OSD DISPLAYS

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Customer:	
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For Customer's Acceptance

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1				
2				
3				
4				
5				

Contents

◆GENERAL INFORMATION

1.LCM Parameter

Item	Contents	Unit
LCD Type	TFT Transmissive Normal Black	/
Viewing Direction	Free	O' Clock
LCM Outline Dimension	114.70（H）×184.20（V）×2.53	mm
Active Area(W*H)	107.64（H）×172.22（V）	mm
Number of Dots	800*RGB×1280	mm
Pixel Pitch (mm)	0.135(H) ×0.135 (V)	mm
Driver IC	HX8394D Or Compatiable	/
Backlight Type	LED	/
Interface Type	MIPI	/
Weight	TBD	g

2.CTP Parameter

Item	Contents	Unit
Outline Size	126.87（H）×198.47（V）×1.65	mm
View Area	108.24 (H) ×172.82(V)	mm
Sensor Area	115.96（H）×182.72（V）	mm
Sensor Channels	16×26	/
Interface Mode	IIC	/
Controller	FT5416	/
I2C Address	0X70	/
Touch Type	Multi Touch	/

◆ABSOLUTE MAXIMUM RATINGS

1.LCD Driver IC Parameter

Parameter	Symbol	Min.	Max.	Unit
Power Supply	VDD3V3	-0.3	4.0	V
Operating temperature	Top	-10	60	℃
Storage temperature	Tst	-20	70	℃
Humidity	RH	-	90%(Max60	RH

2. CTP Controller IC Parameter

Parameter	Symbol	Min.	Max.	unit
Power Supply Voltage	VDD3.3V	-0.3	4.0	V

◆ELECTRICAL CHARACTERISTICS

1. LCD Characteristics

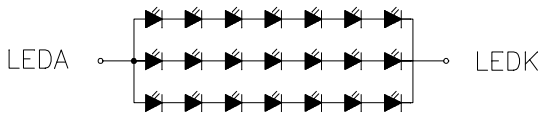
Parameter	Symbol	Min.	Typ.	Max.	Unit
Power Supply	VDD	3.0	3.3	3.6	V
Power Supply	IOVDD	xx	xx	xx	V

Input voltage ' H ' level	V_{IH}	0.7VDD	-	VDD	V
Input voltage ' L ' level	V_{IL}	GND	-	0.3VDD	V
Output voltage ' H ' level	V_{OH}	0.8VDD	-	VDD	V
Output voltage ' L ' level	V_{OL}	GND	-	0.2VDD	V

2.CTP Controller IC Characteristics

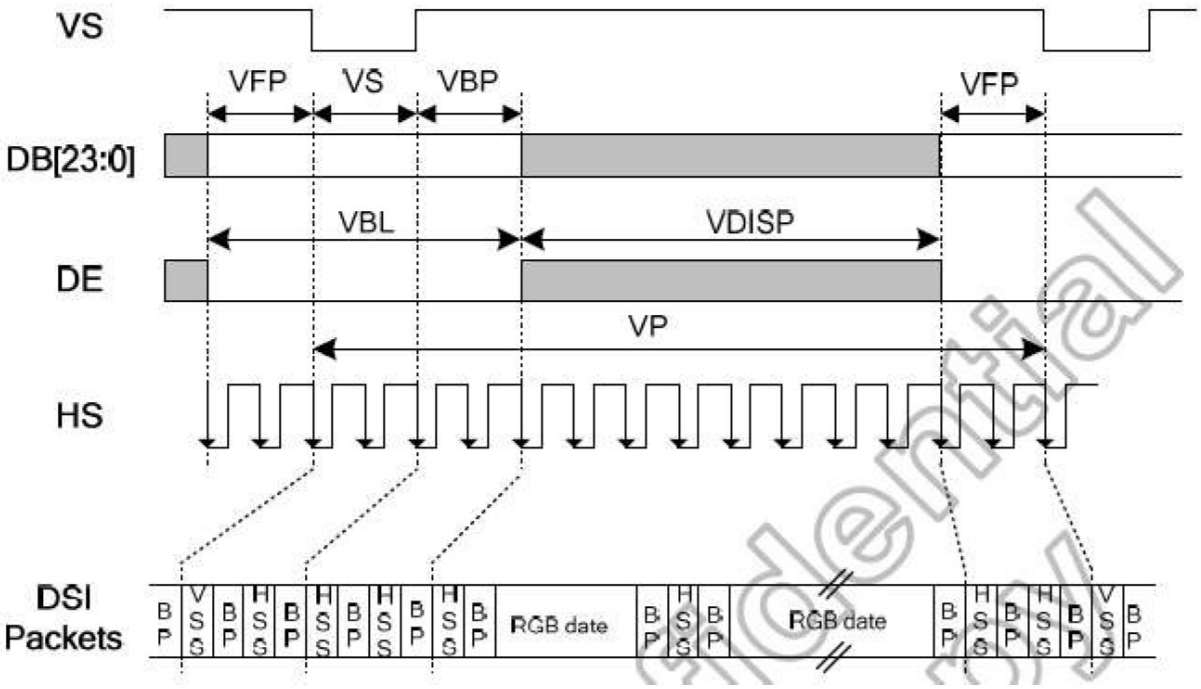
Parameter	Symbol	Min.	Typ.	Max.	Unit
Interface Singal Voltage	IOVDD	xx	xx	xx	V
Power Voltage	VDD	3.0	3.3	3.6	V
Low Input Logic Level	Vil	-0.3	-	0.3VDD	V
High Input Logic Level	Vih	0.7VDD	-	VDD+0.5	V
Low Output Voltage	Vol	0	-	0.2VDD	V
High Output Voltage	Voh	0.8VDD	-	VDD	V

◆BACKLIGHT SYSTEM CHARACTERISTICS

Symbol	Function	Min.	Typ.	Max.	Unit
I_L	LED Supply Circuit	-	60	75	mA
V_L	LED Supply Voltage	-	22.4	23.1	V
Number of LED	-		21		Piece
LED life-time	-	20000	-	-	Hrs
Connection Mode					

◆TIMING CHARACTERISTICS

1.Timing Specification



Parameter	Symbol	Condition	Spec.			Unit
			Min.	Typ.	Max.	
Vertical cycle	VP	-	1286	-	-	Line
Vertical low pulse width	VS	-	2	-	Note(1)	Line
Vertical front porch	VFP	-	2	-	-	Line
Vertical back porch	VBP	-	2	-	Note(1)	Line
Vertical data start point	-	VS+VBP	4	-	Note(1)	Line
Vertical blanking period	VBL	VS+VBP+VFP	6	-	-	Line
Vertical active area	-	VDISP	-	1280	-	Line
Vertical Refresh rate	VRR	-	-	60	-	Hz

Note: (1) The VS and VBP pulse width are related to GSP and GCK timing. The GSP and GCK must be set at corresponding position for LCD normal display.

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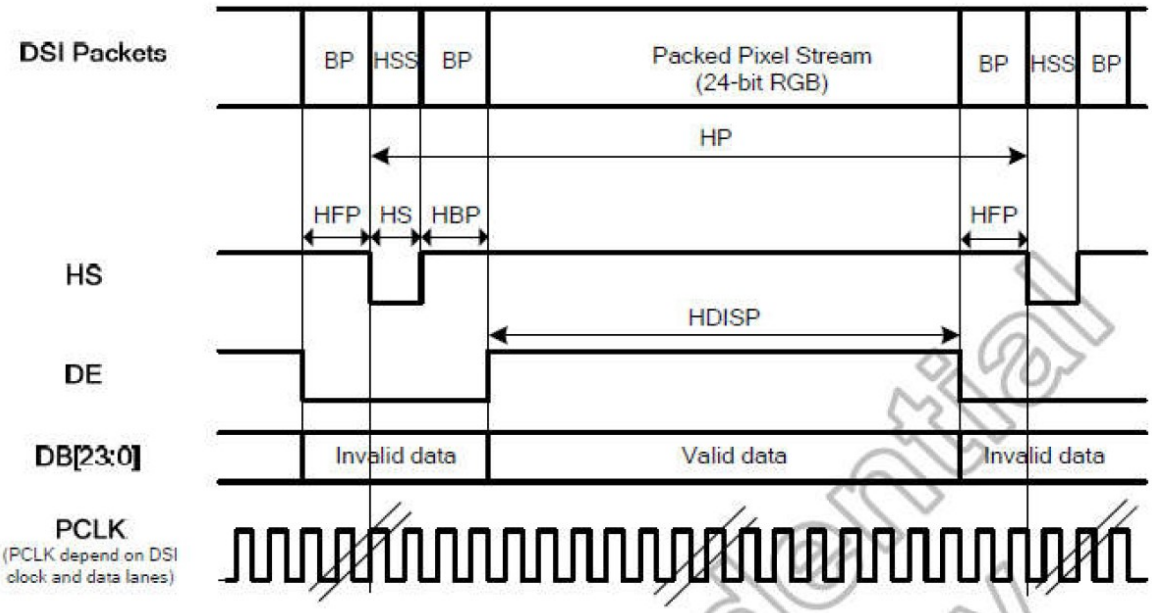
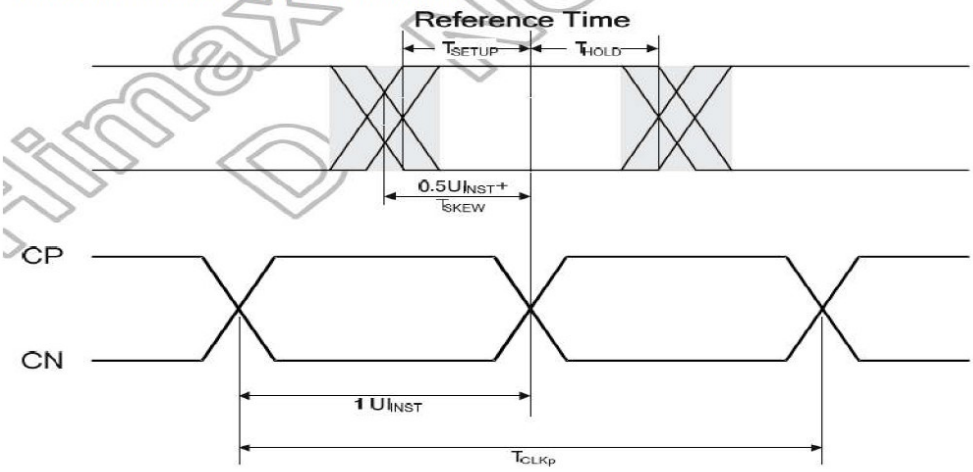


Parameter	Symbol	Condition	Spec.			Unit
			Min.	Typ.	Max.	
HS low pulse width	HS	-	8	-	-	pclk(note1)
Horizontal back porch	HBP	-	30	-	-	pclk(note1)
Horizontal front porch	HFP	-	10	-	-	pclk(note1)
Horizontal data start point	-	HS+HBP	38	-	-	pclk(note1)
Horizontal blanking period	HBLK	HS+HBP+HFP	48	-	-	pclk(note1)
Horizontal active area	HDISP		-	800	-	DCK

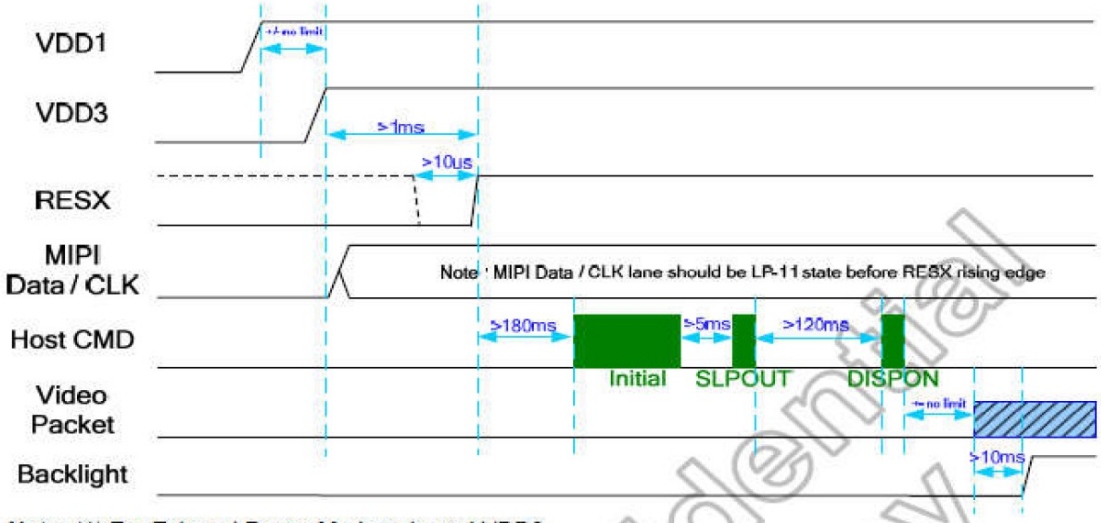
Note: (1) Depend on 550Mbps*4-Lane@60Hz



2. MIPI mode data input format
TBD

3. Power Sequence

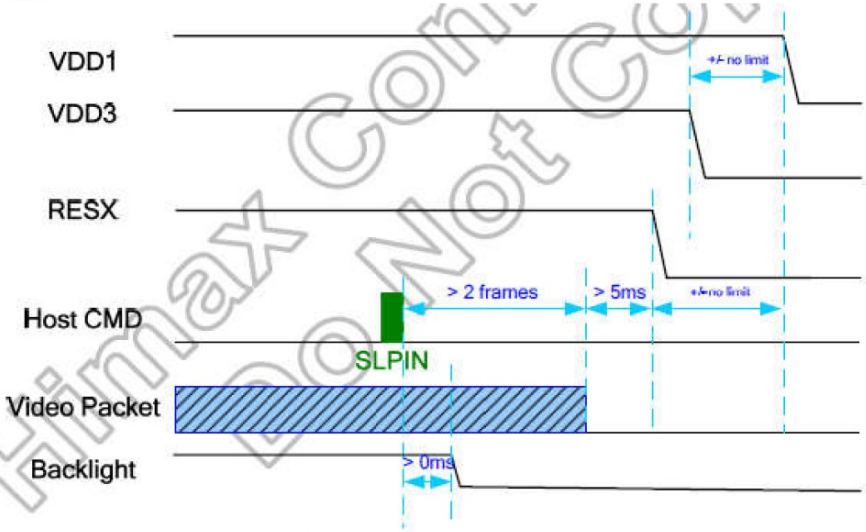
Power on



Note: (1) For External Power Mode not need VDD3

Figure 5.20: VDD1/VDD3 input power on sequence

Power off



Note: (1) For External Power Mode not need VDD3

Figure 5.21: VDD1/VDD3 input power off sequence

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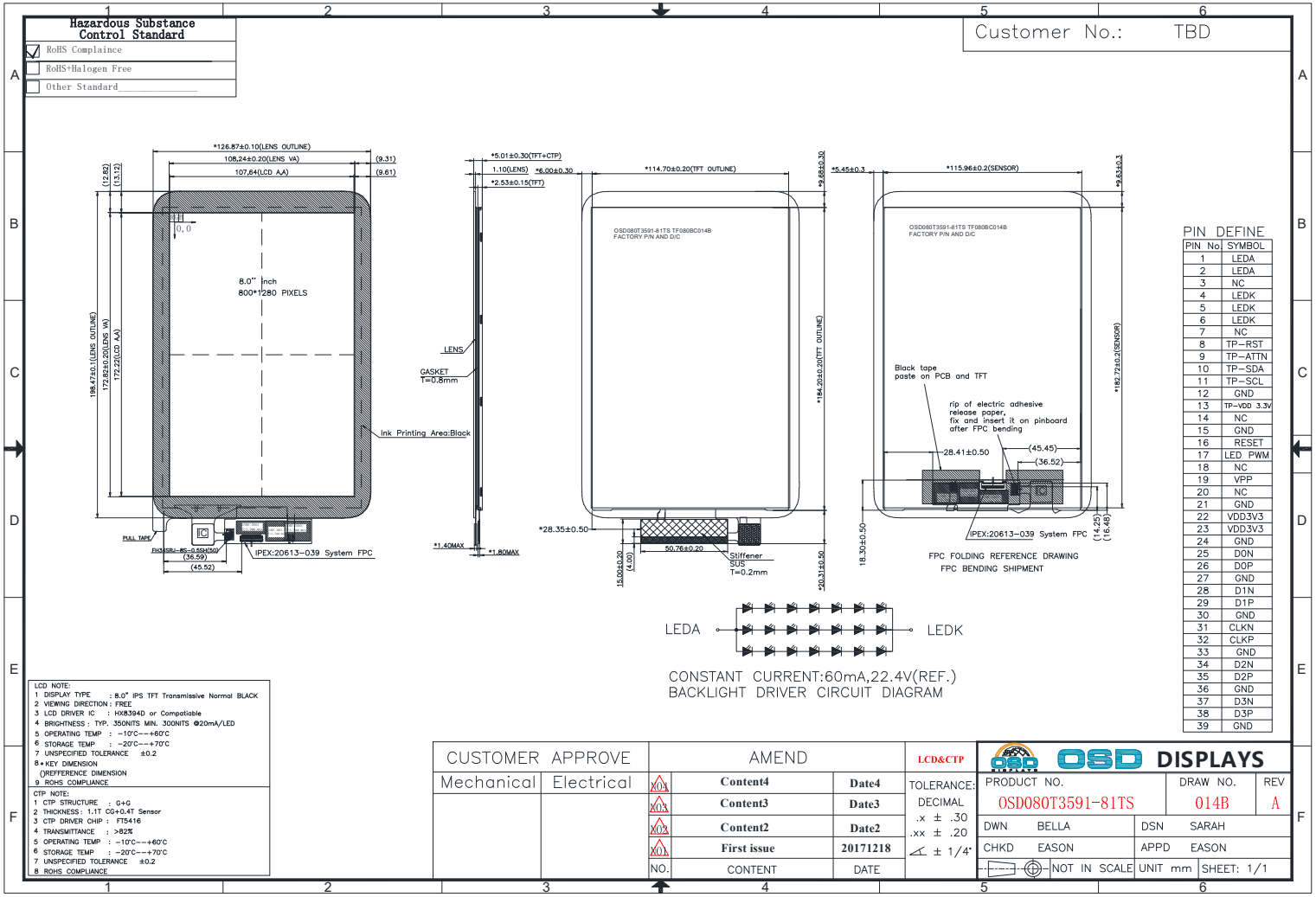
◆ EXTERNAL DIMENSIONS



◆ELECTRO-OPTICAL CHARACTERISTIC

Item		Symbol	Condition	Min	Typ	Max	Unit	Note
Response Time		Tr +Tf	Viewing Normal Angle ΘX =ΘY =0°	-	20	40	ms	4
Contrast Ratio		Cr		600	800	-	-	1
Luminance Uniformity		△L		75	80	-	%	3
Surface Luminance		Lw		300	350	-	cd/m²	2
Viewing Angle Range	Vertical	12o'clock	CR≧10	75	80	-	deg	6
		6o'clock		75	80	-	deg	
	Horizontal	3o'clock		75	80	-	deg	
		9o'clock		75	80	-	deg	
CIE (x, y) Chromaticity	RED	X	-	0.5303	0.5703	0.6103	-	5
		Y		0.2916	0.3316	0.3716		
	GREEN	X		0.2903	0.3450	0.3850		
		Y		0.6050	0.6478	0.6878		
	BLUE	X		0.1078	0.1455	0.1855		
		Y		0.0455	0.0856	0.1256		
	WHITE	X		0.2756	0.3125	0.3525		
		Y		0.3125	0.3531	0.3931		
NTSC Ratio		S	-	-	50%	-	-	7

Note1. Contrast Ratio (CR) is defined mathematically by the following formula. For more information see FIG 1.:

$$\text{Contrast Ratio} = \frac{\text{Average Surface Luminance with all white pixels (P1, P2, P 3, P4, P5)}}{\text{Average Surface Luminance with all black pixels (P1, P2, P 3, P4, P5)}}$$

Note2. Surface luminance is the LCD surface from the surface with all pixels displaying white. For more information see FIG 1.
Lv = Average Surface Luminance with all white pixels (P1, P2, P 3,P4, P5)

Note3. The uniformity in surface luminance （δ WHITE）is determined by measuring luminance at each test position 1 through 5, and then dividing the maximum luminance of 5 points luminance by minimum luminance of 5 points luminance. For more information see FIG 1.

$$\delta \text{ WHITE} = \frac{\text{Minimum Surface Luminance with all white pixels (P1, P2, P3,P4,P5)}}{\text{Maxi mum Surface Luminance with all white pixels (P1, P2, P3,P4,P5)}}$$

Note4. Response time is the time required for the display to transition from White to black(Rise Time, Tr) and from black to white(Decay Time, Tf). For additional information see FIG 2..

Note5. CIE (x, y) chromaticity ,The x,y value is determined by screen active area position 5. For more information see FIG 1.

Note6. Viewing angle is the angle at which the contrast ratio is greater than 2. For TFT module the contrast ratio is greater than 10. The angles are determined for the horizontal or x axis and the vertical or y axis with respect to the z axis which is normal to the LCD surface. For more information see FIG 3.

Note7: NTSC ratio： For more information see FIG 4.

$$\text{NTSC ratio} = \frac{\text{Area of RGB triangle}}{\text{Area of NTSC triangle}}$$

Note8. For Viewing angle and response time testing, the testing data is base on Autronic-Melchers's ConoScope. Series Instruments. For contrast ratio, Surface Luminance, Luminance uniformity and CIE， the testing data is base on BM-7 photo detector.

Note9. For TFT transmissive module, Gray scale reverse occurs in the direction of panel viewing angle

FIG.1. The definition of Response Time

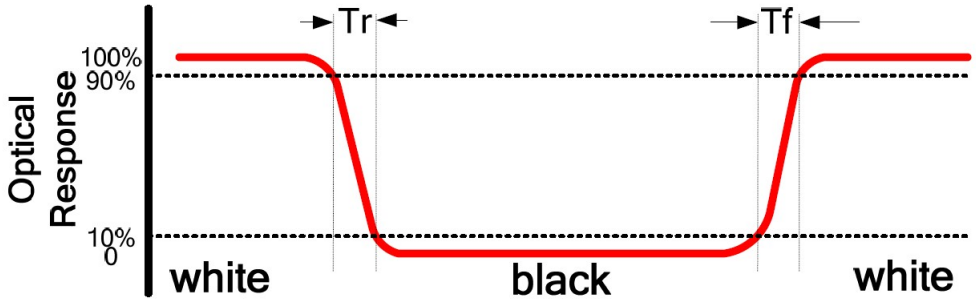


FIG.2. Measuring method for Contrast ratio,surface luminance, Luminance uniformity,CIE (x, y) chromaticity

A : 5 mm
B : 5 mm
H,V : Active Area
Light spot size ∅=5mm, 500mm distance from the LCD surface to detector lens
measurement instrument is TOPCON's luminance meter BM-5

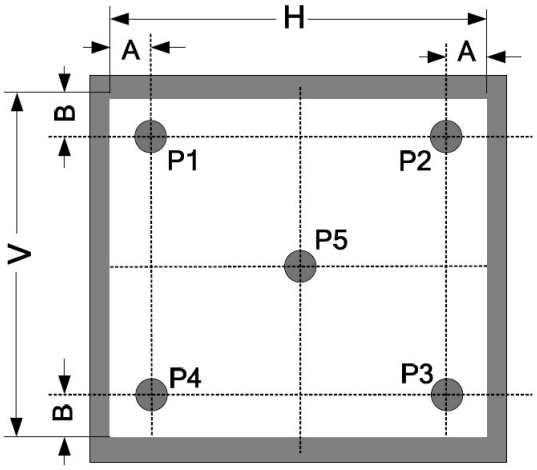
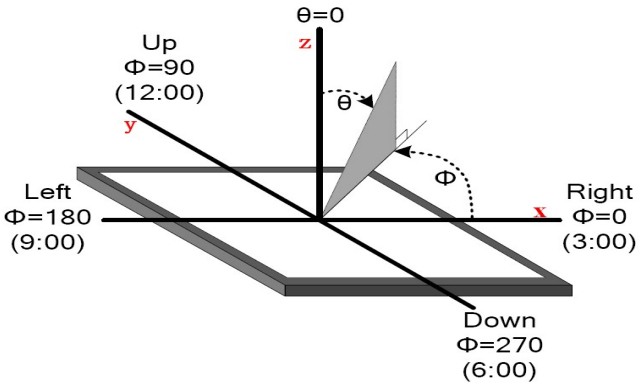


FIG.3. The definition of viewing angle



◆INTERFACE PIN ASSIGNMENT

1. LCD Interface Pins Definition

Pin No.	Symbol	Description
1~2	LEDA	Power for LED backlight(Anode)
3	NC	No connect
4~6	LEDK	Power for LED backlight(Cathode)
7	NC	No connect
8	TP-RST	TP Reset low
9	TP-ATTN	State change interrupt of CTP
10	TP-SDA	Serial interface date of CTP
11	TP-SCL	Serial interface clock of CTP
12	GND	Ground
13	TP-VDD 3.3V	Power Supply of CTP(3.3V)
14	TP-VBUS 3.3V	Power Supply of CTP(3.3V)
15	GND	Ground
16	RESET	Global reset pin
17	LED PWM	Backlight on/off control pin
18	NC	No connect
19	VPP	External high voltage pin used in OTP mode
20	NC	No connect
21	GND	Ground
22~23	VDD3V3	Power Voltage for digital circuit
24	GND	Ground

25	D0N	MIPI data pair0 negative signal
26	D0P	MIPI data pair0 Positive signal
27	GND	Ground
28	D1N	MIPI data pair1 negative signal
29	D1P	MIPI data pair1 Positive signal
30	GND	Ground
31	CLKN	MIPI CLK negative signal
32	CLKP	MIPI CLK Positive signal
33	GND	Ground
34	D2N	MIPI data pair2 negative signal
35	D2P	MIPI data pair2 Positive signal
36	GND	Ground
37	D3N	MIPI data pair3 negative signal
38	D3P	MIPI data pair3 Positive signal
39	GND	Ground

2. TP Interface PINS Definition

PinNo.	Symbol	Description
1	xx	xx
2	xx	xx
3	xx	xx
4	xx	xx
5	xx	xx
6	xx	xx
7	xx	xx
8	xx	xx

Note: IIC timing refer CTP driver chip datasheet.

◆REFERENCE APPLICATION CIRCUIT

Please consult our technical department for detail information.

◆REFERENCE INITIAL CODE

Please consult our technical department for detail information.

◆LCM PRODUCT INSPECTION CRITERIA

1 Description

This specification is made to be used as the standard acceptance/rejection criteria for TFT LCM Product.

1.Sample plan

Sampling plan according to GB/T2828.1-2003/ISO 2859-1 : 1999 and ANSI/ASQC Z1.4-1993, normal level 2 and based on:

Major defect: AQL 0.65

Minor defect: AQL 1.5

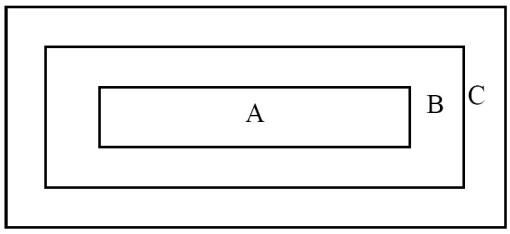
2. Inspection condition

●Viewing distance for cosmetic inspection is about 30±5cm with bare eyes, and under an environment 600~1000lux for visual inspection and 0~200lux for function test., all directions for inspecting the sample should be within 45°against perpendicular line. (Normal temperature 18～28°C and normal humidity 60±15%RH).

● Driving voltage

The Vop value from which the most optical contrast can be obtained near the specified Vop in the specification (Within ±0.5V of the typical value at 25°C.).

3. Definition of inspection zone in LCD



Zone A: character/Digit area

Zone B: viewing area except Zone A (Zone A+Zone B=minimum Viewing area)

Zone C: Outside viewing area (invisible area after assembly in customer's product)

Fig.1 Inspection zones in an LCD.

Note: As a general rule, visual defects in Zone C are permissible, when it is no trouble for quality and assembly of customer's product.

2 Inspection criterion

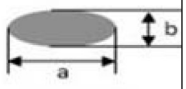
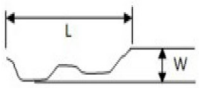
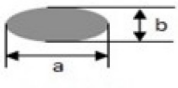
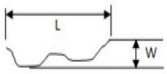
2.1 Function defect

Items to be inspected	Inspection criterion	Classification of defects
All functional defects	1) No display 2) Display abnormally 3) Missing vertical，horizontal segment 4) Short circuit 5) Back-light no lighting, flickering and abnormal lighting. 6) obvious striation 7) Current beyond specification value	MA
Missing	Missing component	
Outline dimension	Overall outline dimension exceed the drawing is not allowed.	

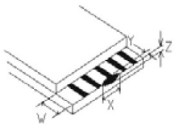
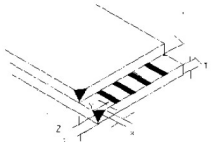
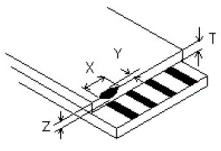
2.2 LCD pixel defect (bad dot)(defect type:MI)

Item	Inspection criterion		
Size	S<5”	5”≤S<10”	10”≤S<15”
Color pixel dot defect(RGB dot)	1	2	2
2 connected bright dot	0	1	1
3 connected bright dot or more	0	0	1
Bright dot quantity	1	2	3
Random dark dot quantity	2	3	4
2 connected dark dot	1	1	2
3 connected dark dot or more	0	0	0
Dark dot quantity	3	4	5
Multi-bright dot	ND 3%hidden, OK		
Remark: 2 bright dots distance DS≥15mm 2 dark dots distance DS≥5mm 1) Bright dot: Power on TFT and RGB dot in black display 2) Dark dot: Power on TFT and gray or black dot in RGB display 3) Multi-bright dot: Power on TFT and fluorescent tiny dot in black display(only visible in black display)			

2.3 dot and line defect(defect type:MI)

Checking item	Judgment criterion				Figure
	Diameter(mm)\LCD Size		S ≤5.0 Inch	5 < S≤7 Inch	7 < S≤12.3 Inch	
Dot defect	D≤0.15		allowed	allowed	allowed	 D=(a+b)/2
	0.15 < D≤0.25		3	3	allowed	
	D > 0.25		0	0	0	
	the distance between the two defect dot:DS≥5mm					
line defect	Length(mm)	width(mm)	Judgment criterion			
	disregard	W≤0.05	allowed	allowed	allowed	
	L≤2.5	0.05 < W≤0.1	3	3	7	
	L > 5	W > 0.1	0	0	0	
Concave point and air bubble for polarizer	LCD Size(mm)		Judgment criterion			 D=(a+b)/2
	D≤0.2		allowed	allowed	allowed	
	0.2 < D≤0.5		3	3	5	
	D > 0.5		0	0	0	
Fold mark、linear scar for polarizer	Length (mm)	width (mm)	Judgment criterion			
	disregard	W≤0.05	allowed	allowed	allowed	
	1 < L≤5	0.05 < W≤0.1	3	3	5	
	L > 5	W > 0.1	0	0	0	
	Notes:1.If the fold mark and linear scar for polarizer is visible with operating condition,the defect is judged with line judge ; 2.If the fold mark and linear scar for polarizer is visible with non-operating condition,the defect is judged with the above judgment standard.					

2.4 Corner and others crack for LCD (defect type:MI)

Checking item	Judgment criterion	Figure
electric conduction crack	X≤3.0mm,Y≤1/4w,Z≤t,N≤2	
corner crack	X≤3.0mm,Y≤3.0mm , Z≤t,N≤3 Corner crack extended to ITO PIN,none allowed	
surface crack	X≤1.5mm,Y≤1.0mm, Z≤t, N≤4	

2.5 Module Cosmetic Criteria(defect type:MI)

Item	Judgment Criterion
Difference in Spec.	None allowed
Pattern peeling	No substrate pattern peeling and floating
Soldering defects	No soldering missing No soldering bridge No cold soldering Notes:detail judgment referring to IPC-A-610 grade II
Resist flaw on Printed Circuit Boards	visible copper foil (0.5mm or more) on substrate pattern, none allowed
Accretion of metallic Foreign matter	No accretion of metallic foreign matters (Not exceed 0.2mm)
Stain	No stain to spoil cosmetic badly
Plate discoloring	No plate fading, rusting and discoloring
Newton ring	Referring to limited sample
Mura	Invisible with 5%ND,allowed
Light leaks	Referring to limited sample

3. Reliability test

No.	Test Item	Test Condition	Inspection after test
1	High Temperature Storage	70±2℃/96 hours	Inspection after 2~4 hours storage at room temperature, the sample shall be free from defects: 1.Airbubblein the LCD; 2.Sealleak; 3.Non-display; 4.missing segments; 5.Glass crack; 6. Current Idd is twice higher than initial value.
2	Low Temperature Storage	-20±2℃/96 hours	
3	High Temperature Operation	60±2℃/96 hours	
4	Low Temperature Operation	-10±2℃/96 hours	
5	Temperature Cycle	-20±2℃(30min.) ~25(5min.)~70(30min.)±2℃ ~25(5min.) ×10cycles	
6	Humidity Test	50℃±5℃×90%RH/96 hours	
7	Vibration Test	Frequency：10Hz~55Hz~10Hz Amplitude：1.5mm, X，Y，Z direction for total 0.5hours(Packing condition)	
8	Dropping test	Drop to the ground from 1.0m height, one time, every side of carton. (Packing condition)	
9	ESD test	Voltage:±8KV R: 330Ω C: 150pF Air discharge, 10time	

Remark:：

1. The test samples should be applied to only one test item.
2. Sample size for each test item is 5~10pcs.
3. For Damp Proof Test, Pure water(Resistance＞10MΩ) should be used.
4. In case of malfunction defect caused by ESD damage, if it would be recovered to normal state after resetting, it would be judged as a good part.
5. EL evaluation should be excepted from reliability test with humidity and temperature: Some defects such as black spot/blemish can happen by natural chemical reaction with humidity and Fluorescence EL has.
6. Failure Judgment Criterion: Basic Specification, Electrical Characteristic, Mechanical Characteristic, Optical Characteristic.

4. Symbol/Label、Package、Shipping and storage

4.1 Symbol/Label

4.1.1There should be manufacturing date and model no. information on the LCM.

4.2 Package

4.2.1 After inspection, put the LCMs into anti-static bags, and then packed into cartons. There should be clear, clean and tidy labels on the carton, indicating the below information:

a) Name;
b) Model No. & Qty;
c) Customer;
d) Manufacturing company or brand;
e) There should be notification “Anti-humidity” on the obvious place of the carton. The notification should comply with GB/T 191-2008 standard.

4.3 Shipping

4.3.1 During the transportation, the package should be taken carefully to avoid collision and knocking. It is prohibited to put the package with causticity products, such as acid and alkali.

4.3.2 There is no special requirement for the transportation tools, but it should ensure that during the transportation to avoid collision, rain and sown and erosion.

4.4 Storage

4.4.1 Put the LCMs into anti-static bags, store in normal temperature to avoid sunlight or Fluorescence light.

4.4.2 Avoid electrode erosion. Be cautious of water drop, humidity coagulation and high temperature that may accelerate electrode erosion.

◆PRECAUTIONS FOR USING LCD MODULES

Handing Precautions

(1) The display panel is made of glass and polarizer. As glass is fragile, it tends to become or chipped during handling especially on the edges. Please avoid dropping or jarring. Do not subject it to a mechanical shock by dropping it or impact.

(2) If the display panel is damaged and the liquid crystal substance leaks out, be sure not to get any in your mouth. If the substance contacts your skin or clothes, wash it off using soap and water.

(3) Do not apply excessive force to the display surface or the adjoining areas since this may cause the color tone to vary. Do not touch the display with bare hands. This will stain the display area and degraded insulation between terminals (some cosmetics are determined to the polarizer).

(4) The polarizer covering the display surface of the LCD module is soft and easily scratched. Handle this polarizer carefully. Do not touch, push or rub the exposed polarizers with anything harder than an HB pencil lead (glass, tweezers, etc.). Do not put or attach anything on the display area to avoid leaving marks on. Condensation on the surface and contact with terminals due to cold will damage, stain or dirty the polarizer. After products are tested at low temperature they must be warmed up in a container before coming is contacting with room temperature air.

(5) If the display surface becomes contaminated, breathe on the surface and gently wipe it with a soft dry cloth. If it is heavily contaminated, moisten cloth with one of the following solvents
- Isopropyl alcohol
- Ethyl alcohol

Do not scrub hard to avoid damaging the display surface.

(6) Solvents other than those above-mentioned may damage the polarizer. Especially, do not use the following.
- Water
- Ketone
- Aromatic solvents

Wipe off saliva or water drops immediately, contact with water over a long period of time may cause deformation or color fading. Avoid contacting oil and fats.
(7) Exercise care to minimize corrosion of the electrode. Corrosion of the electrodes is accelerated by water droplets, moisture condensation or a current flow in a high-humidity environment.
(8) Install the LCD Module by using the mounting holes. When mounting the LCD module make sure it is free of twisting, warping and distortion. In particular, do not forcibly pull or bend the I/O cable or the backlight cable.

(9) Do not attempt to disassemble or process the LCD module.

(10) NC terminal should be open. Do not connect anything.

(11) If the logic circuit power is off, do not apply the input signals.

(12) Electro-Static Discharge Control，Since this module uses a CMOS LSI, the same careful attention should be paid to electrostatic discharge as for an ordinary CMOS IC. To prevent destruction of the elements by static electricity, be careful to maintain an optimum work environment.
- Before remove LCM from its packing case or incorporating it into a set, be sure the module and your body have the same electric potential. Be sure to ground the body when handling the LCD modules.
- Tools required for assembling, such as soldering irons, must be properly grounded. Make certain the AC power source for the soldering iron does not leak. When using an electric screwdriver to attach LCM, the screwdriver should be of ground potentiality to minimize as much as possible any transmission of electromagnetic waves produced sparks coming from the commutator of the motor.
- To reduce the amount of static electricity generated, do not conduct assembling and other work under dry conditions. To reduce the generation of static electricity be careful that the air in the work is not too dried. A relative humidity of 50%-60% is recommended. As far as possible make the electric potential of your work clothes and that of the work bench the ground potential
- The LCD module is coated with a film to protect the display surface. Exercise care when peeling off this protective film since static electricity may be generated.

（13）Since LCM has been assembled and adjusted with a high degree of precision, avoid applying excessive shocks to the module or making any alterations or modifications to it.
- Do not alter, modify or change the shape of the tab on the metal frame.
- Do not make extra holes on the printed circuit board, modify its shape or change the positions of components to be attached.
- Do not damage or modify the pattern writing on the printed circuit board.
- Absolutely do not modify the zebra rubber strip (conductive rubber) or heat seal connector.
- Except for soldering the interface, do not make any alterations or modifications with a soldering iron.
- Do not drop, bend or twist LCM.