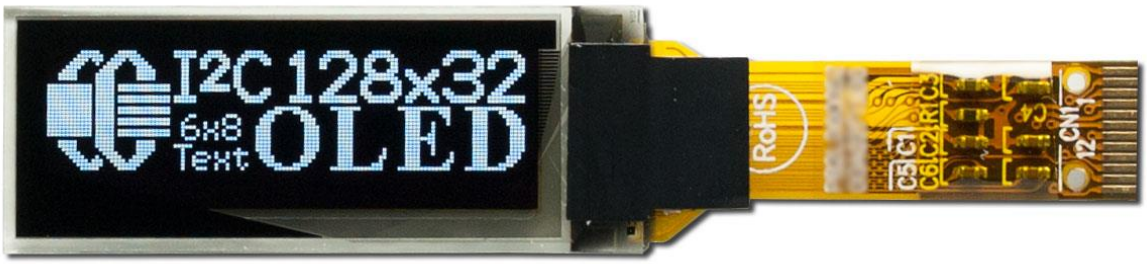
OLED DISPLAY MODULE DATASHEET



Datasheet Release Date 2019-09-25
for
CFAL12832C-0091B-W

Revision v1.1

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1. General Information

Datasheet Revision History
Datasheet Release: **2019-09-25** Datasheet for the CFAL12832C-0091B-W OLED 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 very small white-on-black OLED graphic display module with high resolution. This display was engineered for high volume production. This display has a Solomon Systech SSD1306 or compatible controller with I²C, 3-wire SPI, or 4-wire SPI. The Solomon Systech SSD1306 controller only requires a single 3.3v supply for power and logic.

Please see Solomon Systech SSD1306 LCD Controller Datasheet for further reference.

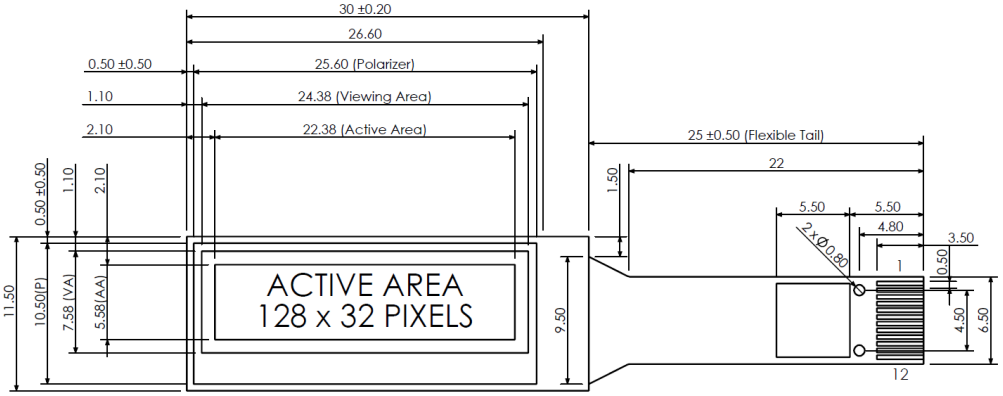
3. Features

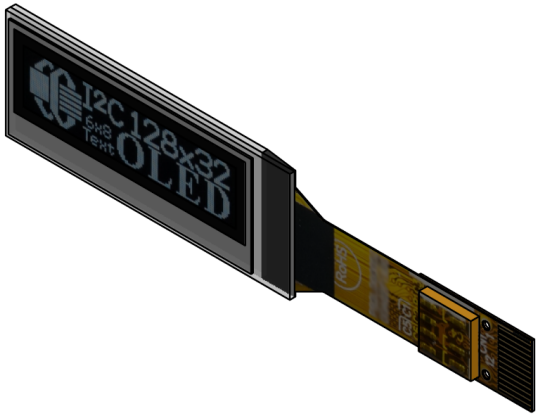
- 128*32 Dot Matrix
- Built-in Controller: SSD1306 (or compatible controller)
- Easy ZIF Connection
- +3V Power Supply
- 1/32 Duty
- Interface: I²C, SPI
- Temperature Operation: -40° to +80°C
- Storage Temperature: -40° to +80°C

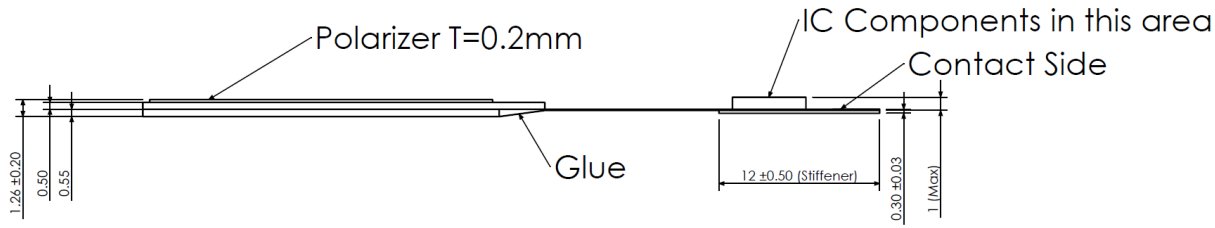
4. Mechanical Data

Item	Specification (mm)	Specification (inches, reference)
Module Dimension with FPC Folded	30.0 (W) x 11.5 (H) x 1.26 (D)	1.181 (W) x 0.453 (H) x 0.050 (D)
Viewing Area	24.38 (W) x 7.58 (H)	0.959 (W) x 0.298 (H)
Active Area	22.38 (W) x 5.58 (H)	0.881 (W) x 0.219 (H)
Dot Pitch	0.175 (W) x 0.175 (H)	0.007 (W) x 0.007 (H)
Dot Size	0.152 (W) x 0.152 (H)	0.006 (W) x 0.006 (H)
Module Connector Pitch	0.50	0.0197
Weight (Typical)	1 gram	0.0352 ounces

5. Mechanical Drawings







PIN FUNCTION REFERENCE	
PIN	FUNCTION
1	GND
2	D2
3	D1
4	D0
5	D/C#
6	RES#
7	CS#
8	BS1
9	BS0
10	VDD
11	VBAT
12	GND

Units: Millimeters
Tolerance: ±0.3mm Unless Specified

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Part Number:	Date:	Filename:	Revision:
CFAL12832C-0091B-W	2019-09-025	CFAL12832C-0091B-W_MILLIMETER.pdf	v 1.1
	Web: www.crystalfontz.com/product/cfal12832c0091bw		Sheet: 1 of 1

6. Interface Pin Function

<table>
<tr><th>Pin No.</th><th>Symbol</th><th>Function</th></tr>
<tr><td>1</td><td>GND</td><td>Ground 1 of 2, both must be connected.</td></tr>
<tr><td>2</td><td>D2</td><td rowspan="3">These are 3-bit bi-directional data bus to be connected to the microprocessor's data bus. When serial interface mode is selected, D0 will be the serial clock input: SCLK: D1 will be the serial data input: SDIN and D2 should be kept NC. When I²C mode is selected, D2, D1 should be tied together and serve as SDA_{OUT}, SDA_{IN} in application and D0 is the serial clock input, SCL.</td></tr>
<tr><td>3</td><td>D1</td></tr>
<tr><td>4</td><td>D0</td></tr>
<tr><td>5</td><td>D/C#</td><td>Data/Command Control Pin. When the pin is pulled high and serial interface mode is selected, the data at SD_{IN} is treated as data. When it is pulled low, the data at SD_{IN} will be transferred to the command register.

For detail relationship to MCU interface signals, please refer to the Timing Characteristics Diagrams.
I²C Mode: D/C# is used to set the I²C slave address as follows:
0 = 0x78
1 = 0x7A</td></tr>
<tr><td>6</td><td>RES#</td><td>Reset Signal Input Pin. When the pin is low, initialization of the chip is executed.</td></tr>
<tr><td>7</td><td>CS#</td><td>Chip Select Input Pin. The chip is enabled for MCU communication only when CS# is pulled low.</td></tr>
<tr><td>8</td><td>BS1</td><td rowspan="2"><table>
<tr><th>SSD1306 Pin Name</th><th>I²C Interface</th><th>4-Wire Serial Interface</th><th>3-Wire Serial Interface</th></tr>
<tr><td>BS0</td><td>0</td><td>0</td><td>1</td></tr>
<tr><td>BS1</td><td>1</td><td>0</td><td>0</td></tr>
</table></td></tr>
<tr><td>9</td><td>BS0</td></tr>
<tr><td>10</td><td>V_{DD}</td><td rowspan="2">Power Supply Inputs, 3.3v nominal. Connect VDD and VBAT together.</td></tr>
<tr><td>11</td><td>V_{BAT}</td></tr>
<tr><td>12</td><td>GND</td><td>Ground 2 of 2, both must be connected.</td></tr>
</table>

7. Interface Pinout for SPI and I²C

		Interface		
Pin No	Sym	3 Wire SPI	4 Wire SPI	I2C
1	GND	**GND**	**GND**	**GND**
2	D2	NC	NC	SDA*
3	D1	SDA	SDA	SDA*
4	D0	SCLK	SCLK	SCL
5	D/C#	NC	D/C	I2C Address***
6	RES#	RESET	RESET	RESET
7	CS#	**GND**	**GND**	**GND**
8	BS1	**GND**	**GND**	**Vcc**
9	BS0	**Vcc**	**GND**	**GND**
10	Vdd	**Vcc****	**Vcc****	**Vcc****
11	Vbat	**Vcc****	**Vcc****	**Vcc****
12	GND	**GND**	**GND**	**GND**

Microcontroller	Control lines defined by layout / code
+3.3v	Supply voltage
Ground	Supply ground

Notes:			
*	Tie D2 and D1 together		
**	Tie Vdd and Vbat together		
***	D/C#	**Vcc**	**GND**
	I2C Address	0x7A	0x78

8. Absolute Maximum Ratings

Parameter	Symbol	Min	Max	Unit	Notes
Supply Voltage for Logic	V_{DD} - V_{BAT}	0	4	V	(1)(2)
Operating Temperature	T_{OP}	-40	+80	°C	-
Storage Temperature	T_{STG}	-40	+80	°C	-

Notes:

(1) These are stress ratings only. Extended exposure to the absolute maximum ratings listed above may affect device reliability or cause permanent damage.

(2) Functional operation should be restricted to the limits in the DC Characteristics table below.

9. DC Characteristics

Item	Symbol	Condition	Min	Typ	Max	Unit
Supply Voltage for Logic	V_{DD} - V_{BAT} (Connect Together)	-	2.8	3.0	3.3	V
High-level Input	V_{IH}	-	0.8 x V_{DD}	-	V_{DD}	V
Low-level Input	V_{IL}	-	0 (GND)	-	0.2 x V_{DD}	V
High-level Output	V_{OH}	-	0.9 x V_{DD}	-	V_{DD}	V
Low-level Output	V_{OL}	-	0 (GND)	-	0.1 x V_{DD}	V
50% Check Board Operating Current	I_{BAT}	-	-	13	16	mA
NOTE: These are stress ratings only. Extended exposure to the absolute maximum ratings listed above may affect device reliability or cause permanent damage.						

10. Optical Characteristics

Item	Symbol	Condition	Min	Typical	Max
View Angle	(V)θ	Vertical	-	≥160°	-
	(H)φ	Horizontal			
Contrast Ratio	CR	Dark	-	2000:1	-
Response Time	T rise	Ta = 25°C	-	10 µs	-
	T fall	Ta = 25°C			
Display with 50% Checkerboard Brightness	-	-	120 cd/m^2	150 cd/m^2	-
CIE_X White	-	CIE1931	0.26	0.28	0.30
CIE_Y White	-		0.30	0.32	0.34

11. OLED Lifetime

Item	Conditions	Min	Typical	Notes
Operating Lifetime	Ta=25°C Initial 50% Check Board Brightness Typical Value	20,000 Hrs	-	(1)(2)(3)

Notes:
(1) Lifetime is defined as the amount of time when the luminance has decayed to <50% of the initial value.
(2) This analysis method uses life data obtained under accelerated conditions to extrapolate an estimated Probability Density Function (PDF) for the product under normal use conditions.
(3) Screen saving mode will extend OLED lifetime.

12. OLED Module Precautions

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

12.1. Modules

- Avoid applying excessive shocks to the module or making any modifications to it.
- Do not make extra holes on the printed circuit board, modify its shape or change the components of the OLED display module.
- Do not disassemble the OLED module.
- Do not drop, bend or twist the OLED module.
- Do not operate the OLED module above its absolute maximum ratings described in this datasheet.
- Solder only to the I/O terminals. Use care when removing solder—it is possible to damage the PCB, for modules with an FPC, use an appropriate ZIF connector.
- Do not reverse polarity to the power supply connections. Reversing polarity will immediately ruin the module.
- Store OLED modules in a clean and static safe environment.
- Do not reverse polarity to the power supply connections. Reversing polarity will immediately ruin the module.

12.2. Handling Precautions

- Take care to not damage the glass display panel
- If the display panel is broken, organic liquid crystal may leak out, avoid bodily contact with this fluid and dispose of the broken module properly.
- Avoid the application of pressure to the display module, as pressure may damage the LCD module's cell structure.
- Polarizers installed on OLED modules are soft and susceptible to scratching, avoid contact between the polarizer and abrasive surfaces.
- Do not use any solvents or liquid to clean the OLED display module, should an OLED need cleaning, contaminants can be removed with plain office tape or oil free compressed air.
- Ensure any mounting solution of the OLED module secures the module fully and protects the module from mechanical stresses
- Do not operate OLED modules in the presence of excessive humidity or condensation
- Dispose of any electronic waste properly. Do not place this module in the normal trash. Please contact local waste management from procedures to dispose of electronic waste.
- Do not place weight or pressure on the module

  The limitation of FPC bending: