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-480272M3TMQW-T01
APPROVED BY	
DATE	

☐ Approved For Specifications
☐ Approved For Specifications & Sample

AMPIRE CO., LTD.
4F., No.116, Sec. 1, Xintai 5th Rd., Xizhi Dist., New Taipei City 221, Taiwan (R.O.C.)
22181 新北市 汐止區 新台五路一段 **116** 號 **4** 樓(東方科學園區 A 棟)
TEL:886-2-26967269 , FAX:886-2-26967196 or 26967270

APPROVED BY	CHECKED BY	ORGANIZED BY

RECORD OF REVISION

Revision Date	Page	Contents	Editor
2011/11/2	-	New Release	Rober
2012/3/30	3	RGB Interface 40pin. → 45pin.	Titan
2012/3/30	19	Correct Reliability Test	Titan

1. FEATURES

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

(2) LCD type : Transmissive , Normally White

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

(4) RGB Interface 45 pin.

(5) LCD Power Supply Voltage : 3.3V single power input,

(6) Touch Panel Included

2. PHYSICAL SPECIFICATIONS

Item	Specifications	unit
Display size (diagonal)	4.3	inch
Resolution	480RGB (W) x 272(H)	dots
Display area	95.04(W) x53.856 (H)	mm
Pixel pitch	0.198 (W) x 0.198 (H)	mm
Overall dimension	105.5(W)x67.2(H)x4.15(D)	mm
Color configuration	R.G.B Vertical stripe	
View Direction	6 o'clock	

3. ABSOLUTE MAXIMUM RATINGS

item	Symbol	Values		Unit	Remark
		Min	Max		
Power Supply for logic	VCC	-0.3	4.0	V	GND=0
Operation Temperature (Ambient)	T_{OP}	-20	70	℃	
Storage Temperature (Ambient)	T_{ST}	-30	80	℃	Note 1
LED Forward current	I_f		25	mA	OneLED/Note2

*TFT LCD Ratings

Note 1: Hsync, Vsync, DEN, DCLK, R0~R7, G0~G7, B0~B7

Note 2: Background color changes slightly depending on ambient temperature. This phenomenon is reversible.

3.1 Power Voltage

item	Symbol	Values			Unit	Remark
		Min	Typ	Max		
Logic power supply	VCC	2.7	3.0	3.6		

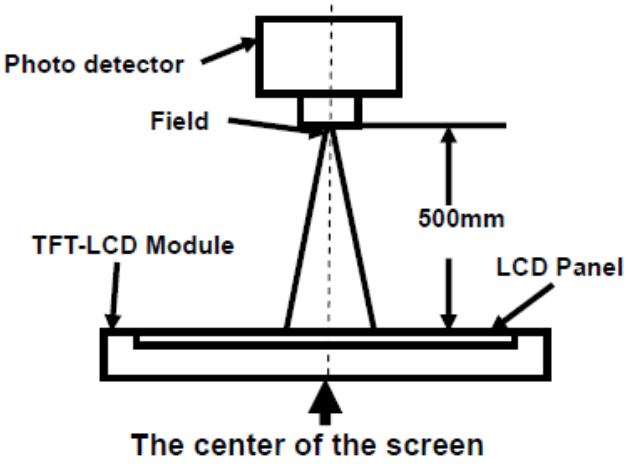
4. OPTICAL CHARACTERISTICS

Item		Symbol	Condition	Min	Typ	Max	Unit	Remark
View Angles		θT	CR≧10	60	70	-	Degree	Note2,3
		θB		40	50	-		
		θL		60	70	-		
		θR		60	70	-		
Contrast Ratio		CR	θ=0°	400	450	-		Note 3
Response Time		T_{ON}	25℃	-	20	30	ms	Note 4
		T_{OFF}						
Chromaticity	White	x	Backlight is on	0.270	0.320	0.370		Note 1,5
		y		0.290	0.340	0.390		
	Red	x		0.531	0.581	0.631		Note 1,5
		y		0.295	0.345	0.395		
	Green	x		0.298	0.348	0.398		Note 1,5
		y		0.531	0.581	0.631		
	Blue	x		0.103	0.153	0.203		Note 1,5
		y		0.045	0.095	0.145		
Uniformity		U			80	-	%	Note 6
NTSC				-	50	-	%	Note 5
Luminance		L		300	400	-	cd/m^2	Note 7

Test Conditions:

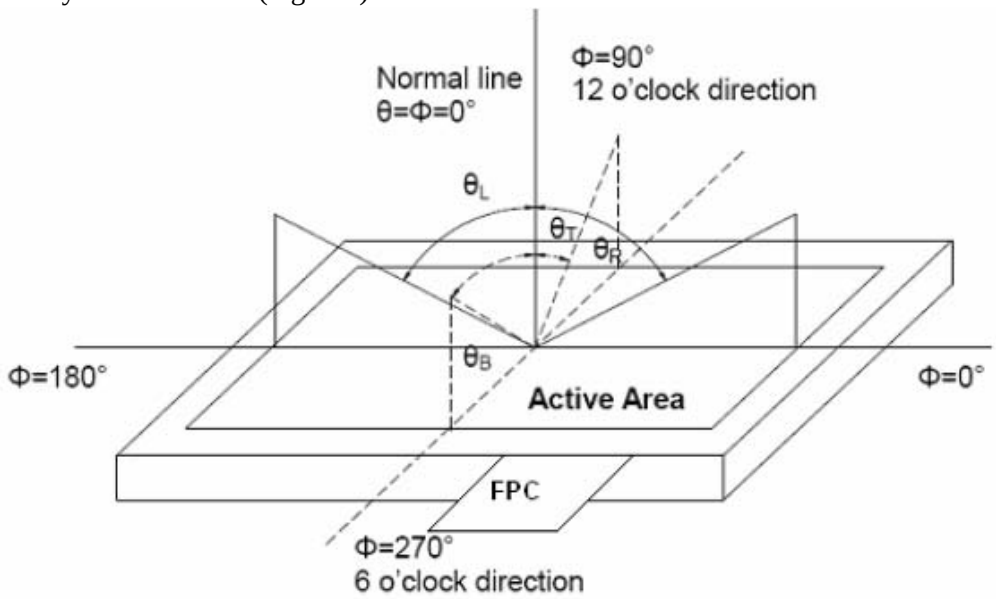
1. I_F= 22 mA, and the ambient temperature is 25℃.
2. The test systems refer to Note 1 and Note 2.

Note 1: Definition of optical measurement system.
The optical characteristics should be measured in dark room. After 5 Minutes operation, the optical properties are measured at the center point of the LCD screen. All input terminals LCD panel must be ground when measuring the center area of the panel.



Item	Photo detector	Field
Contrast Ratio	SR-3A	1°
Luminance		
Chromaticity		
Lum Uniformity		
Response Time	BM-7A	2°

Note 2: Definition of viewing angle range and measurement system.viewing angle is measured at the center point of the LCD by CONOSCOPE(ergo-80)。



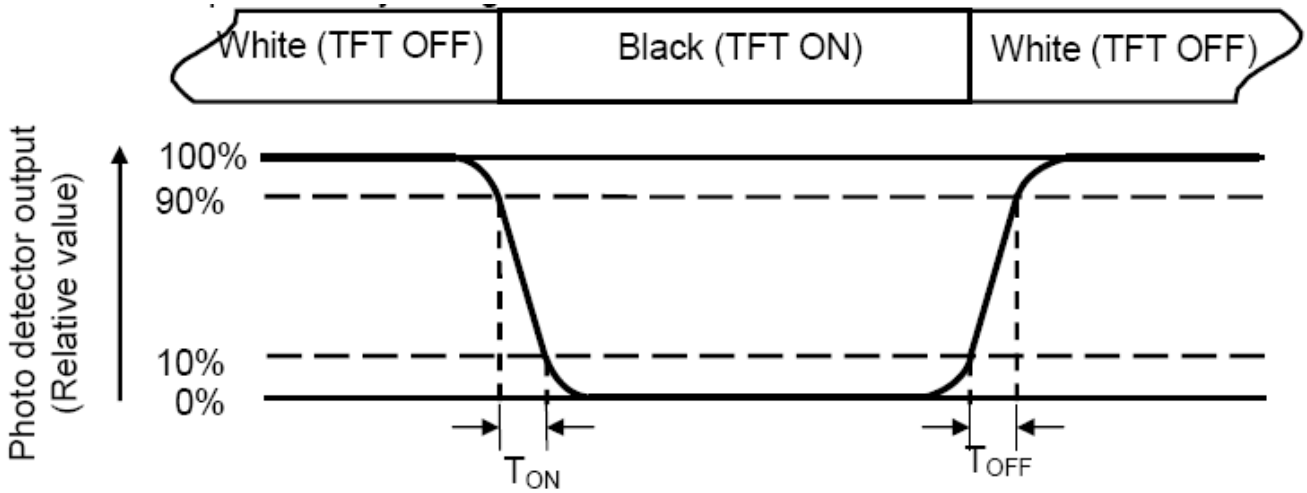
Note 3: Definition of contrast ratio

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

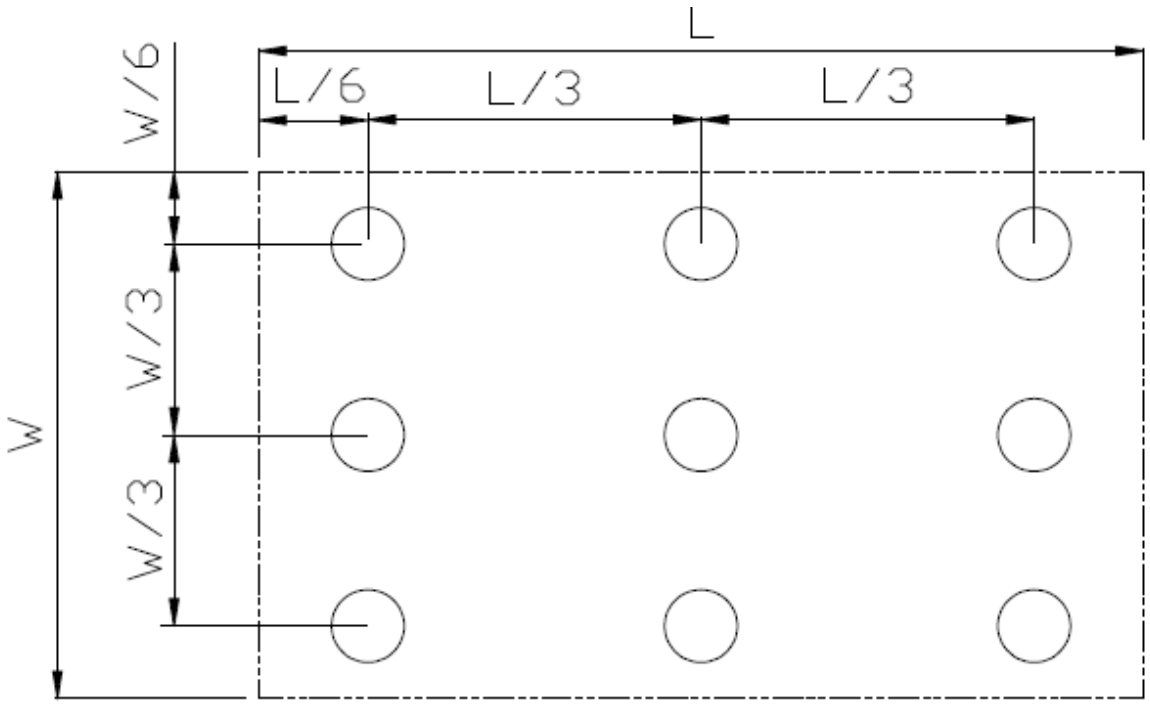
white: To be determined Vblack: To be determined.

Note 4: Definition of Response time

The response time is defined as the LCD optical switching time interval between “White” state and “Black” state. Rise time (T_{ON}) is the time between photo detector output intensity changed from 90% to 10%. And fall time (T_{OFF}) is the time between photo detector output intensity changed from 10% to 90%.



Note 5: Definition of color chromaticity (CIE1931)
Color coordinates measured at center point of LCD.
Note 6: Definition of Luminance Uniformity
Active area is divided into 9 measuring areas (Refer Fig. 2). Every measuring point is placed at the
center of each measuring area.
Luminance Uniformity (U) = Lmin/ Lmax
L-------Active area length W----- Active area width



Lmax: The measured Maximum luminance of all measurement position.
Lmin: The measured Minimum luminance of all measurement position.
Note 7: Definition of Luminance:
Measure the luminance of white state at center point.

5. ELECTRICAL CHARACTERISTICS

LCD driving

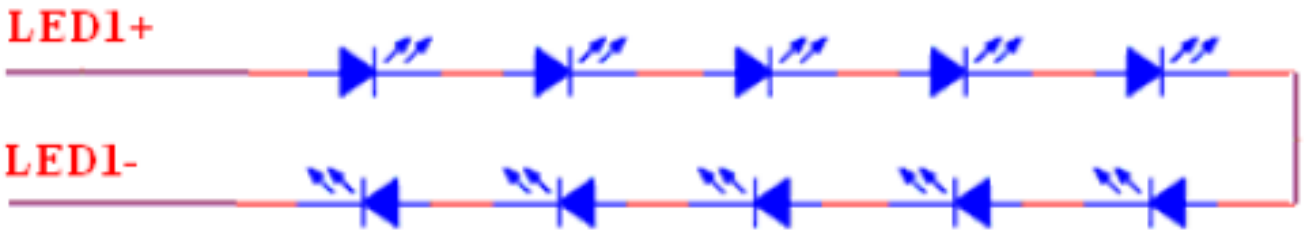
Item		Symbol	Min.	Typ.	Max.	Unit	Note
Power supply voltage		VDD	3.0	3.3	3.6	V	
Input voltage for logic	H Level	V_{IH}	0.7 VDD	--	VDD	V	(1)
	L Level	V_{IL}	0	--	0.3 VDD	V	
Power Consumption		Standby Mode	--	TBD	--	mW	(2)

Note 1: Hsync, Vsync, DEN, DCLK, R0~R5, G0~G5, B0~B5

Note 2: fV =60Hz , Ta=25℃ , Display pattern : All Black

LED back light specification

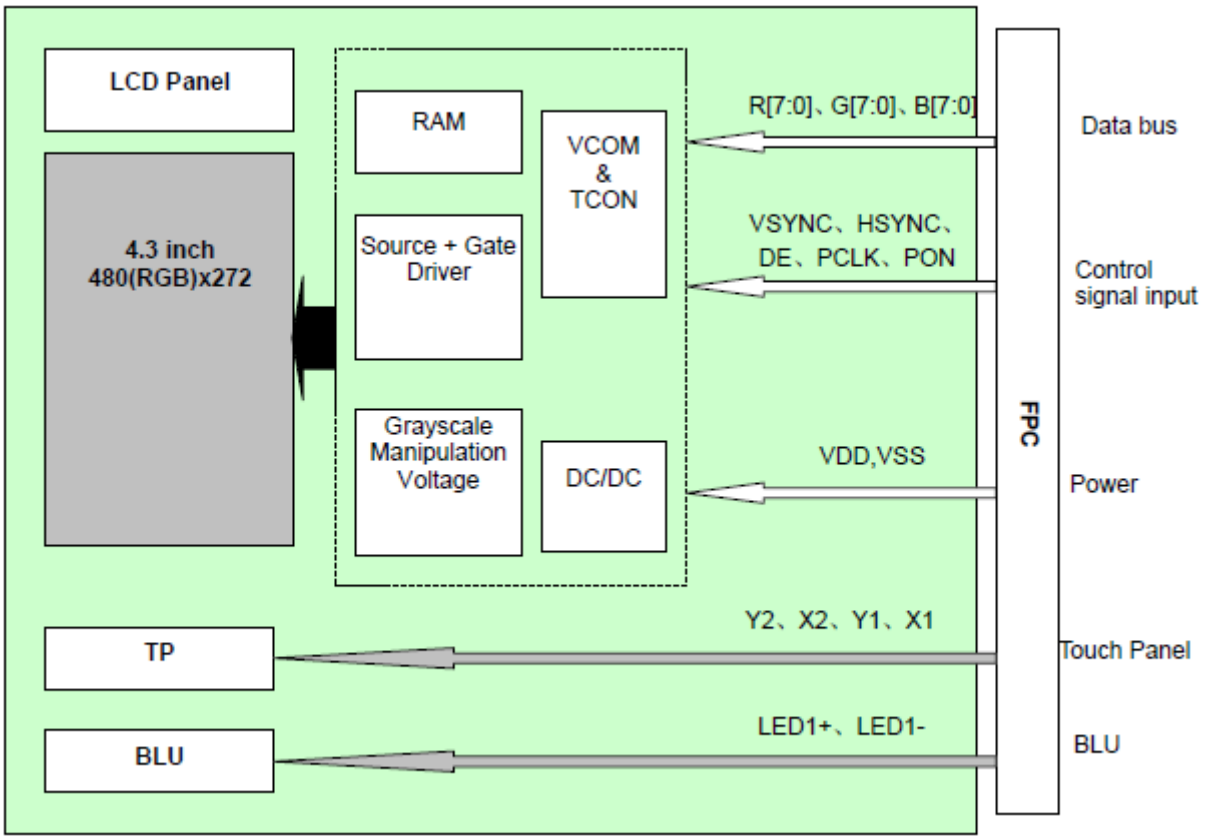
Item	Symbol	MIN	TYP	MAX	Unit	Remark
Forward Current	I_F	--	22	25	mA	
Forward Current Voltage	V_F	--	32	--	V	
Backlight Power Consumption	W_{BL}	--	704	--	mW	



Pin definition of Backlight

Pin no	Symbol	Function
1	LED_K	LED Cathode
2	NC	Keep NC
3	NC	Keep NC
4	LED_A	LED Anode

6. BLOCK DIAGRAM

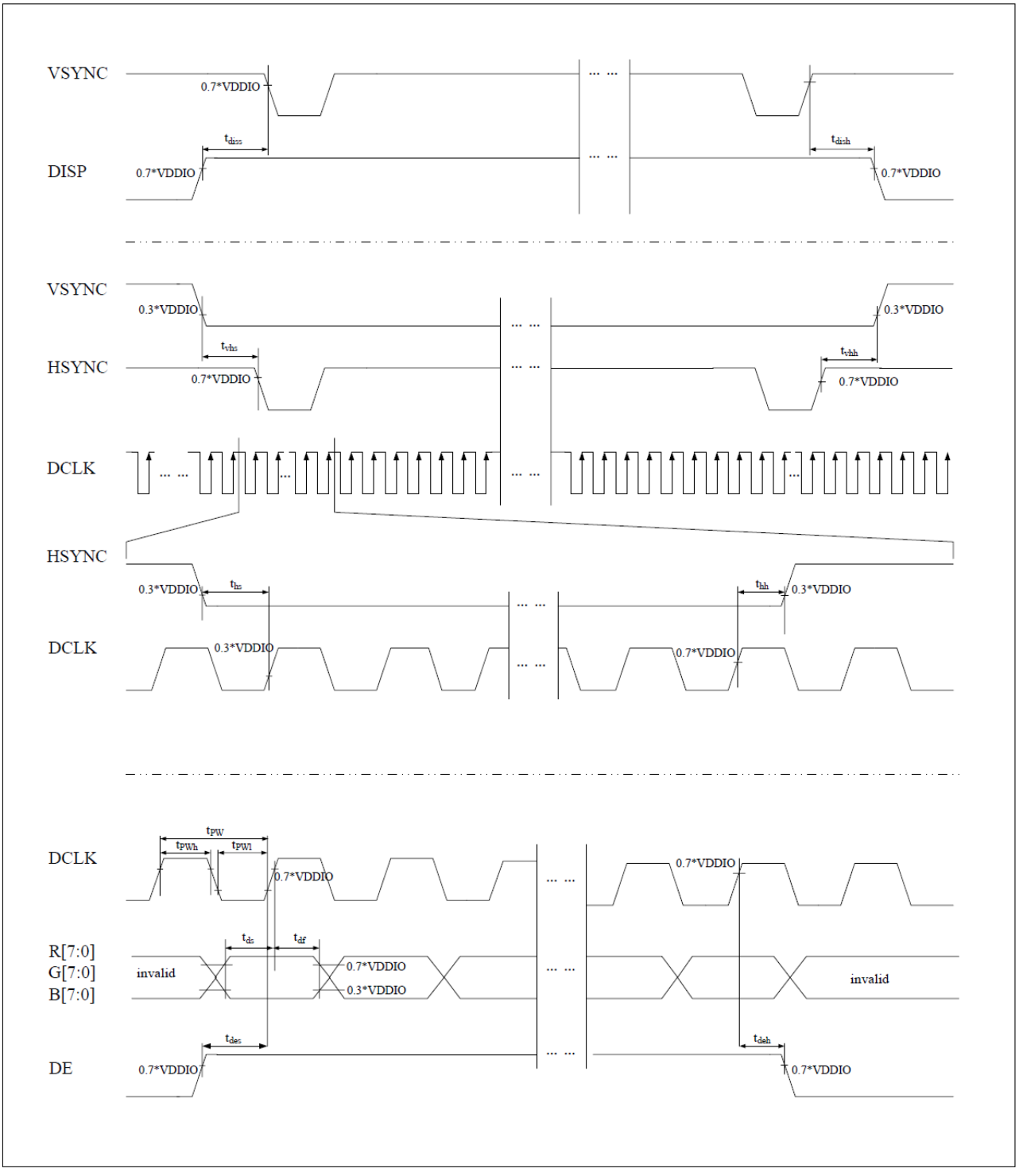


7. TFT LCD Panel FPC Descriptions

Pin no	Symbol	Function
1	GND	Gound
2	GND	Gound
3	VDD	Power Supply
4	VDD	Power Supply
5	R0	Red Data Bit 0
6	R1	Red Data Bit 1
7	R2	Red Data Bit 2
8	R3	Red Data Bit 3
9	R4	Red Data Bit 4
10	R5	Red Data Bit 5
11	R6	Red Data Bit 6
12	R7	Red Data Bit 7
13	G0	Green Data Bit 0
14	G1	Green Data Bit 1
15	G2	Green Data Bit 2
16	G3	Green Data Bit 3
17	G4	Green Data Bit 4
18	G5	Green Data Bit 5
19	G6	Green Data Bit 6
20	G7	Green Data Bit 7
21	B0	Blue Data Bit 0
22	B1	Blue Data Bit 1
23	B2	Blue Data Bit 2
24	B3	Blue Data Bit 3
25	B4	Blue Data Bit 4
26	B5	Blue Data Bit 5
27	B6	Blue Data Bit 6
28	B7	Blue Data Bit 7
29	GND	Ground
30	DCLK	Dot Data Clock
31	PON	Standby mode. PON =“1”: Normally operation. PON =“0”: Standby mode.
32	Hsync	Horizotal Sync Input
33	Vsync	Vertical Sync Input
34	DE	Data input enable. If unused, please pull low level.
35	PWRSEL	Not Connection
36	GND	Gound
37	X_R	XR
38	Y_B	YD
39	X_L	XL
40	Y_T	YU
41	GND	Ground
42	LED K	Back light cathode
43	LED A	Back light anode

44	NC	No connection
45	NC	No connection

8. INPUT SIGNAL

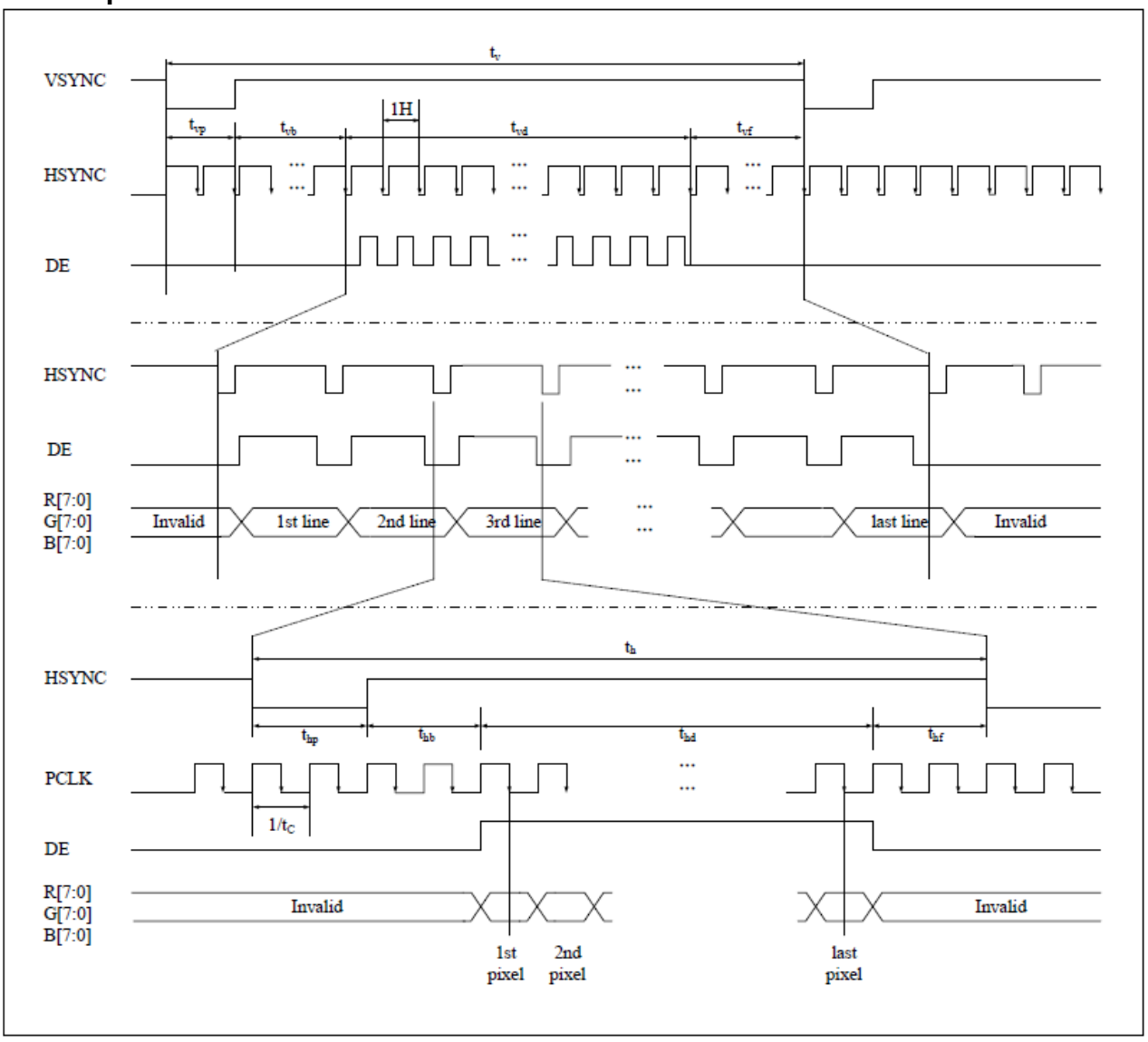


VDD=3.3V Ta=25℃

Parameter	Symbol	Min	Typ	Max	Unit	Remark
DCLK Cycle Time	T_{pw}	66.7	-	-	ns	
DCLK Pulse High Width	T_{pwh}	26.7	-	-	ns	
DCLK Pulse Low Width	T_{pwl}	26.7	-	-	ns	
DE Setup Time	T_{des}	10	-	-	ns	
DE Hold Time	T_{deh}	10	-	-	ns	
HSYNC Setup Time	T_{hs}	10	-	-	ns	
HSYNC Hold Time	T_{hh}	10	-	-	ns	
VSYNC Setup Time	T_{vhs}	10	-	-	ns	
VSYNC Hold Time	T_{vhh}	10	-	-	ns	
Data Setup Time	T_{ds}	10	-	-	ns	
Data Hold Time	T_{dh}	10	-	-	ns	
DISP Setup Time	T_{diss}	10	-	-	us	
DISP Hold Time	T_{dish}	10	-	-	ms	

Note 1: t_r=t_f=2ns.t_r, t_f is defined 10% to 90% of signal amplitude.
Note 2: For parallel interface, maximum clock frequency is 15MHz.

8.4 Data Input format



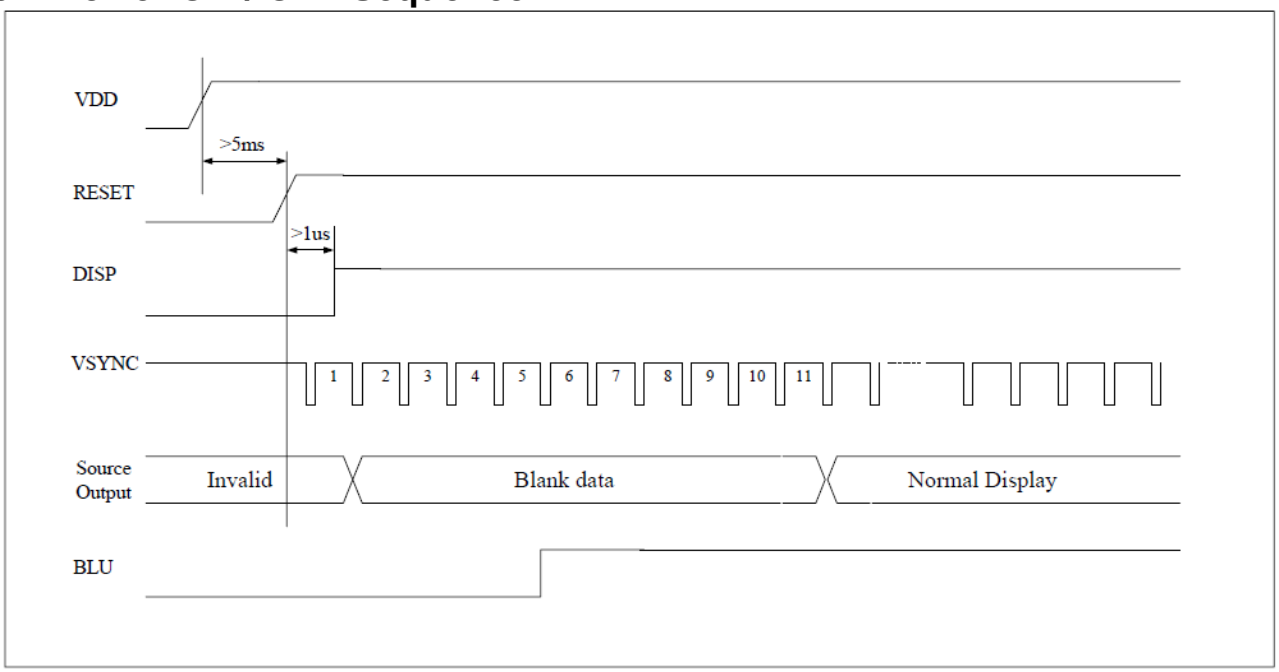
8.5 Data Input Timing Parameter Setting

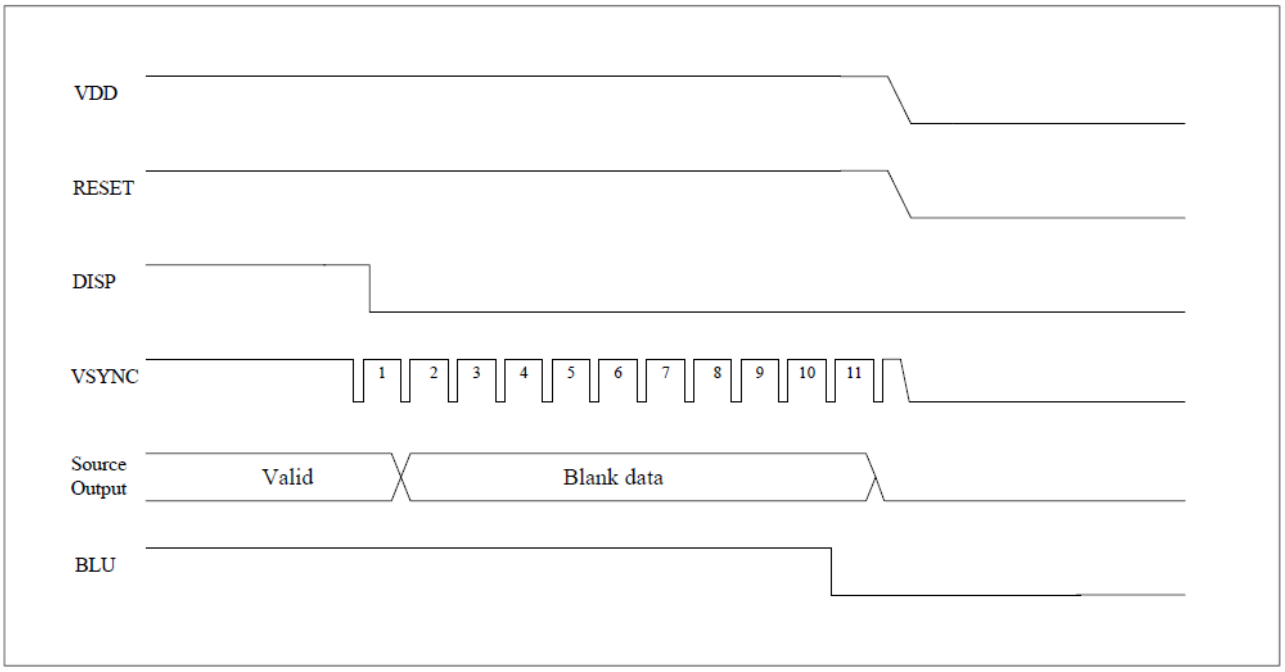
Parameter	Symbol	Spec.			Unit
		Min.	Typ.	Max.	
DCLK frequency	fclk	-	9	15	MHZ
HSYNC frequency	1/th	-	17.14	-	KHZ
VSYNC frequency	1/tv	-	59.94	-	HZ
Horizontal cycle	th	525	525	605	DCLK
Horizontal display period	thd		480		DCLK
Horizontal pulse width	thp	2	41	41	DCLK
Horizontal back porch	thb	2	2	41	DCLK
Horizontal front porch	thf	2	2	82	DCLK
Vertical cycle	tv	285	286	399	HSYNC
Vertical display period	tvd		272		HSYNC
Vertical pulse width	tvp	1	10	11	HSYNC
Vertical back porch	tvb	1	2	11	HSYNC
Vertical front porch	tvf	1	2	227	HSYNC

Note 1: Unit: CLK=1/ f_{CLK} , H= t_h,

Note 2: It is necessary to keep $t_{vp}+t_{vb}=12$ and $t_{hp}+t_{hb}= 43$ in sync mode. DE mode is unnecessary to Keep it.

9. Power ON / OFF Sequence





10. QUALITY AND RELIABILITY

10.1Test Conditions

Tests should be conducted under the following conditions :
Ambient temperature : 25 ± 5°C
Humidity : 60 ± 25% RH.

10.2 Sampling Plan

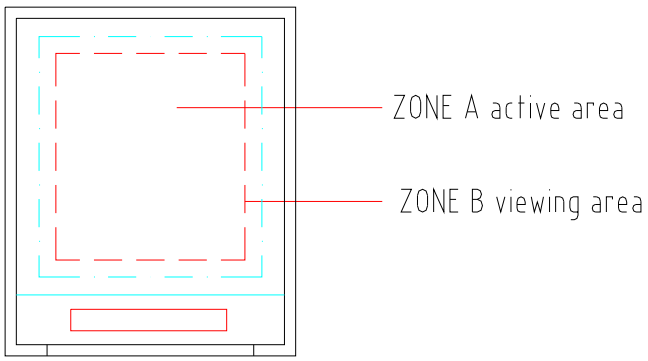
Sampling method shall be in accordance with MIL-STD-105E , level II, normal single sampling plan .

10.3 Acceptable Quality Level

A major defect is defined as one that could cause failure to or materially reduce the usability of the unit for its intended purpose. A minor defect is one that does not materially reduce the usability of the unit for its intended purpose or is an infringement from established standards and has no significant bearing on its effective use or operation.

10.4Appearance

An appearance test should be conducted by human sight at approximately 30 cm distance from the LCD module under florescent light. The inspection area of LCD panel shall be within the range of following limits.



11. Incoming Inspection Standard

11-1Scope

Specifications contain

11-1.1 Display Quality Evaluation

11-1.2 Mechanics Specification

11-2. Sampling Plan

Unless there is other agreement, the sampling plan for incoming inspection shall follow MIL-STD-105E LEVEL II.

11-2.1 Lot size: Quantity per shipment as one lot (different model as different lot).

11-2.2 Sampling type: Normal inspection, single sampling.

11-2.3 Sampling level: Level II.

11-2.4 AQL: Acceptable Quality Level

Major defect: AQL=0.65

Minor defect: AQL=1.0

11-3. Panel Inspection Condition

11-3.1 Environment:

Room Temperature: 25±5°C.

Humidity: 65±5% RH.

Illumination: 300 ~ 700 Lux.

11-3.2 Inspection Distance:

35-40 cm

11-3.3 Inspection Angle:

The vision of inspector should be perpendicular to the surface of the Module.

11-3.4 Inspection time：

Perceptibility Test Time: 20 seconds max.

11-4. Display Quality

11-4.1 Function Related:

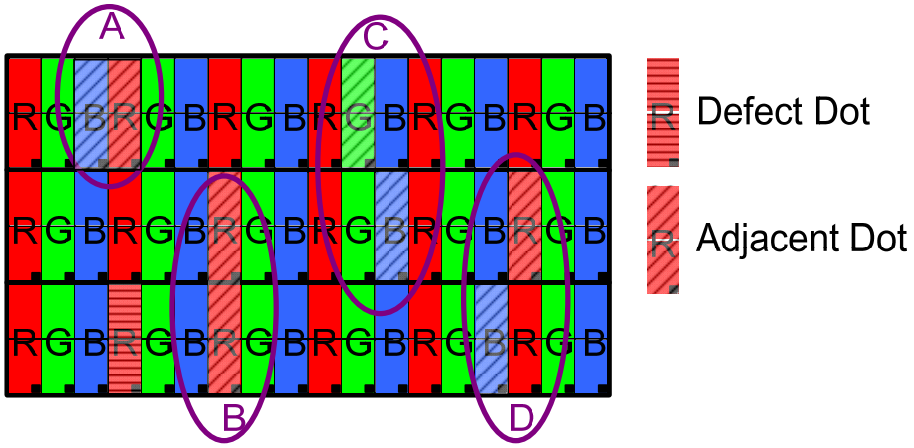
The function defects of line defect, abnormal display, and no display are considered Major defects

11-4.2 Bright/Dark Dots:

Defect Type / Specification	G0 Grade	A Grade
Bright Dots	0	N≤ 1
Dark Dots	0	N≤ 3
Total Bright and Dark Dots	0	N≤ 3

[Note 1]

Judge defect dot and adjacent dot as following.

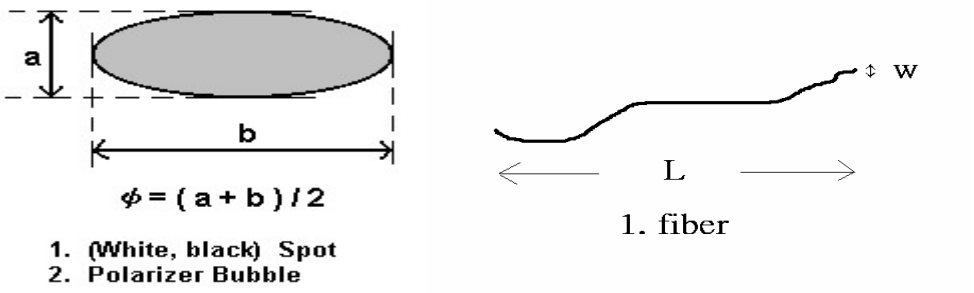


(1) One pixel consists of 3 sub-pixels, including R,G, and B dot.(Sub-pixel = Dot)
(2) The definition of dot: The size of a defective dot over 1/2 of whole dot is regarded as one defective dot.
(3) Allow above (as A, B, C and D status) adjacent defect dots, including bright and dart adjacent dot. And they will be counted 2 defect dots in total quantity.
(4) Defects on the Black Matrix, out of Display area, are not considered as a defect or counted.
(5) There should be no distinct non-uniformity visible through 6% ND Filter within 2 sec inspection times.

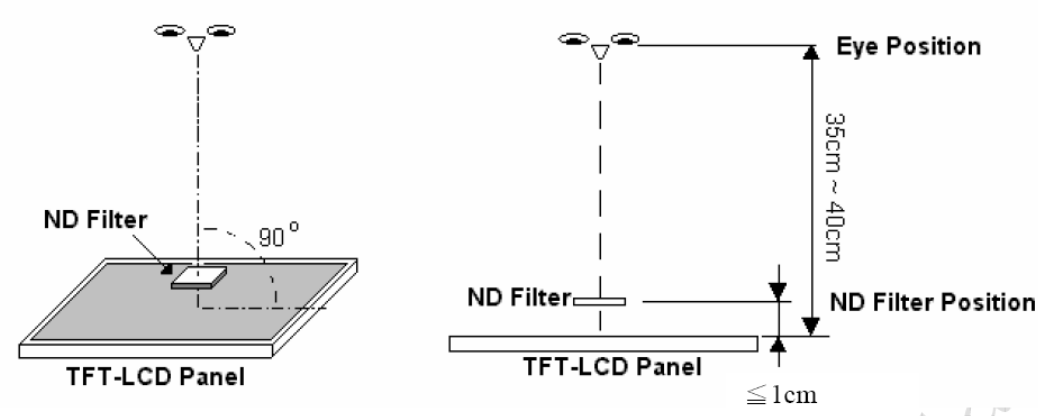
11-4. Visual Inspection specifications

Defect Type	Specification	Count(N)
Dot Shape (Particle、Scratch and Bubbles in display area)	D≤ 0.15mm	Ignored
	0.15mm＜D≤ 0.3mm	N≤ 3
	D＞0.3mm	N=0
Line Shape (Particles、Scratch、Lint and Bubbles in display area)	W≤ 0.05mm	Ignored
	0.05mm<W≤ 0.1mm L≤ 3mm	N≤ 3
	W＞0.1mm， L＞3mm	N=0

[Note2] W : Width[mm], L : Length[mm], N : Number, φ: Average Diameter



[Note3] Bright dot is defined through 6% transmission ND Filter as following.



Judge defect dot and adjacent dot as following. Allow below (as A, B, C and D status) adjacent defect dots, including bright and dart adjacent dot. And they will be counted 2 defect dots in total quantity.

(1) The defects that are not defined above and considered to be problem shall be reviewed and discussed by both parties.
(2) Defects on the Black Matrix, out of Display area, are not considered as a defect or counted.

11-5 Reliability Test

Test Item	Test Conditions	Note
High Temperature Operation	60±3°C , t=240 hrs	
Low Temperature Operation	-20±3°C , t=240 hrs	
High Temperature Storage	70±3°C , t=240 hrs	1,2
Low Temperature Storage	-30±3°C , t=240 hrs	1,2
Thermal Shock Test	-30°C ~ 25°C ~ 70°C Change time:5min, 20 Cycles	1,2
Humidity Test	60 °C, Humidity 90%, 240 hrs	1,2
Vibration Test (Non-operation)	Frequency range:10~55Hz, Stroke:1.5mm Sweep:10Hz~55Hz~10Hz 2 hours for each direction of X.Y.Z. (6 hours for total)(Package condition)	

Note 1: Condensation of water is not permitted on the module.

Note 2: The module should be inspected after 1 hour storage in normal conditions (15-35°C , 45-65%RH).

Definitions of life end point:

- Current drain should be smaller than the specific value.
- Function of the module should be maintained.
- Appearance and display quality should not have degraded noticeably.
- Contrast ratio should be greater than 50% of the initial value.

12. USE PRECAUTIONS

12.1 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 benzene 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.

12.2 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.

12.3 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.

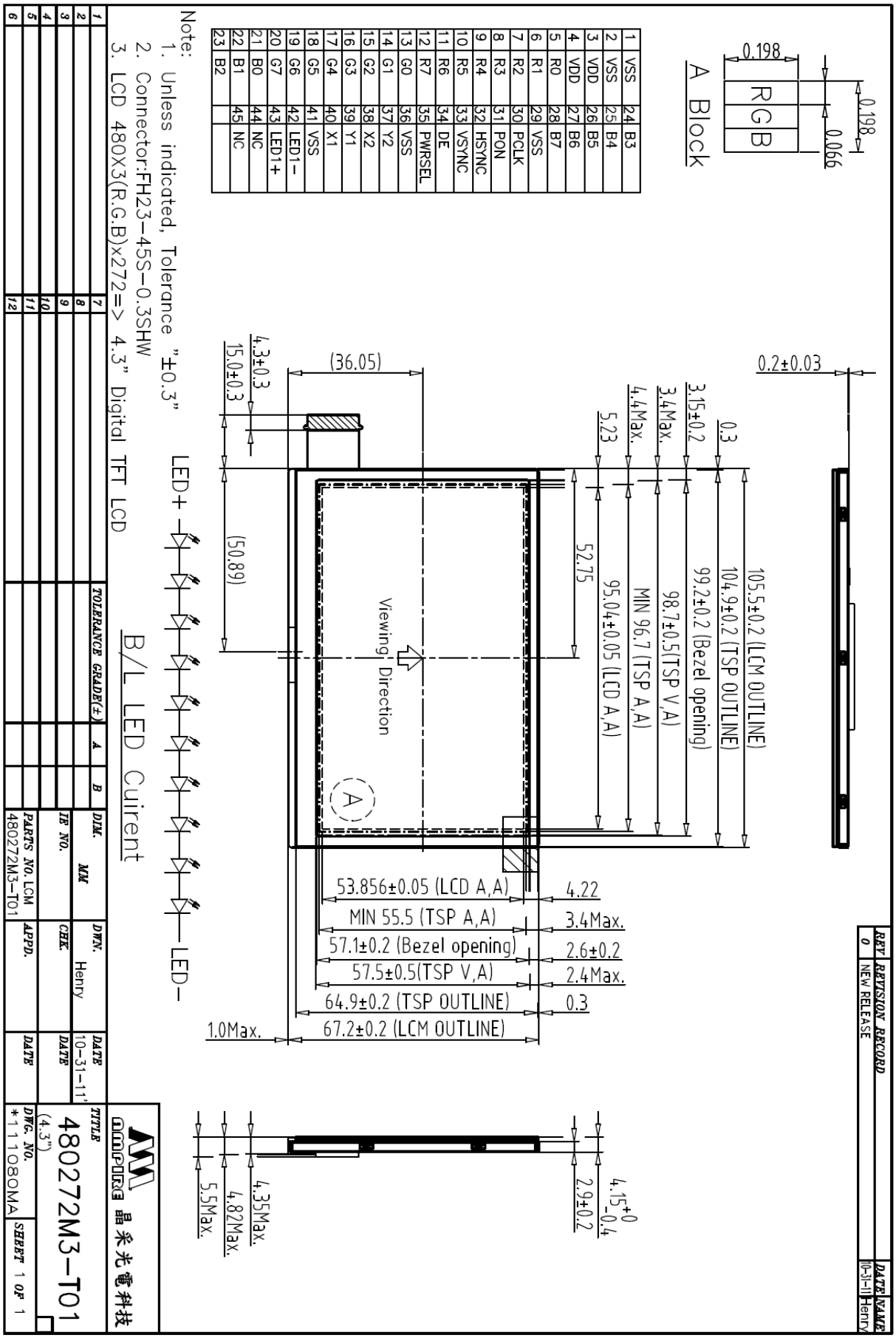
12.4 Operating precautions

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.

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

13 OUTLINE DIMENSION



1	VSS	24	B3
2	VSS	25	B4
3	VDD	26	B5
4	VDD	27	B6
5	R0	28	B7
6	R1	29	VSS
7	R2	30	PCLK
8	R3	31	PON
9	R4	32	HSYNC
10	R5	33	VSYNC
11	R6	34	DE
12	R7	35	PWRSEL
13	G0	36	VSS
14	G1	37	Y2
15	G2	38	X2
16	G3	39	Y1
17	G4	40	X1
18	G5	41	VSS
19	G6	42	LED1-
20	G7	43	LED1+
21	B0	44	NC
22	B1	45	NC
23	B2		

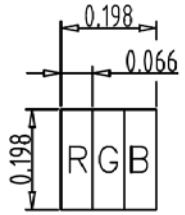
REV	REVISION RECORD	DATE	NAME
0	NEW RELEASE	10-31-11	Henry

TOLERANCE GRADE(±) A B DIM. MM
DWN. Henry DATE 10-31-11
CHK. DATE
APPD. DATE
ITEM NO.
PARTS NO. LCM 480272M3-T01

AMPIRE 晶采光電科技

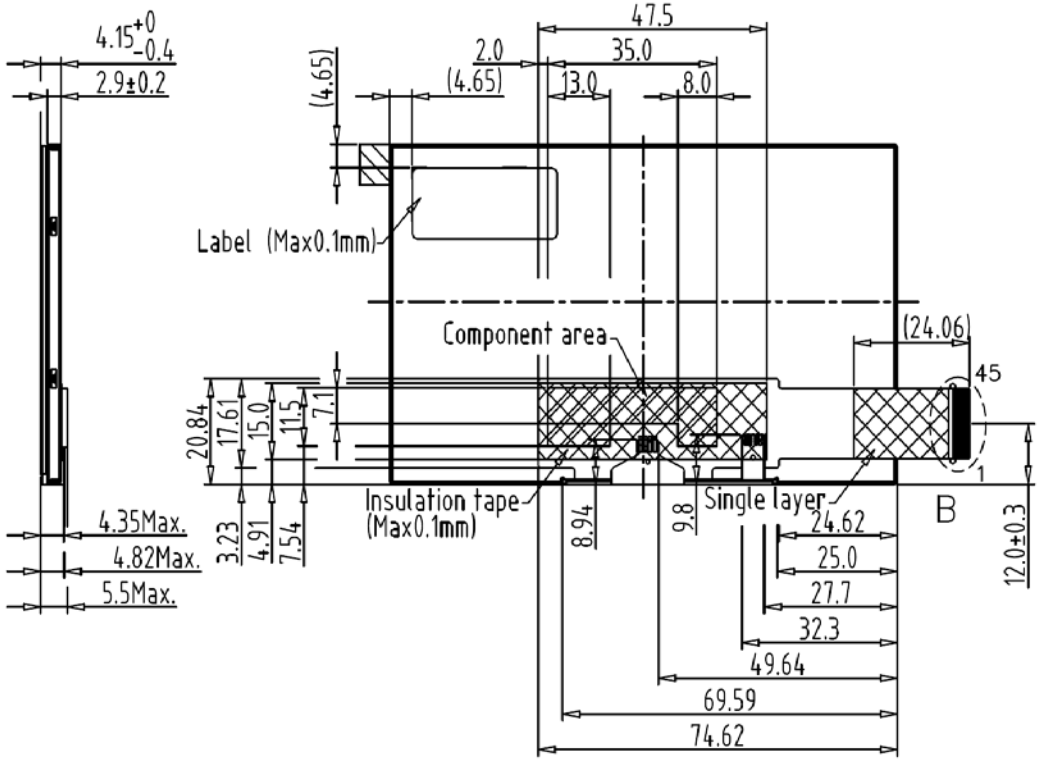
TITLE 480272M3-T01 (4.3")
DWG. NO. *1110801A
SHEET 1 OF 1

REV	REVISION RECORD	DATE	NAME
0	NEW RELEASE	10-31-11	Henry

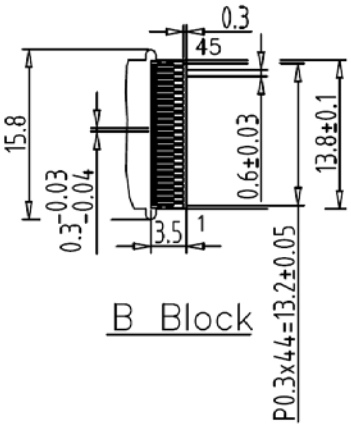


A Block

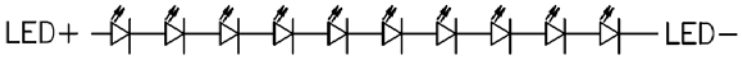
1	VSS	24	B3
2	VSS	25	B4
3	VDD	26	B5
4	VDD	27	B6
5	R0	28	B7
6	R1	29	VSS
7	R2	30	PCLK
8	R3	31	PON
9	R4	32	HSYNC
10	R5	33	VSYNC
11	R6	34	DE
12	R7	35	PWRSEL
13	G0	36	VSS
14	G1	37	Y2
15	G2	38	X2
16	G3	39	Y1
17	G4	40	X1
18	G5	41	VSS
19	G6	42	LED1−
20	G7	43	LED1+
21	B0	44	NC
22	B1	45	NC
23	B2		



Back view



B Block



B/L LED Cuirent

Note:
1. Unless indicated, Tolerance "±0.3"
2. Connector:FH23−45S−0.3SHW
3. LCD 480X3(R.G.B)x272=> 4.3" Digital TFT LCD

1		7		TOLERANCE GRADE(±)	A	B	DIM. MM	DWN. Henry	DATE 10−31−11	TITLE 480272M3−T01 (4.3")	
2		8					IE NO.	CHK.	DATE		
3		9									
4		10									
5		11					PARTS NO. LCM−1 480272M3−T01	APPD.	DATE	DWG. NO. *111081MA	SHEET 1 OF 1
6		12									