Crystalfontz









CFA800480E3-050Sx Family

TFT GRAPHIC DISPLAY MODULES WITH GRAPHIC ACCELERATOR BOARD DATASHEET

CFA800480E3-050SN
CFA800480E3-050SR
CFA800480E3-050SC
CFA800480E3-050SW

Datasheet Release Date 2026-01-27

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1. General Information

Datasheet Revision History
Datasheet Release: 2026-01-27 Datasheet for the CFA800480E3-050Sx Family 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. Introduction

This family of modules comprise one of our four 16.7M color 5-inch TFT graphic displays mounted to a graphic accelerator board. The following touch options are available:

- CFA800480E3-050SN – No touchscreen
- CFA800480E3-050SR – Resistive touchscreen
- CFA800480E3-050SC – Capacitive touchscreen
- CFA800480E3-050SW – Wide glass capacitive touchscreen



The graphic accelerator board boasts the FTDI/Bridgetek BT817 Embedded Video Engine (EVE). All the displays in this family have in-plane switching, and are sunlight readable. The EVE chip handles all communication with the display and touchscreen.

The CFA800480E3-050Sx Family is a family of accelerated display modules for embedded systems. It centers around the FTDI/BridgeTek BT817 EVE4 (Embedded Video Engine) graphics accelerator.

The EVE graphics accelerator cures many of the problems with traditional options for including a TFT in an embedded system. Traditionally, the choices were a very powerful processor that could support a frame buffer and RGB interface or to write directly to TFT controller's frame buffer. These methods both rely on software to render graphics primitives. A simple non-anti-aliased image may take hundreds or even thousands of write operations. Sometimes, read-modify-write operations are required which doubles (or more) the necessary number of commands- further slowing the display performance.

Additionally, these methods require a lot GPIO or GPIO configured as the RGB interface, often requiring a larger processor package. There are examples of using SPI to control small TFT LCDs, but even on small displays the performance suffers.

Text poses another problem for traditional implementations of TFTs. Fonts require a lot of memory to store and rendering them to the frame buffer can be complex- especially if they need to be anti-aliased or rotated. The traditional solution is to support just a few bitmapped, non-anti-aliased fonts rendered only on the horizontal and vertical. Displaying angled text required a very complete and complex (and typically big and slow) graphic library.

The EVE graphics modules accept high-level commands. Writing just a few instructions completely describes a line- fully anti-aliased and fully adjustable in width. Beautiful anti-aliased text from a wide selection of fonts at any angle, responsive graphics, touch handling, audio – all of this is supported by the FTDI/BridgeTek BT817 EVE graphics accelerator at the heart of the module. Embedded systems with 8-bit processors can now have beautiful and responsive displays that do not tax the host processor. Please see the BT817 datasheet for further reference.

Our demo code for the CFA800480E3-050Sx Family was written to be useable on the Seeeduino (a 3.3v clone of the Arduino Uno). Some of the demos included are too large for the Seeeduino's memory alone, and require an external SD card. As always, our source code is freely supplied and our displays are fully supported.

This module also includes land patterns for XIAO and ESP32 microcontrollers.

3. Features

3.1. TFT Display Module Features

- 5-inch 800x480 TFT LCD
- In Plane Switching – free viewing angle
- 5-point Capacitive touch (C and W versions only)
- Overhanging glass for clean mounting (W version only)
- High bright starting at 1000 cd/m^2 with no touchscreen
- Operating Temperature: -20° - 70°C
- FTDI/BridgeTek BT817 EVE graphics accelerator controls touch and display using SPI, QSPI
- Single +3.3V power supply (backlight supply can be 3.3v to 6v)
- Six 2-56 threaded mounting standoffs for simple mechanical design

3.2. Mechanical Data

Item		Specification (mm)	Specification (inch, reference)
Active Area		108.00 x 64.80	4.25 x 2.55
Pixel Pitch		0.135 x 0.135	0.005 x 0.005
CFA800480E3-050S**N**	Weight (Typical)	86 grams	3.0 ounces
	Overall Width, Height, and Depth	120.7 x 75.8 x 8.6	4.8 x 3.0 x 0.3
CFA800480E3-050S**R**	Weight (Typical)	104 grams	3.7 ounces
	Overall Width, Height, and Depth	120.7 x 75.8 x 9.9	4.8 x 3.0 x 0.4
CFA800480E3-050S**C**	Weight (Typical)	127 grams	4.5 ounces
	Overall Width, Height, and Depth	120.7 x 76.3 x 10.8	4.8 x 3.0 x 0.4
CFA800480E3-050S**W**	Weight (Typical)	135 grams	4.7 ounces
	Overall Width, Height, and Depth	135.0 x 91.8 x 10.8	5.3 x 3.6 x 0.4

3.3. EVE Graphics Accelerator Features

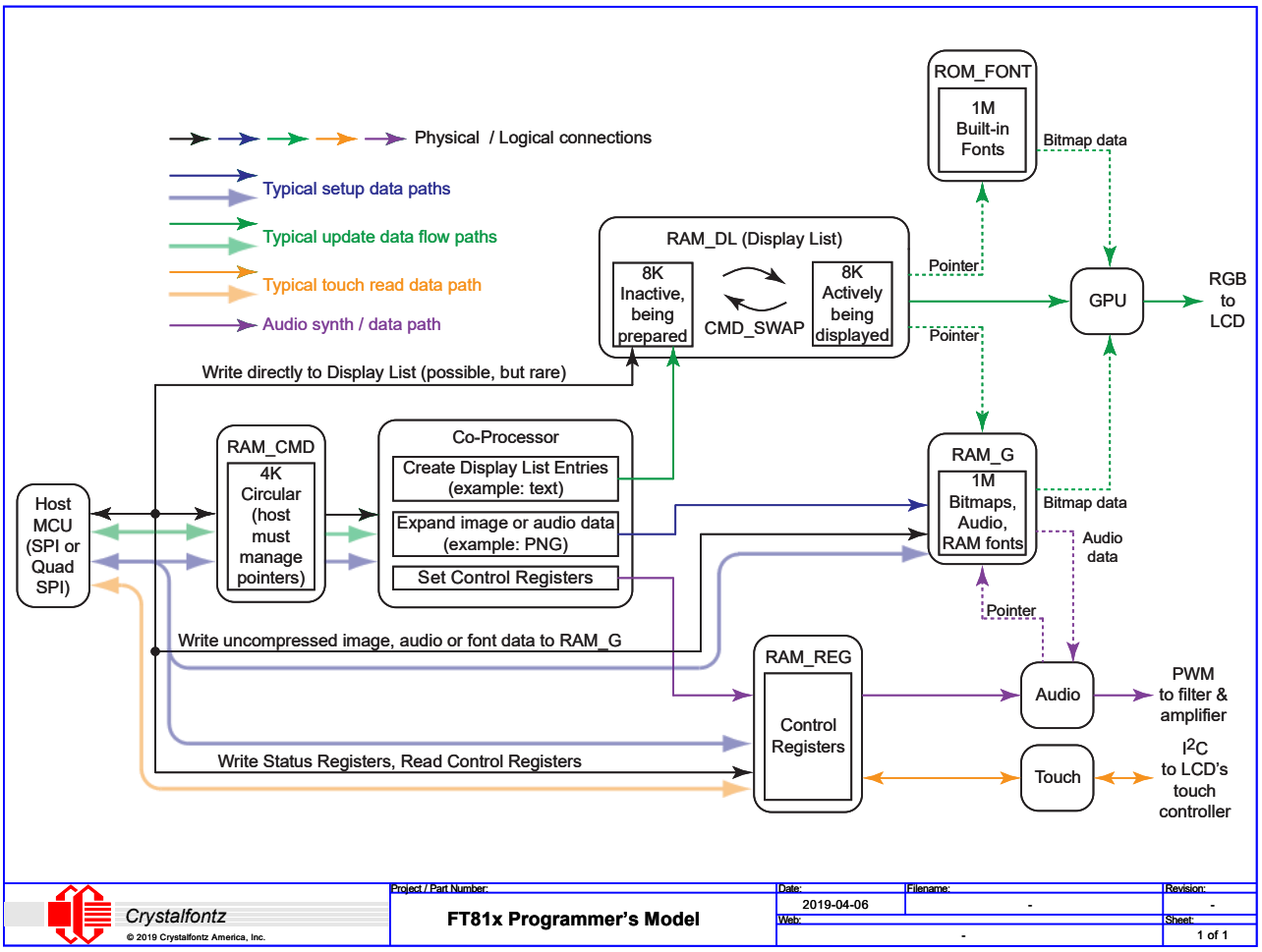
- Supports multiple widgets for simplified design implementation
- User interface design software (PC) simplifies the design process
- Enhanced sketch processing
- Anti-aliasing of primitive displayed objects for higher-quality graphics
- Assorted graphical effects such as alpha-blending, shadows, transitions, 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

3.4. Embedded Video Engine Documentation / Resources

- BT817 Datasheet: https://www.crystalfontz.com/controllers/Bridgetek/BT81x/
- BridgeTek Screen Designer Software: https://brtchip.com/toolchains/
- BridgeTek Forum: http://www.brtcommunity.com/index.php?board=7.0
- FTDI C232HM USB-SPI cable: https://www.ftdichip.com/Products/Cables/USBMPSSE.htm

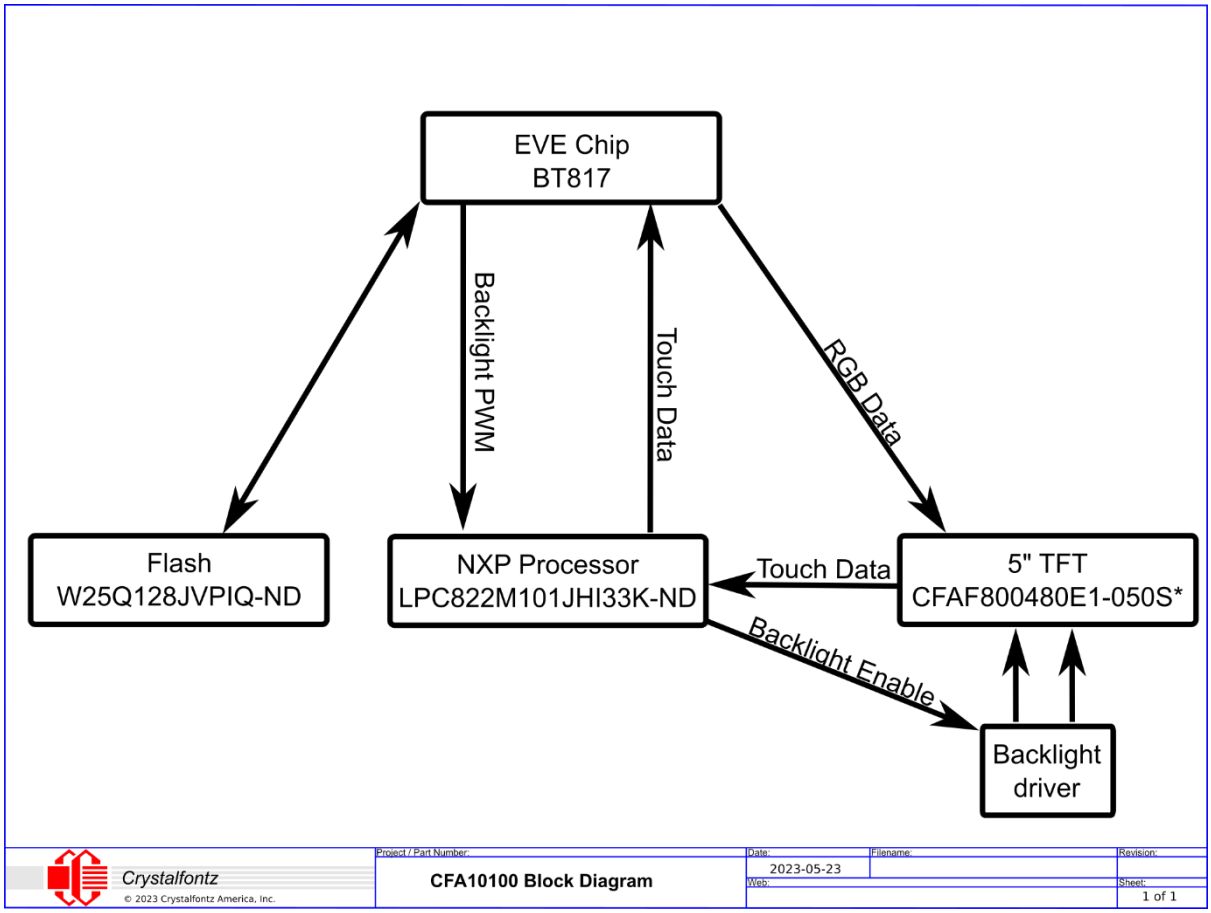
3.5. Embedded Video Engine Programmer's Model

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.

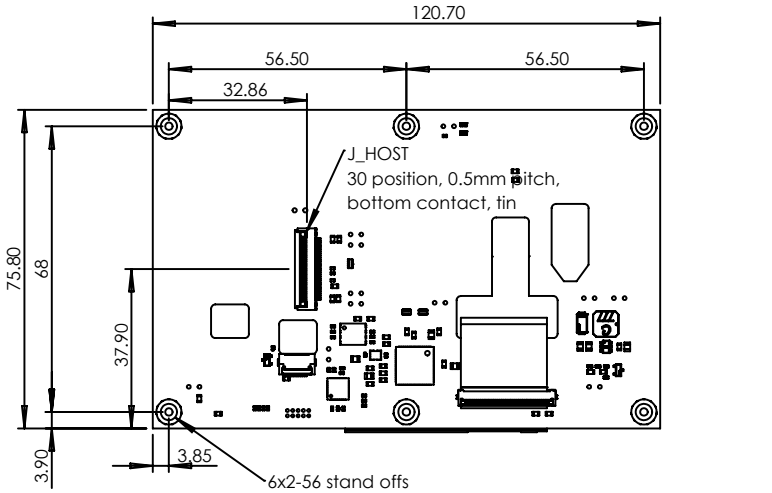


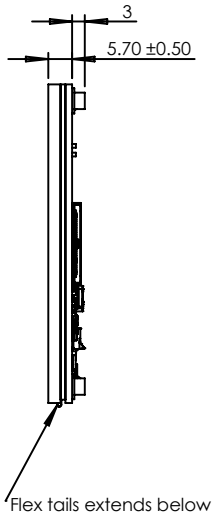
3.6. CFA10100 Block Diagram

The diagram below is a basic overview of the CFA10100 PCB used to create the modules in the CFA800480E3-050Sx Family.

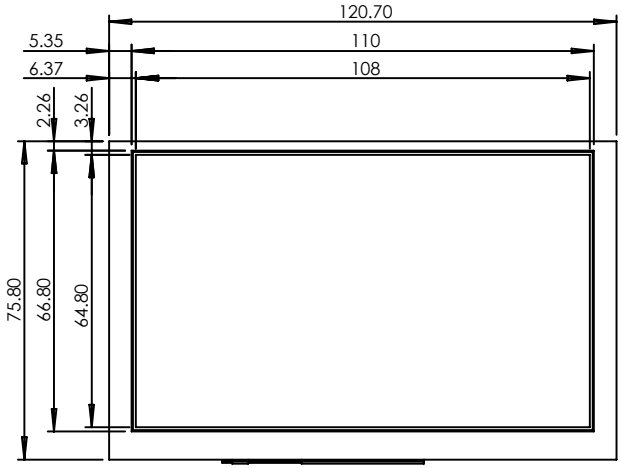


4. Mechanical Drawing





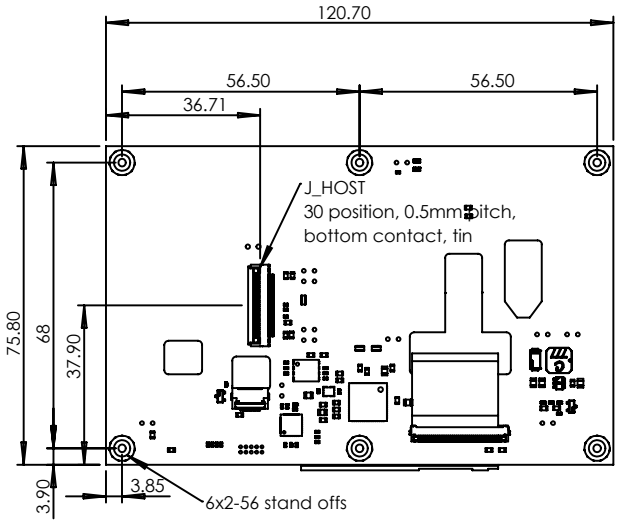
J_HOST CONNECTOR	
PIN #	FUNCTION
1	GND
2	3V3
3	3V3
4	GND
5	3V3
6	3V3
7	GND
8	SCK
9	GND
10	MOSI/D0
11	GND
12	MISO/D1
13	GND
14	GPIO0/D2
15	GND
16	GPIO1/D3
17	GND
18	nCS
19	GND
20	nINT
21	GPIO2
22	nPD
23	AUDIO PWM
24	GND
25	BLPWR
26	BLPWR
27	GND
28	BLPWR
29	BLPWR
30	GND

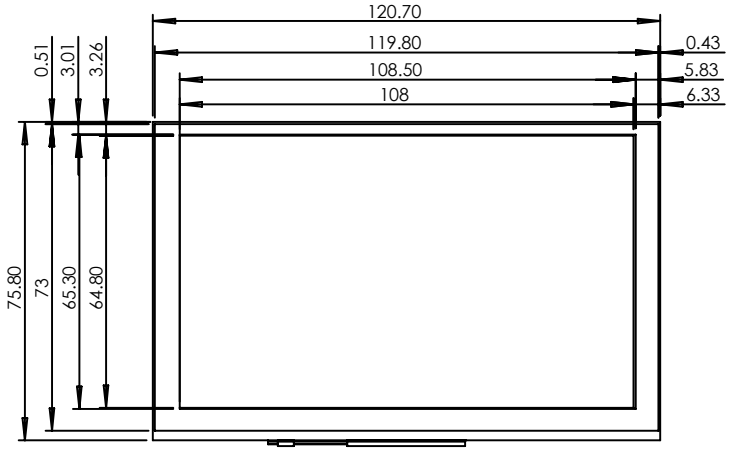


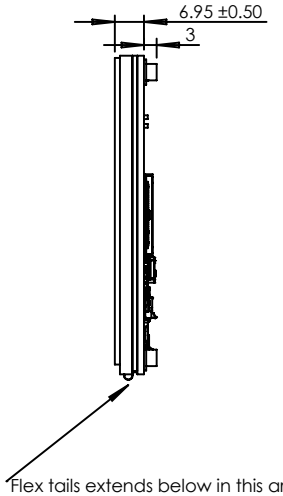
Units: millimeters
Tolerance: ±0.3

Controller	BT817 EVE
Brightness	1000 nits
Viewing Direction	All
Operating Temperature	-20 - 70°C
Voltage Levels	3.3v Logic 5v Backlight

Crystalfontz	Part Number:	Date:	Filename:	Revision:
©2025 Crystalfontz America, Inc.	CFA800480E3-050SN	11/18/2025	CFA800480E3-050SN mm.pdf	v1.0
		Web:		Sheet:
		www.crystalfontz.com/productCFA800480E3-050SN		1 of 1







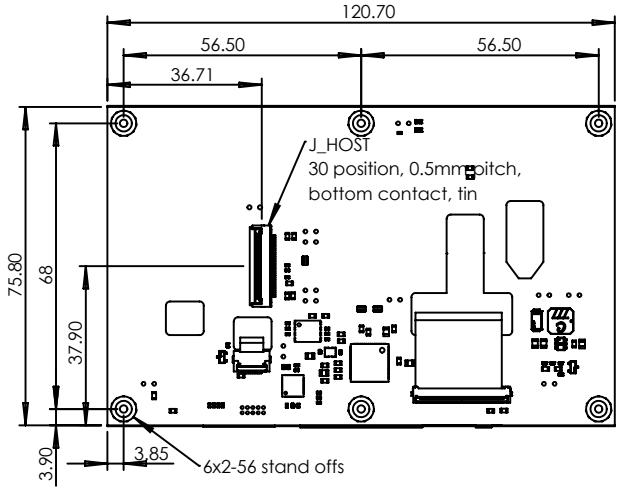
J_HOST CONNECTOR	
PIN #	FUNCTION
1	GND
2	3V3
3	3V3
4	GND
5	3V3
6	3V3
7	GND
8	SCK
9	GND
10	MOSI/D0
11	GND
12	MISO/D1
13	GND
14	GPIO0/D2
15	GND
16	GPIO1/D3
17	GND
18	nCS
19	GND
20	nINT
21	GPIO2
22	nPD
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26	BLPWR
27	GND
28	BLPWR
29	BLPWR
30	GND

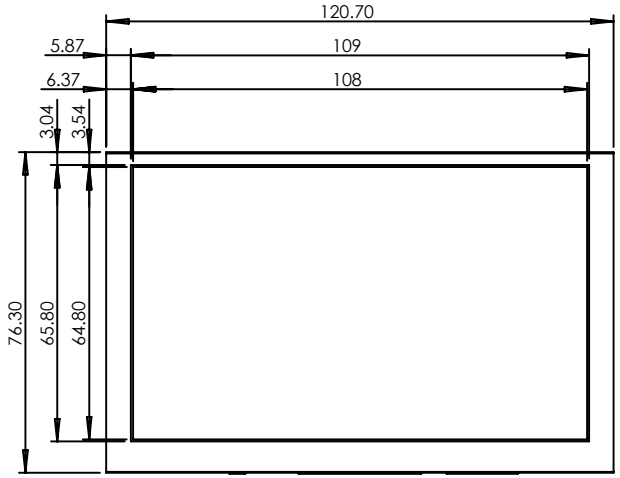
Controller	BT817 EVE
Brightness	850 nits
Viewing Direction	All
Operating Temperature	-20 - 70°C
Voltage Levels	3.3v Logic 5v Backlight

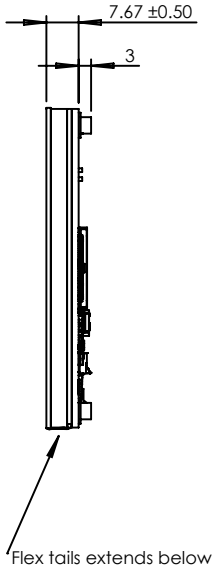
Units: millimeters
Tolerance: ±0.3

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	Web: www.crystalfontz.com/productCFA800480E3-050SR		Sheet: 1 of 1







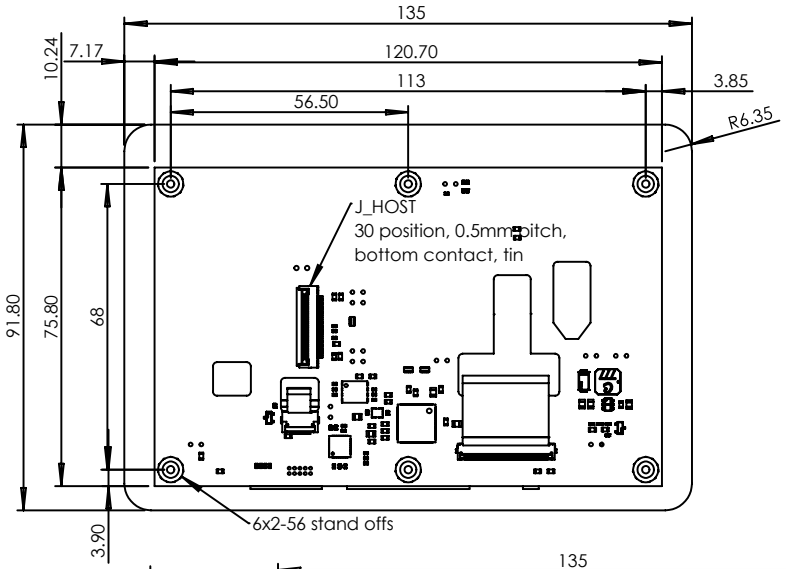
J_HOST CONNECTOR	
PIN #	FUNCTION
1	GND
2	3V3
3	3V3
4	GND
5	3V3
6	3V3
7	GND
8	SCK
9	GND
10	MOSI/D0
11	GND
12	MISO/D1
13	GND
14	GPIO0/D2
15	GND
16	GPIO1/D3
17	GND
18	nCS
19	GND
20	nINT
21	GPIO2
22	nPD
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26	BLPWR
27	GND
28	BLPWR
29	BLPWR
30	GND

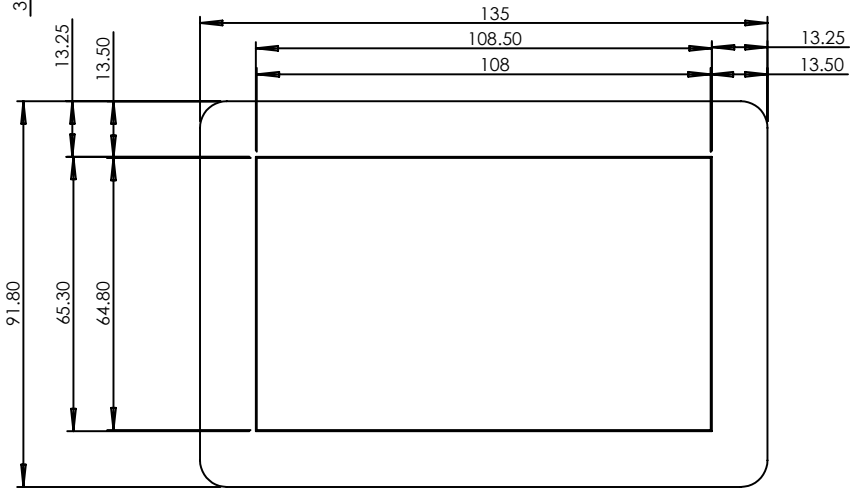
Controller	BT817 EVE
Brightness	800 nits
Viewing Direction	All
Operating Temperature	-20 - 70°C
Voltage Levels	3.3v Logic 5v Backlight

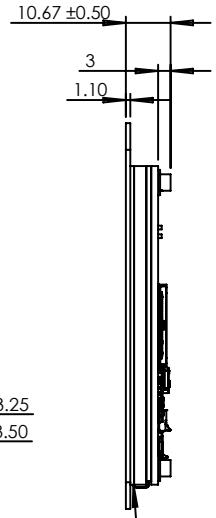
Units: millimeters
Tolerance: ±0.3

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	Web: www.crystalfontz.com/productCFA800480E3-050SC		Sheet: 1 of 1







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

Controller	BT817 EVE
Brightness	850 nits
Viewing Direction	All
Operating Temperature	-20 - 70°C
Voltage Levels	3.3v Logic 5v Backlight

Units: millimeters
Tolerance: ±0.3

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Part Number:	Date:	Filename:	Revision:
CFA800480E3-050SW	1/26/2026	CFA800480E3-050SW.pdf	20260126
	Web: www.crystalfontz.com/productCFA800480E3-050SW		Sheet: 1 of 1

5. Interface Pin Function

Host data connection and power supply are 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, such as 6" WR-FFC-Y50 or the 12" WR-FFC-Y51.

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)

Note: 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.

6. Absolute Maximum Ratings

Parameter	Symbol	Min	Max	Unit
Supply Voltage for Logic	3V3	0	4	V
Supply Voltage for Backlight	BLPWR	0	20	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 listed above may affect device reliability or cause permanent damage. Functional operation should be restricted to the limits in the Electrical Characteristics table below.

7. Electrical Characteristics

Item	Symbol	Condition	Min	Typ	Max	Unit
Supply Voltage for Logic	3V3	-	3.0	3.3	3.6	V
Operating Current	I_{3V3}	3V3 = 3.3V	-	161	-	mA
High-level Input	V_{IH}	-	1.7	-	3.6	V
Low-level Input	V_{IL}	-	-	-	0.7	V
High-level Output	V_{OH}	-	V_{DD} - 0.4	-	-	V
Low-level Output	V_{OL}	-	-	-	0.4	V

8. Optical Characteristics

Item	Symbol	Condition	Min	Typ	Max	Unit
View Angle	(V)θ		-	160	-	deg
	(H)φ		-	160	-	deg
Contrast Ratio	CR		800	1000	-	-
Response Time	$T_{rise}+T_{fall}$		-	30	40	ms
Surface Luminance (N)		Θ=0 No touchscreen	900	1000	-	cd/m2
		Resistive touchscreen (SR)	-	850	-	
		Capacitive touchscreen(SC and SW)	-	800	-	

9. Backlight Characteristics

Item	Symbol	Min	Typ	Max	Unit
Supply Voltage	BLPWR	2.7	5.0	9.0	V
Supply Current (BLPWR= 3.3v)	I_{BLPWR}	-	450	570	mA
Supply Current (BLPWR=5v)		-	405	450	mA
LED Lifetime			30000		hours

Lifetime is defined as the amount of time when the luminance has decayed to <50% of the initial value, and this value is provided as an estimate only.

To avoid burning out the backlight power supply, backlight voltages lower than 3.5V will cause the power at the LEDs to be derated and in turn, the backlight brightness will be reduced. 5V or higher is recommended as the backlight power supply voltage.

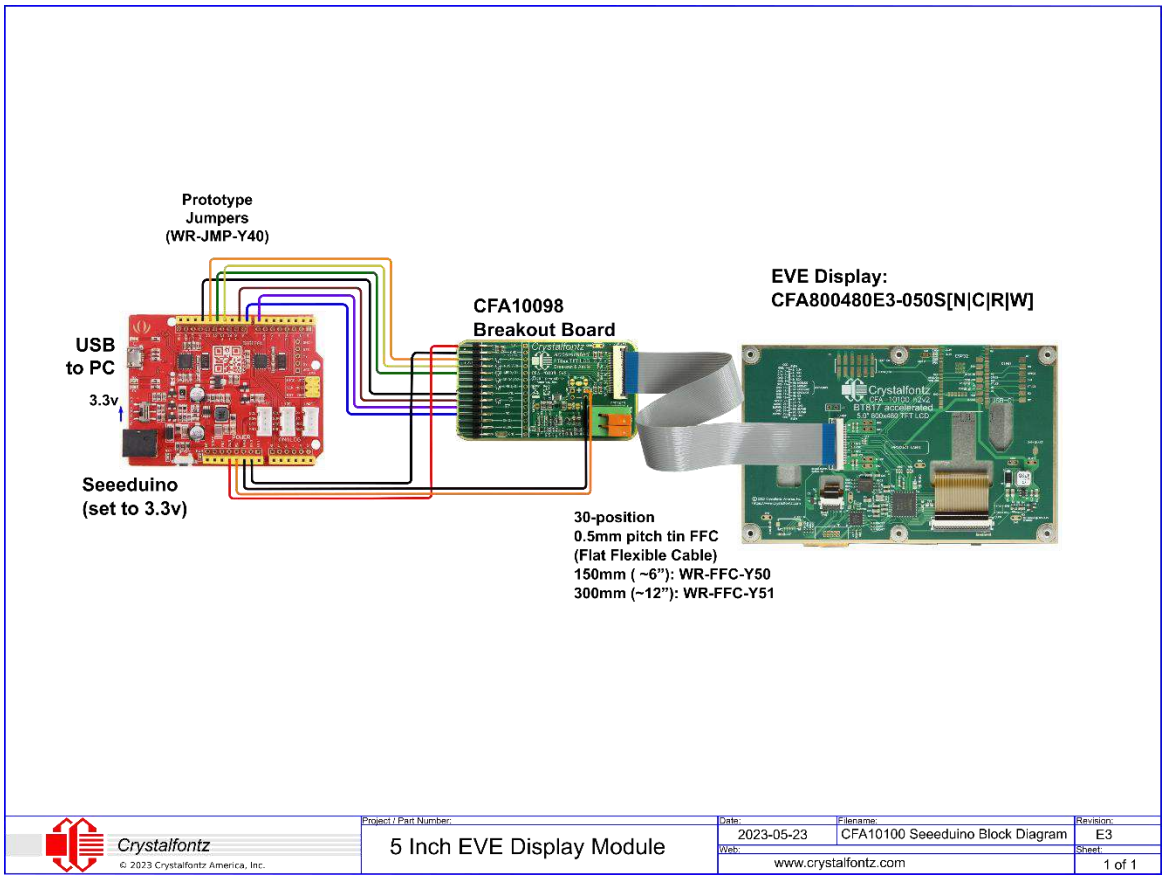
10. Getting Started

10.1. Getting Started with your CFA800480E3-050Sx-KIT

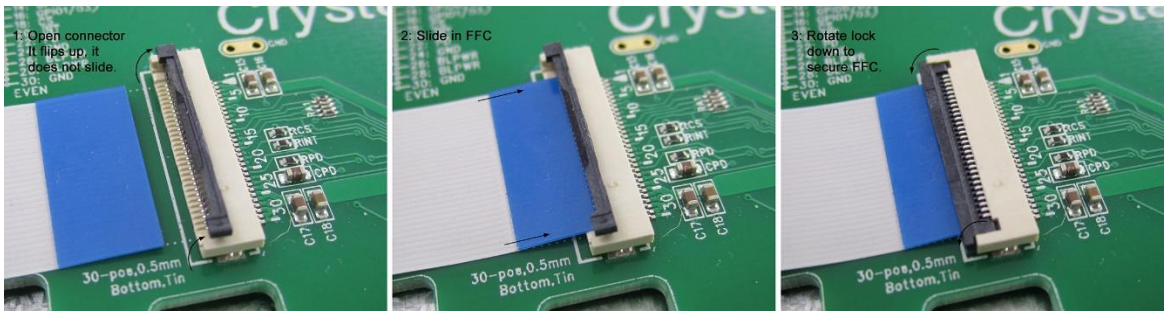
In earlier stages of development, consider the complete development kit, which includes:

- CFA800480E3-050Sx display module
- CFA10098 EVE adapter board
- 30-position, 0.5mm pitch flat flex cable (such as the 6" WR-FFC-Y50 or the 12" WR-FFC-Y51)
- 0.1" female-to-female jumper wires (WR-JMP-Y40)
- Seeeduino (CFAPN15062)

The development kit ships connected as shown (though the FFC may be disconnected to prevent breakages):



If your kit ships with the flex cable disconnected, take note of the orientation of the flat-flex-cable, and use of the locking clip in the following photos.



10.1.1. Hardware Procedure

- Following the Seeeduino Block Diagram, above, connect any components that have come apart.
- Connect the USB cable to your PC

10.1.2. Firmware Procedure

For the kits, the included Seeeduino comes pre-loaded with software and should display graphics immediately on power up. To modify the software:

- Download and install Arduino IDE software (or equivalent IDE)
- Download the example sketch available on Github, and open it in the Arduino IDE.
- Build and upload the sketch to the Seeeduino

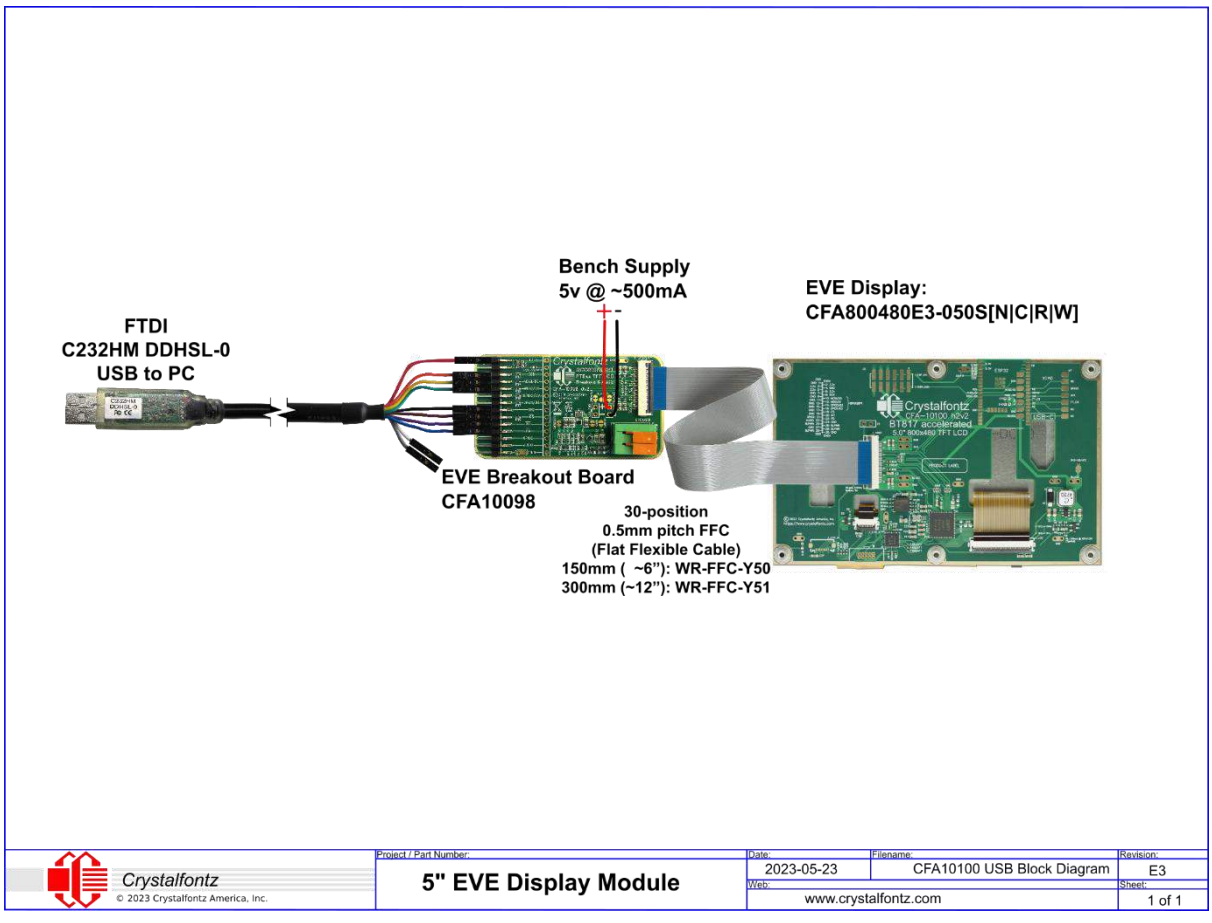
10.2. Getting started with a CFA800480E3-050Sx Family Module and a Windows PC

10.2.1. Components

- CFA800480E3-050Sx display module
- CFA10098 EVE adapter board
- 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

10.2.2. Hardware Procedure

- Connect the CFA10098 to the CFA800480E3-050Sx using the FFC
- Connect the CFA10098 to the C232HM-DDHSL-0 USB adapter
- Connect 3.3v from a bench supply (rated for at least 1000mA) to the CFA10098
- Connect the USB to SPI cable to your Windows PC



10.2.3. Software Procedure:

- Download and install the PC demonstration application from Bridgetek's website.
- Download, open, build and run the example EVE application available on GitHub.

In order to modify and compile the FTDI PC demonstration program, you will need to download Visual Studio. You can use the free version but you may need to register with Microsoft.

10.3. Getting started, hardware, with CFA800480E3-050Sx and your PCB

10.3.1. Components

- CFA800480E3-050Sx display module
- Your PCB with ZIF connector: 30-position, 0.5mm pitch, tin (CS050Y30T-B0)
- Flat-flex-cable (6" WR-FFC-Y50 & 12" WR-FFC-Y51)

10.3.2. Procedure

- Connect the FFC to the ZIF connector on your PCB
- Connect the FFC to the ZIF connector on the CFA800480E3-050Sx

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

10.4. Troubleshooting

Please contact support@crystalfontz.com if you need help troubleshooting your module.

11. Care and Handling Precautions

For optimum operation of the CFA800480E3-050Sx Family and to prolong its life, please follow the precautions described below.

11.1. 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 device such as expansion cards, motherboards, or integrated circuits. Ground your body, work surfaces, and equipment.

11.2. 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.

11.3. 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.

11.4. 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.

11.5. 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.

11.6. 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.

11.7. 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.