Quad Digital Pyroelectric Infrared Sensor (Model： RPTD-646-6-F)

User’s Manual

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Zhengzhou Winsen Electronics Technology Co., Ltd

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Zhengzhou Winsen Electronics Technology CO., LTD.

Quad RPTD-646-6-F Digital Pyroelectric Infrared Sensor

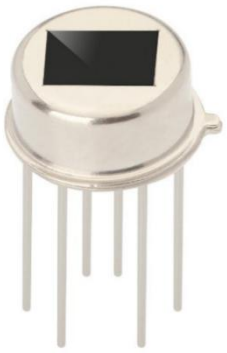
Digital PIR sensor RPTD-646-6-F, is adopting quad series compensation structure sensitive-elements, and integrated design of sensitive element and signal processing chip, packaged sensitive element and IC chip into sensor shield. Sensitive element transfer the human movement signal to high-precision digital chip for data processing. Then the sensor gives digital signal for easy using.

Features:

* High-precision AD signal process
* Differential signal input mode, anti-interference ability
* Sensitivity, delay time, and light adjustment function
* Enable pin controls the sensor output
* Wide voltage power supply(2.2~5V) and low power consumption
* Digital TTL signal output
* Wide sensing angle
* Consistent sensing distance and angle in vertical and horizontal direction

Applications

Security product
Human body induction toys
Human body induction lamps, and switches
Industrial automation control
Smart home
IOT terminals
Smart appliance

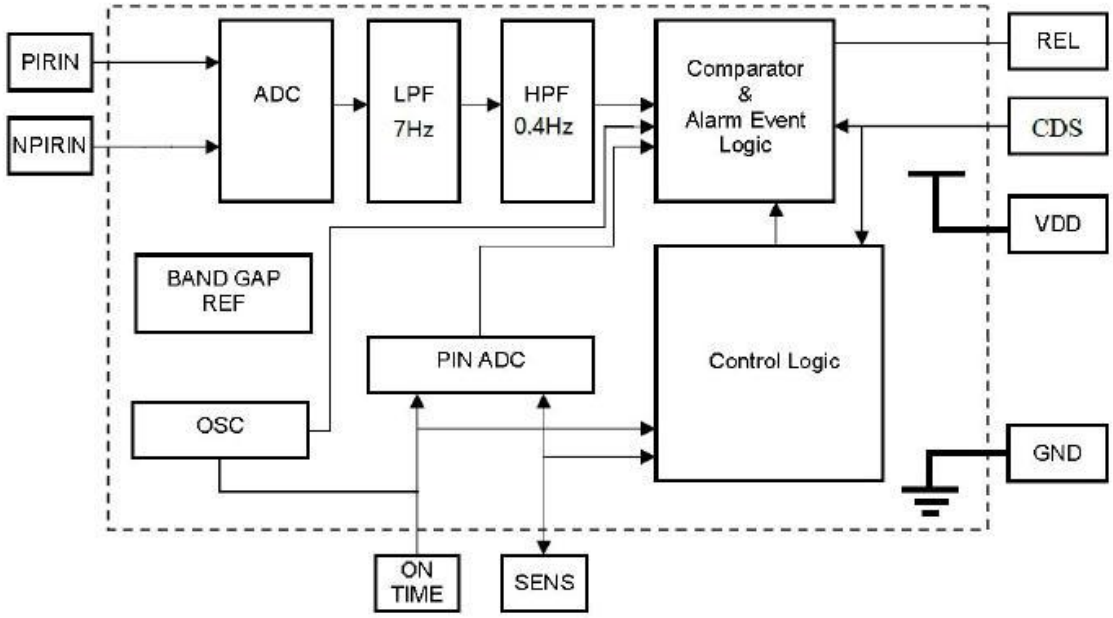


Technical Parameter

1. Working condition(T=25℃,V_{DD}=3.0V)

Parameter	Symbol	Min	Typical	Max	Unit	Note
Working condition						
Working Voltage	V_{DD}	2.2	3.0	5.0	V	Power supply mode
Working Current	I_{DD}	8.0	10	15	uA	V_{DD}=3V, no load
Working Temperature	T_{OPR}	-20		+70	℃	
ONTIME&SENS&OEN						
SENS, ONTIME Input	V_{IN}	0		VDD		
SENS, ONTIME Input Current				20	nA	Pull-down current
OEN Input Low Level	V_{IL_OEN}			0.5	V	V_{DD}=3V
OEN Input High Level	V_{IH_OEN}	1.0			V	V_{DD}=3V
Output Pin(REL)						
Output drive current	I_{REL}			10	mA	V_{DD}=5V
Block time		1.0	2.0	3.0	S	
Delay time	ON_{TIME}	2		3600	S	16 levels (non-linear)

2. Internal frame



3. Trigger mode

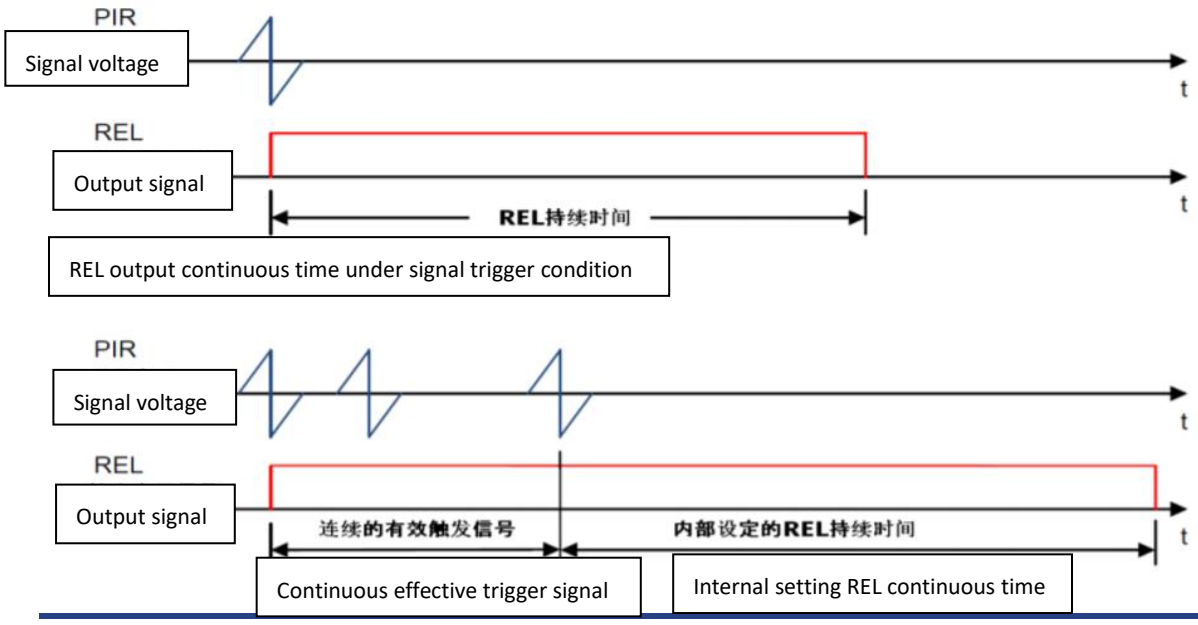
In the normal detection condition, the following two conditions are valid:

(1) When the signal amplitude successively exceeds the positive and negative thresholds within 4S ;

(2) The signal amplitude exceeds 5 times the threshold;

After the sensor is effectively triggered, the REL pin gives output and maintains a high level for a certain period of time. The output high level time can be adjusted by the voltage divider resistor of the ONTIME pin. During the high level output period, if the effective trigger signal is detected again, the output high time is recalculated.

Remark: The sensor has warm-up time. After power on, the REL pin outputs high level for 2 seconds and low level for 2 seconds. Warm-up time has nothing to do with ONTIME



4. Delay time adjustment

The delay time is the high-level TTL output duration time when sensor reaches the comparison threshold. The input voltage of ONTIME pin, determines the duration of output signal. Each time a trigger signal is received, the delay time is recalculated.

Relationship between ONTIME pin voltage, delay time and voltage divider resistance:

Item	Center value of Pin voltage	Duration time (Second)	Theoretical pull-down resistor(ohm)	Recommended pull-down resistor(ohm)
1	1*VDD/64	2S	0K	0K
2	3*VDD/64	5S	49K	51K
3	5*VDD/64	10S	85K	91K
4	7*VDD/64	15S	123K	130K
5	9*VDD/64	20S	164K	160K
6	11*VDD/64	30S	208K	220K
7	13*VDD/64	45S	255K	270K
8	15*VDD/64	60S	306K	330K
9	17*VDD/64	90S	363K	360K
10	19*VDD/64	120S	422K	430K
11	21*VDD/64	180S	488K	510K
12	23*VDD/64	300S	561K	560K
13	25*VDD/64	600S	641K	680K
14	27*VDD/64	900S	730K	750K
15	29*VDD/64	1800S	829K	820K
16	31*VDD/64	3600S	939K	1M

5. Sensitivity adjustment

The SENS pin sets comparison threshold of different signals, by setting different voltages through an external resistor network.

When connected to ground, the sensor comparison threshold is the lowest, sensitivity is highest, that is, detection distance is the farthest.

When the input voltage is over 1/2VDD, it would choose max threshold, sensitivity is the lowest, that is, the detection distance is minimal.

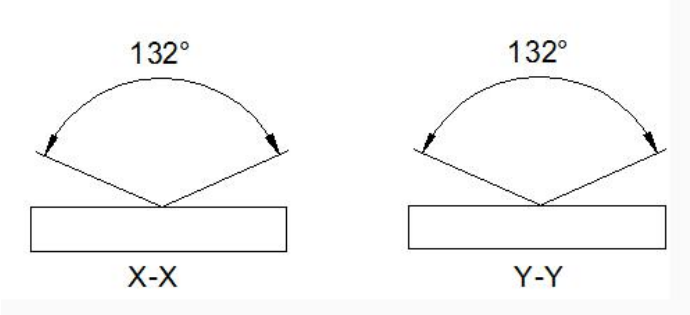
The sensing distance is not linear with the voltage on the SENS pin. With different Fresnel lenses, the sensitivity is different, and distance depends on actual measurement.

Relationship between sensitivity threshold and resistance network:

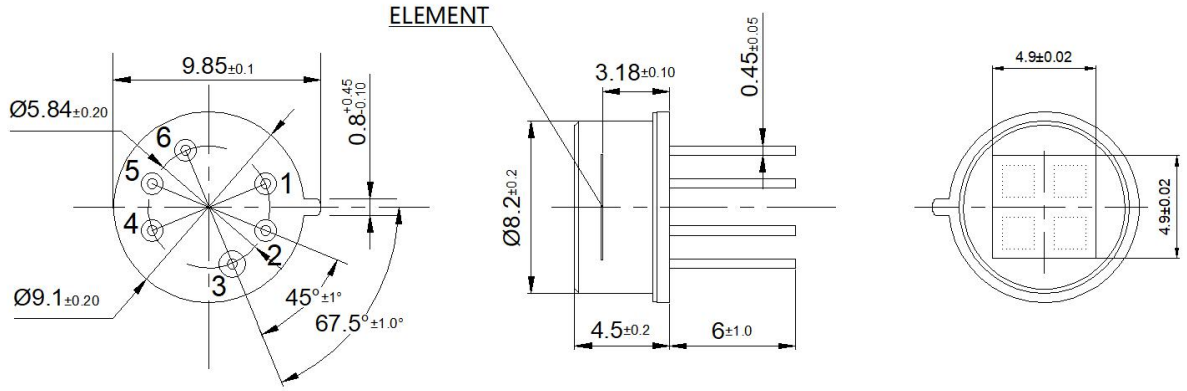
(The pull-up and pull-down resistors are recommended to be 1% or more accurate)

Item	Center value of SENS Pin	Theoretical pull-down resistor(ohm)	Recommended pull-down resistor(ohm)
0	1/128	0K	0K
1	5/128	41K	43K
2	9/128	76K	75K
3	13/128	113K	110K
4	17/128	153K	150K
5	21/128	196K	200K
6	25/128	243K	240K
7	29/128	293K	300K
8	33/128	347K	360K
9	37/128	407K	430K
10	41/128	471K	470K

6. Sensor Detection Angle



7. Component Structure (Unit: mm)

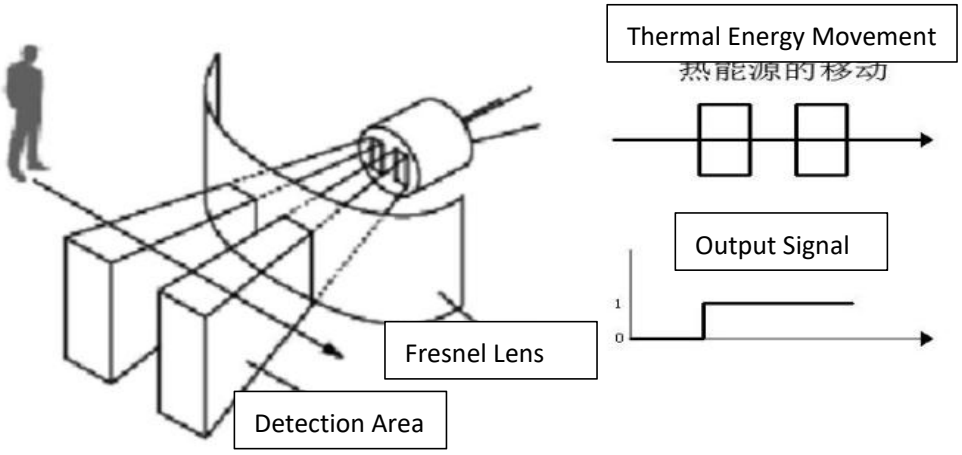


Top view Side view Bottom view

Pin Definition

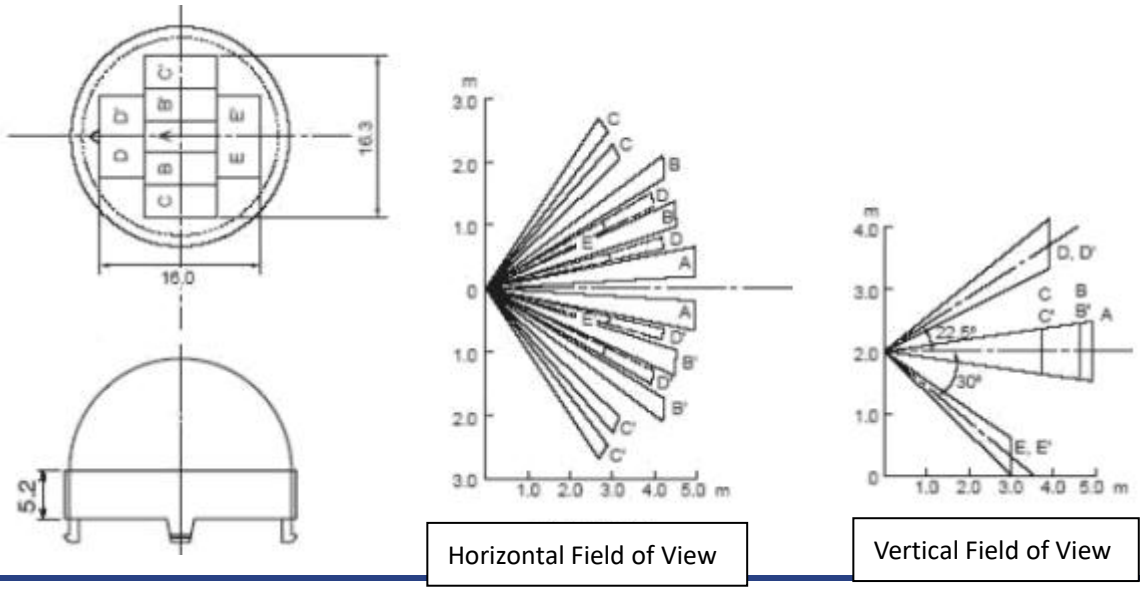
Item	Name	Definition
1	SENS	Sensitivity pin (0-1/2V_{DD}); 0- highest sensitivity; ≥1/2V_{DD}- Lowest sensitivity
2	OEN	photo-cell adjustment pin. when OEN <0.5, it's forbidden to trigger; when OEN>1.0V, it's allowed to trigger.
3	VSS	power ground
4	VDD	sensor power supply pin
5	REL	sensor output pin, TTL high/low level output, TTL high level valid
6	ONTime	delay time adjustment pin, 16 level option, the delay time is recalculated after each trigger
Note		Select 0, it's recommended using a resistor to pull down to ground. Select high level, it's recommended pulling up to high level with resistor.

Frequency characteristic

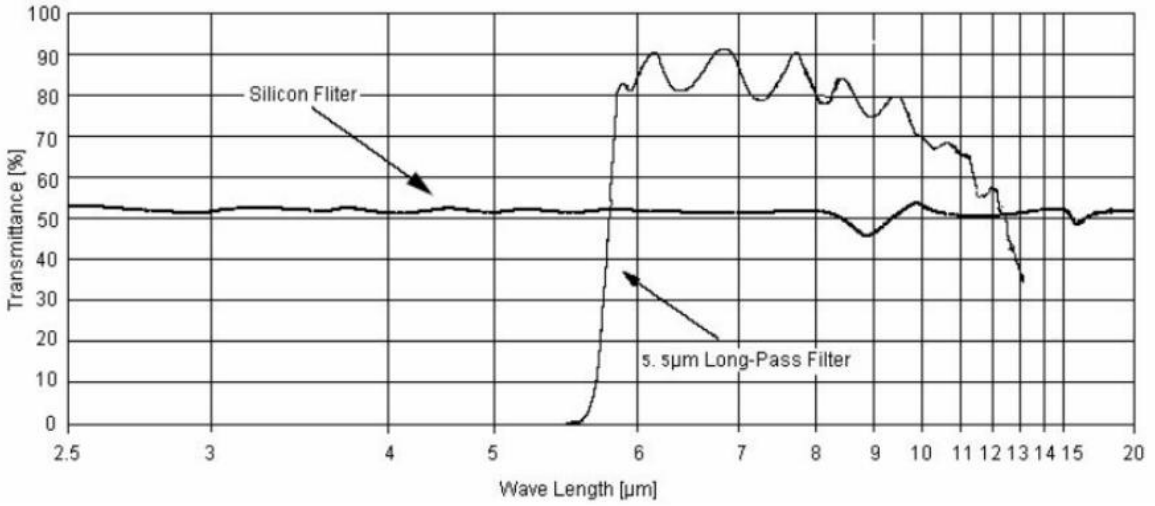


Fresnel Lens:

Fresnel Lens used, would determine the sensor's detection angle and distance, which can correspond to a variety of detection range and distance, according to customers' requirement.

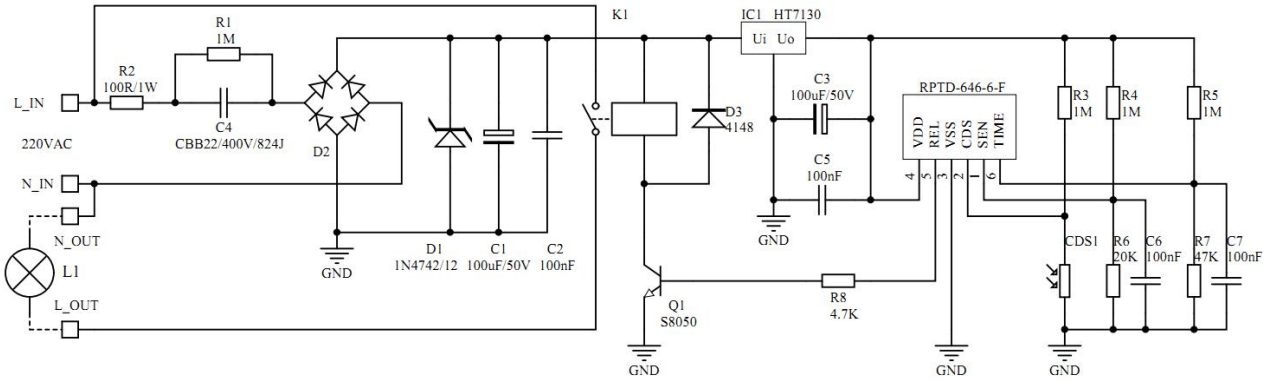


Wave Length



Note: The graph shows a typical 5um infrared filter reference, and the curve is the average of infrared pass rate. The window material is a special vacuum coating of semiconductor wafers.

Typical Application circuit



Cautions:

1. **The sensor's parameter is obtained by standard testing condition after 1 minute's settling time.**
2. **Please pay attention on Sensor's window direction, must combine with Fresnel lens to get a perfect detecting angle.**
3. **Sensors detecting distance is affected by ambient temperature, moving objects' temperature, Fresnel lens, Amplifier amplification factor, the comparator threshold voltage setting…etc. please take a comprehensive consideration of various parameters when using the sensors.**

4. **Please do not touch the window area to avoid damaging to the optical filter.**
5. **Please handle the sensor with care when using it.**
6. **Please try to use hand soldering and make the soldering time as short as possible. Soldering temperature should be less than 300°C, and soldering time be less than 3 seconds.**
7. **Please get electrostatic protective measures when using this product. Static level HBM: ±5500V, CDM: ±500V**

Note: To keep continual product development, we reserve the right to change design features without prior notice.

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