



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-1024600YTZQW-00H
APPROVED BY	
DATE	

- Approved For Specifications
- Approved For Specifications & Sample

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RECORD OF REVISION

Revision Date	Page	Contents	Editor
2016/1/25	--	New Release	Alan
2017/2/2	11,18,19	Modify interface	Jessica

1. Features

This module is a color active matrix thin film transistor (TFT) liquid crystal display (LCD) that uses amorphous silicon TFT as a switching device. This TFT LCD has a 9.0 (16:9) inch diagonally measured active display area with WSVGA (1024 horizontal by 600 vertical pixel) resolution.

(1) 9 (16:9 diagonal) inch configuration.

(2) 16.2M color by 6bit + FRC.

(3) ROHS design & Halogen-Free Compliance.

2. PHYSICAL SPECIFICATIONS

Item	Specifications	unit
LCD size	9 inch (Diagonal)	
Resolution	1024 (RGB) x 600	dot
Dot pitch	0.192(W) x 0.19025(H)	mm
Active area	196.6(W) x 114.1(H)	mm
Module size	211.1(W) x 126.5(H) x6.8(D)	mm
Surface Treatment	Antiglare, Hard-Coating(3H)	
Display Mode	Normally Black	
Color arrangement	RGB Vertical stripe	
interface	LVDS	
Brightness	500	cd/m ²
Weight	240(Typ.)	g

3. ABSOLUTE MAX. RATINGS

Item	Symbol	Values		UNIT	Note
		Min.	Max.		
Power Consumption	Logic System	--	0.3	W	
	B/L System	--	2.76		
Operation temperature	TOP	-30	85	°C	
Storage temperature	TST	-30	85	°C	

4. ELECTRICAL CHARACTERISTICS

4-1 Typical Operation Conditions

TFT LCD Module

Parameters	Symbol	Min.	Max.	Unit	Note
Power Supply voltage	VDD	-0.3	5	V	
	AVDD	-0.5	15	V	
	VGH	-0.3	42	V	
	VGL	-20	0.3	V	
	VGH-VGL	-0.3	40	V	

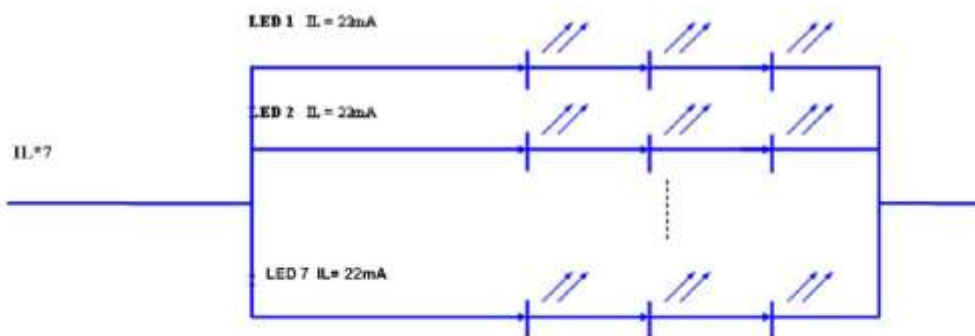
4-2 LED Driving Conditions

Parameter	Symbol	Min	Typ	Max	Units	Condition
LED Current	I_F	--	140	--	mA	$T_a=25^\circ\text{C}$
LED Voltage	V_F	--	10.5		Volt	$T_a=25^\circ\text{C}$
LED Life-Time	N/A	30,000	--	--	Hour	$T_a=25^\circ\text{C}$ $I_F=20\text{mA}$ Note (2)

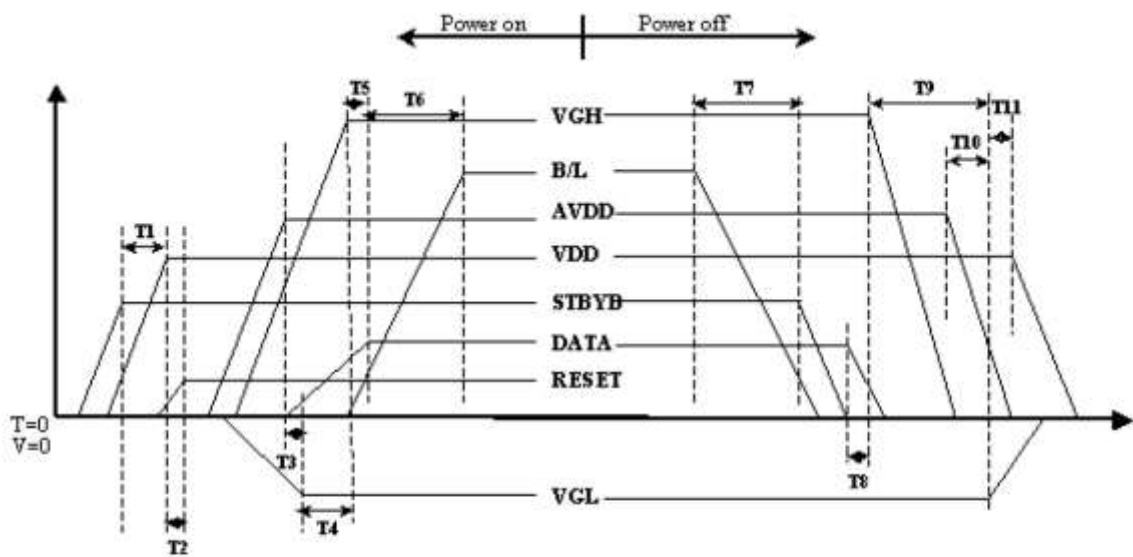
Note (1) LED life time (Hr) can be defined as the time in which it continues to operate under the condition: $T_a=25\pm 3^\circ\text{C}$, typical I_L value indicated in the above table until the brightness becomes less than 50%.

Note (2) The "LED life time" is defined as the module brightness decrease to 50% original brightness at $T_a=25^\circ\text{C}$ and $I_L=140\text{mA}$. The LED lifetime could be decreased if operating I_L is larger than 140mA. The constant current driving method is suggested.

Note (3) LED Light Bar Circuit



4-3 Power Sequence



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

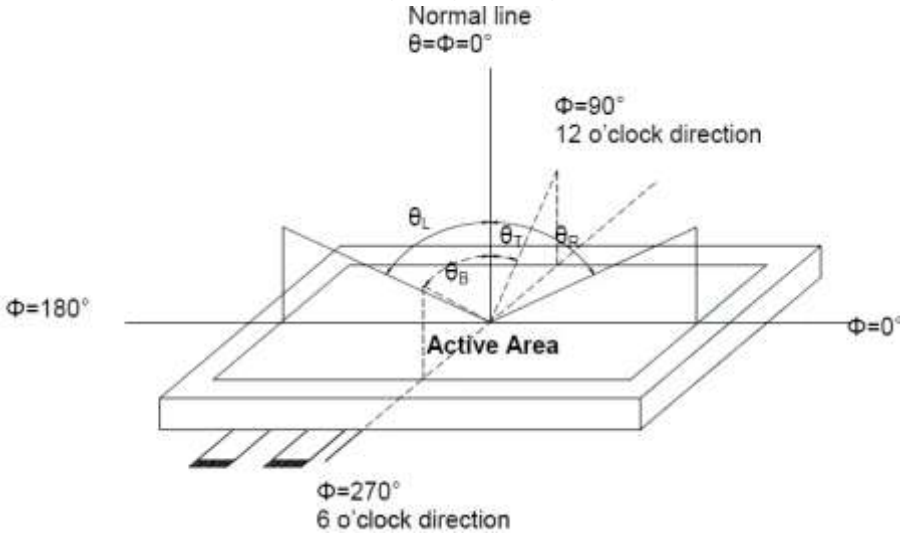
5. Optical Specifications

Item	Symbol	Condition	Values			Unit	Note
			Min.	Typ.	Max.		
Viewing angle (CR \geq 10)	θ L	$\Phi = 180^\circ$ (9 o'clock)	75	85	--	degree	Note1
	θ R	$\Phi = 0^\circ$ (3 o'clock)	75	85	--		
	θ T	$\Phi = 90^\circ$ (12 o'clock)	75	85	--		
	θ B	$\Phi = 270^\circ$ (6 o'clock)	75	85	--		
Response time	TON	Normal $\theta = \Phi = 0^\circ$	--	18	--	msec	Note3
	TOFF		--	17	--	msec	
Contrast ratio	CR		640	800	--	--	Note4
Color chromaticity	WX		0.260	0.310	0.360	--	Note5
	WY		0.280	0.330	0.380	--	Note6
Luminance	L		400	500	--	cd/m ²	Note6

Test Conditions:

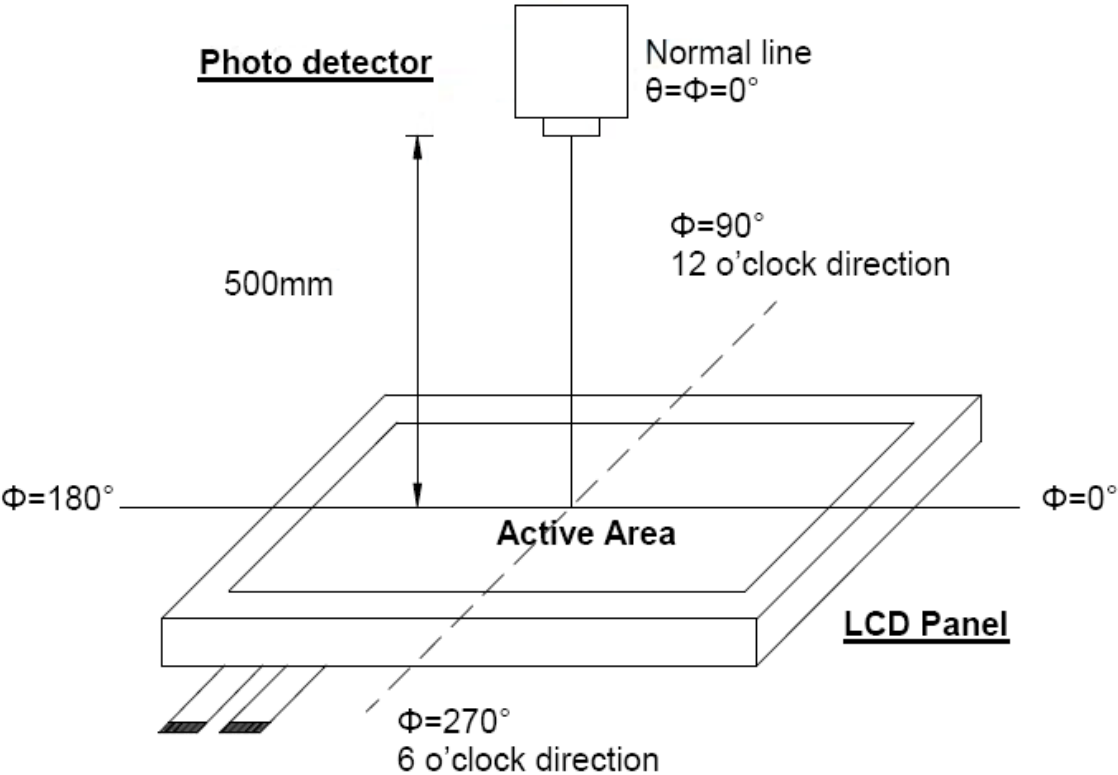
1. VCC = 3.3V, IL = 140mA (Backlight current), the ambient temperature is 25°C.
2. The test systems refer to Note 2.

Note 1 : Definition of viewing angle range



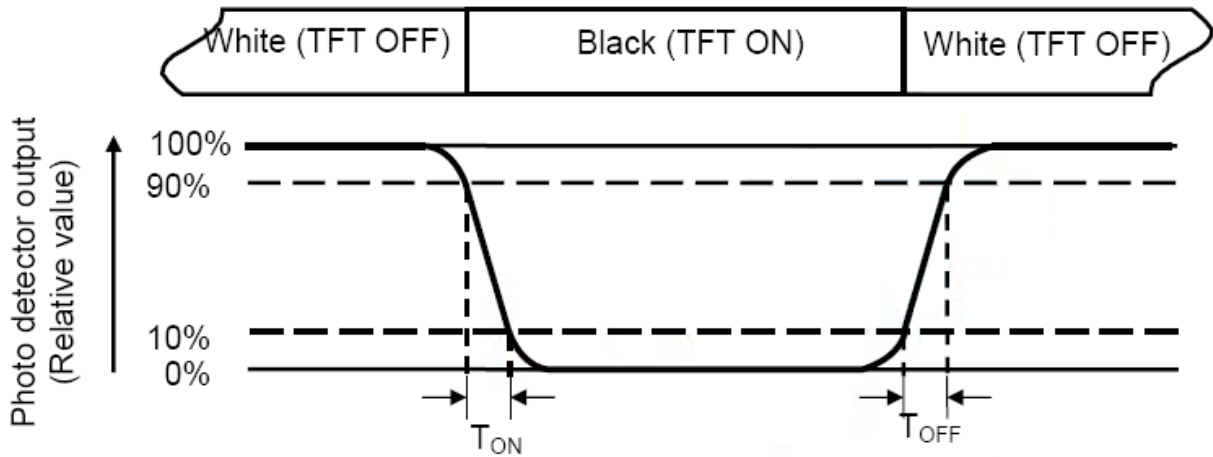
Note 2 : Definition of optical measurement system.

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. (Response time is measured by Photo detector TOPCON BM-7, other items are measured by BM-5A/Field of view : 1° / Height : 500mm.)



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 (T_{ON}) is the time between photo detector output intensity changed from 90% to 10%. And fall time (T_{OFF}) is the time between photo detector output intensity changed from 10% to 90%.



Note 4 : Definition of contrast ratio

$$\text{Contrast ratio (CR)} = \frac{\text{Luminance measured when LCD on the "White" state}}{\text{Luminance measured when LCD on the "Black" state}}$$

Note 5 : Definition of color chromaticity (CIE1931)

Color coordinated measured at center point of LCD.

Note 6 : All input terminals LCD panel must be ground when measuring the center area of the panel.

6. INTERFACE

Pin No.	Symbol	I/O	Function	Note
1	VCOM	P	Common Voltage	
2	VDD	P	Power Voltage for digital circuit	
3	VDD	P	Power Voltage for digital circuit	
4	NC	---	No connection	
5	Reset	I	Global reset pin	Note1
6	U/D	I	Vertical inversion	Note2
7	L/R	I	Horizontal inversion	Note2
8	STBYB	I	Standby mode, Normally pulled high STBYB = "1", normal operation STBYB = "0", timing controller, source driver will turn off, all output are High-Z	
9	GND	P	Ground	
10	RXCLKIN-	I	- LVDS differential data input	
11	RXCLKIN+	I	+ LVDS differential data input	
12	GND	P	Ground	
13	RXIN0-	I	- LVDS differential data input	
14	RXIN0+	I	+ LVDS differential data input	
15	GND	P	Ground	
16	RXIN1-	I	- LVDS differential data input	
17	RXIN1+	I	+ LVDS differential data input	
18	GND	P	Ground	
19	RXIN2-	I	- LVDS differential clock input	
20	RXIN2+	I	+ LVDS differential clock input	
21	GND	P	Ground	
22	RXIN3-	I	- LVDS differential data input	
23	RXIN3+	I	+ LVDS differential data input	
24	GND	P	Ground	
25	SELB	I	6bit/8bit mode selection	Note3
26	GND	P	Ground	
27	AVDD	P	Power for Analog Circuit	
28	GND	P	Ground	
29	VGH	P	Gate ON Voltage	
30	NC	---	No connection	
31	NC	---	No connection	
32	VGL	P	Gate off Voltage	
33	GND	P	Ground	
34	NC	---	No connection	

Pin No.	Symbol	I/O	Function	Note
35	NC	P	No connection	
36		P		
37		---		
38		---		
39		P		
40		P		

I: input O: Output P: Power

Note1 : Global reset pin: Active low to enter reset mode. Suggest connecting with an RC reset circuit for stability. Normally pull high. (R=10KΩ, C=0.1μF)

Note: If RC is not added, users must follow the rule, T2 > 50ms on page 18 item 6.5 power on/off sequence.

Note2 : When L/R="0", set right to left scan direction.

When L/R="1", set left to right scan direction.

When U/D="0", set top to bottom scan direction.

When U/D="1", set bottom to top scan direction.

Note3 : If LVDS input data is 6 bits, SELB must be set to High;

If LVDS input data is 8 bits, SELB must be set to Low.

7. TIMING CHARACTERISTICS

7-1 Electrical Characteristics TFT LCD Module

Item	Symbol	Min.	Typ.	Max.	Unit	Note
Supply Voltage	VDD	3.0	3.3	3.6	V	
	VGH	22	23	24	V	Note (1)
	VGL	-9	-10	-11	V	Note (2)
	AVDD	12.3	12.6	12.9	V	
	VCOM	4	4.5	5	V	Note (3)
Input signal voltage	V _{IH}	0.7 VDD	-	VDD	V	
	V _{IL}	0	-	0.3 VDD	V	
Current of power supply	I _{DD}	-	(TBD)	-	mA	VDD =3.3V
	I _{ADD}	-	(TBD)	-	mA	AVDD=12.6V
	I _{GH}	-	(TBD)	-	mA	VGH=23V
	I _{GL}	-	(TBD)	-	mA	VGL=-10V
	I _{vcom}	(TBD)	--	--	mA	VCOM=4.5V

Switching Characteristics for LVDS Receiver

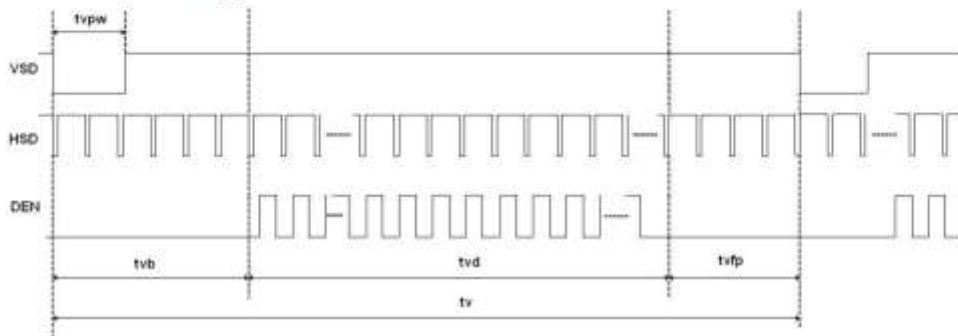
Item	Symbol	Min.	Typ.	Max.	Unit	Conditions
Differential Input High Threshold	V _{th}	—	—	100	mV	V _{CM} =1.2V
Differential Input Low Threshold	V _{tl}	-100	—	—	mV	
Input Current	I _{IN}	-10	—	+10	uA	
Differential input Voltage	V _{ID}	0.1	—	0.6	V	
Common Mode Voltage Offset	V _{CM}	0.7	1.2	1.6	V	

7-3 Timing(DE MODE)

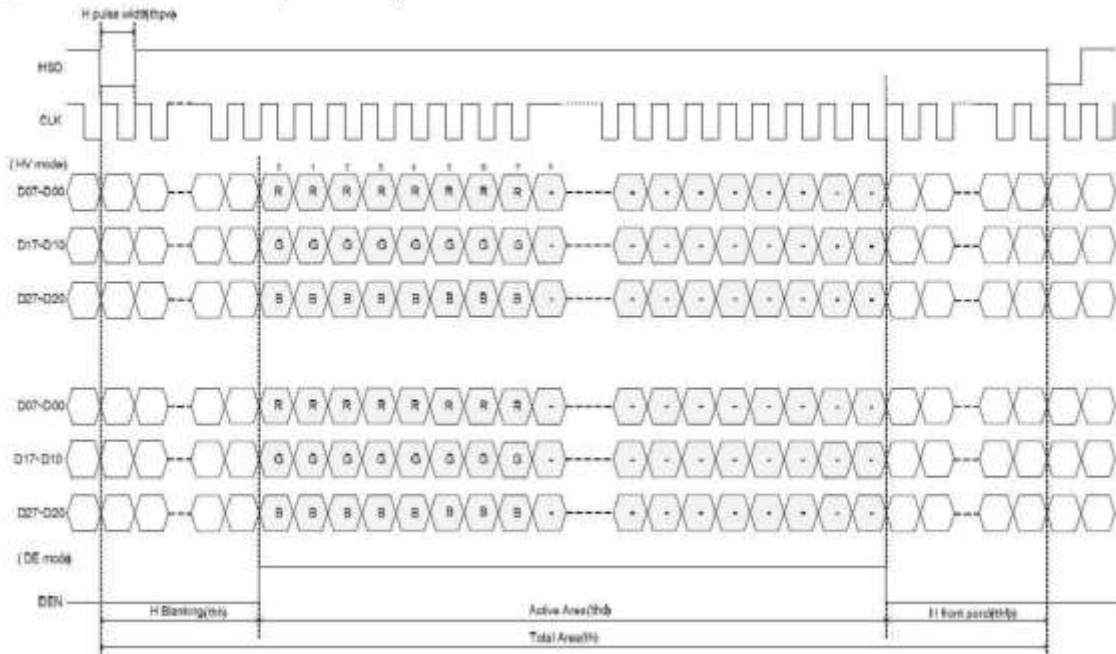
Parameter	Symbol	Value			Unit
		Min.	Typ.	Max.	
DCLK frequency @Frame rate=60hz	fclk	40.8	51.2	67.2	Mhz
Horizontal display area	thd	1024			DCLK
HSYNC period time	th	1114	1344	1400	DCLK
HSYNC blanking	thb+thfp	90	320	376	DCLK
Vertical display area	tvd	600			H
VSYNC period time	tv	610	635	800	H
VSYNC blanking	tvb+tvfp	10	35	200	H

Timing Diagram of Interface Signal (DE mode)

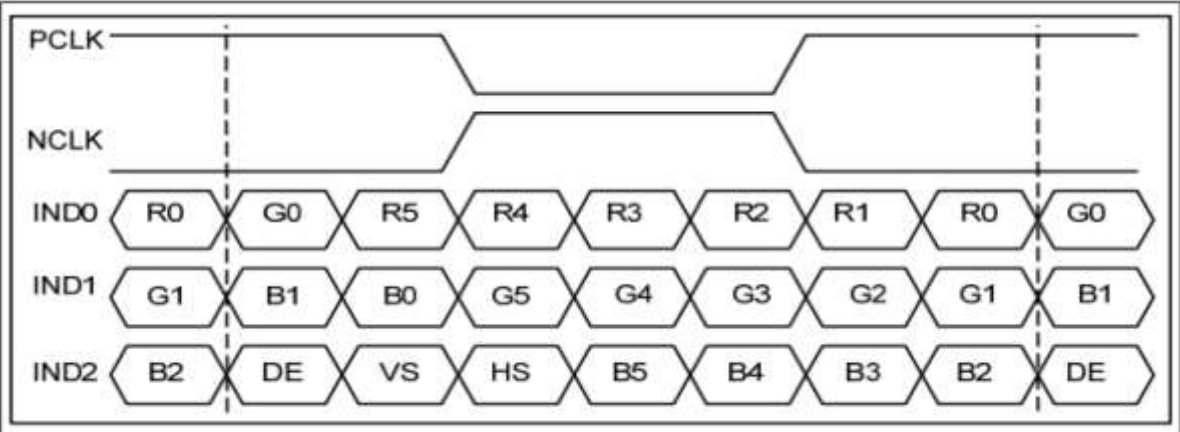
(1) Vertical input timing



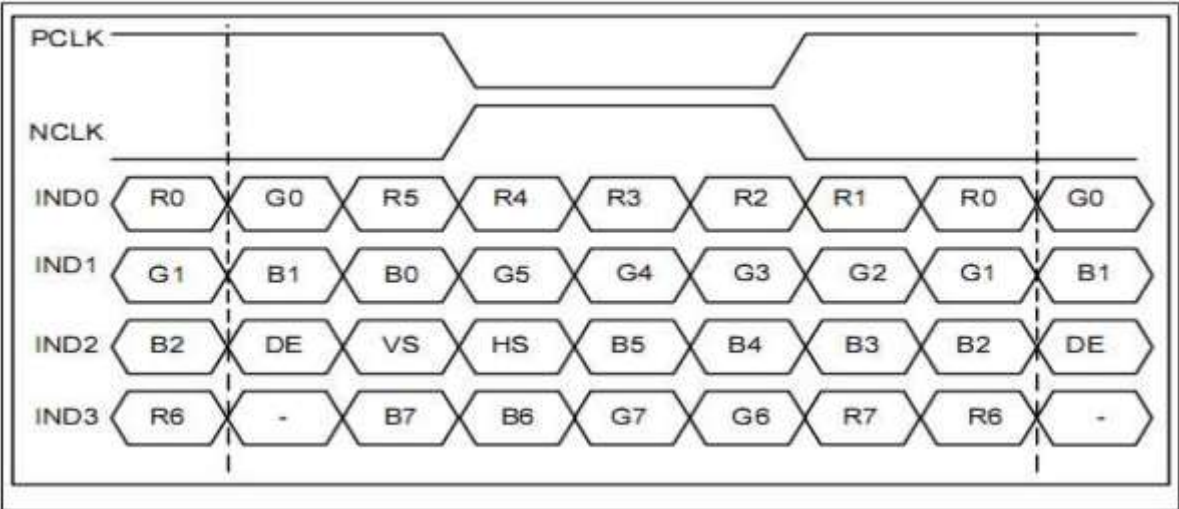
(2) Horizontal Vertical input timing



6bit LVDS input



8bit LVDS input



8 RELIABILITY TEST CONDITIONS

Test Item	Test Conditions	Note
High Temperature Operation	85±3°C ,Dry t=240 hrs	
Low Temperature Operation	-30±3°C, Dry t=240 hrs	
High Temperature Storage	85±3°C , Dry t=240 hrs	1,2
Low Temperature Storage	-30±3°C ,Dry t=240 hrs	1,2
Thermal Shock Test	-30°C ~ 25°C ~ 85°C 30 m in. 5 min. 30 min. (1 cycle) Total 100 cycle(Dry)	1,2
Storage Humidity Test	60 °C, Humidity 90%, 240 hrs	1,2

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.

9. USE PRECAUTIONS

9-1 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.

(1) 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.

9-2 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

9-3 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.

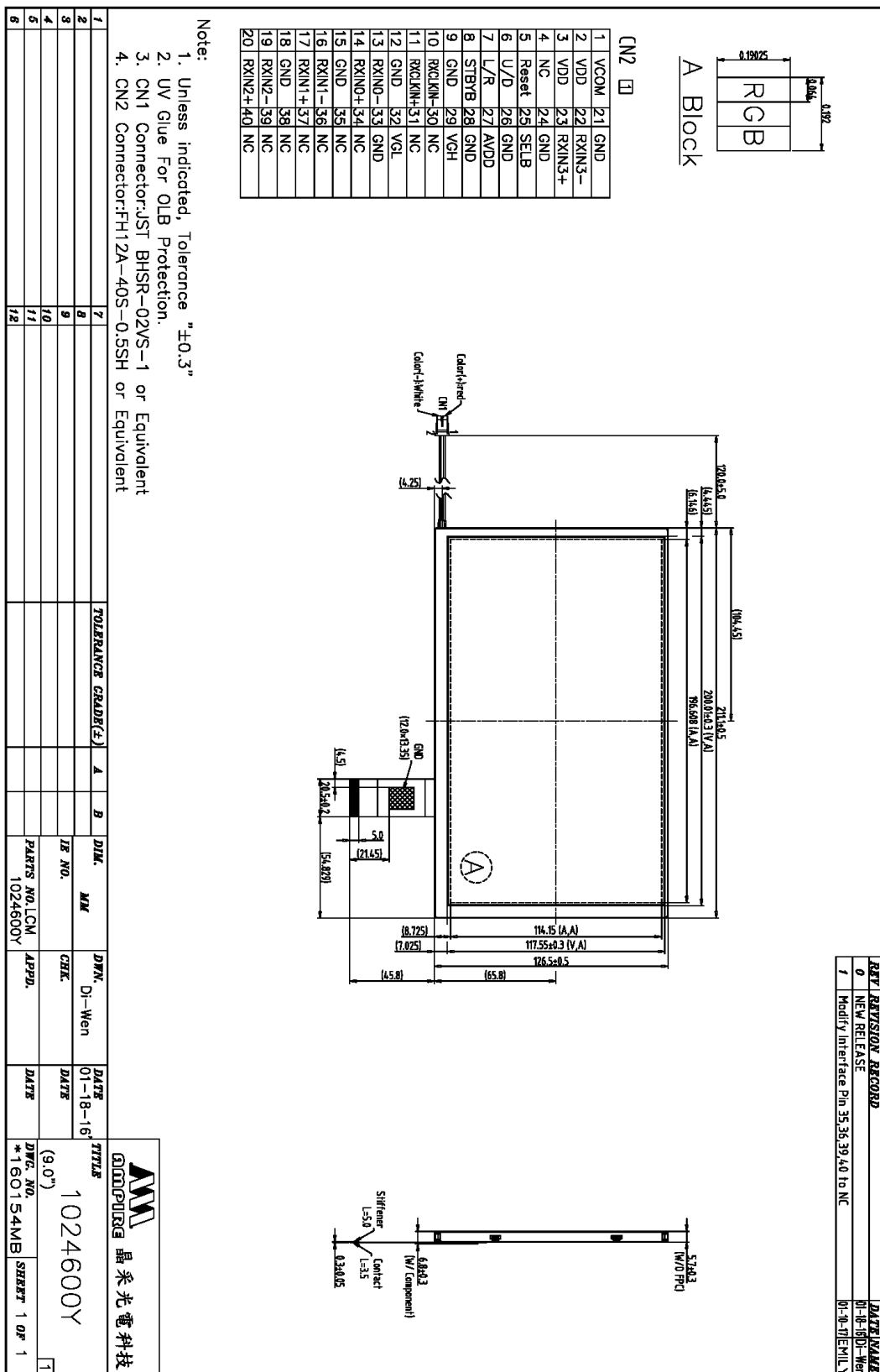
9-4 Operating precautions

- (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 drive 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: 0.2V_{dd} or less and H level: 0.8V_{dd} 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.

9-5 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 warranty for all products and three months warranty for all repairing products..

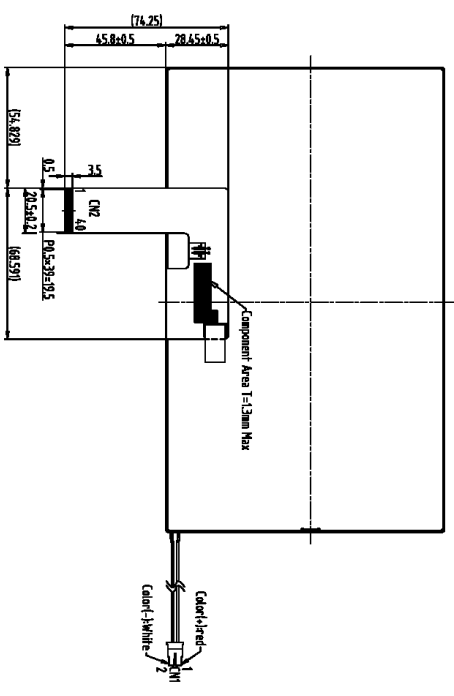
10. OUTLINE DIMENSION



REV	REVISION RECORD	DATE
0	NEW RELEASE	01-18-16
1	Modify Interface Pin 35,36,39,40 to NC	01-10-17 E.M.L.Y

CN2 □

1	VCOM	21	GND
2	VDD	22	RXIN3-
3	VDD	23	RXIN3+
4	NC	24	GND
5	Reset	25	SELB
6	U/D	26	GND
7	L/R	27	AVDD
8	STBYB	28	GND
9	GND	29	VGH
10	RXKINH	30	NC
11	RXKINH	31	NC
12	GND	32	VGL
13	RXIND	33	GND
14	RXIND	34	NC
15	GND	35	NC
16	RXIN1	36	NC
17	RXIN1	37	NC
18	GND	38	NC
19	RXIN2	39	NC
20	RXIN2	40	NC



Back View

- Note:
1. Unless indicated, Tolerance "±0.3"
 2. UV Glue For OLB Protection.
 3. CN1 Connector: JST BHSR-02VS-1 or Equivalent
 4. CN2 Connector: FH12A-40S-0.5SH or Equivalent

1	7	TOLERANCE GRADY(%)	A	B	DIR.	MM	DIVN.	DATE
2	8				IR NO.		Di-Wen	01-18-16
3	9						CHK	DATE
4	10				PARTS NO./LCM--1		APPL.	DATE
5	11				1024600Y			
6	12							



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TITLE
 1024600Y
 DWG. NO.
 *1601SSMB
 SHEET 1 OF 1