Product Specification

Part Name: 4.3inch TFT Display Module
Customer Part ID:
Topovision Part ID: TVT0430D-P
Ver: A

Customer:
Approved by

From:	Distributed by: TEXIM EUROPE www.texim-europe.com
Approved by	

Notes:
1. Please contact Topovision Technology Co., Ltd. before assigning your product based on this module specification
2. The information contained herein is presented merely to indicate the characteristics and performance of our products.   No responsibility is assumed by Topovision Technology Co., Ltd. for any intellectual property claims or other problems that may result from application based on the module described herein.

Records of Revision

DATE	REF.PAGE PARAGRAPH DRAWING No.	REVISED No.	SUMMARY	REMARK
2013-2-20		01	FIRST ISSUE	
2013-3-23	Page15-24	02	Change Reliability&Quality	
	Page14		Add timing	
2013-4-08	Page7-9	03	Add Input current，Chromaticity Coordinate	
2013-5-30	Page14	04	Change timing	
2013-8-20	Page6	A	Changemechanicaldrawing	

Contents

1. Introduction

1.1 Scope of application
  This specification applies to the Negative type TFT transmissive dot matrix LCD module.
LCD specification: Dots 480xRGBx272.
As to basic specification of the driver IC, refer to the IC (HX8257A) specification and data sheet.

1.2 Structure:
Double display structure:
TFT Module + FPC +BL+TP
FULL 16.7M Color4.3 inch TFT LCD size for main LCD;
One bare chip with gold bump (COG) TECH;
24 BITS RGB interface;

1.3 TFT features:
Structure: TFT PANNEL+IC+FPC+BL;
Transmissive Type LCD
480 dot-source and 272 dot-gate outputs;
16.7M Color
White LED back light;
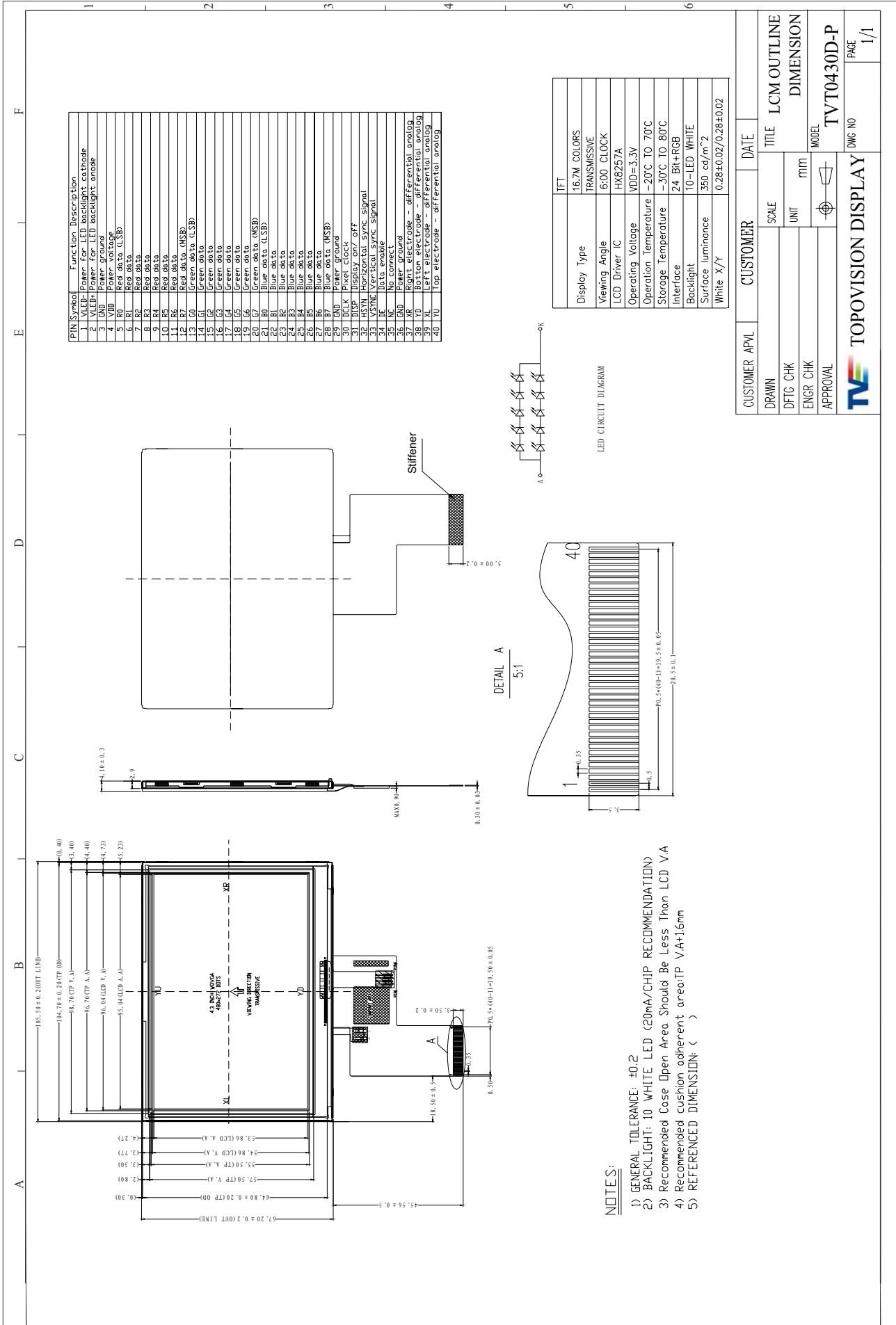24 BITS RGB interface;

1.4 Applications:
Mobile phone
   PSP
   PDA
   GPS
   Etc…

2. General specification

ITEM	Standard value	UNIT
LCD Type	TFT Transmissive/Normal White	---
Driver element	a-Si TFT Active matrix	
Number of Dots	480*(RGB)*272	Dots
Pixel Arrangement	RGB Vertical Stripe	
Active Area	53.86 *95.04	mm
Viewing Area (W*H)	54.86*96.04	mm
Viewing Direction	6 0' clock	
Driver IC	HX8257A	
Module Size(W*H*T)	67.2x105.5x4.1	mm
Approx. Weight	60	g
Back Light	White LED	
System interface	24 BITS RGB interface	

PIN	Symbol	Function Description
1	VLED-	Power for LED backlight cathode
2	VLED+	Power for LED backlight anode
3	GND	Power ground
4	VDD	Power voltage
5	R0	Red data (LSB)
6	R1	Red data
7	R2	Red data
8	R3	Red data
9	R4	Red data
10	R5	Red data
11	R6	Red data
12	R7	Red data (MSB)
13	G0	Green data (LSB)
14	G1	Green data
15	G2	Green data
16	G3	Green data
17	G4	Green data
18	G5	Green data
19	G6	Green data
20	G7	Green data (MSB)
21	B0	Blue data (LSB)
22	B1	Blue data
23	B2	Blue data
24	B3	Blue data
25	B4	Blue data
26	B5	Blue data
27	B6	Blue data
28	B7	Blue data (MSB)
29	GND	Power ground
30	DCLK	Pixel clock
31	DISP	Display on/off
32	HSYN	Horizontal sync signal
33	VSYNC	Vertical sync signal
34	DE	Data enable
35	NC	No connect
36	GND	Power ground
37	XR	Right electrode - differential analog
38	YD	Bottom electrode - differential analog
39	XL	Left electrode - differential analog
40	YU	Top electrode - differential analog

Display Type	TFT
	16.7M COLORS
	TRANSMISSIVE
Viewing Angle	6:00 CLOCK
LCD Driver IC	HX8257A
Operating Voltage	VDD=3.3V
Operation Temperature	-20°C TO 70°C
Storage Temperature	-30°C TO 80°C
Interface	24 Bit+RGB
Backlight	10-LED WHITE
Surface luminance	350 cd/m^2
White X/Y	0.28±0.02/0.28±0.02

LED CIRCUIT DIAGRAM

DETAIL A
5:1

Stiffener

5.00 ± 0.2

4.3 INCH WVGA
480x272 DOTS
VIEWING DIRECTION
TRANSMISSIVE

NOTES:
1) GENERAL TOLERANCE: ±0.2
2) BACKLIGHT: 10 WHITE LED (20mA/CHIP RECOMMENDATION)
3) Recommended Case Open Area Should Be Less Than LCD V.A
4) Recommended cushion adherent area:TP V.A+1.6mm
5) REFERENCED DIMENSION: (   )

CUSTOMER APVL
CUSTOMER
CUSTOMER APVL
DRAWN
DFTG CHK
ENGR CHK
APPROVAL
SCALE
UNIT   mm
DATE

TOPOVISION DISPLAY

TITLE   LCM OUTLINE DIMENSION
MODEL   TVT0430D-P
DWG NO
PAGE   1/1

4. ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Min	Max	Unit
Supply voltage for logic	V_{DD}	−0.3	4.0	V
Input voltage for logic	V_{IN}	−0.5	V_{DD} +0.3	V
Supply current (One LED)	I_{LED}		30	mA
Operating temperature	T_{OP}	−20	+70	℃
Storage temperature	T_{ST}	−30	+80	℃

5. ELECTRICAL CHARACTERISTICS

Item	Symbol	Min	Typ	Max	Unit	Applicable terminal
Supply voltage for logic	V_{DD}	3.0	3.3	3.6	V	V_{DD}
Input voltage	V_{IL}	−0.3	–	0.3 V_{DD}	V	
	V_{IH}	0.8 V_{DD}	–	V_{DD}	V	
Input current	I_{DD}		13	16	mA	
LED Forward voltage	V_f	3.0	3.2	3.4	V	−−
Input backlight current	I_{LED}	–	20	25	mA	With One LED

6. OPTICAL CHARACTERISTICS

ITEM		SYMBOL	CONDITIONS	SPECIFICATIONS			UNIT	NOTE
				MIN.	TYP.	MAX		
Brightness		B		310	350	-	Cd/m^2	
Contrast Ratio		CR		400	500	——	——	
Response Time		Tr+Tf		——	50	70	ms	
Chromaticity Coordinate (Transmissive)	Red	X	Viewing normal angle θ X = θ Y =0° BL Brightness =4000 Cd/m^2	0.551	0.591	0.631		All left side data are based on TIANMA's product reference only
		Y		0.270	0.310	0.350		
	Green	X		0.302	0.342	0.382		
		Y		0.516	0.561	0.601		
	Blue	X		0.105	0.145	0.185		
		Y		0.047	0.087	0.127		
	White	X		0.244	0.284	0.324		
		Y		0.249	0.289	0.339		
Viewing Angle	Hor.	θ_{X+}	Center CR>=10	60	70	——	Deg.	
		θ_{X-}		60	70	——		
	Ver.	θ_{Y+}		40	50	——		
		θ_{Y-}		60	70			
Uniformity		Un		75	80		%	

Note 1 : Definition of Viewing Angle θ x and θ y :

Normal

θx = θy = 0º

θy-   θy+

θX- = 90º   x-

12 o' clock direction

y+

θy+ = 90º

θx-   θx+

6 o' clock   y-

θy- = 90º

x+   θX+ = 90º
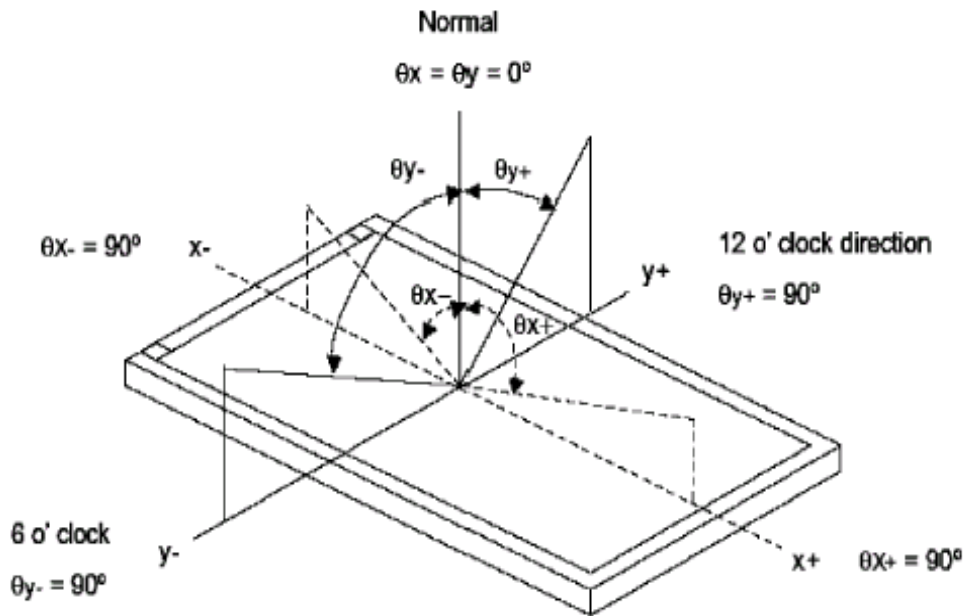
Note 2: Definition of contrast ratio CR:

$$CR = \frac{\text{Brightness of non-selected dots (white)}}{\text{Brightness of selected dots (black)}}$$

Note 3: Definition of response time (T_R, T_F)
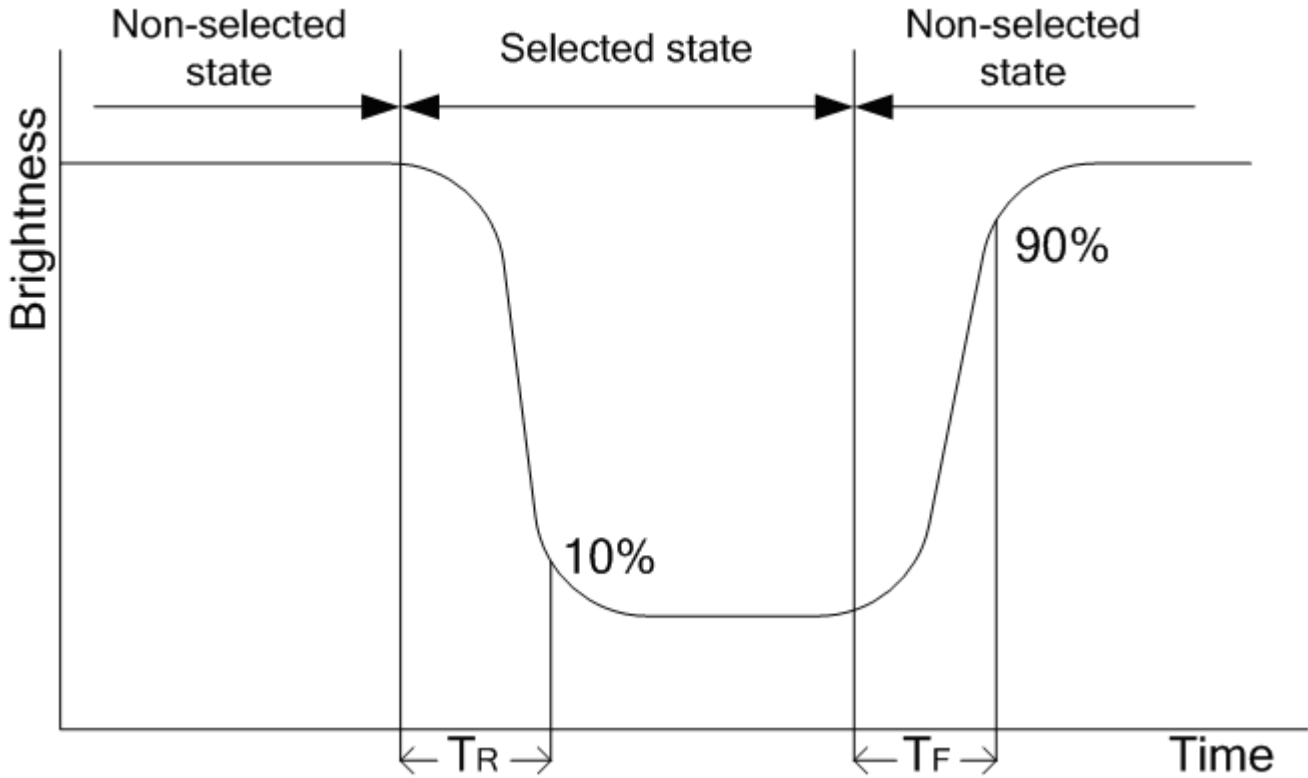
: The brightness test equipment setup

20mA Field=2° (As measuring "black" image, field=2° is the best testing condition)

BM-7

Field = 2°

50 cm

TFT-LCD Panel

The center of the screen

Note 4 :

H/6

H/3   Active area

H/3   H

H/6

L/6   L/3 L/3   L/6

L

Active area

Unit: mm
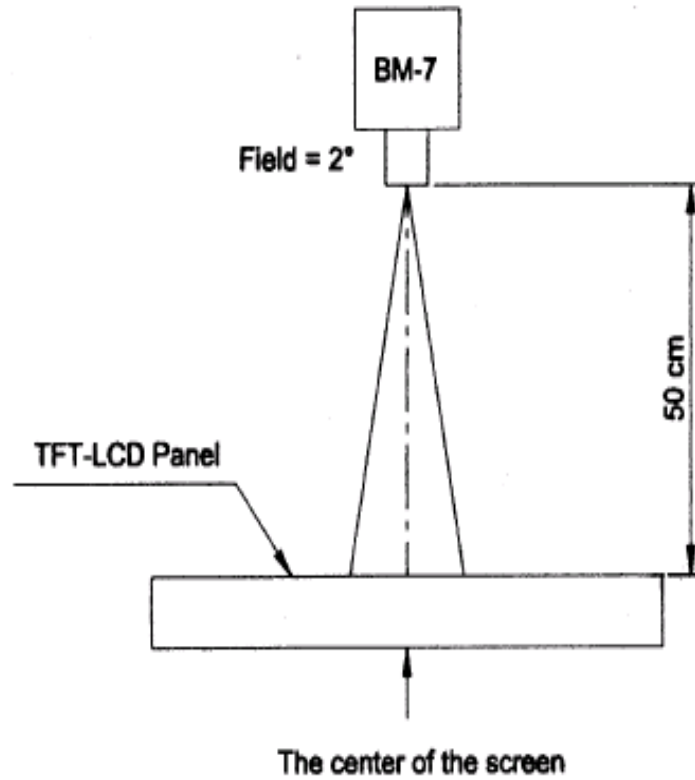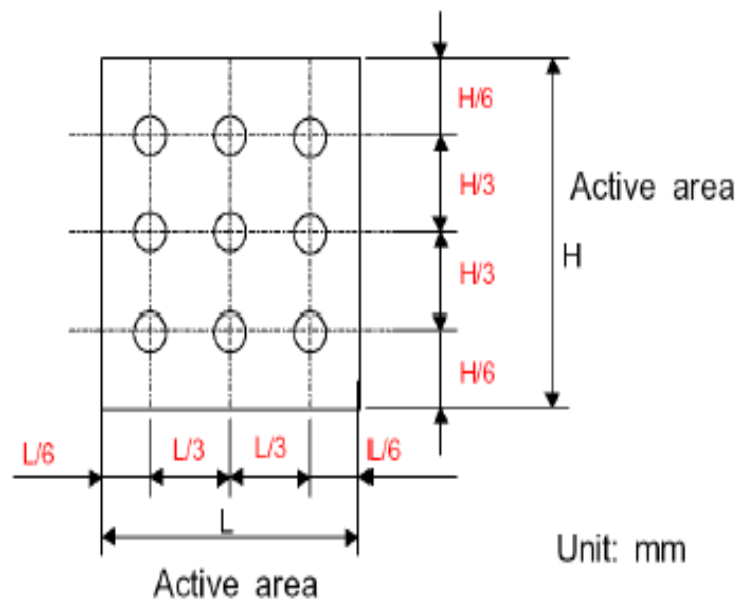
7. TOUCH PANEL SPECIFICATIONS

7.1 Electrical Characteristics

ITEM	SPECIFICATIONS			UNIT	REMARK
	MIN.	TYP.	MAX		
Linearity	-1.5	-	1.5	%	After environment & life test
Terminal Resistance	200	-	650	ohm	X(Film side)
	350	-	800	ohm	Y(Glass side)
Insulation Resistance	10	-	-	Mohm	DC 25V 1min
Operating Voltage	-	5	-	V	DC

7.2 Optical Characteristics

ITEM	SPECIFICATIONS			UNIT	REMARK
	MIN.	TYP.	MAX		
Response Time	-	-	10	ms	100kohm pull-up
Light Transparency	80	-	-	%	

7.3 Mechanical Characteristics

ITEM	SPECIFICATIONS			UNIT	REMARK
	MIN.	TYP.	MAX		
Operation Force	-	20	50	gf	Note1
Surface Hardness	3	-	-	H	
Pen Sliding Durability	100,000			times	Note2
Hitting Durability	1,000,000			times	Note3

Note 1: Do not operate it with a thing except a polyacetal pen (tip R0.8mm or less) or a finger, especially those with hard or sharp tips such as a ball point pen or a mechanical pencil.

　　　Depending on the pitch & the dimension of the spacer dots in between.

Note 2: Measurement for surface area.

　　　-Scratch 100,000 times straight line on the film with a stylus change every 20,000 times.

　　　-Force: 100gf.

　　　-Speed: 60mm/sec.

　　　-Stylus: R0.8 polyacetal tip.

Note 3: Hit 1,000,000 times on the film with an R12.5mm tip.

　　　-Force: 250gf.

　　　-Speed: 2 times/sec.

8. Interface Pin Function

. Table 2: Pin assignment

Pin No.	Symbol	Description
1	VLED-	Cathode of LED backlight
2	VLED+	Anode of LED backlight
3	GND	Power ground
4	VDD	Power voltage
5	R0	Red data (LSB)
6	R1	Red data
7	R2	Red data
8	R3	Red data
9	R4	Red data
10	R5	Red data
11	R6	Red data
12	R7	Red data (MSB)
13	G0	Green data (LSB)
14	G1	Green data
15	G2	Green data
16	G3	Green data
17	G4	Green data
18	G5	Green data
19	G6	Green data
20	G7	Green data(MSB)
21	B0	Blue data(LSB)
22	B1	Blue data
23	B2	Blue data
24	B3	Blue data
25	B4	Blue data
26	B5	Blue data
27	B6	Blue data
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29	GND	Power ground
30	DCLK	Pixel clock
31	DISP	Display on/off
32	HSYN	Horizontal sync signal
33	VSYNC	Vertical sync signal
34	DE	Data enable
35	NC	NO connect
36	GND	Power ground
37	XR	Right electrode
38	YD	Bottom electrode
39	XL	Left electrode
40	YU	Top electrode

9.　BLOCK　DIAGRAM

Driver IC:HX8257A or Compatible
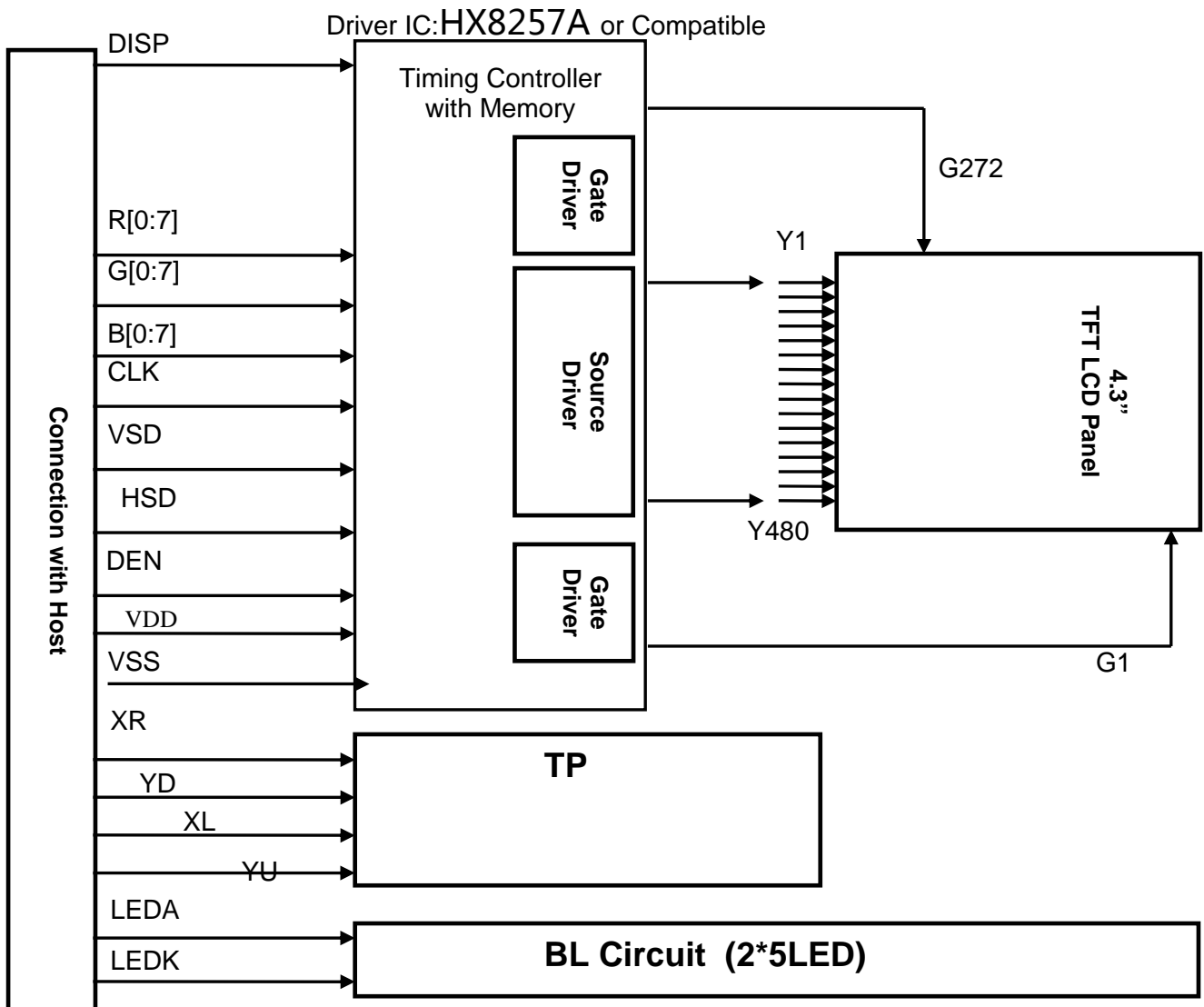
10. Timing/Characteristics

10.1 Clock and data input time diagram
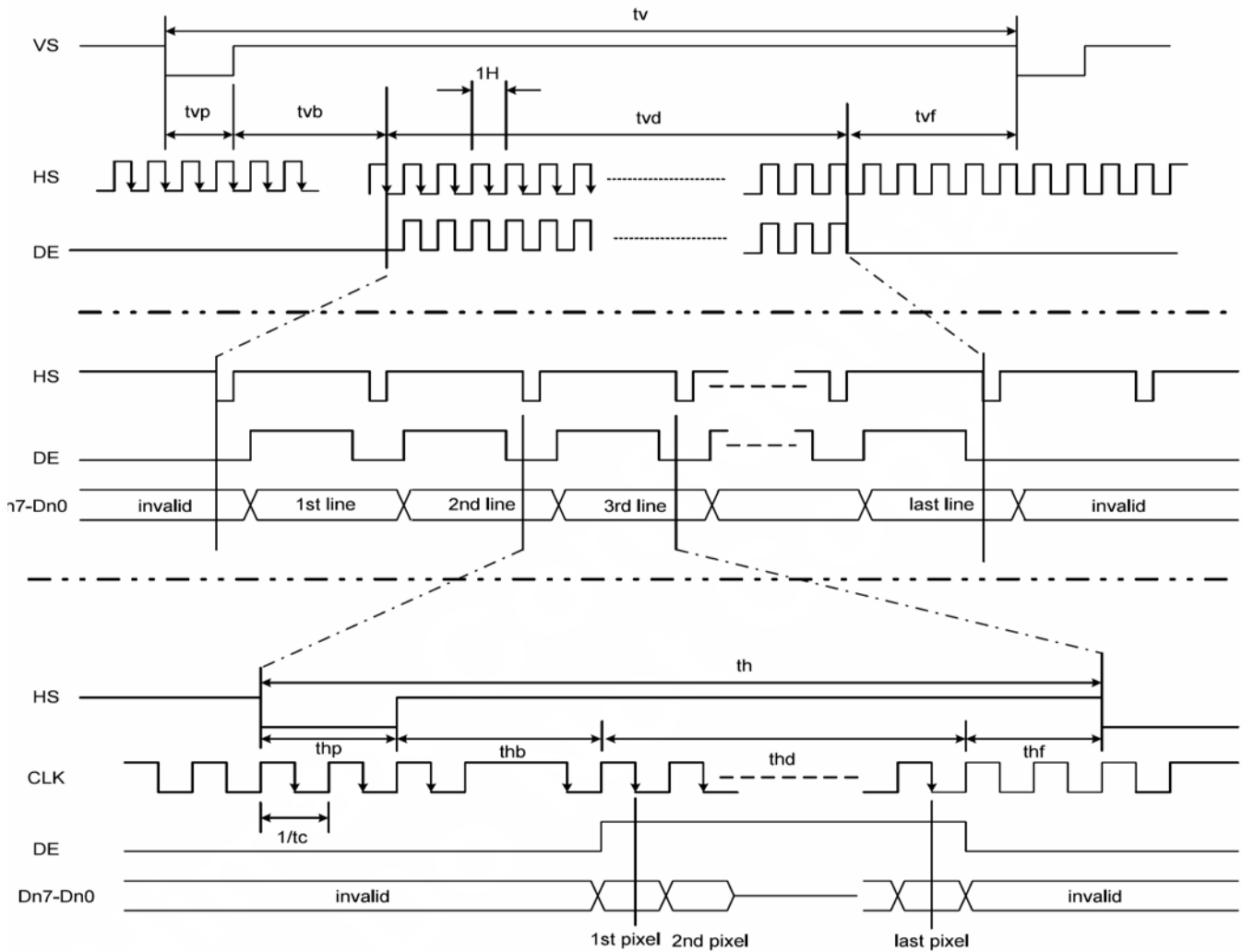
10.2 Parallel RGB input timing table

Parameter	Symbol	Spec.			Unit
		Min.	Typ.	Max.	
Clock cycle	f_{CLK}[1]	–	9	15	MHz
Hsync cycle	1/th	–	17.14	–	KHz
Vsync cycle	1/tv	–	59.94	–	Hz
Horizontal Signal					
Horizontal cycle	th	525	525	605	CLK
Horizontal display period	thd	480	480	480	CLK
Horizontal front porch	thf	2	2	82	CLK
Horizontal pulse width	thp[2]	2	41	41	CLK
Horizontal back porch	thb[2]	2	2	41	CLK
Vertical Signal					
Vertical cycle	tv	285	286	399	H[1]
Vertical display period	tvd	272	272	272	H[1]
Vertical front porch	tvf	1	2	227	H[1]
Vertical pulse width	tvp[2]	1	10	11	H[1]
Vertical back porch	tvb[2]	1	2	11	H[1]

Note: (1) Unit: CLK=1/ f_{CLK} , H= th,
(2) It is necessary to keep tvp+tvb=12 and thp+thb=43 in sync mode. DE mode is unnecessary to keep it.

11. LCM Reliability :

11-1. Standard Specifications for Reliability of LCD Module

No	Item	Description
01	High temperature operation	The sample should be allowed to stand at 70℃ for 120 hours under driving condition and then returning it to normal temperature condition, and allowing it stand for 2 hours.
02	Low temperature operation	The sample should be allowed to stand at -20℃ for 120 hours under driving condition and then returning it to normal temperature condition, and allowing it stand for 2 hours.
03	High temperature storage	The sample should be allowed to stand at 80℃ for 240 hours under no-load condition, and then returning it to normal temperature condition, and allowing it stand for 2 hours.
04	Low temperature storage	The sample should be allowed to stand at -30℃ for 240 hours under no-load condition, then returning it to normal temperature condition, and allowing it stand for 2 hours.
05	Moisture storage	The sample should be allowed to stand at 60℃,90%RH MAX for 240 hours under no-load condition, then taking it out and drying it at normal temperature for 2 hours.
06	Thermal shock storage	The sample should be allowed to stand the following 10 cycles : -30℃ for 30 minutes → normal temperature for 5 minutes → +80℃ for 30 minutes → normal temperature for 5 minutes, as one cycle.
07	Packing vibration	Frequency range : 10Hz ~ 55Hz Amplitude of vibration : 1.5mm Sweep time: 12 min X,Y,Z 2 hours for each direction.
08	Packing drop test	According to ISTA 1A 2001.
09	Electrical Static Discharge	Air: ±4KV 150pF/330Ω 5 times
		Contact: ±2KV 150pF/330Ω 5 time

*Sample size for each test item is 3~5pcs

11- 2. Testing Conditions and Inspection Criteria

For the final test the testing sample must be stored at room temperature for 24 hours, after the tests listed in Table 12.2, Standard specifications for Reliability have been executed in order to ensure stability.

No	Item	Test Model	In section Criteria
01	Current Consumption	Refer To Specification	The current consumption should conform to the product specification.
02	Contrast	Refer To Specification	After the tests have been executed, the contrast must be larger than half of its initial value prior to the tests.
03	Appearance	Visual inspection	Defect free.

11- 3. MTBF

MTBF	Functions, performance, appearance, etc. shall be free from remarkable deterioration within 50,000 hours under ordinary operating and storage conditions room temperature (25±5℃), normal humidity (50±10% RH), and in area not exposed to direct sun light.

12. Specification of Quality Assurance:

12-1. Purpose

This standard for Quality Assurance should affirm the quality of LCD module products to supply to purchaser by TeCenStar.

12-2. Standard for Quality Test

a. Inspection:

Before delivering, the supplier should take the following tests, and affirm the quality of product.

b. Electro-Optical Characteristics:

According to the individual specification to test the product.

c. Test of Appearance Characteristics:

According to the individual specification to test the product.

d. Test of Reliability Characteristics:

According to the definition of reliability on the specification for testing products.

e. Delivery Test:

Before delivering, the supplier should take the delivery test.

(i) Test method: According to MIL-STD105E. General Inspection Level Ⅱ take a single time.

(ii) The defects classify of AQL as following:

Major defect: AQL = 0.65

Minor defect: AQL = 2.5

Total defects: AQL = 2.5

12-3. Non- conforming Analysis & Deal With Manners

a. Non- conforming Analysis:

(i) Purchaser should supply the detail data of non- conforming sample and the non- conforming.

(ii) After accepting the detail data from purchaser, the analysis of non- conforming should be finished in two weeks.

(iii) If supplier can not finish analysis on time, must announce purchaser before 3 days.

b. Disposition of non- conforming:

(i) If find any product defect of supplier during assembly time, supplier must change the good product for every defect after recognition.

(ii) Both supplier and customer should analyze the reason and discuss the disposition of non-conforming when the reason of nonconforming is not sure.

12-4. Agreement items

Both sides should discuss together when the following problems happen.

a. There is any problem of standard of quality assurance, and both sides should think that must be modified.

b. There is any argument item which does not record in the standard of quality assurance.

c. Any other special problem.

12-5. Standard of The Product Appearance Test
    a. Manner of appearance test:
     (i) The test must be under 20W × 2 or 40W fluorescent light, and the distance of view must be at 30±5cm.
     (ii) When test the model of transmissive product must add the reflective plate.
    (iii) The test direction is base on around 10° of vertical line.
    (iiii) Temperature: 25±5℃   Humidity: 60±10%RH
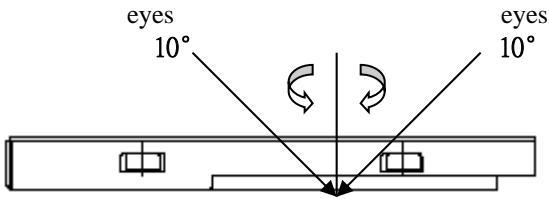
  (iv) Definition of area:
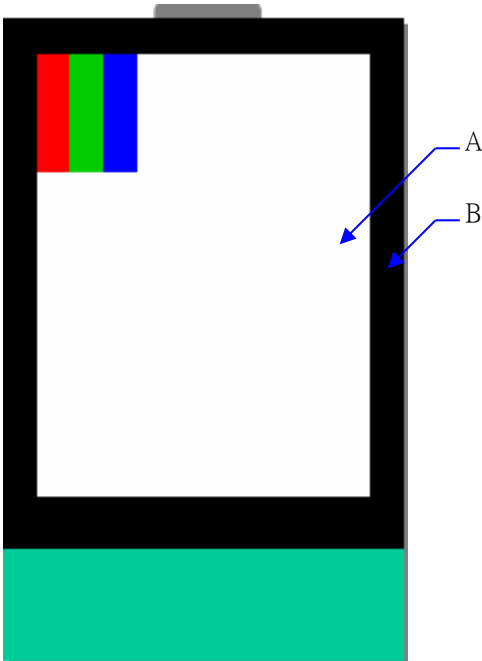
A. Area: Viewing area.
B. Area: Out of viewing area.
    (Outside viewing area)
b. Basic principle:
 (i) It will accord to the AQL when the standard can not be described.
 (ii) The sample of the lowest acceptable quality level must be discussed by both supplier and customer when any dispute happened.
 (iii) Must add new item on time when it is necessary.
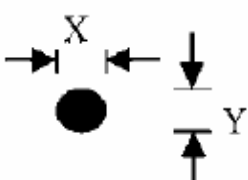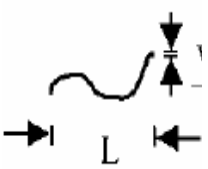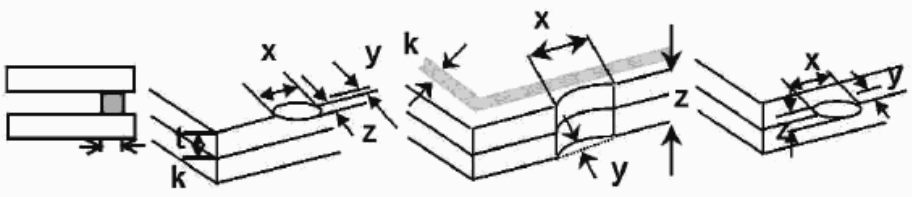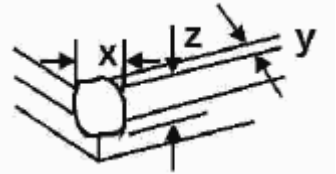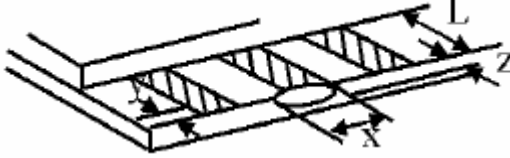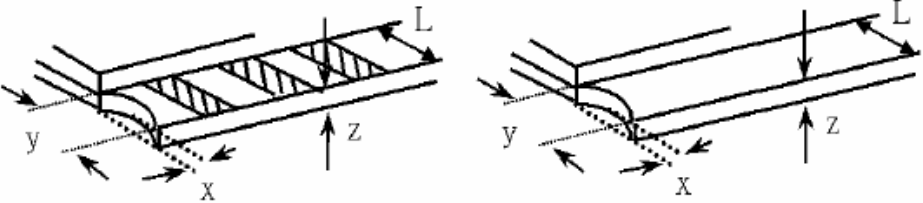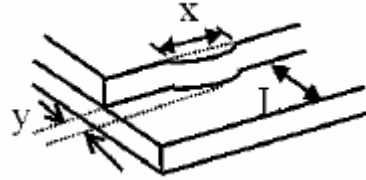
c. Standard of inspection: (Unit: mm)
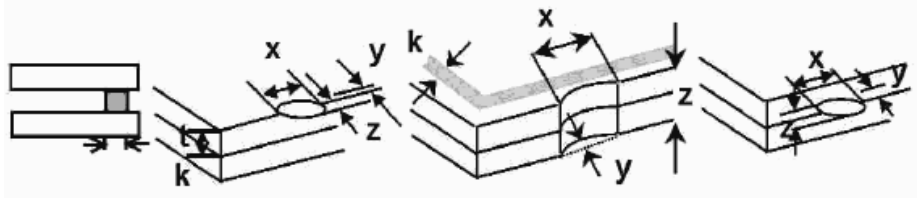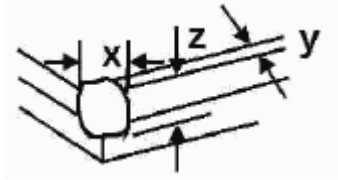
12-6. Inspection specification
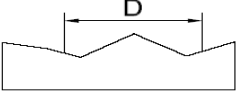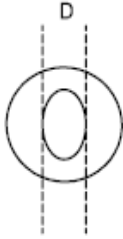
NO	Item	Criterion	AQL
01	Electrical Testing	1.1 Missing vertical, horizontal segment, segment contrast defect. 1.2 Missing character, dot or icon. 1.3 Display malfunction. 1.4 No function or no display. 1.5 Current consumption exceeds product specifications. 1.6 LCD viewing angle defect. 1.7 Mixed product types. 1.8 Flicker	0.65
02	Black or White spots or Bright spots or Color spots on LCD (Display only)	2.1 White and black or color spots on display ≦ 0.25mm, no more than Five spots. 2.2 Densely spaced: No more than three spots within 3mm.	2.5
03	LCD and Touch Panel black spots, white spots, contamination (non – display)	3.1 Round type: As following drawing Φ ＝ (X+Y) ／ 2 <table><tr><td>Size(mm)</td><td>Acceptable Q'ty</td></tr><tr><td>Φ≦0.10</td><td>Accept no dense</td></tr><tr><td>0.10＜ Φ≦0.20</td><td>2</td></tr><tr><td>0.20＜ Φ≦0.25</td><td>2</td></tr><tr><td>0.25＜ Φ≦0.30</td><td>1</td></tr><tr><td>0.30＜ Φ</td><td>0</td></tr></table> ＊ Densely spaced: No more than two spots within 3mm. 3.2 Line type: (As following drawing) <table><tr><td>Length(mm)</td><td>Width(mm)</td><td>Acceptable Q'ty</td></tr><tr><td>———</td><td>W≦0.02</td><td>Accept no dense</td></tr><tr><td>L≦3.0</td><td>0.02＜W≦0.05</td><td rowspan="2">2</td></tr><tr><td>L≦2.5</td><td>0.03＜W≦0.08</td></tr><tr><td>———</td><td>0.08＜W</td><td>Rejection</td></tr></table> ＊ Densely spaced: No more than two lines within 3mm.	2.5 2.5

NO	Item	Criterion	AQL
04	Polarizer bubbles	If bubbles are visible, judge using black spot specifications, not easy to find, must check in specify direction 	Size Φ (mm)	Acceptable Q'ty
---	---
Φ≦0.20	Accept no dense
0.20< Φ≦0.50	3
0.50< Φ≦1.00	2
1.00< Φ	0
Total Q'ty	3		2.5
05	Scratches	Follow NO.3 -2 Line Type.	
06	Chipped glass	Symbols: x: Chip length y: Chip width z: Chip thickness k: Seal width t: Glass thickness a: LCD side length L: Electrode pad length 6.1 General glass chip: 6.1.1 Chip on panel surface and crack between panels: | z: Chip thickness	y: Chip width	x: Chip length
---	---	---
Z≦1/2t	Not over viewing area	x≦1/8a
1/2t< z≦2t	Not exceed 1/3k	x≦1/8a | ⊙ Unit: mm ⊙ If there are 2 or more chips, x is the total length of each chip 6.1.2 Corner crack: | z: Chip thickness	y: Chip width	x: Chip length
---	---	---
Z≦1/2t	Not over viewing area	x≦1/8a
1/2t< z≦2t	Not exceed 1/3k	x≦1/8a | ⊙ Unit: mm ⊙ If there are 2 or more chips, x is the total length of each chip	2.5

NO	Item	Criterion	AQL
07	Glass crack	Symbols: x: Chip length　　y: Chip width　　z: Chip thickness k: Seal width　　　t: Glass thickness　a: LCD side length L: Electrode pad length 7.2 Protrusion over terminal: 7.2.1 Chip on electrode pad: _(see figure)_ 7.2.2　　　　　　　　　　　　　　　　　　　Non-conductive portion: _(see figures)_ ⊙ If there chipped area touches the ITO terminal, over 2/3 of the ITO must remain and be inspected according to electrode terminal specifications. ⊙ If the product will be heat sealed by the customer, the alignment mark must mot be damaged. 7.2.3 Substrate protuberance and internal crack _(see figure)_	2.5

7.2.1 Chip on electrode pad:

y: Chip width	x: Chip length	z: Chip thickness
$y \leqq 0.5mm$	$x \leqq 1/8a$	$0 < z \leqq t$

7.2.2 Non-conductive portion:

y: Chip width	x: Chip length	z: Chip thickness
$y \leqq L$	$x \leqq 1/8a$	$0 < z \leqq t$

7.2.3 Substrate protuberance and internal crack

y: width	x: length
$y \leqq 1/3L$	$X \leqq a$

NO	Item	Criterion	AQL
08	Cracked glass	The LCD with extensive crack is not acceptable.	2.5
09	Backlight elements	9.1 Illumination source flickers when lit. 9.2 Spots or scratches that appear when lit must be judged. Using LCD spot, lines and contamination standards. 9.3 Backlight doesn't light or color is wrong.	2.5 2.5 0.65
10	Bezel	Bezel must comply with product specifications.	2.5
11	PCB、COB	11.1 COB seal may not have pinholes larger than 0.2mm or contamination. 11.2 COB seal surface may not have pinholes through to the IC. 11.3 The height of the COB should not exceed the height indicated in the assembly diagram. 11.4 There may not be more than 2mm of sealant outside the seal area on PCB. And there should be no more than three places. 11.5 Parts on PCB must be the same as on the production characteristic chart, There should be no wrong parts, missing parts or excess parts. 11.6 The jumper on the PCB should conform to the product characteristic chart.	2.5 2.5 2.5 2.5 0.65 0.65
12	FPC	12.1 FPC terminal damage ≦ 1/2 FPC terminal width and can not affect the function , we judge accept. 12.2 FPC alignment hole damage ≦ 1/2 alignment area and can not affect the function , we judge accept.	2.5 2.5
13	Soldering	13.1 No cold solder joints, missing solder connections, oxidation or icicle. 13.2 No short circuits in components on PCB or FPC.	2.5 0.65

NO	Item	Criterion	AQL
14	Touch Panel Chipped glass	Symbols: x: Chip length　　y: Chip width　　z: Chip thickness k: Seal width　　　t: Touch Panel Total thickness　a: LCD side length L: Electrode pad length 14.1 General glass chip: 14.1.1 Chip on panel surface and crack between panels: （see table below） 14.1.2 Corner crack: （see table below）	2.5

14.1.1 Chip on panel surface and crack between panels:

z: Chip thickness	y: Chip width	x: Chip length
$Z \leqq t$	$\leqq 1/2$ k and not over viewing area	$x \leqq 1/8a$

⊙ Unit: mm
⊙ If there are 2 or more chips, x is the total length of each chip

14.1.2 Corner crack:

z: Chip thickness	y: Chip width	x: Chip length
$z \leqq t$	$\leqq 1/2$ k and not over viewing area	$x \leqq 1/8a$

⊙ Unit: mm
⊙ If there are 2 or more chips, x is the total length of each chip

NO	Item	Criterion	AQL
15	Touch Panel(Fish eye、dent and bubble on film)	<table><tr><td>SIZE(mm)</td><td>Acceptable Q'ty</td></tr><tr><td>Φ≦0.2</td><td>Accept no dense</td></tr><tr><td>0.2< D ≦0.4</td><td>5</td></tr><tr><td>0.4< D ≦0.5</td><td>2</td></tr><tr><td>0.5< D</td><td>0</td></tr></table>	2.5
16	Touch Panel Newton ring	Newton ring dimension ≦ 1/2 touch panel area and not affect font and line distortion(≦2.5%) , it is acceptable.	2.5
17	Touch Panel Linearity	Less than 2.5% is acceptable.	2.5
18	LCD Ripple	Touch the touch panel , can not see the LCD ripple. Pen: R 1.0mm silicon rubber. Operation Force: 80g	2.5
19	General appearance	19.1 Pin type must match type in specification sheet. 19.2 LCD pin loose or missing pins. 19.3 Product packaging must the same as specified on packaging specification sheet. 19.4 Product dimension and structure must conform to product specification sheet.	0.65 0.65 0.65 0.65

13. Packing method

------TBD