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Renesas Electronics Corporation

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H8S/H8SX Families

Using the Graphics API to Implement Touchable Icons

Introduction

Renesas provides a standard set of functions for creating and manipulating graphics and text on a TFT-LCD panel. These functions are referred to as the Graphics Application Programming Interface or GAPI.

This Application Note is one in a series of application examples which show how to implement interactive graphics on an LCD panel.

This Application Note can be used with any available Direct Drive LCD Demo PCB from Renesas.

Design manuals, software and schematics are also available from www.america.renesas.com/h8lcd.

This application note must be used in conjunction with the REU05b0112_H8SAP application note and code. Please download and install REU05b0112_H8SAP application note first and use the below instructions to add this source code to the project.

Target Device

H8S2378, H8S2456, H8SX1668R

and Direct Drive LCD Demo Board

Contents

1. Creating an Icon

This sample code uses GAPI calls which will access the bitmap in memory and place its first icon at specific coordinates on the screen. Please refer to REU05b0107_H8SAP for more details on how to create a bitmap file with transparency that is compatible with GAPI.

This code also maps the coordinates to a touchable area based on the size of the icon, and specifies which function will be called in the event that the icon is touched.

Each time the Icon is touched, the image will toggle between “On” and “Off”.

Figure 1 shows the bitmap for the light bulb that we will use in the sample code:

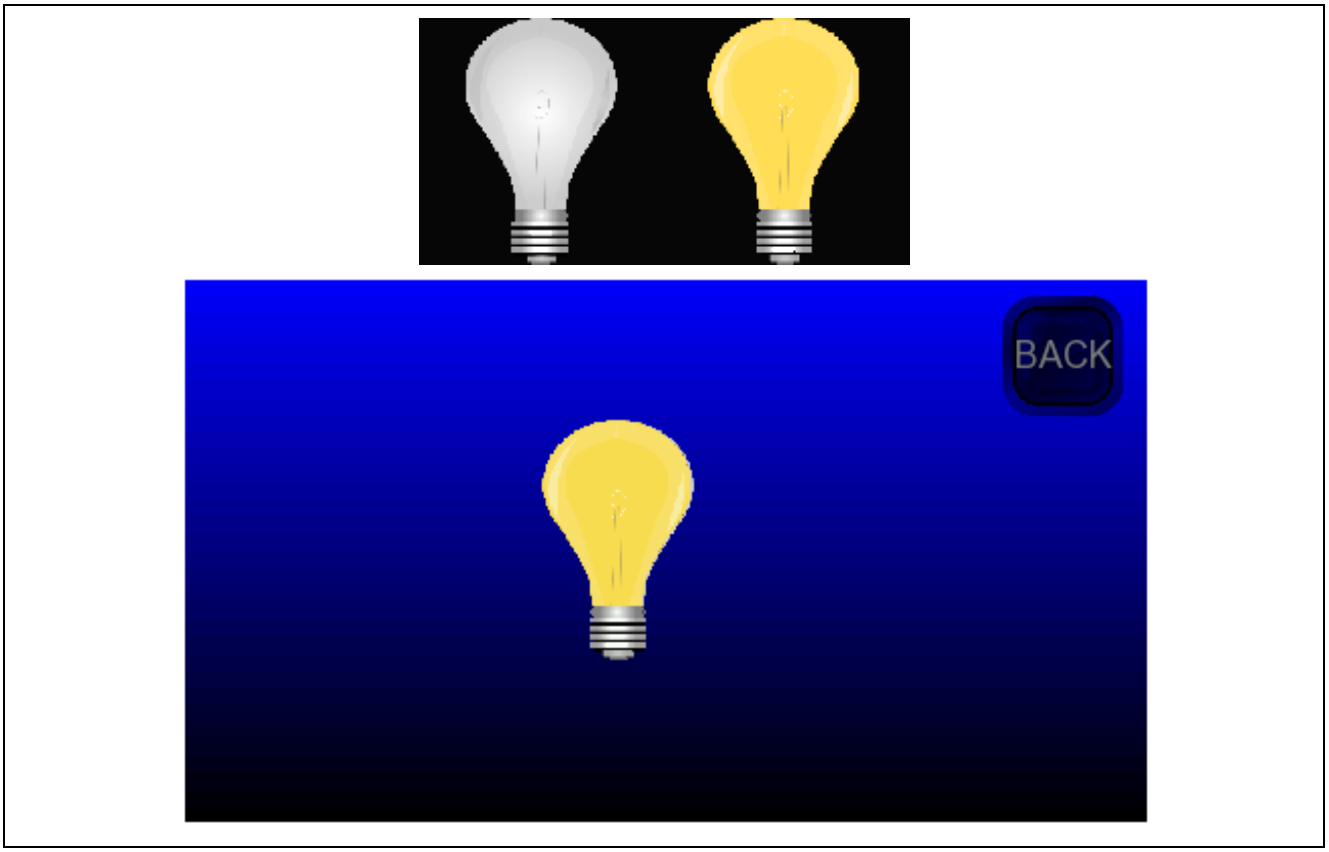


Figure 1 Light.BMP and ScreenLight

2. Code

2.1 Setting Up the Icon

The Icons table describes which objects will be placed on the screen. The first pBMP_ButtonLight image will be placed at screen coordinates x = 0.328, y = 0.304 (relative screen coordinates) when the "BasicConstructor" processes the "LightOn" callback function.

Any number of icons can be placed on the screen; the final entry in the table must be a NULL to terminate the list.

```
static const ICON_type Icons[]=
{
//*****************************************************************************
//BITMAP ADDR                              FUNCTION CALL             Y POSITION
//                        COLOR SCHEME                  X POSITION
//*****************************************************************************

  { &pBMP_ButtonS, T_SchemeBlue,   ButtonBack,     SX(0.850), SY(0.750) },
  { &pBMP_ButtonLight,  T_SchemeNoColor,     LightOn,      SX(0.328),   SY(0.304)   },
  { NULL,               NULL,           NULL,           0,       0      },};

SCREEN_type ScreenHomeData=
{
  Constructor, Destructor, Icons
};
```

2.2 Screen Constructor/Destructor

Every screen is started by the framework calling the screen Constructor. In this sample code, the constructor first locates the “Light” (BMP) file in the pResources structure and assigns this location to the “pBMP_ButtonLight” handle. When the “BasicConstructor” is called, it will execute each Icon table callback function (these functions are responsible for placing their own graphic images).

The “Destructor” function is called on exit from the screen by the framework.

```
static void Constructor(SCREEN_type const *pS)
{
  if(pBMP_ButtonLight == NULL)
    pBMP_ButtonLight = FileFind(pResources, "Light");

  // Clear the background
  (void)LCDBMPFillGradient(backFrameBuf, 0, 0, FRAME_WIDTH, FRAME_HEIGHT,  SCHEME[1].ct , 90);

  // Run default behavior
  BasicConstructor(pS);
}

static void Destructor(SCREEN_type const *pS)
{
  /* Run default behavior (stops screen tasks) */
  BasicDestructor(pS);
}
```

2.3 Callback function

The “LightOn” function will be called on every event that the system receives while this sample screen is active. It is the responsibility of this function to decide if it needs to process the event.

When “LightOn” is called by the “BasicConstructor”, it will be passed a message ID of “MSG_DRAW”. When this message is received, the “IconHandler” framework call will process the “MSG_DRAW” request and will paint the initial image in the frame buffer.

When “LightOn” is called because of touch events, the “IconHandler” call will determine if the touch was within the bounds of the icon. If the event was with the bounds and message contained a “MSG_PRESS” ID, we will toggle a state variable that controls which icon version to display within the icon table bitmap (“On” or “Off).

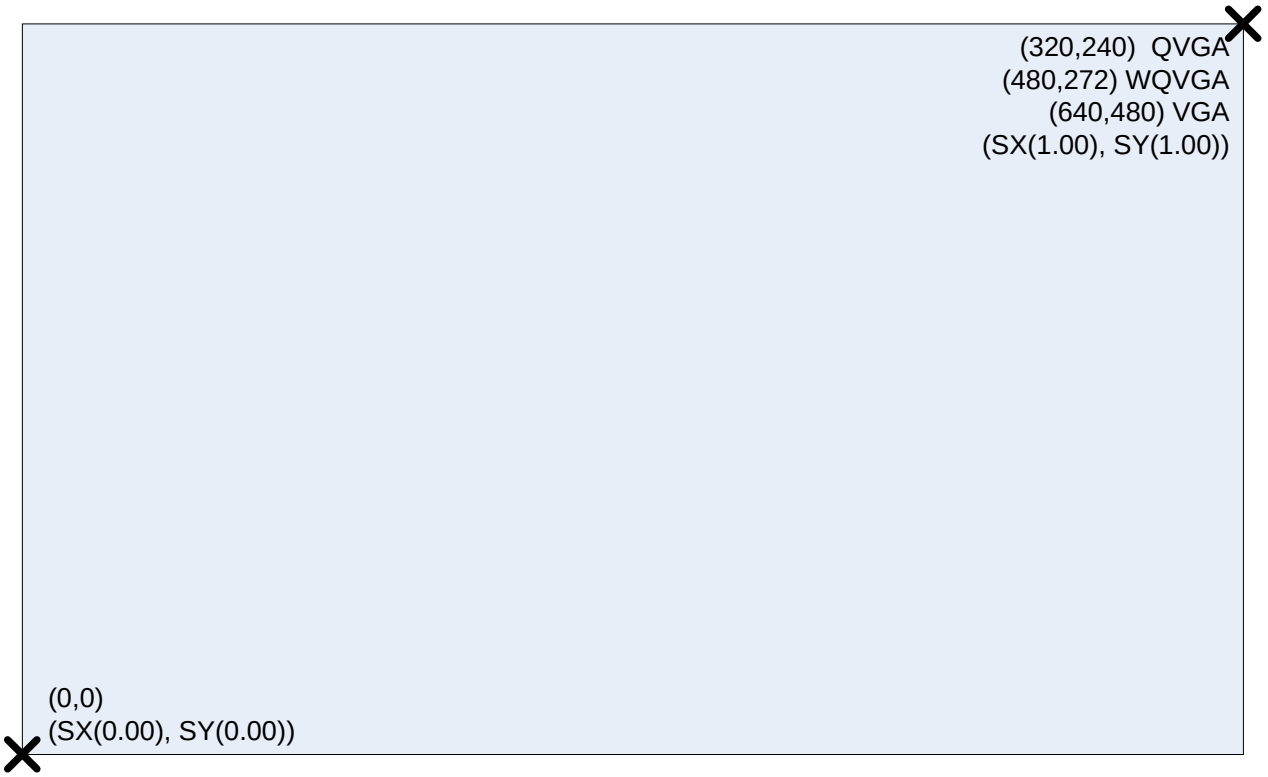
```
void LightOn(ICON_type const *pS, EVENT_MSG const *pMsg)
{
  static sI16 state=0;
  static sI16 toggle_light=0;
   if(0 != (state =IconHandler(pS, pMsg, toggle_light, state)))
    if (MSG_PRESS == pMsg->id)
    {
      //calculate number of buttons in the bitmap
      if (++toggle_light >= (BMP_Width(*pS->ppBmp)/BMP_Height(*pS->ppBmp)))
        toggle_light = 0;                          //and scroll through them

      (void) LCDBMPIndex(*pS->ppBmp,displayFrameBuf,
             pS->PosX,pS->PosY, toggle_light); //change bmp to on/off
    }
}
```

3. Touchscreen and Panel Coordinates

By convention, the sample code uses relative screen coordinates. This is accomplished by use of the “SX” and “SY” macro expansions. These expansions convert normalized coordinates (0.00 to 1.00) to absolute screen coordinates. If desired, the SX/SY macros can not be used and absolute screen coordinates used.

For example SX(0.5), SY(0.5) on a QVGA (320x240) panel would expand to (160,120)



4. Installation and Source Code Structure

The code is contained within one source file called “ScreenLight.c,” and the bitmap images used are contained in a bitmap file “light.bmp”. To install the sample code, double click on the installation executable “REUE05B0106.exe” to bring up the installer. (figure 2) Make sure you click on the browse button in the “Destination Folder” Panel and select your LCD Direct Drive demo project (REU05b0112_H8SAP installation) directory. Then click the next button to copy the new files into your project directory.

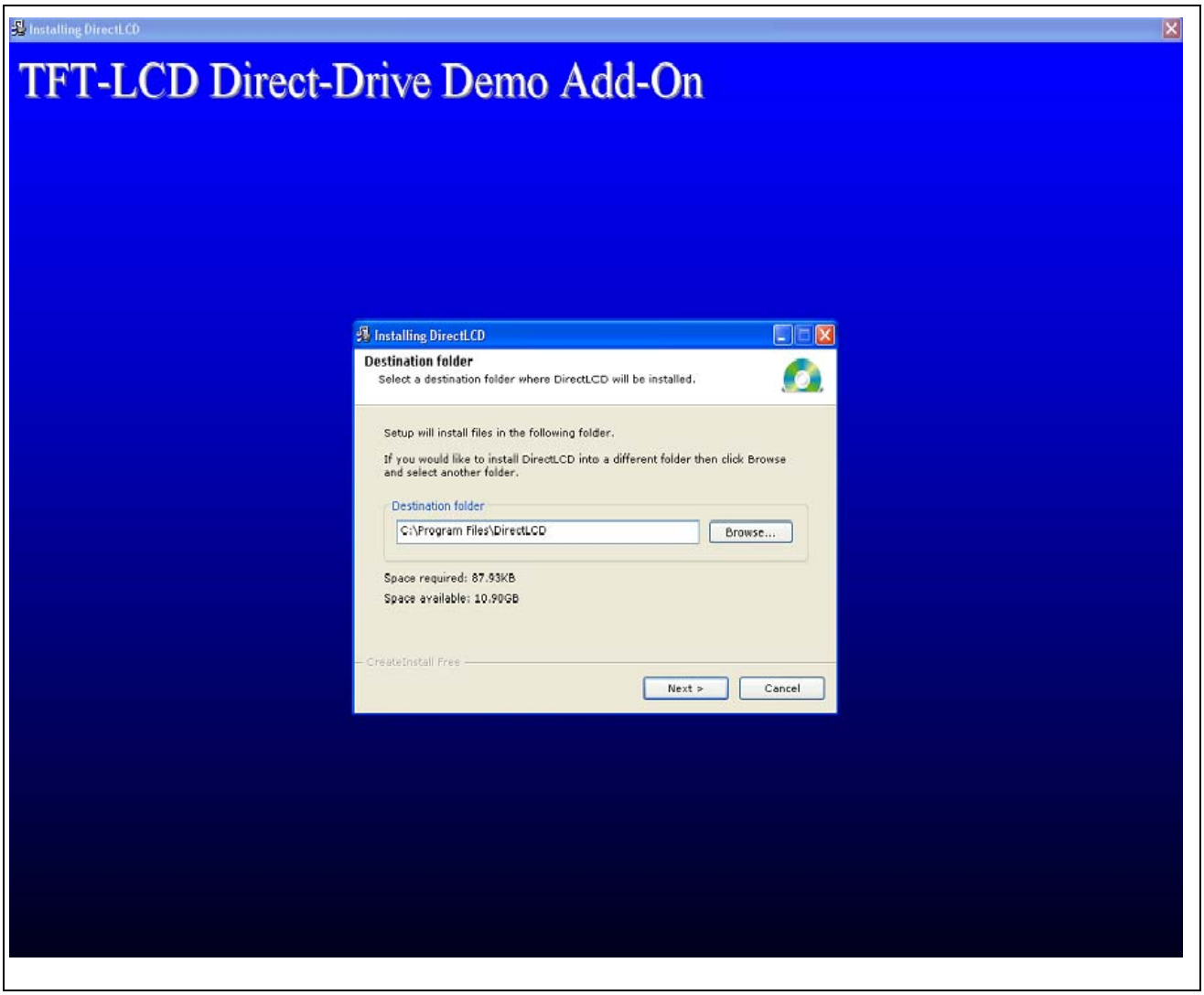


Figure 2: Installation

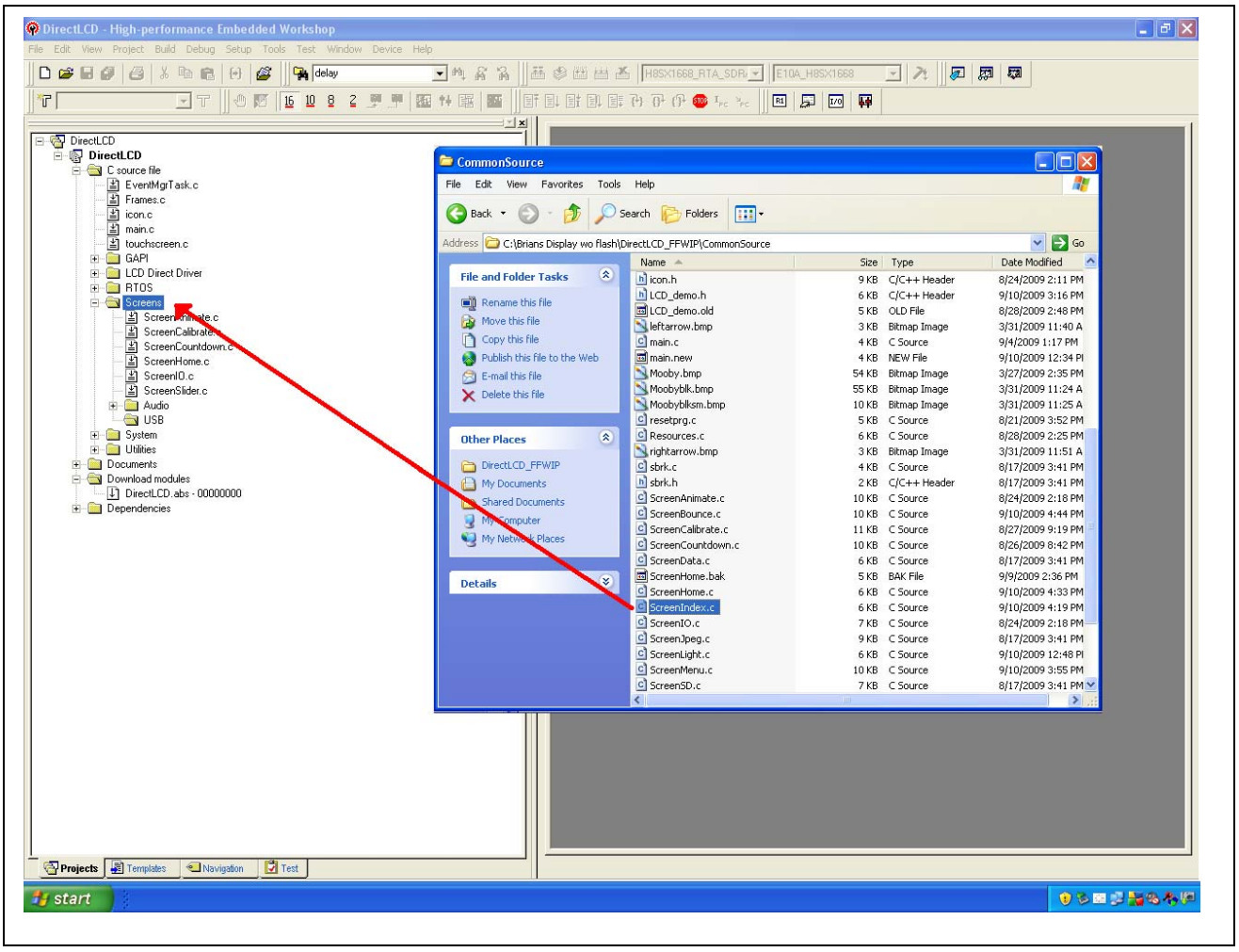


Figure 3: Adding "ScreenLight.c" to the Direct LCD demo project in HEW

Then, open your LCD Direct Drive demo project in HEW. The ScreenLight.c file will be located in your CommonSource directory. Add the ScreenLight.c source file to your project in HEW by dragging the file into the Screens folder of your project. (Figure 3)

The installer places Bitmap Images that are sized for a WQVGA display panel into your resource directory by default. If you are using QVGA or VGA you will need to replace the bitmaps in your resource directory with ones of the appropriate resolution for your display panel. You will find several subdirectories in your resource folder that contain bitmaps of different resolutions. Simply copy all the files from the subdirectories corresponding to your panel resolution and paste them over the files in your resource directory.

Refer to the REU05b0112_H8SAP application note on instructions on how to build and update code resources in the target.

File Name	***File Description***
CommonSource\ ScreenLight.c	Demo screen code
Resources\Light.bmp	Bitmap image

Website and Support

Renesas Technology Website
http://www.renesas.com/

Renesas Technology America LCD Website
http://america.renesas.com/h8lcd

Inquiries
http://www.renesas.com/inquiry
csc@renesas.com (Global Support)
TechSupport.rta@renesas.com (United States / Canada / Mexico only)

Revision Record

Rev.	Date	Description	
		Page	Summary
1.00	March.20.09	—	First edition issued
1.10	January.01.10	—	Converted format to add-in code to REU05b0112

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