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-1024768ATZQW-30
APPROVED BY	
DATE	

☐Approved For Specifications

☐**Approved For Specifications & Sample**

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RECORD OF REVISION

Revision Date	Page	Contents	Editor
2018/03/01	--	New Release	Raymond

1.0 General Descriptions

1.1 Introduction

AM-1024768ATZQW-30 is a 15.0” TFT Liquid Crystal Display IAV module with LED Backlight units and 20 pins LVDS interface. This module supports 1024 x 768 XGA mode and can display 16.2M/262k colors.

The PSWG is to establish a set of displays with standard mechanical dimensions and select electrical interface requirements for an industry standard 15.0” XGA LCD panel and the LED driving device for Backlight is built in PCBA.

1.2 Features

- XGA (1024 x 768 pixels) resolution
- DE (Data Enable) only mode
- LVDS Interface with 1pixel/clock
- PSWG (Panel Standardization Working Group)
- Wide operating temperature.
- RoHS compliance

1.3 Application

-TFT LCD Monitor

- Factory Application
- Amusement
- Vehicle

1.4 General specifications

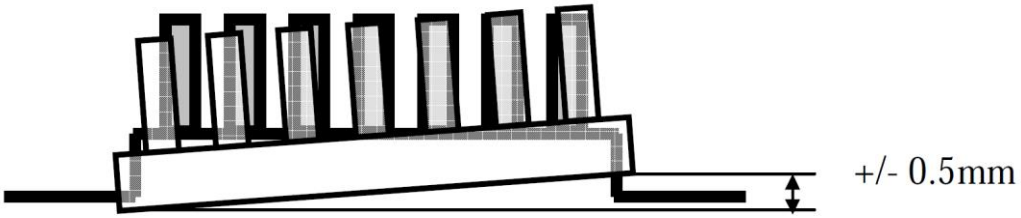
Items	Specifications	Unit	Note
Active Area	304.1 (H) x 228.1(V) (15.0” diagonal)	mm	
Bezel Opening Area	307.4(H) x 231.3(V)	mm	
Driver Element	a-Si TFT active matrix	-	
Pixel Number	1024 x R.G.B x 768	Pixel	
Pixel Pitch	0.297(H) x 0.297(W)	mm	
Pixel Arrangement	RGB vertical Stripe		
Display Colors	16.2M / 262K	Color	
Display Mode	Normally Black	-	
Surface Treatment	Hard Coating (3H), Anti-Glare	-	

1.5 Mechanical specifications

Item		Min.	Typ.	Max	Unit	Note
Module Size	Horizontal(H)	326	326.5	327	mm	(1)
	Vertical(V)	253	253.5	254	mm	(1)(2)
	Depth(D)	8.6	9.1	9.6	mm	
Bezel Area	Horizontal	307.1	307.4	307.7	mm	
	Vertical	231	231.3	231.6	mm	
Active Area	Horizontal	-	304.1	-	mm	
	Vertical	-	-	-	mm	

Note (1) Please refer to the attached drawings for more information of front and back outline dimensions.

Note (2) The depth is without connector.



2.0 Absolute Maximum Ratings

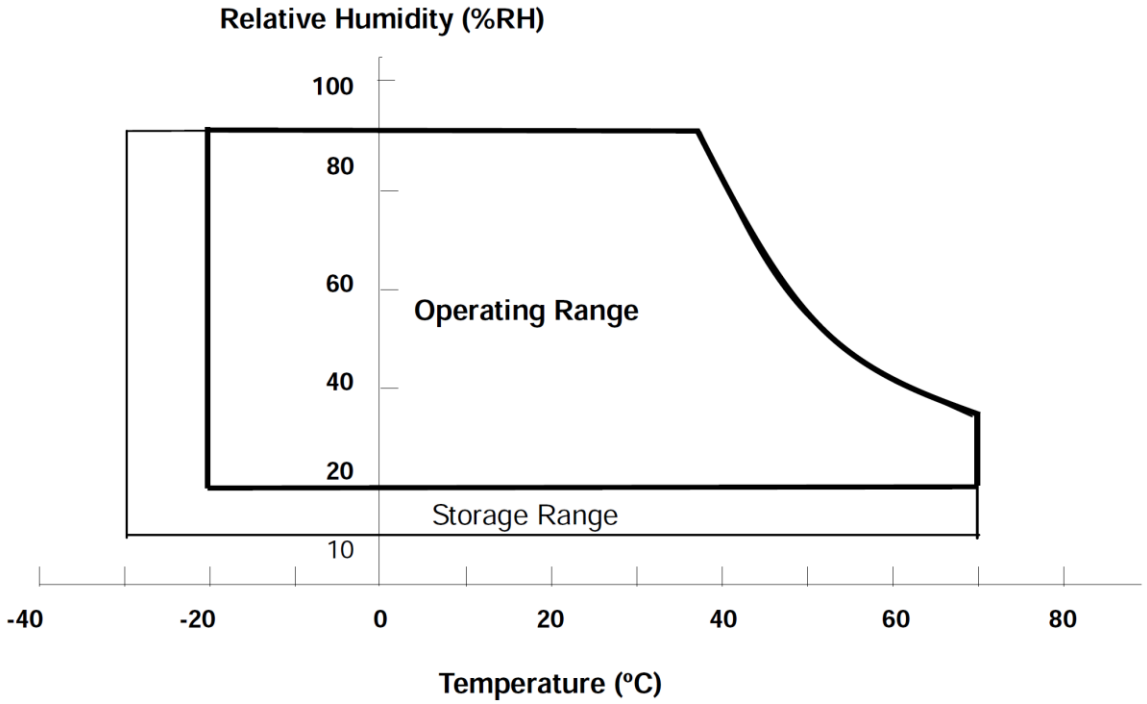
2.1 ABSOLUTE RATINGS OF ENVIRONMENT

Item	Symbol	Min	Max	Unit	Note
Operating Ambient Temperature	T_{OP}	-20	+70	℃	(1)(2)(3)
Storage Temperature	T_{ST}	-30	+70	℃	(1)(2)(3)

Note (1) Temperature and relative humidity range is shown in the figure below.

(2) 90 %RH Max. (Ta < 40℃).

(3) Wet-bulb temperature should be 39℃ Max.



2.2 ELECTRICAL ABSOLUTE RATINGS

2.2.1 TFT LCD MODULE

Item	Symbol	Min	Max	Unit	Note
Power Supply Voltage	V_{CC}	-0.3	4	V	(1)

Item	Symbol	Min	Max	Unit	Note
Converter Voltage	V_i	-0.3	18	V	(1)(2)
Enable Voltage	EN	-	5.5	V	

Note (1) Permanent damage to the device may occur if maximum values are exceeded. Function operation should be restricted to the conditions described under Normal Operating Conditions.

Note (2) Specified values are for lamp (Refer to 3.2 for further information).

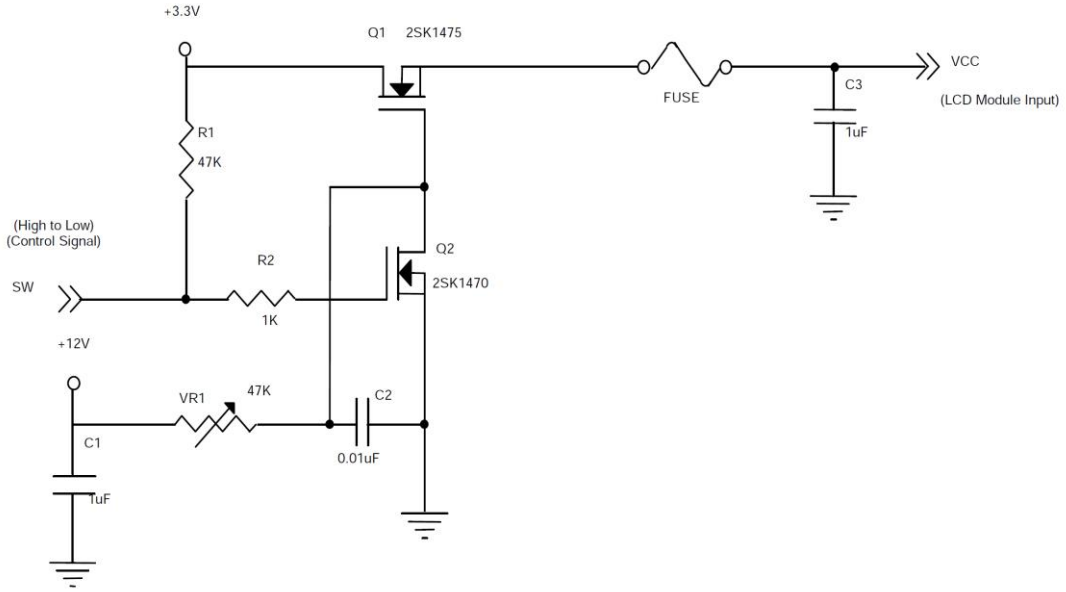
3. ELECTRICAL CHARACTERISTICS

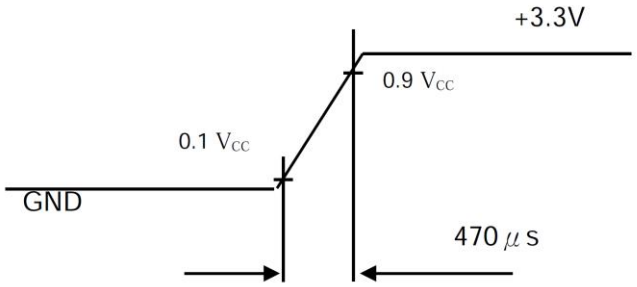
3.1 TFT LCD MODULE

Item		Symbol	Value			Unit	Note
			Min.	Typ.	Max		
Power Supply Voltage		V_{CC}	3.0	3.3	3.6	V	-
Ripple Voltage		V_{RIP}	-	-	100	mVp-p	(2)
Rush Current		I_{RUSH}	-	-	2.0	A	(3)a
Power Supply Current	White	I_{CC}	-	800	960	mA	(3)b
	Black		-	670	800	mA	
LVDS differential input voltage		V_{id}	200	-	600	mV	
LVDS common input voltage		V_{ic}	1.0	1.2	1.4	V	
Differential Input Voltage for LVDS Receiver Threshold	"H" level	V_{IH}	-	-	100	mV	
	"L" level	V_{IL}	-100	-	-	mV	
Terminating Resistor		R_T	-	100	-	ohm	

Note (1) The module should be always operated within above ranges.

Note (2) Measurement Conditions:





Note (3) The specified power supply current is under the conditions at V_{DD} =3.3V, Ta = 25 ± 2 ℃, DC Current and f_v = 60 Hz, whereas a power dissipation check pattern below is displayed.

a. White Pattern

Active Area

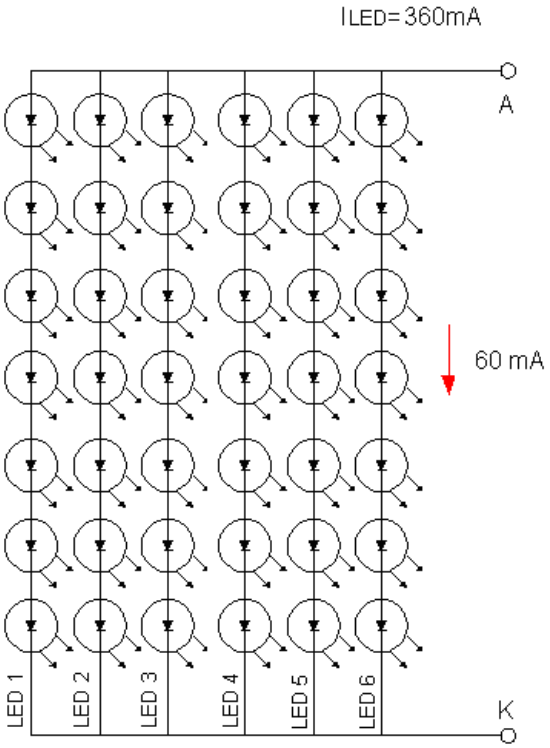
b. Black Pattern

Active Area

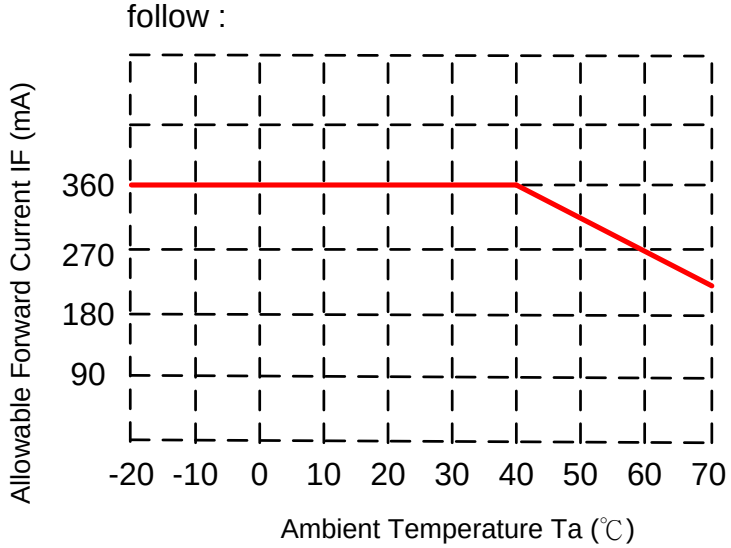
3.2 BACKLIGHT UNIT

ITEM	SYMBOL	MIN	TYP	MAX	UNIT	CONDITION
LED Backlight Voltage	V_{BL}	--	24.5	--	V	For reference
LED Backlight Current	I_{BL}	-	360	--	mA	Ta=25℃
LED Life Time		--	50K	-	KHr	Note*

Note* : Brightness to be decreased to 50% of the initial value. Ta=25℃

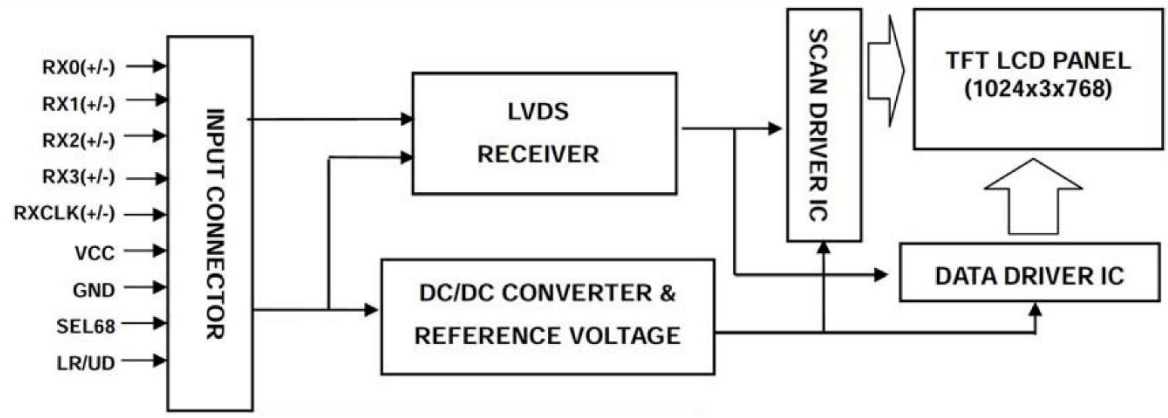


When LCM is operated over 40℃ ambient temperature, the ILED should be follow :



4. BLOCK DIAGRAM

4.1 TFT LCD MODULE



5. INPUT TERMINAL PIN ASSIGNMENT

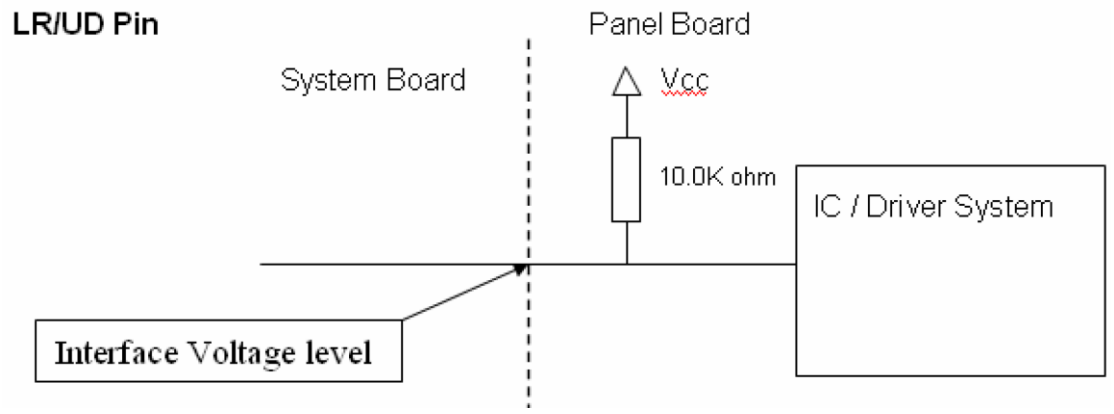
5.1 TFT LCD MODULE

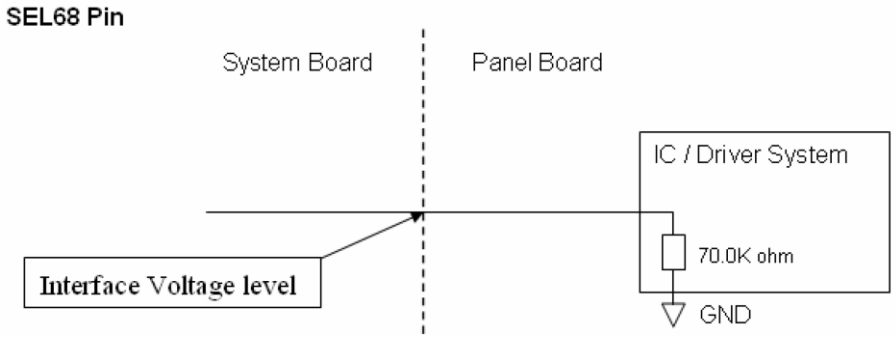
Pin No.	Symbol	Function	Polarity	Note
1	VCC	Power Supply +3.3V(typical)		
2	VCC	Power Supply +3.3V(typical)		
3	NC	No Connection (Reserve for INX test)		
4	LR/UD	Reverse Scan Control, High level or NC = Normal Mode. Level = Horizontal/ Vertical Reverse Scan.		
5	RX0-	LVDS Differential Data Input	Negative	
6	RX0+	LVDS Differential Data Input	Positive	
7	GND	GND		
8	RX1-	LVDS Differential Data Input	Negative	
9	RX1+	LVDS Differential Data Input	Positive	
10	NC	No Connection (Reserve for INX test)		
11	RX2-	LVDS Differential Clock Input	Negative	
12	RX2+	LVDS Differential Clock Input	Positive	
13	GND	GND		
14	RXCLK-	LVDS Differential Data Input	Negative	
15	RXCLK+	LVDS Differential Data Input	Positive	
16	GND	GND		
17	RX3-	LVDS Differential Data Input	Negative	
18	RX3+	LVDS Differential Data Input	Positive	
19	NC	No Connection (Reserve for INX test)		
20	SEL68	LVDS 6/8 bit select function control, High level: 6bit Input Mode. Low level or NC: 8bit Input Mode.		Note(3)

Note (1) Connector Part No.: Cvilux CID520D1HR0-NH or equivalent.

Note (2) User's connector Part No.: Hirose DF14-20S-1.25C or equivalent.

Note (3) "Low" stands for 0V. "High" stands for 3.3V. "NC" stands for "No Connection".





5.3 COLOR DATA INPUT ASSIGNMENT

The brightness of each primary color (red, green and blue) is based on the 8-bit gray scale data input for the color. The higher the binary input the brighter the color. The table below provides the assignment of color versus data input.

Color		Data Signal																							
		Red								Green								Blue							
		R7	R6	R5	R4	R3	R2	R1	R0	G7	G6	G5	G4	G3	G2	G1	G0	B7	B6	B5	B4	B3	B2	B1	B0
Basic Colors	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Green	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	Blue	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	Cyan	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Magenta	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	Yellow	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	White	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Gray Scale Of Red	Red(0) / Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(1)	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(2)	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Red(252)	1	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(252)	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(252)	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gray Scale Of Green	Green(0)/Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Green(1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
	Green(2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Green(252)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0
	Green(252)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0
	Green(252)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
Gray Scale Of Blue	Blue(0) / Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Blue(1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	Blue(2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Blue(252)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1
	Blue(252)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0
	Blue(252)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1

Note (1) 0: Low Level Voltage, 1: High Level Voltage

6. INTERFACE TIMING

6.1 INPUT SIGNAL TIMING SPECIFICATIONS

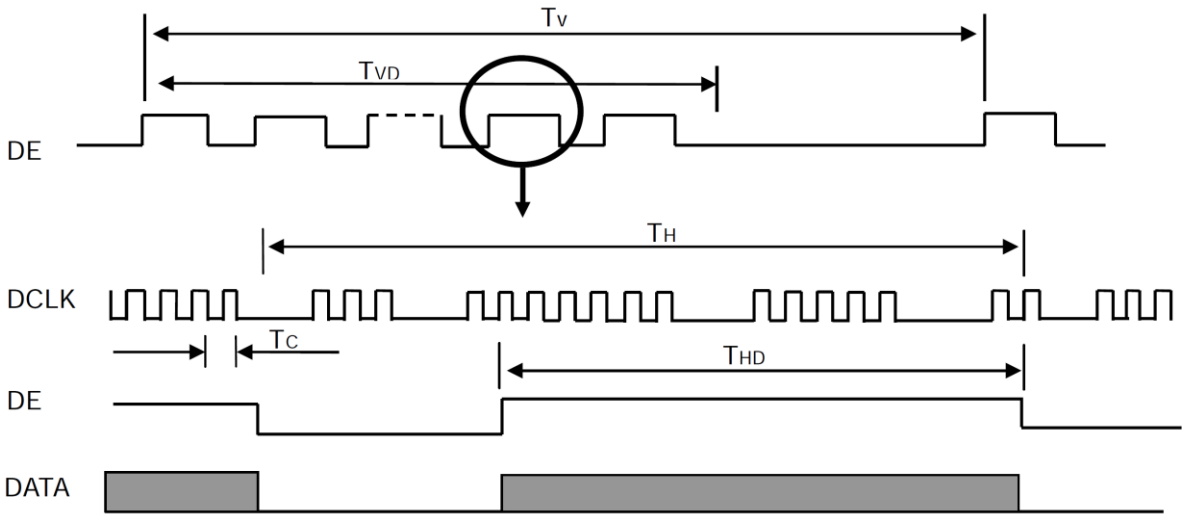
The input signal timing specifications are shown as the following table and timing diagram.

Signal	Item	Symbol	Min	Min	Max	Unit	Note
LVDS Clock	Frequency	F_c	53.35	65	80	MHz	
	Period	T_c	12.5	15.38	18.75	Ns	
	Input cycle to cycle jitter	T_{rcl}	-	-	200	Ns	(a)
	Input Clock to data skew	TLVDS	-.02*Tc	-	0.02*Tc	Ps	(b)
	Spread spectrum modulation range	F_{clkin_mod}	-	-	1.02*Fc	MHz	(C)
	Spread spectrum modulation frequency	F_{SSM}	-	-	200	KHz	
Vertical Display Term	Frame Rate	F_r	55	60	70	Hz	Tv=Tvd+Tvb
	Total	T_v	780	806	840	Th	-
	Active Display	T_{vd}	768	768	768	Th	-
	Blank	T_{vb}	Tv-Tvd	38	Tv-Tvd	Th	-
Horizontal Display Term	Total	T_h	1240	1344	1360	Tc	Th=Thd+Thb
	Active Display	T_{hd}	1024	1024	1024	Tc	-
	Blank	T_{hb}	Th-Thd	320	Th-Thd	Tc	-

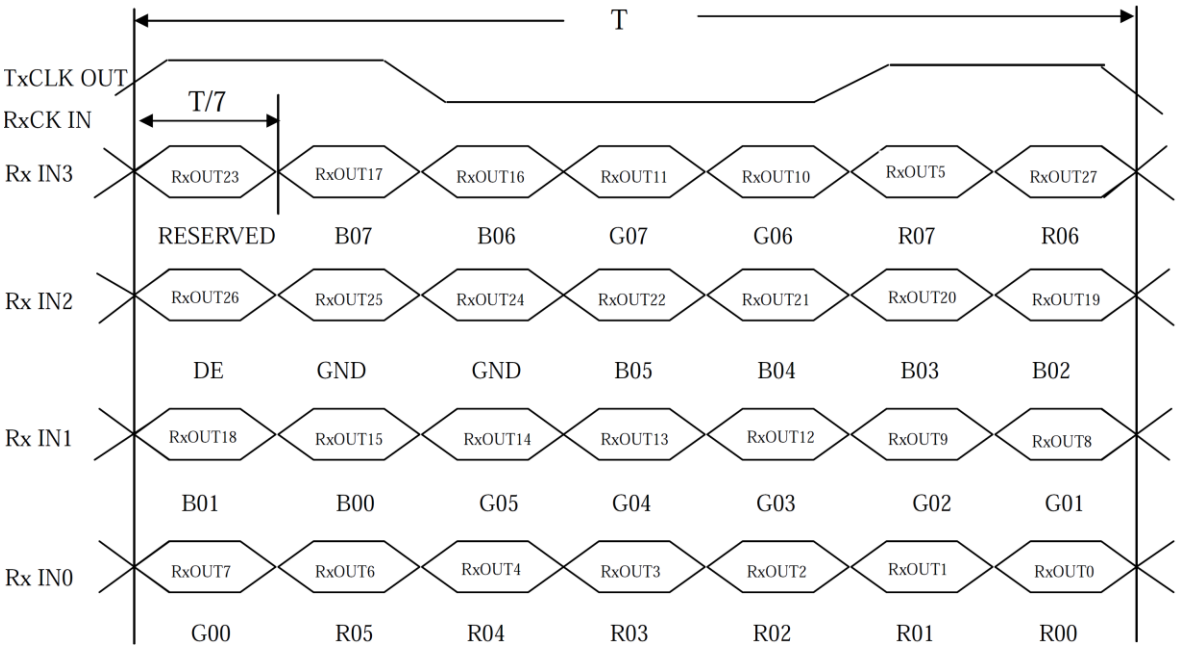
Note (1) Because this module is operated by DE only mode, Hsync and Vsync input signals should be set to low logic level or ground. Otherwise, this module would operate abnormally.

Note (2) The Tv(Tvd+Tvb) must be integer, otherwise, the module would operate abnormally.

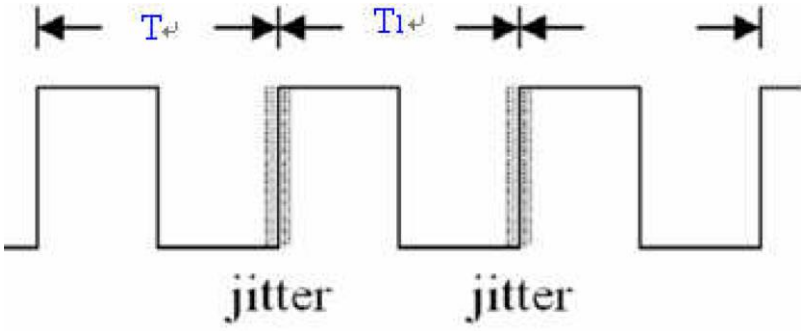
INPUT SIGNAL TIMING DIAGRAM



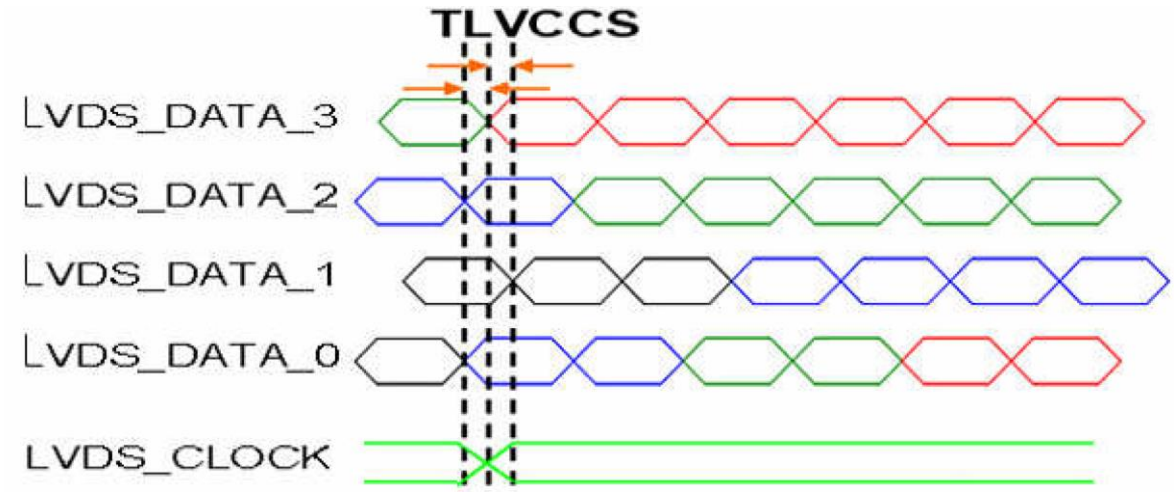
TIMING DIAGRAM of LVDS



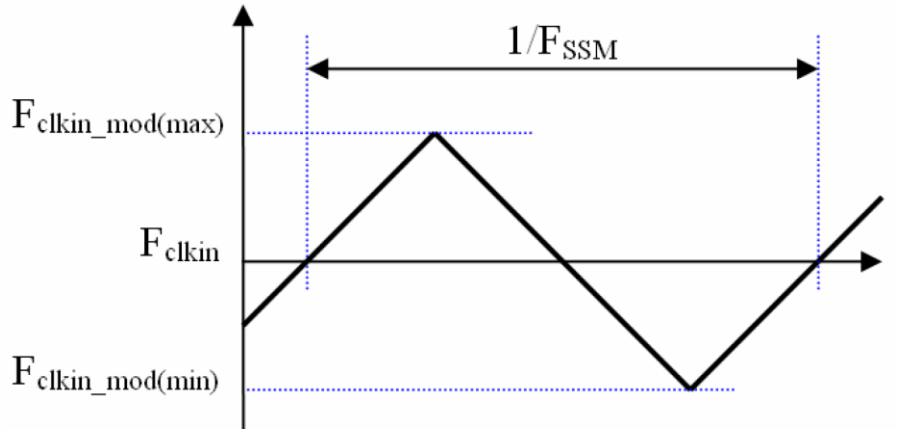
Note (a) The input clock cycle-to-cycle jitter is defined as below figures. Trcl = I T_1 – TI



Note (b) Input Clock to data skew is defined as below figures.

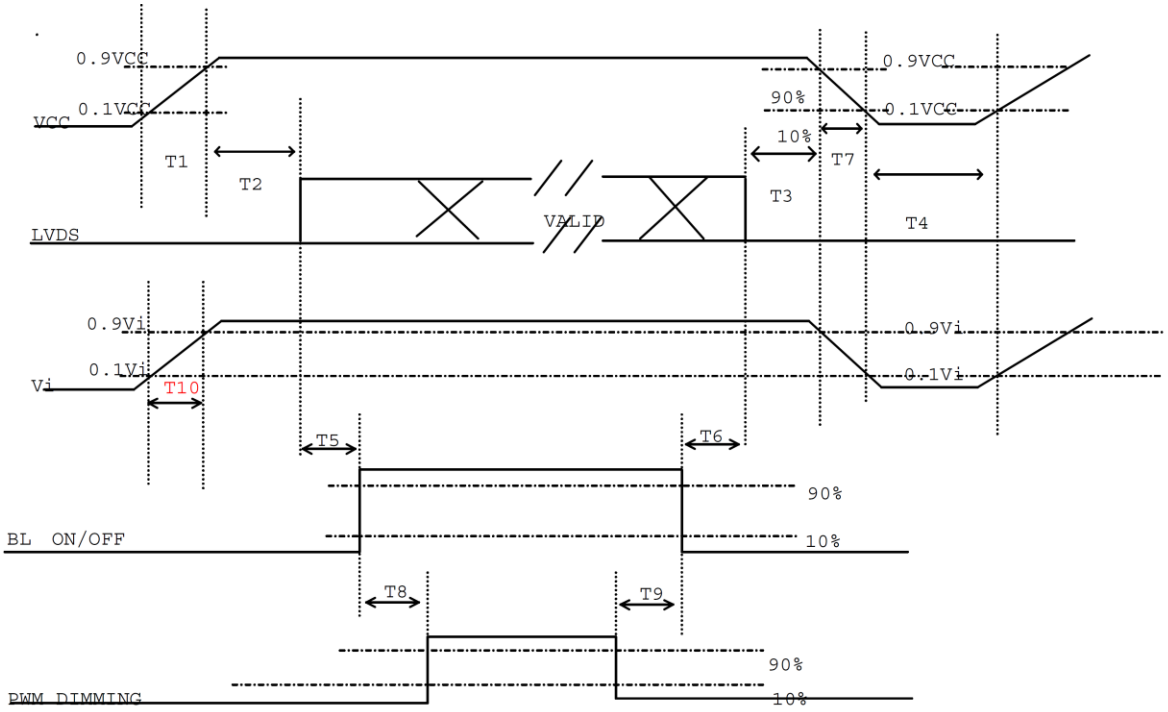


Note (c) The SSCG (Spread spectrum clock generator) is defined as below figures.



6.2 POWER ON/OFF SEQUENCE

To prevent a latch-up or DC operation of LCD assembly, the power on/off sequence should be as the diagram below.



Power ON/OFF sequence

Note (1) Please avoid floating state of interface signal at invalid period.

Note (2) When the interface signal is invalid, be sure to pull down the power supply of LCD VCC to 0 V.

Note (3) The Backlight converter power must be turned on after the power supply for the logic and the interface signal is valid. The Backlight converter power must be turned off before the power supply for the logic and the interface signal is invalid.

Parameter	Value			Units
	Min	Typ	Max	
T1	0.5	-	10	ms
T2	0	-	50	ms
T3	0	-	50	ms
T4	500	-	-	ms
T5	200	-	-	ms
T6	200	-	-	ms
T7	5	-	300	ms
T8	10	-	-	ms
T9	10	-	-	ms
T10	20		50	ms

6.3 SCANNING DIRECTION

The following figures show the image see from the front view. The arrow indicates the direction of scan.

Fig.1 Normal Scan

Fig.2 Reverse Scan

Fig. 1 Normal scan (pin 4, LR/UD = High or NC)

Fig. 2 Reverse scan (pin 4, LR/UD = Low)

7. OPTICAL CHARACTERISTICS

7.1 TEST CONDITIONS

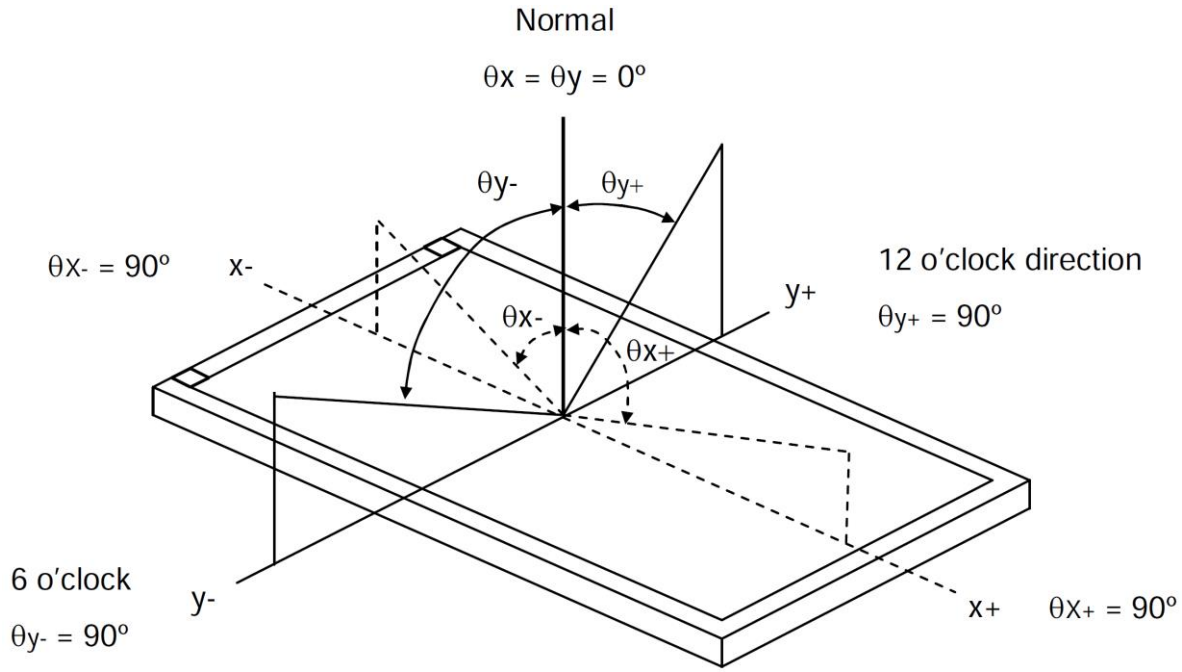
Item	Value	Unit
Ambient Temperature (Ta)	25±2	℃
Ambient Humidity (Ha)	50±2	%RH
Supply Voltage	According to typical value in "ELECTRICAL CHARACTERISTICS"	
Input Signal		
LED Light Bar Input Current Per Input Pin		

7.2 OPTICAL SPECIFICATIONS

The relative measurement methods of optical characteristics are shown in 7.2 and all items are measured at the center point of screen except white variation. The following items should be measured under the test conditions described in 7.1 and stable environment shown in Note (5).

Item		Symbol	Conditions	Min.	Typ.	Max.	Unit	Note
Color Chromaticity	Red	Rx	$\theta_X=\theta_Y=0^\circ$ BM-7/ CS-1000T	--	TBD	--	-	(1),(5)
		Ry			TBD			
	Green	Gx			TBD			
		Gy			TBD			
	Blue	Bx			TBD			
		By			TBD			
	White	Wx			TBD			
		Wy			TBD			
Center Luminance of White		LC		400	500		cd/m^2	(4),(5)
Contrast Ratio		CR		1300	2000		-	(2),(5)
Response Time		TR	$\theta_X=\theta_Y=0^\circ$	-	16	21	ms	(3)
		TF		-	7	14		
White Variation		δW	$\theta_X=\theta_Y=0^\circ$	-	1.25	1.33	-	(5),(6)
Viewing Angle	Horizontal	θ_{X+}	CR≧10	80	88	-	Deg.	(1),(5)
		θ_{X-}		80	88	-		
	Vertical	θ_{Y+}		80	88	-		
		θ_{Y-}		80	88	-		

Note (1) Definition of Viewing Angle (θ_X,θ_Y):



Note (2) Definition of Contrast Ratio (CR):

The contrast ratio can be calculated by the following expression.

Contrast Ratio (CR) = L255 / L0

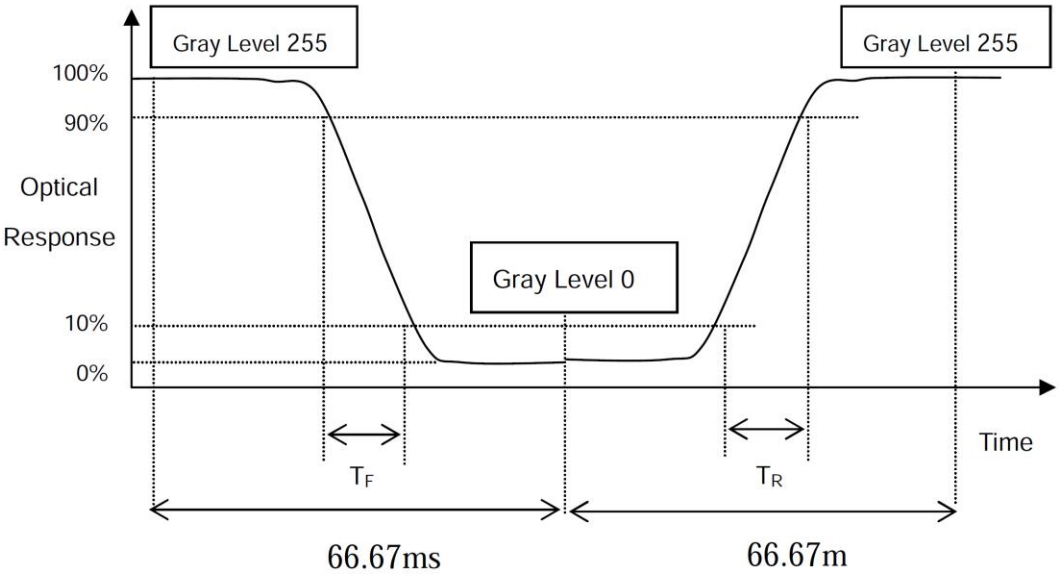
L255: Luminance of gray level 255

L0: Luminance of gray level 0

CR = CR (5)

CR (X) is corresponding to the Contrast Ratio of the point X at Figure in Note (6).

Note (3) Definition of Response Time (T_R, T_F):



Note (4) Definition of Luminance of White (L_C):

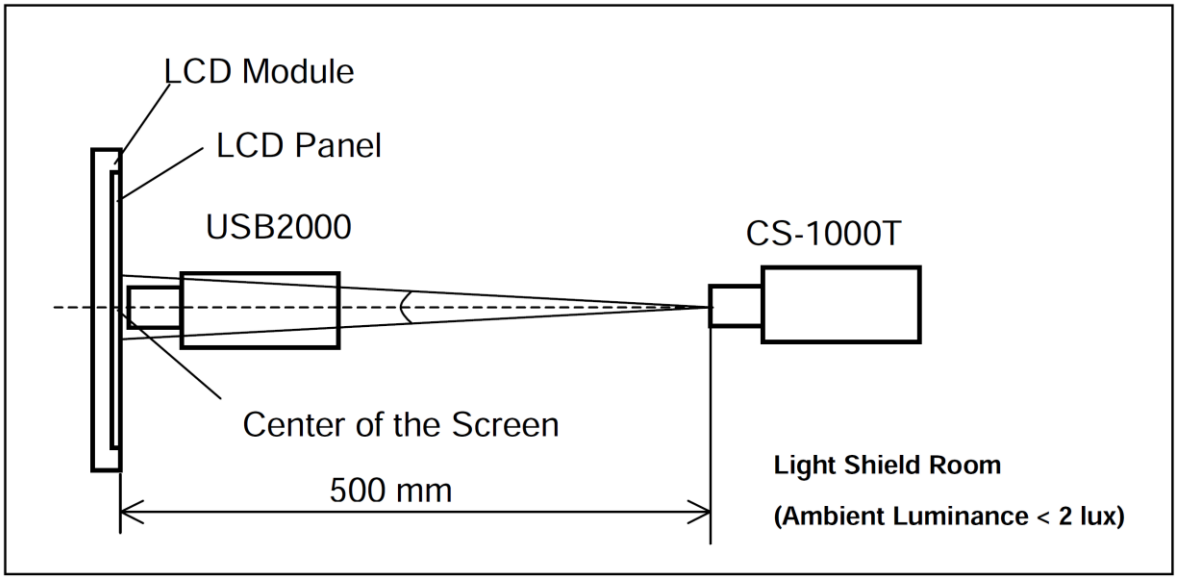
Measure the luminance of gray level 255 at center point

$L_C = L$ (5)

L (x) is corresponding to the luminance of the point X at Figure in Note (6).

Note (5) Measurement Setup:

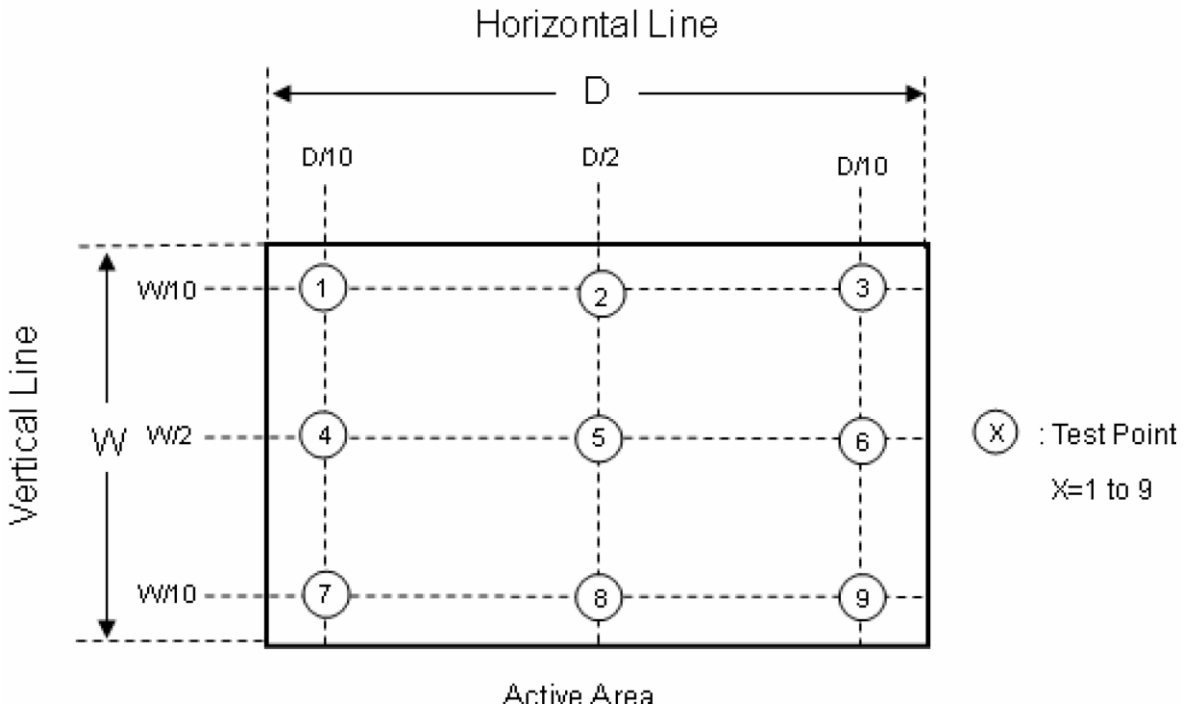
The LCD module should be stabilized at given temperature for 20 minutes to avoid abrupt temperature change during measuring. In order to stabilize the luminance, the measurement should be executed after lighting Backlight for 20 minutes in a windless room.



Note (6) Definition of White Variation (δW):

Measure the luminance of gray level 63 (255) at 9 points

$$\delta W = \frac{\text{Maximum [L (1), L (2), L (3), L (4), L (5) , L (6), L (7), L (8), L (9)]}}{\text{Minimum [L (1), L (2), L (3), L (4), L (5) , L (6), L (7), L (8), L (9)]}}$$



8. RELIABILITY TEST CRITERIA

Test Item	Test Condition	Note
High Temperature Storage Test	70℃, 240 hours	(1),(2),(3),(4)
Low Temperature Storage Test	-30℃, 240 hours	
Thermal Shock Storage Test	-30℃, 0.5 hour←→70℃, 0.5 hour; 100cycles, 1 hour/cycle)	
High Temperature Operation Test	70℃, 240 hours	
Low Temperature Operation Test	-20℃, 240 hours	
High Temperature & High Humidity Operation Test	60℃, RH 90%, 240 hours	(1),(2),(3),(5)

Note (1) There should be no condensation on the surface of panel during test.

Note (2) Temperature of panel display surface area should be 73ºC Max.

Note (3) In the standard conditions, there is no function failure issue occurred. All the cosmetic specification is judged before reliability test.

Note (4) Before cosmetic and function test, the product must have enough recovery time, at least 2 hours at room temperature.

Note (5) Before cosmetic and function test, the product must have enough recovery time, at least 24 hours at room temperature.

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.
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.

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

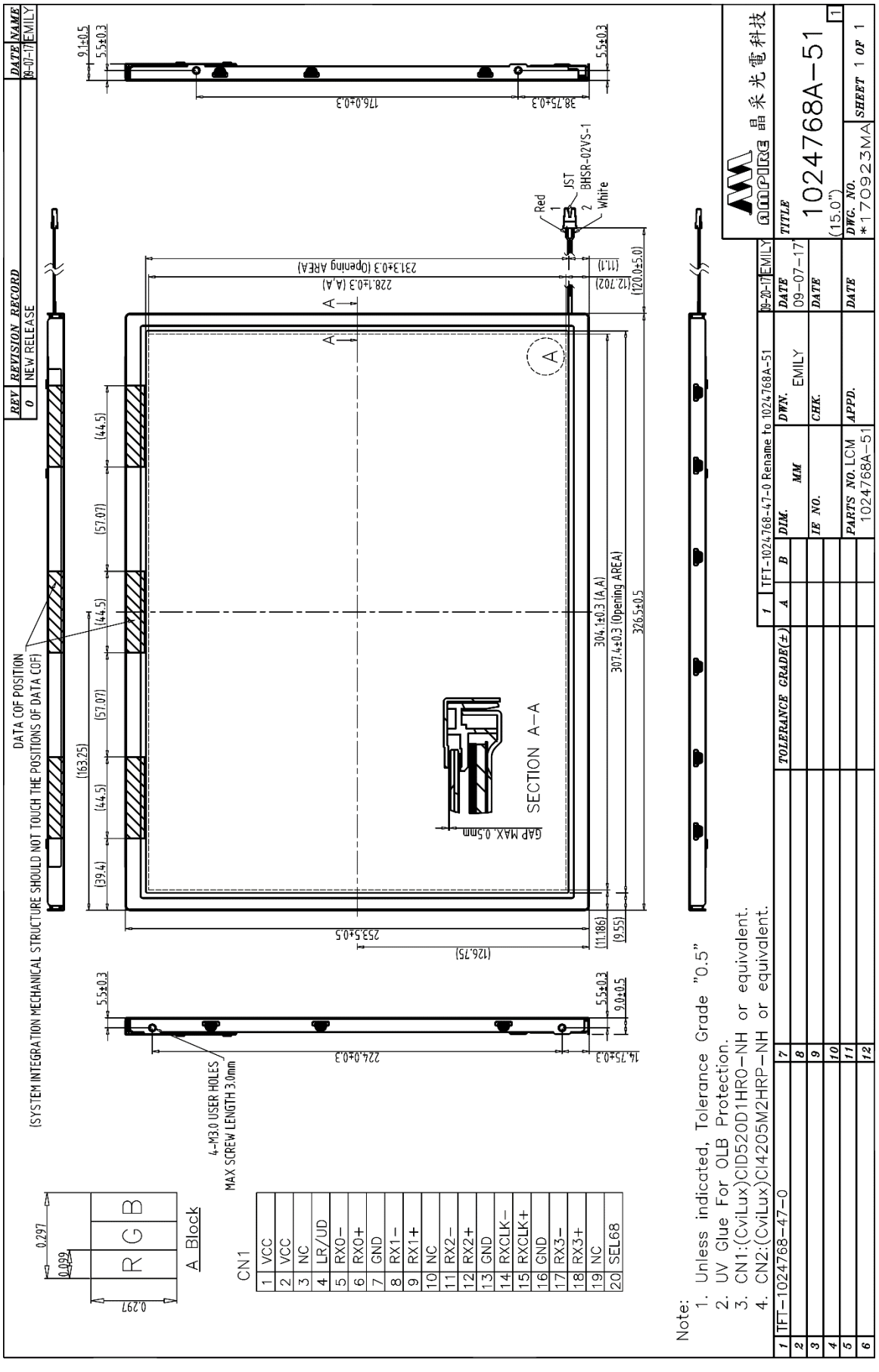
1) Do not boost the applied drive voltage abnormally. Failure to do so may break ICs. When applying power voltage, check the electrical features beforehand and be careful. Always turn off the power to the LC module controller before removing or inserting the LC module input connector. If the input connector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

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 warrantee for all products and three months warrantee for all repairing products.

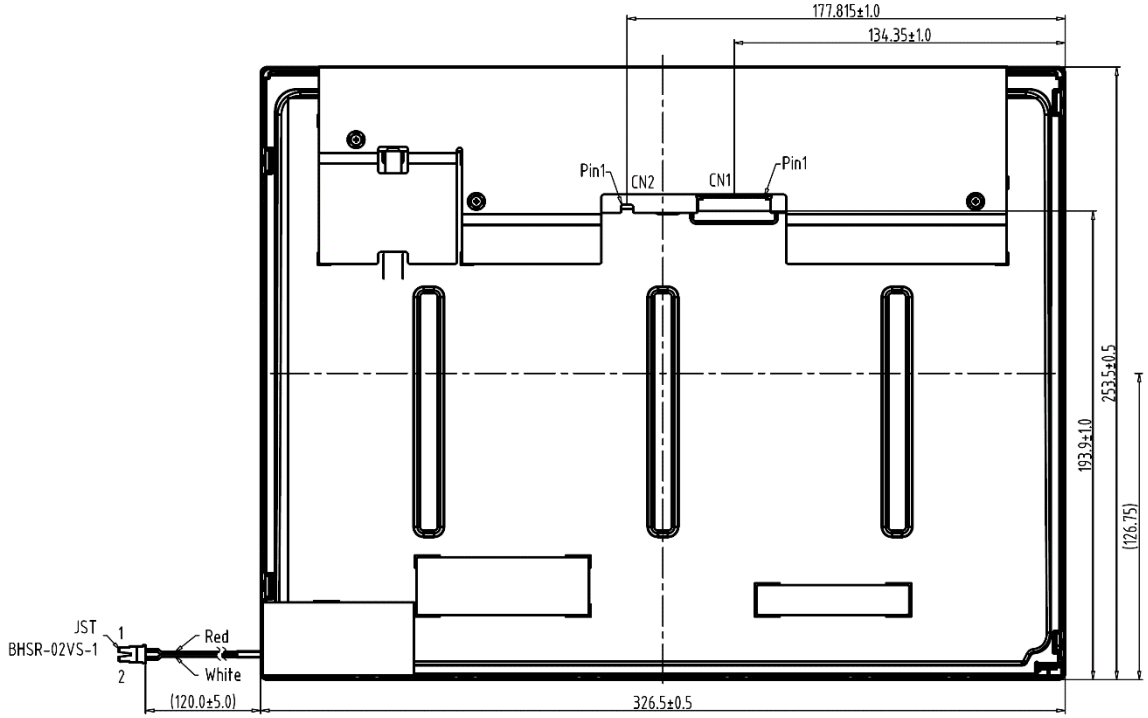
10. MECHANIC DRAWING



REV	REVISION RECORD	DATE	NAME
0	NEW RELEASE	09-07-17	EMILY
1	TFT-1024768-47-0 Rename to 1024768A-51	09-20-17	EMILY

CN1

1	VCC
2	VCC
3	NC
4	LR/UD
5	RX0−
6	RX0+
7	GND
8	RX1−
9	RX1+
10	NC
11	RX2−
12	RX2+
13	GND
14	RXCLK−
15	RXCLK+
16	GND
17	RX3−
18	RX3+
19	NC
20	SEL68



Back View

Note:
1. Unless indicated, Tolerance Grade "0.5"
2. UV Glue For OLB Protection.
3. CN1:(CviLux)CID520D1HR0−NH or equivalent.
4. CN2:(CviLux)CI4205M2HRP−NH or equivalent.

1	TFT−1024768−47−0	7		TOLERANCE GRADE(±)	A	B	DIM. MM	DWN. EMILY	DATE 09−07−17	TITLE 1024768A−51 (15.0")
2		8					IE NO.	CHK.	DATE	
3		9								
4		10								
5		11					PARTS NO.LCM−1 1024768A−51	APPD.	DATE	DWG. NO. *170924MA
6		12								SHEET 1 OF 1

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