Tentative

Date : 2006.08.31

승 인 원
Specification for Approval

고객명
customer :

모델명
model name : UF-80I001-A

품 명
description : Liquid Crystal Display module

검 토 (Proposed by)		승 인(Approved by)
기 안 Designed	승 인 Approved	
전산결재	전산결재	
M.H.KWON 2006.08.	W.C.CHOI 2006.08.	

SAMSUNG SDI CO., LTD

Tentative

REV.	DATE	CONTENTS	WRITTEN	APPROVED
A	'06.08.31	Initial Specification Release. (Tentative)	M.H.KWON	G.Y.JEONG

Tentative

CONTENTS

1. Introduction

This specification defines the general provisions of the product as well as the inspection standard for Samsung SDI's a-Si TFT LCD module.
If the event of unforeseen problems or unspecified items occur, we naturally shall negotiate and agree to solution with customer.

2. Warranty and Disclaimer

Samsung warranty term is 12 months from the production date. Within the period, Samsung shall compensate for the defectives as specified in this document. User must take care of the precautions and the product should be stored and used in right manner specified in this document.

Any type of mishandling or any type of change on the Samsung product in electrical and mechanical shall void Samsung warranty. After the expiration of the warranty period, the replacement of any parts or of the entire product shall be charged.

For further information or the customer service, contact Samsung Quality Assurance Group.

This Specification stipulates the final and comprehensive requirements for the respective products hereof. Beyond this Specification, it is the responsibility of the customer to explicitly disclose any additional requirements, information or reservations regarding these requirements to Samsung SDI prior to implementation, where any and all disclosures of the customer shall be with an authorized representative of Samsung SDI in writing. Samsung SDI shall not be responsible for safety, performance, functionality or compatibility of the system with which the Samsung SDI-supplied components are integrated unless such features have been expressly communicated and described in the Specification. **SAMSUNG SDI MAKES NO GUARANTY OR WARRANTY, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, TO ANY PARTY.** Moreover, any party should do their own due diligence regarding these requirements prior to implementation.

3. Features

3-1 MAIN LCD

ITEM	Specifications	Unit	Note
Number of dots	800(W) * (RGB) * 480(H)	-	-
Display Mode	ECB Color (260K colors under normal driving mode)	-	-
Viewing Angle	6	o'clock	
Driving LSI & Manufacturer	HX8234,HX8662 by HIMAX		
Pixel Array	RGB vertical stripes		
BACK LIGHT	LED, WHITE		
CPU INTERFACE	18 bit Parallel RGB Interface		

4. Physical characteristics

ITEM	Specifications	-	Unit
Dimensional outline	Refer to attached drawing	-	mm
Number of dots	800(W) X 480(H)	-	Pixels
Active area	86.4(W) X 51.84(H)	-	mm
Pixel pitch	0.108(W) X 0.108(H)	-	mm
Dots size	0.036(W) X RGB X 0.108(H)	-	mm
Glass Thickness	0.4(T)	-	mm
Surface Hardness for pol	2H		

5. Maximum rating

ITEM		Symbol	Min.	Max.	Unit	Note
Supply voltage	Logic	DVDD	-0.3	5.0	V	1,2,3,4
	Power Circuit	AVDD	-0.3	7.0	V	1,2,3,4
		VLED	-0.3	7.0	V	1,2,3,4
Input voltage		Vin	-0.3	DVDD + 0.3	V	2,3,3,4
Operating temperature		Top	-20	60	℃	2,3
Humidity		Hop	10	90	%RH	2,3
Storage temperature		Tstg	-30	70	℃	2,3
Humidity		Hstg	10	90	%RH	2,3

Note 1) DVDD is the logic voltage of HX8234,HX8662.
AVDD is boosted to HX8234 and HX8662's driving power in the FPCB circuits.
Note 2) Wet bulb temperature should be kept under 29℃ of no condensation.
Note 3) This product must be used under the absolute maximum ratings at any time.
The values exceeding the ratings may result in a permanent failure of the product.
Note 4) all the supply voltages should satisfy more than Vss(GND) level.

6. Electrical characteristics

6-1. Electrical Characteristics.

(Vss=0V)

ITEM		Symbol	Condition	Min	Typ.	Max.	Unit	Note
Supply voltage (Logic)		DVDD	-	2.25	2.5	3.6	V	1
Supply voltage (Power Circuit)		AVDD	-	3.0	-	5.5	V	-
		VLED	-	2.5	-	6.0	V	-
Input voltage	"H" level	V_{IH}	-	0.8DVDD	-	DVDD	V	1
	"L" level	V_{IL}		Vss	-	0.2DVDD		
Output voltage	"H" level	V_{OH}	I_{OH} = -1mA I_{OL} = 1mA	DVDD -0.3	-	DVDD	V	1
	"L" level	V_{OL}		Vss	-	Vss+0.3		
I/O leakage current		I_{IL}	V_{IN}=0 or Vss	-1.0	-	+1.0	uA	2
Current consumption (Main LCD)		Icc1	Full Display (FULL WHITE)	-	TBD	TBD	mA	3
		Icc2	Stand-by mode	-	TBD	TBD	uA	

Note

1) The following figures illustrate the configurations of 1 pin, I/O pin, and O pin
2) This excludes the current through the output drive MOS.
3) Full WHITE Mode

6-2. LED back light specification (per a Chip)

Item	Symbol	Condition	Min.	Typ.	Max.	Unit.
Forward voltage	V_F	I_F=20㎃	3.0	-	3.8	V
Reverse voltage	V_R	I_R=10㎃	0.6	-	2.0	V
Forward current	I_F	-	-	-	30	mA
Reverse Current	I_R	V_R=5V	-	-	85	mA
Uniformity(with L/G)	-	I_F=15㎃	70%	-	-	-
Luminous color	White					
Chip , maker	SLSNNWH412TSISEI, SAMSUNG					
RANK SORTING	Rank of the chromaticity coordinate : E Rank of the luminous intensity : H					
Chip connection	2Channel, Each Channel 5chip serial connection.					

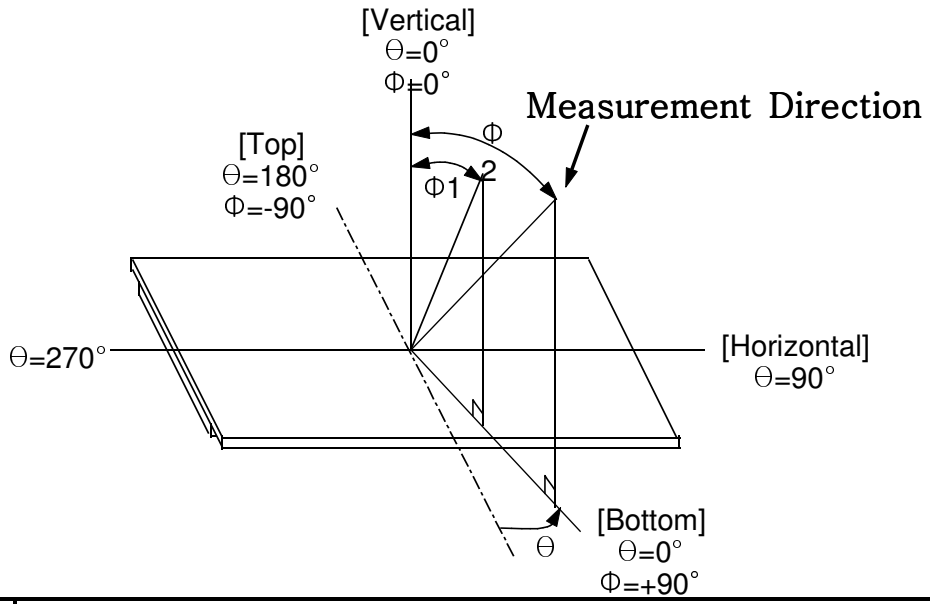
7. Electro-Optical characteristic

7-1. Targeted optical characteristics for design

(Ta : 25°C)

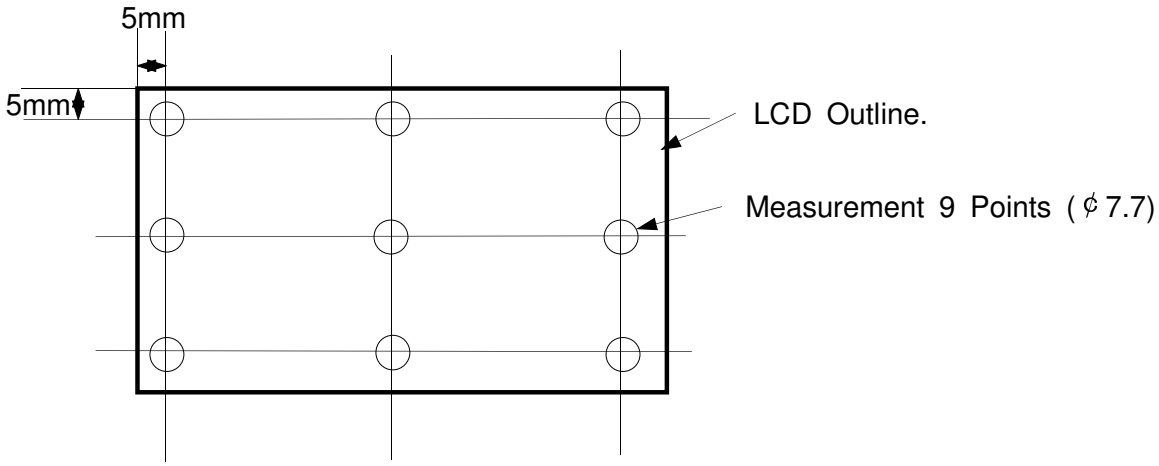
ITEM		Symbol	Condition			Min.	Typ.	Max.	Unit.	Note
Response time	Rising	Ton	Φ=0°, Θ=0° Display : Black->White			TBD	5ms	TBD	msec	1,2,3
	Falling	Toff	Φ=0°, Θ=0° Display : White->Black			TBD	20ms	TBD		
Viewing angle		Φ	K≥10	Φ=180°	Display B/W	TBD	70	TBD	deg.	1,4,6
				Φ=0°		TBD	70	TBD		
				Φ=-90°		TBD	70	TBD		
				Φ=+90°		TBD	70	TBD		
Contrast ratio		K	Φ=0°, Θ=0°			TBD	300:1	TBD	-	1,2,5
Brightness	Normal	Bn	Φ=0°, Θ=0° ILED=20mA			TBD	220	TBD	cd/㎡	1,2
Color of CIE coordinate	White	X	Φ=0° Θ=0°			0.291	0.311	0.331	-	1,2
		Y				0.320	0.340	0.360	-	
	Red	X				0.596	0.616	0.636	-	
		Y				0.322	0.342	0.362	-	
	Green	X				0.291	0.311	0.331	-	
		Y				0.538	0.558	0.578	-	
	Blue	X				0.115	0.135	0.155	-	
		Y				0.122	0.142	0.162	-	

Note 1) Φ and Θ Definition



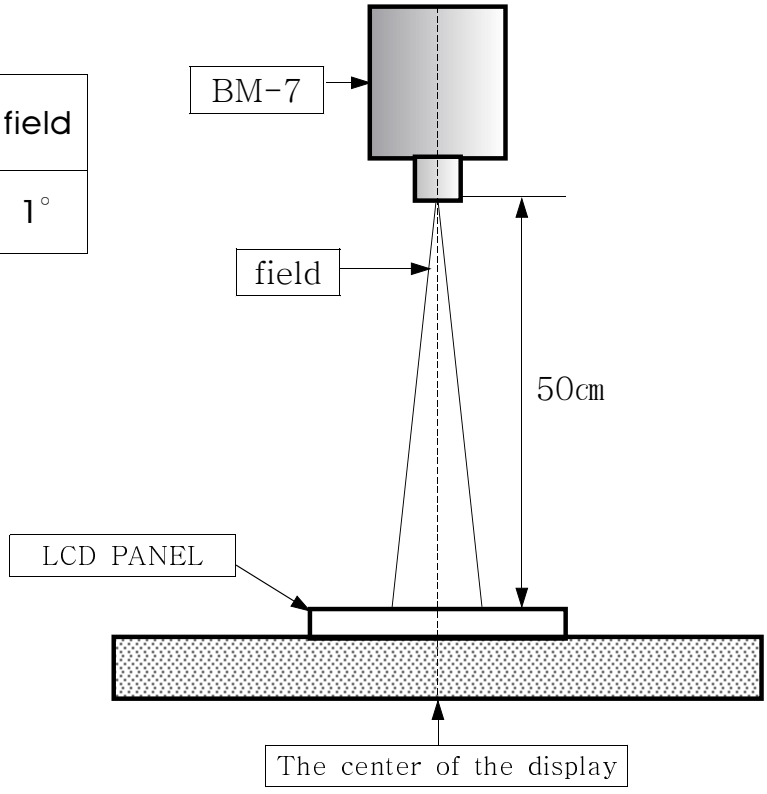
Note 2) Backlight Measurement.

Measuring equipment : BM-7 (TOPCON), Vertical front Measurement.

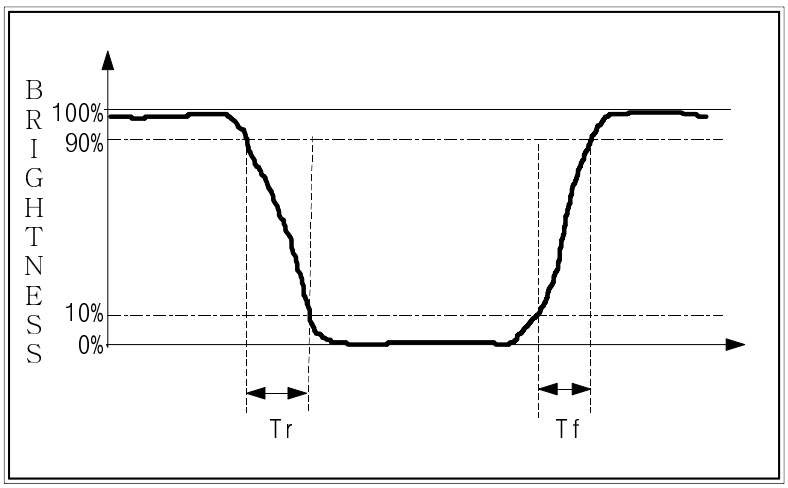


Uniformity = Lmin/Lmax * 100 [%]

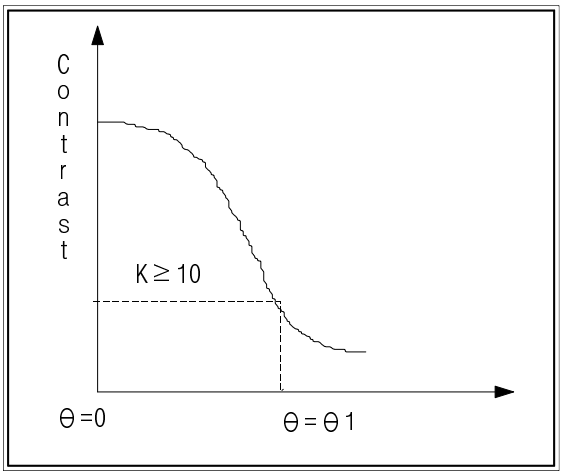
Instruments	field
BM-7	1°



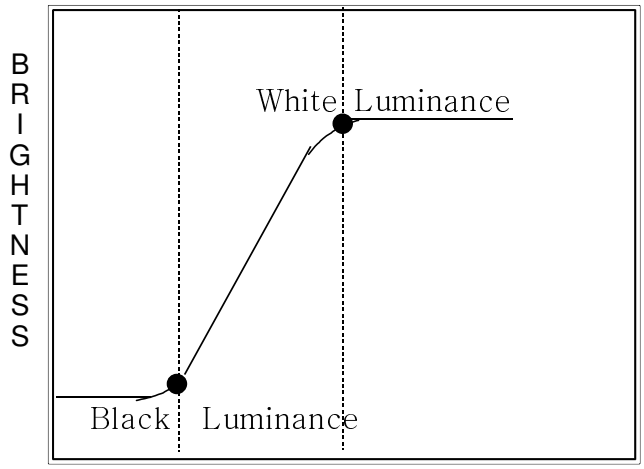
Note 3) Definition of Response time



Note 4) Definition of Viewing angle

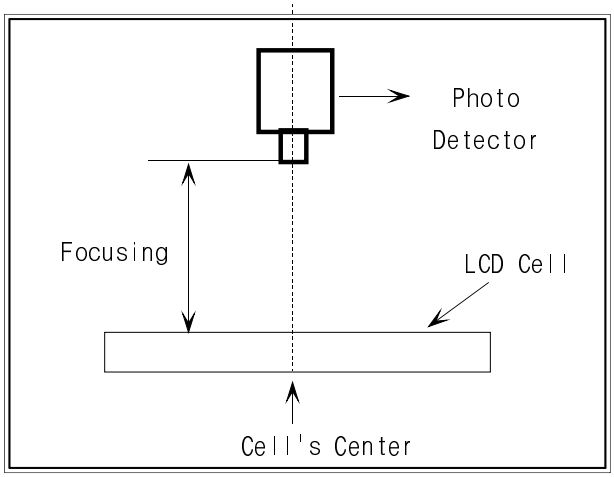


Note 5) Definition of contrast ratio (K)



Note 6) Optical measuring system

temperature regulated chamber



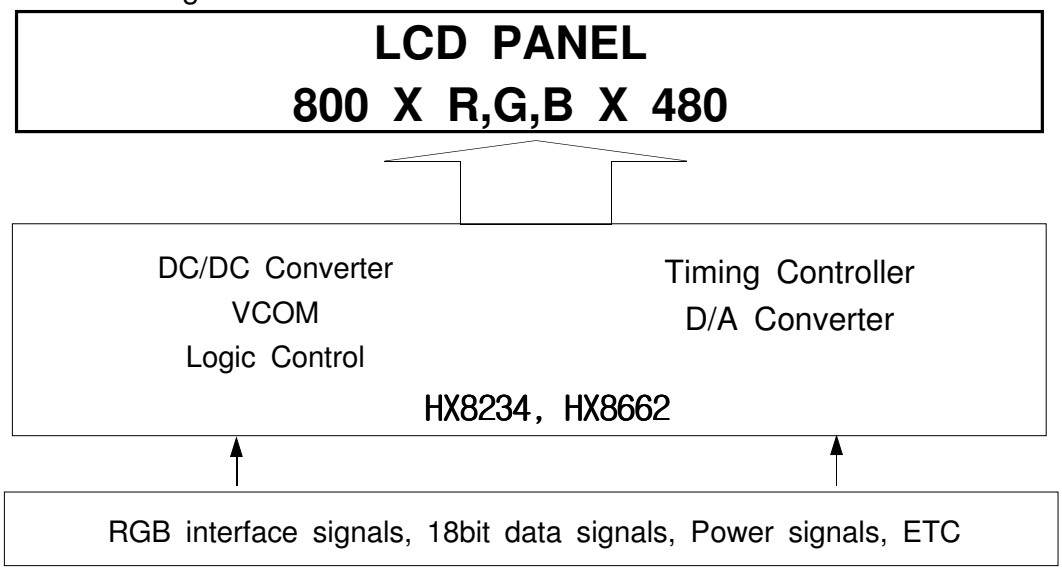
$$\text{Contrast ratio (K)} = \frac{\text{Brightness of non-Selected dot (Boff)}}{\text{Brightness of selected dot (Bon)}}$$

8. Interface

8-1. I/O connection

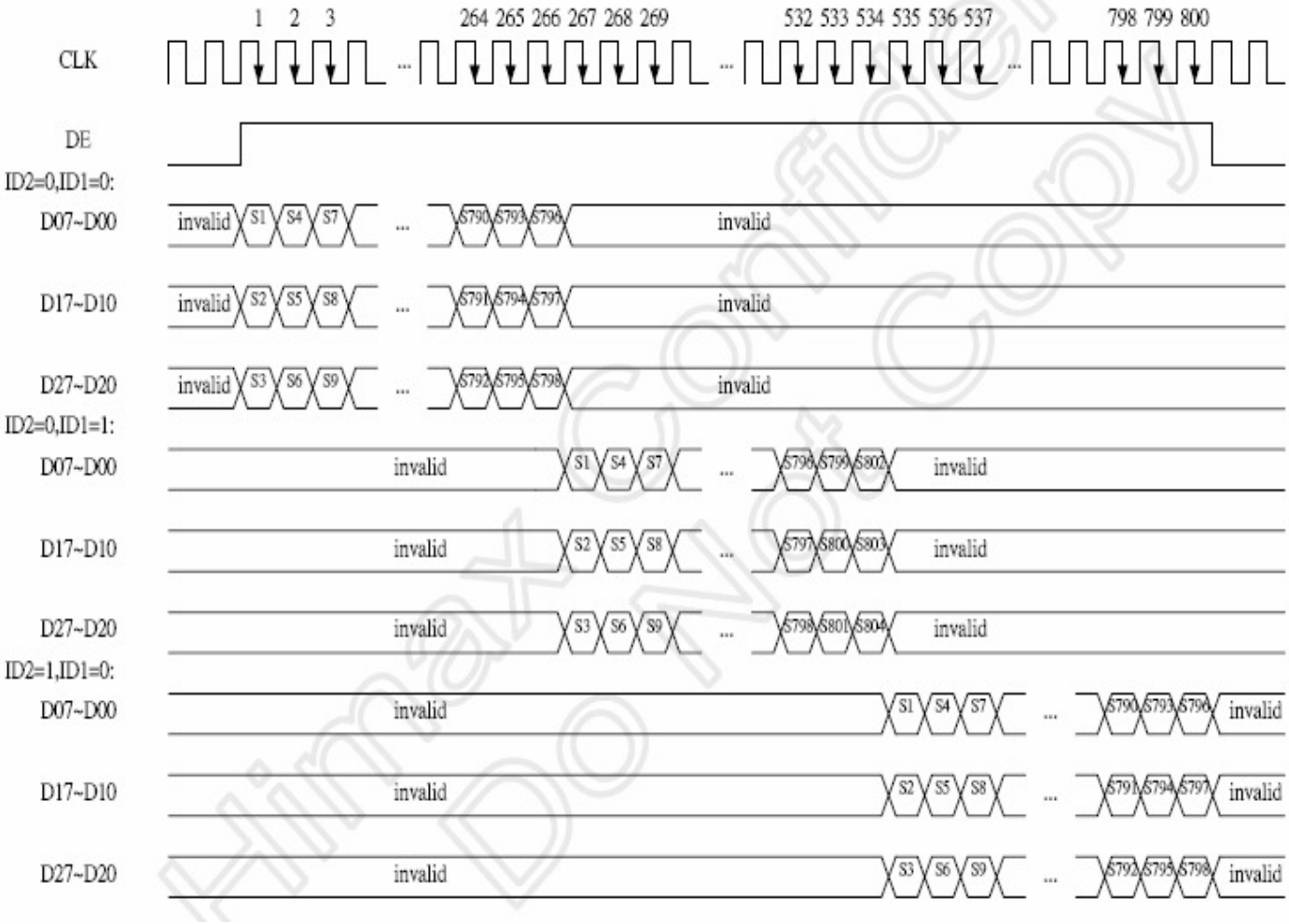
Pin No.	Symbol	Pin No.	Symbol
1	GND	21	D26
2	GND	22	D27
3	AVDD	23	D12
4	VLED	24	D13
5	AVDD	25	D14
6	VLED	26	D15
7	EN_PWM	27	D16
8	TEST1	28	D17
9	TEST3	29	DE
10	TEST2	30	RESETB
11	D2	31	GND
12	D3	32	DISP
13	D4	33	CLK
14	D5	34	GND
15	D6	35	DVDD
16	D7	36	HS
17	D22	37	DVDD
18	D23	38	VS
19	D24	39	GND
20	D25	40	GND

8-2. Circuit block diagram



8.3. Signal timing diagram for TFT LCD driver HX8234

8.3.1 Interface Function



8.3.2 Parallel RGB Interface Timing Operation

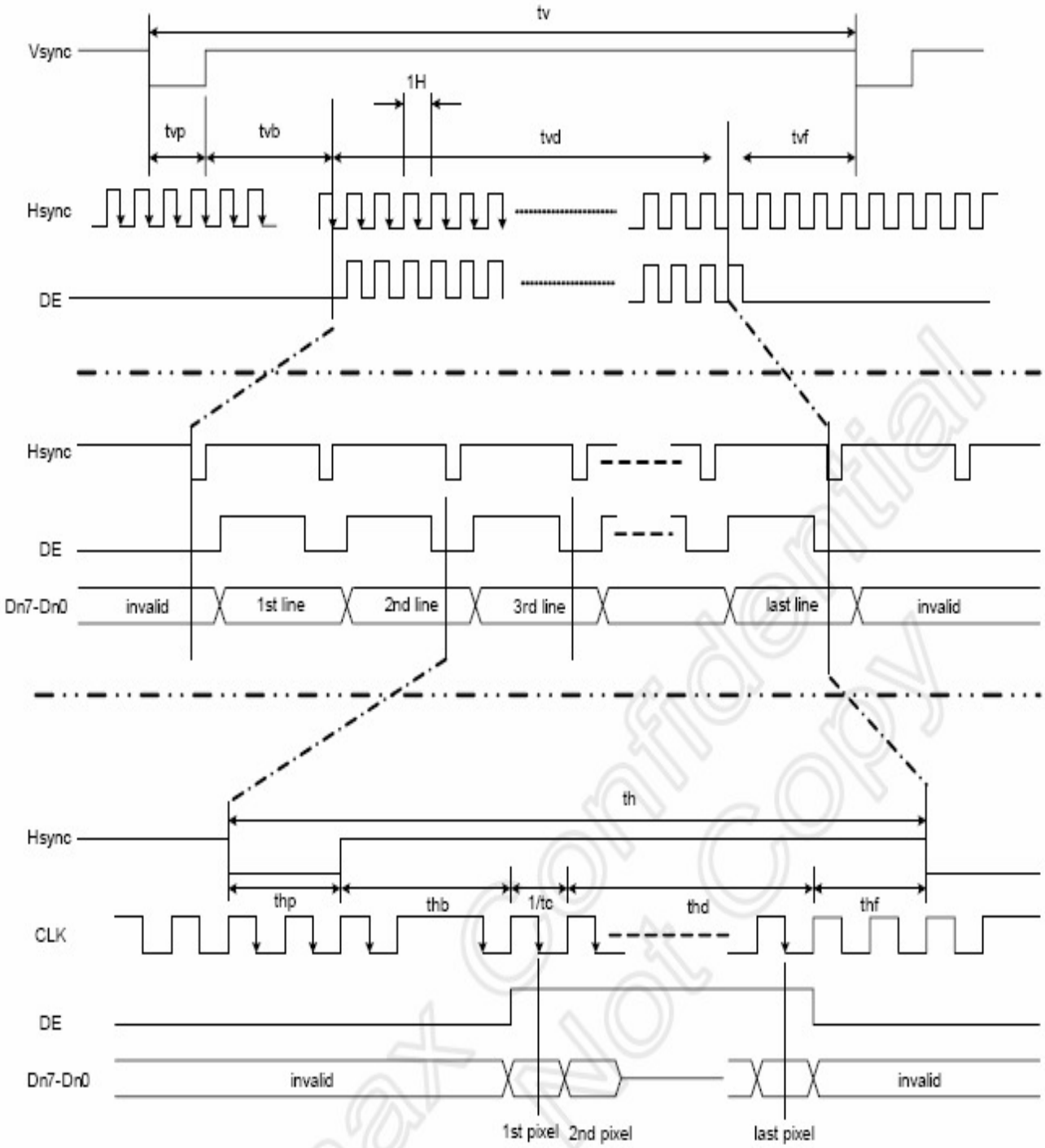


Figure 7. 4 Timing Requirement 1

8.3.2 Parallel RGB Interface Timing Operation (continued)

1. 800RGBx480(T_A=25°C, DVDD=2.25V to 3.6V, DVSS= 0V)

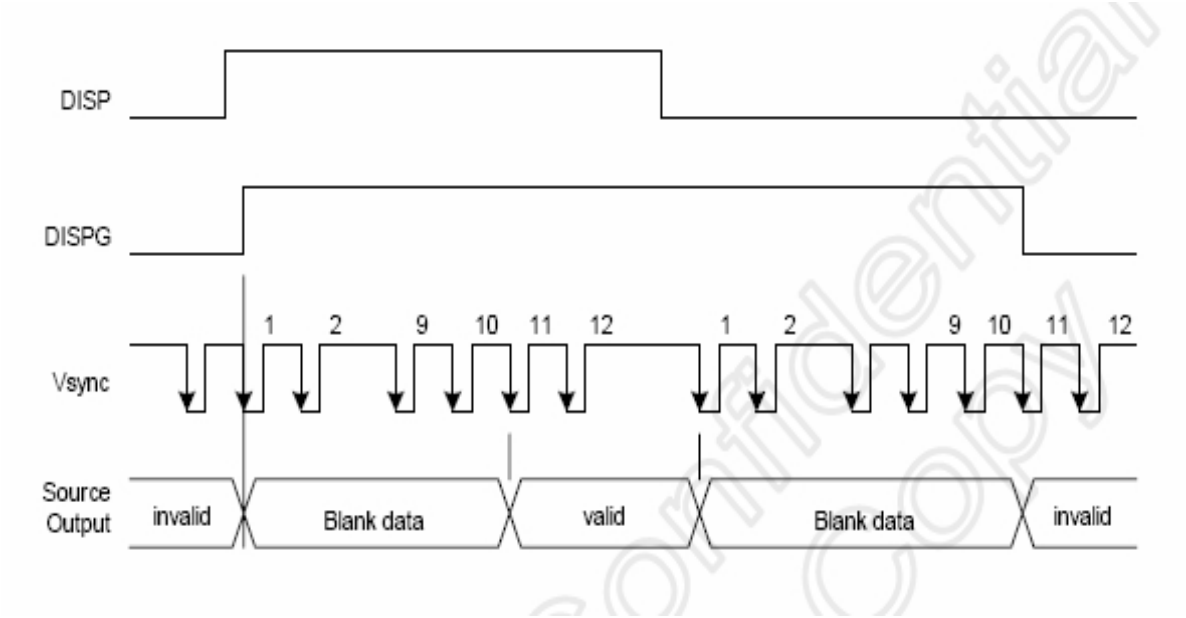
PARAMETER	Symbol	Min.	Typ.	Max.	Unit
Clock cycle	$1/t_C$	20	33.3	45	MHz
Hsync cycle	$1/f_H$	-	31.5	-	KHz
Vsync cycle	$1/f_V$	-	60	-	Hz
Horizontal Signal					
Horizontal cycle	Th	-	1056	2047	CLK
Horizontal display period	thd	800	800	800	CLK
Horizontal front porch	thf	2	40	-	CLK
Horizontal pulse width	thp	2	128	-	CLK
Horizontal back porch	thb	2	88	-	CLK
Vertical Signal					
Vertical cycle	Tv	-	525	1022	H
Vertical display period	Tvd	480	480	480	H
Vertical front porch	tvf	2	10	-	H
Vertical pulse width	Tvp	2	2	-	H
Vertical back porch	Tvb	2	33	-	H

Note: thd=800CLK, thf + fhp > 56

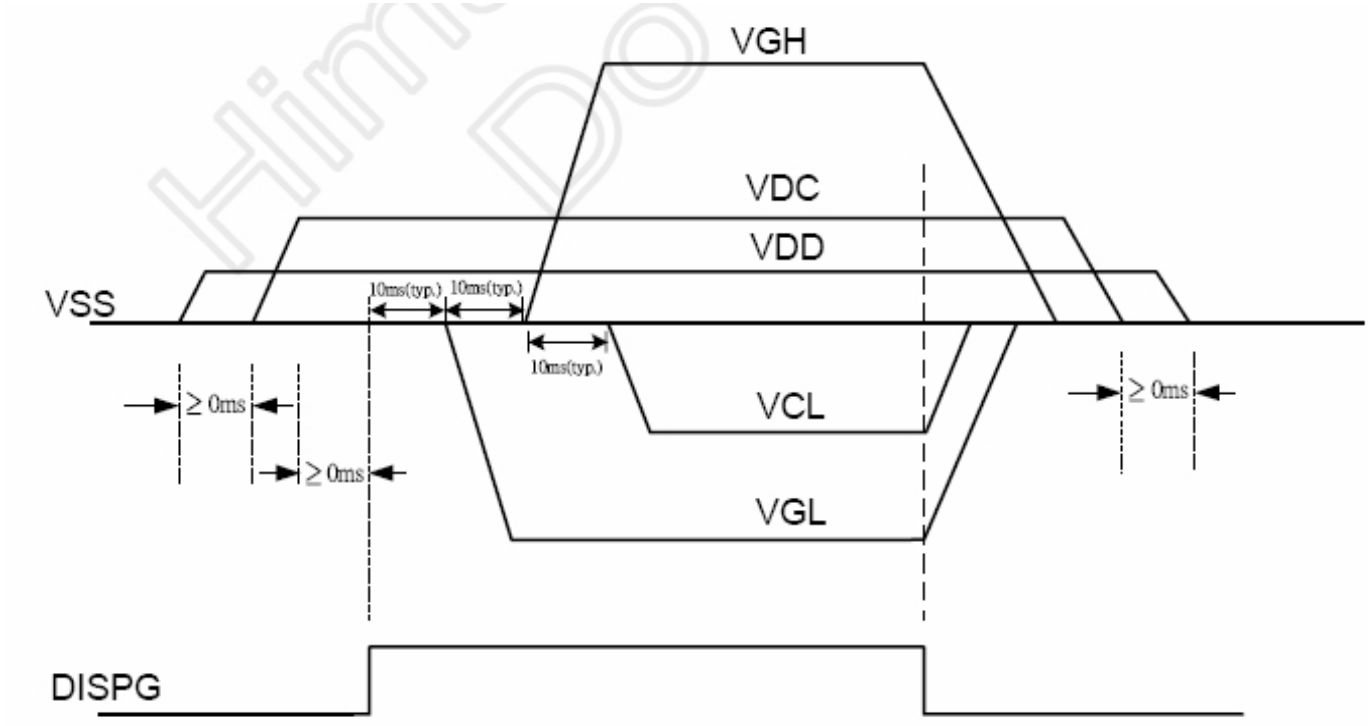
8.4 POWER CIRCUIT SET-UP SEQUENCE

8.4.1 POWER ON/OFF SEQUENCE

HX8234 ON/OFF sequence



HX8662 ON/OFF sequence



9. Quality level

9-1. Inspection conditions

9-1-1. The environmental conditions for inspection shall be as follows.

Room temperature : 20 ±3℃

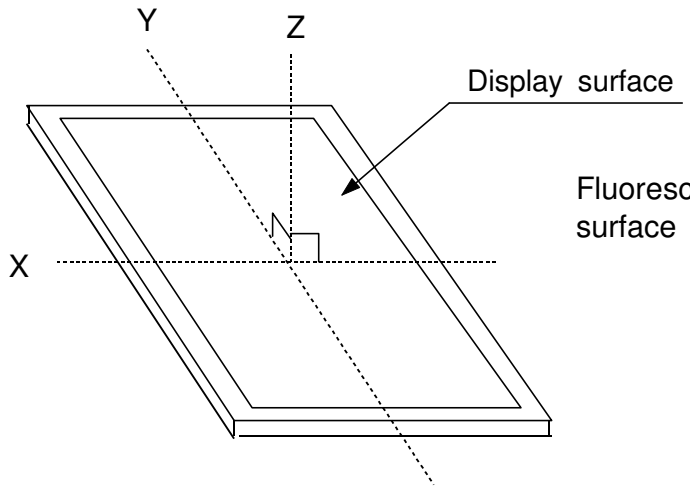
Humidity : 65 ±20%RH

9-1-2. The external visual inspection

The inspection shall be performed by using a single 20W fluorescent lamp for illumination and the distance should be kept more than 30cm between inspector`s eyes and surface of LCD.

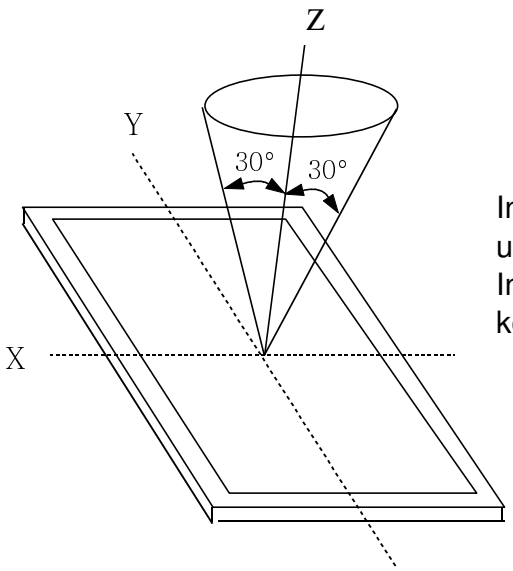
9-1-3.

(1) Light method



Fluorescent lamp will be set on the surface of LCD perpendicularly

(2) Inspection distance and angle



Inspection should be performed within ø (ø is usually 30°) from Z axis to each X and Y axis. Inspection distance in direction within ø must be kept more than 30cm to the surface of LCD.

9-2. Sampling procedures for each item's acceptance level

Defect type	Sampling procedures	AQL
Major defect	MIL-STD-105D Inspection level Ⅰ normal inspection single sample inspection	0.65
Minor defect	MIL-STD-105D Inspection level Ⅰ normal inspection single sample inspection	1.5

9-3. Classification of defects

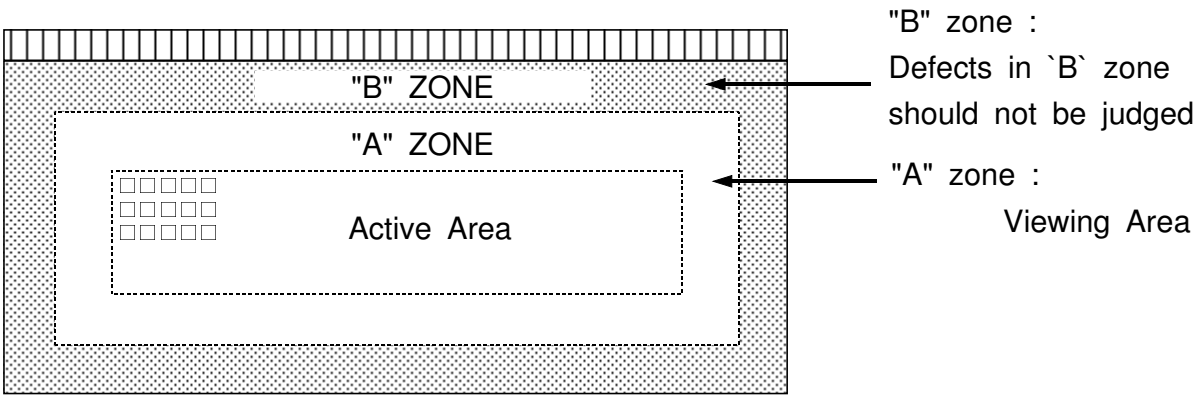
9-3-1. Major defect

: A major defect refers to the defect which is considered to substantial degradation to the usability for product application.

9-3-2. Minor defect

: A minor defect refers to the defect which is not considered to be substantial degradation for product application, or the defect which deviates from the existing standards, and it is almost irrelated to the effective use of the product or its operation.

9-3-3.Defect application zone :Viewing Area



9-4. Inspection standards

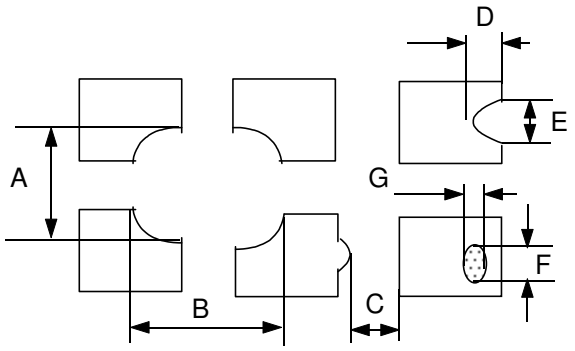
※ All of electrical defects must be judged at the state of optimum voltage that has the best contrast.

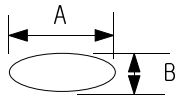
9-4-1.Definition of Black/White Spot or Line

ITEM	Criterion for defects
Black/White spots(Ⅰ) Black/White lines (Ⅰ)	Spots or lines appear dark or white in display patterns and remain unvaried in terms of size or shade with varying the LCD operating voltage.
Black/White spots(Ⅱ) Black/White lines (Ⅱ)	Spots or lines appear dark or white in display patterns and they are variable in terms of size and shade with varying the LCD operating voltage.

9-4-2. Inspection standards

<table>
<tr><th>ITEM</th><th>Criterion for defects</th><th>Defect type</th></tr>
<tr><td>1) Non display</td><td>·No non display is allowed</td><td>Major</td></tr>
<tr><td>2) Irregular operating</td><td>·No irregular operation is allowed</td><td>Major</td></tr>
<tr><td>3) Short</td><td>·No shorts are allowed</td><td>Major</td></tr>
<tr><td>4) Open</td><td>·Any segments or common patterns that don't activate are rejectable.</td><td>Major</td></tr>
<tr><td>5) Black/White spot(Ⅰ)</td><td><table><tr><th>Size ø(mm)</th><th>Acceptable number</th></tr><tr><td>ø ≤ 0.10</td><td>4</td></tr><tr><td>0.10 < ø ≤ 0.20</td><td>2</td></tr><tr><td>0.20 < ø ≤ 0.25</td><td>1</td></tr><tr><td>0.25 < ø</td><td>0</td></tr></table></td><td>Minor</td></tr>
<tr><td>6) Black/White line(Ⅰ)</td><td><table><tr><th>Length (mm)</th><th>width (mm)</th><th>Acceptable number</th></tr><tr><td>10 < L</td><td>0.03 < W ≤ 0.04</td><td>5</td></tr><tr><td>5.0 < L ≤10</td><td>0.04 < W ≤ 0.06</td><td>3</td></tr><tr><td>1.0 < L ≤5.0</td><td>0.06 < W ≤ 0.07</td><td>2</td></tr><tr><td>L ≤1.0</td><td>0.07 < W ≤ 0.09</td><td>1</td></tr></table></td><td>Minor</td></tr>
<tr><td>7) Black/White spot(Ⅱ)</td><td><table><tr><th>Size ø(mm)</th><th>Acceptable number</th></tr><tr><td>ø ≤ 0.30</td><td>Ignore</td></tr><tr><td>0.30 < ø ≤ 0.50</td><td>5</td></tr><tr><td>0.50 < ø ≤ 1.20</td><td>3</td></tr><tr><td>1.20 < ø</td><td>0</td></tr></table></td><td>Minor</td></tr>
</table>

<table>
<tr><th>ITEM</th><th>Criterion for defects</th><th>Defect type</th></tr>
<tr><td>8) Black/White line(II)</td><td>
<table>
<tr><th>Length (mm)</th><th>width (mm)</th><th>Acceptable number</th></tr>
<tr><td>20 < L</td><td>0.05<W≤0.07</td><td>5</td></tr>
<tr><td>10 < L ≤20</td><td>0.07<W≤0.09</td><td>3</td></tr>
<tr><td>5.0 < L ≤10</td><td>0.09<W≤0.10</td><td>2</td></tr>
<tr><td>L ≤5.0</td><td>0.10<W≤0.15</td><td>1</td></tr>
</table>
</td><td>Minor</td></tr>
<tr><td>9) Back Light</td><td>1)No Lighting is rejectable
2)Flickering and abnormal lighting are rejectable
※In case of the model with back light
(E/L , LED or CCFT type)</td><td>Major</td></tr>
<tr><td>10) Display pattern</td><td> 

[Unit: mm]
<table>
<tr><td>A+B/2≤0.30</td><td>0 < C</td><td>D+E/2≤0.25</td><td>F+G/2≤0.25</td></tr>
</table>
Note : 1) Acceptable up to 3 damages
2) NG if there're two or more pinholes per dot</td><td>Minor</td></tr>
<tr><td>11) Blemish & Foreign matters
Size :
ø=(A+B)/ 2
 
</td><td>
<table>
<tr><th>Size ø(mm)</th><th>Acceptable number</th></tr>
<tr><td>ø≤ 0.10</td><td>4</td></tr>
<tr><td>0.10 < ø≤ 0.20</td><td>2</td></tr>
<tr><td>0.20 < ø≤ 0.25</td><td>1</td></tr>
<tr><td>0.25 < ø</td><td>0</td></tr>
</table>
</td><td>Minor</td></tr>
<tr><td>12)Scratch on Polarizer</td><td>
<table>
<tr><th>width (mm)</th><th>Length (mm)</th><th>Acceptable number</th></tr>
<tr><td>W≤0.03</td><td>Ignore</td><td>Ignore</td></tr>
<tr><td>0.03<W≤0.05</td><td>L≤2.0</td><td>Ignore</td></tr>
<tr><td></td><td>L>2.0</td><td>1</td></tr>
<tr><td>0.05<W≤0.08</td><td>L>1.0</td><td>1</td></tr>
<tr><td></td><td>L≤1.0</td><td>Ignore</td></tr>
<tr><td>0.08<W</td><td>Note (1)</td><td>Note(1)</td></tr>
</table>
Note (1) Regard as a blemish</td><td>Minor</td></tr>
</table>

<table>
<tr><th>ITEM</th><th>Criterion for defects</th><th>Defect type</th></tr>
<tr><td>13) Bubble in polarizer</td><td>
<table>
<tr><th>Size ø (mm)</th><th>Acceptable number</th></tr>
<tr><td>ø ≤ 0.20</td><td>Ignore</td></tr>
<tr><td>0.20 < ø ≤ 0.50</td><td>3</td></tr>
<tr><td>0.50 < ø ≤ 0.80</td><td>2</td></tr>
<tr><td>0.80 < ø</td><td>0</td></tr>
</table>
</td><td>Minor</td></tr>
<tr><td>14) Stains on LCD panel surface</td><td>Stains which cannot be removed even when wiped lightly with a soft cloth or similar cleaning too are rejectable.</td><td>Minor</td></tr>
<tr><td>15) Rust in Bezel</td><td>Rust which is visible in the bezel is rejectable.</td><td>Minor</td></tr>
<tr><td>16) Defect of land surface contact (Poor soldering)</td><td>Evident crevices which is visible are rejectable.</td><td>Minor</td></tr>
<tr><td>17) Parts mounting</td><td>(1) Failure to mount parts
(2) Parts not in the specifications are mounted
(3) Polarity, for example, is reversed</td><td>Major
Major
Major</td></tr>
<tr><td>18) Parts alignment</td><td>(1) LSI, IC lead width is more than 50% beyond pad outline.
(2) Chip component is off center and more than 50% of the leads is off the pad outline.</td><td>Minor
Minor</td></tr>
<tr><td>19) Conductive foreign matter (Solder ball, Solder chips)</td><td>(1) 0.45 < ø , N ≥ 1
(2) 0.30 < ø ≤ 0.45 , N ≥ 1
ø Average diameter of solder ball (unit::mm)
(3) 0.50 < L , N ≥ 1
L: Average length of solder chip (unit::mm)</td><td>Minor
Minor
Minor</td></tr>
<tr><td>20) Faulty PWB correction</td><td>(1) Due to PWB copper foil pattern burnout, the pattern is connected, using a jumper wire for repair; 2 or more places are corrected per PWB.
(2) Short circuited part is cut, and no resist coating has been performed.</td><td>Minor
Minor</td></tr>
<tr><td>21) Flicker of TFT LCD</td><td>Flicker of TFT LCD is not the item of the inspection.</td><td></td></tr>
</table>

<table>
<tr><th>ITEM</th><th>Criterion for defects</th><th>Defect type</th></tr>
<tr><td>22) Dot Defect</td><td>
<table>
<tr><th rowspan="2">ITEM 1)2)</th><th colspan="2">Specifications</th></tr>
<tr><th>Number of missing dots</th><th>Total</th></tr>
<tr><td>Bright dots 3)</td><td>0</td><td rowspan="2">3 or less</td></tr>
<tr><td>Dark dots 4)</td><td>3</td></tr>
</table>
Irregular light emmissions by individual dots, caused by failures in TFT array, are counted as dot defects.

Note 1) Any missing dots in TFT array are counted as bright dots.
Note 2) Any unconspicuous dot defect shall not be counted as a defect.(Any defect that cannot be verified by using 5% ND-filter shall not be counted.)
Note 3) A bright dot refers to a bright dot at gradation level(black)
Note 4) A dark dot refers a dark dot at gradation level L63(R,G,B)
</td><td>Minor</td></tr>
<tr><td>23) External view of plastic frame</td><td>No conspicuous contamination, crack or chip</td><td></td></tr>
<tr><td>24) External view of LCD panel 1)</td><td>
Any dirt or defect in the active display area should satisfy the following conditions
Granular
<table>
<tr><th>Ave. dia. (mm) 2)</th><th colspan="2">Number of pieces (n)</th><th>Inter-dust/defect distance 3)</th></tr>
<tr><td>D ≤ 0.1</td><td colspan="2">Ignored</td><td rowspan="4">5 mm or more</td></tr>
<tr><td>0.1 < D≤ 0.2</td><td>n ≤ 4</td><td rowspan="2">Total
n ≤ 4</td></tr>
<tr><td>0.2 < D ≤ 0.25</td><td>n ≤ 1</td></tr>
<tr><td>0.25 < D</td><td colspan="2">n = 0</td></tr>
</table>
Linear
<table>
<tr><th>Length
L (mm)</th><th>Width
W (mm)</th><th>Number of pieces (n)</th><th>Inter-ust/defect distance 3)</th></tr>
<tr><td>-</td><td>W ≤ 0.02</td><td>Ignored</td><td rowspan="4">5 mm or more</td></tr>
<tr><td>L ≤ 2.0</td><td>0.02 <W ≤ 0.03</td><td>n ≤ 3</td></tr>
<tr><td>L ≤ 1.0</td><td>0.03 <W ≤ 0.05</td><td>n ≤ 1</td></tr>
<tr><td>-</td><td>0.05 < W</td><td>n = 0</td></tr>
</table>
Note 1) Any unconspicuous defects without real damages are typically not counted.
Note 2) Any defects or bubbles, etc. with a width of 0.10 mm or more will be judged according to the average diameter(granular shape).
</td><td></td></tr>
</table>

	Note 3) This standard will not apply to any standard in which dirt, defects, or number of bubbles are ignored	

[Connector connection.]

By the foreign material or the operator's mis-aligement, when assemble LCD module into the set with ZIF connector, the connection can be poor. So it needs to contact several time when abnormal display or no display.

[Camera preview mode]

The any phenomenon that appear only in camera preview mode, is not a defect. If the phenomenon don't be occurred in the other mode(such as color bar, white mode), this is not a defect of LCD module.

10. Reliability

10-1. Items of reliability

: All test result of items should be judged in 1 hour recovery time at Room temperature.

ITEM	Condition	Criterion
1) High temperature operating	60℃ 96 hrs	· After testing,cosmetic defects should not happen. · Contrast ratio should not happen lower than 10% of initial value · Total current consumption should not be over 10% of initial value. Polarizers may fail in humidity test, but only this failure is allowable.
2) Low temperature operating	-20℃ 96 hrs	
3) Humidity	40℃, 90%RH, 96 hrs	
4) High temperature storage	70℃ 96 hrs	
5) Low temperature storage	-30℃ 96 hrs	
6) Thermal shock	25℃→-30℃→25℃→70℃ 5(min) 30(min) 5(min) 30(min) 5 cycle, 55~60%RH	
7) Temperature humidity cycle	JIS.C.0028.1 5 cycle	
8) Vibration	10～55～10Hz amplitude : 1.5mm 2hrs for each direction (X, Y, Z)	·Not allowed cosmetic and electrical defects. (note) test will be performed at state of carton box,not each of the modules
9)Static Electricity	150pF 330Ω ±8kV 10 times air discharge.	·After testing ,cosmetic and electrical defects should not happen. ·Total current consumption should be below double of initial value.

(Note1)

In case of malfunction defect caused by ESD damage, if it would be recovered to normal state after reseting,it would be judged as a good part.

11. Handling precautions

11-1. Mounting method

The LCD panel of SAMSUNG SDI LCD module consists of two thin glass plates with polarizes which easily be damaged. And since the module in so constructed as to be fixed by utilizing fitting holes in the printed circuit board. Extreme care should be needed when handling the LCD modules.

11-2. Caution of LCD handling and cleaning

When cleaning the display surface, Use soft cloth with solvent [recommended below] and wipe lightly

- ◎ Isopropyl alcohol
- ◎ Ethyl alcohol
- ◎ Trichlorotriflorothane

Do not wipe the display surface with dry or hard materials that will damage the polarizer surface.

Do not use the following solvent:

- ◎ Water
- ◎ Ketone
- ◎ Aromatics

Do not wipe ITO pad area with the dry or hard materials that will damage the ITO patterns.

Do not use the following solvent on the pad or prevent it from being contaminated :

- ◎ HCFC
- ◎ Soldering flux
- ◎ Chlorine(Cl), Salfur(S)
- ◎ Spittle, Fingerprint(It contains Cl)

If goods were sent without being silicon coated on the pad, ITO patterns could be damaged due to the corrosion as time goes on.

SAMSUNG SDI would like to propose that the Customer conduct the Silicon coating unless the goods supplied without Silicon coating.

If ITO corrosion happen by mis-handling or using some materials such as Chlorine(Cl), Salfur(S) from customer, Responsibility is on customer.

11-3. Caution against static charge

The LCD module use C-MOS LSI drivers, so we recommended that you; Connect any unused input terminal to Vdd or Vss, do not input any signals before power is turned on, and ground your body, work/assembly areas, assembly equipment to protect against static electricity.

11-4. Packing

◎ Module employ LCD elements, and must be treated as such. Avoid intense shock and falls from a height.

◎ To prevent modules from degradation, do not operate or store them exposed direct to sunshine or high temperature/humidity.

11-5. Caution for operation

◎ It is an indispensable condition to drive LCD's within the specified voltage limit since the higher voltage then the limit cause the shorter LCD life.
An electrochemical reaction due to direct current causes LCD's undesirable deterioration, so that the use of direct current drive should be avoided.

◎ Response time will be extremely delayed at lower temperature then the operating temperature range and on the other hand at higher temperature LCD's show dark color in them.
However those phenomena do not mean malfunction or out of order with LCD's, Which will come back in the specified operating temperature.

◎ If the display area is pushed hard during operation, Some font will be abnormally displayed but it resumes normal condition after turning off once.

◎ A slight dew depositing on terminals is a cause for electro-chemical reaction resulting in terminal open circuit.
Usage under the maximum operating temperature,50%RH or less is required.

11-6. Storage

In the case of storing for a long period of time [for instance, for years for the purpose or replacement use, The following ways are recommended.

◎ Storage in a polyethylene bag with the opening sealed so as not to enter fresh air outside in it. And with no desiccant.

◎ Placing in a dark place where neither exposure to direct sunlight nor light's Keeping the storage temperature range.

◎ Storing with no touch on polarizer surface by the anything else.
[It is recommended to store them as they have been contained in the inner container at the time of delivery from us.]

11-7. Safety

◎ It is recommendable to crash damaged or unnecessary LCD's into pieces and wash off liquid crystal by either of solvents such as acetone and ethanol, Which should be burned up later.

◎ When any liquid leaked out of a damaged glass cell comes in contact with your hands, please wash it off well with soap and water.

12. Precaution for use

12-1. A limit sample should be provided by the both parties on an occasion when the both parties agreed its necessity.
Judgement by a limit sample shall take effect after the limit sample has been established and confirmed by the both parties.

12-2. On the following occasions, the handling of problem should be decided through discussion and agreement between responsible of the both parties.

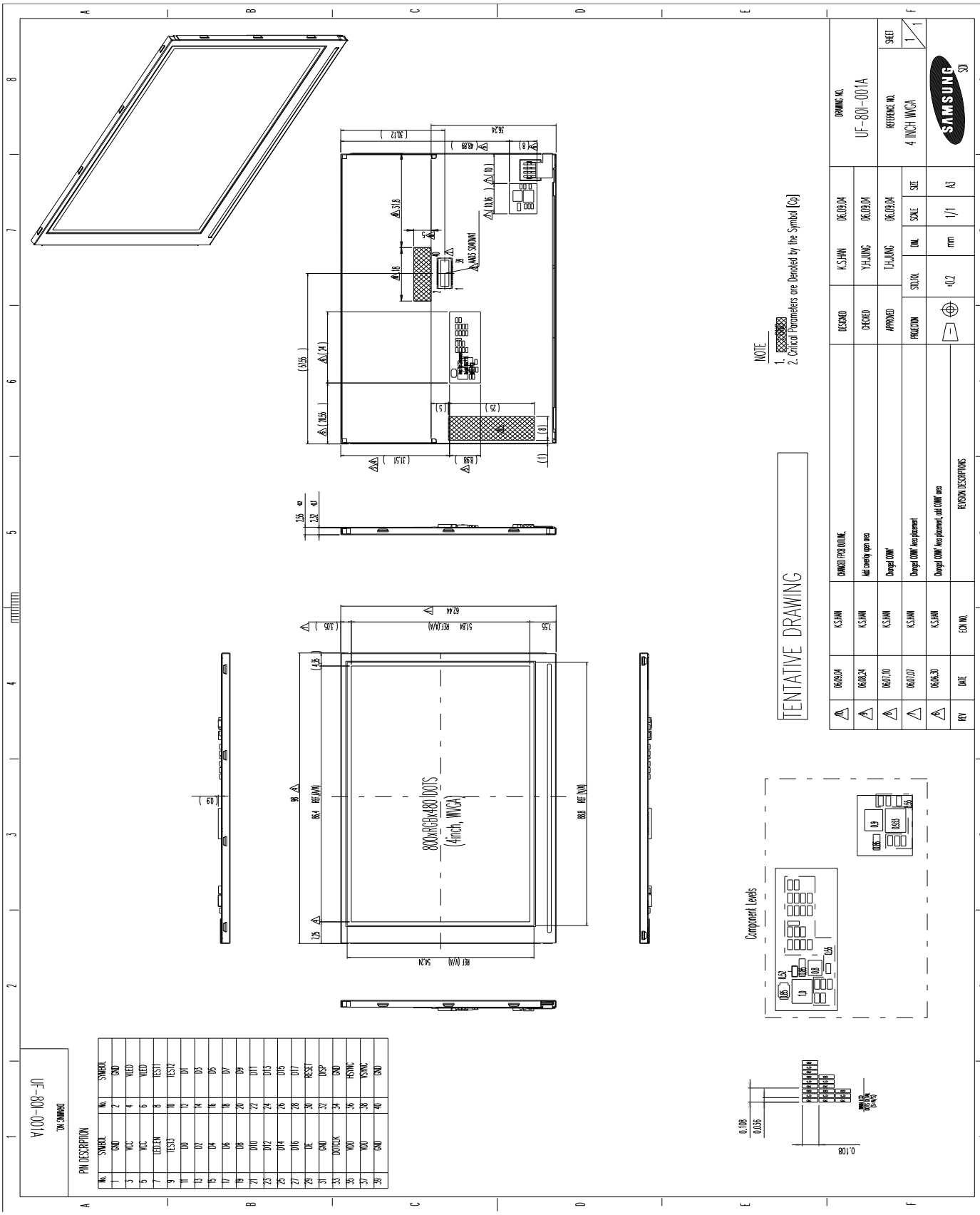
◎ When a question is arisen in this specifications.

◎ When a new problem is arisen which is not specified in this specifications.

◎ When an inspection specifications change or operating condition change in customer is reported to SDI, and some problem is arisen in this specification due to the change.

◎ When a new problem is arisen at the customer's operating set for sample evaluation in the customer site.

13. Dimensional Outline



CAUTION

Do not disassemble, nor repair LCD module without permission because you may be traumatized by the edge or the sharp point of LCD module.
When LCD is broken and the liquid crystal leaks, it may be harmful to skin. if you touch the liquid crystal, wash it in water.
Do not handle LCD module with a bare hand. When you do that, you may receive an electrical shock by ESD.

SAMSUNG SDI