iC-WQ
AC PHOTO SENSOR WITH CURRENT OUTPUT

FEATURES

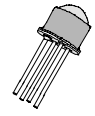
- Low-noise current amplifier with integrated photodiode
- High reliability due to monolithical design
- Effective photodiode area 0.9mm²
- High sensitivity for visible light and near infrared
- Integrated bandpass filter with 100kHz center frequency
- High background light suppression
- Analog output as current source
- Minimal external wiring
- Low power consumption from 5..12V supply

- Option: daylight filter

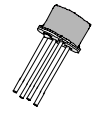
APPLICATIONS

- Amplification of alternating light signals
- Receiver for reflecting and nonreflecting light barriers

PACKAGES

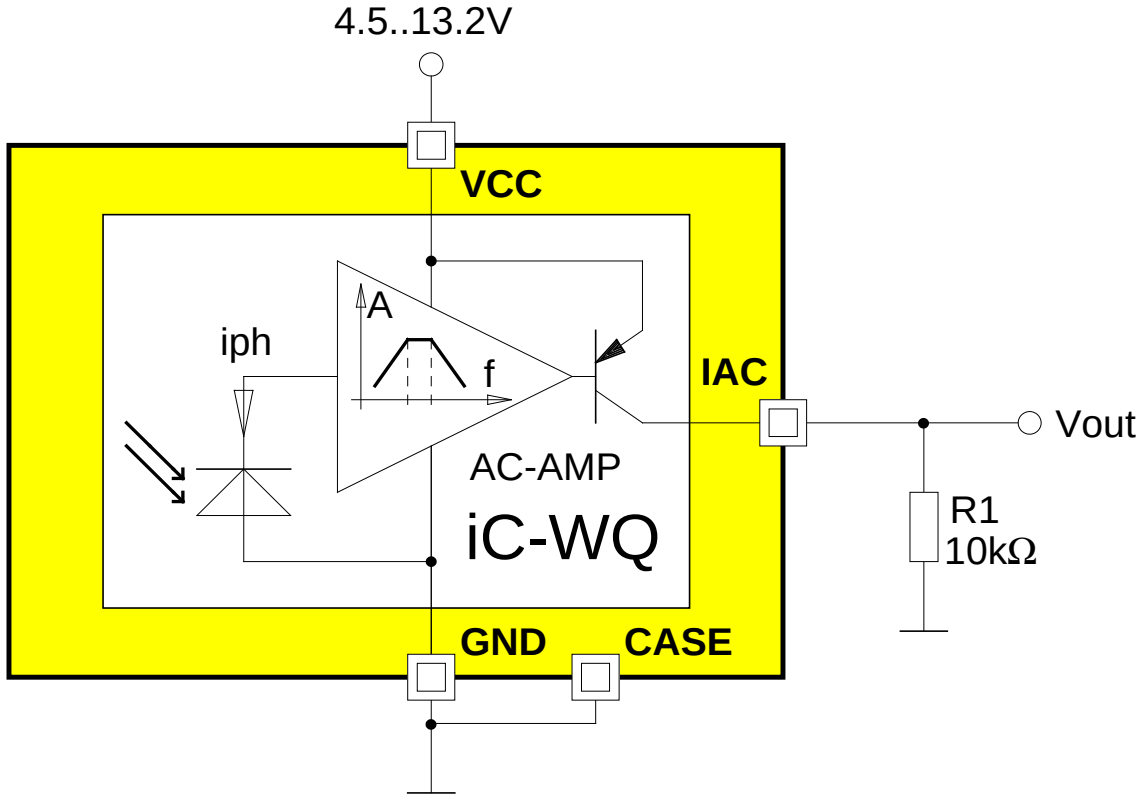


TO18-4L



TO18-4F

BLOCK DIAGRAM



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DESCRIPTION

The iC-WQ device is an alternating-light photo sensor with a monolithic integrated photodiode. The device supersedes conventional photoelectric detectors, e.g. in light barriers.

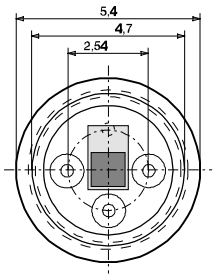
Constant light and low-frequency variing light are suppressed by a highpass filter. A lowpass filter reduces high-frequency interference to a minimum. The maximum sensitivity for alternating-light signals (for AC photoelectric currents) is about 100kHz, with a power amplification typically at 50dB. The analog output offers directly the amplified AC photoelectric current.

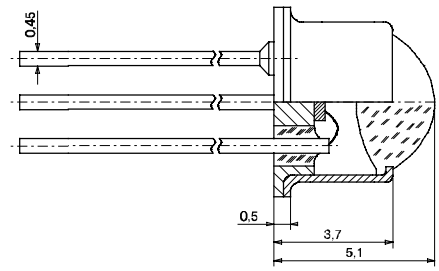
PACKAGES TO18-4L(F) to JEDEC Standard

PACKAGE LABEL

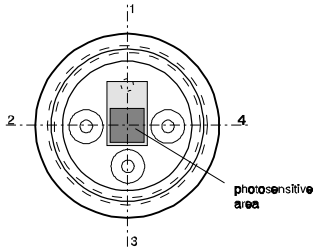
iC-WQ *Code*
yyww

PHYSICAL DIMENSIONS (dimensions given in mm)





PIN CONFIGURATION
(top view)



PIN FUNCTIONS

No.	Name	Function
1	GND	Ground
2	IAC	Current output
3	VCC	Supply Voltage 5..12V
4	GND	Ground

optical input from top

ABSOLUTE MAXIMUM RATINGS

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

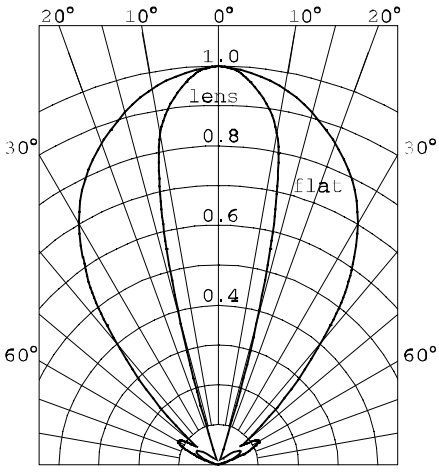
Item	Symbol	Parameter	Conditions	Fig.	Min.	Max.	Unit
G001	VCC	Supply Voltage			0	15	V
G002	I(IAC)	Current in IAC			-1	0	mA
TG1	Tj	Junction Temperature			-40	130	°C
TG2	Ts	Storage Temperature			-40	130	°C

THERMAL DATA

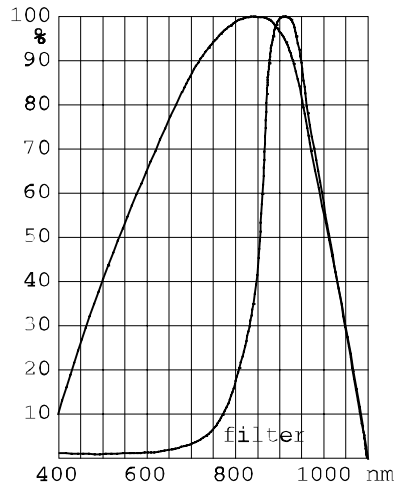
Operating Conditions: VCC= 4.5..13.2V

Item	Symbol	Parameter	Conditions	Fig.	Min.	Typ.	Max.	Unit
T1	Ta	Operating Ambient Temperature Range (extended temperature range on request)			-25		90	°C

TYPICAL CHARACTERISTICS



Directional characteristics Srel(φ)



Relative spectral sensitivity Srel(λ)

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..125°C, unless otherwise noted

Item	Symbol	Parameter	Conditions	Tj °C	Fig.	Min.	Typ.	Max.	Unit
Total Device									
001	VCC	Permissible Supply Voltage				4.5		13.2	V
002	I(VCC)	Supply Current in VCC	iph= 0	 27		0.30	 0.49	1.25	mA mA
003	Vs(IAC)	Saturation Voltage at IAC	Vs(IAC)= VCC-V(IAC); I(IAC)= -400µA					0.5	V
004	I0(IAC)	Leakage Current in IAC	iph= 0	 27		-210	 -108		µA µA
Photodiode									
005	S(λ)max	Spectral Sensitivity					0.5		A/W
006	Se(λ)	Range of Spectral Sensitivity	Se(λ)= 0.1×S(λ)max			500		1050	nm
007	Aph()	Radiant Sensitive Area					0.9		mm²
Photo Current Amplifier									
008	I(IAC)	Output Current Operating Range in IAC				-500		0	µA
009	Ee()pk	Permissible Irradiance for Alternating Light (peak value)	f= fc; TO18-4F (flat) TO18-4L (lens)					 0.25 0.1	 mW/cm² mW/cm²
010	I(IAC)eff	Output Current (RMS)	TO18-4F (flat): f= fc, Ee()ac= 30µW/cm² TO18-4L (lens): f= fc, Ee()ac= 5µW/cm²	 27 27		25 30	 50 60		µA µA µA µA
011	iph()dc	DC Photo Current Capabillity		 27		3.4	 11		µA µA
012	Ev()dc	Permissible Ambient Light Level	Standard Illuminant A at T= 2856°K; TO18-4F (flat) TO18-4L (lens) TO18-4FF (flat,filter) TO18-4LF (lens,filter)				 380 55 7600 1100		 lx lx lx lx
013	fc	Bandpass Center Frequency				40	100	160	kHz
014	Q	Filter Q-factor	Q= fc / (fhc-flc)			0.3	0.5	0.52	
015	Ai()fc	In-band Photo Current Gain	f= fc			47	51	53	dB
016	Ai()100	Low-frequency Photo Current Gain	f= 100Hz			1	3	6	dB
017	Vn(Vout)	RMS Noise Voltage	with external filter: R1= 10kΩ, C1= 120pF, R2= 50kΩ, C2= 100pF	1			2.1	2.8	mV

APPLICATIONS INFORMATION

Examples of Output Signals

The following oscilloscope graphs show examples of possible iC-WQ output signals (RL= 10kΩ, no external filter).

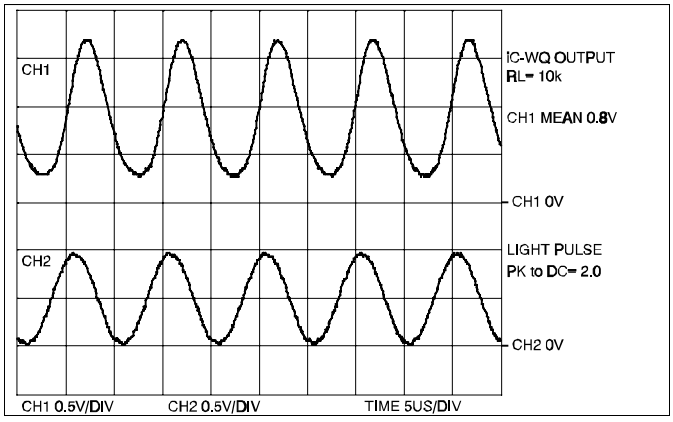


Fig. 1:
Sinussoidal light signal, f≈ 100kHz,
no ambient light

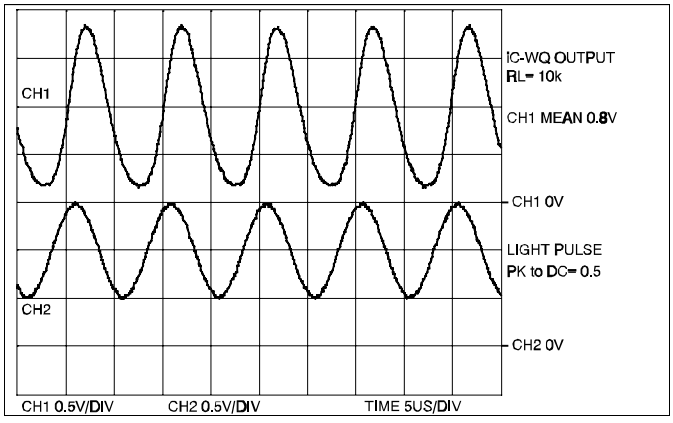


Fig. 2:
Light signal as in Fig. 1, superimposed by ambient light with a level twice the signal peak level (ACpk).
Little effect on the output signal (low increase of the AC gain).

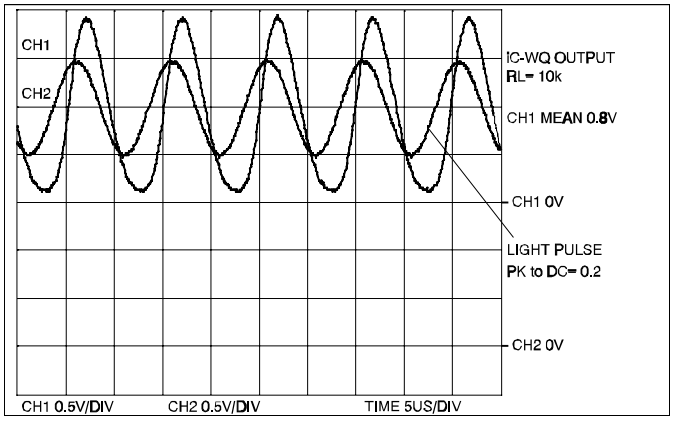


Fig. 3:
Light signal as in Fig. 1, superimposed by a high ambient light level.
Output signal almost equal to that in Fig. 2.

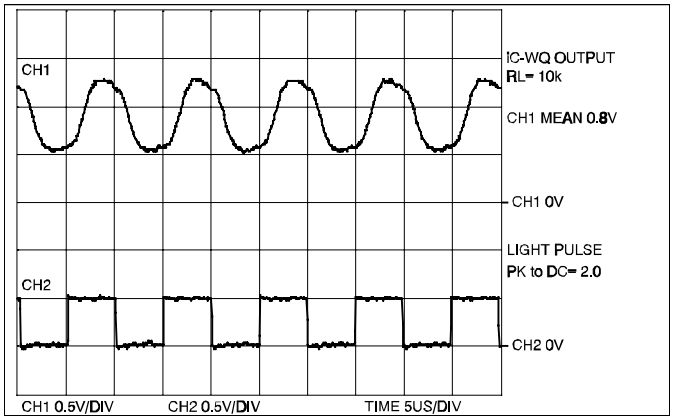


Fig. 4:
Pulsed light input (5µs pulse, 5µs pause),
no ambient light.

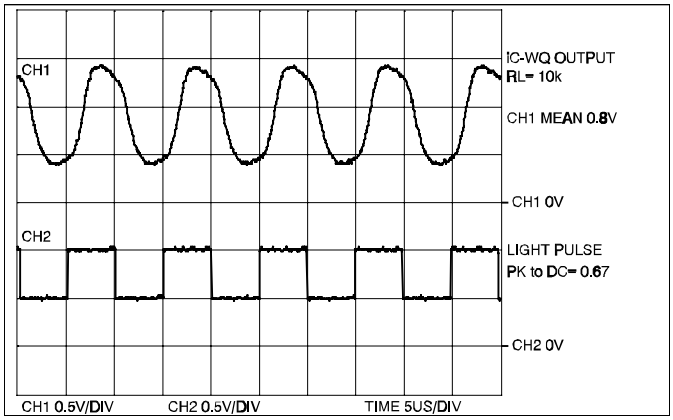


Fig. 5:
Pulsed light input as in Fig. 4,
superimposed by ambient light.
Little effect on the output signal.

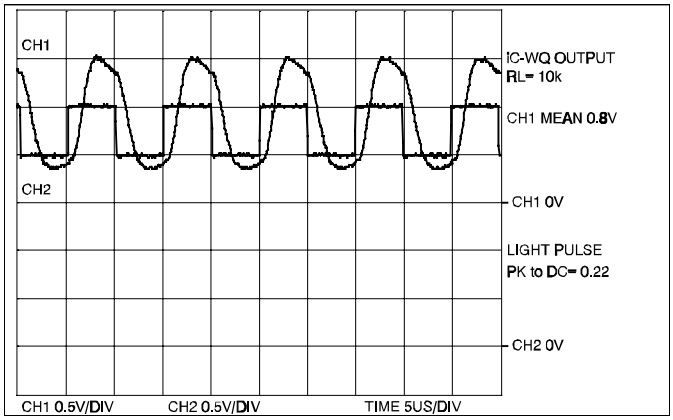


Fig. 6:
Pulsed light input as in Fig. 4,
superimposed by a very high ambient light level.
Output signal almost unchanged.

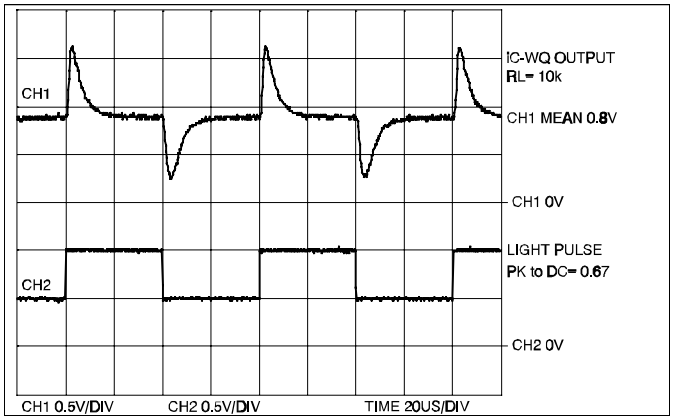


Fig. 7:
Pulsed light input (20µs pulse, 20µs pause), low ambient light.

The output reacts to every signal change, ie. on each flank.

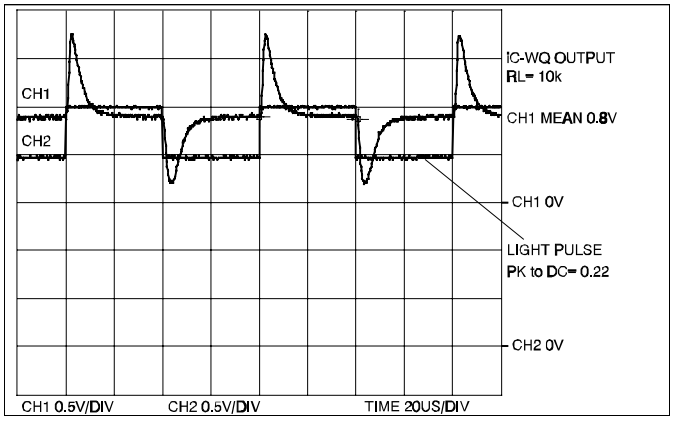


Fig. 8:
Pulsed light input as in Fig. 7,superimposed by a very high ambient light level.
Little effect on the output signal.

Example of a circuit with an external filter

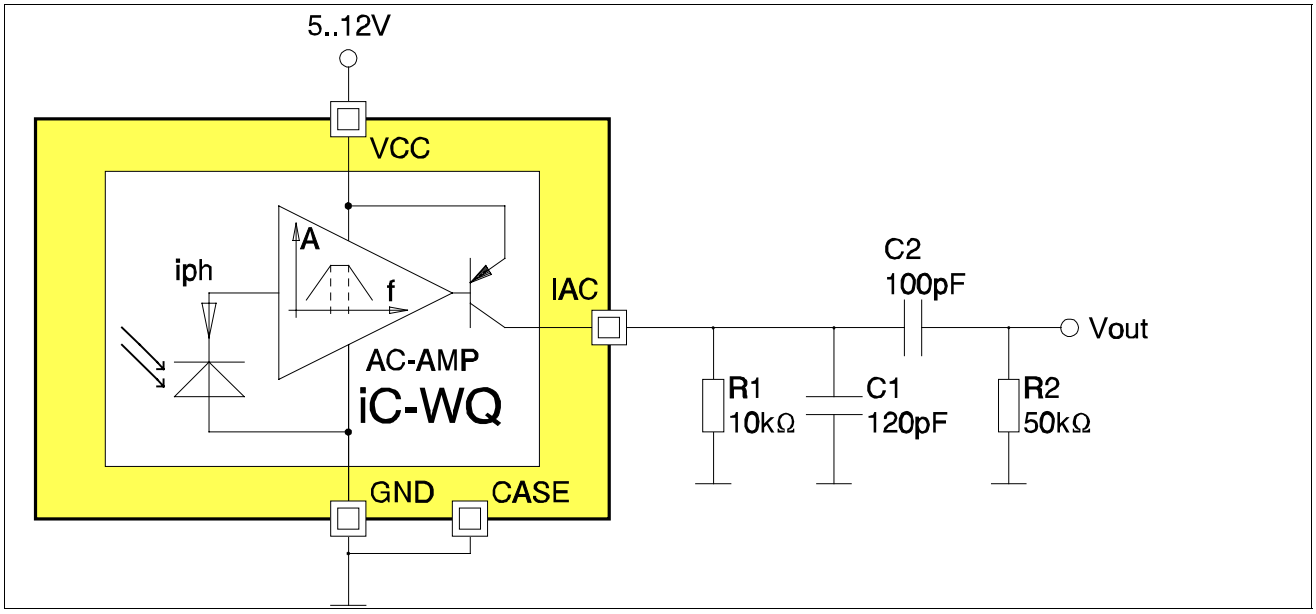


Fig. 9: Additional external bandpass filter to cut off DC signals and noise.

ORDERING INFORMATION

Type	Package	Order designation
iC-WQ	TO18-4 lens	iC-WQ-TO18-4L
iC-WQ	TO18-4 flat	iC-WQ-TO18-4F

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

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