SAMSUNG ELECTRONICS

Approval

TO : **NEC**

DATE : **Oct. 15. 2001.**

SAMSUNG TFT-LCD

MODEL NO. : LTM170W1-T01

APPROVED BY :

_____

_____

_____

_____

Any Modification of Spec is not allowed without SEC's permission.

Senior manager :

PREPARED BY : AMLCD Technical Customer Service Team

SAMSUNG ELECTRONICS CO., LTD.

wise view™ SAMSUNG TFT-LCD

CONTENTS

Approval

Revision History

Approval

Date	Rev.No.	Page	Summary
Sep. 05, 2001	000		Approval spec of LTM170W1 -T01 model is issued for the first time.
Sep.15.2001	001		Insert the Reliability test and cosmetic spec. etc.
Oct.15.2001	002		Change the Timing Parameter. etc(TTL CLK Level)

GENERAL DESCRIPTION

DESCRIPTION

LTM170W1-T01 is a color active matrix TFT (Thin Film Transistor) liquid crystal display that uses amorphous silicon TFT switching devices. This model is composed of a TFT LCD panel, a driver circuit and a back-light system. The resolution of 17.0- inch contains 1,280 x 768 pixels and can display up to 16.2 millions colors.

FEATURES

- High contrast ratio, High aperture structure
- Wide viewing angle
- High-speed response
- WXGA(1280x768 pixels) resolution
- Low power consumption
- 2 dual CCFTs (Cold Cathode Fluorescent Tube)
- DE Only Mode
- TTL Interface with 2 pixel / clock

APPLICATIONS

- Desktop monitors
- Display terminals for AV application products
- Monitors for Industrial machine

GENERAL SPECIFICATIONS

ITEM	SPECIFICATION	UNIT	NOTE
Active area	370.560(H) X 222.336(V)	mm	
Driver element	a-Si TFT active matrix		
Display colors	16.2M		
Number of pixel	1280 x 768	pixel	Wide XGA
Pixel arrangement	RGB vertical stripe		
Pixel pitch	0.2895(H) x 0.2895(V)	mm	
Display Mode	Normally white		
Surface treatment	Haze 25 , Hard - Coating (3H)		

Mechanical Information

ITEM		MIN.	TYP.	MAX.	NOTE
Module size	Horizontal (H)	403.5	404.0	404.5	mm
	Vertical (V)	257.5	258.0	258.5	mm
	Depth (D)	-	16.2	16.7	mm
Weight		-	-	2000	g

1. ABSOLUTE MAXIMUM RATINGS

1.1 ABSOLUTE RATINGS OF ENVIRONMENT

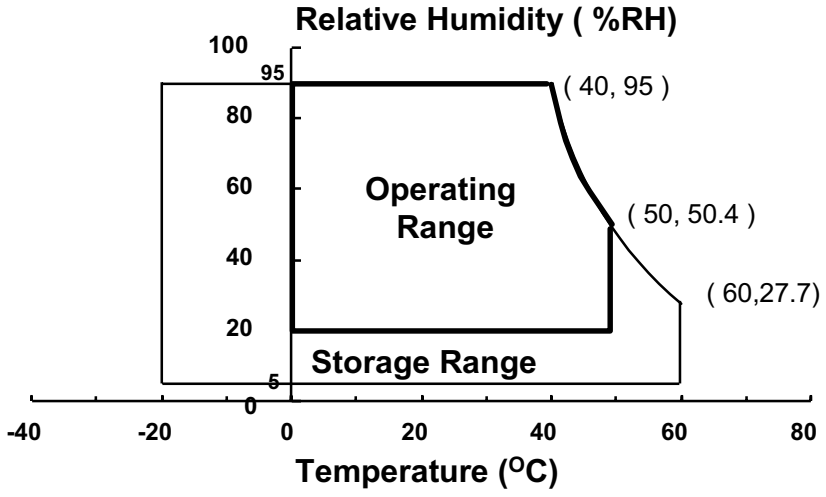
ITEM	SYMBOL	MIN.	MAX.	UNIT	NOTE
Storage temperature	T_{STG}	-20	60	°C	(1)
Operating temperature (Surface of Glass)	T_{OPR}	0	50	°C	(1)
Shock (non-operating)	Snop	-	50	G	(2),(4)
Vibration (non-operating)	Vnop	-	1.5	G	(3),(4)

Note (1) Temperature and relative humidity range are shown in the figure below.
Maximum wet-bulb temperature at 39℃ or less.
(Equal to 90 % RH Max. at 40 ℃≥ Ta)
No condensation.

(2) 11ms, sine wave, one time for ±X,±Y,±Z axis

(3) 10-300 Hz, Sweep rate 10min, 30min for X,Y,Z axis

(4) At testing Vibration and Shock, the fixture in holding the Module to be tested have to be hard and rigid enough so that the Module would not be twisted or bent by the fixture.



1.2 ELECTRICAL ABSOLUTE RATINGS

(1) TFT LCD MODULE

(Vss = GND = 0 V)

ITEM	SYMBOL	MIN.	MAX.	UNIT	NOTE
Power Supply Voltage	V_{DD}	GND	7.0	V	(1)

NOTE (1) With Ta (25 ± 2 ^{O}C)

(2) BACK-LIGHT UNIT

Ta = 25 ± 2 ^{O}C

ITEM	SYMBOL	MIN.	MAX.	UNIT.	NOTE
Lamp current	I_L	3.0	8.0	mA_{rms}	(1) (2)
Lamp frequency	f_L	30	80	KHz	(1)

NOTE (1) Permanent damage to the device may occur if maximum values are exceeded. Functional operation should be restricted to the conditions described under Normal Operating Conditions.

(2) Specified values are for a single lamp

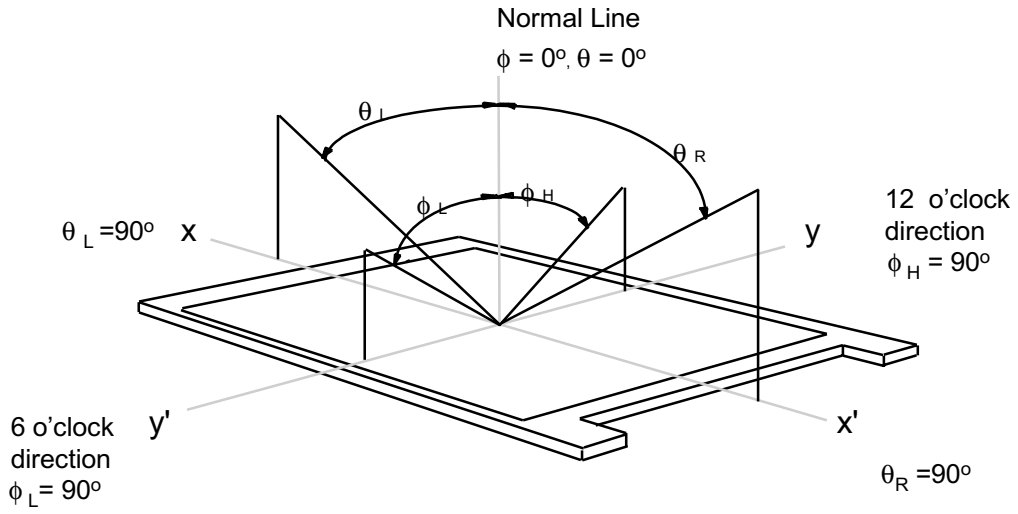
2. OPTICAL CHARACTERISTICS

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).
Measuring equipment : TOPCON BM-5A , BM-7, PHOTO RESEARCH PR650,Eldim EZ-Contrast

* Ta = 25 ± 2 °C , V_{DD} = 5.0V, fv= 60Hz, f_{DCLK}=32.5MHz, I_L = 7.0 mArms

ITEM		SYMBOL	Condition	MIN.	TYP.	MAX.	UNIT	NOTE
Contrast Ratio (Center of screen)		CR	ϕ = 0, θ = 0 Normal Viewing Angle	350	400	-		(2),BM5A
Response Time at Ta	Rising	T_R		-	5	10	msec	(3),BM7
	Falling	T_F		-	20	25		
Luminance of White (Center of screen)		Y_L		400	450	-	cd/m^2	BM7
Color Chromaticity (CIE 1933)	Red	R_X		0.627	0.632	0.657		(4) PR650
		R_Y		0.332	0.357	0.382		
	Green	G_X		0.264	0.289	0.314		
		G_Y		0.571	0.596	0.621		
	Blue	B_X		0.118	0.143	0.168		
		B_Y		0.060	0.085	0.110		
	White	W_X		0.291	0.316	0.341		
		W_Y		0.313	0.338	0.363		
Viewing Angle	Hor.	θ_L	CR ≥ 10	65	70	-	Degrees	(1) BM5A
		θ_R		65	70	-		
	Ver.	ϕ_H		45	50	-		
		ϕ_L		55	60	-		
Brightness Uniformity (13 Point)		B_{UNI}		-	-	25	%	(5),BM5A

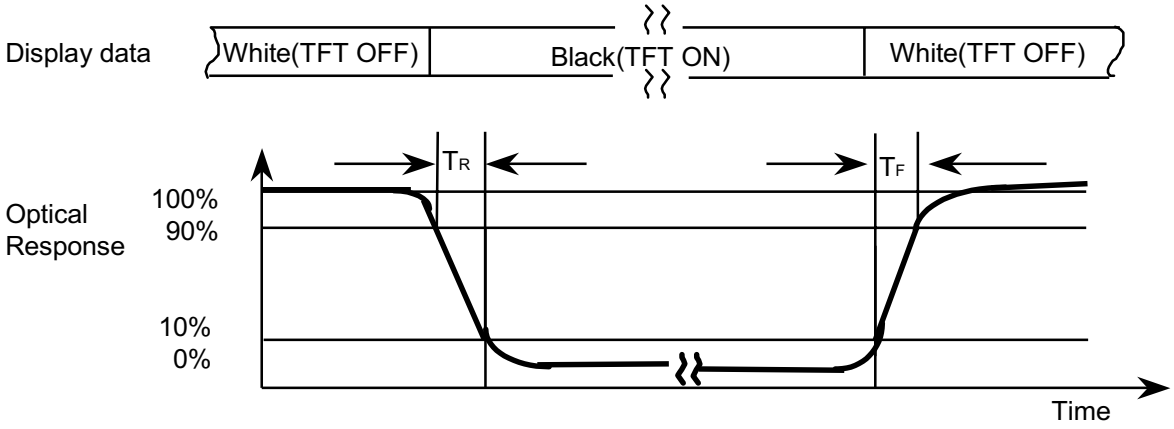
Note 1) Definition of Viewing Angle : Viewing angle range ($10 \leq CR$)



Note 2) Definition of Contrast Ratio (CR) : Ratio of gray max (Gmax) ,gray min (Gmin) at the center point of panel.

$$CR = \frac{\text{Luminance with all pixels white (Gmax)}}{\text{Luminance with all pixels black (Gmin)}}$$

Note 3) Definition of Response time : Sum of T_R ,T_F

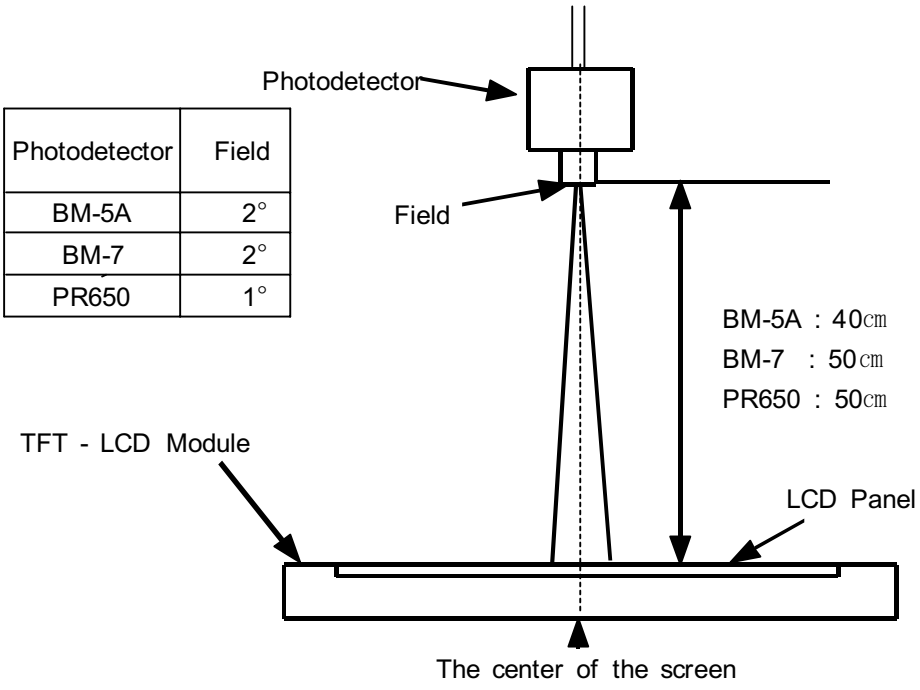


Note 4) Test Equipment Setup

After stabilizing and leaving the panel alone at a given temperature for 30 min , the measurement should be executed. Measurement should be executed in a stable, windless, and dark room 30 min after lighting the back-light. This should be measured in the center of the screen.

Single lamp current : 7.0mA, Environment condition : Ta = 25 ± 2℃

Photodetector	Field
BM-5A	2°
BM-7	2°
PR650	1°



Optical Measuring Equipment Setup

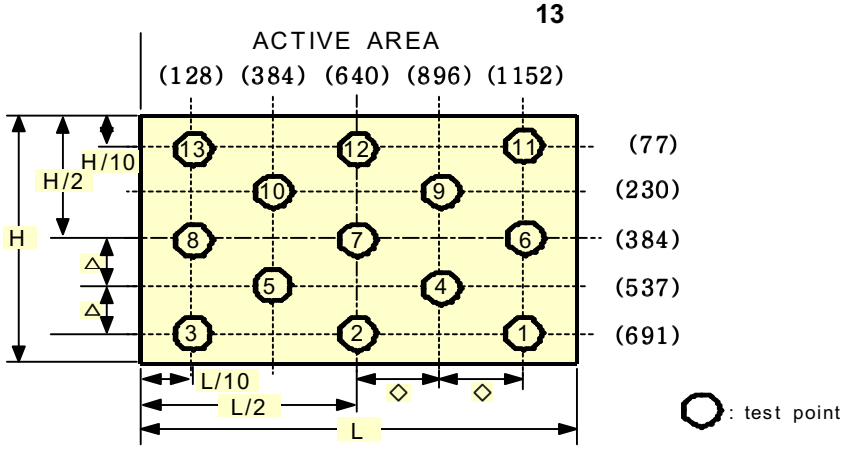
Note 5) Definition of 13 points brightness uniformity

$$B_{UNI} = \frac{\left| \text{Bmax or Bmin - Bave} \right|}{\text{Bave}} \text{ X 100}$$

Bmax : Maximum Brightness

Bmin : Minimum Brightness

Bave : Average Brightness = $\frac{\sum_{k=1}^{9} (B(k))}{13}$



3. ELECTRICAL CHARACTERISTICS

3.1 TFT LCD MODULE

Ta= 25 ± 2 ˚C

ITEM		SYMBOL	MIN	TYP	MAX	UNIT	NOTE
Voltage of Power Supply		V_{DD}	4.5	5.0	5.5	V	
Signal Input Voltage	High	V_{IH}	2.0	3.3	5.5	V	(1)
	Low	V_{IL}	GND	-	0.6	V	
Current of Power Supply	White	I_{DD}	-	320	-	mA	(2)(4)*a
	Black		-	330	-	mA	(2)(4)*b
	Sub-pixel checker		-	500	550	mA	(2)(4)*c
Vsync Frequency		fV	-	60	72	Hz	
Hsync Frequency		fH	-	48.4	60	kHz	
Main Frequency		fDCLK	-	32.5	41	MHz	(3)
Rush Current		Irush	-	-	3.0	A	(5)

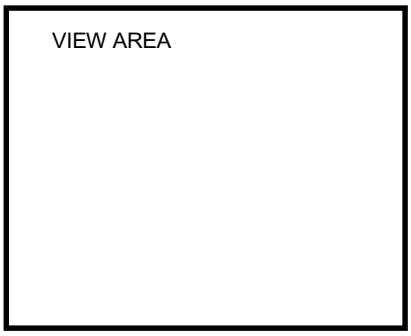
Note (1) MCLK , Vsync , Hsync , DE , RA0 ~ RA7 , GA0 ~ GA7 , BA0 ~ BA7 , RB0 ~ RB7 , GB0 ~ GB7 , BB0 ~ BB7 (ODD,EVEN)

(2) f_V=60Hz, f_{DCLK} =32.5MHZ, V_{DD} = 5.0V, DC Current.

(3) 2 Pixel/clock

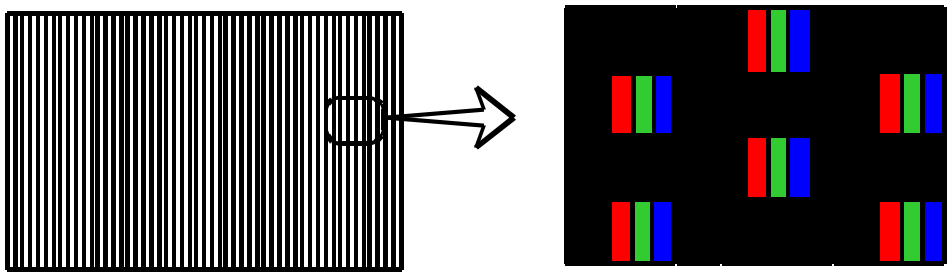
(4) Power dissipation check pattern

*a) White Pattern



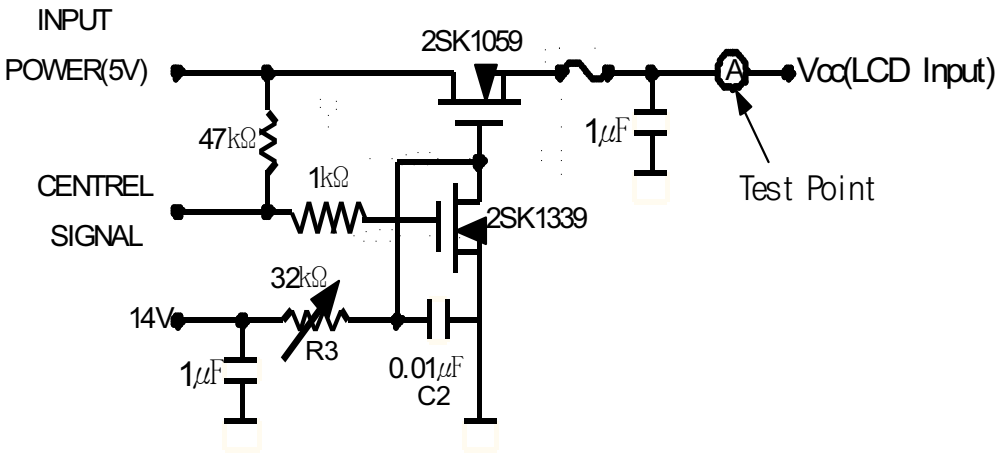
*b) Black Pattern

c) Sparse dot Morie Pattern



(5) Measurement Conditions

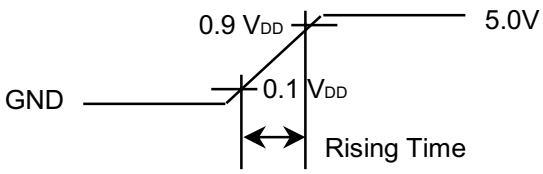
V_{DD} rising time : 470us



Note : Control Signal : High(+5V) -->Low(Ground)

All Signal lines to panel except for power 5V : Ground

The rising time of supplied voltage is controlled to 470us by R3 and C2 value.



3.2 BACK-LIGHT UNIT

The back-light system is an edge-lighting type with 4 CCFTs(Cold Cathode Fluorescent Tube).

The characteristics of four lamps are shown in the following tables.

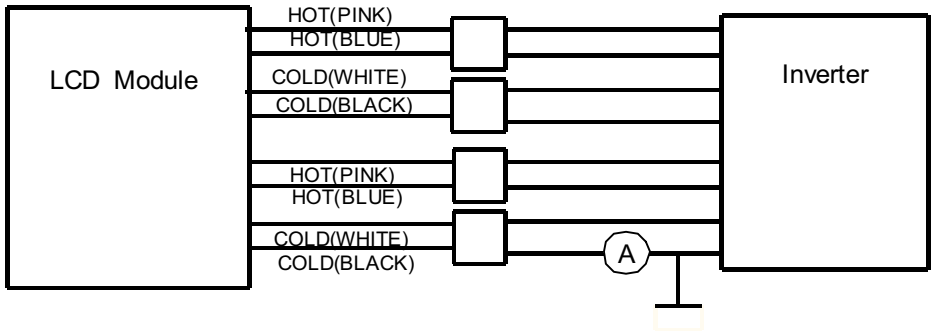
Ta= 25 ± 2 °C

ITEM	SYMBOL	MIN	TYP	MAX	UNIT	NOTE
Lamp Current	I_L	3.0	7.0	8.5	mA_{rms}	(1)
Lamp Voltage	V_L	-	665	-	V_{rms}	I_L=7.0 mArms
Lamp Frequency	F_L	40	-	60	kHz	(2)
Operating Life Time of Lamp	Hr	25,000	50,000	-	Hour	(3)
Startup Voltage	Vs	-	-	25°C :1430 0°C :1020	Vrms	(4)

Note) The waveform of the inverter output voltage must be area symmetric and the design of the inverter must have specifications for the modularized lamp.

The performance of the back-light, for example life time or brightness, is much influenced by the characteristics of the DC-AC inverter for the lamp. So all the parameters of an inverter should be carefully designed so as not to produce too much leakage current from high-voltage output of the inverter. When you design or order the inverter, please make sure that a poor lighting caused by the mismatch of the back-light and the inverter(miss lighting, flicker, etc.) never occur. When you confirm it, the module should be operated in the same condition as it is installed in your instrument.

Note (1) Lamp current is measured with current meter for high frequency as shown below.



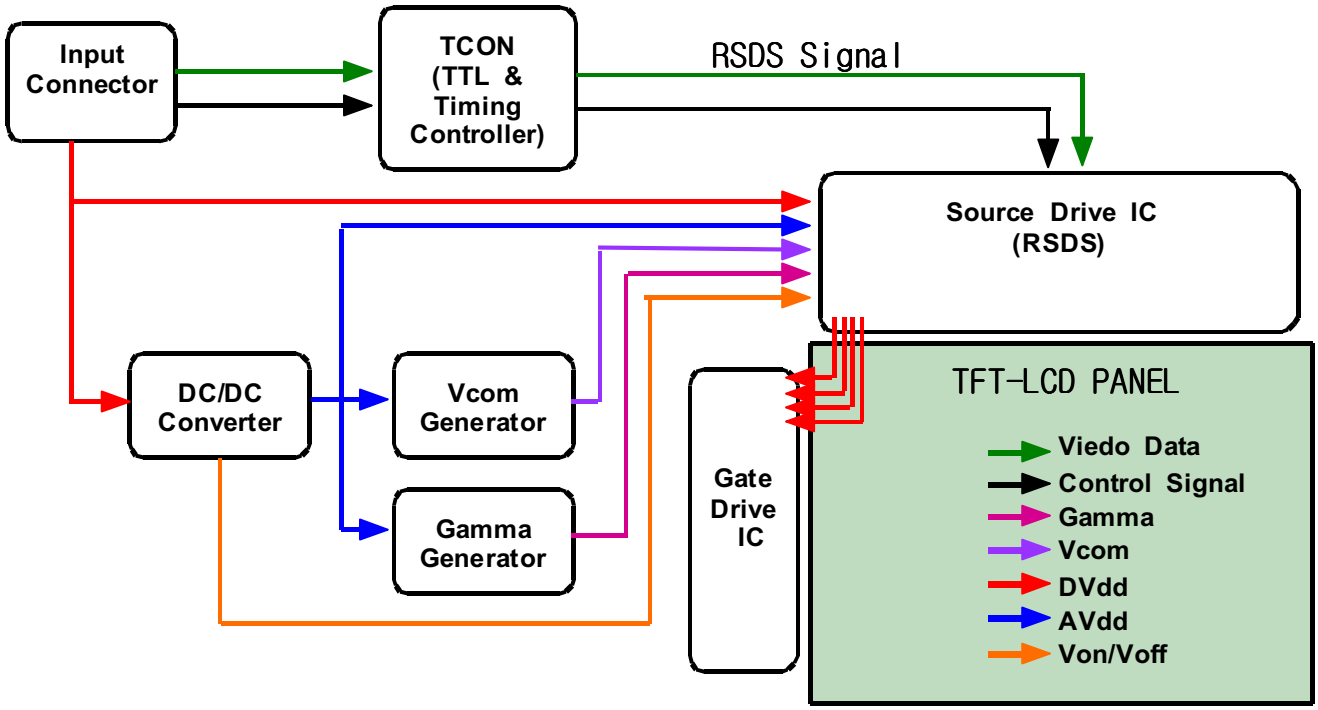
(2) Lamp frequency may produce interference with horizontal synchronous frequency and this may cause line flow on the display. Therefore lamp frequency shall be detached from the horizontal synchronous frequency and its harmonics as far as possible in order to avoid interference.

(3) Life time (Hr) of a lamp is defined as the time in which it continues to operate under the condition of Ta = 25 ± 2 °C and I_L = 7.0 mArms until the brightness becomes 50% or lower than it's original value.

(4) The voltage above this value should be applied to the lamps for more than 1 second to startup. Otherwise the lamps may not to be turned on.

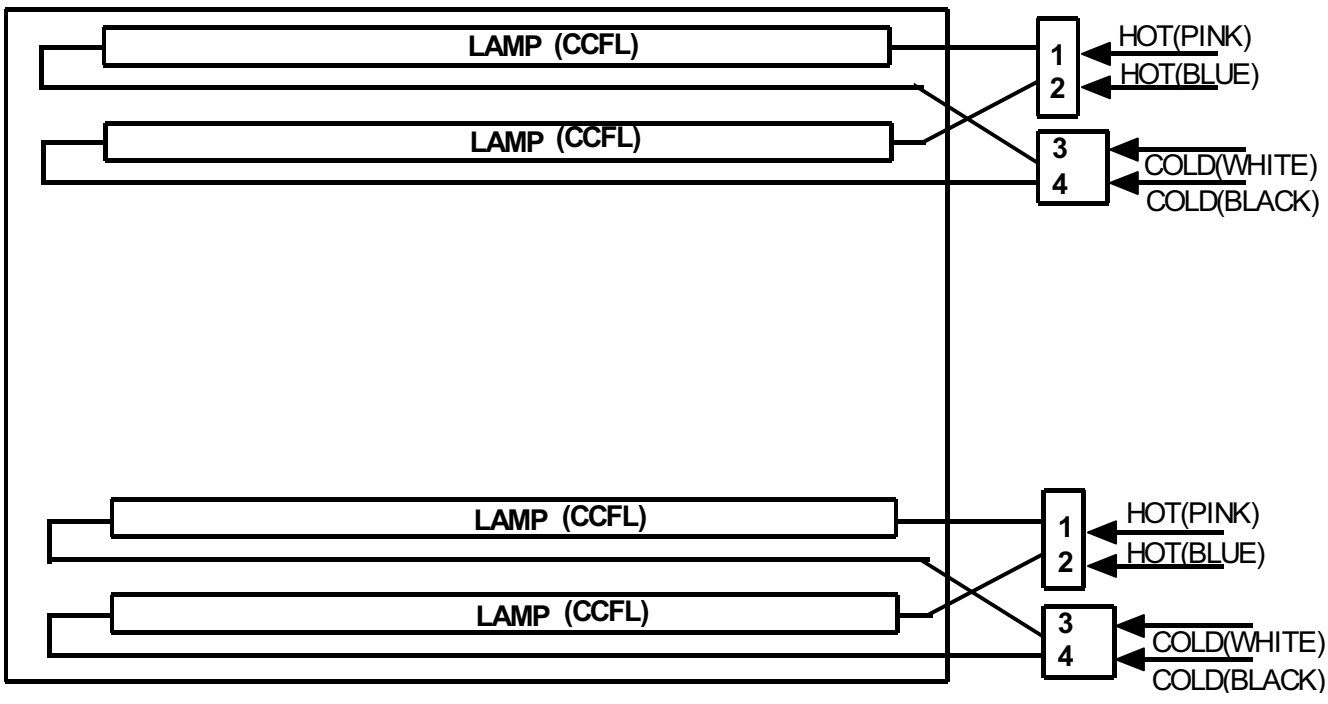
4. BLOCK DIAGRAM

4.1 TFT LCD MODULE



4.2 BACK-LIGHT UNIT

* Module-Side Connector : JST BHR-02VS-1(HOT-side)
JST BHSR-02VS-1(COLD-side)



5. INPUT TERMINAL PIN ASSIGNMENT

5.1 Input Signal & Power

Connector 36 pin-side CN1 : 04-6240-040-003-800 (Kyocera)

Pin No.	Symbol	Function	Remark
1	GND	Ground	
2	ODDB0	Blue Data(LSB) - ODD	Positive
3	ODDB1	Blue Data	Positive
4	ODDB2	Blue Data	Positive
5	ODDB3	Blue Data	Positive
6	GND	Ground	
7	ODDB4	Blue Data	Positive
8	ODDB5	Blue Data	Positive
9	ODDB6	Blue Data	Positive
10	ODDB7	Blue Data(MSB) - ODD	Positive
11	GND	Ground	
12	ODDG0	Green Data(LSB) - ODD	Positive
13	ODDG1	Green Data	Positive
14	ODDG2	Green Data	Positive
15	ODDG3	Green Data	Positive
16	GND	Ground	
17	ODDG4	Green Data	Positive
18	ODDG5	Green Data	Positive
19	ODDG6	Green Data	Positive
20	ODDG7	Green Data(MSB) - ODD	Positive
21	GND	Ground	
22	ODDR0	Red Data(LSB) - ODD	Positive
23	ODDR1	Red Data	Positive
24	ODDR2	Red Data	Positive
25	ODDR3	Red Data	Positive
26	GND	Ground	
27	ODDR4	Red Data	Positive
28	ODDR5	Red Data	Positive
29	ODDR6	Red Data	Positive
30	ODDR7	Red Data(MSB) - ODD	Positive
31	GND	Ground	
32	DCLK	Data Clock	Falling Edge
33	GND	Ground	
34	DENA	Data Enable Signal	Positive
35	VD	Vertical Sync Signal	Negative
36	HD	Horizontal Sync Signal	Negative
37	GND	Ground	
38	VCC	Power Supply(+5.0V)	
39	VCC	Power Supply(+5.0V)	
40	GND	Ground	

Note (1) Display data is sampled at the falling edge of data clock (32.5MHz Typ).

Connector 36 pin-side CN2 : 04-6240-036-003-800 (Kyocera)

Pin No.	Symbol	Function	Remark
1	GND	Ground	
2	EVENB0	Blue Data(LSB) - EVEN	Positive
3	EVENB1	Blue Data	Positive
4	EVENB2	Blue Data	Positive
5	EVENB3	Blue Data	Positive
6	GND	Ground	
7	EVENB4	Blue Data	Positive
8	EVENB5	Blue Data	Positive
9	EVENB6	Blue Data	Positive
10	EVENB7	Blue Data(MSB) - EVEN	Positive
11	GND	Ground	
12	EVENG0	Green Data(LSB) - EVEN	Positive
13	EVENG1	Green Data	Positive
14	EVENG2	Green Data	Positive
15	EVENG3	Green Data	Positive
16	GND	Ground	
17	EVENG4	Green Data	Positive
18	EVENG5	Green Data	Positive
19	EVENG6	Green Data	Positive
20	EVENG7	Green Data(MSB) - EVEN	Positive
21	GND	Ground	
22	EVENR0	Red Data(LSB) - EVEN	Positive
23	EVENR1	Red Data	Positive
24	EVENR2	Red Data	Positive
25	EVENR3	Red Data	Positive
26	GND	Ground	
27	EVENR4	Red Data	Positive
28	EVENR5	Red Data	Positive
29	EVENR6	Red Data	Positive
30	EVENR7	Red Data(MSB) - EVEN	Positive
31	GND	Ground	
32	GND	Ground	
33	FAV	1 Frame DATA Average Voltage 0V(White) ~ 3.3V(Black)	OUTPUT
34	SGC	Open or 1.65V : Gamma = 2.2 Vg > 1.65V : Gamma < 2.2 Vg < 1.65V : Gamma > 2.2	INPUT
35	SVC	Open or 10V : Gamma = 2.2 Vc < 10V : Darknesss Control	INPUT
36	GND	Ground	

5.2 Inverter Output Pin Assignment

	PIN NO	OUTPUT	Connector Part No. (User-side connector)
UP	1, 2	HOT(High)	SM02(4.0)B-BHS-1-TB
	3, 4	COLD(Ground)	SM02B-BHSS-1-TB
DOWN	1, 2	HOT(High)	SM02(4.0)B-BHS-1-TB
	3, 4	COLD(Ground)	SM02B-BHSS-1-TB

5.3 Input Signal,Basic Display Colors and Gray Scale of Each Colors

COLOR	DISPLAY (8bit)	DATA SIGNAL																								GRAY SCALE LEVEL
		RED								GREEN								BLUE								
		R0	R1	R2	R3	R4	R5	R6	R7	G0	G1	G2	G3	G4	G5	G6	G7	B0	B1	B2	B3	B4	B5	B6	B7	
BASIC COLOR	BLACK	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-
	BLUE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	-
	GREEN	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	-
	CYAN	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	-
	RED	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-
	MAGENTA	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	-
	YELLOW	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	-
	WHITE	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	-
GRAY SCALE OF RED	BLACK	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	R0
	DARK	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	R1
	↑	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	R2
		:	:	:	:	:	:			:	:	:	:	:	:			:	:	:	:	:	:			R3~
		:	:	:	:	:	:			:	:	:	:	:	:			:	:	:	:	:	:			R249
	↓	1	0	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	R250
	LIGHT	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	R251
	RED	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	R252
GRAY SCALE OF GREEN	BLACK	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	G0
	DARK	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	G1
	↑	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	G2
		:	:	:	:	:	:			:	:	:	:	:	:			:	:	:	:	:	:			G3~
		:	:	:	:	:	:			:	:	:	:	:	:			:	:	:	:	:	:			G249
	↓	0	0	0	0	0	0	0	0	1	0	1	1	1	1	1	1	0	0	0	0	0	0	0	0	G250
	LIGHT	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	G251
	GREEN	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	G252
GRAY SCALE OF BLUE	BLACK	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	B0
	DARK	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	B1
	↑	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	B2
		:	:	:	:	:	:			:	:	:	:	:	:			:	:	:	:	:	:			B3~
		:	:	:	:	:	:			:	:	:	:	:	:			:	:	:	:	:	:			B249
	↓	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	1	1	1	1	B250
	LIGHT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	B251
	BLUE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	B252

Note) ✓ Definition of Gray :

Rn : Red Gray, Gn : Green Gray, Bn : Blue Gray (n = Gray level)

✓ Input Signal : 0 = Low level voltage, 1 = High level voltage

6. INTERFACE TIMING

6.1 Timing Parameters (DE only mode)

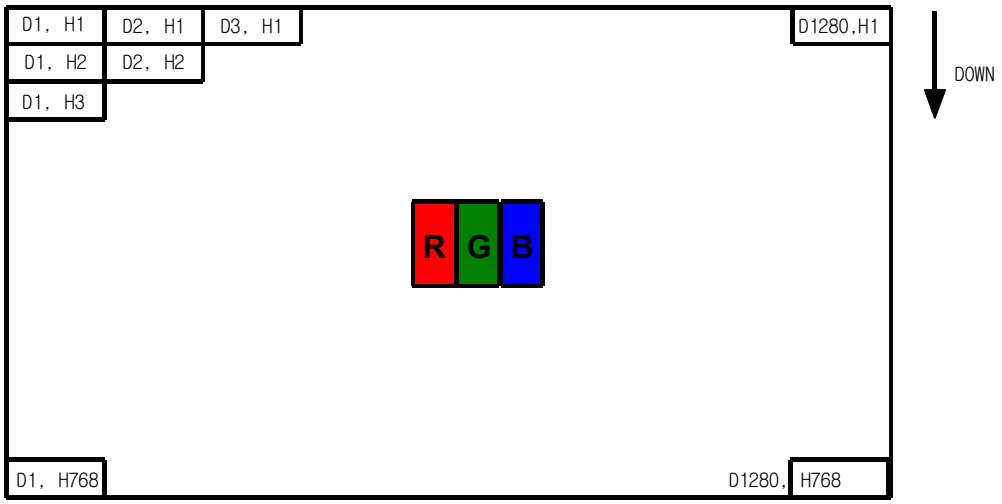
Signal	Item	Symbol	MIN	TYP	MAX	Unit	Note
Clock	Frequency	1 / Tc	-	32.5	41	MHz	
	High Time	Tch	7	-	-	nsec	
	Low Time	Tcl	7	-	-	nsec	
Data	Setup Time	Tds	3	-	-	nsec	
	Hold Time	Tdh	3	-	-	nsec	
Data Enable	Setup Time	Tes	3	-	-	nsec	(1)
Frame Frequency	Cycle	Tv	772	16.7 / 806	-	msec / lines	
Vertical Active Display Term	Display Period	Tvd	768	768	768	lines	
One Line Scanning Time	Cycle	Th	655	672	-	clocks	
Horizontal Active Display Term	Display Period	Thd	640	640	640	clocks	

Note (1) When LTM170W1-T01 model is operated by DE only mode,

(2) Hsync and Vsync input signals should be fixed to "Low" for stable operation.

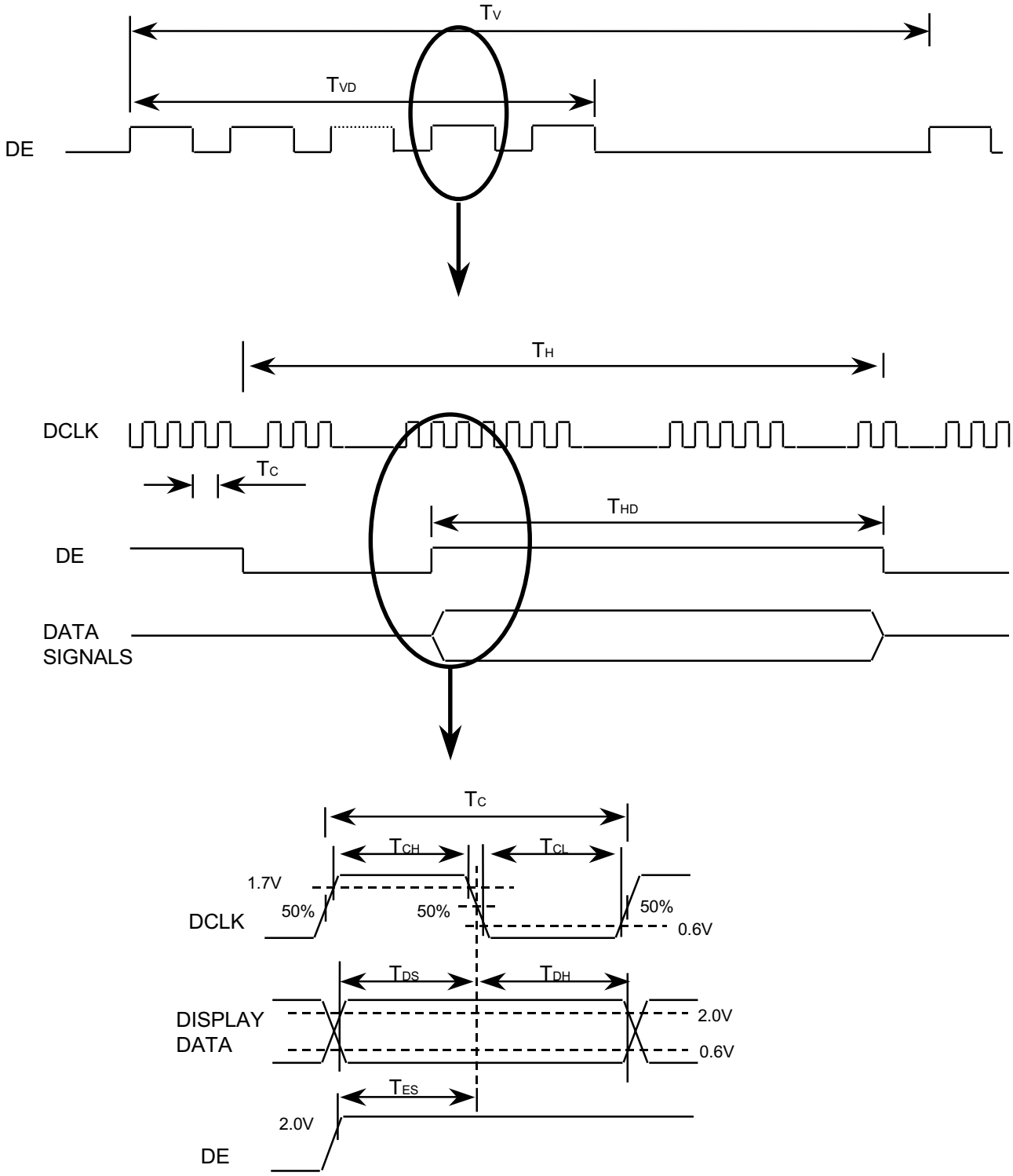
(3) With DE in the "High" state,It will operate well even if Hsync and Vsync are "High"

6.2 PIXEL FORMAT



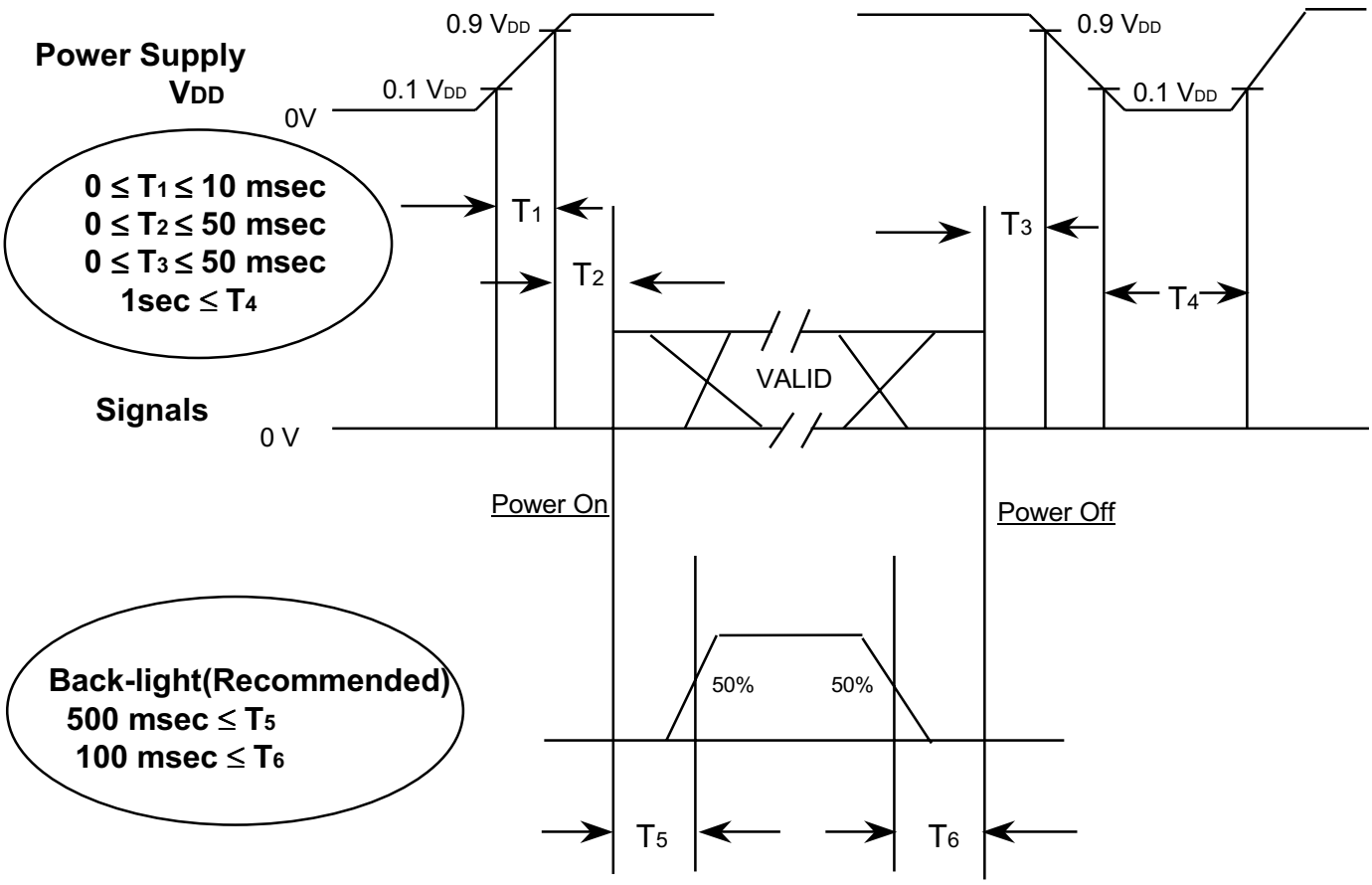
NOTE
(Dn, Hm) = # n, # m Pixel

6.3 Timing diagrams of interface signal (DE only mode)



6.4 Power ON/OFF Sequence

: To prevent a latch-up or DC operation of the LCD module, the power on/off sequence should be as the diagram below.



Power ON/OFF Sequence

NOTE.

(1) The supply voltage of the external system for the module input should be the same as the definition of V_{DD}.

(2) Apply the lamp voltage within the LCD operation range. When the back-light turns on before the LCD operation or the LCD turns off before the back-light turns off, the display may momentarily become white.

(3) In case of V_{DD} = off level, please keep the level of input signals on the low or keep a high impedance.

(4) T4 should be measured after the module has been fully discharged between power off and on period.

(5) Interface signal shall not be kept at high impedance when the power is on.

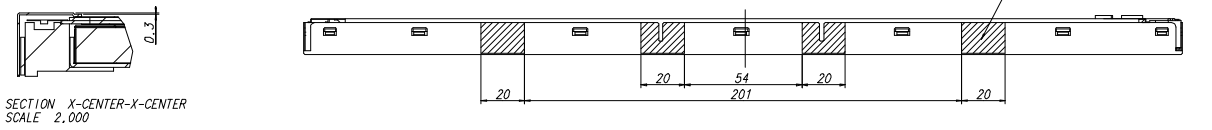
Approval

7. OUTLINE DIMENSION

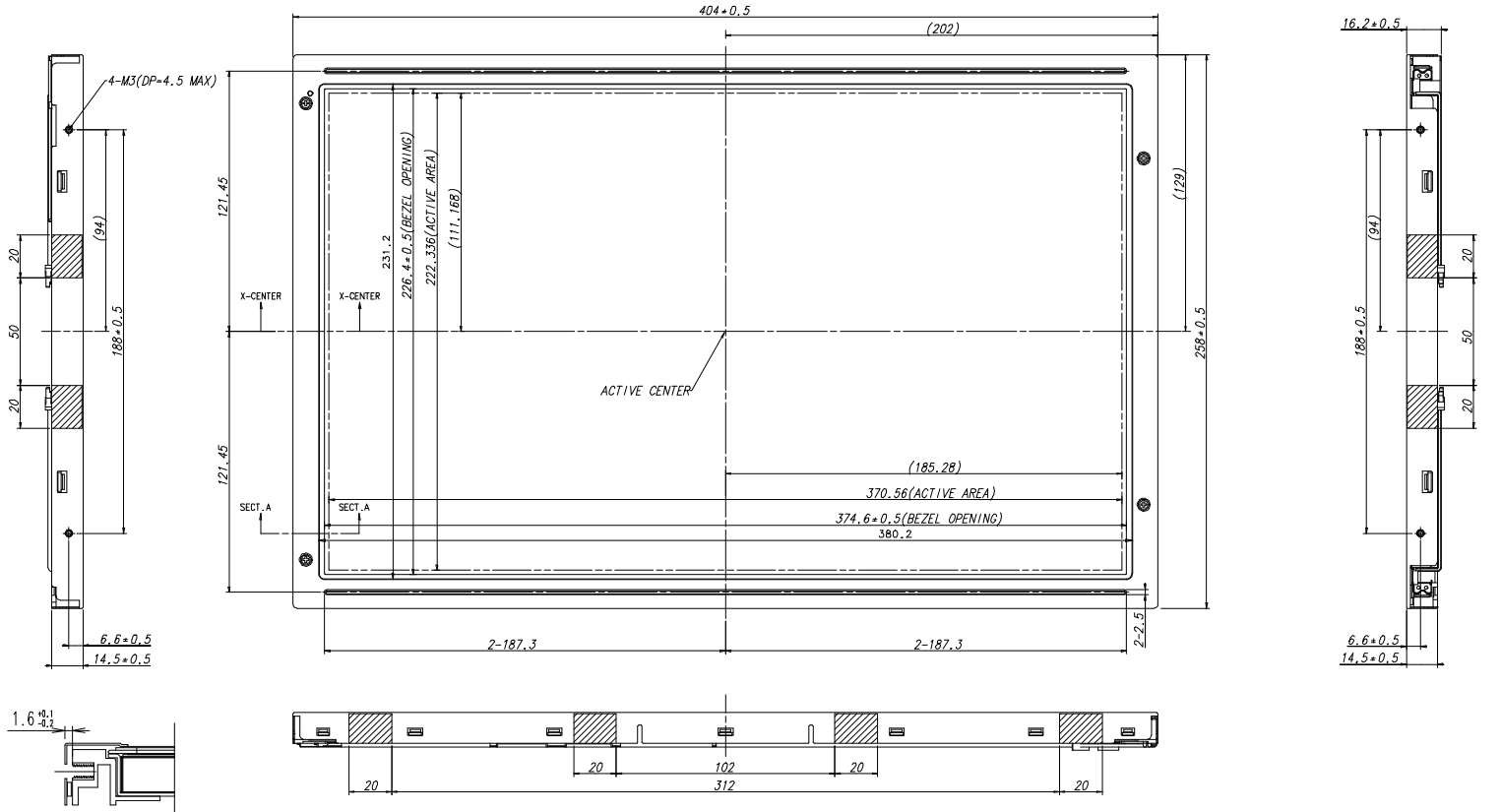
[Refer to the next pages : 22 -front view, 23- back view]

FILE NO.

NO	PART NAME	CODE NO	SPECIFICATION	Q'TY	WEIGHT FINISH	WEIGHT MATERIAL	UNFOLDED DIM. OF MATERIAL	REMARK



SECTION X-CENTER-X-CENTER
SCALE 2.000



SECTION A-A (SCALE 2.0)

GENERAL TOLERANCE			
STEP	LEVEL 1	LEVEL 2	LEVEL 3
0 < X <= 4	±0.05	±0.1	±0.2
4 < X <= 16	±0.08	±0.15	±0.3
16 < X <= 64	±0.12	±0.25	±0.5
64 < X <= 256	±0.25	±0.4	±0.8

REV	DATE	DESCRIPTION OF REVISION			
		UNIT: mm	DRA'N BY	DES'D BY	CHK'D BY	APP'D BY
		SCALE: 1.000	Y.S.CHOI		T.J.LEE	J.D.PARK
		TOLERANCE: ±0.5	12-OCT-01		12-OCT-01	12-OCT-01

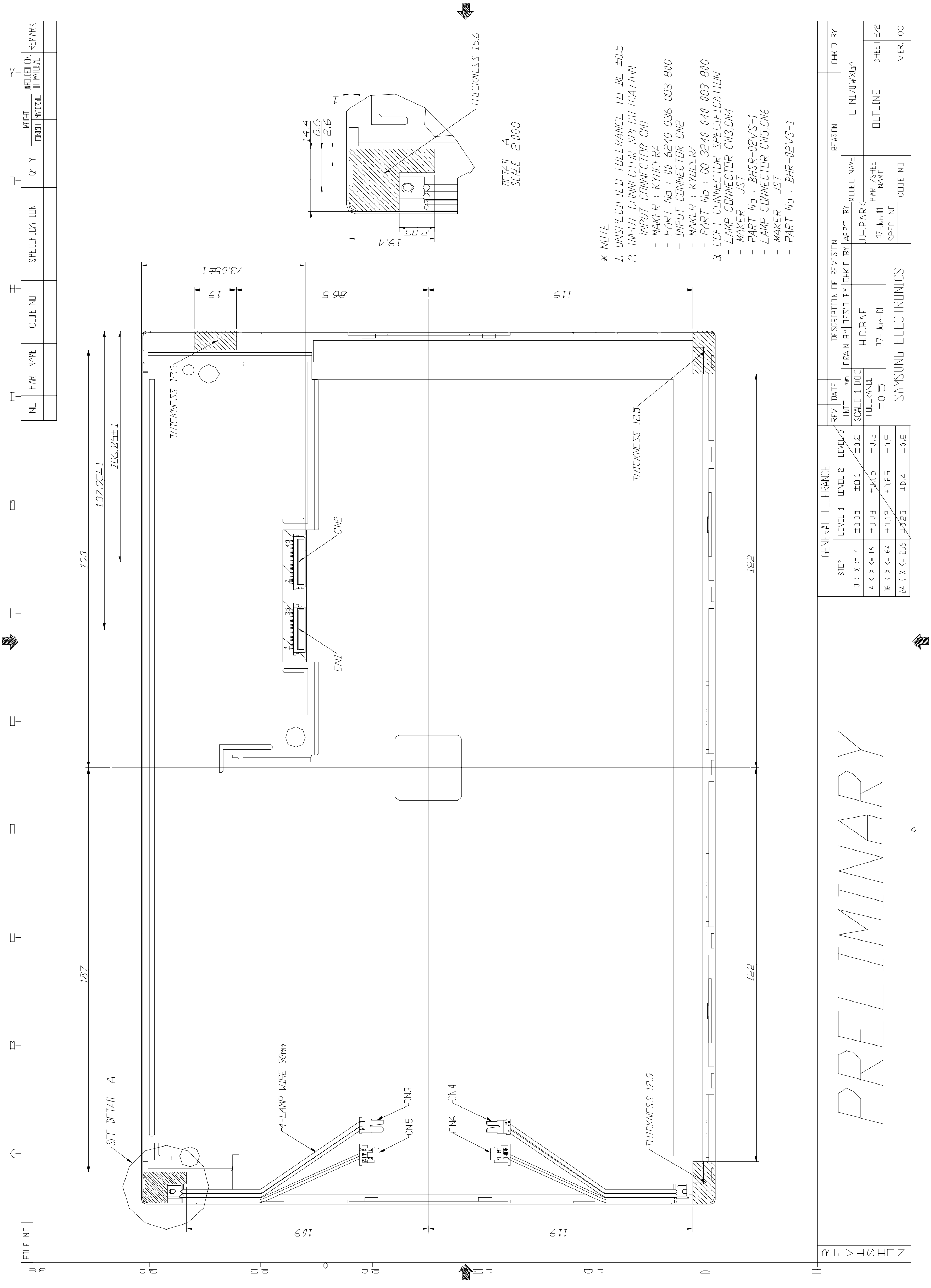
SAMSUNG ELECTRONICS

REASON	CHK'D BY

MODEL NAME	LTM170W1
PART/SHEET NAME	OUTLINE
SPEC. NO	
CODE NO	
SHEET	1/2
VER	00

REVISION

Approval



* NOTE
1. UNSPECIFIED TOLERANCE TO BE ±0.5
2. INPUT CONNECTOR SPECIFICATION
- INPUT CONNECTOR CN1
- MAKER : KYOCERA
- PART No : 00 6240 036 003 800
- INPUT CONNECTOR CN2
- MAKER : KYOCERA
- PART No : 00 3240 040 003 800
3. CCFT CONNECTOR SPECIFICATION
- LAMP CONNECTOR CN3,CN4
- MAKER : JST
- PART No : BHSR-02VS-1
- LAMP CONNECTOR CN5,CN6
- MAKER : JST
- PART No : BHR-02VS-1
DETAIL A
SCALE 2.000
THICKNESS 15.6
THICKNESS 12.6
THICKNESS 12.5
SEE DETAIL A
4-LAMP WIRE 90mm
CN1
CN2
CN3
CN4
CN5
CN6
GENERAL TOLERANCE
LTM170WXGA
OUTLINE
SAMSUNG ELECTRONICS
H.C.BAE
J.H.PARK
27-Jun-01
PRELIMINARY

8. Torque specification of user hole

8-1. Measurement tool : Digital Torque Meter HDM-50(Japan HOIS)

8-2. Specification

	Min.	Typ.	Max.	Remark
Torque Value	-	0.503	0.7	N·m

9. Reliability Test

Test Items	Conditions	Time/Cycle	Sample
HTOL*	50°C , Bias	500 hrs	12
LTOL*	0°C , Bias	500 hrs	5
THB**	40°C / 95% , Bias	500 hrs	5
HTS***	70°C , No Bias	500 hrs	5
LTS***	-30°C , No Bias	500 hrs	5
Thermal Cycle	-20°C/30min ~ +60°C/30min , No bias	100 cycle	5
Box Drop	1 angle , 3 edge , 6 side , 66 cm		5
Shock (Non-operatine)	50G , 11msec Sine wave , ± x/y/z axis	1 time/axis	side mount 3 top mount 3
Vibration (Non-operating)	1.5G , 10~300 Hz x/y/z axis , sweep rate : 10 min	30min/axis	side mount 3 top mount 3
ESD (Non-Operating)	contact : 150pF , 330 ohm, 9point Air(non-contact) : 150pF , 330 ohm, 9point CDM : 150pF , 330 ohm, 9point	± 10kV ± 20kV ± 10kV	3 3 3

[Result Evaluation Criteria]

Under the display quality test conditions with normal operation state, these should be no change which may affect practical display functions.

* HTOL/ LTOL : High/Low Temperature Operating Life,

** THB : Temperature Humidity Bias

*** HTS/LTS : High/Low Temperature Storage

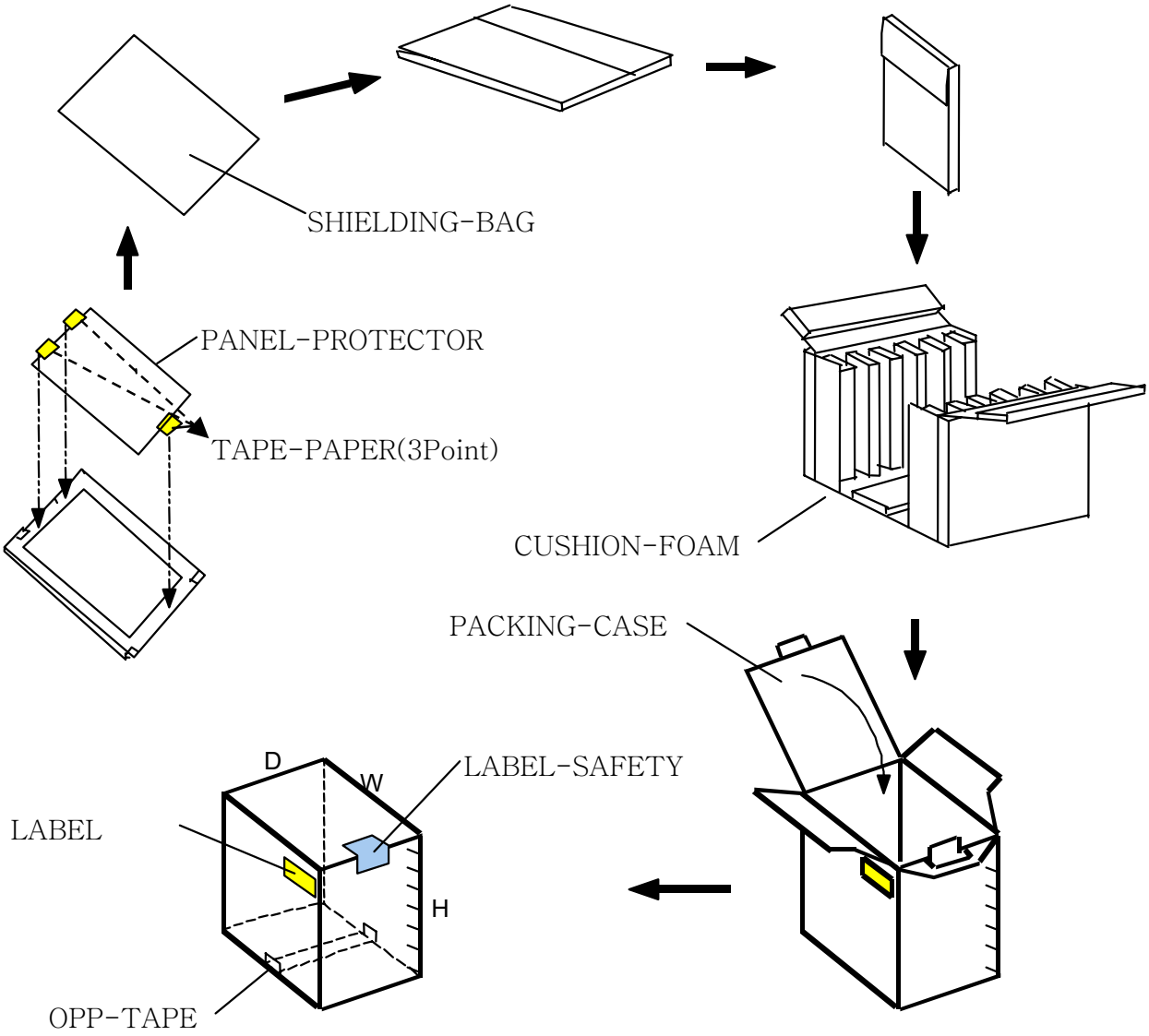
10. PACKING

10.1 CARTON(Internal Package)

(1) Packing Form

Corrugated fiberboard box and corrugated cardboard as shock absorber

(2) Packing Method



NOTE) 1) TOTAL : Approx. 13.0㎏

2) Acceptance number of piling : 5sets

3) Carton size :405(W) X 365(D) X 475(H)

4) MAX accumulation quantity : 5 cartons

(3) Packing Material

No	Part name	Quantity	No	Part name	Quantity
1	PROTECTOR-PANEL	1	6	SHIELDING-BAG	1
2	TAPE-PAPER	0.2MT	7	OPP-TAPE	0.2MT
3	PACKING-CASE	0.2	8	LABEL-PAPER	1
4	CUSHION-FOAM(U)	0.2	9	LABEL-SAFETY	1
5	CUSHION-FOAM(L)	0.2	10	LABEL-BARCODE	1

11.MARKING **& OTHERS**

A nameplate bearing followed by is affixed to a shipped product at the specified location on each product.

(1) Parts number : LTM170W1-T01

(2) Revision : One letter

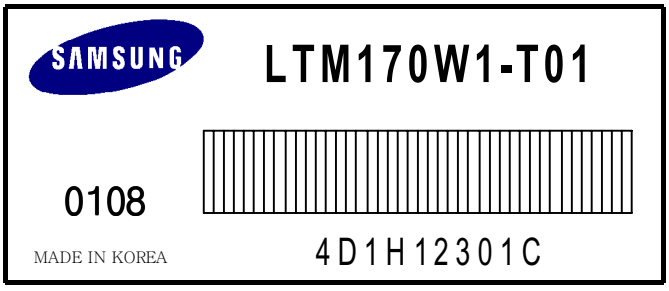
(3) Control : One letter

(4) Lot number : 4 D 1 H 123 01 C

1 2 3 4 5 6 7

① 4 : Line
② D : Device
③ 1 : Year
④ H : Month
⑤ 123 : LOT NO
⑥ 01 : GLASS NO
⑦ C : CELL NO

(5) Nameplate Indication



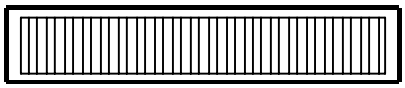
(6) Bar code marking for Customer

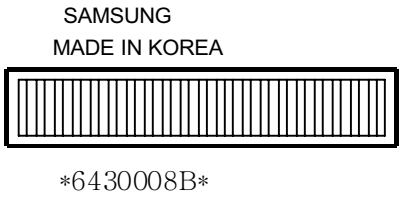
The bar code marking is attached to module backside.

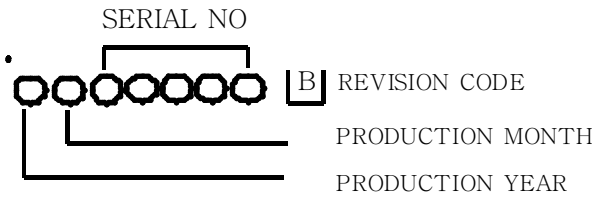
1) MODEL NAME : LTM170W1-T01
2) SAMSUNG
3) MADE IN KOREA
4) PRODUCTION NUMBER
5) USER MODEL NAME

Bar codeshows

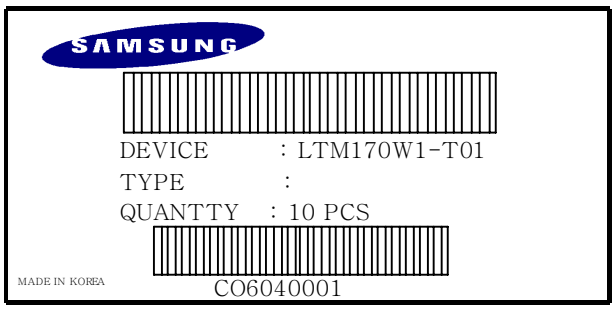
a) User model name
LTM170W1-T01







(7) Packing box attach



(8) Others
1.After service part

Part Name	Description
LJ91-00380A(U)	ASS'Y 170W1-LAMP(U)
LJ91-00379A(L)	ASS'Y 170W1-LAMP(L)

12. General Precautions

12.1 Handling

(a) When the module is assembled, It should be attached to the system firmly using every mounting holes. Be careful not to twist and bend the modules.

(b) Refrain from strong mechanical shock and / or any force to the module. In addition to damage, this may cause improper operation or damage to the module and CCFT back-light.

(c) Note that polarizers are very fragile and could be easily damaged. Do not press or scratch the surface harder than a HB pencil lead.

(d) Wipe off water droplets or oil immediately. If you leave the droplets for a long time, Staining and discoloration may occur.

(e) If the surface of the polarizer is dirty, clean it using some absorbent cotton or soft cloth.

(f) The desirable cleaners are water, IPA(Isopropyl Alcohol) or Hexane.
Do not use Ketone type materials(ex. Acetone), Ethyl alcohol, Toluene, Ethyl acid or Methyl chloride. It might permanent damage to the polarizer due to chemical reaction.

(g) If the liquid crystal material leaks from the panel, it should be kept away from the eyes or mouth . In case of contact with hands, legs or clothes, it must be washed away thoroughly with soap.

(h) Protect the module from static , it may cause damage to the C-MOS Gate Array IC.

(i) Use finger-stalls with soft gloves in order to keep display clean during the incoming inspection and assembly process.

(j) Do not disassemble the module.

(k) Do not pull or fold the lamp wire.

(l) Do not adjust the variable resistor which is located on the back side.

(m) Pins of I/F connector shall not be touched directly with bare hands.

12.2 Storage

(a) Do not leave the module in high temperature, and high humidity for a long time. It is highly recommended to store the module with temperature from 0 to 35 °C and relative humidity of less than 70%.

(b) Do not store the TFT-LCD module in direct sunlight.

(c) The module shall be stored in a dark place. It is prohibited to apply sunlight or fluorescent light during the store.

12.3. Operation

(a) Do not connect, disconnect the module in the " Power On" condition.

(b) Power supply should always be turned on/off by following item 6.6 " Power on/off sequence ".

(c) Module has high frequency circuits. Sufficient suppression to the electromagnetic interference shall be done by system manufacturers. Grounding and shielding methods may be important to minimize the interference.

(d) The cable between the back-light connector and its inverter power supply shall be a minimized length and be connected directly . The longer cable between the back-light and the inverter may cause lower luminance of lamp(CCFT) and may require higher startup voltage(Vs).

12.4 Others

(a) Ultra-violet ray filter is necessary for outdoor operation.

(b) Avoid condensation of water. It may result in improper operation or disconnection of electrode.

(c) Do not exceed the absolute maximum rating value. (the supply voltage variation, input voltage variation, variation in part contents and environmental temperature, so on) Otherwise the module may be damaged.

(d) If the module displays the same pattern continuously for a long period of time, it can be the situation when the image "sticks" to the screen.

(e) This module has its circuitry PCB's on the rear side and should be handled carefully in order not to be stressed.

Approval

Cosmetic Outgoing Inspection Specification

(170W1-T01 Monitor TFT LCD)

NEC _____

Samsung S Shim

J. S. Shim
Senior Manager, LCD CS Group

LCD CS Group
AMLCD DIVISION
SAMSUNG Semiconductor Co., LTD

Address : San 24 Nongseo-Lee, Kihung-Eup, Yongin Si, Kyungki-Do, Korea
Tel. 82-31-209-7838 Fax. 82-2-760-7369

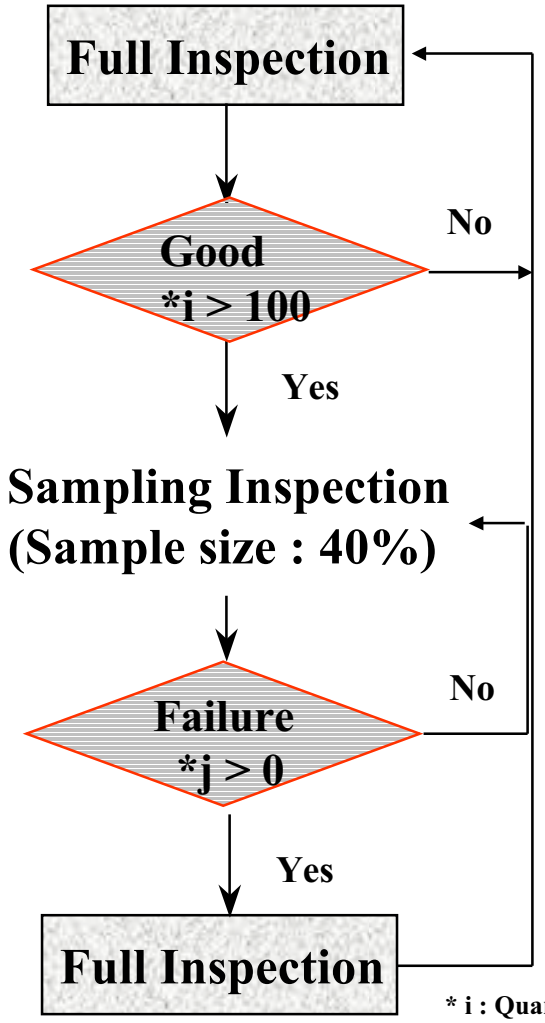
1. Outgoing Inspection

1.1 Outgoing Inspection Plan

1.1.1 Sampling Plan

+ Sample size : 40 %

1.1.2 Flow Chart



+ Material Review Board or Line Stop +

1> Same failure found over two from 1 box.(10 pcs)

2> Different failure found over three from 1 box.

3> Same failure which was found before 40% inspection over two during full inspection.

* i : Quantity of Good LCDs

j : Quantity of failed LCDs

1.2 Outgoing Inspection Criteria

1.2.1 Inspection Introduction

1.2.1.1 Conditions

viewing distance	35 ~ 50 cm
ambient illumination	300 ~ 700 Lux (nominal 500 Lux)
ambient temperature	25 + - 5 'C
viewing angle	The surface of the module and the inspector's line of view shall be at 90 degrees.
display pattern	Pure R, G, B, Black and White
inspection area	active area

1.2.1.2 Defect Modes

dark / bright spots

points on the display which appear dark / bright and remain unchanged in size

dark / bright lines

lines on the display which appear dark / bright and remain unchanged in size

polarizer scratch

when the unit is lit a light, line is seen across a darker background; line does not vary in size

polarizer dent

when the unit is lit a light, light(white) spots appear against a darker background, and do not vary in size

bright/dark dot

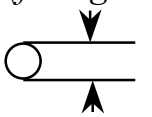
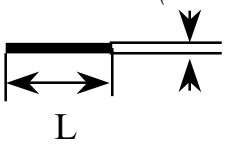
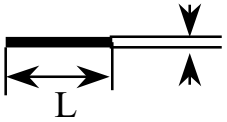
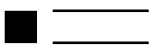
a sub-pixel (R, G, B dot) stuck off / on

1.2.2 Mechanical Inspection

Chassis Gap	max. 0.7mm
Silicone Gasket (Glue)	silicone material shall not be exposed beyond the metal frame edge into the view area
Light Leakage	there shall be no visible light around the edges of the screen.

**** If there is none identified criteria in this specification, Samsung will refer production specification that Customer and Samsung agreed.***
**** If there is mechanical dimension issue which has no designated tolerance, Samsung will apply natural tolerance.***

1.2.3. Visual Inspection

Defect Type	Count (mm)	Reject (mm)
Dark / bright spot (foreign material,Stain,Dust) 	0.1 < D <= 0.8 ← 0.5 N <= 4	D > 0.8
Bright line (light lint), or dark line (dark lint / hair) 	0.01 < W <= 0.08 0.3 < L <= 2.0 N <=4	W > 0.08 L > 2.0
Polarizer scratch 	0.01 < W <= 0.1 0.3 < L <= 5.0 N <= 3	W > 0.1 L > 5.0
Polarizer dent/bubble 	D <= 0.8 ← 0.5 N <= 6	D > 0.8
Maximum allowable number of defects	N <= 10 ← 6	N > 10

[D : diameter, W : width, L : length, N : count]

赤字部分を超えた場合、不良とは見なさないが、**Field**にて**Claim**があった際には無償**Repair**を行う。

1.2.4 Electrical Inspection

Defect Type	Accept	Reject
Bright dot ***(Fig. 1)***		
random	N <= 1	N > 1
two adjacent	N <= 1	N > 1
three adjacent	N <= 0	N > 0
Dark dot, ***(Fig. 2)***		
random	N <= 7	N > 7
two adjacent	N <= 2	N > 2
three adjacent	N <= 1 ← 0	N > 1
Maximum allowable number of dot defect	N <= 7	N > 7
Minimum distance between defects, ***(Fig. 3)*** *dark dot - to - dark dot*	L => 5mm	L < 5mm
Bright Dot on center area(Fig.4)	N <= 0	N > 0

11月MP後、SECでのYield調査後 別途再協議を行う。

[L : length, N : count]

Definitions*/ Notes;*

- A bright dot any Red, Green, or Blue pixel suck in the “On” mode.
- A dark dot any Red, Green, or Blue pixel suck in the “Off ” mode.

Fig. 1. Bright dot defect description

【two adjacent】

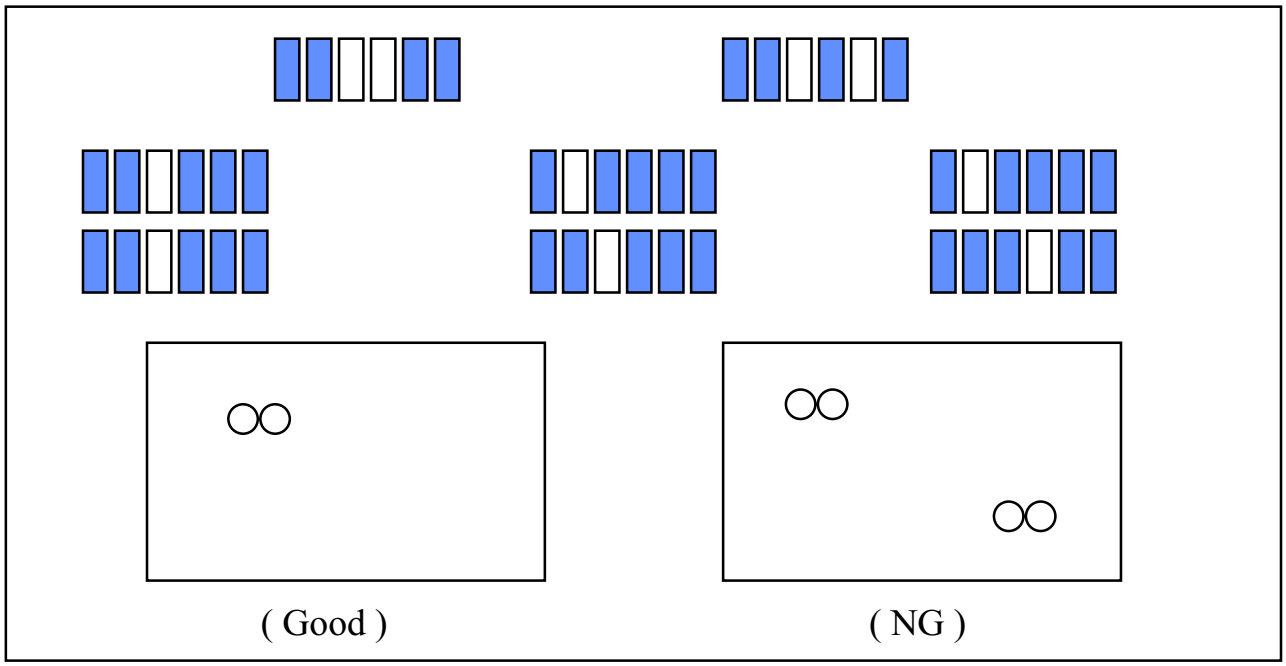


Fig. 2. Dark dot defect description

【two adjacent】

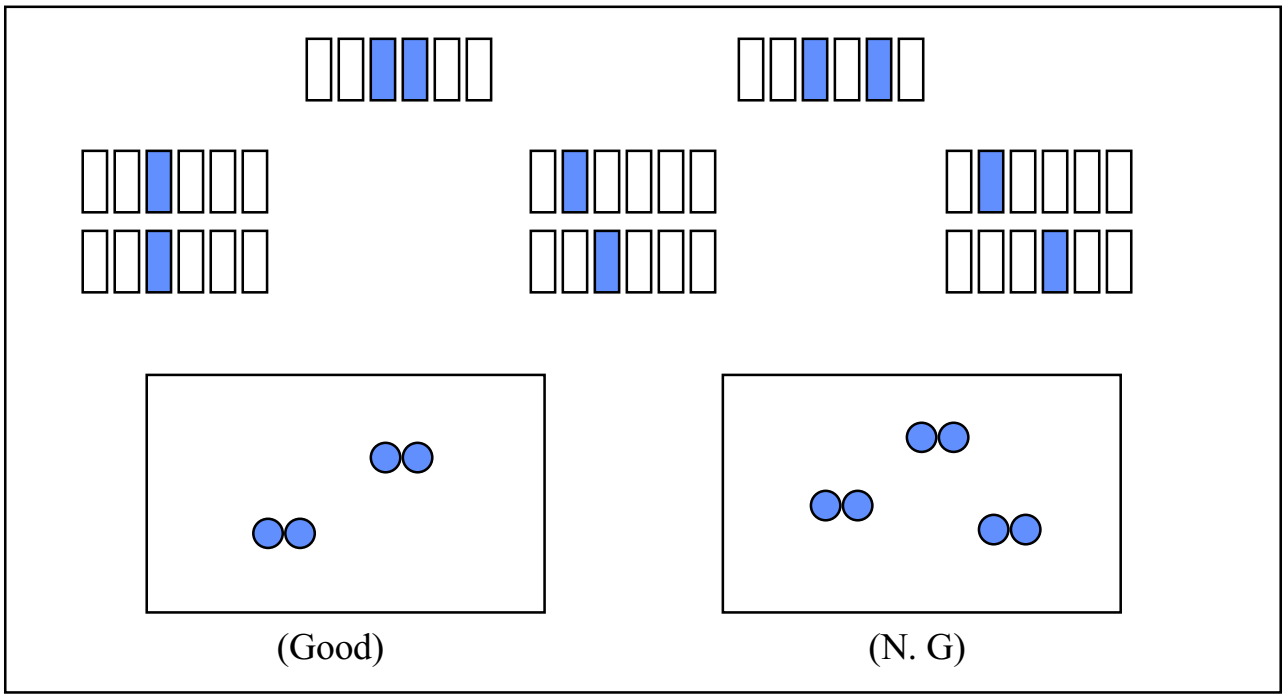


Fig. 2. Dark dot defect description

【three adjacent】

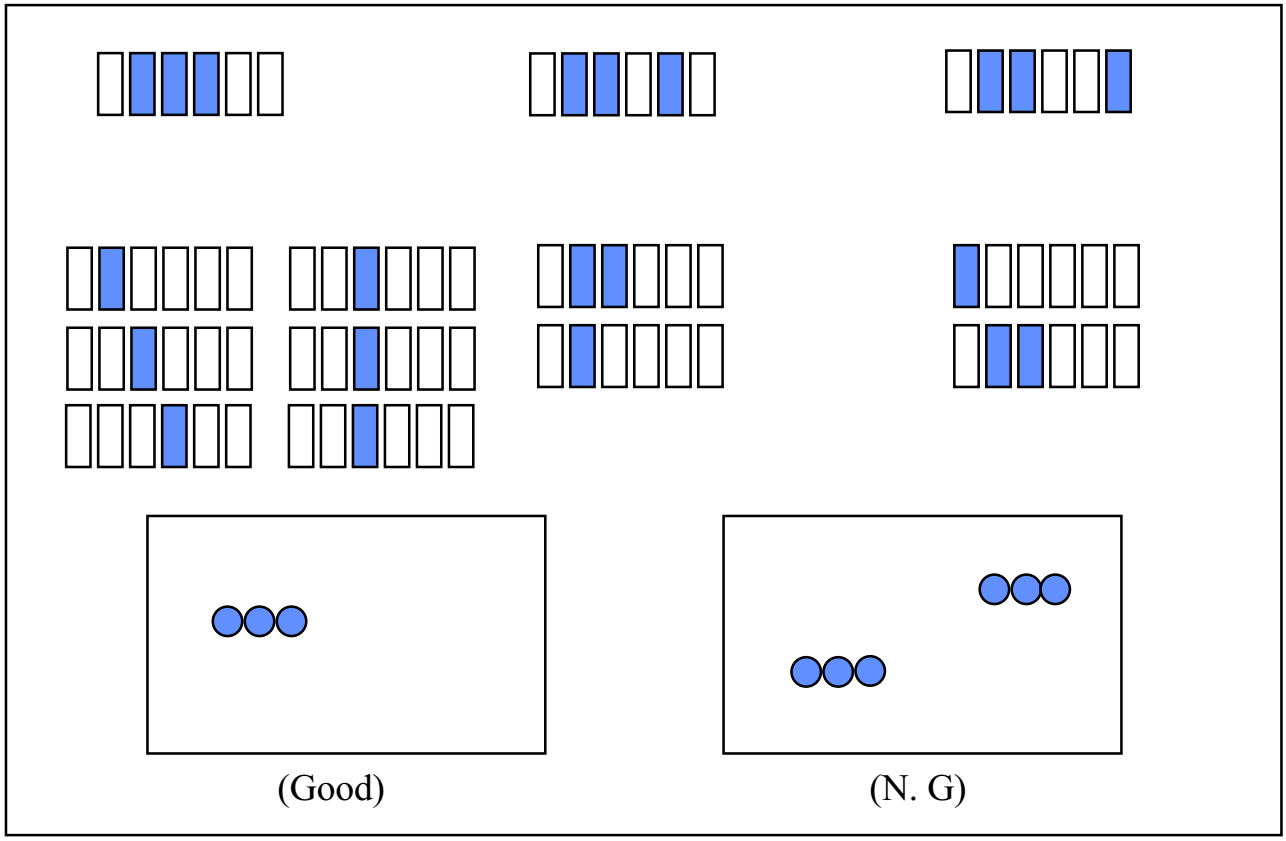


Fig. 3. Minimum distance between dot defects

【dark dot - to - dark dot】

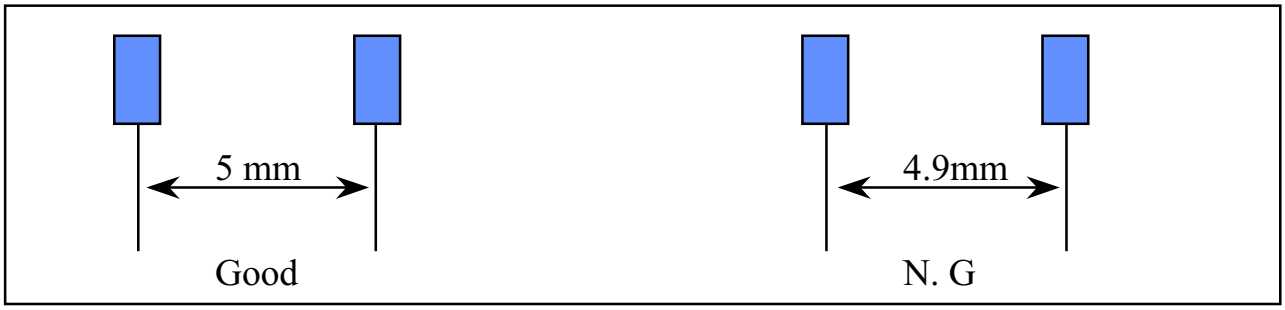


Fig. 4. Center Area (Active Area)