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Thin-Film-Transistor LCD Module
Model: GNIX84BNLC1A0


Acceptance

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Revise Records

Rev.	Date	Contents	Written	Approved
A	2021/05/13	Preliminary Specification	Alex	Ken
B	2022/09/06	New bezel and add the PI tape	Alex	Ken
C	2023/11/6	Corrected the Pins direction	Alex	Aven
D	2023/11/30	ADD The Led life time Typ. 50000hr	Alex	Aven


Special Notes

Note1.	
Note2.	
Note3.	
Note4.	
Note5.	

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1. General Description and Features

GNIX84BNLC1A0 is Normally black TFT thin film transistor (TFT) liquid crystal display (LCD) that uses amorphous silicon TFT as a switching device. This model is composed of a TFT LCD panel, a driving circuit and a back light system. This TFT LCD has a 8.4 (4:3) inch diagonally measured active display area with XGA (1024 horizontal by 768 vertical pixel) resolution.

1.1 Features

- Transmissive and back-light with 27 LEDs are available.
- IPS (In-Plane Switching) mode.
- LVDS Receiver 8 bit Interface.
- ROHS Compliance

1.2 LCD Module


Item	Specification	Unit
Screen Size	8.4 inches	Diagonal
Display Resolution	1024 (H) x 768 (V)	Pixel
Active Area	170.496(H) x 127.872(V)	mm
Outline Dimension	203.0 x 145.9 x 6.55 (Typ.)	mm
Pixel Size	0.1665(H) x 0.1665(V)	mm
Display Mode	Normally Black mode/ Transmissive	--
Pixel Arrangement	R,G,B Vertical Stripe	--
Input Interface	LVDS Receiver 8bit Interface (VESA)	--
Display Color	16.7M	--
Viewing Direction	Full View	--
Surface Treatment	Anti-Glare and Hard Coating(3H)	--

2. Mechanical Information

Item		Min.	Typ.	Max.	Unit	Note
Module Size	Horizontal (H)	--	203.0	--	mm	
	Vertical (V)	--	145.9	--	mm	
	Thickness (T)	--	6.55	--	mm	(1)
Weight		--	250	--	g	--

Note (1) Not Include Component. Refer to the Outline Dimension Drawing as attached.

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3. Electrical Specifications

3.1 Absolute Max. Ratings

3.1.1 Absolute Ratings of Environment

If the operating condition exceeds the following absolute maximum ratings, the TFT LCD module may be damaged permanently.

(Ta=25±2°C, V_{SS}=GND=0)

Item	Symbol	Min.	Max.	Unit	Note
Storage temperature	T _{STG}	-30	80	°C	(1)
Operating temperature	T _{OPR}	-20	70	°C	(1,2,3)

Note (1) 95 % RH Max. (40 °C ≥ Ta). Maximum wet-bulb temperature at 39 °C or less. (Ta > 40 °C)
No condensation.

Note (2) In case of below 0°, the response time of liquid crystal (LC) becomes slower and the color of panel becomes darker than normal one. Level of retardation depends on temperature, because of LC's character

Note (3) Only operation is guaranteed at operating temperature. Contrast, response time, another display quality are evaluated at +25°C.


3.1.2 Electrical Absolute Maximum Ratings

3.1.2.1 TFT-LCD Module

(V_{SS}=GND=0)

Parameter	Symbol	Min.	Max.	Unit	Remark
Power supply voltage	V _{CC}	-0.3	4.0	V	-
	VLED	-0.3	12.0	V	-

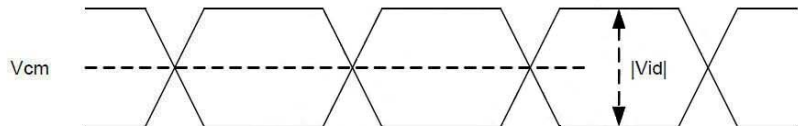
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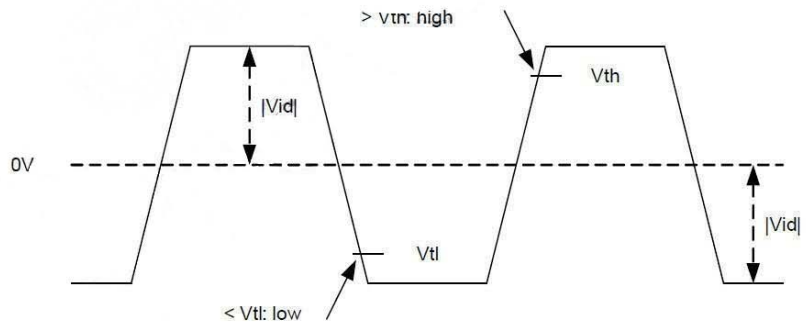
3.1.3 DC Electrical Characteristics of the TFT LCD

Item	Symbol	Min.	Typ.	Max.	Unit	Remark	
Power supply	V_{CC}	3.0	3.3	3.6	V		
Power Supply current	I_{CC}	--	180	--	mA	$V_{CC}=3.3V$	
Power supply LED voltage	V_{LED}	--	12	--	V		
Power Supply LED current	I_{LED}	--	(240)	--	mA		
Logic Input Voltage (LVDS:IN+,IN-)	Threshold Voltage(high)	V_{th}	-	-	+0.1	V	$V_{cm}=1.2V$
	Threshold Voltage(low)	V_{tl}	-0.1	-	-	V	
	Input voltage range (singled-end)	V_{INLV}	0.7	-	1.7	V	
	Common mode voltage	V_{cm}	1	1.2	$1.7 - \frac{ V_{id} }{2}$	V	
	Differential voltage	$ V_{id} $	0.1	-	0.6	V	
	leakage current	I_{Ivleak}	-10	-	+10	μA	
LED life time	--	20000	50000	--	hr		


Single-ended:
 LVCLKP (R),
 LVCLKN (R),
 LVD [3:0]P(R),
 LVD [3:0]N(R)



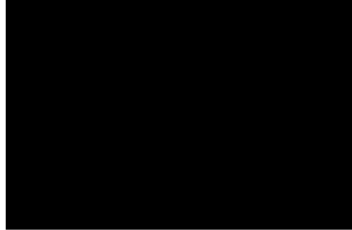
Differential:
 LVCLKP (R)-LVCLKN (R),
 LVD [3:0]P(R)-
 LVD [3:0]N(R)



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Note: $f_v = 60\text{Hz}$, $T_a = 25^\circ\text{C}$, Display pattern : Black pattern



3.1.4 Power Signal sequence

$$t_1 \leq 10\text{ms}$$

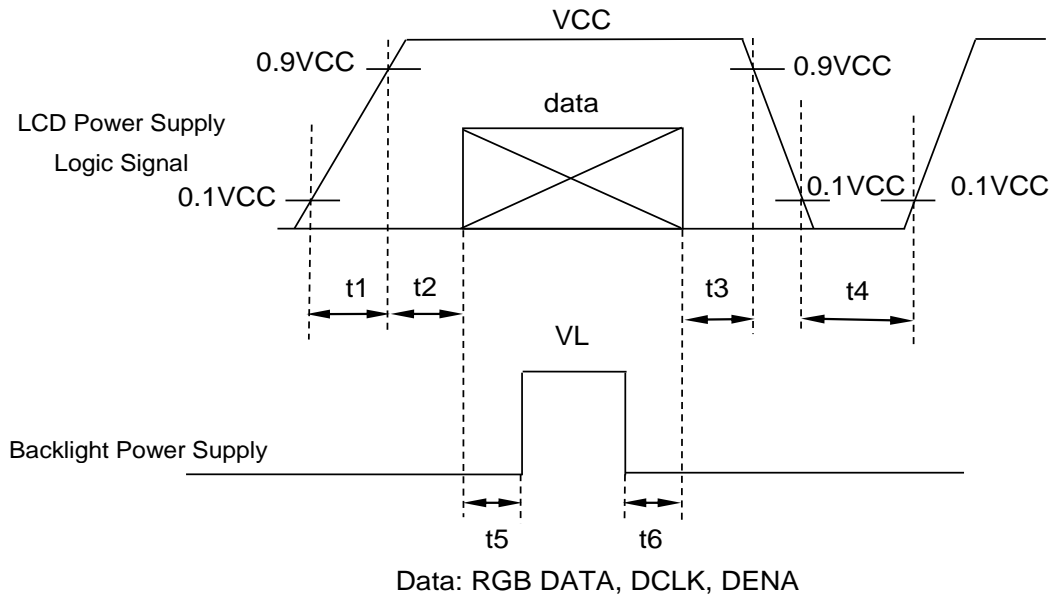
$$0 < t_2 \leq 50\text{ms}$$

$$0 < t_3 \leq 50\text{ms}$$

$$200\text{ms} \leq t_4$$

$$200\text{ms} \leq t_5$$

$$0 \leq t_6$$



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3.2 Timing Characteristic of The LCD

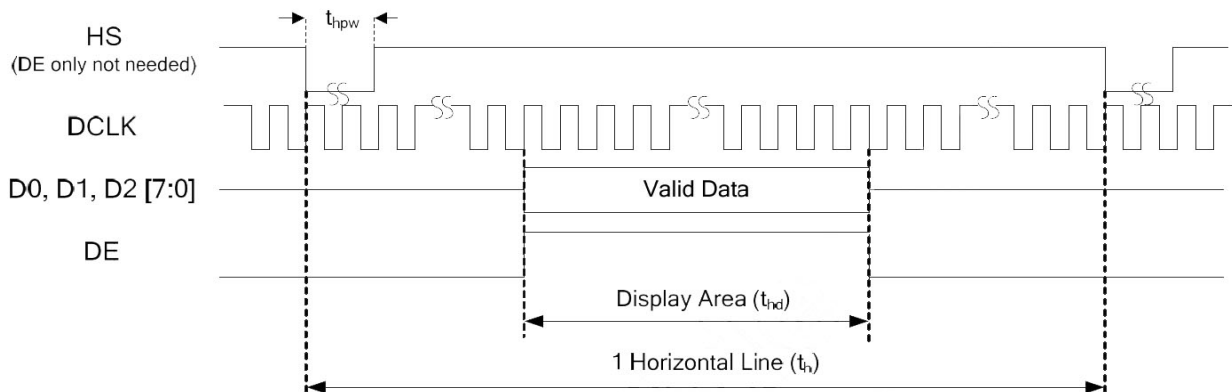
3.2.1 DE mode only

Parameter	Symbol	Min.	Typ.	Max.	Unit
DCLK frequency	F_{DCLK}	49.0	50.0	79.7	MHz
Horizontal valid data	T_{hd}	1024			DCLK
1 Horizontal line	T_h	1053	1066	1331	DCLK
Vertical valid data	T_{vd}	768			H
1 Vertical field	T_v	775	781	998	H
Frame rate	FR	--	60	--	Hz

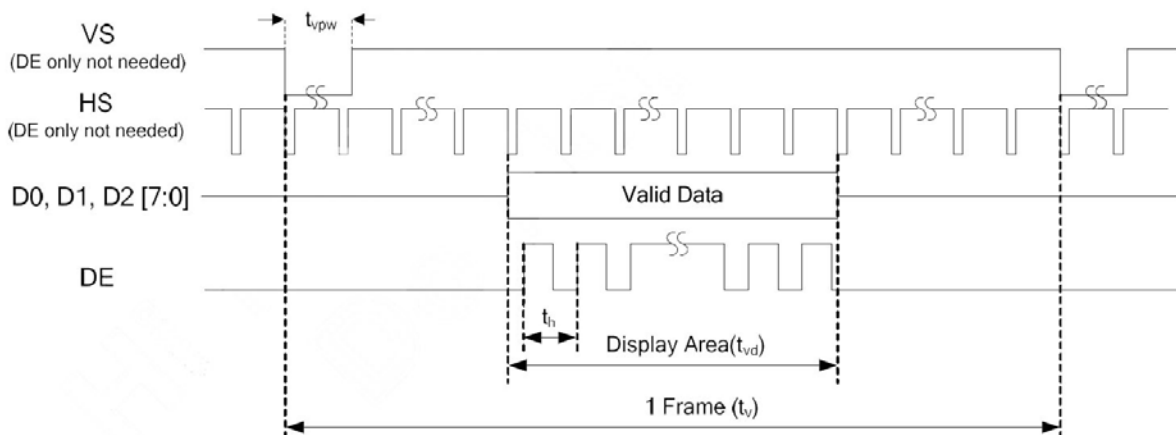
3.2.2 Timing Characteristic

3.2.2.1 Input Timing characteristic


• Horizontal



• Vertical

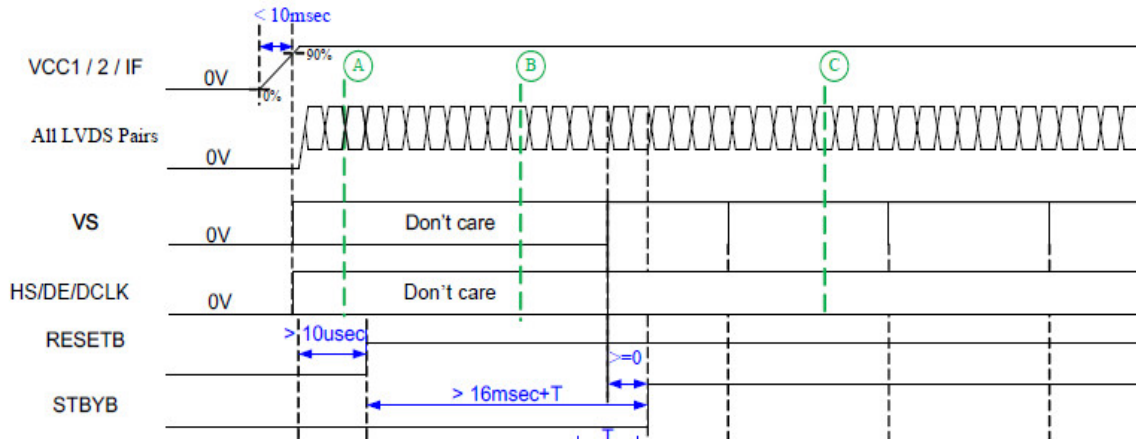


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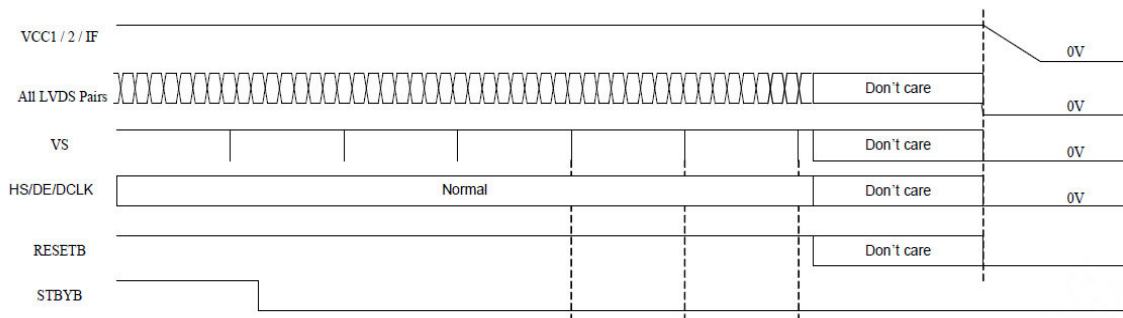
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3.2.3 Power ON/OFF Sequence

Power ON Sequence




Power OFF Sequence



The above on/off sequence should be applied to avoid abnormal function in the display. Please make sure to turn off the power when you plug the cable into the input connector or pull the cable out of the connector.

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4. Optical Characteristics


4.1 Optical characteristic of the LCD

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

Measuring equipment: BM-7A

Item	Symbol	Condition	Min	Type	Max	Unit	Note	
Brightness	B		800	1000	--	cd/m ²		
Response time	T _r + T _f	θ=0°	--	22	25	ms	.	
Contrast ratio	CR	At optimized viewing angle	800	1000	--	--		
Luminance Uniformity	ΔL		70	--		%		
Color Chromaticity (CIE 1931)	White	Wx	θ=0° Normal Viewing Angle	0.23	0.28	0.33	--	BM-7A
		Wy		0.28	0.33	0.38		
	Red	Rx		0.57	0.62	0.67	--	
		Ry		0.28	0.33	0.38		
	Green	Gx		0.24	0.29	0.34	--	
		Gy		0.57	0.62	0.67		
	Bule	Bx		0.06	0.11	0.16	--	
		By		0.02	0.05	0.08		
Viewing Angle	Hor.	θ _R	CR≥10	80	--	--	Degree	
		θ _L		80	--	--		
	Ver.	θ _U		80	--	--		
		θ _D		80	--	--		

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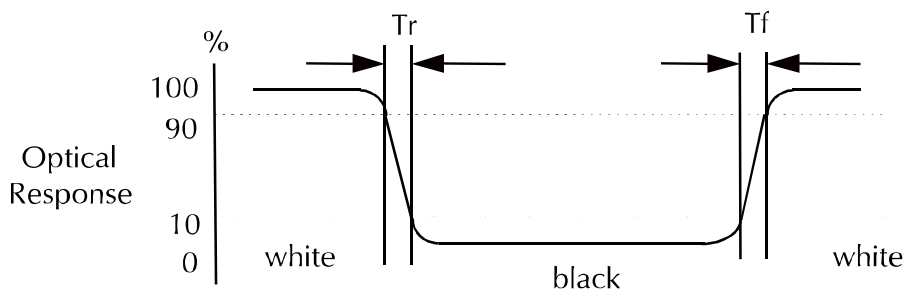
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a. Test equipment setup

After stabilizing and leaving the panel alone shall be warmed up for the stable operation of LCM, 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 2° at a distance of 50cm and normal direction.

b. Definition of response time: Tr and Tf

The response time is defined as the following figure and shall be measured by switching the input signal for "black" and "white".




c. Definition of contrast ratio:

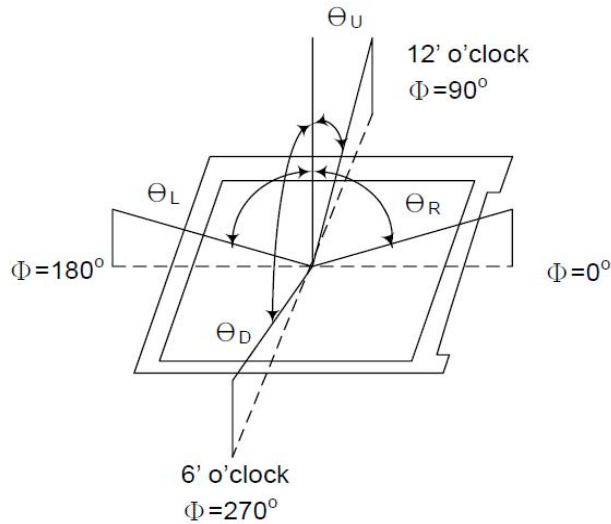
$$\text{Contrast Ratio (CR)} = \frac{\text{Brightness measured when LCD is at "white state"}}{\text{Brightness measured when LCD is at "black state"}}$$

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

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e. View Angle




f. Definition of Luminance of White: Luminance of white at the center points

Light Source of Back-Light Unit	LED Type
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g. Definition of White Uniformity

$$\text{White Uniformity} = \frac{\text{Min. luminance of white among 9-points}}{\text{Max. luminance of white among 9-points}} \times 100\%$$

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5. I/O Terminal

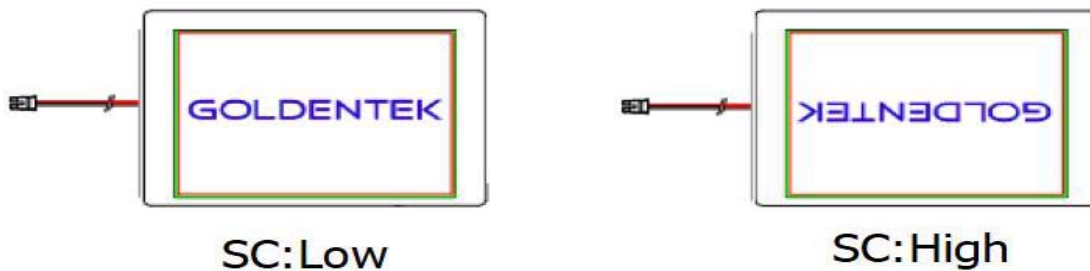
5.1 Pin Assignment (connector part No: MSB24013P20HA or equivalent.)

Pin No.	Symbol	I/O	Function	Remark
1	VCC	P	Power Supply Logic voltage (+3.3V)	
2	VCC	P	Power Supply Logic voltage (+3.3V)	
3	SC	I	Scan direction control (Low=Normal, High= Reverse)	Note1
4	NC	-	NO Connect	
5	RXIN1-	I	Negative LVDS differential data input	
6	RXIN1+	I	Positive LVDS differential data input	
7	GND	P	Ground	
8	RXIN2-	I	Negative LVDS differential data input	
9	RXIN2+	I	Positive LVDS differential data input	
10	GND	P	Ground	
11	RXIN3-	I	Negative LVDS differential data input	
12	RXIN3+	I	Positive LVDS differential data input	
13	GND	P	Ground	
14	RXCLKIN-	I	Negative LVDS differential clock input	
15	RXCLKIN+	I	Positive LVDS differential clock input	
16	GND	P	Ground	
17	NC	-	NO Connect	
18	NC	-	NO Connect	
19	RXIN4-	I	Negative LVDS differential data input	
20	RXIN4+	I	Positive LVDS differential data input	


- 1) I: Input, P: Power
- 2) NC Pin must be retained; this pin can't contact GND or other signal.
- 3) GND Pin must ground contact, can't be floating.

Notes1:

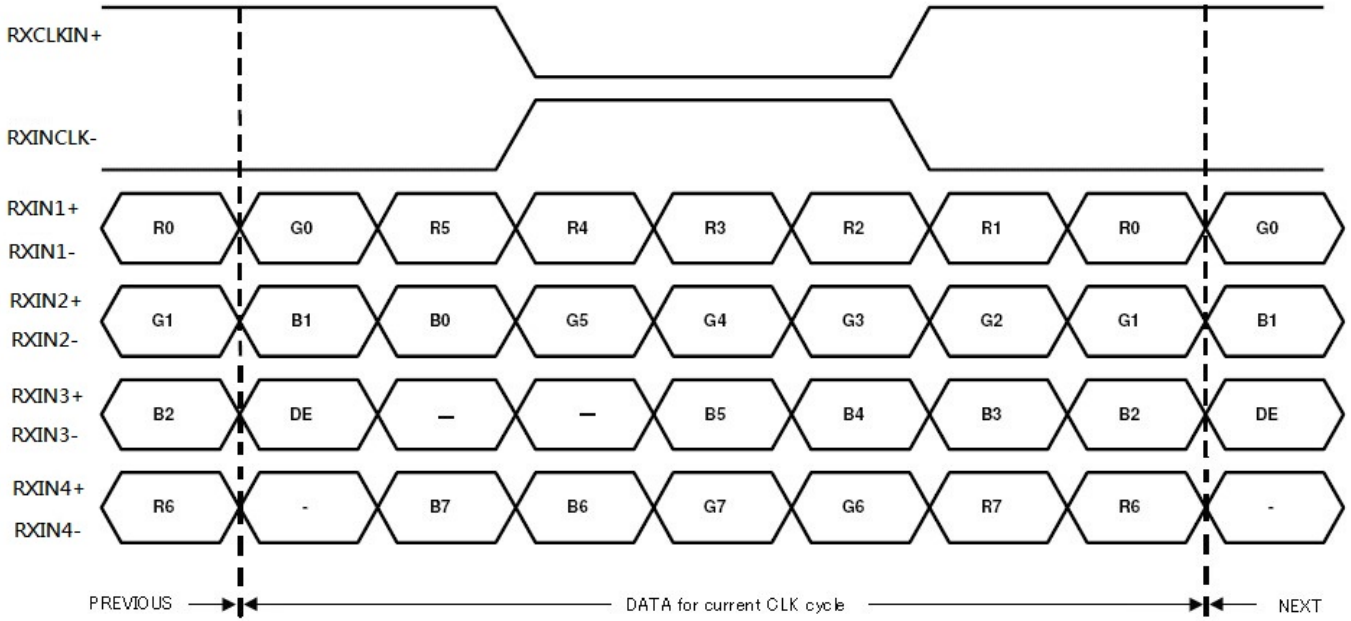
Scanning Direction



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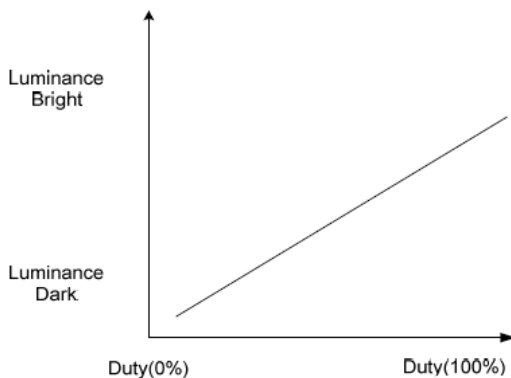
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5.2 LVDS Input Data mapping 8 Bit LVDS Input



5.3 Back Light Unit (connector part No ENTERY 3808K-F04N-02R or Equivalent)

Pin No.	Symbol	Function	Remark
1	VLED	Power Supply Input Voltage for LED Driver (+12V)	
2	GND	GND for LED Driver	
3	ON/OFF	Backlight ON/OFF Control (3.3V)	
4	PWM	Dimming control	



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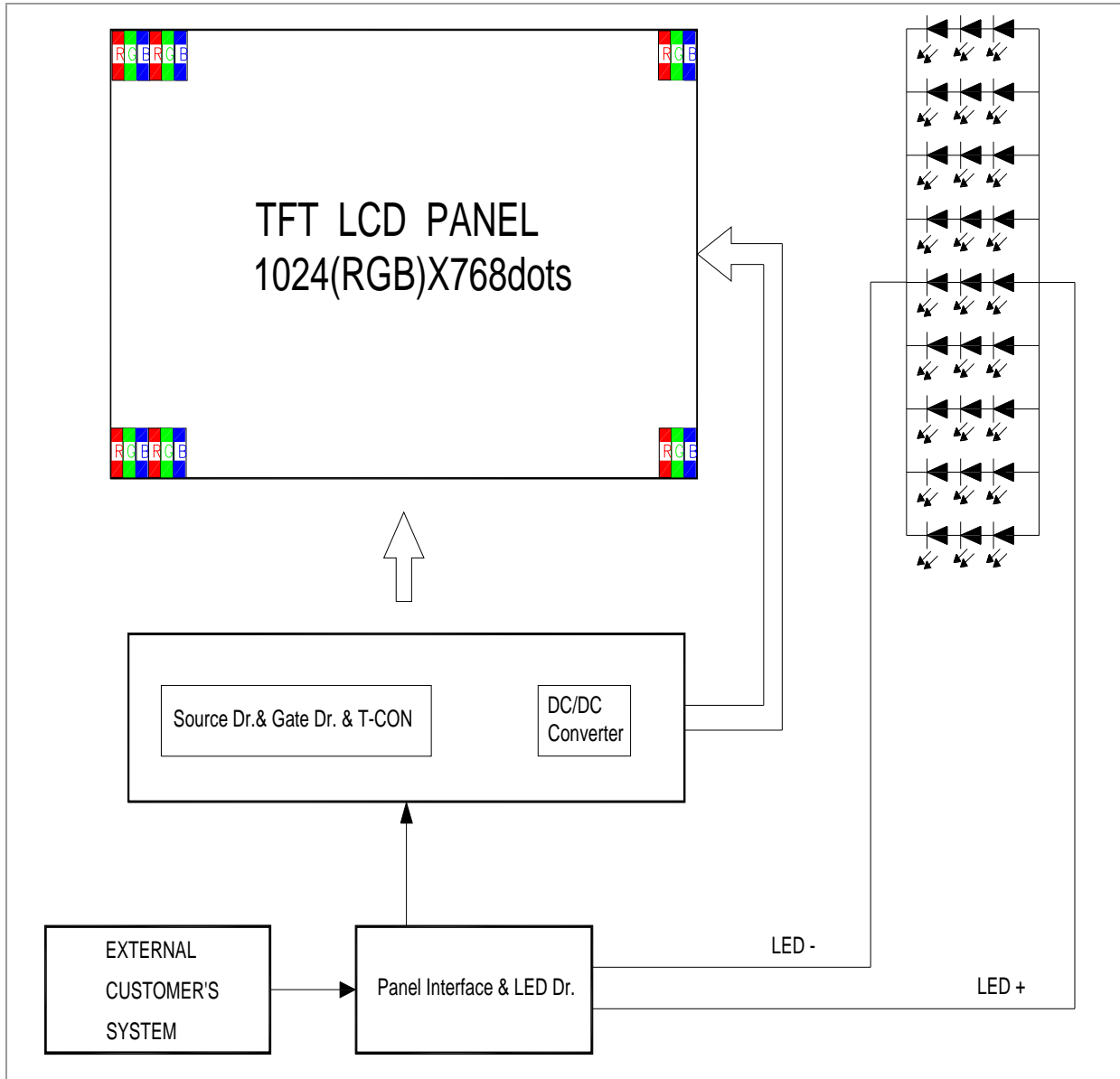
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5.4 Block Diagram



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6. Displayed Color and Input Data

COLOR	INPUT DATA	R DATA								G DATA								B DATA							
		R7	R6	R5	R4	R3	R2	R1	R0	G7	G6	G5	G4	G3	G2	G1	G0	B7	B6	B5	B4	B3	B2	B1	B0
		MSB							LSB	MSB							LSB	MSB							LSB
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
	RED(255)	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	GREEN(255)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	BLUE(255)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	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
	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
RED	RED(0)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	RED(1)	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	RED(2)	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	RED(254)	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	RED(255)	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
GREEN	GREEN(0)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	GREEN(1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
	GREEN(2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
	GREEN(254)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0
GREEN(255)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	
BLUE	BLUE(0)	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(1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	BLUE(2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
	BLUE(254)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0
BLUE(255)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	

0 : Low level voltage, 1 :High level voltage

Each basic color can be displayed in 256 gray scales from 8 bit data signals. With the combination of total 24 bit data signals, the 16,777,216-color display can be achieved on the screen.

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7. Reliability Condition

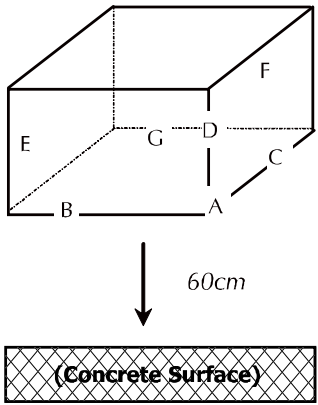
No change on display and in operation under the following test condition.

Condition: Unless otherwise specified, tests will be conducted under the following condition.

Temperature: 20±5°C.

Humidity: 65±5%RH.

Tests will be not conducted under functioning state.

No.	Parameter	Condition	Notes
1	High Temperature Operating	70°C±2°C, 240hrs (Operation state).	
2	Low Temperature Operating	-20°C±2°C, 240hrs (Operation state).	1
3	High Temperature Storage	80°C±2°C, 240hrs.	2
4	Low Temperature Storage	-30°C±2°C, 240hrs.	1,2
5	High Temperature and High Humidity Operation Test	60°C±2°C, 90%, 240hrs.	1,2
6	Vibration Test	Total fixed amplitude: 1.5mm. Vibration Frequency: 10~55Hz. One cycle 60 seconds to 3 direction of X, Y, Z each 15 minutes.	3
7.	Drop Test	To be measured after dropping from 60cm high on the concrete surface in packing state.  <div style="margin-left: 20px;"> <p><i>Dropping method corner dropping:</i></p> <p><i>A corner: Once edge dropping.</i></p> <p><i>B, C, D edge: Once face dropping.</i></p> <p><i>E, F, G face: Once.</i></p> </div>	

- Notes:
1. No dew condensation to be observed.
 2. The function test shall be conducted after 4 hours storage at the normal temperature and humidity after removed from the test chamber.
 3. Vibration test will be conducted to the product itself without putting I in a container.

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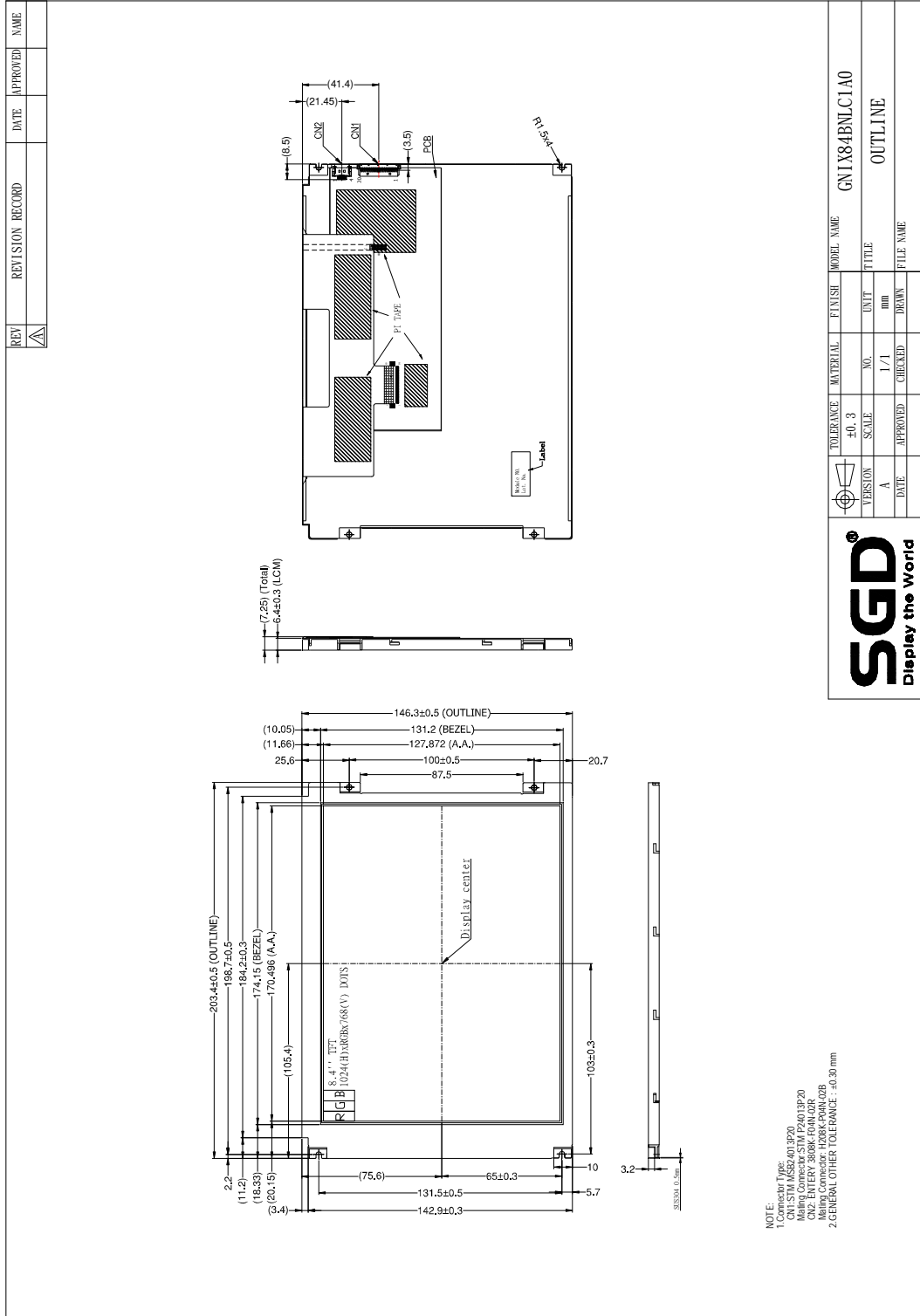
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8. Dimensional Outlines



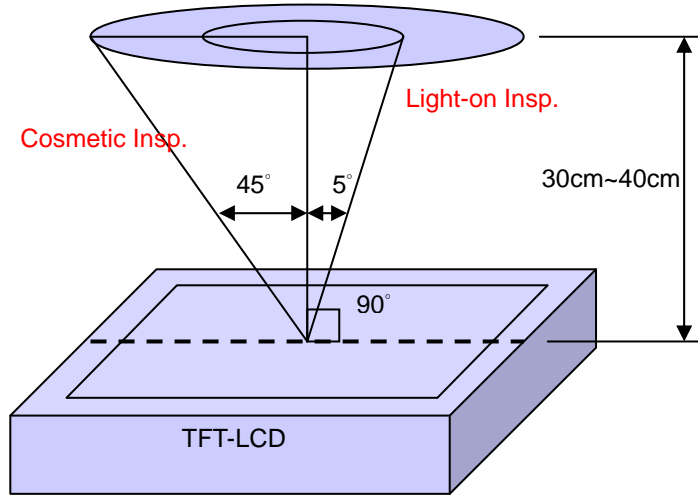
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9. Incoming Inspection Standards

9.1 Inspection and Environment Conditions

9.1.1 Inspection Conditions:

- (1) Inspection Distance: 35 cm±5cm
- (2) View Angle : Light-on Inspection Angle : ±5°
Cosmetic Inspection Angle : ±45°



(perpendicular to LCD panel surface)

9.1.2 Environment Conditions:

Ambient Temperature		23°C ±5°C
Ambient Humidity		55±10%RH
Ambient Illumination	Cosmetic Inspection	more than 600 Lux
	Functional Inspection	300~500 Lux


9.1.3 Sampling Conditions:

- (1) Lot Size: Quantity of shipment lot per model
- (2) Sampling Method:

Sampling Plan		MIL-STD-105E
		Normal Inspection, Single Sampling
		Level II
AQL	Major Defect	1.0%
	Minor Defect	1.5%

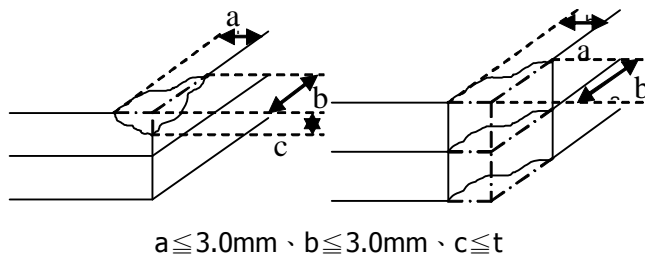
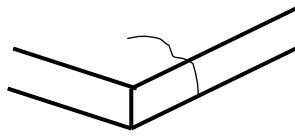
- (3) The classification of Major(MA) and Minor(MI) defects is shown as 3. Inspection Criteria.

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9.1.4 Inspection Criteria

9.1.4.1 Cosmetic Inspection(Panel):

Item	Judgment Criteria	Classification
Chipping on Panel	 <p style="text-align: center;">$a \leq 3.0\text{mm} \cdot b \leq 3.0\text{mm} \cdot c \leq t$ (Bottom glass thickness)</p>	MA
Scratch on Panel *Note-2	$W \leq 0.05\text{mm}$ or $L < 5\text{mm}$: Ignored $0.05\text{mm} < W \leq 0.1\text{mm}$ and $L \leq 5\text{mm}$: $N \leq 5$ $W > 0.1\text{mm}$ or $L > 5\text{mm}$: Not allowed	MI
Bubble or Dent on Panel *Note-3	$D \leq 0.2\text{mm}$: Ignored $0.2\text{mm} < D \leq 0.3\text{mm}$: $N \leq 5$ $D > 0.3\text{mm}$: Not allowed	MI
Panel Crack	 <p style="text-align: center;">Not Allowed crack</p>	MA
Bezel Deformation	Obvious deformation is not allowed.	MI
Bezel Oxidation	Not allowed if it rusts continuously over 1 cm (It is out of warranty with rusted tin plate)	MI
Bezel Scratch	$L \leq 20\text{mm}$, $W \leq 0.2$, $N \leq 3$	MI
Metal Squash Dent /Flange(Front Side)	$D(W) \leq 1, L \leq 3, N \leq 3;$	MI
B/L High Voltage Wire Denudation	Not allowed	MA
Polarizer flaw or leak out resin	Defect is defined as the active area.	MI
Outline Dimension	Must in Spec, refer to related product spec.	MI


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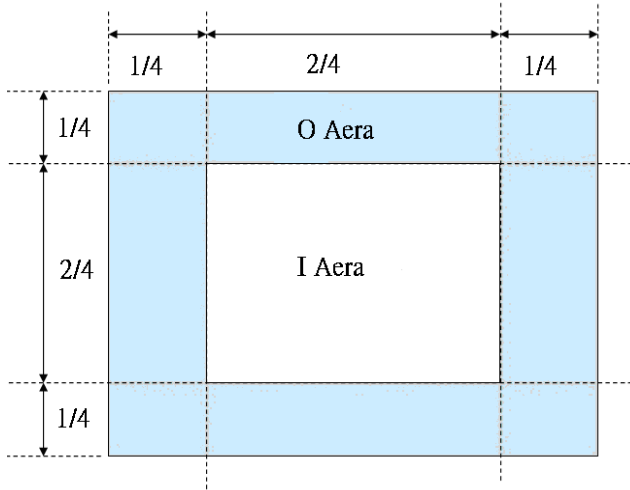
9.1.4.2 Functional Inspection:

Item	Judgment Criteria			Classification	
	Area(Note1)	I	O		
Point Defect	Bright dot	Random	2		
		2 dots adjacent	0	0	
		3 dots adjacent or more	0	0	
	Dark dot	Random	3		
		2 dots adjacent	1		
		3 dots adjacent or more	0	0	
	Total Dot Defect		5		
	Distance	Distance between Bright and Bright dot		$L \geq 5\text{mm}$	
		Distance between Bright and Dark dot		$L \geq 5\text{mm}$	
		Distance between Dark dot		$L \geq 5\text{mm}$	
(1) It is defined as Point Defect if defect area $> 0.5\text{dot}$ (2) It is ignored if defect area $\leq 0.5\text{dot}$ (3) Weak point defect will be defined as Bright Dot if it can be observed through ND filter 5% (Full Screen Black Inspection)					
Line Defect	Obvious vertical or horizontal line defect is not allowed.			MA	
Mura	Not allowed if it can be observed through ND Filter 5 %			MI	
Foreign Material in spot shape *Note-3	$D \leq 0.2\text{mm}$: Ignored $0.2\text{mm} < D \leq 0.5\text{mm}$: $N \leq 8$ $D > 0.5\text{mm}$: Not allowed			MI	
Foreign Material in line or spiral shape *Note-4	$W \leq 0.05\text{mm}$ or $L \leq 5\text{mm}$: Ignored $0.05\text{mm} < W \leq 0.2\text{mm}$ and $L 1.0\text{mm} \leq 5\text{mm}$: $N \leq 8$ $W > 0.2\text{mm}$ or $L > 5\text{mm}$: Not allowed			MI	
Display Function Abnormal	No Malfunction can be allowed			MA	

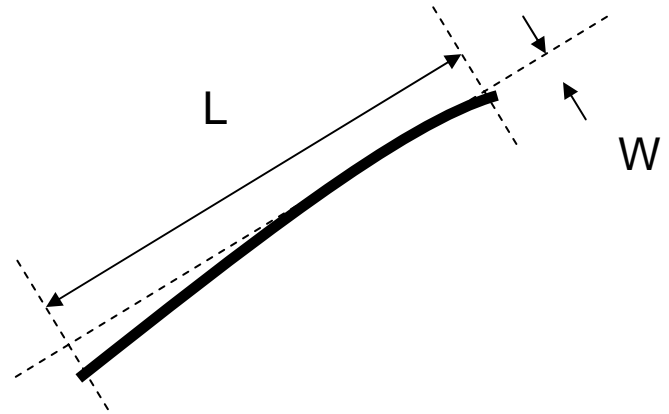
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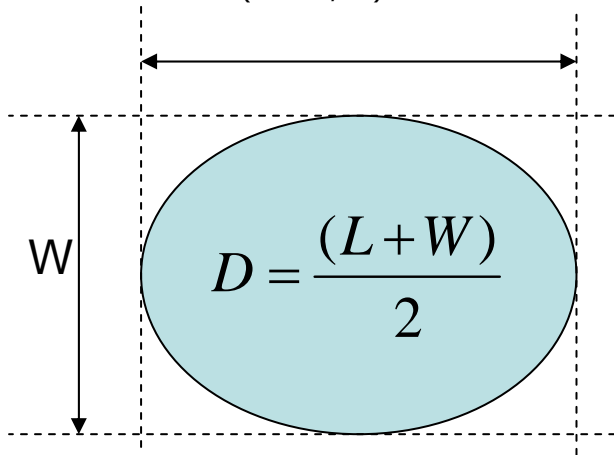
Note-1 : I/O Area Definition



Note-2 : Polarizer Scratch



Note-3 : Spot Foreign Material
($W \geq L / 4$)



Note-4 : Line or Spiral Foreign Material
($W < L / 4$)

