OptoSupply
Light It Up

Intelligent Fully-Configurable Digital PIR

OS-PIR214D-D4

The **PIR214D-D4** digital pyroelectric infrared sensor integrates the sensitive element of the traditional pyroelectric infrared sensor with the signal processing chip, and integrates the sensitive element and the IC chip into the sensor shield. The sensitive element transmits the infrared signal generated by the external human movement to the high-precision digital intelligent processing chip for processing by differential input. When the signal processing is completed, A configurable motion detection unit is implemented. Once motion was detected, an interrupt will be sent to the host system. Putting the host system to sleep an overall ultra-low power consumption will be achieved. All data is accessible from the host system to enable advanced signal analysis with your own detection criteria.

Feature

- Digital signal processing, modifiable working mode
- Configurable interrupt trigger conditions, read signal data
- Strong anti-electromagnetic interference ability
- Very low power consumption

Application

- Long distance motion detection
- Applicable to all kinds of intrusion detectors for burglar alarms
- Energy saving applications
- Applicable to all kinds of smart household appliances

Advantages

- Strict quality assurance system
- Provide a full range of technical support

Maximum Ratings

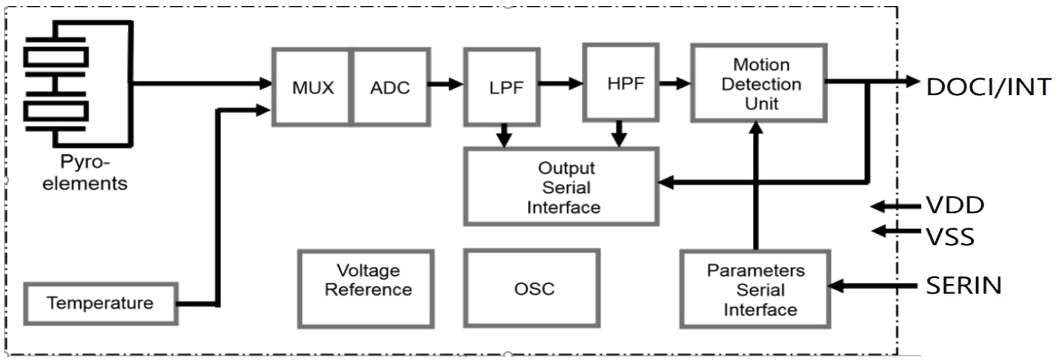
Parameter	Symbol	Min.	Max.	Unit	Note
Input Voltage	V_{DD}	-0.3	3.6	V	
Pin Current	I_{nto}	-100	100	mA	
Storage Temperature	T_{st}	-40	85	℃	
Operating Temperature	T_{op}	-20	70	℃	

Working Condition (Ta=25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Remarks/Conditions
Operating Voltage	V_{DD}	1.8	3.0	3.6	V	
Supply Current	I_{DD}	-	3.0	4.0	μA	VDD =1.8 V, no load
SERIN						
Input Low Voltage	V_{SIL}	-	-	0.2VDD	V	
Input High Voltage	V_{SIH}	0.8VDD	-	-	V	
Input Current	I_{SI}	-1	-	1	μA	VSS <VIN <VDD
Data Clock Low Time	t_{sL}	2000	-	10000	nS	
Data Clock High Time	t_{SH}	2000	-	10000	nS	
Data In Hold Time	t_{SHD}	72	-	-	μS	
Data Load Time	t_{SLT}	580	-	-	μS	
DOCI/INT						
Input Low Voltage	V_{DIL}	-	-	0.2VDD	V	
Input High Voltage	V_{DIH}	0.8VDD	-	-	V	
Input Current	I_{DI}	-1	-	1	μA	
Data Set-up Time	t_{DS}	75	-	150	μS	Interrupt Readout Mode

Data Set-up Time	t_{DS}	110		150	µS	Forced Readout Mode
Data Clock Low Time	t_{DL}	200		2000	nS	
Data Clock High Time	t_{DH}	200		2000	nS	
Data Bit Settling Time	t_{BS}			2	µS	CLOAD <10 pF
Sample Time	t_{SMPL}	2		12.5	mS	
Bit Time	t_{BIT}			22	µS	
ADC Resolution		14			Bits	
PIR ADC Sensitivity		6.5			µV/Count	
PIR ADC Offset		7000	8000	9000	Counts	In stable condition
Sensitivity of TAMB			80		Counts/K	
Counts at 300 K (27 ° C)		6620	8200	9980	Counts	
LPF Cut-off Frequency	f1		7		Hz	
HPF Cut-off Frequency	f2		0.2/0.4		Hz	Configurable
Internal Clock Frequency	f_{CLK}	28	32	40	kHz	

Internal Block Diagram

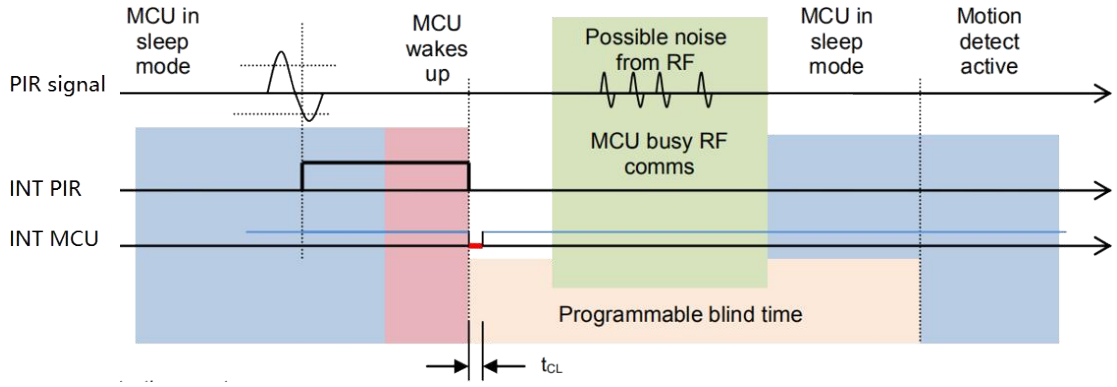


Trigger Method

The pyro-electric sensing elements are connected to a built-in IC, Included are also Low- and High-Pass Filters and a Motion Detection Unit. The serial interface “SERIN” is provided to configure the internal registers. The configuration memory is volatile which means that after power up the register settings are undefined.
A second serial interface called “DOCI/INT” can be configured to:

1. Send an interrupt once a motion event is detected.
2. Read a continuous data stream from the detector.

Motion Detection Unit



To enable the internal Motion Detection Unit configure the sensor to "Wake Up" mode. The DOCI/INT will be pulled HIGH when the motion criteria are met. DOCI/INT will not automatically fall back to LOW. To clear the interrupt, DOCI/INT needs to be pulled to LOW by the micro-controller for at least 35 µs. When the alarm event is cleared by resetting the interrupt, any further motion detection is stopped for the programmed blind time.

Configuration Register

Note: It configures the contents of the register. The value of the register is uncertain after power-on

Register Description	Bit#	Description	Size[bit]	Remarks
Readout Register	[39]	Out of Range	1	0: PIR was reset
	[38:25]	ADC Counts	14	Value of selected source
Configuration Register	[24:17]	Threshold	8	Detection threshold on BPF value
	[16:13]	Blind Time	4	=0.5 s + [Reg Val] · 0.5 s
	[12:11]	Pulse Counter	2	=1+ [Reg Val]
	[10:9]	Window Time	2	=2 s + [Reg Val] · 2 s
	[8]	Motion Detector Enable	1	0 = Disable, 1 = Enable
	[7]	Interrupt Source	1	0 = Motion, 1 = Filter
	[6:5]	Signal Source	2	0: PIR (BPF) 1: PIR (LPF) 2: Reserved 3: Temperature
	[4]	Reserved	1	Reserved: Must be set to dec 1
	[3:0]	Reserved	4	Reserved: Must be set to dec 0

Threshold:

The sensitivity detection threshold is defined with the register value. The resolution of the register is 6.5uV .

threshold=[reg_value]*6.5 u V.

Blind Time:

Ignores motion after the interrupt output is switched back to 0. Range:0.5s~8S. Blind time= [reg_value]*0.5S

Pulse Counter:

1~4 pulses with sign change in between.

Amount of pulses=[reg_value]+1

Window Time:

The pulse counter is evaluated for pulses above the threshold within a given moving window time. The window time can be set from 2 s up to 8 s in intervals of 2 s.

Window time=[reg_value]*2s+2s

Motion Detector Enable:

0=disable ， 1=enable

Interrupt Source:

The interrupt source defaults to the motion mode, allowing you to choose between ADC and motion modes. If you select the ADC mode, the data frame interval is 16 ms (512/FCLK).

0= Motion, 1=ADC

Voltage Source for ADC:

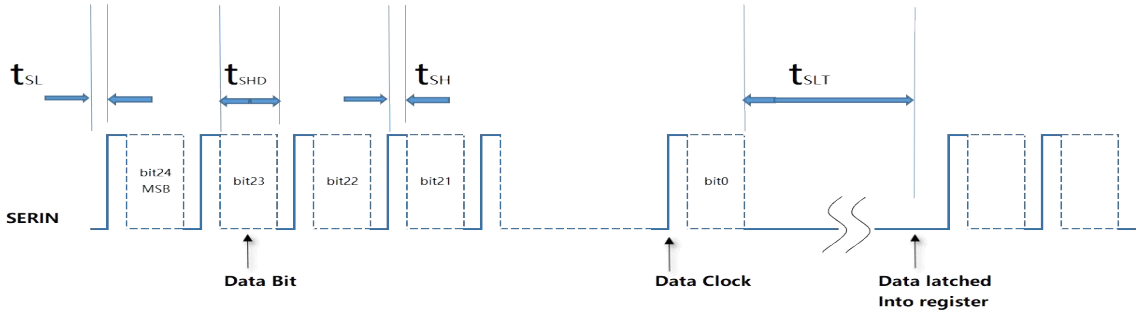
The following source voltages are selectable for the ADC: For motion detector mode, 0 or 1 has to be selected.

0= PIR Signal, BPF output

1= PIR signal, LPF output

2= Reserved

3= On chip temperature senso



Serial In Interface

The configuration data is set via the serial input "SERIN" . The external micro-controller has to generate a LOW to HIGH transition on the SERIN input and subsequently apply the data bit value (LOW or HIGH). The LOW and HIGH time (t_{SL} and t_{SH}) for the transition can be very short (1 instruction cycle of the microcontroller). The data bit value must be applied for at least t_{SHD} >= 72 µs.

Whenever the device has received more than 25 data bits and the transfer of data bits is interrupted for a period greater than t_{SLT} >580 µs, the last data received is latched into the configuration register.

DOCI/INT Interface

The DOCI/INT interface is a bi-directional one wire serial interface which is used to generate an interrupt or to continuously retrieve data from the sensor.

Bit#	Description	Size[bit]	Remarks
[39]	Out of Range	1	0: PIR was reset 1: Normal operation
[38:25]	ADC Counts	14	Value of selected source
[24:0]	Configuration	25	Register settings

Out of Range:

1：normal ， 0：Indicates exceeding the limit

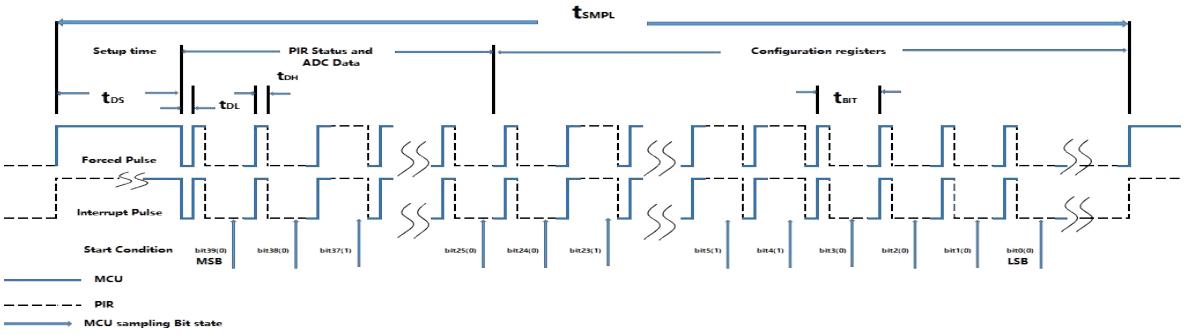
ADC Counts:

The data represents either ADC counts after low-pass filtering, after band-pass filtering or the reference temperature counts. The band-pass filtered data is represented as a two's complement 14 bit signed integer value. The low-pass data and the reference temperature data is represented as 14 bit unsigned integer.

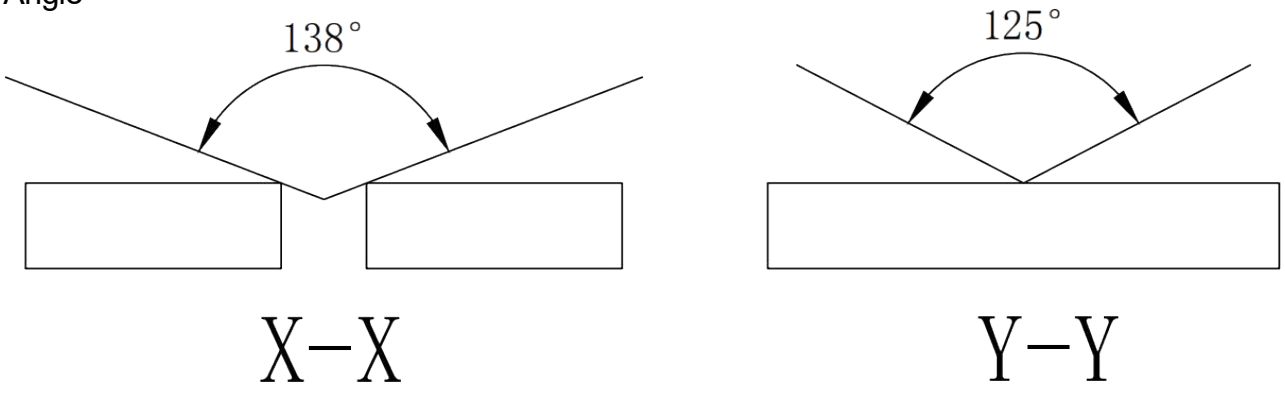
Configuration:

The settings of the alarm event unit are contained here.

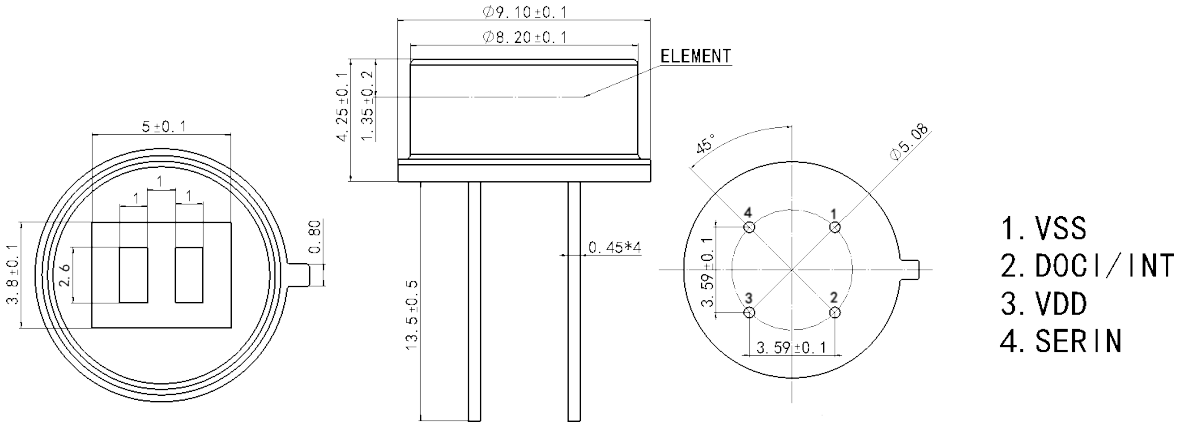
Data Transmission Diagram



Detection Angle



Product Dimension(mm)



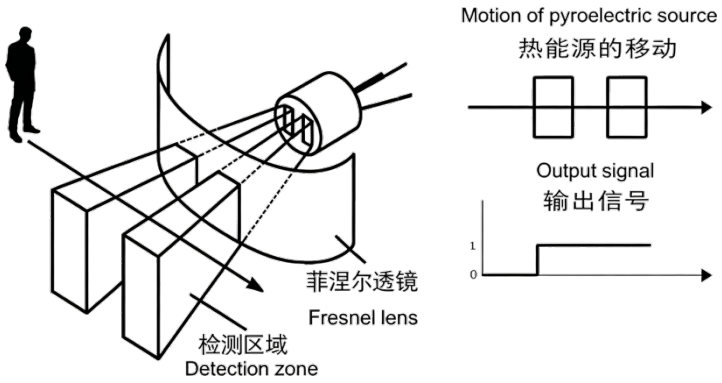
TOP VIEW
FIGURE A

SIDE VIEW
FIGURE B

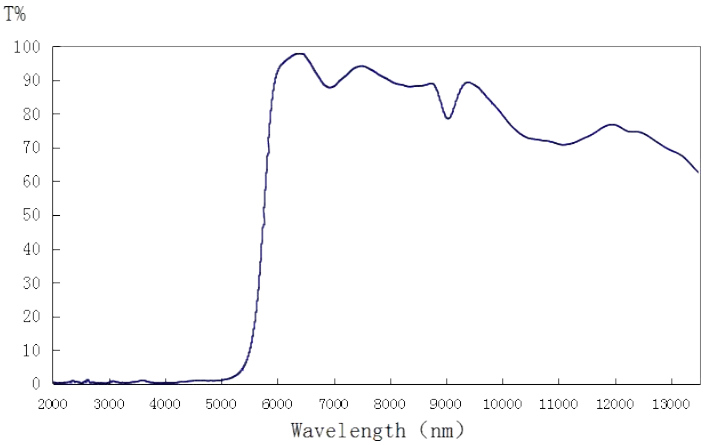
BOTTOM VIEW
FIGURE C

Pin Description：	
1	VSS Power ground GND
2	DOCI/INT Sensor data output pin
3	VDD Power supply pin
4	SERIN Sensor input pin, register configuration

Signal Feature

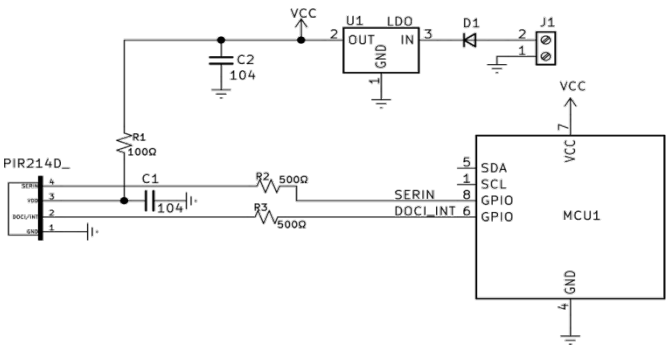


Window Material Receiving Wavelength Range



Note: the chart shows a typical 5.5um infrared filter reference chart. The curve is the average of the infrared pass rate.

Typical Application Circuit



Soldering

Careless operation during soldering will cause damage to the product, please be careful. Please avoid put pressure on the product bracket or package part during soldering. When soldering, please ensure that the soldering position has a certain distance from the bottom of the sensor. This distance varies with different soldering methods. Please refer to the recommended soldering conditions below.

Recommended Soldering Conditions

Soldering Mode		Fixed Form
Manual soldering	Soldering iron temperature	< 350℃
	Soldering time	< 5 seconds
	Soldering position	More than 1.5mm (from PCB to base)
Tin stove soldering	Preheat	Max 100℃，no more than 60 seconds
	Dip soldering temperature	Max 280℃
	Dip soldering time	< 5 seconds
	Soldering position	More than 1.5mm (from PCB to base)

Caution

Thanks for using our company's PIR series products. In order to enhance your understanding of our products characteristics and avoid unnecessary damage due to manmade factors, we provide corresponding operation standard instruction. At the same time, even if you are using the same specification PIR, its reliability is related to overall system design level, operation mode and use condition. This instruction couldn't cover all questions customers may meet during using. We apologize for any inconvenience caused sincerely

■ Product Declaration

- The factory parameters of the sensor are tested after one minute stabilization time under standard blackbody and related parameter test conditions.

- In order to confirm the product is right for using purpose, pretest is necessary before use. We don't guarantee the product application introduction don't contravene any patent. The corresponding import and export legal responsibility should be taken by customers. Please verify relevant provision in each country and district beforehand. We may change specifications from time to time in the interest of product development, without prior notification or public announcement. We require formal product specifications to be signed before mass production.

■ Storage

- Under the storage conditions of 30℃ or less and humidity less than 60%RH, the storage period is 6months. Store the products in sealed container with moisture absorbent could prolong the storage time to a certain extent. Bad storage conditions may cause the product pin corrode or characteristics change.

■ Static

- Static and electric surge would change the product features, such as decreasing forward voltage or damage the products. Please make sure adopt effective anti-static measures. All the relative devices and machinery must be properly grounded. And please use anti-static wristbands, anti-electrostatic gloves, anti-electrostatic containers at the same time to prevent static and electric surge.

■ Design Suggestion

- Please pay attention to the window direction of the sensor when designing the product, and combine the Fresnel lens to achieve a better detection angle.
- The sensor detection distance is related to the background temperature, the moving target temperature, the Fresnel lens, the ambient temperature, and the amplifier magnification setting. It is necessary to consider all parameters when using.

■ Others

- The sensor is sealed by a metal casing. In order to ensure the airtightness of the device, it is not recommended to bend the lead during use. Bending the lead may damage the airtightness of the glass and metal sealing parts, cause air leakage. If you need to bend, please use tool assist and ensure that the root of the lead is not stressed during the bending process. Please ensure the distance between the bending point and sensor base is more than 3mm.Do not twist the leads axially during use.
- The sensor window lens is a semiconductor wafers filter vacuum coated by special materials. Please don't touch the window with your hands or hard objects when using. If the filter is dirty, please wipe it with absolute ethanol by lint-free cloth.
- Please avoid mechanical shock for the sensor. Frequent or excessive vibration will cause the sensitive element break.