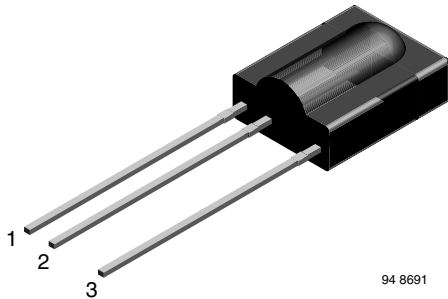


## IR Receiver Modules for Remote Control Systems



### LINKS TO ADDITIONAL RESOURCES



### DESCRIPTION

The TSOP11... series devices are the latest generation miniaturized IR receiver modules for infrared remote control systems. This series provides 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 robustness against spurious pulses originating from Wi-Fi signals has been enhanced. 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 TSOP111.., TSOP113.., and TSOP115.. series devices are designed to receive short burst codes (6 or more carrier cycles per burst). The third digit designates the AGC level (AGC1, AGC3, or AGC5) 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. AGC1 provides basic noise suppression, AGC3 provides enhanced noise suppression and AGC5 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.

### FEATURES

- Improved dark sensitivity
- Improved immunity against optical noise
- Improved immunity against Wi-Fi noise
- Low supply current
- Photo detector and preamplifier in one package
- Internal filter for PCM frequency
- Supply voltage: 2.5 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)

### MECHANICAL DATA

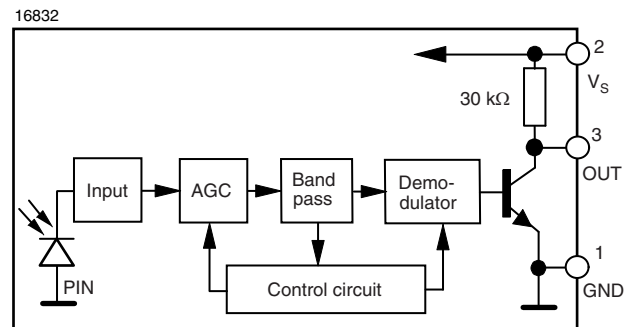
#### Pinning:

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

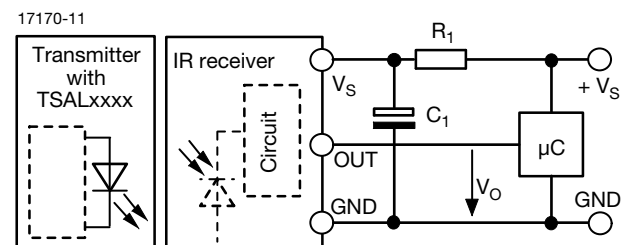
### ORDERING CODE

TSO.1. - 1000 pieces in tubes

### BLOCK DIAGRAM



### APPLICATION CIRCUIT



$R_1$  and  $C_1$  recommended to reduce supply ripple for  $V_S < 2.8$  V



PARTS TABLE					
AGC		BASIC NOISE SUPPRESSION (AGC1)	ENHANCED NOISE SUPPRESSION (AGC3)	MAXIMIZED NOISE SUPPRESSION (AGC5)	
Carrier frequency	30 kHz	TSOP11130	TSOP11330	TSOP11530	
	33 kHz	TSOP11133	TSOP11333	TSOP11533	
	36 kHz	TSOP11136	TSOP11336 <sup>(1)</sup>	TSOP11536	
	38 kHz	TSOP11138	TSOP11338 <sup>(2)(4)</sup>	TSOP11538	
	40 kHz	TSOP11140	TSOP11340	TSOP11540	
	56 kHz	TSOP11156	TSOP11356 <sup>(3)</sup>	TSOP11556	
Package		Cast			
Pinning		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 choice for		(1) RCMM (2) RECS-80 Code (3) r-map (4) XMP-1, XMP-2			

**Note**

- 30 kHz and 33 kHz only available on written request

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 <sub>amb</sub> = 25 °C, unless otherwise specified)						
PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT
Supply current (pin 2)	E <sub>v</sub> = 0, V <sub>S</sub> = 3.3 V	I <sub>SD</sub>	0.55	0.7	0.9	mA
	E <sub>v</sub> = 40 klx, sunlight	I <sub>SH</sub>	-	0.8	-	mA
Supply voltage		V <sub>S</sub>	2.5	-	5.5	V
Transmission distance	E <sub>v</sub> = 0, test signal see Fig. 1, IR diode TSAL6200, I <sub>F</sub> = 50 mA	d	-	24	-	m
Output voltage low (pin 3)	I <sub>OSL</sub> = 0.5 mA, E <sub>e</sub> = 0.7 mW/m <sup>2</sup> , test signal see Fig. 1	V <sub>OSL</sub>	-	-	100	mV
Minimum irradiance	Pulse width tolerance: t <sub>pi</sub> - 3.0/f <sub>o</sub> < t <sub>po</sub> < t <sub>pi</sub> + 3.5/f <sub>o</sub> , test signal see Fig. 1	E <sub>e min.</sub>	-	0.12	0.25	mW/m <sup>2</sup>
Maximum irradiance	t <sub>pi</sub> - 3.0/f <sub>o</sub> < t <sub>po</sub> < t <sub>pi</sub> + 3.5/f <sub>o</sub> , test signal see Fig. 1	E <sub>e max.</sub>	30	-	-	W/m <sup>2</sup>
Maximum long burst irradiance (AGC3, AGC5)	t <sub>pi</sub> - 3.0/f <sub>o</sub> < t <sub>po</sub> < t <sub>pi</sub> + 3.5/f <sub>o</sub> , test signal see Fig. 1, dark ambient, burst length > 30 cycles	E <sub>e max.</sub>	0.5	-	-	W/m <sup>2</sup>
Directivity	Angle of half transmission distance	φ <sub>1/2</sub>	-	± 45	-	°

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

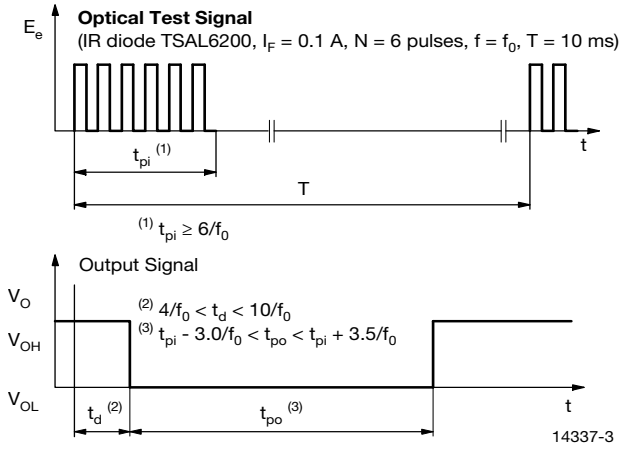


Fig. 1 - Output Delay and Pulse-Width

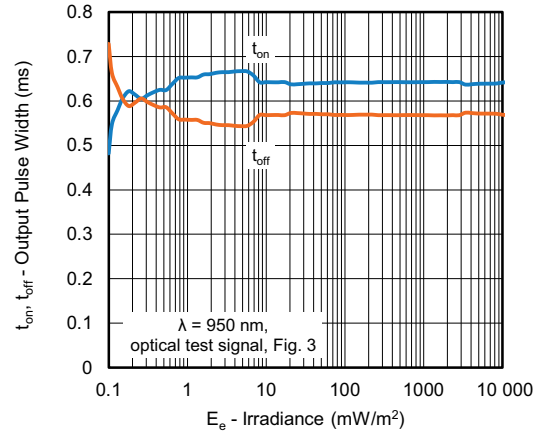


Fig. 4 - Pulse-Width vs. Irradiance in Dark Ambient

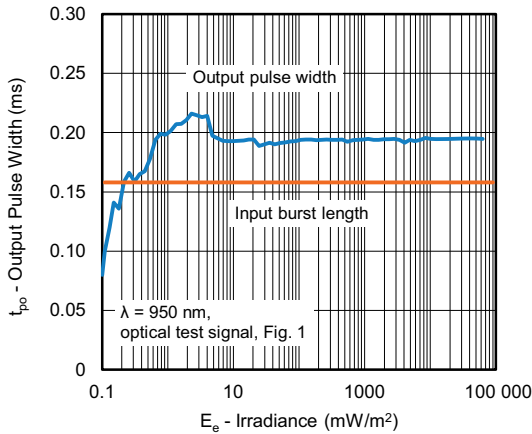


Fig. 2 - Pulse-Width vs. Irradiance in Dark Ambient

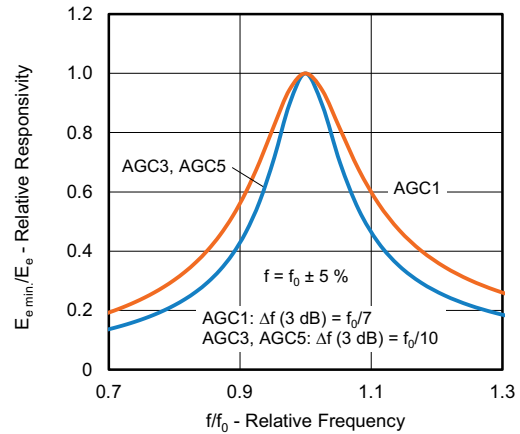


Fig. 5 - Frequency Dependence of Responsivity

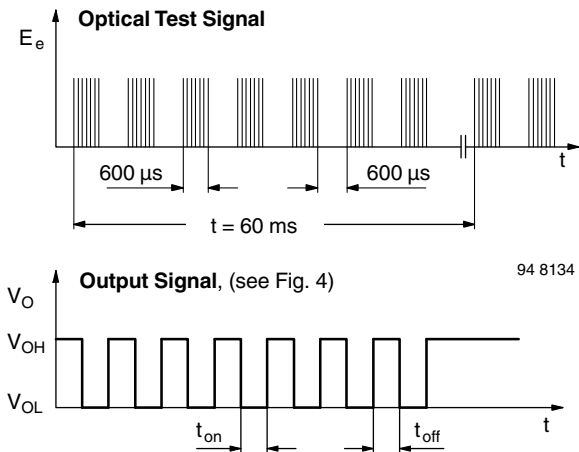


Fig. 3 - Test Signal

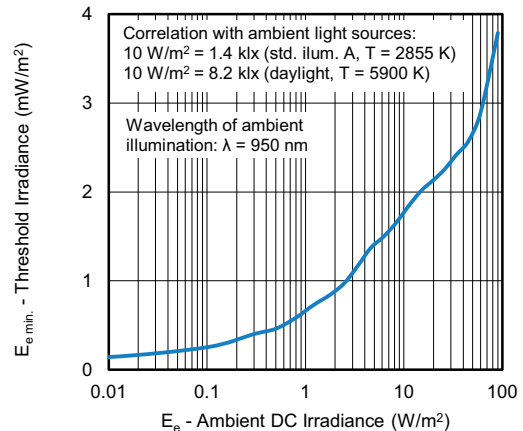


Fig. 6 - Sensitivity in Bright Ambient

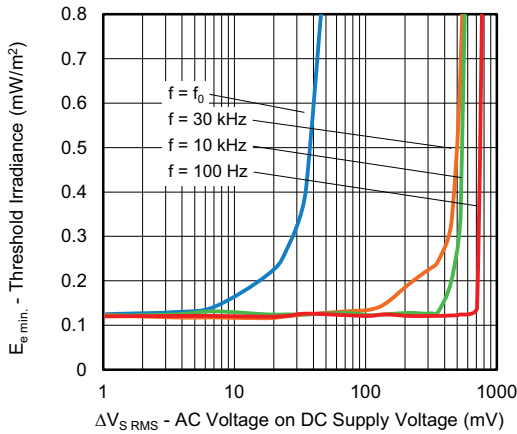


Fig. 7 - Sensitivity vs. Supply Voltage Disturbances

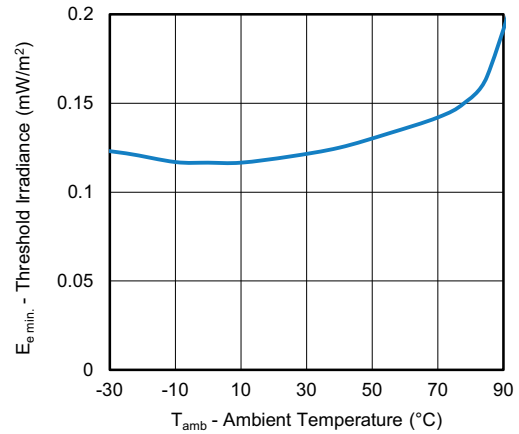


Fig. 9 - Sensitivity vs. Ambient Temperature

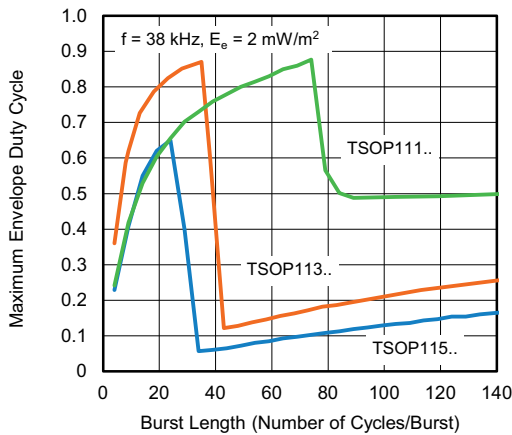


Fig. 8 - Max. Envelope Duty Cycle vs. Burst Length

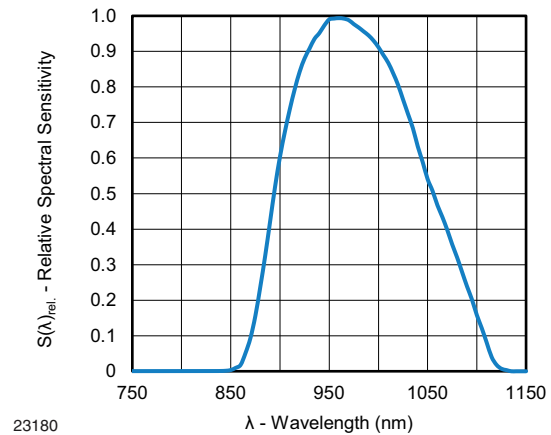


Fig. 10 - Relative Spectral Sensitivity vs. Wavelength

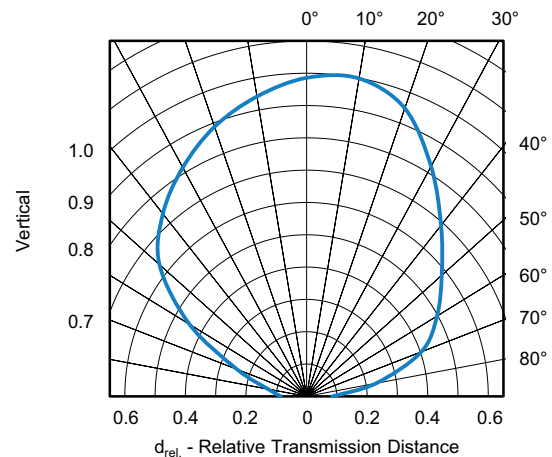
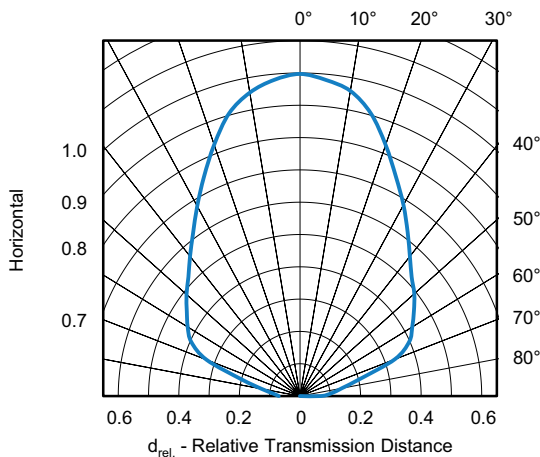


Fig. 11 - Horizontal and Vertical Directivity

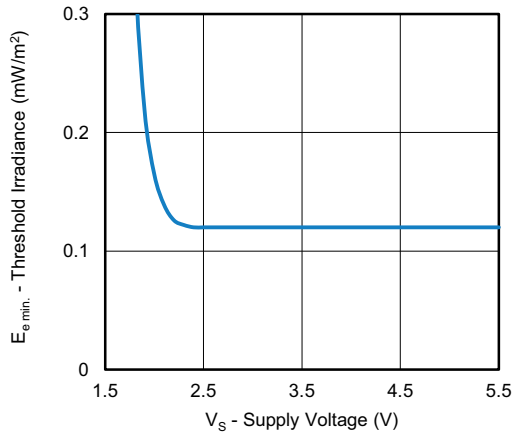


Fig. 12 - Sensitivity vs. Supply Voltage

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

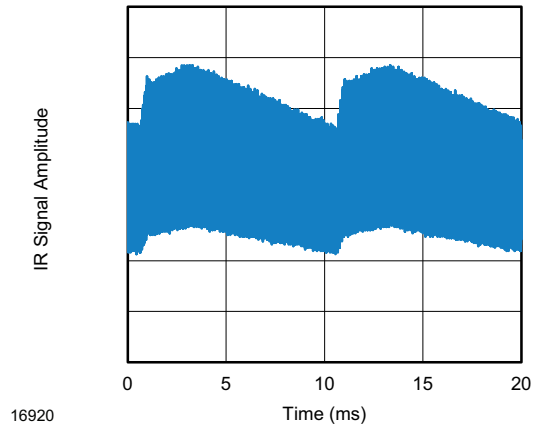


Fig. 13 - IR Emission from Fluorescent Lamp with Low Modulation

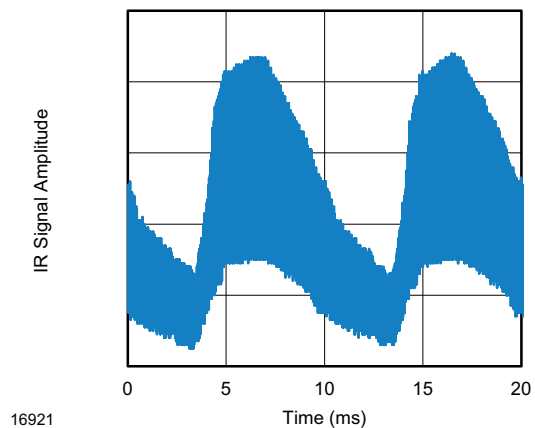


Fig. 14 - IR Emission from Fluorescent Lamp with High Modulation

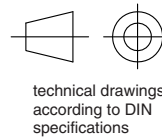
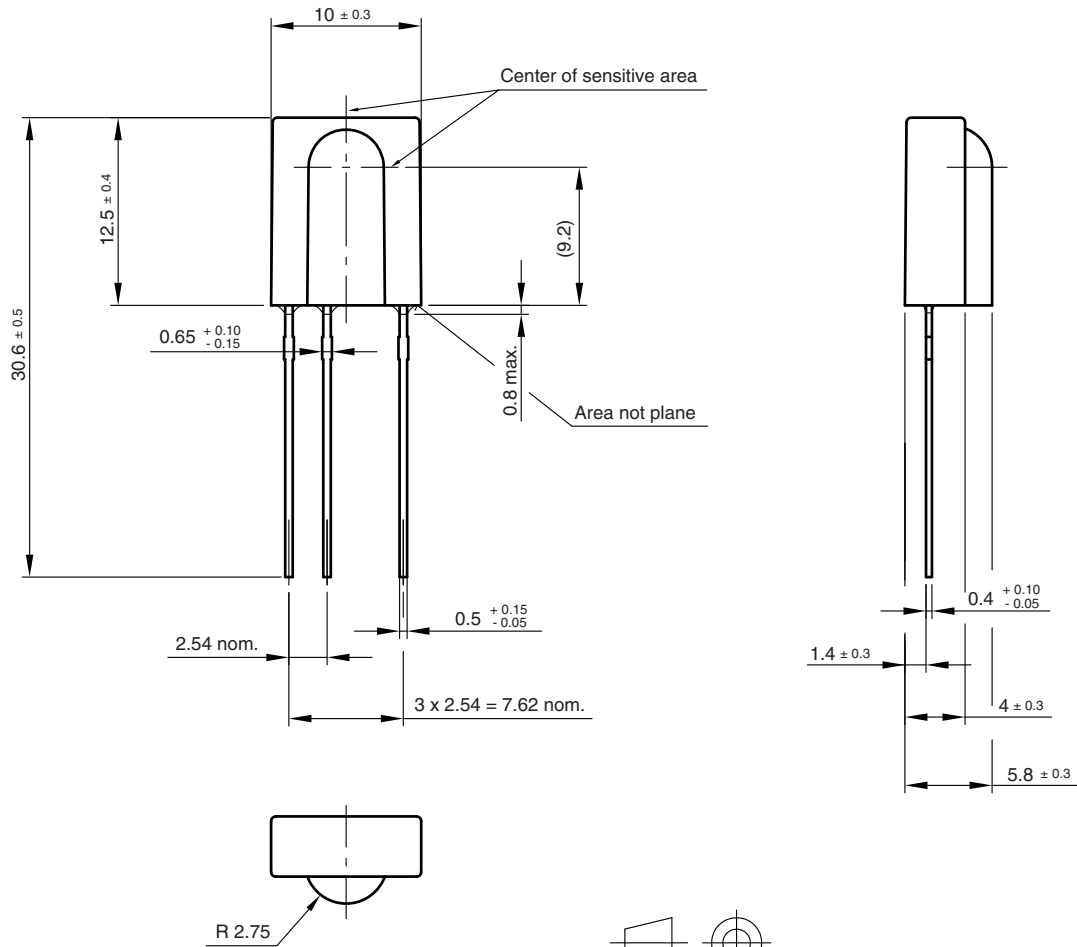
	<b>TSOP111..</b>	<b>TSOP113..</b>	<b>TSOP115..</b>
Minimum burst length	6 cycles/burst	6 cycles/burst	6 cycles/burst
After each burst of length A gap time is required of	6 to 70 cycles ≥ 10 cycles	6 to 35 cycles ≥ 10 cycles	6 to 24 cycles ≥ 10 cycles
For bursts greater than a minimum gap time in the 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	1800	2800	1800
MCIR code	Yes	Preferred	Yes
RCMM code	Yes	Preferred	Yes
XMP-1, XMP-2 code	Yes	Preferred	Yes
Suppression of interference from fluorescent lamps	Fig. 13	Fig. 13 and Fig. 14	Fig. 13 and Fig. 14

**Note**

- For data formats with long bursts (more than 10 carrier cycles) please see the datasheet for TSOP112.., TSOP114.., TSOP116..



## PACKAGE DIMENSIONS in millimeters



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



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