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-800480E4TMQW -02H (SYNC mode)**
APPROVED BY	
DATE	

☑**Approved For Specifications**
☐**Approved For Specifications & Sample**

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RECORD   OF   REVISION

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1. INTRODUCTION

Ampire Display Module AM800480E4 is a color active matrix TFT-LCD that uses amorphous silicon TFT as a switching device . This model is composed of a TFT-LCD panel ,This TFT-LCD has a high resolution (800(R.G.B) X 480) and can display up to 262,144 colors .

1-1. Features

- 7" WVGA (16:9 diagonal) configuration
- Input interface voltage : 3.3V
- SYNCmode

1-2. Applications

- Portable TV
- Car use DVD
- Industrial application
- HMI (Human machine interface)

2. PHYSICAL SPECIFICATIONS

Item	Specifications	unit
Display resolution(dot)	800RGB (W) x 480(H)	dots
Active area	152.4 (W) x 91.44 (H)	mm
Pixel pitch	0.1905 (W) x 0.1905 (H)	mm
Color configuration	R.G.B Vertical stripe	
Overall dimension	165.0(W)x104.0(H)x8.4 max(T)	mm
Weight	123.0 ± 1.0	g
Brightness	400 nit(typ)	cd/m^2
Contrast ratio	250 : 1	
Backlight unit	LED	
Display color	262,144	colors

3. ABSOLUTE MAX. RATINGS

ITEM	SYMBOL	MIN	MAX	UNIT
Power Supply Voltage for LCD	Vcc	-0.5	5.0	V
Signal input voltage	DCLK DE HSYNC VSYNC R0~R5 G0~G5 B0~b5	-0.5	VCC+0.5	V
Operation Temperature	Top	-10	60	℃
Storage Temperature	Tstg	-20	70	℃

The following values are maximum operation conditions, If exceeded, it may cause faulty operation or damage
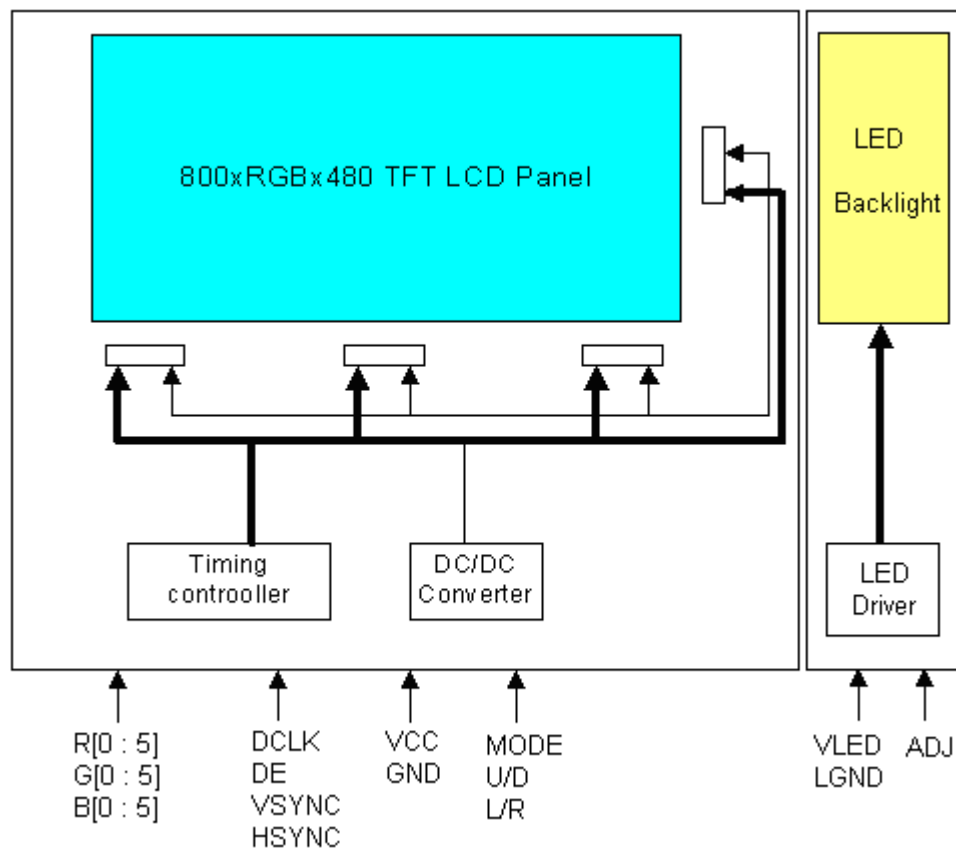
4. ELECTRICAL CHARACTERISTICS

4-1 TFT LCD Module voltage

ITEM		SYMBOL	MIN	TYP	MAX	UNIT	CONDITION
Power Supply Voltage For LCD		Vcc	3.0	3.3	4.0	V	
Power Supply Current For LCD		Icc	170	210	250	mA	VCC=3.3V
Power Supply Voltage For LED		V_{LED}	4.5	5.0	5.5	V	
Power Supply Current For LED		I_{LED}	-	390	420	mA	V_{LED}=5V V_{ADJ}=3.3V (duty 100%)
LED Backlight Voltage		V_{BL}	-	10.5	12	V	I_{BL}=162mA
LED Backlight Current		I_{BL}	-	162	180	mA	V_{LED}=5V V_{ADJ}=3.3V (duty 100%)
ADJ Input Voltage		V_{ADJ}	-	3.3	-	V	duty=100%
Logic Input Voltage	Input Voltage	V_{IN}	0	-	Vcc	V	
	Threshold Voltage(High)	V_{TH}	3.0	-	Vcc	V	
	Threshold Voltage(Low)	V_{TL}	GND	-	0.5	V	

Note 1:

VCC –dip codition:
1) When 2.7 V≦VCC＜3.0V，td≦10ms.
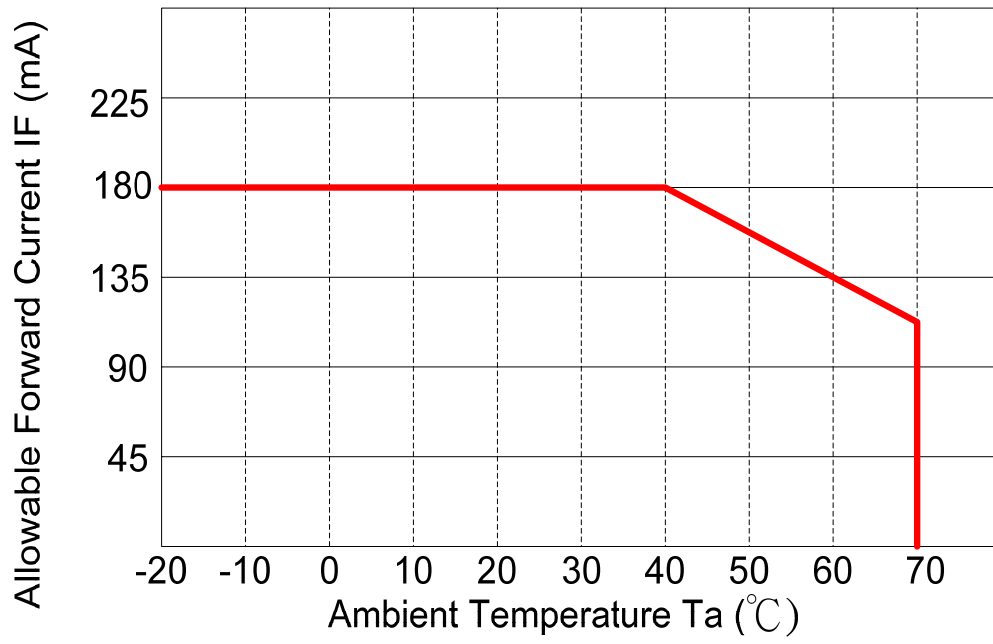2) VCC＞3.0V，VCC-dip condition should be same as VCC-turn-on condition.
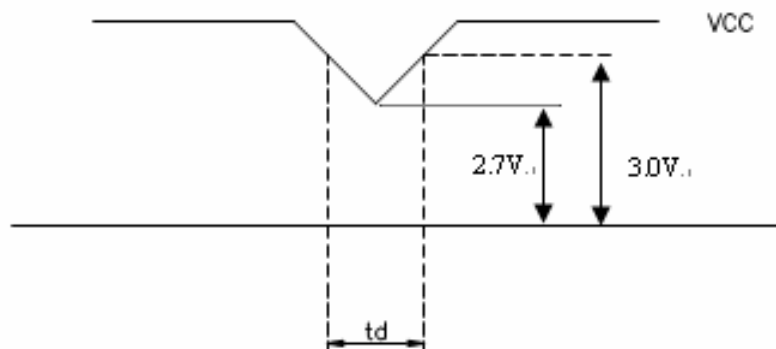
Note 2:

The constant current source is needed for white LED back-light driving.

When LCM is operated over 60℃ ambient temperature, the I_{BL} of the LED

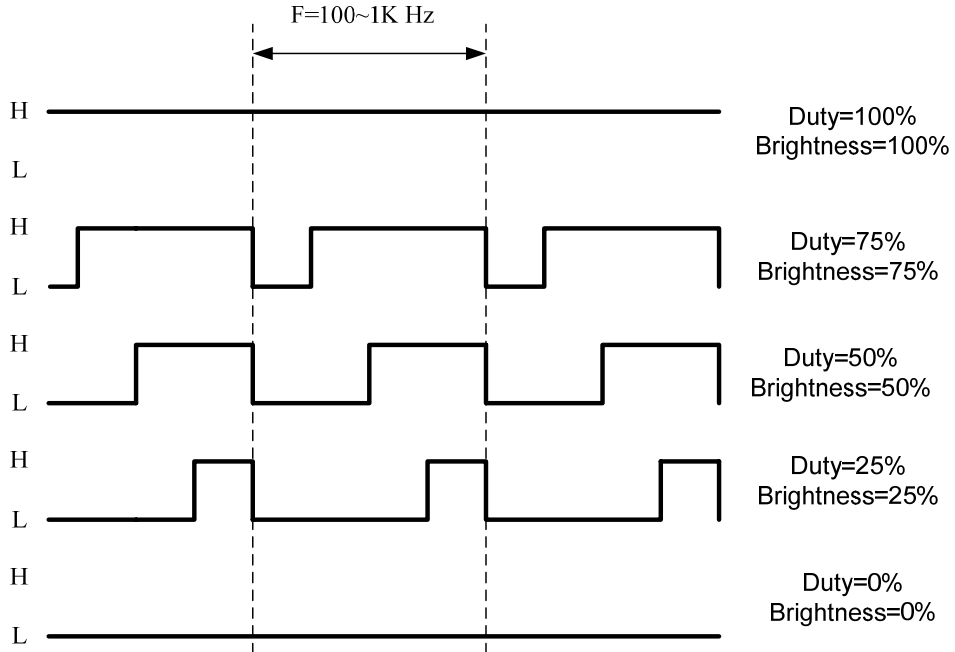back-light should be adjusted to 135mA max

5. INTERFACE

Pin no	Symbol	Function	Note
1	VLED	Power supply for LED (5V)	
2	VLED	Power supply for LED (5V)	
3	ADJ	Adjust for LED Brightness	(1)
4	LGND	LED Driver Ground	
5	LGND	LED Driver Ground	
6	VCC	Power supply for LED (3.3V)	
7	VCC	Power supply for LCD (3.3V)	
8	MODE	DE or SYNC mode Select	(2)
9	DE	Data Enable Timing Signal	
10	VSYNC	Vsync signal input	
11	HSYNC	Hsync signal input	
12	GND	Ground	
13	B5	Blue data (MSB)	
14	B4	Blue data	
15	B3	Blue data	
16	GND	Ground	
17	B2	Blue data	
18	B1	Blue data	
19	B0	Blue data (LSB)	
20	GND	Ground	
21	G5	Green data (MSB)	
22	G4	Green data	
23	G3	Green data	
24	GND	Ground	
25	G2	Green data	
26	G1	Green data	
27	G0	Green data (LSB)	
28	GND	Ground	
29	R5	Red data (MSB)	
30	R4	Red data	
31	R3	Red data	
32	GND	Ground	
33	R2	Red data	
34	R1	Red data	
35	R0	Red data (LSB)	
36	GND	Ground	
37	DCLK	Data Clock	
38	NC	No Connection (need to be floating)	
39	L/R	Select left or right scanning direction	(3)
40	U/D	Select up or down scanning direction	(3)

NOTE :
(1) Pin3: ADJ is PWM signal input. It is for brightness control.

ITEM	SYMBOL	MIN	TYP	MAX	UNIT
ADJ signal frequency	f_{PWM}	100	--	1K	Hz
ADJ signal logic level High	VIH	2V	--	VLED (5.0V)	V
ADJ signal logic level Low	VIL	0	--	0.5	V

F=100~1K Hz

H ——————————————————————————— Duty=100% Brightness=100%
L

H ⎍⎍⎍ Duty=75% Brightness=75%
L

H ⎍⎍⎍ Duty=50% Brightness=50%
L

H ⎍⎍⎍ Duty=25% Brightness=25%
L

H Duty=0% Brightness=0%
L ———————————————————————————

(2) DE Mode, Mode="H",HSYNC floating and VSYNC floating
    HV Mode, Mode="L" and DE floating

(3) Selection of scanning mode

Setting of scan control input		Scanning direction
U/D	R/L	
GND	VCC	Up to Down, Left to Right
VCC	GND	Down to Up, Right to Left
GND	GND	Up to Down, Right to Left
VCC	VCC	Down to Up, Left to Right

6. OPTICAL CHARACTERISTICS

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Response Time		$T_r + T_f$	$\Theta=\Phi=0°$	-	20	30	ms	(1)
Contrast ratio		CR			250			(2)(3)
Viewing Angle	Vertical	Θ	$CR \geqq 10$		120			(5)
	Horizontal	Φ			140			
Luminance		L	$\Theta=\Phi=0°$		500			(3)(4)
Color chromaticity	Red	Rx	$\Theta=\Phi=0°$	0.541	0.581	0.621		(3)
		Ry		0.321	0.361	0.401		
	Green	Gx		0.314	0.354	0.394		
		Gy		0.524	0.564	0.604		
	Blue	Bx		0.108	0.148	0.188		
		By		0.084	0.124	0.164		
	White	Wx		0.277	0.317	0.357		
		Wy		0.315	0.355	0.395		

NOTE :

● These items are measured by BM-7(TOPCON) in the dark room (no ambient light)
● Brightness conditions : IL=180mA.

(1) Definition of Response Time (White-Black)
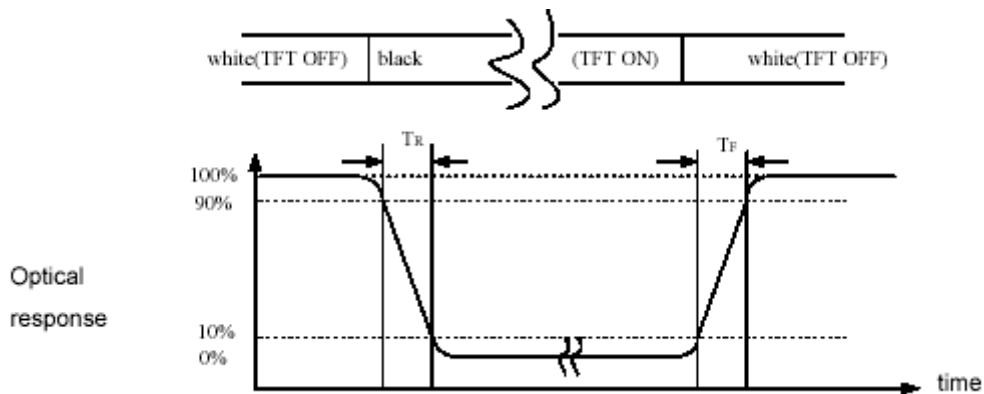
(2) Definition of Contrast Ratio

Measure contrast ratio on the below 5 points(refer to figurel,#1~#5point) and take the average value
Contrast ratio is calculated with the following formula :

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

(3) Definition of Luminance :

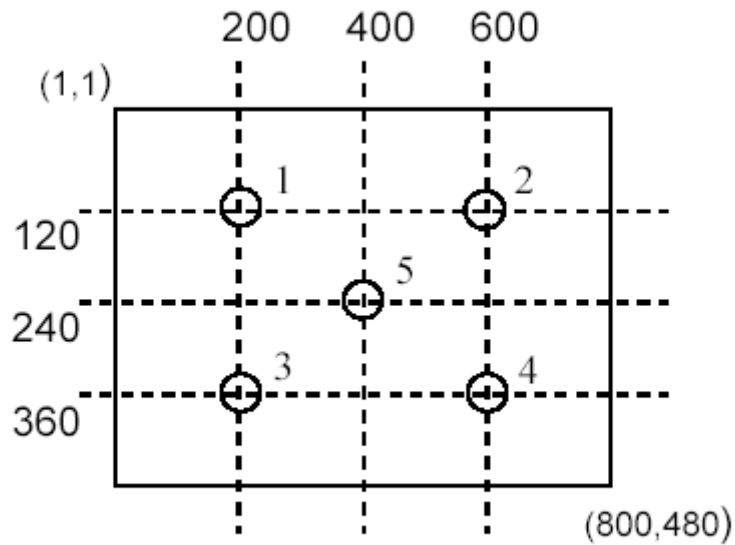Measure white luminance on the same 5 points and take the average value
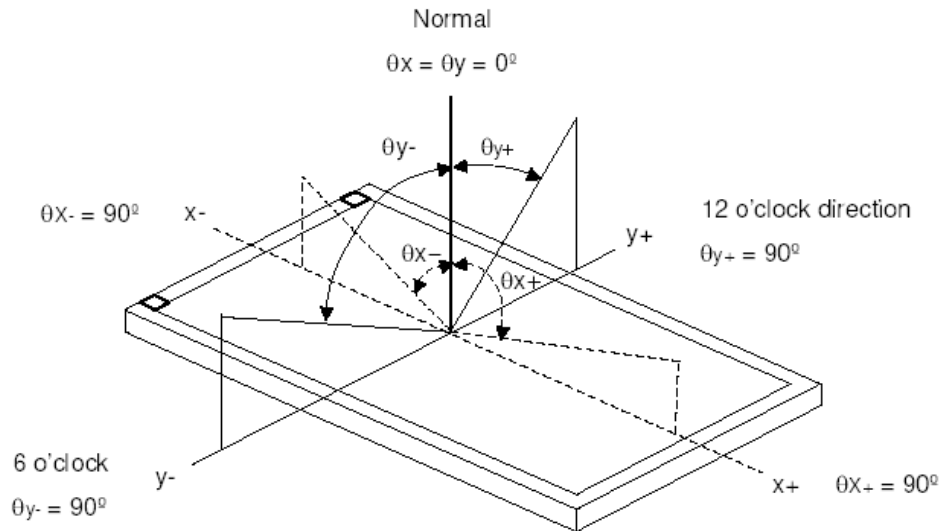

Fig.1   Measuring point

(1) Definition of Luminance Uniformity :
Measured Maximum luminance[L(MAX)] and Minimum luminance[L(MIN)] on the 5 points
Luminance Uniformity is calculated with the following formula :

ΔL =[L(MAX) / L(MIN) −1] X 100

(2) Definition of Viewing Angle

Φ =(Θx+)＋(Θx-)   Θ =(Θy+)＋(Θy-)

7. TIMING CHARACTERISTICS

DE only mode

DE mode Input signal characteristics, 800 x 480

PARAMETER		SYMBOL	MIN	TYP	MAX	UNIT	REMARK
DCLK	PERIOD	TCLK	25	34	-	NS	
	FREQUENCY	FCLK	-	29.5	40	MHZ	
	LOW LEVEL WIDTH	TWCL	6	-	-	NS	
	HIGH LEVEL WIDTH	TWCH	6	-	-	NS	
	RISE, FALL TIME	TCLKR, TCLKF	-	-	3	NS	
	DUTY	-	0.45	0.50	0.55	-	
DE	SETUP TIME	TDES	5	-	-	NS	
	HOLD TIME	TDEH	5	-	-	NS	
	RISE, FALL TIME	TDER, TDEF	-	-	5	NS	
	HORIZONTAL PERIOD	THP	810	928	1600	TCLK	
	HORIZONTAL VALID	THV	800			TCLK	
	HORIZONTAL BLANK	THBK	THP - THV			TCLK	
	VERTICAL PERIOD	TVP	485	525	960	THP	
	VERTICAL VALID	TW	480			THP	
	VERTICAL BLANK	TVBK	TVP - TW			THP	
DATA	SETUP TIME	TDS	5	-	-	NS	
	HOLD TIME	TDH	5	-	-	NS	
	RISE, FALL TIME	TDR, TDF	-	-	3	NS	

TVP:min=490H,typ=500H,max=550H

VSYNC

DE

TVW+TVBP   TW:typ=480H   TFP

TVBK = TVW + TVBP + TVFP : min=10H, typ=20H, max=70H

At DE mode, HSYNC is no use, VSYNC is option If no VSYCN drive in, CY2860 will use irternal VSYNC

THP : min=850T, typ=900T, max=1056T

DE

DCLK

R/G/B in   Valid data   Invalid data

THV: 800T

THBK : min=50T,typ=100T,max=256T
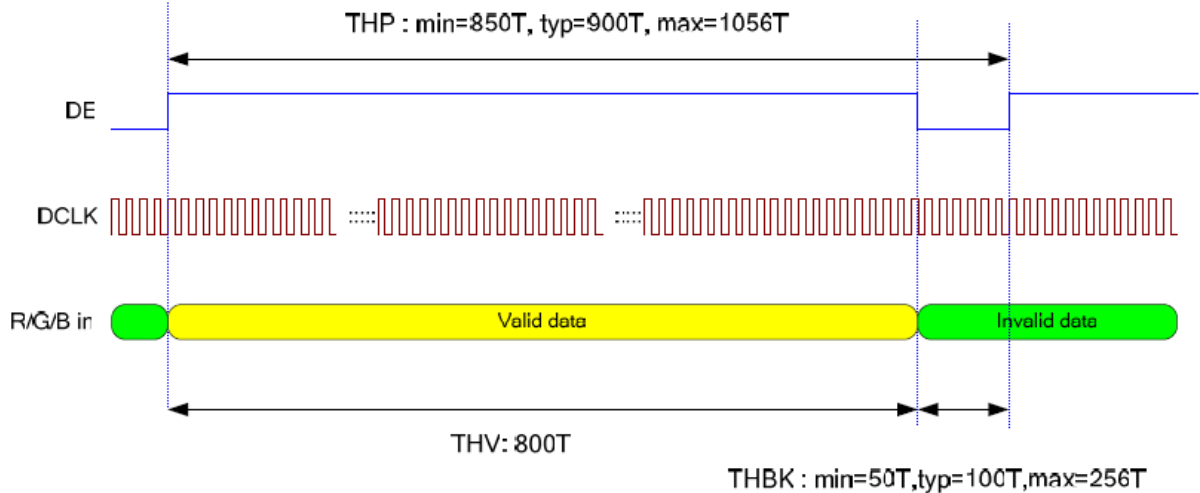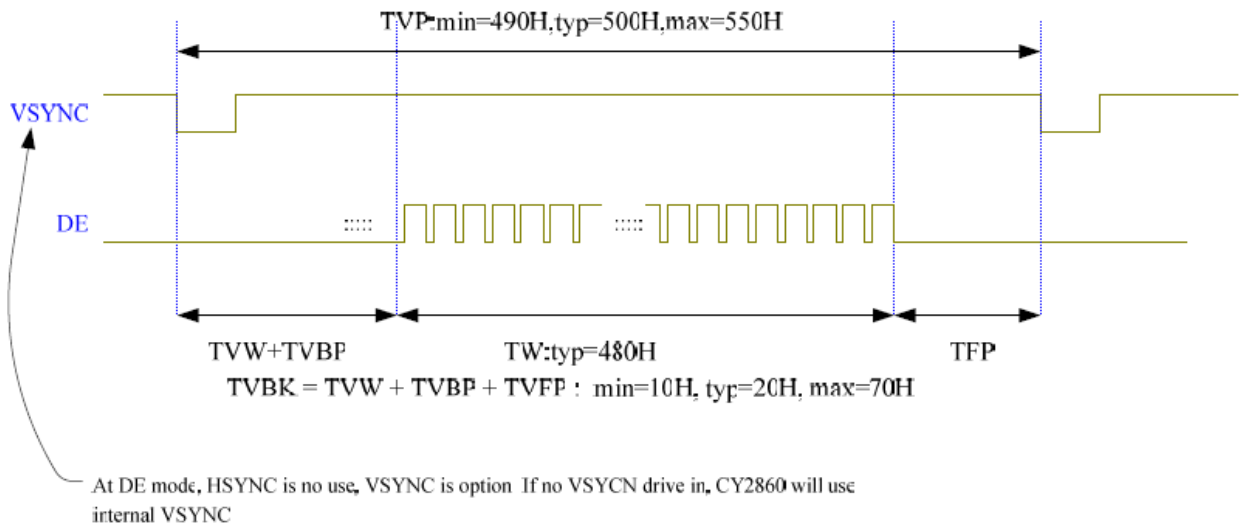
SYNC mode

SYNC mode Input signal characteristic, 800 x 480

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	REMARK
CLOCK PERIOD	TCLK	25	34	-	NS	
CLOCK FREQUENCY	FCLK	-	29.5	40	MHZ	
CLOCK LOW LEVEL WIDTH	TWCL	8	-	-	NS	
CLOCK HIGH LEVEL WIDTH	TWCH	8	-	-	NS	
CLOCK RISE, FALL TIME	TCLKR, TCLKF	-	-	3	NS	
HSYNC PERIOD	THP	810	928	1600	TCLK	
HSYNC PULSE WIDTH	THW	-	48	-	TCLK	
HSYNC BACK PORCH	THBP	-	40	-	TCLK	
HSYNC WIDTH + BACK PORCH	THW+ THBP	88			TCLK	
HORIZONTAL VALID DATA WIDTH	THV	800			TCLK	
HSYNC FRONT PORCH	THFP	THP – THW - THBP - THV			TCLK	
HORIZONTAL BLANK	THBK	THP – THV			TCLK	
VSYNC PERIOD	TVP	485	525	960	THP	
VSYNC PULSE WIDTH	TVW	-	3	-	THP	
VSYNC BACK PORCH	TVBP	29			THP	
VERTICAL DATA VALID WIDTH	TW	480			THP	
VSYNC FRONT PORCH	TVFP	TVP – TVW - TVBP - TW			THP	
VERTICAL BLANK	TVBK	TVP – TW			THP	
DATA SETUP TIME	TDS	5	-	-	NS	
DATA HOLD TIME	TDH	5	-	-	NS	

THW + THBP : typ=88T

HSYNC

DCLK

R/G/B in   Invalid data   D1 D2 D3 D4 D5 ::::

THW : min=4T.typ=48T.max=81T   THBP:min=7T.typ=40T.max=84T

THP : min=895Ttyp=928TT,max=1056T

HSYNC

DCLK

R/G/B in   Invalid data   Valid data   Invalid data

THW + THBP : typ=88T   THV: 800T

THFP : min=7T.typ=40T,max=168T
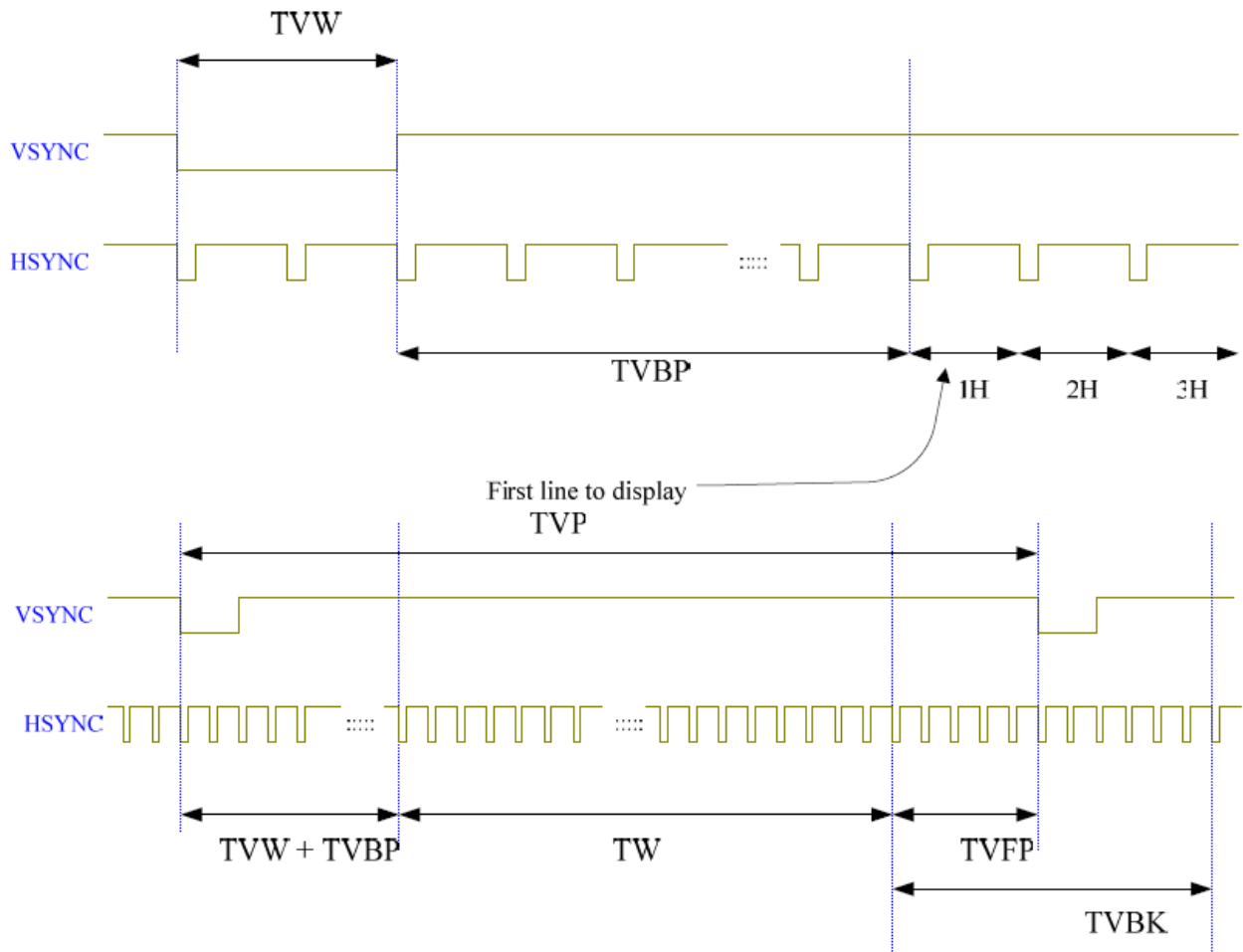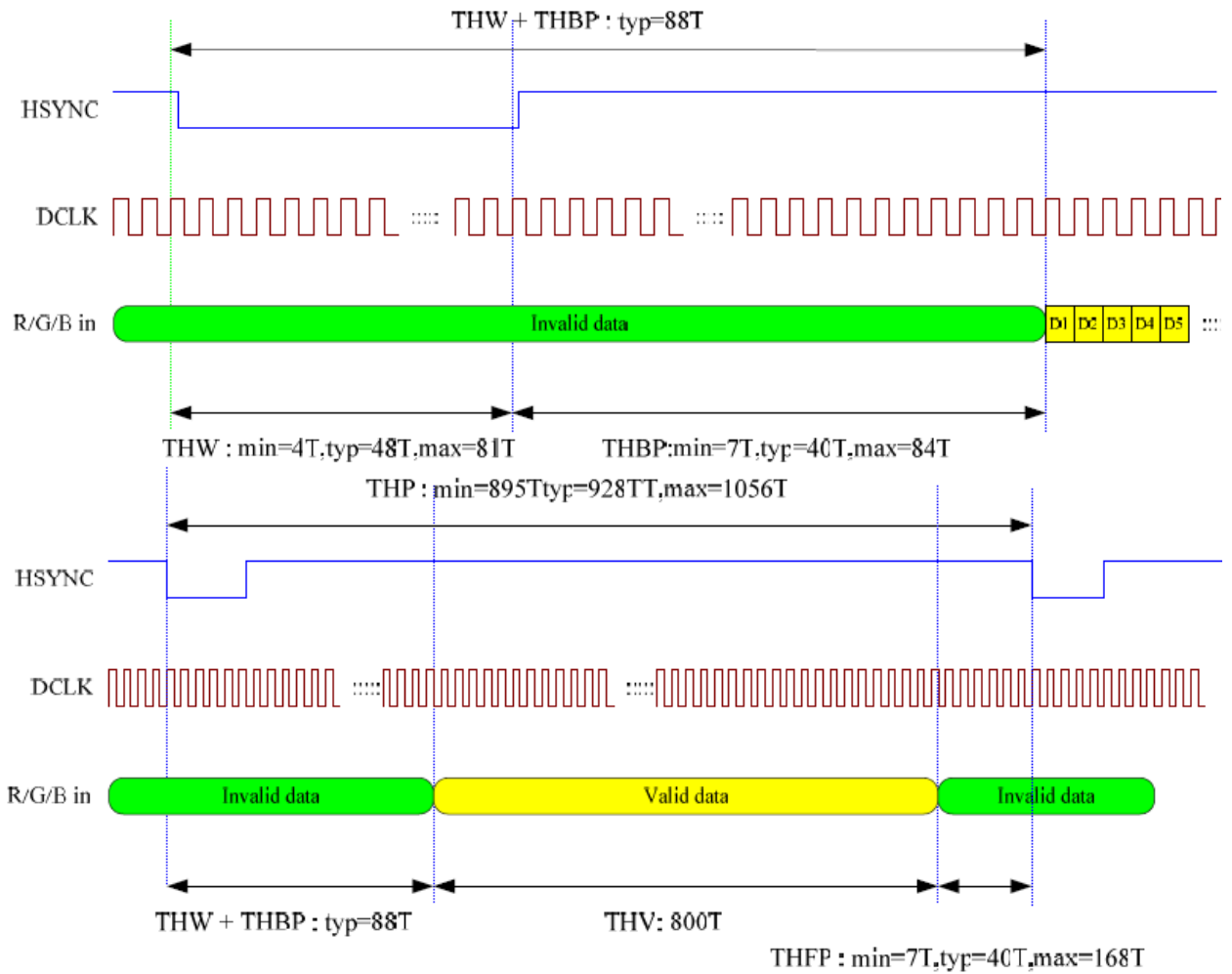
Input clock, Setup/Hold time

TCLKr : max=3ns
from 10% to 90%

TCLK : min=20M, typ=33.3M, max=40M (HSYNC)
min=25M, typ=27M, max=35M (DE)

DCLK

TCLKf : max=3ns
from 10% to 90%

Clock high go low latch
data

DCLK

R/G/B in   Valid

TDH : min=10ns

DE,HSYNC,
VSYNC

TDS: min=5ns
TDES : min=5ns

TDEH : min=5ns
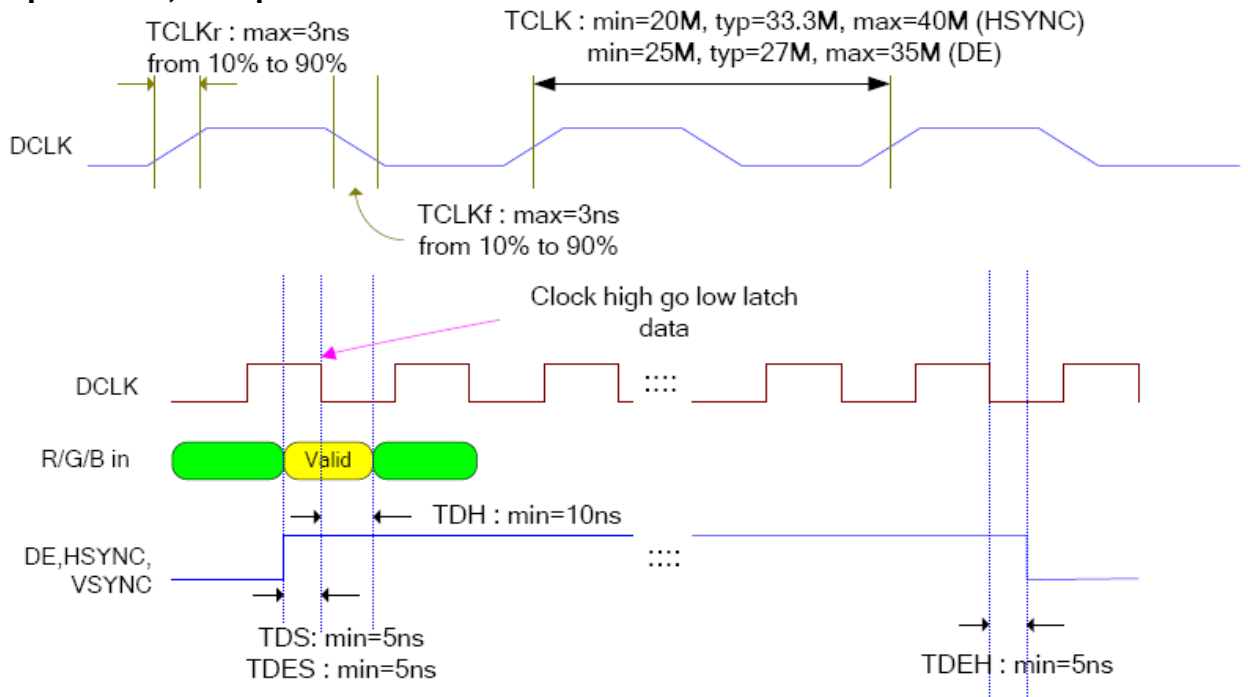
8. QUALITY AND RELIABILITY

8.1 TEST CONDITIONS

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

8.2 SAMPLING PLAN

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

8.3 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.

8.4 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.

ZONE A active area

ZONE B viewing area
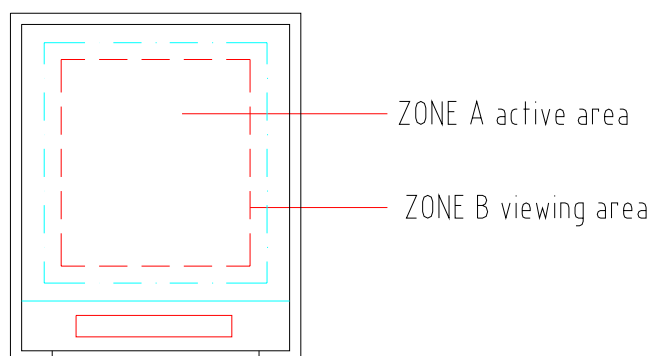
8.5   INCOMING INSPECTION STANDARD FOR   TFT-LCD PANEL

| DEFECT TYPE			LIMIT						Note
VISUAL DEFECT	INTERNAL	SPOT	$\varphi<0.15mm$			Ignore			Note1
			$0.15mm\leqq\varphi\leqq0.5mm$			$N\leqq4$			
			$0.5mm<\varphi$			$N=0$			
		FIBER	$0.03mm<W\leqq0.1mm$, $L\leqq5mm$			$N\leqq3$			Note1
			$1.0mm<W$, $1.5mm<L$			$N=0$			
		POLARIZER BUBBLE	$\varphi<0.15mm$			Ignore			Note1
			$0.15mm\leqq\varphi\leqq0.5mm$			$N\leqq2$			
			$0.5mm<\varphi$			$N=0$			
		Mura	It' OK if mura is slight visible through 6%ND filter						
ELECTRICAL DEFECT			A Grade			B Grade			
		BRIGHT DOT	C Area	O Area	Total	C Area	O Area	Total	Note3
			$N\leqq0$	$N\leqq2$	$N\leqq2$	$N\leqq2$	$N\leqq3$	$N\leqq5$	Note2
		DARK DOT	$N\leqq2$	$N\leqq3$	$N\leqq3$	$N\leqq3$	$N\leqq5$	$N\leqq8$	
		TOTAL DOT	$N\leqq4$			$N\leqq5$	$N\leqq6$	$N\leqq8$	Note2
		TWO ADJACENT DOT	$N\leqq0$	$N\leqq1$ pair	$N\leqq1$ pair	$N\leqq1$ pair	$N\leqq1$ pair	$N\leqq1$ pair	Note4
		THREE OR MORE ADJACENT DOT	NOT ALLOWED						
		LINE DEFECT	NOT ALLOWED						

(1) **One pixel consists of 3 sub-pixels, including R,G, and B dot.(Sub-pixel = Dot)**

(2) **LITTLE BRIGHT DOT acceptable under 6% ND-Filter**

  [Note1] W : Width[mm], L : Length[mm], N : Number, φ: Average Diameter

$\phi = (a + b) / 2$

1. (White, black) Spot
2. Polarizer Bubble

1. fiber
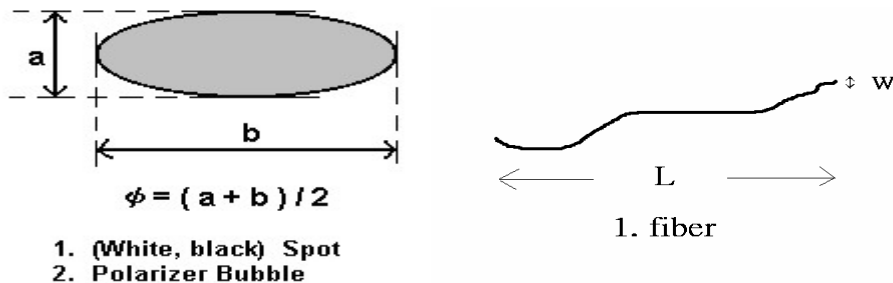
  [Note2] Bright dot is defined through 5% transmission ND Filter as following.
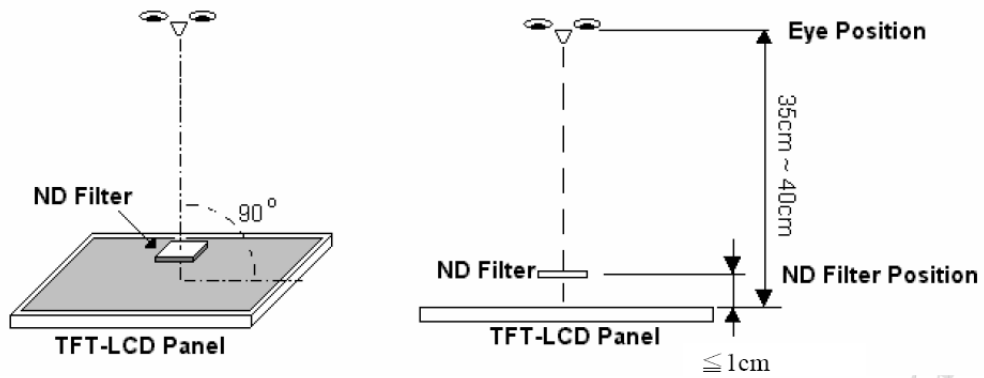
[Note3]
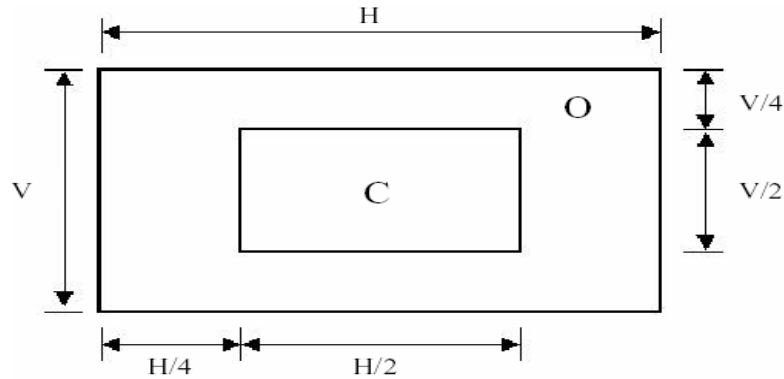
C Area: Center of display area

C Area: Outer of display area

[Note4]

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.
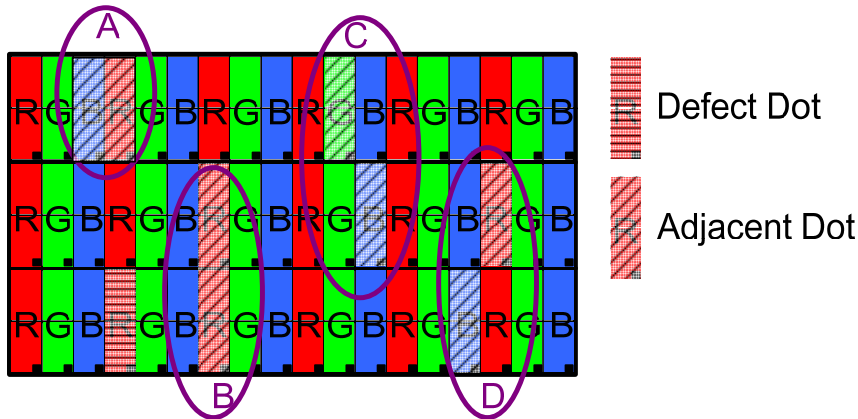
(1) The defects that are not defined above and considered to be problem shall be reviewed and discussed by both parties.

(2) Defects on the Black Matrix, out of Display area, are not considered as a defect or counted.

8.6 RELIABILITY TEST CONDITIONS

ITEM	CONDITIONS	NOTE
HIGH TEMPERATURE OPERATION	60℃ , 240Hrs	
HIGH TEMPERATURE AND HIGH HUMIDITY OPERATION	40℃ , 90%RH , 240Hrs	
HIGH TEMPERATURE AND HIGH HUMIDITY STORAGE	60℃ , 90%RH , 48 Hrs	
HIGH TEMPERATURE STORAGE	70℃ , 240Hrs	
LOW TEMPERATURE OPERATION	-10℃ , 240Hrs	
LOW TEMPERATURE STORAGE	-20℃ , 240Hrs	
THERMAL SHOCK (No operation)	-20℃(0.5Hr) ~60℃(0.5Hr) 200Cycle	
ESD	±8kV&±15kV air & contact test	(1)
	0Ω,±200V contact test	(2)

NOTE : Measure point :

(1) LCD glass and bezel

(2) IF connector pins

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

CN2

1	VLED
2	VLED
3	ADJ
4	LGND
5	LGND
6	VCC
7	VCC
8	MODE
9	DE
10	VSYNC
11	HSTNC
12	GND
13	B5
14	B4
15	B3
16	GND
17	B2
18	B1
19	B0
20	GND
21	G5
22	G4
23	G3
24	GND
25	G2
26	G1
27	G0
28	GND
29	R5
30	R4
31	R3
32	GND
33	R2
34	R1
35	R0
36	GND
37	DCLK
38	NC
39	L/R
40	U/D

A Block

Note:
1. Unless indicated, Tolerance "±0.3"
2. UV Glue For OLB Protection.
3. CN2:FH19SC-40S-0.5SH
4. CN3:FH19SC-50S-0.5SH
5. LCD 800X3(R.G.B)x480=> 7.0" Digital TFT LCD

TOLERANCE GRADE(±)				
DIM.	A	B	IE NO.	
~6	0.05	0.1		
6~18	0.08	0.18		
18~50	0.1	0.25		
50~180	0.2	0.4		
180~	0.3	0.5		

		MM	PARTS NO. LCM 800480E4-02

Viewing Direction

94.3±0.3 (V,A)
91.44 (A,A)
80.2±0.3
155.3±0.3 (V,A)
152.4 (A,A)
165.0±0.3
104.0±0.3
54.5±0.3
(7.35)
(8.7)
(2.55)
(3.92)
0.1905
0.0635
5.5±0.3
5.2±0.3
8.4±0.5

AMPIRE 晶采光電科技

TITLE: 800480E4-02 (7.0")
DWG. NO.: *090415MA
SHEET 1 OF 1

DWN. EMILY DATE 04-09-09
CHK. DATE
APPD. DATE

A Block

	RGB

0.1905
0.1905
0.0635

CN2

1	VLED	21	G5
2	VLED	22	G4
3	ADJ	23	G3
4	LGND	24	GND
5	LGND	25	G2
6	VCC	26	G1
7	VCC	27	G0
8	MODE	28	GND
9	DE	29	R5
10	VSYNC	30	R4
11	HSTNC	31	R3
12	GND	32	GND
13	B5	33	R2
14	B4	34	R1
15	B3	35	R0
16	GND	36	GND
17	B2	37	DCLK
18	B1	38	NC
19	B0	39	L/R
20	GND	40	U/D

Note:
1. Unless indicated, Tolerance "±0.3"
2. UV Glue For OLB Protection.
3. CN2:FH19SC-40S-0.5SH
4. CN3:FH19SC-50S-0.5SH
5. LCD 800X3(R.G.B)x480=> 7.0" Digital TFT LCD

Back View

(49.5±0.3)
(42.9±0.5)
54.5±0.3
(32.8±0.5)
(104.0±0.5)
(84.8±0.3)
80.2±0.3
CN3
CN2
No.1:Anode(+) Wire.red,φ=0.9mm
No.2:Cathode(-) Wire.white,φ=0.9mm
(34.5±0.5)
(42.9±0.5)

1 With Sync mode

	TOLERANCE GRADE(±)	A	B
DIM. MM			
~6		0.05	0.1
6~18		0.08	0.18
18~50		0.1	0.25
50~180		0.2	0.4
180~		0.3	0.5

IE NO.	PARTS NO.LCM-1 800480E4-02		
DMN.	EMILY		
CHK.		DATE 04-09-09'	
APPD.		DATE	

REV | REVISION RECORD | DATE | NAME
0 | NEW RELEASE | 04-09-09 | EMILY

AMPIRE 晶采光電科技

TITLE 800480E4-02 (7.0")

DWG. NO. *090416MA   SHEET 1 OF 1