



Makerbase

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MKS DLP Mainboard Datasheet

Makerbase

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Version Update

Version	update time	Modification	Remark
V1.0.0	11 th Jul, 2018	Original version	

Catalogue

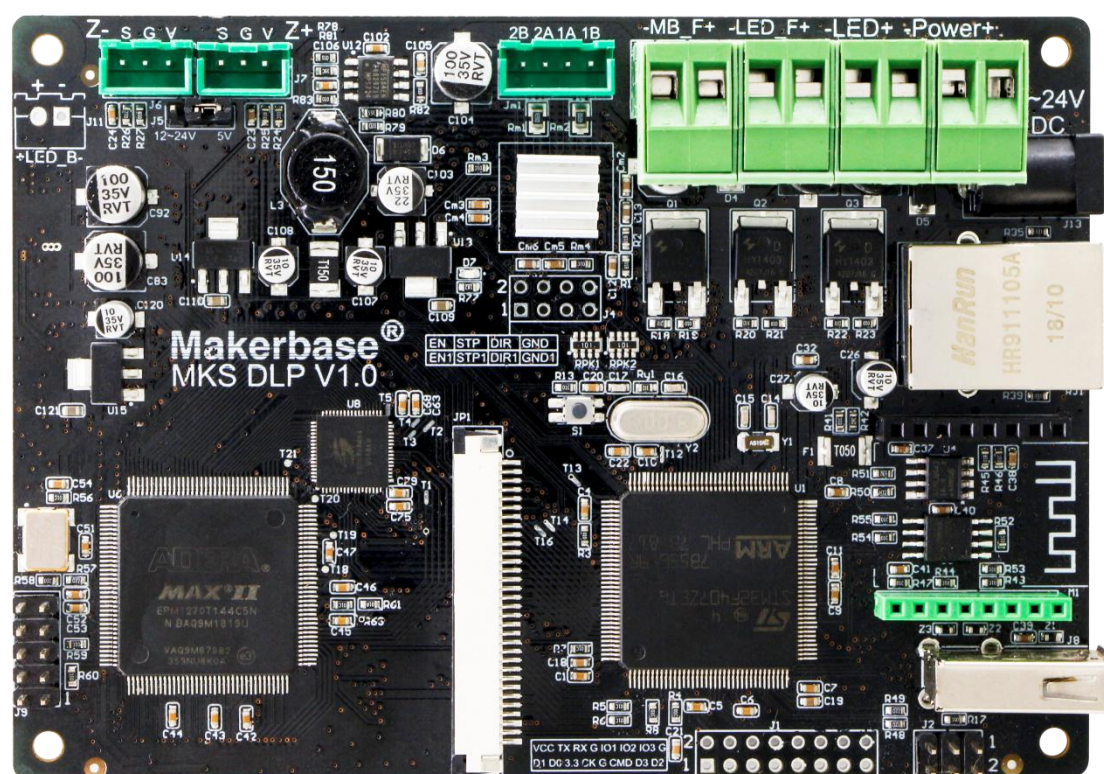
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I Background and overview

Compared with FDM, LCD photocuring technology is favored by the market because of its accuracy improvement, but its market coverage is far less than FDM technology due to various factors, such as higher cost, less solutions, and material restriction. Thus, our MKS team independently developed MKS DLP motherboard and related slicing software to promote the development of LCD photocuring for 3D printing solution by less cost.

Most of the traditional LCD photocuring mainboards are made of "Raspberry Pi PCB + HDMI to MIPI adapter + Z-axis adapter + serial screen". It is made of several-layer boards and complicated wires that results in high cost finally. While MKS DLP mainboard adopts an integrated PCB, integrates main controlled chip and memory processor, and works with 3.5-inch TFT touch screen. It is equivalent to the "four-in-one" of the traditional scheme to greatly reduce the cost. Currently, DLP mainboard has supported Sharp 5.5-inch 2k HD imaging screen, and USB flash drive for offline printing.

Schematic, firmware and slicing software (MKS DHOST) are open resource. They can be downloaded from Makerbase official github: <https://github.com/makerbase-mks>



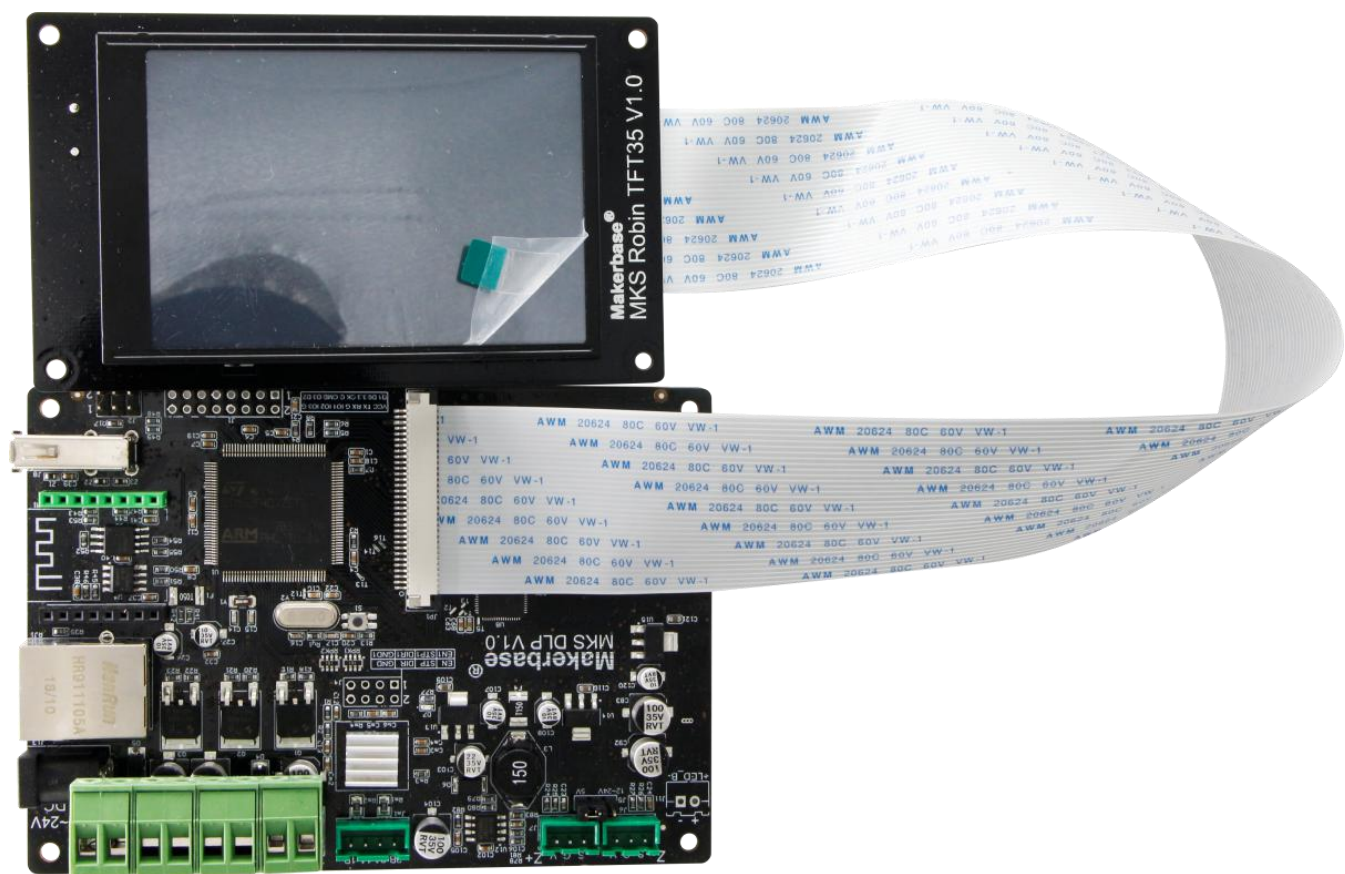
MKS DLP mainboard

II . Mainboard parameter

Item	MKS DLP	Microprocessor	STM32
Input voltage	12-24V	Memory processor	EPN1270T
Mainboard size	119mm*85mm	Installation size	112mm*78mm
Firmware type	MKSDLP firmware	Update method	USB flash drive
Printing file format	Mdlp	Slicing software	MKS DHOST
Operation screen	MKS RobinTFT35	Imaging screen	5.5 inch sharp screen resolution （1440*2560）

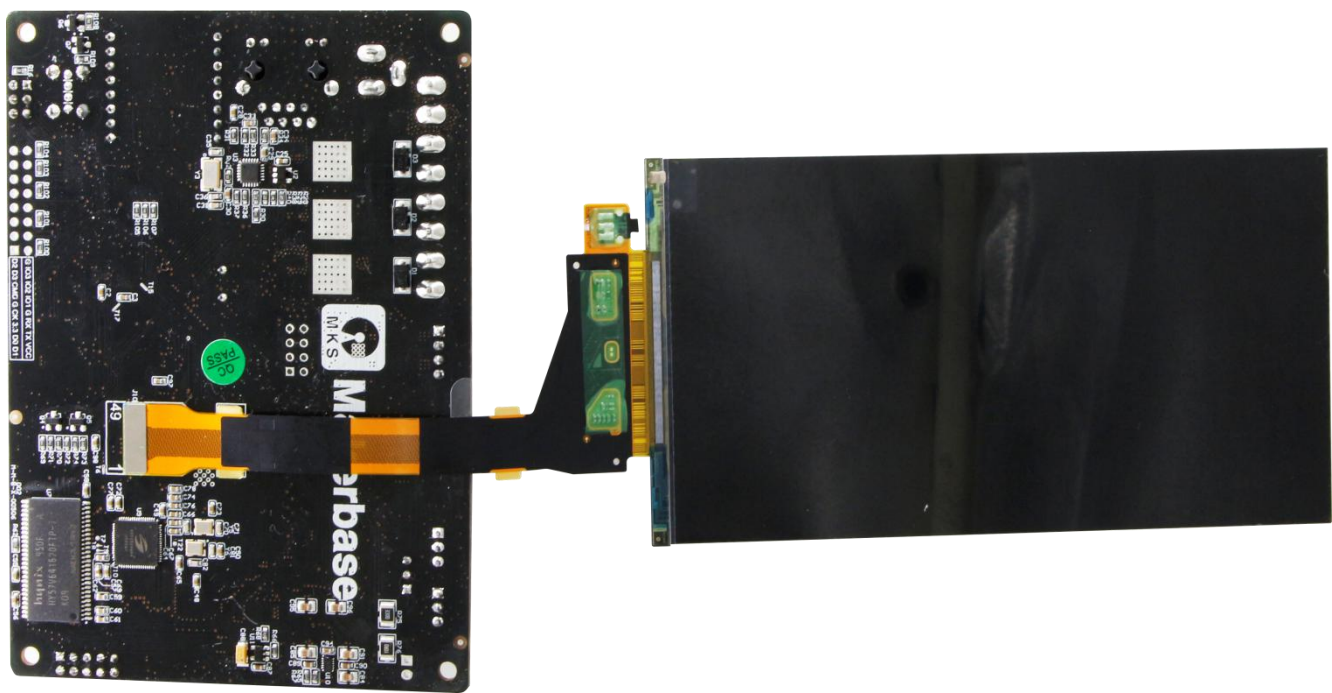
III. Connection diagram

3.1 Connected diagram of DLP to TFT display

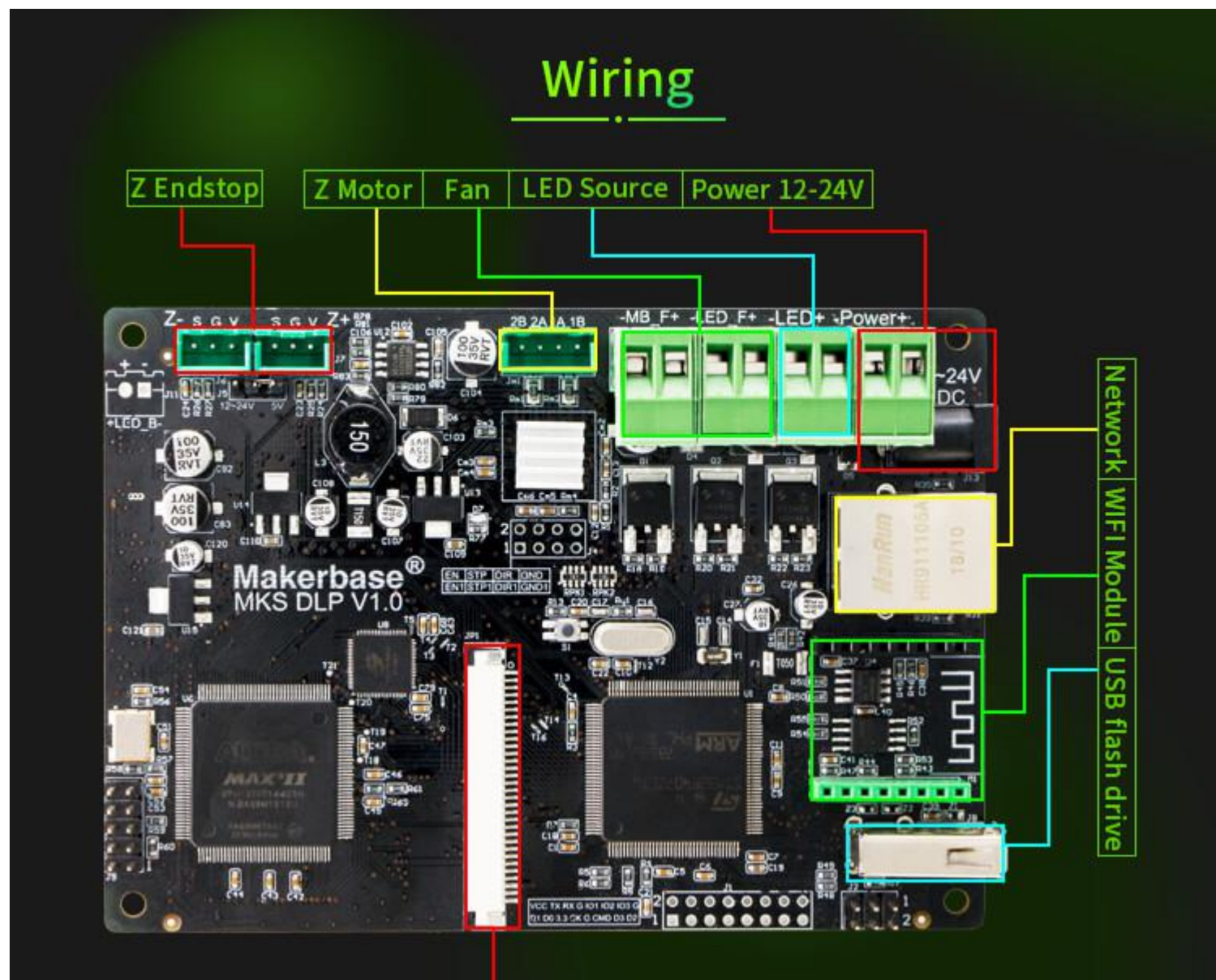


3.2 Connected diagram of mainboard to imaging screen

Currently, DLP only supports Sharp 5.5 inch imaging screen LS055R1SX04, its resolution is up to 2560*1440



3.3 PIN interface diagram



IV. Operation instruction

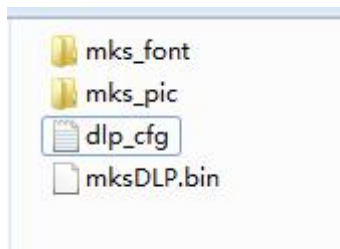
4.1 Firmware update

MKS DLP mainboard adopts mks dlp slicing firmware self-developed , which is upgraded via USB flash drive.

The way to get firmware: download firmware via our website, or from the customer service staffs.

Update steps are as follows.

As the following figure shows, Copy the following files to the root directory of the USB flash drive.



Note: Don't modify the file name, otherwise firmware can't be upgraded normally.

Subsequent modification of firmware parameters, users just need to update "config.txt" file, not need to update all files.

4.2 Config file instruction

Mainboard parameter setting: configure mainboard parameter via modifying the parameter in config file “config.txt”.

After that, copy the file to USB flash drive to update.

1. Language setting

```
#=====语言设置=====
>cfg_language_adjust_type      1      #语言切换方式配置(1:屏幕按钮切换语言,0:配置文件选项切换语言).
>cfg_language_type            1      #语言(1:简体中文;2:繁体中文;3:英文;4:俄语;5:西班牙语,6:法语,7:意大利语)
                                     #此配置只有在cfg_multiple_language设置为0时有效.
```

2. Travelling setting

```
#===== Basic Settings =====
# Travel limits after homing (units are in mm)
>Z_MIN_POS 0
>Z_MAX_POS 155

>Z_PAUSE_POS    10      #暂停时 Z上升高度(mm)
```

3. Movement setting

```
#===== Stepper Motor Settings =====
#Invert the stepper direction.
>INVERT_Z_DIR      1

#Movement setting
>DEFAULT_Z_STEPS_PER_UNIT      1600      #Default Axis-Z Steps Per Unit (steps/mm)
>DEFAULT_Z_MAX_FEEDRATE      5      #Default Axis-Z Max Feed Rate (mm/s)
>DEFAULT_Z_MAX_ACCELERATION      100      #Default Axis-Z Max Acceleration (change/s) change = mm/s
>DEFAULT_ACCELERATION      1000      #X, Y, Z and E acceleration for printing moves
>DEFAULT_RETRACT_ACCELERATION      1000      #X, Y, Z and E acceleration for retracts
>DEFAULT_TRAVEL_ACCELERATION      1000      #X, Y, Z acceleration for travel (non printing) moves
>DEFAULT_MINIMUMFEEDRATE      0.0      #minimum feedrate
>DEFAULT_MINSEGMENTTIME      20000      #minimum time in microseconds that a movement needs to take if the buffer is
emptied.
>DEFAULT_MINTRAVELFEEDRATE      0.0      #
>DEFAULT_ZJERK      0.4      #Default Axis-Z Jerk (mm/s)
>CURRENT_VREF_Z      600      #Default motor current for Z in mA, range (0~1000)
```

Main parameter setting

INVERT_Z_DIR : Invert the stepper direction of Axis-Z (the value can be configured to “0” or “1”)

DEFAULT_Z_STEPS_PER_UNIT: Axis-Z steps per unit (step/unit), if motor input value (1600) is different from the real situation, you can modify the value, that means “1600” can be modified.

CURRENT_VREF_Z: Axis-Z current setting

Generally, you don't need to modify other parameters except 3 items above. If the printer have endstop, you can modify its parameter according to its running situation.

4. Endstop setting

```
#===== Endstop Settings =====  
>MIN_SOFTWARE_ENDSTOPS 0          # 0:axes can move below MIN_POS; 1:axes won't move below MIN_POS.  
>MAX_SOFTWARE_ENDSTOPS 1          # 0:axes can move below MAX_POS; 1:axes won't move below MAX_POS;  
  
# Mechanical endstop with COM to ground and NC to Signal uses "false" here (most common setup).  
>Z_MIN_ENDSTOP_INVERTING 1        # set to true to invert the logic of the endstop.  
>Z_MAX_ENDSTOP_INVERTING 1        # set to true to invert the logic of the endstop.
```

SOFTWARE_ENDSTOPS: software endstops setting

Refer to the picture above, if you enable the last 2 items value to "1", the machine moving scopes will not be over the MIN_POS or the MAX_POS.

If enable them to "0", machine moving scope and the position of homing will not be controlled by endstop.

ENDSTOP_INVERTING: Axis-Z endstop type setting. Axis-Z endstop type setting error will cause homing failure.

5. Other setting

```
#===== Home Settings =====  
>Z_HOME_DIR -1                    # Direction of endstops when homing; 1=MAX, -1=MIN :[-1,1]  
>HOMING_FEEDRATE_Z 240            # Homing Z speeds (mm/m)  
  
#=====蜂鸣器设置=====  
>cfg_buzzer_type 1               # 0:蜂鸣器声音关; 1:蜂鸣器声音开  
  
#end.
```

Z_HOME_DIR: Axis-Z homing direction, "-1" = minimum, 1:=maximum, the minimum or maximum direction is based on the machine moving direction

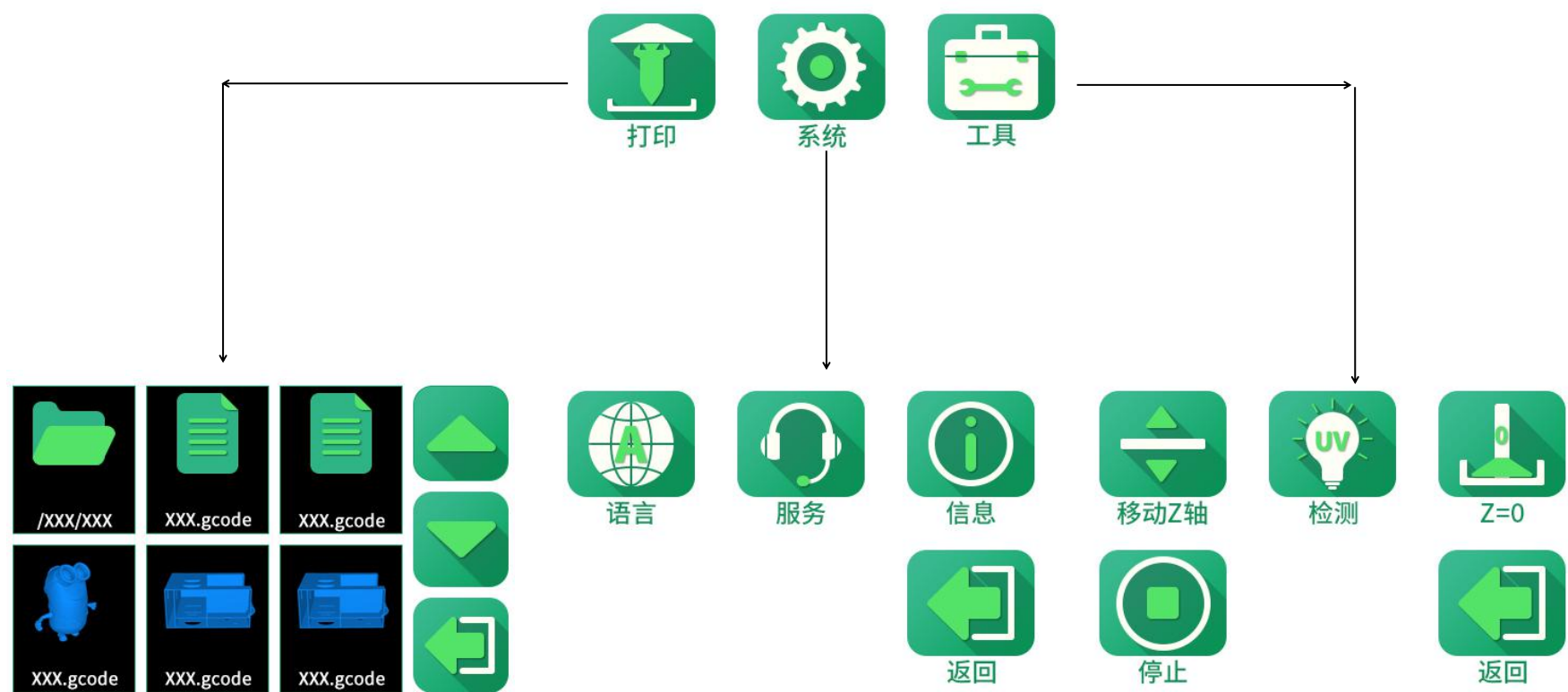
HOMING_FEEDRATE_Z: Axis-Z homing feedback

cfg_buzzer_type: buzzer setting, 0 :Turn off the buzzer, 1: Turn on the buzzer.

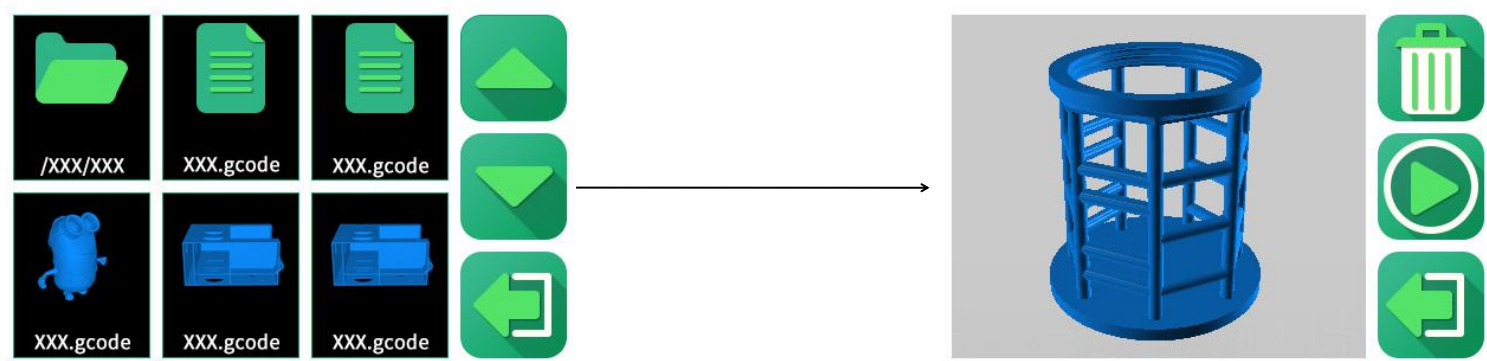
4.3 operation interface of screen

MKS DLP mainboard is compatible to a 3.5-inch TFT touch screen which is easy to operate with beautiful and simple interface. Model preview is available with the MKS DHOST slicing software.

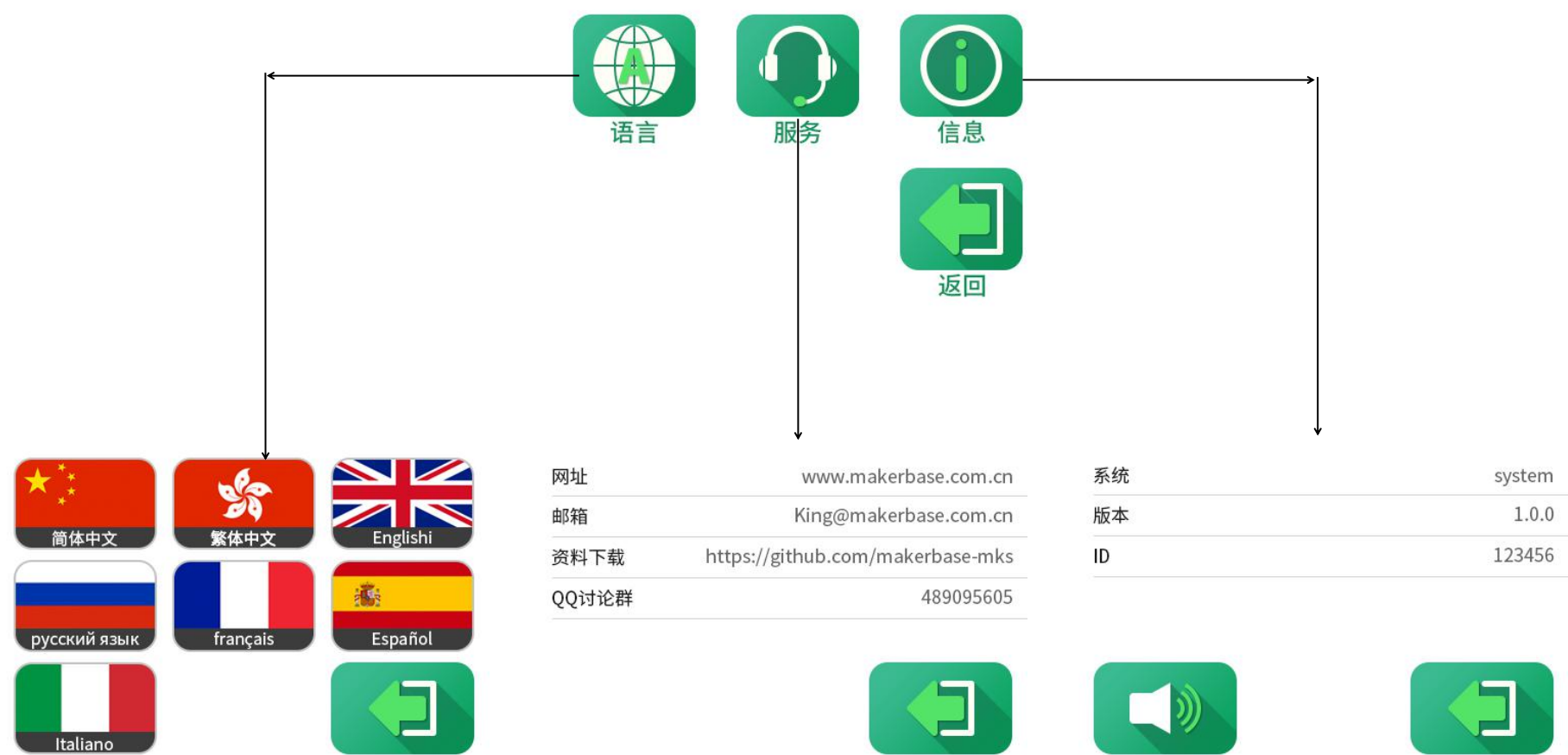
● Home interface



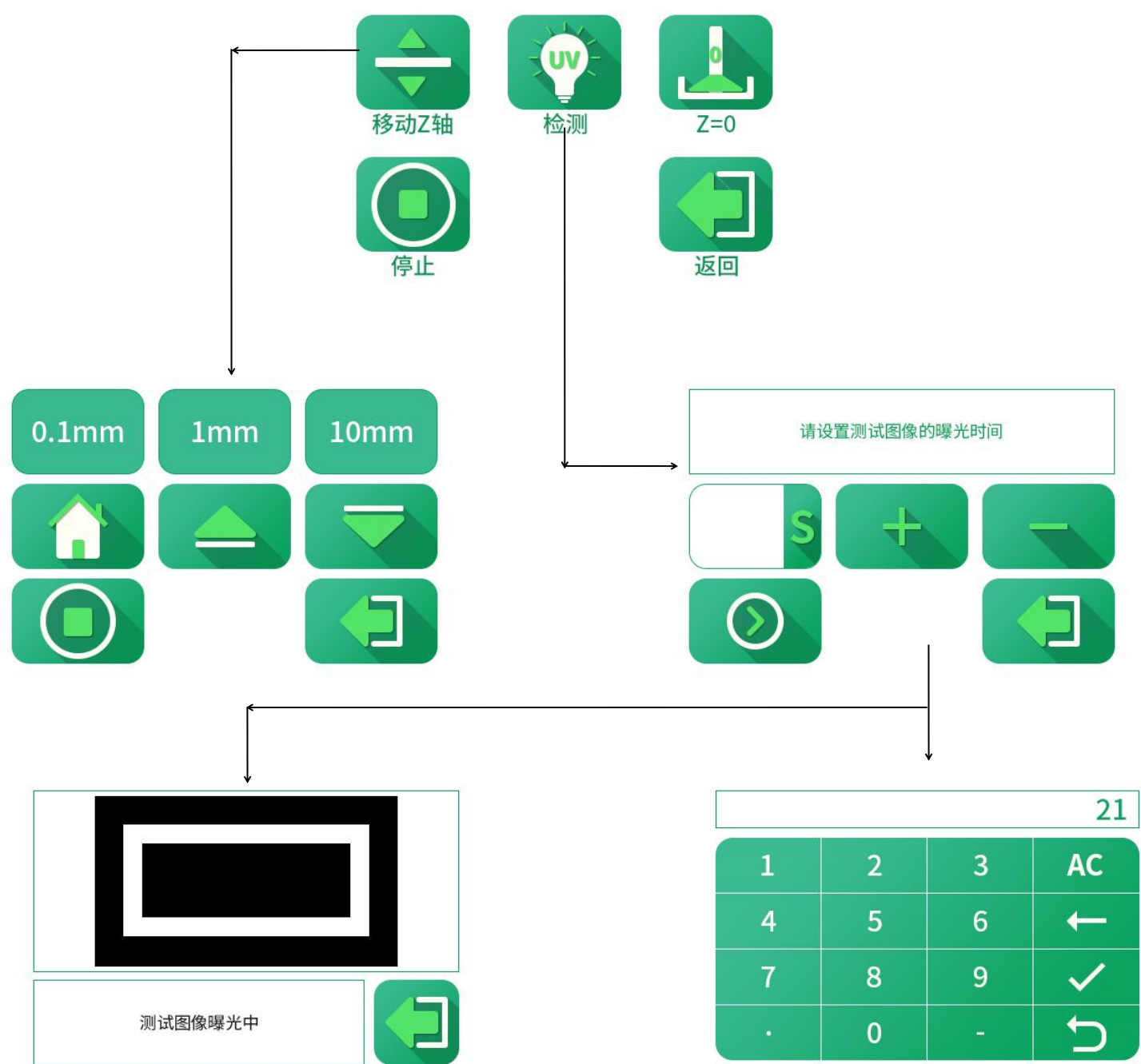
● Printing interface



● User interface

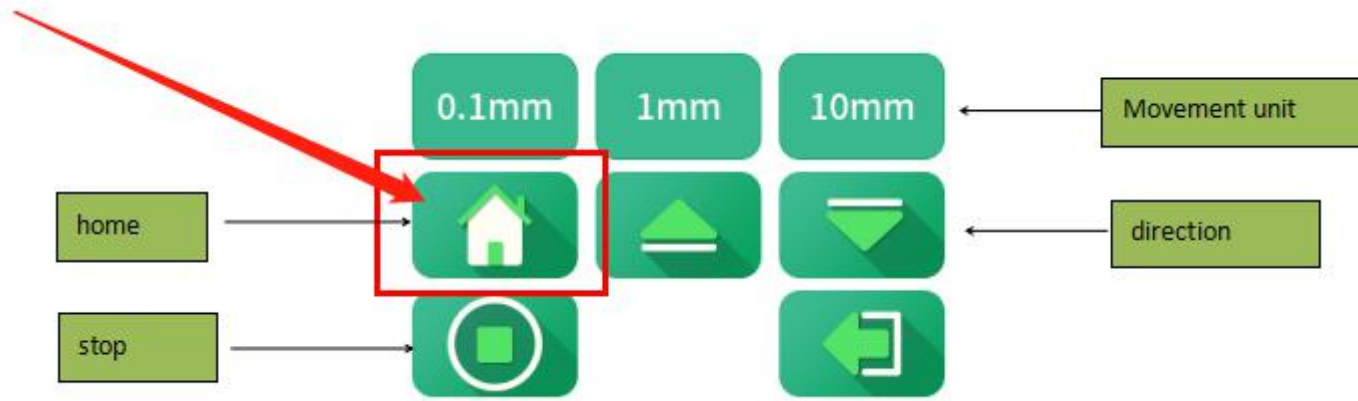


● Tool interface



4.2 Leveling steps

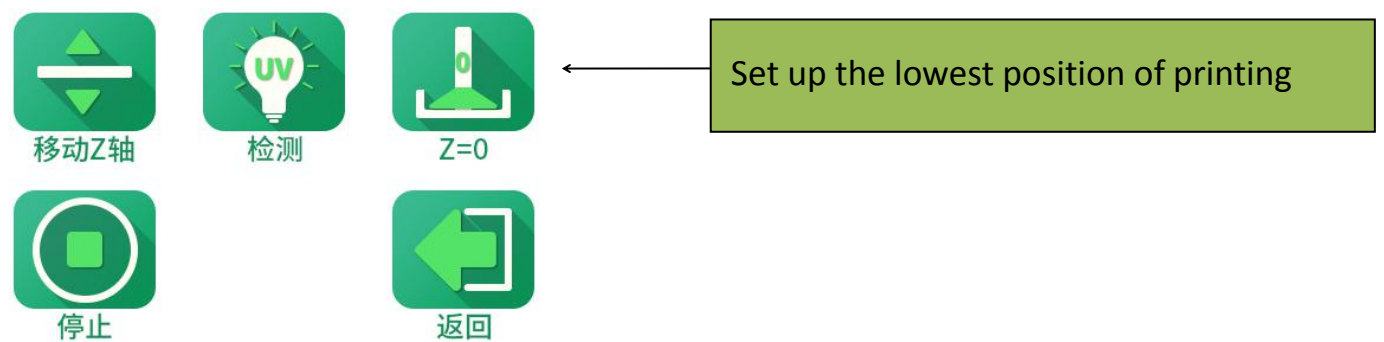
- a) Click on Home button to make printing platform return to the machine's origin.



- b) In the case of fixing the mechanical structure, adjust the distance between the printing platform and the 2K forming screen, which is as thick as one A4 paper. If the distance is too short, it will cause printing platform to crush the formed screen easily. while too far will affect on printing quality.

Note: When Z-axis was endstopped to return home (original position), ensure that the platform is a little higher than the 2k forming screen (sharp screen), and then adjust the distance carefully by the direction button. If there is a possibility of hitting the screen during the Z-axis returning home (original position) or during adjusting the height, immediately press the emergency stop button to stop the movement of the z-axis to prevent sharp screen from damage.

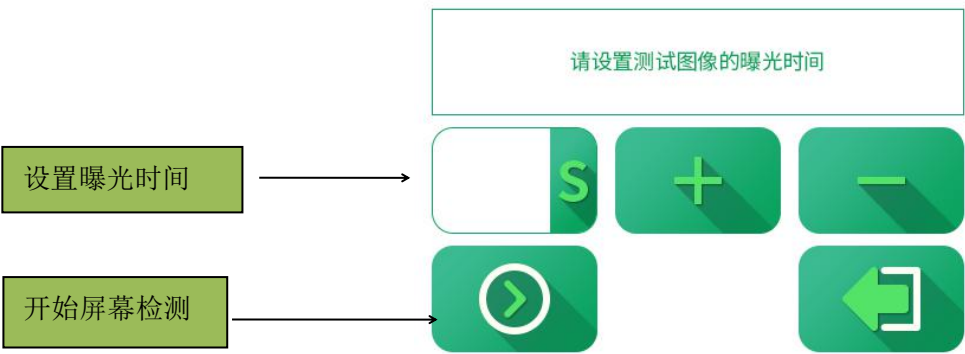
- c) When the height of the Z axis is adjusted by the direction button (the distance between the platform and the forming screen is as thin as an A4 paper). Back to the tool interface and click “Z=0” button to set the current height as “the lowest position of printing”. After clicking on “Confirm”, the data will be saved.



4.3 UV-curable screen detective

连接主板和 2K 成型屏，若成型屏背光未拆，主板需接 24V 电源（12V 背光不亮）；若成型屏背光已拆，需要用外置光源提供背光（如打开手机的手电筒或使用打印机的 UV 灯在成型屏背面投射），然后通过控制屏上的“工具”→“检测”→“下一步”，若 2K 成型屏能显示一个完整的圆，则表示屏正常工作。

Connect the motherboard and 2K forming screen (Sharp screen). If the backlight of the molding screen is not removed, the motherboard needs to be connected to 24V power supply (12V backlight is not bright); if the backlight of the molding screen has been removed, it needs to be backlit with an external light source (such as turning on the flashlight of the mobile phone or using the printer) The UV lamp is projected on the back of the molding screen, and then through the “Tools” → “Detection” → “Next” on the control panel. If the 2K molding screen can display a complete circle, it means the screen works normally.



4.3 Wifi and network function

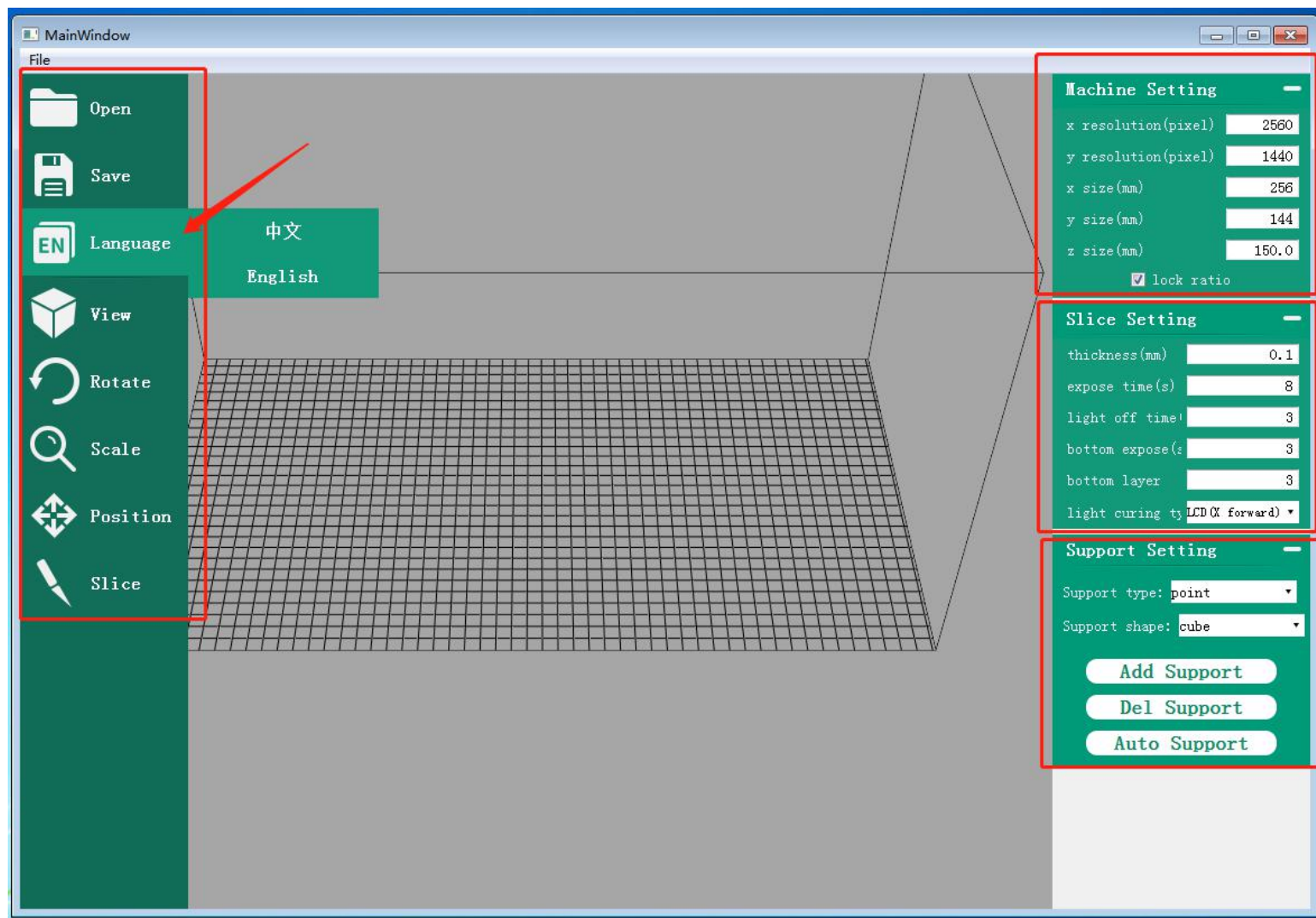
So far, the MKS DLP motherboard has reserved interface for wifi module and network, but the firmware software which supports network or wifi printing has not been released. we will update these functions in the future. Sorry for any inconveniences.

V . Slicing software

5.1.MKS DHOST

MKS DLP needs to work with MKS slicing software

Software is divided into four parts (circled by red color), as the following picture shows.



Homing interface

Open: Open the printing file for preview

language: support English and Chinese

View: support top view, front view and bottom view

Rotuta: rotuta the angle of printing module

Scale: scale the printing module up and down

Position: configure the printing module position on the printing platform

Slice: Slice the printing module to “.mdlp” format (only in “.mdlp” format can it be recognized and printed by mainboard, not support any other formats)

Machine setting

XY resolution: configure resolution according to screen, the resolution of sharp screen is 2560*1440.

XYZ size: configure XYZ size according to machine size.

Slicing setting

Layer thickness: The thickness of each layer of printed model is related to the printing accuracy (the smaller the layer thickness, the higher the precision, the longer the printing time)

Exposure time: 6-15s. The larger the layer thickness, the longer the exposure time required.

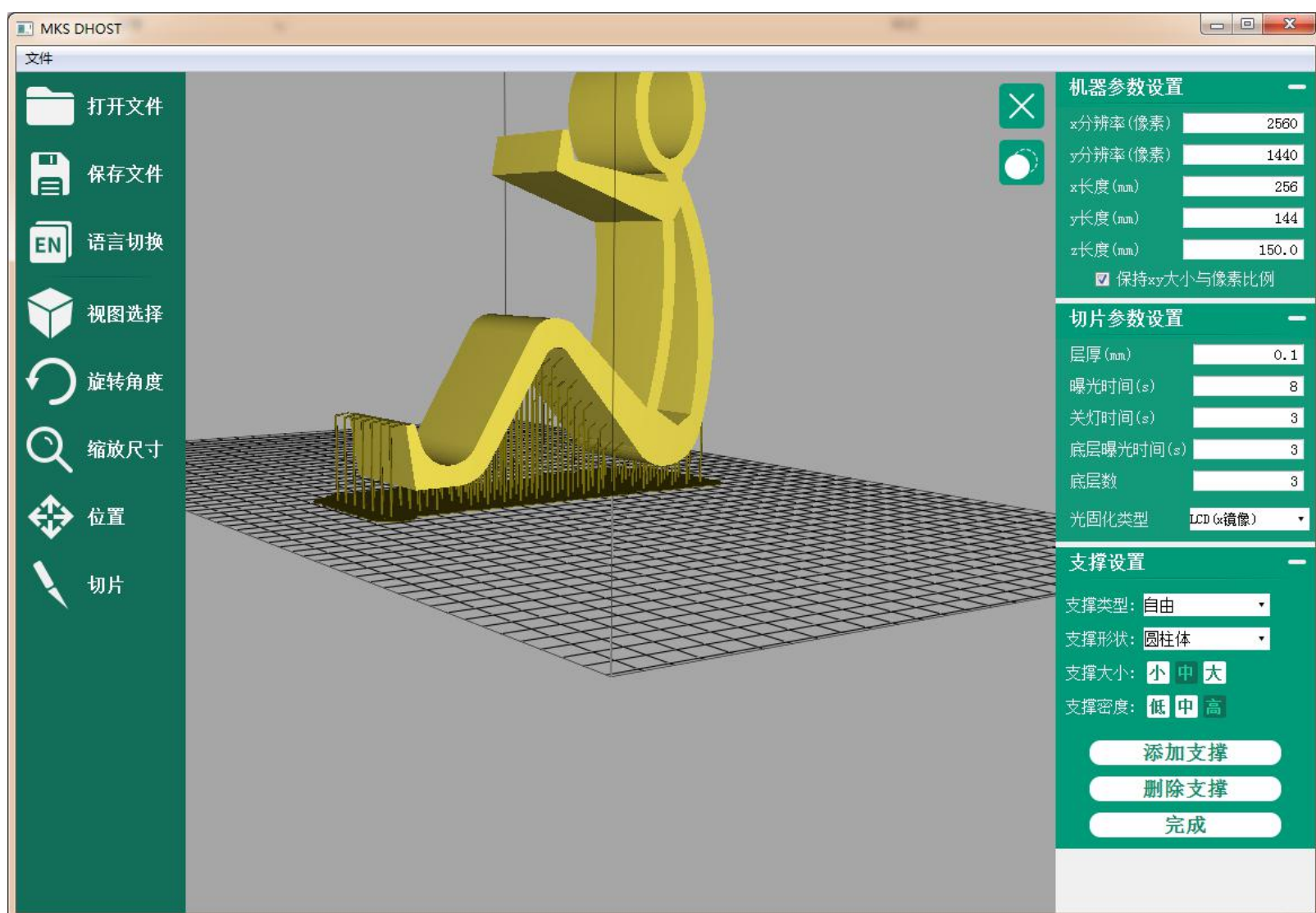
Turn off the light: 3-6s recommended.

Bottom layer exposure time: 30-80s recommended. It is related to the viscosity between the bottom of the model and the platform.

Number of bottom layers: 3-6 layers recommended.

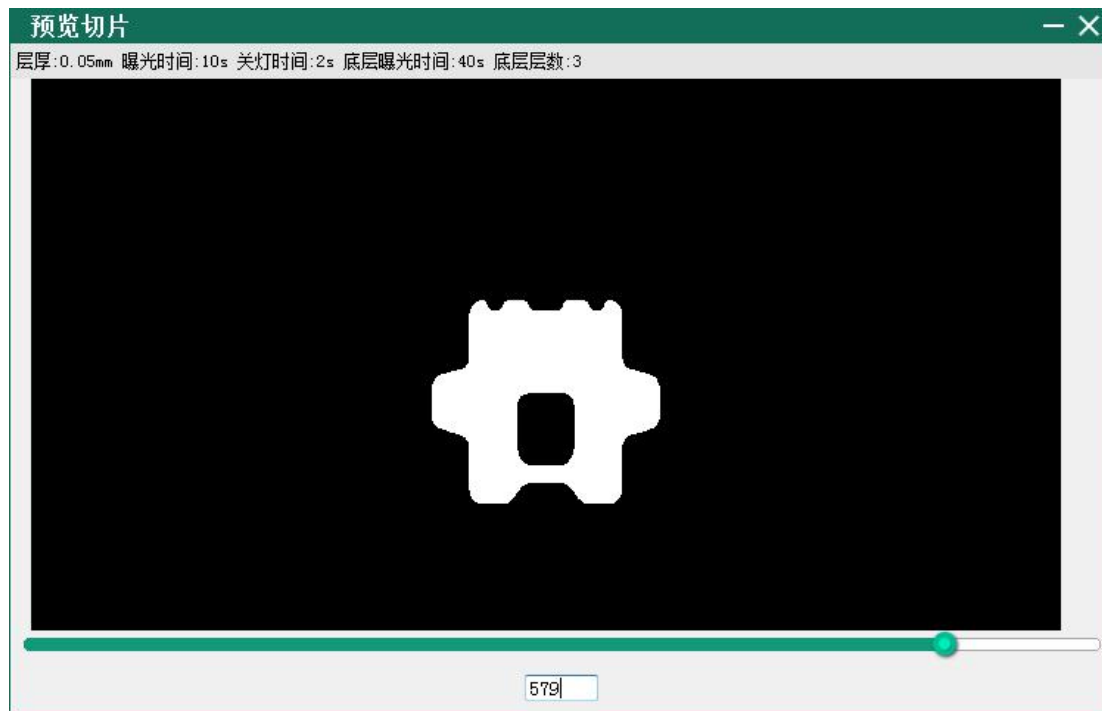
Support setting

The support parameters can be set according to the needs of the model, and the user can also choose to manually add the supporting items to prevent the partial printing module from dropping down.



Slicing preview function

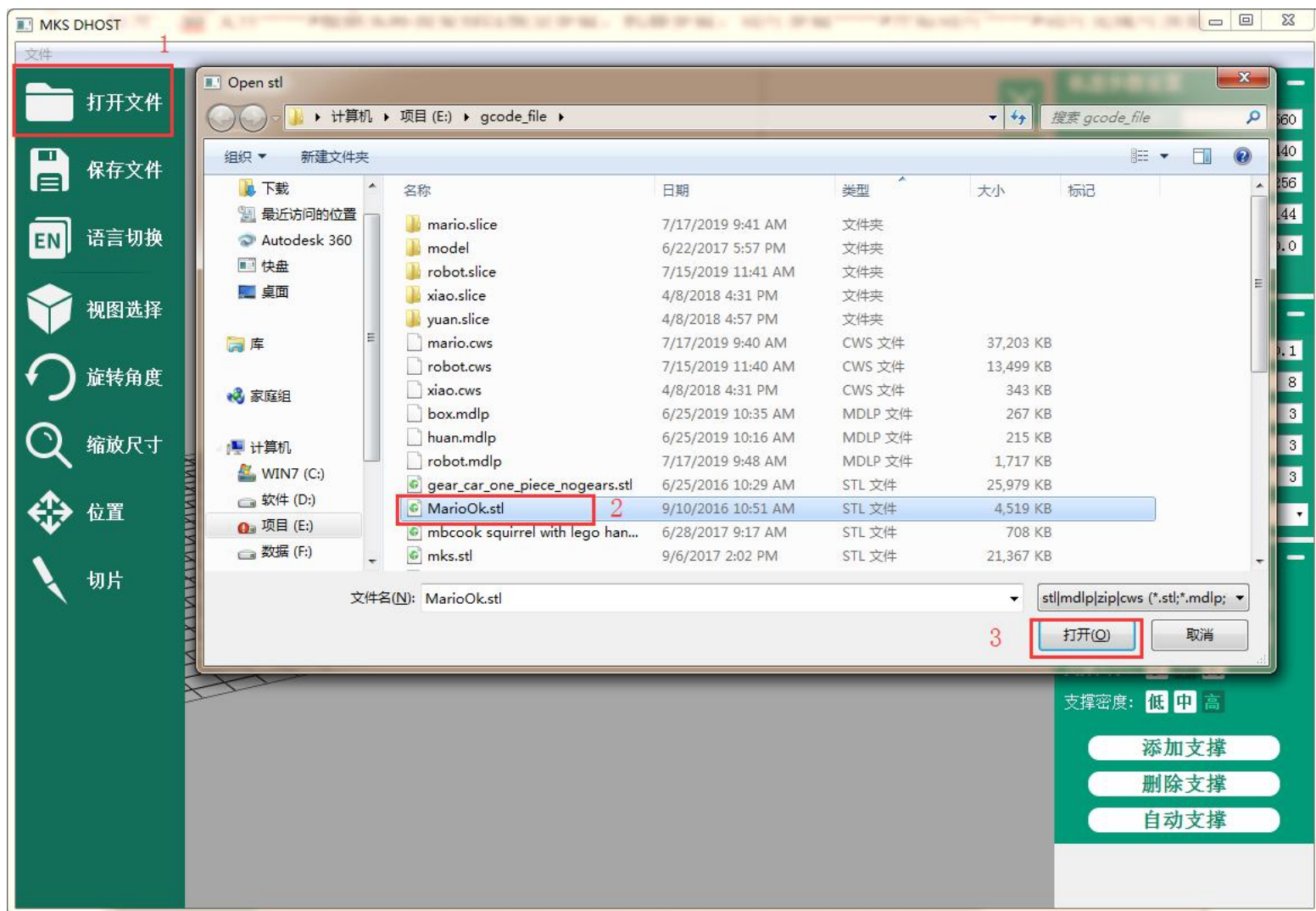
Preview each layer of the model after finishing slicing

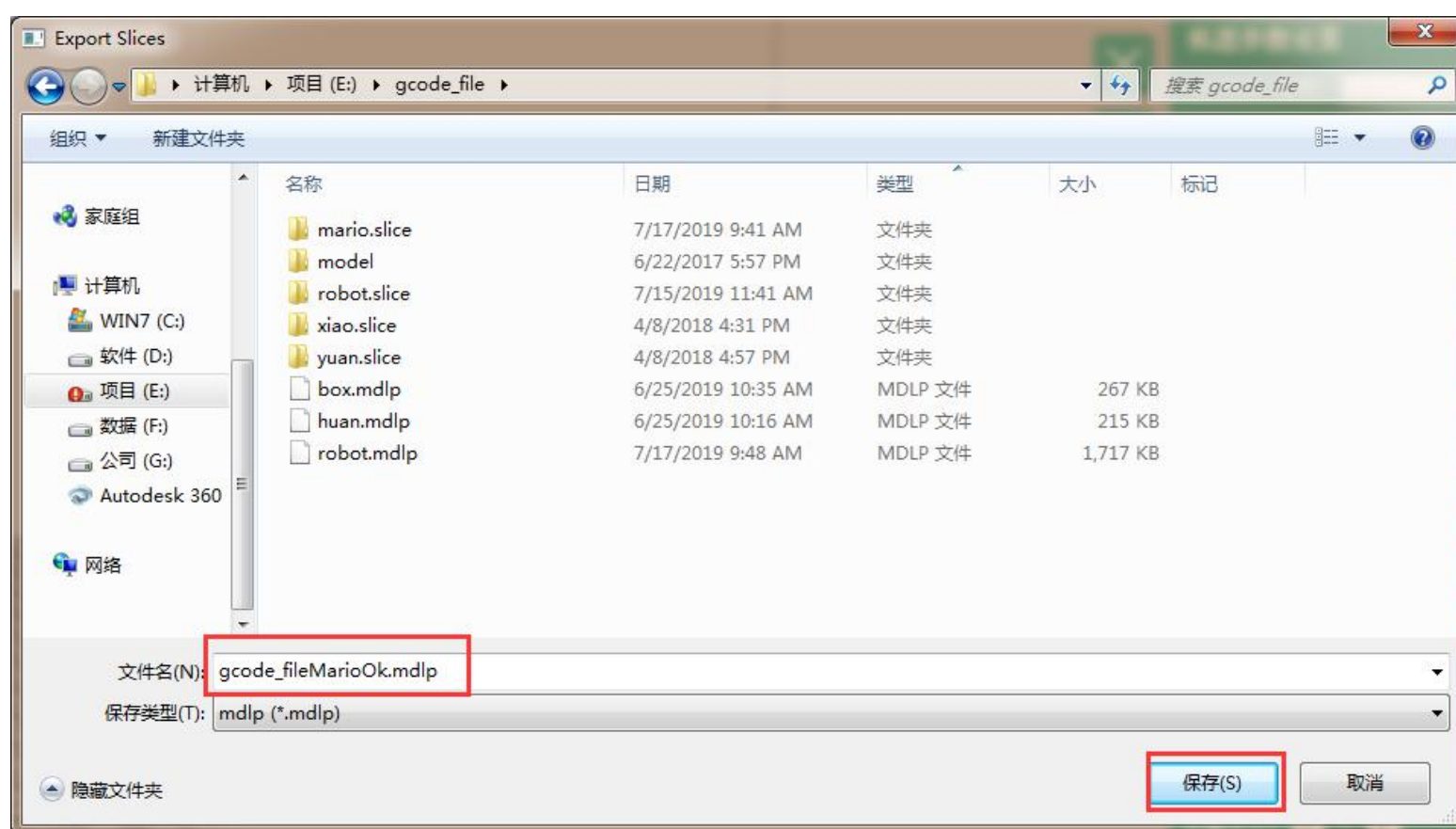
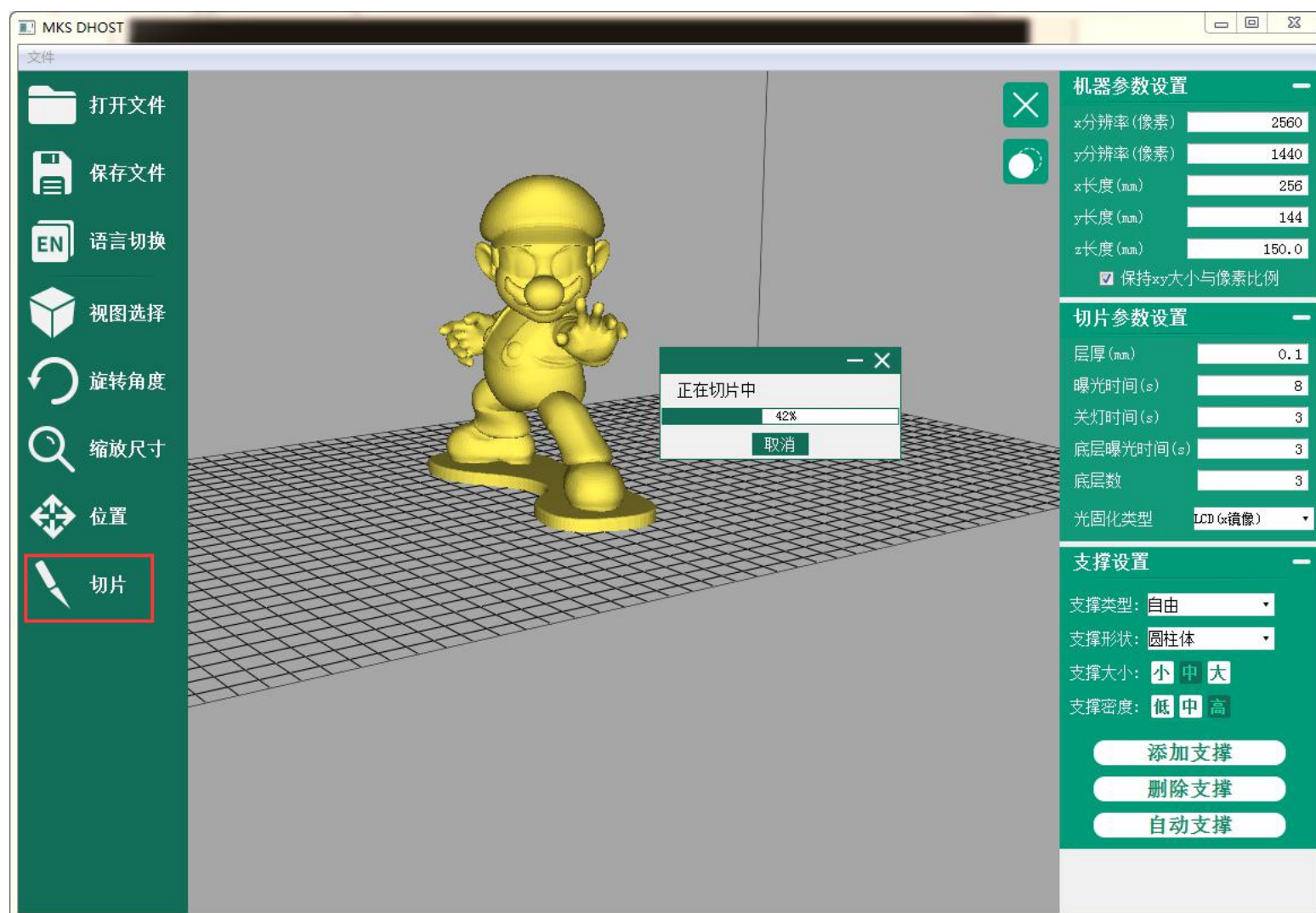


Slicing steps

Open the ".stl" file —> modify the model parameters, machine parameters, slice parameters according to actual needs —> start slicing—> preview the model or save the ".mdlp" file

Copy ".mdlp" file to the USB flash drive to print via MKS DLP motherboard.

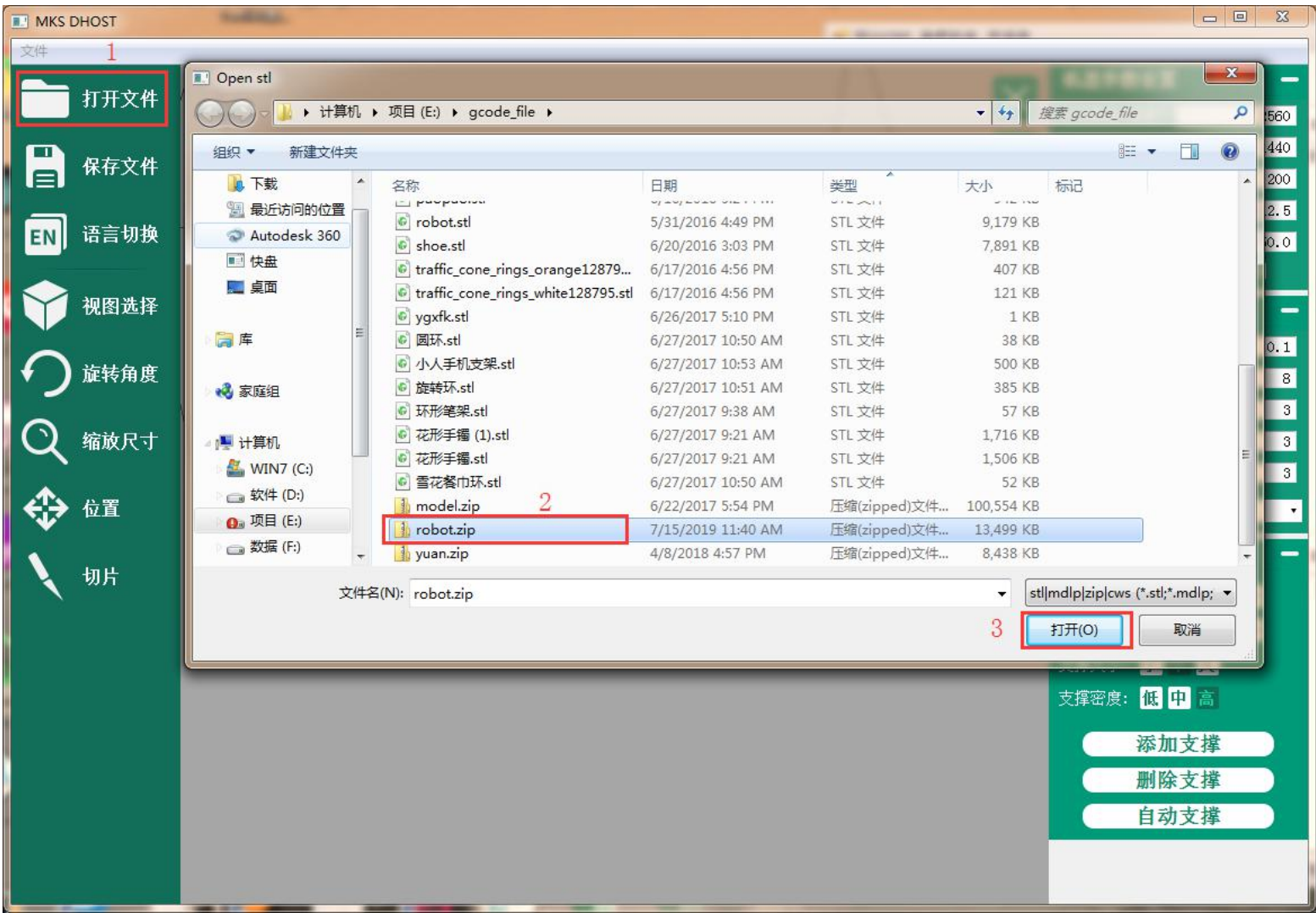




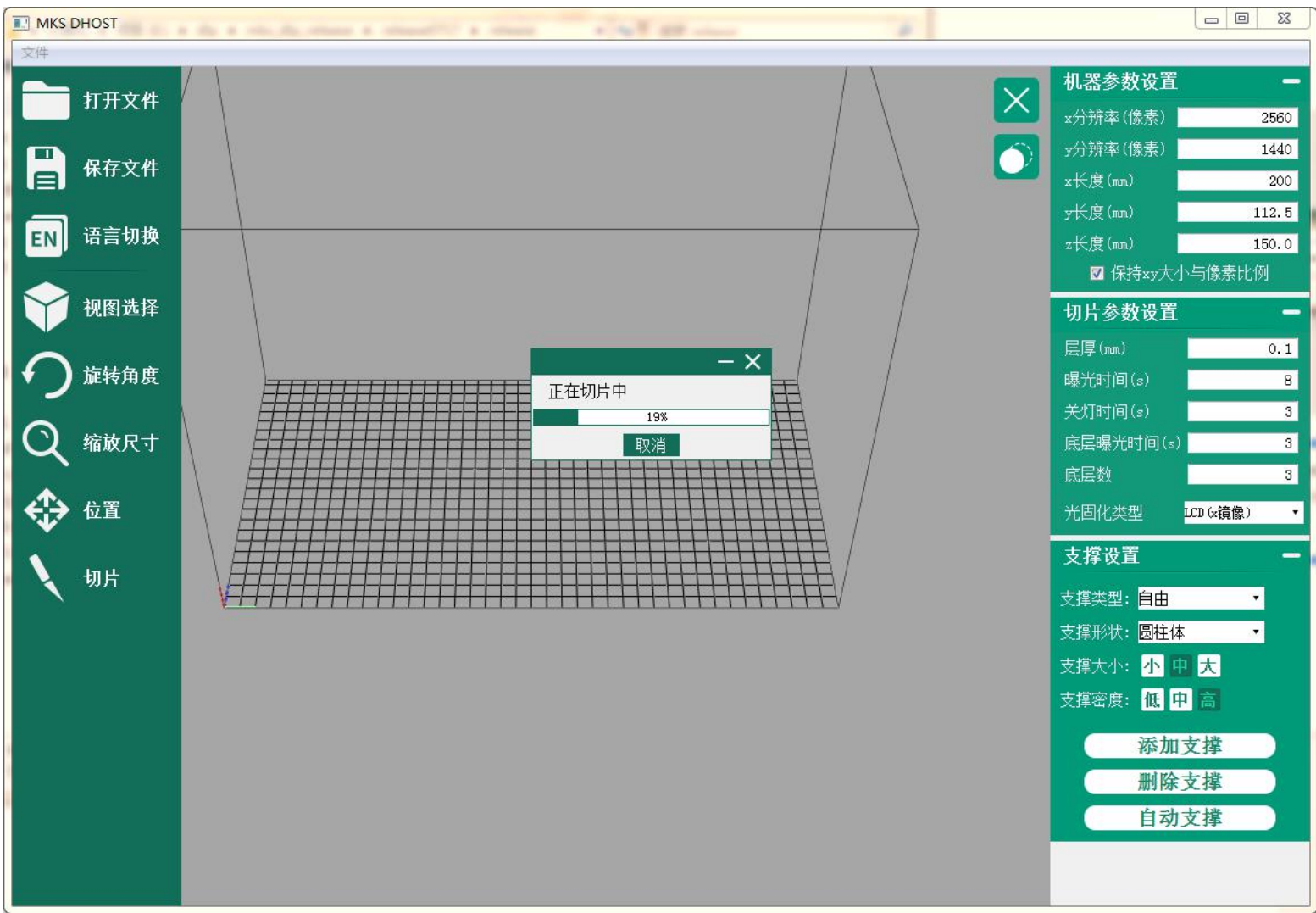
5.2. other slicing software

MKS DHOST provides format conversion function, users can open traditional photocuring folder and converse it to ".mdlp" format via MKS DHOST. Thus, users can use slicing software such as "Creation" and "Workshop" to create ".Zip"/".cws" format file, then convert it to ".mdlp" format via MKS DHOST.

a. users can use slicing software such as “Creation” and “Workshop” to create “.Zip”/“.cws” format file, and open this file via MKS DHOST.



c.Begin to converse:



d. After the conversion, you can preview the printing module and save it as ".mdl" file. Copy this ".mdl" file to the USB flash drive to print via DLP mainboard.

VI. Frequently failures and precautions

- 1.The model is not tightly attached to the platform: probably because exposure time of bottom printing module is insufficient or the leveling setting is not accurate enough.
2. The model cracks: it may be caused by the exposure time shortage, the forming film losing, the trough material shortage, and so on.
3. Because the UA-curable forming display is fragile, be careful when installing and operating to prevent it from crushing.