Specifications for LCD module

Customer	
Customer part no.	
Ampire part no.	**AM-800480N3TZQW-30H**
Approved by	
Date	

☐ **Preliminary Specification**

■ **Formal Specification**

Approved by	Checked by	Organized by
Patrick	Simon	Jessica

This Specification is subject to change without notice.

RECORD OF REVISION

| Revision Date	Page	Contents	Editor
2020/03/26	---	New Release	Jessica
2020/04/13	18,19, 26,27	Update drawings (modify interface)	Jessica
2020/04/16	1	Rename to official part number	Jessica

1. Features

5 inch Amorphous-TFT-LCD (Thin Film Transistor Liquid Crystal Display) module. This TFT LCD has a 5.0 (5:3) inch diagonally measured active display area with 800x480 (800 horizontal by 480 vertical pixels) resolution. This module is composed of a 5" TFT-LCD panel, backlight unit, and LED driver circuit.

(1) Construction: a-Si TFT-LCD with driving system, White LED Backlight.

(2) LCD type : IPS

(3) Number of the Colors : 16.7M colors (R,G,B 8bit digital each)

(4) Interface : LVDS

(5) LCD Power Supply Voltage: 3.3V single power input, built-in power supply circuit.

2. Physical Specifications

Item	Specifications	unit
Display size (diagonal)	5.0	inch
Resolution	800 (W) x RGB x 480 (H)	dot
Pixel pitch	0.135 (W) x 0.135 (H)	mm
Color configuration	R.G.B Vertical stripe	
Display Mode	Normally Black	
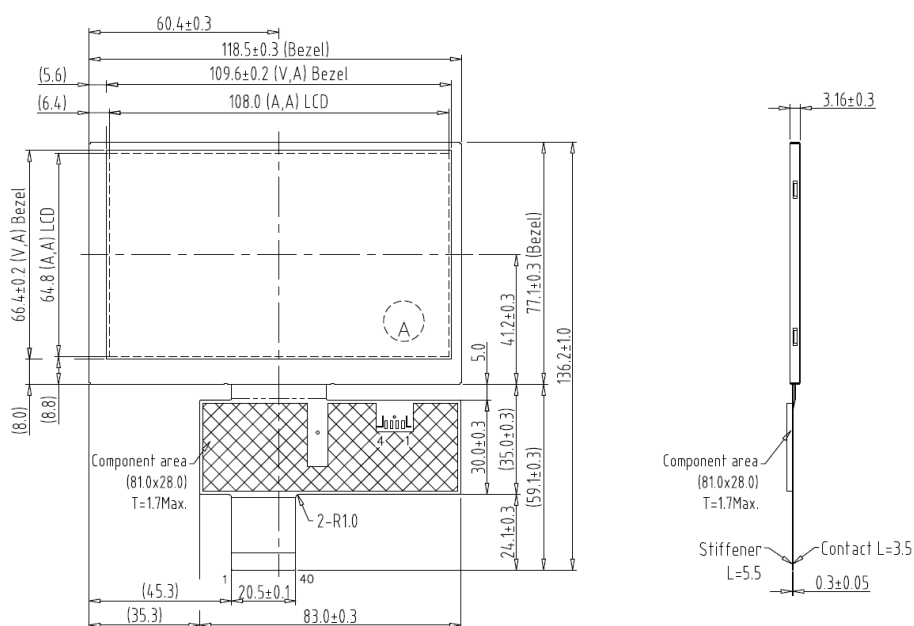
3. Absolute Maximum Ratings

3.1 Electrical Absolute max. ratings

Item	Symbol	Condition	Min.	Max.	Unit	Remark
Power voltage	VDD	GND=0	-0.3	4.0	V	
LED Driver Power Voltage	VLED	GND=0	--	6	V	

Note(1) The following are maximum values which, if exceeded, may cause operation or damage to the unit.

3.2 Environmental Absolute Maximum Ratings

Item	Operating		Storage		Remark
	Min.	Max.	Min.	Max.	
Temperature	-30	85	-30	85	Note(2),(3),(4),(5),(6),(7)
Humidity	Note(1)		Note(1)		
Corrosive Gas	Not Acceptable		Not Acceptable		

Note(1) Ambient temperature Temp. <= 60℃ : 90% RH max

Note(2) For storage condition Ta at -30℃ < 240h , at 85℃ < 240h

Note(3) For operating condition Ta at -30℃ < 100h , at 85℃ < 240h

Note(4) Background color changes slightly depending on ambient temperature. This phenomenon is reversible.

Note(5) The response time will be slower at low temperature.

Note(6) Only operation is guaranteed at operating temperature. Contrast, response time, another display quality are evaluated at +25℃

Note(7) When LCM panel is operated over 60℃ (center of the panel surface temperature), the IAK of the LED back-light should be adjusted to 105mA

Note(8) This is center of the panel surface temperature, not ambient temperature.

Note(9) At 25℃

4. Optical Characteristics

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Viewing Angle	Hor.	θU	CR≧10	75	85	--	deg.	(1),(4)
		θD		75	85	--		
	Ver.	θL		75	85	--		
		θR		75	85	--		
Contrast ratio		CR	Θ=Φ=0°	800	1000	--	--	(1),(2)
Response Time		$T_R + T_F$	Θ=Φ=0°	--	30	40	msec	(1),(3)
Color Gamut		(%)		45	50	--	%	
Color chromaticity	Red	Rx	Θ=Φ=0°	Typ. -0.05	TBD	Typ. +0.05	--	(1),(4),(5)
		Ry			TBD			
	Green	Gx			TBD			
		Gy			TBD			
	Blue	Bx			TBD			
		By			TBD			
	White	Wx			0.32			
		Wy			0.37			
Luminance (IAK=140mA)		L	Θ=Φ=0°	400	500	--	cd/m²	(1),(6)
Luminance Uniformity		ΔL	Θ=Φ=0°	70	-	-	%	(7)

Measuring Condition

Ta=25°C. To be measured on the center area of panel after 10 minutes operation. LED Back-light IAK=140mA.

- Measuring surrounding：Dark room
- Ambient temperature：25±2℃
- 15min. Warm-up time.
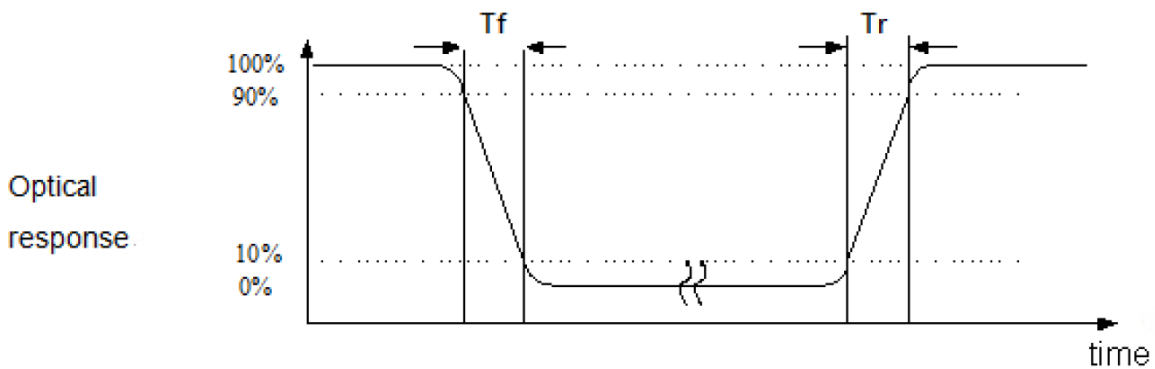
Note(1) Definition of Viewing Angle
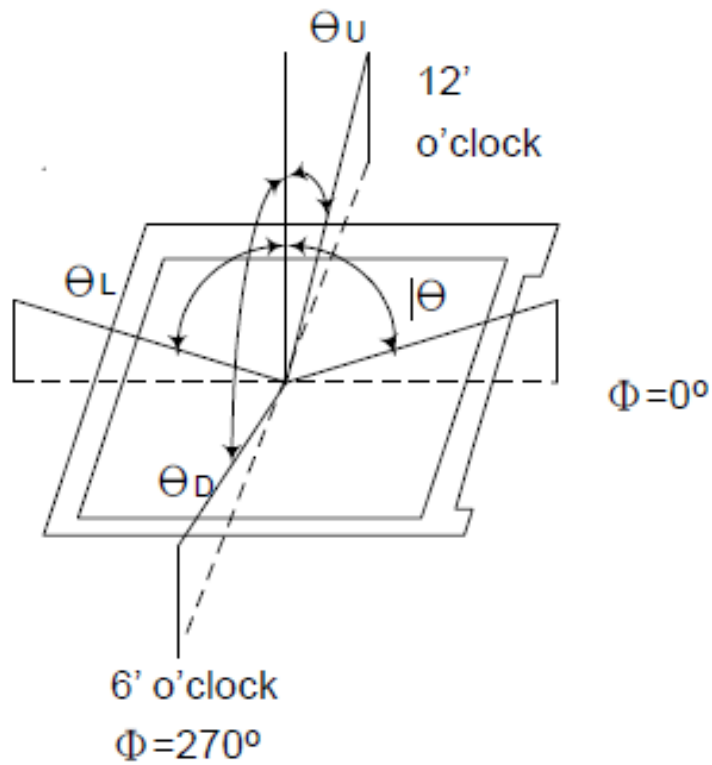
Note(2) Definition of Contrast Ratio (CR) :

Contrast ratio is calculated with the following formula.

$$\text{Contrast ratio (CR)} = \frac{\text{Photo detector output when LCD is at "White" state}}{\text{Photo detector Output when LCD is at "Black" state}}$$

Note(3) Definition of Response Time : Sum of TR and TF

Note(4) Definition of optical measurement setup

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.)
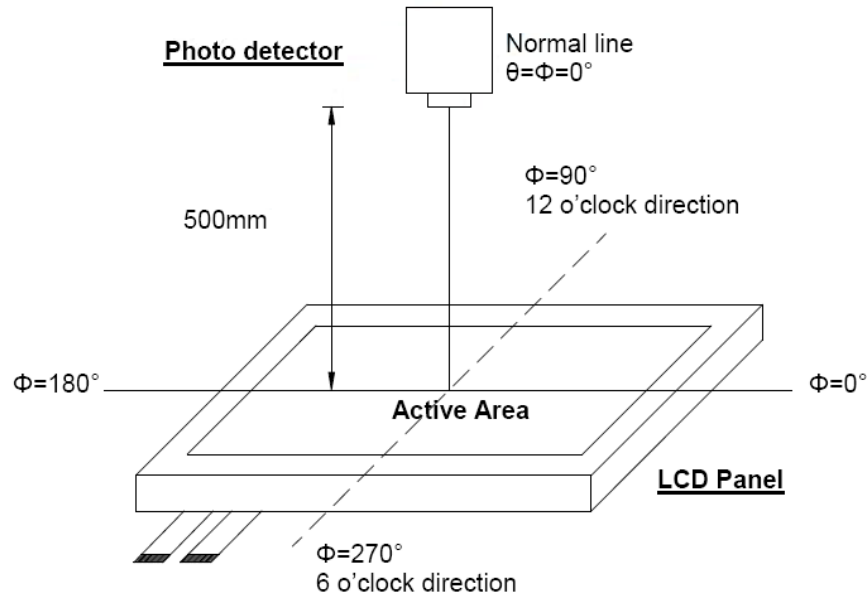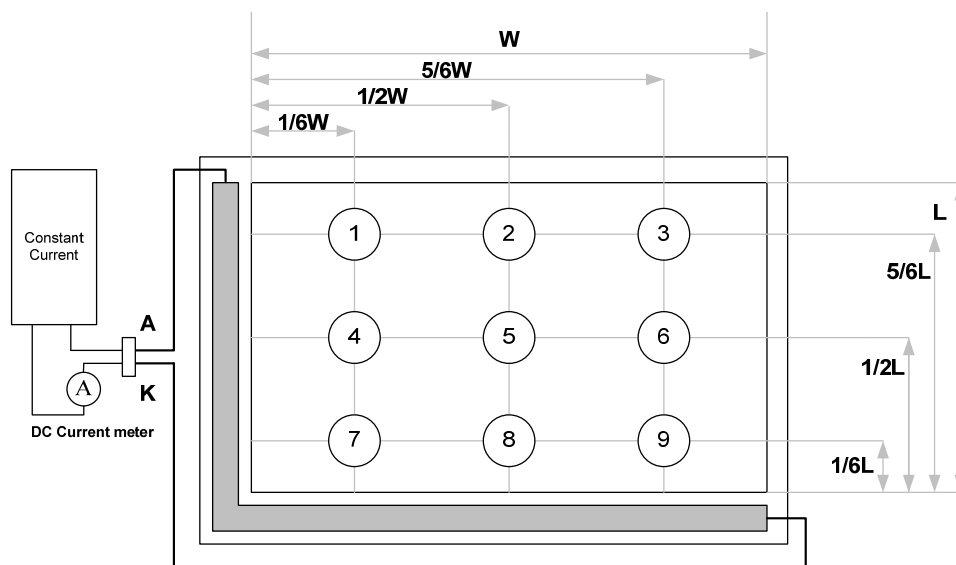

Note(5) Definition of color chromaticity (CIE1931)

Color coordinated measured at center point of LCD.

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

Note(6) Luminance is measured at point 5 of the display.

Note(7) 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.

$$\text{Luminance Uniformity (Yu)} = \frac{\text{Bmin}}{\text{Bmax}}$$

L ----- Active area length   W ----- Active area width
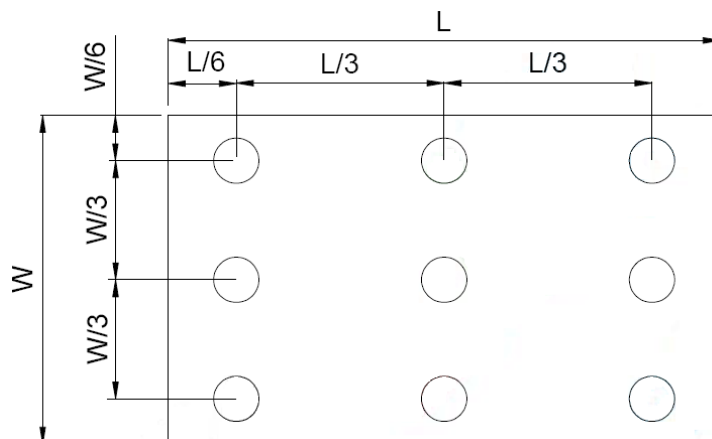
Bmax: The measured maximum luminance of all measurement position.
Bmin: The measured minimum luminance of all measurement position.

5. Electrical Characteristics

5.1 Electrical Characteristic Of LED Backlight

Item	Symbol	Min.	Typ.	Max.	Unit	Note
Power Voltage For VLED	VLED	--	5.0	--	V	
PWM Dimming DC active level	VDIMH	0.4	--	--	V	
	VDIML	--	--	1.4	V	
PWM Dimming Freq.	FDIM	0.1	--	50	kHz	
LED Forward Voltage	VAK	8.4	9.0	10.2	V	IAK=140mA, Ta=25℃
LED Forward Current	IAK	--	140	--	mA	Ta=25℃
LED life time			30k	-	Hrs.	IAK=140mA, Ta=25℃

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

Note(2) If the module is driven by high current or at high ambient temperature & humidity condition. The operating life will be reduced.

Note(3) The constant current source is needed for LED back-light driving.

Note(4) Operating life means brightness goes down to 50% minimum brightness. LED life time is estimated data. Ta=25℃

Note(5) The structure of LED B/L shows as below.
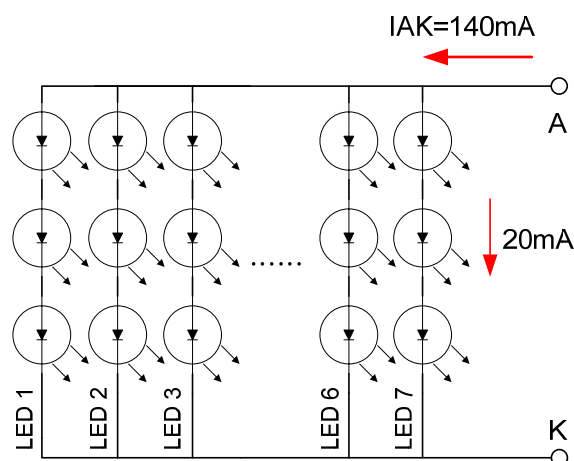
Note(6) When LCM is operated over 60℃ ambient temperature, the IAK of the LED
backlight should be adjusted to 105mA max
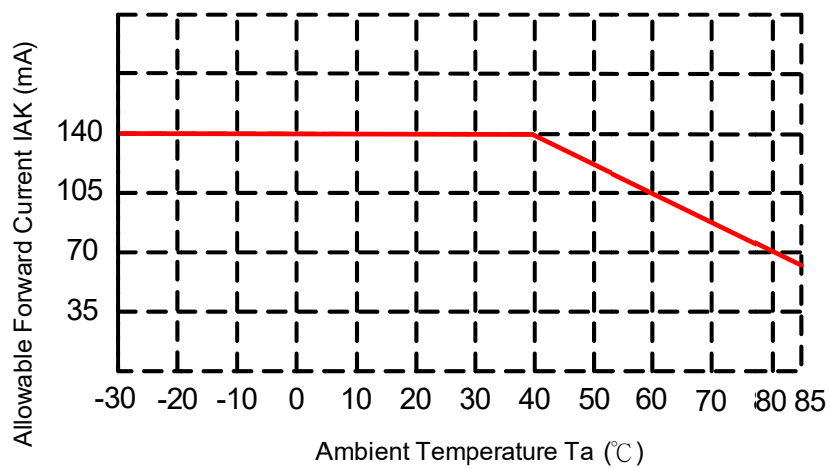
Note(7) PWM adjust brightness to control Pin, Pulse duty the bigger the brighter.

Note(8) PWM operation frequency: 100Hz~50 KHz with amplitude greater than 1.5V.

5.2 DC Characteristics

Item		Symbol	Min.	Typ.	Max.	Unit	Note
Power supply voltage		VDD	3.3	--	3.6	V	
Input voltage for logic	H Level	VIH	0.7* VDD	--	VDD	V	
	L Level	VIL	GND	--	0.3* VDD	V	
Power Supply current		IDD	--	**80**	--	mA	(1)

Note(1) Ta=25℃, Display pattern: All White.

Note(2) *:Will be reference only

5.3 DC Characteristics for LVDS Receiver Circuit

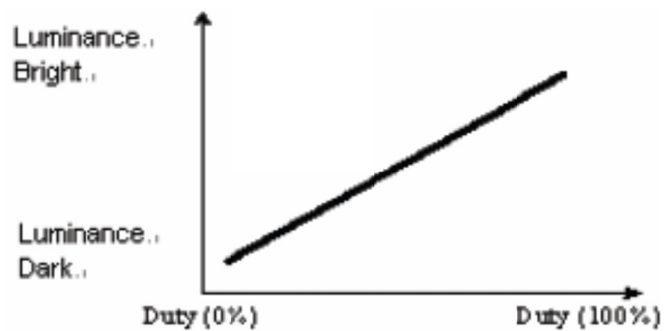| Item	Symbol	Min.	Typ.	Max.	Unit	Conditions
Differential Input High Threshold Voltage	R_{xVTH}	-	-	0.1	V	R_{xVCM} =
Differential Input Low Threshold Voltage	R_{xVTL}	-0.1	-	-	V	1.2V
Input Voltage Range (Singled-End)	R_{xVIN}	0	-	VDD-1.0	V	
Differential Input Common Mode Voltage	R_{xVCM}	$|V_{ID}|/2$	-	$2.4-|V_{ID}|/2$	V	
Differential Input Voltage	$|V_{ID}|$	0.2	-	0.6	V	

Single End Signals
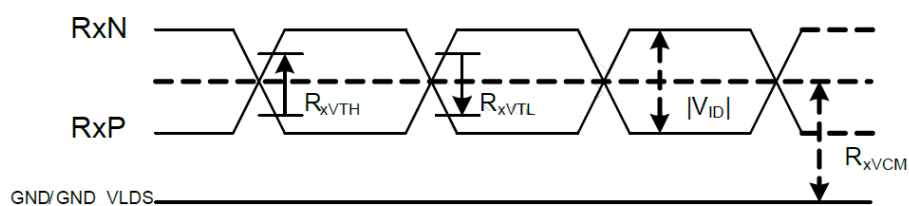
Differential Signals
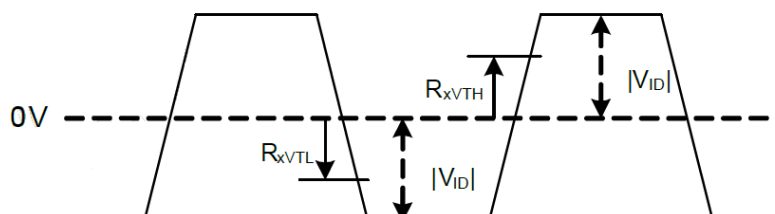
5.4 AC Characteristics

LVDS Input Timing Table
(PVDD=PVDD1=VDD=VDDI= 3.3V, AGND= 0V, TA=25℃)

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 x RX$_{FCLK}$)			ns	
Clock Low Time	T$_{LVCL}$	3/(7 x 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	%	
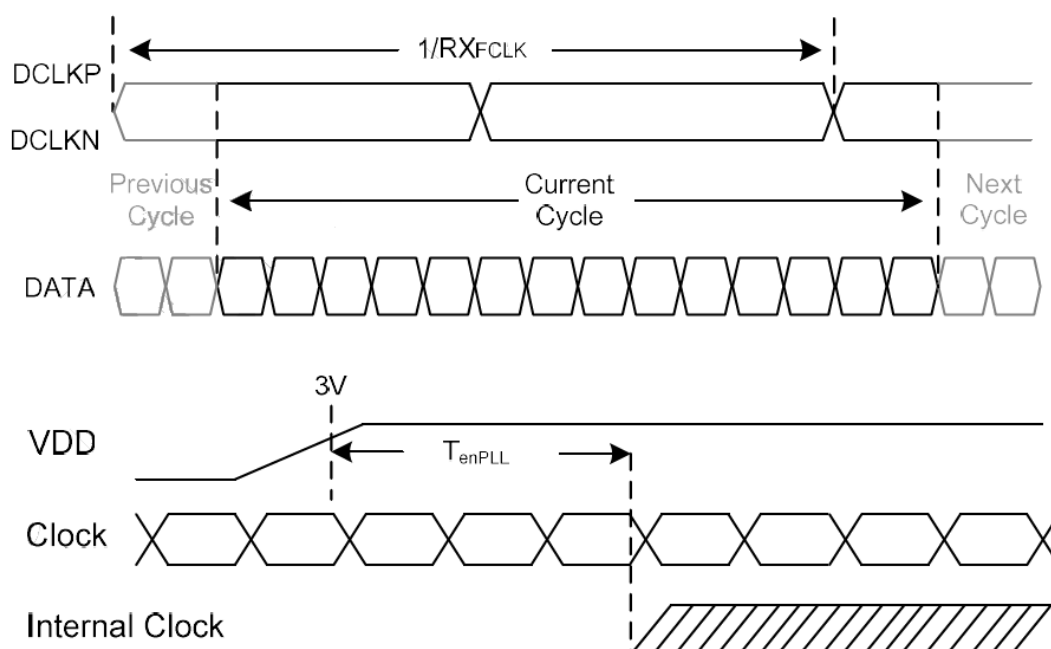
TTL
Timing for RGB Interface
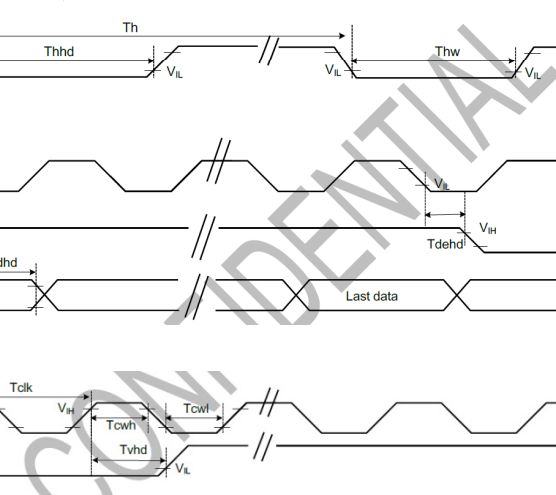
Item	Symbol	Min.	Typ.	Max.	Unit	Conditions
CLK Pulse Duty	Tcw	40	50	60	%	
VSYNC Setup Time	Tvst	-	-	10	ns	
VSYNC Hold Time	Tvhd	-	-	10	ns	
HSYNC Setup Time	Thst	-	-	10	ns	
HSYNC Hold Time	Thhd	-	-	10	ns	
Data Setup Time	Tdsu	-	-	10	ns	
Data Hold Time	Tdhd	-	-	10	ns	
DE Setup Time	Tdest	-	-	10	ns	
DE Hold Time	Tdehd	-	-	10	ns	

SYNC Mode
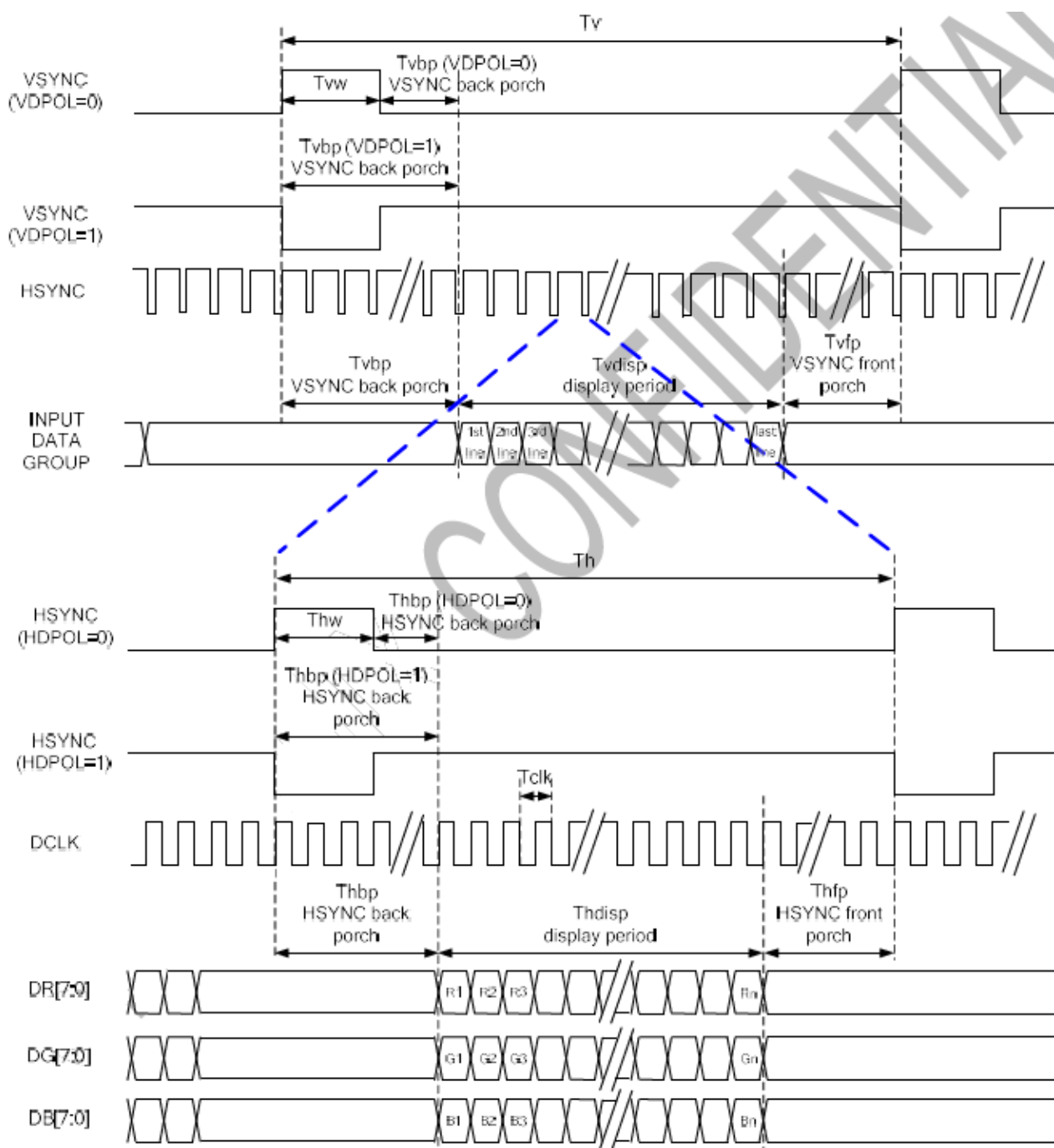
SYNC-DE Mode
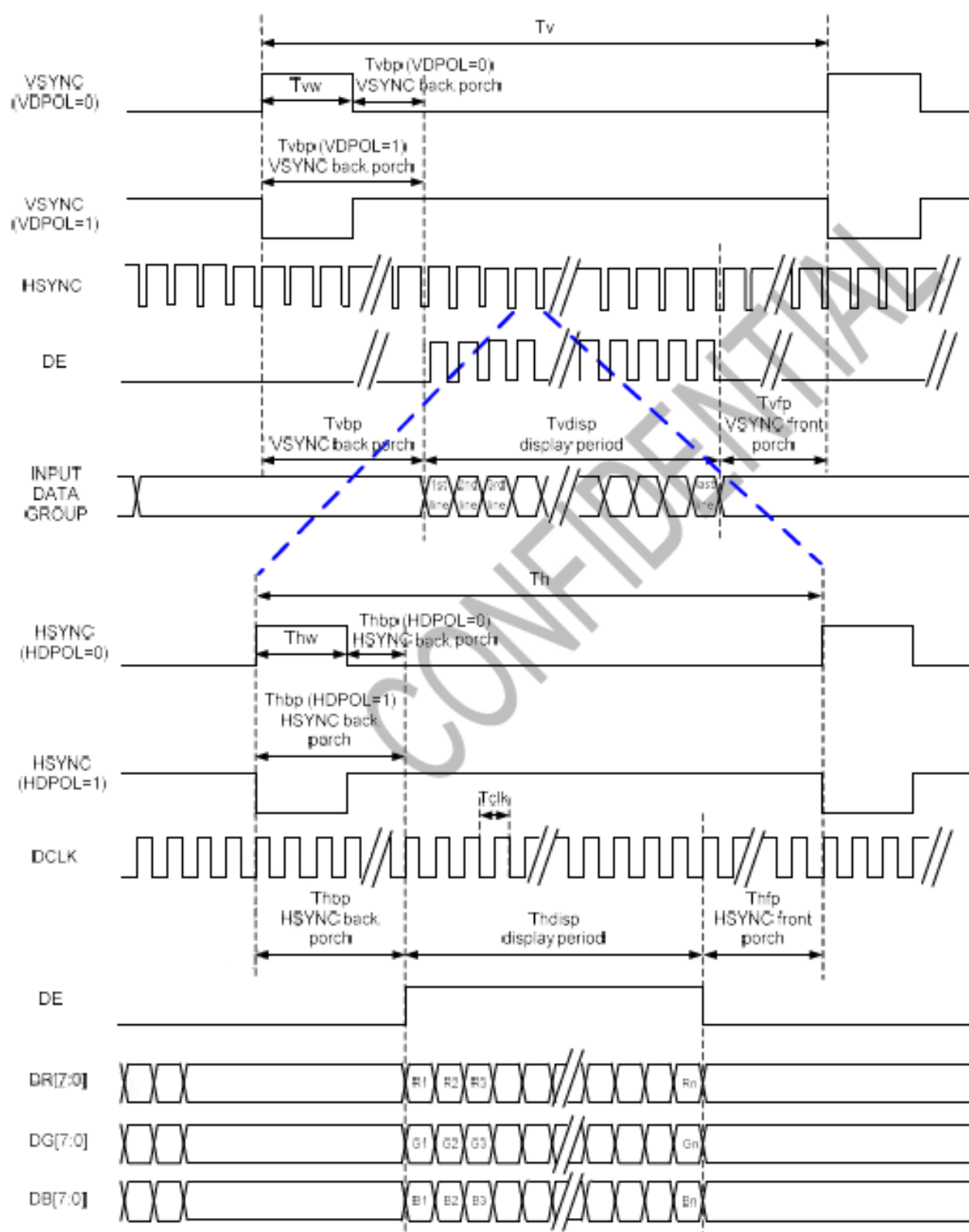
DE mode
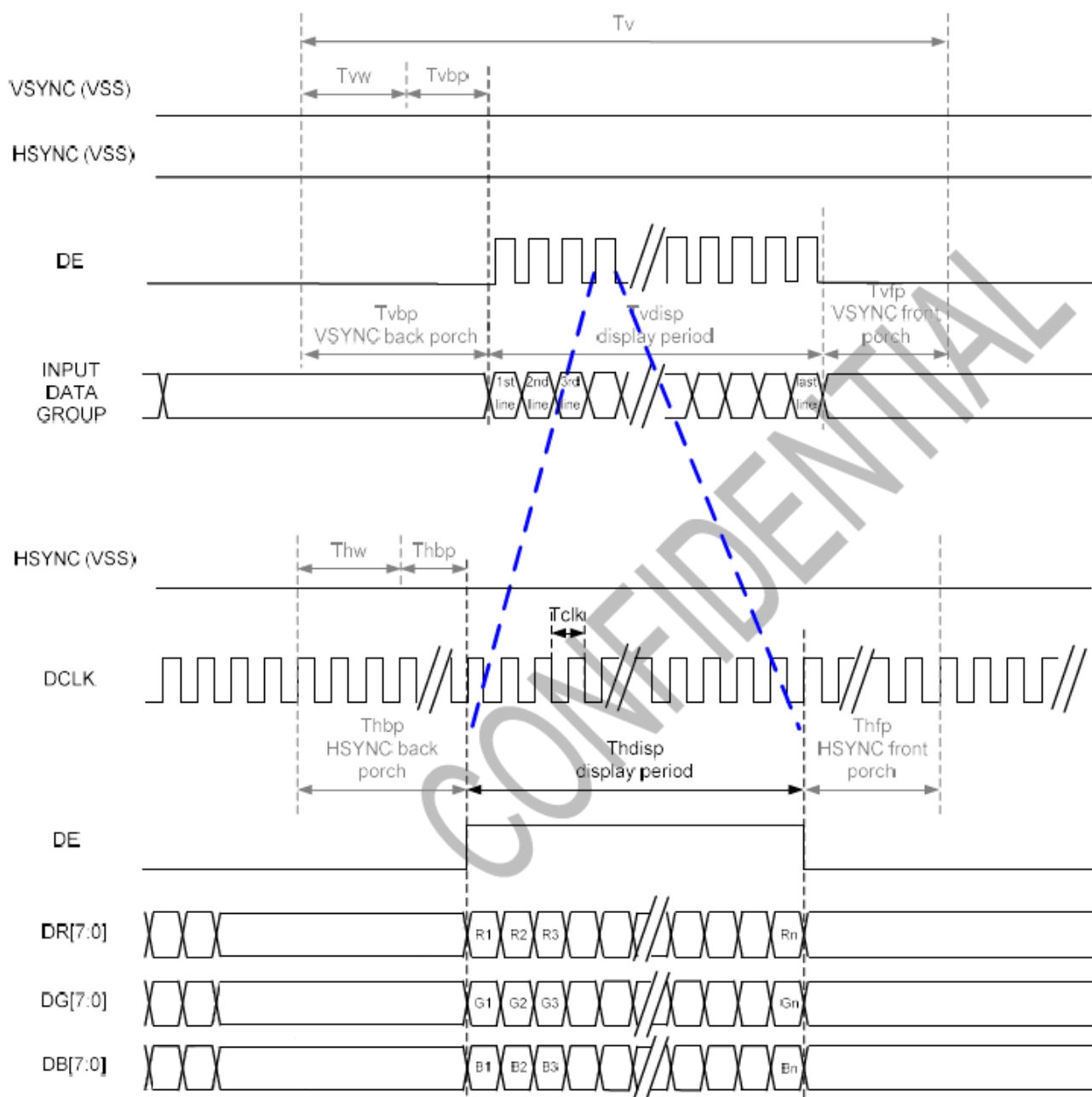
Parallel 24-bit RGB Input Timing (PVDD=PVDD1=VDD=VDDI= 3.3V, AGND= 0V, TA=25°C)

Parallel 24-bit RGB Interface Timing Table						
Item		Symbol	Min.	Typ.	Max.	Unit	Remark
DCLK Frequency		Fclk	23	25	27	MHz	
HSYNC	Period Time	Th	-	816	896	DCLK	
	Display Period	Thdisp		800		DCLK	
	Back Porch	Thbp	-	8	48	DCLK	
	Front Porch	Thfp	-	8	48	DCLK	
	Pulse Width	Thw	-	4	8	DCLK	
VSYNC	Period Time	Tv	-	496	504	HSYNC	
	Display Period	Tvdisp		480		HSYNC	
	Back Porch	Tvbp	-	8	12	HSYNC	
	Front Porch	Tvfp	-	8	12	HSYNC	
	Pulse Width	Tvw	-	4	8	HSYNC	

6. Interface Pin Assignment

Pin No	Symbol	Function
1	ENPROG	Not use. Keep no connection.
2	DISP	DISP sets the display mode L：Standby mode (Default) 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	XR/NC	Not use. Keep no connection.
29	YD/NC	Not use. Keep no connection.
30	XL/NC	Not use. Keep no connection.
31	YU/NC	Not use. Keep no connection.
32	SC	Not use. Keep no connection. Scan direction selectable by jumper.
33	VLED	Power supply of LED driving circuit
34	VLED	Power supply of LED driving circuit
35	PWM	Adjust for LED Brightness
36	GND	Power Ground
37	LEDK/NC	Not use. Keep no connection.
38	LEDA/NC	Not use. Keep no connection.
39	LEDK/NC	Not use. Keep no connection.
40	LEDA/NC	Not use. Keep no connection.

7. Power On/Off Sequence
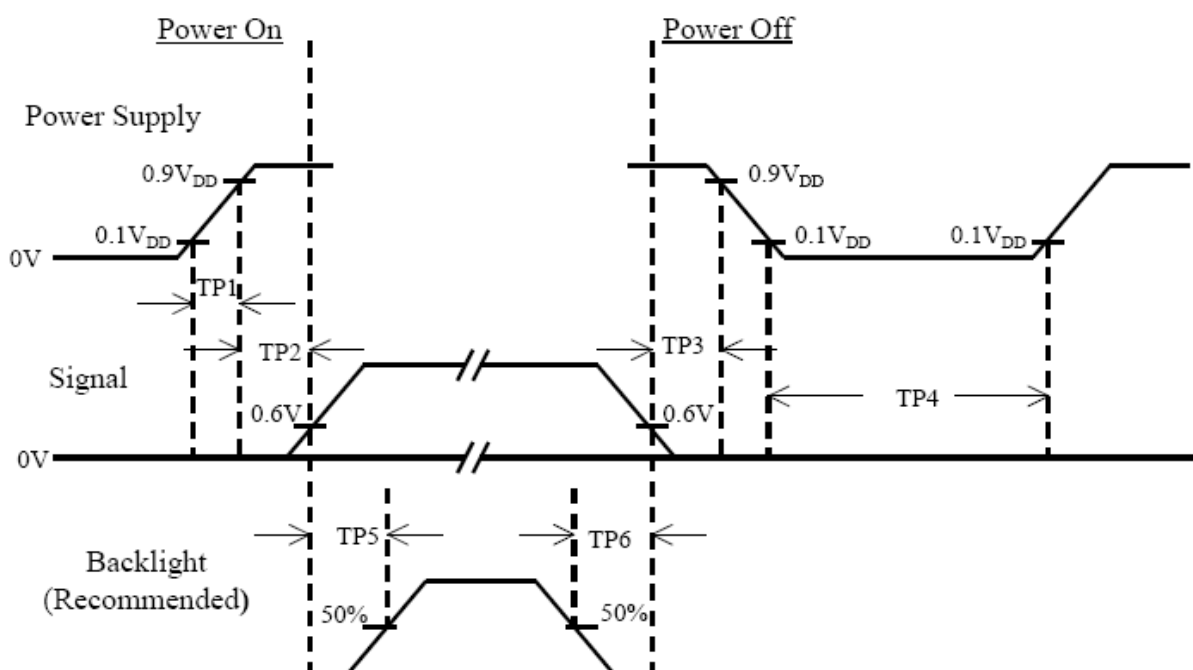
Item	Min.	Typ.	Max.	Unit	Remark
TP1	0.5	--	10	msec	
TP2	0	--	50	msec	
TP3	0	--	50	msec	
TP4	500	--	--	msec	
TP5	200	--	--	msec	
TP6	200	--	--	msec	

Note(1) The supply voltage of the external system for the module input should be the same as the definition of VDD.

Note(2) Apply the lamp voltage within the LCD operation range. When the back-light turns on before the LCD operation or the LCD turns off before the back-light turns off, the display may momentarily become white.

Note(3) In case of VDD = off level, please keep the level of input signal on the low or keep a high impedance.

Note(4) TP4 should be measured after the module has been fully discharged between power off and on period.

Note(5) Interface signal shall not be kept at high impedance when the power is on.

8. Displayed Color and Input Data

4 Lane VESA Data Format Color Bit Map
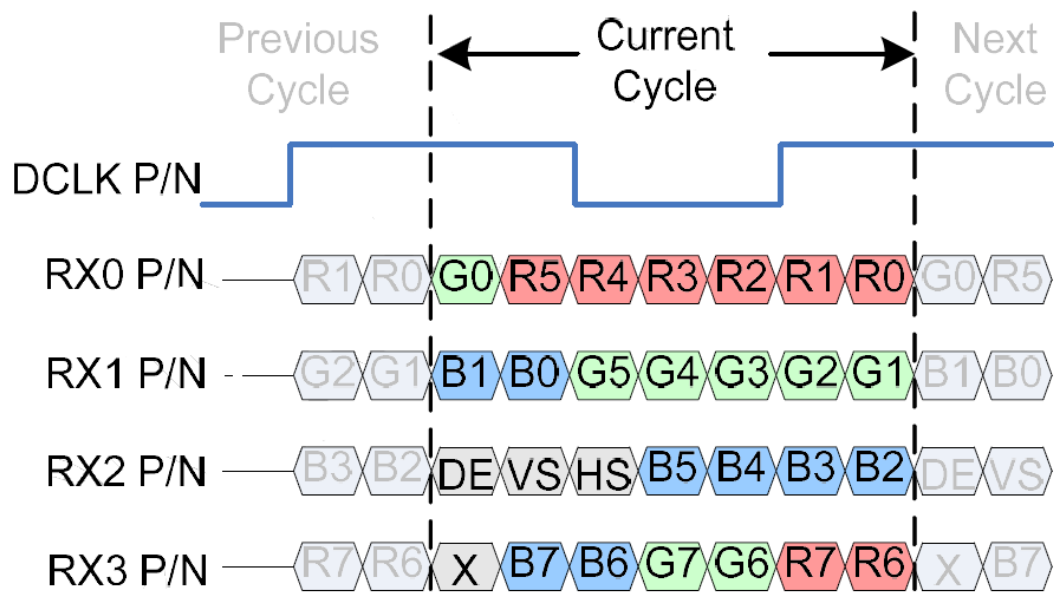
9. Reliability Test Conditions

Test Item	Test Conditions	Note
High Temperature Operation	85±3°C , t=240 hrs	
Low Temperature Operation	-30±3°C , t=240 hrs	
High Temperature Storage	85±3°C , t=240 hrs	(1),(2)
Low Temperature Storage	-30±3°C , t=240 hrs	(1),(2)
Storage Humidity Test	60 °C, Humidity 90%, 240 hrs	(1),(2)
Vibration Test (Packing)	Sweep frequency : 10 ~ 50 ~ 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 inspired after 1 hour storage in normal conditions (15~35℃, 45~65%RH).

Note(3) The module shouldn't be tested over one condition, and all the tests are independent.

Note(4) All reliability tests should be done without the protective film.

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 initial value.

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) 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.

(4) AMIPRE will provide one year warrantee for all products and three months warrantee for all repairing products.

11. Outline Dimension

A Block

1	ENPROG	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	XR/NC
9	CS	29	YD/NC
10	GRB	30	XL/NC
11	GND	31	YU/NC
12	SC	32	SC
13	DCLKN	33	VLED
14	GND	34	VLED
15	D3N	35	PWM
16	D3P	36	GND
17	GND	37	LEDK/NC
18	D2N	38	LEDA/NC
19	D2P	39	LEDK/NC
20	GND	40	LEDA/NC

Note:
1. Unless indicated, Tolerance "±0.3"
2. UV Glue For OLB Protection.
3. LCD 800x480 (R.G.B) TFT LCD => 5.0" TFT LCD

1	500nits / 30K	7	
2	800480N3	8	
3	new FPC	9	
4	TF800480-401-0	10	
5		11	
6		12	

0.135
0.135
0.045
RGB

(8.0)
(8.8)
66.4±0.2 (V,A) Bezel
64.8 (A,A) LCD
(5.6)
(6.4)
60.4±0.3
118.5±0.3 (Bezel)
109.6±0.2 (V,A) Bezel
108.0 (A,A) LCD

Component area
(81.0x28.0)
T=1.7Max.
(35.3)
(45.3)
20.5±0.1
40
2-R1.0
83.0±0.3

(A)

30.0±0.3
5.0
24.1±0.3
(35.0±0.3)
41.2±0.3
(59.1±0.3)
77.1±0.3 (Bezel)
136.2±1.0

DIM.	MM		
	A	B	
IR NO.			
PARTS NO. LCM 800480N3-30			

TOLERANCE GRADE(±)

DWN. SNOW
DATE 03-18-20'
CHK. DATE
APPD. DATE

TITLE 800480N3-30
(5.0") IPS

DWG. NO. *2003126MA
SHEET 1 OF 1

AMPIRE 晶采光電科技

Component area
(81.0x28.0)
T=1.7Max.
Stiffener
L=5.5
Contact L=3.5
0.3±0.05
3.16±0.3

REV	REVISION RECORD		DATE	NAME
0	NEW RELEASE		03-18-20'	SNOW
1	Rename TF800480-401-0 to 800480N3-30		04-06-20'	SNOW
2	Modify Interface		04-09-20'	SNOW

1	ENPROG	21	D1N			
2	DISP	22	D1P			
3	VDD	23	GND			
4	VDD	24	DON			
5	GND	25	DOP			
6	GND	26	GND			
7	SCL	27	GND			
8	SDA	28	XR/NC			
9	CS	29	YD/NC			
10	GRB	30	XL/NC			
11	GND	31	YU/NC			
12	GND	32	SC			
13	DCLKN	33	VLED			
14	GND	34	VLED			
15	D3N	35	PWM			
16	D3P	36	GND			
17	GND	37	LEDK/NC			
18	D2N	38	LEDA/NC			
19	D2P	39	LEDK/NC			
20	GND	40	LEDA/NC			

Note:
1. Unless indicated, Tolerance "±0.3"
2. UV Glue For OLB Protection.
3. LCD 800x480 (R.G.B) TFT LCD => 5.0" TFT LCD

1	500nits / 30K	7	
2	800480N3	8	
3	new FPC	9	
4	TF800480-401-0	10	
5		11	
6		12	

Back view

Tape
(12.0x6.0x0.06T)

R0.3

40

P0.5x39
20.5±0.1
0.5
(45.3)
W=0.3
1

118.5±0.3 (Bezel)
59.1±0.3
77.1±0.3 (Bezel)

3.16±0.3

Contact L=35
0.3±0.05
Stiffener
L=5.5
Component area
(81.0x28.0)
T=1.7Max.

TOLERANCE GRADE(±)

	A	B	DIM. MM	DWN. SNOW	CHK.	APPD.
			IB NO.	DATE 03-18-20'	DATE	DATE

PARTS NO. LCM-1
800480N3-30

TITLE
800480N3-30
(5.0") IPS

DWG. NO.
*200312?MA

SHEET 1 OF 1

AMPIRE 晶采光電科技

REV	REVISION RECORD	DATE	NAME
0	NEW RELEASE	03-18-20'	SNOW
1	Rename TF800480-401-0 to 800480N3-30	04-06-20'	SNOW
2	Modify Interface	04-09-20'	SNOW

12. Package

TBD