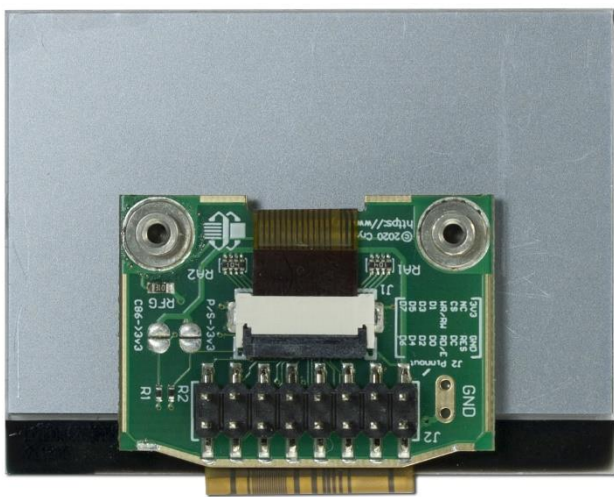




# 240x128 Graphic Display Module with Carrier Board

## DATASHEET



**CFAG240128U0-NFH-E1**  
**CFAG240128U0-TFH-E1**

Datasheet Release: 2022-12-13



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## 1. General Information

### Datasheet Revision History

Datasheet Release: 2022-12-13  
Datasheet for the CFAG240128U0-xFH-E1 display module.

### Product Change Notifications

You can check for or subscribe to [Part Change Notices](#) for this display module on our website.

### Variations

Slight variations between lots are normal (e.g., contrast, color, or intensity).

### Volatility

This display module has volatile memory.

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## 2. Introduction

The CFAG240128U0-xFH-E1 family includes two modules, one with a backlight (CFAG240128U0-TFH-E1) and one without a backlight (CFAG240128U0-NFH-E1). Both are 2.2-inch, 240x128 graphic, 4-color grayscale LCD display modules. They are small, thin, and very low-power. Without the backlight, this family of displays is visible in most lighting situations, including normal office lighting and bright sunlight. The backlit version enables visibility in dark environments. This display is well suited for low-power hand-held devices that are normally used in well-lit environments.

This LCD display has an integrated [Sitronix ST75256P LCD driver](#) and voltage generating components mounted on the flexible tail. The carrier board for this display module breaks the ZIF tail out to a 16-pin 0.1" (2.54mm) header.

## 3. Features

- 2.2-inch 240x128 graphic LCD display module mounted on a carrier board
- Simple 4-wire SPI, I2C, or 8-bit parallel interface
- 4-color grayscale
- Ultra-low power consumption
- Wide operating temperature range: -20°C to 70°C (-4°F to 158°F)

## 4. Mechanical Data

### 4.1. CFAG240128U0-NFH-E1

Item	Specification (mm)	Specification (inch)
Module Dimension	56.0 (W) x 42.5 (H) x 5.8 (D)	2.20 (W) x 1.67 (H) x 0.22 (D)
Viewing Area	52.0 (W) x 33.5(H)	2.05 (W) x 1.32 (H)
Active Area	47.98 (W) x 29.42 (H)	1.88 (W) x 1.16 (H)
Dot Pitch	0.20 (W) x 0.23 (H)	0.008 (W) x 0.009 (H)
Weight (Typical)	15 grams	0.53 ounces

### 4.2. CFAG240128U0-TFH-E1

Item	Specification (mm)	Specification (inch)
Module Dimension	58.2 (W) x 44.7 (H) x 7.4 (D)	2.29 (W) x 1.76 (H) x 0.29 (D)
Viewing Area	52.0 (W) x 33.5(H)	2.05 (W) x 1.32 (H)
Active Area	47.98 (W) x 29.42 (H)	1.88 (W) x 1.16 (H)
Dot Pitch	0.20 (W) x 0.23 (H)	0.008 (W) x 0.009 (H)
Weight (Typical)	20.5 grams	0.72 ounces



## 5. Electrical Data

### 5.1. Absolute Maximum Ratings

Parameter	Symbol	Min	Max	Unit
Logic Power Supply	3v3	-0.3	3.6	V
Operating Temperature	T <sub>OP</sub>	-20	+70	°C
Storage Temperature	T <sub>ST</sub>	-30	+80	°C

Notes:

- (1) These are stress ratings only. Extended exposure to the absolute maximum ratings listed above may affect device reliability or cause permanent damage.
- (2) Temp. ≤60°C, 90% RH Maximum Temp. >60°C Absolute humidity < 90% RH at 60°C

### 5.2. Electrical Characteristics

Item	Symbol	Min	Typ	Max	Unit
Logic Power Supply	3v3	3.0	3.3	3.6	V
Input Logic High	V <sub>IH</sub>	0.7 * (3v3)	-	3v3	V
Input Logic Low	V <sub>IL</sub>	0	-	0.3 * (3v3)	V
Logic Supply Current	I <sub>3v3</sub>	-	1.0	-	mA

### 5.3. Optical Characteristics

Item	Symbol	Condition	Min	Typ	Max	Unit
Response Time	T <sub>r</sub>	25°C	-	150	225	ms
	T <sub>f</sub>		-	280	420	ms
Contrast Ratio	CR	θ=0°	-	4	-	-
Viewing Angle	Θ 180°	CR≥2	30	35	-	Degree
	Θ 0°		35	40	-	
	Θ 90°		30	35	-	
	Θ 270°		30	35	-	
Viewing Direction	6 o'clock					



#### 5.4. Interface Pin Function - J2 Connection on CFA10110 Adapter Board

Pin	Symbol	Function
1	GND	Ground
2	3v3	Supply Voltage
3	RES	Hardware Reset (active low)
4	NC	No connection
5	DC	Data Command (Register select). Data high, command low.
6	CS	Chip select, selected when low.
7	RD/E	<b>SPI</b> – No connection <b>6800</b> – Read/Write Enable <b>8080</b> – Read enable (active low)
8	WR/RW	<b>SPI</b> – No connection <b>6800</b> – Read/Write <b>8080</b> – Write enable (active low)
9	D0	<b>SPI and I2C</b> – Serial Clock <b>8080 and 6800</b> – D0
10	D1	<b>SPI and I2C</b> – Serial Data. Tie together <b>8080 and 6800</b> – D1-3
11	D2	
12	D3	
13	D4	<b>SPI and I2C</b> – No Connection <b>8080 and 6800</b> – D4-5
14	D5	
15	D6	<b>SPI</b> – No Connection <b>I2C</b> – SA[0] I2C address bit <b>8080 and 6800</b> – D6
16	D7	<b>SPI</b> – No Connection <b>I2C</b> – SA[1] I2C address bit <b>8080 and 6800</b> – D7

Notes:

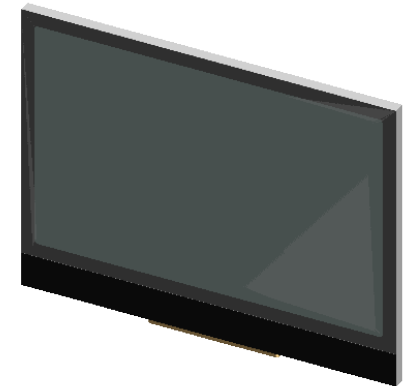
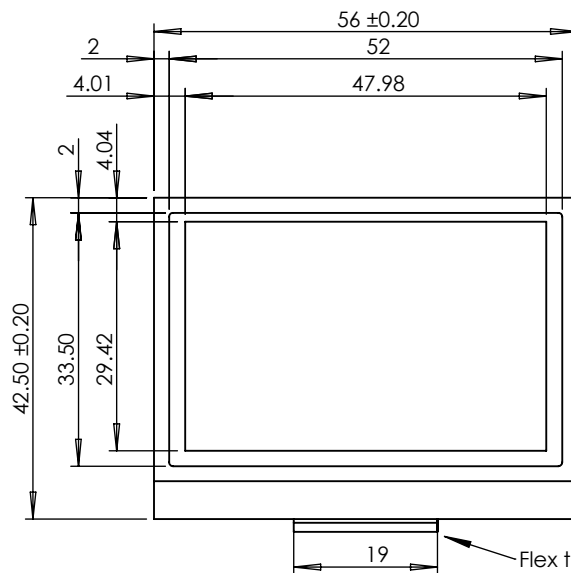
- The 4-wire SPI serial interface is write-only at all times.

#### 5.5. Backlight Characteristics (TFH only)

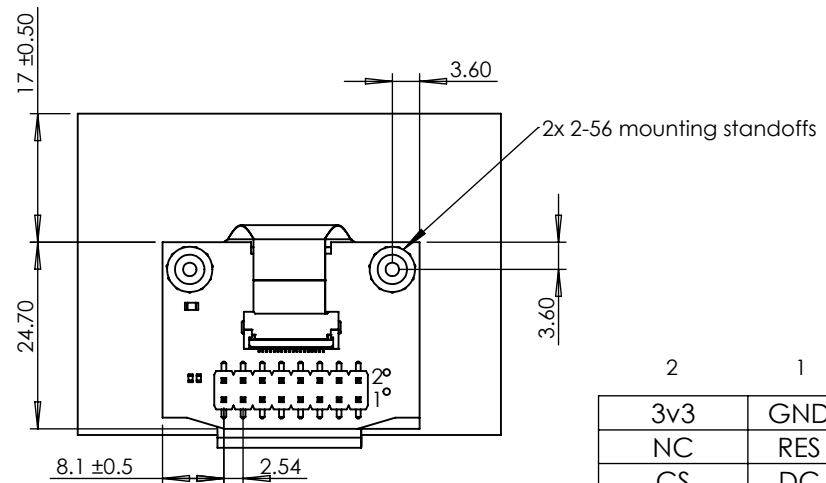
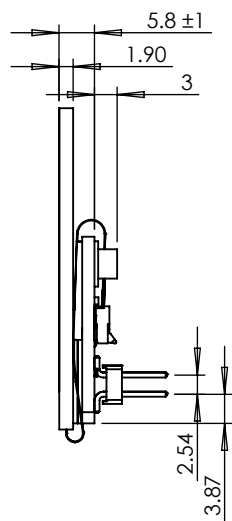
Item	Symbol	Conditions	Min	Typ	Max	Unit
Supply Voltage	VLED		-	3.5	-	V
Supply Current	ILED	VF=3.5V	36	48	60	mA
LED Lifetime		ILED=48mA @ 25°C	-	30000	-	hours (estimated)
Luminance	IV	ILED=48mA	688	860	-	cd/m2

Notes:

- Backlight is drive by current. Voltage is for reference only.
- Backlight power is provided via the A and K tabs on the back of the display



Flex tail extends below in this area. Avoid pressure on the flex tail.



2	1
3v3	GND
NC	RES
CS	DC
WR/RW	RD/E
D1	D0
D3	D2
D5	D4
D7	D6

Units: millimeters  
Tolerance: ±0.3



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Part Number:

**CFAG240128U0NFH-E1**

Date:

2022-12-8

Filename:

CFAG240128U0NFH-E1 mm.pdf

Revision:

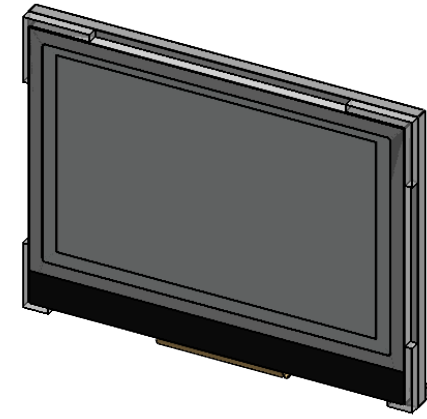
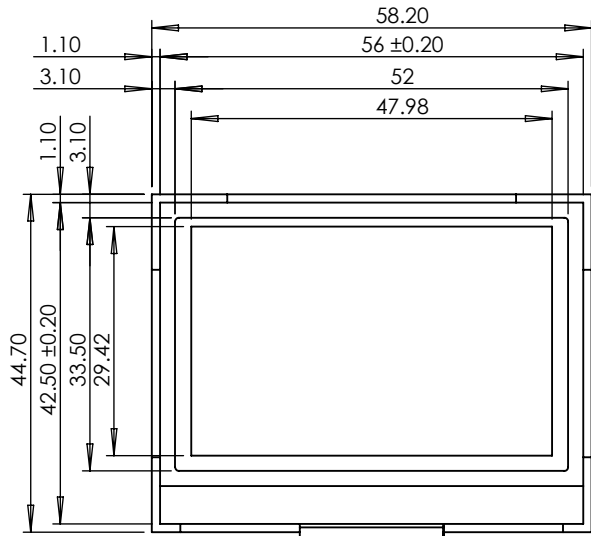
v1.0

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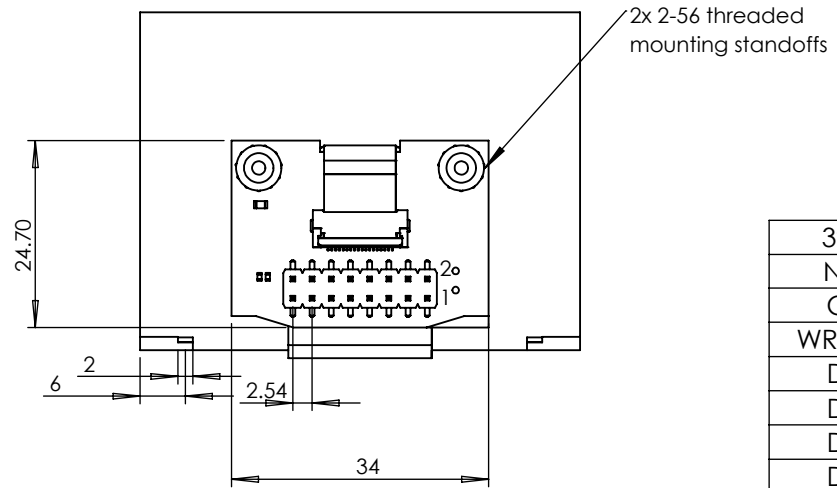
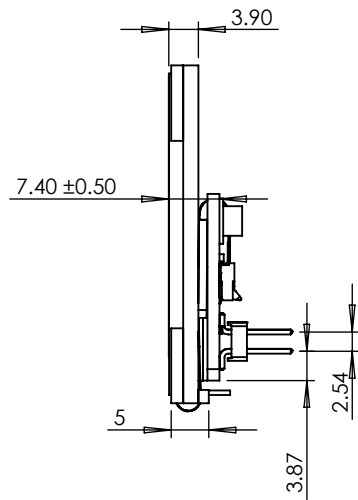
[www.crystallfontz.com/product/CFAG240128U0NFH-E1](http://www.crystallfontz.com/product/CFAG240128U0NFH-E1)

Sheet:

1 of 1



Flex tail extends below in this area.  
Avoid pressure on flex tail.



2	1
3v3	GND
NC	RES
CS	DC
WR/RW	RD/E
D1	D0
D3	D2
D5	D4
D7	D6

Units: millimeters  
Tolerance:  $\pm 0.3$



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Part Number:

**CFAG240128U0TFH-E1**

Date:

2022-12-06

Filename:

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Revision:

v1.0

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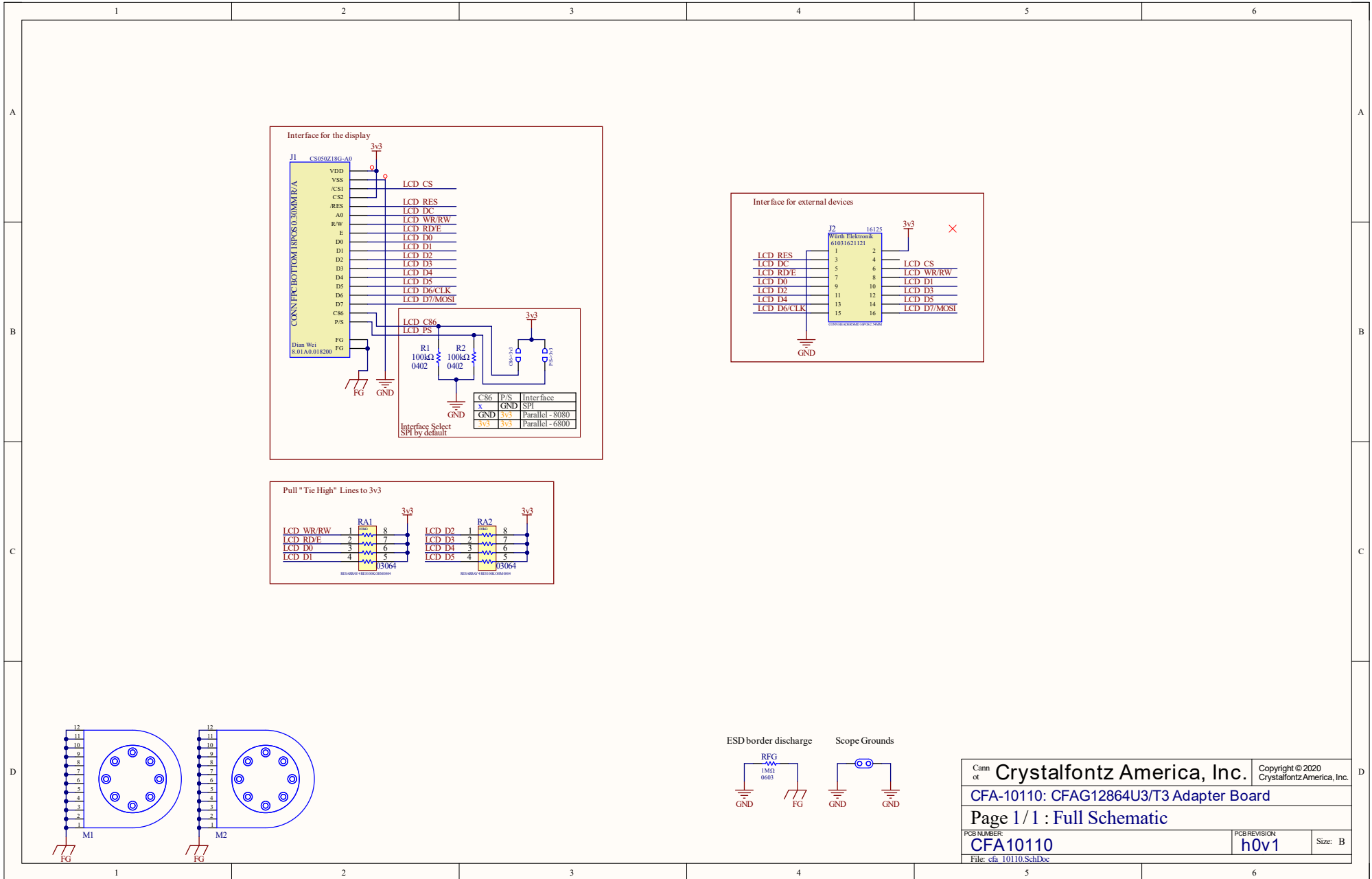
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Sheet:

1 of 1



# 8. Schematic



Conn ot	<b>Crystalfontz America, Inc.</b>	Copyright © 2020 Crystalfontz America, Inc.
<b>CFA-10110: CFAG12864U3/T3 Adapter Board</b>		
<b>Page 1 / 1 : Full Schematic</b>		
PCB NUMBER: <b>CFA10110</b>	PCB REVISION: <b>h0v1</b>	Size: B
File: cfa_10110.SchDoc		



## 9. LCD Module Precautions

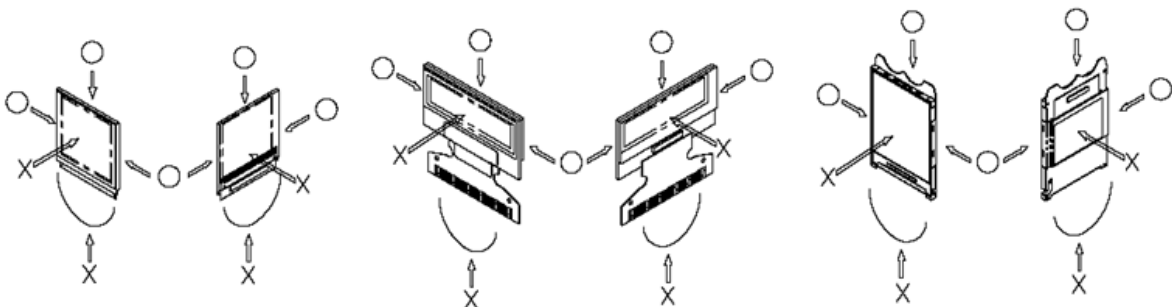
These precautions help ensure personal safety, module performance, and compliance of environmental regulations when using an LCD module.

### 9.1. Modules

- Avoid excessive physical and electrical shocks to module.
- Do not drop, bend, or twist the LCD display module.
- Do not make extra holes, modify the shape, or change the components of the printed circuit board.
- Do not disassemble the LCD display module.
- Do not operate the LCD display module outside the absolute maximum rating.
- Only solder to the I/O terminals.
- Store in an anti-static electricity container and clean environment.
- Do not display static information for long periods of time to avoid burn in.
- Crystalfontz has the right to change passive components on the display module. Resistors, capacitors and other passive components may have different appearance and color.
- Crystalfontz has the right to change the PCB revision/version in order to satisfy the supply stability, management optimization, the best product performance, etc., under the premise of not affecting the electrical characteristics and external dimensions.

### 9.2. Handling Precautions

- The display panel is made of glass. Do not apply mechanical impacts, stress or pressure to the LCD display module.
- Pressure applied to or near the display surface may damage the cell structure.
- If the display panel is accidentally broken and the internal organic substance leaks out, do not inhale or touch the organic substance.
- The polarizer covering the surface of the LCD display module is soft and can be easily scratched. Cover the polarizer in the final design.
- Clean the surface of the polarizer using Scotch Mending Tape No. 810 or an equivalent
  - Never breathe on the surface or wipe the surface using a cloth containing solvent such as ethyl alcohol, as the surface of the polarizer will become cloudy.
  - Water, ketone, and aromatic solvents may ruin the polarizer.
- Do not over bend the film with electrode pattern layouts. This can effect the display performance.



- Do not apply stress to the LSI chips and the surrounding molded sections.
- Do not apply input signals while the logic power is off.
- Prevent damage by electrostatic discharge (ESD) when handling the LCD display module:
  - Ground personnel handling LCD display modules.
  - Ground tools used for assembly such as soldering irons.
  - To suppress generation of ESD, avoid carrying out assembly work under dry environments.
  - Remove the protective film applied to the display panel slowly as ESD may be generated when removing the film.
- Protective film is applied to the surface of the display panel. Remove the film before assembly. If the LCD display module has been stored for a long period of time, residue adhesive material of the protection film may remain on the surface of the display panel after the film has been removed. In such a case, remove the residue material as discussed above.



### 9.3. Storing Precautions

- Store the LCD display modules in ESD preventative bags. Avoid exposure to direct sunlight and fluorescent lamps. Avoid high temperature and high humidity environments and low temperature (less than 0°C) environments. We recommend storing these modules in the packaged state in which they were shipped from Crystalfontz.
- Do not let water drops or dew adhere to the packages or bags.
- If electric current is applied when water is on the surface of the LCD display module, the module may become dewed. If a dewed LCD display module is placed under high humidity environments the electrodes may become corroded.

### 9.4. Designing Precautions

- The absolute maximum ratings cannot be exceeded for LCD display module. If these values are exceeded, panel damage may happen.
- Satisfy the VIL and VIH specifications and, ensure the signal line cable is as short as possible to avoid signal noise.
- Install excess current preventative unit (fuses, etc.) to the power circuit. Recommend value: 0.5A
- Avoid occurrence of mutual noise interference with the neighboring devices.
- When fastening the LCD display module, fasten the external plastic housing section.  
If the power supply to the LCD display module is forcibly shut down, by such errors as taking out the main battery while the LCD display panel is in operation, we cannot guarantee the quality of this LCD display module.
- Connection (contact) to any other potential than the above may lead to rupture of the IC.

### 9.5. Disposing Precautions

- Request qualified companies handle the industrial waste when disposing of the LCD display modules. Observe all relevant laws and regulations.

### 9.6. Other Precautions

- When an LCD display module is operated for a long period of time with a fixed pattern, the fixed pattern may remain as an after image or a slight contrast deviation may occur.
  - If the operation is interrupted and left unused for a while, normal state can be restored.
  - This will not cause a problem in the reliability of the module.
- To protect the LCD display module from performance drops by static electricity rapture, etc., do not touch the following sections whenever possible while handling the LCD display modules.
  - Pins and electrodes
  - Pattern layouts such as the TCP & FPC
- With this LCD display module, the LCD driver is exposed. If this LCD driver is exposed to light, malfunctioning may occur. Design the product and installation method so that the LCD driver may be shielded from light in actual usage and during the inspection processes.
- Although this LCD display module stores the operation state data by the commands and the indication data, when excessive external noise, etc. enters into the module, the internal status may be changed. Therefore, it is necessary to take appropriate measures to suppress noise generation or to protect from influences of noise on the system design.
- Periodically refresh the operation statuses in the software (reset the commands and retransfer the display data), to cope with catastrophic noise.
- Resistors, capacitors, and other passive components will have different appearance and color caused by the different supplier.
- Crystalfontz has the right to upgrade and modify the product function.
- The limitation of FPC bending:

