CFA240400E1-030TC DATASHEET

Datasheet Release Date 2022-10-06

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1. General Information

Datasheet Revision History
Datasheet Release: **2022-10-06** Datasheet for the CFA240400E1-030TC 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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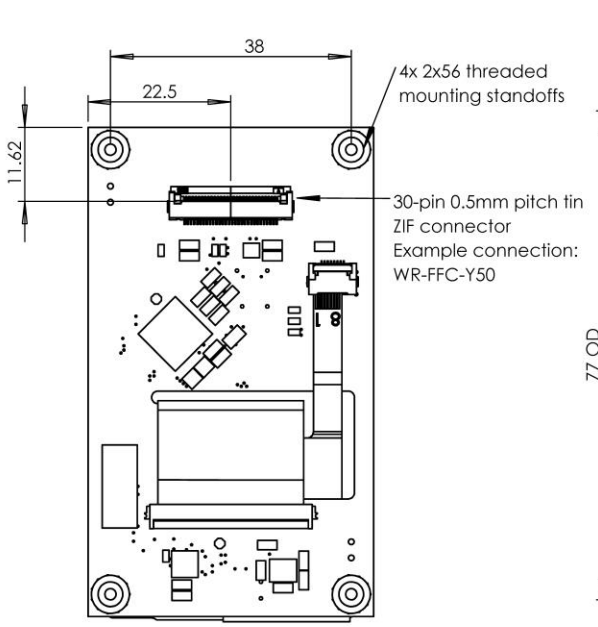
2. Module Description

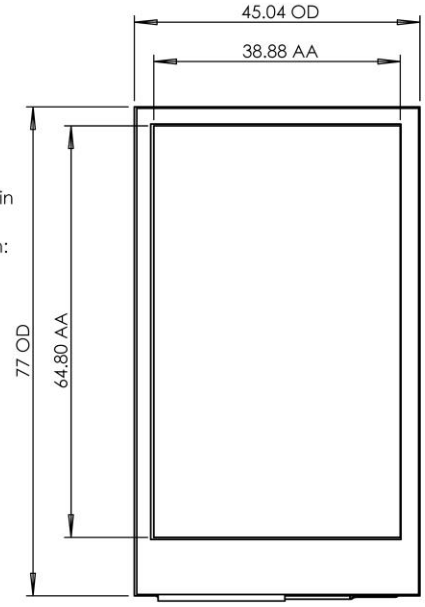
This is a full color IPS TFT graphic display module with a stunning 262k color span, bright white LED backlight, and built-in capacitive touch screen. The display is mounted on a CFA10097 carrier board with an FTDI FT811 EVE graphics accelerator for both high-performance accelerated graphics and easy design integration. The EVE board handles all of the display and touch communication with the module, appearing to a controller as a memory-mapped SPI device.

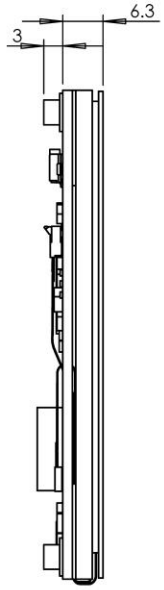
3. Mechanical Data

Item	Specification (mm)	Specification (inch, reference)
Overall Width and Height	45 (W) x 77 (H) x 6.3 (D)	1.77 (W) x 3.03 (H) x 0.34 (D)
Active Area	38.88 (W) x 64.8 (H)	1.53 (W) x 2.55 (H)
Dot Pitch	0.162 (W) x 0.162 (H)	0.0064 (W) x 0.0064 (H)
Weight (Typical)	42 grams	1.5 ounces

4. Mechanical Drawing







J_HOST CONNECTOR	
PIN #	FUNCTION
1	GND
2	3V3
3	3V3
4	GND
5	3V3
6	3V3
7	GND
8	SCK
9	GND
10	MOSI/D0
11	GND
12	MISO/D1
13	GND
14	GPIO0/D2
15	GND
16	GPIO1/D3
17	GND
18	nCS
19	GND
20	nINT
21	GPIO2
22	nPD
23	AUDIO PWM
24	GND
25	BLPWR
26	BLPWR
27	GND
28	BLPWR
29	BLPWR
30	GND

Display Controller	EVE FT811
Brightness	400
Viewing Direction	All
Operating Temperature	-20 - 70°C
Voltage Levels	3.3v

Units: millimeters
Tolerance: ±0.3

Crystalfontz	Part Number:	Date:	Filename:	Revision:
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		Web:		Sheet:
		www.crystalfontz.com/product/cfa240400e1030tc		1 of 1

5. Module Details

5.1. Module Features

- FTDI/BridgeTek FT811 Embedded Video Engine (EVE)
- 240*400 Dot Matrix
- White LED backlight
- Wide viewing angles in all directions
- Integrated capacitive touch screen
- SPI single or Quad host interface
- Compact 30-pin, 0.5mm ZIF host connection
- 4x 2-56 threaded mounting standoffs for simple integration
- Compact footprint
- Single 3.3v power supply

5.2. EVE Graphics Accelerator Features

- All display, touch sensing, backlight control and audio features are controlled via the Embedded Video Engine which appears to the host MCU as a memory-mapped SPI device.
- The host MCU sends commands and data over the EVE SPI serial protocol.
- Support multiple widgets for simplified design implementation
- User interface design software (PC) simplifies the design process
- Hardware engine can recognize touch tags and track touch movement
- Enhanced sketch processing
- Anti-aliasing of primitive displayed objects for higher-quality graphics
- Assorted graphical effects such as alpha-blending, shadows, transitions, wipes, etc.
- Programmable interrupt controller provides interrupts to host MCU
- Support playback of motion-JPEG encoded AVI videos
- Mono audio channel output with wave playback and built-in sound synthesizer
- PWM output for display backlight dimming control

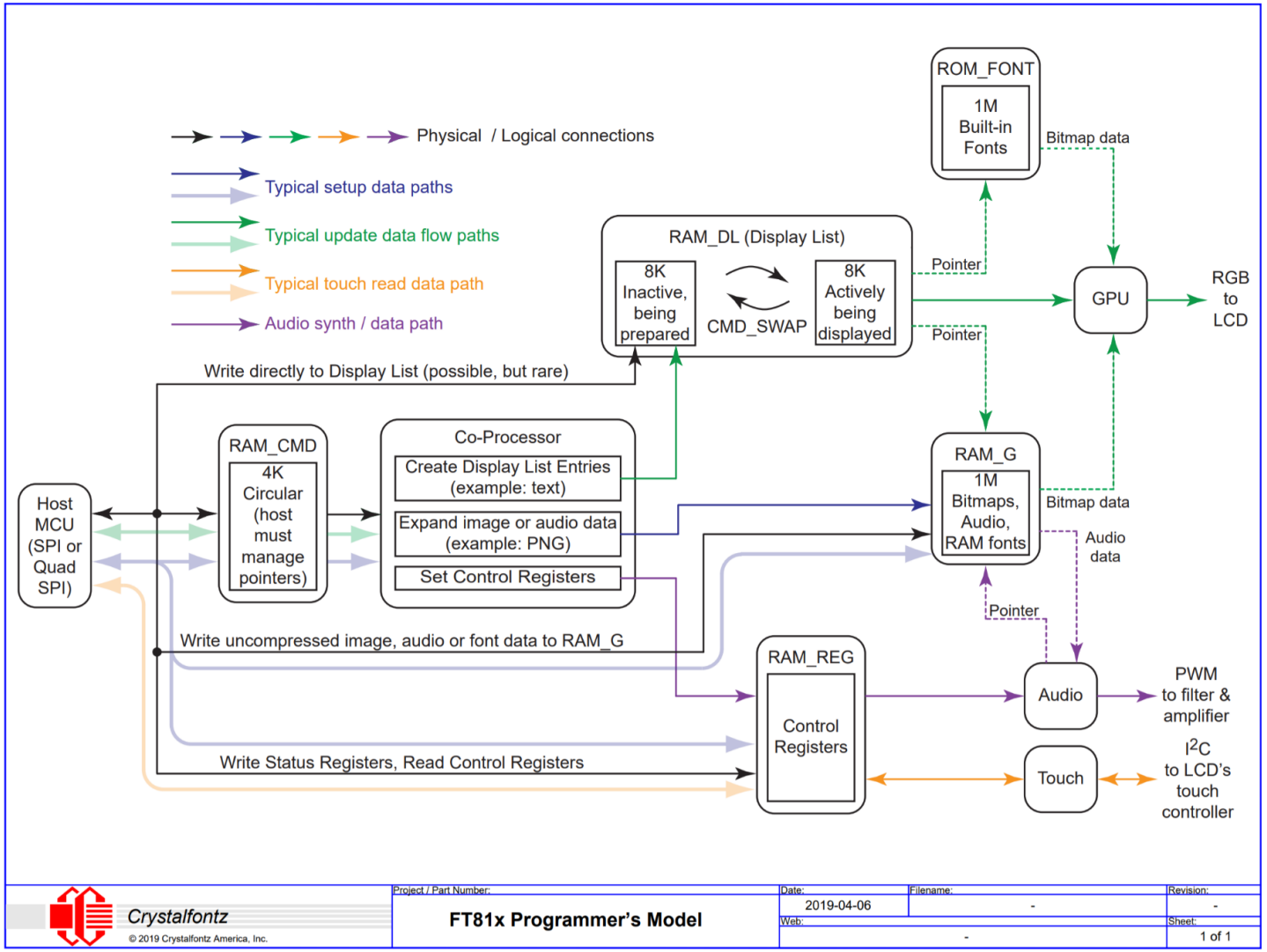
5.3. Additional Information

For more information about the implementing an EVE module, refer to the following resources:

- Crystalfontz ATmega328P (Arduino/Seeeduino) demo code
- Crystalfontz product page
- Bridgetek documentation
- Bridgetek software

5.4. Embedded Video Engine Programmer's Model

The diagram below is a basic overview of the EVE programming model showing data flow paths to and from the SPI host interface to the memory and processing blocks of the embedded video engine.



5.5. Interface Pin Function

Host data connection and power supply is achieved via a single 30 pin flat-cable connector (labeled J_HOST) on the rear of the module. Any 30 pin FFC-FPC ZIF cable with a 0.5mm pitch and bottom contacts will be compatible with this module.

J_HOST Connection			
Pin	**Symbol**	**Signal Direction**	**Function**
1	GND		Ground (1)
2	3V3		Logic Power Supply (1)
3	3V3		Logic Power Supply (1)
4	GND		Ground (1)
5	3V3		Logic Power Supply (1)
6	3V3		Logic Power Supply (1)
7	GND		Ground (1)
8	SCK	Input	SPI Clock
9	GND		Ground (1)
10	MOSI / D0	Input	SPI Single Mode: SPI MOSI SPI Dual/Quad Mode: SPI Data Line 0
11	GND		Ground (1)
12	MISO / D1	Output	SPI Single Mode: SPI MISO SPI Dual/Quad Mode: SPI Data Line 1
13	GND		Ground (1)
14	GPIO0 / D2	Input / Output	SPI Single/Dual Mode: General Purpose IO0 SPI Quad Mode: SPI Data Line 2
15	GND		Ground (1)
16	GPIO1 / D3	Input / Output	SPI Single/Dual Mode: General Purpose IO1 SPI Quad Mode: SPI Data Line 3
17	GND		Ground (1)
18	nCS	Input	SPI Slave Chip-Select
19	GND		Ground (1)
20	nINT	Output	Interrupt to Host
21	GPIO2		General purpose IO2
22	nPD	Input	Chip Power Down Mode
23	AUDIO PWM	Output	Audio PWM
24	GND		Ground (1)
25	BLPWR		Backlight Power Supply (1)
26	BLPWR		Backlight Power Supply (1)
27	GND		Ground (1)
28	BLPWR		Backlight Power Supply (1)
29	BLPWR		Backlight Power Supply (1)
30	GND		Ground (1)

Notes:

1. *It is recommended that these pins are all connected to their respective power source. Not doing so may produce unpredictable results or damage the display module.*

5.6. Absolute Maximum Ratings

Parameter	Symbol	Min	Max	Unit
Logic Power Supply	3V3	0.0	4.0	V
Backlight Power Supply	BLPWR	0.0	5.5	V
Operating Temperature	T_{OP}	-20	+70	°C
Storage Temperature	T_{ST}	-30	+80	°C

Note: 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

5.7. Electrical Characteristics

Item	Symbol	Min	Typ	Max	Unit
Logic Power Supply	3V3	2.97	3.30	3.63	V
Input Logic High	VIH	2.0	-	3V3	V
Input Logic Low	VIL	0	-	0.8	V
Logic Supply Current	I3V3	--	54	70	mA

5.8. Backlight Characteristics

Item	Symbol	Conditions	Min	Typ	Max	Unit
Supply Voltage	BLPWR		3.0	3.3	5.0	V
Supply Current	IBLPWR	BLPWR=3.4V	-	39.7	80.1	mA
LED Lifetime		at 100% brightness	-	50000	-	hours

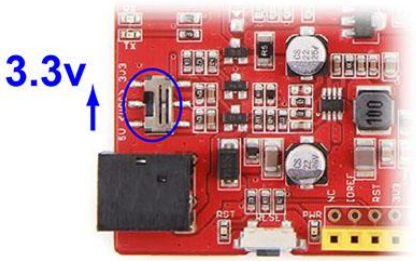
Backlight driver supports 16 brightness steps.

5.9. Optical Characteristics

Item		Symbol	Condition	Min	Typ	Max	Unit
Response Time		$T_r + T_f$	25°C	-	35	-	ms
Contrast Ratio		(CR)	θ=0°	-	600	-	-
White Chromaticity		Wx	Backlight On	0.245	0.285	0.325	ms
		Wy		0.271	0.311	0.351	ms
Viewing Angle	Horizontal	θL	CR≧10	-	80	-	Degree
		θR		-	80	-	
	Vertical	θT		-	80	-	
		θB		-	80	-	
Luminance		L	-	400	-	-	cd/m^2
Viewing Direction		12 o'clock					

6. Getting Started

6.1. Getting started with the CFA240400E1-030TC-KIT



Components:

- Crystalfontz CFA240400E1-030TC display module
- Crystalfontz CFA10098 EVE adapter board
- Appropriate flat-flex-cable (6” WR-FFC-Y50 & 12” WR-FFC-Y51)
- 0.1” female-to-female jumper wires (Crystalfontz WR-JMP-Y40)
- Seeeduino v4.2 set to 3.3 V (Crystalfontz CFAPN15062)
- USB Cable (Crystalfontz WR-USB-Y27)
- A PC with Arduino IDE (or equivalent) installed and at least one USB port

Hardware Procedure:

- Connect the components per the Example Connection Diagrams in Section 7.4
- Ensure the Seeeduino is set to 3v3
- Connect the USB cable to a PC

Firmware Procedure:

- Download and install Arduino IDE software.
- Download the sketch available on the product page or GitHub, and open it in the Arduino IDE.
- Build and upload the sketch to the Seeeduino

6.2. Getting started with the CFA240400E1-030TC and a Windows PC

Components:

- Crystalfontz CFA240400E1-030TC display module
- Crystalfontz CFA10098 EVE adapter board
- Appropriate flat-flex-cable (6” WR-FFC-Y50 & 12” WR-FFC-Y51)
- FTDI C232HM-DDHSL-0 USB-to-SPI cable
- Bench supply set to 3.3v, rated for at least 1000mA

Hardware Procedure:

- Connect the CFA10098 to the CFA240400E1-030TC using the FFC (see section 6.5 below)
- Connect the USB-to-SPI cable to the CFA10097 carrier board of the CFA240400E1-030TC
- Connect 3.3v from a bench supply (rated for at least 1000mA) to the CFA10098
- Connect the USB to SPI cable to a Windows PC

Software Procedure:

- Download and install the FTDI PC demonstration application from the Bridgetek website.
- Download, open, build and run the example EVE application available on GitHub.
- Visual Studio is required to modify and compile the FTDI PC demonstration program.

6.3. Getting started with CFA240400E1-030TC and a Custom PCB

Components:

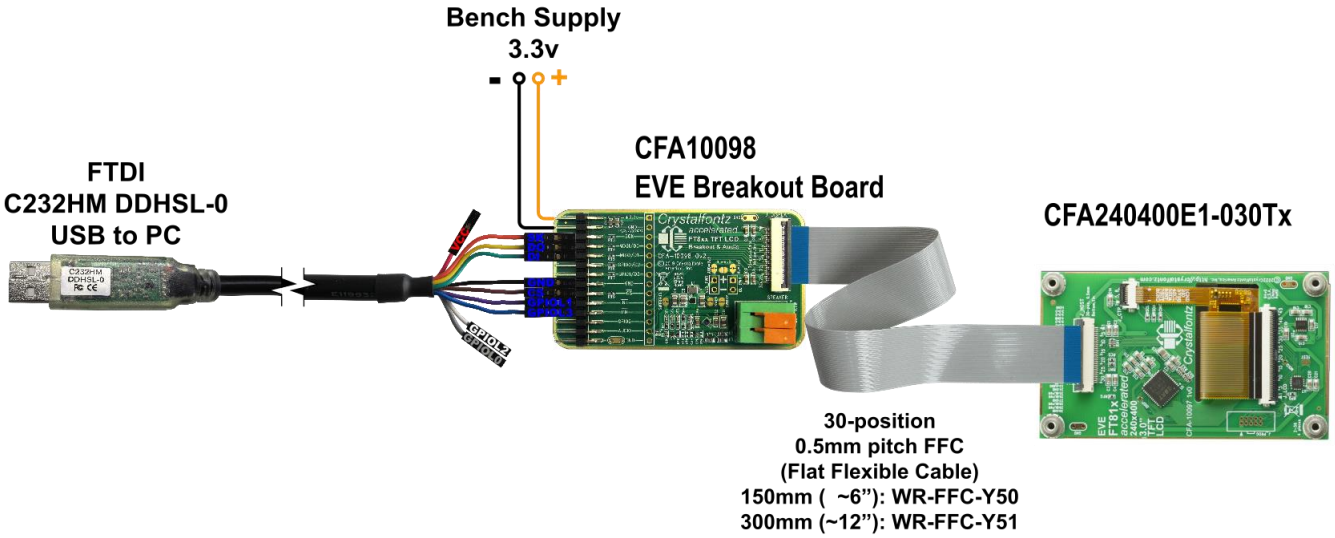
- Crystalfontz CFA240400E1-030TC display module
- Appropriate ZIF connector: 30-position, 0,5mm pitch, tin contact mounted to the custom PCB
- Appropriate flat-flex-cable (6” WR-FFC-Y50 & 12” WR-FFC-Y51)

Procedure:

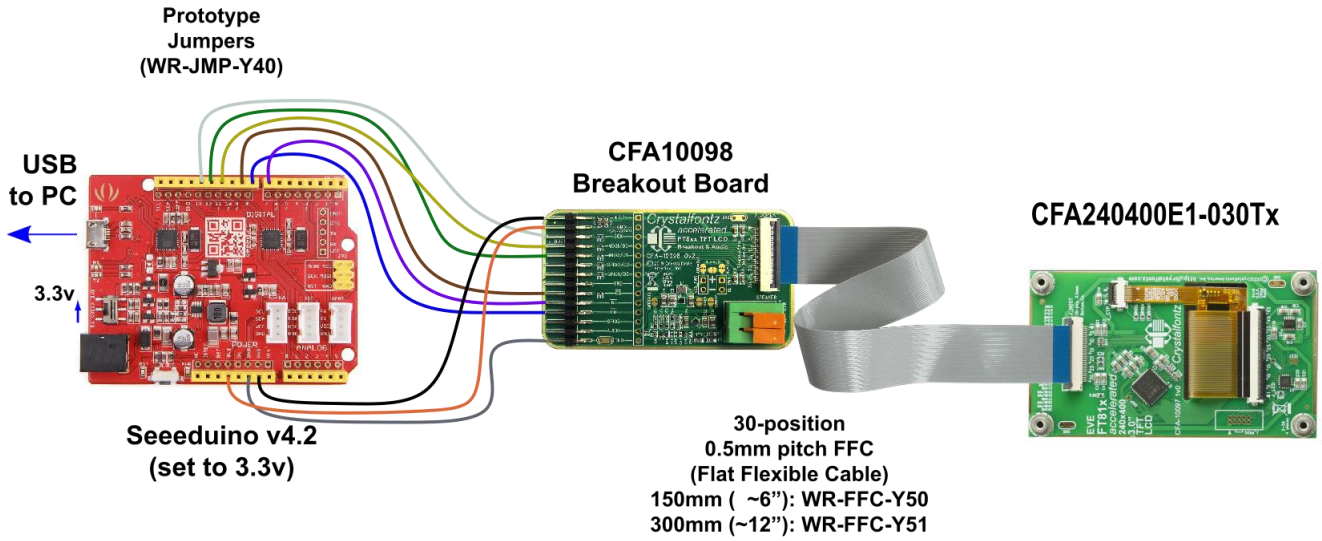
- Connect the FFC to the ZIF connector on the PCB
- Connect the FFC to the ZIF connector on the CFA240400E1-030TC (see the 6.5 below)

Note the power supply must be able to supply enough current to drive the backlight.

6.4. Example Connection Diagrams



Crystalfontz © 2022 Crystalfontz America, Inc.	Project / Part Number: **CFA240400E1-030Tx**	Date: 2022-09-20	Filename: CFA240400E1-030Tx Block Diagram	Revision: 2022-09-20
		Web: crystalfontz.com/product/CFA240400E1030TCKIT		Sheet: 1 of 1



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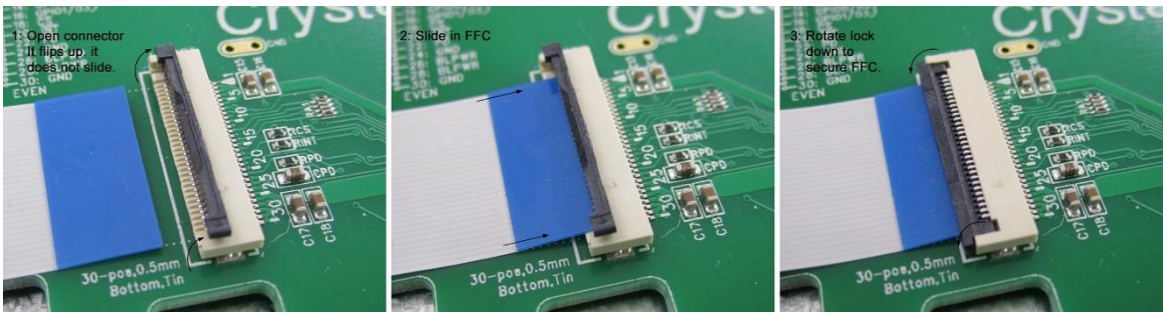
		Web: crystalfontz.com/product/CFA240400E1030TCKIT		Sheet: 1 of 1

6.5. ZIF Connector Use With Flat-Flex-Cable (FFC)

Please take note of the orientation of the flat-flex-cable, and use of the locking clip in the following photos.



6.6. Troubleshooting

The CFA240400E1-030TC ships with jumper TEST opened. When JTEST is open, the TFT will initialize to black and the backlight will be off until VSYNC activity is detected. Closing the jumper will cause the TFT to initialize to a boot screen with the backlight on until VSYNC activity is detected.

Reach out to our support team at support@crystalfontz.com for further troubleshooting help.

7. Care and Handling Precautions

For optimum operation of the CFA240400E1-030TC is and to prolong its life, please follow the precautions described below.

7.1. ESD (Electrostatic Discharge)

If present, the USB D+ & D- lines have enhanced ESD protection following industry standard USB2 practice.

The remainder of this circuitry is industry standard CMOS logic and susceptible to ESD damage. Please use industry standard antistatic precautions as you would for any other static sensitive devices such as expansion cards, motherboards, or integrated circuits. Ground your body, work surfaces, and equipment.

7.2. Design and Mounting

- The exposed surface of the display is either a touch-sensitive panel, or a polarizer laminated on top of the glass. To protect the surface from damage, the module ships with a protective film over the display. Please peel off the protective film slowly. Peeling off the protective film abruptly may generate static electricity.
- If the display does not have a touch-sensitive panel, to protect the soft plastic polarizer from damage, place a transparent plate (for example, acrylic, polycarbonate or glass), in front of the module, leaving a small gap between the plate and the display surface.
- Do not disassemble or modify the module.
- Do not modify the six tabs of the metal bezel or make connections to them.
- Do not reverse polarity to the power supply connections. Reversing polarity will immediately ruin the module.

7.3. Mechanical Shock, Impact, Torque, or Tension

- Do not expose the module to strong mechanical shock, impact, torque, or tension.
- Do not drop, toss, bend, or twist the module.
- Do not place weight or pressure on the module.

7.4. LCD Panel Breakage

- If the LCD panel breaks, be careful to not get the liquid crystal fluid in your mouth or eyes.
- If the liquid crystal fluid touches your skin, clothes, or work surface, wash it off immediately using warm soapy water.

7.5. Cleaning

- The display surface can easily be scratched or become hazy, so use extra care when you clean it.
- Do not clean the display surface with liquids.
- If the display surface becomes dusty, carefully blow it off with clean, dry, oil-free compressed air.
- Use the removable protective film to remove smudges (for example, fingerprints), and any foreign matter. If you no longer have the protective film, use standard transparent office tape (for example, Scotch® brand “Crystal Clear Tape”).
- If the above methods are not adequate, gently wipe using a very soft, clean, dry, lint free cloth (such as a microfiber towelette).
- Contact with moisture may permanently spot or stain the polarizer.

7.6. Operation

- Protect the module from ESD and power supply transients.
- Observe the operating temperature limitations: a minimum of -20°C to a maximum of +70°C with minimal fluctuation. Operation outside of these limits may shorten life and/or harm display.
- At lower temperatures of this range, response time is delayed.
- At higher temperatures of this range, display becomes dark (you may need to adjust the contrast).
- Operate away from dust, moisture, and direct sunlight.
- Adjust backlight brightness so the display is readable, but not too bright.
- Dim or turn off the backlight during periods of inactivity to conserve the backlight lifetime.

7.7. Storage and Recycling

- Store in an ESD-approved container away from dust, moisture, and direct sunlight.
- Observe the storage temperature limitations: -30°C minimum, +80°C maximum with minimal fluctuation. Rapid temperature changes can cause moisture to form, resulting in permanent damage.
- Do not allow weight to be placed on the module while in storage.
- Please recycle your outdated Crystalfontz modules at an approved facility.