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SPECIFICATION
FOR
LCD MODULE

MODULE NO: EarthLCD-2.8-32064-CT

Doc.Version:00

Customer Approval:

☐ Accept	☐ Reject

■ APPROVAL FOR SPECIFICATIONS ONLY

☐ APPROVAL FOR SPECIFICATIONS AND SAMPLE

1. Revision History

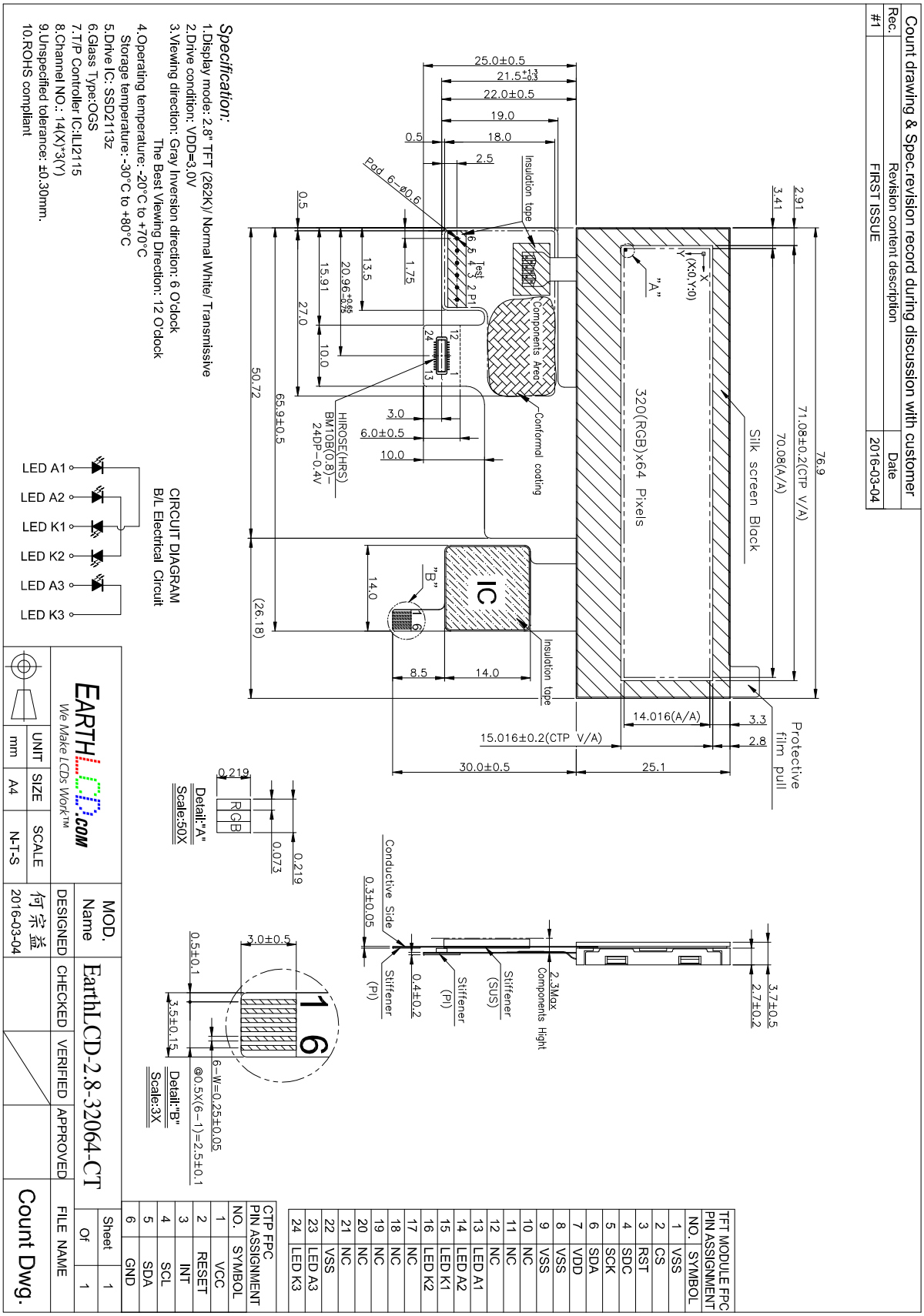
Sample Version	DOC. Version	DATE	DESCRIPTION		CHANGED BY
A0	00	2016-03-04	Spec Only	First issue	Shien/Jimmy

2. Table of Contents:

4. General Specification:

ITEM	CONTENTS
Module Size	76.9(W) * 25.1(H) * 3.7(T) mm
Module Size(With FPC)	76.9(W) *55.1 (H) * 3.7(T) mm
Display Size(Diagonal)	2.8 inch
Display Format	320(RGB) * 64 Pixels
Active Area	70.08(W) * 14.016(H) mm
Pixel Pitch	0.219 * 0.219 mm
LCD Type	TFT(262K) / Transmissive/NW
View Angle (Gray inversion)	6 O'clock
The Best View Angle	12 O'clock
Controller IC	SSD2113Z
CTP IC	ILI2115
Weight	TBD

5. LCM drawing:



6. Electrical Characteristics

6-1 Absolute Maximum Ratings (Ta=25℃ VSS=0V)

Item	Symbol	Min.	Type	Max.	Unit	Remark
Input Voltage	V_{DD}	-0.3	-	+4.0	Volt	Note1
Operating Temperature	Topr	-20	-	+70	℃	-
Storage Temperature	Tstg	-30	-	+80	℃	-

Note1: Absolute maximum rating is the limit value beyond which the IC maybe broken. They do not assure operations.

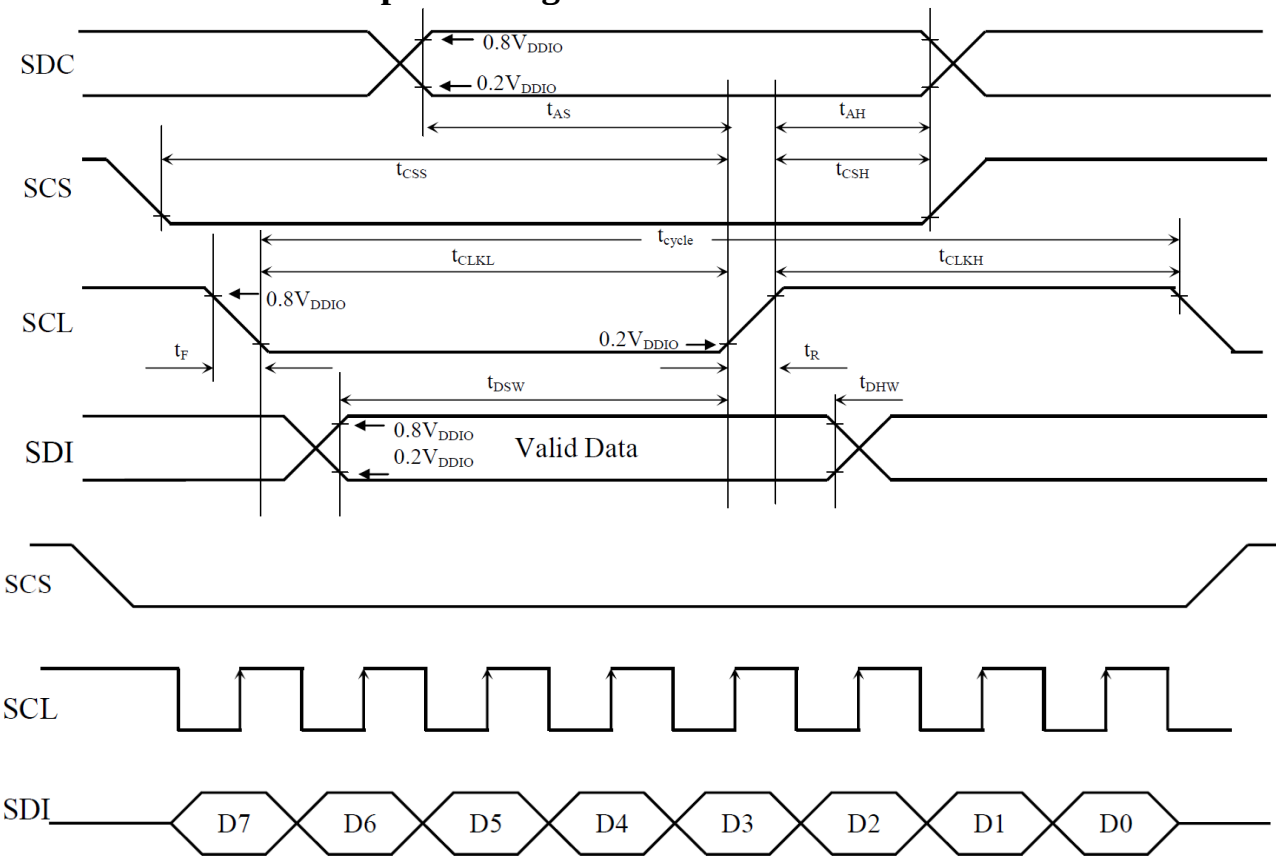
6-2 Operating Conditions (Ta=25℃)

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Power Supply voltage1	V_{DD}	-	2.8	3.0	3.2	Volt
Input Voltage	V_{IH}	-	0.8 * V_{DD}	-	V_{DD}	V
	V_{IL}	-	0	-	0.2 * V_{DD}	V
Power Supply Current for LCM	I_{DD}	V_{DD}=3.0V	-	6	9	mA
TFT gate on voltage	VGH		10.0		16.0	V
TFT gate off voltage	VGL		-16.0		-9.0	V
TFT common electrode voltage	VCOMH		2.5		5.0	V
	VCOML		-2.5		0	V
Booster voltages	VCIX2	V_{DD}=3.0V	-	5.5	-	V

Note:VCIX2 voltage depends on VDD, Initial code has to be modified along with the adjustment of VDD

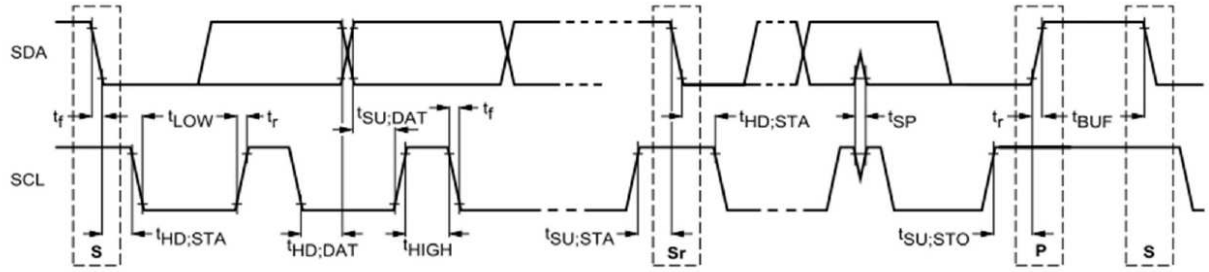
6-3 Timing Characteristics

6-3-1 TFT Data Input Timing



Symbol	Parameter	Min	Typ	Max	Unit
t_{cycle}	Clock Cycle Time	66	-	-	ns
f_{CLK}	Serial Clock Cycle Time SPI Clock tolerance = +/- 2 ppm	-	-	15	MHz
t_{AS}	Register select Setup Time	4	-	-	ns
t_{AH}	Register select Hold Time	5	-	-	ns
t_{CSS}	Chip Select Setup Time	2	-	-	ns
t_{CSH}	Chip Select Hold Time	10	-	-	ns
t_{DSW}	Write Data Setup Time	5	-	-	ns
t_{OHW}	Write Data Hold Time	10	-	-	ns
t_{CLKL}	Clock Low Time	33	-	-	ns
t_{CLKH}	Clock High Time	33	-	-	ns
t_R	Rise time	-	-	15	ns
t_F	Fall time	-	-	15	ns

6-3-2 Touch panel controller IC Input Timing



Symbol	Parameter	Standard Mode			Fast Mode		
		Min	Max	Unit	Min	Max	Unit
f_{SCL}	SCL clock frequency	0	100	KHz	0	400	KHz
$t_{HD;STA}$	Hold time (repeated) START condition. After this period, the first clock pulse is generated	4.0	–	μs	0.6	–	μs
t_{LOW}	LOW period of the SCL clock	4.7	–	μs	1.3	–	μs
t_{HIGH}	HIGH period of the SCL clock	4.0	–	μs	0.6	–	μs
$t_{SU;STA}$	Set-up time for a repeated START condition	4.7	–	μs	0.6	–	μs
$t_{HD;DAT}$	Data hold time For I^2C Device	5.0 0	– 3.45	μs μs	– 0	– 0.9	μs μs
$t_{SU;DAT}$	Data set-up time	250	–	ns	100	–	ns
t_r	Rise time of both SDA and SCL signals	–	1000	ns	–	300	ns
t_f	Fall time of both SDA and SCL signals	–	300	ns	–	300	ns
C_b	Capacitance load for each SDA/SCL lines		400	pF		300	pF
$t_{SU;STO}$	Set-up time for STOP condition	4.0	–	μs	0.6	–	μs
t_{BUF}	Bus free time between a STOP and START condition	4.7	–	μs	1.3	–	μs

7. Optical Characteristics:

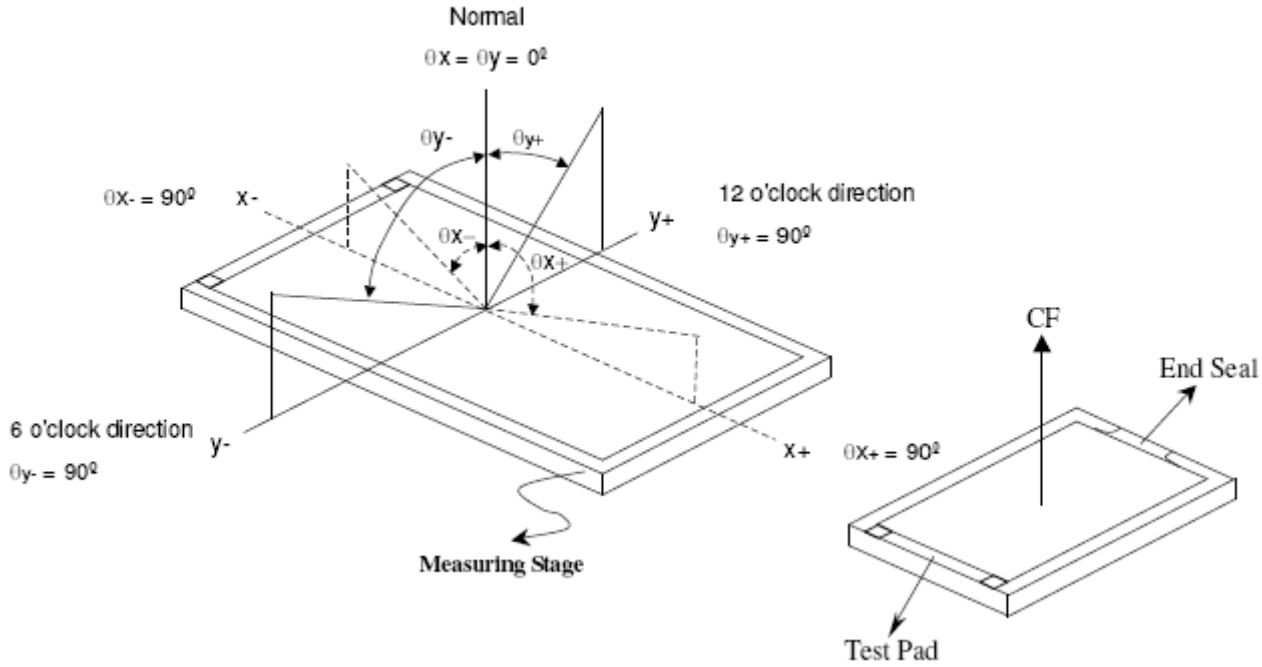
Item		Symbol	Conditions	Specifications			Unit	Note
				Min	Typ	Max		
Transmittance (With PL)		T(%)	–	-	6.0	-	%	-
Contrast Ratio		CR	Θ=0 Normal Viewing angle	-	500	-		(1) (2)
Response time		TR+TF	–	-	35	-	ms	(1) (3)
Viewing angle	Hor.	ΘX+	CR≧10	-	70	-	deg.	-
		ΘX-		-	70	-		
	Ver.	Θy+		-	60	-		
		Θy-		-	70	-		

Measuring Condition
1. Measuring surrounding: dark room
2. Ambient temperature: 25±2℃
3. 30 min. Warm-up time.

Color of CIE Coordinate:

Item		Symbol	Condition	Min.	Typ.	Max.
Chromaticity Coordinates (Transmissive)	Red	x	θ = ϕ = 0° LED Backlight	0.592	0.642	0.692
		y		0.282	0.332	0.382
	Green	x		0.253	0.303	0.353
		y		0.533	0.583	0.633
	Blue	x		0.091	0.141	0.191
		y		0.088	0.138	0.188
	White	x		0.264	0.314	0.364
		y		0.295	0.345	0.395

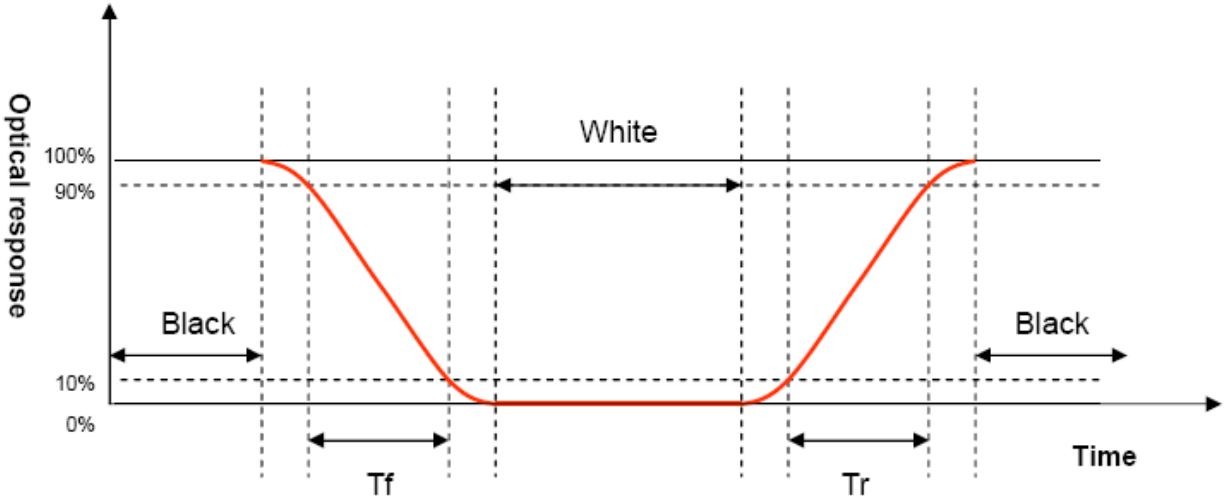
Note (1) Definition of Viewing Angle :



Note (2) Definition of Contrast Ratio(CR) :
measured at the center point of panel

$$\text{Contrast ratio (CR)} = \frac{\text{Photo detector output when LCD is at "White" state}}{\text{Photo detector output when LCD is at "Black}}$$

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



8. Interface Pin Assignment:

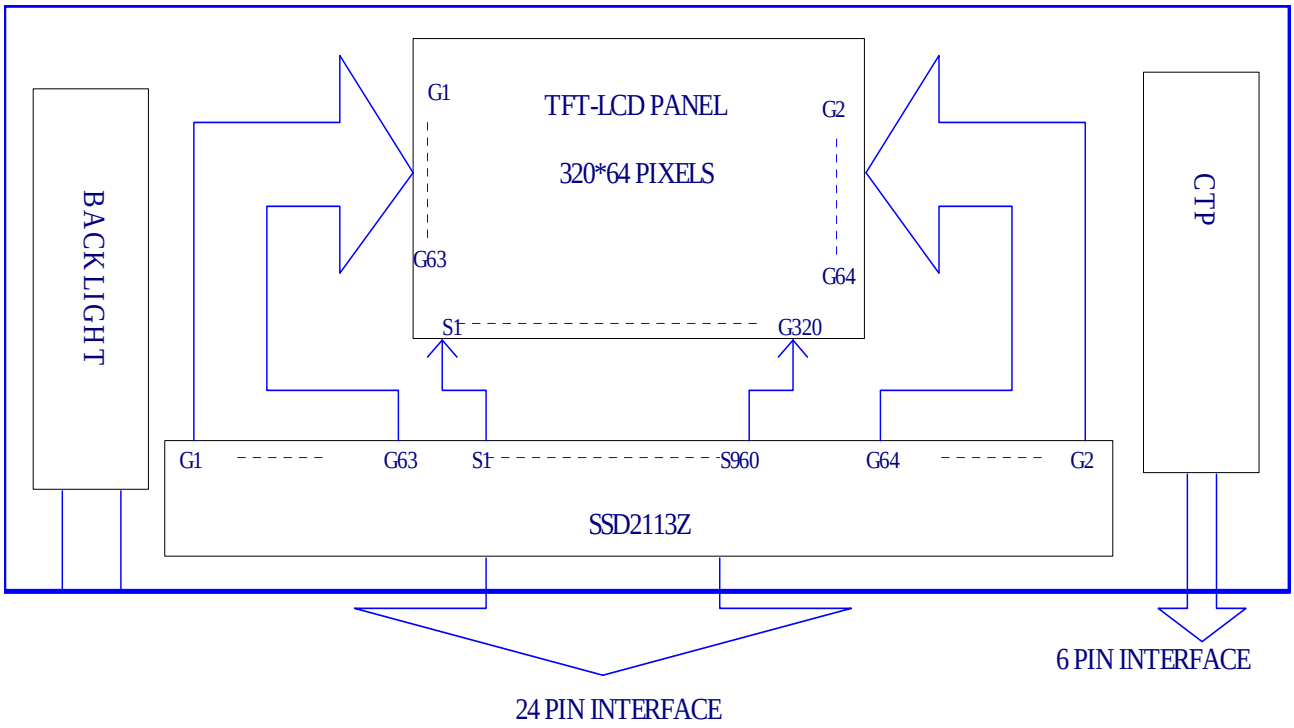
8-1 TFT Interface

No.	Symbol	Function
1	VSS	Ground
2	CS	Chip Select Pin(for SPI bus)
3	RST	Hardware Reset Input Pin
4	SDC	data/register selection for SPI bus
5	SCK	Serial Clock Input
6	SDA	Serial Data input (MOSI)
7	VDD	Supply Voltage
8	VSS	Ground
9	VSS	Ground
10	NC	NC
11	NC	NC
12	NC	NC
13	LEDA1	Anode of LED group 1 and 3
14	LEDA2	Anode of LED group 2 and 4
15	LEDK1	Cathode of LED group 1 and 3
16	LEDK2	Cathode of LED group 2 and 4
17	NC	NC
18	NC	NC
19	NC	NC
20	NC	NC
21	NC	NC
22	VSS	Ground
23	LEDA3	Anode of LED 5
24	LEDK3	Cathode of LED 5

8-1 CTP Interface

No.	Symbol	Function
1	VCC	Digital power supply
2	RESST	System reset signal input, active low
3	INT	Indicate coordinate data ready
4	SCL	I2C Serial Clock
5	SDA	I2C Serial Data
6	GND	Ground

9. Block Diagram:



10. Backlight:

1. Standard Lamp Styles (Edge Lighting Type):
   The LED chips are distributed over the edge light area of the illumination unit, which gives the less power consumption:

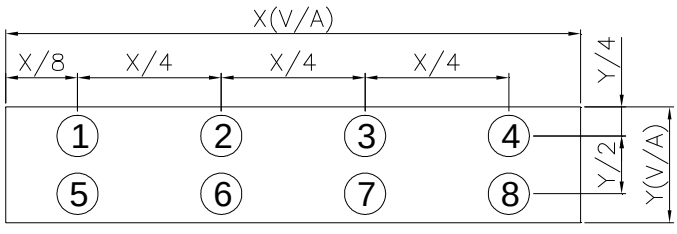
2. The Main Advantages of the LED Backlight are as following:
   2.1 The brightness of the backlight can simply be adjusted.
   By a resistor or a potentiometer.

3. Data About LED Backlight: (Ta=25℃)

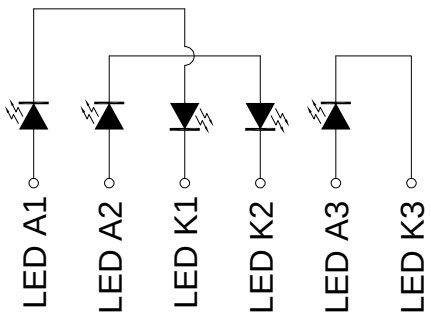
PARAMETER	Sym.	Min.	Typ.	Max.	Unit	Test Condition	Note
Supply Current (LED A1-K1)	V	5.6	6.4	6.8	V	I=20mA	
Supply Current (LED A2-K2)	V	5.6	6.4	6.8	V	I=20mA	
Supply Current (LED A3-K3)	V	2.8	3.2	3.4	V	I=20mA	
Reverse VoltageI (Per LED)	Ir	-	-	0.8	uA	Vr=5.0V	
Luminous Intensity for LCM	LV	340	420	-	cd/m^2	-	2
Uniformity for LCM	-	70	-	-	%	-	3
Life Time	-	20000	50000	-	Hr.	-	4
Color	White						

NOTE:
1. Backlight Only
2. Average Luminous Intensity of P1-P8
3. Uniformity = Min/Max * 100%
4. LED life time defined as follows: The final brightness is at 50% of original brightness

Measured Method: (X*Y: Light Area)



Internal Circuit Diagram



(Effective spatial Distribution)
Hole Diameter ø3 mm; 1 to 8 per Position Measured Luminous

11.Initial Code(VDD=3.0V):

Commond	
Reg	Data
28H	0006H
00H	0001H
01H	723FH
02H	0000H
03H	6864H
10H	0000H
Delay 20mS	
11H	6230H
07H	0033H
0CH	0002H
25H	C000H
48H	0000H
49H	003FH
4EH	0000H
4FH	0000H
30H	EE0CH
31H	3199H
32H	CDC8H
33H	3011H
34H	E724H
35H	18CCH
36H	6533H
37H	331CH
0DH	000CH
1EH	019CH
0EH	2C00H
44H	3F00H
45H	0000H
46H	013FH
22H	--

12. Standard Specification for Reliability:

12–1. 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

12 - 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.

12- 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.

13. Specification of Quality Assurance:

13-1. Purpose

This standard for Quality Assurance should affirm the quality of LCD module products to supply to purchaser by EarthLCD (Supplier).

13-2. 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

13-3. 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.

13-5. Standard of The Product Appearance Test

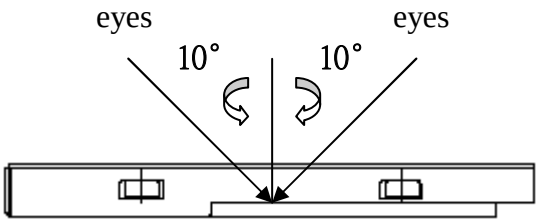
a. Manner of appearance test:

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

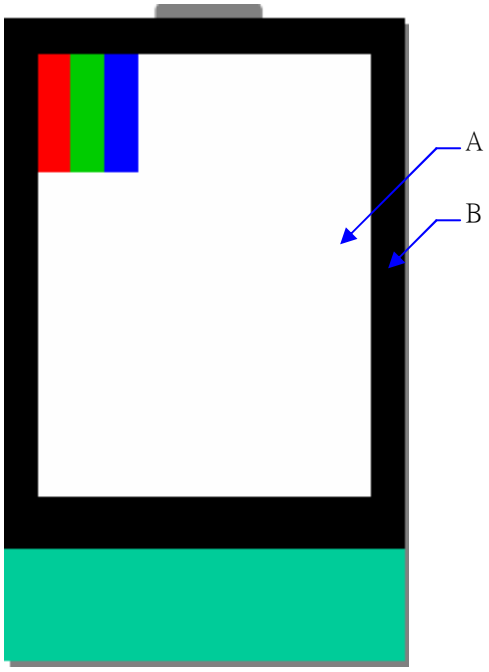
(ii) When test the model of transmissive product must add the reflective plate.

(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.

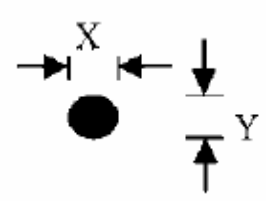
(ii) The sample of the lowest acceptable quality level must be discussed by both supplier and customer when any dispute happened.

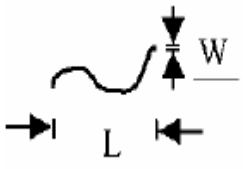
(iii) Must add new item on time when it is necessary.

c. Standard of inspection: (Unit: mm)

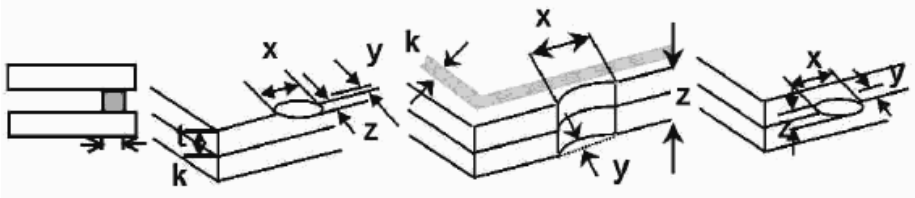
13-6. Inspection specification

Defect out of viewing area can be neglected.

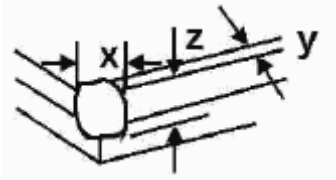
<table>
<tr><th>NO</th><th>Item</th><th>Criterion</th><th>AQL</th></tr>
<tr><td>01</td><td>Electrical Testing</td><td>1.1 Missing vertical, horizontal segment, segment contrast defect.
1.2 Missing character, dot or icon.
1.3 Display malfunction.
1.4 No function or no display.
1.5 Current consumption exceeds product specifications.
1.6 LCD viewing angle defect.
1.7 Mixed product types.
1.8 Flicker</td><td>0.65</td></tr>
<tr><td>02</td><td>Black or White spots or Bright spots or Color spots on LCD (Display only)</td><td>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.</td><td>2.5</td></tr>
<tr><td rowspan="2">03</td><td rowspan="2">LCD and Touch Panel black spots, white spots, contamination (non – display)</td><td>3.1 Round type: As following drawing
Φ = (X+Y) / 2
 

<table>
<tr><th>Size(mm)</th><th>Acceptable Q'ty</th></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.</td><td>2.5</td></tr>
<tr><td>3.2 Line type: (As following drawing)
 

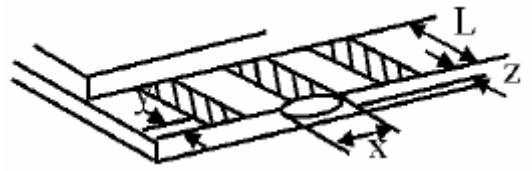
<table>
<tr><th>Length(mm)</th><th>Width(mm)</th><th>Acceptable Q'ty</th></tr>
<tr><td>---</td><td>W≦0.02</td><td>Accept no dense</td></tr>
<tr><td>L≦3.0</td><td>0.02<W≦0.05</td><td rowspan="2">2</td></tr>
<tr><td>L≦2.5</td><td>0.03<W≦0.08</td></tr>
<tr><td>---</td><td>0.08<W</td><td>Rejection</td></tr>
</table>
* Densely spaced: No more than two lines within 3mm.</td><td>2.5</td></tr>
</table>

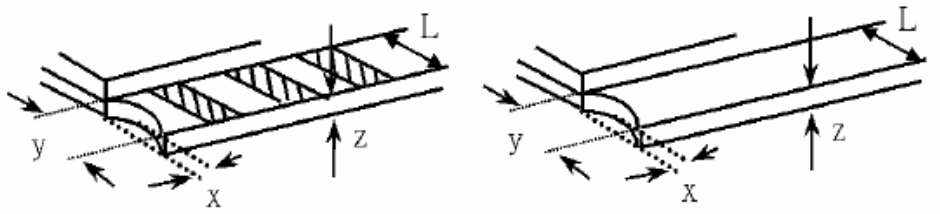
<table>
<tr><th>NO</th><th>Item</th><th>Criterion</th><th>AQL</th></tr>
<tr><td>04</td><td>Polarizer bubbles</td><td>If bubbles are visible, judge using black spot specifications, not easy to find, must check in specify direction
<table>
<tr><th>Size Φ(mm)</th><th>Acceptable Q'ty</th></tr>
<tr><td>Φ≦0.20</td><td>Accept no dense</td></tr>
<tr><td>0.20< Φ≦0.50</td><td>3</td></tr>
<tr><td>0.50< Φ≦1.00</td><td>2</td></tr>
<tr><td>1.00< Φ</td><td>0</td></tr>
<tr><td>Total Q’ty</td><td>3</td></tr>
</table></td><td>2.5</td></tr>
<tr><td>05</td><td>Scratches</td><td>Follow NO.3 -2 Line Type.</td><td></td></tr>
<tr><td>06</td><td>Chipped glass</td><td>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:
 

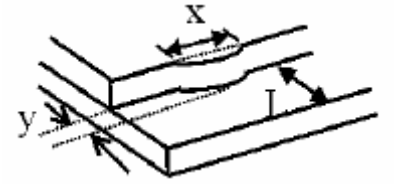
<table>
<tr><th>z: Chip thickness</th><th>y: Chip width</th><th>x: Chip length</th></tr>
<tr><td>Z≦1/2t</td><td>Not over viewing area</td><td>x≦1/8a</td></tr>
<tr><td>1/2t< z≦2t</td><td>Not exceed 1/3k</td><td>x≦1/8a</td></tr>
</table>
⊙ Unit: mm
⊙ If there are 2 or more chips, x is the total length of each chip

6.1.2 Corner crack:
 

<table>
<tr><th>z: Chip thickness</th><th>y: Chip width</th><th>x: Chip length</th></tr>
<tr><td>Z≦1/2t</td><td>Not over viewing area</td><td>x≦1/8a</td></tr>
<tr><td>1/2t< z≦2t</td><td>Not exceed 1/3k</td><td>x≦1/8a</td></tr>
</table>
⊙ Unit: mm
⊙ If there are 2 or more chips, x is the total length of each chip</td><td>2.5</td></tr>
</table>

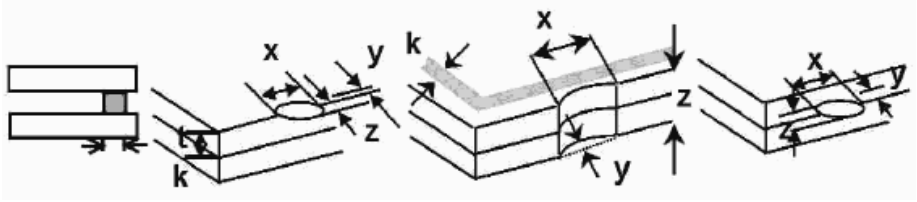
<table>
<tr><th>NO</th><th>Item</th><th>Criterion</th><th>AQL</th></tr>
<tr><td>07</td><td>Glass crack</td><td>
Symbols:
x: Chip length y: Chip width z: Chip thickness
k: Seal width t: Glass thickness a: LCD side length
L: Electrode pad length
7.2 Protrusion over terminal:
7.2.1 Chip on electrode pad:


<table>
<tr><th>y: Chip width</th><th>x: Chip length</th><th>z: Chip thickness</th></tr>
<tr><td>y≦0.5mm</td><td>x≦1/8a</td><td>0< z≦t</td></tr>
</table>
7.2.2
Non-conductive portion:


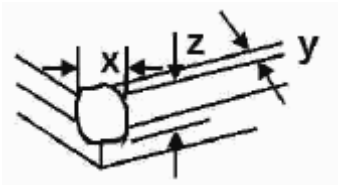
<table>
<tr><th>y: Chip width</th><th>x: Chip length</th><th>z: Chip thickness</th></tr>
<tr><td>y≦L</td><td>x≦1/8a</td><td>0< z≦t</td></tr>
</table>
⊙ If there chipped area touches the ITO terminal, over 2/3 of the ITO must remain and be inspected according to electrode terminal specifications.
⊙ If the product will be heat sealed by the customer, the alignment mark must mot be damaged.
7.2.3 Substrate protuberance and internal crack


<table>
<tr><th>y: width</th><th>x: length</th></tr>
<tr><td>y≦1/3L</td><td>X≦a</td></tr>
</table>
</td><td>2.5</td></tr>
</table>

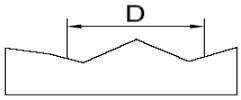
NO	Item	Criterion	AQL
08	Cracked glass	The LCD with extensive crack is not acceptable.	2.5
09	Backlight elements	9.1 Illumination source flickers when lit. 9.2 Spots or scratches that appear when lit must be judged. Using LCD spot, lines and contamination standards. 9.3 Backlight doesn't light or color 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

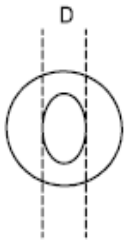
<table>
<tr><th>NO</th><th>Item</th><th>Criterion</th><th>AQL</th></tr>
<tr><td>14</td><td>Touch Panel Chipped glass</td><td>
Symbols:
x: Chip length y: Chip width z: Chip thickness
k: Seal width t: Touch Panel Total thickness a: LCD side length
L: Electrode pad length
14.1 General glass chip:
14.1.1 Chip on panel surface and crack between panels:


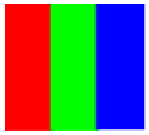
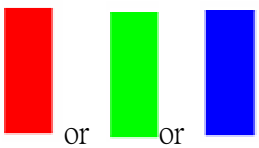
<table>
<tr><th>z: Chip thickness</th><th>y: Chip width</th><th>x: Chip length</th></tr>
<tr><td>Z≦t</td><td>≦1/2 k and not over viewing area</td><td>x≦1/8a</td></tr>
</table>
⊙ Unit: mm
⊙ If there are 2 or more chips, x is the total length of each chip

14.1.2 Corner crack:


<table>
<tr><th>z: Chip thickness</th><th>y: Chip width</th><th>x: Chip length</th></tr>
<tr><td>z≦t</td><td>≦1/2 k and not over viewing area</td><td>x≦1/8a</td></tr>
</table>
⊙ Unit: mm
⊙ If there are 2 or more chips, x is the total length of each chip
</td><td>2.5</td></tr>
</table>

<table>
<tr><th>NO</th><th>Item</th><th>Criterion</th><th>AQL</th></tr>
<tr><td>15</td><td>Touch Panel(Fish eye、dent and bubble on film)</td><td>
<table>
<tr><th>SIZE(mm)</th><th>Acceptable Q’ty</th></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>




</td><td>2.5</td></tr>
<tr><td>16</td><td>Touch Panel Newton ring</td><td>Newton ring dimension ≦ 1/2 touch panel area and not affect font and line distortion(≦2.5%) , it is acceptable.</td><td>2.5</td></tr>
<tr><td>17</td><td>Touch Panel Linearity</td><td>Less than 2.5% is acceptable.</td><td>2.5</td></tr>
<tr><td>18</td><td>LCD Ripple</td><td>Touch the touch panel , can not see the LCD ripple.
Pen: R 1.0mm silicon rubber.
Operation Force: 80g</td><td>2.5</td></tr>
<tr><td>19</td><td>General appearance</td><td>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.</td><td>0.65
0.65
0.65
0.65</td></tr>
<tr><td>20</td><td>Definition of Pixel</td><td>Pixel : Group of Three Sub-pixels (Red, Green ,Blue):
 
Dot : Red or Green or Blue
 
or or
Dot : Any sub-pixel
Bright Dot Defects
Dots (sub-pixels) on display which is bright in the picture and visible at</td><td></td></tr>
</table>

Black Pattern.

Dark Dot Defects

Dots(sub-pixels) on display which is dark in the picture and visible at Red/Green/Black/White Pattern.

Neighbour Dot Defects

Two or three neighbour dots (dot: sub-pixel) cluster(R&G,G&B,B&R,or R&G&B).Dot Defects Inspection Criteria

NOTE : Dot out of VA can be ignored.

Items	Inspection Criteria	
	Details	Allowed quantity
Bright Dot	Not Neighbour Dot	2
Dark Dot	Not Neighbour Dot	3
Total acceptable Qty		5

- Size of dot defect is larger than half of one sub-pixel.

14. Handling Precaution:

14-1 Handling of LCM

- Don't give external shock.
- Don't apply excessive force on the surface.
- Liquid in LCD is hazardous substance. Must not lick and swallow. when the liquid is attach to your hand, skin, cloth etc. Wash it out thoroughly and immediately.
- Don't operate it above the absolute maximum rating.
- Don't disassemble the LCM.
- The operators should be grounded whenever he/she comes into contact with the module. Never touch any of the conductive parts such as the LSI pads,the copper leads on the PCB and the interface terminals with any parts of the human body.
- The modules should be kept in antistatic bags or other containers resistant to static for storage.
- The module is coated with a film to protect the display surface. Be care when peeling off this protective film since static electricity may be generated.

14-2 Storage

- Store in an ambient temperature of 25±10℃, and in a relative humidity of 50±10%RH. Don't expose to sunlight or fluorescent light.
- Storage in a clean environment, free from dust, active gas, and solvent.
- Store in anti-static electricity container.
- Store without any physical load.

14-3 Soldering

- Use only soldering irons with proper grounding and no leakage.
- Iron: No higher than 280±10℃ and less than 3 sec during Hand soldering.
- Rewiring: no more than 2 times.