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AM30RA-MS400-N

Product Description

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|--|---|
| <ul style="list-style-type: none">• 3.0-inch AMOLED (52.91x62.58mm)• 16.7M Colors / 10000:1 Contrast Ratio• 1080x1200 Pixels• 4-Lane MIPI Interface• Special Temperature Range | <ul style="list-style-type: none">• Normally Black• 3.3V (Analog) / 1.8V (Logic)• Driver IC: RM67295• RoHS Compliant |
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Revision History

Date	Rev. No	Page	Summary
12/03/2024	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 3.0-inch diagonally measured active display area with a resolution of 1080 horizontal by 1200 vertical pixel arrays. Each pixel is divided into RED and GREEN dots, or BLUE and GREEN dots, where two pixels share RED or BLUE dots arranged in a vertical stripe. The module is capable of displaying up to 16.7M colors.

Features

Input Voltage: 3.3V

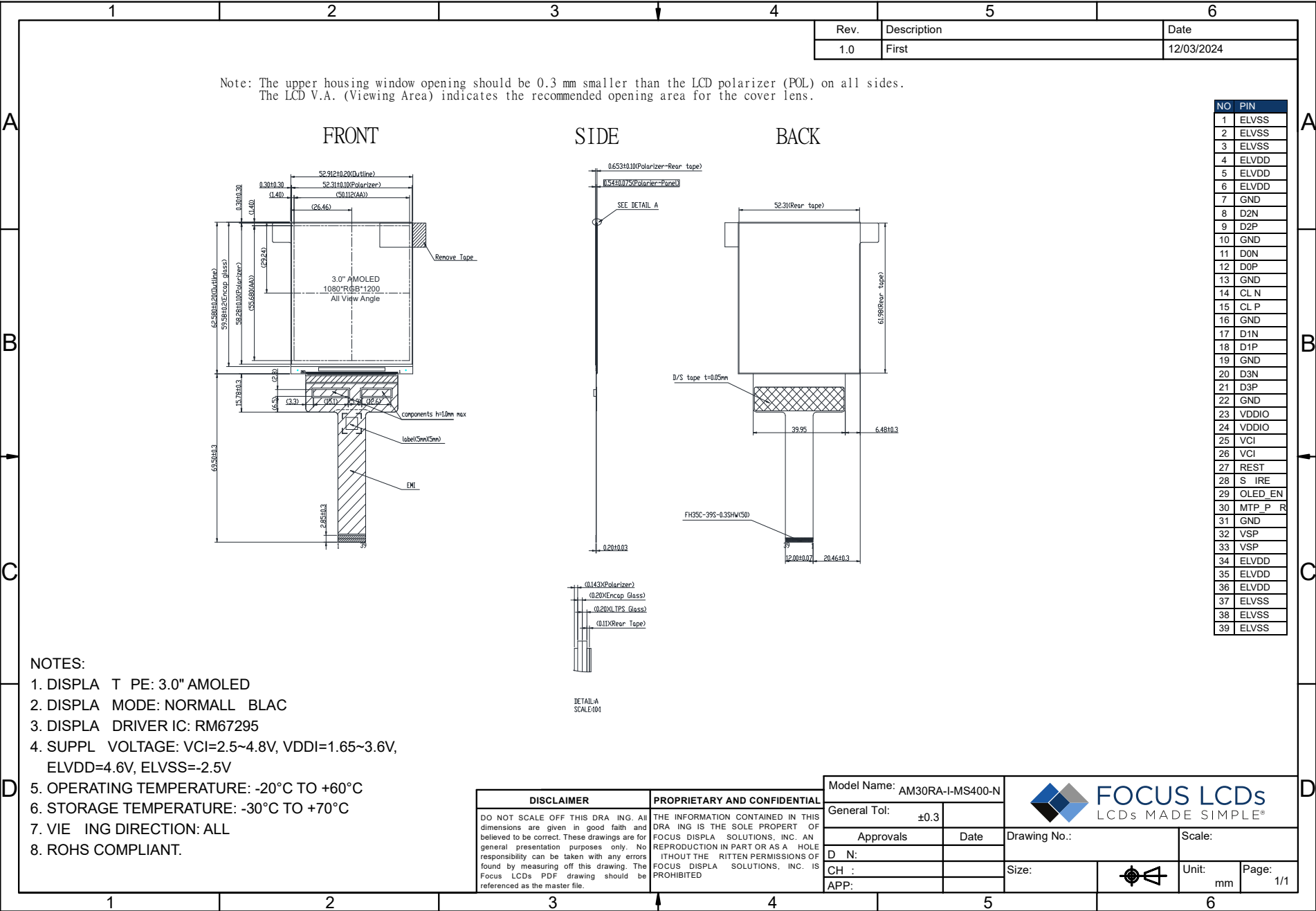
Display Interface: 4-Lane MIPI

General Information Items	Specification	Unit	Note
	Main Panel		
Display Area (AA)	50.11(H) x 55.68(V) (3.0 inch)	mm	--
Driver Element	TFT active matrix	--	--
Display Colors	16.7M	colors	--
Number of Pixels	1080(RGB)x1200	dots	--
Pixel Arrangement	Real RGB Stripe / PenTile	--	--
Pixel Pitch	0.0464 (H) x 0.0464 (V)	mm	--
Viewing Angle	ALL	o'clock	--
Display Driver IC	RM67295	--	--
Display Mode	Normally Black	--	--
Operating Temperature	-20 to +60	°C	--
Storage Temperature	-30 to +70	°C	--

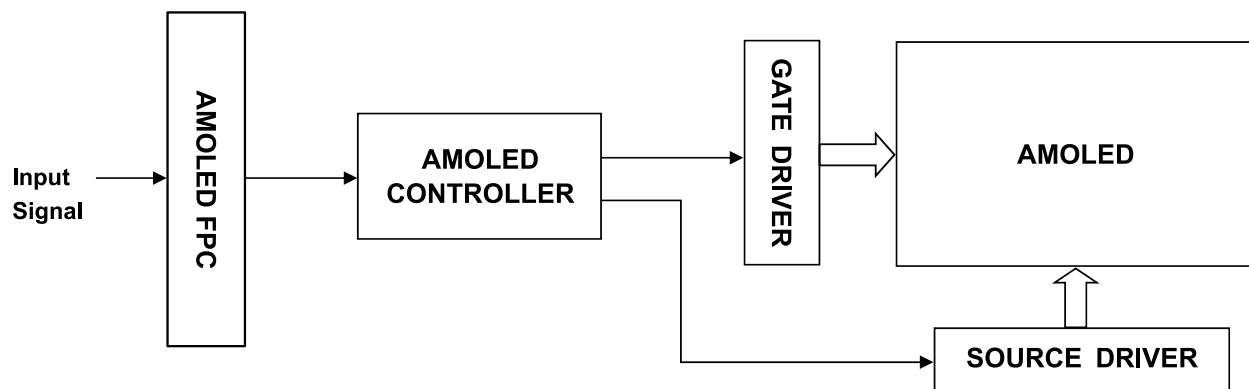
Mechanical Information

Item		Min.	Typ.	Max.	Unit	Note
Module Size	Horizontal (H)	--	52.91	--	mm	--
	Vertical (V)	--	62.58	--	mm	--
	Depth (D)	--	0.65	--	mm	--
Weight		--	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	ELVSS	AMOLED EL negative power.	P
2	ELVSS		
3	ELVSS		
4	ELVDD	AMOLED EL positive power.	P
5	ELVDD		
6	ELVDD		
7	GND	Ground.	P
8	D2N	MIPI data line.	I
9	D2P	MIPI data line.	I
10	GND	Ground.	P
11	D0N	MIPI data line.	I
12	D0P	MIPI data line.	I
13	GND	Ground.	P
14	CLKN	MIPI CLK line.	I
15	CLKP	MIPI CLK line.	I
16	GND	Ground.	P
17	D1N	MIPI data line.	I
18	D1P	MIPI data line.	I
19	GND	Ground.	P
20	D3N	MIPI data line.	I
21	D3P	MIPI data line.	I
22	GND	Ground.	P
23	VDDIO	AMOLED logic power for DDIC.	P
24	VDDIO	AMOLED logic power for DDIC.	P
25	VCI	AMOLED logic power for DDIC.	P
26	VCI	AMOLED logic power for DDIC.	P
27	REST	Drive IC reset.	I
28	SWIRE	Control the PMIC.	I
29	OLED_EN	Power IC enable.	P
30	MTP_PWR	Power supply for MTP programming or erase.	O
31	GND	Ground.	P

NO.	Symbol	Description	I/O
32	VSP	Power supply for analog system.	P
33	VSP		
34	ELVDD	AMOLED EL positive power.	P
35	ELVDD		
36	ELVDD		
37	ELVSS	AMOLED EL negative power.	P
38	ELVSS		
39	ELVSS		

4. AMOLED Optical Characteristics

4.1 Optical Specifications

Item		Symbol	Condition	Min	Typ.	Max	Unit	Note
Color Gamut		S(%)	--	80	105	--	%	(5)
LCM Luminance		L _v	White mode	300	400	--	cd/m ²	(6)
Contrast Ratio		CR	θ=0° Normal viewing angle	10000	--	--	%	(2)
Color Filter Chromaticity	White	W _x		0.2600	0.3000	0.3400	(5)(6)	
		W _y		0.2770	0.3170	0.3570		
	Red	R _x		0.6410	0.6810	0.7210		
		R _y		0.2780	0.3180	0.3580		
	Green	G _x		0.2010	0.2410	0.2810		
		G _y		0.6340	0.6740	0.7140		
	Blue	B _x		0.1000	0.1400	0.1800		
		B _y		0.0100	0.0500	0.0900		
OLED Life	Time	Hr		--	30000	--	hours	--
Option View Direction		ALL						(1)

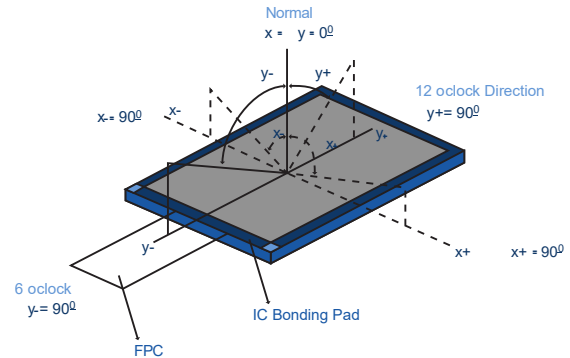
Measuring Conditions:

1. Dark Room
2. Ambient Temperature of 25±2°C
3. 15 Minute arm up

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.

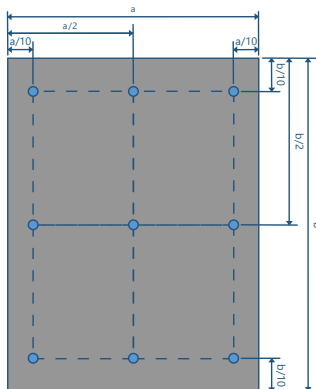


(2) Definition of Contrast Ratio:

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:

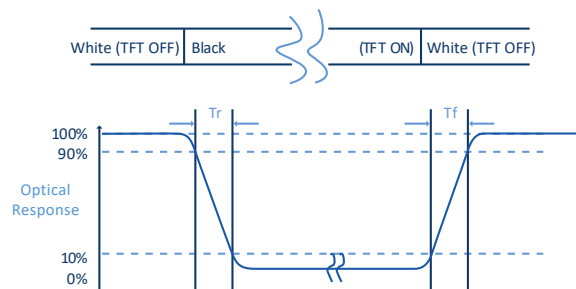


$$Luminance = \frac{(Total\ Luminance\ of\ 9\ Points)}{9}$$

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

(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: $R(x,y)$, $G(x,y)$, $B(x,y)$. FPM520 of Estar 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.

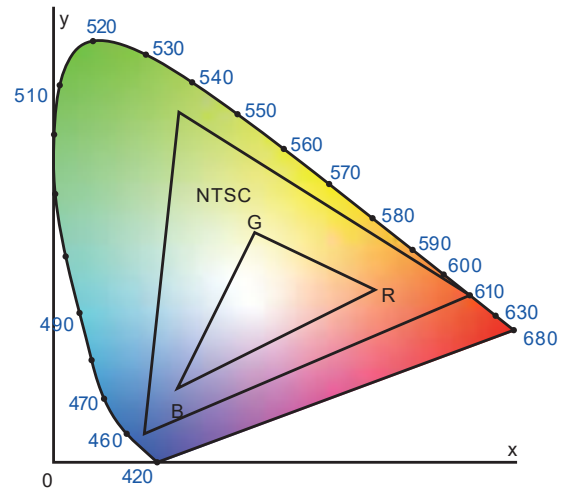
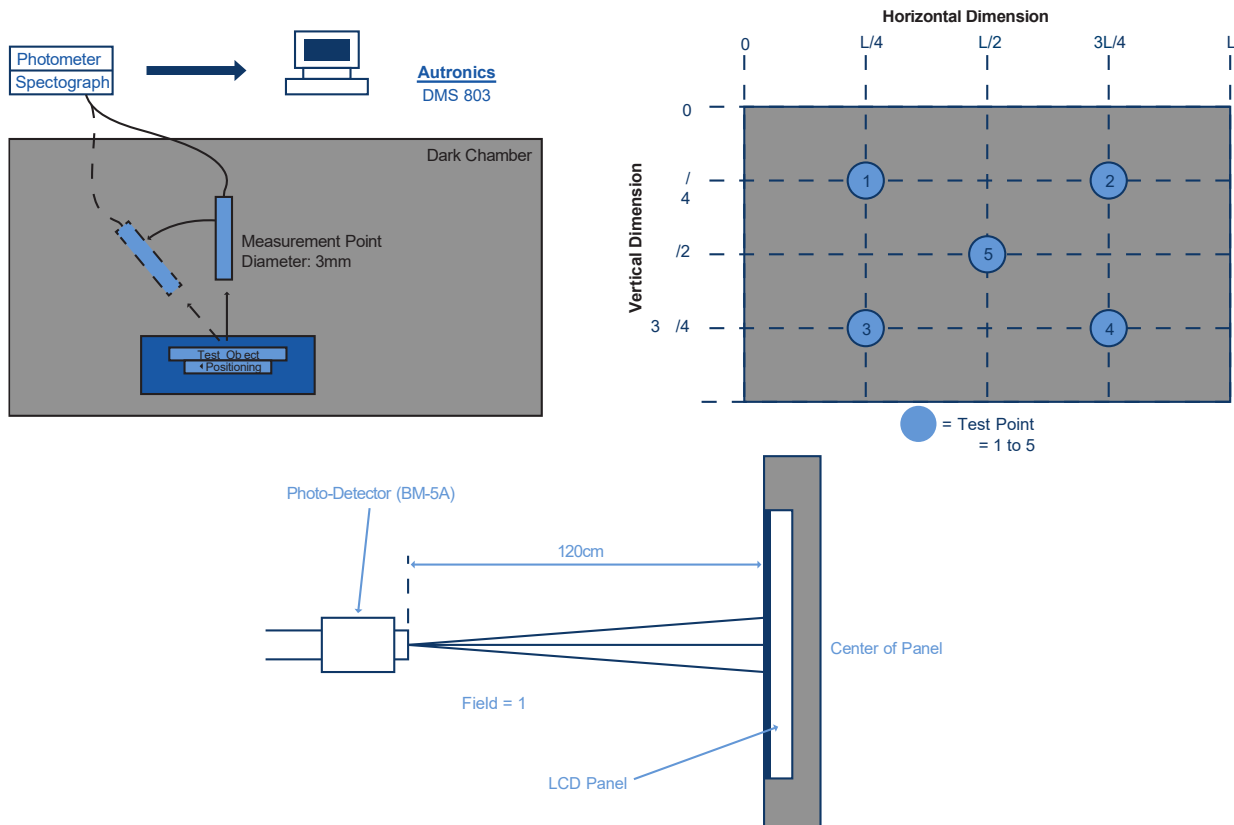


Fig. 1931 CIE Chromaticity Diagram

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

(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
Logic Power Supply	VDDIO	-0.3	5.5	V
Analog Supply Voltage	VCI	-0.3	5.5	V
Analog Supply Voltage	VSP	-0.6	6.6	V
OLED Positive Supply Voltage	ELVDD	0.0	5.0	V
OLED Negative Supply Voltage	ELVSS	-2.5	0.0	V
Operating Temperature	T _{OP}	-20	+60	°C
Storage Temperature	T _{ST}	-30	+70	°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
Supply Voltage (Logic)	VDDI	1.65	1.8	3.6	V	--
Analog Supply Voltage	VCI	2.5	3.3	4.8	V	--
Analog Supply Voltage	VSP	6.1	6.4	6.5	V	--
OLED Positive Source	ELVDD	--	4.6	--	V	--
OLED Negative Source	ELVSS	--	-2.5	--	V	--
Level Input Voltage	V _{IH}	0.7*VDDIO	--	VDDIO	V	--
	V _{IL}	0	--	0.7* VDDIO	V	--
Level Output Voltage	V _{OH}	0.8* VDDIO	--	VDDIO	V	--
	V _{OL}	0	--	0.2* VDDIO	V	--

5.3 Power Characteristics

Mode	Symbol	Condition	Min	Typ.	Max	Unit	Note
@ Gray 255	I _{ELVDD} /I _{ELVSS}	VELVDD=4.6V	--	45	55	mA	Ref
	I _{VCI}	VELVSS=-2.5V VCI=3.3V	--	1.5	1.8	mA	Ref
	I _{VDDIO}	VDDIO=1.8V	--	30	40	mA	Ref
	I _{VSP}	VSP=6.4V	--	12	15	mA	Ref

6. AMOLED AC Characteristics

6.1 MIPI Interface Timing Characteristics

For detailed High-Speed data transmission burst timing, HS clock transmission timing, and signal line transition characteristics of the 4-Lane MIPI DSI interface, see the table and diagrams on pages 109-110 of the data sheet for controller IC RM67295. The data sheet can be found here:

<https://focuslcds.com/wp-content/uploads/Drivers/RM67295.pdf>

6.2 Turnaround Procedure

For turnaround procedure timing diagrams, see diagrams on page 111 of the data sheet for controller IC RM67295. The data sheet can be found here:

<https://focuslcds.com/wp-content/uploads/Drivers/RM67295.pdf>

6.3 Reset Timing Characteristics

For hardware reset timing parameters, including minimum reset pulse width, reset completion time, and timing sequence diagrams, see page 113 of the data sheet for controller IC RM67295. The data sheet can be found here: <https://focuslcds.com/wp-content/uploads/Drivers/RM67295.pdf>

7. Operating Sequences

7.1 Power On/Off Sequence

For the power-on and power-off timing sequences, see diagrams on pages 115-116 of the data sheet for controller IC RM67295. The data sheet can be found here:

<https://focuslcds.com/wp-content/uploads/Drivers/RM67295.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.