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-640480GHTNQW-T00H-C**
APPROVED BY	
DATE	

☐ **Preliminary Specification**
☑ **Formal Specification**

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Approved by	Checked by	Organized by
Patrick	*Mark*	*Tank*

*This specification is subject to change without notice.

RECORD OF REVISION

Revision Date	Page	Contents	Editor
2020/08/14	--	New Release	Tank

1. Features

5.7 inch Amorphous-TFT-LCD (Thin Film Transistor Liquid Crystal Display) module. This module is composed of a 5.7" TFT-LCD panel, a driver circuit, touch panel and backlight unit.

(1) Construction: 5.7" a-Si color TFT-LCD, LED Backlight, touch panel and PCB.

(2) Resolution (pixel): 640(R.G.B) X 480

(3) Number of the Colors : 262K colors (R , G , B 6 bit digital each)

(4) LCD type : Transmissive Color TFT LCD (normally White)

(5) Interface: 40 pin

(6) Power Supply Voltage: 3.3V single power input. Built-in power supply circuit.

(7) Viewing Direction: 12 O'clock (gray inversion)

(8) New FPC supplier

2. PHYSICAL SPECIFICATIONS

Item	Specifications	unit
Display resolution(dot)	640RGB (W) x 480(H)	dots
Display area	115.2 (W) x 86.4 (H)	mm
Pixel pitch	0.1815 (W) x 0.1815 (H)	mm
Color configuration	R.G.B Vertical stripe	
Overall dimension	131.0(W) x 102.2(H) x 13.17(D) (Typ.)	mm
Brightness	270	cd/m^2
Contrast ratio	250 : 1	
Backlight unit	LED	

3. ABSOLUTE MAXIMUM RATINGS

3.1 Absolute max. ratings

3.1.1 Electrical Absolute max. ratings

ITEM	SYMBOL	MIN	MAX	UNIT	NOTE
Power Supply Voltage	Vcc	-0.5	5	V	
Signal Input Voltage		-0.5	Vcc + 0.5	V	Note 1

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

3.1.2 Environmental Absolute max. ratings

Item	OPERATING		STORAGE		Remark
	MIN	MAX	MIN	MAX	
Temperature	-20	70	-30	80	Note2,3,4,5,6,7
Humidity	Note1		Note1		
Corrosive Gas	Not Acceptable		Not Acceptable		

Note1 : Ta <= 40℃ : 85% RH max

　　　　Ta > 40℃ : Absolute humidity must be lower than the humidity of 85%RH at 40℃

Note2 : For storage condition Ta at -30℃ < 48h , at 80℃ < 100h

　　　　For operating condition Ta at -20℃ < 100h

Note3 : Background color changes slightly depending on ambient temperature. This phenomenon is reversible.

Note4 : The response time will be slower at low temperature.

Note5 : Only operation is guarantied at operating temperature. Contrast , response time, another display quality are evaluated at +25℃

Note6 : When LCM is operated over 40℃ ambient temperature, the I_{LED} of the LED back-light should be follow :
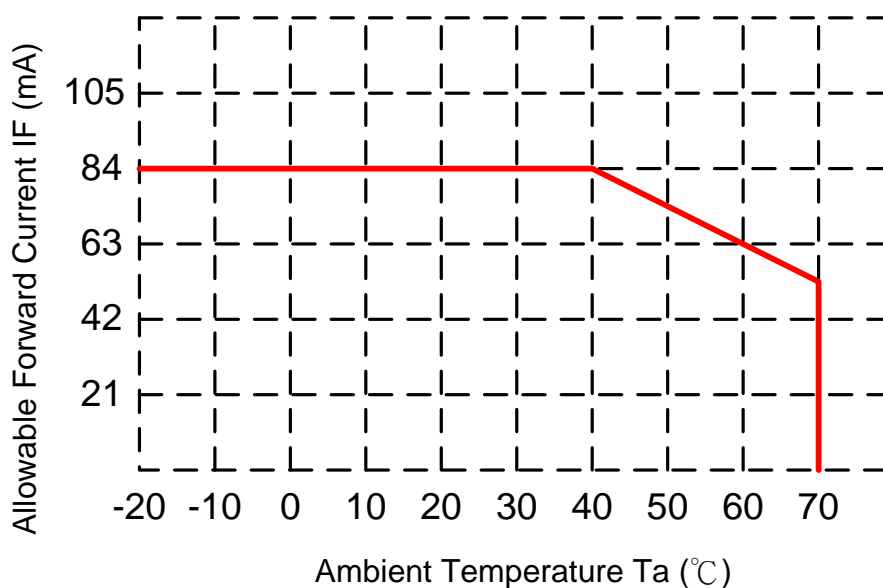
Note7 : This is panel surface temperature, not ambient temperature.

Note8 : When LCM be operated over than 40℃ , the life time of the LED back-light will be reduced.

4. ELECTRICAL CHARACTERISTICS

4-1 DC Electrical characteristic of the LCD

ITEM	SYMBOL	MIN	TYP	MAX	UNIT	NOTE
Power Voltage For LCD	V_{CC}	3.0	3.3	3.6	V	
Logic Input Voltage	VIH	$V_{CC}*0.7$	--	V_{CC}	V	Note1
	VIL	0	--	$V_{CC}*0.3$	V	
LCD Power Current	Icc	--	82	--	mA	Note2

Note1: Hsync, Vsync, DTMG, DCLK, R0~R5, G0~G5, B0~B5

Note2: fV =60Hz , Ta=25℃ , Display pattern : All Black

4-2 Electrical characteristic of LED Back-light

Parameter	Symbol	Min.	Typ.	Max.	Unit	Condition
LED voltage	V_{AK}	9.0	9.12	9.24	V	I_{LED} =84mA,Ta=25℃
LED forward current	I_{LED}	--	84	91	mA	Ta=25℃

I_{LED} = 84mA

A

K
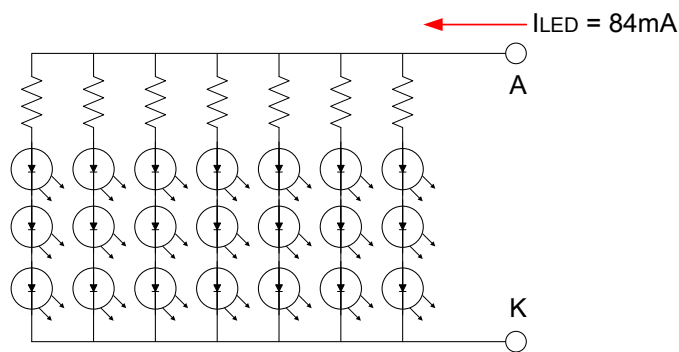
4-3 Touch Panel Electrical Specification

Parameter	Condition	Standard Value
Terminal Resistance	X Axis	160 ~ 640 Ω
	Y Axis	200 ~ 900 Ω
Insulating Resistance	DC 25 V	More than 20MΩ
Linearity	--	±1.5 %
Pen writing Durability	Note a	100,000 times(min)
Input life by finger	Note b	1,000,000 times (min)

Note A .

Writing length 35 mm.

Writing speed: 300mm/sec.

Shape of pen end : R0.8

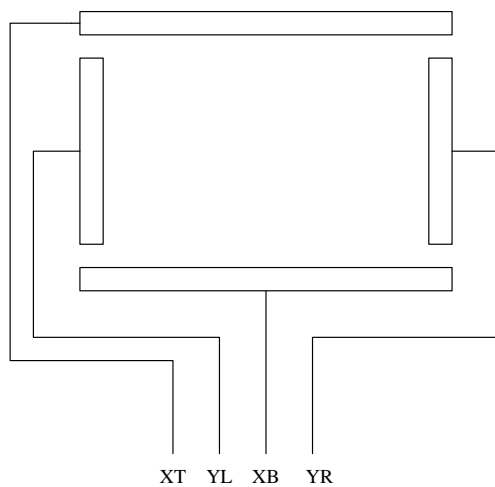Load : 250 g

Note B

By Silicon rubber tapping at same point

Shape of rubber end : R8

Load : 200g

Frequency : 5 Hz

Interface

No.	Symbol	Function
1	YR	Touch Panel Right Signal
2	XB	Touch Panel Bottom Signal
3	YL	Touch Panel Left Signal
4	XT	Touch Panel Top Signal

XT   YL   XB   YR

5. INTERFACE

Pin No	Symbol	Function
1	VDD	Power Supply for Logic
2	VDD	
3	U/D	Vertical Display mode Control (Note 1)
4	L/R	Horizontal Display mode Control (Note 1)
5	VSYNC	Vertical Sync Pulse (Note 2)
6	DEN	Timing Signal for Data (Note 2)
7	VSS	GND
8	DCLK	Dot Clock
9	VSS	GND
10	HSYNC	Horizontal Sync Pulse (Note 2)
11	VSS	GND
12	B5	Blue Data
13	B4	
14	B3	
15	VSS	GND
16	B2	Blue Data
17	B1	
18	B0	
19	VSS	GND
20	G5	Green Data
21	G4	
22	G3	
23	VSS	GND
24	G2	Green Data
25	G1	
26	G0	
27	VSS	GND
28	R5	Red Data
29	R4	
30	R3	
31	VSS	GND
32	R2	Red Data
33	R1	
34	R0	
35	NC	No Connection
36	IRQ	GND
37	YR	Touch Panel Right Signal
38	YL	Touch Panel Left Signal
39	XT	Touch Panel Top Signal
40	XB	Touch Panel Bottom Signal

Note 1: Vertical Display mode and Horizontal Display mode control.
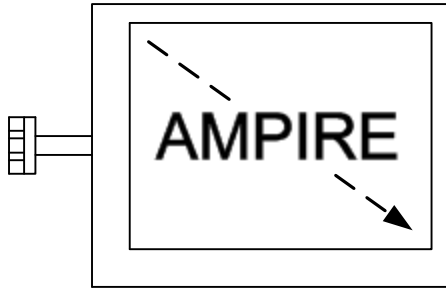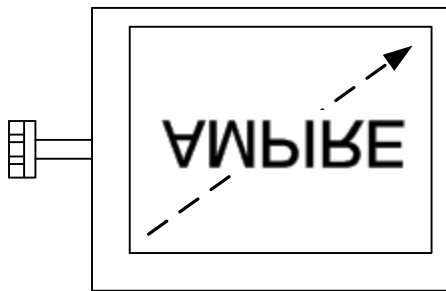
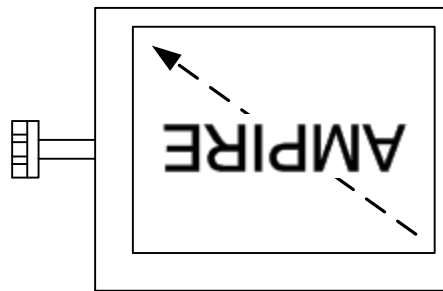L/R : H, U/D : H   L/R : L, U/D : H
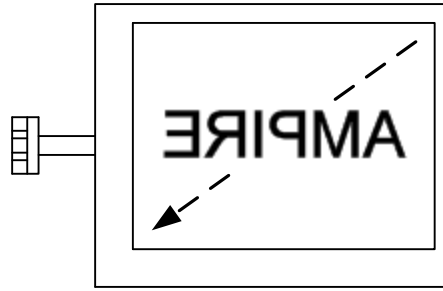
L/R : H, U/D : L   L/R : L, U/D : L

Note 2: It will auto detect which mode is used. If DEN signal is fixed low, SYNC mode
   is used. Otherwise, DE mode is used.
   (1) Use DE mode : DEN only, VSYNC and HSYNC short to GND
   (2) Use SYNC mode: VSYNC and HSYNC only, DEN short to GND.

6. INPUT SIGNAL:

6-1 Timing Specification.

6.1.1 AC Electrical Characteristics

PARAMETER	Symbol	Spec.			Unit
		Min.	Typ.	Max	
HS setup time	T_{HST}	10			ns
HS hold time	T_{HHD}	10			ns
VS setup time	T_{VST}	10			ns
VS hold time	T_{VHD}	10			ns
Data setup time	T_{DSU}	10			ns
Date hold time	T_{DHD}	10			ns
DEN setup time	T_{ESU}	10			ns

6.1.2 Digital Parallel RGB interface

PARAMETER	Symbol	Spec.			Unit
		Min.	Typ.	Max	
CLK frequency	F_{CPH}		25.175		MHz
CLK period	T_{CPH}	-	39.7	-	ns
CLK pulse duty	T_{CWH}	40	50	60	%
HS period	T_H	-	800	-	T_{CPH}
HS pulse width	T_{WH}	5	30	-	T_{CPH}
HS-first horizontal data time	T_{HS}	112	144	175	T_{CPH}
DEN pulse width	T_{EP}	-	640	-	T_{CPH}
VS pulse width	T_{WV}	1	3	5	T_H
VS-DEN time	T_{STV}	-	35	-	T_H
VS period	T_V	-	525	-	T_H

Note: When SYNC mode is used, 1st data start from 144th CLK after HS falling (when STHD[5:0]=00000)

PARAMETER	Symbol	Spec.			Unit
		Min.	Typ.	Max	
OEV pulse width	T_{OEV}		100	-	T_{CPH}
CKV pulse width	T_{CKV}	-	96	-	T_{CPH}
HS-CKV time	T_1	-	52	-	T_{CPH}
HS-OEV time	T_2	-	8	-	T_{CPH}
HS-POL time	T_3	-	72	-	T_{CPH}
STV setup time	T_{SUV}	-	46	-	T_{CPH}
STV pulse width	T_{WSTV}	-	1	-	T_H

6-2 Timing chart

Clock and Data input waveforms
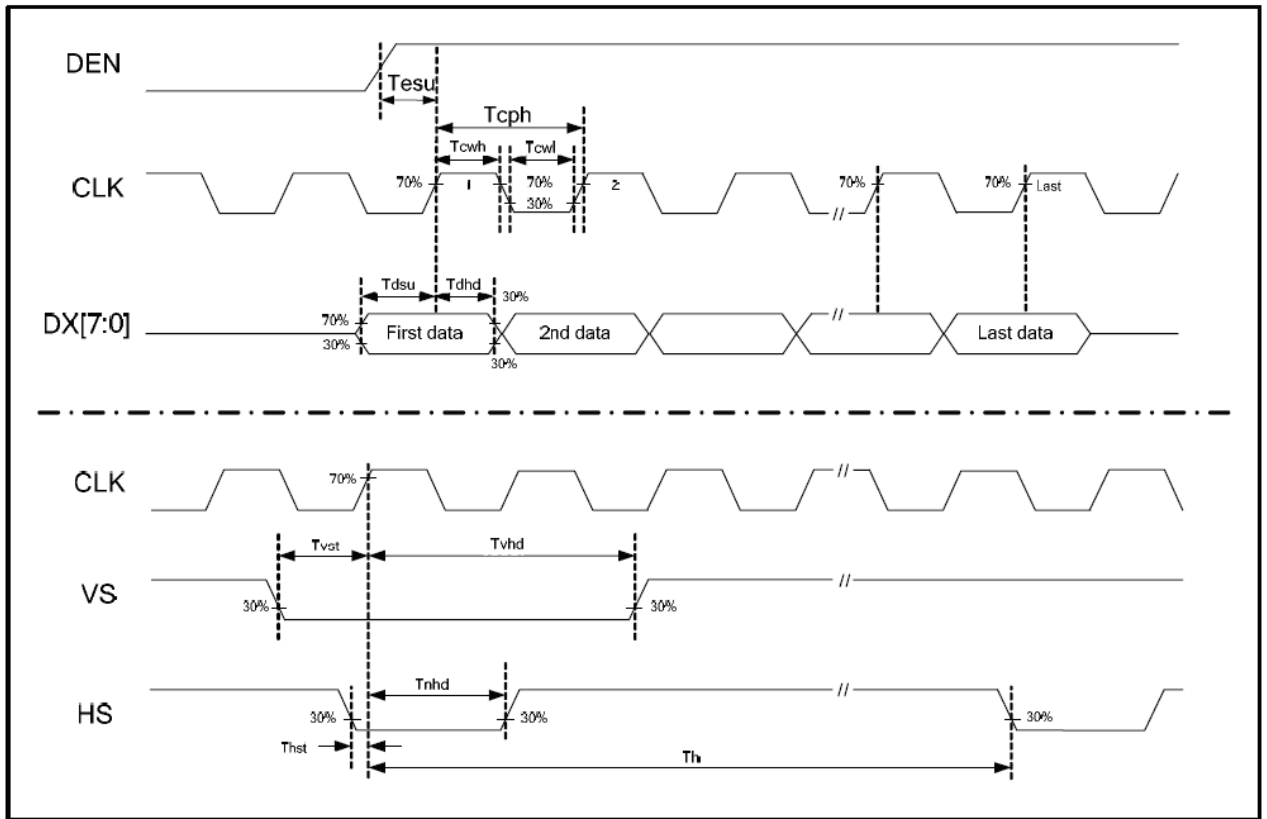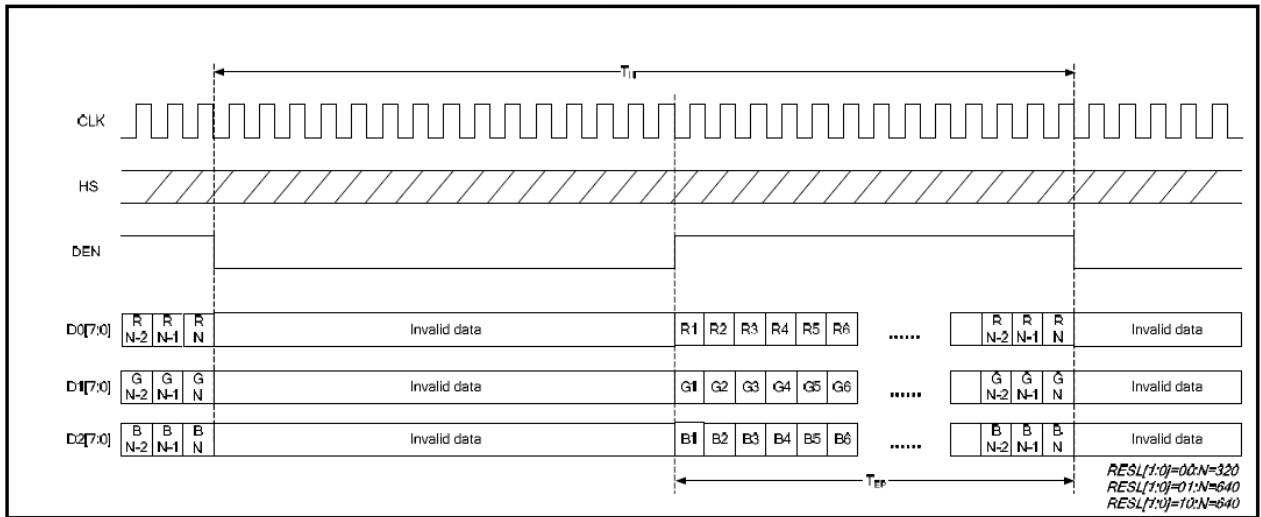

Parallel RGB SYNC Mode Horizontal Data Format
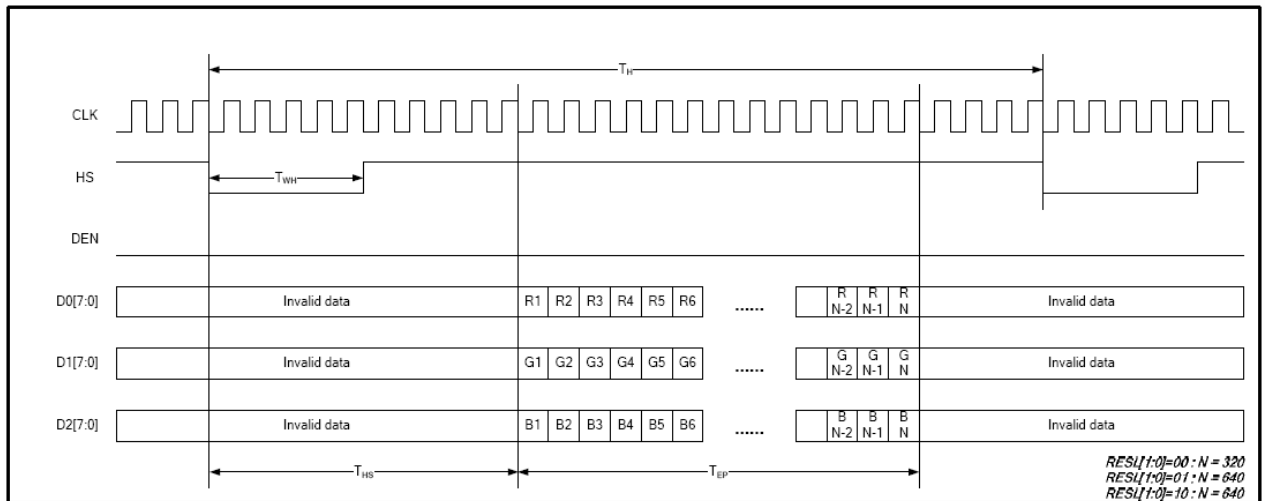
Parallel RGB DE Mode Horizontal Data Format

RESL[1:0]=00:N=320
RESL[1:0]=01:N=640
RESL[1:0]=10:N=640

6-3 Color Data Assignment

| COLOR	Input Data	R DATA						G DATA						B DATA					
		R5 MSB	R4	R3	R2	R1	R0 LSB	G5 MSB	G4	G3	G2	G1	G0 LSB	B5 MSB	B4	B3	B2	B1	B0 LSB
BASIC COLOR	BLACK	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	RED(63)	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
	GREEN(63)	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
	BLUE(63)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1
	CYAN	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1
	MAGENTA	1	1	1	1	1	1	0	0	0	0	0	0	1	1	1	1	1	1
	YELLOW	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0
	WHITE	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
RED	RED(0)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	RED(1)	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
	RED(2)	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	RED(62)	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	RED(63)	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
GREEN	GREEN (0)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	GREEN (1)	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
	GREEN (2)	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
	GREEN (62)	0	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0	0
	GREEN (63)	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
BLUE	BLUE (0)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	BLUE (1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	BLUE (2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
	BLUE (62)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	0
	BLUE (63)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1

NOTE : (1) Definition of Gray Scale , Color(n) : n is series of Gray Scale
The more n value is the bright Gray Scale
(2) Data : 1-High , 0-Low

7. OPTICAL CHARACTERISTICS

Item			Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Contrast ratio			CR		200	250	--	--	(1)(2)(3)
Luminance			Lw		160	270	-	cd/m²	(1)(3)
Luminance Uniformity			ΔL	Point - 5 Θ=Φ=0°	70	75	-	%	(1)(3)
Response Time (White – Black)			$T_r + T_f$		--	50	--	ms	(1)(3)(5)
Viewing Angle	Vertical		Θ	CR≧10	80	100	-	Deg.	(1)(2)(4)
	Horizontal		Φ	Point – 5	120	140	-		
Color chromaticity	Red	Rx			0.566	0.616	0.666	--	(1)(3)
		Ry			0.302	0.352	0.402		
	Green	Gx			0.308	0.358	0.408		
		Gy		Point - 5 Θ=Φ=0°	0.518	0.568	0.618		
	Blue	Bx			0.096	0.146	0.196		
		By			0.086	0.136	0.186		
	White	Wx			0.296	0.346	0.396		
		Wy			0.328	0.378	0.428		
Life time			Ta = 25℃	--	50K	--	Hour	(6)	

NOTE :

(1) Measure conditions: 25℃±2℃ , 60±10%RH under 10Lux , in the dark room by
    BM-7TOPCON) ,viewing 2° , VCC=3.3V , VDD=3.3V
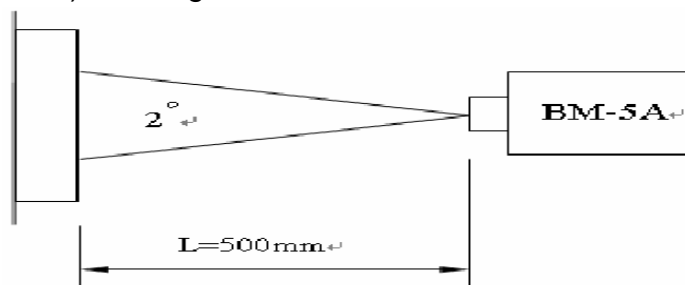
(2) Definition of Contrast Ratio:

   Contrast Ratio (CR) = (White) Luminance of ON ÷ (Black) Luminance of OFF

(3) Definition of Luminance :
    Definition of Luminance Uniformity
    Measure white luminance on the point 5 as figure9-1
    Measure white luminance on the point 1 ~ 9 as figure9-1

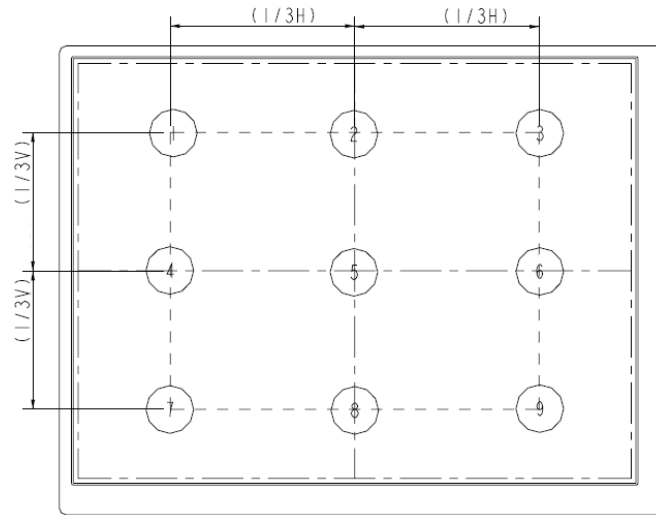   **ΔL = [L(MIN) / L(MAX)] X 100%**

Fig9-1 Measuring point

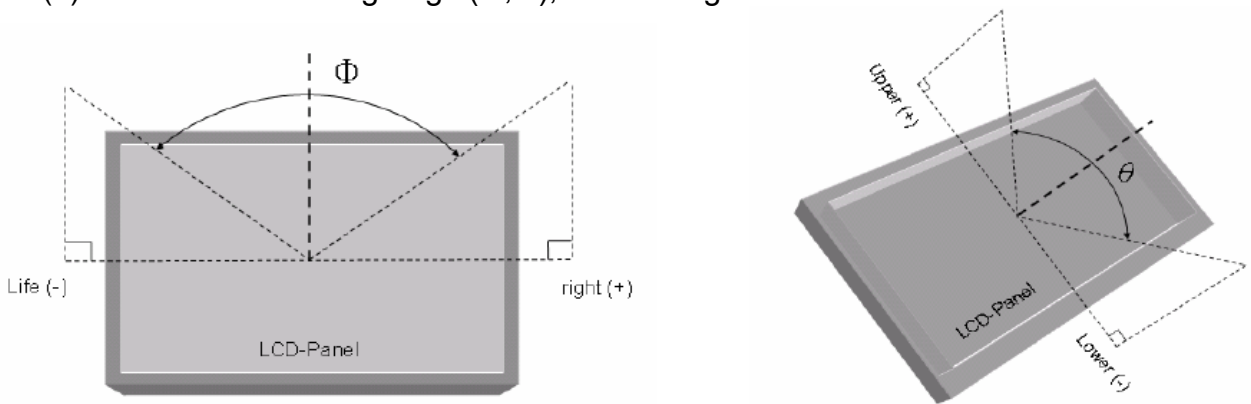(4) Definition of Viewing Angle(Θ,Φ), refer to Fig9-2 as below :

Fig9-2 Definition of Viewing Angle

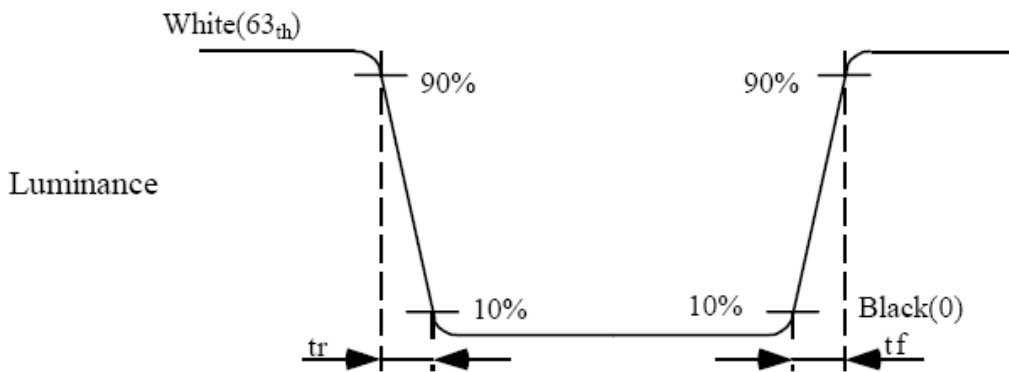(5) Definition of Response Time.(White – Black)

Fig9-3 Definition of Response Time(White-Black)

(6) End of Life shall be determined by the time when any of the following is satisfied under continuous lighting at 25℃
- Intensity drops to 50% of the Initial Value (Min. Luminance)
- Based on LED
- It is an estimative value

8. Reliability Test Items

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 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 the initial value.

9 USE PRECAUTIONS

9.1 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.

9.2 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.

9.3 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.
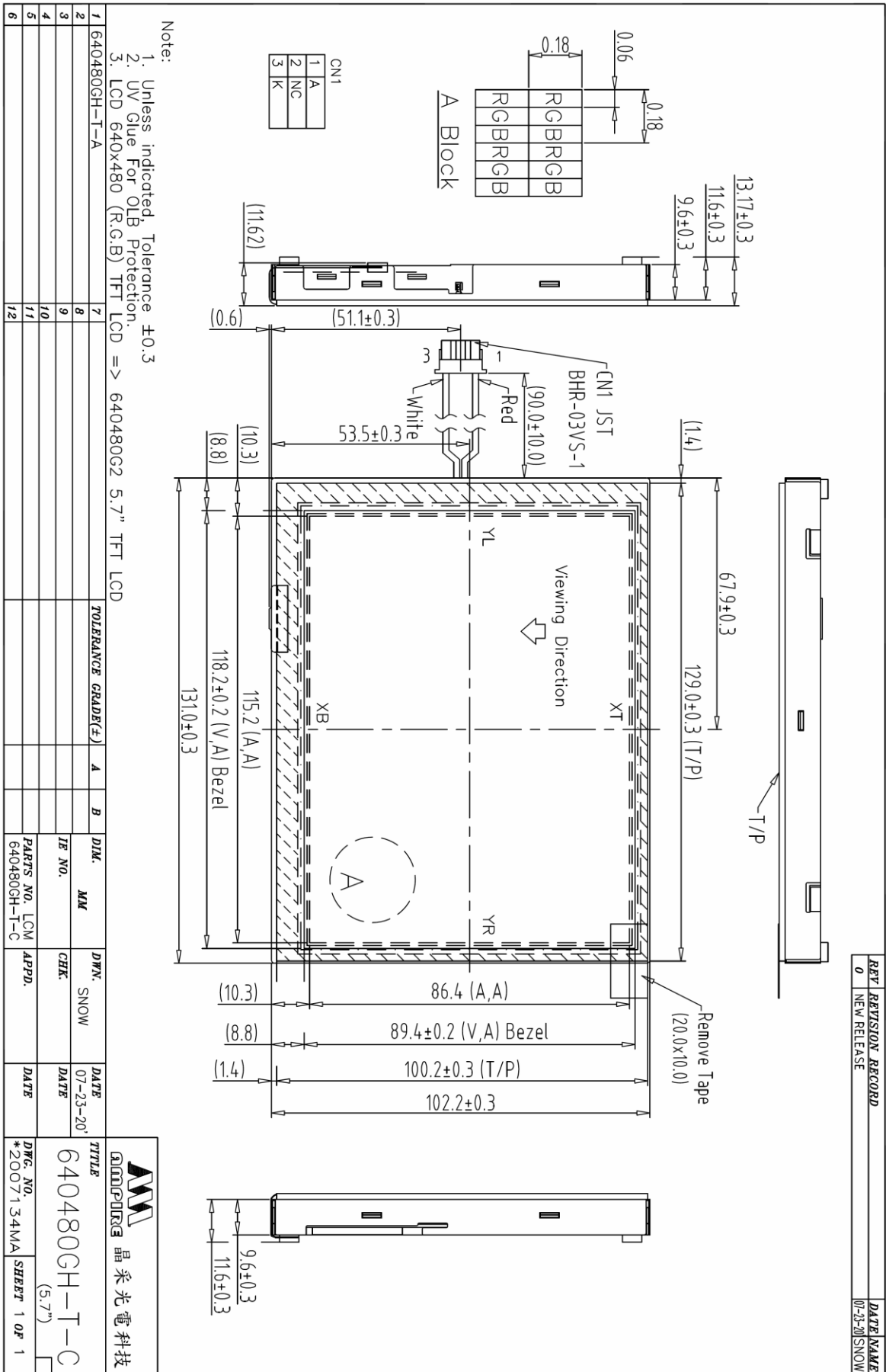
9.4 Operating precautions

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.

9.5 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 warrantee for all products and three months warrantee for all repairing products.

10. OUTLINE DIMENSION

J1

1	VDD	21	G4
2	VDD	22	G3
3	U/D	23	VSS
4	L/R	24	G2
5	VSYNC	25	G1
6	DEN	26	G0
7	VSS	27	VSS
8	DCLK	28	R5
9	VSS	29	R4
10	HSYNC	30	R3
11	VSS	31	VSS
12	B5	32	R2
13	B4	33	R1
14	B3	34	R0
15	VSS	35	NC
16	B2	36	IRQ
17	B1	37	SK/YR
18	B0	38	DO/YL
19	VSS	39	DI/XT
20	G5	40	TPCS/XB

Note:
1. Unless indicated, Tolerance ±0.3
2. UV Glue For OLB Protection.
3. LCD 640x480 (R.G.B) TFT LCD => 640480G2 5.7" TFT LCD

Back view

J1 Connector
089H4.0-000000-G2-C
or Equivalent

			640480GH-T-A	7	8	9	10	11	12

			TOLERANCE GRADE(±)	A	B	DIM.	DMN.		DATE

IE NO.   MM   CHK.   DATE   07-23-20'

PARTS NO. LCM-1   APPD.   DATE
640480GH-T-C

DWG. NO. *2007135MA   SHEET 1 OF 1

TITLE 640480GH-T-C (5.7")

AMPIRE 晶采光電科技

53.5±0.3
102.2±0.3
(4.8)
92.6±0.2
23.2±0.3
4-φ2.4/φ5.2
131.0±0.3
125.0±0.2
67.9±0.3
(3.0)
(38.0±0.3)
(26.0±0.3)
(90.0±10.0)
White
Red
(0.6)
(51.1±0.3)
13.17±0.3
11.6±0.3
9.6±0.3
(11.62)
120.5±0.5
J1
U1B
U1A
J2

11. Package

EPE PROTECT SHEET ☐1

氣泡袋 or 金屬袋 ☐1

Small Box
Size:LxWxH
(267.0x224.0x124.0mm)

Big Box
(No.2)
Size:LxWxH
(491.0x300.0x295.0mm) ☐1

CNT NO.
MADE IN TAIWAN

RoHS

Note:
1 Tray=1x2=2Pcs.
2 Small Box=5xTray=10Pcs.(5 Tray)
3 Big Box=4xSmall Box=40Pcs.

1						7
2						8
3						9
4						10
5						11
6						12

TOLERANCE GRADE(±)

	A	B	DIM.
			MM

IE NO.

PARTS NO. BOX
240128B

DWN.	NINNY	DATE	08-22-03'
CHK.		DATE	
APPD.		DATE	

AMPIRE 晶采光電科技

TITLE 240128B

DWG. NO.
*O3O832SC

SHEET 1 OF 1

REV	REVISION RECORD	DATE	NAME
0	NEW RELEASE	08-22-03'	NINNY
1	Add 氣泡袋 or 金屬袋 & EPE PROTECT SHEET	08-24-18	MILLY
2	Modify the outer box printing	11-20-18	MILLY