

# iC-OD, iC-ODL

## OPTICAL POSITION-SENSITIVE DETECTOR (PSD)



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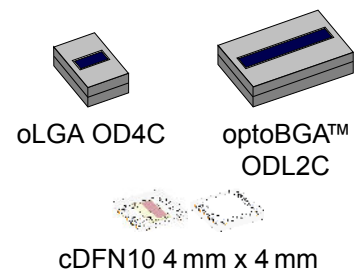
### FEATURES

- ◆ 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

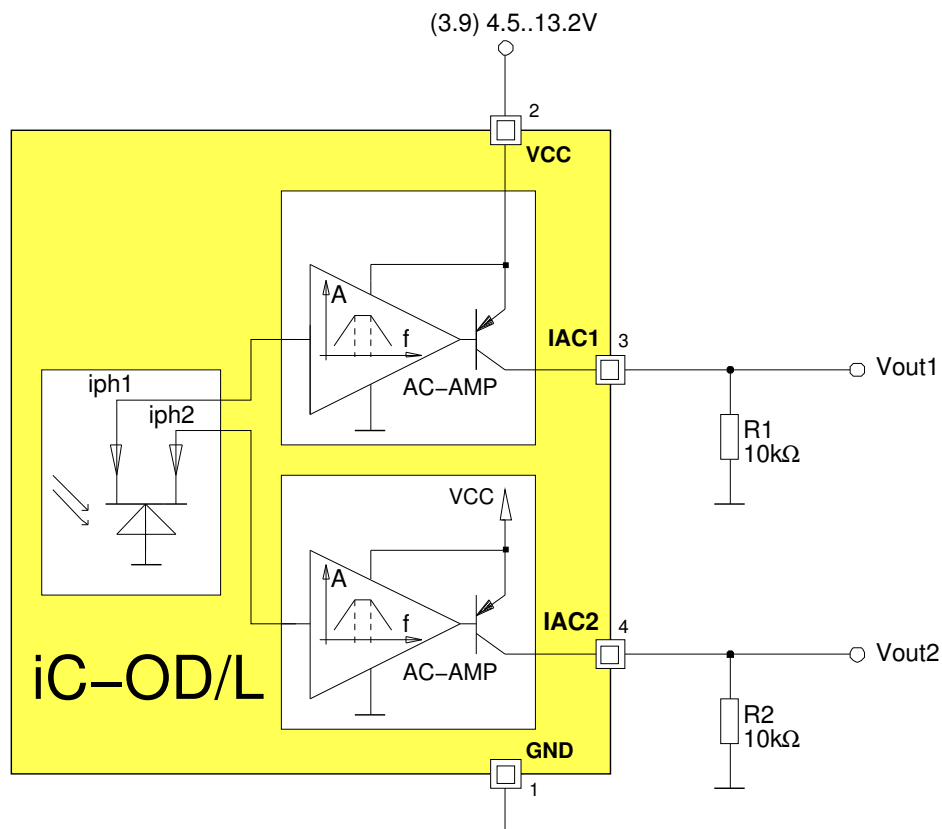
### APPLICATIONS

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

### PACKAGES



### BLOCK DIAGRAM



Pin numbers given for iC-OD oLGA OD4C

# iC-OD, iC-ODL

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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 max-

imum 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.

# iC-OD, iC-ODL

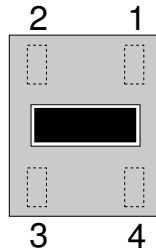
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## PACKAGING INFORMATION

### PIN CONFIGURATION OLGA OD4C

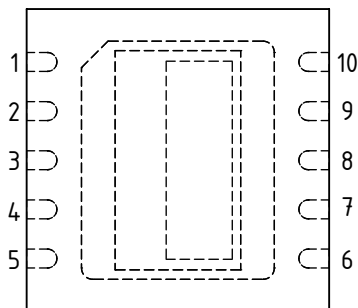


### PIN FUNCTIONS

**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 cDFN10 4 mm x 4 mm

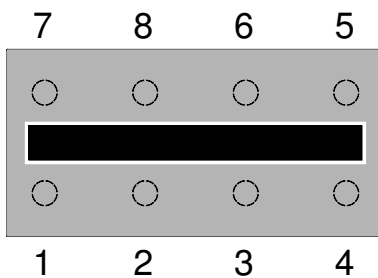


### PIN FUNCTIONS

**No. Name Function**

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

### PIN CONFIGURATION OBGA™ ODL2C



### 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.

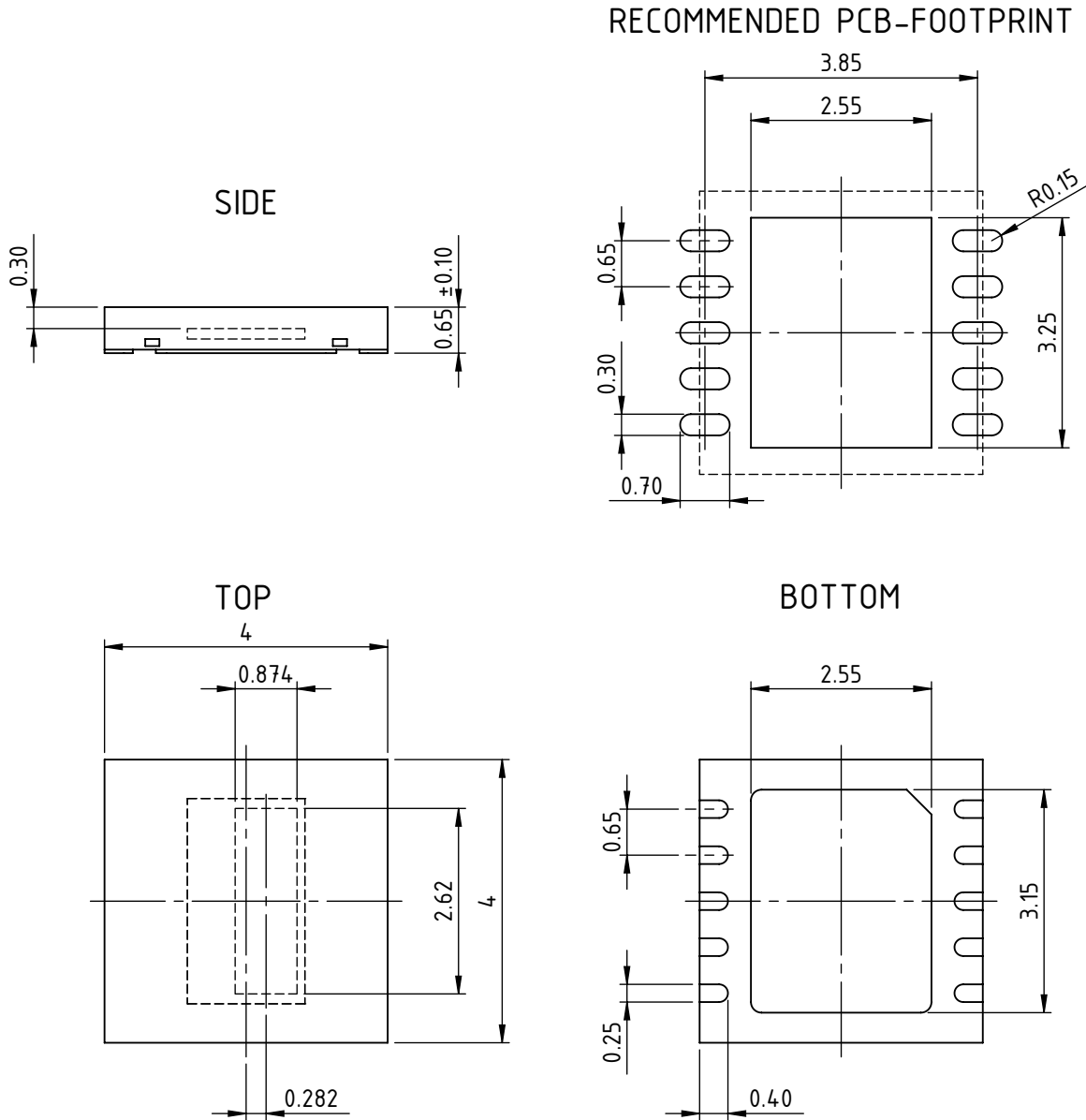
# iC-OD, iC-ODL

## OPTICAL POSITION-SENSITIVE DETECTOR (PSD)



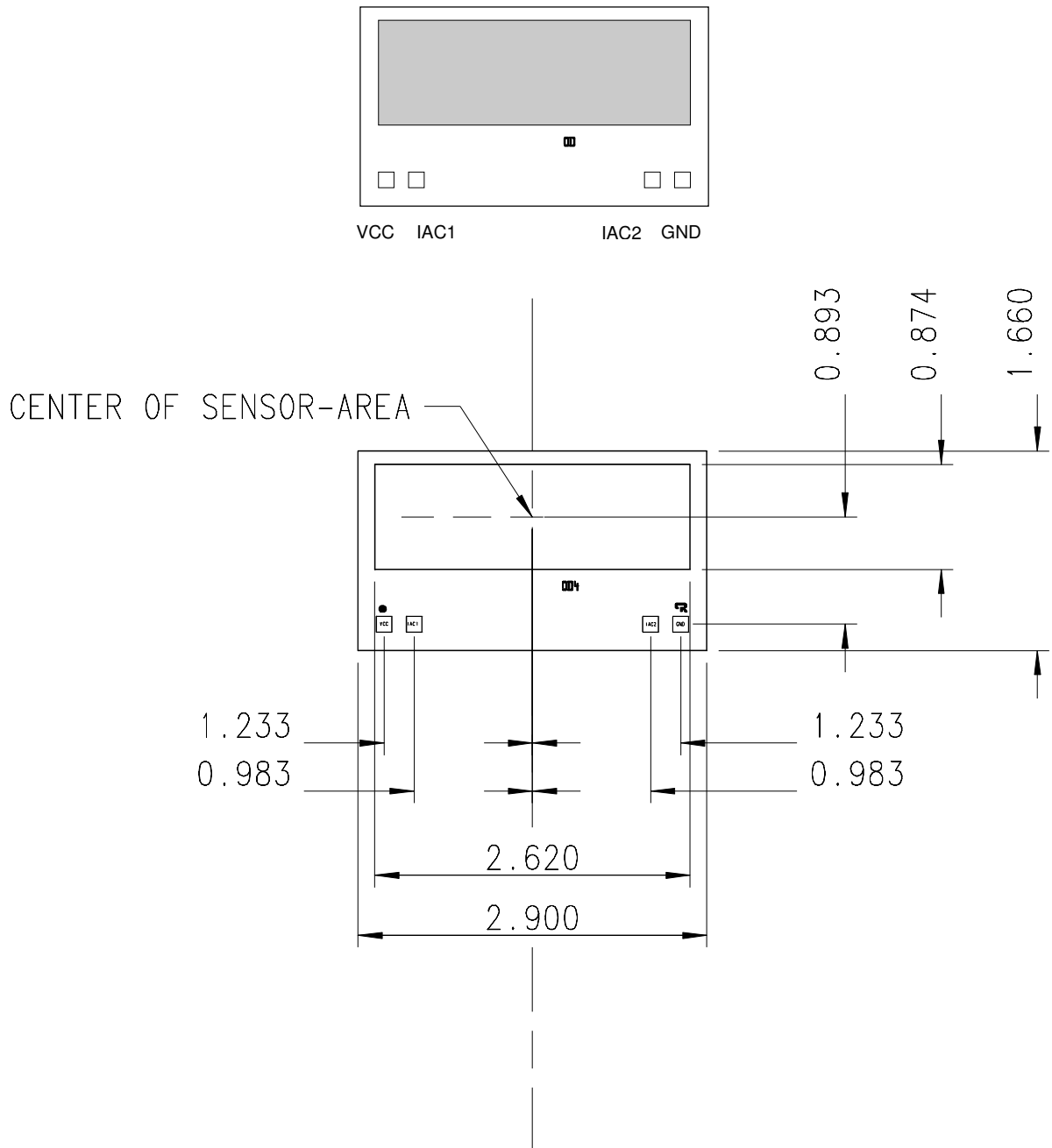
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### PACKAGE DIMENSIONS cDFN10-4x4

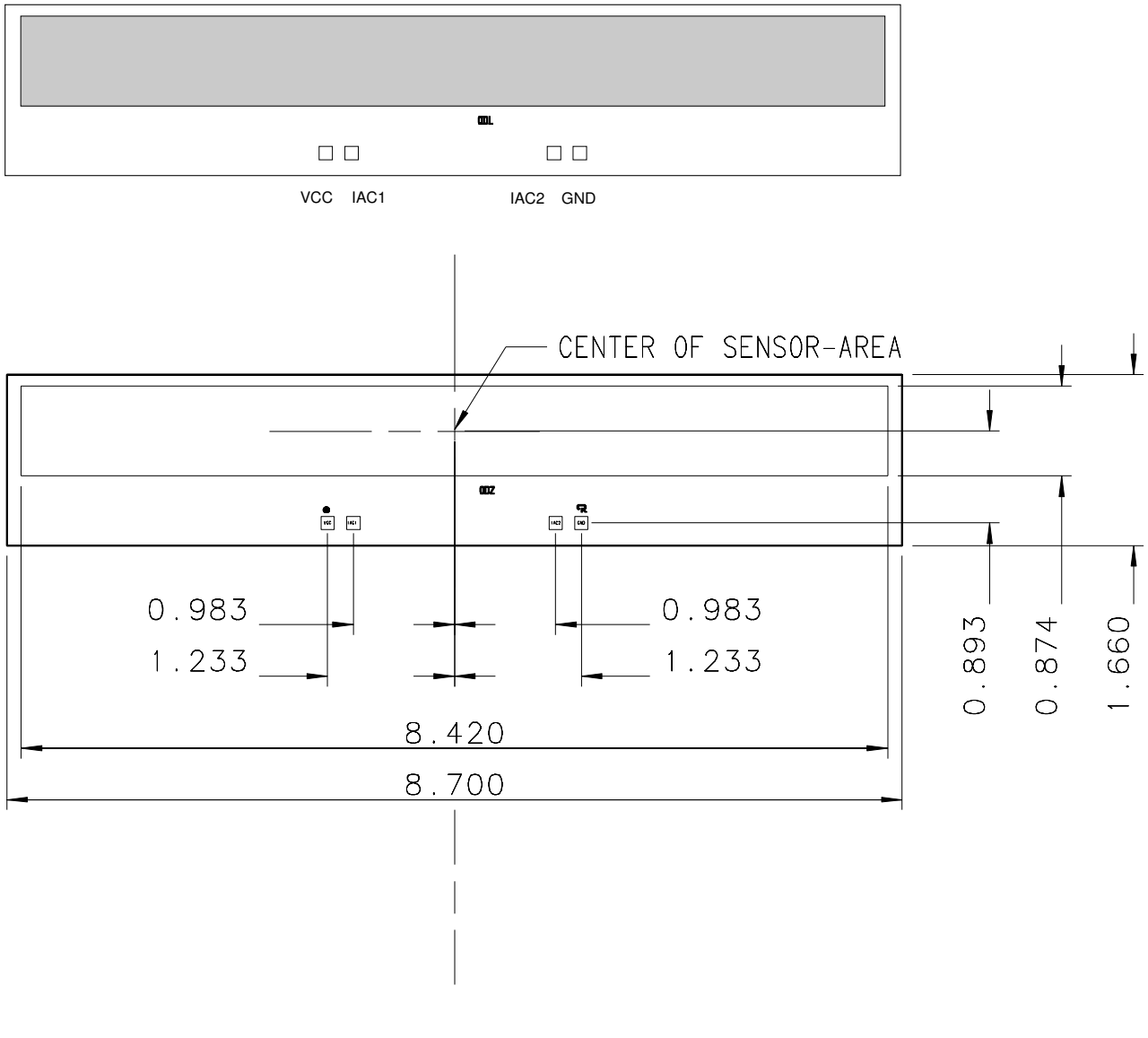


All dimensions given in mm. Tolerances of form and position according to JEDEC MO-229.  
Tolerance of sensor pattern: ±0.10mm / ±1° (with respect to center of backside pad).

## CHIP LAYOUT iC-OD



**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	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...13.2V

Item No.	Symbol	Parameter	Conditions	Min.   Typ.   Max.			Unit
				Min.	Typ.	Max.	
T01	Ta	Operating Ambient Temperature Range	cDFN10 oLGA OD4C and oBGA ODL2C, see package specifications	0		70	°C

All voltages are referenced to ground unless otherwise stated.

All currents flowing into the device pins are positive; all currents flowing 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				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 Tj = 27 °C	0.35	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 Tj = 27 °C	-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> Tj = 27 °C	-25	-50		$\mu$ A $\mu$ A
204	iph() <sub>dc</sub>	DC Photo Current Capability	Position of light spot arbitrary Tj = -25...85 °C Tj = 0...60 °C Tj = 27 °C, position of light spot centered	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 (see Fig. 6)		2.1	2.8	mV
214	t <sub>on</sub> (VCC)	Power-on Setup Time	Tj = 27 °C		30	50	$\mu$ s $\mu$ s
215	t <sub>on</sub> (VCC)	Power-on Setup Time	VCC = 0 $\rightarrow$ 4 V; Tj = 0...60 °C Tj = 27 °C		70	100	$\mu$ s $\mu$ s



### TYPICAL CHARACTERISTICS

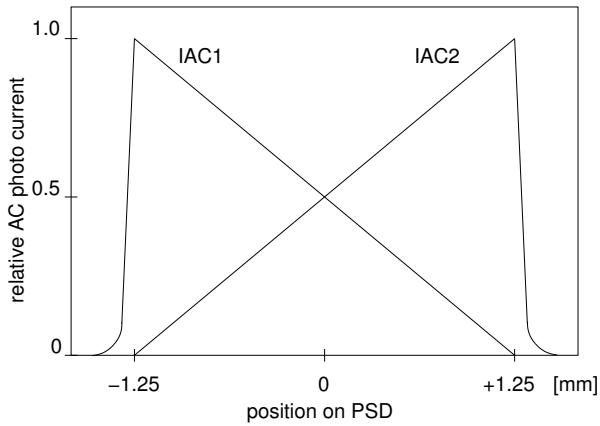


Figure 1: Example for position sensing characteristics

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

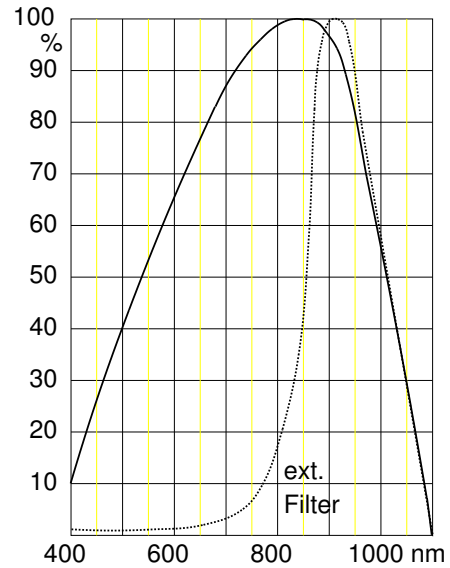


Figure 2: Relative spectral sensitivity

### APPLICATIONS INFORMATION

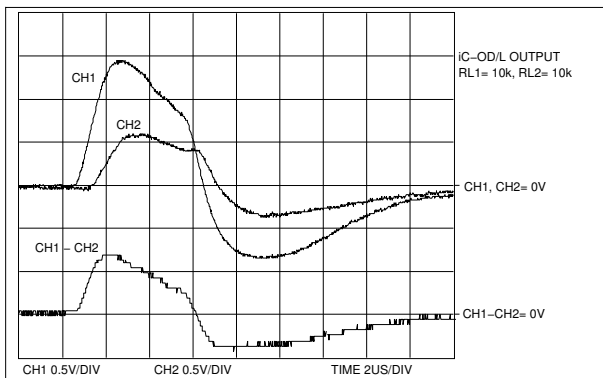


Figure 3: The light spot impinges to the left

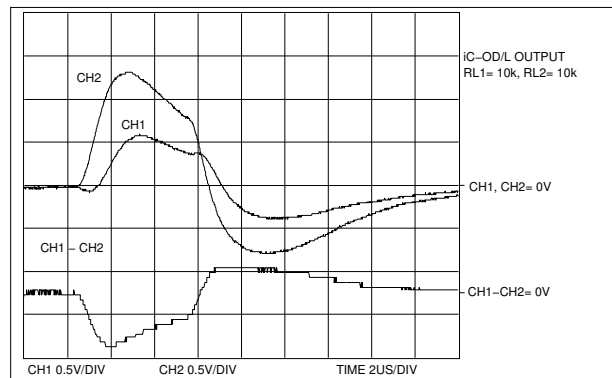


Figure 5: The light spot impinges to the right

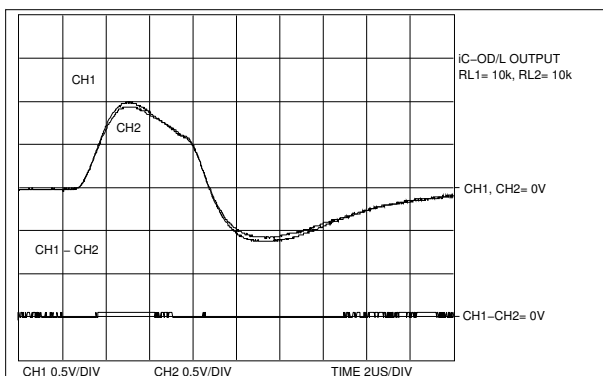


Figure 4: The light spot impinges in the center

#### 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.

**Example: external filter**

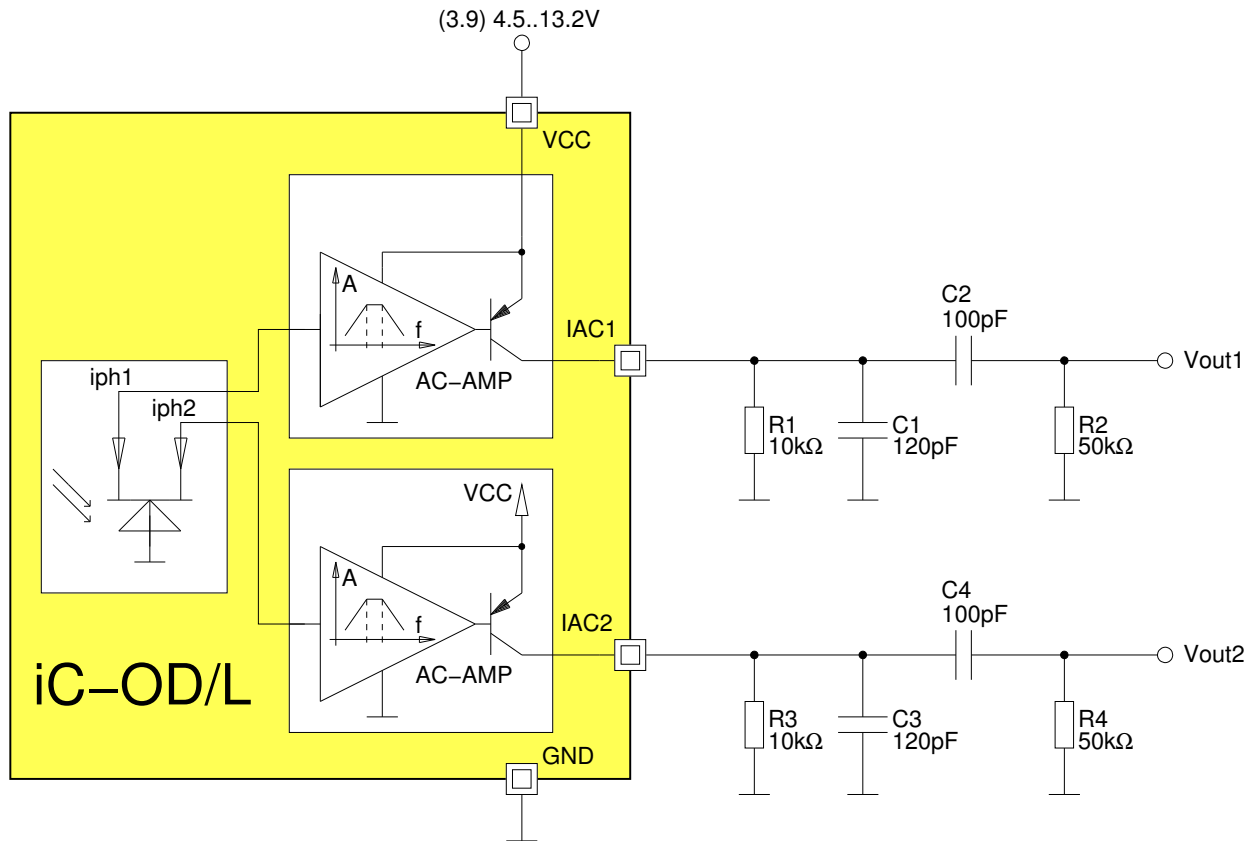


Figure 6: External filter to detach the DC-portion and to reduce the noise

### REVISION HISTORY

Rel.	Rel. Date*	Chapter	Modification	Page
E1	2015-11-24	PACKAGES	cDFN10 package update	1
		PACKAGING INFORMATION	cDFN10 package update	3, 4
		ELECTRICAL CHARACTERISTICS	002: Min value reduced to 0.35 mA	8

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\* Release Date format: YYYY-MM-DD

# iC-OD, iC-ODL

OPTICAL POSITION-SENSITIVE DETECTOR (PSD)



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## ORDERING INFORMATION

Type	Package	Order Designation
iC-OD	-	iC-OD chip
iC-OD	OLGA OD4C	iC-OD oLGA OD4C
iC-OD	cDFN10 4 mm x 4 mm	iC-OD cDFN10
iC-ODL	-	iC-ODL chip
iC-ODL	OBGA™ ODL2C	iC-ODL oBGA ODL2C

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