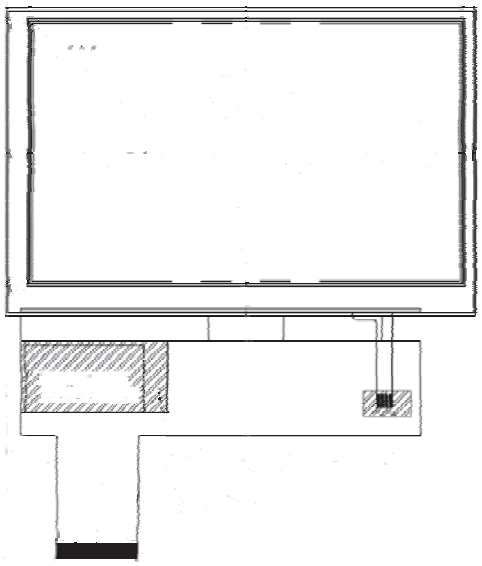
HANTRONIX

PRODUCT SPECIFICATION

HDA500V

5”, 800 X 480 (WVGA) TFT COLOR GRAPHICS LCD DISPLAY MODULE



HANTRONIX, INC. 10080 BUBB RD. CUPERTINO, CA 95014	Q.A.: Z.W.	REV.: 1.0	HDA500V	SHEET 1 OF 22 DATE: 5/19/10

Application

This specification is applied to the 5 inch WVGA supported TFT-LCD module, and can display true 16.7M colors(8 bit/ color). The module is designed for OA, Car TV application and other electronic products which require flat panel display of digital signal interface. This module is composed of a 5"TFT-LCD panel, a driver circuit and backlight unit.

Features

- WVGA (800×480 pixels) resolution.
- Digital 24 bit parallel RGB.
- Dot inversion mode with stripe type.

General Specifications

Item	Specifications	Unit
Screen Size	5 (Diagonal)	inch
Display Format	800RGB(H)×480(V)	dot
Active Area	108(H)×64.8(V)	mm
Pixel Size	0.135(H)×0.135(V)	mm
Pixel Configuration	RGB Vertical Stripe	-
Display Mode	TN Type Transmissive Mode Normally White	-
Surface Treatment	Anti-Glare and Hard Coating(3H)	-
Viewing Direction	6 O'clock (The Gray Inversion will appear at this direction)	-
Outline Dimension	118.5(W)×77.55(H)×3.4(D)	mm
Weight	60.4	g

Absolute Maximum Ratings

Absolute Ratings of Environment

Item	Symbol	Value		Unit	Note
		Min.	Max.		
Storage Temperature	T_{ST}	-30	+80	°C	(1)(3)
Operating Temperature	T_{OP}	-20	+70	°C	(1)(2)

Note1: Background color changes slightly depending on ambient temperature. This phenomenon is reversible.

Note2: Ta≦70℃: 75%RH max.

Note3: Please refer to item of RELIABILITY.

Electrical Absolute Ratings

TFT-LCD Module

(Ta=25±2°C, GND=V_{SS}=0V)

Item	Symbol	Value		Unit	Note
		Min.	Max.		
Digital Power Supply Voltage	V_{CC}	-0.3	7.0	V	-

Backlight Unit

(Ta=25±2°C)

Item	Symbol	Value		Unit	Note
		Min.	Max.		
Current of Backlight Unit	I_B	-	50	mA	(1)
Voltage of Backlight Unit	V_B	-	35	V	(1)

Note (1) Permanent damage to the device may occur if maximum values are exceeded or reverse voltage is loaded.

Electrical Characteristics

TFT-LCD Module

(Ta=25±2°C)

Item	Symbol	Value			Unit	Note
		Min.	Typ.	Max.		
Power Supply Voltage	V_{CC}	2.7	3.3	3.6	V	-
Power Supply Current	I_{CC}	-	110	154	mA	(1)
Input High Threshold Voltage	V_{IH}	$0.7V_{CC}$	-	V_{CC}	V	-
Input Low Threshold Voltage	V_{IL}	0	-	$0.3V_{CC}$	V	-
Power Consumption	P_L	-	363	508	mW	(1)
VSYNC Frequency	F_V	-	60	-	Hz	-
DCLK Frequency	DCLK	-	33.26	-	MHz	-

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.

Black Pattern / 0 Gray

Active Area

Backlight Unit

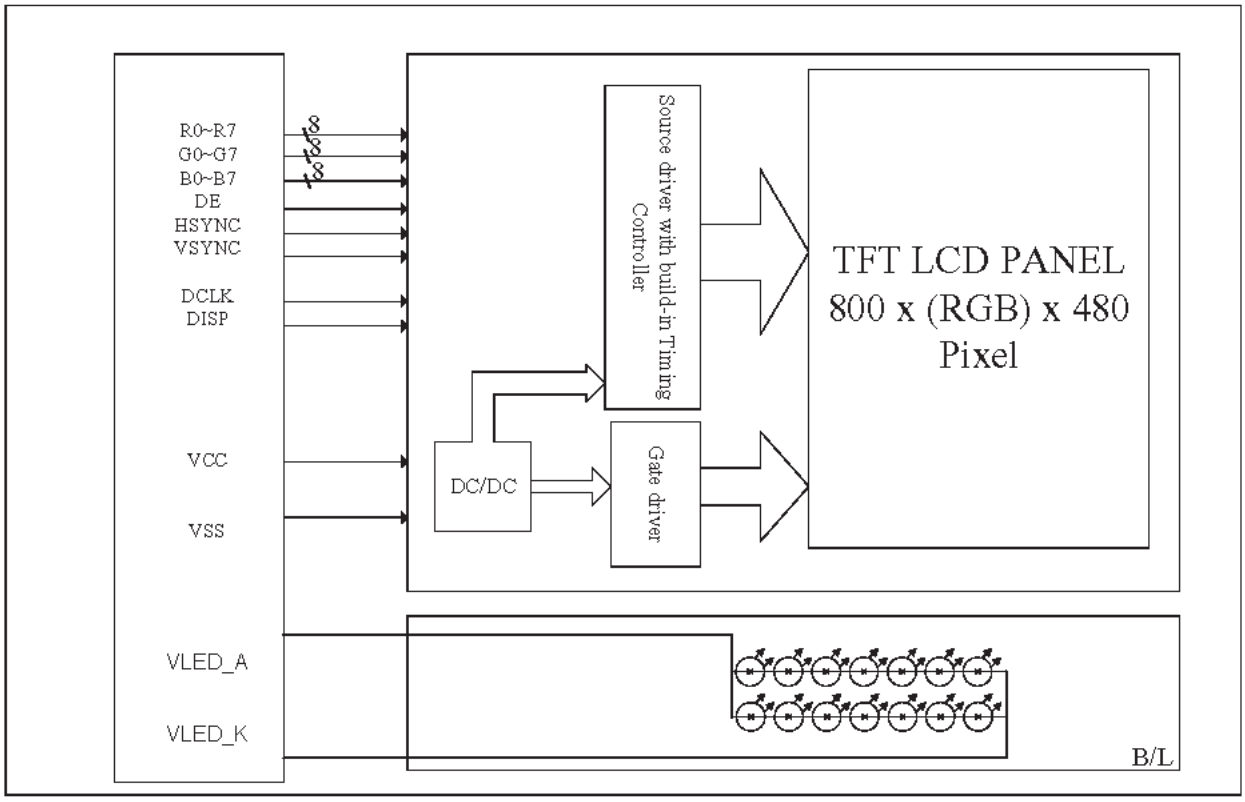
(Ta=25±2°C)

Item	Symbol	Value			Unit	Note
		Min.	Typ.	Max.		
Current of Backlight Unit	I_B	-	40	-	mA	-
Voltage of Backlight Unit	V_B	-	23.1	-	V	I_B =40mA
Power Consumption	P_{BL}	-	(0.924)	-	W	I_B =40mA
LED Life Time(25℃)	-	10000	-	-	hr	(1)

Note (1)：LED life time is defined as under 25±2°C , when the average brightness decrease to 50% of original brightness

Block Diagram

TFT-LCD Module with Backlight Unit



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Input / Output Terminals Pin Assignment

TFT-LCD Module

Pin No.	Symbol	I/O	Description
1	VLED_K	I	LED Cathode
2	VLED_A	I	LED Anode
3	GND	I	Ground
4	V_{CC}	I	+3.3V power supply
5	R0	I	RED data (LSB)
6	R1	I	RED data
7	R2	I	RED data
8	R3	I	RED data
9	R4	I	RED data
10	R5	I	RED data
11	R6	I	RED data
12	R7	I	RED data(MSB)
13	G0	I	GREEN data(LSB)
14	G1	I	GREEN data
15	G2	I	GREEN data
16	G3	I	GREEN data
17	G4	I	GREEN data
18	G5	I	GREEN data
19	G6	I	GREEN data
20	G7	I	GREEN data(MSB)
21	B0	I	Blue data(LSB)
22	B1	I	Blue data
23	B2	I	Blue data
24	B3	I	Blue data
25	B4	I	Blue data
26	B5	I	Blue data
27	B6	I	Blue data
28	B7	I	Blue data(MSB)
29	GND	I	Ground
30	DCLK	I	Dot Clock
31	DSIP	I	Display On/Off (Note1)

Pin No.	Symbol	I/O	Description
32	HSYNC	I	Horizontal synchronous signal
33	VSYNC	I	Vertical synchronous signal
34	DE	I	Input data enable control
35	NC	I	No Connect
36	GND	I	Ground
37	NC	I	No Connect
38	NC	I	No Connect
39	NC	I	No Connect
40	NC	I	No Connect

Note1: Usually pull high. High: Display On / Low: Display Off

Color Data Input Assignment

The brightness of each primary color(red, green and blue) is based on the 8 bit gray scale data input for the color. The higher the binary input, the brighter the color. The table provides the assignment of color versus data input.

Color		Data Signal																							
		Red								Green								Blue							
		D07	D06	D05	D04	D03	D02	D01	D00	D17	D16	D15	D14	D13	D12	D11	D10	D27	D26	D25	D24	D23	D22	D21	D20
Basic Colors	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	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	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	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
Gray Scale Of RED	Red(0) / Dark	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(253)	1	1	1	1	1	1	0	1	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
Gray Scale Of Green	Green(0) / Dark	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(253)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	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	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
Gray Scale Of Blue	Blue(0) / Dark	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(253)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	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	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

Interface Timing

Input Signal Characteristics

- **sync mode**

Parameter	Symbol	Spec.			Unit
		Min.	Typ.	Max.	
CLK frequency	F_{CPH}	29.93	33.26	36.59	MHz
CLK period	T_{CPH}	27.32	30.06	33.41	ns
CLK pulse duty	T_{CWH}	40	50	60	%
HS period	T_H	950	1056	1600	T_{CPH}
HS pulse width	T_{WH}	1	128	T_{HS} -2	T_{CPH}
HS-first horizontal data time	T_{HS}	STHD[7:0]+88(1)			T_{CPH}
HS Active Time	T_{HA}	-	800	-	T_{CPH}
VS period	T_V	490	525	625	T_H
VS pulse width	T_{WV}	1	2	T_{VS}	T_H
VS-DEN time	T_{VS}	STVD[6:0]+8			T_H
VS Active Time	T_{VA}	-	480	-	T_H

Note: (1) $T_{HS}+T_{HA}<T_H$

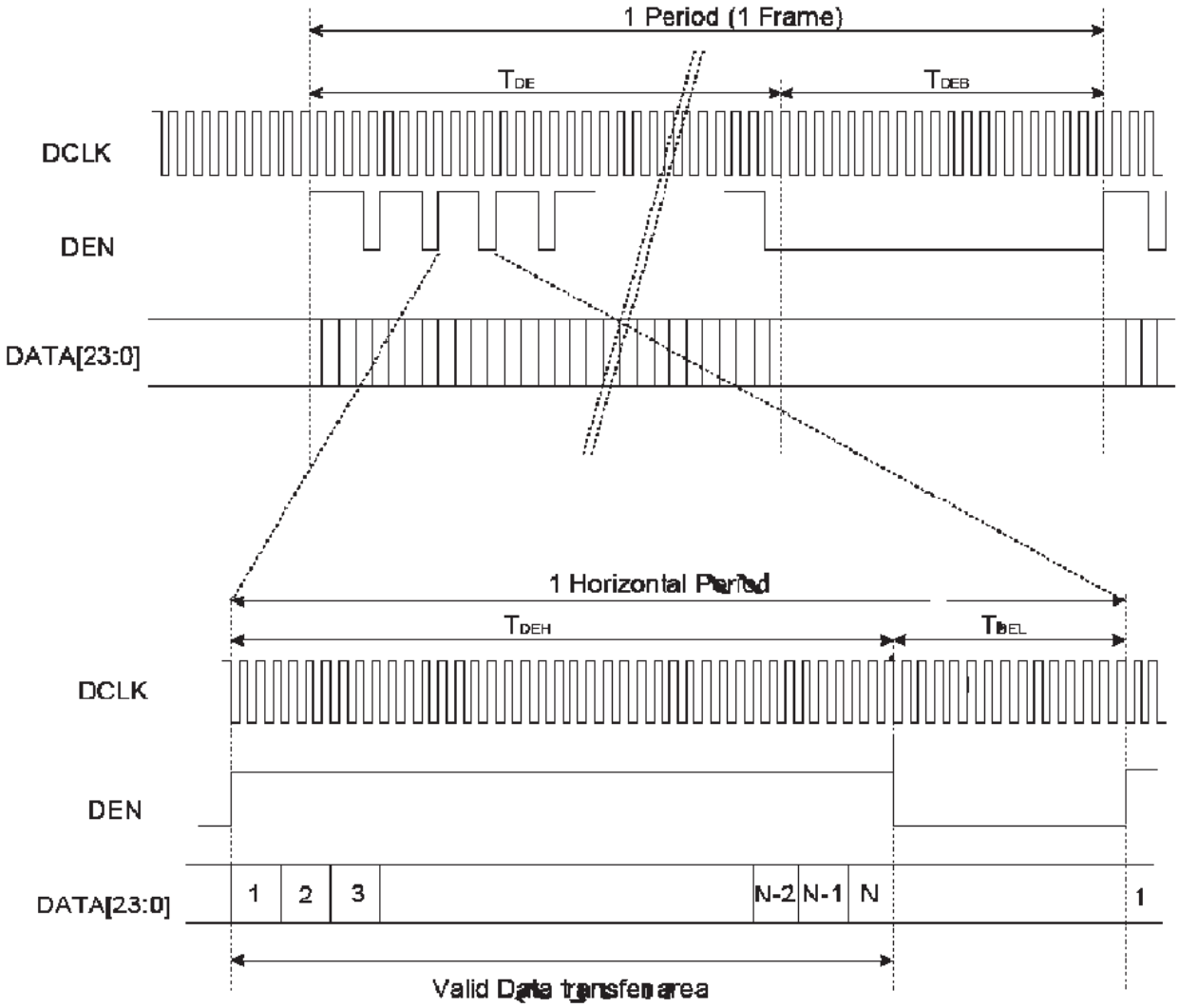
- **DE mode**

Parameter	Symbol	Spec.			Unit
		Min.	Typ.	Max.	
CLK frequency	F_{CPH}	29.93	33.26	36.59	MHz
CLK period	T_{CPH}	-	30.06	-	ns
CLK pulse duty	T_{CWH}	40	50	60	%
DE period	$T_{DEH}+T_{DEL}$	1000	1056	1200	T_{GPH}
DE pulse width	T_{DEH}	-	800	-	T_{GPH}
DE frame blanking(2)	T_{DEB}	10	45	110	$T_{DEH}+T_{DEL}$
DE frame width	T_{DE}	-	480	-	$T_{DEH}+T_{DEL}$

Note: (2) DE frame blanking (T_{DEB}) must be the integer of DE period ($T_{DEH}+T_{DEL}$).

Parameter	Symbol	Spec.			Unit
		Min.	Typ.	Max.	
OEV pulse width	T_{OEV}	-	150	-	T_{CPH}
CKV pulse width	T_{CKV}	-	133	-	T_{CPH}
DE(internal)-STV time	T_1	-	4	-	T_{CPH}
DE(internal)-CKV time	T_2	-	40	-	T_{CPH}
DE(internal)-OEV time	T_3	-	23	-	T_{CPH}
DE(internal)-POL time	T_4	-	157	-	T_{CPH}
STV pulse width	-	-	1	-	T_H

Waveform
DEN mode



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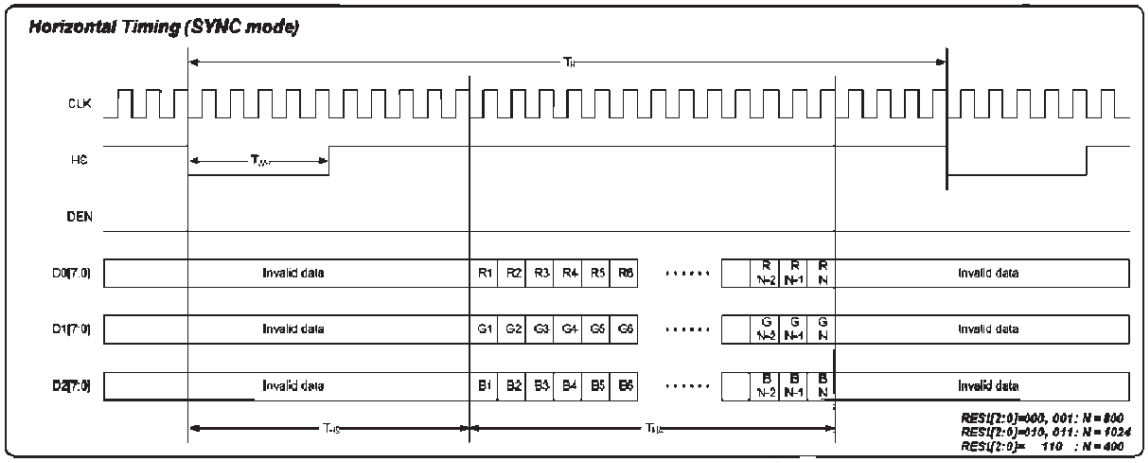
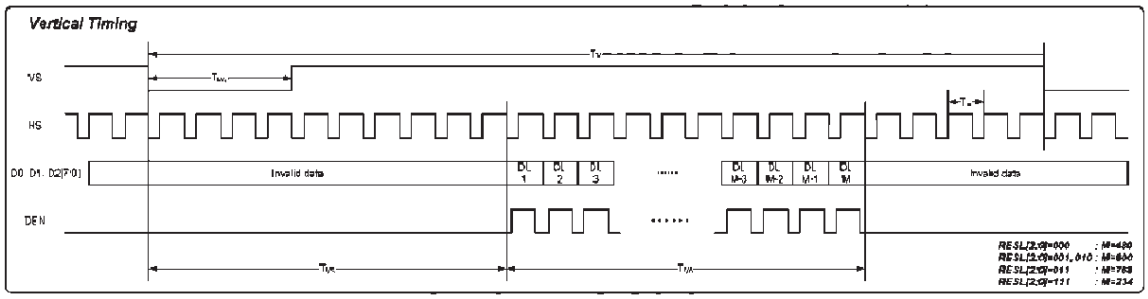
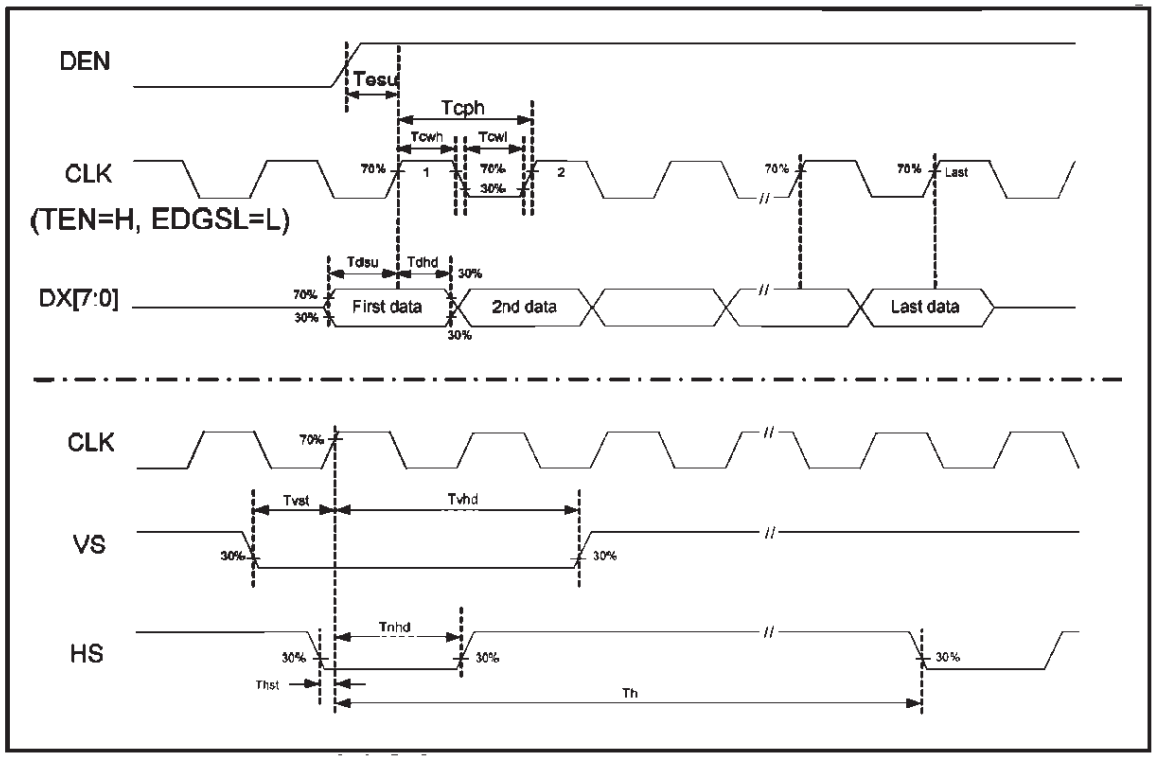
Sync mode



SYNC Mode Horizontal Data Format



SYNC Mode Vertical Data Format



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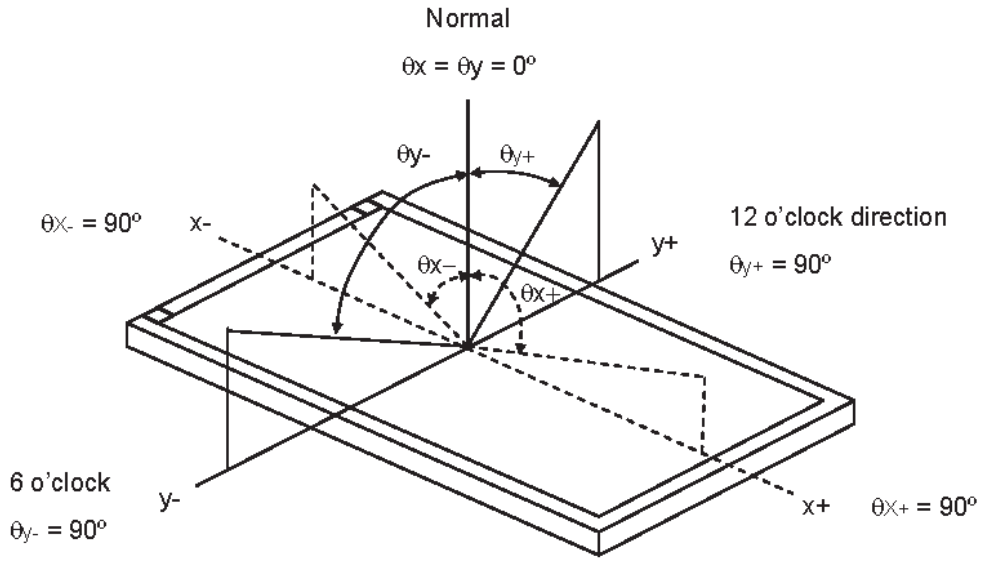
Optical Characteristics

The optical characteristics should be measured in a dark environment (≦ 1 lux) or equivalent state with the methods shown in Note (4).

Item		Symbol	Conditions	Min.	Typ.	Max.	Unit	Note
Contrast Ratio		CR	θ_X=0°, θ_Y =0° Viewing Normal Angle	350	(400)	-	-	(2)
Response Time		T_R		-	15	30	ms	(3)
		T_F		-	35	50	ms	
Luminance(Center)		Y		270	(310)	-	cd/m^2	(4)
Brightness uniformity		BUNI		75	(80)	-	%	(5)
Color Chromaticity	Red	Rx		0.590	0.640	0.690	-	(1),(4)
		Ry		0.270	0.320	0.370	-	
	Green	Gx		0.320	0.370	0.420	-	
		Gy		0.500	0.550	0.600	-	
	Blue	Bx		0.100	0.150	0.200	-	
		By		0.050	0.100	0.150	-	
	White	Wx		0.260	0.310	0.360	-	
		Wy		0.280	0.330	0.380	-	
Viewing Angle	Horizontal	θ_X+	CR≥10	60	(70)	-	deg.	
		θ_X-		60	(70)	-		
	Vertical	θ_Y+		50	(60)	-		
		θ_Y-		60	(70)	-		

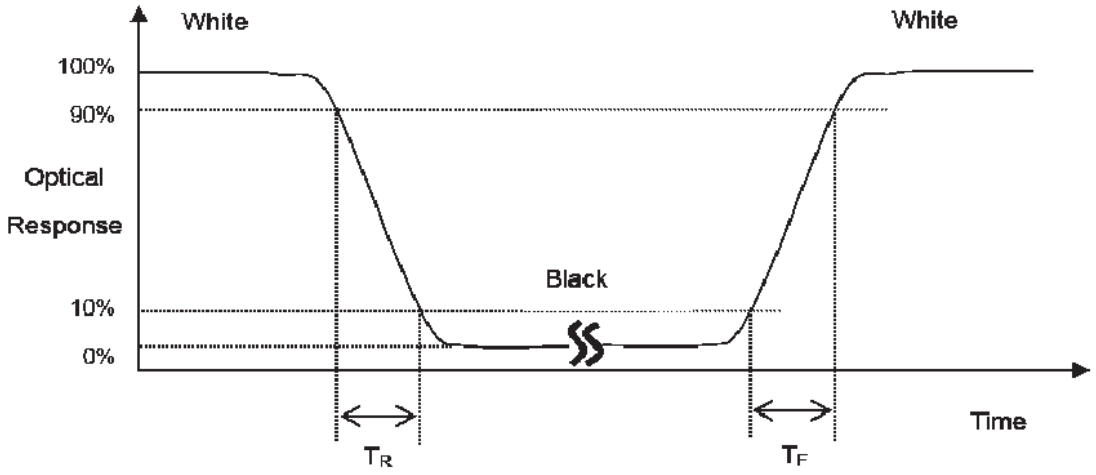
Note (1) Definition of Viewing Angle (θx, θy):



Note (2) Definition of Contrast Ratio (CR):

$$CR = \frac{\text{Luminance (brightness) all pixels "White"}}{\text{Luminance (brightness) all pixels "dark"}}$$

Note (3) Definition of Response Time (T_R, T_F):



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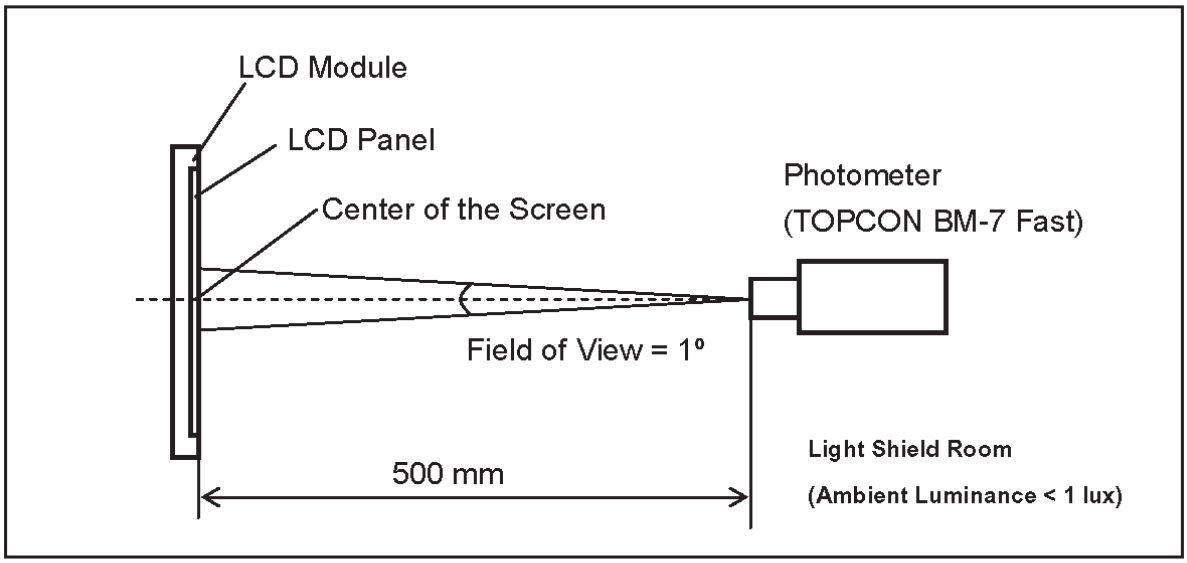
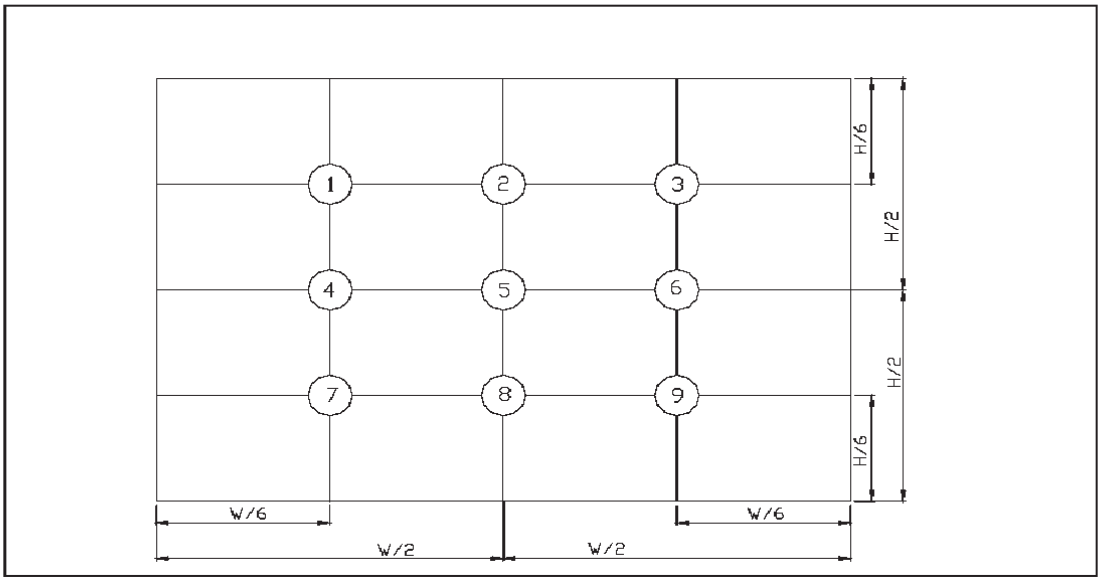
Note (4) Measurement Set-Up:

The LCD module should be stabilized at a given temperature for 30 minutes to avoid abrupt temperature change during measuring. In order to stabilize the luminance, the measurement should be executed after lighting Backlight for 30 minutes in a windless room.



Note (5) Definition of brightness uniformity

Brightness uniformity=(Min Luminance of 9 points)/(Max Luminance of 9 points)×100%



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Reliability Test

No.	Test Items	Test Condition	Remark
1	High Temperature Storage Test	T_a= 80℃ 240 hours	-
2	Low Temperature Storage Test	T_a= -30℃ 240 hours	-
3	High Temperature Operation Test	T_a= 70℃ 240 hours	-
4	Low Temperature Operation Test	T_a= -20℃ 240 hours	-
5	High Temperature and High Humidity Operation Test	T_a=60℃ 90%RH 240 hours	-
6	Electro Static Discharge Test (non-operating)	-Panel Surface/Top Case : 150pF, 330Ω Air: ±15kV, Contact: ±8kV	-
7	Mechanical Shock Test (non-operating)	Half sine wave, 100G, 6ms 3 times shock of each six surfaces	-
8	Vibration Test (non-operating)	Sine wave, 10 ~ 55 ~ 10Hz, 3 axis, 2 hours/axis	-
9	Thermal Shock Test (non-operating)	-20℃(30min) ~ 70℃(30min), 100 cycles	-
10	Drop Test(with Carton)	Height: 80cm 1 corner, 3 edges, 6 surfaces	-

Incoming Inspection Standards

The environmental condition of inspection

The environmental condition and visual inspection shall be conducted as below.

(1) Ambient temperature 25 ± 5℃

(2) Humidity: 60 ± 5% RH

(3) Viewing distance is approximately 35 ~ 40 cm

(4)Viewing angle is normal to the LCD panel as Fig _1(10°)

(5) Ambient Illumination: 300 ~ 500 Lux for external appearance inspection

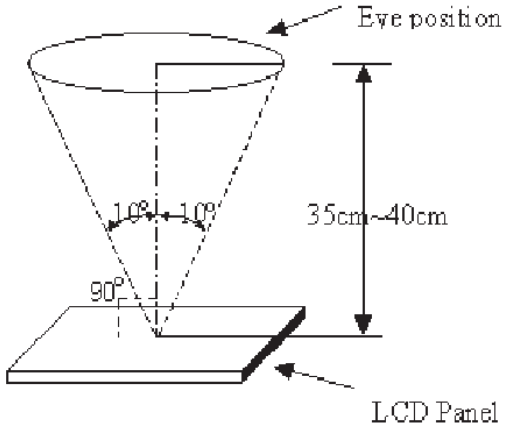


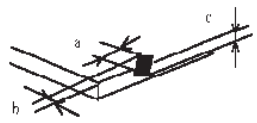
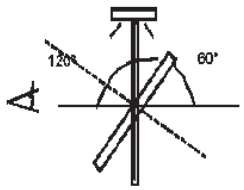
Fig _ 1

The defects classify of AQL as following:

Class of defects	AQL	Definition
Major	0.65%	It is defect that is likely to result in failure or to reduce materially the usability of the intended function.
Minor	1.5%	It is a defect that will not result in functioning problem with deviation classified.

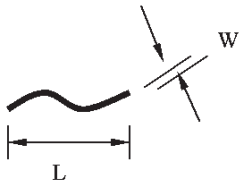
Inspection Parameters

<table>
<tr><th colspan="2">Item</th><th colspan="5">Specification/Description</th><th>Note</th></tr>
<tr><td rowspan="2">Display</td><td rowspan="2">Function</td><td colspan="5">No Display</td><td>-</td></tr>
<tr><td colspan="5">Malfunction</td><td>-</td></tr>
<tr><td rowspan="9">Operating</td><td>Contrast ratio</td><td colspan="5">Out of Spec</td><td>-</td></tr>
<tr><td>Line defect</td><td colspan="5">No obvious Vertical and Horizontal line defect in bright , dark and colored.</td><td>-</td></tr>
<tr><td rowspan="8">Point Defect
(red,green,blue,dark , white)
Mura (50% gray)</td><td colspan="2" rowspan="2">Item</td><td colspan="3">Acceptable number</td><td rowspan="8">Note:
1、2、5、
6、7</td></tr>
<tr><td>A</td><td>B</td><td>Total</td></tr>
<tr><td colspan="2">BRIGHT DOT</td><td>N≦2</td><td>N≦2</td><td rowspan="3">N≦7</td></tr>
<tr><td colspan="2">DARK DOT</td><td>N≦3</td><td>N≦4</td></tr>
<tr><td colspan="2">TOTAL DOT</td><td>N≦4</td><td>N≦5</td></tr>
<tr><td colspan="2">TWO ADJACENT BRIGHT DOT</td><td colspan="3">NOT ALLOWED</td></tr>
<tr><td colspan="2">TWO ADJACENT DARK DOT</td><td colspan="3">N≦1</td></tr>
<tr><td colspan="2">THREE OR MORE ADJACENT DOT</td><td colspan="3">NOT ALLOWED</td></tr>
<tr><td rowspan="3">External Inspection
(non-operating)</td><td>Scratch on the polarizer</td><td colspan="5"><table><tr><td>L(mm)</td><td>W(mm)</td><td>Acceptable number</td></tr><tr><td>L≦2.5</td><td>W≦0.1</td><td>4</td></tr><tr><td>L＞2.5</td><td>W＞0.1</td><td>0</td></tr></table></td><td>Note:3</td></tr>
<tr><td>Dent or bubble on the polarizer</td><td colspan="5"><table><tr><td>Dimension(mm)</td><td>Acceptable number</td></tr><tr><td>D≦0.5</td><td>4</td></tr><tr><td>D≦0.15</td><td>Disregard</td></tr></table></td><td>Note:4</td></tr>
<tr><td>Foreign material on the polarizer</td><td colspan="5"><table><tr><td>Dimension(mm)</td><td>Acceptable number</td></tr><tr><td>D≦0.5</td><td>4</td></tr><tr><td>D≦0.15</td><td>Disregard</td></tr></table></td><td>Note:4</td></tr>
</table>

Item		Specification/Description			Note
Touch Panel	Scratch	L(mm)	W(mm)	Acceptable number	Note:3
		L≦10	W＜0.05	Disregard	
			0.05≦W＜0.1	N≦4	
			W≧0.1	0	
	Foreign Materials (Linear shape)	L≦10	W＜0.05	Disregard	Note:3
			0.05≦W＜0.1	N≦3	
			W≧0.1	0	
	Foreign Materials (Circular shape)	Dimension(mm)		Acceptable number	Note:4
		D≦0.25		Disregard	
		0.25＜D≦0.5		N≦6	
		D＞0.5		0	
	Glass chipping			a≦5mm b≦3mm c≦t (t：Glass think)	Note:8
				a≦3mm b≦3mm c≦t (t：Glass think)	Note:8
	Newton-ring	(In case of doubtful situations) Observe on 60° from the product surface under a while Fluorescent lamp(3-wavelength lamp). 		Average diameter ≦1/3 Touch Panel area Disregard.	Note:8

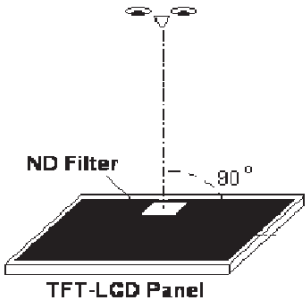
Note1. The definition of dot defect : The dot defect was judged after repair and the size of a defective dot over 1/2 of whole dot is regarded as one defective dot.

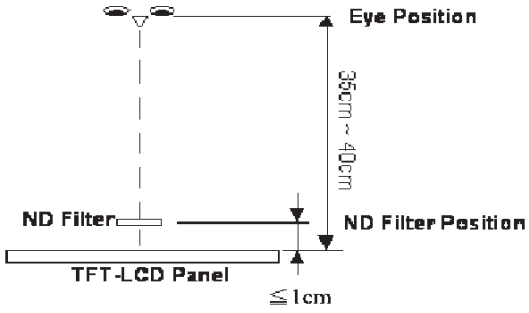
Note2.



Note3. D：Diameter D=(a+b)/2

Note4. Bright dot is defined through 6% transmission ND Filter as following.





Note5. ADJACENT DOT

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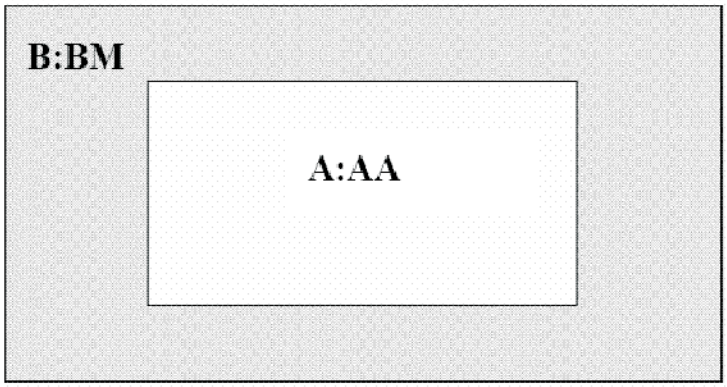
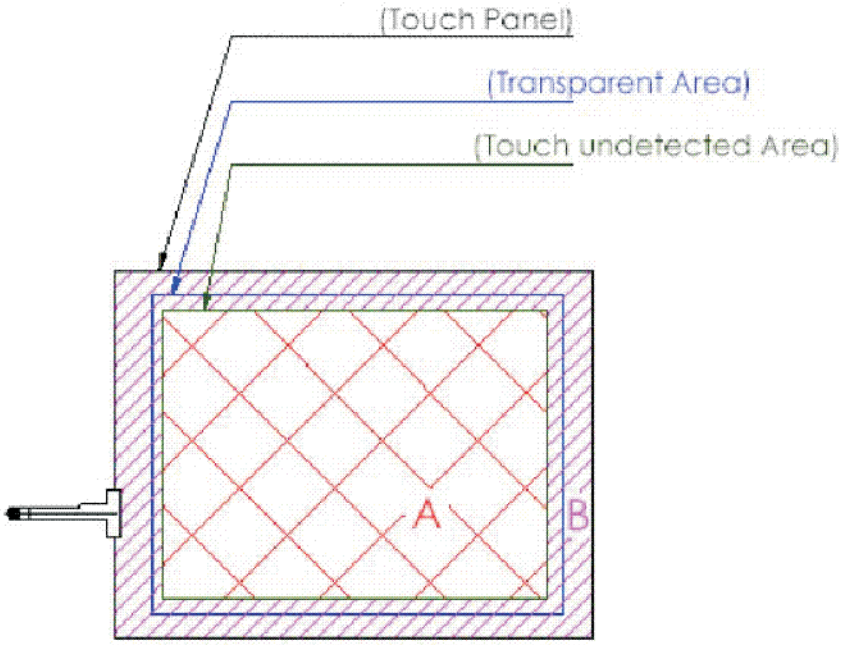
Note6.



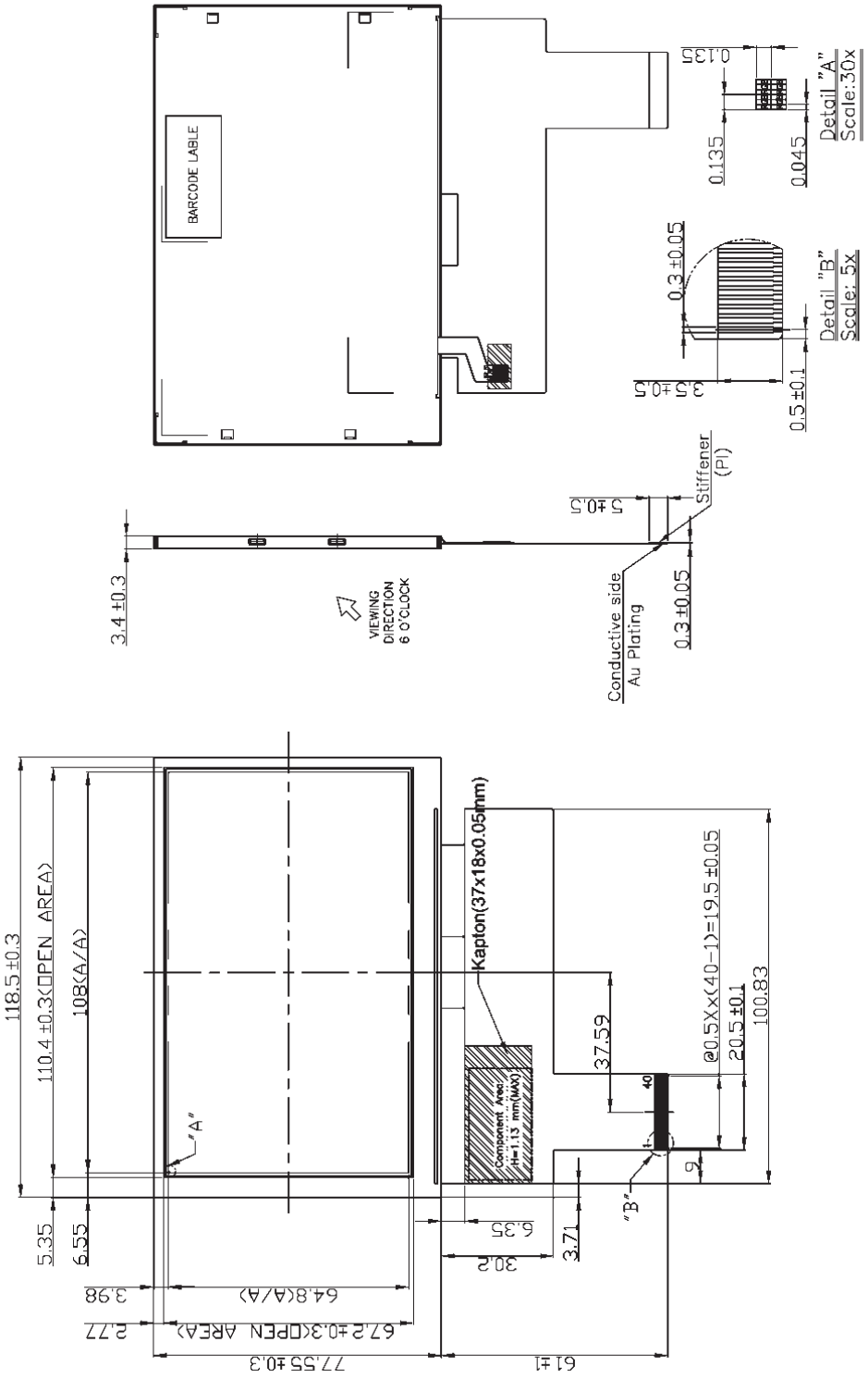
Note7.



A area : Without any defect point effect on normal operation.

B area : None-specify

Outline Drawing



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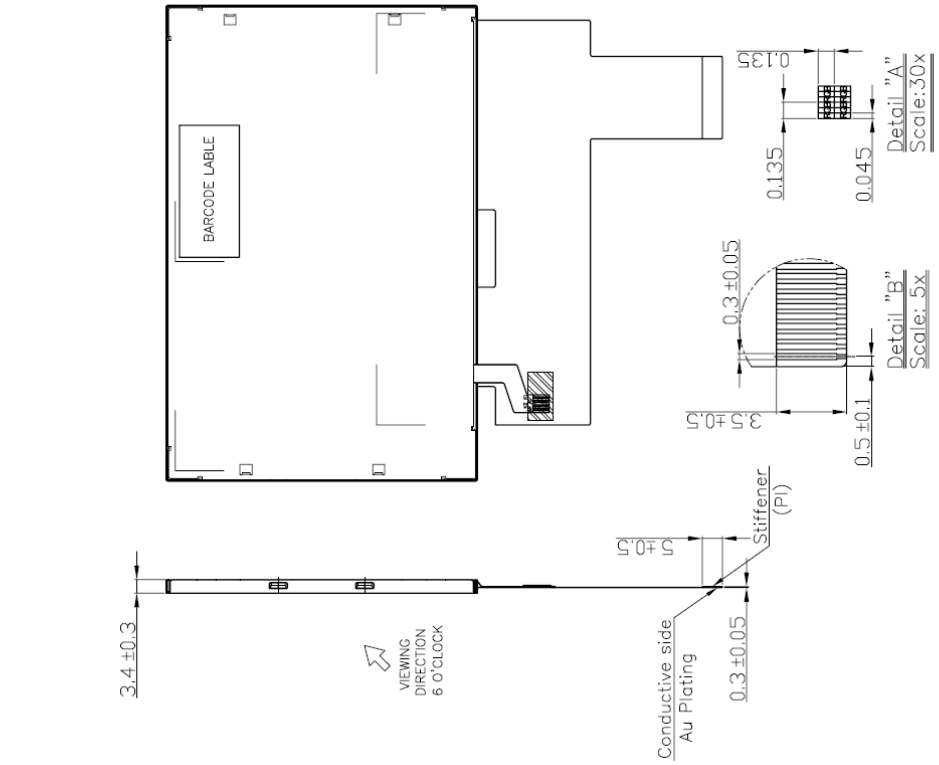
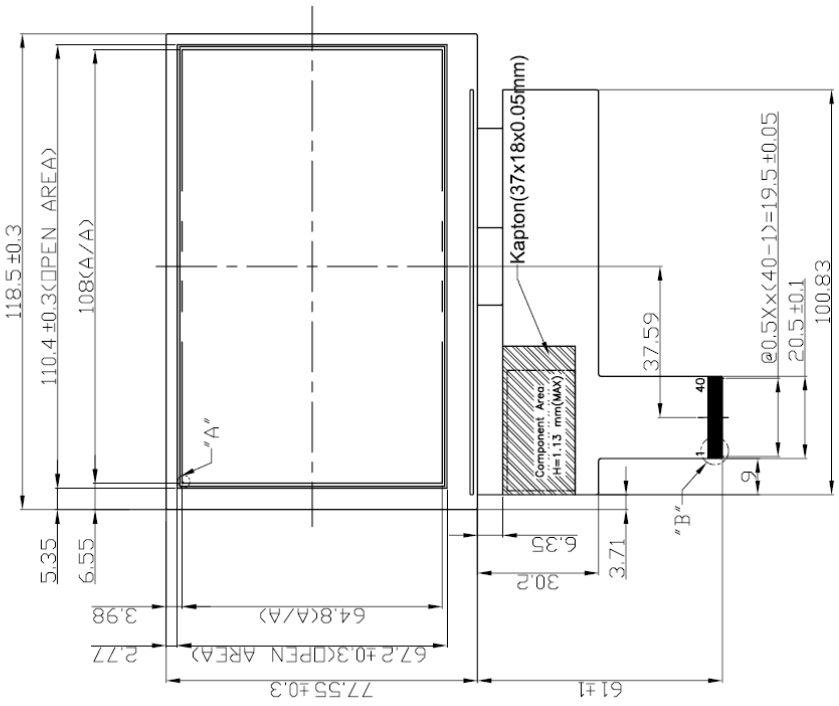
Outline Drawing





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