

FU GANG ELECTRONIC (KUNSHAN) CO., LTD.

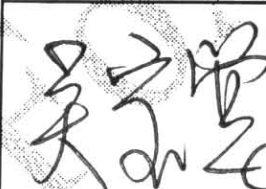



PRODUCT SPECIFICATION

**RoHS**

4.3" a-Si TFT LCD MODULE  
MODEL: FL430QHR01-B0

- < ◇ > Preliminary Specification
- < ◇ > Engineering Specification
- < ◆ > Approval Specification

CUSTOMER'S APPROVAL	
CUSTOMER :	
SIGNATURE:	DATE:

APPROVED BY	PM REVIEWED	PD REVIEWED	PREPARED By
 <small>Sep 15/09</small>		 <small>9/24/09</small>	 <small>9/24/09</small>

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## 1. General Description

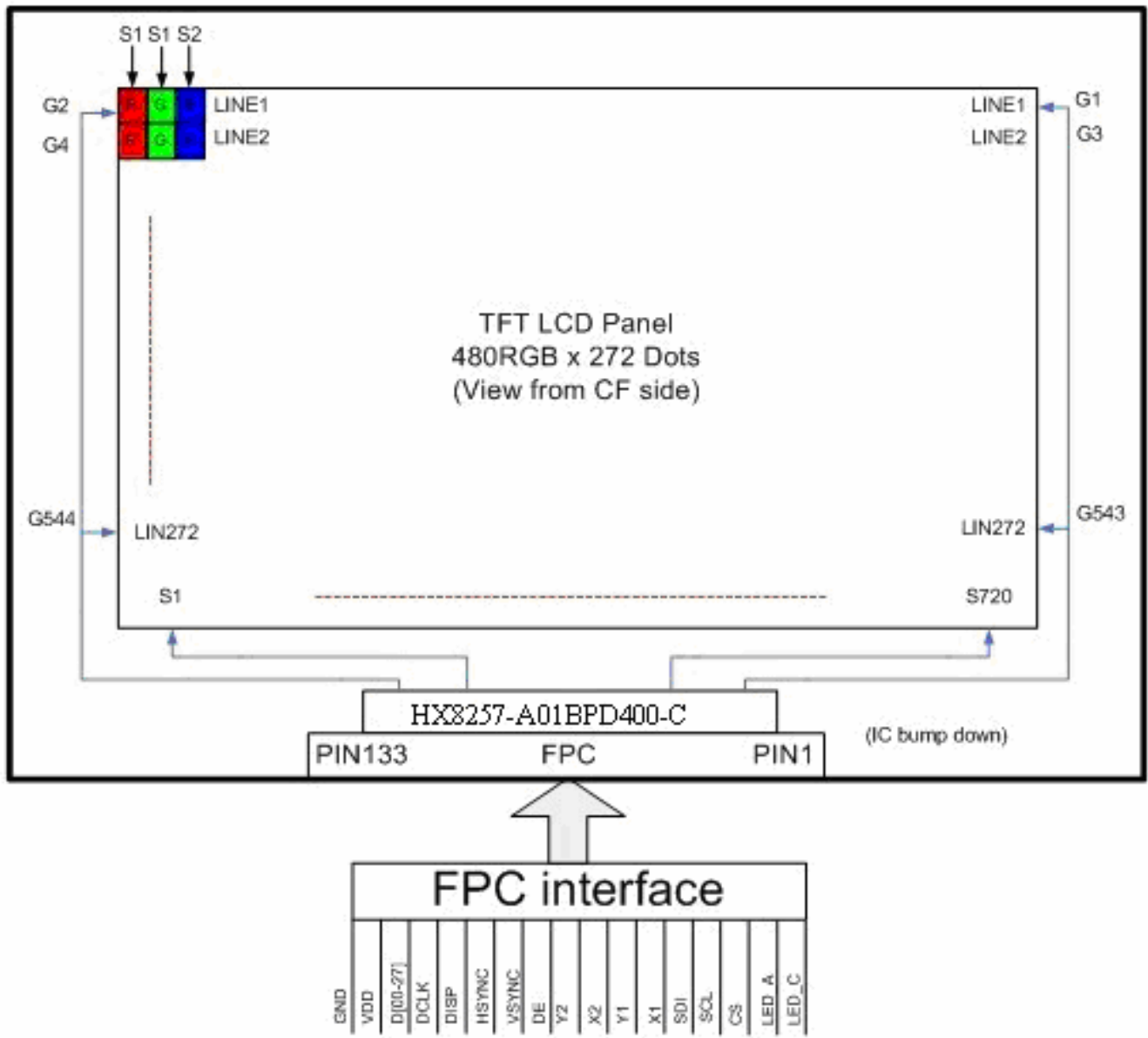
### 1.1 Description

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 IC,FPC and a backlight unit. The following table described the features of FL430QHR01-B0.

### 1.2 Features:

No.	Item	Specification	Unit
1	Panel Size	4.3" Diagonal	inch
2	Number of Pixels	480(H) x RGB x 272(V)	Pixels
3	Active Area	95.04(H) x 53.856(V)	mm
4	Pixel Pitch	0.198(H) x 0.198 (V)	mm
5	Outline Dimension	105.5(W) x 67.2(H) x 4.05 (D)	mm
6	Number of Colors	16.7M Colors	-
7	Pixel Arrangement	RGB Vertical Stripe	-
8	Display Mode	Normally White TN/Transmissive	-
9	Brightness (LED If=20mA)	450 (Typ.) / 410(Min.)	cd/m <sup>2</sup>
10	Contrast Ratio	500:1 (Typ.)	-
11	Chromaticity(White, x/y)	0.310 / 0.330 (Typ.)	
12	Uniformity	80%(Typ.)	
13	Response time (Tr+Tf)	20(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	-
18	Surface Treatment	Hard coating(SWV)	-
19	Driver IC	HX8257-A01BPD400-C	
20	Weight	(44.9)	g

## 2. Functional Block Diagram



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## 4. Pin Description

### 4.1 Interface Pin Description

No.	Symbol	I/O	Function	Remark
1	VSS	P	Ground	
2	VSS	P	Ground	
3	VDD	P	Power supply	
4	VDD	P	Power supply	
5	R0	I	Red signal data bus (LSB)	
6	R1	I	Red signal data bus	
7	R2	I	Red signal data bus	
8	R3	I	Red signal data bus	
9	R4	I	Red signal data bus	
10	R5	I	Red signal data bus	
11	R6	I	Red signal data bus	
12	R7	I	Red signal data bus (MSB)	
13	G0	I	Green signal data bus (LSB)	
14	G1	I	Green signal data bus	
15	G2	I	Green signal data bus	
16	G3	I	Green signal data bus	
17	G4	I	Green signal data bus	
18	G5	I	Green signal data bus	
19	G6	I	Green signal data bus	
20	G7	I	Green signal data bus (MSB)	
21	B0	I	Blue signal data bus (LSB)	
22	B1	I	Blue signal data bus	
23	B2	I	Blue signal data bus	
24	B3	I	Blue signal data bus	
25	B4	I	Blue signal data bus	
26	B5	I	Blue signal data bus	
27	B6	I	Blue signal data bus	
28	B7	I	Blue signal data bus (MSB)	
29	VSS	P	Ground	
30	PCLK	I	Dot clock signal	

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31	PON	I	Display on/off mode control	
32	HSYNC	I	Horizontal synchronous signal	
33	VSYNC	I	Vertical synchronous signal	
34	DE	I	Data enable signal	
35	NC	-	NA	
36	VSS	P	Ground	
37	YU	-	NC	
38	XL	-	NC	
39	YD	-	NC	
40	XR	-	NC	
41	SDI	I	Data input pin in serial mode	
42	LED-	P	Cathode for LED	
43	LED+	P	Anode for LED	
44	SCL	I	Clock pin of serial interface	
45	CS	I	Chip select pin of serial interface	

Note :

It must send the initial code to the module through the serial interface. If not, it will be not initialized and can't receive the RGB data.



## 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	5	V	GND=0
LED Forward Voltage	$V_F$	3.2		V	One LED
LED Forward Current	$I_F$	20		mA	
Storage Temperature	TST	-30	80	°C	
Operating Temperature	Topa	-20	70	°C	

### 5.2 DC Electrical Characteristics

#### 5.2.1 LCD DC Characteristics

Typical Operating Conditions ( $T_a=25^\circ\text{C}$ )

Item	Symbol	Values			Unit	Remark
		Min	Typ	Max.		
Operating voltage	VDD	1.8	2.8	3.6	V	
Input high voltage	$V_{IH}$	$0.8 \cdot VDD$		VDD	V	
Input low voltage	$V_{IL}$	0		$0.2 \cdot VDD$	V	
Output high voltage	$V_{OH}$	$0.9 \cdot VDD$		VDD	V	
Output low voltage	$V_{OL}$	0		$0.1 \cdot VDD$	V	
Current Consumption	$I_{VDD}$	-	14.0	21.0	mA	VDD=2.8V
Power Consumption	PLCD	-	46.2	69.3	mW	

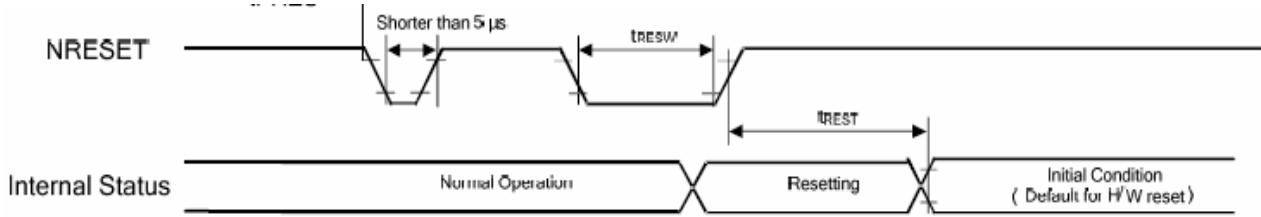
#### 5.2.2 Backlight Unit (GND=0V)

Item	Symbol	Values			Unit	Remark
		Min	Typ	Max.		
LED Voltage	$V_L$	-	30	-	V	LED*9
LED Current	$I_F$	-	20	-	mA	LED*9
Power Consumption	$P_{LED}$	-	600	-	mW	LED*9

#### 5.2.3 Reset Timing Characteristics(VDD =1.8 ~ 3.3V)

Item	Symbol	Values			Unit	Remark
		Min	Typ	Max.		
Reset low pulse width	$t_{RESW}$	10	-	-	$\mu\text{s}$	
Reset complete width	$t_{REST}$	-	-	5	ms	Sleep mode
		-	-	120	ms	Normal mode

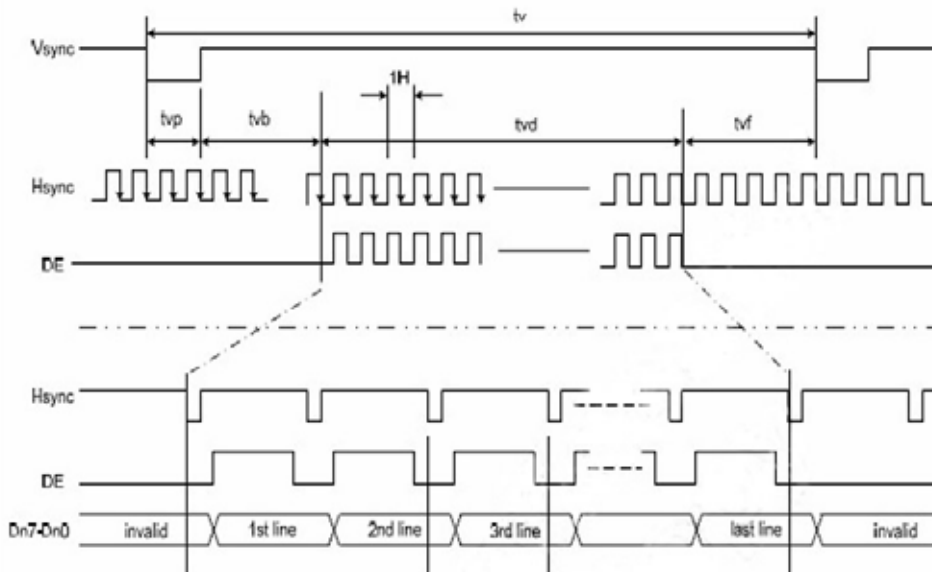
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## 5.3 AC Electrical Characteristics

### 5.3.1 AC Timing Diagrams

Characteristics	Symbol	Values			Unit	Remark
		Min	Typ	Max.		
Clock cycle	fclk	-	9	15	MHz	
Hsync cycle	1/th	-	17.14	-	KHz	
Vsync cycle	1/tv	-	59.94	-	Hz	
Horizontal Signal						
Horizontal cycle	th	525	525	605	CLK	
Horizontal display period	thd	480	480	480	CLK	
Horizontal front porch	thf	2	2	82	CLK	
Horizontal pulse width	thp	2	41	41	CLK	
Horizontal back porch	thb	2	2	41	CLK	
Vertical Signal						
Vertical cycle	tv	285	286	511	H	
Vertical display period	tvd	272	272	272	H	
Vertical front porch	tvf	1	2	227	H	
Vertical pulse width	tvp	1	10	11	H	
Vertical back porch	Tvb	1	2	11	H	

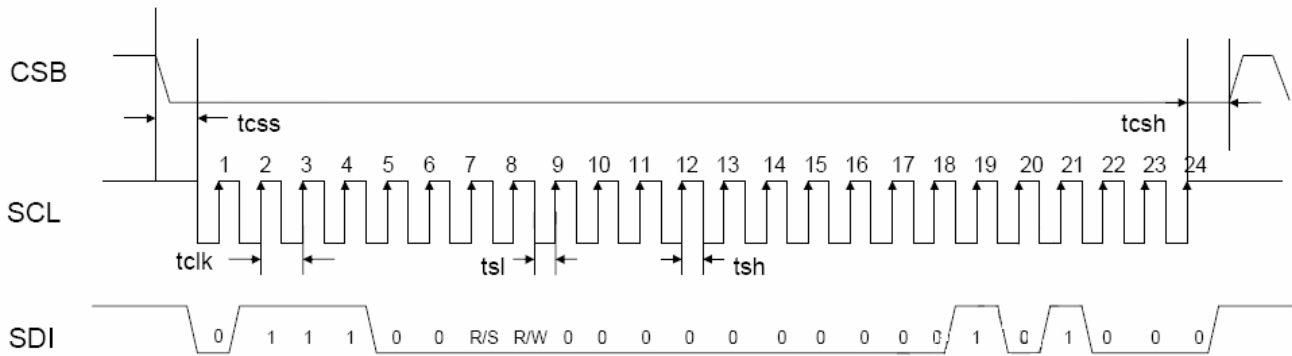


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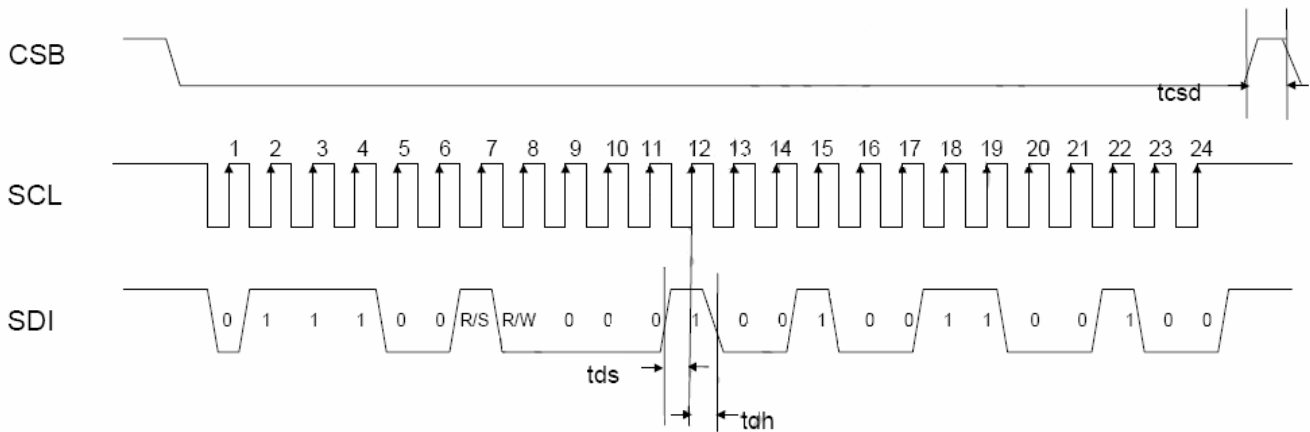
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### 5.3.2 SPI Timing Diagrams & transaction example

First Transmission (Register)



Second Transmission (Data)



Note: the example writes “0x1264” to the register R28h.

Parameter	Symbol	Spec.			Unit
		Min.	Typ.	Max.	
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	tchsh	10	-	-	ns
Chip Select High Delay Time	tchsd	20	-	-	ns
Data Setup Time	tds	5	-	-	ns
Data Hold Time	tdh	10	-	-	ns

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## 6. Optical Characteristics

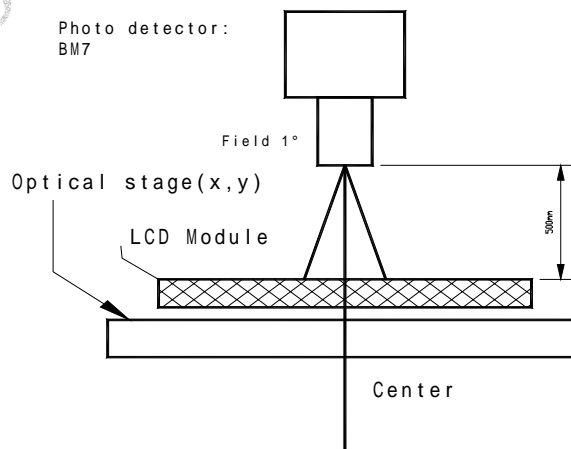
The following items are measured under stable conditions. The optical characteristics should be measured in a dark room or equivalent state with the methods shown in Note.1.

### 6.1 Main LCD Optical Characteristics

Item	Symbol	Condition	Min.	Typ.	Max.	Unit		
Viewing Angle	Top	$\Phi U$	$CR \geq 10$	-	50	-	degree	Note.2
	Bottom	$\Phi D$		-	55	-		
	Left	$\theta L$		-	60	-		
	Right	$\theta R$		-	60	-		
Response time( $T_r+T_f$ )		T=0	-	20	-	ms	Note.3	
Brightness		Center	410	450	-	cd/m <sup>2</sup>		
Uniformity			-	80	-	%	Note.4	
Contrast Ratio		CR	At optimized viewing angle	450	500	-	-	Note.5
Color Chromaticity	White	Xw	Viewing normal angle $\Phi, T=0$	(0.26)	(0.31)	(0.36)	-	Note.6
		Yw		(0.28)	(0.33)	(0.38)		
	Red	XR		(0.56)	(0.61)	(0.66)		
		YR		(0.31)	(0.36)	(0.41)		
	Green	XG		(0.29)	(0.34)	(0.39)		
		YG		(0.51)	(0.56)	(0.61)		
	Blue	XB		(0.09)	(0.14)	(0.19)		
		YB		(0.03)	(0.08)	(0.13)		

Note.0:  $B=B(\min)/B(\max)$

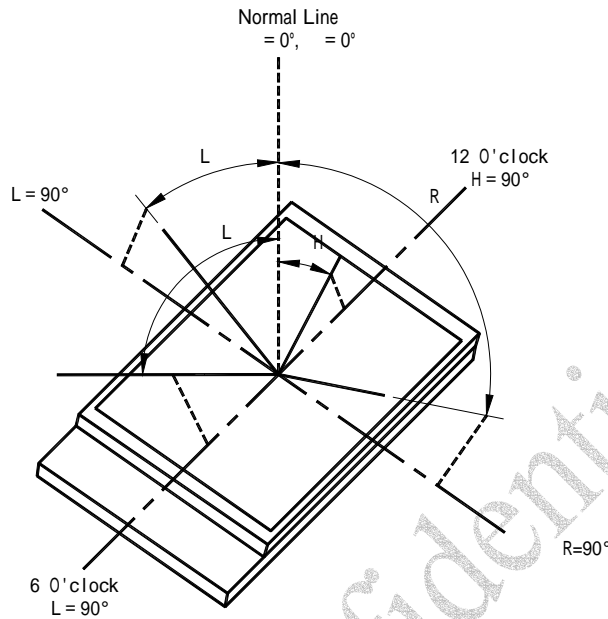
Note.1: After stabilizing and leaving the panel alone at a given temperature for 30 minutes, the measurement should be executed. Measurement should be executed in a stable, windless, and dark room. Optical specifications are measured by Topcon BM-7(fast) with a viewing angle of 1° at a distance of 50cm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



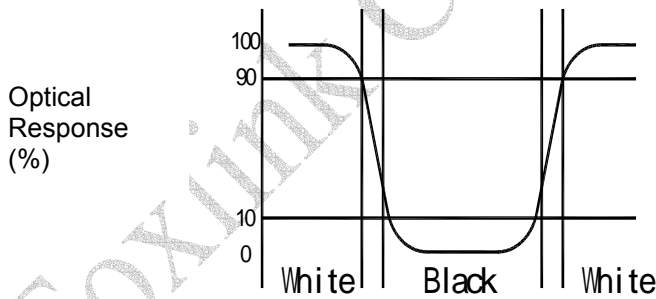
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Note.2: Definition of Viewing Angle: Refer to figure as below:



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)  

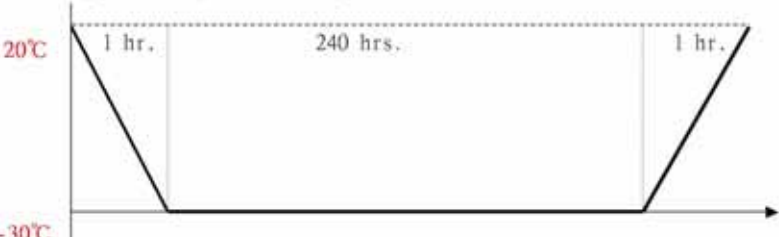
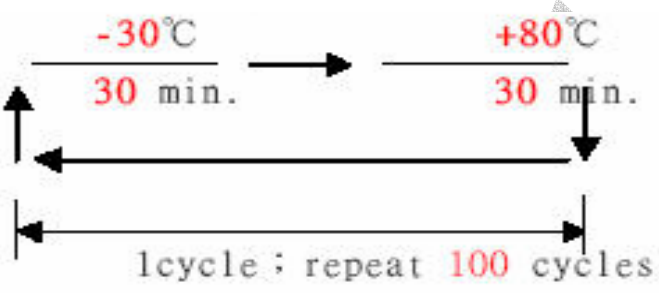
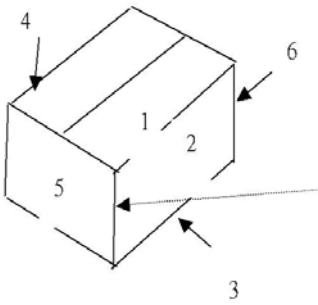
$$\text{Contrast ratio (CR)} = (\text{G max}) / (\text{G min})$$
 (G max)=luminance with central pixel white  
 (G min)=luminance with central pixel black

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

## 7. Reliability

Test Item	Test Condition
High Temperature Operation	<p>70°C for 240 hours</p>
High Temperature Operation Humidity Operation	<p>60°C,90%RH for 240 hours</p>
Low Temperature Operation	<p>-20°C for 240 hours</p>
High Temperature Storage	<p>80°C for 240 hours</p>

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Test Item	Test Condition
Low Temperature Storage	<p>-30°C for 240 hours</p> 
Thermal Shock	<p>-30°C (30min) ~ +80°C (30min) for 100 cycles</p> 
Electrostatic Discharge (Not operation)	<p>Discharge Resistance : 330 Energy Storage Capacitor : 150 pF Output voltage : (1)Contact Discharge ±4KV. (2)Air Discharge ± 8KV. Polarity of the output voltage : positive and negative Discharge times : 5 times</p>
Package Vibration	<p>Frequency (Random Wave) : 10Hz ~ 55Hz~10Hz Amplitude : 2mm Orientation : X , Y , Z (3 axis) Test Time : 2 hr.each axis, total 6 hrs</p>
Package Drop Test	<p>100cm height natural falling</p> <p>Drop sequence : 1 corner, 3 edges, and 6 faces, total 10 times.</p>  <p>紙箱接合點</p> <ol style="list-style-type: none"> <li>1) 角corner 2-3-5</li> <li>2) 稜edge 2-5</li> <li>3) 稜edge 2-3</li> <li>4) 稜edge 3-5</li> <li>5) 面face 5</li> <li>6) 面face 6</li> <li>7) 面face 2</li> <li>8) 面face 4</li> <li>9) 面face 3</li> <li>10) 面face 1</li> </ol>

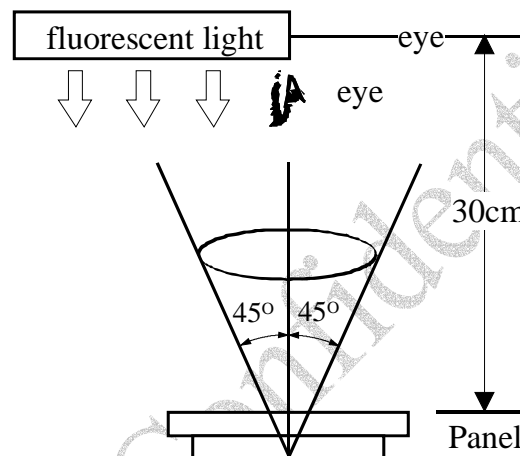
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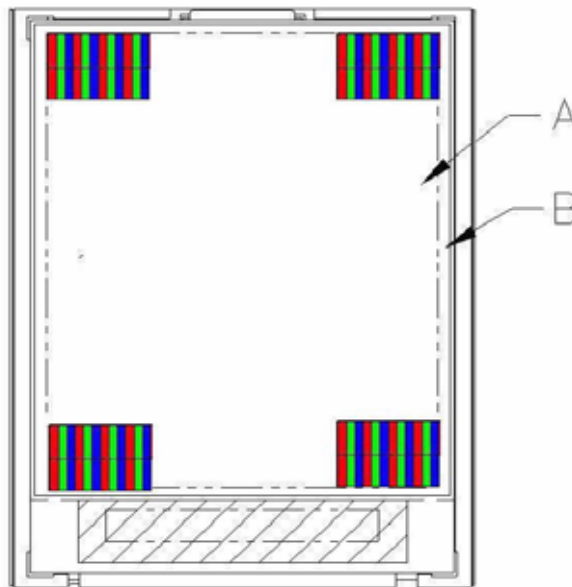
## 8. Cosmetic Criteria of LCD Screen

### 8.1 Inspection Condition

- Inspect under 300~500Lux fluorescent light, leaving 30~35cm between panels and eyes, and between panels and lights.
- Inspection condition is  $23\pm 5^{\circ}\text{C}$ ,  $50\pm 20\%\text{RH}$  maximum.
- Judge criterion  
Judgment under above mentioned criterion (panel must be tested under light transparent), testing goods defect can be visible within 10 seconds, which will be judged as major defects.



- Definition of area:






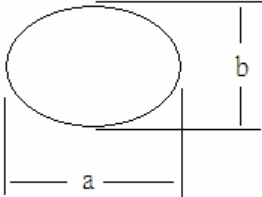
**A Area :** Viewing area.

**B Area :** Out of viewing.( Don't care cosmetic in outside viewing area)



## 8.2 Inspection Specification

NO	Item	Acceptable specification	Judgment Criterion
1	Electrical Testing	<p><b>1-1 sub pixel classification</b></p> <ul style="list-style-type: none"> <li>● Sub Pixel:               <ul style="list-style-type: none"> <li>a&gt; Bright dot ---- Three Allowed</li> <li>b&gt; Two dots link together doesn't exceed two</li> <li>c&gt; The definition of dot----- The size of a defective dot over 1/2 of whole dot is regarded as one defective dot.</li> <li>d&gt; Bright sub pixel:The distance more than 5mm between bright dot and bright dot.</li> </ul> </li> </ul> <div style="text-align: center;">  <p>Sub Pixel (Dot)</p> </div> <ul style="list-style-type: none"> <li>● Pixel : Three dots link together doesn't exceed ones</li> </ul> <div style="text-align: center;">  <p>Pixel</p> </div> <p><b>1-2 Pervious to light</b></p> <ul style="list-style-type: none"> <li>● Pervious to light be not allowed.</li> </ul> <p><b>1-3 Picture to shake</b></p> <ul style="list-style-type: none"> <li>● Picture had shake, twinkle and noise etc. instable of defect that be not allowed.</li> </ul> <p><b>1-4 Function</b></p> <ul style="list-style-type: none"> <li>● No display or No function.</li> <li>● Missing vertical, horizontal segment.</li> <li>● Segment Contrast defect.</li> <li>● Viewing angle defect.</li> <li>● Current consumption exceeds product specifications.</li> <li>● Display malfunction.</li> </ul>	<p><math>N \leq 3</math> <math>N \leq 2</math></p> <p>5mm</p> <p><math>N \leq 1</math></p> <p><math>N=0</math></p> <p><math>N=0</math></p> <p><math>N=0</math></p>
2	Mechanical Dimension	<p>2-1 Mechanical Dimension exceeds product specifications.</p> <p>2-2 Out of frame and boss of plastic changed shape that be not allowed.</p>	$N=0$
3	Mura	6%ND filter Inspection	
4	Micro-Dot Defect	6%ND filter Inspection	

NO	Item	Acceptable specification	Judgment Criterion																																										
5	Cosmetic Inspection	<p><b>5-1 Line shapes of defect</b></p> <table border="1" data-bbox="379 387 1331 739"> <thead> <tr> <th>Length</th> <th>Width</th> <th>Acceptable number</th> <th>Mini. space</th> </tr> </thead> <tbody> <tr> <td>---</td> <td><math>W \leq 0.03</math></td> <td>Ignore</td> <td rowspan="3">5 m m</td> </tr> <tr> <td><math>L \leq 3.0</math></td> <td><math>0.03 &lt; W \leq 0.05</math></td> <td>4</td> </tr> <tr> <td><math>L \leq 2.0</math></td> <td><math>0.05 &lt; W \leq 0.1</math></td> <td>2</td> </tr> <tr> <td>--</td> <td><math>W &gt; 0.1</math></td> <td>Not allowed</td> <td>---</td> </tr> </tbody> </table> <p>L: length(mm) W: width(mm)</p>  <p><b>5-2 dot shapes of defect.</b></p> <table border="1" data-bbox="450 1030 1299 1193"> <thead> <tr> <th>Dimension</th> <th>Acceptable number</th> <th>Mini. pace</th> </tr> </thead> <tbody> <tr> <td><math>\phi \leq 0.20</math></td> <td>Ignore</td> <td>---</td> </tr> <tr> <td><math>0.20 &lt; \phi \leq 0.30</math></td> <td>3</td> <td>5 m m</td> </tr> <tr> <td><math>\phi &gt; 0.30</math></td> <td>0</td> <td>---</td> </tr> </tbody> </table> <p><b>5-3 Polarizer Bubble/dent</b></p> <table border="1" data-bbox="450 1267 1299 1431"> <thead> <tr> <th>Dimension</th> <th>Acceptable number</th> <th>Mini. pace</th> </tr> </thead> <tbody> <tr> <td><math>\phi \leq 0.20</math></td> <td>Ignore</td> <td>---</td> </tr> <tr> <td><math>0.20 &lt; \phi \leq 0.30</math></td> <td>2</td> <td>15 m m</td> </tr> <tr> <td><math>\phi &gt; 0.30</math></td> <td>0</td> <td>---</td> </tr> </tbody> </table> <p>Foreign Substances</p>  <p style="text-align: center;"><math>\phi = (a+b)/2</math></p>	Length	Width	Acceptable number	Mini. space	---	$W \leq 0.03$	Ignore	5 m m	$L \leq 3.0$	$0.03 < W \leq 0.05$	4	$L \leq 2.0$	$0.05 < W \leq 0.1$	2	--	$W > 0.1$	Not allowed	---	Dimension	Acceptable number	Mini. pace	$\phi \leq 0.20$	Ignore	---	$0.20 < \phi \leq 0.30$	3	5 m m	$\phi > 0.30$	0	---	Dimension	Acceptable number	Mini. pace	$\phi \leq 0.20$	Ignore	---	$0.20 < \phi \leq 0.30$	2	15 m m	$\phi > 0.30$	0	---	
		Length	Width	Acceptable number	Mini. space																																								
		---	$W \leq 0.03$	Ignore	5 m m																																								
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		--	$W > 0.1$	Not allowed	---																																								
		Dimension	Acceptable number	Mini. pace																																									
		$\phi \leq 0.20$	Ignore	---																																									
		$0.20 < \phi \leq 0.30$	3	5 m m																																									
		$\phi > 0.30$	0	---																																									
Dimension	Acceptable number	Mini. pace																																											
$\phi \leq 0.20$	Ignore	---																																											
$0.20 < \phi \leq 0.30$	2	15 m m																																											
$\phi > 0.30$	0	---																																											

NO	Item	Acceptable specification	Judgment Criterion																		
6	Cosmetic Inspection	<p><b>6-1 Scratch</b></p> <p style="text-align: right;">Unit:mm</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 25%;">Length</th> <th style="width: 25%;">Width</th> <th style="width: 25%;">Acceptable number</th> <th style="width: 25%;">Mini. space</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">---</td> <td style="text-align: center;"><math>W \leq 0.03</math></td> <td style="text-align: center;">Ignore</td> <td rowspan="3" style="text-align: center; vertical-align: middle;">5 m m</td> </tr> <tr> <td style="text-align: center;"><math>L \leq 3.0</math></td> <td style="text-align: center;"><math>0.03 &lt; W \leq 0.05</math></td> <td style="text-align: center;">4</td> </tr> <tr> <td style="text-align: center;"><math>L \leq 2.0</math></td> <td style="text-align: center;"><math>0.05 &lt; W \leq 0.1</math></td> <td style="text-align: center;">2</td> </tr> <tr> <td style="text-align: center;">--</td> <td style="text-align: center;"><math>W &gt; 0.1</math></td> <td style="text-align: center;">Not allowed</td> <td style="text-align: center;">---</td> </tr> </tbody> </table>	Length	Width	Acceptable number	Mini. space	---	$W \leq 0.03$	Ignore	5 m m	$L \leq 3.0$	$0.03 < W \leq 0.05$	4	$L \leq 2.0$	$0.05 < W \leq 0.1$	2	--	$W > 0.1$	Not allowed	---	
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--	$W > 0.1$	Not allowed	---																		
7	Package	<p>7-1 Mixed product types</p> <p>7-2 Shipping q'ty should be the same as "shipping notice form" q'ty.</p> <p>7-3 Outer box can't broken.</p>	N=0																		

## 9. Package

Customer		LCM包裝規格書 LCM Packaging specifications	Prepared	Checked	DATE	
LCM Model			FL037-A3	hui	Jos	07/01/07
				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)	98.3*62.4*4.95	TBD	216pcs
2	靜電袋 (1) Antistatic Bag	130*120	2.1	216pcs
3	氣泡袋 (2) Bubble Bag	140*120	3.2	216pcs
4	A1隔板 (3) A1 Partition	465*74*2.5	12.7	78pcs
5	B1隔板 (4) B1 Partition	275*74*2.5	8.6	24pcs
6	EPE Board(5)	270*460*10	27.65	12pcs
7	內盒(6)Product Box	285*475*100	265	6pcs
8	外紙箱(7)Carton	585*490*315	1310	1pcs
9	乾燥劑(8)(Drier)	10g/pcs	11.01	6pcs

2.單箱數量規格表(Packaging Specifications and Quantity):

(1)Quantity of spacer per box : A1 Partition \* 13 ;B1 Partition \* 4  
(2)Total LCD quantity in carton : number per box 36 \* number of box 6 = 216

When Sealing the carton by the 2-1/ 2"tape,the ending position must be within 70mm~90mm. Horizontally,the printed working must be visible.This is comply with all sealing tape.

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## 10. Precautions for Use

### 10.1 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.

### 10.2 Storage Conditions

- (1) Store the panel or module in a dark place where the temperature is  $23\pm 5^{\circ}\text{C}$  and the humidity is below  $50\pm 20\%\text{RH}$ .
- (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.

### 10.3 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 wipe the polarizing plate with a dry cloth, as it may easily scratch the surface of plate.
- (5) Do not use ketonics solvent & Aromatic solvent, use with a soft cloth soaked with a cleaning naphtha solvent.
- (6) Do not operate it above the absolute maximum rating.
- (7) Do not remove the panel or frame from the module.
- (8) Please wear clean finger sacks, gloves and mask to protect the products from fingerprint or stain attach, and also hold the portion outside the view area when handling the panel.
- (9) Do not put one product on the other. Otherwise, it may cause the product to be scratched and/or change on cosmetic occur (ex. Newton ring).
- (10) Do not put a heavy, hard or sharp object on the product.

### 10.4 Warranty

- (1) The period is within twelve months since the date of shipping out under normal using and storage conditions.
- (2) All process and material comply ROHS.