



## IR Receiver Modules for Remote Control Systems



22963

### LINKS TO ADDITIONAL RESOURCES



### DESCRIPTION

The TSOP99... 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 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 TSOP993.. and TSOP995.., series devices are designed to receive short burst codes (6 or more carrier cycles per burst). The third digit designates the AGC level (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. 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
- Very low supply current
- Photo detector and preamplifier in one package
- Internal filter for PCM frequency
- Supply voltage: 2.0 V to 3.6 V
- Insensitive to supply voltage ripple and noise
- 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)

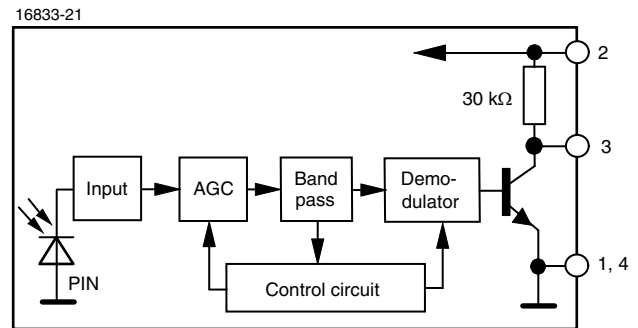
### MECHANICAL DATA

1, 4 = GND, 2 = V<sub>S</sub>, 3 = OUT

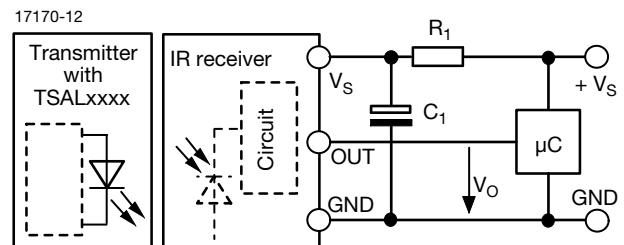
### ORDERING CODE

TSOP.9.... - 2400 pieces in 6 bags

### BLOCK DIAGRAM



### APPLICATION CIRCUIT



R<sub>1</sub> and C<sub>1</sub> recommended to reduce supply ripple for V<sub>S</sub> < 2.2 V



PARTS TABLE			
AGC		ENHANCED NOISE SUPPRESSION (AGC3)	MAXIMIZED NOISE SUPPRESSION (AGC5)
Carrier frequency	30 kHz	TSOP99330	TSOP99530
	33 kHz	TSOP99333	TSOP99533
	36 kHz	TSOP99336 <sup>(1)</sup>	TSOP99536
	38 kHz	TSOP99338 <sup>(2)(4)</sup>	TSOP99538
	40 kHz	TSOP99340	TSOP99540
	56 kHz	TSOP99356	TSOP99556 <sup>(3)</sup>
Package		TVCast	
Pinning		1, 4 = GND, 2 = V <sub>S</sub> , 3 = OUT	
Dimensions (mm)		6.8 W x 2.6 H x 5.3 D	
Mounting		Leaded	
Application		Remote control	
Best choice for		<sup>(1)</sup> RCMM <sup>(2)</sup> RECS-80 Code <sup>(3)</sup> r-map <sup>(4)</sup> 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		V <sub>S</sub>	-0.3 to +3.6	V
Supply current		I <sub>S</sub>	3	mA
Output voltage		V <sub>O</sub>	-0.3 to (V <sub>S</sub> + 0.3)	V
Output current		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

**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	0.37	0.45	mA
	E <sub>v</sub> = 40 klx, sunlight	I <sub>SH</sub>	-	0.50	-	mA
Supply voltage		V <sub>S</sub>	2.0	-	3.6	V
Transmission distance	E <sub>v</sub> = 0, test signal see Fig. 1, IR diode TSAL6200, I <sub>F</sub> = 50 mA	d	-	26	-	m
Output voltage low	I <sub>O</sub> SL = 0.5 mA, E <sub>e</sub> = 0.7 mW/m <sup>2</sup> , test signal see Fig. 1	V <sub>O</sub> SL	-	-	100	mV
Minimum irradiance	Test signal: XMP code	E <sub>e</sub> min.	-	0.12	0.25	mW/m <sup>2</sup>
	Test signal: NEC code	E <sub>e</sub> min.	-	0.10	0.20	mW/m <sup>2</sup>
Maximum irradiance	t <sub>pi</sub> - 3.0/f <sub>0</sub> < t <sub>po</sub> < t <sub>pi</sub> + 3.5/f <sub>0</sub> , test signal see Fig. 1	E <sub>e</sub> max.	30	-	-	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)

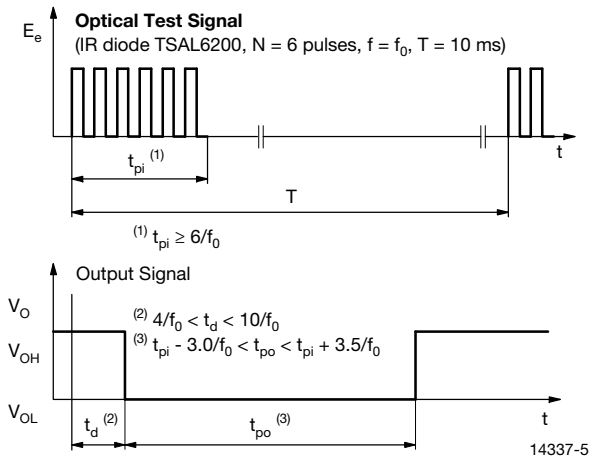


Fig. 1 - Output Delay and Pulse-Width

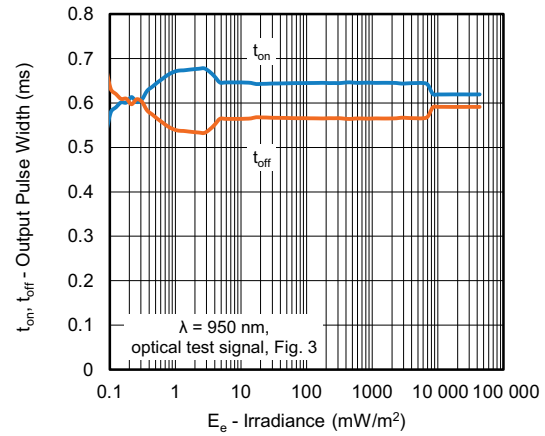


Fig. 4 - Pulse-Width vs. Irradiance in Dark Ambient

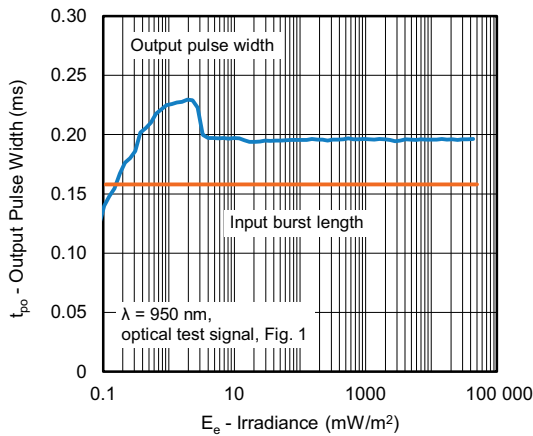


Fig. 2 - Pulse-Width vs. Irradiance in Dark Ambient



Fig. 5 - Frequency Dependence of Responsivity



Fig. 3 - Test Signal

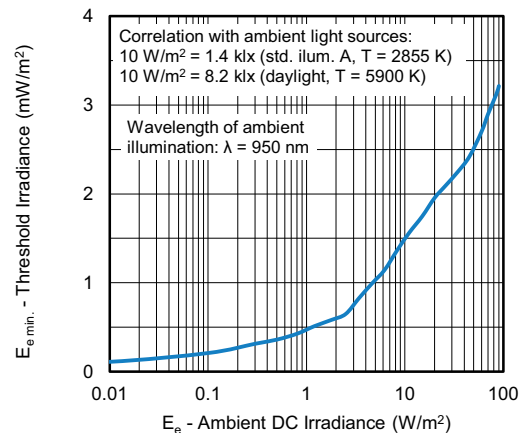


Fig. 6 - Sensitivity in Bright Ambient

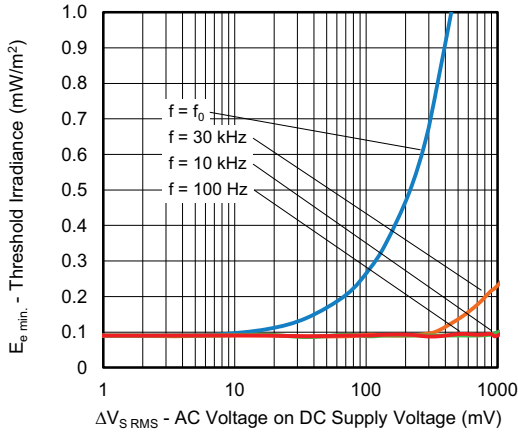


Fig. 7 - Sensitivity vs. Supply Voltage Disturbances

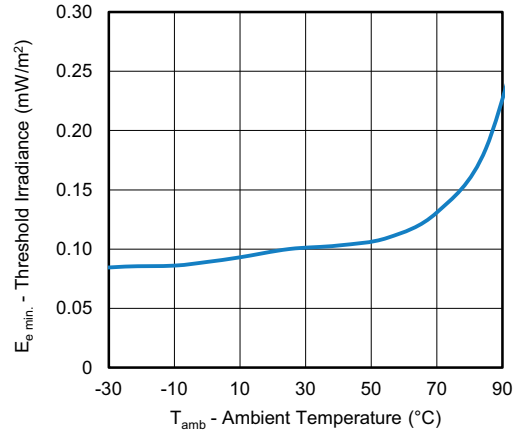


Fig. 9 - Sensitivity vs. Ambient Temperature

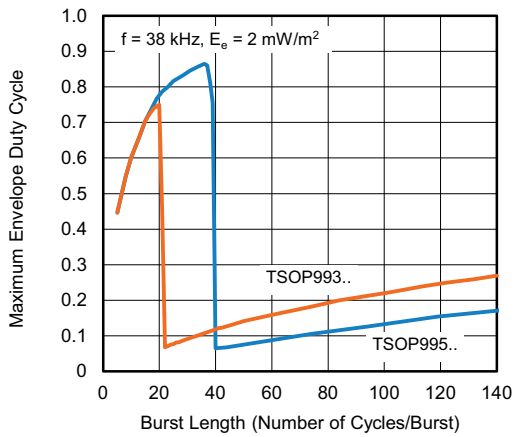


Fig. 8 - Max. Envelope Duty Cycle vs. Burst Length

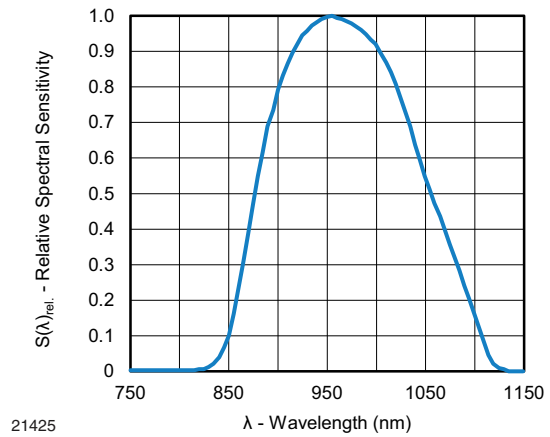


Fig. 10 - Relative Spectral Sensitivity vs. Wavelength

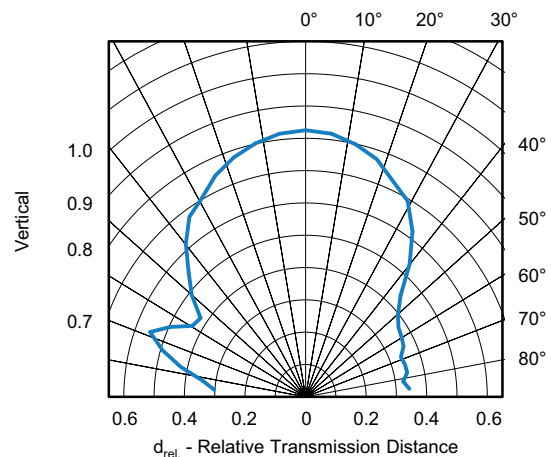
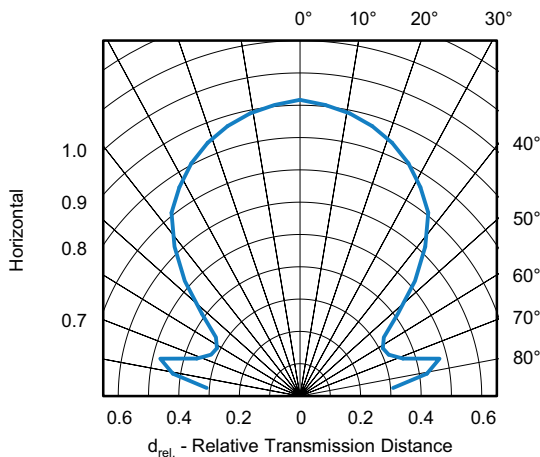


Fig. 11 - Horizontal and Vertical Directivity

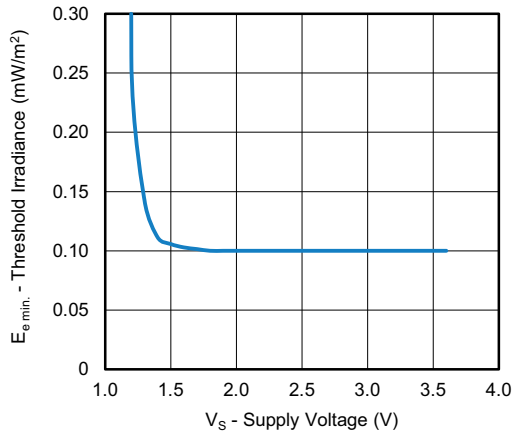


Fig. 12 - Sensitivity vs. Supply Voltage

**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)



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



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

	<b>TSOP993..</b>	<b>TSOP995..</b>
Minimum burst length	6 cycles/burst	6 cycles/burst
After each burst of length A gap time is required of	6 to 20 cycles ≥ 8 cycles	6 to 38 cycles ≥ 8 cycles
For bursts greater than a minimum gap time in the data stream is needed of	20 cycles > 6 x burst length	38 cycles > 20 ms
Maximum number of continuous short bursts/second	2500	2500
RCMM code	Preferred	Yes
XMP-1 code	Preferred	Yes
r-map code	Yes	Preferred
RECS-80 code	Preferred	Yes
Suppression of interference from fluorescent lamps	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 TSOP992..., TSOP994..., or TSOP996..

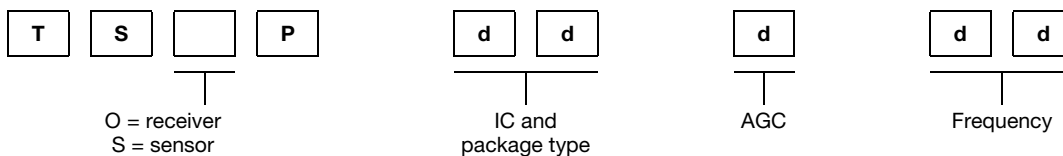
## PACKAGE DIMENSIONS in millimeters



## BULK PACKAGING

Standard shipping for TVCast is in conductive plastic bags. The packing quantity is determined by weight and the number of components per carton may vary by a maximum of ± 0.3 %.

## ORDERING INFORMATION



### Note

- d = "digit", please consult the list of available devices create a valid part number

Example: TSOP99338

## PACKAGING QUANTITY

- 400 pieces per bag (each bag is individually boxed)
- 6 bags per carton



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