



# **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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## 2 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 I<sup>2</sup>C 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>

### 2.1 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.

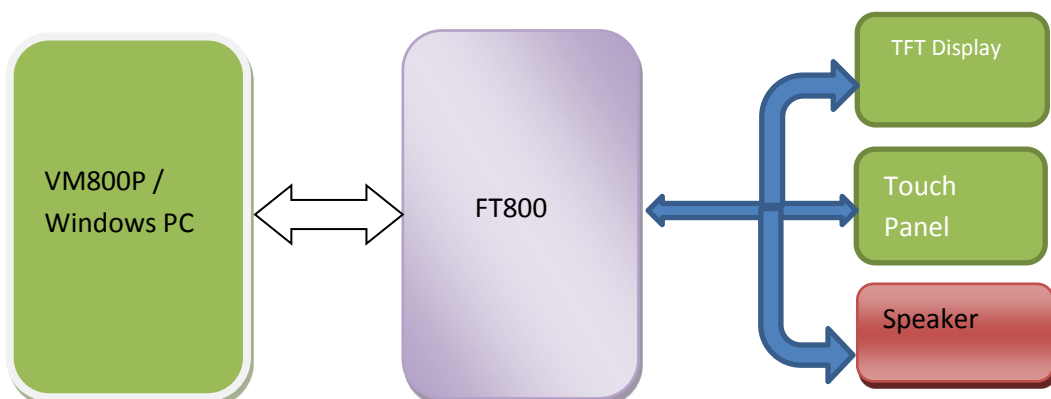
### 2.2 Scope

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.

### 2.3 Overview

#### 2.3.1 Hardware

The diagram below gives the basic hardware setup.



**Figure 1 Block Diagram of Setup**

## 2.3.2 Application flow

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

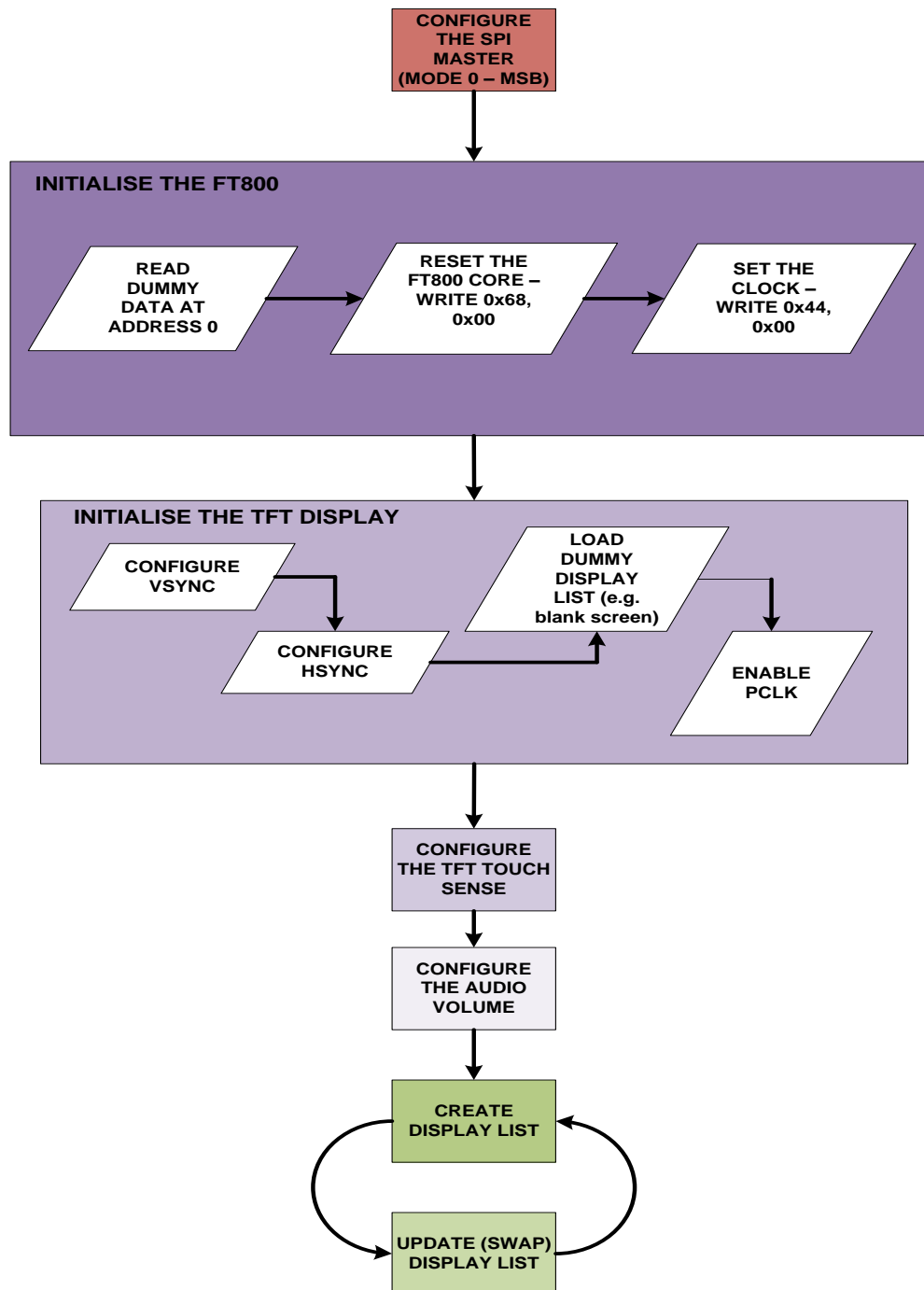
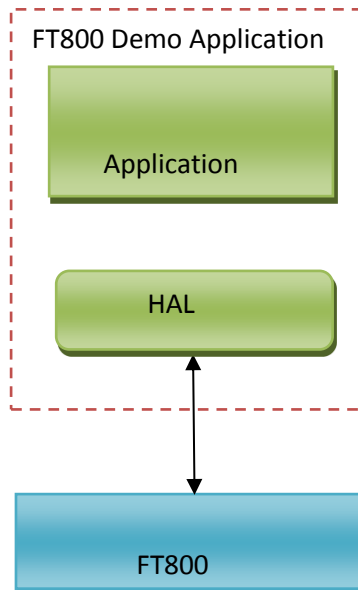


Figure 2 Application Flow

## 2.3.3 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 3 Architecture Diagram**

## 2.4 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

## 2.5 Software requirement

- [D2XX driver](#) for FTDI MPSSE cable. Please download and install on the PC.
- Arduino IDE 1.0.5
- FT800 Chinese Font Demo Application release package.

### 2.5.1 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.

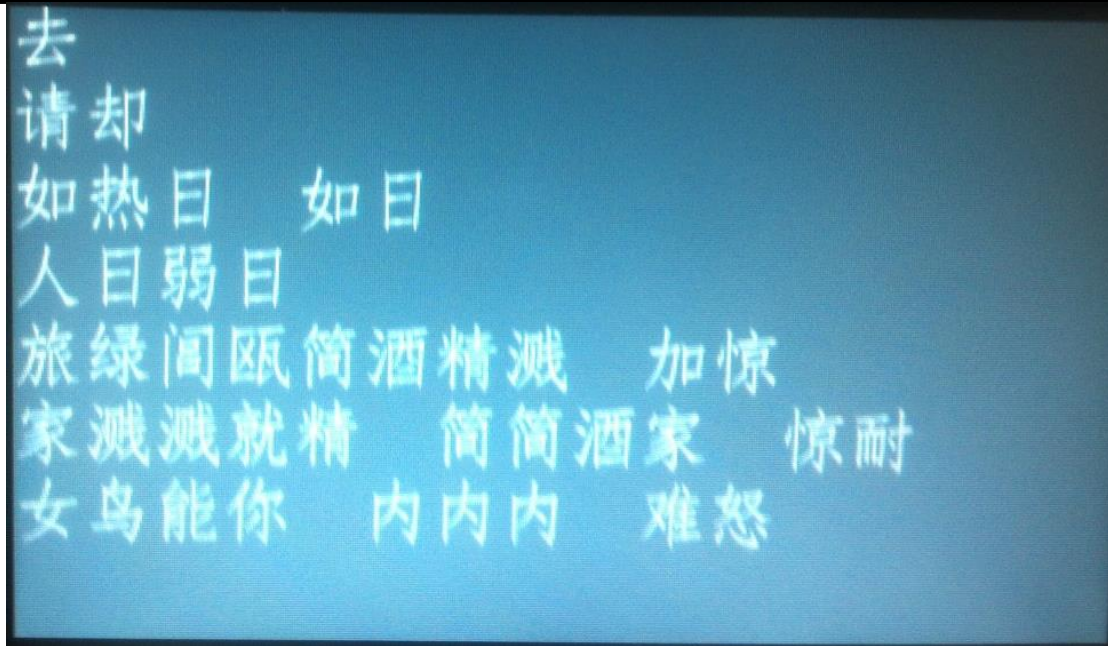
### 3 Application design note

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 4 Main UI of Application



**Figure 5 Preview interface**

### 3.1 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 1 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	1~28	5	114832	114504	13476	L4 format Stride 14	20 characters whose pinyin



xt/Y-Z_ChineseT.txt						width 28 Height 34	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.

### 3.2 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:

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

*Character code between 1 to 268*

$$\text{Character code} = 60*4 + 28 + \text{CELL} \text{ when Handle is 6.}$$

*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 ,

$$\text{Handle} = 6$$

$$\text{Cell} = \text{character code} - 268$$

If Character code between 1 to 268 ,

$$\text{Handle} = \text{character code} / 60 + 1 \quad \text{Cell} = \text{character code} \% 60$$

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

$$\text{Handle} = \text{character code} / 60 \quad \text{Cell} = 60$$

*if (character code % 60) is zero*

## 4 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 2 Tag layout table at the main interface**

UI element	Tag value	Description
Cmd_keys	65-90	"QWERTYUIOP"
Cmd_keys		"ASDFGHJKL"

Cmd_keys		"ZXCVCBNM"
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/Simplified chinese toggle

## 5 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](#).

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\*:



SC\_Note.txt

Simplified Chinese input file\*:



Y-Z\_ChineseS.txt



S-X\_ChineseS.txt



M-R\_ChineseS.txt



A-F\_ChineseS.txt



G-L\_ChineseS.txt

Traditional Chinese input file\*:

 Y-Z\_ChineseT.txt     S-X\_ChineseT.txt     M-R\_ChineseT.txt     G-L\_ChineseT.txt     A-F\_ChineseT.txt

\*All files are available for download in the EVE Software example – FT\_Chinese Font,  
available here: [http://www.ftdichip.com/Support/SoftwareExamples/FT800\\_Projects.htm](http://www.ftdichip.com/Support/SoftwareExamples/FT800_Projects.htm)

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## 7 Appendix A– References

### 7.1 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

### 7.2 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

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## 9 Appendix C– Revision History

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Revision	Changes	Date
0.1	Initial draft release	2013-03-06
1.0	Initial release	2014-09-06