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S5U13781R00C100
Demonstration Manual
for STM32 VL-Discovery
and OPTREX T-55343GD035JU-LW-AND Panel

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Table of Contents

1 Introduction

1.1 General Description

This manual describes following two types of demonstration system using S5U13781R00C100 reference board.

(1) Demonstration system consisting of a microcontroller evaluation board and an LCD panel.

(2) Demonstration system consisting of a personal computer and an LCD panel.

By the instruction of this manual, you can realize above two types of demonstration system easily.

For detailed specification of the S5U13781R00C100 reference board, please refer to the "S5U13781R00C100 Reference Board User Manual".

This user manual is updated as appropriate. Please check the Epson Website at http://www.epson.jp/device/semicon_e/product/lcd_controllers/reference_design/index.htm for the latest revision of this document before beginning any development.

We appreciate your comments on our documentation. Please contact us via email at vdc-documentation@ea.epson.com.

1.2 Terminology

SPI: Serial Peripheral Interface

LUT: Look Up Table

ppm format: portable pixmap format

bpp: bits per pixel

URL: Uniform Resource Locator

PIP: Picture In Picture

LED: Light Emitting Diode

1.3 Required Materials for Demonstration System

■ Hardware

Following parts are required to establish demonstration system.

1. S5U13781R00C100 (LCDC reference board from Epson)
2. T-55343GD035JU-LW-ADN

   (3.5 inch, 320x240 dot, 24-bit full color TFT LCD panel from OPTREX)
3. UM232H (USB-Serial conversion board from FTDI)
4. AC power supply (e.g. General purpose DC5V2A output, 100V – 240V input, inner diameter 2.1mm)
5. AC power supply (e.g. General purpose DC3.3V2A output, 100V – 240V input, inner diameter 2.1mm)
6. DC jack (e.g. General purpose inner diameter 2.1mm)
7. Pin header (e.g. General purpose 2x25 2.54mm pitch)
8. Jumper pin (e.g. General purpose 2.54mm pitch)
9. USB cable A female – mini B male (General purpose A-miniB)
10. Personal computer

    For programming of STM32 VL-Discovery and UM232H control.

    Required software is available on the internet.

    Demonstrations explained in this manual are confirmed operating on a personal computer configured as follows.

    OS: Microsoft Windows XP Professional Version 2002 Service Pack 3

    CPU: Intel(R) Core(TM)2 CPU U7600 @1.2GHz

    On board memory: 1GB

    Capacity of hard disk: 37GB capacity of C: drive. (Disk space required for the software tools is less than 5GB.)

■ Software (Demo)

Sample software package (includes image data for demo and configuration information for LCD) is available on the Epson website at vdc.epson.com.

■ Software (Development Tool)

Following tools are required.

1. IAR Embedded Workbench for ARM, v. 6.30, 32K Kickstart Edition from IAR systems
2. STM32F10x standard peripheral library from ST Microelectronics
3. Visual C++ 2010 Express from Microsoft
4. Driver and MPSSE-SPI library for UM232H from FTDI

These tools are available without charge on web site of each vendor.

2 Preparation of Demo

For preparation of demo, this section describes the tool set up and data package.

2.1 Instruction for Tool Download and Install

1. IAR Embedded Workbench for ARM, v. 6.309, 32K Kickstart Edition from IAR systems

Download from the following URL and install according to the introduction provided from the company.

EWARM 32K size limited version for evaluation (KS version) Ver 6.309. File size: 782MB.
http://ftp.iarsys.co.jp/~download/KH_forSE_EWARMKS6.30_P/EWARM-KS-CD-6309.exe

Note:
Install the IAR Embedded Workbench and Driver (ST-Link) in the ARM Kickstart installer window.

2. ST Microelectronics STM32F10x standard peripheral library

The standard peripheral library is available from the following URL.
<http://www.st.com/internet/com/SOFTWARE_RESOURCES/SW_COMPONENT/FIRMWARE/stm32f10x_stdperiph_lib.zip>

(3)Microsoft™ Visual C++ 2010 Express from Microsoft.

Download Microsoft™ Visual C++ 2010 Express from the following URL and install according to the introduction provided by Microsoft.
http://www.microsoft.com/visualstudio/en-us/products/2010-editions/visual-cpp-express/

4. Driver and MPSSE-SPI library for UM232H from FTDI

Download the Driver and MPSSE-SPI library from the following URLs.

Driver for UM232H
http://www.ftdichip.com/Drivers/D2XX.htm

D2XX driver for Windows can be downloaded from the following URL (located on the above web page).
http://www.ftdichip.com/Drivers/CDM/CDM20814_WHQL_Certified.zip

MPSSE-SPI library
http://www.ftdichip.com/Support/SoftwareExamples/MPSSE/LibMPSSE-SPI.htm

The MPSSE-SPI library (file name: libMPSSE-SPI.zip) can be downloaded from the following URL (located on the above web page).
http://www.ftdichip.com/Support/SoftwareExamples/MPSSE/LibMPSSE-SPI/libMPSSE-SPI.zip

2.2 Instruction for Demo Sample Software Download

The LCDC reference sample software package “epson_lcdc_demo_qvga2_rev1.zip” is downloadable from the EPSON LCDC reference Web site.

Verify that the files described in Table 2-1, *T-55343GD035JU-LW-ADN Download File*, are in the downloaded file.

Table 2-1 T-55343GD035JU-LW-ADN Download File

For T-55343GD035JU-LW-ADN (3.5 inch 320x240 dot 24-bit full color TFT panel from OPTREX)

Download File	Contents
demo_stm32vl_qvga2.zip	Firmware project file for STM32VL-Discovery Target tool: EWARM
flash_qvga2.zip	Project file for data writing to M25P16 (SPI flash ROM) Target tool: Visual C++ 2010 Express
demo_um232h_qvga2.zip	Project file for UM232H demo Target tool: Visual C++ 2010 Express

2.3 Unzip Downloaded Files

(1) Preparation for display demo using STM32 VL-Discovery

1. Make the project folder “demo_stm32vl_qvga” and place the file “stm32f10x_stdperiph_lib.zip” into this folder.
2. Unzip the file “stm32f10x_stdperiph_lib.zip”. The folder “STM32F10x_StdPeriph_Lib_Vx.x.x” will be created.
3. Unzip the file “demo_stm32vl_qvga2.zip” described in the Table 2-1, *T-55343GD035JU-LW-ADN Download File*. The folder “S1D13781” and “STM32F10x_s1d13781_Demo” will be created.
4. Move folder “S1D13781” to the following folder.
“\demo_stm32vl_qvga\STM32F10x_StdPeriph_Lib_Vx.x.xLibraries”
5. Move folder “STM32F10x_s1d13781_Demo“ to the following folder.
“\demo_stm32vl_qvga\STM32F10x_StdPeriph_Lib_Vx.x.x\Project”
*Vx.x.x shows version number.

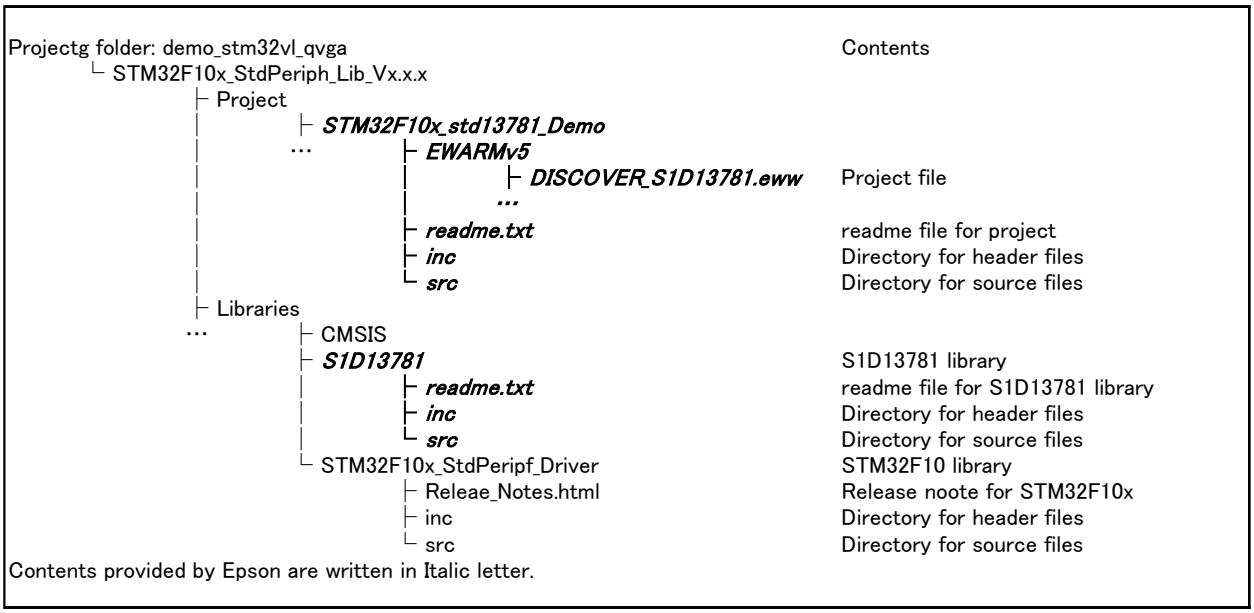


Figure 2-1 Structure of the Project Folder (STM32)

(2) Preparation for writing data into flash memory

1. Unzip the file "flash_qvga2.zip" described in the Table 2-1, *T-55343GD035JU-LW-ADN Download File*. The project folder "flash_qvga" is created.
2. Unzip the MPSSE-SPI library "libMPSSE-SPI.zip" downloaded in Section 2.1, Instruction for Tool Download and Install. The folder "libMPSSE-SPI" will be created.
3. Double click the "b.bat" icon in the folder "\libMPSSE-SPI\Release-SPI\samples".

   A command window is opened. Type "3" to select "SPI-Static".

   Copy following three files from the folder "\libMPSSE-SPI\Release-SPI\samples\SPI" into the project folder: "flash_qvga".

   ftd2xx.h
   libMPSSE.a
   libMPSSE_spi.h

   This completes embedding the MPSSE-SPI library into the M25P16 write project folder: "flash_qvga".

Project folder: flash_qvga	Contents
├ ***ReadMe.txt***	
├ ***EPSON_LCDC_REF.sln***	Solution file
├ ******.cpp***	Source file
├ ******.h***	Header file
├ libMPSSE.a	MPSSE library from FTDI
├ libMPSSE.h	MPSSE header file from FTDI
├ ftd2xx.h	D2XX header file from FTDI
├ ***pix***	Directory for demo image data
… ├ ***image*_480x272.ppm***	Demo image data for PSP panel (in PPM format)
…	
├ ***image*_320x240.ppm***	Demo image data for QVGA panel (in PPM format)
…	

Contents provided by Epson are written in Italic letter.

Figure 2-2 Structure of The Project Folder (Flash)

(3) Preparation for display demo using PC

1. Unzip the file “demo_un232h_qvga2.zip” described in Table 2-1, *T-55343GD035JU-LW-ADN Download File*. The Project folder “demo_um232h_qvga” is created.
2. Unzip the MPSSE-SPI library “libMPSSE-SPI.zip” downloaded in Section 2.1, Instruction for Tool Download and Install. Then the folder “libMPSSE-SPI” will be created.
3. Double click the “b.bat” icon in the folder “\libMPSSE-SPI\Release-SPI\samples”.

   A command window is opened. Then type “3” to select “SPI-Static”.

   Copy following three files from the folder “\libMPSSE-SPI\Release-SPI\samples\SPI” into the project folder: “demo_um232h_qvga”.

   ftd2xx.h
   libMPSSE.a
   libMPSSE_spi.h

   This completes embedding MPSSE-SPI library into the UM232H demo project folder: “demo_um232h_qvga”.

Project folder: demo_um232h_qvga	Contents
├ *ReadMe.txt*	
├ *EPSON_LCDC_REF.sln*	Solution file
├ ****.cpp*	Source file
├ ****.h*	Header file
├ libMPSSE.a	MPSSE library from FTDI
├ libMPSSE.h	MPSSE header file from FTDI
├ ftd2xx.h	D2XX header file from FTDI
├ *pix*	Directory for demo image data
… ├ *image*_480x272.ppm*	Demo image data for PSP panel (in PPM format)
…	
├ *image*_320x240.ppm*	Demo image data for QVGA panel (in PPM format)
…	

Contents provided by Epson are written in Italic letter.

Figure 2-3 Structure of the project folder (UM232H)

3 Explanation of the Demo using STM32 VL-Discovery

This section describes about the contents and instruction for display demo using STM32 VL-Discovery.

3.1 Summary

The STM32VL-Discovery is the evaluation board for ARM Cortex-M3 on board STM32F100xx microcontroller from ST Microelectronics (hereafter STM). This board is reasonably priced and includes an ICE feature, making it suitable for this evaluation.

The demo displays a still image on an LCD panel. Hardware consists of following items.

LCD controller: S5U13781R00C100 reference board

Microcontroller: STM32VL-Discovery

LCD panel:

T-55343GD035JU-LW-ADN from OPTREX (3.5 inch, 320x240 dots, 24 bit full color TFT panel)

Display image data on PC will be written into the 16Mbit SPI NOR Flash standard memory (M25P16) on the S5U13781R00C100 reference board by using UM232H*.

* The UM232H Single Channel USB Hi-Speed FT232H Development Module is a one chip USB-serial conversion IC from Future Technology Devices International. This board is reasonably priced, making it suitable for this evaluation.

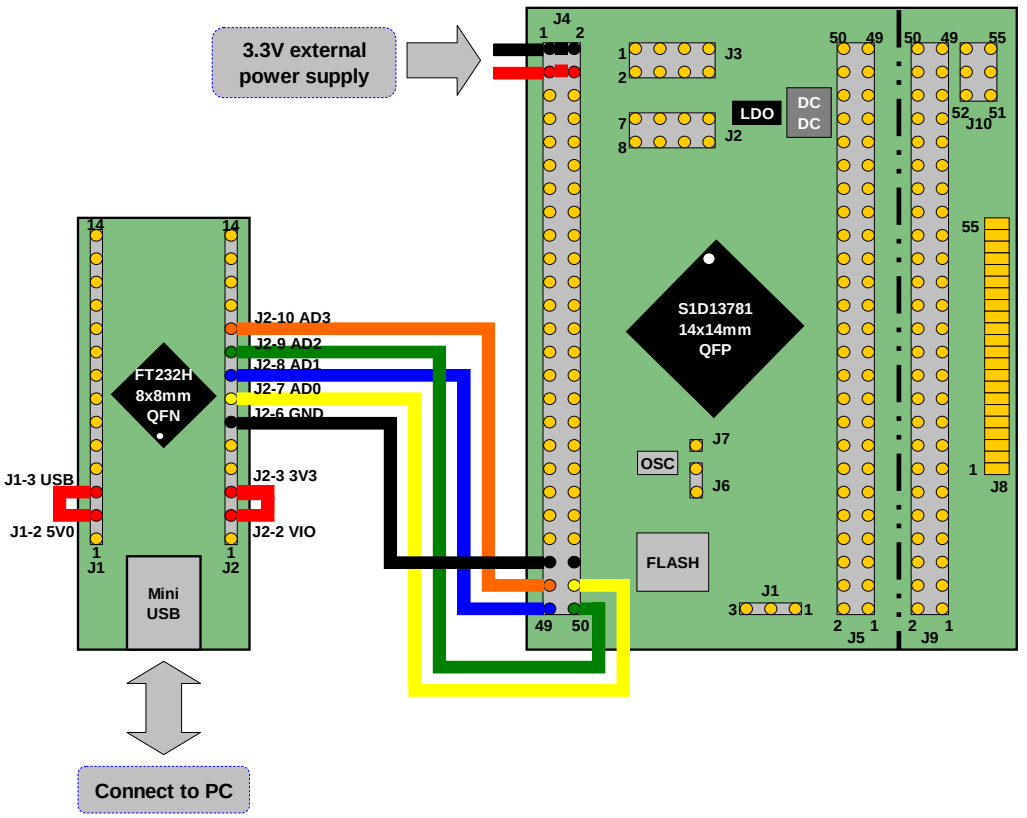
The firmware for the STM32 VL-Discovery is written using “IAR Embedded Workbench for ARM, 6.30, 32K Kickstart Edition” from IAR systems.

3.2 Write Image Data into Flash Memory

3.2.1 S5U13781R00C100 Connection with UM232H

A connection example for the S5U13781R00C100 reference board and the UM232H via SPI for writing image data into the M25P16 is described in Figure 3-1, *Connection with UM232H (via SPI)*.

If noise on the SPI signal causes problems, place a resistor of several hundred ohms between the S5U13781R00C100 and STM 32 VL-Discovery SPI port for the purpose of noise damping.



UM232				UM232		
JP-PIN	Name	FUNCTION		JP-PIN	Name	FUNCTION
J1-2	5V0	VREGIN	↔	J1-3	USB	5.0V OUT
J2-2	VIO	VCCIO IN	↔	J2-3	3V3	3.3V OUT

UM232				S5U13781		
JP-PIN	Name	FUNCTION		JP-PIN	Name	FUNCTION
J2-3	3V3	3.3V OUT	↔	J1-2	VCC	FLASH-VCC IN
J2-6	GND	GND	↔	J4-45	GND	GND
J2-7	AD0	MPSSE/SK	↔	J4-48	SCK	FLASH SCK IN
J2-8	AD1	MPSSE/DO	↔	J4-49	MOSI	FLASH DATA IN
J2-9	AD2	MPSSE/DI	↔	J4-50	MISO	FLASH DATA
J2-10	AD3	MPSSE/CS	↔	J4-47	SCS#	FLASH CS IN

3.3V external power supply	S5U13781		
	JP-PIN	Name	FUNCTION
→	J4-1	GND	GND
→	J4-2	GND	GND
→	J4-3	VDDIO	3.3V IN
→	J3-4	VDDDCDC	3.3V IN

Figure 3-1 Connection with UM232H (via SPI)

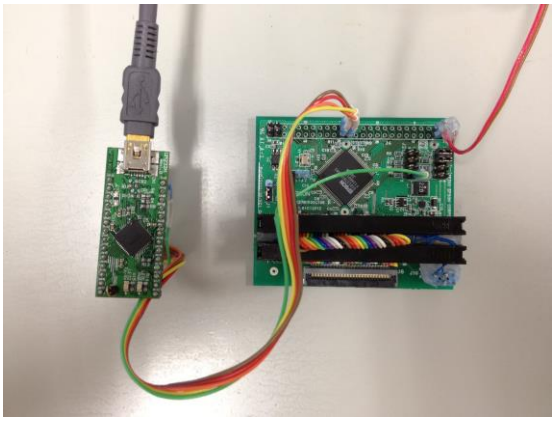
3.2.2 Procedure for Writing Image Data into Flash Memory

This section describes the image data writing procedure to the M25P16 (SPI flash ROM) for the demo using the T-55343GD035JU-LW-ADN (3.5 inch, 320x240 dot, 24-bit full color TFT LCD panel from OPTREX).

To start, connect the S5U13781R00C100 reference board to the UM232H via SPI, and connect the UM232H to the PC via USB.

See Section 3.2.1, Connection with UM232H (Control S1D13781 via SPI), for connection information.

Unzip and apply the UM232H driver prepared in Section 2.1, Instruction for tool download and install.

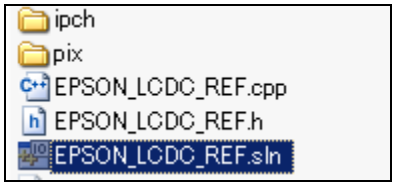


Note: the S5U13781R00C100 requires an external power supply.

↓

Launch the project file for Visual C++ 2010 Express.

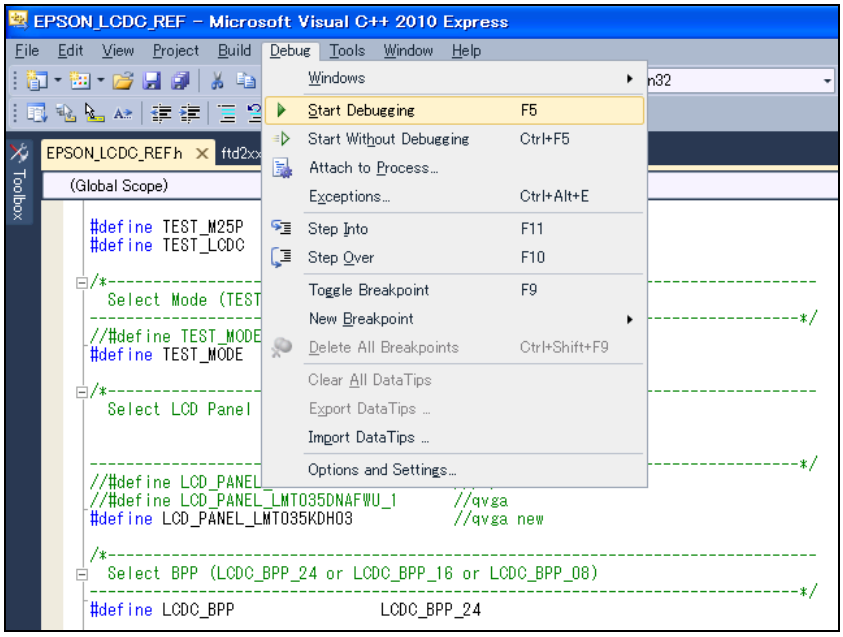
Double click the “EPSON_LCDC_REF.sln” icon in the project folder for writing M25P16: “flash_qvga” which is prepared at 2-3-(2): “Preparation for writing data into flash memory”.



↓

Proceed with writing data to the M25P16.

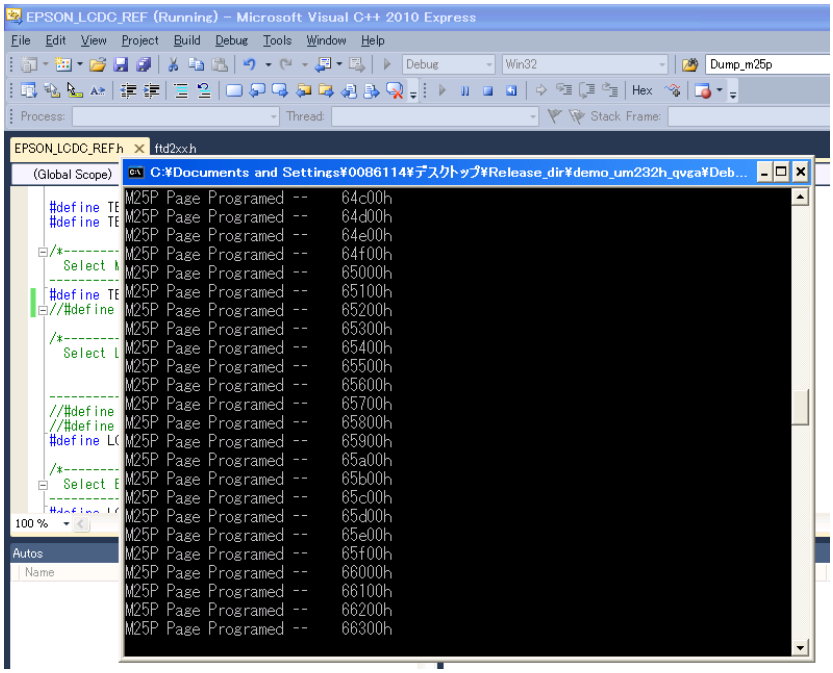
Select “Debug” from the menu → “Start Debugging” from the sub menu.



Here, if the window opens which asks “This project is changed. Will you build?”, select “Yes”.

↓

A command window is opened and the data write starts.

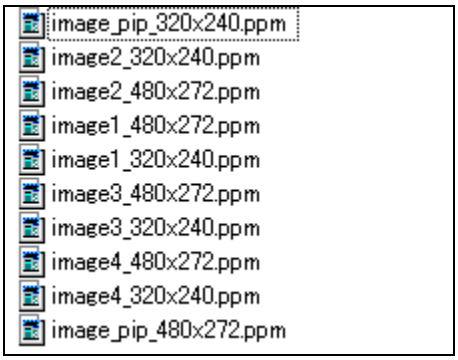


*It may take several minutes (up to 10) to write the Epson logo image and the four photo images. Once writing completes, the command window will be closed automatically.

Supplemental information

The Epson logo image and four photograph images data are on the PC and have a color depth of 24bpp.

The stored folder is “flash_qvga\pix” or “flash_psp\pix”



The software writes each image to the M25P16 in the format used for the demo.

Epson logo (PIP window): Written as 16bpp image data
Four photo images (Main window): Written as 24bpp image data

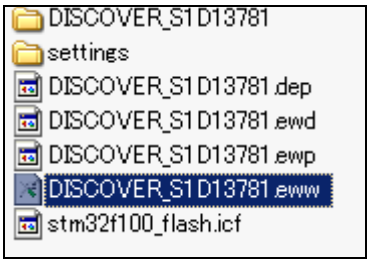
3.3 Write Demo Sample Software into STM32 VL-Discovery

Connect the STM32 VL-Discovery to the PC via USB.

↓

Launch the project file for IAR Embedded Workbench.

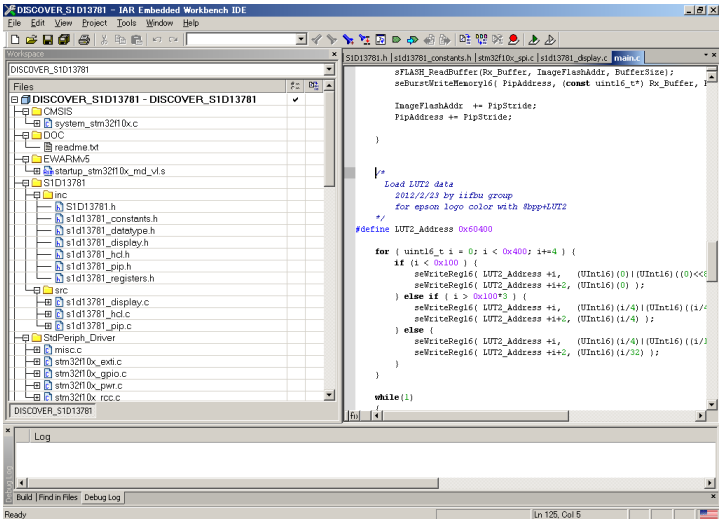
Double click “DISCOVER_S1D13781.eww” located in the project folder: “\demo_stm32vl_qvga\STM32F10x_StdPeriph_Lib_V3.5.0\Project”.



Here, if the window opens which states “Can not open this file”, then launch “IAR Embedded Workbench” from the Windows start menu.

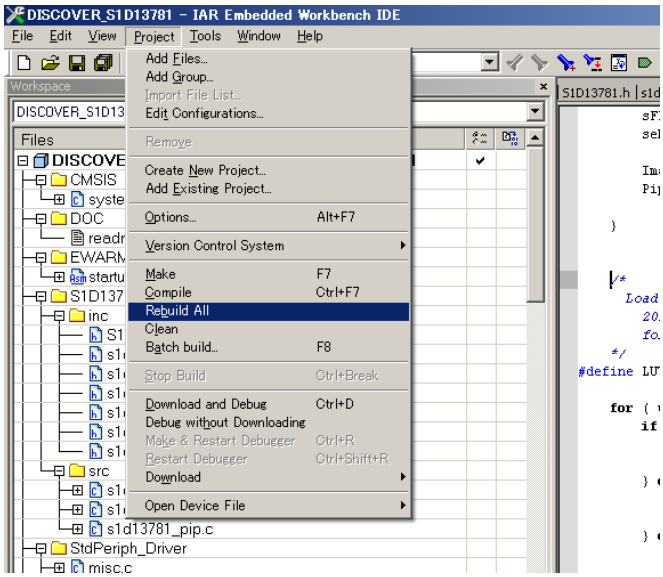
↓

EWARM is launched and project file is opened.



Build the project file.

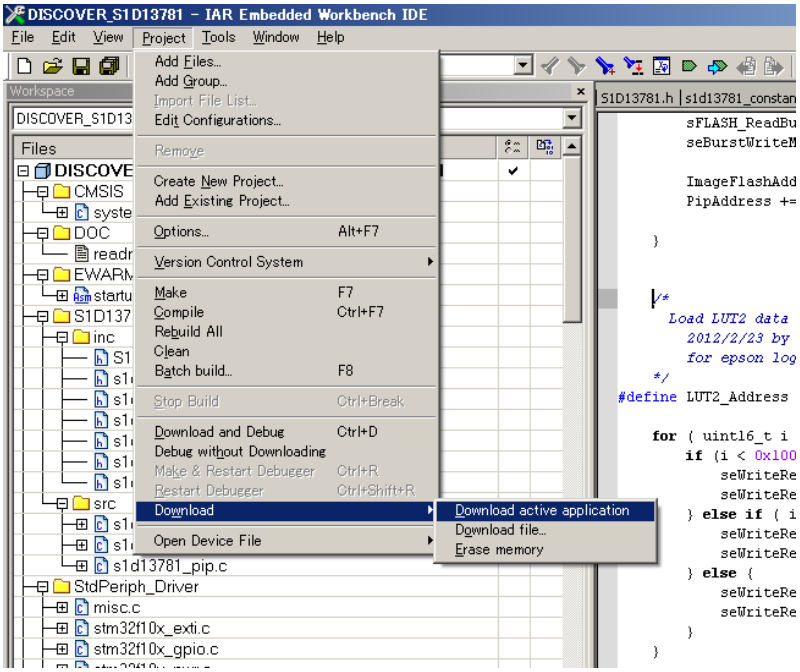
Select “Project” from the menu → “Rebuild All” from the sub menu.



↓

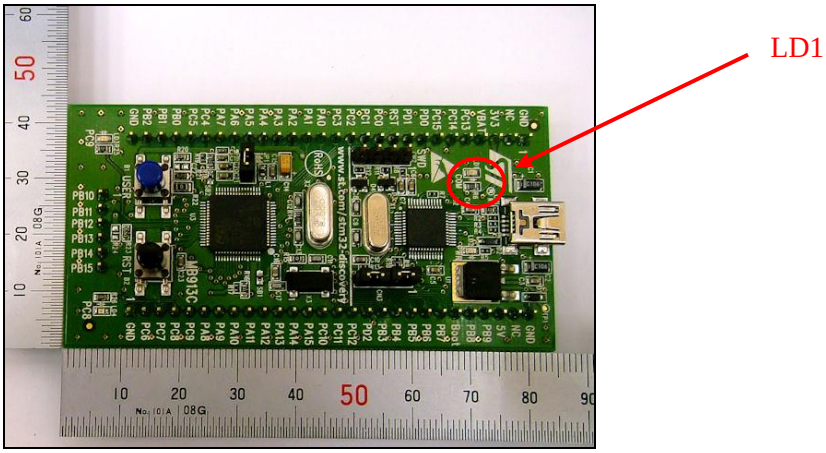
Download the code to the STM32 VL-Discovery and write it into Flash.

Select “Project” from the menu → “Download” from the sub menu → “Download active application”



↓

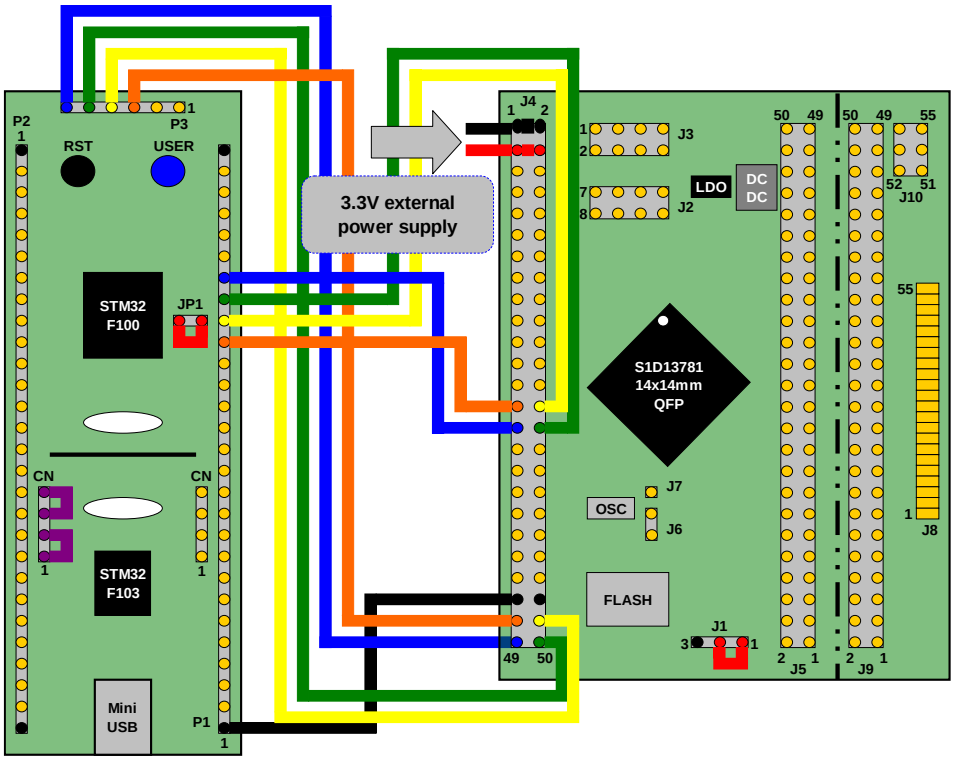
The red LED (LD1) blinks and the code will be written.



3.4 Connect the S5U13781R00C100 with the STM32 VL-Discovery

A connection example for the S5U13781R00C100 reference board and the STM32 VL-Discovery via SPI is shown in Figure 3-2, *Connection Example for STM32VL-Discovery (via SPI)*.

If noise on the SPI signal causes problems, place a resistor of several hundred ohms between the S5U13781R00C100 and STM 32 VL-Discovery SPI port for the purpose of noise damping.



STM32VLD				STM32VLD		
JP-PIN	Name	FUNCTION		JP-PIN	Name	FUNCTION
JP1-1	IDD	IDD	↔	JP1-2	IDD	IDD
CN3-1	SWD	SWD	↔	CN3-2	SWD	SWD
CN3-3	SWD	SWD	↔	CN3-4	SWD	SWD

S5U13781				S5U13781		
JP-PIN	Name	FUNCTION		JP-PIN	Name	FUNCTION
J1-1	VDDIO	VDDIO	↔	J1-2	VCC	FLASH-VCC IN

STM32VLD				S5U13781		
JP-PIN	Name	FUNCTION		JP-PIN	Name	FUNCTION
P1-1	GND	GND	↔	J4-45	GND	GND
P1-19	PA4	SPI1_NSS	↔	J4-27	SCS#	SPI CS IN
P1-20	PA5	SPI1_SCK	↔	J4-28	SCK	SPI SCK IN
P1-21	PA6	SPI1_MISO	↔	J4-30	MISO	SPI DATA OUT
P1-22	PA7	SPI1_MOSI	↔	J4-29	MOSI	SPI DATA IN
P3-3	PB12	SPI2_NSS	↔	J4-47	SCS#	FLASH CS IN
P3-4	PB13	SPI2_SCK	↔	J4-48	SCK	FLASH SCK IN
P3-5	PB14	SPI2_MISO	↔	J4-50	MISO	FLASH DATA
P3-6	PB15	SPI2_MOSI	↔	J4-49	MOSI	FLASH DATA IN

3.3V external power supply	S5U13781		
	JP-PIN	Name	FUNCTION
↔	J4-1	GND	GND
↔	J4-2	GND	GND
↔	J4-3	VDDIO	3.3V IN
↔	J3-4	VDDDCDC	3.3V IN

Figure 3-2 Connection Example for STM32VL-Discovery (via SPI)

3.5 Connect the S5U13781R00C100 with LCD Panel

This section describes the TFT panel connection to the S5U13781R00C100 reference board using the T-55343GD035JU-LW-ADN.

The T-55343GD035JU-LW-ADN is a 3.5 inch, 320x240 dot, 24-bit full color TFT LCD panel from OPTREX.

A connection example between the S5U13781R00C100 reference board and the T-55343GD035JU-LW-ADN is shown in Figure 3-3, *T-55343GD035JU-LW-ADN Connection Example*.

Table 3-1, *T-55343GD035JU-LW-ADN Connection Example (1 of 2)*, and Table 3-2, *T-55343GD035JU-LW-ADN Connection Example (2 of 2)*, show detailed connection information for each signal.

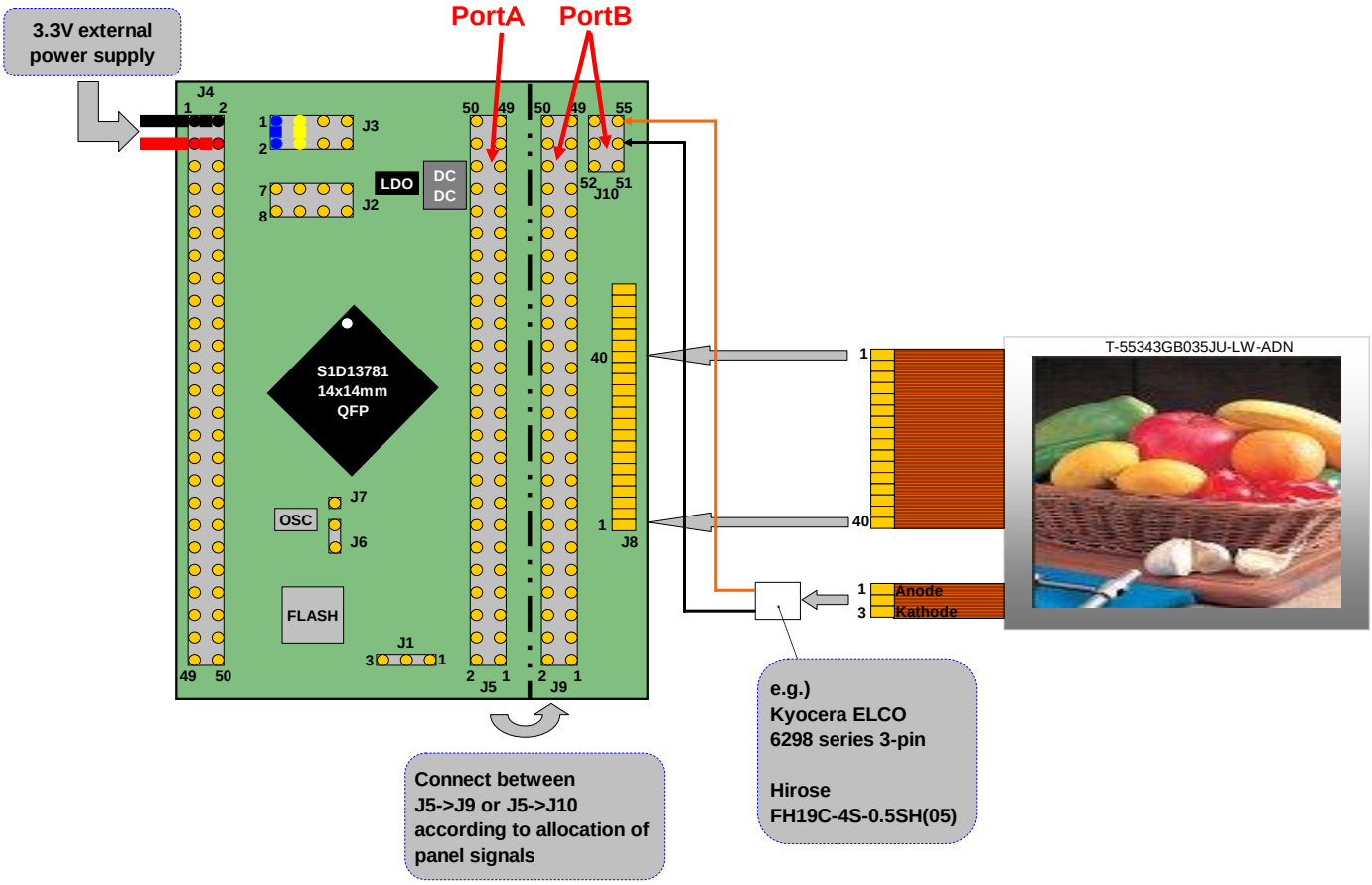


Figure 3-3 T-55343GD035JU-LW-ADN Connection Example

Table 3-1 T-55343GD035JU-LW-ADN Connection Example (1 of 2)

S5U13781R00C100 reference board				T-55343GD035JU TFT panel	
Pin name	PortA	→	PortB	Pin name	Pin number
GND	J5-1	→	J9-3	GND	CN1-38
-	-	→	J9-35	ENABLE	CN1-6
PCLK	J5-6	→	J9-38	DOTCLK	CN1-3
GND	J5-7	→	J9-17	GND	CN1-24
PDT0	J5-9	→	J9-9	DB0	CN1-32
PDT1	J5-10	→	J9-10	DB1	CN1-31
PDT2	J5-11	→	J9-11	DB2	CN1-30
PDT3	J5-12	→	J9-12	DB3	CN1-29
PDT4	J5-13	→	J9-13	DB4	CN1-28
PDT5	J5-14	→	J9-14	DB5	CN1-27
PDT6	J5-15	→	J9-15	DB6	CN1-26
PDT7	J5-16	→	J9-16	DB7	CN1-25
PDT8	J5-17	→	J9-18	DB8	CN1-23
PDT9	J5-18	→	J9-19	DB9	CN1-22
PDT10	J5-19	→	J9-20	DB10	CN1-21
PDT11	J5-20	→	J9-21	DB11	CN1-20
PDT12	J5-21	→	J9-22	DB12	CN1-19
PDT13	J5-22	→	J9-23	DB13	CN1-18
PDT14	J5-23	→	J9-24	DB14	CN1-17
PDT15	J5-24	→	J9-25	DB15	CN1-16
PDT16	J5-25	→	J9-27	DB16	CN1-14
PDT17	J5-26	→	J9-28	DB17	CN1-13
PDT18	J5-27	→	J9-29	DB18	CN1-12
PDT19	J5-28	→	J9-30	DB19	CN1-11
PDT20	J5-29	→	J9-31	DB20	CN1-10
PDT21	J5-30	→	J9-32	DB21	CN1-9
PDT22	J5-31	→	J9-33	DB22	CN1-8
PDT23	J5-32	→	J9-34	DB23	CN1-7
VDDIO	J5-39	→	J9-2	VCC	CN1-39
LED+	J5-46	→	J10-55	LED_A	CN2-1
LED-	J5-48	→	J10-53	LED_K	CN2-3
GND	J5-50	→	J9-26	GND	CN1-15
HS	J5-4	→	J9-36	HSYNC	CN1-5
VS	J5-3	→	J9-37	VSYNC	CN1-4
VDDIO	J5-40	→	J9-1	VCC	CN1-40
GPIO0	J5-33	→	J9-8	SDI	CN1-33
GPIO1	J5-34	→	J9-7	SCL	CN1-34
GPIO2	J5-35	→	J9-6	CS	CN1-35
GPIO3	J5-36	→	J9-4	SDO	CN1-37
RESET#	J2-8	→	J9-5	RESET	CN1-36
VDDIO	J5-39	→	J9-40	RL	CN1-1
VDDIO	J5-39	→	J9-39	TB	CN1-2

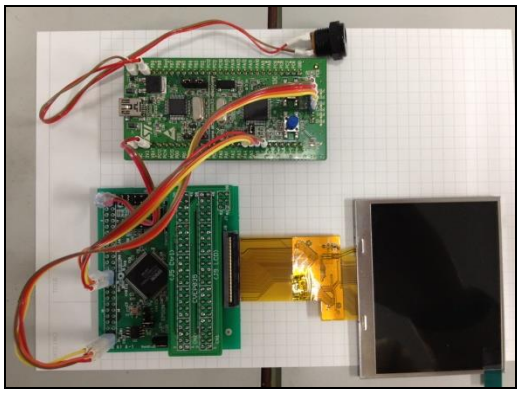
Table 3-2 T-55343GD035JU-LW-ADN Connection Example (2 of 2)

S5U13781R00C100 reference board	Description
Connect J3-1 and J3-2	Set DC-DC converter enable
Connect J3-3 and J3-4	Set DC-DC converter output current = 20mA
Connect GND of power source to J4-1and J4-2	Connect power source GND
Connect 3.3V of power source to J4-3 and J4-4	Connect power source 3.3V to VDDIO and VDDDCDC

3.6 Running Demo

Connect the S5U13781R00C100 with the STM32VL-Discovery and T-55343GD035JU-LW-ADN

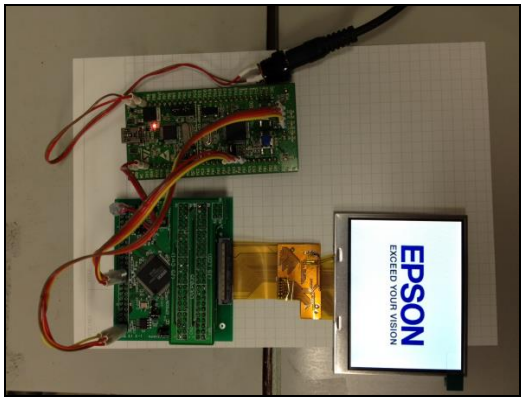
Refer to Section 3.4, Connect the S5U13781R00C100 with the STM32 VL-Discovery, and Section 3.5, Connect the S5U13781R00C100 with LCD Panel, for further information.



Connection image

Power ON starts the demo

Supplying power to the STM32 VL-Discovery (from USB or 5V external power supply) and to the S5U13781R00C100 (from 3.3V external power supply) starts the demo automatically.



Connection image

The demo proceeds as shown in figure 3-4, *Demo Flow Diagram.*

The Epson logo (PIP window) and photo image (Main window) will alternately be changed. The Epson logo will be overlaid on the photo image and repeats fade-in and fade-out.

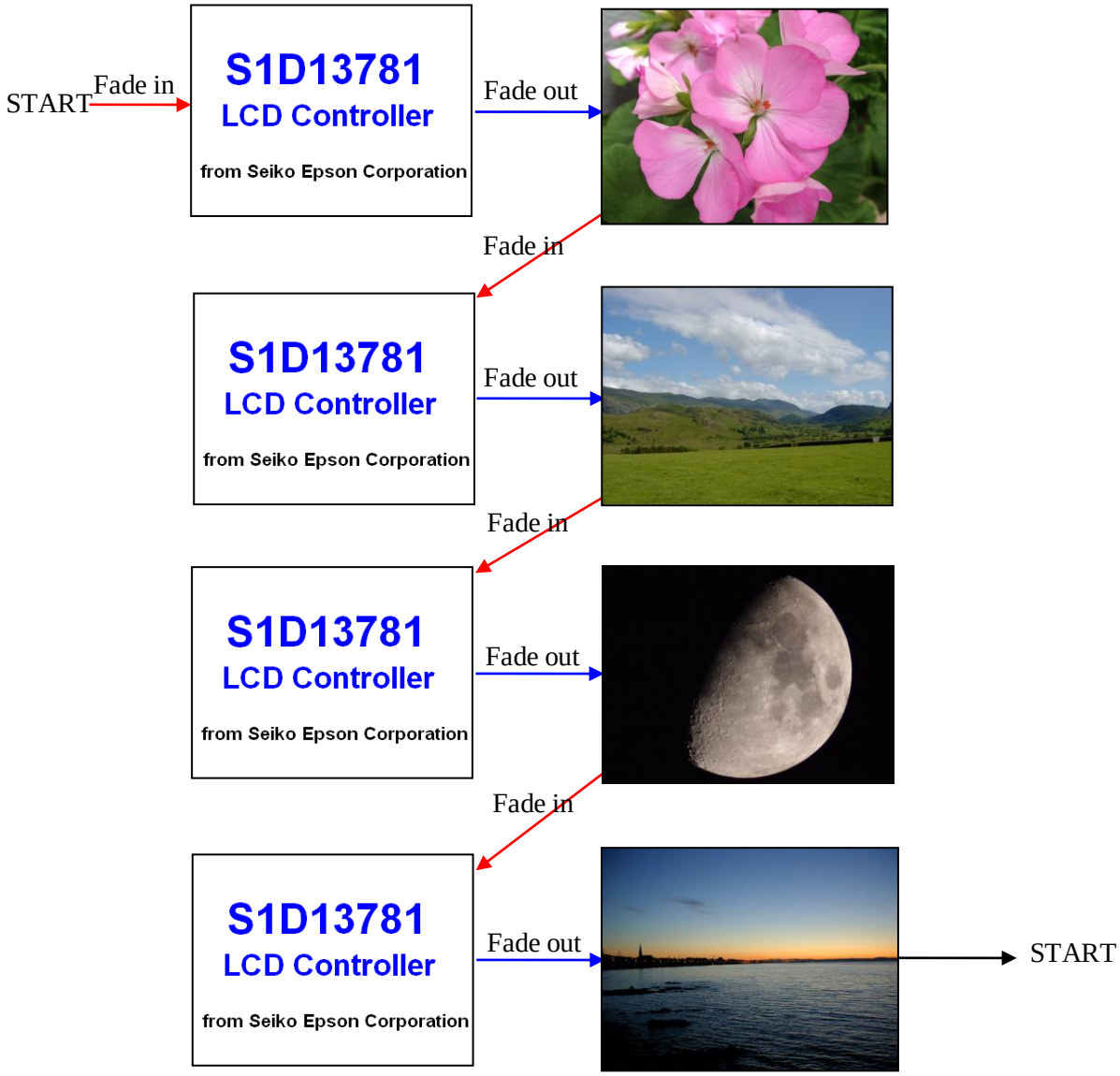


Figure 3-4 Demo Flow Diagram

Here, the display image data of the Epson logo is in 16bpp and the photo image is 24bpp.

Using the above data formats enables S1D13781 to process display with its built-in 384kbytes SRAM.

4 Explanation of the Demo using PC

This section describes display demo using the UM232H USB-SPI conversion board connected to PC.

Hardware configuration for the demo is shown in the following figure.

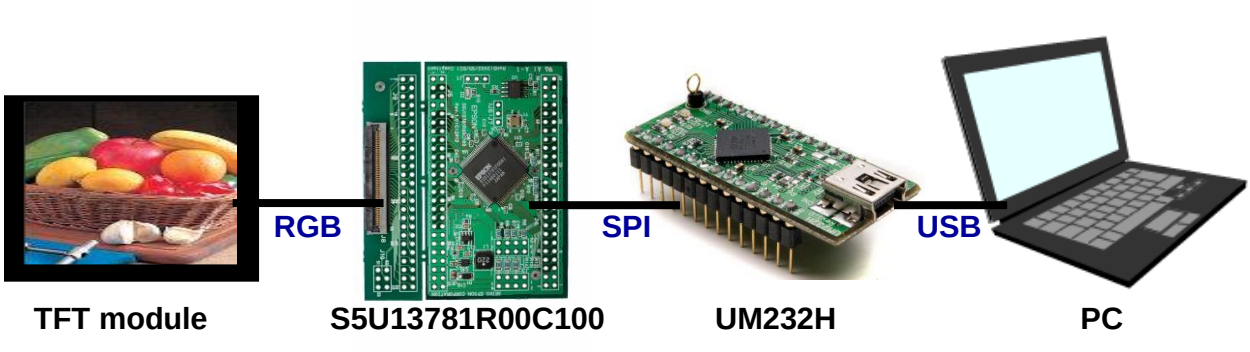


Figure 4-1 Constitution of Display Demo using a PC

For this demo, the display system consists of the following hardware.

PC
LCD controller: S5U13781R00C100 reference board
USB-SPI conversion board: UM232H
T-55343GD035JU-LW-ADN from OPTREX
(3.5 inch, 320x240 dots, 24 bit full color TFT panel)

The demo is as follows.

1. Color gradation bar display demo using the S1D13781 2D BitBLT feature
2. Still image display

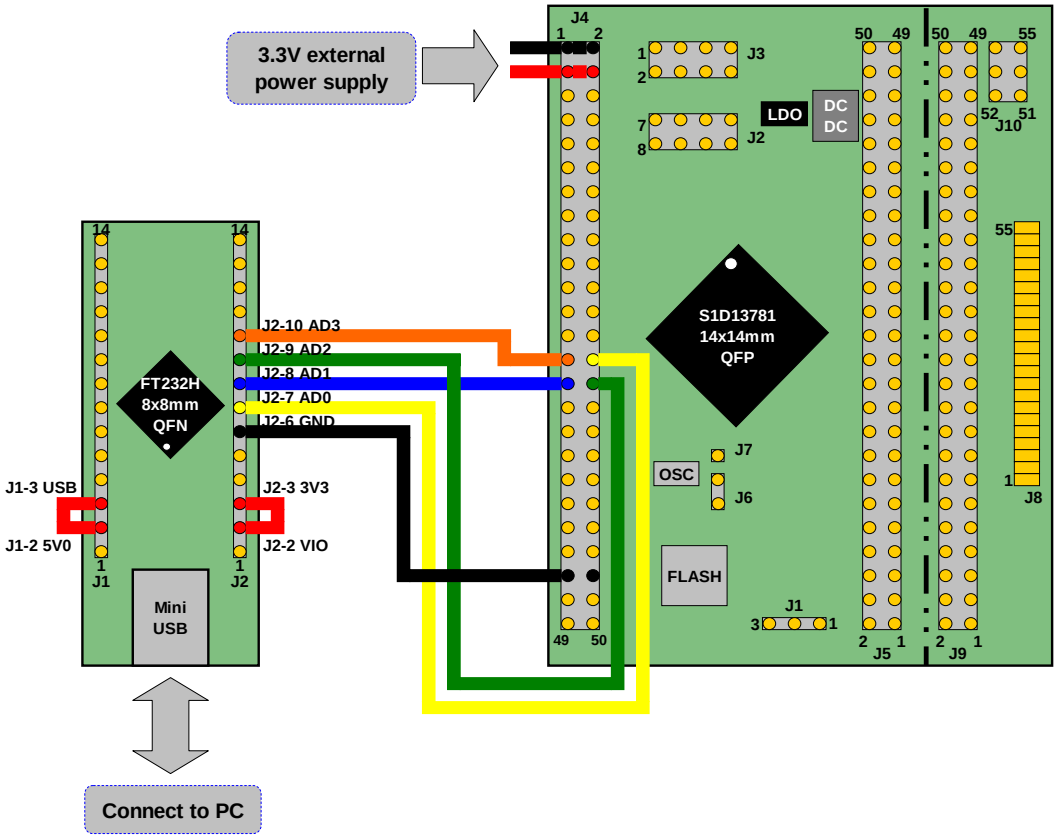
In this demo, a PPM format image stored in a PC will be used as the demo still image.

The sample project provided on the EPSON web site is verified in its compilation and operation with Microsoft Visual C++ 2010 Express compiled.

4.1 Connection with USB Serial Conversion Board: UM232H (Control S1D13781 via SPI)

A connection example to control the S1D13781 by connecting the S5U13781R00C100 reference board and the UM232H via SPI is described in Figure 4-2, *Connecting the UM232H to S1D13781 via SPI*.

If noise on the SPI signal causes problems, place a resistor of several hundred ohms between the S5U13781R00C100 and STM 32 VL-Discovery SPI port for the purpose of noise damping.



UM232				UM232	
JP-PIN	Name	FUNCTION		JP-PIN	Name	FUNCTION
J1-2	5V0	VREGIN	↔	J1-3	USB	5.0V OUT
J2-2	VIO	VCCIO IN	↔	J2-3	3V3	3.3V OUT

UM232				S5U13781		
JP-PIN	Name	FUNCTION		JP-PIN	Name	FUNCTION
J2-6	GND	GND	↔	J4-45	GND	GND
J2-7	AD0	MPSSE/SK	↔	J4-28	SCK	SPI SCK IN
J2-8	AD1	MPSSE/DO	↔	J4-29	MOSI	SPI DATA IN
J2-9	AD2	MPSSE/DI	↔	J4-30	MISO	SPI DATA OUT
J2-10	AD3	MPSSE/CS	↔	J4-27	SCS#	SPI CS IN

3.3V external power supply	S5U13781		
	JP-PIN	Name	FUNCTION
→	J4-1	GND	GND
→	J4-2	GND	GND
→	J4-3	VDDIO	3.3V IN
→	J3-4	VDDDCDC	3.3V IN

Figure 4-2 Connecting the UM232H to S1D13781 via SPI

4.2 Connection with LCD panel

See Section 3.5, Connect the S5U13781R00C100 with LCD panel, for further information.

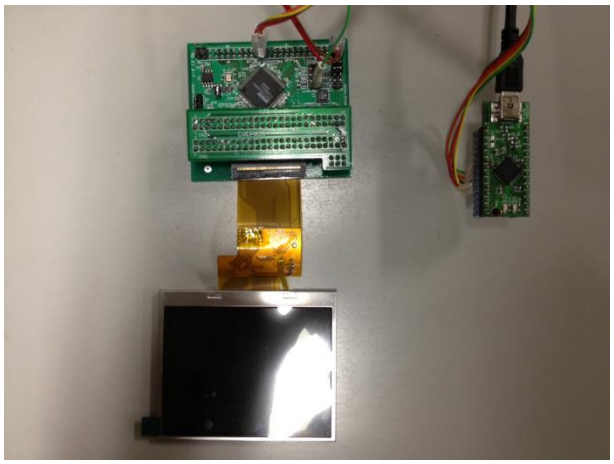
4.3 Displaying an Image on LCD

Displaying an still image using T-55343GD035JU-LW-ADN (3.5 inch, 320x240 dots, 24 bit full color TFT panel) from OPTREX

Connect the S5U13781R00C100 reference board and the UM232H via SPI and connect the UM232H to PC via USB.

See Section 4.1, Connection with UM232H (Control S1D13781 via SPI), for connection information.

Unzip and apply the UM232H driver prepared in Section 2.1, Instruction for Tool Download and Install.



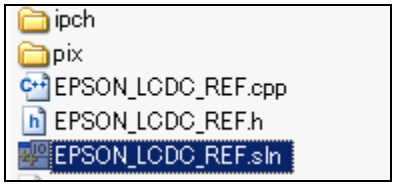
Connection image

↓

Launch project file for Visual C++ 2010 Express.

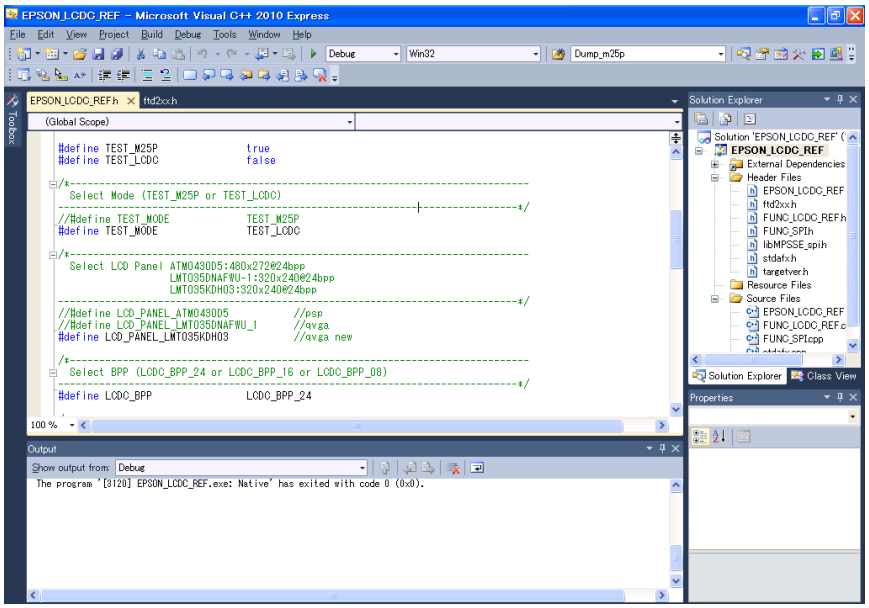
Double click the “EPSON_LCDC_REF.sln” icon in the UM232H demo project folder: “demo_um232h_qvga” prepared at 2-3-(3): “Preparation for display demo using PC”.

↓



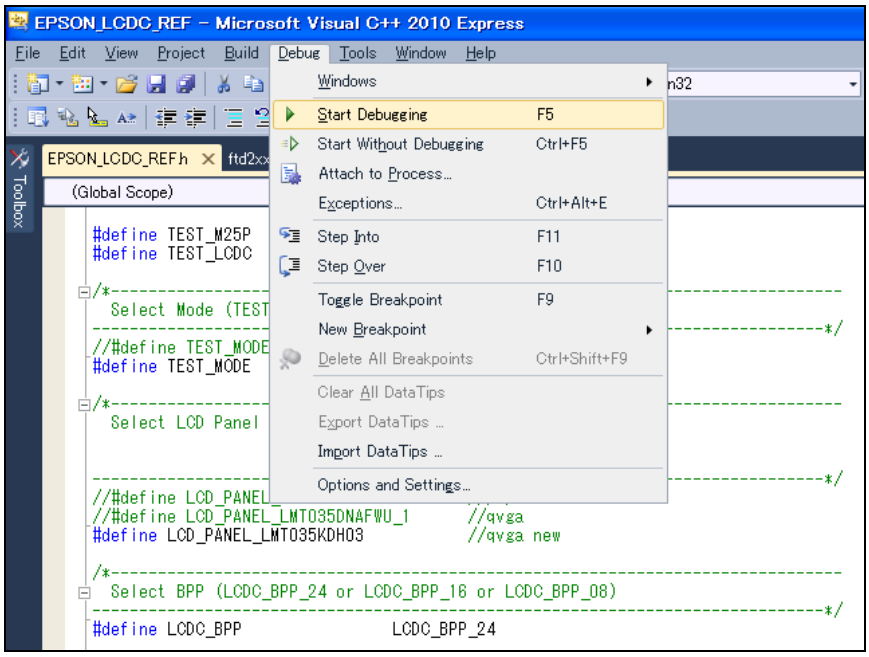
↓

The Visual C++ 2010 Express window is opened.



↓

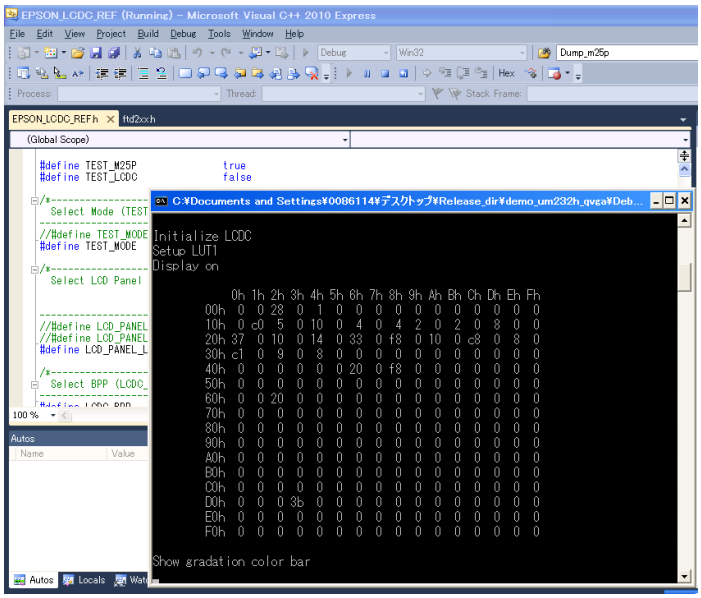
Start the demo by selecting “Debug” from the menu → “Start Debugging” from the sub menu



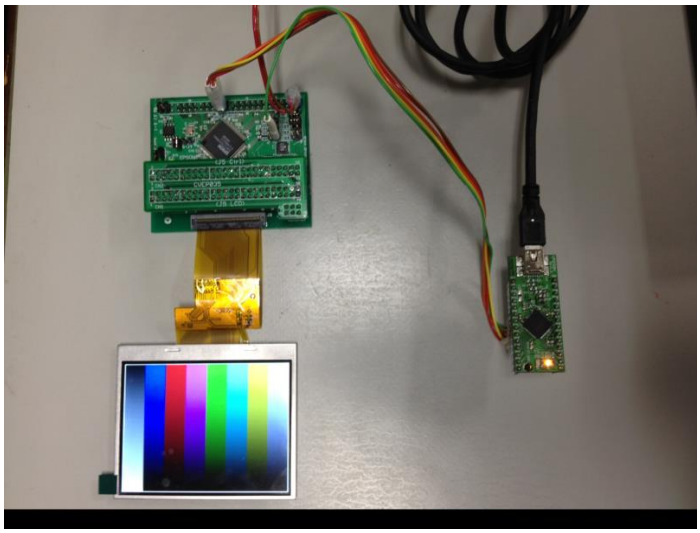
Here, if the window opens which asks “This project is changed. Will you build?”, select “Yes”.

↓

A command window is opened and the data write starts.



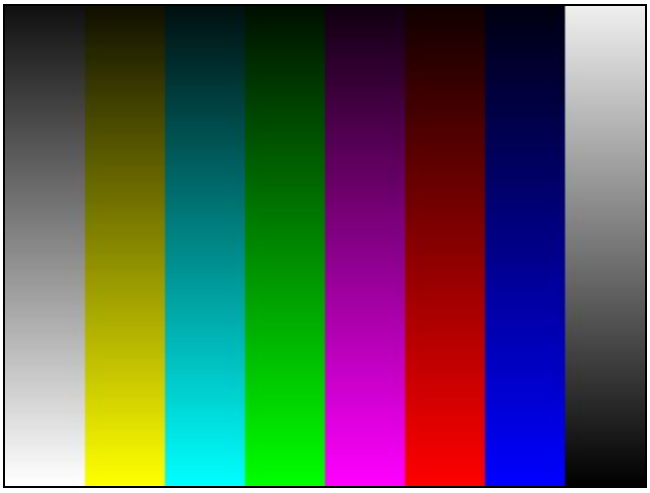
↓



Connection image

This demo displays the image on the LCD in the following order.

(1) Color gradation bar image using 2D BitBLT feature



↓

(2) Displays the image “image1_320x240.ppm” located in the folder “demo_um232h_qvga\pix”.

↓

Return to (1)

5 Change Record

X94A-G-005-01 Revision 1.3 - Issued: April 9, 2018

- Maintenance update to fix contacts/addresses and some minor formatting

X94A-G-005-01 Revision 1.2 - Issued: January 15, 2013

- Section 2.1 Instruction for Tool Download and Install – changes URL to item 1, IAR Embedded Workbench for ARM .
- Section 3.2 Write Image Data into Flash Memory – changes figure 3-1. Connection with UM232H (via SPI)
- Section 3.6 Running demo – changes photos of figure 3-4. Demo flow diagram.
- Section 4.3 Displaying an Image on LCD – changes photo of Demo flow diagram.

X94A-G-005-01 Revision 1.1 - Issued: April 11, 2012

- Section 2.1 Instruction for Tool Download and Install – changes to item 3, Microsoft™ Visual C++ 2010 Express from Microsoft.
- Section 3.3 Write Demo Sample Software into STM32 VL-Discovery – change the folder inpargraph “Double click “DISCOVER_S1D13781.eww” located in the project folder…”

X94A-G-005-01 Revision 1.0 - Issued: March 26, 2012

- Re-format and edit document

6 Sales and Technical Support

For more information on Epson Display Controllers, visit the Epson Global website.

https://global.epson.com/products_and_drivers/semicon/products/display_controllers/

For Sales and Technical Support, contact the Epson representative for your region.

https://global.epson.com/products_and_drivers/semicon/information/support.html