., TSOP353.. and TSOP355.. in the presence of a disturbance signal, the sensitivity of the receiver is reduced to insure that no spurious pulses are present at the output. Some examples of disturbance signals which are suppressed are:

- DC light (e.g. from tungsten bulb or sunlight)
- Continuous signals at any frequency
- Strongly or noise from fluorescent lamps with electronic ballasts

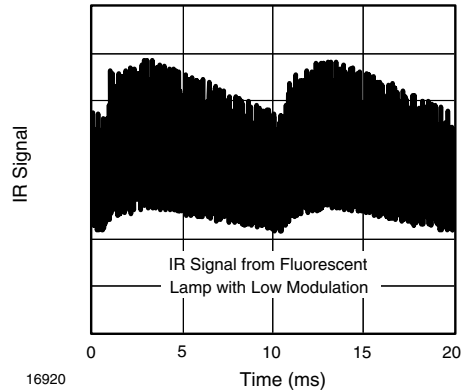


Fig. 14 - IR Signal from Fluorescent Lamp with Low Modulation

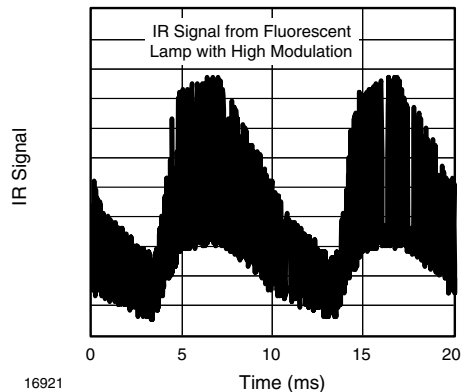


Fig. 15 - IR Signal from Fluorescent Lamp with High Modulation

| | TSOP351.. | TSOP353.. | TSOP355.. |
|--|--|--|--|
| Minimum burst length | 6 cycles/burst | 6 cycles/burst | 6 cycles/burst |
| After each burst of length a minimum gap time is required of | 6 to 70 cycles ≥ 10 cycles | 6 to 35 cycles ≥ 10 cycles | 6 to 24 cycles ≥ 10 cycles |
| For bursts greater than a minimum gap time in the data stream is needed of | 70 cycles > 1.2 x burst length | 35 cycles > 6 x burst length | 24 cycles > 25 ms |
| Maximum number of continuous short bursts/second | 2000 | 2000 | 2000 |
| Recommended for NEC code | yes | yes | yes |
| Recommended for RC5/RC6 code | yes | yes | yes |
| Recommended for Sony code | yes | no | no |
| Recommended for RCMM code | yes | yes | yes |
| Recommended for r-step code | yes | yes | yes |
| Recommended for XMP code | yes | yes | yes |
| Suppression of interference from fluorescent lamps | Common disturbance signals are suppressed (example: signal pattern of fig. 14) | Even critical disturbance signals are suppressed (example: signal pattern of fig. 14 an fig. 15) | Even critical disturbance signals are suppressed (example: signal pattern of fig. 14 an fig. 15) |

Note

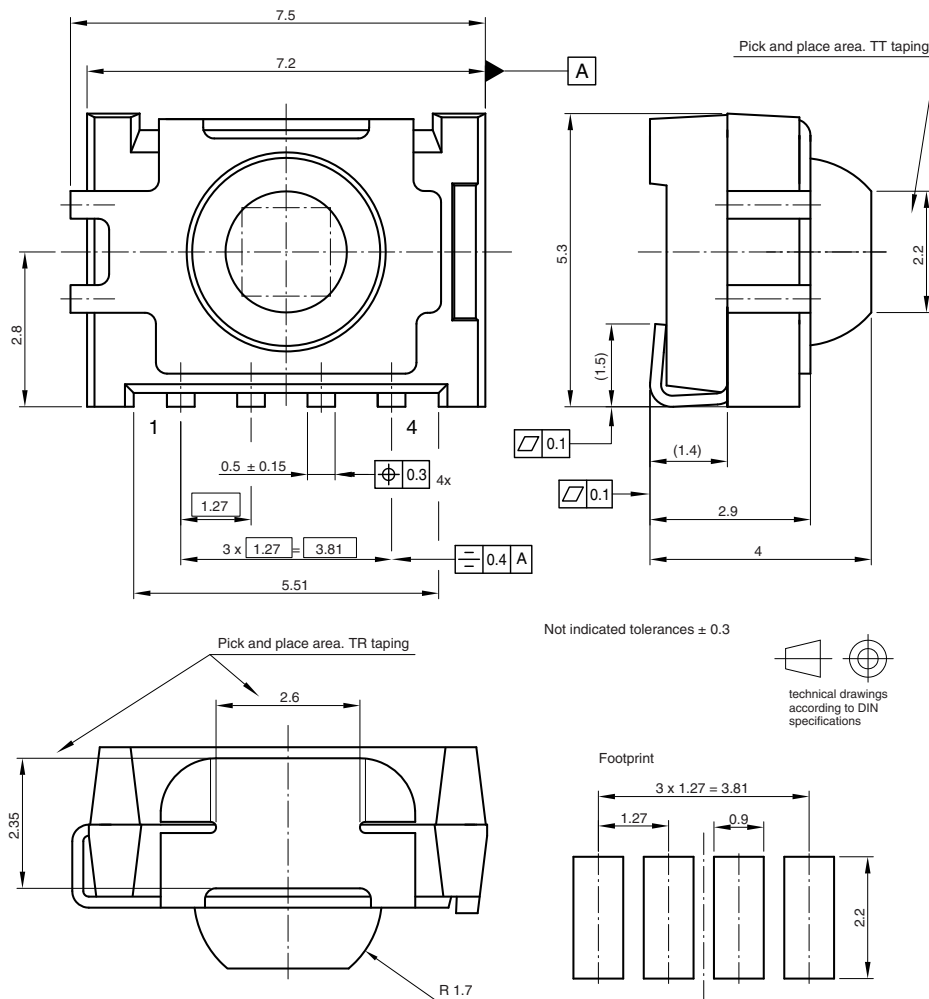
- For data formats with long bursts (more than 10 carrier cycles) please see the datasheet for TSOP352.., TSOP354..

TSOP351.., TSOP353.., TSOP355..

Vishay Semiconductors IR Receiver Modules for Remote Control Systems



PACKAGE DIMENSIONS in millimeters



Drawing-No.: 6.544-5341.01-4
Issue: 8; 02.09.09
16776

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

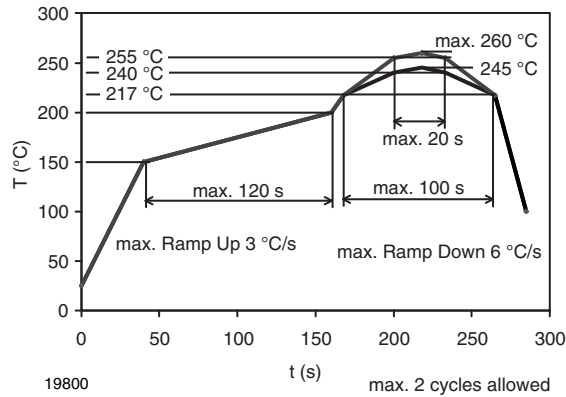
- Use a soldering iron of 25 W or less. Adjust the temperature of the soldering iron below 300 °C
- Finish soldering within 3 s
- Handle products only after the temperature has cooled off.



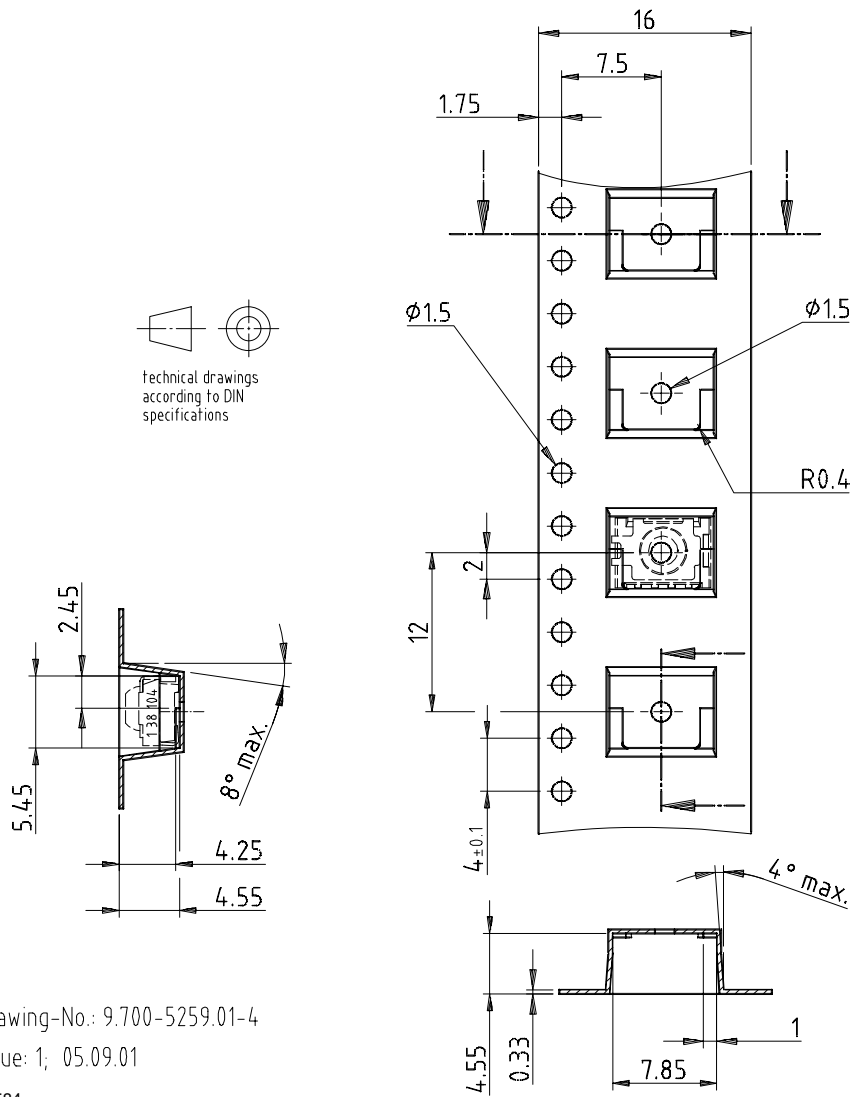
TSOP351.., TSOP353.., TSOP355..

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VISHAY LEAD (Pb)-FREE REFLOW SOLDER PROFILE



TAPING VERSION TSOP..TT Dimensions in millimeters



Drawing-No.: 9.700-5259.01-4

Issue: 1; 05.09.01

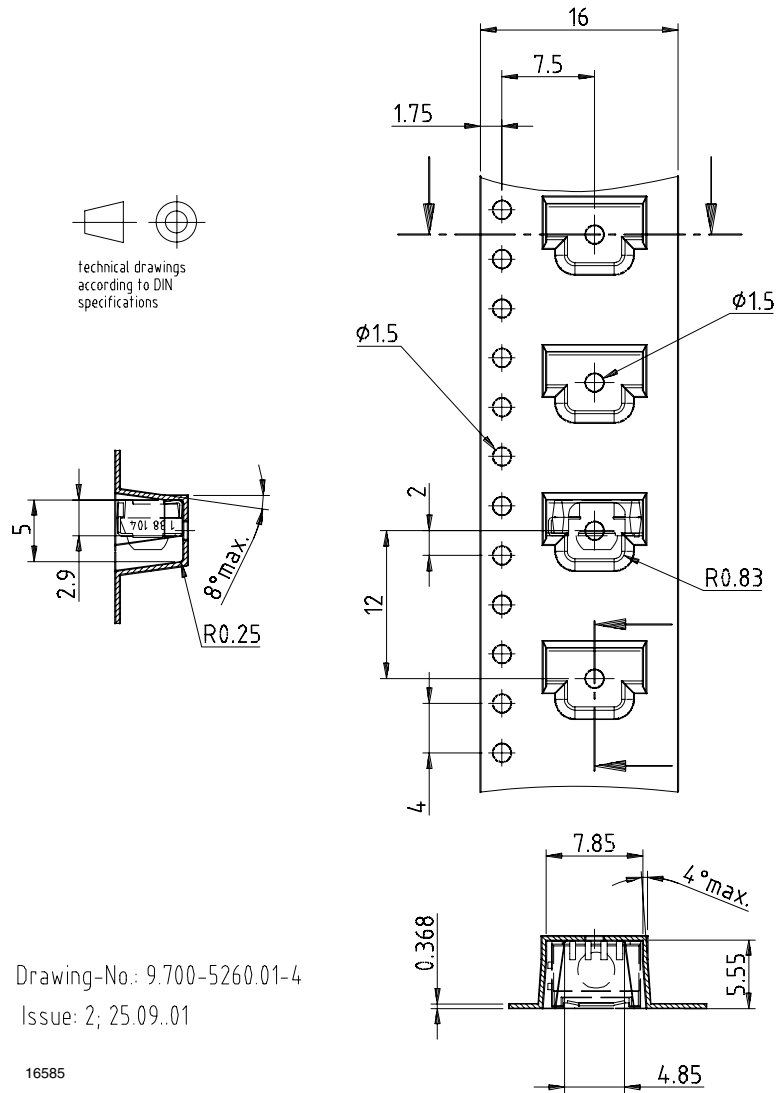
16584

TSOP351.., TSOP353.., TSOP355..



Vishay Semiconductors IR Receiver Modules for Remote Control Systems

TAPING VERSION TSOP..TR Dimensions in millimeters

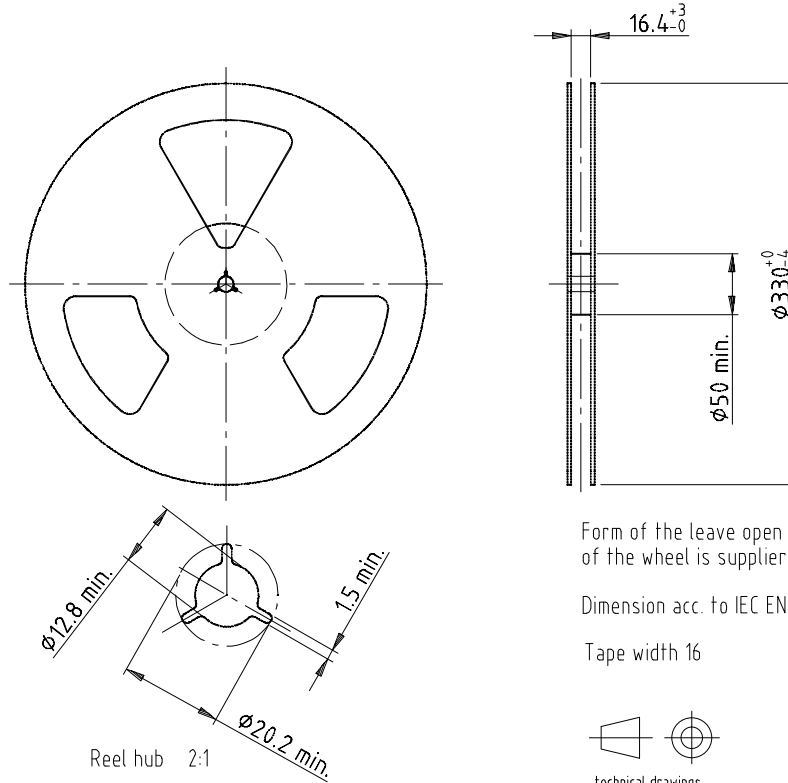




TSOP351.., TSOP353.., TSOP355..

IR Receiver Modules for Remote Control Systems Vishay Semiconductors

REEL DIMENSIONS in millimeters

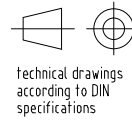


Drawing-No: 9.800-5052.V2-4
 Issue: 1; 07.05.02
 16734

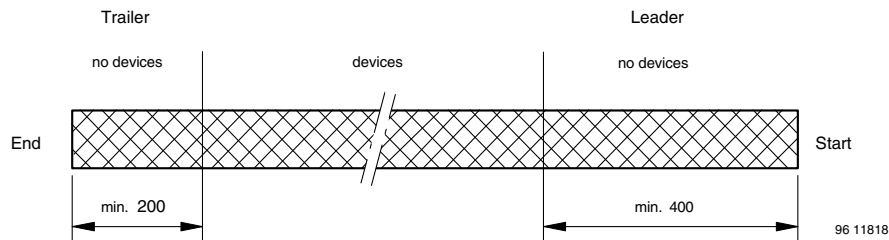
Form of the leave open of the wheel is supplier specific.

Dimension acc. to IEC EN 60 286-3

Tape width 16



LEADER AND TRAILER Dimensions in millimeters



COVER TAPE PEEL STRENGTH

According to DIN EN 60286-3
 0.1 N to 1.3 N
 300 mm/min. ± 10 mm/min.
 165° to 180° peel angle

LABEL

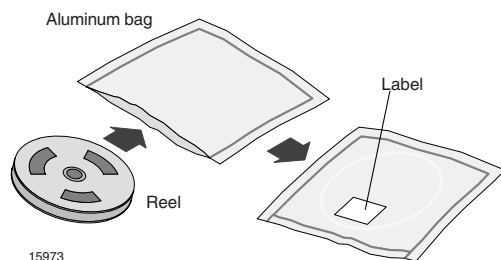
Standard bar code labels for finished goods

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.



TSOP351.., TSOP353.., TSOP355..

IR Receiver Modules for Remote Control Systems Vishay Semiconductors



CAUTION
This bag contains
MOISTURE-SENSITIVE DEVICES

L E V E L

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 infrared reflow, vapor-phase reflow, or equivalent processing (peak package body temp. 220°C) must be:

2a. Mounted within 72 hours at factory condition of ≤ 30°C/60%RH or
2b. Stored at ≤ 20% RH.

3. Devices require baking before mounting if:
Humidity Indicator Card is >20% when read at 23°C ± 5°C or
2a or 2b is 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±5°C and <5%RH | For all device containers or |
| 24 hours at 125±5°C | Not suitable for reels or tubes |

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

Note: LEVEL defined by EIA JEDEC Standard JESD22-A112

16943

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.



VISHAY

TSOP6238TR

ORIGIN
PHILIPPINES

| | | | | | |
|-----|-----|---------|------|------|-----------|
| PTC | SEL | DATE | CODE | (J4) | BATCH NO. |
| 19 | | 2002/16 | 5 | | |



1120
PCS

16962



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All product specifications and data are subject to change without notice.

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