FireBeetle Covers-ePaper Black&White Display Module SKU: DFR0511

Introduction

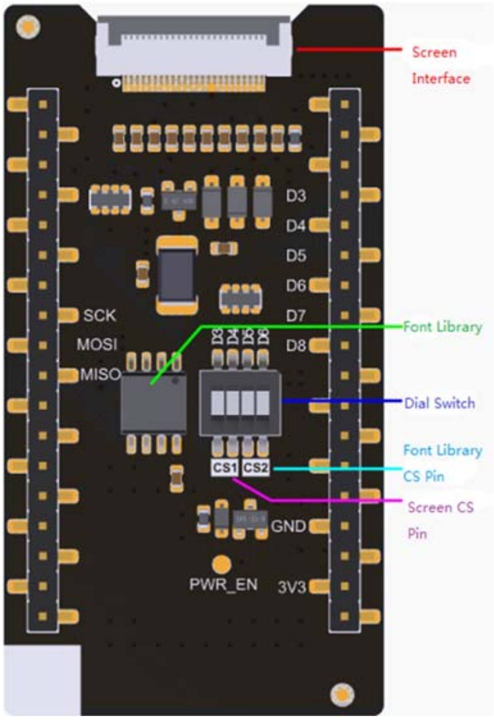
DFRobot FireBeetle Series is a low power development component designed for Internet of Things (IoT). This 2.13-inch black and white electronic epaper screen with SPI interface and 250 * 122 resolution, supporting Arduino library and microPython programming.
This module is suitable for the current main control board of Firebeetle series. It has the characteristics of small size, compact layout, plug and play, low power consumption and good display effect. It also integrates the GT30L24A3W multi-language font chip, but only suitable for static picture or text display, not suitable for dynamic refresh.

⚠ **NOTE**: This board is only available for ESP32 and ESP8266, but not for FireBeetle BLE4.1.

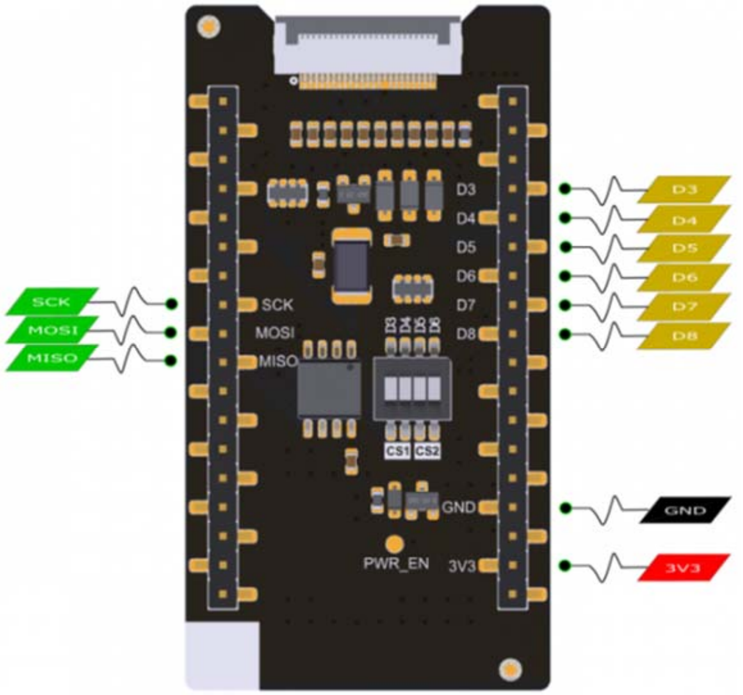
Specification

- Input Voltage: 3.3V
- Ink Screen GDE0213B1
- Dimension: 59.2 x 29.2 x 1.05mm/2.33 x 1.15 x 0.04in
- Screen Size: 48.55 x 23.80mm/1.19 x 0.94in
- Resolution: 250 x 122
- Data Bus: SPI
- Color: Black and white
- Refresh Time: takes about 4 seconds to fully refresh,0.5 seconds to partly refresh.
- Refresh Consumption: 26.4mW
- Font Chip GT30L24A3W
- Character Set:
- GB18030 Simplified Chinese/Traditional Chinese
- KSC5601 Korean
- JIS0208 Japanese
- 180 Foreign Font
- Support for multinational Unicode
- IS08859 and CODE PAGE
- Chinese Character Size:12 dot matrix, 16dot matrix, 24dot matrix
- Foreign Character Size:16 dot matrix, 24 dot matrix
- Operating Current: 12mA

Board Overview



Function



Pinout

API List

This module only supports the simplified Chinese of 16*16 lattice and the ASCII characters of 16*8 lattice. More fonts, font sizes will be updated later.

```
/*!
 * @Function:  Set and initializeCS pin of font and ink screen
 *
 * @Parameter   busy:  BUSY pin of ink screen
 *          D7: Available pin(directly plug in)
 */
void begin(const char busy);


/*!
 * @Function: Clear the screen and set the screen to the specified colo
r.
 *
 * @Paremeter   mode: refresh way
 *        PART:  Part refreshment
 *        FULL: Full refreshment
 */
void flush(uint8_t mode);

/*!
 * @Function: Display picture
 *
 * @Paremeter   pic      Black-and White picture
 */
void drawPicture(const unsigned char *pic);

/*!
 * @Function: Display character string
 *
 * @Parameter   x: Abscissa
 *        y: Ordinate
 *        size: Font size
 *        ch: Characters for display
 *        color: Black/White
 */
void disString(uint8_t x, uint8_t y, uint8_t size, char *ch, uint8_t co
lor);

/*!
 * @Function: Fill in the screen
 * @Parameter    color: Fill in the color
 */
void fillScreen(uint16_t color);

/*!
 * @Function: Draw pixel
 * @Parameter   x: Abscissa
 *        y: Ordinate
 */
void drawPixel(int16_t x, int16_t y, uint16_t color);

/*!
 * @Function: Draw lines
 *
 * @Parameter   x0:  The abscissa of the starting point
 *        y0: The ordinate of the starting point
 *        x1: The abscissa of the ending point
 *        y1: The ordinate of the ending point
 *        color: The color of the line
 */
void drawLine(int16_t x0, int16_t y0, int16_t x1, int16_t y1,
              uint16_t color);

/*!
 * @Function: Draw a horizontal line
 *
 * @Parameter   x: The x-axis of the starting point
 *        y: The y-axis of the starting point
 *        width:  the length of the line
 */
void drawHLine(int16_t x, int16_t y, int16_t width, uint16_t color);

/*!
 * @Function: Draw an vertical line
 *
 * @Parameter   x: The x-axis of the starting point
 *        y: The y-axis of the starting point
 *        height: The length of the line
 */
void drawVLine(int16_t x, int16_t y, int16_t height, uint16_t color);
```

```
/*!
 * @Function: Draw rectangles
 *
 * @Parameter   x: The x-axis of the starting point
 *        y: The y-axis of the starting point
 *        width: The length of rectangle
 *        height: The width of rectangle
 *
void drawRect(int16_t x, int16_t y, int16_t width, int16_t height,
              uint16_t color);

/*!
 * @Function: Draw a filled rectangle
 * @Parameter   x: The x-axis of starting point
 *        y: The y-axis of starting point
 *        width: The length of filled rectangle
 *        height: The width of filled rectangle
 */
void fillRect(int16_t x, int16_t y, int16_t width, int16_t height,
              uint16_t color);

/*!
 * @Function: Draw a circle
 *
 * @Parameter   x: The abscissa of center
 *        y: The ordinate of center
 *        r: radius
 */
void drawCircle(int16_t x, int16_t y, int16_t r, uint16_t color);

/*!
 * @Function: Draw a filled circle
 *
 * @Parameter   x: The abscissa of center
 *        y: The ordinate of center
 *        r: Radius
 */
void fillCircle(int16_t x, int16_t y, int16_t r, uint16_t color);

/*!
 * @Function: Draw an triangle
 *
 * @Parameter   x0: The abscissa of first point
 *        y0: The ordinate of first point
 *        x1: The abscissa of second point
 *        y1: The ordinate of second point
 *        x2: The abscissa of third point
 *        y2: The ordinate of third point
 */
void drawTriangle(int16_t x0, int16_t y0, int16_t x1, int16_t y1,
                  int16_t x2, int16_t y2, uint16_t color);

/*!
 * @Function: Draw a filled triangle
 *
 * @Parameter   x0: The abscissa of first point
 *        y0: The ordinate of first point
 *        x1: The abscissa of second point
 *        y1: The ordinate of second point
 *        x2: The abscissa of third point
 *        y2: The ordinate of third point
 */
void fillTriangle(int16_t x0, int16_t y0, int16_t x1, int16_t y1,
                  int16_t x2, int16_t y2, uint16_t color);

/*!
```

```
 * @Function: Draw a rounded rectangle
 *
 * @Parameter   x: The x-axis of starting point
 *        y: The y-axis of starting point
 *        width: The length of rounded rectangle
 *        height: The width of rounded rectangle
 *        r: radius
 */
void drawRoundRect(int16_t x, int16_t y, int16_t, width, int16_t height
,
                   int16_t r, uint16_t color);


/*!
 * @Funciton: Draw a filled rounded rectangle
 *
 * @Parameter  x: The x-axis of starting point
 *        y: The y-axis of starting point
 *        width: The length of rounded rectangle
 *        height: The width of rounded rectangle
 *        r: radius
 */
void fillRoundRect(int16_t x, int16_t y, int16_t, width, int16_t height
,
                   int16_t r, uint16_t color);
```

Tutorial

Requirements

- **Hardware**
- 1 x ESP32 control board (ESP8266)
- 1 x FireBeetle Coves-ePaper Black&White Display Module(SPI)

- **Software**
- Arduino IDE Click to Download Arduino IDE from Arduino®
- Download and install the **DFRobot_ePaper Library**. (How to install the library?)

Tip:
1. The **lcd-image-converter.exe** is located in the tool folder where the e-paper package is downloaded.
2. DFRobot _ ePaper also has a dependency library, the DFRobot _ ILI9488 Display library. **Click to download**. (Just unzip the package into the Arduino library file).

Examples

Hardware Connection
Select D3 and D6 (D3 is the Ink Screen CS pin and D6 is the Font Library CS pin), and then plug the FireBeetle Cover-ePaper Display Module into the esp32.<bt> **Demo Selection**
After selecting the port and board, click "File" in the Arduino menu to open "Example", select DFRobot _ ePaper-master, select DFRobot _ IL3895 _ SPI and open the demo in it.

Graphic Display

Sample Code

```
#include "Arduino.h"
#include "DFRobot_IL3895_SPI.h"

DFRobot_IL3895_SPI epaper;

#define EPAPER_CS  D3
#define Font_CS  D6
#define EPAPER_DC  D8
#define EPAPER_BUSY     D7

void setup(void)
{
    Serial.begin(115200);
    epaper.begin(EPAPER_CS, Font_CS, EPAPER_DC, EPAPER_BUSY); //Select the corresponding pins
    epaper.fillScreen(WHITE);//Clear the screen and display white
    epaper.flush(FULL);  //Refresh screen display
    /*Displays a string, black font*/
    epaper.disString(0,0,1,"SPI",BLACK);
    epaper.flush(PART);

    /*Let me draw a red dot*/
    for(uint8_t x=12,y=12; y<110; y+=3)
    {
        epaper.drawPixel(x,y,BLACK);
    }
    epaper.flush(PART);

    /*Draw two lines*/
    epaper.drawLine(24,12, 36,110,BLACK);
    epaper.drawLine(36,12, 24,110,BLACK);
    epaper.flush(PART);

    /*Draw a red rectangle*/
    epaper.drawRect(48,12, 40,98,BLACK);
    epaper.flush(PART);

    /*Fill a rectangle with black*/
    epaper.fillRect(55,19, 26,84,BLACK);
    epaper.flush(PART);

    /*Draw a hollow circle*/
    epaper.drawCircle(122,37, 25,BLACK);
    epaper.flush(PART);

    /*Draw a solid circle*/
    epaper.fillCircle(122,37, 18,BLACK);
    epaper.flush(PART);

    /*Draw a rounded rectangle*/
    epaper.drawRoundRect(97,67, 50,43, 10,BLACK);
    epaper.flush(PART);
```

```
    /*Fill in a rounded rectangle*/
    epaper.fillRoundRect(102,72, 40,33, 8,BLACK);
    epaper.flush(PART);

    /*Draw a triangle*/
    epaper.drawTriangle(180,12, 155,110, 205,110,BLACK);
    epaper.flush(PART);

    /*Fill in a triangle*/
    epaper.fillTriangle(180,23, 162,105, 198,105,BLACK);
    epaper.flush(PART);

    /*Prompt characters*/
    epaper.disString(215,12, 2,"pic",BLACK);
    epaper.disString(215,78, 2,"shape",BLACK);
    epaper.flush(PART);
}

void loop(void)
{
    delay(8000);
}
```

Function: The display includes drawing points, drawing lines, drawing rectangular boxes, drawing filled rectangles, drawing circles, drawing filled circles, drawing rounded rectangles, drawing filled rounded rectangles, and displaying characters (including letters and Chinese characters).

Effect:

FireBeetle Covers-ePaper Black&White Display Module(SPI)

Character display

Sample Code

```
#include "Arduino.h"
#include "DFRobot_IL3895_SPI.h"
DFRobot_IL3895_SPI epaper;

#define EPAPER_CS  D3
#define Font_CS  D6
#define EPAPER_DC  D8
#define EPAPER_BUSY     D7

void setup(void)
{
    Serial.begin(115200); //Select the corresponding pins
    epaper.begin(EPAPER_CS, Font_CS, EPAPER_DC, EPAPER_BUSY);

    epaper.fillScreen(WHITE);//Clear the screen and display white
    epaper.flush(FULL); //Refresh screen display

    /*Displays a string, black font*/
    epaper.disString(0,0,1,"SPI",BLACK);
    epaper.flush(PART);

    /*Displays a string, black font*/
    epaper.disString(41,12,1,"DFRobot Black&White Ink Screen",BLACK);
    epaper.flush(PART);

    /*Displays a string, black font*/
    epaper.disString(57,40,1,"《+-*/=!@#$%&*(》",BLACK);
    epaper.flush(PART);

    /*Display large font*/
    epaper.disString(61,65,2,"Large Font",BLACK);
    epaper.flush(PART);
}

void loop(void)
{
    delay(8000);
}
```

Function: The display includes Chinese characters, ASCII code characters, punctuation.
Effect:

FireBeetle Covers-ePaper Black&White Display Module(SPI)

Picture display

Code

```
#include "Arduino.h"
#include "DFRobot_IL3895_SPI.h"
DFRobot_IL3895_SPI epaper;

#define EPAPER_CS  D3
#define Font_CS  D6
#define EPAPER_DC  D8
#define EPAPER_BUSY     D7

const unsigned char pic1[] = {
0XFF,0XFF,0XFF,0XFF,0XFF,0XFF,0XFF,0XFF,0XFF,0XFF,0XFF,0XFF,0XFF,0XFF,0XFF,0XC0,
0XFF,0XFF,0XFF,0XFF,0XFF,0XFF,0XFF,0XFF,0XFF,0XFF,0XFF,0XFF,0XFF,0XFF,0XFF,0XC0,
0XFF,0XFF,0XFF,0XFF,0XFF,0XFF,0XFF,0XFF,0XFF,0XFF,0XFF,0XFF,0XFF,0XFF,0XFF,0XC0,
0XFF,0XFF,0XFF,0XFF,0XFF,0XFF,0XFF,0XFF,0XFF,0XFF,0XFF,0XFF,0XFF,0XFF,0XFF
,0XC0,

0XFF,0XFF,0XFF,0XFF,0XFF,0XFF,0XFF,0XFF,0XFF,0XFF,0XFF,0XFF,0XFF,0XFF,0XFF
,0XC0,

0XFF,0XFF,0XFF,0XFF,0XF7,0XFF,0XFF,0XFF,0XFF,0XFF,0XFF,0XFF,0XFF,0XFF,0XFF
,0XC0,

0XFF,0XFF,0XFF,0XFF,0XF3,0XFF,0XFF,0XFF,0XFF,0XFF,0XFF,0XBF,0XFF,0XFF,0XFF
,0XC0,

0XFF,0XFF,0XFF,0XFF,0XF9,0XFF,0XFF,0XFF,0XFF,0XFF,0XFF,0X7F,0XFF,0XFF,0XFF
,0XC0,

0XFF,0XFF,0XFF,0XFF,0XFC,0XFF,0XFF,0XFF,0XFF,0XFF,0XFE,0X7F,0XFF,0XFF,0XFF
,0XC0,

0XFF,0XFF,0XFF,0XFF,0XFC,0X7F,0XFF,0XFF,0XFF,0XFF,0XF8,0XFF,0XFF,0XFF,0XFF
,0XC0,

0XFF,0XFF,0XFF,0XFF,0XFE,0X1F,0XFF,0XFF,0XFF,0XFF,0XF1,0XFF,0XFF,0XFF,0XFF
,0XC0,

0XFF,0XFF,0XFF,0XFF,0XFF,0X07,0XFF,0XFF,0XFF,0XFF,0XC3,0XFF,0XFF,0XFF,0XFF
,0XC0,

0XFF,0XFF,0XFC,0XFF,0XFF,0X81,0XFF,0XFF,0XFF,0XFE,0X07,0XFF,0XFC,0X7F,0XFF
,0XC0,

0XFF,0XFF,0XF8,0X3F,0XFF,0XE0,0X7F,0XFF,0XFF,0XFC,0X0F,0XFF,0XF0,0X7F,0XFF
,0XC0,

0XFF,0XFF,0XF8,0X1F,0XFF,0XF8,0X3F,0XFF,0XFF,0XF0,0X3F,0XFF,0XE0,0X3F,0XFF
,0XC0,

0XFF,0XFF,0XF0,0X07,0XFF,0XFE,0X1F,0XFF,0XFF,0XE0,0XFF,0XFF,0XC0,0X1F,0XFF
,0XC0,

0XFF,0XFF,0XE0,0X03,0XFF,0XFF,0X0F,0XFF,0XFF,0XC3,0XFF,0XFF,0X80,0X1F,0XFF
,0XC0,

0XFF,0XFF,0XE0,0X01,0XFF,0XFF,0X87,0XFF,0XFF,0X87,0XFF,0XFF,0X00,0X0F,0XFF
,0XC0,

0XFF,0XFF,0XE0,0X01,0XFF,0XFF,0XC3,0XFF,0XFF,0X8F,0XFF,0XFE,0X00,0X0F,0XFF
,0XC0,

0XFF,0XFF,0XC0,0X00,0XFF,0XFF,0XE3,0XFF,0XFF,0X1F,0XFF,0XFC,0X00,0X0F,0XFF
,0XC0,

0XFF,0XFF,0XC0,0X00,0X7F,0XFF,0XF1,0XFF,0XFE,0X3F,0XFF,0XFC,0X00,0X07,0XFF
,0XC0,

0XFF,0XFF,0X80,0X00,0X7F,0XFF,0XF9,0XFF,0XFE,0X3F,0XFF,0XF8,0X00,0X07,0XFF
,0XC0,

0XFF,0XFF,0X80,0X00,0X3F,0XFF,0XFC,0XFF,0XFE,0X7F,0XFF,0XF8,0X00,0X07,0XFF
,0XC0,

0XFF,0XFF,0X80,0X00,0X3F,0XFB,0XFC,0XFF,0XFC,0XFF,0X7F,0XF0,0X00,0X03,0XFF
,0XC0,
0XFF,0XFF,0X80,0X00,0X3F,0XF9,0XFE,0XFF,0XFC,0XFF,0X7F,0XF0,0X00,0X07,0XFF
,0XC0,

0XFF,0XFF,0XF8,0X00,0X1F,0XFD,0XFE,0X7F,0XFD,0XFE,0X7F,0XF0,0X00,0X7F,0XFF
,0XC0,

0XFF,0XFF,0XFE,0X00,0X1F,0XFC,0XFE,0X7F,0XF9,0XFE,0XFF,0XE0,0X00,0XFF,0XFF
,0XC0,

0XFF,0XFF,0XFF,0X00,0X1F,0XFE,0XFF,0X7F,0XF9,0XFC,0XFF,0XE0,0X03,0XFF,0XFF
,0XC0,

0XFF,0XFF,0XFF,0XC0,0X0F,0XFE,0XFF,0X3F,0XFB,0XFC,0XFF,0XE0,0X07,0XFF,0XFF
,0XC0,

0XFF,0XFF,0XFF,0XE0,0X0F,0XFE,0X7F,0X3F,0XFB,0XFD,0XFF,0XC0,0X0F,0XFF,0XFF
,0XC0,

0XFF,0XFF,0XFF,0XF0,0X0F,0XFE,0X7F,0XBF,0XF3,0XF9,0XFF,0XC0,0X1F,0XFF,0XFF
,0XC0,

0XFF,0XFF,0XFF,0XF8,0X0F,0XFE,0X3F,0XBF,0XF3,0XF9,0XFF,0XC0,0X3F,0XFF,0XFF
,0XC0,

0XFF,0XFF,0XFF,0XFC,0X0F,0XFF,0X3F,0XBF,0XF7,0XF1,0XFF,0XC0,0X7F,0XFF,0XFF
,0XC0,

0XFF,0XFF,0XFF,0XFC,0X0F,0XFF,0X3F,0X9F,0XF7,0XF1,0XFF,0XC0,0XFF,0XFF,0XFF
,0XC0,

0XFF,0XFF,0XFF,0XFE,0X0F,0XFF,0X3F,0X9F,0XF7,0XF1,0XFF,0XC0,0XFF,0XFF,0XFF
,0XC0,

0XFF,0XFF,0XFF,0XFF,0X07,0XFF,0X1F,0X9F,0XF7,0XF1,0XFF,0XC1,0XFF,0XFF,0XFF
,0XC0,

0XFF,0XFF,0XFF,0XFF,0X07,0XFF,0X5F,0X9F,0XE7,0XED,0XFF,0X83,0XFF,0XFF,0XFF
,0XC0,

0XFF,0XFF,0XFF,0XFF,0X87,0XFF,0X5F,0X9F,0XE7,0XE9,0XFF,0X87,0XFF,0XFF,0XFF
,0XC0,

0XFF,0XFE,0X7F,0XFF,0XC3,0XFE,0X4F,0XDF,0XE7,0XED,0XFF,0X87,0XFF,0XF9,0XFF
,0XC0,

0XFF,0XFF,0X0F,0XFF,0XC3,0XFE,0XCF,0X9F,0XE7,0XEC,0XFF,0X0F,0XFF,0XE3,0XFF
,0XC0,

0XFF,0XFF,0X83,0XFF,0XE1,0XFE,0XEF,0XDF,0XE7,0XCC,0XFF,0X0F,0XFF,0X87,0XFF
,0XC0,

0XFF,0XFF,0XC1,0XFF,0XE1,0XFC,0XEF,0X9F,0XE7,0XCC,0X7E,0X1F,0XFE,0X0F,0XFF
,0XC0,

0XFF,0XFF,0XC0,0X7F,0XF0,0XF0,0XEF,0X8F,0XE7,0XCE,0X3C,0X3F,0XF8,0X0F,0XFF
,0XC0,

0XFF,0XFF,0XE0,0X3F,0XF8,0X01,0XE7,0X9F,0XE7,0XCE,0X00,0X3F,0XF0,0X1F,0XFF
,0XC0,

0XFF,0XFF,0XE0,0X1F,0XFC,0X03,0XE7,0X9F,0XE7,0XCF,0X00,0X7F,0XE0,0X1F,0XFF
,0XC0,
0XFF,0XFF,0XF0,0X0F,0XFE,0X03,0XE7,0X9F,0XE7,0XCF,0X80,0XFF,0XC0,0X3F,0XFF
,0XC0,
0XFF,0XFF,0XF0,0X07,0XFF,0X0F,0XE7,0X9E,0XE3,0X8F,0XC3,0XFF,0X80,0X3F,0XFF
,0XC0,
0XFF,0XFF,0XF0,0X03,0XFF,0XFF,0XC7,0X9E,0XE3,0X8F,0XFF,0XFF,0X00,0X3F,0XFF
,0XC0,
0XFF,0XFB,0XF8,0X01,0XFF,0XFF,0XC7,0X9E,0XE3,0XC7,0XFF,0XFE,0X00,0X3F,0X3F
,0XC0,
0XFF,0XF5,0XF8,0X00,0XFF,0XFF,0X87,0X9C,0XE3,0X87,0XFF,0XFC,0X00,0X3E,0X1F
,0XC0,
0XFF,0XE6,0XF8,0X00,0X7F,0XFF,0X87,0X9C,0XE3,0X83,0XFF,0XF8,0X00,0X7C,0XDF
,0XC0,
0XFF,0XEF,0XF8,0X00,0X3F,0XFF,0X07,0X1C,0XE3,0X83,0XFF,0XF0,0X00,0X7F,0XCF
,0XC0,
0XFF,0XEB,0XF8,0X00,0X0F,0XFE,0X07,0X1C,0X73,0X80,0XFF,0XE0,0X00,0X7F,0X2F
,0XC0,
0XFF,0XE1,0XF8,0X00,0X03,0XF8,0X07,0X1D,0X73,0X80,0X7F,0X80,0X00,0X7E,0X0F
,0XC0,
0XFF,0XE4,0XFC,0X00,0X00,0X00,0X07,0X19,0X73,0X80,0X00,0X00,0X00,0X7E,0X4F
,0XC0,
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,0XC0,

0XFF,0XFF,0XFF,0X1B,0X64,0X7D,0XE7,0XB8,0XE3,0X7C,0X6F,0XBC,0XF6,0XFF,0XFF
,0XC0,

0XFF,0XFF,0XFF,0X1B,0X64,0X7D,0XE7,0XB8,0XE3,0X7C,0X6F,0XBC,0XF6,0XFF,0XFF
,0XC0,

0XFF,0XFF,0XFF,0X1B,0X64,0X7D,0XE7,0XB8,0XE3,0X7C,0X6F,0XBC,0XF6,0XFF,0XFF
,0XC0,

0XFF,0XFF,0XFF,0X1B,0X64,0X7D,0XE7,0XB8,0XE3,0X7C,0X6F,0XBC,0XF6,0XFF,0XFF
,0XC0,

0XFF,0XFF,0XFF,0X1B,0X64,0X7D,0XE7,0XB8,0XE3,0X7C,0X6F,0XBC,0XF6,0XFF,0XFF
,0XC0,
0XFF,0XFF,0XFF,0X1B,0X64,0X7D,0XE7,0XB8,0XE3,0X7C,0X6F,0XBC,0XF6,0XFF,0XFF
,0XC0,

0XFF,0XFF,0XFF,0X1B,0X64,0X7D,0XE7,0XB8,0XE3,0X7C,0X6F,0XBC,0XF6,0XFF,0XFF
,0XC0,

0XFF,0XFF,0XFF,0X1B,0X64,0X7D,0XE7,0XB8,0XE3,0X7C,0X6F,0XBC,0XF6,0XFF,0XFF
,0XC0,

0XFF,0XFF,0XFF,0X1B,0X64,0X7D,0XE7,0XB8,0XE3,0X7C,0X6F,0XBC,0XF6,0XFF,0XFF
,0XC0,

0XFF,0XFF,0XFF,0X1B,0X64,0X7D,0XE7,0XB8,0XE3,0X7C,0X6F,0XBC,0XF6,0XFF,0XFF
,0XC0,

0XFF,0XFF,0XFF,0X1B,0X64,0X7D,0XE7,0XB8,0XE3,0X7C,0X6F,0XBC,0XF6,0XFF,0XFF
,0XC0,

0XFF,0XFF,0XFF,0X1B,0X64,0X7D,0XE7,0XB8,0XE3,0X7C,0X6F,0XBC,0XF6,0XFF,0XFF
,0XC0,

0XFF,0XFF,0XFF,0X1B,0X64,0X7D,0XE7,0XB8,0XE3,0X7C,0X6F,0XBC,0XF6,0XFF,0XFF
,0XC0,

0XFF,0XFF,0XFF,0X1B,0X64,0X7D,0XE7,0XB8,0XE3,0X7C,0X6F,0XBC,0XF6,0XFF,0XFF
,0XC0,

0XFF,0XFF,0XFF,0X1B,0X64,0X7D,0XE7,0XB8,0XE3,0X7C,0X6F,0XBC,0XF6,0XFF,0XFF
,0XC0,

0XFF,0XFF,0XFF,0X1B,0X64,0X7D,0XE7,0XB8,0XE3,0X7C,0X6F,0XBC,0XF6,0XFF,0XFF
,0XC0,

0XFF,0XFF,0XFF,0X1B,0X64,0X7D,0XE7,0XB8,0XE3,0X7C,0X6F,0XBC,0XF6,0XFF,0XFF
,0XC0,

0XFF,0XFF,0XFF,0X1B,0X64,0X7D,0XE7,0XB8,0XE3,0X7C,0X6F,0XBC,0XF6,0XFF,0XFF
,0XC0,

0XFF,0XFF,0XFF,0X1B,0X64,0X7D,0XE7,0XB8,0XE3,0X7C,0X6F,0XBC,0XF6,0XFF,0XFF
,0XC0,

0XFF,0XFF,0XFF,0X1B,0X64,0X7D,0XE7,0XB8,0XE3,0X7C,0X6F,0XBC,0XF6,0XFF,0XFF
,0XC0,

0XFF,0XFF,0XFF,0X1B,0X64,0X7D,0XE7,0XB8,0XE3,0X7C,0X6F,0XBC,0XF6,0XFF,0XFF
,0XC0,

0XFF,0XFF,0XFF,0X1B,0X64,0X7D,0XE7,0XB8,0XE3,0X7C,0X6F,0XBC,0XF6,0XFF,0XFF
,0XC0,

0XFF,0XFF,0XFF,0X1B,0X64,0X7D,0XE7,0XB8,0XE3,0X7C,0X6F,0XBC,0XF6,0XFF,0XFF
,0XC0,

0XFF,0XFF,0XFF,0X1B,0X64,0X7D,0XE7,0XB8,0XE3,0X7C,0X6F,0XBC,0XF6,0XFF,0XFF
,0XC0,

0XFF,0XFF,0XFF,0X1B,0X64,0X7D,0XE7,0XB8,0XE3,0X7C,0X6F,0XBC,0XF6,0XFF,0XFF
,0XC0,

0XFF,0XFF,0XFF,0X1B,0X64,0X7D,0XE7,0XB8,0XE3,0X7C,0X6F,0XBC,0XF6,0XFF,0XFF
,0XC0,
0XFF,0XFF,0XFF,0X1B,0X64,0X7D,0XE7,0XB8,0XE3,0X7C,0X6F,0XBC,0XF6,0XFF,0XFF
,0XC0,

0XFF,0XFF,0XFF,0X1B,0X64,0X7D,0XE7,0XB8,0XE3,0X7C,0X6F,0XBC,0XF6,0XFF,0XFF
,0XC0,

0XFF,0XFF,0XFF,0X1B,0X64,0X7D,0XE7,0XB8,0XE3,0X7C,0X6F,0XBC,0XF6,0XFF,0XFF
,0XC0,

0XFF,0XFF,0XFF,0X1B,0X64,0X7D,0XE7,0XB8,0XE3,0X7C,0X6F,0XBC,0XF6,0XFF,0XFF
,0XC0,

0XFF,0XFF,0XFF,0X1B,0X64,0X7D,0XE7,0XB8,0XE3,0X7C,0X6F,0XBC,0XF6,0XFF,0XFF
,0XC0,

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,0XC0,

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,0XC0,

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,0XC0,

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,0XC0,

0XFF,0XFF,0XFF,0X1B,0X64,0X7D,0XE7,0XB8,0XE3,0X7C,0X6F,0XBC,0XF6,0XFF,0XFF
,0XC0,

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,0XC0,

0XFF,0XFF,0XFF,0X1B,0X64,0X7D,0XE7,0XB8,0XE3,0X7C,0X6F,0XBC,0XF6,0XFF,0XFF
,0XC0,

0XFF,0XFF,0XFF,0X1B,0X64,0X7D,0XE7,0XB8,0XE3,0X7C,0X6F,0XBC,0XF6,0XFF,0XFF
,0XC0,

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,0XC0,

0XFF,0XFF,0XFF,0X1B,0X64,0X7D,0XE7,0XB8,0XE3,0X7C,0X6F,0XBC,0XF6,0XFF,0XFF
,0XC0,

0XFF,0XFF,0XFF,0X1B,0X64,0X7D,0XE7,0XB8,0XE3,0X7C,0X6F,0XBC,0XF6,0XFF,0XFF
,0XC0,

0XFF,0XFF,0XFF,0X1B,0X64,0X7D,0XE7,0XB8,0XE3,0X7C,0X6F,0XBC,0XF6,0XFF,0XFF
,0XC0,

0XFF,0XFF,0XFF,0X1B,0X64,0X7D,0XE7,0XB8,0XE3,0X7C,0X6F,0XBC,0XF6,0XFF,0XFF
,0XC0,

0XFF,0XFF,0XFF,0X1B,0X64,0X7D,0XE7,0XB8,0XE3,0X7C,0X6F,0XBC,0XF6,0XFF,0XFF
,0XC0,

0XFF,0XFF,0XFF,0X1B,0X64,0X7D,0XE7,0XB8,0XE3,0X7C,0X6F,0XBC,0XF6,0XFF,0XFF
,0XC0,

0XFF,0XFF,0XFF,0XFB,0X7F,0XFF,0XFF,0XFF,0XFF,0XFF,0XFF,0XBC,0XF6,0XFF,0XFF
,0XC0,
0XFF,0XFF,0XFF,0XFB,0X7F,0XFF,0XFF,0XFF,0XFF,0XFF,0XFF,0XBC,0XF6,0XFF,0XFF
,0XC0,

0XFF,0XFF,0XFF,0XFB,0X7F,0XFF,0XFF,0XFF,0XFF,0XFF,0XFF,0XBC,0XF6,0XC7,0XFF
,0XC0,

0XFF,0XFF,0XCF,0XBB,0X79,0XFB,0XC7,0XBC,0X7C,0X71,0XEF,0XBC,0XF6,0XF7,0XFF
,0XC0,

0XFF,0XFF,0XF7,0X9B,0X7E,0XF9,0XD7,0X99,0XBD,0XB6,0XE7,0XBC,0XF6,0XFB,0XFF
,0XC0,

0XFF,0XFF,0XFB,0XBB,0X7F,0X7B,0XBB,0XBB,0XFB,0XAE,0XEF,0XBC,0XF6,0XF3,0XFF
,0XC0,

0XFF,0XFF,0XE5,0XBB,0X7C,0XBB,0XBB,0XBB,0XFB,0XAE,0XEF,0XBC,0XF6,0XEF,0XFF
,0XC0,

0XFF,0XFF,0XC9,0XBB,0X79,0X3B,0XBB,0XBB,0XFB,0XAE,0XEF,0XBC,0XF6,0XDF,0XFF
,0XC0,

0XFF,0XFF,0XDD,0XBB,0X7B,0XBB,0XBB,0XBD,0XFB,0X2C,0XEF,0XBC,0XF6,0XDF,0XFF
,0XC0,

0XFF,0XFF,0XDD,0XBF,0XFB,0XBB,0XBB,0XBE,0XF8,0X61,0XEF,0XFF,0XFF,0XDF,0XFF
,0XC0,

0XFF,0XFF,0XDD,0XBF,0XFB,0XBB,0XBB,0XBE,0XFD,0XF7,0XEF,0XFF,0XFF,0XEF,0XFF
,0XC0,

0XFF,0XFF,0XEB,0XBF,0XFD,0X7B,0XD7,0XBB,0X7E,0XFB,0XEF,0XFF,0XFF,0XF1,0XFF
,0XC0,

0XFF,0XFF,0XE3,0X1F,0XFC,0X71,0XC7,0X18,0X3F,0X3C,0XC7,0XFF,0XFF,0XFF,0XFF
,0XC0,

0XFF,0XFF,0XFF,0XFF,0XFF,0XFF,0XFF,0XFF,0XFF,0XFF,0XFF,0XFF,0XFF,0XFF,0XFF
,0XC0,

0XFF,0XFF,0XFF,0XFF,0XFF,0XFF,0XFF,0XFF,0XFF,0XFF,0XFF,0XFF,0XFF,0XFF,0XFF
,0XC0,

0XFF,0XFF,0XFF,0XFF,0XFF,0XFF,0XFF,0XFF,0XFF,0XFF,0XFF,0XFF,0XFF,0XFF,0XFF
,0XC0,

0XFF,0XFF,0XFF,0XFF,0XFF,0XFF,0XFF,0XFF,0XFF,0XFF,0XFF,0XFF,0XFF,0XFF,0XFF
,0XC0,

0XFF,0XFF,0XFF,0XFF,0XFF,0XFF,0XFF,0XFF,0XFF,0XFF,0XFF,0XFF,0XFF,0XFF,0XFF
,0XC0,

0XFF,0XFF,0XFF,0XFF,0XFF,0XFF,0XFF,0XFF,0XFF,0XFF,0XFF,0XFF,0XFF,0XFF,0XFF
,0XC0,

0XFF,0XFF,0XFF,0XFF,0XDF,0XFF,0XDB,0XFF,0X7F,0XFF,0XFF,0XFF,0XFF,0XFF,0XFF
,0XC0,

0XFF,0XFF,0XFF,0XFF,0XEF,0XFF,0XDD,0XFF,0XBF,0XFF,0XFF,0XFF,0XFF,0XFF,0XFF
,0XC0,

0XFF,0XFF,0XFF,0XFF,0XEF,0XFF,0XFD,0XFF,0XBF,0XFF,0XFF,0XFF,0XFF,0XFF,0XFF
,0XC0,
0XFF,0X92,0X7D,0X98,0XEE,0X49,0XE4,0X7F,0X8F,0X39,0XC7,0XF6,0X9D,0XA6,0XD3
,0XC0,

0XFF,0XA7,0XBD,0XBD,0X6E,0X9A,0XED,0XBF,0XB7,0X5A,0XEB,0XF6,0XAD,0XAA,0XD5
,0XC0,

0XFF,0XB7,0XDD,0X3D,0XAE,0XDE,0XEE,0XBF,0XD7,0X6B,0X6D,0XF6,0XCD,0XB2,0XD9
,0XC0,

0XFF,0XDB,0XDD,0X7D,0XB6,0XED,0XF6,0XD8,0XDB,0X6B,0X6D,0XFA,0XDE,0XB7,0X5B
,0XC0,

0XFF,0XDA,0XDE,0X78,0X97,0X6D,0X76,0X5F,0XCB,0X6B,0X65,0XFA,0X5E,0X97,0X4B
,0XC0,

0XFF,0X9B,0X1B,0X7D,0X27,0X8C,0X64,0X9F,0X93,0X8C,0X69,0XDC,0X9F,0X27,0X93
,0XC0,

0XFF,0XFF,0XFF,0X7F,0XFF,0XEF,0XFF,0XFF,0XFF,0XFF,0XED,0XFE,0XDF,0XB7,0XDB
,0XC0,

0XFF,0XFF,0XFF,0XBF,0XFF,0XEF,0XFF,0XFF,0XFF,0XFF,0XEE,0XFF,0XFF,0XFF,0XFF
,0XC0,

0XFE,0X00,0X00,0X00,0X00,0X00,0X00,0X00,0X00,0X00,0X00,0X00,0X00,0X00,0X00
,0XC0,

0XFF,0XFF,0XFF,0XC7,0XFF,0XC7,0XFF,0XFF,0XFF,0XFF,0XF8,0XFF,0XFF,0XFF,0XFF
,0XC0,

0XFF,0XFF,0XFF,0XFF,0XFF,0XFF,0XFF,0XFF,0XFF,0XFF,0XFF,0XFF,0XFF,0XFF,0XFF
,0XC0,

0XFF,0XFF,0XFF,0XFF,0XFF,0XFF,0XFF,0XFF,0XFF,0XFF,0XFF,0XFF,0XFF,0XFF,0XFF
,0XC0,

0XFF,0XFF,0XFF,0XFF,0XFF,0XFF,0XFF,0XFF,0XFF,0XFF,0XFF,0XFF,0XFF,0XFF,0XFF
,0XC0,

0XFF,0XFF,0XFF,0XFF,0XFF,0XFF,0XFF,0XFF,0XFF,0XFF,0XFF,0XFF,0XFF,0XFF,0XFF
,0XC0,

0XFF,0XFF,0XFF,0XFF,0XFF,0XFF,0XFF,0XFF,0XFF,0XFF,0XFF,0XFF,0XFF,0XFF,0XFF
,0XC0,

0XFF,0XFF,0XFF,0XFF,0XFF,0XFF,0XFF,0XFF,0XFF,0XFF,0XFF,0XFF,0XFF,0XFF,0XFF
,0XC0,};


const unsigned char pic2[] = {

0X00,0X00,0X00,0X00,0X00,0X00,0X00,0X00,0X00,0X00,0X00,0X00,0X00,0X00,0X00
,0X00,

0X00,0X00,0X00,0X00,0X00,0X00,0X00,0X00,0X00,0X00,0X00,0X00,0X00,0X00,0X00
,0X00,

0X00,0X00,0X00,0X00,0X00,0X00,0X00,0X00,0X00,0X00,0X00,0X00,0X00,0X00,0X00
,0X00,

0X00,0X00,0X00,0X00,0X00,0X00,0X00,0X00,0X00,0X00,0X00,0X00,0X00,0X00,0X00
,0X00,
0X00,0X00,0X00,0X00,0X00,0X00,0X00,0X00,0X00,0X00,0X00,0X00,0X00,0X00,0X00
,0X00,

0X00,0X00,0X00,0X00,0X00,0X00,0X00,0X00,0X00,0X00,0X00,0X00,0X00,0X00,0X00
,0X00,

0X00,0X00,0X00,0X00,0X00,0X00,0X00,0X00,0X00,0X00,0X00,0X00,0X00,0X00,0X00
,0X00,

0X00,0X00,0X00,0X00,0X00,0X00,0X00,0X00,0X00,0X00,0X00,0X00,0X00,0X00,0X00
,0X00,

0X00,0X00,0X00,0X00,0X00,0X00,0X00,0X00,0X00,0X00,0X00,0X00,0X00,0X00,0X00
,0X00,

0X00,0X00,0X00,0X00,0X00,0X00,0X00,0X00,0X00,0X00,0X00,0X00,0X00,0X00,0X00
,0X00,

0X00,0X00,0X00,0X00,0X00,0X00,0X00,0X00,0X00,0X00,0X00,0X00,0X00,0X00,0X00
,0X00,

0X00,0X00,0X00,0X00,0X00,0X00,0X00,0X00,0X00,0X00,0X00,0X00,0X00,0X00,0X00
,0X00,

0X00,0X00,0X00,0X00,0X00,0X00,0X00,0X00,0X00,0X00,0X00,0X00,0X00,0X00,0X00
,0X00,

0X00,0X00,0X00,0X00,0X00,0X00,0X00,0X00,0X00,0X00,0X00,0X00,0X00,0X00,0X00
,0X00,

0X00,0X00,0X00,0X00,0X00,0X00,0X00,0X00,0X00,0X00,0X00,0X00,0X00,0X00,0X00
,0X00,

0X00,0X00,0X00,0X00,0X00,0X00,0X00,0X00,0X00,0X00,0X00,0X00,0X00,0X00,0X00
,0X00,

0X00,0X00,0X00,0X00,0X00,0X00,0X00,0X00,0X00,0X00,0X00,0X00,0X00,0X00,0X00
,0X00,

0X00,0X00,0X00,0X00,0X00,0X00,0X00,0X00,0X00,0X00,0X00,0X00,0X00,0X00,0X00
,0X00,

0X00,0X00,0X00,0X00,0X00,0X00,0X00,0X00,0X00,0X00,0X00,0X00,0X00,0X00,0X00
,0X00,

0X00,0X00,0X00,0X00,0X00,0X00,0X00,0X00,0X00,0X00,0X00,0X00,0X00,0X00,0X00
,0X00,

0X00,0X00,0X00,0X00,0X00,0X00,0X00,0X00,0X00,0X07,0XE0,0X00,0X00,0X00,0X00
,0X00,

0X00,0X00,0X00,0X00,0X00,0X00,0X00,0X00,0X3F,0XFF,0XF0,0X00,0X00,0X00,0X00
,0X00,

0X00,0X00,0X00,0X00,0X00,0X00,0X07,0XE0,0X7F,0XFF,0XF4,0X00,0X00,0X00,0X00
,0X00,

0X00,0X00,0X00,0X00,0X00,0X1F,0XFF,0XF0,0XFF,0XFF,0XEC,0X00,0X00,0X00,0X00
,0X00,

0X00,0X00,0X00,0X00,0X00,0XFF,0XFF,0XF9,0XFF,0XFF,0XDE,0X00,0X00,0X00,0X00
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,0X00,};


void setup(void)

{

    Serial.begin(115200);

    epaper.begin(EPAPER_CS, Font_CS, EPAPER_DC, EPAPER_BUSY);  //Select th
e corresponding pins


    epaper.fillScreen(WHITE); //Clear the screen and display white

    epaper.flush(FULL);  //Refresh screen display

}
```
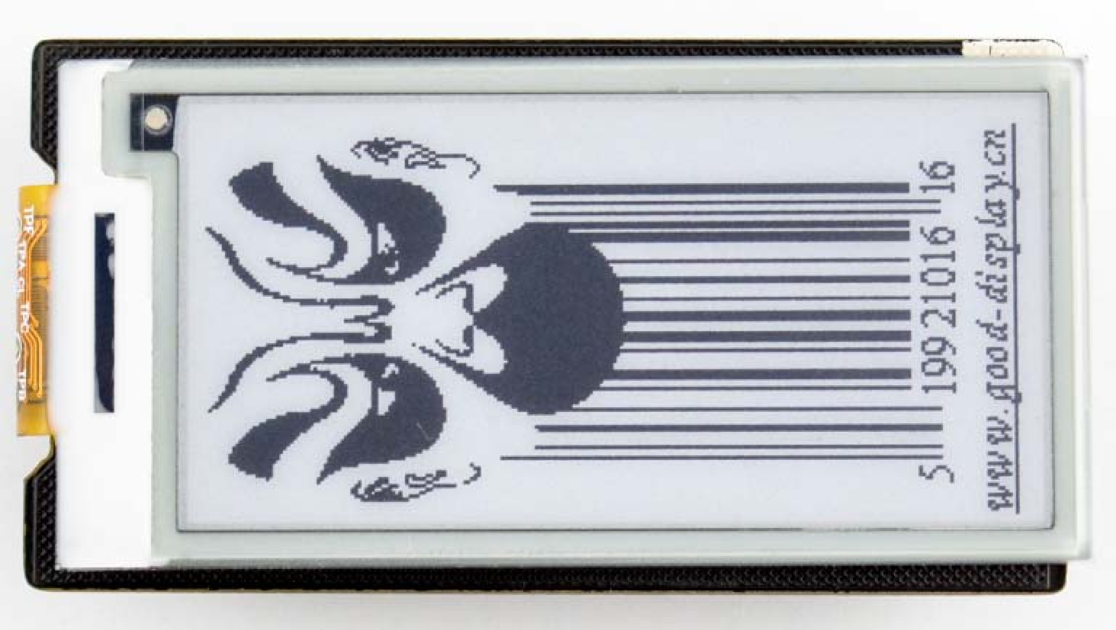

```
void loop(void)
{

    epaper.drawPicture(pic1);//Display image 1
    epaper.flush(FULL);
    delay(8000);

    epaper.drawPicture(pic2); //Display image 2
    epaper.flush(FULL);
    delay(8000);
}
```

Function: Display 2 pictures.
Effect:



FireBeetle Covers-ePaper Black&White Display Module(SPI)

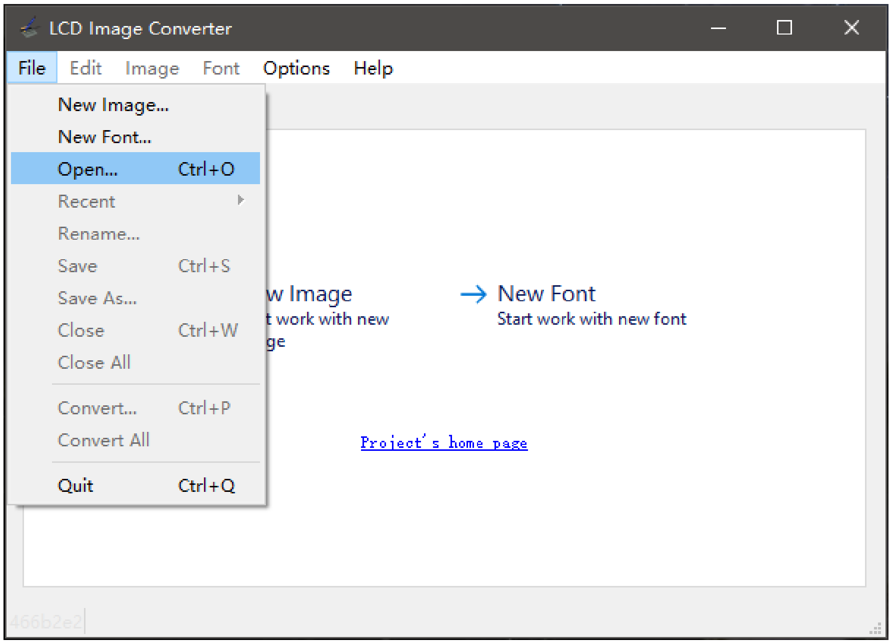
Display a Image

Make black and white picture
This screen does not support grayscale, so you need to make 250 * 122 resolution pure black and white pictures in the production, and saved as.bmp or jpg files.

lcd-image-converter.exe

The Lcd-image-converter.exe software can be used to Grab the image. Tip: The software in the tool folder of e-paper compressed package, the steps are as follows:

①Open a picture "xxx.jpg".
File->open



FireBeetle Covers-ePaper Black&White Display Module(SPI)

②Set the picture to rotate 180 °.
image->rotate->180

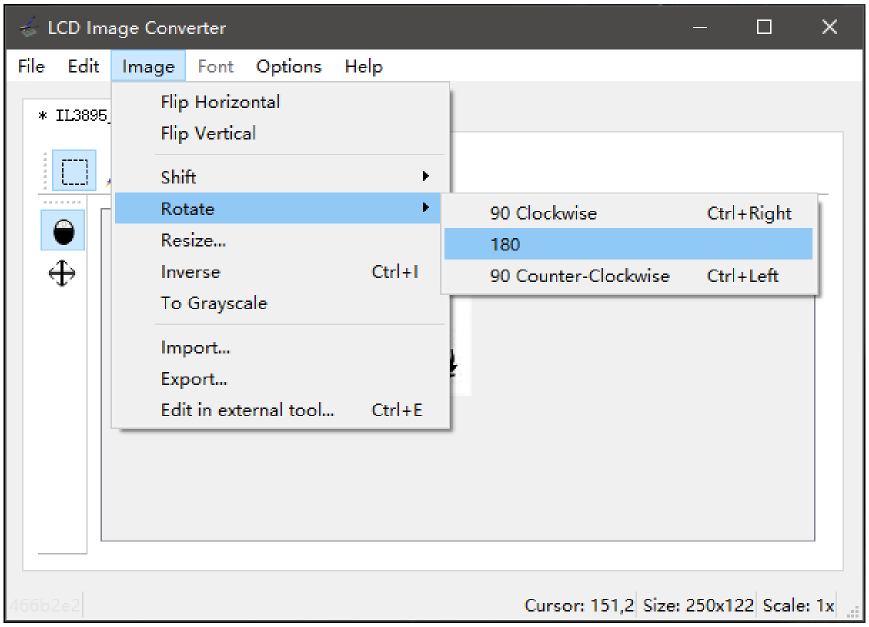


Fig3:FireBeetle Covers-ePaper Black&White Display Module(SPI)

③Open the menu to set the output format.
Options->conversion

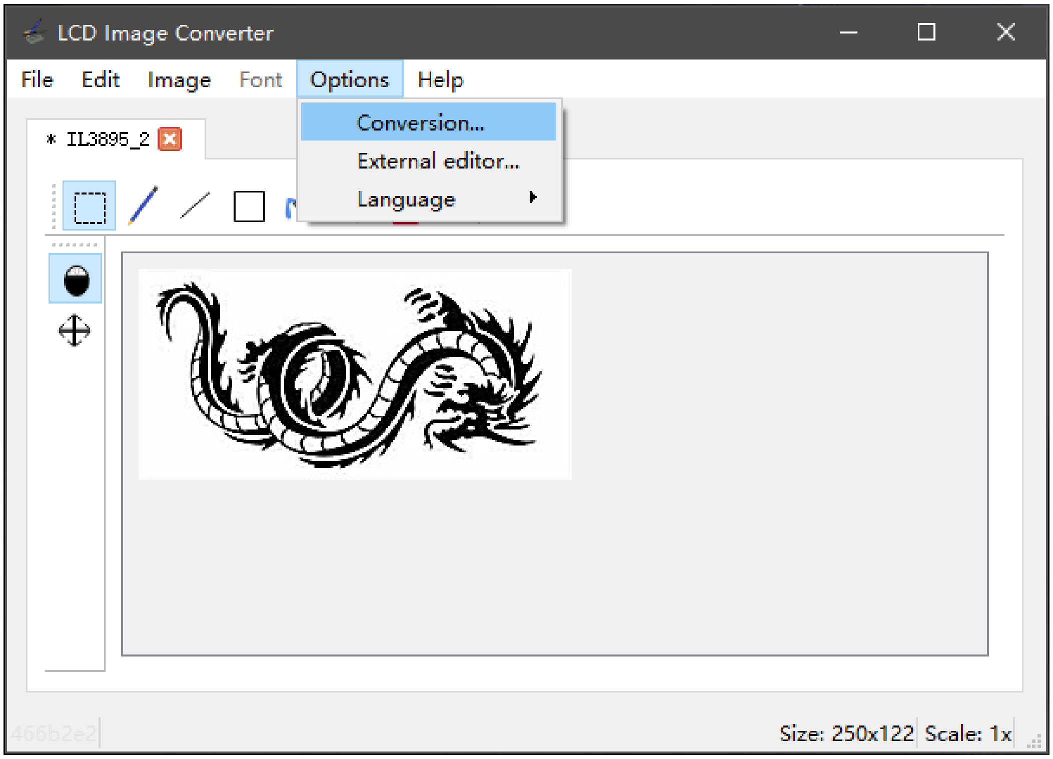
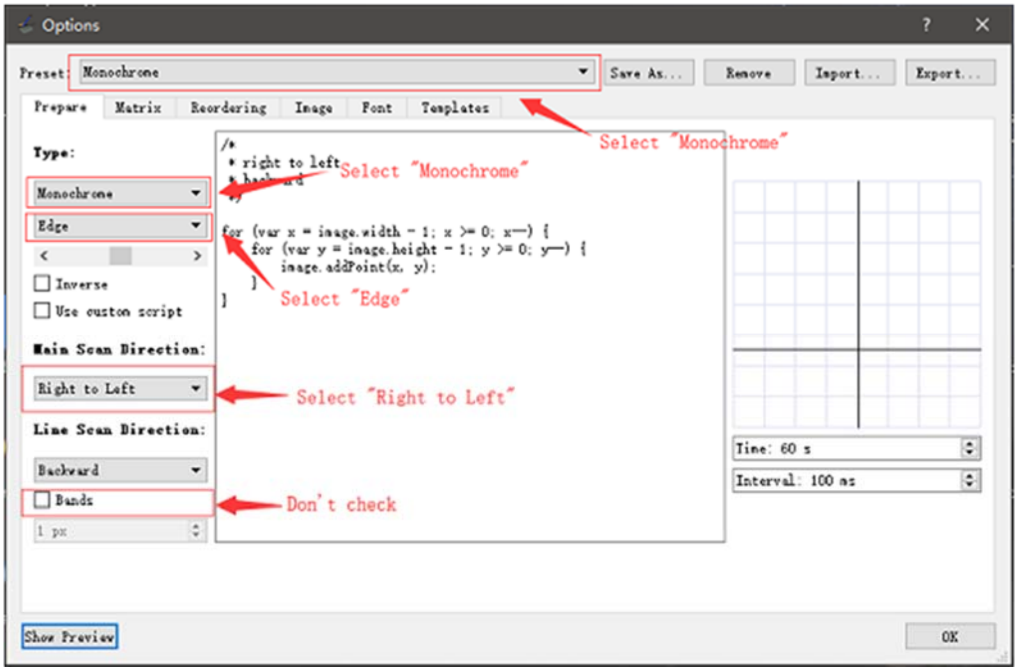


Fig3:FireBeetle Covers-ePaper Black&White Display Module(SPI)

④ Set the parameters according to the following figure.



Preset: Monochrome

Type: Monochrome

Edge

□ Inverse

□ Use custom script

Main Scan Direction: Right to Left

Line Scan Direction: Backward

□ Bands

1 px

Time: 60 s

Interval: 100 ms

```
/*
 * right to left
 * backward
 */

for (var x = image.width - 1; x >= 0; x--) {
    for (var y = image.height - 1; y >= 0; y--) {
        image.addPoint(x, y);
    }
}
```

Select "Monochrome"

Select "Monochrome"

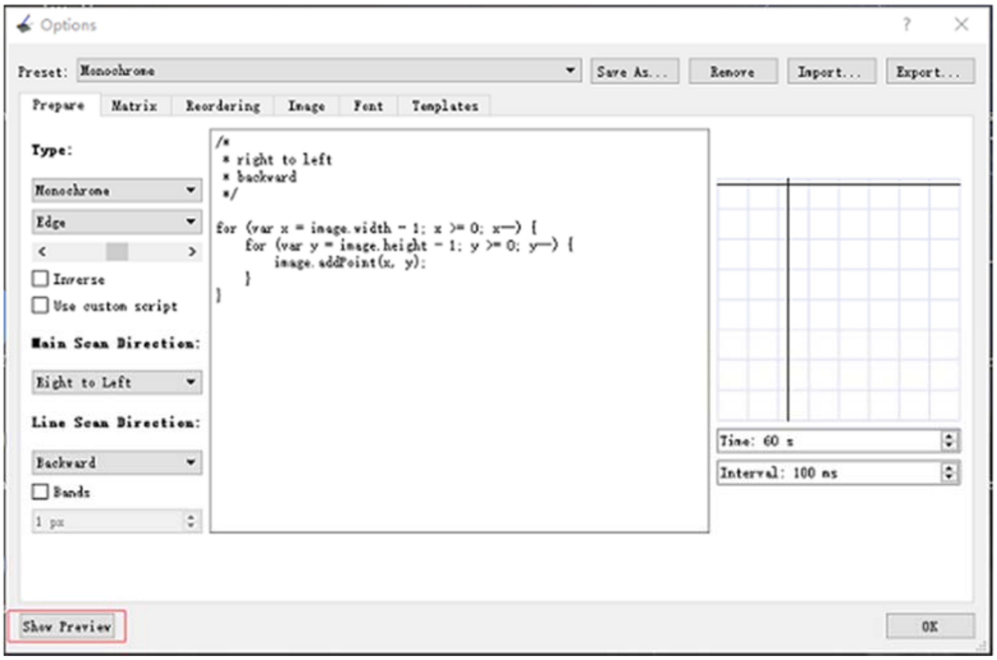
Select "Edge"

Select "Right to Left"

Don't check

Fig3:FireBeetle Covers-ePaper Black&White Display Module(SPI)

⑤ After setting the parameters, click "Show Preview".



Preset: Monochrome

Type:

Monochrome

Edge

□ Inverse

□ Use custom script

Main Scan Direction:

Right to Left

Line Scan Direction:

Backward

□ Bands

1 px

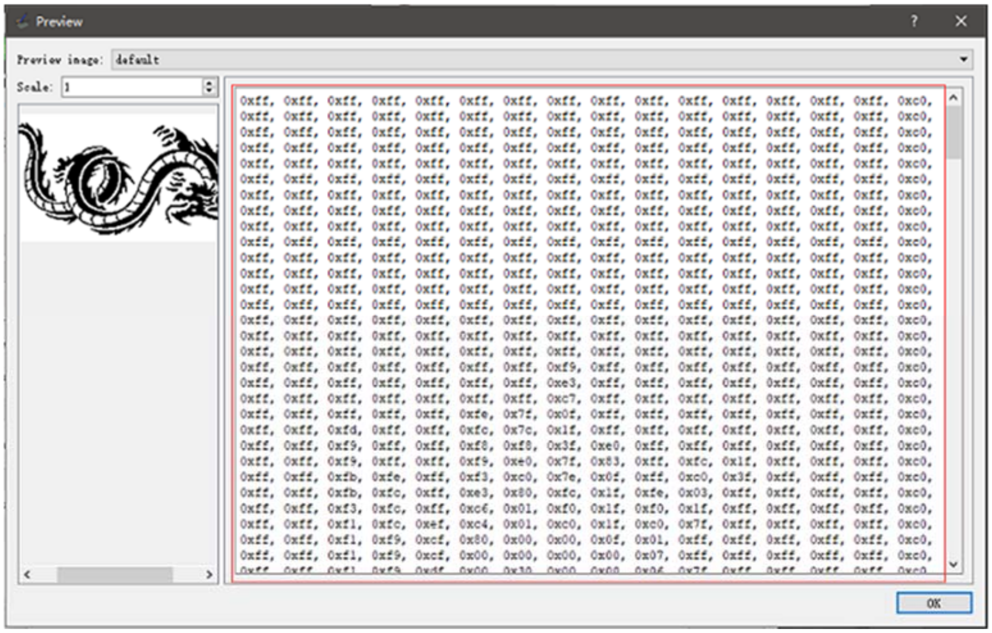
```
/*
 * right to left
 * backward
 */

for (var x = image.width - 1; x >= 0; x--) {
    for (var y = image.height - 1; y >= 0; y--) {
        image.addPoint(x, y);
    }
}
```

Time: 60 s

Interval: 100 ms

Fig3:FireBeetle Covers-ePaper Black&White Display Module(SPI)

⑥ Replaces the array in the example with binaries in the dialog box.



Preview image: default

Scale: 1

```
0xff, 0xff, 0xff, 0xff, 0xff, 0xff, 0xff, 0xff, 0xff, 0xff, 0xff, 0xff, 0xff, 0xff, 0xff, 0xc0,
0xff, 0xff, 0xff, 0xff, 0xff, 0xff, 0xff, 0xff, 0xff, 0xff, 0xff, 0xff, 0xff, 0xff, 0xff, 0xc0,
0xff, 0xff, 0xff, 0xff, 0xff, 0xff, 0xff, 0xff, 0xff, 0xff, 0xff, 0xff, 0xff, 0xff, 0xff, 0xc0,
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0xff, 0xff, 0xff, 0xff, 0xff, 0xff, 0xff, 0xe3, 0xff, 0xff, 0xff, 0xff, 0xff, 0xff, 0xff, 0xc0,
0xff, 0xff, 0xff, 0xff, 0xff, 0xff, 0xff, 0xc7, 0xff, 0xff, 0xff, 0xff, 0xff, 0xff, 0xff, 0xc0,
0xff, 0xff, 0xff, 0xff, 0xff, 0xfe, 0x7f, 0x0f, 0xff, 0xff, 0xff, 0xff, 0xff, 0xff, 0xff, 0xc0,
0xff, 0xff, 0xfd, 0xff, 0xff, 0xfc, 0x7c, 0x1f, 0xff, 0xff, 0xff, 0xff, 0xff, 0xff, 0xff, 0xc0,
0xff, 0xff, 0xf9, 0xff, 0xff, 0xf8, 0xf8, 0x3f, 0xe0, 0xff, 0xff, 0xff, 0xff, 0xff, 0xff, 0xc0,
0xff, 0xff, 0xf9, 0xff, 0xff, 0xf9, 0xe0, 0x7f, 0x83, 0xff, 0xfc, 0x1f, 0xff, 0xff, 0xff, 0xc0,
0xff, 0xff, 0xfb, 0xfe, 0xff, 0xf3, 0xc0, 0x7e, 0x0f, 0xff, 0xc0, 0x3f, 0xff, 0xff, 0xff, 0xc0,
0xff, 0xff, 0xfb, 0xfc, 0xff, 0xe3, 0x80, 0xfc, 0x1f, 0xfe, 0x03, 0xff, 0xff, 0xff, 0xff, 0xc0,
0xff, 0xff, 0xf3, 0xfc, 0xff, 0xc6, 0x01, 0xf0, 0x1f, 0xf0, 0x1f, 0xff, 0xff, 0xff, 0xff, 0xc0,
0xff, 0xff, 0xf1, 0xfc, 0xef, 0xc4, 0x01, 0xc0, 0x1f, 0xc0, 0x7f, 0xff, 0xff, 0xff, 0xff, 0xc0,
0xff, 0xff, 0xf1, 0xf9, 0xcf, 0x80, 0x00, 0x00, 0x0f, 0x01, 0xff, 0xff, 0xff, 0xff, 0xff, 0xc0,
0xff, 0xff, 0xf1, 0xf9, 0xcf, 0x00, 0x00, 0x00, 0x00, 0x07, 0xff, 0xff, 0xff, 0xff, 0xff, 0xc0,
0xff, 0xff, 0xf1, 0xf9, 0xdf, 0x00, 0x30, 0x00, 0x00, 0x06, 0x7f, 0xff, 0xff, 0xff, 0xff, 0xc0
```

Fig3:FireBeetle Covers-ePaper Black&White Display Module(SPI)

⑦Then, download the program to mainboard and the image will be displayed on the screen