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AM24RA-XS800-N

Product Description

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|--|---|
| <ul style="list-style-type: none">• 2.4-inch AMOLED (38.72x51.56mm)• 16.7M Colors/1000000:1 Contrast Ratio• 450x600 Pixels• MCU/MIPI Interfaces• Special Temperature Range | <ul style="list-style-type: none">• Normally Black• 3.3V (Analog) / 1.8V (Logic)• Driver IC: RM690B0• RoHS Compliant |
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Revision History

Date	Rev. No	Page	Summary
04/22/2025	1.0	All	First issue

Description

This is a color active matrix AMOLED module using Low Temperature Poly-silicon Thin Film Transistors (LTPS TFT) as active switching devices. This module features a 2.4-inch diagonally measured active display area with a resolution of 450 horizontal by 600 vertical pixel arrays. Each pixel is divided into RED, GREEN, BLUE dots arranged in a vertical stripe. The module is capable of displaying up to 16.7M colors.

Features

Input Voltage: 3.3V

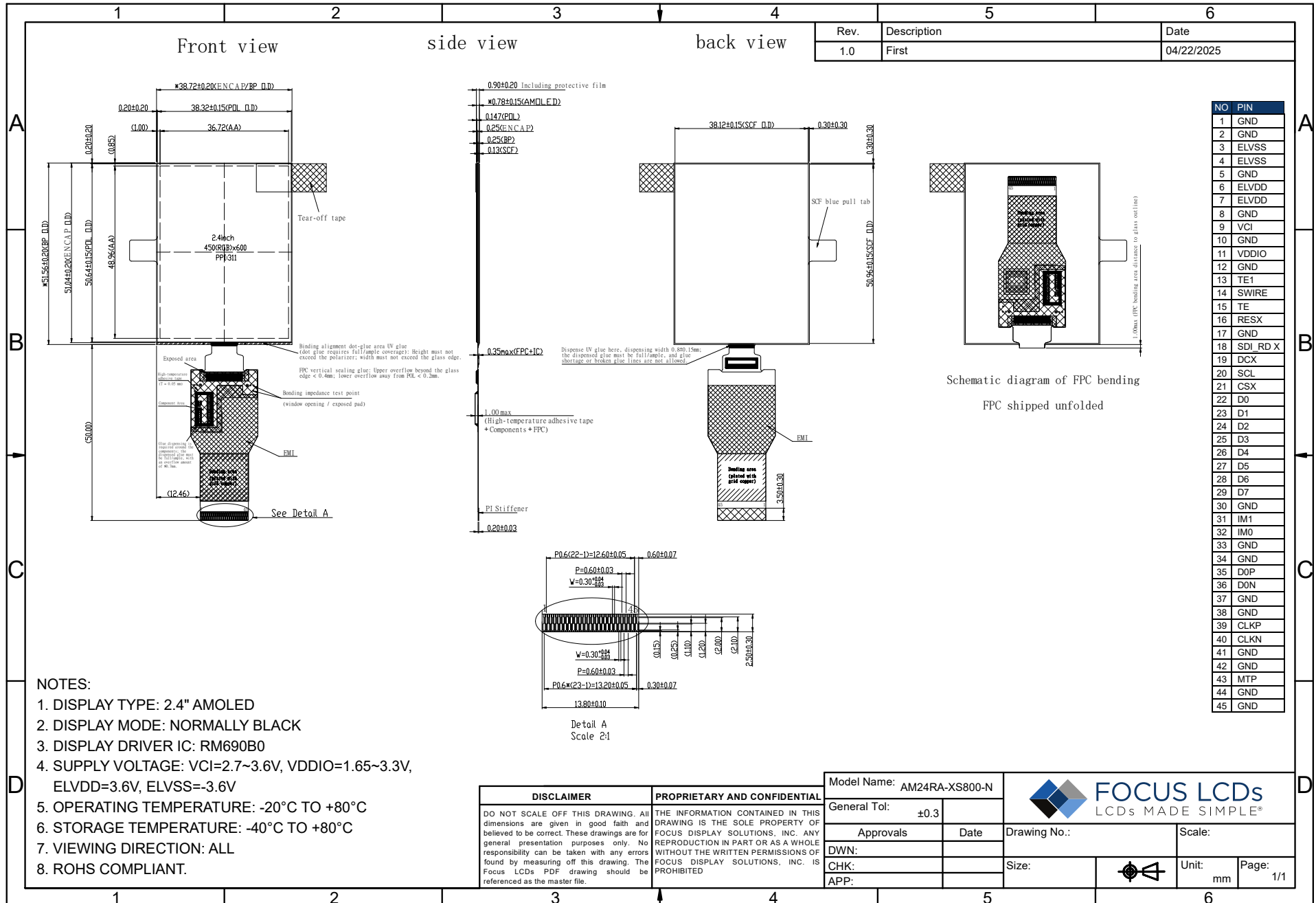
Display Interface: MCU/MIPI

General Information Items	Specification	Unit	Note
	Main Panel		
Display Area (AA)	36.72(H) x 48.96(V) (2.4 inch)	mm	--
Driver Element	LTPS TFT active matrix	--	--
Display Colors	16.7M	colors	--
Number of Pixels	450(RGB)x600	dots	--
Pixel Arrangement	RGB Vertical Stripe	--	--
Pixel Pitch	0.0816 (H) x 0.0816(V)	mm	--
Viewing Angle	ALL	o'clock	--
Display Driver IC	RM690B0	--	--
Display Mode	Normally Black	--	--
Operating Temperature	-20 to +80	°C	--
Storage Temperature	-40 to +80	°C	--

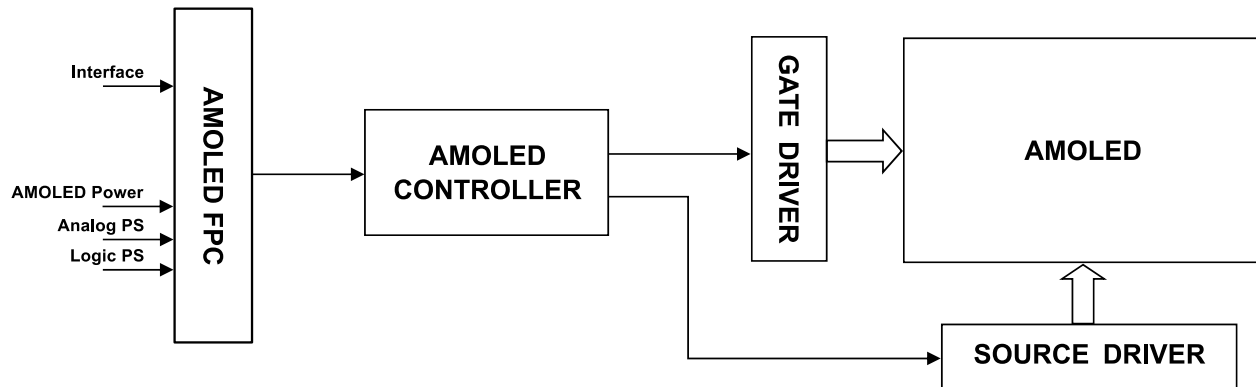
Mechanical Information

Item		Min.	Typ.	Max.	Unit	Note
Module Size	Horizontal (H)	--	38.72	--	mm	--
	Vertical (V)	--	51.56	--	mm	--
	Depth (D)	--	0.78	--	mm	--
Weight		--	3.5	--	g	Approximate

1. Outline Dimensions



2. Block Diagram



3. Input Terminal Pin Assignment

3.1 Display Pin Assignment

NO.	Symbol	Description	I/O
1	GND	Ground.	P
2	GND	Ground.	P
3	ELVSS	AMOLED power negative.	P
4	ELVSS	AMOLED power negative.	P
5	GND	Ground.	P
6	ELVDD	AMOLED power positive.	P
7	ELVDD	AMOLED power positive.	P
8	GND	Ground.	P
9	VCI	Power supply for display driver IC analog system.	P
10	GND	Ground.	P
11	VDDIO	Power supply for display driver IC interface and logic system.	P
12	GND	Ground.	P
13	TE1	IC status active reporting pin.	O
14	SWIRE	Swire protocol setting pin of power IC.	O
15	TE	Tearing effect output pin to synchronize MCU to frame writing, activated by S/W command. When this pin is not activated, this pin is output low.	O
16	RESX	Display driver reset, must be applied to properly initialize the chip. Signal is active low.	I
17	GND	Ground.	P
18	SDI_RD X	RDX: Reads strobe signal to write data when RDX is "Low" in 80-series MPU interface.	I/O
19	DCX	Display data / command selection in 80-series MPU I/F.	I
20	SCL	WRX: Writes strobe signal to write data when WRX is "Low" in 80-series MPU interface.	I
21	CSX	Chip select input pin ("Low" enable) in 80-series MPU interface.	I
22	D0	8-bit bi-directional data bus for 80-series MPU I/F and 8-bit input data bus for RGB I/F.	I/O
23	D1		
24	D2		
25	D3		
26	D4		
27	D5		
28	D6		
29	D7		

NO.	Symbol	Description	I/O
30	GND	Ground.	P
31	IM1	IM[10]=00, MIPI interface IM[10]=11, MCU interface	I
32	IM0		I
33	GND	Ground.	P
34	GND	Ground.	P
35	D0P	Differential data signals if MIPI interface is selected.	I/O
36	D0N		I/O
37	GND	Ground.	P
38	GND	Ground.	P
39	CLKP	Differential clock signals if MIPI interface is selected.	I
40	CLKN		I
41	GND	Ground.	P
42	GND	Ground.	P
43	MTP	MTP programming power supply. Must be left open or connected to GND in normal condition.	P
44	GND	Ground.	P
45	GND	Ground.	P

4. AMOLED Optical Characteristics

4.1 Optical Specifications

Item		Symbol	Condition	Min	Typ.	Max	Unit	Note
Color Gamut		S(%)	--	97	100	--	%	(5)
LCM Luminance		L _V	θ=0°, ϕ=0°	720	800	880	cd/m ²	(6)
Uniformity		ΔL	--	90	--	--	%	(3)
Color Temperature		T _C	--	7000	7500	8000	K	--
Contrast Ratio		CR	θ=0° Normal viewing angle	1000000	--	--	%	(2)
Response Time	Rising	T _R		--	--	2	ms	(4)
	Falling	T _F						
Color Filter Chromaticity	White	W _X		0.2600	0.3000	0.3400		(5)(6)
		W _Y		0.2700	0.3100	0.3500		
	Red	R _X		0.6340	0.6740	0.7140		
		R _Y		0.2860	0.3260	0.3660		
	Green	G _X		0.1900	0.2300	0.2700		
		G _Y		0.6410	0.6810	0.7210		
	Blue	B _X		0.0990	0.1390	0.1790		
		B _Y	0.0080	0.0480	0.0880			
Viewing Angle	Hor.	Θ _L	CR≥10	80	--	--	degree	(1)(6)
		Θ _R		80	--	--		
	Ver.	Θ _T		80	--	--		
		Θ _B		80	--	--		
OLED Life Time		Hr	Ta=25°C	30000	--	--	hours	--
Option View Direction		ALL						(1)

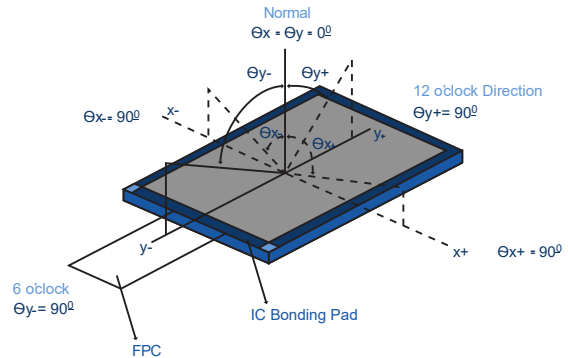
Measuring Conditions:

1. Dark Room
2. Ambient Temperature of 25±2°C
3. AMOLED lighted on for more than 5 minutes

Optical Specification Reference Notes:

(1) Definition of Viewing Angle:

The viewing angle is the angle at which the contrast ratio is greater than 10. The viewing angles are determined for the horizontal or 3,9 o'clock direction and the vertical or 6,12 o'clock direction with respect to the optical axis which is normal to the LCD surface.

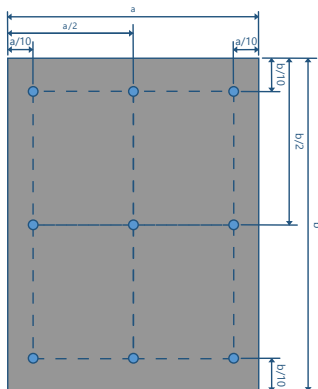


(2) Definition of Contrast Ratio:

Measured at the center point of panel. The contrast ratio (Cr) measured on a module, is the ratio between the luminance (Lw) in a full white area (R=G=B=1) and the luminance (Ld) in a dark area (R=G=B=0).

$$Cr = \frac{Lw}{Ld}$$

(3) Definition of 9-points Luminance Uniformity Measurement Setup:

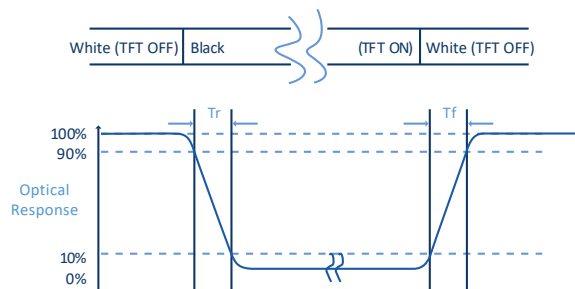


$$Luminance = \frac{(Total Luminance of 9 Points)}{9}$$

$$Uniformity = \frac{Minimum Luminance in 9 Points (1-9)}{Maximum Luminance in 9 Points (1-9)}$$

(4) Definition of Response Time (TR, TF):

The rise time 'Tr' is defined as the time for luminance to change from 90% to 10% as a result of a change of the electrical condition. The fall time 'Tf' is defined as the time for luminance to change from 10% to 90% as a result of a change of the electrical condition.



(5) Definition of Color Gamut:

Measuring machine CFT-01. NTSC's Primaries: $R(x,y,Y)$, $G(x,y,Y)$, $B(x,y,Y)$. FPM520 of Westar Display Technologies, INC., which utilized SR-3 for Chromaticity and BM-5A for other optical characteristics. The color chromaticity shall be calculated from the spectral data measured with all pixels first in red, green, blue and white. Measurements shall be made at the center of the panel.

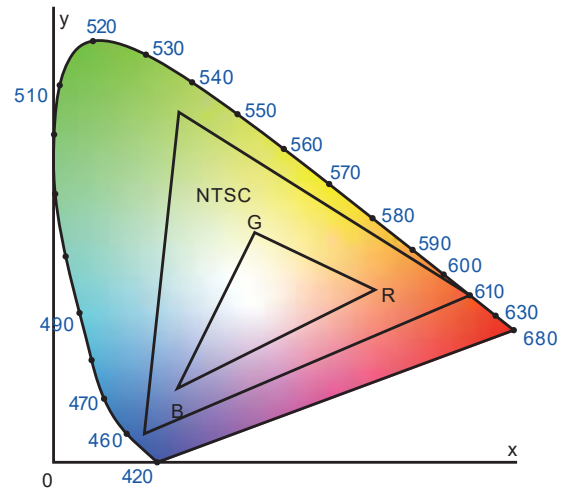
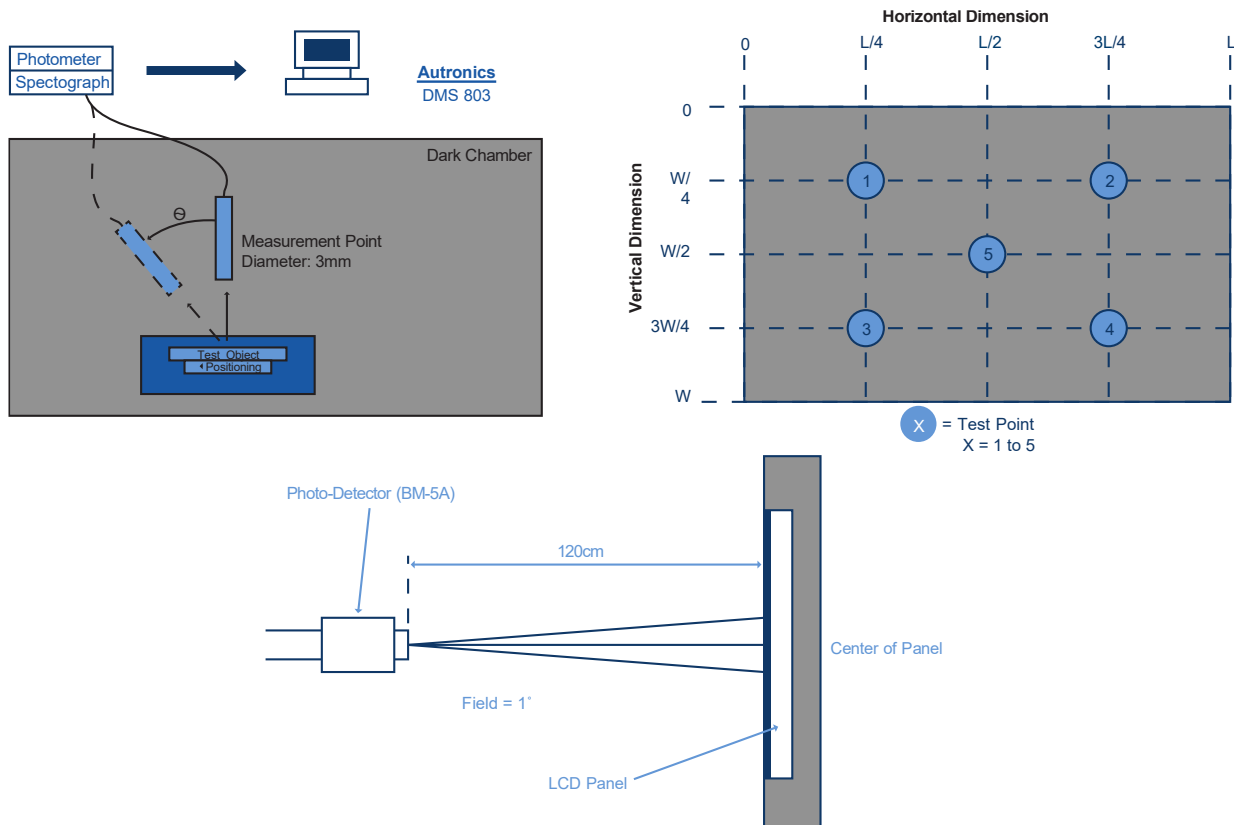


Fig. 1931 CIE Chromaticity Diagram

$$\text{Color Gamut: } S = \frac{\text{Area of RGB Triangle}}{\text{Area of NTSC Triangle}} \times 100\%$$

(6) Definition of Optical Measurement Setup:

The display module should be stabilized at a given temperature for 20 minutes to avoid abrupt temperature changes during measuring. In order to stabilize the luminance, the measurement should be executed after displaying a full white pattern for 20 minutes.



5. AMOLED Electrical Characteristics

5.1 Absolute Maximum Rating (Ta=25°C)

Characteristics	Symbol	Min	Max	Unit
Operating Temperature	T _{OP}	-20	+80	°C
Storage Temperature	T _{ST}	-40	+80	°C

NOTE: If the absolute maximum rating of the above parameters is exceeded, even momentarily, the quality of the product may be degraded. Absolute maximum ratings specify the values which the product may be physically damaged if exceeded. Be sure to use the product within the range of the absolute maximum ratings.

5.2 DC Electrical Characteristics

Characteristics	Symbol	Min	Typ.	Max	Unit	Note
Analog Supply Voltage	V _{CI}	2.7	3.3	3.6	V	--
Supply Voltage (Logic)	V _{DDIO}	1.65	1.8	3.3	V	--
OLED Positive Source	ELVDD	2.0	3.6	6.0	V	--
OLED Negative Source	ELVSS	-4.7	-3.6	-0.4	V	--
Level Input Voltage	V _{IH}	0.8*V _{DDIO}	--	V _{DDIO}	V	--
	V _{IL}	0	--	0.2*V _{DDIO}	V	--
Level Output Voltage	V _{OH}	0.8*V _{DDIO}	--	V _{DDIO}	V	--
	V _{OL}	0	--	0.2*V _{DDIO}	V	--

6. AMOLED AC Characteristics

6.1 MIPI Timing Characteristics

For MIPI Display Serial Interface timing parameters, high-speed clock and data lane configurations, and electrical specifications, see the table and diagram on pages 121-122 of the data sheet for controller IC RM690B0. The data sheet for controller IC RM690B0 can be found here:

<https://focuslcds.com/wp-content/uploads/Drivers/RM690B0.pdf>

6.2 Turnaround Procedure

For the bus turnaround procedure and bidirectional control timing parameters, see the table and diagram on page 123 of the data sheet for controller IC RM690B0. The data sheet for controller IC RM690B0 can be found here: <https://focuslcds.com/wp-content/uploads/Drivers/RM690B0.pdf>

6.3 Reset Timing Characteristics

For the hardware reset timing characteristics table and diagram, see page 124 of the data sheet for controller IC RM690B0. The data sheet for controller IC RM690B0 can be found here:

<https://focuslcds.com/wp-content/uploads/Drivers/RM690B0.pdf>

7. Operating Sequences

7.1 Power On/Off Sequence and Timing

For the power-on and power-off sequence steps, voltage rail stabilization order, and timing characteristics, see the table and diagram on pages 128-129 of the data sheet for controller IC RM690B0. The data sheet can be found here: <https://focuslcds.com/wp-content/uploads/Drivers/RM690B0.pdf>

7.2 Power Level Modes

For power level modes, operational states, and power-saving configuration details, see the table and diagram on page 130 of the data sheet for controller IC RM690B0. The data sheet can be found here: <https://focuslcds.com/wp-content/uploads/Drivers/RM690B0.pdf>

8. Quality Inspection Standards

For AMOLED quality inspection standards, please see the following link:

<https://focuslcds.com/lcd-resources/amoled-quality-inspection-standards/>

9. Cautions and Handling Precautions

9.1 Handling and Assembly Precautions

1. Mount the module firmly to the system without warping, twisting, or applying pressure to the panel, as twisting or pressing can alter the display thickness or cause color tone shifts.
2. Protect the glass display panel from drops, impacts, or excessive force to prevent physical fracturing or internal component damage.
3. Do not press or scratch the soft, fragile surface of the display polarizer.
4. Clean the surface by blowing on it and wiping gently with a dry, soft cloth or absorbent cotton; if needed, moisten only with ethyl alcohol, IPA, or hexane. Do not use water, ketone (e.g., acetone), or aromatic solvents.
5. Do not disassemble or modify the module, as doing so can cause electric shock, dust adhesion, or damage to sensitive internal parts.
6. Wear soft gloves or finger stalls during inspection and assembly to keep the surface clean, and avoid touching the interface connector pins with bare hands.
7. In case internal module contents come into contact with skin, eyes, or mouth, wipe immediately with paper towels or gauze, wash thoroughly with soap and water, and seek medical attention if necessary.
8. Protect internal cables and connectors from forced folding or extreme structural stress during assembly.
9. Ensure the enclosure window is fixed strictly within the designated active viewing area, as display characteristics outside this zone are not guaranteed.

9.2 Electrical and Operational Operating Precautions

1. Maintain an optimum grounded working environment; all operators, assembly tools (e.g., soldering irons), and equipment must be properly grounded to prevent static damage to the C-MOS LSI drivers.
2. Peel off the surface protective film slowly just before final assembly to minimize the generation of electrostatic charges.
3. Connect any unused input terminals to VDD or VSS to protect against static electricity accumulation.
4. Strictly adhere to the recommended Power-On and Power-Off sequences; do not connect or disconnect the module while power is applied, and do not input signals before the logic circuits are powered on.
5. System design must include current-limiting protection on the VDD rail to protect the module against electrical surges.
6. Incorporate a voltage-controllable function in the set module to ensure optimal operating voltages and stable contrast levels.
7. Design enclosures to shield the AMOLED panel from surrounding electromagnetic or environmental interference, and design the module layout considering emitting energy to satisfy EMI standards.
8. Avoid displaying static images for extended periods to mitigate the risk of permanent AMOLED image-sticking (burn-in).
9. Note that display response times may experience severe delays at temperatures lower than the operating range, and normal operation may be disrupted at excessively high temperatures.

9.3 Storage and Transportation Precautions

1. Store modules in environments with temperatures maintained between 0°C to 35°C (recommended) or up to 40°C max, with a relative humidity level below 70% to 80%.
2. Keep modules in a dark place, ensuring they are not directly exposed to sunlight, strong ultraviolet radiation, or prolonged fluorescent light.
3. Avoid storing the module under conditions where condensation can form, as electro-chemical reactions may occur on the pads under high humidity. Never operate the display if dew condensation has occurred inside.
4. Store the modules in clean rooms free from acids, alkalis, or harmful, corrosive gases.
5. During transit, protect modules from falls, violent mechanical shocks, excessive pressing, moisture, and direct sunshine. Handle with care to prevent stressing the circuitry FPC on the bottom side of the panel.