



LT768x

High Performance TFT-LCD Graphics Controller

UartTFT_V3.33

User Manual V1.0



UartTFT is a set of software provided by Levetop. It can convert pictures, GIF, and fonts to Bin files. Users can also utilize UartTFT to make Bootloader for LT768x and graphic cursors, and finally combine all the bin files together to produce a single bin file that can be programmed to SPI Flash. These functions are listed as below:

- 1. Convert Pictures to Bin Files
- 2. Convert GIFs to Bin Files
- 3. Convert Fonts to Bin Files
- 4. Make/Modify Graphic Cursors
- 5. Convert Wav files to Bin Files
- 6. Setup Bootloader
- 7. Combine Bin files

1. Convert Pictures to Bin Files

1-1 Open [UartTFT.exe]:

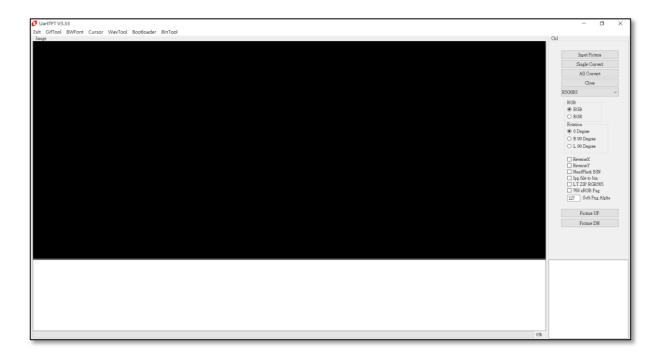


Figure 1-1: Open UartTFT.EXE



1-2 Click on [Input Picture], and select the desired picture from the pop-up window.

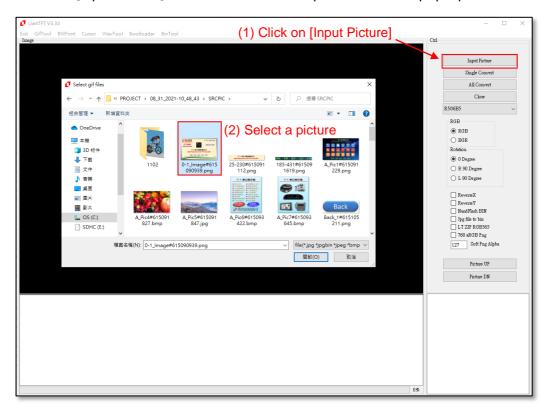


Figure 1-2: Input Picture



Figure 1-3: Picture Loaded



1-3 Users can setup the color depth (R5G6B5 / R8G8B8 / Black_White / 4 bits / 8 bits / R3G3B2) for the exported picture, as shown below:

(Note: if Black_White is set, the source picture needs to be black and white picture.)



Figure 1-4: Setup the Color Depth

Setup the RGB format and Rotation:



Figure 1-5: Setup the RGB format and Rotation



Settings for special effects:

ReverseX → Export picture from right to left (X direction);

ReverseY → Export picture from bottom to top (Y direction);

NandFlash BIN → Export picture in the format of NandFlash;

Jpg file to bin → Export picture by JPG format;

LT ZIP RGB565 → Export picture by Levetop's compressed format

768 α RGB Png \rightarrow Export picture with the opacity values

Soft Png Alpha → Export picture according to the alpha settings



Figure 1-6: Settings for Special Effects



UartTFT V3.33 xit GifTool BWFont Cursor WayTool Bootloader BinTool **了**乐升半导体 Input Picture 5" TFT 800*480 Single Convert All Convert LT-7689 功能演示范例 (Cortex M4 Inside) ⊃ BGR TFT 串口屏控制芯片 **High Performance Uart TFT Controller** OR 90 Degre O L 90 Degree 家电○车载○医疗○工控○仪表 ReverseX
ReverseY
NandFlash BIN
Jpg file to bin
LT ZIP RGB565 768 aRGB Png 127 Soft Png Alpha Picture UP Picture DN 0-1_Image#615090939.png 183-831#615091619.png 25-239#615091112.png A-pici#615091229.png A-pici#615091229.png A-pici#615091847.jpg A-pici#615091847.jpg A-pici#615093422.bmp A-pici#615093453.bmp Back_1#615105211.png Back_2#615115132.png barl-a#615102251.bmp (2) Using these two buttons to move the selected picture (1) Select a picture

Move and rearrange the order of the listed pictures:

Figure 1-7: Rearrange the Picture Order

1-4 Click on [Single Convert] or [All Convert] to export the bin file for single picture or all pictures in the same file folder. Please note that the file name should not include special characters such as ? * / \ < > : " |

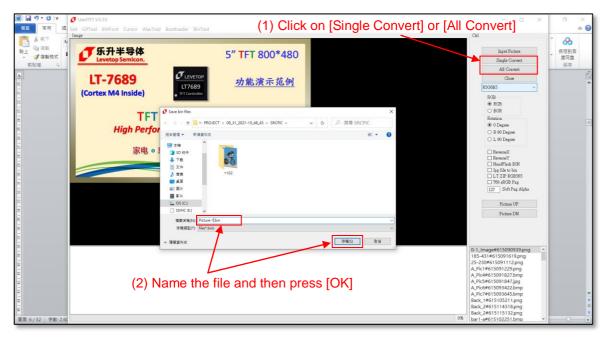


Figure 1-8: Export Picture (1/2)





Figure 1-9: Export Picture (2/2)

1-5 Check the exported bin file:

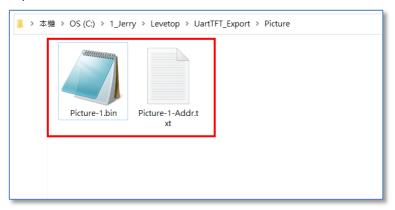


Figure 1-10: Exported Bin File

When a bin file is exported, a txt file will also be generated. The txt file will be named after the bin file plus a suffix of "-Addr.txt". The txt file lists the picture information including resolution, starting address, pictures size, and the file path, as shown below:



Figure 1-11: The Content of the TXT File



2. Convert GIFs to Bin Files

2-1 Click on [GifTool] to open the menu for converting GIFs.

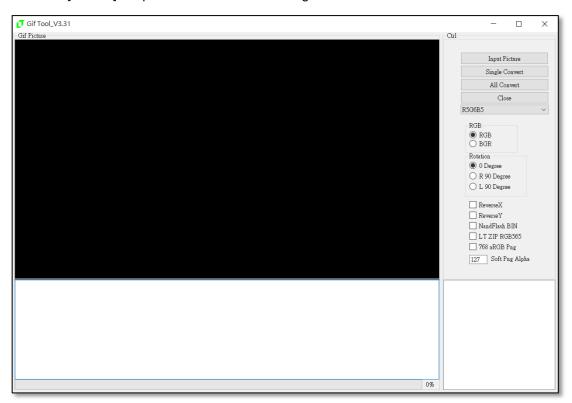


Figure 2-1: Open GifTool

2-2 Click on [Input Picture], and select the desired GIF from the pop-up window.

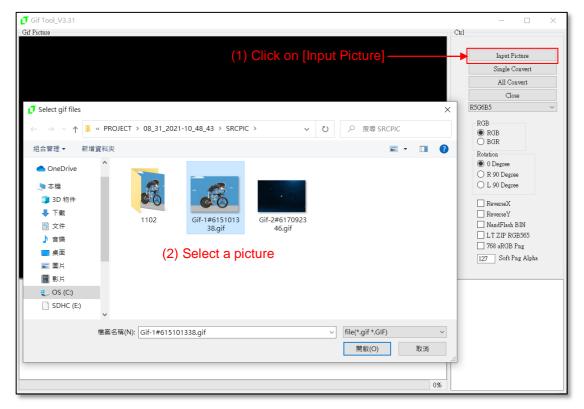


Figure 2-2: Input Picture



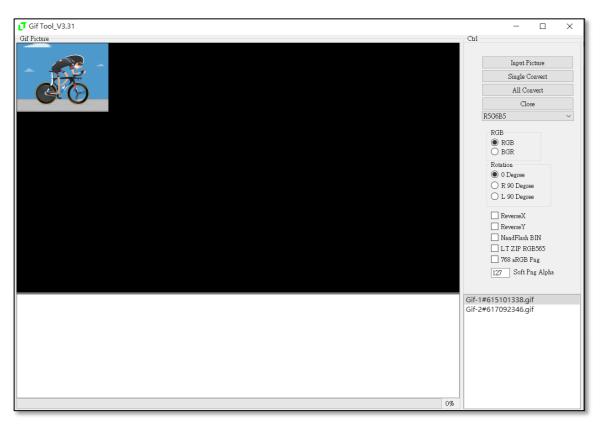


Figure 2-3: Picture Loaded

2-3 Users can setup the color depth (R5G6B5 / R8G8B8) for the exported GIF, as shown below:

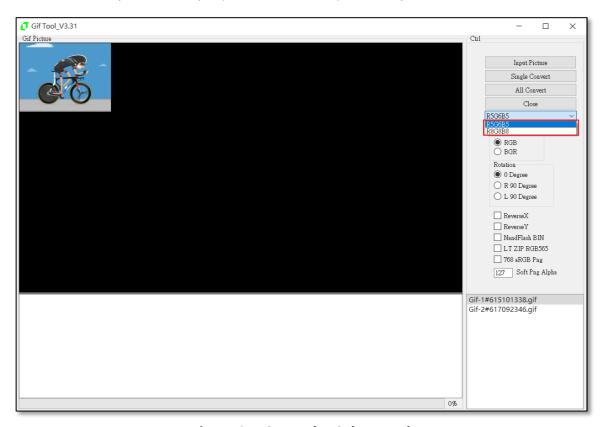


Figure 2-4 Setup the Color Depth



Setup the RGB format and Rotation

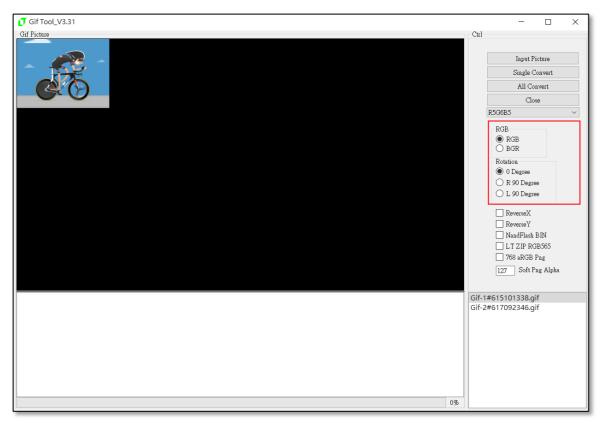


Figure 2-5: Setup the RGB format and Rotation



Settings for special effects:

ReverseX → Export picture from right to left (X direction);

ReverseY → Export picture from bottom to top (Y direction);

NandFlash BIN → Export picture in the format of NandFlash;

LT ZIP RGB565 → Export picture by Levetop's compressed format

768 α RGB Png \rightarrow Export picture with the opacity values

Soft Png Alpha → Export picture according to the alpha settings

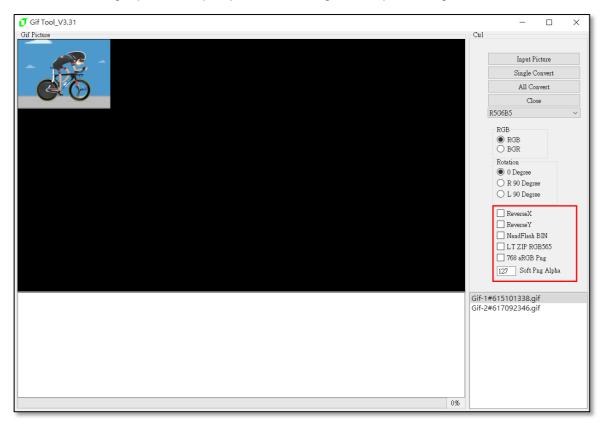


Figure 2-6: Settings for Special Effects



2-4 Click on [Single Convert] or [All Convert] to export the bin file for single GIF or all GIFs. Please note that the file name should not include special characters such as ? * / \ < > : " |

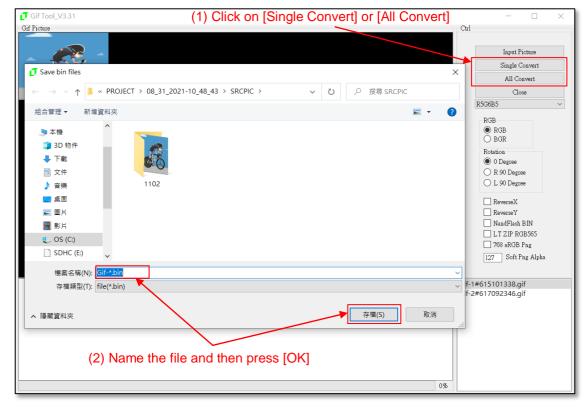


Figure 2-7: Export GIF (1/2)

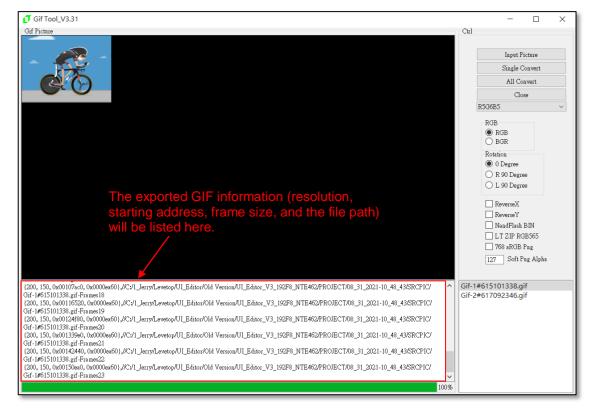


Figure 2-8: Export GIF (2/2)



2-5 Check the exported bin file:



Figure 2-9: Exported Bin File

The related information (resolution, starting address, and the frame size) of each frame will be listed in the txt file (e.g. Gif-1-Addr.txt)

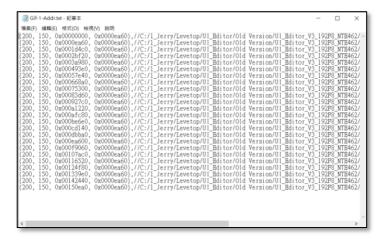


Figure 2-10: Information of Each Frame



3. Convert Fonts to Bin Files

3-1 Convert Complete Font File to Bin File

3-1-1 Click on [BW Font] to open the menu for converting fonts. Users can select a Chinese coding among GB2312 (Simplified Chinese), BIG5, GBK, and UniCode.

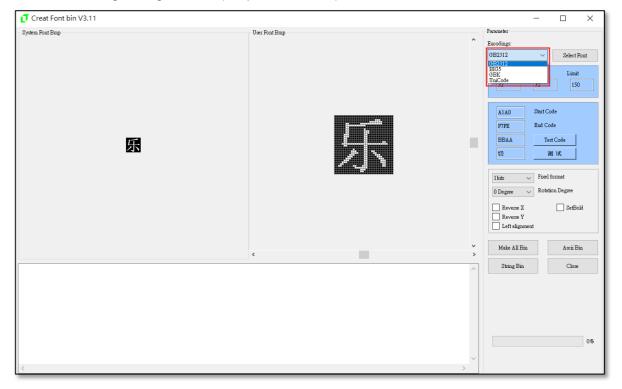


Figure 3-1: Open BWFont

3-1-2 Click on [Select Font] to set up font, font style, and font size etc.

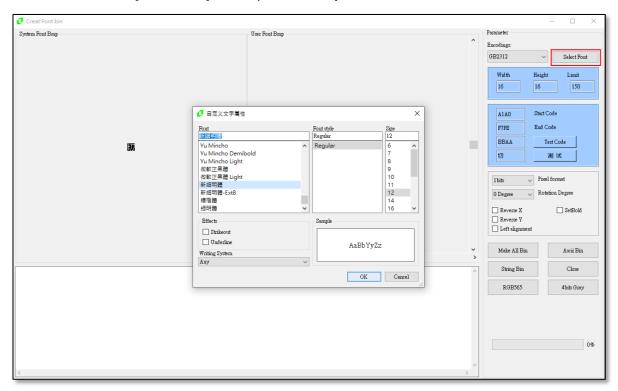


Figure 3-2: Select Font



3-1-3 Set the width and height. Click on [Test Code] to verify the change.

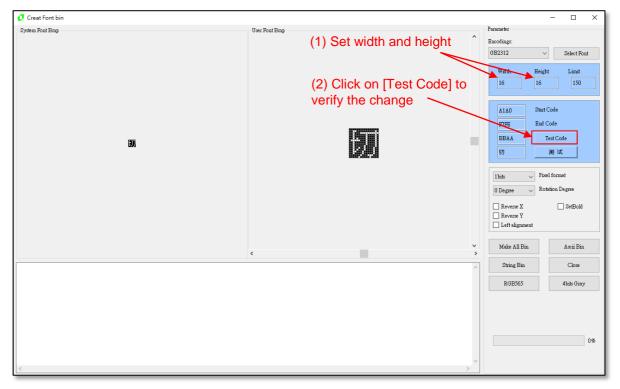


Figure 3-3: Set the Font Parameters

3-1-4 Click on [Make All Bin] to export the bin file. Please note that the file name should not include special characters such as ? * / \ < > : " |

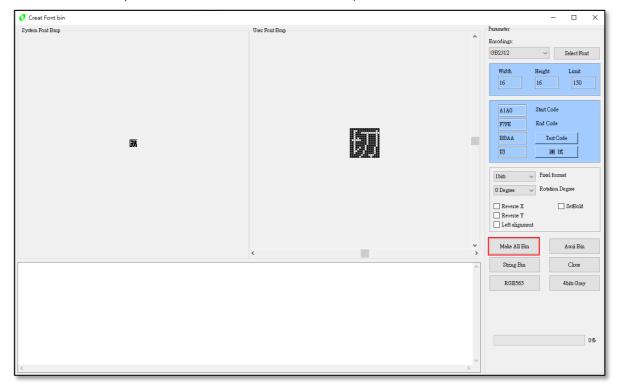


Figure 3-4: Make the Bin File



When a message box of 【Font Lib ok】 pops up, it means the bin file is exported successfully.

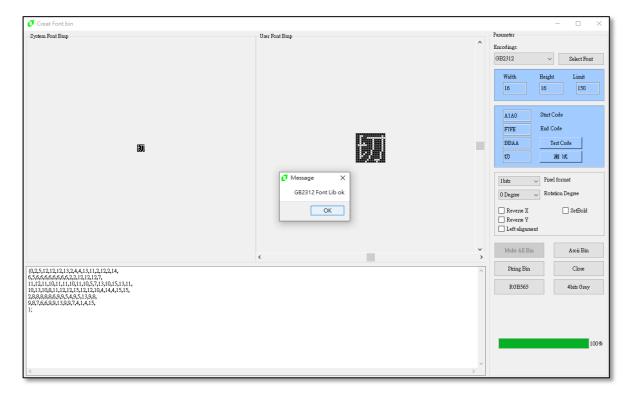


Figure 3-5: Convert to Bin File Successfully

3-1-5 Check the exported file:



Figure 3-6: Exported Bin File



3-2 Convert Partial Font File to Bin File

Since a complete font file is usually big and will occupy quite some room of the SPI Flash, it will be more efficient to customize the font file with only the characters needed. Please refer to the following for the process of converting a customized 48*48 Chinese font file to a bin file.

3-2-1 Open "Notepad.exe", edit and add the characters needed, and then save it as a txt file.

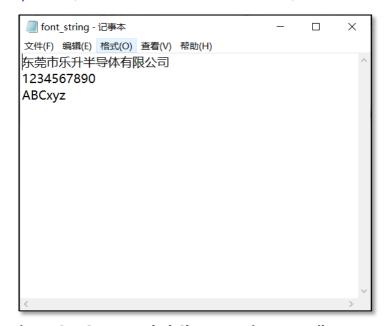


Figure 3-7 Save Needed Characters in a TXT File

3-2-2 Click on [Select Font]. Set the desired font, style, and size, and then set the parameters. Finally, click on [String Bin]

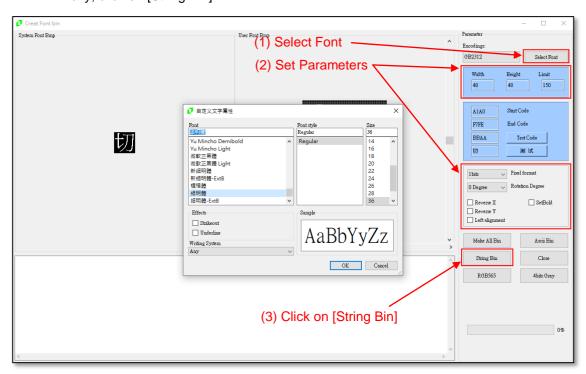


Figure 3-8 Select Font and Set the Parameters



3-2-3 Name the bin file, and then click [OK]. Another resource manager will pop up and ask for the txt file. Select the prepared txt file, and then click [OK]

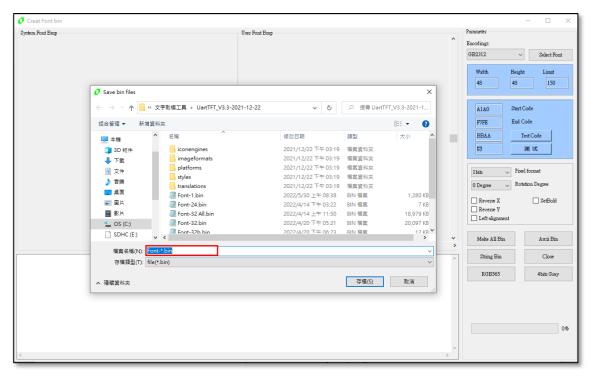


Figure 3-9 Name the Bin File

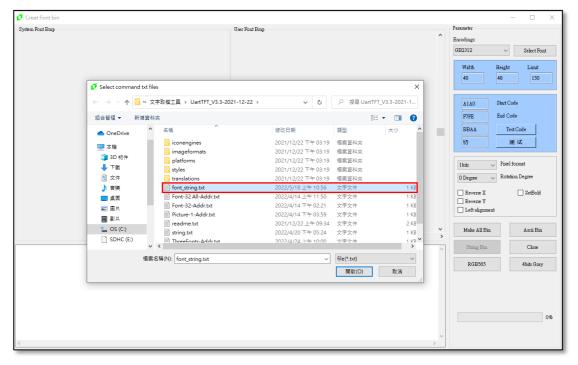


Figure 3-10 Select the Prepared TXT File



3-2-4 When a message box of [String Font bin ok] pops up, it means the bin file is exported successfully:

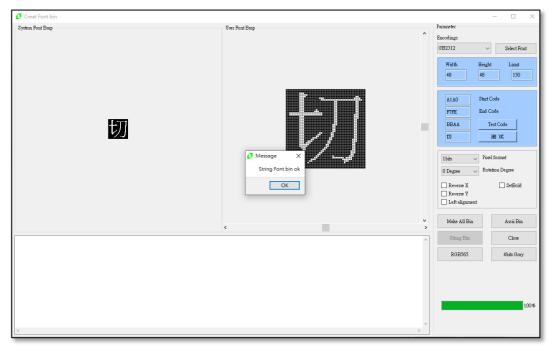


Figure 3-11 Convert to Bin File Successfully

3-2-5 Check the exported bin file:



Figure 3-12 Exported Bin File



4. Make/Modify Graphic Cursors

4-1 Make Cursors

4-1-1 Click on [Cursor] to open the menu for making / modifying cursors.

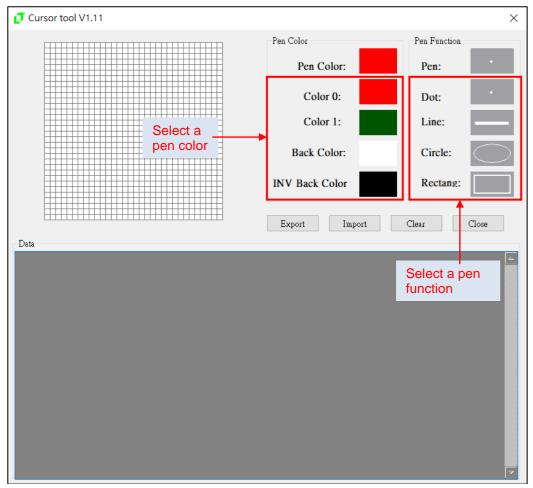


Figure 4-1 Open Cursor Menu



4-1-2 After the drawing is finished, click on [Export] to save the data. Users can also find the graphic data shown in the Data window, as shown below:

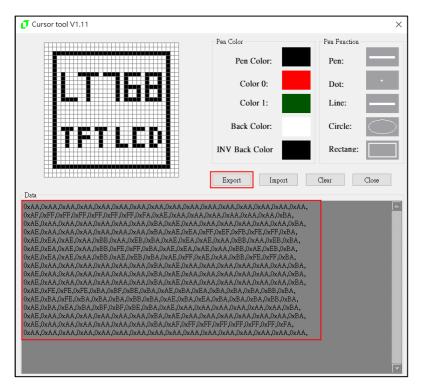


Figure 4-2 Export the Graphic data

4-1-3 Copy the graphic data:

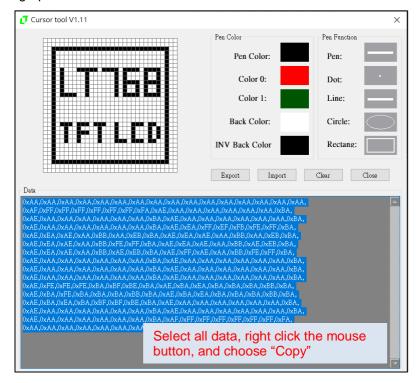


Figure 4-3 Copy the Exported Graphic data



4-1-4 To apply these graphic data, simply paste them to the program, as shown below:

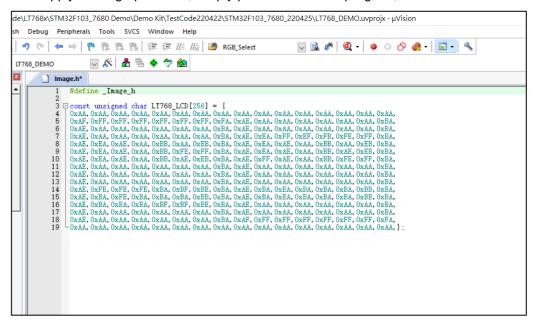


Figure 4-4 Paste the Graphic Data to the Program



4-2 Modify Cursors

4-2-1 To import existed graphic data, users have to copy the graphic data first, as shown below:

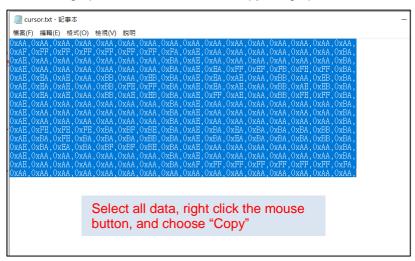


Figure 4-5 Copy the Existed Graphic Data

4-2-2 Paste those data to the Data window of Cursor Menu, and then click on [Import] to import the graphic cursor, as shown below:

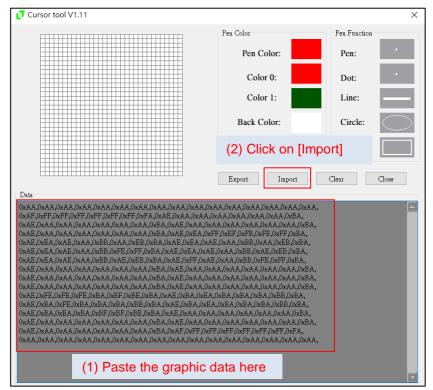


Figure 4-6 Paste the Graphic data to Data Window



4-2-3 The graphic cursor will be shown as below:

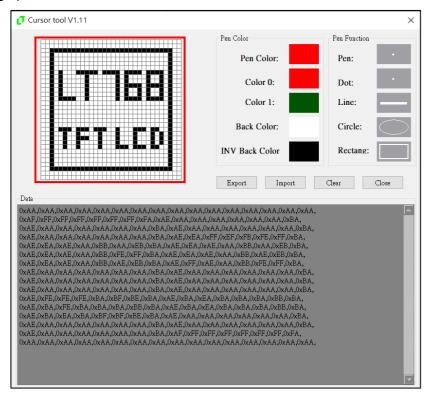


Figure 4-7 Graphic Cursor Successfully Imported



5. Convert Wav Files to Bin Files

5-1 Click on [WavTool] to open the menu for converting Wav files.

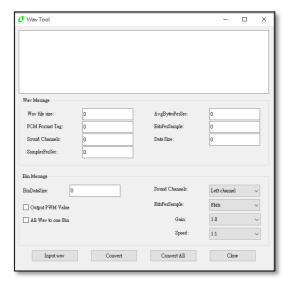


Figure 5-1: WavTool

5-2 Click on "Input wav" and select the target wav file.

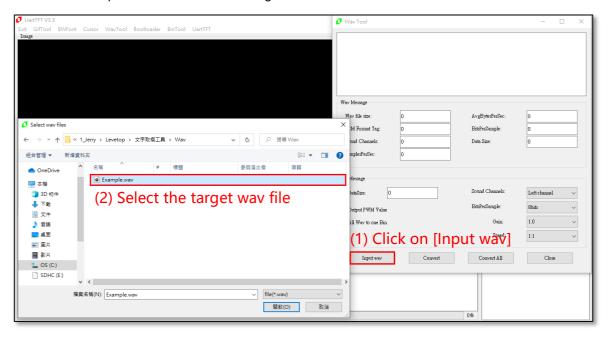


Figure 5-2: Select WAV File

After the wav file is opened, the related information will be shown as the below picture. If the sample rate (SamplesPerSec) is neither 11025 nor 22050, it is suggested that users adjust the ratio of the Speed parameter or use other audio tools to change the sample rate to 11025 or 22050 before converting the wav file to a bin file.

Note: Only non-compressed wav file can be converted



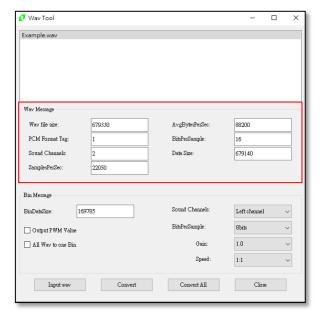


Figure 5-3: Check Related Parameters

5-3 Set the parameters:

- (1) Output PWM Value: Check the box to use default setting.
- (2) Sound Channels: Left Channel, Right Channel, and Two Channels
- (3) BitsPerSample: 8bits, 16bits
- (4) Speed: Sampling speed while generating the bin file.

It is suggested that users set to single channel / 8bits. When setting the sampling speed, the higher the speed, the lower the audio quality.

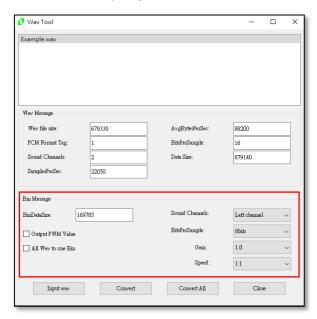


Figure 5-4: Set Parameters



5-4 Click on [Convert] to export the bin file. Please note that the file name should not include special characters such as ? * / \ < > : " |

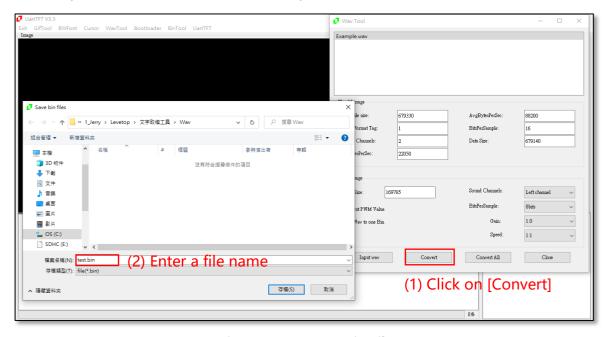


Figure 5-5: Export Bin File

If the parameters are not set properly, an error message will pop up. Please follow step 3 and set the parameters again.

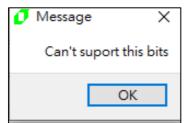


Figure 5-6: Error Message

5-5 Check the exported bin file.

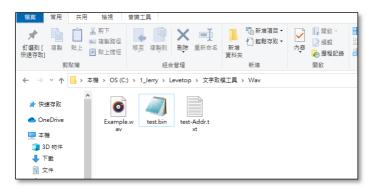


Figure 5-7: Exported Bin File



6. Setup Bootloader

6-1 Click on [Bootloader] to open the bootloader menu.

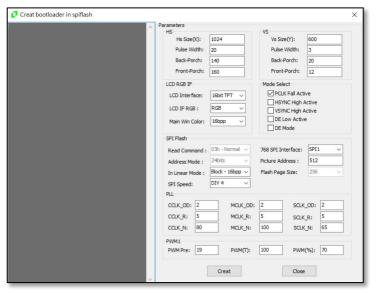


Figure 6-1: Setup the Bootloader

6-2 Set Panel Parameters: Hsync, Vsync and Mode Select. Set the parameters according to the LCD panel specification:

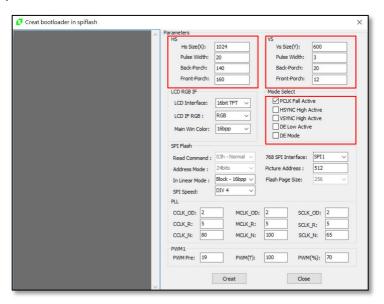


Figure 6-2: Setup the Bootloader

6-3 Setup LCD interface.



- A. Select 16, 18, or 24bits RGB Interface
- B. LCD IF RGB: Select RGB color arrangement
- C. Main Win Color: Select color depth from the options of 24bpp(RGB 8:8:8), 16bpp(RGB 5:6:5) and 8bpp(RGB 3:3:2)

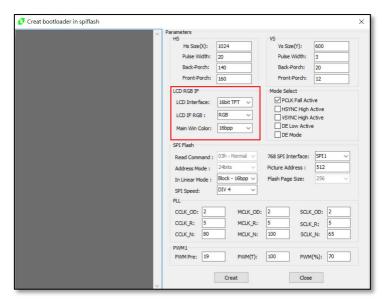


Figure 6-3: Setup LCD Interface

- 6-4 Setup SPI Flash Parameters
 - A. Read Command: Select SPI Flash Read Mode → Using default setting
 - B. LT768x SPI Interface: Select LT768x SPI I/F from the options of SPI0 and SPI1
 - C. Address Mode: Options of 24bits and 32bits → Using default setting
 - D. Picture Address: Setup the Flash Address of Boot Loader
 - E. In Liner Mode: Select the depth of Display RAM
 - F. Flash Page Size: Using default setting
 - G. SPI Speed: Select SPI Speed from the options of DIV 2 to 16

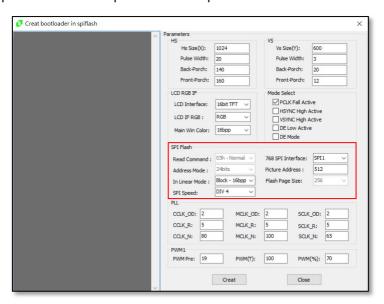


Figure 6-4: Setup SPI Flash Parameters



6-5 Click [Create] button to save the Bin file. Please note that the file name cannot contain special characters such as:? */* *: |, otherwise it cannot be saved.

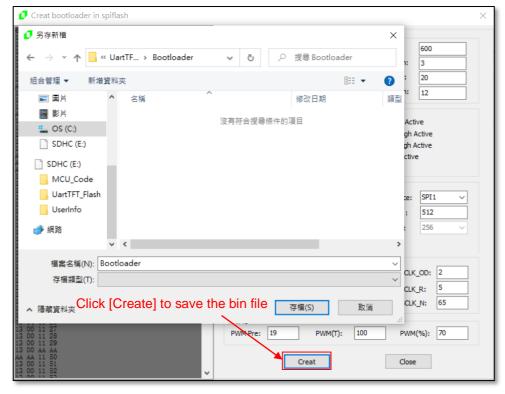


Figure 6-5: Save Bootloader Bin File (1/3)

If the file is saved successfully, a prompt message, "OK", will pop up.

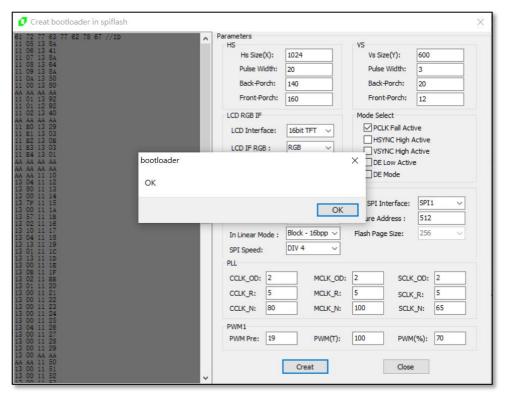


Figure 6-6: Save Bootloader Bin File (2/3)



6-6 After the bin file is created, the exported "Bootloader.bin" can be found in the destination folder:



Figure 6-7: Save Bootloader Bin File (3/3)



7. Combine Bin Files

In the previous sections, it is explained that users can create bin files for pictures, fonts, wave files, and the bootloader. Users can also combine all of these bin files into one bin file, and then program it into the SPI Flash. This program can consolidate up to 6 bin files.

7-1 Click on [BinTool] to open the menu, and then click [File 1~6] to add the bin files sequentially. Please note that the bin file of the bootloader needs to be placed at address 0, that is, File1.

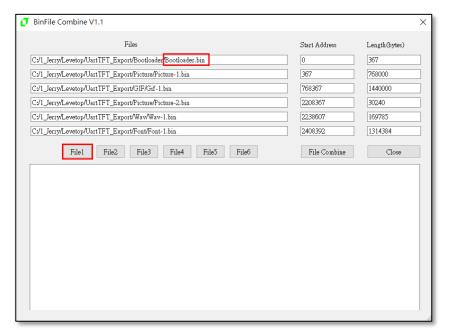


Figure 7-1: Combination of the Bin Files



7-2 Click the [File Combine] button to save the consolidated file. Please note the file name should not contain special characters such as:? */* *: |, otherwise the file will not be saved.

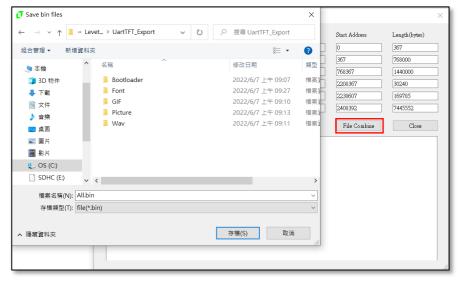


Figure 7-2: Save the Combined Bin Files

If a prompt message, "Combine over", pops up, it means the combination succeeds, and the starting address and the size of each source file will be displayed in the below window. The tool will also generate an "All-Addr.txt" file which allows users to review the details of each source file's starting address, size, and its path.

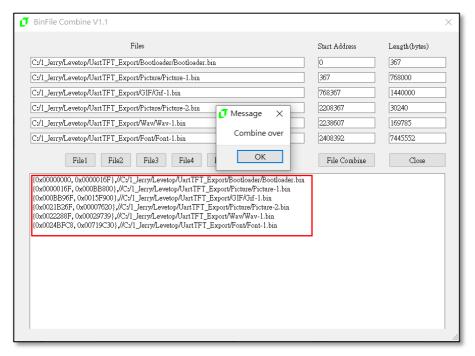


Figure 7-3: Information of the Combined Bin Files



7-3 An "All-Addr.txt" file is created:

Figure 7-4: The Content of All-Addr.txt

After the consolidation is completed, the exported "All.bin" file can be found in the destination folder. Users can use the SPI Flash Programmer to write this file to an external SPI Flash connected to LT768x.

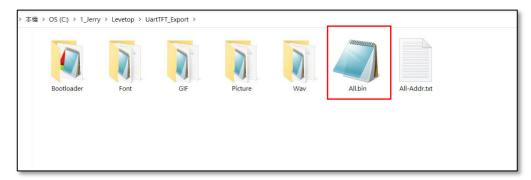


Figure 7-5: The Generated Bin File



8. Programing Example

Followings are two examples illustrating how users can access the external SPI Flash, and retrieve the programmed data.

Example 1: Access SPI Flash to retrieve Picture 1 and Picture 2, and display them in loop. The resolution of the two pictures is 1024x600, and the color depth is 16bits.

```
Select Main Window 16bpp();
                                        // Set color depth = 16bits
Main Image Start Address(0);
                                        // Display image from address 0
Main Image Width(1024);
                                        // Width of the Main Window
Main_Window_Start_XY(0, 0);
                                        // Main Window starts from (0,0)
Canvas Image Start address(0);
                                        // Writing data from Canvas address 0
Canvas_image_width(1024);
                                        // Width of the Canvas
Active_Window_XY(0, 0);
                                        // Working Window: start displaying from (0,0)
Active Window WH(1024, 600);
                                        // Set the width/Height of the working window
while(1)
{
/*----Display the first picture. Its address is 0x0000013D */
LT768_DMA_24bit_Block(0, 0, 0, 0, 1024, 600, 0x0000013D);
delay ms(500);
/*----Display the second picture. Its address is 0x0000013D+1024*600*2 */
LT768 DMA 24bit Block(0, 0, 0, 0, 1024, 600, 0x0000013D+1024*600*2);
delay ms(500);
}
```

Example 2: Access SPI Flash to retrieve the programmed 16x16 Font, and display "东莞市 乐电子有限公司". The displaying parameters are set to (1) no enlargement; (2) Transparent; (3) Alignment.

```
Select Main_Window_16bpp();
                                        // Set color depth = 16bits
Main_Image_Start_Address(0);
                                        // Display image from address 0
Main_Image_Width(1024);
                                        // Width of the Main Window
Main Window Start XY(0, 0);
                                        // Main Window starts from (0,0)
Canvas_Image_Start_address(0);
                                        // Writing data from Canvas address 0
Canvas_image_width(1024);
                                        // Width of the Canvas
Active Window XY(0, 0,);
                                        // Working Window: start displaying from (0,0)
Active Window WH(1024, 600);
                                        // Set the width/Height of the working window
LT768 DrawSquare Fill(0, 0, 1024, 600, White); // Draw a white color background
/*----Initialize external Font (Font starting address: 0x0115E1BD, Size: 0x00041400) --- */
LT768 Select Outside Font Init(1, 0, 0x0115E1BD, 1024*600*2, 0x00041400, 16, 1, 1, 1, 1);
/*----Display the string ----*/
LT768_Print_Outside_Font_String(425,50,Red,White,(u8*)"东莞市乐电子有限公司");
```



Copyright Notice

This document is the copyright of Levetop Semiconductor Co., Ltd. No part of this document may be reproduced or duplicated in any form or by any means without the prior permission of Levetop. The information appearing in this document is believed to be accurate at the time of publication. However, Levetop assumes no responsibility arising from the use of the specifications described. The applications mentioned herein are used solely for the purpose of illustration and Levetop makes no warranty or representation that such applications will be suitable without further modification, nor recommends the use of its products for application that may present a risk to human life due to malfunction or otherwise. Levetop's products are not authorized for use as critical components in life support devices or systems. Levetop reserves the right to alter its products without prior notification. For the most up-to-date information, please visit our web site at http://www.levetop.cn.