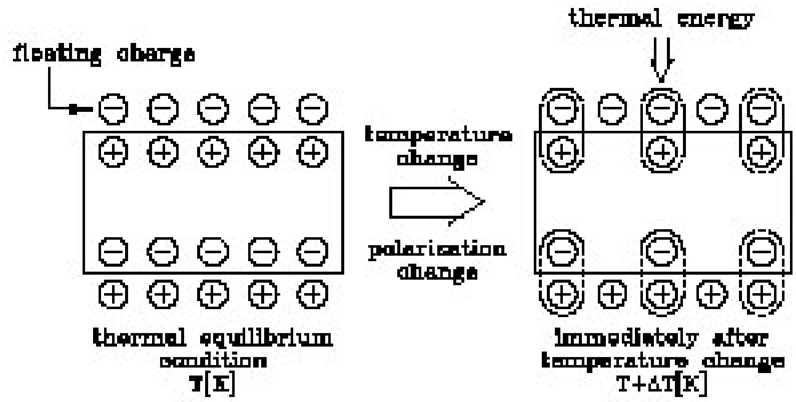
Rev. 1-00-05-27

Model No.:

General Description

The pyroelectric infrared sensor detects infrared radiation by making use of the property that the polarization of pyroelectric materials changes with temperature. Materials called ferroelectrics absorb thermal energy, which changes spontaneous polarization generating a surface electrical charge. The charge is proportional to polarization change. This phenomenon is called the pyroelectric effect. A pyrosensor using fine ceramic materials can detect even the slightest infrared energy charge, such as that from a human body.

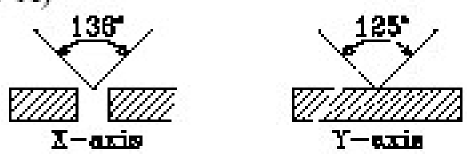
Two compensated sensing elements are applied to suppress the interference due to temperature variation. As a result, the operating stability of the sensor is greatly improved. Therefore, dual element type is highly sensitive to human body movement while remaining insensitive to ambient temperature change, vibration or optical noise because of the dual configuration that electrically cancels such effects.



Configuration (Figure 1)

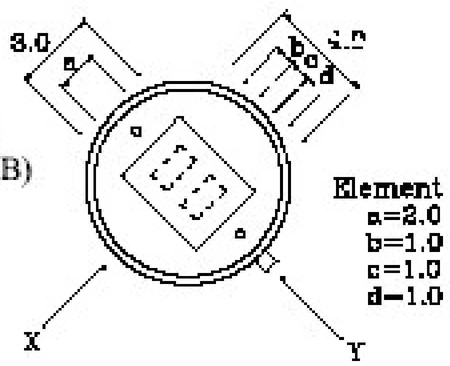
Field of View

(Figure 1-A)



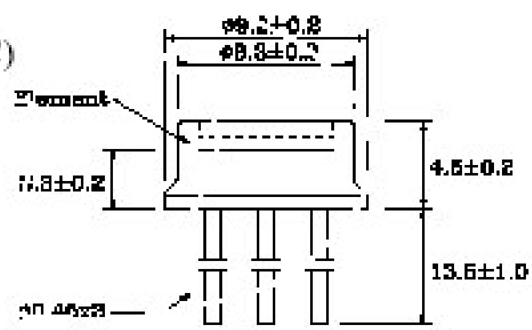
Top View

(Figure 1-B)



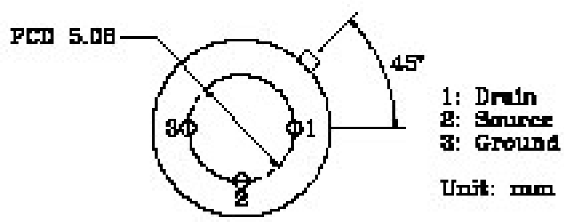
Side View

(Figues 1-C)



Base View

(Figure 1-D)



Electrical Characteristics

(Ta=25℃)

Item		Min.	Typ.	Max.	Unit	Remark
Element Geometry		2.0 X 1.0			mm^2	
Window	Substrate Thickness	Silicon 0.5			mm	
	Film	Si				
	Cut-On Wavelength	5.0 ± 0.5			μm	
	Average Transmission	75			%	
	Pass Band	6.0~14.0			μm	
Signal Output		2.5	4.0		Vp-p	Note 2
Noise Output			90	250	mVp-p	Note 3
Field Of View		138 X 125			deg.	
Balance Output				15	%	Note 4
Detectivity		$1.2X10^7$			$cm{\cdot}Hz^{1/2}/W$	Note 6
Noise Equivalent Power				$1.1X10^{-8}$	$W/Hz^{1/2}$	Note 7
Operating Voltage		3		10	VDC	Rs=47kΩ
Source Voltage		0.35		1.5	V	VD=5V , Rs=47kΩ
Frequency Response		0.3		3.0	Hz	Tolerance ±10dB
Operating Temperature		-20 ~ +60			℃	
Storage Temperature		-30 ~ +80			℃	

PIR Pyroelectric Infrared Sensor

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Note 1. Circuit configuration is three-terminal sensor with source follower (See Fig. 2)

Note 2. Signal output is measured at chopper frequency of 1 Hz when connected to the amplifier of gain 72.5 dB (at 1 Hz) and submitted to the emission of infrared energy 13μW/cm² from 420K black body. (See Fig. 3)

Note 3. Noise output is measured for 20 seconds when connected to the amplifier of gain 72.5 dB and shut out from infrared energy. (See Fig. 3)

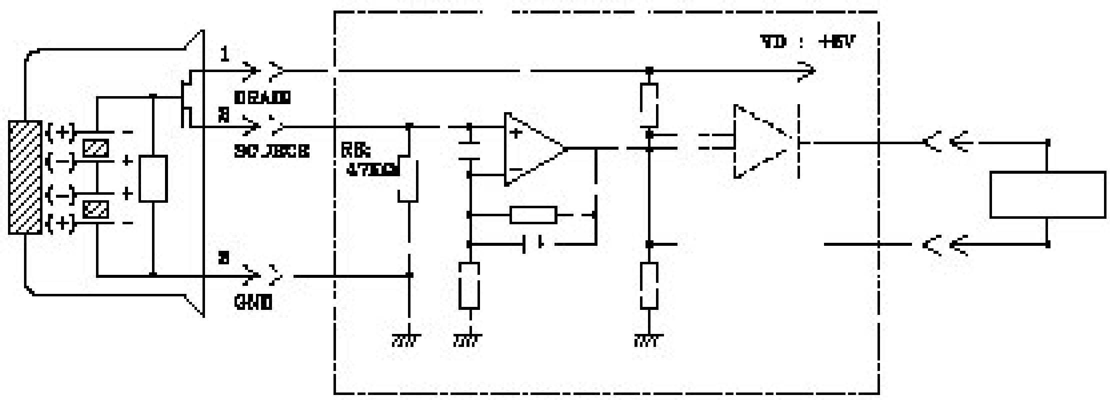
Note 4. (BO / |SA+SB|) ≤ 0.2   BO : Balance Output
SA : Signal output on element A
SB : Signal output on element B

Note 5. Relative Humidity: The sensor shall operate without increase in noise output when exposed to 90 ~ 95% RH at 30°C continuously.

Note 6. Detectivity is an indication of what extent signals and noises are obtained when infrared radiation (1 watt) from a black body enters a PIR sensor. It is measured using a 420K black body, a noise bandwidth of 1 Hz and a chopping frequency of 1 Hz. The greater the value, the better the sensor.

Note 7. Noise Equivalent Power is the power of incident light required to obtain output signals equal to the amount of noise generated from the PIR sensor itself. It is an Signal-to-Noise Ratio of 1. This is measured at the chopping frequency of 1 Hz.

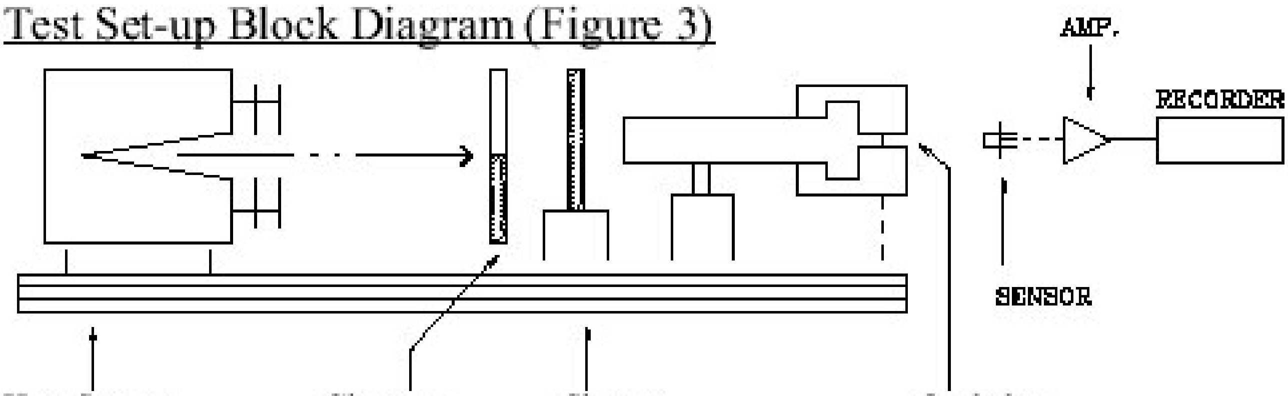
Circuit Configuration (Figure 2)



Sensor   Measurement Amplifier   Recorder

※ Measurement Amp.: Non-inverted type, Gain=72.5dB at 1 Hz, 0.4~2.7 Hz / -3dB

Test Set-up Block Diagram (Figure 3)



Heat Source
420K Block Body
Aperture ∅12mm

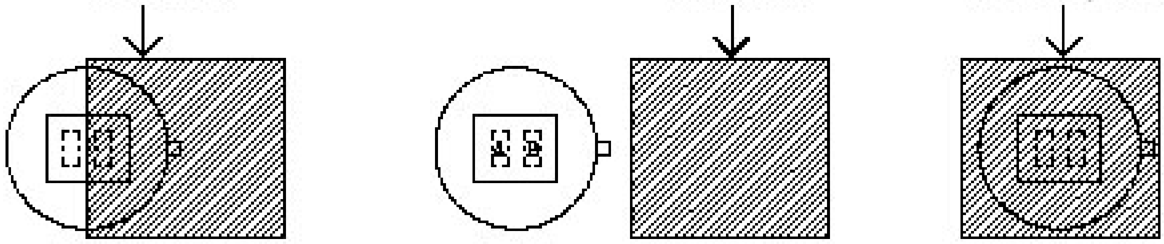
Chopper
1 Hz Chopping

Shutter
(For Noise Measurement)

Occluder

Occluder Position

Occluder   Occluder   Shutter, Chopper



Signal Output   Balance Output   Noise Output

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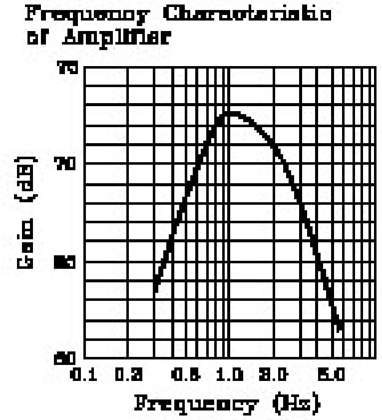
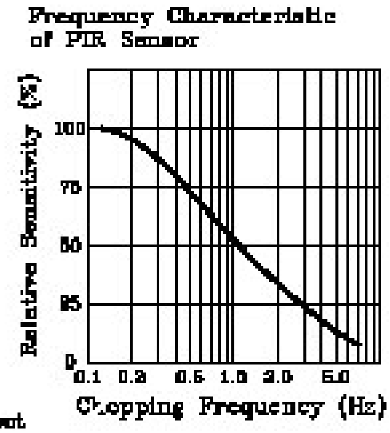
Reliability Standard

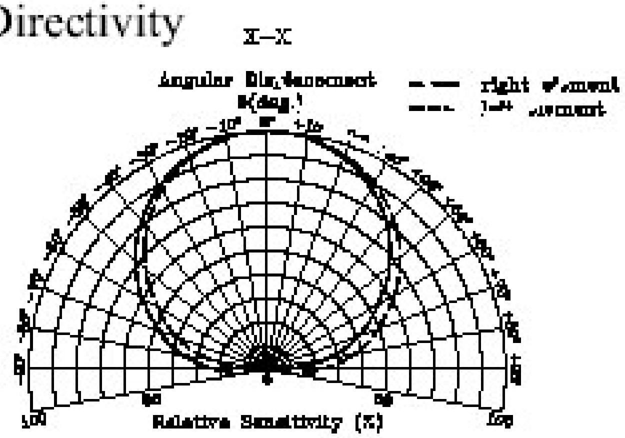
Item	Condition	Standard
Humidity	60°C, 95%RH, 500hr.	Within ±20% of initial value. No remarkable damage. (Naturally normalized for 2hr at room temperature.)
High Temperature Loading	85°C, 5V applied, 47kΩ load, 1000hr.	
Low Temperature Storage	-40°C, 1000hr.	
Thermal Shock	-10°C, 30min↔50°C, 30minX100cycles	
Vibration	5V applied, 47kΩ load, 25±5°C, acceleration 1G each frequency 7.62 & 200Hz each direction X, Y & Z each 30 minutes.	
Lead Strength	1kg strain force along lead, 5sec.	
Soldering Test	260±5°C, 10±1sec lead to submerge into solder up to 1.5mm below stem.	
Hermetic Seal	160mmHg water, 1min.	No bubble visible.
Leakage	80±5°C, FC40, 1min according to MIL-STD-202E	No bubble visible. Within ±20% of initial value.

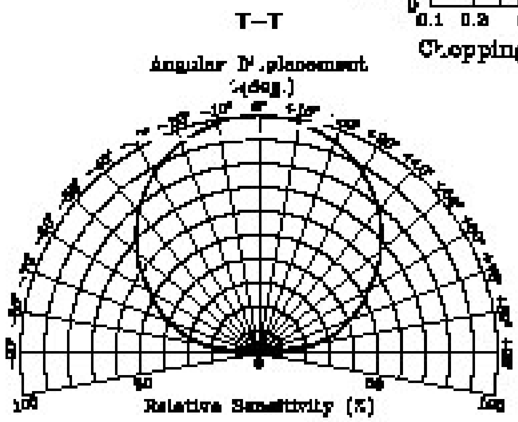
Frequency Characteristics



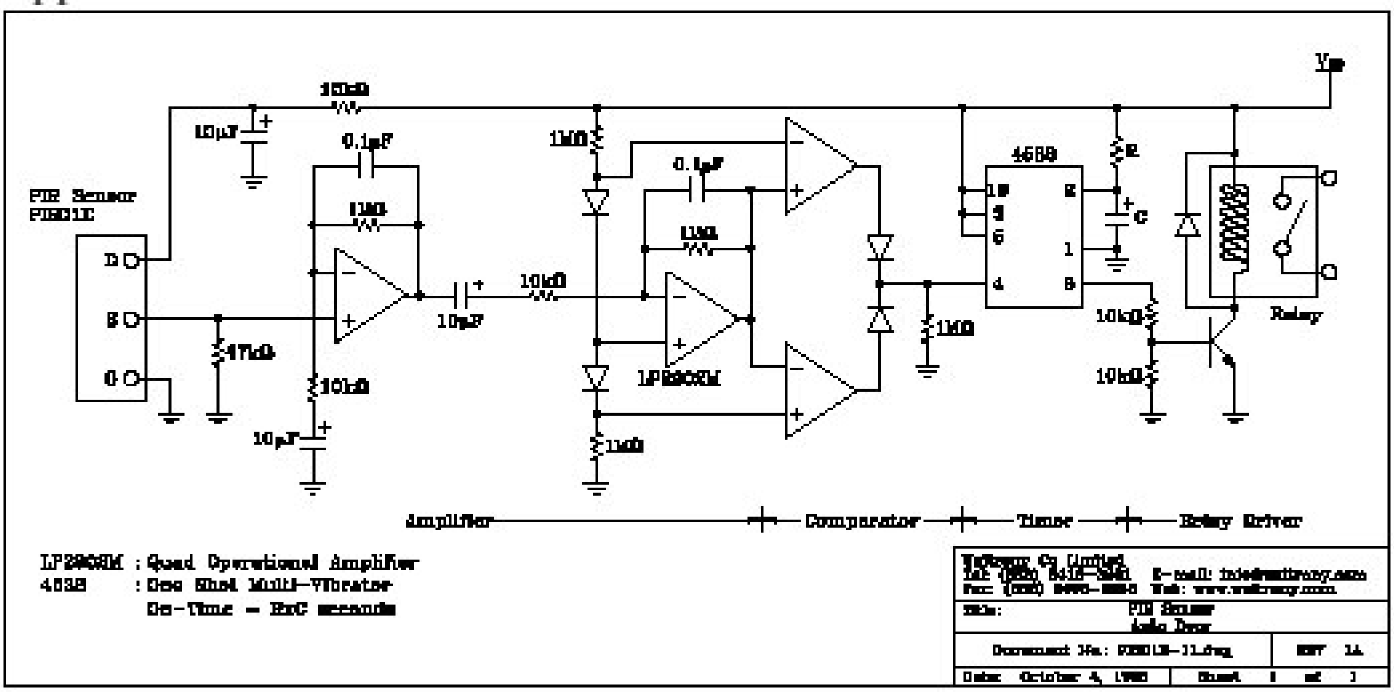


Directivity





Application Circuit



PIR Pyroelectric Infrared Sensor

Model No.:

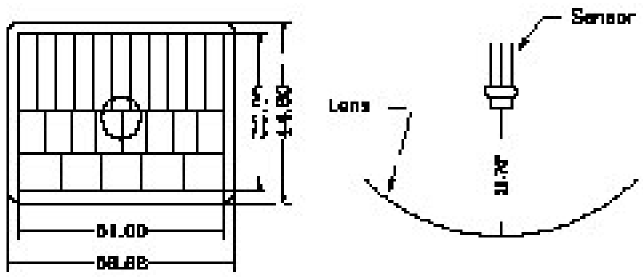
Lens

The detecting theory of PIR sensor to detect human body is by using two ceramic sensing elements. For example, when a human body appears from right to left, the infrared energy charge of the left sensing element is greater than that of right sensing element in a short period. And then a voltage potential difference occurs until the energy charge of both left and right sensing elements become back to Equilibrium State. In this case, the left sensing element will become Equilibrium State first and then next to the right elements. This detecting principle is also applied when a human body appears from left to right but this time the voltage potential difference is reversed and the right sensing element will become back to Equilibrium State first. Meanwhile, the ambient temperature change, vibration or optical noise is usually located at a fixed position or changing slowly. Therefore, the infrared energy charge of the left sensing element is equal to that of right element and hence the voltage potential difference is zero.

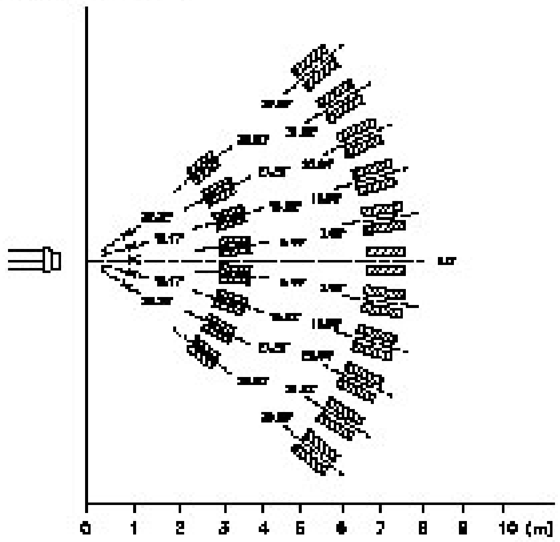
Referring to the above principle, in order to make the PIR sensor to detect human body more easily, a special lens is needed to create the strobe and null effect. The following are the common lenses for use with PIR sensor.

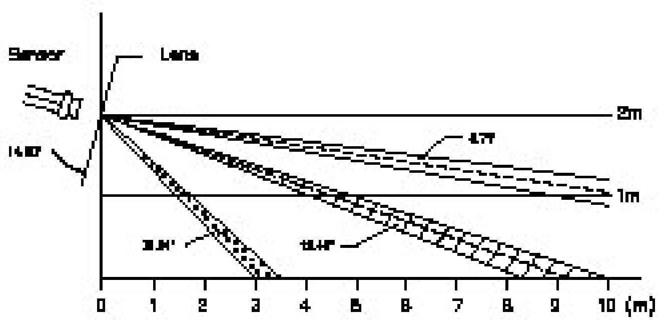
Lens –7708

¤ Dimension:
(Unit: mm)



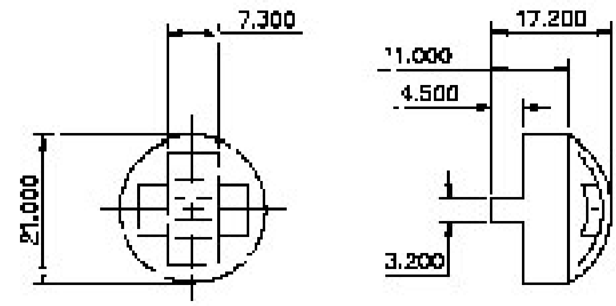
¤ Detecting Area:
(Unit: meter)





Lens –7709

¤ Dimension:
(Unit: mm)



¤ Detecting Area:
(Unit: meter)