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-480272METMQW-16H
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.)
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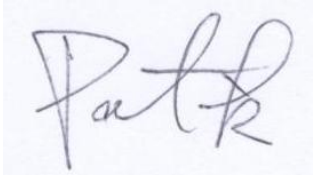
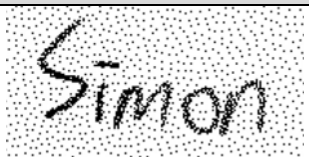
TEL:886-2-26967269 . FAX:886-2-26967196 or 26967270

APPROVED BY	CHECKED BY	ORGANIZED BY
		

RECORD OF REVISION

Revision Date	Page	Contents	Editor
2016/10/11	--	New Release	Emil

1. FEATURES

(1) Construction : amorphous silicon TFT-LCD with driving system, Stainless Bezel and White LED Backlight.

(2) LCD type : Transmissive , Normally White.

(3) Interface : 24bit RGB interface.

(4) Power Supply Voltage : 3.3V power input for TFT, built-in power supply circuit.

(5) RoHS Compliance.

2. PHYSICAL SPECIFICATIONS

Item	Specifications	unit
Display size (diagonal)	4.3	inch
Resolution	480 RGB(H) x 272(V)	Dot
Display area	95.04 (H) x 53.856 (V)	mm
Pixel pitch	0.198 (H) x 0.198 (V)	mm
Overall dimension	105.5 x 67.2 x 2.9 (Typ.)	mm
Color configuration	R.G.B Vertical stripe	
Surface treatment	Antiglare, Hard-Coating (3H)	
(Gray Inversion Direction)	6 o'clock	
Viewing Direction	12 o'clock	
Brightness	500	cd/m^2
Backlight unit	LED	

3. ABSOLUTE MAXIMUM RATINGS

Item	Symbol	Min.	Typ.	Max.	Unit	Note
Power Supply Voltage	VDD	-0.3	--	4	V	GND=0
Logic Signal Input Level	V_I	-0.3	--	4	V	
LED Current	I_L	--	40	--	mA	(1)(2)(3)
LED voltage	V_L	--	19.8	--	V	(1)(2)(3)
Operating Temperature	Tops	-30	--	80	℃	
Storage Temperature	Tstg	-30	--	80	℃	

Note :

(1) Permanent damage may occur to the LCD module if beyond this specification. Functional operation should be restricted to the conditions described under normal operating conditions.

(2) Ta =25±2℃

(3) Test Condition: LED current 40 mA. The LED lifetime could be decreased if operating IL is larger than 40mA.

4. OPTICAL CHARACTERISTICS

4.1 Optical specification

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Viewing Angle	Left	Θ_L	CR≧10	60	70	--	deg.	(1)(4)
	Right	Θ_R		60	70	--		
	Up	Θ_U		40	50	--		
	Down	Θ_D		60	70	--		
Contrast ratio		CR	Θ=0 Normal viewing angle	400	500	--	--	(1)(2)
Response Time	Rising	T_R		--	8	10	msec	(1)(3)
	Falling	T_F		--	17	20	msec	
Color chromaticity (CIE1931)	White	Wx		0.26	0.31	0.36	--	(1)(4)
		Wy		0.28	0.33	0.38		
	Red	Rx		0.53	0.58	0.63	--	
		Ry		0.3	0.35	0.4		
	Green	Gx		0.29	0.34	0.39	--	
		Gy		0.55	0.60	0.65		
	Blue	Bx		0.09	0.14	0.19	--	
		By		0.02	0.07	0.12		
White Luminance (Center)		Y_L		400	500	--	cd/m^2	(1)(4)(7) (IL=40mA)
Brightness Uniformity		B_{UNI}		70	--	--	%	(5)(7)
Optima View Direction		6 o'clock						(6)

4.2 Measuring Condition

(1) Measuring surrounding : dark room

(2) LED current I_L : 40mA

(3) Ambient temperature : 25±2℃

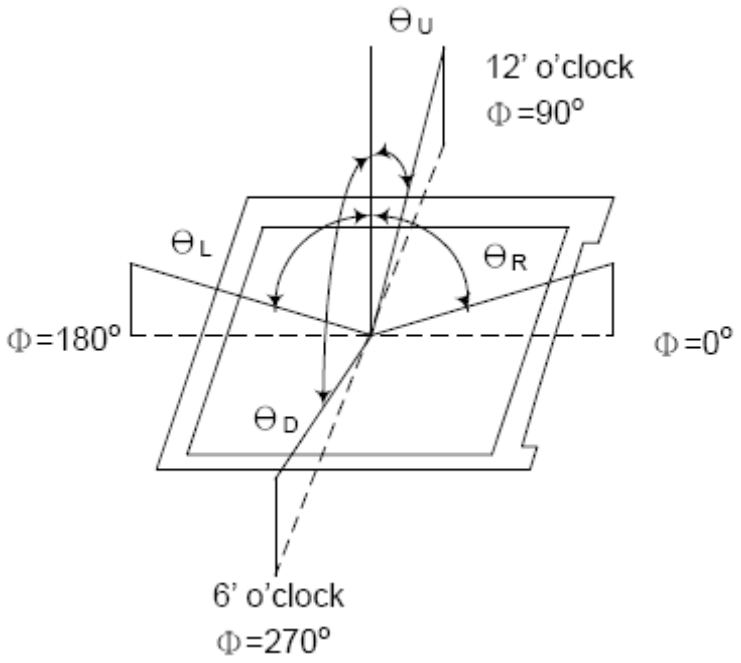
(4) 15min. warm-up time.

4.3 Measuring Equipment

(1) FPM520 of Westar Display technologies, INC., which utilized SR-3 for Chromaticity and BM-5A for other optical characteristics.

(2) Measuring spot size: 20 ~ 21 m

Note (1) Definition of Viewing Angle:

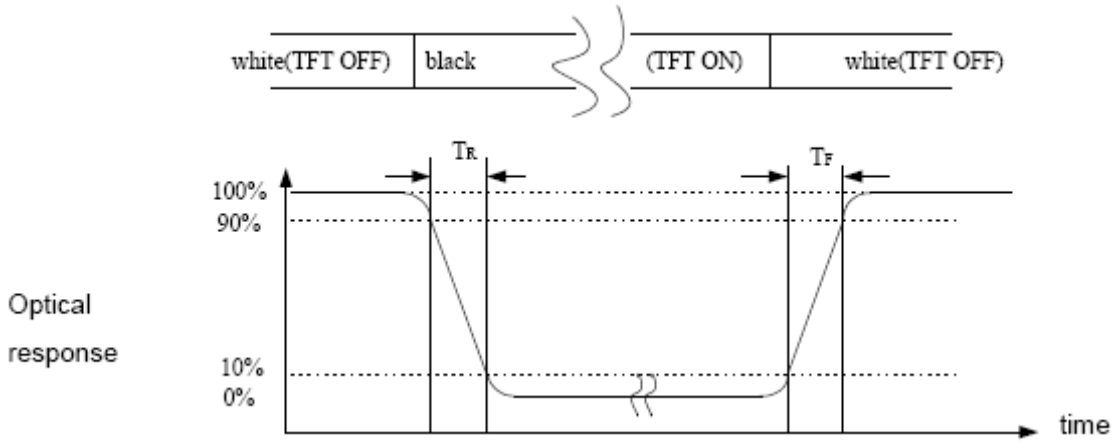


Note (2) Definition of Contrast Ratio (CR) :

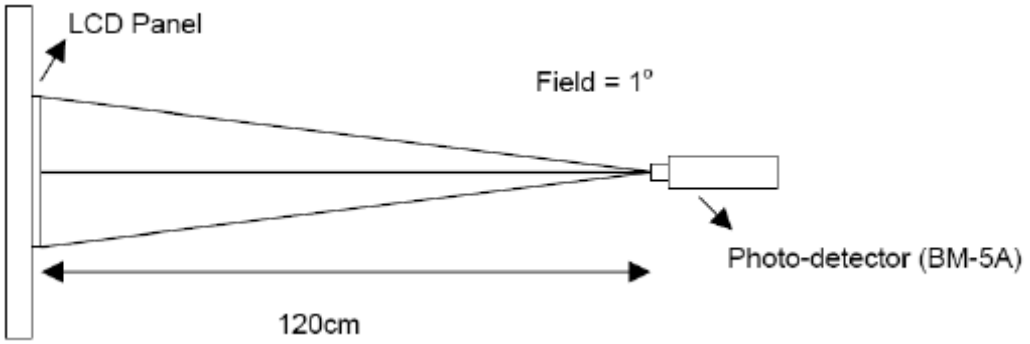
measured at the center point of panel

$$CR = \frac{\text{Luminance with all pixels white}}{\text{Luminance with all pixels black}}$$

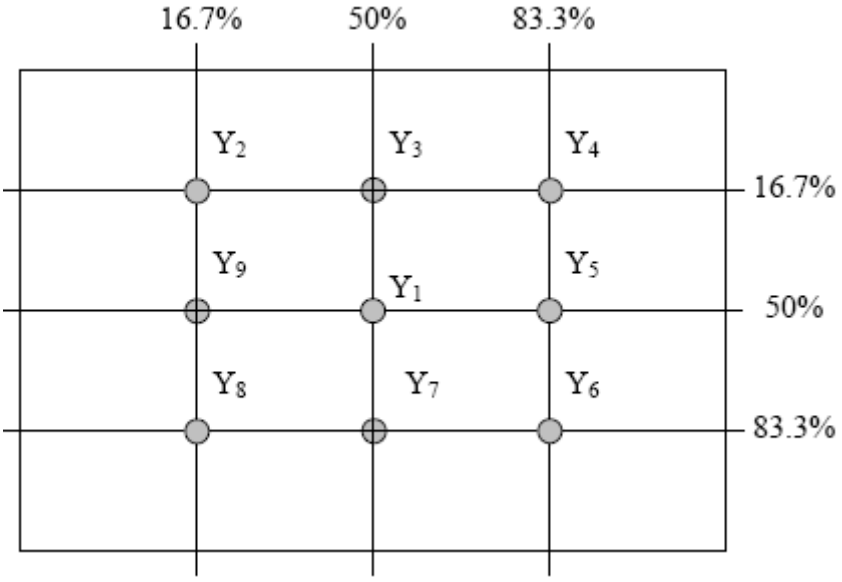
Note (3) Definition of Response Time : Sun of T_R and T_F



Note (4) Definition of optical measurement setup



Note (5) Definition of brightness uniformity



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

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

Note (7) Measured at the brightness of the panel when all terminals of LCD panel ate electrically open.

5. ELECTRICAL CHARACTERISTICS

5.1 TFT LCD Module

Item	Symbol	Min.	Typ.	Max.	Unit	Note
Supply Voltage	V_{DD}	3.0	3.3	3.6	V	
Input signal voltage	V_{IH}	$0.7V_{DD}$	--	V_{DD}	V	Note(1)
	V_{IL}	0	--	$0.3V_{DD}$	V	
Current of power supply	I_{CC}	--	25	--	mA	V_{DD}=3.3V

Note (1) : HSYNC , VSYNC , DE , R/G/B Date

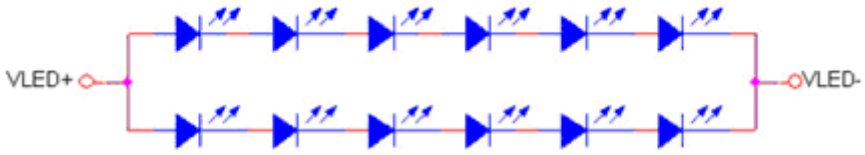
Note (2) : GND = 0V

5.2 Back-Light Unit

The back-light system is an edge-lighting type with 12 LED.

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

Item	Symbol	Min.	Typ.	Max.	Unit	Note
LED current	IL	--	40	--	mA	(2)
LED voltage	VL	--	19.8	--	V	
Operating LED life time	Hr	20K	25K	--	Hours	(1)(2)

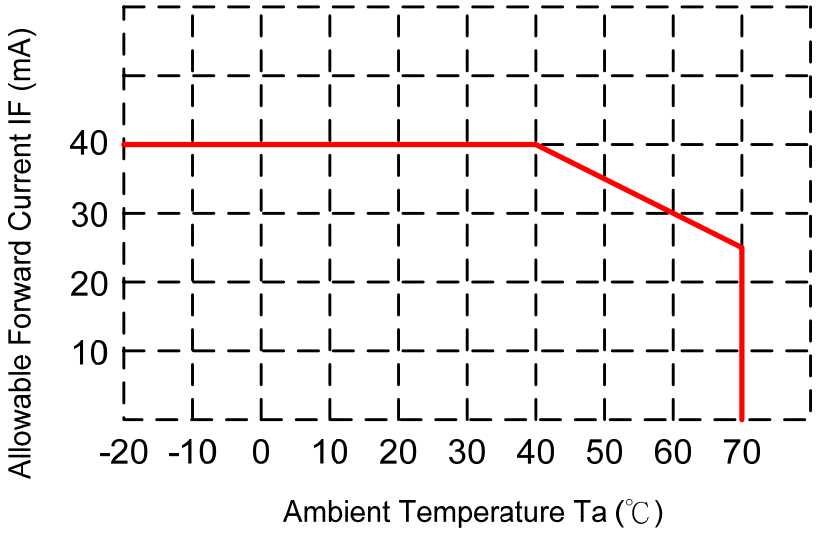


LED Light Bar Circuit

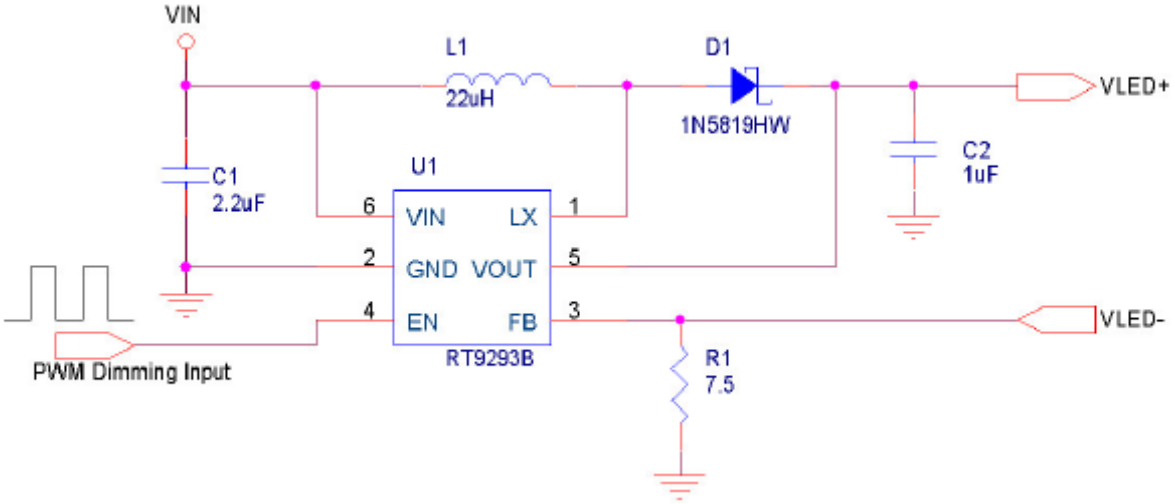
Note (1) LED life time (Hr) can be defined as the time in which it continues to operate under the condition: Ta=25±3℃, typical IL value indicated in the above table until the brightness becomes less than 50%.

Note (2) The “LED life time” is defined as the module brightness decrease to 50% original brightness at Ta=25℃ and IL=40mA. The LED lifetime could be decreased if operating IL is larger than 40mA. The constant current driving method is suggested.

The constant current source is needed for white LED back-light driving. When LCM is operated over 60℃ ambient temperature, the I_L of the LED back-light should be adjusted to 30mA max.

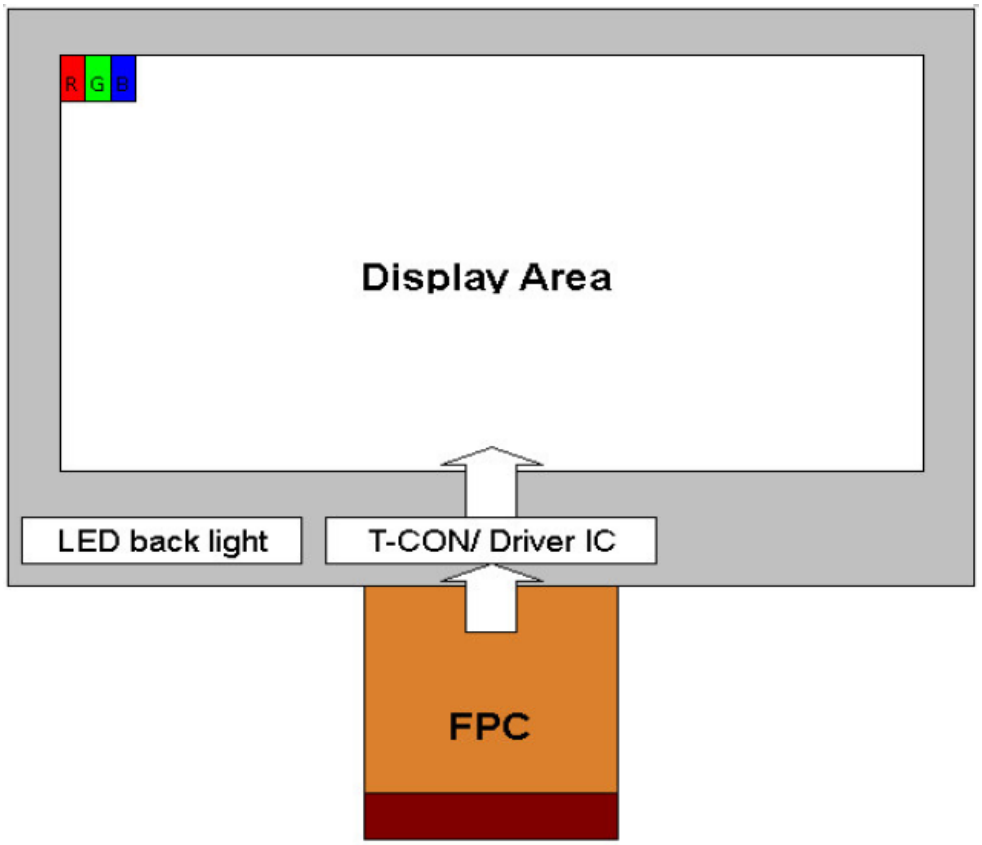


Note (3) Suggested Schematic of LED Back-Light Driver

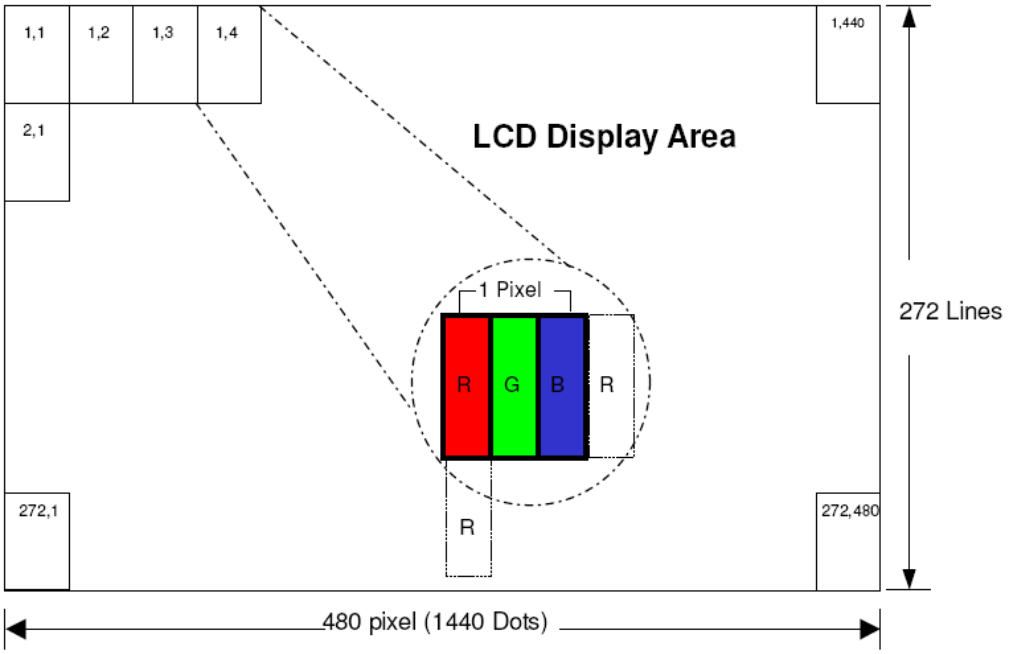


6. BLOCK DIAGRAM

6.1 TFT LCD Module



6.2 Pixel Format



7. INTERFACE PIN ASSIGNMENT

FPC connector is used for electronics interface. The recommended model is FH19SC-40S-0.5SH (05) manufactured by HIROSE

Pin no	Symbol	I/O	Function	Note
1	VLED-	P	Power for LED Backlight Cathode	
2	VLED+	P	Power for LED Backlight Anode	
3	GND	P	Power Ground	
4	VDD	P	Power Voltage	
5	R0	I	Red Data (LSB)	
6	R1	I	Red Data	
7	R2	I	Red Data	
8	R3	I	Red Data	
9	R4	I	Red Data	
10	R5	I	Red Data	
11	R6	I	Red Data	
12	R7	I	Red Data (MSB)	
13	G0	I	Green Data (LSB)	
14	G1	I	Green Data	
15	G2	I	Green Data	
16	G3	I	Green Data	
17	G4	I	Green Data	
18	G5	I	Green Data	
19	G6	I	Green Data	
20	G7	I	Green Data (MSB)	
21	B0	I	Blue Data (LSB)	
22	B1	I	Blue Data	
23	B2	I	Blue Data	
24	B3	I	Blue Data	
25	B4	I	Blue Data	
26	B5	I	Blue Data	
27	B6	I	Blue Data	

28	B7	I	Blue Data (MSB)	
29	GND	P	Power Ground	
30	DCLK	I	Pixel Clock Data latched at rising edge of this signal.	
31	DISP	I	Display On(Hi)/ Off(Lo)	
32	HSYNC	I	Horizontal Sync Signal	
33	VSYNC	I	Vertical Sync Signal	
34	DE	I	Data Enable	
35	NC	--	No connect	
36	GND	P	Power Ground	
37	X_R	I/O	No Connection	
38	Y_B	I/O	No Connection	
39	X_L	I/O	No Connection	
40	Y_T	I/O	No Connection	

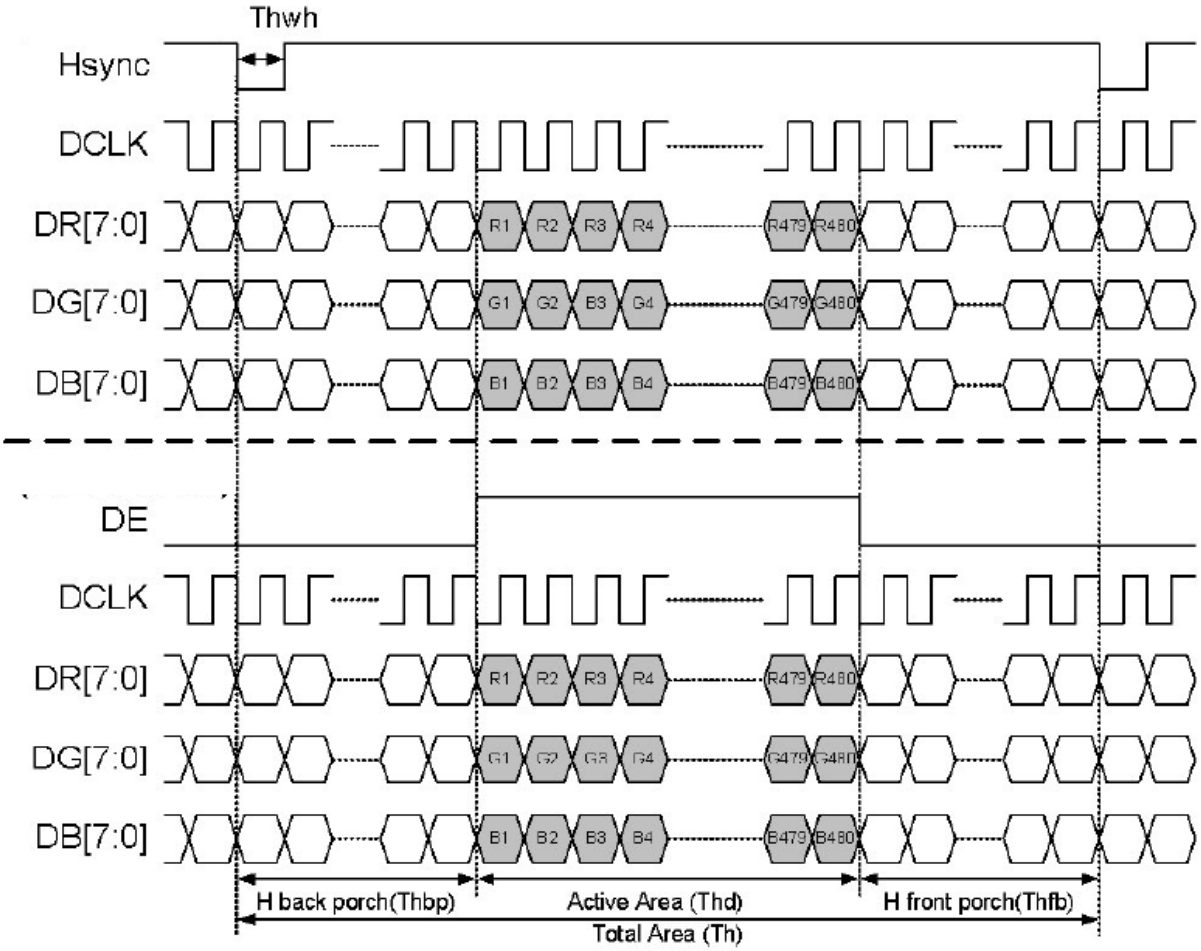
I/O : I: input, O: output, P: power

8. INTERFACE TIMING

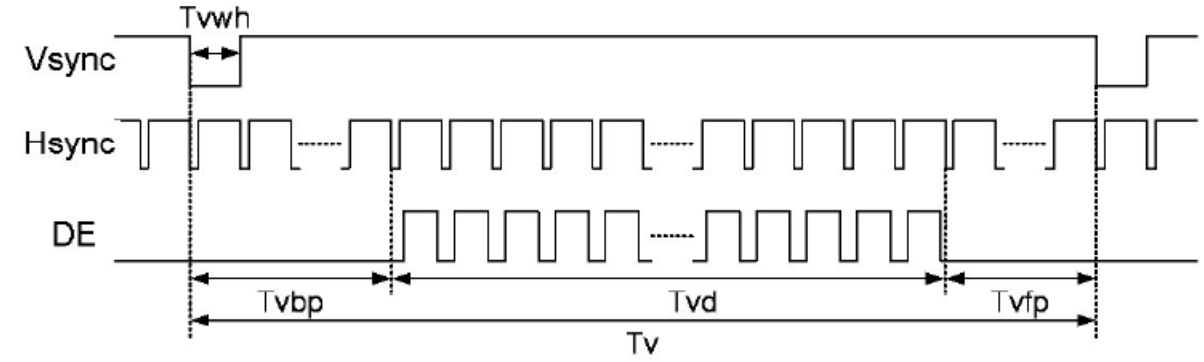
8.1 Parallel 24*bit RGB Input Timing Table

Item	Symbol	Min.	Typ.	Max.	Unit	Note
DCLK frequency	Fclk	8	9	12	MHz	
VSYNC period time	Tv	285	286	399	Th	
VSYNC display area	Tvd		272		Th	
VSYNC back porch	Tvbp	1	2	11	Th	
VSYNC front porch	Tvfp	1	2	227	Th	
VSYNC pulse width	Tvwh	1	10	11	Th	
HSYNC period time	Th	525	525	605	DCLK	
HSYNC display area	Thd		480		DCLK	
HSYNC back porch	Thbp	36	40	255	DCLK	
HSYNC front porch	Thfp	2	2	82	DCLK	
HSYNC pulse width	Thwh	2	2	41	DCLK	

Parallel 24-bit RGB Mode Data Format (DE Mode)



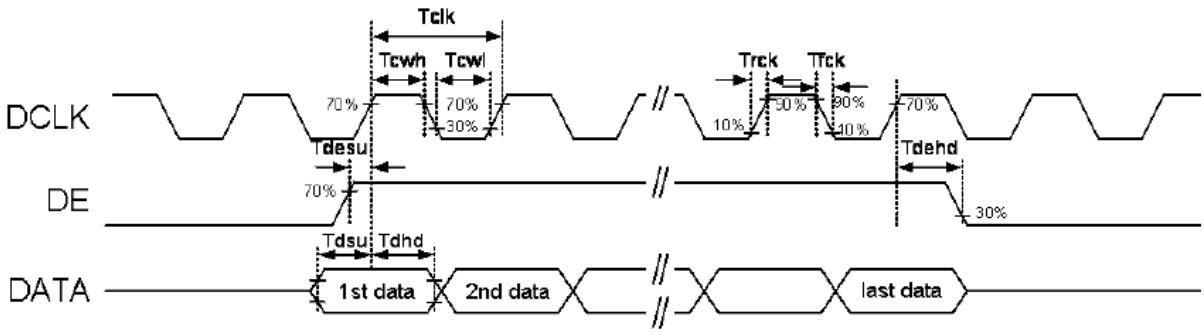
Vertical Input Timing

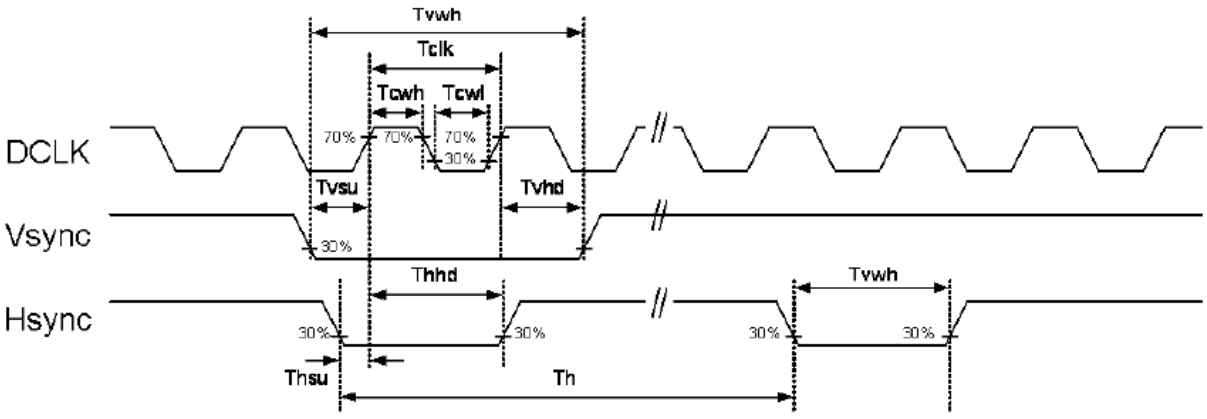


8.2 AC Electrical Characteristics

Item	Symbol	Min.	Typ.	Max.	Unit	Note
DCLK period time	Tclk	66.7	--	--	ns	
DCLK rising time	Trck	--	--	6.65	ns	
DCLK falling time	Tfck	--	--	6.65	ns	
DCLK pulse duty	Tcwh	40	50	60	%	
DE setup time	Tdesu	10	--	--	ns	
DE hold time	Tdehd	10	--	--	ns	
HSYNC pulse width	Thwh	2	--	--	DCLK	
HSYNC setup time	Thsu	10	--	--	ns	
HSYNC hold time	Thhd	10	--	--	ns	
VSYNC pulse width	Tvwh	1	--	--	Th	
VSYNC setup time	Tvsu	10	--	--	ns	
VSYNC hold time	Tvhd	10	--	--	ns	
Data setup time	Tdsu	10	--	--	ns	
Data hold time	Tdhd	10	--	--	ns	

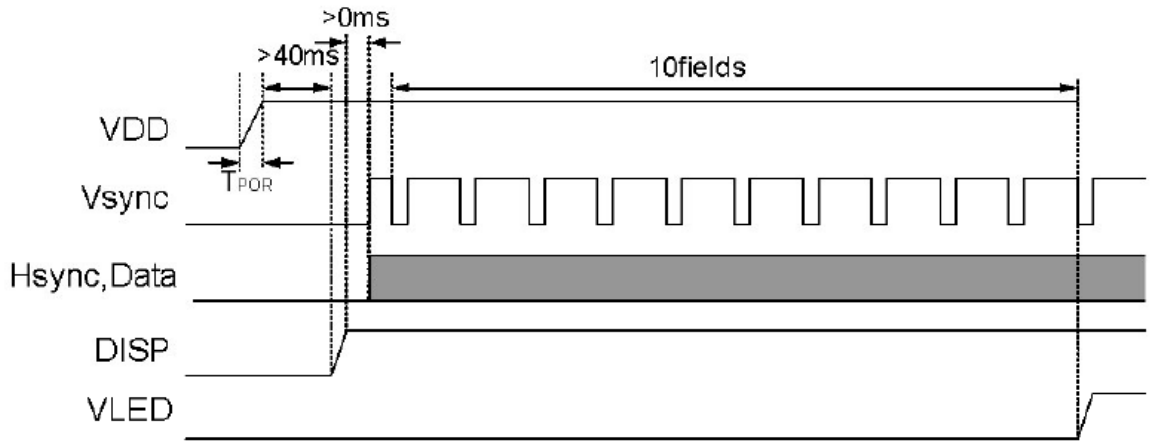
Clock and Data Input Timing Diagram



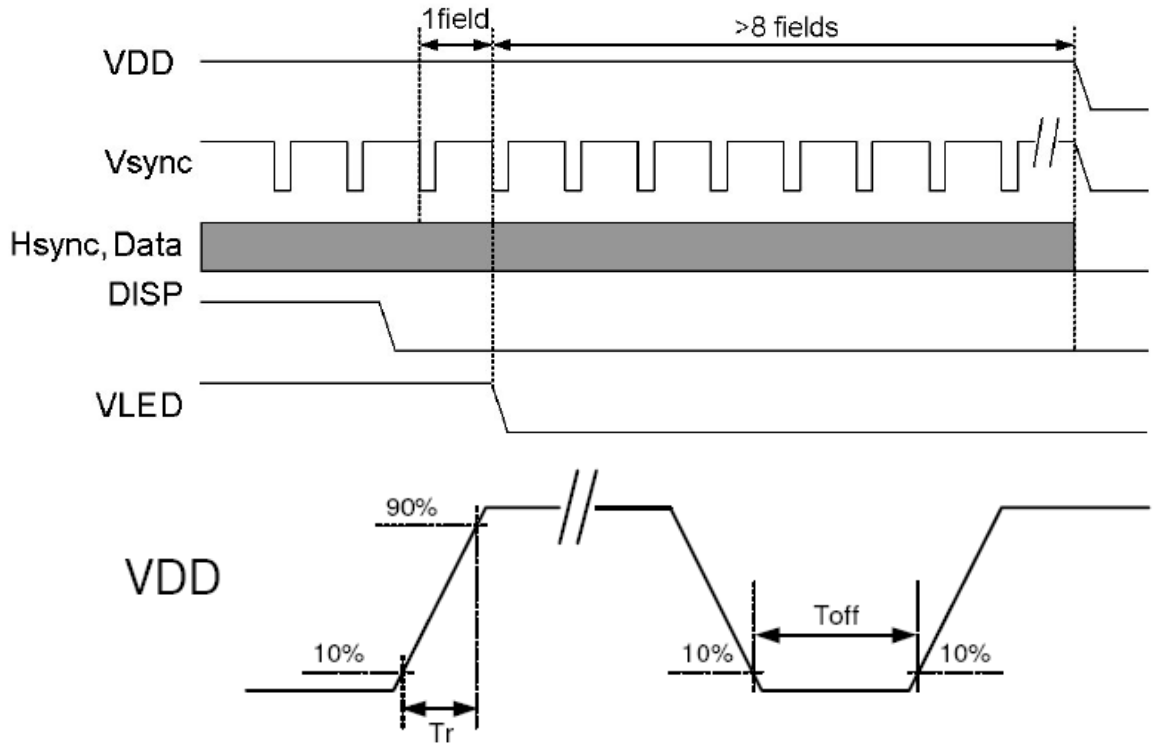


8.3 Power Sequence

Power On Sequence



Power Off Sequence



VDD power input timing

Notes:

Data include R0~R7, G0~G7, B0~B7, HSD, VSD, DCLK, DE
Power on sequence: VDD → DISP → Data → V_{LED}
Power off sequence: DISP → V_{LED} → Data → VDD
VDD power input timing: 0.5ms < Tr < 10ms; Toff > 500ms

9. QUALITY AND RELIABILITY

9.1 TEST CONDITIONS

Tests should be conducted under the following conditions :

Ambient temperature : 25 ± 5°C

Humidity : 60 ± 25% RH.

9.2 SAMPLING PLAN

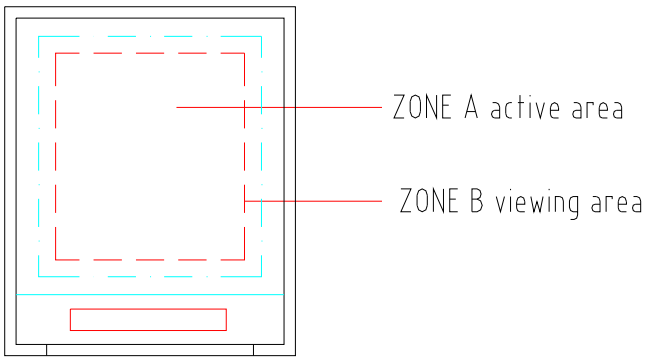
Sampling method shall be in accordance with MIL-STD-105E , level II, normal single sampling plan .

9.3 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.

9.4 APPEARANCE

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.



9.5 RELIABILITY TEST CONDITIONS

Test Item	Test Conditions	Note
High Temperature Operation	80±3°C , t=240 hrs	
Low Temperature Operation	-30±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
Thermal Shock Test	-20°C ~ 25°C ~ 70°C 30 m in. 5 min. 30 min. (1 cycle) Total 5 cycle	1,2
Humidity Test	40 °C, Humidity 90%, 96 hrs	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).

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.

10. GENERAL PRECAUTION

10-1 Use Restriction

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.

10-2 Disassembling or Modification

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.

10-3 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.

10-4 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.

10-5 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.

10-6 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 causes deformation or color fading.
(5) When cleaning the adhesives, please use absorbent cotton wetted with a little petroleum benzine or other adequate solvent.

10-7 Mechanism

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

10-8 Static Electricity

(1) Protection film must remove very slowly from the surface of LCD module to prevent from electrostatic occurrence.
(2) Because LCD module 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.

10-9 Strong Light Exposure

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

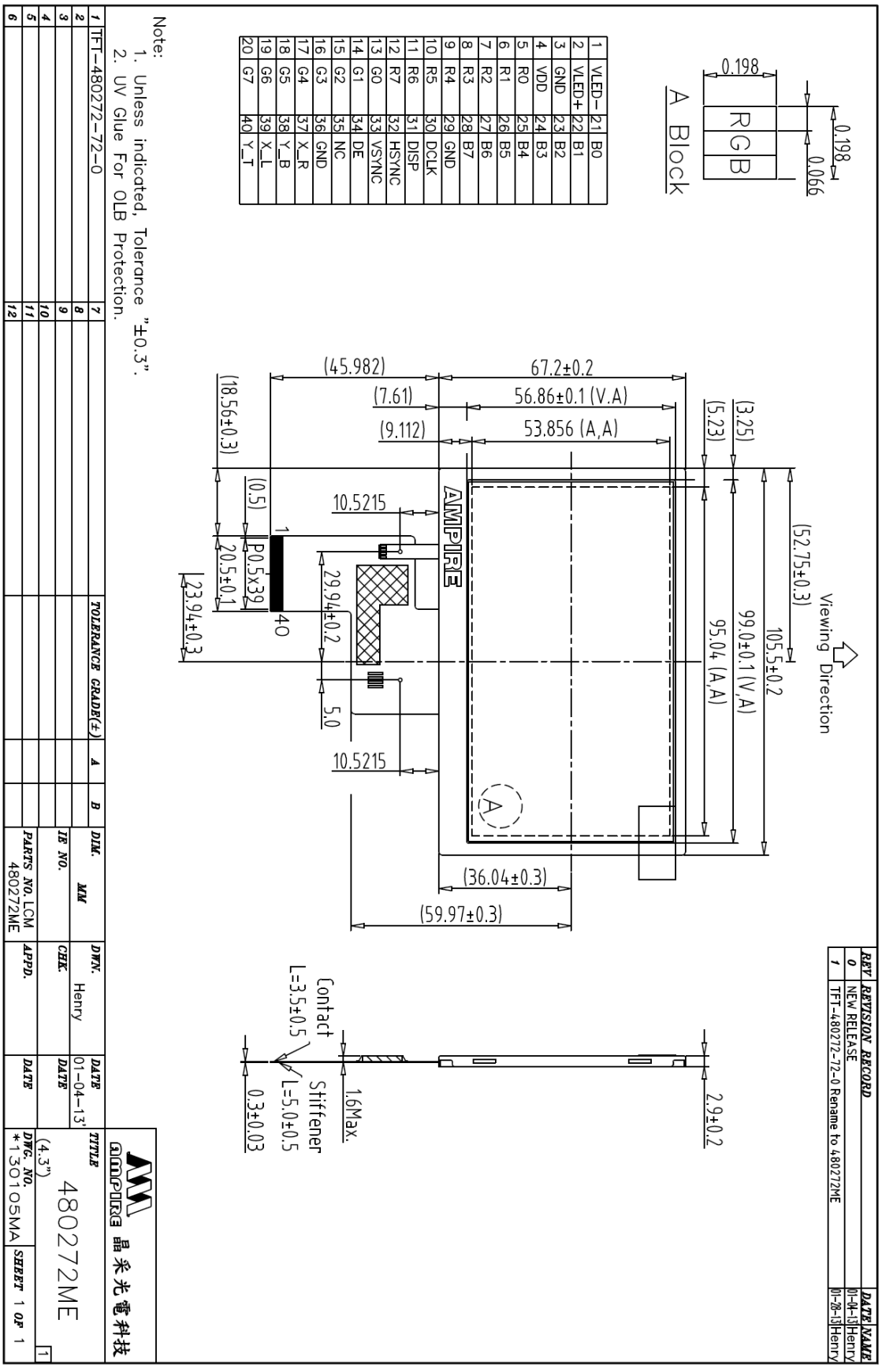
10-10 Disposal

When disposing LCD module, obey the local environmental regulations.

10-11 Others

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

11. OUTLINE DIMENSION



1	VLED-	21	B0	2	VLED+	22	B1	3	GND	23	B2
4	VDD	24	B3	5	R0	25	B4	6	R1	26	B5
7	R2	27	B6	8	R3	28	B7	9	R4	29	GND
10	R5	30	DCLK	11	R6	31	DISP	12	R7	32	HSYNC
13	G0	33	VSYNC	14	G1	34	DE	15	G2	35	NC
16	G3	36	GND	17	G4	37	X_R	18	G5	38	Y_B
19	G6	39	X_L	20	G7	40	Y_T				

REV	REVISION RECORD	DATE	NAME
0	NEW RELEASE	01-04-13	Henry
1	TFT-480272-72-0 Rename to 480272ME	01-28-13	Henry

1	VLED−	21	B0
2	VLED+	22	B1
3	GND	23	B2
4	VDD	24	B3
5	R0	25	B4
6	R1	26	B5
7	R2	27	B6
8	R3	28	B7
9	R4	29	GND
10	R5	30	DCLK
11	R6	31	DISP
12	R7	32	HSYNC
13	G0	33	VSYNC
14	G1	34	DE
15	G2	35	NC
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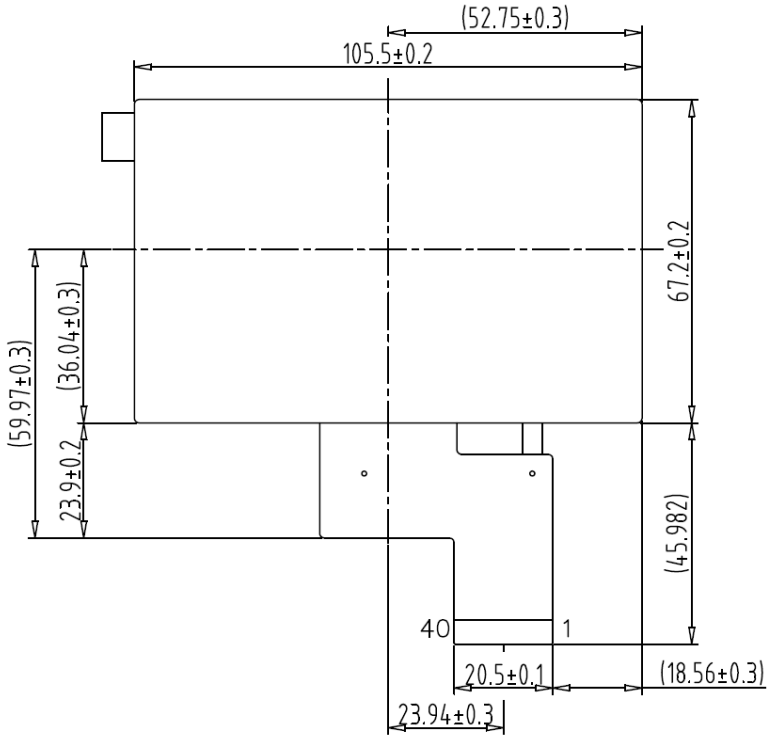
18	G5	38	Y_B
19	G6	39	X_L
20	G7	40	Y_T



Back View

Note:
1. Unless indicated, Tolerance "±0.3".
2. UV Glue For OLB Protection.

1	TFT−480272−72−0	7		TOLERANCE GRADE(±)	A	B	DIM. MM	DWN. Henry	DATE 01−04−13'	TITLE 480272ME (4.3") 1
2		8								
3		9					IE NO.	CHK.	DATE	
4		10								
5		11					PARTS NO. LCM−1 480272ME	APPD.	DATE	DWG. NO. *130106MA SHEET 1 OF 1
6		12								

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