



PRODUCT SPECIFICATION

PUBLICATION DATE: 09/24/2024

PART NUMBER: HDA430-3G1-IPS

CUSTOMER APPROVAL

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1 General Description and Features

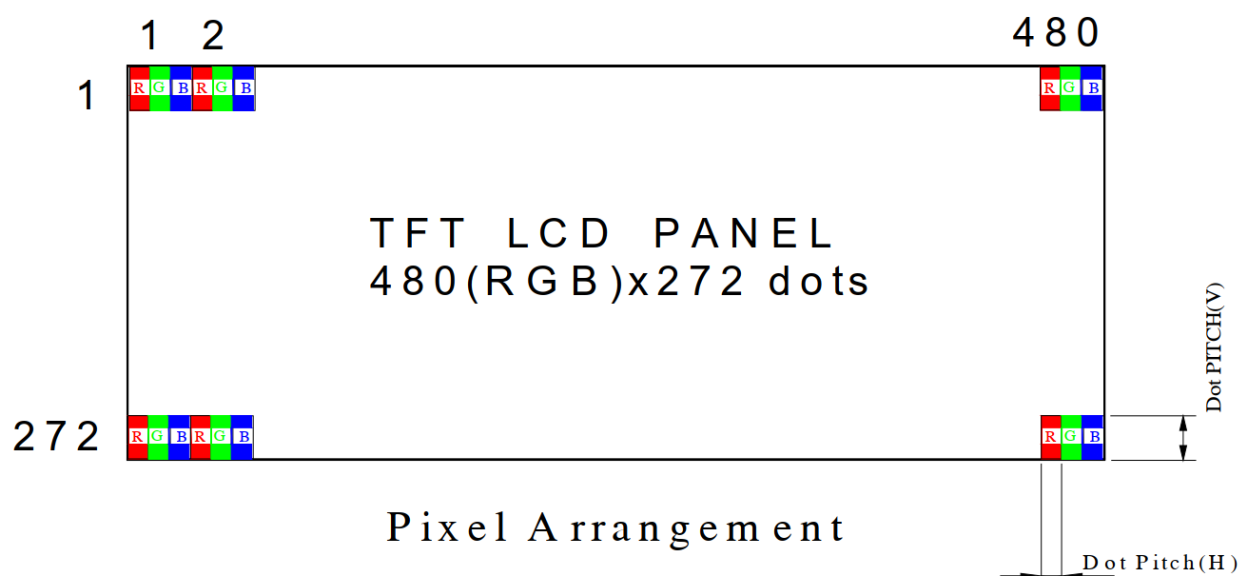
HDA430-3G1-IPS is a Normally black TFT (Thin Film Transistor) liquid crystal display (LCD) that uses amorphous silicon TFT as a switching device. This model is composed of a TFT-LCD module, a driver circuit and a back-light unit. The resolution of a 4.3" contains 480(RGB)x272 dots. The following table described the features of HDA430-3G1-IPS.

1.1 Features

- Transmissive and back-light with 7 LEDs are available.
- IPS
- 24bit RGB Interface
- RoHS Compliance

1.2 LCD Module

Item	Specification	Unit
Screen Size	4.3 inches	Diagonal
Display Resolution	480(H) x RGB x 272(V)	Dot
Pixel size	0.198 (H) x 0.198 (V)	mm
Active Area	95.040 (H) x 53.856 (V)	mm
Outline Dimension	105.5 (L) x 67.2 (W) x 3.1(H)	mm
Display Mode	Normally black	--
Pixel Arrangement	RGB Vertical-Stripe	--
Surface Treatment	Anti-glare (AG)	--
Display Color	16.7M	--
Viewing Direction	FREE	--
Input Interface	Digital 24-bits parallel RGB	--
Driver IC	ILI6485D	--
Color Gamut (NTSC%)	NTSC 50%	--



2. Mechanical Information

Item		Min.	Typ.	Max.	Unit	Note
Module Size	Horizontal (H)	--	105.5	--	mm	--
	Vertical (V)	--	67.2	--	mm	(1)
	Thickness (T)	--	3.1	--	mm	(1)
Weight		--	38	--	g	--

Note (1) Not include FPC.
Refer to the Dimensional Outlines for further information.

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 guarantied at operating temperature. Contrast, response time, another display quality are evaluated at +25°C.

3.2 Electrical Absolute Rating

3.2.1 TFT-LCD Module

Item	Symbol	Value		Unit	Condition
		Min.	Max.		
Power supply voltage	VCI	-0.3	4.6	V	
IO Supply Voltage	VDDI	-0.3	4.6	V	
Charge Pump Supply Voltage	VCIP	-0.3	4.6	V	
Logic Input Voltage Range	VIN	-0.3	VDDI+0.3	V	
Logic Output Voltage Range	VO	-0.3	VDDI+0.3	V	

3.2.2 Back-Light Unit

(Ta=25±2°C)

Item	Symbol	Min.	Max.	Unit	Note
Current of One LED	I _{LED}	--	25	mA	(1)

Note (1) Permanent damage to the device may occur if maximum values are exceeded or reverse voltage is loaded. Functional operation should be restricted to the conditions described under normal operating conditions.

4 Electrical Characteristics

4.1 TFT-LCD Module

(Ta=25±2°C, V_{DD} =3.3V)

Item	Symbol	Value			Unit	Condition
		Min.	Typ.	Max.		
Power supply voltage	V _{DD}	3.0	3.3	3.6	V	
IO Supply Voltage	V _{DDI}	3.0	3.3	3.6	V	V _{DDI} ≤V _{CI}
Digital Current 	I _{DD}	-	22	30	mA	

Note (1) The specified power consumption is under the conditions at V_{CC}=3.3V , F_V=60Hz, whereas a Power dissipation check pattern below is displayed.

White Pattern



Active Area

4.2 Backlight Unit

The back-light system is an edge-lighting type with white LED (Light Emitting Diodes).

(Ta=25±2°C)

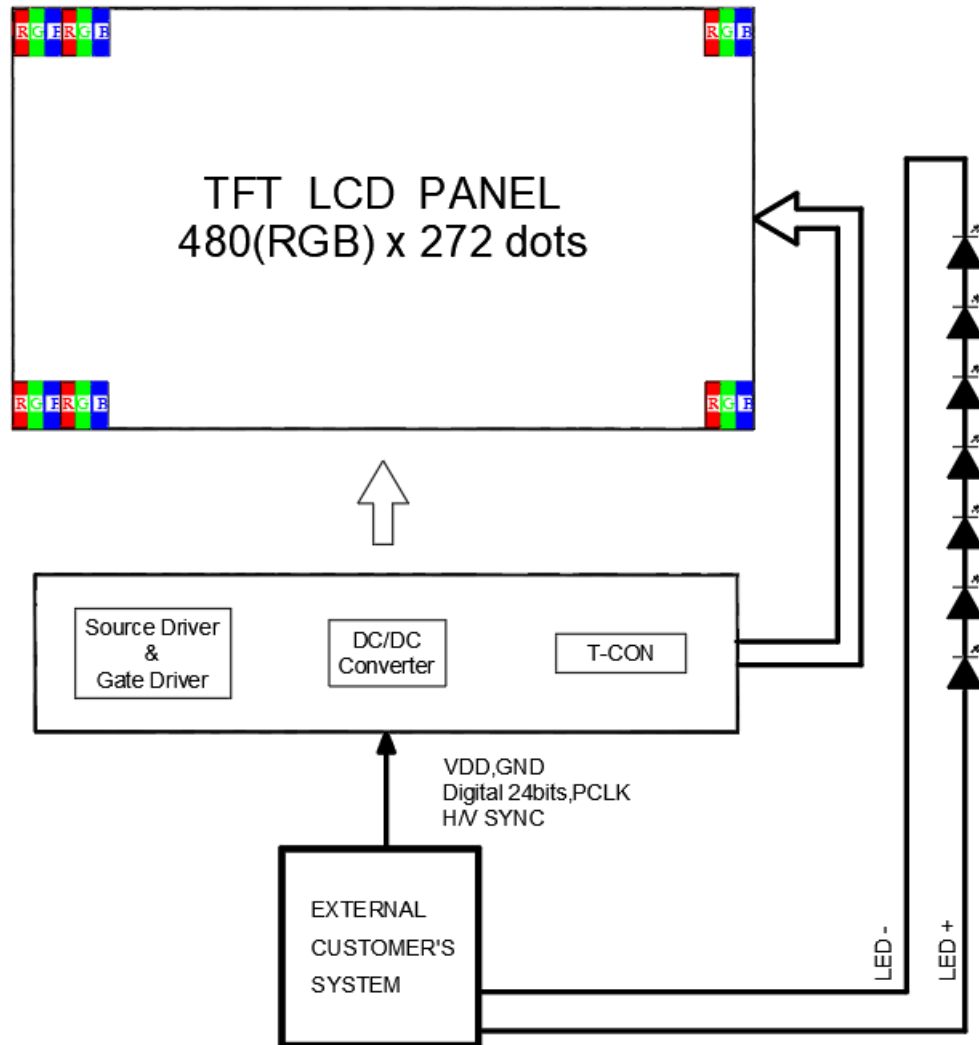
Item	Symbol	Value			Unit	Condition
		Min.	Typ.	Max.		
LED Voltage	V _L	18.9	21.0	23.1	V	
LED Current	I _f	-	20	-	mA	
Power Consumption	P _{BL}	-	420	-	mW	(2)
LED Life Time (25°C)	-	30000	-	-	hr	(3)

Note : (1) 7 LEDs serial 1 parallel type.

(2) Where I_f = 20mA ; V_L =21.0V ; P_{BL} = V_L × I_f

(3)The environmental conducted under ambient air flow , at Ta=25±2°C , 60%RH±5%

5 Block Diagram



6 Input Terminal Pin Assignment

6.1 CN1 Pin Assignment

(Reference Connector: Hirose Electric Co., LTD. Product No. FH12A-40S-0.5SH(55) Top contact type.)

Pin No.	Symbol	I/O	Function	Remark
1	VSS	P	Ground	
2	VSS	P	Ground	
3	V _{DD}	P	Logic power supply	
4	V _{DD}	P	Logic power supply	
5	R0	I	Red Data Bit 0 (LSB)	
6	R1	I	Red Data Bit 1	
7	R2	I	Red Data Bit 2	
8	R3	I	Red Data Bit 3	
9	R4	I	Red Data Bit 4	
10	R5	I	Red Data Bit 5	
11	R6	I	Red Data Bit 6	
12	R7	I	Red Data Bit 7 (MSB)	
13	G0	I	Green Data Bit 0 (LSB)	
14	G1	I	Green Data Bit 1	
15	G2	I	Green Data Bit 2	
16	G3	I	Green Data Bit 3	
17	G4	I	Green Data Bit 4	
18	G5	I	Green Data Bit 5	
19	G6	I	Green Data Bit 6	
20	G7	I	Green Data Bit 7 (MSB)	
21	B0	I	Blue Data Bit 0 (LSB)	
22	B1	I	Blue Data Bit 1	
23	B2	I	Blue Data Bit 2	
24	B3	I	Blue Data Bit 3	
25	B4	I	Blue Data Bit 4	
26	B5	I	Blue Data Bit 5	
27	B6	I	Blue Data Bit 6	
28	B7	I	Blue Data Bit 7 (MSB)	
29	VSS	P	Ground	
30	P _{CLK}	I	Dot Data Clock	
31	DISP	I	Display ON / OFF	
32	H _{SYNC}	I	Horizontal Sync Input.	

33	V _{SYNC}	I	Vertical Sync Input.	
34	DE	I	Data Enable	
35	NC	-	No Connect	
36	NC	-	No Connect	
37	NC	-	No Connect	
38	NC	-	No Connect	
39	NC	-	No Connect	
40	NC	-	No Connect	

6.2 Backlight Pin Assignment

(Reference Connector: Kyocera Elco Corporation Product No. 6298 Bottom contact type.)

Pin No.	Symbol	Function	Remark
1	VLED-	Power for LED backlight cathode.	--
2	NC	NC	--
3	NC	NC	--
4	VLED+	Power for LED backlight anode.	--

7 Optical Characteristics

The following items are measured under stable conditions. The optical characteristics should be measured in a dark room.

Measuring equipment: BM-7A

(Ta=25±2°C , VDD =3.3V, If=20mA)

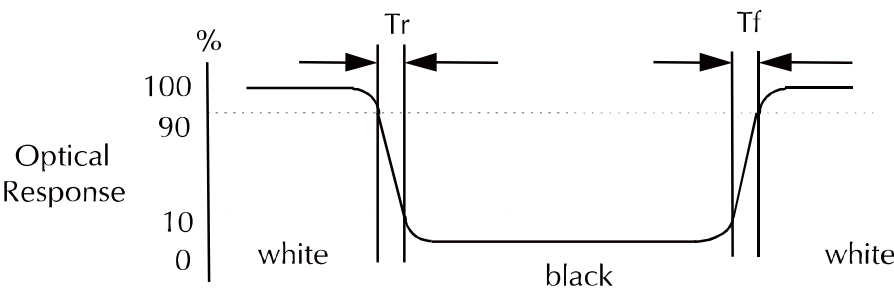
Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Brightness		--	--	400	500	--	cd/m ²	--
Response time		T _R +T _F	θ=0°	--	--	40	ms	--
Contrast ratio		CR	At optimized viewing angle	450	500	--	--	--
Color Chromaticity	Red	R _X	θ=0° Normal Viewing Angle	0.54	0.59	0.64	--	--
		R _Y		0.28	0.33	0.38		
	Green	G _X		0.31	0.36	0.41	--	
		G _Y		0.55	0.60	0.65		
	Blue	B _X		0.08	0.13	0.18	--	
		B _Y		0.09	0.14	0.19		
	White	W _X		0.24	0.29	0.34	--	
		W _Y		0.30	0.35	0.40		
Viewing Angle (6H)	Hor.	θ _R	CR≥10	--	(85)	--	Degree	--
		θ _L		--	(85)	--		
	Ver.	θ _U		--	(85)	--		
		θ _D		--	(85)	--		

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-5A/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".

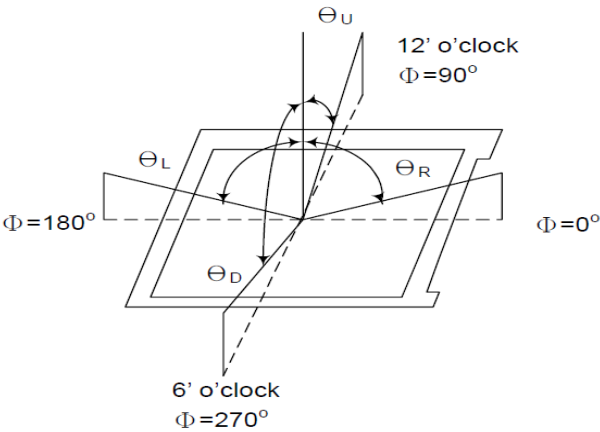


c. Definition of contrast ratio:

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

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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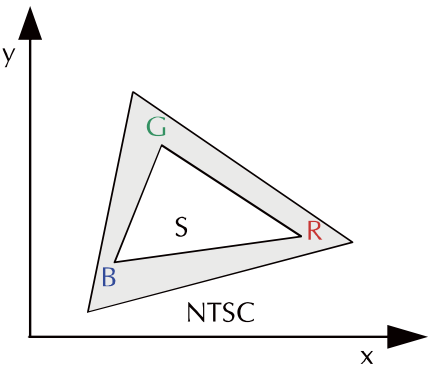
g. Definition of White Uniformity

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

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

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

$$\text{Color Gamut : NTSC(\%)} = \left(\frac{\text{RGB Triangle Area}}{\text{NTSC Triangle Area}} \right) \times 100$$



8 Basic Display Color and Gray Scale

		Color & Gray Scale	Data Signal																											
			R7	R6	R5	R4	R3	R2	R1	R0	G7	G6	G5	G4	G3	G2	G1	G0	B7	B6	B5	B4	B3	B2	B1	B0				
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	0			
		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	0			
		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	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	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	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	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	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	1			
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	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	0			
		Red(2)	0	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(127)	0	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(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	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	0			
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	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	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	0			
		:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:			
		Green(127)	0	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(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	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	0			
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	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(127)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	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	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	1			

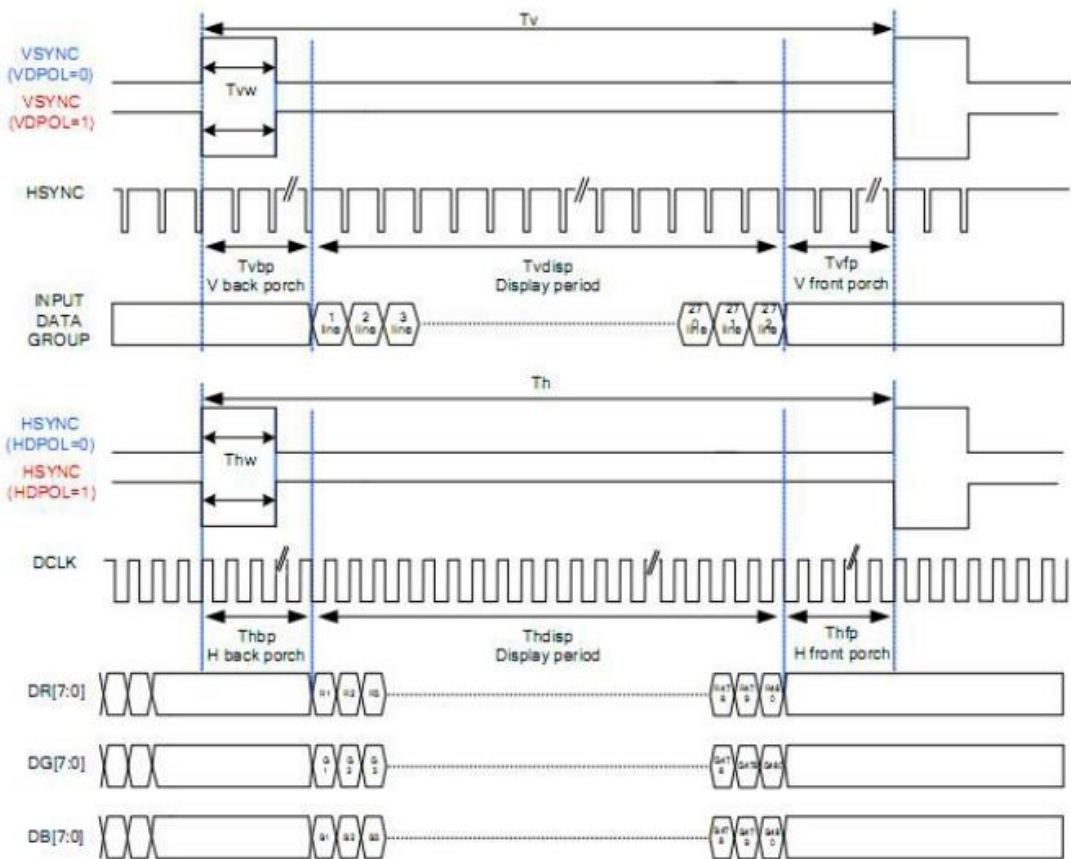
0 : Low level voltage, 1 :High level voltage

. Each basic color can be displayed in 2 5 6 gray scales from 8 bit data signals. With the combination of total 2 4 bit data signals, the 1 6 , 7 7 7 , 2 1 6 - color display can be achieved on the screen.

9 AC Timing

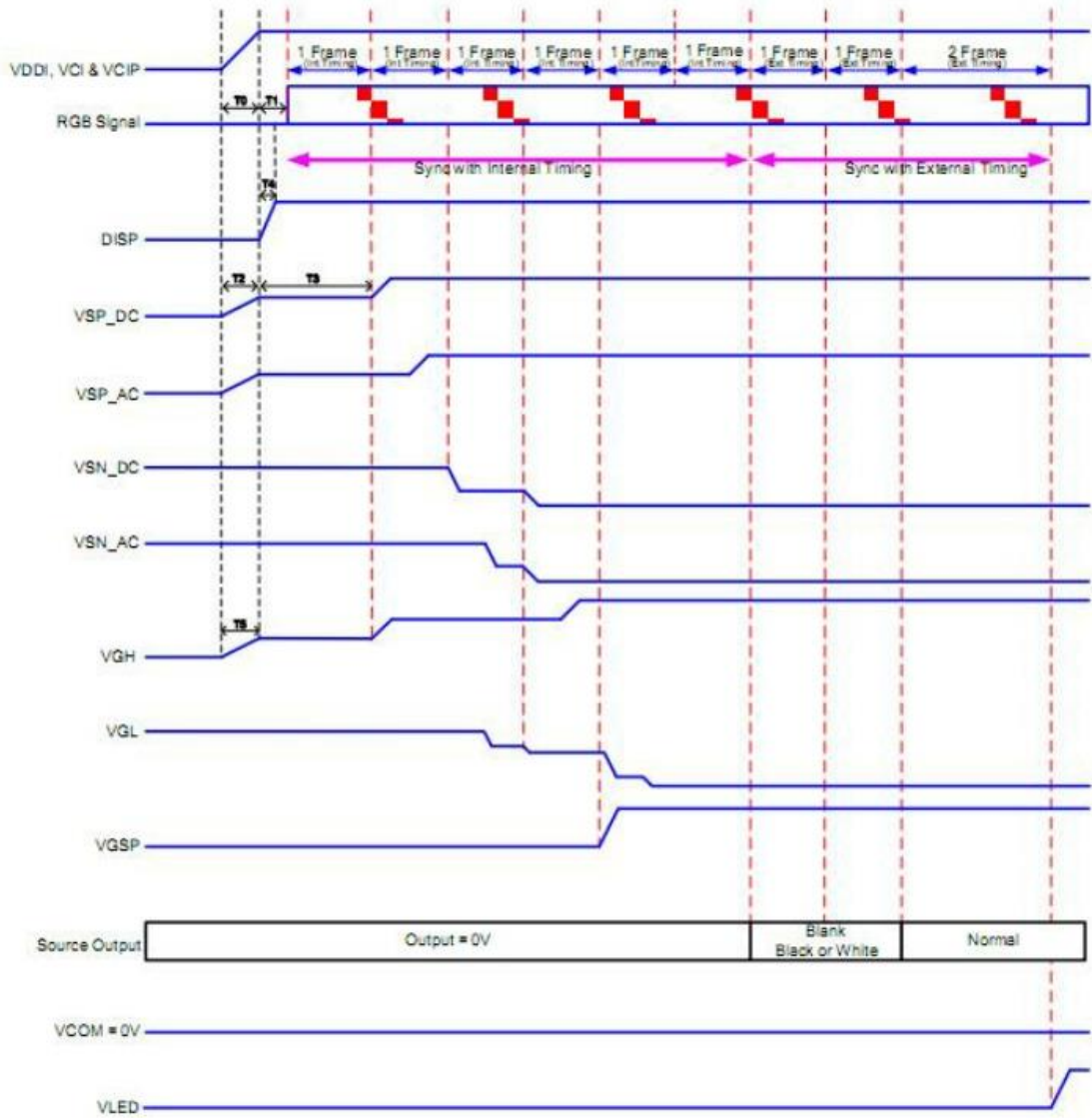
9.1 Parallel RGB Input Timing Table

480RGB X 272 Resolution Timing Table						
Item	Symbol	Min.	Typ.	Max.	Unit	Remark
DCLK Frequency	Fclk	8	9	12	MHz	
DCLK Period	Tclk	125	111	83	ns	
HSYNC	Period Time	Th	531	598	DCLK	
	Display Period	Thdisp	480	-	DCLK	
	Back Porch	Thbp	43	43	DCLK	By H_Blanking setting
	Front Porch	Thfp	8	75	DCLK	
	Pulse Width	Thw	4	75	DCLK	
VSYNC	Period Time	Tv	292	321	H	
	Display Period	Tvdisp	272	-	H	
	Back Porch	Tvbp	12	12	H	By V_Blanking setting
	Front Porch	Tvfp	8	37	H	
	Pulse Width	Tvw	4	37	H	



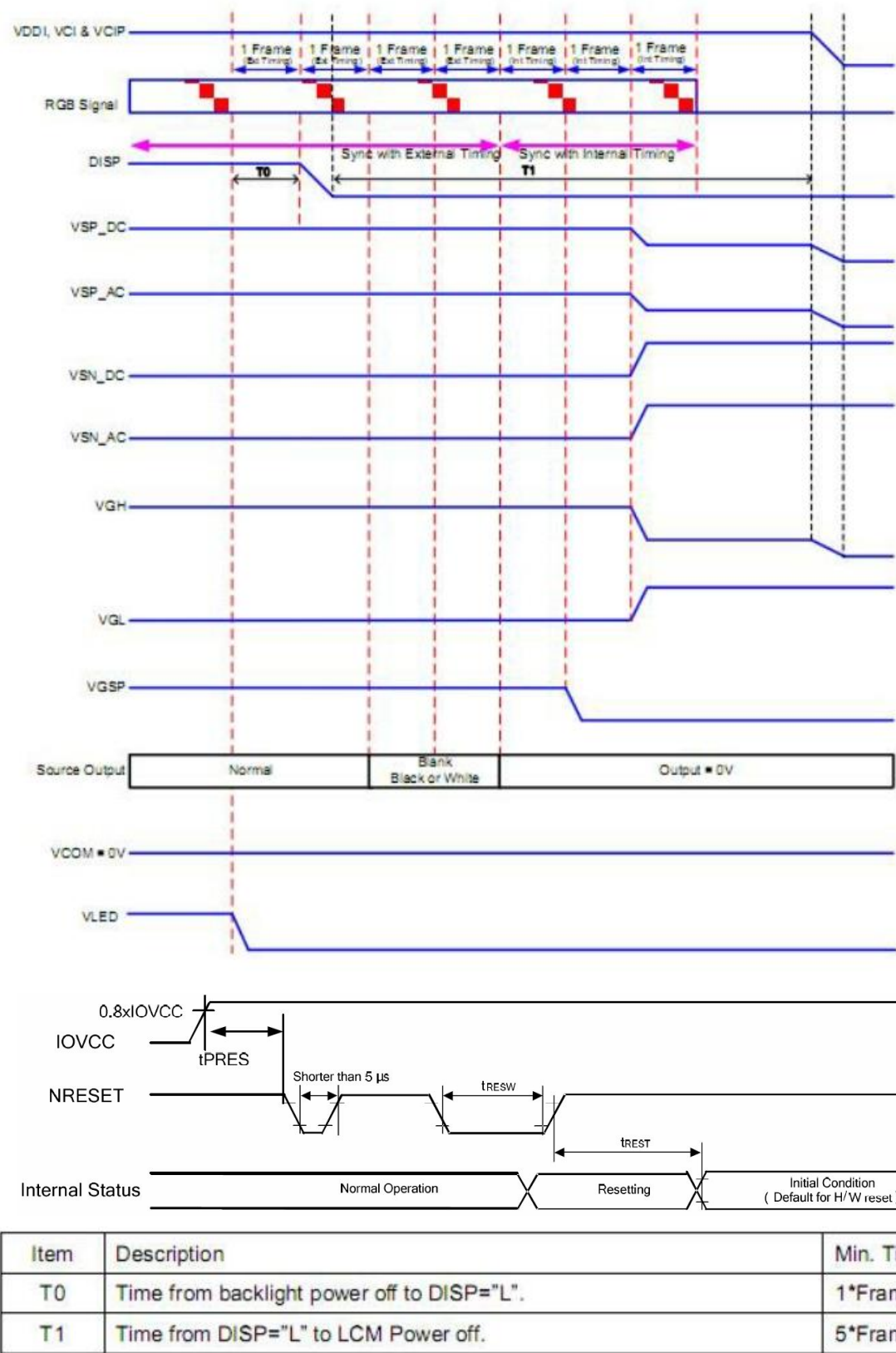
9.2 Power ON/OFF Sequence

9.2.1 Power ON Sequence



Item	Description	Min. Time
T0	Determined by the external power.	
T1	Time from stable VDDI, VCI, VCIP set-up to the first frame.	T1=0
T2	Time from VSP_DC=0V to VSP_DC=3.3V.	T2=T0
T3	Time from VSP_DC =3.3V to VSP_DC =6.0V.	T3=T1+ (1*Frame)
T4	Time from stable VDDI, VCI, VCIP set-up to DISP asserted.	T4=0
T5	Time from VGH=0V to VGH=3.3V.	T5=T0

9.2.2 Power OFF Sequence



10 Test

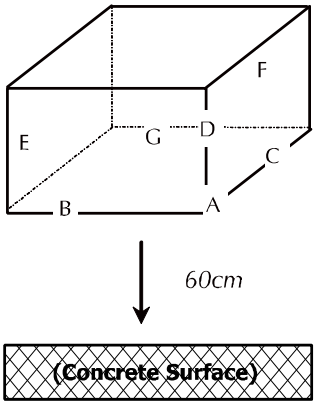
No change on display and in operation under the following test condition.

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

Temperature: $20 \pm 5^{\circ}\text{C}$.

Humidity: $65 \pm 5\%\text{RH}$.

Tests will be not conducted under functioning state.

No.	Parameter	Condition	Notes
1	High Temperature Operating	$70^{\circ}\text{C} \pm 2^{\circ}\text{C}$, 240hrs (Operation state).	
2	Low Temperature Operating	$-20^{\circ}\text{C} \pm 2^{\circ}\text{C}$, 240hrs (Operation state).	1
3	High Temperature Storage	$80^{\circ}\text{C} \pm 2^{\circ}\text{C}$, 240hrs.	2
4	Low Temperature Storage	$-30^{\circ}\text{C} \pm 2^{\circ}\text{C}$, 240hrs.	1,2
5	High Temperature and High Humidity Operation Test	$60^{\circ}\text{C} \pm 2^{\circ}\text{C}$, 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	Electro Static Discharge Test (non-operating)	Panel Surface/Top Case: 150pF, 330 ohm Air: $\pm 12\text{kV}$, Contact: $\pm 6\text{kV}$	
8	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>	

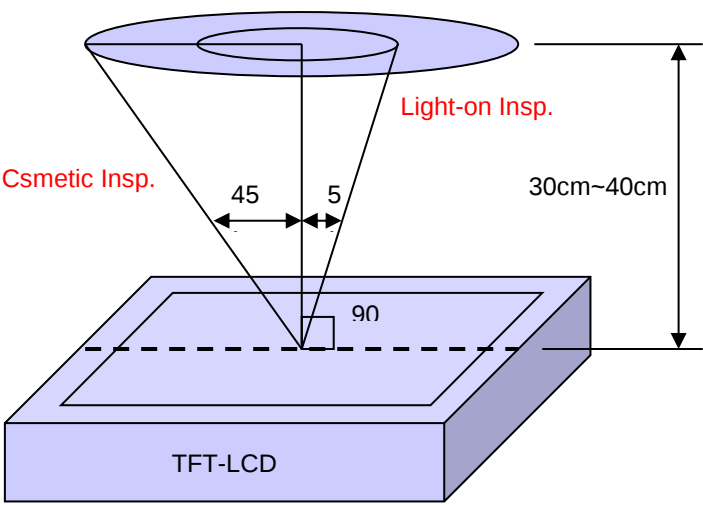
- Notes:
1. No dew condensation to be observed.
 2. The function test shall be conducted after 4 hours storage at the normal temperature and humidity after removed from the test chamber.
 3. Vibration test will be conducted to the product itself without putting I in a container.

12 Incoming Inspection Standards

12.1 Inspection and Environment Conditions.

12.1.1 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)

12.1.2 Environment Conditions :

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

12.1.3 Sampling Conditions :

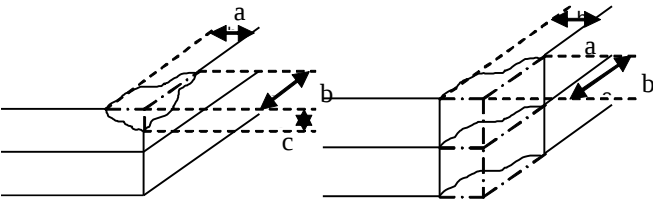
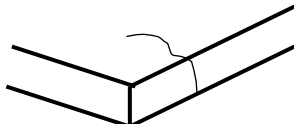
- (1) Lot Size: Quantity of shipment lot per model.
- (2) Sampling Method:

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.

12.1.4 Inspection Criteria :

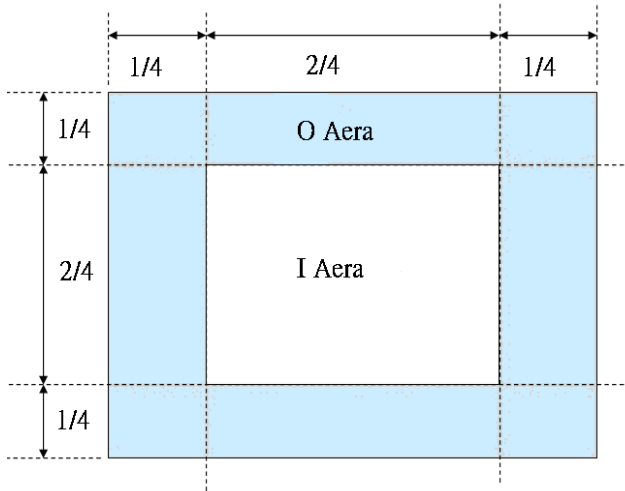
12.1.4.1 Cosmetic Inspection (Panel) :

Item	Judgment Criteria	Classification
Chipping on Panel	 $a \leq 3.0\text{mm}$、$b \leq 3.0\text{mm}$、$c \leq t$ (Bottom glass thickness.)	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	 Not Allowed crack	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

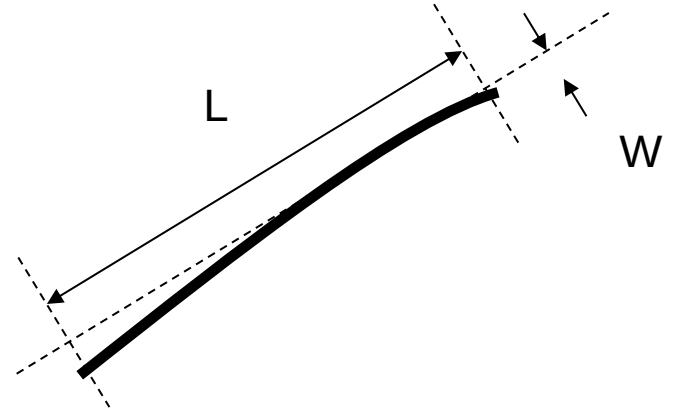
12.1.4.2 Functional Inspection:

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	0		
		3 dots adjacent or more	0	0	
	Total Dot Defect		5		
	Distance	Distance between Bright and Bright dot.	L≥5mm		
		Distance between Bright and Dark dot.	L≥5mm		
		Distance between Dark dot.	L≥5mm		
	(1) It is defined as Point Defect if defect area > 0.5dot (2) It is ignored if defect area ≤0.5dot (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≤0.2mm: Ignored 0.2mm<D≤0.5mm: N≤8 D>0.5mm: Not allowed				MI
Foreign Material in line or spiral shape *Note-4	W≤0.05mm or L≤5mm: Ignored 0.05mm<W≤0.2mm and L≤1.0mm: N≤8 W>0.2mm or L>5mm: Not allowed				MI
Display Function Abnormal	No Malfunction can be allowed.				MA

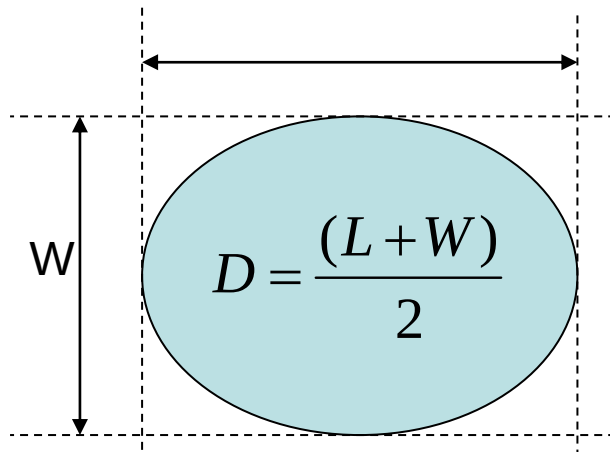
Note-1 : I/O Area Definition



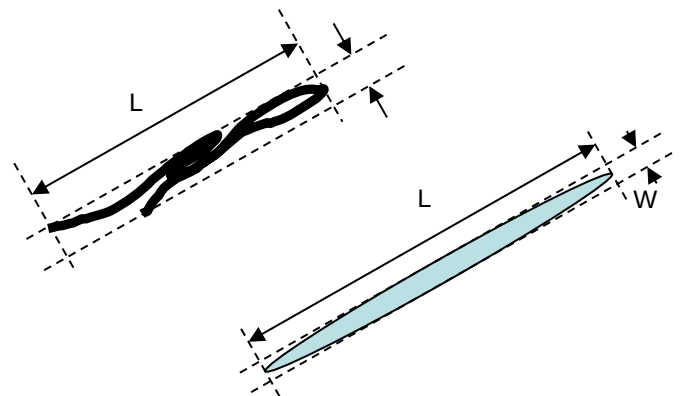
Note-2 : Polarizer Scratch



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



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



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