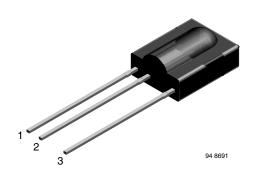


# **IR Receiver Modules for Remote Control Systems**



#### **LINKS TO ADDITIONAL RESOURCES**













### **DESCRIPTION**

The TSOP312.., TSOP314..series are miniaturized IR receiver modules for infrared remote control systems. A PIN diode and a preamplifier are assembled on a leadframe, the epoxy package contains an IR filter.

The demodulated output signal can be directly connected to a microprocessor for decoding.

The TSOP314.. series devices are optimized to suppress almost all spurious pulses from energy saving lamps like CFLs. The AGC4 used in the TSOP314.. may suppress some data signals. The TSOP312.. series are provided primarily for compatibility with old AGC2 designs. New designs should prefer the TSOP314.. series containing the newer AGC4.

These components have not been qualified according to automotive specifications.

#### **FEATURES**

- Very low supply current
- · Photo detector and preamplifier in one package
- · Internal filter for PCM frequency
- Supply voltage: 2.5 V to 5.5 V
- · Improved immunity against ambient light
- Insensitive to supply voltage ripple and noise
- Material categorization: for definitions of compliance please see www.vishav.com/doc?99912





ROHS
COMPLIANT
HALOGEN
FREE
GREEN

(5-2008)

### Pinning:

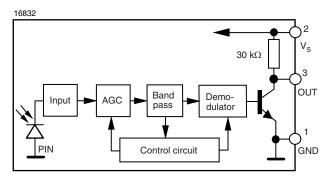
 $1 = GND, 2 = V_S, 3 = OUT$ 

**MECHANICAL DATA** 

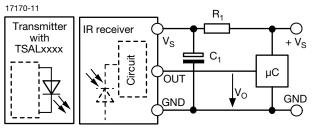
### **ORDERING CODE**

TSO.1. - 1000 pieces in tubes

#### **BLOCK DIAGRAM**



### **APPLICATION CIRCUIT**



 $R_1$  and  $C_1$  recommended to reduce supply ripple for  $V_S < 2.8 \text{ V}$ 



PARTS TABLE						
AGC		LEGACY, FOR LONG BURST REMOTE CONTROLS (AGC2)	RECOMMENDED FOR LONG BURST CODES (AGC4)			
	30 kHz	TSOP31230	TSOP31430			
Carrier frequency	33 kHz	TSOP31233	TSOP31433			
	36 kHz	TSOP31236	TSOP31436 (1)(2)(3)			
	38 kHz	TSOP31238	TSOP31438 (4)(5)			
	40 kHz	TSOP31240	TSOP31440			
	56 kHz	TSOP31256	TSOP31456 (6)(7)			
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) RC-5 (2) RC-6 (3) Panasonic (4) NEC (5) Sharp (6) r-step (7) Thomson RCA				
Special options		Low voltage option: <a href="https://www.vishay.com/doc?82382">www.vishay.com/doc?82382</a>				

ABSOLUTE MAXIMUM RATINGS						
PARAMETER	TEST CONDITION	SYMBOL	VALUE	UNIT		
Supply voltage (pin 2)		V <sub>S</sub>	-0.3 to +6.0	V		
Supply current (pin 2)		I <sub>S</sub>	3	mA		
Output voltage (pin 3)		Vo	-0.3 to (V <sub>S</sub> + 0.3)	V		
Output current (pin 3)		I <sub>O</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 ≤ 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 (pin 2)	$E_{V} = 0, V_{S} = 3.3 V$	I <sub>SD</sub>	0.27	0.35	0.45	mA
Supply current (pin 2)	E <sub>v</sub> = 40 klx, sunlight	I <sub>SH</sub>	-	0.45	-	mA
Supply voltage		Vs	2.5	-	5.5	V
Transmission distance	$E_v = 0$ , test signal see Fig. 1, IR diode TSAL6200, $I_F = 50$ mA	d	-	24	-	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 <sub>OSL</sub>	-	-	100	mV
Minimum irradiance	Pulse width tolerance: $t_{pi} - 5/f_o < t_{po} < t_{pi} + 6/f_o, \text{ test signal see Fig. 1}$	E <sub>e min.</sub>	-	0.12	0.25	mW/m²
Maximum irradiance	$t_{pi}$ - 5/f <sub>o</sub> < $t_{po}$ < $t_{pi}$ + 6/f <sub>o</sub> , test signal see Fig. 1	E <sub>e max.</sub>	30	-	-	W/m <sup>2</sup>
Directivity	Angle of half transmission distance	Ψ1/2	-	± 45	-	۰

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

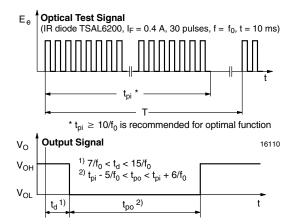


Fig. 1 - Output Active Low

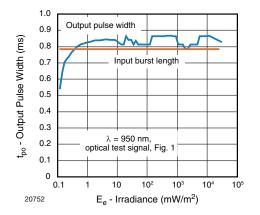


Fig. 2 - Pulse Length and Sensitivity in Dark Ambient

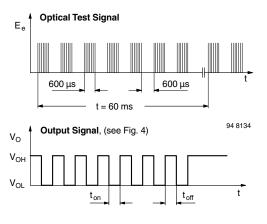


Fig. 3 - Output Function

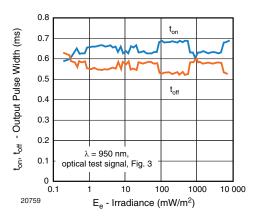


Fig. 4 - Output Pulse Diagram

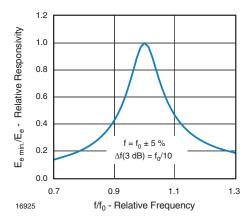


Fig. 5 - Frequency Dependence of Responsivity

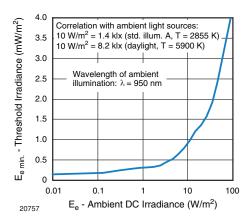


Fig. 6 - Sensitivity in Bright Ambient

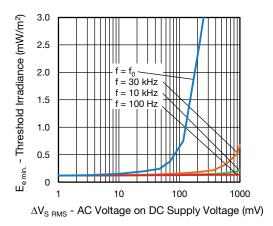


Fig. 7 - Sensitivity vs. Supply Voltage Disturbances

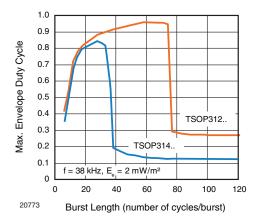


Fig. 8 - Maximum Envelope Duty Cycle vs. Burst Length

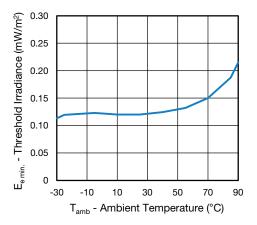


Fig. 9 - Sensitivity vs. Ambient Temperature

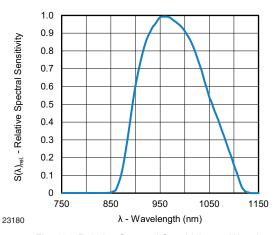


Fig. 10 - Relative Spectral Sensitivity vs. Wavelength

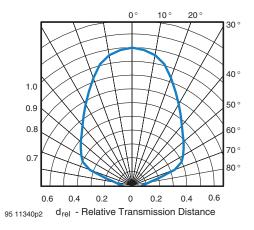


Fig. 11 - Horizontal Directivity

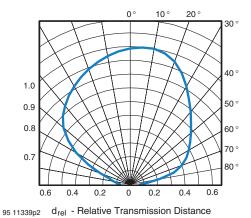


Fig. 12 - Vertical Directivity



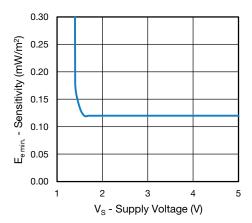


Fig. 13 - Sensitivity vs. Supply Voltage

### 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).

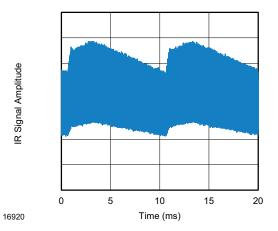


Fig. 14 - IR Disturbance from Fluorescent Lamp with Low Modulation

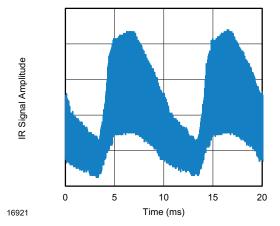


Fig. 15 - IR Disturbance from Fluorescent Lamp with High Modulation

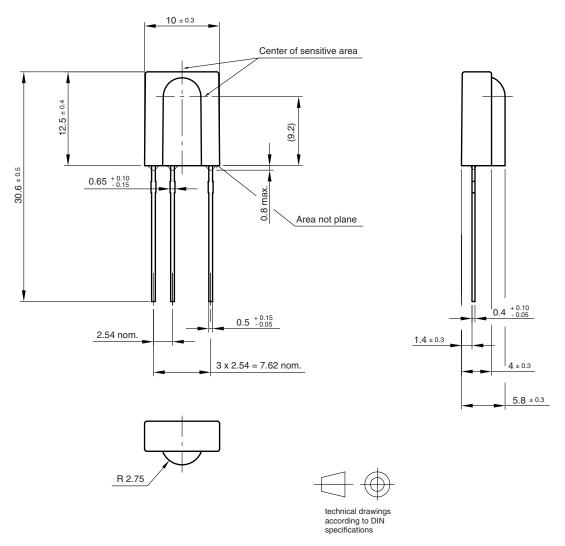
	TSOP312	TSOP314
Minimum burst length	10 cycles/burst	10 cycles/burst
After each burst of length a minimum gap time is required of	10 to 70 cycles ≥ 10 cycles	10 to 35 cycles ≥ 10 cycles
For bursts greater than a minimum gap time in the data stream is needed of	70 cycles > 4 x burst length	35 cycles > 10 x burst length
Maximum number of continuous short bursts/second	1800	1500
NEC code	Yes	Preferred
RC5/RC6 code	Yes	Preferred
Thomson 56 kHz code	Yes	Preferred
Sharp code	Yes	Preferred
Suppression of interference from fluorescent lamps	Mild disturbance patterns are suppressed (example: signal pattern of Fig. 14)	Complex and critical disturbance patterns are suppressed (example: signal pattern of Fig. 15 or highly dimmed LCDs)

#### Notes

- For data formats with short bursts please see the datasheet for TSOP311.., TSOP313..
- For SIRCS 15 and 20 bit, Sony 12 bit IR codes, please see the datasheet for TSOP31S40



### **PACKAGE DIMENSIONS** in millimeters



Drawing-No.: 6.550-5095.01-4

Issue: 20; 15.03.10

96 12116



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