

**SPECIFICATION
FOR
TFT MODULE**

MODULE NO: AFA320480M-3.5-A8
REVISION NO: 00

Customer's Approval:

| |
|--|
| |
|--|

| | SIGNATURE | DATE |
|---------------------------|-----------|------|
| PREPARED BY (RD ENGINEER) | | |
| CHECKED BY | | |
| APPROVED BY | | |

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Easy TFT is target to the users updating their product from monochrome LCD to TFT displays or new products fast developing, our solution can provides a simple and reliable way to control TFT displays. M7-M series include small screen with CPU port from 2.3" to 3.5" as well as screen with RGB port from 3.5" to 7", meeting the requirements for various applications from customers.

1.0 General Description

1. The bottle neck of MCU speed is solved: compared with the black and white module, the data volume of color screen is much larger and require rapid data refresh while updating interface, which cannot be satisfied by traditional MCU, otherwise the responding speed of whole system will be very slow.
2. The data storage space of common MCU is within 64K, which is not enough to store one picture for TFT displays; our module adopts an 2Mbyte-8Mbyte FLASH to store picture data and this is quite enough for common interface design.
3. The technology of TFT displays change quickly and the driver IC updating fast, the product life time can't be guaranteed. The software and hardware is required to change often in order to adopt the new displays, which brings a lot of extra work. Our solution can help customer to solve the problem, when there is screen change, we can adopt it on our mainboard, the consumer don't need to changing their software and hardware.
4. The adoption of alphabetic string command for module control is simple and clear; only need MCU output "Hello World" from the UART
5. The RAM on the module is virtualized as a USB flash disk, the user copy pictures from computer to the module, saving a lot of work like general modeling and compiling etc. and development time is shortened.

2.0 Electrical Parameters:

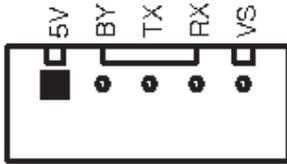
| Name | spec | note |
|-----------------------|-----------------------------|--------------|
| Input voltage | 5V±5% | |
| Current | <210mA | Backlight on |
| Color Depth | 65K colors | |
| Operating Temperature | -20----70°C | |
| Storage Temperature | -30----80°C | |
| Luminance | 300cd/m ² (type) | |
| Display Mode | Transmissive | |

3.0 Mechanical Parameters (mm)

| ITEM | spec | note |
|----------------|-------------------|--------------|
| Size of panel | 82.94*54.66 | 320*480 Dots |
| Size of module | 93.50*69.00*13max | |
| Size (VA) | 74.80*50.50 | |

4.0 Pin Definition

J1 on module is communication port and K1 is reset key.



5.0 Interface Design:

1. Firstly, put all pictures needed into the folder of BMP_FILE, convert them into BMP format and change picture names in proper sequence from 000.BMP. The operation can be completed with software of ACDSEE; see [Appendix I](#) for details in operation.

The picture files with names in proper sequence are shown in figure below:

| | | | |
|----------|--------|----------------|-------------|
| 000. bmp | 83 KB | Windows Bitmap | 240x117x24b |
| 001. bmp | 83 KB | Windows Bitmap | 240x117x24b |
| 002. bmp | 83 KB | Windows Bitmap | 240x117x24b |
| 003. bmp | 83 KB | Windows Bitmap | 240x117x24b |
| 004. bmp | 83 KB | Windows Bitmap | 240x117x24b |
| 005. bmp | 83 KB | Windows Bitmap | 240x117x24b |
| 006. bmp | 282 KB | Windows Bitmap | 240x400x24b |

2. Execute batch processing command MakeDAT.bat and three files will be generated in the folder of BMP_DATA after execution, among which BMPDATA.BIN is the data file where all picture data are put successively and TABLE.BIN is the table file equivalent to index file; copy these two files into the folder virtualized by the module and then they are available for use. There are picture serial numbers and corresponding information of picture size in the file of BmpDataBin.h, which is a reference provided to user without the necessity of being copied to USB flash disk.

3. If special character display is required by user, like Chinese or Japanese etc. The software attached in this module can be used for extracting font library; see [Appendix IV](#) for details. (Only for Chinese version)
Revise the name of extracted font library file and copy it in to USB flash disk for application; the file name should be changed as HZK.BIN.

4. Note: this USB flash disk is a virtualized one; the file system is regulated for the convenience of application of this module and improvement of picture refreshing speed; please use FAT12 to format the USB flash disk (this is the default format in WinXP); the limit number of files in root directory is 16 and generally there are only font library file, table file and data file; if other files need to be stored by user, it had better to make a new folder for storage of these files.

5. Press K1 key (reset key) on module after all files are copied into USB flash disk and then they are available for use.

6.0 Control Command

This module adopts alphabetic string to control all operations.

The command format begins with command word continued with parameter list in which parameters are separated by space and ends with a return character; pay attention that the return character is a must. *When the command is executing, the busy pin is low, and the module can't receive new command, until the busy pin is high.*

“CMD n1 n2.....Return”

The parameters n1, n2... in table below express a 16-bit unsigned integer data and s1, s2...expresses alphabetic string.

Drawing commands

| Function | Command Format | Example | Execution time |
|---|---------------------------|-------------------------------|----------------|
| Browse Pictures | ALL | "ALL\n" | - |
| Draw a circle | CIRCLE Xa Ya R C | "CIRCLE 100 100 50 31\n" | 4ms |
| Fill in color | CLR Xa Ya Xe Ye C | "CLR 0 0 100 100 31\n" | 5ms |
| Clear screen | CLS C | "CLS 31\n" | 28ms |
| Cut a picture | CUT Pn Xa Ya Xb Yb Xs Ys | "CUT 1 30 30 0 0 100 100\n" | 20ms |
| Draw a dot | DOT Xa Ya C | "DOT 100 100 31\n" | 0.12ms |
| Draw a frame with linetype and chamfer | FRAME Xa Ya Xe Ye Ds Do C | "FRAME 10 10 200 40 2 3 31\n" | 4ms |
| Draw a line | LINE Xa Ya Xe Ye C | "LINE 10 10 50 50 31\n" | 0.7ms |
| Backlight on | LEDON | "LEDON\n" | 4us |
| Adjusting backlight luminance | LEDON X (X:1~10) | "LEDON10\n" | 4us |
| Backlight off | LEDOFF | "LEDOFF\n" | 4us |
| Animation | MOT Xa Ya Ps Pe Pt | "MOT 0 0 10 14 100\n" | 0.15ms |
| Animation off | MOFF | "MOFF\n" | 4us |
| Call on PIC | PIC Pn Xa Ya | "PIC 1 30 30\n" | 125ms |
| Draw a rectangle | RECT Xa Ya Xe Ye C | "RECT 10 10 100 100 31\n" | 5ms |
| Get screen size * | SIZE | "SIZE\n" | 13ms |
| Display alphabetic string | STR Xa Ya C Str | "STR 0 0 31 ABCDEF\n" | 0.8ms/Char |
| Display alphabetic string with background color | STB Xa Ya C Cb Str | "STB 0 20 65535 31 ABC\n" | 30us/Char |

Note:

Xa Ya :start x y coordinates

Xe Ye :End x y coordinates

C :color(16bits,RGB 565)

Cb : Background color

Xb Yb : start end X Y coordinates in livelong PIC

Xs Ys : Need to intercept the size from livelong picture

Ds Do :Length of Solid line/Dotted line

Str :alphabetic string(8x16)

Pn : Pictures serial number(000-999)

R : Radius

Ps : Start animation picture number

Pe : End animation picture number

Pt : Spacing time(step :100ms)

* Using the command ,there will be a return value format is a "SXY Xsize Ysize\n"

Configure Commands

| Function | Command Format | Example | Time |
|--------------------------------------|----------------|--------------------|-------|
| Set baud rate | BAUD b1 b2 | "BAUD 9600 9600\n" | 20ms |
| Demonstrate PIC | DEMO Dt Xa Ya | "DEMO 1000 0 0\n" | 20ms |
| Off demonstrate | DMOFF | "DMOFF\n" | 20ms |
| Change direction Display of panel | TURN Tn | "TURN 90\n" | 140ms |

Note:

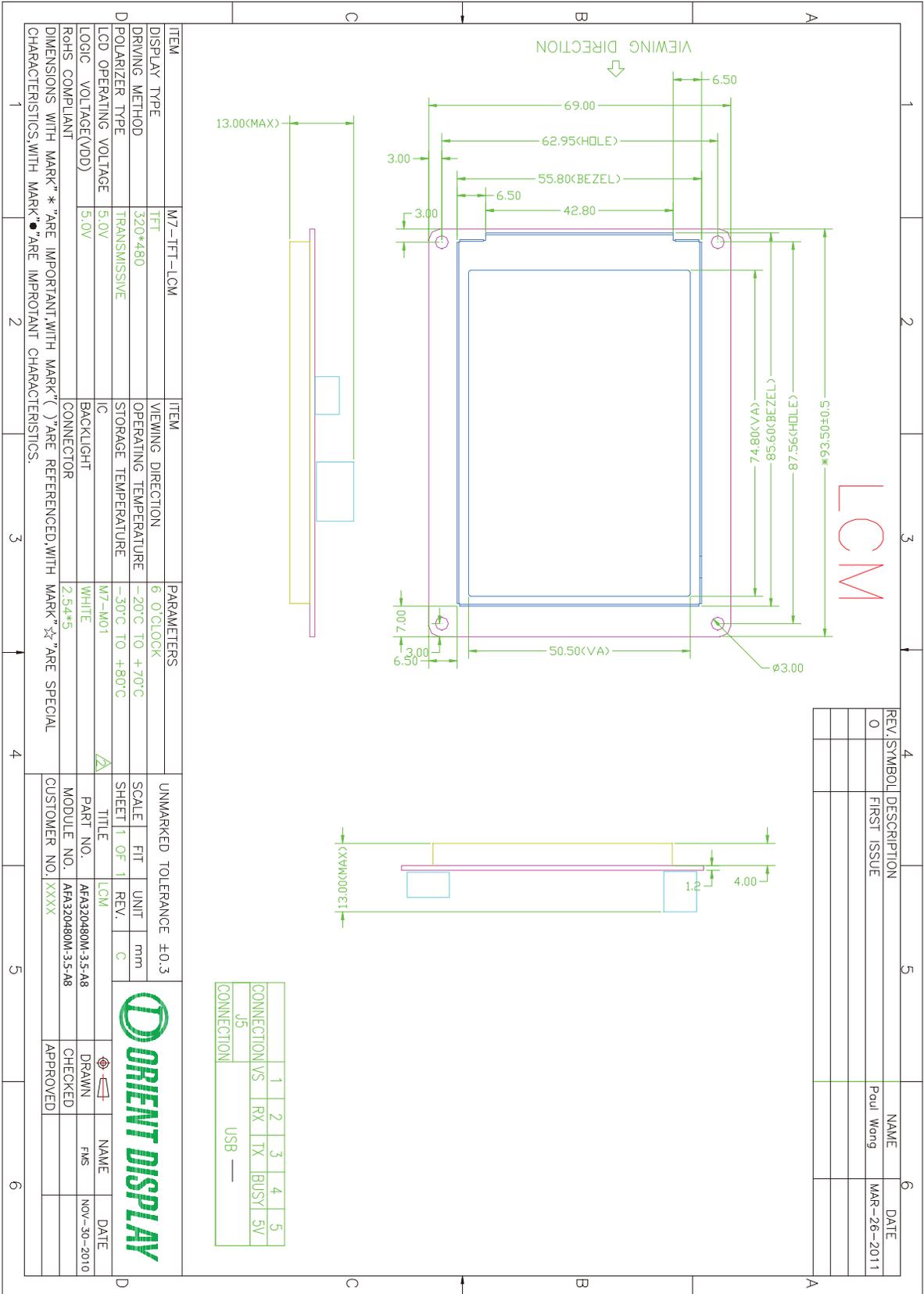
b1 b2 denote baud rate

(range:2400,4800,9600,19200,38400,56000,57600,115200)

Dt denote DEMO interval(step 100ms)

Tn Rotation angle (0° 90°)

7.0 Outline Drawing



| ITEM | ITEM | PARAMETERS |
|--|----------------------|-----------------------|
| DISPLAY TYPE | M7-TFT-LCM | |
| DRIVING METHOD | TFT | VIEWING DIRECTION |
| POLARIZER TYPE | 320*480 TRANSMISSIVE | OPERATING TEMPERATURE |
| LCD OPERATING VOLTAGE | 5.0V | STORAGE TEMPERATURE |
| LOGIC VOLTAGE(VDD) | 5.0V | IC |
| RoHS COMPLIANT | | BACKLIGHT |
| DIMENSIONS WITH MARK * ARE IMPORTANT WITH MARK () ARE REFERENCED WITH MARK ☆ ARE SPECIAL CHARACTERISTICS WITH MARK ● ARE IMPROTANT CHARACTERISTICS. | | CONNECTOR |
| | | WHITE |
| | | 2.54*5 |

| UNMARKED TOLERANCE | ±0.3 |
|--------------------|------------------|
| SCALE | FIT UNIT mm |
| SHEET | 1 OF 1 REV. C |
| TITLE | LCM |
| PART NO. | AF320480M-3.5-A8 |
| MODULE NO. | AF320480M-3.5-A8 |
| CUSTOMER NO. | XXXX |
| DRAWN | NAME DATE |
| CHECKED | FMS NOV-30-2010 |
| APPROVED | |

| CONNECTION VS | 1 | 2 | 3 | 4 | 5 |
|---------------|----|----|------|----|---|
| USB | RX | TX | BUSY | 5V | |
| CONNECTION | | | | | |

| REV. | SYMBOL | DESCRIPTION | NAME | DATE |
|------|--------|-------------|-----------|-------------|
| 0 | | FIRST ISSUE | Paul Wang | MAR-26-2011 |
| | | | | |
| | | | | |

8.0 User's Guide

Appendix I

Application of ACDSEE for classifying pictures

1. Collect materials for use into the folder of BMP_FILE; at the beginning, the pictures may be disordered and the processing of following steps is needed to make them in proper order for operation.



3. Sort the pictures successively beginning with 000.



5. Execute the batch file of MakeDAT.bat



6. After execution, there are three files generated in BMP_DATA, wherein BMPDATA.BIN is data file in which all picture data are put inside in order; TABLE.BIN is table file equivalent to index file. Copy these two files into the folder virtualized the module and then they are available for use. There are picture serial numbers in the file of BmpDataBin.h corresponding to picture size information as a reference provided to user which is unnecessary to be copied into USB flash disk.



2. Convert all files into BMP format.

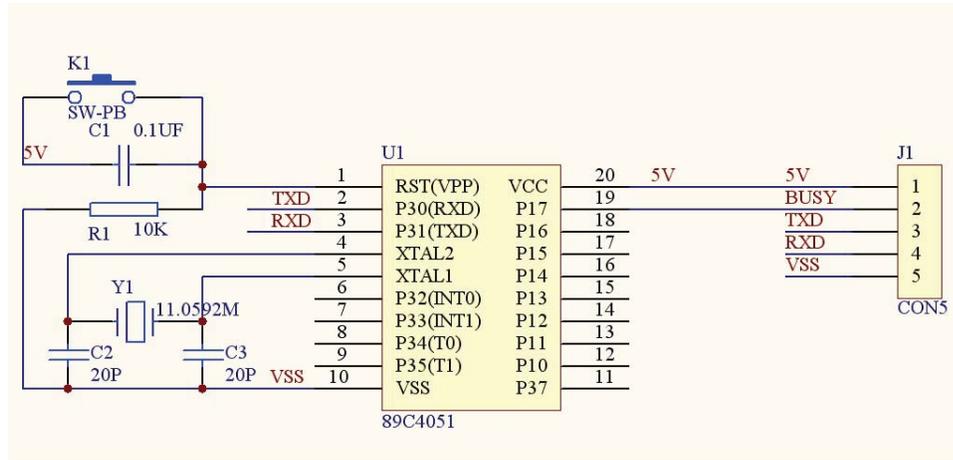


4. Reorder the special picture sequence, for instance, the animation part and special font part must be continuous.

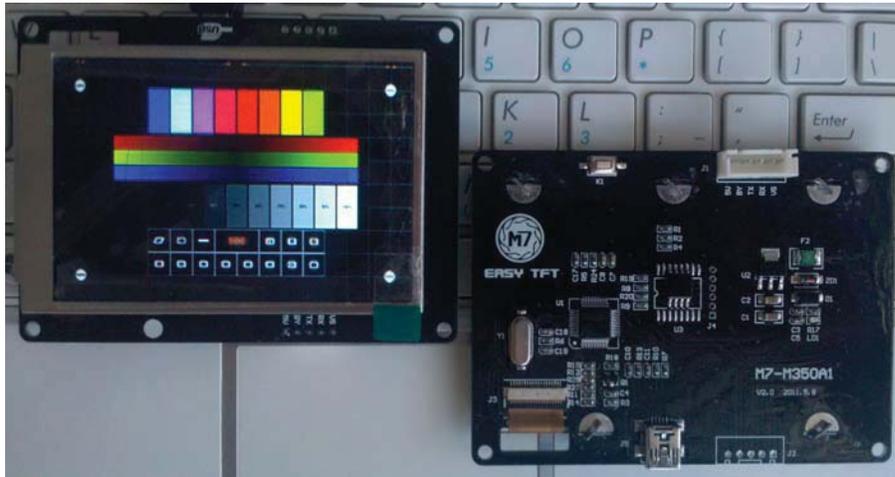


Appendix II

Application circuit



Appendix III



9.0 Reliability Test Items

| No | Item | Condition | Quantity |
|----|----------------------------|--------------------------------------|----------|
| 1 | High Temperature Operating | 70°C, 96Hrs | 5 |
| 2 | Low Temperature Operating | -20°C, 96Hrs | 5 |
| 3 | High Humidity | 60°C, 90%RH, 96Hrs | 5 |
| 4 | High Temperature Storage | 80°C, 96Hrs | 5 |
| 5 | Low Temperature Storage | -40°C, 96Hrs | 5 |
| 6 | Thermal shock | -20°C, 30min~70°C, 30min, 20 cycles. | 5 |

Note1. No deflection cosmetic and operational function allowable.

10.0 Package Specification TBD