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-800480MTZQW-00H**
Approved by	
Date	

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

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This Specification is subject to change without notice.

RECORD OF REVISION

Revision Date	Page	Contents	Editor
2024/09/19	--	New Release	Jessica

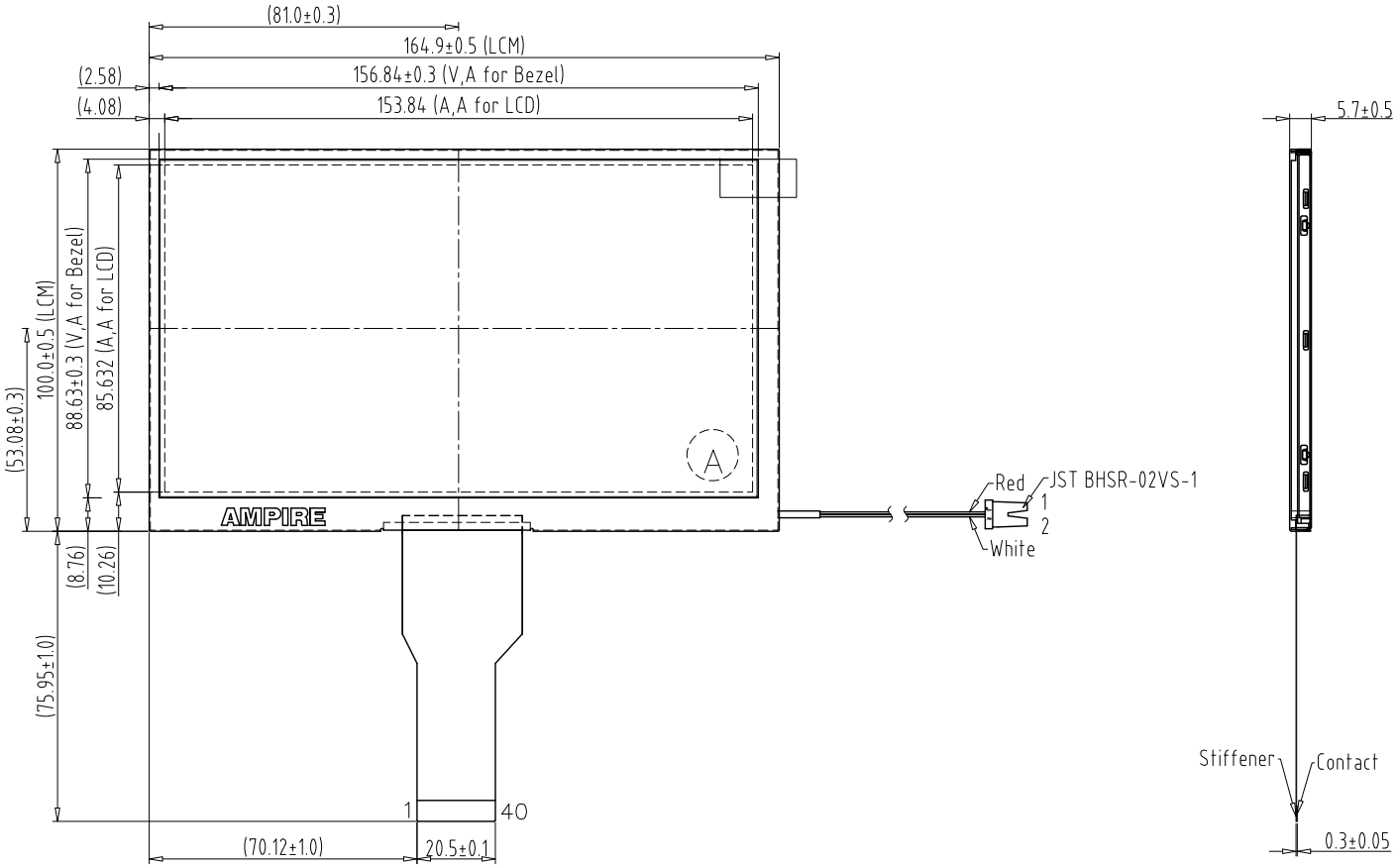
1. Features

(1) 3.3 V Logic Power

(2) Green Product (RoHS)

2. Specifications

Items	Specifications	Unit
Screen Diagonal	7	Inch
Pixel Format	800 (H) x RGB x 480 (V)	-
Pixel Pitch	0.1923 (H) x 0.1784 (V)	mm
Pixel Arrangement	R.G.B. Vertical Stripe	-
Display Mode	Normally Black	-
White Luminance	**500(Typ.)**	cd /m2
Contrast Ratio	1000 : 1 (Typ.)	-
Color Depth	16.7M	-
LCM Interface	LVDS	-



3. Absolute Max. Ratings

Item	Symbol	Values		UNIT	Note
		Min.	Max.		
Power Supply Voltage	VDD	-0.3	+4.0	V	
Operation Temperature	TOP	**-20**	**70**	℃	
Storage Temperature	TST	**-30**	**80**	℃	

Note(1) Permanent damage to the device may occur if maximum values are exceeded functional operation should be restricted to the condition described under normal operating conditions.

Note(2) Ta =25±2℃

4. Electrical Characteristics

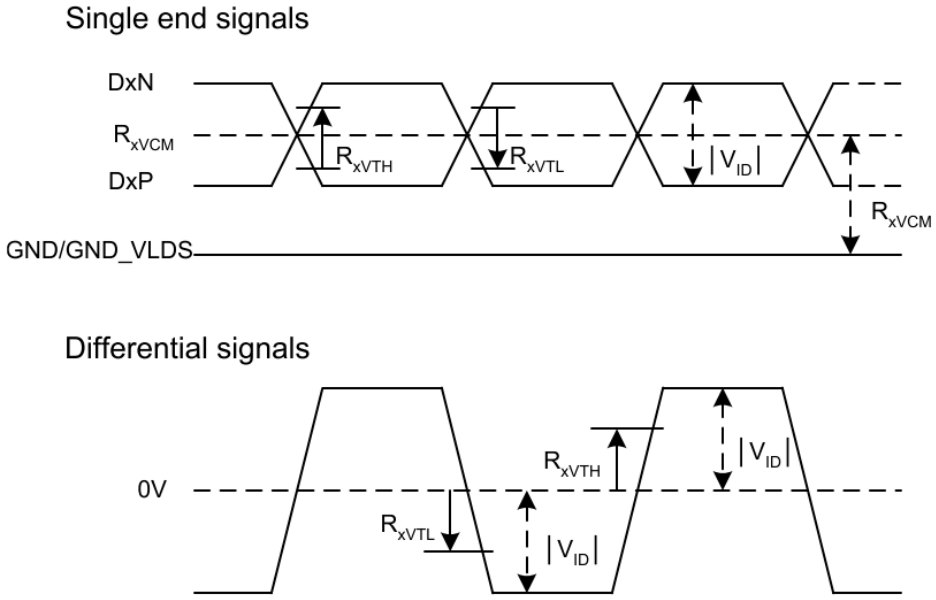
4.1 TFT LCD Module

Item	Symbol	Min.	Typ.	Max.	Unit.	Note
Power supply voltage	VDD	3.1	3.3	3.6	V	GND=0
	VRP			100	mV	VCC=+3.3V
	IVCC	-	100	--	mA	AGND=0
	IRUSH			800	mA	
Operation Temperature	TOP	**-20**		**70**	℃	
Storage Temperature	TST	**-30**		**80**	℃	

Note(1) The supply voltage is measured and specified at the interface connector of LCM.

Note(2) The current draw and power consumption specified is for VCC=3.3V at 25℃.

4.2 DC Characteristics for LVDS Receiver Circuit



Item	Symbol	Min.	Typ.	Max.	Unit	Conditions
Differential Input High Threshold Voltage	R_{xVTH}	-	-	0.1	V	RxVCM = 1.2V
Differential Input Low Threshold Voltage	R_{xVTL}	-0.1	-	-	V	
Input Voltage Range (Singled-End)	R_{xVIN}	0	-	VDD-1.0	V	
Differential Input Common Mode Voltage	R_{xVCM}	|VID|/2	-	2.4-|VID|/2	V	
Differential Input Voltage	| VID |	0.2	-	0.6	V	
Differential Input Leakage Current	RV_{xliz}	-10	-	10	uA	
LVDS Digital Operating Current	I_{VDD_LVDS}	-	10	15	mA	
LVDS Digital Stand-by Current	I_{STBD_LVDS}	-	10	50	uA	
Differential Input Termination Resistance	R_{ID}	90	100	110	Ω	

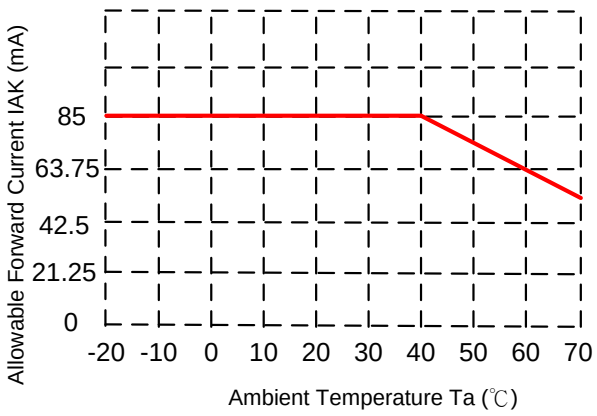
5. Backlight Unit

The characteristics of the LED are shown in the following tables.

Item	Symbol	Min.	Typ.	Max.	Unit	Note
LED Voltage	VAK	-	23.1	-	V	
LED Current	IAK	-	85	-	mA	(2)
Operating LED life time	Hr	-	30K	-	Hrs	(1)(2)

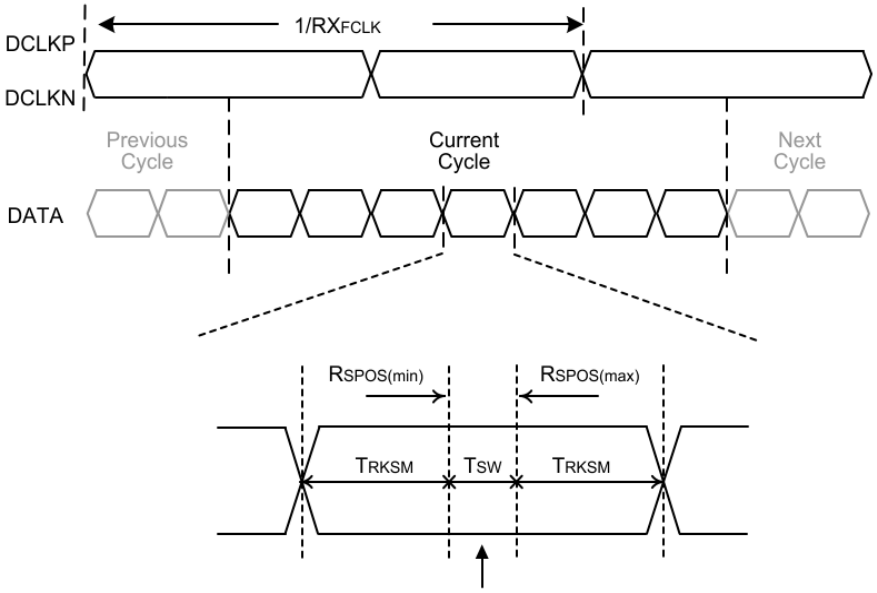
Note(1) LED life time (Hr) can be defined as the time in which it continues to operate under the condition: Ta=25±3℃, typical IAK value indicated in the above table until the brightness becomes less than 50%.

Note(2) The “LED life time” is defined as the module brightness decrease to 50% original brightness at Ta=25℃ and IAK=85mA. The LED lifetime could be decreased if operating IAK is larger than 85mA. The constant current driving method is suggested.

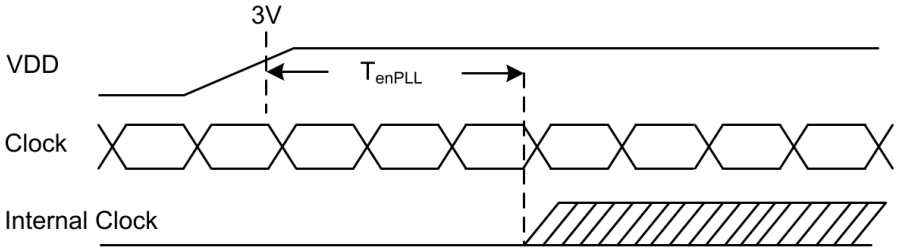


6. Interface Timings

6.1 LVDS Input Timing Table



RRKSM : Receiver strobe margin
RSPOS : Receiver strobe position
TSW : Strobe width (internal DATA sampling window)



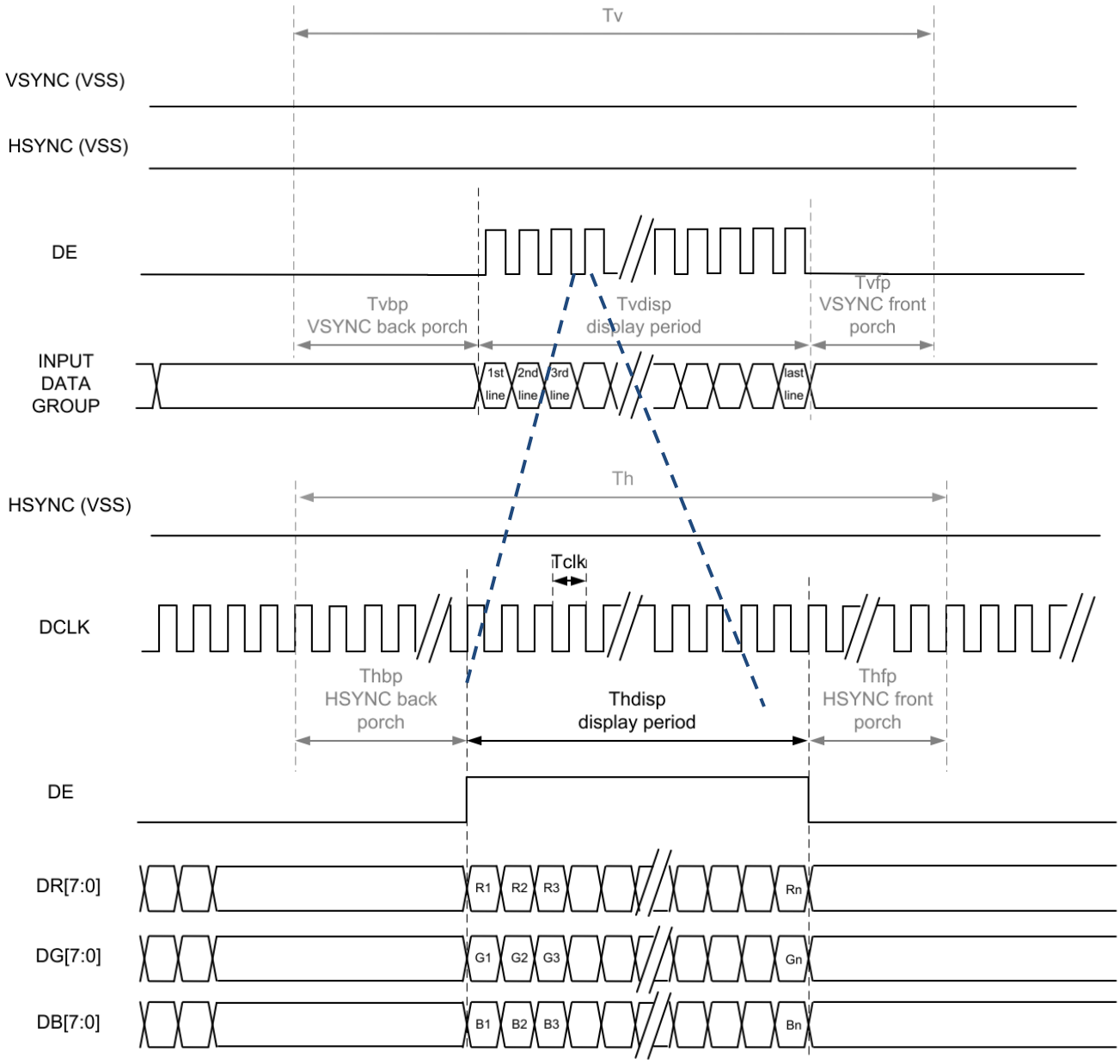
Item	Symbol	Min.	Typ.	Max.	Unit	Conditions
Clock Frequency	RX_{FCLK}	23	25	27	MHz	
Input Data Skew Margin	T_{RSKM}	400	-	-	ps	
Clock High Time	T_{LVCH}	$4/(7 \times RX_{FCLK})$			Ns	
Clock Low Time	T_{LVCL}	$3/(7 \times RX_{FCLK})$			Ns	
PLL Wake-up Time	T_{enPLL}	-	-	150	us	
LVDS Spread Spectrum Clocking (SSC) Tolerance of LVDS Receiver						
Modulation Frequency	SSC_{MF}	-	-	100	KHz	
Modulation Rate	SSC_{MR}	-	-	+/-3	%	

Note(1) The maximum RXFCLK Frequency is 27MHz.

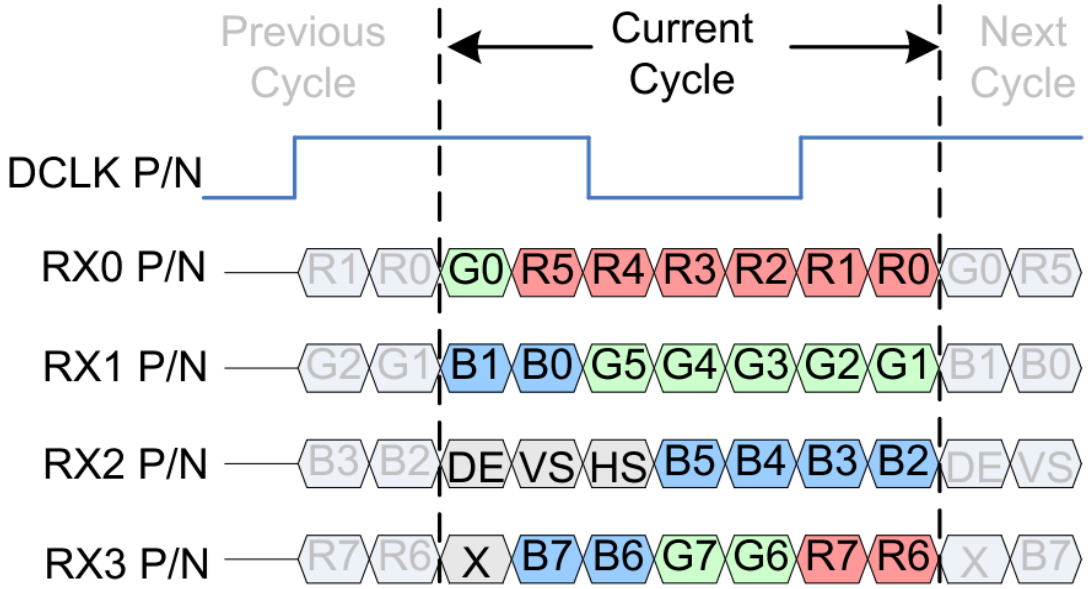
6.2 Timing Diagram

Refresh rate 60HZ

Signal	Item	Symbol	Min.	Typ.	Max.	Unit	Note
DCLK	Frequency	1/Tc	23	25	27	MHz	-
DE	Horizontal Period Time	Th	808	816	848	Tc	
	Horizontal Display Period	Thdisp	-	800	-	Tc	
	Horizontal Back Porch	Thbp	4	8	24	Tc	
	Horizontal Front Porch	Thfp	4	8	24	Tc	
	Horizontal Pulse Width	Thw	2	4	8	Tc	
	Vertical Period Time	Tv	496	512	528	Th	-
	Vertical Display Period	Tvdisp	-	480	-	Th	-
	Vertical Back Porch	Tvbp	8	16	24	Th	
	Vertical Front Porch	Tvfp	8	16	24	Th	
	Vertical Pulse Width	Tvw	2	4	8	Th	


Tv
VSYNC (VSS)
HSYNC (VSS)
DE
Tvbp
VSYNC back porch
Tvdisp
display period
Tvfp
VSYNC front
porch
INPUT
DATA
GROUP
1st
line
2nd
line
3rd
line
last
line
Th
HSYNC (VSS)
Tclk
DCLK
Thbp
HSYNC back
porch
Thdisp
display period
Thfp
HSYNC front
porch
DE
DR[7:0]
R1
R2
R3
Rn
DG[7:0]
G1
G2
G3
Gn
DB[7:0]
B1
B2
B3
Bn

6.3 24 bit LVDS VESA mapping



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.
CLK+ CLK-	LVDS Clock Input	
DE	Display Enable	
VS	Vertical Sync Signal	
HS	Horizontal Sync Signal	

6.4 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.

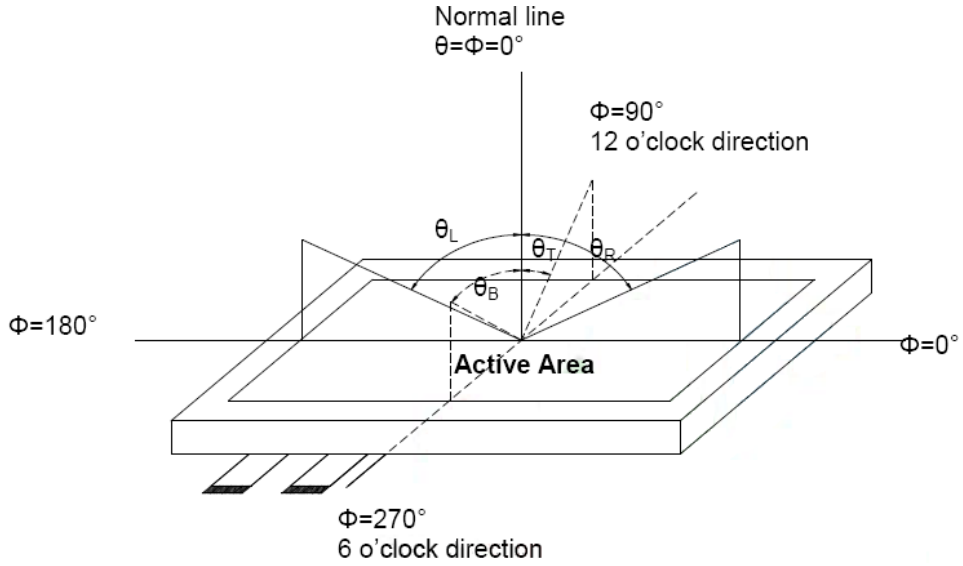
	Display	MSB R7	R6	R5	R4	R3	R2	R1	LSB R0	MSB G7	G6	G5	G4	G3	G2	G1	LSB G0	MSB B7	B6	B5	B4	B3	B2	B1	LSB B0	Gray scale Level
Basic color	Black	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	-
	Blue	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	H	H	H	H	H	H	H	H	-
	Green	L	L	L	L	L	L	L	L	H	H	H	H	H	H	H	H	L	L	L	L	L	L	L	L	-
	Light Blue	L	L	L	L	L	L	L	L	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	-
	Red	H	H	H	H	H	H	H	H	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	-
	Purple	H	H	H	H	H	H	H	H	L	L	L	L	L	L	L	L	H	H	H	H	H	H	H	H	-
	Yellow	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	L	L	L	L	L	L	L	L	-
	White	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	-
Gray scale of Red	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
	Dark	L	L	L	L	L	L	L	H	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L1
		L	L	L	L	L	L	H	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L2
	↑				:								:								:					L3..L251
	↓	H	H	H	H	H	H	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L252
	Light	H	H	H	H	H	H	L	H	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L253
		H	H	H	H	H	H	H	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L254
	Red	H	H	H	H	H	H	H	H	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L255
Gray scale of Green	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
	Dark	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	H	L	L	L	L	L	L	L	L	L1
		L	L	L	L	L	L	L	L	L	L	L	L	L	L	H	L	L	L	L	L	L	L	L	L	L2
	↑				:								:								:					L3..L251
	↓	L	L	L	L	L	L	L	L	H	H	H	H	H	H	L	L	L	L	L	L	L	L	L	L	L252
	Light	L	L	L	L	L	L	L	L	H	H	H	H	H	H	L	H	L	L	L	L	L	L	L	L	L253
		L	L	L	L	L	L	L	L	H	H	H	H	H	H	H	L	L	L	L	L	L	L	L	L	L254
	Green	L	L	L	L	L	L	L	L	H	H	H	H	H	H	H	H	L	L	L	L	L	L	L	L	L255
Gray scale of Blue	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
	Dark	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	H	L1
		L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	H	L	L2
	↑				:								:								:					L3..L251
	↓	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	H	H	H	H	H	H	L	L	L252
	Light	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	H	H	H	H	H	H	L	H	L253
		L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	H	H	H	H	H	H	H	L	L254
	Blue	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	H	H	H	H	H	H	H	H	L255
Gray scale of White & Black	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
	Dark	L	L	L	L	L	L	L	H	L	L	L	L	L	L	L	H	L	L	L	L	L	L	L	H	L1
		L	L	L	L	L	L	H	L	L	L	L	L	L	L	H	L	L	L	L	L	L	L	H	L	L2
	↑				:								:								:					L3..L251
	↓	H	H	H	H	H	H	L	L	H	H	H	H	H	H	L	L	H	H	H	H	H	H	L	L	L252
	Light	H	H	H	H	H	H	L	H	H	H	H	H	H	H	L	H	H	H	H	H	H	H	L	H	L253
		H	H	H	H	H	H	H	L	H	H	H	H	H	H	H	L	H	H	H	H	H	H	H	L	L254
	White	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	L255

7. Optical Specifications

The optical characteristics are measured under stable conditions as following notes

Item	Conditions		Min.	Typ.	Max.	Unit	Note
Viewing Angle （CR>10）	Horizontal	θ_L	80	85	-	degree	(1)
		θ_R	80	85	-		
	Vertical	θ_T	80	85	-		
		θ_B	80	85	-		
Contrast Ratio	Center		800	1000	-	-	(2)
Response Time	Rising + Falling		-	25	30	ms	(4)
Color Chromaticity (CIE1931)	Red	x	Typ. -0.05	0.59	Typ. +0.05	-	(3)
	Red	y		0.36		-	
	Green	x		0.34		-	
	Green	y		0.58		-	
	Blue	x		0.18		-	
	Blue	y		0.13		-	
	White	x		0.32		-	
	White	y		0.34		-	
White Luminance	Center		**400**	**500**	-	cd/m^2	(3)
Luminance Uniformity	9Points		-	75	-	%	(3)

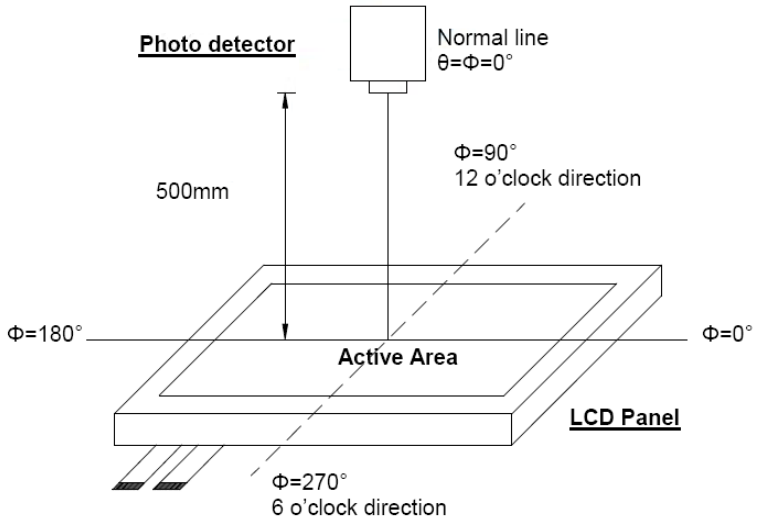
Note(1) Viewing angle is the angle at which the contrast ratio is greater than 10. The viewing angles are determined for the horizontal or 3, 9 o'clock direction and the vertical or 6, 12 o'clock direction with respect to the optical axis which is normal to the LCD surface (see Figure1).



Note(2) Contrast measurements shall be made at viewing angle of Θ= 0 and at the center of the LCD surface. Luminance shall be measured with all pixels in the view field set first to white, then to the dark (black) state (see Figure1). Luminance Contrast Ratio (CR) is defined mathematically as CR = Luminance when displaying a white raster / Luminance when displaying a black raster.

Note(3) 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.)



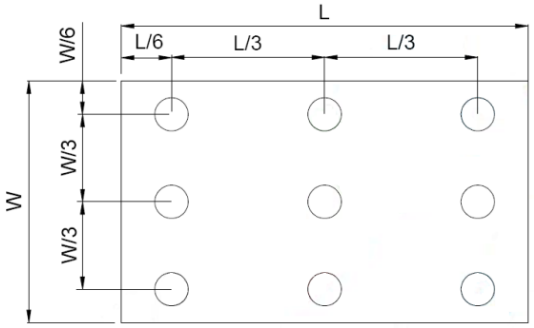
Definition of Luminance Uniformity

Active area is divided into 9 measuring areas (Refer to bellow figure).

Every measuring point is placed at the center of each measuring area.

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

L ----- Active area length W ----- Active area width

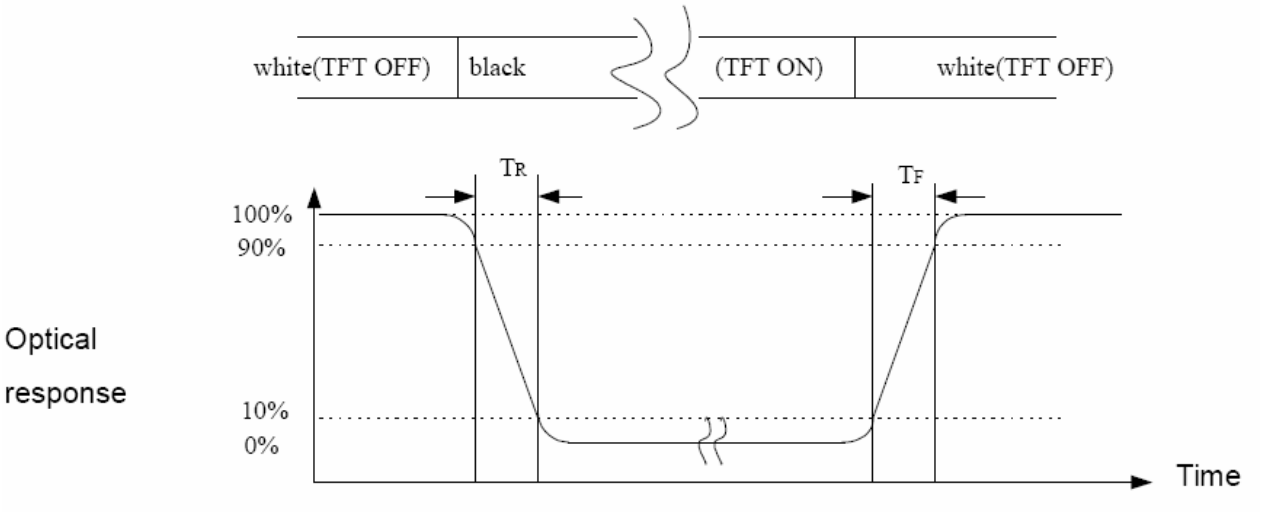


Bmax : The measured maximum luminance of all measurement position.

Bmin : The measured minimum luminance of all measurement position.

Note(4) Definition of Response Time: Sum of TR and TF

The electro-optical response time measurements shall be made as Figure 4 by switching the “data” input signal ON and OFF. The times needed for the luminance to change from 10% to 90% is TR, and 90% to 10% is TF



8. Interface

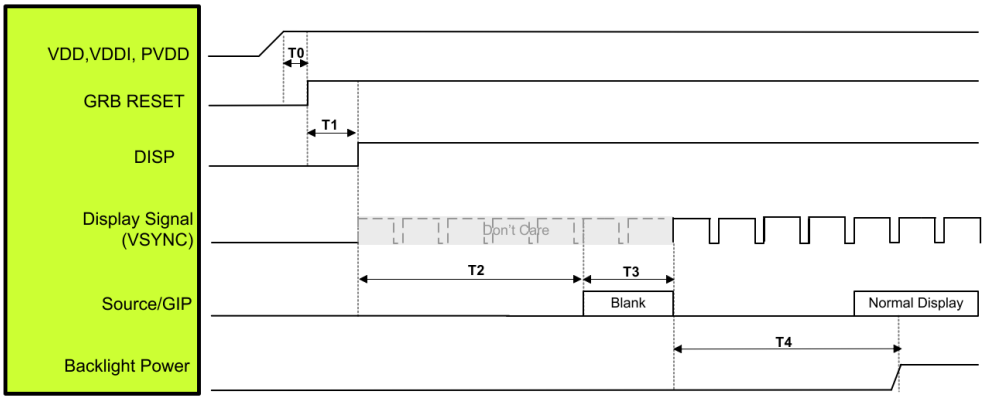
8.1 Pin Description

Pin No	Symbol	Function
1	NC	No connection.
2	DISP	DISP sets the display mode L：Standby mode H：Normal display mode
3	VDD	3.3V Power Supply for LCD
4	VDD	3.3V Power Supply for LCD
5	GND	Power Ground
6	GND	Power Ground
7	SCL	Not use. Keep no connection.
8	SDA	Not use. Keep no connection.
9	CS	Not use. Keep no connection.
10	GRB	Global reset pin. When GRB is “L”, internal initialization procedure is executed.
11	GND	Power Ground
12	DCLKN	Sampling Clock
13	DCLKP	Sampling Clock
14	GND	Power Ground
15	D3N	Transmission Data of Pixels 3
16	D3P	Transmission Data of Pixels 3
17	GND	Power Ground
18	D2N	Transmission Data of Pixels 2
19	D2P	Transmission Data of Pixels 2
20	GND	Power Ground
21	D1N	Transmission Data of Pixels 1
22	D1P	Transmission Data of Pixels 1
23	GND	Power Ground
24	D0N	Transmission Data of Pixels

25	D0P	Transmission Data of Pixels
26	GND	Power Ground
27	GND	Power Ground
28	NC	No connection.
29	NC	No connection.
30	NC	No connection.
31	NC	No connection.
32	SC	Not use. Keep no connection. Scan direction selectable by jumper.
33	NC	No connection.
34	NC	No connection.
35	NC	No connection.
36	GND	Power Ground
37	NC	No connection.
38	NC	No connection.
39	NC	No connection.
40	NC	No connection.

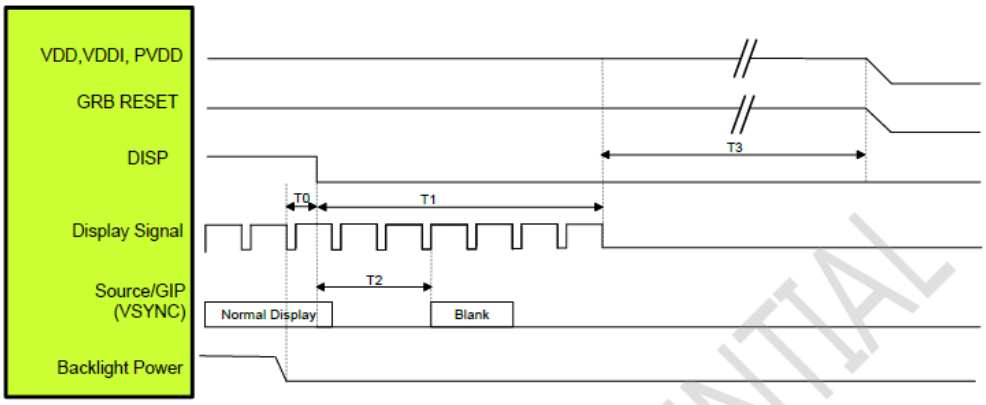
9. Power On/Off Sequence

To prevent a latch-up or DC operation of the LCD module, the power on/off sequence shall be as shown below.



Symbol	Description	Time	Unit
T0	System power stability to GRB RESET signal	≥1	ms
T1	GRB RESET= “High” to DISP=“High”	≥10	ms
T2	DISP=“High” to Source/GIP scan blank	85	ms
T3	IC scan blanking signal	≥33	ms
T4	Display signal input to Backlight power on (base on Display Signal Frame Rate 60Hz)	≥100	ms

Note(1) When DISP pull “H” or “L”, IC will execute the internal power on or power off procedures .Please be careful about the timing of DISP and do not interrupt it during power on or power off procedure, otherwise unexpected errors will occur.
Note(2) RGB interface Display signal: DCLK; VSYNC; HSYNC; DE; DR[7:0]; DG[7:0]; DB[7:0].
Note(3) LVDS interface Display signal: DCLK P/N; RX[3:0] P/N.



Symbol	Description	Time	Unit
T0	Backlight Power off to DISP=“Low”	≥1	ms
T1	DISP=“Low” to IC internal voltage discharge complete	≥100	ms
T2	DISP=“Low” to Source/GIP scan blank (base on Display Signal Frame Rate 60Hz)	≤50	ms
T3	IC internal voltage discharge is completed to VDD/VDDI/PVDD off	≥0	ms

Note(1) When DISP pull “H” or “L”, IC will execute the internal power on or power off procedures .Please be careful about the timing of DISP and do not interrupt it during power on or power off procedure, otherwise unexpected errors will occur.
Note(2) RGB interface Display signal: DCLK; VSYNC; HSYNC; DE; DR[7:0]; DG[7:0]; DB[7:0].
Note(3) LVDS interface Display signal: DCLK P/N; RX[3:0] P/N.

10. Reliability Test

The reliability test items and its conditions are shown below.

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
Vibration Test (Packing)	Sweep frequency : 10~55~10 Hz/1min Amplitude : 0.75mm Test direction : X.Y.Z/3 axes Duration : 30 min/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.

11. General Precaution

11.1 Use Restriction

(1) This product is not authorized for use in life supporting systems, aircraft navigation control systems, military systems and any other application where performance failure could be life-threatening or otherwise catastrophic.

11.2 Disassembling or Modification

(1) Do not disassemble or modify the module. It may damage sensitive parts inside LCD module, and may cause scratches or dust on the display. AMPIRE does not warrant the module, if customers disassemble or modify the module.

11.3 Breakage of LCD Panel

(1) If LCD panel is broken and liquid crystal spills out, do not ingest or inhale liquid crystal, and do not contact liquid crystal with skin.
(2) If liquid crystal contacts mouth or eyes, rinse out with water immediately.
(3) If liquid crystal contacts skin or cloths, wash it off immediately with alcohol and rinse thoroughly with water.
(4) Handle carefully with chips of glass that may cause injury, when the glass is broken.

11.4 Electric Shock

(1) Disconnect power supply before handling LCD module.
(2) Do not pull or fold the LED cable.
(3) Do not touch the parts inside LCD modules and the fluorescent LED’s connector or cables in order to prevent electric shock.

11.5 Absolute Maximum Ratings and Power Protection Circuit

(1) Do not exceed the absolute maximum rating values, such as the supply voltage variation, input voltage variation, variation in parts’ parameters, environmental temperature, etc., otherwise LCD module may be damaged.
(2) Please do not leave LCD module in the environment of high humidity and high temperature for a long time.
(3) It’s recommended to employ protection circuit for power supply.

11.6 Operation

(1) Do not touch, push or rub the polarizer with anything harder than HB pencil lead.
(2) Use fingerstalls of soft gloves in order to keep clean display quality, when persons handle the LCD module for incoming inspection or assembly.
(3) When the surface is dusty, please wipe gently with absorbent cotton or other soft material.
(4) Wipe off saliva or water drops as soon as possible. If saliva or water drops contact with polarizer for a long time, they may cause deformation or color fading.
(5) When cleaning the adhesives, please use absorbent cotton wetted with a little petroleum benzene or other adequate solvent.

11.7 Mechanism

(1) Please mount LCD module by using mounting holes arranged in four corners tightly.

11.8 Static Electricity

(1) Protection film must remove very slowly from the surface of LCD module to prevent from electrostatic occurrence.
(2) Because LCD modules use CMOS-IC on circuit board and TFT-LCD panel, it is very weak to electrostatic discharge. Please be careful with electrostatic discharge. Persons who handle the module should be grounded through adequate methods.

11.9 Strong Light Exposure

(1) The module shall not be exposed under strong light such as direct sunlight. Otherwise, display characteristics may be changed.

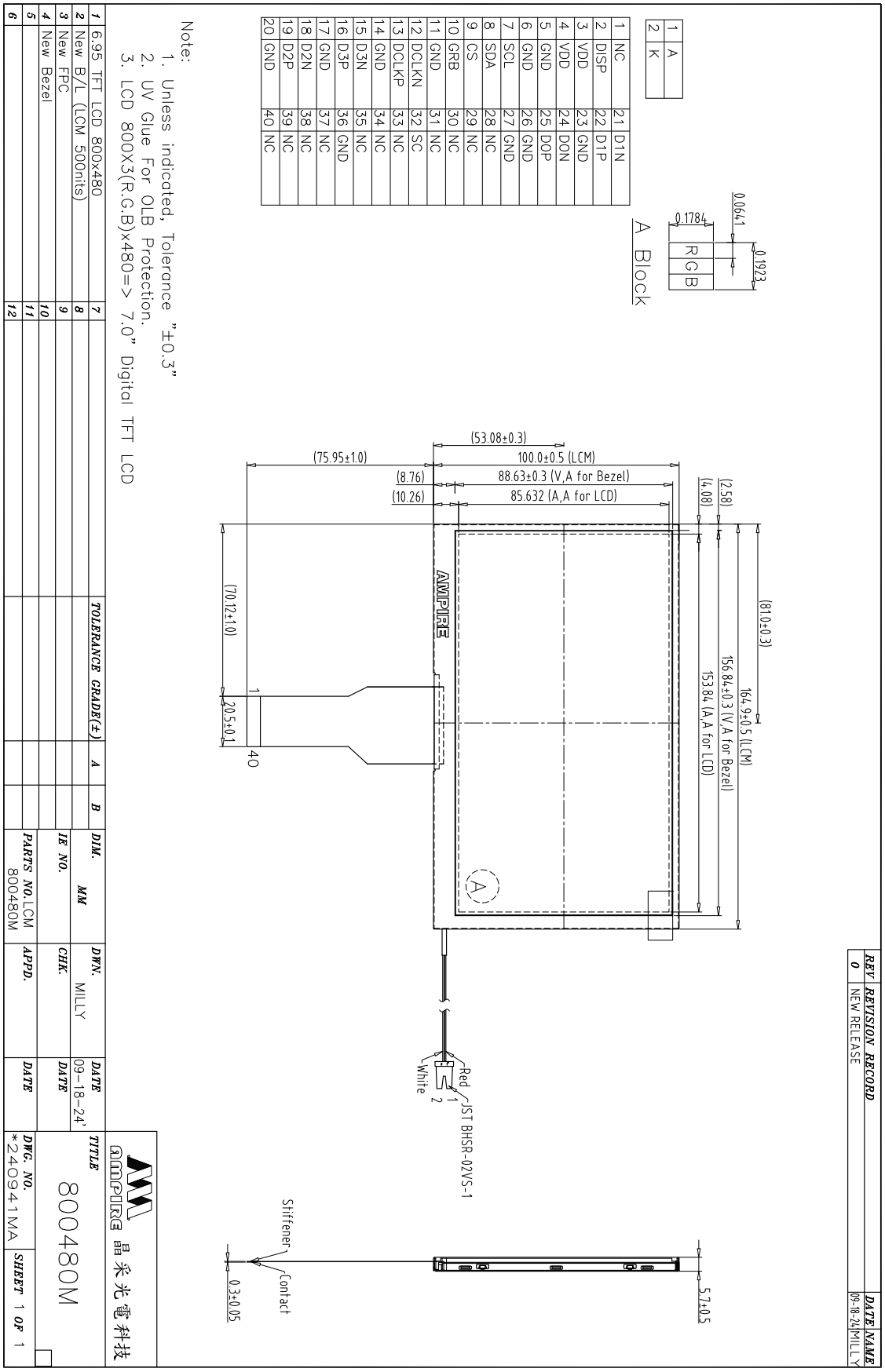
11.10 Disposal

(1) When disposing LCD module, obey the local environmental regulations.

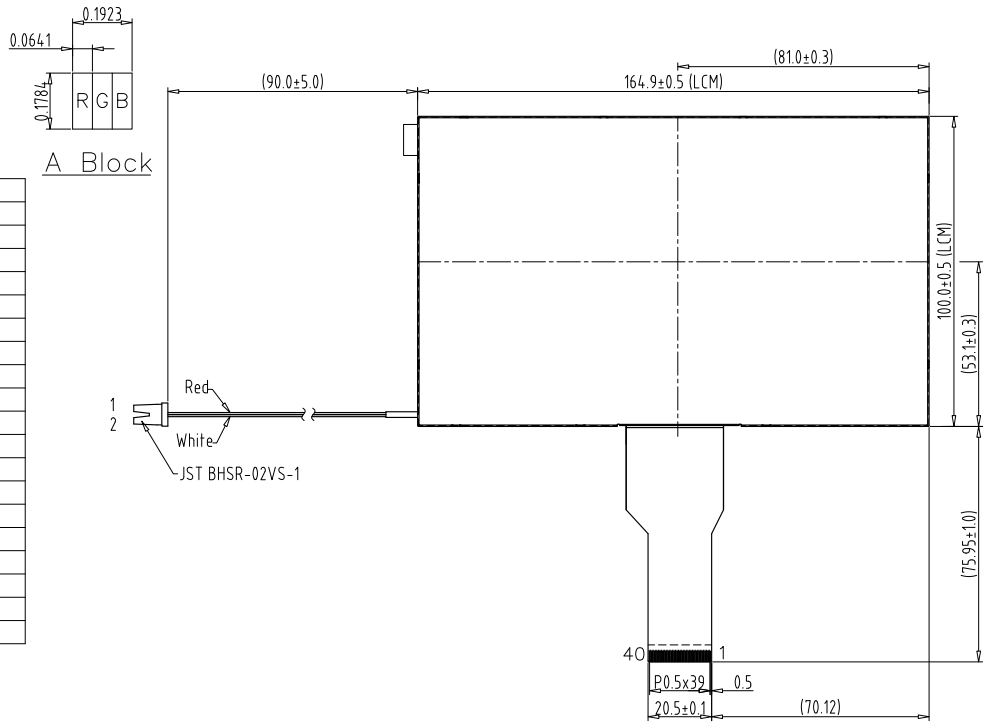
11.11 Others

(1) 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.

12. Outline Dimension



REV	REVISION RECORD	DATE	NAME
0	NEW RELEASE	09-18-24	MILLY



1	A
2	K

1	NC	21	D1N
2	DISP	22	D1P
3	VDD	23	GND
4	VDD	24	D0N
5	GND	25	D0P
6	GND	26	GND
7	SCL	27	GND
8	SDA	28	NC
9	CS	29	NC
10	GRB	30	NC
11	GND	31	NC
12	DCLKN	32	SC
13	DCLKP	33	NC
14	GND	34	NC
15	D3N	35	NC
16	D3P	36	GND
17	GND	37	NC
18	D2N	38	NC
19	D2P	39	NC
20	GND	40	NC

Note:
1. Unless indicated, Tolerance "±0.3"
2. UV Glue For OLB Protection.
3. LCD 800X3(R.G.B)x480=> 7.0" Digital TFT LCD

1	6.95 TFT LCD 800x480	7		TOLERANCE GRADE(±)	A	B	DIM. MM	DWN. MILLY	DATE 09-18-24'	TITLE 800480M	
2	New B/L (LCM 500nits)	8					IE NO.	CHK.	DATE		
3	New FPC	9									
4	New Bezel	10									
5		11					PARTS NO. LCM-1 800480M	APPD.	DATE	DWG. NO. *240942MA	SHEET 1 OF 1
6		12									

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13. Package
TBD