ENGINEERING SAMPLES

PYROELECTRIC IR-DETECTOR

CUSTOMER :

TYPE : PYD 1998

PART-NO. : Engineering samples

No. of samples :

Dual element detector, serial opposed format, two elements based on pyroceramic. The signal is converted to a digital value using Sigma-Delta and DSP techniques.

This specification is provided by

PerkinElmer Optoelectronics GmbH & Co. KG, Wiesbaden.

It covers the complete technical data of a pyroelectric IR detector. All detectors have met the requirements of PerkinElmer test-specifications and passed outgoing inspection.

We kindly ask for approval with the return of a signed copy.

Checked: Date: 18.10.04

Customer approval: Date:

Electrical Configuration:

The sensing elements are connected to built-in IC, detailed description as following:

The ASIC contains an on chip low power oscillator, an analogue to digital converter which generates a digital signal from the voltage level of the sensing elements and a 2nd order digital low-pass filter eliminates unwanted higher frequency components. The data is transferred from the filter to the output latch whenever new data are available and the output latch is not being read. If the micro controller reads the register faster than the update rate of the filter the data read is 'all zeros'.

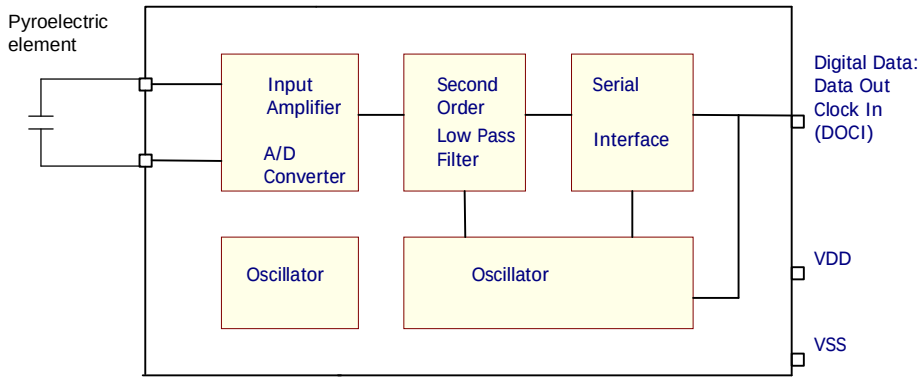


Fig.1: ASIC

The signal process is as followed.

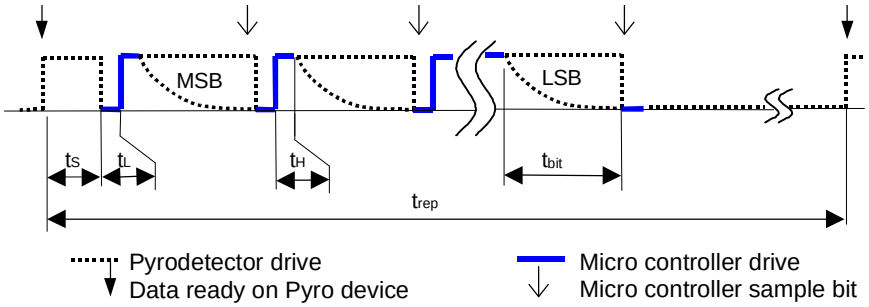


Fig.2: Signal process

The start of a read cycle is indicated by the pyrodetector pulling DOCI high. The micro controller must wait wait for ~ 25µs and than generates a low to high transition on the DOCI line before it samples the data bit. The first bit read is the MSB and is repeated until all 15 bits have been read. After the last bit the micro controller must force low level and subsequently release DOCI. When a new filter value is generated the pyrodetector pull DOCI high and a new data bit can be read. If reading is interrupted for more than 256 system clocks with DOCI interface at low level the data latch is updated with a new filter value. Reading can be interrupted while DOCI is forced high.

Electrical data:

Unless specified differently, all data refer to 25°C:

Tab.1: Electrical data for ASIC

Parameter	Symbol	Min	Typ	Max	Unit	Remarks
Operating voltage	V_{DD}	3.5	5	5.5	V	
Supply Current	I_{DD}			60	µA	V_{DD} = 5V
Input low voltage	V_{IL}			20	$\%V_{DD}$	
Input high voltage	V_{IH}	80			$\%V_{DD}$	
Pull up / down current			100		µA	Input to V_{SS} / V_{DD}
Input capacitance			5		pF	
Data setup time	t_s	2			$1/F_{CLK}$	
Data clock low time	t_L	200			ns	
Data clock high time	t_H	200			ns	
Data bit settling time	t_{bit}	1			µs	C_{LOAD} = 10pF
Serial Interface upate time	T_{REP}		256		$1/F_{CLK}$	
ADC Resolution			14		Bits	Max Count = 2^{14}
ADC Sensitivity		6.1	6.5	7	µV/count	
ADC Temperatue Coefficient		-300		300	ppm/K	
ADC Offset		7000	8192	9200	counts	
LPF cut-off frequency			10		Hz	
A/D Conversion time	T_{ADC}		32		$1/F_{CLK}$	
Internal clock frequency	F_{CLK}	80	90	100	kHz	

Responsivity: **min.: 3.3 kV/W** typ.: 4.0 kV/W

Responsivity is measured within spectral range 7 - 14 µm as per fig. 3 at 1Hz.

Noise: **max.: 50 μV_{pp}** typ.: 20 μV_{pp}

After a 10 minute settling time, noise is monitored for the duration of 1500 sec. at a temperature of 25°C, shut from infrared energy, electrical bandwidth of 0.4 to 10Hz.

Typical Responsivity vs. Frequency

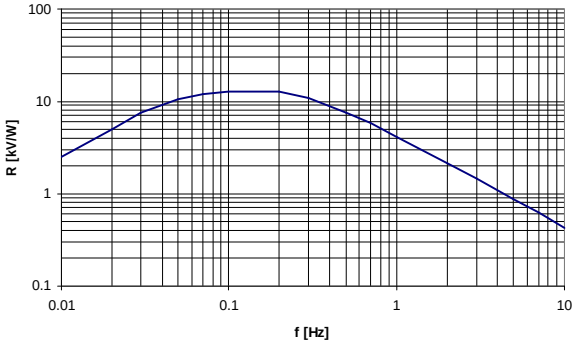


Fig.2: Frequency response

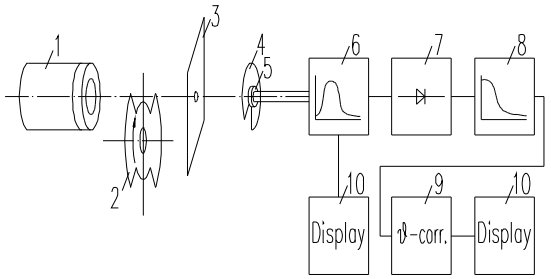
Sample data

The samples attached to this specification have been randomly selected. Test equipment as per fig. 3 and fig.4.

Tab.1: Sample data

Sample no.	R_A [kV/W]	R_B [kV/W]	Match [kV/W]
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			

Test Set up



1: Black Body Radiator 373K = 100°C
2: 1 Hz Chopper
3: Aperture
4: Cover plate
5: Detector
6: Bandpass filter 1 Hz
7: Rectifier
8: Lowpass filter
9: Temperature compensation
10: Display

Fig.3: Test Set – up

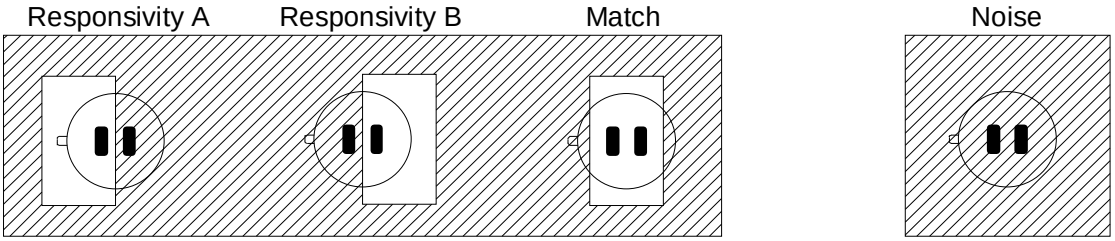


Fig.4.: Responsivity measurement

Spectral range:

The spectral range of the detector is determined by filter built in (window).

Substrate: Silicon, multilayer coated

Cut – on: 5.5 ± 0.3 µm

Transmission: T > 77% average between 7 µm and 14 µm

Blocking: T < 0.1% for λ < 5 µm

Configuration:

Housing: TO- 5 metal housing with infrared transparent window

Element size: 2 x 1, see also drawing: 2/71428

Connections: Refer to drawing: 2/71428

Field of View

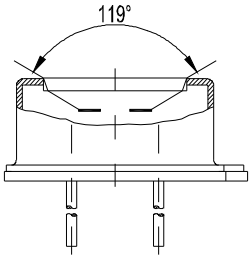


Fig.5: Field of View

Operating temperature: -40°C to +85°C
The electrical parameters may vary from specified values accordance with their temperature dependence.

Storage temperature: -40°C to +85°C
Avoid storage under high humid environment.

Humidity:

The IR-detector shall not increase noise or decrease responsivity when exposed to 95% r.H. at 30°C. Operation below dew point might affect performance.

Hermetic seal:

This IR-detector is sealed to pass a He-leakage test with maximum leak rate of 10^{-8} mbar·l·s^{-1}.

Quality:

PerkinElmer is a **QS 9000** certified manufacturer with established SPC and TQM. Detector out-going inspections include the parameters Responsivity, Match, Offset, Noise, Gross leak (Mil Std 883 method 1014C1) on 100%. Individual data are not stored, statistical details can be disclosed on request.

Handling:

Electrostatic charges may destroy the detector. We recommend applying precautions necessary for ESD devices to avoid damages. Do not apply physical force to detector leads. Do not expose detector to aggressive detergents such as Freon, trichloroethylene, etc.

Solder conditions:

Hand soldering and standard wave soldering process may be applied. Avoid heat exposure to the top and the window of the detector. Reflow soldering is not recommended.

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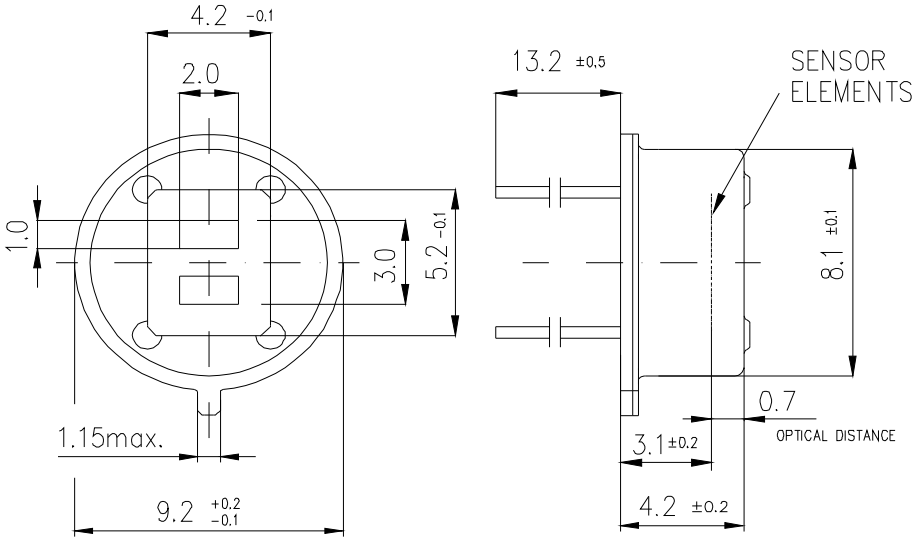

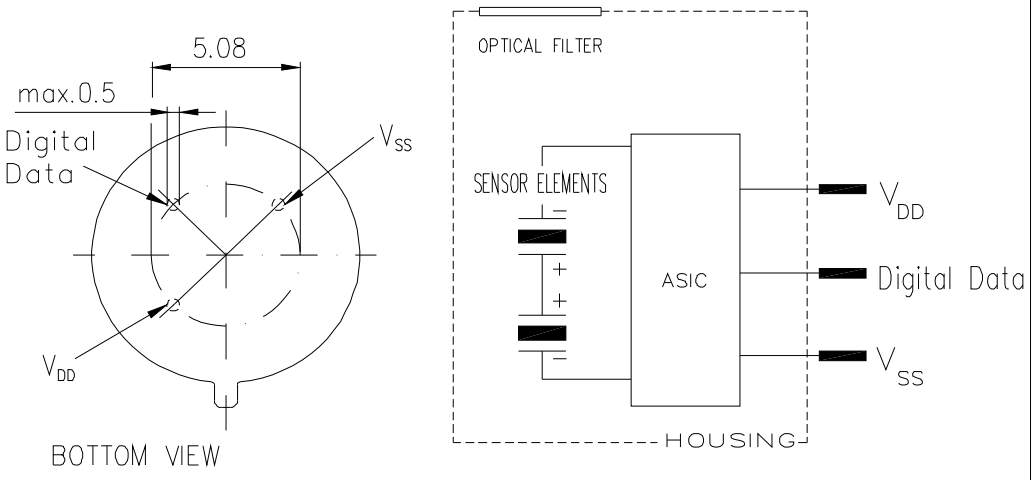

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	Datum DATE	Name NAME	Werkstoff MATERIAL	PerkinElmer® optoelectronics.
Gez. DRAWN BY	17.03.04	Tkocz		
Gepr. CHECKED BY				
Maßstab SCALE	Benennung/TITLE			Zeichnung Nr./DRAWING NO.
5:1	ELEMENTORIENTATION AND CONNECTIONS PYD 1998			2/71428
				Ersatz für/REPLACEMENT FOR
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Index NO.	Änderung REVISION	Datum DATE	Name NAME
1	–	16.08.04	Tkocz

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