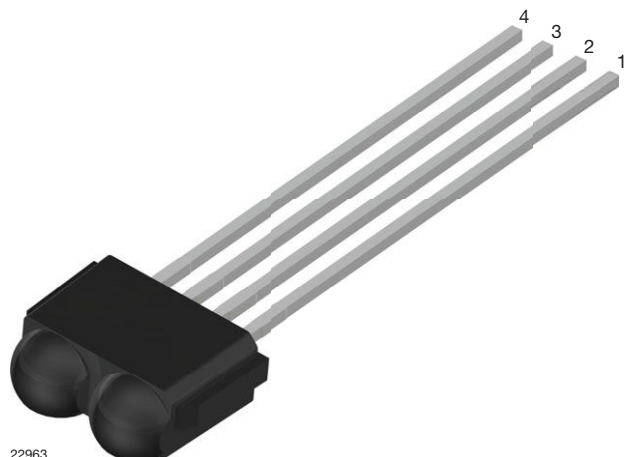


## IR Receiver Modules for Remote Control Systems



22963

### DESIGN SUPPORT TOOLS

[click logo to get started](#)

**3D**  
Models  
Available

### MECHANICAL DATA

#### Pinning:

1, 4 = GND, 2 =  $V_S$ , 3 = OUT

### 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
- Two lenses for high sensitivity
- Insensitive to supply voltage ripple and noise
- Ultra small top-view PCB footprint
- 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)

### DESCRIPTION

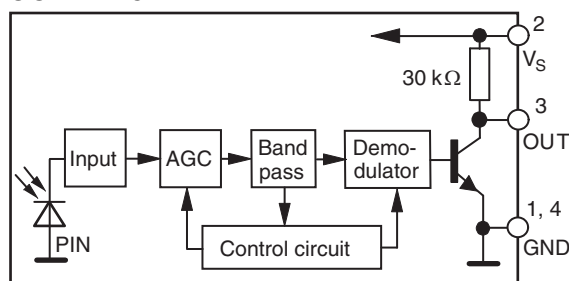
The TSOP39... series are miniaturized receiver modules for infrared remote control systems. Two PIN diodes and a preamplifier are assembled on a leadframe, the epoxy package contains an IR filter. The demodulated output signal can be directly connected to digital circuitry for decoding.

The TSOP394.. series devices are optimized to suppress almost all spurious pulses from energy saving lamps like CFLs. The AGC4 used in the TSOP394.. may suppress some data signals. The TSOP392.. series are provided primarily for compatibility with old AGC2 designs. New designs should prefer the TSOP394.. series containing the newer AGC4.

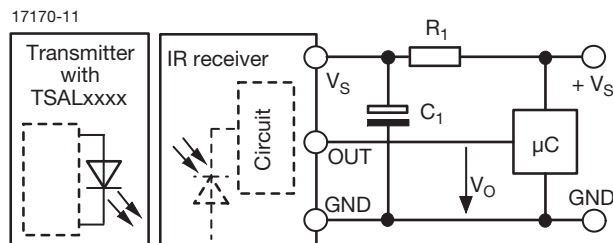
These components have not been qualified according to automotive specifications.

### PARTS TABLE

AGC		NOISY ENVIRONMENTS AND LONG BURSTS (AGC2)	VERY NOISY ENVIRONMENTS AND LONG BURSTS (AGC4)
Carrier frequency	30 kHz	TSOP39230	TSOP39430
	33 kHz	TSOP39233	TSOP39433
	36 kHz	TSOP39236	TSOP39436 <sup>(1)(2)(3)</sup>
	38 kHz	TSOP39238	TSOP39438 <sup>(4)(5)</sup>
	40 kHz	TSOP39240	TSOP39440
	56 kHz	TSOP39256	TSOP39456 <sup>(6)(7)</sup>
Package		TVCast	
Pinning		1, 4 = GND, 2 = $V_S$ , 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> RC-5 <sup>(2)</sup> RC-6 <sup>(3)</sup> Panasonic <sup>(4)</sup> NEC <sup>(5)</sup> Sharp <sup>(6)</sup> r-step <sup>(7)</sup> Thomson RCA	

**BLOCK DIAGRAM**


20445-1

**APPLICATION CIRCUIT**

 $R_1$  and  $C_1$  recommended to reduce supply ripple for  $V_S < 2.8\text{ V}$ 
**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	$T_{amb} \leq 85\text{ °C}$	$P_{tot}$	10	mW
Soldering temperature	$t \leq 10\text{ s}$ , 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** ( $T_{amb} = 25\text{ °C}$ , unless otherwise specified)

PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT
Supply voltage		$V_S$	2.5	-	5.5	V
Supply current	$E_v = 0$ , $V_S = 3.3\text{ V}$	$I_{SD}$	0.27	0.35	0.45	mA
	$E_v = 40\text{ klx}$ , sunlight	$I_{SH}$	-	0.45	-	mA
Transmission distance	$E_v = 0$ , test signal see Fig. 1, IR diode TSAL6200, $I_F = 50\text{ mA}$	$d$	-	30	-	m
Output voltage low	$I_{OSL} = 0.5\text{ mA}$ , $E_e = 0.7\text{ mW/m}^2$ , test signal see Fig. 1	$V_{OSL}$	-	-	100	mV
Minimum irradiance	Pulse width tolerance: $t_{pi} - 5/f_0 < t_{po} < t_{pi} + 6/f_0$ , test signal see Fig. 1	$E_e\text{ min.}$	-	0.08	0.12	mW/m <sup>2</sup>
Maximum irradiance	$t_{pi} - 5/f_0 < t_{po} < t_{pi} + 6/f_0$ , test signal see Fig. 1	$E_e\text{ max.}$	30	-	-	W/m <sup>2</sup>
Directivity	Angle of half transmission distance	$\phi_{1/2}$	-	$\pm 45$	-	°

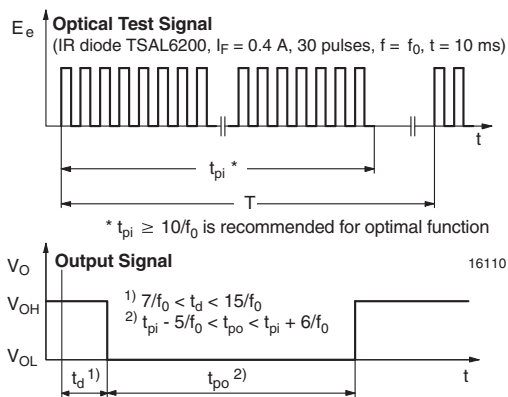
**TYPICAL CHARACTERISTICS** ( $T_{amb} = 25\text{ °C}$ , unless otherwise specified)


Fig. 1 - Output Active Low

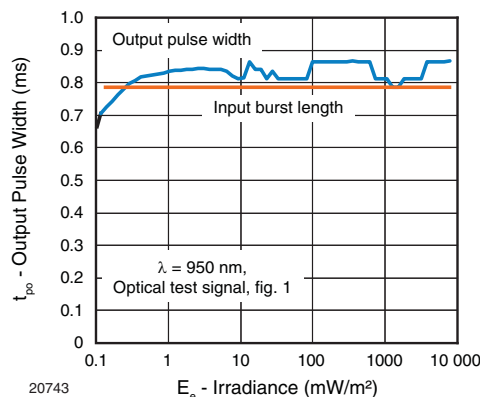


Fig. 2 - Pulse Length and Sensitivity in Dark Ambient

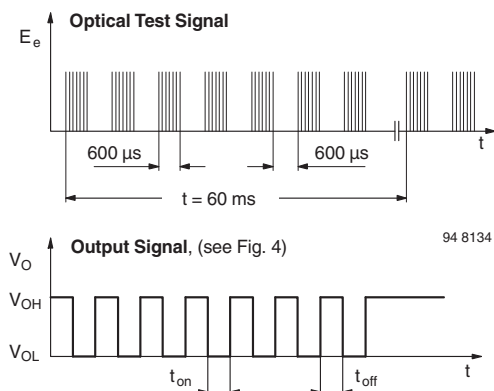


Fig. 3 - Output Function

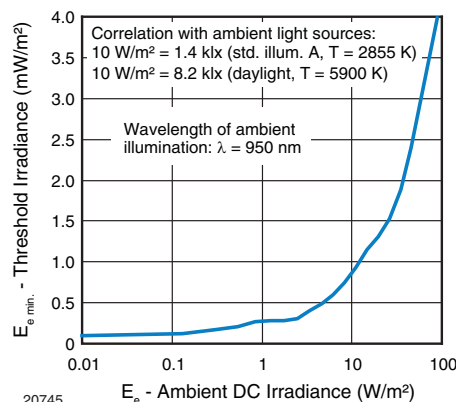


Fig. 6 - Sensitivity in Bright Ambient

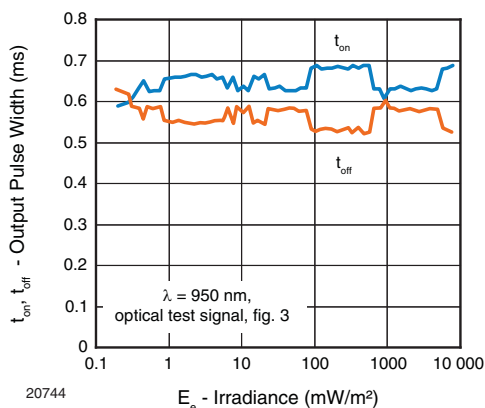


Fig. 4 - Output Pulse Diagram

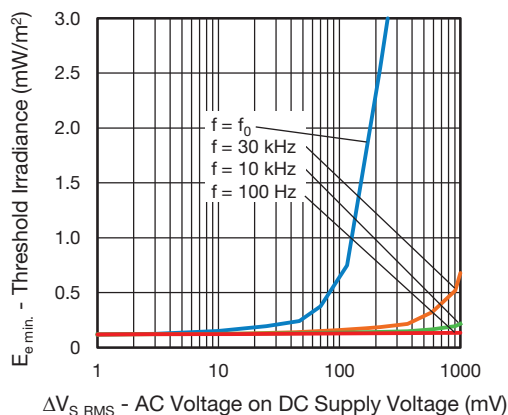


Fig. 7 - Sensitivity vs. Supply Voltage Disturbances

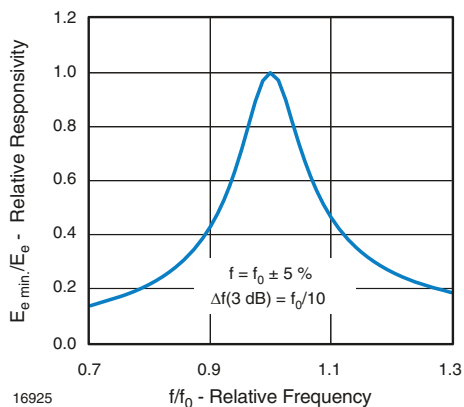


Fig. 5 - Frequency Dependence of Responsivity

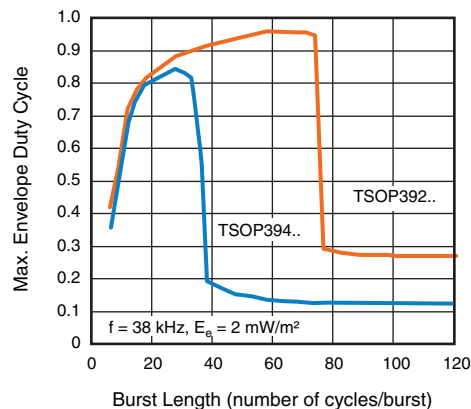


Fig. 8 - Max. Envelope Duty Cycle vs. Burst Length

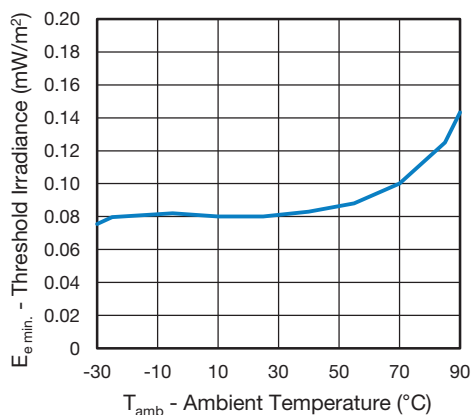


Fig. 9 - Sensitivity vs. Ambient Temperature

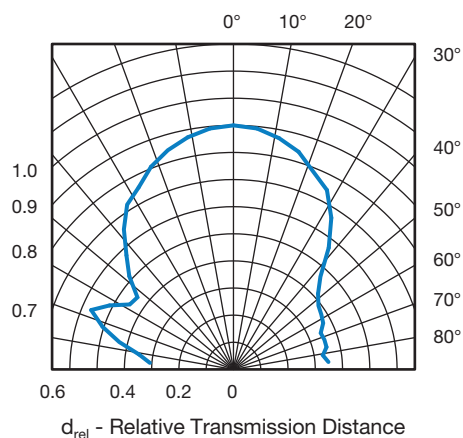


Fig. 12 - Vertical Directivity

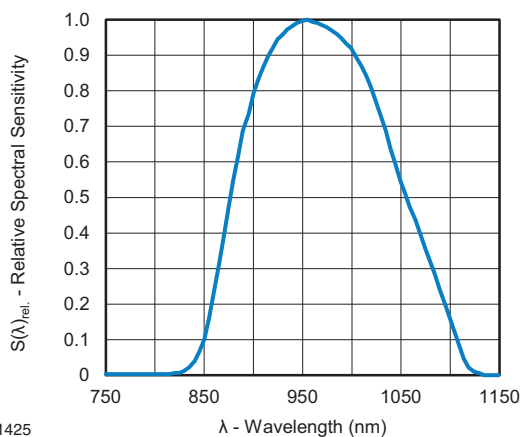


Fig. 10 - Relative Spectral Sensitivity vs. Wavelength

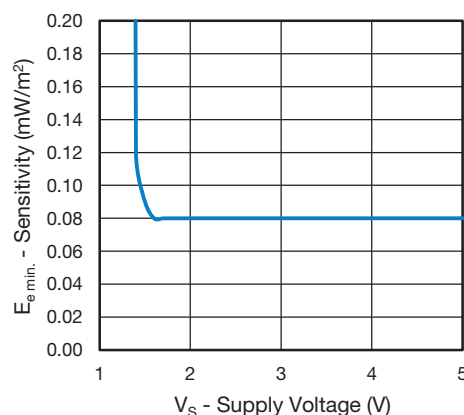


Fig. 13 - Sensitivity vs. Supply Voltage

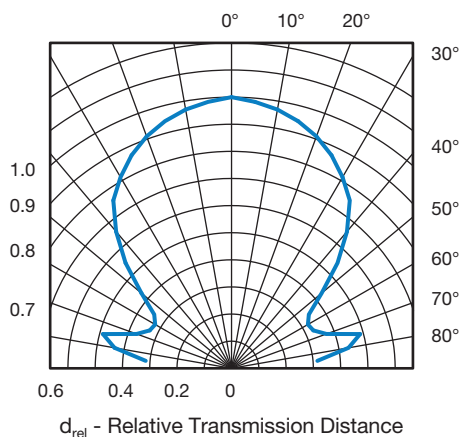


Fig. 11 - Horizontal Directivity

**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 pattern from fluorescent lamps with electronic ballasts (see Fig. 14 or Fig. 15)

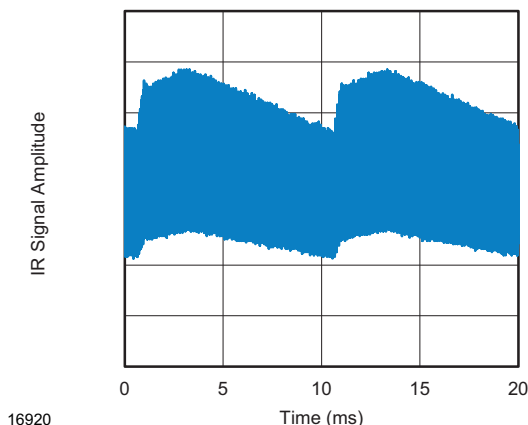


Fig. 14 - IR Disturbance from Fluorescent Lamp With Low Modulation

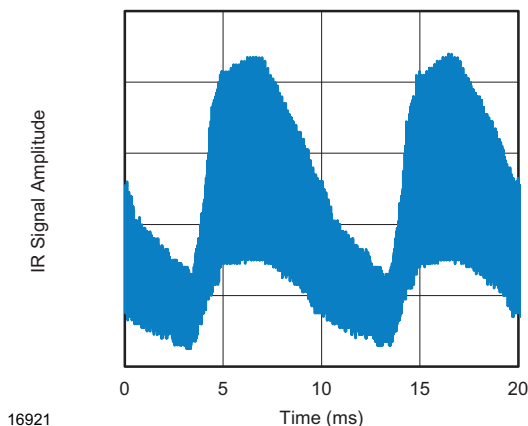
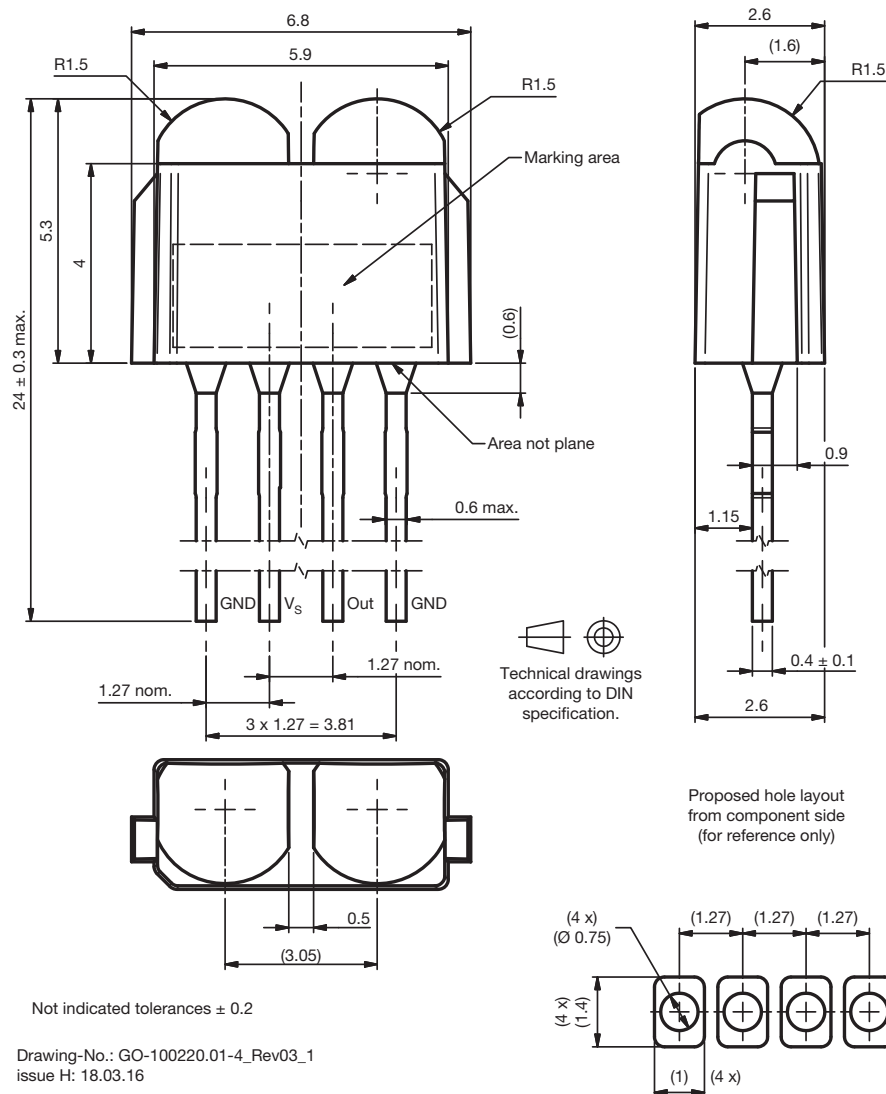


Fig. 15 - IR Disturbance from Fluorescent Lamp With High Modulation

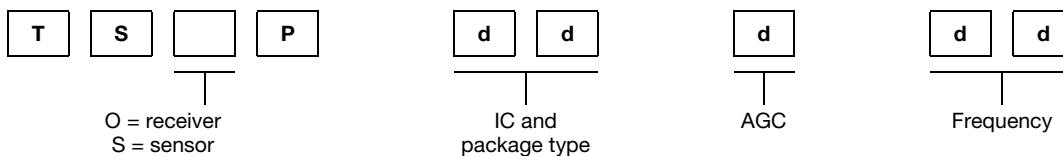
	<b>TSOP392..</b>	<b>TSOP394..</b>
Minimum burst length	10 cycles/burst	10 cycles/burst
After each burst of length a minimum gap time is required of	10 to 70 cycles ≥ 10 cycles	10 to 35 cycles ≥ 10 cycles
For bursts greater than a minimum gap time in the data stream is needed of	70 cycles > 4 x burst 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. 13)	Complex and critical disturbance patterns are suppressed (example: signal pattern of Fig. 14 or highly dimmed LCDs)

**Note**

- For data formats with short bursts please see the datasheet for TSOP393.., TSOP395..

**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: TSOP39438**

**PACKAGING QUANTITY**

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



## Disclaimer

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