FORENEX FES4335U1-56T Memory Mapping Graphics Control Module User Manual

Contents

FORENEX FES4335U1-56T Memory Mapping Graphics Control Module

Revision histories

Rev. No.	Date	Substantial Changes
1.0	2016	First issue.

General Description

FES4335U1-56T is a low cost, high efficiency and smart of TFT-LCD display control module which can provide characters or 2D graphics application within an embedded 768KB of display RAM.
FES4335U1-56T offers serial interface (Uart-TT) to establish a hardware communication with an external simple MCU (as like 8051 etc.), and providing the “Commands Table” for graphical effect calling and execution. According to the “Commands Table” of graphics APIs, the external MCU only need to transmit the corresponding command code with parameters into FES4335U1-56T over serial interface. The command decoder inside of FES4335U1-56T would go to implement the graphics task by automatically.

The FG875D_command_encoder.exe is a PC’s software utility and providing user to experience the various function commands in “Commands Table”.

Item	Specification	Remark
LCD size	5.6 inch(Diagonal)	
Resolution	640 x 3(RGB) x 480	dot
Display type	Normally White, Transmissive	
Dot pitch	0.0588(W) x 0.1764(H) mm	
Active area	112.896(W) x 84.672(H) mm	
Module size	142.5(W) x 100.0(H) x 16.72(D) mm	
View angle	L:70/ R:70/ T:50/ B:70	**θ**
Surface treatment	Anti-Glare	
Color arrangement	64k colors w/ RGB-stripe	
Touch type	4-wire Resistive	
Backlight	Build-in LED driver	
Interface	Uart (TTL-RX/TX), 115200/N/8/1	
Software offer	*Commands Table*	Note1
Operation Temp	-10℃ to 60℃	
Storage Temp	-20℃ to 70℃	

Note1: All of usable APIs is summarized in commands Table. Please refer to document (FG875D_Commands Table_vx.pdf). And detail usage description for each command, refer to (FG4335x_software_Note_V1.pdf).

Pin Assignment

UART Input interface (H4)

Connector: (Box Header_2x5pin/ 2.0mm/ side entry)							
Pin num	**Description**	**I/O**	**Note**	**Pin num**	**Description**	**I/O**	**Note**
Pin1	GND			Pin2	RX	I	
Pin3	TX	O		Pin4	NC		
Pin5	Shield GND			Pin6	NC		
Pin7	NC			Pin8	NC		
Pin9	5V/350mA	I	1	Pin10	5V/350mA	I	1

NOTE1: External power source DC5V input

2-2 Alternative Power connector (W2) option

Connector: (wafer_2pin/ 2.0mm/ side entry)							
Pin num	**Description**	**I/O**	**Note**	**Pin num**	**Description**	**I/O**	**Note**
Pin1	GND	I		Pin2	5V/700mA		

To provide an extra-connector for external power source input. If the power source (DC5V) do not provides from the Pin 9&10 of H4.

GPIO interface (H2)

Connector: (Header_2x5pin/ 2.0mm/ side entry)							
Pin num	**Description**	**I/O**	**Note**	**Pin num**	**Description**	**I/O**	**Note**
Pin1	GPO 0	O	2	Pin2	GPI 0	I	3
Pin3	GPO 1	O	2	Pin4	GPI 1	I	3
Pin5	GPO 2	O	2	Pin6	GPI 2	I	3
Pin7	GPO 3	O	2	Pin8	GPI 3	I	3
Pin9	GND			Pin10	GND		

NOTE2: The GPO_0 ~ 3 are output with open-drain and should have a pull-high resister on external board.
NOTE3: The GPI_0 ~ 3 are 3.3V input with 5V tolerant.

Operation Specifications

Electrical specifications

Absolute Maximum Ratings

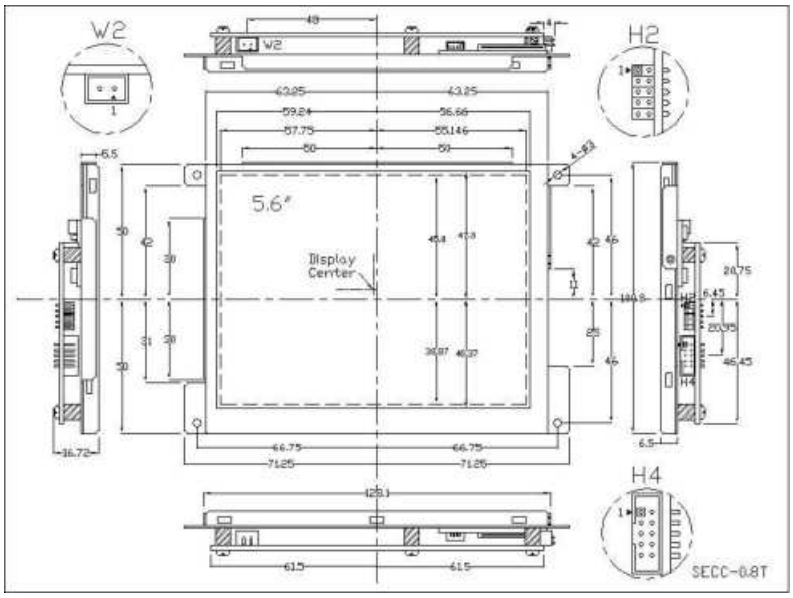
Symbol	**Symbol**	**Min.**	**Max.**	**Unit**	**Note**
Power Voltage	VCC	-0.3	5.2	V	
Operating Temperature	T_{OP}	-10	60	℃	
Storage Temperature	T_{ST}	-20	70	℃	

*The absolute maximum rating values of this product are not allowed to be exceeded at any times.

Recommended operating condition

Symbol	Description	Min.	Typ.	Max.	Unit	Note
Vcc	Supply voltage	3.7	5	5.2	V	
Icc	Current	0.7			A	
UART_TTL(Tx,Rx,CTS,RTS) & I2C(SCL,SDA) signal level						
VIH	Input High Voltage	2.64		3.3	V	
VIL	Input Low Voltage	0		0.66	V	
VOH	Output High Voltage	2.9		3.3	V	
VOL	Output Low Voltage	0		0.4	V	
Optical Specifications (θ=0°)						
CR	Contrast Ratio	400	500			
L	Luminance	230	280		cd/m²	
Baud Rate						
UART			115200		bps	
Power consumption @ 5v input, 100% brightness						
Consumption		5.6” , 640×480		3.1	W	

Mechanical specification



Hardware specification

Block Diagram

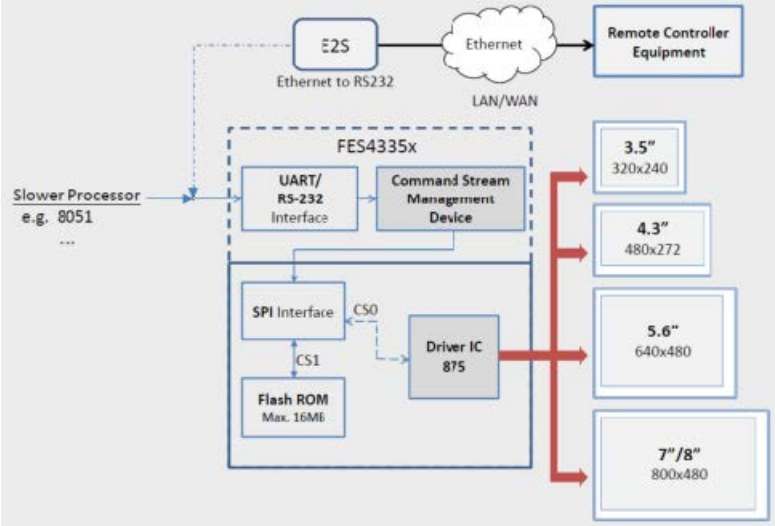
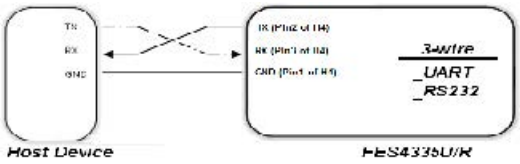


Figure 3-a : FES4335 Block Diagram

Hardware Interface

1. The adapted model is FES4335U1-56T.
2. UART (TTL-RX/TX): 3-wire (TX, RX, GND) refer to (Section: pin assignment).
3. Baud Rate: be fixed at 115200 bps/N/8/1.
4. The connectivity between Host and FES4335U1-56T



Software

Communication (handshaking)

Due to the serial interfaces (Uart-TTL) those FES4335 has offer to establish a communication with an external host. The host is able to transmit a command stream to FES4335 for a task implementation asking.

According to the capacity of transmission, the command stream format is simply defined into two categories.

- Standard Command Stream: This is an essential command stream format for each one task which is listed in the Commands Table. (Refer to Section 4-3 Commands Table).
- Bulk Data Transmission Stream: Only provide to some tasks will ask for a bulk data transmission, and the asking has confirmed during the standard command stream stage.
  Currently only below two tasks which will ask for a Bulk Data Transmission protocol.

1. FG875D_WriteToSerialROM (function code 0x21).
2. FG875D_ Display _Block_RW (function code 0x24).

According to the Commands Table, each command has a unique function code for a specific operation task. (Refer to Section 4-3 Commands Table).
Therefore, once the FES4335 has received a complete of Standard Command Stream and which part of

checksum is checked firstly. After that, the function code part would be identified and implemented along with parameters part.

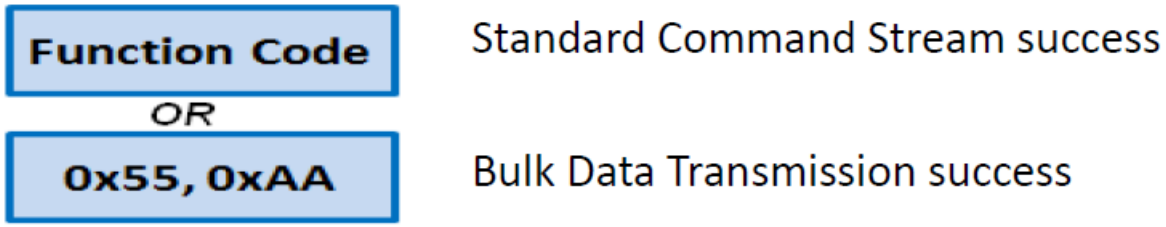
There are a specifically code area 0x50~0x5F where will dedicate to define some message code and also be isolated from the all of function code.

Return message code	**ASCII**	**hex**	**Description**
Wrong code	“X”	0x58	Checksum error
Waiting code	“W”	0x57	FES4335 is busy
Ready code	“S”	0x53	FES4335 is ready
Timeout code	“T”	0x54	Receive Timeout
Touch Interrupt code	“P”	0x50	Touch panel has been touched
Command success code	Function code		Command implement success
Bulk transmission success code	0x55,0xAA		Bulk data transmission success

If there is no error encountered during transmission.

The FES4335 will implement command according to function code that has received in Standard Command Stream Stage, and return function code to Host for success checking.
or
Return function code (0x55,0xAA) to indicate this time of Bulk Data Transmission has completed without problem in “Bulk Data Transmission stage”.

Return Success code or (0x55,0xAA), informing a success status.



Host could send next new command stream.

- If there is any unexpected condition has encountered during transmission.

The FES4335 will return a corresponding error code message and along with the received function code for error checking.

If return Wrong code (0x58) like below. (indicate a Checksum error has occurred)

Standard Command Stream stage error
or

Bulk Data Transmission stage error
Host should repeat the previously command stream.

If return Timeout code (0x54) like below, (indicate a Timeout error has occurred)

Standard Command Stream stage error
or

Bulk Data Transmission stage error
Host should repeat the previously command stream.

Return Wait code (0x57) like below, (indicate a wait status has occurred)

Standard Command Stream is Busy

Bulk Data Transmission is Busy To inform host that FES4335 is in a busy status. Host should temporary stop transmission until FES4335 return Ready code (0x53) and then continue the command stream or bulk data stream those do not finish data yet.

Return Ready code (0x53) like below, (indicate a ready message has occurred)

Standard Command Stream is Ready
or

Bulk Data Transmission is Ready
To inform host that FES4335 has released from the period of busy status. The Host can continue the rest of command stream or bulk data stream.

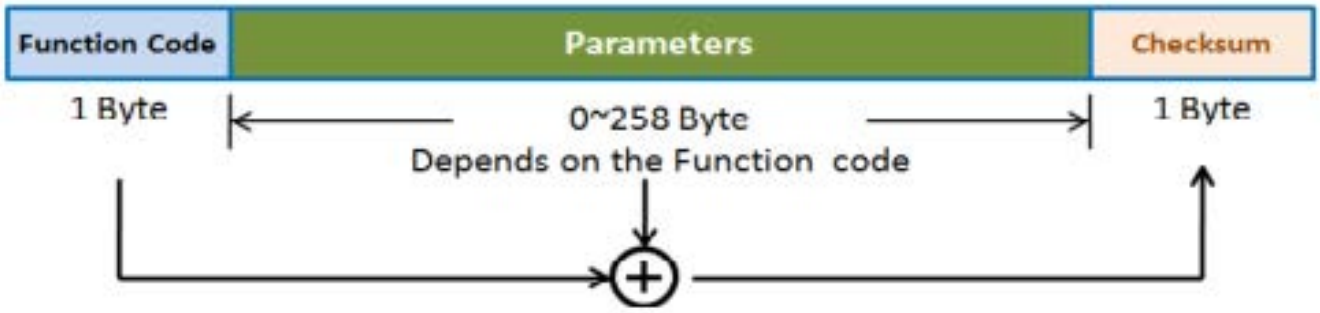
- A specific code to inform the touch interrupt has occurred and also would return the coordinate (x,y) value of touch panel automatically.
    - Return Touch interrupt code (0x50) with coordinate (x,y) value like below,

- a. In a bulk data transmission stage, the FES4335 will temporary to disable touch function and stop return the coordinate (x,y) of touch.
- b. Out of a bulk data transmission stage. FES4335 would automatically return the coordinate (x,y) of touch when a touch interrupt has occurred.
- c. Host could also to poll the coordinate (x,y) value by sending Function code 0x03 (APIs:FG875D_Detect_Touch).

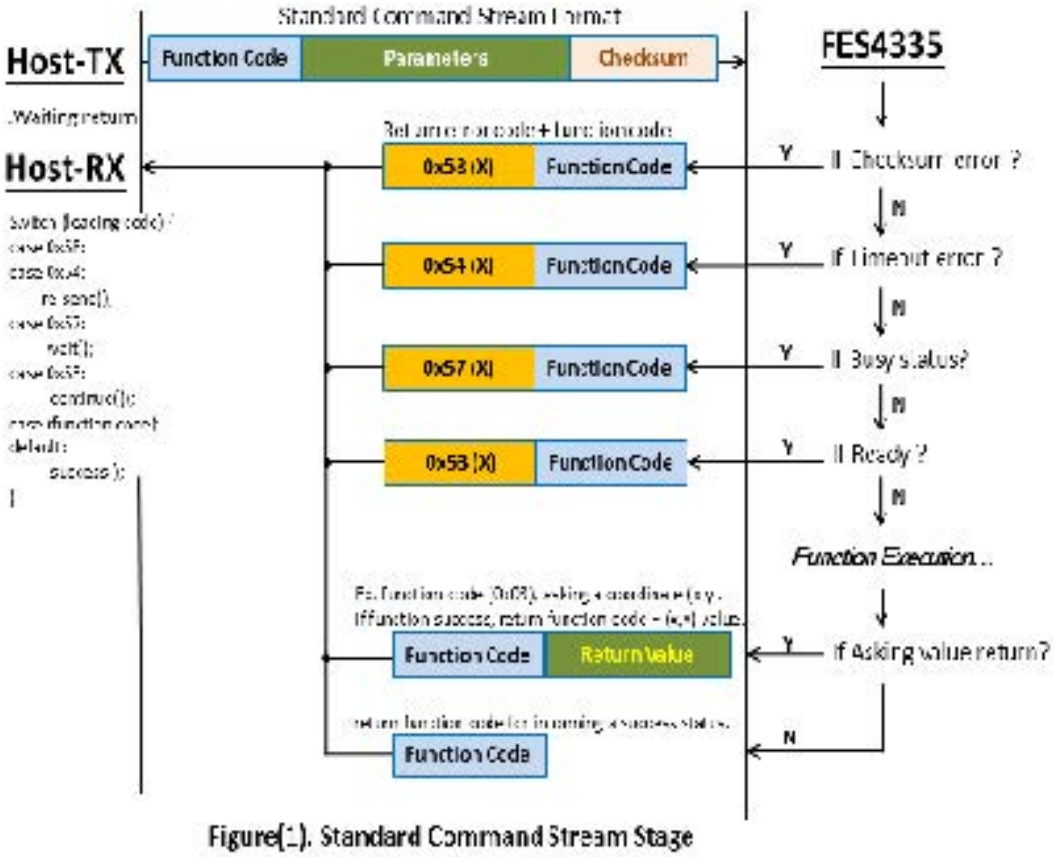
Command (Stream /Format /protocol)

Standard Command Stream

- **Format:** This format combines a byte of function code and several parameter bytes and a byte of checksum **code.**



- **Protocol:**



Figure(1). Standard Command Stream Stage

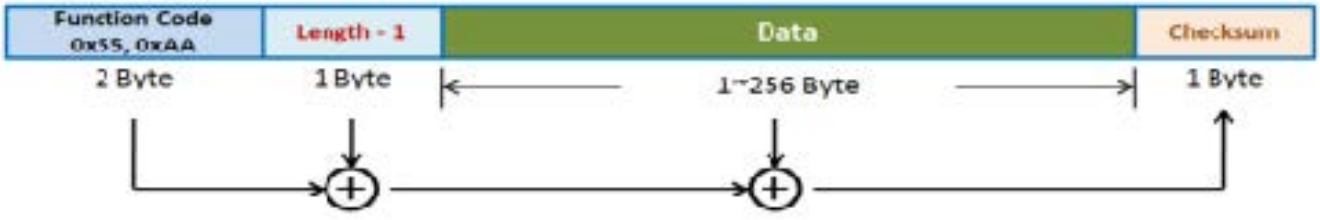
Bulk Data Transmission

Since the function code in Standard Command Stream is (0x21) or (0x24) that will ask a bulk data transmission task after those function code have be identified by FES4335.

In this case, the whole communication process will be separated into two stages (Standard Command Stream stage + Bulk Data Transmission protocol stage).

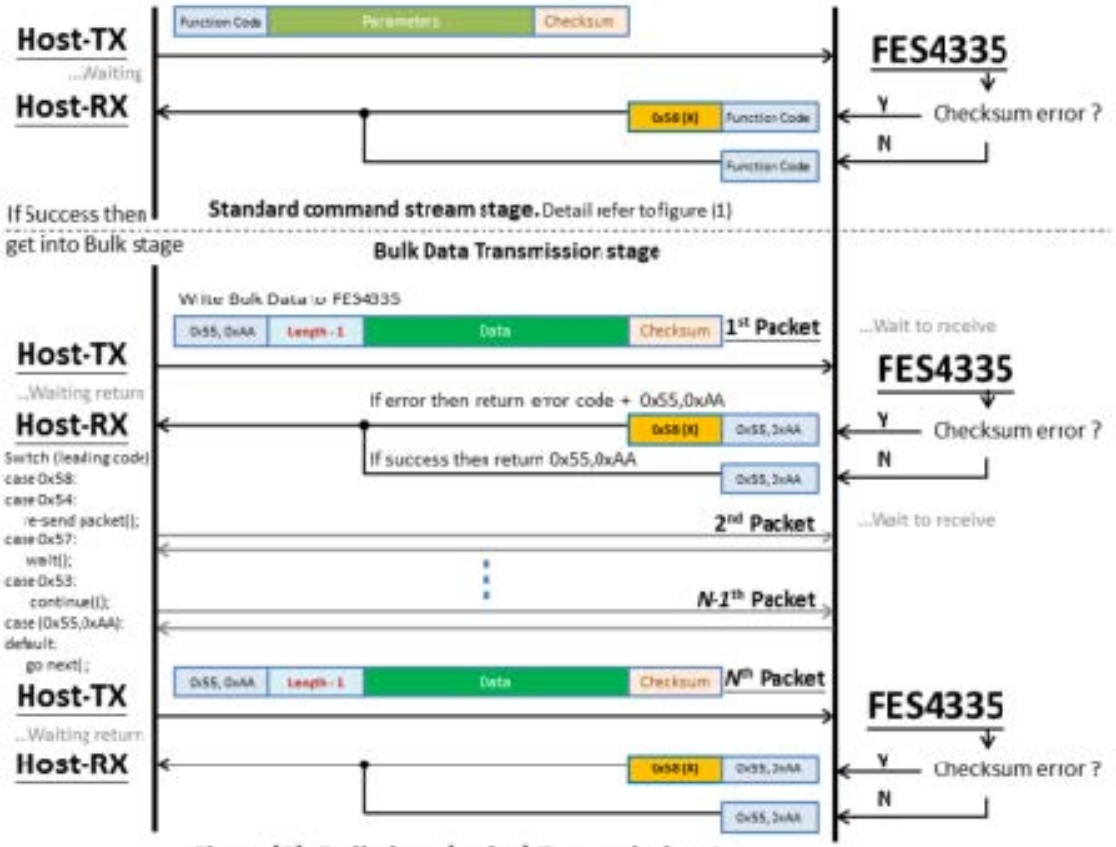
- **Format:** This format is available for bulk data transmission stage only.

  The leading code (0x55,0xAA) will replace function code to indicate a Bulk Data Transmission beginning and then the value be set into length byte is indicated how many data byte will comes up in continuously. Notice to set length byte with real data quantity minus 1.



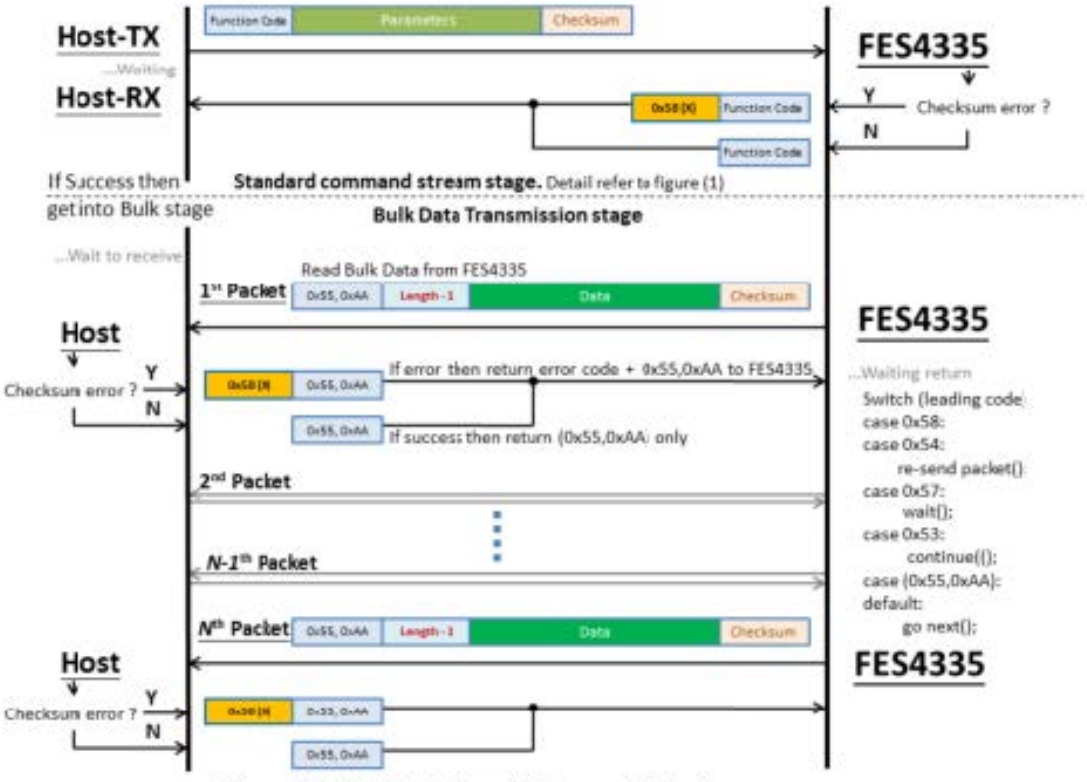
- **Protocol:**

  The illustration to show the standard command stream which ask to write a bulk data transmission to FES4335.



Figure(2). Bulk data-(write) Transmission Stage

The illustration to show the standard command stream which ask to read a bulk data transmission from FES4335.



Figure(3). Bulk data-(read) Transmission Stage

Commands Table

Please, refer to document “FG875D_Commands Table_vx.pdf”.

Appendix (Tips)

Three steps to show a still images on screen more quickly.

Step1): Converting image to a .bin file:
Due to the FES4335's Flash-ROM that only accept .bin file of image. Therefore, providing an utility FG875_BMP_to_Bin.exe that able converts a .BMP image file into .BIN file.
(Refer to document FG875_BMP_to_Bin_manual.pdf for detail).

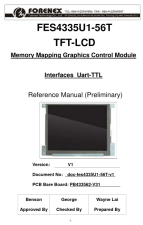
Step2): Loading .bin file to the internal SPI-FlashROM(AMIC A25LQ64).

1. Using the function code 0x21 (APIs:FG875D_WriteToSerialROM) to require FES4335 to go into the bulk data transmission stage.
2. After the Command success code(0x21) is returned from FES4335, then external MPU be allowed to transmit images according to the protocol description about the bulk data-(write) transmission on section 4-2-2. Refer to figure (2).
3. Another way to skip ① & ②:
   On PC side, to execute utility software (FG875D_command_encoder.exe) and choose function item (APIs:FG875D_WriteToSerialROM) in selection dialog. After then, the utility software will take care all about communication protocol and uploading image file into SPI-FlashROM.
   Regarding to the usage of utility software (FG875D_command_encoder.exe), please refer to document "FG875D_Command_Encoder-UsersMenu.pdf".

Step3): Using the function code 0x22 (APIs:FG875D_SerialROM_Show_On_Panel) to require FES4335 to display images from internal SPI_FlashROM to an indicated location of panel.

By this way to show image that would be faster than filling display buffer by 8051 MCU bus.

Documents / Resources

	FORENEX FES4335U1-56T Memory Mapping Graphics Control Module [pdf] User Manual FES4335U1-56T Memory Mapping Graphics Control Module, FES4335U1-56T, Memory Mapping Graphics Control Module, Mapping Graphics Control Module, Graphics Control Module, Control Module, Module