PIR233C-SG 数字热释电红外传感器是将传统热释电红外传感器的敏感元与信号处理芯片集成化设计，将敏感元与 IC 芯片集成封装到传感器屏蔽罩内部，敏感元通过感应外界人体移动产生的红外信号，以差分输入的方式传送到高精度的数字智能处理芯片进行处理, 通过采集、滤波等输出 16 位数字信号，无需对器件进行配置，即可通过串行总线读取数据进行信号分析。 PIR233E-SG digital pyroelectric infrared sensor is an integrated design of the sensitive element and signal processing chip of traditional pyroelectric infrared sensor, and the sensitive element and IC chip are integrated and packaged into the sensor shield. The infrared signal generated by the movement is transmitted to the high-precision digital intelligent processing chip for processing by means of differential input, and the 16-bit digital signal is output through acquisition, filtering, etc., without configuring the device, the data can be read through the serial bus Signal analysis.

特性 Feature

- 高精度 AD 信号处理 High precision AD signal processing
- 可行通讯方式 Serial communication
- 极强的抗电磁干扰能力 Strong anti-electromagnetic interference ability
- 极低的功耗 Very low power consumption

应用 Application

- 长距离的运动检测 Long distance motion detection
- 各种节能场景 Energy saving applications
- 适用于各类防盗报警用入侵探测器 Applicable to all kinds of intrusion detectors for burglar alarms
- 适用于各类智能家用电器 Applicable to all kinds of smart household appliance

优势 Advantages

- 品种齐全, 生产周期短, 小批量库存备货 Complete varieties, short production cycle,Prepared small batch inventory
- 严格的品质保障体系，让您使用无忧 Strict quality assurance system
- 提供全方位的技术支持服务 Provide a full range of technical support

最大额定值 Maximum Ratings

参 数 Parameter	符号 Symbol	最小值 min	最大值 max	单位 unit	备注 note
供电电压 Input voltage	V_{DD}	-0.3	5.5	V	
储存温度 Storage temp	T_{st}	-40	125	℃	
工作温度 Operating temp	T_{op}	-40	70	℃	

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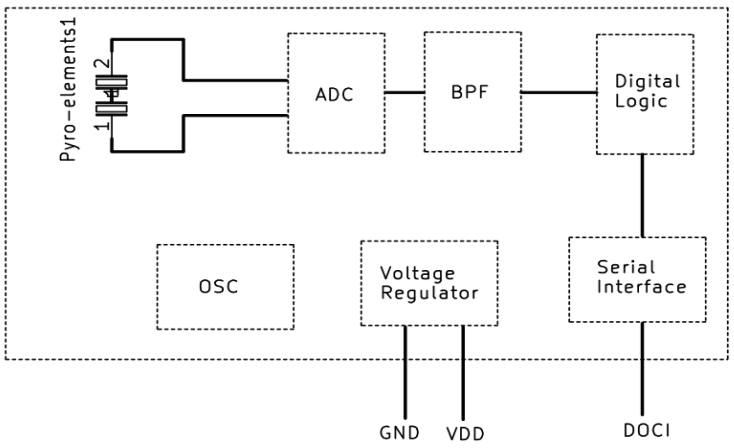
工作条件 Working Condition（Ta=25℃)

参　数 Parameter	符号 Symbol	最小值 min	典型值 typical	最大值 max	单位 unit	备注 note
工作电压 Operating Voltage	V_{DD}	2.7	3	5.0	V	
电源电流 Supply Current	I_{DD}		18	20	μA	V_{DD} =3 V, no load
检测波长 Detect wavelength	λ	5		14	μm	
HPF截止频率 HPF cutoff frequency				7	Hz	
低通滤波器截止频率 LPF　cutoff frequency				0.44	Hz	
ADC						
开始时间 Start Time	t_S	40	60	100	μS	
CLK 低时间 CLK Low Time	t_{CL}		1	2	μS	
CLK 高时间 CLK High Time	t_{CH}		1	2	μS	
位时间 Bit Time	t_{BIT}		10	20	μS	
ADC分辨率 ADC Resolution			16		Bits	

内部框图 Internal Block Diagram



工作原理 Principle

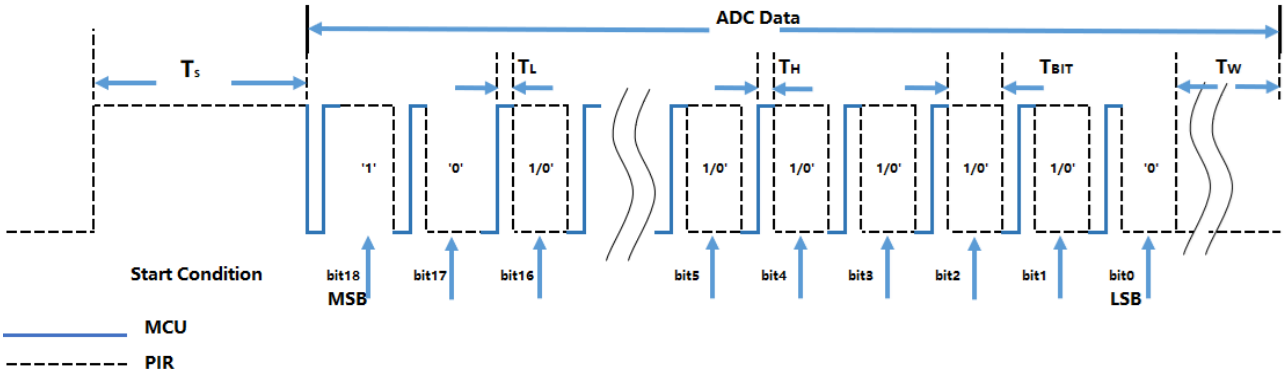
信号首先进行 ADC 转换，然后先经过一个二阶巴特沃斯低通 滤波器滤波，过滤掉不需要的高频信号分量。经过 LPF 之后的信号再输入到可编程二阶高通滤波器 HPF，经过带通滤波器后的数据，用户可使用串行总线 进行读取。

The PIR signal is first converted by an ADC and then filtered by a second-order Butterworth low-pass filter to filter out unwanted high-frequency signal components. The signal after LPF is then input to the programmable second-order high-pass filter HPF, where the data after the band-pass filter can be read by the user using the serial bus.

■ PIR 定时中断读取 BPF 数据 PIR timing interrupt read

PIR上电后,无需进行参数配置，即可直接读取数据。PIR每16mS更新一次数据，每一帧由19位数据组成，DOCI被 PIR拉高，维持2个系统时钟周期。MCU等待TL后，在 DOCI 线上产生一个上升沿TH， 然后开始读取数据。第一个被读出数据是最高位。重复该过程直至16位数据 都被读出。最后一位数据读出后，MCU必须强制为低且立即释放DOCI。 DOCI时序图如下图所示。蓝线表示MCU驱动，虚线表示 PIR驱动。

After PIR is powered on, the data can be read directly without parameter configuration. PIR updates data every 16mS, each frame consists of 19 bits of data, DOCI is pulled high by PIR to maintain 2 system clock cycles. After waiting for TL, the MCU generates a rising edge TH on the DOCI line and starts reading data. The first readout data is the highest bit. Repeat the process until all 16 bits of data are read. After the last bit of data is readout, the MCU must force low and release DOCI immediately. The DOCI timing diagram is shown in the figure below. The blue line indicates the MCU drive and the dotted line indicates the PIR drive.



■ 数据格式 Data format

DOCI 接口输出高通滤波器的值。DOCI 输出数据如下图所示，共 19 位数据的首 2 位和末位是标志位，为固定值，如与默认值不符则说明数据错误，请舍去该组数据。The DOCI interface outputs the value of the high-pass filter. The DOCI output data is shown in the figure below, the first 2 bits and the last bits of the total 19 bits of data are flag bits, which are fixed values, if they do not match the default values, it means that the data is wrong, please discard the set of data.

19 Bits Data																		
BIT18	BIT17	BIT16	BIT15	BIT14	BIT13	BIT12	BIT11	BIT10	BIT9	BIT8	BIT7	BIT6	BIT5	BIT4	BIT3	BIT2	BIT1	BIT0
1	0	ADC VAL																0

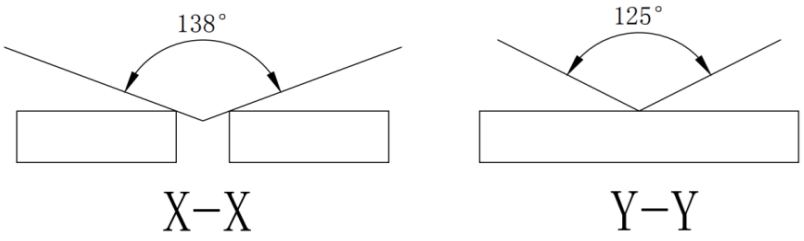
■ 数据说明 Data description

Value	Header		16Bits Data																Tail
(Dec)	B18	B17	B16	B15	B14	B13	B12	B11	B10	B9	B8	B7	B6	B5	B4	B3	B2	B1	B0
32767	1	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0
32766	1	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0
32765	1	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	0
:																			
2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0
-2	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0
-3	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	0
:																			
-32765	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0
-32766	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
-32767	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0

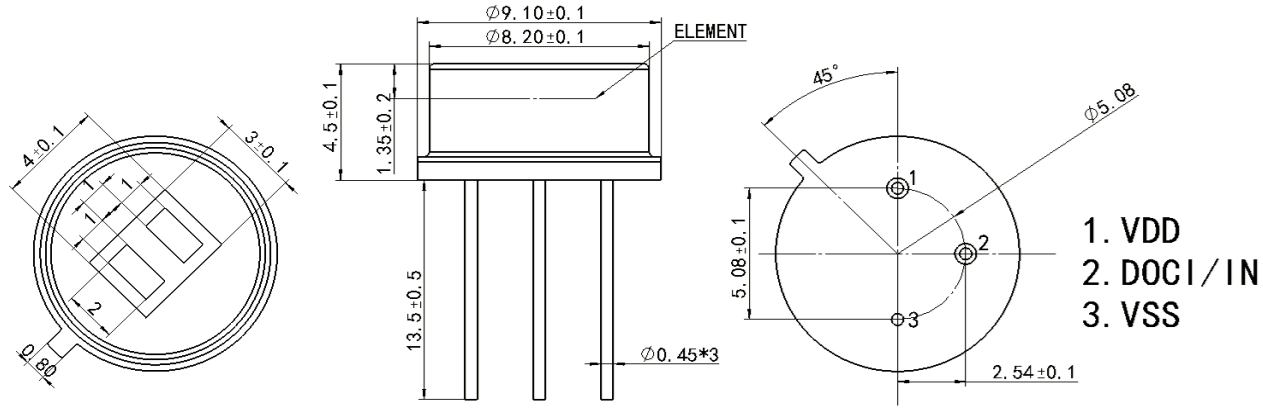
BPF 数据每 16ms 更新一次，LPF 数据每 1ms 更新一次。 对应的十进制数见上表。

当 Bit16 为“0”时，数据保持不变;当 Bit16 为“1”时，Bit15~Bit1 取反码并在 Bit1 上加 1 处理。得到的数据 Bit16 为符号位，“0”代表正，“1”代表负；Bit15~Bit1 为常规二进制码。When Bit16 is "1", Bit15~Bit1 takes the reverse code and adds 1 to Bit1 for processing. The resulting data bit16 is the sign bit, "0" represents positive, "1" represents negative; Bit15~Bit1 is a regular binary code. When Bit16 is "0", the data remains the same

感应角度 Detection Angle



产品外形尺寸 (mm)Product Dimension

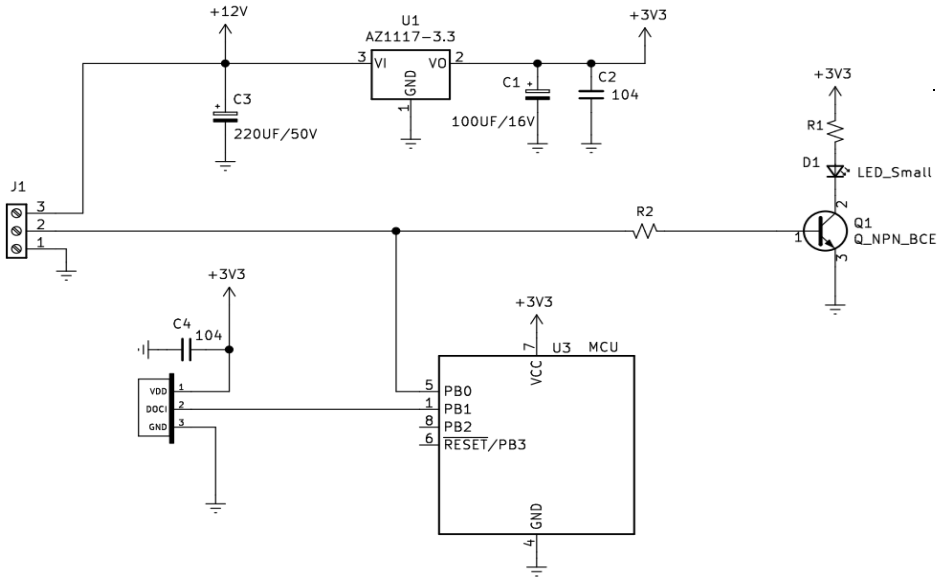


TOP VIEW FIGURE A　　SDIE VIEW FIGURE B　　BOTTOM VIEW FIGURE C

管脚定义：	pin description	
1	VDD	传感器供电脚 Power supply pin
2	DOCI	传感器数据输出脚 Sensor data output pin
3	VSS	电源地 Power ground GND

典型应用电路

Typical application circuit



焊接 Soldering

焊接过程中的不慎操作将会引起产品的损坏，请务必注意。焊接过程中应避免对产品支架或封装部分施加压力。焊接时，请保证焊接位置与传感器底部有一定的距离，该距离因不同的焊接方法而有所不同，请参照以下推荐焊接条件。

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 welding methods. Please refer to the recommended welding conditions below.

推荐焊接条件 Recommended Soldering Conditions

焊接模式 Soldering Mode		固定形式 Fixed Form
手工焊接 manual soldering	烙铁温度 Soldering iron temperature	<350℃
	焊接时间 Soldering time	<5 秒 <5seconds
	焊接位置 Soldering position	>1.5mm (从 PCBA 到底座) >1.5mm(from PCBA to base)
锡炉焊接 Tin stove welding	预热 Preheat	最高温度 100℃ 不超过 60 秒 Highest temperature 100 degree,not more than 60 seconds
	浸焊温度 Dip soldering temperature	最高 280℃ Max 280 degree
	浸焊时间 Dip soldering time	<5 秒 <5 seconds
	焊接位置 Soldering position	>1.5mm (从 PCBA 到底座) >1.5mm(from PCBA to base)

使用注意事项 Caution

■ 储存 Storage

- 在温度不高于 30℃，湿度不高于 60%RH 的条件下，产品保存期限为 6 个月。将产品保存在密封的容器中并附带干燥剂可以在一定程度上延续产品的储存日期。不良的储存条件会导致产品引脚的腐蚀或产品性能的改变。
- 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.

■ 静电 Static

- 静电和电涌会导致产品特性发生改变，例如正向电压降低等，如果情况严重甚至会损毁产品，所以在使用时必须采取有效的防静电措施。所有相关的设备和机器都应该正确的接地，同时必须采取其他防静电和电涌的措施。使用防静电手环，防静电垫子，防静电工作服，工作鞋，手套，防静电容器，都是有效的防止静电和电涌的措施。
- 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 wrist bands,anti-electrostatic gloves, anti-electrostatic containers at the same time to prevent static and electric surge.

■ 设计建议 Design Suggestion

- 设计产品时请注意传感器的窗口方向，结合菲涅尔透镜来达到较理想的探测角度。
- 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.
- 传感器的距离和背景温度、移动中的目标温度、菲涅尔透镜、环境温度、放大器放大倍数设置均有直接关系，使用时需综合考虑各参数。
- 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.

■ 其它 Others

- 传感器采用金属外壳密闭封焊而成，为保证器件的气密性，使用过程中不建议对引线进行弯折，弯折可能会破坏玻璃和金属封接部位的气密性，造成器件漏气。如果需要弯折使用，请使用工具辅助，并保证折弯过程中引线根部不受力。请保证折弯点与传感器底座之间有 3mm 以上的距离。使用过程中不可轴向扭动引线。
- 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.
- 传感器窗口镜片为半导体硅片经特殊材料真空镀膜的滤光片，使用时不能用手或硬物直接接触窗口，如滤光片有脏污，可用绒布沾无水乙醇适度擦拭。
- 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.
- 传感器应避免机械冲击，频繁、过度振动会导致传感器内部敏感元断裂，使用时需轻拿轻放。
- Please avoid mechanical shock for the sensor. Frequent or excessive vibration will cause the sensitive element break.