



## IR Receiver Modules for Remote Control Systems



23196

### 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.

### LINKS TO ADDITIONAL RESOURCES



[Product Page](#)

[Marking](#)

[Packages](#)

[Holders](#)

[Bends and Cuts](#)

### 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)

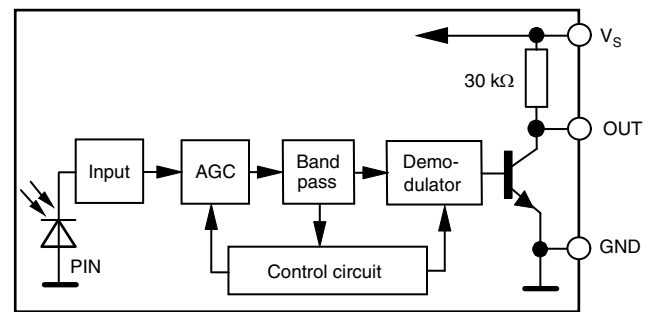
### APPLICATIONS

- Infrared remote control systems

### DESIGN SUPPORT TOOLS

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

### BLOCK DIAGRAM



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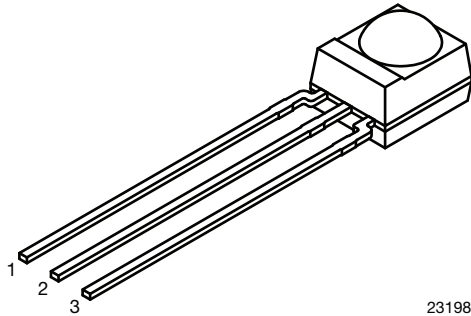
**MECHANICAL DATA**

**Pinning for TSOP14...:**

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

**Pinning for TSOP12...:**

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

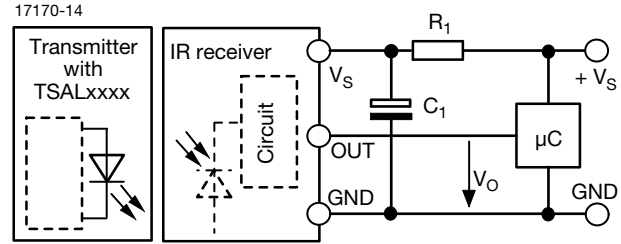


23198

**ORDERING CODE**

TSOP12..., TSOP14... - 2160 pieces in tubes

**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	TSOP14230	TSOP12230	TSOP14430	TSOP12430	TSOP14630	TSOP12630
	33 kHz	TSOP14233	TSOP12233	TSOP14433	TSOP12433	TSOP14633	TSOP12633
	36 kHz	TSOP14236	TSOP12236	TSOP14436 <sup>(4)(6)</sup>	TSOP12436 <sup>(4)(6)</sup>	TSOP14636 <sup>(5)</sup>	TSOP12636 <sup>(5)</sup>
	38 kHz	TSOP14238	TSOP12238	TSOP14438 <sup>(2)(3)(9)(10)</sup>	TSOP12438 <sup>(2)(3)(9)(10)</sup>	TSOP14638	TSOP12638
	40 kHz	TSOP14240 <sup>(11)</sup>	TSOP12240 <sup>(11)</sup>	TSOP14440	TSOP12440	TSOP14640	TSOP12640
	56 kHz	TSOP14256 <sup>(1)</sup>	TSOP12256 <sup>(1)</sup>	TSOP14456 <sup>(8)</sup>	TSOP12456 <sup>(8)</sup>	TSOP14656 <sup>(7)</sup>	TSOP12656 <sup>(7)</sup>
Package		Mold					
Pinning		1 = OUT, 2 = GND, 3 = $V_S$	1 = OUT, 2 = $V_S$ , 3 = GND	1 = OUT, 2 = GND, 3 = $V_S$	1 = OUT, 2 = $V_S$ , 3 = GND	1 = OUT, 2 = GND, 3 = $V_S$	1 = OUT, 2 = $V_S$ , 3 = GND
Dimensions (mm)		6.0 W x 6.95 H x 5.6 D					
Mounting		Leaded					
Application		Remote control					
Best choice for		<sup>(1)</sup> Cisco <sup>(2)</sup> Mitsubishi <sup>(3)</sup> NEC <sup>(4)</sup> Panasonic <sup>(5)</sup> RC-5 <sup>(6)</sup> RC-6 <sup>(7)</sup> RCA <sup>(8)</sup> r-step <sup>(9)</sup> Sejin 4PPM <sup>(10)</sup> Sharp <sup>(11)</sup> 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	$T_{amb} \leq 85$ °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 <sub>amb</sub> = 25 °C, unless otherwise specified)						
PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT
Supply current	E <sub>v</sub> = 0, V <sub>S</sub> = 3.3 V	I <sub>SD</sub>	0.25	0.35	0.45	mA
	E <sub>v</sub> = 40 klx, sunlight	I <sub>SH</sub>	-	0.45	-	mA
Supply voltage		V <sub>S</sub>	2.0	-	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	-	39	-	m
Output voltage low	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	Test signal: RC5 code	E <sub>e min.</sub>	-	0.05	0.1	mW/m <sup>2</sup>
	Test signal: NEC code	E <sub>e min.</sub>	-	0.1	0.2	mW/m <sup>2</sup>
Maximum irradiance	t <sub>pi</sub> - 5/f <sub>0</sub> < t <sub>po</sub> < t <sub>pi</sub> + 5/f <sub>0</sub> , test signal see Fig. 1	E <sub>e max.</sub>	30	-	-	W/m <sup>2</sup>
Directivity	Angle of half transmission distance	φ <sub>1/2</sub>	-	± 45	-	°

**TYPICAL CHARACTERISTICS** (T<sub>amb</sub> = 25 °C, unless otherwise specified)

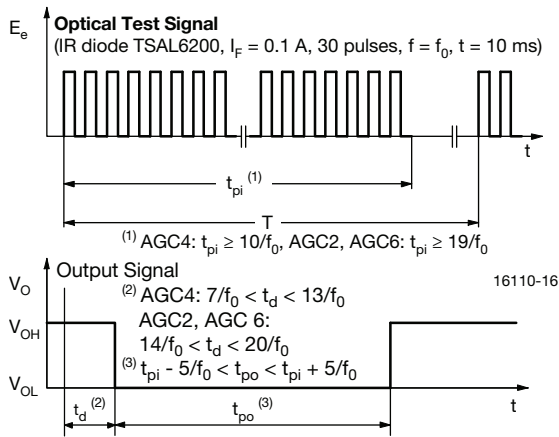


Fig. 1 - Output Delay and Pulse-Width

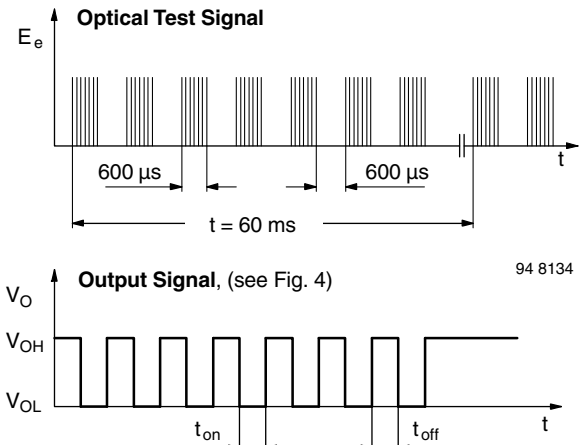


Fig. 3 - Test Signal

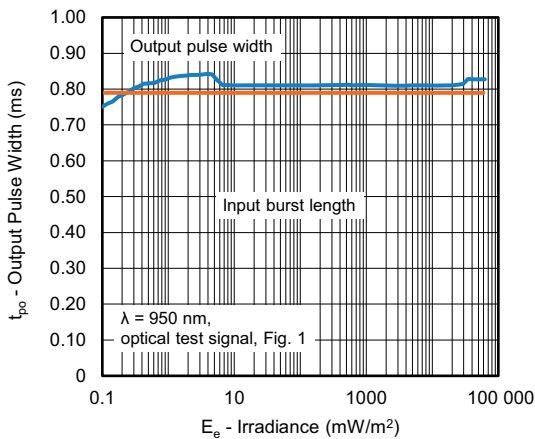


Fig. 2 - Pulse-Width vs. Irradiance in Dark Ambient

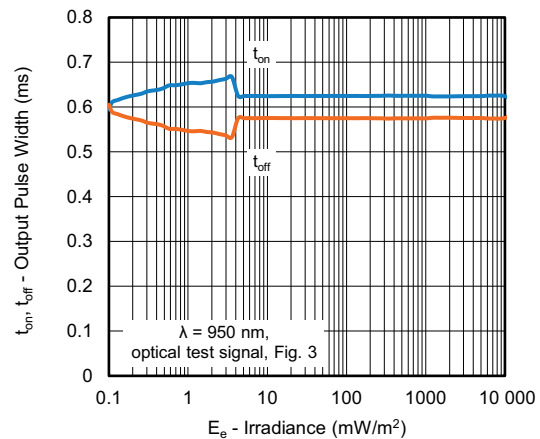


Fig. 4 - Pulse-Width vs. Irradiance in Dark Ambient

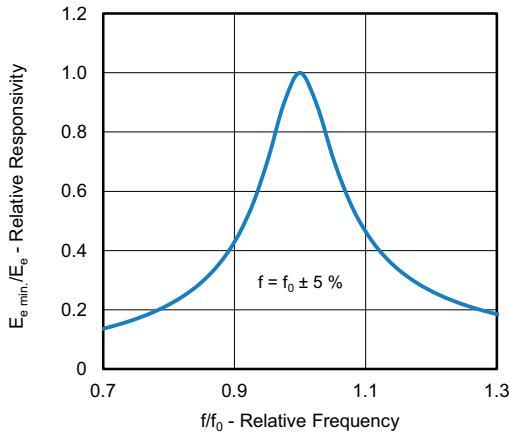


Fig. 5 - Frequency Dependence of Responsivity

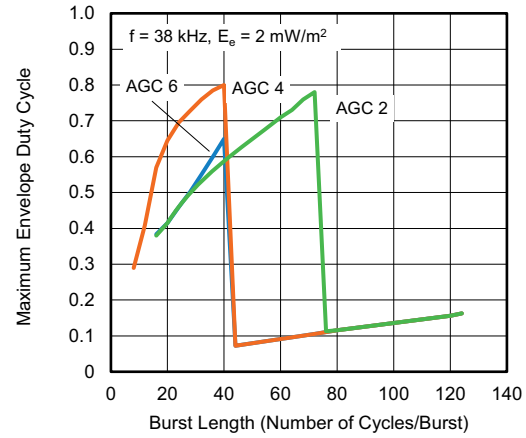


Fig. 8 - Max. Envelope Duty Cycle vs. Burst Length

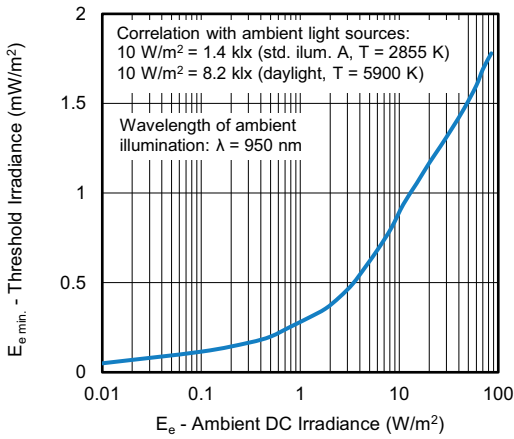


Fig. 6 - Sensitivity in Bright Ambient

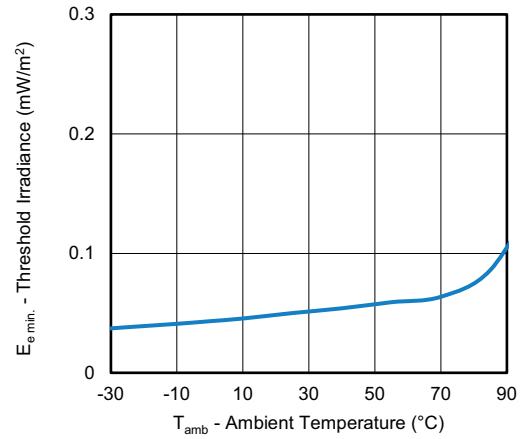


Fig. 9 - Sensitivity vs. Ambient Temperature

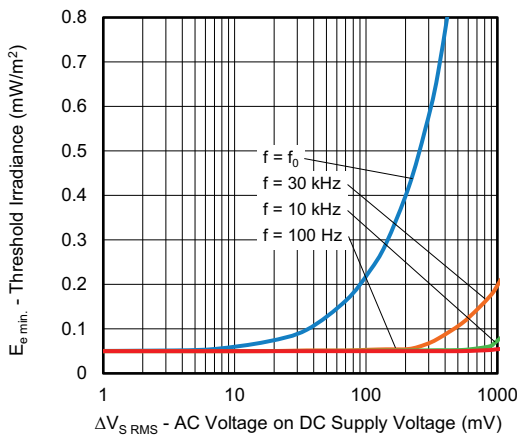


Fig. 7 - Sensitivity vs. Supply Voltage Disturbances

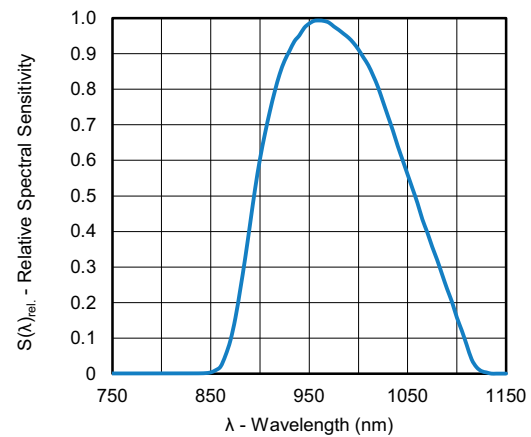


Fig. 10 - Relative Spectral Sensitivity vs. Wavelength

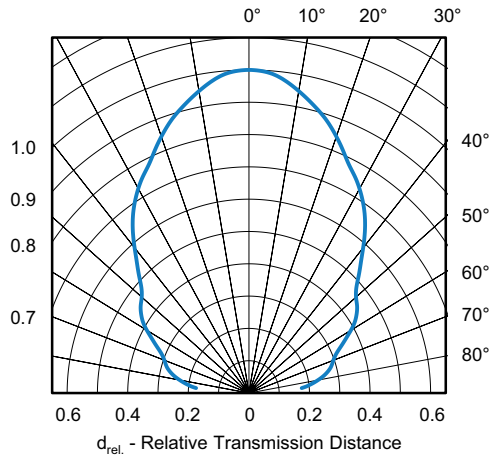


Fig. 11 - Directivity

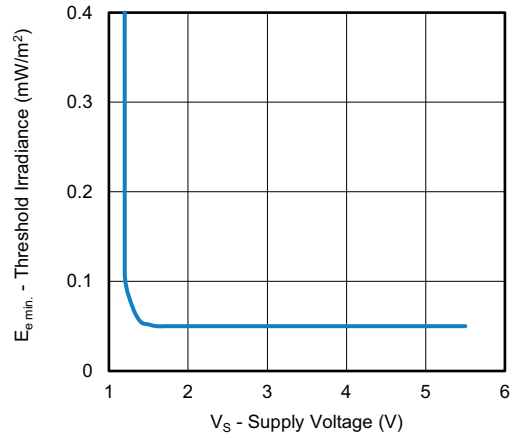


Fig. 12 - Sensitivity vs. Supply Voltage



**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

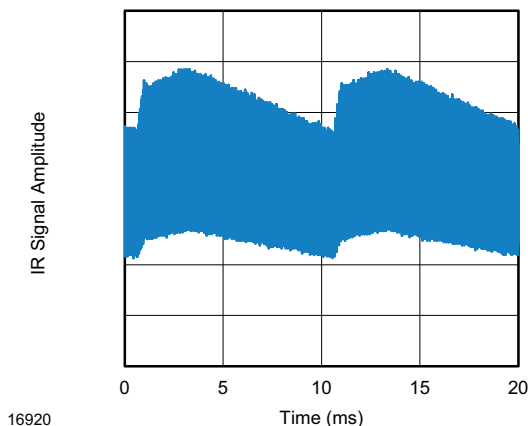


Fig. 13 - IR Emission from Fluorescent Lamp With Low Modulation

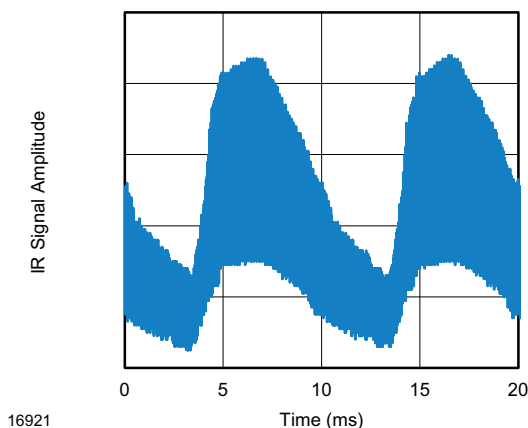


Fig. 14 - IR Emission from Fluorescent Lamp With High Modulation

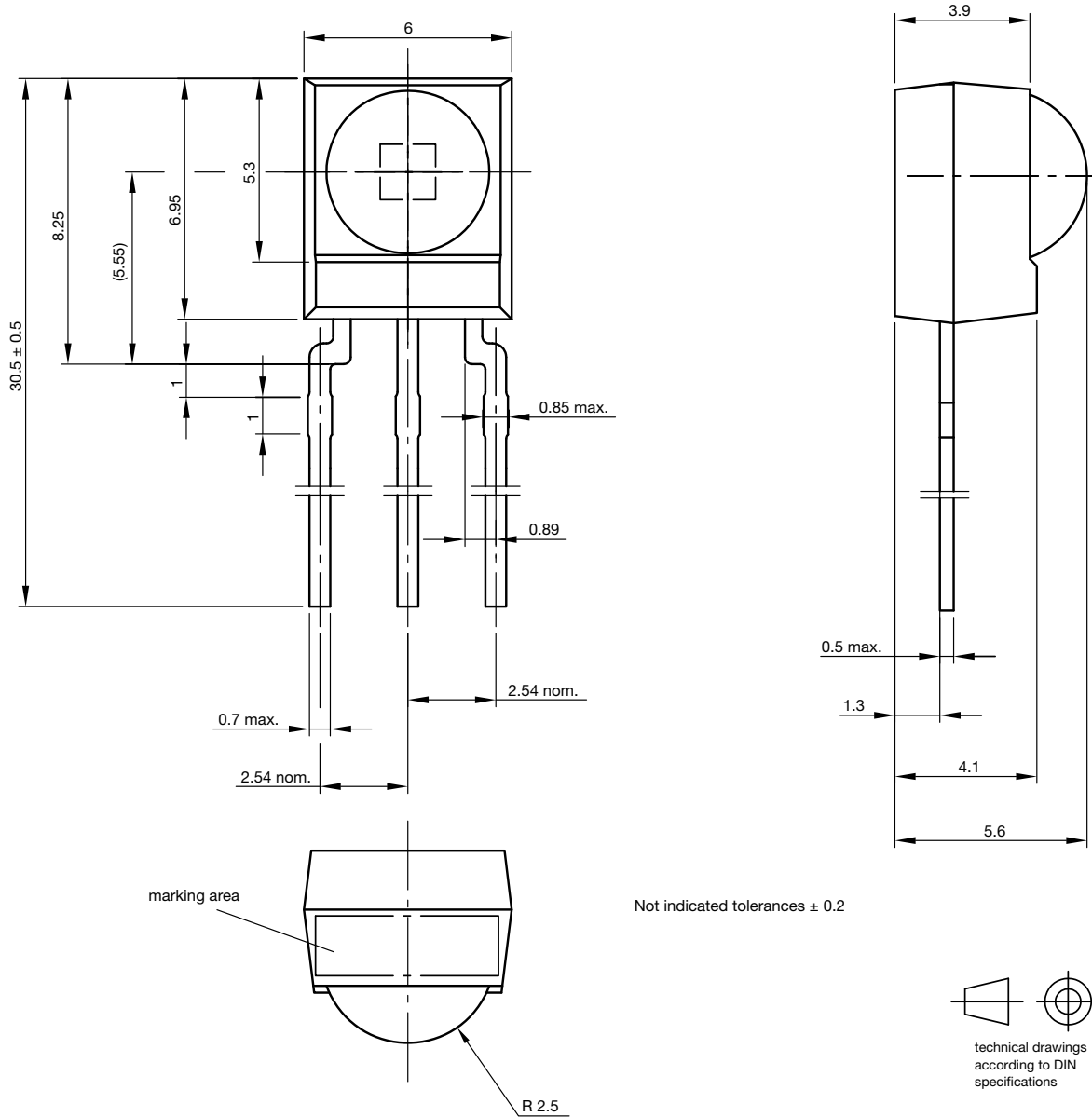
	TSOP122.., TSOP142..	TSOP124.., TSOP144..	TSOP126.., TSOP146..
Minimum burst length	19 cycles/burst	10 cycles/burst	19 cycles/burst
After each burst of length a minimum gap time is required of	19 to 72 cycles ≥ 20 cycles	10 to 40 cycles ≥ 11 cycles	19 to 40 cycles ≥ 20 cycles
For bursts greater than a minimum gap time in the data stream is needed of	72 cycles > 6 x burst length	40 cycles > 10 x burst length	40 cycles > 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 TSOP121.., TSOP123.., TSOP125.., TSOP141.., TSOP143.., TSOP145..



**PACKAGE DIMENSIONS** in millimeters



Drawing-No.: 6.550-5169.01-4  
Issue: 9; 03.11.10  
13655



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