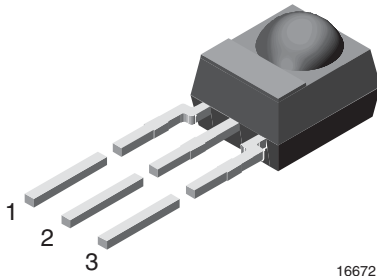


IR Receiver Modules for Remote Control Systems



16672

MECHANICAL DATA

Pinning for TSOP44..., TSOP48...:

 1 = OUT, 2 = GND, 3 = V_S

Pinning for TSOP22..., TSOP24...:

 1 = OUT, 2 = V_S , 3 = GND

FEATURES

- 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
- Material categorization:
for definitions of compliance please see www.vishay.com/doc?99912



DESCRIPTION

The TSOP22..., TSOP48..., TSOP24.. and TSOP44.. series are miniaturized IR receiver modules for infrared remote control systems. A PIN diode and a preamplifier are assembled on lead frame, the epoxy package contains an IR filter.

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

The TSOP24..., TSOP44.. are optimized to suppress almost all spurious pulses from energy saving lamps like CFLs. The AGC4 used in the TSOP24.. and TSOP44.. may suppress some data signals. The TSOP22..., TSOP48.. are legacy products for all common IR remote control data formats. Between these four receiver types, the TSOP24..., TSOP44.. are preferred. Customers should initially try the TSOP24..., TSOP44 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) (1) | |
| Carrier frequency | 30 kHz | TSOP4830 | TSOP2230 | TSOP4430 | TSOP2430 |
| | 33 kHz | TSOP4833 | TSOP2233 | TSOP4433 | TSOP2433 |
| | 36 kHz | TSOP4836 | TSOP2236 | TSOP4436 (2)(3)(4) | TSOP2436 (2)(3)(4) |
| | 38 kHz | TSOP4838 | TSOP2238 | TSOP4438 (5)(6)(7) | TSOP2438 (5)(6)(7) |
| | 40 kHz | TSOP4840 | TSOP2240 | TSOP4440 | TSOP2440 |
| | 56 kHz | TSOP4856 | TSOP2256 | TSOP4456 (7)(8) | TSOP2456 (7)(8) |
| Package | Mold | | | | |
| Pinning | 1 = OUT, 2 = GND, 3 = V_S | 1 = OUT, 2 = V_S , 3 = GND | 1 = OUT, 2 = GND, 3 = V_S | 1 = OUT, 2 = V_S , 3 = GND | |
| Dimensions (mm) | 6.0 W x 6.95 H x 5.6 D | | | | |
| Mounting | Leaded | | | | |
| Application | Remote control | | | | |
| Best remote control code | (2) RC-5 (3) RC-6 (4) Panasonic (5) NEC (6) Sharp (7) r-step (8) Thomson RCA | | | | |

Note

(1) We advise try AGC4 first if the burst length is unknown.

BLOCK DIAGRAM

APPLICATION CIRCUIT


The external components R_1 and C_1 are optional to improve the robustness against electrical overstress (typical values are $R_1 = 100 \Omega$, $C_1 = 0.1 \mu\text{F}$).

ABSOLUTE MAXIMUM RATINGS

| PARAMETER | TEST CONDITION | SYMBOL | VALUE | UNIT |
|-----------------------------|---|------------------|-----------------------|--------------------|
| Supply voltage | | V_S | -0.3 to +6 | V |
| Supply current | | I_S | 5 | mA |
| Output voltage | | 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 | | I_O | 5 | mA |
| Junction temperature | | T_j | 100 | $^{\circ}\text{C}$ |
| Storage temperature range | | T_{stg} | -25 to +85 | $^{\circ}\text{C}$ |
| Operating temperature range | | T_{amb} | -25 to +85 | $^{\circ}\text{C}$ |
| Power consumption | $T_{\text{amb}} \leq 85 \text{ }^{\circ}\text{C}$ | P_{tot} | 10 | mW |
| Soldering temperature | $t \leq 10 \text{ s}$, 1 mm from case | T_{sd} | 260 | $^{\circ}\text{C}$ |

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

| PARAMETER | TEST CONDITION | SYMBOL | MIN. | TYP. | MAX. | UNIT |
|-----------------------|---|--------------------|------|----------|------|-----------------|
| Supply current | $E_v = 0$, $V_S = 5 \text{ V}$ | I_{SD} | 0.55 | 0.7 | 0.9 | mA |
| | $E_v = 40 \text{ klx}$, sunlight | I_{SH} | | 0.8 | | mA |
| Supply voltage | | V_S | 2.5 | | 5.5 | V |
| Transmission distance | $E_v = 0$, test signal see fig. 1, IR diode TSAL6200, $I_F = 200 \text{ mA}$ | d | | 45 | | m |
| Output voltage low | $I_{\text{OSL}} = 0.5 \text{ mA}$, $E_e = 0.7 \text{ mW/m}^2$, test signal see fig. 1 | V_{OSL} | | | 100 | mV |
| Minimum irradiance | Pulse width tolerance: $t_{\text{pi}} - 5/f_o < t_{\text{po}} < t_{\text{pi}} + 6/f_o$, test signal see fig. 1 | $E_e \text{ min.}$ | | 0.12 | 0.25 | mW/m^2 |
| Maximum irradiance | $t_{\text{pi}} - 5/f_o < t_{\text{po}} < t_{\text{pi}} + 6/f_o$, test signal see fig. 1 | $E_e \text{ max.}$ | 50 | | | W/m^2 |
| Directivity | Angle of half transmission distance | $\phi_{1/2}$ | | ± 45 | | deg |

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



Fig. 1 - Output Active Low



Fig. 4 - Output Pulse Diagram



Fig. 2 - Pulse Length and Sensitivity in Dark Ambient



Fig. 5 - Frequency Dependence of Responsivity



Fig. 3 - Output Function

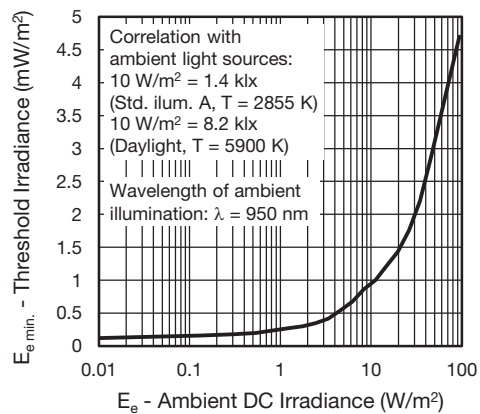


Fig. 6 - Sensitivity in Bright Ambient



Fig. 7 - Sensitivity vs. Supply Voltage Disturbances



Fig. 10 - Relative Spectral Sensitivity vs. Wavelength



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

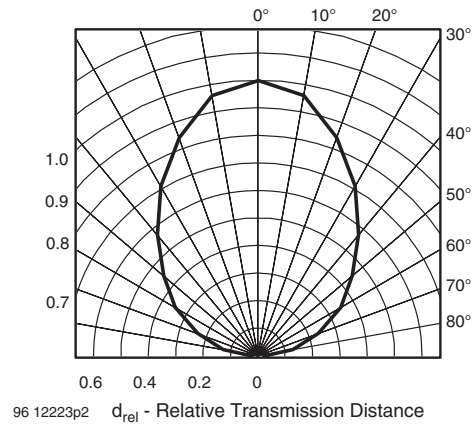


Fig. 11 - Horizontal Directivity



Fig. 9 - Sensitivity vs. Ambient Temperature



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 figure 13 or figure 14).



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



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

| | TSOP22..., TSOP48.. | TSOP24..., TSOP44.. |
|--|---|--|
| 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 ≥ 12 cycles | 10 to 35 cycles ≥ 12 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 | 800 | 1300 |
| 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 please see the datasheet of TSOP23..., TSOP43..
- Best choice of AGC for some popular IR-codes:
 - TSOP4436, TSOP2436: RC-5, RC-6, Panasonic
 - TSOP4438, TSOP2438: NEC, Sharp, r-step
 - TSOP4456, TSOP2456: r-step, Thomson RCA
- For SIRCS 15 and 20 bit, Sony 12 bit IR-codes, please see the datasheet for TSOP4S40, TSOP2S40



PACKAGE DIMENSIONS in millimeters



Drawing-No.: 6.550-5169.01-4
 Issue: 9; 03.11.10
 13655



IR Receiver Modules for Remote Control Systems

Vishay offers stock molded IR receivers in four different packages:

- Loose packed in tubes, mounted on tape for reel or ammopack, or packed bulk in plastic bags.
- Vishay IR receiver with metal holders are packed in plastic trays. Vishay IR receiver with plastic holders are packed in plastic tubes.



FEATURES

- Material categorization:
For definitions of compliance please see www.vishay.com/doc?99912



AVAILABLE FOR

- TSOP348..
- TSOP344..
- TSOP343..
- TSOP341..
- TSOP44...
- TSOP48...
- TSOP41...
- TSOP324..
- TSOP323..
- TSOP322..
- TSOP321..
- TSOP24...
- TSOP22...
- TSOP21...
- TSOP345..
- TSOP325..
- TSOP43...
- TSOP23...
- TSSP4..
- TSMP4..

LOOSE PACKED IN TUBE

ORDERING INFORMATION



O = for IR receiver applications
M = for repeater/learning applications
S = for sensor applications

Note

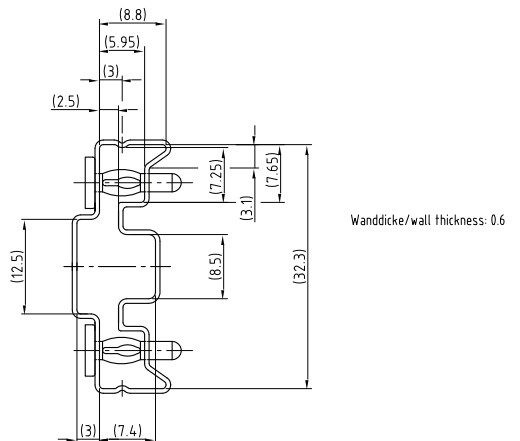
- d = "digit", please consult the list of available devices create a valid part number.

Example: TSOP4838

PACKAGING QUANTITY

- 90 pieces per tube
- 24 tubes per carton

PACKAGING DIMENSIONS in millimeters



Drawing-No.: 9.700-5185.0-4
Rev. 13; Date: 20.11.03
20273-1

Druck / Printing for tubes
1.400-5548.0-3 Version 1



TAPE AND REEL/AMMOPACK

Up to 3 consecutive components may be missing if the gap is followed by at least 6 components. A maximum of 0.5 % of the components per reel quantity may be missing. At least 5 empty positions are present at the start and the end of the tape to enable insertion.

Tensile strength of the tape: > 15 N

Pulling force in the plane of the tape, at right angles to the reel: > 5 N



80079 tape on reel-s



80079 ammpack-s



| VERSION | DIMENSION "H" |
|---------|---------------|
| BS | 20 ± 0.5 |
| PS | 23.3 ± 0.5 |
| OS | 26 ± 0.5 |

ORDERING INFORMATION

T S d P

O = for IR receiver applications
 M = for repeater/learning applications
 S = for sensor applications

d d d d d

2 or 3 digit product series 2 digit frequency

S S 1

SS1 for T and R, bulk or ammpack

d d d d

dd = BS, PS or OS Tape and reel dd = 12 or 21

Z

Ammpack

Note

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

Example: TSOP4838SS1BS12
TSOP2238SS1BS12Z

PACKAGING QUANTITY

- 1000 pieces per reel
- 1000 pieces per ammpack



BULK PACKAGING

The option “BK” signifies bulk packaging in conductive plastic bags. A maximum of 0.3 % of the components per box may be missing.

ORDERING INFORMATION



Note

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

EXAMPLE: TSOP4838SS1BK
TSOP2238SS1BK

PACKAGING QUANTITY

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

OUTER PACKAGING

| CARTON BOX DIMENSIONS in millimeters | | | |
|--|------------------|--------------|---------------|
| | | | |
| KINDS OF CARTON BOX | THICKNESS | WIDTH | LENGTH |
| Packaging Plastic Tubes (Normal/auxiliary devices) | 80 | 150 | 600 |
| Packaging Plastic Trays (Devices with metal holders) | 120 | 290 | 490 |
| Tape and Reel Box (Taping in reels) | 400 | 310 | 410 |
| Ammo-Box (Zigzag taping) | 50 | 130 | 350 |



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