Project Size.	2.31 inch
Model No.	P023H022
Samples No.	
Product type.	320xRGBx240 MCU/SPI/RGB mode
Signature by customer:	

Prepared	Checked	Approved

Web Site:www.zjhlcd.com

Mobile: 86-133 9284 8764

1.0 GENERAL DESCRIPTION

1.1 Introduction

Display model P023H022 is a (TM)Transmissive type color active matrix thin Film transistor(TFT) liquid crystal display (LCD) that uses amorphous silicon TFT as a switching device.This model is composed of a TFT LCD panel, a driving circuit, a back light system. The resolution of a 2.31" contains 320_{RGB}x240 dots and can display up to 262k colors.

Item	Specification	Unit
Screen Size	2.31 inch	Diagonal
Number of Pixel	320RGB(H)x240(V)	Pixels
Display area	46.75(H)x35.06(V)	mm
Pixel pitch	0.1461(H)x0.1461(V)	mm
Outline Dimension	50.96x45.80x2.40	mm
Pixel arrangement	RGB Vertical Stripe	——
Display mode	Normally White	——
Viewing Direction(eye)	12 0'CLOCK	——
Gray inversion direction	--	
Display Color	262K	——
Luminance(cd/m^2)	300	nit
Contrast Ratio	500:1	——
Surface treatment	——	——
Interface	MCU8/16BIT SPI3/4wire RGB18BIT	
Back-light	LED Side-light type	——
Drive IC	ILI9342C	
Operation Temperature	-20~70	℃
Storage Temperature	-30~80	℃
Weight	——	g

1.2 Features

- **n** MCU8/16BIT SPI3/4wire RGB18BIT interface.

1.3 Applications

- **n** MPOS Device.
- **n** Personal Navigation Device.
- **n** Other devices which require high quality displays.

2.0 INPUT INTERFACE PIN ASSIGNMENT

FPC connector is used for electronics interface.

<table>
<tr><th>Pin No.</th><th>Symbol</th><th>Function</th></tr>
<tr><td>1</td><td>YU</td><td>Touch the upper circuit</td></tr>
<tr><td>2</td><td>XL</td><td>Touch the left line</td></tr>
<tr><td>3</td><td>YD</td><td>Touch the lower line</td></tr>
<tr><td>4</td><td>XR</td><td>Touch the right end line</td></tr>
<tr><td>5-10</td><td>D17-D12</td><td>MCU interface data bus/RGB Red data input</td></tr>
<tr><td>11-16</td><td>D11-D6</td><td>MCU interface data bus/RGB green data input</td></tr>
<tr><td>17-22</td><td>D5-D0</td><td>MCU interface data bus/RGB blue data input</td></tr>
<tr><td>23</td><td>SDA</td><td>SPI interface input pin</td></tr>
<tr><td>24</td><td>PCLK</td><td>Dot clock signal for RGB interface operation</td></tr>
<tr><td>25</td><td>DEN</td><td>Data enable signal for RGB interface operation</td></tr>
<tr><td>26</td><td>HSYNC</td><td>Horizontal synchronous input signal</td></tr>
<tr><td>27</td><td>VSYNC</td><td>Vertical synchronization of input signals</td></tr>
<tr><td>28</td><td>RD</td><td>Read enable in 8080 MCU parallel interface.</td></tr>
<tr><td>29</td><td>WR/SPI_RS</td><td>Write a signal / SPI Display data/command selection</td></tr>
<tr><td>30</td><td>RS/SPI_SCL</td><td>Display data/command selection / SPI interface clock</td></tr>
<tr><td>31</td><td>CS</td><td>Chip select input pin</td></tr>
<tr><td>32</td><td>RESET</td><td>External reset input.</td></tr>
<tr><td>33</td><td>IM0</td><td rowspan="4"><table>
<tr><th rowspan="2">IM3</th><th rowspan="2">IM2</th><th rowspan="2">IM1</th><th rowspan="2">IM0</th><th rowspan="2">MCU-Interface Mode</th><th colspan="2">Pins in use</th></tr>
<tr><th>Register/Content</th><th>GRAM</th></tr>
<tr><td>0</td><td>1</td><td>0</td><td>0</td><td>80 MCU 8-bit bus interface I</td><td>D[7:0]</td><td>D[7:0]</td></tr>
<tr><td>0</td><td>1</td><td>1</td><td>0</td><td>80 MCU 16-bit bus interface I</td><td>D[7:0]</td><td>D[15:0]</td></tr>
<tr><td>0</td><td>1</td><td>0</td><td>1</td><td>80 MCU 9-bit bus interface I</td><td>D[7:0]</td><td>D[8:0]</td></tr>
<tr><td>0</td><td>1</td><td>1</td><td>1</td><td>80 MCU 18-bit bus interface I</td><td>D[7:0]</td><td>D[17:0]</td></tr>
<tr><td>1</td><td>1</td><td>0</td><td>1</td><td>3-wire 9-bit data serial interface I</td><td colspan="2">SDA: In/OUT</td></tr>
<tr><td>1</td><td>1</td><td>1</td><td>1</td><td>4-wire 8-bit data serial interface I</td><td colspan="2">SDA: In/OUT</td></tr>
</table></td></tr>
<tr><td>34</td><td>IM1</td></tr>
<tr><td>35</td><td>IM2</td></tr>
<tr><td>36</td><td>IM3</td></tr>
<tr><td>37</td><td>VCC</td><td>Power Supply. 2.8V</td></tr>
<tr><td>38</td><td>GND</td><td>Ground</td></tr>
<tr><td>39</td><td>LEDA</td><td>LED back light(Anode)</td></tr>
<tr><td>40</td><td>LEDK</td><td>LED back light(Cathode)</td></tr>
</table>

3.1 Electrical Absolute Rating

3.1.1 TFT LCD Module

Item	Symbol	Min	Max	Unit	Note
Digital supply voltage	VDDI	-0.3	+4.6	V	GND=0
Analog supply voltage	VCI	-0.3	+4.6	V	GND=0
Logic Signal Input Level	VIN	-0.3	VDDI+0.5	V	GND=0

3.1.2 Back-Light Unit

Item	Symbol	Min	Max	Unit	Note
LED current	I_{BL}	60	80	mA	-
LED voltage	V_{BL}	2.8	3.2	V	-

3.2 Environment Absolute Rating

Item	Symbol	Min	Max	Unit	Note
Operating temperature	TOPR	-20	70	°C	-
Storage temperature	TSTG	-30	80	°C	-

Note:
Permanent damage may occur to the LCD module if beyond this specification.

4.0 OPTICAL CHARACTERISTICS

4.1 Optical specification

Item		Symbol	Condition	Min	Type	Max	Unit	Note
White luminance (Center)		Lv	Θ=0 Normal Viewing Angle I_{BL}=80mA	--	300	--	cd/m²	(4)(5)(7)
Response time		Tr+Tf		--	16	28	ms	(3)
Contrast ratio		CR		400	500	--	--	(2)(4)
Color Chromaticity (CIE1931)	white	Wx		0.283	0.303	0.23		(6)
		Wy		0.304	0.324	0.344		
Viewing Angle	Hor	ΘL	CR≥10	60	70	--		(1)
		ΘR		60	70	--		
	Ver	ΘU		60	70	--		
		ΘD		50	60	--		
Brightness uniformity		Avg	Θ=0	80	90	--	%	(5)
Color Gamut		NTSC	Θ=0	--	50	--	%	(6)
Optima View Direction		12 O’clock						(1)

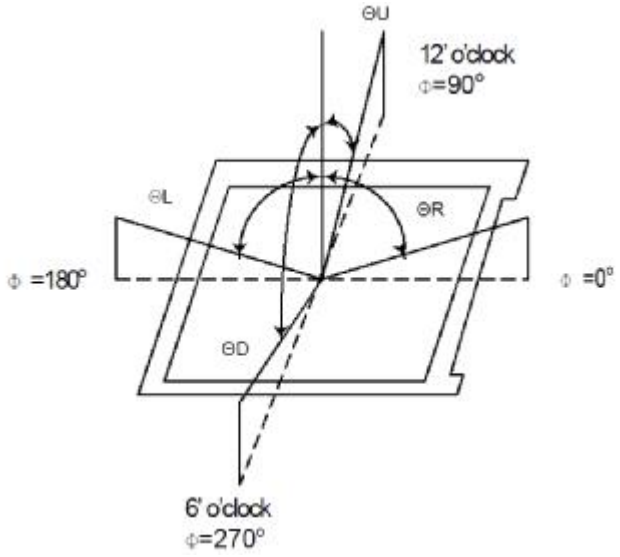
4.2 Measuring Condition

- Measuring surrounding: dark room
- LED current IL: 80mA
- Ambient temperature: 25±2℃
- 15min. warm-up time

4.3 Measuring Equipment

- FPM520 of Westar Display technologies, INC., which utilized SR-3 for Chromaticity and BM-7 for other optical characteristics.
- Measuring spot size：20 ~ 21 mm

Note (1) Definition of Viewing Angle

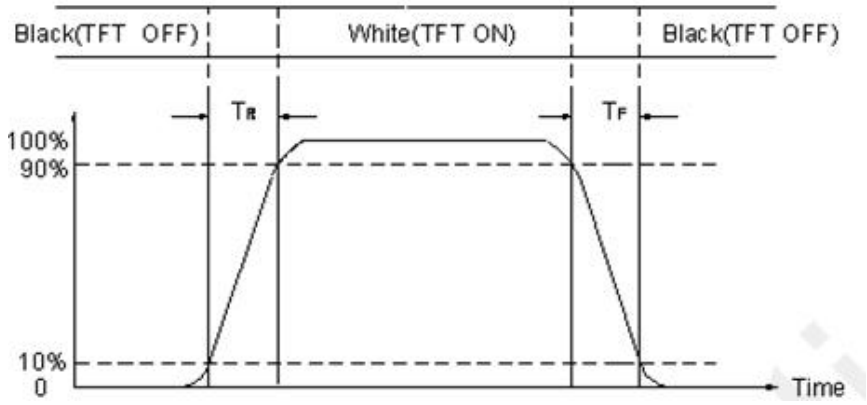


Note (2) Definition of Contrast Ratio(CR):

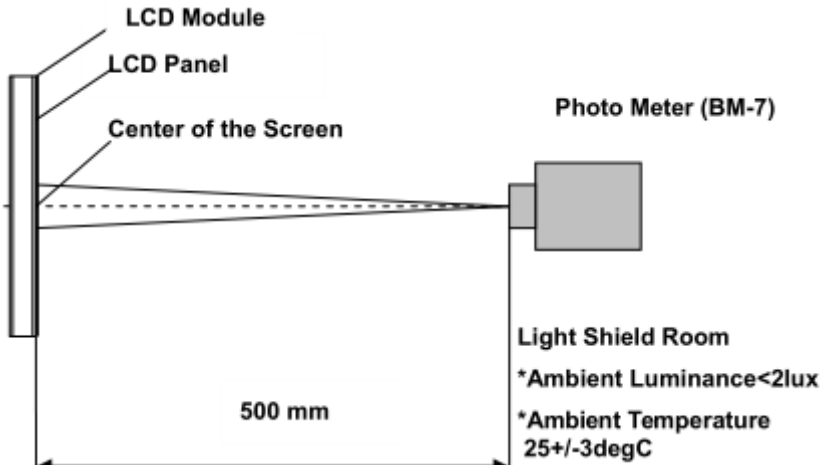
Measured at the center point of panel

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

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



Note (4) Definition of optical measurement setup



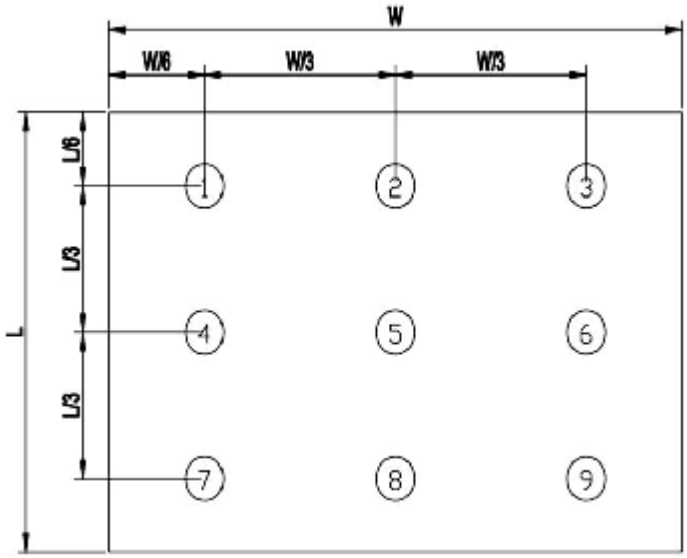
Note (5) Definition of brightness uniformity

The luminance uniformity is calculated by using following formula.

△Bp = Bp (Min.) / Bp (Max.)×100 (%)

Bp (Max.) = Maximum brightness in 9 measured spots

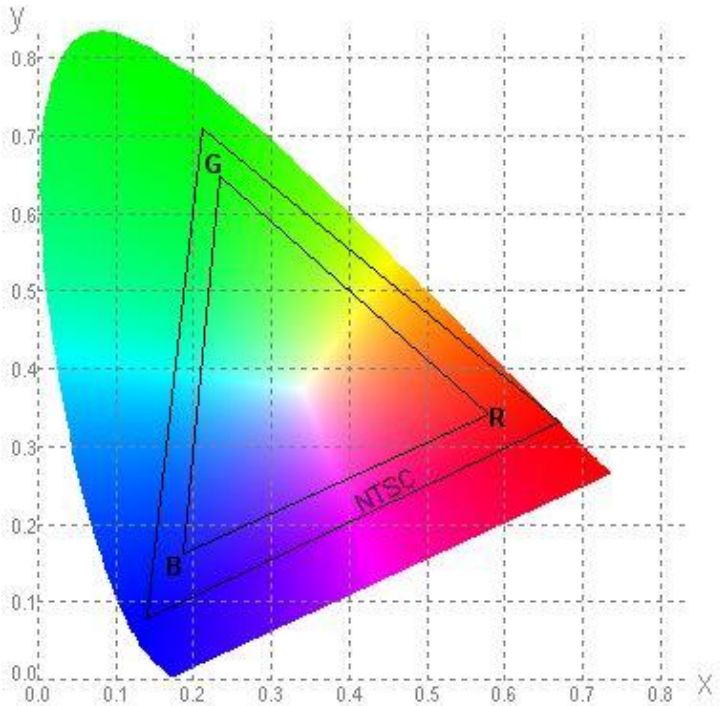
Bp (Min.) = Minimum brightness in 9 measured spots .



Note (6) Definition of Color of CIE1931 Coordinate and NTSC Ratio.

Color gamut:

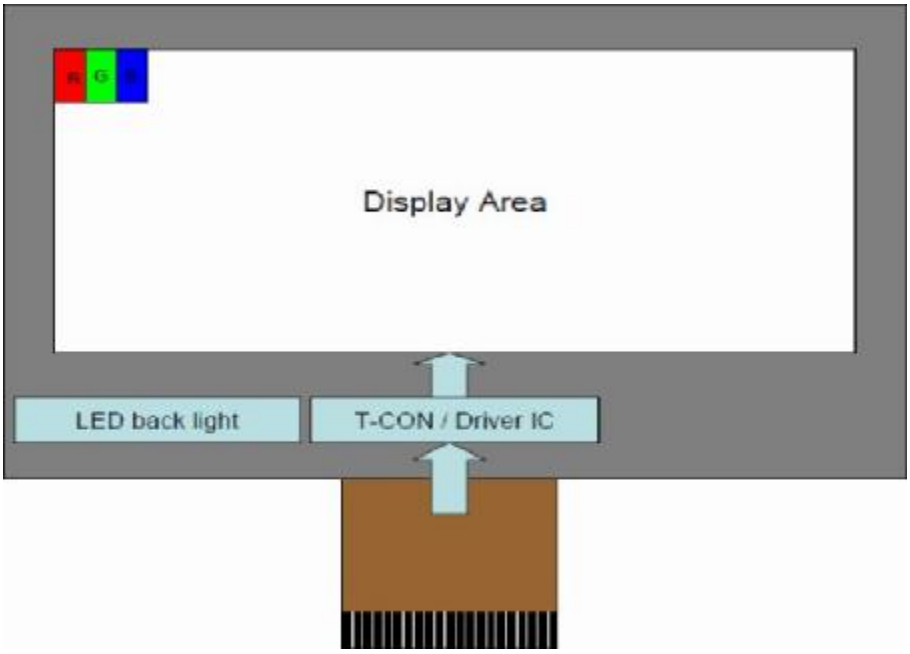
$$S = \frac{\text{Area of RGB triangle}}{\text{Area of NTSC triangle}} \times 100\%$$



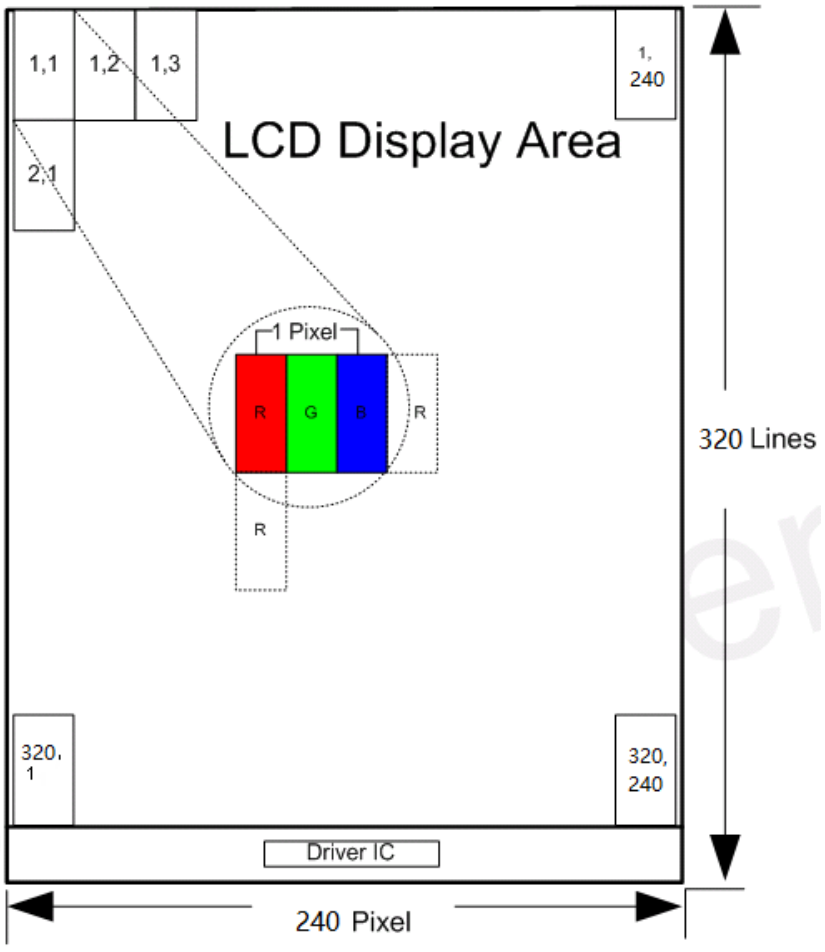
Note (7) Measured the luminance of white state at center point.

5.0 BLOCK DIAGRAM

5.1 TFT LCD Module



5.2 Pixel Format



6.0 ELECTRICAL CHARACTERISTICS

6.1 TFT LCD Module

Item	Symbol	Min.	Typ.	Max.	Unit	Remark
Analog supply voltage	VDD	2.4	2.8	3.3	V	
Digital supply voltage	VDDI	1.65	1.8	3.3		
Input signal Voltage	VIH	0.7VDDI	-	VDDI	V	
	VIL	GND	-	0.3VDDI	V	

6.2 Back-Light Unit

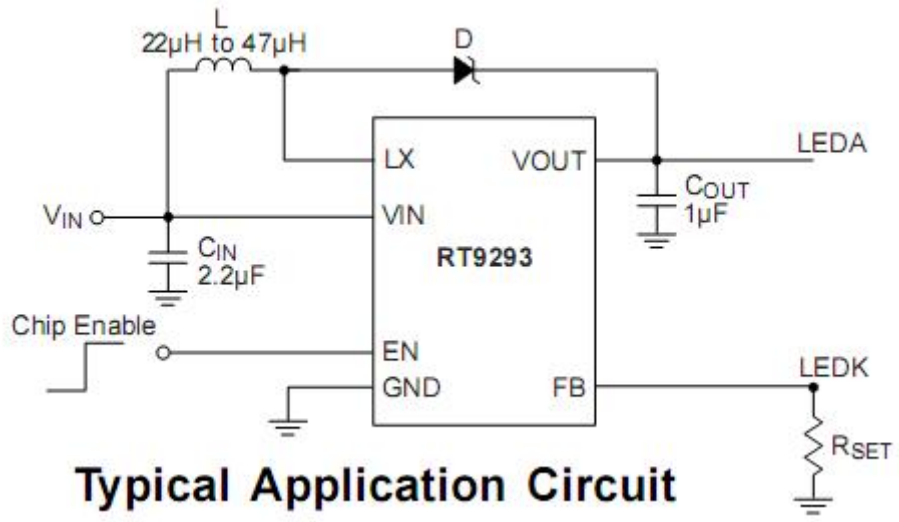
The backlight system is an edge-lighting type with 4 LED Dies.
The characteristics of the LED are shown in the following tables.

Item	Symbol	Min	Typ	Max	Unit	Note
LED current	IL	-	60	80	mA	(2)
LED voltage	VL	-	2.8	3.2	V	
Operating LED life time	Hr	-	4500	5000	Hour	(1)(2)

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=80mA. The LED lifetime could be decreased if operating IL is larger than 100mA. The constant current driving method is suggested.

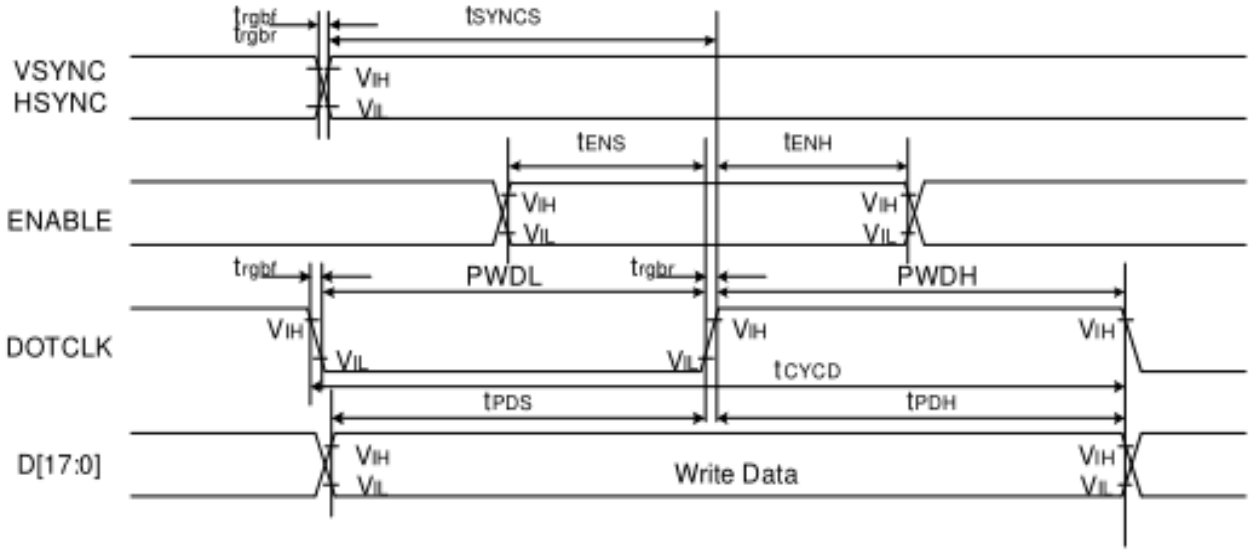
Note (3) Suggested schematic of LED backlight driver



Typical Application Circuit

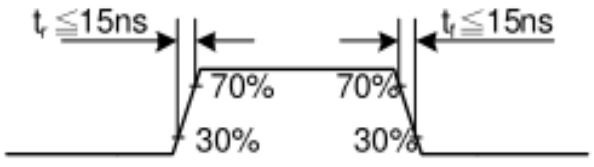
6.3 Interface Characteristics

8080 Series RGB Parallel Interface Characteristics: 18-bit Bus

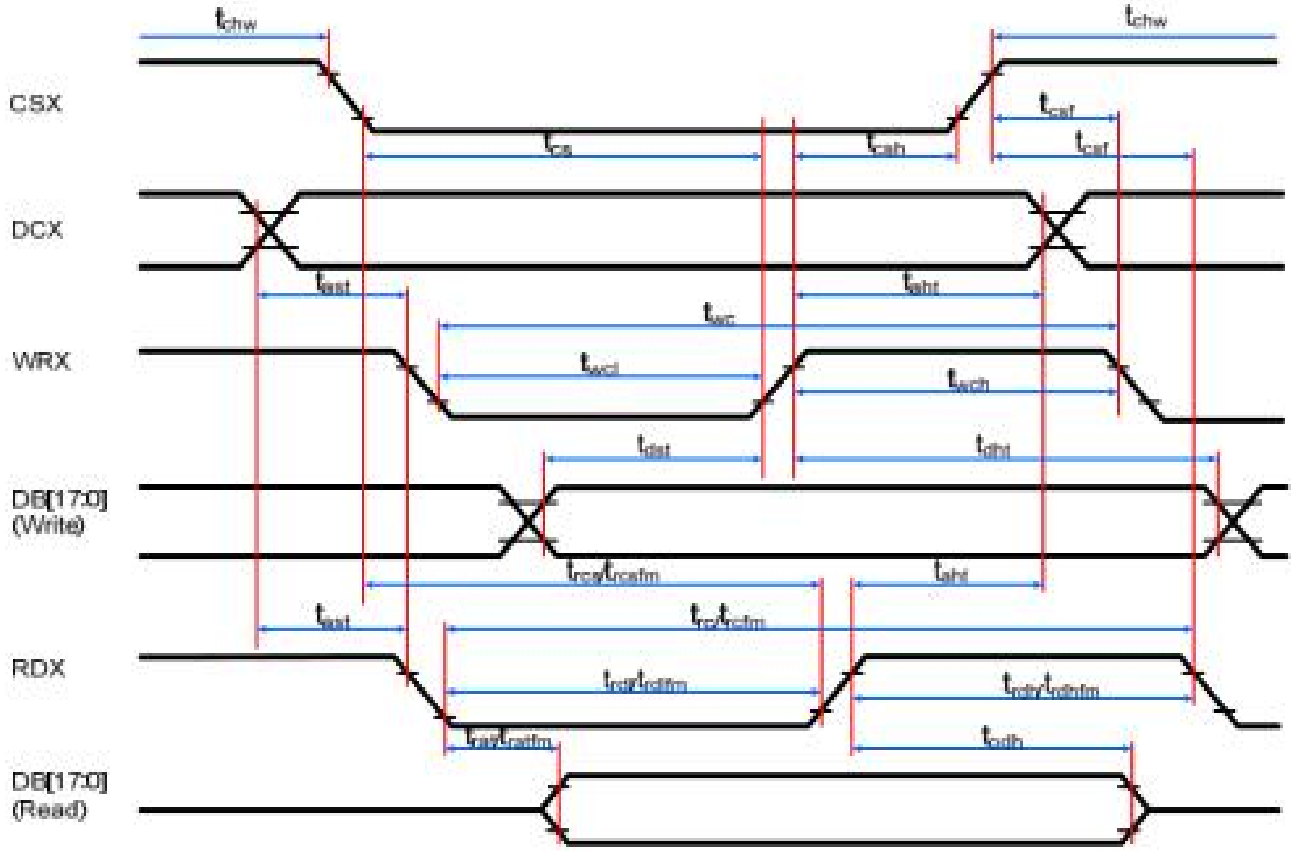


Signal	Symbol	Parameter	min	max	Unit	Description
VSYNC / HSYNC	t_{SYNCS}	VSYNC/HSYNC setup time	15	-	ns	18/16-bit bus RGB interface mode
	t_{SYNCH}	VSYNC/HSYNC hold time	15	-	ns	
DE	t_{ENS}	DE setup time	15	-	ns	
	t_{ENH}	DE hold time	15	-	ns	
D[17:0]	t_{PDS}	Data setup time	15	-	ns	
	t_{PDH}	Data hold time	15	-	ns	
DOTCLK	PWDH	DOTCLK high-level period	33	-	ns	
	PWDL	DOTCLK low-level period	33	-	ns	
	t_{CYCD}	DOTCLK cycle time(18 bit)	100	-	ns	
	t_{rgbr} , t_{rgbf}	DOTCLK,HSYNC,VSYNC rise/fall time	-	15	ns	
VSYNC / HSYNC	t_{SYNCS}	VSYNC/HSYNC setup time	15	-	ns	6-bit bus RGB interface mode
	t_{SYNCH}	VSYNC/HSYNC hold time	15	-	ns	
DE	t_{ENS}	DE setup time	15	-	ns	
	t_{ENH}	DE hold time	15	-	ns	
D[17:0]	t_{PDS}	Data setup time	15	-	ns	
	t_{PDH}	Data hold time	15	-	ns	
DOTCLK	PWDH	DOTCLK high-level pulse period	25	-	ns	
	PWDL	DOTCLK low-level pulse period	25	-	ns	
	t_{CYCD}	DOTCLK cycle time	50	-	ns	
	t_{rgbr} , t_{rgbf}	DOTCLK,HSYNC,VSYNC rise/fall time	-	15	ns	

Note: Ta = -30 to 70 ℃, IOVCC=1.65V to 2.8V, VCI=2.6V to 3.3V, AGND=GND=0V

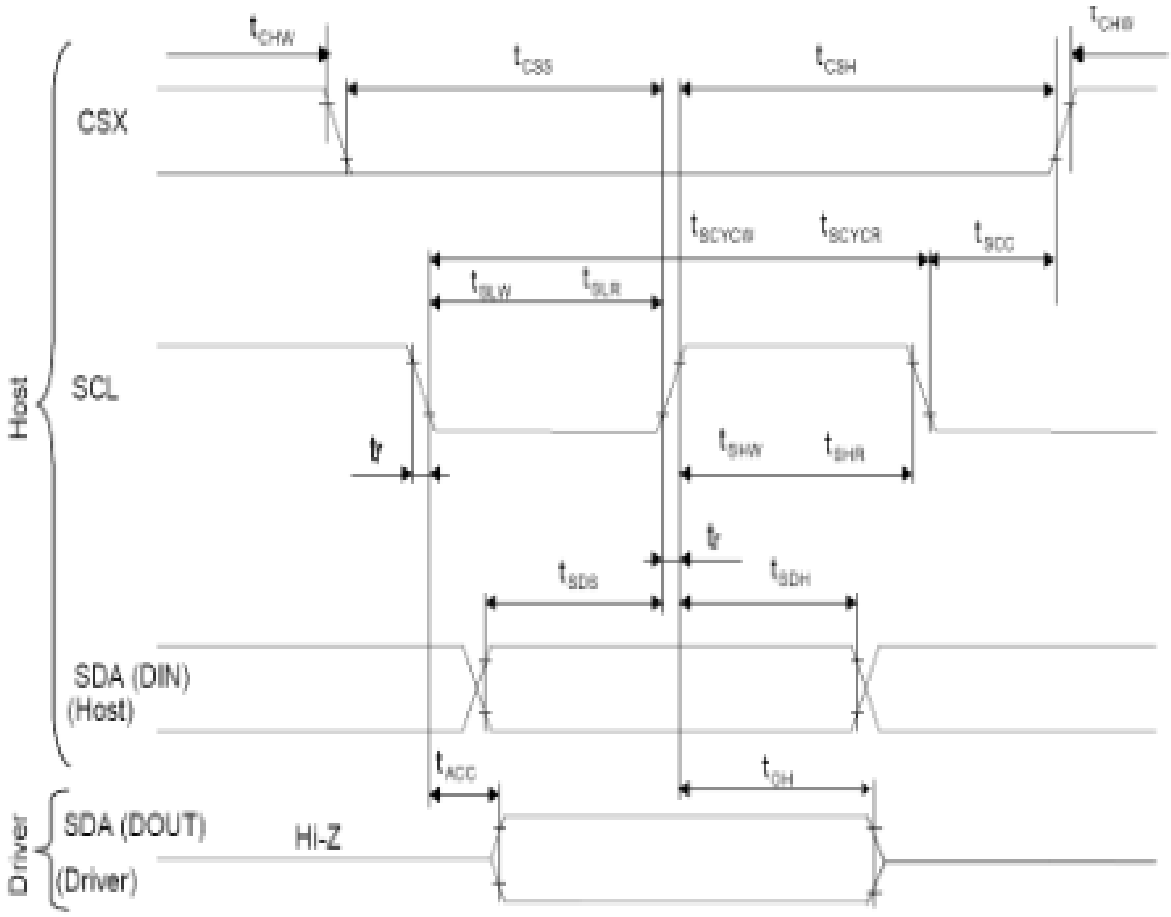


8080 MCU Parallel Interface Characteristics: 8/16bit Bus



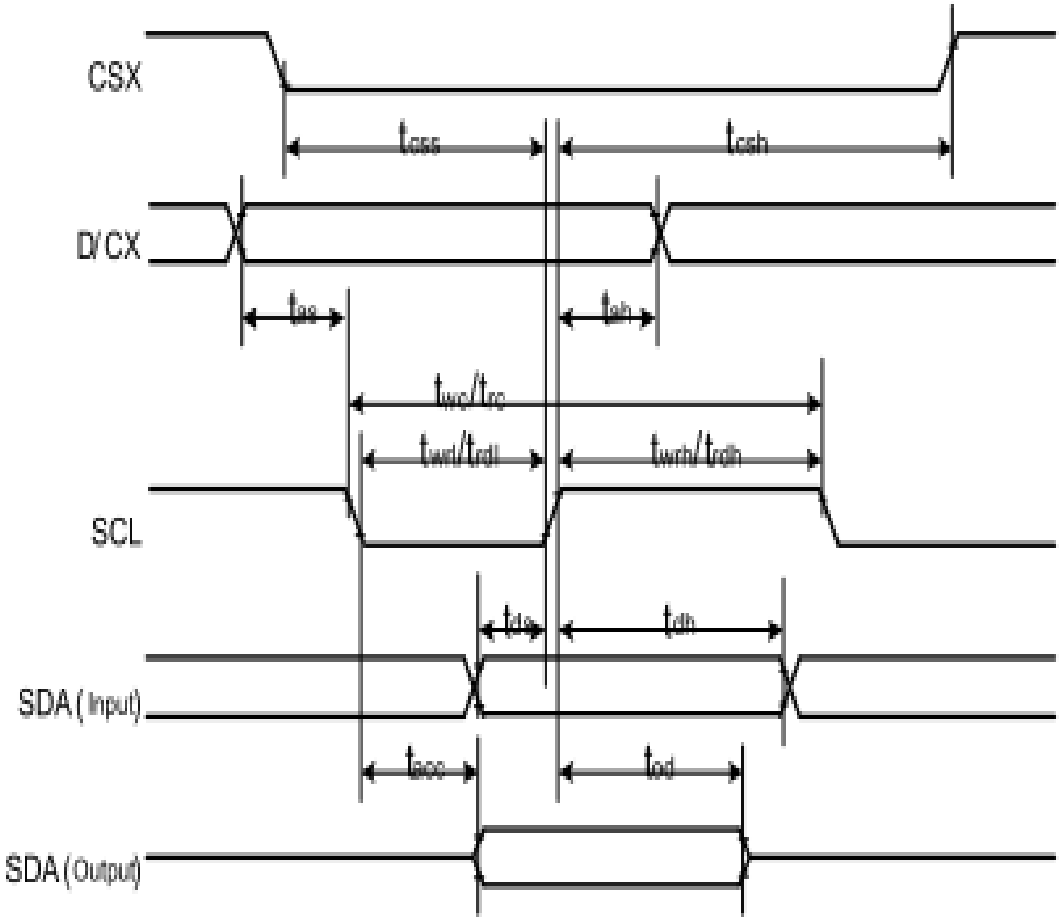
Signal	Symbol	Parameter	min	max	Unit	Description
DCX	tast	Address setup time	0	-	ns	
	taht	Address hold time (Write/Read)	10	-	ns	
CSX	tchw	CSX "H" pulse width	0	-	ns	
	tcs	Chip Select setup time (Write)	15	-	ns	
	trcs	Chip Select setup time (Read ID)	45	-	ns	
	trcsfm	Chip Select setup time (Read FM)	355	-	ns	
	tcsf	Chip Select Wait time (Write/Read)	10	-	ns	
WRX	twc	Write cycle	66	-	ns	
	twrh	Write Control pulse H duration	15	-	ns	
	twrl	Write Control pulse L duration	15	-	ns	
RDX (FM)	trcfm	Read Cycle (FM)	450	-	ns	
	trdhfm	Read Control H duration (FM)	90	-	ns	
	trdlfm	Read Control L duration (FM)	355	-	ns	
RDX (ID)	trc	Read cycle (ID)	160	-	ns	
	trdh	Read Control pulse H duration	90	-	ns	
	trdl	Read Control pulse L duration	45	-	ns	
D[17:0], D[15:0], D[8:0], D[7:0]	tdst	Write data setup time	10	-	ns	For maximum CL=30pF For minimum CL=8pF
	tdht	Write data hold time	10	-	ns	
	trat	Read access time	-	40	ns	
	tratfm	Read access time	-	340	ns	
	trod	Read output disable time	20	80	ns	

8080 Serial Interface Characteristics:3-line SPI



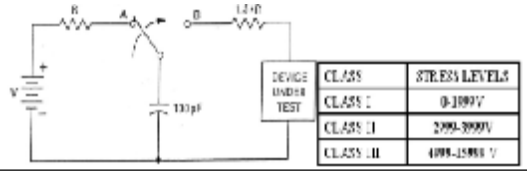
Signal	Symbol	Parameter	min	max	Unit	Description
SCL	tscycw	Serial Clock Cycle (Write)	100	-	ns	
	tshw	SCL "H" Pulse Width (Write)	35	-	ns	
	tslw	SCL "L" Pulse Width (Write)	35	-	ns	
	tscycr	Serial Clock Cycle (Read)	150	-	ns	
	tshr	SCL "H" Pulse Width (Read)	60	-	ns	
	tslr	SCL "L" Pulse Width (Read)	60	-	ns	
SDA (Input)	tsds	Data setup time (Write)	30	-	ns	
	tsdh	Data hold time (Write)	30	-	ns	
SDA (Output)	tacc	Access time (Read)	10	-	ns	
	toh	Output disable time (Read)	15	50	ns	
CSX	tscc	SCL-CSX	20	-	ns	
	tchw	CSX "H" Pulse Width	40	-	ns	
	tcss	CSX-SCL Time(write)	30	-	ns	
	tcsh		30	-	ns	

8080 Serial Interface Characteristics:4-line SPI



Signal	Symbol	Parameter	min	max	Unit	Description
CSX	tcss	Chip select time (Write)	30	-	ns	
	tcsh	Chip select hold time (write)	30	-	ns	
SCL	twc	Serial clock cycle (Write)	100	-	ns	
	twrh	SCL "H" pulse width (Write)	35	-	ns	
	twrl	SCL "L" pulse width (Write)	35	-	ns	
	trc	Serial clock cycle (Read)	150	-	ns	
	trdh	SCL "H" pulse width (Read)	60	-	ns	
	trdl	SCL "L" pulse width (Read)	60	-	ns	
D/CX	tas	D/CX setup time	10	-		
	tah	D/CX hold time (Write / Read)	10	-		
SDA (Input)	tds	Data setup time (Write)	30	-	ns	
	tdh	Data hold time (Write)	30	-	ns	
SDA (Output)	tacc	Access time (Read)	-	50	ns	For maximum CL=30pF
	tod	Output disable time (Read)	15	50	ns	For minimum CL=8pF

7.0 Reliability conditions

NO	Item	Conditions	Notes
1	High Temperature Storage	Ta=80℃±2℃, 72hrs	
2	Low Temperature Storage	Ta=-30℃±2℃, 72hrs	
3	High Temperature Operation	Ta=70℃±2℃, 72hrs(Operation state)	
4	Low Temperature Operation	Ta=-20℃±2℃, 72hrs(Operation state)	
5	High Temperature and High Humidity (Storage)	Ta=+60℃, 90%RH, 72hrs	
6	Thermal Cycling Test (non operation)	-20℃(30min) → +70℃(30min), 10cycles	
7	Electro static Discharge	Human Body Mode 100pF±10%/1500Ω±1% Air±8kV / contact±6kV Consecutive 10times/ Each discharge 	
8	Vibration test(with carton)	Total fixed amplitude:15mm Vibration Frequency :10~55Hz One cycle 60 seconds to 3 directions of X,Y,Z for Each 15 minutes	
9	Drop (with carton)	Height: 60cm 1 corner, 3 edges, 6 surfaces	

Note: There is no display function NG issue occurred, all the cosmetic specification is judged before the reliability stress.

8.0 Precautions

8.1 Operation

Burn-in sometimes happens when the same character was displayed at along time. Therefore, to prevent Burn-in, it is recommended to set up a Screen-saver function.

8.2 Safety

The liquid crystal in the LCD is poisonous, DO NOT put it in your mouth. If the liquid crystal touches your skin or clothes, wash it off immediately using soap and water.

8.3 Handling

	a. The LCD module shall be installed flat, without twisting or bending. b. COF or FPC has narrow pattern width, so easily become open circuit by external force. DO NOT apply pressure to COF or FPC especially in bending area.
	c. To avoid damage in appearance or malfunction, DO NOT subject the module to mechanical shock or to excessive force on its surface.
	d. The polarizer attached to the display is very easy to damage, handle it with care to avoid scratching.
	e. To avoid contamination on the display surface, DO NOT touch the display surface with bare hands. f. Provide a space so that the LCD module does not come into contact with other components.

8.4 Static Electricity

Since a module is composed of electronic circuits, it is not strong to electrostatic discharge.

a. The LCD module shall be installed flat, without twisting or bending. Ground soldering iron tips, tools and testers when they operate.
b. Ground your body when handling the products.
c. DO NOT apply voltage to the input terminal without applying power supply.
d. DO NOT apply voltage that exceeds the absolute maximum rating.
e. Store the products in an anti-electrostatic container.
f. Peel off protect tape, attached to polarizer, slowly to minimize ESD damage.

8.5 Storage

Store the products in a dark place at +5 ~ +25 degree C, low humidity (50%RH or less).

DO NOT store the products in an atmosphere containing organic solvents or corrosive gases.

8.6 Cleaning

a. DO NOT wipe the polarizer with dry cloth, as it might cause scratch.
b. Wipe the polarizer with a soft cloth soaked with petroleum IPA, other chemical might damage.

8.7 Waste

When dispose of LCD module, manage it at the production waste according to the relevant laws and regulations.

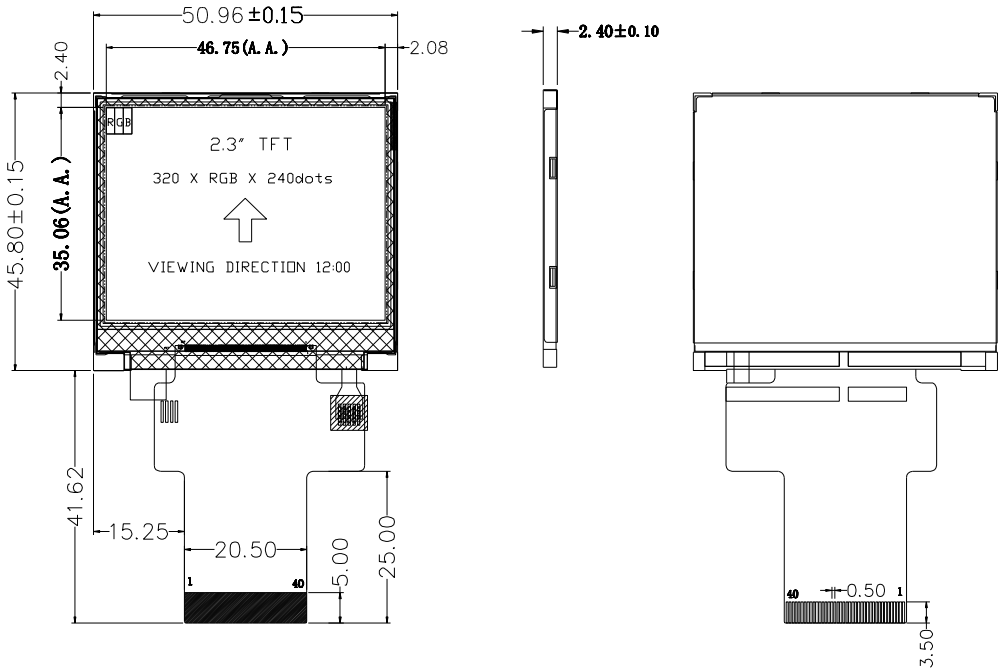
深圳市正晶浩电子有限公司

SHEN ZHEN ZHENG JING HAO ELECTRONICS CO.,LTD.

网址：www.zjhlcd.com 电话：0755-29355801，133-9284-8764

9.0 OUTINE DIMENSION

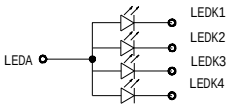
Customer s Approval	
Customer	
Date	



1	YU
2	XL
3	YD
4	XR
5	D17
6	D16
7	D15
8	D14
9	D13
10	D12
11	D11
12	D10
13	D9
14	D8
15	D7
16	D6
17	D5
18	D4
19	D3
20	D2
21	D1
22	D0
23	SDA
24	PCLK
25	DEN
26	HSYNC
27	VSYNC
28	RD
29	WR/SPI_RS
30	RS/SPI_SCL
31	CS
32	RESET
33	IM0
34	IM1
35	IM2
36	IM3
37	VCC
38	GND
39	LEDA
40	LEDK

NOTES:

1.DISPLAY TYPE: TFT
2.VIEING DIRECTION: 12:00
3 LCD DRIVE IC: ILI9342C
4.POLARIZER MODE: TRANSMISSIVE/POSITIVE
6.VDD2 2.8V(TYPE) VDD 2.8V(TYPE)
7.OPERATING TEMP: -20°C -- 70°C
8.STORAGE TEMP: -30°C -- 80°C
9.UNMARKED TOLERANCE: ±0.20
10.REQUIREMENTS ON ENVIRONMENTAL PROTECTION: RoHS



(CIRCUIT DIAGRAM)
IF=15*4=60mA (2.9-3.3V)

REVISED RECORD		
A		
B		
C		
D		
E		

深圳市正晶浩电子有限公司

UNIT	SCALE	PAGE	DRAWN BY	YUN
mm	1:1	1/1	CHECKED BY	
PRODUCT NO:	P023H022		APPROVED BY	
			ORG DATE	

1 0.0 LOT MARK

10.1 Location of Lot Mark

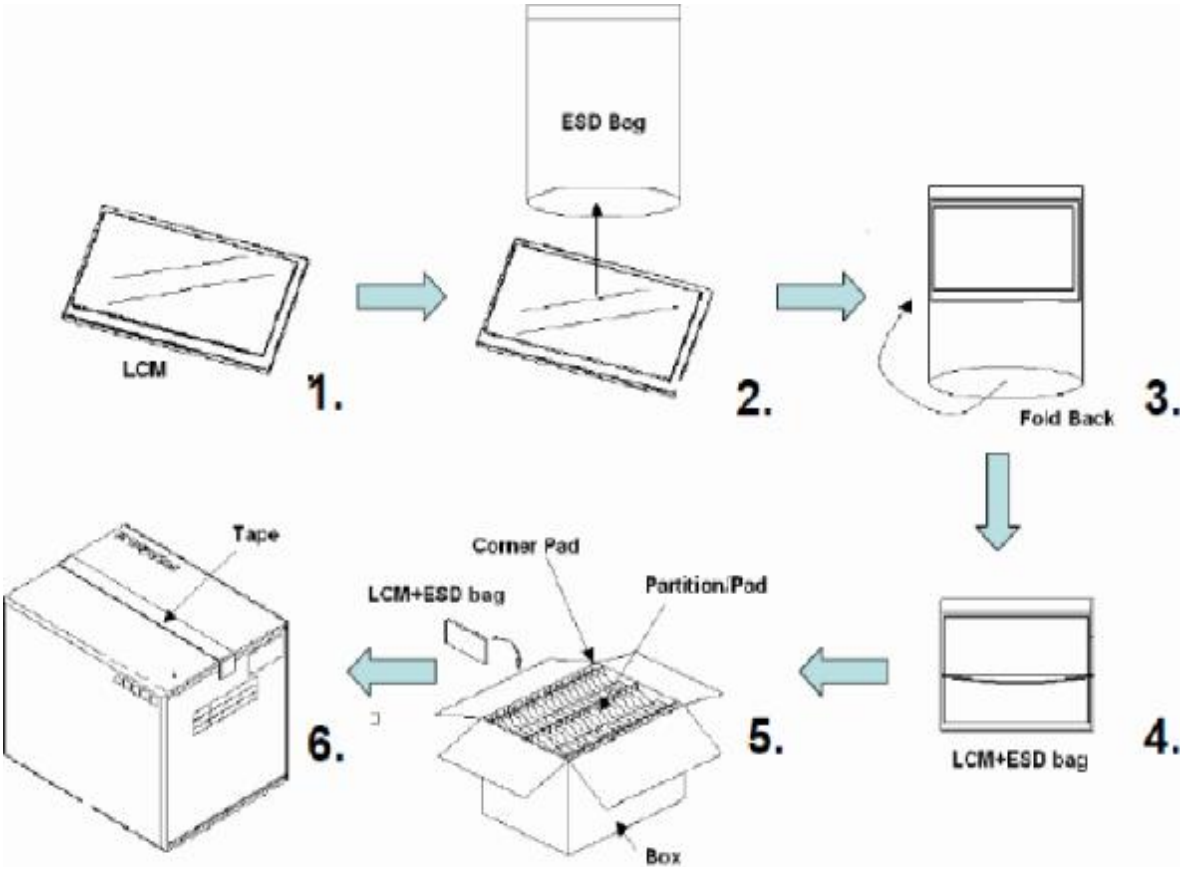
(1) Location: The label is attached to the backside of the LCD module.
(2) Detail of the Mark: as attached below.
(3) This is subject to change without prior notice.

11.0 PACKAGE SPECIFICATION

11.1 Packing form

LCM Model	LCM Qty. in the box	Inner Box Size (mm)	Notice
	TDB	TDB	

11.2 Packing assembly drawings11.2 Packing assembly drawings



Items	Material	Notice
Box	Corrugated Paper Board	AB Flute
Partition/Pad	Corrugated Paper Board	A/B Flute
Corner Pad	Corrugated Paper Board	AB Flute
ESD bag	PE	

12.0 Items and Criteria：

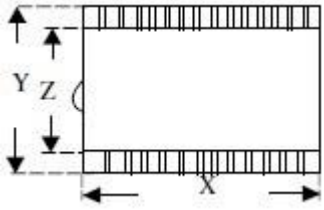
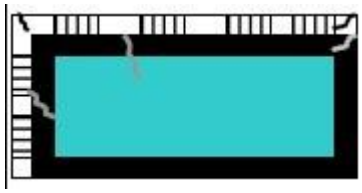
12.1 Guarantee

APEX warrants the quality of our products for ***1 year*** (from the date of delivery). If there are functional defects found during the period of warranty, the defective products would be replaced on a one-to-one ba Apex would not be responsible for any direct /indirect liabilities consequential to any parties.

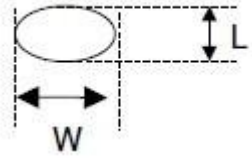
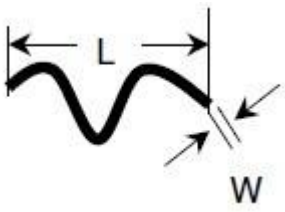
All the products should be stored or used as specified conditions described in these sheets. If module productions are not stored or used as specified conditions, herein, it will be void the ***1 year*** warranty(guarantee).

12.2 Visual inspection criterion in cosmetic

(1) Glass defect

Glass defect			
NO	Defect	Criteria	Remark
1	Dimension(Minor)	By engineering diagram	
2	Cracks(Major)	Extensive crack 【Reject】	

(2) LCM appearance defect

NO	Defect	Criteria		Remark
1	Round type(Minor)	Spec	Permissible Qty	1.ψ=(L+W)/2, L: Length, W: Width 2. Disregard if out of A.A. 
		ψ≦0.10mm	Disregard	
		0.10mm<ψ ≦ 0.20mm	**3**	
		0.20mm<ψ	**0**	
2	Line type(Minor)	Spec	Permissible Qty	1. L: Length, W: Width 2. Disregard if out of A.A. 
		W≦0.03mm	Disregard	
		L≦3.0mm and 0.03mm<W≦0.05mm	2	
		L≦3.0mm and 0.05mm<W≦0.10mm	1	
		W>0.10mm orL>3.0mm	0	
3	Polarizer dent(Minor)	Spec.	Permissible Qty	1.ψ=(L+W)/2 , L: Length, W: Width 2.Disregard if out of A.A.
		ψ≦0.20mm	Disregard	
		0.20mm<ψ≦ 0.30mm	2	
		0.30mm<ψ≦ 0.50mm	1	

(3) FPC

NO	Defect	Criteria	Remark
1	Copper peeling(Minor)	Copper peeling 【Reject】	
2	Golden finger	FPC golden finger broken, dead fold, indentation makes FPC surface broken 【Reject】 Tin plating layer(or gold plating) scratch, but not hurt circuit 【Accept】 Except circuit, other position scratch but not expose metal wire 【Accept】	
3	Pin	FPC PI layer delamination 【Reject】 Material and color are inconsistent with sample, FPC burrs 【Reject】 FPC Pin deformation but not affect function. 【Accept】 FPC Pin area is dirty 【Reject】 Other than FPC Pin area is dirty but not affect function 【Accept】	
4	Golden finger	Golden finger edge has burrs,foreign material【Reject】 Golden finger oxidation (dark), uneven electroplating, pinhole, foreign material 【Reject】 Golden finger soldering pad crack exceeds 1/3 length of soldering pad, and soldering pad crack exceed 2 Pins【Reject】 Golden finger tin plating(or gold plating)scratch, but not hurt circuit 【Accept】 Other than golden finger area scratch but not expose metal circuit 【Accept】	
5	FPC Silk printing	Ghosting, incomplete silk printing, wrong printing 【Reject】	
6	FPC Circuit line width	Line width deviation exceed 1/3 line width【Reject】	

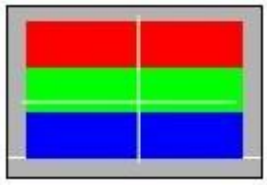
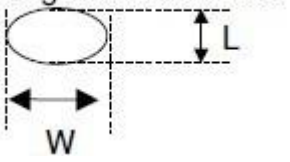
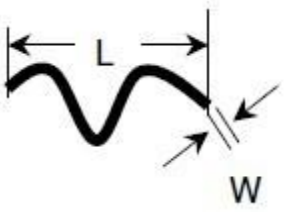
(4) Black tape

NO	Defect	Criteria	Remark
1	Shift(Minor)	IC exposed 【Reject】	
2	No black tape(Minor)	No black tape【Reject】	

(5) Silicon

NO	Defect	Criteria	Remark
1	Amount of silicon (Minor)	ITO exposed 【Reject】	

12.3 Visual inspection criterion in electrical display

NO	Defect	Criteria		Remark
1	No display (Major)	Not allowed		
2	Missing line (Major)	Not allowed		
3	Darker or lighter Line (Major)	Not allowed		
4	Weak line(Major)	By limited sample		
5	Bright / Dark point (Minor)	Spec.	Permissible Qty	1:1sub-pixel: 1R or 1G or1B 2:Point defect area≦1/2 sub pixel.
		Bright point	1	
		Dark point	2	
6	Round type (Minor)	Spec	Permissible Qty	1.ψ=(L+W)/2, L: Length, W: Width 2. Disregard if out of A.A. 
		ψ≦0.10mm	Disregard	
		0.10mm<ψ≦ 0.20mm	3	
		0.20mm<ψ	0	
7	Line type (Minor)	Spec.	Permissible Qty	1. L: Length, W: Width 2. Disregard if out of A.A. 
		W≦0.03mm	Disregard	
		L≦3.0mm and 0.03mm<W≦0.05mm	2	
		L≦3.0mm and 0.05mm<W≦0.10mm	1	
		W>0.10mm or L>3.0mm	0	
8	Mura (Minor)	By 5% ND filter invisible		

9.2.4. Others

1. Issues that are not defined in this document shall be discussed and agreed with both parties. (Customer and supplier)
2. Unless otherwise agreed upon in writing, the criteria shall be applied to both parties. (Customer and supplier)