

# SPECIFICATION

**Customer:** \_\_\_\_\_  
**Model Name:** SAT050AT40H12B22-30076T051ZN-115  
**ERP NO.:** 1010500115  
**Spec Vision:** V.1  
**Date:** 2022-09-12

- 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	2022-09-12	ALL	First Issued.	WSC

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## 1. General Specifications

5.0" is a color active matrix thin film transistor (TFT) TN 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	12 o'clock	
	Gray Scale Inversion Direction	6 o'clock	
6	Resolution	800 x 3(RGB) x 480	
7	Active Area	108(W) x 64.8(H) mm	
8	Dot Pitch	0.135(W) x 0.135 (H) mm	
9	Pixel Arrangement	RGB - stripe	
10	Module Size	120.8(W) x 75.9(H) x 2.85(D) mm	
11	Interface	TTL RGB-24bit parallel interface	
12	Driving IC	ILI6122+ILI5960	
13	Luminance	280(TYP)	cd/m <sup>2</sup>
14	Backlight	White LED	
15	Weight	TBD	g

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

Note 2: LCM weight tolerance:  $\pm 5\%$

### 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	
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	XR	Right electrode-differential analog	When this PIN not used,please leave it open
38	YD	Bottom electrode-differential analog	
39	XL	Left electrode-differential analog	
40	YU	Top electrode-differential analog	

## 3. Operation Specifications

### 3.1. Absolute Maximum Ratings

Voltage (AGND=GND=0V, Ta = 25°C)

Item	Symbol	Values		Unit	Remark
		Min.	Max.		
Power Voltage	VDD	-0.3	4.5	V	
Operating Temperature	T <sub>op</sub>	-10	60	°C	
Storage Temperature	T <sub>st</sub>	-20	70	°C	

**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

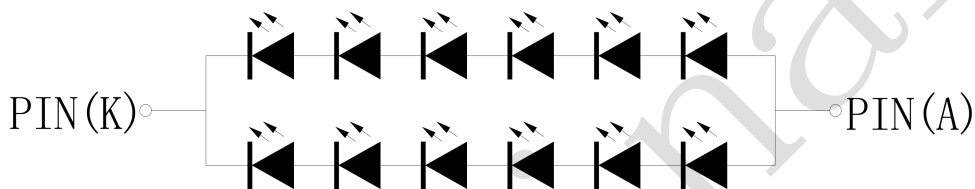
Item	Symbol	Values			Unit
		Min.	Typ.	Max.	
Power Voltage	VDD	3.0	3.3	3.6	V
Input logic high voltage	V <sub>IH</sub>	0.7V <sub>DD</sub>	-	V <sub>DD</sub>	V
Input logic low voltage	V <sub>IL</sub>	0	-	0.3V <sub>DD</sub>	V

#### 3.1.2. Current Consumption

Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
Current for Driver	I <sub>GH</sub>	-	110	130	mA	VDD=3.3V

### 3.1.3. Backlight Driving Conditions

Parameter	Symbol	Min.	Typ.	Max.	Unit	Remark
Supply voltage of white LED backlight	$V_L$	17.4	19.2	21	V	6S2P
Current for LED backlight	$I_L$	30	40	50	mA	20mA/LED
Power dissipation	$P_d$	-	768	-	mW	12LED
Luminance (on the module surface, BM-7)		230	280	-	cd/m <sup>2</sup>	
LED life time	-	30000	-	-	Hr	



电路原理图:  
( $I_f=40\text{mA}$ ,  $V_f=17.4\text{--}21\text{V}$ )

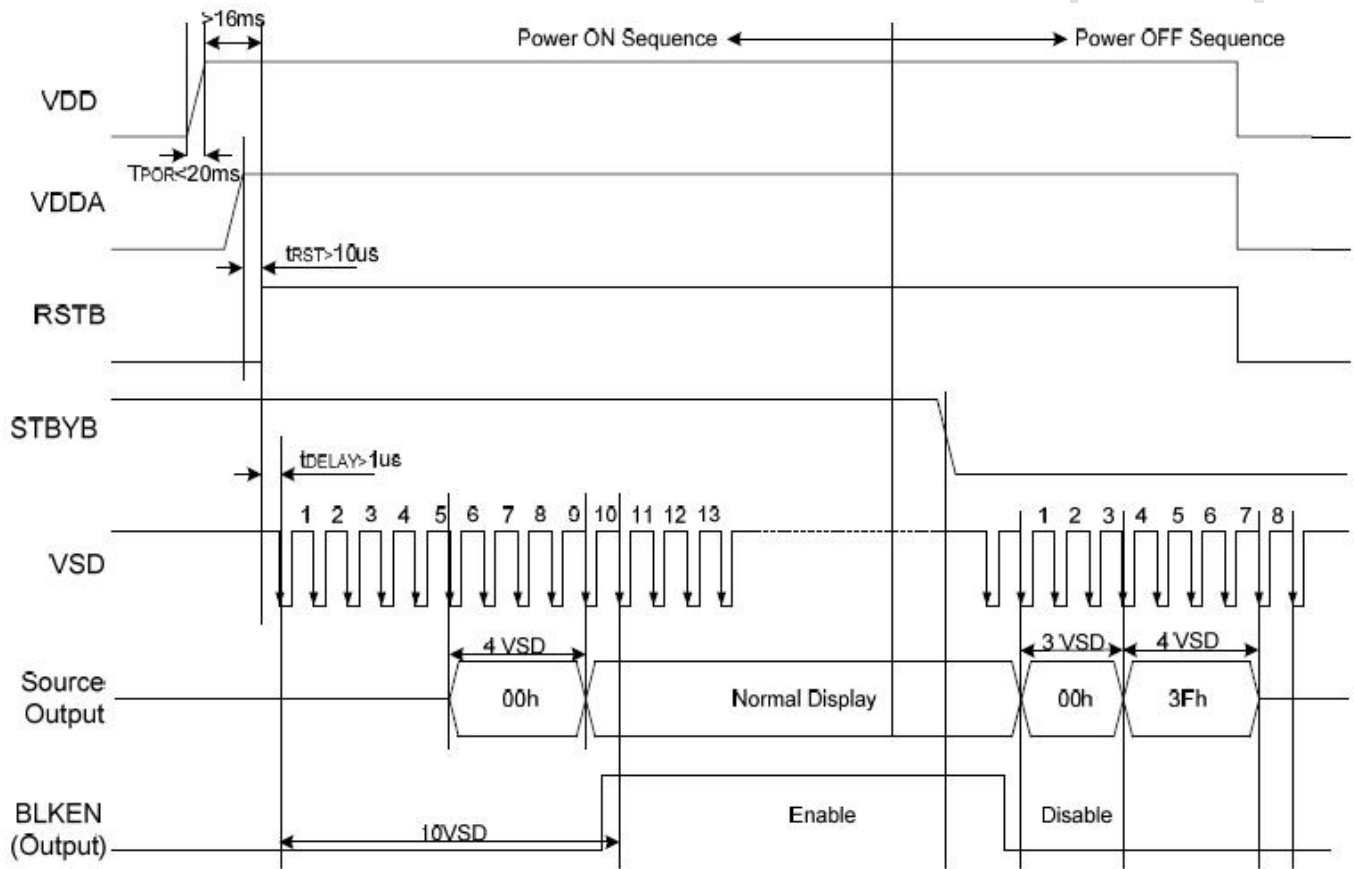
### 3.2. Power Sequence

To prevent the device damage from latch up, the power ON/OFF sequence shown below must be followed.

Power ON: VDD, DGND → VDDA, AGND → V1 to V14

Power OFF: V1 to V14 → VDDA, AGND → VDD, DGND

In order to prevent ILI6122 from power ON reset fail, the rising time ( $t_{POR}$ ) of the digital power supply VDD should be maintained within given specifications. The power ON/OFF timing sequence is illustrated as below:



Note: For prevent anormal operation,  $t_{RST}$  must be longer than 10us during Power ON sequence.



### 3.3. Timing Characteristics

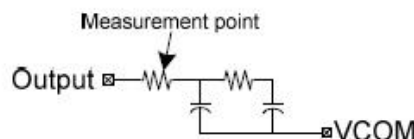
#### 3.3.1. AC Electrical Characteristics

Parameter	Symbol	Spec			Unit	Conditions
		Min.	Typ.	Max.		
VDD Power ON slew rate	$t_{POR}$	--	--	20	ms	0V ~ 0.9VDD
RSTB pulse width	$t_{RST}$	10	--	--	us	CLKIN=50MHz
CLKIN cycle time	$t_{CPH}$	20	--	--	ns	
CLKIN pulse duty	$t_{CWH}$	40	50	60	%	
VSD setup time	$t_{VST}$	8	--	--	ns	
VSD hold time	$t_{VHD}$	8	--	--	ns	
HSD setup time	$t_{HST}$	8	--	--	ns	
HSD hold time	$t_{HHD}$	8	--	--	ns	
Data setup time	$t_{DST}$	8	--	--	ns	D0[7:0], D1[7:0], D2[7:0] to CLKIN
Data hold time	$t_{DHD}$	8	--	--	ns	D0[7:0], D1[7:0], D2[7:0] to CLKIN
DE setup time	$t_{EST}$	8	--	--	ns	
DE hold time	$t_{EHD}$	8	--	--	ns	
Output stable time	$t_{SST}$	--	--	6	us	10% to 90% target voltage. CL=120pF, R=10K $\Omega$
CLKIN frequency	$f_{CLK}$	--	40	50	MHz	VDD=3.0 ~ 3.6V
CLKIN cycle time	$t_{CLK}$	20	25	--	ns	
CLKIN pulse duty	$t_{CWH}$	40	50	60	%	$T_{CLK}$
Time from HSD to Source output	$t_{HSO}$	--	20	--	CLKIN	
Time from HSD to LD	$t_{HLD}$	--	20	--	CLKIN	Note (2)
Time from HSD to STV	$t_{HSTV}$	--	2	--	CLKIN	
Time from HSD to CKV	$t_{HCKV}$	--	20	--	CLKIN	
Time from HSD to OEV	$t_{HOEV}$	--	4	--	CLKIN	
LD pulse width	$t_{WLD}$	--	10	--	CLKIN	Note (2)
CKV pulse width	$t_{WCKV}$	--	66	--	CLKIN	
OEV pulse width	$t_{WOEV}$	--	74	--	CLKIN	

Note: (1) VDD=3.0 ~ 3.6V, VDDA=6.5~13.5V, DGND=AGND=0V, Ta=-20~+85 $^{\circ}$ C

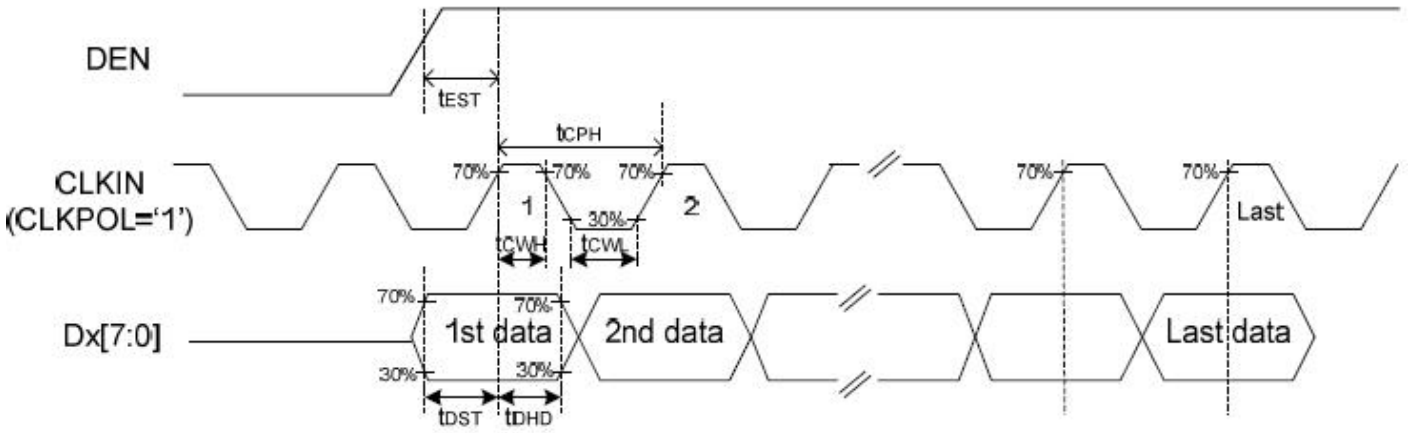
(2) The contents of the data register are transferred to the latch circuit at the rising edge of LD. Then the gray scale voltage is output from the device at the falling edge of LD.

(3) Output loading condition :

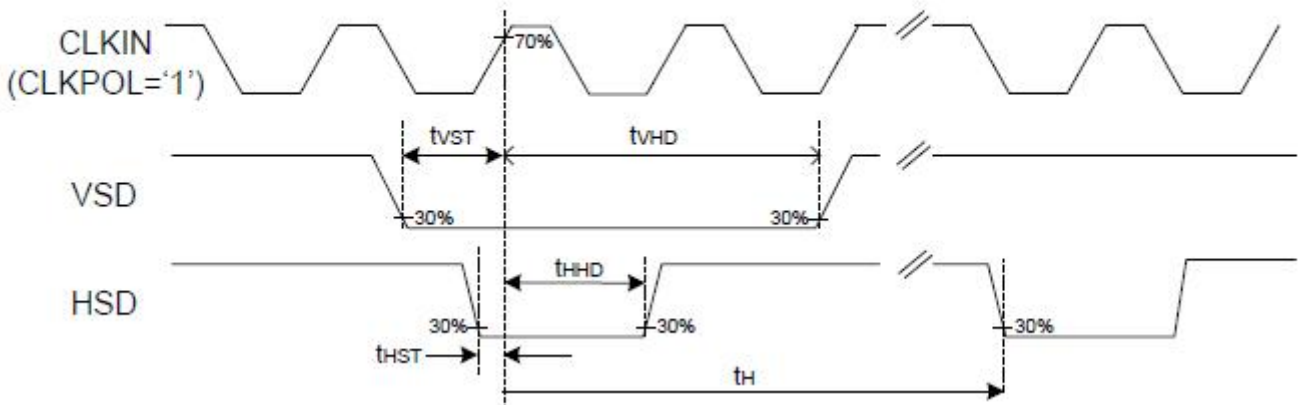


### 3.3.2. Input Clock and Data Timing Diagram:

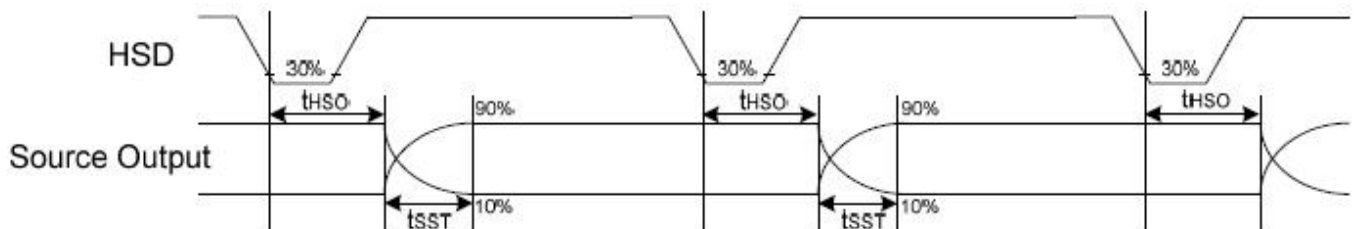
#### DE Mode (MODE='1')



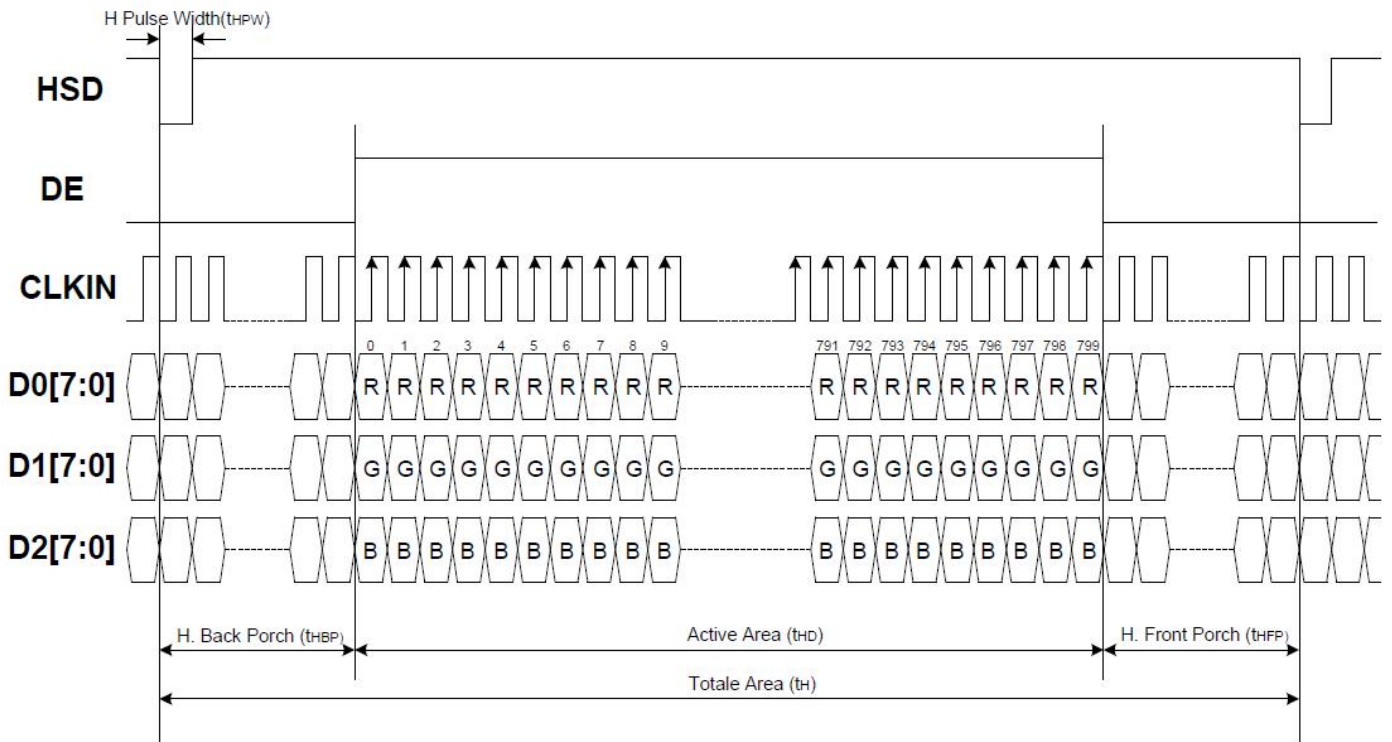
#### SYNC Mode (MODE='0')



#### Source Output timing Diagram (Cascade)

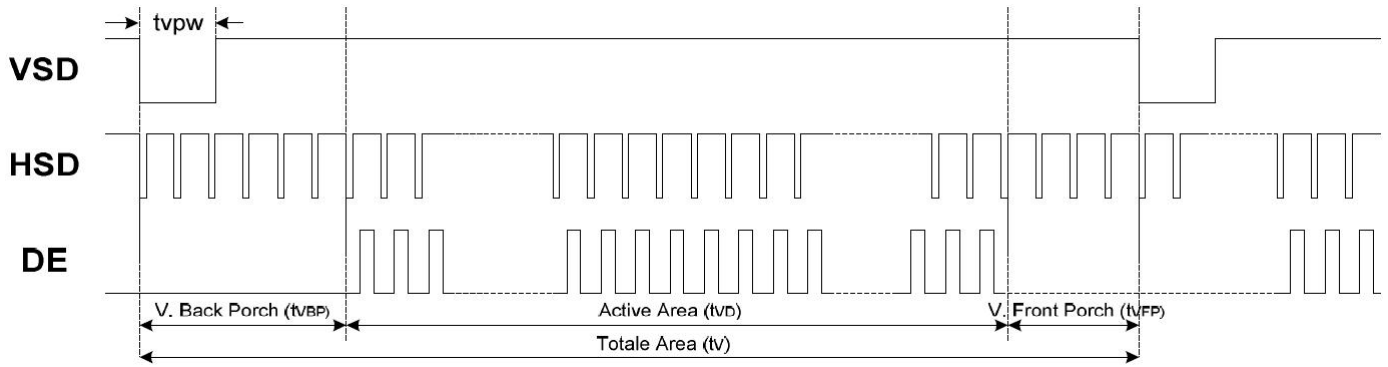


### 3.3.3. Timing



### Horizontal Input Timing

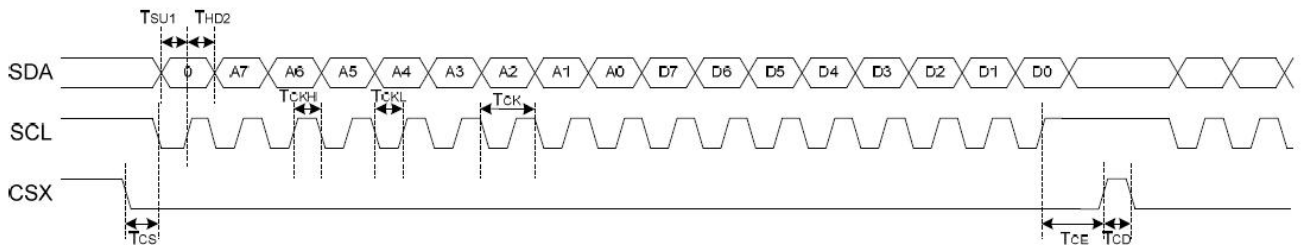
Parameter	Symbol	Value			Unit	
		Min.	Typ.	Max.		
Horizontal display area	$t_{HD}$	--	800	--	CLKIN	
CLKIN frequency	$f_{CLK}$	--	33.3	50	MHz	
1 Horizontal line period	$t_H$	862	1056	1200	CLKIN	
HSD pulse width	$t_{HPW}$	Min.	--	1	CLKIN	
		Typ.	--	--	CLKIN	
		Max.	--	40	CLKIN	
HSD back porch	SYNC	$t_{HBP}$	46	46	46	CLKIN
HSD front porch	SYNC	$t_{HFP}$	16	210	354	CLKIN



### Vertical Input Timing

Parameter	Symbol	Value			Unit
		Min.	Typ.	Max.	
Vertical display area	$t_{vD}$	--	480	--	HSD
VSD period time	$t_v$	510	525	650	HSD
VSD pulse width	$t_{vPW}$	1	--	20	HSD
VSD back porch	$t_{vBP}$	23	23	23	HSD
VSD front porch	$t_{vFP}$	7	22	147	HSD

### SPI Timing



Parameter	Symbol	Spec			Unit	Conditions
		Min.	Typ.	Max.		
SCL period	$T_{CK}$	60	--	--	ns	
SCL high width	$T_{CKH}$	30	--	--	ns	
SCL low width	$T_{CKL}$	30	--	--	ns	
Data setup time	$T_{SU1}$	12	--	--	ns	
Data hold time	$T_{HD1}$	12	--	--	ns	
CSX to SCL setup time	$T_{CS}$	20	--	--	ns	
CSX to SDA hold time	$T_{CE}$	20	--	--	ns	
CSX high pulse width	$T_{CD}$	50	--	--	ns	

### 4. Optical Specifications

Item	Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Viewing Angle	$\theta T$	$CR \geq 10$	30	40	-	degree	3
	$\theta B$		40	50	-		
	$\theta L$		40	50	-		
	$\theta R$		40	50	-		
Contrast Ratio	CR	$\theta = 0^\circ$	400	500	-	-	4
Color saturation	NTSC	CIE 1931	-	49	-	%	
Response Time	$T_{on} + T_{off}$	25°C	-	25	50	ms	5
Chromaticity	White	LCM	-0.03	0.280	+0.03	-	1
				Y			
	Red		X	0.535	+0.03		
			Y	0.302			
	Green		X	0.317	+0.03		
			Y	0.608			
	Blue		X	0.143	+0.03		
			Y	0.088			
Luminance (center)	L		230	280	-	cd/m <sup>2</sup>	1
Luminance Uniformity	$\Delta L$		75	80	-	%	1.2

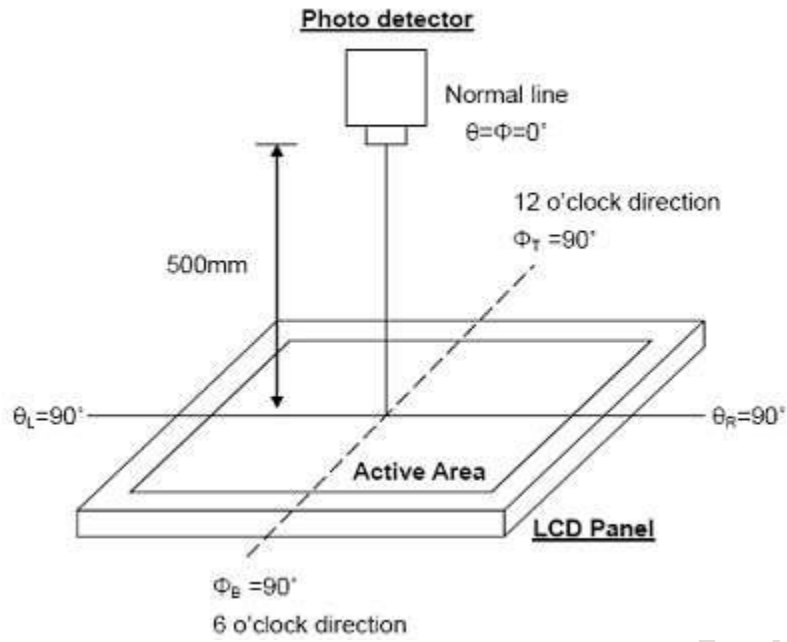
Note: The parameter is slightly changed by temperature, driving voltage and materiel

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:  $T_a = 25^\circ C$ .
- 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.

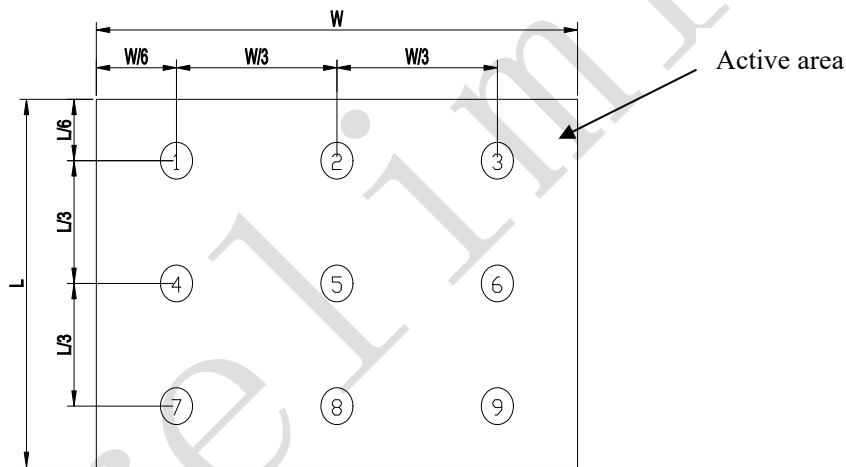


Note 2: The luminance uniformity is calculated by using following formula.

$$\Delta B_p = B_p (\text{Min.}) / B_p (\text{Max.}) \times 100 (\%)$$

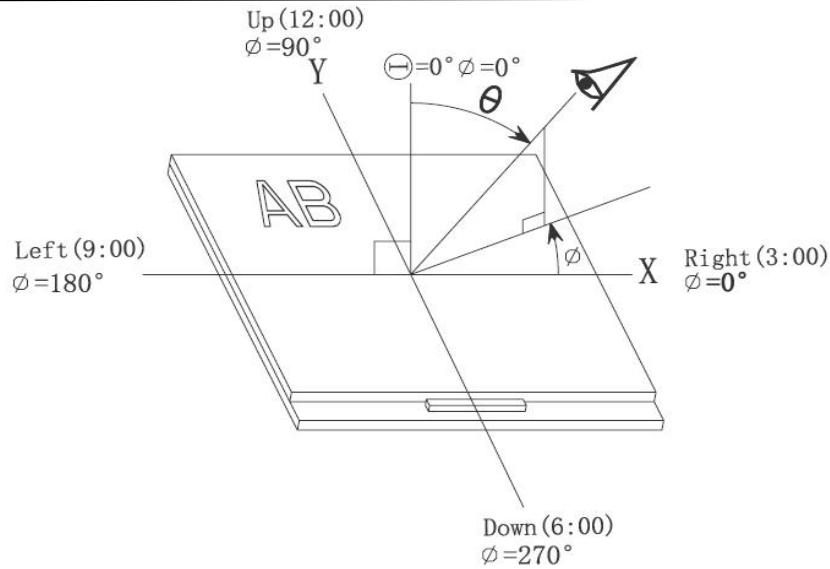
$B_p (\text{Max.})$  = Maximum brightness in 9 measured spots

$B_p (\text{Min.})$  = Minimum brightness in 9 measured spots.



Note 3: The definition of viewing angle:

Refer to the graph below marked by  $\theta$  and  $\phi$



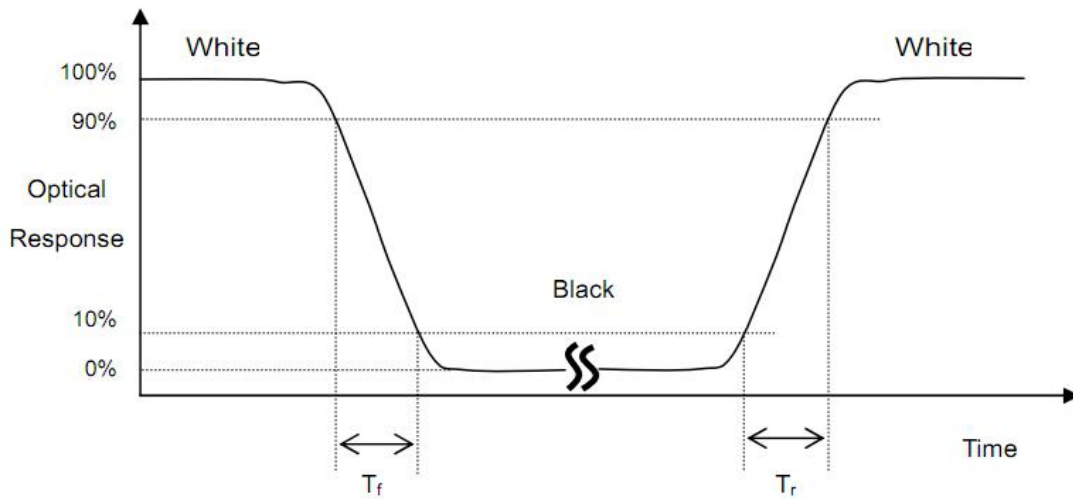
**Note 4: Definition of contrast ratio**

Contrast measurements shall be made at viewing angle of  $\Theta = 0$  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 “white” to “black”(Tf) and from “black” to “white”(Tr), 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°C; 120Hrs	Note1 ,Note4
Low Temperature Storage	Ta=-20°C; 120Hrs	Note1, Note4
High Temperature Operation	Ts=55°C; 120Hrs	Note2 ,Note4
Low Temperature Operation	Ts=-10°C; 120Hrs	Note4
Operation at High Temperature and Humidity	+50°C,90%RH; 120Hrs (no condensation)	Note4
Thermal Shock	-10°C/30min~+55°C/30min for a total 100 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°C ; 2hrs	Note5

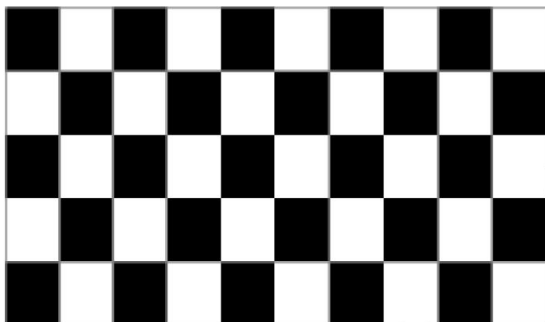
Note1: Ta is the ambient temperature of samples.

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 °C ± 2 °C , Operation with test pattern sustained for 2hrs,then change to gray pattern immediately. After 5 min's, the Mura must be disappeared completely.



(a) Test Pattern (chess board P pattern )

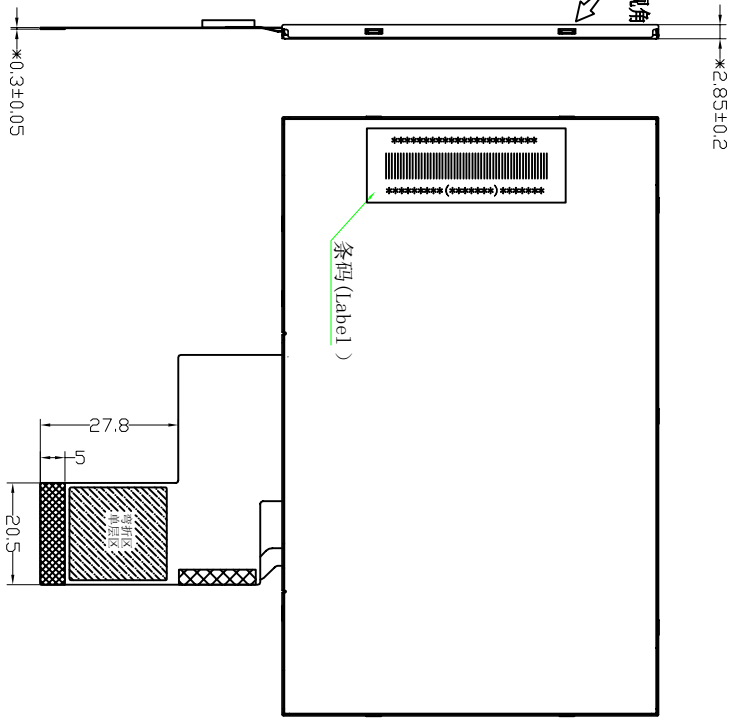
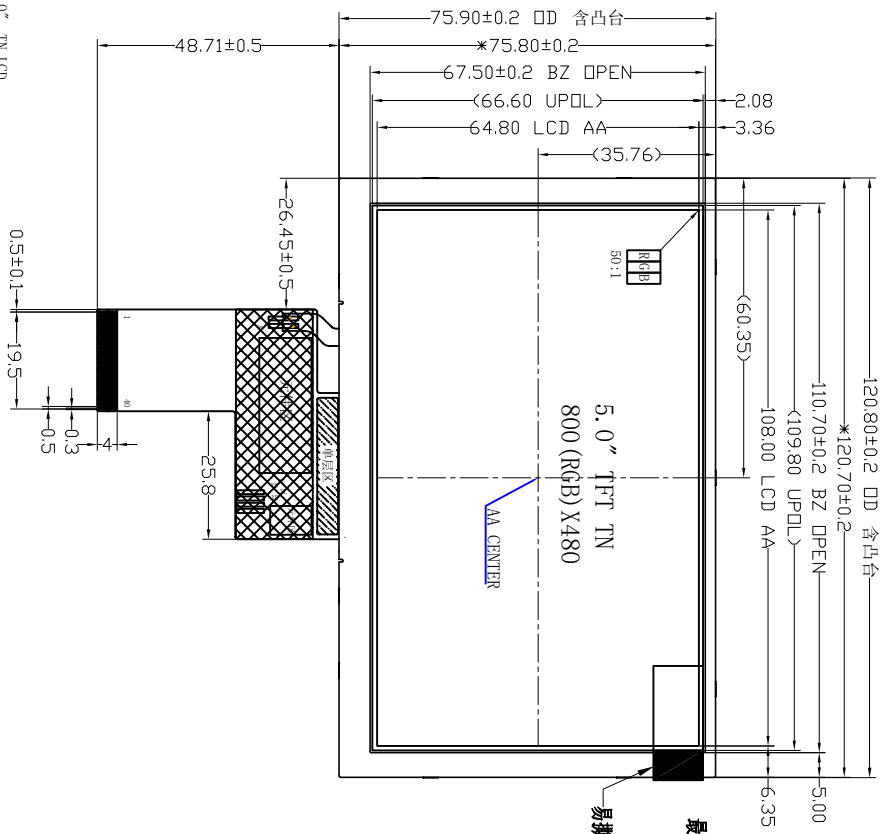


(b) Gray P pattern

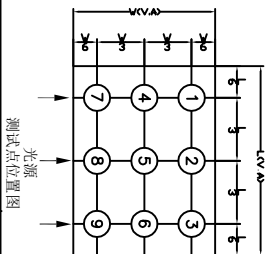


# 成品图

RoHS



- NOTES:
1. DISPLAY TYPE: 5.0", TN LCD
  2. DISPLAY MODE: Normally White
  3. VIEWING DIRECTION: 6.0° Clock (GIS)
  4. DRIVER IC: ILI6122+ILI5960
- . LCM (White 9 AVG 1/6) :
- Brightness: 280cd/m<sup>2</sup> (TYP) (用BME-7测)
  - Chromaticity: 0.280±0.03; 0.310±0.03.
  - Uniformity: 75%(MIN)
6. BACK LIGHT: 12 chip white LEDs If=20mA/LED Vf=17.4-21V
  7. OPERATING TEMP: -10°C TO 60°C; STORAGE TEMP: -20°C TO 70°C
  8. \* Critical Parameter: ( ) Ref Parameter; [ ] cpk Parameter
- Unspecified Tolerances: ±0.30mm
- Modification mark:
9. SUGGESTION: TP window size unilateral increase 0.3\*0.5mm than LCM A.A
  10. REQUIREMENTS ENVIRONMENTAL PROTECTION: RoHS



序号 No.	修订日期 DATE	修订记录 REVISION RECORD	修订者 REVISER

PIN	
1	LED K
2	LED A
3	GND
4	VDD
5	R0
6	R1
7	R2
8	R3
9	R4
10	R5
11	R6
12	R7
13	G0
14	G1
15	G2
16	G3
17	G4
18	G5
19	G6
20	G7
21	B0
22	B1
23	B2
24	B3
25	B4
26	B5
27	B6
28	B7
29	GND
30	DCLK
31	DISP
32	HSYNC
33	VSYNC
34	DE
35	NC
36	GND
37	XR
38	YD
39	XL
40	YU

**SATON** 视安通电子  
SAT INTERNATIONAL CO., LTD. SAT ELECTRONIC CO., LTD

产品名称 PROJECT NAME	5.0寸群创彩色液晶屏
物料编码 MATERIAL ITEM	1010500115

版本 REV.	V1
材料 MATERIAL	1010500115

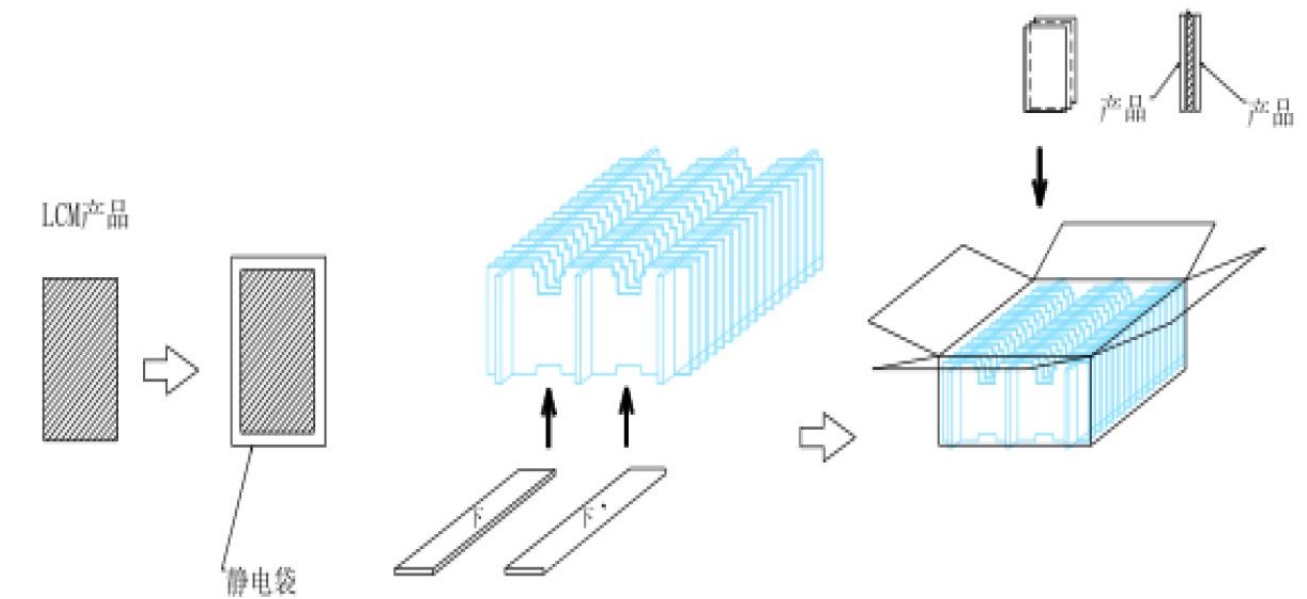
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比例 SCALE	1:1

单位 UNIT:	mm
第三角法	

日期 DATE:	
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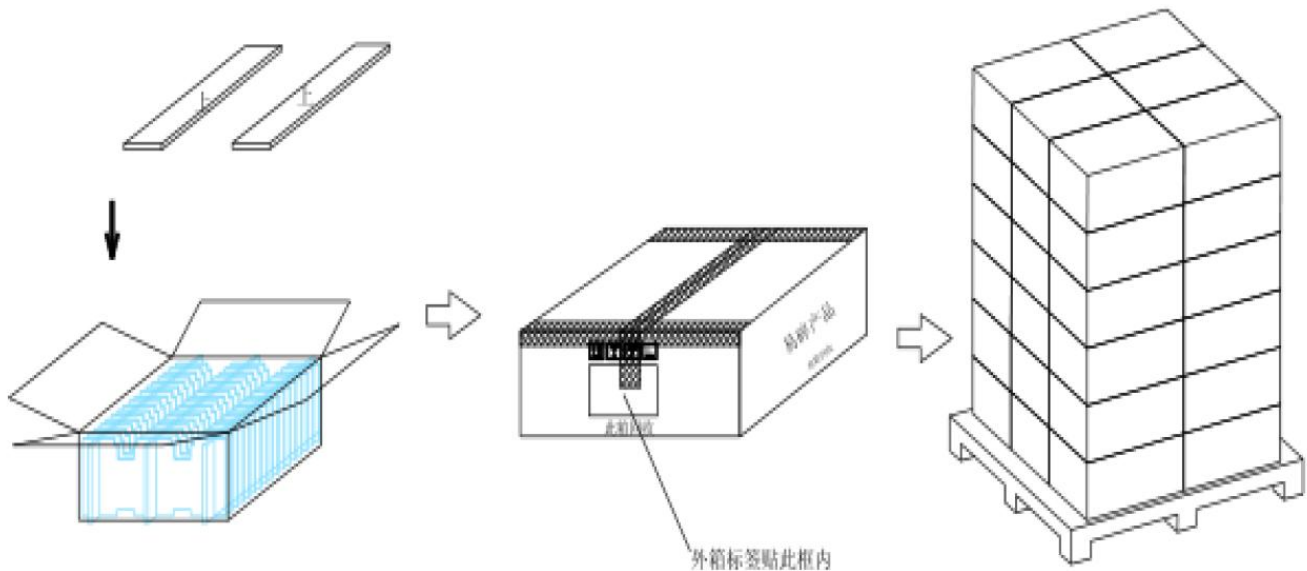
## 7. Package Drawing



**第一步：**  
LCM产品装入静电袋

**第二步：**  
把长卡，短卡组成卡阵（短卡朝向一致）  
形状和数量按照 BOM 实际物料  
卡阵底部放对应的 线刀卡后装箱

**第三步：**  
放产品，每个卡槽内放两片产品；  
2PCS 产品显示面相对，

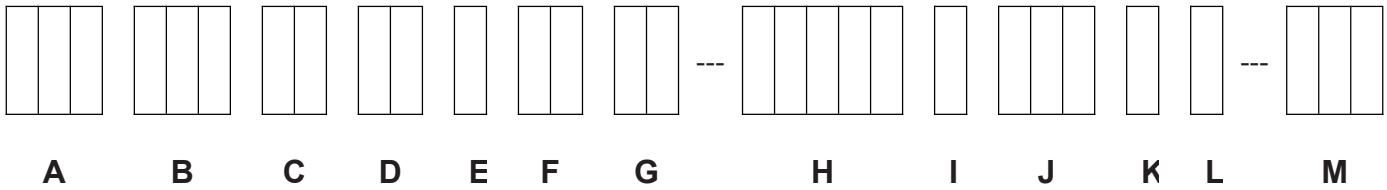


**第四步：**  
装箱后，按照BOM实际物料在纸箱内

**第五步：**  
最后胶带封箱，贴外箱标签

**第六步：**  
将每箱整齐摆放在栈板上并包裹  
最高可堆叠6层

### 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;
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