Preamplifier Circuit for IR Remote Control

**FEATURES**

- Carrier-out-function: carrier frequency and burst length accurately correspond to the input signal
- AC coupled response from 20 kHz to 60 kHz; all data formats
- Small QFN package with 2 mm width
- Can be used with either a photodiode or an IR emitter in forward or reverse polarity
- AC coupled input is insensitive to DC photocurrents

**DESCRIPTION**

The VSOP98260 is designed for use in an IR learning application together with a photo PIN diode or IR LED as optical detector. It is compatible with all data formats for IR remote control. On the other hand it is immune to current caused by light sources such as tungsten bulbs or fluorescent lamps.

---

**MECHANICAL DATA**

Pinning:

1, 4, 5 = N.C., 2 = VS, 3 = OUT, 6, 8 = GND, 7 = IN

**PARTS TABLE**

<table>
<thead>
<tr>
<th>Parts Table</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Carrier frequency</td>
<td>38 kHz</td>
</tr>
<tr>
<td>Package</td>
<td>VSOP</td>
</tr>
<tr>
<td>Pinning</td>
<td>1, 4, 5 = N.C., 2 = VS, 3 = OUT, 6, 8 = GND, 7 = IN</td>
</tr>
<tr>
<td>Dimensions (mm)</td>
<td>2.0 W x 2.0 H x 0.76 D</td>
</tr>
<tr>
<td>Mounting</td>
<td>SMD</td>
</tr>
<tr>
<td>Application</td>
<td>Code learning</td>
</tr>
</tbody>
</table>

**APPLICATION CIRCUIT**

Recommended to minimize the connection distance between the IR LED and the input of the VSOP98260, and if possible to shield this connection to Gnd.

**Note**

(1) For further information, see application note, “IC for Code Learning Applications”

---

**DESIGN SUPPORT TOOLS**

[Click logo to get started](http://www.vishay.com)

---

**RoHS**

COMPLIANT

[HALOGEN FREE GREEN](RoHS).

---

THIS DOCUMENT IS SUBJECT TO CHANGE WITHOUT NOTICE. THE PRODUCTS DESCRIBED HEREIN AND THIS DOCUMENT ARE SUBJECT TO SPECIFIC DISCLAIMERS, SET FORTH AT [www.vishay.com/doc?79100](http://www.vishay.com/doc?79100).
ABSOLUTE MAXIMUM RATINGS \((T_{\text{amb}} = 25 ^\circ C,\) unless otherwise specified\)

<table>
<thead>
<tr>
<th>PARAMETER</th>
<th>TEST CONDITION</th>
<th>SYMBOL</th>
<th>VALUE</th>
<th>UNIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply voltage</td>
<td>Pin 2</td>
<td>(V_S)</td>
<td>-0.3 to +6</td>
<td>V</td>
</tr>
<tr>
<td>Supply current</td>
<td>Pin 2</td>
<td>(I_S)</td>
<td>5</td>
<td>mA</td>
</tr>
<tr>
<td>Output voltage</td>
<td>Pin 3</td>
<td>(V_O)</td>
<td>-0.3 to ((V_S + 0.3))</td>
<td>V</td>
</tr>
<tr>
<td>Output current</td>
<td>Pin 3</td>
<td>(I_O)</td>
<td>5</td>
<td>mA</td>
</tr>
<tr>
<td>Input voltage</td>
<td>Pin 7</td>
<td>(V_I)</td>
<td>-0.3 to 3.3</td>
<td>V</td>
</tr>
<tr>
<td>Input current</td>
<td>Pin 7</td>
<td>(I_I)</td>
<td>7</td>
<td>mA</td>
</tr>
<tr>
<td>Power dissipation</td>
<td>(T_{\text{amb}} \leq 85 ^\circ C)</td>
<td>(P_{\text{tot}})</td>
<td>10</td>
<td>mW</td>
</tr>
<tr>
<td>Operating temperature range</td>
<td>(T_{\text{amb}})</td>
<td>(-25 to +85 ^\circ C)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Storage temperature range</td>
<td>(T_{\text{stg}})</td>
<td>(-25 to +85 ^\circ C)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

ESD stress, HBM

| Pin 2, pin 3, MIL-STD-883C | \(V_{\text{ESD}}\) | 2000 | V |
| Pin 7, MIL-STD-883C          | \(V_{\text{ESD}}\) | 500  | V |

ESD stress, MM

| Pin 2, pin 3, MIL-STD-883C | \(V_{\text{ESD}}\) | 200  | V |
| Pin 7, MIL-STD-883C          | \(V_{\text{ESD}}\) | 100  | V |

**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 CHARACTERISTICS \((T_{\text{amb}} = 5 ^\circ C to +85 ^\circ C,\) unless otherwise specified\)**

<table>
<thead>
<tr>
<th>PARAMETER</th>
<th>TEST CONDITION</th>
<th>SYMBOL</th>
<th>MIN.</th>
<th>TYP.</th>
<th>MAX.</th>
<th>UNIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply voltage</td>
<td>VS</td>
<td>2.0</td>
<td>-</td>
<td>3.6</td>
<td>V</td>
<td></td>
</tr>
<tr>
<td>Supply current (pin 2)</td>
<td>(I_N = 0, V_S = 5 V)</td>
<td>(I_S)</td>
<td>0.55</td>
<td>0.7</td>
<td>0.9</td>
<td>mA</td>
</tr>
<tr>
<td>Output voltage low (pin 3)</td>
<td>(I_{OL} = 2 \text{ mA})</td>
<td>(V_{OL})</td>
<td>-</td>
<td>-</td>
<td>100</td>
<td>mV</td>
</tr>
<tr>
<td>Output voltage high (pin 3)</td>
<td>(I_{OL} = 0)</td>
<td>(V_{OH})</td>
<td>(V_S - 0.25)</td>
<td>-</td>
<td>-</td>
<td>V</td>
</tr>
<tr>
<td>Internal pull up resistor (pin 2, pin 3)</td>
<td>(R_{PU})</td>
<td>-</td>
<td>33</td>
<td>-</td>
<td>kΩ</td>
<td></td>
</tr>
<tr>
<td>Max. input DC current</td>
<td>(V_{IN} &gt; 0)</td>
<td>(I_{N,\text{DC}})</td>
<td>400</td>
<td>-</td>
<td>-</td>
<td>μA</td>
</tr>
<tr>
<td>Min. signal detection current</td>
<td>(I_{N,\text{DC}} = 0, f_C = f_{\text{BPF}})</td>
<td>(I_{\text{N-min.}})</td>
<td>-</td>
<td>40</td>
<td>80</td>
<td>nA</td>
</tr>
<tr>
<td></td>
<td>(I_{N,\text{DC}} = 100 \mu A, f_C = f_{\text{BPF}})</td>
<td>(I_{\text{N-min.}})</td>
<td>-</td>
<td>50</td>
<td>-</td>
<td>nA</td>
</tr>
<tr>
<td>Output accuracy</td>
<td>(f_C = 20 \text{ kHz} to 60 \text{ kHz},) (I_{IN} = 80 \text{ nA} to 50 \mu A,) (\text{testsignal see fig. 1, BER} \leq 2%)</td>
<td>(N)</td>
<td>carrier pulses</td>
<td>input burst length</td>
<td>-1 cycle</td>
<td>input burst length</td>
</tr>
</tbody>
</table>

**Carrier cycle**

(26.3 μs in case of 38 kHz)

- Photocurrent (input signal)
- Delay time \(t_d\)
- Output voltage

Fig. 1 - Testsignal
1. Coplanarity (0.1 mm) applies to the exposed pad as well as the exposed terminals.

2. Package dimension does not include mold flash, protrusions, burrs or metal smearing.

Pinning:
1. n.c.
2. VS
3. Out
4. n.c.
5. n.c.
6. GND
7. IN
8. GND

Chamfered corner

Exposed pad

technical drawings according to DIN specifications

Not indicated tolerances ± 0.1

Drawing-No.: 6.550-5314.04-4
Issue: -; 13.05.16
ASSEMBLY INSTRUCTIONS

Reflow Soldering

- 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.

Manual Soldering

- Use a soldering iron of 25 W or less. Adjust the temperature of the soldering iron below 300 °C.
- Finish soldering within 3 s.
- Handle products only after the temperature has cooled off.

VISHAY LEAD (PB)-FREE REFLOW SOLDER PROFILE
Taping Version VSOP Dimensions in millimeters

*Measured from centerline of sprocket hole to centerline of pocket
REEL DIMENSIONS in millimeters

<table>
<thead>
<tr>
<th>REEL SIZE (inch)</th>
<th>REEL WIDTH (mm)</th>
<th>TRAILER LENGTH (mm)</th>
<th>LEADER LENGTH (mm)</th>
<th>QANTITY PER REEL</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>8.4</td>
<td>160</td>
<td>400</td>
<td>3000</td>
</tr>
</tbody>
</table>

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)

<table>
<thead>
<tr>
<th>PLAIN WRITTING</th>
<th>ABBREVIATION</th>
<th>LENGTH</th>
</tr>
</thead>
<tbody>
<tr>
<td>Item-description</td>
<td>-</td>
<td>18</td>
</tr>
<tr>
<td>Item-number</td>
<td>INO</td>
<td>8</td>
</tr>
<tr>
<td>Selection-code</td>
<td>SEL</td>
<td>3</td>
</tr>
<tr>
<td>LOT-/serial-number</td>
<td>BATCH</td>
<td>10</td>
</tr>
<tr>
<td>Data-code</td>
<td>COD</td>
<td>3 (YWW)</td>
</tr>
<tr>
<td>Plant-code</td>
<td>PTC</td>
<td>2</td>
</tr>
<tr>
<td>Quantity</td>
<td>QTY</td>
<td>8</td>
</tr>
<tr>
<td>Accepted by</td>
<td>ACC</td>
<td>-</td>
</tr>
<tr>
<td>Packed by</td>
<td>PCK</td>
<td>-</td>
</tr>
<tr>
<td>Mixed code indicator</td>
<td>MIXED CODE</td>
<td>-</td>
</tr>
<tr>
<td>Origin</td>
<td>xxxxxxx+</td>
<td>Company logo</td>
</tr>
</tbody>
</table>

LONG BAR CODE TOP

<table>
<thead>
<tr>
<th>TYPE</th>
<th>LENGTH</th>
</tr>
</thead>
<tbody>
<tr>
<td>Item-number</td>
<td>N</td>
</tr>
<tr>
<td>Plant-code</td>
<td>N</td>
</tr>
<tr>
<td>Sequence-number</td>
<td>X</td>
</tr>
<tr>
<td>Quantity</td>
<td>N</td>
</tr>
<tr>
<td>Total length</td>
<td>-</td>
</tr>
</tbody>
</table>

SHORT BAR CODE BOTTOM

<table>
<thead>
<tr>
<th>TYPE</th>
<th>LENGTH</th>
</tr>
</thead>
<tbody>
<tr>
<td>Selection-code</td>
<td>X</td>
</tr>
<tr>
<td>Data-code</td>
<td>N</td>
</tr>
<tr>
<td>Batch-number</td>
<td>X</td>
</tr>
<tr>
<td>Filter</td>
<td>-</td>
</tr>
<tr>
<td>Total length</td>
<td>-</td>
</tr>
</tbody>
</table>
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.
Tape and Reel Standards for Surface-Mount IR Receiver Modules

Vishay Semiconductor surface-mount IR receivers are packaged on tape and reel. The following specification is based on IEC publication 286, which takes the industrial requirements for automatic insertion into account.

Absolute maximum ratings, mechanical dimensions, optical and electrical characteristics for taped devices are identical to the basic catalog types and can be found in the specifications for untaped devices.

PACKAGING
The tapes of components are available on reels. Each reel is marked with labels which contain the following information:
- Vishay
- Type
- Group
- Tape code, normally part of type name
- Production code
- Quantity

MISSING COMPONENTS
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 tape insertion.

Tensile strength of the tape: > 15 N

NUMBER OF COMPONENTS
A. Panhead: quantity per reel:
   - TT, top view package, 1190 pcs
   - TR, side view package, 1120 pcs
B. Heimdall: quantity per reel:
   - TT, top view package, 2200 pcs
   - TR, side view package, 2300 pcs
C. Heimdall without lens: quantity per reel:
   - WTT, top view package, 2200 pcs
   - WTR, side view package, 2300 pcs
D. Belobog: quantity per reel:
   - TT1, top view package, 1800 pcs
E. Belobog with shield: quantity per reel:
   - TT1, top view package, 1500 pcs
F. Minimold DF1P: quantity per reel:
   - DF1P, 1100 pcs
G. TVCastSMD TR1: quantity per reel:
   - TR1, side view package, 2000 pcs

ORDER DESIGNATION
The type designation of the device is extended by TT or TT1 for top view or TR for side view.

Example:
- TSOP6238TR (reel packing)
- TSOP75238TR (reel packing)
- TSOP75338WTT (reel packing)
- TSOP57438TT1 (reel packing)
- TSOP57238HTT1 (reel packing)
- TSOP39438TR1 (reel packing)
REEL DIMENSIONS FOR PANHEAD, HEIMDALL, AND TVCASTSMD TR in millimeters

Note
• The body structure of the reel can vary
Taping Version TSOP..TT (Top View) Dimensions in millimeters

A. Panhead (TSOP36...TT, TSSP....TT, TSOP6...TT, TSOP16...TT, TSOP96...TT)
**TAPING VERSION TSOP..TT (TOP VIEW) DIMENSIONS** in millimeters

B. Heimdall (TSOP75...TT, TSOP77...TT, TSSP77...TT, TSOP15...TT, TSOP95...TT)

---

**Drawing-No.:** 9.700-5338.01-4

**Issue:** 4; 12.06.13

---

**technical drawings according to DIN specifications**
TAPING VERSION TSOP..TT (TOP VIEW) DIMENSIONS in millimeters

C. Heimdall without lens (TSOP75...WTT, TSOP77...WTT, TSSP77...WTT, TSOP15...WTT, TSOP95...WTT)

Drawing-No.: 9.700-5341.01-4
Issue: 3; 06.10.15
TAPPING VERSION TSOP..TT1 (TOP VIEW) DIMENSIONS in millimeters

D. Belobog (TSOP37...TT1, TSOP57...TT1, TSOP17...TT1, TSOP97...TT1)

Tape and reel dimensions:

- Reel size “Y”
  - TT1 Ø 180 ± 2 = 1800 pcs.
- Unreel direction
  - Tape position coming out from reel
- Parts mounted
  - Empty leader 400 mm min.
- Empty trailer 200 mm min.
- Direction of pulling out
- 100 mm min. with cover tape
- Ø Y 2 ± 0.5
- Label posted here
- Ø 21 ± 0.8
- Ø 13 ± 0.2
- Ø 60 min.

Leader and trailer tape:

- Technical drawings according to DIN specifications

Drawing-No.: 9.700-5347.01-4
Issue: 2; 07.03.18

Not indicated tolerances ± 0.1
Taping Version TSOP...TT1 (Top View) Dimensions in millimeters

E. Belobog with shield (TSOP37...HTT1, TSOP57...HTT1, TSOP17...HTT1, TSOP97...HTT1)

Tape and reel dimensions:

Reel size “Y”
TT1 Ø 180 ± 2 = 1500 pcs.

Unreel direction

Tape position coming out from reel

Ø 21 ± 0.8

Label posted here

Parts mounted

Empty leader 400 mm min.

100 mm min. with cover tape

Direction of pulling out

Leader and trailer tape:

Empty trailer 200 mm min.

X 2 : 1

Technical drawings according to DIN specifications

Drawing-No.: 9.700-5380.01-4
Issue: 3; 07.03.18

Not indicated tolerances ± 0.1
TAPPING VERSION TSOP..DF1P (SIDE VIEW) DIMENSIONS in millimeters

F. Minimold DF1P (TSOP33...DF1P, TSOP53...DF1P, TSOP13...DF1P, TSOP93...DF1P)

Technical drawing according to DIN specifications

Form of the leave open of the wheel is supplier specific.
Dimensions according to IEC EN 60 286-3

Tape width: 24

Drawing-No.: 9.800-5052.V3-4
Issue: 1; 17.12.02

Drawing-No.: 9.700-5399.01-4
Issue: 1; 30.06.16
**Taping Version TSOP..TR (Side View) Dimensions** in millimeters

G. TVCastSMD TR1 (TSOP59...TR1, TSOP39...TR1, TSOP19...TR1, TSOP99...TR1)

---

**Technical drawing**

Drawing-No.: GO-100220.10_Z

Issue B: 08.02.17
Taping version TSOP..TR (Side View) Dimensions in millimeters

A. Panhead (TSOP36...TR, TSSP6...TR, TSOP6...TR, TSOP16...TR, TSOP96...TR)
TAPING VERSION TSOP..TR (SIDE VIEW) DIMENSIONS in millimeters

B. Heimdall (TSSP7...., TSOP75...TR, TSOP77...TR, TSSP7....TR, TSOP15...TR, TSOP95...TR)

Drawing-No.: 9.700-5337.01-4
Issue: 2; 06.10.15

technical drawings according to DIN specifications

Direction of feed
TAPING VERSION TSOP..TR (SIDE VIEW) DIMENSIONS in millimeters

C. Heimdall without lens (TSOP75...WTR, TSOP77...WTR, TSSP...WTR, TSOP15...WTR, TSOP95...WTR)

Drawing-No.: 9.700-5342.01-4
Issue: 2; 12.06.13

technical drawings according to DIN specifications
LEADER AND TRAILER DIMENSIONS in millimeters

![Leader and Trailer Dimensions Diagram]

COVER TAPE REEL STRENGTH
According to DIN EN 60286-3
0.1 N to 1.3 N
300 mm/min. ± 10 mm/min.
165° to 180° peel angle

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                                            | xxxxxxxx+                  | Company logo |
| **LONG BAR CODE TOP**                             | **TYPE**                   | **LENGTH** |
| Item-number                                       | N                          | 8          |
| Plant-code                                        | N                          | 2          |
| Sequence-number                                   | X                          | 3          |
| Quantity                                          | N                          | 8          |
| Total length                                      | -                          | 21         |
| **SHORT BAR CODE TOP**                            | **TYPE**                   | **LENGTH** |
| Selection-code                                    | X                          | 3          |
| Data-code                                         | N                          | 3          |
| Batch-number                                      | X                          | 10         |
| Filter                                            | -                          | 1          |
| Total length                                      | -                          | 17         |
DRY PACKAGING
The reel is packed in an anti-humidity bag to protect the devices from absorbing moisture during transportation and storage.

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 ≤ 60 % RH max.

After more than 72 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 °C + 5 °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® standard JSTD-020 level 4 label is included on all dry bags.

OUTER PACKAGING
The sealed reel is packed into a pizza box.

CARTON BOX DIMENSIONS in millimeters

<table>
<thead>
<tr>
<th></th>
<th>THICKNESS</th>
<th>WIDTH</th>
<th>LENGTH</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pizza box (SMD and heimdall) (taping in reels)</td>
<td>50</td>
<td>340</td>
<td>340</td>
</tr>
</tbody>
</table>
Disclaimer

ALL PRODUCT, PRODUCT SPECIFICATIONS AND DATA ARE SUBJECT TO CHANGE WITHOUT NOTICE TO IMPROVE RELIABILITY, FUNCTION OR DESIGN OR OTHERWISE.

Vishay Intertechnology, Inc., its affiliates, agents, and employees, and all persons acting on its or their behalf (collectively, “Vishay”), disclaim any and all liability for any errors, inaccuracies or incompleteness contained in any datasheet or in any other disclosure relating to any product.

Vishay makes no warranty, representation or guarantee regarding the suitability of the products for any particular purpose or the continuing production of any product. To the maximum extent permitted by applicable law, Vishay disclaims (i) any and all liability arising out of the application or use of any product, (ii) any and all liability, including without limitation special, consequential or incidental damages, and (iii) any and all implied warranties, including warranties of fitness for particular purpose, non-infringement and merchantability.

Statements regarding the suitability of products for certain types of applications are based on Vishay’s knowledge of typical requirements that are often placed on Vishay products in generic applications. Such statements are not binding statements about the suitability of products for a particular application. It is the customer’s responsibility to validate that a particular product with the properties described in the product specification is suitable for use in a particular application. Parameters provided in datasheets and / or specifications may vary in different applications and performance may vary over time. All operating parameters, including typical parameters, must be validated for each customer application by the customer’s technical experts. Product specifications do not expand or otherwise modify Vishay’s terms and conditions of purchase, including but not limited to the warranty expressed therein.

Except as expressly indicated in writing, Vishay products are not designed for use in medical, life-saving, or life-sustaining applications or for any other application in which the failure of the Vishay product could result in personal injury or death. Customers using or selling Vishay products not expressly indicated for use in such applications do so at their own risk. Please contact authorized Vishay personnel to obtain written terms and conditions regarding products designed for such applications.

No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted by this document or by any conduct of Vishay. Product names and markings noted herein may be trademarks of their respective owners.