

## 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-1024768YDHZQW-00H
APPROVED BY	
DATE	1-1-1 PE

- ☐ Preliminary Specification
- **■** Formal Specification



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Approved by	Checked by	Organized by
Kokai	Mark	Lawlite

This Specification is subject to change without notice.

## **RECORD OF REVISION**

Revision Date	Page	Contents	Editor
2023/07/27 2023/10/20	12	New Release Update LED Lifetime & LED Voltage	Lawlite Lawlite
			P

## **General specification**

This is a color active matrix thin film transistor (TFT) liquid crystal display (LCD) that uses amorphous silicon TFT as a switching device. This model is composed of a TFT LCD panel, a driving circuit and a back light system. This TFT LCD has a 10.4 inch diagonally measured active display area with HD (1024 horizontal by 768 vertical pixels) resolution.

(1) Construction: 10.4" a-Si TFT active matrix, White LED Backlight.

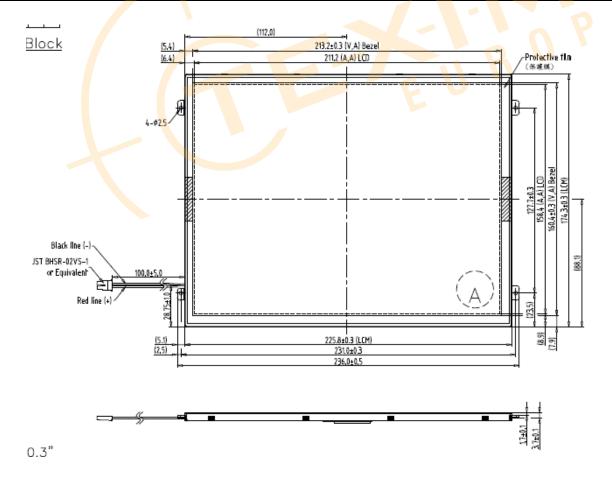
(2) Resolution (pixel): 1024(R.G.B) X 768

(3) Number of the Colors: 16.2M (R, G, B 8 bit digital each)

(4) LCD type: Normally black (5) Interface: LVDS interface

## 1.1 Display Characteristics

Item	Specification	Unit
Outline Diemension	236.0(H) x 174.3(V) x7.4 (D)	mm
Display area	211.2(H) x 158.4(V)	mm
Number of Pixel	1024(H) x 768(V)	pixels
Pixel pitch	0.20625(H) x 0.20625(V)	mm
Pixel arrangement	RGB Vertical Stripe	
Display mode	Normally Black	
NTSC	70(Typ.)	%
Back light	Single LED(Side-Light type)	



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## 2. ABSOLUTE MAXIMUM RATINGS

## 2.1 Absolute Ratings of TFT LCD Module

Item	Symbol	Min.	Max.	Unit	Note
	V <sub>DVDD</sub> V <sub>DVDD_LVDS</sub>	-0.3	5	V	
Dower overhoveltogs	V <sub>AVDD</sub>	-0.5	15	٧	
Power supply voltage	V <sub>GH</sub>	-0.3	42	٧	
	V <sub>GL</sub>	-20	0.3	V	
	V <sub>GH</sub> - V <sub>GL</sub>	-0.3	40	V	
Logic Signal Input Level	V <sub>DVDD</sub> V <sub>DVDD_LVDS</sub>	-0.3	5	V	

## 2.2 Absolute Ratings of Environment

Item	Symbol	Min.	Max.	Unit	Note
Operating Temperature	T <sub>opa</sub>	-20	70	°C	
Storage Temperature	T <sub>stg</sub>	-30	80	°C	

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## 3. INTERFACE PIN CONNECTION

## **FPC Pin Assignment:**

FPC connector is used for electronics interface. The recommended model is CN1 (Input signal): 089K60-000100-G2-R (STARCONN)

Pin NO.	Symbol	Description	Note
1	AGND	Analog ground	00
2	AVDD	Analog power	
3	DVDD	Digital power	
4	GND	Digital ground	
5	VCOM	Not connect	
6	DVDD	Digital power	Y-2.
7	GND	Digital ground	
8	V14	Not connect	
9	V13	Not connect	
10	V12	Not connect	
11	V11	Not connect	
12	V10	Not connect	
13	V9	Not connect	
14	V8	Not connect	
15	GND	Digital ground	
16	DVDD_LVDS	LVDS power	0
17	GND	Digital ground	
18	PIND3	Positive LVDS differential data input	
19	NIND3	Negative LVDS differential data input	
20	GND	Digital ground	
21	PINC	Positive LVDS differential clock input	
22	NINC	Negative LVDS differential clock input	
23	GND	Digital ground	
24	PIND2	Positive LVDS differential data input	
25	NIND2	Negative LVDS differential data input	
26	GND	Digital ground	
27	PIND1	Positive LVDS differential data input	
28	NIND1	Negative LVDS differential data input	
29	GND	Digital ground	
30	PIND0	Positive LVDS differential data input	

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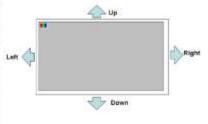
Pin NO.	Symbol	Description	Note				
31	NIND0	Negative LVDS differential data input					
32	GND	Digital ground					
33	GND_LVDS	_VDS ground					
34	GRB	Global reset pin. Active low to enter reset state. Suggest to connecting with an RC reset circuit for stability. Normally pull high. (R=10KΩ,C=0.1uF)					
35	STBYB	Standby mode,normally pull high STBYB= 1, normal operation STBYB=0 ,timing control, source driver will turn off, all output are high-Z					
36	SHLR	Left or right display control	Note 1				
37	DVDD	Digital power					
38	UPDN	Up / down display control					
39	AGND	Analog ground					
40	AVDD	Analog power					
41	VCOM	Not connect	V				
42	DITH	Dithering function enable control.Normally pull low DITHER= "1",Enable internal dithering function DITHER= "0",Disable internal dithering function	9				
43	GND	Digital ground					
44	DVDD	Digital Power					
45	GND	Digital ground					
46	V7	Not connect					
47	V6	Not connect					
48	V5	Not connect					
49	V4	Not connect					
50	V3	Not connect					
51	V2	Not connect					
52	V1	Not connect					
53	GND	Digital ground					
54	DVDD	Digital power					

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Pin NO.	Symbol	Note	
55 SELB		6bit/8bit mode select, SELB = "0", LVDS input data is 8bits SELB = "1": LVDS input data is 6bits	Note 2
56	VGH	Positive power for TFT	
57	DVDD	Digital power for Gate IC	
58	VGL	Negative power for TFT	
59	GND	Digital ground for Gate IC	
60	NC	Not connect	

Note 1: UPDN and SHLR control function

UPDN	SHLR	Data shifting	
0	1	Normally display	
0	0	Inverse Left and Right	
1	1	Inverse Up and Down	
1	0	Inverse Left and Right Inverse Up and Down	



Note 2: 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 DITH and SELB control function

DITH	SELB	Data shifting		
0	4911	Colors (262K)		
0	0	Colors (262K)		
1	1	Colors (262K)		
1	0	Colors (16.2M)		

## 4. ELECTRICAL CHARACTERISTICS

#### **4.1 TFT LCD Module**

Item	Symbol	Min.	Тур.	Max.	Unit	Note
	$V_{DVDD}$ $V_{DVDD\_LVDS}$	3	3.3	3.6	٧	
	VGH		25		V	Note (1)
Supply Voltage	VGL		-10		V	Note (2)
	AVDD		12.1		V	
	VCOM	5.18	5.48	5.78	٧	Note (3)
Input signal	ViH	0.8 VDD		VDD	V	
voltage	ViL	0		0.2VDD	V	
	IDD	TBD	TBD	TBD	mA	VDD =3.3V/ Note (4)
	lavdd	TBD	TBD	TBD	mA	AVDD=12.1V/ Note (4)
Current of power supply	lvgh	TBD	TBD	TBD	mA	VGH=25V/ Note (4)
	lvgl	TBD	TBD	TBD	mA	VGL=-10V/ Note (4)
	lvcom	TBD	TBD	TBD	mA	VCOM=5.275V/ Note (4)

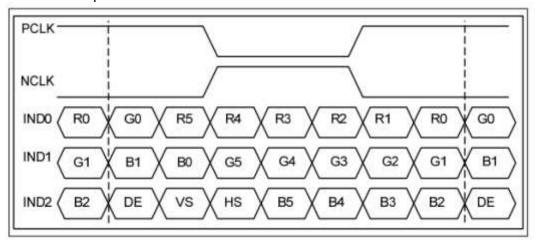
#### Note:

- (1): VGH is TFT Gate operating Voltage.
- (2): VGL is TFT Gate operating Voltage.
- (3): VCOM must be adjusted to optimize display quality \_ Flicker Pattern
- (4): @ White Pattern & 60Hz •

## 4.2 Switching Characteristics for LVDS Receiver

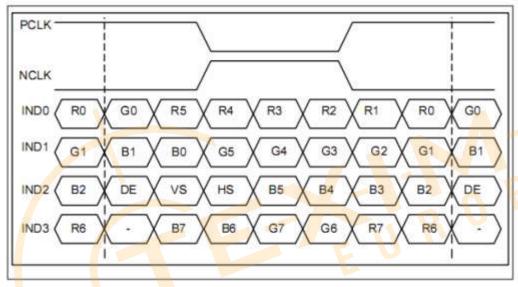
Item	Symbol	Min.	Тур.	Max.	Unit	Conditions	
Differential Input High Threshold	Vth			100	mV	V 4.0V	
Differential Input Low Threshold	Vtl	-100			mV	V <sub>CM</sub> =1.2V	
Input Current	I <sub>IN</sub>	-10		10	uA		
Differential input Voltage	$ V_{ID} $	0.1		0.6	٧		
Common Mode Voltage Offset	V <sub>CM</sub>	0.7	1.2	1.6	٧		

## **4.3 Bit LVDS input** 4.3.1 6Bit LVDS input



## 4.3.2 8Bit LVDS input

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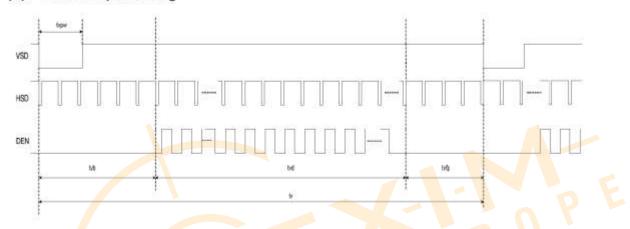


## 4.4 Interface Timing (DE mode)

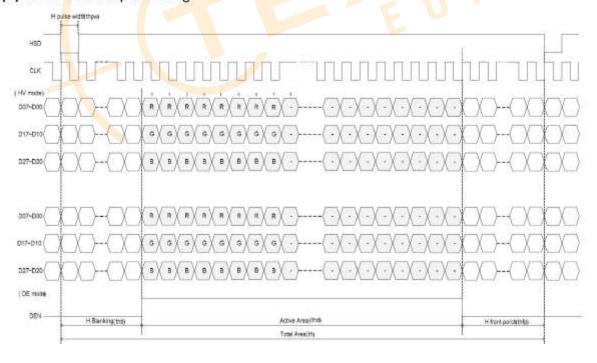
Parameter	Cumbal		Value		Unit
Farameter	Symbol	Min.	Тур.	Max.	Unit
DCLK frequency @Frame rate=60hz	fclk	52	65	71	Mhz
Horizontal display area	thd			DCLK	
HSYNC period time	th	1114	1344	1400	DCLK
HSYNC blanking	thb+thfp	90	320	376	DCLK
Vertical display area	tvd		Н		
VSYNC period time	tv	778	806	845	н
VSYNC blanking	tvb+tvfp	10	38	77	Н

## Timing Diagram of Interface Signal (DE mode)

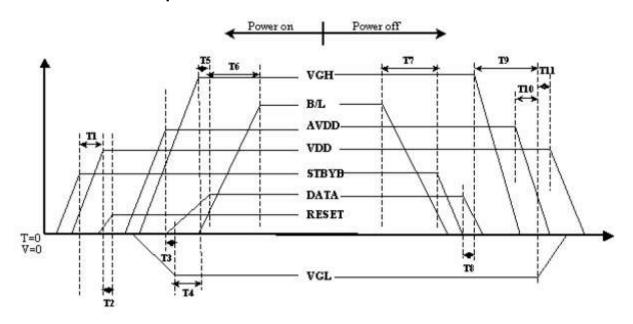
## (1). Vertical input timing



## (2). Horizontal input timing



## 4.5 Power On / Off Sequence



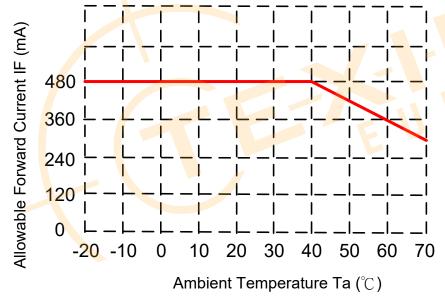
Item	Min.	Тур.	Max.	Unit
T1	0			ms
T2	50		0440	ms
T3	5	5T.	0.000	ms
T4	10	***	( mm)	ms
T5	20			ms
T6	50		(++)	ms
T7	20	270		ms
T8	10	55.		ms
Т9	20	<u>271</u> 8		ms
T10	10	58)		ms
T11	20			ms

## 4.6 Backlight Unit

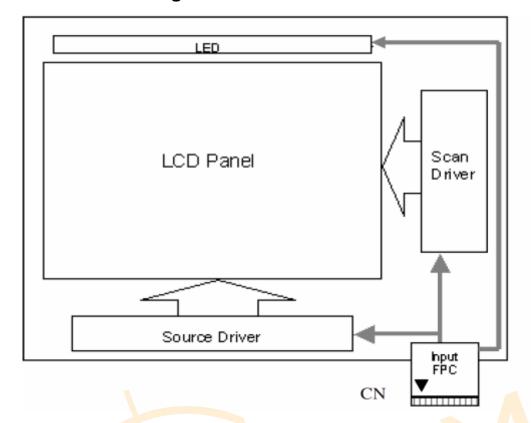
Parameter	Symbol	Min	Тур	Max	Units	Condition
LED Current	ĬL		480		mA	TA=25°C
LED Voltage	VL		12	14	\/	TA=25°C
LED Voltage	VL	<b></b>	12	14	V	IL=480mA
LED Life-Time						TA=25°℃
	N/A	30,000	50,000		Hour	IL=480mA
						Note(2)

- Note(1). LED life time (Hr) can be defined as the time in which it continues to operate under the condition:  $Ta=25\pm3^{\circ}C$ , typical IL value indicated in the above table nutil the brightness becomes less than 50%.
- Note(2). The "LED life time" is defined as the module brightness decrease to 50% original brightness at Ta=25°C and IL=480mA. The LED lifetime could be decreased if operating IL is larger than 480mA. The constant current driving method is suggested.

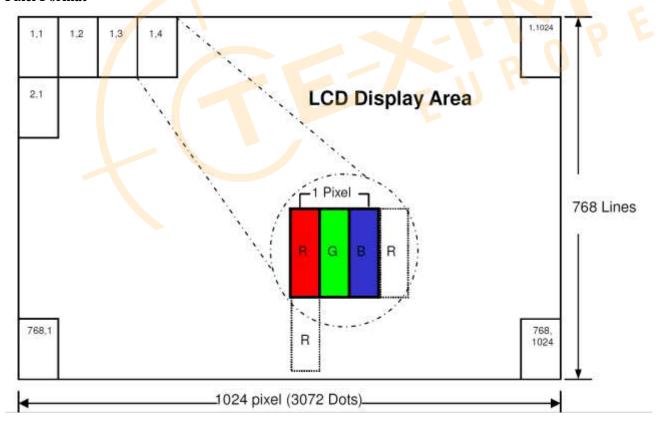
When LCM is operated over 40°C ambient temperature, the IL should be follow:



## 5. Functional Block Diagram



#### **Pixel Format**



## Relationship between Displayed Color and Input

	Î	MS	SB				_	L	SB	MS	SB					L	SB	MS	SB					L	SB	Gray scale
	Display	R7	R6	R5	R4	R3	R2	R1	Ro	G7	G6	G5	G4	G3	G2	G1	GO	B7	В6	B5	B4	Вз	B2	B1	Во	Level
	Black	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	*
	Blue	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	Н	Н	Н	Н	Н	Н	Н	Н	2
	Green	L	L	L	L	L	L	L	L	Н	Н	Н	Н	Н	Н	Н	Н	L	L	L	L	L	L	L	L	-
Basic	Light Blue	L	L	L	L	L	L	L	L	Н	Н	Н	Н	Н	Н	Н	Н	Н	Н	Н	Н	Н	Н	Н	Н	У.
color	Red	Н	Н	Н	Н	Н	Н	Н	Н	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	
	Purple	Н	Н	Н	Н	Н	Н	Н	Н	L	L	L	L	L	L	L	L	Н	Н	Н	Н	Н	Н	Н	Н	
	Yellow	Н	Н	Н	Н	Н	Н	Н	Н	Н	Н	Н	Н	Н	Н	Н	Н	L	L	L	L	L	L	L	L	- 4
	White	Н	Н	Н	Н	Н	Н	Н	Н	Н	Н	Н	Н	Н	Н	Н	Н	Н	Н	Н	Н	Н	Н	Н	Н	
	Black	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L0
		L	L	L	L	L	L	L	Н	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L1
	Dark	L	L	L	L	L	L	Н	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L2
Gray scale	1				į				Ĵ				2.0	Ÿ.			- 3					86				L3…L251
of Red	↓ ↓	Н	Н	Н	Н	Н	Н	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L252
	Light	Н	Н	Н	Н	Н	Н	L	Н	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L253
	100 30000	Н	Н	Н	Н	Н	Н	Н	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L254
	Red	Н	Н	Н	Н	Н	Н	Н	Н	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	Red L255
	Black	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	LO
		L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	Н	L	L	L	L	L	L	L	L	L1
	Dark	L	L	L	L	L	L	L	L	L	L	L	L	L	L	Н	L	L	L	L	L	L	L	L	L	L2
Gray scale	_ ↑					:							3											7	A	L3L251
of Green	1	L	L	L	L	L	L	L	L	Н	Н	Н	Н	Н	Н	L	L	L	L	L	L	L	L	L	L	L252
	Light	L	L	L	L	L	L	L	L	Н	Н	Н	Н	Н	Н	L	Н	L	L	L	L	L	L	L	L	L253
		L	L	L	L	L	L	L	L	Н	Н	Н	Н	Н	Н	Н	L	L	L	L	L	L	L	L	L	L254
	Green	L	L	L	L	L	L	L	L	Н	Н	Н	Н	Н	Н	Н	Н	L	L	L	L	L	L	L	L	Green L255
	Black	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	LO
		L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	Н	L1
	Dark	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	Ľ	Н	L	L2
Gray scale	1												- 8													L3L251
of Blue	1	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	Н	Н	Н	Н	Н	Н	L	L	L252
	Light	L	L	L	L	L	L	L	L	L	L	L	_	L	_	_	L	-	Н				_	L	-	L253
		L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	_	Н					Н	_	L254
	Blue	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	Н	_	_	Н	_	Н	-	Н	Blue L255
	Black	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	LO
		L	L	L	L	Ľ	L	L	Н	L	L	L	L	L	L	L	Н	L	L	L	L	L	Ľ	L	Н	L1
	Dark	L	L	L	L	L	L	Н	L	L	L	L	L	L	L	Н	L	L	L	L	L	L	L	Н	L	L2
Gray scale	1				-	V							- 5								;	W				L3L251
of White & Black	1	Н	Н	Н	Н	Н	Н	L	L	Н	Н	Н	Н	Н	Н	L	L	Н	Н	Н	Н	Н	Ĥ	L	L	L252
DIACK	Light	-				Н			_	-		Н				-								L	Н	L253
	-5	Н		-	-	-	Н	_		-	_	Н	_	_	_	_	_	Н	_		_	_	Н	_	_	L254
	White	-	-	_	_	Н			_	-	_	_	_	_		_	_			_	_	_	_		-	And the second s

## 6. Optical Characteristics

Item		Symbol	Condition	Min.	Тур.	Max.	Unit	Note
Contrast	ast			600	900	_		(1)(2)
Response	Rising	TR+TF		_	30	40	msec	(1)(3)
time	Falling	11111				10	111366	(1)(3)
White lumina (Center)	ance	Y <sub>L</sub>		500	600	-	cd/m <sup>2</sup>	(1)(4) (I <sub>L</sub> =480mA)
	White	W <sub>x</sub>	Θ=0 Normal		0.296			
		$W_y$	viewing	Typ0.05	0.323	Typ. +0.05		
Color	Red	$R_x$	angle		T.B.D			
chromaticity	Red	R <sub>y</sub>			T.B.D			
(CIE1931)	0,000	G <sub>x</sub>			T.B.D			
	Green	Gy			T.B.D			(1)(4)
	Blue	B <sub>x</sub>			T.B.D			
	Blue	B <sub>y</sub>			T.B.D			
	Hor	ΘL		80	85	-		
Viewing	Hor.	$\Theta_{R}$	CR>10	80	85	1		OE
angle	) / = n	Θu	CK>10	80	85			
	Ver.	$\Theta_{D}$		80	85	1+1	1	
Brightness u	niformity	B <sub>UNI</sub>	Θ=0	70	80	9	%	(5)
Optima View I	Direction			Free	•			(6)

## **Measuring Condition**

■ Measuring surrounding : dark room

■ LED current I<sub>L</sub>: 480mA

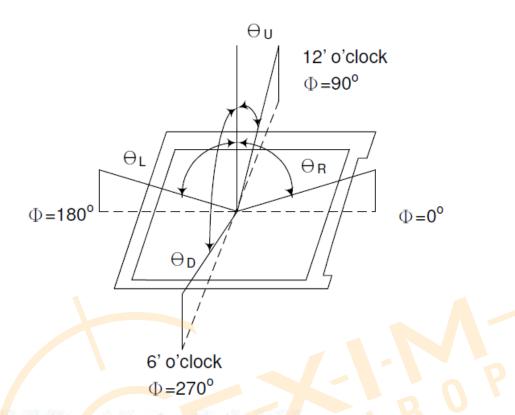
■ Ambient temperature: 25±2°C

■ 15min. warm-up time.

Date: 2023/10/20

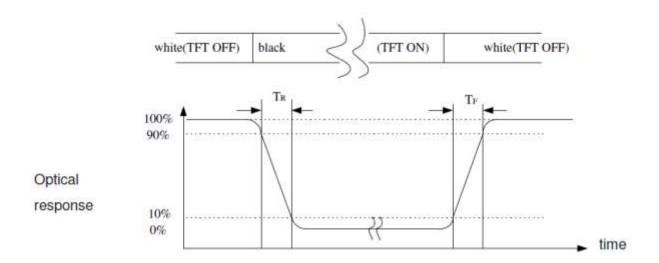
## **Measuring Equipment**

- FPM520 of Westar Display technologies, INC., which utilized SR-3 for Chromaticity and BM-5A for other optical characteristics.
- Measuring spot size : 20 ~ 21 mm Note (1) Definition of Viewing Angle:

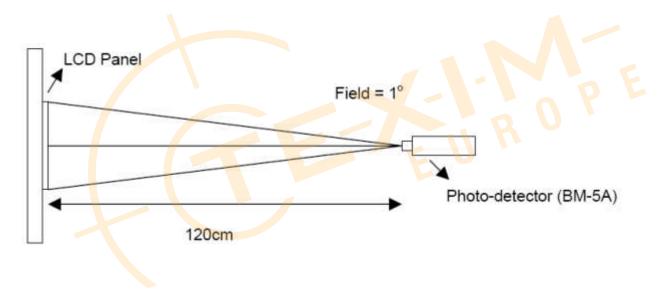


Note (2) Definition of Contrast Ratio (CR): measured at the center point of panel

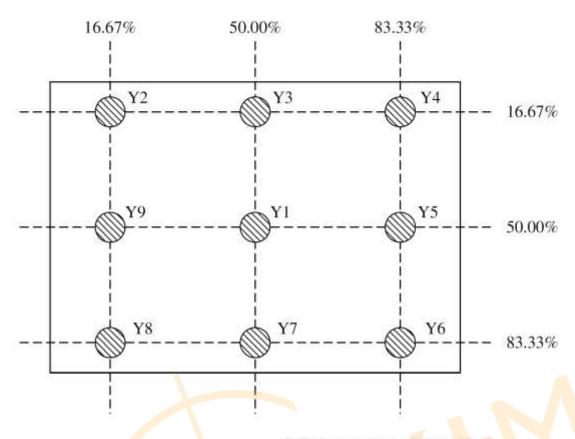
Note (3) Definition of Response Time : Sum of T<sub>R</sub> and T<sub>F</sub>



Note (4) Definition of optical measurement setup



Note (5) Definition of brightness uniformity



 $Luminance uniformity = \frac{\text{(Min Luminance of 9 points)}}{\text{(Max Luminance of 9 points)}} \times 100\%$ 

Note (6): Rubbing Direction (The different Rubbing Direction will cause the different optima view direction.

## 7. RELIABILITY TEST CRITERIA

Test Item	Test Conditions	Note
High Temperature Operation	70±3°C , t=240 hrs	
Low Temperature Operation	-20±3°C , t=240 hrs	
High Temperature Storage	80±3°C , t=240 hrs	1,2
Low Temperature Storage	-30±3°C , t=240 hrs	1,2
Storage at High Temperature and Humidity	60°C, 90% RH , 240 hrs	1,2
Thermal Shock Test	-20°C (30min) ~ 70°C (30min) 100 cycles	1,2
Vibration Test (Packing)	Sweep frequency : 10 ~ 55 ~ 10 Hz/1min Amplitude : 0.75mm Test direction : X.Y.Z/3 axis Duration : 30min/each axis	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).
- 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.

#### 8. USE PRECAUTIONS

#### 8.1 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.

#### 8.2 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.

#### 8.3 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.

#### 8.4 Operating precautions

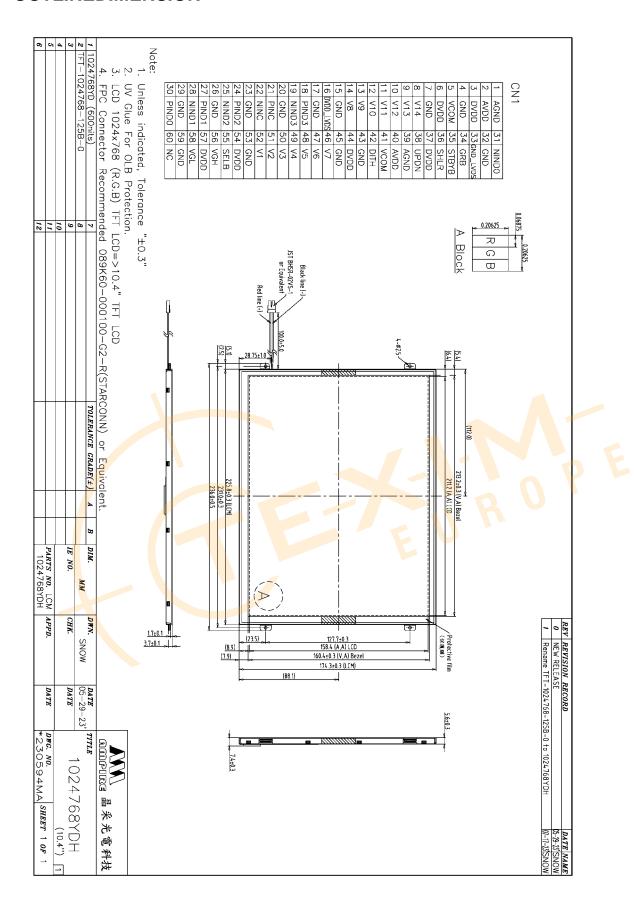
- 1) Do not boost the applied drive voltage abnormally. Failure to do so may break ICs. When applying power voltage, check the electrical features beforehand and be careful. Always turn off the power to the LC module controller before removing or inserting the LC module input connector. If the input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

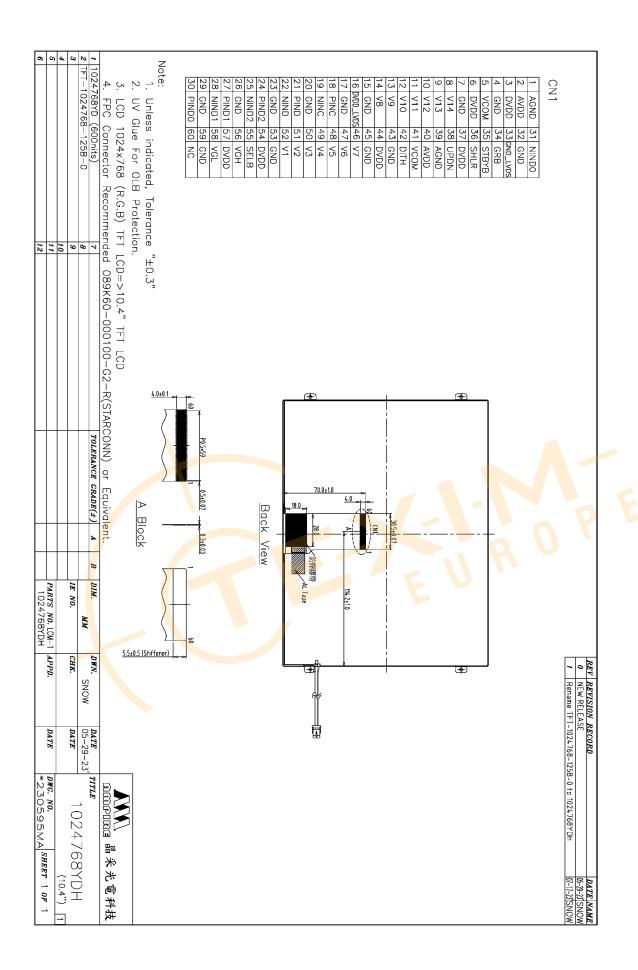
## 8.5 Other

- 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 warrantee for all repairing products.

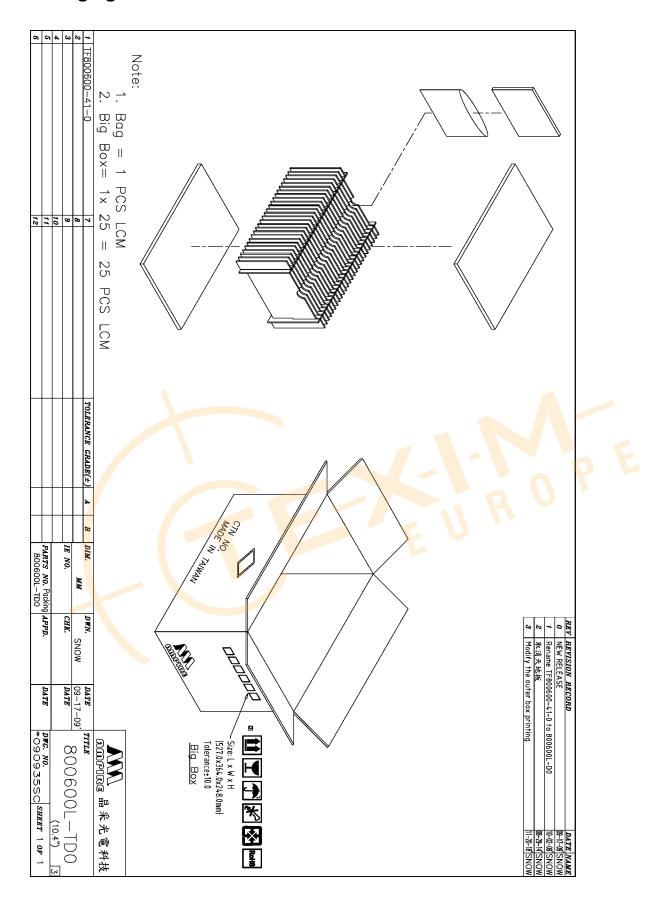


## 9. OUTLINEDIMENSION





## 10. Packaging



#### **Disclaimer**

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All operating parameters, including typical parameters, must be validated for each customer application by the customer's technical experts.

Please contact us if you have any questions about the contents of the datasheet.

This may not be the latest version of the datasheet. Please check with us if a later version is available.



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