

S5U13781R00C100 Demonstration Manual

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

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Table of Contents

1	1 Introduction					
	1.1	General Description	5			
	1.2	Terminology	5			
	1.3	Required Materials for Demonstration System	6			
2	Pre	paration of Demo	8			
2	2.1	Instruction for Tool Download and Install	8			
	2.2	Instruction for Demo Sample Software Download	9			
2	2.3	Unzip Downloaded Files	10			
3	Exp	lanation of the Demo using STM32 VL-Discovery	13			
	3.1	Summary	13			
	3.2	Write Image Data into Flash Memory	14			
	3.2.	1 S5U13781R00C100 Connection with UM232H	14			
	3.2.	2 Procedure for Writing Image Data into Flash Memory	15			
	3.3	Write Demo Sample Software into STM32 VL-Discovery	18			
	3.4	Connect the S5U13781R00C100 with the STM32 VL-Discovery	21			
	3.5	Connect the S5U13781R00C100 with LCD Panel	22			
	3.6	Running Demo	24			
4	Exp	lanation of the Demo using PC	26			
4	4.1	Connection with USB Serial Conversion Board: UM232H (Control S1D13781 via SPI)	27			
4	4.2	Connection with LCD panel	28			
4	4.3	Displaying an Image on LCD	28			
5	Cha	ange Record	32			
6	Sale	es and Technical Support	33			

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 InterfaceLUT: Look Up Tableppm format: portable pixmap formatbpp: bits per pixelURL: Uniform Resource LocatorPIP: Picture In PictureLED: 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. <<u>http://www.st.com/internet/com/SOFTWARE_RESOURCES/SW_COMPONENT/FIRMWARE/stm32f</u> 10x_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 <u>EPSON LCDC reference Web site</u>.

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.
- Move folder "S1D13781" to the following folder.
 "\demo_stm32vl_qvga\STM32F10x_StdPeriph_Lib_Vx.x.xLibraries"



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 MPSSE library from FTDI			
⊢ libMPSSE.a				
─ libMPSSE.h	MPSSE header file from FTDI			
– ftd2xx.h	D2XX header file from FTDI			
– pix	Directory for demo image data			
···	Demo image data for PSP panel (in PPM format)			
<i>⊢ image*_320x240.ppm</i>	Demo image data for QVGA panel (in PPM format)			

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 gyga 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 Demo image data for PSP panel (in PPM format) image*_480x272.ppm Demo image data for QVGA panel (in PPM format) image*_320x240.ppm 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.



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".



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Proceed with writing data to the M25P16.

ile <u>E</u> dit <u>V</u> iew <u>P</u> roject <u>B</u> uil	d <u>D</u> eb	u <mark>g T</mark> ools <u>W</u> indow <u>H</u> elp			
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□ • • • • • • • • • • • • • • • • • • •	2 🕨	<u>S</u> tart Debugging	F5		
	=⊳	Start Without Debugging	Ctrl+F5		
	÷ 🗟	Attach to <u>P</u> rocess			
(Global Scope)	_	E <u>x</u> ceptions	Ctrl+Alt+E		_
#define TEST_M25P	S	Step Into	F11		
#define TEST_LCDC	Ç⊒	Step <u>O</u> ver	F10		
≓/*	ан 8 т	Toggle Breakpoint	F9		-
		New Breakpoint		•	_
//#define TEST_MO #define TEST_MODE	DE 🔊	Delete All Breakpoints	Ctrl+Shift+F9		
- /*		Clear <u>A</u> ll DataTips			
Select LCD Pane		E <u>x</u> port DataTips			
		Import DataTips			
		Options and Settings			-;
//#define LCD_PAN //#define LCD_PAN #define LCD_PANEL	EL_LM1 _LMT03	TO35DNAF₩U_1 //qvga 35KDHO3 //qvga	a new		
/* ⊟ Select BPP (LCD	C_BPP	24 or LCDC_BPP_16 or LC	DC_BPP_08)		
ttdefine LCDC BPP					_;

Select "Debug" from the menu \rightarrow "Start Debugging" from the sub menu.

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

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A command window is opened and the data write starts.

EPSON_LCDC	_REF (Running) – Microsoft \	∕isual C++ 2010 Exp	ress		
jile <u>E</u> dit <u>V</u> iew	<u>Project B</u> uild <u>D</u> ebug <u>T</u> ools <u>V</u>	⊻indow <u>H</u> elp			
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EPSON_LCDC_REF	ftd2xxh				
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Hulad Lass TE	M25P Page Programed	64c00h			-
define TF	M25P Page Programed	64d00h			
	M25P Page Programed	64e00h			
⊜/*	M25P Page Programed	64f00h			
Select	M25P Page Programed	65000h			
#define TE	M25P Page Programed	65100h			
⊨ //#define	M25P Page Programed	65200h			
14	M25P Page Programed	65300h			
Select L	M25P Page Programed	65400h			
	M25P Page Programed	65500h			
	M25P Page Programed	65600h			
//ttdefine	M25P Page Programed	65700h			
//#define	M25P Page Programed	65800h			_
#define LC	M25P Page Programed	65900h			
/*	M25P Page Programed	65a00h			
Select E	M25P Page Programed	65b00h			
L	M25P Page Programed	65c00h			
100 % + C	M25P Page Programed	65d00h			
	M25P Page Programed	65e00h			
Autos	M25P Page Programed	65f00h			
Name	M25P Page Programed	66000h			
	M25P Page Programed	66100h			
	M25P Page Programed	66200h			
	M25P Page Programed	66300h			

*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"

🗾 image_pip_320x240.ppm	
📷 image2_320x240.ppm	
🛅 image2_480x272.ppm	
🛅 image1_480x272.ppm	
🛅 image1_320x240.ppm	
🛅 image3_480x272.ppm	
📷 image3_320x240.ppm	
🛅 image4_480x272.ppm	
🛅 image4_320x240.ppm	
📷 image_pip_480x272.ppm	

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.



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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".

DISCOVER_S1D13781
🛅 settings
🔂 DISCOVER_S1D13781.dep
DISCOVER_S1D13781.ewd
DISCOVER_S1D13781.ewp
DISCOVER_S1D13781.eww
🖻 stm32f100_flash.icf

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.

PISCOVER_S1D13781 - IAR Embedded Workbench IDE		X
Eile Edit View Project Tools Window Help		
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Workspace	×	S1D13781.h s1d13781_constants.h stm32f10x_spi.c s1d13781_display.c main.c **
DISCOVER_S1D13781	•	sFLASH ReadBuffer(Fx Buffer, ImageFlashAddr, BufferSize);
DISCOVER_SID13781 Files Files DISCOVER_SID13781 - DISCOVER_SID13781 DISCOVER_SID13781 - DISCOVER_SID13781 DISCOVER_SID13781 - DISCOVER_SID13781 DISCOVER_SID1378 DISCOVER_SID178 DISCOVER_SID178 DISCOVER_SID178 DISCOVER_SID1		<pre>S101370.1.1.101370_contents.0.1000_conc.0.101370_conc.0.101370_contents.0.10137</pre>
Herip SuPeriph_Diver HB (micc) HB		<pre>seVitieRegi6(UTI2_Address +1, (UTLi6)(1/A)(UTLi6)(1/A)</pre>
Log Log Log		2
Deate		1

Build the project file.

Select "Project" from the menu \rightarrow "Rebuild All" from the sub menu.

Eile Edit View Image: Contract of the second se	D13781 - IAR Embedded W Project Tools Window H Add Files Add Group Import File List	orkbench IDE	× 4 %	🍾 🏋 🛐 ⋑
DISCOVER_S1D13	Edit Configurations		_	sF
Files	Remo <u>v</u> e		8: 🗳 🔺	sei
	Create <u>N</u> ew Project Add <u>E</u> xisting Project			Im Pij
	Options	Alt+F7		,
FWARN	Version Control System	•		ĺ
	<u>M</u> ake <u>C</u> ompile	F7 Otrl+F7		V* Load
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	Stop Build	Ctrl+Break		#define LU
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-⊞ C s1ı	Open Device File	•		Í Í
Hand Barrier Hand Barrier Hand Barrier Hand Barrier Hand Barrier	113781_pip.c h_Driver			} •
	-	Ļ		•

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

Select "Project" from the menu \rightarrow "Download" from the sub menu \rightarrow "Download active application"

CISCOVER_S1D13781 - IAR Embedded Workbench IDE	
<u>File Edit View Project Tools Window H</u> elp	
Workspace Add Eiles Import File List Import File List DISCOVER_S1D13 Edit Configurations	▶ ♣> ♣ ♣ ♣ :1d13781_constan :sFLASH_ReadBu
Files Remoye St. 🛱 🔺	seBurstWriteM
□ □ DISCOVE □ □ CMSIS ↓ □ □ CMSIS Add Existing Project	ImageFlashAdd PipAddress +=
HE DOC Options Alt+F7	
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h S1 Download and Debug Ctrl+D h S1 Debug without Downloading i h S1 Nake & Restart Debugger Ctrl+R h S1 Restart Debugger Otrl+Shift+R	(uintl6_t i if (i < 0x100 seWriteRe seWriteRe
Download active application	else if (i
Download file	seWriteRe
Lase memory	seWriteRe
FQ StdPeriph_Driver	seWriteRe
	seWriteRe
)	}
[] sunscript_cri	

 \downarrow

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				STM3	2VLD
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
	S5U1	3781		S5U13781		
JP-PIN	Name	FUNCTION		JP-PIN	Name	FUNCTION
J1-1	VDDIO	VDDIO	↔	J1-2	VCC	FLASH-VCC IN
	-				-	
	STM3	2VLD			S5U1	3781
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
				S5U13781		
	,			JP-PIN	Name	FUNCTION
(\rightarrow	J4-1	GND	GND
	3.3	v external	→	J4-2	GND	GND
	pov	ver supply		J4-3	VDDIO	3.3V IN
			៸	.13-4	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

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

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



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".



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The Visual C++ 2010 Express window is opened.

EPSON_LCDC_REF - Microsoft Visual C++ 2010 Express												
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	#define TEST_LCDC false		🗈 📴 External Dependencies									
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	*/	/	- h ftd2xxh									
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	Select LCD Panel ATM0430D5:480x272024bpp	_	h stdatx.h									
	LMT0350MAFWU-1:320X2400240pp LMT035KDH03:320x2400240pp		Resource Files									
	//#define LCD PANEL ATM0430D5 //psp	/	EPSON_LCDC_REF									
	//#define_LCD_PANEL_LMT035DNAFWU_1 //qvga		- G FUNC_LODC_REF.c									
			Cull atdafy app									
	/# □ Select BPP (LCDC_BPP_24 or LCDC_BPP_16 or LCDC_BPP_08)		🖏 Solution Explorer 🏼 😫 Class View									
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Start the demo by selecting "Debug" from the menu \rightarrow "Start Debugging" from the sub menu

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		 #de	fine LC)C_BPP		LCDC_BPP_2				*/

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".



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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

