



GRAPHIC OLED MODULE DATA SHEET



Datasheet Release Date 2016-10-26
for
[CFAL12864N-A-B4](#)

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Datasheet Revision History

Datasheet Release: 2016-10-26

Removed incorrect illustration of pin detail, page 7. Replaced with pin table, ordered sequentially by pin number. Pins in this table [Pin Table \(Pg. 9\)](#) are the same as the pins shown grouped by function in the table of [Details Of Interface Pin Functions \(Pg. 10\)](#).

Datasheet Release: 2016-03-16

Removed information on LEDs. OLEDs do not have LEDs.

Preliminary Data Sheet Release: 2014-07-22

Revised PHYSICAL CHARACTERISTICS and MODULE OUTLINE DRAWING. Depth of CFAL12864N-A-B4 display module changed from 1.2 millimeters to 1.4 millimeters.

Preliminary Data Sheet Release: 2014-06-09

Preliminary Data Sheet for the CFAL12864N-A-B4 display module.

About Variations

Slight variations (for example, contrast, color, or intensity) between lots are normal.



The Fine Print

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About Volatility

The CrystalFontz CFAL12864N-A-B4 module has volatile memory.



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PHYSICAL CHARACTERISTICS

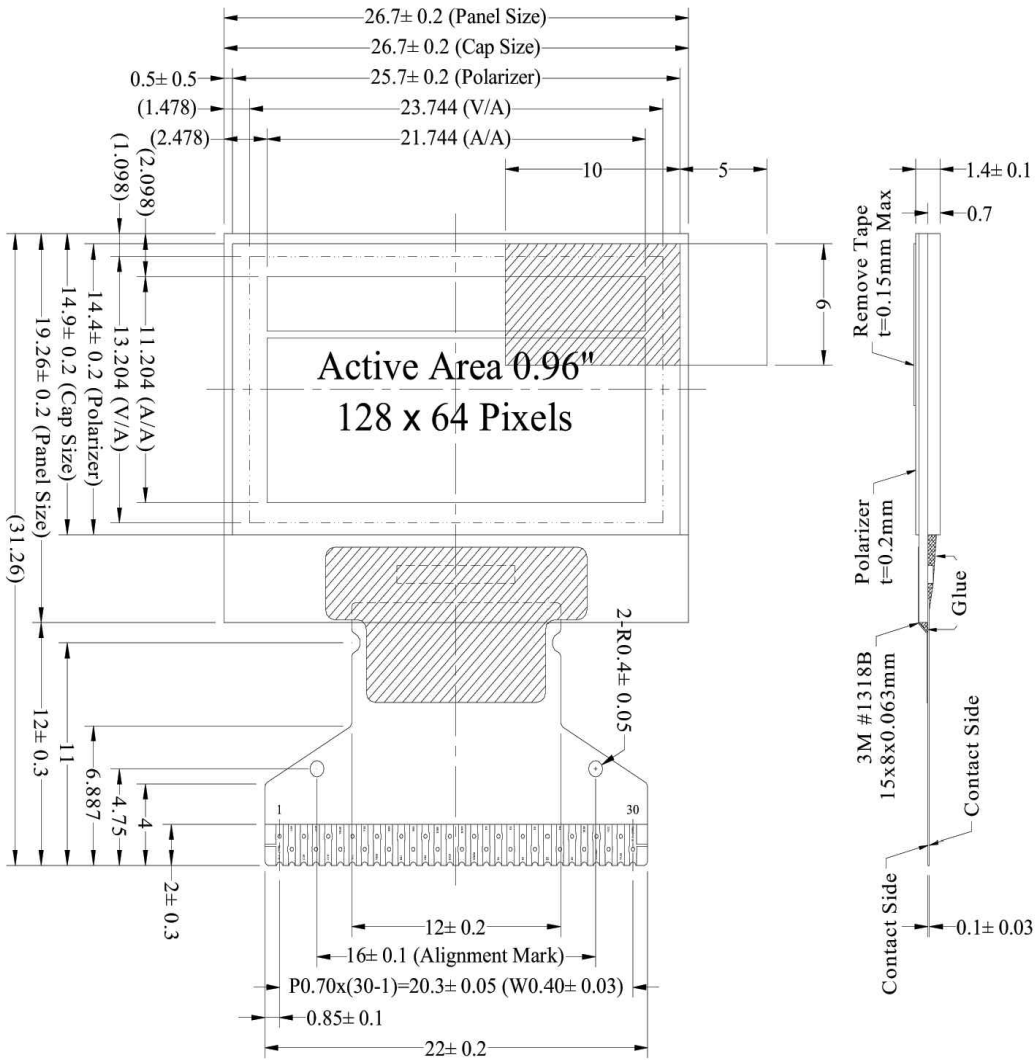
No.	Items	Specification	Unit
1	Display Mode	Passive Matrix OLED	-
2	Display Color	Monochrome (Yellow & Blue)	-
3	Duty	1/64	-
4	Resolution	128(H) x 64 (V)	Pixel
5	Active Area	21.744 (W) x 11.204 (H)	mm
6	Outline Dimension	26.70 (W) x 19.26 (H) x 1.4 (D)	mm
7	Pixel Pitch	0.17 (W) x 0.17 (H)	mm
8	Pixel Size	0.154 (W) x 0.154 (H)	mm
9	Driver IC	SSD1306	-
10	Interface	8-bit parallel,3-/4-wire SPI,I2C	-
11	Weight	1.54	g

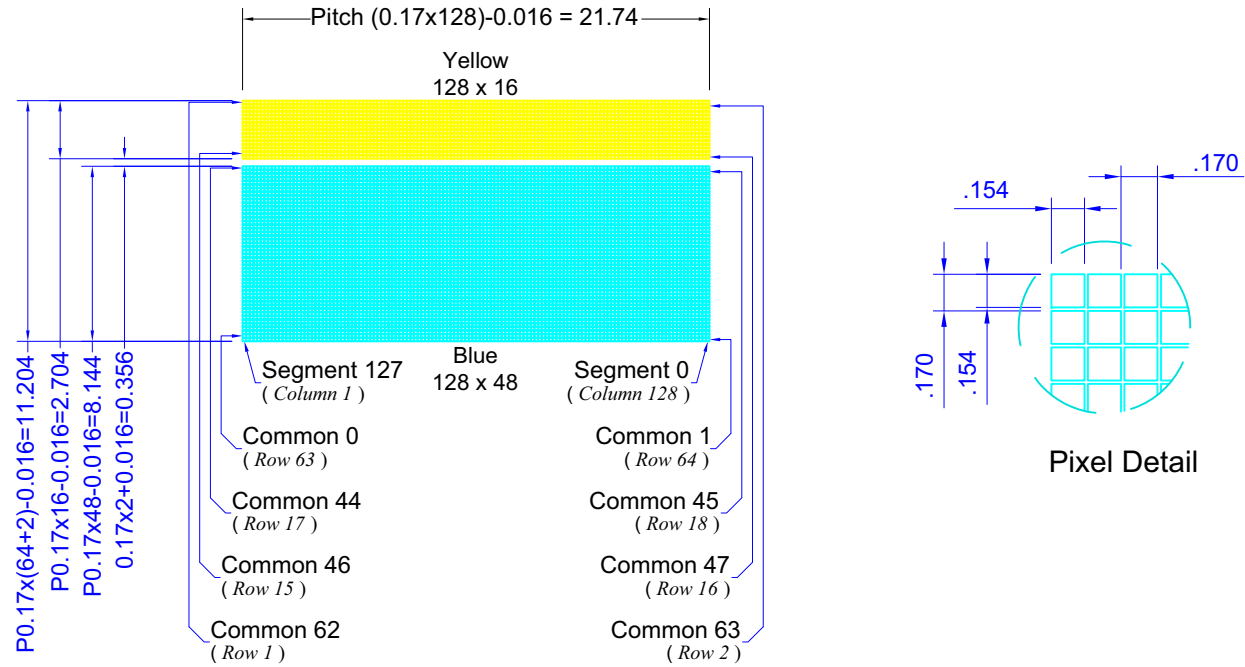
ADDITIONAL FEATURES

- These modules have a [Solomon Systech SSD1306](#) 128 x 64 Dot Matrix OLED/PLED Segment/Common Driver with Controller.
- RoHS compliant.
- CrystalFontz America Incorporated is ISO 9001:2008 certified.



MODULE OUTLINE DRAWING

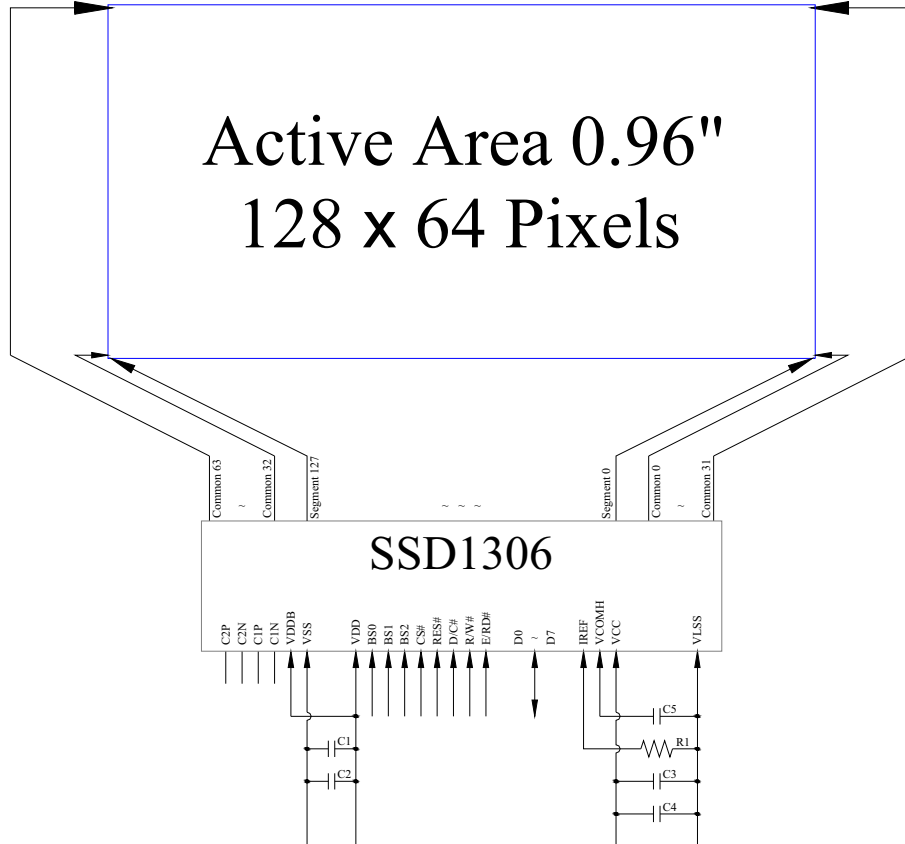






BLOCK DIAGRAM

1.1 V_{CC} Supplied Externally



MCU Interface Selection: BS0, BS1 and BS2
Pins connected to MCU interface: CS#, RES#, D/C#, R/W#, E/RD#, and D0~D7

C1, C3: 0.1µF
C2: 4.7µF
C4, C5: 4.7µF / 16V X7R
R1: 910kΩ, R1 = (Voltage at IREF - VSS) / IREF



PIN DESCRIPTIONS

PIN TABLE

Pin	Symbol
1	N.C. (GND)
2	C2P
3	C2N
4	C1P
5	C1N
6	VBAT
7	N.C.
8	VSS
9	VDD
10	BS0
11	BS1
12	BS2
13	CS#
14	RES#
15	D/C#
16	R/W#
17	E/RD#
18	D0
19	D1
20	D2
21	D3
22	D4
23	D5
24	D6
25	D7
26	IREF
27	VCOMH
28	VCC
29	VLSS
30	N.C. (GND)



DETAILS OF INTERFACE PIN FUNCTIONS

Pin Number	Symbol	I/O	Function																								
Power Supply																											
9	VDD	P	Power Supply for Logic This is a voltage supply pin. It must be connected to external source.																								
8	VSS	P	Ground of Logic Circuit This is a ground pin. It acts as a reference for the logic pins. It must be connected to external ground.																								
28	VCC	P	Power Supply for OEL Panel This is the most positive voltage supply pin of the chip. A stabilization capacitor should be connected between this pin and V _{SS} when the converter is used. It must be connected to external source when the converter is not used.																								
29	VLSS	P	Ground of Analog Circuit This is an analog ground pin. It should be connected to V _{SS} externally.																								
Driver																											
26	IREF	I	Current Reference for Brightness Adjustment This pin is segment current reference pin. A resistor should be connected between this pin and V _{SS} . Set the current at 12.5μA maximum.																								
27	VCOMH	O	Voltage Output High Level for COM Signal This pin is the input pin for the voltage output high level for COM signals. A capacitor should be connected between this pin and V _{SS} .																								
DC/DC Converter																											
6	VBAT	P	Power Supply for DC/DC Converter Circuit This is the power supply pin for the internal buffer of the DC/DC voltage converter. It must be connected to external source when the converter is used. It should be connected to V _{DD} when the converter is not used.																								
4 / 5 2 / 3	C1P / C1N C2P / C2N	I	Positive Terminal of the Flying Inverting Capacitor Negative Terminal of the Flying Boost Capacitor The charge-pump capacitors are required between the terminals. They must be floated when the converter is not used.																								
Interface																											
10 11 12	BS0 BS1 BS2	I	Communicating Protocol Select These pins are MCU interface selection input. See the following table: <table border="1" style="margin-left: 20px;"> <thead> <tr> <th></th> <th>BS0</th> <th>BS1</th> <th>BS2</th> </tr> </thead> <tbody> <tr> <td>I²C</td> <td>0</td> <td>1</td> <td>0</td> </tr> <tr> <td>3-wire SPI</td> <td>1</td> <td>0</td> <td>0</td> </tr> <tr> <td>4-wire SPI</td> <td>0</td> <td>0</td> <td>0</td> </tr> <tr> <td>8-bit 68XX Parallel</td> <td>0</td> <td>0</td> <td>1</td> </tr> <tr> <td>8-bit 80XX Parallel</td> <td>0</td> <td>1</td> <td>1</td> </tr> </tbody> </table>		BS0	BS1	BS2	I ² C	0	1	0	3-wire SPI	1	0	0	4-wire SPI	0	0	0	8-bit 68XX Parallel	0	0	1	8-bit 80XX Parallel	0	1	1
	BS0	BS1	BS2																								
I ² C	0	1	0																								
3-wire SPI	1	0	0																								
4-wire SPI	0	0	0																								
8-bit 68XX Parallel	0	0	1																								
8-bit 80XX Parallel	0	1	1																								
14	RES#	I	Power Reset for Controller and Driver This pin is reset signal input. When the pin is low, initialization of the chip is executed. Keep this pin pull high during normal operation.																								
13	CS#	I	Chip Select This pin is the chip select input. The chip is enabled for MCU communication only when CS# is pulled low.																								
15	D/C#	I	Data/Command Control This pin is Data/Command control pin. When the pin is pulled high, the input at D7~D0 is treated as display data. When the pin is pulled low, the input at D7~D0 will be transferred to the command register. When the pin is pulled high and serial interface mode is selected, the data at SDIN will be interpreted as data. When it is pulled low, the data at SDIN will be transferred to the command register. In I ² C mode, this pin acts as SA0 for slave address selection. For detail relationship to MCU interface signals, please refer to the Timing Characteristics Diagrams.																								
17	E/RD#	I	Read/Write Enable or Read This pin is MCU interface input. When interfacing to a 68XX-series microprocessor, this pin will be used as the Enable (E) signal. Read/write operation is initiated when this pin is pulled high and the CS# is pulled low. When connecting to an 80XX-microprocessor, this pin receives the Read (RD#) signal. Data read operation is initiated when this pin is pulled low and CS# is pulled low. When serial or I ² C mode is selected, this pin must be connected to V _{SS} .																								



Pin Number	Symbol	I/O	Function
Interface(Continued)			
16	R/W#	I	<p>Read/Write Select or Write This pin is MCU interface input. When interfacing to a 68XX-series microprocessor, this pin will be used as Read/Write (R/W#) selection input. Pull this pin to "High" for read mode and pull it to "Low" for write mode. When 80XX interface mode is selected, this pin will be the Write (WR#) input. Data write operation is initiated when this pin is pulled low and the CS# is pulled low. When serial or I²C mode is selected, this pin must be connected to V_{SS}.</p>
18~25	D0~D7	I/O	<p>Host Data Input/Output Bus These pins are 8-bit bi-directional data bus to be connected to the microprocessor's data bus. When serial mode is selected, D1 will be the serial data input SDIN and D0 will be the serial clock input SCLK. 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. Unused pins must be connected to V_{SS} except for D2 in serial mode.</p>
Reserve			
7	N.C.	-	<p>Reserved Pin The N.C. pin between function pins are reserved for compatible and flexible design.</p>
1, 30	N.C. (GND)	-	<p>Reserved Pin (Supporting Pin) The supporting pins can reduce the influences from stresses on the function pins. These pins must be connected to external ground as the ESD protection circuit.</p>



OPTICAL CHARACTERISTICS

Color Coordinate	Blue	CIE x	0.10	0.14	0.18	-	Without Polarizer
		CIE y	0.20	0.24	0.28		
Color Coordinate	Yellow	CIE x	0.43	0.47	0.51	-	Without Polarizer
		CIE y	0.45	0.49	0.53		

ABSOLUTE MAXIMUM CHARACTERISTICS

Items	Symbol	Min	Typ.	Max	Unit
Supply voltage for logic	V _{DD}	-0.3	-	4	V
Supply voltage for display	V _{CC}	0	-	16.0	V
Supply voltage for DC/DC	V _{DDB}	-0.3	-	5.0	V
Operating temperature	T _{OP}	-40	-	80	°C
Storage temperature	T _{ST}	-40	-	80	°C



RECOMMENDED DC CHARACTERISTICS

Items	Symbol	Conditions	Min	Typ.	Max	Unit
Supply voltage for logic	V _{DD}		1.65	2.8	3.3	V
Supply voltage for display (Supplied externally)	V _{CC}	Note 5	11.5	12.0	12.5	V
Supply voltage for DC/DC	V _{BAT}	Internal DC/DC enable	3.5	-	4.2	V
Supply voltage for display (Generated by internal DC/DC)	V _{CC}	Note 5	7.0	-	7.5	V
High level input	V _{IH}		0.8 x V _{DD}	-	V _{DD}	V
Low level input	V _{IL}		0	-	0.2 x V _{DD}	V
High level output	V _{OH}	I _{OUT} = 100µA, 3.3MH	0.9 x V _{DD}	-	V _{DD}	V
Low level output	V _{OL}	I _{OUT} = 100µA, 3.3MH	0	-	0.1x V _{DD}	V
Operating current for V _{DD}	I _{DD}		-	180	300	µA
Operating current for V _{CC} (V _{CC} Supplied externally)	I _{CC}	Note 6	-	12.3	16.0	mA
Operating current for V _{DDB} (V _{CC} Generated by internal DC/DC)	I _{BAT}	Note 7	-	25.6	32.0	mA
Sleep mode current for V _{DD}	I _{DD,SLEEP}		-	1	5	µA
Sleep mode current for V _{CC}	I _{CC,SLEEP}		-	2	10	µA

Note 5: Supply Voltage for Display (V_{CC}) are subject to the change of the panel characteristics and the customer' s request.

Note 6: V_{DD} = 2.8V, V_{CC} = 12V, 100% Display Area Turn on.

Note 7: V_{DD} = 2.8V, V_{CC} = 7.25V, 100% Display Area Turn on.

* Software configuration follows Actual Application Example .

Note:

Our recommendation is to use V = 12v and R1 = 910K.



ESD (ELECTRO-STATIC DISCHARGE)

The circuitry is industry standard CMOS logic and is 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.

PRODUCT RELIABILITY AND LONGEVITY

MODULE RELIABILITY

PART NUMBER	SPECIFICATION
CFAL12864N-A-B4	Brightness will be >50% of a new module's initial brightness for at least 50,000 hours of operation when supply to OLED is below 12.3 mA.
<i>Under operating and storage temperature specification limitations, humidity non-condensing) RH up to 65%, and no exposure to direct sunlight. Value listed above is approximate and represent typical lifetime.</i>	

MODULE LONGEVITY (EOL/REPLACEMENT POLICY)

CrystalFontz is committed to making all of our modules available for as long as possible. For each module we introduce, we intend to offer it indefinitely. We do not pre-plan a module's obsolescence. The majority of modules we have introduced are still available.

We recognize that discontinuing a module may cause problems for some customers. However, rapidly changing technologies, component availability, or low customer order levels may force us to discontinue ("End of Life" EOL) a module. For example, we must occasionally discontinue a module when a supplier discontinues a component or a manufacturing process becomes obsolete. When we discontinue a module, we will do our best to find an acceptable replacement module with the same fit, form, and function.

In most situations, you will not notice a difference when comparing a "fit, form, and function" replacement module to the discontinued module. However, sometimes a change in component or process for the replacement module results in a slight variation, perhaps an improvement, over the previous design.

Although the replacement module is still within the stated Datasheet specifications and tolerances of the discontinued module, changes may require modification to your circuit and/or firmware. Possible changes include:

- *Controller.* A new controller may require minor changes in your code.
- *Component tolerances.* Module components have manufacturing tolerances. In extreme cases, the tolerance stack can change the visual or operating characteristics.

Please understand that we avoid changing a module whenever possible; we only discontinue a module if we have no other option. We will post Part Change Notices on the product's web page as soon as possible. If interested, you can subscribe to future part change notifications.