

Product Specification

Customer: _____

Model Name: IE-AI-0907CS06R24-R0-1

Date: _____

Version: _____

Preliminary Specification

Final Specification

For Customer's Acceptance

Approved by	Comment

Approved by	Reviewed by	Prepared by

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2. General Specifications

Feature		Spec
Characteristics	Size	3.5inch
	Resolution	320(horizontal)*240(Vertical)
	Glass Maker	Tianma
	Interface	24bit-RGB
	Connect type	Connector
	Display Colors	16.7M
	Technology type	a-Si
	Pixel pitch (mm)	0.219 x 0.219
	Pixel Configuration	R.G.B. Stripe
	Display Mode	Normally Black
	Driver IC	St7272
	Luminance	430nits
	Viewing Direction	ALL
	Gray Scale Inversion Direction	FREE
Mechanical	LCM (W x H x D) (mm)	76.90*64.0*4.25
	Active Area(mm)	70.08 x 52.56
	With /Without TSP	With RTP
	Weight (g)	28g
	LED Numbers	6LEDs (6S)

Note 1: Viewing direction is following the data which measured by optics equipment.

Note 2: Requirements on Environmental Protection: RoHS

Note 3: LCM weight tolerance: +/- 5%

3. Input/output Terminals

No.	Symbol	Description
1,2	VBL-	Backlight LED Cathode
3,4	VBL+	Backlight LED Anode.
5~7	NC	NC
8	RESET	Reset Signal pin ("Low" is enable)
9	NC/CS	Chip select
10	NC/SCL	Serial Clock.
11	NC/SDA	Serial Data
12-19	B0~B7	Data bus
20-27	G0~G7	Data bus
28-35	R0~R7	Data bus
36	HSYNC	Line Synchronous Signal
37	VSYNC	Frame Synchronous Signal
38	DOTCLK	Dot-clock signal and oscillator source
39-40	NC	NC
41-42	VCC	Power supply for logic operation
43-47	NC	NC
48	XR	Touch panel right side
49	YD	Touch panel bottom side
50	XL	Touch panel left side
51	YU	Touch panel up side
52	DEN	Display enable signal
53-54	GND	System Ground

4. Absolute Maximum Ratings

Item	Symbol	MIN	MAX	Unit	Remark
Supply Voltage	V_{DD}	-0.5	5.0	V	
Operating Temperature	T_{OPR}	-20	70	°C	
Storage Temperature	T_{STG}	-30	80	°C	

5. Electrical Characteristics

5.1 Driving TFT LCD Panel

$T_a = 25\text{ }^\circ\text{C}$

Item	Symbol	MIN	TYP	MAX	Unit	Remark
Digital Supply Voltage	V_{DD}	3.0	3.3	3.6	V	
Input Signal Voltage	Low Level	V_{IL}	GND	-	$0.1 \times V_{DD}$	V
	High Level	V_{IH}	$0.8 \times V_{DD}$	-	V_{DD}	V
TFT Common Electrode	V_{COMH}	2.5	-	4.5	V	
TFT Gate ON Voltage	V_{GH}	-	15	-	V	
TFT Gate Off Voltage	V_{GL}	-	-10	-	V	

5.2 Driving Backlight

Item	Symbol	MIN	TYP	MAX	Unit	Remark
Forward Current	I_F	-	20	25	mA	
Forward Voltage	V_F	-	19.2	19.8	V	
Backlight Power consumption	W_{BL}	-	0.384	0.495	W	
LED Lifetime		25000	-	-	Hrs	

Note 1: Each LED: $I_F = 20\text{ mA}$, $V_F = 3.2\text{ V}$.

Note 2: Optical performance should be evaluated at $T_a = 25\text{ }^\circ\text{C}$ only.

Note 3: If LED is driven by high current, high ambient temperature & humidity condition. The life Time of LED will be reduced. Operating life means brightness goes down to 50% initial brightness. Typical operating life time is estimated data.

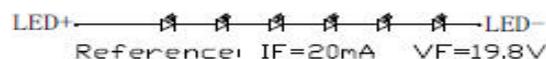
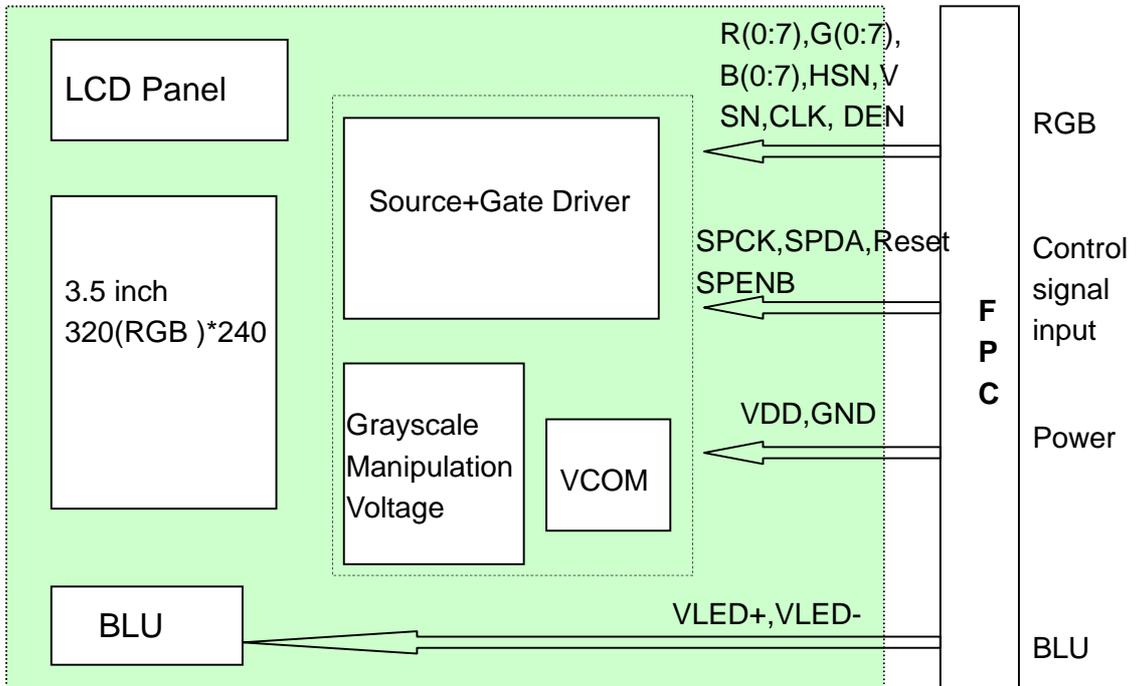


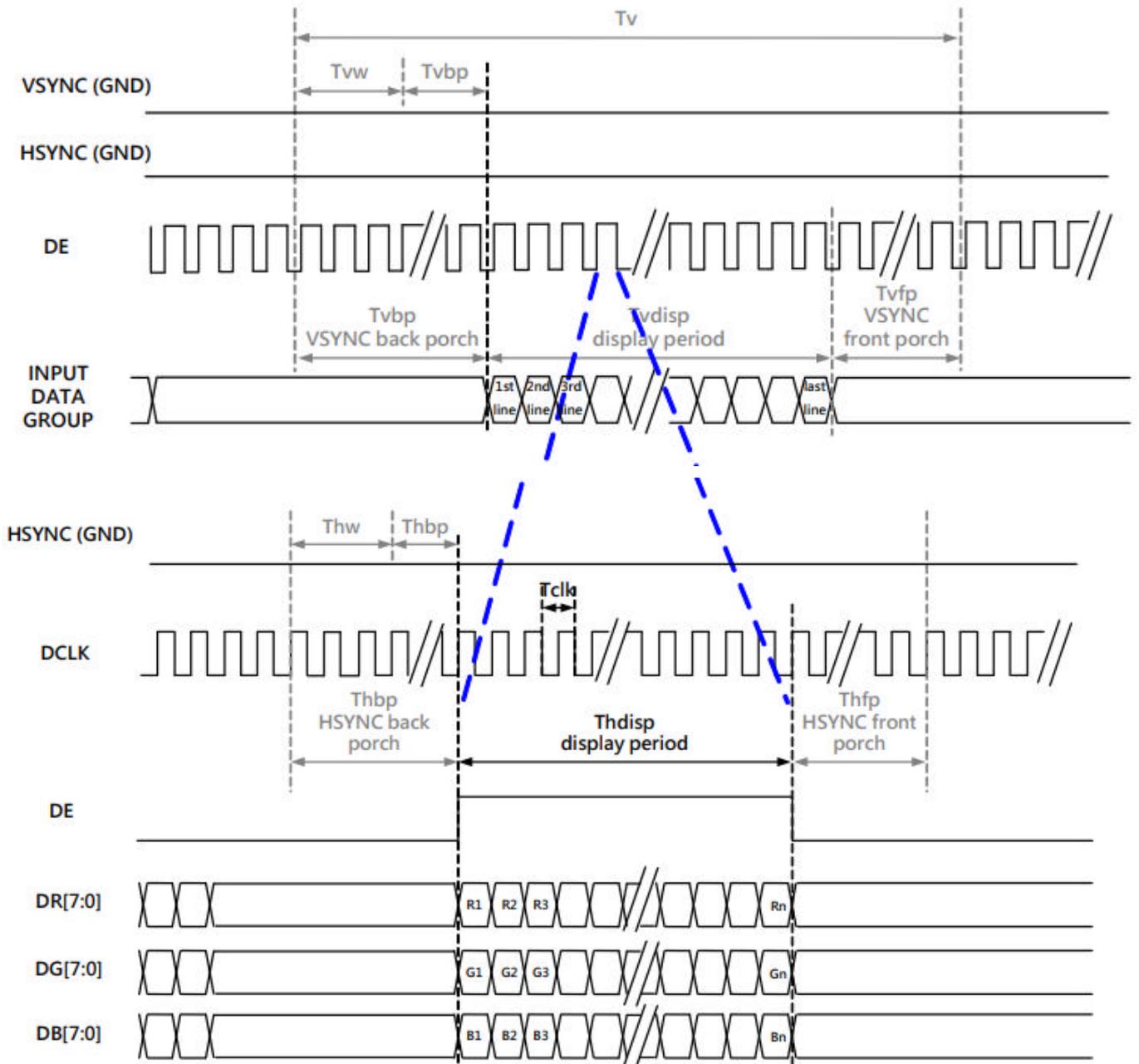
Figure : LED connection of backlight

5.3 Block Diagram



6. Interface Timing

6.1 Parallel RGB DE Mode



6.2 Parallel RGB Input Timing Table

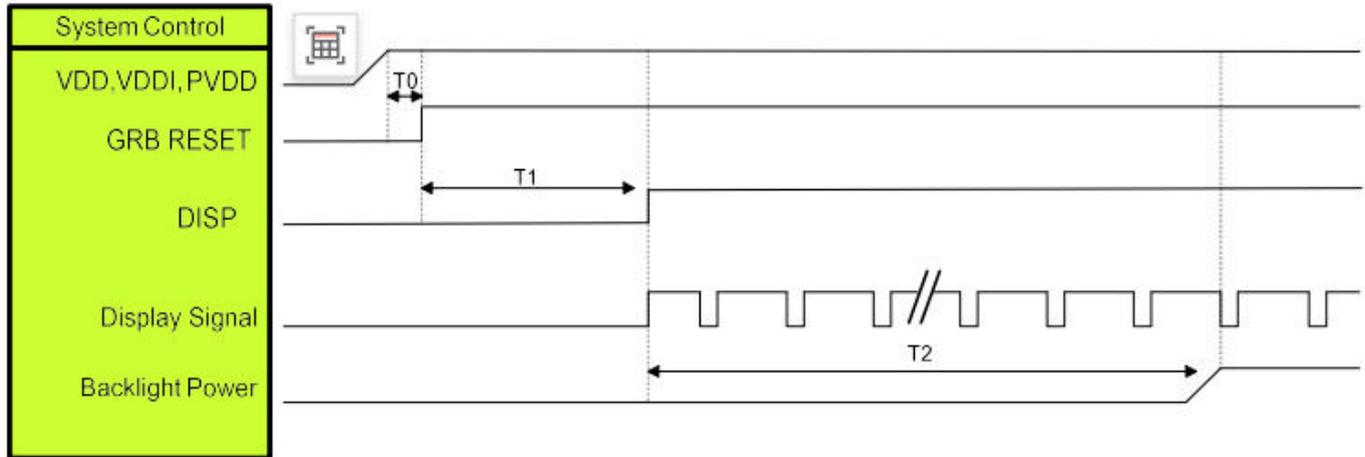
Parallel 24-bit RGB Input Timing (PVDD=VDD=VDDI= 3.3V, AGND= 0V, TA=25°C)

Parallel 24-bit RGB Input Timing Table							
Item	Symbol	Min.	Typ.	Max.	Unit	Note	
DCLK Frequency	Fclk	5	6	8	MHz		
DCLK Period	Tclk	125	167	200	ns		
HSYNC	Period Time	Th	325	371	438	DCLK	
	Display Period	Thdisp	-	320	-	DCLK	
	Back Porch	Thbp	3	43	43	DCLK	SYNC mode back porch control by H_BLANKING[7:0] setting Thbp= H_BLANKING[7:0]
	Front Porch	Thfp	2	8	75	DCLK	
	Pulse Width	Thw	2	4	43	DCLK	
VSYNC	Period Time	Tv	244	260	289	HSYNC	
	Display Period	Tvdisp	-	240	-	HSYNC	
	Back Porch	Tvbp	2	12	12	HSYNC	SYNC mode back porch control by V_BLANKING[7:0] setting Tvbp= V_BLANKING[7:0]
	Front Porch	Tvfp	2	8	37	HSYNC	
	Pulse Width	Tvw	2	4	12	HSYNC	

Note: It is necessary to keep Tvbp =12 and Thbp =43 in sync mode. DE mode is unnecessary to keep it.

6.3 POWER ON/OFF SEQUENCE

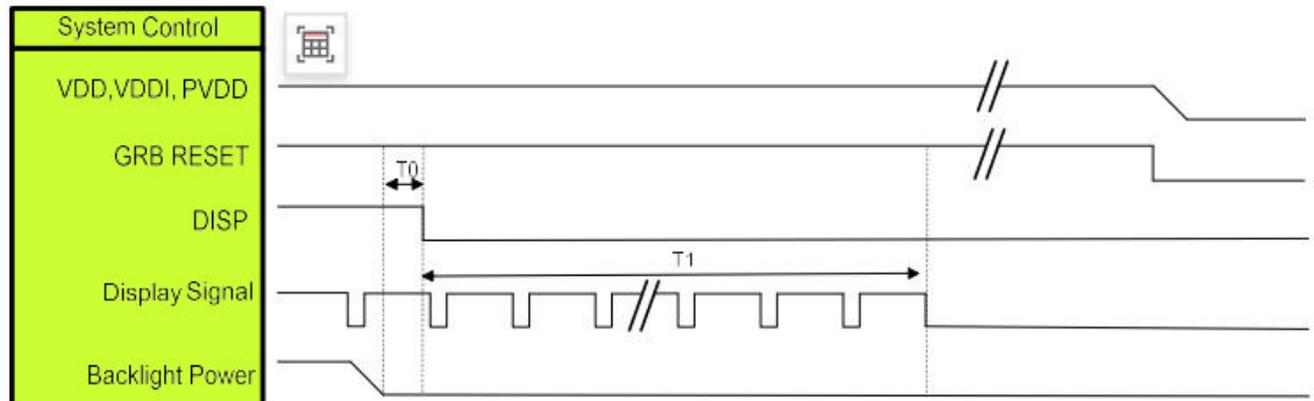
Power On Sequence



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

Power Off Sequence



Symbol	Description	Min. Time	Unit
T0	Backlight Power off to DISP="Low"	5	ms
T1	DISP="Low" to IC internal voltage discharge complete	80	ms

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

7. Optical Characteristics

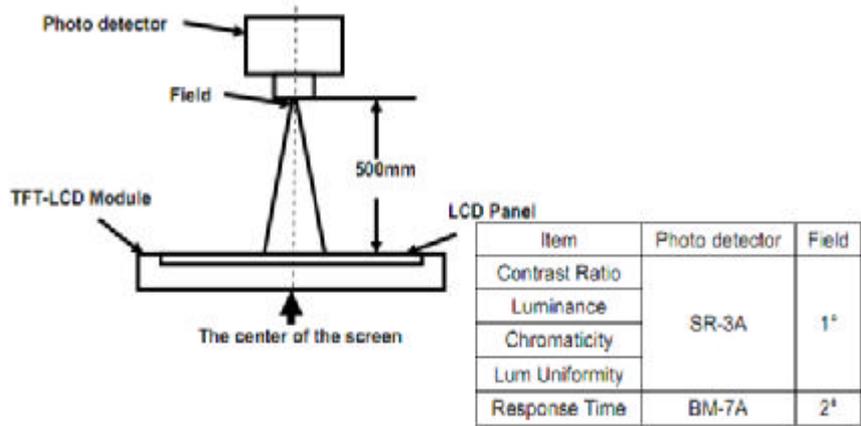
Items	Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
Viewing angles	θ_T	Center CR \geq 10	-	85	-	Degree.	Note2
	θ_B		-	85	-		
	θ_L		-	85	-		
	θ_R		-	85	-		
Contrast Ratio	CR	$\Theta = 0$	-	800	-	-	Note1, Note3
Response Time	T_{ON}	25°C	-	25	40	ms	Note1, Note4
	T_{OFF}		-	25	40		
Chromaticity	White	X_W	0.26	0.31	0.36	-	Note1, Note5
		Y_W	0.28	0.33	0.38	-	
Uniformity	U		80	-	-	%	Note1, Note6
NTSC			-	50	-	%	Note5
Luminance	L			430	-	nits	Note1, Note7

Test Conditions:

1. IF= 20mA (one channel), the ambient temperature is 25.
2. The test systems refer to Note 1 and Note 2.

Note 1: Definition of optical measurement system.

The optical characteristics should be measured in dark room. After 5 minutes operation, the optical Properties are measured at the center point of the LCD screen. All input terminals LCD panel must be ground when measuring the center area of the panel.



Note 2: Definition of viewing angle range and measurement system.

Viewing angle is measured at the center point of the LCD by CONOSCOPE(ergo-80).

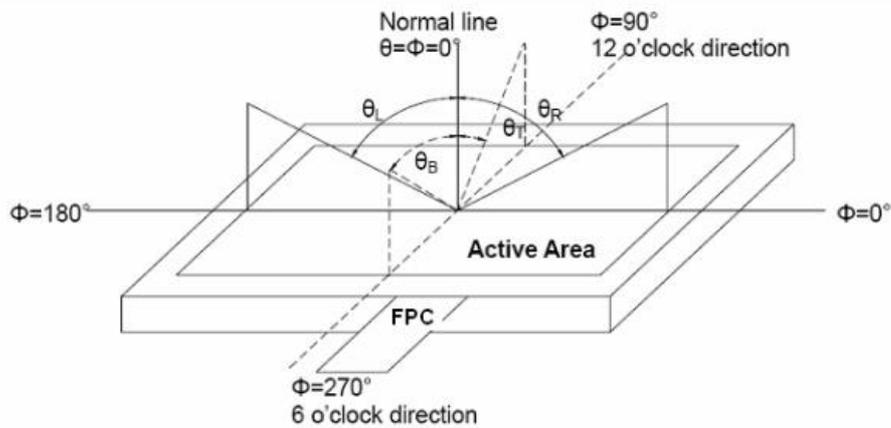


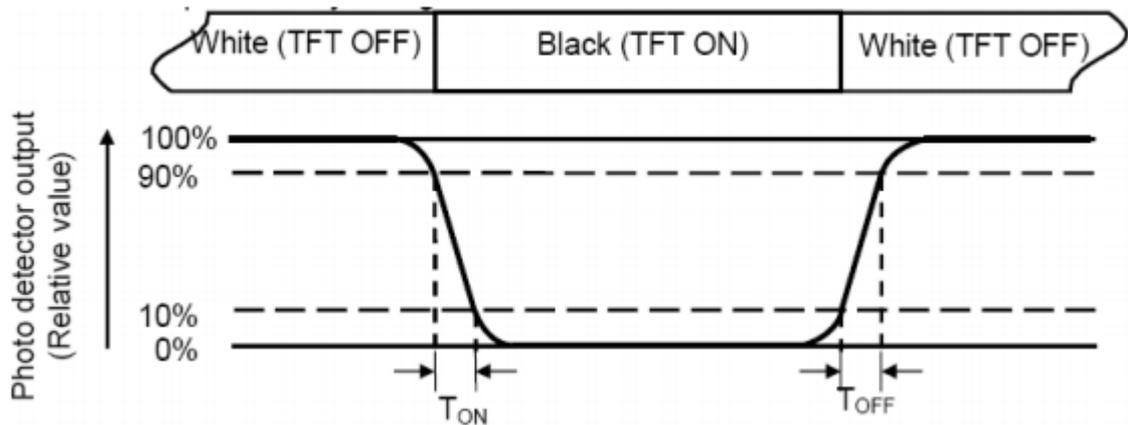
Fig. 1 Definition of viewing angle

Note 3: Definition of contrast ratio

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

Note 4: Definition of Response time

The response time is defined as the LCD optical switching time interval between “White” state and “Black” state. Rise time (TON) is the time between photo detector output intensity changed from 90% to 10%. And fall time (TOFF) is the time between photo detector output intensity changed from 10% to 90%.



Note 5: Definition of color chromaticity (CIE1931)
 Color coordinates measured at center point of LCD.

Note 6: Definition of Luminance Uniformity

Active area is divided into 9 measuring areas (Refer Fig. 2). Every measuring point is placed at the Center of each measuring area

$$\text{Luminance Uniformity (U)} = \text{Lmin} / \text{Lmax} \times 100\%$$

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

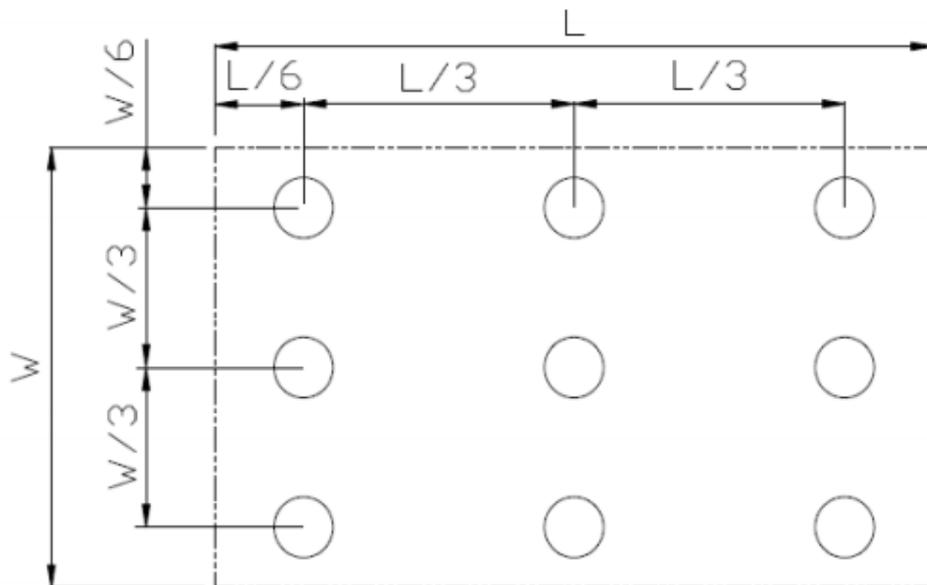


Fig. 2 Definition of uniformity

Lmax: The measured maximum luminance of all measurement position.

Lmin: The measured minimum luminance of all measurement position.

Note 7: Definition of Luminance:

Measure the luminance of white state at center point.

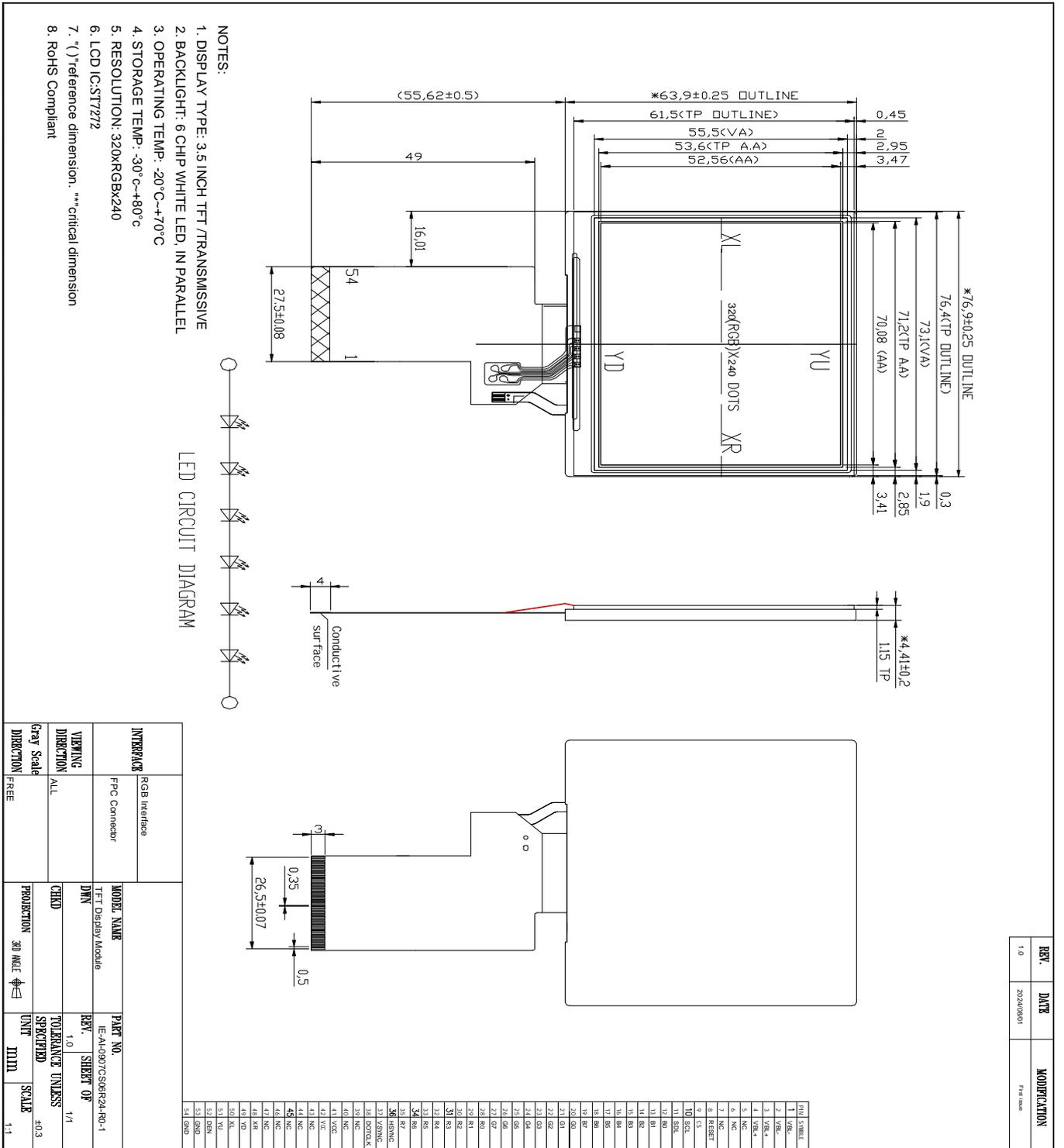
8. Environmental / Reliability Tests

No	Test Item	Condition	Remarks
1	High Temperature Operation	T _s = +70°C, 240hrs	Note 1 IEC60068-2-2, GB2423. 2-89
2	Low Temperature Operation	T _a = -20°C, 240hrs	Note 2 IEC60068-2-1 GB2423.1-89
3	High Temperature Storage	T _a = +80°C, 240hrs	IEC60068-2-2 GB2423. 2-89
4	Low Temperature Storage	T _a = -30°C, 240hrs	IEC60068-2-1 GB/T2423.1-89
5	High Temperature & Humidity Storage	T _a = +60°C, 90% RH max, 160 hours	IEC60068-2-3 GB/T2423.3-2006
6	Thermal Shock (Non-operation)	-30°C 30 min ~ +80°C 30 min Change time: 5min, 30 Cycle	Start with cold temperature, end with high temperature IEC60068-2-14, GB2423.22-87
7	Electro Static Discharge (Operation)	C=150pF, R=330 Ω, 5 points/panel Air:±8KV, 5 times; Contact: ±4KV, 5 times; (Environment: 15°C ~ 35°C, 30% ~ 60%, 86Kpa ~ 106Kpa)	IEC61000-4-2 GB/T17626.2-1998
8	Vibration (Non-operation)	Frequency range: 10~55Hz, Stroke: 1.mm Sweep: 10Hz~55Hz~10Hz 2 hours for each direction of X .Y. Z. (package condition)	IEC60068-2-6 GB/T2423.5-1995
9	Shock (Non-operation)	60G 6ms, ± X, ±Y , ± Z 3 times for each direction	IEC60068-2-27 GB/T2423.5-1995
10	Package Drop Test	Height: 80 cm, 1 corner, 3 edges, 6 surfaces	IEC60068-2-32 GB/T2423.8-1995

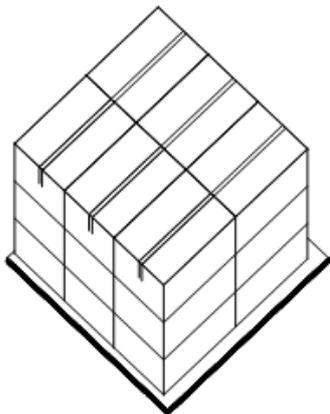
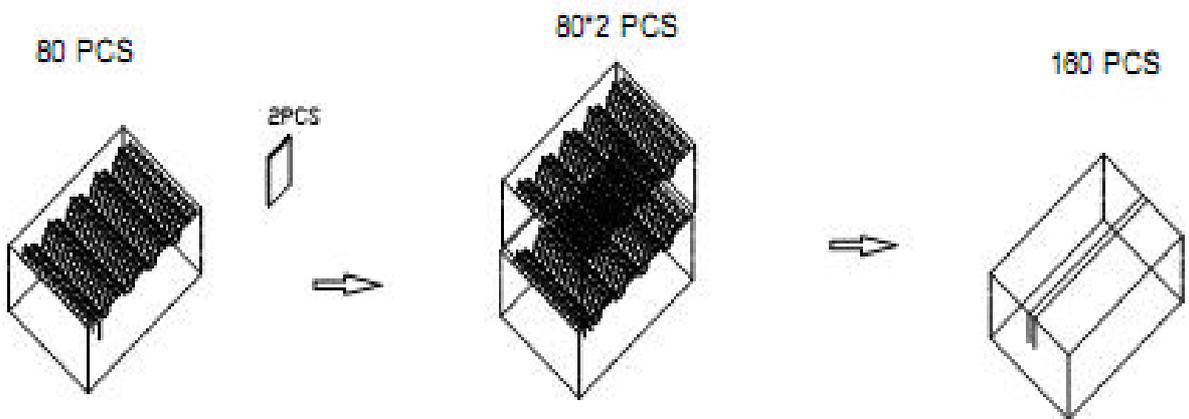
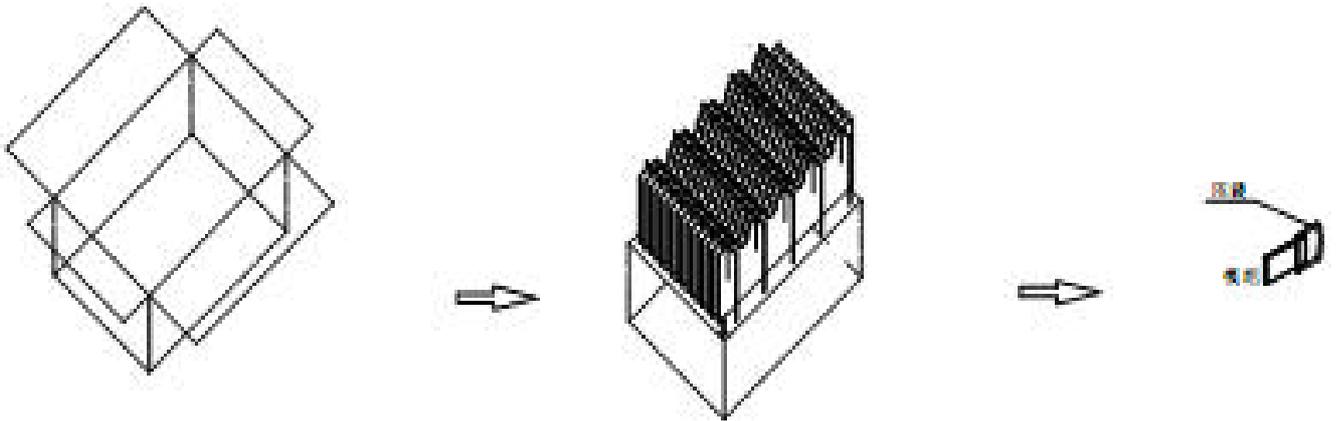
Note: 1. T_S is the temperature of panel's surface.

2. T_a is the ambient temperature of sample.

9. Mechanical Drawing



10. Packing



11. Precautions for Use of LCD modules

11.1 Handling Precautions

11.1.1. The display panel is made of glass. Do not subject it to a mechanical shock by dropping it from a high place, etc.

11.1.2. If the display panel is damaged and the liquid crystal substance inside it leaks out, be sure not to get any in your mouth, if the substance comes into contact with your skin or clothes, promptly wash it off using soap and water.

11.1.3. Do not apply excessive force to the display surface or the adjoining areas since this may cause the color tone to vary.

11.1.4. The polarizer covering the display surface of the LCD module is soft and easily scratched. Handle this polarizer carefully.

11.1.5. If the display surface is contaminated, breathe on the surface and gently wipe it with a soft dry cloth. If still not completely clear, moisten cloth with one of the following solvents:

- Isopropyl alcohol
- Ethyl alcohol

Solvents other than those mentioned above may damage the polarizer. Especially, do not use the following:

- Water
- Ketone
- Aromatic solvents

11.1.6. Do not attempt to disassemble the LCD Module.

11.1.7. If the logic circuit power is off, do not apply the input signals.

11.1.8. To prevent destruction of the elements by static electricity, be careful to maintain an optimum work environment.

11.1.8.1. Be sure to ground the body when handling the LCD Modules.

11.1.8.2. Tools required for assembly, such as soldering irons, must be properly ground.

11.1.8.3. To reduce the amount of static electricity generated, do not conduct assembly and other work under dry conditions.

11.1.8.4. The LCD Module is coated with a film to protect the display surface. Be care when peeling off this protective film since static electricity may be generated.

11.2 Storage Precautions

11.2.1. When storing the LCD modules, avoid exposure to direct sunlight or to the light of fluorescent lamps.

11.2.2. The LCD modules should be stored under the storage temperature range. If the LCD modules will be stored for a long time, the recommend condition is:

Temperature : 0°C ~ 40°C Relatively humidity: ≤80%

11.2.3. The LCD modules should be stored in the room without acid, alkali and harmful gas.

11.3 Transportation Precautions

The LCD modules should be no falling and violent shocking during transportation, and also should avoid excessive press, water, damp and sunshine.