



TFT GRAPHIC DISPLAY MODULE DATASHEET



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for
CFAF480640C0-035BC

Revision A0

Crystalfontz America, Inc.

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CONTENTS

1. General Information	3
2. Module Description	4
3. Features	4
4. Mechanical Data	4
5. Mechanical Drawing	5
6. Interface Pin Function	6
6.1. TFT Pin Functions	6
6.2. CTP Pin Functions.....	6
7. System Block Diagram.....	7
8. Absolute Maximum Ratings	7
9. DC Electrical Characteristics	7
10. Optical Characteristics	8
11. Backlight Characteristics.....	8
12. AC Characteristics	8
13. Capacitive Touch Panel Specifications.....	8
13.1. Absolute Maximum Ratings.....	8
13.2. DC Electrical Characteristics	9
13.3. AC Characteristics.....	9
13.4. I2C Communication	9
14. LCD Module Precautions	10
14.1. Modules	10
14.2. Handling Precautions	10
14.3. Storage Precautions	11
14.4. Designing Precautions	11
14.5. Disposing Precautions.....	11
14.6. Other Precautions.....	11



1. General Information

Datasheet Revision History

Datasheet Release: 2020-05-20
Datasheet for the CFAF480640C0-035BC 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 uses Blanview technology to combine the benefits of transmissive and transreflective displays for stellar performance in office lighting and sunlight, while maintaining low power requirements. This display has a built-in Ilitek ILI9806E controller.

Please see the [ILI9806E controller datasheet](#) for further reference.

This module also has a capacitive touch panel (CTP) with five-point touch. The panel has a built in Goodix GT911 controller. Please see the [GT911 controller datasheet](#) for further reference.

3. Features

- 3.5" Diagonal Viewing Area
- 480x640 Dot Matrix
- Viewing Direction: Any
- 65K/ 262K/ 16.7M Colors
- Built-in Controller: Ilitek ILI9806E (or equivalent)
- Operating Temperature: -20 - +70°C
- Storage Temperature: -30 - +80°C
- +3V Power Supply
- Interface: 3-wire SPI+16/18/24 bit RGB
- CTP interface: I2C

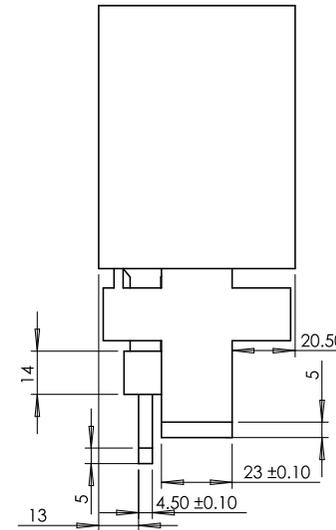
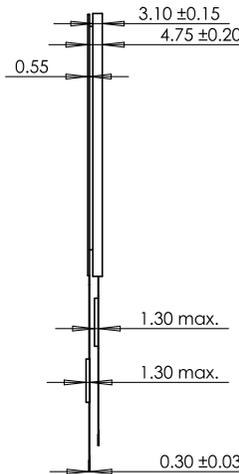
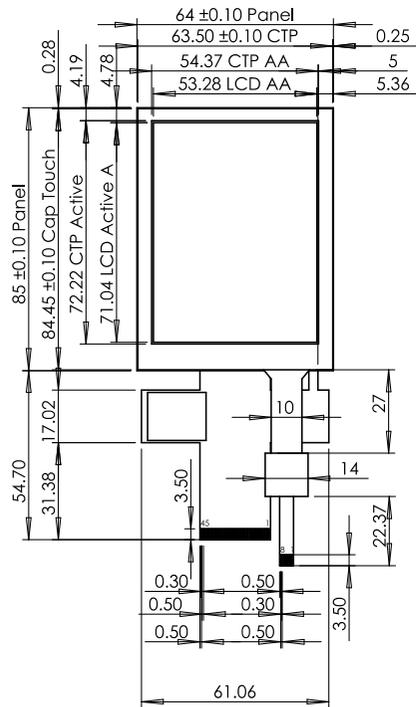
4. Mechanical Data

Item	Specification (mm)	Specification (inch, reference)
Overall Width and Height	64.00 x 85.00 x 4.75	2.52 x 3.35 x 0.12
Viewing Area	54.37 x 72.22	2.14 x 2.84
Active Area	53.28 x 71.04	2.10 x 2.80
Pixel Pitch	0.111 x 0.111	0.004 x 0.004
Weight (Typical)	31.6 grams	1.11 ounces



5. Mechanical Drawing

Pin No	Symbol
1-4	NC
5-6	GND
7	VCI
8	IOVCC
9	SDO
10	SDI
11	SCL
12	CS
13	RESET
14-37	DB23-DB0
38	DE
39	DOTCLK
40	HSYNC
41	VSYSN
42	NC
43	LEDK
44	NC
45	LEDA



Units: millimeters
Tolerance: ±0.3



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Sheet:

1 of 1



6. Interface Pin Function

6.1. TFT Pin Functions

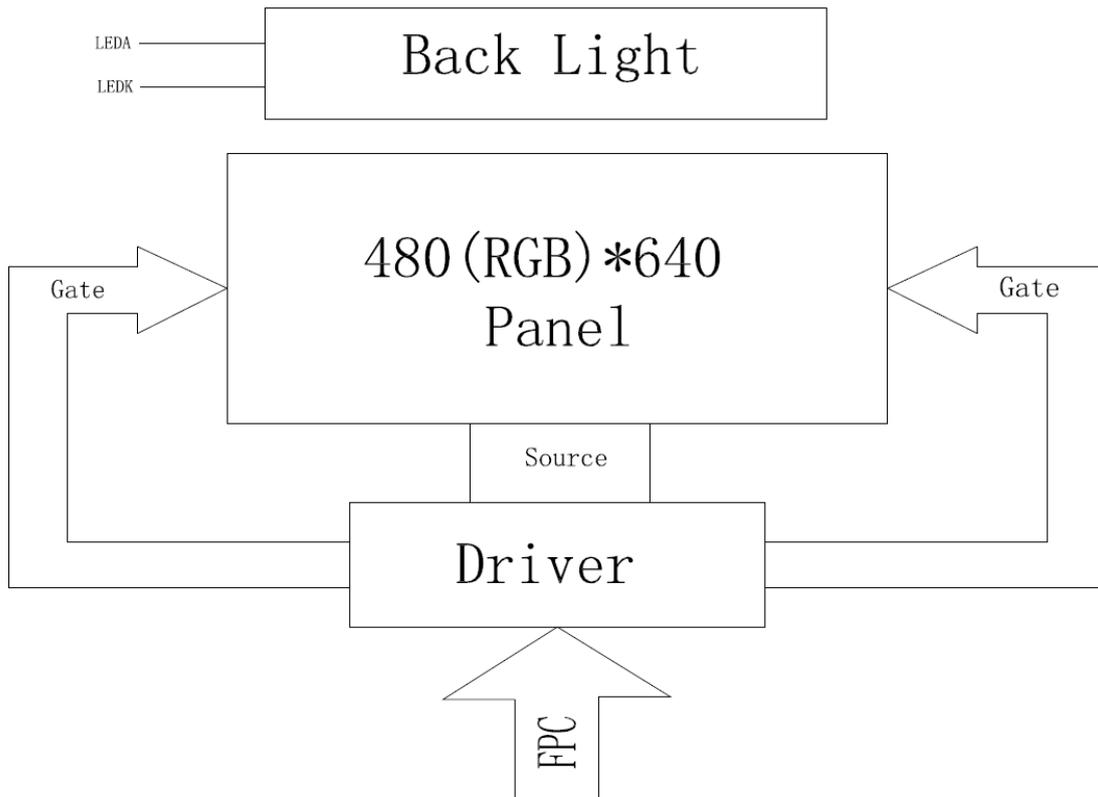
PIN No.	Symbol	Function
1-4	NC	No connection, leave open.
5-6	GND	Ground
7	V _{Cl}	Supply voltage (typ 3.3v)
8	IOV _{CC}	I/O power supply voltage
9	SDO	SPI interface output pin. Data is output on the falling edge of SCL. Leave open if not used.
10	SDI	SPI interface input pin. Data is latched on the rising edge of SCL.
11	SCL D/C	Serial interface clock. Data/Command for parallel interface. When D/C is high, data is selected. When D/C is low, command is selected.
12	CS	Chip Select input pin, low enabled. Fix to IOV _{CC} or GND when not in use.
13	RESET	Reset pin. Set pin low to initialize. Must be reset after power is applied.
14-37	DB23-DB0	24-bit parallel bi-directional data bus. Fix to GND when not in use.
38	DE	Data enable signal for RGB operation. Fix to IOV _{CC} or GND when not in use.
39	DOTCLK	Dot clock signal for RGB interface. Fix to GND when not in use.
40	HSYNC	Line synchronizing signal. Fix to IOV _{CC} or GND when not in use.
41	VSYNC	Frame synchronizing signal. Fix to IOV _{CC} or GND when not in use.
42	NC	No connection, leave open.
43	LEDK	Cathode pin for backlight.
44	NC	No connection, leave open.
45	LEDA	Anode pin of backlight.

6.2. CTP Pin Functions

PIN No.	Symbol	Function
1	GND	Ground
2	NC	No connection
3	V _{DD}	Supply voltage
4	SCL	I2C clock input
5	SDA	I2C data input and output
6	INT	External interrupt to the host
7	RST	External reset. Active low.
8	GND	Ground



7. System Block Diagram



8. Absolute Maximum Ratings

Parameter	Symbol	Min	Max	Unit
Digital Supply Voltage	V _{CI}	-0.3	4.6	V
Digital Interface Supply Voltage	IOV _{CC}	-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.

9. DC Electrical Characteristics

Item	Symbol	Min	Typ	Max	Unit
Digital Supply Voltage	V _{CI}	2.5	3.3	3.6	V
Digital Interface Supply Voltage	IOV _{CC}	1.65	1.8	3.6	V
High-level Input	V _{IH}	0.7IOVCC	-	IOVCC	V
Low-level Input	V _{IL}	GND	-	0.3IOVCC	V
High-level Output	V _{OH}	0.8IOVCC	-	IOVCC	V
Low-level Output	V _{OL}	GND	-	0.2IOVCC	V
Normal Mode Current	I _{DD}	-	20	-	mA



10. Optical Characteristics

Item	Symbol	Condition	Min	Typ	Max	Unit
View Angle	(V) θ		-	160	-	deg
	(H) ϕ		-	160	-	deg
Contrast Ratio	CR	Dark	500	700	-	-
Response Time	T _{rise} +T _{fall}	-		25		ms
Uniformity	S(%)			51.7		%
Color Filter Chromaticity	White	W _x	0.2594	0.2994	0.3394	
	White	W _y	0.2899	0.3299	0.3699	
	Red	R _x	0.4975	0.5375	0.5775	
	Red	R _y	0.2928	0.3328	0.3728	
	Green	G _x	0.2970	0.3370	0.3770	
	Green	G _y	0.5346	0.5746	0.6146	
	Blue	B _x	0.1139	0.1539	0.1939	
	Blue	B _y	0.0746	0.1146	0.1546	

11. Backlight Characteristics

Item	Symbol	Min	Typ	Max	Unit
Forward Current	I _F	15	20	-	mA
Supply Voltage	V _F	-	18.6	-	V
Luminous Intensity for LCM	L _v	323	373	-	cd/m ²
Uniformity	Avg	80	-	-	%
LED Lifetime	-	-	50,000	-	Hour

Note: LED lifetime is defined as the amount of time they operate under typical conditions until the brightness becomes less than 50% of the original brightness. LED lifetime can be decreased when operated outside of typical conditions.

12. AC Characteristics

Please see the Ilitek [LI9806E controller datasheet](#). Relevant sections include:

3.4.2. DPI Interface Timing (p. 48)

9.1.3. Reset Timing

14.4.1. Display Serial Interface Timing Characteristics (3-line SPI system) (p. 313)

14.4.2. Parallel 24/18/16-bit RGB Timing Characteristics (p. 314)

13. Capacitive Touch Panel Specifications

13.1. Absolute Maximum Ratings

Parameter	Symbol	Min	Max	Unit
Power Supply Voltage	V _{DD}	2.66	3.47	V
Operating Temperature	T _{OP}	-20	70	°C
Storage Temperature	T _{STG}	-30	80	°C



13.2. DC Electrical Characteristics

Item	Symbol	Min	Typ	Max	Unit
Power Supply Voltage	V _{DD}	2.66	3.3	3.47	V
Normal Mode Operating Current	-	-	9	14.5	mA
Green Mode Operating Current	-	-	3.3	-	mA
Sleep Mode Operating Current	-	70	-	120	μA
Doze Mode Operating Current	-	-	0.78	-	mA
High-level Input	V _{IH}	0.57V _{DD}	-	V _{DD} +0.3	V
Low-level Input	V _{IL}	-0.3	-	0.25V _{DD}	V
High-level Output	V _{OH}	0.85 V _{DD}	-	-	V
Low-level Output	V _{OL}	-	-	0.15 V _{DD}	V

13.3. AC Characteristics

Parameter	Min	Typ	Max	Unit
OSC Oscillation Frequency	50	60	61	MHz
I/O Output rise and fall time	-	14	-	ns

13.4. I2C Communication

For more information on I2C communication with the touch controller, please see the Goodix [GT911 controller datasheet](#) section 6. I2C Communication.

The touch module supports two I2C slave addresses: 0xBA/0xBB and 0x28/0x29.

Communication with the touch controller is initiated by the host after the valid start condition is signaled: the SDA line being pulled from high to low while the SCL line is high.



14. LCD Module Precautions

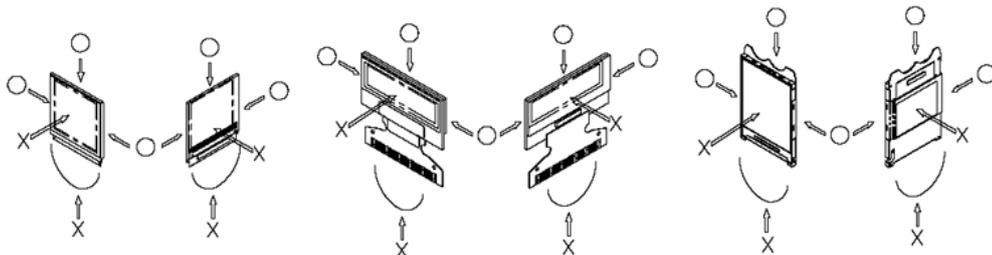
The precautions below should be followed when using LCD modules to help ensure personal safety, module performance, and compliance of environmental regulations.

14.1. Modules

- Avoid applying excessive shocks to module.
- Do not make extra holes on the printed circuit board, modify its shape or change the components of LCD display module.
- Do not disassemble, alter, or modify the LCD display module.
- Do not operate the LCD display module above the absolute maximum rating.
- Do not drop, bend or twist the LCD display module.
- Solder 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 LCD display module.
 - Do not use the fixed information for long periods of time in real application.
 - Do not use fixed information in LCD 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 has 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 LCD 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 LCD display module is soft and can be easily scratched. Please be careful when handling the LCD display module.
- Clean the surface of the polarizer covering the LCD 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 LCD display module very carefully when placing the LCD display module into the system housing.
- Do not apply excessive stress or pressure to the LCD 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 LCD display module.
- Do not apply input signals while the logic power is off.
- Pay sufficient attention to the working environments when handing the LCD display module to prevent occurrence of element breakage accidents by static electricity.
 - Be sure to make human body grounding when handling LCD 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 LCD 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. Remove the protection film before assembling it. At this time, 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 by the method discussed above.
- If electric current is applied when the LCD 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 LCD display module.

14.3. Storage Precautions

- Store LCD modules in static electricity preventive bags. 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 LCD display module the LCD display module may have become dewed. If a dewed LCD 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 LCD display module.

14.4. Designing Precautions

- The absolute maximum ratings are the ratings that cannot be exceeded for LCD 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 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.

14.5. Disposing Precautions

- Request the qualified companies to handle the industrial wastes when disposing of the LCD display modules. Observe all environmental and hygienic laws and regulations.

14.6. 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.
 - Restore the display by shutting the display off for an extended period.



- 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 being exposed. Generally speaking, semiconductor elements change their characteristics when light is radiated according to the principle of the solar battery. Consequently, 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.
 - Design the product and installation method so that the LCD driver may be shielded from light during the inspection processes.
- Excessive electrical noise may compromise the performance of the LCD module. Ensure system design suppresses noise generation and protect the module from noise.
- We recommend that software periodically refreshes the operation statuses (reset the commands and resend the display data), to cope with noise.
- Resistors, capacitors, and other passive components may have different appearances and colors.
- Crystalfontz has the right to upgrade and modify the product function.
- The limitation of FPC bending:

