晶采光電科技股份有限公司
AMPIRE CO., LTD.

SPECIFICATIONS FOR LCD MODULE

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

☐**Approved For Specifications**
☐Approved For Specifications & Sample

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RECORD OF REVISION

Revision Date	Page	Contents	Editor
2015/3/23	--	New Release	KOKAI
2015/8/4	7	Modify Contrast	KOKAI

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

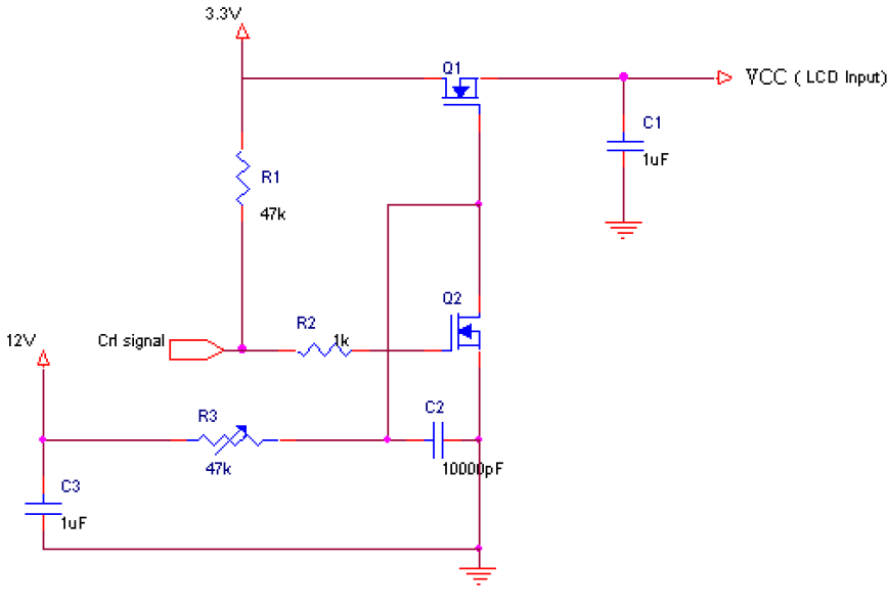
Item	Specifications				Remark
LCD size	12.3 inch(Diagonal)				
Active area	292.032 (W) x 109.512 (H) mm				
Number of Pixels	1920(H) × 3 (RGB) × 720(V)				
Color arrangement	R.G.B-stripe				
Display mode	Normally Black				
Number of Colors	16.7M				
Brightness (cd/m^2)	460nit(min) / 700nit(typ)				
Response Time (ms)	25ms(Typ.)				
Contrast Ratio	1000:1(Typ.)/ 700:1(min)				
Viewing Angle (CR≧10)	170degree (Horizontal.)				
	170degree (Vertical)				
Driver element	Active matrix TFT in IPS technology				
Interface	LVDS				
Module Size (mm)					
	Horizontal(H)	313.5	313.8	314.1	
	Vertical(V)	131.9	132.2	132.5	
	Depth(D)	13.0	13.3	13.6	
Module Weight (g)	(630) (typ)				
Backlight Unit	LED				
Surface Treatment	Anti-Glare				

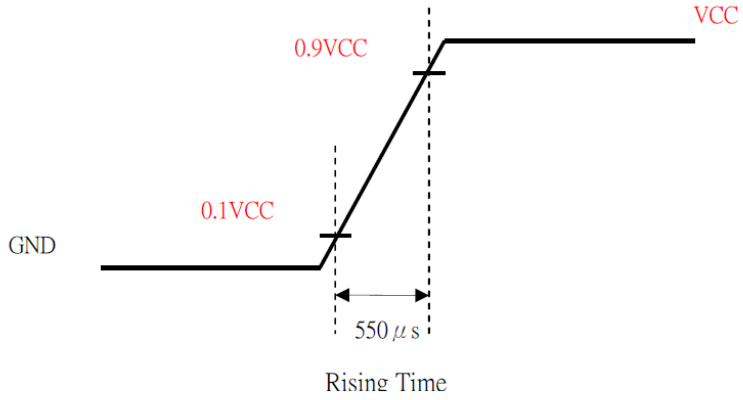
3. ABSOLUTE MAX. RATINGS

The following are maximun 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	3.9	V	
Voltage range at any terminal	VI	-0.3	VCC	V	
ICC Rush current	IRUSH		2	A	1
Operating Temperature	Top	-30	+85	℃	
Storage Temperature	Tstg	-40	+95	℃	

Note 1:The input pulse-current measurement system is as below:
Control signal: High (+3.3V)→Low (GND)
Supply Voltage of rising time should be from R3 and C2 tune to 550 μs.





Rising Time

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

4. ELECTRICAL CHARACTERISTICS

4.1. Power Specification

Item	Symbol	Min.	Typ.	Max.	Unit	Note
Logic Supply Voltage	VCC	3.0	3.3	3.6	V	
VDD Current	ICC	--	(T.B.D)	(T.B.D)	mA	(1)
LVDS DRIVER DC SPECIFICATIONS						
Differential Output Voltage	|VID|	100	--	600	mV	RL=100ohm (2)
Common Mode Voltage	VCM	0.7	--	1.6	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 :

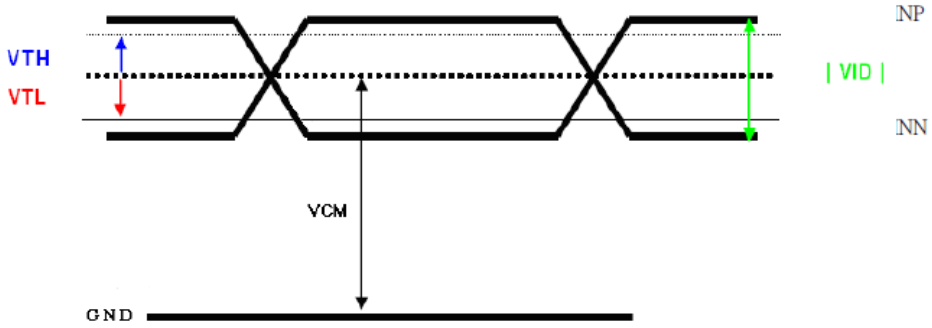
- Typical :256 fray pattern

256 gray pattern

- Maximum: White Pattem

White Patter

Note2: LVDS signal

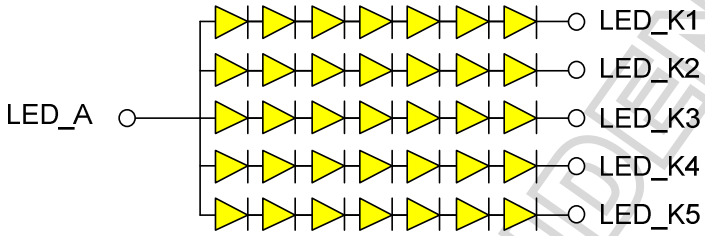


4.2. LED BACKLIGHT DRIVER UNIT

Item	Symbol	Min.	Typ.	Max.	Unit	Note
LED Forward Current	IF	--	400	--	mA	Ta=25℃
LED Forward Voltage	VF	18.55	21	24.15	V	IF=80mA/series, Ta=25℃
Power consumption	WL			8.4	W	IF=80mA/series, Ta=25℃
LED Lifetime	--		30000		Hr	IF=80mA/series, Ta=60℃

Note 1: Ta means ambient temperature of TFT-LCD module.

Note 2: the structure of LED B/L shows as below.



Note 3: Using the constant current control to avoid the leakage light and brightness quality issue.

Note 4: Definition of Led lifetime：Luminance < Initial luminance 70%.

5. Optical Specifications

Item	Symbol	Condition	Values			Unit	Remark
			Min	Typ	Max		
Viewing angle (CR≥ 10)	θ_L	θ=180°(9 o'clock)	75	85	-	degree	Note 1
	θ_R	θ=0°(3 o'clock)	75	85	-		
	θ_T	θ=90°(12 o'clock)	75	85	-		
	θ_B	θ=270°(6 o'clock)	75	85	-		
Response time	$T_{r+}T_f$	Normal θ=Φ=0° Point-5	-	25	35	Msec	Note 2 Note 3
Contrast ratio	CR		700	1000	-	-	Note 4
Color chromaticity	Wx		0.273	0.313	0.353	-	Note 2 Note 5 Note 6
	Wy		0.289	0.329	0.369	-	
Luminance	L		460	700		cd/m^2	Note 6
Luminance uniformity	Yu		70	80	-	%	Note 7
NTSC	-	Point-5	70	80	-	%	

Test Conditions:

1. VCC=3.3V, IL=400 mA (Backlight current), the ambient temperature is 25℃.
2. The test systems refer to Note 2.

Note 1: Definition of viewing angle range

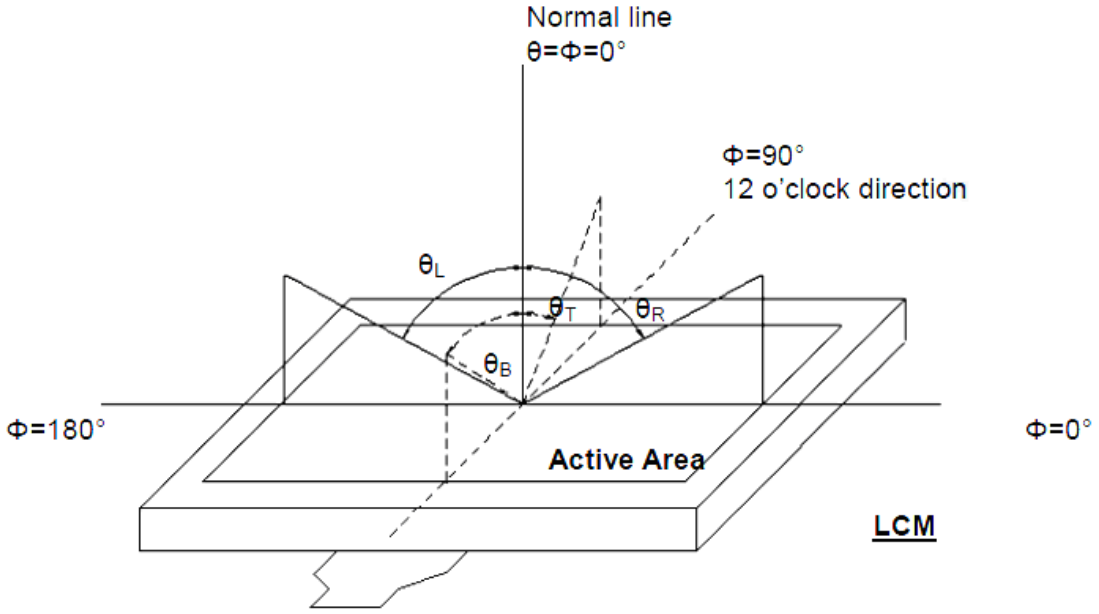


Fig. 6-1 Definition of viewing angle

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.)

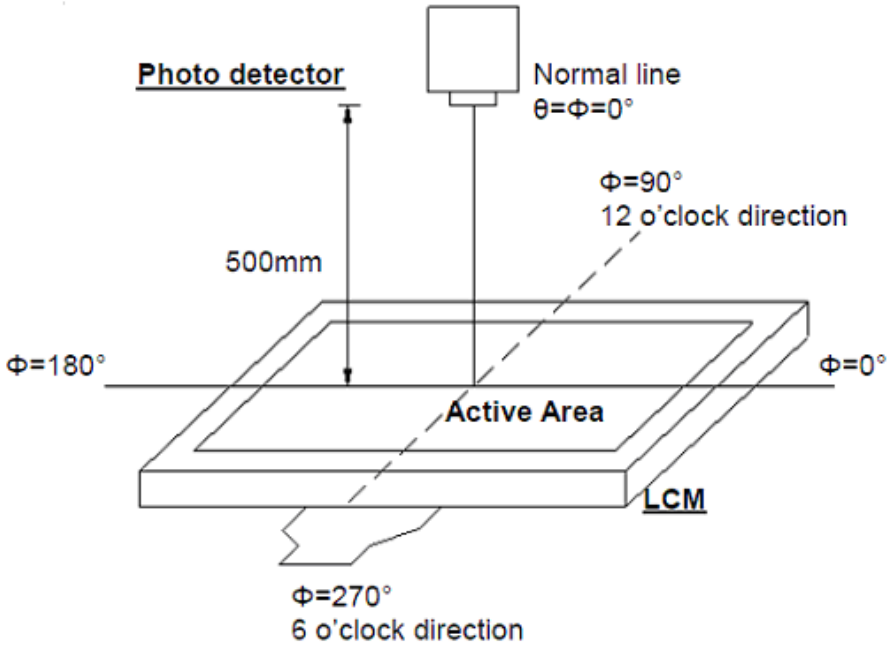


Fig. 6-2 Optical measurement system setup

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%.

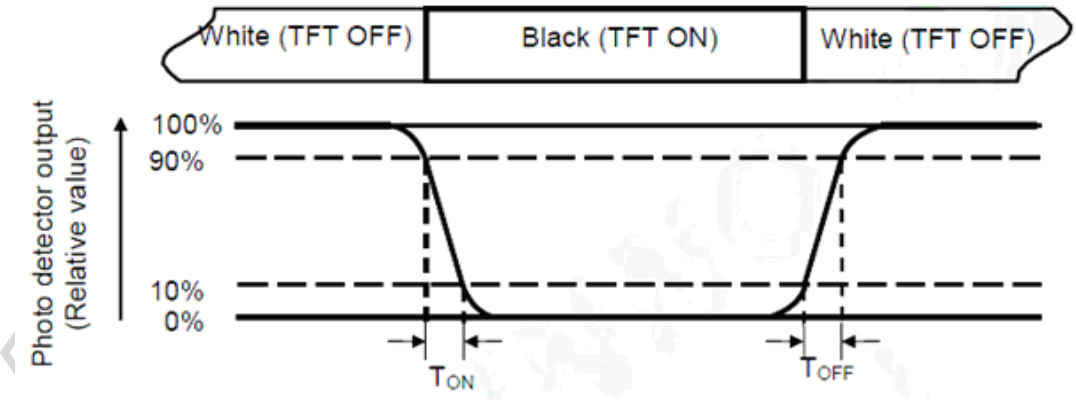


Fig. 6-3 Definition of response time

Note 4: Definition of contrast ratio

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

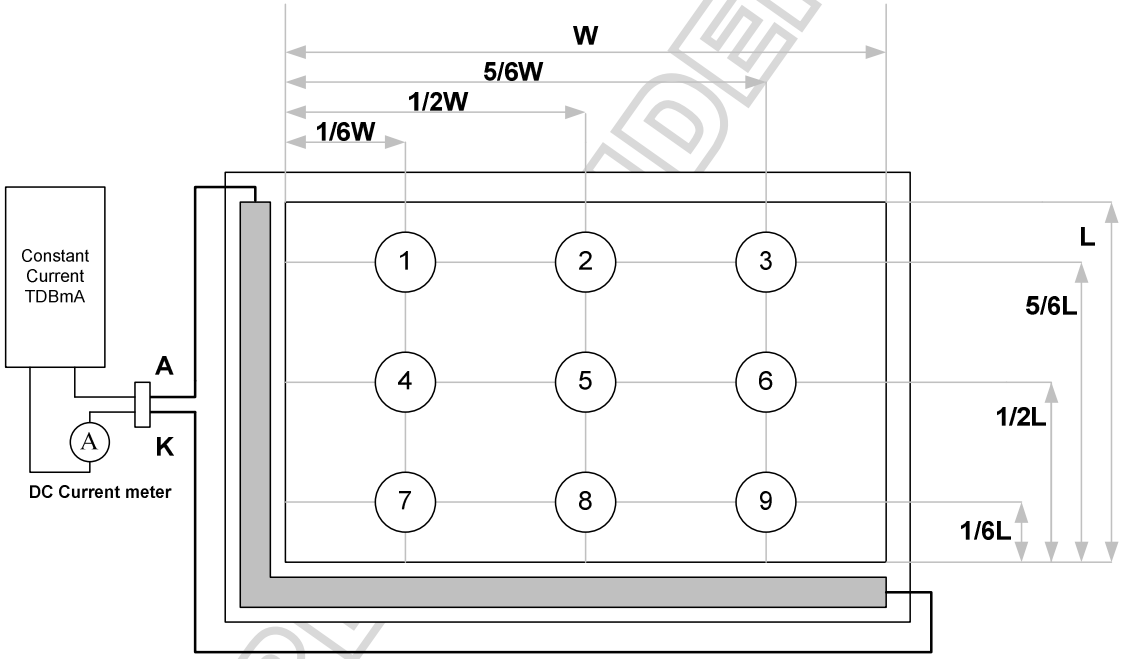
Note 5: Definition of color chromaticity (CIE1931)

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=600 mA.

Note 7: Definition of Luminance Uniformity

$$Luminance\ \ Uniformity\ (Yu) = \frac{B_{min}}{B_{max}}$$



B_{max}: The measured maximum luminance of all measurement position.

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

6. INTERFACE

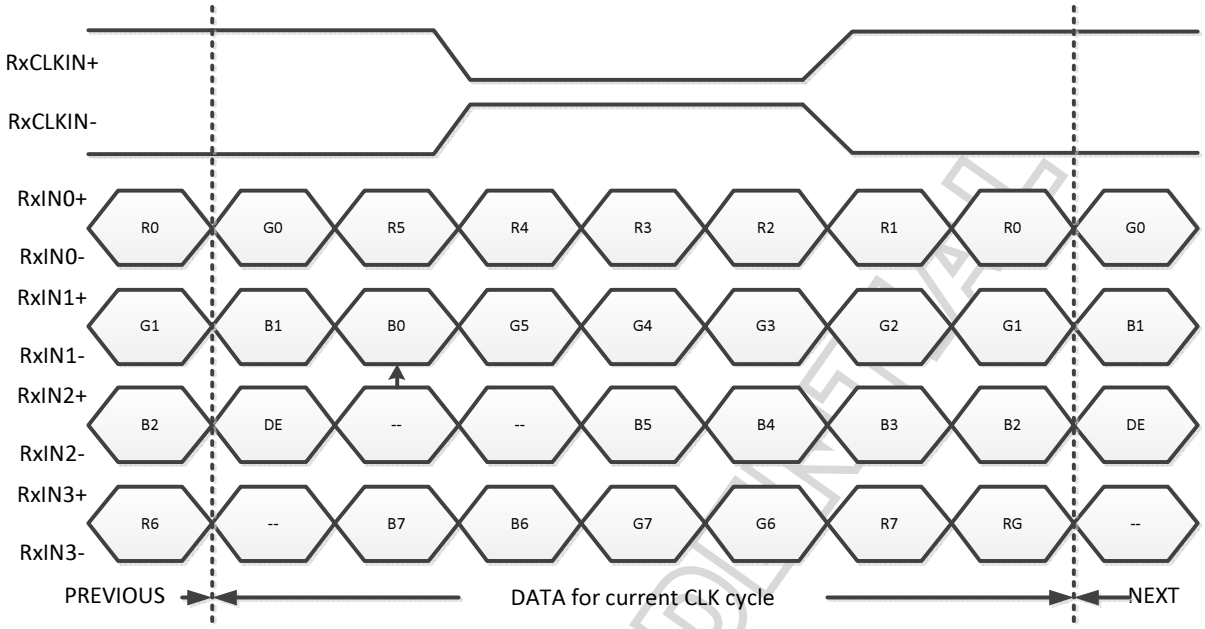
6.1. CN1: IPEX (20455-040E) or Equivalent

Pin No.	Symbol	I/O	Description	Note
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	NC	-	No connection	
33	NC	-	No connection	
34	NC	-	No connection	
35	NC	-	No connection	
36	NC	-	No connection	
37	NC	-	No connection	
38	GND	P	Power ground	
39	GND	P	Power ground	
40	GND	P	Power ground	

6.2. CN2 LED Back-light

Pin No.	Symbol	I/O	Description	Note
1	A	P	Anode	
2	A	P	Anode	
3	A	P	Anode	
4	K1	P	Cathode 1	
5	K2	I	Cathode 2	
6	K3	-	Cathode 3	
7	K4	-	Cathode 4	
8	K5	-	Cathode 5	
9	NTC_A	-	NTC_Anode	
10	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

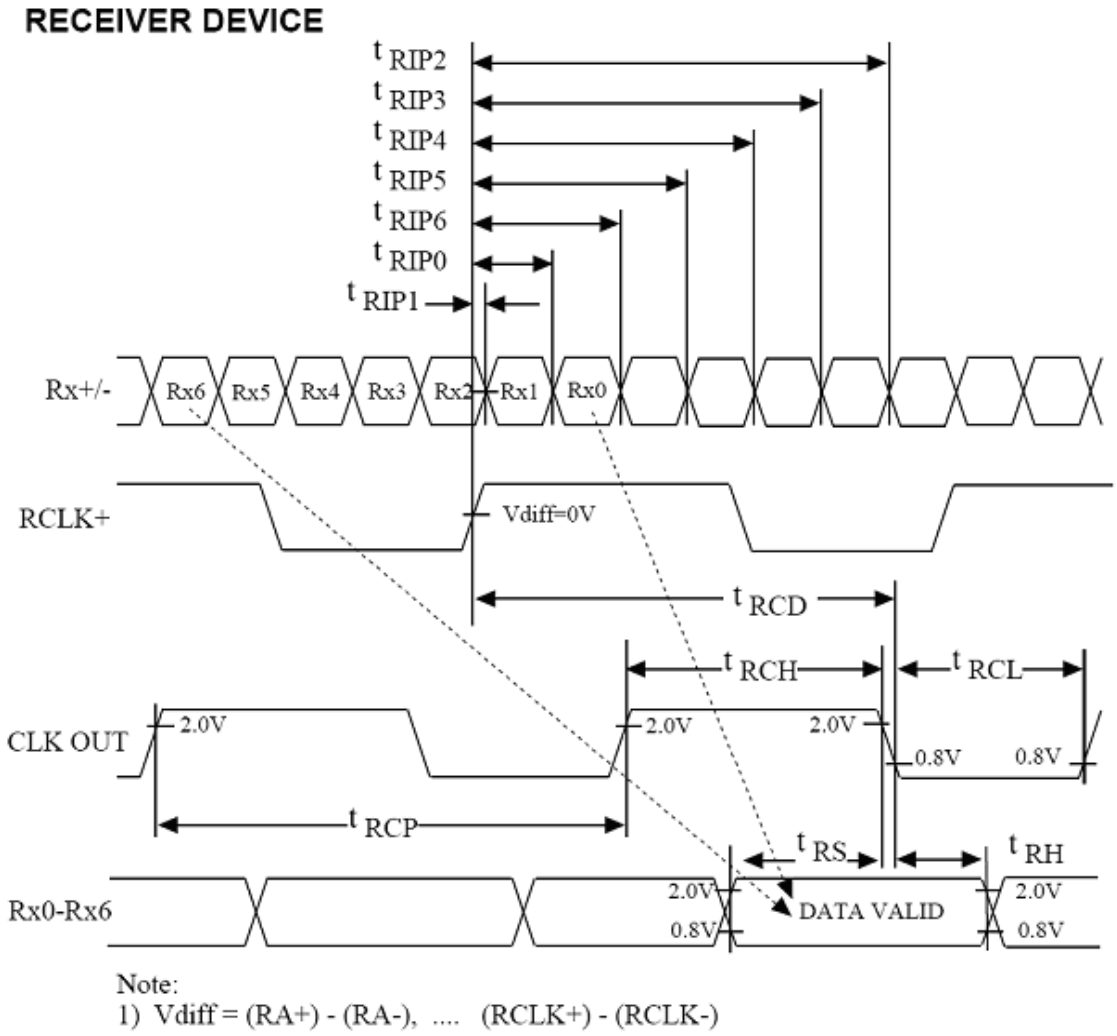
8.1. AC Timing characteristic of LVDS

Switching Characteristics

Vcc = 3.0 - 3.6V, Ta = -10 - +70 ˚C

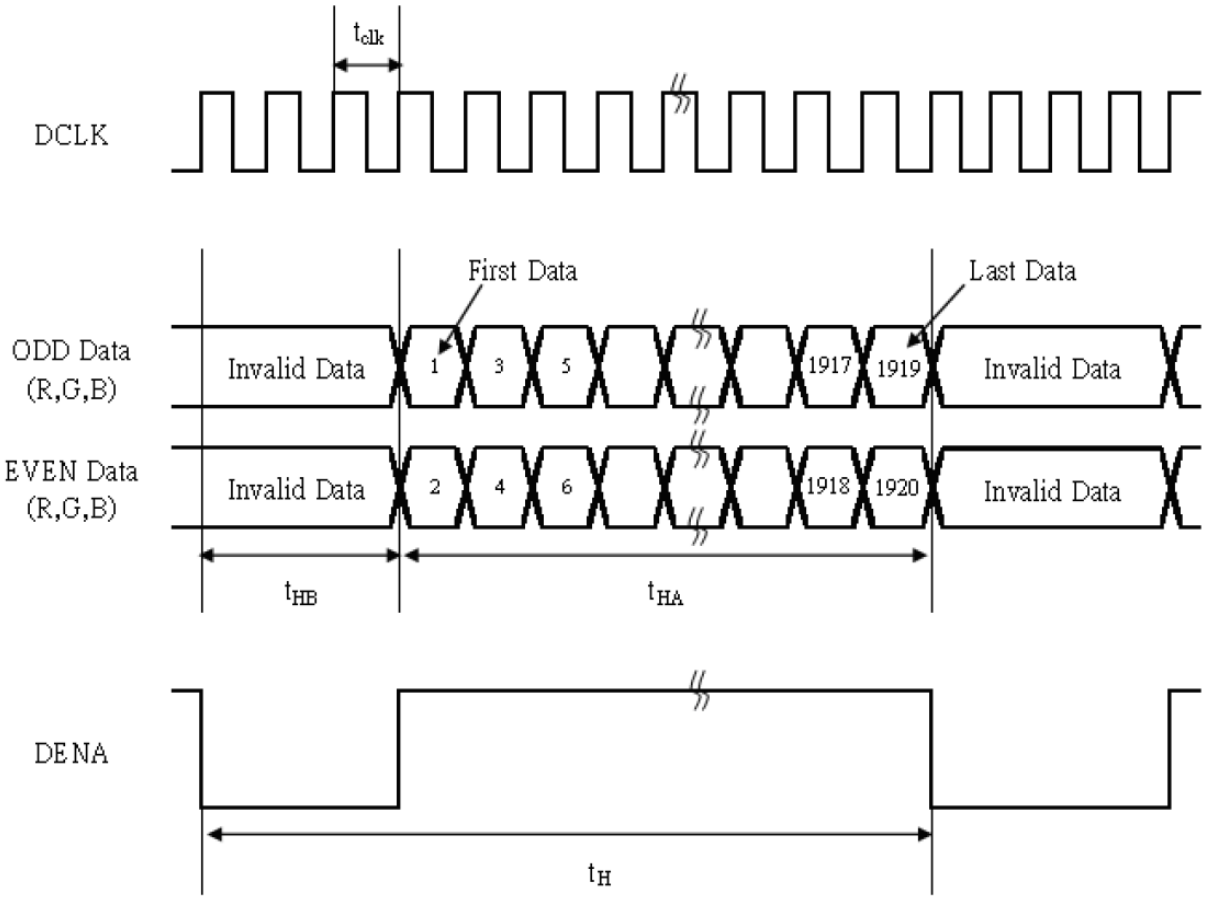
RECEIVER

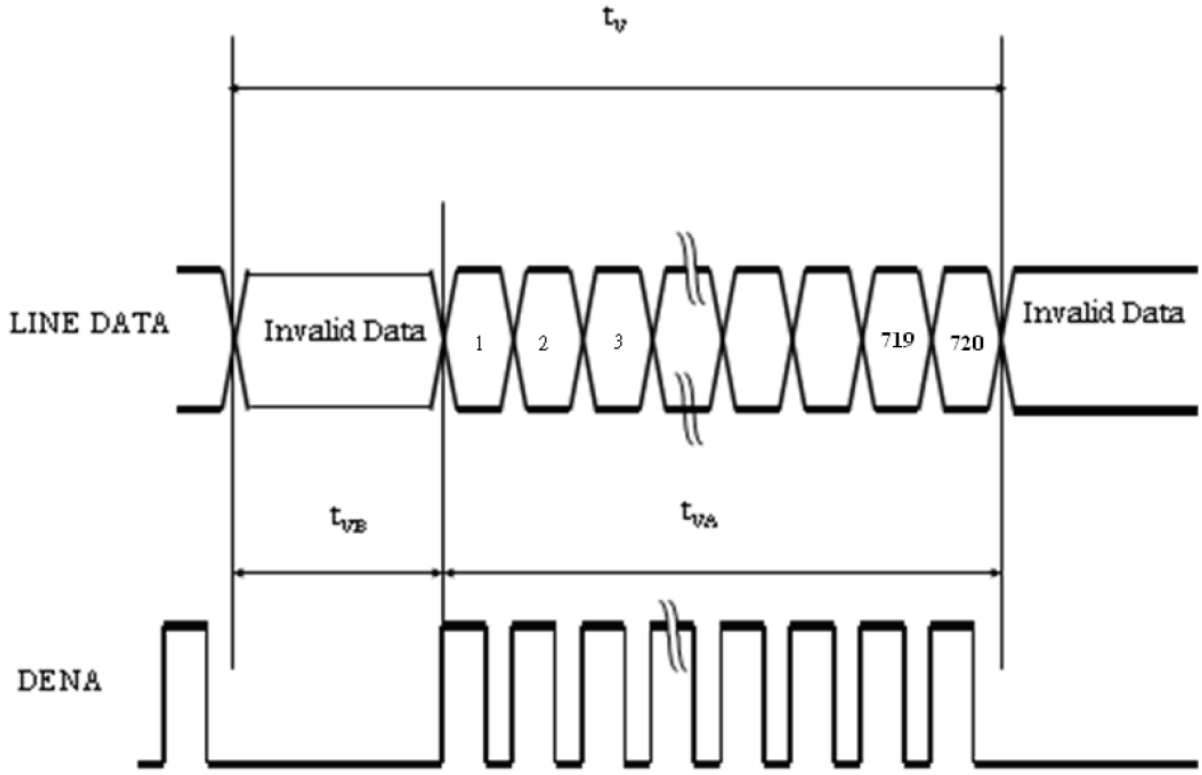
t_{RCP}	CLK OUT Period	11.76	T	50.0	ns
t_{RCH}	CLK OUT High Time		4T/7		ns
t_{RCL}	CLK OUT Low Time		3T/7		ns
t_{RCD}	RCLK+/- to CLK OUT Delay		5T/7		ns
t_{RS}	TTL Data Setup to CLK OUT	3T/7-2.5			ns
t_{RH}	TTL Data Hold from CLK OUT	4T/7-3.5			ns
t_{TLH}	TTL Low to High Transition Time		3.0	5.0	ns
t_{THL}	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



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

8.2. Timing characteristic of Panel (DE only mode)

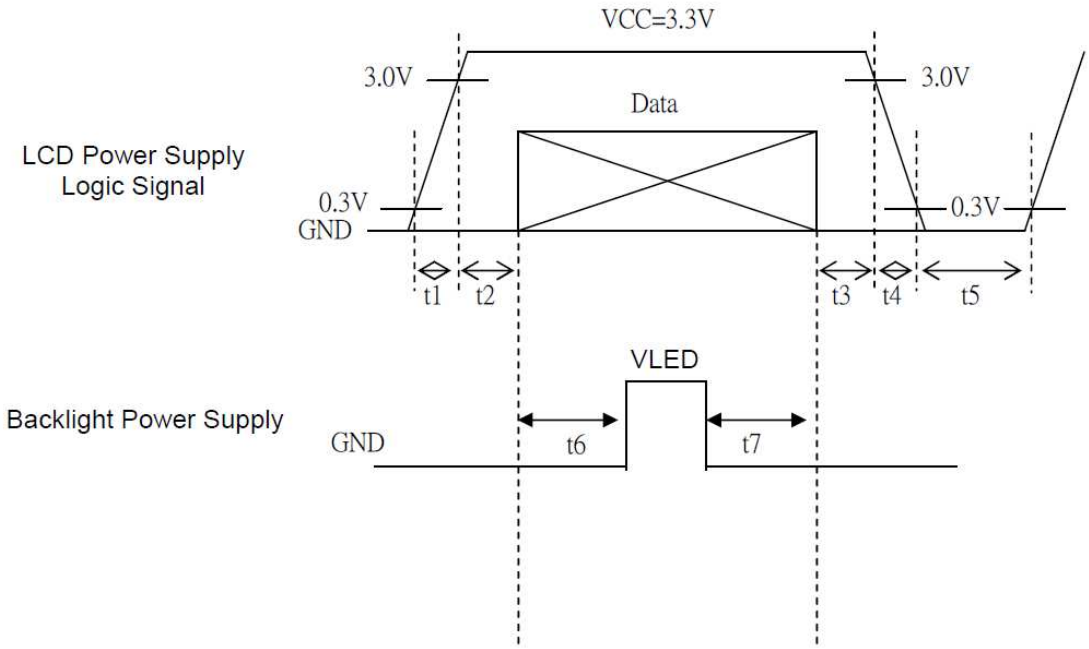




Timing Specification

Item				Symbol	Min	Typ	Max	Unit
LVDS input signal sequence	CLK Frequency			fCLKin	40	52.3	66.12	MHz
LCD input signal sequence （Input LVDS Transmitter）	DENA	Horizontal	Horizontal total Time	t_H	1070	1150	1230	tCLK
			Horizontal effective Time	t_{HA}		960		tCLK
			Horizontal Blank Time	t_{HB}	110	190	270	tCLK
			Vertical total Time	t_V	748	758	768	t_H
			Vertical effectiveTime	t_{VA}		720		t_H
			Vertical Blank Time	t_{VB}	28	38	48	t_H

8.3. Power ON/OFF Timing



Logical signal：RGB data, DCLK, DENA
Power ：VCC,VLED

0.5<t1≦10ms	200ms≦t6
0＜t2≦50ms	200ms≦t7
0＜t3≦50ms	
0＜t4≦10ms	
200ms≦t5	

9. RELIABILITY TEST CONDITIONS

Test Item	Test Conditions	Note
High Temperature Operation	85±3°C , t=1000 hrs	
Low Temperature Operation	-30±3°C , t=1000 hrs	
High Temperature Storage	95±3°C , t=1000 hrs	1,2
Low Temperature Storage	-40±3°C , t=1000 hrs	1,2
Thermal Shock Test	-40°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 (Packing)	Sweep frequency : 10 ~ 500 ~ 10 Hz/1min Amplitude : 0.75mm Test direction : X.Y.Z/3 axis Duration : 30min/each axis	2
Image Sticking	25 ℃± 2 ℃ ; 2&4hrs	3

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).

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.

Note 3 : Condition of Image Sticking test：25 ℃± 2 ℃

Operation with test pattern sustained for 2 and 4 hrs, then change to gray pattern immediately. After 5 mins, the mura must be disappeared completely .

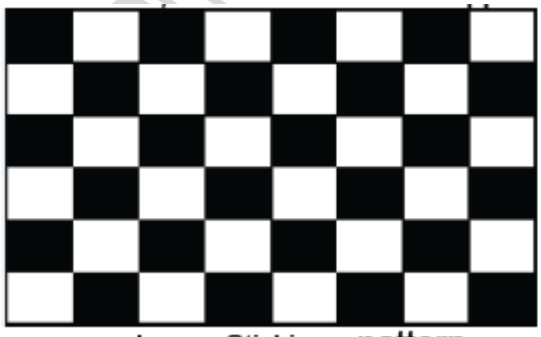
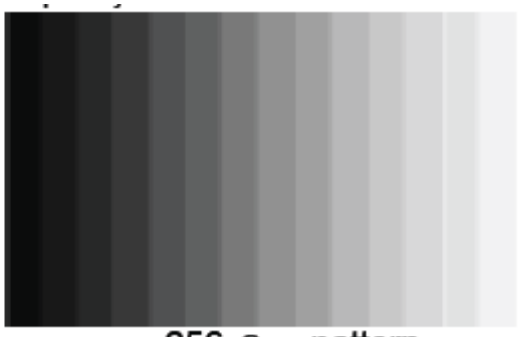


Image Sticking –pattern



256-Gray pattern

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

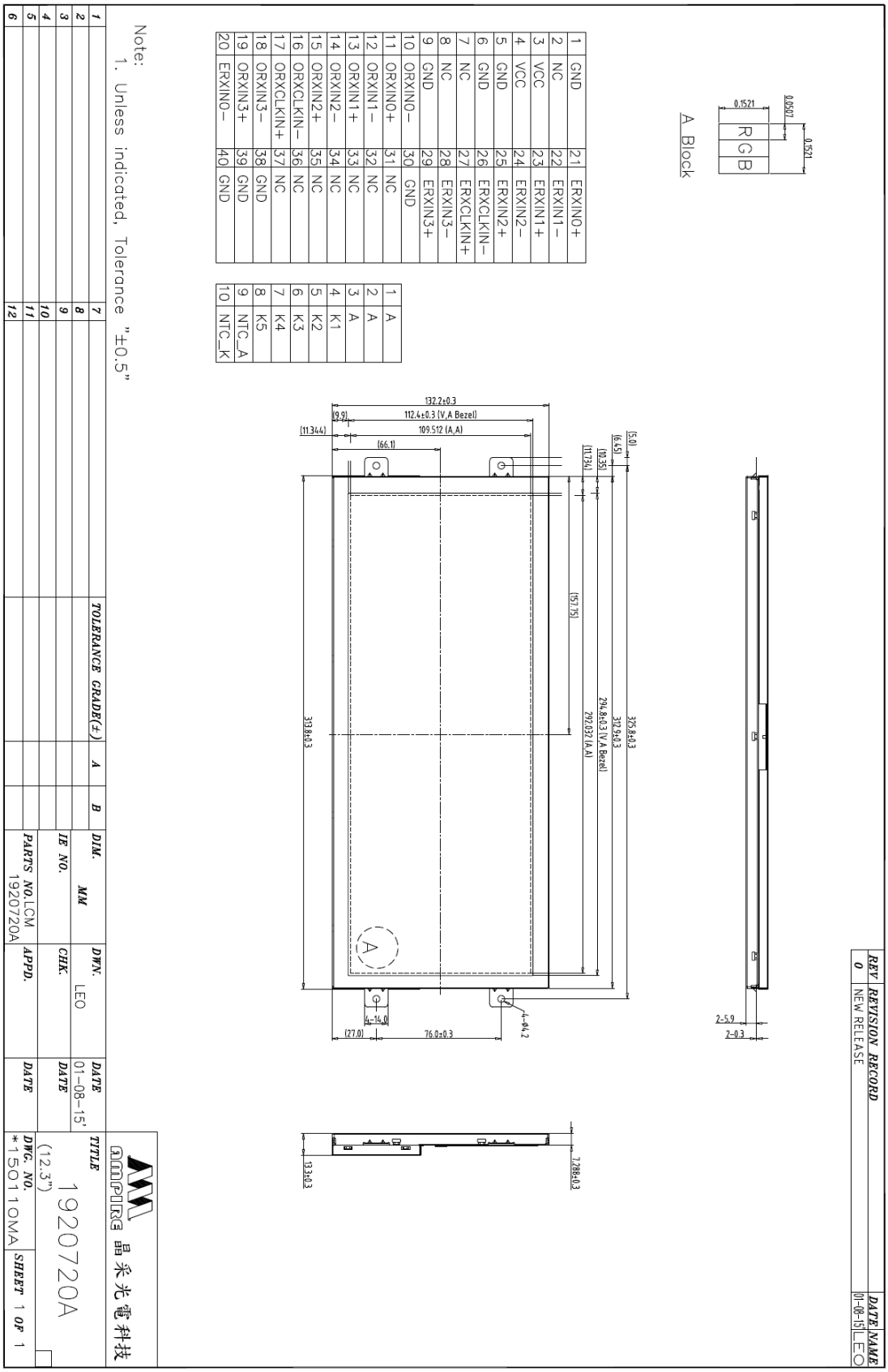
1) Do not boost the applied drive voltage abnormally. Failure to do so may break ICs. When applying power voltage, check the electrical features beforehand and be careful. Always turn off the power to the LC module controller before removing or inserting the LC module input connector. If the input connector 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.

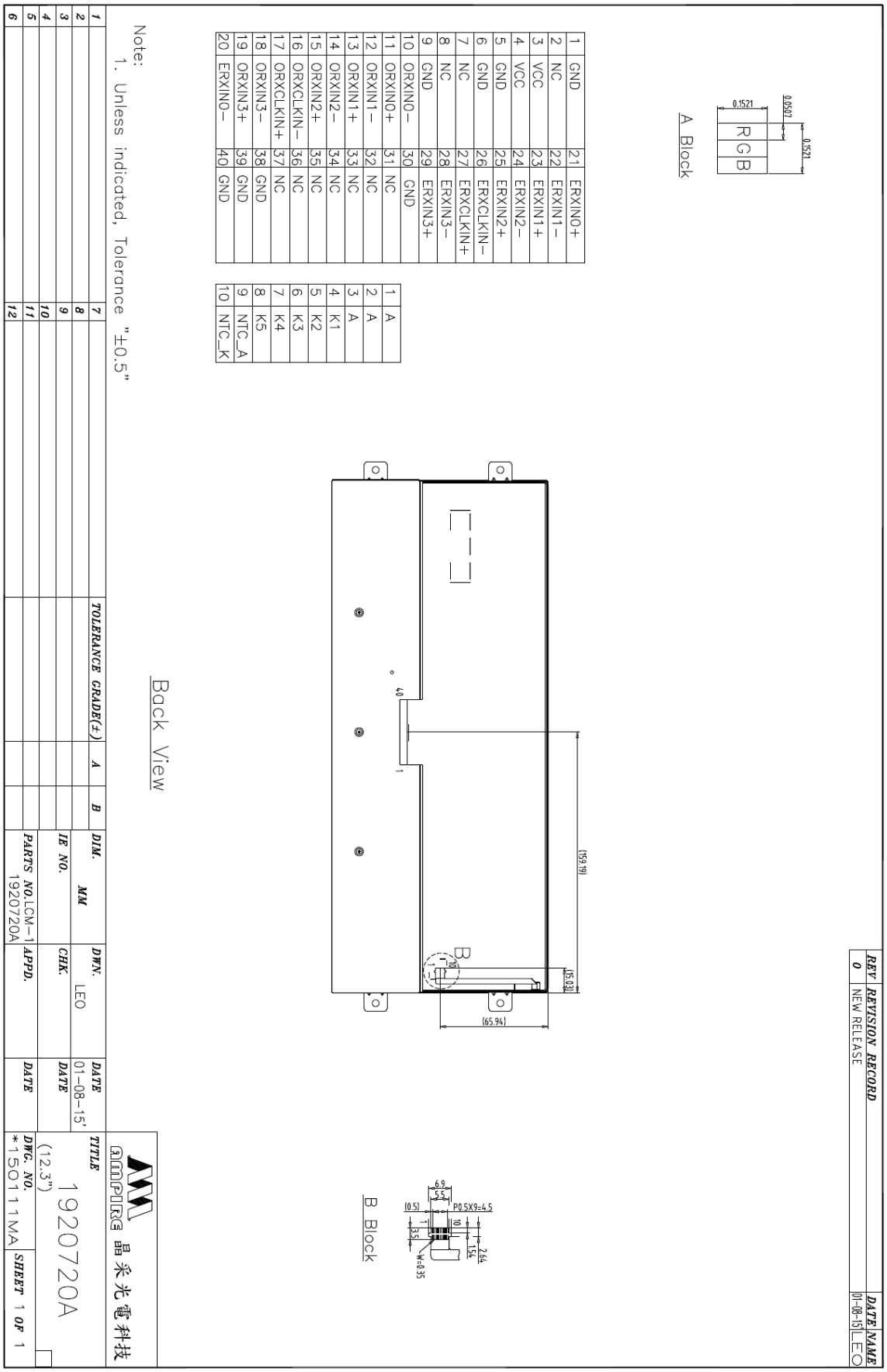
8) Crosstalk occurs because of characteristics of the LCD. In general, crosstalk occurs when the regularized display is maintained. Also, crosstalk is affected by the LC drive voltage. Design the contents of the display, considering crosstalk.

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) The residual image may exist if the same display pattern is shown for hours. This residual image, however, disappears when another display pattern is shown or the drive is interrupted and left for a while. But this is not a problem on reliability.
3) AMIPRE will provide one year warrantee for all products and three months warrantee for all repairing products.

11. OUTLINE DIMENSION





1	GND	21	ERXIN0+
2	NC	22	ERXIN1−
3	VCC	23	ERXIN1+
4	VCC	24	ERXIN2−
5	GND	25	ERXIN2+
6	GND	26	ERXCLKIN−
7	NC	27	ERXCLKIN+
8	NC	28	ERXIN3−
9	GND	29	ERXIN3+
10	ORXIN0−	30	GND
11	ORXIN0+	31	NC
12	ORXIN1−	32	NC
13	ORXIN1+	33	NC
14	ORXIN2−	34	NC
15	ORXIN2+	35	NC
16	ORXCLKIN−	36	NC
17	ORXCLKIN+	37	NC
18	ORXIN3−	38	GND
19	ORXIN3+	39	GND
20	ERXIN0−	40	GND

1	A
2	A
3	A
4	K1
5	K2
6	K3
7	K4
8	K5
9	NTC_A
10	NTC_K