



## IR Receiver Modules for Remote Control Systems



23051

### 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



Product Page



Marking



Packages



Holders



Bends and Cuts

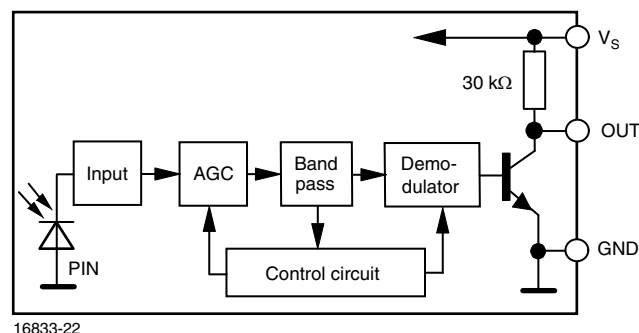
### APPLICATIONS

- Infrared remote control systems

### DESIGN SUPPORT TOOLS

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

### BLOCK DIAGRAM



16833-22



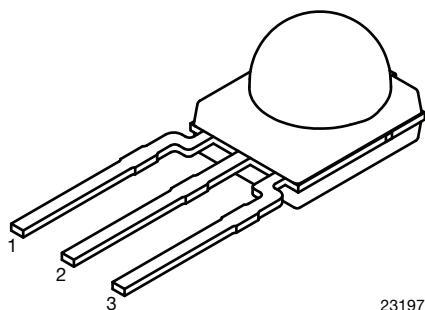
# TSOP132.., TSOP134.., TSOP136..

Vishay Semiconductors

## MECHANICAL DATA

### Pinning for TSOP13...:

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

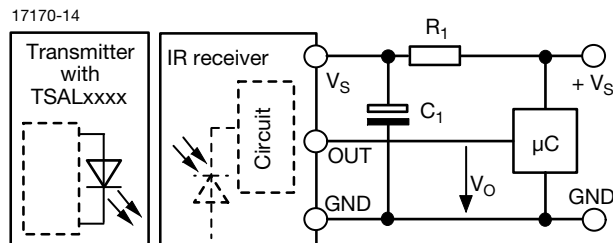


23197

## ORDERING CODE

TSOP13... - 1800 pieces in bags

## APPLICATION CIRCUIT



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

## PARTS TABLE

| AGC               |                                                                                                                                                                                                                                                      | BASIC NOISE SUPPRESSION (AGC2) | ENHANCED NOISE SUPPRESSION (AGC4) | MAXIMIZED NOISE SUPPRESSION (AGC6) |
|-------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|-----------------------------------|------------------------------------|
| Carrier frequency | 30 kHz                                                                                                                                                                                                                                               | TSOP13230                      | TSOP13430                         | TSOP13630                          |
|                   | 33 kHz                                                                                                                                                                                                                                               | TSOP13233                      | TSOP13433                         | TSOP13633                          |
|                   | 36 kHz                                                                                                                                                                                                                                               | TSOP13236                      | TSOP13436 (4)(6)                  | TSOP13636 (5)                      |
|                   | 38 kHz                                                                                                                                                                                                                                               | TSOP13238                      | TSOP13438 (2)(3)(9)(10)           | TSOP13638                          |
|                   | 40 kHz                                                                                                                                                                                                                                               | TSOP13240 (11)                 | TSOP13440                         | TSOP13640                          |
|                   | 56 kHz                                                                                                                                                                                                                                               | TSOP13256 (1)                  | TSOP13456 (8)                     | TSOP13656 (7)                      |
| Package           | Minimold                                                                                                                                                                                                                                             |                                |                                   |                                    |
| Pinning           | 1 = OUT, 2 = GND, 3 = $V_S$                                                                                                                                                                                                                          |                                |                                   |                                    |
| Dimensions (mm)   | 5.4 W x 6.35 H x 4.9 D                                                                                                                                                                                                                               |                                |                                   |                                    |
| Mounting          | Leaded                                                                                                                                                                                                                                               |                                |                                   |                                    |
| Application       | Remote control                                                                                                                                                                                                                                       |                                |                                   |                                    |
| Best choice for   | (1) Cisco (2) Mitsubishi (3) NEC (4) Panasonic (5) RC-5 (6) RC-6 (7) RCA (8) r-step (9) Sejin 4PPM (10) Sharp (11) Sony                                                                                                                              |                                |                                   |                                    |
| Special options   | <ul style="list-style-type: none"> <li>Narrow optical filter: <a href="http://www.vishay.com/doc?81590">www.vishay.com/doc?81590</a></li> <li>Wide optical filter: <a href="http://www.vishay.com/doc?82726">www.vishay.com/doc?82726</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   |
| Soldering temperature       | $t \leq 10$ s, 1 mm from case   | $T_{sd}$  | 260                     | °C   |

### 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 current                                                                                        | $E_v = 0$ , $V_s = 3.3\text{ V}$                                               | $I_{SD}$          | 0.25 | 0.35     | 0.45 | mA              |
|                                                                                                       | $E_v = 40\text{ klx}$ , sunlight                                               | $I_{SH}$          | -    | 0.45     | -    | mA              |
| Supply voltage                                                                                        |                                                                                | $V_s$             | 2.0  | -        | 5.5  | V               |
| Transmission distance                                                                                 | $E_v = 0$ , test signal see Fig. 1, IR diode TSAL6200, $I_F = 50\text{ mA}$    | $d$               | -    | 39       | -    | 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                                                          | $E_e\text{ min.}$ | -    | 0.05     | 0.1  | $\text{mW/m}^2$ |
|                                                                                                       | Test signal: NEC code                                                          | $E_e\text{ min.}$ | -    | 0.1      | 0.2  | $\text{mW/m}^2$ |
| 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                                            | $\Phi_{1/2}$      | -    | $\pm 45$ | -    | $^{\circ}$      |

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

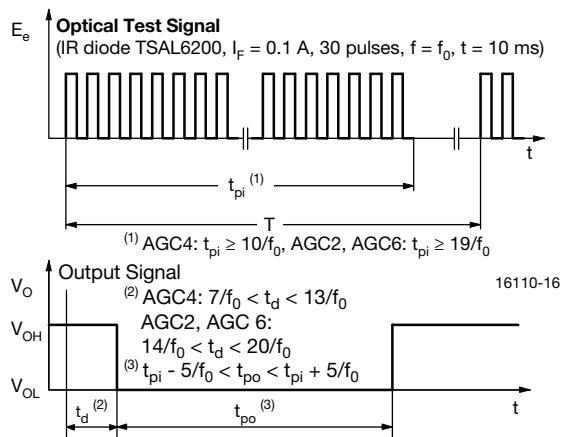


Fig. 1 - Output Delay and Pulse-Width

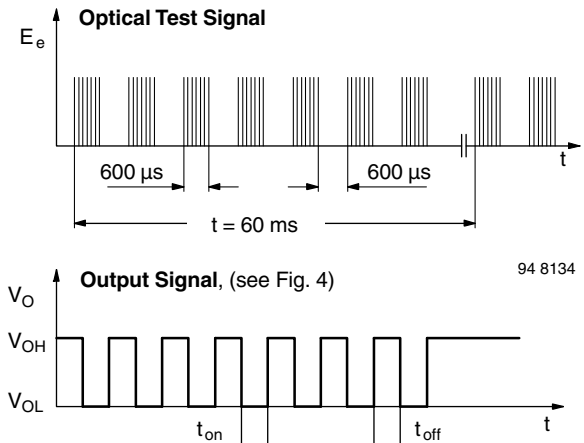


Fig. 3 - Test Signal

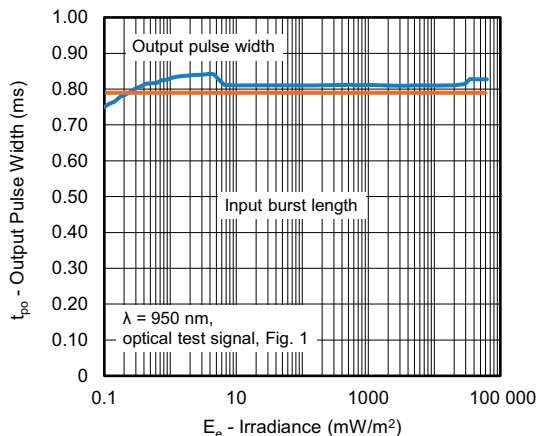


Fig. 2 - Pulse-Width vs. Irradiance in Dark Ambient

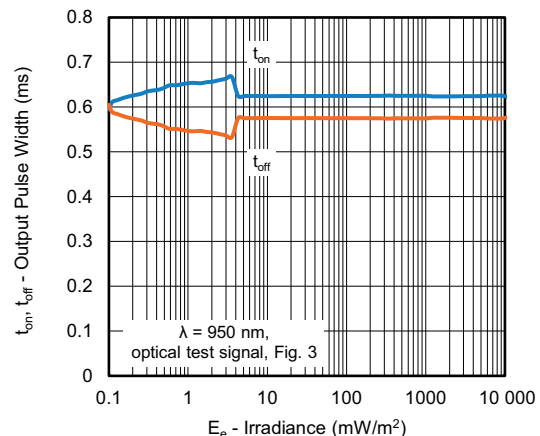


Fig. 4 - Pulse-Width vs. Irradiance in Dark Ambient

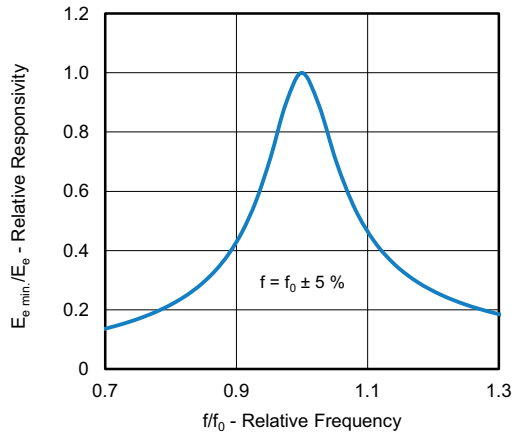


Fig. 5 - Frequency Dependence of Responsivity

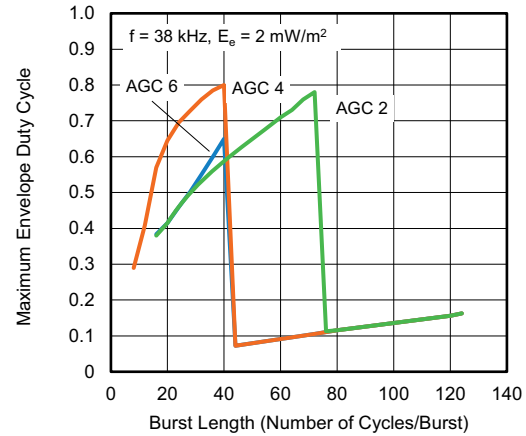


Fig. 8 - Max. Envelope Duty Cycle vs. Burst Length

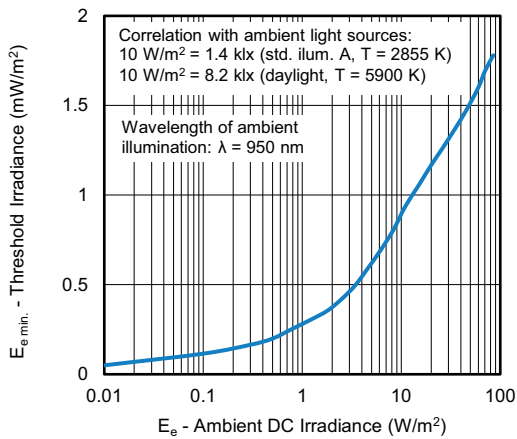


Fig. 6 - Sensitivity in Bright Ambient

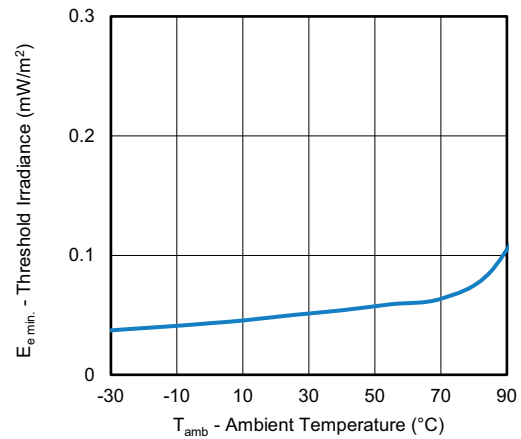


Fig. 9 - Sensitivity vs. Ambient Temperature

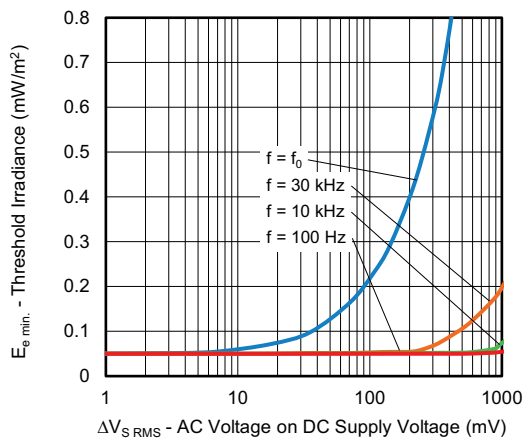


Fig. 7 - Sensitivity vs. Supply Voltage Disturbances

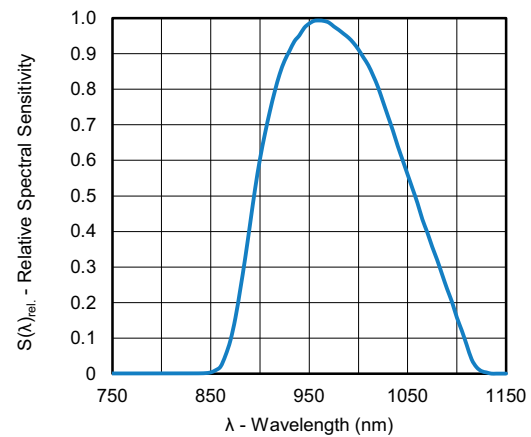
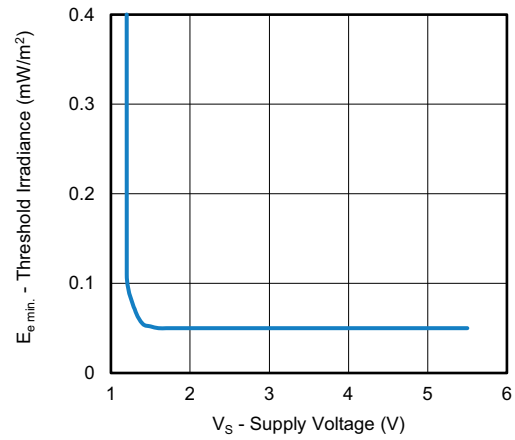
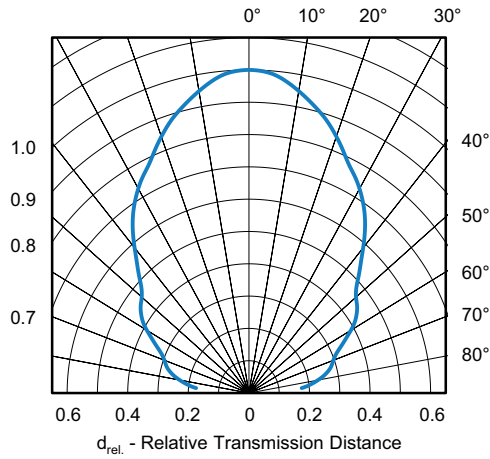


Fig. 10 - Relative Spectral Sensitivity vs. Wavelength





### 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)
- 2.4 GHz and 5 GHz Wi-Fi

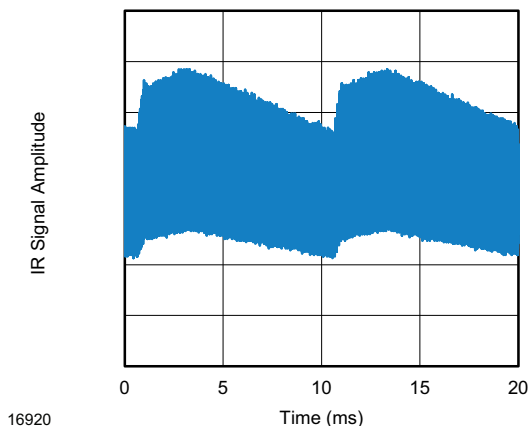


Fig. 13 - IR Emission from Fluorescent Lamp With Low Modulation

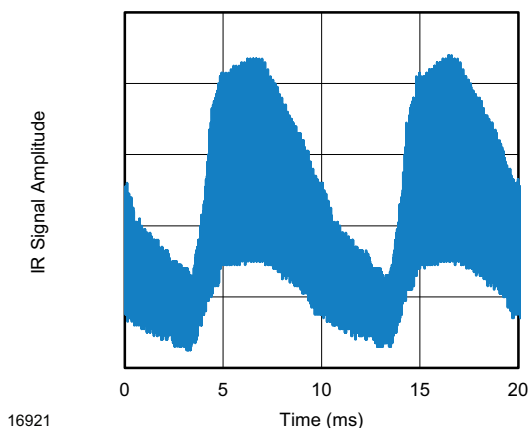


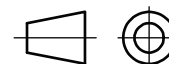
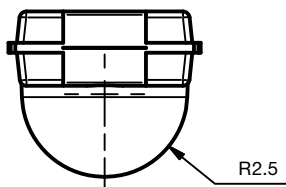
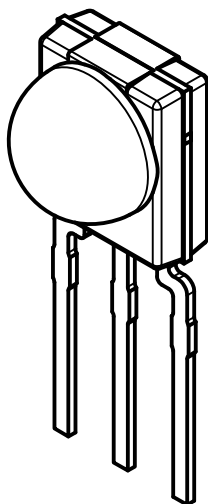
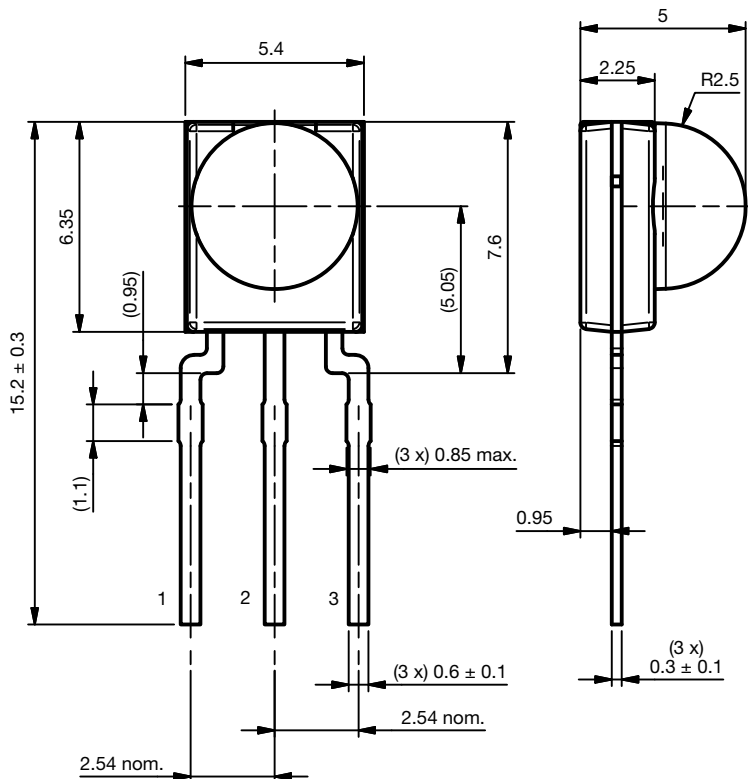
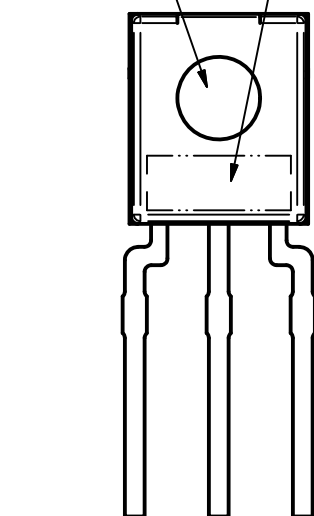
Fig. 14 - IR Emission from Fluorescent Lamp With High Modulation

|                                                                            | TSOP132..                       | TSOP134..                        | TSOP136..                        |
|----------------------------------------------------------------------------|---------------------------------|----------------------------------|----------------------------------|
| Minimum burst length                                                       | 19 cycles/burst                 | 10 cycles/burst                  | 19 cycles/burst                  |
| After each burst of length a minimum gap time is required of               | 19 to 72 cycles<br>≥ 20 cycles  | 10 to 40 cycles<br>≥ 11 cycles   | 19 to 40 cycles<br>≥ 20 cycles   |
| For bursts greater than a minimum gap time in the data stream is needed of | 72 cycles<br>> 6 x burst length | 40 cycles<br>> 10 x burst length | 40 cycles<br>> 10 x burst length |
| Maximum number of continuous short bursts/second                           | 750                             | 1300                             | 750                              |
| RC-5 code                                                                  | Yes                             | Yes                              | Preferred                        |
| RC-6 code                                                                  | No                              | Preferred                        | No                               |
| NEC code                                                                   | Yes                             | Preferred                        | Yes                              |
| r-step code                                                                | No                              | Preferred                        | No                               |
| Sony code                                                                  | Preferred                       | No                               | No                               |
| RCA 56 kHz code                                                            | Yes                             | Yes                              | Preferred                        |
| Suppression of interference from fluorescent lamps                         | Fig. 13                         | Fig. 13 and Fig. 14              | Fig. 13 and Fig. 14              |

#### Note

- For data formats with short bursts please see the datasheet for TSOP131.., TSOP133.., TSOP135..

Cavity number         Marking area



Technical drawings  
according to DIN  
specifications

Not indicated tolerances  $\pm 0.2$

Drawing-No.: 6.550-5335.01-4  
Issue: 2; 02.07.19



## **BULK PACKAGING**

Standard shipping for minimold is in conductive plastic bags. The packing quantity is determined by weight and the number of components per carton may vary by a maximum of  $\pm 0.3\%$ .

## **ORDERING INFORMATION**

Examples: TSOP13438

TSOP13456VI1

TSOP13438SS1F

For more information, see: [www.vishay.com/doc?80076](http://www.vishay.com/doc?80076)

## **PACKAGING QUANTITY**

- 300 pieces per bag (each bag is individually boxed)
- 6 bags per carton





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