

SPECIFICATION

LCD MODULE

YT50F51J0

Revision: A















REVISION RECORD

DESIGN	CHECK	REVIEW
VERSION	DATE	CONTENTS
A	2012-05-04	First Release

CUSTOMER

Customer company:	Date:
Customer signature:	Date:

CONTENTS

-  **GENERAL INFORMATION**
-  **ABSOLUTE MAXIMUM RATINGS**
-  **ELECTRICAL CHARACTERISTICS**
-  **TIMING OF POWER SUPPLY**
-  **BACKLIGHT CHARACTERISTICS**
-  **EXTERNAL DIMENSIONS**
-  **INTERFACE SIGNALS**
-  **APPLICATION CIRCUIT**
-  **INITIAL CODE**
-  **ELECTRO-OPTICAL CHARACTERISTICS**
-  **RELIABILITY TEST**
-  **QUALITY LEVEL**
-  **PACKAGING DRAWING**
-  **PRECAUTINGS FOR USE OF LCD MODULES**

GENERAL INFORMATION

Item	Contents	Unit
Driver element	IPS active matrix	--
Optimum Viewing angle	Normally Black	--
Active area (W×H)	56.16*93.6	mm
Number of Dots	480RGB*800	Pixel
Driver IC	HX8369-A	--
Colors	16.7M	--
Weight	31.2	g
Backlight Type	LED	--
Interface Type	MIPI	--
Pixel Pitch	0.117*0.117mm	mm
Power consumption	520	mw

ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Min	Max	Unit
I/O and interface power supply	VDD1	-0.3	3.6	V
Analog power supply	VDD2	-0.3	5.5	V
Logic power supply and DSI power supply	VDD3	-0.3	3.6	V
Operating temperature	Top	-20	70	°C
Storage temperature	TST	-30	80	°C
Humidity	RH	-	90%(Max60°C)	RH

ELECTRICAL CHARACTERISTICS

DC CHARACTERISTICS

Parameter	Symbol	Min	Typ	Max	Unit
Supply voltage for logic	VDD3	2.3	2.8	4.8	V
Supply voltage for analog	VDD2	2.3	2.8	4.8	V
Supply voltage for interface I/O	VDD1	1.65	1.8	3.3	V
Input Current (Test Condition: IOVCC=1.8V,VCC=VCI=2.8V, 320 line drive, fFLM=60Hz, Ta=25°C,)	Idd	—	TBD	TBD	mA
Input voltage 'H' level	VIH	0.7*IOVcc	—	IOVcc	V
Input voltage 'L' level	VIL	0.0	—	0.3*IOVcc	V
Output voltage 'H' level	VOH	0.8*IOVcc	—	IOVcc	V
Output voltage 'L' level	VOL	0.0	—	0.2*IOVcc	V

TIMING OF POWER SUPPLY

PLEASE REFER TO THE DRIVER IC SPECIFICATION.

BACKLIGHT CHARACTERISTICS

Item	Symbol	Min	Typ	Max	Unit	Condition
Forward voltage	Vf	24	25.6	27.2	V	If=20 mA
Luminance	Lv	4800	5200	—	cd/m²	
Number of LED	—	8			Piece	—
Connection mode	p	Series			—	—

EXTERNAL DIMENSIONS

The drawing includes a front view (top) and a side view (bottom) of the LCD module. The front view shows a rectangular display area with dimensions: 104.25±0.15 (total width), 100.85 (LCD width), and 93.60 (LCD AA width). The display area is labeled 'IPS 4.3" inch 480 RGB*800 DOTS Free View'. The side view shows the module's profile with dimensions: 12.53 (display height), 36.00 (display width), 61.06±0.15 (total height), 59.16 (LCD height), and 46.16 (LCD AA height). The module is labeled 'FPC 弯折参考图' (FPC Bending Reference Diagram).

Pinout Table:

Pin No.	Pin Name
1	GND
2	LEDK
3	LEDA
4	LCD_ID
5	GND
6	VDD2
7	GND
8	VDD1
9	GND
10	LEDPWM
11	GND
12	TE
13	GND
14	RESET
15	GND
16	DSI_DON
17	DSI_DOP
18	GND
19	DSI_DIN
20	DSI_DIP
21	GND
22	DSI_CLKN
23	DSI_CLKP
24	GND
25	VDD3

Notes:

1. DISPLAY TYPE: MAIN LCD 4.3" 480(DON)*800 IPS Transmissive
2. OPERATING TEMP: -20° C~70° C STORAGE TEMP: -30° C~80° C
3. MAIN LCD DRIVER IC: HX8369-A01
4. OPTIMUM VIEWING ANGLE: ALL
5. BACKLIGHT: 80HP WHITE LED(20mA/LED);
6. LUMINANCE: 300cd/cm² (MIN) 400cd/cm² (typ) Chromaticity (x=0.31±0.03, y=0.31±0.03)
7. Contrast ratio: 700/1, NTSC: 72%, Viewing angle range: 80/80/80.
8. GENERAL TOLERANCE: ±0.2
9. MARK** IS THE IMPORTANT DIMENSION, MARK△ IS THE CHANGEABLE DIMENSION
10. REES COMPLIANT

Interface Signals

Pin No.	Symbol	Level	Description
1	GND	Power supply	Ground.
2	LED-	LED driver	LED CATHODE
3	LED+	LED driver	LED ANODE
4	LCD_ID	Power supply	ID PIN
5	GND	Power supply	Ground.
6	VDD2	Power supply	A power supply for the analog power. VDD2=2.3 to 4.8V VDD2 input level should be same as VDD3 input level to avoid the level-mismatching at internal level shifter circuit.TYPE:2.8V
7	GND	Power supply	Ground.
8	VDD1	Power supply	A power supply for the I/O circuit. VDD1=1.65 to 3.3V. TYPE:1.8V
9	GND	Power supply	Ground.
10	LEDPWM	O	Backlight on/off control pin. If use CABC function, the pin can connect to external LED driver IC. The output voltage range=0 to VDD1.
11	GND	Power supply	Ground.
12	TE	O	Serves TE (Tearing Effect) pin on MPU interface.
13	GND	Power supply	Ground.
14	RESET	I host processor	Reset pin. Setting either pin low initializes the LSI. Must be reset after power is supplied (Must be connected to GND or VDD1).
15	GND	Power supply	Ground.
16	DSI_D0N	I/O	MIPI-DSI interface: MIPI-DSI Data differential signal input pins. (Data lane 0)
17	DSI_D0P		
18	GND	Power supply	Ground.
19	DSI_D1N	I/O	MIPI-DSI interface:MIPI-DSI Data differential signal input pins. (Data lane 1) MDDI interface: High Speed Interface Data differential signal input pins. (Data lane 0) Connect to a terminal resistance (100) between MDDI_D0P and MDDI_D0N.
20	DSI_D1P		
21	GND	Power supply	Ground.
22	DSI_CLKN	I	MIPI-DSI interface:MIPI-DSI CLOCK differential signal input pins.
23	DSI_CLKP		
24	GND	Power supply	Ground.
25	VDD3	Power supply	A power supply for the logic power, DC/DC converter VDD3=2.3 to 4.8V. TYPE:2.8V

APPLICATION CIRCUIT

Please consult our technical department for detail information.

ELECTRO-OPTICAL CHARACTERISTICS

Item		Symbol	Condition	Min	Typ	Max	Unit	Remark	Note
Response time		Tr+Tf	$\theta = 0^{\circ}$ $\phi = 0^{\circ}$ Ta=25℃	—	25	30	ms	FIG 1.	4
Contrast ratio		Cr		500	700	—	—	FIG 2.	1
Luminance uniformity		δ WHITE		80	85	—	%	FIG 2.	3
Surface Luminance		Lv		350	400	—	cd/m²	FIG 2.	2
NTSC		Gamut		TBD	72		%	FIG 2.	8
Viewing angle (CR≥10)		θ	$\phi = 90^{\circ}$	80	—	—	deg	FIG 3.	6
			$\phi = 270^{\circ}$	80	—	—	deg	FIG 3.	
			$\phi = 0^{\circ}$	80	—	—	deg	FIG 3.	
			$\phi = 180^{\circ}$	80	—	—	deg	FIG 3.	
CIE(x, y) chromaticity	Red	x	$\theta = 0^{\circ}$ $\phi = 0^{\circ}$ Ta=25℃	0. 630	0. 660	0. 690	FIG 2.	5, 8	
		y		0. 290	0. 320	0. 350			
	Green	x		0. 259	0. 289	0. 319			
		y		0. 558	0. 588	0. 618			
	Blue	x		0. 108	0. 138	0. 168			
		y		0. 051	0. 081	0. 111			
	White	x		0. 281	0. 311	0. 341			
		y		0. 299	0. 329	0. 359			

Note 1. Contrast Ratio(CR) is defined mathematically as For more information see FIG 2.:

$$\text{Contrast Ratio} = \frac{\text{Average Surface Luminance with all white pixels (Y1~Y9)}}{\text{Average Surface Luminance with all black pixels (Y1~Y9)}}$$

Note 2. Surface luminance is the LCD surface from the surface with all pixels displaying white. For more information see FIG 2.

Lv = **Average** Surface Luminance with all white pixels (**Y1~Y9**)

Note 3. The uniformity in surface luminance, δ WHITE is determined by measuring luminance at each test position 1 through 9, and then dividing the maximum luminance of 9 points luminance by minimum luminance of 9 points luminance. For more information see FIG 2.

$$\delta \text{ WHITE} = \frac{\text{Minimum Surface Luminance with all white pixels (Y1~Y9)}}{\text{Maximum Surface Luminance with all white pixels (Y1~Y9)}}$$

Note 4. 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 1. The test equipment is Autronic-Melchers' s ConoScope. series

Note 5. CIE (x, y) chromaticity, The x,y value is determined by measuring luminance at each test position 1 through 9, and then make average value.

Note 6. 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. 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, CIE The test data is base on TOPCON's BM-7A photo detector.

Note8. Udata depends on BL test result.

FIG. 1 The definition of Response Time

The response time is defined as the following figure and shall be measured by switching the input signal for "black" and "white".

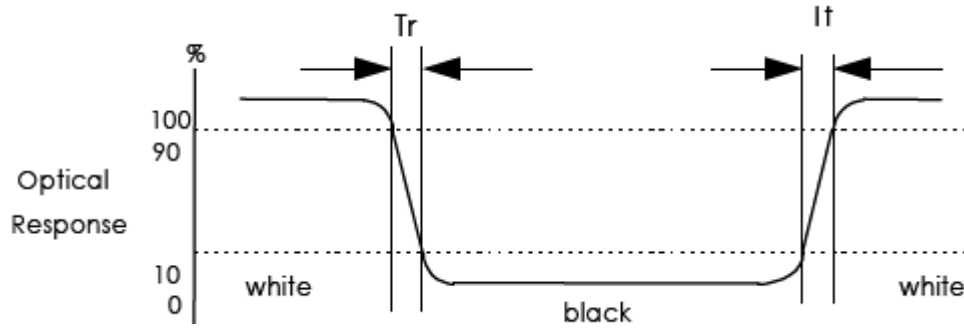
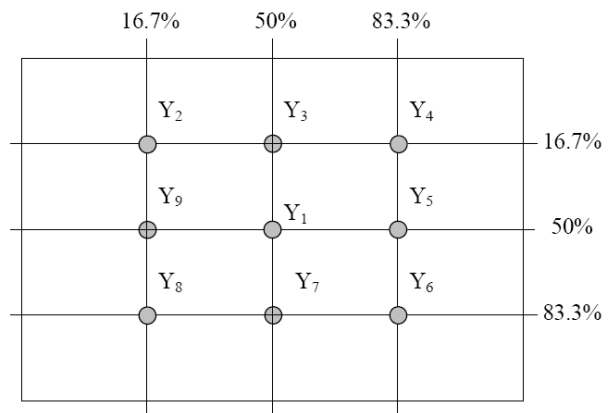


FIG. 2 Measuring method for Contrast ratio, surface luminance, Luminance uniformity , CIE (x, y) chromaticity



A : 5 mm

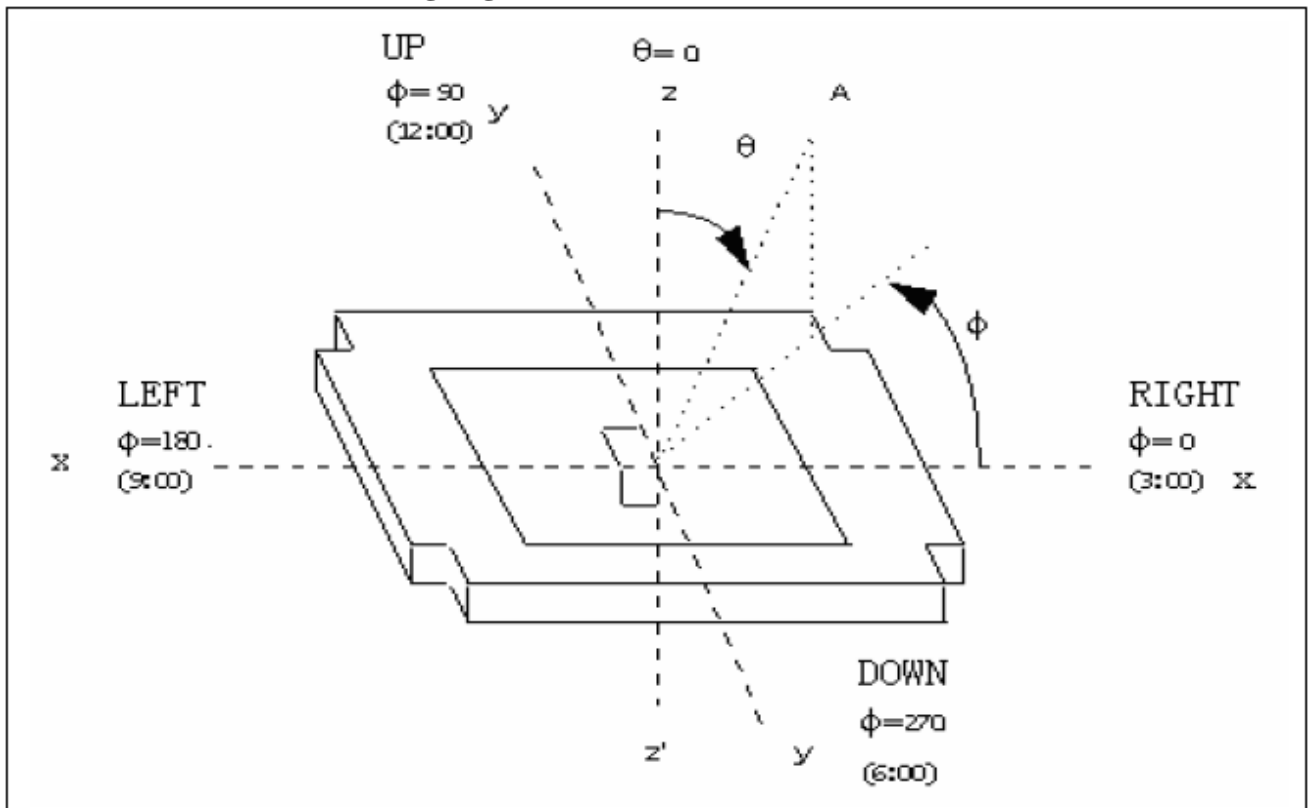
B : 5 mm

H,V : Active Area

Light spot size $\varnothing=5\text{mm}$, 350mm distance from the LCD surface to detector lens

measurement instrument is TOPCON' s luminance meter BM-7A

FIG. 3 The definition of viewing angle



RELIABILITY TEST

Reliability test conditions (Polarizer characteristics null)

NO.	Test Item	Test Conditions	Remarks
1	Low Temperature Storage	-30℃±3℃ for 240 hours	Module (Without Contamination)
2	Low Temperature Operation	-20℃±3℃ for 240 hours	
3	High Temperature Storage	+80℃±3℃ for 240 hours	
4	High Temperature Operation	+70℃±3℃ for 240 hours	
5	Thermal Shock	-30℃/0.5h ~ +70℃/0.5h for a total 100 cycles, Start with cold temp and end with high temp	
6	Vibration	Frequency range:10~55Hz Stoke:1.5mm Sweep:10Hz~55Hz~10Hz 2 hours for each direction of X. Y. Z. (6 hours for total)	
7	Operate at High Temperature and Humidity	+60℃±3℃, 90%±3%RH max. for 240 hours	
8	Electro Static Discharge	V: (±2KV~±8KV) R: 330 Ω C: 150PF Air discharge: 10 time V: (±2KV~±4KV) R: 330 Ω C: 150PF Contact discharge : 10 time	
9	Mechanical Shock	100G 6ms, ±X, ±Y, ±Z 3 times for each direction	
10	Package Drop Test	Height :72cm(Weight≤10kg); 60cm(Weight>10kg) 1 corner, 3 edges, 6 surfaces	
11	Package Vibration Test	Random Vibration : 0.015G ² /Hz from 5-200Hz, -6dB/Octave from 200-500Hz 2 hour for each direction of X. Y. Z. (6 hours for total)	

※ 1) No.1~ No.11 : No guarantee for panel, only for module with the above test conditions.

Result Evaluation Criteria

LCM should be at room temperature for 2 hours when the display quality test is over. There should be no particular change which might affect the practical display function and the display quality test should be conducted under normal operating condition.

Quality level

Outgoing Quality Standard.

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:

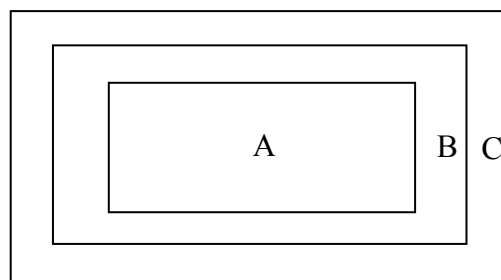
Major defect: AQL 0.65

Minor defect: AQL 1.5

2. Inspection condition

Viewing distance for cosmetic inspection is about 30cm with bare eyes, and under an environment of 20~40W light intensity, all directions for inspecting the sample should be within 45° against perpendicular line.

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.

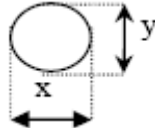
Note: As a general rule, visual defects in Zone C are permissible, when it is no trouble for quality and assembly of customer's product.

4.Standards of inspection items

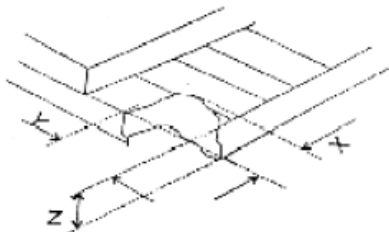
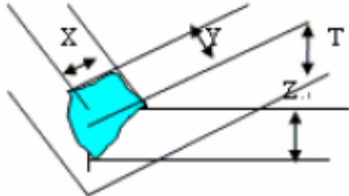
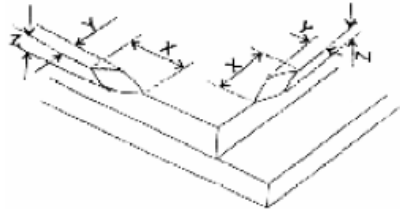
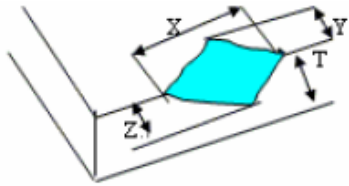
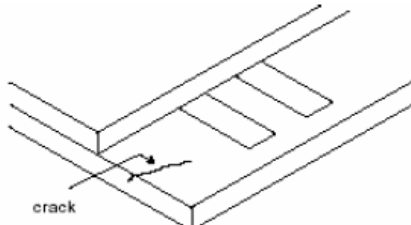
4.1Major Defect

Item No	Items to be inspected	Inspection Standard	Classification of defects
4.1.1	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.	Major
4.1.2	Missing	Missing component	
4.1.3	Outline dimension	Overall outline dimension beyond the drawing is not allowed.	
4.1.4	linearity	No more than 1.5%	

4.2 Cosmetic Defect

Item No	Items to be inspected	Inspection Standard			Classification of defects	
4.21	Clear Spots Black and white Spot defect Pinhole, Foreign Particle, polarizer Dirt	For dark/white spot, size Φ is defined as $\Phi = \frac{(x + y)}{2}$			Minor	
		1				
		<div>Zone Size(mm)</div>	Acceptable Qty			
			A	B		C
		$\Phi \leq 0.15$	Ignore			Ignore
		$0.15 < \Phi \leq 0.20$	2			
		$0.20 < \Phi \leq 0.30$	1			
		$\Phi > 0.30$	0			
	Clear Spots TP Dirt	2			Minor	
		<div>Zone Size(mm)</div>	Acceptable Qty			
			A	B		C
		$\Phi \leq 0.15$	Ignore			Ignore
		$0.15 < \Phi \leq 0.20$	2			
		$0.20 < \Phi \leq 0.30$	1			
		$\Phi > 0.30$	0			
	Dim Spots Circle shaped and dim edged defects	3			Minor	
		<div>Zone Size(mm)</div>	Acceptable Qty			
			A	B		C
		$\Phi \leq 0.2$	Ignore			Ignore
		$0.20 < \Phi \leq 0.40$	2			
		$0.40 < \Phi \leq 0.60$	1			
		$\Phi > 0.60$	0			

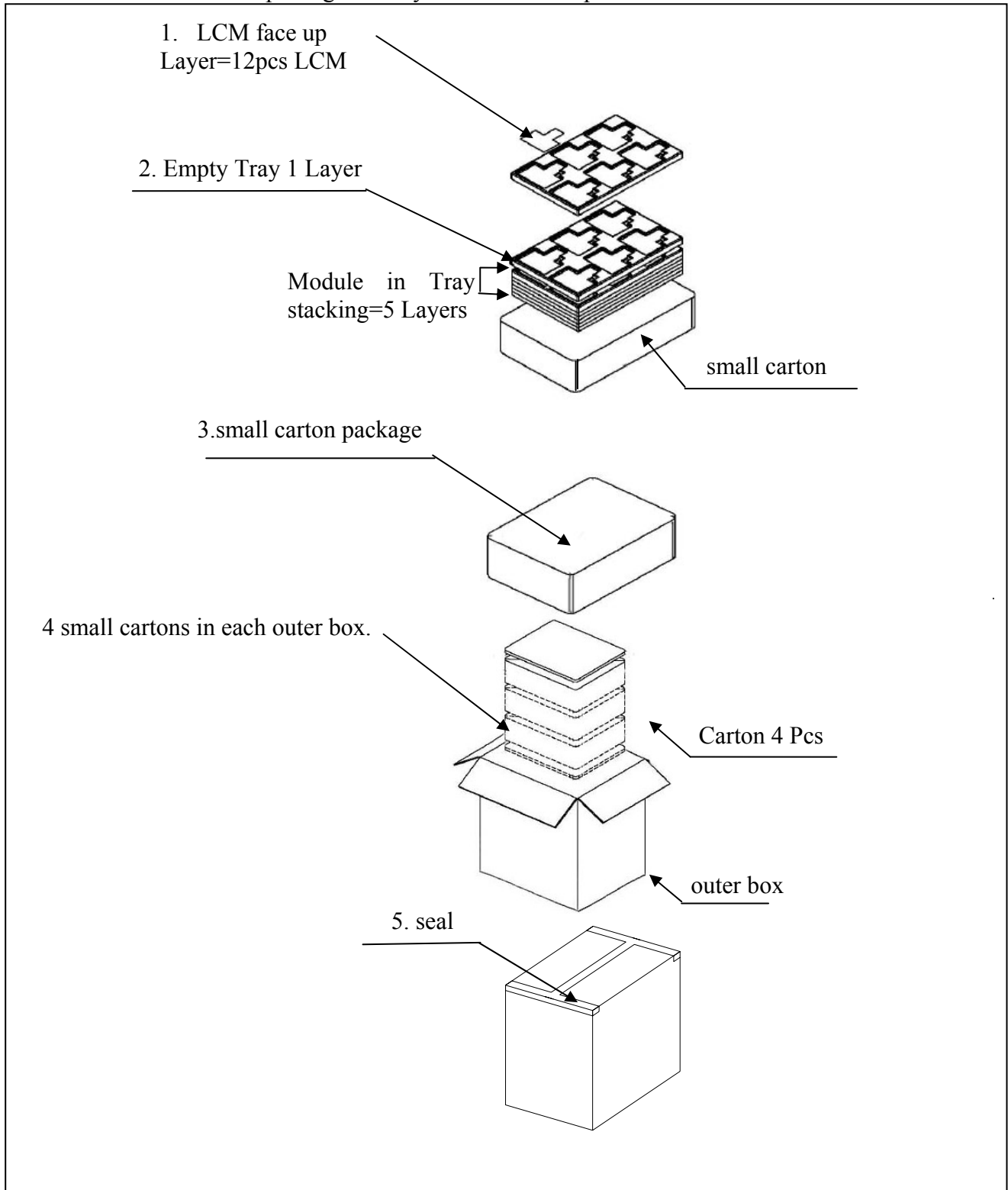
Item No	Items to be inspected	Inspection Standard					Classification of defects
4.2.2	Line defect Black line, White line, Foreign material on polarizer	Size(mm)		Acceptable Qty			Minor
		L (Length)	W (Width)	Zone			
				A	B	C	
		Ignore	$W \leq 0.01$	Ignore		Ignore	
		$L \leq 3.0$	$0.01 < W \leq 0.03$	2			
		$L \leq 3.0$	$0.03 < W \leq 0.05$	1			
			$W > 0.05$	0			
	Foreign material on TP film	The line can be seen after mobile phone in the operating condition:					Minor
		Size(mm)		Acceptable Qty			
		L (Length)	W (Width)	Zone			
				A	B	C	
		Ignore	$W \leq 0.03$	Ignore		Ignore	
		$L \leq 5.0$	$0.03 < W \leq 0.05$	3			
		$W > 0.05$	0				
4.2.3	Dim line defect Polarizer scratch TP film scratch	If the scratch can be seen after mobile phone cover assembling or in the operating condition, judge by the line defect of 4.2.2. If the scratch can be seen only in non-operating condition or some special angle, judge by the following.					Minor
		Size(mm)		Acceptable Qty			
		L (Length)	W (Width)	Zone			
				A	B	C	
		Ignore	$W \leq 0.03$	Ignore		Ignore	
		$5.0 < L \leq 10.0$	$0.03 < W \leq 0.05$	2			
		$L \leq 5.0$	$0.05 < W \leq 0.08$	1			
			$W > 0.08$	0			
		4.2.4	Polarize Air bubble	Air bubbles between glass & polarizer			
Zone Size(mm)	Acceptable Qty						
	A			B	C		
$\Phi \leq 0.25$				Ignore		Ignore	
$0.25 < \Phi \leq 0.5$				2			
$\Phi > 0.50$				0			

Item No	Items to be inspected	Inspection Standard			Classification of defects
4. 2. 5	Glass defect	(i) Chips on corner A:LCD Glass defect			Minor
					
		X (mm)	Y (mm)	Z (mm)	
		≤2.0	≤S	Disregard	
		Notes: S=contact pad length Chips on the corner of terminal shall not be allowed to extend into the ITO pad or expose perimeter seal. B:TP Glass defect			
					
		X (mm)	Y (mm)	Z (mm)	
		≤3.0	≤3.0	Disregard	
		(ii)Usual surface cracks A:LCD Glass defect			
					
		X (mm)	Y (mm)	Z (mm)	
		≤3.0	<Inner border line of the seal	Disregard	
		B:TP Glass defect			
					
		X (mm)	Y (mm)	Z (mm)	
		≤6.0	<2.0	Disregard	
		(iii) Crack Cracks tend to break are not allowed.			
					

■ Packaging drawing

- a: Use plastic module, cardboard, carton.
- b: lay certain piece according to product's dimension.
- c: 6 layers in each small carton.
- d: 4 small cartons in each .
- e: 1 outer box = 4 small carton, 1 small carton=5 Layer, 1 Layer=12pcs LCM.

Remark: We will use this package when you have a mass production.



Precautions for Use of LCD Modules

1. Handling 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 alcoholDo 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 solventsWipe 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.

2. Storage precautions

2.1 When storing the LCD modules, avoid exposure to direct sunlight or to the light of fluorescent lamps.

2.2 The LCD modules should be stored under the storage temperature range. If the LCD modules will be stored for a long time, the recommend condition is:

Temperature : 0℃ ~ 40℃ Relatively humidity: ≤80%

2.3 The LCD modules should be stored in the room without acid, alkali and harmful gas.

3 The LCD modules should be no falling and violent shocking during transportation, and also should avoid excessive press, water, damp and sunshine.

----- END