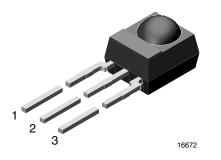


**Vishay Semiconductors** 

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



### **MECHANICAL DATA**

Pinning for TSOP341.., TSOP343.., TSOP345..:  $1 = OUT, 2 = GND, 3 = V_S$ Pinning for TSOP321.., TSOP323.., TSOP325..:  $1 = OUT, 2 = V_S, 3 = GND$ 

## FEATURES

- Very low supply current
- Photo detector and preamplifier in one package
- Internal filter for PCM frequency
- Improved shielding against EMI
- Supply voltage: 2.5 V to 5.5 V
- Improved immunity against ambient light
- Insensitive to supply voltage ripple and noise
- Compliant to RoHS Directive 2002/95/EC and in accordance to WEEE 2002/96/EC

### DESCRIPTION

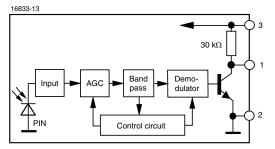
These products are miniaturized receivers for infrared remote control systems. A PIN diode and a preamplifier are assembled on a lead frame, the epoxy package acts as an IR filter.

The demodulated output signal can be directly decoded by a microprocessor. The TSOP321.., TSOP341.. are compatible with all common IR remote control data formats. The TSOP323.., TSOP343.. are optimized to better suppress spurious pulses from energy saving fluorescent lamps. The TSOP325.., TSOP345.. have an excellent noise suppression. It is immune to dimmed LCD backlighting and any fluorescent lamps. AGC3 and AGC5 may also suppress some data signals in case of continuous transmission.

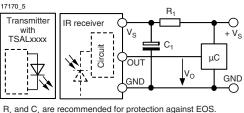
This component has not been qualified according to automotive specifications.

PARTS TABLE								
	SHORT BURST AND HIGH DATA RATE (AGC1)		NOISY ENVIROMENTS AND SHORT BURST (AGC3)		VERY NOISY ENVIROMENTS AND SHORT BURSTS (AGC5)			
CARRIER FREQUENCY		PINNING						
FREQUENCI	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 <sub>S</sub> , 3 = GND		
30 kHz	TSOP34130	TSOP32130	TSOP34330	TSOP32330	TSOP34530	TSOP32530		
33 kHz	TSOP34133	TSOP32133	TSOP34333	TSOP32333	TSOP34533	TSOP32533		
36 kHz	TSOP34136	TSOP32136	TSOP34336	TSOP32336	TSOP34536	TSOP32536		
38 kHz	TSOP34138	TSOP32138	TSOP34338	TSOP32338	TSOP34538	TSOP32538		
40 kHz	TSOP34140	TSOP32140	TSOP34340	TSOP32340	TSOP34540	TSOP32540		
56 kHz	TSOP34156	TSOP32156	TSOP34356	TSOP32356	TSOP34556	TSOP32556		

### **BLOCK DIAGRAM**



### **APPLICATION CIRCUIT**



R<sub>1</sub> and C<sub>1</sub> are recommended for protection against EOS. Components should be in the range of 33  $\Omega$  < R<sub>1</sub> < 1 k $\Omega$ , C<sub>1</sub> > 0.1  $\mu$ F.

\*\* Please see document "Vishay Material Category Policy": <u>www.vishay.com/doc?99902</u>



GREEN



## IR Receiver Modules for Remote Control Systems



ABSOLUTE MAXIMUM RATINGS						
PARAMETER	TEST CONDITION	SYMBOL	VALUE	UNIT		
Supply voltage		Vs	- 0.3 to + 6	V		
Supply current		I <sub>S</sub>	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	$T_{amb} \le 85 \ ^{\circ}C$	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.

ELECTRICAL AND OPTICAL CHARACTERISTICS (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>	0.27	0.35	0.45	mA
	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 <sub>F</sub> = 250 mA	d		45		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	Pulse width tolerance: t <sub>pi</sub> - 5/f <sub>o</sub> < t <sub>po</sub> < t <sub>pi</sub> + 6/f <sub>o</sub> , test signal see fig. 1	E <sub>e min.</sub>		0.1	0.25	mW/m²
Maximum irradiance	t <sub>pi</sub> - 5/f <sub>o</sub> < t <sub>po</sub> < t <sub>pi</sub> + 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	φ1/2		± 45		deg

### TYPICAL CHARACTERISTICS (Tamb = 25 °C, unless otherwise specified)

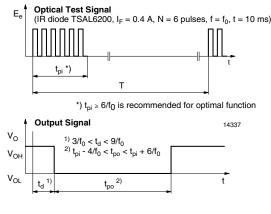


Fig. 1 - Output Active Low

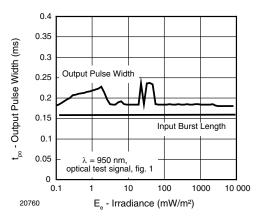
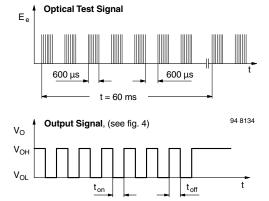


Fig. 2 - Pulse Length and Sensitivity in Dark Ambient



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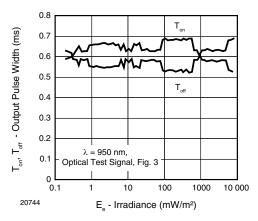


Fig. 4 - Output Pulse Diagram

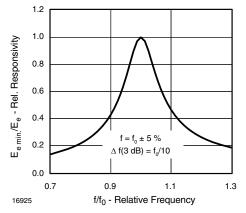


Fig. 5 - Frequency Dependence of Responsivity

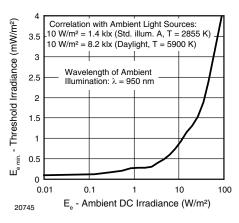


Fig. 6 - Sensitivity in Bright Ambient

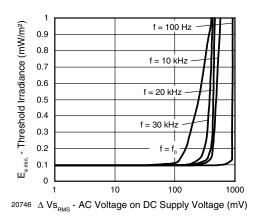


Fig. 7 - Sensitivity vs. Supply Voltage Disturbances

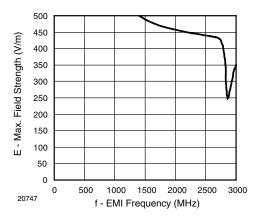
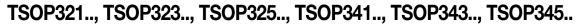


Fig. 8 - Sensitivity vs. Electric Field Disturbances





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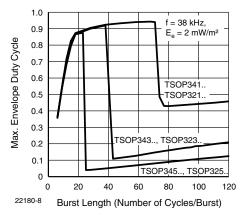


Fig. 9 - Maximum Envelope Duty Cycle vs. Burst Length

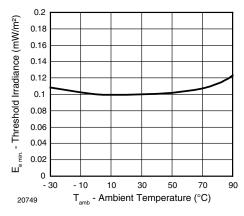


Fig. 10 - Sensitivity vs. Ambient Temperature

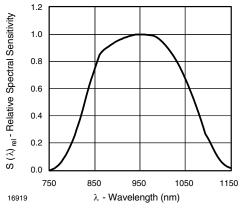


Fig. 11 - Relative Spectral Sensitivity vs. Wavelength

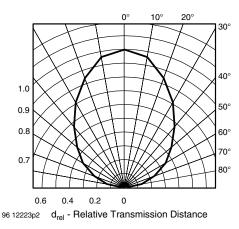


Fig. 12 - Horizontal Directivity

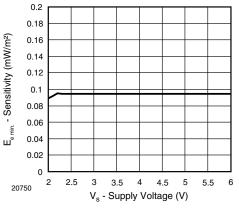


Fig. 13 - Sensitivity vs. Supply Voltage



IR Receiver Modules for Remote V Control Systems

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## SUITABLE DATA FORMAT

These products are designed to suppress spurious output pulses due to noise or disturbance signals. Data and disturbance signals can be distinguished by the devices according to carrier frequency, burst length and envelope duty cycle. The data signal should be close to the band-pass center frequency (e.g. 38 kHz) and fulfill the conditions in the table below.

When a data signal is applied to the IR receiver in the presence of a disturbance signal, the sensitivity of the receiver is reduced to insure that no spurious pulses are present at the output. Some examples of disturbance signals which are suppressed are:

- DC light (e.g. from tungsten bulb or sunlight)
- Continuous signals at any frequency
- Modulated noise from fluorescent lamps with electronic ballasts (see figure 14 or figure 15)

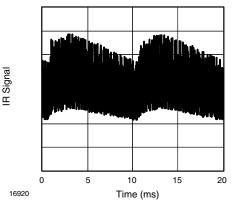


Fig. 14 - IR Signal from Fluorescent Lamp with Low Modulation

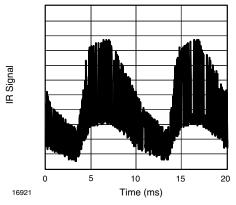


Fig. 15 - IR Signal from Fluorescent Lamp with High Modulation

	TSOP341, TSOP321	TSOP343, TSOP323	TSOP345, TSOP325	
Minimum burst length	6 cycles/burst	6 cycles/burst	6 cycles/burst	
After each burst of length a minimum 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	2000	2000	2000	
Recommended for NEC code	yes	yes	yes	
Recommended for RC5/RC6 code	yes	yes	yes	
Recommended for Sony code	yes	no	no	
Recommended for RCMM code	yes	yes	yes	
Recommended for r-step code	yes	yes	yes	
Recommended for XMP code	yes	yes	yes	
Suppression of interference from fluorescent lamps	Common disturbance signals are supressed (example: signal pattern of fig. 14)	Even critical disturbance signals are suppressed (examples: signal pattern of fig. 14 and fig. 15)	Even critical disturbance signals are suppressed (examples: signal pattern of fig. 14 and fig. 15)	

#### Note

For data formats with long bursts (more than 10 carrier cycles) please see the datasheet for TSOP348.., TSOP344.., TSOP322.., TSOP324...

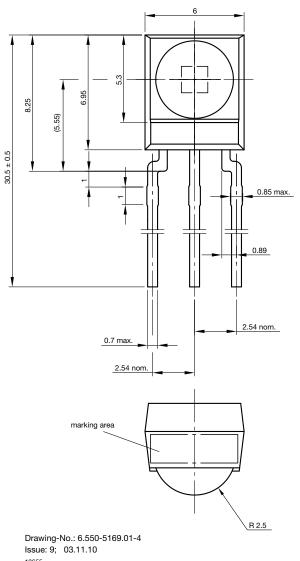


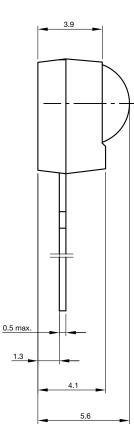


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IR Receiver Modules for Remote Control Systems

## **PACKAGE DIMENSIONS** in millimeters





Not indicated tolerances ± 0.2



13655



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