RAKINDA（SCANMAX)

3D TOF Depth Camera M5

User Manual

Document Version：V1.4

Confidential：Open

Revision Records

Revision Date	Version No.	Revision Description
2018/12/06	V1.0	First Version
2019/02/26	V1.1	Update working distance range and power consumption data
2019/03/16	V1.2	1) Add interface description and radiating design guide
2019/04/08	V1.3	1) Adjust size, thickness changed to 10.6mm and update diagram 2) The max ideal working distance adjusted to 1.2m; 3) The max working temperature adjusted to 45℃ and for the embedded type design, the whole machine radiating must be considered.
2019/04/08	V1.4	1) Update interface terminal description

Contents

Ⅰ Product Brief

M5 Facial Recognition Module is new generation small size **3D TOF Depth camera** developed by Shenzhen Rakinda Technologies Co., Ltd. M5 combines 640×480 pixel TOF camera and 5 million pixel RGB camera. The small and thin structure makes it easy for various embedded type, handheld detection terminal application to realize facial recognition, face liveness detection, scene recognition and gestures recognition. We provide SDK. Users can make product integration and secondary development according to own requirement.

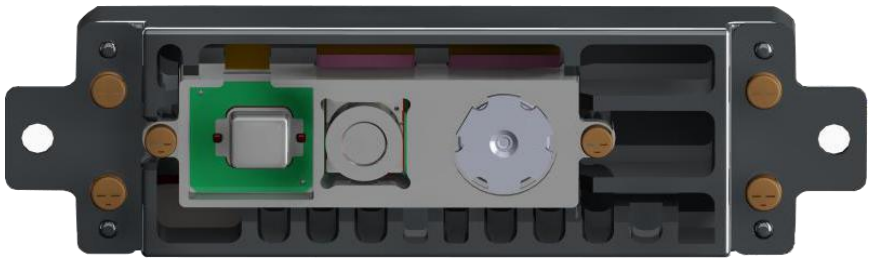


Figure1:M5Module

Features:

- Designed based on TOF;
- High resolution 640×480;
- High precision: up to 0.1%
- With 940nm VCSEL light source, can be used outdoor;
- Small and thin, dimensions 55mm×18mm×10.6mm, fit for various embedded type application;
- Accurate synchronization and matching among Depth map, IR picture and RGB picture.

Ⅱ Product Introduction

2. 1. Specs

1：See table 1 for products specs

Table 1: M5 Specs

Specifications		
Model		M5
TOF	Precision (horizontal x vertical)	640×480
	Field of View (horizontal x vertical)	60°× 45°
	FPs	30 Max
RGB	Precision (horizontal x vertical)	1080P/960P/720P/VGA
	Field of View (horizontal x vertical)	74°× 56° @960P（Default） 63°× 37° @1080P 74°× 42°@720P 74°× 56°@VGA
	FPs	30 Max
	Video Coding	JPEG, RGB
Measurement Distance (Unit: m) Note[1]		0.3 - 1.2
Measurement Precision Note[2]		0.1%
Measurement Accuracy Note[3]		1%
Light Source		940nm VCSEL
Data Transmission Interface		Micro USB
Supply Note[4]		5V
Typical Power Consumption (W)		3.4
Working Temperature（℃）Note[5]		0-45
Operating System		Windows7 or above, Linux, Android
Dimension (length x width x thickness mm)		55×18×10.6 (module without steel fixture) 65.8×18×10.6 (module with steel fixture)

Note 1: measurement distance: testing with 90% reflectivity white wall, it is detective distance in the central area. The reflectivity has impact on measurement distance, precision and accuracy.

Note 2: measurement precision: RMS error of central area with repeated testing on 90% reflectivity white wall;

Note 3: measurement accuracy: the error between measurement distance and real distance for testing on 90% reflectivity white wall;

Note 4: board USB 5V power supply, current above 1A, direct USB power supply can be used; if current less than 1A, the special power supply cable needs to be used.

Note 5: The radiating design must take the whole machine into consideration; please refer to the radiation design guide or contact factory for support.

2. 2. Main Hardware Components

- 1 TOF camera module
- 1 VCSEL laser
- 1 RGB camera module
- 1 dedicated ASIC processing chip
- 1 control motherboard (including CPU, FLASH, etc.)

2. 3. Product Structure & Size

（Unit：mm）

- **M5 module structure & size:**

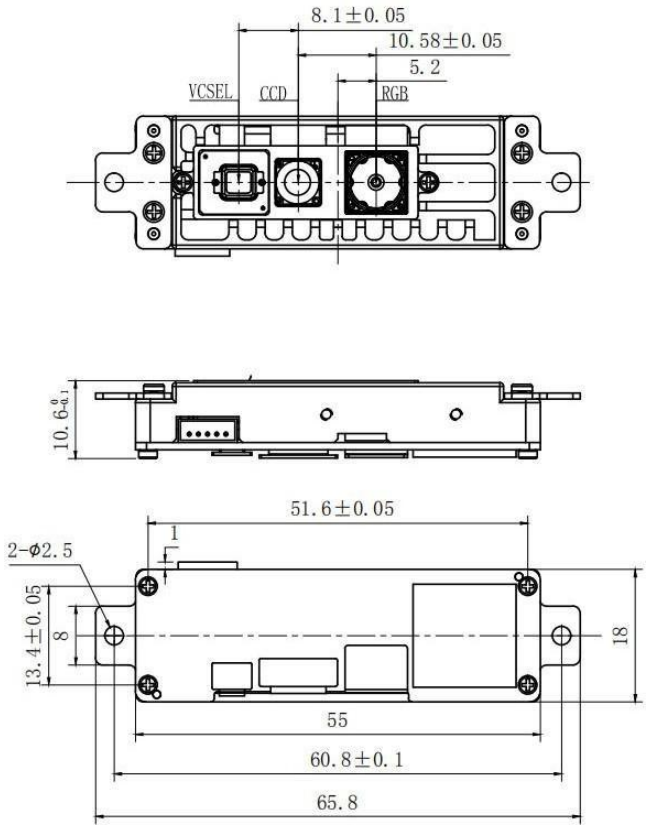


Figure 2 M5 structure & size

1. Fixing Instruction

(1) If the customer's product is a metal material, the module can be fixed to the product through two fixed steel sheets on the module. Customer can design the limit structure according to the internal structure of the product to facilitate assembly, and also prevent assembly deviations from causing deviations between the lens and the glass transparent area.

(2) If the customer's products are plastic parts, in addition to meeting the above requirements, the screw column should also have enough strength to prevent the fracture in the process of assembly. It is not recommended to use self-tapping screws for screw selection. It is recommended to add copper column of screws in the screw column and fix it with mechanical screws.

(3) During the module installation, do not touch the lens by hand. Wear anti-static gloves and anti-static bracelet to prevent the damage of the module's main board components caused by static electricity.

2. Operating Instructions for Front Panel Glass

(1) Glass size set according to the customer product structure and light transmittance of glass all band ≧ 98%, glass installation needs to have enough of the bearing surface, cannot affect the safe use, in the case of address security thinned as far as possible, suggest 1 mm thickness, in order to prevent the VCSEL infrared light reflection to the CCD camera, Suggestions on the glass CCD and VCSEL window around the area to increase absorption of infrared coating.

(2) The windowing area of CCD,VCSEL and RGB on the glass is designed according to the market Angle (refer to the 3D picture for details), and a margin should be left to prevent the assembly deviation from causing the blocking of glass screen printing.

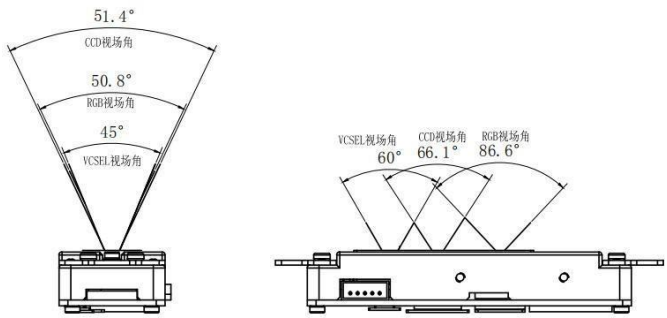
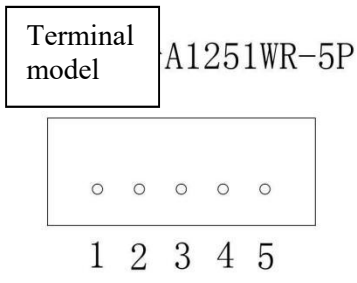


Figure 3. Field View of M5 Module

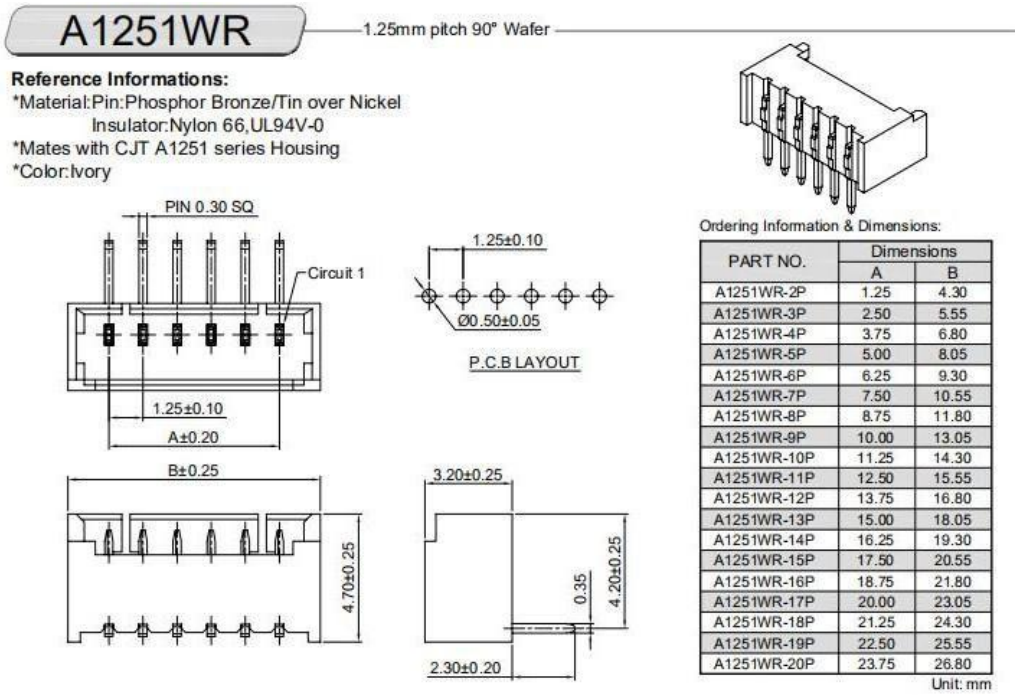
(3) Between the module and the glass, light-blocking cotton shall be added around the CCD and VCSEL to prevent the infrared light of VCSEL from reflecting into the CCD lens. The compressed light-blocking cotton shall not exceed the windowing area of the glass.

(4) Glass, light-blocking cotton and modules shall be fitted closely.

2.4 Interface Definition



Pin	Name
1	GND
2	5V
3	DM
4	DP
5	GND



PART NO.	Dimensions	
	A	B
A1251WR-2P	1.25	4.30
A1251WR-3P	2.50	5.55
A1251WR-4P	3.75	6.80
A1251WR-5P	5.00	8.05
A1251WR-6P	6.25	9.30
A1251WR-7P	7.50	10.55
A1251WR-8P	8.75	11.80
A1251WR-9P	10.00	13.05
A1251WR-10P	11.25	14.30
A1251WR-11P	12.50	15.55
A1251WR-12P	13.75	16.80
A1251WR-13P	15.00	18.05
A1251WR-14P	16.25	19.30
A1251WR-15P	17.50	20.55
A1251WR-16P	18.75	21.80
A1251WR-17P	20.00	23.05
A1251WR-18P	21.25	24.30
A1251WR-19P	22.50	25.55
A1251WR-20P	23.75	26.80

Figure 4: terminal definition of module

1. Power supply requirement: 5V / 1A

Photo5 A1251WR-5P connector description

Attention: The male seat is configured in the equipment, the corresponding female seat is 1.25mm, 5P, and the data cable is made into a twisted pair.

2.5. Module thermal design description

1. Because the product volume is too small, the chip temperature is relatively high, heat conduction treatment is required to avoid excessive temperature to reduce product life, you can add a radiator on the back, the radiator material is AL6063, aluminum extrusion or machining, the heat dissipation area is not less than 100cm^2 , the surface treatment is anodized black (increasing the emissivity), the radiator selection should avoid using long strips;

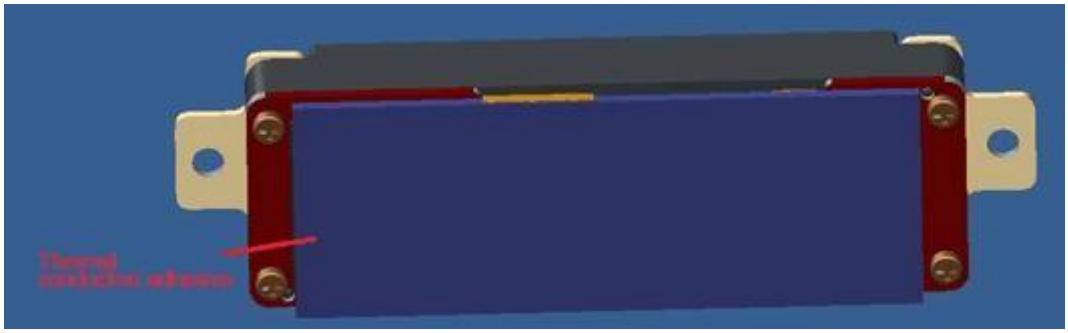
2. If the back of the customer's product is made of metal, the temperature can be directly led to the back cover;

3. The entire motherboard conducts heat to the heat sink (the heat sink is a whole) through a thermally conductive silicone sheet (without viscosity). The thermal conductivity of the thermally conductive adhesive is 3W / mk and the thickness is 1mm and the module presses the thermally conductive silicone sheet. However, it should be noted that the pressure should be controlled within the compression amount of the thermal conductive glue to prevent the chip from being crushed;

4：The ambient temperature of the equipment doesn’t exceed 45 ℃;

5: When installing the radiator, please pay attention not to contact with other components of the motherboard to prevent damage to the motherboard due to short circuit

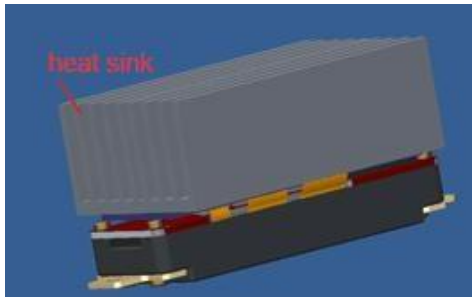
6: It is forbidden to stick tape and other materials that affect heat dissipation on the motherboard and bracket, so as not to cause the motherboard temperature to be too high and affect product performance.



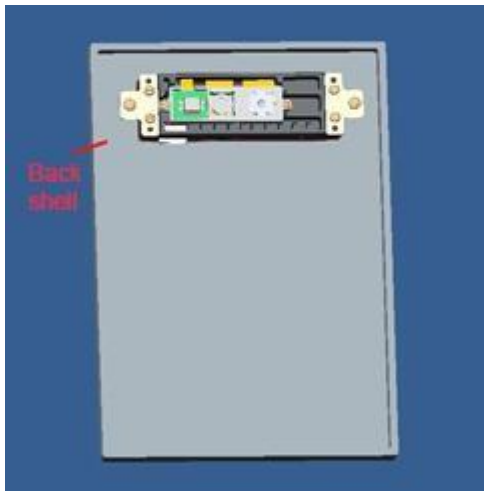
Installation location of thermally conductive silicone sheet

Examples of fixing methods:

Example 1: Add a radiator on the back:



Example 2: Conduct heat to the rear shell:



For the long rear shell in the above figure, a layer of graphene can be attached inside the shell to quickly and evenly spread the heat to avoid local overheating of the shell.

Ⅲ Functions Introduction

1. Depth data output: output **unit16** depth data;
2. IR image data output: output **8bit** infrared intensity map;
3. RGB image output: output **JPEG** or **24-bit RGB data**;
4. Synchronization and alignment between depth data, IR and RGB data.

Ⅳ Usage Guide

This product is connected to the host through a USB cable when it is used. When the power supply of the main board is insufficient, it can be connected to a DC 5V power supply. Currently SDK supports Windows, Linux, Android platforms, the recommended configuration is as follows:

A:operating system

Windows:

Windows 7, 8, 10 on x86 (32/64 bit)； **Ubuntu:**

Ubuntu 12.04 (32/64/arm)And above；

Android:

Android 5.0 and above；

B. Processor

Pentium 4, 1.4GHz and above；

AMD Athlon 64/FX 1GHz and above

Arm Cortex A8 and above ；

C. Memory

More than 64MB；

D. External storage

More than 250MB；

E. Interface

Micro USB 2.0；

F. Development environment VS2010，VS2015，

Eclipse，Android Studio；

G. Graphics:

Some sample programs need to be higher than ATI RADEON x1300 or NVIDIA GeForce 7300; for more detailed instructions, please refer to the "Developer's Guide" after purchasing M5 device.

After obtaining the M5 prototype, please select the appropriate system platform, read the installation and diagnostic guide of Rakinda intelligent equipment and install and use Rakinda intelligent client, and carry out product development according to the "Developer's Guide". If you encounter technical problems, please work with Rakinda in time Personnel contact.

Ⅴ Application Scenario

M5 products can be widely used in various deep vision inspection scenarios, mainly including:

Industry	Application
Somatosensory entertainment	Somatosensory games, bone extraction, 3D fitting, gesture recognition, etc.
Face recognition	Face payment, face access control, personal identification machine, etc.
Education	3D interactive teaching, TOF learning Demo