

iC-OD, iC-ODL

OPTICAL POSITION-SENSITIVE DETECTOR (PSD)



Rev D3, Page 1/9

FEATURES

- ◆ Low-noise current amplifier with an integrated position-sensitive photodiode
- ◆ High reliability due to monolithic design
- ◆ Effective photodiode area: 2.6 mm x 0.88 mm (iC-OD) resp. 8.4 mm x 0.88 mm (iC-ODL)
- ◆ High sensitivity for visible light and near infrared
- ◆ Integrated bandpass filter with 100 kHz center frequency
- ◆ High background light suppression
- ◆ Analogue current source output
- ◆ Minimum external circuitry required
- ◆ Low power consumption from 3.9 to 13.2 V supply voltage

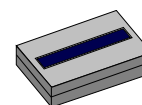
APPLICATIONS

- ◆ Position-sensitive detection of pulse lights
- ◆ Receiver for motion or proximity sensors

PACKAGES

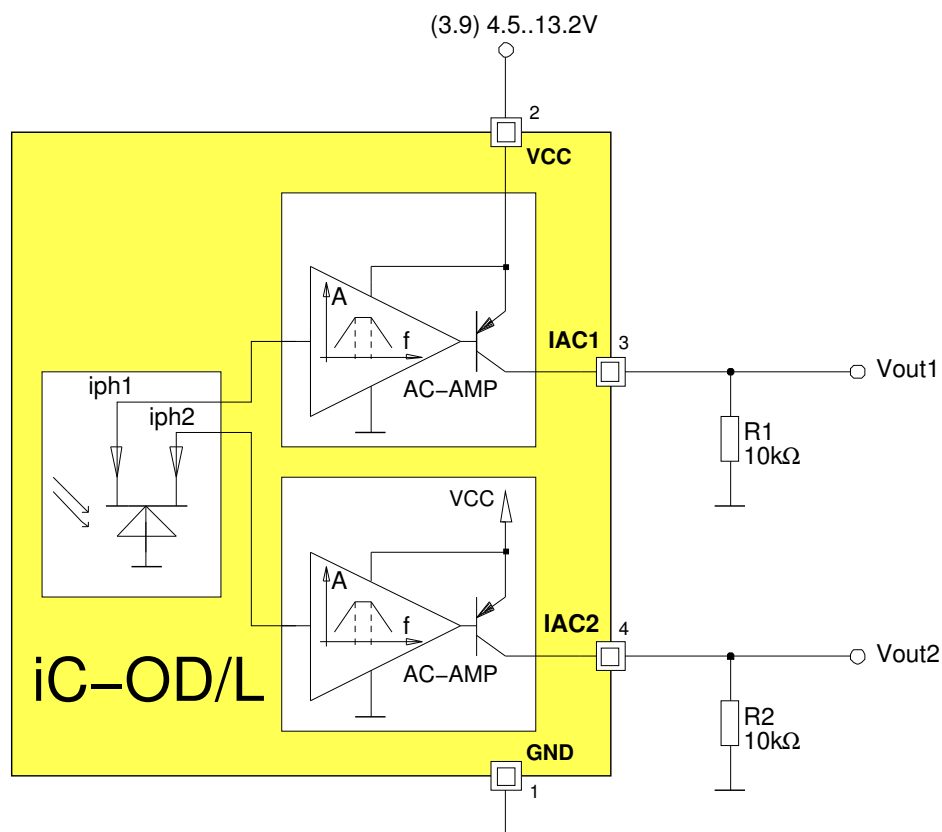


oLGA OD4C



OBGA™
OD L2C

BLOCK DIAGRAM



Pin numbers given for iC-OD oLGA OD4C

iC-OD, iC-ODL

OPTICAL POSITION-SENSITIVE DETECTOR (PSD)



Rev D3, Page 2/9

DESCRIPTION

The iC-OD/L device is an optical position sensitive detector with a monolithic integrated photodiode. The device supersedes one PSD and two conventional photoelectric detectors, e.g. in motion sensors.

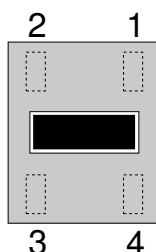
Constant light and low-frequency varying light are suppressed by a highpass filter. A lowpass filter reduces high-frequency interference to a minimum.

The maximum sensitivity for alternating-light signals (for AC photoelectric currents) is about 100 kHz, with a current amplification of typically 48 dB.

The photoelectric current is partitioned to the two photocurrent amplifiers according to the position of the light signal. The analogue outputs IAC1 and IAC2 offer directly the amplified AC photoelectric current.

PACKAGES

PIN CONFIGURATION OLGA OD4C (top view)

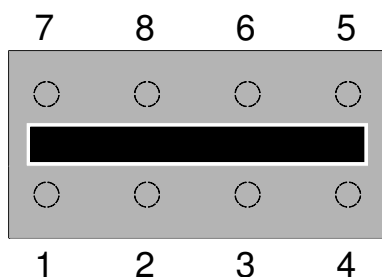


PIN FUNCTIONS

No. Name Function

| | | |
|---|------|-------------------------------------|
| 1 | GND | Ground |
| 2 | VCC | +(3.9)4.5 to +13.2 V Supply Voltage |
| 3 | IAC1 | Current Output 1 |
| 4 | IAC2 | Current Output 2 |

PIN CONFIGURATION OBGA™ ODL2C (top view)

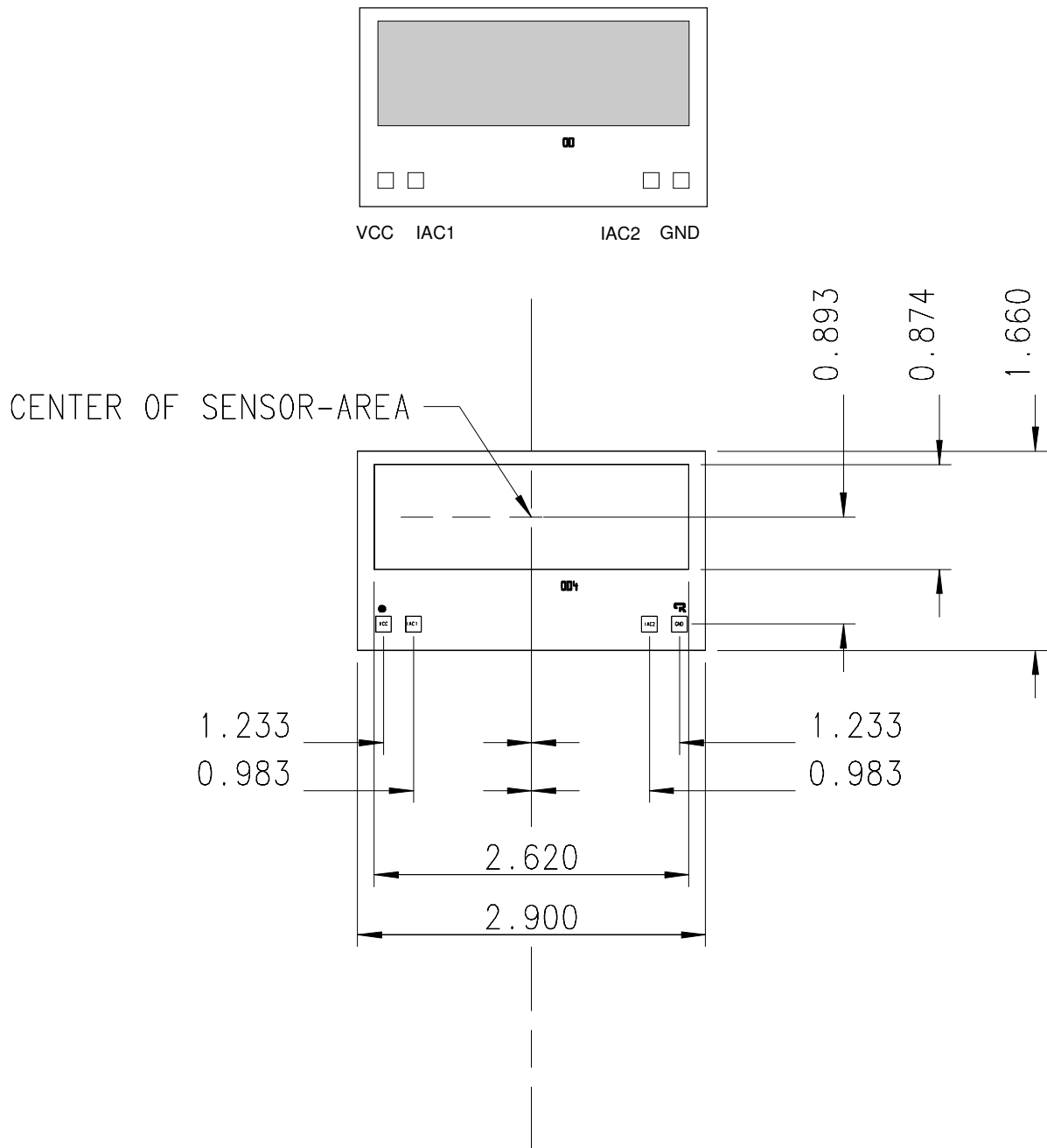


PIN FUNCTIONS

No. Name Function

| | | |
|---|------|-------------------------------------|
| 1 | VCC | +(3.9)4.5 to +13.2 V Supply Voltage |
| 2 | IAC1 | Current Output 1 |
| 3 | IAC2 | Current Output 2 |
| 4 | GND | Ground |
| 5 | n.c. | |
| 6 | n.c. | |
| 7 | n.c. | |
| 8 | n.c. | |

CHIP LAYOUT iC-OD



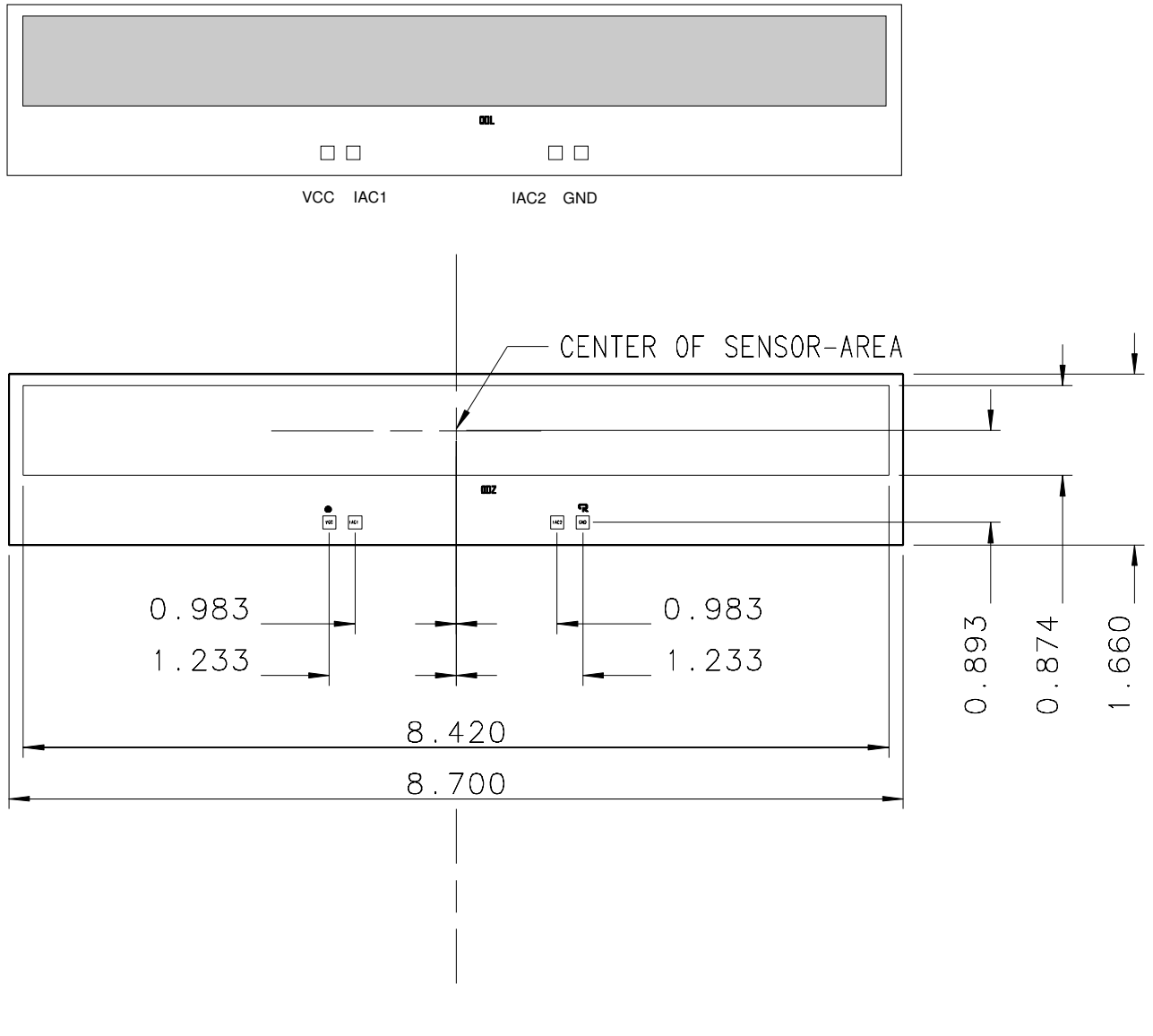
iC-OD, iC-ODL

OPTICAL POSITION-SENSITIVE DETECTOR (PSD)



Rev D3, Page 4/9

CHIP LAYOUT iC-ODL



iC-OD, iC-ODL

OPTICAL POSITION-SENSITIVE DETECTOR (PSD)



Rev D3, Page 5/9

ABSOLUTE MAXIMUM RATINGS

Beyond these values damage may occur; device operation is not guaranteed.

| Item No. | Symbol | Parameter | Conditions | Fig. | Min. Max. | | Unit |
|----------|--------|-----------------------|----------------------------|------|-------------|------|------|
| | | | | | Min. | Max. | |
| G001 | VCC | Supply Voltage | | | 0 | 15 | V |
| G002 | I() | Current in IAC1, IAC2 | | | -1 | 0 | mA |
| G003 | Tj | Junction Temperature | | | -40 | 130 | °C |
| G004 | Ts | Storage Temperature | see package specifications | | | | |

THERMAL DATA

Operating Conditions: VCC = 4.5...13.2 V

| Item No. | Symbol | Parameter | Conditions | Fig. | Min. Typ. Max. | | | Unit |
|----------|--------|-------------------------------------|----------------------------|------|--------------------|------|------|------|
| | | | | | Min. | Typ. | Max. | |
| T01 | Ta | Operating Ambient Temperature Range | see package specifications | | | | | |

All voltages are referenced to ground unless otherwise stated.

All currents into the device pins are positive; all currents out of the device pins are negative.

iC-OD, iC-ODL

OPTICAL POSITION-SENSITIVE DETECTOR (PSD)



Rev D3, Page 6/9

ELECTRICAL CHARACTERISTICS

Operating Conditions: VCC = 4.5...13.2 V, $\lambda = 880$ nm, Tj = -25...85 °C, unless otherwise noted

| Item No. | Symbol | Parameter | Conditions | Tj °C | Fig. | | | | Unit |
|-------------------------------------------|-------------------------------|-----------------------------------------------------------|----------------------------------------------------------------------------------------------------------------|-------|------|-------------|-----------|--------------|-------------------------------|
| | | | | | | Min. | Typ. | Max. | |
| Total Device | | | | | | | | | |
| 001 | VCC | Permissible Supply Voltage VCC | Tj = -25...85 °C Tj = 0...60 °C | | | 4.5 3.9 | | 13.2 13.2 | V V |
| 002 | I(VCC) | Supply Current in VCC | iph = 0 | 27 | | 0.55 | 0.95 | 2.4 | mA mA |
| 003 | Vs() | Saturation Voltage at IAC1, IAC2 | Vs() = VCC – V(); I() = -400 μ A | | | | | 0.5 | V |
| 004 | I0() | Output Bias Current in IAC1, IAC2 | iph = 0 | 27 | | -210 | -108 | | μ A μ A |
| Photodiode | | | | | | | | | |
| 101 | S(λ) _{max} | Spectral Sensitivity | | | | | 0.5 | | A/W |
| 102 | λ_{ar} | Range of Spectral Sensitivity | Se(λ_{ar}) = 0.1 x S(λ) _{max} | | | 500 | | 1050 | nm |
| 103 | A _{ph} () | Radiant Sensitive Area iC-OD | | | | 2.63 x 0.88 | | | mm ² |
| 104 | A _{ph} () | Radiant Sensitive Area iC-ODL | | | | 8.42 x 0.88 | | | mm ² |
| Photo Current Amplifier IAC1, IAC2 | | | | | | | | | |
| 201 | I() | Output Current Operating Range in IAC1, IAC2 | | | | -500 | | 0 | μ A |
| 202 | Pe() _{pk} | Permissible Irradiance for Alternating Light (peak value) | f = fc iC-OD iC-ODL | | | | | 2.2 0.7 | μ W μ W |
| 203 | ISUM | Sum of Output Currents (RMS) | ISUM = I(IAC1) + I(IAC2); f = fc, Ee() _{ac} = 30 μ W/cm ² | 27 | | -25 | -50 | | μ A μ A |
| 204 | iph() _{dc} | DC Photo Current Capability | Position of light spot irrelevant Tj = -25...85 °C Tj = 0...60 °C position of light spot centered | 27 | | 2.7 4.5 | 16 | | μ A μ A μ A |
| 205 | Ev() _{dc} | Permissible Ambient Light Level | Standard Illuminant A at T = 2856 K; iC-OD iC-ODL | | | | 250 75 | | lx lx |
| 206 | fc | Bandpass Center Frequency | | | | | 100 | | kHz |
| 207 | Q | Filter Q-Factor | Q = fc / (f _{hc} – f _{lc}) | | | 0.35 | 0.5 | 0.52 | |
| 208 | I()/ISUM | Single Amplifier Output Current to Sum of Output Currents | f = fc, position of light spot centered | | | 0.40 | | 0.60 | |
| 209 | I() _{min} /ISUM | Smaller Output Current to Sum of Output Currents | f = fc, position of light spot 1 mm out of center | | | 0.13 | | 0.18 | |
| 210 | Ai() _{fc} | Photo Current Gain for Alternating Light | Ai() _{fc} = ISUM / (iph1 + iph2); f = fc, position of light spot centered | | | 44 | 48 | 52 | dB |
| 211 | dAi() _{fc} | Change of Photo Current Gain | f = fc, position of light spot 1 mm out of center | | | -10 | | 10 | % |
| 212 | Ai() ₁₀₀ | Low-Frequency Photo Current Gain | f = 100 Hz | | | 1 | 3 | 6 | dB |
| 213 | Vn(Vout) | RMS Noise Voltage | With external filter: R1, R3 = 10 k Ω , C1, C3 = 120 pF, R2, R4 = 50 k Ω , C2, C4 = 100 pF | | 6 | | 2.1 | 2.8 | mV |
| 214 | t _{on} (VCC) | Power-on Setup Time | | 27 | | | 30 | 50 | μ s μ s |
| 215 | t _{on} (VCC) | Power-on Setup Time | Tj = 0...60 °C, VCC = 0 \rightarrow 4 V | 27 | | | 70 | 100 | μ s μ s |

TYPICAL CHARACTERISTICS

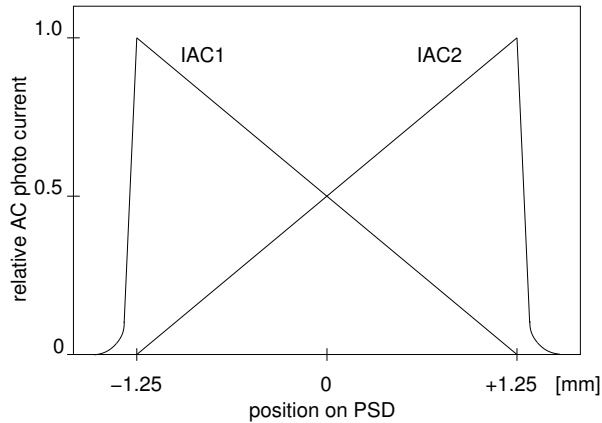


Figure 1: Example for position sensing characteristics

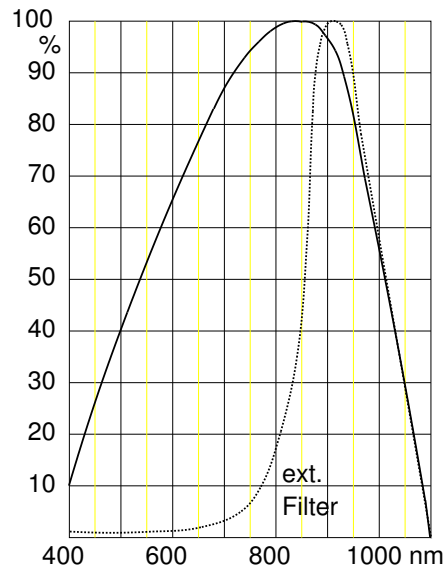


Figure 2: Relative spectral sensitivity

External filter (RG850) improves the suppression of ambient light by a factor of ca. 20 to 30.

APPLICATIONS INFORMATION

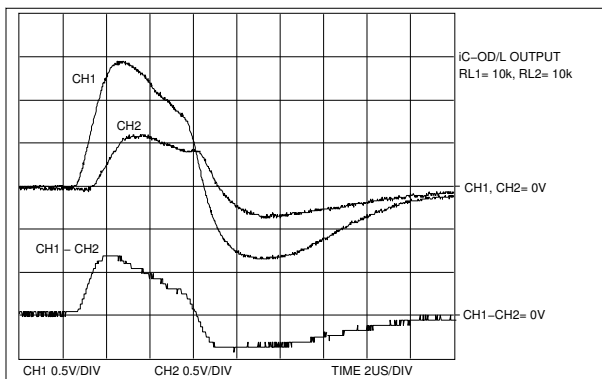


Figure 3: The light spot impinges to the left

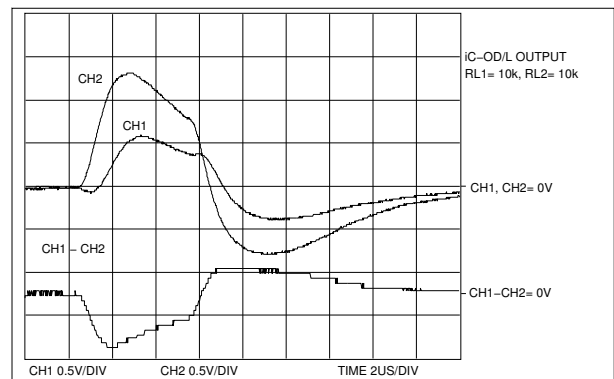


Figure 5: The light spot impinges to the right

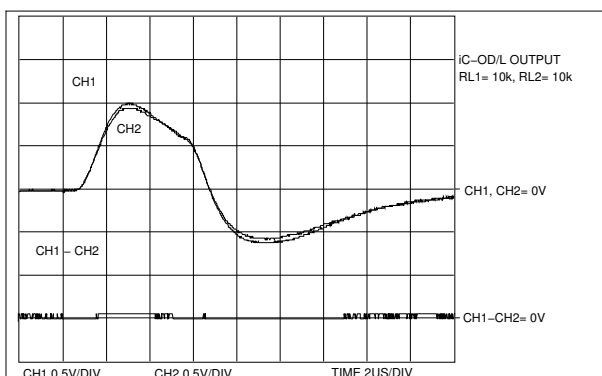


Figure 4: The light spot impinges in the center

Examples of output signals

The oscilloscope pictures show the signal patterns at iC-OD outputs IAC1 and IAC2 when receiving a 5 μ s light pulse. The differential signal shown has been calculated.

Both of the outputs are terminated with 10 k Ω . An external filter is not used.

iC-OD, iC-ODL

OPTICAL POSITION-SENSITIVE DETECTOR (PSD)



Rev D3, Page 8/9

Example: external filter

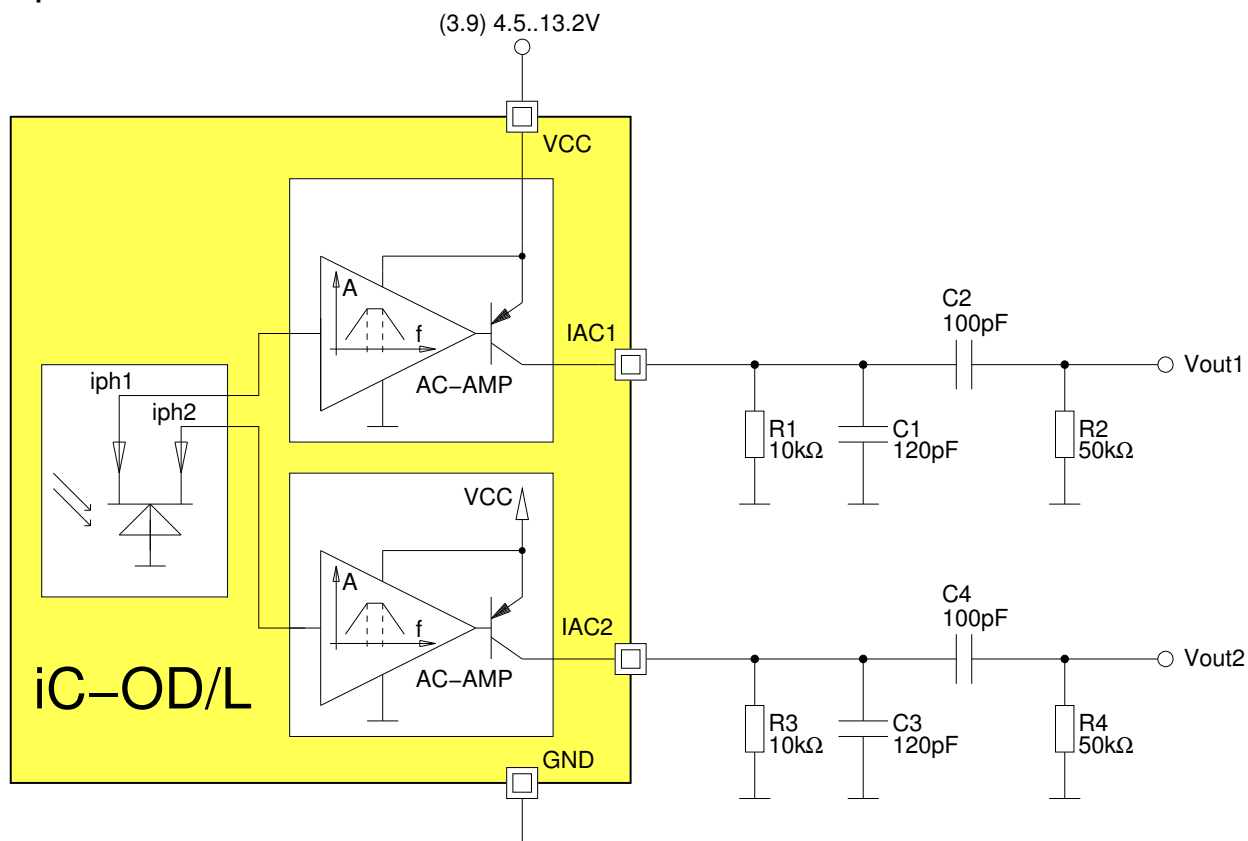


Figure 6: External filter to detach the DC-portion and to reduce the noise

This specification is for a newly developed product. iC-Haus therefore reserves the right to change or update, without notice, any information contained herein, design and specification; and to discontinue or limit production or distribution of any product versions. Please contact iC-Haus to ascertain the current data. Copying – even as an excerpt – is only permitted with iC-Haus approval in writing and precise reference to source. iC-Haus does not warrant the accuracy, completeness or timeliness of the specification on this site and does not assume liability for any errors or omissions in the materials. The data specified is intended solely for the purpose of product description. No representations or warranties, either express or implied, of merchantability, fitness for a particular purpose or of any other nature are made hereunder with respect to information/specification or the products to which information refers and no guarantee with respect to compliance to the intended use is given. In particular, this also applies to the stated possible applications or areas of applications of the product. iC-Haus conveys no patent, copyright, mask work right or other trade mark right to this product. iC-Haus assumes no liability for any patent and/or other trade mark rights of a third party resulting from processing or handling of the product and/or any other use of the product.

iC-OD, iC-ODL

OPTICAL POSITION-SENSITIVE DETECTOR (PSD)



Rev D3, Page 9/9

ORDERING INFORMATION

| Type | Package | Order Designation |
|--------|------------------|----------------------------------|
| iC-OD | - OLGA OD4C | iC-OD chip iC-OD OLGA OD4C |
| iC-ODL | - OBGA™ ODL2C | iC-ODL chip iC-ODL OBGA ODL2C |

For information about prices, terms of delivery, other packaging options etc. please contact:

iC-Haus GmbH
Am Kuemmerling 18
D-55294 Bodenheim
GERMANY

Tel.: +49 (61 35) 92 92-0
Fax: +49 (61 35) 92 92-192
Web: <http://www.ichaus.com>
E-Mail: sales@ichaus.com