

AN\_258

FT800 Chinese Font Demo Application

Design Note

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This document is to introduce the design flow and note of FT800 Chinese Font Demo Application. It will give the audience the overall picture of the software.

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# Introduction

FT800 combines display, audio and touch functionality into one single chip, powered by advanced FTDI Chip’s EVE technology (Embedded Video Engine). The FT800 device interfaces with a system MCU via either SPI or I2C interface. To help customers easily make Chinese UI with the feature of FT800, a sample application is provided here for tutorial purposes.

In this application, FT800 custom font is created for Chinese UI and applied on widgets, such as toggle, keys, buttons as well as texts.

Note that the code relating to the creation of the screen shots could be reused in different MCU design environments.

To learn more about Arduino platform and its IDE, please check <http://www.arduino.cc>

## Audience

This document assumes the audience has read the datasheet and programmer guide of the FT800. In addition, familiarity of the C/C++programming language is necessary to understand the sample application source code. Since the SPI interface is the main interface of FT800, the knowledge of SPI interface is also preferred.

## Scope

The Chinese Font Demo Application mentioned in this document is created with Arduino Pro IDE and Microsoft Windows Visual Studio. It is able to run on VM800P or Windows PC.

## Overview

### Hardware

The diagram below gives the basic hardware setup.

FT800

Speaker

VM800P / Windows PC

SPI

Touch Panel

TFT Display

Figure Block Diagram of Setup

### Application flow

The diagram below gives the basic flow and structure to configuring the FT800 in an application.



Figure Application Flow

### Architecture

The application is designed to easily port to various platforms with SPI host functionality. Therefore, the application introduces one generic HAL (hardware abstraction layer) which can be used as a guideline for other platforms.

Figure Architecture Diagram

FT800

FT800 Demo Application

HAL

Application

## Hardware requirement

**Option A:**

* VM800B or VM800C development kit.

Note that this kit comes with an option for 3 different size displays, 3.5”, 4.3”, or 5.0”(VM800B35A-D, VM800C35A-D, VM800B35A-D, VM800C43A-D, VM800B50A-D, VM800C50A-D, respectively).

* One FTDI MPSSE cable for USB to SPI bridge or VA800A-SPI board.
* Windows PC

**Option B:**

* VM800P development kit.
* One USB cable with MicroB connector to provide power to the VM800P board and download binary into VM800P.
* Windows PC

## Software requirement

* [D2XX driver](http://www.ftdichip.com/Drivers/D2XX.htm) for FTDI MPSSE cable. Please download and install on the PC.
* Arduino IDE 1.0.5
* FT800 Chinese Font Demo Application release package.

### Software package introduction

* “Bin” folder contains the library and run time executables for Windows platform.
* “Docs” folder contains the application note of this application.
* “Hdr” folder contains the header file of windows MSVC project.
* “Src” folder contains the source code of windows MSVC project.
* “Test” folder contains the font file used by application when running up.
* “Project” folder contains both the project files for Windows and Arduino platform.

# Application design note

This application implements one notepad with simple Chinese Input method enabled. It enables users to input the simplified or traditional Chinese font with SimFang (仿宋) style. All the bitmap information used in this application for Chinese UI are extracted from simfang.ttf, which is part of windows 7 installation. You can find it from “$(WindowsInstallPaths)\windows\fonts\”.

When users touches any letter from ‘A’ to ‘Z’, the application gives 10 characters candidates for users to select. Users can choose any characters and constructs one note with up to 10 rows , 16 characters per row including space. After users complete the editing, users can view all the characters in a scrolling window.

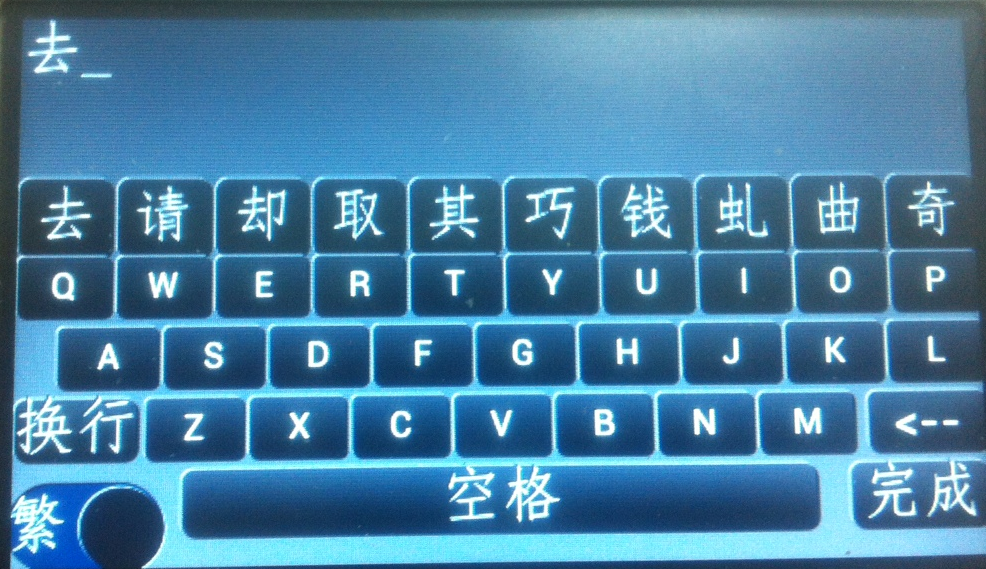


Figure Main UI of Application

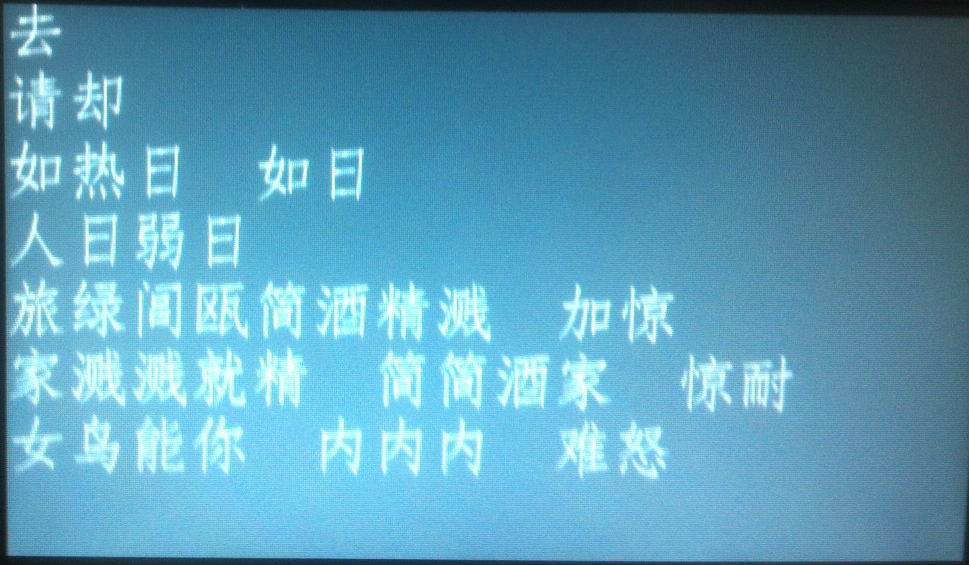


Figure Preview interface

## Bitmap data information

Out of “A” to “Z”, every key maps to 10 Chinese characters. All the fonts is in L4 format.

The font style is SimFang (仿宋). The following table describes the bitmap data information in details.

Table Bitmap data information used in font application

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Input File | CELL | Handle | Address in RAM\_G | Bitmap Source | Raw file size in byte | Format & Style | Description |
| A-F\_ChineseS.txt/  A-F\_ChineseT.txt | 1~60 | 1 | 0 (RAM\_G) | -328 | 28708 | L4 format Stride 14 width 28 Height 34 | 60 characters whose pinyin begins with from ‘A’ to ‘F’ |
| G-L\_ChineseS.txt/  G-L\_ChineseT.txt | 1~60 | 2 | 28708 | 28380 | 28708 | L4 format Stride 14 width 28 Height 34 | 60 characters whose pinyin begins with from ‘G’ to ‘L’ |
| M-R\_ChineseS.txt/M-R\_ChineseT.txt | 1~60 | 3 | 57416 | 57088 | 28708 | L4 format Stride 14 width 28 Height 34 | 60 characters whose pinyin begins with from ‘M’ to ‘R’ |
| S-X\_ChineseS.txt/S-X\_ChineseT.txt | 1~60 | 4 | 86124 | 85796 | 28708 | L4 format Stride 14 width 28 Height 34 | 60 characters whose pinyin begins with from ‘S’ to ‘X’ |
| Y-Z\_ChineseS.txt/Y-Z\_ChineseT.txt | 1~28 | 5 | 114832 | 114504 | 13476 | L4 format Stride 14 width 28 Height 34 | 20 characters whose pinyin begins with from ‘Y’ to ‘Z’  8 characters for buttons |
| SC\_Note.txt | 1~12 | 6 | 128308 | 127946 | 6268 | L4 format Stride 15 width 30 Height 34 | 12 characters consists of space, cursor etc. |

## Character code and bitmap handle

The character code is invented to store the code of each character and there is one notepad buffer storing character code: (Max Row: 10, Max Col: 16) in the application. Every character code is 2 byte valid and range from 1 to 270. Application translates the tag value of touching character into character code by following formula and storing it into notepad buffer:

Given Handle and Cell , calculate the character code by:

*Character code = (Handle-1) \* 60 + CELL* *when Handle falls in 1 to 5.*

*Character code between 1 to 268*

*Character code = 60\*4 + 28 + CELL* *when Handle is 6.*

*Character code between 269 to 280*

When displaying all the characters stored in notepad buffer, i.e., all the characters selected by users, the character code has to be converted back into handle and cell number by following formula:

Given Character code, calculate the handle and cell by:

If Character code between 269 to 280 ,

*Handle = 6*

*Cell = character code – 268*

If Character code between 1 to 268 ,

*Handle = character code / 60 + 1 Cell = character code % 60*

*if (character code % 60) is not zero*

*Handle = character code / 60 Cell = 60*

*if (character code % 60) is zero*

# Tag layout

In main interface, tag feature of FT800 is utilized to detect user’s touch. The table below shows the tag value layout in main interface.

Table Tag layout table at the main interface

|  |  |  |
| --- | --- | --- |
| UI element | Tag value | Description |
| Cmd\_keys | 65-90 | “QWERTYUIOP” |
| Cmd\_keys | “ASDFGHJKL” |
| Cmd\_keys | “ZXCVBNM” |
| Cmd\_keys | 1 – 60 | Candidate characters |
| Cmd\_button | 251 | Backspace |
| Cmd\_button | 252 | Space |
| Cmd\_button | 253 | Enter |
| Cmd\_button | 254 | Input Done(Finish editing) |
| Cmd\_toggle | 250 | Traditional/Simpified chinese toggle |

# Generate the bitmap data and metrics block

There is one font conversion utility from FTDI to export the bitmap information from windows true type font file and form metrics blocks as FT800 specified. Users can easily run the following commands and find the output data at the output folder. For example, for command line 1, the output data is in file “simfang\_A-F\_ChineseS.txt30\L4\simfang.ttf\_30\_L4.raw”. Its format is in file “simfang\_A-F\_ChineseS.txt30\L4\simfang.ttf\_30\_L4.rawh”.

About the fnt\_cvt details , please refer to its [release package](http://www.ftdichip.com/Support/Utilities/EVE/fnt_cvt_0.1.zip).

To generate for Simplified Chinese:

1. fnt\_cvt.exe -i simfang.ttf -s 30 -u A-F\_ChineseS.txt -d 0
2. fnt\_cvt.exe -i simfang.ttf -s 30 -u G-L\_ChineseS.txt -d 28708
3. fnt\_cvt.exe -i simfang.ttf -s 30 -u M-R\_ChineseS.txt -d 57416
4. fnt\_cvt.exe -i simfang.ttf -s 30 -u S-X\_ChineseS.txt -d 86124
5. fnt\_cvt.exe -i simfang.ttf -s 30 -u Y-Z\_ChineseS.txt -d 114832
6. fnt\_cvt.exe -i simfang.ttf -s 30 -u SC\_Note.txt -d 128308

To generate for traditional Chinese:

1. fnt\_cvt.exe -i simfang.ttf -s 30 -u A-F\_ChineseT.txt -d 0
2. fnt\_cvt.exe -i simfang.ttf -s 30 -u G-L\_ChineseT.txt -d 28708
3. fnt\_cvt.exe -i simfang.ttf -s 30 -u M-R\_ChineseT.txt -d 57416
4. fnt\_cvt.exe -i simfang.ttf -s 30 -u S-X\_ChineseT.txt -d 86124
5. fnt\_cvt.exe -i simfang.ttf -s 30 -u Y-Z\_ChineseT.txt -d 114832
6. fnt\_cvt.exe -i simfang.ttf -s 30 -u SC\_Note.txt -d 128308

The resource used in both scenario:



Simplified Chinese input file:



Traditional Chinese input file:



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# Appendix A– References

## Document References

1. datasheet for VM800C
2. datasheet for VM800B
3. datasheet for VM800P
4. FT800 programmer guide FT\_000793
5. FT800 Embedded Video Engine Datasheet FT\_000792

## Acronyms and Abbreviations

|  |  |
| --- | --- |
| Terms | Description |
| Arduino Pro | The open source platform variety based on ATMEL’s ATMEGA chipset |
| EVE | Embedded Video Engine |
| SPI | Serial Peripheral Interface |
| UI | User Interface |
| USB | Universal Serial Bus |

# Appendix B – List of Tables & Figures

[Figure 1 Block Diagram of Setup 3](file:///C:\Users\paul.jiao\Documents\FT800_SVN\branches\pauljiao\FT800_DemoApps\FT_App_Font\Docs\AN_258_FT800_APP_Font_Design_Note.docx#_Toc367281262)

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# Appendix C– Revision History

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| --- | --- | --- |
| Revision | Changes | Date |
| 1.0 | Initial Release | 2013-xx-xx |
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|  | 2013-05-06 | Initial Draft |
|  |  |  |
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| **Revision** | **Date**  **YYYY-MM-DD** | **Changes** | **Editor** |
| 0.1 | 2013-05-20 | Initial draft | Jiao Shouwu Paul |
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