

PCIR series non-contact infrared temperature measurement module is an infrared temperature measurement module independently developed by Shenzhen Point Cloud Intelligent Technology Co. Ltd., which integrates the infrared temperature measurement chip of Melexis sensor , and is used for short-distance non-contact temperature measurement.

PCIR series module is integrated with dual core processor, with computing capacity of up to 600dmips, 2MB flash memory, and communication rate of up to 230400bps through UART. The module has its own calibration algorithm, so the user does not need to calibrate before using. it supports flash encryption and decryption, which can allow the user to store sensitive data, and the user's storage space is 2MB. The module supports hardware AES accelerator to further protect the user's data.

The module has its own CPU computing unit, user just need to obtain real-time temperature data through the serial port. Therefore user can integrate our module into the product in one day.

Application:

High precision non-contact temperature measurement and human body temperature measurement



Feature

- Temperature measurement at the center
- Full resolution maximum / minimum temperature capture
- fixed pixel temperature measurement
- area temperature measurement

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1.Product specification

Model	PCIR-21CB
CPU	ESP32
Sensor	MLX90621 BAB
Working temperature	0° ~ 50°
Range (Note 1)	-20° ~ 300°
measurement accuracy (Note 2)	±0.3°
Measuring distance	0.1m~0.6m
FOV	60°*16°
Resolving power	16*4
Refresh rate	0.5Hz~10Hz
Interface	UART(3.3V CMOS)
image processing	Nonuniformity correction Digital filter noise reduction Pixel enhancement
Power supply range	3.6V-6V@500mA

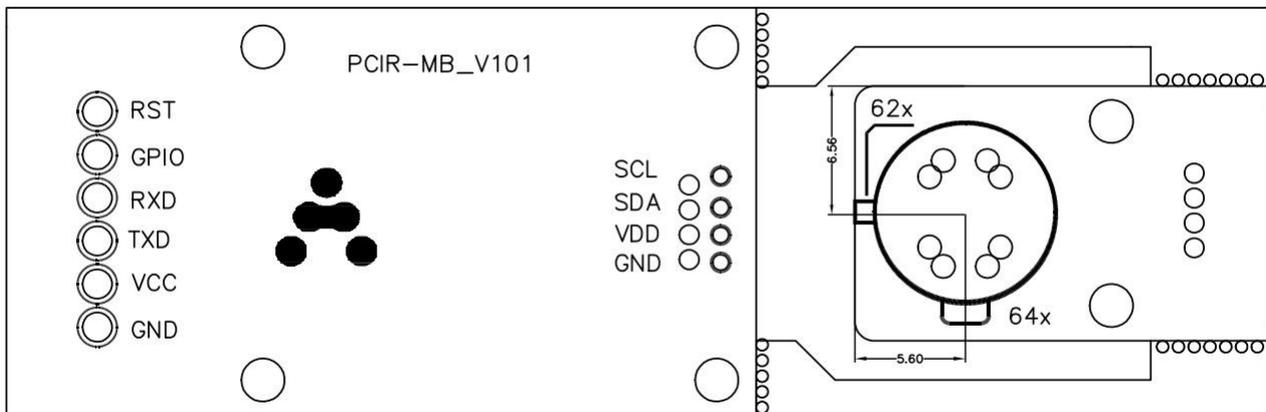
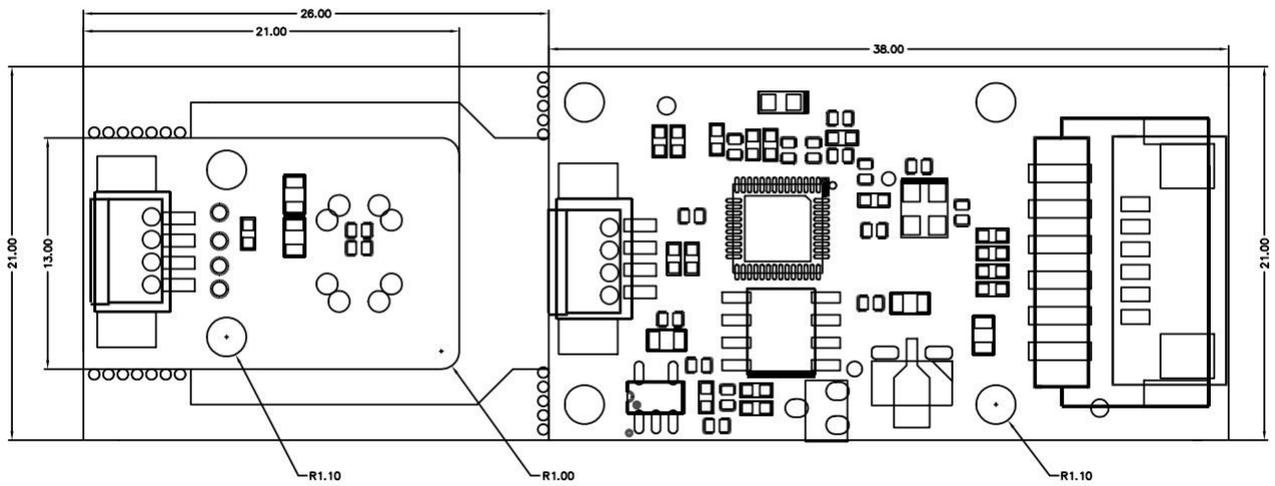
Note 1: The measuring range is the measurable temperature range, and the accuracy of it is detailed in Section 3.1.

Note 2: The test environment for this accuracy is:

- 1) The measurement range of human body is 33 ° C to 42 ° C
- 2) The target is within the measurement distance,
- 3) Using the surface temperature to human body temperature algorithm

2.Product structure & size

Product size



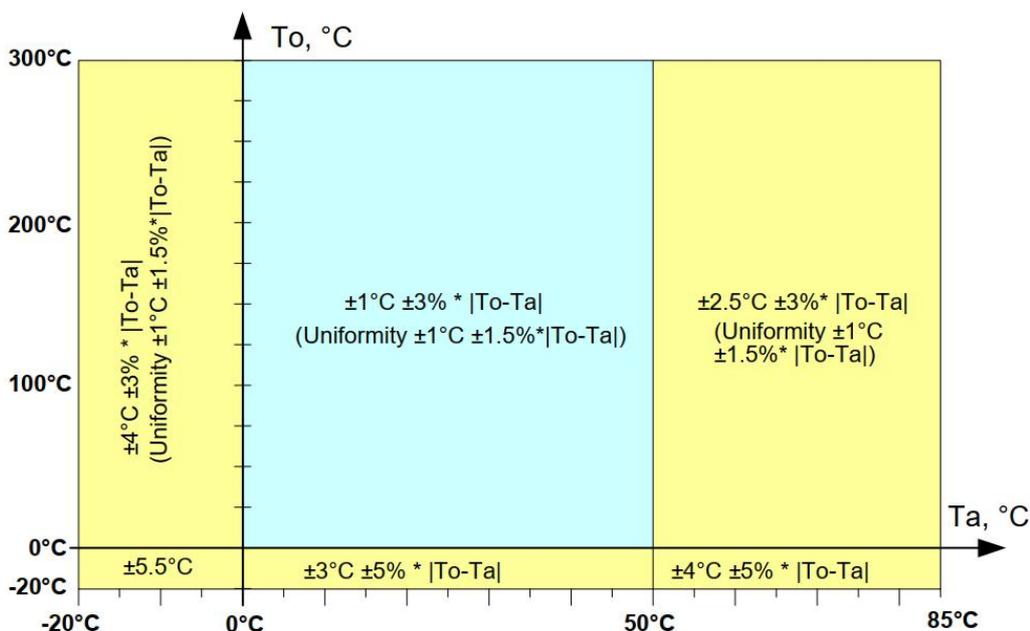
3.Accuracy

1.Temperature accuracy

All accuracy specifications apply under settled isothermal conditions only. Furthermore, the accuracy is only valid if the object fills the FOV of the sensor completely.

For normal object measurement , the measurement accuracy of the module is shown in Figure 4:

Figure 4 Temperature measurement accuracy for normal objects



Note:

- 1) The accuracy $\pm 1^\circ\text{C} \pm 3\% * |T_o - T_a|$ is specified for the four central pixels.
- 2) The accuracy of the rest of the pixels is $\pm 1^\circ\text{C} \pm 1.5\% * |T_o - T_a|$.
- 3) The abscissa in the figure above is the working temperature of the module.

In order to obtain better measurement accuracy, it is recommended to make the module work in the temperature range of $0^\circ \sim 50^\circ$.

2. Human body temperature measurement algorithm

For the scene of human body temperature measurement, the module apply the human body temperature measurement algorithm. In this mode, the module carries out fine calibration for the temperature range of 33 °C ~ 42 °C at the measurement distance of 50cm. After calibration and algorithm optimization, the accuracy of temperature measurement can reach ± 0.3 ° C.

4.Hardware interface

1) Feature

1. UART receive / send function
2. High speed UART interface, baud rate up to 230400 kbit / S
3. on board 30kbytes flash memory for storing calibration data

2) Seat interface

Ph2.0mm seat is adopted for the module, standard 3.3V CMOS TTL level is adopted for the serial port signal, and no up / down pull is made on the board. Power input supports 3.6V – 6V @ 50mA DC power supply.

3) Pins

Pins	1	2	3	4	5	6
Funciton	RST	IO	RXD	TXD	VCC	GND

5.API

UART Baud Rate: 230400, More details please refer to :

<https://github.com/pointcloudAI/PCIR-Examples>

1)Data Frame

Evaluate Mode

this mode is for customer evaluate temperature precision result if suitable for their product as soon as possible.

As long as the module is plugged in, it can send data to the upper computer continuously. The number of data is: $16 * 4 + 1 = 65$ data. The temperature appended at the end is the ambient temperature.

Operate Mode

This mode is for integrate to product, Data format is following: data frame format: 'DAT' + Data Bytes Length[2 bytes] + Environment Temp[4 Bytes float type] + data[pixelx4bytes float] + '\r\n'

For example, mlx90621 16x4 pixel:

$$3\text{Bytes} + 2\text{Byte} + 4\text{Bytes} + 16 \times 4 \times 4 + 2\text{Bytes} = 267\text{Bytes}$$

2)Command List

The length of the command is 6 bytes. And the format as below :

' CMD' +Type[1Byte]+Value[1Byte]+CRC[1Byte].

Quick start command :

Send Operate mode command 'CMDE\0x00\0x19', In hex: 43 4D 44 45 00 19

Send 2fps command 'CMDF\0x02\0x1c', In hex: 43 4D 44 46 02 1C

Send open command 'CMDC\0x01\0x18', In hex: 43 4D 44 43 01 18

Parser receive data 'DAT',validate data Length equal to sensor pixel and frame end '\r\n'.

CAMMAND usage	Type	Option Value
Set Open	C	[1-open 0-close 2- 1 Frame if Mode command ==0]
Set Sending Mode	M	[0-receive frame manual 1-receiver frame continuous]
Object Switch	O	[1-body measure 0-object measure]
Set Freq	F	[0-1/2fps 1-1fps 2-2fps 3-3fps 4-4fps]
Get Version	V	[0]
Evaluate Switch	E	[0-Operate mode 1- Evaluate mode 2- get Evaluate mode status]
Get Offset	T	[0-get common offset]

3)Command Reault List

All above command will return a result. The format as below :

'RETCMD + Type[1Byte] + Value[multiple Bytes] + '\r\n'

4)Python usage Example

https://github.com/pointcloudAI/PCIR-Examples/tree/master/visual_monitor