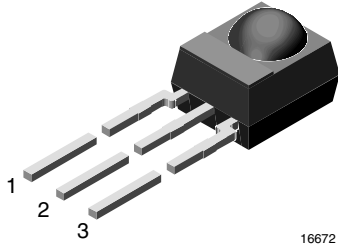


# IR Receiver Modules for Mid Range Proximity Sensors



## MECHANICAL DATA

### Pinning

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

## FEATURES

- Low supply current
- Photo detector and preamplifier in one package
- Internal filter for burst frequency
- Improved shielding against EMI
- Supply voltage: 2.7 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



**RoHS**  
COMPLIANT

## DESCRIPTION

The TSOP4P.. series are miniaturized receivers for Mid range proximity sensor systems. A PIN diode and a preamplifier are assembled on a lead frame, the epoxy package acts as an IR filter.

The output pulse width of the TSOP4P.. has an almost linear relationship to the distance of the emitter or the distance of an reflecting object. The TSOP4P.. is optimized to suppress almost all spurious pulses from energy saving fluorescent lamps.

This component has not been qualified according to automotive specifications.

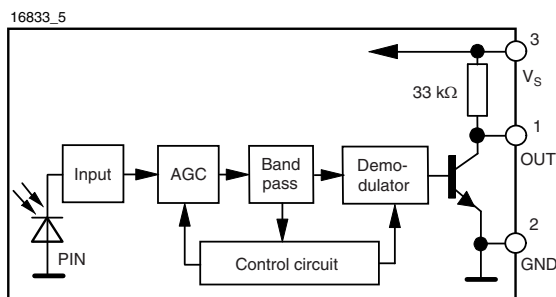
## PARTS TABLE

CARRIER FREQUENCY	STANDARD APPLICATIONS (AGC2/AGC8)
38 kHz <sup>(1)</sup>	TSOP4P38

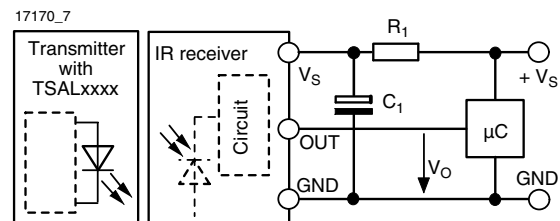
### Note

<sup>(1)</sup> Other frequencies available by request

## BLOCK DIAGRAM



## APPLICATION CIRCUIT



The external components  $R_1$  and  $C_1$  are optional to improve the robustness against electrical overstress (typical values are  $R_1 = 100 \Omega$ ,  $C_1 = 0.1 \mu\text{F}$ ). The output voltage  $V_O$  should not be pulled down to a level below 1 V by the external circuit. The capacitive load at the output should be less than 2 nF.

ABSOLUTE MAXIMUM RATINGS				
PARAMETER	TEST CONDITION	SYMBOL	VALUE	UNIT
Supply voltage (pin 3)		$V_S$	- 0.3 to + 6	V
Supply current (pin 3)		$I_S$	5	mA
Output voltage (pin 1)		$V_O$	- 0.3 to 5.5	V
Voltage at output to supply		$V_S - V_O$	- 0.3 to ( $V_S + 0.3$ )	V
Output current (pin 1)		$I_O$	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	$T_{amb} \leq 85 \text{ }^\circ\text{C}$	$P_{tot}$	10	mW
Soldering temperature	$t \leq 10 \text{ s, } 1 \text{ mm from case}$	$T_{sd}$	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 ( $T_{amb} = 25 \text{ }^\circ\text{C}$ , unless otherwise specified)						
PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT
Supply current (pin 3)	$E_v = 0, V_S = 5 \text{ V}$	$I_{SD}$	0.65	0.85	1.05	mA
	$E_v = 40 \text{ klx, sunlight}$	$I_{SH}$		0.95		mA
Supply voltage		$V_S$	2.7		5.5	V
Transmission distance	$E_v = 0$ , test signal see fig. 1, IR diode TSAL6200, $I_F = 400 \text{ mA}$	$d$		45		m
Output voltage low (pin 1)	$I_{OSL} = 0.5 \text{ mA, } E_e = 0.7 \text{ mW/m}^2$ , 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	$E_e \text{ min.}$		0.17	0.35	$\text{mW/m}^2$
Maximum irradiance	$t_{pi} - 5/f_0 < t_{po} < t_{pi} + 6/f_0$ , test signal see fig. 1	$E_e \text{ max.}$	30			$\text{W/m}^2$
Directivity	Angle of half transmission distance	$\phi_{1/2}$		$\pm 45$		deg

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

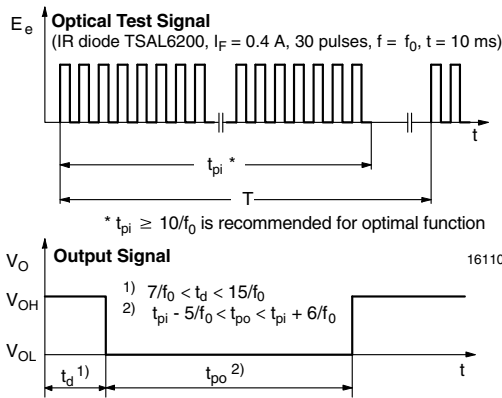


Fig. 1 - Output Active Low

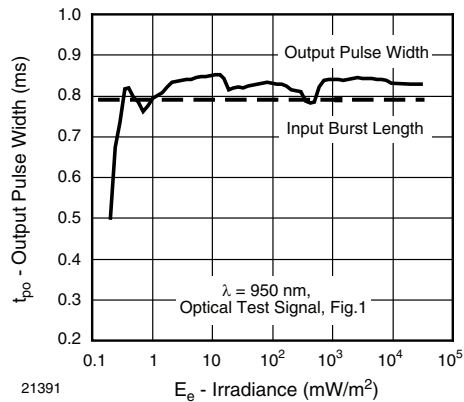


Fig. 2 - Pulse Length and Sensitivity in Dark Ambient

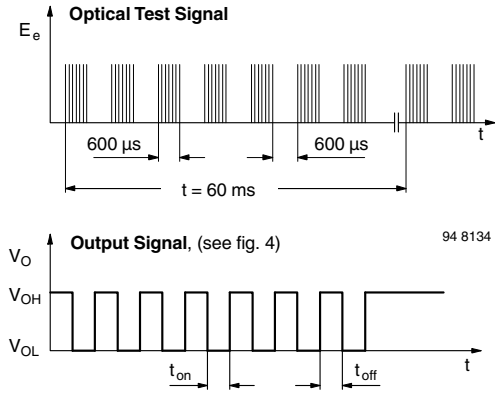


Fig. 3 - Output Function

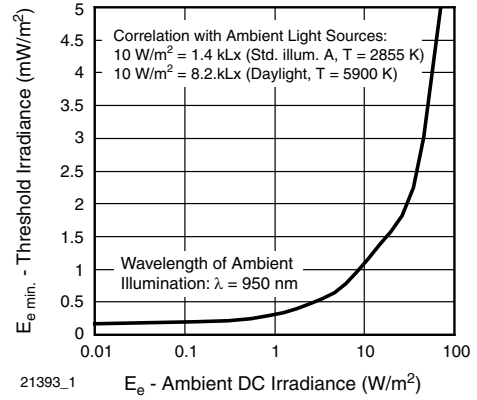


Fig. 6 - Sensitivity in Bright Ambient

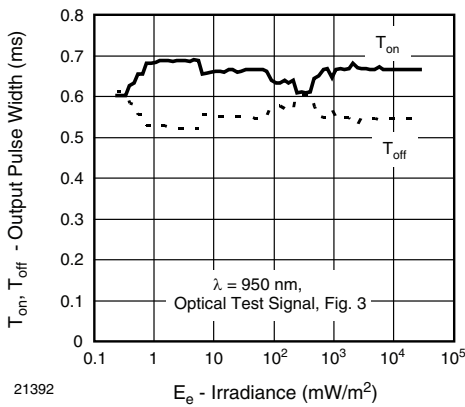


Fig. 4 - Output Pulse Diagram

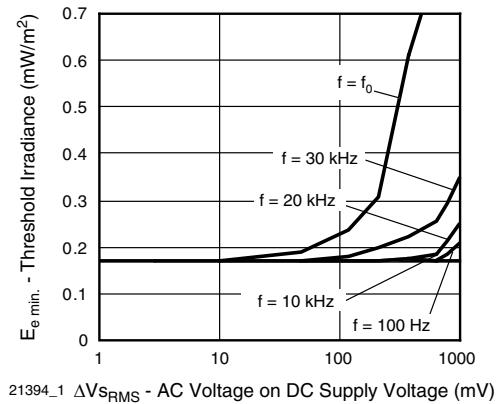


Fig. 7 - Sensitivity vs. Supply Voltage Disturbances

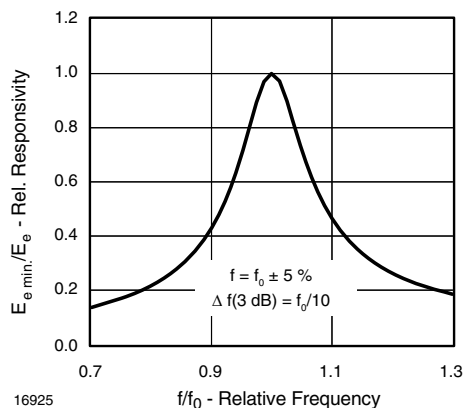


Fig. 5 - Frequency Dependence of Responsivity

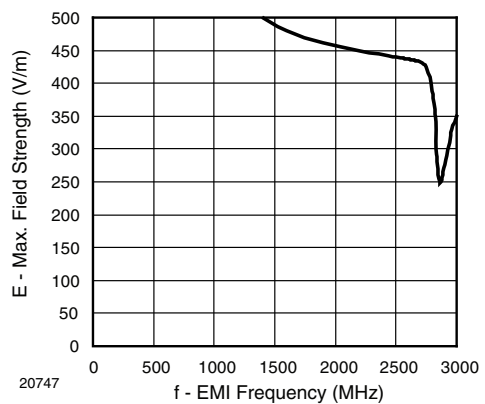


Fig. 8 - Sensitivity vs. Electric Field Disturbances

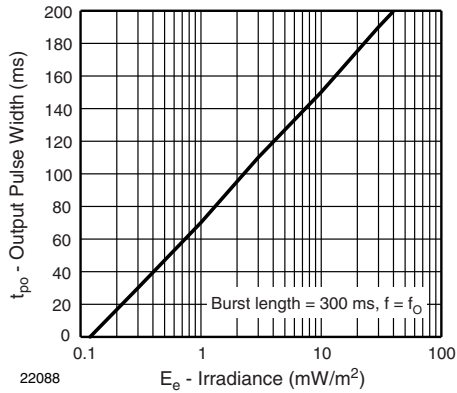


Fig. 9 - Max. Output Pulse Width vs. Irradiance

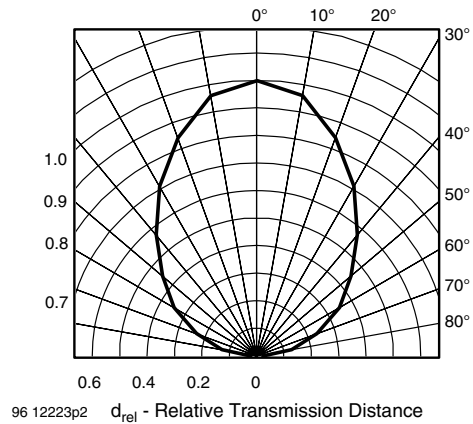


Fig. 12 - Horizontal Directivity

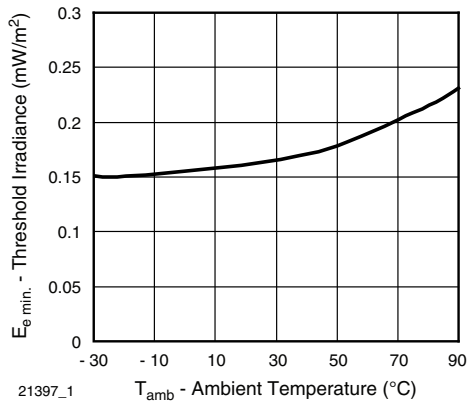


Fig. 10 - Sensitivity vs. Ambient Temperature

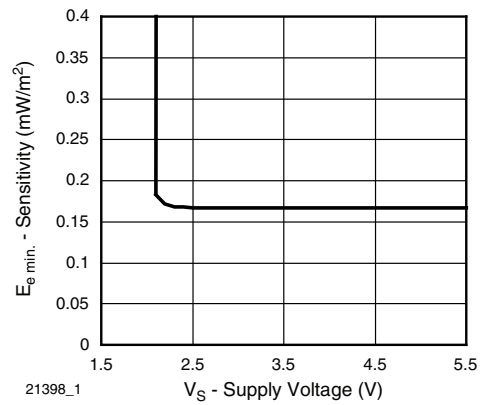


Fig. 13 - Sensitivity vs. Supply Voltage

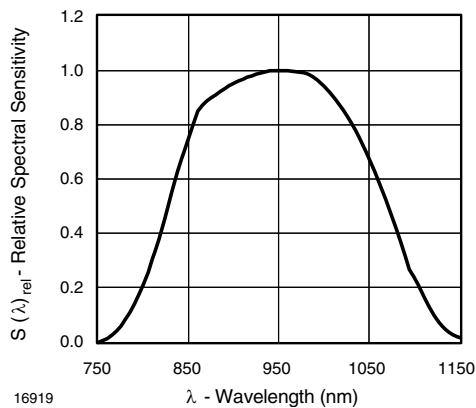
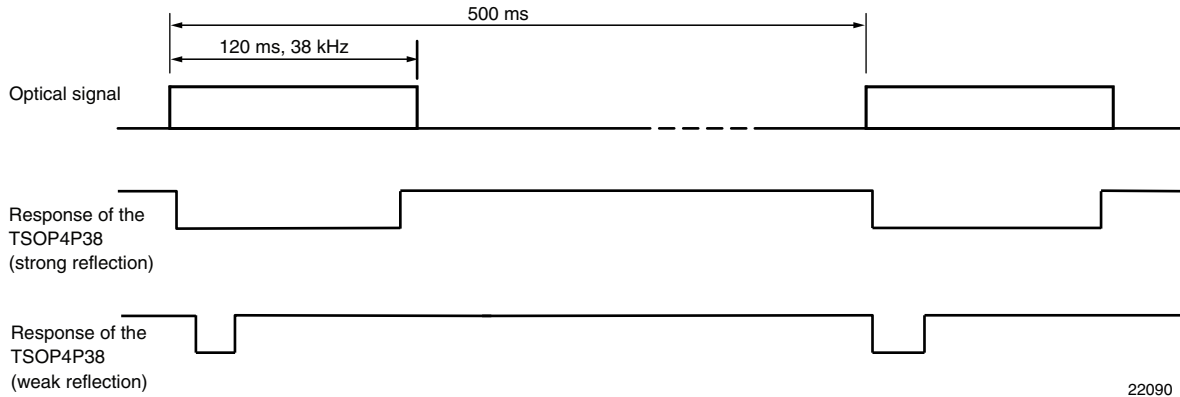


Fig. 11 - Relative Spectral Sensitivity vs. Wavelength

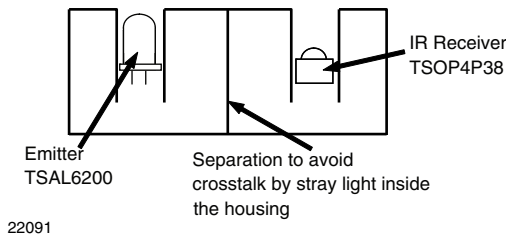
The typical application of the TSOP4P38 is a reflective sensor with analog information contained in its output. Such a sensor is evaluating the time required by the AGC to suppress a quasi continuous signal. The time required to suppress such a signal is longer when the signal is strong than when the signal is weak, resulting in a pulse length corresponding to the distance of an object from the sensor. This kind of analog information can be evaluated by a microcontroller. The absolute amount of reflected light depends much on the environment and is not evaluated. Only sudden changes of the amount of reflected light, and therefore changes in the pulse width, are evaluated using this application.

Example of a signal pattern:



22090

Example for a sensor hardware:



There should be no common window in front of the emitter and receiver in order to avoid crosstalk by guided light through the window.

The logarithmic characteristic of the AGC in the TSOP4P38 results in an almost linear relationship between distance and pulse width. Ambient light has also some impact to the pulse width of this kind of sensor, making the pulse shorter.

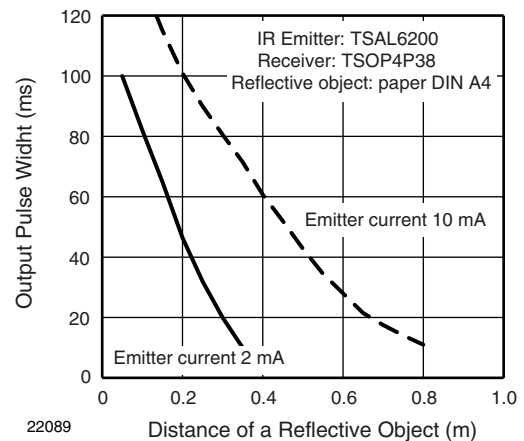


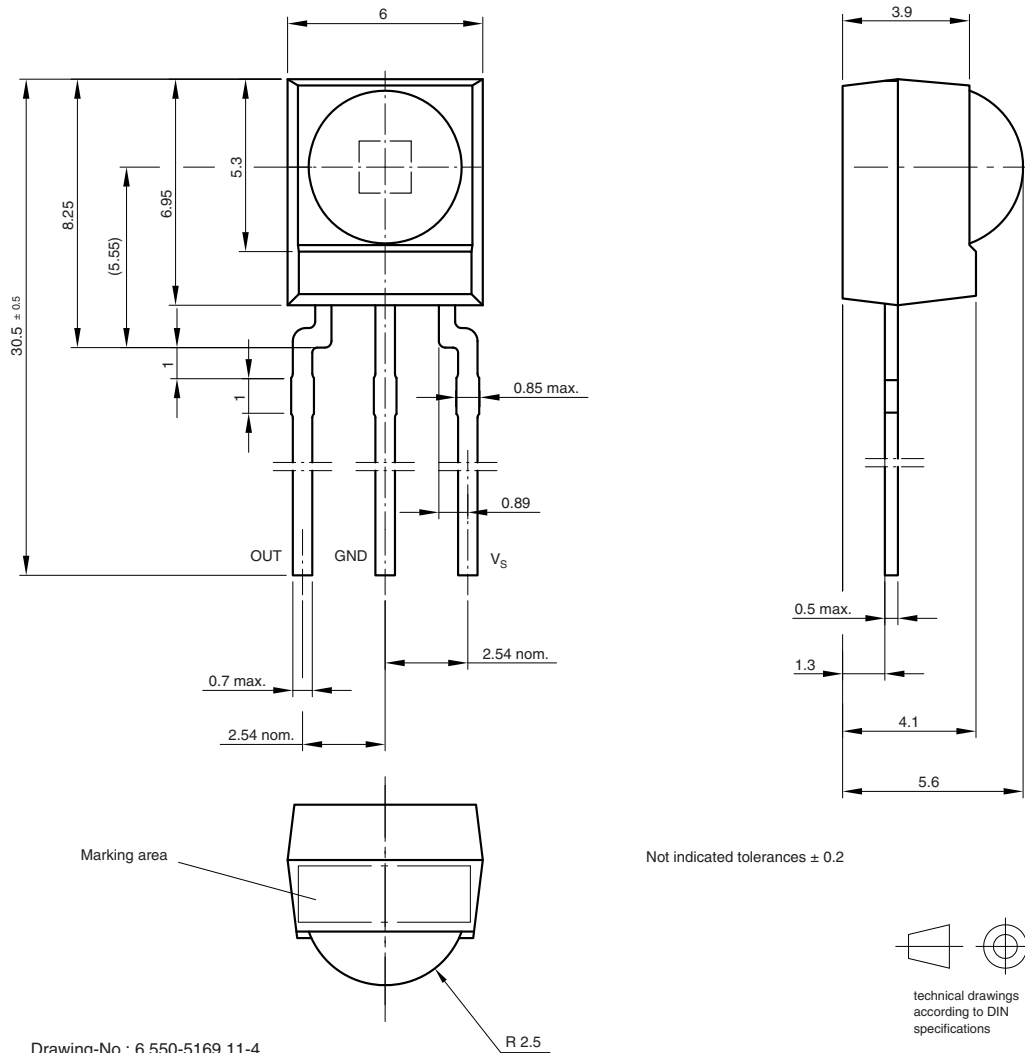
Fig. 14 - Distance Characteristic of a Typical Reflective Sensor using the TSOP4P38

# TSOP4P..

Vishay Semiconductors IR Receiver Modules for Mid Range Proximity Sensors



## PACKAGE DIMENSIONS in millimeters



Drawing-No.: 6.550-5169.11-4  
Issue: 13; 17.12.08  
16003



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