**Vishay Semiconductors** 

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



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#### **ORDERING CODE**

Taping: TSOP37...TT1 - top view taped TSOP37...TT2 - top view taped

#### FEATURES

- Very low supply current
- Photo detectors 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.vishay.com/doc?99912

#### DESCRIPTION

The TSOP37... series are miniaturized SMD IR receiver modules for infrared remote control systems. A PIN diode and a preamplifier are assembled on a PCB, the epoxy package contains an IR filter.

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

The TSOP372.., TSOP374.. are optimized to suppress almost all spurious pulses from energy saving lamps like CFLs. The AGC4 used in the TSOP374.. may suppress some data signals. The TSOP372.. is a legacy product for all common IR remote control data formats. Between these two receiver types, the TSOP374.. is preferred. Customers should initially try the TSOP374.. in their design.

These components have not been qualified according to automotive specifications.

PARTS TABLE					
AGC		LEGACY, FOR LONG BURST REMOTE CONTROLS (AGC2)	RECOMMENDED FOR LONG BURST CODES (AGC4) <sup>(1)</sup>		
	36 kHz	TSOP37236	TSOP37436 <sup>(2)(3)(4)</sup>		
Carrier	38 kHz	TSOP37238	TSOP37438 <sup>(5)(6)</sup>		
frequency	40 kHz	TSOP37240	TSOP37440		
	56 kHz	TSOP37256	TSOP37456 <sup>(7)(8)</sup>		
Package		Belobog			
Pinning		1 = OUT, 2, 3, 6, 7, 8 = GND, 4, 5 = V <sub>S</sub>			
Dimensions (mm)		3.95 W x 3.95 H x 0.8 D			
Mounting		SMD			
Application		Remote control			
Best remote control code		<sup>(2)</sup> RC-5 <sup>(3)</sup> RC-6 <sup>(4)</sup> Panasonic <sup>(5)</sup> NEC <sup>(6)</sup> Sharp <sup>(7)</sup> r-step <sup>(8)</sup> Thomson RCA			

Note

<sup>(1)</sup> We advise try AGC4 first if the burst length is unknown.

RoHS COMPLIANT HALOGEN







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#### **BLOCK DIAGRAM**



20445-5

#### **APPLICATION CIRCUIT**



 $\rm R_1$  and  $\rm C_1$  are recommended for protection against EOS. Components should be in the range of 33  $\Omega$  <  $\rm R_1$  < 1 k $\Omega$ ,  $\rm C_1$  > 0.1  $\mu F.$ 

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 <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 voltage		Vs	2.5		5.5	V
Supply ourront	$V_{S} = 3.3 V, E_{v} = 0$	I <sub>SD</sub>	0.27	0.35	0.45	mA
	$E_v = 40$ klx, sunlight	I <sub>SH</sub>		0.45		mA
Transmission distance	$E_v = 0$ , IR diode TSAL6200, I <sub>F</sub> = 200 mA, test signal see fig. 1	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>		0.12	0.25	mW/m²
Maximum irradiance	$\begin{array}{l} t_{pi} \text{ - } 5/f_o < t_{po} < t_{pi} + 6/f_o, \\ \text{test signal see fig. 1} \end{array}$	E <sub>e max.</sub>	30			W/m <sup>2</sup>
Directivity	Angle of half transmission distance	φ1/2		± 75		deg

# TSOP372.., TSOP374..



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



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Fig. 1 - Output Function



Fig. 2 - Output Pulse Width vs. Irradiance





Fig. 4 - Output Pulse Diagram



Fig. 5 - Frequency Dependance of Responsivity



Fig. 6 - Sensitivity in Bright Ambient

Rev. 1.5, 27-Feb-15

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Fig. 7 - Sensitivity vs. Supply Voltage Disturbances



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



Fig. 9 - Sensitivity vs. Ambient Temperature

1.0 0.9 0.8 0.7 0.6 0.5 0.4 0.3

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Fig. 11 - Directivity



Fig. 12 - Sensitivity vs. Supply Voltage

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#### SUITABLE DATA FORMAT

The TSOP372.., TSOP374.. 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 TSOP372.., TSOP374.. 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 figure 13 or figure 14)

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Fig. 13 - IR Signal from Fluorescent Lamp with Low Modulation



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

	TSOP372	TSOP374
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	Most common disturbance patterns are suppressed	Even extreme disturbance patterns are suppressed

Notes

• For data formats with short bursts (less than 10 carrier cycles) please see the datasheet for TSOP373.., TSOP375...

 Best choice of AGC for some popular IR-codes: TSOP37436: RC-5, RC-6, Panasonic; TSOP37438: NEC, Sharp, r-step;

TSOP37456: r-step, Thomson RCA

• For Sony 12, 15, and 20 bit IR-codes please see the datasheet of TSOP37S40



#### **PACKAGE DIMENSIONS** in millimeters

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• Use a soldering iron of 25 W or less. Adjust the

· Handle products only after the temperature has cooled off

temperature of the soldering iron below 300 °C

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#### **ASSEMBLY INSTRUCTIONS**

#### **Reflow Soldering**

- Reflow soldering must be done within 168 h while stored under a max. temperature of 30 °C, 60 % RH after opening the dry pack envelope
- Set the furnace temperatures for pre-heating and heating in accordance with the reflow temperature profile as shown in the diagram. Exercise extreme care to keep the maximum temperature below 260 °C. The temperature shown in the profile means the temperature at the device surface. Since there is a temperature difference between the component and the circuit board, it should be verified that the temperature of the device is accurately being measured
- Handling after reflow should be done only after the work surface has been cooled off

#### VISHAY LEAD (Pb)-FREE REFLOW SOLDER PROFILE

#### 300 <u>m</u>ax. 260 °C 255 240 250 °C C° 245 °C 217 °C 200 max. 20 s T (°C) 150 max. 120 s max. 100 s 100 max. Ramp Up 3 °C/s max. Ramp Down 6 °C/s 50 0 100 0 50 150 200 250 300 t (s) 19800 max. 2 cycles allowed

Manual Soldering

• Finish soldering within 3 s

ORDERING INFORMATION				
ORDERING CODE	PACKAGING	VOLUME <sup>(1)</sup>	REMARKS	
TSOP37TT1	Tapa and real	MOQ: 1800 pcs	2.05 mm x 2.05 mm x 0.75 mm	
TSOP37TT2	Tape and reel	MOQ: 7000 pcs	3.95 mm x 3.95 mm x 0.75 mm	

Note

(1) MOQ: minimum order quantity

# TSOP372.., TSOP374..



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#### TAPING VERSION TSOP37... DIMENSIONS in millimeters



Drawing-No.: 9.700-5347.01-4 Issue: 1; 14.11.11 Not indicated tolerances  $\pm 0.1$ 

TSOP372.., TSOP374..





#### LABEL

#### Standard bar code labels for finished goods

The standard bar code labels are product labels and used for identification of goods. The finished goods are packed in final packing area. The standard packing units are labeled with standard bar code labels before transported as finished goods to warehouses. The labels are on each packing unit and contain Vishay Semiconductor GmbH specific data.

VISHAY SEMICONDUCTOR GmbH STANDARD BAR CODE PRODUCT LABEL (finished goods)				
PLAIN WRITING	ABBREVIATION	LENGTH		
Item-description	-	18		
Item-number	INO	8		
Selection-code	SEL	3		
LOT-/serial-number	BATCH	10		
Data-code	COD	3 (YWW)		
Plant-code	PTC	2		
Quantity	QTY	8		
Accepted by	ACC	-		
Packed by	PCK	-		
Mixed code indicator	MIXED CODE	-		
Origin	xxxxxx+	Company logo		
LONG BAR CODE TOP	ТҮРЕ	LENGTH		
Item-number	N	8		
Plant-code	N	2		
Sequence-number	Х	3		
Quantity	N	8		
Total length	-	21		
SHORT BAR CODE BOTTOM	ТҮРЕ	LENGTH		
Selection-code	Х	3		
Data-code	N	3		
Batch-number	Х	10		
Filter	-	1		
Total length	-	17		

#### **DRY PACKING**

The reel is packed in an anti-humidity bag to protect the devices from absorbing moisture during transportation and storage.



#### **FINAL PACKING**

The sealed reel is packed into a cardboard box. A secondary cardboard box is used for shipping purposes.

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#### **RECOMMENDED METHOD OF STORAGE**

Dry box storage is recommended as soon as the aluminum bag has been opened to prevent moisture absorption. The following conditions should be observed, if dry boxes are not available:

- Storage temperature 10 °C to 30 °C
- Storage humidity  $\leq$  60 % RH max.

After more than 168 h under these conditions moisture content will be too high for reflow soldering.

In case of moisture absorption, the devices will recover to the former condition by drying under the following condition: 192 h at 40 °C + 5 °C / - 0 °C and < 5 % RH (dry air / nitrogen) or

96 h at 60  $^{\circ}\text{C}$  + 5  $^{\circ}\text{C}$  and < 5 % RH for all device containers or

24 h at 125 °C + 5 °C not suitable for reel or tubes.

An EIA JEDEC<sup>®</sup> standard J-STD-020 level 3 label is included on all dry bags.



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EIA JEDEC standard J-STD-020 level 3 label is included on all dry bags

#### ESD PRECAUTION

Proper storage and handling procedures should be followed to prevent ESD damage to the devices especially when they are removed from the antistatic shielding bag. Electrostatic sensitive devices warning labels are on the packaging.

#### VISHAY SEMICONDUCTORS STANDARD BAR CODE LABELS

The Vishay Semiconductors standard bar code labels are printed at final packing areas. The labels are on each packing unit and contain Vishay Semiconductors specific data.

#### BAR CODE PRODUCT LABEL (example)



22178



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