



# 128 x 64 TRANSPARENT GRAPHIC LCD DISPLAY

## DATASHEET



**CFAG12864U4-NFI**

Datasheet Release: 2023-12-20

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## 1. General Information

### Datasheet Revision History

Datasheet Release: 2023-12-20  
Datasheet for the CFAG12864U4-NFI 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 CFAG12864U4-NFI is a transparent, 128x64 graphic LCD display module. It is thin, light, and very low power. Since this LCD module has no backlight, there is no power used for the backlight, however, the display is not viewable in dark environments without an external light source.

In addition to the 128x64 monochrome graphic array, there is a row of icons across the top of the display, that can easily be turned on and off.

This LCD display has an integrated controller and voltage generating components mounted on the flexible tail. The tail connects to a standard 18-conductor 0.5mm pitch ZIF (Zero Insertion Force) connector

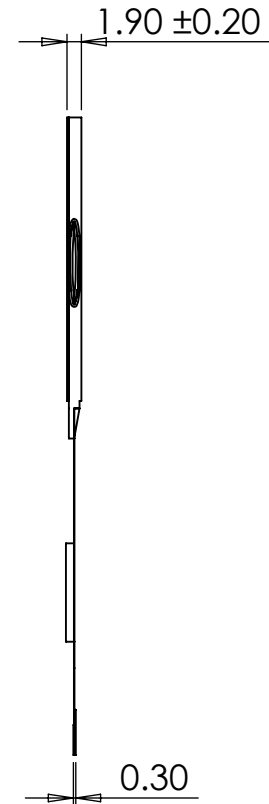
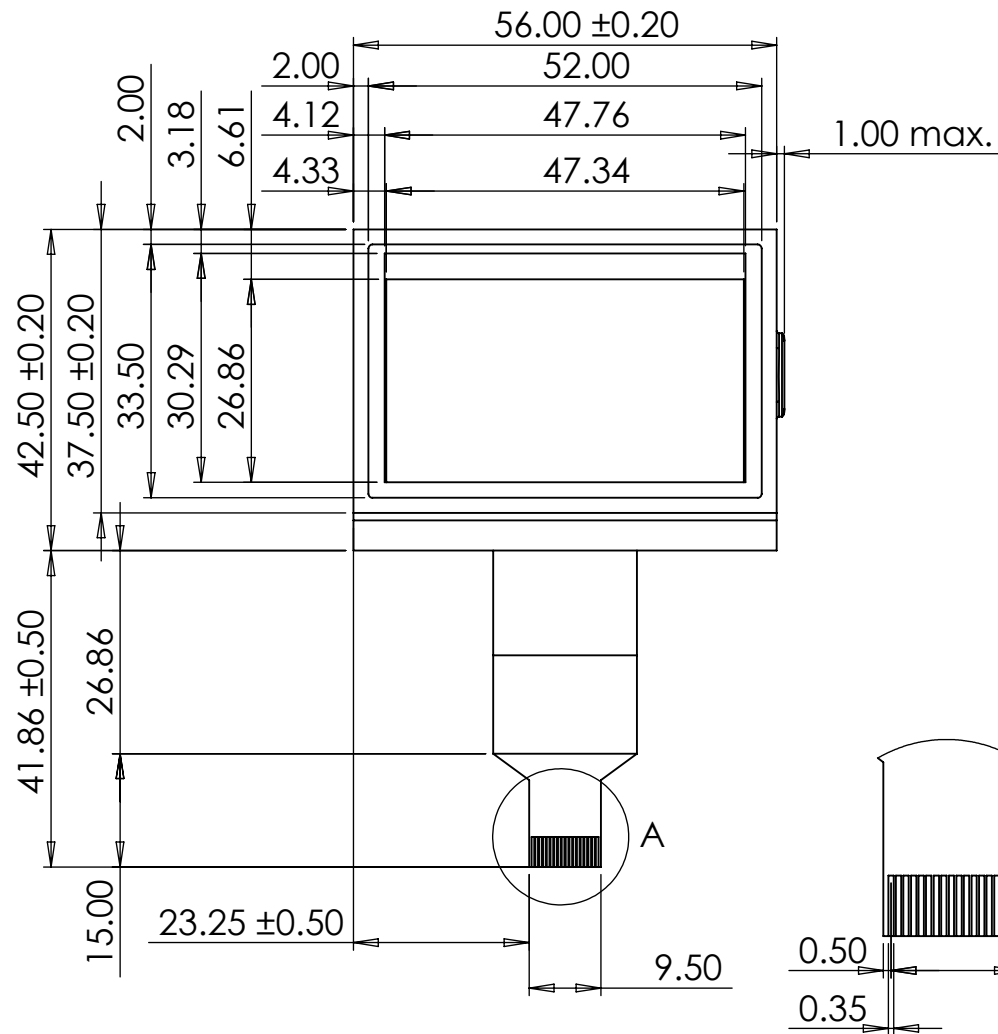
This module uses an Sitronix ST7565P LCD driver.

## 3. Features

- 2.2-inch 128 x 64 graphic LCD display module with status icons
- Thin and light TAB construction
- Simple 4-wire, 8-bit SPI or 8-bit parallel interface
- Ultra-low power consumption
- Wide temperature range: -20°C to 70°C (-4°F to 158°F)

## 4. Mechanical Data

Item	Specification (mm)	Specification (inch)
Overall Module Dimension	56.0 (W) x 42.5 (H) x 1.9 (D)	2.20 (W) x 1.673 (H) x 0.074 (D)
Viewing Area	52.0 (W) x 33.5 (H)	2.047 (W) x 1.318 (H)
Active Area	47.76 (W) x 30.29 (H)	1.880 (W) x 1.192 (H)
Dot Pitch	0.42 (W) x 0.37 (H)	0.0165 (W) x 0.0145 (H)
Weight (Typical)	9.5 grams	0.3 ounces



Display Controller	ST7565
Viewing Direction	6:00
Operating Temperature	-20 to 70 C
Voltage Levels	3.3

1	VDD
2	VSS
3	/CS1
4	CS2
5	/RES
6	A0
7	RW, /WR
8	E, /RD
9-14	D0 - D5
15	D6
16	D7
17	C86
18	P/S

Units: millimeters  
Tolerance:  $\pm 0.3\text{mm}$



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## 6. LCD Panel

### 6.1. General Information

The CFAG12864U4-NFI module uses an Sitronix ST7565P LCD driver.

For detailed information on this controller IC, please see the ST7565P datasheet which can be found on our website here: <https://www.crystalfontz.com/controllers/Sitronix/ST7565P>

### 6.2. Interface Pin Function

Pin	Symbol	4-wire SPI Interface	6800 Parallel Interface	8080 Parallel Interface
1	VDD	Power Supply		
2	VSS	System Ground		
3	/CS1	Interface access is enabled when /CS1="L" <b>and</b> CS2="H". When the chip is not selected (/CS1="H" <b>or</b> CS2="L"), D[7:0] pins are high impedance.		
4	CS2			
5	/RES	Hardware Reset (active low)		
6	A0	Address the Data Register (A0="H") or Command Register (A0="L")		
7	RW , /WR	Not Used (fix to "H")	Read / Write Select	Write Enable (active low)
8	E , /RD	Not Used (fix to "H")	Read / Write Enable	Read Enable (active low)
9 – 14	D0 – D5	Not Used (fix to "H")	8-bit Bi-Directional Data Bus	
15	D6	SPI Serial Clock Input		
16	D7	SPI Serial Data Input		
17	C86	Not Used (fix to "H")	Fix to "H" for 6800 Mode	Fix to "L" for 8080 Mode
18	P/S	Fix to "L" for Serial Mode	Fix to "H" for 6800 Mode	Fix to "H" for 8080 Mode

Notes:

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

### 6.3. Absolute Maximum Ratings

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

Notes:

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



## 6.4. Electrical Characteristics

Item	Symbol	Min	Typ	Max	Unit
Logic Power Supply	VDD	3.0	-	3.3	V
Input Logic High	VIH	0.8 * VDD	-	VDD	V
Input Logic Low	VIL	0	-	0.2 * VDD	V
Logic Supply Current	IVDD	-	1.0	2.0	mA

## 6.5. Optical Characteristics

Item	Symbol	Condition	Min	Typ	Max	Unit
Response Time	$T_r$	25°C	-	200	300	ms
	$T_f$		-	250	350	ms
Contrast Ratio	CR	$\theta=0^\circ$	-	5	-	-
Viewing Angle	$\Theta 180^\circ$	$CR \cong 2$	0	-	30	Degree
	$\Theta 0^\circ$		0	-	60	
	$\Theta 90^\circ$		0	-	45	
	$\Theta 270^\circ$		0	-	45	
Viewing Direction	6 o'clock					

## 7. LCD Module Precautions

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

### 7.1. 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.

### 7.2. Handling Precautions

- The display panel is made of glass. Do not apply mechanical impacts, stress or pressure.
- Pressure applied to or near the display surface may damage the cell structure.
- If the internal organic substance leaks, 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 affect 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) by grounding personnel handling LCD modules, and tools used for assembly such as soldering irons. To suppress generation of ESD, avoid carrying out assembly work under dry environments.
- Protective film is applied to the surface of the display panel.
  - Remove the protective film slowly as ESD may be generated when removing the film.
  - Remove the film before assembly. If residue from the adhesive material of the protection film remains on the surface of the display panel after the film has been removed, remove the residue material as discussed above.

### 7.3. 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.

### 7.4. Designing Precautions

- The absolute maximum ratings cannot be exceeded for LCD display module. If these values are exceeded, panel damage may happen.
- Meet the VIL and VIH specifications and ensure the signal line cable is short 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.
- If the power supply to the LCD display module is forcibly shut down, 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.

### 7.5. Disposing Precautions

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

### 7.6. 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
- 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 is shielded from light.
- Take appropriate measures to suppress noise generation and protect from influences of noise.
- Periodically refresh the operation statuses in the software cope with catastrophic noise.
- The limitation of FPC bending:

