CHENG UEI PRECISION INDUSTRY CO., LTD.

PRODUCT SPECIFICATION

3.5" a-Si TFT LCD MODULE
MODEL: FL350QVR00_A0T

< ◇> Preliminary Specification

< ◇> Engineering Specification

< ◆> Approval Specification

CUSTOMER'S APPROVAL	
CUSTOMER :	
SIGNATURE:	DATE:

APPROVED BY	PM REVIEWD	PD REVIEWD	PREPARED By

Prepared By:

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* This specification is subject to change without notice. Please contact Foxlink or it's representative

Revision Status

Version	Revise Date	Page	Content	Modified By
X1	8/22/2007		First Issued	Hom & Jack
X2	8/31/2007	P4/P6	Add Haze 7% and drawing to adjust	Hom & Jack

Table of Contents

1. General Description

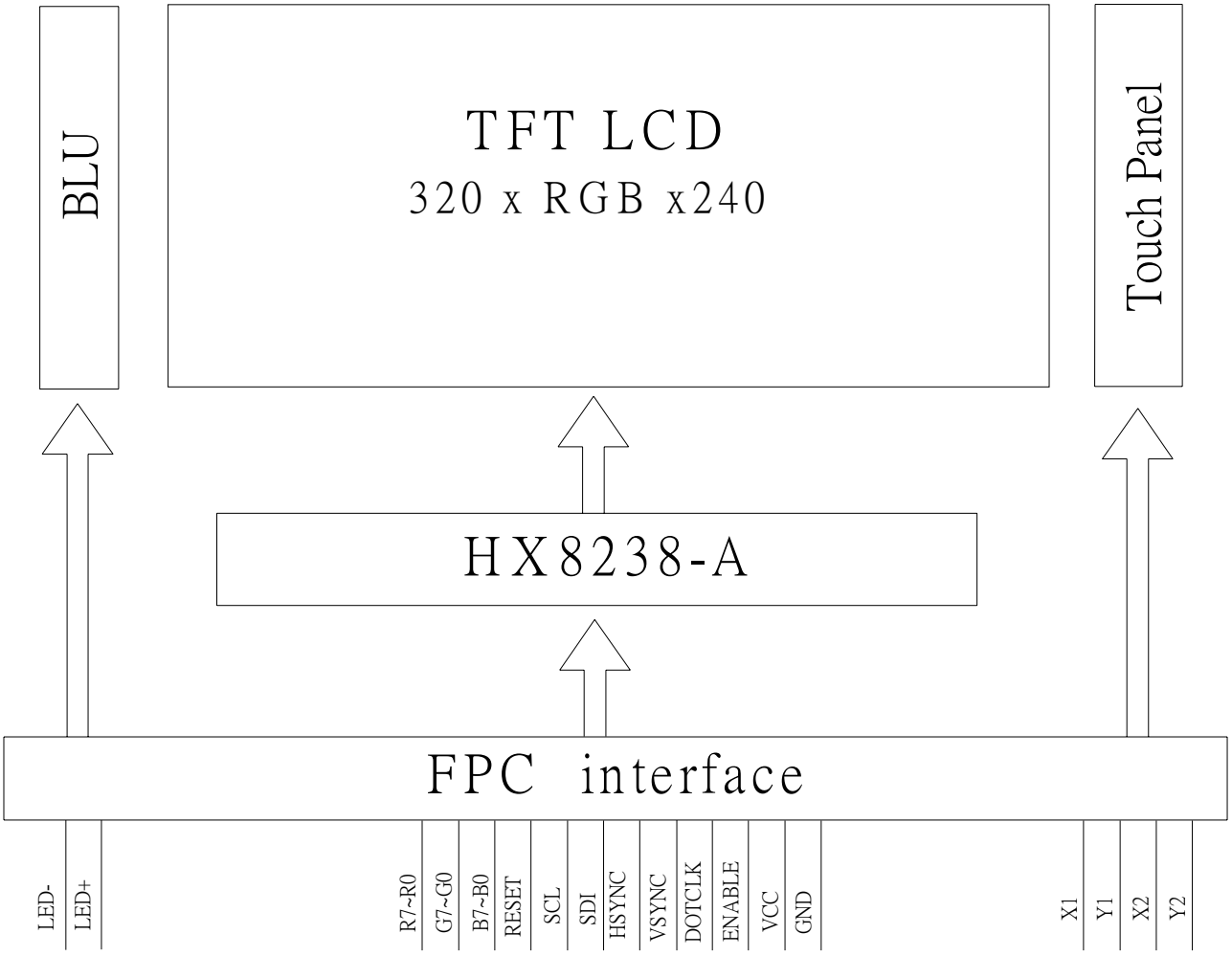
1.1 Description

The specifications is a transmissive type color active matrix liquid crystal display (LCD) which uses amorphous thin film transistor (TFT) as switching devices. This product is composed of a TFT LCD panel, driver ICs,FPC and a backlight unit. The following table described the features of FL350QVR00_A0T.

1.2 Features:

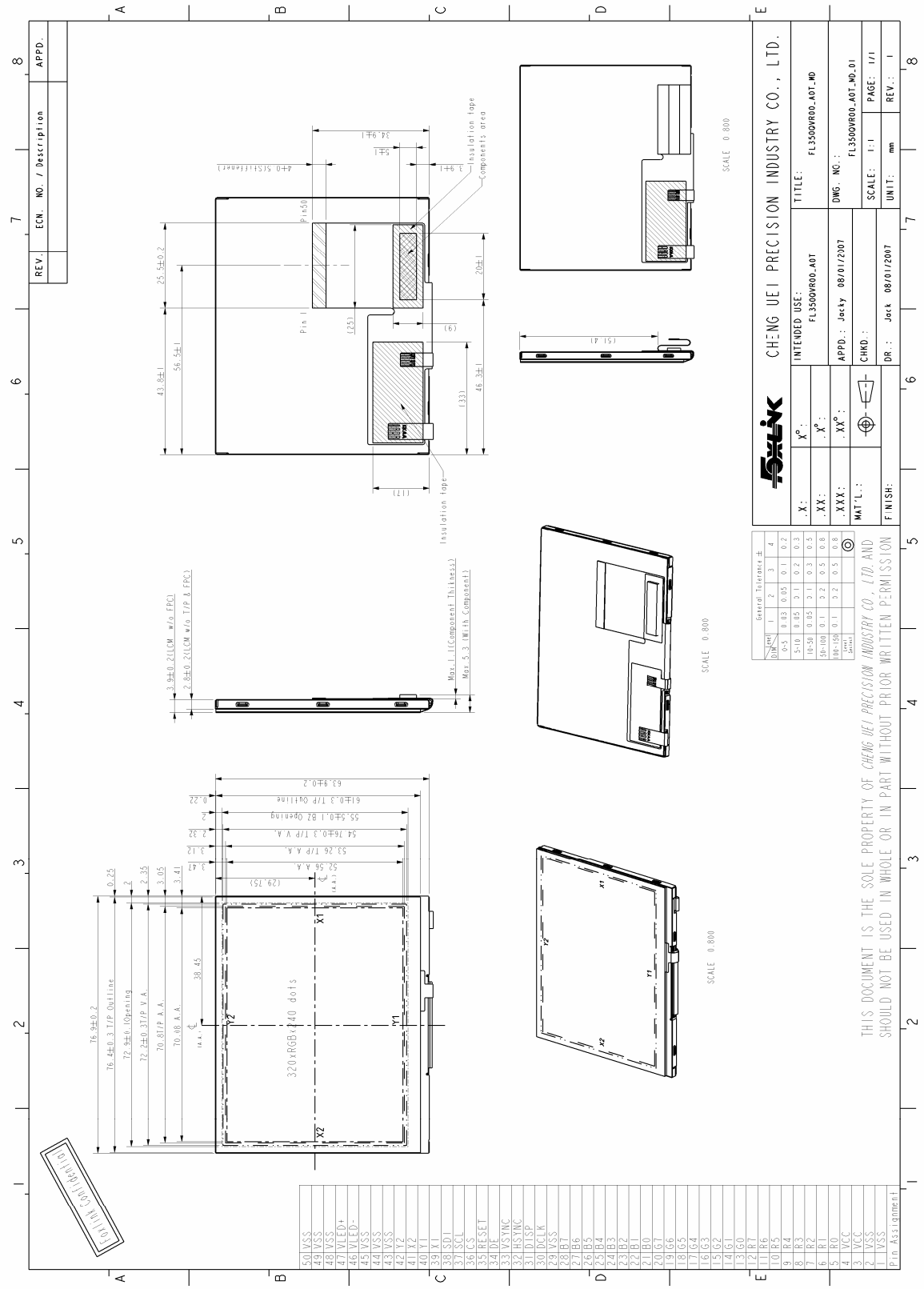
No.	Item	Specification	Unit
1	Panel Size	3.5	inch
2	Number of Pixels	320(H)×RGB×240(V)	Pixels
3	Active Area	70.08(H)×52.56(V)	mm
4	Pixel Pitch	0.219(H) x0.219 (V)	mm
5	Outline Dimension	76.9(H) x 63.9(V) x 5.3(D)	mm
6	Number of Colors	262k	-
7	Pixel Arrangement	RGB Vertical Stripe	-
8	Display Mode	Normally White TN / Transmissive	-
9	Brightness (LED I_f=20mA)	320 (Typ.) 280(Min.)	cd/m^2
10	Contrast Ratio	250 :1 (Typ.)	-
11	Chromaticity (White, x / y)	0.33/ 0.34 (Typ.)	
12	Uniformity	80% (Typ.)	
13	Response time (Tr+Tf)	50 (Typ.)	ms
14	Viewing Direction	6 o'clock	-
15	Input Interface	RGB interface	-
16	Viewing Angle (U/D/L/R)	50/55/60/60	degree
17	Backlight unit	LED * 6	-
18	Surface Treatment	Anti-Glare With Touch Panel (Haze : 7%)	-
19	Driver IC	HX8238-A	
20	Weight	(37.7)	g

2. Functional Block Diagram



3. Mechanical Specification

3.1 Mechanical Dimension



4. Pin Description

4.1 Interface Pin Description

No.	Symbol	I/0	Function	Remark
1	VSS	P	Ground	
2	VSS	P	Ground	
3	VCC	P	Power Supply	
4	VCC	P	Power Supply	
5	R0	I	Red Data (LSB)	
6	R1	I	Red Data	
7	R2	I	Red Data	
8	R3	I	Red Data	
9	R4	I	Red Data	
10	R5	I	Red Data	
11	R6	I	Red Data	
12	R7	I	Red Data (MSB)	
13	G0	I	Green Data (LSB)	
14	G1	I	Green Data	
15	G2	I	Green Data	
16	G3	I	Green Data	
17	G4	I	Green Data	
18	G5	I	Green Data	
19	G6	I	Green Data	
20	G7	I	Green Data (MSB)	
21	B0	I	Blue Data (LSB)	
22	B1	I	Blue Data	
23	B2	I	Blue Data	
24	B3	I	Blue Data	
25	B4	I	Blue Data	
26	B5	I	Blue Data	
27	B6	I	Blue Data	
28	B7	I	Blue Data (MSB)	
29	VSS	P	Ground	
30	DOTCLK	I	Data Clock	
31	DISP	P	Internal pull high	
32	HSYNC	I	Horizontal Synchronous Signal	

33	**VSYNC**	**I**	Vertical Synchronous Signal	
34	**ENABLE**	**I**	Data Enabling Signal	
35	**RESET**	**I**	Reset	
36	**CS**	**I**	Chip select pin of serial interface	Internal pull high
37	**SCL**	**I**	Clock pin of serial interface	
38	**SDI**	**I**	Data input pin in serial mode	
39	**X1**	**I**	X_ Right	
40	**Y1**	**I**	Y_ Bottom	
41	**X2**	**I**	X_ Left	
42	**Y2**	**I**	Y_ Up	
43	**VSS**	**P**	Ground	
44	**VSS**	**P**	Ground	
45	**VSS**	**P**	Ground	
46	**VLED-**	**P**	LED_ Cathode	
47	**VLED+**	**P**	LED_ Anode	
48	**VSS**	**P**	Ground	
49	**VSS**	**P**	Ground	
50	**VSS**	**P**	Ground	

5. Electrical Characteristics

5.1 Absolute Maximum Ratings

5.1.1 Electronic Absolute Maximum Ratings

Item	Symbol	Values		Unit	Remark
		Min	Max.		
Power Supply Voltages	VDD	-0.3	+4	V	GND=0
	V_{GH}-V_{GL}	-0.3	+25	V	GND=0
Input signal voltage	V_i	-0.3	VDD+0.3	V	
LED Reverse Voltage	V_r	-	5	V	ONE LED
LED Forward Current	I_F	-	35	mA	ONE LED
LED Power Dissipation	P_d	-	126	mW	ONE LED
Storage Temperature	T_{ST}	-30	80	℃	
Operating Temperature (Ambient Temperture)	T_{opa}	-20	70	℃	

5.2 DC Electrical Characteristics

5.2.1 LCD DC Characteristics

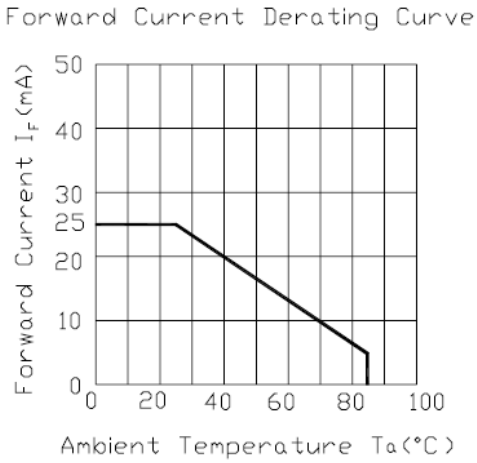
Typical Operating Conditions (Ta=25℃)

Item	Symbol	Values			Unit	Remark
		Min	Typ	Max.		
Operating voltage	VDD	2.4	2.8	3.3	V	
Input high voltage	V_{IH}	0.8*VDD	-	VDD	V	
Input low voltage	V_{IL}	0	-	0.2*VDD	V	
Output high voltage	V_{OH}	0.9*VDD	-	VDD	V	
Output low voltage	V_{OL}	0	-	0.1*VDD	V	
Current Consumption	$I_{CC\text{-}Black}$	-	8.53	12.8	mA	
Power Consumption	P_{LCD}	-	23.89	42.24	mW	

5.2.2 Backlight Unit (VSS=0V)

Item	Symbol	Values			Unit	Remark
		Min	Typ	Max.		
LED Voltage	V_L	-	19.2	-	V	LED*6
LED Current	If	-	20	-	mA	LED*6
Power Consumption	P_{LED}	-	384	-	mW	LED*6

5.2.3 LED Forward Current

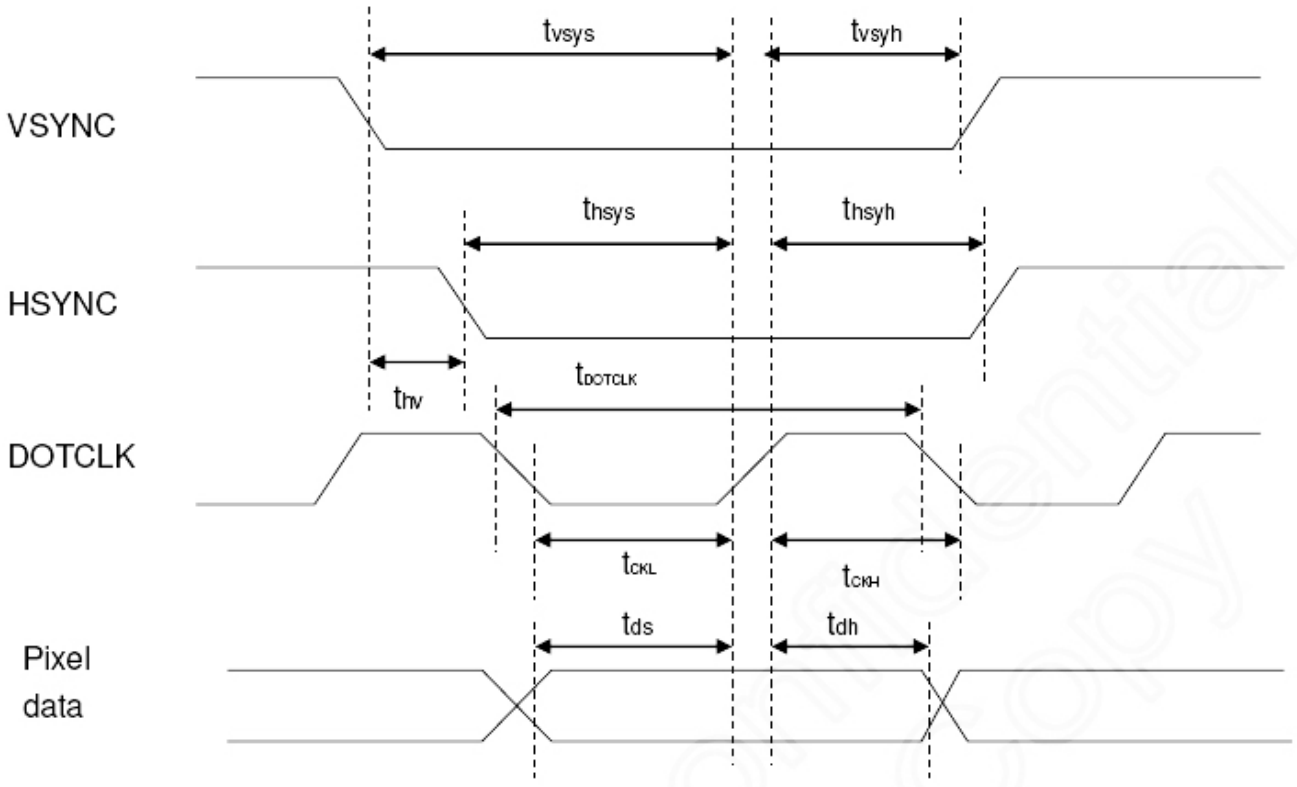


5.3 AC Electrical Characteristics

5.3.1 Pixel Timing Characteristics

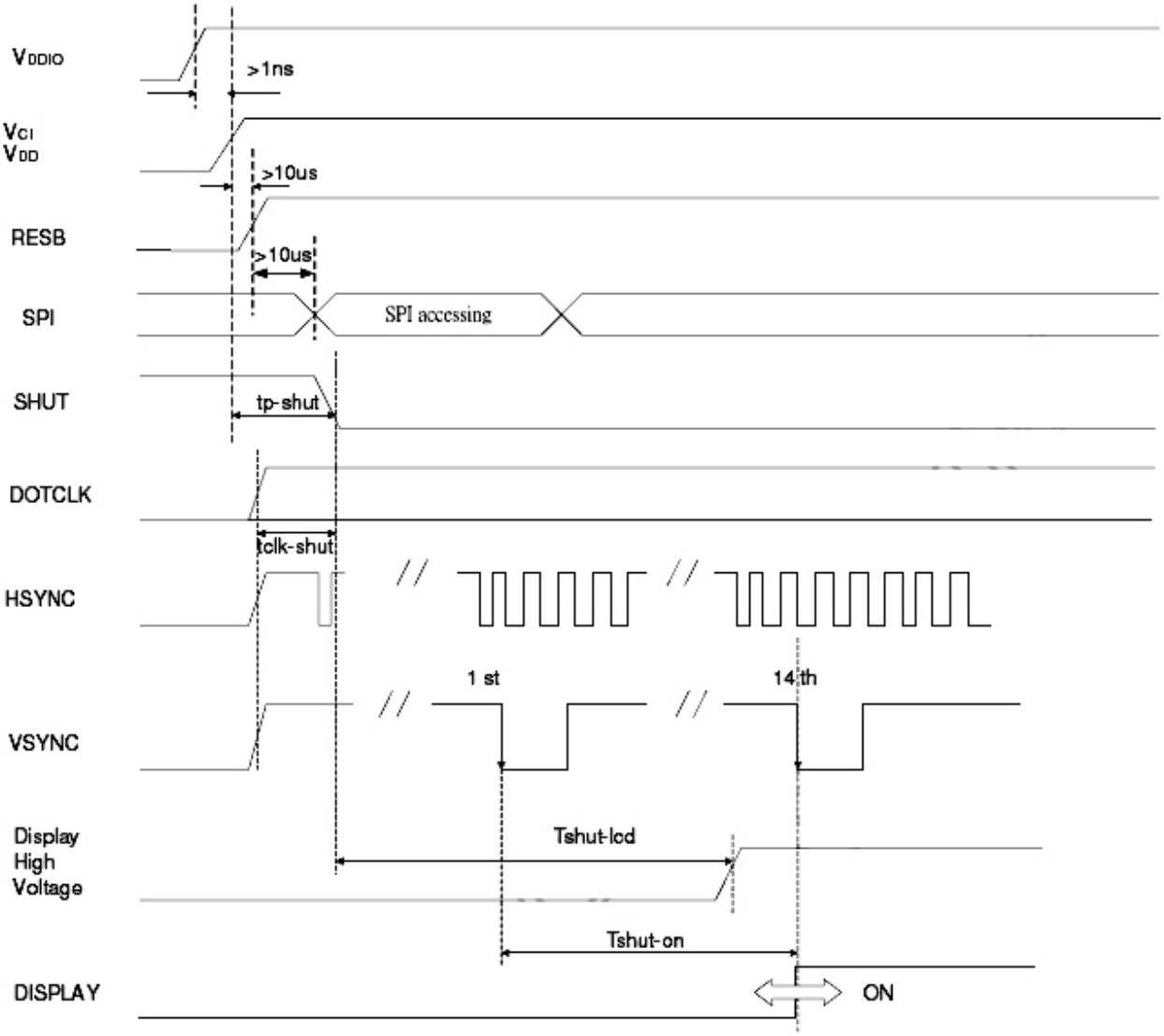
(VDD = 2.5~3.6V)

Characteristics	Symbol	Values			Unit	Remark
		Min	Typ	Max.		
DOTCLK Frequency	fDOTCLK	-	6.5	10	MHz	
DOTCLK Period	tDOTCLK	100	154	-	ns	
Vertical Sync Setup Time	tvsys	20	-	-	ns	
Vertical Sync Hold Time	tvsyh	20	-	-	ns	
Horizontal Sync Setup Time	thsys	20	-	-	ns	
Horizontal Sync Hold Time	thsyh	20	-	-	ns	
Phase difference of Sync Signal Falling Edge	thv	1		240	tDOTCLK	
DOTCLK Low Period	tCKL	50	-	-	ns	
DOTCLK High Period	tCKH	50	-	-	ns	
Data Setup Time	tds	12	-	-	ns	
Data Hold Time	tdh	12	-	-	ns	
Reset Pulse Width	tRES	10	-	-	us	



Pixel timing

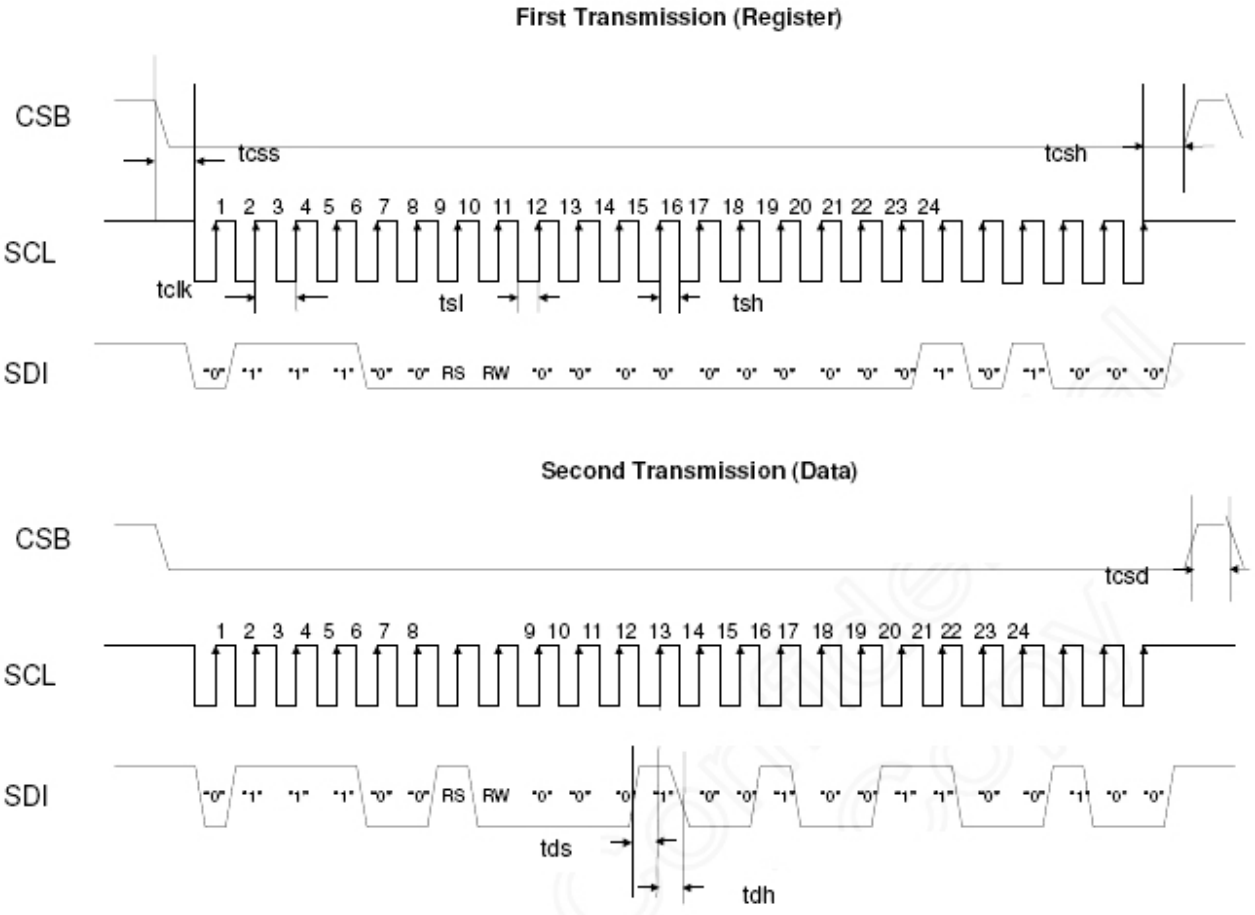
5.4 Power Up Sequence



VDDIO = VDD0 = VCI = VDD ,
SHUT => Connect to VSS for normal operating mode

Characteristics	Symbol	Min	Typ	Max	Units
VDDD / VDDIO on to falling edge of SHUT	tp-shut	1	-	-	us
DOTCLK	tclk-shut	1	-	-	clk
Falling edge of SHUT to LCD power on	tshut-lcd	-	-	128	ms
Falling edge of SHUT to display start - 1 line: 408 clk - 1 frame: 262 line -DOTCLK = 6.5MHz	tshut-on	-	-	14	frame
		-	166	232.4	ms

5.5 SPI interface timing diagram & transaction example



Characteristics	Symbol	Min	Typ	Max	Unit
Serial Clock Frequency	fclk	-	-	20	MHz
Serial Clock Cycle Time	tclk	50	-	-	ns
Clock Low Width	tsl	25	-	-	ns
Clock High Width	tsh	25	-	-	ns
Chip Select Setup Time	tcss	0	-	-	ns
Chip Select Hold Time	tcsh	10	-	-	ns
Chip Select High Delay Time	tcsd	20	-	-	ns
Data Setup Time	tds	5	-	-	ns
Data Hold Time	tdh	10	-	-	ns

6. Touch Screen Panel Specifications

6.1 Electronic characteristics

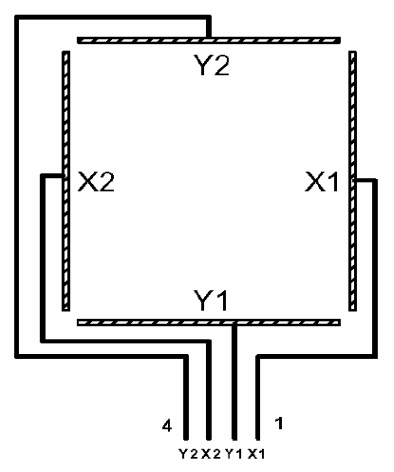
Item		Min.	Typ.	Max.	Unit	Note
Linearity		-	-	1.5	%	
Circuit Resistance	X-axis	200	-	900	Ω	
	Y-axis	200	-	900	Ω	
Insulation Resistance		20	-	-	MΩ	
Operating Voltage		-	-	5	V	
Chattering		-	-	10	ms	
Transmittance		80	-	-	%	

6.2 Mechanical & Reliability Characteristics

Item	Min.	Typ.	Max.	Unit	Note
Activation force	-	-	60	g	Note.1
Pen Writing Durability	100,000	-	-	characters	Note.2
Pitting Durability	1,000,000	-	-	touches	Note.3
Surface hardness	3	-	-	H	

Note.1：Operation foece with R0.8mm silicone finger.
Note.2：With the silicon Rubbre R8mm on the same point of the touch panel with 250g force, frequency 240 times/min.
Note.3：Writing with R0.8mm plastic stylus pen; writing force 150g in active area. Speed is 60mm/sec.

6.3 Touch Screen Panel



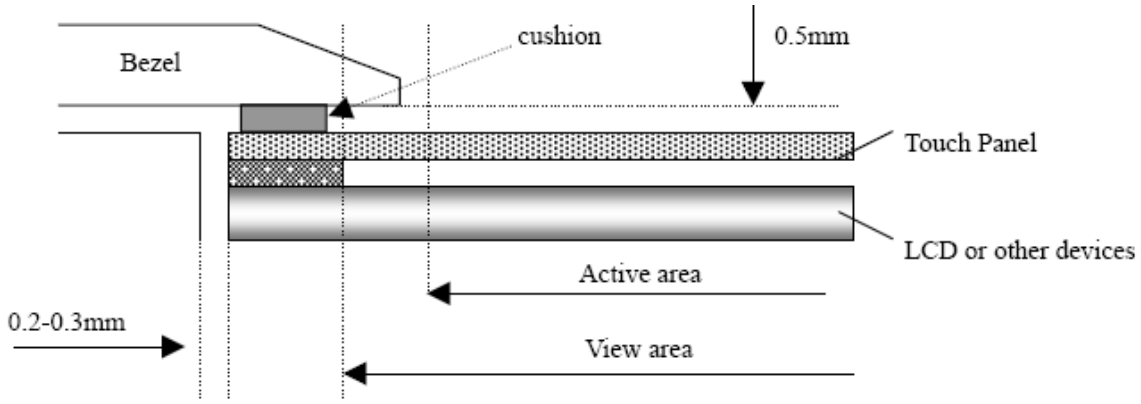
X : Upper electrode
Y : Lower electrode

6.4 Touch Screen Panel pin define

Pin No.	Symbol	I/O	Function
1	X1	Right	Right electrode – differential analog
2	Y1	Bottom	Bottom electrode – differential analog
3	X2	Left	Left electrode – differential analog
4	Y2	Top	Top electrode – differential analog

6.5 Design Guideline For Touch Panel

Bezel edge must be positioned in the area between the active area and view area.The bezel may press the touch screen and cause activation if the edge touches the active area. A gap of approximately 0.5mm is needed between the bezel and the top electrode. It may cause unexpected activation if the gap is too narrow. There is a tolerance of 0.2~0.3mm for the outside dimenation of the touch panel and tail. A gap must be made to absorb the tolerance in the case and connector



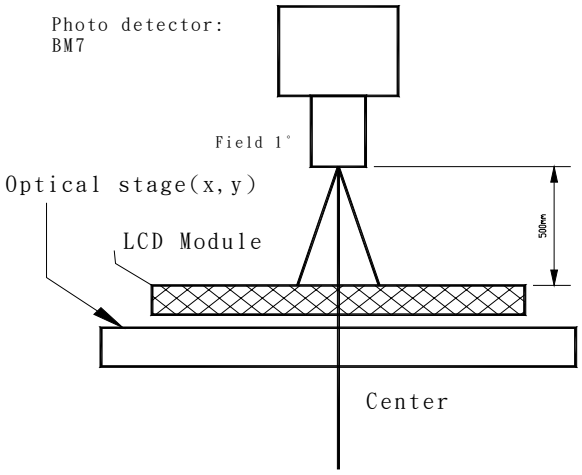
7. Optical Characteristics

The following items are measured under stable conditions. The optical characteristics should be measured in a dark room or equivalent state with the methods shown in Note.1.

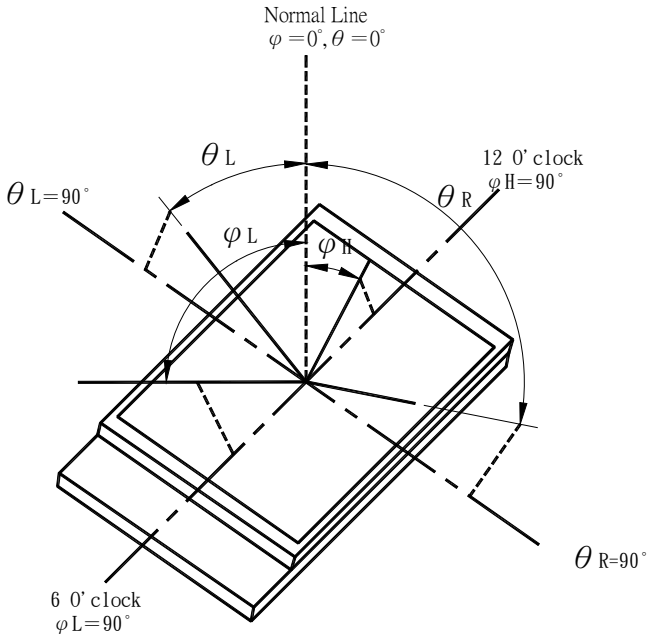
7.1 Main LCD Optical Characteristics

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
Viewing Angle	Top	ΦH	CR≧10	-	50	-	degree	Note.2
	Bottom	ΦL		-	55	-		
	Left	ΘL		-	60	-		
	Right	ΘR		-	60	-		
Response time(Tr+Tf)			Θ=0	-	25	-	25	Note.3
Brightness			Center	280	320	-	cd/m^2	
Contrast Ratio		CR	At optimized viewing angle	230	250	-	-	Note.4
Color Chromaticity	White	X_W	Viewing normal angle Φ,Θ=0	0.29	0.34	0.39	-	Note.5
		Y_W		0.31	0.36	0.41		
	Red	X_R		0.62	0.67	0.72	-	-
		Y_R		0.28	0.33	0.38		
	Green	X_G		0.3	0.35	0.4	-	-
		Y_G		0.55	0.60	0.65		
	Blue	X_B		0.11	0.16	0.21	-	-
		Y_B		0.06	0.11	0.16		

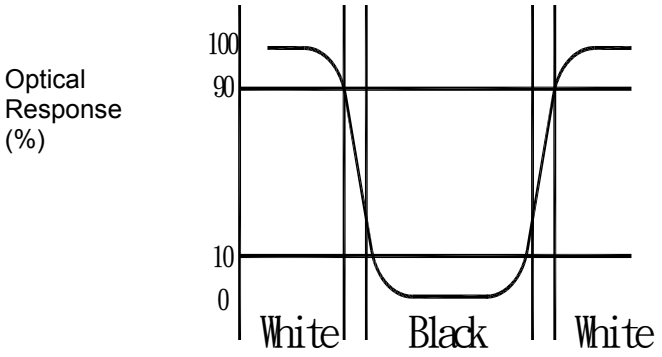
Note.1: After stabilizing and leaving the panel alone at a given temperature for 30 minutes, the measurement should be executed. Measurement should be executed in a stable, windless, and dark room. Optical specifications are measured by Topcon BM-7 with a viewing angle of 1° at a distance of 50cm and normal direction.



Note.2: Definition of Viewing Angle: Refer to figure as below:



Note.3: Definition of Response Time: TR and TF
The figure below is the output signal of the photo detector.



Note.4: Definition of Contrast Ratio (CR)

Ratio of gray max (G max)& gray min(G min)
Contrast ratio (CR) =(G max) / (G min)
(G max)=luminance with all pixel white
(G min)=luminance with all pixel black

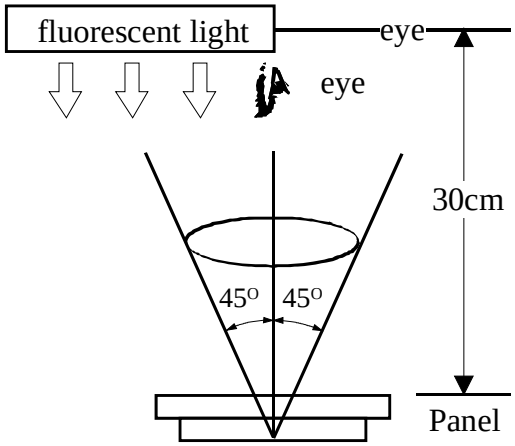
Note.5: Measured at the center area of the panel when all the input terminals of LCD panel are electrically opened.

8. Reliability

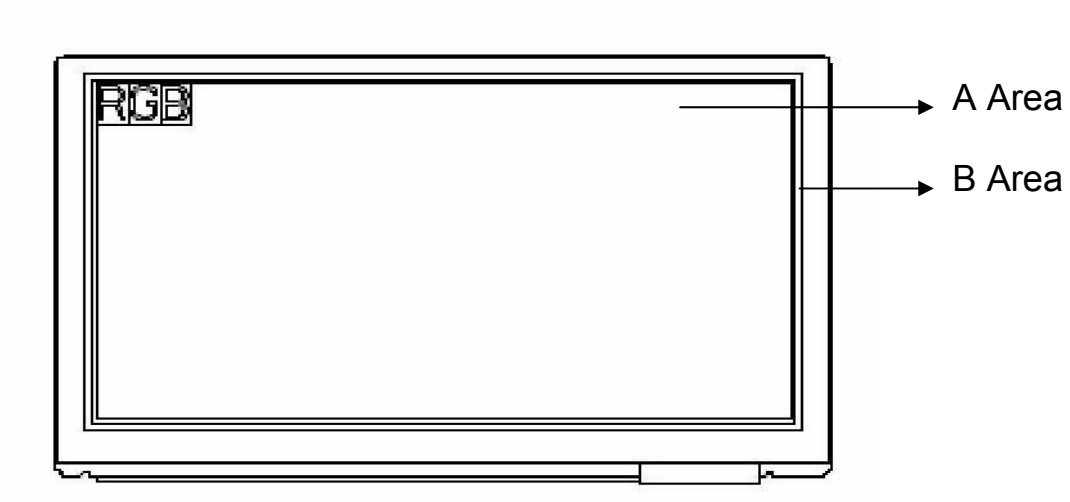
9. Cosmetic Criteria of LCD Screen

9.1 Inspection Condition

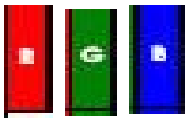
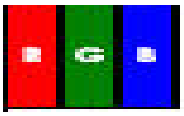
- Sample Plan: MIL-STD-105E LEVEL: Ⅱ
  AQL: Major(MA):0.65% / Minor(MI):1.5%
- Cosmetic inspect 300~500Lux fluorescent light, leaving 30~35cm between panels and eyes, and between panels and lights.
- Functional inspec under 200Lux.
- Inspection condition is 23±5°C, 50±20%RH maximum.



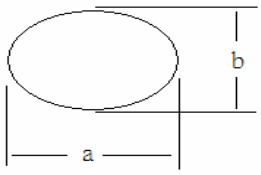
● Definition of area:



9.2 Inspection Specification

NO	Item	Acceptable specification	Judgment Criterion
1	Electrical Testing (Ma)	**1-1 sub pixel classification** ● Sub Pixel: Number of sub pixel doesn't exceed Five dot.  **Sub Pixel (Dot)** **a> Dark dot ----Four Allowed** **b> Bright dot ---- one Allowed** **c> The definition of dot----- The size of a defective dot over 1/2 of whole dot is regarded as one defective dot.** **d> Dark sub pixel:The distance more than 5mm between dot and dot.** **e> Bright sub pixel:The distance more than 20mm between bright dot and bright dot.** ● Pixel : Three dots link together ------ one allowed.  **Pixel** **1-2 Leakage to light** ● Leakage to light be not allowed. **1-3 Picture to shake** ● Picture had shake, twinkle and noise etc. instable of defect that be not allowed. **1-4 Function** ● No display or No function. ● Source Line, Gate Line. ● Contrast Ratio ● Current consumption exceeds product specifications. ● Display malfunction.	N≦4 N≦1 N≦1 N=0 N=0 N=0
2	Mechanical Dimension (Ma)	2-1 Mechanical Dimension exceeds product specifications. 2-2 Out of frame and boss of plastic changed shape that be not allowed	N=0

<table>
<tr><th>NO</th><th>Item</th><th>Acceptable specification</th><th>Judgment Criterion</th></tr>
<tr><td>3</td><td>Cosmetic Inspection (Ma)</td><td>
3-1 Fiber / Line shapes of defect
<table>
<tr><th>Length</th><th>Width</th><th>Acceptable number</th><th>Mini. space</th></tr>
<tr><td>---</td><td>W≦0.05</td><td>Ignore</td><td rowspan="2">5 m m</td></tr>
<tr><td>L≦3</td><td>0.05<W≦0.1</td><td>3</td></tr>
<tr><td>--</td><td>W＞0.1</td><td>Not allowed</td><td rowspan="2">---</td></tr>
<tr><td>L>3</td><td>----</td><td>Not allowed</td></tr>
</table>
L: length(mm)
W: width(mm)


3-2 Blemish: dot shapes of defect.
<table>
<tr><th>Dimension</th><th>Acceptable number</th><th>Mini. Space</th></tr>
<tr><td>Φ≦0.2</td><td>Ignore</td><td>---</td></tr>
<tr><td>0.2＜Φ≦0.3</td><td>3</td><td>5 m m</td></tr>
<tr><td>Φ＞0.3</td><td>0</td><td>---</td></tr>
</table>
3-3 Bubble
<table>
<tr><th>Dimension</th><th>Acceptable number</th><th>Mini. Space</th></tr>
<tr><td>Φ≦0.20</td><td>Ignore</td><td>---</td></tr>
<tr><td>0.20＜Φ≦0.30</td><td>3</td><td>15 m m</td></tr>
<tr><td>Φ＞0.30</td><td>0</td><td>---</td></tr>
</table>
Foreign Substances


Φ=(a+b)/2
</td><td></td></tr>
</table>

<table>
<tr><th>NO</th><th>Item</th><th>Acceptable specification</th><th>Judgment Criterion</th></tr>
<tr><td>3</td><td>Cosmetic Inspection (Ma)</td><td>
3-4 Scratch
● Sensate scratch not allowed.
● Impassive scratch as below.
<table>
<tr><th>Length</th><th>Width</th><th>Acceptable number</th><th>Mini. space</th></tr>
<tr><td>---</td><td>W≦0.05</td><td>Ignore</td><td rowspan="2">5 m m</td></tr>
<tr><td>L≦3</td><td>0.05<W≦0.1</td><td>3</td></tr>
<tr><td>--</td><td>W＞0.1</td><td>Not allowed</td><td rowspan="2">---</td></tr>
<tr><td>L>3</td><td>----</td><td>Not allowed</td></tr>
</table>
3-5 Newton Ring
●D≦8mm----one or less
●D≧8mm----NG
</td><td>N≦1</td></tr>
<tr><td>4</td><td>Crack/Break (MA)</td><td>Not Allowed.</td><td>N=0</td></tr>
<tr><td>5</td><td>Package (MI)</td><td>4-1 Mixed product types
4-2 Shipping q’ty should be the same as “shipping notice form” q’ty.
4-3 Outer box can’t broken.</td><td>N=0</td></tr>
</table>

10. Package

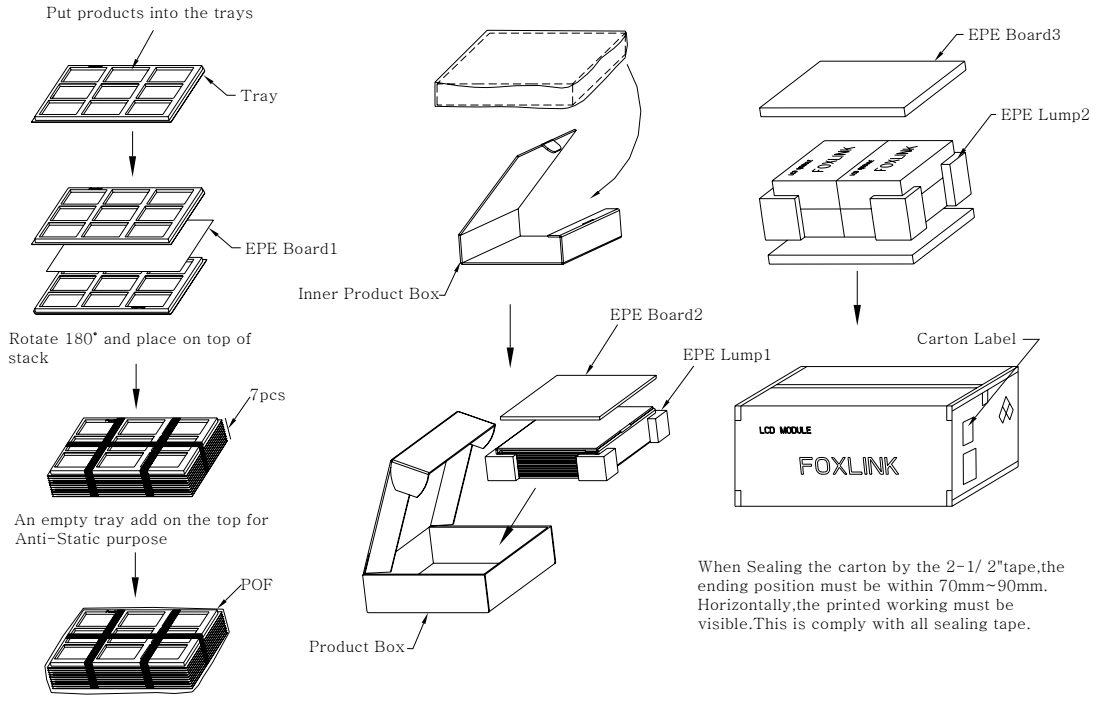
FU GANG ELECTRONIC CO.,LTD.CHENG UEI GROUP

Customer		LCM包裝規格書 LCM Packaging specifications	Prepared	Checked	DATE
			hui	Jos	05/15/07
LCM Model	FL064-A0,A1		版次Ver	Modify Description	
			1		

1.包裝材料規格表(Packaging Material):(per carton)

No.	Item	Dimension(mm)	Weight(g/pcs)	Net Quantity
1	成品(LCD MODULE)	76.9*63.9*3.89	TBD	216pcs
2	TRAY	350*250*13(0.8T)	TBD	28pcs
3	多層薄膜POF(2.1')	360		4pcs
4	EPE Board1	315*215*1	1.7	24pcs
5	EPE Board2	380*290*20	57.5	4pcs
6	EPE Board3	650*445*20	145	2pcs
7	EPE Lump1	70*70*60*20	3.7	16pcs
8	EPE Lump2	120*120*160*20	18.4	4pcs
9	內固定盒Inner Product Box	350*258*75(720*754/2)	129	4pcs
10	內盒Product Box	415*306*98(926*845/1)	302	4pcs
11	外紙箱Carton	464*670*256	1450	1pcs
12	乾燥劑(Drier)	40g/pcs	40	4pcs

2.單箱數量規格表(Packaging Specifications and Quantity):
(1)LCD quantity per box：number per Tray　　9* number of Tray　6　=　54
(2)Total LCD quantity in carton：number per box　54 * number of box　4　= 216



11. Precautions for Use

11.1 Safety

(1) Do not swallow any liquid crystal, even if there is no proof that liquid crystal is poisonous.
(2) If the LCD panel breaks, be careful not to get liquid crystal to touch your skin.
(3) If skin is exposed to liquid crystal, wash the area thoroughly with alcohol or soap.

11.2 Storage Conditions

(1)Store the panel or module in a dark place where the temperature is 23±5°C and the humidity is below 50±20%RH.
(2)Store in anti-static electricity container.
(3)Store in clean environment, free from dust, active gas, and solvent.
(4)Do not place the module near organics solvents or corrosive gases.
(5)Do not crush, shake, or jolt the module.

11.3 Handling Precautions

(1)Avoid static electricity which can damage the CMOS LSI.
(2)The polarizing plate of the display is very fragile. So, please handle it very carefully.
(3)Do not give external shock.
(4)Do not apply excessive force on the surface.
(5)Do not wipe the polarizing plate with a dry cloth, as it may easily scratch the Surface of plate.
(6)Do not use ketonics solvent & Aromatic solvent, use with a soft cloth soaked with a cleaning naphtha solvent.
(7)Do not operate it above the absolute maximum rating.
(8)Do not remove the panel or frame from the module.

11.4 Warranty

The period is within twelve months since the date of shipping out under normal using and storage conditions.