Pilot Series

Infrared Automotive Camera

User Manual V1.0.0

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1. Responsibility Statement

1.1 Responsibility Statement

A two-year warranty from the date of delivery of the initial purchase, and a three-month warranty on accessories under the premise of normal storage, reasonable use and maintenance.

This warranty is non-transferable and does not apply to any product damaged by misuse, negligence, accident, or abnormal operating conditions.

Any defective product covered by this warranty shall not be used or repaired by yourself to prevent further damages. If there is indeed a problem with the product or its accessories, the user can contact the after-sales service department within the warranty period for repair or return of the product.

1.2 Quality Assurance

The quality management system has been certified according to ISO 9001 standard.

We reserve the right to make changes or improvements to any product without prior notice.

2. Product Overview

2.1 Product Description

The Pilot series infrared automotive camera is an intelligent infrared thermal imaging day and night safe driving night vision device for industry applications. It can be connected to the automobile multi-sensor fusion strategy to give full play to the advantages of various sensors. Based on the GMSL high-speed video communication protocol, the infrared automotive night vision device provides clear images day and night, which solves the key problems that affect safe driving such as bad weather, poor lighting at night, and poor vision due to dazzle light. There are application cases in scenes such as rail transit, mining vehicles, unmanned logistics trucks, docks and ports.

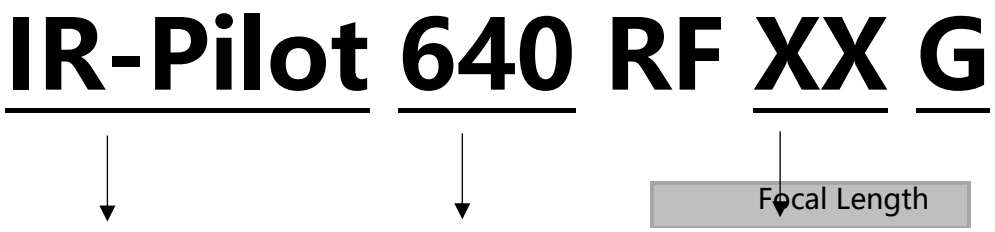
The Pilot series infrared automotive camera uses maxim96705 encoding chip (transmission speed of up to 1.74Gbps). It is equipped with FAKRA coaxial connector, and in POC (power over coax) mode, a single coaxial cable can complete the transmission of power supply and GMSL video signals and communication control signals. This series of products can be connected to the vehicle-mounted edge computing unit to provide night visual data for ADAS and autonomous driving scheme.

2.2 Product Features

No.	Product Features
1	Operating temperature range: -40°~85°;
2	Waterproof grade IP69K, waterproof and dustproof;
3	HD array image, to provide video data with rich details to the autonomous driving computing center;
4	Standard FAKRA interface, which can be directly connected with most of the vehicle-mounted computing centers in the market and easy to be accessed by the autonomous driving system;
5	Low power consumption, high stability, seismic resistance, and impact resistance;
6	Scene-based non-uniformity correction technology eliminates "blinks" of the infrared camera during driving;

3. Product Specifications

3.1 Model Description



IR-Pilot Series Products	Resolution (Width×Height)	
	256	256×192
	384	384×288
	640	640×512
	1280	1280×1024

(mm)	
f69	6.9
f91	9.1
f13	13
f19	19

Technical Specifications		**Pilot256**	**Pilot 384**	**Pilot 640**		
Camera Parameters	Sensor Type	Uncooled VOx infrared detector				
	Spectral Band	8~14μm				
	NETD	< 50mK @25°C, F#1.0,25Hz	≤40mK@25°C,F#1.0			
	Resolution	256×192	384×288	640×512		
	Pixel Size	12μm				
	Focal Length	7mm	9.1mm	4.1mm	6.9mm	13mm
	FOV	25°x19°	28°x21°	120°×92°	62°×50°	32°×26°
	Identification Distance	110m/83m	145m/107m	57m/48m	110m/80m	208m/162m
	Frame Rate	25Hz	50Hz			
	High Light Protection	Support				
	Scene-Based Correction	Support				

	Window Defrost	Support		
Dimensions (Excluding Connectors)		39×33×31mm		38×38×52mm
Weight		< 80g		< 180g
Environment Adaptability	IP Rating	IP69K		
	Operating Temperature	-40°Cto+80°C		
Interface		FAKRA		
Protocol		GMSL1		
Communication		I2C	UART	I2C
External Synchronization		Not supported	Not supported	Support
Power Supply		12V DC(Poc)		
Power Consumption		≤1W. No more than 4W with automatic defrost enabled		

3.2 Performance Specifications

3.3 External Dimensions

(1) The Pilot256RFf70G series product consists of a front shell, a rear shell, and a FAKRA connector, as shown in Figure 1-1.

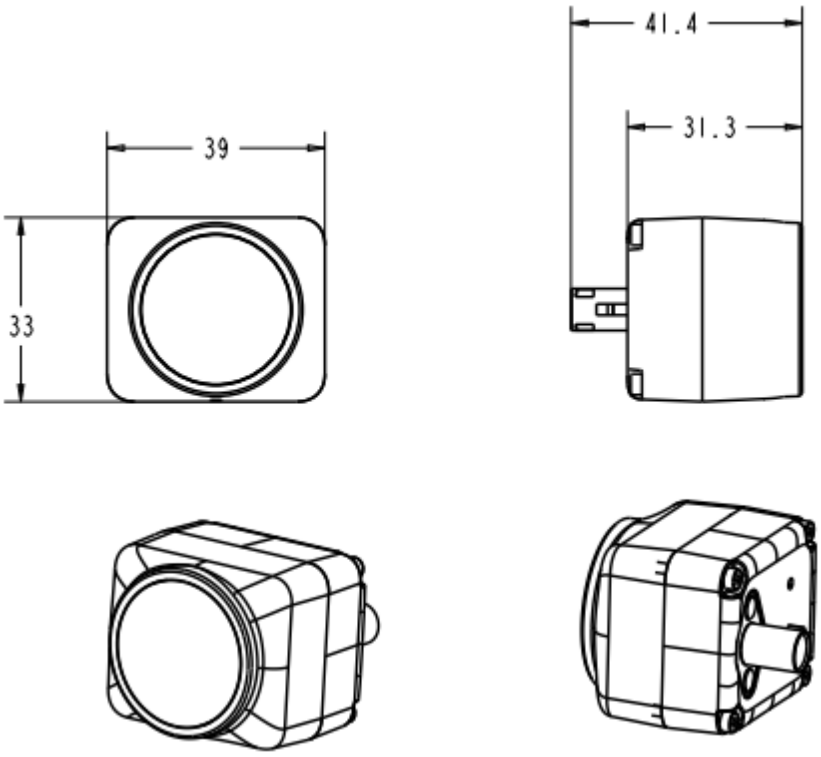


Figure 1-1 Appearance of Pilot256RFf70G

(2) The Pilot384RFf91G series product consists of a front shell, a rear shell, and a FAKRA connector, as shown in Figure 1-2.

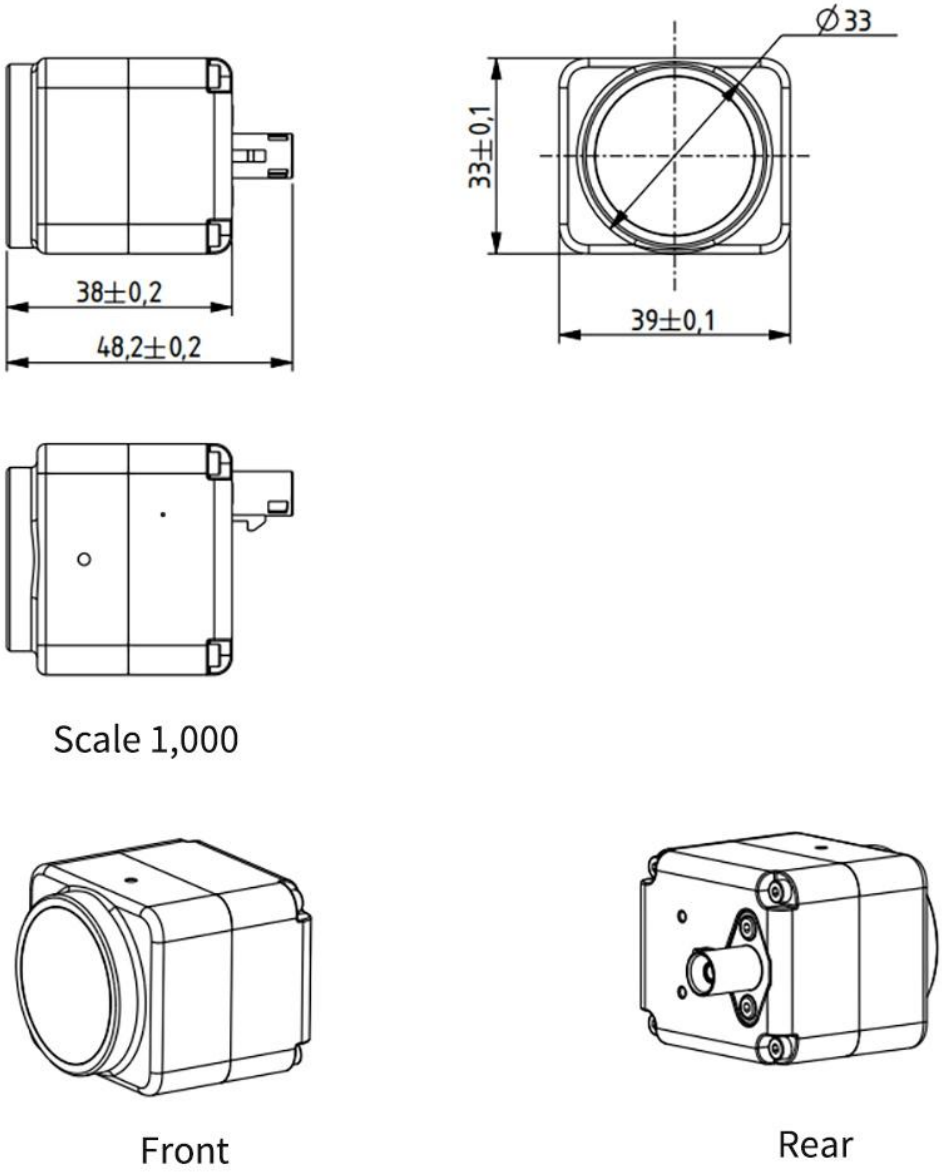


Figure 1-2 Appearance of Pilot384RFf91G

(3) The Pilot640RFXXG series product consists of a front shell, a rear shell, and a FAKRA connector, as shown in Figure 1-3.

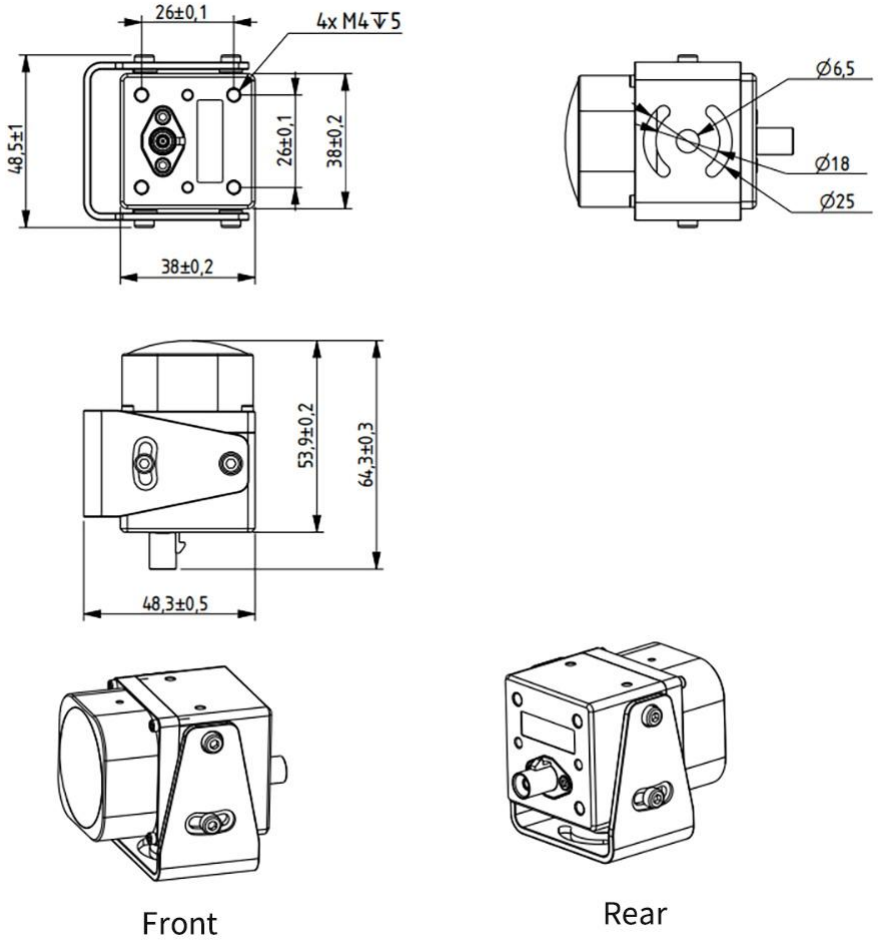


Figure 1-3 External Dimensions of Pilot640RFXXG

(4) For the dimensions of FAKRA connector (Z type), see Figure 1-4:

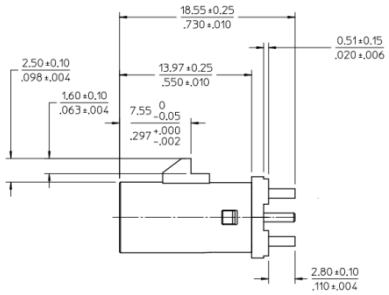


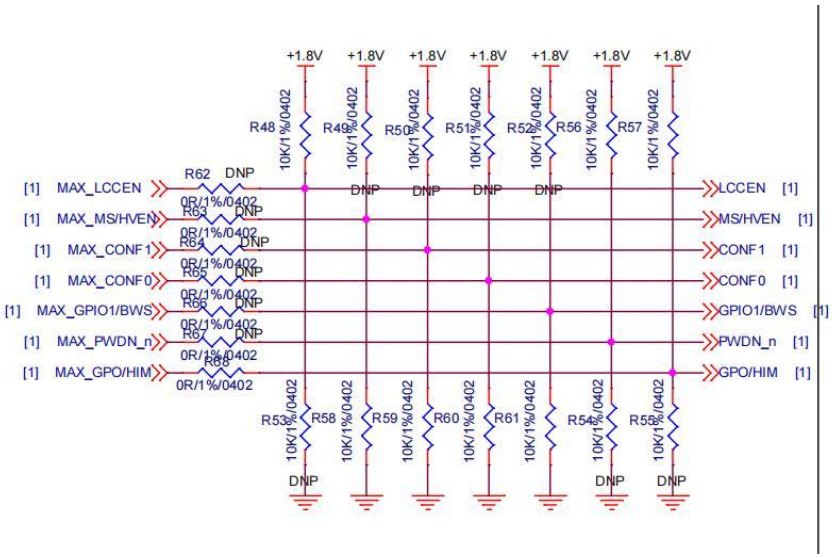
Figure 1-4 Dimensions of FAKRA Connector

4. Functional Description

The coaxial cable provides a 12V power supply to the camera in POC mode. The product adopts GMSL as its video protocol. The image output is in SHUTLESS mode: Scene-based non-uniformity correction technology eliminates "blinks" of the infrared camera during driving. The window enables automatic defrosting and heating: when the detected ambient temperature is lower than 2°C, the window automatically heats for 20 minutes.

4.1 GMSL Debugging: The camera uses the GMSL1-gen 96705 chip, of which the pin configuration is defined as follows:

Maxim Max96705	
I2C Address	0x40 (7-bit address, excluding read-write bit)
LCCEN	1
MS/HVEN	0
CONF1	0
CONF0	0
GPIO1/BWS	0
PWDN_n	1
GPO/HIM	1

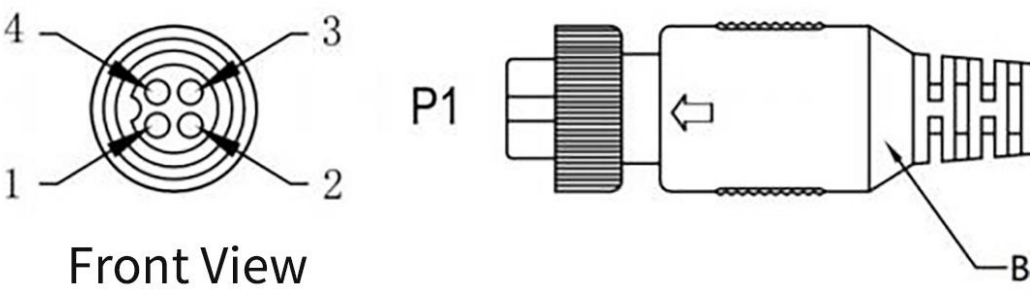


Note: 1. The camera with a resolution of 640×512 outputs data in format BT601, YUV422, with the order of UYVY.

2. The camera with a resolution of 384×288 outputs data in format BT601, YUV422, with the order of UYVY.

3. The camera with a resolution of 256×192 outputs data in format BT601, YUV422, with the order of UYVY.

4.2 For 640×512 series cameras, 4.1mm and 6.9mm focal length cameras with PAL output are added, while other parameters remain unchanged. The video output format is PAL analog video (CVBS interface), utilizing a 4-core M12 aviation as the connector. This aviation facilitates both power supply and video data transmission. By connecting this aviation to a CVBS-compatible display device, the infrared image can be directly displayed on the screen. The interfaces are defined as shown below:



Line Sequence Number	Definition
1	12V power supply positive
2	GND power supply
3	Audio (not used)
4	Video

5. Installation Recommendations

1. **Device interface and wiring requirements, power interface and communication interface, etc.**

The equipment uses the same one interface for power supply and communication in POC (power over coax) mode. The exposed line is the coaxial cable, which is both the power supply interface and the communication interface.

2. Safety distance requirements for surrounding parts

Operating temperature: -40~85 ° C. It is recommended that the ambient temperature for long-term operation shall not exceed 60°C and shall not be in direct contact with high-temperature parts.

Good ventilation and natural heat dissipation.

3. Device installation direction

Horizontal installation, with the installation adapter vertically downward.

Avoid sun exposure. There shall be no glass blocking in the FOV.

The installation height and position shall be determined according to the FOV model and the car body itself.

4. Magnetic field interference on the device and safe distance

The Pilot series product, except for the germanium window in the front, is a metal cavity, which has a strong anti-electromagnetic interference capability. The current test results have not revealed any obvious interference.

For more product information, visit Raythink website:
http://www.raythink-tech.cn