



Japan  
Display  
Inc.  
Group

# **SDK board** **(for MIP 1.28",2.7",4.4")** **Operation Manual**

**Rev.0**  
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**Product Dept.**  
**Display Solutions BU1**  
**Japan Display Inc.**

# Preparation in advance (1/3)

1. Connect LCD module to interface(I/F) board.  
(Fig.1,2,3,4)

- (1) Connectors to be used on the interface board depends on the spec of the LCD module (Fig.1).
- (2) Unlock the connector (Push up the lock lever) before inserting FPC. Then, insert the FPC in the inmost edge of the connector (Fig.2, Fig.3)
- (3) Lock the connector (Push down the lock lever) (Fig.4).

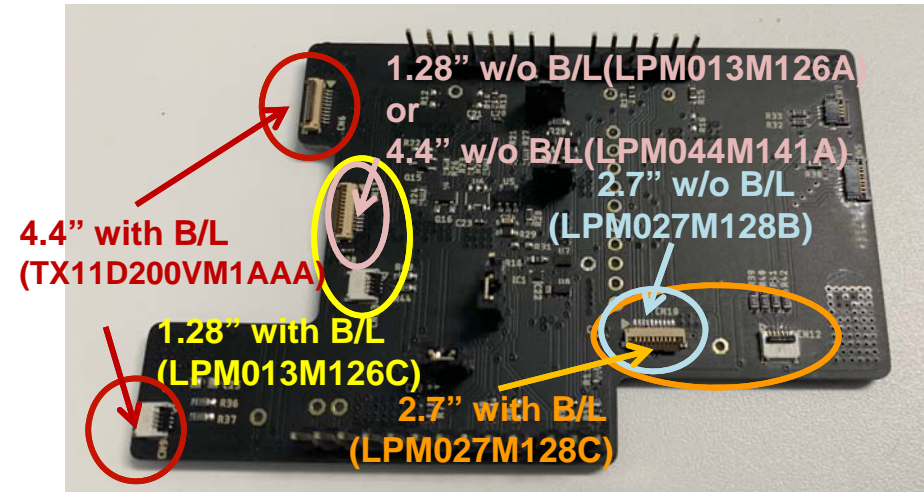


Fig.1 interface board

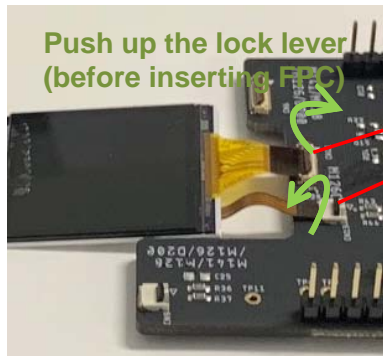


Fig.2 Example of 1.28" with B/L (Connector **unlocked**)

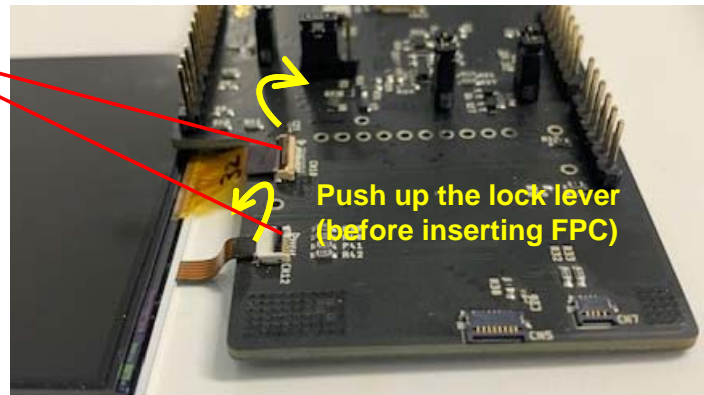


Fig.3 Example of 2.7" with B/L (Connector **unlocked**)

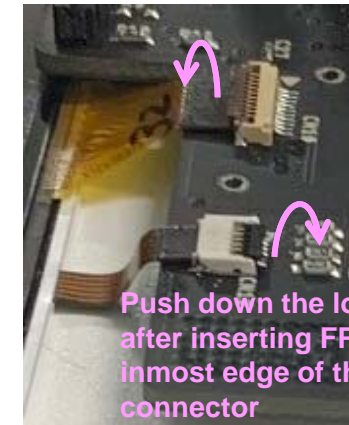


Fig.4 Example of 2.7" with B/L (Connector **locked**)

In case of 1.28" w/o B/L (M126A), 2.7" w/o B/L (M128B), and 4.4" w/o B/L (LPM044M141A), connect only LCD FPC to the connector on the board.

## Preparation in advance (2/3)

2. Connect I/F board to mbed board.

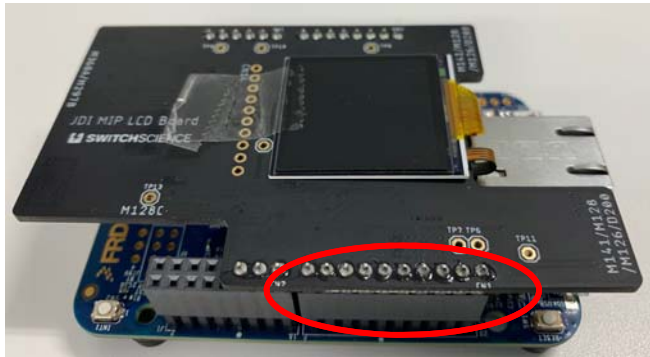


Fig.5

Connect the interface board along the rightmost pin.

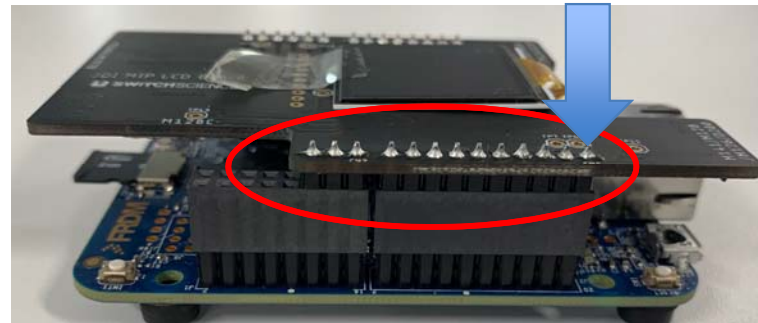


Fig.6

Connect the interface board along the leftmost pin.

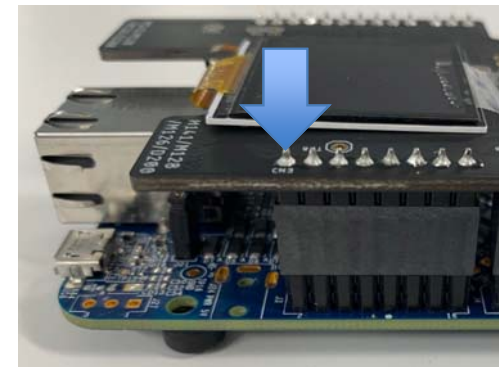


Fig.7 (Opposite side)

**Be careful for direction and position to insert pins.**

# Preparation in advance (3/3)

## 3. Power supply

- (1) Mobile battery or AC adapter for micro USB in the Fig.8 are convenient.
- (2) When the power supply is supplied to the demo board from PC (Fig.9), please pay attention to the followings.
  - (a) When the demo board connects to PC to obtain the power supply (Fig.9), the board accesses to PC, and MBED is going to open automatically (Fig.10).
  - (b) When you see MBED ( MBED(D:), MBED(E:),MBED(F:), etc.) on the PC screen (Fig.10), click "X" and close MBED.
  - (c) If you don't do it, the program of the board may change accidentally.

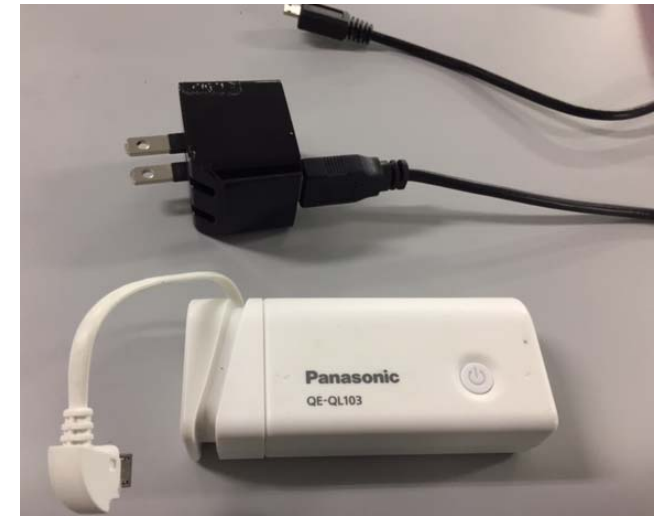


Fig.8 Examples of Power supply

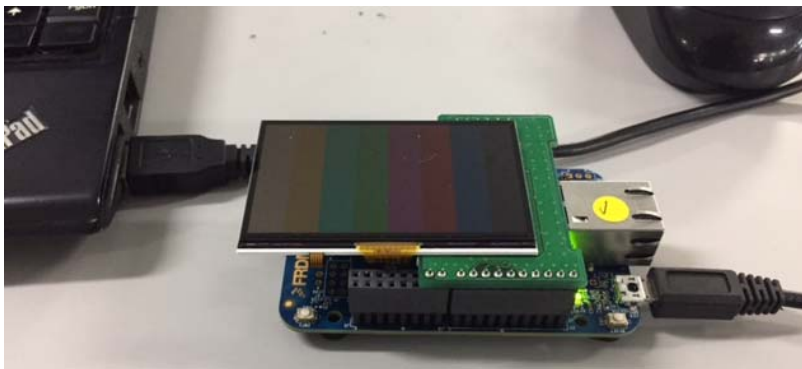
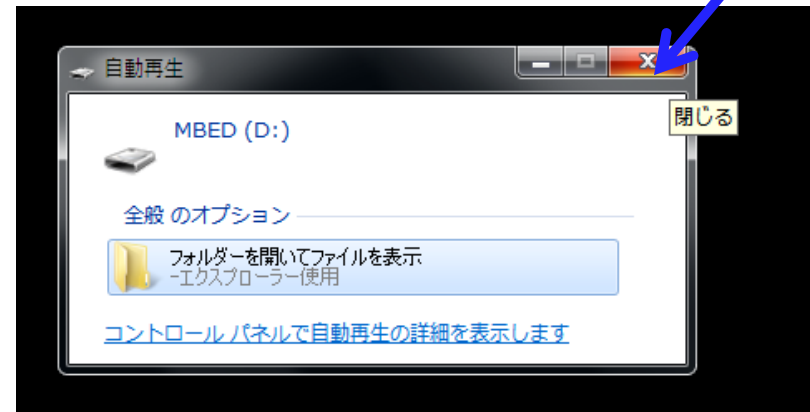


Fig.9 demo board connecting to PC



Click "X" and close MBED

Fig.10 PC screen when demo board connecting to PC

- (3) In case of Windows 8 or 10, updating the DAPLink bootloader is necessary in accordance with the below site.

<https://os.mbed.com/blog/entry/DAPLink-bootloader-update/>

# Software

Install the desired software from the mbed site..

<https://os.mbed.com/teams/JapanDisplayInc/>

The Most simple software is **MIP8f\_FRDM\_sample** displaying some bitmaps as a slide show. Micro SD card is also necessary. In accordance with the guideline on the below site, set up the board.

[https://os.mbed.com/teams/JapanDisplayInc/code/MIP8f\\_FRDM\\_sample/](https://os.mbed.com/teams/JapanDisplayInc/code/MIP8f_FRDM_sample/)

# Operation ( in case of MIP8f\_FRDM\_sample)

## Power on

1. Connect micro USB cable to the board for power supply and confirm the slide show starts. (Fig.11)

Micro USB connection  
(Power supply)



Fig.11

2. When you push INT2(SW3) button, the slide show stops. To restart the show, push INT2 button again. (Fig.12)



Fig.12

3. To turn on the Back light (B/L), push INT1(SW2). Brightness rises every pushing INT1 button. PWM duty changes every 10% from 10% to 100% (10 steps). Pushing the button 11 times , B/L turns off. (Fig.13)

(In case of 1.28" w/o B/L (M126A) , 2.7" w/o B/L (M128B), and 4.4" w/o B/L (M141A), these don't function.)



INT1(SW2)

Fig.13

## Power off

1. Press INT1(SW2) for more than 3 seconds and release it.
2. Confirming screen off , take off the micro USB cable.



# Backlight

## 1. LED current

LED current (PWM duty 100%) is set up as follows:

2.7" (LPM027M128C) : 40mA, i.e.10mA/pc (=10mA x 4 LEDs)

1.28" (LPM013M126C) : 40mA, i.e.20mA/pc (=20mA x 2 LEDs)

4.4" (TX11D200VM1AAA) : 160mA

- The PWM duty can be changeable every 10% (as shown on page 5).

## 2. Examples of Brightness vs LED current

2.7"(LPM027M128C)

Brightness step	PWM duty	Brightness (Ave.)(cd/m <sup>2</sup> )	LED current	
			equivalent to DC Total(mA)	equivalent to DC (mA/pc)
1	10%	2.5	4.0	1.0
2	20%	5.0	8.0	2.0
3	30%	7.5	12.0	3.0
4	40%	10.0	16.0	4.0
5	50%	12.5	20.0	5.0
6	60%	15.0	24.0	6.0
7	70%	17.5	28.0	7.0
8	80%	20.0	32.0	8.0
9	90%	22.5	36.0	9.0
10	100%	25.0	40.0	10.0

100%=40mA/4 LEDs

\*Red color : Suitable conditions for confirmation

1.28"(LPM013M126C)

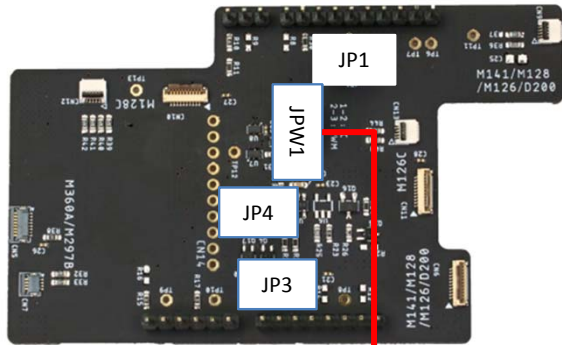
Brightness step	PWM duty	Brightness (Ave.)(cd/m <sup>2</sup> )	LED current	
			equivalent to DC Total(mA)	equivalent to DC (mA/pc)
1	10%	8.0	4.0	2.0
2	20%	16.0	8.0	4.0
3	30%	24.0	12.0	6.0
4	40%	32.0	16.0	8.0
5	50%	40.0	20.0	10.0
6	60%	48.0	24.0	12.0
7	70%	56.0	28.0	14.0
8	80%	64.0	32.0	16.0
9	90%	72.0	36.0	18.0
10	100%	80.0	40.0	20.0

100%=40mA/4 LEDs

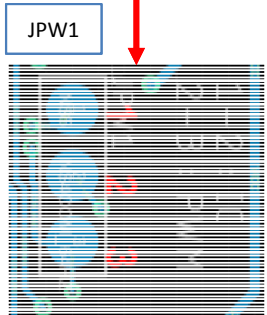
\*Red color : Suitable conditions for confirmation

The above values are only for reference and the actual brightness changes depending on the distribution of LCD modules.

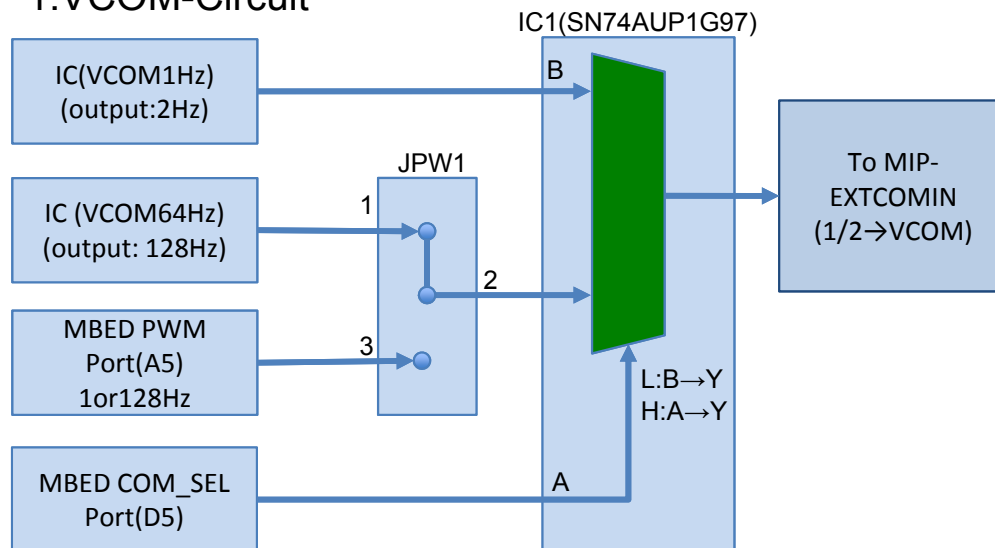
# Jumper of board (when measurement is necessary)



JP	1pin	2pin	3pin	Remarks
JP1	Mbed Board Power	VCOM-Circuit & MIP-Panel		For MIP+VCOM current measurement
JPW1 (*1)	Make VCOM 64Hz (IC128Hz)	To MIP EXTCOMIN	Make VCOM 64Hz (CPU-PWM128Hz)	Default: IC Select(1-2short)
JP3	Vcc(JP1-2)			For MIP current measurement
JP4	VBUS 5V	BackLight Circuit		w/o B/L module → Open For BackLight current measurement



## \*1:VCOM-Circuit



	JPW1	COM_SEL
2Hz:IC & 128Hz:IC(Init)	1-2short	L:2Hz(IC) H:128Hz(IC)
2Hz:CPU & 128Hz:IC	No use case	
2Hz:IC & 128Hz:CPU	2-3short	L:2Hz(IC) H:PWM(128Hz)
2Hz:CPU & 128Hz:CPU	2-3short	H:PWM (2/128Hz)



# Appendix

# SDK(Software Development Kit) Open source, for MIP 8 color products

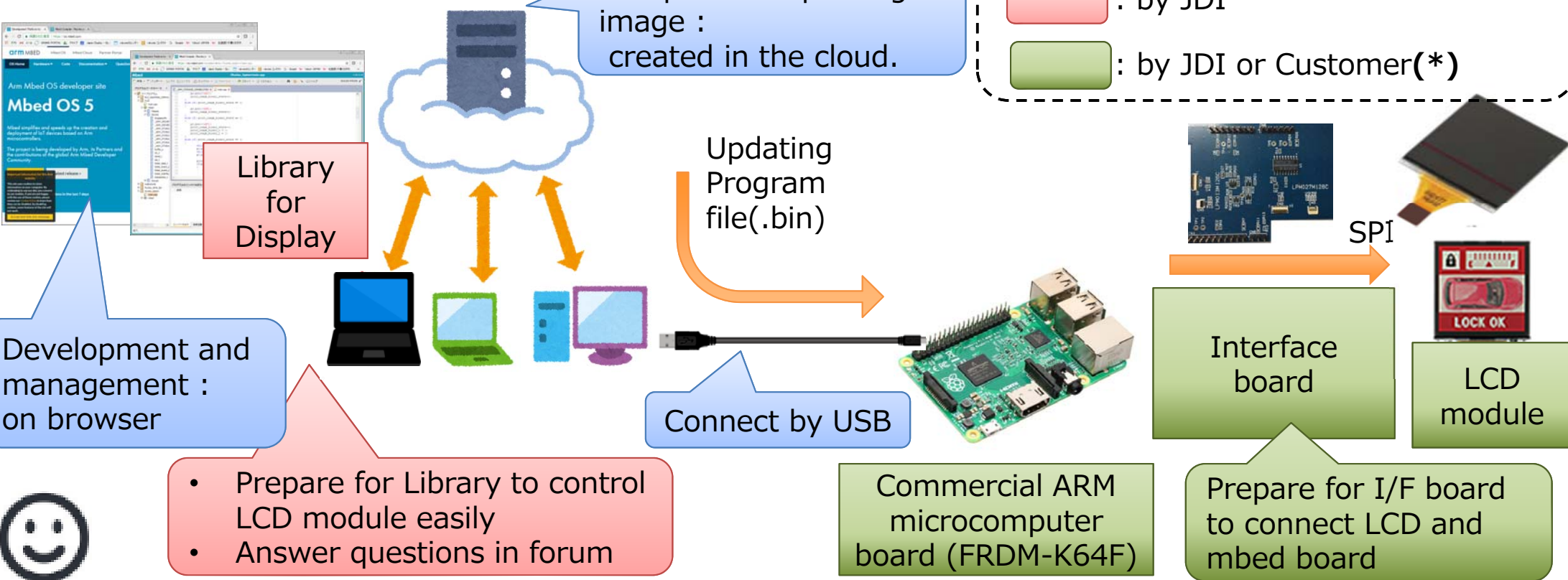
We prepared for software environment for MIP 8 color standard products (except 1.34 inch) so that customers (users) can develop display unit without software support from JDI group.

mbed is integrated development environment managed by ARM microcomputers on Web.

The development is possible even on the local environment.

<https://os.mbed.com/>

- : by Customer (Users)
- : by JDI
- : by JDI or Customer(\*)



To prepare for only software Library, connection cable, I/F+mbed board, and LCD can compose SDK.

(\*) : Customer can buy from I/F board maker (**SWITCHSCIENCE**) as well as JDI group.

# SDK mbed site

## mbed site

<https://os.mbed.com/teams/JapanDisplayInc/>

Software for SDK is disclosed on mbed site and can be downloaded.

### Examples of contents disclosed :

The screenshot shows the ARM Mbed website navigation menu with options: Overview, Mbed OS, Device Management, Blog, Events, and Contact Us. Below the menu is the 'JapanDisplayInc' team page, which includes a brief description of the company's focus on display technology and a navigation bar with 'Summary', 'Code', 'Wiki', and 'Community' tabs.

### Team code repositories (2)

Sort by: **Date** | Alphabetical | Imports | Commits

The screenshot displays two code repositories. The first is 'MIP8F\_SPI', described as a 'JDI\_MIP Frame buffer sample on FRDM-K64F', with a last update date of 11 Oct 2018 and 2 downloads. The second is 'OS 2 MIP8f\_FRDM\_sample', described as a 'JDI\_MIP8F sample', also updated on 11 Oct 2018 with 1 download. Both repositories have a 'display, JDI\_MIP, LCD, MIP, SPI' tag.

The screenshot shows the 'MIP8f\_FRDM\_sample' repository page. It includes the repository name, dependencies (MIP8F\_SPI and mbed), and a 'Fork of jdi\_mip8f\_FRDM\_sample by Mbed\_developer JDI' link. A navigation bar at the bottom of the repository page contains links for Home, History, Graph, API Documentation, Wiki, and Pull Requests.

### Introduction

This Wiki page describes how to use the sample code to evaluate JDI\_MIP. For JDI\_MIP, please refer to the following Wiki page

<https://os.mbed.com/teams/JapanDisplayInc/wiki/MIP-Reflective-type-Color-Display>

[https://os.mbed.com/teams/JapanDisplayInc/wiki/SPI\\_MIP8](https://os.mbed.com/teams/JapanDisplayInc/wiki/SPI_MIP8)

### Constitution

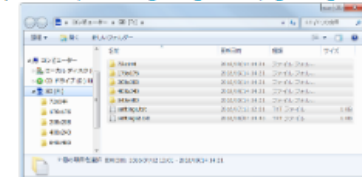
- FRDM-K64F(NXP)
- JDI\_MIP Panel
- JDI\_MIP Interface board.

### Usage

1. Get MIP-panel, and JDI\_MIP Interface Board, FRDM-K64F(NXP).



2. Import into compiler & Compile Program.  
[/media/uploads/JDI\\_Mbed\\_Team/anordertodownloadthesamplecodecompileronthetargetboard.pdf](/media/uploads/JDI_Mbed_Team/anordertodownloadthesamplecodecompileronthetargetboard.pdf)
3. Copy Setting File and Image to micro SD-CARD.
  - a) Download the follow file, and rename file identifier (.bin -> .zip), and unzip the files on micro SD Card's root directory. [/media/uploads/JDI\\_Mbed\\_Team/mip8\\_sdcard\\_1\\_bin](/media/uploads/JDI_Mbed_Team/mip8_sdcard_1_bin)



- b) Edit "Settings2.txt"
    - Line 1 : pixels (X)
    - Line 2 : lines (Y)
    - Line 3 : backlight selector (0:40mA, 1:160mA)
  - c) Insert micro SD-CARD to FRDM-K64F.
4. Upload binary file to FRDM-K64F.

### Interface board

- Get from Switch Science
- schematic/Parts list

[/media/uploads/JDI\\_Mbed\\_Team/mip-board\\_schematic\\_20180810b.pdf](/media/uploads/JDI_Mbed_Team/mip-board_schematic_20180810b.pdf)

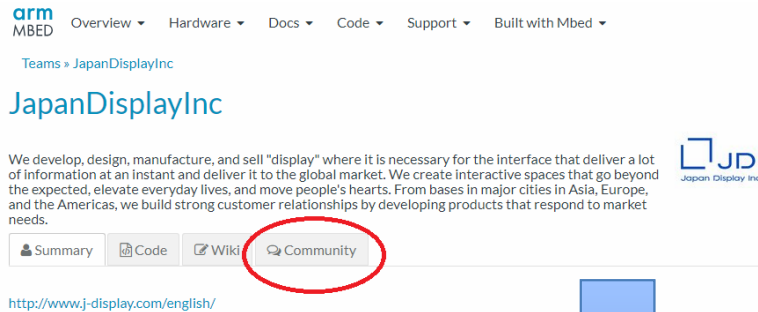
[/media/uploads/JDI\\_Mbed\\_Team/mip-interface\\_partslist\\_20180810b.pdf](/media/uploads/JDI_Mbed_Team/mip-interface_partslist_20180810b.pdf)

### FRDM Pin(Port) assign

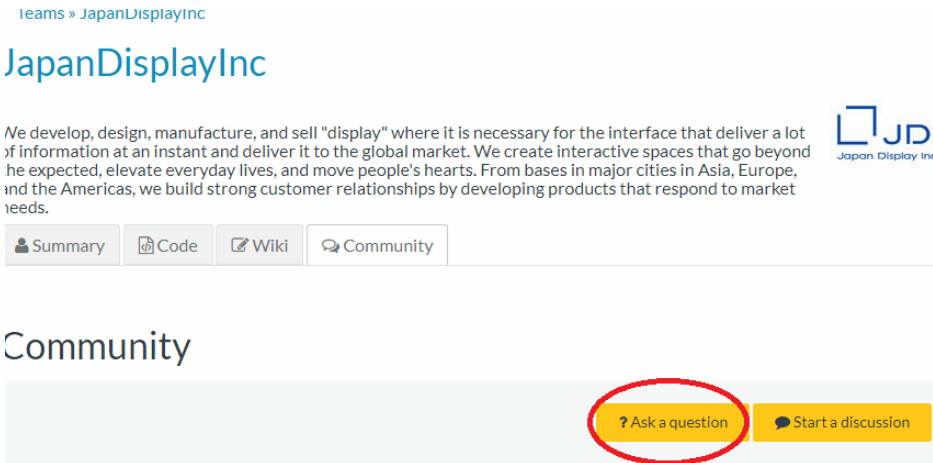


# SDK mbed site : Questions

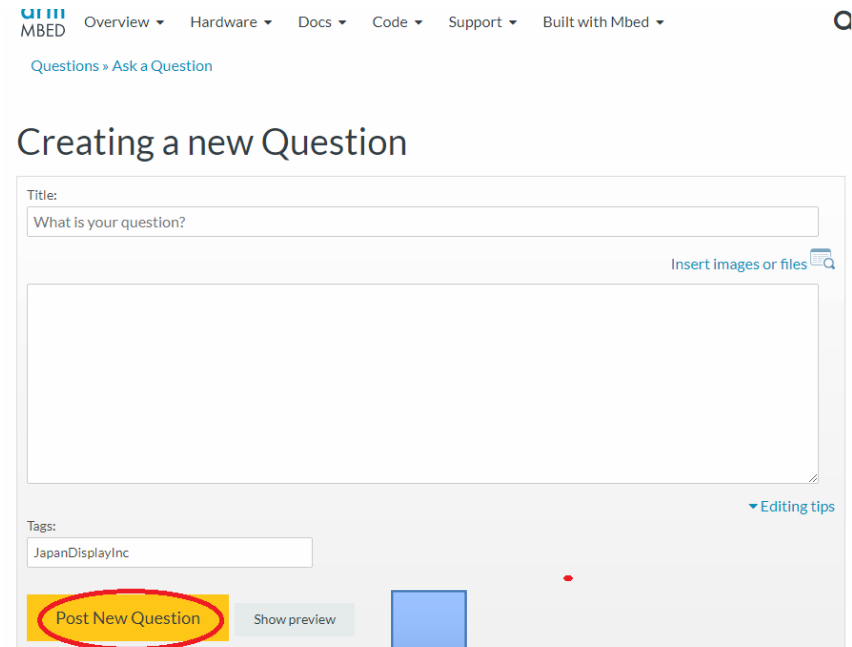
(1) If you have questions regarding software, click Community on mbed site of JDI.



(2) Then, please push "? Ask a Question".



(3) At first, mail address and password will be asked. After you sign up them, the below is displayed. Then, please fill in the title and contents. Finally, please click "Post New Question" and post it.



(4) Our software engineers will reply on mbed site though they are disclosed.

EOF