



OLED DISPLAY MODULE DATASHEET



Datasheet Release Date 2017-11-28
for
CFAL12864S-Y-B1

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

CONTENTS

1. General Information	3
2. Module Description	4
3. Features	4
4. Mechanical Data	4
5. Mechanical Drawings	5
6. Interface Pin Function	8
7. System Block Diagram	10
8. Application Circuit Example	10
9. Circuit Example – Externally Supplied for Display	10
10. Absolute Maximum Ratings	11
11. Electrical Characteristics	12
12. Optical Characteristics	13
13. OLED Lifetime	13
14. OLED Module Precautions	14

1. General Information

Datasheet Revision History

Datasheet Release: **2017-11-28**
Datasheet for the CFAL12864S-Y-B1 OLED 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

This is a yellow monochrome OLED display module that has a high contrast ratio and wide viewing angle. This display has a built-in Solomon Systech SSD1303 controller.

Please see [Solomon Systech SSD1303 LCD Controller Datasheet](#) for further reference.

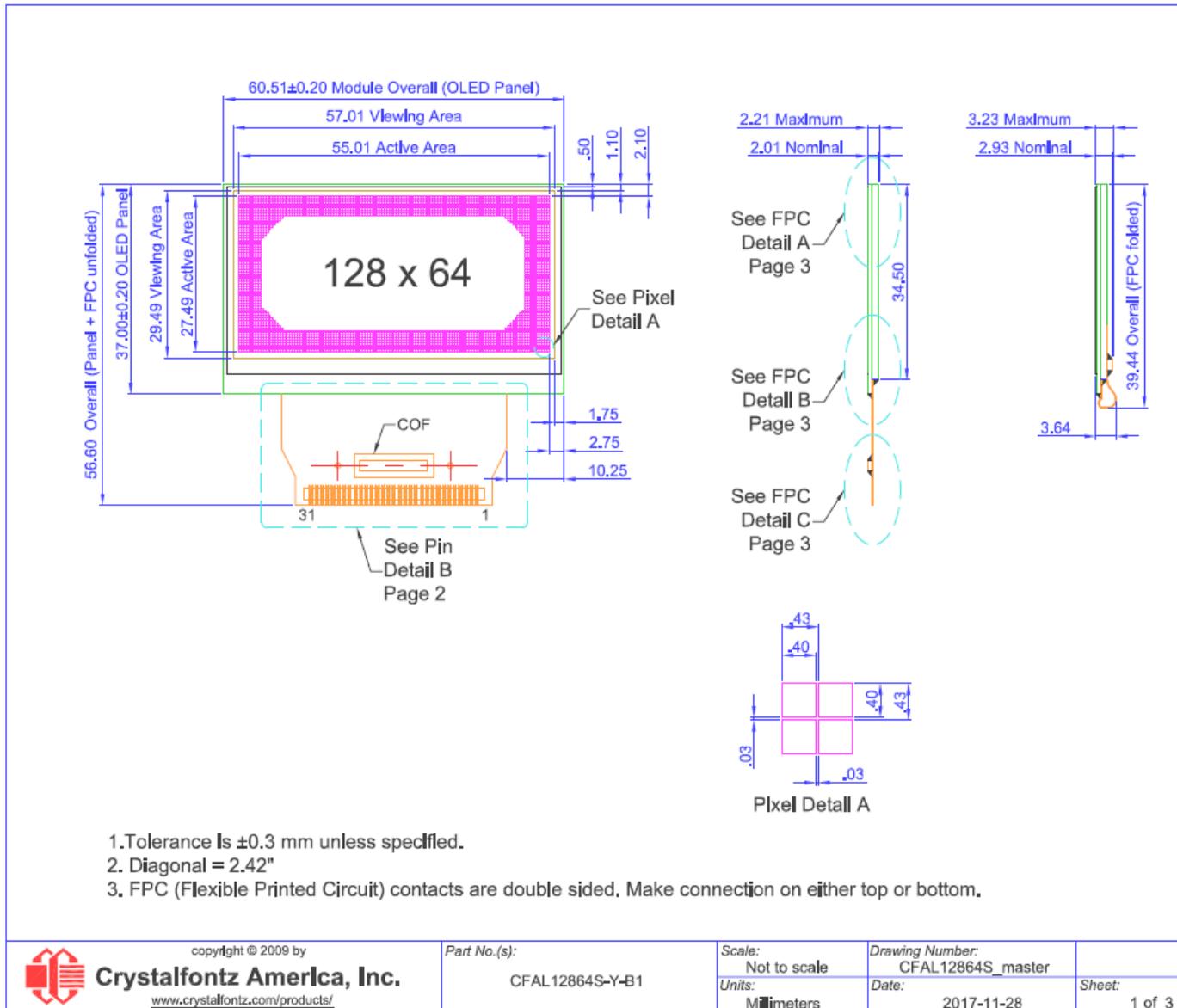
3. Features

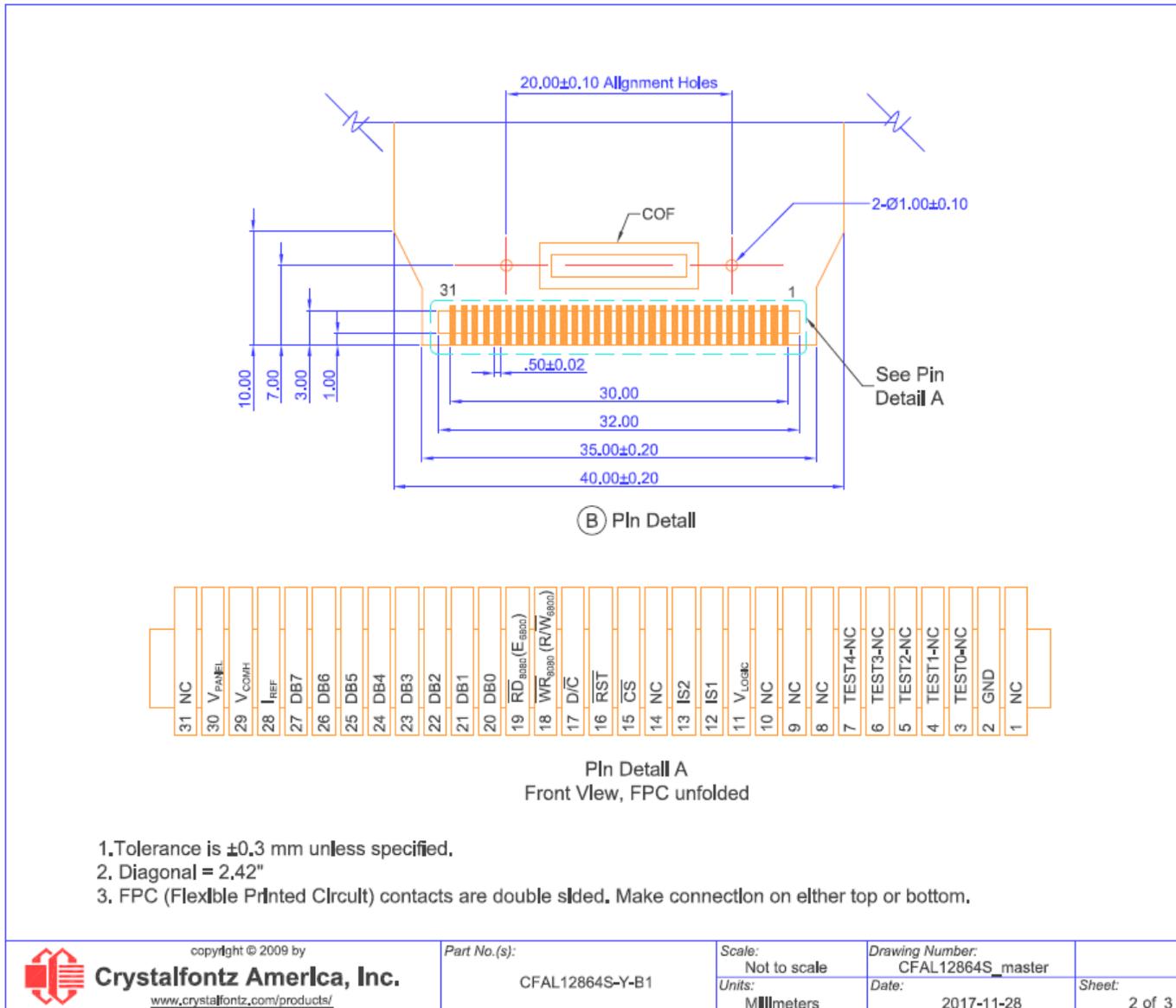
- 128*64 Dot Matrix
- Built-in Controller: SSD1303 (or equivalent)
- 3V Power Supply
- 1/64 Duty
- Operating Temperature: -20° to +70°C
- Storage Temperature: -30° to +80°C
- Interface: 8-Bit Parallel / SPI

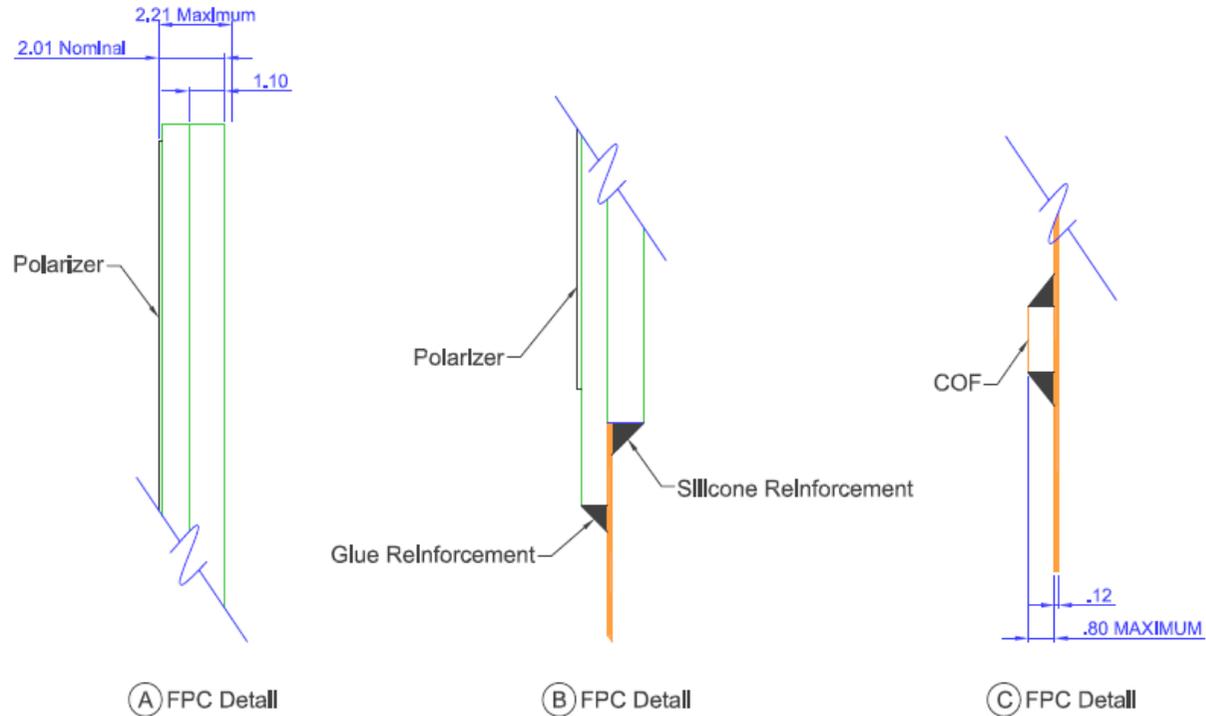
4. Mechanical Data

Item	Specification (mm)	Specification (inches, reference)
Module Dimension	60.5 (W) x 56.6 (H) x 2.01 (D)	2.382 (W) x 2.228 (H) x 0.079 (D)
Viewing Area	57.01 (W) x 29.49 (H)	2.244 (W) x 1.161 (H)
Active Area	55.01 (W) x 27.49 (H)	2.166 (W) x 1.082 (H)
Dot Pitch	0.43 (W) x 0.43 (H)	0.017 (W) x 0.017 (H)
Dot Size	0.40 (W) x 0.40 (H)	0.016 (W) x 0.016 (H)
Weight (Typical)	9 grams	0.32 ounces

5. Mechanical Drawings







1. Tolerance is ± 0.3 mm unless specified.
2. Diagonal = 2.42"
3. FPC (Flexible Printed Circuit) contacts are double sided. Make connection on either top or bottom.



6. Interface Pin Function

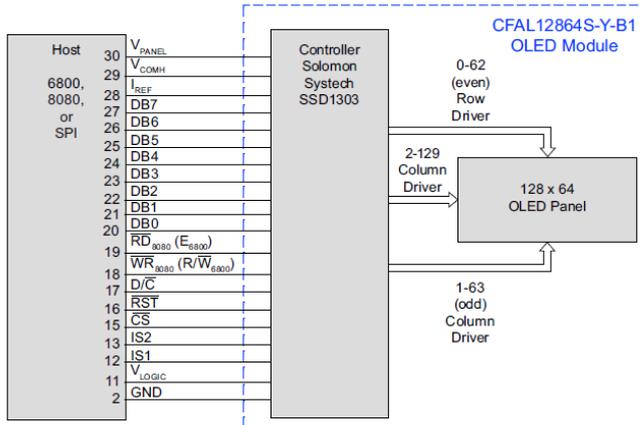
Pin	Symbol	Level	Direction	Function															
1	NC	-	-	No Connection															
2	GND	0v	-	Ground. Must be connected to an external source.															
3-7	TEST-NC	-	-	No Connection. Reserved for manufacturer testing.															
8-10	NC	-	-	No Connection															
11	V _{LOGIC}	+2.4 to +3.5v	I	Power supply input. Must be connected to an external source.															
12	IS1	H/L	I	<table border="1"> <thead> <tr> <th>IS1</th> <th>IS2</th> <th>Interface Mode</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>0</td> <td>SPI (Serial)</td> </tr> <tr> <td>0</td> <td>1</td> <td>6800 Parallel</td> </tr> <tr> <td>1</td> <td>0</td> <td>Not Allowed</td> </tr> <tr> <td>1</td> <td>1</td> <td>8080 Parallel</td> </tr> </tbody> </table>	IS1	IS2	Interface Mode	0	0	SPI (Serial)	0	1	6800 Parallel	1	0	Not Allowed	1	1	8080 Parallel
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1	0	Not Allowed																	
1	1	8080 Parallel																	
13	IS2	H/L	I																
14	NC	H/L	-	No Connection															
15	CS	H/L	I	Chip Select Pin Low: Controller chip is selected. Communications with the host is possible. High: Controller chip is not selected. Host interface signals are ignored by the controller.															
16	RST	H/L	I	Reset Signal Low: Display controller is reset. The RST pin should be pulsed low shortly after power is applied. High: The RST pin should be brought high for normal operation.															
17	D/C#	H/L	I	Data/Command Control. Determines whether data bits are data or command. 1 – High: Addresses the data register. 2 – Low: Addresses the command register.															
18	WR ₈₀₈₀ (RW ₆₈₀₀)	H/L	I	Host Interface Input 8080 Host: Active low. Signal on the data bus is latched at the rising edge of WR signal. 6800 Host: read/write control signal output. R/W = High: Read (Host ← Module) R/W = Low: Write (Host → Module) SPI (serial) mode: Connect to ground.															
19	RD ₈₀₈₀ (E ₆₈₀₀)	H/L	I	Host Interface Input 8080 Host: Active low. Signal on the data bus is latched at the rising edge of RD signal. 6800 Host: Enable control signal input active high. E = High: Read or Write Active E = Low: No Read or Write Active SPI (serial) mode: Connect to ground.															

Pin	Symbol	Level	Direction	Function
20	DB0	H/L	I/O	Bidirectional data bus connects to 8-bit standard host data bus. In SPI (serial) mode (IS1=0, IS2=0): DB0 serves as the serial clock input signal (SCL) and DB1 serves as the serial data input pin (SI). DB2-DB7 are high impedance. In serial mode, data can be written to the display but not read. Pin 18 (WR8080 (R/W6800)) and pin 19 (RD8080 (E6800)) are unused and should be tied low. In 6800 Parallel mode: Pin 18 is used as R/W6800. Pin 19 is used as E6800. Data is input or output on DB0-DB7. In 8080 Parallel mode: Pin 18 is used as WR8080. Pin 19 is used as RD8080. Data is input or output on DB0-DB7.
21	DB1	H/L	I/O	
22	DB2	H/L	I/O	
23	DB3	H/L	I/O	
24	DB4	H/L	I/O	
25	DB5	H/L	I/O	
26	DB6	H/L	I/O	
27	DB7	H/L	I/O	
28	IREF	-	O	Segment output current reference for brightness adjustment. A resistor should be connected between this pin and GND. Used to set the current.
29	V _{COMH}	-	I	High level voltage output for common signals. A low ESR capacitor should be connected between this pin and GND. Do not connect external power supply directly to this pin.
30	V _{PANEL}	+12.5v to +13.5v	I	Driver supply voltage. Only high voltage input on chip. Power must be supplied externally. NOTE: You must observe power sequencing for this pin. Power Up – Display must be powered up and initialized before power is applied to the pin. Power Down – Power must be removed from this pin before the display is powered off.
31	NC	-	-	No Connection

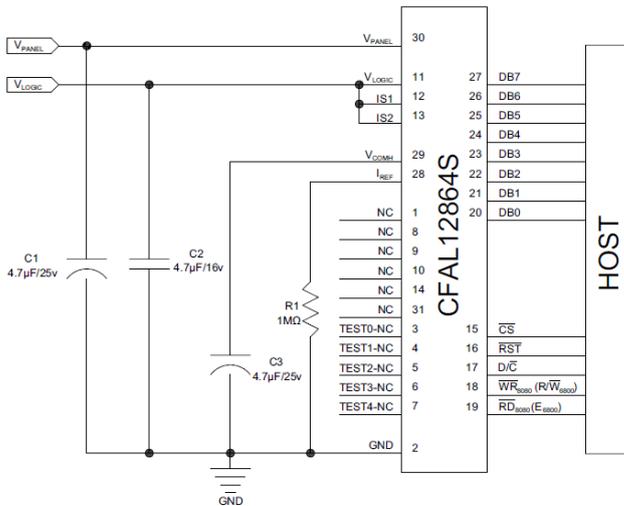
ESD (ELECTRO-STATIC DISCHARGE)

The circuitry is industry standard CMOS logic and susceptible to ESD damage. Please use industry standard antistatic precautions as you would for any other PCB such as expansion cards or motherboards. Ground your body, work surfaces, and equipment.

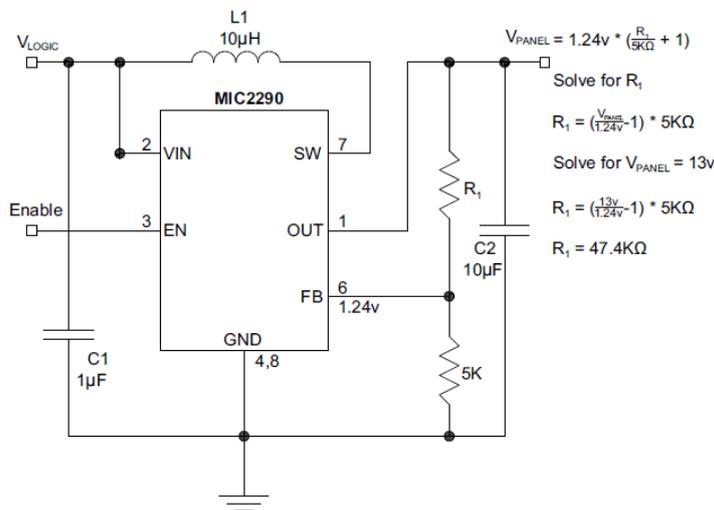
7. System Block Diagram



8. Application Circuit Example



9. Circuit Example – Externally Supplied for Display



10. Absolute Maximum Ratings

Ambient Temperature ($T_A=25^{\circ}\text{C}$) / Maximum 50% Relative Humidity					
Parameter	Symbol	Min	Max	Unit	Notes
Supply Voltage for Logic	V_{LOGIC}	-0.3	+3.5	V	(1)(2)
Supply Voltage for Display	V_{PANEL}	+8	+16	V	(1)(2)
Humidity	RH	0	90	%	-
Operating Temperature	T_{OP}	-20	+70	$^{\circ}\text{C}$	-
Storage Temperature	T_{STG}	-30	+80	$^{\circ}\text{C}$	-

Notes:

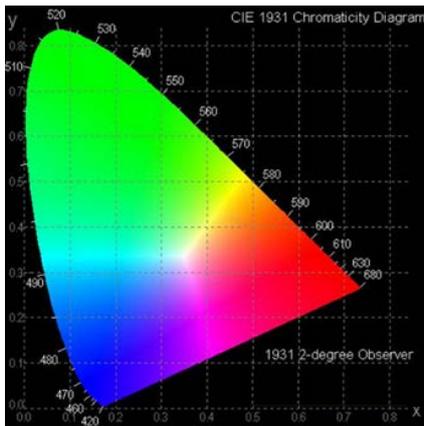
- (1) *These are stress ratings only. Extended exposure to the absolute maximum ratings listed above may affect device reliability or cause permanent damage.*
- (2) *Functional operation should be restricted to the limits in the Electrical Characteristics table below.*

11. Electrical Characteristics

Item	Symbol	Condition	Min	Typ	Max	Unit
Supply Voltage for Logic	V _{LOGIC}	T _{OP} = -20°C to +70°C	2.4	2.7	3.5	V
Supply Voltage for Display	V _{PANEL}	T _{OP} = -20°C to +70°C	12.5	13.0	13.5	V
High-level Input	V _{IH}	-	+0.8v x V _{LOGIC} for V _{LOGIC} = +2.7v V _{IH} = +0.8v x +2.7v = +2.16v	-	V _{LOGIC}	V
Low-level Input	V _{IL}	-	0v (GND)	-	+0.2v x V _{LOGIC} for V _{LOGIC} = +2.7v V _{IL} = +0.2v x +2.7v = +0.54v	V
High-level Output	V _{OH}	I _{OUT} = 100 μA 3.3MHz	+0.9v x V _{LOGIC} for V _{LOGIC} = +2.7v V _{OH} = +0.9v x +2.7v = +2.43v	-	V _{DD}	V
Low-level Output	V _{OL}	I _{OUT} = 100 μA 3.3MHz	0v	-	+0.1v x V _{LOGIC} for V _{LOGIC} = +2.7v V _{OL} = +0.1v x +2.7v = +0.27v	V
Normal Mode Power Consumption	P _{OPERATION}	All pixels on V _{LOGIC} = +2.7v V _{PANEL} = +13v Frame Rate = 105 Hz Contrast Setting = 0x8F			400	mW
Standby Mode Power Consumption	P _{STANDBY}	10% pixels on V _{LOGIC} = +2.7v V _{PANEL} = +13v Frame Rate = 105 Hz Contrast Setting = 0x00			45	mW
Operating Current for V _{LOGIC}	I _{LOGIC}	Contrast = 0xFF	190	-	300	μA
Operating Current for V _{PANEL}	I _{PANEL}	Contrast = 0xFF	550	-	1000	μA
NOTE: The V _{PANEL} input must be a stable value with no ripple or noise.						

12. Optical Characteristics

Item	Symbol	Condition	Min	Typ	Max	Unit
Viewing Angle	(V) θ	-	-	≥ 160	-	deg
	(H) ϕ	-	-	≥ 160	-	deg
Contrast Ratio (dark room)	CR	80 cd/m ²	-	$\geq 2000:1$	-	-
Luminous Intensity, Normal (IV)	L _{BRNORMAL}	With polarizer, all pixels on, Driving voltage: +13v Contrast setting: 0x8F Frame rate: 105Hz	60	80	-	cd/m ²
CIE _x Yellow		CIE1931	0.43	0.47	0.51	-
CIE _y Yellow		CIE1931	0.45	0.49	0.53	-



13. OLED Lifetime

Item	Conditions	Min	Typ	Notes
Operating Lifetime	T _a =25°C Initial 50% Check Board Brightness Typical Value	20,000 Hrs.	-	(1)(2)(3)

Notes:

- (1) Lifetime is defined as the amount of time when the luminance has decayed to <50% of the initial value.
- (2) This analysis method uses life data obtained under accelerated conditions to extrapolate an estimated Probability Density Function (PDF) for the product under normal use conditions.
- (3) Screen saving mode will extend OLED lifetime.

14. OLED Module Precautions

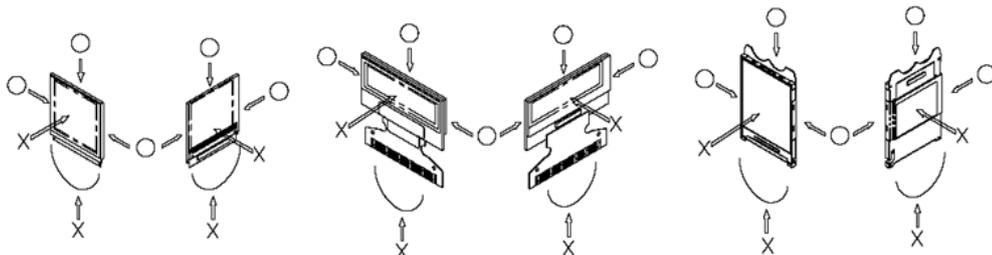
The precautions below should be followed when using OLED modules to help ensure personal safety, module performance, and compliance of environmental regulations.

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 OLED display module.
- Do not disassemble the OLED display module.
- Do not operate the OLED display module above the absolute maximum rating.
- Do not drop, bend or twist the OLED 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 OLED display module.
 - Do not use the fixed information for long periods of time in real application.
 - Do not use fixed information in OLED panel for long periods of time to extend "screen burn" effect time.
- Crystalfontz has the right to change the passive components, including R2 and R3 adjust resistors. (Resistors, capacitors and other passive components will have different appearance and color caused by the different supplier.)
- Crystalfontz have the right to change the PCB Rev. (In order to satisfy the supplying stability, management optimization and the best product performance, etc., under the premise of not affecting the electrical characteristics and external dimensions, Crystalfontz has the right to modify the version.)

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 OLED 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 OLED display module is soft and can be easily scratched. Please be careful when handling the OLED display module.
- Clean the surface of the polarizer covering the OLED 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 OLED display module very carefully when placing the OLED display module into the system housing.
- Do not apply excessive stress or pressure to the OLED 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 OLED display module.
- Do not apply input signals while the logic power is off.
- Pay sufficient attention to the working environments when handing the OLED display module to prevent occurrence of element breakage accidents by static electricity.
 - Be sure to make human body grounding when handling OLED 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 OLED 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 OLED 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 OLED 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 OLED display module.

14.3. Storage Precautions

- When storing the OLED 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 OLED display module the OLED display module may have become dewed. If a dewed OLED 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 OLED display module.

14.4. Designing Precautions

- The absolute maximum ratings are the ratings that cannot be exceeded for OLED display module. If these values are exceeded, panel damage may happen.
- To prevent occurrence of malfunctioning by noise pay attention to satisfy the V_{IL} and V_{IH} 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 (V_{DD}). (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 OLED display module, fasten the external plastic housing section.
- If the power supply to the OLED display module is forcibly shut down, by such errors as taking out the main battery while the OLED display panel is in operation, we cannot guarantee the quality of this OLED display module.
 - Connection (contact) to any other potential than the above may lead to rupture of the IC.

14.5. Precautions When Disposing of the OLED Display Modules

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

14.6. Other Precautions

- When an OLED 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 OLED display module from performance drops by static electricity rapture, etc., do not touch the following sections whenever possible while handling the OLED display modules.
 - Pins and electrodes
 - Pattern layouts such as the TCP & FPC
- With this OLED display module, the OLED 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 OLED driver is exposed to light, malfunctioning may occur.
 - Design the product and installation method so that the OLED driver may be shielded from light in actual usage.
 - Design the product and installation method so that the OLED driver may be shielded from light during the inspection processes.
- Although this OLED 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:

