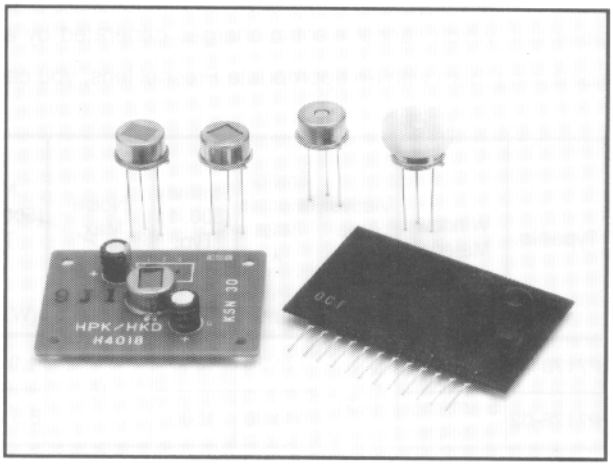
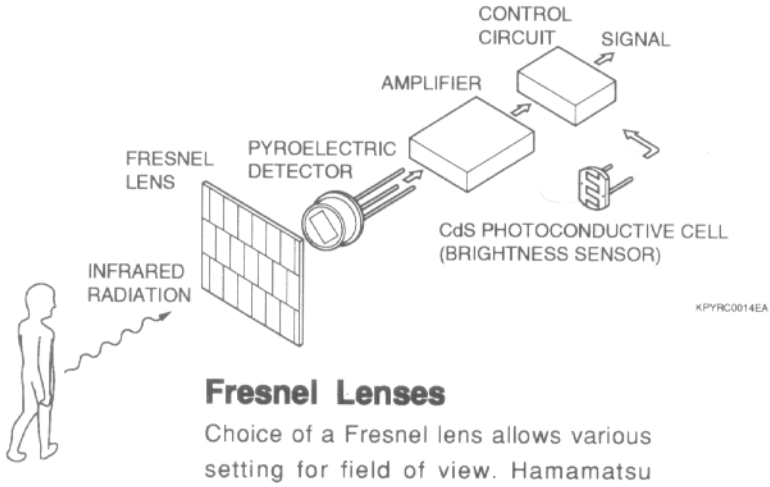
HAMAMATSU

PYROELECTRIC DETECTORS AND PERIPHERAL PRODUCTS

Pyroelectric Detectors

The pyroelectric detector detects infrared radiation from the human body by converting it into heat. It has constant sensitivity with respect to all wavelengths and thus the spectral response range can be determined by the window material. P7178 series pyroelectric detectors with improved temperature characteristic have been added to our product line, ensuring more stable operation during ambient temperature changes.





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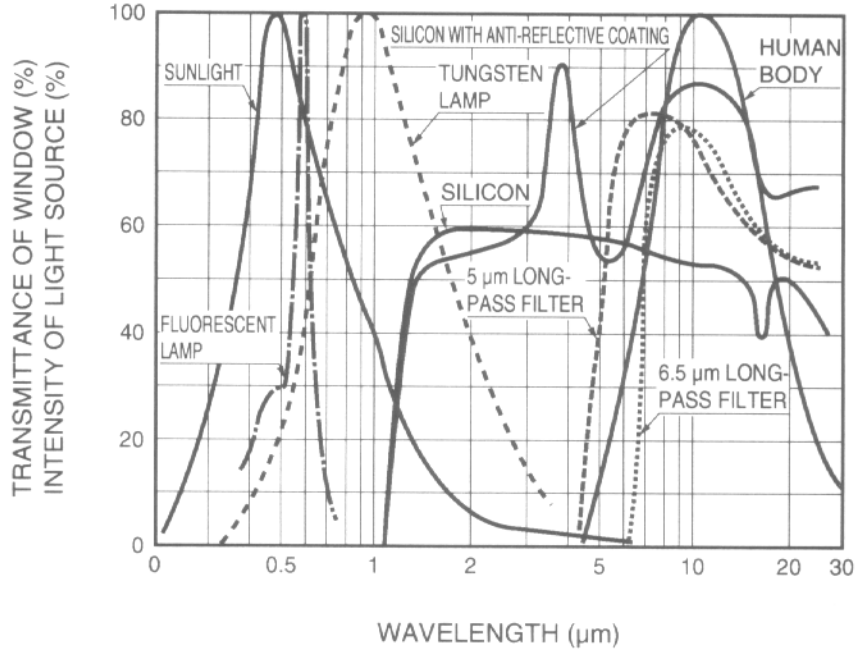
CdS Photoconductive Cells (for Light Level Detection)

The CdS photoconductive cell detects ambiemt light level (daytime/nighttime) to allows the human body sensor to operate in dark location or at night.

Fresnel Lenses

Choice of a Fresnel lens allows various setting for field of view. Hamamatsu provides a variety of Fresnel lenses, such as lenses for long-distance use (up to 40 meters) and ceiling-mounted use.



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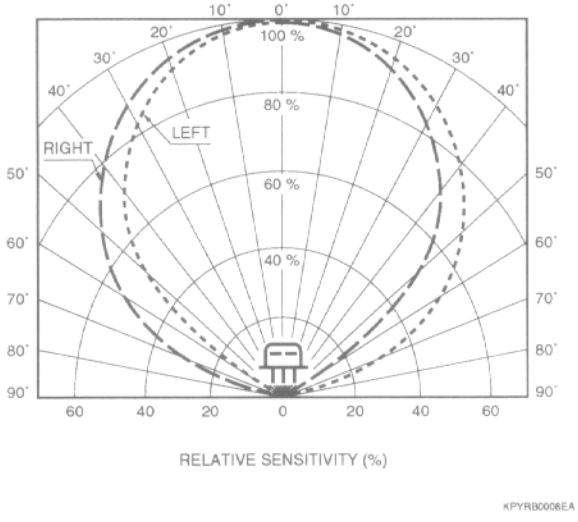
HAMAMATSU

DUAL ELEMENT TYPE PYROELECTRIC DETECTORS P7178 SERIES

They have two pyroelectric elements in a TO-5 package for general use. The elements are connected in series with opposite polarities, which cancel electric charges generated by ambient temperature variations, thus preventing faulty operation. When combining them with an appropriate Fresnel lens, you can get detection ranges that suit your applications.

Type No.	Window Material	Active Area (mm)	Spectral Response Range λ (μm)	Sensitivity (500, 1) Typ. (V/W)	Noise Max. (μV/Hz$^{1/2}$)	NEP (500, 1, 1) Typ. (W/Hz$^{1/2}$)	D* (500, 1, 1) Typ. (cm·Hz$^{1/2}$/W)	Rise Time tr 0~63 % Typ. (ms)	Temp. Coefficient of Sensitivity Max. (%/°C)	Supply Voltage (V)	Offset Voltage RL=22 kΩ (V)	Maximum Ratings: Operating Temperature (°C)	Maximum Ratings: Storage Temperature (°C)
P7178	6.5 μm long-pass filter	2 × 1 (× 2)	7 to 20	1300	15	1.0×10^{-9}	1.5×10^{8}	100	0.2	3 to 15	0.2 to 1.0	-20 to +60	-30 to +85
P7178-02	5 μm long-pass filter		5 to 20	1500		8.5×10^{-10}	1.7×10^{8}						

Figure 1: Directivity



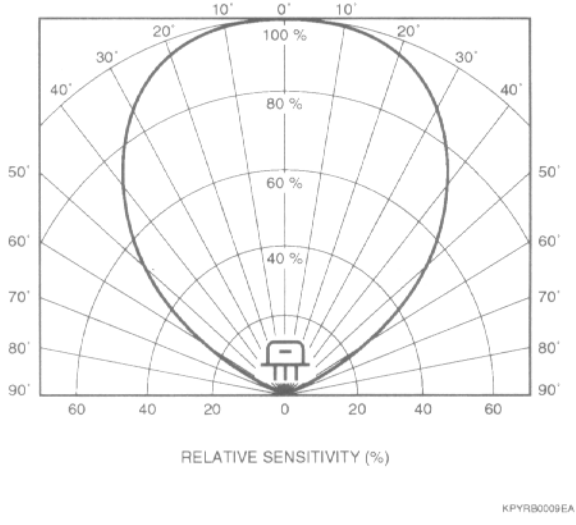


Figure 2: Frequency Response

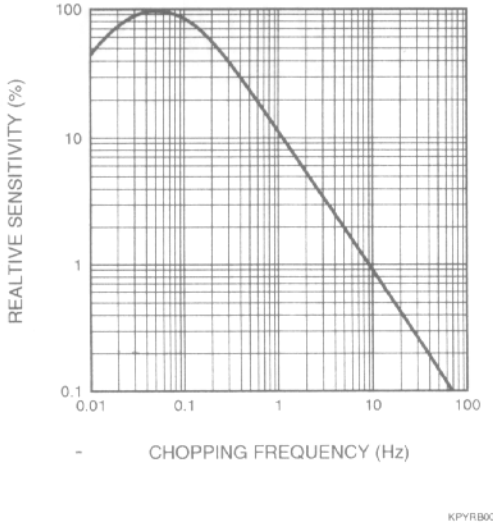
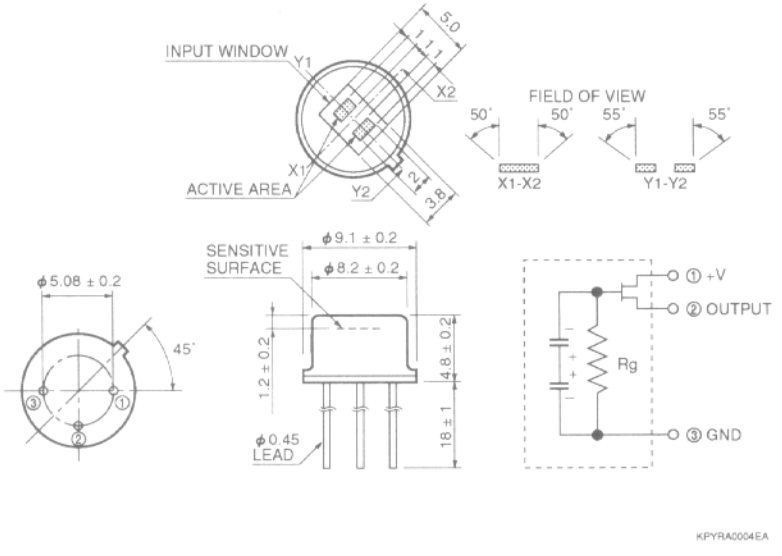


Figure 3: Dimensional Outline (Unit: mm)



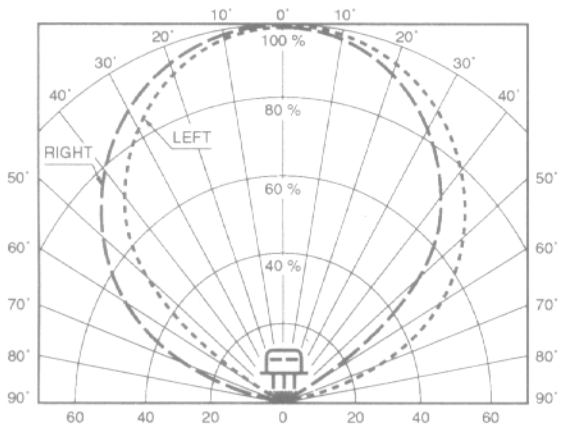
HAMAMATSU

DUAL ELEMENT TYPE PYROELECTRIC DETECTORS P7156 SERIES

They have two pyroelectric elements in a TO-5 package. The elements are connected in series with opposite polarities, which cancel electric charges generated by ambient temperature variations and external noise, thus preventing faulty operation. When combining them with an appropriate Fresnel lens, you can get detection ranges that suit your applications. The P7156 series have superior temperature characteristic and endurance, so they are suitable for security application.

Type No.	Window Material	Active Area (mm)	Spectral Response Range λ (μm)	Sensitivity (500, 1) Typ. (V/W)	Noise Max. (μV/Hz$^{1/2}$)	NEP (500, 1, 1) Typ. (W/Hz$^{1/2}$)	D* (500, 1, 1) Typ. (cm·Hz$^{1/2}$/W)	Rise Time tr 0~63 % Typ. (ms)	Temp. Coefficient of Sensitivity Max. (%/°C)	Supply Voltage (V)	Offset Voltage RL=22 kΩ (V)	Maximum Ratings: Operating Temperature (°C)	Maximum Ratings: Storage Temperature (°C)
P7156	6.5 μm long-pass filter	2 × 1 (× 2)	7 to 20	1300	15	1.0 × 10^{-9}	1.5 × 10^{8}	100	0.2	3 to 15	0.4 to 1.2	-20 to +60	-30 to +85
P7156-02	5 μm long-pass filter		5 to 20	1500		8.5 × 10^{-10}	1.7 × 10^{8}						

Figure 4: Directivity



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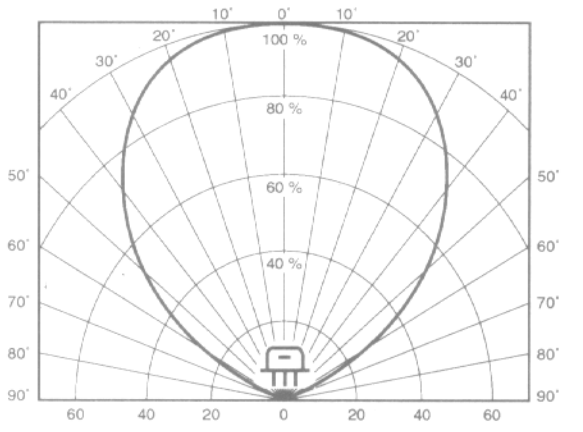

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Figure 5: Frequency Response

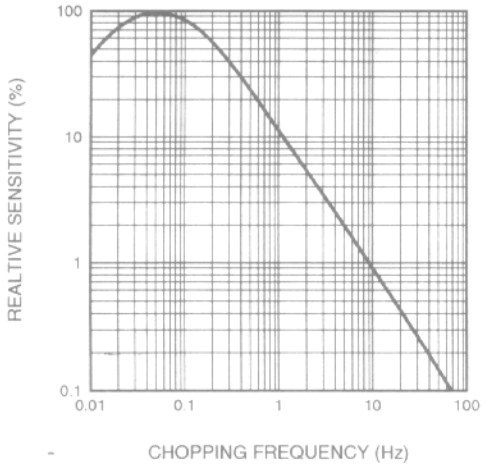

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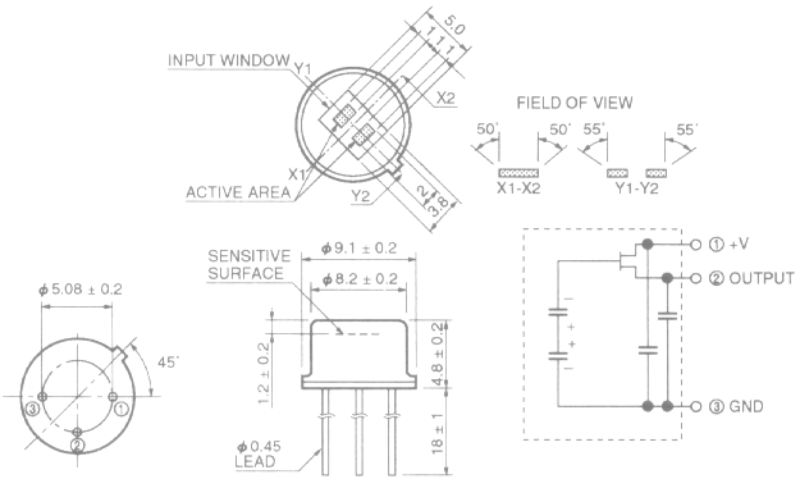
Figure 6: Dimensional Outline (Unit: mm)



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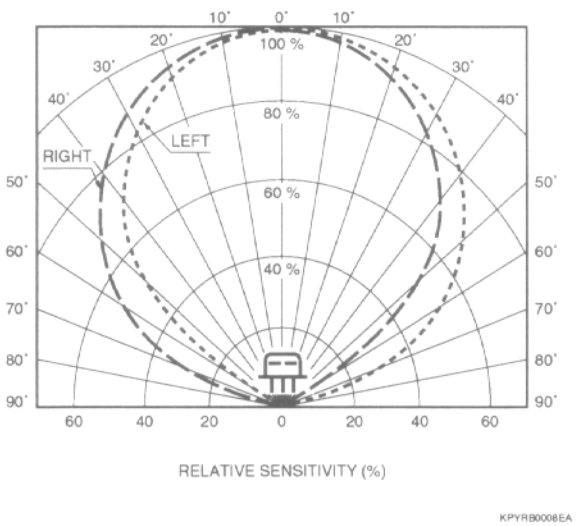
HAMAMATSU

DUAL ELEMENT TYPE PYROELECTRIC DETECTORS P7176 SERIES

They have two pyroelectric elements in a TO-5 package. The elements are connected in series with opposite polarities, which cancel electric charges generated by external noise, thus preventing faulty operation. The P7176 series has superior temperature characteristics and reliability, so they are suitable for a security application. When combining them with an appropriate Fresnel lens, you can get detection ranges that suit your applications.

Type No.	Window Material	Active Area (mm)	Spectral Response Range λ (μm)	Sensitivity (500, 1) Typ. (V/W)	Noise Max. (μV/Hz$^{1/2}$)	NEP (500, 1, 1) Typ. (W/Hz$^{1/2}$)	D* (500, 1, 1) Typ. (cm·Hz$^{1/2}$/W)	Rise Time tr 0~63 % Typ. (ms)	Temp. Coefficient of Sensitivity Max. (%/°C)	Supply Voltage (V)	Offset Voltage RL=22 kΩ (V)	Maximum Ratings: Operating Temperature (°C)	Maximum Ratings: Storage Temperature (°C)
P7176	6.5 μm long-pass filter	2 × 1 (× 2)	7 to 20	1300	15	1.0×10^{-9}	1.5×10^{8}	100	0.2	3 to 15	0.2 to 1.0	-20 to +60	-30 to +85
P7176-02	5 μm long-pass filter		5 to 20	1500		8.5×10^{-10}	1.7×10^{8}						

Figure 7: Directivity



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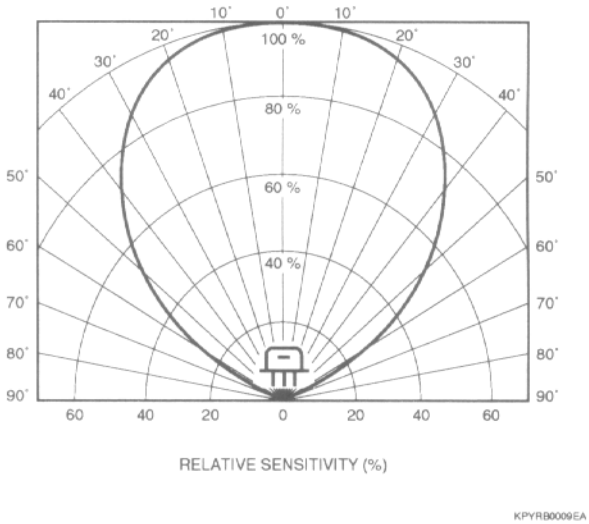

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Figure 8: Frequency Response

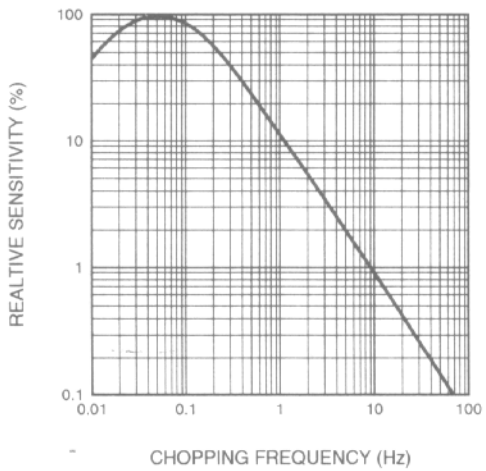

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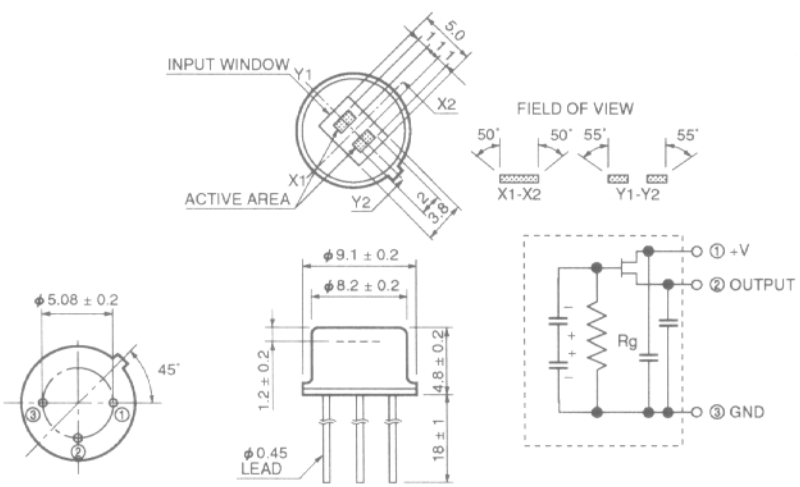
Figure 9: Dimensional Outline (Unit: mm)



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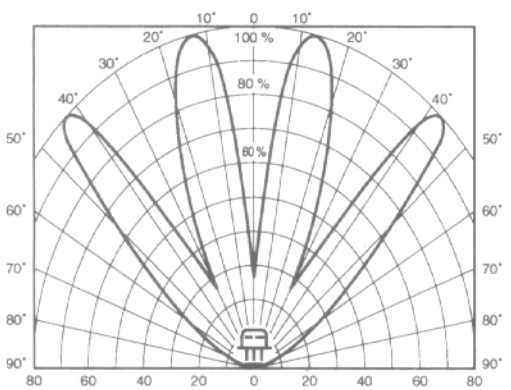
DUAL ELEMENT TYPES WITH LENS PYROELECTRIC DETECTORS P3514 SERIES

They are suited for the detection of a human body at a short distance of about 2 to 3 meters. Since the devices require no Fresnel lens, they can be put in a small sensor unit.

Type No.	Window Material	Active Area (mm)	Spectral Response Range λ (μm)	Sensitivity (500, 1) Typ. (V/W)	Noise Max. (μV/Hz$^{1/2}$)	NEP (500, 1, 1) Typ. (W/Hz$^{1/2}$)	D* (500, 1, 1) Typ. (cm・Hz$^{1/2}$/W)	Rise Time tr 0~63 % Typ. (ms)	Temp. Coefficient of Sensitivity Max. (%/°C)	Supply Voltage (V)	Offset Voltage RL=22 kΩ (V)	Maximum Ratings: Operating Temperature (°C)	Maximum Ratings: Storage Temperature (°C)
P3514	6.5 μm long-pass filter	2 × 1 (× 2)	7 to 20	450	15	1.5×10^{-9}	1.0×10^{8}	100	0.2	3 to 15	0.2 to 1.0	-20 to +60	-30 to +85
P3515-01													
P3514-02	5 μm long-pass filter		5 to 20	500		1.4×10^{-9}	1.1×10^{8}						
P3514-03													

Figure 10: Directivity

P3514/-02



P3514-01/-03

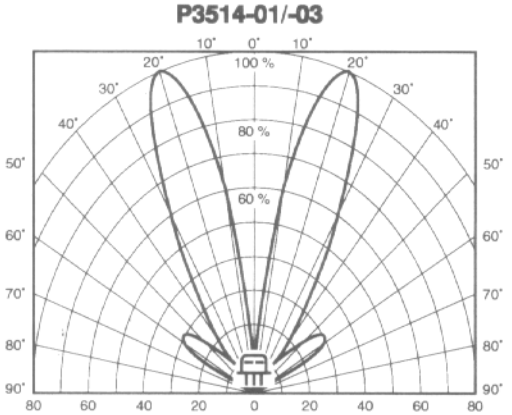
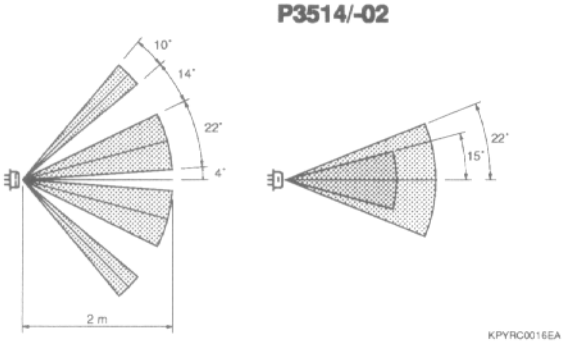


Figure 11: Field of View

P3514/-02



P3514-01/-03

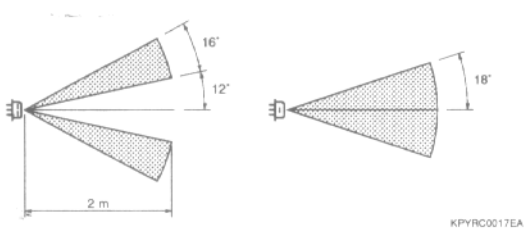
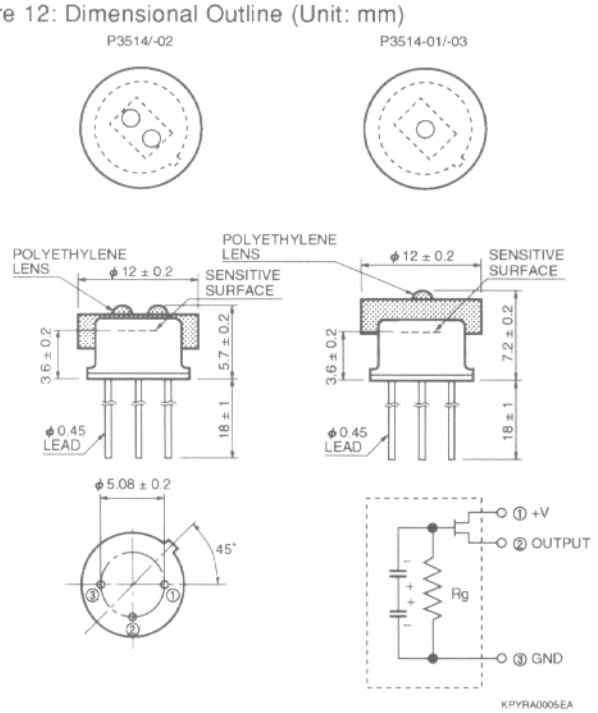


Figure 12: Dimensional Outline (Unit: mm)



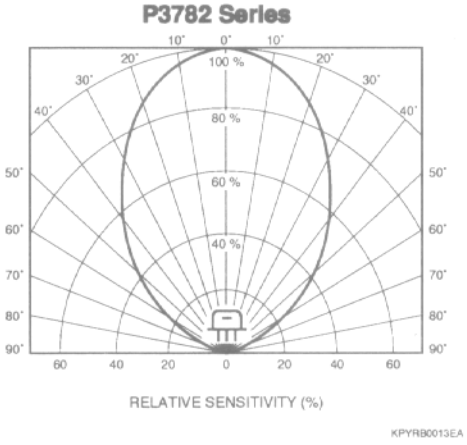
SINGLE ELEMENT TYPES P3782/P4736/P2613 SERIES

Since the P3782 and P4736 series integrate a element for temperature compensation, they can prevent faulty operation due to ambient temperature variations. They are suitabale for CO_2 detection, etc.

Type No.	Window Material	Active Area (mm)	Spectral Response Range λ (μm)	Sensitivity (500, 1) Typ. (V/W)	Noise Max. (μV/Hz$^{1/2}$)	NEP (500, 1, 1) Typ. (W/Hz$^{1/2}$)	D* (500, 1, 1) Typ. (cm·Hz$^{1/2}$/W)	Rise Time tr 0~63 % Typ. (ms)	Temp. Coefficient of Sensitivity Max. (%/°C)	Supply Voltage (V)	Offset Voltage RL=22 kΩ (V)	Maximum Ratings: Operating Temperature (°C)	Maximum Ratings: Storage Temperature (°C)
P3782	Silicon		2 to 20	1000		3.0×10^{-9}	5.9×10^{7}						
P3782-01	7 μm long-pass filter		7 to 20	840		3.6×10^{-9}	4.9×10^{7}						
P3782-05	5 μm long-pass filter		5 to 20	1200		2.5×10^{-9}	7.1×10^{7}						
P4736	Silicon		2 to 20	940		3.2×10^{-9}	5.5×10^{7}						
P4736-01	7 μm long-pass filter		7 to 20	670		4.5×10^{-9}	3.9×10^{7}						
P4736-05	5 μm long-pass filter		5 to 20	880		3.4×10^{-9}	5.2×10^{7}						
P2613	Silicon		2 to 20	1200	15	2.5×10^{-9}	7.1×10^{7}	100	0.2	3 to 15	0.2 to 1.0	-20 to +60	-30 to +85
P2613-01	7 μm long-pass filter		7 to 20	940		3.2×10^{-9}	5.5×10^{7}						
P2613-02	4.3 μm band-pass filter		4.3 (HW=90 nm)	1500 *1		2.0×10^{-9}	8.9×10^{7}						
P2613-03	8-14 μm band-pass filter		8 to 14	670		4.5×10^{-9}	3.9×10^{7}						
P2613-12	4.4 μm band-pass filter		4.4 (HW=600 nm)	2000 *2		1.5×10^{-9}	1.2×10^{8}						

*1: λ=4.3 μm *2: λ=4.4 μm

Figure 13: Directivity



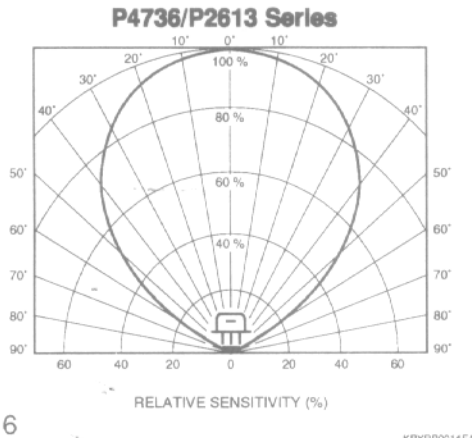
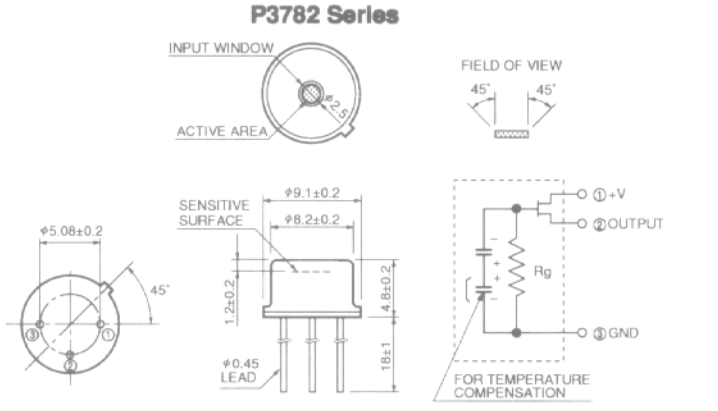
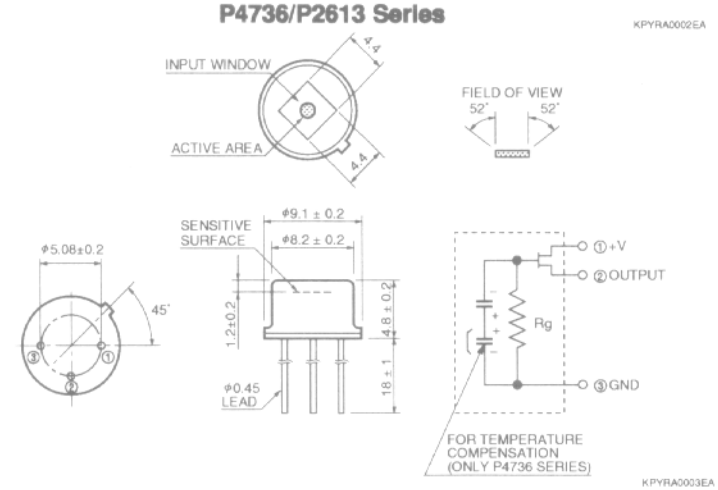


Figure 14: Dimensional Outline (Unit: mm)





FRESNEL LENSES

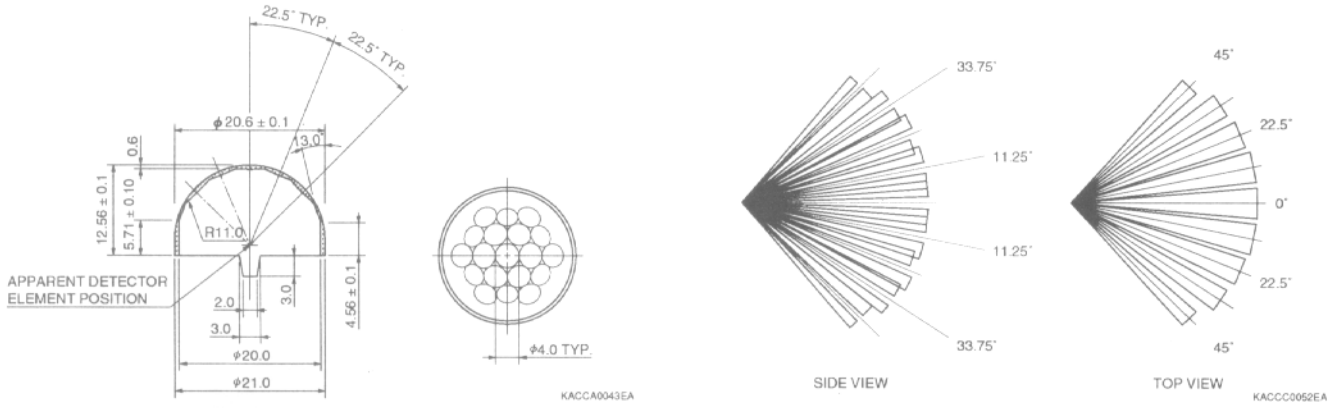
A Fresnel lens is usually used to enhance the sensitivity of the human body sensor and determine its detection range. Hamamatsu is willing to accept special orders than the following standard products. Please feel free to consult us for your special applications.

Type No.	Application	Number of Divided Areas	Detectable Distance (m)	Dimensional Outline (mm)	Focal Length (mm)	Configuration for Use	Outline
E5141 Series *1	For general use (mini-size)	19	5	φ21	11.2	-	P. 8
E4116-01	For general use	24	12	64 × 52 (Lens: 52 × 40)	25	Flat	
E4116-02	For long distance	11	40			Flat	
E4116-03	For corridor	11	12			Flat	
E4116-04	For ceiling	31	7 (at 2.4 m height)	64 × 52 (Lens: φ37)	15	Flat	
E4737 Series *2	For general use (mini-size)	37	5	φ26	14.4	-	P. 7

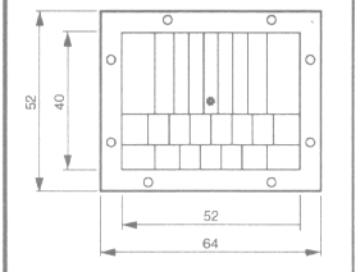
*1 E5141: milky (semitrans), E5141-01: black, E5141-02: white
*2 E4737: milky (semi-trans), E4737-01: black, E4737-02: white

Figure 17: Lens Pattern and Field of View (Unit: mm)

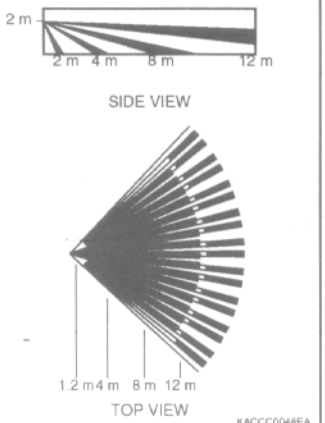
E5141



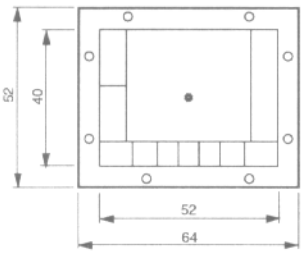
E4116-01

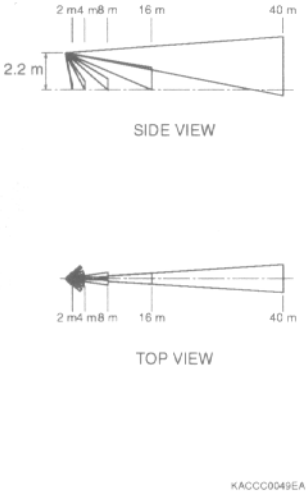


The directivity characteristics when coupled with a dual type are shown to E4116-01 as below.

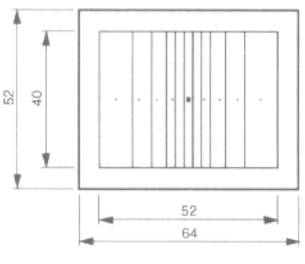


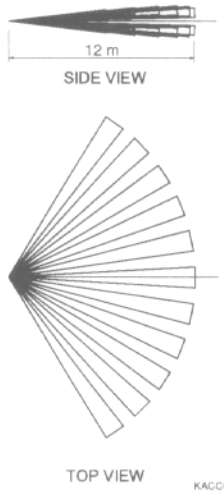
E4116-02



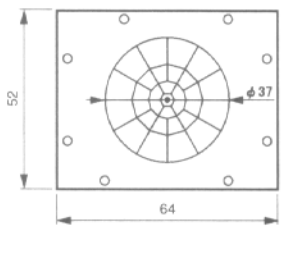


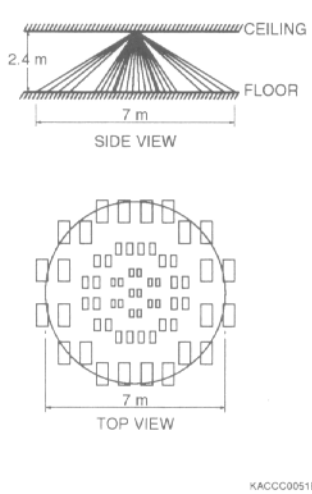
E4116-03



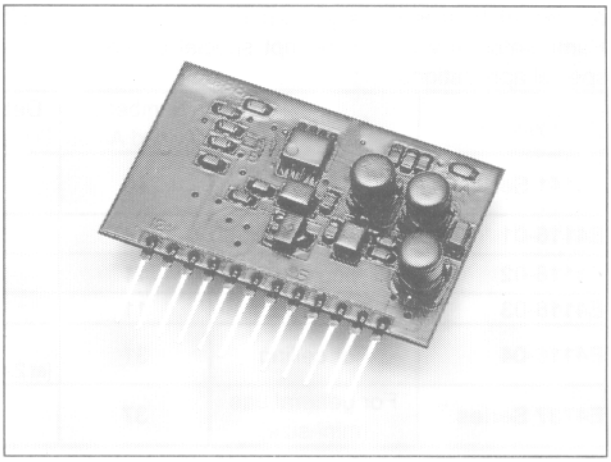


E4116-04





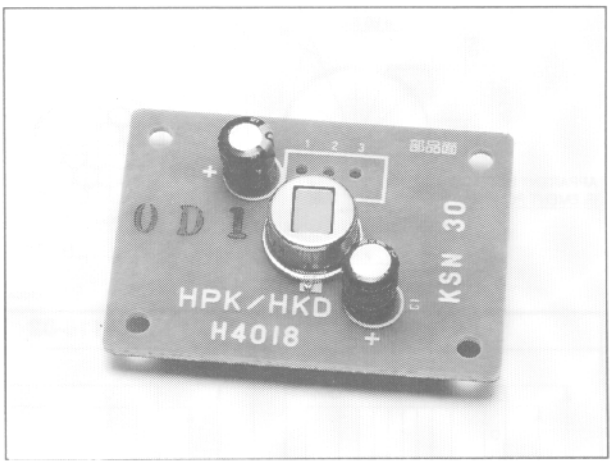
Multipurpose Type Hybrid IC H3651



The H3651 hybrid IC is specially designed for operating Hamamatsu pyroelectric detectors. By simply connecting a pyroelectric detector to the H3651 and supplying a single voltage of 7 to 15 V, infrared detection of a human body can be easily performed. Since the detection range is set at low-range frequency coming from action of humans, the H3651 is optimal to used as a sensor unit for a wide range of human body detection.

- **Operable with a single power supply of 7 to 15 V**
- **Outputs re-trigger type timer signals**
- **Timer pulse width can be adjusted between 0.1 and 200 seconds by an externally-connected capacitor**

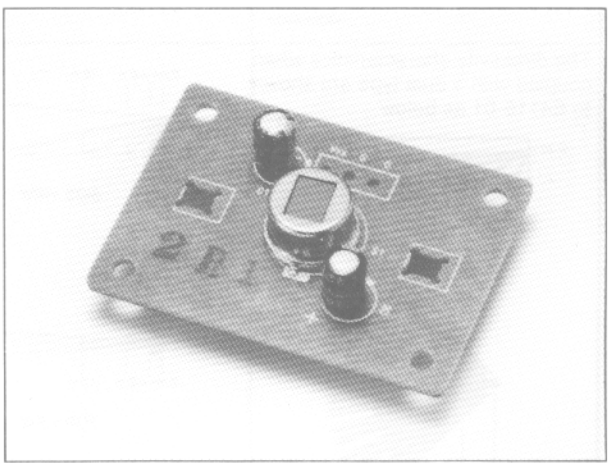
Simplified Type Hybrid IC (with a Pyroelectric Detector) H4018 Series



The H4018 series are hybrid ICs with a Hamamatsu pyroelectric detector. Operating the H4018 series is very easy. Just supplying a single voltage to the H4018 series allow for infrared detection of human body. Since the detection range is set at low frequency coming from motion of humans, the H4018 series are suited for a sensor unit for automatic illumination system, intruder alarming system, etc.

- **Two types are available**
  - **H4018: operates with the normal power supply**
  - **H4018-01: operates with dry batteries (low power consumption)**

Analog Output Amplifier (with Pyroelectric Detector) H5526 Series

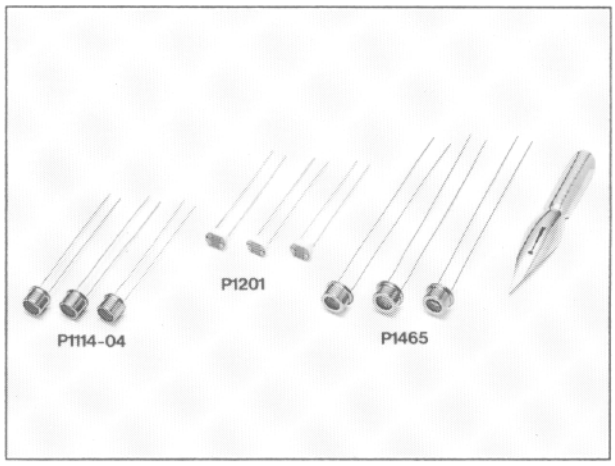


The H5526 series output analog signal of amplifier circuit set in low frequency range. By using the H5526 series, you can detect not only existence of human and animal, also activity information (frequency distribution, intensity, etc.). So they are used for many applications. The H5526 series are compact, they are used in head part of equipments.

- **Two types are available**
  - **H5526: operates with the normal power supply**
  - **H5526-01: operates with dry batteries (low power consumption)**

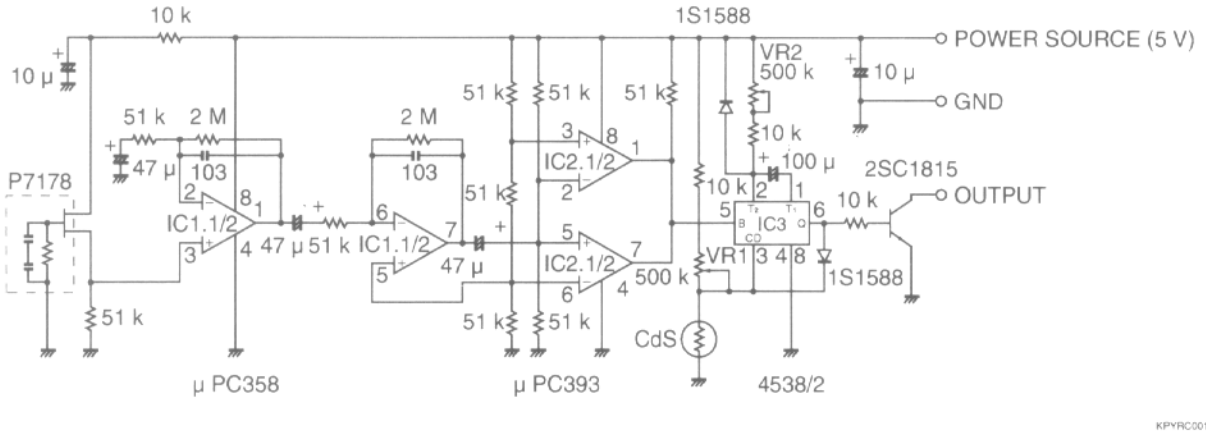
CdS Photoconductive Cells

A CdS photoconductive cell changes its resistance value according to the brightness of incident light. It is used for cameras, exposure meters, clock dimmers, and so forth. Many types of CdS photoconductive cells are available from Hamamatsu. Here, three types are selected as the most suitable for the "human body" sensor. They are all made in a compact size and available at low price. In the table below, 10 *lx* correspond to twilight. So you may design the pyroelectric detector to be turned on at around 10 *lx* under normal circumstances.



Type No.	Feature	Resistance		Package	Dimension (mm)
		0 *lx* (MΩ)	10 *lx* (kΩ)		
P1201	Low price	5 Min.	20 to 60	Resin coating	4.3 × 5.1
P1114-04	High reliability	10 Min.	15 to 45	Metal	ϕ4.75
P1465			27 to 81	Metal	ϕ5.5

Figure 18: Example of Human Body sensor Circuit



HAMAMATSU

HAMAMATSU PHOTONICS K.K., Solid State Division
1126-1 Ichino-cho, Hamamatsu City, 435-8558 Japan, Telephone: (81) 053-434-3311, Fax: (81) 053-434-5184
U.S.A.: Hamamatsu Corporation: 360 Foothill Road, P.O.Box 6910, Bridgewater, N.J. 08807-0910, U.S.A., Telephone: (1) 908-231-0960, Fax: (1) 908-231-1218
Germany: Hamamatsu Photonics Deutschland GmbH: Arzbergerstr. 10, D-82211 Herrsching am Ammersee, Germany, Telephone: (49) 08152-3750, Fax: (49) 08152-2658
France: Hamamatsu Photonics France: S.A.R.L.: 8, Rue du Saule Trapu, Parc du Moulin de Massy, 91882 Massy Cedex, France, Telephone: 33-(1) 69 53 71 00, Fax: 33-(1) 69 53 71 10
United Kingdom: Hamamatsu Photonics UK Limited: Lough Point, 2 Gladbeck Way, Windmill Hill, Enfield, Middlesex EN2 7JA, United Kingdom, Telephone: (44) 0181-367-3560, Fax: (44) 0181-367-6384
North Europe: Hamamatsu Photonics Norden AB: Smidesvägen 12, SE-171 41 Solna, Sweden, Telephone: (46) 8-509-031-00, Fax: (46) 8-509-031-01
Italy: Hamamatsu Photonics Italia S.R.L.: Strada della Moia, 1/E, 20020 Arese, Milano, Italy, Telephone: (39) 02-935-81-733, Fax: (39) 02-935-81-741

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