CMOS 32-BIT SINGLE CHIP MICROCONTROLLER

S1C31D01
MDC Tool Manual

Rev.1.0

NOTICE: PLEASE READ THE FOLLOWING NOTICE CAREFULLY BEFORE USING THIS DOCUMENT

Table of Contents

1. Overview

This manual describes how to use the MDC (Memory Display Controller) tools included in the S1C31D01 sample software package.

In addition to this manual, please also refer to the following:

- S1C31D01 Technical manual…Microcontroller details available from our website
- S5U1C31D01Tx Manual…Evaluation board details available from our website

Also, in advance

- S1C31 Family Software development setup tool…Available from our website
Please install.

2.   MDC Tool Package Configuration

The MDC tools are included in the S1C31D01 sample software package. The folder structure is as follows.

```
s1c31d01sp_very_yy.zip
[s1c31d01sp_very_yy]
        |- [Licenses] : License group
        |- [Drivers] : Driver group
        |- [Middlewares] : Middleware group
        |- [Projects] : Sample software group
        |- [Tools] : Tools used by the sample software
        |       |- [MDC]:(MDCTools)
        | | imgcpy_calcscaling.exe              (Image scaling calculator)
        | | MDCFontConv.exe                     (Font conversion tool)
        | | MDCImgConv.exe                      (Image conversion tool)
        | | MDCSerFlashImg.exe                  (Binary image generation tool for serial flash memory)
        README_e.txt
        README_j.txt
```

Figure 2.1 Configuration of S1C31D01 sample software package

3.   Image Scaling Calculator   **imgcpy_calcscaling.exe**

MDC's image/bitmap copy feature allows for certain combinations of source image size, destination image size, and scaling values so that not all pixels of the source original image are copied to the destination memory, but all of the original image may not be displayed on the panel.

This tool calculates the size, conversion center coordinates, and correction values for scaling values using the width and height of the original image size as the copy source and the width and height of the image size as the copy destination. By using the correction values calculated with this tool, it is possible to avoid the above limitations.

Example of use:

・In case of the copy source image size is 208x208 and the copy destination image size is 208x208(1:1 ratio)

If the copy source and copy destination image sizes are the same, the denominator of the enlargement/reduction ratio is fixed at 256, so the left/right/top/bottom scaling values set in the MDC register will be 256. However, if you use this scaling value as is, only 207x207 pixels of the source image will be copied to the destination memory, and the right and bottom edges of the source image will not be copied. Therefore, to correctly copy 208x208 pixels to the destination memory, you need to set the image size, conversion coordinates, and scaling correction values calculated by this tool.

<Operating procedure>

(1) Launch imgcpy_calcscaling.exe. When launched, a console screen will be displayed.

(2) Enter the original source image size and original destination image size on the console screen (see Table.3.1). Once entered, the image size, transformation coordinates, and scaling correction values are output to the console screen (see Table.3.2).

Table 3.1 Input of original image size

Enter source image width:<u>208</u>	Original copy source image size
Enter source image height:<u>208</u>	
Enter destination image width:<u>208</u>	Original destination image size
Enter destination image height:<u>208</u>	

Table 3.2 Correction value output

Original source width = 208	
Original source height = 208	
Source width = 210	Correction value for copy source image size
Source height = 210	
SourceCenter X = 104	Correction value of copy source image transformation center coordinates
SourceCenter Y = 104	
Ddestination width = 208	Correction value for copy destination image size
Ddestination height = 208	
DestinationCenter X = 104	Correction value of copy destination image transformation center coordinates
DestinationCenter Y = 104	
XLSCALE = 257	Scaling correction value
XRSCALE = 252	
YTSCALE = 257	
YBSCALE = 252	

3. Image **Scaling Calculator**   **imgcpy_calcscaling.exe**

Using the correction values shown in Table 3.2, if you set the source image size to 210x210, the left/top scaling value to 257, and the right/bottom scaling value to 252, all pixels in the 208x208 source image will be copied to 208x208 destination memory.

*This tool does not calculate correct correction values for all combinations of copy source image size and copy destination image size. If the correct correction value cannot be calculated, a warning message will be displayed. If a warning message is displayed, please fine-tune the copy source image size and copy destination image size before use.

4. **Font Conversion Tool** **MDCFontConv.exe**

MCFontConv.exe is a general-purpose tool for generating font bitmap header files (.h) and binary files (.mdcfont) from fonts that exist on the Windows system used by the user.
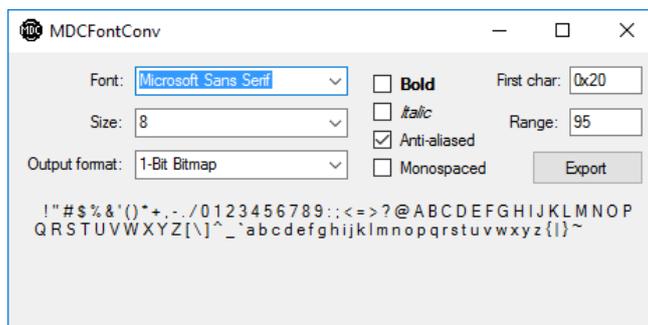
Figure 4.1 MDCFontConv.exe

This tool provides the functions listed below.

・Specification of first character hex code ('First char:') and to number of characters to output ('Range:')
・Font size selection
・1bit or2bit/Select between pixels
・Select font style: bold, italic, anti-aliasing
・Creation of proportional or non-proportional fonts

The output file (.h, .mdcfont) contains the seMDC_GFX_FontChar structure.

The following member variables are defined in the seMDC_GFX_FontChar structure.
・bitmapfmt   Specify bitmap format (0: 1bit, 1: 2bit)
・height   Specify the height of each character bitmap in pixels.
・numchars   Number of characters in the font set
・asciioffset   ASCII offset of the first character of the font set
・charstbl   Pointer to the table of (width, offsetloc) pairs of characters in the font set.
    width: Width of the character bitmap
    offsetloc: offset position of the start of the character bitmap in the pix_data array
・pxdata   Pointer to pixel data string of character bitmap in font set

Header files (.h) are used in C language source code to include images in ROM data.

The binary file (.mdcfont) is used by the MDCSerFlashImg.exe tool to download to the N25Q128 NOR Flash memory on the S5U1C31D01Tx.

<Operating procedure>

(1) Launch MDCFontConv.exe and set the font information parameters.(See Figure 4.1) Click the Export button and select a folder to store the output files (.h, .mdcfont).

(2) Select C Header file (*.h) from File Type to generate a header file (.h), and select MDCFONT file (*.mdcfont) to generate a binary file (.mdcfont). (See Figure 4.2)

4. Font **Conversion Tool** **MDCFontConv.exe**
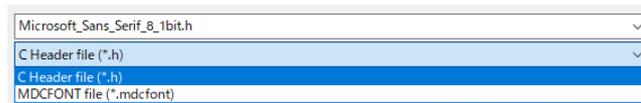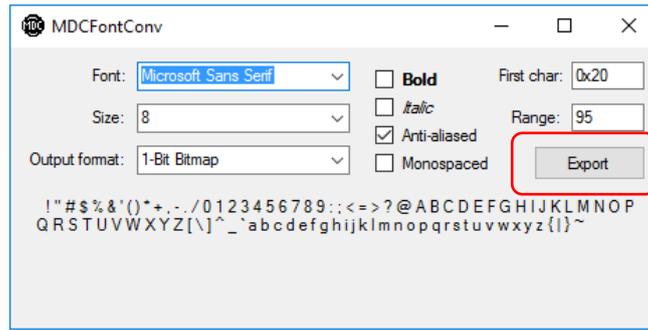
Figure 4.2   How to store files with MDCFontConv.exe

5.   Image Conversion Tool   **MDCImgConv.exe**

MDCImgConv.exe is a tool that converts various image types (BMP, PNG, JPG, ICO, TIF, GIF) to images supported by MDC pixel format. The converted images are generated in header file (.h), binary file (.mdcimg), and hex file (.hex) formats.

Figure 5.1   MDCImgConv.exe

This tool provides the functions listed below.

・Selection of MDC pixel format to output

6bit Color / 3bit Color / 1bit BW / 8bpp Gray scale / 4bpp Gray scale / 2bpp Gray scale / 1bpp Gray scale / 2bit Bitmap / 1bit Bitmap

・Image preview display with selected pixel format

・Selection of the following three types of error diffusion options or no error diffusion.

Floyd Steinberg / Jarvis Judice Ninke / Burkes / None (no error diffusion)

・Rotate the image in 90 degree increments

0 deg/90 deg/180 deg/270 deg

・Batch conversion of images (.h, .hex, .mdcimg)

The output files (.h, .hex, .mdcimg) contain the seMDC_ImgStruct structure. The following member variables are defined in the seMDC_ImgStruct structure.

・width   Image width (in pixels)

・hight   Image height (in pixels)

・stride   Image stride (in pixels, same value as width)

・imgtype   Specify MDC image format

・pxdata   Pointer to byte string of image pixels

Header files (.h) are used in C language source code to include images in ROM data. The binary file (.mdcimg) is used by the MDCSerFlashImg.exe tool to download to the N25Q128 NOR Flash memory on the S5U1C31D01Tx. Hex files (.hex) are used by external serial flash programming tools to program the N25Q128 NOR Flash memory on the S5U1C31D01Tx.

5. Image **Conversion Tool**   **MDCImgConv.exe**

<Operating procedure>

(1) Launch MDCImgConv.exe, load the image file with the Open Image button, and set the image information parameters. (See Figure 5.1)

(2) Click the Export Image button and select the folder to store the output file (.h, .hex, .mdcimg).

(3) Select Header file (*.h) from File Type to create a header file (.h), and select Hex file(.hex) (*.h) to create a Hex file (.hex) from MDCFONT If you select file (*.mdcimg), a binary file (.mdcimg) will be generated. (See Figure 5.2)

Figure 5.2   How to store files with MDCImgConv.exe-1

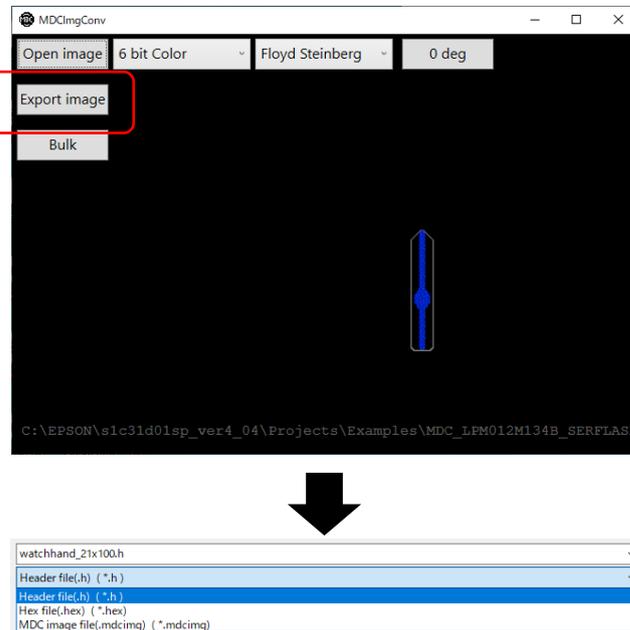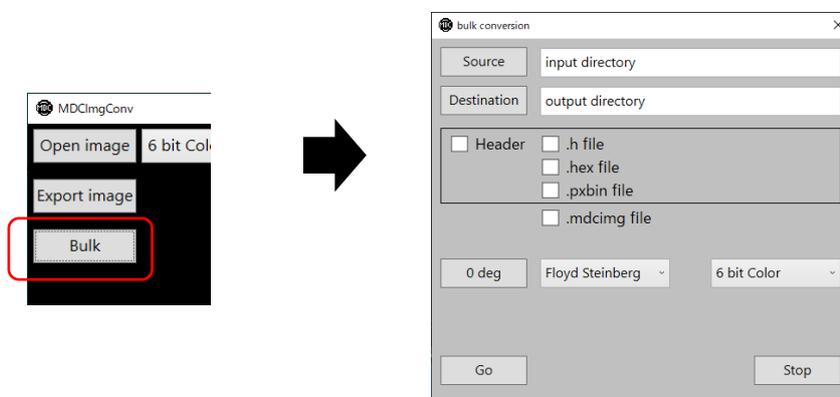(4) Click the Bulk button to generate output files (.h, .hex, .mdcimg) in bulk. (See Figure 5.3)

Figure 5.3   How to store files with MDCImgConv.exe-2

6. Binary Image Generation Tool for Serial Flash Memory
MDCSerFlashImg.exe

MDCSerFlashImg.exe is a tool that generates and downloads binary images for the N25Q128 NOR flash memory on the S5U1C31D01Tx. This tool uses binary files generated by MDCImgConv.exe and MDCFontConv.exe. The output of the tool consists of two files. One is the header file, which defines the addresses of all items used in the application. The other type is a binary file, in which all binary image data and font data (.mdcimg, .mdcfont) are combined into one binary image.

This tool has the functions listed below.

・Addition and deletion of font files (.mdcfont) and image files (.mdcimg)

・Generation of header file (.h) and binary image (.bin)

・Programming binary image (.bin) to N25Q120 NOR flash memory with evaluation board (optional)

<Operating procedure>

(1) The file below in the sample software installation folder,
¥¥s1c31d01sp_very_yy¥Projects¥Demonstration¥SERIAL_FLASH¥install¥segger¥S1C31D01_N25Q128.FLM

is copied to

C:¥Program Files¥SEGGER¥JLink_Vyyy¥Devices¥Epson¥

(2) Launch MDCSerFlashImg.exe and select the following file using the "Add" button.

(Example using the sample included in the S1C31D01 sample software package)

¥s1c31d01sp_very_yy¥Projects¥Examples¥MDC_LPM012M134B_SERFLASH

        Archivo_Black_28_1bit.mdcfont

        Source_Code_Pro_Black_28_1bit.mdcfont

        watchhand_21x100.mdcimg
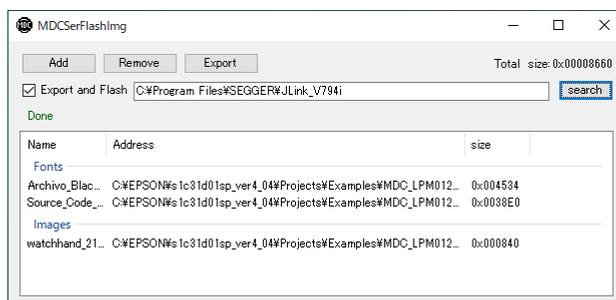
Figure 6.1   MDCSerFlashImg.exe

(3) Click the Export button and specify the storage folder and file name to generate a header file (.h) and binary image (.bin).

*If you enable the "Export and Flash" checkbox, you can generate a header file (.h) and binary image (.bin) at the same time as using SEGGER J-Link Commander, a software included with J-Link, on this tool. You can download a binary image (.bin) directly to the N25Q128 NOR flash memory. SEGGER J-Link Commander is not configured to work with S1C31D01, the error message "J-Link does not have S1C31D01_N25Q128 registered" or "missing an (.FLM) file message" will be displayed.

6. Binary **Image Generation Tool for Serial Flash Memory MDCSerFlashImg.exe**

The header file (.h) contains structures seMDC_GFX_SerFlashFontStruct and seMDC_SerFlashImgStruct for all fonts and images included in the binary image (.bin).

The following member variables are defined in seMDC_GFX_SerFlashFontStruct.

・rmadrh   Value to set in the RMADRH register of QSPI peripheral to access external serial flash memory in memory mapped access (MMA) mode.

- *Font   The following member variables are defined in seMDC_SerFlashImgStruct, a pointer to the seMDC_GFX_FontStruct structure in the external serial flash memory.

・rmadrh   Value to set in the RMADRH register of QSPI peripheral to access external serial flash memory in memory mapped access (MMA) mode.

・*Font   Pointer to seMDC_ImgStruct structure in external serial flash memory

This tool cannot add files larger than 1MByte. Also, the total size of files added cannot exceed 16MByte. Also, when downloading a binary image to an external serial flash memory, connect the J-Link debug probe to the PC and board and install the J-Link software in advance.

Revision History

<div align="right">Attachment-1</div>

Rev. No.	Date	Page	Category	Contents
Rev 1.0	2024/02/15	All	new	

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