iC-OD
OPTICAL POSITION SENSITIVE DETECTOR (PSD)

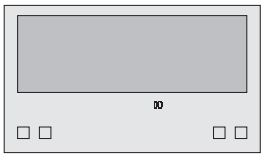
FEATURES

- Low-noise current amplifier with integrated position sensitive photodiode
- High reliability due to monolithical design
- Effective photodiode area 2.6mm × 0.88mm
- High sensitivity for visible light and near infrared
- Integrated bandpass filter with 100kHz center frequency
- High background light suppression
- Analog output as current source
- Minimal external wiring
- Low power consumption from 3.9..13.2V supply

APPLICATIONS

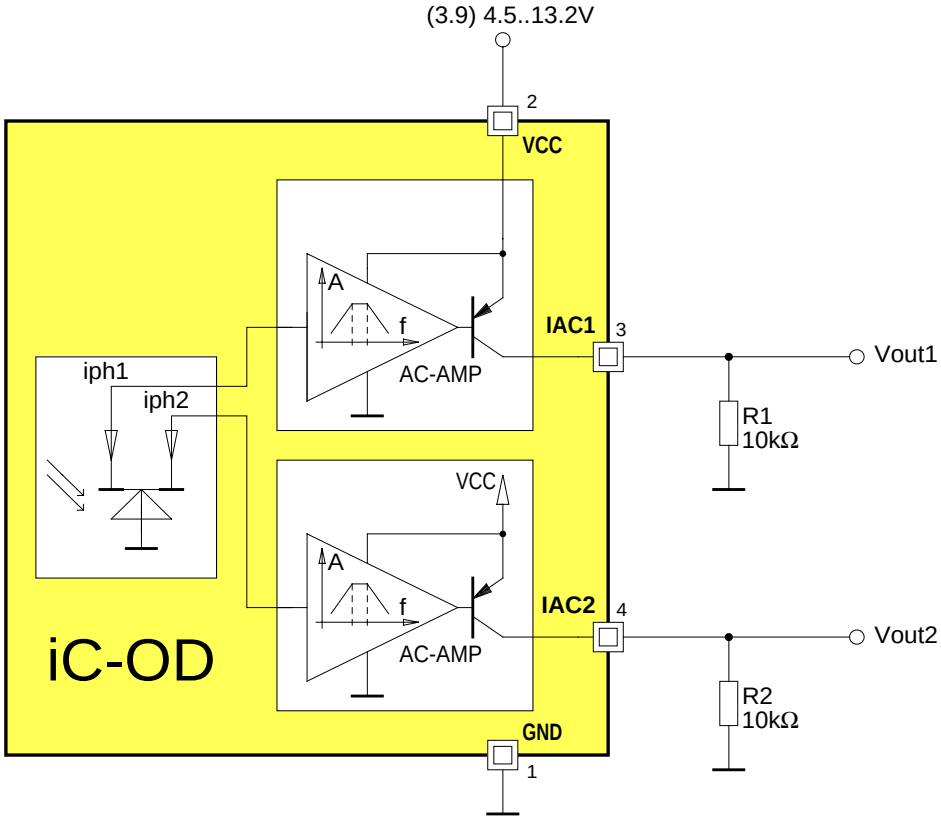
- Position sensitive amplification of AC light signals
- Receiver for motion or proximity sensors

PACKAGES



chip size 2.90mm × 1.66mm

BLOCK DIAGRAM



Rev C2

iC-Haus GmbH
Integrated Circuits
Am Kuemmerling 18, D-55294 Bodenheim

Tel +49-6135-9292-0
Fax +49-6135-9292-192
http://www.ichaus.com

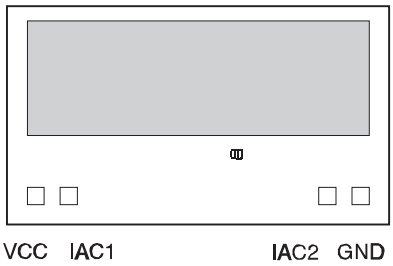
DESCRIPTION

The iC-OD 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 variing 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 100kHz, with a current amplification typically at 48dB. The photoelectric current is partitioned to the two photocurrent amplifiers according to the position of the light signal. The analog outputs IAC1 and IAC2 offer directly the amplified AC photoelectric current.

CHIP LAYOUT

(top view)



Name	Function
VCC	+(3.9)4.5V to +13.2V Supply Voltage
IAC1	Current Output 1
IAC2	Current Output 2
GND	Ground

ABSOLUTE MAXIMUM RATINGS

Values beyond which damage may occur; device operation is not guaranteed.

Item	Symbol	Parameter	Conditions	Fig.	Min.	Max.	Unit
G001	VCC	Supply Voltage			0	15	V
G002	I()	Current in IAC1, IAC2			-1	0	mA
TG1	Tj	Junction Temperature			-40	130	°C
TG2	Ts	Storage Temperature	see package specifications				

THERMAL DATA

Operating Conditions: VCC= 4.5..13.2V

Item	Symbol	Parameter	Conditions	Fig.	Min.	Typ.	Max.	Unit
T1	Ta	Operating Ambient Temperature Range	see package specifications					

All voltages are referenced to ground unless otherwise noted.
All currents into the device pins are positive; all currents out of the device pins are negative.

ELECTRICAL CHARACTERISTICS

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

Item	Symbol	Parameter	Conditions	Tj °C	Fig.	Min.	Typ.	Max.	Unit
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()= -400µA					0.5	V
004	IO()	Output Bias Current in IAC1, IAC2	iph= 0	 27		-210	 -108		µA µA
Photodiode									
005	S(λ)max	Spectral Sensitivity					0.5		A/W
006	λar	Range of Spectral Sensitivity	Se(λar)= 0.1 × S(λ)max			500		1050	nm
007	Aph()	Radiant Sensitive Area					2.63 × 0.88		mm²
Photo Current Amplifier IAC1, IAC2									
008	I()	Output Current Operating Range in IAC1, IAC2				-500		0	µA
009	Ee()pk	Permissible Irradiance for Alternating Light (peak value)	f= fc					2.2	µW
010	ISUM	Sum of Output Currents (RMS)	ISUM= I(IAC1) + I(IAC2); f= fc, Ee()ac= 30µW/cm²	 27		-25	 -50		µA µA
011	iph()dc	DC Photo Current Capabillity	position of light spot irrelevant Tj= -25..85°C Tj= 0..60°C position of light spot centered	 27		 2.7 4.5	 16		 µA µA µA
012	Ev()dc	Permissible Ambient Light Level	Standard Illuminant A at T= 2856°K				250		lx
013	fc	Bandpass Center Frequency					100		kHz
014	Q	Filter Q-Factor	Q= fc / (fhc-flc)			0.35	0.5	0.52	
015	I()/ISUM	Single Amplifier Output Current to Sum of Output Currents	f= fc, position of light spot centered			0.40		0.60	
016	I()min/ ISUM	Smaller Output Current to Sum of Output Currents	f= fc, position of light spot 1mm out of center			0.13		0.18	
017	Ai()fc	Photo Current Gain for Alternating Light	Ai()fc= ISUM / (iph1+iph2); f= fc, position of light spot centered			44	48	52	dB
018	dAi()fc	Change of Photo Current Gain	f= fc, position of light spot 1mm out of center			-10		10	%
019	Ai()100	Low-Frequency Photo Current Gain	f= 100Hz			1	3	6	dB
020	Vn(Vout)	RMS Noise Voltage	with external filter: R1,R3= 10kΩ, C1,C3= 120pF, R2,R4= 50kΩ, C2,C4= 100pF		1		2.1	2.8	mV
021	ton(VCC)	Power-on Setup Time		 27			 30	50	µs µs
022	ton(VCC)	Power-on Setup Time	Tj= 0..60°C, VCC= 0 →4V	 27			 70	100	µs µs

TYPICAL CHARACTERISTICS

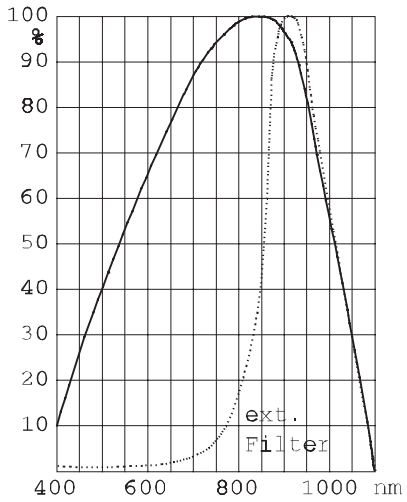


Fig. 1: Relative spectral sensitivity

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

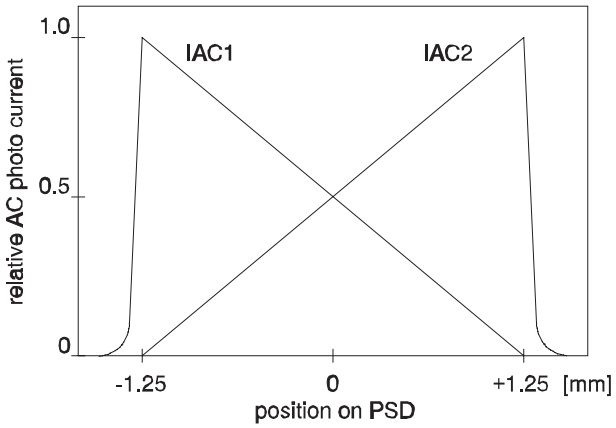
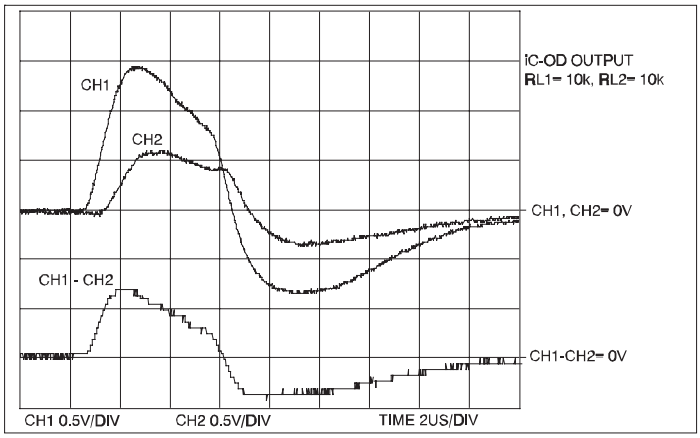


Fig. 2: Example for position sensing characteristics.

APPLICATIONS INFORMATION

Examples for output signals



The following oscilloscope pictures show the signal patterns at iC-OD outputs IAC1 and IAC2 when receiving a 5µs light pulse. The differential signal shown has been calculated. Both of the outputs are terminated with 10kΩ. An external filter is not used.

Fig. 3:
The light spot impinges to the left.

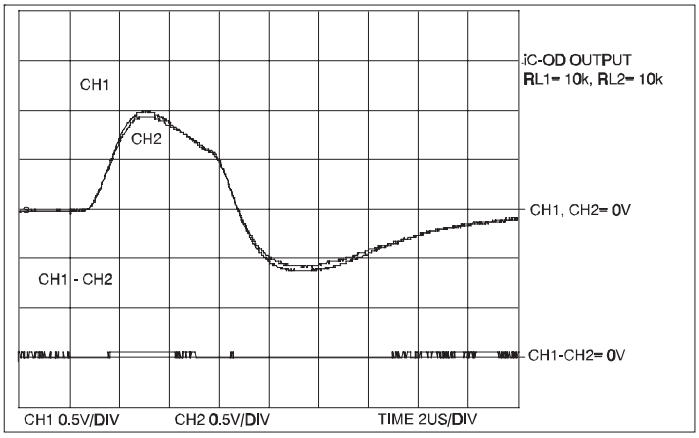


Fig. 4:
The light spot impinges roughly in the center.

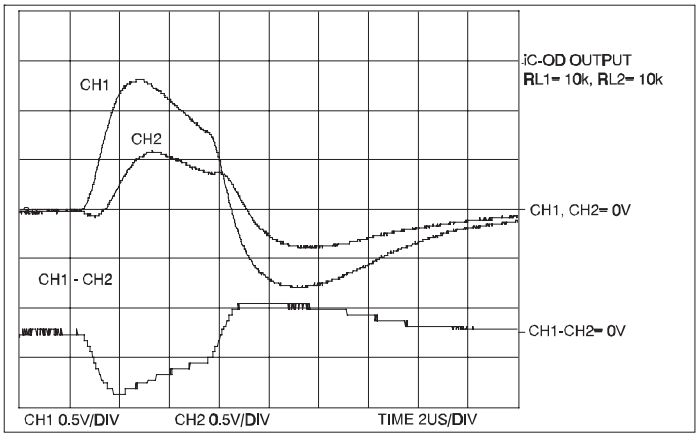


Fig. 5:
The light spot impinges to the right.

Example: external filter

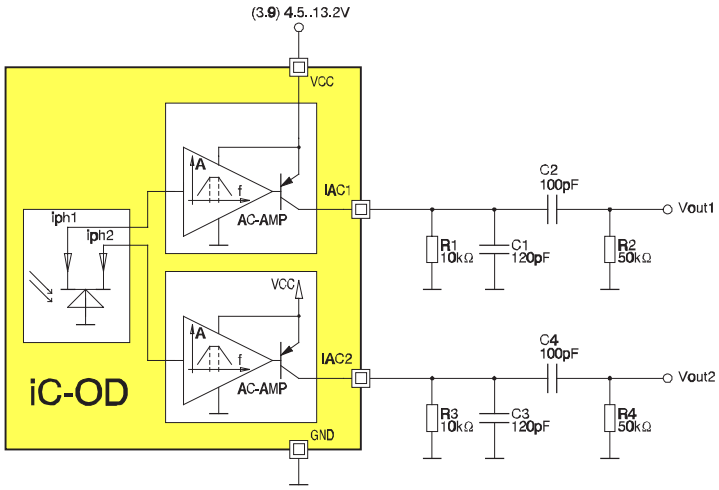


Fig. 6:
External filter to detach the
DC-portion and to reduce the noise.

ORDERING INFORMATION

Type	Package	Order designation
iC-OD	-	iC-OD chip
iC-OD	OBGA OD3C	iC-OD OBGA OD3C
iC-OD	OLGA OD4C	iC-OD OLGA OD4C

For information about prices, terms of delivery, options for other case types, etc., please contact:

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

Tel +49-6135-9292-0
Fax +49-6135-9292-192
http://www.ichaus.com