TFT GRAPHIC DISPLAY MODULE DATASHEET

Datasheet Release Date 2025-07-10
For
CFAF240240A4-013TN

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1. General Information

Datasheet Revision History
Datasheet Release: **2025-07-10** Datasheet for the CFAF240240A4-013TN 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

This is a full color TFT graphic display module with a white LED backlight. This display has a built-in Sitronix ST7789H2 controller.

Please see Sitronix ST7789H2 LCD Controller Datasheet for further reference.

3. Features

- 240 x 240 Dot Matrix
- Viewing Direction: Free
- Built-in Controller: Sitronix ST7789H2 (or equivalent)
- Operating Temperature: -20°C to 70°C
- Storage Temperature: -30°C to 80°C
- 262K color depth
- Transmissive, normally black
- +3.3v Power
- SPI Interface

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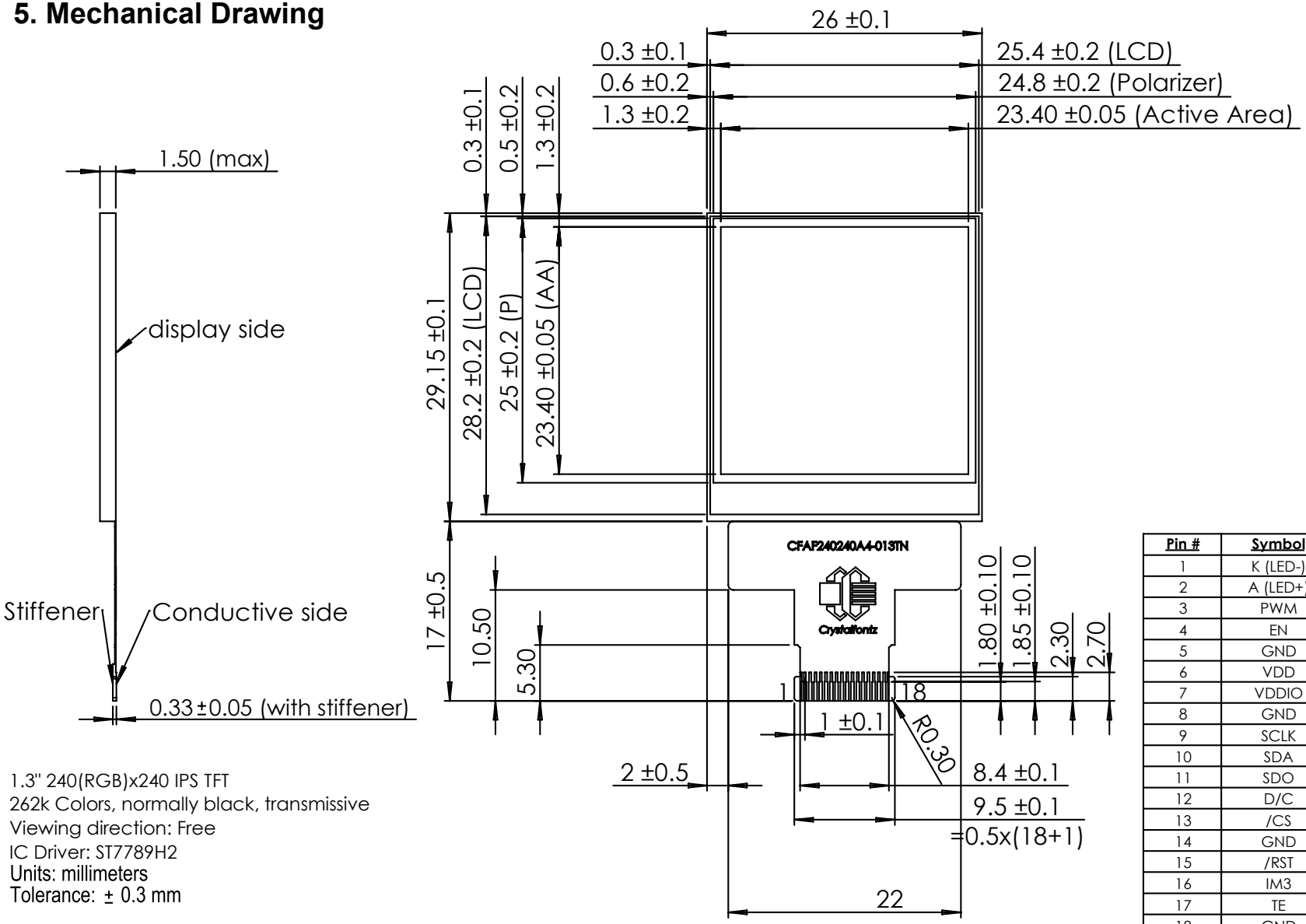
1. CFA – Crystalfontz America
2. F – TFT
3. 240240 – Pixel resolution
4. A4 – Family name and version
5. 013 – Diagonal dimension
6. T – Not sunlight readable
7. N – No touchscreen

4. Mechanical Data

Item	Specification (mm)	Specification (inch, reference)
Overall Width and Height	26.0 (W) x 29.15 (H) x 1.5 (D)	1.024 (W) x 1.148 (H) x 0.059 (D)
Active Area	23.4 (W) x 23.4 (H)	0.921 (W) x 0. 921 (H)
Dot Pitch	0.975 (W) x 0.975 (H)	0.04 (W) x 0.04 (H)
Weight (Typical)	2.0 grams	0.07 ounces

5. Mechanical Drawing



1.3" 240(RGB)x240 IPS TFT
262k Colors, normally black, transmissive
Viewing direction: Free
IC Driver: ST7789H2
Units: millimeters
Tolerance: ± 0.3 mm

Pin #	Symbol
1	K (LED-)
2	A (LED+)
3	PWM
4	EN
5	GND
6	VDD
7	VDDIO
8	GND
9	SCLK
10	SDA
11	SDO
12	D/C
13	/CS
14	GND
15	/RST
16	IM3
17	TE
18	GND

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Part Number:	Date:	Filename:	Revision:
CFAF240240A4-013TN	2025-07-10	CFAF240240A4-013TN.pdf	v 1.0
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6. Interface Pin Function

PIN No.	Symbol	Function
1	K (LED-)	Negative terminal or Cathode of LED Backlight.
2	A (LED+)	Positive terminal or Anode of LED Backlight.
3	PWM	PWM out to control your backlight driving circuit. Leave open if not in use.
4	EN	Pin to enable your backlight driving circuit. Leave open if not in use.
5	GND	Ground
6	VDD	Supply Voltage (3.3v typical)
7	VDDIO	IO Voltage (3.3v typical)
8	GND	Ground
9	SCK	Serial Interface Clock
10	SDA	IM3: Low, Serial input/output pin IM3: High, Serial input pin (MOSI) Data is latched on the rising endge of the SCL signal
11	SDO	IM3: Low, not used – leave open IM3: High, Serial output pin (MISO). Data is latched on the falling edge
12	D/C	Data/Command pin High = Data Register, Low = Command Register
13	/CS	Chip Select Active Low
14	GND	Ground
15	/RST	Reset Active Low, must be applied to initialize the chip
16	IM3	MCU Interface Mode 0: 4-line Serial I/F with SDA = in / out 1: 4-line Serial I/F II with SDA = in, SDO = out
17	TE	Tearing effect pin used to synchronize MCU to frame memory writing (output) Leave open if not in use.
18	GND	Ground

7. Absolute Maximum Ratings

Parameter	Symbol	Min	Max	Unit
Supply Voltage for Logic	V_{DDIO}	-0.3	4.6	V
Supply Voltage for Display	V_{DD}	-0.3	4.6	V
Operating Temperature	T_{OP}	-20	+70	°C
Storage Temperature	T_{STG}	-30	+80	°C

Note: These are stress ratings only. Extended exposure to the absolute maximum ratings may affect device reliability or cause permanent damage. Functional operation should be restricted to the limits in the Electrical Characteristics table below.

8. Electrical Characteristics

Item	Symbol	Condition	Min	Typ	Max	Unit
Supply Voltage for Logic	V_{DDIO}	-	1.65	1.8	3.3	V
Supply Voltage for Display	V_{DD}	-	2.4	2.8	3.3	V
High-level Input	V_{IH}	-	0.7 x V_{DDIO}	-	V_{DDIO}	V
Low-level Input	V_{IL}	-	GND	-	0.3 x V_{DDIO}	V
Power supply Current	I_{DD}	V_{DD} = 2.8V	-	5.9	8.9	mA

9. Optical Characteristics

Item	Symbol	Condition	Min	Typ	Max	Unit
Transmittance	T	-	4.1	4.59	-	%
Response Time	T rise + T fall	-	-	30	35	ms
White Chromaticity	x	Ta = 25°C	0.2594	0.3094	0.3594	
	y		0.2889	0.3389	0.3889	
Red Chromaticity	x		0.5457	0.5957	0.6457	
	y		0.2893	0.3393	0.3893	
Green Chromaticity	x		0.2741	0.3241	0.3741	
	y		0.4884	0.5384	0.5884	
Blue Chromaticity	x		0.0953	0.1453	0.1953	
	y		0.0418	0.0918	0.1418	
Viewing Angle, Horizontal	θ_X	CR≥10	-	160	-	deg
Viewing Angle, Vertical	θy		-	160	-	deg
Contrast Ratio	CR	Θ = 0, Dark, 25±2°C	600	800	-	-

10. Backlight Characteristics

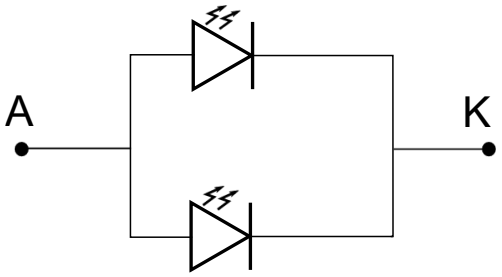
Item	Symbol	Condition	Min	Typ	Max	Unit
Forward Current	I_F	V_F=2.9V	-	20	-	mA
Forward Voltage	V_F	I_F=20mA	2.5	2.9	3.3	V
Luminous Intensity for LCM	I_V		250	320	-	cd/m^2
Uniformity for LCM	-		70	-	-	%
LED Lifetime *(*)*	-		20K	-	-	Hr.

* Lifetime is defined as the amount of time when the luminance has decayed to <50% of the initial value (20K hours is an estimate for reference only).

LED circuit (white LEDs):

LEDs are current devices. We recommend the use of a constant-current supply. For example, one channel of an ON Semiconductor CAT3604V would be a good solution. At a minimum, a current limiting circuit that ensures the backlight current does not exceed 20mA is necessary.

The brightness of the backlight can be adjusted by lowering the forward current. Driving the backlight at higher currents than listed in the backlight characteristics may cause shortened LED lifetime.



11. LCD Module Precautions

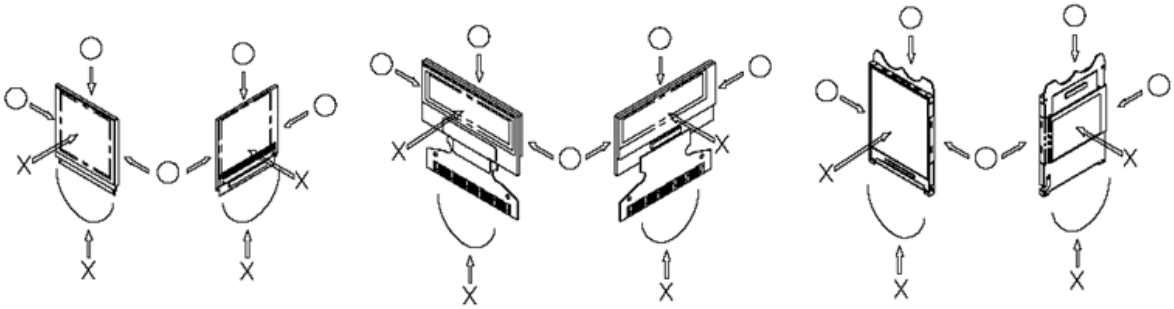
These precautions help ensure personal safety, module performance, and compliance of environmental regulations when using an LCD module.

11.1. 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.

11.2. 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 accidently 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.

11.3. 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.

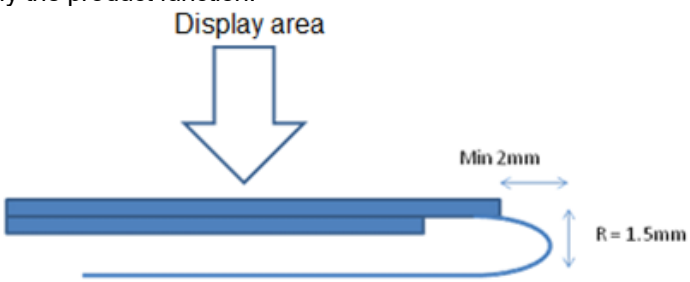
- Do not let water drops or dew adhere to the packages or bags.
- If electric current is applied when water is on the surface of the LCD display module, the module may become dewed. If a dewed LCD display module is placed under high humidity environments the electrodes may become corroded.

11.4. 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.

11.5. Disposing Precautions

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

11.6. 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: