

# iC-OD, iC-ODL

## OPTICAL POSITION-SENSITIVE DETECTOR (PSD)



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### 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

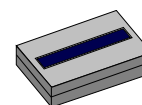
### APPLICATIONS

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

### PACKAGES

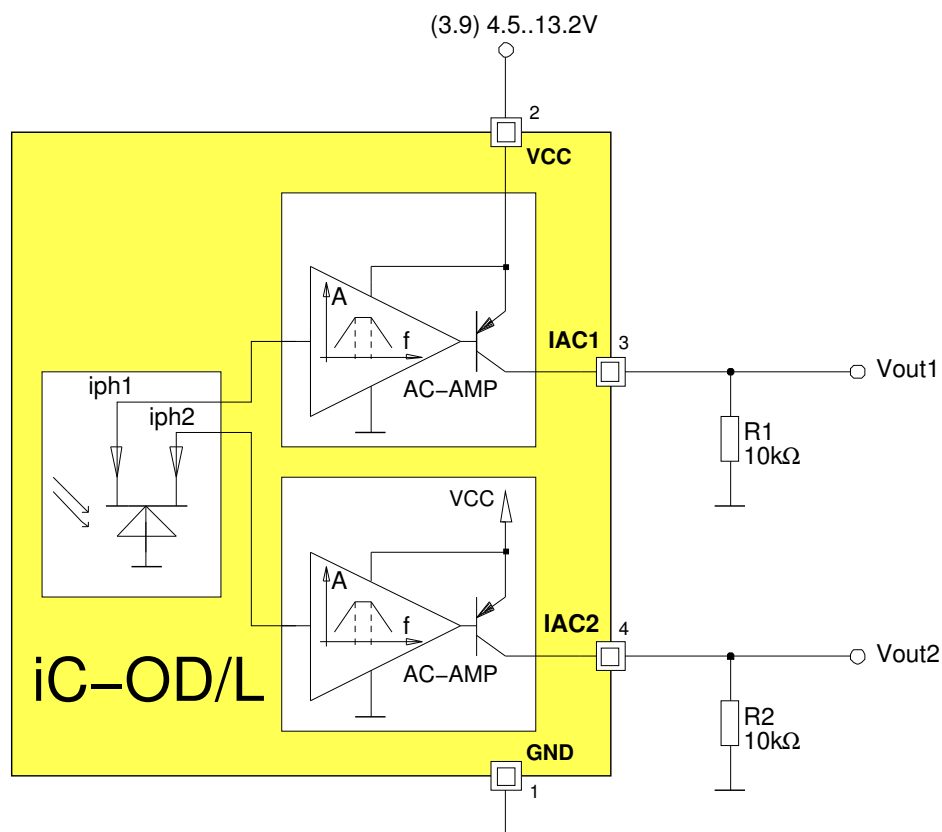


oLGA OD4C



OBGA™  
OD L2C

### BLOCK DIAGRAM



Pin numbers given for iC-OD oLGA OD4C

# iC-OD, iC-ODL

## OPTICAL POSITION-SENSITIVE DETECTOR (PSD)



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### 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.

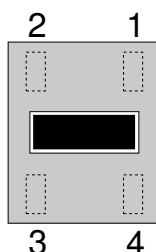
Constant light and low-frequency varying light are suppressed by a highpass filter. A lowpass filter reduces high-frequency interference to a minimum.

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)

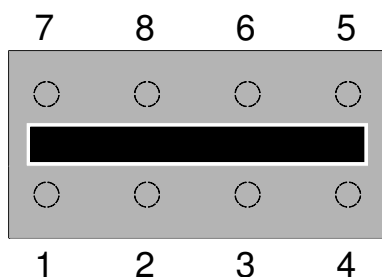


#### PIN FUNCTIONS

##### 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)

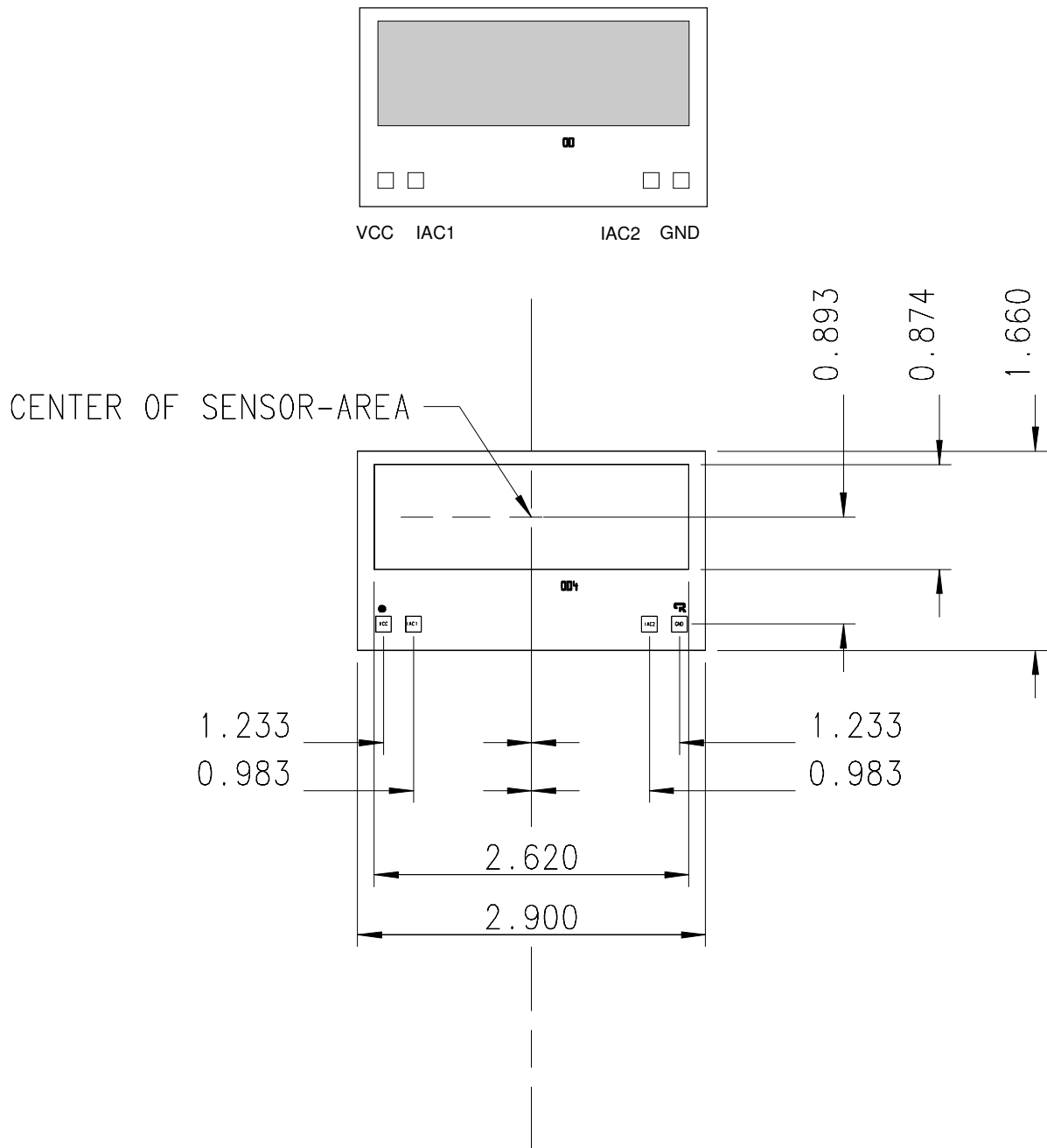


#### PIN FUNCTIONS

##### 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



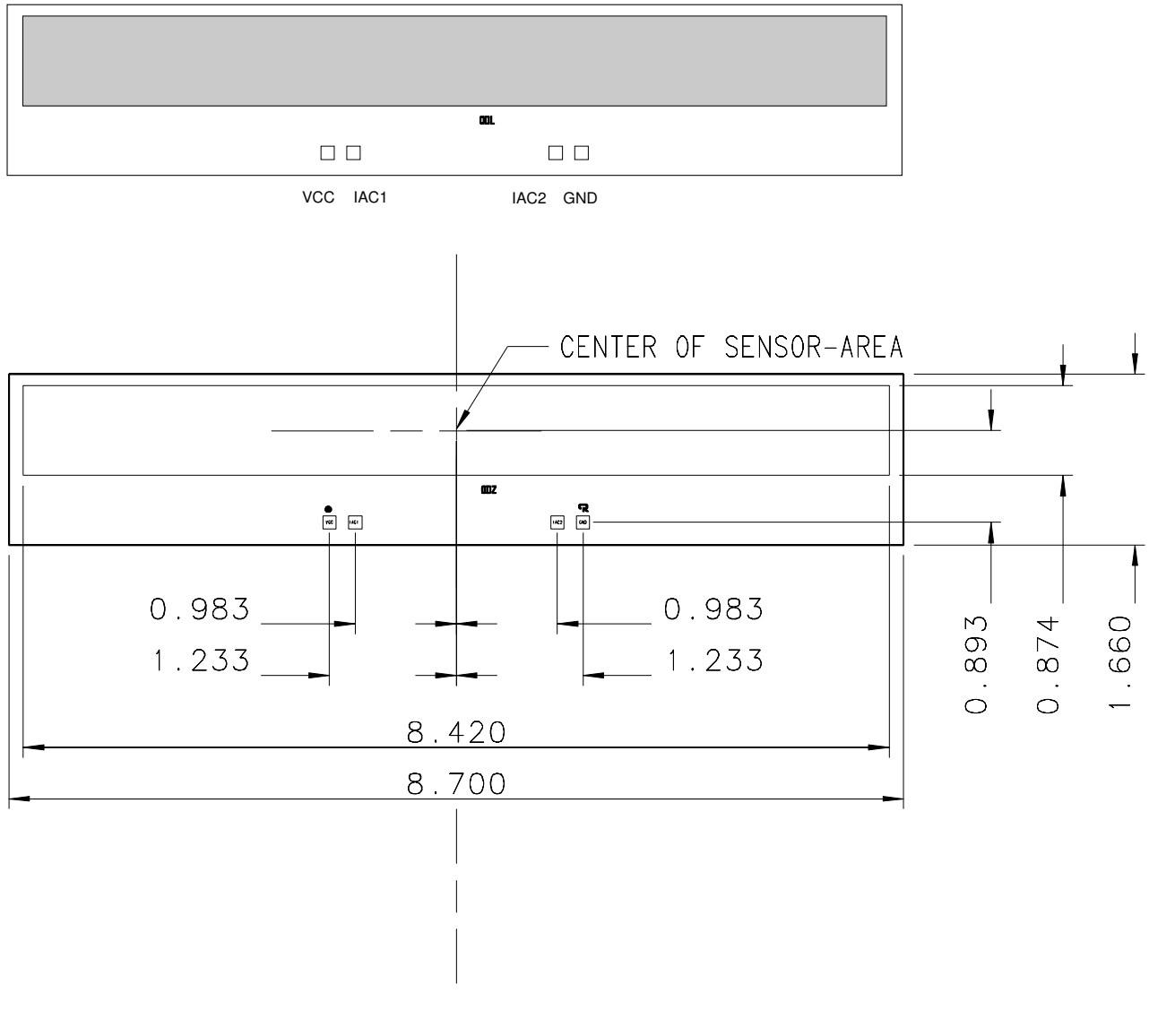
# iC-OD, iC-ODL

OPTICAL POSITION-SENSITIVE DETECTOR (PSD)



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## CHIP LAYOUT iC-ODL



# iC-OD, iC-ODL

## OPTICAL POSITION-SENSITIVE DETECTOR (PSD)



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### ABSOLUTE MAXIMUM RATINGS

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

Item No.	Symbol	Parameter	Conditions	Fig.	Limits		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.	Limits			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)



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### 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.	
<b>Total Device</b>									
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 $\mu$ A					0.5	V
004	I0()	Output Bias Current in IAC1, IAC2	iph = 0	27		-210	-108		$\mu$ A $\mu$ A
<b>Photodiode</b>									
101	S( $\lambda$ ) <sub>max</sub>	Spectral Sensitivity					0.5		A/W
102	$\lambda_{ar}$	Range of Spectral Sensitivity	Se( $\lambda_{ar}$ ) = 0.1 x S( $\lambda$ ) <sub>max</sub>			500		1050	nm
103	A <sub>ph</sub> ()	Radiant Sensitive Area iC-OD				2.63 x 0.88			mm <sup>2</sup>
104	A <sub>ph</sub> ()	Radiant Sensitive Area iC-ODL				8.42 x 0.88			mm <sup>2</sup>
<b>Photo Current Amplifier IAC1, IAC2</b>									
201	I()	Output Current Operating Range in IAC1, IAC2				-500		0	$\mu$ A
202	Pe() <sub>pk</sub>	Permissible Irradiance for Alternating Light (peak value)	f = fc iC-OD iC-ODL					2.2 0.7	$\mu$ W $\mu$ W
203	ISUM	Sum of Output Currents (RMS)	ISUM = I(IAC1) + I(IAC2); f = fc, Ee() <sub>ac</sub> = 30 $\mu$ W/cm <sup>2</sup>	27		-25	-50		$\mu$ A $\mu$ A
204	iph() <sub>dc</sub>	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		$\mu$ A $\mu$ A $\mu$ A
205	Ev() <sub>dc</sub>	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 <sub>hc</sub> – f <sub>lc</sub> )			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() <sub>min</sub> /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() <sub>fc</sub>	Photo Current Gain for Alternating Light	Ai() <sub>fc</sub> = ISUM / (iph1 + iph2); f = fc, position of light spot centered			44	48	52	dB
211	dAi() <sub>fc</sub>	Change of Photo Current Gain	f = fc, position of light spot 1 mm out of center			-10		10	%
212	Ai() <sub>100</sub>	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 $\Omega$ , C1, C3 = 120 pF, R2, R4 = 50 k $\Omega$ , C2, C4 = 100 pF		6		2.1	2.8	mV
214	t <sub>on</sub> (VCC)	Power-on Setup Time		27			30	50	$\mu$ s $\mu$ s
215	t <sub>on</sub> (VCC)	Power-on Setup Time	Tj = 0...60 °C, VCC = 0 $\rightarrow$ 4 V	27			70	100	$\mu$ s $\mu$ s

### TYPICAL CHARACTERISTICS

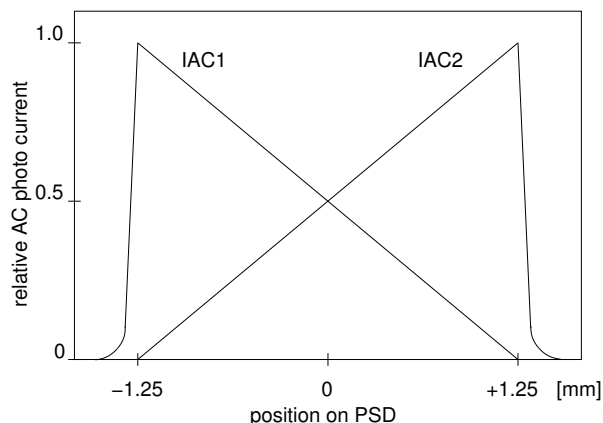


Figure 1: Example for position sensing characteristics

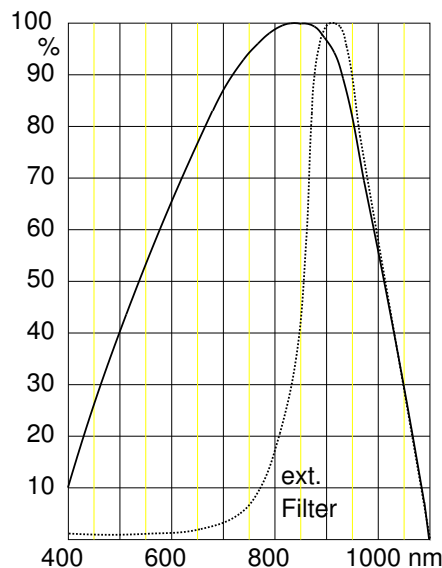


Figure 2: Relative spectral sensitivity

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

### APPLICATIONS INFORMATION

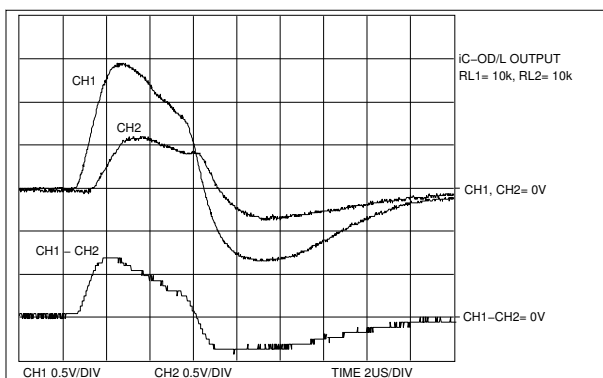


Figure 3: The light spot impinges to the left

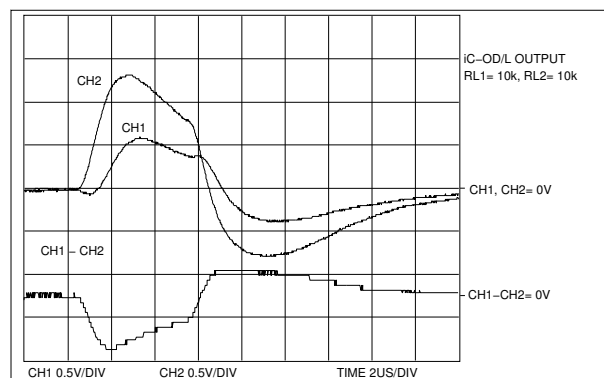


Figure 5: The light spot impinges to the right

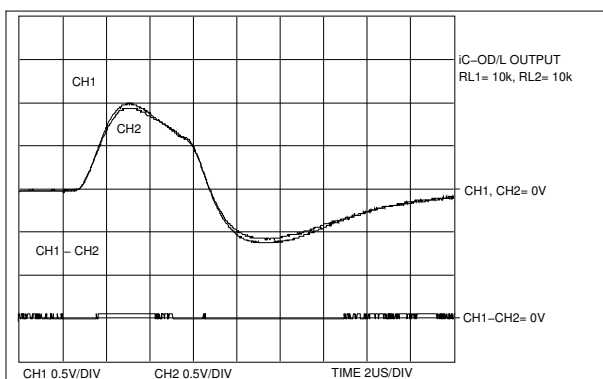


Figure 4: The light spot impinges in the center

#### Examples of output signals

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

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

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### Example: external filter

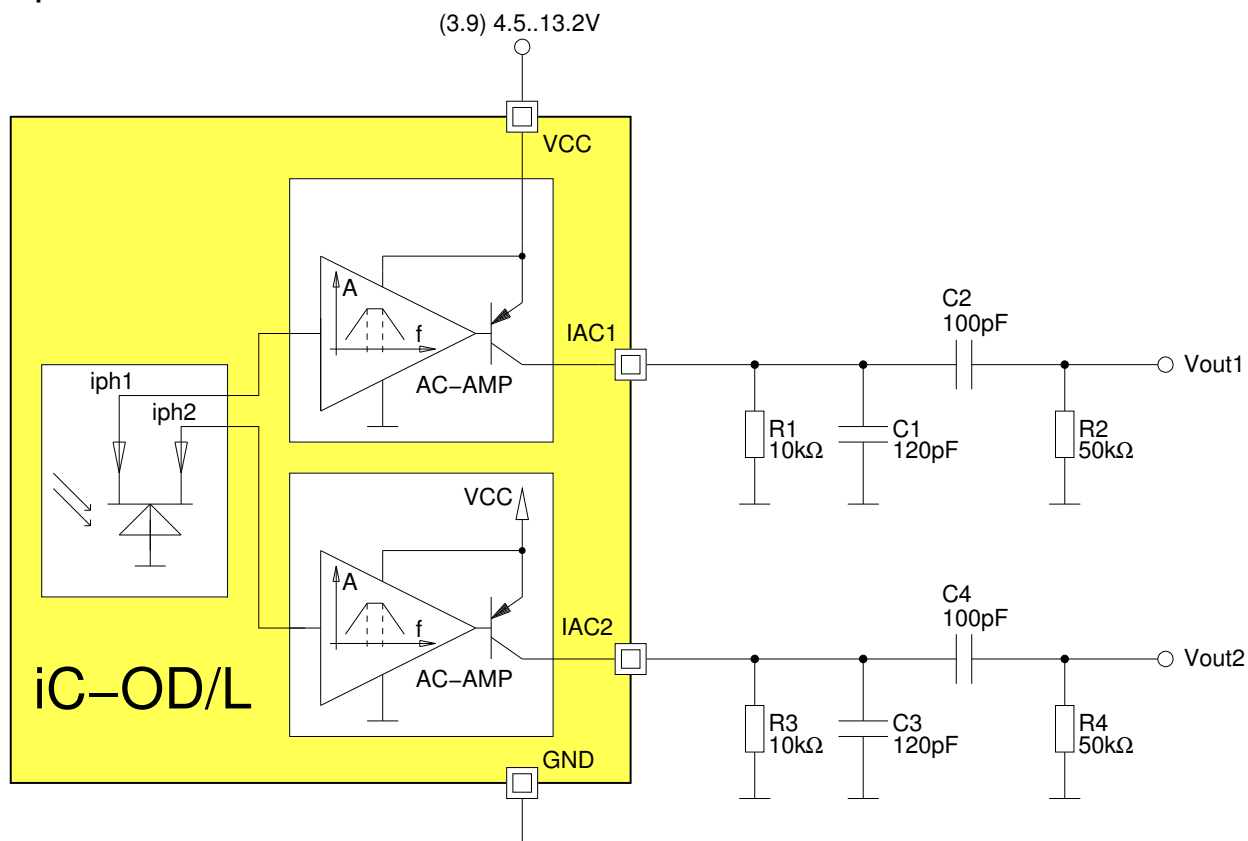


Figure 6: External filter to detach the DC-portion and to reduce the noise

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# iC-OD, iC-ODL

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## 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:

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