

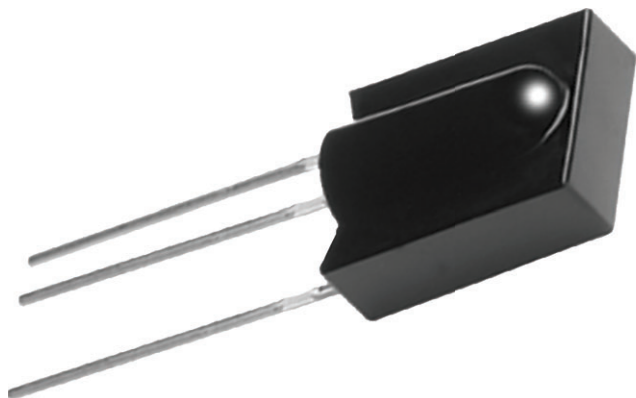


# THE DATASHEET OF TSOP31130





## IR Receiver Modules for Remote Control Systems



### DESCRIPTION

This IR receiver series is optimized for short 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

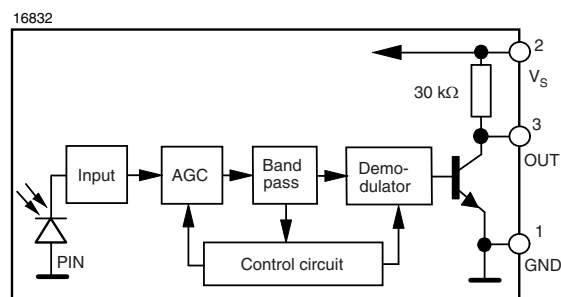


Bends and Cuts

### DESIGN SUPPORT TOOLS

- [3D models](#)

### BLOCK DIAGRAM

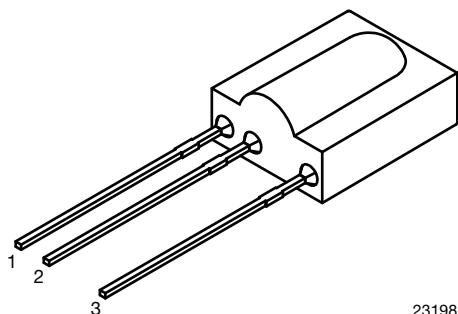




**MECHANICAL DATA**

**Pinning:**

1 = GND, 2 = V<sub>S</sub>, 3 = OUT

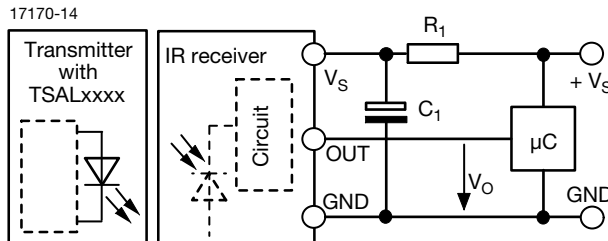


23198

**ORDERING CODE**

TSO.1. - 1000 pieces in tubes

**APPLICATION CIRCUIT**



R<sub>1</sub> and C<sub>1</sub> recommended in case there are strong ripple or spikes on the supply line.

| PARTS TABLE              |   |  |  |   |
|--------------------------|---|--|--|---|
| AGC                      |   | LEGACY, FOR SHORT BURST REMOTE CONTROLS (AGC1) | NOISY ENVIRONMENTS AND SHORT BURSTS (AGC3) | VERY NOISY ENVIRONMENTS AND SHORT BURSTS (AGC5) |
| Carrier frequency        | 30 kHz  | TSOP31130                                      | TSOP31330                                  | TSOP31530                                       |
|                          | 33 kHz  | TSOP31133                                      | TSOP31333                                  | TSOP31533                                       |
|                          | 36 kHz  | TSOP31136                                      | TSOP31336 <sup>(1)(6)</sup>                | TSOP31536                                       |
|                          | 38 kHz  | TSOP31138                                      | TSOP31338 <sup>(2)(3)(4)(5)</sup>          | TSOP31538                                       |
|                          | 40 kHz  | TSOP31140                                      | TSOP31340                                  | TSOP31540                                       |
|                          | 56 kHz  | TSOP31156                                      | TSOP31356                                  | TSOP31556                                       |
| Package                  | Cast  |  |  |   |
| Pinning                  | 1 = GND, 2 = V <sub>S</sub> , 3 = OUT   |  | 1 = GND, 2 = V <sub>S</sub> , 3 = OUT      | 1 = GND, 2 = V <sub>S</sub> , 3 = OUT           |
| Dimensions (mm)          | 10.0 W x 12.5 H x 5.8 D   |  |  |   |
| Mounting                 | Leaded  |  |  |   |
| Application              | Remote control  |  |  |   |
| Best remote control code | <sup>(1)</sup> MCIR <sup>(2)</sup> r-step <sup>(3)</sup> RECS-80 Code <sup>(4)</sup> r-map <sup>(5)</sup> XMP <sup>(6)</sup> RCMM |  |  |   |

| ABSOLUTE MAXIMUM RATINGS    |                          |                  |                                |      |
|-----------------------------|--------------------------|------------------|--------------------------------|------|
| PARAMETER                   | TEST CONDITION           | SYMBOL           | VALUE                          | UNIT |
| Supply voltage (pin 2)      |                          | V <sub>S</sub>   | -0.3 to +6                     | V    |
| Supply current (pin 2)      |                          | I <sub>S</sub>   | 3                              | mA   |
| Output voltage (pin 3)      |                          | V <sub>O</sub>   | -0.3 to (V <sub>S</sub> + 0.3) | V    |
| Output current (pin 3)      |                          | I <sub>O</sub>   | 5                              | mA   |
| Junction temperature        |                          | T <sub>j</sub>   | 100                            | °C   |
| Storage temperature range   |                          | T <sub>stg</sub> | -25 to +85                     | °C   |
| Operating temperature range |                          | T <sub>amb</sub> | -25 to +85                     | °C   |
| Power consumption           | T <sub>amb</sub> ≤ 85 °C | P <sub>tot</sub> | 10                             | mW   |
| Soldering temperature       | t ≤ 10 s, 1 mm from case | T <sub>sd</sub>  | 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 ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified) |  |                     |      |          |      |                 |
|---|--|---------------------|------|----------|------|-----------------|
| PARAMETER   | TEST CONDITION   | SYMBOL              | MIN. | TYP.     | MAX. | UNIT            |
| Supply current (pin 2)  | $E_v = 0, V_S = 3.3\text{ V}$  | $I_{SD}$            | 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, $I_F = 50\text{ mA}$    | $d$                 | -    | 26       | -    | m               |
| Output voltage low (pin 3)  | $I_{OSL} = 0.5\text{ mA}$ , $E_e = 0.7\text{ mW/m}^2$ , test signal see Fig. 1 | $V_{OSL}$           | -    | -        | 100  | mV              |
| Minimum irradiance  | Test signal: RC5 code  | $E_{e\text{ min.}}$ | -    | 0.1      | 0.2  | $\text{mW/m}^2$ |
|   | Test signal: XMP code  | $E_{e\text{ min.}}$ | -    | 0.15     | 0.3  | $\text{mW/m}^2$ |
| Maximum irradiance  | $t_{pi} - 3/f_0 < t_{po} < t_{pi} + 3.5/f_0$ , 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 ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)

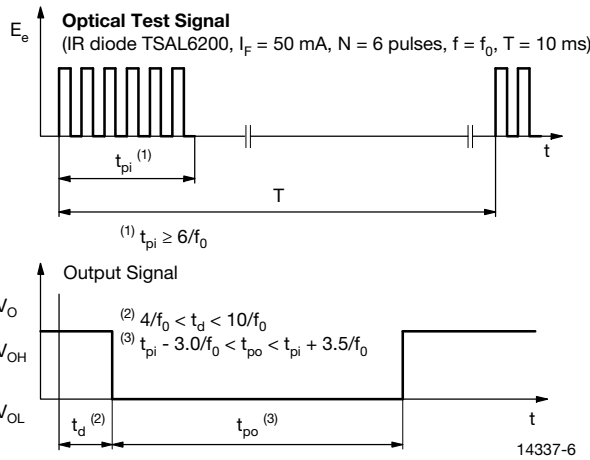


Fig. 1 - Output Active Low

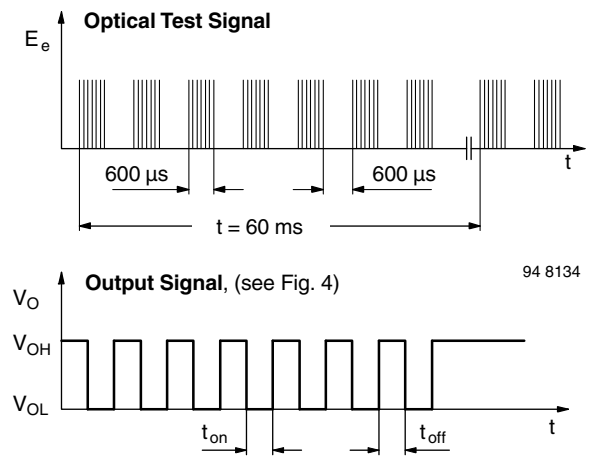


Fig. 3 - Output Function

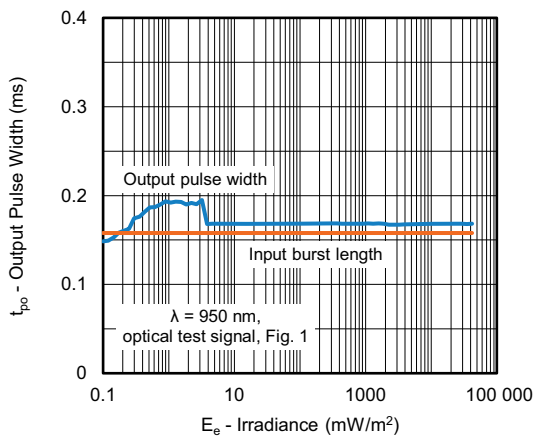


Fig. 2 - Pulse Length and Sensitivity in Dark Ambient

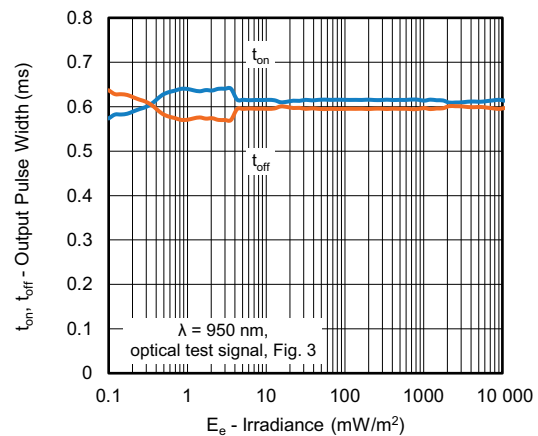


Fig. 4 - Output Pulse Diagram

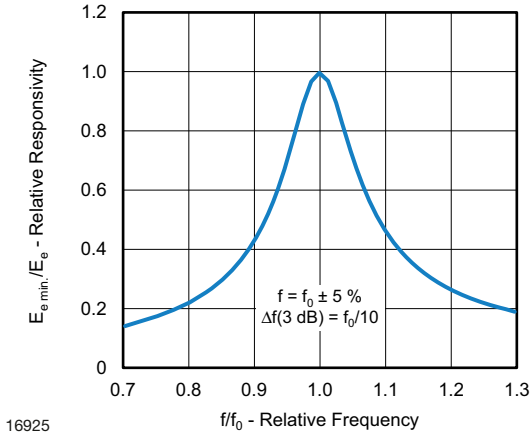


Fig. 5 - Frequency Dependence of Responsivity

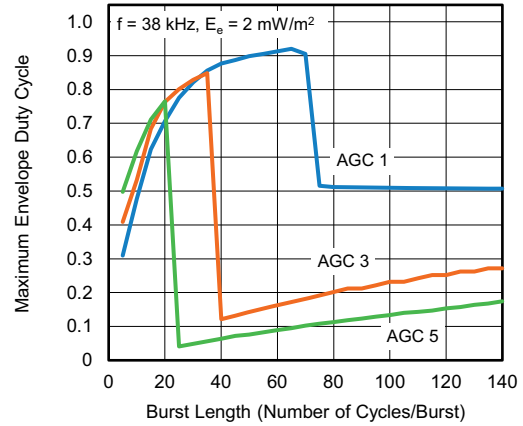


Fig. 8 - Max. Envelope Duty Cycle vs. Burst Length

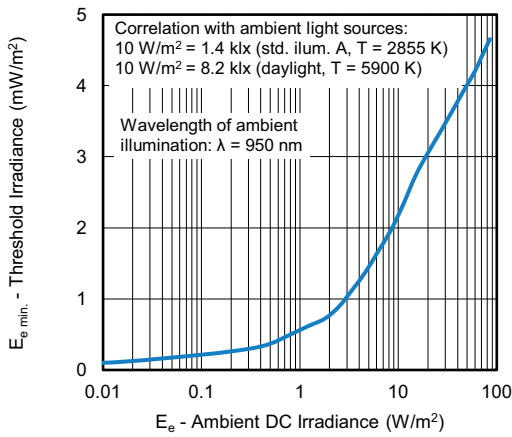


Fig. 6 - Sensitivity in Bright Ambient

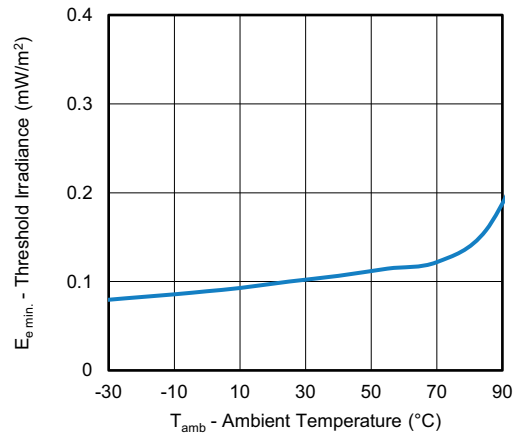


Fig. 9 - Sensitivity vs. Ambient Temperature

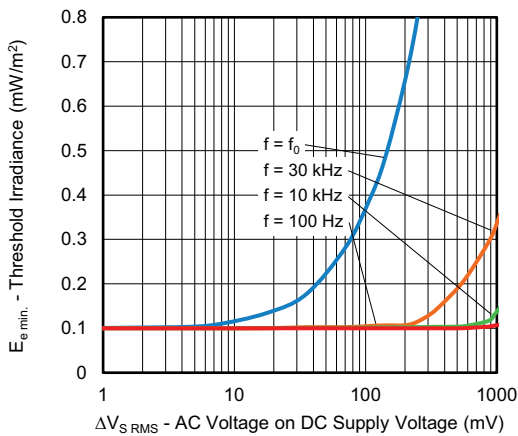


Fig. 7 - Sensitivity vs. Supply Voltage Disturbances

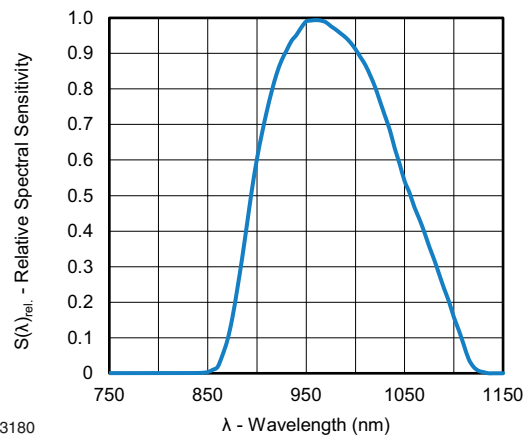


Fig. 10 - Relative Spectral Sensitivity vs. Wavelength

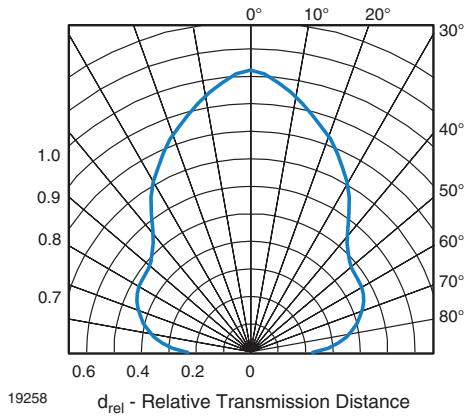


Fig. 11 - Horizontal Directivity

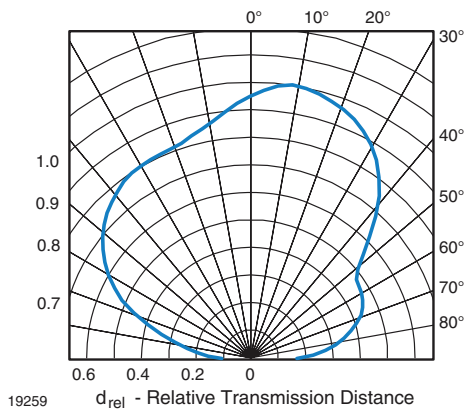


Fig. 12 - Vertical Directivity

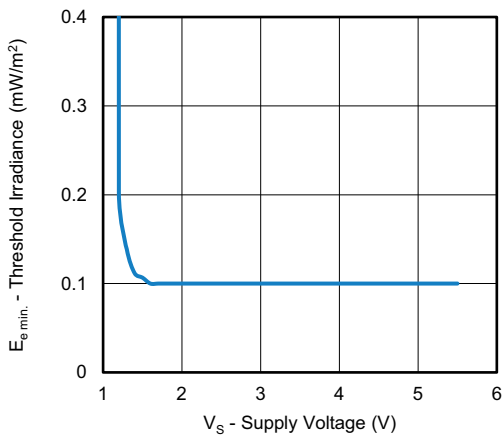


Fig. 13 - Sensitivity vs. Supply Voltage



**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 patterns from fluorescent lamps with electronic ballasts (see Fig. 14 or Fig. 15).

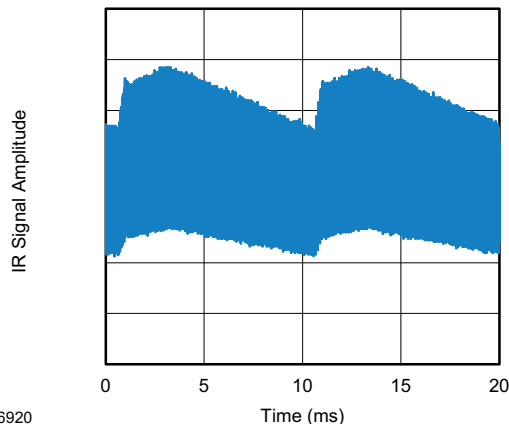


Fig. 14 - IR Disturbance from Fluorescent Lamp with Low Modulation

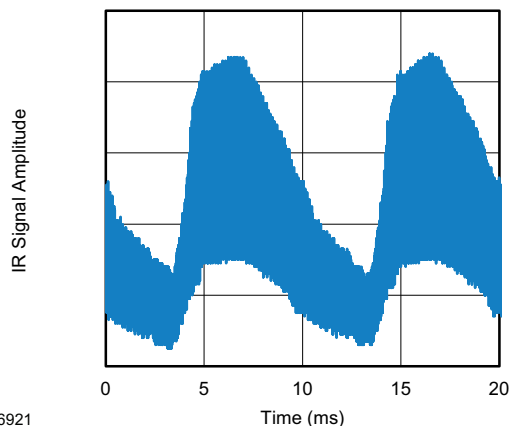


Fig. 15 - IR Disturbance from Fluorescent Lamp with High Modulation

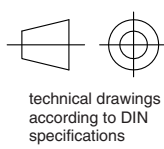
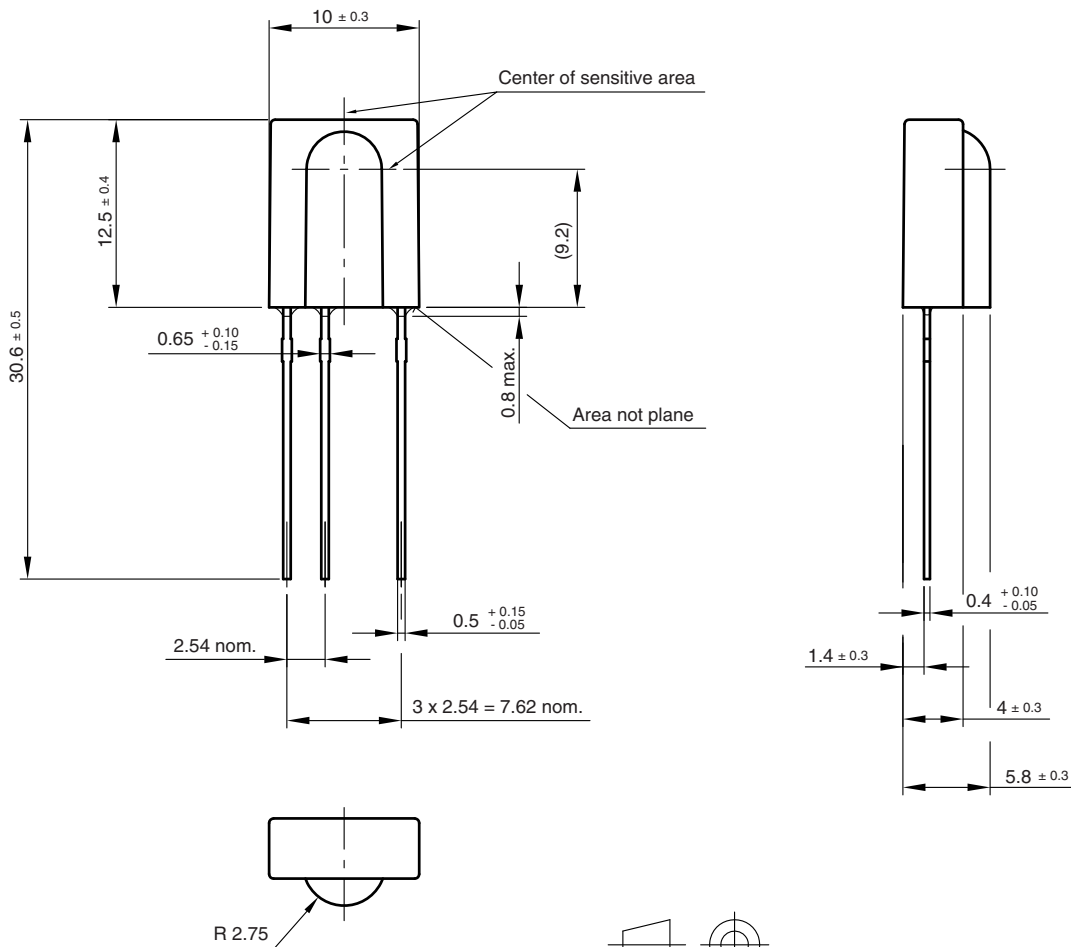
|  | TSOP311..                       | TSOP313..                       | TSOP315..                        |
|--|---------------------------------|---------------------------------|----------------------------------|
| Minimum burst length   | 6 cycles/burst                  | 6 cycles/burst                  | 6 cycles/burst                   |
| After each burst of length A gap time is required of                       | 6 to 70 cycles<br>≥ 10 cycles   | 6 to 35 cycles<br>≥ 10 cycles   | 6 to 20 cycles<br>≥ 10 cycles    |
| For bursts greater than a minimum gap time in the data stream is needed of | 70 cycles<br>> 2 x burst length | 35 cycles<br>> 9 x burst length | 20 cycles<br>> 25 x burst length |
| Maximum number of continuous short bursts/second                           | 2000                            | 2000                            | 2000                             |
| MCIR code  | Yes                             | Preferred                       | No                               |
| RCMM code  | Yes                             | Preferred                       | Yes                              |
| XMP code   | Yes                             | Preferred                       | Yes                              |
| RECS-80 code   | Yes                             | Preferred                       | Yes                              |
| r-map code   | Yes                             | Preferred                       | Yes                              |
| Suppression of interference from fluorescent lamps                         | Fig. 14                         | Fig. 14 and Fig. 15             | Fig. 14 and Fig. 15              |

**Note**

- For data formats with long bursts (more than 10 carrier cycles) please see the datasheet for TSOP312.., TSOP314..



PACKAGE DIMENSIONS in millimeters



Drawing-No.: 6.550-5095.01-4  
Issue: 20; 15.03.10  
96 12116



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