



APPROVAL SHEET

MODELNO: PV03501TD40B-R

Approval option: Specification

Sample

■ Customer' s Confirmation

Customer :
Approved by:
Date:
Note:

■ Center Confirmed:

Approved	Checked by	Made by



Contents

1	Introduction-----	4
	-	
2	General specification-----	5
3	Mechanical drawing-----	6
4	Absolute maximum ratings-----	7
5	Electrical characteristics-----	7
6	Optical characteristics -----	8
	-	
7	Pin Assignment -----	11
	-	
8	Block diagram -----	13
	-	
9	Timing/Characteristics-----	14
10	LCM reliability-----	16
11	LCM quality -----	18
12	Packing method-----	25
	-	



1. Introduction

1.1 Scope of application

This specification applies to the positive type TFT dot matrix LCD module.

LCD specification: Dots 480xRGBx272.

As to basic specification of the driver IC, refer to the IC (OTA5180A) specification and data sheet.

1.2 Structure:

Double display structure:

TFT Module + FPC +BL+TP

FULL 16.7M Color3.5 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;

IPS Type LCD

480 dot-source and 272 dot-gate outputs;

16.7 M 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	transmissive, Normal white	---
Driver element	a-Si TFT Active matrix	
Number of Dots	480*(RGB)*272	Dots
Pixel Arrangement	RGB Vertical Stripe	
Active Area	77.79 *43.52	mm
Viewing Direction	6 O' CLOCK	
Driver IC	OTA5180A	
Module Size(W*H*T)	86.80x56.50x3.90	mm
Approx. Weight	TBD	g
Back Light	White LED	
System interface	24 BITS RGB interface	



4. ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Min	Max	Unit
Supply voltage for logic	VDD	-0.3	4.0	V
Input voltage for logic	IOVCC	-0.5	V _{DD} +0.3	V
Supply current (One LED)	I _{LED}		30	mA
Operating temperature	T _{OP}	-20	+70	°C
Storage temperature	T _{ST}	-30	+80	°C

5. ELECTRICAL CHARACTERISTICS

Item	Symbol	Min	Typ	Max	Unit	Applicable terminal
Supply voltage for logic	VDD	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	
LED Forward voltage	V _f	3.0	3.2	3.4	V	---
Input backlight current	I _{LED}	-	20	25	mA	With One LED

Backlight driving conditions

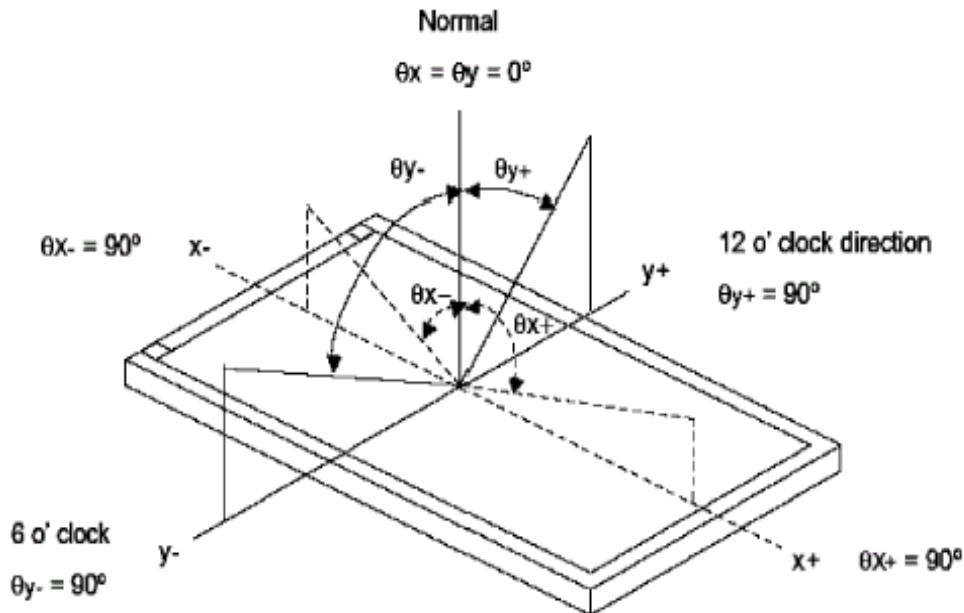
Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
Voltage for LED backlight	V _L	-	19.2	-	V	
Current for LED backlight	I _L	-	20	-	mA	
LED life time	-	30,000	50,000	-	Hr	



6. OPTICAL CHARACTERISTICS

ITEM	SYMBOL	CONDITIONS	SPECIFICATIONS			UNIT	NOTE	
			MIN.	TYP.	MAX			
Brightness	B	Viewing normal angle	-	250	-	Cd/m ²	All left side data are based on LG' s product reference only	
Contrast Ratio	CR					--		
Response Time	Tr+Tf					ms		
Chromaticity Coordinate (Transmissive)	Red		X					
			Y					
	Green		X					
			Y					
	Blue		X					
			Y					
White	X							
	Y							
Viewing Angle	Hor.	θ_{x+}			--	Deg.		
		θ_{x-}			--			
	Ver.	θ_{y+}	Center CR>=10				--	
		θ_{y-}					--	
transmittance	Un			-			%	

Note 1 : Definition of Viewing Angle θ_x and θ_y :

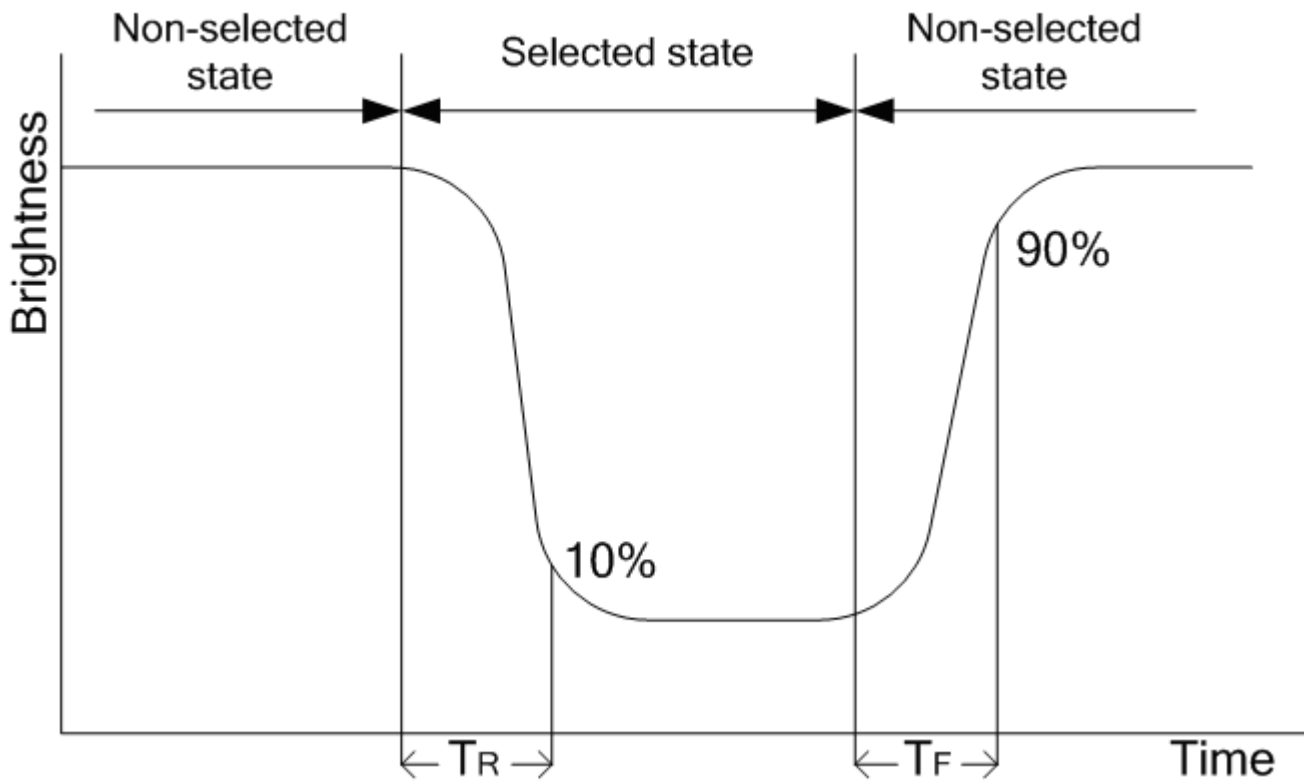




Note 2: Definition of contrast ratio CR:

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

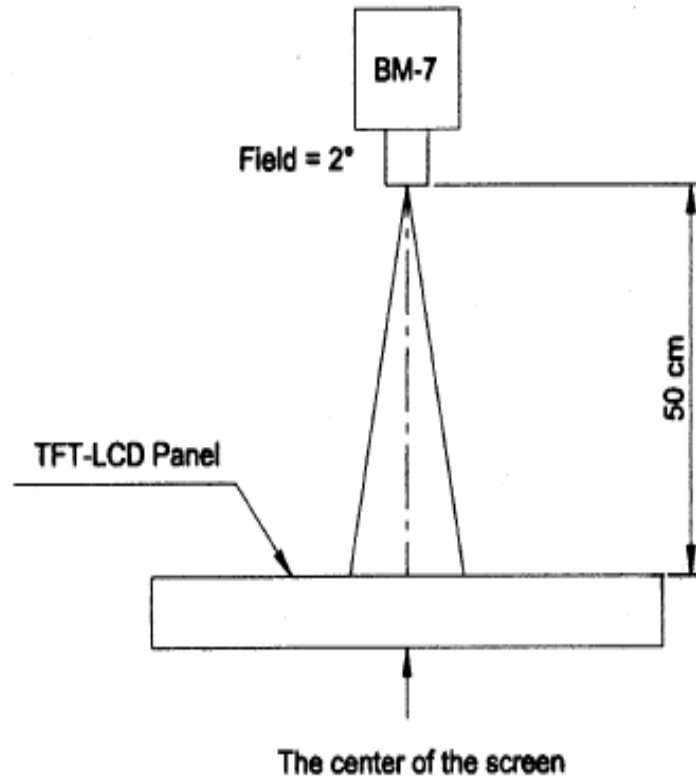
Note 3: Definition of response time (T_R , T_F)



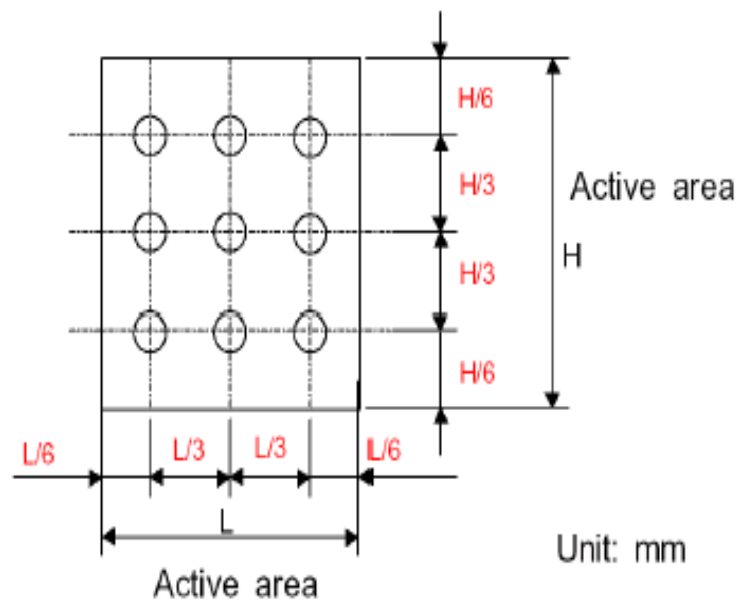


: The brightness test equipment setup

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



Note 4 :





7. Interface Pin Function

. Table 2: Pin assignment

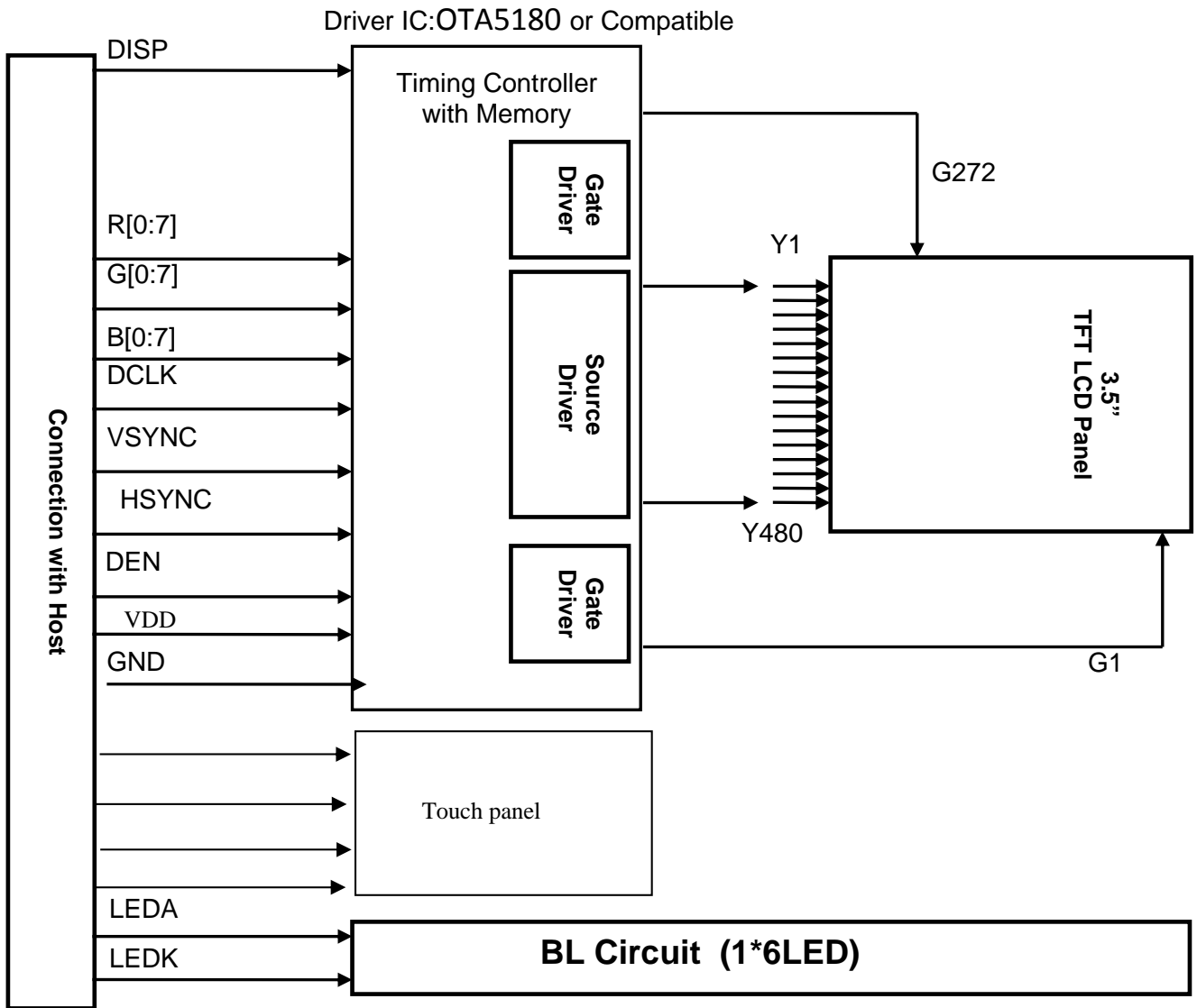
Pin No.	Symbol	Description
1	LED-	Cathode of LED back light
2	LED+	Anode of LED back light
3	GND	Power ground
4	VDD	Power voltage
5	R0	Red data bus
6	R1	Red data bus
7	R2	Red data bus
8	R3	Red data bus
9	R4	Red data bus
10	R5	Red data bus
11	R6	Red data bus
12	R7	Red data bus
13	G0	Green data bus
14	G1	Green data bus
15	G2	Green data bus
16	G3	Green data bus
17	G4	Green data bus
18	G5	Green data bus
19	G6	Green data bus
20	G7	Green data bus
21	B0	Blue data bus
22	B1	Blue data bus
23	B2	Blue data bus
24	B3	Blue data bus
25	B4	Blue data bus
26	B5	Blue data bus
27	B6	Blue data bus
28	B7	Blue data bus
29	GND	Power ground
30	DCLK	Dot clock signal
31	DISP	Display data signal



32	HSYNC	Horizon signal YNC
33	VSYNC	Vertical signal YNC
34	DEN	Data enable signal
35	NC	No connect
36	GND	Power ground
37	XR	TP pin
38	YD	TP pin
39	XL	TP pin
40	YU	TP pin



8. BLOCK DIAGRAM

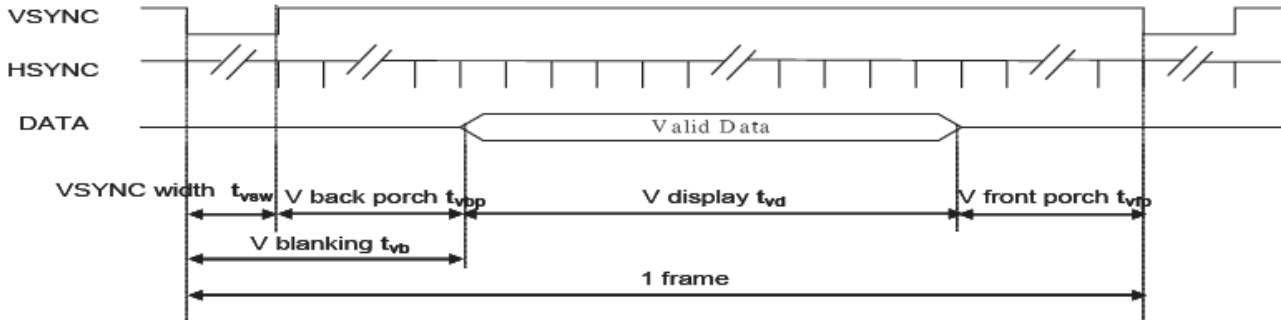




9. Timing/Characteristics

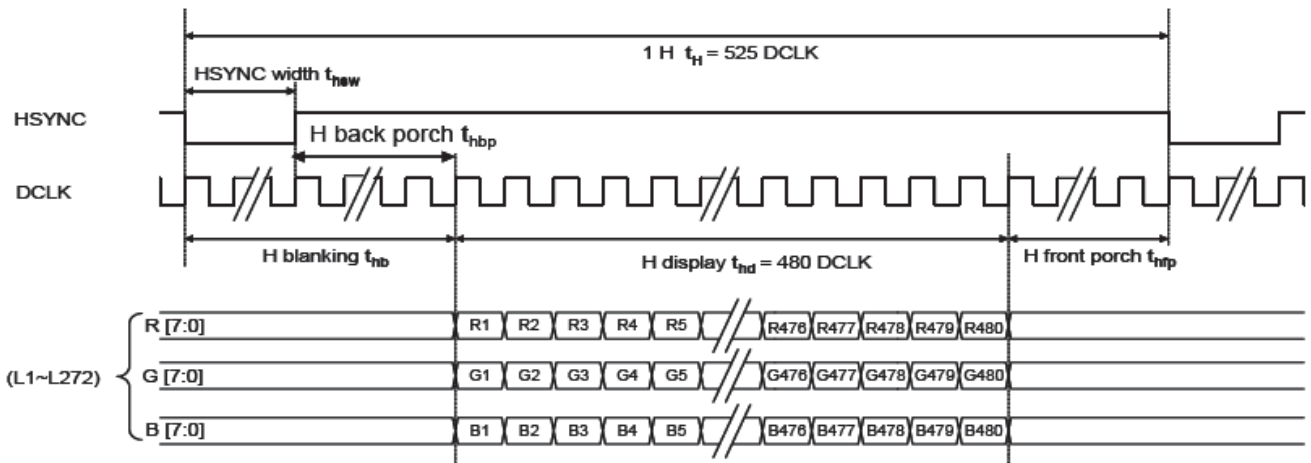
9.1 Vertical timing

Item	Min.	Typ.	Max.	Unit
V display t_{VD}		272		H
V blanking t_{VB}		12		
V front porch t_{VFP}		3		
VSYNC width t_{VSW}		10		
1 frame		287		



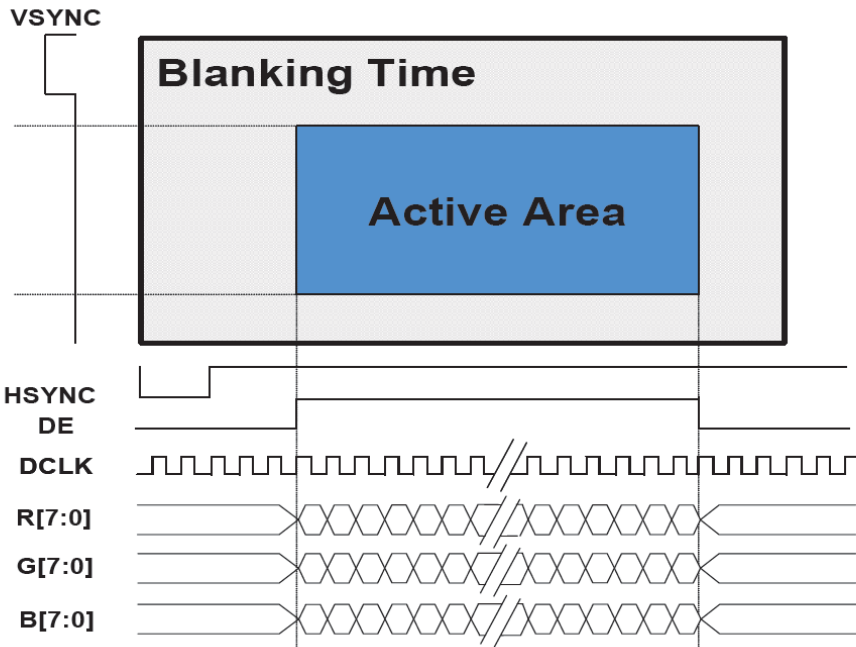
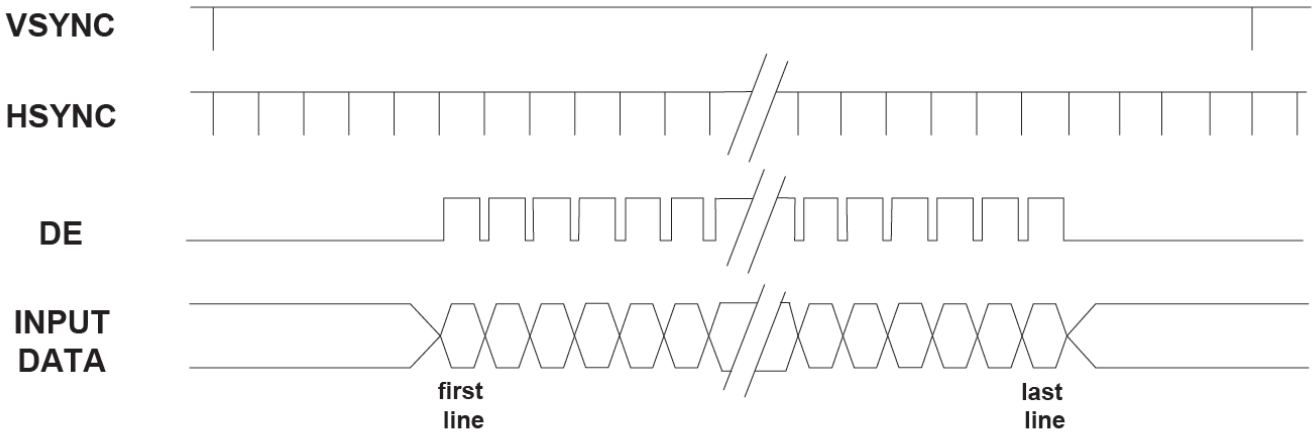
9.2 Vertical timing

640x240 mode	Min	Min	Max	UNIT
H display t_{HD}		480		DCLK
1 H t_H		576		
H blanking t_{HB} (*)		88		
H front porch t_{HFP}		8		
HSYNC width t_{HSW}		41		
Frequency		9.0		MHz





9.3 SYNC-DE MODE





10. Standard Specification for Reliability :

10-1. Standard Specifications for Reliability of LCD Module

No	Item	Description
01	High temperature operation	The sample should be allowed to stand at 70 °C for 240 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 °C for 240 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 °C 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 °C 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 °C, 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 °C for 30 minutes → normal temperature for 5 minutes → +80 °C 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/330 Ω 5 times
		Contact: ±2KV 150pF/330 Ω 5 time

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



10 - 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.

10- 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 ($25 \pm 5^{\circ}\text{C}$), normal humidity ($50 \pm 10\% \text{ RH}$), and in area not exposed to direct sun light.
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11. Specification of Quality Assurance:

11-1. Purpose

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

11-2. 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

11-3. 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.

11-4. 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.



11-5. Standard of The Product Appearance Test

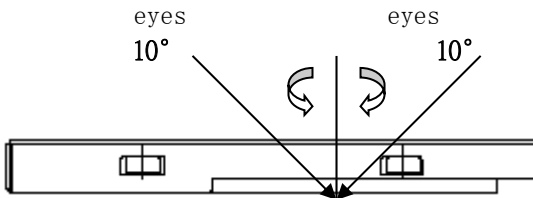
a. Manner of appearance test:

(i) The test must be under 20W × 2 or 40W fluorescent light, and the distance of view must be at 30±5cm.

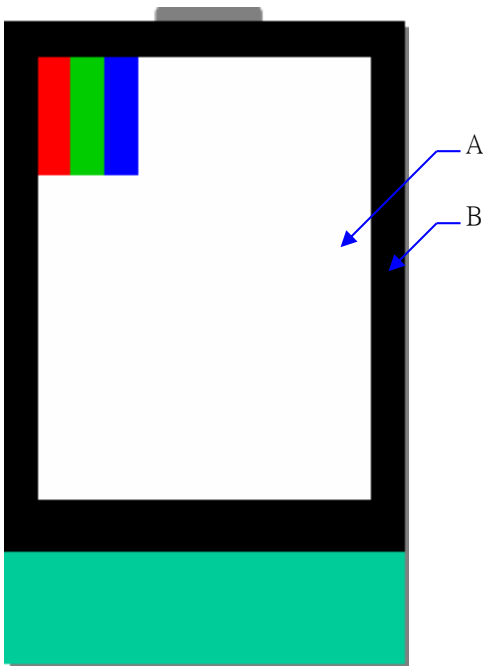
(ii) When test the model of transmissive product must add the reflective plate.

(iii) The test direction is base on around 10° of vertical line.

(iiii) Temperature: 25±5°C 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.

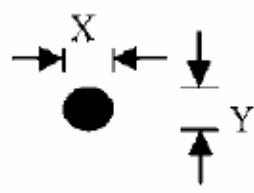
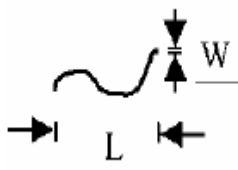
(ii) The sample of the lowest acceptable quality level must be discussed by both supplier and customer when any dispute happened.

(iii) Must add new item on time when it is necessary.

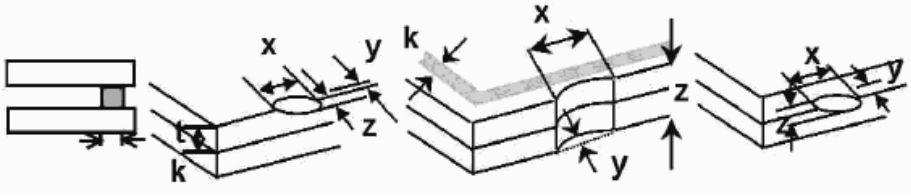
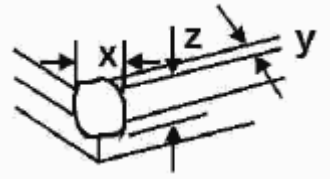
c. Standard of inspection: (Unit: mm)



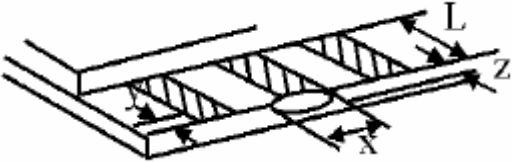
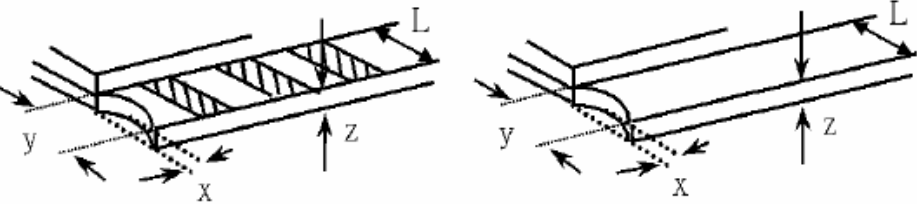
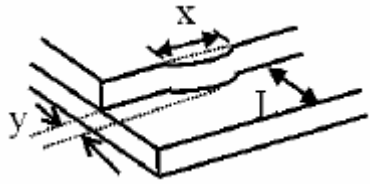
11-6. Inspection specification

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 $\leq 0.25\text{mm}$, 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 $\Phi = (X+Y) / 2$  <table border="1" data-bbox="750 1097 1284 1310"> <thead> <tr> <th>Size(mm)</th> <th>Acceptable Q' ty</th> </tr> </thead> <tbody> <tr> <td>$\Phi \leq 0.10$</td> <td>Accept no dense</td> </tr> <tr> <td>$0.10 < \Phi \leq 0.20$</td> <td>2</td> </tr> <tr> <td>$0.20 < \Phi \leq 0.25$</td> <td>2</td> </tr> <tr> <td>$0.25 < \Phi \leq 0.30$</td> <td>1</td> </tr> <tr> <td>$0.30 < \Phi$</td> <td>0</td> </tr> </tbody> </table> <p style="text-align: center;">* Densely spaced: No more than two spots within 3mm.</p>	Size(mm)	Acceptable Q' ty	$\Phi \leq 0.10$	Accept no dense	$0.10 < \Phi \leq 0.20$	2	$0.20 < \Phi \leq 0.25$	2	$0.25 < \Phi \leq 0.30$	1	$0.30 < \Phi$	0	2.5
		Size(mm)	Acceptable Q' ty												
$\Phi \leq 0.10$	Accept no dense														
$0.10 < \Phi \leq 0.20$	2														
$0.20 < \Phi \leq 0.25$	2														
$0.25 < \Phi \leq 0.30$	1														
$0.30 < \Phi$	0														
3.2 Line type: (As following drawing)  <table border="1" data-bbox="654 1444 1284 1668"> <thead> <tr> <th>Length(m)</th> <th>Width(mm)</th> <th>Acceptable Q' ty</th> </tr> </thead> <tbody> <tr> <td>---</td> <td>$W \leq 0.02$</td> <td>Accept no dense</td> </tr> <tr> <td>$L \leq 3.0$</td> <td>$0.02 < W \leq 0.05$</td> <td rowspan="2">2</td> </tr> <tr> <td>$L \leq 2.5$</td> <td>$0.03 < W \leq 0.08$</td> </tr> <tr> <td>---</td> <td>$0.08 < W$</td> <td>Rejection</td> </tr> </tbody> </table> <p style="text-align: center;">* Densely spaced: No more than two lines within 3mm.</p>	Length(m)	Width(mm)	Acceptable Q' ty	---	$W \leq 0.02$	Accept no dense	$L \leq 3.0$	$0.02 < W \leq 0.05$	2	$L \leq 2.5$	$0.03 < W \leq 0.08$	---	$0.08 < W$	Rejection	2.5
Length(m)	Width(mm)	Acceptable Q' ty													
---	$W \leq 0.02$	Accept no dense													
$L \leq 3.0$	$0.02 < W \leq 0.05$	2													
$L \leq 2.5$	$0.03 < W \leq 0.08$														
---	$0.08 < W$	Rejection													



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 <table border="1" data-bbox="826 309 1321 521"> <thead> <tr> <th>Size Φ (mm)</th> <th>Acceptable Q' ty</th> </tr> </thead> <tbody> <tr> <td>$\Phi \leq 0.20$</td> <td>Accept no dense</td> </tr> <tr> <td>$0.20 < \Phi \leq 0.50$</td> <td>3</td> </tr> <tr> <td>$0.50 < \Phi \leq 1.00$</td> <td>2</td> </tr> <tr> <td>$1.00 < \Phi$</td> <td>0</td> </tr> <tr> <td>Total Q' ty</td> <td>3</td> </tr> </tbody> </table>	Size Φ (mm)	Acceptable Q' ty	$\Phi \leq 0.20$	Accept no dense	$0.20 < \Phi \leq 0.50$	3	$0.50 < \Phi \leq 1.00$	2	$1.00 < \Phi$	0	Total Q' ty	3	2.5						
Size Φ (mm)	Acceptable Q' ty																				
$\Phi \leq 0.20$	Accept no dense																				
$0.20 < \Phi \leq 0.50$	3																				
$0.50 < \Phi \leq 1.00$	2																				
$1.00 < \Phi$	0																				
Total Q' ty	3																				
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:  <table border="1" data-bbox="336 1025 1155 1137"> <thead> <tr> <th>z: Chip thickness</th> <th>y: Chip width</th> <th>x: Chip length</th> </tr> </thead> <tbody> <tr> <td>$Z \leq 1/2t$</td> <td>Not over viewing area</td> <td>$x \leq 1/8a$</td> </tr> <tr> <td>$1/2t < z \leq 2t$</td> <td>Not exceed 1/3k</td> <td>$x \leq 1/8a$</td> </tr> </tbody> </table> <ul style="list-style-type: none"> ⊙ Unit: mm ⊙ If there are 2 or more chips, x is the total length of each chip 6.1.2 Corner crack:  <table border="1" data-bbox="336 1518 1155 1630"> <thead> <tr> <th>z: Chip thickness</th> <th>y: Chip width</th> <th>x: Chip length</th> </tr> </thead> <tbody> <tr> <td>$Z \leq 1/2t$</td> <td>Not over viewing area</td> <td>$x \leq 1/8a$</td> </tr> <tr> <td>$1/2t < z \leq 2t$</td> <td>Not exceed 1/3k</td> <td>$x \leq 1/8a$</td> </tr> </tbody> </table> <ul style="list-style-type: none"> ⊙ Unit: mm ⊙ If there are 2 or more chips, x is the total length of each chip 	z: Chip thickness	y: Chip width	x: Chip length	$Z \leq 1/2t$	Not over viewing area	$x \leq 1/8a$	$1/2t < z \leq 2t$	Not exceed 1/3k	$x \leq 1/8a$	z: Chip thickness	y: Chip width	x: Chip length	$Z \leq 1/2t$	Not over viewing area	$x \leq 1/8a$	$1/2t < z \leq 2t$	Not exceed 1/3k	$x \leq 1/8a$	2.5
z: Chip thickness	y: Chip width	x: Chip length																			
$Z \leq 1/2t$	Not over viewing area	$x \leq 1/8a$																			
$1/2t < z \leq 2t$	Not exceed 1/3k	$x \leq 1/8a$																			
z: Chip thickness	y: Chip width	x: Chip length																			
$Z \leq 1/2t$	Not over viewing area	$x \leq 1/8a$																			
$1/2t < z \leq 2t$	Not exceed 1/3k	$x \leq 1/8a$																			

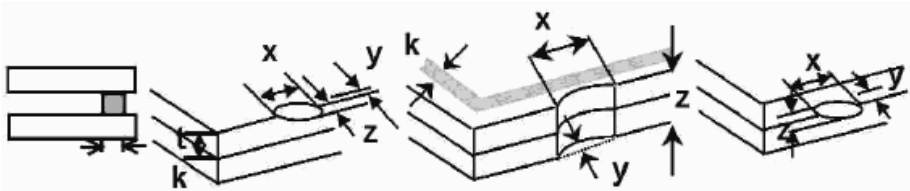
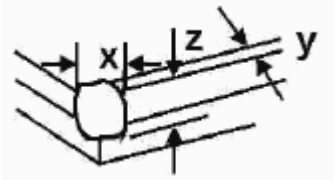


NO	Item	Criterion	AQL																
07	Glass crack	<p>Symbols: x: Chip length y: Chip width z: Chip thickness k: Seal width t: Glass thickness a: LCD side length L: Electrode pad length</p> <p>7.2 Protrusion over terminal: 7.2.1 Chip on electrode pad:</p>  <table border="1" data-bbox="497 685 1185 842"> <tr> <td>y: Chip width</td> <td>x: Chip length</td> <td>z: Chip thickness</td> </tr> <tr> <td>$y \leq 0.5\text{mm}$</td> <td>$x \leq 1/8a$</td> <td>$0 < z \leq t$</td> </tr> </table> <p>7.2.2 Non-portion:</p>  <table border="1" data-bbox="497 1182 1185 1339"> <tr> <td>y: Chip width</td> <td>x: Chip length</td> <td>z: Chip thickness</td> </tr> <tr> <td>$y \leq L$</td> <td>$x \leq 1/8a$</td> <td>$0 < z \leq t$</td> </tr> </table> <p>conductive</p> <p>⊙ 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 not be damaged.</p> <p>7.2.3 Substrate protuberance and internal crack</p>  <table border="1" data-bbox="798 1590 1236 1747"> <tr> <td>y: width</td> <td>x: length</td> </tr> <tr> <td>$y \leq 1/3L$</td> <td>$X \leq a$</td> </tr> </table>	y: Chip width	x: Chip length	z: Chip thickness	$y \leq 0.5\text{mm}$	$x \leq 1/8a$	$0 < z \leq t$	y: Chip width	x: Chip length	z: Chip thickness	$y \leq L$	$x \leq 1/8a$	$0 < z \leq t$	y: width	x: length	$y \leq 1/3L$	$X \leq a$	2.5
y: Chip width	x: Chip length	z: Chip thickness																	
$y \leq 0.5\text{mm}$	$x \leq 1/8a$	$0 < z \leq t$																	
y: Chip width	x: Chip length	z: Chip thickness																	
$y \leq L$	$x \leq 1/8a$	$0 < z \leq t$																	
y: width	x: length																		
$y \leq 1/3L$	$X \leq a$																		

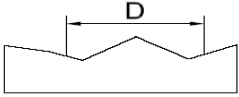
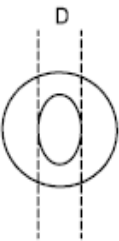


NO	Item	Criterion	AQL
08	Cracked glass	The LCD with extensive crack is not acceptable.	2.5
09	Backlight elements	9.1 Illumination source flickers when lit. 9.2 Spots or scratches that appear when lit must be judged. Using LCD spot, lines and contamination standards. 9.3 Backlight doesn't light or color 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 \leq 1/2 FPC terminal width and can not affect the function , we judge accept. 12.2 FPC alignment hole damage \leq 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	<p>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</p> <p>14.1 General glass chip: 14.1.1 Chip on panel surface and crack between panels:</p>  <table border="1" data-bbox="359 761 1177 974"> <tr> <td>z: Chip thickness</td> <td>y: Chip width</td> <td>x: Chip length</td> </tr> <tr> <td>$z \leq t$</td> <td>$\leq 1/2 k$ and not over viewing area</td> <td>$x \leq 1/8a$</td> </tr> </table> <p>⊙ Unit: mm ⊙ If there are 2 or more chips, x is the total length of each chip</p> <p>14.1.2 Corner crack:</p>  <table border="1" data-bbox="359 1321 1177 1534"> <tr> <td>z: Chip thickness</td> <td>y: Chip width</td> <td>x: Chip length</td> </tr> <tr> <td>$z \leq t$</td> <td>$\leq 1/2 k$ and not over viewing area</td> <td>$x \leq 1/8a$</td> </tr> </table> <p>⊙ Unit: mm ⊙ If there are 2 or more chips, x is the total length of each chip</p>	z: Chip thickness	y: Chip width	x: Chip length	$z \leq t$	$\leq 1/2 k$ and not over viewing area	$x \leq 1/8a$	z: Chip thickness	y: Chip width	x: Chip length	$z \leq t$	$\leq 1/2 k$ and not over viewing area	$x \leq 1/8a$	2.5
z: Chip thickness	y: Chip width	x: Chip length													
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z: Chip thickness	y: Chip width	x: Chip length													
$z \leq t$	$\leq 1/2 k$ and not over viewing area	$x \leq 1/8a$													



NO	Item	Criterion	AQL										
15	Touch Panel (Fish eye, dent and bubble on film)	<table border="1" data-bbox="400 282 927 465"> <thead> <tr> <th>SIZE (mm)</th> <th>Acceptable Q' ty</th> </tr> </thead> <tbody> <tr> <td>$\Phi \leq 0.2$</td> <td>Accept no dense</td> </tr> <tr> <td>$0.2 < D \leq 0.4$</td> <td>5</td> </tr> <tr> <td>$0.4 < D \leq 0.5$</td> <td>2</td> </tr> <tr> <td>$0.5 < D$</td> <td>0</td> </tr> </tbody> </table>  	SIZE (mm)	Acceptable Q' ty	$\Phi \leq 0.2$	Accept no dense	$0.2 < D \leq 0.4$	5	$0.4 < D \leq 0.5$	2	$0.5 < D$	0	2.5
SIZE (mm)	Acceptable Q' ty												
$\Phi \leq 0.2$	Accept no dense												
$0.2 < D \leq 0.4$	5												
$0.4 < D \leq 0.5$	2												
$0.5 < D$	0												
16	Touch Panel Newton ring	Newton ring dimension $\leq 1/2$ touch panel area and not affect font and line distortion ($\leq 2.5\%$), 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										

12. Packing method

-----TBD