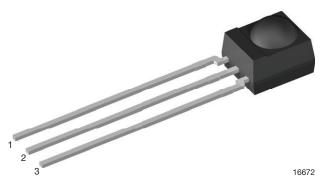
TSOP122.., TSOP124.., TSOP126.., TSOP142.., TSOP144.., TSOP146..



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# **IR Receiver Modules for Remote Control Systems**



### LINKS TO ADDITIONAL RESOURCES



#### DESCRIPTION

The TSOP12... and TSOP14... series devices are the latest generation miniaturized IR receiver modules for infrared remote control systems. These series provide 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 TSOP122.., TSOP124.., TSOP126.., TSOP142.., TSOP144.., and TSOP146.. series devices are designed to receive long burst codes (10 or more carrier cycles per burst). The third digit designates the AGC level (AGC2, AGC4, or AGC6) 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. AGC2 provides basic noise suppression, AGC4 provides enhanced noise suppression and AGC6 provides maximized noise suppression. Generally, we advise to select the highest AGC that satisfactorily receives the desired remote code.

These components have not been gualified 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
- Insensitive to supply voltage ripple and noise
- · Material categorization: for definitions of compliance please see <a href="https://www.vishay.com/doc?99912">www.vishay.com/doc?99912</a>

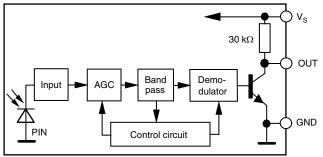
#### MECHANICAL DATA

Pinning for TSOP14...:  $1 = OUT, 2 = GND, 3 = V_S$ Pinning for TSOP12...: 1 = OUT, 2 = V<sub>S</sub>, 3 = GND

#### **ORDERING CODE**

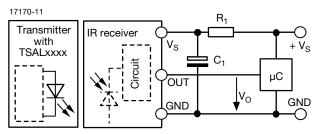
TSOP12..., TSOP14... - 2160 pieces in tubes

#### **BLOCK DIAGRAM**



16833-22

### **APPLICATION CIRCUIT**



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

RoHS

COMPLIANT

HALOGEN FREE

GREEN

(5-2008)

TSOP122.., TSOP124.., TSOP126.., TSOP142.., TSOP144.., TSOP146..



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PARTS TABLE								
AGC		BASIC NOISE SUPPRESSION (AGC2)		ENHANCED NOISE SUPPRESSION (AGC4)		MAXIMIZED NOISE SUPPRESSION (AGC6)		
	30 kHz	TSOP14230	TSOP12230	TSOP14430	TSOP12430	TSOP14630	TSOP12630	
	33 kHz	TSOP14233	TSOP12233	TSOP14433	TSOP12433	TSOP14633	TSOP12633	
Carrier	36 kHz	TSOP14236	TSOP12236	TSOP14436 (2)(5)(7)	TSOP12436 (2)(5)(7)	TSOP14636 (6)	TSOP12636 (6)	
frequency	38 kHz	TSOP14238	TSOP12238	TSOP14438 (3)(4)(10)(11)	TSOP12438 (3)(4)(10)(11)	TSOP14638	TSOP12638	
	40 kHz	TSOP14240 (12)	TSOP12240 (12)	TSOP14440	TSOP12440	TSOP14640	TSOP12640	
	56 kHz	TSOP14256 (1)	TSOP12256 (1)	TSOP14456 <sup>(9)</sup>	TSOP12456 <sup>(9)</sup>	TSOP14656 <sup>(8)</sup>	TSOP12656 <sup>(8)</sup>	
Package	Package		Mold					
Pinning		1 = OUT, 2 = GND, 3 = V <sub>S</sub>	1 = OUT, 2 = V <sub>S</sub> , 3 = GND	1 = OUT, 2 = GND, 3 = V <sub>S</sub>	1 = OUT, 2 = V <sub>S</sub> , 3 = GND	1 = OUT, 2 = GND, 3 = V <sub>S</sub>	1 = OUT, $2 = V_S, 3 = GND$	
Dimensions	nsions (mm) 6.0 W x 6.95 H x 5.6 D							
Mounting		Leaded						
Application		Remote control						
Best choice for		<ul> <li>(1) Cisco <sup>(2)</sup> MCIR <sup>(3)</sup> Mitsubishi <sup>(4)</sup> NEC <sup>(5)</sup> Panasonic <sup>(6)</sup> RC-5 <sup>(7)</sup> RC-6</li> <li><sup>(8)</sup> RCA <sup>(9)</sup> r-step <sup>(10)</sup> Sejin 4PPM <sup>(11)</sup> Sharp <sup>(12)</sup> Sony</li> </ul>						
Special options		<ul> <li>Narrow optical filter: <u>www.vishay.com/doc?81590</u></li> <li>Wide optical filter: <u>www.vishay.com/doc?82726</u></li> </ul>						

ABSOLUTE MAXIMUM RATINGS						
PARAMETER	TEST CONDITION	SYMBOL	VALUE	UNIT		
Supply voltage		V <sub>S</sub>	-0.3 to +6	V		
Supply current		IS	3	mA		
Output voltage		Vo	-0.3 to (V <sub>S</sub> + 0.3)	V		
Output current		Ι <sub>Ο</sub>	5	mA		
Junction temperature		Tj	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	$t \le 10$ s, 1 mm from case	T <sub>sd</sub>	260	°C		

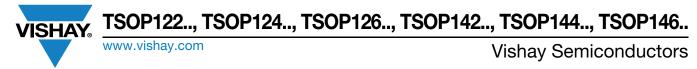
Note

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

<b>ELECTRICAL AND OPTICAL CHARACTERISTICS</b> (T <sub>amb</sub> = 25 °C, unless otherwise specified)							
PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT	
Supply current	$E_v = 0, V_S = 3.3 V$	I <sub>SD</sub>	0.55	0.7	0.9	mA	
Supply current	E <sub>v</sub> = 40 klx, sunlight	I <sub>SH</sub>	-	0.8	-	mA	
Supply voltage		VS	2.5	-	5.5	V	
Transmission distance	$E_v = 0$ , test signal see Fig. 1, IR diode TSAL6200, I <sub>F</sub> = 50 mA	d	-	30	-	m	
Output voltage low	$I_{OSL} = 0.5 \text{ mA}, E_e = 0.7 \text{ mW/m}^2,$ test signal see Fig. 1	V <sub>OSL</sub>	-	-	100	mV	
Minimum irradiance	$\begin{array}{c} \mbox{Pulse width tolerance:} \\ t_{pi} - 3.5/f_0 < t_{po} < t_{pi} + 3.5/f_0, \\ test signal see Fig. 1 \end{array}$	E <sub>e min.</sub>	-	0.08	0.15	mW/m <sup>2</sup>	
Maximum irradiance	$t_{pi} - 3.5/f_0 < t_{po} < t_{pi} + 3.5/f_0, \\ test \ signal \ see \ Fig. \ 1$	E <sub>e max.</sub>	30	-	-	W/m <sup>2</sup>	
Directivity	Angle of half transmission distance	Φ1/2	-	± 45	-	0	

Rev. 1.9, 14-Dec-2021

2



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

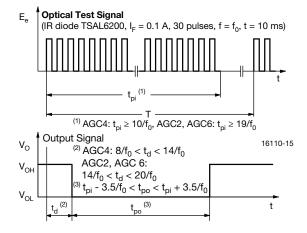


Fig. 1 - Output Delay and Pulse-Width

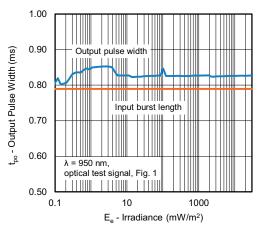
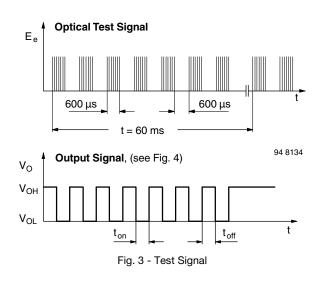


Fig. 2 - Pulse-Width vs. Irradiance in Dark Ambient



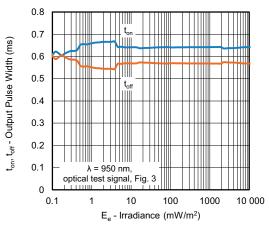


Fig. 4 - Pulse-Width vs. Irradiance in Dark Ambient

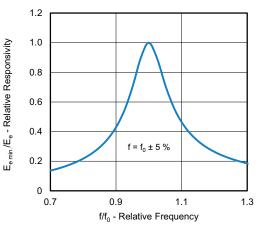
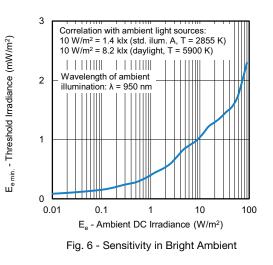


Fig. 5 - Frequency Dependence of Responsivity

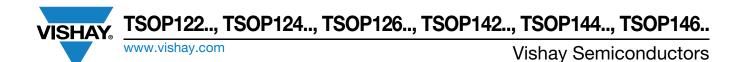


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3

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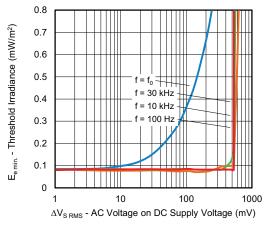


Fig. 7 - Sensitivity vs. Supply Voltage Disturbances

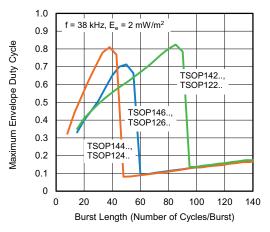


Fig. 8 - Max. Envelope Duty Cycle vs. Burst Length

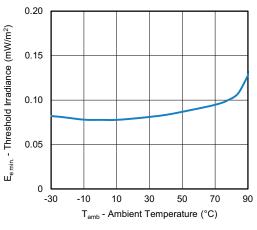


Fig. 9 - Sensitivity vs. Ambient Temperature

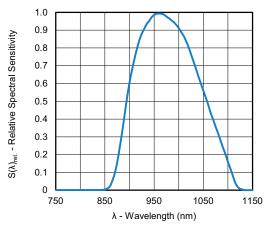
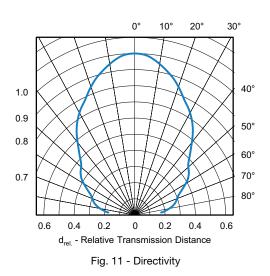
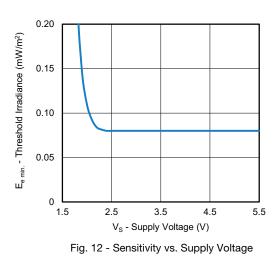


Fig. 10 - Relative Spectral Sensitivity vs. Wavelength





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TSOP122.., TSOP124.., TSOP126.., TSOP142.., TSOP144.., TSOP146..

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## 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

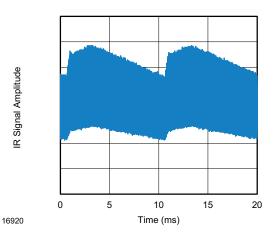


Fig. 13 - IR Emission from Fluorescent Lamp With Low Modulation

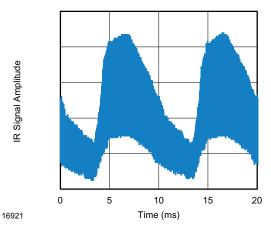
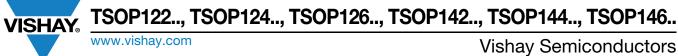


Fig. 14 - IR Emission from Fluorescent Lamp With High Modulation

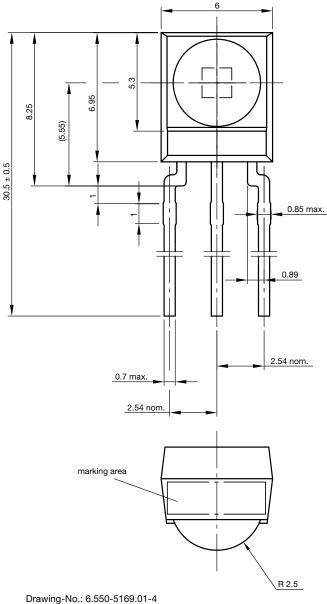
	TSOP122, TSOP142	TSOP124, TSOP144	TSOP126, TSOP146
Minimum burst length	19 cycles/burst	10 cycles/burst	19 cycles/burst
After each burst of length a minimum gap time is required of	19 to 85 cycles ≥ 19 cycles	10 to 40 cycles ≥ 12 cycles	19 to 50 cycles ≥ 19 cycles
For bursts greater than a minimum gap time in the data stream is needed of	85 cycles > 6 x burst length	40 cycles > 10 x burst length	50 cycles > 10 x burst length
Maximum number of continuous short bursts/second	800	1300	800
RC-5 code	Yes	Preferred	Preferred
RC-6 code	Yes	Preferred	Yes
NEC code	Yes	Preferred	Yes
r-step code	Yes	Preferred	Yes
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

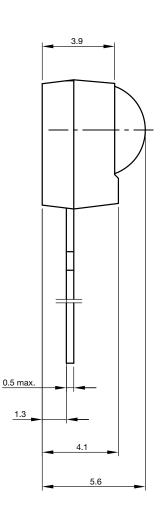
#### Note

• For data formats with short bursts please see the datasheet for TSOP121.., TSOP123.., TSOP125.., TSOP141.., TSOP143.., TSOP145...



### **PACKAGE DIMENSIONS** in millimeters





Not indicated tolerances ± 0.2



according to DIN specifications

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