

**Display Elektronik GmbH**

**DATA SHEET**

**TFT MODULE**

**DEM 1920720A VMX-PW-N**

**12,3" TFT  
(Wide-Screen)**

**Product Specification**

**Ver.: 1**

**03.01.2017**

Revise Records

Rev.	Date	Contents	Written	Approved
0	21.11.2016	Preliminary Specification	MH	MH
1	03.01.2017	Update Drawing	MH	MH

Special Notes

Note1.	
Note2.	
Note3.	
Note4.	
Note5.	

## Contents

<b>1. General Description and Features .....</b>	<b>4</b>
1.1 Features	4
1.2 LCD Module	4
<b>2. Mechanical Information .....</b>	<b>4</b>
<b>3. Absolute Max. Ratings .....</b>	<b>5</b>
3.1 Absolute Ratings of Environment	5
3.2 Absolute Ratings of Electrical	5
<b>4. Electrical Characteristics .....</b>	<b>6</b>
4.1 TFT-LCD Module	6
4.2 TFT-LCD Current Consumption	7
4.3 Power \ Signal sequence	7
4.4 Backlight	8
<b>5. Input Terminal Pin Assignment .....</b>	<b>9</b>
5.1 CN1 (Signal Input, IPEX 20455-040E-12)	9
5.2 CN2 (LED backlight)	10
<b>6. Optical Characteristics .....</b>	<b>11</b>
<b>7. Interface Timing(DE ONLY MODE) .....</b>	<b>13</b>
7.1 Timing specification	13
7.2 Timing sequence(Timing chart)	13
<b>8. Reliability Condition .....</b>	<b>16</b>
<b>9. DIMENSIONAL OUTLINE .....</b>	<b>16</b>
<b>10. Incoming Inspection Standards .....</b>	<b>19</b>
10.1 Inspection and Environment Conditions	19

**1. General Description and Features**

This module is 12.3" Color TFT-LCD (Thin Film Transistor Liquid Crystal Display) module composed of LCD panel, driver ICs, Control Circuit and LED Backlight. By applying 1920x720 images are displayed on the 12.3" diagonal screen. Display 16.7M colors by LVDS signal input.

**1.1 Features**

- 1920 x 720 Pixels Resolution.
- Display in 16.7M Colors.
- LED Backlight with 700cd/m2
- Extreme Temperature Range
- LVDS Interface
- RoHS Compliance

**1.2 LCD Module**

Item	Specification	Unit
Screen Size	12.3 Inches	Diagonal
Display Resolution	1920 x RGB x 720	Dot
Active Area	292.032 x 109.512	mm
Outline Dimension	313.80 x 132.20 x 13.30	mm
Display Mode	Normally Black (MVA)	--
Pixel Pitch	0.1521 x 0.1521	mm
Pixel Arrangement	RGB-Vertical Stripe	--
Display Color	16.7 Million	--
Surface Treatment	Anti-Glare	--
Viewing Direction	Full	--
Input Interface	LVDS	--

**2. Mechanical Information**

Item		Min.	Typ.	Max.	Unit	Note
Module Size	Horizontal (H)	264.90	265.20	265.50	mm	--
	Vertical (V)	109.50	109.80	110.10	mm	
	Thickness (T)	6.70	7.00	7.30	mm	(1)
Weight		--	540	--	g	--

Note (1) Not include FPC.

Refer to the Outline Dimension for further information.

**3. Absolute Max. Ratings**

**3.1 Absolute Ratings of Environment**

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

Item	Symbol	Min.	Max.	Unit	Note
Storage Temperature	T <sub>STG</sub>	-40	+95	°C	(1)
Operating Temperature	T <sub>OPR</sub>	-30	+85	°C	(1)

Note (1) If users use the product out off the environmen-tal operation range (temperature and humidity), it will have visual quality concerns.

**3.2 Absolute Ratings of Electrical**

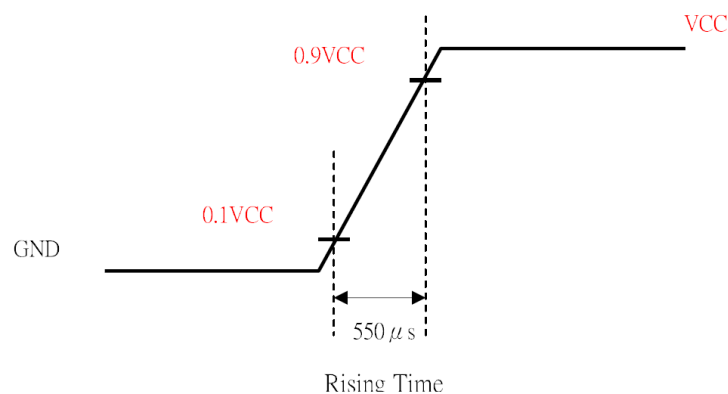
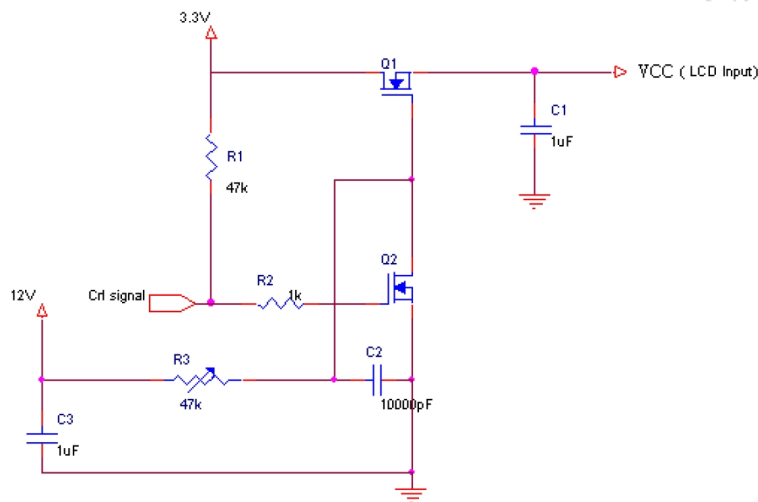
The following are maximum values which, if exceeded, may cause faulty operation or damage to the unit.

Item	Symbol	Min.	Max.	Unit	Note
LCD Supply Voltage	VCC	-0.3	3.9	V	
Signal Input Voltage	RxIN0+ ~ RxIN3+ RxIN0- ~ RxIN3- Rx CLK IN +/-	-0.3	Vcc	V	
ICC Rush Current	IRUSH	-	2	A	Note 1

Note (1) The input pulse-current measurement system is as below:

Control signal: High (+3.3V) Low (GND)

Supply Voltage of rising time should be from R3 and C2 tune to 550 μs.



4. Electrical Characteristics

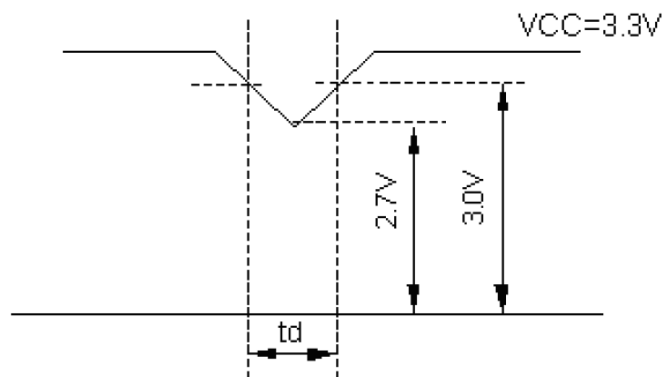
4.1 TFT-LCD Module

ITEM	SYMBOL	MIN	TYP	MAX	UNIT	NOTE
LCD Supply Voltage	VCC	3.0	3.3	3.6	V	*1)
Logic Input Voltage (LVDS:IN+,IN-)	VCM	0.7	-	1.6	V	*2)
	VID	100	-	600	mV	*2)
	VTH	-	-	100	mV	*2)
	VTL	-100	-	-	mV	*2)

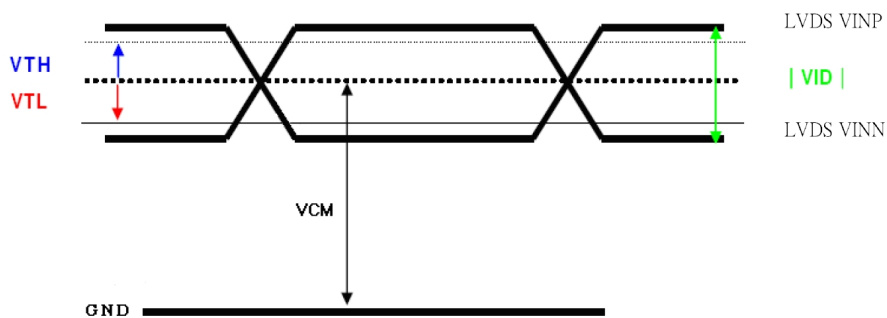
【Note1】 VCC-dip state

(1) when  $3.0V > VCC \geq 2.7V$ ,  $t_d \leq 10ms$ .

(2) when  $VCC < 2.7V$ , VCC-dip condition should as the VCC-turn-off condition.



【Note2】 LVDS signal



4.2 TFT-LCD Current Consumption

Item	Symbol	Min.	Typ.	Max.	Unit.	Note.
LCD Supply Current	ICC	-	600	1000	mA	【Note1】

Note1: Typical: Under 256 gray pattern  
 Maximum: Under white pattern

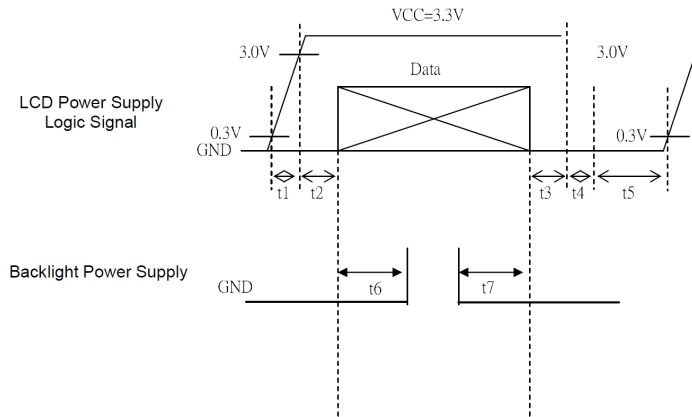


256 gray pattern



White Pattern

4.3 Power Signal Sequence



Logical signal : RGB data, DCLK, DENA  
 Power : VCC,VLED

- 0.5<t1 ≤ 10ms
- 0 < t2 ≤ 50ms
- 0 < t3 ≤ 50ms
- 0 < t4 ≤ 10ms
- 200ms ≤ t5
- 200ms ≤ t6
- 200ms ≤ t7

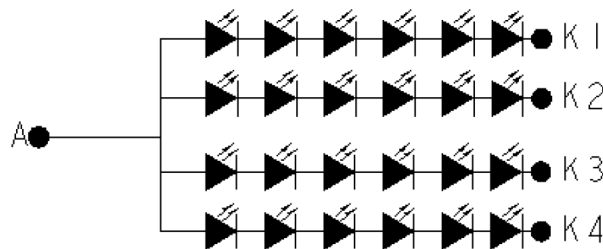
4.4 Backlight

Ta=25°C

ITEM	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNIT	NOTE
LED Current	IL	Ta=25°C (80mA/serise)	--	320	--	mA	
LED Voltage	VL	Ta=25°C (80mA/serise)	15.9	18	20.7	V	
Power Consumption	WL	Ta=25°C (80mA/serise)	--	5.76	--	W	
LED Lifetime	-	Ta=25°C IF=80mA	-	30000		Hr	

Remarks :

\*1)LED Circuit Diagram



\*2) A : Anode(+) · K : Cathode(—)

\*3) Suggestion: Using the constant current control to avoid the leakage light and brightness quality issue.

\*4) Definition of Led lifetime : Luminance < Initial luminance 70%.



**5. Input Terminal Pin Assignment****5.1 CN1 (Signal Input, IPEX 20455-040E-12)**

Pin No.	Symbol	Function	Remark
1	GND	Power ground	
2	NC	No connect	
3	VCC	Digital power	
4	VCC	Digital power	
5	GND	Power ground	
6	GND	Power ground	
7	NC	No connect	
8	NC	No connect	
9	GND	Power ground	
10	ORXIN0-	Odd pixel negative LVDS differential data inputs	
11	ORXIN0+	Odd pixel positive LVDS differential data inputs	
12	ORXIN1-	Odd pixel negative LVDS differential data inputs	
13	ORXIN1+	Odd pixel positive LVDS differential data inputs	
14	ORXIN2-	Odd pixel negative LVDS differential data inputs	
15	ORXIN2+	Odd pixel positive LVDS differential data inputs	
16	ORXCLKIN-	Odd pixel negative LVDS differential clock inputs	
17	ORXCLKIN+	Odd pixel positive LVDS differential clock inputs	
18	ORXIN3-	Odd pixel negative LVDS differential data inputs	
19	ORXIN3+	Odd pixel positive LVDS differential data inputs	
20	ERXIN0-	Even pixel negative LVDS differential data inputs	
21	ERXIN0+	Even pixel positive LVDS differential data inputs	
22	ERXIN1-	Even pixel negative LVDS differential data inputs	
23	ERXIN1+	Even pixel positive LVDS differential data inputs	
24	ERXIN2-	Even pixel negative LVDS differential data inputs	
25	ERXIN2+	Even pixel positive LVDS differential data inputs	
26	ERXCLKIN-	Even pixel negative LVDS differential clock inputs	
27	ERXCLKIN+	Even pixel positive LVDS differential clock inputs	
28	ERXIN3-	Even pixel negative LVDS differential data inputs	
29	ERXIN3+	Even pixel positive LVDS differential data inputs	
30	GND	Power ground	
31	NC	No connect	
32	NC	No connect	
33	NC	No connect	
34	NC	No connect	
35	NC	No connect	
36	NC	No connect	
37	NC	No connect	
38	GND	Power ground	
39	GND	Power ground	
40	GND	Power ground	

**5.2 CN2 (LED backlight)**

Pin No.	Symbol	Function
1	A	Anode
2	A	Anode
3	A	Anode
4	K1	Cathode 1
5	K2	Cathode 2
6	K3	Cathode 3
7	K4	Cathode 4
8	NC	NC
9	NTC_A	NTC_Anode
10	NTC_K	NTC_Cathode

6. Optical Characteristics

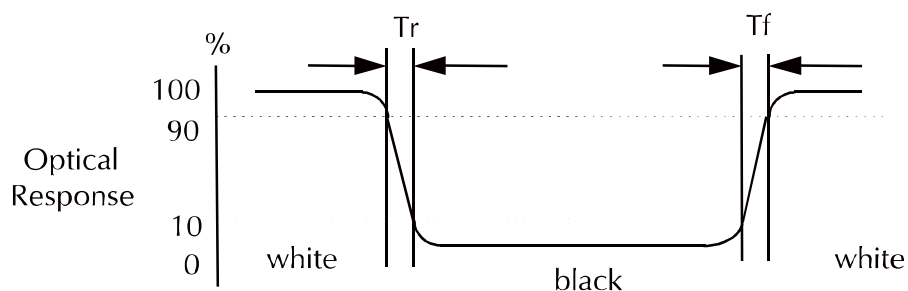
Item	Symbol	Condition	Min	Type	Max	Unit	Note	
Brightness (Center)	L		500	700	--	cd/m <sup>2</sup>		
Response Time (White - Black)	Tr +Tf	θ=0°	--	25	35	ms		
Contrast Ratio	CR	At optimized viewing angle	800	1000	--	--		
Luminance Uniformity	ΔL		70	80		%		
Color Chromaticity	White	Wx	θ=0° Normal Viewing Angle	0.250	0.290	0.330	--	BM-7A
		Wy		0.260	0.300	0.340		
Viewing Angle	Ver.	θ <sub>U</sub>	CR≥10	75	85	--	Degree	
		θ <sub>D</sub>		75	85	--		
	Hor.	θ <sub>L</sub>		75	85	--		
		θ <sub>R</sub>		75	85	--		
NTSC	-		60	70		%		

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

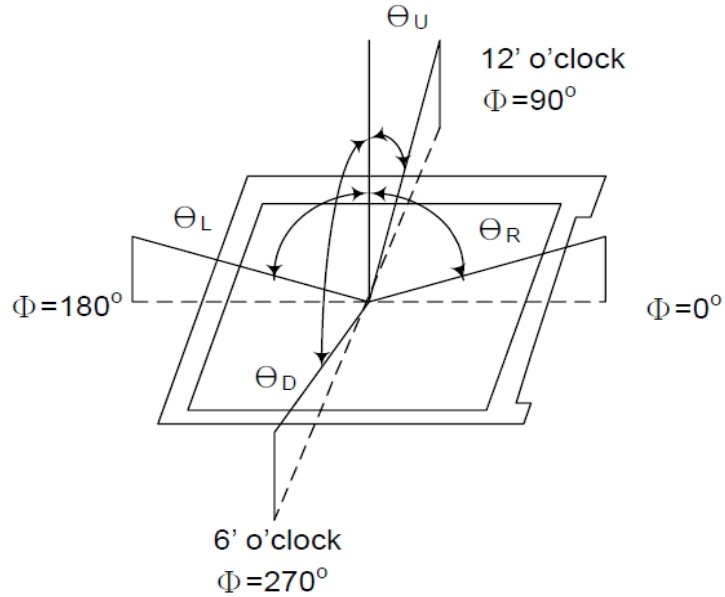
The response time is defined as the following figure and shall be measured by switching the input signal for "black" and "white".



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.
- 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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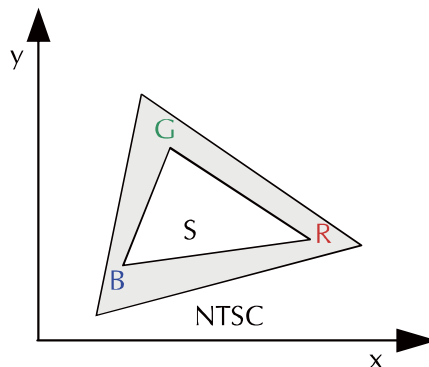
- g. Definition of White Uniformity

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

- h. The definition of Color Gamut -Color Chromaticity CIE 1931

Color coordinate of white & red, green, blue at center point.

Color Gamut : NTSC(%) = ( RGB Triangle Area / NTSC Triangle Area ) x 100



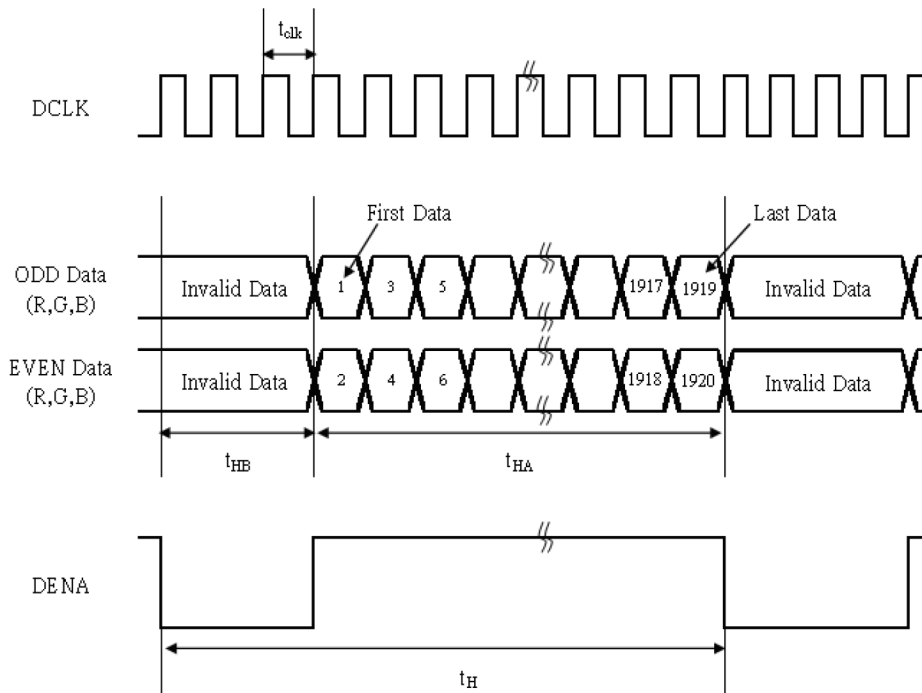
7. Interface Timing(DE ONLY MODE)

7.1 Timing specification

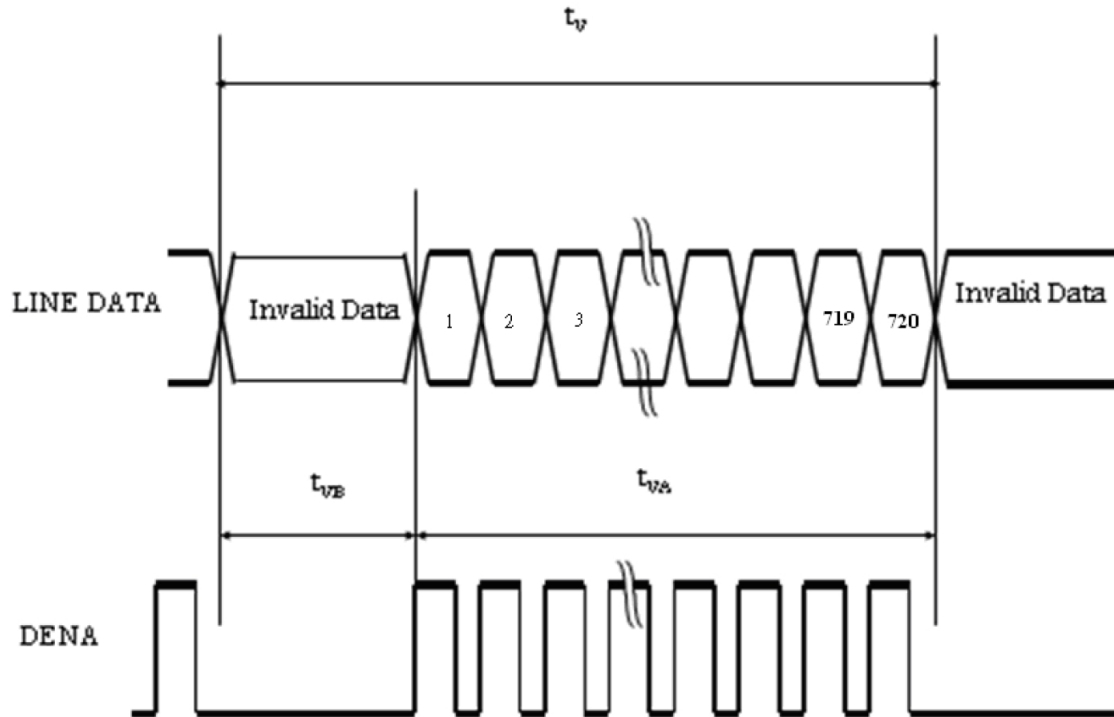
Item		Symbol	Min.	Typ.	Max.	Unit	
LVDS Input Signal Sequence	CLK Frequency	tclk	40	52.3	66.12	MHz	
LCD Input Signal Sequence (Input LVDS Transmitter)	Horizontal	Horizontal total Time	tH	1070	1150	1230	tCLK
		Horizontal effective Time	tHA	960			tCLK
		Horizontal Blank Time	tHB	110	190	270	tCLK
	Vertical	Vertical total Time	tV	748	758	768	tH
		Vertical effective Time	tVA	720			tH
		Vertical Blank Time	tVB	28	38	48	tH

7.2 Timing sequence (Timing chart)

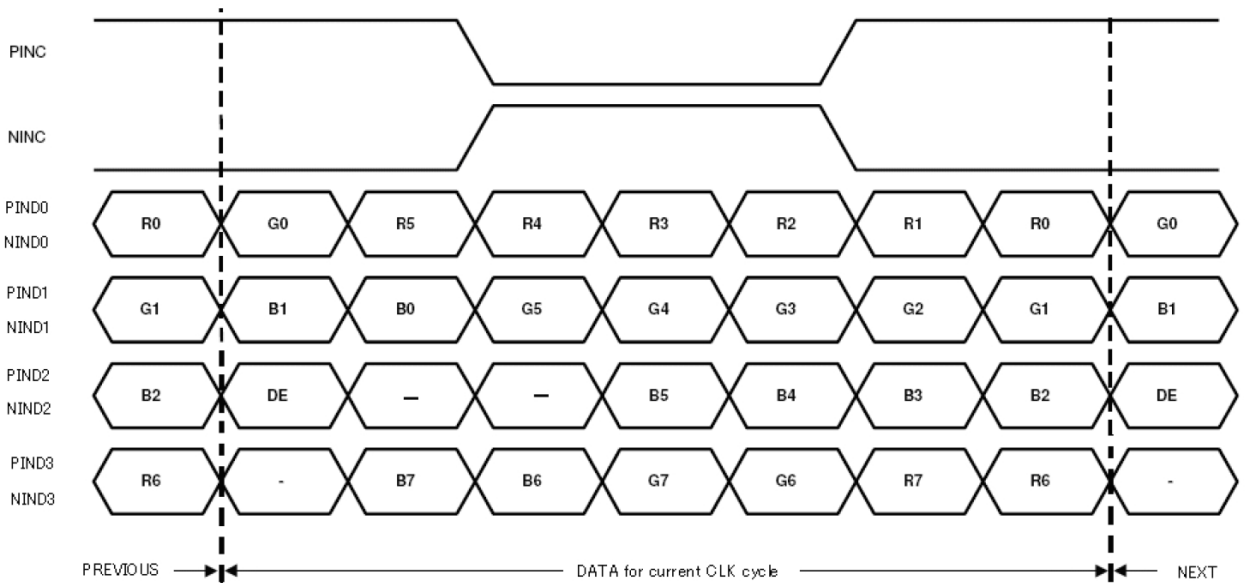
7.2.1 Horizontal Timing Sequence



7.2.2 Vertical Timing Sequence



7.2.3 LVDS Input Data mapping



7.2.4 Color Data Reference

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	
	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	
	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	
	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	
	CYAN	0	0	0	0	0	0	0	0	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	
	YELLOW	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	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	
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		
	RED(1)	0	0	0	0	0	0	0	1	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		
	RED(254)	1	1	1	1	1	1	1	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		
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		
	GREEN(1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0		
	GREEN(2)	0	0	0	0	0	0	0	0	0	0	0	0	0	1	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		
	GREEN(255)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	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		
	BLUE(1)	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	1		
	BLUE(254)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	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	

【Note】

- (1) Gray level: Color(n) : n is level order; higher n means brighter level.
- (2) DATA: 1: high , 0: low

**8. Reliability Condition**

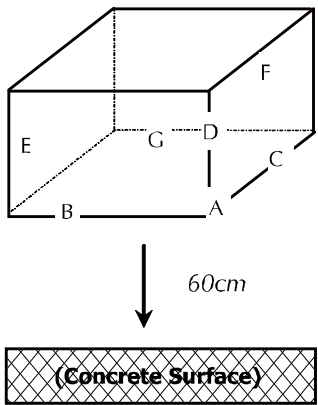
No change on display and in operation under the following test condition.

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

Temperature: 20±5°C.

Humidity: 65±5%RH.

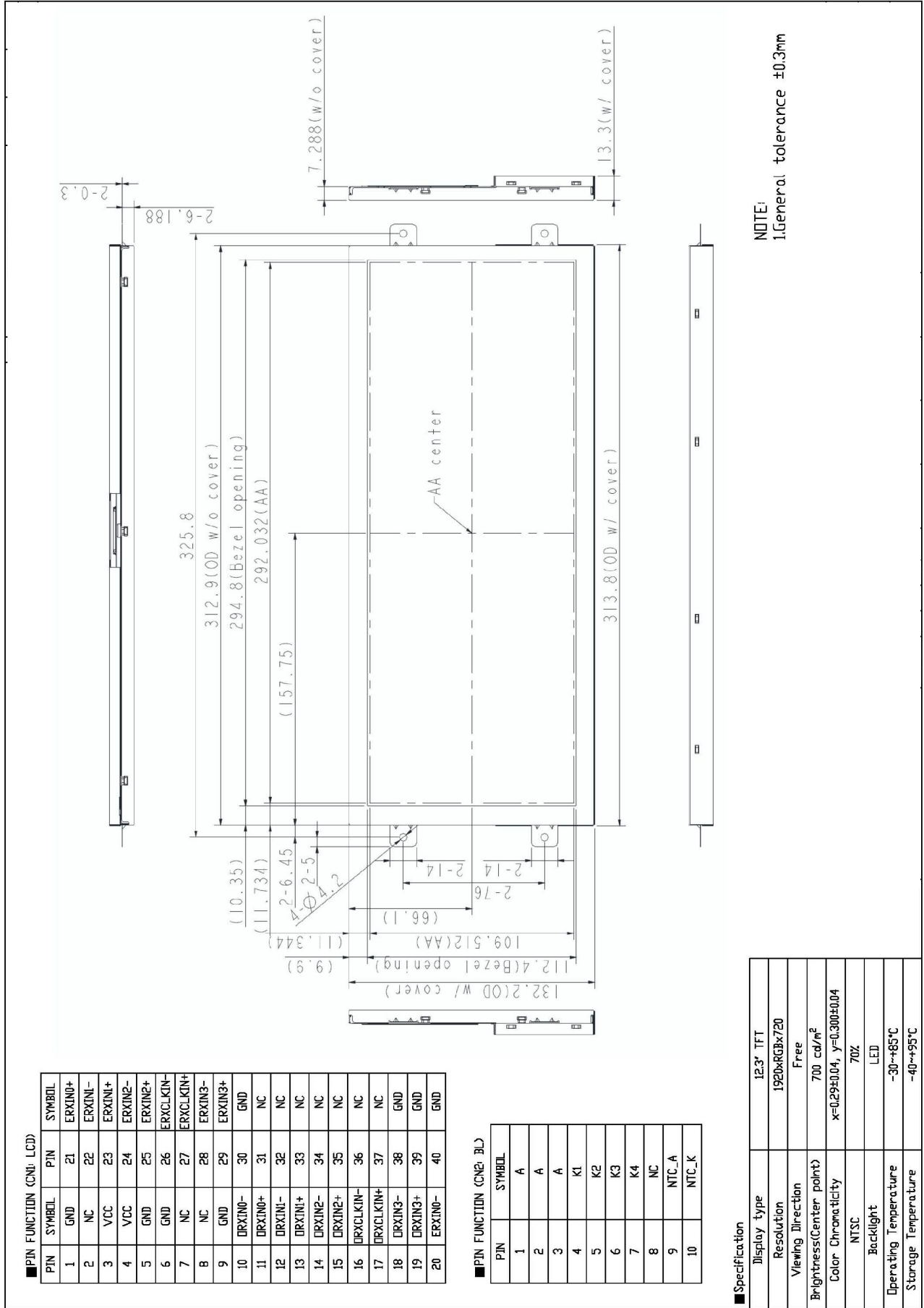
Tests will be not conducted under functioning state.

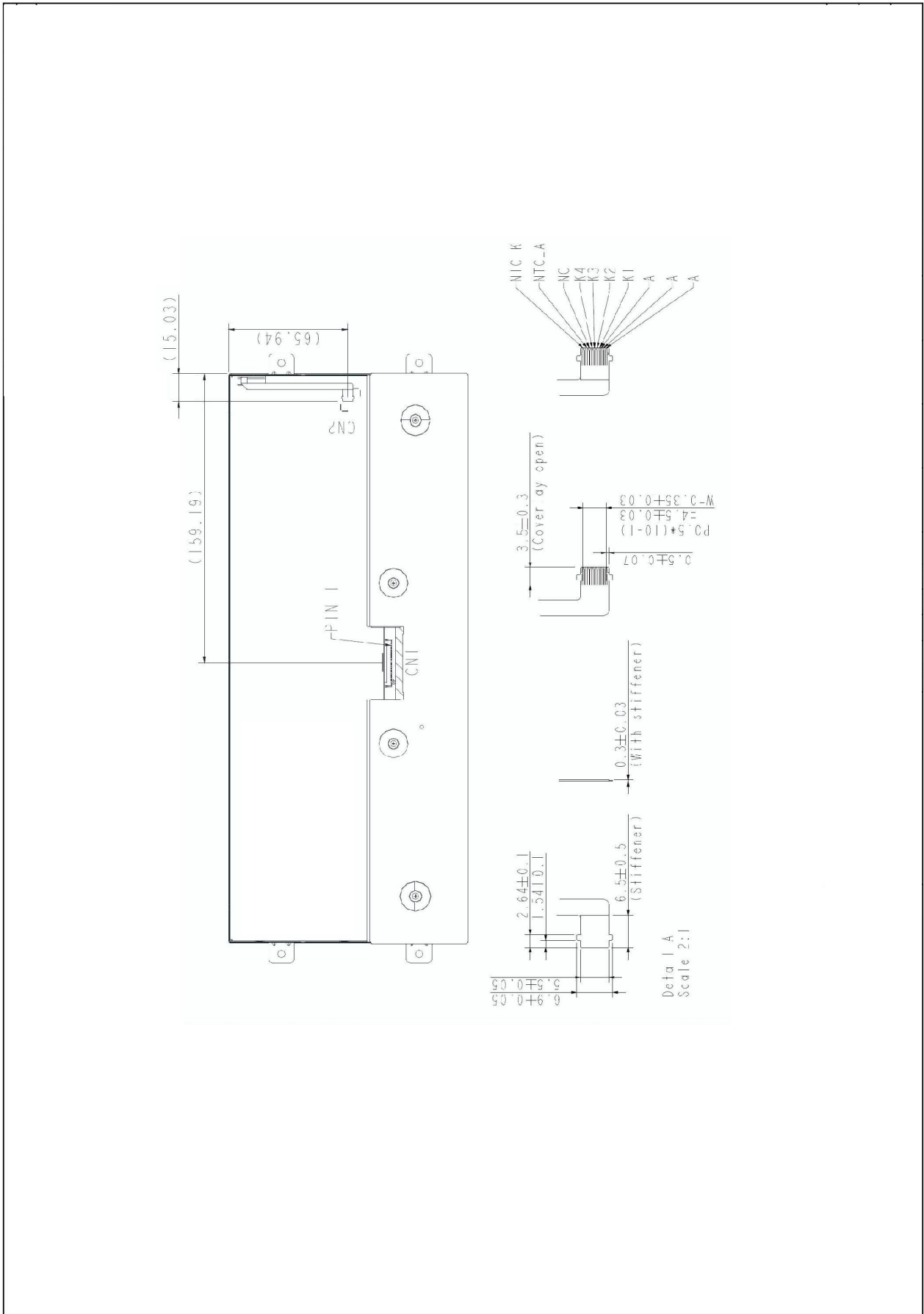
No.	Parameter	Condition	Notes
1	High Temperature Operating	85°C±2°C, 240hrs (Operation state).	
2	Low Temperature Operating	-30°C±2°C, 240hrs (Operation state).	1
3	High Temperature Storage	95°C±2°C, 240hrs.	2
4	Low Temperature Storage	-40°C±2°C, 240hrs.	1,2
5	High Temperature and High Humidity Operation 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. 	<i>Dropping method corner dropping:</i>  <i>A corner: Once edge dropping.</i> <i>B, C, D edge: Once face dropping.</i> <i>E, F, G face: Once.</i>

- 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 it in a container.



9. DIMENSIONAL OUTLINE





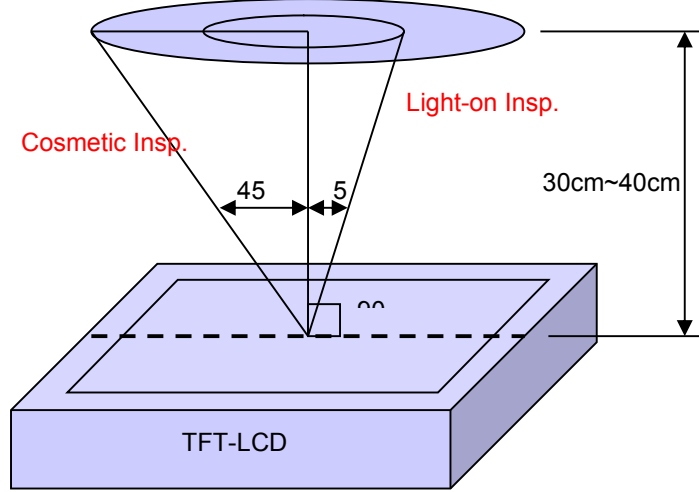
10. Incoming Inspection Standards

10.1 Inspection and Environment Conditions

10.1.1 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)

10.1.2 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

10.1.3 Sampling Conditions:

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

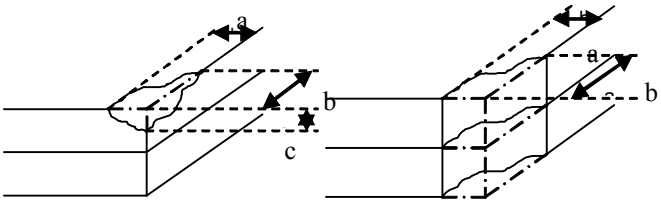
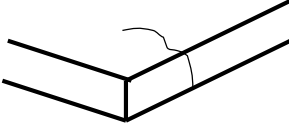
(2) Sampling Method:

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.

10.1.4 Inspection Criteria

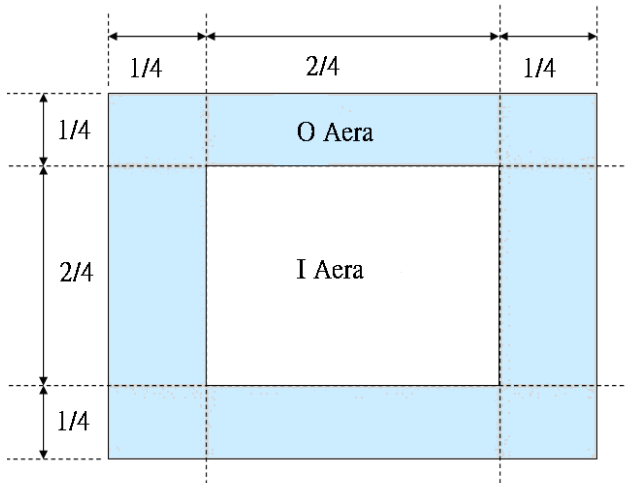
10.1.4.1 Cosmetic Inspection(Panel):

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

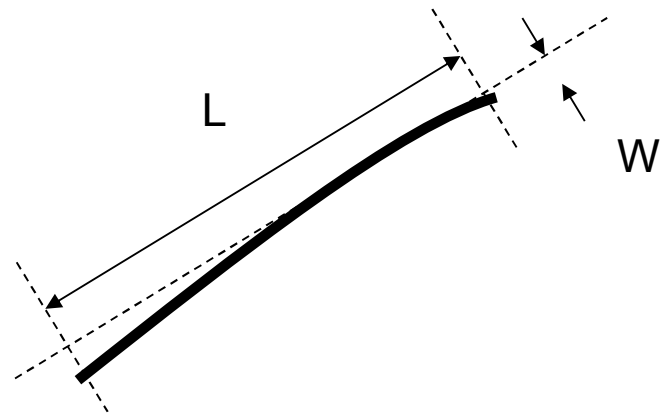
10.1.4.2 Functional Inspection:

Item	Judgment Criteria			Classification	
	Area(Note1)	I	O		
Point Defect	Bright dot	Random	2		MI
		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 > 0.5dot (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	

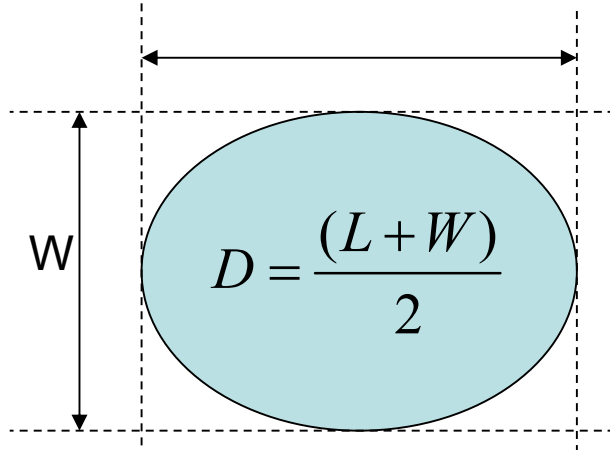
Note-1 : I/O Area Definition



Note-2 : Polarizer Scratch



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



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

