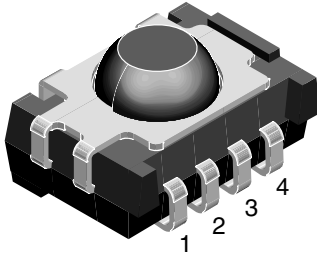




## IR Receiver Modules for 3D Synchronization Signals



16797

### MECHANICAL DATA

#### Pinning:

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

### FEATURES

- Center frequency at 25 kHz to reduce interference with IR remote control signals at 30 kHz to 56 kHz
- Package can be used with IR emitters with wavelength 830 nm as well as standard 940 nm
- Very low supply current and stand-by mode
- Photo detector and preamplifier in one package
- Internal filter for PCM frequency
- Supply voltage range: 2.5 V to 5.5 V
- Improved immunity against modulated light sources
- Insensitive to supply voltage ripple and noise
- Taping available for topview and sideview assembly
- Compliant to RoHS directive 2002/95/EC and in accordance to WEEE 2002/96/EC



**RoHS**  
COMPLIANT

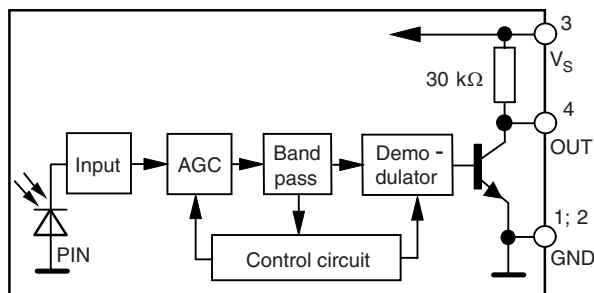
### DESCRIPTION

The TSOP35D25 is an SMD IR receiver module for 3D synchronisation signals. The receiver is designed to operate at a carrier frequency of 25 kHz and a wavelength of 830 nm to avoid interference with standard remote control systems at 940 nm and 30 kHz to 56 kHz. The TSOP35D25 can receive continuously transmitted signal patterns with a minimum burst length of 6 cycles and frame rates up to 200 Hz. The circuit provides good suppression of optical noise from CFLs, LCD backlight and plasma panels.

### PARTS TABLE

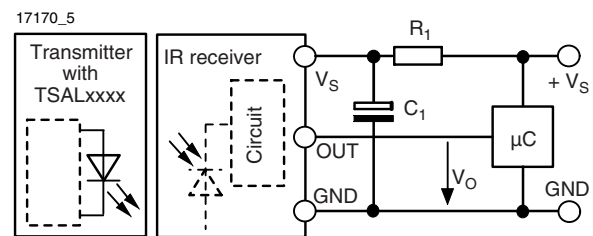
| CARRIER FREQUENCY | GOOD NOISE SUPPRESSION AND FAST BURST RATE |
|-------------------|--|
| 25 kHz            | TSOP35D25                                  |

### BLOCK DIAGRAM



16839

### APPLICATION CIRCUIT



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

# TSOP35D25

Vishay Semiconductors

IR Receiver Modules for 3D  
Synchronization Signals



| ABSOLUTE MAXIMUM RATINGS <sup>(1)</sup> |                      |           |                          |      |
|---|----------------------|-----------|--------------------------|------|
| 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

<sup>(1)</sup> 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 <sup>(1)</sup> ( $T_{amb} = 25$ °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 <sup>2</sup> , test signal see fig. 1                                     | $V_{OSL}$    |      |          | 100  | mV                |
| Minimum irradiance   | Pulse width tolerance:<br>$t_{pi} - 80$ $\mu$ s < $t_{po}$ < $t_{pi} + 160$ $\mu$ s,<br>test signal see fig. 1 | $E_e$ min.   |      | 0.15     | 0.35 | mW/m <sup>2</sup> |
| Maximum irradiance   | $t_{pi} - 80$ $\mu$ s < $t_{po}$ < $t_{pi} + 160$ $\mu$ s,<br>test signal see fig. 1                           | $E_e$ max.   | 30   |          |      | W/m <sup>2</sup>  |
| Directivity  | Angle of half transmission distance  | $\phi_{1/2}$ |      | $\pm 50$ |      | deg               |

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

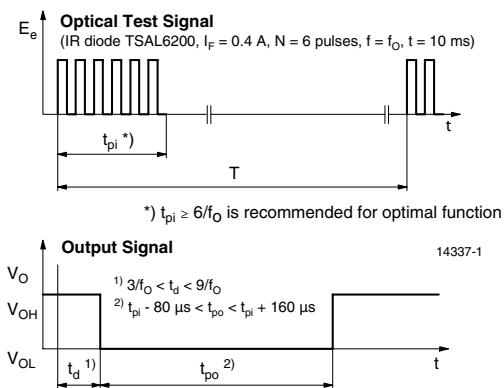


Fig. 1 - Output Active Low

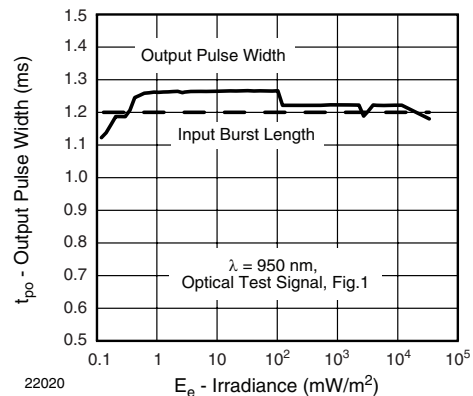


Fig. 2 - Pulse Length and Sensitivity in Dark Ambient



IR Receiver Modules for 3D Synchronization Signals

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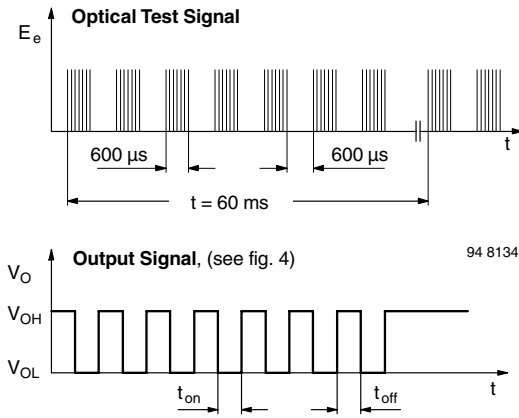


Fig. 3 - Output Function

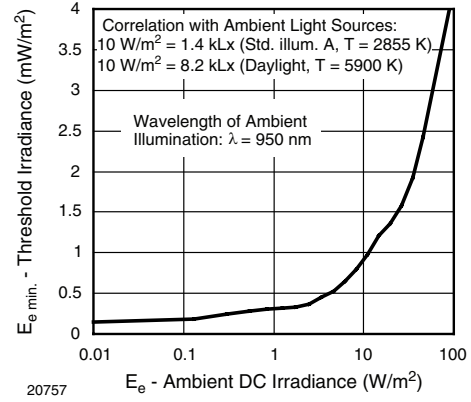


Fig. 6 - Sensitivity in Bright Ambient

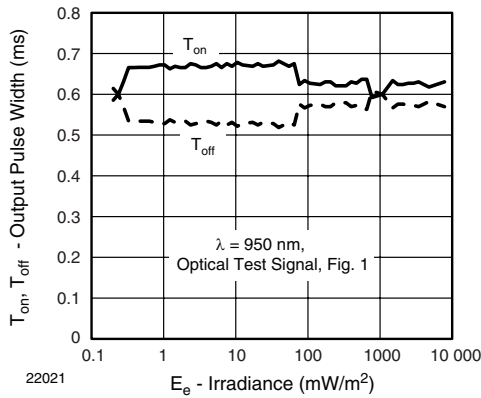


Fig. 4 - Output Pulse Diagram

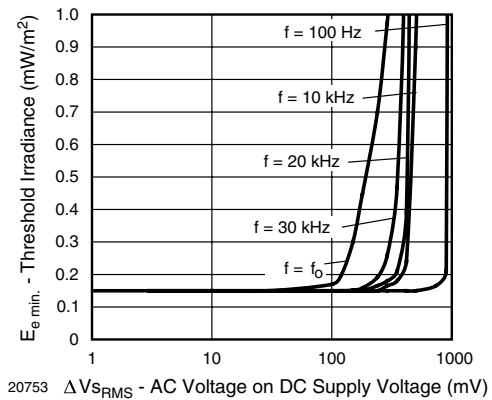


Fig. 7 - Sensitivity vs. Supply Voltage Disturbances

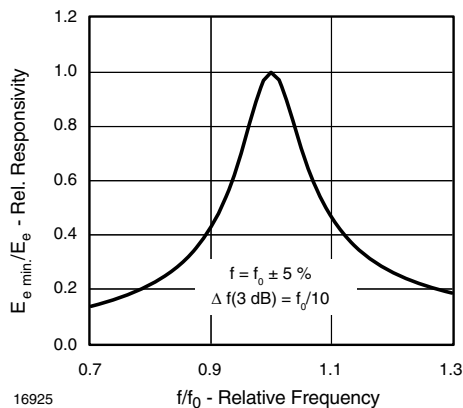


Fig. 5 - Frequency Dependence of Responsivity

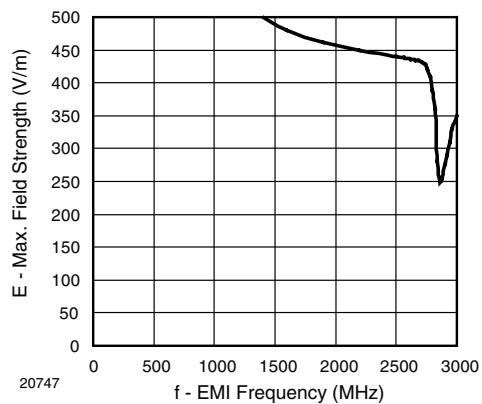


Fig. 8 - Sensitivity vs. Electric Field Disturbances

# TSOP35D25



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IR Receiver Modules for 3D Synchronization Signals

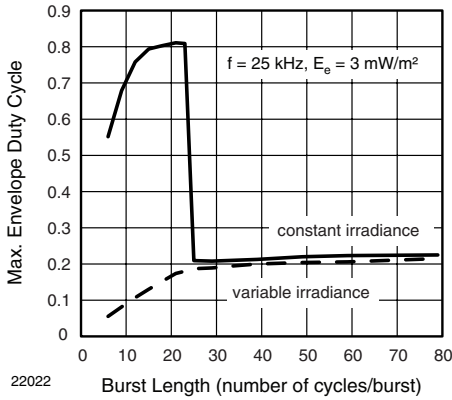


Fig. 9 - Maximum Envelope Duty Cycle vs. Burst Length

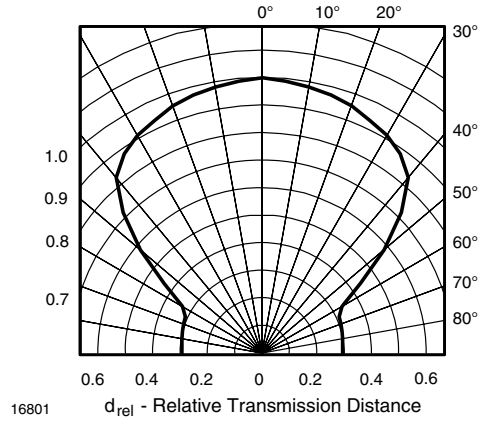


Fig. 12 - Horizontal Directivity

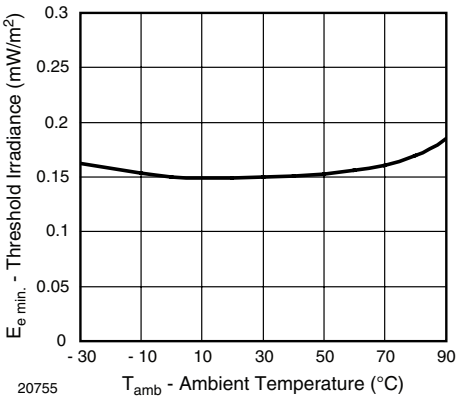


Fig. 10 - Sensitivity vs. Ambient Temperature

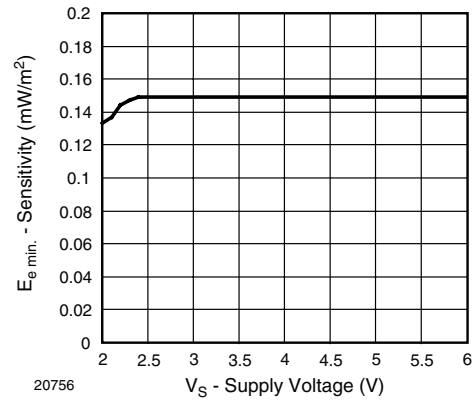


Fig. 13 - Sensitivity vs. Supply Voltage

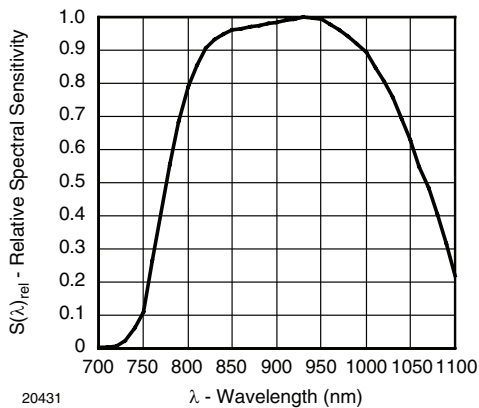


Fig. 11 - Relative Spectral Sensitivity vs. Wavelength



### SUITABLE DATA FORMAT

The TSOP35D25 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. 25 kHz) and fulfill the conditions in the table below.

When a data signal is applied to the TSOP35D25 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 weakly modulated noise from fluorescent lamps with electronic ballasts (see figure 14 or figure 15)

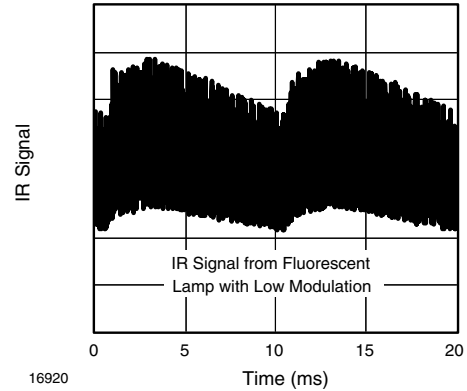


Fig. 14 - IR Signal from Fluorescent Lamp with Low Modulation

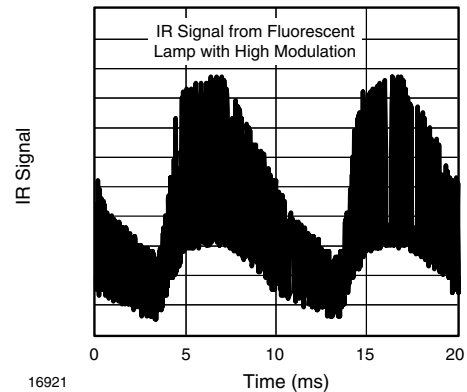


Fig. 15 - IR Signal from Fluorescent Lamp with High Modulation

|  | <b>TSOP35D25</b>                |
|--|---------------------------------|
| Minimum burst length   | 6 cycles/burst                  |
| After each burst of length a minimum gap time is required of               | 6 to 24 cycles<br>≥ 6 cycles    |
| For bursts greater than a minimum gap time in the data stream is needed of | 24 cycles<br>> 4 x burst length |
| Maximum rate of short bursts (constant irradiance)                         | 2000 bursts/s                   |
| Maximum rate of short bursts (variable irradiance)                         | 220 bursts/s                    |

# TSOP35D25

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## STAND-BY MODE OF THE TSOP35D25

If an application requires an ultra low average supply current in order to save battery life, the TSOP35D25 can be operated with an intermittent supply voltage. A typical application circuit shown in fig. 16.

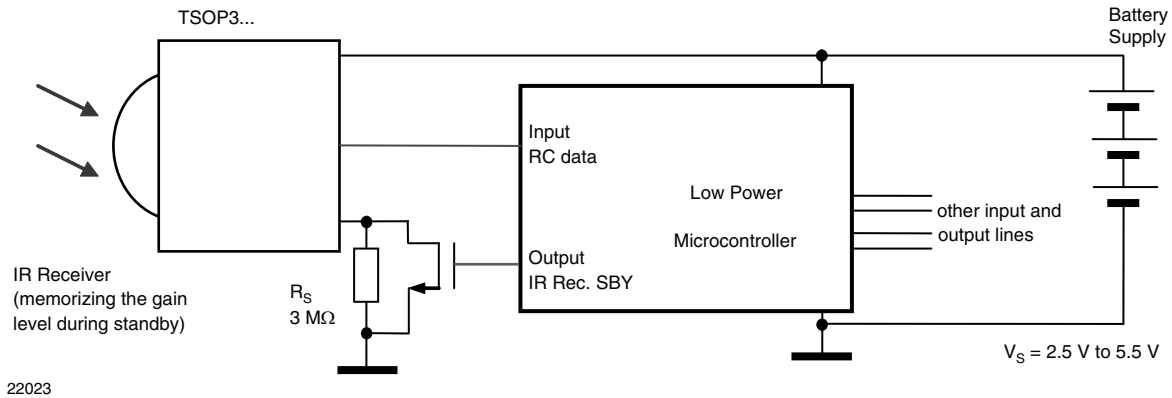


Fig. 16 - Application Circuit for the TSOP3...with Intermittent Supply Voltage

To receive a continuous data signal while using the TSOP3... with an intermittent supply voltage, the receiver must be activated in advance of the expected data frame as shown in figure 17.

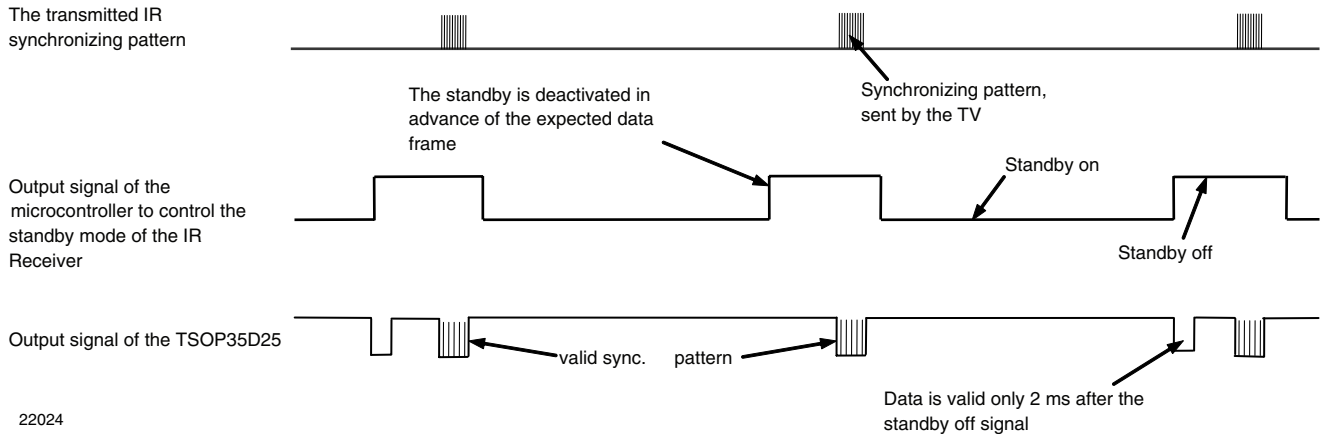


Fig. 17 - Signal Timing in Power Saving Mode with Continuous Receiving Function

In normal operation without using the stand-by feature, the gain level of the TSOP35D25 returns to a default level after the device is disconnected from supply voltage and reconnected again. A settling time of up to 100 ms is necessary until the gain has settled to an optimum level that is well matched to the ambient noise level.

Using the device in stand-by mode, the TSOP35D25 memorizes its gain setting while in standby. On re-activation, the gain immediately returns to the correct level present before stand-by. This operation insures that there are no spurious pulses on power-up due to mismatch between the gain level and the ambient light conditions.



| <b>ELECTRICAL AND OPTICAL CHARACTERISTICS (1)</b> ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified) |  |                |      |      |      |               |
|--|--|----------------|------|------|------|---------------|
| PARAMETER  | TEST CONDITION   | SYMBOL         | MIN. | TYP. | MAX. | UNIT          |
| Serial resistor to activate the standby mode   | $V_S = 3\text{ V}$   | $R_S$          | 1.2  | 1.5  | 2    | $M\Omega$     |
|  | $V_S = 5\text{ V}$   | $R_S$          | 2    | 3    | 4    |               |
| Standby supply current   | $V_S = 3\text{ V}$ , $R_S = 1.5\text{ M}\Omega$              | $I_{SBY}$      | 1    | 1.4  | 2    | $\mu\text{A}$ |
|  | $V_S = 5\text{ V}$ , $R_S = 3\text{ M}\Omega$                | $I_{SBY}$      | 1    | 1.4  | 2    |               |
| Latency time for standby-off (delay until there is a valid response)   | $V_S > 2.5\text{ V}$ , dark ambient, output is valid         | $t_{delay}$    |      | 0.4  | 0.8  | ms            |
|  | $V_S > 2.5\text{ V}$ , 10 kLux daylight, output is valid     | $t_{delay}$    |      | 1.5  | 2.5  |               |
| Duration of standby-off period   | $V_S > 2.5\text{ V}$ , dark ambient                          | $t_{SBY\_OFF}$ | 1    |      |      | ms            |
|  | $V_S > 2.5\text{ V}$ , 10 kLux daylight, AGC1 or AGC3 device | $t_{SBY\_OFF}$ | 4    |      |      |               |
|  | $V_S > 2.5\text{ V}$ , 10 kLux daylight, AGC2 or AGC4 device | $t_{SBY\_OFF}$ | 3    |      |      |               |

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

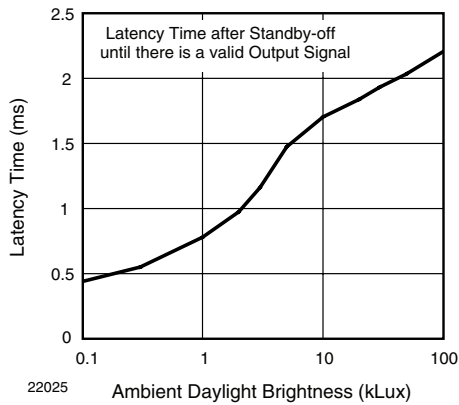


Fig. 1 - Delay Time after Standby-off until the TSOP3... is ready to receive Data

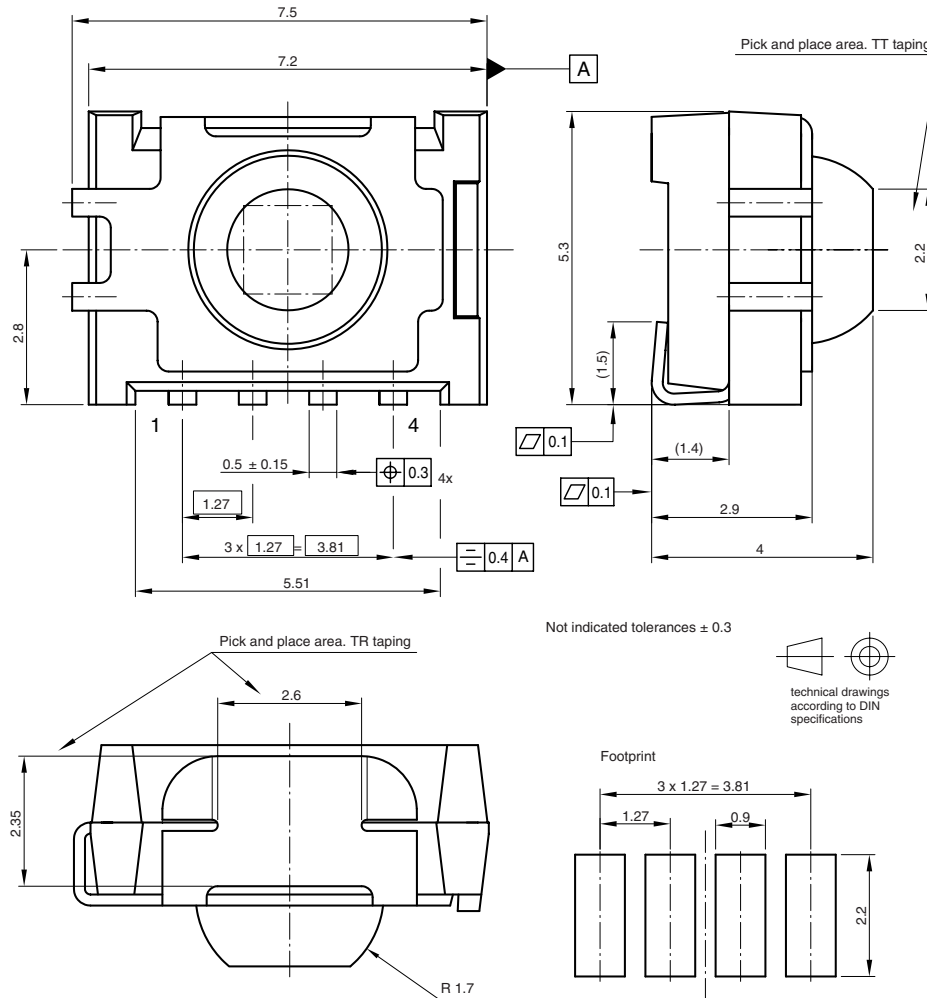
# TSOP35D25

Vishay Semiconductors

IR Receiver Modules for 3D  
Synchronization Signals



## 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

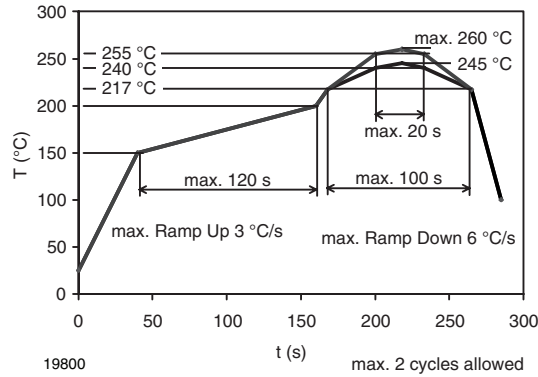
### Manual Soldering

- 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

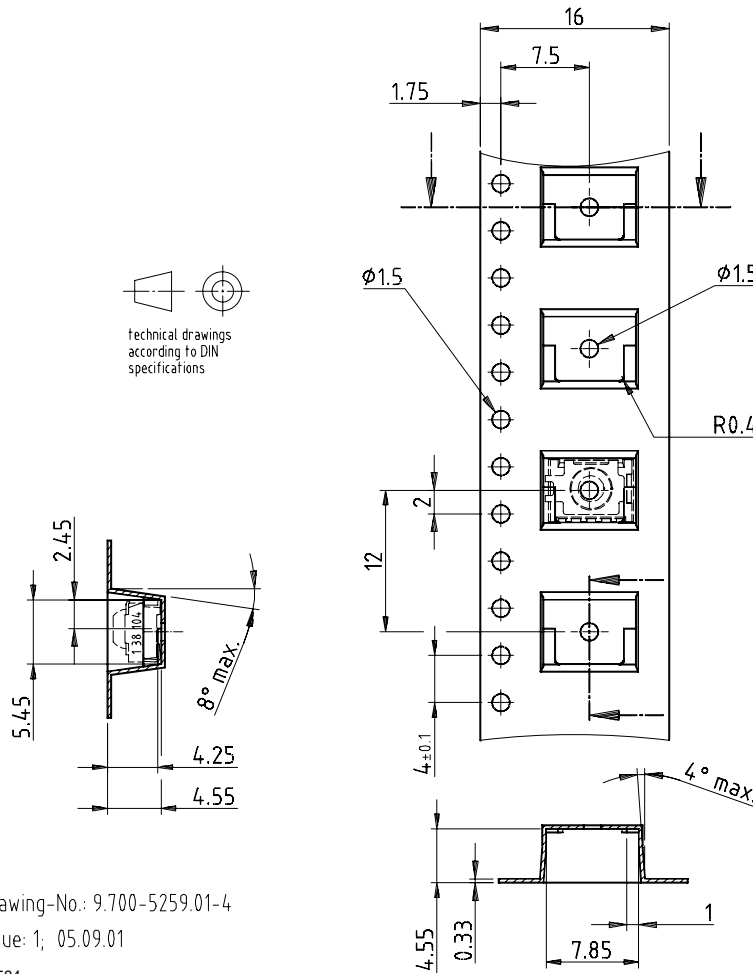




**VISHAY LEAD (Pb)-FREE REFLOW SOLDER PROFILE**



**TAPING VERSION TSOP..TT Dimensions in millimeters**



Drawing-No.: 9.700-5259.01-4  
 Issue: 1, 05.09.01  
 16584

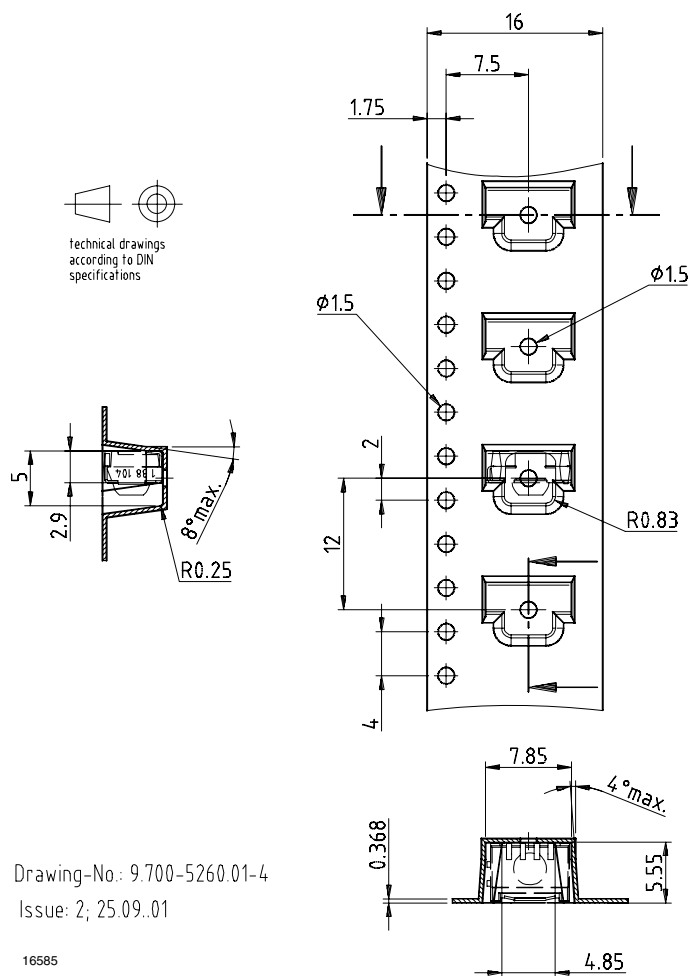
# TSOP35D25



Vishay Semiconductors

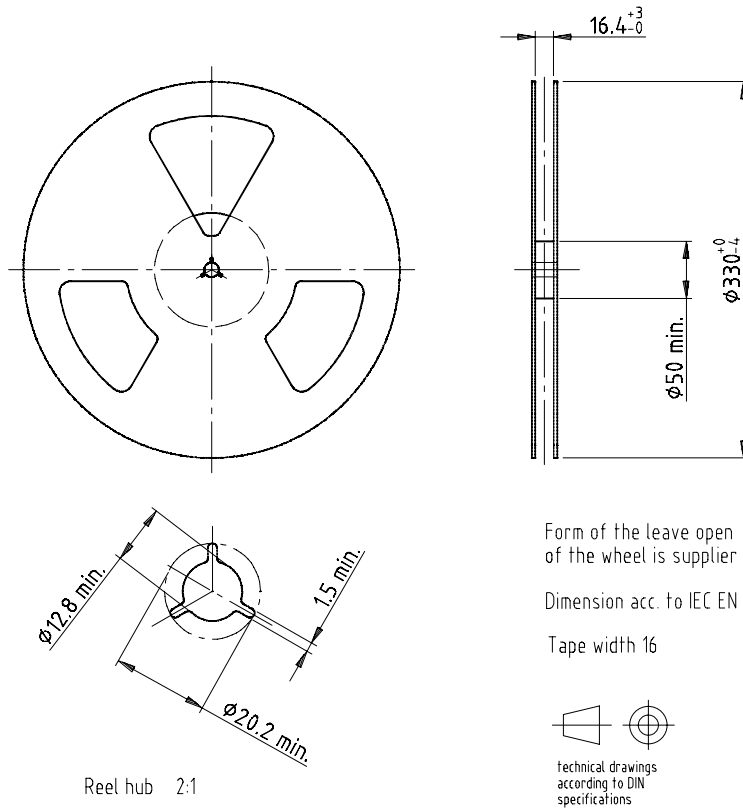
IR Receiver Modules for 3D Synchronization Signals

**TAPING VERSION TSOP..TR** Dimensions in millimeters



Drawing-No.: 9.700-5260.01-4  
Issue: 2; 25.09.01

16585

**REEL DIMENSIONS** in millimeters

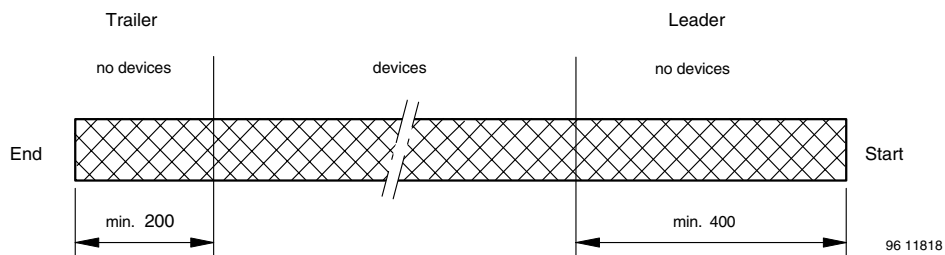
Reel hub 2:1

Drawing refers to following types: Reel for blister carrier tape Version B

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 mm/min.  $\pm$  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.

# TSOP35D25

Vishay Semiconductors

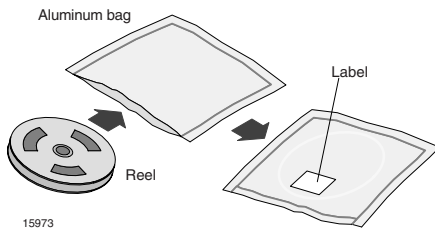
IR Receiver Modules for 3D  
Synchronization Signals



| 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.



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.

## FINAL PACKING

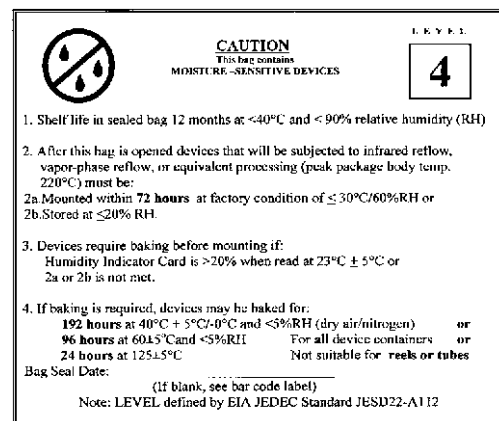
The sealed reel is packed into a cardboard box. A secondary cardboard box is used for shipping purposes.

## 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.



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.



16962



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

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