SPECIFICATION

Customer: _____

Model Name: SAT050BO40D12R17-30076T051KD

ERP NO.: 1010500113

Spec Vision: V.1

Date: 2022-04-23

■ **Preliminary Specification**

☐ **Final Specification**

Approved by	Comment

Prepared by	Reviewed by	Approved by

Record of Revision

Version	Revise Date	Page	Content	Modified by
V.1	2022-04-23	ALL	First Issued.	Tyler

Contents

1. General Specifications

5.0” is a color active matrix thin film transistor (TFT) IPS liquid crystal display (LCD) that uses amorphous silicon TFT as a switching device. It is composed of a TFT LCD panel, Driver IC, FPC and Backlight.

NO.	Item	Specification	Remark
1	Panel Size	5.0 inch(Diagonal)	
2	Driver Method	a-Si TFT active matrix	
3	Display Color	16.7M	
4	Display Mode	Normally White	
5	Viewing Direction	6 o’clock	
	Gray Scale Inversion Direction	Free o’clock	
6	Resolution	480 x 3(RGB) x 272	
7	Active Area	110.88(W) x62.83(H) mm	
8	Pixel pitch	0.077(H) × 0.231(V)	
9	Pixel Arrangement	RGB - stripe	
10	Module Size	120.7(W) x 75.8(H) x 2.9(D) mm	
11	Interface	TTL RGB-24bit parallel interface	
12	Driving IC	ST7257	
13	Backlight	White LED	
14	Weight	TBD	g

Note 1: Color tune is slightly changed by temperature and driving voltage.

Note 2: LCM weight tolerance: ±5%

2. Pin Assignment

No.	Symbol	Function	Remarks
1	LED_K	Power for LED backlight(Cathode)	
2	LED_A	Power for LED backlight(anode)	
3	GND	Power Ground	
4	VDD	Power for Digital Circuit(3.3V)	
5~12	R0~R7	Red data	
13~20	G0~G7	Green data	
21~28	B0~B7	Blue data	
29	GND	Power Ground	
30	DCLK	Pixel clock	
31	DISP	Display on/off	
32	HSYNC	Horizontal Sync input	
33	VSYNC	Vertical Sync input	
34	DE	Data input enable	
35	NC	No connection	
36	GND	Power Ground	
37	NC(XR)	Right electrode-differential analog	When this PIN not used,please leave it open
38	NC(YD)	Bottom electrode-differential analog	
39	NC(XL)	Left electrode-differential analog	
40	NC(YU)	Top electrode-differential analog	

3. Operation Specifications

3.1. Absolute Maximum Ratings

Voltage (AGND=GND=0V, Ta = 25℃)

Item	Symbol	Values		Unit	Remark
		Min.	Max.		
Power Voltage	VDD	-0.3	4.0	V	
Operating Temperature	Top	-20	55	℃	
Storage Temperature	Tst	-20	60	℃	

Note: 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 case, the module may be permanently destroyed.

3.1.1. Typical Operation Range

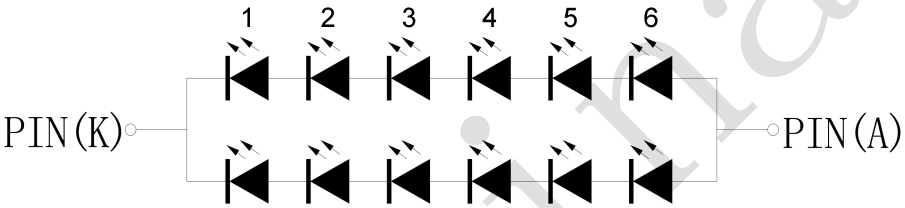
Item	Symbol	Values			Unit
		Min.	Typ.	Max.	
Power Voltage	VDD	3.0	3.3	3.6	V
Input logic high voltage	V_{IH}	0.7V_{DD}	-	V_{DD}	V
Input logic low voltage	V_{IL}	0	-	0.3V_{DD}	V

3.1.2. Current Consumption

Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
Current for Driver	I_{GH}	-	70	-	mA	VDD=3.3V

3.1.3. Backlight Driving Conditions

Parameter	Symbol	Min.	Typ.	Max.	Unit	Remark
Supply voltage of white LED backlight	V_L	16.8	18.6	20.4	V	6S2P
Current for LED backlight	IL	-	40	-	mA	20mA/LED
Power dissipation	Pd	-	744	-	mW	12LED
Luminance (on the module surface,BM-7)		450	500	-	cd/m^2	
LED life time	-	30000	-	-	Hr	

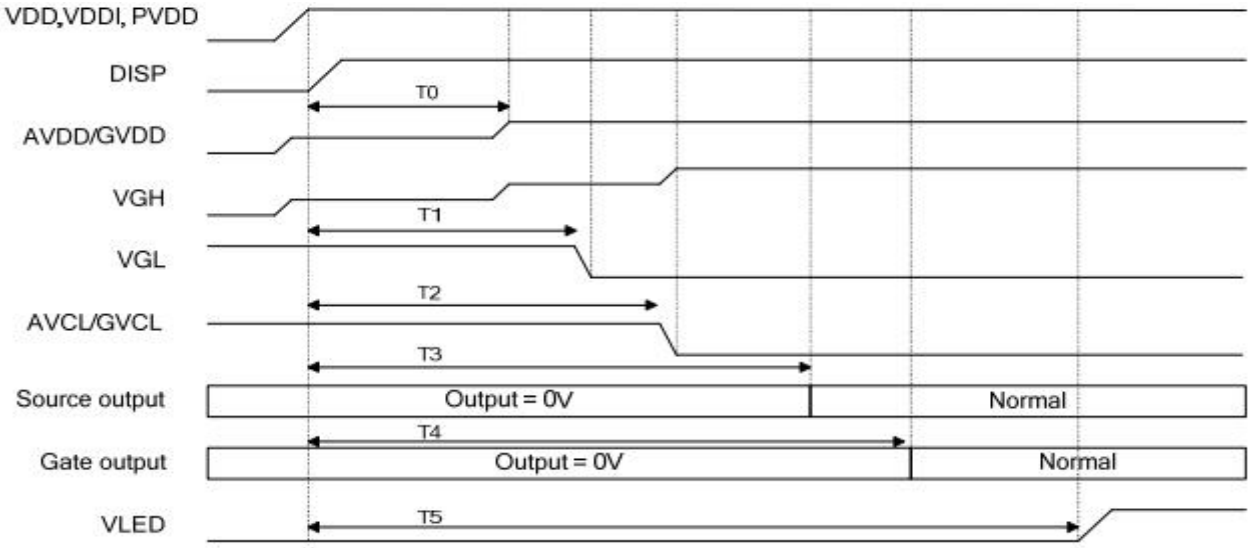


电路原理图:

(If=40mA. Vf=18.6±1.8V)

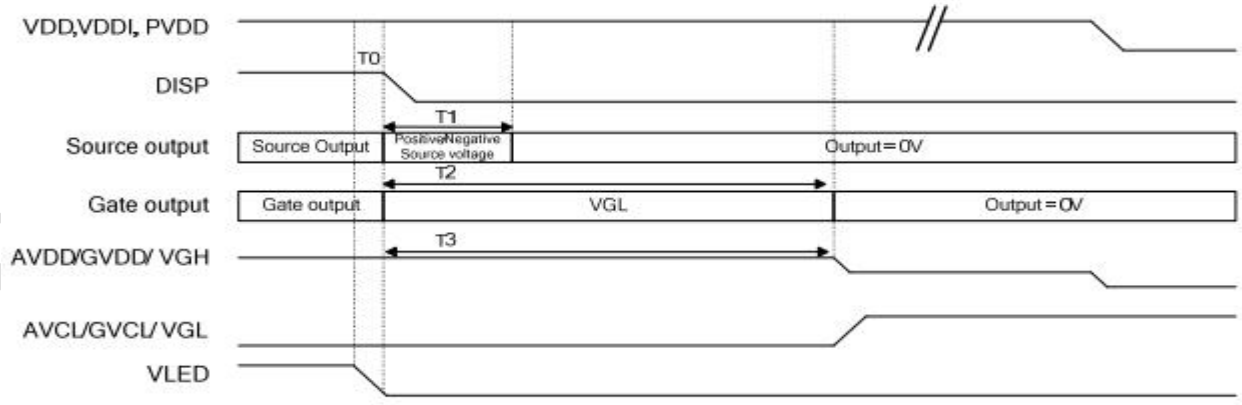
3.2. Power Sequence

3.2.1. Power On Sequence



Symbol	Description	Min. Time	Unit
T0	DISP="High" to AVDD/GVDD voltage stability	40	ms
T1	DISP="High" to VGL voltage stability	50	ms
T2	DISP="High" to AVCL/GVCL stability	70	ms
T3	DISP="High" to Source output	100	ms
T4	DISP="High" to Gate output	110	ms
T5	Black Turn on	130	ms

3.2.2. Power Off Sequences



Symbol	Description	Min. Time	Unit
T0	Backlight turn off to DISP="Low"	5	ms
T1	DISP="Low" to Source output disable	20	ms
T2	DISP="Low" to Gate output disable	50	ms
T3	DISP="Low" to Gate output disable	50	ms

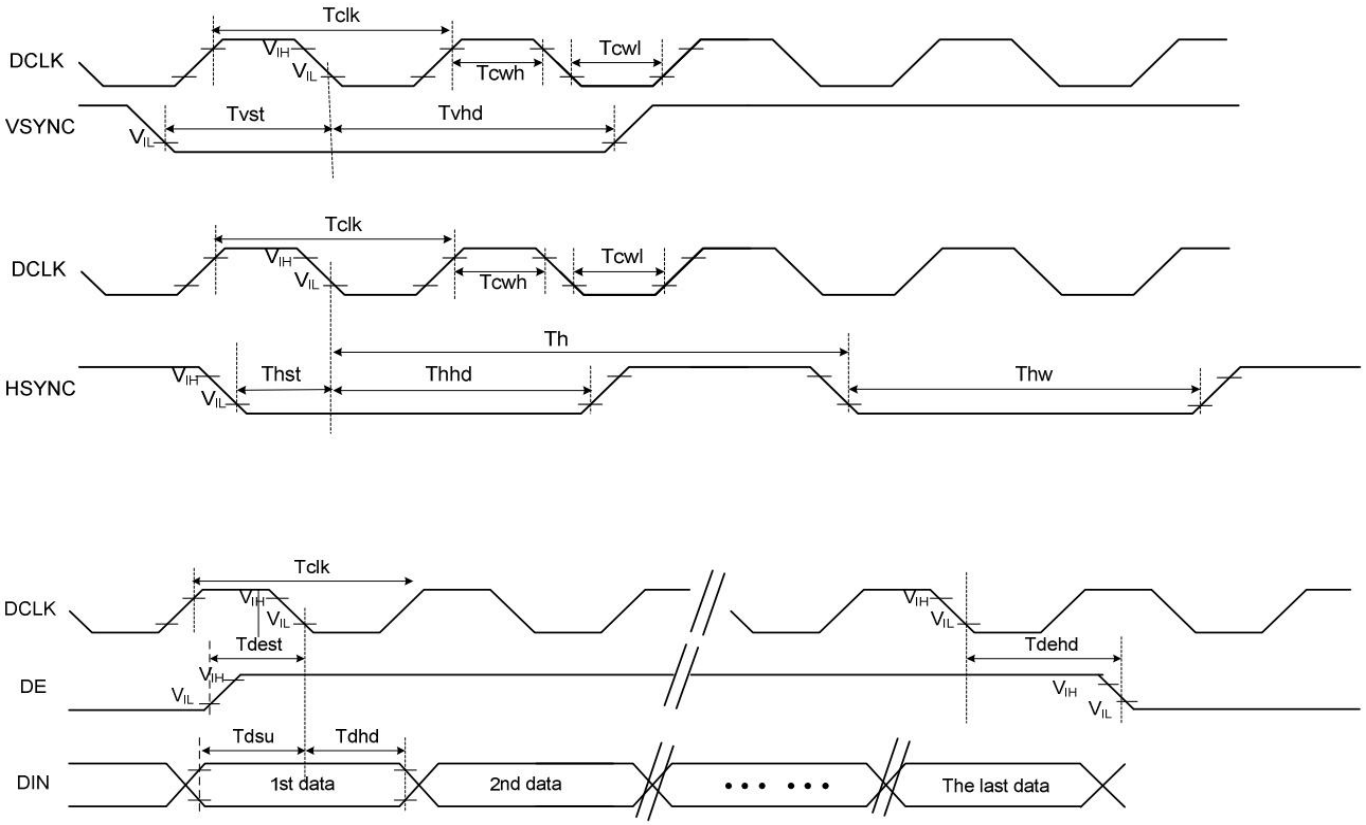
3.3. Timing Characteristics

3.3.1. AC Electrical Characteristics

AC Electrical Characteristics (VDD=VDDI= 3.3V, AGND= 0V, TA=25°C)

Item	Symbol	Min.	Typ.	Max.	Unit	Conditions
System operation timing						
VDD power source slew time	TPOR	-	-	20	ms	From 0V to 99% VDD
GRB pulse width	tRSTW	10	50	-	us	R=10Kohm, C=1uF
Input/ Output timing						
CLK pulse duty	Tcw	40	50	60	%	
HSYNC period	Th	55	60	65	us	
VSYNC setup time	Tvst	12	-	-	ns	
VSYNC hold time	Tvhd	12	-	-	ns	
HSYNC setup time	Thst	12	-	-	ns	
HSYNC hold time	Thhd	12	-	-	ns	
Data setup time	Tdsu	12	-	-	ns	
Data hold time	Tdhd	12	-	-	ns	
DE setup time	Tdest	12			ns	
DE hold time	Tdehd	12			ns	
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-wire serial communication						
Delay between CSB and VSYNC	Tcv	1			us	
CS input setup time	Ts0	50			ns	
Serial data input setup time	Ts1	50			ns	
CS input hold time	Th0	50			ns	
Serial data input hold time	Th1	50			ns	
SCL pulse high width	Twh1	50			ns	
SCL pulse low width	Twl1	50			ns	
CS pulse high width	Tw2	400			ns	

3.3.2. Input Clock and Date Timing Diagram:



3.3.3. Timing

480RGB X 272 Resolution Timing Table							
Item		Symbol	Min.	Typ.	Max.	Unit	Remark
DCLK Frequency		Fclk	8	9	12	MHz	
DCLK Period		Tclk	83	111	125	ns	
HSYNC	Period Time	Th	485	531	598	DCLK	
	Display Period	Thdisp		480		DCLK	
	Back Porch	Thbp	3	43	43	DCLK	By H_Blanking setting
	Front Porch	Thfp	2	8	75	DCLK	
	Pulse Width	Thw	2	4	75	DCLK	
VSYNC	Period Time	Tv	276	292	321	H	
	Display Period	Tvdisp		272		H	
	Back Porch	Tvbp	2	12	12	H	By V_Blanking setting
	Front Porch	Tvfp	2	8	37	H	
	Pulse Width	Tvw	2	4	37	H	

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

4. Optical Specifications

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Viewing Angle		θU	CR≥10	40	50	-	degree	3
		θD		60	70	-		
		θL		60	70	-		
		θR		60	70	-		
Contrast Ratio		CR	Θ=0°	350	500	-	-	4
Color saturation		NTSC	CIE 1931	-	60	-	%	
Response Time		Ton+ Toff	25℃	-	20	-	ms	5
Chromaticity	White	X	LCM	-0.03	0.290	+0.03	-	1
		Y			0.330			
	Red	X	LCD SPEC	-0.03	0.602	+0.03		
		Y			0.325			
	Green	X			0.300			
		Y			0.562			
	Blue	X			0.144			
		Y			0.175			
Luminance (center)		L		450	500	-	cd/m²	1
Luminance Uniformity		ΔL		75	80	-	%	1.2

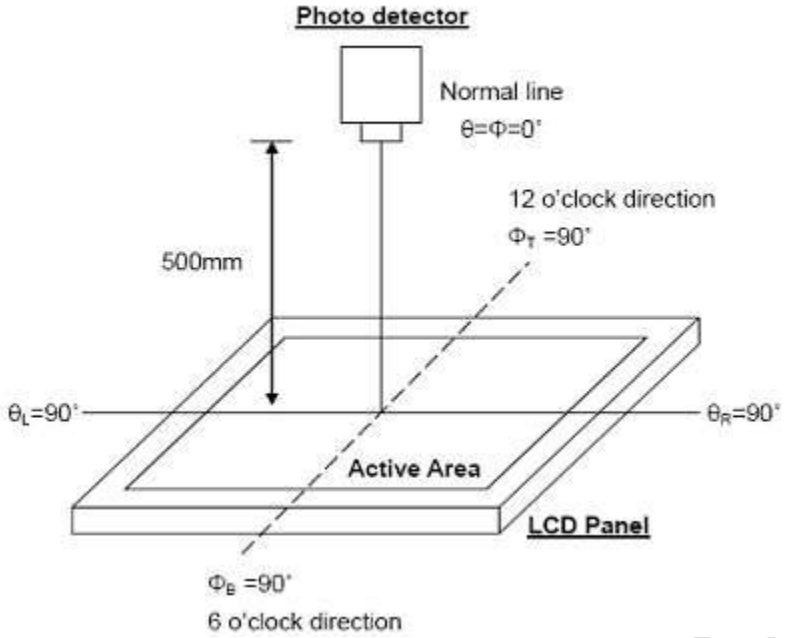
Note：The parameter is slightly changed by temperature, driving voltage and materiel

Note 1: The data are measured after LEDs are turned on for 5 minutes. LCM displays full white. The brightness is the average value of 9 measured spots. Measurement equipment BM-7 (Φ8mm)

Measuring condition:

- Measuring surroundings: Dark room.
- Measuring temperature: Ta=25℃.
- Adjust operating voltage to get optimum contrast at the center of the display.

The measured value is more than 5 minutes at the center point of the LCD panel, and the backlight is turned on at the same time.

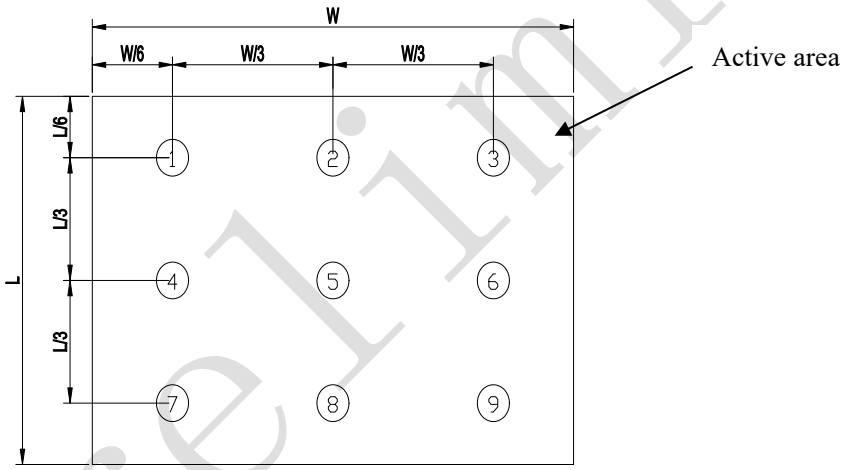


Note 2: The luminance uniformity is calculated by using following formula.

⊿Bp = Bp (Min.) / Bp (Max.)×100 (%)

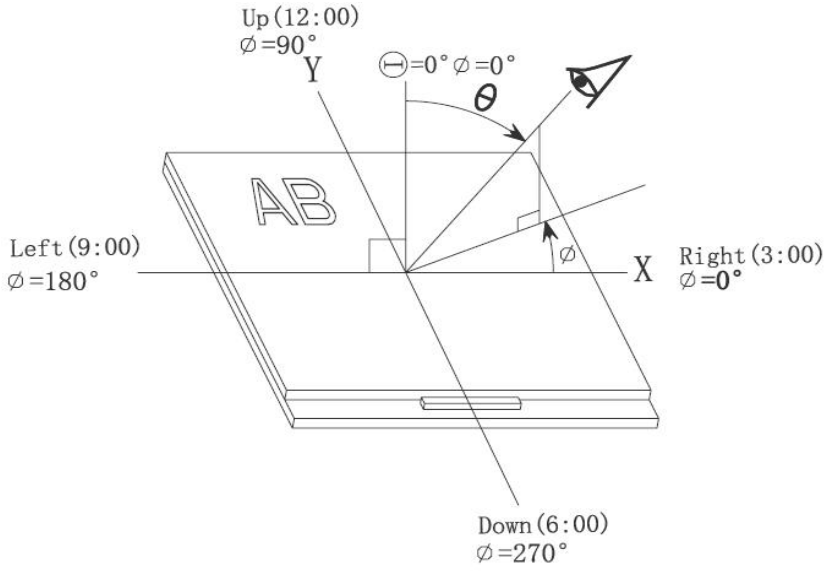
Bp (Max.) = Maximum brightness in 9 measured spots

Bp (Min.) = Minimum brightness in 9 measured spots.



Note 3: The definition of viewing angle:

Refer to the graph below marked by θ and Φ



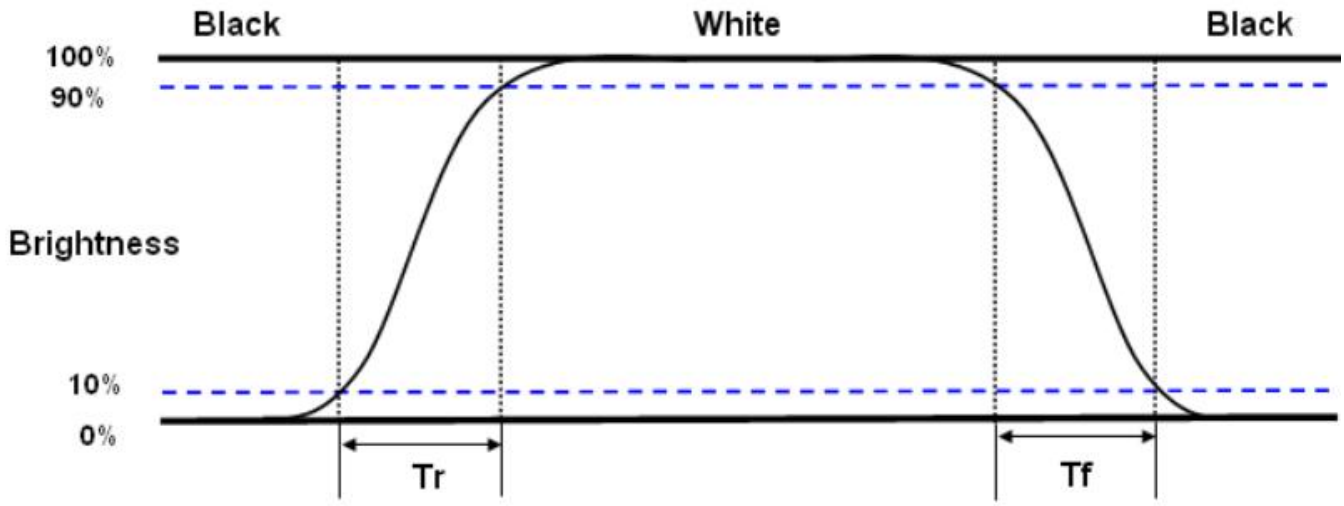
Note 4: Definition of contrast ratio

Contrast measurements shall be made at viewing angle of Θ= 0 and at the center of the LCD surface. Luminance shall be measured with all pixels in the view field set first to white, then to the dark (black) state.

$$CR = \frac{\text{Luminance when displaying a white raster}}{\text{Luminance when displaying a black raster}}$$

Note 5: Definition of Response time

The output signals of photo detector are measured when the input signals are changed from “black” to “white”(Tr) and from “white” to “black”(Tf), respectively. The response time is defined as the time interval between the 10% and 90% of amplitudes. Refer to figure as below.



5. Reliability Test Items

Item	Test Conditions	Remark
High Temperature Storage	Ta=60℃; 120Hrs	Note1 ,Note4
Low Temperature Storage	Ta=-20℃; 120Hrs	Note1, Note4
High Temperature Operation	Ts=60℃; 120Hrs	Note2 ,Note4
Low Temperature Operation	Ts=-20℃; 120Hrs	Note4
Operation at High Temperature and Humidity	+50℃,90%RH; 120Hrs (no condensation)	Note4
Thermal Shock	-20℃/30min~+60℃/30min for a total 48 cycles	Start with cold temperature and end with high temperature
Package Drop Test	Height 60cm 1corner ， 3edges ， 6surfaces	
Elector Static Discharge	150pF/330Ω, Contact:±2KV,Air:±4KV	Human Body Mode
Image Sticking	25℃ ; 60min's	Note5

Note1: Ta is the ambient temperature of samples.

Note2: Ts is the temperature of panel's surfaces.

Note3: In the standard condition, there shall be no practical problem that may affect the display function. After the reliability test, the product only guarantees operation, but don't guarantee all of the cosmetic specification.

Note4: before cosmetic and function test, the product must have enough recovery time, at least 2 hours at room temperature.

Note5: Condition of image sticking test :25℃±2℃, Operation with test pattern sustained for 60min's,then change to gray pattern immediately. After 5min's, the Mura must be disappeared completely.

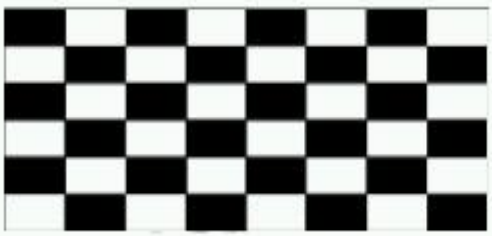
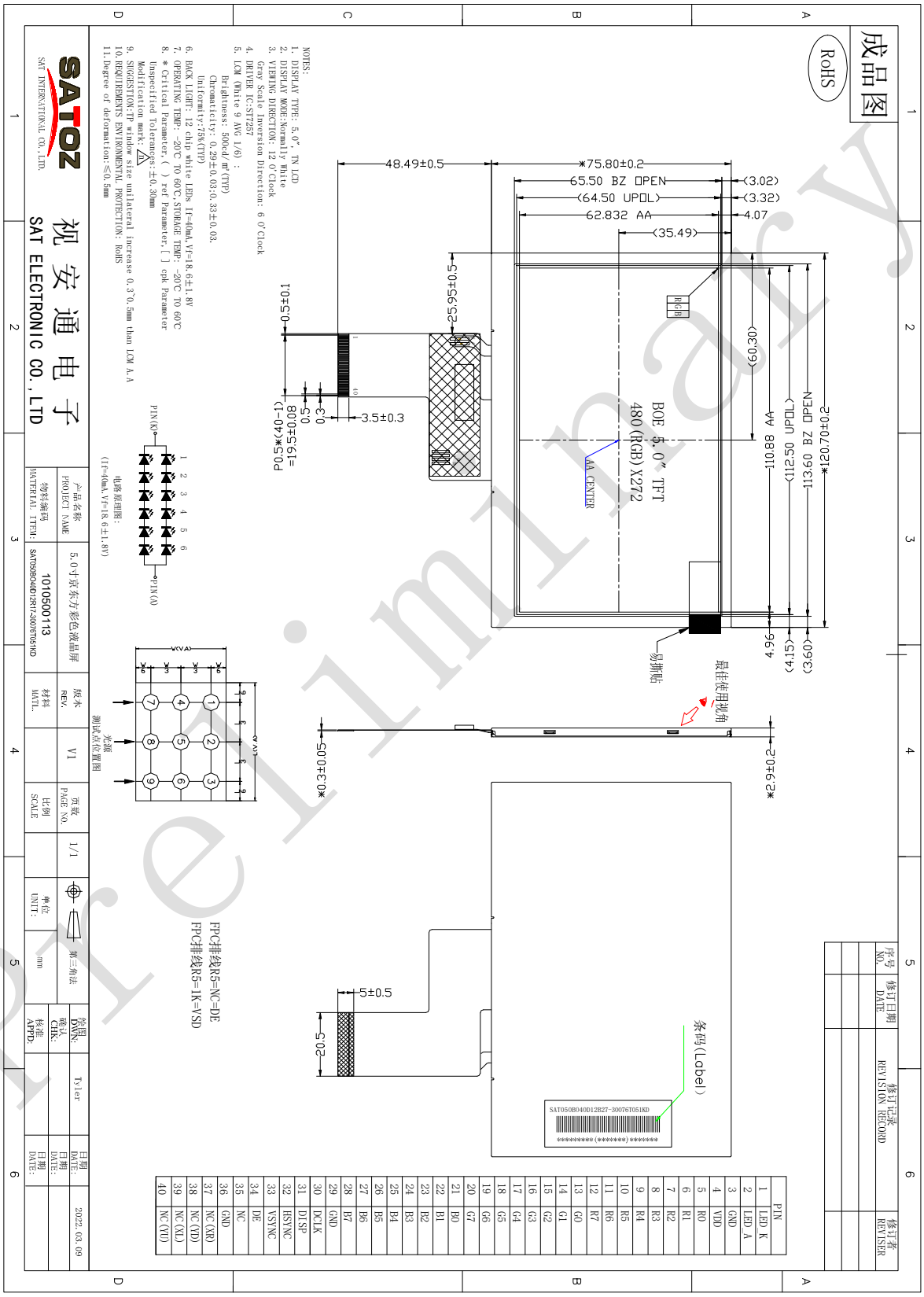


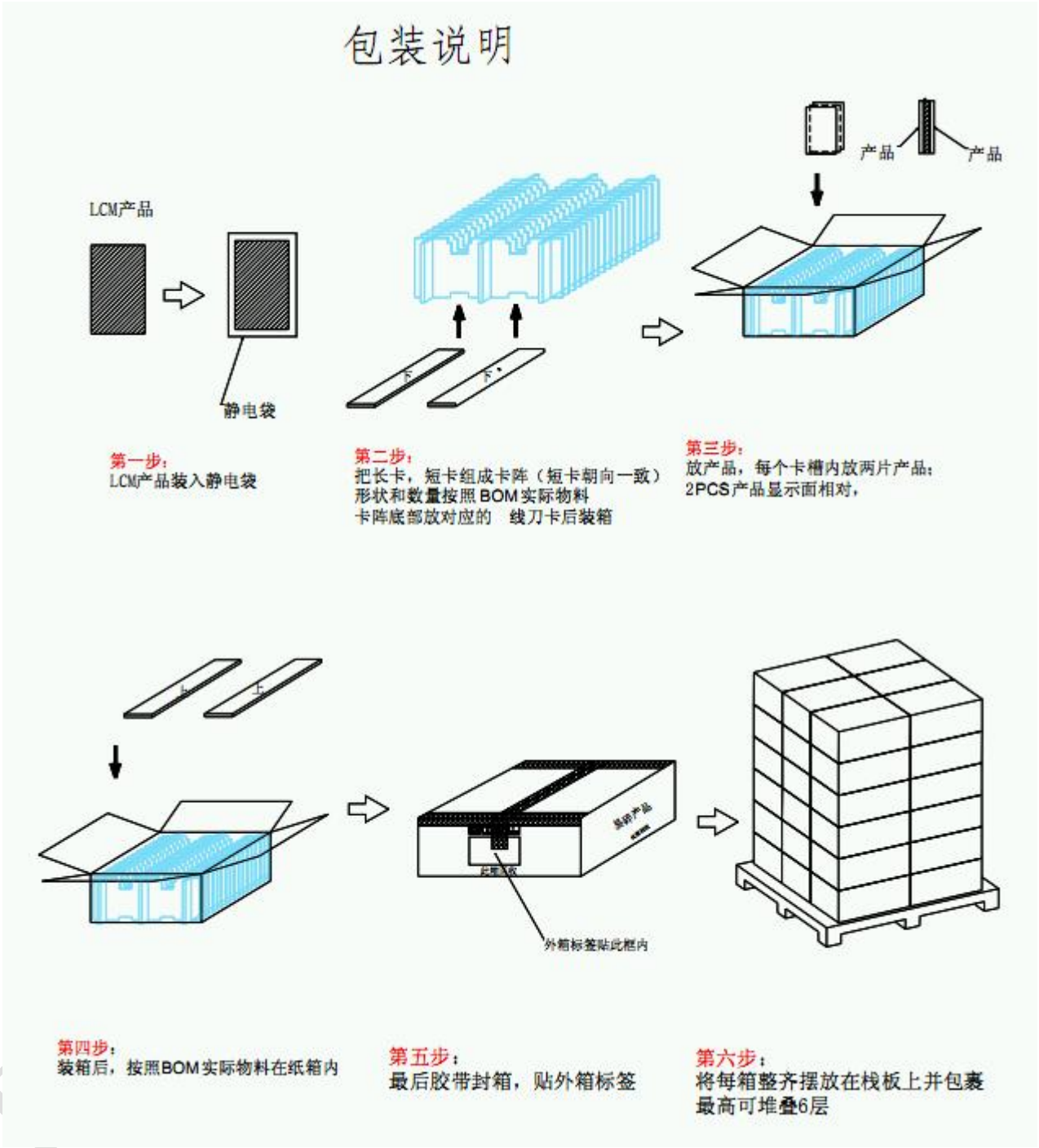
Image Sticking -pattern

Lv127 Gray pattern

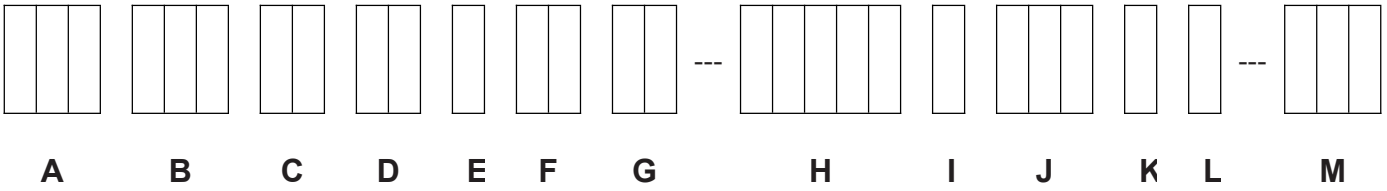
6. Mechanical Drawing



7. Package Drawing



8. Numbering System



NO.	Definition	Specifications
A	Company code	SAT INTERNATIONAL CO.LTD.
B	Display monitor opposite angle line size	Unit : inch (size<10inch:take two integers; size>=10inch:takes three integers)
C	LCD Brands	AU-AUO；CP-CPT；IV-IVO；TM-TIANMA；HS-HSD; CM-CMO；BO-BOE；AT-INNOLUX；CT-CTC
D	Interface PIN Number	Arabic numerals from 01 to 99
E	LCD Type	A--Alternated Video Signal; D--Data Video Signal; H--High Definition ; I--IPS
F	Backlight LED Number	Arabic numerals from 01 to 99
G	Backlight Color Are	Include R1、R2、Y0、Y1、B1、B2;
H	Structure Size	Include module length and width size
I	Interface Mode	T:TTL L:LVDS M:MIPI
J	FPC Length	It represents the length of FPC with three figures, divided into long rows ,middle rows and short rows
K	View Angles	Z : represent narrow viewing angle K : represent wide viewing angle I : represent all viewing angle
L	Operating Mode	D: DE mode V: VSD mode F: Inverting mode N: No mode requirements
M	Suffix	1. NULL ; 2. TP/CTP-- Touch panel; 3. other--Insignificance