DY-256M Thermal Imaging Module

User Manual

1. Product introduction

1.1. Description

DY-256M is a long-wave infrared (8~14μm, LWIR) micro thermal imaging module that can convert the thermal radiation of an object into images and temperature data. The product is small in size and low in power consumption, apply to security monitoring, temperature measurement tools, smart home appliances and other fields.

1-1. DY-256M

1.2. Features

- Focus on the consumer thermal imaging market
- 256×192@12μmWLP high-performance vox uncooled infrared detector
- High speed 25Hz frame rate
- Excellent lens optical design, adjustable focus position
- Support full array temperature data output
- Self-developed ISP dedicated chip, user friendly, low power consumption, good performance,

1.3. Application scene

- Smart life: smart home appliances, smart sensors
- Handheld terminals: temperature measurement tools, night vision equipment
- Security inspection: industrial monitoring, perimeter scanning, power detection
- Fire rescue: fire warning, fire helmets
- And more

2. Model options

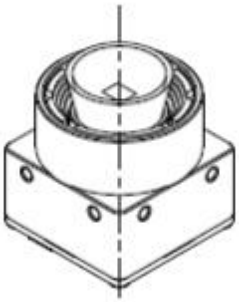
2.1. Introduction

2-1. DY-256M

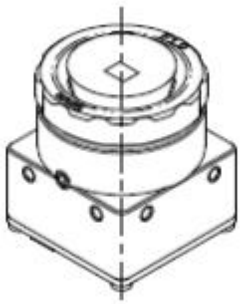
256 XX	06812X	H	WR
IR resolution	**Lens**	**Enhancement**	**Temp measurement**	**预留**
256×192	04010X：4.0mm F1.0 06812X：6.8mm F1.2 09010X：9.0mm F1.0 13012X：13.0mm F1.2	H：high quality S：high quality/wide measurement range switch	WR: industrial measurement HR：high response	XX: fix focus FA: manual focus

Note 1: High-quality mode refers to the original high-gain mode. In this state, the module response rate is high, the imaging effect is good, but the temperature measurement range is narrow; wide-range mode refers to the original low-gain mode. In this state, the module response rate is low, the imaging effect is poor, but the temperature measurement range is wide.

Note 2: The focus here refers only to manual focus. There is no electric focus version or zoom version.



2-1. Fix focus



2-2. Manual focus

2.2. Model options

2-2. DY-256M

序号	型号	特点
1	DY 256 06812X S WR XX	-
2	DY 256 09010X S WR XX	-
3	DY 256 04010X S WR XX	-

4	DY 256 13012X H WR XX	-
5	DY 256 09010X S WR FA	Manual focus
6	DY 256 04010X S WR FA	Manual focus
7	DY 256 04010X S HR FA	Manual focus

2.3. Lens option

2-3. DY-256M Lens

Item	Lens	Detection distance	Recognition	Identification	Measurement distance	
04010X	lens：4.0mm F 1.0 FOV：45°×33° IFOV：3mrad	0.33m~∞	430m	108m	54m	
06812X	lens：6.8mm F 1.2 FOV：26°×20° IFOV：1.76mrad	0.8m~∞	680m	170m	85m	-
09010X	lens：9.0mm F 1.0 FOV：20°×15° IFOV：1.33mrad	1.69m~∞	900m	225m	112m	0.25m~25m
13012X	lens：13mm F 1.2 FOV：13°×10° IFOV：0.92mrad	2.93m ~∞	1300m	325m	162m	-

Note 1: The above detection distance, recognition distance and identification distance are estimated based on the Johnson criterion with pedestrians (1.8×0.5×0.3m) as the target; the temperature measurement distance is estimated based on a surface source blackbody with a diameter of 0.15m.

3. Specification

3-1. DY-256M

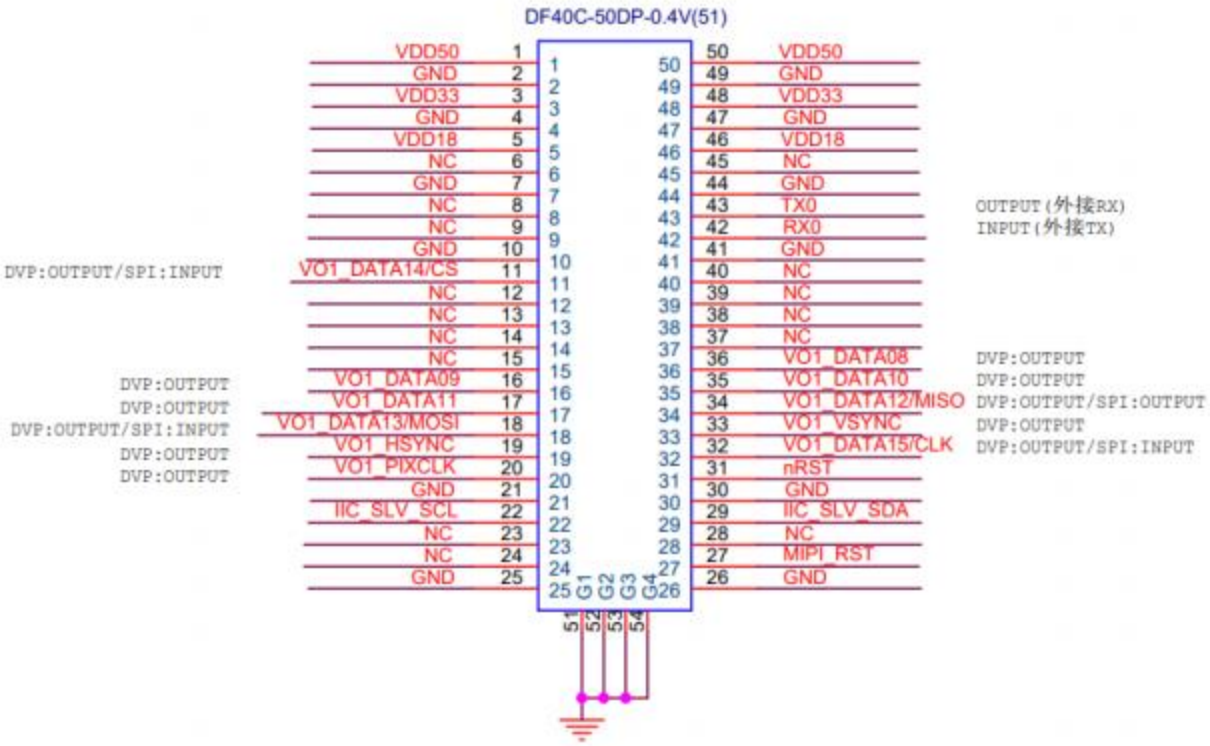
General	
Detector type	Uncooled Vox
Spectral range	8~14 μm
IR resolution	256×192
Pixel	12μm
NETD	＜50mK @25℃, F#1.0，25Hz
Thermal time constant	＜10ms
Refresh rate	≤25Hz
Non-uniformity correction	Automatic shutter correction
Image output	10bit/14bit（switchable）
Focus	Fix or manual
Measurement	
Measurement range	-15℃~150℃（high quality）50℃~550℃（wide range）
Accuracy	±2℃ or ±2%
Electrical	
Power	1.8V, 3.3V
Image date interface	VoSPI/DVP
Control interface	I2C
Consumption	Normal：270 mW Shutter：1200mW
模组物理特性（不含镜头和法兰）	
Dimension	21mm×21mm×21mm
机芯重量	-

Environment	
Working temperature	image：-40℃~80℃ measurement：-10℃~75℃
Storage temp	-45℃~85℃
Shock	25g，11ms

Note: The default voltage level is 3.3V. The voltage can be switched to 1.8V through the control instruction VCMD_SWITCH_DVP_VOL.

4. Hardware introduction

4.1. Pin definition



4-1. DY256 模组产品引脚图示

4-1. DY-256M module pin definition

Pin number	Pin name	Type	说明
1、50	VDD50	POWER	
2、4、7、10、21、25、26、30、41、44、47、49	GND	GND	

3、48	VDD33	POWER	
5、46	VDD18	POWER	

6、8、9、12、13、14、15、23、24、28、37、38、39、40、45	NC	NC	
11	VO1_DATA14(SPI_CS)	I/O	DVP data signal, SPI 出图复用成 SPI_CS
16	VO1_DATA9	O	DVP
17	VO1_DATA11	I/O	DVP
18	VO1_DATA13(SPI_MOSI)	I/O	DVP，SPI 出图复用成 SPI_MOSI
19	VO1_HSYNC	O	DVP 行同步信号
20	VO1_PIXCLK	O	DVP time signal
22	IIC_SLV_SCL	I/O	IIC time signal
27	MIPI_RST	I	预留，NC
29	IIC_SLV_SDA	I/O	IIC data signal
31	nRST	I	复位信号，低电平复位
32	VO1_DATA15(SPI_CLK)	I/O	DVP data signal，SPI 出图复用成 SPI_CLK
33	VO1_VSYNC	O	DVP 帧同步信号
34	VO1_DATA12(SPI_MISO)	O	DVP data signal，SPI 出图复用成 SPI_MISO
35	VO1_DATA10	I/O	DVP data signal
36	VO1_DATA8	O	DVP data signal
42	RX0	I	
43	TX0	O	

51、52、53、54			插座固定焊盘

4.2. Power supply

The detector used in the module is sensitive to power supply noise, especially the noise of the analog part, which can be directly reflected in the imaging video. The following table shows the maximum noise, typical operating current and maximum current that the module can tolerate.

4-2. DY256 Voltage, current and noise

引脚名称	状态	Min voltage	Gen Vol	Max Vol	典型电流	Max Curr	Max noise (1Hz~50KHz)
VDD50	Normal	4.5V	5V	5.5V	40.7mA	77.5mA	200μV（1Hz~50KHz）
VDD33	Shutter pressed	3.15V	3.3V	3.45V	75.3mA	294mA	50mV（1Hz~50KHz）
	Shutter pressed	3.15V	3.3V	3.45V	317mA	772mA	
VDD18	Normal	1.71V	1.8V	1.89V	5mA	40mA	50mV（1Hz~50KHz）

5. Development

5.1. Software

- Demo：Falcon Application
- Development kit：Windows，Linux，Android，RTOS

5.2. Control and data transmission

The device control interface uses standard I2C, with a maximum clock frequency of 400KHz, complies with the CCI protocol in MIPI CSI-2, and a 7-bit I2C address of 0111100b.

5.2.1. DVP

Data interface

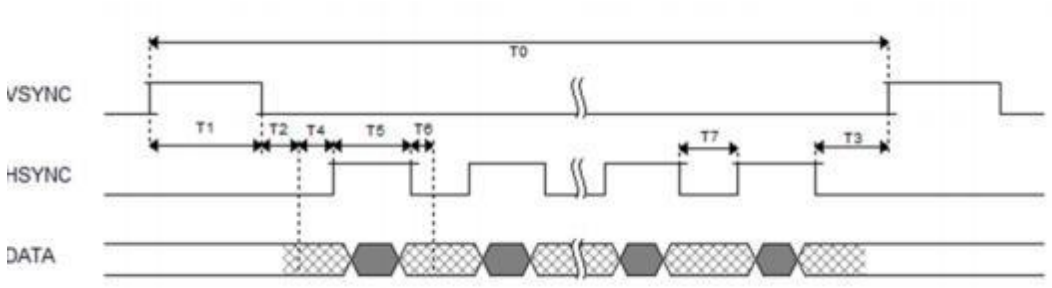


图5-1. 外同步时序图

Supports internal coding synchronization signal and external line and field synchronization signal, 8-bit parallel port transmission mode.

Data format

如下几种类型数据格式

5-1. DVP 数据格式说明

Mode	Data type	Data format
Image	Original image	Y14/Y10
	Pseudo color	YUV422
Temperature	Temp data	Y14
Image + Temperature	Image and temp	YUV422 +Y14

5.2.2. VoSPI

Data interface

The data output interface is VoSPI (Video out SPI interface). It uses the Motorola Serial Peripheral Interface (SPI) 4 lines interface protocol. VOSPI defines two data read commands, including reading a new frame and continuing to read the current frame. Reading a new frame is used for the SPI master to obtain a new frame of image from RS001. When a frame of image is too long and cannot

be transmitted in one time, continuing to read the current frame is used to continue the transmission of the new frame of image previously read.

VoSPI Timing Description

A. 256×192 image or temp

B. 256×192 (Image and temperature), obtain the corresponding data by sending image stream command or temperature stream command

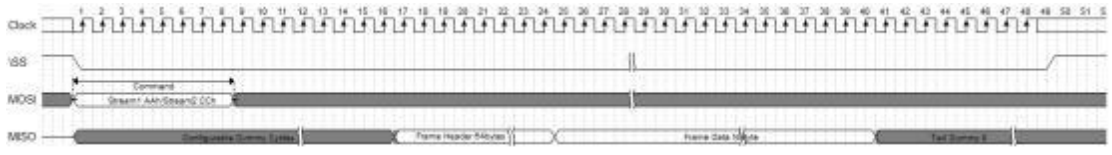


图 5-2. 读取新的一帧时序图

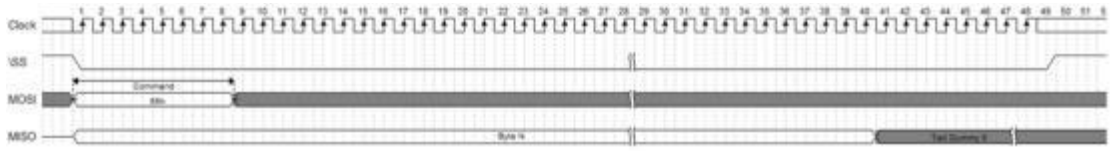


图 5-3. 继续读取当前帧时序图

数据格式

如下几种类型数据格式

表 5-2. VOSPI 数据格式说明

模式	数据类型	数据格式
Image	Original image/pseudo	(Y14/Y10)/ YUV422
Temperature	Temp data	Y14
Image + Temperature	Image and temp	YUV422 +Y14

5.3. 模组功能

5-3. DY-256M

功能	实现形式	备注
获取产品信息	SDK/ Firmware	包括 SN 码、PN 码、固件版本等
固件升级功能	SDK + Firmware	
快门控制	Firmware	包括最小、最大、任意快门间隔、自动快门开关、触发阈值等
防灼伤保护	SDK	
获取探测器 FPA 温度	Firmware	

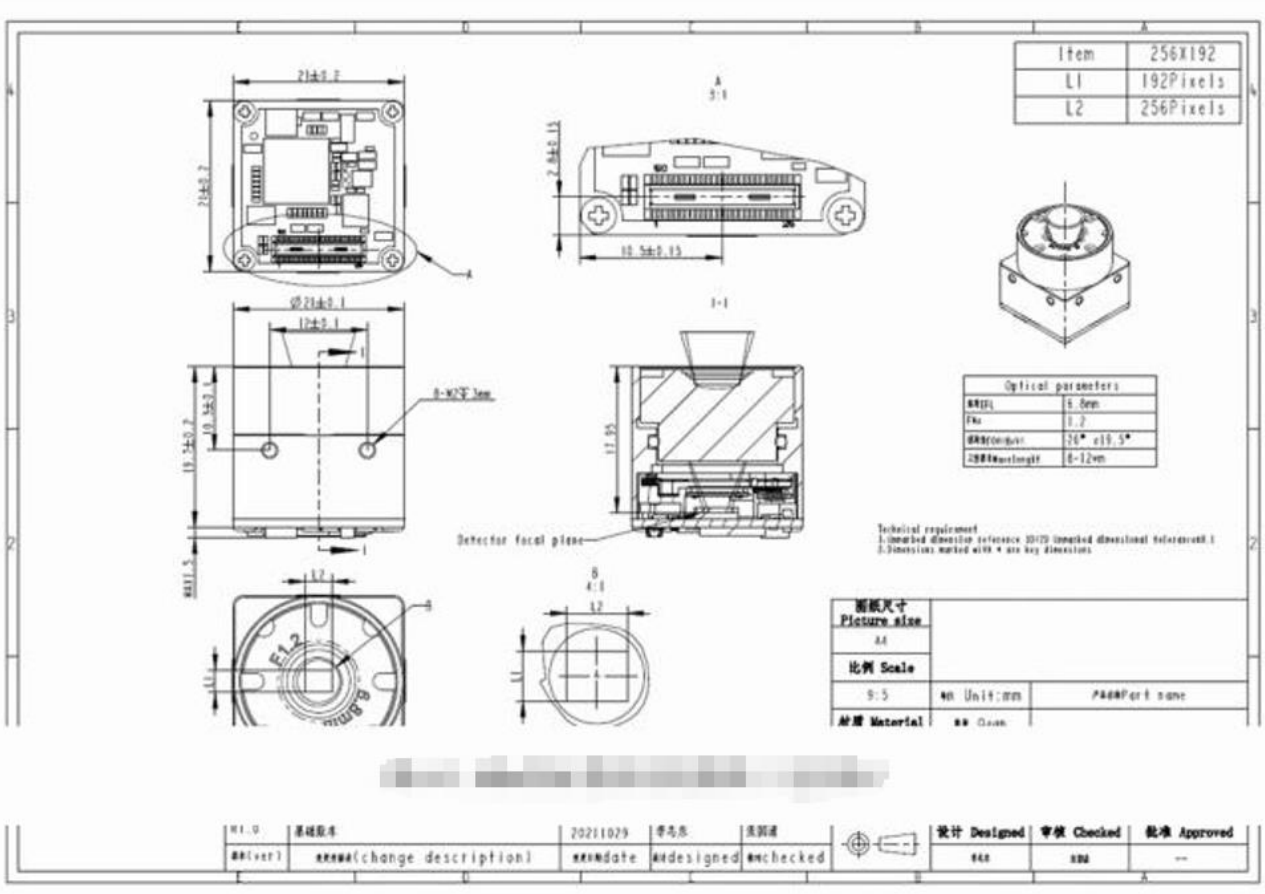
测温参数设置	SDK/ Firmware	包括环境反射温度、环境大气温度、目标发射率、大气透过率

测温分析	SDK/ Firmware	包括整帧的最大、最小温度，点的温度，线框的最大值、最小值及坐标，平均值
测温挡位切换	Firmware	SDK 可支持自动切换
测温报警功能	SDK	
用户温度补偿	SDK/ Firmware	
细节增强	Firmware	
AGC	Firmware	
3D 数字降噪	Firmware	包括时域降噪、空域降噪
非均匀校正	Firmware	
翻转、旋转、镜像	SDK/Firmware	可旋转90°或180°
缩放	Firmware	按中心放大、缩小；按位置放大、缩小
伪彩	SDK/ Firmware	

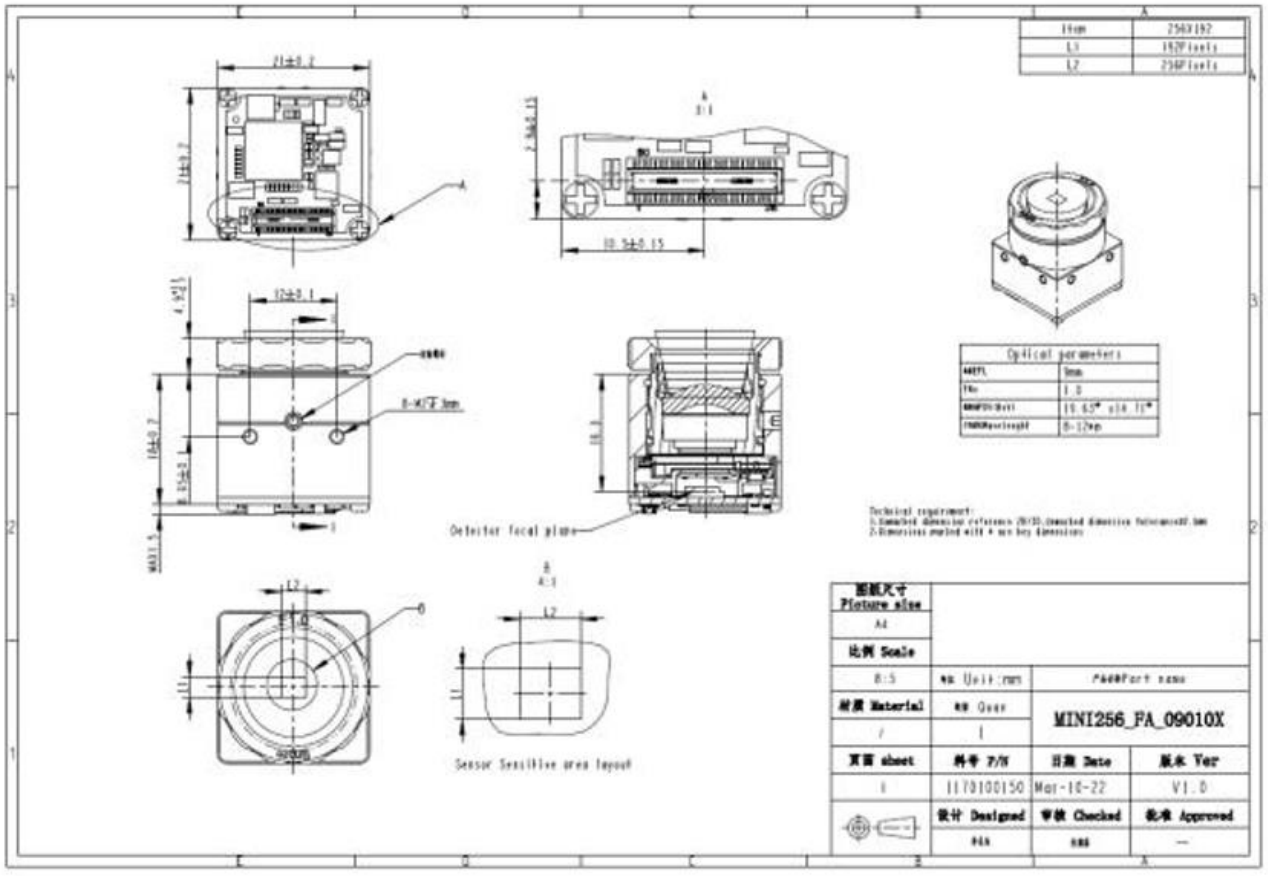
6. Structure and size

Note 1: The fixed focus version takes DY 256 06812X as an example

Note 2: The adjustable focus version takes DY 256 09010X as an example


Item 256X192
L1 192Pixels
L2 256Pixels
Optical parameters
Detector focal plane
Technical requirement
Picture size
A4
Scale
Unit:mm
Designed
Checked
Approved

Fixed focus



Adjustable focus

7. 配件简介

7.1. USB 拓展组件

USB 连接器型号：FWFS-08R1-04-19

7-1. USB 连接器

7-1. USB interface definition

引脚序号	引脚名称	类型	说 明
1	VBUS_IN	Power	外部电源输入为5V
2	GND	GND	接地
3	USB_DP	I/O	USB2.0 信号线
4	USB_DM	I/O	USB2.0 信号线