

Display Elektronik GmbH

DATA SHEET

TFT- MODULE

DEM 1280480A VMH-PW-N

10,3" TFT

Product Specification

Ver.: 2

15.02.2017

Revise Records

Rev.	Date	Contents	Written	Approved
0	21.11.2016	Preliminary Specification	MH	MH
1	10.02.2017	1. Added the Power Consumption 2. Modify the Electrical Characteristics 3. Modify the Optical Characteristics 4. Modity the DIMENSIONAL OUTLINE	MH	MH
2	15.02.2017	Revise the Active Area	MH	MH

Special Notes

Note1.	
Note2.	
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Note5.	

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1. General Description and Features

This TFT is a 10.3" color TFT-LCD (Thin Film Transistor Liquid Crystal Display) module composed of LCD panel, driver ICs, control circuit and LED backlight. By applying 1280x480 images are displayed on the 10.3" diagonal screen. Display 16.7M colors by R.G.B signal input.

1.1 Features

- 1280 x 480 Pixels Resolution.
- Display in 16.7M colors.
- LED Backlight
- RoHS Compliance

1.2 LCD Module

Item	Specification	Unit
Screen Size	10.3 Inches	Diagonal
Display Resolution	1280 x RGB x 480	Dot
Active Area	243.84 x 91.44	mm
Outline Dimension	265.20 x 109.80 x 7.00	mm
Display Mode	Normally Black	--
Pixel Pitch	0.1905 x 0.1905	mm
Pixel Arrangement	RGB-Vertical Stripe	--
Display Color	16.7 Million	--
Surface Treatment	AG 25%	--
Viewing Direction	Full	--
Power Consumption	6.148 (typ.)	W
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		--	260	--	g	--

Note (1) Not include FPC.

Refer to the Outline Dimension for further information.

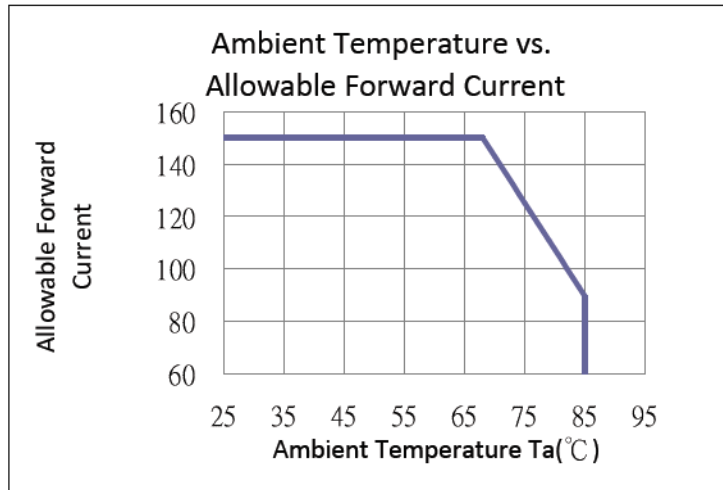
3. Absolute Max. Ratings

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 _{STG}	-30	+80	°C	(1)
Operating Temperature	T _{OPR}	-20	+70	°C	(1)

Note (1) If users use the product out off the environmental 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
Digital Supply Voltage	DVDD DVDD_LVDS	-0.3	5	V	
Analog Supply Voltage	AVDD	-0.5	15	V	
Gate On Voltage	VGH	-0.3	VGL+44	V	
Gate Off Voltage	VGL	VGH-44	0.3	V	
Gate On-Gate Off Voltage	VGH-VGL	VGL-0.3	VGG+0.3	V	
Signal Input Voltage	NIND0 ~ NIND3 PIND0 ~ PIND3 NINC,PINC	-0.3	DVDD+0.3	V	
Forward Current (per LED)	I _f	-	150	mA	
Pulse forward current (per LED)	I _{fp}	-	240	mA	1、2、3

Note (1) If the product were used out of the operation and storage range, it will have quality issue.

Note (2) I_{fp} Conditions: Pulse Width ≤ 10msec, Duty ≤ 1/10.

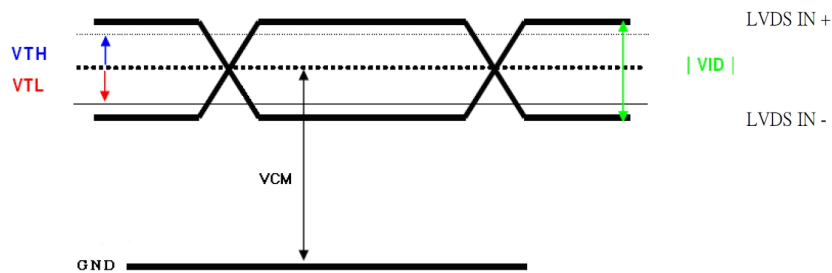
Note (3) Each one of LED operation must be follow diagram of Ambient Temperature and Allowable Forward Current.

4. Electrical Characteristics

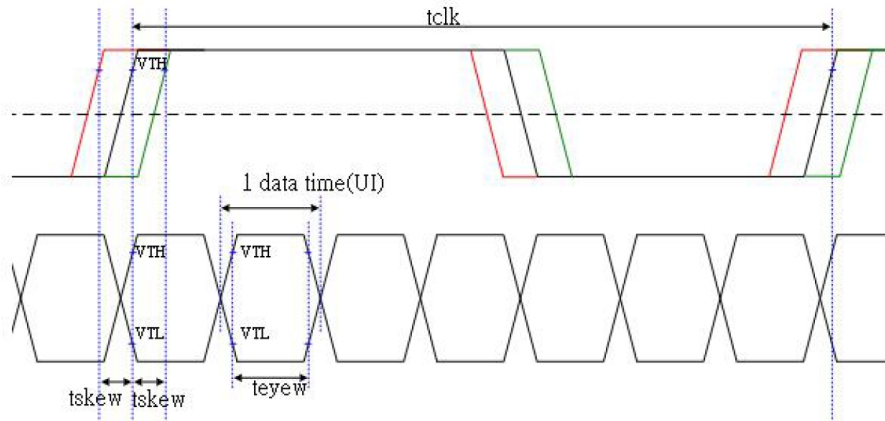
4.1 TFT-LCD Module

ITEM	SYMBOL	MIN	TYP	MAX	UNIT	NOTE
Digital Power Supply Voltage For LCD	DVDD VDD_LVDS	3	3.3	3.6	V	
Logic Input Voltage (LVDS:IN+,IN-)	VCM	$\frac{ VID }{2}$	-	DVDD-1.2	V	Note1
	VID	200	-	600	mV	Note1
	VTH	-	-	100	mV	VCM=1.2V Note1
	VTL	-100	-	-	mV	
1 Date time	UI	-	Tclk*1/7	-	Tclk	Note2
LVDS clock to data skew	Txkew	-	-	0.2	UI	
Input data eye width	Teyew	0.6	-	-	UI	
Analog Power Supply Voltage	AVDD	12.8	13	13.2	V	
Gate On Power Supply Voltage	VGH	21	22	23	V	
Gate Off Power Supply Voltage	VGL	-6.6	-6	-5.4	V	
Logic Input Voltage	VIH	0.7*DVDD	-	DVDD	V	
	VIL	GND	-	0.3*DVDD	V	
Gamma Voltage	V1	-	12.35	-	V	Note3
	V2	-	10.26	-	V	
	V3	-	9.70	-	V	
	V4	-	9.02	-	V	
	V5	-	8.44	-	V	
	V6	-	7.96	-	V	
	V7	-	6.98	-	V	
	V8	-	6.07	-	V	
	V9	-	5.09	-	V	
	V10	-	4.6	-	V	
	V11	-	4.02	-	V	
	V12	-	3.35	-	V	
	V13	-	2.79	-	V	
	V14	-	0.71	-	V	

【Note1】 Single- ended LVDS signal



【Note2】 Differential LVDS signal



【Note3】 (1)Gamma voltage is the reference voltage for customer, it could be adjust by customer.

(2)The voltage of these pins must be:

$$V1 > V2 > V3 > V4 > V5 > V6 > V7 > V8 > V9 > V10 > V11 > V12 > V13 > V14$$

$$AVDD - 0.1 > V1 \sim V7 > 0.4AVDD ; 0.6AVDD > V8 \sim V14 > AGND + 0.1$$

【Recommend】 VCOM must be optimized according to each LCM. Please adjust VR to make the flicker level be minimum for getting excellent image

4.2 TFT-LCD Current Consumption

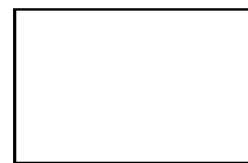
Item	Symbol	Condition	Min.	Typ.	Max.	Unit.	Note.
Gate on Current	IVGH	VGH = 22V	-	0.5	1	mA	【Note1】
Gate off Current	IVGL	VGL = -6V	-	0.5	1	mA	【Note1】
Digital Current	IDVDD	DVDD = 3.3V	-	25	35	mA	【Note1】
Analog Current	IAVDD	AVDD = 13V	-	30	60	mA	【Note1】
Total Power Consumption	PC		-	486.5	923.5	mW	【Note1】

Note1: Typical: Under 256 gray pattern

Maximum: Under white pattern



256 gray pattern

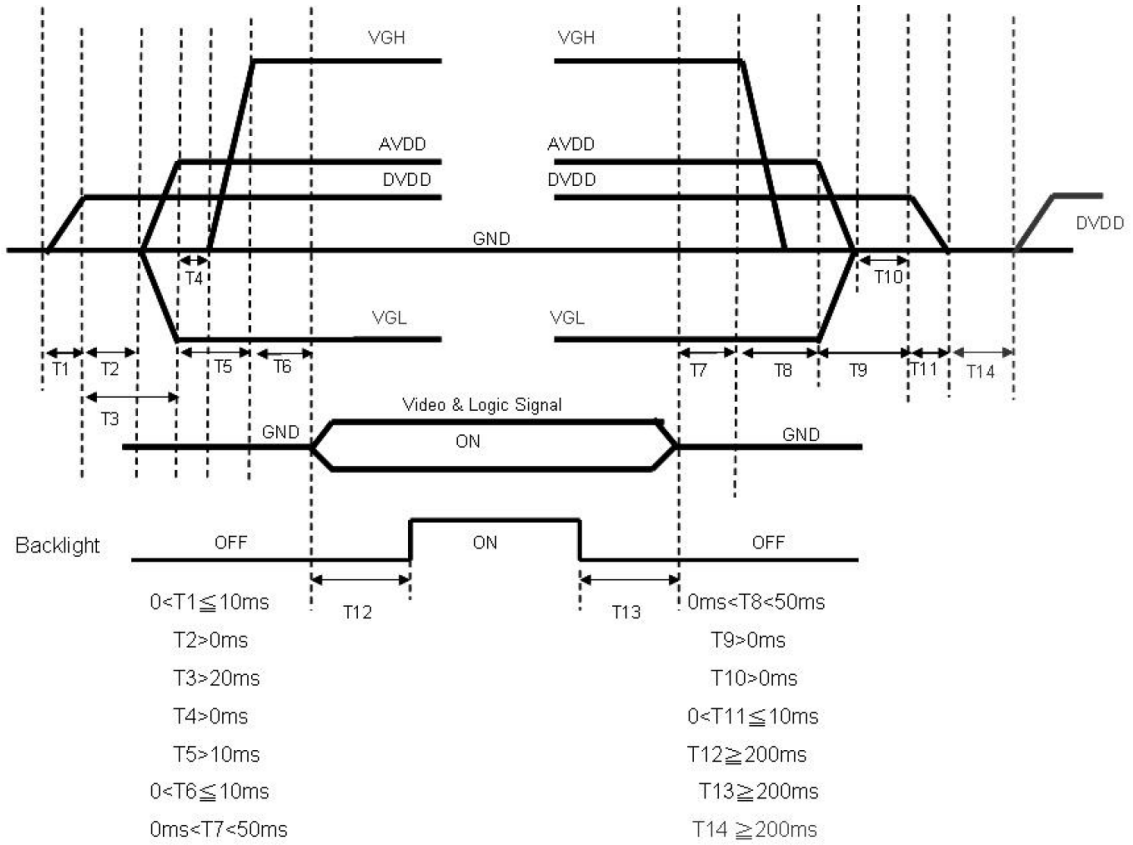


White Pattern

4.3 Power, Signal sequence

Power On : DVDD→AVDD/VGL →VGH →Video &Logic Signal→Backlight

Power Off : Backlight→Video &Logic Signal→ VGH→AVDD/VGL→DVDD



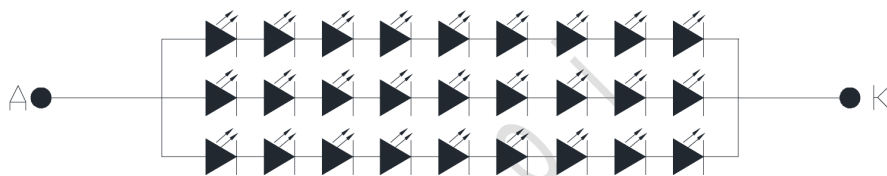
4.4 Backlight

Ta=25°C

ITEM	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNIT	NOTE
LED Current	IL	Ta=25°C (70mA/serise)	--	210	--	mA	--
LED Voltage	VL	Ta=25°C (70mA/serise)	23.814	26.964	30.114	V	--
Power Consumption	WL	Ta=25°C (70mA/serise)	--	5.662	--	W	--
LED Lifetime	-	Ta=25°C IF=70mA	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 50%.

5. Input Terminal Pin Assignment

5.1 CN1 (Input signal)

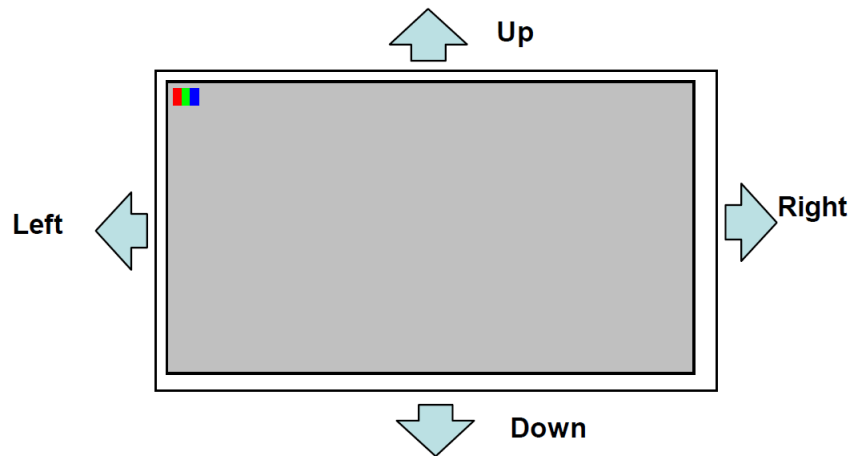
Pin No.	Symbol	Function	Remark
1	AGND	Analog ground	
2	AVDD	Analog power	
3	DVDD	Digital power	
4	GND	Digital ground	
5	NC	Not connect	
6	DVDD	Digital power	
7	GND	Digital ground	
8	V14	Gamma correction voltage reference	
9	V13	Gamma correction voltage reference	
10	V12	Gamma correction voltage reference	
11	V11	Gamma correction voltage reference	
12	V10	Gamma correction voltage reference	
13	V9	Gamma correction voltage reference	
14	V8	Gamma correction voltage reference	
15	GND	Digital ground	
16	DVDD_LVDS	LVDS power	
17	GND	Digital ground	
18	PIND3	Positive LVDS differential data input	
19	NIND3	Negative LVDS differential data input	
20	GND	Digital ground	
21	PINC	Positive LVDS differential clock input	
22	NINC	Negative LVDS differential clock input	
23	GND	Digital ground	
24	PIND2	Positive LVDS differential data input	
25	NIND2	Negative LVDS differential data input	
26	GND	Digital ground	
27	PIND1	Positive LVDS differential data input	
28	NIND1	Negative LVDS differential data input	
29	GND	Digital ground	
30	PIND0	Positive LVDS differential data input	
31	NIND0	Negative LVDS differential data input	
32	GND	Digital ground	
33	GND_LVDS	LVDS ground	
34	GRB	Global reset pin. Active low to enter reset state. Suggest to connecting with an RC reset circuit for stability. Normally pull high. (R=47K Ω , C=1 μ F)	
35	STBYB	Standby mode, normally pull high STBYB="1", normal operation STBYB="0", timing control, source driver will turn off, all output are GND, suggest to turn off AVDD power simultaneously	
36	SHLR	Left or right display control	

37	DVDD	Digital power	
38	UPDN	Up / down display control	
39	AGND	Analog ground	
40	AVDD	Analog power	
41	NC	Not connect	
42	NC	Not connect	
43	GND	Digital ground	
44	DVDD	Digital Power	
45	GND	Digital ground	
46	V7	Gamma correction voltage reference	
47	V6	Gamma correction voltage reference	
48	V5	Gamma correction voltage reference	
49	V4	Gamma correction voltage reference	
50	V3	Gamma correction voltage reference	
51	V2	Gamma correction voltage reference	
52	V1	Gamma correction voltage reference	
53	GND	Digital ground	
54	DVDD	Digital power	
55	SELB	6bit/8bit mode select, SELB = "1", LVDS input data is 8bits SELB = "0", LVDS input data is 6bits	
56	VGH	Positive power for TFT	
57	DVDD	Digital power for Gate IC	
58	VGL	Negative power for TFT	
59	GND	Digital ground for Gate IC	
60	NC	Not connect	

Remarks : Mating connector : 089K60-000100-G2-R (STARCONN)

Note 1 : UPDN and SHLR control function

SHLR	UPDN	Data shifting
DVDD	GND	Left→Right · Up→Down(default)
GND	GND	Right→Left · Up→Down
DVDD	DVDD	Left→Right · Down→Up
GND	DVDD	Right→Left · Down→Up



5.2 CN2 (LED backlight)

Pin No.	Symbol	Function	Remark
1	+	positive pole	BLACK
2	-	negative pole	WHITE

Input connector : BHSR-02VS-1(JST)

Outlet connector: SM02B-BHSS-1(JST)

6. Optical Characteristics

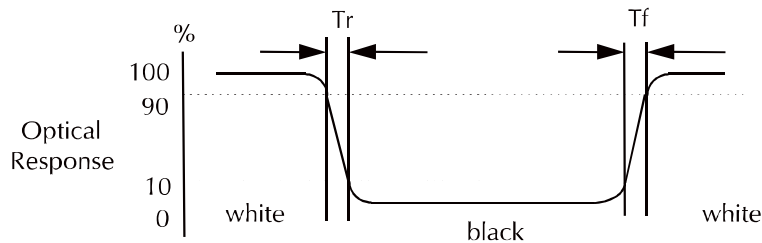
Item	Symbol	Condition	Min	Type	Max	Unit	Note	
Brightness (Center)	L		600	800	--	cd/m ²		
Response Time (White - Black)	Tr +Tf	$\theta=0^\circ$	--	25	35	ms		
Contrast Ratio	CR	At optimized viewing angle	600	1000	--	--		
Luminance Uniformity	ΔL		70	85		%		
Color Chromaticity	White	Wx	$\theta=0^\circ$ Normal Viewing Angle	0.264	0.304	0.344	--	BM-7A
		Wy		0.295	0.335	0.375		
	Red	Rx		0.609	0.649	0.689		
		Ry		0.301	0.341	0.381		
	Green	Gx		0.269	0.309	0.349		
		Gy		0.603	0.643	0.683		
	Blue	Bx		0.107	0.147	0.187		
		By		0.049	0.089	0.129		
Viewing Angle	Ver.	θ_U	CR \geq 10	75	85	--	Degree	
		θ_D		75	85	--		
	Hor.	θ_L		75	85	--		
		θ_R		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

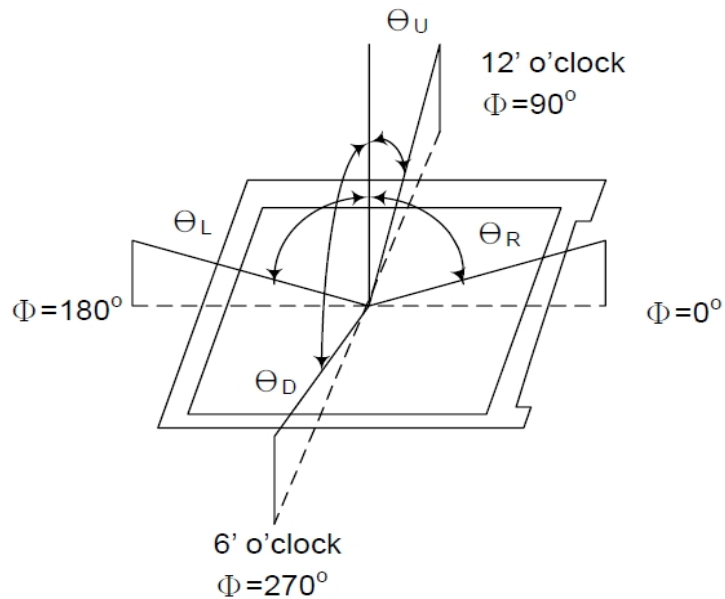
The response time is defined as the following figure and shall be measured by switching the input signal for "black" and "white".



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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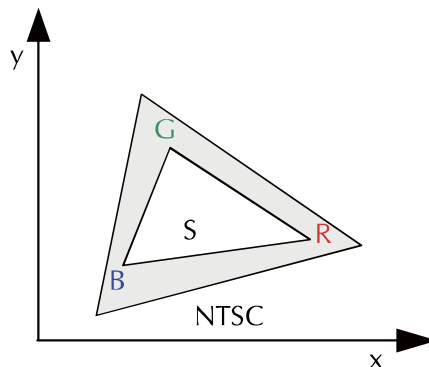
- g. Definition of White Uniformity

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

- 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



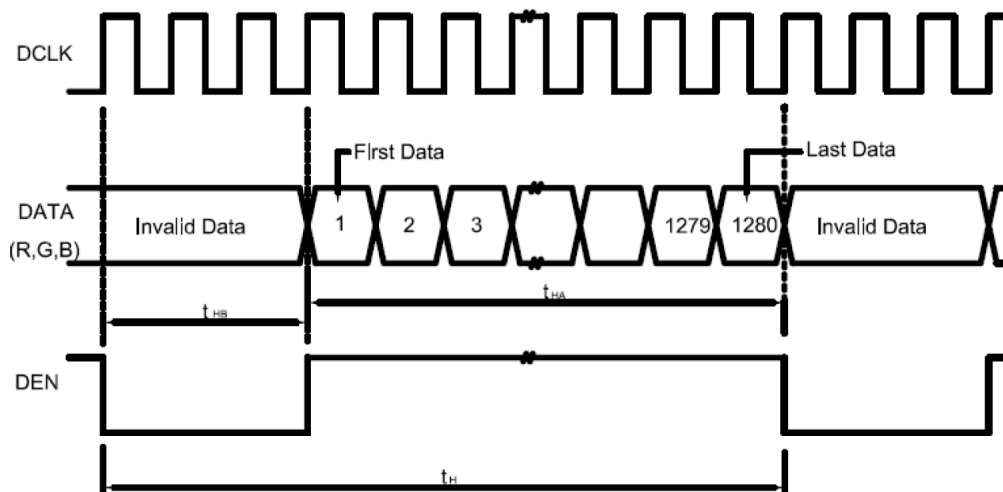
7. Interface Timing(DE ONLY MODE)

7.1 Timing specification

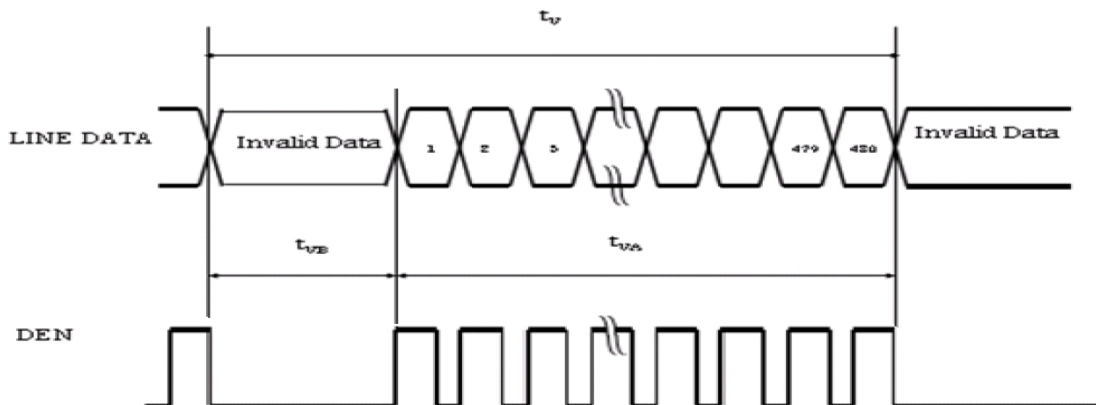
Item		Symbol	Min.	Typ.	Max.	Unit	
LVDS input signal sequence	CLK Frequency	tclk	42	45	60	MHz	
LCD input signal sequence (Input LVDS Transmitter)	Horizontal	Horizontal total Time	tH	1373	1413	1488	tCLK
		Horizontal effective Time	tHA	1280			tCLK
		Horizontal Blank Time	tHB	93	133	208	tCLK
	Vertical	Vertical total Time	tV	517	533	672	tH
		Vertical effective Time	tVA	480			tH
		Vertical Blank Time	tVB	37	53	192	tH

7.2 Timing sequence(Timing chart)

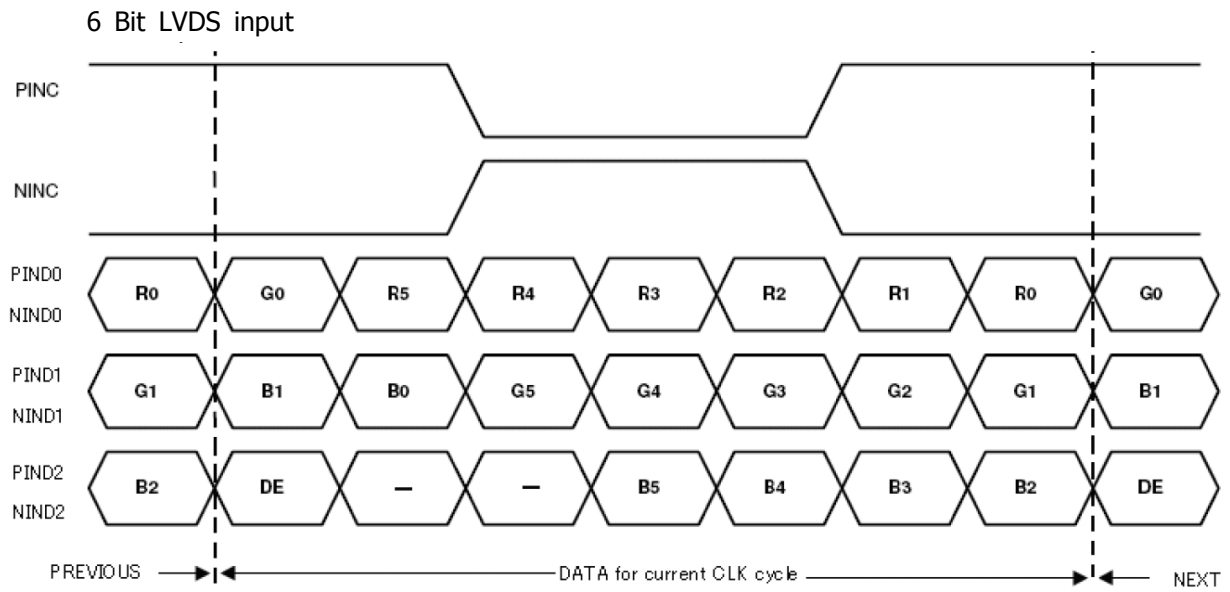
7.2.1 Horizontal Timing Sequence



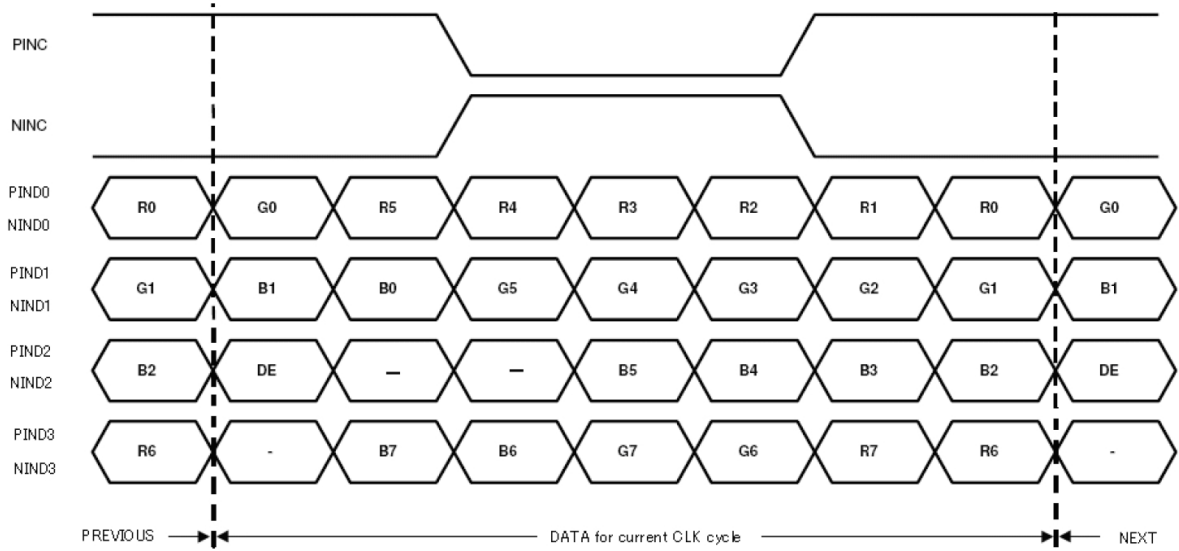
7.2.2 Vertical Timing Sequence



7.2.3 LVDS Input Data mapping



8 Bit LVDS input



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	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	1	0	0	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	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

【Note】

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

8. Reliability Condition

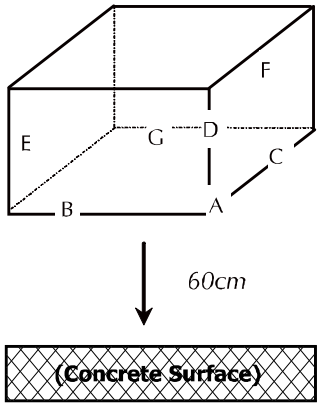
No change on display and in operation under the following test condition.

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

Temperature: 20±5°C.

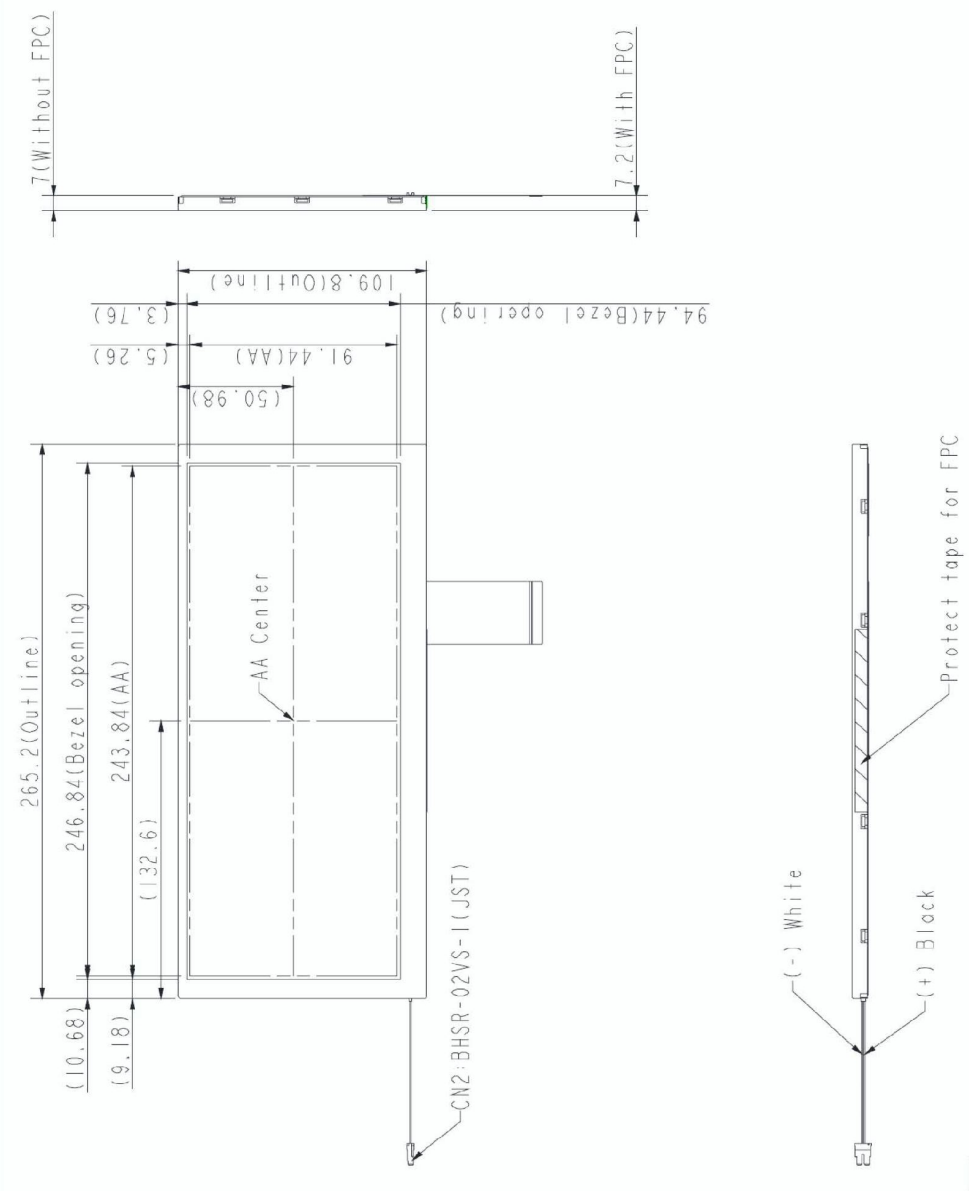
Humidity: 65±5%RH.

Tests will be not conducted under functioning state.

No.	Parameter	Condition	Notes
1	High Temperature Operating	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.  <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 I in a container.

9. DIMENSIONAL OUTLINE

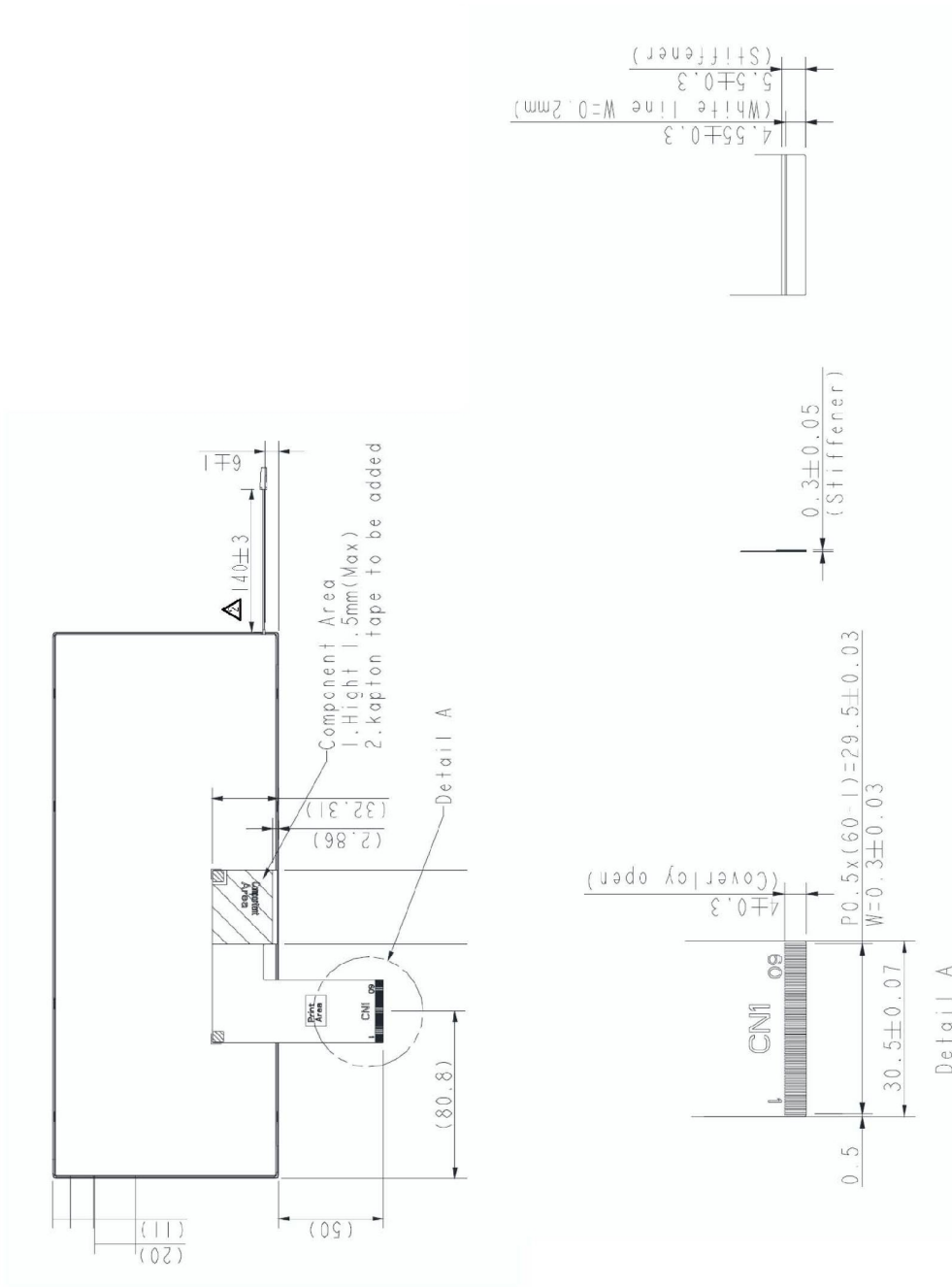


NOTE:
1. General tolerance ±0.3mm

■ PIN FUNCTION (CNI: LCD)

PIN	SYMBOL	PIN	SYMBOL
1	AGND	31	NIND0
2	AVDD	32	GND
3	DVDD	33	GND.L_VDS
4	GND	34	GRB
5	NC	35	STBYB
6	DVDD	36	SHLR
7	GND	37	DVDD
8	V14	38	UPDN
9	V13	39	AGND
10	V12	40	AVDD
11	V11	41	NC
12	V10	42	NC
13	V9	43	GND
14	V8	44	DVDD
15	GND	45	GND
16	DVDD.L_VDS	46	V7
17	GND	47	V6
18	PIND3	48	V5
19	NIND3	49	V4
20	GND	50	V3
21	PINC	51	V2
22	NINC	52	V1
23	GND	53	GND
24	PIND2	54	DVDD
25	NIND2	55	SELB
26	GND	56	VGH
27	PIND1	57	DVDD
28	NIND1	58	VGL
29	GND	59	GND
30	PIND0	60	NC

Display type	10.3" TFT
Resolution	1280xRGBx480
Viewing Direction	Free
Brightness(Center point)	600 cd/m ²
Color Chromaticity	x=0.304±0.04, y=0.335±0.04
NTSC	70%
Backlight	LED
Operating Temperature	-20~+70°C
Storage Temperature	-30~+80°C

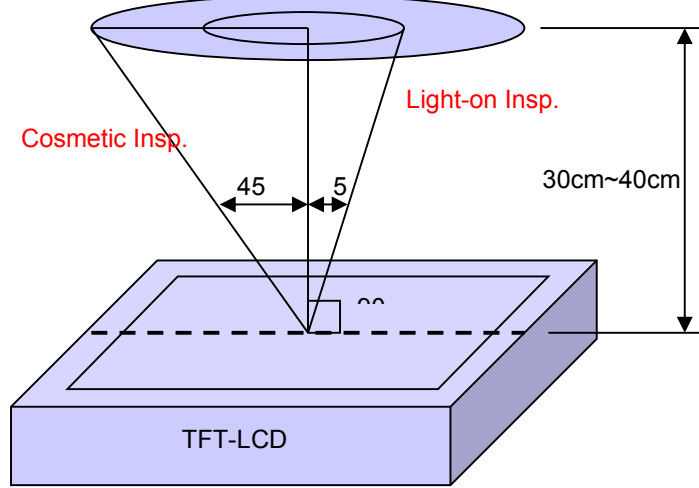


10. Incoming Inspection Standards

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:

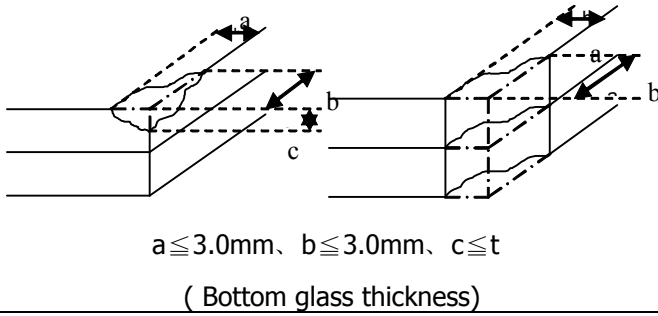
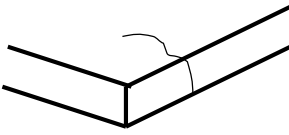
- (1) Lot Size: Quantity of shipment lot per model
- (2) Sampling Method:

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

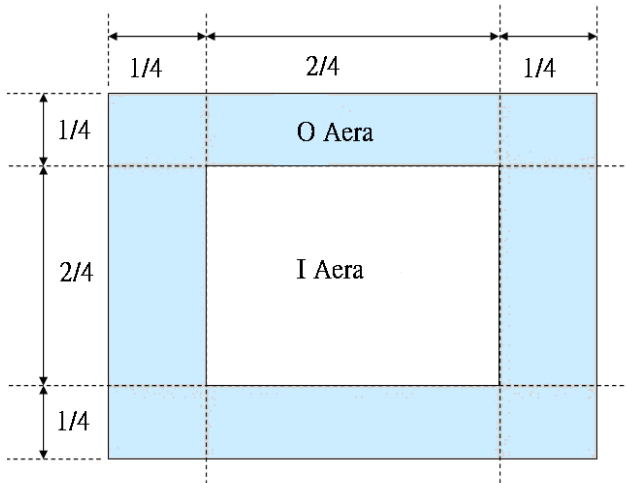
10.1.4.1 Cosmetic Inspection(Panel):

Item	Judgment Criteria	Classification
Chipping on Panel	 <p>$a \leq 3.0\text{mm}$, $b \leq 3.0\text{mm}$, $c \leq t$ (Bottom glass thickness)</p>	MA
Scratch on Panel *Note-2	<p>$W \leq 0.05\text{mm}$ or $L < 5\text{mm}$: Ignored</p> <p>$0.05\text{mm} < W \leq 0.1\text{mm}$ and $L \leq 5\text{mm}$: $N \leq 5$</p> <p>$W > 0.1\text{mm}$ or $L > 5\text{mm}$: Not allowed</p>	MI
Bubble or Dent on Panel *Note-3	<p>$D \leq 0.2\text{mm}$: Ignored</p> <p>$0.2\text{mm} < D \leq 0.3\text{mm}$: $N \leq 5$</p> <p>$D > 0.3\text{mm}$: Not allowed</p>	MI
Panel Crack	 <p>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

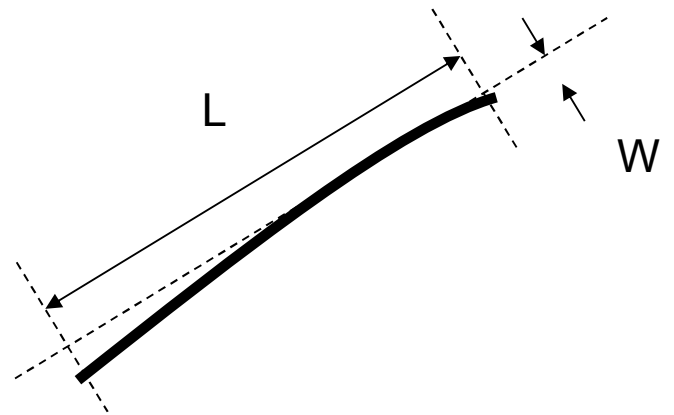
10.1.4.2 Functional Inspection:

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 > 0.5dot (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

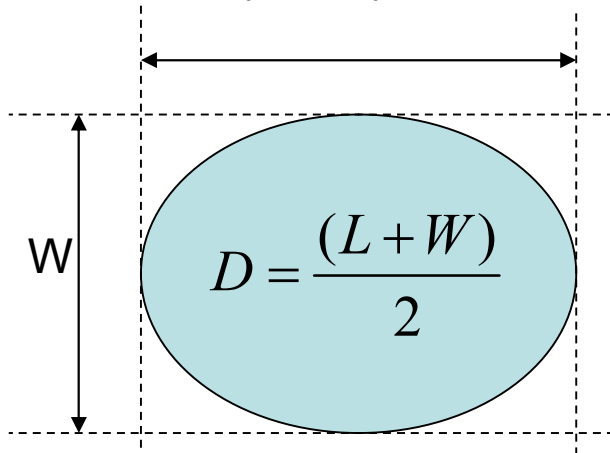
Note-1 : I/O Area Definition



Note-2 : Polarizer Scratch



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



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

