SPECIFICATION
FOR
LCD Module
RX070A-05

MODULE:	**RX070A-05**
CUSTOMER:	

REV	DESCRIPTION	DATE
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Revision History

Data	Rev. No.	Page	Summary
2013.05.02	1.0		FIRST ISSUE

Contents

General Description

* Description

This is a color active matrix TFT (Thin Film Transistor) LCD (liquid crystal display) that uses amorphous silicon TFT as a switching device. This model is composed of a Transmissive type TFT-LCD Panel, driver circuit, back-light unit. The resolution of a 7.0" TFT-LCD contains 800RGB x 480 pixels, and can display up to 16.7M colors.

* Features

-Low Input Voltage: VCC: 2.5V~3.3V
-Display Colors of TFT LCD: 16.7M colors
-CPU Interface: 24bit parallel (RGB) input timing
-Internal Power Supply Circuit.

General Information Items	Specification	**Unit**	**Note**
	Main Panel		
Display area(AA)	154. 08(H) * 85.92(V) (7.0 inch)	mm	-
Driver element	a-Si TFT active matrix	-	-
Display colors	16.7M	colors	-
Color Gamut	50	%	-
Number of pixels	800(RGB) *480	dots	-
Pixel arrangement	RGB vertical stripe	-	-
Pixel pitch	0.0642(H) *0.1790(V)	mm	-
Viewing angle	6:00	o'clock	-
Drive IC	OTA7001+ OTD9960A	-	-
Display mode	Transmissive/ Normally White	-	-
Operating temperature	-20～+70	℃	-
Storage temperature	-30～+80	℃	-

* Mechanical Information

Item		**Min.**	**Typ.**	**Max.**	**Unit**	**Note**
Module size	Horizontal(H)	-	164.90	-	mm	-
	Vertical(V)	-	100	-	mm	-
	Depth(D)		3.5		mm	-
Weight		-	TBD	-	g	-

1. Optical Characteristics

The following items are measured under stable conditions. The optical characteristics should be measured in a dark room or equivalent state

Parameter		Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
Viewing Angle range	Horizontal	Θ_3	CR > 10	70	75	-	Deg.	WV-Pol Note 1
		Θ_9		70	75	-	Deg.	
	Vertical	Θ_{12}		65	70	-	Deg.	
		Θ_6		70	75	-	Deg.	
Luminance Contrast ratio		CR	Θ = 0°	400	500	-		Note 2
Cell Transmittance		Tr		-	6.03	-	%	Base on C Light Note 3
White Chromaticity		x_w		0.294	0.304	0.314		Note 4 CF Glass
		y_w		0.329	0.339	0.349		
Reproduction of color (C light)	Red	R_x		0.586	0.601	0.616		
		R_y		0.309	0.324	0.339		
	Green	G_x		0.291	0.301	0.311		
		G_y		0.552	0.567	0.582		
	Blue	B_x		0.133	0.143	0.153		
		B_y		0.159	0.174	0.189		
Color Gamut (C light)				-	50	-	%	
Response Time (Rising + Falling)		T_{RT}	Ta= 25° C Θ = 0°	-	25	-	ms	Note 5

Note :

1. 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 (see FIGURE 1).

2. Contrast measurements shall be made at viewing angle of Θ= 0 and at the center of the LCD surface. Luminance shall be measured with all pixels in the view field set first to white, then to the dark (black) state . (see FIGURE 1) Luminance Contrast Ratio (CR) is defined mathematically.

$$CR = \frac{\text{Luminance when displaying a white raster}}{\text{Luminance when displaying a black raster}}$$

3. Transmittance is the Value with Polarizer

4. The color chromaticity coordinates specified in Table 5 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.

5. The electro-optical response time measurements shall be made as FIGURE 3 by switching the "data" input signal ON and OFF. The times needed for the luminance to change from 10% to 90% is Tr, and 90% to 10% is Td.

2. Electrical Characteristics

2.1 Absolute Maximum Rating (Ta=25 VSS=0V)

Characteristics	Symbol	Min.	Typ.	Max.	Unit	Note
System voltage	VCC	-0.3		+4.6	V	
Supply voltage (Digital)	VCC	-0.3		+4.6	V	
Supply voltage (Logic)	VCC	-0.3		+4.6	V	
Operating temperature	T_{OP}	-20		+70	℃	1
Storage temperature	T_{ST}	-30		+80	℃	2

Note1: Background color changes slightly depending on ambient temperature. This phenomenon is reversible. Ta70℃: 75%RH max

Ta>70℃: absolute humidity must be lower than the humidity of 75%RH at 70℃

Note2: Ta at -30℃will be <48hrs, at 80℃ will be <120hrs

2.2 DC Electrical Characteristics

Parameter		Symbol	Condition	Min	Typ	Max	Unit	Note
Power supply		VCC	Ta=25℃	2.6	3.3	3.6	V	
Input voltage	'H'	V_{IH}	V_{CC}=2.8V	0.8V_{CC}	-	V_{CC}	V	
	'L'	V_{IL}	V_{CC}=2.8V	0	-	0.2V_{CC}	V	
Current Consumption		I_{CC1}	Normal mode	-	-	110	mA	2
		I_{CC2}	Sleep mode	-	0.03	0.09	mA	2
Clock Frequency		fCLK	-	-	-	-	MHz	

Note:

1:When an optimum contrast is obtained in transmissive mode.

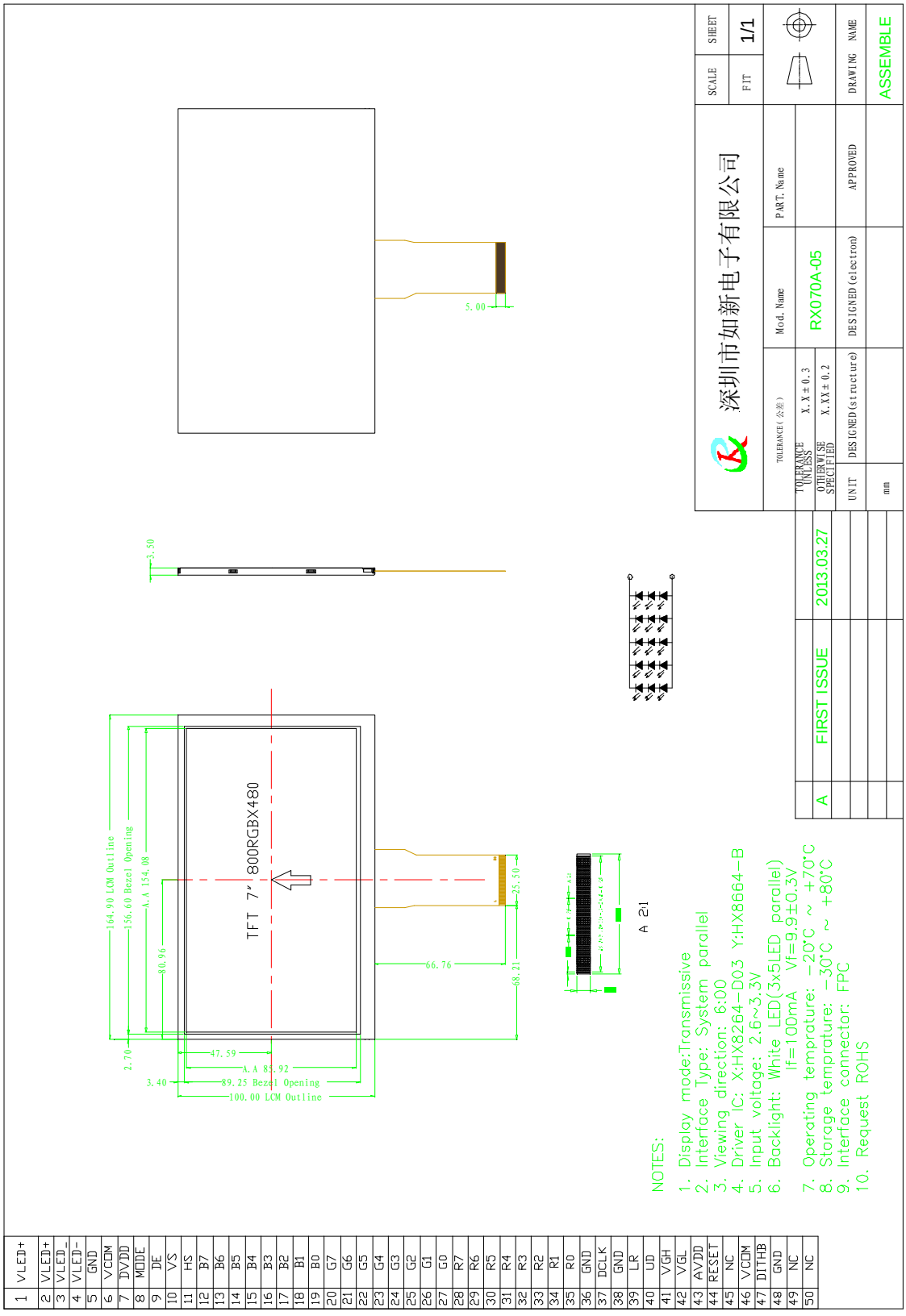
2: Tested in 1×1 chessboard pattern.

2.3 LED Backlight Characteristics

The back-light system is edge-lighting type with 4chips White LED in serial

Item	Symbol	Min.	Typ.	Max.	Unit	Note
Forward Current	I_F	-	100	-	mA	
Forward Voltage	V_F		9.6		V	-
LCM Luminance	L_V		TBD	-	cd/m2	
Uniformity	AVg	80	-	-	%	-

3.Outline dimension



4. Input terminal Pin Assignment

Pin NO.	Symbol	Function
1	LED_A	Backlight+
2	LED_A	Backlight+
3	LED_K	Backlight-
4	LED_K	Backlight-
5	GND	Ground
6	VCOM	Common voltage 3.3V
7	DVDD	Power for Digital Circuit
8	MODE	DE/SYNC mode select
9	DE	Data enable input
10	VSYNC	Vertical SYNC input
11	HSYNC	horizontal SYNC input
12-19	B7-B0	Blue Date Bit
20-27	G7-G0	Green Date Bit
28-35	R7-R0	Red Date Bit
36	GND	Ground
37	DCLK	Dot Date Clock
38	GND	Ground
39	L/R	Left/Right selection
40	U/D	Up/Down selection
41	VGH	Gate ON Voltage 18V
42	VGL	Gate OFF Voltage -8.0V
43	AVDD	DATA BUS DB8
44	RESET	Hardware reset pin
45	NC	NC
46	VCOM	Common voltage 3.3V
47	DITHB	Dithering function
48	GND	Ground
49	NC	NC
50	NC	NC

5. Timing Characteristic

Please refer to OTA7001A data sheet for more details.

Parameter	Symbol	Value			Unit
		Min.	Typ.	Max.	
Horizontal display area	thd		800		DCLK
DCLK frequency	Fclk	-	30	50	MHZ
1 Horizontal line	th		928		DCLK
HSYNC pulse width	thpw	1	48	-	
HSYNC Back Porch (blanking)	thb	-	88	-	
HSYNC front porch	thfp	-	40	-	
Vertical display area	tvd		480		H
VSD period time	tv	-	525	-	
VSD pulse width	tvpw	-	3	-	
VSD Back Porch (blanking)	tvb	-	32	-	
VSD front porch	tvfp	-	13	-	

6. Reliability Test Result

Item	Condition	Sample Size	Test Result	Note
Low Temperature Operating Life test	-20℃, 96HR	3ea	pass	-
Thermal Humidity Operating Life test	40℃, 90%RH, 96HR	3ea	pass	-
Temperature Cycle ON/OFF test	-20℃ ↔ 70℃, ON/OFF, 20CYC	3ea	pass	(1)
High Temperature Storage test	80℃, 96HR	3ea	pass	-
Low Temperature Storage test	－30℃, 96HR	3ea	pass	-
Thermal Shock Resistance	The sample should be allowed to stand the following 5 cycles of operation: TSTL for 30 minutes -> normal temperature for 5 minutes -> TSTH for 30 minutes -> normal temperature for 5 minutes, as one cycle, then taking it out and drying it at normal temperature, and allowing it stand for 24 hours	3ea	pass	
Box Drop Test	1 Corner 3 Edges 6 faces, 66㎝(MEDIUM BOX)	1box	pass	-

Note (1) ON Time over 10 seconds, OFF Time under 10 seconds

7. Packing

TBD

8. Cautions and Handling Precautions

8.1 Handling and Operating the Module

(1) When the module is assembled, it should be attached to the system firmly.
Do not warp or twist the module during assembly work.
(2) Protect the module from physical shock or any force. In addition to damage, this may cause improper operation or damage to the module and back-light unit.
(3) Note that polarizer is very fragile and could be easily damaged. Do not press or scratch the surface.
(4) Do not allow drops of water or chemicals to remain on the display surface.
If you have the droplets for a long time, staining and discoloration may occur.
(5) If the surface of the polarizer is dirty, clean it using some absorbent cotton or soft cloth.
(6) The desirable cleaners are water, IPA (Isopropyl Alcohol) or Hexane.
Do not use ketene type materials (ex. Acetone), Ethyl alcohol, Toluene, Ethyl acid or Methyl chloride. It might permanent damage to the polarizer due to chemical reaction.
(7) If the liquid crystal material leaks from the panel, it should be kept away from the eyes or mouth. In case of contact with hands, legs, or clothes, it must be washed away thoroughly with soap.
(8) Protect the module from static; it may cause damage to the CMOS ICs.
(9) Use finger-stalls with soft gloves in order to keep display clean during the incoming inspection and assembly process.
(10) Do not disassemble the module.
(11) Protection film for polarizer on the module shall be slowly peeled off just before use so that the electrostatic charge can be minimized.
(12) Pins of I/F connector shall not be touched directly with bare hands.
(13) Do not connect, disconnect the module in the “Power ON” condition.
(14) Power supply should always be turned on/off by the item 6.1 Power On Sequence &6.2 Power Off Sequence

8.2 Storage and Transportation.

(1) Do not leave the panel in high temperature, and high humidity for a long time.
It is highly recommended to store the module with temperature from 0 to 35 ℃ and relative humidity of less than 70%
(2) Do not store the TFT-LCD module in direct sunlight.
(3) The module shall be stored in a dark place. When storing the modules for a long time, be sure to adopt effective measures for protecting the modules from strong ultraviolet radiation, sunlight, or fluorescent light.
(4) It is recommended that the modules should be stored under a condition where no condensation is allowed. Formation of dewdrops may cause an abnormal operation or a failure of the module.

In particular, the greatest possible care should be taken to prevent any module from being operated where condensation has occurred inside.

(5) This panel has its circuitry FPC on the bottom side and should be handled carefully in order not to be stressed.

9. BHL&BMDT Customer Quality Service Process

12. BHL&BMDT Customer Quality Service Process

In order to provide better service to Customer, BHL&BMDT shall apply the after-sales product quality service process as below:

1. **According to the P/O from Customer, BHL&BMDT should deliver required product to the place appointed by Customer.**
2. **Customer will do IQC for the incoming procuct.**
3. **Inspection standard should be provided by BHL&BMDT, and it will be valid after confirmed by Customer.Inspection and Defects determination should be carried out according to the standard agreed by both Parties.**
4. **In order to guarantee in-time communication of product quality information and effective service, QA staff on Customer side should send Weekly Quality Report to the appointed CS staff in BHL&BMDT.**
5. **After BHL&BMDT get related information, both sides should arrange time and place to determin the defects found by Customer.**
6. **BHL&BMDT should cooperate with Customer for special quality requirement.**
7. **After confirmed by both side, BHL&BMDT should be responsible for the defect products which caused by its quality problem. BHL&BMDT should take back the confirmed defect product and return the good product to the place required by customer.**
8. **BHL&BMDT agree to provide related training of LCD product technology and usage.**
9. **Customer should use the LCD product according to the instruction. BHL&BMDT will not be responsible for the defect product caused by violation of Users' Instruction.**
10. **Both parties should deal with the quality problem with friendly cooperative policy. And both parties should negotiate to deal with the defect products of which the responsibility is not very clear.**