



TFT DISPLAY MODULE
WITH CAPACITIVE TOUCH PANEL
DATASHEET



CFAF480128A0-039TC

Datasheet Release: 2020-06-11

Revision A1

Crystalfontz America, Inc.

12412 East Saltese Avenue
Spokane Valley, WA 99216-0357
Phone: 888-206-9720
Fax: 509-892-1203
Email: support@crystalfontz.com
URL: www.crystalfontz.com

Table of Contents

1. GENERAL INFORMATION	3
2. MODULE DESCRIPTION	4
3. FEATURES.....	4
4. MECHANICAL DATA	4
5. MECHANICAL DRAWING.....	5
6. INTERFACE PIN FUNCTION	6
6.1. LCD PIN DEFINITION	6
6.2. CAPACITIVE TOUCH PANEL PIN DEFINITION.....	6
7. SYSTEM BLOCK DIAGRAM.....	7
8. ABSOLUTE MAXIMUM RATINGS	7
9. ELECTRICAL CHARACTERISTICS	8
9.1. OPERATING CONDITIONS	8
9.2. BACKLIGHT CHARACTERISTICS	8
10. DC CHARACTERISTICS.....	8
11. OPTICAL CHARACTERISTICS	9
12. INTERFACE TIMING	9
12.1. PARALLEL SYNC MODE RGB INPUT TIMING TABLE	9
13. CAPACITIVE TOUCH PANEL INTERFACE	10
14. LCD MODULE PRECAUTIONS	11
14.1. MODULES.....	11
14.2. HANDLING PRECAUTIONS.....	11
14.3. STORING PRECAUTIONS.....	12
14.4. DESIGNING PRECAUTIONS.....	12
14.5. DISPOSING PRECAUTIONS.....	13
14.6. OTHER PRECAUTIONS.....	13

1. General Information

Datasheet Revision History

Datasheet Release: 2020-06-11
Datasheet for the CFAF480128A0-039TC TFT graphic 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. Module Description

The CFAF480128A0-039TC is a 3.9-inch color TFT LCD graphic display module with a capacitive touch-sensitive panel. This display is suitable for server systems, audio systems, security equipment, outdoor intercom systems, medical equipment, appliances, and more.

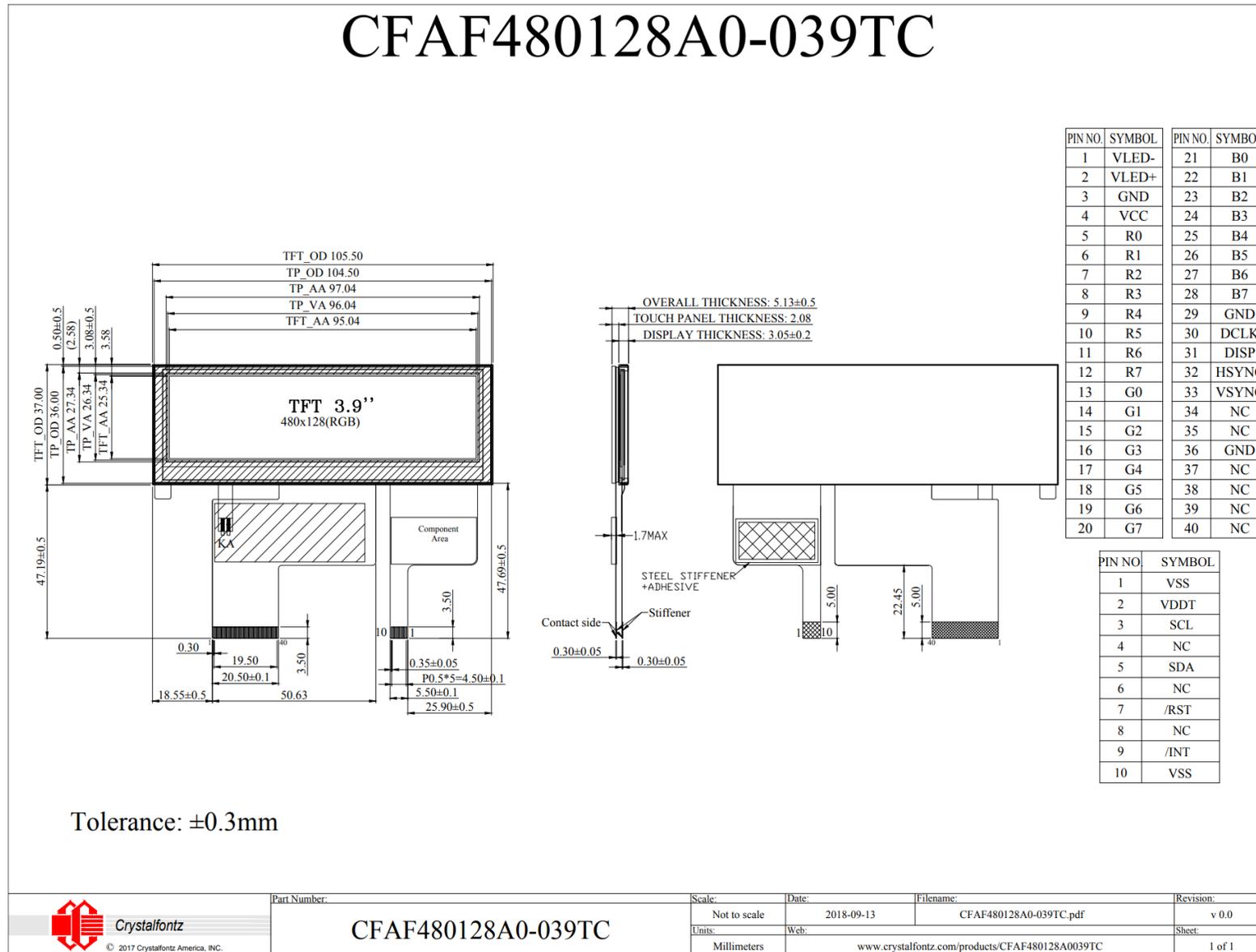
3. Features

- 480x128 RGB TFT Dot Matrix LCD
- Capacitive Touch Panel using Cypress CYTMA568
- 24-bit Parallel RGB Interface
- +3.3V Power Supply
- Ideal Viewing Direction 6 o'clock
- Operating Temperature: -20°C to +70°C
- Storage Temperature: -30°C to +80°C

4. Mechanical Data

Item	Specification (mm)	Specification (inch, reference)
Overall Module Dimension	105.5 (W) x 37.0 (H) x 5.13 (D)	4.154 (W) x 1.457 (H) x 0.202 (D)
Viewing Area	97.04 (W) x 27.34 (H)	3.820 (W) x 1.076 (H)
Active Area	95.04 (W) x 25.34 (H)	3.742 (W) x 0.9976 (H)
Dot Pitch	0.066 (W) x 0.198 (H)	0.0026 (W) x 0.0078 (H)
Weight (Typical)	43 grams	1.52 ounces

5. Mechanical Drawing



6. Interface Pin Function

6.1. LCD Pin Definition

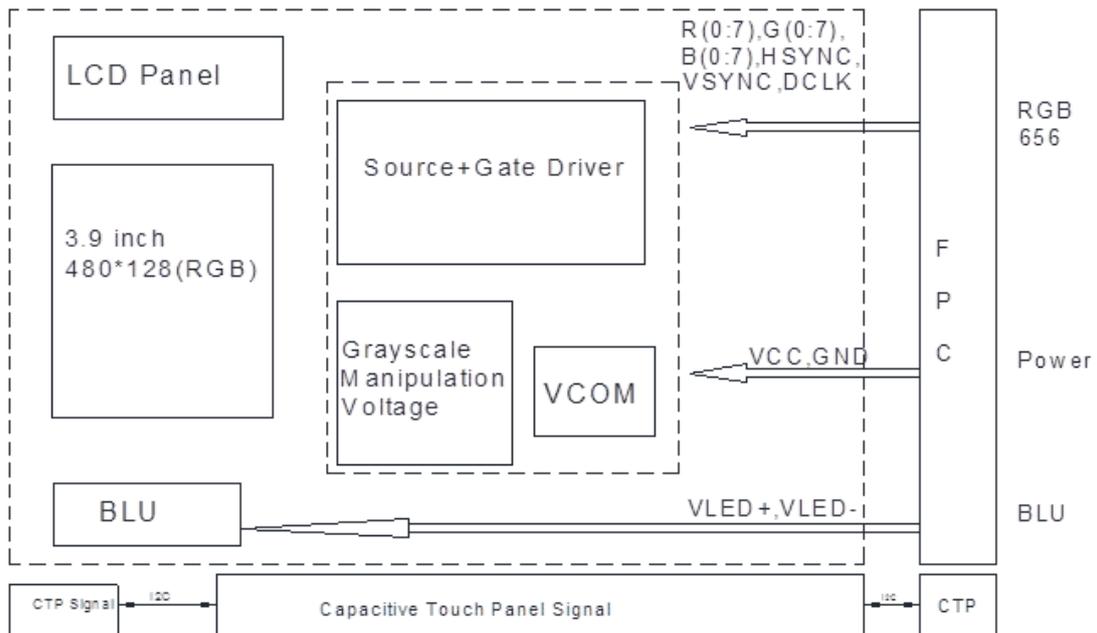
Pin	Symbol	Function
1	V _{LED-}	Backlight LED Cathode
2	V _{LED+}	Backlight LED Anode
3	GND	System Ground
4	V _{CC}	Power Supply for Logic Operation
5-12	R0-R7	Data Bus
13-20	G0-G7	Data Bus
21-28	B0-B7	Data Bus
29	GND	System Ground
30	D _{CLK}	Pixel Clock Signal
31	D _{ISP}	Display On/Off Control
32	H _{SYNC}	Horizontal Sync Signal
33	V _{SYNC}	Vertical Sync Signal
34	NC	No Connection (Option DE)
35	NC	No Connection
36	GND	System Ground
37	NC	No Connection
38	NC	No Connection
39	NC	No Connection
40	NC	No Connection

The default function on this module is SYNC mode. Use DE if you want to change the mode; the FPC will modify the resistive jumper.

6.2. Capacitive Touch Panel Pin Definition

Pin	Symbol	Function
1	VSS	Ground for analog circuit
2	VDDT	Power Supply: +3.0V
3	SCL	SPI mode: chip select, active low I2C mode: clock input and output
4	NC	No connect
5	SDA	SPI mode: data input I2C mode: data input and output
6	NC	No connect
7	/RST	External Reset, active low
8	NC	No connect
9	/INT	External interrupt to the host
10	VSS	Ground for analog circuit

7. System Block Diagram



8. Absolute Maximum Ratings

Parameter	Symbol	Min	Typ	Max	Unit	Notes
Operating Temperature	T _{OP}	-20		+70	°C	(1)(2)
Storage Temperature	T _{ST}	-30		+80	°C	(1)(2)

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

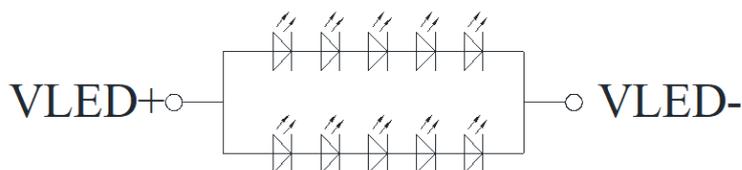
9. Electrical Characteristics

9.1. Operating Conditions

Item	Condition	Symbol	Min	Typ	Max	Unit
Supply Voltage for LCM	$V_{CC}=3.3v$ $T_a=25^{\circ}C$	V_{CC}	3.0	3.3	3.6	V
Supply Current for LCM		I_{CC}	-	15	25	mA
Supply Voltage for Touch Logic	-	VDDT	2.8	-	3.3	V

9.2. Backlight Characteristics

Item	Symbol	Min	Typ	Max	Unit	Notes
Forward Current	I_{LED}	-	40	-	mA	(1)(2)(3)(4)
Forward Voltage	V_{LED+}	14	15	17	V	
LED Lifetime	Hr.	-	50K	-	Hr.	



Notes:

- (1) There is one group of LEDs
- (2) $T_a=25^{\circ}C$
- (3) Forward current minimum value is only for reference since the LED brightness efficiency keeps enhancing. Current consumption becomes less and less to achieve the same luminance.
- (4) Lifetime is defined as the amount of time when the luminance has decayed to <50% of the initial value (50K hours is an estimate for reference only).

10. DC Characteristics

Item	Symbol	Min	Typ	Max	Unit
Low Level Input Voltage	V_{IL}	0	-	$0.3V_{CC}$	V
High Level Input Voltage	V_{IH}	$0.7V_{CC}$	-	V_{CC}	V

11. Optical Characteristics

Item		Symbol	Condition	Min	Typ	Max	Unit
Response Time		T_r	$\theta=0^\circ, \Phi=0$	-	10	-	ms
		T_f		-	15	-	ms
Contrast Ratio		(CR)	At Optimized Viewing Angle	-	500	-	-
White Chromaticity		W_x	$\theta=0^\circ, \Phi=0$	0.269	0.319	0.369	ms
		W_y		0.273	0.323	0.373	ms
Viewing Angle	Horizontal	θ_L	CR ≥ 10 Ta=25 \pm 2 $^\circ$ C I _{LED} =40mA	-	65	-	Degree
		θ_R		-	65	-	
	Vertical	θ_T		-	65	-	
		θ_B		-	50	-	
Brightness		-	-	300	400	-	cd/m ²
Viewing Direction		6 o'clock					

12. Interface Timing

12.1. Parallel SYNC Mode RGB Input Timing Table

Item		Symbol	Min	Typ	Max	Unit
CLK Frequency		F_{CLK}	-	9.05	-	MHz
DCLK Period		T_{CLK}	-	111	-	ns
H _{SYNC}	Period Time	T_H	510	524	862	D _{CLK}
	Display Period	T_{HDISP}	-	480	-	D _{CLK}
	Back Porch	T_{HBP}	6	16	127	D _{CLK}
	Front Porch	T_{HFP}	24	28	255	D _{CLK}
	Pulse Width	T_{HW}	11	16	127	D _{CLK}
V _{SYNC}	Period Time	T_V	280	288	526	H
	Display Period	T_{VDISP}	-	272	-	H
	Back Porch	T_{VBP}	3	8	127	H
	Front Porch	T_{VFP}	4	8	127	H
	Pulse Width	T_{VW}	1	3	20	H

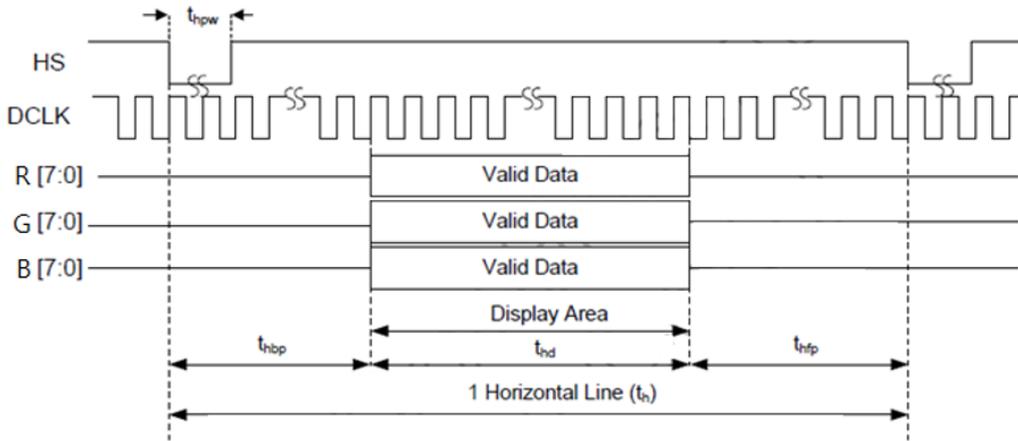


Figure 1 - Parallel RGB in SYNC Mode (Horizontal)

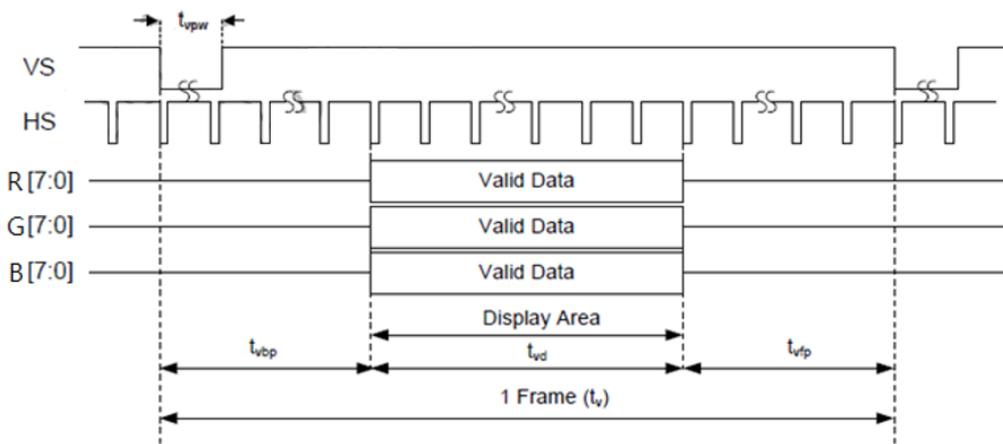


Figure 2 - 12.2. Parallel RGB in SYNC Mode (Vertical)

13. Capacitive Touch Panel Interface

Example Arduino source code (C/C++) for reading data from the capacitive touch screen controller is available on the Crystalfontz website.

See here: <https://www.crystalfontz.com/product/cfaf480128a0039tc>

Note: A pull-up resistor must be used on the touch controller interrupt line (pin 9 on the touch controller cable) for the Arduino example to operate correctly.

If other detailed information on the touch panel controller is required, please contact [Crystalfontz support](#).

14. LCD Module Precautions

The precautions below should be followed when using LCD modules to help ensure personal safety, module performance, and compliance of environmental regulations.

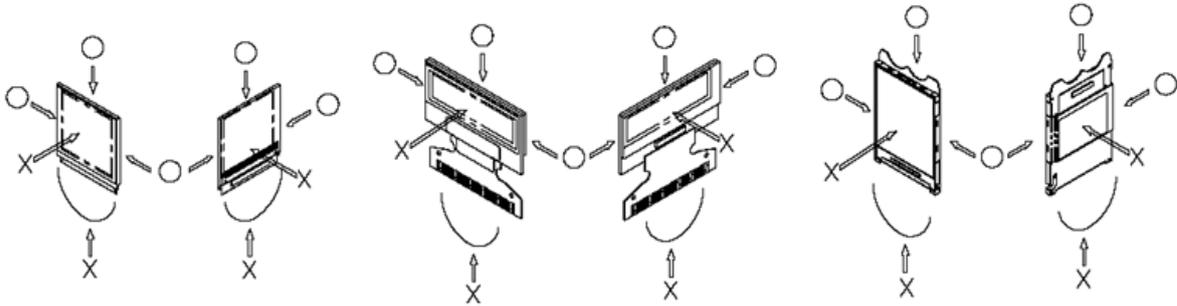
14.1. Modules

- Avoid applying excessive shocks to module or making any alterations or modifications to it.
- Do not make extra holes on the printed circuit board, modify its shape or change the components of LCD display module.
- Do not disassemble the LCD display module.
- Do not operate the LCD display module above the absolute maximum rating.
- Do not drop, bend or twist the LCD display module.
- Soldering: only to the I/O terminals.
- Store in an anti-static electricity container and clean environment.
- It is common to use the "screen saver" to extend the lifetime of the LCD display module.
 - Do not use the fixed information for long periods of time in real application.
 - Do not use fixed information in LCD panel for long periods of time to extend "screen burn" effect time.
- 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.

14.2. Handling Precautions

- Since the display panel is made of glass, do not apply mechanical impacts such as dropping from a high position.
- If the display panel is accidentally broken, and the internal organic substance leaks out, be careful not to inhale or touch the organic substance.
- If pressure is applied to the display surface or its neighborhood of the LCD display module, the cell structure may be damaged, so be careful not to apply pressure to these sections.
- The polarizer covering the surface of the LCD display module is soft and can be easily scratched. Please be careful when handling the LCD display module.
- Clean the surface of the polarizer covering the LCD display module if it becomes soiled using following adhesion tape.
 - Scotch Mending Tape No. 810 or an equivalent
 - Never breathe the soiled surface or wipe the surface using a cloth containing solvent such as ethyl alcohol, since the surface of the polarizer will become cloudy.
 - The following liquids/solvents may spoil the polarizer:
 - Water
 - Ketone
 - Aromatic Solvents
- Hold the LCD display module very carefully when placing the LCD display module into the system housing.

- Do not apply excessive stress or pressure to the LCD display module. And, do not over bend the film with electrode pattern layouts. These stresses will influence the display performance. Also, be sure to secure the sufficient rigidity for the outer cases.



- Do not apply stress to the LSI chips and the surrounding molded sections.
- Do not disassemble or modify the LCD display module.
- Do not apply input signals while the logic power is off.
- Pay sufficient attention to the working environments when handing the LCD display module to prevent occurrence of element breakage accidents by static electricity.
 - Be sure to make human body grounding when handling LCD display modules.
 - Be sure to ground tools to use for assembly such as soldering irons.
 - To suppress generation of static electricity, avoid carrying out assembly work under dry environments.
 - Protective film is being applied to the surface of the display panel of the LCD display module. Be careful since static electricity may be generated when exfoliating the protective film.
- Protection film is being applied to the surface of the display panel and removes the protection film before assembling it. At this time, 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 by the method discussed above.
- If electric current is applied when the LCD display module is being dewed or when it is placed under high humidity environments, the electrodes may become corroded. If this happens proceed with caution when handling the LCD display module.

14.3. Storing Precautions

- When storing the LCD display modules put them in static electricity preventive bags to avoid exposure to direct sunlight and fluorescent lamps. Also avoid high temperature and high humidity environments and low temperatures (less than 0°C) environments. (We recommend you store these modules in the packaged state when they were shipped from Crystalfontz). Be careful not to let water drops adhere to the packages or bags, and do not let dew gather on them.
- If electric current is applied when water drops are adhering to the surface of the LCD display module the LCD display module may have become dewed. If a dewed LCD display module is placed under high humidity environments it may cause the electrodes to become corroded. If this happens proceed with caution when handling the LCD display module.

14.4. Designing Precautions

- The absolute maximum ratings are the ratings that cannot be exceeded for LCD display module. If these values are exceeded, panel damage may happen.
- To prevent occurrence of malfunctioning by noise pay attention to satisfy the VIL and VIH specifications and, at the same time, to make the signal line cable as short as possible.
- We recommend that you install excess current preventive unit (fuses, etc.) to the power circuit (VDD). (Recommend value: 0.5A)
- Pay sufficient attention to avoid occurrence of mutual noise interference with the neighboring devices.
- As for EMI, take necessary measures on the equipment side.
- 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.

14.5. Disposing Precautions

- Request the qualified companies to handle the industrial wastes when disposing of the LCD display modules. Or, when burning them, be sure to observe the environmental and hygienic laws and regulations.

14.6. 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 being exposed. Generally speaking, semiconductor elements change their characteristics when light is radiated according to the principle of the solar battery. Consequently, 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.
 - Design the product and installation method so that the LCD driver may be shielded from light 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.
- We recommend that you construct its software to make periodical refreshment of the operation statuses (re-setting of the commands and re-transference of 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:

