MLCD Transfer Sample Code (Using CMSIS Driver Package) for RE01 1500KB Group

R_PMIP Sample Code Using CMSIS Driver Package

Summary

This application note describes the MLCD Transfer sample code using the RE01 CMSIS driver package. The sample code can be found in the project delivered with this application note.

The overview of this sample code is shown in the table below.

Table Overview of Sample Code

Overview of Sample Code Operation	Peripheral Module Mainly Used	Driver Module Mainly Used
Output image data to parallel MIP LCD panel using PMIP driver. Input image data to the MLCD H/W using DMAC driver.	MLCD、LPM、DMAC	R_PMIP、R_LPM、R_DMAC

Target Device

Microcontroller：RE01 1500KB Group

Parallel MIP LCD (Monochrome)：TN0104ANVAANN-GN00 (Kyocera)

Note

When applying the sample code covered in this application note to another microcontroller, please modify the code according to the specifications for the target microcontroller and conduct an extensive evaluation of the modified program.

Contents

1. Specifications

1.1 Description of Project

A sample code project "an4883_hal_pmip_re" is provided with this application note.

“an4883_hal_pmip_re” project has been tested using the Evaluation Kit RE01 1500KB. This project is configured to match the settings of R7F0E015D2CFB mounted on the Evaluation Kit RE01 1500KB. When using another device, change the device settings in the project to those of the target device.

1.2 Pins used

The pins used by the sample code are shown in Table 1-1.

Table 1-1 Pins Used

Pin Used	Purpose of Use
P113	MLCD_VCOM
P112	MLCD_XRST
P111	MLCD_SCLK
P110	MLCD_DEN
P108	MLCD_ENBG
P109	MLCD_ENBS
P107	MLCD_SI[0]
P106	MLCD_SI[1]
P105	MLCD_SI[2]
P104	MLCD_SI[3]
P103	MLCD_SI[4]
P102	MLCD_SI[5]
P101	MLCD_SI[6]
P100	MLCD_SI[7]*

*When using pin, it is necessary to modify the Evaluation Kit RE01 1500KB.

2. Operating Conditions

The operation of the sample code provided with this application note has been tested under the following conditions (Table 2-1).

Table 2-1 Operating Conditions

Item	Description
Microcontroller used	R7F0E015D2CFB (RE E01 group)
Operating frequency	• System clock (ICLK): 2 MHz (MOCO) • Peripheral module clock A (PCLKA): 2 MHz (MOCO frequency is not divided) • Peripheral module clocks B(PCLKB): 2 MHz (MOCO frequency is not divided)
Operating voltage	3.3V
Target board	Evaluation Kit RE01 1500KB (Product type number: RTK70E015DSxxxxxBE)
Development environment / Compiler	IAR Embedded Workbench for ARM Version 8.32.1 C compiler：IAR C/C++ Compiler for ARM Version 8.32.1
	Renesas e² studio Version 7 C compiler：GCC ARM Embedded Version 6.3.1.20170620 GNU 6-2017-q2-update
Parallel MIP LCD panel	Kyocera TN0104ANVAANN-GN00
Version of CMSIS driver package	Rev1.00
Version of sample code	Rev1.00

3. Description of Software

The sample code performs the following operations using the drivers in the overview table.

1. Initialization settings
2. Output 176X176 bit image to the parallel MIP LCD panel（Figure 3-1(a)）
3. Wait for 1 second
4. Output black-and-white inverted image of image used in Step 2 to parallel MIP LCD panel（Figure 3-1(b)）
5. Wait for 1 second
6. Repeat from Step 2 to Step 5

(a) (b)

Figure 3-1 (a)Normal image display (b)Reversed image display

Figure 3-2 shows the flowchart of the sample code.

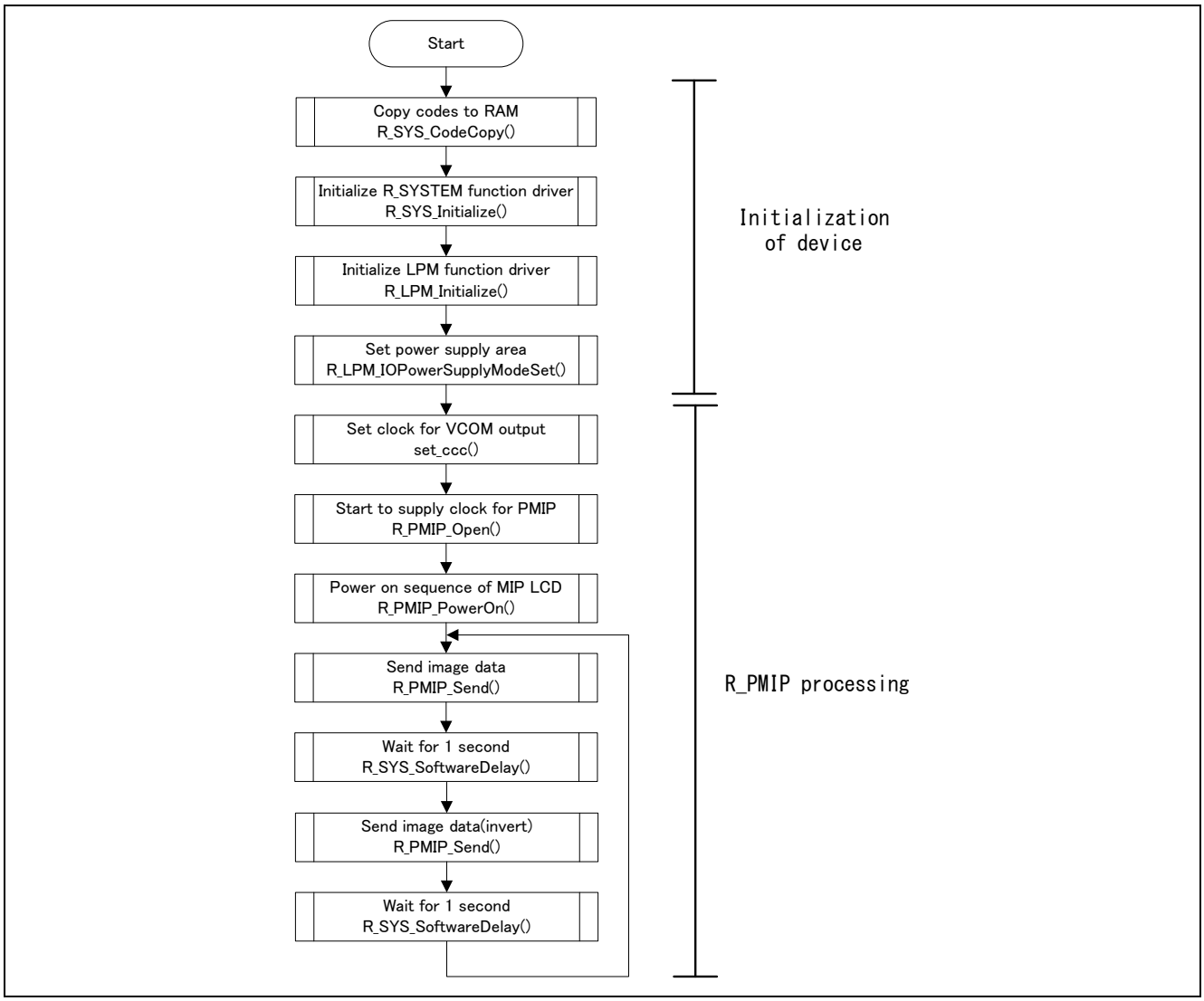

Figure 3-2 Flow of sample code

4. Modification of Evaluation Kit RE01 1500KB

MLCD_SI [7] is not connected by default in the Evaluation Kit RE01 1500KB main board (Figure 4-1). When using a parallel MIP LCD panel, solder a 0Ω resistor to R247 of the Evaluation Kit RE01 1500KB main board as shown in Table 4-1. For details, refer to the user's manual: Evaluation Kit RE01 1500KB main board layout.

Table 4-1 Evaluation Kit RE01 1500KB main board modifications

Modification point	Detail
R247	Solder a 0Ω resistor to R247

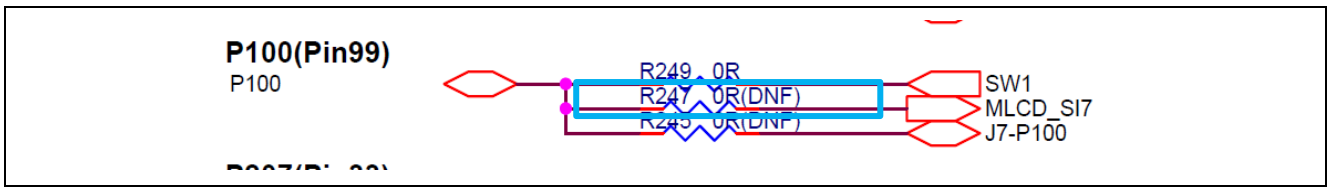

Figure 4-1 Schematic diagram of Evaluation Kit RE01 1500KB main board (R247 part)

Reference Documents

User's Manual: Hardware

RE01 1500KB Group User's Manual: Hardware, R01UH0796

(The latest version can be downloaded from the Renesas Electronics website.)

User's Manual: Evaluation Kit RE01 1500KB

Evaluation Kit RE01 1500KB, R20UT4379

(The latest version can be downloaded from the Renesas Electronics website.)

Startup Guide for RE01 1500KB CMSIS Package

RE01 1500KB Group User's Manual: Hardware, R01UH0796

(The latest version can be downloaded from the Renesas Electronics website.)

CMSIS Driver P_MIP Specification for RE01 1500KB Group, R01AN4861

(The latest version can be downloaded from the Renesas Electronics website.)

Technical Update/Technical News

(The latest version can be downloaded from the Renesas Electronics website.)

User's Manual: Development Tools

(The latest version can be downloaded from the Renesas Electronics website.)

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Revision History

Rev.	Date	Description	
		Page	Summary
1.00	Aug. 30, 2019	—	First edition issued

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1. Precaution against Electrostatic Discharge (ESD)

   A strong electrical field, when exposed to a CMOS device, can cause destruction of the gate oxide and ultimately degrade the device operation. Steps must be taken to stop the generation of static electricity as much as possible, and quickly dissipate it when it occurs. Environmental control must be adequate. When it is dry, a humidifier should be used. This is recommended to avoid using insulators that can easily build up static electricity. Semiconductor devices must be stored and transported in an anti-static container, static shielding bag or conductive material. All test and measurement tools including work benches and floors must be grounded. The operator must also be grounded using a wrist strap. Semiconductor devices must not be touched with bare hands. Similar precautions must be taken for printed circuit boards with mounted semiconductor devices.
2. Processing at power-on

   The state of the product is undefined at the time when power is supplied. The states of internal circuits in the LSI are indeterminate and the states of register settings and pins are undefined at the time when power is supplied. In a finished product where the reset signal is applied to the external reset pin, the states of pins are not guaranteed from the time when power is supplied until the reset process is completed. In a similar way, the states of pins in a product that is reset by an on-chip power-on reset function are not guaranteed from the time when power is supplied until the power reaches the level at which resetting is specified.
3. Input of signal during power-off state

   Do not input signals or an I/O pull-up power supply while the device is powered off. The current injection that results from input of such a signal or I/O pull-up power supply may cause malfunction and the abnormal current that passes in the device at this time may cause degradation of internal elements. Follow the guideline for input signal during power-off state as described in your product documentation.
4. Handling of unused pins

   Handle unused pins in accordance with the directions given under handling of unused pins in the manual. The input pins of CMOS products are generally in the high-impedance state. In operation with an unused pin in the open-circuit state, extra electromagnetic noise is induced in the vicinity of the LSI, an associated shoot-through current flows internally, and malfunctions occur due to the false recognition of the pin state as an input signal become possible.
5. Clock signals

   After applying a reset, only release the reset line after the operating clock signal becomes stable. When switching the clock signal during program execution, wait until the target clock signal is stabilized. When the clock signal is generated with an external resonator or from an external oscillator during a reset, ensure that the reset line is only released after full stabilization of the clock signal. Additionally, when switching to a clock signal produced with an external resonator or by an external oscillator while program execution is in progress, wait until the target clock signal is stable.
6. Voltage application waveform at input pin

   Waveform distortion due to input noise or a reflected wave may cause malfunction. If the input of the CMOS device stays in the area between V_{IL} (Max.) and V_{IH} (Min.) due to noise, for example, the device may malfunction. Take care to prevent chattering noise from entering the device when the input level is fixed, and also in the transition period when the input level passes through the area between V_{IL} (Max.) and V_{IH} (Min.).
7. Prohibition of access to reserved addresses

   Access to reserved addresses is prohibited. The reserved addresses are provided for possible future expansion of functions. Do not access these addresses as the correct operation of the LSI is not guaranteed.
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   Before changing from one product to another, for example to a product with a different part number, confirm that the change will not lead to problems. The characteristics of a microprocessing unit or microcontroller unit products in the same group but having a different part number might differ in terms of internal memory capacity, layout pattern, and other factors, which can affect the ranges of electrical characteristics, such as characteristic values, operating margins, immunity to noise, and amount of radiated noise. When changing to a product with a different part number, implement a system-evaluation test for the given product.

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