



SPECIFICATION FOR TFT LCD MODULE

CUSTOMER : _____

CUSTOMER MODULE : _____

HL MODEL : HG050WV034

Preliminary Specification

Final Specification

Customer Confirmation column:

Approved by : _____ Dept. : _____ Data : _____

Please return one of the copies of the specification with your signature to us within two weeks after you receive this document. If it is not returned, we will assume that you agree to the entire contents of this specification document.

Designed by	Checked by	Approved by



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1. General Specifications

No.	Item	Specification	Remark
1	LCD size	5.0 inch	
2	Driver element	a-Si TFT active matrix	
3	Resolution	800 × (RGB) × 480	
4	Display mode	Normally BLACK	
5	Dot pitch	0.135 (H) x 0.135(V) mm	
6	Active area	108(W) ×64.8(H) mm	
7	Module size	120.7(W) ×75.8(H) ×2.9(D) mm	Note 1
8	View direction	ALL	O'Clock
9	Surface treatment	Anti-Glare	
10	Color arrangement	RGB-stripe	
11	Interface	RGB	
12	Lcm power consumption	1.2W	TYP
13	Drive IC	ST7265	

Note 1: Refer to Mechanical Drawing.



2. Pin Assignment

FPC Connector is used for the module electronics interface. The recommended model is FH12A-50S-0.5SH manufactured by Hirose.

Pin No	Symbol	I/O	Function	Remark
1	GLED	P	LED Cathode	
2	VLED	P	LED Anode	
3	GND	P	Ground	
4	VDD	P	Power for Digital Circuit	
5-12	R0-R7	I	Red data,R7 is MSB,R0 is LSB.	
13-20	G0-G7	I	Green data,G7 is MSB,G0 is LSB.	
21-28	B0-B7	I	Blue data,B7 is MSB,B0 is LSB.	
29	GND	P	Ground	
30	DCLK	I	Sample clock	
31	DISP	I	Display ON/OFF control.Internally pulled high	
32	HS	I	Horizontal Sync Input	
33	VS	I	Vertical Sync Input	
34	DE	I	Data Input Enable	
35	NC	-	No connect	
36	GND	P	Ground	
37	NC	-	No connect	
38	NC	-	No connect	
39	NC	-	No connect	
40	NC	-	No connect	



Note I: input; O: output; P: Power or Ground(0V).

3. Operation Specifications

3.1. Absolute Maximum Ratings

(Note 1)

Item	Symbol	Values		Unit	Remark
		Min.	Max.		
Power voltage	VDD	3.0	3.6	V	VSS=0V, TA=25°C
Operation Temperature	T _{OP}	-30	85	°C	
Storage Temperature	T _{ST}	-30	85	°C	

Note1 : The absolute maximum rating values of this product are not allowed to be exceeded at any times. Should a module be used with any of the absolute maximum ratings exceeded, the characteristics of the module may not be recovered, or in an extreme case, the module may be permanently destroyed.

3.2. Typical Operation Conditions

Test condition: GND=0V, TA=25 °C

Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
Power voltage	VDD	3.0	3.3	3.6	V	
Input logic high voltage	V _{IH}	0.7 V _{DD}	-	V _{DD}	V	
Input logic low voltage	V _{IL}	0		0.3 V _{DD}	V	



3.3. Current Consumption

Current for LED Driver

Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
Voltage for LED Backlight	V_L	19.6	18.0	23.8	V	Note 1
Current for LED Backlight	I_L	-	80	-	mA	
LED life time	-	20,000	-	-	Hr	Note 2

Note1: $V_L=21V$, $I_L=80mA$ (Backlight circuit: 7 series connection, 2 parallel connection), the ambient temperature is $25^{\circ}C$.

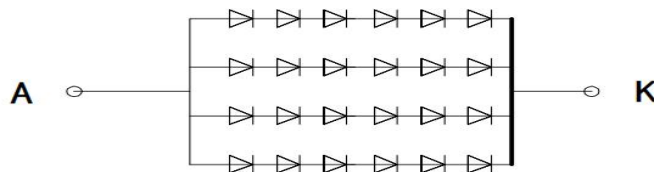


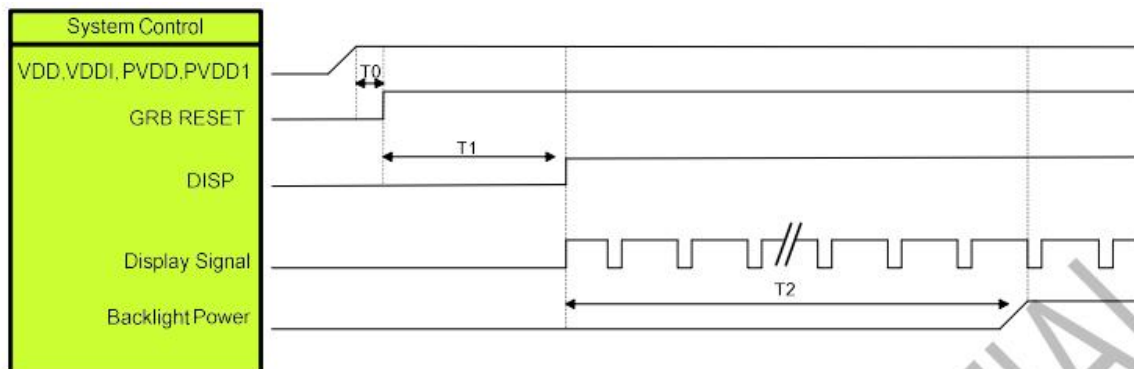
Fig. 3-1 LED test circuit diagram

Note 2: The “LED life time” is defined as the module brightness decrease to 50% original brightness at $T_a=25^{\circ}C$ and 1/2 rated current. The LED lifetime could be decreased if operating I_L is larger than 80 mA.



3.4. PowerSequence

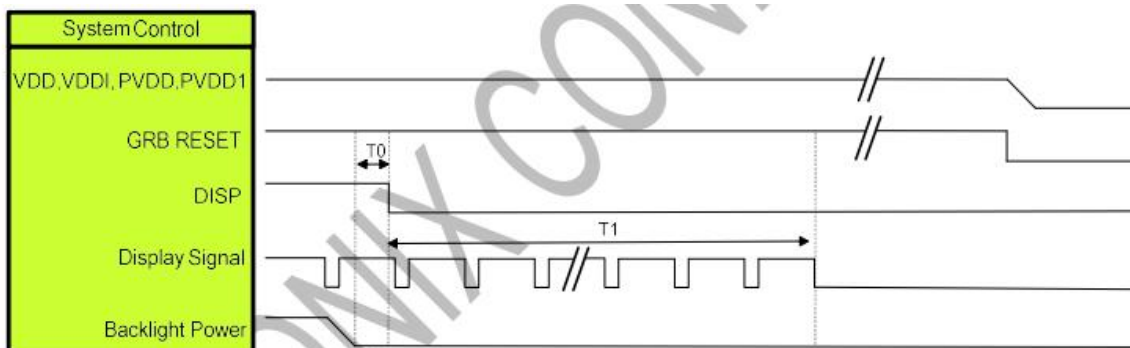
Power on:



Symbol	Description	Min. Time	Unit
T0	System power stability to GRB RESET signal	0	ms
T1	GRB RESET= "High" to DISP="High"	10	ms
T2	Display Signal output to Backlight Power on	250	ms

Note: RGB interface Display signal: DCLK; VSYNC; HSYNC; DE; DR[7:0]; DG[7:0]; DB[7:0]

Power off:



Symbol	Description	Min. Time	Unit
T0	Backlight Power off to DISP="Low"	5	ms
T1	DISP="Low" to IC internal voltage discharge complete	100	ms

Note: RGB interface Display signal: DCLK; VSYNC; HSYNC; DE; DR[7:0]; DG[7:0]; DB[7:0]



3.5. Signal Timing Characteristics

3.5.1. AC Electrical Characteristics

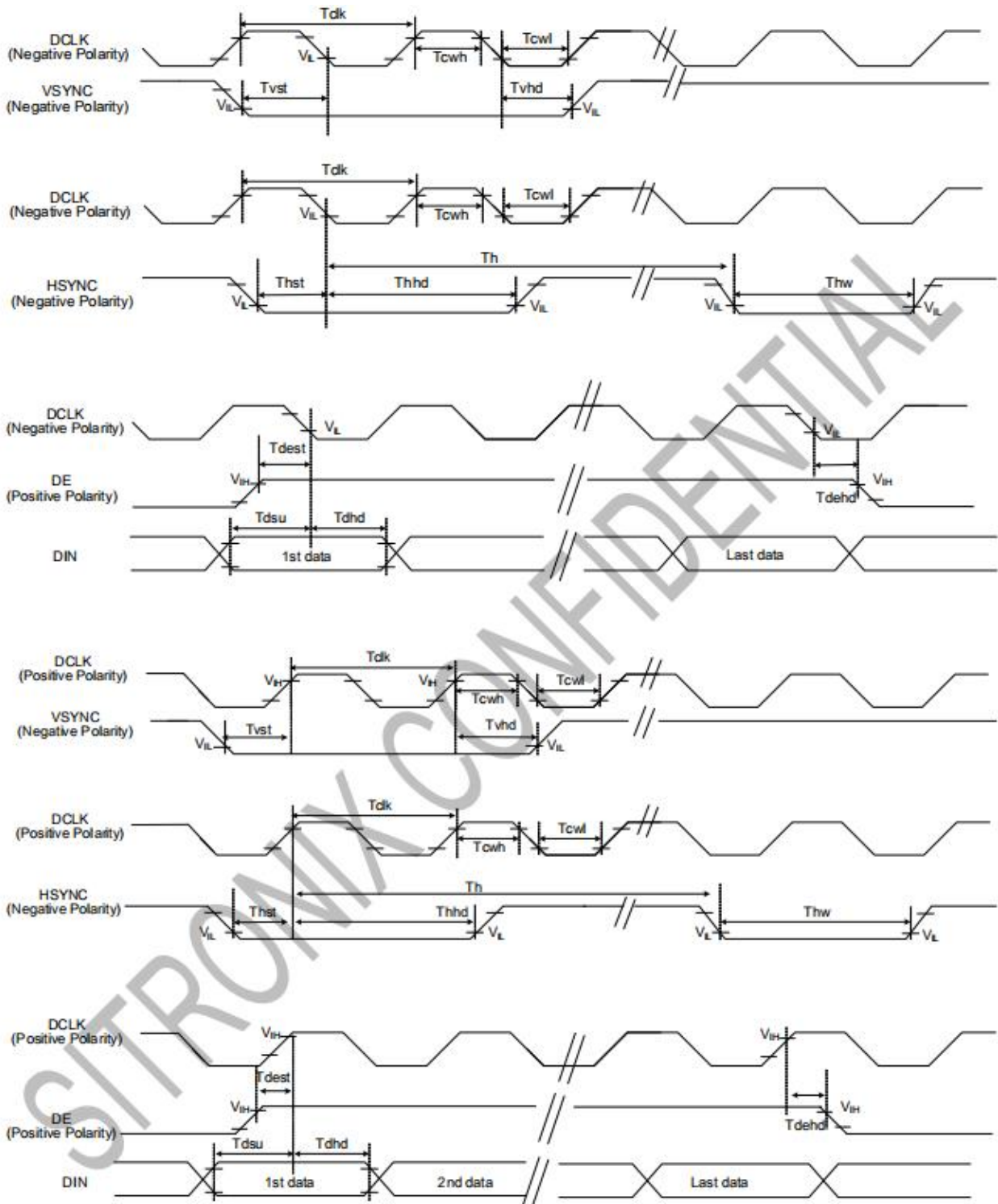
Item	Symbol	Min.	Typ.	Max.	Unit	Conditions
VDD Power Source Slew Time	TPOR	-	-	20	ms	From 0V to 99% VDD
GRB Pulse Width	tRSTW	10	50	-	us	R=10Kohm, C=1uF
SD Output Stable Time	Tst	-	-	12	us	Output settled within +20mV Loading = 6.8k+28.2pF.
GD Output Rise and Fall Time	Tgst	-	-	6	us	Output settled (5%~95%), Loading = 4.7k+29.8pF

3.5.2. DC Electrical Characteristics

Item	Symbol	Min.	Typ.	Max.	Unit	Conditions
Logic-High Input Voltage	Vih	0.7VDDI	-	VDDI	V	
Logic-Low Input Voltage	Vil	DGND	-	0.3VDDI	V	
Logic-High Output Voltage	Voh	VDDI-0.4	-	VDDI	V	
Logic-Low Output Voltage	Vol	DGND	-	DGND+0.4	V	



3.5.3. Timing Controller



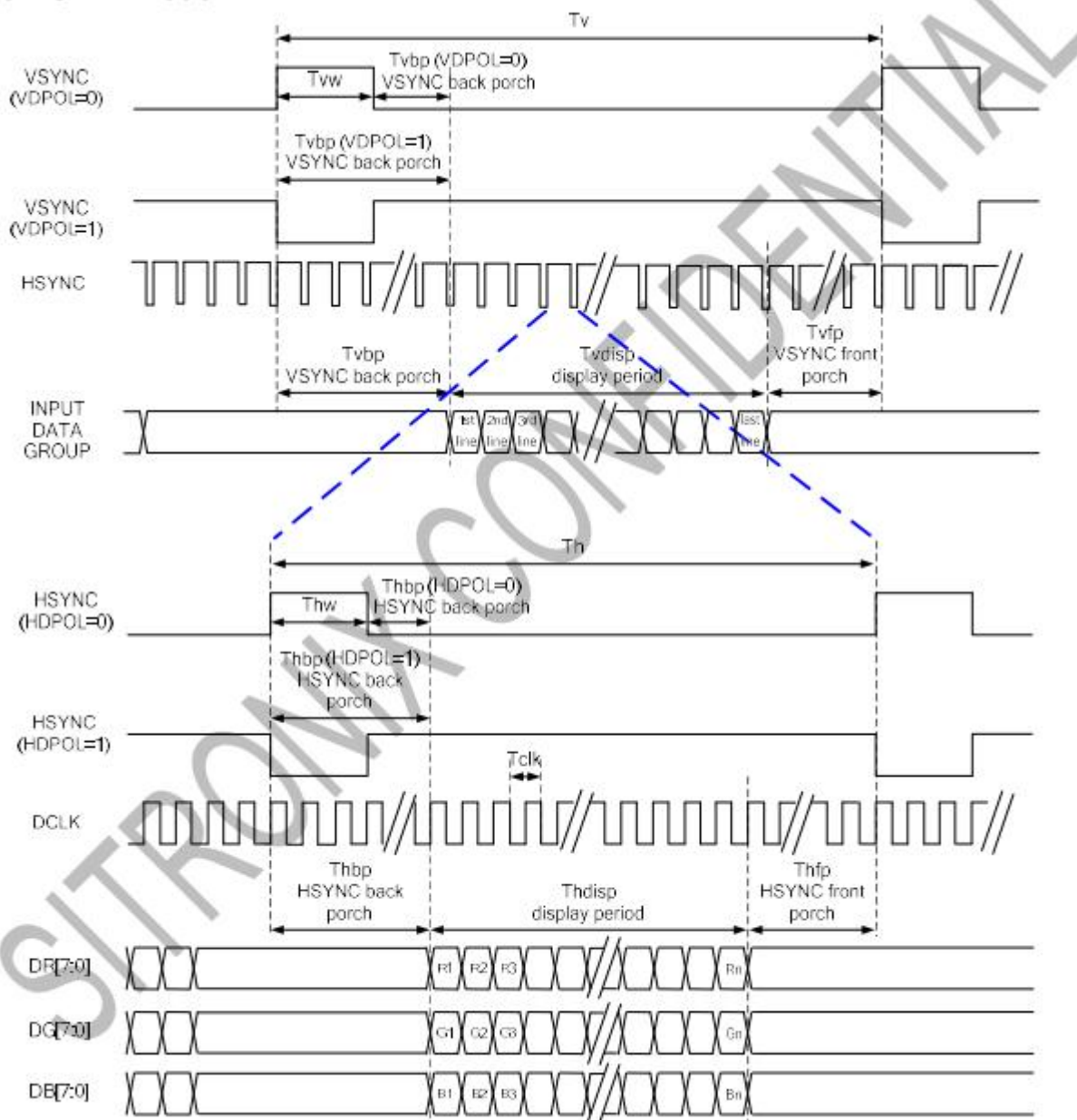


Item	Symbol	Min.	Typ.	Max.	Unit	Conditions
CLK Pulse Duty	Tcw	40	50	60	%	
VSYNC Setup Time	Tvst	-	-	10	ns	
VSYNC Hold Time	Tvhd	-	-	10	ns	
HSYNC Setup Time	Thst	-	-	10	ns	
HSYNC Hold Time	Thhd	-	-	10	ns	
Data Setup Time	Tdsu	-	-	10	ns	
Data Hold Time	Tdhd	-	-	10	ns	
DE Setup Time	Tdest	-	-	10	ns	
DE Hold Time	Tdehd	-	-	10	ns	



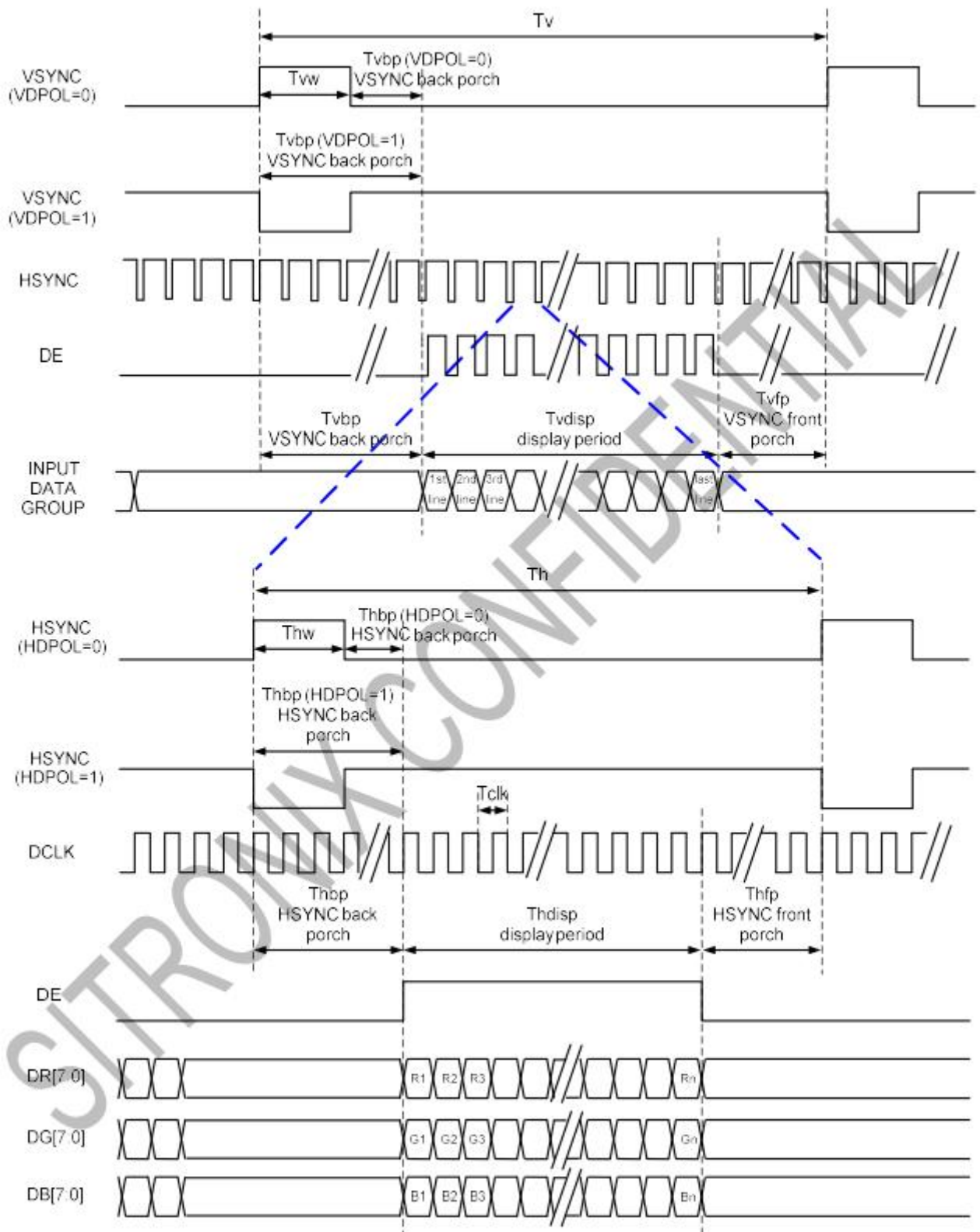
3.5.4. Data Input Format

SYNC Mode:



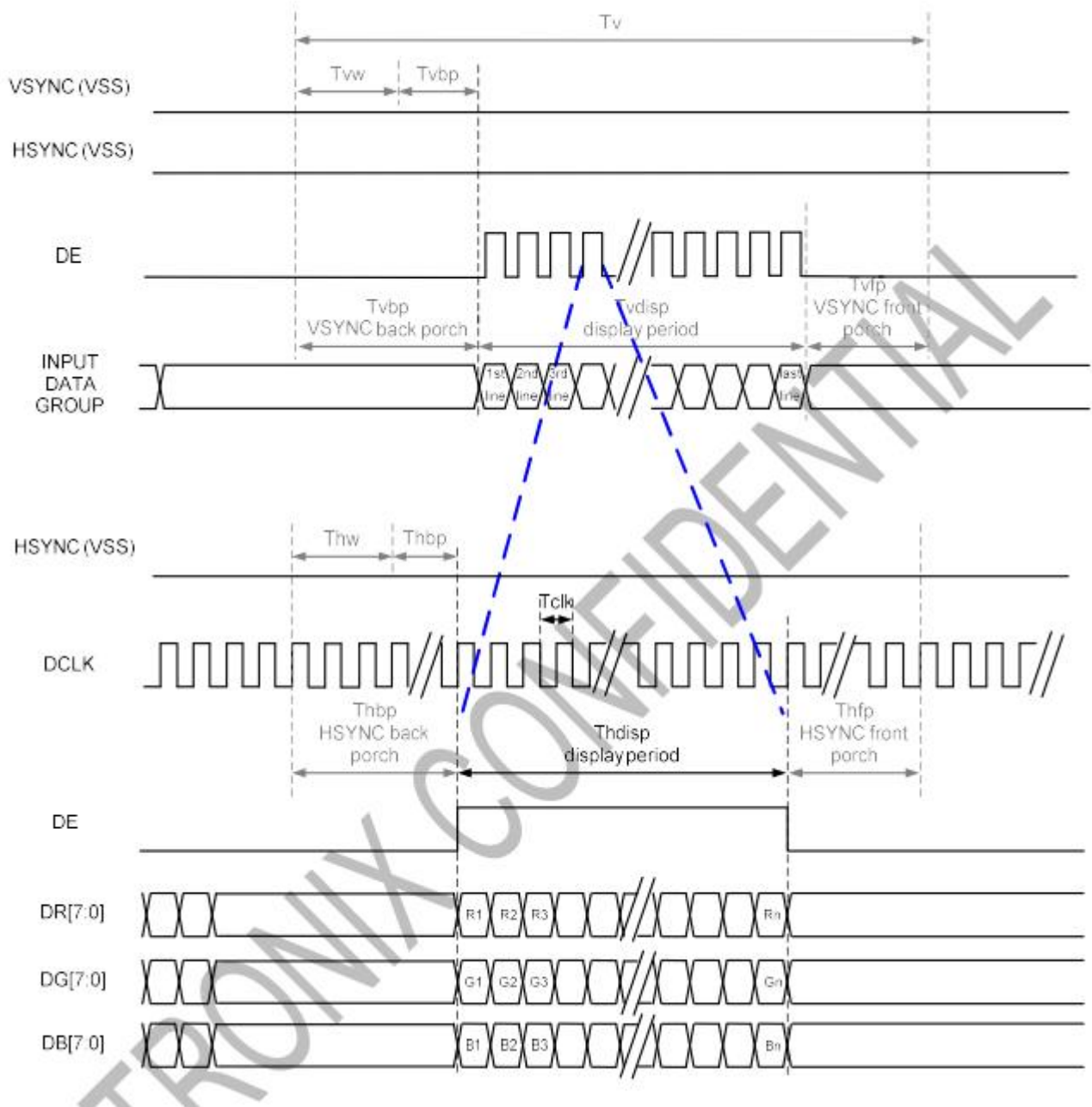


SYNC-DE Mode:





DE Mode:





4. Optical Specifications

Item	Symbol	Condition	Values			Unit	Remark
			Min.	Typ.	Max.		
Viewing angle (CR \geq 10)	θ_L	$\Phi=180^\circ$ (9 o'clock)	70	80	-	degree	Note 1
	θ_R	$\Phi=0^\circ$ (3 o'clock)	70	80	-		
	θ_T	$\Phi=90^\circ$ (12 o'clock)	70	80	-		
	θ_B	$\Phi=270^\circ$ (6 o'clock)	70	80	-		
Response time	T_{ON+off}	Normal $\theta=\Phi=0^\circ$	-	25	40	msec	Note 3
Contrast ratio	CR		1000	1500	-	-	Note 4
Color chromaticity	W_X		-	0.30	-	-	Note 2 Note 5 Note 6
	W_Y		-	0.32	-	-	
NTSC			55	60		%	
Luminance	L		900	1000	-	cd/m ²	Note 6
Luminance uniformity	Y_U		75	80	-		Note 7

The test systems refer to Note 2.



Note 1: Definition of viewing angle range

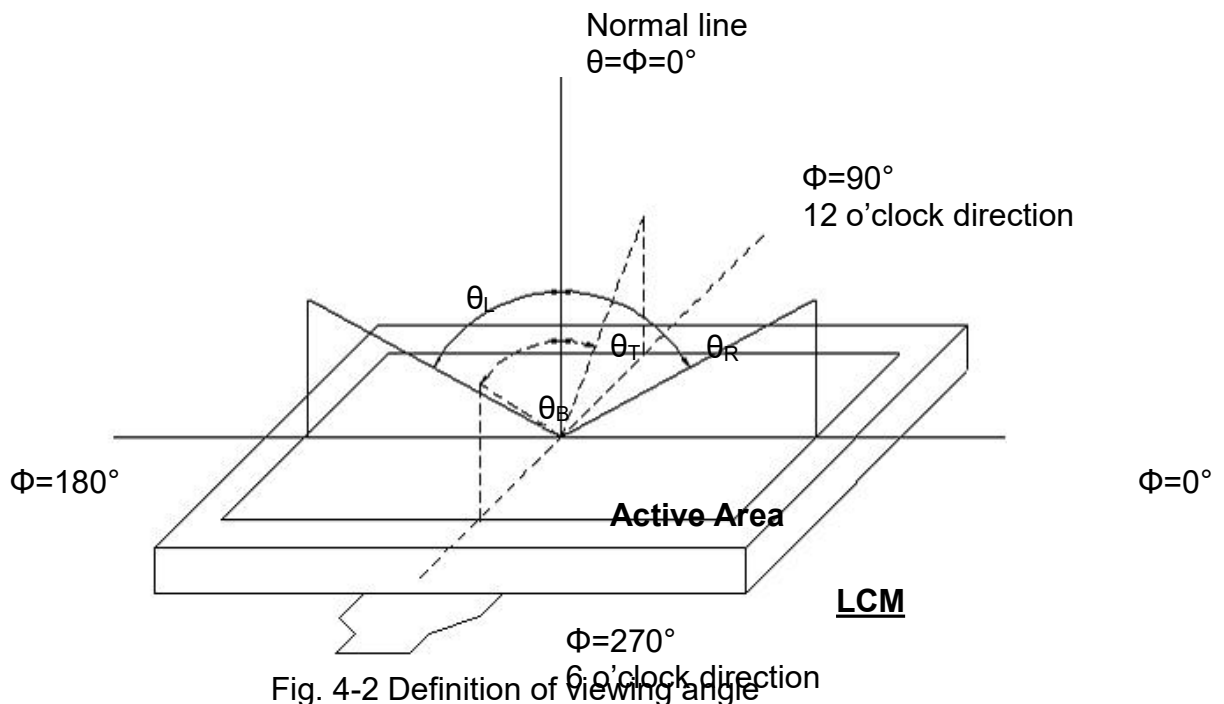


Fig. 4-2 Definition of viewing angle

Note 2: Definition of optical measurement system.

The optical characteristics should be measured in dark room. After 30 minutes operation, the optical properties are measured at the center point of the LCD screen. (Viewing angle is measured by ELDIM-EZ contrast/Height :1.2mm, Response time is measured by Photo detector TOPCON BM-7, other items are measured by BM-5A/ Field of view: 1° /Height: 500mm.) or CA-210.

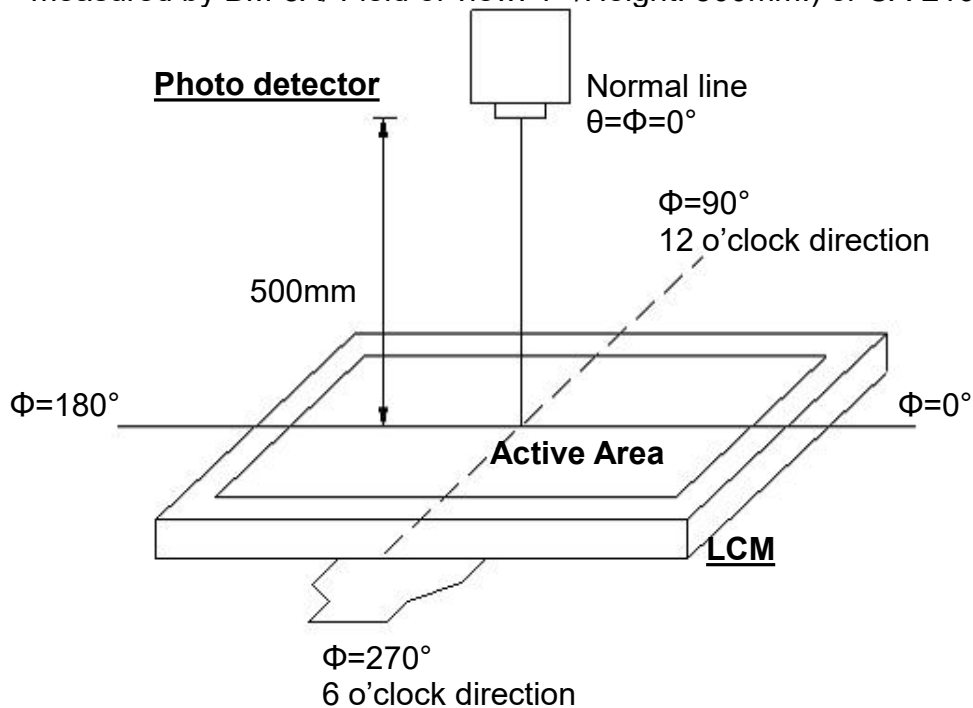


Fig. 4-3 Optical measurement system setup



Note 3: Definition of Response time

The response time is defined as the LCD optical switching time interval between "White" state and "Black" state. Rise time (T_{ON}) is the time between photo detector output intensity changed from 90% to 10%. And fall time (T_{OFF}) is the time between photo detector output intensity changed from 10% to 90%.

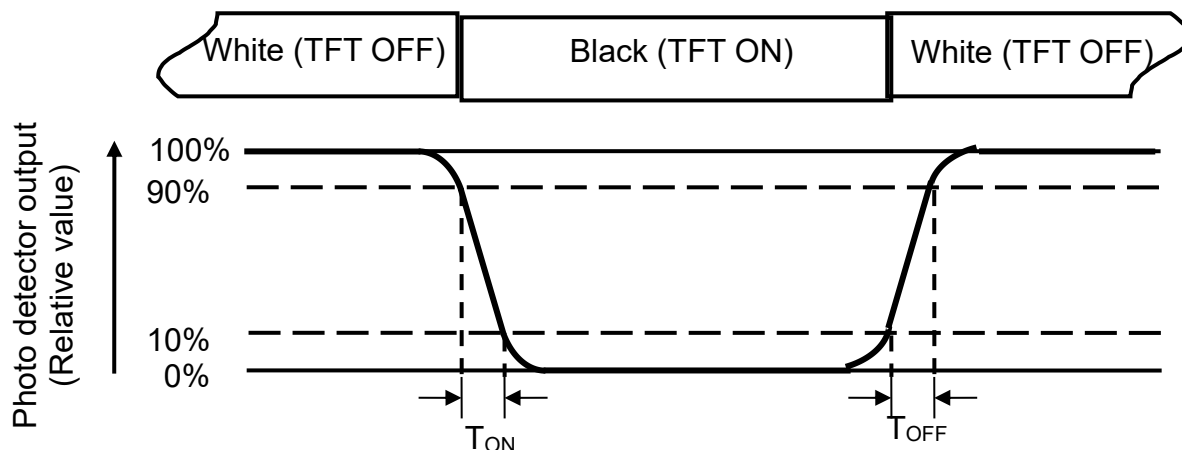


Fig. 4-4 Definition of response time

Note 4: Definition of contrast ratio

$$\text{Contrast ratio (CR)} = \frac{\text{Luminance measured when LCD on the "White" state}}{\text{Luminance measured when LCD on the "Black" state}}$$

Note 5: Definition of color chromaticity (CIE1931)

Color coordinates measured at center point of LCD.

Note 6: All input terminals LCD panel must be ground while measuring the center area of the panel. The LED driving condition is $I_L=80\text{mA}$.



Note 7: Definition of Luminance Uniformity

Active area is divided into 9 measuring areas(Refer to Fig. 4-4).

Every measuring point is placed at the center of each measuring area.

$$\text{Luminance Uniformity (Yu)} = \frac{B_{min}}{B_{max}}$$

L-----Active area length W----- Active area width

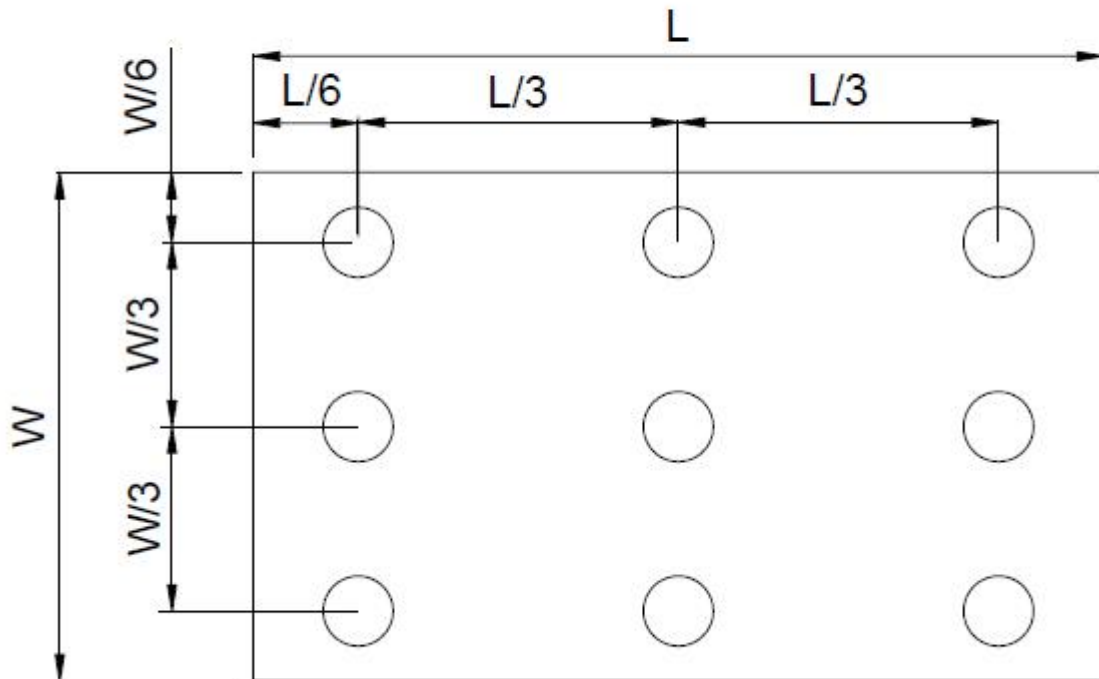


Fig. 4-4 Definition of measuring points

B_{MAX} : The measured maximum luminance of all measurement position.

B_{MIN} : The measured minimum luminance of all measurement position.



5. Reliability Test Items

Item	Test Conditions	Criterion
High Temperature Storage	Ta = 80°C 96hrs	A,B,C,D,E
Low Temperature Storage	Ta = -30°C 96hrs	A,B,C,D,E
High Temperature Operation	Ts = 80°C 96hrs	A,B,C,D,E
Low Temperature Operation	Ta = -30°C 96hrs	A,B,C,D,E
Operate at High Temperature and Humidity	+60°C, 90%RH 96hrs	A,B,C,D,E
Thermal Shock(non operation)	-20°C/30 min ~ +70°C/30 min for a total 30 cycles, Start with cold temperature and end with high temperature.	A,B,C,D,E
Vibration Test	Sweep:10Hz~55Hz~10Hz 2G 2 hours for each direction of X. Y. Z. (6 hours for total)	A,B,C,D,E
Package Vibration Test	Random Vibration : 0.015G*G/Hz from 5-200HZ, -6dB/Octave from 200-500HZ 2 hours for each direction of X. Y. Z. (6 hours for total)	A,B,C,D,E
Package Drop Test	Height:60 cm 1 corner, 3 edges, 6 surfaces	A,B,C,D,E
Electro Static Discharge	Contact=+/-4KV, Air=+/-8KV,(R=330R,C=150pF), 1 sec,9point,10times/point;	A,B,C,D,E

※Criterion:

A.LCM each function is OK,.

B.LCM appearance inspection without abnormalities (Including scratch, damage, corrosion and serious deformation)

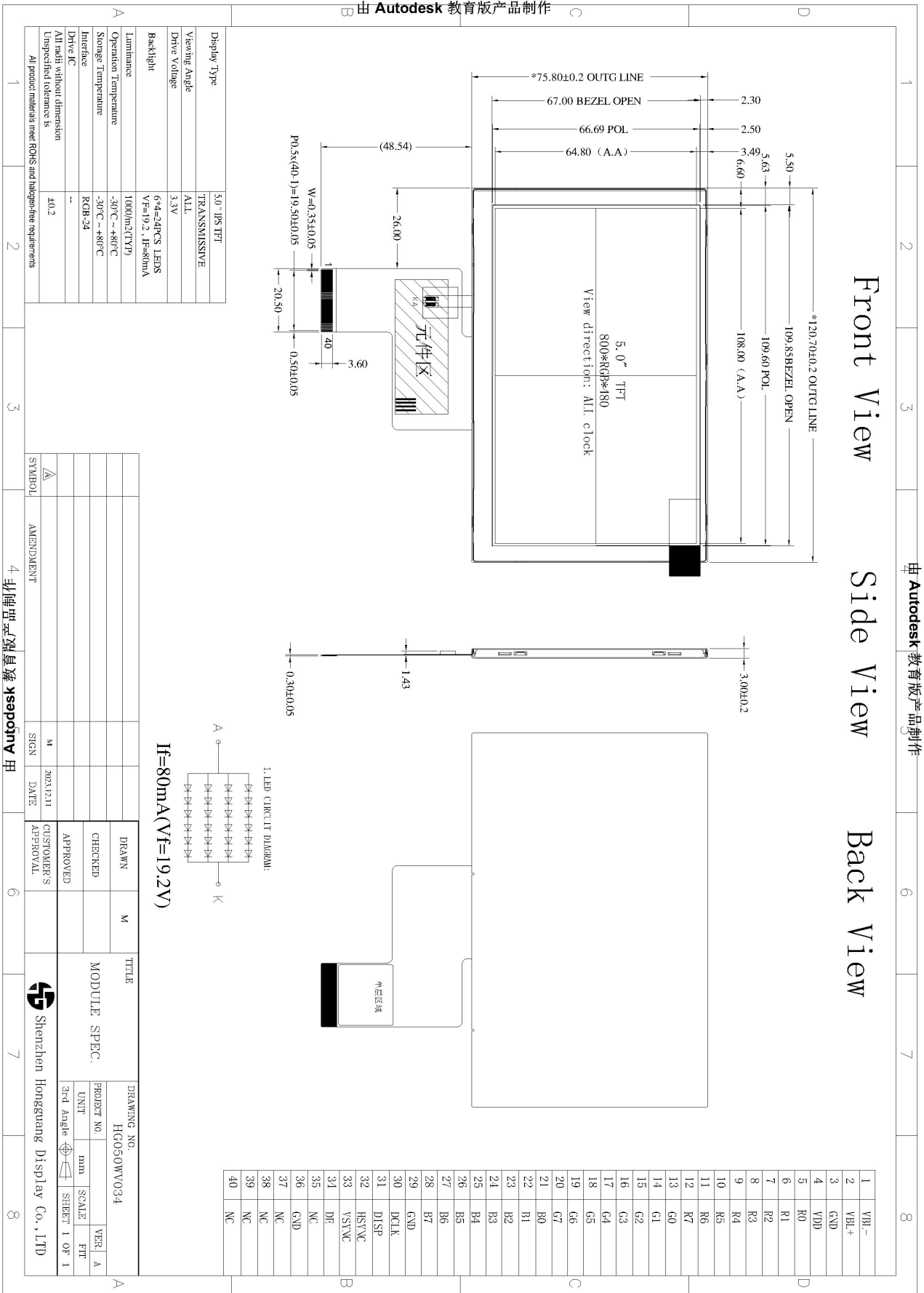
C.LCM brightness above the Min. value of Spec.

D. Luminance uniformity above the Min. value of Spec.

E. Color chromaticity within tolerance range



6. Mechanical Drawing





7. Package Drawing

TBD

8. General Precautions

8.1. Safety

Liquid crystal is poisonous. Do not put it in your mouth. If liquid crystal touches your skin or clothes, wash it off immediately by using soap and water.

8.2. Handling

1. The LCD panel is plate glass. Do not subject the panel to mechanical shock or to excessive force on its surface.
2. The polarizer attached to the display is easily damaged. Please handle it carefully to avoid scratch or other damages.
3. To avoid contamination on the display surface, do not touch the module surface with bare hands.
4. Keep a space so that the LCD panels do not touch other components.
5. Put cover board such as acrylic board on the surface of LCD panel to protect panel from damages.
6. Transparent electrodes may be disconnected if you use the LCD panel under environmental conditions where the condensation of dew occurs.
7. Do not leave module in direct sunlight to avoid malfunction of the ICs.

8.3. Static Electricity

1. Be sure to ground module before turning on power or operating module.
2. Do not apply voltage which exceeds the absolute maximum rating value.

8.4. Storage

1. Store the module in a dark room where must keep at $25\pm 10^{\circ}\text{C}$ and 65%RH or less.
2. Do not store the module in surroundings containing organic solvent or corrosive gas.
3. Store the module in an anti-electrostatic container or bag.

8.5. Cleaning

1. Do not wipe the polarizer with dry cloth. It might cause scratch.
2. Only use a soft sloth with IPA to wipe the polarizer, other chemicals might permanent damage to the polarizer.