SPECIFICATIONS   FOR
LCD MODULE

CUSTOMER	
CUSTOMER PART NO.	
AMPIRE PART NO.	**AM-1920720B4TZQW-00H**
APPROVED BY	
DATE	

☐Approved For Specifications
☐Approved For Specifications & Sample

APPROVED BY	CHECKED BY	ORGANIZED BY
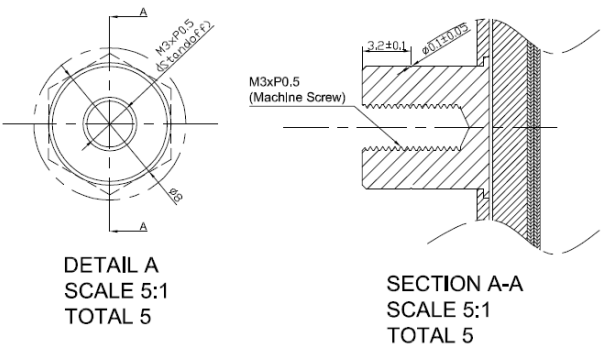
RECORD   OF   REVISION

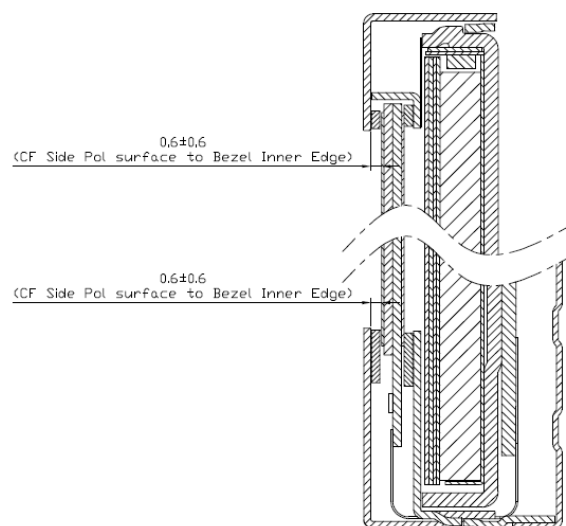| Revision Date	Page	Contents	Editor
2018/6/7	--	New Release	Kokai
2019/2/11	10	Correct the Note 6 IL=350mA to IL=280mA	Kokai
2020/12/21	5, 17	Update Operating Temperature Min Value	Tank

1. INTRODUCTION

12.3" color TFT-LCD (Thin Film Transistor Liquid Crystal Display) module composed of LCD panel, driver ICs ,control circuit and LED backlight. By applying 1920X720 images are displayed on the 12.3" diagonal screen. Display 16.7M colors by R.G.B signal input.

2. PHYSICAL SPECIFICATIONS

Item	Specifications
LCD size	12.3 inch(Diagonal)
Active area	292.032 (W) x 109.512 (H) mm
Number of Pixels	1920(H) × 3 (RGB) × 720(V)
Color arrangement	R.G.B-stripe
Display mode	Normally Black
Number of Colors	16.7M
Brightness (cd/m^2)	650nit(min) / 850nit(typ)
Response Time (ms)	30ms
Contrast Ratio	1100:1(Typ.)
Viewing Angle (CR≧10)	170degree (Horizontal.)
	170degree (Vertical)
Driver element	Active matrix TFT in IPS technology
Interface	Two port 24BIT LVDS
Module Size (mm)	308.1 x 130.0 x 7.6mm (typ)
Module Weight (g)	T.B.D
Backlight Unit	LED
Surface Treatment	Glare
M3xP0.5 Machine Screws	

Front Metal Bezel	 0.6±0.6 (CF Side Pol surface to Bezel Inner Edge) 0.6±0.6 (CF Side Pol surface to Bezel Inner Edge) SECTION Y-Y SCALE 5:1

3. ABSOLUTE MAX. RATINGS

The following are maximum values which, if exceeded, may cause faulty operation or damage to the unit.

Item	Symbol	Min.	Max.	Unit	Note
Supply voltage range	VCC	-0.3	3.6	V	
Voltage range at any terminal	VI	-0.3	VCC	V	
Operating Temperature	Top	-40*	+85	℃	
Storage Temperature	Tstg	-40	+85	℃	

Note : All voltage values are with respect to the GND terminals unless otherwise noted.

*Ampire cannot guarantee the LCD performance between -30~-40℃

4. ELECTRICAL CHARACTERISTICS

4.1. Power Specification

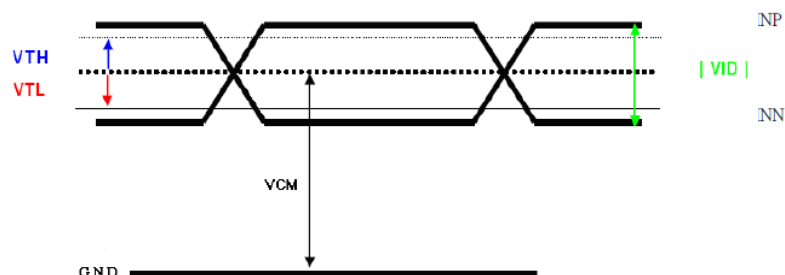| Item	Symbol	Min.	Typ.	Max.	Unit	Note
Supply Voltage	VCC	3.0	3.3	3.6	V	
Input Signal Voltage	VIH	VCC*0.7		VCC	V	
	VIL	0		VCC*0.3	V	
VDD Current	ICC	--	--	500	mA	VCC =3.3V Note (1)
LVDS DRIVER DC SPECIFICATIONS						
Differential Output Voltage	|VID|	200	--	600	mV	RL=100ohm (2)
Common Mode Voltage	VCM	1	1.2	1.7	mV	
LVDS RECEIVER DC SPECIFICATIONS						
Differential Input High Threshold	VTH	--	--	+100	mV	(2)
Differential Input Low Threshold	VTL	-100	--	--	mV	

Note1: Ta=25℃ , Display pattern :

● Maximum: White Pattern

White Patter

Note2: LVDS signal

4.2. LED BACKLIGHT DRIVER UNIT

Item	Symbol	Min.	Typ.	Max.	Unit	Note
LED Forward Current	IF	--	280	--	mA	Ta=25℃
LED Forward Voltage	VF	--	--	37.4	V	Ta=25℃
LED Lifetime	--	30000	--	--	Hr	IF=70mA/series, Ta=25℃

Note (1) LED life time (Hr) can be defined as the time in which it continues to operate under the condition: Ta=25±3 ^{O}C, typical IL value indicated in the above table until the brightness becomes less than 50%.

Note (2) The "LED life time" is defined as the module brightness decrease to 50% origin brightness at Ta=25℃ and IL= 280 mA. The LED lifetime could be decreased if operating IL is larger than 300 mA. The constant current driving method is suggested.

Note (3) LED Light Bar Circuit 11S4P =44pcs LED

Note (4) LED temperature current curve, The temperature at 60 degrees before the output 70mA / CH, 60 degrees to 80 degrees when the linear drop to 35mA.
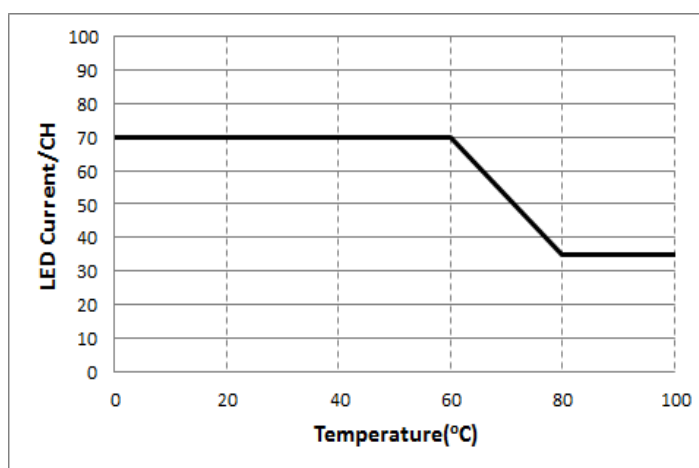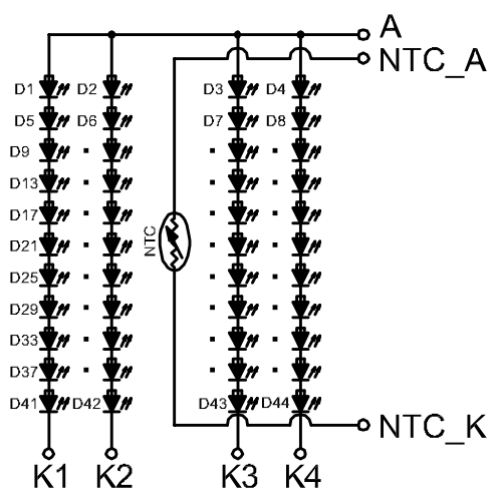
5. Optical Specifications

Item	Symbol	Condition	Values			Unit	Remark
			Min	Typ.	Max		
Viewing angle (CR≥ 10)	θL	θ=180°(9 o'clock)	80	85	-	degree	Note 1
	θR	θ=0°(3 o'clock)	80	85	-		
	θT	θ=90°(12 o'clock)	80	85	-		
	θB	θ=270°(6 o'clock)	80	85	-		
Response time	Tr+Tf		-	30	--	Msec	Note 2 Note 3
Contrast ratio	CR		900	1100	-	-	Note 4
Color chromaticity	WX	Normal θ=Φ=0° Point-5	-0.05	0.296	+0.05	-	Note 2 Note 5 Note 6
	WY			0.324			
	RX			0.648			
	RY			0.333			
	GX			0.291			
	GY			0.609			
	BX			0.146			
	BY			0.060			
Luminance	WY		650	850		cd/m^2	Note 6
Luminance uniformity	YU		--	70	-	%	Note 7
NTSC	-	Point-5	-	70	-	%	

Test Conditions:

1. VDD=3.3V, IL=280 mA (Backlight current), the ambient temperature is 25℃.

2. The test systems refer to Note 2.

Note 1: Definition of viewing angle range

Fig.6-1 Definition of viewing angle
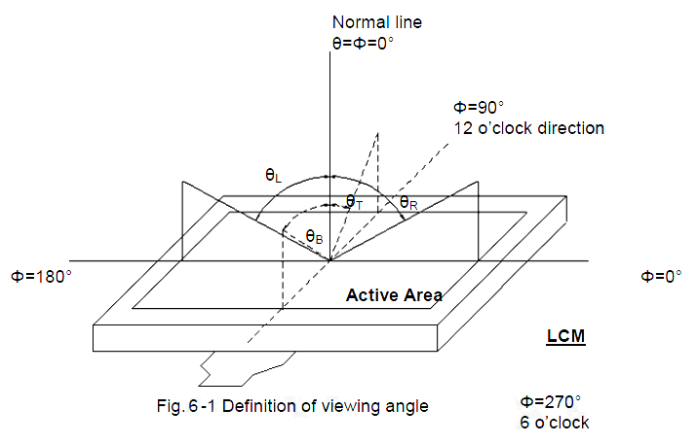
Note 2: Definition of optical measurement system.

The optical characteristics should be measured in dark room. After 30 minutes operation, the optical properties are measured at the center point of the LCD screen. (Viewing angle is measured by ELDIM-EZ contrast/Height :1.2mm, Response time is measured by Photo detector TOPCON BM-7, other items are measured by BM-5A/ Field of view: 1° /Height: 500mm.)

Fig. 6-2 Optical measurement system setup
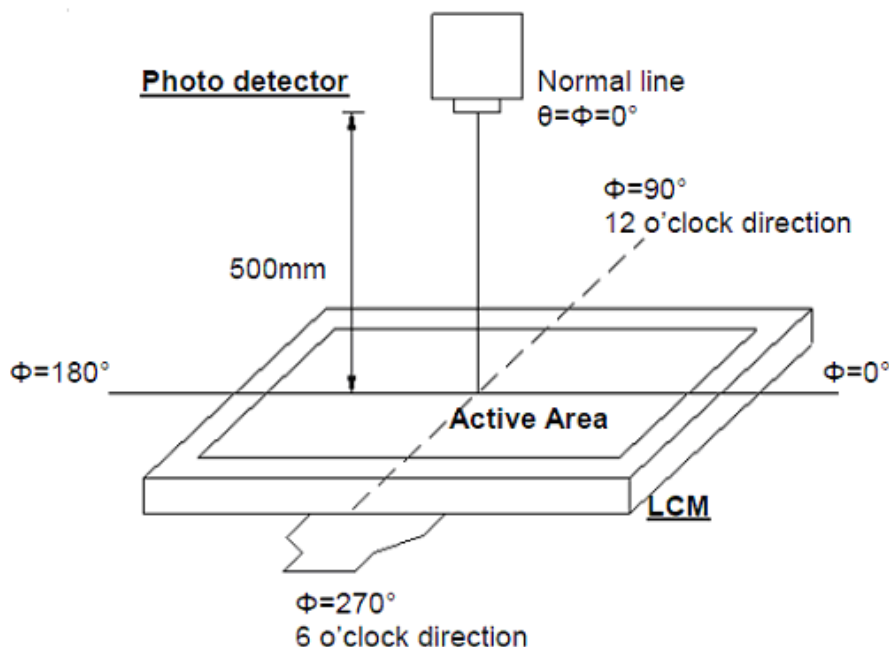
Note 3: Definition of Response time

The response time is defined as the LCD optical switching time interval between "White" state and "Black" state. Rise time (TON) is the time between photo detector output intensity changed from 90% to 10%. And fall time (TOFF) is the time between photo detector output intensity changed from 10% to 90%.
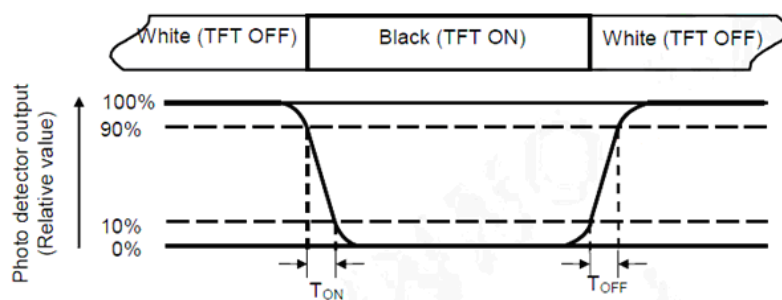
Fig. 6-3 Definition of response time

Note 4: Definition of contrast ratio

$$\text{Contrast ratio (CR)} = \frac{\text{Brightness @ ``White'' state}}{\text{Brightness @ ``Black'' state}}$$

Note 5: Definition of color chromaticity (CIE1931)

Color coordinates measured at center point of LCD.

Note 6: All input terminals LCD panel must be ground while measuring the center area of the panel. The LED driving condition is IL=280mA.

Note 7: Definition of Luminance Uniformity

$$\textit{Luminance Uniformity (Yu)} = \frac{B_{min}}{B_{max}}$$
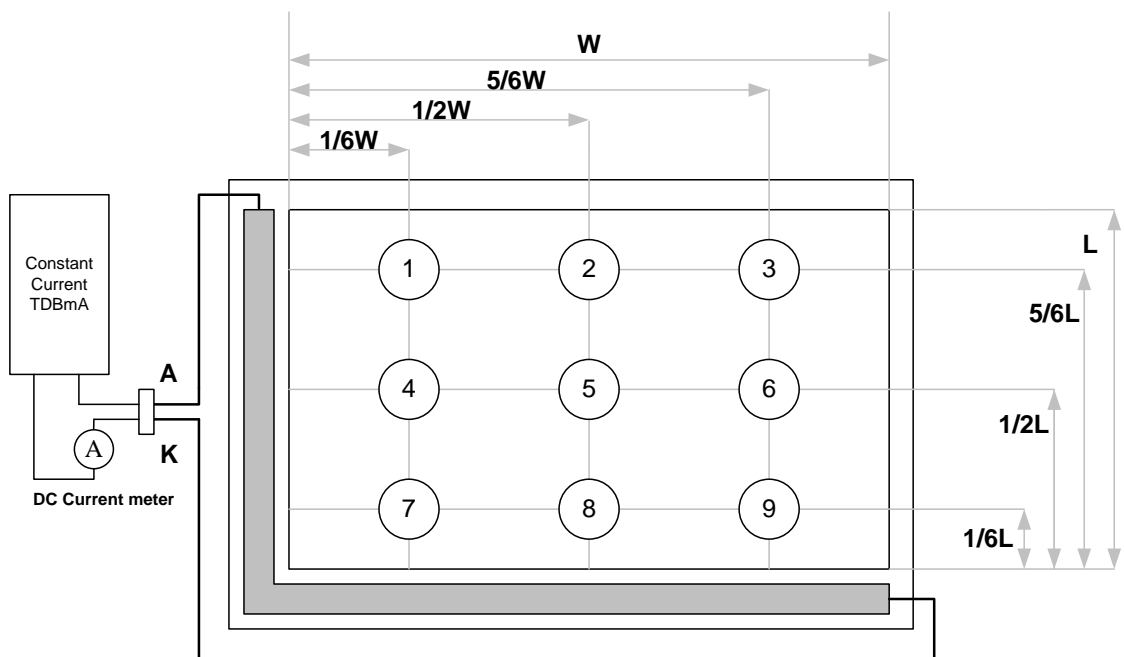
B_{max}: The measured maximum luminance of all measurement position.

B_{min}: The measured minimum luminance of all measurement position.

6. INTERFACE

6.1. CN1: AORORA F31L-1A7H1-21050 , 50PIN or Equivalent

APPLICABLE FFP RECOMMENDED DIMENSION

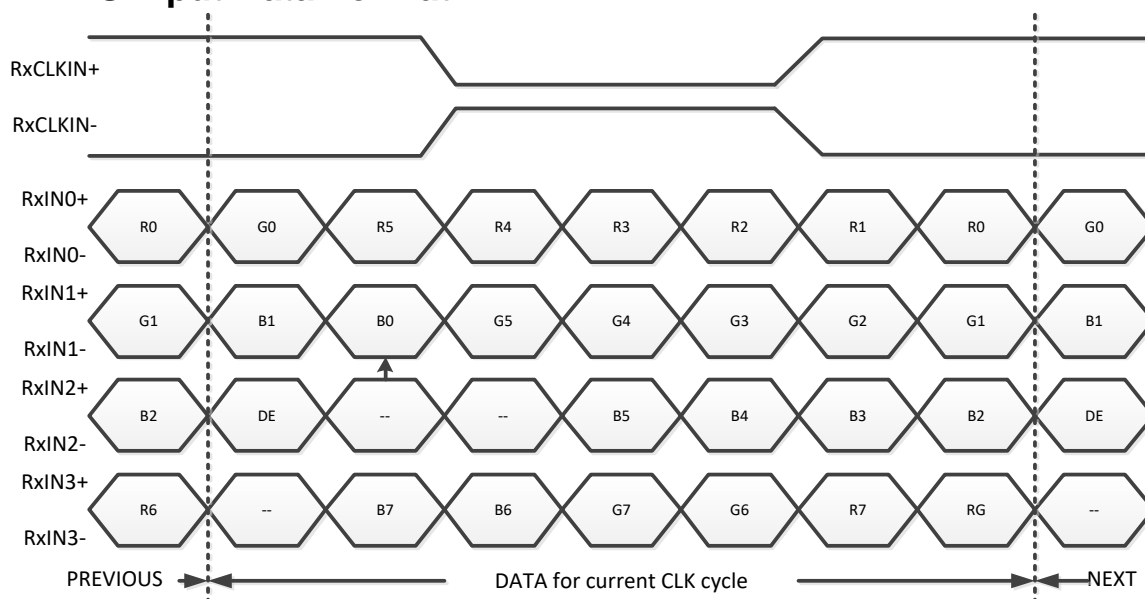| Pin No.	Symbol	I/O	Description
1	GND	P	Power ground
2	NC	-	No connection
3	VCC	P	Power supply for digital circuit (3.3V)
4	VCC	P	Power supply for digital circuit (3.3V)
5	GND	P	Power ground
6	GND	P	Power ground
7	NC	-	No connection
8	NC	-	No connection
9	GND	P	Power ground
10	ORXIN0-	I	Odd pixel negative LVDS differential data inputs
11	ORXIN0+	I	Odd pixel positive LVDS differential data inputs
12	ORXIN1-	I	Odd pixel negative LVDS differential data inputs
13	ORXIN1+	I	Odd pixel positive LVDS differential data inputs
14	ORXIN2-	I	Odd pixel negative LVDS differential data inputs
15	ORXIN2+	I	Odd pixel positive LVDS differential data inputs
16	ORXCLKIN-	I	Odd pixel negative LVDS differential clock inputs
17	ORXCLKIN+	I	Odd pixel positive LVDS differential clock inputs
18	ORXIN3-	I	Odd pixel negative LVDS differential data inputs
19	ORXIN3+	I	Odd pixel positive LVDS differential data inputs
20	ERXIN0-	I	Even pixel negative LVDS differential data inputs
21	ERXIN0+	I	Even pixel positive LVDS differential data inputs
22	ERXIN1-	I	Even pixel negative LVDS differential data inputs
23	ERXIN1+	I	Even pixel positive LVDS differential data inputs
24	ERXIN2-	I	Even pixel negative LVDS differential data inputs
25	ERXIN2+	I	Even pixel positive LVDS differential data inputs

26	ERXCLKIN-	I	Even pixel negative LVDS differential clock inputs
27	ERXCLKIN+	I	Even pixel positive LVDS differential clock inputs
28	ERXIN3-	I	Even pixel negative LVDS differential data inputs
29	ERXIN3+	I	Even pixel positive LVDS differential data inputs
30	GND	P	Power ground
31	NC	-	No connection
32	RESET	-	Global reset pin, active low.
33	STBYB	-	Standby mode, active low.
34	CA3	-	Output signal to indicate self-protection mode, when DE,HS,VS,DCLK, any of these signals is missing, it will become High. If using this pin, CA3 need to pulled low by an resistor, else let it floating. **User Keep it floating.**
35	SCL(NC)	-	Serial interface clock input. **User Keep it floating.**
36	SDA(NC)	-	Serial interface data input/output. **User Keep it floating.**
37	CSB(NC)	-	Serial interface chip enable. **User Keep it floating.**
38	GND	P	Power ground
39	GND	P	Power ground
40	NC	-	No connection
41	LEDA	P	LED power Anode
42	LEDA	P	LED power Anode
43	LEDA	P	LED power Anode
44	NC	-	No connection
45	LEDK1	I	Cathode 1
46	LEDK2	-	Cathode 2
47	LEDK3	-	Cathode 3
48	LEDK4	-	Cathode 4
49	NTC_A	-	NTC_Anode
50	NTC_K	-	NTC_Cathode

7. LVDS Input Data Format

Note : R/G/B data 7 : MSB, R/G/B data 0 : LSB

Signal Name	Description	Remark
R7 R6 R5 R4 R3 R2 R1 R0	Red Data 7 (MSB) Red Data 6 Red Data 5 Red Data 4 Red Data 3 Red Data 2 Red Data 1 Red Data 0 (LSB)	Red-pixel Data Each red pixel's brightness data consists of these 8 bits pixel data.
G7 G6 G5 G4 G3 G2 G1 G0	Green Date 7 (MSB) Green Date 6 Green Date 5 Green Date 4 Green Date 3 Green Date 2 Green Date 1 Green Date 0 (LSB)	Green-pixel Data Each green pixel's brightness data consists of these 8 bits pixel data.
B7 B6 B5 B4 B3 B2 B1 B0	Blue Data 7 (MSB) Blue Data 6 Blue Data 5 Blue Data 4 Blue Data 3 Blue Data 2 Blue Data 1 Blue Data 0 (LSB)	Blue-pixel Data Each blue pixel's brightness data consists of these 8 bits pixel data.
RxCLKIN+ RxCLKIN-	LVDS Clock Input	
DE	Display Enable	
VS	Vertical Sync	
HS	Horizontal Sync	

8. AC Timing characteristic

8.1. AC Timing characteristic of LVDS

Switching Characteristics

Vcc = 3.0 - 3.6V, Ta = -10 - +70 °C

RECEIVER

|					
t_{RCP}	CLK OUT Period	11.76	T	50.0	ns
t_{RCH}	CLK OUT High Time		4T/7		ns
t_{RCL}	CLK OUT Low Time		3T/7		ns
t_{RCD}	RCLK+/- to CLK OUT Delay		5T/7		ns
t_{RS}	TTL Data Setup to CLK OUT	3T/7-2.5			ns
t_{RH}	TTL Data Hold from CLK OUT	4T/7-3.5			ns
t_{TLH}	TTL Low to High Transition Time		3.0	5.0	ns
t_{THL}	TTL High to Low Transition Time		3.0	5.0	ns
t_{RIP1}	Input Data Position 0 (T=11.76ns)	-0.4	0.0	0.4	ns
t_{RIP0}	Input Data Position 1 (T=11.76ns)	T/7-0.4	T/7	T/7+0.4	ns
t_{RIP6}	Input Data Position 2 (T=11.76ns)	2T/7-0.4	2T/7	2T/7+0.4	ns
t_{RIP5}	Input Data Position 3 (T=11.76ns)	3T/7-0.4	3T/7	3T/7+0.4	ns
t_{RIP4}	Input Data Position 4 (T=11.76ns)	4T/7-0.4	4T/7	4T/7+0.4	ns
t_{RIP3}	Input Data Position 5 (T=11.76ns)	5T/7-0.4	5T/7	5T/7+0.4	ns
t_{RIP2}	Input Data Position 6 (T=11.76ns)	6T/7-0.4	6T/7	6T/7+0.4	ns
t_{RPLL}	Phase Lock Loop Set			10.0	ms

RECEIVER DEVICE
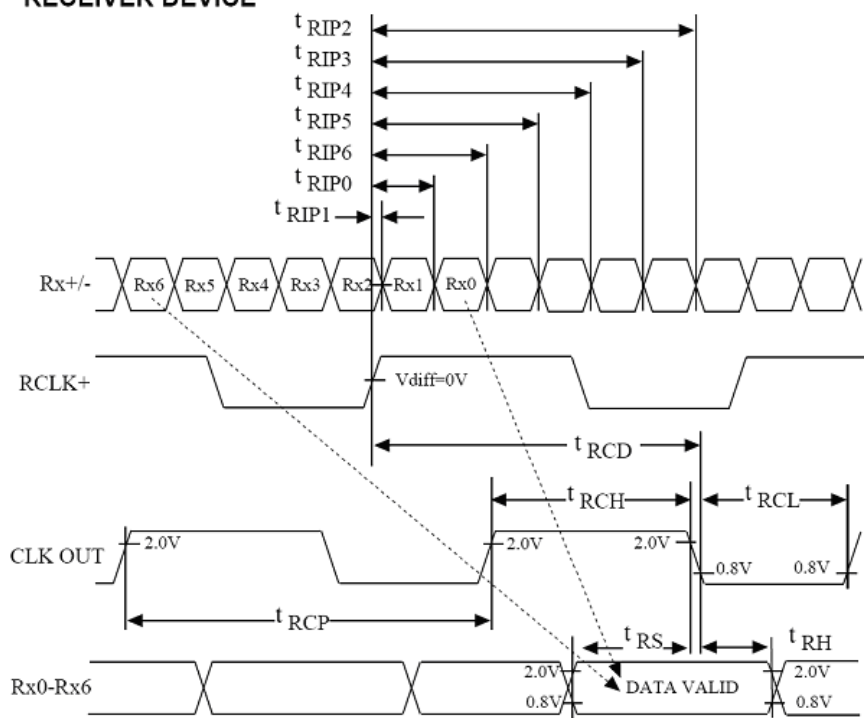
Note:
1) Vdiff = (RA+) - (RA-), ... (RCLK+) - (RCLK-)

8.2. Timing characteristic of Panel (DE only mode)
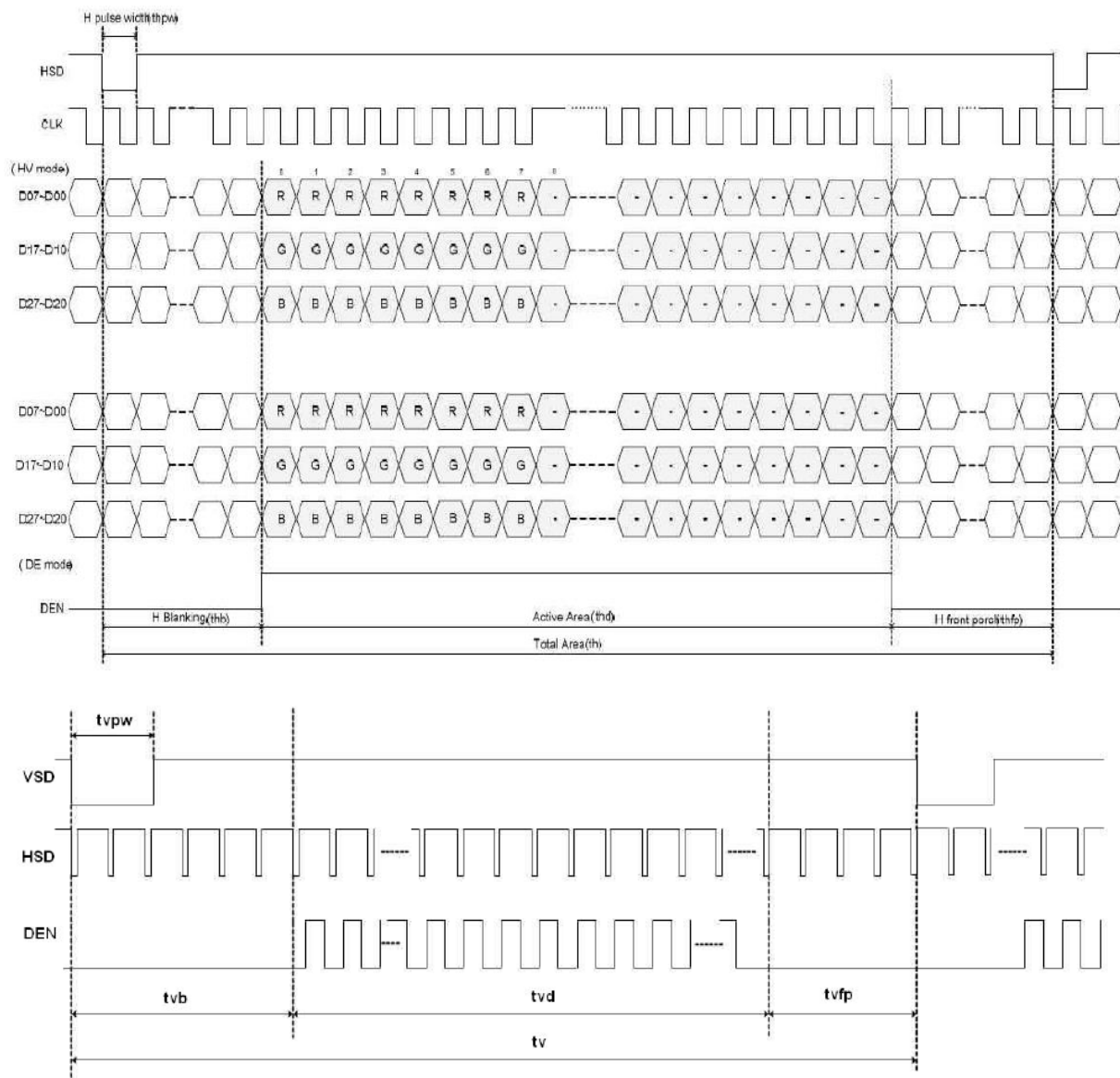
Parameter	Symbol	Value			Unit
		Min.	Typ.	Max.	
DCLK frequency	fclk	85	90	95	Mhz
Horizontal display area	thd		960		DCLK
Horizontal Blanking Time	thb+thfp	24	32	144	DCLK
1 Horizontal line	th	984	992	1104	DCLK
Vertical display area	tvd		720		H
Vertical Blanking Time	tvb+tvfp	10	72	144	H
1 Vertical field frame	tv	730	792	864	H
Frame rate	FR	55	60	65	Hz

8.3. Power ON/OFF Timing
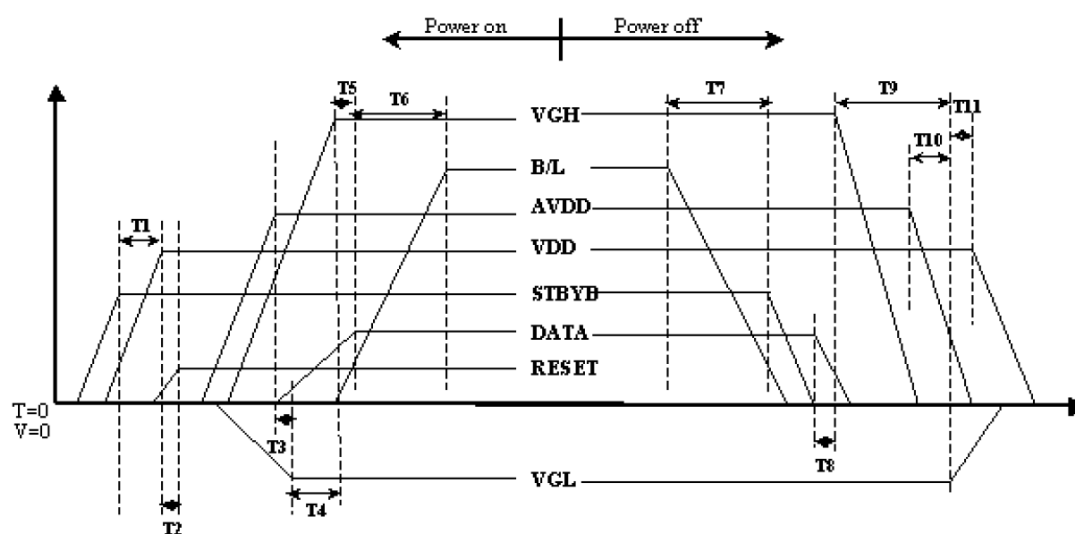
Item	Min.	Typ.	Max.	Unit
T1	0	--	--	ms
T2	50	--	--	ms
T3	5	--	--	ms
T4	10	--	--	ms
T5	20	--	--	ms
T6	50	--	--	ms
T7	20	--	--	ms
T8	10	--	--	ms
T9	20	--	--	ms
T10	10	--	--	ms
T11	20	--	--	ms

9. RELIABILITY TEST CONDITIONS

Test Item	Test Conditions	Note
High Temperature Operation	85±3°C , t=240 hrs	
Low Temperature Operation	-40±3°C , t=240 hrs	
High Temperature Storage	85±3°C , t=240 hrs	1,2
Low Temperature Storage	-40±3°C , t=240 hrs	1,2
Thermal Shock Test	-30°C ~ 85°C 30 m in. ~ 30 min. (1 cycle) Total 100cycle	1,2
Humidity Test	60 °C, Humidity 90%, 240 hrs	1,2
Vibration Test	1.Random: 1.04G, 10~500Hz, XYZ, 30min/each direction 2.Sine: Freq.1.5G, 8~33.3Hz, Stoke: 1.3mmhz Sweep: 2.9G, 333.3~400 X/Z: 2hrs, Y:4hrs	2
Vibration Test (Packing)	Random: 0.015G^2/Hz, 5~200Hz -6dB/Octave, 200~400Hz XYZ 2hrs	

Note 1 : Condensation of water is not permitted on the module.

Note 2 : The module should be inspected after 1 hour storage in normal conditions (15-35°C , 45-65%RH).

Note 3 : The module shouldn't be tested more than one condition, and all the test conditions are independent.

Note 4 : All the reliability tests should be done without protective film on the module.

Definitions of life end point :
- Current drain should be smaller than the specific value.
- Function of the module should be maintained.
- Appearance and display quality should not have degraded noticeably.
- Contrast ratio should be greater than 50% of the initial value.

10. USE PRECAUTIONS

10.1. Handling precautions

1) The polarizing plate may break easily so be careful when handling it. Do not touch, press or rub it with a hard-material tool like tweezers.

2) Do not touch the polarizing plate surface with bare hands so as not to make it dirty. If the surface or other related part of the polarizing plate is dirty, soak a soft cotton cloth or chamois leather in benzine and wipe off with it. Do not use chemical liquids such as acetone, toluene and isopropyl alcohol. Failure to do so may bring chemical reaction phenomena and deteriorations.

3) Remove any spit or water immediately. If it is left for hours, the suffered part may deform or decolorize.

4) If the LCD element breaks and any LC stuff leaks, do not suck or lick it. Also if LC stuff is stuck on your skin or clothing, wash thoroughly with soap and water immediately.

10.2. Installing precautions

1) The PCB has many ICs that may be damaged easily by static electricity. To prevent breaking by static electricity from the human body and clothing, earth the human body properly using the high resistance and discharge static electricity during the operation. In this case, however, the resistance value should be approx. 1MΩ and the resistance should be placed near the human body rather than the ground surface. When the indoor space is dry, static electricity may occur easily so be careful. We recommend the indoor space should be kept with humidity of 60% or more. When a soldering iron or other similar tool is used for assembly, be sure to earth it.

2) When installing the module and ICs, do not bend or twist them. Failure to do so may crack LC element and cause circuit failure.

3) To protect LC element, especially polarizing plate, use a transparent protective plate (e.g., acrylic plate, glass etc) for the product case.

4) Do not use an adhesive like a both-side adhesive tape to make LCD surface (polarizing plate) and product case stick together. Failure to do so may cause the polarizing plate to peel off.

10.3. Storage precautions

1) Avoid a high temperature and humidity area. Keep the temperature between 0°C and 35°C and also the humidity under 60%.
2) Choose the dark spaces where the product is not exposed to direct sunlight or fluorescent light.
3) Store the products as they are put in the boxes provided from us or in the same conditions as we recommend.
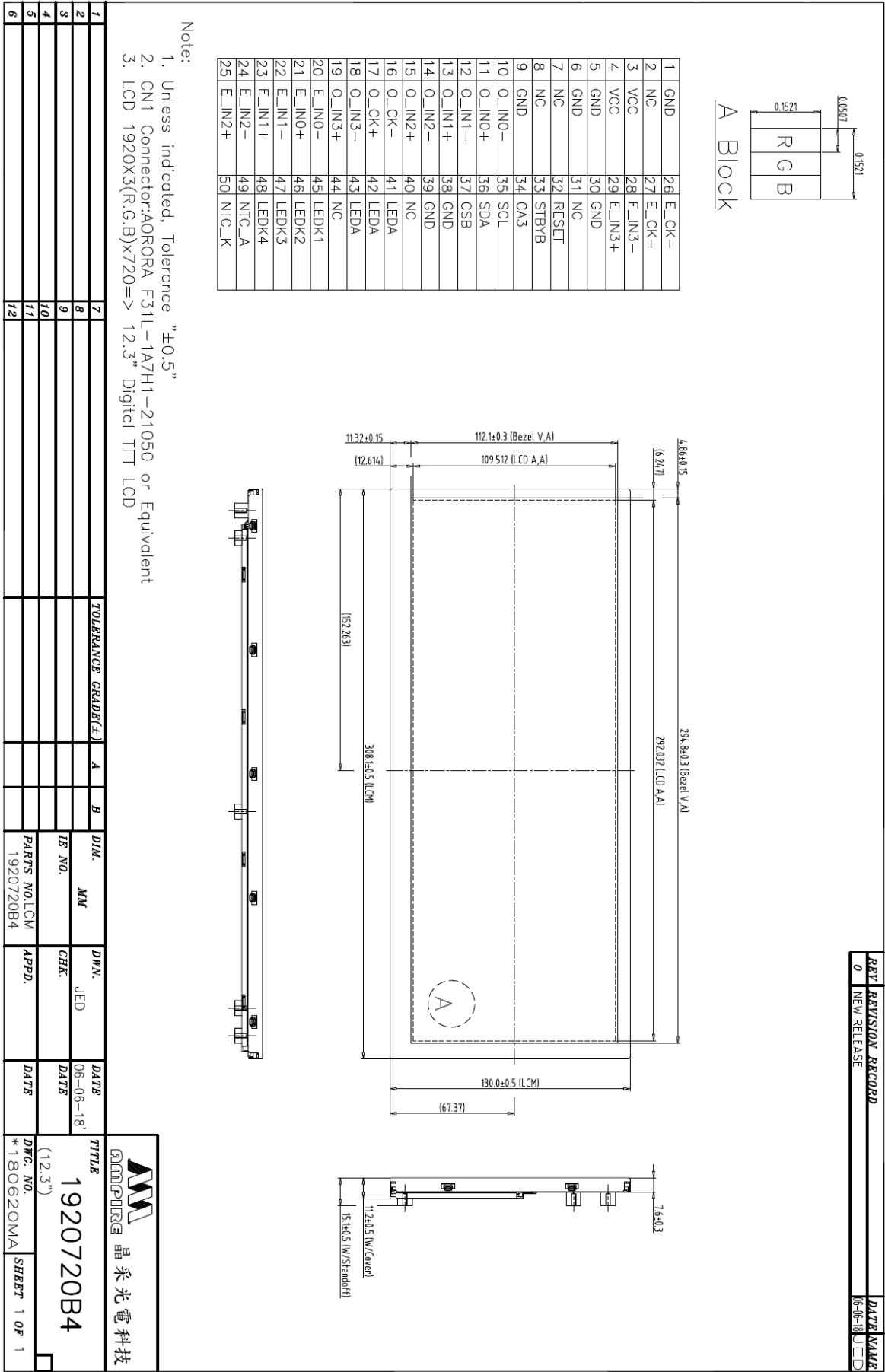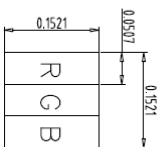
10.4. Operating precautions

1) Do not boost the applied drive voltage abnormally. Failure to do so may break ICs. When applying power voltage, check the electrical features beforehand and be careful. Always turn off the power to the LC module controller before removing or inserting the LC module input connector. If the input connector is removed or inserted while the power is turned on, the LC module internal circuit may break.
2) The display response may be late if the operating temperature is under the normal standard, and the display may be out of order if it is above the normal standard. But this is not a failure; this will be restored if it is within the normal standard.
3) The LCD contrast varies depending on the visual angle, ambient temperature, power voltage etc. Obtain the optimum contrast by adjusting the LC dive voltage.
4) When carrying out the test, do not take the module out of the low-temperature space suddenly. Failure to do so will cause the module condensing, leading to malfunctions.
5) Make certain that each signal noise level is within the standard (L level: 0.2Vdd or less and H level: 0.8Vdd or more) even if the module has functioned properly. If it is beyond the standard, the module may often malfunction. In addition, always connect the module when making noise level measurements.
6) The CMOS ICs are incorporated in the module and the pull-up and pull-down function is not adopted for the input so avoid putting the input signal open while the power is ON.
7) The characteristic of the semiconductor element changes when it is exposed to light emissions, therefore ICs on the LCD may malfunction if they receive light emissions. To prevent these malfunctions, design and assemble ICs so that they are shielded from light emissions.
8) Crosstalk occurs because of characteristics of the LCD. In general, crosstalk occurs when the regularized display is maintained. Also, crosstalk is affected by the LC drive voltage. Design the contents of the display, considering crosstalk.

10.5. Other

1) Do not disassemble or take the LC module into pieces. The LC modules once disassembled or taken into pieces are not the guarantee articles.
2) Do not keep the LCD at the same display pattern continually. The residual image will happen and it will damage the LCD. Please use screen saver.
3) AMIPRE will provide one year warrantee for all products and three months warrantee for all repairing products.

A Block

| | R | G | B | |

0.1521
0.0507
0.1521

1	GND	26	E_CK-	
2	NC	27	E_CK+	
3	VCC	28	E_IN3-	
4	VCC	29	E_IN3+	
5	GND	30	GND	
6	GND	31	NC	
7	NC	32	RESET	
8	NC	33	STBYB	
9	GND	34	CA3	
10	GND	35	SCL	
11	O_IN0+	36	SDA	
12	O_IN0-	37	CSB	
13	O_IN1+	38	GND	
14	O_IN1-	39	GND	
15	O_IN2+	40	NC	
16	O_IN2-	41	LEDA	
17	O_CK+	42	LEDA	
18	O_CK-	43	LEDA	
19	O_IN3+	44	NC	
20	O_IN3-	45	LEDK1	
21	E_IN0+	46	LEDK2	
22	E_IN0-	47	LEDK3	
23	E_IN1+	48	LEDK4	
24	E_IN1-	49	NTC_A	
25	E_IN2+	50	NTC_K	

Note:
1. Unless indicated, Tolerance "±0.5"
2. CN1 Connector: AORORA F31L-1A7H1-21050 or Equivalent
3. LCD 1920X3(R.G.B)x720=> 12.3" Digital TFT LCD

TOLERANCE GRADE(±)

DIM.	MM	DWN.	APPD.	DATE
IE NO.	CHK. JED	DATE 06-06-18	DATE	DATE
PARTS NO.LCM 1920720B4				

Dimensions:
11.32±0.15
(12.614)
112.1±0.3 (Bezel V,A)
109.512 (LCD A,A)
4.86±0.15
(6.247)
294.8±0.3 (Bezel V,A)
292.032 (LCD A,A)
(52.263)
308.1±0.5 (LCM)
130.0±0.5 (LCM)
(67.37)
112±0.5 (W/Cover)
7.6±0.3
15.1±0.5 (W/Standoff)

REV REVISION RECORD
0 NEW RELEASE

DATE 06-06-18 NAME JED

AMPIRE 晶采光電科技

TITLE 1920720B4
(12.3")
DWG. NO. *180620MA
SHEET 1 OF 1

A Block

#	Signal	#	Signal
1	GND	26	E_CK-
2	NC	27	E_CK+
3	VCC	28	E_IN3-
4	VCC	29	E_IN3+
5	GND	30	GND
6	GND	31	NC
7	NC	32	RESET
8	NC	33	STBYB
9	GND	34	CA3
10	O_IN0-	35	SCL
11	O_IN0+	36	SDA
12	O_IN1-	37	CSB
13	O_IN1+	38	GND
14	O_IN2-	39	GND
15	O_IN2+	40	NC
16	O_CK-	41	LEDA
17	O_CK+	42	LEDA
18	O_IN3-	43	LEDA
19	O_IN3+	44	NC
20	E_IN0-	45	LEDK1
21	E_IN0+	46	LEDK2
22	E_IN1-	47	LEDK3
23	E_IN1+	48	LEDK4
24	E_IN2-	49	NTC_A
25	E_IN2+	50	NTC_K

R G B

0.1521
0.0507

Note:
1. Unless indicated, Tolerance ±0.5"
2. CN1 Connector:AORORA F31L-1A7H1-21050 or Equivalent
3. LCD 1920X3(R.G.B)x720=> 12.3" Digital TFT LCD

Back View

5-M3xP0.5(standoff)
5-Φ8.0
(67.37)
(8.12)
(110.08)
(283.85)
308.1±0.5 (LCM)
(280.5)
(174.26)
(152.263)
117.36±0.1 (LVDS Connector)
(26.65)
CN1
50
1
(11.65)
(8.12)
70.64±0.1 (LVDS Connector)
(99.37)
(118.2)
130.0±0.5 (LCM)